IBM Multi-site Workload Lifeline V2.5 User's Guide

Version 2 Release 5

SC27-4653-07

Note:
Before using this information and the product it supports, be sure to read the general information under "Notices" on page 331.

Eighth Edition (July 2018)

This edition applies to Version 2 Release 5 of IBM Multi-site Workload Lifeline (5655-UM4), and to subsequent releases and modifications until otherwise indicated in new editions.

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- Title and order number of this document
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About this document

This document describes how to use IBM® Multi-site Workload Lifeline to load balance TCP/IP workload requests across two sites at unlimited distances when both sites run the same server applications and have the same data sources.

Who should read this document

This document is written for system administrators who need to understand how to load balance TCP/IP workload requests.

How this document is organized

This document contains the following information:

- Chapter 1, "Overview of Multi-site Workload Lifeline," on page 1 introduces the concept of Lifeline Advisors, Lifeline Agents, external and internal load balancers, as well as an overview of Lifeline support for Linux on z Systems workloads, SNA workloads, and IBM MQ Cluster workloads.
- Chapter 2, "Preparing to use Multi-site Workload Lifeline," on page 35 contains the information about the tasks that you need to complete before you can configure Multi-site Workload Lifeline.
- Chapter 3, "Configuring Multi-site Workload Lifeline," on page 47 contains the information about the tasks to configure Multi-site Workload Lifeline.
- Chapter 4, "Starting the Lifeline Advisors and Agents," on page 69 contains the information about how to start the Lifeline Advisors and Agents that make up Multi-site Workload Lifeline.
- Chapter 5, "Diagnosing problems in Multi-site Workload Lifeline," on page 73 contains the information that you need to diagnose problems.
- Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93 describes the configuration statements of the Lifeline Advisors and Agents.
- Chapter 7, "Lifeline Advisor commands," on page 127 describes the commands that you can use to display Lifeline Advisor information and modify Lifeline Advisor state information.
- Chapter 8, "Lifeline z/OS Agent commands," on page 169 describes the commands that you can use to display Lifeline z/OS® Agent information and modify this Agent's state information.
- Chapter 9, "Lifeline Linux on z Systems Management Agent commands," on page 185 describes the commands that you can use to display Linux on z Systems Management Agent information and modify this Agent's state information.
- Chapter 10, "Network Management Interface for Multi-site Workload Lifeline," on page 193 describes the Network Management Interface (NMI) that you can use to monitor Lifeline metrics and statistics.
- Chapter 11, "Display Command API for Multi-site Workload Lifeline," on page 203 describes the Display Command API that you can use to issue Lifeline Advisor DISPLAY commands.
- Chapter 12, "Multi-site Workload Lifeline messages," on page 209 contains the Multi-site Workload Lifeline messages.

- Appendix A, “A sample started procedure for Lifeline Advisors,” on page 297 contains a sample procedure that can be used to start the Lifeline Advisor.
- Appendix B, “A sample started procedure for Lifeline z/OS Agents,” on page 299 contains a sample procedure that can be used to start the Lifeline z/OS Agent.
- Appendix C, “Sample Multi-Site Workload Lifeline configurations,” on page 301 provides several examples of workloads that can be managed by Multi-site Workload Lifeline and the Lifeline Advisor and Agent configuration statements for these workloads.
- Appendix D, “Sample AT-TLS configuration policies,” on page 323 provides samples of Policy Agent configuration statements to be used to enable AT-TLS policies between Lifeline Advisors, Lifeline Agents and external load balancers.
- Appendix E, “Sample Display Command API application,” on page 327 provides an example of how to use the sample user application to send a Lifeline Advisor DISPLAY command and process the response.
- Appendix F, “Accessibility,” on page 329 describes accessibility features to help users with physical disabilities.
- “Notices” on page 331 contains notices and trademarks used in this document.

How to use this document

To use this document, you should be familiar with the network access to your z/OS server applications, either TCP/IP or SNA. If your workload server applications reside on Linux on z Systems guests, you should also be familiar with Linux on z Systems and z/VM® management of these guests.

Determining whether a publication is current

As needed, IBM updates its publications with new and changed information. For a given publication, updates to the hardcopy and associated BookManager® softcopy are usually available at the same time. Sometimes, however, the updates to hardcopy and softcopy are available at different times. The following information describes how to determine if you are looking at the most current copy of a publication:

- At the end of a publication's order number there is a dash followed by two digits, often referred to as the dash level. A publication with a higher dash level is more current than one with a lower dash level. For example, in the publication order number GC28-1747-07, the dash level 07 means that the publication is more current than previous levels, such as 05 or 04.
- If a hardcopy publication and a softcopy publication have the same dash level, it is possible that the softcopy publication is more current than the hardcopy publication. Check the dates shown in the Summary of Changes. The softcopy publication might have a more recently dated Summary of Changes than the hardcopy publication.
- To compare softcopy publications, you can check the last two characters of the publication's file name (also called the book name). The higher the number, the more recent the publication. Also, next to the publication titles in the CD-ROM booklet and the readme files, there is an asterisk (*) that indicates whether a publication is new or changed.

How to contact IBM service

For immediate assistance, visit this website: http://www.ibm.com/support/entry/portal/Overview/Software/Other_Software/z~OS_Communications_Server/

Most problems can be resolved at this website, where you can submit questions and problem reports electronically, and access a variety of diagnosis information.

For telephone assistance in problem diagnosis and resolution (in the United States or Puerto Rico), call the IBM Software Support Center anytime (1-800-IBM-SERV). You will receive a return call within 8 business hours (Monday – Friday, 8:00 a.m. – 5:00 p.m., local customer time).

Outside the United States or Puerto Rico, contact your local IBM representative or your authorized IBM supplier.

If you would like to provide feedback on this publication, see "Communicating your comments to IBM" on page 339.

Conventions and terminology that are used in this document

Samples used in this book might not be updated for each release. Evaluate a sample carefully before applying it to your system.

Qualifying elements

Titles

Some topics apply only to Lifeline Advisors and the Lifeline Agents that reside on z/OS systems. Such topics have the feature information presented in parentheses as a qualifying element in the topic title. For example, the topic "(z/OS systems) Granting users explicit authority to control the Lifeline Advisor and Agent" applies only to Lifeline Advisors and those Lifeline Agents that reside on z/OS systems.

Notes

Information traditionally qualified as **Notes** is further qualified as follows:

Note Supplemental detail

Tip Offers shortcuts or alternative ways of performing an action; a hint

Guideline
Customary way to perform a procedure

Rule Something you must do; limitations on your actions

Restriction
Indicates certain conditions are not supported; limitations on a product or facility

Requirement
Dependencies, prerequisites

Result Indicates the outcome

How to read a syntax diagram

This syntax information applies to all commands and statements that do not have their own syntax described elsewhere.

The syntax diagram shows you how to specify a command so that the operating system can correctly interpret what you type. Read the syntax diagram from left to right and from top to bottom, following the horizontal line (the main path).

Symbols and punctuation

The following symbols are used in syntax diagrams:

Symbol
Description

►► Marks the beginning of the command syntax.

► Indicates that the command syntax is continued.

| Marks the beginning and end of a fragment or part of the command syntax.

►◄ Marks the end of the command syntax.

You must include all punctuation such as colons, semicolons, commas, quotation marks, and minus signs that are shown in the syntax diagram.

Parameters

The following types of parameters are used in syntax diagrams.

Required
Required parameters are displayed on the main path.

Optional
Optional parameters are displayed below the main path.

Default
Default parameters are displayed above the main path.

Parameters are classified as keywords or variables. For MVS™ console commands, the keywords are not case sensitive. You can code them in uppercase or lowercase. If the keyword appears in the syntax diagram in both uppercase and lowercase, the uppercase portion is the abbreviation for the keyword (for example, OPERand).

For the z/OS UNIX commands, the keywords must be entered in the case indicated in the syntax diagram.

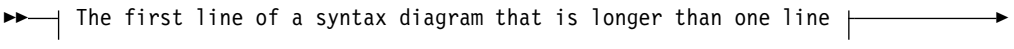
Variables are italicized, appear in lowercase letters, and represent names or values you supply. For example, a data set is a variable.

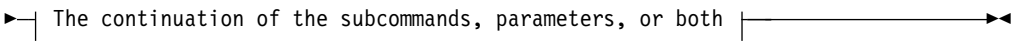
Syntax examples

In the following example, the USER command is a keyword. The required variable parameter is *user_id*, and the optional variable parameter is *password*. Replace the variable parameters with your own values.

Longer than one line

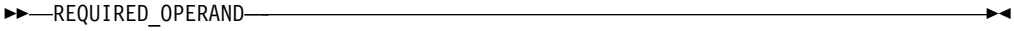
If a diagram is longer than one line, the first line ends with a single arrowhead and the second line begins with a single arrowhead.





Required operands

Required operands and values appear on the main path line. You must code required operands and values.

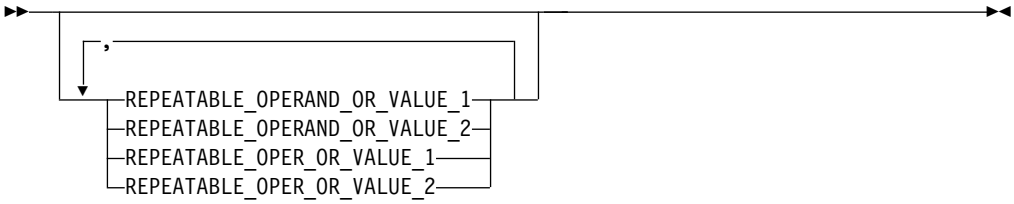


Optional values

Optional operands and values appear below the main path line. You do not have to code optional operands and values.

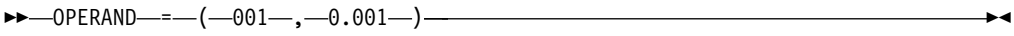
Selecting more than one operand

An arrow returning to the left above a group of operands or values means more than one can be selected, or a single one can be repeated.



Nonalphanumeric characters

If a diagram shows a character that is not alphanumeric (such as parentheses, periods, commas, and equal signs), you must code the character as part of the syntax. In this example, you must code OPERAND=(001,0.001).

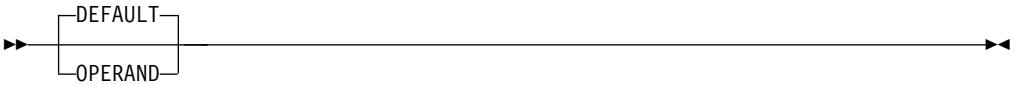


Blank spaces in syntax diagrams

If a diagram shows a blank space, you must code the blank space as part of the syntax. In this example, you must code OPERAND=(001 FIXED).

Default operands

Default operands and values appear above the main path line. Multi-site Workload Lifeline uses the default if you omit the operand entirely.



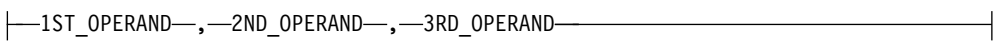
Variables

A word in all lowercase italics is a *variable*. Where you see a variable in the syntax, you must replace it with one of its allowable names or values, as defined in the text.

Syntax fragments

Some diagrams contain syntax fragments, which serve to break up diagrams that are too long, too complex, or too repetitious. Syntax fragment names are in mixed case and are shown in the diagram and in the heading of the fragment. The fragment is placed below the main diagram.

Syntax fragment:



How to send your comments

Your feedback is important in helping to provide the most accurate and high-quality information. If you have any comments about this document or any other z/OS Communications Server documentation, do one of the following:

- Go to the z/OS contact page at http://www.ibm.com/systems/z/os/zos/webqs.html. You can enter and submit your comments in the form provided at this Web site.
- Send your comments by e-mail to comsvrcf@us.ibm.com. Be sure to include the name of the document, the part number of the document, the version of z/OS Communications Server, and, if applicable, the specific location of the text that you are commenting on (for example, a section number, a page number or a table number).

Summary of changes

Changes made in IBM Multi-site Workload Lifeline Version 2 Release 5, as updated July 2018

This document contains information previously presented in SC27-4653-06, which supports IBM Multi-site Workload Lifeline Version 2 Release 5.

New Information

- "Activating a workload when not all members for the workload are registered" on page 57 has been added.
- "Deactivating a workload when not all members for the workload are registered" on page 58 has been added.

Changed Information

- "Overview of Lifeline in a SNA workload environment" on page 22 has been updated.
- "Operational characteristics of SNA workloads" on page 24 has been updated.
- "Activating a workload when the workload is not deactivated" on page 55 has been updated.
- "Deactivating a workload when not all Lifeline Agents are connected" on page 57 has been updated.
- Chapter 4, "Starting the Lifeline Advisors and Agents," on page 69 has been updated.
- "cross_sysplex_list" on page 99, and "sna_application_list" on page 118 have been updated.
- "MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information" on page 127, "MODIFY *advisor_proc*,ACTivate command: Activate workloads" on page 158, and "MODIFY *advisor_proc*,QUIESCE command: Quiesce workloads" on page 162 have been updated.
- "NMI message format" on page 195 has been updated.
- "AQS0155I" on page 238, "AQS0179I" on page 253, "AQS0201I" on page 263, "AQS0207I" on page 267, and "AQS0228W" on page 282 have been updated.

Changes made in IBM Multi-site Workload Lifeline Version 2 Release 5, as updated July 2017

This document contains information previously presented in SC27-4653-05, which supports IBM Multi-site Workload Lifeline Version 2 Release 5.

New Information

- "Granting a user application authority to use the Display Command API" on page 45 has been added.
- Chapter 11, "Display Command API for Multi-site Workload Lifeline," on page 203 and "Display Command API message format" on page 204 have been added.
- Messages "AQS0150I" on page 236, "AQS0226I" on page 282, and "AQS0227I" on page 282 have been added.

- Appendix E, “Sample Display Command API application,” on page 327 has been added.

Changed Information

- “How this document is organized” on page xi has been updated.
- Chapter 1, “Overview of Multi-site Workload Lifeline,” on page 1 has been updated.
- “Granting a network management application authority to use the Network Management Interface” on page 45 has been updated.
- “Interpreting the workload and LB displays” on page 76, “Verifying that the Lifeline Advisor and Agent systems are functioning correctly” on page 78, “Diagnosing why a workload is not being distributed to a server application” on page 81, and “Diagnosing workload distribution problems for server applications” on page 84 have been updated.
- “advisor_takeover_policy” on page 96 and “cross_sysplex_list” on page 99 have been updated.
- “cross_sysplex_list” on page 99 and “query_workload_list” on page 116 have been updated.
- “MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information” on page 127 and “MODIFY *advisor_proc*,TRANSfer command: Transfer messages for MQ workloads” on page 165 have been updated.
- Chapter 10, “Network Management Interface for Multi-site Workload Lifeline,” on page 193 has been updated.
- Message “AQS0008I” on page 211 has been updated.
- Messages “AQS0119I” on page 222, “AQS0164W” on page 244, “AQS0179I” on page 253, “AQS0184W” on page 259, and “AQS0192W” on page 263 have been updated.
- Messages “AQS0207I” on page 267, “AQS0215W” on page 274, “AQS0221I” on page 275, “AQS0222I” on page 276, “AQS0223I” on page 279, and “AQS0225I” on page 280 have been updated.
- Message “AQS0301I” on page 283 has been updated.

Changes made in IBM Multi-site Workload Lifeline Version 2 Release 5, as updated December 2016

This document contains information previously presented in SC27-4653-04, which supports IBM Multi-site Workload Lifeline Version 2 Release 5.

New Information

- “Diagnosing problems when a Lifeline Advisor TRANSFER command fails” on page 90 has been added.
- “MODIFY *advisor_proc*,TRANSfer command: Transfer messages for MQ workloads” on page 165 has been added.
- Messages “AQS0119I” on page 222, “AQS0215W” on page 274, and “AQS0220I” on page 275 through “AQS0225I” on page 280 have been added.

Changed Information

- “Diagnosing Linux on z Systems workload problems” on page 21, “Operational characteristics of SNA workloads” on page 24, “Overview of MQ Cluster Workloads” on page 29, and “Operational characteristics of MQ cluster workloads” on page 32 have been updated.

- Chapter 2, “Preparing to use Multi-site Workload Lifeline,” on page 35 and “(z/OS systems) Enabling the Lifeline Agents to communicate with MQ queue managers” on page 42 have been updated.
- Chapter 3, “Configuring Multi-site Workload Lifeline,” on page 47 has been updated.
- “Interpreting the workload and LB displays” on page 76, “Verifying that the Lifeline Advisor and Agent systems are functioning correctly” on page 78, and “Diagnosing workload distribution problems for IBM MQ clusters” on page 85 have been updated.
- Chapter 6, “Multi-site Workload Lifeline configuration statements,” on page 93 has been updated.
- Chapter 7, “Lifeline Advisor commands,” on page 127 has been updated.
- Chapter 10, “Network Management Interface for Multi-site Workload Lifeline,” on page 193 has been updated.
- Messages “AQS0010I” on page 212, “AQS0155I” on page 238, “AQS0162I” on page 242, “AQS0170I” on page 248, “AQS0179I” on page 253, “AQS0180W” on page 256, “AQS0207I” on page 267 have been updated.
- Appendix A, “A sample started procedure for Lifeline Advisors,” on page 297 has been updated.
- Appendix B, “A sample started procedure for Lifeline z/OS Agents,” on page 299 has been updated.
- Appendix C, “Sample Multi-Site Workload Lifeline configurations,” on page 301 has been updated.

Changes made in IBM Multi-site Workload Lifeline Version 2 Release 5, as updated November 2015

This document contains information previously presented in SC27-4653-03, which supports IBM Multi-site Workload Lifeline Version 2 Release 5.

New Information

- “failure_detection_groups” on page 102 has been added.

Changed Information

- Chapter 1, “Overview of Multi-site Workload Lifeline,” on page 1, “Operational characteristics of Linux on z Systems workloads” on page 19, and “Operational characteristics of SNA workloads” on page 24 have been updated.
- “Lifeline Advisor configuration statements” on page 93 has been updated.
- “cross_sysplex_list” on page 99 and “sna_application_list” on page 118 have been updated.
- “MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information” on page 127 has been updated.
- “MODIFY *agent_proc*,DISplay command: Display Lifeline Agent information” on page 169 has been updated.
- “Display Linux on z Systems Management Agent information” on page 185 has been updated.
- Messages “AQS0158I” on page 240 and “AQS0159I” on page 241 have been updated.
- Message “AQS0168I” on page 246 has been updated.
- Message “AQS0180W” on page 256 has been updated.

- Appendix C, “Sample Multi-Site Workload Lifeline configurations,” on page 301 has been updated.

Changes made in IBM Multi-site Workload Lifeline Version 2 Release 5, as updated July 2015

This document contains information previously presented in SC27-4653-02, which supports IBM Multi-site Workload Lifeline Version 2 Release 5.

New Information

- “IBM MQ Clusters” on page 13 and “IBM MQ Cluster Workloads” on page 29 have been added.
- “(z/OS systems) Authorizing the Lifeline Advisors and Agents to issue event-driven messages” on page 39 and “(z/OS systems) Enabling the Lifeline Agents to communicate with MQ queue managers” on page 42 have been added.
- “Customizing the NetView for z/OS Message Revision Table when configuring SNA workloads” on page 62 and “Configuring IBM MQ clusters” on page 68 have been added.
- “Diagnosing why a workload is not being distributed to an MQ cluster queue” on page 83 and “Diagnosing workload distribution problems for IBM MQ clusters” on page 85 have been added.
- “mq_manager_list” on page 112 has been added.
- Message “AQS0010I” on page 212 has been added.
- Message “AQS0191I” on page 263 has been added.

Changed Information

- Chapter 1, “Overview of Multi-site Workload Lifeline,” on page 1 has been updated.
- Chapter 2, “Preparing to use Multi-site Workload Lifeline,” on page 35 has been updated.
- “Lifeline Advisor configuration file” on page 47, “Lifeline Agent configuration file” on page 47, “Configuring a Lifeline Agent” on page 50, “Migrating IBM Multi-site Workload Lifeline” on page 55, and “Migrating the Lifeline Advisor” on page 58 have been updated.
- Chapter 5, “Diagnosing problems in Multi-site Workload Lifeline,” on page 73 has been updated.
- Chapter 6, “Multi-site Workload Lifeline configuration statements,” on page 93 has been updated.
- “MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information” on page 127, “MODIFY *advisor_proc*,ACTivate command: Activate workloads” on page 158, “MODIFY *advisor_proc*,DEACTivate command: Deactivate workloads” on page 160, and “MODIFY *advisor_proc*,QUIESCE command: Quiesce workloads” on page 162 have been updated.
- “MODIFY *agent_proc*,DISplay command: Display Lifeline Agent information” on page 169 and “MODIFY *agent_proc*,ENABLE command: Enable server applications” on page 177 have been updated.
- “Change the debug level” on page 190, “Dump internal trace records” on page 190, and “Terminate the Linux on z Systems Management Agent” on page 190 have been updated.
- Chapter 10, “Network Management Interface for Multi-site Workload Lifeline,” on page 193 has been updated.

- Messages “AQS0153I” on page 237 through “AQS0156I” on page 239 have been updated.
- Messages “AQS0158I” on page 240 and “AQS0159I” on page 241 have been updated.
- Message “AQS0162I” on page 242 has been updated.
- Messages “AQS0167I” on page 245 and “AQS0168I” on page 246 have been updated.
- Message “AQS0177I” on page 251 has been updated.
- Messages “AQS0179I” on page 253 and “AQS0180W” on page 256 have been updated.
- Message “AQS0185I” on page 259 has been updated.
- Messages “AQS0201I” on page 263 and “AQS0202I” on page 264 have been updated.
- Message “AQS0207I” on page 267 has been updated.
- Messages “AQS0308W” on page 289 through “AQS0310I” on page 290 have been updated.
- Messages “AQS0313I” on page 291 through “AQS0318W” on page 294 have been updated.
- Appendix C, “Sample Multi-Site Workload Lifeline configurations,” on page 301 has been updated.

Changes made in IBM Multi-site Workload Lifeline Version 2 Release 5

This document contains information previously presented in SC27-4653-01, which supports IBM Multi-site Workload Lifeline Version 2 Release 0.

Some topics apply only to Lifeline Advisors and the Lifeline Agents that reside on z/OS systems. Such topics have the feature information presented in parentheses as a qualifying element in the topic title. For example, the topic "(z/OS systems) Granting users explicit authority to control the Lifeline Advisor and Agent" applies only to Lifeline Advisors and those Lifeline Agents that reside on z/OS systems. See “Qualifying elements” on page xiii for more information.

New Information

- “Linux on z Systems Workloads” on page 13 and “SNA workloads” on page 22 have been added.
- “(z/OS systems) Authorizing the Lifeline Agents to monitor SNA applications” on page 41 has been added.
- “Activating a workload for the first time” on page 55, “Activating a workload when the workload is not deactivated” on page 55, “Activating or quiescing a workload when not all first-tier load balancers are registered” on page 56, “Activating a workload when not all Lifeline Agents are connected” on page 56, “Deactivating a workload when not all Lifeline Agents are connected” on page 57, and “Customizing the VTAM started procedure when configuring SNA workloads” on page 62 have been added.
- “Diagnosing problems in the Linux on z Systems Management Agent” on page 90 has been added.
- Lifeline Advisor configuration statements “management_guest_list” on page 110 and “sna_application_list” on page 118, and Lifeline Agent configuration statement “site_name” on page 125 have been added.

- Chapter 9, “Lifeline Linux on z Systems Management Agent commands,” on page 185 has been added. This chapter applies to the Linux on z Systems Management Agent. For information about issuing commands to the z/OS Agent, see Chapter 8, “Lifeline z/OS Agent commands,” on page 169.
- Message “AQS0009I” on page 211 has been added.
- Messages “AQS0207I” on page 267 through “AQS0214I” on page 274 have been added.
- Sample configuration statements “Multi-site Workload Lifeline configuration Example 4” on page 310 and “Multi-site Workload Lifeline configuration Example 5” on page 313 have been added.

Changed Information

- Chapter 1, “Overview of Multi-site Workload Lifeline,” on page 1 has been updated.
- Chapter 2, “Preparing to use Multi-site Workload Lifeline,” on page 35 has been updated.
- “Lifeline Agent configuration file” on page 47, “Configuring a Lifeline Agent” on page 50, “Migrating IBM Multi-site Workload Lifeline” on page 55, “Configuring and starting syslogd” on page 59, “(z/OS systems) Customizing the TCP/IP profiles of the TCP/IP stacks” on page 60, and “Configuring external load balancers” on page 63 have been updated.
- Chapter 4, “Starting the Lifeline Advisors and Agents,” on page 69 has been updated.
- Chapter 5, “Diagnosing problems in Multi-site Workload Lifeline,” on page 73 has been updated.
- Chapter 6, “Multi-site Workload Lifeline configuration statements,” on page 93 has been updated.
- “MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information” on page 127, “MODIFY *advisor_proc*,ACTivate command: Activate workloads” on page 158, “MODIFY *advisor_proc*,DEACTivate command: Deactivate workloads” on page 160, “MODIFY *advisor_proc*,DUMPLog command: Dump the internal debug records” on page 162, and “MODIFY *advisor_proc*,QUIESCE command: Quiesce workloads” on page 162 have been updated.
- “MODIFY *agent_proc*,DISplay command: Display Lifeline Agent information” on page 169 and “MODIFY *agent_proc*,DUMPLog command: Dump the internal trace records” on page 182 have been updated.
- Chapter 10, “Network Management Interface for Multi-site Workload Lifeline,” on page 193 has been updated.
- Messages “AQS0004I” on page 209 through “AQS0008I” on page 211 have been updated.
- Messages “AQS0105I” on page 214 through “AQS0111I” on page 217 have been updated.
- Messages “AQS0114I” on page 219 through “AQS0118I” on page 222 have been updated.
- Message “AQS0120I” on page 223 has been updated.
- Messages “AQS0122I” on page 224 and “AQS0123I” on page 224 have been updated.
- Message “AQS0127W” on page 226 has been updated.
- Message “AQS0130I” on page 228 has been updated.
- Message “AQS0132I” on page 229 has been updated.

- Messages “AQS0135W” on page 230 through “AQS0140I” on page 233 have been updated.
- Message “AQS0144I” on page 234 has been updated.
- Message “AQS0147I” on page 235 has been updated.
- Messages “AQS0156I” on page 239 through “AQS0159I” on page 241 have been updated.
- Message “AQS0162I” on page 242 has been updated.
- Messages “AQS0167I” on page 245 and “AQS0168I” on page 246 have been updated.
- Messages “AQS0174I” on page 250 through “AQS0176I” on page 251 have been updated.
- Messages “AQS0179I” on page 253 and “AQS0180W” on page 256 have been updated.
- Message “AQS0182I” on page 258 has been updated.
- Messages “AQS0185I” on page 259 through “AQS0188W” on page 261 have been updated.
- Messages “AQS0201I” on page 263 and “AQS0202I” on page 264 have been updated.
- Messages “AQS0204I” on page 265 through “AQS0206I” on page 267 have been updated.
- Messages “AQS0300I” on page 283 through “AQS0303I” on page 286 have been updated.
- Messages “AQS0308W” on page 289 through “AQS0318W” on page 294 have been updated.
- Appendix A, “A sample started procedure for Lifeline Advisors,” on page 297 has been updated.
- Appendix B, “A sample started procedure for Lifeline z/OS Agents,” on page 299 has been updated.
- Appendix C, “Sample Multi-Site Workload Lifeline configurations,” on page 301 has been updated.

Removed Information

- Message AQS0191I has been removed.
- Message AQS0200I has been removed.

Changes made in IBM Multi-site Workload Lifeline Version 2 Release 0, as updated June 2014

This document contains information previously presented in SC27-4653-00, which supports IBM Multi-site Workload Lifeline Version 2 Release 0. This document contains minor maintenance updates.

Changed information

- “Diagnosing problems when the Lifeline Agent connection terminates” on page 88 has been updated.
- “MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information” on page 127 has been updated.
- “MODIFY *advisor_proc*,ACTivate command: Activate workloads” on page 158 has been updated.
- NMI message format has been updated.

Changes made in IBM Multi-site Workload Lifeline Version 2 Release 0

This document contains information previously presented in SC23-8600-03, which supports IBM Multi-site Workload Lifeline Version 1 Release 1. This document contains minor maintenance updates and updates pertaining to Active/Query workload support.

New Information

- " Authorizing the Lifeline Advisor to accept secure peer Advisor connections" on page 37, "(z/OS systems) Authorizing the Lifeline Advisor to accept secure Agent connections" on page 38, and "Authorizing the Lifeline Advisor to accept secure Load Balancer connections" on page 38 have been added.
- "Migrating IBM Multi-site Workload Lifeline" on page 55, "Migrating the Lifeline Advisor" on page 58, and "Migrating the Lifeline Agent" on page 59 have been added.
- Messages "AQS0007I" on page 210, "AQS0008I" on page 211, "AQS0106I" on page 215 have been added.
- Messages "AQS0201I" on page 263 through "AQS0206I" on page 267 have been added.
- Messages "AQS0300I" on page 283 through "AQS0318W" on page 294 have been added.

Changed information

- Chapter 1, "Overview of Multi-site Workload Lifeline," on page 1 has been updated.
- "(z/OS systems) Granting users explicit authority to control the Lifeline Advisor and Agent" on page 35 has been updated.
- Chapter 3, "Configuring Multi-site Workload Lifeline," on page 47 has been updated.
- "Diagnosing problems when a workload is not distributed" on page 81 and "Diagnosing workload distribution problems" on page 84 have been updated.
- Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93 has been updated.
- Chapter 7, "Lifeline Advisor commands," on page 127 has been updated.
- Chapter 10, "Network Management Interface for Multi-site Workload Lifeline," on page 193 has been updated.
- The following messages have been updated:
  - Message "AQS0105I" on page 214 has been updated.
  - Message "AQS0124I" on page 225 has been updated.
  - Message "AQS0127W" on page 226 has been updated.
  - Messages "AQS0135W" on page 230 through "AQS0137I" on page 232 have been updated.
  - Message "AQS0153I" on page 237 has been updated.
  - Message "AQS0156I" on page 239 has been updated.
  - Messages "AQS0158I" on page 240 and "AQS0159I" on page 241 have been updated.
  - Message "AQS0162I" on page 242 has been updated.
  - Message "AQS0164W" on page 244 has been updated.

  - Messages “AQS0166I” on page 245 through “AQS0168I” on page 246 have been updated.
  - Messages “AQS0173I” on page 250 through “AQS0178I” on page 252 have been updated.
  - Message “AQS0180W” on page 256 has been updated.
  - Message “AQS0182I” on page 258 has been updated.
  - Message “AQS0185I” on page 259 has been updated.
  - Message “AQS0188W” on page 261 has been updated.
  - Message “AQS0189W” on page 262 has been updated.
  - Message AQS0191I has been updated.
- Appendix C, “Sample Multi-Site Workload Lifeline configurations,” on page 301 has been updated.

Removed information

- Message AQS0152I has been removed.
- Message AQS0154I has been removed.

Changes made in IBM Multi-site Workload Lifeline Version 1 Release 1

This document contains information previously presented in SC23-8600-01, which supports IBM Multi-site Workload Lifeline Version 1 Release 1. This document contains minor maintenance updates.

New Information

- “Intermediary nodes” on page 13 has been added.
- Lifeline Advisor configuration statement “intermediary_node_list” on page 105 has been added.
- Message “AQS0190I” on page 262 has been added.
- Sample configuration statement “Multi-site Workload Lifeline configuration Example 2” on page 304 has been added.

Changed information

- Chapter 1, “Overview of Multi-site Workload Lifeline,” on page 1 has been updated.
- Chapter 6, “Multi-site Workload Lifeline configuration statements,” on page 93 has been updated.
- “Lifeline Advisor configuration statements” on page 93 has been updated.
- “agent_id_list” on page 98 has been updated.
- Message “AQS0158I” on page 240 has been updated.
- Message “AQS0159I” on page 241 has been updated.
- Message “AQS0166I” on page 245 has been updated.
- Appendix C, “Sample Multi-Site Workload Lifeline configurations,” on page 301 has been updated.

Changes made in IBM Multi-site Workload Lifeline Version 1 Release 1

This document contains information previously presented in SC23-8600-00, which supports IBM Multi-site Workload Lifeline Version 1 Release 1. This document contains minor maintenance updates.

New Information

- Lifeline Advisor configuration statement "peer_advisor_id" on page 115 has been added.
- Lifeline Advisor configuration statement "advisor_id_list" on page 123 has been added.
- Message "AQS0190I" on page 262 has been added.
- Message AQS0191I has been added.

Changed information

- "External load balancers" on page 10 has been updated.
- "(z/OS systems) Granting users explicit authority to control the Lifeline Advisor and Agent" on page 35 has been updated.
- "(z/OS systems) Configuring Lifeline Agents to automatically restart" on page 54 has been updated.
- "cross_sysplex_list" on page 99 has been updated.
- "advisor_id" on page 122 has been updated.
- Message "AQS0006I" on page 210 has been updated.
- Message "AQS0116I" on page 220 has been updated.
- Message "AQS0125I" on page 225 has been updated.
- Message "AQS0147I" on page 235 has been updated.
- Message "AQS0168I" on page 246 has been updated.

Chapter 1. Overview of Multi-site Workload Lifeline

Multi-site Workload Lifeline provides the ability to load balance TCP/IP workload requests across two sites at unlimited distances, when both sites are running the same server applications and have the same data sources. To load balance workload requests, Multi-site Workload Lifeline either defines two tiers of load balancing or uses IBM MQ clusters.

A workload consists of one or more groups of applications that access the same data sources to provide related services for a client. All group members for a workload are configured as follows:

- In one or more load balancer application groups within external load balancers as server applications
- In one or more MQ cluster queue groups within Multi-site Workload Lifeline as MQ cluster queues
- A combination of load balancer application groups and MQ cluster queue groups

The server applications or MQ cluster queues in these groups provide the same service for that client.

Rule: All subsequent use of the term "workload groups" refers to both load balancer application groups configured in external load balancers and MQ cluster queue groups configured in Multi-site Workload Lifeline.

Each server application or MQ cluster queue within a workload group can provide the same services as the other applications or MQ cluster queues in the group. You can group server applications or MQ cluster queues that access different data sources into their own workload to provide more granular control of each group of applications or MQ cluster queues.

For a workload consisting of server applications, a first-tier load balancer registers application groups that contain members that are in both sites. These members are considered second-tier load balancers. These members can be external load balancers, sysplex distributed DVIPAs, or intermediary nodes. When the first-tier load balancer distributes connections for an Active/Standby workload, it distributes work only to the second-tier load balancers in one active site. When the first-tier load balancer distributes connections for an Active/Query workload, it distributes work to the second-tier load balancers in the active or both active sites.

An external load balancer, operating as a second-tier load balancer, registers groups of server applications that are on the same site. As this external load balancer receives a workload connection request from a first-tier load balancer, the second-tier external load balancer distributes the request to one of the server applications in the matching application group.

A workload that uses MQ cluster queues is called an MQ cluster workload. An IBM MQ cluster is used to distribute messages for the workload to the MQ queue managers within the MQ cluster. When the MQ cluster distributes connections for an Active/Standby workload, it distributes messages only to the MQ queue managers on the active site.

Rule: MQ cluster workloads can be configured only as Active/Standby workloads.

Multi-site Workload Lifeline consists of Lifeline Advisors and Lifeline Agents. Lifeline Advisors run as processes on z/OS, and Lifeline Agents run as processes on z/OS and Linux on z Systems Management guests. The primary Lifeline Advisor communicates with external load balancers, if applicable, one or more Lifeline Agents, and possibly a secondary Lifeline Advisor. Lifeline Advisor uses the Server/Application State Protocol (SASP) when communicating with external load balancers.

Each workload that is configured to Multi-site Workload Lifeline is classified as an Active/Standby or Active/Query workload. By definition, an Active/Standby workload can be distributed to only one site at a time, because the workload might contain transactions that update databases. By contrast, an Active/Query workload can be distributed to both sites at the same time, because the workload contains only transactions that query databases. Multi-site Workload Lifeline enforces the single or dual site distribution. If more than one workload is configured, some of the workloads can be distributed to one site, some workloads can be distributed to the other site, and the remaining workloads can be distributed to both sites.

An Active/Query workload is associated with an Active/Standby workload. The database sources that are updated by an Active/Standby workload's transactions are the same database sources that are queried by an Active/Query workload's transactions. Database replication ensures that database updates that occur on the active site are replicated to the standby site. Therefore, the Active/Query workload can query the database on either site. A metric called average replication latency state is used to determine whether the database on the standby site is treated as stale. Average database replication latency is a measure of how long it takes for database updates on the active site to be replicated to the standby site. A configured threshold for average replication latency is specified on the data replication product and is used to determine the average database replication state. When this threshold is exceeded, Lifeline receives an acute latency state, and the database on the standby site is considered stale.

A workload is unavailable on a site if its workload group is unavailable.

When a single workload defines multiple workload groups for an Active/Standby workload, the services that each group provides depend on each other. As a result, if one of the groups is unavailable on that site, the workload is not available on that site.

Rule: For an Active/Query workload, only a single load balancer application group can be defined.

For an Active/Standby workload, a workload failure occurs if at least one of the workload groups, either a load balancer application group or, if configured, that group's failure detection group, on the site where the workload is active has been continuously unavailable for the failure detection interval that is configured for the workload.

An Active/Standby workload is unavailable if either of the following conditions is true:

- All of the workload's server applications within a load balancer application group or, if configured, that group's failure detection group are unavailable.

- All instances of the workload's MQ cluster queue within an MQ cluster queue group are unavailable.

A server application is considered unavailable if any of the following conditions is true:

- The server application is not active.
- The server application is active but not fully operational.
- The system on which the server application runs is resource constrained.

An MQ cluster queue instance is considered unavailable if any of the following conditions is true:

- The MQ queue manager that hosts the MQ cluster queue is not active.
- The MQ queue manager is active but has either not defined the MQ cluster queue or the MQ cluster queue is not enabled to receive messages.
- The system on which the MQ queue manager runs is resource constrained.

For an Active/Query workload, a workload failure occurs if its load balancer application group or, if configured, that group's failure detection group, on the sites where the workload is active has been continuously unavailable for the failure detection interval that is configured for the workload.

An Active/Query workload is unavailable if all of its server applications within the load balancer application group are unavailable or the database on the standby site is stale. A server application is considered unavailable if any of the following conditions is true:

- The server application is not active.
- The server application is active but not fully operational.
- The system on which the server application runs is resource constrained.

Rules:

- When this information describes z/OS target systems, *site* and *sysplex* are used interchangeably.
- All z/OS target systems in a particular site must belong to the same sysplex.
- Linux on z Systems target systems are not configured in a sysplex. However, they will belong to the same site as the co-located z/OS target systems.

In a typical configuration, the first-tier load balancer determines which site to route a new workload request to and forwards the request to a second-tier load balancer. The second-tier load balancer determines which server application within the site to route the workload request to and forwards it to the z/OS system where the server application is running. Multi-site Workload Lifeline provides the different tiers with routing recommendations based on the availability and health of the server applications and the z/OS systems within the site.

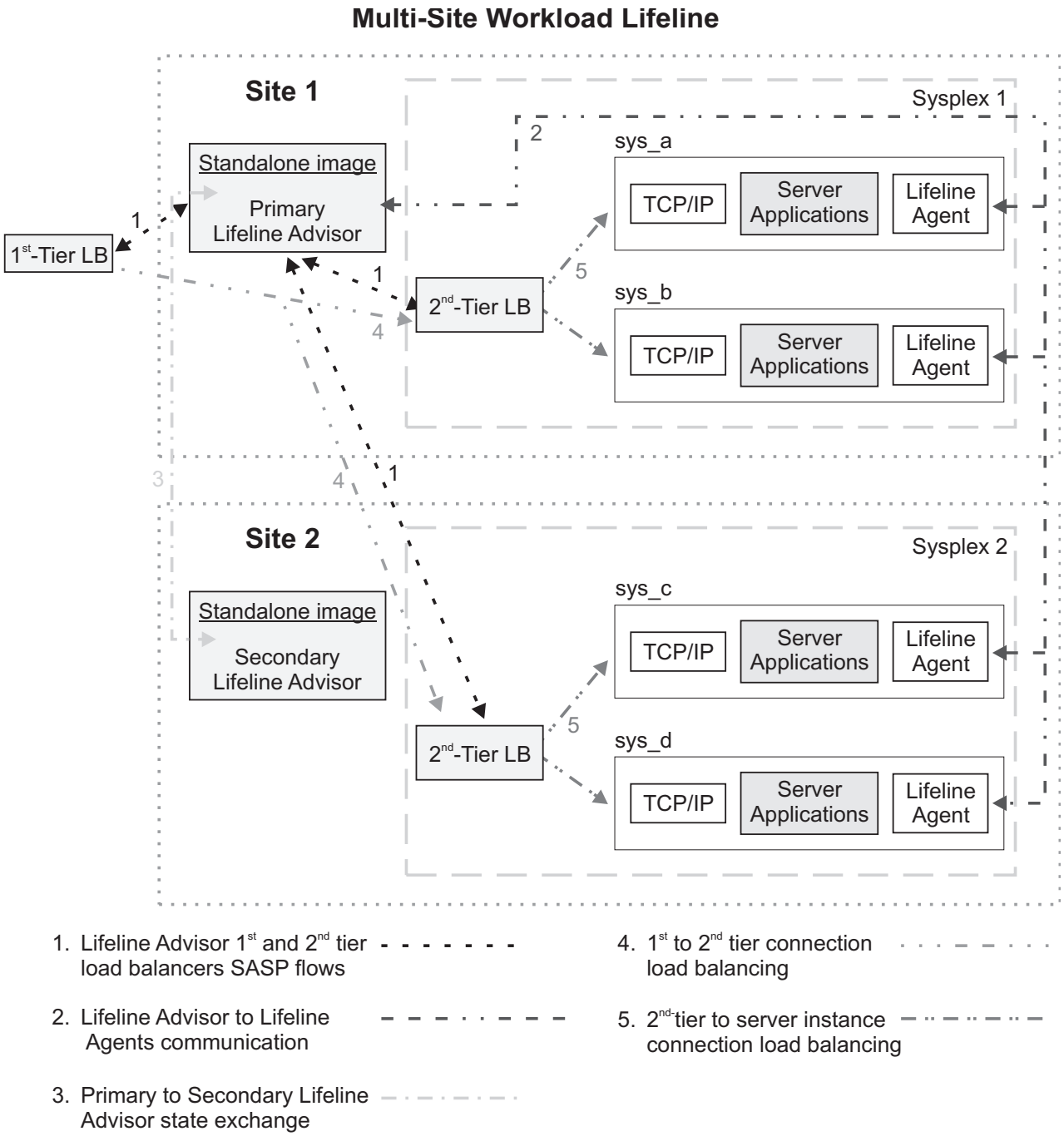


Figure 1. Relationships between external load balancers, Lifeline Advisors, and Lifeline Agents

In Figure 1, the Lifeline Agents running on each z/OS system in the two sites, Sysplex1 and Sysplex2, monitor the health of the server applications and the system where the Agent is active. The Lifeline Agents periodically send this information to the primary Lifeline Advisor, indicated by the network flows labeled **2**. The primary Lifeline Advisor uses this information to calculate routing recommendations for the workloads that use these server applications. The Lifeline Advisor periodically sends recommendations to first-tier load balancers about which site to route workload requests to and recommendations to second-tier load balancers about which server application within a site to route the workload requests to, indicated by the network flows labeled **1**.

The primary Lifeline Advisor also periodically notifies the secondary Lifeline Advisor about any changes in the workload states, indicated by the network flows labeled **3**, so that the secondary Advisor can take over primary Advisor responsibilities if the current primary Advisor becomes not-operational.

When workload requests are handled by the first-tier load balancers, based on routing recommendations from the Lifeline Advisor, the load balancer selects a site and forwards the request to the second-tier load balancer in that site, indicated by the network flows labeled **4**. When workload requests are handled by the second-tier load balancers, based on routing recommendations from the Lifeline Advisor, the load balancer selects a server application in the site and forwards it to the TCP/IP stack running on the z/OS system, indicated by the network flows labeled **5**. When these second-tier load balancers are external, they receive routing recommendations directly from the Lifeline Advisor. When these second-tier load balancers are internal, also known as z/OS sysplex distributors, they reside on a z/OS system in the site, and receive routing recommendations directly by using z/OS Communications Server functions. For more information about the z/OS sysplex distributor, see *z/OS Communications Server: IP Configuration Guide*.

In another configuration, the second-tier load balancer is not responsible for routing workload requests to a server application within a site. In this case, load balancing within a site will not be accomplished by using a second-tier load balancer such as the z/OS sysplex distributor. Instead, it will be performed by some other node, which is called an intermediary node.

In Figure 2 on page 6, static VIPA addresses might be the preferable method to reach target server applications rather than distributable dynamic VIPAs. These static VIPAs are considered the intermediary node. The first-tier load balancer will distribute workload requests directly to the intermediary node (that is, to server applications using static VIPAs) rather than a second-tier load balancer.

In Figure 3 on page 7, a customized load balancing solution that does not communicate with the Lifeline Advisor might be the preferable method to reach target server applications rather than distributable dynamic VIPAs. These load balancers are considered the intermediary node. The first-tier load balancer will distribute workload requests directly to the intermediary node (that is, to the customized load balancing solution) rather than a second-tier load balancer. The intermediary node will then distribute workload requests to the server applications within the site.

In both cases, the z/OS sysplex distributor is configured as a second-tier load balancer, though it will not distribute workload requests. The z/OS sysplex distributor is used to dynamically determine the set of server applications for each workload, thus these server application instances can be monitored. Multi-site Workload Lifeline provides routing recommendations only to the first-tier load balancer.

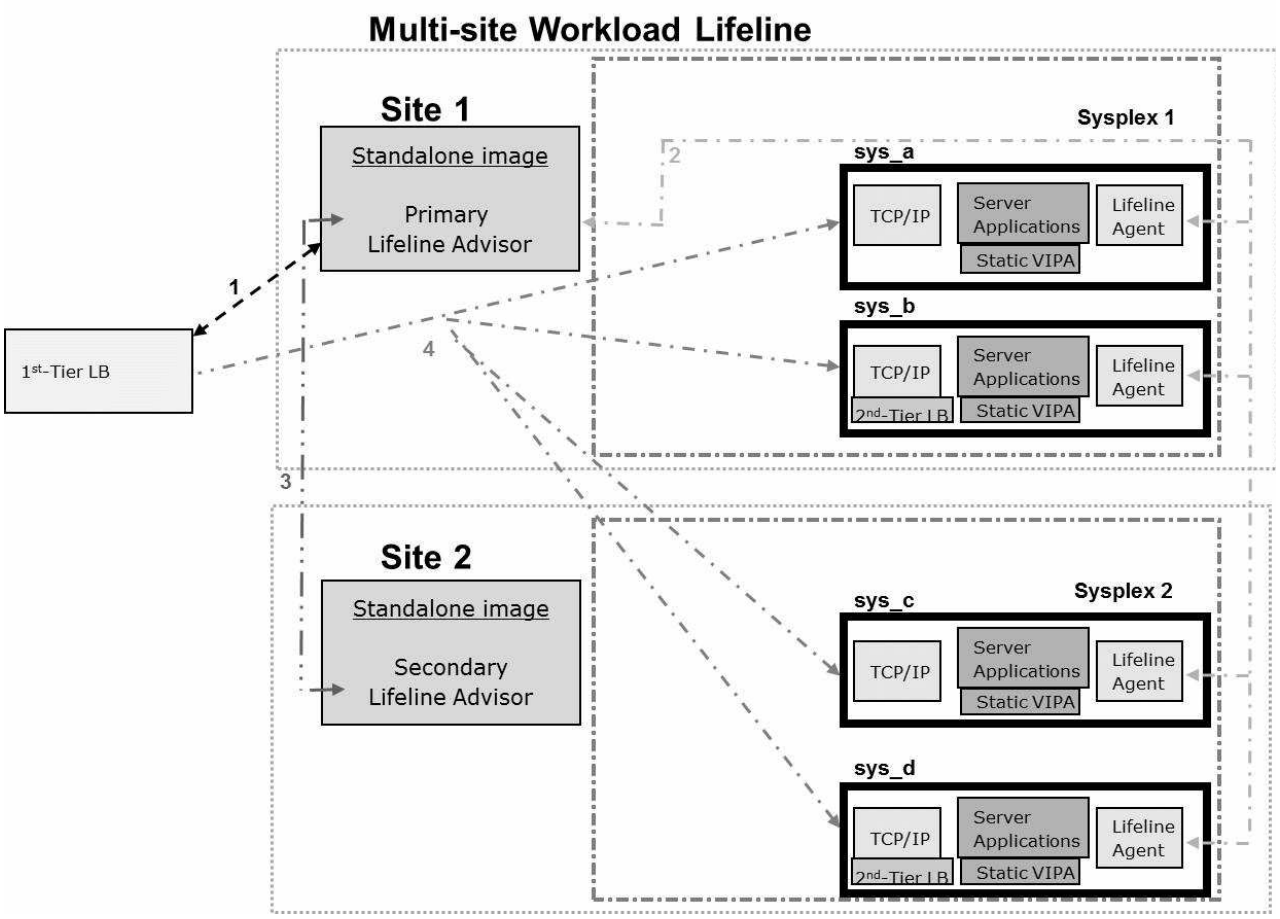


Figure 2. Relationships between external load balancers, internal intermediary nodes, Lifeline Advisors, and Lifeline Agents

In Figure 2, the Lifeline Agents, Lifeline Advisors, and first-tier load balancers communicate as is shown in Figure 1 on page 4. However, when a first-tier load balancer handles workload requests based on routing recommendations from the Lifeline Advisor, the load balancer selects a site and forwards the request directly to the intermediary node as indicated by the network flows labeled **4**. In this case, the intermediary node is the TCP/IP stack running on the z/OS system that owns the static VIPA. No second-tier load balancers distribute workload requests within the site. However, these second-tier load balancers that are configured as z/OS sysplex distributors are used to monitor the server applications for the workload.

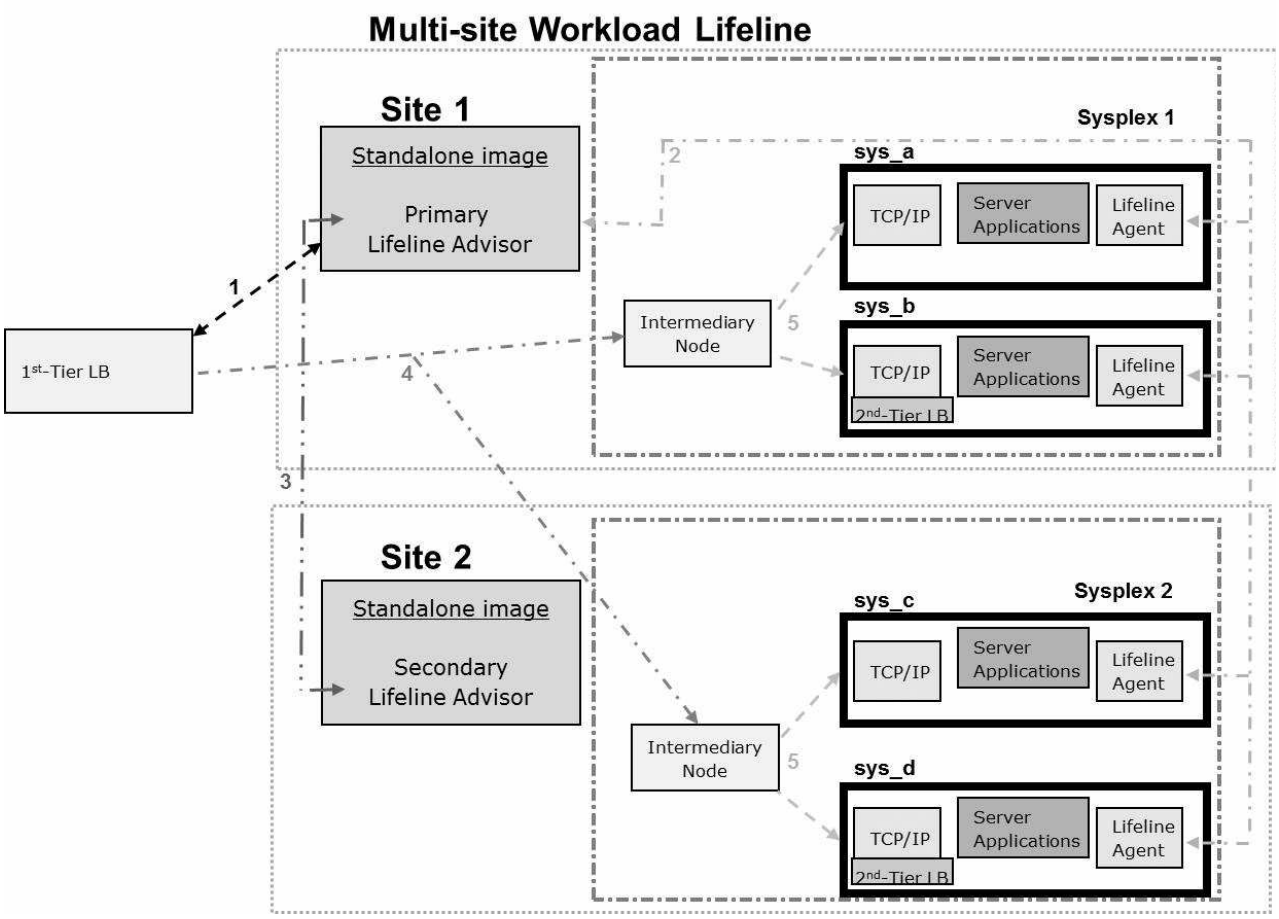


Figure 3. Relationships between external load balancers, external intermediary nodes, Lifeline Advisors, and Lifeline Agents

In Figure 3, the Lifeline Agents, Lifeline Advisors, and first-tier load balancers communicate as is shown in Figure 1 on page 4. However, when a first-tier load balancer handles workload requests based on routing recommendations from the Lifeline Advisor, the load balancer selects a site and forwards the requests directly to the intermediary node as indicated by the network flows labeled **4** . In this case, the intermediary node is the customized load balancing solution within that site. When the intermediary node handles workload requests, the intermediary node selects a server application in the site and forwards it to the TCP/IP stack that is running on the z/OS system, as indicated by the network flows labeled **5** . No second-tier load balancers distribute workload requests within the site. However, these second-tier load balancers that are configured as z/OS sysplex distributors are used to monitor the server applications for the workload.

See Figure 4 on page 14 in “Overview of Linux on z Systems Workloads” on page 13 for an example of how a typical workload that contains an application tier on Linux on z Systems target systems is configured with Multi-site Workload Lifeline.

See Figure 5 on page 23 in “Overview of Lifeline in a SNA workload environment” on page 22 for an example of how a typical workload that contains SNA applications is configured with Multi-site Workload Lifeline.

See Figure 6 on page 31 in “Overview of MQ Cluster Workloads” on page 29 for an example of how a typical workload that uses an IBM MQ cluster is configured with Multi-site Workload Lifeline.

Lifeline Advisors

For a workload consisting of server applications, the primary Lifeline Advisor provides recommendations that are used by a first-tier external load balancer to determine how to route new requests to a second-tier load balancer to select a target site. The second-tier load balancer then routes each request to a target z/OS system in the site to select a target application.

Rule: In this information, whenever the term Lifeline Advisor or Advisor is mentioned, it is referring to the primary Lifeline Advisor. Any references to the secondary Lifeline Advisor are indicated by the terminology secondary Lifeline Advisor or secondary Advisor.

The following are the supported types of second-tier load balancers:

- The second-tier load balancer can be an external load balancer. It uses the Lifeline Advisor recommendations to determine how to route these new requests to the target applications in the z/OS site.
- The second-tier load balancer can be an intermediary node. It uses its own recommendations to determine how to route these new requests to the target applications in the z/OS site.
- The second-tier load balancer can be a z/OS sysplex distributor. It creates its own recommendations that are similar to the ones that the Lifeline Advisor creates to determine how to route these new requests to the target applications in the z/OS site.

The Lifeline Advisor maintains at least two, and up to four, listening sockets or ports; one is for the Lifeline Agents to connect to, up to two are for the external load balancers to connect to, and optionally one is for the secondary Lifeline Advisor to connect to. There are separate IPv4 and IPv6 listening sockets for external load balancers. If your TCP/IP stack is not IPv6 enabled, you will not be able to use the IPv6 listening socket.

The Lifeline Advisor maintains an access control list that allows external load balancers, the secondary Lifeline Advisor, and the Lifeline Agents to connect to it. The access control list specifies the remote IP address of the connecting external load balancers, the remote IP address and port of the secondary Lifeline Advisor, and the Lifeline Agents that are allowed to connect to the Lifeline Advisor.

For a workload consisting of MQ cluster queues, the primary Lifeline Advisor provides recommendations that are used by Lifeline Agents to control the site and target system where MQ cluster queues are enabled for messages. If the site is not active, the MQ cluster queues on that site are disabled for receiving messages. If the site is active, the MQ cluster queues on that site are enabled for receiving messages.

Recommendations provided by the Lifeline Advisor

The recommendations provided by the Lifeline Advisor are dynamic, and can change as the conditions of the target sites, systems, and server applications or MQ cluster queues change. The recommendations include the following information:

- An indication of whether the target server application or MQ cluster queue, the target system, or the target site is currently active. The Advisor uses this information to exclude systems or sites that are not active or do not have the required server applications running or MQ cluster queue available
- For target server applications or MQ cluster queues that reside on z/OS, z/OS Workload Management (WLM) server-specific recommendations. WLM recommendations provide a relative measure of the ability of a target system to handle new workload, as compared to other target systems across both sites. They also provide a measure of the performance of individual server applications or MQ queue managers that host the MQ cluster queue, as compared to the WLM policy goals specified for that workload. The WLM recommendations are derived from the following metrics that are based on the importance of the workload, as defined by the WLM policy:
  - Displaceable general CPU capacity of each system
  - System z® Application Assist Processor (zAAP) capacity
  - System z Integrated Information Processor (zIIP) capacity
  - The proportion of each type of CPU that the server application is using
- For target TCP server applications that reside on z/OS, an indication of server application health from a TCP/IP perspective. TCP/IP statistics for target applications are monitored to determine whether specific server applications are encountering problems that prevent the applications from keeping up with the current workload. For example, is a target TCP server application keeping up with TCP connection requests? Are requests being rejected because the backlog queue is full? In such scenarios, the recommendations passed back to the external load balancers are adjusted appropriately, so that the load balancer can direct fewer connections to any server application that is experiencing these problems. These recommendations are provided for TCP server applications and are referred to as Communications Server weights in this information.

Lifeline Agents

The Lifeline Agent receives from the Lifeline Advisor a list of server applications that are configured to receive workload requests from registered external load balancers. The Lifeline Agent gathers data about these server applications and returns the information to the Advisor.

The Lifeline Agent also receives from the Lifeline Advisor, a list of MQ queue managers and MQ cluster queues that are configured to receive workload messages. The Lifeline Agent gathers data about these MQ queue managers and MQ cluster queues and returns the information to the Advisor.

Lifeline Agents can reside on z/OS systems or Linux on z Systems Management Guests.

- For TCP/IP workloads, the Lifeline Agents reside on z/OS. The Agent monitors the health and availability of both the z/OS system and the workload's TCP/IP server applications on that system.
- For MQ cluster workloads, the Lifeline Agents reside on z/OS. The Agent monitors the health and availability of both the z/OS system and the workload's MQ queue managers and MQ cluster queues on that system.
- For SNA workloads, the Lifeline Agents reside on z/OS. The Agent monitors the health and availability of the z/OS system and the availability of the workload's SNA applications on that system.

- For Linux on z Systems workloads, the Lifeline Agents reside on both z/OS and Linux on z Systems. A Linux on z Systems workload consists of server applications residing on Linux on z Systems guests, and the database subsystem or SNA applications being accessed by these server applications, residing on z/OS systems.
  - The Agent on Linux on z Systems runs on a Linux on z Systems Management Guest. The Agent monitors the availability of the Linux on z Systems guests configured for the workload that reside on the same z/VM system as the Management Guest. The Agent also monitors the availability of the server applications that run on each of these guests.
  - The Agent on z/OS monitors the health and availability of both the z/OS system and the workload's database subsystem or SNA applications.
  - The Agent on Linux on z Systems does not monitor any MQ queue managers and MQ cluster queues on Linux on z Systems guests for MQ cluster workloads.

  See "Linux on z Systems Workloads" on page 13 for details about Lifeline Agents that reside on Linux on z Systems.

Rule: In this information, the term *z/OS Agent* refers to the Lifeline Agent that resides on z/OS. The term *Linux on z Systems Management Agent* refers to the Lifeline Agent that resides on the Linux on z Systems Management Guest. The term *Agent* by itself refers to both the z/OS Agent and the Linux on z Systems Management Agent.

The Lifeline Linux on z Systems Management Agent maintains a single connection to the Lifeline Advisor. The Lifeline z/OS Agent maintains two connections to the Lifeline Advisor. The first connection is used to communicate status information. For z/OS Agents, the second connection is used to send and receive MQ messages that are being transferred as a result of a MODIFY advisor_proc,TRANSFER command. These connections can be either an IPv4 or IPv6 connection. If the TCP/IP stack where the Agent resides is not IPv6-enabled, you will not be able to create the IPv6 connection.

See the Recommendations provided by the Lifeline Advisor section in "Lifeline Advisors" on page 8 for the set of metrics gather by the Agents about the server applications, MQ queue managers and MQ cluster queues, and z/OS system being monitored.

External load balancers

For workloads consisting of server applications, external load balancers are required to distribute workload requests. External load balancers use Server/Application State Protocol (SASP) to obtain recommendations and topology information related to server applications and systems in a clustered environment.

Rule: First-tier load balancers must be external load balancers that are SASP-enabled.

A second-tier load balancer can be an external load balancer that is SASP-enabled, an intermediary node, or a z/OS sysplex distributor on a z/OS system in the site.

External load balancers can obtain detailed information regarding the state of target z/OS applications and systems by communicating with the Lifeline Advisor using the SASP protocol. External load balancers use SASP to do the following things:

- Obtain detailed recommendations about how to distribute workload requests between the two sites, based on the current configuration and workload conditions.
- Obtain detailed recommendations about how to distribute workload requests in the site, based on the current configuration and workload conditions.
- Perform workload load balancing that is optimized for your two sites.

In some configurations, multiple server applications may be listening on the same port. When the TCP connection requests reach a target TCP/IP stack for these server applications sharing the same port, the connections are load balanced by TCP/IP across the multiple server application instances. How this load balancing is performed depends on whether the SHAREPORT or SHAREPORTWLM parameter is specified on the PORT statement. For more details about the PORT statement, see *z/OS Communications Server: IP Configuration Reference*. When you use Multi-site Workload Lifeline, all instances of this server application that share the same port on a target system are reported to external load balancers through a single member entry.

You might be able to customize the features of the way that the external load balancer communicates with the Lifeline Advisor. The SASP protocol defines two features of the external load balancer implementation that you might be able to configure:

- Whether the external load balancer polls the Lifeline Advisor for updated data or whether the updated data is pushed to the external load balancer.
- Whether only members that have updated data should be sent to the external load balancer or whether all members should be sent to the load balancer, regardless of whether their data has changed.

If you configure the external load balancer to request that the Lifeline Advisor push the updated information to the load balancer, the Lifeline Advisor updates the load balancer at least once every update interval. If you configure the external load balancer to poll the Lifeline Advisor for updated information, the Lifeline Advisor passes a recommended polling interval to the load balancer. However, you can configure the external load balancer to disregard this guideline.

Rule: Always configure first-tier load balancers to have updated information pushed to the load balancer.

Guideline: You can configure external second-tier load balancers to either poll for updated information or have updated information pushed to the load balancer.

External load balancers typically use a cluster IP address to represent the server applications that are being load balanced. Client applications use this cluster IP address as the destination IP address for their requests.

In addition, some external load balancers might be able to use either directed or dispatch mode when they forward packets to their destinations.

Directed mode

When an external load balancer uses directed mode to forward packets to their destinations, it can use NAT to convert the destination IP address (the cluster IP address) to an IP address owned by the target z/OS system. When IP packets for these connections are sent back to clients, the external load balancer converts the source IP address (the IP address of the target z/OS system) back to the cluster IP

address that the application used on its request. The load balancer either modifies the destination IP address (server NAT) in the packet itself or modifies both the destination and source IP addresses (server NAT and client NAT) in the packet. The packet must return through the same external load balancer, which recognizes the changes and does the reverse mapping. Then a packet can flow from the original destination to the original source.

Rule: Always configure first-tier load balancers to use directed mode. These load balancers route requests only to second-tier load balancers.

Guideline: You can configure external second-tier load balancers to use either directed or dispatch mode, although directed mode is recommended to avoid having to make server application changes.

Dispatch mode

When an external load balancer uses dispatch mode to forward packets to their destinations, the destination IP addresses for incoming IP packets are not changed. Instead, the external load balancer forwards the packet to a target z/OS system by using the MAC address of a network adapter on that system. The receiving z/OS system inspects the destination IP address of the packet, and accepts the packet if the IP address matches one of the IP addresses in its HOME list. As a result, with dispatch mode, all target z/OS systems must have the external load balancer's cluster IP address defined in their HOME list. However, these addresses must not be advertised externally through dynamic routing protocols. To prevent the addresses from being advertised externally through dynamic routing protocols, define these IP addresses as loopback addresses on z/OS.

Dispatch mode eliminates the need to perform network address translation (NAT). Dispatch mode has the following restrictions, which ensure that the second-tier external load balancer functions correctly:

Restrictions:

- An OSA device can be shared among logical partitions (LPARs) only if virtual MAC (VMAC) addressing is configured for each TCP/IP target stack that shares the OSA device.
- All target applications must bind to the IP address specified by INADDR_ANY or IN6ADDR_ANY, and the cluster IP address of the 2nd-tier load balancer must be defined to the stack. To ensure that this cluster IP address is not advertised, define it as a loopback address.
- First-tier load balancers cannot be configured in dispatch mode.

If you do not meet the previous restrictions, load balancing will not be optimal because work will not be routed to some servers.

Internal load balancers

An internal load balancer, also known as z/OS sysplex distributor, resides on a z/OS system in the site. It uses z/OS Communications Server functions to obtain recommendations and topology information related to server applications in a sysplex environment.

For more information about z/OS sysplex distributor, see *z/OS Communications Server: IP Configuration Guide*.

Tip: You can use z/OS sysplex distributor to perform the second-tier load balancing function.

Intermediary nodes

An intermediary node does not communicate directly with the Lifeline Advisor, but it replaces the function of a second-tier load balancer. An intermediary node is used in any of the following cases:

- Where customized load balancing has been built into a workload
- When the server applications reside on Linux on z Systems
- When the workload contains SNA applications

When customized balancing is being used, the z/OS sysplex distributor must still be defined, but it is used only for obtaining recommendations and topology information that the first-tier load balancer uses to select the site for a workload connection request.

For Linux on z Systems applications defined as IP intermediary nodes, the z/OS sysplex distributor must still be defined because it is used to monitor and obtain recommendations on the database subsystem that is referenced by the Linux on z Systems applications.

For SNA applications, the z/OS sysplex distributor is not needed because recommendations are gathered by using a different method.

The intermediary node makes the load balancing decision to select a server application instance within the site.

IBM MQ Clusters

For workloads that route messages to MQ cluster queues, external load balancers are not used to distribute workload messages. An IBM MQ cluster is instead used to distribute messages destined for an MQ cluster queue to an MQ queue manager instance that is configured in the MQ cluster.

For more information about workloads that uses IBM MQ clusters, see "IBM MQ Cluster Workloads" on page 29.

Linux on z Systems Workloads

Overview of Linux on z Systems Workloads

Multi-site Workload Lifeline provides the ability to load balance requests for a workload across two sites at unlimited distances that target TCP/IP applications running on Linux on z Systems guests. Similar to other workloads defined to Lifeline, a first-tier load balancer registers application groups that contain members that are in both sites.

For Linux on z Systems workloads, these members are defined as intermediary nodes. The first-tier load balancer distributes TCP/IP connections and the transactions that are sent over these connections to the intermediary node servers. In turn, the intermediary node servers create connections with the server applications on z/OS and send transactions to the z/OS application. These z/OS applications can be TCP/IP server applications (for example, a database

subsystem) or SNA applications. Lifeline monitors the availability of the server applications on Linux on z Systems as well as the health and availability of the server applications on z/OS.

Because a workload consists of one or more groups of applications, it is possible for a workload to consist of a group of TCP/IP z/OS applications, a group of TCP/IP Linux on z Systems applications, a group of MQ cluster queues, and a group of SNA applications that each access the same data sources on z/OS. Each group of applications must be defined in its own load balancer application group or MQ cluster queue group. Different types of applications cannot be defined in the same workload group.

Linux on z Systems workloads can only be configured to Lifeline when the Linux on z Systems server applications reside on Linux on z Systems guests running on z/VM. Lifeline does not support workloads with server applications that run in a native Linux on z Systems partition. Linux on z Systems workloads can be defined as Active/Standby workloads or Active/Query workloads.

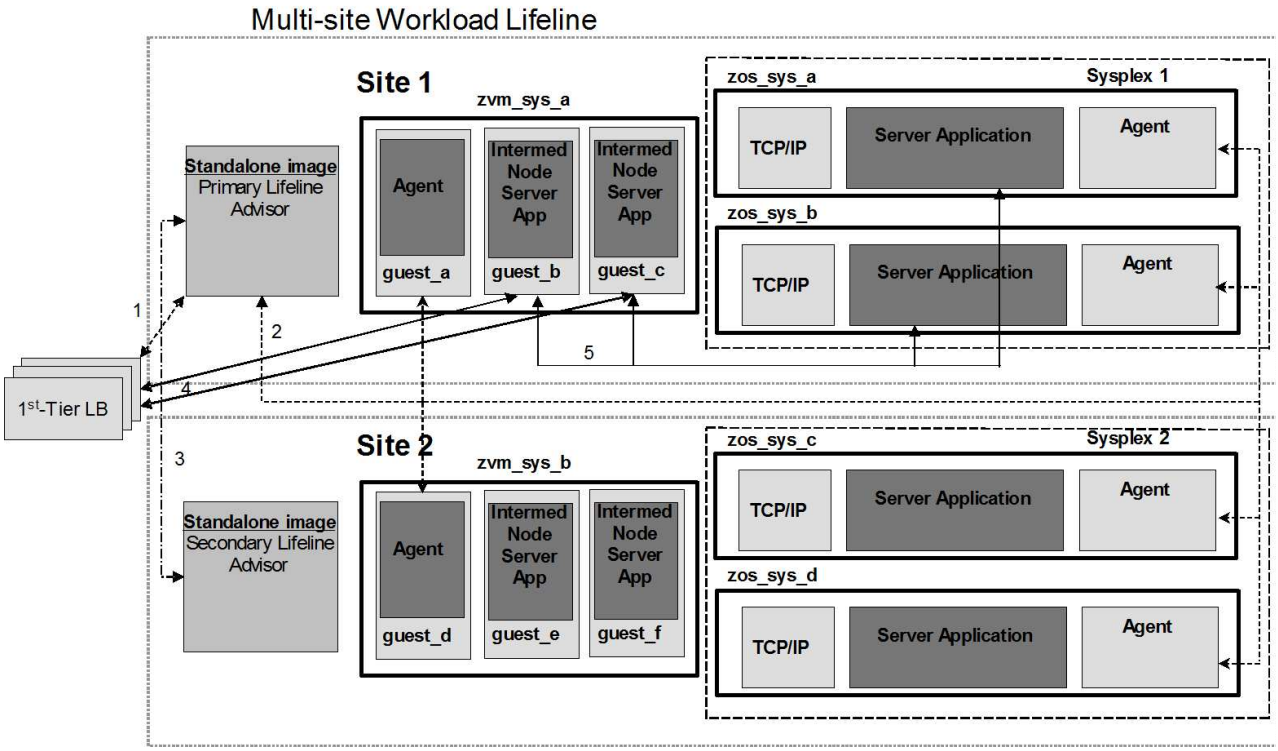


Figure 4. Relationships between external load balancers, Linux on z Systems intermediary nodes, Lifeline Advisors, and Lifeline Agents for Linux on z Systems workloads

Figure 4 shows an environment where workloads are processed by Linux on z Systems server applications. The Lifeline Agents, Lifeline Advisors, and first-tier load balancers communicate as is shown in Figure 1 on page 4. However, the Advisor also communicates with Linux on z Systems Management Agents in addition to z/OS Agents. When a first-tier load balancer handles workload requests based on routing recommendations from the Advisor, the load balancer selects the active site, which is Site 1 in this example, and forwards the requests directly to the Linux on z Systems intermediary nodes as indicated by the network flows labeled 4. In this case, the intermediary node is an application-tier Linux on z Systems server application within that site. The Linux on z Systems server

applications then establish TCP/IP connections to data-tier server applications on z/OS, as indicated by the network flows labeled 5. The Linux on z Systems server applications typically connect to a z/OS sysplex distributor instance to achieve load balancing across the data-tier server applications within the site.

Monitoring Linux on z Systems application groups

The first-tier load balancer registers a group of intermediary nodes to the Lifeline Advisor. The Advisor is configured with the z/OS server applications, the list of intermediary nodes, and a corresponding list of Linux on z Systems guests that use the same workload name. The Advisor sends the intermediary node server group to the Lifeline Linux on z Systems Management Agents and sends the z/OS applications to the Lifeline z/OS Agents. The Linux on z Systems Management Agents gather information about the availability of the application-tier intermediary node server applications and return the information to the Advisor. The z/OS Agents gather information about the health and availability of the data-tier server applications and return the information to the Advisor. The Advisor uses the information from both types of Agents to determine the availability of the workload on that site.

See Figure 26 on page 314 for an example of how to configure the Advisor intermediary_node_list and management_guest_list configuration statements for a Linux on z Systems workload.

The Linux on z Systems Management Guest

The Linux on z Systems Management Guest is a privileged z/VM guest IPLed with Linux on z Systems. One Linux on z Systems Management Guest is required per z/VM system that participates in Linux on z Systems workloads. The Linux on z Systems Management Agent runs as a Linux on z Systems daemon on this Management Guest. For more information, see “Management Guest system requirements” on page 16.

The Linux on z Systems Management Agent

The Linux on z Systems Management Agent is a Linux on z Systems daemon that runs on the Linux on z Systems Management Guest. It monitors the availability of server applications that run on Linux on z Systems guests on the same z/VM system as the Linux on z Systems Management Agent. It reports the status of these server applications to the Lifeline Advisor. Only one Linux on z Systems Management Agent can be active at a time on any given z/VM system. The Linux on z Systems Management Agent is also responsible for logging off and logging back on monitored Linux on z Systems guests when the workloads that the guests participate in are deactivated. For more information about the DEACTIVATE command, see “MODIFY *advisor_proc*,DEACTivate command: Deactivate workloads” on page 160.

Requirement: The Linux on z Systems Management Agent has a dependency on the nmap package. When the Lifeline Linux on z Systems RPM is installed, this dependency will be checked. The Linux on z Systems Management Agent requires a minimum nmap version of 4.0 to monitor IPv4 server applications and a minimum nmap version of 6.0 to monitor IPv6 server applications.

Restrictions:

- The Linux on z Systems Management Agent does not support monitoring of UDP applications.

- The Linux on z Systems Management Agent does not support Transport Layer Security (TLS) connections to the Advisor.

Preparing to use the Linux on z Systems Management Agent

Management Guest system requirements

The Linux on z Systems Management Guest is supported in a z/VM single system image (SSI) or outside of a single system image.

The Linux on z Systems Management Guest has several system requirements to allow the Linux on z Systems Management Agent to function properly.

Requirements:

- The Linux on z Systems Management Guest must have a minimum of 1 GB of memory.
- The Linux on z Systems Management Guest must be running a supported Linux on z Systems distribution. The supported distributions are SUSE Linux Enterprise Server (SLES) 10 SP4 or higher level and Red Hat Enterprise Linux (RHEL) 5 version 5.8 or higher level.
- Monitored server applications must not reside on the Linux on z Systems Management Guest. The Linux on z Systems guests for the monitored server applications are logged off when workloads are deactivated.
- The Linux on z Systems Management Guest must be on the same network as the monitored server applications.
- The `/opt/ibm/lifeline/log` file system must have 256 MB of available space to prevent truncation of the dumped internal log. If a file system exists for /opt and it does not have 256 MB of available space, an alternate file system can be used as long as a symbolic link is established for /opt/ibm/lifeline/log to point to that file system.
- The Linux on z Systems Management Guest must have z/VM Class A privileges for the FORCE and XAUTOLOG commands. The Linux on z Systems Management Agent issues these z/VM commands to log off, log on and re-IPL monitored server applications on Linux on z Systems guests when workloads are deactivated.

Guideline: For Linux on z Systems Management Agents, internal trace is used by default. However, syslogd should also be configured to capture ERROR, WARNING, and EVENT log messages from the Linux on z Systems Management Agent. For more information, see “Configuring and starting syslogd” on page 59.

Rule: Monitored Linux on z Systems guests can be relocated by using z/VM Live Guest Relocation (LGR). However, the Linux on z Systems Management Guest must not be relocated. See the publications for the z/VM product for methods to configure z/VM to prevent relocation of the Linux on z Systems Management Guest.

Monitored server application requirements

To successfully monitor server applications that run on Linux on z Systems guests, ensure that the following requirement and guidelines are met.

Requirement: Network and host firewalls must not block repeated SYN port scans. The Linux on z Systems Management Agent relies on SYN port scans to determine the availability of monitored Linux on z Systems server applications.

The Advisor considers the monitored Linux on z Systems server applications unavailable when firewalls block the SYN port scans.

Guidelines:

- Enable the Linux on z Systems guests for shutdown signals and define a default system shutdown timeout. This ensures the Linux on z Systems guests of monitored server applications can shut down the Linux on z Systems operating system in an orderly manner before the Linux on z Systems guests are logged off by Lifeline during workload deactivate processing. See the publications for the z/VM product for details.
- Configure the Linux on z Systems guests with an IPL statement in the z/VM system directories of the guests to load the Linux on z Systems operating system when the Linux on z Systems guests are logged on. Linux on z Systems guests are logged off and restarted by Lifeline during workload deactivate processing. For more information about the DEACTIVATE command, see "MODIFY *advisor_proc*,DEACTivate command: Deactivate workloads" on page 160.
- Configure the Linux on z Systems operating systems on the monitored Linux on z Systems guests to automatically start the server applications when the Linux on z Systems kernel is IPLed.

Installing the Linux on z Systems Management Agent

The Linux on z Systems Management Agent is installed on the Linux on z Systems Management Guest. The recommended method of installation is to use the RPM from the SMP/E installation of the Lifeline product on z/OS. See the program directory that is included with the Multi-site Workload Lifeline installation for information about the location of the RPM and how to transfer the RPM to the Linux on z Systems Management Guest. The RPM will check prerequisites, create the necessary directories with the proper permissions, and install files and programs in those directories.

Requirement: The Linux on z Systems Management Agent must be installed from a user ID with root privileges.

Rule: Only one Linux on z Systems Management Agent is allowed per z/VM system.

The Linux on z Systems Management Agent is installed as a program named aqsagzvm. The RPM also installs a program named aqsllcmd, which is used to send commands to the Linux on z Systems Management Agent. These programs expect to find specific directories and files in locations that are installed by the RPM. If any of these directories or files are moved, symbolic links that represent the original locations must be established to reference the new locations. For more information about the aqsllcmd program, see Chapter 9, "Lifeline Linux on z Systems Management Agent commands," on page 185.

The system administrator needs to be aware of the following files and directories:

`/opt/ibm/lifeline/bin`
: The location where the Linux on z Systems Management Agent program, aqsagzvm, and the aqsllcmd program are installed. Include this path in the PATH environment variable for system administrators.

`/opt/ibm/lifeline/config/agent.conf`
: The default configuration file for the Agent. For more information, see "Configuring a Lifeline Agent" on page 50.

/opt/ibm/lifeline/log/agent.trace
The location where internal trace is dumped. For more information, see "Diagnosing problems in the Linux on z Systems Management Agent" on page 90.

/opt/ibm/lifeline/lib/msg/C/aqsllmsg.cat
The location where the message catalog for the Linux on z Systems Management Agent can be found.

/opt/ibm/lifeline/man
The location where man pages can be found for aqsagzvm, aqsllcmd, and agent.conf. To display one of these man pages, enter `man -M /opt/ibm/lifeline/man man_page`, where man_page is one of these man pages.

Guideline: After you install the Linux on z Systems Management Agent, it is recommended to configure the Linux on z Systems Management Guest operating system to automatically start the Linux on z Systems Management Agent, aqsagzvm, when the Linux kernel is IPLed.

Configuring the Linux on z Systems Management Agent

The Linux on z Systems Management Agent requires a configuration file. The default configuration file location is `/opt/ibm/lifeline/conf/agent.conf`. An alternate configuration file can be used by specifying the file and path with the aqsagzvm -c start option.

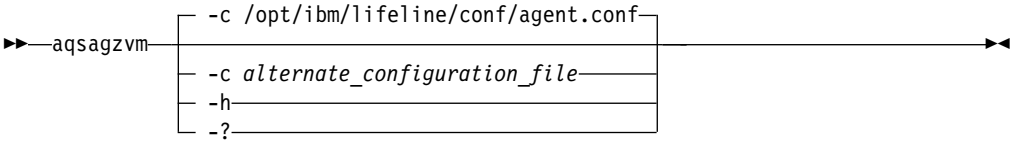
For more information on the Agent configuration file, see "Lifeline Agent configuration statements" on page 122.

Restriction: The Linux on z Systems Management Agent does not support TLS. If the Advisor is configured to use Application Transparent TLS (AT-TLS) for its Agent connections, the Advisor's AT-TLS policy must ensure that no AT-TLS policy is configured for Linux on z Systems Management Agent connections.

Starting the Linux on z Systems Management Agent

The **aqsagzvm** program is used to start the Linux on z Systems Management Agent. The program must be started by a user with root privileges.

Format



Parameters

-c *alternate_configuration_file*
Uses the *alternate_configuration_file* instead of the default `/opt/ibm/lifeline/conf/agent.conf` configuration file.

-h,-?
Display a help message and exits.

The Linux on z Systems Management Agent runs as a daemon and writes all system messages to syslogd.

A man page is available for **aqsagzvm**. To display the man page, enter the following command:

```
man -M /opt/ibm/lifeline/man aqsagzvm
```

Operational characteristics of Linux on z Systems workloads

Workload failure detection

The first-tier load balancer registers a group of intermediary nodes that the Advisor maps to a set of Linux on z Systems guest names, a set of Linux on z Systems server applications, a set of z/OS server applications, and a workload. The workload group's z/OS server applications are monitored by the z/OS agents on the systems where the server applications reside. The Linux on z Systems intermediary node server applications are monitored by the Linux on z Systems Management Agents residing on the z/VM systems where the server applications reside.

A load balancer application group for a Linux on z Systems workload is unavailable on a site when either of the following conditions is true:

- All of the Linux on z Systems server applications that make up the workload are unavailable on that site.
- All of the z/OS server applications that make up the workload are unavailable on that site.

A Linux on z Systems workload failure occurs for a site when one of the workloads groups, either a load balancer application group or, if configured, that group's failure detection group, is continuously unavailable for the failure detection interval that is configured for that workload.

A Linux on z Systems workload recovers for a site when all of the workload's load balancer application groups or, if configured, that group's failure detection group, on that site recover. A load balancer application group or that group's failure detection group for a Linux on z Systems workload is recovered on a site when at least one of the Linux on z Systems server applications in the group on that site becomes available and at least one of the z/OS server applications for the group on that site becomes available.

Activating a Linux on z Systems workload

Linux on z Systems Management Agents can monitor the availability of Linux on z Systems server applications, but the Agents do not monitor the active connections to those server applications or terminate the connections. When a Linux on z Systems workload is activated for the first time, a check for active connections is made to the z/OS Agents on the alternate site for the z/OS server applications, but this check is skipped for the Linux on z Systems Management Agents. For more information, see “Activating a workload for the first time” on page 55.

Guideline: Before you activate a Linux on z Systems workload for the first time, verify that no active connections to the server applications that make up the workload on the Linux on z Systems guests on the alternate site exist. To ensure that the Linux on z Systems server applications do not have active connections on the alternate site, take either of the following actions:

- Manually determine whether any connections for the workload exist on the monitored Linux on z Systems guests, and manually terminate them. For example, netstat can be issued on the Linux on z Systems guests to determine whether connections for the workload exist. If such connections exist, the server applications could be recycled to terminate connections or could be terminated by other means.
- Deactivate the workload before activating it if the workload can tolerate a temporary outage.

Deactivating Linux on z Systems workloads

Linux on z Systems Management Agents do not selectively terminate connections to the monitored Linux on z Systems server applications when a workload is deactivated. Instead, the Linux on z Systems Management Agents log off the monitored Linux on z Systems guests that participate in the workload and log them back on. For more information about how to re-IPL the Linux on z Systems guests and how to restart the server applications, see "Monitored server application requirements" on page 16.

Active/Query workload persistent connection timeout

Restriction: The Linux on z Systems Management Agent does not monitor how long a persistent Active/Query connection has been established, and therefore, will not terminate these connections after the timeout period has expired. Connections for Active/Query Linux on z Systems workloads will always behave as if a timeout value of 0 was configured for the workload on the query_workload_list Advisor configuration statement. For more information about configuration statements and parameters, see Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93.

Active/Query workload failures

When the acute state for database replication latency is detected for an Active/Query workload, the workload is considered unavailable. Active connections will be reset on that site to prevent queries from accessing stale data. Because the Linux on z Systems Management Agent does not monitor connections directly, the Linux on z Systems guests that host these server applications are logged off and logged back on. This process accomplishes the same goal of preventing queries from returning stale data for those workloads. The Active/Query workload will be available on this site when both of the following conditions are true:

- The database is no longer considered stale.
- The Linux on z Systems guests and server applications are back up and active.

For more information about the database replication latency state, see Chapter 1, "Overview of Multi-site Workload Lifeline," on page 1.

Diagnosing Linux on z Systems Management Agent problems

When a Linux on z Systems server application is not being reported as available, you can use the information in *Diagnosing problems in Multi-site Workload Lifeline* as well as this topic to verify the Linux on z Systems Management Agent is functioning correctly.

About this task

To diagnose possible problems with the Linux on z Systems Management Agent, complete the following steps:

Procedure

1. Determine whether the Linux on z Systems Management Agent has started correctly by using the ps command to check whether the aqsagzvm process is running. See the documentation for your Linux distribution for information about the ps command.
2. Determine whether the Linux on z Systems Management Agent is communicating with the Advisor by using the following command on the Linux on z Systems Management Guest from a user ID with root privileges:

   ```
   aqsllcmd display,members
   ```

   Each registered load balancer application group member that is associated with a Linux on z Systems guest on the z/VM system of the Linux on z Systems Management Agent will be displayed. Linux on z Systems guests are associated with registered load balancer application group members in the management_guest_list statement of the Advisor's configuration file. For more information about configuration statements and parameters, see Chapter 6, “Multi-site Workload Lifeline configuration statements,” on page 93.
3. Dump the Linux on z Systems Management Agent's internal trace and look for ERROR or WARNING messages in the trace file. The internal trace can be dumped to the `/opt/ibm/lifeline/log/agent.trace` file by issuing the following command on the Linux on z Systems Management Guest from a user ID with root privileges:

   ```
   aqsllcmd dumplog
   ```

Diagnosing Linux on z Systems workload problems

When a Linux on z Systems workload is unavailable, you can use the information in *Diagnosing problems when a workload is not distributed* as well as this topic to verify the Linux on z Systems workload configuration is correct.

About this task

To diagnose problems with the Linux on z Systems workload, complete the following steps:

Procedure

1. Determine whether the application-tier Linux on z Systems server applications for the workload are available on the monitored Linux on z Systems guests. Use the netstat command to display the listening TCP ports on the Linux on z Systems guests where the server applications are running. Verify that a listening TCP socket on a port and IP address that is compatible with one of the registered members from the first-tier load balancer's load balancer application group exists. See the documentation for your Linux distribution for information about using the netstat command.
2. Verify that the application-tier Linux on z Systems server applications can communicate with the data-tier z/OS server applications. For more information about diagnosing connectivity problems, see *z/OS Communications Server: IP Diagnosis Guide*.
3. Verify that the Lifeline Advisor configuration is correct by checking the following items:

- Verify that the intermediary_node_list entry containing the server application IP address and port is configured with the correct workload name and site.
- Verify that the management_guest_list entry containing the Linux on z Systems guest name where the server application resides is configured with the correct IP address and workload name.

For more information about configuration statements and parameters, see Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93.

4. Verify that one or more data-tier z/OS server applications in the workload is available and one or more application-tier Linux on z Systems server applications per registered load balancer application group in the workload is available. Display the server applications that make up the workload by issuing the following command on the Advisor:

   ```
   MODIFY procname,DISPLAY,WORKLOAD=workloadname,DETAIL
   ```

5. If registered load balancer application group IPv6 members are not available, verify that the version of nmap installed on the Linux on z Systems Management Guest is version 6.0 or higher by issuing the following command on the Linux on z Systems Management Guest:

   ```
   nmap -V
   ```

6. Verify that network or host firewalls are not blocking SYN port scans of the application-tier Linux on z Systems server applications by the Linux on z Systems Management Agent. Issue the following command on the Linux on z Systems Management Guest to verify connectivity to a Linux on z Systems guest's IPv4 address:

   ```
   nmap -sS -send-ip -p portnum ipv4_address
   ```

   Issue the following command on the Linux on z Systems Management Guest to verify connectivity to a Linux on z Systems guest's IPv6 address:

   ```
   nmap -sS -6 -send-ip -p portnum ipv6_address
   ```

   where *portnum* is the TCP port the application-tier Linux on z Systems server application is listening on and *ipv4_address* and *ipv6_address* is the IPv4 or IPv6 address the application-tier Linux on z Systems server applications is bound to. The ports in the nmap display output should show a status of *open*. If the status for a port is not *open*, verify whether one of the following conditions has occurred:

   - If the status of a port is *filtered*, a firewall might be interfering with the SYN scans that the Linux on z Systems Management Agent performs.
   - If the status of a port is *closed*, either a firewall might be interfering with the SYN scans that the Linux on z Systems Management Agent performs or the application might not be listening on the specified IP address and port.

SNA workloads

Overview of Lifeline in a SNA workload environment

Multi-site Workload Lifeline provides the ability to load balance requests for a workload that targets legacy SNA applications across two sites at unlimited distances. Similar to other workloads defined to Lifeline, a first-tier load balancer registers application groups that contain members that are in both sites.

For SNA workloads, these members are defined as intermediary nodes. The first-tier load balancer distributes TCP/IP connections and the transactions that are sent over these connections to the intermediary node servers. In turn, the

intermediary node servers create SNA sessions with the SNA applications in the same site and send transactions to the SNA applications. These SNA sessions can be established over native SNA networks or Enterprise Extender connections.

Because a workload consists of one or more groups of applications, it is possible for a workload to consist of a group of TCP/IP z/OS applications, a group of TCP/IP Linux on z Systems applications, a group of MQ cluster queues, and a group of SNA applications that each access the same data sources on z/OS. Each group of applications must be defined in its own load balancer application group or MQ cluster queue group. Different types of applications cannot be defined in the same workload group.

SNA workloads can be configured as Active/Standby workloads or Active/Query workloads. When the first-tier load balancer distributes connections on behalf of a SNA workload, it routes the connections to the intermediary node servers in the sites where the workload is active.

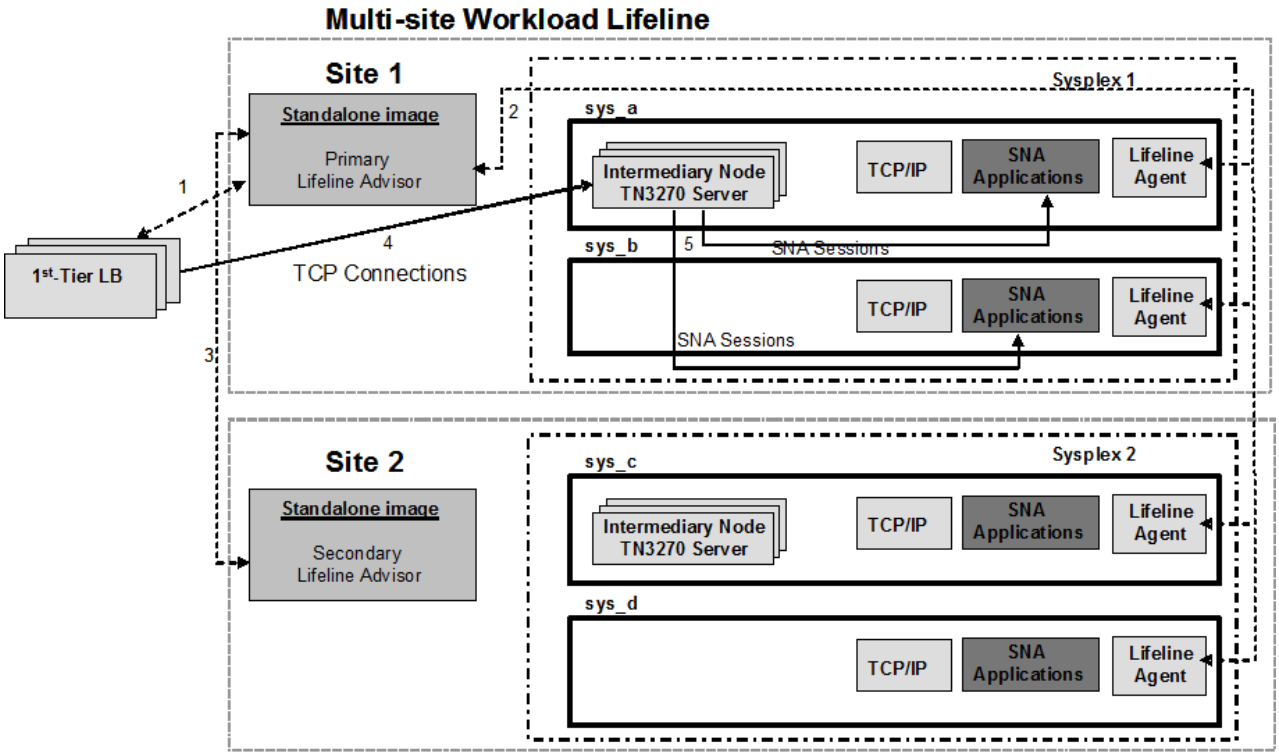


Figure 5. Relationships between external load balancers, internal intermediary nodes, Lifeline Advisors, and Lifeline Agents for SNA workloads

Figure 5 shows an environment in which a workload is processed by SNA applications. The Lifeline Agents, Lifeline Advisors, and first-tier load balancers communicate as is shown in Figure 1 on page 4. When a first-tier load balancer handles TCP/IP workload requests based on routing recommendations from the Advisor, the load balancer selects the active site, which is Site 1 in this example, and forwards the requests directly to the internal intermediary node on that site, indicated by the network flows labeled 4. In this example, the intermediary node is a z/OS Communications Server TN3270 server. When the TN3270 server handles workload requests, it creates a SNA session to the requested SNA application, indicated by the network flows labeled 5. Any subsequent transactions over the

TCP/IP connection that are distributed to the TN3270 server are sent over the existing SNA session to the SNA application. Load balancing across SNA applications within a site can be accomplished by using existing techniques, such as Generic Resource.

Monitoring SNA application groups

The first-tier load balancer registers a group of intermediary node servers to the Lifeline Advisor. The Advisor is configured with the intermediary node servers and a corresponding list of SNA applications that use the same workload name. The Advisor sends the intermediary node server group and its SNA applications to the Lifeline Agents. The Agents gather and return information about the availability of the SNA applications to the Advisor. If the intermediary nodes are internal, the Agents also return the availability information about these intermediary node servers, because these servers are on the same systems as the Agents.

See Figure 23 on page 311 for an example of how to configure the Advisor intermediary_node_list and sna_application_list configuration statements for a SNA workload.

Multi-site Workload Lifeline also supports configurations where the intermediary node servers are external. If these external intermediary node servers reside on Linux on z Systems guests, they can be monitored by the Linux on z Systems Management Agents that gather and return the availability information about these intermediary node servers. See “Linux on z Systems Workloads” on page 13 for details about how Multi-site Workload Lifeline can support these workload types.

Preparing z/OS Agents for monitoring SNA applications

Each Lifeline Agent uses an extended MCS console to monitor SNA applications. See *MVS Programming Authorized Assembler Services Guide* for a description of extended MCS consoles. By using this console, the Agent issues VTAM® commands to monitor the status of the SNA applications that make up the workload, and alter the state of these SNA applications. See “(z/OS systems) Authorizing the Lifeline Agents to monitor SNA applications” on page 41 for steps about protecting access to the Agent's extended MCS console.

Guideline: If message flood automation is enabled, the DEFAULT action should be specified as AUTO. This specification allows messages to continue to be sent to the extended MCS console of the Agent. Otherwise, if messages that are destined for the extended MCS console of the Agent are suppressed, the SNA applications might be reported as unavailable, because the Agent cannot monitor them. See *z/OS MVS Initialization and Tuning Reference* for details about the DEFAULT statement in the MSGFLDxx member.

Operational characteristics of SNA workloads

Workload failure detection

The first-tier load balancer registers a group of intermediary node servers which the Lifeline Advisor maps to a set of SNA applications and a workload name. The SNA applications of the load balancer application group are monitored by the Lifeline Agents on the systems where the SNA applications reside. The intermediary node servers for an application group are one of the following types:

Monitored intermediary nodes

- The intermediary node servers are on the systems that are monitored by Lifeline z/OS Agents.
- The intermediary node servers are on the Linux on z Systems guests that are monitored by Lifeline Linux on z Systems Management Agents.

Unmonitored intermediary nodes
The intermediary node servers are not on the systems that are monitored by Lifeline Agents.

A load balancer application group or the group's failure detection group for a SNA workload that contains monitored intermediary nodes is unavailable on a site when one of the following conditions occurs:

- All of the SNA applications of the load balancer application group or, if configured, the group in the failure_detection_groups statement, are unavailable on that site.
- All of the intermediary node servers of the load balancer application group or, if configured, the group in the failure_detection_groups statement, are unavailable on that site.

A load balancer application group for a SNA workload that contains unmonitored intermediary nodes is unavailable on a site when the following condition occurs:

- All of the SNA applications of the load balancer application group, or if configured, the group in the failure_detection_groups statement, are unavailable on that site.

A SNA workload failure occurs when one of the monitored workload's groups, either a load balancer application group or, if configured, the group's failure detection group, is continuously unavailable for the failure detection interval that is configured for that workload.

The SNA workload recovers for a site when all of the load balancer application groups or, if configured, the group's failure detection groups, for the SNA workload on that site recover.

- A load balancer application group or the group's failure detection group for a SNA workload that contains monitored intermediary nodes recovers when both of the following conditions occur:
  - At least one SNA application becomes available on that site.
  - At least one intermediary node server becomes available on that site.
- A load balancer application group for a SNA workload that contains unmonitored intermediary nodes recovers when at least one SNA application becomes available on that site.

Activating a SNA workload

When a SNA workload is activated and the intermediary nodes are internal, monitored servers, the Lifeline Advisor queries the Lifeline Agents on the alternate site to determine whether active TCP/IP connections exist in either of the following situations:

- The SNA Active/Standby is activated for the first time or Active/Query workload is activated for the first time to a single site.
- The SNA Active/Standby workload is not being activated for the first time and the workload is not in a deactivated state.

If active connections are found, the ACTIVATE command is not successful.

When a SNA workload is activated and the intermediary nodes are external, unmonitored servers:

- If the SNA Active/Standby workload is activated for the first time or an Active/Query workload is activated for the first time to a single site, the Lifeline Advisor queries the Lifeline Agents on the alternate site to determine whether active SNA sessions exist. If active sessions are found, the ACTIVATE command is not successful.
- If the SNA Active/Standby workload is not being activated for the first time and the workload is not in a deactivated state, the ACTIVATE command is not successful. The SNA workload must be deactivated first.

For more information, see "Activating a workload for the first time" on page 55 and "Activating a workload when the workload is not deactivated" on page 55.

When the intermediary node servers are monitored by Linux on z Systems Management Agents, see Linux on z Systems Workloads for more information.

Deactivating a SNA workload

When a SNA workload is deactivated, and the intermediary nodes are internal, monitored servers, the Lifeline Advisor directs the Lifeline Agents on the target sites to terminate active TCP/IP connections to the intermediary node servers.

When a SNA workload is deactivated, and the intermediary nodes are external, unmonitored servers, the Lifeline Advisor directs the Lifeline Agents on the target sites to terminate active SNA sessions. To do this, the Agents inactivate the SNA application resources that make up the workload.

When the intermediary node servers are monitored by Linux on z Systems Management Agents, see "Linux on z Systems Workloads" on page 13 for more information.

Reactivating a SNA workload

When a SNA workload is activated to a site that was previously deactivated and the intermediary nodes are external, unmonitored servers, the Lifeline Advisor directs the Lifeline Agents on this site to activate the workload's SNA application resources that were previously inactivated. The Agent issues message AQS0214I for each SNA application resource that the Agent successfully activates. After the SNA application resource is activated, the SNA application that uses the resource might need to be restarted as some SNA applications shut down when the associated SNA application resource is inactivated.

Active/Query workload persistent connection timeout

Restriction: The Lifeline Agent does not monitor how long a persistent Active/Query connection has been established for SNA workloads, and therefore, will not terminate these connections after the timeout period has expired. Connections for Active/Query SNA workloads will always behave as if a timeout value of 0 was configured for the workload on the query_workload_list Advisor configuration statement. For more information about configuration statements and parameters, see Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93.

Active/Query workload failures

When the acute state for database replication latency is detected for an Active/Query workload, the workload is considered unavailable on that site. Active connections will be reset on that site to prevent queries from accessing stale data.

If the intermediary nodes are external, unmonitored servers:

- If DYNAMIC routing is configured, the Lifeline Agents inactivate the SNA application resources on that site that make up the workload and then reactivate the SNA application resources.
- If STATIC routing is configured, and the configured workload_switch_policy is AUTOMATIC, the workload is quiesced and deactivated on that site. When the workload is deactivated, the Lifeline Agents inactivate and reactivate the workload's SNA application resources on that site. When the database replication latency is no longer in the acute state, the workload is activated on that site.

Guideline: Lifeline Agents issue AQS0214I when the SNA application resources are reactivated. See the Automation section for this message if you need to automatically restart the SNA applications.

This process accomplishes the goal of preventing queries from returning stale data for the workload. The Active/Query workload will be available on this site when both of the following conditions are true:

- The database is no longer considered stale.
- For external, unmonitored servers, the SNA application resources are activated and, if needed, the SNA applications using those resources are restarted.

For more information about the database replication latency state, see Chapter 1, "Overview of Multi-site Workload Lifeline," on page 1.

Diagnosing problems when a SNA application is unavailable

When a SNA application is not reported as available, you can use the following information to diagnose the problem.

About this task

To diagnose SNA applications that are not available, complete the following steps:

Procedure

1. To determine whether the SNA application resource is active, issue the following command on the system where the SNA application should be active:

   ```
   D NET,ID=resourcename
   ```

   See *z/OS Communications Server: SNA Operation* for more information about this command.
2. Determine whether you need to restart the SNA application. If the SNA application resource was inactivated by the Agent and later activated, the SNA application that uses the resource might have shut down when the associated SNA application resource was inactivated.
3. To determine whether the Lifeline Agent is able to use an extended MCS console to monitor SNA applications, verify that message AQS0009I SNA APPLICATIONS CANNOT BE MONITORED was not issued when the Agent

was started. If the message was issued and syslogd was started, check the syslogd file of the Agent for ERROR or WARNING messages and take the appropriate corrective actions. The syslogd identifier is llagent for the Agent. Otherwise, if the Agent internal trace is being used, dump and check the internal trace for ERROR or WARNING messages and take the appropriate corrective actions.

4. To determine whether messages were suppressed from the Agent's extended MCS console, verify that no message flooding warnings exist on the system console. If warnings exist, see "Preparing z/OS Agents for monitoring SNA applications" on page 24 for information about considerations to take when message flooding automation is enabled.
5. Determine whether the system where the SNA application is active has sufficient system resources. Issue the following command to determine whether the Agent views the SNA application as active:

   ```
   MODIFY procname,DISPLAY,MEMBERS,DETAIL
   ```

   - If the SNA application is active, issue the following command to determine whether the Advisor views the SNA application as available:

     ```
     MODIFY procname,DISPLAY,WORKLOAD,DETAIL
     ```

   - If the SNA application is not available, determine whether it is because the reported WLM weight for that system is zero.

Diagnosing problems when SNA intermediary node servers are unavailable

When the monitored intermediary node servers of a SNA workload are not reported as available, you can use the following information to diagnose the problem.

About this task

To diagnose SNA intermediary node servers that are not available, complete the following step:

Procedure

Determine whether the Lifeline Agent views the intermediary node servers as active. Issue the following command on the system where the intermediary node server should be active when the intermediary node resides on z/OS:

```
MODIFY procname,DISPLAY,MEMBERS,DETAIL
```

Issue the following command on the Linux on z Systems Management Agent when the intermediary node server resides on a Linux on z Systems guest:

```
aqsllcmd DISPLAY,MEMBERS,DETAIL
```

If the intermediary node server is not available, use the netstat display on the Agent's system to verify that the intermediary node server is listening on the load balancer application group member's registered port and IP address (or the IPv6 unspecified address or IPv4 inaddr_any address).

- If a z/OS Agent monitors the intermediary node server, see *z/OS Communications Server: IP System Administrator's Commands* for information about using the netstat command.
- If a Linux on z Systems Management Agent monitors the intermediary node server, see the documentation of your Linux distribution for information about using the netstat command.

IBM MQ Cluster Workloads

Overview of MQ Cluster Workloads

Multi-site Workload Lifeline provides the ability to load balance requests for a workload that targets MQ cluster queues hosted by MQ queue managers on z/OS within an IBM MQ cluster across two sites at unlimited distances. Unlike other workloads defined to Lifeline, a first-tier load balancer is not required to perform the load balancing of workload requests. Lifeline leverages the capabilities of IBM MQ clusters to select which MQ queue managers are eligible to receive messages on behalf of a workload, based on which site the workload is active, and the health and availability of the MQ queue managers to handle additional workload requests.

For MQ cluster workloads, the MQ cluster queues that are defined for the workload are the group members that make up the workload. The IBM MQ cluster distributes messages destined for these MQ cluster queues based on recommendations provided by Lifeline.

Because a workload consists of one or more groups of applications, it is possible for a workload to consist of a group of TCP/IP z/OS applications, a group of TCP/IP Linux on z Systems applications, a group of MQ cluster queues, and a group of SNA applications that each access the same data sources on z/OS. Each group of applications must be defined in its own load balancer application group or MQ cluster queue group. Different types of applications cannot be defined in the same application/queue group.

MQ cluster workloads can be configured only in an Active/Standby configuration. When messages are targeted to a specific MQ cluster queue, the IBM MQ cluster distributes the messages only to the MQ queue managers in the active site.

When configuring the MQ cluster receiver channels for MQ queue managers that are participating in the IBM MQ cluster, the transport type (TRPTYPE) must be specified as TCP. Configure the connection name (CONNAME) on the MQ CHANNEL definition with an IPv4 address, an IPv6 address, or a hostname. For high availability, use a static VIPA as the configured or resolved IP address. The CONNAME port is optional and will default to 1414 if not specified. If using multiple MQ queue managers on the same z/OS system, each MQ queue manager must be configured with a different port. If hostnames are used as the CONNAME, ensure the resolver search order used by the MQ queue manager is the same as what is used by the Lifeline Agents. See *z/OS Communications Server: IP Configuration Guide* for more information about determining the resolver search order.

When configuring the MQ queue managers that are participating in a workload's MQ cluster, the MQ cluster receiver channel must be stopped and the rank of the MQ cluster queues (CLWLRANK) for the workload must be set to '0' when the MQ queue manager is started. This is to prevent MQ queue managers that are being started from erroneously receiving messages based on the current state of the workload. When a Lifeline Agent detects the newly started MQ queue manager, the Agent will ensure that the MQ cluster receiver channel and MQ cluster queue ranks are set to the appropriate state and value, respectively. The Agent will also set the MQ cluster receiver channel weights (CLWLWGHT) for the MQ queue manager based on WLM recommendations.

By default, when an MQ application connects to a local MQ queue manager and sends messages that target an MQ cluster queue, these messages are routed only to the local MQ queue manager, if it hosts the MQ cluster queue. To ensure that these messages get routed to the correct MQ queue managers, based on the rank of the MQ cluster queue and state of each of the MQ queue manager's cluster receiver channel, the use-queue attribute of the MQ cluster queue (CLWLUSEQ) must be set to ANY.

By default, MQ cluster queues are defined with a binding, DEFBIND(OPEN). This binding indicates that when the cluster queue is selected for a remote queue manager, the message will remain queued locally until the MQ cluster queue becomes available on the selected remote MQ queue manager. In a Lifeline MQ workload configuration, this default behavior is undesirable because the selected MQ cluster queue might reside on a target MQ queue manager whose site will not be the active site. Any messages that are to be forwarded to target MQ queue managers on the non-active site will remain queued indefinitely, until the workload is eventually activated to the site where these MQ queue managers reside. To ensure that messages that are queued on the local queue managers get forwarded once the workload is activated, the default binding for the MQ cluster queue must be set to DEFBIND(NOTFIXED). This allows MQ cluster workload management to reallocate the messages to an available target MQ queue manager on the active site.

When a Lifeline Agent initially connects to a local MQ queue manager, the Agent sets both the short retry interval (SHORTTMR) and long retry interval (LONGTMR) for the MQ queue manager's cluster receiver channel to 5 seconds. This allows the MQ cluster to react quickly to any changes in the state of the MQ workload. However, when a cluster receiver channel is stopped for the MQ queue manager, these lower retry intervals increase the frequency that MQ messages CSQX534E and CSQX599E are issued to the system console and MQ joblog. To prevent these two messages from being issued, add them to the EXCLMSG system parameter for CSQ6SYSP in the MQ system parameter module. See *IBM MQ: Installing IBM MQ* for information about the EXCLMSG system parameter.

When determining what two MQ queue managers in the MQ cluster are to hold full repositories, these MQ queue managers cannot also host MQ cluster queues for any of the MQ cluster workloads. Because message routing is influenced by changing the state of the MQ queue manager's cluster receiver channel, if an MQ queue manager's cluster receiver channel is stopped while holding a full repository, all other MQ queue managers in the MQ cluster would not be able to communicate with that full repository. See *IBM MQ: Installing IBM MQ* for information about full repositories.

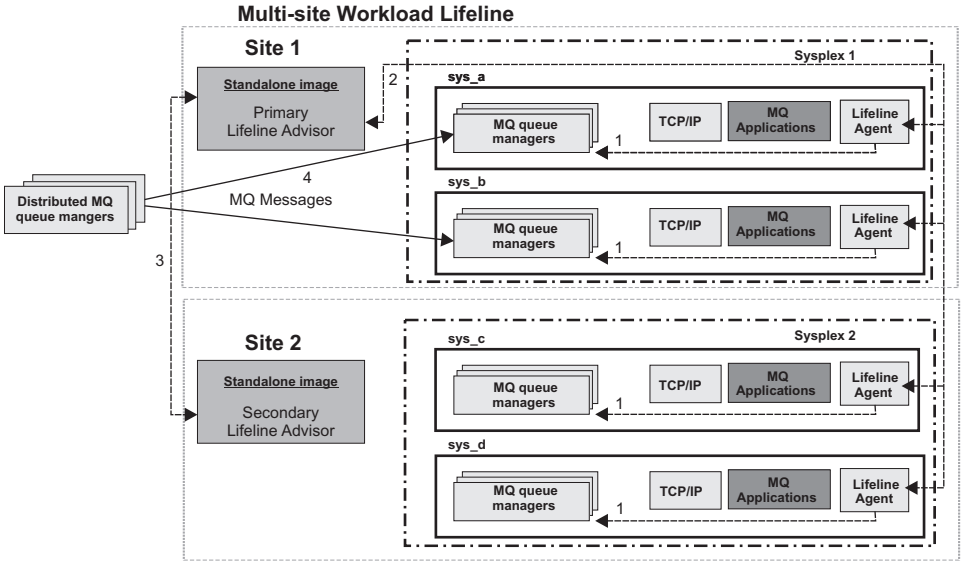


Figure 6. Relationships between MQ queue managers, Lifeline Advisors, and Lifeline Agents for MQ cluster workloads

Figure 6 shows an environment in which a workload is utilizing IBM MQ clusters. The Lifeline Advisors communicate as shown in Figure 1. All MQ queue managers that are depicted in the figure belong to the same MQ cluster. The Lifeline Agents running on each z/OS system in the two sites, Sysplex1 and Sysplex2, monitor the health of the MQ queue managers and the system where the Agent is active. The Lifeline Agents periodically send this information to the primary Lifeline Advisor, indicated by the network flows labeled 2. The primary Lifeline Advisor uses this information to calculate routing recommendations for the workload's messages. The Lifeline Advisor periodically sends recommendations to the Lifeline Agents about which MQ cluster queues are eligible to receive messages. The Lifeline Agent communicates with the MQ queue managers that are on the same system, to make MQ cluster queues eligible or ineligible for receiving messages targeted to that queue, indicated by the flows labeled 1.

A distributed MQ queue manager distributes messages to eligible MQ queue managers based on recommendations from the Advisor. In this example, Site 1 is the active site and messages are routed as shown in the network flows labeled 4. If multiple MQ queue managers are eligible to receive these messages, then the requests are distributed in a round-robin manner between the eligible MQ queue managers.

Monitoring MQ cluster queue groups

When an MQ cluster workload is configured to the Lifeline Advisor, an MQ cluster queue group is dynamically created by the Advisor for each MQ cluster queue defined for the workload. The Advisor sends the MQ cluster queue groups, each consisting of the list of MQ queue managers and the MQ cluster queue they are hosting, to the Lifeline Agents. The Agents gather and return information about the availability and health of the MQ queue managers and the MQ cluster queues to the Advisor.

See Figure 31 on page 318 for an example of how to configure the Advisor mq_manager_list configuration statement for an MQ cluster workload.

Preparing z/OS Agents for monitoring MQ queue managers

Each Lifeline Agent communicates directly with each MQ queue manager on the same system as the Agent. By using this MQ connection, the Agent issues IBM MQ commands to monitor the status and alter the eligibility of the MQ cluster channels hosted on the MQ queue manager. See "(z/OS systems) Enabling the Lifeline Agents to communicate with MQ queue managers" on page 42 for steps on adding the correct IBM MQ libraries in the linklist concatenation.

Operational characteristics of MQ cluster workloads

Workload failure detection

When the Lifeline Advisor parses the entries in the mq_manager_list, the Advisor builds MQ cluster queue groups for each unique MQ cluster queue name it finds. The MQ queue managers and the MQ cluster queue of the MQ cluster queue group are monitored by the Lifeline Agents on the systems where the MQ queue managers reside.

An MQ cluster queue group for an MQ cluster workload is unavailable on a site when either of the following conditions occurs:

- All of the MQ queue managers of the MQ cluster queue group are unavailable on that site.
- The MQ cluster queue of the MQ cluster queue group is unavailable on all MQ queue managers on that site.

An MQ cluster workload failure occurs when one of the MQ cluster queue groups of the MQ cluster workload is continuously unavailable for the failure detection interval that is configured for that workload.

The MQ cluster workload recovers for a site when all of the MQ cluster queue groups for the MQ cluster workload on that site recover.

An MQ cluster queue group for an MQ cluster workload recovers when both of the following conditions occur:

- At least one MQ queue manager that hosts the cluster queue becomes available on that site.
- At least one MQ cluster queue instance becomes available on an MQ queue manager on that site.

Activating an MQ cluster workload

When an MQ cluster workload is activated, the Lifeline Advisor queries the Lifeline Agents on the alternate site to determine whether queued messages exist on MQ cluster queues and whether MQ cluster receiver channels are stopped in either of the following situations:

- The MQ cluster workload is activated for the first time.
- The MQ cluster workload is not being activated for the first time and the workload is not in a deactivated state.

If queued messages are found on the MQ cluster queues or not all MQ cluster receiver channels are stopped, the ACTIVATE command is not successful.

When an MQ cluster workload is activated, the Lifeline Advisor directs the Lifeline Agents on the target site to change the queue rank of each MQ cluster queue in the workload to a '1' and to set the MQ cluster receiver channel weight based on WLM recommendations. The Agents also start each MQ cluster's receiver channel on each MQ queue manager that hosts the workload's MQ cluster.

For more information, see “Activating a workload for the first time” on page 55 and “Activating a workload when the workload is not deactivated” on page 55.

Quiescing an MQ cluster workload

When an MQ cluster workload is quiesced, the Lifeline Advisor directs the Lifeline Agents on the target site to change the queue rank of each MQ cluster queue in the workload to a '0' and to set the MQ cluster receiver channel weight to '1'. The Agents also stop each MQ cluster's receiver channel on each MQ queue manager that hosts the workload's MQ cluster.

Deactivating an MQ cluster workload

When an MQ cluster workload is deactivated, the Lifeline Advisor queries the Lifeline Agents on the previously active site to determine whether MQ cluster receiver channels are stopped and whether queued messages exist on MQ cluster queues hosted by MQ queue managers on the site.

Whether or not the MQ cluster receiver channels are stopped or queued messages are found on the MQ cluster queues, the MQ cluster workload is transitioned into a deactivated state. However, if either of these conditions is true, the DEACTIVATE command is not successful.

If queued messages are found on the MQ cluster queues, determine whether these messages should be transferred to the alternate site before reactivating the MQ cluster workload to that site. See “MODIFY *advisor_proc*,TRANSfer command: Transfer messages for MQ workloads” on page 165 for a description of the TRANSFER command.

For other failures, refer to the System Programmer Response for message AQS0207I to determine the possible actions to take if the DEACTIVATE command is not successful.

Reactivating an MQ cluster workload

When an MQ cluster workload that was deactivated is activated to the same site, the Lifeline Advisor directs the Lifeline Agents on this site to change the queue rank of each MQ cluster queue in the workload to a '1' and to set the MQ cluster receiver channel weight based on WLM recommendations. The Agents also start each MQ cluster receiver channel on each MQ queue manager that hosts the workload's MQ cluster.

Diagnosing problems when an MQ queue manager is unavailable

When an MQ queue manager is not reported as available, you can use the following information to diagnose the problem.

About this task

To diagnose MQ queue managers that are not available, complete the following steps:

Procedure

1. To determine whether the Lifeline Agent views the MQ queue manager as active, issue the following command on the system where the MQ queue manager should be active:

   ```
   MODIFY procname,DISPLAY,MEMBERS,DETAIL
   ```

2. To determine whether the Lifeline Agent can communicate with MQ queue managers, verify that message AQS0010I MQ QUEUE MANAGERS CANNOT BE MONITORED was not issued when the Agent was started. If the message was issued and syslogd was started, check the syslogd file of the Agent for ERROR or WARNING messages and take the appropriate corrective actions. The syslogd identifier is llagent for the Agent. Otherwise, if the Agent internal trace is being used, dump and check the internal trace for ERROR or WARNING messages and take the appropriate corrective actions.
3. To determine whether all MQ cluster queues that were configured for the MQ queue manager are defined and enabled to receive messages, issue the following Agent command:

   ```
   MODIFY procname,DISPLAY,MEMBERS,DETAIL
   ```

4. To determine whether the system where the MQ queue manager is active has sufficient system resources, issue the following command to determine whether the Agent views the MQ queue manager as active:

   ```
   MODIFY procname,DISPLAY,MEMBERS,DETAIL
   ```

   - If the MQ queue manager is active, issue the following command to determine whether the Advisor views the MQ queue manager as available:

     ```
     MODIFY procname,DISPLAY,WORKLOAD,DETAIL
     ```

   - If the MQ queue manager is not available, determine whether it is because the reported WLM weight for that system is zero.

Chapter 2. Preparing to use Multi-site Workload Lifeline

You need to evaluate TCP/IP workloads and grant users authority before you can configure Multi-site Workload Lifeline to balance workloads between the two z/OS sites.

Before you begin

You must meet the following requirements:

- All z/OS systems should be at the V2R1 or higher levels.
- All Linux on z Systems guest systems must be at the SUSE Linux Enterprise Server (SLES) 10 SP4 or Red Hat Enterprise Linux (RHEL) 5 version 5.8 level or higher levels.
- For workloads consisting of server applications, ensure both of the following statements are true:
  - You must have at least one first-tier external load balancer that supports the Server/Application State Protocol (SASP). The load balancer must have IP connectivity to each second-tier load balancer. The second-tier load balancer is another external load balancer that supports SASP, an intermediary node, and/or a z/OS sysplex distributor that runs on a target system in the site.
  - The applications that are identified to be load balanced must be able to run on target systems that are in different sites, and must be able to access data sources that are synchronized across the sites.
- For workloads utilizing IBM MQ clusters, ensure both of the following statements are true:
  - All MQ queue managers must be at IBM MQ 7.1.0 or higher levels.
  - The MQ queue managers that host the MQ cluster queues for the workload must be configured in an IBM MQ cluster that spans the sites, and must have access to data sources that are synchronized across the sites.

(z/OS systems) Granting users explicit authority to control the Lifeline Advisor and Agent

Rule: This task is only applicable to Lifeline Advisors and the Lifeline Agents residing on z/OS systems.
Grant explicit authority to all users that can start, stop, or modify the Lifeline Advisor and Agent, to prevent unauthorized users from controlling it. If you do not grant explicit authority, any user that is able to issue the START, STOP, or MODIFY command can control the Lifeline Advisor and Agent.

About this task

Restriction: The only commands that you can issue against the Lifeline Advisor and Agent are MODIFY commands, with the exception of the START command that you use to start the Lifeline Advisor or Agent or the STOP command that you use to stop the Lifeline Advisor or Agent. Limit which users are able to issue the START, STOP, and MODIFY commands for these two servers.

To grant users explicit authority to start, stop, or modify the Lifeline Advisor and Agent, complete the following steps:

Procedure

1. Issue the following two commands to ensure that the OPERCMDS class is active and that RACLIST processing is enabled:

   ```
   SETROPTS CLASSACT(OPERCMDS)
   SETROPTS RACLIST (OPERCMDS)
   ```

2. Define the following OPERCMDS class profile using a security product like RACF® for the Lifeline Advisor:

   ```
   RDEFINE OPERCMDS (MVS.SERVMGR.LLADVSR) UACC(NONE)
   ```

3. Define the following OPERCMDS class profile using a security product like RACF for the Lifeline Agent:

   ```
   RDEFINE  OPERCMDS (MVS.SERVMGR.LLAGENT) UACC(NONE)
   ```

4. Permit the Lifeline Advisor to the OPERCMDS class profile:

   ```
   PERMIT MVS.SERVMGR.LLADVSR CLASS(OPERCMDS) ACCESS(CONTROL) ID(userid)
   ```

5. Permit the Lifeline Agent to the OPERCMDS class profile:

   ```
   PERMIT MVS.SERVMGR.LLAGENT CLASS(OPERCMDS) ACCESS(CONTROL) ID(userid)
   ```

6. Issue the following command to refresh the OPERCMDS class profile:

   ```
   SETROPTS RACLIST(OPERCMDS) REFRESH
   ```

Authorizing the Lifeline Advisors to use BCPii

You need to grant Lifeline Advisors general authority to use the Base Control Program Internal Interface (BCPii), including authority to specific resources such as the interconnected Central Processor Complexes (CPCs) and images on those CPCs.

About this task

To allow a Lifeline Advisor to query CPC and image information, complete the following steps. See “Using the Base Control Program Internal Interface” on page 59 for more information.

Procedure

1. Issue the following two commands to ensure that the FACILITY class is active and that RACLIST processing is enabled:

   ```
   SETROPTS CLASSACT(FACILITY)
   SETROPTS RACLIST (FACILITY)
   ```

2. Define the following FACILITY class profile for authority to use BCPii:

   ```
   RDEFINE FACILITY HWI.APPLNAME.HWISERV UACC(NONE)
   ```

3. Permit the Lifeline Advisor to the FACILITY class:

   ```
   PERMIT HWI.APPLNAME.HWISERV CLASS(FACILITY) ACCESS(READ) ID(userid)
   ```

4. Define the following FACILITY class profile (one for each CPC) for authority to query the CPC.

   ```
   RDEFINE FACILITY HWI.TARGET.netid.nau UACC(NONE) APPLDATA(community-name)
   ```

   Where:

   - *netid.nau* represents the 3 to 17 character SNA name of the particular CPC.
   - *community-name* is the SNMP community name that was defined on the Support Element for that CPC.

5. Permit the Lifeline Advisor to each of the FACILITY class profiles:

   ```
   PERMIT HWI.TARGET.netid.nau CLASS(FACILITY) ACCESS(READ) ID(userid)
   ```

6. Define the following FACILITY class profile (one for each CPC) for authority to query each image of the CPC.

   ```
   RDEFINE FACILITY HWI.TARGET.netid.nau.* UACC(NONE)
   ```

   Where:

   - *netid.nau* represents the 3 to 17 character SNA name of the particular CPC.

7. Permit the Lifeline Advisor to each of these FACILITY class profiles:

   ```
   PERMIT HWI.TARGET.netid.nau.* CLASS(FACILITY) ACCESS(READ) ID(userid)
   ```

8. Issue the following command to refresh the FACILITY class profile:

   ```
   SETROPTS RACLIST(FACILITY) REFRESH
   ```

Authorizing the Lifeline Advisor to accept secure peer Advisor connections

If you want to authenticate a peer Lifeline Advisor using Application Transparent TLS (AT-TLS), you need to grant the user ID associated with the peer Advisor access to the AQS.LLADVSR.ADVISORACCESS resource.

About this task

To authenticate a peer Lifeline Advisor by using AT-TLS, grant the peer Advisor access to the AQS.LLADVSR.ADVISORACCESS resource. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring AT-TLS.

To allow a Lifeline Advisor to authenticate a peer Advisor by using AT-TLS, rather than the advisor_id_list Advisor configuration statement, complete the following steps:

Procedure

1. Issue the following two commands to ensure that the SERVAUTH class is active and that RACLIST processing is enabled:

   ```
   SETROPTS CLASSACT(SERVAUTH)
   SETROPTS RACLIST (SERVAUTH)
   ```

2. Define the following SERVAUTH class profile:

   ```
   RDEFINE SERVAUTH(AQS.LLADVSR.ADVISORACCESS.sysname) UACC(NONE)
   ```

   Where:

   - *sysname* is the MVS system name where the local Advisor resides.

3. Grant the user ID associated with the peer Lifeline Advisor READ access to the SERVAUTH class profile:

   ```
   PERMIT AQS.LLADVSR.ADVISORACCESS.sysname CLASS(SERVAUTH) ACCESS(READ) ID(userid)
   ```

4. Issue the following command to refresh the SERVAUTH class profile:

   ```
   SETROPTS RACLIST(SERVAUTH) REFRESH
   ```

   See Appendix D, “Sample AT-TLS configuration policies,” on page 323 for examples of Lifeline Advisor and peer Lifeline Advisor AT-TLS configurations for a peer Lifeline Advisor connection.

(z/OS systems) Authorizing the Lifeline Advisor to accept secure Agent connections

Rule: This task is only applicable to the Lifeline Agents residing on z/OS systems. Linux on z Systems Management Agents do not support authenticating to Advisors using AT-TLS.
If you want to authenticate a Lifeline Agent using Application Transparent TLS (AT-TLS), you need to grant the user ID associated with the Agent access to the AQS.LLADVSR.AGENTACCESS resource.

About this task

To authenticate a Lifeline Agent by using AT-TLS, grant the Agent access to the AQS.LLADVSR.AGENTACCESS resource. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring AT-TLS.

Note: You must configure each Agent IP addresses in the agent_id_list Advisor configuration statement, regardless of whether secure Agent connections are used.

To allow a Lifeline Advisor to authenticate an Agent by using AT-TLS, complete the following steps:

Procedure

1. Issue the following two commands to ensure that the SERVAUTH class is active and that RACLIST processing is enabled:

   ```
   SETROPTS CLASSACT(SERVAUTH)
   SETROPTS RACLIST (SERVAUTH)
   ```

2. Define the following SERVAUTH class profile:

   ```
   RDEFINE SERVAUTH (AQS.LLADVSR.AGENTACCESS.sysname) UACC(NONE)
   ```

   Where:

   - *sysname* is the MVS system name where the Advisor resides.

3. Grant the user ID associated with the Lifeline Agent READ access to the SERVAUTH class profile:

   ```
   PERMIT AQS.LLADVSR.AGENTACCESS.sysname CLASS(SERVAUTH) ACCESS(READ) ID(userid)
   ```

4. Issue the following command to refresh the SERVAUTH class profile:

   ```
   SETROPTS RACLIST(SERVAUTH) REFRESH
   ```

   See Appendix D, “Sample AT-TLS configuration policies,” on page 323 for examples of Lifeline Advisor and peer Lifeline Advisor AT-TLS configurations for a peer Lifeline Advisor connection.

Authorizing the Lifeline Advisor to accept secure Load Balancer connections

If you want to authenticate a load balancer using Application Transparent TLS (AT-TLS), you need to grant the user ID associated with the load balancer access to the AQS.LLADVSR.LBACCESS resource.

About this task

To authenticate a load balancer by using AT-TLS, grant the load balancer access to the AQS.LLADVSR.LBACCESS resource. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring AT-TLS.

Note: You must configure each load balancer IP addresses in the lb_id_list Advisor configuration statement, regardless of whether secure load balancer connections are used.

To allow a Lifeline Advisor to authenticate a load balancer by using AT-TLS, complete the following steps:

Procedure

1. Issue the following two commands to ensure that the SERVAUTH class is active and that RACLIST processing is enabled:

   ```
   SETROPTS CLASSACT(SERVAUTH)
   SETROPTS RACLIST (SERVAUTH)
   ```

2. Define the following SERVAUTH class profile:

   ```
   RDEFINE SERVAUTH (AQS.LLADVSR.LBACCESS.sysname) UACC(NONE)
   ```

   Where:

   - *sysname* is the MVS system name where the Advisor resides.

3. Grant the user ID associated with the load balancer READ access to the SERVAUTH class profile:

   ```
   PERMIT AQS.LLADVSR.LBACCESS.sysname CLASS(SERVAUTH) ACCESS(READ) ID(userid)
   ```

4. Issue the following command to refresh the SERVAUTH class profile:

   ```
   SETROPTS RACLIST(SERVAUTH) REFRESH
   ```

   See Appendix D, “Sample AT-TLS configuration policies,” on page 323 for examples of Lifeline Advisor and peer Lifeline Advisor AT-TLS configurations for a peer Lifeline Advisor connection.

(z/OS systems) Authorizing the Lifeline Advisors and Agents to issue event-driven messages

Rule: This task is only applicable to Lifeline Advisors and the Lifeline Agents residing on z/OS systems.
You need to grant Lifeline Advisors and Agents access to the BPX.CONSOLE resource only if the *userid* that is associated with the OMVS segment created for the Lifeline Advisor and Agent is defined with a non-zero UID. Otherwise, any event-driven message issued by the Lifeline Advisor or Agent will be prefixed with BPXM023I. See "Configuring one Lifeline Advisor as the primary Advisor, and optionally one as the secondary Advisor" on page 44 and "Configuring a Lifeline Agent" on page 46 for more information about OMVS segments.

About this task

If you are using RACF and have already defined the resource profile and enabled the FACILITY class, grant Lifeline Advisors and Agents access to that resource.

If you are using a security product other than RACF that by default denies access to the resource, grant the Lifeline Advisors and Agents access to the resource.

If you are using RACF, complete the following steps to define the resource profile if you have not defined it, and grant Lifeline Advisors and Agents access to the resource:

Procedure

1. Issue the following two commands to ensure that the FACILITY class is active and that RACLIST processing is enabled:
   ```
   SETROPTS CLASSACT(FACILITY)
   SETROPTS RACLIST (FACILITY)
   ```
2. Define the following FACILITY class profile:
   ```
   RDEFINE  FACILITY (BPX.CONSOLE) UACC(NONE)
   ```
3. Grant the Lifeline Advisor READ access to the FACILITY class profile:
   ```
   PERMIT BPX.CONSOLE CLASS(FACILITY) ACCESS(READ) ID(userid)
   ```
4. Grant the Lifeline Agent READ access to the FACILITY class profile:
   ```
   PERMIT BPX.CONSOLE CLASS(FACILITY) ACCESS(READ) ID(userid)
   ```
5. Issue the following command to refresh the FACILITY class profile:
   ```
   SETROPTS RACLIST(FACILITY) REFRESH
   ```

(z/OS systems) Authorizing the Lifeline Agents to use WLM services

Rule: This task is only applicable to the Lifeline Agents residing on z/OS systems. You need to grant Lifeline Agents access to the BPX.WLMSERVER resource only if you have already defined the resource profile.

About this task

If you are using RACF and have already defined the resource profile and enabled the FACILITY class, grant Lifeline Agents access to that resource.

If you are using a security product other than RACF that by default denies access to the resource, grant the Lifeline Agents access to the resource.

If you are using RACF, complete the following steps to define the resource profile if you have not defined it, and grant Lifeline Agents access to the resource:

Procedure

1. Issue the following two commands to ensure that the FACILITY class is active and that RACLIST processing is enabled:
   ```
   SETROPTS CLASSACT(FACILITY)
   SETROPTS RACLIST (FACILITY)
   ```
2. Define the following FACILITY class profile:
   ```
   RDEFINE  FACILITY (BPX.WLMSERVER) UACC(NONE)
   ```
3. Grant the Lifeline Agent READ access to the FACILITY class profile:
   ```
   PERMIT BPX.WLMSERVER CLASS(FACILITY) ACCESS(READ) ID(userid)
   ```
4. Issue the following command to refresh the FACILITY class profile:
   ```
   SETROPTS RACLIST(FACILITY) REFRESH
   ```

(z/OS systems) Authorizing the Lifeline Agents to reset active connections

Rule: This task is only applicable to the Lifeline Agents residing on z/OS systems. You need to grant Lifeline Agents access to the MVS.VARY.TCPIP.DROP resource.

About this task

To process a Lifeline Advisor DEACTIVATE command, the Lifeline Agents must be able to reset active connections that have been identified by the Advisor. See "MODIFY *advisor_proc*,DEACTivate command: Deactivate workloads" on page 160 for more information.

To grant Agents explicit authority to reset active connections, complete the following steps:

Procedure

1. Issue the following two commands to ensure that the OPERCMDS class is active and that RACLIST processing is enabled:
   ```
   SETROPTS CLASSACT(OPERCMDS)
   SETROPTS RACLIST (OPERCMDS)
   ```
2. Define the following OPERCMDS class profile:
   ```
   RDEFINE OPERCMDS (MVS.VARY.TCPIP.DROP) UACC(NONE)
   ```
3. Permit the Lifeline Agent to the OPERCMDS class profile:
   ```
   PERMIT MVS.VARY.TCPIP.DROP CLASS(OPERCMDS) ACCESS(CONTROL) ID(userid)
   ```
4. Issue the following command to refresh the OPERCMDS class profile:
   ```
   SETROPTS RACLIST(OPERCMDS) REFRESH
   ```

(z/OS systems) Authorizing the Lifeline Agents to monitor SNA applications

Rule: This task is only applicable to the Lifeline Agents residing on z/OS systems. To prevent other applications from accessing the Lifeline Agent extended MCS console, define the MVS.MCSOPER.LLAGNT* generic resource and grant Agents access to this resource.

About this task

To monitor SNA applications, a Lifeline Agent uses an extended MCS console to issue VTAM commands. The console name for this extended MCS console is the text string 'LLAGNT' that is appended with the MVS sysclone value of the system where the Agent resides.

To restrict access to the console name that the Lifeline Agent uses, complete the following steps:

Procedure

1. Issue the following two commands to ensure that the OPERCMDS class is active and that RACLIST processing is enabled:
   ```
   SETROPTS CLASSACT(OPERCMDS)
   SETROPTS RACLIST (OPERCMDS)
   ```
2. Define the following OPERCMDS class profile:
   ```
   RDEFINE OPERCMDS (MVS.MCSOPER.LLAGNT*) UACC(NONE)
   ```
3. Permit the Lifeline Agent to the OPERCMDS class profile:
   ```
   PERMIT MVS.MCSOPER.LLAGNT* CLASS(OPERCMDS) ACCESS(READ) ID(userid)
   ```
4. Issue the following command to refresh the OPERCMDS class profile:
   ```
   SETROPTS RACLIST(OPERCMDS) REFRESH
   ```

(z/OS systems) Enabling the Lifeline Agents to communicate with MQ queue managers

Rule: This task is only applicable to the Lifeline Agents residing on z/OS systems.

To allow a Lifeline Agent to communicate with MQ queue managers, complete the following steps:

- The IBM MQ SCSQAUTH and SCSQLOAD libraries must either be added to the LNKLST concatenation or added as a STEPLIB DD statement in the Agent's started procedure.
- You need to grant Lifeline Agents access to any resources defined in the MQADMIN, MQCMDS, MQCONN, or MQQUEUE classes that are already defined to restrict access to MQ queue managers.

About this task

To monitor and alter the MQ queue managers and the MQ cluster queues that they host, the Lifeline Agent creates an MQ connection with each of the MQ queue managers on the system where the Agent resides.

To allow a Lifeline Agent to load the required MQ system calls to communicate with MQ queue managers, complete one of the steps in the following procedure:

Procedure

1. Add the IBM MQ SCSQAUTH and SCSQLOAD dataset names to the LNKLSTxx SYS1.PARMLIB member. See *z/OS Initialization and Tuning Reference* for information on the LNKLSTxx member.
2. Add the IBM MQ SCSQAUTH and SCSQLOAD dataset names as a STEPLIB DD statement in the Agent's started procedure. See *z/OS MVS JCL Reference* for information on the STEPLIB statement.

If you are using RACF and have already defined resource profiles and enabled any of the MQADMIN, MQCMDS, MQCONN, or MQQUEUE classes, grant Lifeline Agents access to the defined resources.

If you are using a security product other than RACF that by default denies access to the resource, grant the Lifeline Agents access to the defined resources.

If you are using RACF, complete the following steps to grant Lifeline Agents access to each resource in this procedure:

Procedure

1. If the *qmgr*.CHANNEL.* resource is defined in the MQADMIN class profile, permit the Lifeline Agent to the resource:

   ```
   PERMIT qmgr.CHANNEL.* CLASS(MQADMIN) ACCESS(ALTER) ID(userid)
   ```

   Where:

   - *qmgr* is the name of the MQ queue manager to be controlled by the Agent.
2. If the *qmgr*.CONTEXT.* resource is defined in the MQADMIN class profile, permit the Lifeline Agent to the resource:

   ```
   PERMIT qmgr.CONTEXT.* CLASS(MQADMIN) ACCESS(CONTROL)
   ID(userid)
   ```

Where:

- *qmgr* is the name of the MQ queue manager to be controlled by the Agent.

3. If the *qmgr*.QUEUE.* resource is defined in the MQADMIN class profile, permit the Lifeline Agent to the resource:

   ```
   PERMIT qmgr.QUEUE.* CLASS(MQADMIN) ACCESS(ALTER) ID(userid)
   ```

   Where:

   - *qmgr* is the name of the MQ queue manager to be controlled by the Agent.

4. Issue the following command to refresh the MQADMIN class profile:

   ```
   SETROPTS RACLIST(MQADMIN) REFRESH
   ```

5. If the *qmgr*.ALTER.* resource is defined in the MQCMDS class profile, permit the Lifeline Agent to the resource:

   ```
   PERMIT qmgr.ALTER.* CLASS(MQCMDS) ACCESS(ALTER) ID(userid)
   ```

   Where:

   - *qmgr* is the name of the MQ queue manager to be controlled by the Agent.

6. If the *qmgr*.DISPLAY.* resource is defined in the MQCMDS class profile, permit the Lifeline Agent to the resource:

   ```
   PERMIT qmgr.DISPLAY.* CLASS(MQCMDS) ACCESS(READ) ID(userid)
   ```

   Where:

   - *qmgr* is the name of the MQ queue manager to be controlled by the Agent.

7. If the *qmgr*.START.* resource is defined in the MQCMDS class profile, permit the Lifeline Agent to the resource:

   ```
   PERMIT qmgr.START.* CLASS(MQCMDS) ACCESS(CONTROL) ID(userid)
   ```

   Where:

   - *qmgr* is the name of the MQ queue manager to be controlled by the Agent.

8. If the *qmgr*.STOP.* resource is defined in the MQCMDS class profile, permit the Lifeline Agent to the resource:

   ```
   PERMIT qmgr.STOP.* CLASS(MQCMDS) ACCESS(CONTROL) ID(userid)
   ```

   Where:

   - *qmgr* is the name of the MQ queue manager to be controlled by the Agent.

9. Issue the following command to refresh the MQCMDS class profile:

   ```
   SETROPTS RACLIST(MQCMDS) REFRESH
   ```

10. If the *qmgr*.BATCH resource is defined in the MQCONN class profile, permit the Lifeline Agent to the resource:

    ```
    PERMIT qmgr.BATCH CLASS(MQCONN) ACCESS(READ) ID(userid)
    ```

    Where:

    - *qmgr* is the name of the MQ queue manager to be controlled by the Agent.

11. Issue the following command to refresh the MQCONN class profile:

    ```
    SETROPTS RACLIST(MQCONN) REFRESH
    ```

12. If the *qmgr*.SYSTEM.COMMAND.INPUT resource is defined in the MQQUEUE class profile, permit the Lifeline Agent to the resource:

    ```
    PERMIT qmgr.SYSTEM.COMMAND.INPUT CLASS(MQQUEUE) ACCESS(UPDATE) ID(userid)
    ```

    Where:

    - *qmgr* is the name of the MQ queue manager to be controlled by the Agent.

13. If the *qmgr*.SYSTEM.COMMAND.REPLY.MODEL resource is defined in the MQQUEUE class profile, permit the Lifeline Agent to the resource:
    ```
    PERMIT qmgr.SYSTEM.COMMAND.REPLY.MODEL CLASS(MQQUEUE) ACCESS(UPDATE) ID(userid)
    ```
    Where:
    - *qmgr* is the name of the MQ queue manager to be controlled by the Agent.
14. If the *qmgr.workloadqueue* resource is defined in the MQQUEUE class profile, permit the Lifeline Agent to the resource:
    ```
    PERMIT qmgr.workloadqueue CLASS(MQQUEUE) ACCESS(UPDATE) ID(userid)
    ```
    Where:
    - *qmgr* is the name of the MQ queue manager to be controlled by the Agent.
    - *workloadqueue* is the name of a cluster queue defined to the MQ workload.
15. The Lifeline Agent dynamically creates the LIFELINE.REPLY.QUEUE queue to receive command responses. To restrict access to this queue, create the *qmgr*.LIFELINE.REPLY.QUEUE resource in the MQQUEUE class profile and permit the Lifeline Agent to the resource:
    ```
    RDEFINE MQQUEUE (qmgr.LIFELINE.REPLY.QUEUE) UACC(NONE)
    PERMIT qmgr.LIFELINE.REPLY.QUEUE CLASS(MQQUEUE) ACCESS(ALTER) ID(userid)
    ```
    Where:
    - *qmgr* is the name of the MQ queue manager to be controlled by the Agent.
16. Issue the following command to refresh the MQQUEUE class profile:
    ```
    SETROPTS RACLIST(MQQUEUE) REFRESH
    ```

(z/OS systems) Ensuring Lifeline Advisors and Lifeline Agents can allocate required threads

Rule: This task is only applicable to Lifeline Advisors and the Lifeline Agents residing on z/OS systems.

About this task

To allow a Lifeline Advisor and Lifeline Agent to allocate the necessary threads to process a Lifeline Advisor TRANSFER command, complete the following steps:

- You need to verify the MAXTHREADS and MAXTHREADTASKS parameters are set correctly.
- You need to ensure the *THREADSMAX* variable, if configured, in the OMVS segment of the Lifeline Advisors and Lifeline Agents is set correctly.

To process a Lifeline Advisor TRANSFER command, the Advisor and Agents allocate threads to handle the transfer of each MQ cluster queue defined to the workload.

To allow a Lifeline Advisor and Lifeline Agent to allocate enough threads to successfully process the transfer of MQ messages for a workload, complete the steps in the following procedure:

Procedure

1. Ensure that the MAXTHREADS and MAXTHREADTASKS parameters in the BPXPRMxx SYS1.PARMLIB member are each set to a value of 512 or higher. See *z/OS Initialization and Tuning Reference* for information on the BPXPRMxx member.
2. If the *THREADSMAX* variable is specified when defining the OMVS segment for the Lifeline Advisor and Lifeline Agent, ensure that the variable is set to a value of 512 or higher. See Appendix A, "A sample started procedure for Lifeline Advisors," on page 297 for sample JCL to define a user ID with an OMVS segment.

Granting a network management application authority to use the Network Management Interface

Multi-site Workload Lifeline provides a Network Management Interface (NMI) to allow an application to retrieve workload states, server application metrics, and connection status from the Lifeline Advisor.

About this task

To use this NMI, you must either allow the *userid* associated with the application to have superuser authority or grant access to the AQS.NETMGMT.DISPLAY resource.

To allow the application to use the NMI without having superuser authority, complete the following steps to grant access to the AQS.NETMGMT.DISPLAY resource:

Procedure

1. Issue the following two commands to ensure that the SERVAUTH class is active and that RACLIST processing is enabled:

   ```
   SETROPTS CLASSACT(SERVAUTH)
   SETROPTS RACLIST (SERVAUTH)
   ```

2. Define the following SERVAUTH class profile:

   ```
   RDEFINE  SERVAUTH AQS.NETMGMT.DISPLAY UACC(NONE)
   ```

3. Permit the user ID that is associated with the application READ access to the SERVAUTH class profile:

   ```
   PERMIT AQS.NETMGMT.DISPLAY  ACCESS(READ) CLASS(SERVAUTH) ID(userid)
   ```

4. Issue the following command to refresh the SERVAUTH class profile:

   ```
   SETROPTS RACLIST(SERVAUTH) REFRESH
   ```

Granting a user application authority to use the Display Command API

Multi-site Workload Lifeline provides a Display Command API to allow an application to send Lifeline DISPLAY commands and retrieve the command responses.

About this task

To use this API, you must either allow the userid associated with the application to have superuser authority or grant access to the AQS.CMDAPI.DISPLAY resource.

To allow the application to use the API without having superuser authority, complete the following steps to grant access to the AQS.CMDAPI.DISPLAY resource:

Procedure

1. Issue the following two commands to ensure that the SERVAUTH class is active and that RACLIST processing is enabled:

   ```
   SETROPTS CLASSACT(SERVAUTH)
   SETROPTS RACLIST (SERVAUTH)
   ```

2. Define the following SERVAUTH class profile:

   ```
   RDEFINE SERVAUTH AQS.CMDAPI.DISPLAY UACC(NONE)
   ```

3. Permit the user ID that is associated with the application READ access to the SERVAUTH class profile:

   ```
   PERMIT AQS.CMDAPI.DISPLAY ACCESS(READ) CLASS(SERVAUTH) ID(userid)
   ```

4. Issue the following command to refresh the SERVAUTH class profile:

   ```
   SETROPTS RACLIST(SERVAUTH) REFRESH
   ```

Chapter 3. Configuring Multi-site Workload Lifeline

You need to configure Multi-site Workload Lifeline before you can use it to balance TCP/IP workloads among different z/OS sites.

Before you begin

Complete the tasks in Chapter 2, "Preparing to use Multi-site Workload Lifeline," on page 35.

Lifeline Advisor configuration file

You specify the Lifeline Advisor configuration file on the CONFIG DD statement in the Lifeline Advisor started procedure to configure both the primary and secondary Lifeline Advisors.

The Lifeline Advisor configuration file serves the following basic purposes:

- Defines the listening sockets for the external load balancers, the secondary Lifeline Advisor, and Lifeline Agents
- Provides an access control list for specifying which external load balancers, Lifeline Advisor, and Lifeline Agents can connect to the primary Lifeline Advisor
- Associates each second-tier load balancer to a site for all the defined workloads
- Customizes optional parameters

The Lifeline Advisor reads configuration data from one file, which can be a z/OS UNIX file, a PDS or PDSE member, or a sequential data set.

The configuration file used by the Lifeline Advisor, when the configuration file is a z/OS UNIX file, must meet these requirements:

- The write permission of the configuration file can only be set for the user and group classes.
- The others class can only be granted read permission.

See Appendix A, "A sample started procedure for Lifeline Advisors," on page 297 for a sample Advisor start procedure.

Lifeline Agent configuration file

For z/OS Agents, specify the Lifeline Agent configuration file on the CONFIG DD statement in the Lifeline Agent start procedure. For Linux on z Systems Management Agents, specify the Lifeline Agent configuration file by using the **-c configfile** parameter, or use the default location `/opt/ibm/lifeline/conf/agent.conf`. See "Linux on z Systems Workloads" on page 13 for more information about the Linux on z Systems Management Agent configuration file.

The Lifeline Agent configuration file serves three basic purposes:

- Defines the IP address and port that the Lifeline Agent binds to for communication with the Lifeline Advisor
- Identifies the IP address and port of the Lifeline Advisor
- Customizes optional parameters

For z/OS Agents, the Lifeline Agent configuration file can be a z/OS UNIX file, a PDS or PDSE member, or a sequential data set.

The configuration file used by the Linux on z Systems Management Agent or the z/OS Agent, when the configuration file is a z/OS UNIX file, must meet these requirements:

- The write permission of the configuration file can only be set for the user and group classes.
- The others class can only be granted read permission.

See Appendix B, "A sample started procedure for Lifeline z/OS Agents," on page 299 for a sample Agent start procedure.

Configuring one Lifeline Advisor as the primary Advisor, and optionally one as the secondary Advisor

Use the Lifeline Advisor configuration file to configure one Lifeline Advisor as the primary Advisor. You can also use this file to configure an optional secondary Lifeline Advisor.

About this task

Only one Lifeline Advisor can serve as a primary Advisor at any given time. To start a secondary Lifeline Advisor to take over primary Advisor responsibilities in the case of a failure of the primary Advisor, specify identical statements in the Lifeline Advisor configuration file for both the primary and secondary Lifeline Advisors.

Complete the following steps to configure Lifeline Advisors:

Procedure

1. Define listening sockets, ports, or both.
   a. Specify the port that the Lifeline Advisor listens on for IPv4 load balancer connections on the lb_connection_v4 configuration statement. The default port for communications with external load balancers is 3860. The IPv4 address on the lb_connection_v4 configuration statement is used by the Lifeline Advisor to accept IPv4 connections from Lifeline Agents and peer Advisor. You can also specify the port that the Lifeline Advisor listens on for IPv6 load balancer connections on the lb_connection_v6 configuration statement. The IPv6 address on the lb_connection_v6 configuration statement is used by the Lifeline Advisor to accept IPv6 connections from Lifeline Agents and peer Advisor.

      Guideline: To enable the movement of the primary Lifeline Advisor to another system when the Lifeline Advisor or its underlying system fails, specify a dynamic VIPA (DVIPA) on the lb_connection_v4 and lb_connection_v6 statements. Furthermore, make this DVIPA a unique application-instance DVIPA (defined through VIPARANGE) rather than a multiple application-instance DVIPA (defined through VIPADEFINE). For more information about configuring DVIPAs, see *z/OS Communications Server: IP Configuration Reference*.

      Rules:

- Run the Lifeline Advisor on an INET system. If you run the Lifeline Advisor on a CINET system, the address or addresses that you specify on the lb_connection_v4 or lb_connection_v6 statement tie the Lifeline Advisor to the stack owning those addresses. Consequently, the termination of that stack results in the termination of the Lifeline Advisor.
- If the primary Lifeline Advisor is using IPv6 for the external load balancer connections, or if any Lifeline Agents are using IPv6 to connect to the Lifeline Advisor, you must configure the system in which the secondary Lifeline Advisor resides to be enabled for IPv6.

b. Specify the local port that the Lifeline Advisor listens on for Lifeline Agent connections on the agent_connection_port statement. If the TCP/IP stack of the Lifeline Advisor is enabled for IPv6, the Lifeline Advisor opens a listening socket for Lifeline Agents on the IPv6 unspecified address (::) on the port specified by this statement. This enables Lifeline Agents to connect to the Lifeline Advisor using either the IPv4 address specified on the lb_connection_v4 statement or the IPv6 address specified on the lb_connection_v6 statement. If the TCP/IP stack is not enabled for IPv6, the Lifeline Advisor opens a listening socket on the IPv4 unspecified address, 0.0.0.0. This enables Lifeline Agents to connect to the Lifeline Advisor using only the IPv4 address specified on the lb_connection_v4 statement.

c. Specify the local port that the Lifeline Advisor listens on for a connection from the secondary Lifeline Advisor on the advisor_connection_port statement. The same information specified in the previous step about the use of the lb_connection_v4 and lb_connection_v6 statements applies in this step.

2. Define the access control list.

   Rule: Specify only complete IP addresses in access control lists. Subnetworks, IP prefixes, or other types of wildcards are not allowed.

   a. Specify the list of external load balancers that are allowed to connect to the Lifeline Advisor on the lb_id_list statement. A maximum limit of 100 external load balancers can be connected to a Lifeline Advisor at any given time.

      You can also use Application Transparent TLS (AT-TLS) to authenticate external load balancers. If you use AT-TLS for a load balancer, you still need to include the IP address of that load balancer in the lb_id_list statement. See “Authorizing the Lifeline Advisor to accept secure Load Balancer connections” on page 38 for more information.

   b. Specify the list of secondary Lifeline Advisors that are allowed to connect to the primary Lifeline Advisor on the advisor_id_list statement. Only a single secondary Lifeline Advisor can be connected to the primary Lifeline Advisor at any given time.

      You can also use Application Transparent TLS (AT-TLS) to authenticate secondary Lifeline Advisors. If you use AT-TLS for a secondary Advisor, you do not need to include the IP address of that Advisor in the advisor_id_list statement. See Authorizing the Lifeline Advisor to accept secure peer Advisor connections for more information.

   c. Specify the list of Lifeline Agents that are allowed to connect to the primary Lifeline Advisor on the agent_id_list statement.

      You can also use Application Transparent TLS (AT-TLS) to authenticate Lifeline z/OS Agents. If you use AT-TLS for a z/OS Agent, you still need to

include the IP address of that z/OS Agent in the agent_id_list statement. See Authorizing the Lifeline Advisor to accept secure Agent connections for more information.

3. Update the TCP/IP profiles on the systems where the primary and secondary Advisors reside to add the VIPARANGE definition that configures the IP address used in the lb_connection_v4 and lb_connection_v6 Advisor configuration statements.
4. Define an OMVS segment for the Lifeline Advisor. Because the Lifeline Advisor accesses files in the UNIX System Services shell, the Lifeline Advisor needs to have an OMVS segment defined for it. See Appendix A, "A sample started procedure for Lifeline Advisors," on page 297 for sample JCL to define a user ID with an OMVS segment.
5. Optional: Customize optional statements, including the update_interval, failure_detection_interval, and debug_level statements.

   Guideline: In most cases, do not customize the debug_level statement, unless you are directed to do so by an IBM service representative. Adding additional types of trace data can cause the amount of captured data to become voluminous. Reducing the amount of trace data from the default might make diagnosing a problem more difficult.
6. Optional: Change the location of the Multi-site Workload Lifeline Advisor message catalog. The Lifeline Advisor uses a standard message catalog. The message catalog must be in the z/OS UNIX file system. The default location of the message catalog is `/usr/lib/nls/msg/C/aqsllmsg.cat`. If you want to store the message catalog in another location, you need to change the NLSPATH or the LANG environment variables. To change the two environment variables, you can update the started procedure of the Lifeline Advisor to pass the ENVAR option to set NLSPATH. If aqsllmsg.cat does not exist, the Lifeline Advisor by default uses the messages hardcoded in the software. These messages duplicate the English message catalog that is shipped with the Multi-site Workload Lifeline product.

Configuring a Lifeline Agent

Use the Lifeline Agent configuration file to configure one Lifeline Agent per z/OS target system across both sites. If workloads contain Linux on z Systems applications, you also need to use the Lifeline Agent configuration file to configure one Linux on z Systems Management Agent per target z/VM system across both sites.

About this task

Only one Lifeline Agent can be active per z/OS system at any time. Only one Linux on z Systems Management Agent per site can be active per z/VM system at any time. If two Linux on z Systems Management Agents are configured on the same z/VM system, each Agent monitors a different set of Linux on z Systems guests for the site they are configured. Complete the following steps to configure Lifeline Agents:

Procedure

1. Specify the local IP address and port that the Lifeline Agent binds to for communicating with the Lifeline Advisor on the host_connection statement. This step is used as part of the Lifeline Advisor's access control enforcement.

Guideline: For high availability of z/OS Agents, use a static VIPA as the local IP address to tolerate individual link outages on the z/OS system. For more information about configuring static VIPAs, see *z/OS Communications Server: IP Configuration Reference*.

2. Specify the IP address and port of the Lifeline Advisor on the advisor_id statement.
3. For Lifeline z/OS Agents, update the TCP/IP profiles on the systems where the Agents reside to add the static VIPA definition that configures the IP address used in the host_connection Agent configuration statement.

   For Lifeline z/OS Agents, you can also use Application Transparent TLS (AT-TLS) to authenticate the Agents. See Authorizing the Lifeline Advisor to accept secure Agent connections for more information.
4. For Lifeline z/OS Agents, define an OMVS segment for the Lifeline Agent. Because the z/OS Agent accesses files in the UNIX System Services shell, you need to define an OMVS segment for the Lifeline Agent. See Appendix B, "A sample started procedure for Lifeline z/OS Agents," on page 299 to define a user ID with an OMVS segment.
5. Optional: Use the debug_level statement to specify how much trace data is captured in the log file of the Lifeline Agent.

   Rule: In most cases, you should not customize this statement, unless you are directed to do so by an IBM service representative. Adding additional types of trace data can cause the amount of data captured to become voluminous. Reducing the amount of trace data from the default might make diagnosing a problem more difficult.
6. Optional: For Lifeline z/OS Agents, change the location of the Multi-site Workload Lifeline Agent message catalog. The z/OS Agent uses a standard message catalog. The message catalog must be in the z/OS UNIX file system. The default location of the message catalog is `/usr/lib/nls/msg/C/aqsllmsg.cat`. If you want to store the message catalog in another location, you need to change the NLSPATH or the LANG environment variables. To change the two environment variables, you can update the started procedure of the z/OS Agent to pass the ENVAR option to set NLSPATH. If aqsllmsg.cat does not exist, the Lifeline z/OS Agent by default uses the messages hardcoded in the software. These messages duplicate the English message catalog that is shipped with the Multi-site Workload Lifeline product.

   For Linux on z Systems Management Agents, the default location of the Multi-site Workload Lifeline Agent message catalog is `/opt/ibm/lifeline/lib/msg/C/aqsllmsg.cat`. To store the message catalog in another location, you must set the NLSPATH environment variable. If aqsllmsg.cat does not exist or cannot be found, the Linux on z Systems Agent by default uses the messages that are hardcoded in the software. These messages duplicate the English message catalog that is shipped with the Multi-site Workload Lifeline product.

(z/OS systems) WLM recommendations

Rule: This section is only applicable to the Lifeline Agents residing on z/OS systems.

The Lifeline z/OS Agents use a WLM recommendation that is referred to as server-specific WLM. Server-specific WLM provides a relative measure of the ability of a target system to handle additional workload requests, as compared to other systems across both sites. It also indicates how well individual server applications or MQ queue managers are doing compared to the WLM policy goals that have been specified for that workload.

Server-specific WLM recommendations are composed of two key elements:

- The amount of displaceable capacity (general, zAAP, and zIIP) available on the target system, based on the importance level of the server application or MQ queue manager, and the proportion of general, zAAP, and zIIP CPU that is currently being consumed by the workload of the application. For example, if the application is using only general and zAAP CPU, the displaceable zIIP capacity is not considered.
- The performance of the application compared to the WLM goals for that application workload.

WLM provides an interface that enables server applications to report the following additional information:

- The abnormal transaction completion rate, or the rate of abnormal completions per 1000 total transactions
- Application health, which is a value in the range 0 - 100% (100% is optimal), representing the overall health of the server application

Configuring Lifeline Advisors to automatically restart

You can use automation software or define an automatic restart manager (ARM) policy to automatically restart the Lifeline Advisor in case the Advisor or system fails. Although this task is optional, you should restart the Lifeline Advisor as soon as possible after it fails.

About this task

The restart capability covers scenarios where the Lifeline Advisor itself fails; in scenarios where the system the Lifeline Advisor is running on fails, you can configure a secondary Lifeline Advisor to automatically take over primary Advisor responsibilities.

If the Lifeline Advisor or its underlying system fails, and no secondary Lifeline Advisor is configured to automatically take over primary Advisor responsibilities, an external load balancer might do one of the following things:

- Continue to distribute workload requests according to the last set of information received from the Lifeline Advisor
- Resort to pre-configured weights
- Stop distributing new workload requests to second-tier load balancers or server applications

The actual behavior depends on the load balancer implementation. Consult the load balancer documentation for your specific external load balancer for details.

You need to restart the Lifeline Advisor as soon as possible when the Lifeline Advisor itself fails, or configure a secondary Lifeline Advisor to automatically take over primary Advisor responsibilities when the system on which the Lifeline Advisor is running fails.

For more information about defining ARM policies, see *z/OS MVS Setting Up a Sysplex*.

The Lifeline Advisor registers with ARM using the following values:

- ELEMTYPE=SYSLVL1
- ELEMNAME=AQSLLADVSR

- TERMTYPE=ELEMTERM

These values indicate that if the Lifeline Advisor fails on this system, the Lifeline Advisor needs to be restarted only on this system.

To configure Lifeline Advisors to automatically restart using ARM, complete the following step:

Procedure

Update the IXCARM resource. The Lifeline Advisors do not run using a system key. If you are using ARM registration, the started task IDs must be permitted with UPDATE authority to the IXCARM.SYSLVL1.AQSLLADVSR resource profile in the FACILITY class using the SAF product on your system. To enable the Advisor to register with ARM, use the following RACF commands to define the profiles and grant update access:

```
RDEFINE FACILITY IXCARM.SYSLVL1.AQSLLADVSR UACC(NONE)
PERMIT IXCARM.SYSLVL1.AQSLLADVSR CLASS(FACILITY) ID(userid) ACCESS(UPDATE)
SETROPTS RACLIST(FACILITY) REFRESH
```

(z/OS systems) Recovering from a planned outage of the TCP/IP stack

Rule: This task is only applicable to Lifeline Advisors and the Lifeline Agents residing on z/OS systems.
If you use automatic restart manager (ARM) and the TCP/IP stack address space terminates, you need to be sure that the system can recover from a planned outage of the TCP/IP stack.

About this task

When the TCP/IP stack becomes unavailable, the Lifeline Advisor also terminates, because the Advisor can no longer establish any TCP/IP communications. An ARM restart of the Lifeline Advisor will likely fail if the TCP/IP stack is not available when the restart occurs. Complete the following steps to recover from a planned outage of the TCP/IP stack:

Procedure

1. Ensure that a secondary Lifeline Advisor has been started on another system.
2. Configure the secondary Lifeline Advisor to automatically take over primary Advisor responsibilities as soon as the primary Lifeline Advisor terminates on the system where TCP/IP is stopped.

Recovering from an unplanned outage of the TCP/IP stack

If you are using automatic restart manager (ARM) and the TCP/IP stack address space terminates, you need to be sure that the system can recover from an unplanned outage of the TCP/IP stack.

About this task

When the TCP/IP stack becomes unavailable, the Lifeline Advisor also terminates, because the Advisor can no longer establish any TCP/IP communications. An ARM restart of the Lifeline Advisor will likely fail if the TCP/IP stack is not available when the restart occurs. Complete the following steps to recover from an unplanned outage of the TCP/IP stack:

Procedure

1. Ensure that an ARM policy or other automation is in place to quickly restart the TCP/IP stack on the same system.
2. Quickly restart the Lifeline Advisor on the same system. You can restart the Lifeline Advisor by using an automation software package, or by using the TCP/IP profile AUTOLOG statement. For more information about the AUTOLOG statement, see *z/OS Communications Server: Configuration Reference*.

(z/OS systems) Configuring Lifeline Agents to automatically restart

Rule: This task is only applicable to the Lifeline Agents residing on z/OS systems. You can use automation software or define an automatic restart manager (ARM) policy to automatically restart the Lifeline z/OS Agent in case the Agent or system fails. Although this task is optional, you can complete it to provide high availability to your target applications.

About this task

When a Lifeline Agent fails, the Lifeline Advisor indicates that it has no information for any server applications running on that system. As a result, if the second-tier load balancer responsible for distributing workload requests for this site is an external load balancer, target applications on the failing system will no longer receive new workload requests until the Lifeline Agent is restarted. Automatically restarting the Lifeline Agent on the same system minimizes this perceived outage. For more information about defining ARM policies, see *z/OS MVS Setting Up a Sysplex*.

Tip: If the second-tier load balancer is z/OS sysplex distributor, target applications on the failing system might continue to receive new workload requests, as z/OS sysplex distributor does not rely on the Lifeline Agent to retrieve information about these target applications.

The Lifeline Agent registers with ARM by using the following values:

- ELEMTYPE=SYSLVL1
- ELEMNAME=AQSLLAGENT*xx*
- TERMTYPE=ELEMTERM

xx in the ELEMNAME value is the MVS sysclone value of the system where the Agent resides.

These values indicate that if the Lifeline Agent fails on this system, the Lifeline Agent needs to be restarted only on this system.

To configure Lifeline Agents to automatically restart using ARM, complete the following step:

Procedure

Update the IXCARM resource. The Lifeline Agents do not run using a system key. If you are using ARM registration, the started task IDs must be permitted with UPDATE authority to the IXCARM.SYSLVL1.AQSLLAGENT* generic resource profile in the FACILITY class using the SAF product on your system. To enable the Agent to register with ARM, use the following RACF commands to define the profiles and grant update access:

```
RDEFINE FACILITY IXCARM.SYSLVL1.AQSLLAGENT* UACC(NONE)
PERMIT IXCARM.SYSLVL1.AQSLLAGENT* CLASS(FACILITY) ID(userid) ACCESS(UPDATE)
SETROPTS RACLIST(FACILITY) REFRESH
```

Migrating IBM Multi-site Workload Lifeline

About this task

When you migrate the Lifeline Advisors and Lifeline Agents to the current level, you do not need to stop all Advisors and Agents and migrate them at the same time.

Tip: Migrate both the primary and secondary Advisors before you migrate the individual Agents.

When migrating to IBM Multi-site Workload Lifeline V2.5, Lifeline performs extra verification checks when processing the ACTIVATE, QUIESCE, and DEACTIVATE commands. For more information about these commands, see Chapter 7, "Lifeline Advisor commands," on page 127.

Activating a workload for the first time

When an Active/Standby or Active/Query workload is activated to a single site for the first time, the Lifeline Advisor queries the Lifeline z/OS Agents on the alternate site to determine whether at least one of the following conditions is true:

- Active TCP/IP connections to the server applications that make up the workload are present on the alternate site.
- Active SNA sessions, for SNA workloads, to the SNA applications that make up the workload are present on the alternate site.
- For MQ cluster workloads, not all MQ cluster receiver channels are stopped or queued messages exist on transfer-eligible MQ cluster queues that are hosted by MQ queue managers on the alternate site.

If one of the above conditions is true, the ACTIVATE command fails for the workload. Message AQS0179I is issued to indicate that connections, sessions, or messages were found. For workloads not specified in the mq_manager_list Advisor configuration statement, the workload must first be deactivated to ensure that active connections or sessions are terminated on the alternate site. For workloads specified in the mq_manager_list Advisor configuration statement, the messages must be processed from the MQ cluster queues and the MQ cluster receiver channels must be stopped.

Activating a workload when the workload is not deactivated

When an Active/Standby workload is activated or an Active/Query workload is activated for the first time to a single site, and the workload is not in a deactivated state, that is, no previous DEACTIVATE command was issued for the workload, the Lifeline Advisor queries the Lifeline Agents on the alternate site to determine whether at least one of the following conditions is true:

- Active TCP/IP connections to the server applications that make up the workload are present on the alternate site.
- Active SNA sessions, for SNA workloads, to the SNA applications that make up the workload are present on the alternate site.

- For MQ cluster workloads, not all MQ cluster receiver channels are stopped or queued messages exist on transfer-eligible MQ cluster queues that are hosted by MQ queue managers on the alternate site.

If one of the above conditions is true, the ACTIVATE command fails for the workload. Message AQS0179I is issued to indicate that connections, sessions, or messages were found. For workloads not specified in the mq_manager_list Advisor configuration statement, the workload must be deactivated to ensure that active connections or sessions are terminated on the alternate site. For workloads specified in the mq_manager_list Advisor configuration statement, the workload must be deactivated; if queued messages remain on the MQ cluster queues or the MQ cluster receiver channels are not stopped, see "Deactivating an MQ cluster workload" on page 33 and the System Programmer Response for message AQS0207I for possible actions to take.

For SNA workloads, see "Activating a SNA workload" on page 25.

For MQ workloads, see "Activating an MQ cluster workload" on page 32.

Activating or quiescing a workload when not all first-tier load balancers are registered

When an Active/Standby or Active/Query workload is activated or quiesced, the Lifeline Advisor determines whether all first-tier load balancers, that are configured in the lb_id_list Advisor configuration statement, have registered. If some of the first-tier load balancers are not registered, although the ACTIVATE or QUIESCE command is successful, warning message AQS0208W is issued to indicate that you should take an action to ensure all configured first-tier load balancers are registered.

Activating or quiescing a workload when not all MQ queue managers are available

When an MQ workload is activated or quiesced, the Lifeline Advisor determines whether all MQ queue managers, that are configured in the mq_manager_list Advisor configuration statement, have been reported by a Lifeline Agent. If some of the MQ queue managers are not available, although the ACTIVATE or QUIESCE command is successful, warning message AQS0215W is issued to indicate that you should take an action to ensure all configured MQ queue managers are available for the workload.

Activating a workload when not all Lifeline Agents are connected

When an Active/Standby or Active/Query workload is activated to a single site, the Lifeline Advisor determines whether all Lifeline Agents on the alternate site, that are configured in the agent_id_list Advisor configuration statement, are connected. If some of the Agents are not connected from the alternate site, the ACTIVATE command fails for the workload. Message AQS0179I is issued to indicate that not all Agents were connected on the alternate site. The Agents must be connected or removed from the agent_id_list Advisor configuration statement before the ACTIVATE command can be retried.

When an Active/Standby or Active/Query workload is activated, the Lifeline Advisor determines whether any Lifeline Agents on the target site, that are configured in the agent_id_list Advisor configuration statement, are connected. If none of the Agents are connected from the target site, the ACTIVATE command fails for the workload. Message AQS0179I is issued to indicate that no Agents were connected on the target site. One or more Agents must be connected from the target site before the ACTIVATE command can be retried.

When a SNA workload is activated, the Lifeline Advisor determines whether all Lifeline Agents on the target sites, that are configured in the agent_id_list Advisor configuration statement, are connected. If some of the Agents are not connected from the target sites, although the ACTIVATE command is successful, warning message AQS0213W is issued to indicate that you should take an action to ensure all SNA applications on the target sites are activated.

Activating a workload when not all members for the workload are registered

When an Active/Standby or Active/Query workload is activated, the Lifeline Advisor determines whether all load balancer application group members for the workload are registered. If one or more members are not registered, message AQS0228W is issued to indicate you should correct the load balancer configuration to register all members for the workload or update the Lifeline Advisor configuration to remove these members from the cross_sysplex_list or intermediary_node_list statement.

- If the workload is activated to a single site and one or more members are not registered on the alternate site, the ACTIVATE command fails for the workload. Message AQS0179I is issued to indicate that not all members are registered on the alternate site.
- If one or members are not registered on the target active sites, the ACTIVATE command is successful.

Deactivating a workload when not all Lifeline Agents are connected

When an Active/Standby or Active/Query workload is deactivated, the Lifeline Advisor determines whether all Lifeline Agents on the single or both target sites, that are configured in the agent_id_list Advisor configuration statement, are connected. If some of the Agents are not connected from the target site, although the DEACTIVATE command is successful, warning message AQS0209W is issued to indicate that you should ensure all of the following conditions are true:

- All active TCP/IP connections to the server applications that make up the workload are terminated on the target sites.
- All active SNA sessions, for SNA workloads, to the SNA applications that make up the workload are terminated on the target site.
- For MQ cluster workloads, see “Deactivating an MQ cluster workload” on page 33 and the System Programmer Response for message AQS0207I for possible actions to take when MQ cluster receiver channels are not stopped or queued messages exist on transfer-eligible MQ cluster queues on the target site.

Deactivating a workload when not all members for the workload are registered

When an Active/Standby or Active/Query workload is deactivated, the Lifeline Advisor determines whether all load balancer application group members for the workload are registered. If one or more members are not registered, although the DEACTIVATE command is successful, warning message AQS0228W is issued to indicate you should correct the load balancer configuration to register all members for the workload or update the Lifeline Advisor configuration to remove these members from the cross_sysplex_list or intermediary_node_list statement.

Migrating the Lifeline Advisor

About this task

To migrate the Lifeline Advisors to the current release, migrate the secondary Advisor first.

Rule: If the primary Advisor is at a later release than the secondary Advisor, the secondary Advisor cannot be started because the connection to the primary Advisor fails. Message AQS0167I is issued on the primary Advisor.

Procedure

1. Stop the secondary Advisor.
2. Migrate the secondary Advisor to the current release.
3. Optional: Update the configuration file of the secondary Advisor to enable functions introduced in the release.

   Rules:

   - If the query_workload_list Advisor configuration statement is coded and the timeout parameter specified, the timeout parameter is ignored and message AQS0311W is issued until all Agents are updated to V2R0 or a later release. See Multi-site Workload Lifeline configuration statements for more information about configuration statements and parameters.
   - If the mq_manager_list Advisor configuration statement is coded, the statement is ignored on all Agents that have not been updated to the same or later service level that supports this statement. See Multi-site Workload Lifeline configuration statements for more information about configuration statements and parameters.
4. Restart the secondary Advisor.
5. Perform an Advisor takeover by using the `MODIFY` *`procname`*`,TAKEOVER` command on the secondary Advisor.

   Note: The peer Advisor will not remain active when it tries to become the secondary Advisor.
6. Update the peer Advisor to the current release.
7. Update the configuration file of the peer Advisor to match the primary Advisor's configuration.
8. Restart the peer Advisor as the secondary Advisor.
9. Optional: Perform an Advisor takeover by using the `MODIFY` *`procname`*`,TAKEOVER` command on the peer Advisor, so that it is made the primary Advisor again.

Migrating the Lifeline Agent

About this task

Each Lifeline Agent can be migrated to the current release, independent of the release level of the other Agents.

Procedure

1. Stop the Agent.
2. Update the Agent to the current release.
3. Optional: Update the configuration file of the Agent to enable functions that are introduced in the release.
4. Restart the Agent.

Using the Base Control Program Internal Interface

The Lifeline Advisor uses Base Control Program Internal Interface (BCPii) services to periodically query all interconnected Central Processor Complexes (CPCs) and the images (LPARs) on these CPCs.

About this task

The Hardware Management Console (HMC) and Support Elements on each CPC typically communicate over a network that is separate from the network used for TCP/IP communications. The Advisor queries the images in a site over this network to determine whether the images are available or whether a site failure has occurred.

For these queries to succeed, complete the following steps:

Procedure

1. Configure the Support Elements to support BCPii. You need to define an SNMP community name, and be sure that the BCPii address space is active. See the information about BCPii in *z/OS MVS Programming: Callable Services for High-Level Languages* for more information.
2. Authorize the Lifeline Advisor to use the BCPii services. See "Authorizing the Lifeline Advisors to use BCPii" on page 36 for more information.

Configuring and starting syslogd

For the Lifeline Advisors and Agents to be able to write their log messages and trace data to the syslog daemon (syslogd), you must configure and start syslogd before you start the Advisor and Agent.

Before you begin

Note: This task is optional.

- If the AQSTRACE DD card is specified in the Advisor and z/OS Agent started procedure, an internal trace is used to log messages and trace data.
- For Linux on z Systems Management Agents, internal trace is used by default.

If syslogd is also started, only log messages at the ERROR, WARNING, and EVENT level are written to syslogd.

About this task

The Lifeline Advisor and z/OS Agent write most log messages and trace data to the syslog daemon (syslogd). A limited number of messages are written to the MVS console, but these are unaffected by syslogd configuration.

As the Lifeline Advisor and z/OS Agent log more data, performance can be adversely affected. The amount of data that is logged by the Lifeline Advisor and Agent is determined by the debug_level statement. If you back up the syslogd output file with a zFS file system instead of a z/OS UNIX file system, you can minimize performance impacts caused by logging.

Tips:

- For Linux on z Systems, it is possible for the Linux on z Systems Management Agent to selectively send log messages to the Linux on z Systems Management Guest console. This is controlled by the syslog daemon's configuration settings on the Linux on z Systems Management Guest.
- To reduce the performance impact caused by logging to syslogd, add the AQSTRACE DD card in the Advisor and z/OS Agent started procedures.
- Logging to syslogd occurs at a default level until the configuration file has been read in.

For more information about configuring syslogd on z/OS, see *z/OS Communications Server: IP Configuration Guide*. See the documentation for your Linux distribution for information about how to configure syslogd on Linux on z Systems.

(z/OS systems) Customizing the TCP/IP profiles of the TCP/IP stacks

Rule: This task is only applicable to Lifeline Advisors and the Lifeline Agents residing on z/OS systems.
To accommodate the Lifeline Advisors and Agents, you need to customize the TCP/IP profiles of the TCP/IP stacks that the Lifeline Advisors and Agents will run on.

About this task

Complete the following steps to customize the TCP/IP profiles of the TCP/IP stacks:

Procedure

1. Reserve the ports that the Lifeline Advisor and Agents will use in their respective TCP/IP profiles. All ports for the Lifeline Advisor and Agent use the TCP protocol; reserve all the ports for TCP. The Lifeline Advisor has at least two ports, and potentially four ports, to reserve, including the ports specified on the following statements:
   - lb_connection_v4
   - lb_connection_v6
   - agent_connection_port
   - advisor_connection_port

   The Lifeline Agent has one port to reserve, which you specify on the following statement:
   - host_connection

2. Configure VIPARANGE with the IP addresses specified on the Lifeline Advisor lb_connection_v4 and lb_connection_v6 statements on the TCP/IP stacks of the systems that the Lifeline Advisor can run on, and configure static VIPAs with the IP address specified on the Lifeline Agent host_connection statement on the TCP/IP stack of the system that the corresponding Lifeline Agent can run on.
3. Optional: If you use the SHAREPORT or SHAREPORTWLM parameters on the TCP/IP profile PORT statement to enable multiple TCP server applications to share the same port, some additional considerations might apply to your configuration. For example, if the TCP server applications sharing the same port are also members of groups that are reported to external second-tier load balancers with SASP, ensure that consistent criteria are used by the various load balancing components. When using the Multi-site Workload Lifeline, all instances of a TCP server application that share the same port on a target system are reported to external second-tier load balancers using a single member entry, and therefore, a single recommendation. This recommendation reflects the average net weight calculated for all the server applications sharing the same port on a target system. When the TCP connection requests reach a target TCP/IP stack and multiple server applications are sharing the same port, the connections are then load balanced by TCP/IP across the multiple server application instances.

   How this load balancing process is performed depends on whether you specify the SHAREPORT or SHAREPORTWLM parameter on the PORT statement. For more details about the PORT statement, see *z/OS Communications Server: IP Configuration Reference*.
4. Ensure that the maximum TCP send and receive buffer sizes are configured with a value of at least 256 KB. The Lifeline Advisor and Lifeline Agent attempt to internally set their send and receive buffer sizes to 256 KB to optimally handle any large messages that are sent between the Advisor and the Agent. Although the Advisor or Agent can operate with lower values for their send and receive buffers, the Advisor or Agent will shut down if many workloads and first-tier load balancers are configured and buffer sizes are not sufficient. For more information about how to use the TCPCONFIG TCPMAXSENDBUFRSIZE and TCPCONFIG TCPMAXRCVBUFRSIZE statements to configure the maximum send and receive buffer sizes , see *z/OS Communications Server: IP Configuration Reference*.

CINET considerations

Although it is not recommended, the Lifeline Advisor can use multiple TCP/IP stacks in a Common INET (CINET) environment.

To simplify your configuration and to make Lifeline Advisor outages that are the result of a TCP/IP stack failure or termination more predictable and recoverable, configure all incoming connections to the Lifeline Advisor to use a single TCP/IP stack. The addresses that you specify in the lb_connection_v4 and lb_connection_v6 statements must belong to the same TCP/IP stack.

Use a VIPARANGE statement to define these dynamic VIPAs in the TCP/IP profiles of all the stacks in the CINET environment.

If the Lifeline Advisor is restarted as a result of failure in a given TCP/IP stack, the dynamic VIPAs are then activated on another TCP/IP stack in that system. If you decide to use the IPv4 or IPv6 unspecified addresses for the lb_connection_v4 and lb_connection_v6 statements, use the BIND parameter on the PORT reservation statement to bind these sockets to the dynamic VIPAs on the one TCP/IP stack that you have decided to use.

Customizing the VTAM started procedure when configuring SNA workloads

When SNA workloads are defined to Lifeline, customize your VTAM started procedure to spin its job log off periodically.

About this task

To monitor and influence the availability of the SNA applications that make up each configured SNA workload, the Lifeline z/OS Agents issue DISPLAY and VARY commands against these SNA applications. The output from these DISPLAY and VARY commands are written to the VTAM's job log. Over time, the job log can consume a considerable amount of JES2 spool space.

Complete the following step to limit the amount of JES2 spool space that is used by the VTAM job log:

Procedure

Add a JOB DD card to the VTAM started procedure, and specify the JESLOG parameter. For example, to close the current VTAM job log every 12 hours and create a new job log, use the following DD card.

```
//<vtamproc> JOB JESLOG=(SPIN,'+12:00')
```

For more details about the JESLOG parameter, see *z/OS MVS JCL Reference.*

Customizing the NetView for z/OS Message Revision Table when configuring SNA workloads

When SNA workloads are defined to Lifeline, customize your Message Revision Table (MRT) to control the logging and automation of VTAM messages.

About this task

To monitor and influence the availability of the SNA applications that make up each configured SNA workload, the Lifeline z/OS Agents issue DISPLAY and VARY commands against these SNA applications. To issue these commands, a Lifeline Agent uses an extended MCS console. The console name for this extended MCS console is the text string 'LLAGNT' that is appended with the MVS sysclone value of the system where the Agent resides. The output from these DISPLAY and VARY commands are written to the NetView® for z/OS network log and Canzlog. These messages are also presented to the NetView program for automation. This might result in unnecessary overhead by the NetView program for z/OS to process these messages.

To avoid such overhead, complete the following step to suppress command responses that are sent to the Agent's extended MCS console from being written to the NetView for z/OS network log and Canzlog.

Procedure

Add the following entry to the Message Revision Table to control the logging and automation for the command responses that are sent to the Agent's extended MCS console.

```
UPON(OTHERMSG)
  SELECT
   WHEN (CONSNAME = 'LLAGNT&SYSCLONE.')
     REVISE('NO' AUTOMATE  'NO' SYSLOG   'YES' DISPLAY)
   OTHERWISE
  END
```

Notes:

- This entry does not affect an existing Message Revision Table.
- The Message Revision Table supports only one UPON(OTHERMSG) statement. If the UPON(OTHERMSG) statement exists in the Message Revision Table, add only the SELECT statement. Any number of SELECT statements can be included under that UPON statement.

For more details about the Message Revision Table, see *NetView for z/OS Automation Guide*

Configuring external load balancers

Configure external load balancers with the IP address and port of the Lifeline Advisor.

About this task

Guideline: If the Lifeline Advisor uses IPv6 for the external load balancer connections or if any Lifeline Agents use IPv6 to connect to the Lifeline Advisor, start the secondary Lifeline Advisor only on a system that supports IPv6.

For maximum availability, define the IP address of the Lifeline Advisor as a VIPARANGE DVIPA.

There is a maximum limit of 100 external load balancers that can be connected to a Lifeline Advisor at any given time.

Complete the following tasks to configure external load balancers:

Procedure

1. Configure the first-tier external load balancers.
2. Configure the second-tier load balancers. You can have external load balancers, a z/OS sysplex distributor on one z/OS target server in each site, or an intermediary node in each site.

Configuring first-tier external load balancers

Configure the first-tier external load balancers with the IP address and port of the Lifeline Advisor.

About this task

Complete the following steps to configure the first-tier external load balancers:

Procedure

1. Customize features of the communication of the external load balancer with the Lifeline Advisor. For more information about the features, see "External load balancers" on page 10.

2. Optional: Configure redundant external load balancers for availability reasons. The unique load balancer identifier (LB UID), sometimes referred to as the UID or UUID, of the external load balancer identifies a load balancer. Duplicate LB UIDs are not allowed and connection attempts to the Lifeline Advisor from an external load balancer using the same LB UID as an existing connection force the existing connection to be broken and replaced by the new connection.

   Requirements:

   - If you want the redundant load balancers to serve as hot standbys that are connected simultaneously with the load balancer that they are backing up, you must specify unique LB UIDs.
   - If you configure the redundant load balancers with the same LB UID, the redundant load balancers must remain unconnected from the Lifeline Advisor until the original load balancer fails.

3. Configure external first-tier load balancers to use directed mode. For more information about directed mode, see "External load balancers" on page 10.

   Rule: Always configure first-tier load balancers to use directed mode. These load balancers route workload requests only to second-tier load balancers.

4. Configure each first-tier external load balancer with the members that represent the second-tier load balancers.
   a. Define members that can share the same type of workload under the same load balancer application group. For example, define members for a TN3270E workload under one group and members for an HTTP workload under another. If server applications that access the same data sources are of different types, configure a single workload for these server applications, but define a different load balancer application group for each server application type. This ensures that the loss of all server applications in one group will result in the entire workload being treated as non-operational.
   b. Specify valid and reachable IP addresses, a nonzero port, and a nonzero protocol. The IP addresses of the members must represent the IP address of an external second-tier load balancer or the DVIPA of a z/OS sysplex distributor. The port number represents the port number used by that server application for the workload. Typically, all members in a group use the same port number. The protocol that is defined can be specified as either tcp or udp.

   Rule: All members must be application members; a nonzero port number must be specified.

Configuring second-tier external load balancers

Configure the second-tier external load balancers with the IP address and port of the Lifeline Advisor.

About this task

Complete the following steps to configure the second-tier external load balancers:

Procedure

1. Customize features of the communication of the external load balancer with the Lifeline Advisor. For more information about the features, see "External load balancers" on page 10.

2. Optional: Configure redundant external load balancers for availability reasons. The unique load balancer identifier (LB UID), sometimes referred to as the UID or UUID, of the external load balancer identifies a load balancer. Duplicate LB UIDs are not allowed and connection attempts to the Lifeline Advisor from an external load balancer using the same LB UID as an existing connection force the existing connection to be broken and replaced by the new connection.

   Requirements:

   - If you want the redundant load balancers to serve as hot standbys that are connected simultaneously with the load balancer that they are backing up, you must specify unique LB UIDs.
   - If you configure the redundant load balancers with the same LB UID, the redundant load balancers must remain unconnected from the Lifeline Advisor until the original load balancer fails.

3. Configure external second-tier load balancers to use directed mode. For more information about directed mode, see "External load balancers" on page 10.

   Guideline: You can configure external second-tier load balancers to use either directed or dispatch mode.

4. Configure each external load balancer with the members that represent the individual target application instances.
   a. Define members that can share the same type of workload under the same load balancer application group. For example, define TN3270E Telnet servers under one group and HTTP servers under another.
   b. Specify an IP address, a nonzero port, and a nonzero protocol to define application members. The IP addresses of the members must represent valid and reachable addresses in each site where the server applications reside. The port number represents the port number used by that server application and must match the port number specified in the first-tier load balancer for this workload group. Typically, all members in a group will use the same port number. The protocol that is defined can be specified as either tcp or udp and must match the protocol specified in the first-tier load balancer for this workload.

   Rules:

   - All IP addresses configured in members belonging to the same group must exist on all second-tier external load balancers.
   - All members must be application members; a nonzero port number must be specified.
   - Certain classes of IP addresses must not be coded for members in the external load balancer. This includes the following classes of addresses:
     – Deprecated IPv6 addresses. These are flagged as such in a NETSTAT HOME display. It is probably safest not to code any auto-configured IPv6 addresses within members.
     – Addresses that are not reachable from the load balancer, including loopback addresses.
     – Unavailable IPv6 addresses. These addresses might be marked as unavailable if duplicate address detection is in progress, has failed, or the interface ID is unknown. These addresses are displayed in a NETSTAT HOME display, along with the reason that they are marked as unavailable.

Configuring second-tier internal load balancers

Configure the second-tier internal load balancers, that is, the z/OS sysplex distributor, with the IP address and port number configured in the first-tier load balancer application group that represents the DVIPA being distributed.

About this task

For information about configuring z/OS sysplex distributors, see *z/OS Communications Server: IP Configuration Reference*.

Configuring support for intermediary nodes

Intermediary nodes do not communicate directly with the Lifeline Advisor, but they function as a second-tier load balancer. A first-tier load balancer registers a group of intermediary nodes. The members of the group are mapped to entries on the intermediary_node_list statement.

Before you begin

- If the intermediary node resides on a Linux on z Systems guest, the intermediary node entries map to entries configured on the Advisor's management_guest_list statement. If the application type for the intermediary node entry is IP, the Advisor's cross_sysplex_list statement contains entries that map to the database subsystems referenced by the server applications residing on the Linux on z Systems guests. If the application type for the intermediary node entry is SNA, the Advisor's sna_application_list statement contains entries that map to the SNA applications referenced by the server applications residing on the Linux on z Systems guests.
- If the intermediary node resides on z/OS and services SNA applications, the intermediary node entries map to entries configured on the Advisor's sna_application_list statement. The Advisor's cross_sysplex_list statement is not used for SNA workloads.
- Otherwise, the intermediary_node_list entries for these registered members are mapped to entries configured on the cross_sysplex_list statement.

When used, the cross_sysplex_list entries are configured with sysplex distributed DVIPAs and ports. The DVIPAs and ports from the cross_sysplex_list entries are monitored to determine the weights and availability of the workload's server applications or database subsystems.

About this task

The members of the registered group are classified as either "Internal" or "External" intermediary nodes.

- A group is an external intermediary group if no member IP addresses configured in the intermediary_node_list statement are defined on any TCP/IP stacks monitored by the Lifeline Agents; the intermediary nodes are external to the systems where the workload's server applications reside. The ports of the intermediary nodes might not match the ports of the workload's TCP/IP server applications. The intermediary_node_list entries are mapped to cross_sysplex_list or sna_application_list entries by using the site and workload names.
- A group is an internal intermediary group if all member IP addresses configured in the intermediary_node_list statement are defined on the TCP/IP stacks monitored by the Lifeline Agents; the intermediary nodes are on the systems where the workload's server applications reside. The ports of the intermediary

nodes match the ports of the workload's server applications. The intermediary_node_list entries are mapped to cross_sysplex_list entries by using the port, site, and workload names.

- If a workload consists of TCP/IP server applications that reside on z/OS, the ports of the intermediary nodes match the ports of the workload's server applications. The intermediary_node_list entries are mapped to cross_sysplex_list entries by using the port, site, and workload names.
- If a workload consists of SNA applications, the intermediary_node_list entries are mapped to sna_application_list entries by using the site and workload names.
- If a workload consists of TCP/IP server applications that reside on Linux on z Systems, the ports of the intermediary nodes might not match the ports of the workload's database subsystems. The intermediary_node_list entries are mapped to management_guest_list and the cross_sysplex_list entries that use the site and workload names.

Procedure

1. Configure the first-tier external load balancers with the groups of the intermediary nodes.
2. Configure the appropriate Lifeline Advisor configuration statements, based on the type of workload:
   - For workloads consisting of TCP/IP server applications residing on z/OS, configure the cross_sysplex_list entries with the sysplex distributed DVIPAs and ports of the monitored server applications.
   - For SNA workloads, configure the sna_application list entries with the network qualified names of the SNA applications.
   - For Linux on z Systems workloads, configure the management_guest_list with the server IP addresses and Linux on z Systems guest name for each of the intermediary nodes. Either configure the cross_sysplex_list entries with the sysplex distributed DVIPAs and ports of the monitored database subsystems or configure the sna_application_list entries with the SNA application names to be monitored.
3. Configure the intermediary_node_list entries for the registered group.
   - The intermediary_node_list entry is configured as IP or SNA depending on the type of applications that make up the workload. IP is the default configuration.

     Note: Intermediary_node_list entries for a registered load balancer application group cannot be a mix of IP and SNA entries. Only one type is allowed to be configured for a group.
   - If this is an external intermediary group, the site and workload of an intermediary_node_list entry must match those of one or more cross_sysplex_list entries or sna_application_list entries.
   - If this is an internal intermediary group for a workload that consists of TCP/IP server applications on z/OS, the port, site, and workload of an intermediary_node_list entry must match those of one or more cross_sysplex_list entries.
   - If this is an internal intermediary group for a SNA workload, the entries must be marked as type SNA, and the site and workload of an intermediary_node_list entry must match those of a sna_application_list entry.

- If this is an external intermediary group for a Linux on z Systems workload, the site and workload of an intermediary_node_list entry must match those of a management_guest_list entry and the intermediary node entries must be configured as either IP or SNA. For intermediary nodes configured as IP, the matching of workload and site is performed against cross_sysplex_list entries. For intermediary nodes configured as SNA, the matching of workload and site is performed against sna_application_list entries.

For more information about how to configure these statements, see "cross_sysplex_list" on page 99, "intermediary_node_list" on page 105, "management_guest_list" on page 110, and "sna_application_list" on page 118 in Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93.

Configuring IBM MQ clusters

MQ queue managers configured in an IBM MQ cluster do not communicate directly with the Lifeline Advisor, but the MQ cluster functions as a load balancer to distribute workload messages destined for an MQ cluster queue to an MQ queue manager instance.

See "Overview of MQ Cluster Workloads" on page 29 for more information on configuring IBM MQ clusters and Lifeline to support MQ workloads. See *IBM MQ: Installing IBM MQ* for general information about configuring IBM MQ clusters.

Chapter 4. Starting the Lifeline Advisors and Agents

To distribute TCP/IP workloads between the two sites, you need to start the Lifeline Advisors and Agents that make up Multi-site Workload Lifeline.

Before you begin

You need to first complete the tasks in Chapter 2, "Preparing to use Multi-site Workload Lifeline," on page 35 and Chapter 3, "Configuring Multi-site Workload Lifeline," on page 47.

About this task

You can start the Lifeline Agents before the Lifeline Advisors, or start the Lifeline Advisors before the Lifeline Agents. If you start the Lifeline Advisor after you start the Lifeline Agents, the Lifeline Agents periodically attempt to connect to the Lifeline Advisor.

Procedure

1. Start the TCP/IP stacks that the Lifeline Advisors and the Lifeline z/OS Agents use.

   Requirement: You must start the TCP/IP stacks that the Lifeline Advisors use before you start the Lifeline Advisors. You can start a Lifeline z/OS Agent before the start of the TCP/IP stack that the Lifeline z/OS Agent uses. If the TCP/IP stack that the Lifeline Agent uses stops, the Lifeline Agent remains active and reestablishes communication with the TCP/IP stack when the TCP/IP stack is restarted.

   Note: If you use automation software to start the primary Lifeline Advisor, you need to consider other factors to determine when to start the Advisor.

   If you configure the Lifeline Advisor to use dynamic VIPAs, your automation software must perform the following steps:

   - Ensure that TCP/IP is started.
   - Wait for message EZD1214I to be issued. Message EZD1214I indicates that TCP/IP completed dynamic VIPA processing.

   For more information about using dynamic VIPAs, see "Configuring one Lifeline Advisor as the primary Advisor, and optionally one as the secondary Advisor" on page 48.
2. Start the server applications that will be the target of load balancing. You do not need to modify these server applications, their configurations, or started procedures, unless the second-tier external load balancer is using dispatch mode for packet forwarding. For more information about dispatch mode, see "External load balancers" on page 10.
3. Optional: Customize WLM policies for the Lifeline Advisors and Lifeline z/OS Agents, and assign the Lifeline Advisors and Agents to the WLM SYSSTC service class to receive the proper dispatching priority. For more information about categorizing work into service classes, see *z/OS MVS Planning: Workload Management*.

Rule: Ensure that the Lifeline Advisors and Lifeline z/OS Agents receive an adequate amount of system resources to properly balance workloads.

4. Start the primary Lifeline Advisor from a started procedure as a started program (EXEC PGM=). See Appendix A, "A sample started procedure for Lifeline Advisors," on page 297 for a sample Advisor start procedure. Verify that each Lifeline Agent that you expect to connect to the Lifeline Advisor has connected. You can also use the `NETSTAT CONN` command on the Lifeline Advisor's TCP/IP stack to see which Lifeline Agents are currently connected. As Lifeline Agents connect to the Lifeline Advisor, messages appear on the MVS consoles where the Advisor and Agents are active.

   Restriction: You cannot start the Lifeline Advisor under BPXBATCH.

   Rule: Systems where the Lifeline Advisor is running should use the default CEE options for the STACK and THREADSTACK parameters. If system-level settings are customized, the Advisor started procedure should override the system-level settings by defining a CEEOPTS DD card as follows:

   ```
   //CEEOPTS  DD *
   STACK(,,ANY,FREE),THREADSTACK(ON,4K,4K,ANY,FREE)
   ```

5. Start a Lifeline z/OS Agent and, if required, a Linux on z Systems Management Agent.
   - Start one Lifeline z/OS Agent from a started procedure as a started program (EXEC PGM=) on each z/OS target system that you want to participate in this method of workload balancing. See Appendix B, "A sample started procedure for Lifeline z/OS Agents," on page 299 for a sample Agent start procedure.

     Rule: Systems where the z/OS Lifeline Agents are running should use the default CEE options for the STACK and THREADSTACK parameters. If system-level settings are customized, the Agent started procedure should override the system-level settings by defining a CEEOPTS DD card as follows:

     ```
     //CEEOPTS  DD *
     STACK(,,ANY,FREE),THREADSTACK(ON,4K,4K,ANY,FREE)
     ```

   - If you configure Linux on z Systems workloads, start one Linux on z Systems Management Agent on each target z/VM system where the Linux on z Systems guests reside for the server applications that make up the workload. Start the Linux on z Systems Management Agent by running the aqsagzvm program. See "Linux on z Systems Workloads" on page 13 for information about this program.

   Guideline: Update the SCHEDxx member to add an entry to the program properties table to make the Lifeline Advisors and Lifeline z/OS Agents run non-swappable.

   Restrictions:
   - You can start only one Lifeline z/OS Agent per z/OS system.
   - You must not start the Lifeline z/OS Agent under BPXBATCH.
   - You can start only one Lifeline Linux on z Systems Management Agent per site per z/VM system.

6. Optional: Start the secondary Lifeline Advisor. When the secondary Advisor connects to the primary Advisor, messages are issued on the MVS consoles where each Lifeline Advisor is running.

7. Optional: Start the first-tier and second-tier load balancers. When an external load balancer has connected, a message is issued on the MVS console where the Lifeline Advisor is running.

Chapter 5. Diagnosing problems in Multi-site Workload Lifeline

You can verify the performance and availability of the system and diagnose problems when you use Multi-site Workload Lifeline.

Debug levels

You can update the debug level to change the level of debug messages to be logged.

The following list describes available debug levels and the associated syslogd priority levels:

Debug level
syslogd priority level

0 NONE. No messages of any kind are sent to the syslogd file after initialization is complete.

1 ERROR. Error messages indicate something that requires attention. Messages at this level could be fatal (terminating) or could indicate that an integral part of the workload advising system is not working properly. This information is logged at the syslogd ERROR priority level.

2 WARNING. Warning messages indicate that an error has occurred, but it is not severe enough to warrant an ERROR. Corrective actions might be necessary because the Advisor or Agent might not be behaving as intended. This information is logged at the syslogd WARNING priority level.

4 EVENT. Event messages are logged for events that occur periodically, like operator commands, UNIX signals, timer pops, and receipt of a network message. This information is logged at the syslogd NOTICE priority level.

8 INFO. Informational messages are sent to the syslogd file. These messages do not require corrective actions. This information is logged at the syslogd INFO priority level.

16 MESSAGE. Message messages log the contents of message packets that are sent between the Advisor and the Load Balancer, the Advisor and peer Advisor, or between the Advisor and Agent. You can use these messages to assist debugging Advisor-to-load balancer, Advisor-to-Advisor, and Advisor-to-Agent communications. This information is logged at the syslogd DEBUG priority level. This level is intended only for IBM service use.

32 COLLECTION. Collection messages log the details of collecting and manipulating the data that forms the basis of weight calculations. This information is logged at the syslogd DEBUG priority level. COLLECTION is only used by the Agent. This level is intended only for IBM service use.

64 DEBUG. The intention of this level of message is to provide information that is useful in debugging code, logic, or timing errors. This information is logged at the syslogd DEBUG priority level. This level is intended for IBM service use only.

128 TRACE. Trace messages are intended for development or service to track code processing (footprints). This information is logged at the syslogd DEBUG priority level. This level is intended for IBM service use only.

Diagnostic data

You can collect multiple pieces of diagnostic data to diagnose problems.

For a workload that consists of TCP/IP server applications on z/OS or SNA workloads, the following diagnostic data is helpful:

- Console messages for the Lifeline Advisors and Agents
- Output from the MODIFY command for the Lifeline Advisors and Lifeline z/OS Agents
- Either syslogd log messages or the dumped internal trace file for Lifeline Advisors and Agents
- Lifeline Advisor and Lifeline z/OS Agent address space dumps and snap output
- TCP/IP packet traces of communication with the primary Lifeline Advisor

For Linux on z Systems workloads, the following diagnostic data is helpful:

- Console messages for the Lifeline Advisors and Agents
- Output from the MODIFY command for the Lifeline Advisors and Lifeline z/OS Agents
- Output from the aqsllcmd command for the Lifeline Linux on z Systems Management Agent
- Either syslogd log messages or the dumped internal trace file for Lifeline Advisors and Agents
- Lifeline Advisor and Lifeline z/OS Agent address space dumps and snap output or core dumps for the Lifeline Linux on z Systems Management Agent
- TCP/IP packet traces of communication with the primary Lifeline Advisor

Guidelines:

- If the AQSTRACE DD card is not specified in the Lifeline Advisor or z/OS Agent started procedure, syslogd is the only logging facility that either the Advisors or Agents can use. Useful diagnostic information might be lost if syslogd is not running before the Advisor or Agents are started.
- If the AQSTRACE DD card is specified in the Lifeline Advisor and z/OS Agent started procedure, you do not have to run syslogd. The Advisors and z/OS Agents use an internal trace as their logging facility. This internal trace is dumped to the file specified by the AQSTRACE DD card when one of the following conditions is true:
  - The Advisor or z/OS Agent is stopped.
  - The DUMPLOG command is issued against the Advisor or z/OS Agent.

  The UNIX System Services file system where the file resides should have 256 MB of available space to prevent truncation of the dumped internal log. A fixed number of debug records are stored in the internal trace. When this number of records has been reached, the logging wraps. See Chapter 7, “Lifeline Advisor commands,” on page 127 for information about the DUMPLOG command for the Advisor and Chapter 8, “Lifeline z/OS Agent commands,” on page 169 for information about the DUMPLOG command for the z/OS Agent.

  Rule: The UNIX System Services file used for dumping the Advisor or z/OS Agent internal trace must meet these requirements:

  - The write permission of the file can be set only for the user and group classes.
  - The others class can be granted only read permission.
- Linux on z Systems Management Agents use internal trace by default. This internal trace is dumped to the `/opt/ibm/lifeline/log/agent.trace` file when one of the following conditions is true:
  - The Linux on z Systems Management Agent is stopped.
  - The DUMPLOG command is issued.

  The `/opt/ibm/lifeline/log` file system should have 256 MB of available space to prevent truncation of the dumped internal log. A fixed number of trace records are stored in internal memory. When this number of records has been reached, the logging wraps. For more information about the DUMPLOG command, see "Linux on z Systems Workloads" on page 13.

  Rule: The Linux on z Systems file used for dumping the Linux on z Systems Management Agent internal trace must meet these requirements:
  - The write permission of the file can be set only for the user and group classes.
  - The others class can be granted only read permission.
- If both syslogd runs and the internal trace is used, log messages at ERROR, WARNING, and EVENT level are written to both logs. Log messages at more detailed levels, INFO, MESSAGE, COLLECT, DEBUG, and TRACE, are written only to internal trace.

The Lifeline Advisor and Lifeline z/OS Agent trigger address space dumps when they encounter certain unexpected error conditions. Both a CEEDUMP and address space snap output are produced and written to the data sets or files that are specified by the started procedure CEEDUMP and CEESNAP DD statements, respectively. The Lifeline Linux on z Systems Management Agents produce core dumps when they encounter unexpected error conditions.

If the Lifeline Advisor or Lifeline z/OS Agent abnormally stops (for example, an 0C4 abend occurs), an unformatted SYSMDUMP is produced and written to the data set that is specified by the started procedure SYSMDUMP DD statement. If you override the Language Environment® run-time option TERMTHDACT during the installation or started procedure, the SYSMDUMP might not be produced, or a CEEDUMP might be produced instead. Therefore, do not override the TERMTHDACT run-time option. See *z/OS Language Environment Programming Guide* for more information about run-time options. When a Linux on z Systems Management Agents abnormally stops, it produces a core dump.

In other situations, the z/OS operator needs to dump the address space manually.

You can collect the TCP/IP packet trace data of communication with the primary Lifeline Advisor. For example, you might need to capture the following communication flows:

- Server/Application State Protocol (SASP) messages sent between the primary Advisor and external load balancers
- Messages sent between the primary Advisor and Agents
- Messages sent between the primary and secondary Advisors

For details about how to use the TCP/IP packet trace facility, see *z/OS Communications Server: IP Diagnosis Guide*.

Interpreting the workload and LB displays

The output from the MODIFY *advisor_proc*,DISPLAY,WORKLOAD,DETAIL command shows all of the registered members that are mapped to a workload with each member's site and availability as reported by the Agent from the system where the server application resides.

The output from the MODIFY *advisor_proc*,DISPLAY,LB,DETAIL command shows the load balancer application groups registered by a load balancer with their matching workload. Each member's status is displayed, including member availability and weight information. This status information shows what the Advisor is sending to the load balancer and might not reflect the availability of a member's server application. Member availability depends on several factors as detailed below.

Load Balancer display for second-tier load balancers

If a load balancer application group is registered by a second-tier load balancer, the member status in the MODIFY *advisor_proc*,DISPLAY,LB,DETAIL command always matches the actual status of the members in the corresponding MODIFY *advisor_proc*,DISPLAY,WORKLOAD,DETAIL command.

Load Balancer display for first-tier load balancers

If a load balancer application group is registered by a first-tier load balancer, the member status in the MODIFY *advisor_proc*,DISPLAY,LB,DETAIL command does not always match the status shown in the MODIFY *advisor_proc*,DISPLAY,WORKLOAD,DETAIL command:

- If the members in the group are sysplex distributed DVIPAs, non-distributed IP addresses, or external second-tier load balancers:
  - If the workload is not active to a site, the LB display shows the members of the inactive site with a status of unavailable because the first-tier load balancer cannot route workload connections to this site.
  - If a workload is active only to one site and at least one member on the active site is available, the LB display of each member on the site matches the actual status that is shown in the Workload display.
  - If a workload is active only to one site and no members on the active site are available, the LB display shows all members with a status of available. This ensures that the first-tier load balancer routes new workload connections only to the active site.
  - If the members in the group are sysplex distributed DVIPAs, each DVIPA represents a different set of server applications within the site. Each weight, as shown in the LB display, is relative to the other members of this group. The first-tier load balancer distributes connections to each of the z/OS sysplex distributors of the DVIPAs based on their relative weight.
  - If the members in the group are non-distributed IP addresses, each IP address represents a server application within the site. Each weight, as shown in the LB display, is relative to the other members of this group. The first-tier load balancer distributes connections directly to these server applications based on their relative weight.
  - If the members in the group are external second-tier load balancers, each second-tier load balancer should be distributing to the same set of server applications within a site. Therefore the weight of each second-tier load balancer within a site is the same value.

  - If an Active/Query workload is active to both sites and static routing is configured in the query_workload_list statement, the weights of the members are adjusted so that a site's weight which is the sum of all member weights within the site matches the configured percentages.
- If the members in the group are intermediary nodes:
  - If the workload is not active to a site, the LB display shows the members of the inactive site with a status of unavailable because the first-tier load balancer cannot route workload connections to this site.
  - For groups containing unmonitored intermediary nodes, the LB display shows all active site members with a status of available and an equal weight. This ensures that the first-tier load balancer routes new workload connections to the active site, but does not prefer one intermediary node over another within the active site. The intermediary node makes the load balancing decision within the site.
  - For groups containing monitored intermediary nodes that are not Linux on z Systems servers and do not map to SNA applications, the LB display shows all active site members with a status of available and a weight of 1. This ensures that the first-tier load balancer routes new workload connections to the active site, but does not prefer one intermediary node over another within the site. The intermediary node makes the load balancing decision within a site.
  - For groups containing monitored Linux on z Systems intermediary nodes, the LB display shows all active site members with a status matching their actual availability. The weights of the available intermediary node servers are set to 1 while the unavailable intermediary node servers have a weight of 0. This ensures that the first-tier load balancer routes new workload connections to the available intermediary node servers in the active site, but does not prefer one available member over another within the site.
  - For groups containing monitored intermediary nodes that map to SNA servers, the LB display shows all active site members with a status matching their actual availability. The weights of the available intermediary node servers are set to 1 while the unavailable intermediary node servers have a weight of 0. This ensures that the first-tier load balancer routes new workload connections to the available intermediary node servers in the active site, but does not prefer one available member over another within the site.
  - If an Active/Query workload is active to both sites, the LB display shows all members within a site with the same weight. However, the weights of the two sites, which are the sum of all member weights, might be different. If dynamic routing is configured on the query_workload_list statement, the site weights match the site's relative capacity for processing new connections for this workload. If static routing is configured on the query_workload_list statement, the site weights match the configured percentages. It allows the first-tier load balancer to route connections for the workload between the sites that are based on the configured routing type. The intermediary node makes the load balancing decision within a site.

Workload Detail display

- For unmonitored intermediary nodes, the output from this command shows the DVIPAs and ports for the cross_sysplex list entries that are mapped by intermediary_node_list entries. An entry is available if a server application is using the cross_sysplex_list entry's port on the TCP/IP stack where the entry's DVIPA is active.
- For monitored intermediary nodes that are not Linux on z Systems servers and do not map to SNA applications, the output from this command shows the IP

addresses and ports for the intermediary_node_list entries. A member is available if all of the following conditions are true:
  - The DVIPA on the mapped cross_sysplex_list entry is active on the same TCP/IP stack where the IP address on the intermediary_node_list entry is active.
  - A server application that is bound to INADDR_ANY or IN6ADDR_ANY for IPv6 addresses by using the mapped cross_sysplex_list entry's port is on the same TCP/IP stack where the IP address on the intermediary_node_list entry is active.
  - No server application is bound to the mapped cross_sysplex_list entry's DVIPA and port on the same TCP/IP stack where the IP address on the intermediary_node_list entry is active.
- For monitored intermediary nodes that are Linux on z Systems servers, the output from the command shows the IP addresses and ports of the Linux on z Systems intermediary_node_list entries. A member is available if it is reported as available by a Linux on z Systems Management Agent. In addition:
  - If the intermediary_node_list entries map to cross_sysplex_list entries, the output from this command shows the DVIPAs and ports mapped by the intermediary_node_list entries. A member is available if a z/OS Agent finds the DVIPA on a TCP/IP stack and a healthy listener for the port.
  - If the intermediary_node_list entries map to sna_application_list entries, the output from this command shows the availability of the SNA applications as reported by the z/OS Agents.
- For intermediary nodes that map to sna_application_list entries, the output from the command shows the availability of the SNA applications as reported by the z/OS Agents. If the intermediary node is monitored, the output from this command also shows IP addresses and ports of the intermediary_node_list entries:
  - If the intermediary node is a Linux on z Systems server, it is available if the Linux on z Systems Management Agent finds that IP address on one of its Linux on z Systems guests.
  - If the member is a z/OS server, it is available if a z/OS Agent finds the IP address on a TCP/IP stack and a healthy listener for the port.

If the output from the command indicates that a server is not available, check the syslogd file of the Advisor for a warning message to see why the server is not available.

Verifying that the Lifeline Advisor and Agent systems are functioning correctly

View the MVS console and logs of the Lifeline Advisor and Lifeline z/OS Agents to verify that the Advisor and Agent systems are functioning correctly. For Linux on z Systems workloads, you also need to view the logs of the Lifeline Linux on z Systems Management Agents to verify these Agent systems.

About this task

View the MVS console of the Lifeline Advisor and Lifeline z/OS Agent systems after they are started to verify that the applications are started and running. For Linux on z Systems workloads, you also need to check the current processes on the Linux on z Systems Management Guest for the aqsagzvm process. If internal trace is used, dump and view the Lifeline Advisor and Agent internal log messages to

determine whether any error or warning messages were issued. Otherwise, view the syslogd files of the Lifeline Advisor and Agent systems to check for these messages.

If there are any failure messages, see Chapter 12, "Multi-site Workload Lifeline messages," on page 209 for the corrective actions that you need to take.

Complete the following steps to verify that the Lifeline Advisors and Lifeline Agents are functioning correctly:

Procedure

1. Determine whether the Lifeline Advisor is started and, if applicable, connected to the expected external load balancers by issuing the following command on the Lifeline Advisor:

   ```
   MODIFY procname,DISPLAY,LB
   ```

   Verify that each external load balancer is displayed.
2. Determine whether each external load balancer configured and registered the proper load balancer application groups and members with the Lifeline Advisor.

   Tip: The Lifeline Advisor does not check for improperly configured members.

   a. After the entire Multi-site Workload Lifeline system is started and running, display all members registered by each external load balancer by issuing the following command:

      ```
      MODIFY procname,DISPLAY,LB,DETAIL
      ```

      This command displays all groups and members that are defined to each of the load balancers. Verify that each member that you expect to be available is flagged as available.

   b. Display all members for each workload by issuing the following command:

      ```
      MODIFY procname,DISPLAY,WORKLOAD,DETAIL
      ```

      Verify that each member that you expect to be available for a workload is flagged as available.

   c. Screen unavailable IP members for configuration errors, such as incorrect IP addresses, ports, or protocols.

   d. Screen unavailable SNA members for configuration errors, such as incorrect SNA application names.
3. Determine whether each Lifeline Agent has started correctly and is communicating with the Lifeline Advisor by issuing one of the following commands on each Lifeline Agent:

   MODIFY *procname*,**DISPLAY,MEMBERS**
   : The command for z/OS Agents. Each registered member, either configured from a load balancer application group or an MQ cluster queue group, is displayed in the output if the member has an IP address owned by the TCP/IP stack where the Lifeline z/OS Agent is active.

   aqsllcmd display,members
   : The command for Linux on z Systems Management Agents. Each registered member is displayed in the output if the member configured from a load balancer application group, maps to a Linux on z Systems

guest on the z/VM system where the Linux on z Systems Management Agent is active, by using the management_guest_list statement.

4. Determine whether the target server applications and MQ queue managers for the workload are available for load balancing. On the Lifeline Advisor, issue the following command:

   ```
   MODIFY procname,DISPLAY,WORKLOAD,DETAIL
   ```

   a. In the display output, check the state for each member defined for this workload. The state is either AVAIL, meaning that the member is available for load balancing, or UNAVAIL, meaning that it is not available for load balancing.

   b. For first-tier external load balancers, to make the member available for load balancing, ensure that all of the following conditions are true:

      - When the member is an external second-tier load balancer, the load balancer must be started and connected to the Lifeline Advisor.
      - When the member is a sysplex distributed DVIPA, the z/OS sysplex distributor that is acting as a second-tier load balancer must be configured on a z/OS image within the site. A Lifeline z/OS Agent must be active on at least one z/OS image that contains a TCP/IP stack where the sysplex distributed DVIPA application is active. Each Agent must be active and communicating with the Lifeline Advisor.
      - When the member is a non-distributed IP address, ensure that both of the following conditions are true:
        - The Lifeline z/OS Agent must be active on the TCP/IP stack that owns the IP address of the member and be communicating with the Lifeline Advisor.
        - The server application must be active.

      If any of the conditions are false, correct the situation and repeat the display command until you are satisfied that all members that you intend to make available for load balancing are displayed as being available.

   c. For second-tier external load balancers, to make the member available for load balancing, ensure that all of the following conditions are true:

      - The Lifeline z/OS Agent must be active on the TCP/IP stack owning the IP address of the member and be communicating with the Lifeline Advisor.
      - The server application must be active.
      - The member must not be quiesced by the Lifeline z/OS Agent operator or the external load balancer. The Lifeline Agent is able to quiesce any member that is owned by the TCP/IP stack where the Agent is active. Depending on the external load balancer implementation, the load balancer administrator might quiesce individual members.

      If one of the conditions is false, correct the situation and repeat the display command until you are satisfied that all members that you intend to make available for load balancing are displayed as being available.

   d. For workloads utilizing IBM MQ clusters, to make the member available for load balancing, ensure that all of the following conditions are true:

      - The MQ queue manager must be started.
      - The MQ cluster queue is defined and enabled on the MQ queue manager.
      - The MQ cluster receiver channel is started.
      - The TCP listener used by the MQ cluster receiver channel is available.

If any of the conditions is false, correct the situation and repeat the display command until you are satisfied that all members that you intend to make available for load balancing are displayed as being available.

Diagnosing problems when a workload is not distributed

Diagnosing why a workload is not being distributed to a server application

When a workload is not being distributed to a server application, you can use the information in this topic to diagnose problems.

About this task

To determine why a workload is not being distributed to a server application, complete the following steps:

Procedure

1. Determine whether the Advisor is running, a z/OS Agent is running on the MVS system that contains the server application, or a Linux on z Systems Management Agent is running in a Management Guest on the z/VM system that contains the server application. If they are not running, start the Advisor or Agent.
2. To determine whether any external load balancers have registered the server application, issue the following command on the Lifeline Advisor:

   ```
   MODIFY procname,DISPLAY,LB
   ```

   Verify that at least one first-tier load balancer is connected to the Advisor.
3. Determine whether the lb_id_list statement of the Advisor includes the IP address of the load balancer in question.

   If you use Application Transparent TLS (AT-TLS) to authenticate the load balancer, verify that the TLS configuration is correct on the load balancer and Advisor. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring AT-TLS.
4. For external first-tier load balancers,
   - If the IP address of the member is an external second-tier load balancer, determine whether the IP address of the member defined on the load balancer matches the IP address of a second-tier load balancer responsible for load balancing to the server applications. If not, correct the definition at the first-tier load balancer.
   - If the member is a sysplex distributed DVIPA, determine whether both the member defined on the load balancer is defined with a protocol of TCP and the IP address and port number of the member match the sysplex distributed DVIPA and port. If not, correct the definition at the first-tier load balancer. See step 8 below when a member is defined with a protocol of UDP.
   - If the IP address of the member is a non-distributed IP address, determine whether the IP address, port number and protocol of the member defined on the load balancer match the IP address, port number, and protocol of the server application. If not, correct the definition at the first-tier load balancer.
5. For external second-tier load balancers, determine whether the IP address, port number, and protocol of the member defined on the load balancer match

the IP address, port number, and protocol of the server application. If not, correct the definition at the second-tier load balancer.

6. To check the member information on the Lifeline Advisor, issue the following command:

   ```
   MODIFY procname,DISPLAY,LB,DETAIL
   ```

   If the DISTDVIPA flag is displayed for the server application, verify that z/OS sysplex distributor is distributing workload requests to the server application. See *z/OS Communications Server: IP Diagnosis* for more information about diagnosing dynamic VIPA and sysplex problems.

7. Determine whether the agent_id_list statement of the Advisor contains the IP address and port that the Agent is bound to on the system where the server application exists. If not, correct the agent_id_list statement in the Advisor configuration or the host_connection statement in the Agent configuration.

   If you use Application Transparent TLS (AT-TLS) to authenticate the z/OS Agent, verify that the TLS configuration is correct on the Agent and Advisor. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring AT-TLS.

8. To check the member information on the Agent, issue the following command:

   MODIFY *procname*,**DISPLAY,MEMBERS**
   : The command for z/OS Agents

   aqsllcmd display,members
   : The command for Linux on z Systems Management Agents

   If the protocol is UDP and the IP address of the server application is a distributed DVIPA address, no workload requests will be distributed for this server application on target TCP/IP stacks. Only the z/OS sysplex distributor TCP/IP stack advertises the DVIPA address, so only server applications running on this TCP/IP stack that binds to the DVIPA for UDP have workload requests distributed to it. Server applications that bind to the distributed DVIPA for protocol UDP on other TCP/IP stacks do not have workload requests distributed to them. On Linux on z Systems Management Agents, if the member is not displayed, ensure that the Linux on z Systems guest that hosts the server application is logged on.

9. Determine whether network connectivity exists between the Advisor and the Agent in question. Unexpected loss of network connectivity between the Advisor and the z/OS Agent results in MVS console messages for the Advisor and Agent and related messages in the Advisor and Agent logs. Unexpected loss of network connectivity between the Advisor and the Linux on z Systems Management Agent results in MVS console messages for the Advisor and related messages in the Agent and Advisor logs. To determine which Agents have connected to the Advisor, and by omission, which have not, issue the following Advisor command:

   ```
   MODIFY procname,DISPLAY,ADVISOR
   ```

10. To determine whether the server application is available and enabled but not quiesced for the workload, issue the following Advisor command:

    ```
    MODIFY procname,DISPLAY,WORKLOAD,DETAIL
    ```

    a. If the member state is UNAVAIL, correct the issue with the server application.

    b. If the server application is quiesced, enable the server application by issuing one of the following commands on the system where the server application is quiesced:

- If the member is an external second-tier load balancer, issue the Agent MODIFY *procname*,ENABLE command.
- If the member is a sysplex distributed DVIPA, issue the VARY TCPIP,,SYSPLEX,RESUME command.
- If the member is a non-distributed IP address, issue the Agent MODIFY *procname*,ENABLE command.

11. If syslogd was started, check the syslogd file for ERROR or WARNING messages and take the appropriate corrective actions. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. Otherwise, if the Advisor or Agent internal trace is being used, dump and check the internal trace for ERROR or WARNING messages. In both cases, take the appropriate corrective actions. If ERROR and WARNING level log messages are not enabled, enable them and recheck the syslogd file or dump and recheck the internal trace messages later.
12. Determine whether the first-tier load balancer has connectivity to the second-tier load balancer, and the second-tier load balancer has connectivity to the TCP/IP stack owning the IP address of the server application in question.
13. Issue the following Advisor command to determine whether the workload has been activated to one of the sites:

    ```
    MODIFY procname,DISPLAY,WORKLOAD
    ```

    If not, activate the workload by issuing the `MODIFY procname,ACTIVATE` command.

Diagnosing why a workload is not being distributed to an MQ cluster queue

When a workload is not being distributed to an MQ cluster queue, you can use the information in this topic to diagnose problems.

About this task

To determine why a workload is not being distributed to an MQ cluster queue, complete the following steps:

Procedure

1. Determine whether the Advisor is running or a z/OS Agent is running on the MVS system that contains the MQ queue manager. If they are not running, start the Advisor or Agent.
2. Determine whether the agent_id_list statement of the Advisor contains the IP address and port that the z/OS Agent is bound to on the system where the MQ queue manager exists. If not, correct the agent_id_list statement in the Advisor configuration or the host_connection statement in the z/OS Agent configuration. If you use Application Transparent TLS (AT-TLS) to authenticate the z/OS Agent, verify that the TLS configuration is correct on the Agent and Advisor. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring AT-TLS.
3. To check the member information on the Agent, issue the following command:

    ```
    MODIFY procname,DISPLAY,MEMBERS,DETAIL
    ```

    If the MQ queue manager is not active, restart the MQ queue manager. If not all MQ cluster queues for the workload are defined to the MQ queue manager,

ensure these MQ cluster queues are defined. If not all MQ cluster queues for the workload are enabled to receive messages, ensure these MQ cluster queues are enabled.

4. Determine whether network connectivity exists between the Advisor and the z/OS Agent in question. Unexpected loss of network connectivity between the Advisor and the z/OS Agent results in MVS console messages for the Advisor and Agent and related messages in the Advisor and Agent logs. To determine which z/OS Agents have connected to the Advisor, and by omission, which have not, issue the following Advisor command:

   ```
   MODIFY procname,DISPLAY,ADVISOR
   ```

5. If syslogd was started, check the syslogd file for ERROR or WARNING messages and take the appropriate corrective actions. The syslogd identifier is lladvsr for the Advisor and llagent for the z/OS Agent. Otherwise, if the Advisor or z/OS Agent internal trace is being used, dump and check the internal trace for ERROR or WARNING messages. In both cases, take the appropriate corrective actions. If ERROR and WARNING level log messages are not enabled, enable them and recheck the syslogd file or dump and recheck the internal trace messages later.
6. Issue the following Advisor command to determine whether the workload has been activated to one of the sites:

   ```
   MODIFY procname,DISPLAY,WORKLOAD
   ```

   If not, activate the workload by issuing the MODIFY *procname*,ACTIVATE command.

Diagnosing workload distribution problems

Diagnosing workload distribution problems for server applications

When workload distribution problems occur, you can use the information in this topic to diagnose problems.

About this task

To diagnose workload distribution problems for server applications, complete the following steps:

Procedure

1. To determine whether a first-tier load balancer has connected to the Lifeline Advisor, issue the following command:

   ```
   MODIFY procname,DISPLAY,LB,DETAIL
   ```

   Ensure that there are groups in the display with the CROSS_SYSPLEX group flag set, and that the IP addresses listed in those groups are the IP addresses of external second-tier load balancers, sysplex distributed DVIPAs, or non-distributed IP addresses.
2. Determine whether the update interval value of the Advisor is not abnormally large. The Advisor must wait at least two update intervals before beginning to receive enough data to properly calculate weights when a server application becomes available or when an Agent is started.
   a. Allow at least three update intervals to expire after a server application is started before re-examining the distribution of workload.

b. If the workload is occasionally being sent to overloaded server applications, adjust the update_interval downward so workload distribution can react more quickly to the pace of new workload requests.

3. To check routing recommendations, periodically issue the following Advisor command to check the weights of members within the group in question.

   ```
   MODIFY procname,DISPLAY,LB,DETAIL
   ```

   Determine whether the weights are consistent with the expected behavior. If not, see "MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information" on page 127, and "Interpreting the workload and LB displays" on page 76 for more information about how to analyze the server application weights.

4. Determine whether the agent_id_list value of the Advisor contains the IP addresses and ports of the MVS systems that each z/OS Agent is bound to and the Linux on z Systems Management Guests that each Linux on z Systems Management Agent is bound to. If not, correct the agent_id_list statement in the Advisor configuration or the host_connection statement in the Agent configuration.

   If you use Application Transparent TLS (AT-TLS) to authenticate the z/OS Agent, verify that the TLS configuration is correct on the Agent and Advisor. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring AT-TLS. The Advisor must be configured not to require Linux on z Systems Management Agents to authenticate by using AT-TLS.

5. Determine whether members of the group in question using this workload are not unexpectedly quiesced or unexpectedly unavailable by issuing the following Advisor command:

   ```
   MODIFY procname,DISPLAY,WORKLOAD,DETAIL
   ```

   If the member state is UNAVAIL, correct the issue with the server application.

6. If syslogd was started, check the syslogd file for ERROR or WARNING messages and take the appropriate corrective actions. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. Otherwise, if the Advisor or Agent internal trace is being used, dump and check the internal trace for ERROR or WARNING messages. In both cases, take the appropriate corrective actions. If ERROR and WARNING level log messages are not enabled, enable them and recheck the syslogd file or dump and recheck the internal log messages later.

Diagnosing workload distribution problems for IBM MQ clusters

When workload distribution problems occur, you can use the information in this topic to diagnose problems.

About this task

To diagnose workload distribution problems for IBM MQ clusters, complete the following steps:

Procedure

1. Determine whether the update interval value of the Advisor is not abnormally large. The Advisor must wait at least two update intervals before beginning to receive enough data to properly calculate weights when an MQ queue manager or MQ cluster queue becomes available or when a z/OS Agent is started.

a. Allow at least three update intervals to expire after the MQ queue manager is started before re-examining the distribution of workload.
b. If the workload messages are occasionally being sent to overloaded MQ queue managers, adjust the update_interval downward so workload distribution can react more quickly to the pace of new workload requests.

2. To check routing recommendations, periodically issue the following z/OS Agent command to check the availability of members within the MQ cluster queue group in question.

   ```
   MODIFY procname,DISPLAY,MEMBERS,DETAIL
   ```

   If the IP address and port number for an MQ queue manager is displayed as 0.0.0.0..0, the hostname specified on the CONNAME parameter for the MQ CHANNEL definition for this MQ queue manager could not be resolved by the z/OS Agent. Verify that the same TCPIP.DATA file is used for both the z/OS Agent and the MQ queue manager, so the hostname can be resolved the same way.

3. Determine whether the agent_id_list value of the Advisor contains the IP addresses and ports of the MVS systems that each z/OS Agent is bound to. If not, correct the agent_id_list statement in the Advisor configuration or the host_connection statement in the z/OS Agent configuration. If you use Application Transparent TLS (AT-TLS) to authenticate the z/OS Agent, verify that the TLS configuration is correct on the Agent and Advisor. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring AT-TLS.

4. Determine whether MQ queue managers or MQ cluster queues for the workload in question are not unexpectedly disabled or unexpectedly unavailable by issuing the following Advisor command:

   ```
   MODIFY procname,DISPLAY,WORKLOAD,DETAIL
   ```

   If the member state is UNAVAIL, correct the issue with the MQ queue manager or MQ cluster queue.

5. If syslogd was started, check the syslogd file for ERROR or WARNING messages and take the appropriate corrective actions. The syslogd identifier is lladvsr for the Advisor and llagent for the z/OS Agent. Otherwise, if the Advisor or Agent internal trace is being used, dump and check the internal trace for ERROR or WARNING messages. In both cases, take the appropriate corrective actions. If ERROR and WARNING level log messages are not enabled, enable them and recheck the syslogd file or dump and recheck the internal log messages later.

Diagnosing problems when the Lifeline Advisor or Agent appears hung

When the Lifeline Advisor or Agent appears hung, you can use the information in this topic to diagnose problems.

About this task

To diagnose problems when the Lifeline Advisor or Agent appears hung, complete the following steps:

Procedure

1. To determine whether the Lifeline Advisor or Agent is hung, issue the following command on the system where the Advisor or Agent is running:

MODIFY *procname*,**DISPLAY,DEBUG**
The command for Advisors

MODIFY *procname*,**DISPLAY,DEBUG**
The command for z/OS Agents

aqsllcmd display,debug
The command for Linux on z Systems Management Agents

If you do not receive a response, attempt to stop the Advisor or Agent instead of canceling the Advisor or Agent. If the Advisor or Agent does not terminate, it might be hung.

2. If the hang occurred when the DEBUG-level Advisor or Agent trace was in effect, collect the problem documentation by taking the following sub-steps and call IBM Service.
   a. Take an SVC dump of the z/OS Agent or Advisor address space (depending on which is hung) and of the OMVS address space including its data spaces. For the Linux on z Systems Management Agent, trigger a core dump, by using the kill -SIGQUIT <process_id> command.
   b. Capture the MVS console messages if applicable.
   c. If syslogd was started, capture the Advisor or Agent messages that are written to syslogd. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent.
   d. If the Advisor or Agent internal trace is used, dump and save the internal trace messages.
3. If DEBUG-level trace was not in effect at the time, turn on DEBUG-level Advisor or Agent trace, reproduce the problem, collect the problem documentation, and call IBM Service.

Diagnosing problems when the group names are not readable

When the load balancer application group names are not readable, you can use the information in this topic to diagnose problems.

About this task

To diagnose problems when the load balancer application group names are not readable, complete the following steps:

Procedure

1. Determine whether the group names defined in the load balancers use characters limited to the ASCII character set. When the load balancers define group names, the names are coded in UTF-8 format. This character set is a superset of the EBCDIC character set; not all characters are translatable to EBCDIC.
2. To make the group names readable, rename the group names in the load balancers to use characters limited to the ASCII character set.

Diagnosing problems when load balancer connection terminates

When the external load balancer connection to the Advisor terminates, you can use the information in this topic to diagnose problems.

About this task

Guideline: The Lifeline Advisor has an internal maximum message size of 128K bytes. If this limit is exceeded, the connection with the external load balancer is closed and an error message is logged stating that the message is too large and was not received.

To diagnose problems when the load balancer connection to the Lifeline Advisor terminates unexpectedly, complete the following steps:

Procedure

1. Determine whether the network administrator has shut down the external load balancer.
2. Determine whether TCP/IP connectivity still exists between the load balancer and the Advisor. For example, from the Advisor system, ping the IP address used by the load balancer.
3. If syslogd was started, check the syslogd file of the Advisor for ERROR or WARNING messages and take the appropriate corrective actions. The syslogd identifier is lladvsr for the Advisor. Otherwise, if the Advisor internal trace is being used, dump and check the internal trace for ERROR or WARNING messages and take the appropriate corrective actions.
   a. If an ERROR message which indicates a `send()` operation failed with `errno = EDC8102I Operation would block` is issued, you might have registered too many groups or members from the load balancer. Increase the TCPCONFIG TCPSENDBFRSIZE statement in the TCP/IP profile where the Advisor is active, or register fewer groups and members from the load balancer, and then try restarting the external load balancer. For details about the TCPCONFIG statement, see *z/OS Communications Server: IP Configuration Reference*.
   b. If ERROR and WARNING level log messages are not enabled, enable them, repeat the operation, and recheck the syslogd file or dump and recheck the internal trace messages again.
4. Check the load balancer for errors.

Diagnosing problems when the Lifeline Agent connection terminates

When the Agent connection to the Advisor terminates, you can use the information in this topic to diagnose problems.

About this task

Guideline: The Advisor and Agent have an internal maximum message size of 128KB. If this limit is exceeded, the connection is closed and an error message is logged stating that the message is too large and was not received.

If the connection between a Lifeline Agent and Advisor terminates unexpectedly, complete the following steps to diagnose problems:

Procedure

1. Determine whether the MVS operator or Linux on z Systems administrator has shut down this Agent.
2. Determine whether TCP/IP connectivity still exists between the Agent and the Advisor. For example, from the Advisor system, ping the IP address used by the Agent.

3. If syslogd was started, check the syslogd file of the Advisor for ERROR or WARNING messages. The syslogd identifier is lladvsr for the Advisor. Otherwise, if internal trace is used, dump and check the internal log for ERROR or WARNING messages. In both cases, take the appropriate corrective actions.
   a. If an ERROR message which indicates a `send()` operation failed with `errno = EDC8102I Operation would block` is issued, you might have registered too many groups or members that belong to the same Agent. Ensure that the TCPCONFIG TCPMAXSENDBFRSIZE and TCPMAXRCVBUFRSIZE statements in the TCP/IP profile are set to 256 KB where the Advisor and z/OS Agent are active, or register fewer groups and members belonging to the Agent, and then try restarting the Agent. For details about the TCPCONFIG statement, see *z/OS Communications Server: IP Configuration Reference*. For Linux on z Systems Management Agents, see the documentation for your Linux distribution to determine how to display and set the maximum TCP send and receive buffer sizes.
   b. If ERROR and WARNING level log messages are not enabled, enable them, repeat the operation, and recheck the syslogd file or dump and recheck the internal trace messages again.

Diagnosing problems when the Lifeline Advisor to Advisor connection terminates

When the connection between the peer Lifeline Advisor and this Advisor terminates unexpectedly, you can use the information in this topic to diagnose problems.

About this task

To diagnose problems when the Advisor to Advisor connection terminates, complete the following steps:

Procedure

1. Determine whether the MVS operator has shut down the peer Advisor.
2. Determine whether TCP/IP connectivity still exists between the peer Advisor and the Advisor. For example, from the Advisor system, ping the IP address used by the peer Advisor.
3. If syslogd was started, check the syslogd file of the Advisor for ERROR or WARNING messages and take the appropriate corrective actions. The syslogd identifier is lladvsr for the Advisor. Otherwise, if the Advisor internal trace is being used, dump and check the internal trace for ERROR or WARNING messages and take the appropriate corrective actions.
4. If syslogd was started, check the syslogd file of the peer Advisor for ERROR or WARNING messages and take the appropriate corrective actions. Otherwise, if the Advisor internal trace is being used, dump and check the internal trace for ERROR or WARNING messages and take the appropriate corrective actions.

(z/OS systems) Diagnosing failures of registering with ARM

Rule: This task is only applicable to the Lifeline Agents residing on z/OS systems. When the Lifeline Advisor or Agent fails to register with the Automatic Restart manager (ARM), you can use the information in this topic to diagnose problems.

About this task

To diagnose problems when the Lifeline Advisor or Agent fails to register with ARM, complete the following step:

Procedure

Check the warning-level message written to the syslogd file. This log message is issued when the IXCARM call fails with the return code and the reason code indicated in the log message. See *z/OS MVS Programming: Sysplex Services Reference* for information about interpreting the IXCARM return code and reason code. One of the common causes of failure is the lack of a security profile. See Chapter 3, "Configuring Multi-site Workload Lifeline," on page 47 for information about how to add an ARM security profile for the Advisor or Agent.

Diagnosing problems in the Linux on z Systems Management Agent

About this task

See "Linux on z Systems Workloads" on page 13 for information about diagnosing problems with the Linux on z Systems Management Agent.

Diagnosing problems when a Lifeline Advisor TRANSFER command fails

When a transfer of MQ messages for a workload fails unexpectedly and AQS0223I is issued, you can use the information in this topic to diagnose problems.

About this task

To diagnose problems when a Lifeline Advisor TRANSFER fails with message AQS0223I, complete the following steps:

Procedure

1. Issue the following Advisor command to determine which source and destination MQ queue managers and queue encountered an error during the transfer:

   MODIFY *procname*,TRANSFER,WORKLOAD=*workloadname*,STATUS
2. If the Advisor internal trace is being used, dump and examine the internal trace messages. Otherwise, examine the Advisor syslogd file. Check for WARNING messages issued at the time the TRANSFER,STATUS command was issued to determine why the transfer failed. Possible reasons for the failure include:
   - Network connectivity between the Advisor and Lifeline Agents participating in the transfer was lost.
   - An MQ application had opened the queue on either the source or destination MQ queue manager, preventing a Lifeline Agent from opening the queue with exclusive access.
   - A Lifeline Agent was not authorized to put or get messages from the queue.
   - The source or destination MQ queue manager is no longer active.
3. If the Agent internal trace is being used, dump and examine the internal trace messages for the Agents where the source and destination MQ queue managers reside. Otherwise, examine the syslogd files for these Agents. Check the traces to locate the message descriptors for the last messages that were successfully

transferred. Since a failure during a transfer could result in the same message being present on both the source and destination MQ queue managers' queue, remove any duplicate message that is present from the source MQ queue manager's queue. See *IBM MQ: Administering IBM MQ* for information about displaying and removing messages from queues on an MQ queue manager.

4. Once the problem resulting in the unexpected failure is corrected and any duplicate messages are resolved, reissue the Advisor TRANSFER command to complete the transfer of messages for this workload.

Chapter 6. Multi-site Workload Lifeline configuration statements

Multi-site Workload Lifeline configuration statements define the information needed to establish communication with an Advisor and external load balancers, an Advisor and Agents, and between peer Advisors.

Two types of Multi-site Workload Lifeline configuration statements are: Lifeline Advisor configuration statements and Lifeline Agent configuration statements.

General configuration rules for the Multi-site Workload Lifeline are as follows:

- You must specify at least one value for each statement and separate the statement from its values by using one or more blanks.
- You can specify only one statement and one or more values per line.
- Text beyond the specified statement and its values is treated as a comment. If the text does not start with a number sign (#), a warning message is written to the log.
- For statements that contain braces ({ and }), you must specify each brace on a separate line, for example:

```
advisor_id_list
{
 10.10.10.1
 10.10.10.2
}
```

- Any text beyond an opening or closing brace is treated as a comment. If the text does not start with a number sign (#), a warning message is written to the log.
- Text beginning with a number sign (#) is a comment and is ignored. The remainder of the line following the number sign (#) is considered part of the comment.
- For statements with identical labels, a warning message is written to the log, and the last instance of the statement is used.
- When a statement is processed, all of the parameters are examined. Any parameter that is specified incorrectly causes an error. Any inconsistencies between parameters also cause an error.
- Static system symbols can be used for values in a statement. For more information about defining symbols, see *z/OS MVS Initialization and Tuning Reference*.

Lifeline Advisor configuration statements

Use the following configuration statements to configure Lifeline Advisors.

Table 1. Lifeline Advisor Configuration Statements

Configuration statement	Allowed values	Default value	Required or optional	Purpose
advisor_connection_port	1 - 65535	None	Required	Specifies the port on which the primary Advisor listens for connections from a secondary Advisor.
advisor_id_list		None	Optional	Specifies which secondary Advisors are allowed to connect to the primary Advisor.

Table 1. Lifeline Advisor Configuration Statements (continued)

Configuration statement	Allowed values	Default value	Required or optional	Purpose
advisor_takeover_policy	automatic manual	manual	Optional	Specifies the action that a secondary Advisor takes when it determines that a primary Advisor has stopped.
advisor_timeout	10 - 600 (in seconds)	10	Optional	Specifies how often the Advisor checks the availability of the peer Advisor.
agent_connection_port	1 - 65535	None	Required	Specifies the port on which the primary Advisor listens for connections from Agents.
agent_id_list		None	Required	Specifies which Agents are allowed to connect to the primary Advisor.
cross_sysplex_list		None	Required if TCP/IP applications make up at least one workload	Specifies the mapping of second-tier load balancers and their respective site name for a specific workload, and the failure detection interval for the workload.
debug_level	0 - 255	7	Optional	Specifies the level of debug information that is logged.
failure_detection_groups		None	Optional	For IP members, specifies the set of all members of one or more load balancer application groups. For SNA members, specifies the subset of entries from the sna_application_list statement. These groups make up a failure detection group for a workload.
failure_detection_interval	10 - 600 (in seconds)	60	Optional	Specifies the interval that the primary Advisor waits before determining a site failure.
intermediary_node_list		None	Optional	Specifies the mapping of intermediary nodes and their respective site name for a specific workload.
lb_connection_v4		None	Required if lb_connection_v6 is not specified	Specifies the port on which the primary Advisor listens for IPv4 connections from external load balancers. The IPv4 address is used by the primary Advisor to accept IPv4 connections from Agents or the secondary Advisor.
lb_connection_v6		None	Required if lb_connection_v4 is not specified	Specifies the port on which the primary Advisor listens for IPv6 connections from external load balancers. The IPv6 address is used by the primary Advisor to accept IPv6 connections from Agents or the secondary Advisor.
lb_id_list		None	Required if the cross_sysplex_list or sna_application_list is specified	Specifies which external load balancers are allowed to connect to the primary Advisor.
management_guest_list		None	Required if the Advisor communicates with one or more Linux on z Systems Management Agents	Specifies the Linux on z Systems guest names and IP addresses that the Linux on z Systems Management Agents monitor.
mq_manager_list		None	Required if MQ workloads are monitored.	Specifies the MQ queue managers, IBM MQ clusters, and MQ cluster queues that the z/OS Agents monitor.

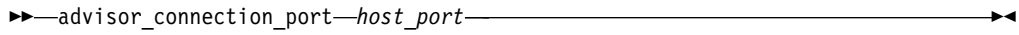
Table 1. Lifeline Advisor Configuration Statements (continued)

Configuration statement	Allowed values	Default value	Required or optional	Purpose
peer_advisor_id		The IPv4 address on the lb_connection_v4 statement or, if not specified, the IPv6 address on the lb_connection_v6 statement	Optional	Specifies the IP address on the primary Advisor that the secondary Advisor uses to connect to.
query_workload_list		None	Optional	Specifies the Active/Query workload, its associated Active/Standby workload, and the distribution method for the Active/Query workload.
sna_application_list		None	Required if SNA applications make up at least one workload	Specifies the SNA application names and their respective site name for the specific workload.
update_interval	10 - 600 (in seconds)	10	Optional	Specifies how frequently the Agents update the primary Advisor with new information.
workload_switch_policy	automatic manual	manual	Optional	Specifies the action that the primary Advisor takes when it determines either the workload is unavailable on the active site or the active site for a workload is unavailable.

advisor_connection_port

Use the advisor_connection_port statement to specify the port that the primary Advisor should listen on for connections from a secondary Advisor.

Syntax



Parameters

host_port
Specifies which port the primary Advisor listens on for connections from a secondary Advisor. The valid range of port values is 1 - 65535.

Requirement: This port number must match the port number specified in the advisor_connection_port configuration statement for the secondary Advisor.

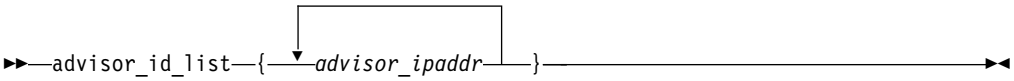
Usage

Restriction: Do not specify the same port that is on the agent_connection_port, lb_connection_v4, or lb_connection_v6 configuration statements; otherwise, the secondary Advisor will connect to the primary Advisor's socket that is used for processing Agent connections or load balancer connections.

advisor_id_list

Use the advisor_id_list statement to specify which secondary Advisors are allowed to connect to the primary Advisor. This list is also used by the secondary Advisor to select a source IP address when it is connecting to the primary Advisor.

Syntax



Parameters

advisor_ipaddr
Specifies a list of secondary Advisors that are allowed to connect to the primary Advisor. The list consists of one or more IP address entries, each specified on a separate line and enclosed in braces. Each of these entries represents the IP address of a given secondary Advisor.

Requirement: Only complete IPv4 or IPv6 addresses are accepted. Host names, prefixes, or subnets are not allowed. The IPv4 INADDR_ANY address (0.0.0.0) and the IPv6 unspecified address (::) are not allowed. Each advisor_ipaddr entry must be specified on one line. The advisor_ipaddr entry cannot be continued to a subsequent line.

Usage

- You can dynamically update this statement to add or delete IP address entries by using the `MODIFY` *procname*`,REFRESH` command. If the secondary Advisor is connected, the entry for that Advisor cannot be deleted.
- For high availability, use a static VIPA as the local IP address to tolerate individual link outages on the z/OS system.

Requirements:

- Do not use VIPARANGE dynamic VIPA.
- You must configure a local IP address for the primary Advisor in this list because it is used during initialization by the primary Advisor to determine whether another primary Advisor is currently active.

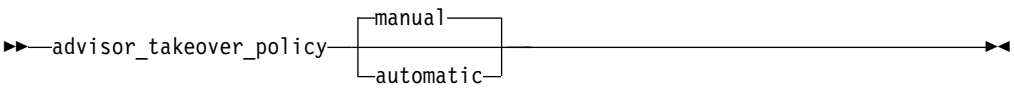
  Configuring the IP address for the peer Advisor in this list is optional. However, if you do not configure an Application Transparent TLS (AT-TLS) policy to permit Advisor to Advisor communication, the statement is required; otherwise, the peer Advisor cannot connect to this Advisor.

  You can configure peer Advisor IP addresses in this statement as well as have an AT-TLS policy enabled, such that a peer Advisor connection is authenticated by using this statement, while a different peer Advisor connection is authenticated by using AT-TLS.

advisor_takeover_policy

Use the advisor_takeover_policy statement to specify the action that the secondary Advisor should take when it determines that the primary Advisor has stopped.

Syntax



Parameters

manual
Configures the secondary Advisor to wait for a MODIFY *procname*,TAKEOVER command before taking over as the primary Advisor. The default value is manual.

automatic
Configures the secondary Advisor to perform a takeover to become the primary Advisor.

Usage

If automation is already in place to detect a primary Advisor failure, specifying manual will allow automation procedures to handle the takeover of the primary Advisor.

Rules:

- Keep the configuration files of the primary and secondary Advisor in sync; otherwise, the automatic takeover will not occur even if the automatic parameter is specified.
- If the state of the primary Advisor is unknown, the automatic takeover will not occur even if the automatic parameter is specified. The state of the primary Advisor can be determined by issuing the MODIFY *procname*,DISPLAY,ADVISOR command on the secondary Advisor.

advisor_timeout

Use the advisor_timeout statement to specify how often the Advisor checks the availability of the peer Advisor.

Syntax

Parameters

interval
Specifies how frequently, in seconds, the Advisor checks the availability of the peer Advisor.

The valid range is 10 – 600 (in seconds). The default value is 10 seconds.

The configuration statement is used by the primary Advisor for the following reasons:

- During initialization to determine how long it waits before concluding that another primary Advisor is not active before becoming the primary Advisor.
- To determine how long to wait for the secondary Advisor to signal that it is available before declaring that the secondary Advisor is no longer active.

The configuration statement is used by the secondary Advisor for the following reason:

- To determine how long to wait for the primary Advisor to signal that it is available before declaring that the primary Advisor is no longer active.

agent_connection_port

Use the agent_connection_port statement to specify the port on which the primary Advisor should listen for connections from Agents.

Syntax

Parameters

host_port
Specifies the port on which the primary Advisor listens for connections from Agents. The valid range of port values is 1 - 65535.

Requirement: This port number must match the port number specified in the advisor_id configuration statement for the Agents.

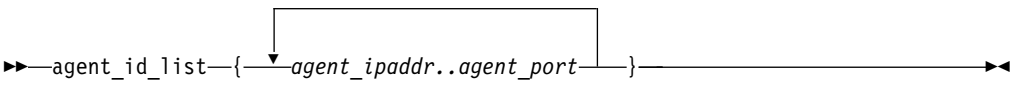
Usage

Restriction: Do not specify the same port that is on the advisor_connection_port, lb_connection_v4, or lb_connection_v6 configuration statement; otherwise, the Agent will connect to the primary Advisor's socket that is used for processing secondary Advisor connections or load balancer connections.

agent_id_list

Use the agent_id_list statement to specify which Agents are allowed to connect to the primary Advisor.

Syntax



Parameters

agent_ipaddr..agent_port
Specifies a list of Agents that are allowed to connect to the primary Advisor. The list consists of one or more IP address and port pairs, each specified on a separate line and enclosed in braces. Each of these pairs represents the IP address and port of a given Agent. The valid range of port values is 1 - 65535. Do not put any spaces between the IP address, the two periods (..), and the port.

Requirements:

- Only complete IPv4 or IPv6 addresses are accepted. Host names, prefixes, or subnets are not allowed. The IPv4 INADDR_ANY address (0.0.0.0) and the IPv6 unspecified address (::) are not allowed. Each agent_ipaddr..agent_port pair must be specified on one line; it cannot be continued to a subsequent line.
- Each IP address and port pair must match the IP address and port in the host_connection configuration statement for an Agent.
- Each IP address in the list can be specified only once.

Usage

If an Agent attempts to connect to the Advisor and the Agent's source IP address and port are not represented in this list, the connection is refused.

Guideline: You can configure this statement as well as have an AT-TLS policy enabled, such that some Agent connections are authenticated only by using this statement, while other Agent connections are also authenticated by using AT-TLS. Linux on z Systems Management Agents cannot be authenticated by using AT-TLS.

You can dynamically update this statement to add or delete IP address and port pair entries by using the MODIFY *procname*,REFRESH command. If an Agent is connected, the entry for that Agent cannot be deleted.

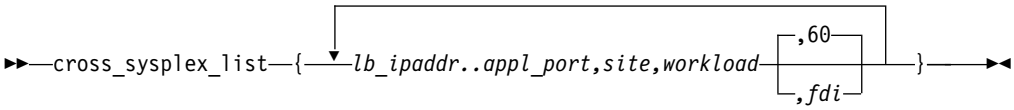
cross_sysplex_list

Use the cross_sysplex_list statement to specify the IP address and site name of each second-tier load balancer or server application, the port of the application group used by the workload, the workload name, and the failure detection interval for the IP workload.

A first-tier load balancer connection is refused when either condition is true:

- If a first-tier load balancer attempts to connect to the primary Advisor and register group members that are not represented in this list or in the intermediary_node_list configuration statement.
- If a first-tier load balancer attempts to connect to the primary Advisor and register an application group containing a mix of second-tier load balancers and server application members.

Syntax



Parameters

lb_ipaddr..appl_port,site,workload,fdi
Specifies either of the following 5-tuples:

- An IP address and port of a second-tier load balancer, the site that the load balancer resides on, and the workload that the load balancer is responsible for.
- A non-distributed IP address and port of a server application, the site that the server application resides on, and the workload that the server application belongs to.

The list consists of one or more IP address, port, site name, workload name, and workload failure detection interval 5-tuples, each specified on a separate line and enclosed in braces. Each of these 5-tuples represents the second-tier load balancer or server application and the mapping of the site name and workload name for that workload.

Requirements:

- Only complete IPv4 or IPv6 addresses are accepted. Host names, prefixes, or subnets are not allowed. The IPv4 INADDR_ANY address (0.0.0.0) and the IPv6 unspecified address (::) are not allowed.
- Each *lb_ipaddr..appl_port,site,workload,fdi* 5-tuple must be specified on one line; it cannot be continued to a subsequent line.
- Do not put any spaces between the IP address, the two periods (..), and the port. Do not put spaces between any parameter and the preceding or following comma (,).

Each entry can represent either an Active/Standby workload or an Active/Query workload.

lb_ipaddr..appl_port
Specifies the IP address and port of a second-tier load balancer or server application. The valid range of port values is 1 - 65535.

site
Specifies the site where the second-tier load balancer resides. The site name corresponds to the MVS sysplex name for that site.

Requirement: Only two unique site names can be specified in the Lifeline Advisor configuration. For each 5-tuple in the list, you must specify one of the two unique site names.

workload
Specifies the workload the load balancer is responsible for or specifies the workload that the server application belongs to. The workload name can consist of alphanumeric characters as well as the @, #, $, -, and _ characters. The first character must be an alphabetic character. The length of the workload name cannot exceed 64 characters.

Requirement: Each workload in the list must have entries that specify the two unique site names.

fdi
Specifies the workload failure detection interval. The failure detection interval specifies how long the Advisor waits to determine that a workload is no longer available on a site. Although an Active/Standby workload might consist of multiple load balancer application groups, the failure detection interval starts when no member of one group, either a load balancer application group or, if configured, the group's failure detection group, is available for that site. For an Active/Query workload or an Active/Standby workload consisting of a single load balancer application group, the failure detection interval starts when no member of the group is available for that site. The failure detection interval resets if at least one of the members of the failing load balancer application group becomes available for that site. The valid range is 10 - 600 in seconds. The default interval is 60 seconds. The failure detection interval value cannot be less than the value that is specified on the update_interval statement.

Rule: All entries for a workload, whether in the cross_sysplex_list, the sna_application_list, or the mq_manager_list, must specify the same fdi value; otherwise a terminating error occurs.

Usage

- A second-tier load balancer IP address can be either the IP address of the external load balancer residing in the site, the IP address of the intermediary

node, or the dynamic virtual IP address (VIPA) that is distributed by the z/OS sysplex distributor residing on a system image in the site.

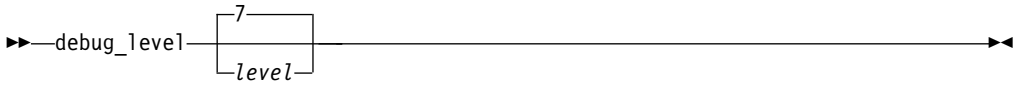
- A server application IP address can only be a non-distributed IP address.
- If an Active/Standby workload consists of multiple load balancer application groups, each load balancer application group must be specified with its own 5-tuple entry, and must be unique with other 5-tuple entries that are defined for the workload by specifying a different second-tier load balancer IP address or server application IP address, or a different port.
- The cross_sysplex_list statement is required when either of the following conditions occurs:
  - The intermediary_node_list and the mq_manager_list statements are not configured.
  - The intermediary_node_list is configured and any of its entries specify an application type of IP or use an application type of IP by default.
- You can dynamically update this statement by using the `MODIFY procname,REFRESH` command.

  Rules:
  - A new 5-tuple entry can be added to an existing workload or for a new workload.
  - An existing 5-tuple entry for a workload cannot be deleted.
  - The workload name and failure detection interval are the only values that can be modified on an existing 5-tuple entry.
  - The workload name can be modified only if the workload is quiesced.
  - If the workload is also defined in an intermediary_node_list entry, sna_application_list entry, mq_manager_list entry, and/or management_guest_list entry, all entries in each list that are using this workload name must be modified.

debug_level

Use the debug_level statement to specify the level of debug information that is logged.

Syntax



Parameters

level

Specifies the debug level. If internal trace is used, all trace messages are written to internal trace, but only the trace messages at the ERROR, WARNING, and EVENT level are written to syslogd. If internal trace is not used, all trace messages are written to syslogd. The level value represents a particular debug level or combination of debug levels. See “Debug levels” on page 73 for the possible values. The default level is 7 (1 + 2 + 4 = 7), which means that all error, warning, and event messages are captured. The valid range is 0 - 255.

Usage

- You can dynamically update this statement by using the `MODIFY procname,DEBUG` command.
- To log a combination of debug levels, add the debug level numbers.

Restriction: Do not customize this statement unless you are directed to do so by an IBM Service representative. Adding additional types of trace data can cause the amount of data captured to become voluminous. Reducing the amount of trace data from the default might make diagnosing a problem more difficult.

failure_detection_groups

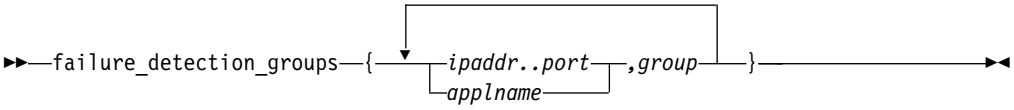
Use the failure_detection_groups statement to combine one or more load balancer application groups that a load balancer registers into a larger failure detection group, or to divide the sna_application_list entries for a workload into a set of smaller failure detection groups.

When using this statement:

- Workload failure detection for these load balancer application groups is determined using the configured failure detection group instead of each individually registered load balancer application group.
- Workload failure detection for a sna_application_list workload is determined using the configured failure detection groups instead of a single failure detection group of all sna_application_list entries for a workload.

Each entry in the list must be specified on a separate line and enclosed in brackets.

Syntax



Parameters

For the IP entries defined in this list:

ipaddr..port,group
Specifies a list of all members of one or more load balancer application groups that are to be combined into a larger group that is used to determine a workload failure. If configured,, two or more IP address, port, group name 3-tuples must be defined.

ipaddr..port
Specifies the IP address and port of a load balancer application group member that is registered by a first-tier load balancer.

Rule: The IP address and port must match an entry in either the cross_sysplex_list or the intermediary_node_list statement.

For the SNA entries defined in this list:

applname,group
Specifies a list of all members of one or more workloads configured in the sna_application_list statement. The entries of a workload will be broken up

into smaller groups for workload failure detection. If configured, two or more applname,group 2-tuples must be defined.

applname
Specifies a network-qualified SNA application name or SNA model application name that is configured on a VTAM APPL definition statement.

Rule: The application name must exactly match an entry defined in the sna_application_list; a model application name must be specified with the same wild card usage as specified in the sna_application_list.

For both IP and SNA members defined in this list:

group
Specifies the group name for the entry in the list that identifies a failure detection group. For IP members, all load balancer application group members that use the same group name are combined into a workload failure detection group. For SNA members, the subset of SNA applications that use the same group name are placed into a workload failure group. The group name can consist of alphanumeric characters as well as the @, #, $, -, and _ characters. The first character must be an alphabetic character. The length of the group name cannot exceed 64 characters. The group name must not be specified as GROUPxxxxxx where xxxxxx is 000000 through 999999. This set of group names is reserved for the Advisor's use.

Usage

The IP entries in this list are used to combine the load balancer application groups registered by a load balancer into one or more failure detection groups. The SNA entries in this list are used to break a SNA workload group into smaller failure detection groups for that SNA workload.

Rules:

- All members that are configured for a given failure detection group must be for the same workload.
- A failure detection group must contain at least two members, one on each site.
- For the IP failure detection groups defined in this list:
  - All members of a failure detection group must either match entries in the cross_sysplex_list statement or match entries in the intermediary_node_list statement. If a member's IP address and port matches an entry in both the cross_sysplex_list and the intermediary_node_list, the member is assumed to match only the intermediary_node_list entry.
  - If the members of a failure detection group match entries in the intermediary_node_list, all matching members in the intermediary_node_list statement must be configured with the same application type.
  - The members of a load balancer application group registered by a load balancer must have one of the following configurations:
    - All of the members are configured in the failure_detection_groups statement.
    - None of the members are configured in the failure_detection_groups statement.

  A subset of the members from a load balancer application group cannot be defined in this statement; otherwise, the registration request fails.
- For the SNA failure detection groups defined in this list:

  - All members of a failure detection group must match entries in the sna_application_list statement.
  - For a given workload in the sna_application_list, a subset of those workload members cannot be defined in this statement. Either all of the sna_application_list entries for that workload are configured in the failure_detection_groups statement, in one or more failure detection groups, or none of the entries for that workload are configured in the failure_detection_groups statement.
- A failure detection group cannot include both SNA and IP members.
- A workload can consist of a combination of registered load balancer application groups whose members are configured in the failure_detection_groups statement, other registered load balancer application groups whose members are not configured in the failure_detection_groups statement, and sna_application_list members for that workload that are either all configured in the failure_detection groups statement or all not configured in the failure_detection groups statement. .
  - For load balancer application groups with members that are not configured in the failure_detection_groups statement, workload failure detection starts if a load balancer application group becomes unavailable.
  - For load balancer application groups that are configured in the failure_detection_groups statement, workload failure detection starts if a failure detection group that these load balancer application groups are configured to becomes unavailable.
- You can dynamically update this statement by using the MODIFY *procname*,REFRESH command.
  - A new entry can be added to an existing failure detection group or a new failure detection group.
  - An existing entry for a failure detection group cannot be deleted.
  - An existing entry for a failure detection group cannot be modified.

failure_detection_interval

Use the failure_detection_interval statement to specify how long the primary Advisor waits for determining that a site is no longer available.

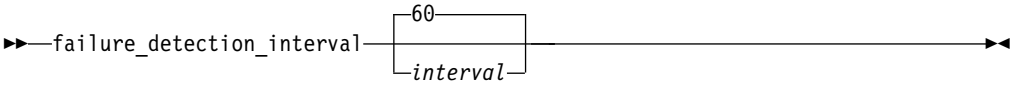
For site failures, the failure detection interval starts when both of the following conditions are true:

- All Agents on that site are not connected to the primary Advisor
- All LPARs on that site are reported to the primary Advisor, via BCPii services, as not available

The failure detection interval resets when one of the following conditions is true:

- At least one Agent on that site connects to the primary Advisor
- At least one LPAR on that site is reported as available, via BCPii services, to the primary Advisor

Syntax



Parameters

interval
Specifies how long the primary Advisor waits for an indication that a site is available. The valid range is 10 - 600 in seconds. The default interval is 60 seconds.

Requirement: The *interval* value cannot be less than the value specified on the update_interval statement.

Usage

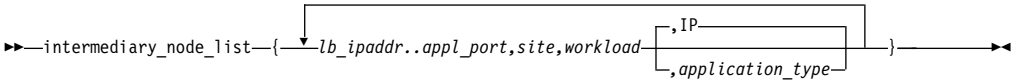
You can dynamically update this statement by using the MODIFY *procname*,REFRESH command.

intermediary_node_list

Use the intermediary_node_list statement to specify the IP address and site name of each intermediary node, the ports of the load balancer application group used by the workload, and the workload name.

If a first-tier load balancer connects to the primary Advisor and attempts to register group members that are not represented in this list or in the cross_sysplex_list configuration statement, the registration is refused and the connection is closed.

Syntax



Parameters

lb_ipaddr..appl_port,site,workload,application_type
Specifies a list of intermediary nodes, the site that the intermediary node resides on, the workload that the intermediary node is responsible for, and the type of application. The list consists of one or more IP address, port, site name, workload name, and application type 5-tuples, each specified on a separate line and enclosed in braces. Each of these 5-tuples represents the intermediary node and the mapping of the site name and workload name for that workload.

Requirements:

- Only complete IPv4 or IPv6 addresses are accepted. Host names, prefixes, or subnets are not allowed. The IPv4 INADDR_ANY address (0.0.0.0) and the IPv6 unspecified address (::) are not allowed.
- Each *lb_ipaddr..appl_port,site,workload,application* type 5-tuple must be specified on one line; it cannot be continued to a subsequent line.
- Do not put any spaces between the IP address, the two periods (..), and the port. Do not put spaces between any parameter and the preceding or following comma (,).

lb_ipaddr..appl_port
Specifies the IP address and port of the intermediary node. The valid range of port values is 1 - 65535.

site
Specifies the site where the intermediary node resides. The site name corresponds to the MVS sysplex name for that site or the site_name that is specified in the Linux on z Systems Management Agent's configuration file.

Requirement: Only two unique site names can be specified in the Lifeline Advisor configuration. For each 5-tuple in the list, you must specify one of the two unique site names.

workload
Specifies the workload that the intermediary node is responsible for. The workload name can consist of alphanumeric characters as well as the @, #, $, -, and _ characters. The first character must be an alphabetic character. The length of the workload name must be within 64 characters.

Requirements:

- Each workload in the list must specify the same two unique site names. All workloads must use the same two names.
- If an Active/Standby workload consists of multiple load balancer application groups, each load balancer application group must be specified with its own 5-tuple entry. Each group's 5-tuple entry must also be unique with other 5-tuple entries that are defined for the workload by specifying a different intermediary node IP address or a different port.

application type
Specifies the type of application that processes the workload distributed by the intermediary node.

IP TCP/IP server applications process the workload. This is the default value.

SNA SNA applications process the workload.

Usage

- The intermediary node IP address resides in the site. It uses its own recommendations rather than receive distribution recommendations from the Multi-site Workload Lifeline.
- The members of a load balancer application group must map to either the IP intermediary node entries or the SNA intermediary node entries. A group cannot be used for both IP and SNA applications.
- You can dynamically update this statement by using the MODIFY *procname*,REFRESH command.

  Rules:

  – A new 5-tuple entry can be added to an existing workload or for a new workload.
  – An existing 5-tuple entry for a workload cannot be deleted.
  – The workload name is the only value that can be modified on an existing 5-tuple entry.
  – The workload name can be modified only if the workload is quiesced.
  – If the workload is also defined in a cross_sysplex_list entry, sna_application_list entry, mq_management_list entry, and/or management_guest_list entry, all entries in each list that are using this workload name must be modified.

Requirement: A load balancer application group that maps to entries in this list must have corresponding entries in the cross_sysplex_list configuration statement if IP is configured or corresponding entries in the sna_application_list if SNA is configured.

- When IP is configured:
  - If a workload has at least one intermediary IP address that matches an IP address configured in one of the z/OS Agent's systems, that is, a monitored internal intermediary node configuration, then each intermediary_node_list entry for that workload must have a corresponding cross_sysplex_list entry with a matching workload name, site, and port.
  - If a workload has at least one intermediary IP address that matches an IP address configured in one of the Linux on z Systems guests, that is, a monitored external intermediary node configuration, then each intermediary_node_list entry for that workload must have a corresponding cross_sysplex_list entry with a matching workload name and site.
  - If a workload has no intermediary IP address that matches an IP address configured in the site, that is, an unmonitored external intermediary node configuration, then each intermediary_node_list entry for that workload must have a corresponding cross_sysplex_list entry with a matching workload name and site.

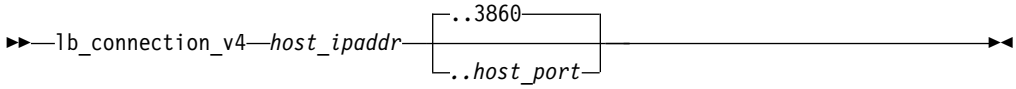
  The corresponding cross_sysplex_list entry specifies the distributable DVIPA to be used to monitor the server application for the workload.
- When SNA is configured:
  - Each intermediary_node_list entry for that workload must have one or more corresponding sna_application_list entries with the same workload and site. The application names of these sna_application_list entries represent the SNA applications that process the workload on that site.

lb_connection_v4

Use the lb_connection_v4 statement to specify the port that the primary Advisor should listen on for IPv4 connections from external load balancers. The IPv4 address in this statement is used by the primary Advisor to accept IPv4 connections from Agents or the secondary Advisor.

This statement is optional. However, if neither a lb_connection_v4 nor lb_connection_v6 statement is present in the configuration file, a terminating error occurs.

Syntax



Parameters

host_ipaddr..host_port
Specifies the port that the primary Advisor listens on for IPv4 connections from an external load balancer. This port must be coordinated on any load balancers that will connect to this Advisor. The port is optional. The default value is 3860. The valid range of port values is 1 - 65535. The IP address is used by the primary Advisor to accept IPv4 connections from Agents or the secondary Advisor

Rule: If you specify the port, do not use spaces between the IP address, the two periods (..), and the port.

Requirement: Only a complete IPv4 address is accepted. Host names, prefixes, or subnets are not allowed. The IPv4 INADDR_ANY address (0.0.0.0) is not allowed.

Usage

- If you specify this statement and also the cross_sysplex_list or sna_application_list statement, you must specify at least one IPv4 address in the lb_id_list statement; otherwise, a terminating error occurs.
- Define the IPv4 address as a VIPARANGE dynamic VIPA. This allows external load balancers and Agents to reconnect to this IP address when the secondary Advisor takes over as the primary Advisor and moves the dynamic VIPA to the host on which the secondary Advisor is active.
- You can dynamically update this statement to add, delete, or modify the IP address and port pair entry on the secondary Advisor by using the MODIFY *procname*,REFRESH command.

  Rules:
  - If the secondary Advisor is using this entry to connect to the primary Advisor, you cannot delete or modify the entry.
  - You cannot dynamically update this statement on the primary Advisor.

Restriction: Do not specify the same port that is on the advisor_connection_port or agent_connection_port configuration statements; otherwise, the Agents and secondary Advisor will connect to the primary Advisor's socket that is used for processing load balancer connections.

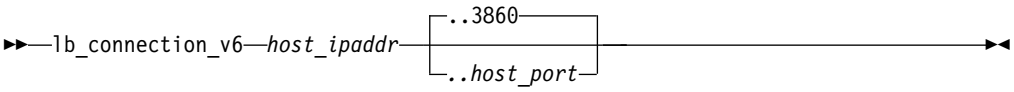
Note: If no lb_id_list statement is configured, the lb_connection_v4 (or lb_connection_v6) statement must still be specified as this statement determines the IP address used by Agents and the secondary Advisor to connect to the primary Advisor.

lb_connection_v6

Use the lb_connection_v6 statement to specify the port that the primary Advisor should listen on for connections from external load balancers. The IPv6 address in this statement is used by the primary Advisor to accept IPv6 connections from Agents or the secondary Advisor.

This statement is optional. However, if neither a lb_connection_v4 nor lb_connection_v6 statement is present in the configuration file, a terminating error occurs.

Syntax



Parameters

host_ipaddr..host_port
Specifies the port that the primary Advisor listens on for IPv6 connections

from an external load balancer. This port must be coordinated on any load balancers that will connect to this Advisor. The port is optional. The default value is 3860. The valid range of port values is 1 - 65535. The IP address is used by the primary Advisor to accept IPv6 connections from Agents or the secondary Advisor

Rule: If you specify the port, do not use spaces between the IP address, the two periods (..), and the port.

Requirement: Only a complete IPv6 address is accepted. Host names, prefixes, or subnets are not allowed. The IPv6 unspecified address (::) is not allowed.

Usage

- If you specify this statement and also the cross_sysplex_list or sna_application_list statement, you must specify at least one IPv6 address in the lb_id_list statement; otherwise, a terminating error occurs.
- Define the IPv6 address as a VIPARANGE dynamic VIPA. This allows external load balancers and Agents to reconnect to this IP address when the secondary Advisor takes over as the primary Advisor and moves the dynamic VIPA to the host on which the secondary Advisor is active.
- You can dynamically update this statement to add, delete, or modify the IP address and port pair entry on the secondary Advisor by using the MODIFY *procname*,REFRESH command.

  Rules:
  - If the secondary Advisor is using this entry to connect to the primary Advisor, you cannot delete or modify the entry.
  - You cannot dynamically update this statement on the primary Advisor.

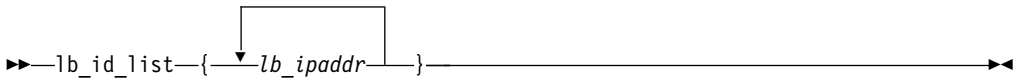
Restriction: Do not specify the same port that is on the advisor_connection_port or agent_connection_port configuration statements; otherwise, the Agents and secondary Advisor will connect to the primary Advisor's socket that is used for processing load balancer connections.

Note: If no lb_id_list statement is configured, the lb_connection_v6 (or lb_connection_v4) statement must still be specified as this statement determines the IP address used by Agents and the secondary Advisor to connect to the primary Advisor.

lb_id_list

Use the lb_id_list statement to specify which external load balancers are allowed to connect to the primary Advisor.

Syntax



Parameters

lb_ipaddr
Specifies a list of external load balancers that are allowed to connect to the primary Advisor. The list consists of one or more IP address entries, each

specified on a separate line and enclosed in braces. Each of these entries represents the IP address of a given load balancer.

Requirement: Only complete IPv4 or IPv6 addresses are accepted. Host names, prefixes, or subnets are not allowed. The IPv4 INADDR_ANY address (0.0.0.0) and the IPv6 unspecified address (::) are not allowed. You must specify each lb_ipaddr entry on one line; it cannot be continued to a subsequent line.

Usage

- If an external load balancer attempts to connect to the primary Advisor and the load balancer's source IP address is not represented in this list, the connection is refused.

  Guideline: You can configure this statement as well as have an AT-TLS policy enabled, such that some external load balancer connections are authenticated only by using this statement, while other load balancer connections are also authenticated by using AT-TLS.
- You can dynamically update this statement to add or delete IP address entries by using the `MODIFY procname,REFRESH` command. If a load balancer is connected, you cannot delete the entry for that load balancer.
- You must configure all external load balancers, both first-tier and second-tier, in this list. If a z/OS sysplex distributor is acting as a second-tier load balancer, do not configure it in this list.

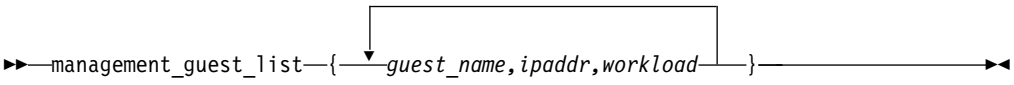
Rules:

- If you specify an IPv4 address, you must specify the lb_connection_v4 statement or a terminating error occurs. Similarly, if you specify an IPv6 address, you must specify the lb_connection_v6 statement or a terminating error occurs.
- This statement is required if the cross_sysplex_list or sna_application_list statement is specified.

management_guest_list

Use the management_guest_list to specify the IP address, the names of the Linux on z Systems guests that are used by the workload, and the workload name.

Syntax



Parameters

guest_name,ipaddr,workload

Specifies a list of Linux on z Systems guest names, IP addresses of the guest, and the workload that the guest belongs to. The list consists of one or more guest name, IP address, and workload name 3-tuples, each specified on a separate line and enclosed in braces.

Requirements:

- Only complete IPv4 or IPv6 addresses are accepted. Host names, prefixes, or subnets are not allowed. The IPv4 INADDR_ANY address (0.0.0.0) and the IPv6 unspecified address (::) are not allowed.

- Each *guest_name,ipaddr,workload* 3-tuple entry must be specified on one line; it cannot be continued to a subsequent line.
- Do not put spaces between any parameter and the preceding or following comma (,).

guest_name
Specifies the name of the Linux on z Systems guest that owns the IP address. The guest name can consist of alphanumeric characters as well as the @, #, $, +, -, and : characters. Contact your z/VM Administrator to understand which Linux on z Systems guests participate in Lifeline workloads and the IP addresses that are used to reach the server applications on those guests.

ipaddr
Specifies the IP address of a Linux on z Systems guest to be monitored by the Linux on z Systems Management Agent.

workload
Specifies the workload that the Linux on z Systems guest belongs to. The workload name can consist of alphanumeric characters as well as the @, #, $, -, and _ characters. The first character must be an alphabetic character. The length of the workload name cannot exceed 64 characters.

Usage

- The entries in the management_guest_list statement are used to monitor the server applications that run on Linux on z Systems guests.

  Rules:

  – Each ipaddr,workload pair must also be configured in the intermediary_node_list.
    - management_guest_list entries that map to intermediary_node_list entries must exist on both sites for a workload.
  – The workload must be configured in the cross_sysplex_list, or the sna_application_list, or both lists.
    - Each management_guest_list entry must map to one or more intermediary_node_list entries with the same workload and site.
    - If the management_guest_list entries distribute connections to TCP/IP server applications, mappable entries for the workload in the cross_sysplex_list must exist. The cross_sysplex_list entries are required to monitor these applications.
    - If the management_guest_list entries distribute connections to SNA applications, mappable entries for the workload in the sna_application_list must exist. The sna_application_list entries are required to monitor these applications.
  – A guest_name must be associated with only one workload; otherwise, a terminating error occurs.
  – Each IP address in the list can be specified only once.
- You can dynamically update this statement by using the `MODIFY` *procname*`,REFRESH` command.

  Rules:

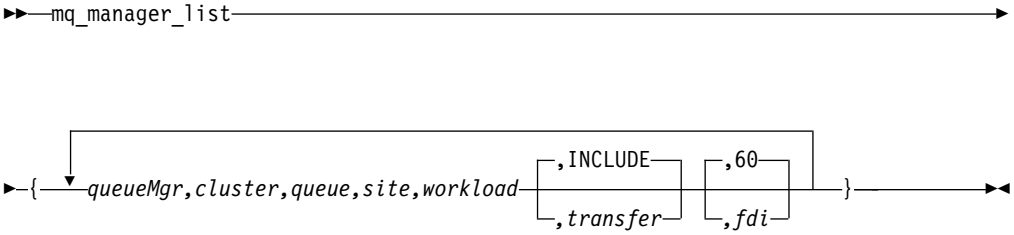
  – A new 3-tuple entry can be added to an existing workload or for a new workload.
  – An existing 3-tuple entry for a workload cannot be deleted.

- The workload name and guest name are the only values that can be modified on an existing 3-tuple entry.
- The workload name can be modified only if the workload is quiesced.
- If the workload is also defined in a cross_sysplex_list entry, intermediary_node_list entry, and/or sna_application_list entry, all entries in each list that are using this workload name must be modified.

mq_manager_list

Use the mq_manager_list statement to specify the MQ queue manager name, the IBM MQ clusters and MQ cluster queues it hosts, the workload associated with each IBM MQ cluster, the site where the MQ queue manager resides, whether any queued messages on the MQ cluster queue are eligible to be transferred, and the failure detection interval for the workload.

Syntax



Parameters

queueMgr,*cluster*,*queue*,*site*,*workload*,*transfer*,*fdi*
Specifies a list of the MQ queue managers, the IBM MQ clusters and MQ cluster queues configured on the MQ queue manager, the site where the MQ queue manager resides, and the workload associated with the IBM MQ cluster. The list consists of one or more blank-delimited MQ queue manager name, cluster name, queue name, site name, workload name, queue transfer eligibility, and workload failure detection interval 7-tuples, each specified on a separate line and enclosed in braces. Each of these 7-tuples represents the MQ queue manager and the mapping of the cluster name, queue names, site name, and workload name for that workload.

Requirements:

- Each queueMgr,cluster,queue,site,workload,transfer,fdi 7-tuple must be specified on one line; it cannot be continued to a subsequent line.
- Do not put spaces between any parameter and the preceding or following comma (,).

queueMgr
Specifies the name of the MQ queue manager. The queue manager name can consist of alphanumeric characters only. The length of the queue manager name cannot exceed 4 characters. Only MQ queue managers that reside on z/OS systems should be configured.

cluster
Specifies the name of an IBM MQ cluster that the MQ queue manager belongs to. The cluster name can consist of alphanumeric characters as well as the _, .,

/, and % characters. The length of the cluster name cannot exceed 48 characters. See *IBM MQ: Installing IBM MQ* for information about rules for cluster names.

Requirement: If the IBM MQ cluster is defined as a mixed-case MQ object to the MQ queue manager, the cluster name specified in the mq_manager_list Advisor configuration statement needs to use the same mixed-case format and be enclosed in single quotes ('). If the cluster name is not enclosed in single quotes, the Lifeline Advisor will convert the cluster name to upper-case characters.

queue
Specifies the name of an MQ cluster queue that is defined for the IBM MQ cluster. The queue name can consist of alphanumeric characters as well as the _, ., /, and % characters. The length of the queue name cannot exceed 48 characters. See *IBM MQ: Installing IBM MQ* for information about rules for queue names.

Requirement: If the MQ cluster queue is defined as a mixed-case MQ object to the MQ queue manager, the queue name specified in the mq_manager_list Advisor configuration statement needs to use the same mixed-case format and be enclosed in single quotes ('). If the queue name is not enclosed in single quotes, the Lifeline Advisor will convert the queue name to upper-case characters.

site
Specifies the site where the MQ queue manager resides. The site name corresponds to the MVS sysplex name for that site.

workload
Specifies the workload that this cluster belongs to.

The workload name can consist of alphanumeric characters as well as the @, #, $, -, and _ characters. The first character must be an alphabetic character. The length of the workload name cannot exceed 64 characters.

Rule: A workload cannot span multiple clusters and a cluster must define the queues for only one workload. Therefore, each workload name should have a one-to-one correspondence with a cluster name:

- A cluster name must always be configured with the same workload name.
- A workload name must always be configured with the same cluster name.

Requirement: Each workload in the list must specify the same two unique site names. All workloads must use the same two names.

transfer
Specifies whether this MQ cluster queue is eligible to have its queued messages transferred when a `MODIFY` *`procname`*`,TRANSFER` command is issued for this workload.

`INCLUDE`
This queue is to be included in the list of queues whose messages are to be transferred and is considered a transfer-eligible queue. This is the default value.

`EXCLUDE`
This queue is to be excluded from the list of queues whose messages are to be transferred.

Rule: All entries for a cluster queue pair must specify the same transfer eligibility; otherwise a terminating error occurs.

fdi

Specifies the workload failure detection interval. The failure detection interval specifies how long the Advisor waits to determine that a workload is no longer available on a site. Although a workload's IBM MQ cluster might consist of multiple MQ cluster queues, the failure detection interval starts when one of the MQ cluster queues is not available on any MQ queue manager for that site. The failure detection interval resets when all MQ cluster queues become available for that site. The valid range is 10 - 600 in seconds. The default interval is 60 seconds. The failure detection interval value cannot be less than the value that is specified on the update_interval statement.

Rule: All entries for a workload, whether in the cross_sysplex_list, the sna_application_list, or the mq_manager_list, must specify the same fdi value; otherwise a terminating error occurs.

Usage

- The entries in this list are used to monitor MQ queue managers and the status of their locally defined MQ cluster queues. Each IBM MQ cluster maps to a workload. Only MQ queue managers residing on z/OS systems are monitored.

  The order of the configured mq_manager_list entries is important because it determines the source and destination MQ queue managers to use when performing a `MODIFY procname,TRANSFER` command for a workload. When the `MODIFY procname,TRANSFER` command for a workload is processed, the Advisor uses the mq_manager_list entries to locate available source MQ queue managers hosting the workload's queues on the previously active site.

  – When transferring messages for a non-shared queue, for each source MQ queue manager hosting the queue, the Advisor locates the next mq_manager_list entry with an available MQ queue manager hosting that same workload's queue on the alternate site as the corresponding destination for these messages.

  – When transferring messages for a shared queue, only the first mq_manager_entry with an available MQ queue manager hosting the queue is used as the source MQ queue manager for all messages on the queue. The Advisor locates the next mq_manager_list entry with an available MQ queue manager hosting that same workload's queue on the alternate site as the destination for these messages.

  An MQ queue manager is selected as a source or destination for a queue if the MQ queue manager is available and the EXCLUDE keyword is not specified on the mq_manager_list entry.

  Rules:

  – A given MQ queue manager name can be defined to only one site. Therefore, every entry for that MQ queue manager must specify the same site.

  – Only one entry with the same queue manager name, cluster name, and queue name can be configured.

  – An MQ cluster's queue must be defined in both sites. Therefore, at least two entries with the same cluster name, queue name and different site name must be configured.

  – The cluster name can be defined to only one workload.

  – Multiple instances of a queue name must be configured in the same IBM MQ cluster.

  - The workload must be an Active/Standby workload.
- You can dynamically update this statement by using the `MODIFY procname,REFRESH` command.

  Rules:
  - A new 7-tuple entry can be added to an existing workload or a new workload.
  - An existing 7-tuple entry cannot be deleted.
  - The workload name, queue transfer eligibility, and failure detection interval are the only values that can be modified on an existing 7-tuple entry.
  - The workload name can be modified only if the workload is quiesced.
  - If the workload is also defined in a cross_sysplex_list entry, intermediary_node_list entry, sna_application_list entry, and/or management_guest_list entry, all entries in each list that are using this workload name must be modified.

peer_advisor_id

Use the peer_advisor_id statement to specify the IP address of the primary Advisor that this secondary Advisor uses to communicate.

This statement is optional. If you do not specify the statement, it defaults to either the IPv4 address specified on the lb_connection_v4 statement, if configured, or the IPv6 address specified on the lb_connection_v6 statement.

Syntax

Parameters

advisor_ipaddr
Specifies the IPv4 or IPv6 address which the Advisor, when acting as the secondary Advisor, uses as the destination IP address to connect to the primary Advisor.

Requirements:
- Only a complete IPv4 or IPv6 address is accepted. Hostnames, prefixes, or subnets are not allowed. The IPv4 INADDR_ANY address (0.0.0.0) and the IPv6 unspecified address (::) are not allowed.
- The IP address must match either the IPv4 address specified on the lb_connection_v4 configuration statement or the IPv6 address specified on the lb_connection_v6 configuration statement for the primary Advisor.

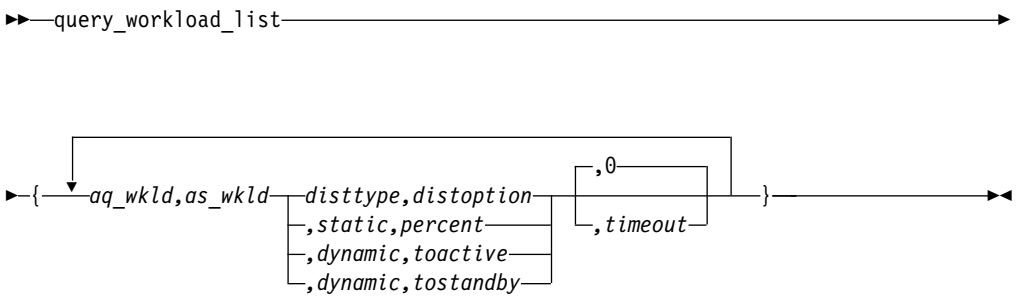
Usage

You can dynamically update this statement only on the primary Advisor by using the MODIFY *procname*,REFRESH command. You cannot dynamically update this statement on the secondary Advisor.

query_workload_list

Use the query_workload_list statement to specify the associated Active/Standby workload for an Active/Query workload, the distribution type and options for this Active/Query workload, and the lifetime for persistent connections for this workload.

Syntax



Parameters

aq_wkld,as_wkld,disttype,distoption,timeout
Specifies the Active/Query workload, its associated Active/Standby workload, the distribution type, the distribution-specific option, and the timeout value before a persistent connection for the Active/Query workload is reset. The list consists of one or more Active/Query workload name, associated Active/Standby workload name, distribution type, distribution option, and timeout 5-tuples, each specified on a separate line and enclosed in braces.

Requirements:

- Each *aq_wkld,as_wkld,disttype,distoption,timeout* 5-tuple must be specified on one line; it cannot be continued to a subsequent line.
- Do not put spaces between any parameter and the preceding or following comma (,).

aq_wkld,as_wkld
Specifies the Active/Query workload and its associated Active/Standby workload. The workload names can consist of alphanumeric characters as well as the @, #, $, -, and _ characters. The first character must be an alphabetic character. The length of each workload name cannot exceed 64 characters.

Requirements:

- The Active/Standby workload must also be defined in at least one of the following statements:
  - cross_sysplex_list
  - mq_manager_list
  - sna_application_list
- The Active/Query workload must also be defined in at least one of the following statements:
  - cross_sysplex_list
  - sna_application_list

Rules:

- An Active/Query workload can be associated with only a single Active/Standby workload.
- An Active/Standby workload can have, at most, two Active/Query workloads associated with it.
- An MQ cluster workload cannot be configured as an Active/Query workload.

disttype/distoption
Specifies the distribution type and the distribution-specific option. The valid Active/Query workload distribution types are either dynamic or static.

dynamic
For the dynamic distribution type, the possible distribution options are **toactive** and **tostandby**. The option **toactive** indicates to gradually favor the same site where the associated Active/Standby workload is active as database replication latency increases. The option **tostandby** indicates to gradually favor the same site where the associated Active/Standby workload is standby as database replication latency increases.

static
For the static distribution type, the distribution option is the percentage, in the range 1 - 99, of new workload connections that are distributed to the active site with the remaining new workload connections that are distributed to the standby site.

timeout
Specifies the timeout value. The timeout value is the elapsed time that an Active/Query workload connection remains established before the connection is reset. The valid range of timeout values, in seconds, is 0 - 3600. The default value is 0, which indicates that persistent Active/Query workload connections are never reset.

Restriction: This value is ignored in both of the following conditions:

- For Active/Query workload connections to Linux on z Systems server applications. A timeout value of 0 is used for these workload connections, which indicates that the connections will never be reset.
- For Active/Query workload connections to SNA workloads. A timeout value of 0 is used for these workload connections, which indicates that the connections will never be reset.

Usage

You can dynamically update this statement to add, delete, or modify 5-tuple entries for an existing or a new Active/Query workload by using the MODIFY *procname*,REFRESH command.

Rules:

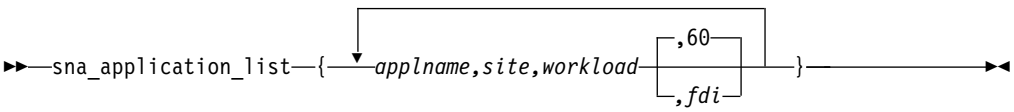
- A new 5-tuple entry can be added or an existing 5-tuple entry can be deleted only if both the Active/Standby and Active/Query workloads have never been active, or if the workloads are deactivated.
- The distribution type for an existing 5-tuple entry can be modified only if the Active/Query workload is quiesced.

- The distribution option and timeout value for an existing 5-tuple entry can be modified without quiescing the Active/Standby and Active/Query workloads.

sna_application_list

Use the sna_application_list statement to specify the SNA application name, the site name, the workload name, and the failure detection interval for this workload.

Syntax



Parameters

applname,site,workload,fdi
Specifies a list of SNA applications, the site where each application resides, and the workload that the SNA application belongs to. The list consists of one or more SNA application name, site name, workload name and workload failure detection interval 4-tuples, each specified on a separate line and enclosed by braces.

Requirements:

- Each *applname,site,workload,fdi* 4-tuple entry must be specified on one line; it cannot be continued to a subsequent line.
- Do not put spaces between any parameter and the preceding or following comma (,).

applname
Specifies the SNA application name that is configured on a VTAM APPL definition statement. You must use a network-qualified name by using the form *netid.applname*.

- The *netid* value can consist of alphanumeric characters as well as the @, #, and $ characters. The first character must be an alphabetic character or the @, #, or $ character.
- The *applname* value can consist of alphanumeric characters as well as the @, #, $, *, and ? characters. The first character must be an alphabetic character or the @, #, $, or ? character.

When the ? or * characters are used, *applname* is a model application program name. Dynamic applications that are created by using the model application name definition will be automatically monitored. For more information about dynamic applications, see "SNA workloads" on page 22. The length of either the *netid* or *applname* value cannot exceed 8 characters.

site
Specifies the site where the SNA application resides. The site name corresponds to the MVS sysplex name for that site.

workload
Specifies the workload that the SNA application belongs to. The workload name can consist of alphanumeric characters as well as the @, #, $, -, and _ characters. The first character must be an alphabetic character. The length of the workload name cannot exceed 64 characters.

fdi

Specifies the workload failure detection interval. The failure detection interval specifies how long the Advisor waits to determine that a workload is no longer available on a site. Although an Active/Standby workload might consist of multiple load balancer application groups, the failure detection interval starts when no member of one group, either a load balancer application group or, if configured, the group's failure detection group, is available for that site. The failure detection interval resets if at least one of the members of the failing load balancer application group or, if configured, the group's failure detection group becomes available for that site. The valid range is 10 - 600 in seconds. The default interval is 60 seconds. The failure detection interval value cannot be less than the value that is specified on the update_interval statement.

Rule: All entries for a workload, whether in the cross_sysplex_list, the sna_application_list, or the mq_manager_list, must specify the same fdi value; otherwise a terminating error occurs.

Usage

- The entries in the sna_application_list statement are used to monitor SNA applications that receive workload connections from intermediary nodes.

  Rules:

  - Each sna_application_list entry must map to one or more intermediary node list entries with the same workload, site, and an application type of SNA.
  - Each application name in the list must be network-qualified. The network-qualified application name must be unique across both sites.
  - Each application must be associated with only one workload; otherwise, a terminating error occurs.
  - For a given workload, sna_application_list entries must exist for both sites. For this type of workload, the members of a first-tier load balancer application group match the IP addresses and ports in the intermediary node list.
  - If the intermediary nodes for the sna_application_list entries reside on Linux on z Systems guests, the management_guest_list contains the list of intermediary nodes that the Linux on z Systems Management Agent monitors. See the “management_guest_list” on page 110 statement for more information.

- You can dynamically update this statement by using the `MODIFY` *`procname`*`,REFRESH` command.

  Rules:

  - A new sna_application_list 4-tuple entry can be added to an existing workload or a new workload.
  - An existing 4-tuple entry for a workload cannot be deleted.
  - The workload name and failure detection interval are the only values that can be modified on an existing 4-tuple entry.
  - If the workload is also defined in a cross_sysplex_list entry, intermediary_node_list entry, mq_manager_list entry, and/or management_guest_list entry, all entries in each list that are using this workload name must be modified.

update_interval

Use the update_interval statement to specify how often Agents update the primary Advisor with new information. You can also use this statement to determine how often the Advisor queries the status of each of the systems in both sites using BCPii communication.

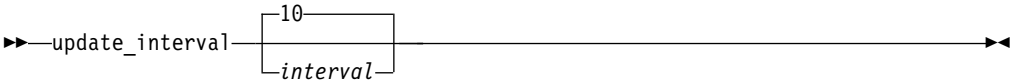
The lower the update interval is, the more up-to-date the recommendations provided to the external load balancer will be with respect to the target's availability and capability to handle additional workload requests. However, the lower the update interval is, the higher the network traffic and CPU overhead are.

Depending on how the external load balancers are configured and implemented, the update_interval statement might also determine how often the external load balancer is updated with data from the primary Advisor. If the external load balancer supports the SASP push flag, and if the flag is set in the load balancer, the primary Advisor sends recommendations to the load balancer at least every update interval. Regardless of what value is set for the update interval, if the push flag is supported and configured in the load balancer, the Advisor might update the load balancer with recommendations before the update interval expires. Events that can trigger an earlier update include starting or stopping a target server application, or the addition or deletion of a member's IP address on the Agent host.

The update interval is a key factor in determining the latency period between when changes occur on the target system and when the load balancer is informed of them. Each Agent updates the primary Advisor with new information every update interval. The Advisor, in turn, updates the load balancer with changes in recommendations every update interval, if the load balancer supports the push flag. If the push flag is supported and configured in the load balancer, the Advisor updates the load balancer with any changes in the availability status of the target system and server application when it discovers such a change from the Agent, instead of waiting for the update interval to expire.

When the external load balancer supports and is configured for the push flag, the maximum amount of latency expected between a change in the member's recommendation and when the load balancer is informed of it, is twice the value of the update interval: one update interval for the Agent to report it to the primary Advisor, and one update interval for the Advisor to report it to the load balancer. However, on average, it takes about one update interval for a change in the target server application's recommendation to reach the load balancer.

Syntax



Parameters

interval

Specifies how frequently Agents update the primary Advisor with new information. At each interval, all Agents update the primary Advisor with the following status information for each registered member, which is the application server that the Agent is responsible for:

- Whether the target server application is active or inactive
- Whether the operator quiesced the target server application

- Various metrics that measure the target system
- The ability of the target server application to handle additional workload requests

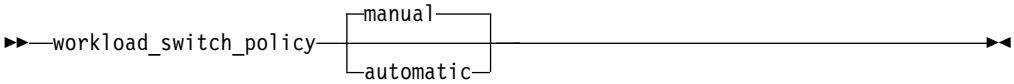
The valid range is 10 - 600 in seconds. The default interval is 10 seconds.

Requirement: The *interval* value cannot be greater than the value specified on the failure_detection_interval statement or the *fdi* value on an entry on the cross_sysplex_list, mq_manager_list, or sna_application_list statement.

workload_switch_policy

Use the workload_switch_policy statement to specify the action that the primary Advisor should take when it determines either that a workload is no longer available on the active site or the active site for a workload is unavailable.

Syntax



Parameters

manual
Configures the primary Advisor to wait for a `MODIFY procname,ACTIVATE` command before redistributing the workload to the alternate site. The default policy is manual.

automatic
Configures the primary Advisor to activate the redistribution of the workload to the alternate site.
This setting is ignored for the following conditions:

- One or more Agents that are not connected; there is no way to communicate with disconnected Agents on the active site to deactivate the existing connections.
- One or more first-tier load balancers are not registered; they cannot be notified that the workload was redistributed to the alternate site.
- No server applications are available for the workload on the alternate site; redistributing the workload to the alternate site will lead to another workload failure.

Usage

If automation is already in place to detect a workload or site failure, specifying manual will allow automation procedures to handle the redistribution of the workload to the alternate site.

Lifeline Agent configuration statements

Use the following configuration statements to configure Lifeline Agents.

Table 2. Lifeline Agent Configuration Statements

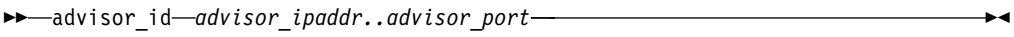
Configuration Statement	Allowed values	Default Value	Required/ Optional	Purpose
advisor_id		None	Required, if advisor_id_list is not specified	Specifies the IP address and port of the primary Advisor that the Agent connects to.
advisor_id_list		None	Required, if advisor_id is not specified	Specifies the list of IP address and port pairs of the primary Advisors that the Agent connects to.
debug_level	0 - 255		Optional	Specifies the level of debug information that is logged.
host_connection		None	Required	Specifies the local IP address and port that the Agent binds to before connecting to the primary Advisor.
site_name		• For z/OS Agents, the local sysplex name. • For Linux on z Systems Management Agents, no default.	• Required for Linux on z Systems Management Agents. • Optional for z/OS Agents	Specifies the site name that the Agent must be associated with when communicating with the primary Advisor.

advisor_id

Use the advisor_id statement to specify the IP address and port of the primary Advisor that this Agent communicates with.

This statement is optional. However, if neither an advisor_id_list nor advisor_id statement is present in the configuration file, a terminating error occurs. If this statement is specified, the advisor_id_list statement cannot be specified, or a terminating error occurs.

Syntax



Parameters

advisor_ipaddr..advisor_port
Specifies the IP address and port of the primary Advisor that this Agent communicates with. The IP address must match either the lb_connection_v4 or lb_connection_v6 IP address of the Advisor. The valid range of port values is 1 - 65535. Do not use spaces between the IP address, the two periods (..), and the port.

Requirements:

- This port number must match the port number specified in the agent_connection_port configuration statement for the Advisor.

- Only a complete IPv4 or IPv6 address is accepted. Host names, prefixes, or subnets are not allowed. The IPv4 INADDR_ANY address (0.0.0.0) and the IPv6 unspecified address (::) are not allowed. The IP address must match either the lb_connection_v4 or lb_connection_v6 IP address.

Usage

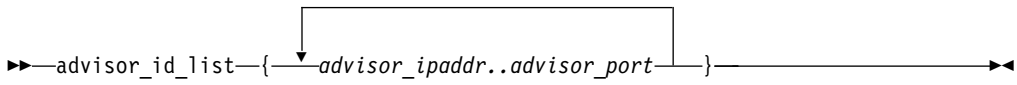
Rule: If you specify an IPv4 address on this statement, you must also specify an IPv4 address on the host_connection statement. Similarly, if you specify an IPv6 address on this statement, you must also specify an IPv6 address on the host_connection statement.

advisor_id_list

Use the advisor_id_list statement to specify the IP address and port pairs of the primary Advisors that this Agent communicates with.

This statement is optional. However, if neither an advisor_id nor advisor_id_list statement is present in the configuration file, a terminating error occurs. If this statement is specified, the advisor_id statement cannot be specified, or a terminating error occurs.

Syntax



Parameters

advisor_ipaddr..advisor_port
Specifies the IPv4 or IPv6 addresses and port of the primary Advisors that this Agent communicates with. The Agent loops through all IP addresses until it successfully connects to the primary Advisor using one of these IP addresses. Each IP address must match either the lb_connection_v4 or lb_connection_v6 IP address of an Advisor. The valid range of port values is 1 - 65535. Do not put any spaces between the IP address, the two periods (..), and the port.

Requirements:

- Only complete IPv4 or IPv6 addresses are accepted. Host names, prefixes, or subnets are not allowed. The IPv4 INADDR_ANY address (0.0.0.0) and the IPv6 unspecified address (::) are not allowed.
- Each advisor_ipaddr..advisor_port 2–tuple must be specified on one line; it cannot be continued to a subsequent line.

Usage

Rules:

- The IP addresses specified must be either all IPv4 addresses or all IPv6 addresses. Do not mix IPv4 and IPv6 addresses in the list.
- If you specify IPv4 addresses on this statement, you must also specify an IPv4 address on the host_connection statement. Similarly, if you specify IPv6 addresses on this statement, you must also specify an IPv6 address on the host_connection statement.
- Do not specify more than two IP address and port pairs.

debug_level

Use the debug_level statement to specify the level of debug information that is logged.

Syntax

Parameters

level
Specifies the debug level. If internal trace is being used, all trace messages are written to the internal trace, but only trace messages at the ERROR, WARNING, and EVENT level are written to syslogd. If internal trace is not being used, all trace messages are written to syslogd. The level value represents a particular debug level or combination of debug levels. See "Debug levels" on page 73 for the possible values. The default level is 7 (1 + 2 + 4 = 7), which means that all error, warning, and event messages are captured. The valid range is 0 - 255.

Usage

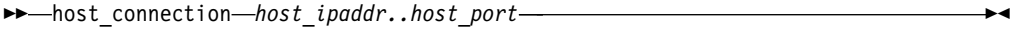
- You can dynamically update this statement by using the z/OS `MODIFY` *procname*`,DEBUG,LEVEL=` command or `aqsllcmd debug,level=` command.
- To log a combination of debug levels, add the specific debug level numbers together.

Restriction: Do not customize this statement unless you are directed to do so by an IBM Service representative. Adding additional types of trace data can cause the amount of data captured to become voluminous. Reducing the amount of trace data from the default might make diagnosing a problem more difficult.

host_connection

Use the host_connection statement to specify the local IP address and port that the Agent binds to for communicating with the primary Advisor.

Syntax



Parameters

host_ipaddr..host_port
Use *host_ipaddr..host_port* to specify the IP address and port that this Agent binds to. The valid range of port values is 1 - 65535.

For z/OS Agents, only the first connection to the primary Advisor uses this IP address and port. The second connection to the primary Advisor uses the same IP address but has an ephemeral port selected by the TCP/IP stack.

Requirement: Only a complete IPv4 or IPv6 address is accepted. Host names, prefixes, or subnets are not allowed. The IPv4 INADDR_ANY address (0.0.0.0) and the IPv6 unspecified address (::) are not allowed. The IP address and port

must match one of the IP address and port pairs specified in the agent_id_list configuration statement for the Advisor.

Rule: If you specify an IPv4 address on the host_connection statement, you must specify an IPv4 address on the advisor_id statement. Similarly, if you specify an IPv6 address on the host_connection statement, you must specify an IPv6 address on the advisor_id statement.

Usage

Guidelines:

- To ensure high availability, specify the IP addresses in the agent_id_list statement for the Advisor and the host_connection statement for each Agent as static VIPAs, so that individual link outages on the hosts are tolerated.
- To ensure simplicity and consistency, specify the same port for this statement for each Agent, and reserve this port on each TCP/IP stack where an Agent will be active.
- You can specify an IPv6 address on this statement if the host where the Agent resides is an IPv6-enabled TCP/IP stack, and the Advisor resides on an IPv6-enabled TCP/IP stack.
- For z/OS Agents, you can have an AT-TLS policy enabled in addition to configuring this statement.

site_name

Use the site_name statement to specify the site that the Agent is running in.

Syntax

Parameters

site_name
Specifies the 1- through 8-character site name that this Agent is to be associated with when the Agent communicates with the Advisor. The name must match one of the site names in the cross_sysplex_list, mq_manager_list, or sna_application_list Advisor configuration statement for the Agent to successfully connect to the Advisor. The site name can consist of alphanumeric characters as well as the @, #, and $ characters.

Requirements:

This statement must be specified for the Linux on z Systems Management Agent. Linux on z Systems Management Agents do not run in a z/OS sysplex, so the site name must be configured.

This statement is optional for z/OS Agents. By default, the site name for z/OS Agents is the local z/OS sysplex name that the Agent is running in.

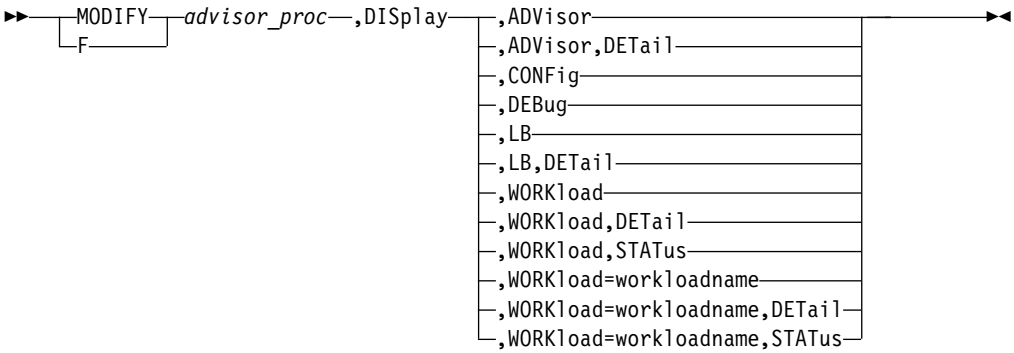
Chapter 7. Lifeline Advisor commands

Use the Life Advisor commands to display Lifeline Advisor information and modify Lifeline Advisor state information.

MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information

The MODIFY *advisor_proc*,DISplay command displays the information related to the Lifeline Advisor.

Format



Parameters

advisor_proc
Indicates the member name of the cataloged procedure used to start the Advisor.

DISplay,ADVisor
Displays information about the external load balancers, Agents, and peer Advisor that are connected to this Advisor. When you issue this command on the secondary Advisor with this parameter, information about the load balancer and Agent is not displayed.

DISplay,ADVisor,DETail
Displays additional information, including the system name and site name where each Agent is and the system name where the peer Advisor is. When you issue this command on the secondary Advisor with this parameter, information about the load balancer and Agent is not displayed.

DISplay,CONFig
Displays the active configuration for this Advisor.

DISplay,DEBug
Displays the debug level in effect for this Advisor.

The debug level displayed is the sum of one or more levels of debug messages being logged. See “Debug levels” on page 73 for more information about the debug levels.

DISplay,LB
Displays information about the load balancers that are connected to the primary Advisor. You can specify this parameter only on the primary Advisor.

DISplay,LB,DETail
Displays additional information, including the register groups and member data for each load balancer. You can specify this parameter only on the primary Advisor.

DISplay,WORKload
Displays information about the workloads and their current state. You can specify this parameter only from the primary Advisor.

DISplay,WORKload,DETail
Displays additional information, including the server applications that make up each workload. You can specify this parameter only from the primary Advisor.

DISplay,WORKload,STATus
Displays information about the workloads and their current state and status on both sites. You can specify this parameter only from the primary Advisor.

DISplay,WORKload=workloadname
Displays information about the workload specified by the *workloadname* value and its current state. You can specify this parameter only from the primary Advisor.

Guidelines:

- If *ALL_AS* is specified for the *workloadname* value, information for all Active/Standby workloads specified in the cross_sysplex_list, mq_manager_list, or sna_application_list will be displayed.
- If *ALL_AQ* is specified for the *workloadname* value, information for all Active/Query workloads specified in the cross_sysplex_list or sna_application_list will be displayed.

DISplay,WORKload=workloadname,DETail
Displays additional information about the workload specified by the *workloadname* value, including the server applications that make up the workload. You can specify this parameter only from the primary Advisor.

Guidelines:

- If *ALL_AS* is specified for the *workloadname* value, additional information for all Active/Standby workloads specified in the cross_sysplex_list, mq_manager_list, or sna_application_list will be displayed.
- If *ALL_AQ* is specified for the *workloadname* value, additional information for all Active/Query workloads specified in the cross_sysplex_list or sna_application_list will be displayed.

DISplay,WORKload=workloadname,STATus
Displays information about the workload specified by the workloadname value and its current state and status on both sites. You can specify this parameter only from the primary Advisor.

Guidelines:

- If *ALL_AS* is specified for the workloadname value, information for all Active/Standby workloads specified in the cross_sysplex_list, mq_manager_list, or sna_application_list will be displayed.

- If *ALL_AQ* is specified for the workloadname value, information for all Active/Query workloads specified in the cross_sysplex_list or sna_application_list will be displayed.

Examples

The following example shows a sample display when you issue `F AQSADV,DISPLAY,ADVISOR` on the primary Advisor.

```
F AQSADV,DISPLAY,ADVISOR
AQS0141I ADVISOR SUMMARY
ADVISOR ROLE   : PRIMARY
 IPADDR        : 192.10.1.1
 LOAD BALANCERS:
  IPADDR  : 192.10.1.32                          CONNECTED: YES
   TIER   : 1
  IPADDR  : 192.10.1.64                          CONNECTED: YES
   TIER   : 2
  IPADDR  : 192.10.1.33                          CONNECTED: NO
   TIER   : 1
  IPADDR  : 192.10.1.65                          CONNECTED: NO
   TIER   : UNKNOWN
 AGENTS         :
  IPADDR  : 192.10.110.1                         CONNECTED: YES
  IPADDR  : 192.10.110.2                         CONNECTED: YES
  IPADDR  : 192.10.110.3                         CONNECTED: YES
  IPADDR  : 192.20.110.1                         CONNECTED: YES
  IPADDR  : 192.20.110.2                         CONNECTED: NO
  IPADDR  : 192.20.110.3                         CONNECTED: DOWN
PEER ADVISOR   :
 IPADDR        : 192.20.130.1
```

The following example shows a sample display when you issue `F AQSADV,DISPLAY,ADVISOR` on the secondary Advisor.

```
F AQSADV,DISPLAY,ADVISOR
AQS0141I ADVISOR SUMMARY
ADVISOR ROLE   : SECONDARY
 IPADDR        : 192.20.130.1
PEER ADVISOR   :
 IPADDR        : 192.10.1.1                     CONNECTED: YES
```

The following information describes the fields in the previous sample display.

Field name
Descriptions

ADVISOR ROLE
The current role and IP address for this Advisor. The IP address can be an IPv4 or an IPv6 address. The Advisor role has the following values:

PRIMARY
Indicates that this Lifeline Advisor is responsible for the following tasks:

- Communicating with the Agents to retrieve information about the systems and server applications that are being monitored
- Communicating with external load balancers to provide routing recommendations for incoming requests for the configured workloads
- Communicating with the secondary Advisor to provide state information for the configured workloads

SECONDARY
Indicates that this Lifeline Advisor is responsible for communicating with the primary Advisor to monitor whether this Advisor needs to take over the primary Advisor responsibilities.

LOAD BALANCERS
The list of external load balancers in this Advisor's configuration, the IP address of each load balancer, whether the specified load balancer is currently connected to the Advisor, and the tier level of each load balancer. The IP address can be an IPv4 or an IPv6 address. The `LOAD BALANCERS` field is displayed only when you issue the command on the primary Advisor. The tier can be one of the following values:

1 Indicates that this load balancer is a first-tier load balancer. The load balancer is responsible for selecting the site that an inbound workload request is routed to.

2 Indicates that this load balancer is a second-tier load balancer. The load balancer is responsible for selecting the server application instance in a site that an inbound workload request is routed to.

UNKNOWN
Indicates that the specified load balancer has never connected to the Advisor so its tier type could not be determined.

AGENTS
The list of Lifeline Agents in the Advisor's configuration, the IP address of the Agent, and whether the specified Agent is currently connected to the Advisor. The IP address can be an IPv4 or an IPv6 address. The `AGENTS` field is displayed only when you issue the command on the primary Advisor.

CONNECTED
When issued from the primary Advisor, indicates whether the external load balancer or Lifeline Agent is connected to the Advisor. When issued from the secondary Advisor, indicates whether the Advisor is connected to the primary Advisor. Possible values are:

YES For the primary Advisor, indicates that the external load balancer or Agent is available and connected to the Advisor.

For the secondary Advisor, indicates that the primary Advisor is available and the secondary Advisor is connected to the primary Advisor.

NO For the primary Advisor, indicates that the external load balancer or Agent is not connected to the Advisor.

For the secondary Advisor, indicates that the state of the primary Advisor is unknown and the secondary Advisor is not connected to the primary Advisor.

DOWN
For the primary Advisor, indicates that the Agent is not connected to the Advisor because the system where the Agent resides is not operational.

For the secondary Advisor, indicates that the primary Advisor is not active because the primary Advisor is not operational or the system where the primary Advisor resides is not operational.

PEER ADVISOR

The IP address of the peer Advisor that is connected to this Advisor. The IP address can be an IPv4 or an IPv6 address.

If no peer Advisor is connected:

- When issued from the primary Advisor, the IP address is displayed as NONE.
- When issued from the secondary Advisor, the IP address displayed is one of the following:
  - The IP address specified on the peer_advisor_id Advisor configuration statement, if configured.
  - The IP address specified on the lb_connection_v4 or lb_connection_v6 Advisor configuration statement.

The following example shows a sample display when you issue `F AQSADV,DISPLAY,ADVISOR,DETAIL` on the primary Advisor.

```
F AQSADV,DISPLAY,ADVISOR,DETAIL
AQS0142I ADVISOR DETAILS
ADVISOR ROLE   : PRIMARY
 IPADDR        : 192.10.1.1
 LOAD BALANCERS:
  IPADDR  : 192.10.1.32                          CONNECTED: YES
   TIER   : 1
  IPADDR  : 192.10.1.64                          CONNECTED: YES
   TIER   : 2
  IPADDR  : 192.10.1.33                          CONNECTED: NO
   TIER   : 1
  IPADDR  : 192.10.1.65                          CONNECTED: NO
   TIER   : UNKNOWN
 AGENTS         :
  IPADDR  : 192.10.110.1                         CONNECTED: YES
   SYSTEM NAME : SYS1A      SITE : PLEX1
  IPADDR  : 192.10.110.2                         CONNECTED: YES
   SYSTEM NAME : SYS1B      SITE : PLEX1
  IPADDR  : 192.10.110.3                         CONNECTED: YES
   SYSTEM NAME : LINUXMG1   SITE : PLEX1
  IPADDR  : 192.20.110.1                         CONNECTED: YES
   SYSTEM NAME : SYS2A      SITE : PLEX2
  IPADDR  : 192.20.110.2                         CONNECTED: NO
   SYSTEM NAME : N/A        SITE : N/A
  IPADDR  : 192.20.110.3                         CONNECTED: DOWN
   SYSTEM NAME : LINUXMG2   SITE : PLEX2
PEER ADVISOR   :
 IPADDR        : 192.20.130.1
   SYSTEM NAME : CNTL2
```

The following example shows a sample display when you issue `F AQSADV,DISPLAY,ADVISOR,DETAIL` on the secondary Advisor.

```
F AQSADV,DISPLAY,ADVISOR,DETAIL
AQS0142I ADVISOR DETAILS
ADVISOR ROLE   : SECONDARY
 IPADDR        : 192.20.130.1
PEER ADVISOR   :
 IPADDR        : 192.10.1.1                     CONNECTED: YES
   SYSTEM NAME : CNTL1
```

The following information describes the fields in the previous sample display.

Field name

Descriptions

ADVISOR ROLE
The current role and IP address for this Advisor. The IP address can be an IPv4 or an IPv6 address. The role has the following values:

PRIMARY
Indicates that this Advisor is responsible for the following tasks:

- Communicating with the Agents to retrieve information about the systems and server applications that are being monitored
- Communicating with external load balancers to provide routing recommendations for incoming requests for the configured workloads
- Communicating with the secondary Advisor to provide state information for the configured workloads

SECONDARY
Indicates that this Advisor is responsible for communicating with the primary Advisor to monitor whether this Advisor needs to take over the primary Advisor responsibilities.

LOAD BALANCERS
The list of external load balancers in this Advisor's configuration, the IP address of the load balancer, whether the specified load balancer is currently connected to the Advisor, and the tier level of the load balancer. The IP address can be an IPv4 or an IPv6 address. The `LOAD BALANCERS` field is only displayed when you issue the command on the primary Advisor. The tier has the following values:

1 Indicates that this load balancer is a first-tier load balancer. The load balancer is responsible for selecting the site that an inbound workload request will be routed to.

2 Indicates that this load balancer is a second-tier load balancer. The load balancer is responsible for selecting the server application instance within a site that an inbound workload request will be routed to.

UNKNOWN
Indicates that the specified load balancer has never connected to the Advisor so its tier type could not be determined.

AGENTS
The list of Lifeline Agents in this Advisor's configuration to this Advisor, the IP address of the Agent, and whether the specified Agent is currently connected to the Advisor. The IP address can be an IPv4 or an IPv6 address. The `AGENTS` field is only displayed when you issue the command on the primary Advisor.

SYSTEM NAME
The MVS system name where the z/OS Agent or peer Advisor is active. For Linux on z Systems Management Agents, the Linux on z Systems guest name on the Linux on z Systems Management Agent. If no peer Advisor is connected, this field is not displayed in the `PEER ADVISOR` section.

SITE The MVS sysplex name of the system where the connected z/OS Agent exists, or where an unconnected z/OS Agent was previously connected. For Linux on z Systems Management Agents, the value that is specified on the site_name Agent configuration statement.

CONNECTED
When issued from the primary Advisor, indicates whether the external

load balancer or Lifeline Agent is connected to the Advisor. When issued from the secondary Advisor, indicates whether the Advisor is connected to the primary Advisor. Possible values are:

YES For the primary Advisor, indicates that the external load balancer or Agent is available and connected to the Advisor.

For the secondary Advisor, indicates that the primary Advisor is available and the secondary Advisor is connected to the primary Advisor.

NO

For the primary Advisor, indicates that the external load balancer or Agent is not connected to the Advisor.

For the secondary Advisor, indicates that the state of the primary Advisor is unknown and the secondary Advisor is not connected to the primary Advisor.

DOWN
For the primary Advisor, indicates that the Agent is not connected to the Advisor because the system where the Agent resides is not operational.

For the secondary Advisor, indicates that the primary Advisor is not active because the primary Advisor is not operational or the system where the primary Advisor resides is not operational.

PEER ADVISOR
The IP address of the peer Advisor that is connected to this Advisor. The IP address can be an IPv4 or an IPv6 address.

If no peer Advisor is connected:

- When issued from the primary Advisor, the IP address is displayed as NONE.
- When issued from the secondary Advisor, the IP address displayed is one of the following:
  - The IP address specified on the peer_advisor_id Advisor configuration statement, if configured.
  - The IP address specified on the lb_connection_v4 or lb_connection_v6 Advisor configuration statement.

The following example shows a sample display when you issue `F AQSADV,DISPLAY,CONFIG`.

```
F AQSADV,DISPLAY,CONFIG
AQS0143I ADVISOR CONFIGURATION
VERSION          : LIFELINE V2.5   SERVICE LEVEL: PI84240
CONFIG FILENAME  : USER.PROFILES(LBADVCNF)
DEBUG LEVEL      : 7
ADVISOR CONN PORT : 8200
ADVISOR ID LIST   :
 IPADDR : 192.10.130.1
 IPADDR : 192.20.130.1
ADVISOR TIMEOUT : 10
ADVISOR TAKEOVER POLICY : MANUAL
AGENT CONN PORT : 8181
AGENT ID LIST   :
 IPADDR..PORT : 192.10.110.1..4000
 IPADDR..PORT : 192.10.110.2..4000
 IPADDR..PORT : 192.10.110.3..4000
 IPADDR..PORT : 192.20.110.1..4000
```

```
 IPADDR..PORT : 192.20.110.2..4000
 IPADDR..PORT : 192.20.110.3..4000
UPDATE INTERVAL  : 10
FAILURE DETECTION INTERVAL  : 60
PEER ADVISOR ID  : 192.10.1.1
LB CONNECTION V4 : 192.10.1.1..3860
LB CONNECTION V6 : 192::10:1:1..3860
LB ID LIST  :
 IPADDR : 192.10.1.32
 IPADDR : 192.10.1.33
 IPADDR : 192.10.1.64
 IPADDR : 192.10.1.65
WORKLOAD SWITCH POLICY  : MANUAL
FAILURE DETECTION GROUPS :
 IPADDR..PORT : 10.10.1.1..5001
  GROUP : WORKLOAD1GROUP
 IPADDR..PORT : 10.20.1.1..5001
  GROUP : WORKLOAD1GROUP
 IPADDR..PORT : 10.10.1.1..6001
  GROUP : WORKLOAD1GROUP
 IPADDR..PORT : 10.20.1.1..6001
  GROUP : WORKLOAD1GROUP
 APPLICATION  : NETA.DYNAPPL*
  GROUP : WORKLOAD4GROUP1
 APPLICATION  : NETB.DYNAPPL*
  GROUP : WORKLOAD4GROUP1
 APPLICATION  : NETA.SNAAPPL1
  GROUP : WORKLOAD4GROUP2
 APPLICATION  : NETB.SNAAPPL1
  GROUP : WORKLOAD4GROUP2
CROSS SYSPLEX LIST :
 IPADDR..PORT : 10.10.1.1..5001
  SITE      : PLEX1
  WORKLOAD  : WORKLOAD1
  FAILURE DETECTION INTERVAL  : 30
 IPADDR..PORT : 10.20.1.1..5001
  SITE      : PLEX2
  WORKLOAD  : WORKLOAD1
  FAILURE DETECTION INTERVAL  : 30
 IPADDR..PORT : 10.10.1.1..6001
  SITE      : PLEX1
  WORKLOAD  : WORKLOAD1
  FAILURE DETECTION INTERVAL  : 30
 IPADDR..PORT : 10.20.1.1..6001
  SITE      : PLEX2
  WORKLOAD  : WORKLOAD1
  FAILURE DETECTION INTERVAL  : 30
 IPADDR..PORT : 10.10.1.1..8020
  SITE      : PLEX1
  WORKLOAD  : WORKLOAD2
  FAILURE DETECTION INTERVAL  : 60
 IPADDR..PORT : 10.20.1.1..8020
  SITE      : PLEX2
  WORKLOAD  : WORKLOAD2
  FAILURE DETECTION INTERVAL  : 60
 IPADDR..PORT : 10.10.1.1..8021
  SITE      : PLEX1
  WORKLOAD  : WORKLOAD2
  FAILURE DETECTION INTERVAL  : 60
 IPADDR..PORT : 10.20.1.1..8021
  SITE      : PLEX2
  WORKLOAD  : WORKLOAD2
  FAILURE DETECTION INTERVAL  : 60
 IPADDR..PORT : 10.10.1.2..7001
  SITE      : PLEX1
  WORKLOAD  : WORKLOAD3
  FAILURE DETECTION INTERVAL  : 60
```

```
  IPADDR..PORT : 10.20.1.2..7001
   SITE      : PLEX2
   WORKLOAD  : WORKLOAD3
   FAILURE DETECTION INTERVAL  : 60
 SNA APPLICATION LIST:
APPLICATION: NETA.DYNAPPL*
   SITE:        PLEX1
   WORKLOAD:    WORKLOAD4
   FAILURE DETECTION INTERVAL: 60
  APPLICATION: NETB.DYNAPPL*
   SITE:        PLEX1
   WORKLOAD:    WORKLOAD4
   FAILURE DETECTION INTERVAL: 60
  APPLICATION: NETA.SNAAPPL1
   SITE:        PLEX1
   WORKLOAD:    WORKLOAD4
   FAILURE DETECTION INTERVAL: 60
  APPLICATION: NETB.SNAAPPL1
   SITE:        PLEX2
   WORKLOAD:    WORKLOAD4
   FAILURE DETECTION INTERVAL: 60
 INTERMEDIARY NODE LIST :
  IPADDR..PORT : 10.1.1.1..9001
   SITE      : PLEX1
   WORKLOAD  : WORKLOAD3
   APPLICATION TYPE: IP
  IPADDR..PORT : 10.2.1.1..9001
   SITE      : PLEX2
   WORKLOAD  : WORKLOAD3
   APPLICATION TYPE: IP
  IPADDR..PORT : 10.3.1.1..10000
   SITE      : PLEX1
   WORKLOAD  : WORKLOAD4
   APPLICATION TYPE: SNA
  IPADDR..PORT : 10.4.1.1..10000
   SITE      : PLEX2
   WORKLOAD  : WORKLOAD4
   APPLICATION TYPE: SNA
 MQ MANAGER LIST :
  MANAGER : QMG1
   CLUSTER  : CLUSTER1
   QUEUE    : QUEUE1
   SITE     : PLEX1
   WORKLOAD : WORKLOAD5
   TRANSFER : INCLUDE
   FAILURE DETECTION INTERVAL  : 60
  MANAGER : QMG2
   CLUSTER  : CLUSTER1
   QUEUE    : QUEUE1
   SITE     : PLEX2
   WORKLOAD : WORKLOAD5
   TRANSFER : INCLUDE
   FAILURE DETECTION INTERVAL  : 60
  MANAGER : QMG1
   CLUSTER  : CLUSTER1
   QUEUE    : QUEUE2
   SITE     : PLEX1
   WORKLOAD : WORKLOAD5
   TRANSFER : INCLUDE
   FAILURE DETECTION INTERVAL  : 60
  MANAGER : QMG2
   CLUSTER  : CLUSTER1
   QUEUE    : QUEUE2
   SITE     : PLEX2
   WORKLOAD : WORKLOAD5
   TRANSFER : INCLUDE
   FAILURE DETECTION INTERVAL  : 60
```

```
QUERY WORKLOAD LIST :
 WORKLOAD : WORKLOAD2
  ASSOCIATED WORKLOAD : WORKLOAD1
  DISTRIBUTION : DYNAMIC      ACTION : TOACTIVE
  PERSISTENT CONNECTION TIMEOUT : 0
MANAGEMENT GUEST LIST :
 GUEST     : GUEST1A
  IPADDR    : 10.1.1.1
  WORKLOAD  : WORKLOAD3
 GUEST     : GUEST2A
  IPADDR    : 10.2.1.1
 WORKLOAD : WORKLOAD3
```

The following information describes the fields in the previous sample display.

Field name
Descriptions

VERSION
The current version and release of the Advisor.

SERVICE LEVEL
The current APAR service level of the Advisor.

CONFIG FILENAME
The configuration file used by this Advisor when the Advisor was initially started.

DEBUG LEVEL
The debug level currently in effect for this Advisor.

ADVISOR CONN PORT
The port number that the primary Advisor listens on for connections from a peer Advisor.

ADVISOR ID LIST
The list of the IP addresses of secondary Advisors that are permitted to connect to the primary Advisor. The IP address can be an IPv4 or an IPv6 address.

ADVISOR TIMEOUT
The interval (in seconds) that the primary Advisor uses to determine whether another primary Advisor is active. The interval used by the secondary Advisor to determine whether the primary Advisor is down.

ADVISOR TAKEOVER POLICY
The action that a secondary Advisor takes when it determines that the primary Advisor is down. The takeover policy allows the following values:

AUTOMATIC
Indicates that the secondary Advisor automatically takes over the primary Advisor responsibilities.

MANUAL
Indicates that the secondary Advisor waits until a `MODIFY AQSADV,TAKEOVER` command is issued before the secondary Advisor takes over the primary Advisor responsibilities.

AGENT CONN PORT
The port number that the primary Advisor listens on for connections from Agents.

AGENT ID LIST
The list of IP addresses of Agents that are permitted to connect to the primary Advisor. The IP address can be an IPv4 or an IPv6 address.

UPDATE INTERVAL
The interval (in seconds) that an Agent uses to update the primary Advisor with information about the system and server applications being monitored. Depending on how the external load balancer is configured, the update_interval statement might also determine how often the load balancer is updated with data from the Lifeline Advisor.

FAILURE DETECTION INTERVAL
The interval (in seconds) that a primary Advisor uses to detect a site failure.

PEER ADVISOR ID
The IPv4 or IPv6 address that the Advisor uses as the destination IP address for connecting to the peer Advisor.

LB CONNECTION V4
The IPv4 address and port number that the primary Advisor listens on for connections from external load balancers.

LB CONNECTION V6
The IPv6 address and port number the primary Advisor listens on for connections from external load balancers.

LB ID LIST
The list of the IP addresses of external load balancers that are permitted to connect to the primary Advisor. The IP address can be an IPv4 or an IPv6 address.

WORKLOAD SWITCH POLICY
The action that a primary Advisor takes when it determines that a workload is no longer active. The switch policy allows the following values:

AUTOMATIC
Indicates that the primary Advisor automatically reroutes a failing workload to the alternate site.

MANUAL
Indicates that the primary Advisor waits until a `MODIFY AQSADV,ACTIVATE` command is issued before the primary Advisor reroutes a failing workload to the alternate site.

FAILURE DETECTION GROUPS
The list of IP and SNA failure detection group members.

- For IP groups, the load balancer application group members that make up one or more failure detection groups. The IP address can be an IPv4 or an IPv6 address.
- For SNA groups, the sna_application_list entries of a workload that make up one or more failure detection groups.

CROSS SYSPLEX LIST
The list of both the external and internal second-tier load balancer IP addresses, the site name (i.e. sysplex name) that identifies each second-tier load balancer, the port number of the server application used for a specific workload, the workload name, and the failure detection interval for the workload. The IP address can be an IPv4 or an IPv6 address.

SNA APPLICATION LIST
The list of SNA applications, the site where the application resides, the workload name, and the failure detection interval for the workload.

INTERMEDIARY NODE LIST
The list of IP addresses and ports that identify each intermediary node, the site name where the intermediary node resides, the workload that the intermediary node belongs to, and the type of application that processes the workload. The site name is the same as the sysplex name. The IP address can be an IPv4 or IPv6 address.

MQ_MANAGER_LIST
The list of MQ queue managers, the IBM MQ clusters hosted by the MQ queue manager, the MQ cluster queues defined on the MQ queue manager, the site where the MQ queue manager resides, the workload associated with each IBM MQ cluster, the queue transfer eligibility, and the failure detection interval for the workload.

QUERY WORKLOAD LIST
The list of the Active/Query and associated Active/Standby workloads, the distribution type, distribution option, and persistent connection timeout for the Active/Query workload. The distribution type can be DYNAMIC or STATIC.

MANAGEMENT_GUEST LIST
The list of Linux on z Systems guests that the Linux on z Systems Management Agents monitor, each guest's IP address, and the workload that the guest belongs to.

The following example shows a sample display when you issue `F AQSADV,DISPLAY,DEBUG`.

```
F AQSADV,DISPLAY,DEBUG
AQS0111I LLADVSR DEBUG LEVEL 7
```

The following example shows a sample display when you issue `F AQSADV,DISPLAY,LB`.

```
F AQSADV,DISPLAY,LB
AQS0112I LOAD BALANCER SUMMARY
LB INDEX      : 00        UUID      : F956AE65
 IPADDR..PORT : 192.10.1.64..55764
 HEALTH       : 7E        FLAGS     : NOCHANGE PUSH
LB INDEX      : 01        UUID      : 9A78BE9E
 IPADDR..PORT : 192.10.1.32..40366
 HEALTH       : 7E        FLAGS     : NOCHANGE PUSH
2 OF 2 RECORDS DISPLAYED
```

The following information describes the fields in the previous sample display.

Field name
Descriptions

LB INDEX
The reference number used to identify the load balancer. The same reference number is used for a load balancer as long as it remains connected.

UUID A hexadecimal value of the universally unique identifier assigned by the load balancer. This byte array can be up to 64 bytes in length. Only one load balancer with the same UUID can be connected to the primary Advisor at the same time.

IPADDR..PORT
The IP address and port number used by the load balancer to connect to the primary Advisor. The IP address can be an IPv4 or an IPv6 address.

HEALTH
A hexadecimal value supplied by the load balancer that indicates the general health of the load balancer. Valid values are in the range from 0 to X'7F'.

FLAGS
Indicators set by the load balancer. The flag values are shown as follows:

NOCHANGE
Indicates that the primary Advisor sends only weights that have changed since the last update interval to the load balancer.

PUSH Indicates that the primary Advisor sends weights to the external load balancer when the update_interval has expired. If this flag is not present, the load balancer periodically retrieves weights from the primary Advisor.

TRUST
Indicates that the load balancer trusts member applications to register themselves. This flag is ignored by the primary Advisor.

The following example shows a sample display when you issue `F AQSADV,DISPLAY,LB,DETAIL`.

```
F AQSADV,DISPLAY,LB,DETAIL
AQS0113I LOAD BALANCER DETAILS
LB INDEX      : 00        UUID      : F956AE65
 IPADDR..PORT : 192.10.1.64..55764
 HEALTH       : 7E        FLAGS     : NOCHANGE PUSH
 GROUP NAME   : WKLD2_GROUP1
  WORKLOAD    : WORKLOAD2
  GROUP FLAGS : CROSS_SYSPLEX
  IPADDR..PORT: 10.10.1.1..8020
   SYSPLEX : PLEX1
   SYSTEM NAME: N/A       PROTOCOL  : TCP  AVAIL     : YES
   WLM WEIGHT : N/A       CS WEIGHT : N/A  NET WEIGHT: 00001
   FLAGS      : DISTDVIPA
  IPADDR..PORT: 10.20.1.1..8020
   SYSPLEX : PLEX2
   SYSTEM NAME: N/A       PROTOCOL  : TCP  AVAIL     : YES
   WLM WEIGHT : N/A       CS WEIGHT : N/A  NET WEIGHT: 00000
   FLAGS      : CMQ DISTDVIPA
 GROUP NAME   : WKLD2_GROUP2
  WORKLOAD    : WORKLOAD2
  GROUP FLAGS : CROSS_SYSPLEX
  IPADDR..PORT: 10.10.1.1..8021
   SYSPLEX : PLEX1
   SYSTEM NAME: N/A       PROTOCOL  : TCP  AVAIL     : YES
   WLM WEIGHT : N/A       CS WEIGHT : N/A  NET WEIGHT: 00001
   FLAGS      : DISTDVIPA
  IPADDR..PORT: 10.20.1.1..8021
   SYSPLEX : PLEX2
   SYSTEM NAME: N/A       PROTOCOL  : TCP  AVAIL     : YES
   WLM WEIGHT : N/A       CS WEIGHT : N/A  NET WEIGHT: 00000
   FLAGS      : CMQ DISTDVIPA
 GROUP NAME   : WKLD1_GROUP1
  WORKLOAD    : WORKLOAD1
  GROUP FLAGS : CROSS_SYSPLEX
  IPADDR..PORT: 10.10.1.1..5001
   SYSPLEX : PLEX1
   SYSTEM NAME: N/A       PROTOCOL  : TCP  AVAIL     : NO
```

```
   WLM WEIGHT : N/A       CS WEIGHT : N/A  NET WEIGHT: 00000
   FLAGS      : CMQ
  IPADDR..PORT: 10.20.1.1..5001
   SYSPLEX : PLEX2
   SYSTEM NAME: N/A       PROTOCOL  : TCP  AVAIL     : YES
   WLM WEIGHT : N/A       CS WEIGHT : N/A  NET WEIGHT: 00001
   FLAGS      : DISTDVIPA
 GROUP NAME   : WKLD1_GROUP2
  WORKLOAD    : WORKLOAD1
  GROUP FLAGS : CROSS_SYSPLEX
  IPADDR..PORT: 10.10.1.1..6001
   SYSPLEX : PLEX1
   SYSTEM NAME: N/A       PROTOCOL  : TCP  AVAIL     : NO
   WLM WEIGHT : N/A       CS WEIGHT : N/A  NET WEIGHT: 00000
   FLAGS      : CMQ
  IPADDR..PORT: 10.20.1.1..6001
   SYSPLEX    : PLEX2
   SYSTEM NAME: N/A       PROTOCOL  : TCP  AVAIL     : YES
   WLM WEIGHT : N/A       CS WEIGHT : N/A  NET WEIGHT: 00001
   FLAGS      : DISTDVIPA
 GROUP NAME   : WKLD3_GROUP1
  WORKLOAD    : WORKLOAD3
  GROUP FLAGS : CROSS_SYSPLEX
  IPADDR..PORT: 10.1.1.1..9001
   SYSPLEX    : PLEX1
   SYSTEM NAME: LINUXMG1  PROTOCOL  : TCP  AVAIL     : YES
   WLM WEIGHT : N/A       CS WEIGHT : N/A  NET WEIGHT: 00001
   FLAGS      : CMQ
  IPADDR..PORT: 10.2.1.1..9001
   SYSPLEX    : PLEX2
   SYSTEM NAME: LINUXMG2  PROTOCOL  : TCP  AVAIL     : NO
   WLM WEIGHT : N/A       CS WEIGHT : N/A  NET WEIGHT: 00000
   FLAGS      : CMQ
 GROUP NAME   : WKLD4_GROUP1
  WORKLOAD    : WORKLOAD4
  GROUP FLAGS : CROSS_SYSPLEX
  IPADDR..PORT: 10.3.1.1..10000
   SYSPLEX    : PLEX1
   SYSTEM NAME: SYS1A     PROTOCOL  : TCP  AVAIL     : YES
   WLM WEIGHT : N/A       CS WEIGHT : N/A  NET WEIGHT: 00001
   FLAGS      : CMQ
  IPADDR..PORT: 10.4.1.1..10000
   SYSPLEX    : PLEX2
   SYSTEM NAME: SYS2A     PROTOCOL  : TCP  AVAIL     : NO
   WLM WEIGHT : N/A       CS WEIGHT : N/A  NET WEIGHT: 00000
   FLAGS      : CMQ
LB INDEX      : 01        UUID      : 9A78BE9E
 IPADDR..PORT : 192.10.1.32..40366
 HEALTH       : 7E        FLAGS     : NOCHANGE PUSH
 GROUP NAME   : TIER2_GROUP1
  WORKLOAD    : WORKLOAD1
  GROUP FLAGS :
  IPADDR..PORT: 192.10.110.1..5001
   SYSPLEX : PLEX1
   SYSTEM NAME: SYS1A      PROTOCOL  : TCP  AVAIL     : YES
   WLM WEIGHT : 00058     CS WEIGHT : 100  NET WEIGHT: 00001
   RAW           CP: 58  ZAAP: 00  ZIIP: 00
   PROPORTIONAL  CP: 58  ZAAP: 00  ZIIP: 00
   ABNORM     : 00000     HEALTH    : 100
   FLAGS      :
  IPADDR..PORT: 192.10.110.2..5001
   SYSPLEX : PLEX1
   SYSTEM NAME: SYS1B      PROTOCOL  : TCP  AVAIL     : YES
   WLM WEIGHT : 00059     CS WEIGHT : 100  NET WEIGHT: 00001
   RAW           CP: 59  ZAAP: 00  ZIIP: 00
   PROPORTIONAL  CP: 58  ZAAP: 00  ZIIP: 00
   ABNORM     : 00000     HEALTH    : 100
```

```
  FLAGS      :
 GROUP NAME   : TIER2_GROUP2
  WORKLOAD    : WORKLOAD2
  GROUP FLAGS :
  IPADDR..PORT: 192.10.110.1..6001
   SYSPLEX : PLEX1
   SYSTEM NAME: SYS1A      PROTOCOL  : TCP  AVAIL     : YES
   WLM WEIGHT : 00058     CS WEIGHT : 100  NET WEIGHT: 00001
   RAW           CP: 58  ZAAP: 00  ZIIP: 00
   PROPORTIONAL  CP: 58  ZAAP: 00  ZIIP: 00
   ABNORM     : 00000     HEALTH    : 100
   FLAGS      :
  IPADDR..PORT: 192.10.110.2..6001
   SYSPLEX : PLEX1
   SYSTEM NAME: SYS1B      PROTOCOL  : TCP  AVAIL     : YES
   WLM WEIGHT : 00059     CS WEIGHT : 100  NET WEIGHT: 00001
   RAW           CP: 59  ZAAP: 00  ZIIP: 00
   PROPORTIONAL  CP: 58  ZAAP: 00  ZIIP: 00
   ABNORM     : 00000     HEALTH    : 100
   FLAGS      :
2 OF 2 RECORDS DISPLAYED
```

The following information describes the fields in the previous sample display.

Field name
Descriptions

LB INDEX
The reference number used to identify the load balancer. The same reference number is used for a load balancer as long as it remains connected.

UUID A hexadecimal value of the universally unique identifier assigned by the load balancer. This byte array can be up to 64 bytes in length. Only one load balancer with the same `UUID` can be connected to the primary Advisor at the same time.

IPADDR..PORT

- The instance listed under the `LB INDEX` field represents the IP address and port number used by the load balancer to connect to the primary Advisor. The IP address can be an IPv4 or an IPv6 address.
- The instances listed within the `GROUP NAME` block for first-tier load balancers can be one of the following:
  - The IP addresses and port numbers of second-tier load balancers. The first-tier load balancer balances workload requests to these second-tier load balancers.
  - The non-distributed IP addresses and port numbers of server applications. The first-tier load balancer balances workload requests directly to the server applications.
- The instances listed within the `GROUP NAME` block for second-tier load balancers represent the IP addresses and port numbers of target server applications. The second-tier load balancer balances workload requests to these server applications.

HEALTH
A hexadecimal value supplied by the load balancer that indicates the general health of the load balancer. Valid values are in the range from 0 to X'7F'.

FLAGS
Indicators set by the load balancer. The flag values are shown as follows:

NOCHANGE
Indicates that the primary Advisor sends only weights that have changed since the last update interval to the load balancer.

PUSH Indicates that the primary Advisor sends weights to the external load balancer when the update_interval has expired. If this flag is not present, the load balancer periodically retrieves weights from the primary Advisor.

TRUST
Indicates that the load balancer trusts member applications to register themselves. This flag is ignored by the primary Advisor.

GROUP
The name of a registered group of related target server applications. The group name is a UTF-8 string displayed in EBCDIC on the MVS console. Any non-displayable character is displayed as a question mark (?).

GROUP FLAGS
The flags currently applicable to the group. Group flags are only valid for first-tier load balancers; for second-tier load balancers, this field is left blank. The group flag values are shown as follows:

CROSS_SYSPLEX
The group is a cross-sysplex group. This group is used to balance the workload across multiple sysplexes. The IP addresses specified in each cross-sysplex group identify the second-tier load balancers that the first-tier load balancer will balance across.

IIN The group is an internal intermediary node group. This group is used to balance the workload across multiple sysplexes. The IP addresses specified in each internal intermediary node group reside on systems where the z/OS Agents are active and identify the internal intermediary nodes that the first-tier load balancer will balance across.

EIN The group is an external intermediary node group. This group is used to balance the workload across multiple sysplexes. The IP addresses specified in each external intermediary node group reside on systems where the z/OS Agents are not used and identify the external intermediary nodes that the first-tier load balancer will balance across.

SYSPLEX
For a first-tier load balancer application group, the value of SYSPLEX indicates the MVS sysplex name where either the specified second-tier load balancer will load balance to or the specified server application resides.

For entries that represent intermediary nodes on a Linux on z Systems guest, the SYSPLEX name corresponds to the value of the site_name Agent configuration statement on the Linux on z Systems Management Agent.

For a second-tier load balancer application group, the value of SYSPLEX indicates the MVS sysplex name of the system where the server application being load balanced exists.

SYSTEM NAME
For a first-tier load balancer application group, if the registered member is a second-tier load balancer, the system name is N/A. Otherwise, the

registered member is a server application, and the system name is the name of the MVS system where the non-distributed IP address for the server application is active.

For entries that represent intermediary nodes on a Linux on z Systems guest, the system name is the guest name of the intermediary node.

For a second-tier load balancer application group, the system name is the name of the MVS system where the server application exists.

PROTOCOL
The protocol used by the second-tier load balancer or server application for first-tier load balancer application groups or server application for second-tier load balancer application groups. The protocol value is either TCP or UDP.

AVAIL
Indicates whether the second-tier load balancer or server application for a first-tier load balancer application group or the server application for a second-tier load balancer application group is available for workload distribution. The value YES indicates that the second-tier load balancer or the server application is available for load balancing. The value NO indicates that the second-tier load balancer or the server application is not recommended for load balancing.

WLM WEIGHT
The server-specific Workload Manager (WLM) weight value of the server application. For a first-tier load balancer application group whose registered members are second-tier load balancers, the WLM weight is N/A. For a first-tier load balancer application group whose registered members are server applications or for a second-tier load balancer application group, the value is a composite weight, in the range 0 - 64, which indicates the sum of the proportional CP, zAAP, and zIIP weights for this server application.

CP Indicates that the RAW value is the WLM server-specific general CP recommendation. This is the amount of displaceable general CPU capacity based on the importance, which is defined by the WLM policy, of the server application as compared to the other target systems within the same MVS sysplex. The PROPORTIONAL value is the RAW value modified by the proportion of general CP capacity that is currently being consumed by the workload of the server application as compared with the other processors (zAAP and zIIP).

zAAP Indicates that the RAW value is the WLM server-specific zAAP recommendation. This is the amount of displaceable zAAP capacity based on the importance, which is defined by the WLM policy, of the server application as compared to the other target systems within the same MVS sysplex. The PROPORTIONAL value is the RAW value modified by the proportion of zAAP capacity that is currently being consumed by the workload of the server application as compared with the other processors (general CPU and zIIP).

zIIP Indicates that the RAW value is the WLM server-specific zIIP recommendation. This is the amount of displaceable zIIP capacity based on the importance, which is defined by the WLM policy, of the server application as compared with the other target systems within the same MVS sysplex. The PROPORTIONAL value is the

RAW value modified by the proportion of zIIP capacity that is currently being consumed by the workload of the server application as compared with the other processors (general CPU and zAAP).

ABNORM
Indicates the rate of abnormal transaction completions per 1000 total transaction completions. The value is nonzero if the server application is experiencing conditions in which transactions are not completed. It is applicable to server applications that report transaction status using Workload Management Services. Under normal conditions or if the server application is not providing this information to WLM, the value of ABNORM is 0. WLM uses abnormal transaction completion rate information to reduce the WLM weight reported for the server application.

HEALTH
The general health of the server application. Values less than 100 indicate that the server application is experiencing conditions that are not enabling it to process new workload requests successfully. It is applicable to server applications that report their health using Workload Management Services. Under normal circumstances or if the server application is not providing this information to WLM, the value of HEALTH is 100. WLM uses health information to reduce the WLM weight reported for the server application.

CS WEIGHT
The Communications Server (CS) weight value recommended by the Lifeline Agent. For a first-tier load balancer application group whose registered members are second-tier load balancers, the CS weight is N/A. For a first-tier load balancer application group whose registered members are server applications or for a second-tier load balancer application group, the CS weight value range is 0 - 100. A higher weight indicates that the server application is able to handle more workload requests than a server application in the same group with a lower weight.

NET WEIGHT
For a first-tier load balancer application group of external second-tier load balancers, `NET WEIGHT` indicates the relative weight of this second-tier load balancer compared to other second-tier load balancers for this workload. For members of an Active/Standby workload, the net weight is either 0 or 1, with a value of 0 indicating that no workload requests are being distributed to this external second-tier load balancer, while a value of 1 indicating that workload requests can be distributed to this external second-tier load balancer.

For a first-tier load balancer application group of server applications, `NET WEIGHT` indicates the relative weight of the server application as compared to other server applications for this workload. This weight is based on the WLM weight, the CS weight, and other factors. Weights within a group are normalized to yield the net weight. Normalization involves reducing the weight values while preserving the ratios between the weights.

For members of an Active/Query workload, the net weight value range is 0 - 64. A higher weight indicates that the site where the load balancer routes to can handle more requests for the workload than the alternate site. This weight is based on the WLM weight, the CS weight, database replication latency state, and other factors. Weights within a group are

normalized to yield the net weight. Normalization involves reducing the weight values while preserving the ratios between the weights.

Additional factors might affect the NET WEIGHT of a first-tier load balancer application group. If the site is not active, the net weight for this member is 0 so that new workload requests are not sent to this site. For an Active/Standby workload, if all members on the active site are unavailable, the net weight for these members will be forced to 1. The net weight is also affected by the type of members in the group; they might be sysplex distributed DVIPAs, external load balancers, non-distributed IP addresses, or intermediary nodes. For more information, see "Interpreting the workload and LB displays" on page 76.

For a second-tier load balancer application group, `NET WEIGHT` indicates the relative weight of this server application compared with other server applications within the same site for this workload. The net weight value range is 0 - 64. A higher weight indicates that a server application can handle more workload requests than a lower weight server application in the same group. This weight is based upon the WLM weight, the CS weight, and other factors. Compare net weights for server applications only with other server applications within the same group. Weights within a group are normalized to yield the net weight. Normalization involves reducing the weight values while preserving the ratios between the weights.

FLAGS

Indicators for the target server applications. The flag values are shown as follows:

CMQ Indicates that the member's site and workload were quiesced with a MODIFY *advisor_proc*,QUIESCE command. No new workload connections are routed to server applications for the specified site and workload.

DISTDVIPA

If the load balancer application group is not an intermediary group, indicates that the IP address of the server application is a distributable DVIPA. The IP address can be an IPv4 or an IPv6 address.

If the load balancer application group is an intermediary node group, indicates that the IP address of the server application is an IP address matching an entry in the intermediary_node_list which is mapped to a corresponding distributable DVIPA entry in the cross_sysplex_list. The distributable DVIPA is used to monitor the server application workload.

LBQ Indicates that an operator at the Load Balancer quiesced the member. No new workload connections are routed to the server application.

NODATA

Indicates that an Agent reported the server application, but at least two update intervals are needed to calculate a valid CS weight.

NOTARGETAPP

Indicates that an Agent reported the member's IP address on a TCP/IP stack but did not find a server application that uses the same port and protocol.

NOTARGETIP
Indicates that an Agent reported the member's IP address on a TCP/IP stack but the IP address is not usable.

NOTARGETSYS
Indicates that no Agent reported the member's IP address on any TCP/IP stacks in either site.

OPQ Indicates that an operator at the owning Agent quiesced the server application or system. No new workload connections are routed to this server application or system.

The following example shows a sample display when you issue `F AQSADV,DISPLAY,WORKLOAD`.

```
F AQSADV,DISPLAY,WORKLOAD
   AQS0145I WORKLOAD SUMMARY
   TYPE : ACTIVE/STANDBY
    WORKLOAD NAME : WORKLOAD1
     STATE : ACTIVE
      SITE : PLEX2
    WORKLOAD NAME : WORKLOAD3
     STATE : ACTIVE
      SITE : PLEX1
    WORKLOAD NAME : WORKLOAD4
     STATE : ACTIVE
      SITE : PLEX1
    WORKLOAD NAME : WORKLOAD5
     STATE : ACTIVE
      SITE : PLEX1
   TYPE : ACTIVE/QUERY
    WORKLOAD NAME : WORKLOAD2
     STATE : ACTIVE
      SITE : PLEX1
      SITE : PLEX2
     ASSOCIATED WORKLOAD : WORKLOAD1
     REPLICATION STATE   : NORMAL
   5 OF 5 RECORDS DISPLAYED
```

The following information describes the fields in the previous sample display.

Field name
Descriptions

TYPE The type of workload. Type values are shown as follows:

ACTIVE/STANDBY
Indicates that the workload has been configured so that it can be activated to only one site at any one time.

ACTIVE/QUERY
Indicates that the workload has been configured so that it can be activated to both sites at the same time.

WORKLOAD NAME
The name of the workload as defined in the cross_sysplex_list, mq_manager_list, or sna_applicaton_list Advisor configuration statement.

STATE
The state of the workload. The state values are shown as follows:

ACTIVE
Indicates that the workload has been activated to the specified site. For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor

notifies first-tier load balancers to route all inbound requests for this workload to the specified site. For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies Lifeline Agents on the active site to change the queue rank of each MQ cluster queue in the workload to a '1' and start the MQ cluster receiver channel.

QUIESCED
Indicates that the workload has been quiesced to both sites. For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor notifies first-tier load balancers to not route any inbound requests for this workload. For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies Lifeline Agents on the active site to change the queue rank of each MQ cluster queue in the workload to a '0' and stop the MQ cluster receiver channel.

DEACTIVATED
Indicates that the workload has been deactivated on both sites. For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor resets any existing connections for this workload on systems where active Agents existed on the previously active site when the workload was deactivated. For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies Lifeline Agents on the previously active site to determine if any MQ cluster receiver channels are not stopped and if any messages exist on any MQ cluster queue for the workload.

SITE The MVS sysplex name where the workload is active. If the state of the workload is QUIESCED or DEACTIVATED, the SITE value is set to N/A. For Active/Query workloads, if the workload is active on both sites, a separate line for each site is displayed.

ASSOCIATED WORKLOAD
For workloads of type Active/Query, the associated Active/Standby workload.

REPLICATION STATE
For workloads of type Active/Query, the current state of data replication for the associated Active/Standby workload. See the specific database replication product documentation for information about how to configure replication latency thresholds. The state values are shown as follows:

NORMAL
Indicates that the replication latency is within the acceptable threshold that was configured for database replication for this workload.

CONSTRAINED
Indicates that the replication latency is within 80% of the maximum threshold that was configured for database replication for this workload.

CRITICAL
Indicates that the replication latency is within 90% of the maximum threshold that was configured for database replication for this workload.

ACUTE
Indicates that the replication latency has exceeded the maximum threshold that was configured for database replication for this workload.

UNKNOWN
Indicates that the replication latency value has either not been reported by the database replication product, or the database replication product cannot determine the current replication latency state.

The following example shows a sample display when you issue `F AQSADV,DISPLAY,WORKLOAD,DETAIL`.

```
F AQSADV,DISPLAY,WORKLOAD,DETAIL
AQS0146I WORKLOAD DETAILS
TYPE : ACTIVE/STANDBY
 WORKLOAD NAME : WORKLOAD1
  STATE : ACTIVE
   SITE : PLEX2
  SERVERS:
   IPADDR..PORT : 192.10.110.1..5001
   SYSTEM NAME : SYS1A    SITE : PLEX1     STATE : AVAIL
   IPADDR..PORT : 10.20.1.1..5001
   SYSTEM NAME : SYS2A    SITE : PLEX2     STATE : AVAIL
   IPADDR..PORT : 192.10.110.2..5001
   SYSTEM NAME : SYS1B    SITE : PLEX1     STATE : AVAIL
   IPADDR..PORT : 10.20.1.1..5001
   SYSTEM NAME : SYS2B    SITE : PLEX2     STATE : UNAVAIL
   IPADDR..PORT : 192.10.110.1..6001
   SYSTEM NAME : SYS1A    SITE : PLEX1     STATE : AVAIL
   IPADDR..PORT : 10.20.1.1..6001
   SYSTEM NAME : SYS2A    SITE : PLEX2     STATE : AVAIL
   IPADDR..PORT : 192.10.110.2..6001
   SYSTEM NAME : SYS1B    SITE : PLEX1     STATE : AVAIL
   IPADDR..PORT : 10.20.1.1..6001
   SYSTEM NAME : SYS2B    SITE : PLEX2     STATE : AVAIL
 WORKLOAD NAME   : WORKLOAD3
  STATE : ACTIVE
   SITE : PLEX1
  SERVERS:
   IPADDR..PORT : 10.10.1.2..7001
   SYSTEM NAME : SYS1A       SITE : PLEX1      STATE : AVAIL
   IPADDR..PORT : 10.20.1.2..7001
   SYSTEM NAME : N/A         SITE : PLEX2      STATE : UNAVAIL
  ZLINUX SERVERS:
   HOST : GUEST1A  IPADDR..PORT : 10.1.1.1..9001
   SYSTEM ID : ZVM1       SITE : PLEX1      STATE : AVAIL
   HOST : GUEST2A  IPADDR..PORT : 10.2.1.1..9001
   SYSTEM ID : ZVM2       SITE : PLEX2      STATE : UNAVAIL
 WORKLOAD NAME   : WORKLOAD4
  STATE : ACTIVE
   SITE : PLEX1
  SERVERS:
   IPADDR..PORT : 10.3.1.1..10000
   SYSTEM NAME : SYS1A      SITE : PLEX1      STATE : AVAIL
   IPADDR..PORT : 10.4.1.1..10000
   SYSTEM NAME : SYS2A      SITE : PLEX2      STATE : AVAIL
  SNA APPLICATIONS:
   APPL: NETA.DYNAPPL*
   SYSTEM NAME : N/A       SITE : PLEX1     STATE : MODEL
    APPL: NETA.DYNAPPL1
    SYSTEM NAME : SYS1A     SITE : PLEX1     STATE : AVAIL
   APPL: NETB.DYNAPPL*
   SYSTEM NAME : N/A       SITE : PLEX2     STATE : MODEL
    APPL: NETB.DYNAPPL1
```

```
     SYSTEM NAME : SYS2A     SITE : PLEX2     STATE : AVAIL
    APPL: NETA.SNAPPL1
    SYSTEM NAME : SYS1A     SITE : PLEX1     STATE : AVAIL
    APPL: NETB.SNAPPL1
    SYSTEM NAME : SYS2A     SITE : PLEX2     STATE : AVAIL
  WORKLOAD NAME : WORKLOAD5
   STATE : ACTIVE
    SITE : PLEX1
   MQ QUEUE MANAGERS:
    QMGR : QMG1     TRANSDEPTH : 9
     IPADDR..PORT : 10.10.1.1..8001
     SYSTEM NAME : SYS1A     SITE : PLEX1
     QUEUE: QUEUE1                                    STATE : AVAIL
     QUEUE: QUEUE2                                    STATE : AVAIL
    QMGR : QMG2     TRANSDEPTH : 0
     IPADDR..PORT : 10.20.1.1..8001
     SYSTEM NAME : SYS2A     SITE : PLEX2
     QUEUE: QUEUE1                                    STATE : AVAIL
     QUEUE: QUEUE2                                    STATE : AVAIL
 TYPE : ACTIVE/QUERY
  WORKLOAD NAME : WORKLOAD2
   STATE : ACTIVE
    SITE : PLEX1
    SITE : PLEX2
   ASSOCIATED WORKLOAD : WORKLOAD1
   REPLICATION STATE   : NORMAL
   SERVERS:
    IPADDR..PORT : 10.10.1.1..8020
    SYSTEM NAME : SYS1A     SITE : PLEX1   STATE : AVAIL
    IPADDR..PORT : 10.10.1.1..8020
    SYSTEM NAME : SYS1B     SITE : PLEX1   STATE : AVAIL
    IPADDR..PORT : 10.20.1.1..8020
    SYSTEM NAME : SYS2A     SITE : PLEX2   STATE : AVAIL
    IPADDR..PORT : 10.20.1.1..8020
    SYSTEM NAME : SYS2B     SITE : PLEX2   STATE : AVAIL
    IPADDR..PORT : 10.10.1.1..8021
    SYSTEM NAME : SYS1A     SITE : PLEX1   STATE : UNAVAIL
    IPADDR..PORT : 10.10.1.1..8021
    SYSTEM NAME : SYS1B     SITE : PLEX1   STATE : AVAIL
    IPADDR..PORT : 10.20.1.1..8021
    SYSTEM NAME : SYS2A     SITE : PLEX2   STATE : AVAIL
    IPADDR..PORT : 10.20.1.1..8021
    SYSTEM NAME : SYS2B     SITE : PLEX2   STATE : AVAIL
 6 OF 6 RECORDS DISPLAYED
```

The following information describes the fields in the previous sample display.

Field name
Descriptions

TYPE The type of workload. Type values are shown as follows:

ACTIVE/STANDBY
Indicates that the workload has been configured so that it can be activated to only one site at any one time.

ACTIVE/QUERY
Indicates that the workload has been configured so that it can be activated to both sites at the same time.

WORKLOAD NAME
The name of the workload as defined in the cross_sysplex_list, mq_manager_list, or sna_application_list Advisor configuration statement.

STATE
The state of the workload. The state values are shown as follows:

ACTIVE
Indicates that the workload has been activated to the specified site. For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor notifies first-tier load balancers to route all inbound requests for this workload to the specified site. For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies Lifeline Agents on the active site to change the queue rank of each MQ cluster queue in the workload to a '1' and start the MQ cluster receiver channel.

QUIESCED
Indicates that the workload has been quiesced to both sites. For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor notifies first-tier load balancers to not route any inbound requests for this workload. For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies Lifeline Agents on the active site to change the queue rank of each MQ cluster queue in the workload to a '0' and stop the MQ cluster receiver channel.

DEACTIVATED
Indicates that the workload has been deactivated on both sites. For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor resets any existing connections for this workload on systems where active Agents existed on the previously active site when the workload was deactivated. For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies Lifeline Agents on the previously active site to determine if any MQ cluster receiver channels are not stopped and if any messages exist on any MQ cluster queue for the workload.

SITE The MVS sysplex name where the workload is active. If the state of the workload is QUIESCED or DEACTIVATED, the SITE value is set to N/A. For Active/Query workloads, if the workload is active on both sites, a separate line for each site is displayed.

ASSOCIATED WORKLOAD
For workloads of type Active/Query, the associated Active/Standby workload.

REPLICATION STATE
For workloads of type Active/Query, the current state of data replication for the associated Active/Standby workload. See the specific database replication product documentation for information about how to configure replication latency thresholds. The state values are shown as follows:

NORMAL
Indicates that the replication latency is within the acceptable threshold that was configured for database replication for this workload.

CONSTRAINED
Indicates that the replication latency is within 80% of the maximum threshold that was configured for database replication for this workload.

CRITICAL
Indicates that the replication latency is within 90% of the maximum threshold that was configured for database replication for this workload.

ACUTE
Indicates that the replication latency has exceeded the maximum threshold that was configured for database replication for this workload.

UNKNOWN
Indicates that the replication latency value has either not been reported by the database replication product, or the database replication product cannot determine the current replication latency state.

IPADDR..PORT
The IP address and port number that the server application is listening on. The IP address can be an IPv4 or an IPv6 address.

SYSTEM NAME
The MVS system name of the system where the server application exists. This value is N/A if the system is not known.

SITE The MVS sysplex name of the site where the server application exists.

STATE
The status of the server application. The state values are shown as follows:

AVAIL
Indicates that the server application is available on the specified system and is able to process workload requests.

UNAVAIL
Indicates that the server application is not available on the specified system and is not able to process workload requests. Possible reasons for the server application being unavailable include not being active on the specified system or quiesced by the MVS operator.

A WARNING message with the reason the server application is unavailable is logged. If syslogd was started, examine the syslogd file for this message. Otherwise, if internal trace is being used, dump and examine the internal trace for this message.

UNREG
Indicates that a first-tier load balancer did not register a member in the load balancer application group mapping to this workload's server application. The server application is defined in the cross_sysplex_list or intermediary_node_list Advisor configuration statement. No information about this server application is gathered by an Agent. When the Advisor determines whether a workload is available, the unregistered group members and their server applications are not considered.

ZLINUX SERVERS
Information about the Linux on z Systems server applications that process a workload.

HOST The name of the Linux on z Systems guest where the server application exists.

IPADDR..PORT
The IP address and port number that the Linux on z Systems server application is listening on. The IP address can be an IPv4 or an IPv6 address.

SYSTEM ID
The z/VM system identifier of the system where the Linux on z Systems guest resides.

SITE The name of the site where the Linux on z Systems server application exists. This value is blank when the Linux on z Systems guest is not available.

STATE
The status of the Linux on z Systems server application. The state values are shown as follows:

AVAIL
Indicates that the Linux on z Systems server application is available and active on the specified host and is able to process workload requests.

UNAVAIL
Indicates that the Linux on z Systems server application is not available on the specified host and is not able to process workload requests. If the system identifier is not available (N/A), the server application was not reported by any Linux on z Systems Management Agent in the specified site.

A WARNING message with the reason the server application is unavailable is logged. If syslogd was started, examine the syslogd file for this message. Otherwise, if internal trace is being used, dump and examine the internal trace for this message.

UNREG
Indicates that a first-tier load balancer did not register a member in the load balancer application group mapping to this workload's server application. The server application is defined in the cross_sysplex_list or intermediary_node_list Advisor configuration statement. No information about this server application is gathered by an Agent. When the Advisor determines whether a workload is available, the unregistered group members and their server applications are not considered.

SNA APPLICATIONS
Information about the SNA applications that process a workload.

APPL The SNA application name. The type of SNA application name displayed can be one of the following:

- SNA model application name specified in the sna_application_list Advisor configuration statement.
- SNA application name specified in the sna_application_list Advisor configuration statement.
- SNA dynamic application name built from the SNA model application name specified in the sna_application_list Advisor configuration statement.

SYSTEM NAME
The MVS system name of the system where the SNA application exists. This value is N/A if the system is not known or if APPL is a SNA model application name.

SITE The MVS sysplex name of the site where the SNA application exists.

STATE
The status of the SNA application. The state values are shown as follows:

AVAIL
Indicates that the SNA application is available and active on the specified system and is able to process workload requests.

UNAVAIL
Indicates that the SNA application is not available on the specified host and is not able to process workload requests. If the system name is not available (N/A), the SNA application was not reported by any z/OS Agent in the specified site.

A WARNING message with the reason the SNA application is unavailable is logged. If syslogd was started, examine the syslogd file for this message. Otherwise, if internal trace is being used, dump and examine the internal trace for this message.

UNREG
Indicates that a first-tier load balancer did not register a member in the load balancer application group mapping to this workload's server application. The server application is defined in the cross_sysplex_list or intermediary_node_list Advisor configuration statement. No information about this server application is gathered by an Agent. When the Advisor determines whether a workload is available, the unregistered group members and their server applications are not considered.

MODEL
Indicates that APPL is a SNA model application name.

MQ QUEUE MANAGERS
Information about the MQ queue managers that process a workload.

QMGR
The name of the MQ queue manager.

TRANSDEPTH
For the MQ cluster queues defined on this MQ queue manager for the workload, the depth of the transfer-eligible queue with the most messages currently queued. Any queues defined with the EXCLUDE keyword in the mq_manager_list Advisor configuration statement are not checked when determining TRANSDEPTH.

IPADDR..PORT
The IP address and port number that the MQ queue manager is listening on for this workload's MQ cluster receiver channel. The IP address can be an IPv4 or an IPv6 address. If multiple cluster receiver channels and listeners are configured for the MQ queue manager's MQ cluster, an IPADDR..PORT entry is displayed for each listener.

SYSTEM NAME
The MVS system name of the system where the MQ queue manager exists. This value is N/A if the MQ queue manager was not reported by any Lifeline Agent.

SITE The MVS sysplex name of the site where the MQ queue manager exists.

QUEUE
The name of an MQ cluster queue that is defined on this MQ queue manager. If the name of a queue exceeds 44 characters, only the first 41 characters will be displayed, followed by "...". See *IBM MQ: Administering IBM MQ* for information about how to display the full MQ cluster queue name.

STATE
The status of the MQ queue manager. The state values are shown as follows:

AVAIL
Indicates that the MQ queue manager is available on the specified system and is able to process messages for the workload on the specified MQ cluster queue.

UNAVAIL
Indicates that the MQ queue manager is not able to process messages for the workload on the specified system and MQ cluster queue. If the system name is not available (N/A), the MQ queue manager was not reported by any z/OS Agent in the specified site.

A WARNING message with the reason the MQ queue manager is unavailable is logged. If syslogd was started, examine the syslogd file for this message. Otherwise, if internal trace is being used, dump and examine the internal trace for this message.

The following example shows a sample display when you issue `F AQSADV,DISPLAY,WORKLOAD,STATUS`.

```
F AQSADV,DISPLAY,WORKLOAD,STATUS
   AQS0149I WORKLOAD STATUS
   TYPE : ACTIVE/STANDBY
    WORKLOAD NAME : WORKLOAD1
     SITE : PLEX1     STATE : DEACTIVATED  STATUS : AVAIL
     SITE : PLEX2     STATE : ACTIVE       STATUS : AVAIL
    WORKLOAD NAME : WORKLOAD3
     SITE : PLEX1     STATE : ACTIVE       STATUS : AVAIL
     SITE : PLEX2     STATE : DEACTIVATED  STATUS : AVAIL
    WORKLOAD NAME : WORKLOAD4
     SITE : PLEX1     STATE : ACTIVE       STATUS : AVAIL
     SITE : PLEX2     STATE : DEACTIVATED  STATUS : UNAVAIL
    WORKLOAD NAME : WORKLOAD5
     SITE : PLEX1     STATE : ACTIVE       STATUS : AVAIL
     SITE : PLEX2     STATE : DEACTIVATED  STATUS : AVAIL
   TYPE : ACTIVE/QUERY
    WORKLOAD NAME : WORKLOAD2
     SITE : PLEX1     STATE : ACTIVE       STATUS : AVAIL
     SITE : PLEX2     STATE : ACTIVE       STATUS : AVAIL
   5 OF 5 RECORDS DISPLAYED
```

The following information describes the fields in the previous sample display.

Field name
Descriptions

TYPE The type of workload. Type values are shown as follows:

ACTIVE/STANDBY
Indicates that the workload has been configured so that it can be activated to only one site at any one time.

ACTIVE/QUERY
Indicates that the workload has been configured so that it can be activated to both sites at the same time.

WORKLOAD NAME
The name of the workload as defined in the cross_sysplex_list, mq_manager_list, or sna_application_list Advisor configuration statement.

SITE The MVS sysplex name where the workload is configured. A separate line for each site is displayed.

STATE
The state of the workload. The state values are shown as follows:

ACTIVE
Indicates that the workload has been activated to the specified site. For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor notifies first-tier load balancers to route all inbound requests for this workload to the specified site. For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies Lifeline Agents on the active site to change the queue rank of each MQ cluster queue in the workload to a '1' and start the MQ cluster receiver channel.

QUIESCED
Indicates that the workload has been quiesced on the specified site. For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor notifies first-tier load balancers to not route any inbound requests for this workload to the specified site. For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies Lifeline Agents on the specified site to change the queue rank of each MQ cluster queue in the workload to a '0' and stop the MQ cluster receiver channel.

DEACTIVATED
Indicates that the workload has been deactivated on the specified site. For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor resets any existing connections for this workload on systems where active Agents existed when the workload was deactivated. For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies Lifeline Agents on the specified site to determine if any messages exist on any MQ cluster queue for the workload.

STATUS
The status of the workload. The status values are shown as follows:

AVAIL
Indicates one of the following:

- For workloads defined in the cross_sysplex_list Advisor configuration statement, both of the following conditions are true:
  - At least one server application is available for the workload and is able to process workload requests on the specified site.
  - If the workload is specified in the query_workload_list Advisor configuration statement, the replication latency state

for the associated Active/Standby workload is NORMAL, CONSTRAINED, or CRITICAL.

- For workloads defined in the sna_application_list Advisor configuration statement, all of the following conditions are true:
  - At least one SNA application is available for the workload and is able to process workload requests on the specified site.
  - If the workload is configured with monitored intermediary nodes, at least one intermediary node is available for the workload and is able to process workload requests on the specified site.
  - If the workload is specified in the query_workload_list Advisor configuration statement, the replication latency state for the associated Active/Standby workload is NORMAL, CONSTRAINED, or CRITICAL.
- For workloads defined in the management_guest_list Advisor configuration statement, both of the following conditions are true:
  - At least one server application on z/OS is available for the workload and is able to process workload requests on the specified site.
  - At least one server application on Linux on z Systems is available for the workload and is able to process workload requests on the specified site.
- For workloads defined in the mq_manager_list Advisor configuration statement, at least one MQ cluster queue for each configured MQ cluster queue is available for the workload and is able to receive workload messages on the specified site.

UNAVAIL

Indicates one of the following:

- For workloads defined in the cross_sysplex_list Advisor configuration statement, either of the following conditions is true:
  - No server application is available for the workload to process workload requests on the specified site.
  - If the workload is specified in the query_workload_list Advisor configuration statement, the replication latency state for the associated Active/Standby workload is ACUTE or UNKNOWN.
- For workloads defined in the sna_application_list Advisor configuration statement, at least one of the following conditions is true:
  - No SNA application is available for the workload to process workload requests on the specified site.
  - If the workload is configured with monitored intermediary nodes, no intermediary node is available for the workload to process workload requests on the specified site.
  - If the workload is specified in the query_workload_list Advisor configuration statement, the replication latency state for the associated Active/Standby workload is ACUTE or UNKNOWN.

- For workloads defined in the management_guest_list Advisor configuration statement, either of the following conditions is true:
  - No server application on z/OS is available for the workload to process workload requests on the specified site.
  - No server application on Linux on z Systems is available for the workload to process workload requests on the specified site.
- For workloads defined in the mq_manager_list Advisor configuration statement, no MQ cluster queue for at least one configured MQ cluster queue is available for the workload to receive workload messages on the specified site.
- For Active/Query workloads, the associated Active/Standby workload was never activated.

The following example shows a sample display when you issue `F AQSADV,DISPLAY,WORKLOAD=WORKLOAD1`.

```
F AQSADV,DISPLAY,WORKLOAD=WORKLOAD1
AQS0145I WORKLOAD SUMMARY
TYPE : ACTIVE/STANDBY
 WORKLOAD NAME : WORKLOAD1
  STATE : ACTIVE
   SITE : PLEX2
1 OF 1 RECORDS DISPLAYED
```

See the example when a **F AQSADV,DISPLAY,WORKLOAD** command is issued for information that describes the fields in this sample display.

The following example shows a sample display when you issue `F AQSADV,DISPLAY,WORKLOAD=*ALL_AQ*,DETAIL`.

```
F AQSADV,DISPLAY,WORKLOAD=*ALL_AQ*,DETAIL
AQS0146I WORKLOAD DETAILS
TYPE : ACTIVE/QUERY
  WORKLOAD NAME : WORKLOAD2
   STATE : ACTIVE
    SITE : PLEX1
    SITE : PLEX2
  ASSOCIATED WORKLOAD : WORKLOAD1
  REPLICATION STATE   : NORMAL
 SERVERS:
  IPADDR..PORT : 10.10.1.1..8020
   SYSTEM NAME : SYS1A     SITE : PLEX1   STATE : AVAIL
  IPADDR..PORT : 10.10.1.1..8020
   SYSTEM NAME : SYS1B     SITE : PLEX1   STATE : AVAIL
  IPADDR..PORT : 10.20.1.1..8020
   SYSTEM NAME : SYS2A     SITE : PLEX2   STATE : AVAIL
  IPADDR..PORT : 10.20.1.1..8020
   SYSTEM NAME : SYS2B     SITE : PLEX2   STATE : AVAIL
  IPADDR..PORT : 10.10.1.1..8021
   SYSTEM NAME : SYS1A     SITE : PLEX1   STATE : UNAVAIL
  IPADDR..PORT : 10.10.1.1..8021
   SYSTEM NAME : SYS1B     SITE : PLEX1   STATE : AVAIL
  IPADDR..PORT : 10.20.1.1..8021
   SYSTEM NAME : SYS2A     SITE : PLEX2   STATE : AVAIL
  IPADDR..PORT : 10.20.1.1..8021
   SYSTEM NAME : SYS2B     SITE : PLEX2   STATE : AVAIL
1 OF 1 RECORDS DISPLAYED
```

See the example when a **F AQSADV,DISPLAY,WORKLOAD,DETAIL** command is issued for information that describes the fields in this sample display.

The following example shows a sample display when you issue F AQSADV,DISPLAY,WORKLOAD=WORKLOAD1,STATUS.

```
F AQSADV,DISPLAY,WORKLOAD=WORKLOAD1,STATUS
   AQS0149I WORKLOAD STATUS
   TYPE : ACTIVE/STANDBY
    WORKLOAD NAME : WORKLOAD1
     SITE : PLEX1     STATE : DEACTIVATED  STATUS : AVAIL
     SITE : PLEX2     STATE : ACTIVE       STATUS : AVAIL
   1 OF 1 RECORDS DISPLAYED
```

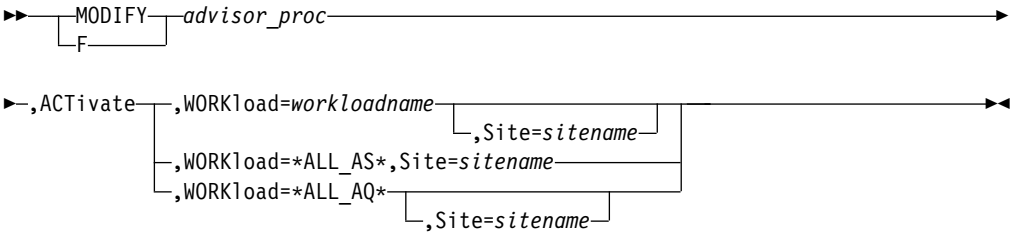
See the example when a the example when a **F AQSADV,DISPLAY,WORKLOAD,STATUS** command is issued for information that describes the fields in this sample display.

MODIFY *advisor_proc*,ACTivate command: Activate workloads

Use the MODIFY *advisor_proc*,ACTivate command to activate a workload. For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, force the Lifeline Advisor to signal first-tier load balancers that new connections for the specified workload or for all the workloads can be routed to the requested site. For workloads defined in the mq_manager_list Advisor configuration statement, force the Lifeline Advisor to signal Lifeline Agents on the active site to change the queue rank of each MQ cluster queue in the workload to a '1', set the MQ cluster receiver channel weight based on WLM recommendations, and start the workload's MQ cluster receiver channel.

Rule: You can issue this command only from the primary Advisor.

Format



Parameters

advisor_proc
Indicates the member name of the cataloged procedure used to start the Advisor.

ACTivate
Signals the first-tier load balancers that a workload can be distributed to a site.

WORKload=

workloadname
Specifies the name of the workload to be activated. The name must match one of the workload names specified in the cross_sysplex_list , mq_manager_list, or sna_application_list Advisor configuration statement. The *workloadname* value must not exceed 64 characters in length.

Rules:

- You must quiesce the specified workload before you issue the command to activate it.

- You must have at least one active Agent on the target site.
- For Active/Standby workloads, if active connections remain after you quiesce the specified workload on the alternate site, you must deactivate the workload before you issue the command to activate it on the target site.

ALL_AS
Indicates that all the Active/Standby workloads specified in the cross_sysplex_list, mq_manager_list, and sna_application_list Advisor configuration statements are to be activated on the requested site.

Rules:
- You must quiesce all the Active/Standby workloads before you issue the command to activate them.
- You must have at least one active Agent on the target site.
- If active connections remain for one or more of the Active/Standby workloads after you quiesce the workloads on the alternate site, you must deactivate the applicable workloads before you issue the command to activate them on the target site.

ALL_AQ
Indicates that all the Active/Query workloads specified in the cross_sysplex_list and sna_application_list Advisor configuration statements are to be activated on the requested site if specified, or on both sites.

Rule: You must have at least one active Agent on the requested target sites.

Guideline: *ALL* is deprecated and, if specified, is processed like *ALL_AS*.

Site=*sitename*
Specifies the name of the site where the workload is to be distributed. The name must match one of the site names specified in the cross_sysplex_list, mq_manager_list, or sna_application_list Advisor configuration statement. The *sitename* value must not exceed 8 characters in length.

For an Active/Query workload, the Site keyword is optional. If not specified, the workload is activated on both sites.

Examples

The following example shows a sample display when you activate an Active/Standby workload by issuing `F AQSADV,ACTIVATE,WORKLOAD=WORKLOAD1,SITE=PLEX1` on the primary Advisor.

```
F AQSADV,ACTIVATE,WORKLOAD=WORKLOAD1,SITE=PLEX1
AQS0153I WORKLOAD WORKLOAD1 ACTIVATED ON SITE PLEX1
```

The following example shows a sample display when you activate an Active/Query workload by issuing `F AQSADV,ACTIVATE,WORKLOAD=WORKLOAD2` on the primary Advisor.

```
F AQSADV,ACTIVATE,WORKLOAD=WORKLOAD2
AQS0155I WORKLOAD WORKLOAD2 ACTIVATED
```

The following example shows a sample display when you activate all Active/Standby workloads by issuing `F AQSADV,ACTIVATE,WORKLOAD=*ALL_AS*,SITE=PLEX1` on the primary advisor.

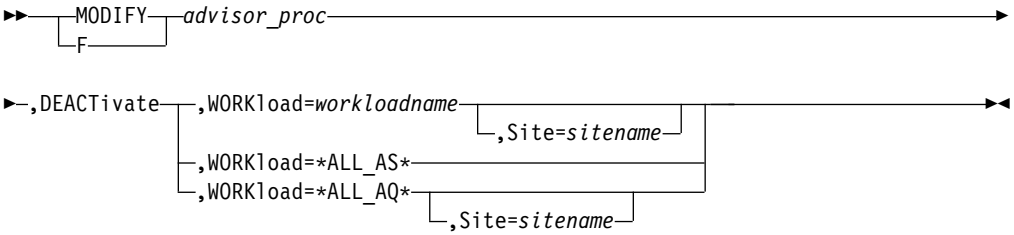
```
F AQSADV,ACTIVATE,WORKLOAD=*ALL_AS*,SITE=PLEX1
AQS0201I ALL MATCHING WORKLOADS ACTIVATED ON SITE PLEX1
```

MODIFY *advisor_proc*,DEACTivate command: Deactivate workloads

Use the MODIFY *advisor_proc*,DEACTivate command to deactivate a workload. For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, force the Lifeline Advisor to reset all the existing connections for the specified workload or for all workloads. For workloads defined in the mq_manager_list Advisor configuration statement, force the Lifeline Advisor to signal Lifeline Agents on the previously active site to verify each MQ cluster receiver channel is stopped and to check for existing messages on each MQ cluster queue in the workload.

Rule: You can issue this command only from the primary Advisor.

Format



Parameters

advisor_proc
Indicates the member name of the cataloged procedure used to start the Advisor.

DEACTivate
Signals the Advisor that a workload needs to be deactivated.

WORKload=

workloadname
Specifies the name of the workload to be deactivated. The name must match one of the workload names specified in the cross_sysplex_list, mq_manager_list, or sna_application_list Advisor configuration statement. The *workloadname* value must not exceed 64 characters in length.

Rule: You must quiesce the specified workload on the target site before you issue the command to deactivate it.

ALL_AS
Indicates that all the Active/Standby workloads specified in the cross_sysplex_list, mq_manager_list, or sna_application_list Advisor configuration statement are to be deactivated.

Rule: You must quiesce all the Active/Standby workloads on the target site before you issue the command to deactivate them.

ALL_AQ
Indicates that all the Active/Query workloads specified in the

cross_sysplex_list and sna_application_list Advisor configuration statements are to be deactivated on the requested site if specified, or on both sites.

Rule: You must quiesce all the Active/Query workloads on the target sites before you issue the command to deactivate them.

Guideline: *ALL* is deprecated and, if specified, is processed like *ALL_AS*.

Site=*sitename*
Specifies the name of the site where the Active/Query workload is to be deactivated. The name must match one of the site names specified in the cross_sysplex_list Advisor configuration statement. The *sitename* value must not exceed 8 characters in length. The Site keyword is optional. If not specified, the workload is deactivated on both sites.

For an Active/Standby workload, the Site keyword is not allowed. The workload is deactivated on the site where the workload was last quiesced.

Examples

The following example shows a sample display when you deactivate an Active/Standby workload by issuing `F AQSADV,DEACTIVATE,WORKLOAD=WORKLOAD1` on the primary Advisor.

```
F AQSADV,DEACTIVATE,WORKLOAD=WORKLOAD1
AQS0155I WORKLOAD WORKLOAD1 DEACTIVATED
```

The following example shows a sample display when you deactivate an Active/Query workload by issuing `F AQSADV,DEACTIVATE,WORKLOAD=WORKLOAD2` on the primary Advisor.

```
F AQSADV,DEACTIVATE,WORKLOAD=WORKLOAD2
AQS0155I WORKLOAD WORKLOAD2 DEACTIVATED
```

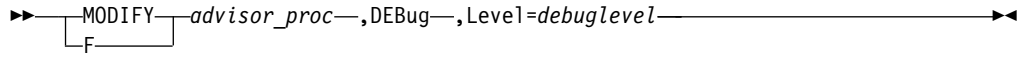
The following example shows a sample display when you issue `F AQSADV,DEACTIVATE,WORKLOAD=*ALL_AS*` on the primary Advisor.

```
F AQSADV,DEACTIVATE,WORKLOAD=*ALL_AS*
AQS0202I ALL MATCHING WORKLOADS DEACTIVATED
```

MODIFY *advisor_proc*,DEBug command: Change the debug level

Use the `MODIFY advisor_proc,DEBug` command to change the debug level that is in effect for the Lifeline Advisor.

Format



Parameters

advisor_proc
Indicates the member name of the cataloged procedure used to start the Advisor.

DEBug,Level=*debuglevel*
Changes the debug level in effect for this Advisor. The debug level that you

can set is the sum of one or more levels of the debug messages to be logged. See "Debug levels" on page 73 for information about debug level values.

Example

The following example shows a sample display when you issue `F AQSADV,DEBUG,LEVEL=127` on the Advisor.

```
F AQSADV,DEBUG,LEVEL=127
AQS0138I LLADVSR DEBUG LEVEL UPDATED
```

MODIFY *advisor_proc*,DUMPLog command: Dump the internal debug records

Use the `MODIFY advisor_proc,DUMPLog` command to dump the internal trace to the UNIX System Services file specified by the AQSTRACE DD card in the Advisor started procedure.

Format

Parameters

advisor_proc
Indicates the member name of the cataloged procedure used to start the Advisor.

DUMPLog
Signals the Advisor that the internal trace records need to be dumped. Any existing data in the target UNIX System Services file will be overwritten.

Example

The following example shows a sample display when you issue `F AQSADV,DUMPLOG` on the Advisor.

```
F AQSADV,DUMPLOG
AQS0204I LLADVSR DUMP INTERNAL LOG COMMAND SUCCESSFUL
```

MODIFY *advisor_proc*,QUIESCE command: Quiesce workloads

Use the `MODIFY advisor_proc,QUIESCE` command to quiesce a workload. For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, force the Lifeline Advisor to signal the first-tier load balancers that no new connections are to be routed for the specified workload or for all workloads. For workloads defined in the mq_manager_list Advisor configuration statement, force the Lifeline Advisor to signal Lifeline Agents to change the queue rank of each MQ cluster queue in the workload to a '0', set the MQ cluster receiver channel weight to '1', and stop the workload's MQ cluster receiver channel.

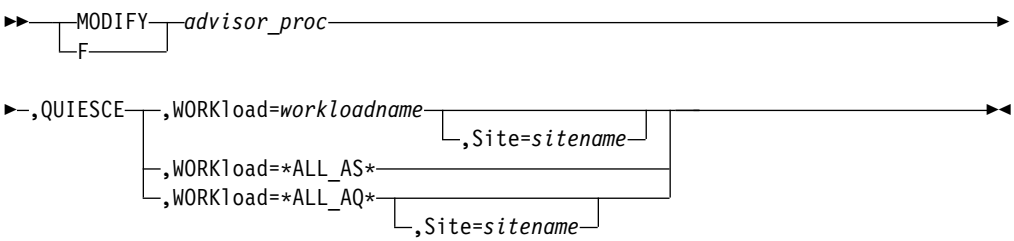
Notes:

- For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, existing connections for this workload will continue to be routed.

- For workloads defined in the mq_manager_list Advisor configuration statement, no new messages will be sent to the MQ queue managers that host the MQ cluster queues for the workload. MQ server applications will continue to be able to process messages from the MQ cluster queues for the workload.

Rule: You can issue this command only from the primary Advisor.

Format



Parameters

advisor_proc
Indicates the member name of the cataloged procedure used to start the Advisor.

QUIESCE
Signals the first-tier load balancers that a workload can no longer be distributed to a site.

WORKload=

workloadname
Specifies the name of the workload to be quiesced. The name must match one of the workload names specified in the cross_sysplex_list, mq_manager_list, or sna_application_list Advisor configuration statement. The *workloadname* value must be less than or equal to 64 characters in length.

ALL_AS
Indicates that all the Active/Standby workloads specified in the cross_sysplex_list, mq_manager_list, or sna_application_list Advisor configuration statement are to be quiesced.

ALL_AQ
Indicates that all the Active/Query workloads specified in the cross_sysplex_list and sna_application_list Advisor configuration statements are to be quiesced on the requested site if specified, or on both sites.

Guideline: *ALL* is deprecated and, if specified, is processed like *ALL_AS*.

Site=*sitename*
Specifies the name of the site where the Active/Query workload is to be quiesced. The name must match one of the site names specified in the cross_sysplex_list Advisor configuration statement. The *sitename* value must not exceed 8 characters in length. The Site keyword is optional. If not specified, the workload is quiesced on both sites.

For an Active/Standby workload, the Site keyword is not allowed. The workload is quiesced on the site where it was previously activated.

Examples

The following example shows a sample display when you quiesce an Active/Standby workload by issuing `F AQSADV,QUIESCE,WORKLOAD=WORKLOAD1` on the primary Advisor.

```
F AQSADV,QUIESCE,WORKLOAD=WORKLOAD1
AQS0155I WORKLOAD WORKLOAD1 QUIESCED
```

The following example shows a sample display when you quiesce an Active/Query workload by issuing `F AQSADV,QUIESCE,WORKLOAD=WORKLOAD2` on the primary Advisor.

```
F AQSADV,QUIESCE,WORKLOAD=WORKLOAD2
AQS0155I WORKLOAD WORKLOAD2 QUIESCED
```

The following example shows a sample display when you quiesce all Active/Standby workloads by issuing `F AQSADV,QUIESCE,WORKLOAD=*ALL_AS*` on the primary Advisor.

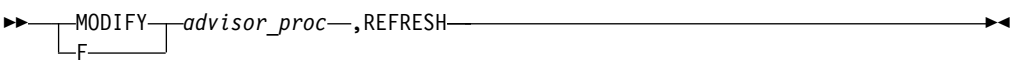
```
F AQSADV,QUIESCE,WORKLOAD=*ALL_AS*
AQS0202I ALL MATCHING WORKLOADS QUIESCED
```

MODIFY *advisor_proc*,REFRESH command: Update configuration

Use the `MODIFY` ***advisor_proc***`,REFRESH` command to force the Lifeline Advisor to read the configuration file again and apply any changes to its active configuration.

See "Lifeline Advisor configuration statements" on page 93 for the configuration statements that are refreshable.

Format



Parameters

advisor_proc
Indicates the member name of the cataloged procedure used to start the Advisor.

REFRESH
Forces this Advisor to read the configuration file again and apply any changes to its active configuration.

Example

The following example shows a sample display when you issue `F AQSADV,REFRESH`.

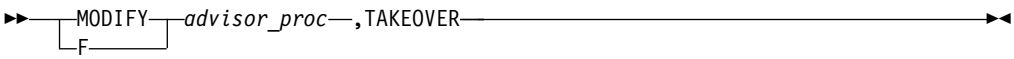
```
F AQSADV,REFRESH
AQS0181I LLADVSR CONFIGURATION UPDATED
```

MODIFY *advisor_proc*,TAKEOVER command: Take over primary Advisor responsibilities

Use the MODIFY *advisor_proc*,TAKEOVER command to force the Lifeline Advisor to take over primary Advisor responsibilities.

Rule: You can issue this command only from the secondary Advisor.

Format



Parameters

advisor_proc
Indicates the member name of the cataloged procedure used to start the Advisor.

TAKEOVER
Forces this Advisor to takeover primary Advisor responsibilities.

Example

The following example shows a sample display when you issue F AQSADV,TAKEOVER on the secondary Advisor.

```
F AQSADV,TAKEOVER
AQS0169I ADVISOR TAKEOVER SCHEDULED
AQS0166I ADVISOR IS NOW IN PRIMARY ROLE
```

MODIFY *advisor_proc*,TRANSfer command: Transfer messages for MQ workloads

Use the MODIFY *advisor_proc*,TRANSfer command for one of the following purposes:

- To transfer messages for MQ workloads stranded on one site over to the alternate site
- To determine the status of a prior MODIFY *advisor_proc*,TRANSfer command
- To test whether a subsequent MODIFY *advisor_proc*,TRANSfer command will be successful
- To cancel a MODIFY *advisor_proc*,TRANSfer command in progress

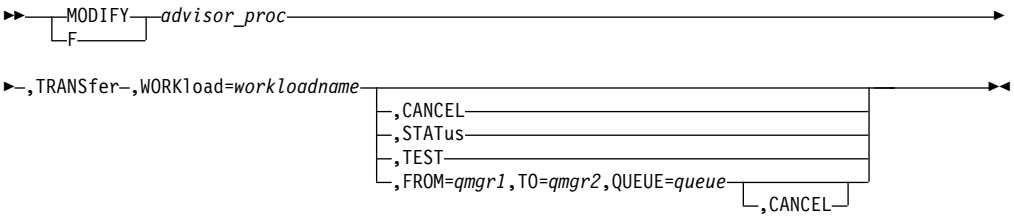
Note: This command is valid only for workloads defined in the mq_manager_list Advisor configuration statement.

Rules:

- You can issue this command only from the primary Advisor.
- You cannot issue this command to start a new transfer of messages while a MODIFY *advisor_proc*,TAKEOVER command is being processed.
- You cannot issue this command to start a new transfer of messages if another MODIFY *advisor_proc*,TRANSfer command is in progress for the same workload and MQ cluster queue.

- You can only issue the command to transfer all messages for an MQ workload if the workload is quiesced and was previously active.

Format



Parameters

advisor_proc
Indicates the member name of the cataloged procedure used to start the Advisor.

TRANSfer

Depending on the parameters specified:

- Signals the Agents to transfer queued messages on MQ cluster queues defined for the workload
- Checks the status of a prior `MODIFY` *`advisor_proc`*`,TRANSfer` command
- Tests whether a subsequent `MODIFY` *`advisor_proc`*`,TRANSfer` command would succeed
- Cancels a `MODIFY` *`advisor_proc`*`,TRANSfer` command in progress

The MQ cluster queues selected to have their messages transferred is based on the keywords used on the `MODIFY` *`advisor_proc`*`,TRANSfer` command:

- If FROM=*qmgr1*,TO=*qmgr2*,QUEUE=*queue* is specified, all messages residing on MQ cluster queue *queue* are transferred from MQ queue manager *qmgr1* to MQ queue manager *qmgr2*.
- If FROM=*qmgr1*,TO=*qmgr2*,QUEUE=*queue* is not specified, all messages residing on the set of non-excluded MQ cluster queues defined for the workload's MQ cluster are transferred. The entries in the mq_manager_list Advisor configuration statement are used to determine the FROM and TO MQ queue managers. See Chapter 6, “Multi-site Workload Lifeline configuration statements,” on page 93 for more information about the mq_manager_list statement.

WORKload=

workloadname
Specifies the name of the workload that queued messages are to be transferred for.

Rules:

- The name must match one of the workload names specified in the mq_manager_list Advisor configuration statement.
- The workloadname value must be less than or equal to 64 characters in length.
- *ALL_AS* or *ALL* cannot be specified as the workload name.

FROM=*qmgr1*,TO=*qmgr2*,QUEUE=*queue*

Specifies the name of the MQ cluster queue that messages are to be transferred for and the names of the source and destination MQ queue managers hosting the MQ cluster queue. The *qmgr1* value represents the source MQ queue manager hosting the MQ cluster queue containing the messages to transfer. The *qmgr2* value represents the destination MQ queue manager hosting the MQ cluster queue that is receiving the transferred messages. The *queue* value represents the name of the MQ cluster queue.

Rules:

- Each MQ queue manager name and MQ cluster queue name must match an MQ queue manager and MQ cluster queue pair specified in the mq_manager_list Advisor configuration statement.
- The *qmgr1* and *qmgr2* values must not exceed 4 characters in length.
- The *queue* value must not exceed 48 characters in length.
- The *qmgr1* and *qmgr2* values must represent MQ queue managers that reside on different sites.

Requirement: If the MQ cluster queue is defined as a mixed-case MQ object to the MQ queue manager, the queue value must be specified using the same mixed-case format and be enclosed in single quotation marks ('). If the queue value is not enclosed in single quotation marks, the Lifeline Advisor converts the queue name to upper-case characters.

Notes:

- You can only issue this command with the FROM=*qmgr1*,TO=*qmgr2*,QUEUE=*queue* parameter for an MQ workload only the workload is quiesced on the site where the source MQ queue manager *qmgr1* resides.
- The FROM=*qmgr1*,TO=*qmgr2*,QUEUE=*queue* parameter is optional. If not specified, all non-excluded messages residing on the set of MQ cluster queues defined for the workload are transferred.

CANCEL

Cancels a prior `MODIFY advisor_proc,TRANSfer` command.

STATus

Checks the status of the results of prior `MODIFY advisor_proc,TRANSfer` commands for the workload. The status of each transfer request of messages from a source MQ queue manager and MQ cluster queue for that workload is displayed. The status is one of the following:

- COMPLETED - The messages were successfully transferred.
- FAILED - The messages were not successfully transferred.
- IN PROGRESS - The transfer of messages is still in progress.
- CANCELLED - The transfer of messages was cancelled before it could be completed.

The transfer status of a source MQ queue manager and MQ cluster queue for a workload is cleared after the workload is activated, or when another `MODIFY advisor_proc,TRANSfer` command is issued for the workload or the same source MQ queue manager and MQ cluster queue.

Note: If multiple transfers are performed for the same MQ cluster queue, the transfer status for that queue is listed in order from the oldest transfer request to the most recent transfer request.

TEST

Determines if a subsequent MODIFY *advisor_proc,*TRANSfer command for the workload will be successful. No MQ messages are transferred when using this option.

Examples

The following example shows a sample display when you transfer messages from all MQ cluster queues for a workload specified in the mq_manager_list Advisor configuration statement by issuing F AQSADV,TRANSFER,WORKLOAD=WORKLOAD5 on the primary Advisor.

```
F AQSADV,TRANSFER,WORKLOAD=WORKLOAD5
AQS0220I MODIFY TRANSFER COMMAND ACCEPTED – TRANSFER OF QUEUES FOR WORKLOAD
WORKLOAD5 STARTED
```

The following example shows a sample display when you transfer messages from a single MQ cluster queue specified in the mq_manager_list Advisor configuration statement by issuing F AQSADV,TRANSFER,WORKLOAD=WORKLOAD5,FROM=QMG1,TO=QMG2,QUEUE=QUEUE1 on the primary Advisor.

```
F AQSADV,TRANSFER,WORKLOAD=WORKLOAD5,FROM=QMG1,TO=QMG2,QUEUE=QUEUE1
AQS0220I MODIFY TRANSFER COMMAND ACCEPTED – TRANSFER OF QUEUE QUEUE1
ON QUEUE MANAGER QMG1 FOR WORKLOAD WORKLOAD5 STARTED
```

The following example shows a sample display when you check the status of previous MODIFY *advisor_proc,*TRANSFER commands to transfer messages from a single MQ cluster queue for a workload specified in the mq_manager_list Advisor configuration statement by issuing F AQSADV,TRANSFER,WORKLOAD=WORKLOAD5,STATUS on the primary Advisor.

```
F AQSADV,TRANSFER,WORKLOAD=WORKLOAD5,STATUS
AQS0224I TRANSFER SUMMARY
 WORKLOAD NAME : WORKLOAD5
  QUEUE : QUEUE1
   FROM : QMG1  TO : QMG2  STATUS : COMPLETED
  QUEUE : QUEUE2
   FROM : QMG1  TO : QMG2  STATUS : IN PROGRESS
 2 OF 2 RECORDS DISPLAYED
```

The following example shows a sample display when you cancel any previous MODIFY *advisor_proc,*TRANSFER commands to transfer messages for a workload specified in the mq_manager_list Advisor configuration statement that are still in process by issuing F AQSADV,TRANSFER,WORKLOAD=WORKLOAD5,CANCEL on the primary Advisor.

```
F AQSADV,TRANSFER,WORKLOAD=WORKLOAD5,CANCEL
AQS0225I MODIFY TRANSFER COMMAND CANCELLED – TRANSFER OF QUEUES FOR WORKLOAD
WORKLOAD5 STOPPED
```

The following example shows a sample display when you test whether a subsequent MODIFY *advisor_proc,*TRANSFER command will be successful for a workload specified in the mq_manager_list Advisor configuration statement by issuing F AQSADV,TRANSFER,WORKLOAD=WORKLOAD5,TEST on the primary Advisor.

```
F AQSADV,TRANSFER,WORKLOAD=WORKLOAD5,TEST
AQS0226I MODIFY TRANSFER TEST COMMAND SUCCESSFUL
```

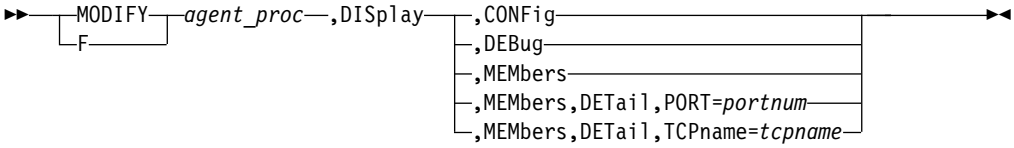
Chapter 8. Lifeline z/OS Agent commands

Use the Lifeline z/OS Agent commands to display Lifeline z/OS Agent information and modify Lifeline z/OS Agent state information.

MODIFY *agent_proc*,DISplay command: Display Lifeline Agent information

Use the `MODIFY` *`agent_proc`*`,DISplay` command to display Lifeline Agent information.

Format



Parameters

`agent_proc`
Indicates the member name of the cataloged procedure used to start the Agent.

`DISplay,CONFig`
Displays the active configuration for this Agent.

`DISplay,DEBug`
Displays the debug level in effect for this Agent.

The debug level displayed is the sum of one or more levels of debug messages being logged. See "Debug levels" on page 73 for more information about the debug levels.

`DISplay,MEMbers`
Displays information about registered local server applications.

`DISplay,MEMbers,DETail`
Displays detailed information about registered local server applications, including the job name and ASID of the server application.

`DISplay,MEMbers,DETail,PORT=`*`portnum`*
Displays detailed information about registered local server applications that are bound to the specified port number. The valid range of the *portnum* is 0 - 65535.

`DISplay,MEMbers,DETail,TCPname=`*`tcpname`*
Displays detailed information about registered local server applications that are associated with the specified TCP/IP stack. The *tcpname* value must be less than or equal to 8 characters in length.

Examples

The following example shows a sample display when you issue `F AQSAGE,DISPLAY,CONFIG`.

```
F AQSAGE,DISPLAY,CONFIG
AQS0144I AGENT CONFIGURATION
VERSION          : Lifeline V2.5   SERVICE LEVEL: PI84240
CONFIG FILENAME  : USER.PROFILES(LBAGECNF)
DEBUG LEVEL      : 7
ADVISOR ID       : 192.10.1.1..8181
HOST CONNECTION  : 192.10.110.1..4000
SITE NAME        : PLEX1
```

The following information describes the fields in the previous sample display.

Field name
Descriptions

VERSION
The current version and release of the Agent.

SERVICE LEVEL
The current APAR service level of the Agent.

CONFIG FILENAME
The configuration file used by this Agent when the Agent was initially started.

DEBUG LEVEL
The debug level currently in effect for this Agent.

ADVISOR ID
The IP address and port number that the primary Advisor listens on for connections from this Agent. The IP address can be an IPv4 or an IPv6 address.

HOST CONNECTION
The source IP address and port number that this Agent uses to connect to the primary Advisor. The IP address can be an IPv4 or an IPv6 address.

SITE NAME
The site where the Agent resides. If the site_name statement is not configured on a z/OS Agent, this information will not be displayed.

The following example shows a sample display when you issue `F AQSAGE,DISPLAY,DEBUG`.

```
F AQSAGE,DISPLAY,DEBUG
AQS0111I LLAGENT DEBUG LEVEL 7
```

The following example shows a sample display when you issue `F AQSAGE,DISPLAY,MEMBERS`.

```
F AQSAGE,DISPLAY,MEMBERS
AQS0114I MEMBER SUMMARY
LB INDEX      : N/A       UUID      : COMPOSITETIER1LB
 GROUP NAME   : GROUP000001
  IPADDR..PORT: 192.10.110.1..5001
   MATCHES    : 001       PROTOCOL  : TCP
   FLAGS      :
 GROUP NAME   : GROUP000002
  IPADDR..PORT: 192.10.110.1..6001
   MATCHES    : 001       PROTOCOL  : TCP
   FLAGS      :
 GROUP NAME   : GROUP000003
  SNA APPL    : NETA.SNAAPPL1  AVAIL : YES
LB INDEX      : N/A       UUID      : COMPOSITETIER2LB
 GROUP NAME   : GROUP000004
  IPADDR..PORT: 10.10.1.1..8020
   MATCHES    : 001       PROTOCOL  : TCP
```

```
    FLAGS      : ANY DISTDVIPA
  GROUP NAME   : GROUP000005
   IPADDR..PORT: 10.10.1.1..8021
    MATCHES    : 000       PROTOCOL  : TCP
    FLAGS      : DISTDVIPA
 MQ CLUSTER    : CLUSTER1
  GROUP NAME   : CLUSTER1-QUEUE1
   IPADDR..PORT: 10.10.1.1..1414
   MATCHES     : 001       PROTOCOL  : TCP
   QMGR NAME   : QMG1
  6 OF 6 RECORDS DISPLAYED
```

The following information describes the fields in the previous sample display.

Field name
Descriptions

LB INDEX
The reference number used to identify the load balancer. The same reference number is used for a load balancer as long as the load balancer remains connected.

The reference number is displayed as N/A if this is a composite load balancer that the Lifeline Advisor creates to send a consolidated list of load balancer application groups to the Lifeline Agent.

UUID A hexadecimal value of the universally unique identifier assigned by the load balancer. This byte array can be up to 64 bytes in length. Only one load balancer with the same UUID can be connected to the primary Advisor at the same time.

If the LB INDEX field is displayed as N/A, the UUID field is for a composite load balancer that the Lifeline Advisor creates to send a consolidated list of load balancer application groups to the Lifeline Agent. The UUID is shown as one of the following character strings:

- "COMPOSITETIER1LB" if the groups in this display are consolidated from registered first-tier load balancer application groups.
- "COMPOSITETIER2LB" if the groups in this display are consolidated from registered second-tier load balancer application groups.

MQ CLUSTER
The name of an IBM MQ Cluster that is hosted by an MQ queue manager on this z/OS system.

GROUP NAME
For load balancer application groups, the name that the Lifeline Advisor creates to represent a group of related target server applications that are consolidated from groups with the same members that one or more external load balancers register. If the members of the load balancer application group are not configured in a failure_detection_groups configuration statement, the group name is selected within the range of GROUP000001 and GROUP999999 and a unique group name is created for each unique registered load balancer application group. If the members of the load balancer application group are configured in a failure_detection_groups configuration statement, the group name matches the group specified in the failure_detection_groups statement.

For MQ cluster queue groups, the name of the group that the Advisor creates for each MQ cluster queue defined for the workload. The group name is the configured MQ cluster name, followed by a hyphen ,“-”, followed by the configured MQ cluster queue name.

IPADDR..PORT
For load balancer application groups, the IP address and port number of a member defined in the registered group.

For MQ cluster queue groups, the IP address and port number that the MQ queue manager is listening on. If multiple cluster receiver channels and listeners are configured for the MQ queue manager's MQ cluster, an IPADDR..PORT entry is displayed for each listener.

The IP address can be an IPv4 or an IPv6 address.

MATCHES
For load balancer application groups, the number of server applications that match the IP address and port number. For the server applications sharing a port, this value can be more than 1. If the value of matches is 0, the Agent finds the IP address of the member reported on an active TCP/IP stack, but does not find a server application listening on that IP address or port number.

For MQ cluster queue groups, matches is 0 if the group's IBM MQ cluster or MQ cluster queue is not defined on the MQ queue manager. The IBM MQ clusters and MQ cluster queues defined on each MQ queue manager are configured on the Advisor in the mq_manager_list configuration statement.

PROTOCOL
The protocol that the member is using. The protocol value is TCP or UDP.

QMGR NAME
The name of an MQ queue manager hosting the IBM MQ cluster and MQ cluster queue mapped by the group name.

FLAGS
Indicators for the member. The flag values are shown as follows:

ANY Indicates that the server application is bound to INADDR_ANY or the unspecified IPv6 address.

DISC Indicates that the Agent is no longer communicating with the Lifeline Advisor.

DISTDVIPA
Indicates that the IP address of the member is a distributable DVIPA. The IP address can be an IPv4 or an IPv6 address.

NODATA
Indicates that the Agent is reporting a temporary value for the Communications Server weight. Two update intervals are needed before the Agent can calculate a proper value for the Communications Server weight.

SDQ Indicates that an operator at the owning Agent quiesced the sysplex distributed DVIPA server application's port, jobname, or TCP/IP stack with a VARY TCPIP,,SYSPLEX,QUIESCE command. No new workload connections are routed to this server application. Use the VARY TCPIP,,SYSPLEX,RESUME command to allow new workload connections to be routed to this server application.

SYSQ, TCPQ, or APPQ
Indicates that the operator has requested that no more work be routed to the quiesced server application. The different flags reflect

the highest level of the quiesce command that applies, and indicates the type of the enable command that must be used to enable the server application.

SYSQ Indicates that the server application was quiesced with the MODIFY *agent_proc*,QUIESCE,SYSTEM command, and that you must use the MODIFY *agent_proc*,ENABLE,SYSTEM command to enable the server application.

TCPQ Indicates that the server application was quiesced with the MODIFY *agent_proc*,QUIESCE,TCPNAME=*tcpname* command, and that you must use the MODIFY *agent_proc*,ENABLE,TCPNAME=*tcpname* command to enable the server application.

APPQ Indicates that the server application was quiesced with the MODIFY *agent_proc*,QUIESCE,PORT=*portnum* command, and that you must use the MODIFY *agent_proc*,ENABLE,PORT=*portnum* command to enable the server application.

V6 Indicates that the server application has specified the IPv6_V6ONLY socket option. Only workload requests from IPv6-enabled clients are able to communicate with the server application.

SNA APPL
The SNA application name.

AVAIL
Indicates whether the SNA application is available to process workload requests. The value YES indicates that the application is available. The value NO indicates that the application is not available.

The following example shows a sample display when you issue F AQSAGE,DISPLAY,MEMBERS,DETAIL.

```
F AQSAGE,DISPLAY,MEMBERS,DETAIL
AQS0115I MEMBER DETAILS
LB INDEX      : N/A       UUID      : COMPOSITETIER1LB
 GROUP NAME   : GROUP000001
  IPADDR..PORT: 192.10.110.1..5001
   MATCHES    : 001       PROTOCOL  : TCP
   FLAGS      :
   TCPNAME    : TCPIP
    JOBNAME   : JOB3      ASID      : 0036 RESOURCE  : 0000096D
 GROUP NAME   : GROUP000002
  IPADDR..PORT: 192.10.110.1..6001
   MATCHES    : 001       PROTOCOL  : TCP
   FLAGS      :
   TCPNAME    : TCPIP
    JOBNAME   : JOB4      ASID      : 0037 RESOURCE  : 0000096E
 GROUP NAME   : GROUP000003
  SNA APPL    : NETA.SNAAPPL1           AVAIL : YES  JOBNAME : JOB5
   SESSION COUNT : 0000000001
LB INDEX      : N/A       UUID      : COMPOSITETIER2LB
 GROUP NAME   : GROUP000004
  IPADDR..PORT: 10.10.1.1..8020
   MATCHES    : 001       PROTOCOL  : TCP
   FLAGS      : ANY DISTDVIPA
   TCPNAME    : TCPIP
    JOBNAME   : JOB1      ASID      : 0034 RESOURCE  : 0000096B
 GROUP NAME   : GROUP000005
```

```
  IPADDR..PORT: 10.10.1.1..8021
   MATCHES    : 000       PROTOCOL  : TCP
   FLAGS      : DISTDVIPA
   TCPNAME    : TCPIP
    JOBNAME   : N/A       ASID      : N/A  RESOURCE  : N/A
MQ CLUSTER    : CLUSTER1
 GROUP NAME   : CLUSTER1-QUEUE1
  IPADDR..PORT: 10.10.1.1..1414
   MATCHES    : 001       PROTOCOL  : TCP
   QMGR NAME  : QMG1
   FLAGS      : ANY
   TCPNAME    : TCPIP
    JOBNAME   : AQS1CHIN  ASID      : 003D RESOURCE  : 0000040E
6 OF 6  RECORDS DISPLAYED
```

The following information describes the fields in the previous sample display.

Field name
Descriptions

LB INDEX
The reference number used to identify the load balancer. The same reference number is used for a load balancer as long as the load balancer remains connected.

The reference number is displayed as N/A if this is a composite load balancer that the Lifeline Advisor creates to send a consolidated list of load balancer application groups to the Lifeline Agent.

UUID A hexadecimal value of the universally unique identifier assigned by the load balancer. This byte array can be up to 64 bytes in length. Only one load balancer with the same UUID can be connected to the primary Advisor at the same time.

If the LB INDEX field is displayed as N/A, the UUID field is for a composite load balancer that the Lifeline Advisor creates to send a consolidated list of load balancer application groups to the Lifeline Agent. The UUID field is shown as one of the following character strings:

- "COMPOSITETIER1LB" if the groups in this display are consolidated from registered first-tier load balancer application groups.
- "COMPOSITETIER2LB" if the groups in this display are consolidated from registered second-tier load balancer application groups.

MQ CLUSTER
The name of an IBM MQ Cluster hosted by an MQ queue manager on this z/OS system.

GROUP NAME
For load balancer application groups, the name that the Lifeline Advisor creates to represent a group of related target server applications that are consolidated from groups with the same members that one or more external load balancers register. If the members of the load balancer application group are not configured in a failure_detection_groups configuration statement, the group name is selected within the range of GROUP000001 and GROUP999999 and a unique group name is created for each unique registered load balancer application group. If the members of the load balancer application group are configured in a failure_detection_groups configuration statement, the group name matches the group specified in the failure_detection_groups statement.

For MQ cluster queue groups, the name of the group that the Advisor creates for each MQ cluster defined for the workload. The group name is

the configured MQ cluster name, followed by a hyphen ,"-", followed by the configured MQ cluster queue name.

IPADDR..PORT
For load balancer application groups, the IP address and port number of a member defined in the registered group.

For MQ cluster queue groups, the IP address and port number that the MQ queue manager is listening on.

The IP address can be an IPv4 or an IPv6 address.

MATCHES
For load balancer application groups, the number of server applications that match the IP address and port number. For server applications sharing a port, this value can be more than 1. If the value of matches is 0, the Agent found the IP address of the member reported on an active TCP/IP stack, but did not find a server application listening on that IP address or port number.

For MQ cluster queue groups, matches is 0 if the group's IBM MQ cluster or MQ cluster queue is not defined on the MQ queue manager. The IBM MQ clusters and MQ cluster queues defined on each MQ queue manager are configured on the Advisor in the mq_manager_list configuration statement.

PROTOCOL
The protocol that the member is using. The protocol value will be TCP or UDP.

QMGR NAME
The name of an MQ queue manager hosting the IBM MQ cluster and MQ cluster queue mapped by the group name.

FLAGS
Indicators for the member. The flag values are shown as follows:

ANY Indicates that the server application is bound to INADDR_ANY or the unspecified IPv6 address.

DISC Indicates that the Agent is no longer communicating with the Lifeline Advisor.

DISTDVIPA
Indicates that the IP address of the member is a distributable DVIPA. The IP address can be an IPv4 or an IPv6 address.

NODATA
Indicates that the Agent is reporting a temporary value for the Communications Server weight. Two update intervals are needed before the Agent can calculate a proper value for the Communications Server weight.

SYSQ, TCPQ, or APPQ
Indicates that the operator has requested that no more work be routed to the quiesced server application. The different flags reflect the highest level of the quiesce command that applies, and indicates the type of the enable command that must be used to enable the server application.

SYSQ Indicates that the server application was quiesced with the `MODIFY` *`agent_proc`*`,QUIESCE,SYSTEM` command, and that

you must use the MODIFY *agent_proc*,ENABLE,SYSTEM command to enable the server application.

TCPQ Indicates that the server application was quiesced with the MODIFY *agent_proc*,QUIESCE,TCPNAME=*tcpname* command, and that you must use the MODIFY *agent_proc*,ENABLE,TCPNAME=*tcpname* command to enable the server application.

APPQ Indicates that the server application was quiesced with the MODIFY *agent_proc*,QUIESCE,PORT=*portnum* command, and that you must use the MODIFY *agent_proc*,ENABLE,PORT=*portnum* command to enable the server application.

V6 Indicates that the server application has specified the IPv6_V6ONLY socket option. Only workload requests from IPv6-enabled clients are able to communicate with the server application.

TCPNAME
The name of the TCP/IP Server stack that owns the IP address for the member.

JOBNAME
The MVS job name of the server application. If there are no server applications matching this member, N/A is displayed.

ASID The MVS address space identifier of the server application. If there are no server applications matching this member, N/A is displayed.

RESOURCE
The identifier used by the TCP/IP stack that uniquely identifies one instance of the server application. The resource identifier is also displayed by the NETSTAT CONN command. If there are no server applications matching this member, N/A is displayed.

SNA APPL
The SNA application name.

AVAIL
Indicates whether the SNA application is available to process workload requests. The value YES indicates that the SNA application is available. The value NO indicates that the SNA application is not available.

JOBNAME
The MVS job name of the SNA application. If no SNA applications match this member, N/A is displayed.

SESSION COUNT
The number of active sessions for the SNA application.

The following example shows a sample display when you issue F AQSAGE,DISPLAY,MEMBERS,DETAIL,PORT=5001.

```
F AQSAGE,DISPLAY,MEMBERS,DETAIL,PORT=5001
AQS0115I MEMBER DETAILS
LB INDEX      : N/A         UUID            : COMPOSITETIER1LB
 GROUP NAME   : GROUP000001
  IPADDR..PORT: 192.10.110.1..5001
   MATCHES    : 001       PROTOCOL  : TCP
```

```
   FLAGS      :
   TCPNAME    : TCPIP
    JOBNAME   : JOB3      ASID      : 0036 RESOURCE  : 0000096D
1 OF 1 RECORDS DISPLAYED
```

The following example shows a sample display when you issue F AQSAGE,DISPLAY,MEMBERS,DETAIL,TCPNAME=TCPIP.

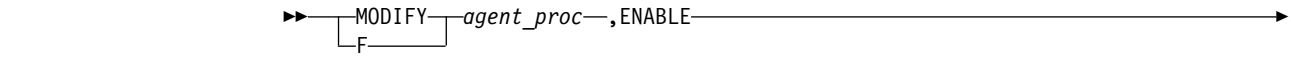
```
F AQSAGE,DISPLAY,MEMBERS,DETAIL,TCPNAME=TCPIP
AQS0115I MEMBER DETAILS
LB INDEX      : N/A         UUID            : COMPOSITETIER1LB
 GROUP NAME   : GROUP000001
  IPADDR..PORT: 192.10.110.1..5001
   MATCHES    : 001       PROTOCOL  : TCP
   FLAGS      :
   TCPNAME    : TCPIP
    JOBNAME   : JOB3      ASID      : 0036 RESOURCE  : 0000096D
 GROUP NAME   : GROUP000002
  IPADDR..PORT: 192.10.110.1..6001
   MATCHES    : 001       PROTOCOL  : TCP
   FLAGS      :
   TCPNAME    : TCPIP
    JOBNAME   : JOB4      ASID      : 0037 RESOURCE  : 0000096E
 GROUP NAME   : GROUP000003
  SNA APPL    : NETA.SNAAPPL1            AVAIL : YES  JOBNAME : JOB5
   SESSION COUNT : 0000000001
LB INDEX      : N/A         UUID            : COMPOSITETIER2LB
 GROUP NAME   : GROUP000004
  IPADDR..PORT: 10.10.1.1..8020
   MATCHES    : 001       PROTOCOL  : TCP
   FLAGS      : ANY DISTDVIPA
   TCPNAME    : TCPIP
    JOBNAME   : JOB1      ASID      : 0034 RESOURCE  : 0000096B
 GROUP NAME   : GROUP000005
  IPADDR..PORT: 10.10.1.1..8021
   MATCHES    : 000       PROTOCOL  : TCP
   FLAGS      : DISTDVIPA
   TCPNAME    : TCPIP
    JOBNAME   : N/A       ASID      : N/A  RESOURCE  : N/A
MQ CLUSTER    : CLUSTER1
 GROUP NAME   : CLUSTER1-QUEUE1
  IPADDR..PORT: 10.10.1.1..1414
   MATCHES    : 001       PROTOCOL  : TCP
   QMGR NAME  : QMG1
   FLAGS      : ANY
   TCPNAME    : TCPIP
    JOBNAME   : AQS1CHIN  ASID      : 003D  RESOURCE : 0000040E
6 OF 6 RECORDS DISPLAYED
```

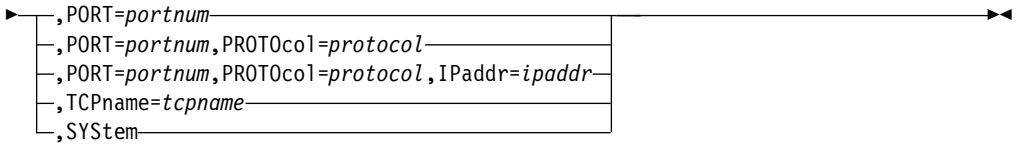
MODIFY *agent_proc*,ENABLE command: Enable server applications

Use the MODIFY *agent_proc*,ENABLE command to mark the server applications as enabled. The Lifeline Agent will notify the Advisor to recommend this server application for new workload requests.

Tip: If more than one server application is sharing a port, all of the server applications are enabled.

Format





Parameters

agent_proc
Indicates the member name of the cataloged procedure used to start the Agent.

ENABLE,PORT=*portnum*
Marks the server applications bound to the specified port number as enabled. The range of the *portnum* value is 0 - 65535.

Rule: If the IP address of the member is a distributable DVIPA when you specify this parameter, you can enable the server applications only by the `VARY TCPIP,,SYSPLEX,RESUME,PORT=portnum` command.

ENABLE,PORT=*portnum*,PROTOcol=*protocol*
Marks the server applications that are bound to the specified port number and use the specified protocol as enabled. The range of the *portnum* value is 0 - 65535. The *protocol* value is TCP or UDP.

Rule: If the IP address of the member is a distributable DVIPA when you specify this parameter, you can enable the server applications only by the `VARY TCPIP,,SYSPLEX,RESUME,PORT=portnum` command.

ENABLE,PORT=*portnum*,PROTOcol=*protocol*,IPaddr=*ipaddr*
Marks the server applications that are bound to the specified port number and use the specified protocol and the specified IP address as enabled. The range of the *portnum* value is 0 - 65535. The *protocol* value is TCP or UDP. The IP address can be an IPv4 or an IPv6 address.

Rule: If the IP address of the member is a distributable DVIPA when you specify this parameter, you can enable the server applications only by the `VARY TCPIP,,SYSPLEX,RESUME,JOBNAME=jobname` command.

ENABLE,TCPname=*tcpname*
Marks the server applications associated with the specified TCP/IP stack as enabled. The *tcpname* value must be less than or equal to 8 characters in length.

Rule: If the IP address of the member is a distributable DVIPA when you specify this parameter, you can enable the server applications only by the `TCPIP,,SYSPLEX,RESUME,TARGET` command.

ENABLE,SYStem
Marks the server applications on this system as enabled.

Rule: If the IP address of the member is a distributable DVIPA when you specify this parameter, you can enable the server applications only by the `VARY TCPIP,,SYSPLEX,RESUME,TARGET` command.

Examples

The following example shows a sample display when you issue `F AQSAGE,ENABLE,PORT=5001`.

```
F AQSAGE,ENABLE,PORT=5001
AQS0139I ALL MATCHING REGISTERED APPLICATIONS ARE ENABLED
```

The following example shows a sample display when you issue F AQSAGE,ENABLE,PORT=8021, but the server application was registered for a distributable DVIPA.

```
F AQSAGE,ENABLE,PORT=8021
AQS0140I 0 OF 1 MATCHING REGISTERED APPLICATIONS ARE ENABLED -
DISTRIBUTED DVIPA MEMBERS ARE IGNORED
```

The following example shows a sample display when you issue F AQSAGE,ENABLE,PORT=5001,PROTOCOL=TCP.

```
F AQSAGE,ENABLE,PORT=5001,PROTOCOL=TCP
AQS0139I ALL MATCHING REGISTERED APPLICATIONS ARE ENABLED
```

The following example shows a sample display when you issue F AQSAGE,ENABLE,PORT=8021,PROTOCOL=TCP, but the server application was registered for a distributable DVIPA.

```
F AQSAGE,ENABLE,PORT=8021,PROTOCOL=TCP
AQS0140I 0 OF 1 MATCHING REGISTERED APPLICATIONS ARE ENABLED -
DISTRIBUTED DVIPA MEMBERS ARE IGNORED
```

The following example shows a sample display when you issue F AQSAGE,ENABLE,PORT=5001,PROTOCOL=UDP, but no matching server applications are listening on this port or protocol.

```
F AQSAGE,ENABLE,PORT=5001,PROTOCOL=UDP
AQS0122I NO MEMBERS MATCH SELECTION CRITERIA
AQS0123I ENABLE APPLICATION COMMAND REJECTED
```

The following example shows a sample display when you issue F AQSAGE,ENABLE,PORT=5001,PROTOCOL=TCP,IPADDR=192.10.110.1.

```
F AQSAGE,ENABLE,PORT=5001,PROTOCOL=TCP,IPADDR=192.10.110.1
AQS0139I ALL MATCHING REGISTERED APPLICATIONS ARE ENABLED
```

The following example shows a sample display when you issue F AQSAGE,ENABLE,PORT=8021,PROTOCOL=TCP,IPADDR=10.10.1.1, but the server application was registered for a distributable DVIPA..

```
F AQSAGE,ENABLE,PORT=8021,PROTOCOL=TCP,IPADDR=10.10.1.1
AQS0140I 0 OF 1 MATCHING REGISTERED APPLICATIONS ARE ENABLED -
DISTRIBUTED DVIPA MEMBERS ARE IGNORED
```

The following example shows a sample display when you issue F AQSAGE,ENABLE,PORT=5001,PROTOCOL=TCP,IPADDR=10.10.1.2, but no matching server applications are listening on this port or protocol.

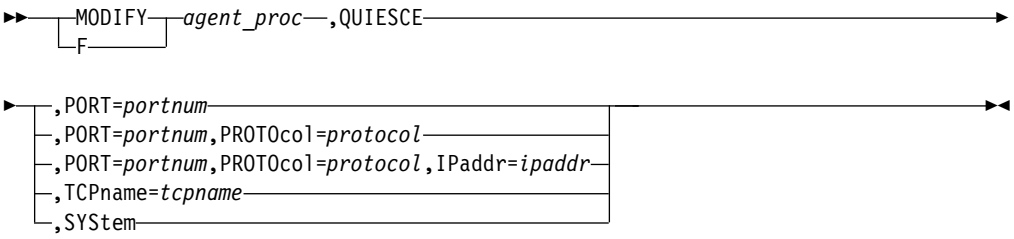
```
F AQSAGE,ENABLE,PORT=5001,PROTOCOL=TCP,IPADDR=10.10.1.2
AQS0122I NO MEMBERS MATCH SELECTION CRITERIA
AQS0123I ENABLE APPLICATION COMMAND REJECTED
```

MODIFY *agent_proc*,QUIESCE command: Quiesce server applications

Use the MODIFY *agent_proc*,QUIESCE command to mark the server applications as quiesced. The Lifeline Agent will notify the Advisor to not recommend this server application for new workload requests.

Tip: If more than one server application is sharing a port, all of the server applications are quiesced.

Format



Parameters

agent_proc
Indicates the member name of the cataloged procedure used to start the Agent.

QUIESCE,PORT=*portnum*
Marks the server applications bound to the specified port number as quiesced. The range of the *portnum* value is 0 - 65535.

Rule: If the IP address of the member is a distributable DVIPA when you specify this parameter, you can quiesce the server applications only by the `VARY TCPIP,,SYSPLEX,QUIESCE,PORT=portnum` command.

QUIESCE,PORT=*portnum*,PROTOcol=*protocol*
Marks the server applications that are bound to the specified port number and use the specified protocol as quiesced. The range of the *portnum* value is 0 - 65535. The *protocol* value is TCP or UDP.

Rule: If the IP address of the member is a distributable DVIPA when you specify this parameter, you can quiesce the server applications only by the `VARY TCPIP,,SYSPLEX,QUIESCE,PORT=portnum` command.

QUIESCE,PORT=*portnum*,PROTOcol=*protocol*,IPaddr=*ipaddr*
Marks the server applications that are bound to the specified port number and use the specified protocol and the specified IP address as quiesced. The range of the *portnum* value is 0 - 65535. The *protocol* value is TCP or UDP. The IP address can be an IPv4 or an IPv6 address.

Rule: If the IP address of the member is a distributable DVIPA when you specify this parameter, you can quiesce the server applications only by the `VARY TCPIP,,SYSPLEX,QUIESCE,JOBNAME=jobname` command.

QUIESCE,TCPname=*tcpname*
Marks the server applications associated with the specified TCP/IP stack as quiesced. The *tcpname* value must be less than or equal to 8 characters in length.

Rule: If the IP address of the member is a distributable DVIPA when you specify this parameter, you can quiesce the server applications only by the `VARY TCPIP,,SYSPLEX,QUIESCE,TARGET` command.

QUIESCE,SYStem
Marks the server applications on this system as quiesced.

Rule: If the IP address of the member is a distributable DVIPA when you specify this parameter, you can quiesce the server applications only by the `VARY TCPIP,,SYSPLEX,QUIESCE,TARGET` command.

Examples

The following example shows a sample display when you issue F AQSAGE,QUIESCE,PORT=5001.

```
F AQSAGE,QUIESCE,PORT=5001
AQS0139I ALL MATCHING REGISTERED APPLICATIONS ARE QUIESCED
```

The following example shows a sample display when you issue F AQSAGE,QUIESCE,PORT=8021, but the server application was registered for a distributable DVIPA.

```
F AQSAGE,QUIESCE,PORT=8021
AQS0140I 0 OF 1 MATCHING REGISTERED APPLICATIONS ARE QUIESCED -
DISTRIBUTED DVIPA MEMBERS ARE IGNORED
```

The following example shows a sample display when you issue F AQSAGE,QUIESCE,PORT=5001,PROTOCOL=TCP.

```
F AQSAGE,QUIESCE,PORT=5001,PROTOCOL=TCP
AQS0139I ALL MATCHING REGISTERED APPLICATIONS ARE QUIESCED
```

The following example shows a sample display when you issue F AQSAGE,QUIESCE,PORT=8021,PROTOCOL=TCP, but the server application was registered for a distributable DVIPA.

```
F AQSAGE,QUIESCE,PORT=8021,PROTOCOL=TCP
AQS0140I 0 OF 1 MATCHING REGISTERED APPLICATIONS ARE QUIESCED -
DISTRIBUTED DVIPA MEMBERS ARE IGNORED
```

The following example shows a sample display when you issue F AQSAGE,QUIESCE,PORT=5001,PROTOCOL=UDP, but no matching server applications are listening on this port or protocol.

```
F AQSAGE,QUIESCE,PORT=5001,PROTOCOL=UDP
AQS0122I NO MEMBERS MATCH SELECTION CRITERIA
AQS0123I QUIESCE APPLICATION COMMAND REJECTED
```

The following example shows a sample display when you issue F AQSAGE,QUIESCE,PORT=5001,PROTOCOL=TCP,IPADDR=192.10.110.1.

```
F AQSAGE,QUIESCE,PORT=5001,PROTOCOL=TCP,IPADDR=192.10.110.1
AQS0139I ALL MATCHING REGISTERED APPLICATIONS ARE QUIESCED
```

The following example shows a sample display when you issue F AQSAGE,QUIESCE,PORT=8021,PROTOCOL=TCP,IPADDR=10.10.1.1, but the server application was registered for a distributable DVIPA.

```
F AQSAGE,QUIESCE,PORT=8021,PROTOCOL=TCP,IPADDR=10.10.1.1
AQS0140I 0 OF 1 MATCHING REGISTERED APPLICATIONS ARE QUIESCED -
DISTRIBUTED DVIPA MEMBERS ARE IGNORED
```

The following example shows a sample display when you issue F AQSAGE,QUIESCE,PORT=5001,PROTOCOL=TCP,IPADDR=10.10.1.2, but no matching server applications are listening on this port or protocol.

```
F AQSAGE,QUIESCE,PORT=5001,PROTOCOL=TCP,IPADDR=10.10.1.2
AQS0122I NO MEMBERS MATCH SELECTION CRITERIA
AQS0123I QUIESCE APPLICATION COMMAND REJECTED
```

The following example shows a sample display when you issue F AQSAGE,QUIESCE,TCPNAME=TCPIP.

```
F AQSAGE,QUIESCE,TCPNAME=TCPIP
AQS0140I 2 OF 4 MATCHING REGISTERED APPLICATIONS ARE QUIESCED -
DISTRIBUTED DVIPA MEMBERS ARE IGNORED
```

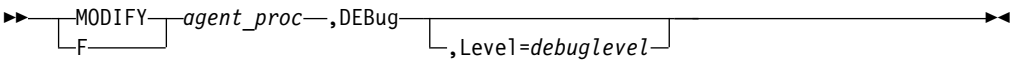
The following example shows a sample display when you issue F AQSAGE,QUIESCE,SYSTEM, but two of the server applications were registered for a distributable DVIPA.

```
F AQSAGE,QUIESCE,SYSTEM
AQS0140I 2 OF 4 MATCHING REGISTERED APPLICATIONS ARE QUIESCED -
DISTRIBUTED DVIPA MEMBERS ARE IGNORED
```

MODIFY *agent_proc*,DEBug command: Change the debug level

Use the MODIFY *agent_proc*,DEBug command to change the debug level that is in effect for the Lifeline Agent.

Format



Parameters

agent_proc
Indicates the member name of the cataloged procedure used to start the Agent.

DEBug,Level=*debuglevel*
Changes the debug level in effect for this Agent. The debug level that you can set is the sum of one or more levels of the debug messages to be logged. See "Debug levels" on page 73 for debug level values.

Example

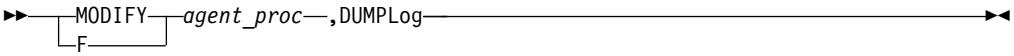
The following example shows a sample display when you issue F AQSAGE,DEBUG,LEVEL=127.

```
F AQSAGE,DEBUG,LEVEL=127
AQS0138I LLAGENT DEBUG LEVEL UPDATED
```

MODIFY *agent_proc*,DUMPLog command: Dump the internal trace records

Use the MODIFY *agent_proc*,DUMPLog command to dump internal trace to the UNIX System Services file specified by the AQSTRACE DD card in the Agent started procedure.

Format



Parameters

agent_proc
Indicates the member name of the cataloged procedure used to start the Agent.

DUMPLog
Signals the Agent that the internal trace records need to be dumped. Any existing data in the target UNIX System Services file will be overwritten.

Example

The following example shows a sample display when you issue F AQSAGE,DUMPLOG.

```
F AQSAGE,DUMPLOG
AQS0204I LLAGENT DUMP INTERNAL LOG COMMAND SUCCESSFUL
```

Chapter 9. Lifeline Linux on z Systems Management Agent commands

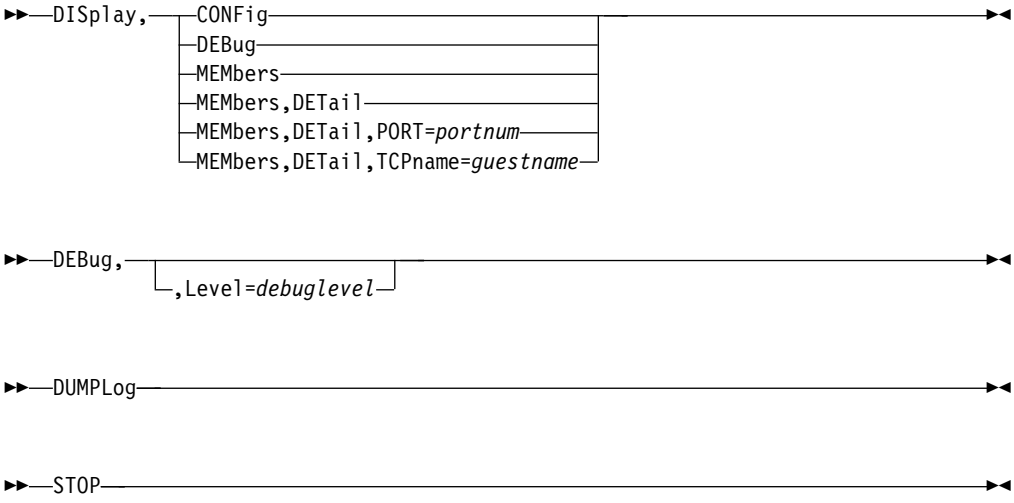
Use the Linux on z Systems Management Agent commands to display Lifeline Linux on z Systems Management Agent information and modify Linux on z Systems Management Agent state information.

Use the aqsllcmd program to issue commands to the Linux on z Systems Management Agent. You must run the program on the Management Guest where the Linux on z Systems Management Agent runs and only by a user with root privileges.

Format

aqsllcmd *command*

command is one of the following options:



Guideline: The value for command is not case sensitive.

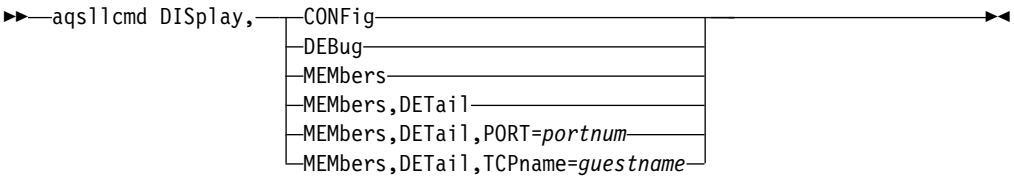
A man page is available for the aqsllcmd command. To display the man page, enter the following command:

```
man -M /opt/ibm/lifeline/man aqsllcmd
```

Display Linux on z Systems Management Agent information

Use the `aqsllcmd DISplay` command to display Linux on z Systems Management Agent information. Use the `MODIFY agent_proc,DISplay` command to display z/OS Agent information.

Format



Parameters

DISplay,CONFig
Displays the active configuration for this Agent.

DISplay,DEBug
Displays the debug level in effect for this Agent.

The displayed debug level is the sum of one or more levels of debug messages being logged. See "Debug levels" on page 73 for more information about the debug levels.

DISplay,MEMbers
Displays information about registered server applications on this z/VM system.

DISplay,MEMbers,DETail
Displays detailed information about registered server applications on this z/VM system, including the host name of the server application.

DISplay,MEMbers,DETail,PORT=*portnum*
Displays detailed information about registered server applications on this z/VM system that are bound to the specified port number. The valid range of the *portnum* is 0 - 65535.

DISplay,MEMbers,DETail,TCPname=*guestname*
Displays detailed information about registered server applications on this z/VM system that are associated with the Linux on z Systems guest, *guestname*. The *guestname* value must be less than or equal to 8 characters in length and is not case sensitive.

Examples

The following example shows a sample display when you issue `aqsllcmd display,config`.

```
aqsllcmd display,config
AQS0144I AGENT CONFIGURATION
VERSION           : Lifeline V2.5   SERVICE LEVEL: PI84240
CONFIG FILENAME   : /opt/ibm/lifeline/conf/agent.conf
DEBUG LEVEL       : 7
ADVISOR ID        : 192.10.1.1..8181
HOST CONNECTION   : 192.10.110.3 ..4000
SITE NAME         : PLEX1
Command complete
```

The following information describes the fields in the sample display.

Field name
Descriptions

VERSION
The current version and release of the Agent.

SERVICE LEVEL
The current APAR service level of the Agent.

CONFIG FILENAME
The configuration file that this Agent used when the Agent was initially started.

DEBUG LEVEL
The debug level currently in effect for this Agent.

ADVISOR ID
The IP address and port number that the primary Advisor listens on for connections from this Agent. The IP address can be an IPv4 or an IPv6 address.

HOST CONNECTION
The source IP address and port number that this Agent uses to connect to the primary Advisor. The IP address can be an IPv4 or an IPv6 address.

SITE NAME
The site where the Agent resides.

The following example shows a sample display when you issue `aqsllcmd display,debug`.

```
aqsllcmd display,debug
AQS0111I LLAGENT DEBUG LEVEL 7
Command complete
```

The following example shows a sample display when you issue `aqsllcmd display,members`.

```
aqsllcmd display,members
AQS0114I MEMBER SUMMARY
LB INDEX      : N/A        UUID             : COMPOSITETIER1LB
 GROUP NAME   : GROUP000004
  IPADDR..PORT: 10.1.1.1..9001
   MATCHES    : 001       PROTOCOL  : TCP
1 of 1 RECORDS DISPLAYED
Command complete
```

The following information describes the fields in the sample display.

Field name
Descriptions

LB INDEX
The reference number that is used to identify the load balancer. The same reference number is used for a load balancer as long as the load balancer remains connected.

The reference number is displayed as N/A if this is a composite load balancer that the Lifeline Advisor creates to send a consolidated list of load balancer application groups to the Lifeline Agent.

UUID A hexadecimal value of the universally unique identifier that is assigned by the load balancer. This byte array can be up to 64 bytes in length. Only one load balancer with the same UUID can be connected to the primary Advisor at the same time.

If the LB INDEX field is displayed as N/A, the UUID field is for a composite load balancer that the Lifeline Advisor creates to send a consolidated list of load balancer application groups to the Lifeline Agent. The UUID field is shown as COMPOSITETIER1LB, which indicates the groups in this display are consolidated from registered first-tier load balancer application groups.

GROUP NAME
The name that the Lifeline Advisor creates to represent a group of related target server applications consolidated from groups with the same members that one or more external load balancers register. If the members of the load balancer application group are not configured in a failure_detection_groups configuration statement, the group name is selected within the range of GROUP000001 and GROUP999999 and a unique group name is created for each unique registered load balancer application group. If the members of the load balancer application group are configured in a failure_detection_groups configuration statement, the group name matches the group specified in the failure_detection_groups statement.

IPADDR..PORT
The IP address and port number of a member defined in the registered group. The IP address can be an IPv4 or an IPv6 address.

MATCHES
The number of available server applications that match the IP address and port number. If the value of matches is 0, the Agent found the Linux on z Systems guest that hosts this member logged on in this z/VM system, but did not find a server application that listens on that IP address and port number. This number will never be greater than 1.

PROTOCOL
The protocol that the member is using. The protocol value will always be TCP.

The following example shows a sample display when you issue `aqsllcmd display,members,detail`.

```
aqsllcmd display,members,detail
AQS0115I MEMBER DETAILS
LB INDEX      : N/A        UUID             : COMPOSITETIER1LB
 GROUP NAME   : GROUP000004
  IPADDR..PORT: 10.1.1.1..9001
   MATCHES    : 001       PROTOCOL  : TCP
   TCPNAME    : GUEST1A
1 of 1 RECORDS DISPLAYED
Command complete
```

The following information describes the fields in the sample display.

Field name
Descriptions

LB INDEX
The reference number that is used to identify the load balancer. The same reference number is used for a load balancer as long as the load balancer remains connected.

The reference number is displayed as N/A if this is a composite load balancer that the Lifeline Advisor creates to send a consolidated list of load balancer application groups to the Lifeline Agent.

UUID A hexadecimal value of the universally unique identifier that is assigned by the load balancer. This byte array can be up to 64 bytes in length. Only one load balancer with the same UUID can be connected to the primary Advisor at the same time.

If the LB INDEX field is displayed as N/A, the UUID field is for a composite load balancer that the Lifeline Advisor creates to send a

consolidated list of load balancer application groups to the Lifeline Agent. The UUID is shown as COMPOSITETIER1LB, which indicates that the groups in this display are consolidated from registered first-tier load balancer application groups.

GROUP NAME
The name that the Lifeline Advisor creates to represent a group of related target server applications consolidated from groups with the same members that one or more external load balancers register. If the members of the load balancer application group are not configured in a failure_detection_groups configuration statement, the group name is selected within the range of GROUP000001 and GROUP999999 and a unique group name is created for each unique registered load balancer application group. If the members of the load balancer application group are configured in a failure_detection_groups configuration statement, the group name matches the group specified in the failure_detection_groups statement.

IPADDR..PORT
The IP address and port number of a member defined in the registered group. The IP address can be an IPv4 or an IPv6 address.

MATCHES
The number of available server applications that match the IP address and port number. If the value of matches is 0, the Agent found the Linux on z Systems guest that hosts this member logged on in this z/VM system, but did not find a server application that listens on that IP address and port number. This number will never be greater than 1.

PROTOCOL
The protocol that the member is using. The protocol value will always be TCP.

TCPNAME
The guest name of the Linux on z Systems guest that hosts this member.

The following example shows a sample display when you issue `aqsllcmd display,members,detail,port=9001`.

```
aqsllcmd display,members,detail,port=9001
AQS0115I MEMBER DETAILS
LB INDEX      : N/A        UUID             : COMPOSITETIER1LB
 GROUP NAME   : GROUP000004
  IPADDR..PORT: 10.1.1.1..9001
   MATCHES    : 001       PROTOCOL  : TCP
   TCPNAME    : GUEST1A
1 of 1 RECORDS DISPLAYED
Command complete
```

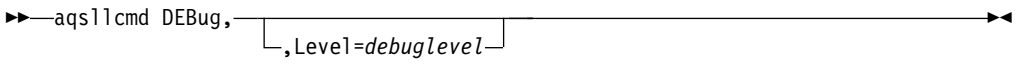
The following example shows a sample display when you issue `aqsllcmd display,members,detail,tcpname=guest1a`.

```
aqsllcmd display,members,detail,tcpname=guest1a
AQS0115I MEMBER DETAILS
LB INDEX      : N/A        UUID             : COMPOSITETIER1LB
 GROUP NAME   : GROUP000004
  IPADDR..PORT: 10.1.1.1..9001
   MATCHES    : 001       PROTOCOL  : TCP
   TCPNAME    : GUEST1A
1 of 1 RECORDS DISPLAYED
Command complete
```

Change the debug level

Use the `aqsllcmd DEBug` command to change the debug level that is in effect for the Linux on z Systems Lifeline Agent.

Format



Parameters

DEBug,Level=debuglevel
Changes the debug level in effect for this Agent. The debug level that you can set is the sum of one or more levels of the debug messages to be logged. See "Debug levels" on page 73 for debug level values.

Example

The following example shows a sample display when you issue `aqsllcmd debug,level=127`.

```
aqsllcmd debug,level=127
AQS0138I LLAGENT DEBUG LEVEL UPDATED
Command complete
```

Dump internal trace records

Use the `aqsllcmd DUMPLog` command to dump internal trace records to the `/opt/ibm/lifeline/log/agent.trace` file.

Format

Parameters

DUMPLog
Signals the Agent that internal trace records need to be dumped. Any existing data in the `/opt/ibm/lifeline/log/agent.trace` file will be overwritten.

Example

The following example shows a sample display when you issue `aqsllcmd dumplog`.

```
aqsllcmd dumplog
AQS0204I LLAGENT DUMP INTERNAL LOG COMMAND SUCCESSFUL
Command complete
```

Terminate the Linux on z Systems Management Agent

Use the `aqsllcmd STOP` command to terminate the Linux on z Systems Management Agent.

Format

Parameters

STOP
Terminates the Linux on z Systems Management Agent.

Example

The following example shows a sample display when you issue `aqsllcmd stop`.

```
aqsllcmd stop
Command complete
```

Chapter 10. Network Management Interface for Multi-site Workload Lifeline

Multi-site Workload Lifeline provides a Network Management Interface (NMI) that you can use to monitor Lifeline metrics and statistics. Network management applications can communicate with the Lifeline NMI by using the AF_UNIX socket opened by the Lifeline Advisor.

The flow between the Lifeline NMI and the network management application is described in Figure 7.

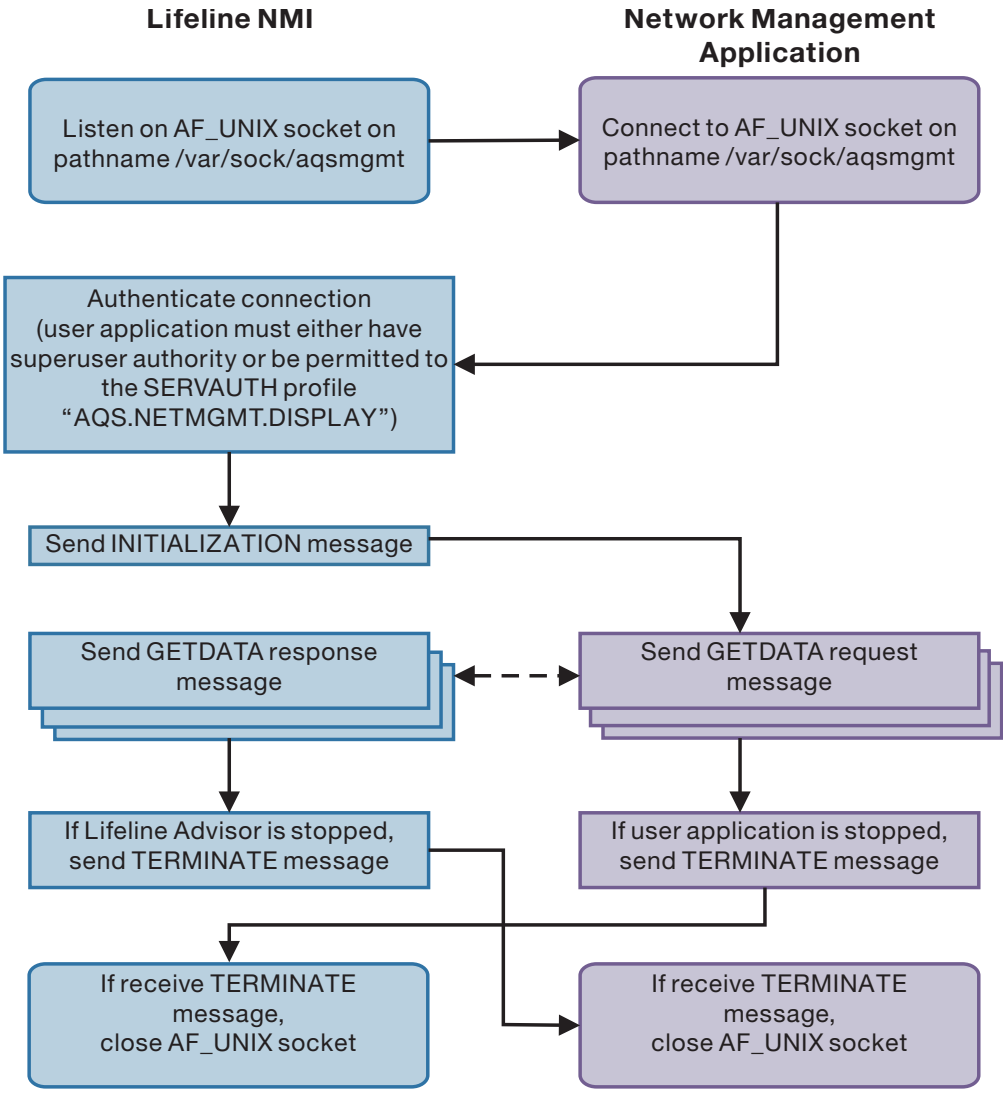


Figure 7. Flow between the Lifeline NMI and the network management application

There are three possible message types: initialization message, data message, and termination message. The initialization and termination message contain only a message header. The data message is either a request or a response. A data request message contains only a message header.

The data response message contains the following headers and section descriptors:

1. A message header.
2. A record header for the overall response.
3. A section descriptor for Lifeline Advisors, which maps one section for the primary Advisor, and optionally, one section for the secondary Advisor.
4. A section descriptor for workloads, which maps sections for each of the defined workloads.
5. A section descriptor for sites, which maps sections for each of the defined sites.
6. A section descriptor for Lifeline Agents, which maps each of the Agents that connect to the primary Advisor.
7. A section descriptor for load balancers, which maps each of the load balancers (either external or z/OS sysplex distributor) that connect to the primary Advisor.
8. A section descriptor for load balancer application groups, which maps the groups that are defined to external load balancers.
9. A section descriptor for load balancer application group IP addresses, which maps the IP addresses that are configured for a specific load balancer application group.
10. A section descriptor for z/OS TCP/IP server applications, which maps all the z/OS TCP/IP server applications that make up each of the defined workloads.
11. A section descriptor for servers that are monitored by the Linux on z Systems Management Agent, which maps all the Linux on z Systems server applications that make up each of the defined workloads.
12. A section descriptor for SNA servers, which maps all the SNA applications that make up each of the defined workloads.
13. A section descriptor for MQ queue managers, which maps all of the MQ queue managers that host the IBM MQ clusters and MQ cluster queues for each defined workload.

Figure 8 on page 195 describes the layout of the data response message.

Message Header
Record Header Response
Section Descriptor for Lifeline Advisors
Section Descriptor for Workloads
Section Descriptor for Sites
Section Descriptor for Agents
Section Descriptor for Load Balancers
Section Descriptor for Load Balancers Groups
Section Descriptor for Load Balancers Group IP Addresses
Section Descriptor for z/OS TCP/IP server applications
Section Descriptor for servers monitored by Linux on z Systems Management Agents
Section Descriptor for SNA servers
Section Descriptor for MQ queue managers
Lifeline Advisor Sections (one for primary Advisor, and one for secondary Advisor – if active)
Zero or more Workload Sections
Zero or more Site Sections
Zero or more Lifeline Agent Sections
Zero or more Load Balancer Sections (both external and Sysplex Distributor load balancers)
Zero or more Load Balancer Group Sections
Zero or more Load Balancer Group IP Address Sections
Zero or more z/OS TCP/IP application Sections
Zero or more servers monitored by Linux on z Systems Management Agent Sections
Zero or more SNA server Sections
Zero or more MQ queue managers Sections

Figure 8. Layout of the data response message

Use the record header descriptor in the message header to locate the response record header. You can locate the offset of the first section descriptor through the header. All eight section descriptors are contiguous. You can locate the data for each of the sections through the respective section descriptor. See "NMI message format" for more details about the layout of the NMI messages.

NMI message format

The following information shows the format of an NMI message.

```
/*
** Message Header
*/
typedef  struct _AQSMessageHdr {
 char             MsgHdrID[4];              /* Identifier for Message Header          */
#define AQSMessageHdrID "AQSM"
 unsigned int     MsgHdrLength;             /* Length of message header               */
 unsigned short   MsgHdrVersion;            /* Interface version                      */

#define AQSVersion1     1                  /* AQS NMI version 1                      */
#define AQSVersion2     2                  /* AQS NMI version 2                      */
#define AQSVersion3     3                  /* AQS NMI version 3                      */
#define AQSVersion4     4                  /* AQS NMI version 4                      */
#define AQSVersion      4                  /* AQS NMI version for V2R5               */

unsigned short   MsgHdrType;               /* Message type                           */
#define AQSInitType     1                  /* Initialization message                 */
#define AQSTermType     2                  /* Termination message                    */
#define AQSGetDataType  3                  /* Get Advisor Data message               */
```

```
 char              MsgHdrRsvd1[4];           /* Reserved - set to 0                    */
 char              MsgHdrCorrelator[16];     /* User-defined correlator                */
 unsigned int      MsgHdrRc;                 /* Return code                            */
#define AQSRcOK     0                       /* Successful NMI call                    */
#define AQSRcError  8                       /* Unsuccessful NMI call                  */
 unsigned int      MsgHdrRsn;                /* Reason code                            */
#define AQSBadID           1                /* Incorrect message identifier           */
#define AQSBadVersion      2                /* Incorrect message version              */
#define AQSBadType         3                /* Incorrect message type                 */
#define AQSBadSize         4                /* Incorrect message size                 */
#define AQSBadFields       5                /* Reserved fields are not zero           */
#define AQSConnsExceeded   6                /* Too many active connections            */
#define AQSInternalError   7                /* Internal error                         */
#define AQSNotAuth         8                /* Authorization failure                  */
 unsigned int      MsgHdrMsgLength;          /* Message length (including header)      */
 unsigned int      MsgHdrTime;               /* Timestamp when message was created     */
 char              MsgHdrRsvd2[16];          /* Reserved - set to 0                    */
 AQSRecordDesc     MsgHdrRecDesc;            /* Record Descriptor - only
                                                meaningful for GETDATA responses       */
} AQSMessageHdr;
/*
** Section Correlator
*/
typedef struct _AQSCorrelator {
  char                    SecID[4];         /* Identifier for the section             */
  unsigned int            SecInstance;      /* Instance count of this section         */
} AQSCorrelator;

#define AQSAdvisorID           "AQSA"       /* Identifier for Advisor section         */
#define AQSWorkloadID          "AQSW"       /* Identifier for Workload section        */
#define AQSSiteID              "AQSI"       /* Identifier for Site section            */
#define AQSAgentID             "AQSC"       /* Identifier for Agent section           */
#define AQSLoadBalancerID      "AQSL"       /* Identifier for Load Balancer section   */
#define AQSGroupID             "AQSG"       /* Identifier for Group section           */
#define AQSGrpIPID             "AQSP"       /* Identifier for Group IP Address section */
#define AQSServerID            "AQSS"       /* Identifier for Servers section         */
#define AQSMgmtGuestServerID   "AQSZ"       /* Identifier for Linux on z Systems
                                               Management Guest Servers section       */
#define AQSSNAServerID         "AQSN"       /* Identifier for SNA Servers section     */
#define AQSMQQmgrID            "AQSQ"       /* Identifier for MQ queue managers section*/
/*
** Message Section for Lifeline Advisors (1st section)
*/
typedef struct _AQSAdvisorSec {
  AQSCorrelator     AdvCorr;                /* Advisor correlator                     */
  struct in_addr    AdvIpAddr4;             /* Advisor's IPv4 Address                 */
  struct in6_addr   AdvIpAddr6;             /* Advisor's IPv6 Address                 */
  char              AdvSysName[8];          /* System Name where Advisor resides      */
  unsigned char     AdvRole;                /* Advisor role                           */
#define AQSAdvisorPrimary      1            /* Advisor in primary role                */
#define AQSAdvisorSecondary    2            /* Advisor in secondary role              */
  char              AdvRsvd[3];             /* Reserved - set to 0                    */
} AQSAdvisorSec;
/*
** Message Section for Workloads (2nd section)
*/
typedef struct _AQSWorkloadSec {
  AQSCorrelator    WkldCorr;                /* Workload correlator                    */
  char             WkldWorkloadName[64];    /* Name of workload                       */
  unsigned char    WkldStatus;              /* Routing status of workload             */
#define AQSWorkloadOk      1               /* Site and servers for workload
                                               are available                          */
#define AQSWorkloadNotOk   2               /* Site or servers for workload
                                               are not available                      */
  char             WkldRsvd[3];             /* Reserved - set to 0                    */
} AQSWorkloadSec;
/*
typedef struct _AQSWorkloadSecAQ {
 unsigned char WkldType;                    /* Workload type                          */
#define AQSWkldTypeAS 1                     /* Active/Standby workload                */
#define AQSWkldTypeAQ 2                     /* Active/Query workload                  */
 unsigned char WkldDistType;                /* Workload distribution type for Ac
                                            tive/Query workloads                      */
#define AQSWkldTypeNotUsed 0                /* Active/Standby workload                */
#define AQSWkldTypeStatic  1                /* Static distribution                    */
#define AQSWkldTypeDynamic 2                /* Dynamic distribution                   */
  char WkldRsvd2[2];                        /* Reserved - set to 0                    */
  AQSCorr_t WkldAssocWorkload;              /* For Active/Query workload,
                                            correlator of the associated
```

```
                                        Active/Standby workload                 */
  unsigned short WkldAssocNum;          /* For Active/Standby workload, the
                                        number of Active/Query workloads
                                        associated with this workload           */
  char WkldRsvd3[2];                     /* Reserved - set to 0                  */
  unsigned int WkldLatencyFlags;         /* For Active/Query workload,
                                         the current replication latency
                                         state                                  */
#define AQSWkldLatencyAcute       0x00000001  /* Acute latency state            */
#define AQSWkldLatencyNormal      0x00000002  /* Normal latency state           */
#define AQSWkldLatencyConstrained 0x00000004  /* Constrained latency state      */
#define AQSWkldLatencyCritical    0x00000008  /* Critical latency state         */
#define AQSWkldLatencyUnknown     0x00000010  /* Unknown latency state          */
  unsigned int WkldStatusRsn;           /* Reason for WkldStatus
                                        set to NotOk                            */
#define AQSWkldStatusOk          1            /* Workload ok                    */
#define AQSWkldStatusQuiesced    2            /* Workload quiesced              */
#define AQSWkldStatusWorkFailure 3            /* Workload failed                */
#define AQSWkldStatusSiteFailure 4            /* Site failed                    */
#define AQSWkldStatusRouting     5            /* Routing not optimal            */
} AQSWorkloadSecAQ;

typedef struct _AQSWorkloadSecV2 {
  AQSWorkloadSec   AQSWorkloadSection1;       /* Base definitions               */
  AQSWorkloadSecAQ AQSWorkloadSection2;       /* Active/Query workload section  */
} AQSWorkloadSecV2;

/*
** Message Section for Sites (3rd section)
*/
typedef struct _AQSSiteSection {
  AQSCorrelator     SiteIdCorr;             /* Site correlator                  */
  AQSCorrelator     SiteWkldCorr;           /* Correlator for workload this
                                               Site section maps to             */
  char              SiteRsvd1[16];          /* Reserved - set to 0              */

  char              SiteName[8];            /* Name of site (i.e. sysplex name) */
  unsigned char     SiteWorkloadState;      /* Routing state of workload        */
#define AQSSiteWorkloadActive      1        /* Workload is active on this site  */
#define AQSSiteWorkloadQuiesce     2        /* Workload is quiesced on this site*/
#define AQSSiteWorkloadDeactivated 3        /* Workload is deactivated on this site */
  char              SiteRsvd2[3];           /* Reserved - set to 0              */
  unsigned short    SiteWeight;             /* Routing weight for the
                                               workload on this site            */
/* If AQS NMI version is less than version 4, SiteFlags is reserved */
  unsigned short    SiteFlags               /* Site flags                       */
#define AQSSiteClusterNmValid  2            /* SiteClusterName is valid         */
} AQSSiteSection ;

typedef struct _AQSSiteSectionAQ {
  unsigned int SitePercentWeight;           /* For static routing,
                                            percent of connections
                                            to be routed to this
                                            site; otherwise 0                   */
  unsigned int SitePreferredFlag;           /* For dynamic routing,
                                            indicator on whether this
                                            is the preferred site;
                                            otherwise 0                         */
#define AQSSiteNotPreferred 1               /* Not the preferred site           */
#define AQSSitePreferred    2               /* The preferred site               */
  char SiteReserved2[3];                    /* Reserved - set to 0              */
} AQSSiteSectionAQ;

typedef struct _AQSSiteSectionV2 {
  AQSSiteSection   AQSSiteSection1;         /* Base definitions                 */
  AQSSiteSectionAQ AQSSiteSection2;         /* Active/Query workload section    */
} AQSSiteSectionV2;

typedef struct _AQSSiteSectionMQ {
 char   SiteClusterName[48];               /* MQ cluster name for MQ workload  */
} AQSSiteSectionMQ;

typedef struct _AQSSiteSectionV4 {
  AQSSiteSection AQSSiteSection1;           /* Base definitions                 */
  AQSSiteSectionAQ AQSSiteSection2;         /* Active/Query site section        */
  AQSSiteSectionMQ AQSSiteSection4;         /* MQ site section                  */
} AQSSiteSectionV4;

 */
** Message Section for Sites (3rd section)
*/
```

```
typedef struct _AQSSiteSec {
  AQSCorrelator     SiteIdCorr;             /* Site correlator                          */
  AQSCorrelator     SiteWkldCorr;           /* Correlator for workload this
                                               Site section maps to                     */
  char              SiteRsvd1[16];          /* Reserved - set to 0                      */

  char              SiteName[8];            /* Name of site (i.e. sysplex name)         */
  unsigned char     SiteWorkloadState;      /* Routing state of workload                */
#define AQSSiteWorkloadActive      1        /* Workload is active on this site          */
#define AQSSiteWorkloadQuiesce     2        /* Workload is quiesced on this site        */
#define AQSSiteWorkloadDeactivated 3        /* Workload is deactivated on this site     */
  char              SiteRsvd2[3];           /* Reserved - set to 0                      */
  unsigned short    SiteWeight;             /* Routing weight for the
                                               workload on this site                    */
/* If AQS NMI version is less than version 4, SiteFlags is reserved */
  unsigned short    SiteFlags               /* Site flags                               */
#define AQSSiteClusterNmValid  2            /* SiteClusterName is valid                 */

/* SiteClusterName field is included when this is AQS NMI version 4 */
  char              SiteClusterName[48]     /* Name of the MQ cluster defined for the
                                               workload                                 */
} AQSSiteSec;

typedef struct _AQSSiteSecAQ {
  unsigned int SitePercentWeight;           /* For static routing,
                                               percent of connections
                                               to be routed to this
                                               site; otherwise 0                        */
  unsigned int SitePreferredFlag;           /* For dynamic routing,
                                               indicator on whether this
                                               is the preferred site;
                                               otherwise 0                              */
#define AQSSiteNotPreferred 1               /* Not the preferred site                   */
#define AQSSitePreferred    2               /* The preferred site                       */
  char SiteReserved2[3];                    /* Reserved - set to 0                      */
} AQSSiteSectionAQ;

typedef struct _AQSSiteSectionV2 {
  AQSSiteSection   AQSSiteSection1;         /* Base definitions                         */
  AQSSiteSectionAQ AQSSiteSection2;         /* Active/Query workload section            */
} AQSSiteSectionV2;

/*
** Message Section for Lifeline Agents (4th section)
*/
typedef struct _AQSAgentSec {
  AQSCorrelator     AgntCorr;               /* Correlator for Agent                     */
  union {
    struct in_addr   in;                    /* Agent's IPv4 address                     */
    struct in6_addr  in6;                   /* Agent's IPv6 address                     */
  } AgntIpAddr;
  char               AgntSysName[8];        /* System name where Agent resides          */
  char               AgntSiteName[8];       /* Name of site (i.e. sysplex name
                                               where Agent resides                      */
  unsigned char      AgntState;             /* State of Agent                           */
#define AQSAgentActive     1                /* Agent is active                          */
#define AQSAgentInActive   2                /* Agent is inactive                        */
  char               AgntType[1];           /* Agent type                               */
#define AQSAgentZOS         1               /* z/OS Agent                               */
#define AQSAgentZLinuxMgmt  2               /* Linux on z Systems Management Agent       */
  unsigned short     AgntFlags;             /* Agent flags                              */
#define AQSAgentIPv4       1                /* AgntIpAddr is IPv4 address               */
}  AQSAgentSec;
/*
** Message Section for Load Balancers (5th section)
*/
typedef struct _AQSLBSec {
  AQSCorrelator     LBCorr;                 /* Correlator for Load Balancer             */
  union {
    struct in_addr   in;                    /* Load Balancer's IPv4 address             */
    struct in6_addr  in6;                   /* Load Balancer's IPv6 address             */
  } LBIpAddr;
  unsigned char      LBTier;                /* Load Balancer Tier                       */
#define AQSLoadBalancerTier1     1          /* First-tier Load Balancer                 */
#define AQSLoadBalancerTier2     2          /* Second-tier Load Balancer                */
#define AQSLoadBalancerTierUnk   3          /* Unknown tier                             */
#define AQSLoadBalancerIntermed  4          /* Intermediary tier Load Balancer          */
  unsigned char      LBState;               /* State of load balancer                   */
#define AQSLoadBalancerActive    1          /* Load balancer is active                  */
#define AQSLoadBalancerInactive  2          /* Load balancer is not active              */
  unsigned short     LBFlags;               /* Load balancer flags                      */
```

```
#define AQSLoadBalancerInt       1          /* Internal load balancer (i.e.
                                               Sysplex Distributor)                */
#define AQSLoadBalancerIPv4      2          /* LBIpAddr is IPv4 address            */
  char               LBRsvd[8];             /* Reserved - set to zero              */
} AQSLBSec;
/*
** Message Section for Groups (6th section)
*/
typedef struct _AQSGroupSec {
  AQSCorrelator      GrpCorr;               /* Correlator for Group                */
  AQSCorrelator      GrpLBCorr;             /* Correlator for Load Balancer
                                               this group is defined to            */
  AQSCorrelator      GrpWkldCorr;           /* Correlator for Workload this
                                               group belongs to                    */
  unsigned short     GrpPortNum;            /* Port number for the servers
                                               configured for this group           */
  char               GrpName[255];          /* Group name                          */
  unsigned short     GrpFLags;              /* Group flags                         */
#define AQSGroupInt 1                       /* Simulated group for internal load
                                               balancers (i.e. Sysplex Distributor) -
                                               there is not a corresponding GroupIP
                                               section for this group              */
  char GrpRsvd[1];                          /* Reserved - set to zero              */
} AQSGroupSec;
/*
** Message Section for Group IP Addresses (7th section)
*/
typedef struct _AQSGrpIpSec {
  AQSCorrelator      GrpIpCorr;             /* Correlator for GrpIp                */
  AQSCorrelator      GrpIpGrpCorr;          /* Correlator for Load Balancer
                                               Group this IP Address is
                                               defined to                          */
  union {
     struct in_addr  in;                    /* IPv4 address for a server
                                               configured for this group           */
     struct in6_addr in6;                   /* IPv6 address for a server
                                               configured for this group           */
} GrpIpAddr;
  unsigned short     GrpIpFlags;            /* Group IP flags                      */
#define AQSGrpIpIPv4         1             /* GrpIpAddr is IPv4 address           */
  char               GrpIpRsvd[2];          /* Reserved - set to zero              */
} AQSGrpIpSec;
/*
** Message Section for Servers (8th section)
*/
typedef struct _AQSServerSec {
 AQSCorrelator      SrvrCorr;               /* Correlator for Server               */
 AQSCorrelator      SrvrLBCorr;             /* Correlator for Load Balancer this
                                               server is defined to                */
 AQSCorrelator      SrvrWkldCorr;           /* Correlator for Workload this
                                               server belongs to                   */
 union {
    struct in_addr   in;                    /* Server's IPv4 address               */
    struct in6_addr in6;                    /* Server's IPv6 address               */
  } SrvrIpAddr;
 char               SrvrJobName[8];         /* The MVS jobname of server           */
 char               SrvrSysName[8];         /* System name where server resides    */
 char               SrvrSiteName[8];        /* Name of site (i.e. sysplex)
                                               where server resides                */
 unsigned int       SrvrNormWeight;         /* Net weight for this server
                                               relative to other servers on this
                                               site - calculated by applying CS
                                               health as percentage of WLM
                                               weight for this server              */
 unsigned int       SrvrWlmWeight;          /* ServerWLM weight for this
                                               server - measure of how well
                                               server is meeting its WLM
                                               policies and represents the
                                               displaceable processor capacity
                                               based on server's importance
                                               relative to other servers on this
                                               site                                */
 unsigned int       SrvrAbTerms;            /* Server abnormal terminations -
                                               number of abnormal transaction
                                               completions per 1000
                                               transactions                        */
 unsigned int       SrvrHealth;             /* Health indicator for server -
                                               used to adjust the reported
                                               ServerWLM weight                    */
 unsigned int       SrvrCPUWeight;          /* CPU factor in WLM weight -
```

```
                                           amount of displaceable general
                                           CPU capacity based on server's
                                           importance relative to other
                                           servers on this site and
                                           modified by proportion of
                                           general CPU capacity being
                                           consumed compared to zAAP
                                           and zIIP processors                  */
 unsigned int       SrvrzAAPWeight;        /* zAAP factor in WLM weight -
                                           amount of displaceable zAAP
                                           capacity based on server's
                                           importance relative to other
                                           servers on this site and modified
                                           by proportion of zAAP capacity
                                           being consumed compared to
                                           general CPU and zIIP
                                           processors                           */
 unsigned int       SrvrzIIPWeight;        /* zIIP factor in WLM weight -
                                           amount of displaceable zIIP
                                           capacity based on server's
                                           importance relative to other
                                           servers on this site and modified
                                           by proportion of zIIP capacity
                                           being consumed compared to
                                           general CPU and zAAP
                                           processors                           */
 unsigned int       SrvrCSHealth;          /* Health of server from a
                                           Communications Server
                                           perspective - calculated based
                                           on how well server is keeping up
                                           with connections in backlog, how
                                           well it is establishing new
                                           connections, and whether the
                                           server is dropping connections       */
 unsigned short     SrvrPortNum;           /* Port number where server is
                                           listening                            */
 unsigned short     SrvrFlags;             /* Server flags                         */
#define AQSServerIPv4    1                /* SrvrIPaddr is Ipv4 address           */
 unsigned char      SrvrState;             /* State of server                      */
#define AQSServerUp      1                /* Server is up                         */
#define AQSServerDown    2                /* Server is down                       */
#define AQSServerUnreg   3                /* Server is unregistered               */
 char               SrvrRsvd[3];           /* Reserved - set to zero               */
} AQSServerSec;
/*
** Message Section for Linux on z Systems Guest Servers (9th section, optional)
*/
typedef struct _AQSMgmtGuestServerSection
{
  AQSCorrelator      MgmtGuestServer;      /* Correlator for Management Guest Server  */
  AQSCorrelator      MgmtGuestServerLB;    /* Correlator for Load Balancer this
                                           server is defined to                 */
  AQSCorrelator      MgmtGuestServerWork;  /* Correlator for Workload this
                                           server belongs to                    */
  union {
     struct in_addr   in;                  /* Server's IPv4 address               */
     struct in6_addr in6;                  /* Server's IPv6 address               */
   } MgmtGuestServerIPaddr;
  char               MgmtGuestSystemID[8]; /* z/VM System ID where the server resides */
  char               MgmtGuestSiteName[8]; /* Name of site where server resides    */
  char               MgmtGuestName[8];     /* Linux on z Systems Guest name where the
                                           server resides                       */
  unsigned int       MgmtGuestServerWt;    /* Net weight for this server relative to
                                           other Linux on z Systems servers on this
                                           site                                 */
  unsigned short     MgmtGuestServerPort;  /* Port number where server is listening */
  unsigned short     MgmtGuestServerFlags; /* Server flags                         */
/* #define AQSServerIPv4   1                MgmtGuestServerIPaddr is IPv4 address */
  unsigned char      MgmtGuestServerState; /* State of server                      */
/* #define AQSServerUp     1                Server is up                         */
/* #define AQSServerDown   2                Server is down                       */
/* #define AQSServerUnreg  3                Server is unregistered               */
  char               MgmtGuestServerRsvd[3]; /* Reserved - set to zero             */
} AQSMgmtGuestServerSection;
/*
** Message Section for SNA Application Servers (10th section, optional)
*/
typedef struct _AQSSNAServerSection
{
  AQSCorrelator      SNAServer;            /* Correlator for SNA Server            */
```

```
  AQSCorrelator      SNAServerLB;           /* Correlator for Load Balancer this
                                               server is defined to                  */
  AQSCorrelator      SNAServerWork;         /* Correlator for Workload this
                                               server belongs to                     */
  char               SNAJobName[8];         /* The MVS jobname of server             */
  char               SNASystemName[8];      /* System name where server resides      */
  char               SNASiteName[8];        /* Name of site (i.e sysplex) where server
                                               resides                               */
  char               SNAServerApplName[8];  /* The VTAM name of the SNA application  */
  char               SNAServerNetid[8];     /* The VTAM network ID of the SNA
                                               application                           */
  unsigned int       SNAServerNormWt;       /* Net weight for this server relative to
                                               other SNA servers on this site        */
  unsigned char      SNAServerState;        /* State of server                       */
#define AQSSNAServerUp     1               /* Server is up                          */
#define AQSSNAServerDown   2               /* Server is down                        */
#define AQSSNAServerUnreg  3               /* Server is unregistered                */
  unsigned char      SNAFlags;              /* Server flags                          */
#define AQSSNADuplicateSvr 1               /* Server SNA application already specified
                                               under a different Load Balancer
                                               correlator.                           */
  char               SNAServerRsvd[2];      /* Reserved - set to zero                */
} AQSSNAServerSection;
/*
** Message Section for MQ queue managers (11th section, optional)
*/
typedef struct _AQSMQQMgrSection
{
  AQSCorrelator      AQSMQQMgr;             /* Correlator for MQ queue manger        */
  AQSCorrelator      AQSMQQMgrWork;         /* Correlator for a workload this MQ queue
                                               manager processes messages for        */
  char           AQSMQQMgrName[4];          /* MQ queue manager name                 */
  char           AQSMQQMgrIPaddr[16];       /* MQ queue manager IP Addr              */
  char           AQSMQQMgrJobName[8];       /* MQ queue manager job name             */
  char           AQSMQSystemName[8];        /* MQ queue manager System name          */
  char           AQSMQSiteName[8];          /* Name of site (i.e. sysplex)
                                               where MQ queue manager resides        */
  char           AQSMQClusterName[48];      /* MQ cluster name                       */
  unsigned int   AQSMQQMgrNormWt;           /* Normalized MQ queue manager weight    */
  unsigned int   AQSMQQMgrWLMWt;            /* WLM MQ queue manager server specific
                                               weight                                */
  unsigned short AQSMQQMgrPort;             /* MQ queue manager port                 */
  unsigned short AQSMQQMgrFlags;            /* MQ queue manager flags                */
#define AQSMQQMgrIPv4      1               /* AQSMQQMgrIPaddr is IPv4               */
  unsigned char  AQSMQQMgrState;            /* MQ queue manager state                */
#define AQSMQQMgrUp        1               /* MQ queue manager is available for the
                                               workload                              */
#define AQSMQQMgrDown      2               /* MQ queue manager is unavailable for
                                               the workload                          */
  char           AQSMQQMgrRsvd[3];          /* Reserved — set to zero                */
} AQSMQQMgrSection;
```

Chapter 11. Display Command API for Multi-site Workload Lifeline

Multi-site Workload Lifeline provides a Display Command API that you can use to issue Lifeline DISPLAY commands and retrieve the responses. User applications can communicate with this Lifeline API by using the AF_UNIX socket opened by the Lifeline Advisor.

The flow between the Lifeline Display Command API and the user application is described in Figure 9.

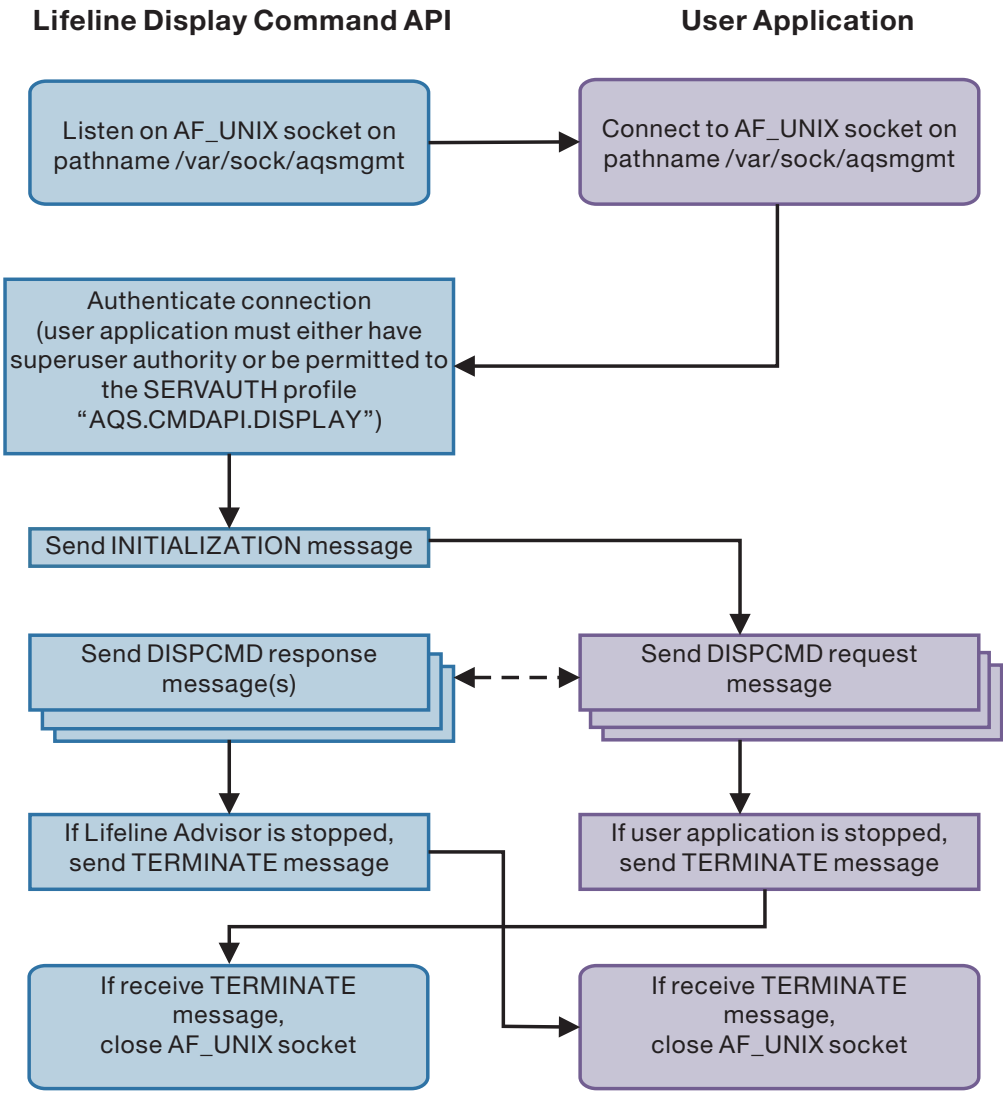


Figure 9. Flow between the Lifeline Display Command API and the user application

There are three possible message types: initialization message, display command message, and termination message. The initialization and termination message contain only a message header. The display command message is either a request or a response.

The display command request message contains the following headers and sections:

1. A message header.
2. A display command request header, which specifies the number of display commands being issued and the time out value to wait for the commands to complete.
3. A display command request message for each display command request.

Figure 10 describes the layout of the data request message.

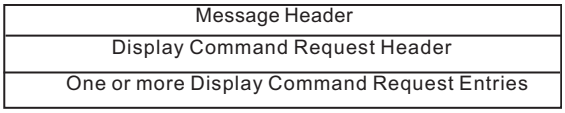


Figure 10. Layout of the Display Command request message

The Display Command Request Header must follow the Message Header and be contiguous. Use the Display Command Request Header to set the location of the first Display Command Request Entry.

The display command response message contains the following headers and sections:

1. A message header.
2. A display command response header, which specifies the number of display command response entries being returned.
3. A display command response entry for each display command response.
4. One or more display command response text lines for each display command response.

Figure 11 describes the layout of the data response message.

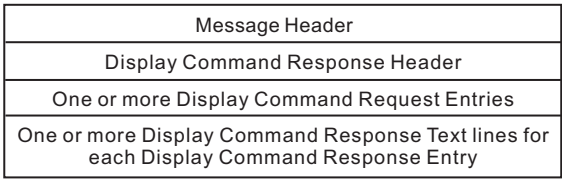


Figure 11. Layout of the Display Command response message

The Display Command Response Header will follow the Message Header and be contiguous. You can locate the offset of the first Display Command Response Entry through the Display Command Response Header. You can locate the offset of the first text message response through each of the Display Command Response Entries. See "Display Command API message format" for more details about the layout of the Display Command Request and Response messages.

See Appendix E, "Sample Display Command API application," on page 327 for an example of how to use this API.

Display Command API message format

The following information shows the format of a Display Command Request message.

```
/*
** Message Header
*/
typedef  struct _AQSMessageHdr {
 char             MsgHdrID[4];              /* Identifier for Message Header          */
#define AQSMessageHdrID "AQSM"
 unsigned int      MsgHdrLength;             /* Length of message header               */
 unsigned short    MsgHdrVersion;            /* Interface version                      */
#define AQSVersion  5                       /* Display Command API version            */
unsigned short    MsgHdrType;               /* Message type                           */
#define AQSInitType        1                /* Initialization message                 */
#define AQSTermType        2                /* Termination message                    */
#define AQSDisplayAPIType  6                /* Display Command API message            */
 char             MsgHdrRsvd1[4];           /* Reserved - set to 0                    */
 char             MsgHdrCorrelator[16];     /* User-defined correlator                */
 char             MsgHdrRsvd2[8];           /* Reserved - set to 0                    */
 unsigned int      MsgHdrMsgLength;          /* Message length (including header)      */
 unsigned int      MsgHdrTime;               /* Timestamp when message was created     */
 char             MsgHdrRsvd3[32];          /* Reserved - set to 0                    */
} AQSMessageHdr;

/*
** Display Command Request Message Header
*/
typedef  struct _AQSDisplayAPIReqHdr {
 char             ReqHdrID[4];              /* Identifier for Display Command Request  */
#define AQSDisplayReqID "AQSD"
 unsigned int      ReqMsgLength;             /* Length of Display Command API message
                                               (including all AQSDisplayAPIReqCmd's)   */
 unsigned int      ReqMsgCount;              /* Number of Display Command requests      */
 unsigned int      ReqMsgTimeOut;            /* Amount of time, in seconds, to wait for
                                               all Display Command requests to complete.
                                               If zero is specified, it indicates to wait
                                               indefinitely for all requests to
                                               complete.                               */
 unsigned int      ReqMsgOffset;             /* Offset from start of AQSMessageHdr to
                                               the first AQSDisplayAPIReqCmd structure */
} AQSDisplayAPIReqHdr;

/*
** Display Command Request Entry
*/
typedef  struct _AQSDisplayAPIReqCmd {
 unsigned int      ReqCmdIndex;              /* Index used for this command – maps to
                                               the index returned on the Display
                                               Command response                        */
 unsigned int      ReqCmdOffset;             /* Offset to next AQSDisplayAPIReqCmd
                                               structure (set to zero, if last or only
                                               Display Command request)                */
 char             ReqCmdText[129];          /* Text of requested Display Command, null-
                                               terminated                              */
} AQSDisplayAPIReqCmd;
```

The following information shows the format of a Display Command Response message.

```
/*
** Message Header
*/
typedef  struct _AQSMessageHdr {
 char             MsgHdrID[4];              /* Identifier for Message Header          */
#define AQSMessageHdrID "AQSM"
 unsigned int      MsgHdrLength;             /* Length of message header               */
 unsigned short    MsgHdrVersion;            /* Interface version                      */
#define AQSVersion  5                       /* Display Command API version            */
unsigned short    MsgHdrType;               /* Message type                           */
#define AQSInitType        1                /* Initialization message                 */
#define AQSTermType        2                /* Termination message                    */
#define AQSDisplayAPIType  6                /* Display Command API message            */
 char             MsgHdrRsvd1[4];           /* Reserved - set to 0                    */
 char             MsgHdrCorrelator[16];     /* User-defined correlator                */
 unsigned int      MsgHdrRc;                 /* Return code                            */
#define AQSRcOK     0                       /* Successful Display Command API call    */
#define AQSRcError  8                       /* Unsuccessful Display Command API call  */
 unsigned int      MsgHdrRsn;                /* Reason code                            */
```

```
#define AQSBadID           1               /* Incorrect message identifier           */
#define AQSBadVersion      2               /* Incorrect message version              */
#define AQSBadType         3               /* Incorrect message type                 */
#define AQSBadSize         4               /* Incorrect message size                 */
#define AQSBadFields       5               /* Reserved fields are not zero           */
#define AQSConnsExceeded   6               /* Too many active connections            */
#define AQSInternalError   7               /* Internal error                         */
#define AQSNotAuth         8               /* Authorization failure                  */
#define AQSCommandFailure  9               /* One or more Display Command API requests
                                              were not successful. Refer to
                                              AQSDisplayAPIRspRc to determine which
                                              requests were not successful.          */

 unsigned int      MsgHdrMsgLength;        /* Message length (including header)      */
 unsigned int      MsgHdrTime;             /* Timestamp when message was created     */
 char              MsgHdrRsvd2[32];        /* Reserved - set to 0                    */
} AQSMessageHdr;

/*
** Display Command Response Message Header
*/
typedef  struct _AQSDisplayAPIRspHdr {
 char              RspHdrID[4];            /* Identifier for Display Command Response */
#define AQSDisplayRspID "AQSD"
 unsigned int      RspMsgLength;           /* Length of Display Command API message
                                              (including all AQSDisplayAPIRspCmd's)  */
 unsigned int      RspMsgCount;            /* Number of Display Command responses,
                                              one for each request                   */
 unsigned int      RspMsgOffset;           /* Offset from start of AQSDisplayAPIRspHdr
                                              to the first AQSDisplayAPIRspCmd
                                              structure                              */
} AQSDisplayAPIRspHdr;

/*
** Display Command Response Entry
*/
typedef  struct _AQSDisplayAPIRspCmd {
 unsigned int      RspCmdIndex;            /* Index of this command — maps to the
                                              index passed on the Display Command
                                              request                                */
 unsigned int      RspCount;               /* Number of response messages returned
                                              for this Display Command request       */
 unsigned int      RspRc;                  /* Return code from processing this Display
                                              Command request                        */
#define AQSCmdOK       0                  /* Display Command request was successfully
                                              processed                              */
#define AQSCmdNotOk    4                  /* Display Command request was not
                                              successfully processed - Display Command
                                              response message describes the failure */
#define AQSCmdTimeout  8                  /* Display Command request was not
                                              successfully processed — time out
                                              occurred before the request could
                                              complete (RspCmdOffset will be zero)   */
#define AQSCmdTrunc   12                  /* Display Command request was successfully
                                              processed, but the Display Command
                                              response was truncated                 */
 unsigned int      RspNextOffset;          /* Offset to next AQSDisplayAPIRspCmd
                                              structure (set to zero, if last or only
                                              Display Command response)              */
 unsigned int      RspCmdOffset;           /* Offset from start of AQSDisplayAPIRspHdr
                                              to array of AQSDisplayAPIRspText
                                              structures                             */
} AQSDisplayAPIRspCmd;

/*
** Display Command Response Text
*/
```

```
typedef  struct _AQSDisplayAPIRspText {
 char              RspText[257];              /* One line of message text from the Display
                                                 Command request, null-terminated        */
} AQSDisplayRspText;
```

Chapter 12. Multi-site Workload Lifeline messages

AQS0001I MULTI-SITE WORKLOAD LIFELINE REQUIRES THE TCP/IP BASE FEATURE OF z/OS

Explanation: The Multi-site Workload Lifeline function is disabled because the TCP/IP base feature of z/OS is not enabled.

System action: Processing ends.

Operator response: Contact the system programmer.

System programmer response: The IFAPRDxx parmlib member specifies whether or not the TCP/IP base feature is enabled. Correct the IFAPRDxx parmlib member if it is in error. IBM has defined the appropriate product enablement settings in the IFAPRD00 member of SYS1.IBM.PARMLIB.

If TCP/IP_BASE is not part of your system, no action is required; the Multi-site Workload Lifeline function cannot be used.

Module: AQSUTUTI

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0004I *applname* **IS NOT SUPPORTED IN THIS ENVIRONMENT**

Explanation: The Multi-site Workload Lifeline application was started in an unsupported environment. It is supported only in the z/OS UNIX shell or batch environments.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline z/OS Agent

System action: Processing ends.

Operator response: Start the Multi-site Workload Lifeline Advisor or z/OS Agent in a supported environment.

System programmer response: None.

Module: AQSUTUTI

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0004I LLADVSR IS NOT SUPPORTED IN THIS ENVIRONMENT
```

AQS0005I *applname* **MUST BE APF-AUTHORIZED**

Explanation: The Multi-site Workload Lifeline application requires APF authorization to function correctly, but the application was not running as APF authorized.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline z/OS Agent

System action: Processing ends.

Operator response: Contact the system programmer to ensure that the Advisor or Agent was installed correctly.

System programmer response: Ensure that the Advisor or z/OS Agent was installed correctly. If the Advisor or z/OS Agent executable application resides in the z/OS UNIX file system, ensure that the APF-authorized attribute is on. If the Advisor or z/OS Agent resides in a load module, ensure that the library that contains it is APF authorized.

Module: AQSUTUTI

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0005I LLADVSR MUST BE APF-AUTHORIZED
```

AQS0006I MESSAGE CATALOG *filename* COULD NOT BE OPENED - DEFAULT MESSAGES WILL BE USED

Explanation: The Multi-site Workload Lifeline message catalog file could not be opened. The command will use the default message strings instead of the message strings in the message catalog file.

In the message text:

filename
The name of the message catalog that could not be opened.

System action: Processing continues.

Operator response: Contact the system programmer.

System programmer response: Ensure that the message catalog was installed properly. If the message catalog is installed in a location other than the default, verify that the NLSPATH and LANG environment variables are correctly defined in your Lifeline Advisor and Lifeline Agent started procedures. For Linux on z Systems Management Agents, verify that the catalog is located in the `/opt/ibm/lifeline/lib/msg/C` directory.

Module: AQSUTUTI

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0006I MESSAGE CATALOG aqsllmsg.cat COULD NOT BE OPENED - DEFAULT MESSAGES WILL BE USED
```

AQS0007I MESSAGE CATALOG *filename* AT INCORRECT SERVICE LEVEL - DEFAULT MESSAGES WILL BE USED

Explanation: The Multi-site Workload Lifeline message catalog is not at the same service level as the Lifeline Advisor or Lifeline Agent. The Lifeline application will use the default message strings instead of the message strings in the message catalog.

In the message text:

filename
The name of the message catalog that could not be used.

System action: Processing continues.

Operator response: Contact the system programmer.

System programmer response: Ensure that the correct service level of the message catalog was installed. If the updated message catalog was installed in a location other than the default location, verify that the NLSPATH and LANG environment variables are correctly defined in your Lifeline Advisor and Lifeline Agent started procedures. For Linux on z Systems Management Agents, verify that the updated catalog is installed in the `/opt/ibm/lifeline/lib/msg/C` directory.

Module: AQSUTUTI

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0007I MESSAGE CATALOG aqsllmsg.cat AT INCORRECT SERVICE LEVEL - DEFAULT MESSAGES WILL BE USED
```

AQS0008I AGENT UNABLE TO PROCESS DEACTIVATE COMMANDS

Explanation: The Multi-site Workload Lifeline z/OS Agent issues this message when it does not have authority to drop connections as a result of a DEACTIVATE command issued from the Lifeline Advisor.

System action: Processing continues.

Operator response: Contact the system programmer.

System programmer response: Using the SAF product on your system, ensure the following conditions are true:

- The OPERCMDS class is active.
- The MVS.VARY.TCPIP.DROP profile is defined.
- The Lifeline z/OS Agent has CONTROL access to this profile.

When the errors are corrected, stop and restart the Lifeline z/OS Agent. See "(z/OS systems) Authorizing the Lifeline Agents to reset active connections" on page 40 for more information about configuring the correct authorization.

Module: LAMAIN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0009I SNA APPLICATIONS CANNOT BE MONITORED

Explanation: The Multi-site Workload Lifeline z/OS Agent issues this message when it does not have authority to open an extended MCS console. The z/OS Agent uses this console to manage SNA applications.

System action: Processing continues; however, SNA applications on this z/OS Agent's system will not be monitored. Multi-site Workload Lifeline Advisor displays will show these SNA applications as not active.

Operator response: Contact the system programmer.

System programmer response: Using the SAF product on your system, ensure the following conditions are true:

- The OPERCMDS class is active.
- The MVS.MCSOPER.LLAGNT* profile is defined.
- The Lifeline z/OS Agent has READ access to this profile.

When the errors are corrected, stop and restart the Lifeline z/OS Agent. See "(z/OS systems) Authorizing the Lifeline Agents to monitor SNA applications" on page 41 for more information about configuring the correct authorization.

Module: LASNA

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0010I MQ QUEUE MANAGERS CANNOT BE MONITORED

Explanation: The Multi-site Workload Lifeline z/OS Agent issues this message when one of the following conditions is true:

- The MQ APIs used to connect to a local MQ queue manager cannot be loaded.
- The MQ queue manager is not at a supported level.
- The z/OS Agent does not have permission to access the local MQ queue manager or the MQ queue manager's resources.
- At least one page set is full for the MQ queue manager.

The z/OS Agent uses this connection to monitor MQ queue managers.

System action: Processing continues; however, MQ queue managers on this z/OS Agent's system will not be monitored. Multi-site Workload Lifeline Advisor displays will show these MQ queue managers as unavailable.

Operator response: Contact the system programmer.

System programmer response: To determine why the MQ queue manager cannot be monitored:

- If internal trace is being used, dump and examine the Agent's internal trace messages.
- If internal trace is not being used, examine the Agent syslogd file. The syslogd identifier is llagent for the Agent.

If the MQ APIs could not be loaded, ensure one of the following conditions is true:

- The IBM MQ SCSQAUTH and SCSQLOAD dataset names are in the LNKLSTxx SYS1.PARMLIB member.
- The IBM MQ SCSQAUTH and SCSQLOAD dataset names are added as a STEPLIB DD statement in the z/OS Agent's started procedure.

If an unsupported version of IBM MQ is being used, ensure that IBM MQ version 7.1.0 or higher is installed.

If the MQ queue manager or MQ queue manager resources are protected by security profiles, ensure that the z/OS Agent has the correct permission to access these resources.

If the MQ queue manager has full page sets, either enlarge the page set involved or reduce the loading on that page set by moving queues to another page set. See *IBM MQ: Administering IBM MQ* for information about resolving page set issues.

When the errors are corrected, stop and restart the Lifeline z/OS Agent. See "(z/OS systems) Enabling the Lifeline Agents to communicate with MQ queue managers" on page 42 for more information about adding the IBM MQ SCSQAUTH and SCSQLOAD dataset names to the z/OS Agent's linklist concatenation and permitting the z/OS Agent access to the MQ queue manager and its resources.

Module: LAMQ

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0101I *applname* **STARTING**

Explanation: The Multi-site Workload Lifeline application is starting.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LAMAIN, LMMAIN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0101I LLADVSR STARTING
```

AQS0102I *applname* **INITIALIZATION COMPLETE**

Explanation: The Multi-site Workload Lifeline application completed initialization.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LAMAIN, LMMAIN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0102I LLADVSR INITIALIZATION COMPLETE
```

AQS0103I *applname* **SHUTDOWN IN PROGRESS**

Explanation: The Multi-site Workload Lifeline application is shutting down in response to a STOP command.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LAMAIN, LMMAIN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0103I LLADVSR SHUTDOWN IN PROGRESS
```

AQS0104I *applname* **SHUTDOWN COMPLETE**

Explanation: The Multi-site Workload Lifeline application ended in response to a STOP command.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

System action: Processing ends.

Operator response: None.

System programmer response: None.

Module: LAMAIN, LMMAIN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0104I LLADVSR SHUTDOWN COMPLETE
```

AQS0105I *applname* **CONFIGURATION ERRORS DETECTED**

Explanation: The configuration file for the Multi-site Workload Lifeline application cannot be opened, or contains one or more errors.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

System action: Processing ends.

Operator response: Contact the system programmer.

System programmer response: If syslogd was started, examine the syslogd file for configuration error messages. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. Otherwise, if internal trace is being used, dump and examine the internal trace messages for configuration error messages. Correct the configuration file errors and restart the application. See Chapter 6, “Multi-site Workload Lifeline configuration statements,” on page 93 for more information about configuration statements and parameters.

Module: LACONFIG, LMCONFIG

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0105I LLADVSR CONFIGURATION ERRORS DETECTED
```

AQS0106I ADVISOR REFRESH ERRORS DETECTED

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,REFRESH` command when the Advisor configuration file contains changes to statements that cannot be refreshed.

System action: The MODIFY command is ignored.

Operator response: Contact the system programmer.

System programmer response: If syslogd was started, examine the syslogd file for configuration error messages. The syslogd identifier is lladvsr for the Advisor. Otherwise, if internal trace is being used, dump and examine the internal trace messages for configuration error messages. Correct the configuration file errors and reissue the `MODIFY procname,REFRESH` command. See Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93 for more information about configuration statements and parameters.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0107I *applname* **MODIFY COMMAND SYNTAX ERROR AT** *location*

Explanation: The Multi-site Workload Lifeline application detected a syntax error on a z/OS MODIFY command or the Linux on z Systems aqsllcmd command.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

location
The portion of the command that is not syntactically valid.

System action: The command is rejected.

Operator response: If syslogd was started, examine the syslogd file to determine why the MODIFY command failed. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. Otherwise, if internal trace is being used, dump and examine the internal trace messages to determine why the command failed. Re-enter the command using the valid syntax. See Chapter 7, "Lifeline Advisor commands," on page 127, Chapter 8, "Lifeline z/OS Agent commands," on page 169, and Chapter 9, "Lifeline Linux on z Systems Management Agent commands," on page 185 for more information.

System programmer response: None.

Module: LACMD, LCCMD, LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0107I LLADVSR MODIFY COMMAND SYNTAX ERROR AT 'BAD'
```

AQS0108I *applname* **MODIFY COMMAND PARAMETER** *parm* **INCORRECT VALUE** *value*

Explanation:

The Multi-site Workload Lifeline application detected an incorrect value for a parameter on a z/OS MODIFY command or the Linux on z Systems aqsllcmd command.

In the message text:

applname
The application name. Possible values:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

parm
The name of the command parameter that is in error.

value
The incorrect value entered on the command.

System action: The command is rejected.

Operator response: Re-enter the MODIFY command with a valid value for the indicated parameter. See Chapter 7, "Lifeline Advisor commands," on page 127, Chapter 8, "Lifeline z/OS Agent commands," on page 169, and Chapter 9, "Lifeline Linux on z Systems Management Agent commands," on page 185 for more information.

System programmer response: None.

Module: LCCMD, LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0108I LLADVSR MODIFY COMMAND PARAMETER LEVEL INCORRECT VALUE 2000
```

AQS0109I *syscall* **CALL FAILED** *errno/errnojr* **FOR PORT** *port*

Explanation: The Multi-site Workload Lifeline Advisor or Agent application was unable to initialize a listening or client socket.

In the message text:

syscall
The type of call that failed. For example, the system call might be a SOCKET, SETSOCKOPT, or BIND call.

errno
The UNIX System Services return code. See *return codes (errnos)* in *z/OS UNIX System Services Messages and Codes* for more information about these return codes.

errnojr
The hexadecimal UNIX System Services reason code. See *return codes (errnos)* in *z/OS UNIX System Services Messages and Codes* for more information about the format of the 4-byte reason code.

port
The port number on which the call failed.

System action: Processing ends.

Operator response: Determine whether TCP/IP is available and restart if necessary. Restart the application. If TCP/IP is available when the application issues this message, take the following actions:

- If internal trace is being used, dump and save the internal trace messages.
- If the internal trace is not being used, save the syslogd file.
- Contact the system programmer.

System programmer response: If TCP/IP is available when the application issues this message and if syslogd was started, examine the syslogd file and correct the error. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. Otherwise, if internal trace is being used, dump and examine the internal trace messages, and correct the error.

Module: LMLISTEN, LASOCKET

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0109I BIND CALL FAILED 6F/744C7246 FOR PORT 3860
```

AQS0110I UNABLE TO ESTABLISH *endpoint* **LISTENING SOCKET**

Explanation: The Multi-site Workload Lifeline Advisor was unable to initialize because it could not create a listening socket.

In the message text:

endpoint
The listening socket that could not be created. Possible values are LOAD BALANCER, ADVISOR, or AGENT.

System action: Processing ends.

Operator response: Determine whether TCP/IP is available and restart if necessary. Restart the application. If TCP/IP is available when the application issues this message, take the following actions:

- If internal trace is being used, dump and save the internal trace messages.
- If internal trace is not being used, dump and save the syslogd file.
- Contact the system programmer.

System programmer response: If TCP/IP is available when the Advisor issues this message, see message AQS0109I that might precede this message, or if syslogd was started, examine the syslogd file and correct the error. The syslogd identifier is lladvsr for the Advisor. Otherwise, if internal trace is being used, dump and examine the internal trace messages, and correct the error.

Module: LMLISTEN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0110I UNABLE TO ESTABLISH LOAD BALANCER LISTENING SOCKET
```

AQS0111I *applname* **DEBUG LEVEL** *level*

Explanation: This message is issued in response to a z/OS `MODIFY procname,DISPLAY,DEBUG` command or a Linux on z Systems `aqsllcmd display,debug` command.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

level
The current debug level in effect. Valid debug level values are:

1 Errors are logged.

2 Warnings are logged.

4 Significant events are logged.

8 Informational messages are logged.

16 Debug data messages are logged. This level is for IBM service use only. If the *applname* value is LLADVSR, messages related to TCP/IP messages sent between the Advisor and load balancers, between the primary and secondary Advisors, and between the Advisor and Agent are logged.

32 Debug data messages are logged. This level is for IBM service use only. If the *applname* value is LLAGENT, messages related to data collection and manipulation that support weight calculations are logged.

64 Internal debug data is logged. This level is for IBM service use only.

128 Function entry and exit tracing are logged. This level is for IBM service use only.

Individual values can be added together. For example, if the debug level displayed is 7, all ERROR, WARNING, and EVENT messages are logged. If the AQSTRACE DD card was specified in the Advisor or z/OS Agent started procedure, these messages are logged in an internal trace, and only messages at the ERROR, WARNING, and EVENT levels are logged to the syslogd file. For Linux on z Systems Agents, internal trace is being used by default. If internal trace is not being used, all messages are logged to the syslogd file.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LACMD, LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0111I LLADVSR DEBUG LEVEL 7
```

AQS0112I LOAD BALANCER SUMMARY

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,DISPLAY,LB` command. This message is followed by summary information about connected load balancers. See "MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information" on page 127 for the explanation of the display output.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 5, 8, 9

Automation: Not applicable for automation.

AQS0113I LOAD BALANCER DETAILS

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,DISPLAY,LB,DETAIL` command. This message is followed by detailed information about connected load balancers. See "MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information" on page 127 for the explanation of the display output.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 5, 8, 9

Automation: Not applicable for automation.

AQS0114I MEMBER SUMMARY

Explanation: The Multi-site Workload Lifeline Agent issues this message in response to a z/OS `MODIFY procname,DISPLAY,MEMBERS` command or a Linux on z Systems `aqsllcmd display,members` command. This message is followed by summary information about members (applications being load balanced) that one or more load balancers registered with the Multi-site Workload Lifeline Advisor. See "MODIFY *agent_proc*,DISplay command: Display Lifeline Agent information" on page 169 or "Display Linux on z Systems Management Agent information" on page 185 for the explanation of the display output.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LACMD

Routing code: 8, 10

Descriptor code: 5, 8, 9

Automation: Not applicable for automation.

AQS0115I MEMBER DETAILS

Explanation: The Multi-site Workload Lifeline Agent issues this message in response to a `MODIFY procname,DISPLAY,MEMBERS,DETAIL` command or a Linux on z Systems `aqsllcmd display,members,detail` command. This message is followed by detailed information about members (applications being load balanced) that one or more load balancers registered with the Multi-site Workload Lifeline Advisor. See "MODIFY *agent_proc*,DISplay command: Display Lifeline Agent information" on page 169 or "Display Linux on z Systems Management Agent information" on page 185 for the explanation of the display output.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LACMD

Routing code: 8, 10

Descriptor code: 5, 8, 9

Automation: Not applicable for automation.

AQS0116I *applname* **INITIALIZATION ERROR - REASON CODE** *reason*

Explanation: The Multi-site Workload Lifeline application could not initialize because it detected an error.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

reason
The code for the error encountered. Possible values for the reason code are:

1 Another copy of the application is already active. Only one copy of the Advisor can be active within the MVS sysplex. Only one copy of the z/OS Agent can be active on an MVS system. Only one copy of the Linux on z Systems Management Agent can be active on a z/VM system for a given site.

2 The Advisor or Agent application cannot open the configuration file, or found an error in the configuration file. Message AQS0105I might precede this message.

3 An internal error was encountered in the application.

4 The Advisor or Agent application found an error in a start option parameter in the started procedure.

5 The user ID associated with the Advisor or z/OS Agent started task is not authorized, or the Advisor or z/OS Agent was not started as a started procedure.

6 A required resource is not available. For example, the TCP/IP stack is not started, or a configured IP address is not defined or available on the TCP/IP stack.

7 One of the following conditions has occurred:
- The Advisor or z/OS Agent application was started on an unsupported z/OS release.
- The Linux on z Systems Management Agent was started and not all of the required components or packages were found.
- The Linux on z Systems Management Agent was started and not all of the required components or packages are at the required level.

System action: Processing ends.

Operator response:
- If the *reason* value is 1, verify that the instance of the active application is the one that you want. If a previous instance of the application is stopped but has not ended, issue a CANCEL command to cancel the previous instance of the Advisor or z/OS Agent before you start the new instance, or kill the previous instance of the Linux on z Systems Management Agent.
- If the *reason* value is 6, start the TCP/IP stack if it is not already started.
- If the *reason* value is 7, verify that Advisor or z/OS Agent is being started on a supported z/OS release. Multi-site Workload Lifeline is supported on z/OS V1R13 and higher releases. For the Linux on z Systems Management Agent, take the following actions:
  - If internal trace is being used, dump and save the internal trace messages.
  - If internal trace is not being used, save the syslogd file.
  - Contact the system programmer.
- If the stack is already started, and for all other reason values, take the following actions:
  - If internal trace is being used, dump and save the internal trace messages.
  - If internal trace is not being used, dump and save the syslogd file.
  - Contact the system programmer.

System programmer response: Ensure that there is sufficient information to debug this problem. Configure the application to use a debug level of 127. See "Debug levels" on page 73 for information about how to configure the debug level for the specified application. Take the appropriate action, based on the *reason* value:

- If the *reason* value is 2, examine the application's dumped internal trace file or syslogd file for errors. Correct the configuration file as needed. See Chapter 3, "Configuring Multi-site Workload Lifeline," on page 47 for information about configuring the Advisor and Agent.
- If the *reason* value is 3, contact the IBM software support center. The application's dumped internal trace file or syslogd file is the minimum diagnostic data that must be provided. See "Diagnostic data" on page 74 for more information about collecting diagnostic data.
- If the *reason* value is 4, examine the application's dumped internal trace file or syslogd file for errors. Correct the started procedure as needed.
- If the *reason* value is 5, examine the security product profiles that have been established for the Advisor and z/OS Agent. Ensure that the Advisor or z/OS Agent is started from a started procedure and that the user ID in the started procedure is permitted to the appropriate profiles if they are defined. See "(z/OS systems) Authorizing the Lifeline Agents to use WLM services" on page 40 for more information about setting up the authorization profiles for the security product. Ensure that the Linux on z Systems Management Agent is started with a user ID with root authority.
- If the *reason* value is 6 and the TCP/IP stack is already started, and if syslogd was started, examine the syslogd file for errors. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. Otherwise, if internal trace is being used, dump and examine the internal trace messages for errors. Verify that the correct IP addresses are configured in the configuration file. Correct the configuration file as needed. See Chapter 3, "Configuring Multi-site Workload Lifeline," on page 47 for more information about configuring the Advisor and Agent.
- If the *reason* value is 7, for the Linux on z Systems Management Agent, see the installation documentation and verify that the following conditions are true:
  - All of the required packages and system software are installed and included in the PATH environment variable.
  - The required packages meet the minimum version and release specifications.
  - The Linux on z Systems Management Agent user ID has the required z/VM command privileges.

Module: LAMAIN, LMADV, LMMAIN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0116I LLADVSR INITIALIZATION ERROR - REASON CODE 6
```

AQS0117I *applname* **CONFIGURATION WARNINGS DETECTED**

Explanation: The Multi-site Workload Lifeline application configuration file contains one or more statements that resulted in warning messages being logged. These warnings do not cause the application to end, but might indicate conditions that affect the normal operation of the application.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

System action: Processing continues.

Operator response: Take the following actions:

- If internal trace is being used, dump and save the internal trace messages.
- If internal trace is not being used, dump and save the syslogd file.
- Contact the system programmer.

System programmer response: If syslogd was started, examine the syslogd file for the application configuration warning messages. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. Otherwise, if internal trace is being used, dump and examine the internal trace messages for the application configuration warning

messages. Correct the configuration file definitions that generated the warning messages and either restart the application or, if the *applname* value is LLADVSR and the corrections are for modifiable configuration definitions, issue the MODIFY *procname*,REFRESH command. See Chapter 3, "Configuring Multi-site Workload Lifeline," on page 47 for more information about configuring the Advisor and Agent.

Module: LACONFIG, LMADV, LMCMD, LMCONFIG

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0117I LLADVSR CONFIGURATION WARNINGS DETECTED
```

AQS0118I ALL APPLICATIONS ARE QUIESCED BY OPERATOR

Explanation: The Multi-site Workload Lifeline z/OS Agent issues this message in response to a request to quiesce or enable a subset of the target applications. A MODIFY *procname*,QUIESCE or MODIFY *procname*,ENABLE command was issued. A previous MODIFY *procname*,QUIESCE,SYSTEM command was issued to quiesce all applications for this z/OS Agent. The z/OS Agent enforces a hierarchy so that a previous SYSTEM action cannot be overridden by a TCPNAME or PORT request.

System action: The MODIFY command is rejected because all applications have been quiesced by the MODIFY *procname*,QUIESCE,SYSTEM command.

Operator response: Issue the MODIFY *procname*,DISPLAY,MEMBERS command to list the registered members and the status flags for each member. The operator quiesce flag (SYSQ) indicates that an MVS operator quiesced all members. If you do not want some of the members to be quiesced, issue the MODIFY *procname*,ENABLE,SYSTEM command to re-enable all members, and the MODIFY *procname*,QUIESCE,TCPNAME=*stackname* command or the MODIFY *procname*,QUIESCE,PORT=*portnum* command to quiesce a subset of the members. See Chapter 8, "Lifeline z/OS Agent commands," on page 169 for more information.

System programmer response: None.

Module: LACMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0119I *applname* **TERMINATING -** *reason*

Explanation: The Multi-site Workload Lifeline application issues this message when error checking determines that it must stop.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline primary Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

reason
The reason the primary Advisor or Agent is stopping. Possible values are:

MESSAGE SIZE EXCEEDED
The primary Advisor is not able to send a message to an Agent or the Agent is not able to send a message to the primary Advisor because the message size exceeds the maximum TCP send buffer size.

System action: Processing ends.

Operator response: Contact the system programmer.

System programmer response: Take the appropriate action based on the *reason* value:

MESSAGE SIZE EXCEEDED

If internal trace is being used, dump and examine the internal trace messages. Otherwise, examine the syslogd files for the Advisor or Agent. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. An ERROR message is logged specifying the message size the application was attempting to send and the configured TCP send buffer size that was exceeded. Modify the maximum TCP send buffer size with a configured value that is larger than the message size being sent. For more information about how to use the TCPCONFIG TCPMAXSENDBUFRSIZE statement to configure the maximum send buffer size, see *z/OS Communications Server: IP Configuration Reference*.

Module: LMAGNT, LAADV

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0119I LLADVSR TERMINATING — MESSAGE SIZE EXCEEDED
```

AQS0120I ALL APPLICATIONS FOR *stackname* ARE QUIESCED BY OPERATOR

Explanation: The Multi-site Workload Lifeline z/OS Agent issues this message in response to a request to quiesce or enable a specific target application. A `MODIFY procname,QUIESCE` or `MODIFY procname,ENABLE` command was issued. A previous `MODIFY procname,QUIESCE,TCPNAME=stackname` command was issued to quiesce all applications for the TCP/IP stack. The z/OS Agent enforces a hierarchy so that a previous TCPNAME action cannot be overridden by a PORT request.

In the message text:

stackname
The name of the TCP/IP stack.

System action: The MODIFY command is rejected because all applications for this TCP/IP stack have been quiesced by the `MODIFY procname,QUIESCE,TCPNAME=stackname` command.

Operator response: Issue the `MODIFY procname,DISPLAY,MEMBERS` command to list the registered members and the status flags for each member. The operator quiesce flag (TCPQ) indicates that an MVS operator quiesced all members for the TCP/IP stack. If you do not want some of the members to be quiesced, issue the `MODIFY procname,ENABLE,TCPNAME=stackname` command to re-enable all members for this TCP/IP stack, and the `MODIFY procname,QUIESCE,PORT=portnum` command to quiesce a subset of the members. See Chapter 8, “Lifeline z/OS Agent commands,” on page 169 for more information.

System programmer response: None.

Module: LACMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0120I ALL APPLICATIONS FOR TCPIP ARE QUIESCED BY OPERATOR
```

AQS0121I NETWORK ACCESS TO PEER ADVISOR ON *sysname* HAS RECOVERED

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it detects that it has reestablished network communication with its peer Advisor.

In the message text:

sysname
The MVS system name where the peer Advisor is active.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0121I NETWORK ACCESS TO PEER ADVISOR ON CNTL2 HAS RECOVERED
```

AQS0122I NO MEMBERS MATCH SELECTION CRITERIA

Explanation: The Multi-site Workload Lifeline z/OS Agent issues this message in response to a `MODIFY procname,QUIESCE` or a `MODIFY procname,ENABLE` command. The MODIFY command is rejected because no active registered target applications match the criteria specified in the MODIFY command.

This message is also issued in response to a `MODIFY procname,QUIESCE,TCP=stackname` or `MODIFY procname,ENABLE,TCP=stackname` command when the *stackname* value does not match a TCP/IP stack that is active on the z/OS Agent system.

System action: The MODIFY command is ignored. Processing continues.

Operator response: Issue the `MODIFY procname,DISPLAY,MEMBERS` command to list the registered members on the local MVS system and the status flags for each member. The operator quiesce flag (SYSQ, TCPQ, or APPQ) indicates that an MVS operator quiesced the member. The absence of this flag indicates that the member is enabled from an MVS operator perspective. If the flag value is not the value that you want, issue a `MODIFY procname,QUIESCE` or a `MODIFY procname,ENABLE` command to change the flag value. See Chapter 8, "Lifeline z/OS Agent commands," on page 169 for more information.

System programmer response: None.

Module: LACMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0123I *cmd* COMMAND REJECTED

Explanation: The Multi-site Workload Lifeline z/OS Agent issues this message in response to a `MODIFY procname,QUIESCE` or a `MODIFY procname,ENABLE` command. The MODIFY command is rejected. A more specific error message precedes this message and explains the reason for the command rejection.

In the message text:

cmd
The command that was rejected. Possible values are:

- QUIESCE TCPNAME
- ENABLE TCPNAME
- QUIESCE APPLICATION
- ENABLE APPLICATION

System action: The MODIFY command is ignored. Processing continues.

Operator response: Look for a previous message that provides more specific information about why the MODIFY command was rejected. Issue the MODIFY *procname*,DISPLAY,MEMBERS command to list the registered members on the local MVS system and the status flags for each member. The operator quiesce flag (SYSQ, TCPQ, or APPQ) indicates that an MVS operator quiesced the member. The absence of this flag indicates that the member is enabled from an MVS operator perspective. If the flag value is not the value that you want, issue a `MODIFY procname,QUIESCE`

or a MODIFY *procname*,ENABLE command to change the flag value. See Chapter 8, "Lifeline z/OS Agent commands," on page 169 for more information.

System programmer response: None.

Module: LACMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0123I QUIESCE APPLICATION COMMAND REJECTED
```

AQS0124I NETWORK ACCESS TO PEER ADVISOR ON *sysname* NOT AVAILABLE

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it detects that it can no longer communicate with its peer Advisor over the network. If the Lifeline Advisor that issues this message is the secondary Advisor, AQS0164W was issued before this message.

In the message text:

sysname
The MVS system name where the peer Advisor was last active.

System action: Processing continues.

Operator response: Contact the system programmer.

System programmer response: Verify the network connectivity between this Advisor and the peer Advisor. Ensure that the Advisor configuration files are identical between this Advisor and the peer Advisor. See *z/OS Communications Server: IP Diagnosis Guide* for more information about diagnosing connectivity problems.

Module: LMBCPII

Routing code: 8, 10

Descriptor code: 12

Automation: This message is a possible candidate for automation if you want to automatically issue the MODIFY *procname*,TAKEOVER command to have this Advisor assume the role of primary Advisor.

Example:

```
AQS0124I NETWORK ACCESS TO PEER ADVISOR ON CNTL2 NOT AVAILABLE
```

AQS0125I BCPII ACCESS TO PEER ADVISOR ON *sysname* NOT AVAILABLE

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it detects that it can no longer communicate with the image (LPAR) where the peer Advisor was active by using the z/OS Base Control Program Internal Interface (BCPii) service.

In the message text:

sysname
The MVS system name where the peer Advisor was last active.

System action: Processing continues.

Operator response: Contact the system programmer.

System programmer response: Verify that z/OS is operational on the peer Advisor's image. Verify the connectivity used by BCPii to communicate with the peer Advisor's image. See *z/OS MVS Programming: Callable Services for High-Level Languages* for information about diagnosing BCPii issues.

Module: LMBCPII

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0125I BCPII ACCESS TO PEER ADVISOR ON CNTL2 NOT AVAILABLE
```

AQS0126I BCPII ACCESS TO PEER ADVISOR ON *sysname* HAS RECOVERED

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it detects that it has reestablished communication with the image (LPAR) where the peer Advisor was active by using the z/OS Base Control Program Internal Interface (BCPii) service.

In the message text:

sysname
The MVS system name where the peer Advisor is active.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMBCPII

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0126I BCPII ACCESS TO PEER ADVISOR ON CNTL2 HAS RECOVERED
```

AQS0127W *applname* CONNECTION TO ADVISOR AT *ipaddress* CLOSED DUE TO PROTOCOL ERROR

Explanation: The Multi-site Workload Lifeline Advisor that was started as the secondary Advisor or Agent issues this message when it closes its connection to the primary Advisor because of an internal protocol error. This message will be deleted and message AQS0129I will be issued when the secondary Advisor or Agent successfully reconnects to the primary Advisor.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline secondary Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

ipaddress
The IP address of the primary Advisor.

System action: The secondary Advisor or Agent writes messages to internal trace or the syslogd file and attempts to reconnect to the primary Advisor.

Operator response:

- If internal trace is being used, dump and save the internal trace messages.
- If internal trace is not being used, dump and save the syslogd file.
- If the packet trace or network sniffer trace is active, dump and save the trace.
- Contact the system programmer.

System programmer response: If internal trace is being used, dump and examine the internal trace message. Otherwise, examine the syslogd files for the Advisor and Agent. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. If the debug level includes messages at the message level, the file will show the data that each application sent or received. If the data that was sent by one application was the same data received by the corresponding application, contact IBM software support services. If the data that was sent was not the same data

that was received, this might indicate that the network integrity has been compromised. If the packet trace is active, examine the trace for the data that was sent and received. If the packet trace or network sniffer trace is not active, try to recreate the problem with active packet trace or network sniffer trace. See *z/OS Communications Server: IP Diagnosis Guide* for information about the packet trace.

Module: LMAARP, LAMAIN

Routing code: 1, 8

Descriptor code: 2, 7

Automation: This message is a possible candidate for automation if you want to automatically create snapshots of the Advisor and Agent syslogd or internal trace files for later problem determination.

Example:

```
AQS0127W LLADVSR CONNECTION TO ADVISOR AT 10.10.10.1 CLOSED DUE TO PROTOCOL ERROR
```

AQS0128I *peername* **CONNECTION FROM** *ipaddress* **CLOSED DUE TO INACTIVITY**

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the Advisor closes its connection to the Multi-site Workload Lifeline Agent or peer Advisor application because this Advisor did not receive a message from the application within the expected time.

In the message text:

peername
The application name. Possible values are:

ADVISOR
For the Multi-site Workload Lifeline Advisor

AGENT
For the Multi-site Workload Lifeline Agent

ipaddress
The IP address of the peer Advisor or Agent

System action: The Advisor closes the connection with the application. The peer Advisor or Agent attempts to reconnect to the Advisor until it is successful or is stopped. If the situation is temporary, the peer Advisor or Agent will successfully reconnect to the Advisor.

Operator response: If the peer Advisor or Agent is not active, start it. If the error persists, contact the system programmer.

System programmer response: Network connectivity problems, routing problems, slow system performance on the peer Advisor or Agent system, and low MVS dispatching priority for the application might cause this problem. If the error persists, increase the value of the advisor_timeout or updated_interval statement in the Advisor configuration file and restart the Advisor. See Chapter 6, “Multi-site Workload Lifeline configuration statements,” on page 93 for more information about configuration statements. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing network connectivity problems.

Module: LMADV, LMAGNT

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0128I ADVISOR CONNECTION FROM 10.10.10.1 CLOSED DUE TO INACTIVITY
```

AQS0129I *applname* **CONNECTED TO ADVISOR AT** *ipaddress*

Explanation: The Multi-site Workload Lifeline secondary Advisor or Agent issues this message when it is connected to the Multi-site Workload Lifeline primary Advisor.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline secondary Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

ipaddress
The IP address of the primary Advisor

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LAADV, LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0129I LLADVSR CONNECTED TO ADVISOR AT 10.10.10.1
```

AQS0130I *applname* **CONNECTION TO ADVISOR AT** *ipaddress* **IS NO LONGER ACTIVE**

Explanation: The Multi-site Workload Lifeline Advisor or Agent issues this message when it has lost its connection to the peer Multi-site Workload Lifeline Advisor.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline primary or secondary Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

ipaddress
The IP address of the primary or secondary Advisor

System action: The Advisor or Agent attempts to reconnect to the other Advisor. If the situation is temporary, the Advisor or Agent will successfully reconnect to the other Advisor.

Operator response:

- If the other Advisor is not active, start it.
- If the Advisor is active, take the following actions:
  - If the internal trace is being used, dump and save the internal trace messages.
  - If the internal trace is not being used, save the syslogd file.
  - Contact the system programmer.

System programmer response: If syslogd was started, examine the syslogd file for Advisor or Agent error or warning messages. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. Otherwise, if internal trace is being used, dump and examine the internal trace messages for error or warning messages. Correct any errors and restart the application that is in error.

Module: LAMAIN, LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0130I LLADVSR CONNECTION TO ADVISOR AT 10.10.10.1 IS NO LONGER ACTIVE
```

AQS0131I AGENT CONNECTED FROM *ipaddress*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it detects that it is connected to a Multi-site Workload Lifeline Agent.

In the message text:

ipaddress
The IP address of the Agent.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMAGNT

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0131I AGENT CONNECTED FROM 10.10.10.1
```

AQS0132I AGENT CONNECTION FROM *ipaddress* **IS NO LONGER ACTIVE**

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it detects that it lost its connection to the Multi-site Workload Lifeline Agent. This message usually indicates that the Agent has been stopped.

In the message text:

ipaddress
The IP address of the previously connected Agent.

System action: Processing continues. If the Agent is not stopped, the Agent attempts to reconnect to the Advisor. If the situation is temporary, the Agent will reconnect to the Advisor.

Operator response: Determine whether the Agent has ended. Restart the Agent if necessary. If the Agent cannot reconnect to the Advisor, take the following actions:

- If internal trace is being used, dump and save the internal trace messages.
- If internal trace is not being used, save the syslogd file.
- Contact the system programmer.

System programmer response: No action is required if the Agent was intentionally stopped; otherwise, if syslogd was started, examine the syslogd file for Advisor or Agent errors, or warning messages. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. Otherwise, if internal trace is being used, dump and examine the internal trace messages for Advisor or Agent errors, or warning messages. Correct any errors and restart the application that is in error.

Module: LMAGNT

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0132I AGENT CONNECTION FROM 10.10.10.1 IS NO LONGER ACTIVE
```

AQS0133I LOAD BALANCER CONNECTED FROM *ipaddress*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it detects that it is connected to a load balancer.

In the message text:

ipaddress
The IP address of the load balancer.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMLB

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0133I LOAD BALANCER CONNECTED FROM 10.10.10.1
```

AQS0134I LOAD BALANCER CONNECTION FROM *ipaddress* **IS NO LONGER ACTIVE**

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it detects that it lost its connection with a load balancer. This message usually indicates that the load balancer has been stopped or the load balancer was incorrectly configured.

In the message text:

ipaddress
The IP address of the previously connected load balancer.

System action: Processing continues. If the load balancer is still active, it might attempt to reconnect to the Advisor.

Operator response: Determine whether the load balancer is active. Restart the load balancer, if necessary. If the load balancer is active, contact the system programmer.

System programmer response: Check the load balancer and correct any configuration or connectivity problems. Restart the load balancer, if necessary. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing network connectivity problems.

Module: LMLB

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0134I LOAD BALANCER CONNECTION FROM 10.10.10.1 IS NO LONGER ACTIVE
```

AQS0135W ADVISOR CONNECTION FROM *ipaddress* **CLOSED DUE TO PROTOCOL ERROR**

Explanation: The Multi-site Workload Lifeline Advisor that was started as the primary Advisor issues this message when it closes its connection to the secondary Advisor because of an internal protocol error. This message will be deleted when the secondary Advisor successfully reconnects to the Advisor.

In the message text:

ipaddress
The IP address of the secondary Advisor.

System action: The primary Advisor writes messages to internal trace or to the syslogd file and waits for the secondary Advisor to reconnect.

Operator response:

- If internal trace is being used, dump and save the internal trace message.
- If internal trace is not being used, save the syslogd file.
- If packet trace is active, save the trace.
- Contact the system programmer.

System programmer response: If internal trace is being used, dump and examine the internal trace messages. Otherwise, examine the syslogd files for the Advisor. The syslogd identifier is lladvsr for the Advisor. If the debug level includes messages at the message level, the file will show the data that each application sent or received. If the data that was sent by one application was the same data received by the corresponding application, contact IBM software support services. If the data that was sent was not the same data that was received, this might indicate that the network integrity has been compromised. If the packet trace is active, examine the trace for the data that was sent and received. If the packet trace is not active, try to recreate the problem with active packet trace. See *z/OS Communications Server: IP Diagnosis Guide* for information about the packet trace.

Module: LMAARP

Routing code: 8, 10

Descriptor code: 12

Automation: This message is a possible candidate for automation if you want to automatically create snapshots of the Advisor and peer Advisor syslogd or internal trace files for later problem determination.

Example:

```
AQS0135W ADVISOR CONNECTION FROM 10.10.10.1 CLOSED DUE TO PROTOCOL ERROR
```

AQS0136W AGENT CONNECTION FROM *ipaddress* CLOSED DUE TO PROTOCOL ERROR

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it closes its connection to the Multi-site Workload Lifeline Agent because of an internal protocol error. This message will be deleted when the Agent successfully reconnects to the Advisor.

In the message text:

ipaddress
The IP address of the previously connected Agent.

System action: The Advisor writes messages to internal trace or to the syslogd file. If the Agent is still active, it attempts to reconnect to the Advisor until the Agent connects with the Advisor or the Agent is stopped. If the situation is temporary, the Agent will reconnect to the Advisor.

Operator response: Take the following actions:

- If internal trace is being used, dump and save the internal trace messages.
- If internal trace is not being used, save the syslogd file.
- If packet trace is active, save the trace.
- Contact the system programmer.

System programmer response: If internal trace is being used, dump and examine the internal trace messages. Otherwise, examine the syslogd files for the Advisor and Agent. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. If the debug level includes messages at the message level, the file will show the data that each application sent or received. If the data that was sent by one application was the same data received by the corresponding application, contact IBM software support services. If the data that was sent was not the same data that was received, this might indicate that the network integrity has been compromised. If the packet trace is active, examine the trace for the data that was sent and received. If the packet trace is not active, try to recreate the problem with active packet trace. See *z/OS Communications Server: IP Diagnosis Guide* for information about the packet trace.

Module: LCZAP, LMAGNT

Routing code: 1, 8

Descriptor code: 2, 7

Automation: This message is a possible candidate for automation if you want to automatically create snapshots of the Advisor and Agent syslogd or internal trace files for later problem determination.

Example:

```
AQS0136W AGENT CONNECTION FROM 10.10.10.1 CLOSED DUE TO PROTOCOL ERROR
```

AQS0137I *applname* **ENDED ABNORMALLY**

Explanation: The Multi-site Workload Lifeline application ended in response to an unexpected error.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

System action: Processing ends.

Operator response: Take the following actions:

- Save the CEEDUMP and snap output or core dump.
- If internal trace is not being used, save the syslogd file.
- Contact the system programmer.

System programmer response: Contact IBM software support services.

Module: LCASSERT, LCERROR

Routing code: 8, 10

Descriptor code: 12

Automation: This message is a possible candidate for automation if you want to automatically create a snapshot of the Advisor or Agent syslogd or internal trace file for later problem determination.

Example:

```
AQS0137I LLADVSR ENDED ABNORMALLY
```

AQS0138I *applname* **DEBUG LEVEL UPDATED**

Explanation: The Multi-site Workload Lifeline application issues this message in response to a z/OS `MODIFY` *procname*`,DEBUG,LEVEL=` command or a Linux on z Systems `aqsllcmd debug,level=` command.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

System action: The command is accepted. Processing continues.

Operator response: None.

System programmer response: None.

Module: LACMD, LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0138I LLADVSR DEBUG LEVEL UPDATED
```

AQS0139I ALL MATCHING REGISTERED APPLICATIONS ARE *state*

Explanation: The Multi-site Workload Lifeline z/OS Agent issues this message in response to a `MODIFY` *procname*`,ENABLE|QUIESCE,SYSTEM` command.

In the message text:

state
The state of the registered applications on the system where the command was issued. Possible values are:

- ENABLED
- QUIESCED

System action: The MODIFY command is accepted. Processing continues.

Operator response: None.

System programmer response: None.

Module: LACMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0139I ALL MATCHING REGISTERED APPLICATIONS ARE QUIESCED
```

AQS0140I *subtotal* **OF** *total* **MATCHING REGISTERED APPLICATIONS ARE** *state* **- DISTRIBUTED DVIPA MEMBERS ARE IGNORED**

Explanation: The Multi-site Workload Lifeline z/OS Agent issues this message in response to a `MODIFY` *procname*`,ENABLE|QUIESCE,PORT|TCPNAME` command.

In the message text:

subtotal
The count of matching applications that can be quiesced or enabled by the z/OS Agent.

total
The number of matching applications. This count includes the applications that can be quiesced or enabled by the z/OS Agent, and the applications that can only be quiesced or enabled by the VARY TCPIP,,SYSPLEX,QUIESCE|RESUME command.

state
The state of the registered applications on the system where the command was issued. Possible values are:

- ENABLED
- QUIESCED

System action: The MODIFY command is accepted. Processing continues.

Operator response: If the *subtotal* value does not equal the *total* value, the remaining matching applications can be quiesced or enabled by TCPIP using only the VARY TCPIP,,SYSPLEX,QUIESCE|RESUME command.

System programmer response: None.

Module: LACMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0140I 4 OF 5 MATCHING REGISTERED APPLICATIONS ARE QUIESCED - DISTRIBUTED DVIPA MEMBERS ARE IGNORED
```

AQS0141I ADVISOR SUMMARY

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,DISPLAY,ADVISOR` command. This message is followed by summary information about this Advisor. See "MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information" on page 127 for the explanation of the display output.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 5, 8, 9

Automation: Not applicable for automation.

AQS0142I ADVISOR DETAILS

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,DISPLAY,ADVISOR,DETAIL` command. This message is followed by detailed information about this Advisor. See "MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information" on page 127 for the explanation of the display output.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 5, 8, 9

Automation: Not applicable for automation.

AQS0143I ADVISOR CONFIGURATION

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,DISPLAY,CONFIG` command. This message is followed by the active configuration for this Advisor. See "MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information" on page 127 for the explanation of the display output.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 5, 8, 9

Automation: Not applicable for automation.

AQS0144I AGENT CONFIGURATION

Explanation: The Multi-site Workload Lifeline Agent issues this message in response to a z/OS `MODIFY procname,DISPLAY,CONFIG` command or a Linux on z Systems `aqsllcmd display,config` command. This message is followed by the active configuration for this Agent. See "MODIFY *agent_proc*,DISplay command: Display Lifeline Agent information" on page 169, or "Display Linux on z Systems Management Agent information" on page 185 for the explanation of the display output.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LACMD

Routing code: 8, 10

Descriptor code: 5, 8, 9

Automation: Not applicable for automation.

AQS0145I WORKLOAD SUMMARY

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,DISPLAY,WORKLOAD` command. This message is followed by summary information about the workloads defined to this Advisor. See "MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information" on page 127 for the explanation of the display output.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 5, 8, 9

Automation: Not applicable for automation.

AQS0146I WORKLOAD DETAILS

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,DISPLAY,WORKLOAD,DETAIL` command. This message is followed by detailed information about the workloads defined to this Advisor. See "MODIFY *advisor_proc*,DISplay command: Display Lifeline Advisor information" on page 127 for the explanation of the display output.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 5, 8, 9

Automation: Not applicable for automation.

AQS0147I BCPII ACCESS TO SITE *sitename* NOT AVAILABLE

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it detects that it can no longer communicate with any of the images (LPARs) in the site specified by the *sitename* value by using the z/OS Base Control Program Internal Interface (BCPii) service.

In the message text:

sitename
The sysplex name of the site to which BCPii access is not available.

System action: Processing continues.

Operator response: Contact the system programmer.

System programmer response:

- Verify that z/OS is operational on at least one of the site's images.
- Verify the connectivity used by BCPii to communicate with each of the site's images.

See *z/OS MVS Programming: Callable Services for High-Level Languages* for information about diagnosing BCPii issues.

Module: LMBCPII

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0147I BCPII ACCESS TO SITE SITE02 NOT AVAILABLE
```

AQS0148I BCPII ACCESS TO SITE *sitename* HAS RECOVERED

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it detects that it has reestablished communication with at least one image (LPAR) in the site specified by the *sitename* value by using the z/OS Base Control Program Internal Interface (BCPii) service.

In the message text:

sitename
The sysplex name of the site to which BCPii access has recovered.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMBCPII

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0148I BCPII ACCESS TO SITE SITE02 HAS RECOVERED
```

AQS0150I MODIFY *cmd* COMMAND NOT SUPPORTED USING COMMAND API

Explanation: The Multi-site Workload Lifeline Advisor issues this message when a user application uses the Display Command API to issue an Advisor command, but the command is not supported on the API. This message is only returned as a response when the Display Command API is being used.

In the message text:

cmd
The command that was issued.

System action: The command is rejected.

Operator response: Ensure the command being requested is a supported Lifeline Advisor DISPLAY command.

System programmer response: None.

Module: LCCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0150I MODIFY DEBUG COMMAND NOT SUPPORTED USING COMMAND API
```

AQS0151I *applname* **DETECTED EXCEPTION CONDITION**

Explanation: The Multi-site Workload Lifeline application detected an unexpected error.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

System action: Processing continues. One of the following events will occur:

- A z/OS Lifeline Advisor or Agent will take an SVC dump.
- A Linux on z Systems Management Agent will take a core dump and a stacktrace.

Operator response: Collect the recommended documentations and contact the system programmer:

- For a z/OS Lifeline Advisor or Agent,
  - Save the SVC dump.
  - If syslogd was started, save the Advisor or Agent messages written to syslogd. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent.
  - Contact the system programmer.
- For a Linux on z Systems Management Agent,
  - Save the Agent messages written to the file "/var/log/messages". The identifier for the Agent is llagent.
  - Save the core dump. The core dump will be in the location where the Linux on z Systems Management Agent program is installed, typically the "/opt/ibm/lifeline/bin" directory.
  - Save the corresponding stacktrace. The stacktrace file will be in the location where the Linux on z Systems Management Agent program is installed, typically the "/opt/ibm/lifeline/log" directory.
  - Contact the system programmer.

System programmer response: Contact the IBM Software Support Center and provide the recommended documentation.

If an exception condition is detected more frequently than five times per hour, this message and its corresponding dump are suppressed; instead a WARNING message is logged indicating that the exception dump was suppressed. Examine the z/OS syslogd file or Linux on z Systems Management Agent messages file for these warning messages. If the warning messages are repeatedly issued, the Advisor or Agent should be recycled.

Module: LCASSERT, LCERROR

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0151I LLAGENT DETECTED EXCEPTION CONDITION
```

AQS0153I **WORKLOAD** *workloadname state* **ON SITE** *sitename*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,ACTIVATE|DEACTIVATE|QUIESCE,WORKLOAD=workloadname,SITE=sitename` command.

In the message text:

workloadname
The name of the workload specified on the MODIFY command.

state
The state of the workload. Possible values are:

- ACTIVATED

- DEACTIVATED
- QUIESCED

sitename
The sysplex name of the site.

System action:

- When the *state* value is QUIESCED,
  - For workloads defined in the cross_sysplex_list Advisor configuration statement, the Advisor notifies load balancers that new connection requests to server applications for the workload specified by the *workloadname* value must not be routed to the site specified by the *sitename* value. Connection timeouts or resets might occur on the client applications that initiated the requests while the workload is in a quiesced state.
- When the *state* value is DEACTIVATED,
  - For workloads defined in the cross_sysplex_list Advisor configuration statement, all active connections to server applications on the site specified by the *sitename* value that are defined in the workload are reset.
- When the *state* value is ACTIVATED,
  - For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor notifies load balancers that new connection request to server applications for the workload specified by the *workloadname* value must be routed to the site specified by the *sitename* value.
  - For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies z/OS Agents on the site, specified by the *sitename* value, to allow new messages for the workload, specified by the *workloadname* value, to be routed to this site.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0153I WORKLOAD WORK01 ACTIVATED ON SITE SITE01
```

AQS0155I **WORKLOAD** *workloadname state*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,ACTIVATE|DEACTIVATE|QUIESCE,WORKLOAD=workloadname` command.

In the message text:

workloadname
The name of the workload specified on the MODIFY command.

state
The state of the specified workload. Possible values are:

- ACTIVATED
- QUIESCED
- DEACTIVATED

System action:

- When the *state* value is QUIESCED,
  - For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor notifies load balancers that new connection requests to server applications for the workload specified by the *workloadname* value must not be routed to any site. Connection timeouts or resets might occur on the client applications that initiated the requests while the workload is in a quiesced state.
  - For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies z/OS Agents on the currently active site to prevent new messages for the workload, specified by the *workloadname* value, to be routed to any site.

- When the *state* value is DEACTIVATED,
  - For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, all active connections to server applications that are defined in the workload are reset.
  - For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies z/OS Agents on the previously active site to check for existing messages on each MQ cluster queue in the workload, specified by the *workloadname* value.
- When the *state* value is ACTIVATED,
  - For Active/Query workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor notifies load balancers that new connection request to server applications for the workload specified by the *workloadname* value must be routed to both sites.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0155I WORKLOAD WORK01 QUIESCED
```

AQS0156I WORKLOAD *workloadname* **IS NOT DEFINED TO SITE** *sitename*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY` *`procname`*`,ACTIVATE` command. The Advisor configuration file contains a cross_sysplex_list, mq_manager_list, or sna_application_list definition for the workload specified by the *workloadname* value, but there is no definition of this workload for the site specified by the *sitename* value.

In the message text:

`workloadname`
The name of the workload specified on the MODIFY command.

`sitename`
The name of the site specified on the MODIFY command.

System action: The MODIFY command is ignored. Processing continues.

Operator response: Take the following actions:

- If internal trace is being used, dump and save the internal trace messages.
- If internal trace is not being used, save the syslogd file.
- Contact the system programmer.

System programmer response:

- If internal trace is being used, dump and examine the internal trace messages.
- If internal trace is not being used, examine the syslogd file. The syslogd identifier is lladvsr for the Advisor.
- Examine the internal trace messages or syslogd file for the Advisor configuration warning messages that were generated while the cross_sysplex_list, mq_manager_list, or sna_application_list definitions were being processed. Correct the configuration file warnings and either restart the Advisor or issue the `MODIFY` *`procname`*`,REFRESH` command. See Chapter 3, “Configuring Multi-site Workload Lifeline,” on page 47 for more information about configuring the Advisor.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0156I WORKLOAD WORK01 IS NOT DEFINED TO SITE SITE01
```

AQS0157I NETWORK ACCESS TO SITE *sitename* NOT AVAILABLE

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it can no longer communicate over the network with any Multi-site Workload Lifeline Agents in the site specified by the *sitename* value.

In the message text:

sitename
The sysplex name of the site to which network access is not available.

System action: Processing continues. If the site specified by the *sitename* value represents the active site for some workloads, the Advisor continues to direct load balancers to route new connection requests to server applications for these workloads to this site.

Operator response: Contact the system programmer.

System programmer response: Verify network connectivity between the Advisor and the site specified by the *sitename* value. Verify that Agents are running on each LPAR and Linux on z Systems Management Guest in the site where a server application for the workloads resides. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing network connectivity problems.

Module: LMLB

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0157I NETWORK ACCESS TO SITE SITE01 NOT AVAILABLE
```

AQS0158I STANDBY SITE *sitename* HAS RECOVERED FOR WORKLOAD *workloadname*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is defined as an Active/Standby workload in the Advisor configuration file.
- Message AQS0159I was previously issued for the workload.
- If the workload is specified in the cross_sysplex_list or sna_application_list Advisor configuration statement, at least one server application is available in the standby site specified by the *sitename* value for each load balancer application group or, if configured, the group's failure detection group, defined for the workload specified by the *workloadname* value.
- If the workload is specified in the mq_manager_list Advisor configuration statement, at least one MQ cluster queue is available in the standby site specified by the *sitename* value for each MQ cluster queue group defined for the workload specified by the *workloadname* value.

In the message text:

sitename
The sysplex name of the standby site.

workloadname
The name of the workload that is defined in the Advisor configuration file.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMLB

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0158I STANDBY SITE SITE02 HAS RECOVERED FOR WORKLOAD WORK01
```

AQS0159I STANDBY SITE *sitename* **HAS UNAVAILABLE SERVERS FOR WORKLOAD** *workloadname*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is defined as an Active/Standby workload in the Advisor configuration file.
- If the workload is specified in the cross_sysplex_list or sna_application_list Advisor configuration statement, no server applications are available in the standby site specified by the *sitename* value for at least one load balancer application group or, if configured, the group's failure detection group, defined for the workload specified by the *workloadname* value.
- If the workload is specified in the mq_manager_list Advisor configuration statement, no MQ cluster queue is available in the standby site specified by the *sitename* value for at least one MQ cluster queue group defined for the workload specified by the *workloadname* value.

In the message text:

sitename
The sysplex name of the standby site.

workloadname
The name of the workload that is defined in the Advisor configuration file.

System action: The site is no longer a usable target for the workload specified by the *workloadname* value.

Operator response: Notify the system programmer.

System programmer response: Ensure that server applications for the workload are active on the standby site specified by the *sitename* value.

Module: LMLB

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0159I STANDBY SITE SITE02 HAS UNAVAILABLE SERVERS FOR WORKLOAD WORK01
```

AQS0160I NETWORK ACCESS TO SITE *sitename* **HAS RECOVERED**

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it reestablishes a connection with at least one Multi-site Workload Lifeline Agent in the site specified by the *sitename* value.

In the message text:

sitename
The sysplex name of the site to which network access has recovered.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LMAGNT, LMLB

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0160I NETWORK ACCESS TO SITE SITE01 HAS RECOVERED
```

AQS0161I UNABLE TO CONNECT TO PEER ADVISOR AFTER *time* SECONDS

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it is started as the primary Advisor and it does not detect another Advisor acting as the primary. When a configured primary Advisor is started, it always verifies that there is no other primary Advisor active before becoming the primary Advisor.

In the message text:

time
The number of seconds the Advisor waited trying to connect to the peer Advisor.

System action: The Advisor assumes the role of primary Advisor.

Operator response: None.

System programmer response: None.

Module: LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0161I UNABLE TO CONNECT TO PEER ADVISOR AFTER 10 SECONDS
```

AQS0162I MODIFY *cmd* COMMAND QUEUED - *reason*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,ACTIVATE|DEACTIVATE|QUIESCE` command. Processing of the command is delayed until the specified reason has been resolved.

In the message text:

cmd
The MODIFY command that was issued. Possible values are:

- ACTIVATE
- DEACTIVATE
- QUIESCE

reason
The reason that the command was not immediately processed. Possible values are:

NO FIRST-TIER LOAD BALANCER IS REGISTERED
A `MODIFY procname,ACTIVATE` or `MODIFY procname,QUIESCE` command was issued, but no first-tier load balancer is currently connected and registered with the Advisor.

DEACTIVATE COMMAND IN PROGRESS
A `MODIFY procname,ACTIVATE` or `MODIFY procname,QUIESCE` command was issued, but a prior `MODIFY DEACTIVATE` command has not yet completed.

UNKNOWN LATENCY STATE FOR WORKLOAD *workloadname*
A `MODIFY procname,ACTIVATE` command was issued for the workload, specified by the *workloadname* value, but the database replication latency state for the workload is unknown.

QUIESCE FOR WORKLOAD *workloadname* **QUEUED**
A `MODIFY procname,DEACTIVATE` command was issued for the workload, specified by the *workloadname* value, but a prior `MODIFY QUIESCE` command has not been processed.

QUIESCE FOR ALL MATCHING WORKLOADS QUEUED
A `MODIFY procname,DEACTIVATE` command was issued for all Active/Standby or all Active/Query workloads, but a prior `MODIFY QUIESCE` command has not been processed.

ACTIVATE OR DEACTIVATE COMMAND IN PROGRESS
A MODIFY *procname*,ACTIVATE command was issued, but a prior ACTIVATE or DEACTIVATE command has not yet completed.

System action: Processing continues.

A MODIFY QUIESCE or MODIFY ACTIVATE command is not processed until the following conditions are true:

- A first-tier load balancer registers.
- A prior MODIFY DEACTIVATE command completes.

A MODIFY ACTIVATE command for an Active/Query workload is delayed if the database replication latency state is unknown. The workload will be activated when either of the following conditions occurs:

- The Advisor receives the first event over its Network Management Interface for the Active/Query workload. The event indicates that the database replication latency state for the workload specified by the *workloadname* value is no longer unknown.
- The failure detection interval for the workload specified by the *workloadname* value expires. Because the database replication latency state is still unknown, the state will be treated as acute.

A MODIFY DEACTIVATE command is not processed until a queued QUIESCE command for the workload specified by the *workloadname* value completes.

Operator response: Take the appropriate action, based on the *reason* value:

NO FIRST-TIER LOAD BALANCER IS REGISTERED
Contact the system programmer.

DEACTIVATE COMMAND IN PROGRESS
The MODIFY command will be processed when the DEACTIVATE command completes.

UNKNOWN LATENCY STATE FOR WORKLOAD *workloadname*
Contact the system programmer.

QUIESCE FOR WORKLOAD *workloadname* **QUEUED**
The MODIFY command will be processed when the QUIESCE command completes.

QUIESCE FOR ALL MATCHING WORKLOADS QUEUED
The MODIFY command will be processed when the QUIESCE command completes.

ACTIVATE OR DEACTIVATE COMMAND IN PROGRESS
The MODIFY ACTIVATE command will be processed when the ACTIVATE or DEACTIVATE command completes.

System programmer response: Take the appropriate action, based on the *reason* value:

NO FIRST-TIER LOAD BALANCER IS REGISTERED
Verify the network connectivity between the Advisor and the first-tier load balancer. Check the load balancer and correct any configuration or connectivity problems. If necessary, restart the load balancer. See *z/OS Communications Server: IP Diagnosis Guide* for more information about diagnosing network connectivity problems.

UNKNOWN LATENCY STATE FOR WORKLOAD *workloadname*
Determine why the database replication latency state is unknown, and correct, if possible.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0162I MODIFY QUIESCE COMMAND QUEUED - DEACTIVATE COMMAND IN PROGRESS
```

AQS0163W WAITING FOR FIRST-TIER LOAD BALANCER REGISTRATION

Explanation: The Multi-site Workload Lifeline Advisor issues this message when no first-tier load balancers are connected and registered to it. This message will be deleted after the first first-tier load balancer connects and registers with the Advisor.

System action: Processing continues.

Operator response: Contact the system programmer.

System programmer response: Verify network connectivity between the Advisor and first-tier load balancer. Check the load balancer and correct any configuration or connectivity problems. Restart the load balancer if necessary. See *z/OS Communications Server: IP Diagnosis Guide* for more information about diagnosing network connectivity problems.

Module: LMMAIN

Routing code: 1, 8

Descriptor code: 2, 7

Automation: Not applicable for automation.

AQS0164W UNABLE TO CONNECT TO PEER ADVISOR AFTER *time* SECONDS

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it is started as the secondary Advisor and is unable to connect to another Advisor acting as the primary Advisor. The message is deleted when either the peer Advisor is contacted or this Advisor assumes the role of primary Advisor.

In the message text:

time
The number of seconds the Advisor waited to try to connect to the peer Advisor.

System action: If the Advisor advisor_takeover_policy configuration statement is configured as manual, the Advisor remains in the secondary role. If advisor_takeover_policy is configured as automatic, the Advisor assumes the role of primary Advisor if the primary Advisor is determined to be down.

Operator response: If advisor_takeover_policy is configured as manual, issue the `MODIFY procname,TAKEOVER` command to have this Advisor assume the role of primary Advisor; otherwise, contact the system programmer.

System programmer response: Ensure that the Advisor started procedure is configured correctly (started in primary or secondary role). Verify the network connectivity between this Advisor and the peer Advisor. Ensure that the Advisor configuration files are identical between this Advisor and the peer Advisor. See Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93 for more information about configuration statements and parameters. See *z/OS Communications Server: IP Diagnosis Guide* for more information about diagnosing network connectivity problems.

Module: LMADV

Routing code: 1, 8

Descriptor code: 2, 7

Automation: This message is a possible candidate for automation if you want to automatically issue the `MODIFY procname,TAKEOVER` command to have this Advisor assume the role of primary Advisor.

Example:

```
AQS0164W UNABLE TO CONNECT TO PEER ADVISOR AFTER 10 SECONDS
```

AQS0165I PEER ADVISOR CONNECTED FROM *ipaddress*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when a peer Advisor has established a connection with it.

In the message text:

ipaddress
The IP address of the peer Advisor.

System action: Processing continues if the peer Advisor is configured as the secondary Advisor. If the peer Advisor is configured as the primary Advisor, this Advisor will assume the role of secondary Advisor.

Operator response: None.

System programmer response: None.

Module: LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0165I PEER ADVISOR CONNECTED FROM 10.10.10.1
```

AQS0166I ADVISOR IS NOW IN PRIMARY ROLE

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it assumes the role of primary Advisor. The Advisor assumes the role in one of the following situations:

- The Advisor procedure was configured to start the Advisor as the primary Advisor.
- Communication was lost with the peer Advisor that is acting as the primary Advisor and this Advisor was configured to automatically take over the role of primary Advisor.
- A MODIFY *procname*, TAKEOVER command was issued.

System action: The Advisor assumes the role of primary Advisor and is able to accept connections from load balancers and Multi-site Workload Agents.

Operator response: None.

System programmer response: None.

Module: LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: This message is a possible candidate for automation if you want to automatically determine when to use MODIFY commands that are valid only for the primary Advisor.

AQS0167I CONNECTION FROM *ipaddress* **REJECTED -** *reason*

Explanation: The Multi-site Workload Lifeline primary Advisor issues this message when it receives a connection request from a peer Advisor or Agent and the request is not accepted.

In the message text:

ipaddress
The IP address of the peer Advisor or Agent.

reason
The reason the connection was rejected. Possible values are:

UNAUTHORIZED ADVISOR
One of the following conditions is true:

- The IP address of the peer Advisor is not included in the Advisor advisor_id_list configuration statement.
- The IP address used to connect to this Advisor does not match the IP address in the Advisor lb_connection_v4 or lb_connection_v6 configuration statement.
- The Advisor requires a secure connection with the peer Advisor by using an Application Transparent TLS policy.

SECONDARY ADVISOR ALREADY REGISTERED
This Advisor is already communicating with another peer Advisor; only one peer connection is allowed.

SECONDARY ADVISOR AT UNSUPPORTED LEVEL
The secondary Advisor is at an earlier version or service level than the primary Advisor. The secondary Advisor must be at the same or later version or service level.

AGENT AT UNSUPPORTED LEVEL
The Agent is at an earlier version that the primary Advisor no longer supports.

MULTIPLE AGENTS ACTIVE ON SYSTEM ID *system_id*
A Linux on z Systems Management Agent attempts to connect to the Advisor while another Linux on z Systems Management Agent on the same system ID, specified by the *system_id* value, and configured with the same site name is already connected.

System action: The connection from the primary Advisor is reset.

Operator response: Contact the system programmer.

System programmer response: Take the appropriate action, based on the *reason* value:

UNAUTHORIZED ADVISOR
For a non-secure connection, ensure that the IP address specified by the *ipaddress* value is included in the Advisor advisor_id_list configuration statement. Ensure that the IP address being used by the peer Advisor to connect to this Advisor matches the IP address in the Advisor lb_connect_v4 or lb_connection_v6 configuration statement. See Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93 for more information about configuration statements and parameters.

For a secure connection, verify that the Application Transparent TLS policy on both Advisors is correctly defined. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring Application Transparent TLS.

SECONDARY ADVISOR ALREADY REGISTERED
Ensure that the peer Advisor currently connected to this Advisor is the correct one. If not, stop this peer Advisor and start the correct peer Advisor.

SECONDARY ADVISOR AT UNSUPPORTED LEVEL
Upgrade the secondary Advisor to a version or service level that is the same with or later than the primary Advisor. See "Migrating the Lifeline Advisor" on page 58 for more information.

AGENT AT UNSUPPORTED LEVEL
Upgrade the Agent to a version that is supported by the primary Advisor. See Migrating the Lifeline Agent for more information.

MULTIPLE AGENTS ACTIVE ON SYSTEM ID *system_id*
Ensure that the Linux on z Systems Management Agent that is connected from the system ID, specified by the *system_id* value , is the correct one. If not, stop the existing Linux on z Systems Management Agent and start the correct Linux on z Systems Management Agent.

Module: LMADV, LMAGNT, LMMAIN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0167I CONNECTION FROM 10.10.10.1 REJECTED - UNAUTHORIZED ADVISOR
```

AQS0168I CONNECTION FROM *ipaddress* **REJECTED -** *reason*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it receives a connection request from a load balancer or Agent and it is not accepted.

In the message text:

ipaddress
The IP address of the load balancer or Agent.

reason
The reason the connection was rejected. Possible values are:

UNAUTHORIZED AGENT
The IP address of the Agent is not included in the Advisor agent_id_list configuration statement, the IP address used to connect to this Advisor does not match the IP address in the Advisor lb_connection_v4 or lb_connection_v6 configuration statement, or for z/OS Agents, the Advisor requires a secure connection with the Agent by using an Application Transparent TLS policy.

UNAUTHORIZED LB
The IP address of the load balancer is not included in the Advisor lb_id_list configuration statement or the Advisor requires a secure connection with the load balancer by using an Application Transparent TLS policy.

UNAUTHORIZED SITE
The sysplex name of the site where the Agent resides is not defined in the Advisor cross_sysplex_list, mq_manager_list, or sna_application_list configuration statement.

INCORRECT LB REGISTRATION
One of the following events occurred:

- A first-tier load balancer attempted to register a group with an IP address or port that is not included in the Advisor cross_sysplex_list or intermediary_node_list configuration statement.
- A first-tier load balancer attempted to register a group with members for only one of the sites that are defined in the Advisor cross_sysplex_list or intermediary_node_list configuration statement.
- A first-tier load balancer attempted to register more than one group for an Active/Query workload.
- A first-tier load balancer attempted to register a group and only a subset of the members are defined in the Advisor failure_detection_groups configuration statement.
- A second-tier load balancer attempted to register before a first-tier load balancer has registered.
- A second-tier load balancer attempted to register a group name that does not match any group name registered by a first-tier load balancer.
- A load balancer attempted to register a group with no associated port.
- A load balancer attempted to register a group with unique members but the maximum number of consolidated groups that are allowed has been exceeded.

System action: The connection from the load balancer or Agent is reset.

Operator response: Contact the system programmer.

System programmer response: Take the appropriate action, based on the *reason* values:

UNAUTHORIZED AGENT
Ensure that the value that *ipaddress* specifies is included in the Advisor agent_id_list configuration statement. Ensure that the IP address being used by the Agent to connect to this Advisor matches the IP address in the Advisor lb_connection_v4 or lb_connection_v6 configuration statement.

For a secure connection with a z/OS Agent, verify that the Application Transparent TLS policy on both the Advisor and Agent is correctly defined. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring Application Transparent TLS.

UNAUTHORIZED LB
Ensure that the value that *ipaddress* specifies is included in the Advisor lb_id_list configuration statement.

For a secure connection, verify that the Application Transparent TLS policy on the Advisor and security configuration on the load balancer is correctly defined. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring Application Transparent TLS.

UNAUTHORIZED SITE
Ensure that the sysplex name where the Agent resides is included in the Advisor cross_sysplex_list, mq_manager_list, or sna_application_list configuration statement. Ensure that a Linux on z Systems Management Agent is not connecting to an Advisor that does not support Linux on z Systems workloads.

INCORRECT LB REGISTRATION

- Dump and examine the internal trace messages, if being used, or examine the syslogd file to determine which group is being registered incorrectly, and modify the first-tier load balancer to remove the group or ensure that the group is included in the Advisor cross_sysplex_list or intermediary_node_list configuration statement and contains members for each of the sites.

- Dump and examine the internal trace messages, if being used, or examine the syslogd file to determine which groups are being registered incorrectly for an Active/Query workload, and modify the first-tier load balancer to ensure all members for the workload are configured in a single group.
- Dump and examine the internal trace messages, if being used, or examine the syslogd file to determine which members for a group that is being registered do not match the members that are included in the Advisor failure_detection_groups configuration statement.
- Ensure that a first-tier load balancer is configured to connect to the Advisor.
- Dump and examine the internal trace messages, if being used, or examine the syslogd file to determine which first-tier load balancer application groups are registered, and modify the second-tier load balancer configuration to ensure that its groups match the registered first-tier load balancer application groups.
- Dump and examine the internal trace messages, if being used, or examine the syslogd file to determine which group is being registered without a port and modify the load balancer configuration to specify a port for that group.
- Dump and examine the internal trace messages, if being used, or examine the syslogd file to determine which group is being registered with unique members. Consider combining members into fewer groups on the first-tier and second-tier load balancer so that fewer consolidated groups need to be created by the Advisor.

See Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93 for more information about configuration statements and parameters.

Module: LMAGNT, LMMAIN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0168I CONNECTION FROM 10.10.10.1 REJECTED - UNAUTHORIZED AGENT
```

AQS0169I PRIMARY ADVISOR TAKEOVER SCHEDULED

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a MODIFY *procname*,TAKEOVER command.

System action: The Advisor attempts to communicate with the peer Advisor to ensure that this Advisor will be the only one to assume the role of primary Advisor. Message AQS0166I will be issued when the takeover has completed.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0170I MODIFY TAKEOVER COMMAND IGNORED -*reason*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY` *`procname`*`,TAKEOVER` command.

In the message text:

`reason`
The reason the MODIFY *procname,*TAKEOVER was ignored. Possible values are:

ALREADY PRIMARY
The Advisor is already the primary Advisor.

ALREADY SCHEDULED
A previous MODIFY *procname*,TAKEOVER command was issued and has not yet completed.

TRANSFER COMMAND IS IN PROGRESS
At least one MODIFY *procname*,TRANSFER command was issued and has not yet completed.

System action: The MODIFY command is ignored.

Operator response: Take the appropriate action, based on the *reason* value:

ALREADY PRIMARY
None.

ALREADY SCHEDULED
None.

TRANSFER COMMAND IS IN PROGRESS
Issue the MODIFY *procname*,TRANSFER,WORKLOAD=*workloadname*,STATUS command to check the status of previous MODIFY *procname*,TRANSFER commands for each MQ workload. Reissue the MODIFY *procname*,TAKEOVER command once all MODIFY *procname*,TRANSFER commands complete for the workload.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0170I MODIFY TAKEOVER COMMAND IGNORED - ALREADY PRIMARY
```

AQS0172I TAKEOVER PROCESSING INCOMPLETE - UNRESPONSIVE PEER AT *ipaddress*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a MODIFY *procname*,TAKEOVER command. The Advisor attempted to notify the peer Advisor that this Advisor will become the primary Advisor. The connection was lost before the notification completed.

In the message text:

ipaddress
The last known IP address of the peer Advisor.

System action: The Advisor assumes the role of primary Advisor, but the role of the peer Advisor is unknown. Message AQS0166I will be issued when the takeover has completed.

Operator response: Contact the system programmer.

System programmer response: Verify the network connectivity between this Advisor and the peer Advisor. If the peer Advisor is not active, restart it. If the peer Advisor is active, verify that it is running as the secondary Advisor. See *z/OS Communications Server: IP Diagnosis Guide* for more information about diagnosing network connectivity problems.

Module: LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0172I TAKEOVER PROCESSING INCOMPLETE - UNRESPONSIVE PEER AT 10.10.10.1
```

AQS0173I ADVISOR IS NOW IN SECONDARY ROLE

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it assumes the role of secondary Advisor. The Advisor assumes the role of secondary Advisor when one of the following has occurred; the Advisor procedure was configured to start the Advisor as the secondary Advisor or a MODIFY *procname*,TAKEOVER command was issued on the peer Advisor.

System action: The Advisor assumes the role of secondary Advisor and attempts to connect to the peer Advisor.

Operator response: None.

System programmer response: None.

Module: LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: This message is a possible candidate for automation if you want to automatically determine when to use MODIFY commands that are valid only for the secondary Advisor.

AQS0174I TAKEOVER FAILED - ERROR ON PRIMARY ADVISOR AT *ipaddress*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,TAKEOVER` command. While attempting to communicate with the peer Advisor to ensure that this Advisor will be the only one to assume the role of primary Advisor, the peer Advisor did not relinquish its role as primary Advisor.

In the message text:

ipaddress
The IP address of the peer Advisor.

System action: This Advisor remains in the role of secondary Advisor and the peer Advisor is in an unknown role.

Operator response: Contact the system programmer.

System programmer response: Check for console messages. If syslogd was started, examine the syslogd file on the system of the peer Advisor. The syslogd identifier is lladvsr for the Advisor. If internal trace is being used, dump and examine the internal trace messages on the system of the peer Advisor. If the peer Advisor is not active, restart it in the role of primary Advisor. If the peer Advisor is active, verify that it is running as the primary Advisor.

Module: LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: This message is a possible candidate for automation if you want to automatically stop the peer Advisor and restart this Advisor as the primary Advisor.

Example:

```
AQS0174I TAKEOVER FAILED - ERROR ON PRIMARY ADVISOR AT 10.10.10.1
```

AQS0175I TAKEOVER FAILED - ERROR ESTABLISHING LISTENING SOCKETS

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,TAKEOVER` command. While attempting to become the primary Advisor, this Advisor was unable to establish listening sockets to allow for load balancers, Multi-site Workload Lifeline Agents, or a peer Advisor to connect to it.

System action: The Advisor remains in the role of secondary Advisor.

Operator response: Determine whether TCP/IP is available and restart if necessary. Reissue the `MODIFY procname,TAKEOVER` command. If TCP/IP is available when this message is issued, save the syslogd file. Otherwise, if internal trace is being used, dump and save the internal trace messages. Contact the system programmer.

System programmer response: To determine which listening sockets cannot be established, take the appropriate action:

- If TCP/IP is available when the Advisor issues this message and internal trace is being used, dump and examine the internal trace messages.
- If TCP/IP is available when the Advisor issues this message and internal trace is not being used, examine the syslogd file.
- The syslogd identifier is lladvsr for the Advisor.

Correct the error.

Module: LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: This message is a possible candidate for automation if you want to automatically start the peer Advisor as the primary Advisor.

AQS0176I *type* **STATE NOT REPLICATED TO SECONDARY ADVISOR**

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it cannot send updated state information to the secondary Advisor.

In the message text:

type
The type of state. Possible values are:
- WORKLOAD
- BCPII

System action: Processing continues.

- If the *type* value is WORKLOAD, the primary and secondary Advisors are no longer in sync. If the secondary Advisor were to take over primary Advisor responsibilities, the state of the workloads is unknown.
- If the *type* value is BCPII and the secondary Advisor were to take over primary Advisor responsibilities, the system images that reside within the sites are unknown, but will be rediscovered as Agents from these system images reconnect to the Advisor.

Operator response: Contact the system programmer.

System programmer response: Verify the network connectivity between this Advisor and the secondary Advisor. If internal trace is being used, dump and examine the internal trace messages to determine the cause of the communication failure. Otherwise, examine the syslogd file to determine the cause of the communication failure. The syslogd identifier is lladvsr for the Advisor. Restart the secondary Advisor to enable the two Advisors to resync. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing network connectivity problems.

Module: LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0176I WORKLOAD STATE NOT REPLICATED TO SECONDARY ADVISOR
```

AQS0177I ADVISOR STOPPING – *reason*

Explanation: The Multi-site Workload Lifeline secondary Advisor issues this message during initialization when the peer Advisor resets the connection with this Advisor.

In the message text:

reason
The reason the secondary Advisor is stopping. Possible values are:

NOT AUTHORIZED TO PRIMARY ADVISOR
One of the following conditions is true:

- The IP address of this Advisor is not included in the peer Advisor advisor_id_list configuration statement.
- The IP address specified in the Advisor lb_connection_v4 or lb_connection_v6 configuration statement does not match what is defined in the peer Advisor's configuration.
- The peer Advisor requires a secure connection with this Advisor by using an Application Transparent TLS policy.

PRIMARY ADVISOR ALREADY HAS A SECONDARY REGISTERED
The peer Advisor is already communicating with another peer Advisor; only one peer connection is allowed.

UNSUPPORTED LEVEL
The secondary Advisor is at an earlier version or service level than the peer Advisor. The secondary Advisor must be at the same or a later version or service level.

System action: Processing ends. The connection with the peer Advisor is reset.

Operator response: Contact the system programmer.

System programmer response: Take the appropriate action, based on the *reason* value:

NOT AUTHORIZED TO PRIMARY ADVISOR
For a non-secure connection, ensure that the Advisor's IP address is included in the peer Advisor's advisor_id_list configuration statement. Ensure that the Advisor's lb_connection_v4 and connection_v6 configuration statements match the peer Advisor's configuration statements. See Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93 for more information about configuration statements and parameters.

For a secure connection, verify that the Application Transparent TLS policy on both Advisors is correctly defined. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring Application Transparent TLS.

PRIMARY ADVISOR ALREADY HAS A SECONDARY REGISTERED
Ensure that the secondary Advisor connected to the peer Advisor is the correct one. If not, stop the current secondary Advisor and restart this Advisor as the secondary Advisor.

UNSUPPORTED LEVEL
Upgrade the secondary Advisor to a version or service level that is the same with or later than the peer Advisor. See "Migrating the Lifeline Advisor" on page 58 for more information.

Module: LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0177I ADVISOR STOPPING – NOT AUTHORIZED TO PRIMARY ADVISOR
```

AQS0178I WORKLOAD *workloadname* MUST BE QUIESCED BEFORE ISSUING A *cmd* COMMAND

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY` *`procname`*`,DEACTIVATE|ACTIVATE` command. The workload must be quiesced before you can deactivate it or reroute it to an alternate standby site.

In the message text:

`cmd`
The MODIFY command that was issued. Possible values are:

- ACTIVATE
- DEACTIVATE

`workloadname`
The name of the workload specified on the MODIFY command.

System action: The MODIFY command is ignored.

Operator response: Issue a MODIFY *procname*,QUIESCE,WORKLOAD=*workloadname* to quiesce the workload, and reissue the MODIFY *procname*,DEACTIVATE|ACTIVATE command.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0178I WORKLOAD WORK01 MUST BE QUIESCED BEFORE ISSUING A DEACTIVATE COMMAND
```

AQS0179I MODIFY *cmd* **COMMAND IGNORED -** *reason*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when a MODIFY *procname* command is ignored.

In the message text:

cmd
The MODIFY command that was issued. Possible values are:

- ACTIVATE
- DEACTIVATE
- TRANSFER

reason
The reason that the MODIFY command was ignored. Possible values are:

WORKLOAD NEVER ACTIVATED
The MODIFY *procname*,DEACTIVATE command was issued, but the workload was never activated.

ADVISOR MUST BE PRIMARY
The MODIFY command specified by the *cmd* value was issued on the Advisor that was acting as the secondary Advisor.

cmd **COMMAND IS QUEUED OR IN PROGRESS FOR WORKLOAD** *workloadname*
The MODIFY *procname*,TRANSFER command was issued for the workload specified by the *workloadname* value, but a previous MODIFY *procname*,ACTIVATE|DEACTIVATE|QUIESCE command was issued for the workload and has not yet started or not yet completed.

NO AGENT IS CONNECTED
The MODIFY *procname*,DEACTIVATE command was issued, but no Multi-site Workload Lifeline Agents from either site are available to reset active connections on their systems.

NOT ALL MEMBERS ARE REGISTERED FOR WORKLOAD *workloadname* **ON SITE** *sitename*
The MODIFY *procname*,ACTIVATE command was issued for the workload specified by the *workloadname* value, but at least one load balancer application group member is not registered on the alternate site, specified by the *sitename* value.

NOT ALL REQUIRED AGENTS CONNECTED ON SITE *sitename*
Possible causes for this failure reason are:

- The MODIFY *procname*,ACTIVATE command was issued to a specific site specified by the *sitename* value and all required Agents were not available on the site.
- The MODIFY *procname*,ACTIVATE command was issued to a specific site and all required Agents were not available on the alternate site specified by the *sitename* value.
- The MODIFY *procname*,ACTIVATE command was issued without specifying a site and all required Agents were not available on the site specified by the *sitename* value.

NOT ALL REQUIRED MQ QUEUE MANAGERS AVAILABLE ON SITE *sitename*
The MODIFY *procname*,ACTIVATE command was issued to a specific site and all required MQ queue managers were not available on the alternate site specified by the *sitename* value.

SNA WORKLOAD NOT DEACTIVATED ON SITE *sitename*
The MODIFY *procname*,ACTIVATE command was issued for a SNA workload, but the workload is not deactivated on the alternate site specified by the *sitename* value.

TAKEOVER COMMAND IS IN PROGRESS
The MODIFY *procname*,TRANSFER command was issued, but a previous MODIFY *procname*,TAKEOVER command was issued and has not yet completed.

TRANSFER COMMAND IS IN PROGRESS
The MODIFY *procname*,ACTIVATE|DEACTIVATE|QUIESCE command was issued, but at least one MODIFY *procname*,TRANSFER command was issued for the workload and has not yet completed.

WORKLOAD *workloadname* **HAS CONNECTIONS ON SITE** *sitename*
The MODIFY *procname*,ACTIVATE command was issued for the workload specified by the *workloadname* value, but active TCP connections or SNA sessions for the workload exist on the alternate site, specified by the *sitename* value.

WORKLOAD *workloadname* **HAS QUEUED MQ MESSAGES ON SITE** *sitename*
The MODIFY *procname*,ACTIVATE command was issued for the workload specified by the *workloadname* value, but messages exist on at least one of the workload's transfer-eligible MQ cluster queues hosted by an MQ queue manager on the alternate site specified by the *sitename* value.

WORKLOAD *workloadname* **CHANNEL NOT STOPPED ON SITE** *sitename*
The MODIFY *procname*,ACTIVATE command was issued for the workload specified by the *workloadname* value, but the workload's MQ cluster receiver channel is not stopped on at least one of the MQ queue managers processing the workload on the alternate site specified by the *sitename* value.

WORKLOAD *workloadname* **NOT DEACTIVATED ON SITE** *sitename*
The MODIFY *procname*,ACTIVATE command was issued for the workload specified by the *workloadname* value, but the Linux on z Systems or SNA workload was quiesced but not deactivated on the site specified by the *sitename* value.

System action: The MODIFY command is ignored.

Operator response: Take the following actions based on the *reason* value:

WORKLOAD NEVER ACTIVATED
The workload can be activated by issuing the MODIFY *procname*,ACTIVATE command.

ADVISOR MUST BE PRIMARY
Reissue the MODIFY command specified by the *cmd* value on the system where the primary Advisor is running.

cmd **COMMAND IS QUEUED OR IN PROGRESS FOR WORKLOAD** *workloadname*
Check for prior AQS0162I messages to determine why the command specified by the *cmd* value was queued for the workload specified by the *workloadname* value. Reissue the MODIFY *procname*,TRANSFER command when the command completes.

NO AGENT IS CONNECTED
Contact the system programmer.

NOT ALL MEMBERS ARE REGISTERED FOR WORKLOAD *workloadname* **ON SITE** *sitename*
Contact the system programmer.

NOT ALL REQUIRED AGENTS CONNECTED ON SITE *sitename*
Issue a MODIFY *procname*,DISPLAY,ADVISOR command to determine which configured Agents are currently not connected. Contact the system programmer with the list of Agents that are not connected.

NOT ALL REQUIRED MQ QUEUE MANAGERS AVAILABLE ON SITE *sitename*

Issue the MODIFY *procname*,DISPLAY,WORKLOAD,DETAIL command to determine which MQ queue managers are currently not available for a configured MQ workload. MQ queue managers displayed with a system name of N/A were not reported by any Lifeline Agent. Contact the system programmer with the list of MQ queue managers that are not available.

SNA WORKLOAD NOT DEACTIVATED ON SITE *sitename*
Issue a MODIFY *procname*,DEACTIVATE,WORKLOAD=*workloadname* command to inactivate SNA applications on the alternate site specified by the *sitename* value, and reissue the MODIFY *procname*,ACTIVATE command.

TAKEOVER COMMAND IS IN PROGRESS
Reissue the MODIFY *procname*,TRANSFER command on the system where the primary Advisor is running when the previous MODIFY *procname*,TAKEOVER command completes.

TRANSFER COMMAND IS IN PROGRESS
Issue the MODIFY *procname*,TRANSFER,WORKLOAD=*workloadname*,STATUS command to check the status of previous MODIFY *procname*,TRANSFER commands for the workload. Reissue the MODIFY,*procname*,ACTIVATE|DEACTIVATE|QUIESCE command once all MODIFY *procname*,TRANSFER commands complete for the workload.

WORKLOAD *workloadname* **HAS CONNECTIONS ON SITE** *sitename*
Issue the MODIFY *procname*,DEACTIVATE,WORKLOAD=*workloadname* command to reset all active connections on the target site specified by the *sitename* value, and reissue the MODIFY *procname*,ACTIVATE command.

WORKLOAD *workloadname* **HAS QUEUED MQ MESSAGES ON SITE** *sitename*
Contact the system programmer.

WORKLOAD *workloadname* **CHANNEL NOT STOPPED ON SITE** *sitename*
Contact the system programmer.

WORKLOAD *workloadname* **NOT DEACTIVATED ON SITE** *sitename*
Issue the MODIFY *procname*,DEACTIVATE,WORKLOAD=*workloadname* command to transition the Linux on z Systems or SNA workload into a deactivated state and reissue the MODIFY *procname*,ACTIVATE command.

System programmer response: Take the following actions based on the *reason* value:

NO AGENT IS CONNECTED
Verify that at least one z/OS Agent is connected on both sites, and for Linux on z Systems workloads, at least one Linux on z Systems Management Agent is connected on both sites. Verify that the Agents on each site are active by issuing the MODIFY *procname*,DISPLAY,ADVISOR command and, if necessary, restart the Agents. Verify network connectivity between the Advisor and Agents. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing z/OS networking connectivity problems. See the documentation for your Linux distribution for more information about diagnosing network connectivity problems on Linux on z Systems.

NOT ALL MEMBERS ARE REGISTERED FOR WORKLOAD *workloadname* **ON SITE** *sitename*

Issue the MODIFY *procname*,DISPLAY,WORKLOAD,DETAIL command for the workload to determine which server applications do not have their load balancer application group members registered for the workload. Check the load balancer and correct any configuration problems or update the Advisor configuration to remove these members from the cross_sysplex_list or intermediary_node_list statement.

NOT ALL REQUIRED AGENTS CONNECTED ON SITE *sitename*
Issue the MODIFY *procname*,DISPLAY,ADVISOR command to determine which required Agents are currently not connected. Verify that at least one z/OS Agent is connected on both sites, and for Linux on z Systems workloads, at least one Linux on z Systems Management Agent is connected on both sites. Verify that the Agents on each site are active and, if necessary, restart the Agents. Verify network connectivity between the Advisor and Agents. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing z/OS network connectivity problems. See the documentation for your Linux distribution for more information about diagnosing network connectivity problems on Linux on z Systems.

If the MODIFY *procname*,ACTIVATE command was issued to a specific site, at least one z/OS Agent must be connected on that site, and for Linux on z Systems workloads, at least one Linux on z Systems Management Agent must be connected on that site. On the alternate site, if the Agent is unable to connect to the Advisor because the Agent's system is down and the Agent cannot be removed from the agent_id_list Advisor configuration statement, issue the MODIFY *procname*,DEACTIVATE,WORKLOAD=*workloadname* command to transition the workload into a deactivated state and reissue the MODIFY *procname*,ACTIVATE command.

NOT ALL REQUIRED MQ QUEUE MANAGERS AVAILABLE ON SITE *sitename*
Issue the MODIFY *procname*,DISPLAY,WORKLOAD,DETAIL command to determine which MQ queue managers are currently not available for a configured MQ workload. From the system where an unavailable MQ queue manager is expected to reside, ensure that the MQ queue manager is active, its channel initiator is started, and all queues configured on the MQ queue manager for the workload are defined and enabled. See *IBM MQ: Administering IBM MQ* for information about displaying, configuring, and enabling queues on an MQ queue manager.

If the MODIFY *procname*,ACTIVATE command was issued to a specific site, at least one MQ queue manager must be available on that site. On the alternate site, if the MQ queue manager is unable to be made available for the workload and cannot be removed from the mq_manager_list Advisor configuration statement, issue the MODIFY *procname*,DEACTIVATE,WORKLOAD=*workloadname* command to transition the workload into a deactivated state and reissue the MODIFY *procname*,ACTIVATE command.

WORKLOAD *workloadname* **HAS QUEUED MQ MESSAGES ON SITE** *sitename*
For each z/OS Agent on the site specified by the *sitename* value:

- If internal trace is being used, dump and examine the internal trace messages.
- Otherwise, examine the syslogd file. The syslogd identifier is llagent for the Agent.

Check for error messages indicating that messages were found on a transfer-eligible MQ cluster queue for the workload specified by the *workloadname* value. If MQ server applications are active and processing messages from these MQ cluster queues, wait until all queued messages are processed and reissue the MODIFY *procname*,ACTIVATE command. If the messages remain on the transfer-eligible MQ cluster queues, perform one of the following steps:

- Start the MQ server applications needed to process these messages.
- Determine whether these messages should be transferred to the alternate site using the MODIFY *procname*,TRANSFER command.
- Issue the MODIFY *procname*,DEACTIVATE,WORKLOAD=*workloadname* command to transition the workload into a deactivated state and reissue the MODIFY *procname*,ACTIVATE command. MQ message processing will start on the activated site even though messages remain on the quiesced site.

WORKLOAD *workloadname* **CHANNEL NOT STOPPED ON SITE** *sitename*
For each z/OS Agent on the site specified by the *sitename* value:

- If internal trace is being used, dump and examine the internal trace messages.
- Otherwise, examine the syslogd file. The syslogd identifier is llagent for the Agent.

Check for error messages indicating that an MQ cluster's receiver channel has not stopped. Wait until the MQ cluster receiver channel stops and reissue the MODIFY *procname*,ACTIVATE command. If the MQ cluster receiver channel does not stop, verify that the MQ cluster receiver channel is correctly configured. If possible, manually stop the MQ cluster receiver channel using the STOP CHANNEL command. See *IBM MQ: Administering IBM MQ* for information about IBM MQ commands.

Optionally, issue the MODIFY *procname*,DEACTIVATE,WORKLOAD=*workloadname* command to transition the workload into a deactivated state and reissue the MODIFY *procname*,ACTIVATE command. Note that although MQ message processing will start on the activated site, additional messages might continue to be received on the quiesced site.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0179I MODIFY QUIESCE COMMAND IGNORED - ADVISOR MUST BE PRIMARY
```

AQS0180W WORKLOAD *workloadname* **HAS UNAVAILABLE SERVERS ON SITE** *sitename*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is defined as an Active/Standby workload in the Advisor configuration file.
- For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, no server application is available in the site specified by the *sitename* value for at least one load balancer application group or, if configured, the group's failure detection group, defined for the Active/Standby workload specified by the *workloadname* value.

  A server application is considered unavailable in any of the following conditions is true:

  – The server application is not active.

- The server application is active but not fully operational.
- The system on which the server application runs is resource constrained.
- For SNA and Linux on z Systems workloads, when either condition is true:
  - No members in the load balancer application group or the group's failure detection group are available on the site specified by the *sitename* value.
  - No applications that the members in the load balancer application group or the group's failure detection group distribute connections to are available on the site specified by the *sitename* value.
- For workloads defined in the mq_manager_list Advisor configuration statement, at least one MQ cluster queue is not available on any MQ queue manager in the site specified by the *sitename* value for the Active/Standby workload specified by the *workloadname* value. The mq_manager_list Advisor configuration statement specifies each MQ queue manager on the site that should have the MQ cluster queue defined.

  An MQ cluster queue is considered unavailable if either of the following conditions is true:
  - No MQ queue managers that host the MQ cluster queue are active.
  - No active MQ queue managers have the MQ cluster queue defined.

For workloads defined in the cross_sysplex_list Advisor configuration statement that are not Linux on z Systems workloads, this message will be deleted when at least one server application in each load balancer application group or the group's failure detection group becomes available on the site specified by the *sitename* value, or the workload is rerouted to the alternate standby site.

For workloads defined in the mq_manager_list Advisor configuration statement, the message will be deleted when all MQ cluster queues become available on the site specified by the *sitename* value, or the workload is rerouted to MQ queue managers on the alternate site.

For SNA and Linux on z Systems workloads, this message will be deleted when both conditions are true:

- At least one member in the load balancer application group or the group's failure detection group is available on the site specified by the *sitename* value.
- At least one server application that the members in the load balancer application group or the group's failure detection group distribute connections to becomes available on the site specified by the *sitename* value.

In the message text:

workloadname
The name of the workload that is defined in the Advisor configuration file.

sitename
The sysplex name of the active site where no servers are available for the workload.

System action: The site is no longer a usable target for the workload specified by the *workloadname* value.

If the Advisor workload_switch_policy configuration statement is configured as automatic:

- For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor will automatically notify load balancers that new connection requests to server applications for the specified workload that are currently being routed to the site specified by the *sitename* value must be routed to the alternate standby site.
- For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor will automatically notify z/OS Agents that MQ cluster queue ranks should be altered so that messages for the specified workload that are currently being routed to MQ queue managers in the site specified by the *sitename* value must be routed to the MQ queue managers in the alternate standby site.

If the workload_switch_policy configuration statement is configured as manual:

- For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor continues notifying load balancers to route new connection requests to server applications for the workload specified by the *workloadname* value to the site specified by the *sitename* value.
- For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor continues notifying z/OS Agents that MQ cluster queue ranks should be unchanged so that messages continue to be routed for the workload specified by the *workloadname* value to the site specified by the *sitename* value.

Operator response: If the workload_switch_policy configuration statement is configured as manual, issue the `MODIFY`

procname,ACTIVATE command for the workload specified by the *workloadname* value currently being routed to the site specified by the *sitename* value to notify the load balancers that new connection requests must be routed to the specified site. See Chapter 7, "Lifeline Advisor commands," on page 127 for more information. Contact the system programmer.

System programmer response: Ensure that the server applications for the workload are available on the active site specified by the *sitename* value. Verify that each server application is active and is fully operational, and that the system where it resides has sufficient resources. See *z/OS Communications Server: IP Diagnosis Guide* and *z/OS Communications Server SNA Diagnosis Vol 1, Techniques and Procedures* for more information about verifying z/OS server application availability. See the documentation for your Linux distribution for more information about verifying Linux on z Systems server application availability.

Module: LMLB

Routing code: 1, 8

Descriptor code: 2, 7

Automation: This message is a possible candidate for automation if you want to automatically issue the MODIFY *procname*,ACTIVATE command to have the workload routed to the alternate site.

Example:

```
AQS0180W WORKLOAD WORK01 HAS UNAVAILABLE SERVERS ON SITE SITE01
```

AQS0181I ADVISOR CONFIGURATION UPDATED

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a MODIFY *procname*,REFRESH command.

System action: The Advisor configuration is updated.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0182I ADVISOR CONFIGURATION NOT UPDATED

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a MODIFY *procname*,REFRESH command. The Advisor configuration file cannot be opened, or contains one or more errors.

System action: The MODIFY command is ignored.

Operator response: Contact the system programmer.

System programmer response: If internal trace is being used, dump and examine the internal trace messages for configuration error messages. Otherwise, examine the syslogd file for configuration error messages. The syslogd identifier is lladvsr for the Advisor. Correct the configuration file errors and reissue the MODIFY *procname*,REFRESH command. See Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93 for more information about configuration statements and parameters.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0184W PRIMARY AND SECONDARY ADVISOR CONFIGURATION NOT IN SYNC

Explanation: The Multi-site Workload Lifeline Advisor issues this message in one of the following cases:

- The secondary Advisor is started using a different configuration file than the primary Advisor.
- A `MODIFY procname,REFRESH` command issued from the peer Advisor results in the active configuration for the two Advisors to no longer be the same.

This message will be deleted when the active configuration of both Advisors is back in synchronization.

System action: Processing continues. If the advisor_takeover_policy Advisor configuration statement is configured as automatic on this Advisor, the automatic takeover function will be disabled until this message is deleted.

Operator response: Ensure that the Advisor configuration file is updated to match the peer Advisor and issue the `MODIFY procname,REFRESH` command from this Advisor.

System programmer response: None.

Module: LMADV

Routing code: 1, 8

Descriptor code: 2, 7

Automation: Not applicable for automation.

AQS0185I AGENT CONNECTION TO ADVISOR AT *ipaddress* REJECTED - *reason*

Explanation: The Multi-site Workload Lifeline Agent issues this message during initialization when the Multi-site Workload Lifeline Advisor resets the connection with this Agent.

In the message text:

ipaddress
The IP address of the Advisor.

reason
The reason the Agent connection was rejected. Possible values are:

SITE NOT DEFINED TO ADVISOR
The site where this Agent resides is not included in the Advisor cross_sysplex_list, mq_manager_list, or sna_application_list configuration statement.

NOT AUTHORIZED TO ADVISOR
One of the following conditions occurred:

- The IP address defined in the Agent host_connection configuration statement is not included in the Advisor agent_id_list configuration statement.
- The IP address defined in the Agent advisor_id or advisor_id_list configuration statement does not match the Advisor lb_connection_v4 or lb_connection_v6 configuration statement.
- For z/OS Agents, the Advisor requires a secure connection with this Agent by using an Application Transparent TLS policy.

UNSUPPORTED LEVEL
The version of the Agent is unknown or no longer supported by the Advisor.

MULTIPLE AGENTS ACTIVE ON THIS SYSTEM ID
Another Linux on z Systems Management Agent from this system and site is already connected to the Advisor.

System action: Processing ends. The connection with the primary Advisor is reset.

Operator response: Contact the system programmer.

System programmer response: Take the appropriate action, based on the *reason* value:

SITE NOT DEFINED TO ADVISOR
Ensure that the Agent's site is included in the Advisor's cross_sysplex_list, mq_manager_list, or sna_application_list configuration statement. Ensure that a Linux on z Systems Management Agent is not

connecting to an Advisor that does not support Linux on z Systems workloads. See Chapter 6, “Multi-site Workload Lifeline configuration statements,” on page 93 for more information about configuration statements and parameters.

NOT AUTHORIZED TO ADVISOR

Ensure that the Agent's IP address defined in the host_connection configuration statement is included in the Advisor's agent_id_list configuration statement. Ensure that the Agent's IP address defined in the advisor_id or advisor_id_list configuration statement matches the Advisor's lb_connection_v4 or lb_connection_v6 configuration statement. See Chapter 6, “Multi-site Workload Lifeline configuration statements,” on page 93 for more information about configuration statements and parameters.

For z/OS Agents that require a secure connection, verify that the Application Transparent TLS policy on both the Advisor and Agent is correctly defined. See *z/OS Communications Server: IP Configuration Guide* for more information about configuring Application Transparent TLS.

UNSUPPORTED LEVEL

Upgrade the Agent to a version supported by the Advisor. See “Migrating the Lifeline Agent” on page 59 for more information.

MULTIPLE AGENTS ACTIVE ON THIS SYSTEM ID

Ensure that the Linux on z Systems Management Agent currently connected from this system is the correct one. If not, stop the existing Linux on z Systems Management Agent and start the correct Linux on z Systems Management Agent.

Module: LAADV, LAMAIN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0185I AGENT CONNECTION TO ADVISOR AT 10.10.10.1 REJECTED - NOT AUTHORIZED TO ADVISOR
```

AQS0186I ADVISOR NMI INTERFACE IS NO LONGER AVAILABLE

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the Network Management Interface (NMI) is stopped.

System action: Processing continues. The NMI connections with network management agents are reset.

Operator response: Contact the system programmer.

System programmer response: If internal trace is being used, dump and examine the internal trace messages for NMI error messages and correct the error. Otherwise, examine the syslogd file for NMI error messages and correct the error. The syslogd identifier is lladvsr for the Advisor. Recycle the Advisor to restart the NMI.

Module: LMNMI

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0187I BCPII MONITORING IS NOT AVAILABLE

Explanation: The Multi-site Workload Lifeline Advisor issues this message when it is unable to use the Base Control Program Internal Interface (BCPii) service.

System action: Processing continues.

Operator response: Take the following actions:

- If internal trace is being used, dump and save the internal trace messages.
- If internal trace is not being used, save the syslogd file.
- Contact the system programmer.

System programmer response: Verify that the BCPii address space was successfully started. Ensure that the Lifeline Advisor is authorized to use BCPii services. If internal trace is being used, dump and examine the internal trace messages to determine the cause of the BCPii failure. Otherwise, examine the syslogd file to determine the cause of the BCPii failure. The syslogd identifier is lladvsr for the Advisor. Correct the problem, and then stop and restart the Lifeline Advisor. See *z/OS MVS Programming: Callable Services for High-Level Languages* for information about diagnosing BCPii issues.

Module: LMBCPII

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0188W SITE *sitename* IS NOT AVAILABLE

Explanation: The Multi-site Workload Lifeline Advisor issues this message when both of the following conditions occur:

- The Advisor can no longer communicate over the network with any Multi-site Workload Lifeline Agents in the specified site.
- The Advisor can no longer communicate with any of the images (LPARs) in the specified site by using the Base Control Program Internal Interface (BCPii) service.

This message will be deleted when at least one Agent from this site reconnects to the Advisor or communication is reestablished with at least one image from this site by using BCPii services.

In the message text:

sitename
The sysplex name of the unresponsive site.

System action: The site is no longer considered responsive and is no longer a usable target for any defined workloads. If the Advisor workload_switch_policy configuration statement is configured with a value of `automatic`, the Advisor will automatically direct load balancers that new connection requests to server applications for workloads currently being routed to the site specified by the *sitename* value should be routed to the alternate, standby site. If workload_switch_policy is configured with a value of `manual`, the Advisor continues to direct load balancers to route new connection requests to server applications for these workloads to the site specified by the *sitename* value.

Operator response: If workload_switch_policy is configured with a value of `manual`, issue the `MODIFY` *`procname`*`,ACTIVATE` command for each workload currently being routed to the site specified by the *sitename* value. This will direct the load balancers that new connection requests should be routed to the alternate, standby site. See Chapter 7, “Lifeline Advisor commands,” on page 127 for more information.

System programmer response: Ensure that the site specified by the *sitename* value is available. If the site is available, verify network connectivity between the Advisor and the site. Verify that Agents are running on each LPAR and Linux on z Systems Management Guest in the site where a server application for the workloads resides. Verify the connectivity used by BCPii to communicate with each of the site's images. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing z/OS network connectivity problems. See the documentation for your Linux distribution for more information about diagnosing network connectivity problems on Linux on z Systems. See *z/OS MVS Programming: Callable Services for High-Level Languages* for High-Level Languages for information about diagnosing BCPii issues.

Module: LMBCPII, LMLB

Routing code: 1, 8

Descriptor code: 2, 7

Automation: This message is a possible candidate for automation if you want to automatically issue the `MODIFY` *`procname`*`,ACTIVATE` command to have workloads routed to the alternate site.

Example:

```
AQS0188W SITE SITE01 IS NOT AVAILABLE
```

AQS0189W PEER ADVISOR IS NOT AVAILABLE

Explanation: The Multi-site Workload Lifeline Advisor issues this message when both of the following conditions occur:

- The Advisor can no longer communicate over the network with the peer Advisor.
- The Advisor can no longer communicate with the image (LPAR) where the peer Advisor was active by using the Base Control Program Internal Interface (BCPii) service.

This message will be deleted when the peer Advisor reconnects to this Advisor or communication is reestablished with the image where the peer Advisor was active by using BCPii services.

System action: Processing continues. The peer Advisor site is no longer considered responsive.

Operator response: If this Advisor is the secondary Advisor and advisor_takeover_policy is configured with a value of `manual`, issue the `MODIFY procname,TAKEOVER` command to make this Advisor assume the role of primary Advisor; otherwise, contact the system programmer.

System programmer response: Ensure that the peer Advisor is available. Check for prior AQS0124I and AQS0125I messages to determine the system name where the peer Advisor was active. If the peer Advisor is available, verify network connectivity between the Advisor and its peer Advisor. Verify the connectivity used by BCPii to communicate with each of the site's images. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing network connectivity problems. See *z/OS MVS Programming: Callable Services for High-Level Languages* for information about diagnosing BCPii issues.

Module: LMBCPII

Routing code: 1, 8

Descriptor code: 2, 7

Automation: This message is a possible candidate for automation if you want to automatically issue the `MODIFY procname,TAKEOVER` command to have this Advisor assume the role of primary Advisor.

AQS0190I MULTIPLE CONNECTION ATTEMPTS FROM *ipaddress* REJECTED

Explanation: The Multi-site Workload Lifeline Advisor issues this message when a load balancer repeatedly tries to connect. This usually indicates that the load balancer was configured incorrectly and that the Advisor does not permit any of the connection attempts.

In the message text:

ipaddress
The IP address of the load balancer.

System action: Processing continues. If the load balancer is still active, it might continue to attempt to reconnect to the Advisor.

Operator response: Locate the prior AQS0168I message that precedes this message and contact the system programmer. Message AQS0168I describes the reason that the load balancer connection was rejected.

System programmer response: See message AQS0168I for information about how to correct the problem.

Module: LMLB

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0190I MULTIPLE CONNECTION ATTEMPTS FROM 10.10.10.1 REJECTED
```

AQS0191I ALL LB CONNECTION ATTEMPTS REJECTED - NO LB_ID_LIST CONFIGURED

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the lb_id_list statement is not configured but load balancers try to connect.

System action: Processing continues. If the load balancers are still active, they might continue to attempt to reconnect to the Advisor.

Operator response: Contact the system programmer.

System programmer response: Stop the load balancers from trying to connect to the Advisor.

Module: LMLB

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0191I ALL LB CONNECTION ATTEMPTS REJECTED – NO LB_ID_LIST CONFIGURED
```

AQS0192W AGENT FROM *ipaddress* IS UNRESPONSIVE – NO MONITORING STATUS REPORTED

Explanation: The Multi-site Workload Lifeline Advisor issues this message when a Lifeline Agent is connected but the Advisor has not received any message indicating the status of the workload server applications being monitored by this Agent. This message is issued when the Advisor has not received any message for more than twice the interval that is configured on the update_interval Advisor configuration statement. The message will be deleted when the Advisor receives a new status message from the Agent or the Agent connection is closed.

In the message text:

ipaddress
The IP address of the Agent.

System action: Processing continues. All server applications and MQ queue managers being reported by this Agent are marked unavailable by the Advisor until a new status message is received.

Operator response: Contact the system programmer.

System programmer response: Ensure the Agent is receiving an adequate amount of system resources to properly monitor the workload server applications and MQ queue managers within the time that is configured on the update_interval Advisor configuration statement. If necessary, assign the Agent to the WLM SYSSTC service class to receive the proper dispatching priority.

Module: LMAGNT

Routing code: 1, 8

Descriptor code: 2, 7

Automation: Not applicable for automation.

Example:

```
AQS0192W AGENT FROM 192.10.110.1 IS UNRESPONSIVE – NO MONITORING STATUS REPORTED
```

AQS0201I ALL MATCHING WORKLOADS *state* ON SITE *sitename*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,ACTIVATE,WORKLOAD=*ALL_AS*,SITE=sitename` or a `MODIFY procname,ACTIVATE|DEACTIVATE|QUIESCE,WORKLOAD=*ALL_AQ*,SITE=sitename` command.

In the message text:

state
The state of the workloads. Possible values are:

- ACTIVATED
- DEACTIVATED

- QUIESCED

sitename
The sysplex name of the site.

System action: Processing continues based on the *state* value:

- When the *state* value is ACTIVATED,
  - For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor notifies load balancers that new connection requests to server applications for the matching workloads are to be routed to the site specified by the *sitename* value.
  - For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies z/OS Agents on the specified site to allow new messages for the matching workloads to be routed to the site specified by the *sitename* value.
- When the *state* value is DEACTIVATED,
  - For Active/Query workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, all active connections to server applications that are defined for the matching workloads on the site specified by the *sitename* value are terminated.
- When the *state* value is QUIESCED,
  - For Active/Query workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor notifies load balancers that new connection requests to server applications for the matching workloads must not be routed to the site specified by the *sitename* value. Connection timeouts or resets might occur on the client applications that initiated the requests while these workloads are in a quiesced state on that site.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0201I ALL MATCHING WORKLOADS QUIESCED ON SITE SITE01
```

AQS0202I ALL MATCHING WORKLOADS *state*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a MODIFY *procname*,DEACTIVATE|QUIESCE,WORKLOAD=*ALL_AS* or a MODIFY *procname*,ACTIVATE|DEACTIVATE|QUIESCE,WORKLOAD=*ALL_AQ* command.

In the message text:

state
The state of the workloads. Possible values are:

- ACTIVATED
- DEACTIVATED
- QUIESCED

System action:

- When the *state* value is ACTIVATED,
  - For Active/Query workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor notifies load balancers that new connection requests to server applications for the matching workloads are to be routed to both sites
- When the *state* value is DEACTIVATED,
  - For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, all active connections to server applications that are defined for the matching workloads are terminated.

  - For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies z/OS Agents on the previously active site to verify that all MQ cluster receiver channels are stopped and to check for existing messages on each MQ cluster queue for each matching workload.
- When the *state* value is QUIESCED,
  - For workloads defined in the cross_sysplex_list or sna_application_list Advisor configuration statement, the Advisor notifies load balancers that new connection requests to server applications for the matching workloads must not be routed to any site. Connection timeouts or resets might occur on the client applications that initiated the requests while these workloads are in a quiesced state.
  - For workloads defined in the mq_manager_list Advisor configuration statement, the Advisor notifies z/OS Agents on the currently active site to prevent new messages for all matching workloads to be routed to any site.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0202I ALL MATCHING WORKLOADS QUIESCED
```

AQS0203W LOAD BALANCER CONNECTION FROM *ipaddress* IS UNRESPONSIVE

Explanation: The Multi-site Workload Lifeline Advisor issues this message when a load balancer is configured to request Server Application State Protocol (SASP) weights but the Advisor has not received any SASP message from this load balancer for more than twice the interval that is configured on the failure_detection_interval Advisor configuration statement. The message will be deleted when the Advisor receives a new SASP message from the load balancer.

In the message text:

ipaddress
The IP address of the load balancer.

System action: Processing continues. If the load balancer is still active, it might attempt to send an SASP message.

Operator response: Determine whether the load balancer is active. Restart the load balancer, if necessary. Otherwise, contact the system programmer.

System programmer response: Check the load balancer and correct any configuration or connectivity problems. Restart the load balancer, if necessary. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing network connectivity problems.

Module: LMLB

Routing code: 1, 8

Descriptor code: 2, 7

Automation: Not applicable for automation.

Example:

```
AQS0203W LOAD BALANCER CONNECTION FROM 10.10.10.1 IS UNRESPONSIVE
```

AQS0204I *applname* DUMP INTERNAL LOG COMMAND SUCCESSFUL

Explanation: The Multi-site Workload Lifeline Advisor or Agent issues this message in response to a z/OS `MODIFY` *`procname`*`,DUMPLOG` command or Linux on z Systems `aqsllcmd dumplog` command when the command completes successfully.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

System action: The internal trace messages are dumped to the file specified by the AQSTRACE DD card in the Advisor or z/OS Agent started procedure, or in the `/opt/ibm/lifeline/log/agent.trace` file for the Linux on z Systems Management Agent.

Operator response: None.

System programmer response: None.

Module: LACMD, LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0204I LLADVSR DUMP INTERNAL LOG COMMAND SUCCESSFUL
```

AQS0205I *applname* **DUMP INTERNAL LOG COMMAND NOT SUCCESSFUL**

Explanation: The Multi-site Workload Lifeline Advisor or Agent issues this message in response to a z/OS `MODIFY` *procname*`,DUMPLOG` command or Linux on z Systems `aqsllcmd dumplog` command when the command does not complete successfully.

In the message text:

applname
The application name. Possible values are:

LLADVSR
For the Multi-site Workload Lifeline Advisor

LLAGENT
For the Multi-site Workload Lifeline Agent

System action: The internal trace messages are not successfully dumped.

Operator response: Contact the system programmer.

System programmer response: Examine the syslogd file for the reason the internal trace messages could not be successfully dumped. The syslogd identifier is lladvsr for the Advisor and llagent for the Agent. Verify that the file system where the internal trace messages are to be dumped has sufficient space. If necessary, on z/OS, you can take a console dump of the application to capture the internal trace messages. On Linux on z Systems, you can issue a kill -SIGQUIT command against the process ID of the application to capture the internal trace messages.

Module: LACMD, LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0205I LLADVSR DUMP INTERNAL LOG COMMAND NOT SUCCESSFUL
```

AQS0206I *peername* **AT** *ipaddress* **IS AT A** *level* **LEVEL - SOME FUNCTIONS MIGHT NOT BE AVAILABLE**

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the Multi-site Workload Lifeline Agent or peer Advisor that connects to this Advisor is not at the same communication protocol version. This occurs when one of the following conditions is true:

- The peer Advisor or Agent is not at the same version level as this Advisor.
- The peer Advisor or Agent is at the same version level, but not at the same service level.

In the message text:

peername
The application name. Possible values are:

ADVISOR
For the Multi-site Workload Lifeline Advisor

AGENT
For the Multi-site Workload Lifeline Agent

ipaddress
The IP address of the peer Advisor or Agent

level
The indication of how the communication level is different. Possible values are:

LOWER
The peer Advisor or Agent is at a lower version or service level

HIGHER
The peer Advisor or Agent is at a higher version or service level

System action: Processing continues. The communication protocol version used will be the lower of the protocol versions between the Advisor and the other application. Any functions that are configurable at the higher communication protocol version are not available because the negotiated protocol version is at a lower level.

Operator response: Contact the system programmer.

System programmer response: If internal trace is being used, dump and examine the internal trace messages. Otherwise examine the syslogd files for the Advisor. The syslogd identifier is lladvsr for the Advisor. A WARNING message is logged which indicates the communication protocol version supported by the Advisor and the negotiated communication protocol version. The negotiated version will be the lower of the protocol versions supported by the Advisor and application. Ensure that all Advisors and Agents are at the same version and service level. See "Migrating IBM Multi-site Workload Lifeline" on page 55 for information on migrating to a newer version.

Module: LMAGNT, LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0206I AGENT AT 10.10.10.10 IS AT A LOWER LEVEL - SOME FUNCTIONS MIGHT NOT BE AVAILABLE
```

AQS0207I **MODIFY** *cmd* **COMMAND MIGHT NOT BE SUCCESSFUL -** *reason*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY` *procname*`,ACTIVATE|DEACTIVATE|QUIESCE` command.

In the message text:

cmd
The MODIFY command issued. Possible values are:

- ACTIVATE
- DEACTIVATE
- QUIESCE

reason
The reason that the command might not be successful. Possible values are:

NOT ALL SNA APPLICATIONS WERE ACTIVATED
A `MODIFY procname,ACTIVATE` command was issued for a SNA workload and not all SNA applications could be activated.

NOT ALL SNA APPLICATIONS WERE INACTIVATED
A `MODIFY procname,DEACTIVATE` command was issued for a SNA workload and not all SNA applications could be inactivated.

NOT ALL LINUX ON SYSTEM z GUESTS WERE LOGGED OFF
A `MODIFY procname,DEACTIVATE` command was issued for a Linux on z Systems workload and not all Linux on z Systems guests could be logged off.

NOT ALL AGENTS WERE CONNECTED
One of the following occurred:

- A MODIFY *procname*,DEACTIVATE command was issued and not all required Multi-site Workload Lifeline z/OS Agents and Multi-site Workload Lifeline Linux on z Systems Management Agents, if the workload contains Linux on z Systems server applications, are connected.
- A MODIFY *procname*,QUIESCE command was issued and not all required z/OS Agents, if the workload is defined in the mq_manager_list Advisor configuration statement, are connected.

NOT ALL CONNECTIONS WERE TERMINATED
A MODIFY *procname*,DEACTIVATE command was issued, but at least one of the Multi-site Workload Lifeline Agents on the previously active site was not able to successfully terminate connections associated with the workload.

NOT ALL MEMBERS ARE REGISTERED
The MODIFY *procname*,ACTIVATE|DEACTIVATE command was issued, but not all members are registered in the load balancer application groups for this workload.

WORKLOAD *workloadname* **NOT ALL MQ QUEUE MANAGERS CONNECTED ON SITE** *sitename*
A MODIFY *procname*,DEACTIVATE command was issued for a workload defined in the mq_manager_list Advisor configuration statement, but at least one MQ queue manager that hosts the workload's MQ cluster queues is not connected on the site specified by the *sitename* value. The Advisor is not able to determine if MQ messaging is disabled on the disconnected MQ queue managers.

WORKLOAD *workloadname* **HAS QUEUED MQ MESSAGES ON SITE** *sitename*
A MODIFY *procname*,DEACTIVATE command was issued for a workload defined in the mq_manager_list Advisor configuration statement, but messages exist on at least one of the workload's transfer-eligible MQ cluster queues hosted by an MQ queue manager running on the site specified by the *sitename* value.

WORKLOAD *workloadname* **MQ MESSAGING NOT ENABLED ON ALL QUEUE MANAGERS**
A MODIFY *procname*,ACTIVATE command was issued for a workload defined in the mq_manager_list Advisor configuration statement, but the MQ cluster receiver channel could not be started on at least one of the workload's MQ cluster queues hosted by an MQ queue manager running on the site specified on the ACTIVATE command.

WORKLOAD *workloadname* **MQ MESSAGING NOT DISABLED ON ALL QUEUE MANAGERS**
A MODIFY *procname*,QUIESCE command was issued for a workload defined in the mq_manager_list Advisor configuration statement, but the MQ cluster receiver channel could not be stopped on at least one of the workload's MQ cluster queues hosted by an MQ queue manager running on the site where the workload was previously active.

WORKLOAD *workloadname* **CHANNEL NOT STOPPED ON SITE** *sitename*
The MODIFY *procname*,DEACTIVATE command was issued for the workload specified by the *workloadname* value, but the workload's MQ cluster receiver channel is not stopped on at least one of the MQ queue managers processing the workload on the alternate site specified by the *sitename* value.

System action: The MODIFY command is processed by the Advisor, but any processing on the Agent systems is skipped for unregistered members and Agents currently not connected to the Advisor.

Operator response: Take the appropriate action, based on the *reason* value:

NOT ALL SNA APPLICATIONS WERE ACTIVATED
Contact the system programmer.

NOT ALL SNA APPLICATIONS WERE INACTIVATED
Contact the system programmer.

NOT ALL LINUX ON SYSTEM z GUESTS WERE LOGGED OFF
Contact the system programmer.

NOT ALL AGENTS WERE CONNECTED
Issue a `MODIFY` *`procname`*`,DISPLAY,ADVISOR` command to determine which configured Agents are currently not connected. Contact the system programmer with the list of Agents that are not connected.

NOT ALL CONNECTIONS WERE TERMINATED
Contact the system programmer.

| **NOT ALL MEMBERS ARE REGISTERED FOR WORKLOAD**
| Contact the system programmer.

| **WORKLOAD** *workloadname* **NOT ALL MQ QUEUE MANAGERS CONNECTED ON SITE** *sitename*
| Contact the system programmer.

WORKLOAD *workloadname* **HAS QUEUED MQ MESSAGES ON SITE** *sitename*
Contact the system programmer.

WORKLOAD *workloadname* **MQ MESSAGING NOT ENABLED ON ALL QUEUE MANAGERS**
Contact the system programmer.

WORKLOAD *workloadname* **MQ MESSAGING NOT DISABLED ON ALL QUEUE MANAGERS**
Contact the system programmer.

WORKLOAD *workloadname* **CHANNEL NOT STOPPED ON SITE** *sitename*
Contact the system programmer.

System programmer response: Take the appropriate action, based on the *reason* value:

NOT ALL SNA APPLICATIONS WERE ACTIVATED
See message AQS0212I for information about how to correct the problem.

NOT ALL SNA APPLICATIONS WERE INACTIVATED
See message AQS0211I for information about how to correct the problem.

NOT ALL LINUX ON SYSTEM z GUESTS WERE LOGGED OFF
See message AQS0210I for information about how to correct the problem.

NOT ALL AGENTS WERE CONNECTED
See message AQS0209W for information about how to correct the problem.

NOT ALL CONNECTIONS WERE TERMINATED
To identify the system of each Agent where the deactivate processing failed:

- If internal trace is being used by the Advisor, dump and examine the internal trace messages.
- Otherwise, examine the syslogd file. The syslogd identifier is lladvsr for the Advisor.

For each z/OS Agent that is identified in a WARNING message, using the SAF product on your system, ensure the following conditions are true:

- The OPERCMDS class is active.
- The MVS.VARY.TCPIP.DROP profile is defined.
- The Lifeline z/OS Agent has CONTROL access to this profile.

When the errors are corrected, stop and restart the Lifeline z/OS Agent. See "(z/OS systems) Authorizing the Lifeline Agents to reset active connections" on page 40 for more information about configuring the correct authorization.

| **NOT ALL MEMBERS ARE REGISTERED FOR WORKLOAD**
| Issue the MODIFY *procname*,DISPLAY,WORKLOAD,DETAIL command for the workload to determine which server applications do not have their load balancer application group members registered for the workload.

Check the load balancer and correct any configuration problems or update the Advisor configuration to remove these members from the cross_sysplex_list or intermediary_node_list statement.

WORKLOAD *workloadname* **NOT ALL MQ QUEUE MANAGERS CONNECTED ON SITE** *sitename*
Issue a MODIFY *procname*,DISPLAY,WORKLOAD=*workloadname*,DETAIL command for the workload to determine which MQ queue managers are not connected. MQ queue managers displayed with a system name of N/A are not connected.

From the system where a disconnected MQ queue manager is expected to reside, ensure that the MQ queue manager is active and its channel initiator is started. Otherwise, for each z/OS Agent on a system where a disconnected MQ queue manager is expected to reside:

- If internal trace is being used, dump and examine the internal trace messages.
- Otherwise, examine the syslogd file. The syslogd identifier is llagent for the Agent.

Check for error or warning messages and take the appropriate corrective actions. See "Diagnosing problems when an MQ queue manager is unavailable" on page 33 for more information.

Message AQS0155I will be issued in response to the MODIFY *procname*,DEACTIVATE command when all problems have been corrected.

WORKLOAD *workloadname* **HAS QUEUED MQ MESSAGES ON SITE** *sitename*
For each z/OS Agent on the site specified by the *sitename* value:

- If internal trace is being used, dump and examine the internal trace messages.
- Otherwise, examine the syslogd file. The syslogd identifier is llagent for the Agent.

Check for error messages indicating that messages were found on a transfer-eligible MQ cluster queue for the workload specified by the *workloadname* value.

If MQ server applications are active and processing messages from these MQ cluster queues, wait until all queued messages are processed and reissue the `MODIFY procname,DEACTIVATE` command. Otherwise, to transfer messages from these MQ cluster queues to MQ queue managers on the alternate site, issue a `MODIFY procname,TRANSFER,WORKLOAD=workloadname` command.

Message AQS0155I will be issued in response to the DEACTIVATE command when messages are no longer found on any transfer-eligible MQ cluster queue for the workload.

WORKLOAD *workloadname* **MQ MESSAGING NOT ENABLED ON ALL QUEUE MANAGERS**
For each z/OS Agent on the site specified by the *sitename* value:

- If internal trace is being used, dump and examine the internal trace messages.
- Otherwise, examine the syslogd file. The syslogd identifier is llagent for the Advisor.

Check for error messages that indicate why starting the MQ cluster receiver channel failed, or error messages that indicate the MQ queue manager configuration does not match the Advisor's configuration for this MQ cluster. Correct the problem and reissue the Activate command. Message AQS0153I will be issued in response to the command when all problems have been corrected.

WORKLOAD *workloadname* **MQ MESSAGING NOT DISABLED ON ALL QUEUE MANAGERS**
For each z/OS Agent on the site specified by the *sitename* value:

- If internal trace is being used, dump and examine the internal trace messages.
- Otherwise, examine the syslogd file. The syslogd identifier is llagent for the Agent.

Check for error messages that indicate why stopping the MQ cluster receiver channel failed, or error messages that indicate the MQ queue manager configuration does not match the Advisor's configuration for this MQ cluster. Correct the problem and reissue the Quiesce command. Message AQS0155I will be issued in response to the command when all problems have been corrected.

WORKLOAD *workloadname* **CHANNEL NOT STOPPED ON SITE** *sitename*
For each z/OS Agent on the site specified by the *sitename* value:

- If internal trace is being used, dump and examine the internal trace messages.
- Otherwise, examine the Agent's syslogd file. The syslogd identifier is llagent for the Agent.

Check for error messages indicating that an MQ cluster's receiver channel has not stopped. Wait until the MQ cluster receiver channel stops and reissue the MODIFY *procname*,DEACTIVATE command. Message

AQS0155I will be issued in response to the command when all MQ cluster receiver channels are stopped for the workload. If the MQ cluster receiver channel does not stop, verify that the MQ cluster receiver channel is correctly configured. If possible, manually stop the MQ cluster receiver channel using the STOP
| CHANNEL command. See *IBM MQ: Administering IBM MQ* for information about IBM MQ commands.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0207I MODIFY DEACTIVATE COMMAND MIGHT NOT BE SUCCESSFUL - NOT ALL AGENTS WERE CONNECTED
```

AQS0208W ACTIVATE AND QUIESCE COMMANDS QUEUED FOR UNREGISTERED LOAD BALANCERS

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,ACTIVATE|QUIESCE` command. Processing of the command is delayed for unregistered first-tier load balancers. The message will be deleted when all first-tier load balancers register or all unregistered load balancers are removed from the Advisor's lb_id_list configuration statement and a `MODIFY procname,REFRESH` command is issued.

System action: Processing continues. The command will be processed for registered first-tier load balancers. All queued commands will be processed for an unregistered first-tier load balancer when it registers. Automatic workload switch is disabled while there are unregistered load balancers.

Operator response: Issue the `MODIFY procname,DISPLAY,ADVISOR` command to determine which configured load balancers are currently not registered. Contact the system programmer with the load balancers that are not registered.

System programmer response: Verify the network connectivity between the Advisor and each unregistered load balancer. Check the load balancer and correct any configuration or connectivity problems. Restart the load balancer if necessary. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing network connectivity problems. If these disconnected load balancers are no longer required, remove them from the Advisor's lb_id_list configuration statement and issue the `MODIFY procname,REFRESH` command.

Module: LMLB

| **Routing code:** 1, 8

| **Descriptor code:** 2,7

Automation: Not applicable for automation.

AQS0209W DEACTIVATE COMMANDS IGNORED FOR DISCONNECTED AGENTS

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,DEACTIVATE` command. Processing of the command is ignored for disconnected Multi-site Workload Lifeline Agents. The message will be deleted when all Agents connect to the Advisor or all disconnected Agents are removed from the Advisor's agent_id_list configuration statement and a `MODIFY procname,REFRESH` command is issued.

System action: Processing continues. On systems where the Agent is disconnected, no active workload connections will be reset. Automatic workload switch is disabled while there are disconnected Agents.

Operator response: Issue the `MODIFY procname,DISPLAY,ADVISOR` command to determine which Agents are not connected. Contact the system programmer with the list of Agents that are not connected.

System programmer response: Verify network connectivity between the Advisor and disconnected Agents. Verify that the Agents are active and, if necessary, restart the Agents. When this message is deleted, reissue the `MODIFY procname,DEACTIVATE` command. The workload can still be activated on the alternate site, but you should verify that all active connections for this workload on the target site are reset before you attempt to issue a `MODIFY procname,ACTIVATE` command for this workload to the alternate site. Verify network connectivity between the Advisor and Agents. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing network connectivity problems. See the documentation for your Linux distribution for more information about diagnosing network connectivity problems on Linux on z Systems. If these disconnected Agents are no longer required, remove them from the Advisor's agent_id_list configuration statement and issue the `MODIFY procname,REFRESH` command.

Module: LMCMD

Routing code: 1, 8

Descriptor code: 2, 7

Automation: Not applicable for automation.

AQS0210I NOT ALL LINUX ON SYSTEM z GUESTS FOR WORKLOAD *workloadname* WERE LOGGED OFF

Explanation: The Multi-site Workload Lifeline Linux on z Systems Management Agent issues this message while a MODIFY *procname*,DEACTIVATE command is processed by the Multi-site Workload Lifeline Advisor and some of the Linux on z Systems guests were not logged off.

In the message text:

workloadname
The name of the workload that is specified on the MODIFY command.

System action: Processing continues. Not all of the Linux on z Systems guests were logged off for the workload specified by the *workloadname* value on the z/VM system where the Linux on z Systems Management Agent is running.

Operator response: Contact the system programmer.

System programmer response: Dump and examine the Agent internal trace messages for error messages. The trace will provide more information about the specific guests that could not be logged off. Log off these guests manually by using the z/VM FORCE command from the Linux on z Systems Management Guest.

Module: LAADV

Routing code: N/A

Descriptor code: N/A

Automation: Not applicable for automation.

Example:

```
AQS0210I NOT ALL LINUX ON SYSTEM z GUESTS FOR WORKLOAD WORK03 WERE LOGGED OFF
```

AQS0211I SOME SNA APPLICATIONS FOR WORKLOAD *workloadname* MIGHT NOT BE INACTIVATED

Explanation: The Multi-site Workload Lifeline z/OS Agent issues this message while a `MODIFY procname,DEACTIVATE` command is processed by the Multi-site Workload Lifeline Advisor and some of the SNA applications might not be inactivated.

In the message text:

workloadname
The name of the workload that is specified on the MODIFY command.

System action: Processing continues. Some of the SNA applications might not have been inactivated for the workload specified by the *workloadname* value.

Operator response: Contact the system programmer.

System programmer response: If internal trace is being used, dump and examine the internal trace messages for error messages. Otherwise, examine the syslogd file for error messages. The syslogd identifier is llagent for the Agent. The trace will provide more information about the specific SNA applications that could not be inactivated.

If the message was issued because the SNA application was manually inactivated prior to the MODIFY *procname*,DEACTIVATE command, no further action is needed for this SNA application. The SNA application will be activated by the z/OS Agent if the workload, specified by the *workloadname* value, is later activated on this site.

Verify that each SNA application for this workload is not active by issuing the `DISPLAY NET,ID=` command for each SNA application on the systems where the SNA applications reside. Manually inactivate any SNA applications that are not inactive by using the `VARY NET,INACT,ID=` command.

Module: LASNA

Routing code: 8,10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0211I SOME SNA APPLICATIONS FOR WORKLOAD WORK04 MIGHT NOT BE INACTIVATED
```

AQS0212I NOT ALL SNA APPLICATIONS FOR WORKLOAD *workloadname* WERE ACTIVATED

Explanation: The Multi-site Workload Lifeline z/OS Agent issues this message while a `MODIFY procname,ACTIVATE` command is processed by the Multi-site Workload Lifeline Advisor and some of the SNA applications were not activated.

In the message text:

workloadname
The name of the workload that is specified on the MODIFY command.

System action: Processing continues. Not all of the SNA applications were activated for the workload specified by the *workloadname* value.

Operator response: Contact the system programmer.

System programmer response: If internal trace is being used, dump and examine the internal trace messages for error messages. Otherwise, examine the syslogd file for error messages. The syslogd identifier is llagent for the z/OS Agent. The trace will provide more information about the specific SNA applications that could not be activated. Manually activate these SNA applications by using the `VARY NET,ACT,ID=` command.

Module: LASNA

Routing code: 8,10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0212I NOT ALL SNA APPLICATIONS FOR WORKLOAD WORK04 WERE ACTIVATED
```

AQS0213W ACTIVATE COMMANDS IGNORED FOR DISCONNECTED AGENTS

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,ACTIVATE` command for a SNA workload. Processing of the command is ignored for disconnected Multi-site Workload Lifeline z/OS Agents. The message will be deleted when all z/OS Agents connect to the Advisor or all disconnected z/OS Agents are removed from the Advisor's agent_id_list configuration statement and a `MODIFY procname,REFRESH` command is issued.

System action: Processing continues. Not all of the SNA applications were activated for the workload specified by the *workloadname* value. None of the SNA applications were activated on a system where a z/OS Agent is disconnected. Automatic workload switch is disabled while there are disconnected Agents.

Operator response: Issue the `MODIFY procname,DISPLAY,ADVISOR` command to determine which z/OS Agents are not connected. Contact the system programmer with the list of z/OS Agents that are not connected.

System programmer response: Verify that the z/OS Agents are active and, if necessary, restart the z/OS Agents. Manually activate the SNA applications that were not activated by using the `VARY NET,ACT,ID=` command. Verify network connectivity between the Advisor and z/OS Agents. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing network connectivity problems. If these disconnected z/OS Agents are no longer required, remove them from the Advisor's agent_id_list configuration statement and issue the `MODIFY procname,REFRESH` command.

Module: LMCMD

Routing code: 1,8

Descriptor code: 2,7

Automation: Not applicable for automation.

AQS0214I APPLICATION *applname* HAS BEEN ACTIVATED

Explanation: The Multi-site Workload Lifeline z/OS Agent issues this message while a MODIFY *procname*,ACTIVATE command is processed by the Multi-site Workload Lifeline Advisor and the SNA application is activated.

In the message text:

applname
The name of the SNA application that was activated.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LASNA

Routing code: 8,10

Descriptor code: 12

Automation: This message is a possible candidate for automation if you want to automatically restart any SNA applications that were previously terminated when the SNA application was inactivated.

Example:

```
AQS0214I APPLICATION SNAAPPL1 HAS BEEN ACTIVATED
```

AQS0215W ACTIVATE AND QUIESCE COMMANDS QUEUED FOR UNAVAILABLE MQ QUEUE MANAGERS

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,ACTIVATE|QUIESCE` command. Processing of the command is delayed for MQ queue managers that were not reported by a Lifeline Agent. The message will be deleted when all MQ queue managers are reported by an Agent or the unavailable MQ queue managers for the workload are removed from the Advisor's mq_manager_list configuration statement and a `MODIFY procname,REFRESH` command is issued.

System action: Processing continues. The command will be processed for all available MQ queue managers. All queued commands will be processed for an unavailable MQ queue manager when it is reported by an Agent. Automatic workload switch is disabled while there are unavailable MQ queue managers.

Operator response: Issue the `MODIFY procname,DISPLAY,WORKLOAD,DETAIL` command to determine which MQ queue managers are currently not available for a configured MQ workload. MQ queue managers displayed with a system name of N/A were not reported by any Lifeline Agent. Contact the system programmer with the MQ queue managers that are not available.

System programmer response: From the system where an unavailable MQ queue manager is expected to reside, ensure that the MQ queue manager is active, its channel initiator is started, and all queues configured on the MQ queue manager for the workload are defined and enabled. See *IBM MQ: Administering IBM MQ* for information about displaying, configuring, and enabling queues on an MQ queue manager. If the MQ queue manager will no longer be required to host the queues configured for this workload, remove the MQ queue manager entries for this workload from the mq_manager_list Advisor configuration statement and issue the `MODIFY procname,REFRESH` command.

Module: LMADV

Routing code: 1, 8

Descriptor code: 2, 7

Automation: Not applicable for automation.

AQS0220I MODIFY TRANSFER COMMAND ACCEPTED - *reason*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,TRANSFER` command when the command is accepted and is in progress.

In the message text:

reason
The `MODIFY procname,TRANSFER` command that is accepted. Possible values are:

TRANSFER OF QUEUE *queuename* **ON QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname* **STARTED**
A `MODIFY procname,TRANSFER` command was issued for the workload specified by the *workloadname* value for the queue specified by the *queuename* value from the MQ queue manager specified by the *qmgrname* value.

TRANSFER OF QUEUES FOR WORKLOAD *workloadname* **STARTED**
A `MODIFY procname,TRANSFER` command was issued for all transfer-eligible queues for the workload specified by the *workloadname* value.

System action: Transfer of messages for the requested workload is started.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0220I MODIFY TRANSFER COMMAND ACCEPTED – TRANSFER OF QUEUES FOR WORKLOAD
WORKLOAD5 STARTED
```

AQS0221I MODIFY TRANSFER COMMAND SUCCESSFUL - *reason*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,TRANSFER` command when the command has completed successfully.

In the message text:

reason
The `MODIFY procname,TRANSFER` command that is successful. Possible values are:

TRANSFER OF QUEUE *queuename* **ON QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname* **COMPLETED**
A `MODIFY procname,TRANSFER` command was issued for the workload specified by the *workloadname* value for the queue specified by the *queuename* value from the MQ queue manager specified by the *qmgrname* value and has successfully completed.

TRANSFER OF QUEUES FOR WORKLOAD *workloadname* **COMPLETED**
A `MODIFY procname,TRANSFER` command was issued for all transfer-eligible queues for the workload specified by the *workloadname* value and has successfully completed.

System action: Transfer of messages for the requested workload has completed.

Operator response: None.

System programmer response: None.

Module: LMAGNT

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0221I MODIFY TRANSFER COMMAND SUCCESSFUL – TRANSFER OF QUEUES FOR WORKLOAD
WORKLOAD5 COMPLETED
```

AQS0222I MODIFY TRANSFER COMMAND FAILED - *reason*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,TRANSFER` command when the command does not complete successfully.

In the message text:

reason
The `MODIFY procname,TRANSFER` command failed. Possible values are:

ALL QUEUES OF WORKLOAD *workloadname* **ARE EXCLUDED FROM TRANSFER**
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value, but all queues for that workload are defined with the EXCLUDE option in the mq_manager_list Advisor configuration statement.

BACK LEVEL AGENT FOUND
A `MODIFY procname,TRANSFER` command was issued for a workload but not all Lifeline Agents monitoring MQ queue managers are at the correct service level.

NOT ALL QUEUES ARE AVAILABLE FOR WORKLOAD *workloadname*
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value but at least one queue for the workload defined in the mq_manager_list Advisor configuration statement is not defined or not enabled on any of its configured MQ queue managers.

ONE OR MORE SOURCE QUEUES ARE IN USE FOR WORKLOAD *workloadname*
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value but at least one MQ application has connected to a source MQ queue manager and opened a queue for input-shared or input-exclusive access belonging to that workload.

QUEUE *queuename* **IS NOT AVAILABLE ON QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname*
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value for the queue specified by the *queuename* value, but one of the following conditions occurred:

- The queue is either not defined or not enabled on the MQ queue manager specified by the *qmgrname* value.
- The Lifeline Agent on the same system as the MQ queue manager, specified by the *qmgrname* value, is not connected to the Advisor.
- The MQ queue manager specified by the *qmgrname* value is not active.

QUEUE *queuename* **IS NOT DEFINED FOR WORKLOAD** *workloadname*
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value for the queue specified by the *queuename* value, but the queue is not defined in the mq_manager_list Advisor configuration statement for the workload.

QUEUE *queuename* **IS NOT DEFINED TO QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname*
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value for the queue specified by the *queuename* value, but the queue is not defined to the MQ queue manager specified by the *qmgrname* value in the mq_manager_list Advisor configuration statement for the workload.

QUEUE MANAGER *qmgrname* **IS NOT DEFINED FOR WORKLOAD** *workloadname*
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value for the MQ queue manager specified by the *qmgrname* value, but the MQ queue manager is not defined in the mq_manager_list Advisor configuration statement for the workload.

QUEUES FOR WORKLOAD *workloadname* **CANNOT BE TRANSFERRED WITHIN SAME SITE**
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value and defined in the mq_manager_list Advisor configuration statement but the specified FROM and TO MQ queue managers reside on the same site.

SHARED QUEUE *queuename* **IS NOT AVAILABLE FOR WORKLOAD** *workloadname*
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value,

but the shared queue specified by the *queuename* value, is either not defined or not enabled on any MQ queue manager on either the source or destination site.

TRANSFER OF QUEUE *queuename* **ON QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname* **ALREADY IN PROGRESS**
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value, for messages on the queue specified by the *queuename* value for the source MQ queue manager specified by the *qmgrname* value, but a `MODIFY procname,TRANSFER` command is already in progress for the same queue and MQ queue manager.

TRANSFER OF QUEUES FOR WORKLOAD *workloadname* **ALREADY IN PROGRESS**
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value, but a MODIFY *procname*,TRANSFER command is already in progress for the same workload.

WORKLOAD *workloadname* **IS NOT DEFINED AS AN MQ CLUSTER WORKLOAD**
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value but the workload is not defined in the mq_manager_list Advisor configuration statement.

WORKLOAD *workloadname* **MUST BE QUIESCED ON SITE** *sitename*
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value but the workload is still active on the site specified by the *sitename* value.

WORKLOAD *workloadname* **WAS NEVER ACTIVE**
A `MODIFY procname,TRANSFER` command was issued for a workload specified by the *workloadname* value but the workload was never active on any site.

System action: The MODIFY command is not processed.

Operator response: Take the appropriate action, based on the *reason* value:

ALL QUEUES OF WORKLOAD *workloadname* **ARE EXCLUDED FROM TRANSFER**
Contact the system programmer. When the issue is resolved, reissue the `MODIFY procname,TRANSFER` command for the workload.

BACK LEVEL AGENT FOUND
Contact the system programmer. When the issue is resolved, reissue the `MODIFY procname,TRANSFER` command for the workload.

NOT ALL QUEUES ARE AVAILABLE FOR WORKLOAD *workloadname*
Issue the `MODIFY procname,DISPLAY,WORKLOAD,DETAIL` command for the workload specified by the *workloadname* value to determine the queues that are not available for the MQ queue manager. Contact the system programmer. When the issue is resolved, reissue the `MODIFY procname,TRANSFER` command for the workload.

ONE OR MORE SOURCE QUEUES ARE IN USE FOR WORKLOAD *workloadname*
Contact the system programmer. When the issue is resolved, reissue the `MODIFY procname,TRANSFER` command for the workload.

QUEUE *queuename* **IS NOT AVAILABLE ON QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname*
Contact the system programmer. When the issue is resolved, reissue the `MODIFY procname,TRANSFER` command for the workload.

QUEUE *queuename* **IS NOT DEFINED FOR WORKLOAD** *workloadname*
Reissue the `MODIFY procname,TRANSFER` command specifying a queue that is defined for the workload specified by the *workloadname* value.

QUEUE *queuename* **IS NOT DEFINED TO QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname*
Reissue the `MODIFY procname,TRANSFER` command specifying a queue that is defined on the MQ queue manager specified by the *qmgrname* value for the workload specified by the *workloadname* value.

QUEUE MANAGER *qmgrname* **IS NOT DEFINED FOR WORKLOAD** *workloadname*
Reissue the `MODIFY procname,TRANSFER` command specifying source and destination MQ queue managers that are defined for the workload specified by the *workloadname* value.

QUEUES FOR WORKLOAD *workloadname* **CANNOT BE TRANSFERRED WITHIN SAME SITE**
Reissue the `MODIFY procname,TRANSFER` command specifying source and destination MQ queue managers that reside on different sites.

SHARED QUEUE *queuename* **IS NOT AVAILABLE FOR WORKLOAD** *workloadname*
Contact the system programmer. When the issue is resolved, reissue the `MODIFY procname,TRANSFER` command for the workload.

TRANSFER OF QUEUE *queuename* **ON QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname* **ALREADY IN PROGRESS**
Issue a `MODIFY procname,TRANSFER,WORKLOAD=workloadname,STATUS` command to check the progress of a previous `MODIFY procname,TRANSFER` command for the queue specified by the *queuename* value and the source MQ queue manager specified by the *qmgrname* value.

TRANSFER OF QUEUES FOR WORKLOAD *workloadname* **ALREADY IN PROGRESS**
Issue a `MODIFY procname,TRANSFER,WORKLOAD=workloadname,STATUS` command to check the progress of a previous `MODIFY procname,TRANSFER` command for the workload.

WORKLOAD *workloadname* **IS NOT DEFINED AS AN MQ CLUSTER WORKLOAD**
Reissue the `MODIFY procname,TRANSFER` command specifying a workload that is defined in the mq_manager_list Advisor configuration statement.

WORKLOAD *workloadname* **MUST BE QUIESCED ON SITE** *sitename*
Issue a `MODIFY procname,QUIESCE` command for the workload specified by the *workloadname* value and reissue the `MODIFY procname,TRANSFER` command.

WORKLOAD *workloadname* **WAS NEVER ACTIVE**
Issue a `MODIFY procname,ACTIVATE` for the workload specified by the *workloadname* value followed by a `MODIFY procname,QUIESCE` command. Then reissue the `MODIFY procname,TRANSFER` command.

System programmer response: Take the appropriate action, based on the *reason* value:

ALL QUEUES OF WORKLOAD *workloadname* **ARE EXCLUDED FROM TRANSFER**
Verify that no messages on any of the queues for the workload specified by the *workloadname* value should be transferred. If necessary, update the mq_manager_list Advisor configuration statement to define the queues as transfer-eligible and issue the `MODIFY procname,REFRESH` command.

BACK LEVEL AGENT FOUND
To determine which Agent is not at the correct release or service level:

- If internal trace is being used, dump and examine the internal trace messages.
- If internal trace is not being used, examine the Agent syslogd file. The syslogd identifier is llagent for the Agent.

Upgrade the Agent to the recommended service level and restart it.

NOT ALL QUEUES ARE AVAILABLE FOR WORKLOAD *workloadname*
From the systems where the queue is not available, ensure that all queues configured on the MQ queue manager for the workload are defined and enabled. See *IBM MQ: Administering IBM MQ* for information about displaying, configuring, and enabling queues on an MQ queue manager.

ONE OR MORE SOURCE QUEUES ARE IN USE FOR WORKLOAD *workloadname*
To determine which queues on source MQ queue managers are opened by MQ applications:

- If internal trace is being used, dump and examine the internal trace warning messages for the Advisor.
- If internal trace is not being used, examine the Advisor syslogd file for warning messages. The syslogd identifier is lladvsr for the Advisor.

After determining the list of source MQ queue managers and queues, issue a DISPLAY QSTATUS command against each MQ queue manager to determine whether the MQ application opened a queue. These MQ applications must be stopped or their connections to the queues must be closed before the `MODIFY procname,TRANSFER` command can be retried. See *IBM MQ: Administering IBM MQ* for information about displaying queues on an MQ queue manager.

QUEUE *queuename* **IS NOT AVAILABLE ON QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname*
From the system where the MQ queue manager specified by the *qmgrname* value resides, take the following actions:

- Ensure that the queue specified by the queuename value is configured on the MQ queue manager for the workload and enabled.
- Verify that the Lifeline Agent on that system is started and connected to the Advisor.
- Ensure that the MQ queue manager is started.

See *IBM MQ: Administering IBM MQ* for information about displaying, configuring, and enabling queues on an MQ queue manager.

SHARED QUEUE *queuename* **IS NOT AVAILABLE FOR WORKLOAD** *workloadname*
Ensure the queue specified by the *queuename* value is defined and enabled for the workload on at least one MQ queue manager on both the source and destination sites. See *IBM MQ: Administering IBM MQ* for information about displaying, configuring, and enabling queues on an MQ queue manager.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0222I MODIFY TRANSFER COMMAND FAILED – WORKLOAD
WORKLOAD5 MUST BE QUIESCED ON SITE PLEX1
```

AQS0223I MODIFY TRANSFER COMMAND ABORTED - *reason*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,TRANSFER` command when the command has completed unsuccessfully.

In the message text:

reason
The `MODIFY procname,TRANSFER` that is unsuccessful. Possible values are:

TRANSFER OF QUEUE *queuename* **ON QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname* **FAILED**
A `MODIFY procname,TRANSFER` command was issued for the workload specified by the *workloadname* value for the queue specified by the *queuename* value from the source MQ queue manager specified by the *qmgrname* value and has failed to successfully complete.

TRANSFER OF QUEUES FOR WORKLOAD *workloadname* **FAILED**
A `MODIFY procname,TRANSFER` command was issued for all transfer-eligible queues for the workload specified by the *workloadname* value and has failed to successfully complete.

System action: Transfer of messages for the requested workload has aborted.

Operator response: Take the appropriate action, based on the *reason* value:

TRANSFER OF QUEUE *queuename* **ON QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname* **FAILED**
Contact the system programmer with the queue and MQ queue managers that were participating in the failed transfer. When the issue is resolved, reissue the `MODIFY procname,TRANSFER` command for the workload to complete the transfer.

TRANSFER OF QUEUES FOR WORKLOAD *workloadname* **FAILED**
Contact the system programmer. When the issue is resolved, reissue the `MODIFY procname,TRANSFER` command for the workload to complete the transfer.

System programmer response: Take the appropriate action, based on the *reason* value:

TRANSFER OF QUEUE *queuename* **ON QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname* **FAILED**
For the Agents residing on the systems where the source and destination MQ queue managers participating in the failed transfer for the queue specified by the *queuename* value:

- If internal trace is being used, dump and examine the internal trace messages.
- If internal trace is not being used, examine the Agent syslogd file. The syslogd identifier is llagent for the Agent.
- If an Agent is no longer active, start it. Verify there are no network connectivity problems between the Advisor and Agents. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing network connectivity problems.
- If an MQ queue manager is no longer active, start it.

Examine the traces to locate the records for the last messages that were successfully transferred. Since a failure during a transfer could result in the same message being present on both the source and destination MQ queue managers' queue, remove any duplicate message that might be present from the source MQ queue manager's queue. See *IBM MQ: Administering IBM MQ* for information about displaying and removing messages from queues on an MQ queue manager.

TRANSFER OF QUEUES FOR WORKLOAD *workloadname* **FAILED**

For each of the Agents residing on the systems where a source or destination MQ queue manager participating in the failed transfer:

- If internal trace is being used, dump and examine the internal trace messages.
- If internal trace is not being used, examine the Agent syslogd file. The syslogd identifier is llagent for the Agent.
- If an Agent is no longer active, start it. Verify there are no network connectivity problems between the Advisor and Agents. See *z/OS Communications Server: IP Diagnosis Guide* for information about diagnosing network connectivity problems.
- If an MQ queue manager is no longer active, start it.

Examine the traces to locate the records for the last messages that were successfully transferred. Since a failure during a transfer could result in the same message being present on both the source and destination MQ queue managers' queue, remove any duplicate message that might be present from each source MQ queue manager's queue. See *IBM MQ: Administering IBM MQ* for information about displaying and removing messages from queues on an MQ queue manager.

Module: LMAGNT, LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0223I MODIFY TRANSFER COMMAND ABORTED — TRANSFER OF QUEUES FOR WORKLOAD
WORKLOAD5 FAILED
```

AQS0224I TRANSFER SUMMARY

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,TRANSFER,WORKLOAD=workloadname,STATUS` command. This message is followed by summary information about the status of any `MODIFY procname,TRANSFER` commands for the workload specified by the *workloadname* value that are either in progress, or have completed successfully, failed, or were cancelled. See "MODIFY *advisor_proc*,TRANSfer command: Transfer messages for MQ workloads" on page 165 for the explanation of the display output.

System action: Processing continues.

Operator response: None.

System programmer response: None.

Module: LACMD

Routing code: 8, 10

Descriptor code: 5, 8, 9

Automation: Not applicable for automation.

AQS0225I MODIFY TRANSFER COMMAND CANCELLED - *reason*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,TRANSFER,CANCEL` command to stop message transfers that are in progress for all transfer-eligible queues for a workload or to stop a message transfer that is in progress for a source MQ queue manager and queue.

In the message text:

reason
The type of message transfer that is cancelled. Possible values are:

TRANSFER OF QUEUE *queuename* **ON QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname* **STOPPED**
A message transfer for the workload specified by the *workloadname* value for the queue specified by the *queuename* value from the source MQ queue manager specified by the *qmgrname* value was in progress and might have been cancelled before it completed.

TRANSFER OF QUEUES FOR WORKLOAD *workloadname* **STOPPED**
A message transfer for all transfer-eligible queues for the workload specified by the *workloadname* value was in progress and might have been cancelled before it completed.

System action: The transfer of messages for the requested workload or source MQ queue manager and queue might have been cancelled.

Operator response: Contact the system programmer.

System programmer response: Take the appropriate action, based on the *reason* value:

TRANSFER OF QUEUE *queuename* **ON QUEUE MANAGER** *qmgrname* **FOR WORKLOAD** *workloadname* **STOPPED**
Issue a MODIFY *procname*,TRANSFER,WORKLOAD=*workloadname*,STATUS to take the following action based on the status of the transfer for the queue specified by the *queuename* value on the MQ queue manager specified by the *qmgrname* value:

COMPLETED
No further actions are needed.

CANCELED
Determine if there are messages still on the specified queue and MQ queue manager. For any remaining messages, determine whether the messages need to be transferred to the alternate site. If so, reissue the MODIFY *procname*,TRANSFER command to transfer the remaining messages. See *IBM MQ: Administering IBM MQ* for information about displaying messages from queues on an MQ queue manager.

FAILED
See the System programmer response for message AQS0223I.

TRANSFER OF QUEUES FOR WORKLOAD *workloadname* **STOPPED**
Issue a MODIFY *procname*,TRANSFER,WORKLOAD=*workloadname*,STATUS to take the following action based on the status of the transfer for the workload specified by the *workloadname* value:

COMPLETED
No further actions are needed.

CANCELED
Determine if there are messages still on any transfer-eligible queues for the specified workload. For any remaining messages, determine whether the messages need to be transferred to the alternate site. If so, reissue the MODIFY *procname*,TRANSFER command to transfer the remaining messages. See *IBM MQ: Administering IBM MQ* for information about displaying messages from queues on an MQ queue manager.

FAILED
See the System programmer response for message AQS0223I.

Module: LMAGNT, LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0225I MODIFY TRANSFER COMMAND CANCELLED – TRANSFER OF QUEUES FOR WORKLOAD
WORKLOAD5 STOPPED
```

AQS0226I MODIFY TRANSFER TEST COMMAND SUCCESSFUL

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a MODIFY *procname*,TRANSFER,TEST command when the command has completed successfully.

System action: Checks were performed and determined that a subsequent MODIFY *procname*,TRANSFER command will succeed.

Operator response: None.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0227I MODIFY TRANSFER TEST COMMAND FAILED – *reason*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a MODIFY *procname*,TRANSFER,TEST command when the command does not complete successfully.

In the message text:

reason

The MODIFY *procname*,TRANSFER,TEST command failed. See message "AQS0222I" on page 276 for possible values.

System action: Checks were performed and determined that a subsequent MODIFY *procname*,TRANSFER command will fail.

Operator response: See message "AQS0222I" on page 276 for the appropriate action.

System programmer response: See message "AQS0222I" on page 276 for the appropriate action.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0227I MODIFY TRANSFER TEST COMMAND FAILED – BACK LEVEL AGENT FOUND
```

AQS0228W WORKLOAD *workloadname* HAS UNREGISTERED MEMBERS

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is active.
- One or more server applications configured for the workload in the cross_sysplex_list or intermediary_node_list do not have their load balancer application group members registered by a load balancer.

System action: The workload remains active but the server applications that do not have their load balancer application group members registered are not monitored. When the Advisor determines if the workload is available, the unregistered group members and their server applications are not considered.

Operator response: Contact the system programmer.

System programmer response:

Issue the MODIFY *procname*,DISPLAY,WORKLOAD,DETAIL command for the workload to determine which server applications do not have their load balancer application group members registered for the workload. Check the load balancer and correct any configuration problems or update the Advisor configuration to remove these members from the cross_sysplex_list or intermediary_node_list statement.

For a workload that uses SNA applications, after you correct the configuration problems, for each previously unregistered SNA application:

- If the workload is ACTIVATED on the site where the SNA application resides, verify that the SNA application is active by issuing the DISPLAY NET,ID= command on the system where the SNA application resides. If it is not active, manually activate the SNA application by using the VARY NET,ACT,ID= command. You may need to restart the SNA application.
- If the workload is DEACTIVATED on the site where the SNA application resides, verify that the SNA application is not active by issuing the DISPLAY NET,ID= command on the system where the SNA application resides. If it is active, manually inactivate the SNA application by using the VARY NET,INACT,ID= command.
- Reissue the MODIFY *procname*,DISPLAY,WORKLOAD,DETAIL command. Verify that each SNA application is displayed with a valid SYSTEM NAME. If the SYSTEM NAME is not valid, see "Diagnosing problems when a SNA application is unavailable" on page 27 for more information on how to correct this problem.
  - If the SNA application's workload site is ACTIVE, verify that the SNA application is displayed with a STATE of AVAIL. If the STATE does not change to AVAIL, see "Diagnosing problems when a SNA application is unavailable" on page 27 for more information on how to correct this problem.
  - If the SNA application's workload site is DEACTIVATED and this site was previously ACTIVE, verify that the SNA application is displayed with a STATE of UNAVAIL.

Module: LMLB

Routing code: 1, 8

Descriptor code: 2, 7

Automation: Not applicable for automation.

AQS0300I SECURE CONNECTION REQUEST RECEIVED FROM USER *userid* **AT** *ipaddress*

Explanation: The Multi-site Workload Lifeline Advisor received a Transport Layer Security (TLS) secure connection request originating at the IP address specified by the *ipaddress* value. The request was sent by a load balancer, Multi-site Workload Lifeline peer Advisor, or Multi-site Workload Lifeline Agent.

In the message text:

userid
The user ID that is associated with the client certificate of the load balancer, peer Advisor, or Agent that requests access to the Advisor.

ipaddress
The IP address of the load balancer, peer Advisor, or Agent that sent the request.

System action: Processing continues. SAF authorization for access to the Advisor will be checked for the user ID specified by the *userid* value.

Operator response: None.

System programmer response: None.

Module: LMMAIN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0300I SECURE CONNECTION REQUEST RECEIVED FROM USER IBMUSER AT 10.10.10.1
```

AQS0301I *client* **CONNECTION ATTEMPT FROM USER** *userid* **AT** *ipaddress* **FAILED - REASON CODE** *reason*

Explanation: The Multi-site Workload Lifeline Advisor received a connection request originating at the IP address specified by the *ipaddress* value. The request was sent by a load balancer, Multi-site Workload Lifeline peer Advisor, or Multi-site Workload Lifeline Agent.

Application Transparent Transport Layer Security (AT-TLS) was enabled in the TCP/IP stack and no matching lb_id_list (for load balancer connections), advisor_id_list (for peer Advisor connections), or agent_id_list (for Agent

connections) entry was configured in the Advisor profile. Authorization for the connection to the Advisor failed for this client.

In the message text:

client
The type of client that attempted to connect to the Advisor. Possible values are:

ADVISOR
The client is a peer Advisor.

AGENT
The client is an Agent.

LB The client is a load balancer.

userid
The user ID of the load balancer, peer Advisor, or Agent that is requesting access to the Advisor. If the user ID is not obtained from AT-TLS, the value is UNKNOWN.

ipaddress
The IP address of the load balancer, peer Advisor, or Agent.

reason
The code that explains the failure. Possible values are:

1 A usable AT-TLS policy does not exist for this connection. For example, the policy agent is not active, or the AT-TLS policy for this connection specifies the wrong port.

2 The AT-TLS policy that is defined for this connection does not enable AT-TLS. In the policy, the TTLSGroupAction statement is not configured with TTLSEnabled set to On.

3 The AT-TLS policy that is defined for this connection does not define the Advisor as a controlling application or require client authentication with SAF checking. In the policy for the Advisor, the TTLSEnvironmentAction statement is not configured correctly. The HandshakeRole must be set to ServerWithClientAuth. The TTLSEnvironmentAdvancedParms parameter must be configured with ApplicationControlled set to On and ClientAuthType set to SAFCheck.

4 The AT-TLS handshake failed for this connection.

5 System authorization facility (SAF) authorization failed for this connection. The SERVAUTH class profile AQS.LLADVSR.LBACCESS.*sysname* (for a load balancer connection), AQS.LLADVSR.ADVISORACCESS.*sysname* (for a peer Advisor connection), or AQS.LLADVSR.AGENTACCESS.*sysname* (for an Agent connection) exists but the userid that is associated with the client certificate is not permitted with READ access to this profile.

6 The Advisor was unable to obtain storage for processing an AT-TLS connection request.

7 The Advisor call to the SIOCTTLSCTL IOCTL failed unexpectedly.

8 System authorization facility (SAF) authorization failed for this connection. The SERVAUTH class profile AQS.LLADVSR.LBACCESS.*sysname* (for a load balancer connection), AQS.LLADVSR.ADVISORACCESS.*sysname* (for a peer Advisor connection), or AQS.LLADVSR.AGENTACCESS.*sysname* (for an Agent connection) is not defined.

System action: Processing continues. The Advisor does not allow connections from this client. The client that attempted to connect to the Advisor might continue to attempt to connect.

Operator response: If the client is a z/OS Agent or load balancer, ensure that IP address of the client is defined in the lb_id_list, or agent_id_list statement in the Advisor configuration file. If the client is a peer Advisor and you are not using AT-TLS for this connection, ensure that IP address of the client is defined in the advisor_id_list.

If you are using AT-TLS for this connection, take the appropriate action, based on the *reason* value:

1 Start the Policy Agent if it is not started. If the AT-TLS policy for the Advisor connections has changed, refresh the Policy Agent. If the problem is not corrected, take the following actions:
- If internal trace is being used, dump and save the Advisor internal trace messages.
- If internal trace is not being used, save the Advisor syslogd file.
- Save the AT-TLS syslogd file.

- Save the policy agent syslogd file.
- Contact the system programmer.

6 If the storage problem cannot be corrected, dump and save the Advisor internal trace messages, if internal trace is being used, or save the Advisor syslogd file. If a dump was not created, take a dump of the Advisor address space, and then contact the system programmer.

For all other reasons, take the following actions:

- Save the system console.
- If internal trace is being used, dump and save the Advisor internal trace messages.
- If internal trace is not being used, save the Advisor syslogd file.
- Save the AT-TLS syslogd file.
- Save the policy agent syslogd file.
- Contact the system programmer.

System programmer response: Examine the Advisor internal trace file or syslogd file for errors. The syslogd identifier is lladvsr for the Advisor. Correct the lb_id_list, advisor_id_list, or agent_id_list statements in the configuration file as needed. See Chapter 6, "Multi-site Workload Lifeline configuration statements," on page 93 for information about configuring the Advisor and Agent.

If you are using AT-TLS for this connection, take the appropriate action, based on the *reason* value:

1 If the Policy Agent is active and has been refreshed since the last change to the AT-TLS policy, examine the system console or internal trace file, the Advisor syslogd file, the AT-TLS syslogd file, and the policy agent syslogd file for errors. Correct the AT-TLS policy for this connection. See *z/OS Communications Server IP Configuration Reference* for more information about the Policy Agent and policy statements for AT-TLS. Refresh the Policy Agent after changing the policy.

2 Change the AT-TLS policy for this connection in the TTLSGroupAction statement to TTLSEnabled On. See *z/OS Communications Server IP Configuration Reference* for more information about the Policy Agent and policy statements for AT-TLS. Refresh the Policy Agent after changing the policy.

3 If the client is a Linux on z Systems Management Agent, ensure that no AT-TLS policy is configured for the IP address and port of this client. For other clients, change the AT-TLS policy for this connection in the TTLSEnvironmentAction statement to ensure the following conditions are true:

- The HandshakeRole is set to ServerWithClientAuth.
- The TTLSEnvironmentAdvancedParms parameter is configured with ApplicationControlled set to On and ClientAuthType set to SAFCheck.

See *z/OS Communications Server IP Configuration Reference* for more information about the Policy Agent and policy statements for AT-TLS. Refresh the Policy Agent after changing the policy.

4 Correct the TLS handshake parameters in the AT-TLS policy for this connection. For example, ensure the following conditions are true:

- The HandshakeTimeout value for the Advisor policy is sufficient.
- The HandshakeRole value for the Advisor is ServerWithClientAuth or Server.
- The HandshakeRole value for the Agent and load balancers is Client.

See *z/OS Communications Server IP Configuration Reference* for more information about the Policy Agent and policy statements for AT-TLS. Refresh the Policy Agent after changing the policy.

5 Ensure that the user ID specified by the *userid* value has at least read access to the correct SERVAUTH class profile:

- AQS.LLADVSR.LBACCESS.*sysname* for a load balancer connection
- AQS.LLADVSR.ADVISORACCESS.*sysname* for a peer Advisor connection
- AQS.LLADVSR.AGENTACCESS.*sysname* for an Agent connection

For more information, see *z/OS Security Server RACF Command Language Reference*.

6 If the storage problem cannot be corrected, contact IBM software support services with all supporting documentation. The application syslogd file or internal trace file is the minimum diagnostic data that should be provided.

7 Examine the system console, the Advisor syslogd file, the AT-TLS syslogd or internal trace file, and the policy agent syslogd file for errors. Ensure that the certificate is correct. For more information, see *z/OS Security Server RACF Command Language Reference*. If the problem is not corrected, contact IBM software support services with all supporting documentation.

8 Define necessary SAF profiles on each system where the Advisor can run. Ensure that the user ID specified by the *userid* value has at least read access to the correct SERVAUTH class profile:
- AQS.LLADVSR.LBACCESS.*sysname* for a load balancer connection
- AQS.LLADVSR.ADVISORACCESS.*sysname* for a peer Advisor connection
- AQS.LLADVSR.AGENTACCESS.*sysname* for an Agent connection

For more information, see *z/OS Security Server RACF Command Language Reference*.

Module: LMMAIN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0301I AGENT CONNECTION ATTEMPT FROM USER UNKNOWN AT 10.10.10.1 FAILED - REASON CODE 1
```

AQS0302I WORKLOAD *workloadname1* **MUST BE ACTIVE BEFORE ACTIVATING WORKLOAD** *workloadname2*

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a MODIFY *procname*,ACTIVATE,WORKLOAD=*workloadname2* command when *workloadname1* is not active. The Advisor configuration file contains a query_workload_list definition that associates the workload specified by the *workloadname2* value with the workload specified by the *workloadname1* value.

In the message text:

workloadname1
The name of the Active/Standby workload associated with the workload specified on the MODIFY command.

workloadname2
The name of the Active/Query workload specified on the MODIFY command.

System action: The MODIFY command is ignored.

Operator response: Issue a MODIFY *procname*,ACTIVATE,WORKLOAD=*workloadname1*,SITE= command to activate the associated workload. Reissue the previous MODIFY command to activate the workload name specified by the *workloadname2* value. See Chapter 7, "Lifeline Advisor commands," on page 127 for more information.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0302I WORKLOAD WORK01 MUST BE ACTIVE BEFORE ACTIVATING WORKLOAD WORK02
```

AQS0303I WORKLOAD *workloadname* **MUST BE QUIESCED ON SITE** *sitename* **BEFORE ISSUING A DEACTIVATE COMMAND**

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,DEACTIVATE,WORKLOAD=workloadname` command when the workload specified by the *workloadname* value has not been quiesced on the site specified by the *sitename* value.

In the message text:

workloadname
The name of the workload specified on the MODIFY command.

sitename
The sysplex name of the site where the workload is active.

System action: The MODIFY command is ignored.

Operator response: Issue a `MODIFY procname,QUIESCE` command to quiesce the workload specified by the *workloadname* value on the target site. Reissue the previous MODIFY command to deactivate the workload. See Chapter 7, "Lifeline Advisor commands," on page 127 for more information.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0303I WORKLOAD WORK02 MUST BE QUIESCED ON SITE SITE01 BEFORE ISSUING A DEACTIVATE COMMAND
```

AQS0304I *cmd* **COMMAND FOR WORKLOAD** *workloadname* **MUST NOT SPECIFY A SITE**

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,DEACTIVATE|QUIESCE,WORKLOAD=workloadname,SITE= command` for an Active/Standby workload. Workloads that are defined in the Advisor configuration file as Active/Standby workloads cannot be deactivated or quiesced specifying the SITE keyword. The SITE keyword is valid on this MODIFY command only for workloads that are defined in the Advisor Configuration file as Active/Query workloads.

In the message text:

cmd
The MODIFY command that was issued. Possible values are:

- DEACTIVATE
- QUIESCE

workloadname
The name of the workload specified on the MODIFY command.

System action: The MODIFY command is ignored.

Operator response: Reissue the MODIFY command without specifying the SITE keyword. See the MODIFY command section for more information.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0304I QUIESCE COMMAND FOR WORKLOAD WORK01 MUST NOT SPECIFY A SITE
```

AQS0305I ACTIVATE COMMAND FOR WORKLOAD *workloadname* **MUST SPECIFY A SITE**

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY procname,ACTIVATE,WORKLOAD=workloadname` command for an Active/Standby workload. The workload specified by the *workloadname* value is defined in the Advisor configuration file as an Active/Standby workload and cannot be activated without specifying the SITE keyword. Omitting the SITE keyword is valid on this MODIFY command only

for workloads that are defined in the Advisor Configuration file as Active/Query workloads.

In the message text:

workloadname
The name of the workload specified on the MODIFY command.

System action: The command is ignored.

Operator response: Reissue the MODIFY command specifying the SITE keyword. See the MODIFY command section for more information.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0305I ACTIVATE COMMAND FOR WORKLOAD WORK01 MUST SPECIFY A SITE
```

AQS0306I ACTIVATE COMMAND FOR MATCHING WORKLOADS MUST SPECIFY A SITE

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a MODIFY *procname*,ACTIVATE,WORKLOAD=*ALL_AS* command. All workloads that are defined in the Advisor configuration file as Active/Standby workloads cannot be activated without specifying the SITE keyword. Omitting the SITE keyword is valid on this MODIFY command only for workloads that are defined in the Advisor Configuration file as Active/Query workloads.

System action: The command is ignored.

Operator response: Reissue the MODIFY command specifying the SITE keyword. See the MODIFY command section for more information.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

AQS0307I *cmd* COMMAND FOR MATCHING WORKLOADS MUST NOT SPECIFY A SITE

Explanation: The Multi-site Workload Lifeline Advisor issues this message in response to a `MODIFY` *procname*`,DEACTIVATE|QUIESCE,WORKLOAD=*ALL_AS*,SITE=` command. All workloads that are defined in the Advisor configuration file as Active/Standby workloads cannot be deactivated or quiesced specifying the SITE keyword. The SITE keyword is valid on this MODIFY command only for workloads that are defined in the Advisor Configuration file as Active/Query workloads.

In the message text:

cmd
The MODIFY command that was issued. Possible values are:

- DEACTIVATE
- QUIESCE

System action: The MODIFY command is ignored.

Operator response: Reissue the MODIFY command without specifying the SITE keyword. See the MODIFY command section for more information.

System programmer response: None.

Module: LMCMD

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0307I QUIESCE COMMAND FOR MATCHING WORKLOADS MUST NOT SPECIFY A SITE
```

AQS0308W WORKLOAD *workloadname* **ACCESSING STALE DATA ON SITE** *sitename*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is defined as an Active/Query workload in the Advisor configuration file.
- Static routing is configured for the workload, and the workload_switch_policy Advisor configuration statement is defined as manual.
- The Advisor receives an event over its Network Management Interface which indicates that the database replication latency state for the workload is acute or unknown.

The message will be deleted when the database replication for the workload is no longer in the acute or unknown state or the workload is quiesced on the site specified by the *sitename* value.

In the message text:

workloadname
The name of the workload that is defined in the Advisor configuration file.

sitename
The sysplex name of the site where the database is not current.

System action: Processing continues.

Operator response: Contact the system programmer.

System programmer response: Determine why database replication is in the acute or unknown state, and correct, if possible. If the workload specified by the *workloadname* value is active on the alternate site, quiesce the workload on the site specified by the *sitename* value, using the `MODIFY procname,QUIESCE,WORKLOAD=workloadname,SITE=` command, to ensure that the workload is routed only to the site where the database is current.

Module: LMADV

Routing code: 1, 8

Descriptor code: 2, 7

Automation: This message is a possible candidate for automation if you want to automatically issue the `MODIFY procname,QUIESCE` command to quiesce routing to the site where the database is not current.

Example:

```
AQS0308W WORKLOAD WORK02 ACCESSING STALE DATA ON SITE SITE01
```

AQS0309I WORKLOAD *workloadname* **DATA ACCESS ON SITE** *sitename* **NOT AVAILABLE**

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is defined as an Active/Query workload in the Advisor configuration file.
- Dynamic routing is configured for the workload or static routing is configured for the workload and the workload_switch_policy Advisor configuration statement is defined as automatic.
- The Advisor receives an event over its Network Management Interface which indicates that the database replication latency state for the workload is acute or unknown.

In the message text:

workloadname
The name of the workload that is defined in the Advisor configuration file.

sitename
The sysplex name of the site where the database is not current.

System action: For workloads defined in the cross_sysplex_list Advisor configuration statement, the Advisor notifies load balancers to route connection requests to the alternate site and deactivates the workload on the site specified by the *sitename* value to prevent accessing stale data.

Operator response: Contact the system programmer.

System programmer response: Determine why database replication is in the acute or unknown state, and correct, if possible.

Module: LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0309I WORKLOAD WORK02 DATA ACCESS ON SITE SITE01 NOT AVAILABLE
```

AQS0310I WORKLOAD *workloadname* DATA ACCESS ON SITE *sitename* HAS RECOVERED

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is defined as an Active/Query workload in the Advisor configuration file.
- Dynamic routing is configured for the workload or static routing is configured for the workload and the workload_switch_policy Advisor configuration statement is defined as automatic.
- Message AQS0309I was previously issued for the workload.
- The Advisor receives an event over its Network Management Interface which indicates that the database replication latency state for the workload is no longer acute or unknown.

In the message text:

workloadname
The name of the workload that is defined in the Advisor configuration file.

sitename
The sysplex name of the site where the database is now current.

System action: The Advisor re-activates the workload on the site specified by the *sitename* value and notifies load balancers to route new connection requests to both sites.

Operator response: None.

System programmer response: None.

Module: LMLB

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0310I WORKLOAD WORK02 DATA ACCESS ON SITE SITE01 HAS RECOVERED
```

AQS0311W PERSISTENT CONNECTION FUNCTION IS DISABLED - BACK LEVEL AGENT FOUND

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the timeout parameter was enabled on the query_workload_list Advisor configuration statement, and a Lifeline Agent from an earlier release of Multi-site Workload Lifeline connects to the Advisor. See Chapter 6, “Multi-site Workload Lifeline configuration statements,” on page 93 for more information about configuration statements and parameters. The message will be deleted when the Agent, that is not at the current release, is stopped and the connection is closed with the Advisor.

System action: The persistent connection function is disabled.

Operator response: Contact the system programmer.

System programmer response: To determine which Agent is not at the current release:

- If internal trace is being used, dump and examine the internal trace messages.
- If internal trace is not being used, examine the Advisor syslogd file. The syslogd identifier is lladvsr for the Advisor.

Upgrade the Agent to the current release and restart it.

Module: LMAGNT, LMCMD

Routing code: 1, 8

Descriptor code: 2, 7

Automation: Not applicable for automation.

AQS0312W ROUTING CONFIGURATION FOR WORKLOAD *workloadname* **IGNORED - NOT ACTIVE ON SITE** *sitename*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is configured as an Active/Query workload in the Advisor configuration file.
- Static routing is configured for the workload, and the workload_switch_policy Advisor configuration statement is defined as manual.
- The workload is activated to only a single site.

The message will be deleted when the workload is activated to the alternate site or the workload is quiesced.

In the message text:

workloadname
The name of the workload that is defined in the Advisor configuration file.

sitename
The sysplex name of the site where the workload is not activated.

System action: For workloads defined in the cross_sysplex_list Advisor configuration statement, the Advisor notifies load balancers to route new connection requests for the workload only to the alternate site.

Operator response: Issue the `MODIFY` *`procname`*`,ACTIVATE,WORKLOAD=`*`workloadname`*`,SITE=`*`sitename`* command to ensure the workload is activated to both sites.

System programmer response: None.

Module: LMADV

Routing code: 1, 8

Descriptor code: 2, 7

Automation: Not applicable for automation.

Example:

```
AQS0312W ROUTING CONFIGURATION FOR WORKLOAD WORK02 IGNORED - NOT ACTIVE ON SITE SITE01
```

AQS0313I ROUTING CONFIGURATION FOR WORKLOAD *workloadname* **IGNORED - NOT ACTIVE ON SITE** *sitename*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is configured as an Active/Query workload in the Advisor configuration file.
- Static routing is configured for the workload, and the workload_switch_policy Advisor configuration statement is defined as automatic.

- The workload is activated to only a single site.

In the message text:

workloadname
The name of the workload that is defined in the Advisor configuration file.

sitename
The sysplex name of the site where the workload is not activated.

System action: For workloads defined in the cross_sysplex_list Advisor configuration statement, the Advisor notifies load balancers to route new connections for the workload only to the alternate site.

Operator response: Issue the `MODIFY procname,ACTIVATE,WORKLOAD=workloadname,SITE=sitename` command to ensure the workload is activated to both sites.

System programmer response: None.

Module: LMADV

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0313I ROUTING CONFIGURATION FOR WORKLOAD WORK02 IGNORED - NOT ACTIVE ON SITE SITE01
```

AQS0314I ROUTING CONFIGURATION FOR WORKLOAD *workloadname* **RESTORED**

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is configured as an Active/Query workload in the Advisor configuration file.
- Static routing is configured for the workload, and the workload_switch_policy Advisor configuration statement is defined as automatic.
- Message AQS0313I was previously issued for the workload.
- The workload is now activated to both sites.

In the message text:

workloadname
The name of the workload that is defined in the Advisor configuration file.

System action: For workloads defined in the cross_sysplex_list Advisor configuration statement, the Advisor notifies load balancers to route new connection requests for the workload to both sites.

Operator response: None.

System programmer response: None.

Module: LMMAIN

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0314I ROUTING CONFIGURATION FOR WORKLOAD WORK02 RESTORED
```

AQS0315W WORKLOAD *workloadname* **ATTEMPTING TO ACCESS UNAVAILABLE SERVERS ON SITE** *sitename*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is defined as an Active/Query workload in the Advisor configuration file.
- Static routing is configured for the workload, and the workload_switch_policy Advisor configuration statement is defined as manual.
- The workload is active on the site specified by the *sitename* value.
- No server applications are available on the site specified by the *sitename* value for the single load balancer application group defined for the workload. A server application is considered unavailable if it is not active, it is active but not fully operational, or the system where it resides is resource constrained.

The message will be deleted when at least one server application in the load balancer application group is active on the site or the workload is quiesced on the site specified by the *sitename* value.

In the message text:

workloadname
The name of the workload that is defined in the Advisor configuration file.

sitename
The sysplex name of the site where no server applications are available for the workload.

System action: The Advisor continues notifying load balancers to route new connection requests for the workload to both sites.

Operator response: Contact the system programmer.

System programmer response: Ensure that the server applications for the workload are available on the site specified by the *sitename* value. Verify that each server application is active and is fully operational, and that the system where it resides has sufficient resources. If the workload specified by the *workloadname* value is active on the alternate site, quiesce the workload on the site specified by the *sitename* value, by using the `MODIFY procname,QUIESCE,WORKLOAD=workloadname,SITE= command`. This ensures the workload is routed only to the site where the server applications are active. See Chapter 7, "Lifeline Advisor commands," on page 127 for more information.

Module: LMLB

Routing code: 8, 10

Descriptor code: 12

Automation: This message is a possible candidate for automation if you want to automatically issue the `MODIFY procname,QUIESCE` command to quiesce routing to the site where no servers for the workload are available.

Example:

```
AQS0315W WORKLOAD WORK02 ATTEMPTING TO ACCESS UNAVAILABLE SERVERS ON SITE SITE01
```

AQS0316I WORKLOAD *workloadname* **HAS UNAVAILABLE SERVERS ON SITE** *sitename*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is defined as an Active/Query workload in the Advisor configuration file.
- The workload is not active on the site specified by the *sitename* value, or dynamic routing is configured for the workload, or static routing is configured for the workload and the workload_switch_policy Advisor configuration statement is defined as automatic.
- No servers applications are available on the site specified by the *sitename* value for the single load balancer application group defined for the workload. A server application is considered unavailable if it is not active, it is active but not fully operational, or the system where it resides is resource constrained.

In the message text:

workloadname
The name of the workload that is defined in the Advisor configuration file.

sitename
The sysplex name of the site where no server applications are available for the workload.

System action: For workloads defined in the cross_sysplex_list Advisor configuration statement, the Advisor notifies

load balancers to route new connection requests for the workload only to the alternate site.

Operator response: Contact the system programmer.

System programmer response: Ensure that the server applications for the workload are available on the site specified by the *sitename* value. Verify that each server application is active and is fully operational, and that the system where it resides has sufficient resources.

Module: LMLB

Routing code: 1, 8

Descriptor code: 2, 7

Automation: Not applicable for automation.

Example:

```
AQS0316I WORKLOAD WORK02 HAS UNAVAILABLE SERVERS ON SITE SITE01
```

AQS0317I WORKLOAD *workloadname* **HAS RECOVERED ON SITE** *sitename*

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is defined as an Active/Query workload in the Advisor configuration file.
- Dynamic routing is configured for the workload or static routing is configured for the workload and the workload_switch_policy Advisor configuration statement is defined as automatic.
- Message AQS0316I was previously issued for the workload.
- At least one server application is available on the site specified by the *sitename* value for the single load balancer application group defined for the workload.

In the message text:

workloadname
The name of the workload that is defined in the Advisor configuration file.

sitename
The sysplex name of the site where a server application is now available.

System action: For workloads defined in the cross_sysplex_list Advisor configuration statement, the Advisor notifies load balancers to route new connection requests for the workload to both sites.

Operator response: None.

System programmer response: None.

Module: LMLB

Routing code: 1, 8

Descriptor code: 2, 7

Automation: Not applicable for automation.

Example:

```
AQS0317I WORKLOAD WORK02 HAS RECOVERED ON SITE SITE01
```

AQS0318W WORKLOAD *workloadname* **IS NOT AVAILABLE**

Explanation: The Multi-site Workload Lifeline Advisor issues this message when the following conditions are true:

- The workload specified by the *workloadname* value is defined as an Active/Query workload in the Advisor configuration file.
- The workload is unavailable on both sites. A workload is unavailable on a site when one of the following conditions is true:
  - No server applications are available on that site for the single load balancer application group defined for the workload. A Linux on z Systems workload is unavailable if either no Linux on z Systems server applications are available for the load balancer application group defined for the workload or no z/OS server applications that

these Linux on z Systems applications distribute to are available on that site. A server application is considered unavailable when one of the following conditions is true:

- The server application is not active.
- The server application is active but not fully operational.
- The system where the server application resides is resource constrained.

– The workload is not activated on the site.
– The Advisor receives an event over its Network Management Interface which indicates that the database replication latency state for the workload is acute or unknown on that site.

The message will be deleted when at least one server application in each load balancer application group is active on one of the sites. A Linux on z Systems workload becomes available when at least one Linux on z Systems server application and one of its z/OS server applications is available on that site.

In the message text:

workloadname
The name of the workload that is defined in the Advisor configuration file.

System action: Processing continues.

Operator response: Contact the system programmer.

System programmer response: Issue `MODIFY procname,DISPLAY,WORKLOAD,DETAIL` to determine whether the workload failure on a site is caused by server application unavailability, the workload not being activated on the site, or replication latency state.

- If the server application is unavailable, verify that each server application is active and is fully operational, and that the system where it resides has sufficient resources.
- If the workload is not activated on the site, issue the `MODIFY procname,ACTIVATE,WORKLOAD=` command to activate the workload on the site.
- If the replication latency state is causing the failure, determine why database replication is in the acute or unknown state, and, if possible, resolve the cause of the replication latency state.

Module: LMLB

Routing code: 8, 10

Descriptor code: 12

Automation: Not applicable for automation.

Example:

```
AQS0318W WORKLOAD WORK02 IS NOT AVAILABLE
```

Appendix A. A sample started procedure for Lifeline Advisors

You can use the sample started procedure to understand how to set up the environment for the Lifeline Advisor.

```
//AQSADV PROC ROLE=S
//*
//*********************************************************************
//* Function: Sample procedure for running the Multi-site
//* Workload Lifeline Advisor
//*
//* Parameters: [ROLE={S | P}]
//* S ==> Secondary Advisor (Default Role)
//* P ==> Primary Advisor
//*********************************************************************
//AQSADV  EXEC PGM=AQSLBADV,REGION=0K,TIME=NOLIMIT,
// PARM='/ -R &ROLE'
//*********************************************************************
//* The STEPLIB card below points to the PDS/E where the Lifeline
//* load modules are kept.
//*********************************************************************
//STEPLIB  DD DSN=USER.LOADLIB,DISP=SHR
//*********************************************************************
//* The CONFIG card below points to the member where the Lifeline
//* Advisor configuration file is located.
//*********************************************************************
//CONFIG   DD DSN=USER.PROFILES(ADVCONF),DISP=SHR
//STDENV   DD DUMMY
//SYSPRINT DD SYSOUT=*,DCB=(RECFM=F,LRECL=80,BLKSIZE=80)
//SYSIN    DD DUMMY
//SYSERR DD SYSOUT=*
//SYSOUT DD SYSOUT=*,DCB=(RECFM=F,LRECL=80,BLKSIZE=80)
//CEEDUMP DD SYSOUT=*,DCB=(RECFM=FB,LRECL=132,BLKSIZE=132)
//SYSMDUMP DD SYSOUT=*,DCB=(RECFM=FB,LRECL=132,BLKSIZE=132)
//*********************************************************************
//* The SYSTCPD card below points to the member where the TCPIP.DATA
//* file is located.
//*********************************************************************
//SYSTCPD  DD DSN=USER.PROFILES(TCPDATA),DISP=SHR
//*********************************************************************
//* The AQSTRACE card below points to the UNIX System Services
//* file where the Advisor dumps internal trace messages.
//*********************************************************************
//AQSTRACE DD PATH='/tmp/advisor.trace',PATHOPTS=(OWRONLY,OCREAT),
//                          PATHMODE=(SIRUSR,SIWUSR,SIRGRP,SIROTH)
```

Figure 12. Sample started procedure AQSADV

You should create a unique user ID for the Lifeline Advisor. The user ID does not require superuser authority, so the UID can be non-zero. The Lifeline Advisor accesses files within the UNIX System Services shell, so this user ID must have an OMVS segment defined. Assuming that the Lifeline Advisor is started using a procedure called AQSADV, use the following JCL snippet to define the OMVS segment, where xxx is the UID you want for the Lifeline Advisor:

```
//EZARACF JOB MSGLEVEL=(1,1),MSGCLASS=A,CLASS=A
//ADVID  EXEC PGM=IKJEFT01
//SYSTSPRT DD  SYSOUT=*
//SYSTSIN  DD  *
```

```
|                          ADDUSER AQSADV DFLTGRP(OMVSGRP) OMVS(UID(xxx)   THREADSMAX(512)  HOME('/tmp'))
                           RDEFINE STARTED AQSADV.* STDATA(USER(AQSADV))
                           SETROPTS RACLIST(STARTED) REFRESH
                         //*
```

Appendix B. A sample started procedure for Lifeline z/OS Agents

You can use the sample started procedure to understand how to set up the environment for the Lifeline Agent.

```
//AQSAGE     PROC
//*
//*********************************************************************
//*
//* Function: Sample procedure for running the Multi-site
//* Workload Lifeline Agent
//*
//*********************************************************************
//AQSAGE  EXEC PGM=AQSLBAGE,REGION=0K,TIME=NOLIMIT,
//   PARM='POSIX(ON) ALL31(ON)/'
//*********************************************************************
//* The STEPLIB card below points to the PDS/E where the Lifeline
//* load modules are kept.
//*********************************************************************
//STEPLIB  DD DSN=USER.LOADLIB,DISP=SHR
//*********************************************************************
//* The CONFIG card below points to the member where the Lifeline
//* Agent configuration file is located.
//*********************************************************************
//CONFIG   DD DSN=USER.PROFILES(AGECONF),DISP=SHR
//STDENV   DD DUMMY
//SYSPRINT DD SYSOUT=*,DCB=(RECFM=F,LRECL=80,BLKSIZE=80)
//SYSIN    DD DUMMY
//SYSERR   DD SYSOUT=A
//SYSOUT   DD SYSOUT=A
//CEEDUMP  DD SYSOUT=A
//SYSMDUMP DD SYSOUT=A
//*********************************************************************
//* The SYSTCPD card below points to the member where the TCPIP.DATA
//* file is located. If configured for MQ workloads and MQ queue
//* managers are configured with a hostname in the CONNAME definition,
//* ensure this SYSTCPD card points to the same TCPIP.DATA file used
//* by the MQ queue manager.
//*********************************************************************
//SYSTCPD  DD DSN=USER.PROFILES(TCPDATA),DISP=SHR
//*********************************************************************
//* The AQSTRACE card below points to the UNIX System Services
//* file where the Agent dumps internal trace messages.
//*********************************************************************
//AQSTRACE DD PATH='/tmp/agent.trace',PATHOPTS=(OWRONLY,OCREAT),
//                         PATHMODE=(SIRUSR,SIWUSR,SIRGRP,SIROTH)
```

Figure 13. Sample started procedure AQSAGE

You should create a unique user ID for the Lifeline Agent. The user ID does not require superuser authority so the UID can be non-zero. The Lifeline Agent accesses files within the UNIX System Services shell, so this user ID must have an OMVS segment defined. Assuming that the Lifeline Agent is started using a procedure called AQSAGE, use the following JCL snippet to define the OMVS segment, where xxx is the UID you want for the Lifeline Agent:

```
//EZARACF JOB MSGLEVEL=(1,1),MSGCLASS=A,CLASS=A
//AGENTID  EXEC PGM=IKJEFT01
//SYSTSPRT DD  SYSOUT=*
```

```
//SYSTSIN  DD  *
   ADDUSER AQSAGE DFLTGRP(OMVSGRP) OMVS(UID(xxx)   THREADSMAX(512)  HOME('/tmp'))
   RDEFINE STARTED AQSAGE.* STDATA(USER(AQSAGE))
   SETROPTS RACLIST(STARTED) REFRESH
//*
```

Appendix C. Sample Multi-Site Workload Lifeline configurations

You can use the following examples to understand how to configure the Lifeline Advisor and the Lifeline Agent for different workload environments.

Multi-site Workload Lifeline configuration Example 1

The following figure shows an example of the Multi-site Workload Lifeline configuration where an Active/Standby workload uses the z/OS sysplex distributor to route requests within a site. It also shows how to configure the Lifeline Advisors and Lifeline Agents to work in such an environment.

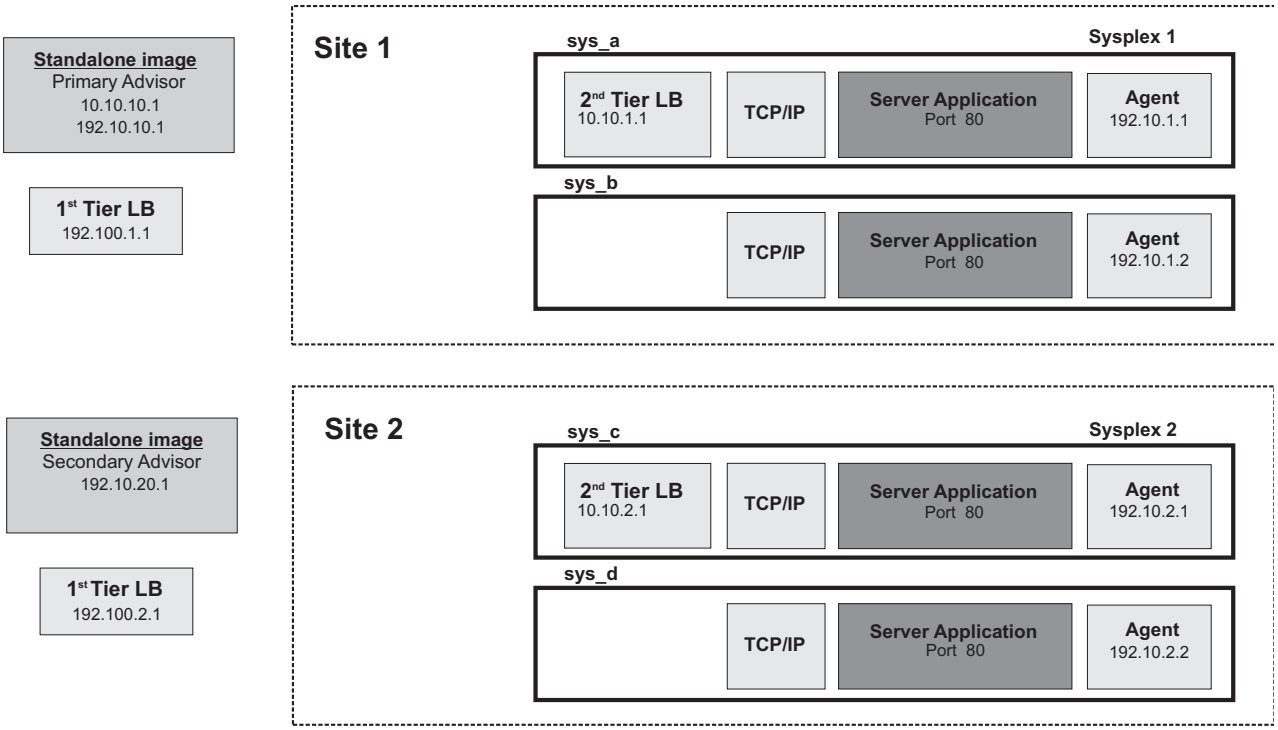


Figure 14. Multi-site Workload Lifeline configuration Example 1

To configure the previous sample environment shown in Figure 14, complete the following tasks:

1. Configure and start the Lifeline Advisor on the primary controller in the primary role. The primary Advisor listens on dynamic VIPA (DVIPA) address 10.10.10.1, which is defined in the VIPARANGE statement.
2. Configure and start the Lifeline Advisor on the secondary controller, in the secondary role. The secondary Advisor uses static VIPA address 192.10.20.1 to communicate with the primary Advisor.
3. Define distributable DVIPA 10.10.1.1 on system sys_a in sysplex Site1, and allow both sys_a and sys_b to be targets of this DVIPA.
4. Define distributable DVIPA 10.10.2.1 on system sys_c in sysplex Site2, and allow both sys_c and sys_d to be targets of this DVIPA.

5. Configure and start Lifeline Agents on each of the images in Site 1 and Site 2, by using the static VIPA that is defined in that image (192.10.1.1 on sys_a, 192.10.1.2 on sys_b, 192.10.2.1 on sys_c, and 192_10.2.2 on sys_d).

Sample configuration statements for the Lifeline Advisor

You can use the following sample configuration file to configure the Lifeline Advisor for Example 1. Use this configuration file for the Advisors on both the primary and secondary controllers.

```
#====================================================================
#
#  This file contains sample configuration statements for the Lifeline
#  Advisor - using default settings in most cases.
#
#====================================================================

# Following specifies the port which the primary Advisor will listen
# on for connections from Agents.
agent_connection_port     8181

# Following specifies which Agents are allowed to connect to the
# primary Advisor.
agent_id_list
{
   192.10.1.1..4000       # IP address and port for sys_a
   192.10.1.2..4000       # IP address and port for sys_b
   192.10.2.1..4000       # IP address and port for sys_c
   192.10.2.2..4000       # IP address and port for sys_d
}

# Following specifies the port which the primary Advisor will listen
# on for connections from a secondary Advisor.
advisor_connection_port   8000

# Following specifies which secondary Advisors are allowed to connect
# to the primary Advisor (should contain at least the IP address of this
# host).
advisor_id_list
{
   192.10.10.1            # IP address for Advisor on primary controller
   192.10.20.1            # IP address for Advisor on secondary controller
}

# Following specifies the port the primary Advisor listens on for
# connections from load balancers. The IPv4 address in this statement
# is used by the primary Advisor to accept connections from Agents
# or the secondary Advisor.
lb_connection_v4          10.10.10.1..3860

# Following specifies which load balancers are allowed to connect to
# the primary Advisor.
lb_id_list
{
  192.100.1.1             # IP address of LB in Site1
  192.100.2.1             # IP address of LB in Site2
}

# Following specifies the IP address and site name (i.e. sysplex name)
# that identifies each z/OS sysplex distributor
# used to route the workload, the port number of the server
# application used for the workload, and the workload name.
# These entries represent the load balancer server groups
# registered by the first-tier load balancers.
cross_sysplex_list
{
  10.10.1.1..80,SITE1,WORKLOAD1     # HTTP Server on Site1
  10.10.2.1..80,SITE2,WORKLOAD1     # HTTP Server on Site2
}
```

Figure 15. Sample configuration statements for the Lifeline Advisor

The Lifeline Advisor accesses files within the UNIX System Services shell, so the Lifeline Advisor needs to have an OMVS segment defined for it. See Appendix A, "A sample started procedure for Lifeline Advisors," on page 297 for sample JCL to define the OMVS segment.

Based on this example, you need to update the TCPIP profile on the two stand-alone images to contain the following information:

```
VIPADYNAMIC
  VIPARANGE DEFINE 255.255.255.255 10.10.10.1
ENDVIPADYNAMIC
```

Sample configuration statements for the Lifeline Agent

You can use the following sample configuration file to configure the Lifeline Agent for Example 1.

```
#====================================================================
#
#  This file contains sample configuration statements for the Lifeline
#  Agent - most defaults are selected.
#
#====================================================================

# Following specifies the IP address and port of the primary Advisor
# that this Agent connects to.
advisor_id                10.10.10.1..8181

# Specifies the local IP address and port this Agent binds to before
# connecting to the primary Advisor.  Uncomment the statement that
# applies to the image that the Agent is running on.
#host_connection          192.10.1.1..4000   # sys_a
#host_connection          192.10.1.2..4000   # sys_b
#host_connection          192.10.2.1..4000   # sys_c
#host_connection          192.10.2.2..4000   # sys_d
```

Figure 16. Sample configuration statements for the Lifeline Agent

The Lifeline Agent accesses files within the UNIX System Services shell, so the Lifeline Agent needs to have an OMVS segment defined for it. See Appendix B, "A sample started procedure for Lifeline z/OS Agents," on page 299 for sample JCL to define the OMVS segment.

According to previous samples, you need to update the TCPIP profile on the image owning the distributable dynamic VIPA in the following way:

```
VIPADYNAMIC
; Uncomment statement that applies to the image where the z/OS sysplex distributor
; is being started
;
; Site1 definitions
; VIPADEFINE 255.255.255.255 10.10.1.1
;  VIPADIST DISTMETHOD SERVERWLM 10.10.1.1 PORT 80 DESTIP ALL
;
; Site2 definitions
; VIPADEFINE 255.255.255.255 10.10.2.1
;  VIPADIST DISTMETHOD SERVERWLM 10.10.2.1 PORT 80 DESTIP ALL
ENDVIPADYNAMIC
```

Multi-site Workload Lifeline configuration Example 2

The following figure shows an example of the Multi-site Workload Lifeline configuration where an Active/Standby workload uses a customized load balancer to route requests within a site. It also shows how to configure the Lifeline Advisors and Lifeline Agents to work in such an environment.

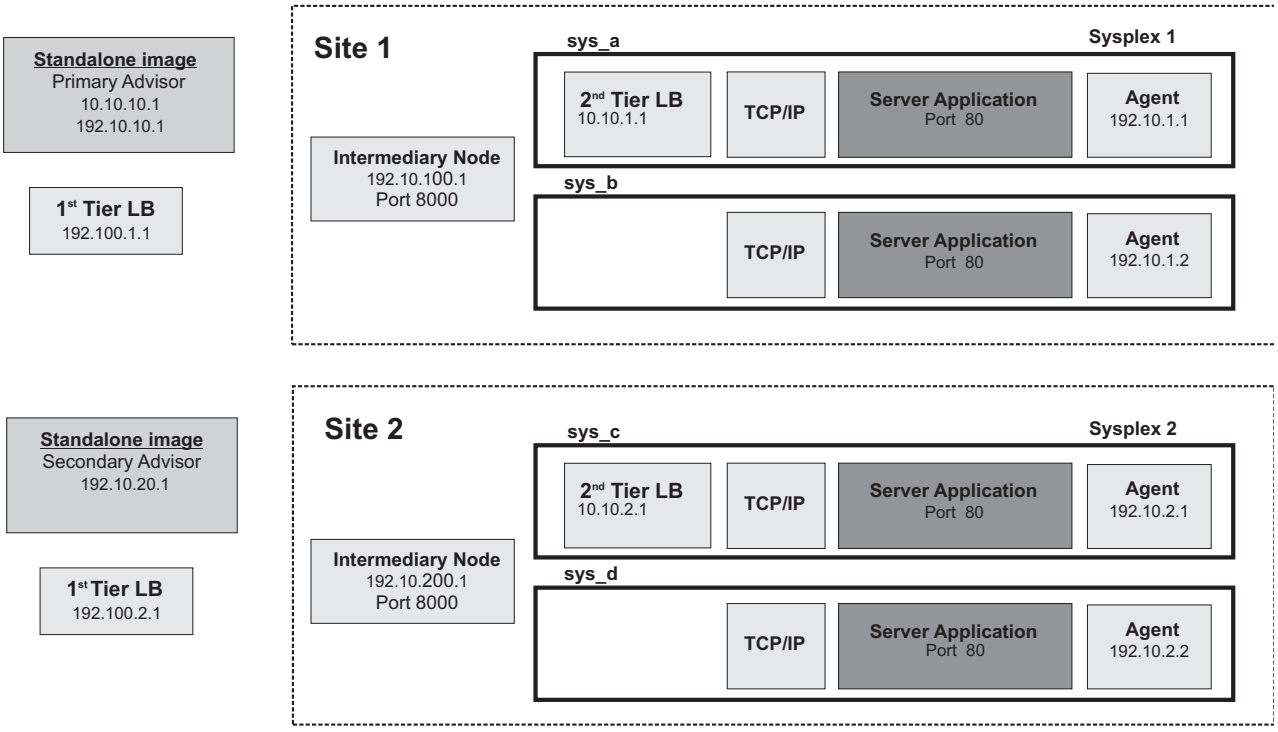


Figure 17. Multi-site Workload Lifeline configuration Example 2

To configure the previous sample environment shown in Figure 17, first repeat the initial five tasks from Example 1.

Sample configuration statements for the Lifeline Advisor

You can use the following sample configuration file to configure the Lifeline Advisor for Example 2. Use this configuration file for the Advisors on both the primary and secondary controllers.

```
#====================================================================
#
#  This file contains sample configuration statements for the Lifeline
#  Advisor - using default settings in most cases.
#
#====================================================================

# Following specifies the port which the primary Advisor will listen
# on for connections from Agents.
agent_connection_port     8181

# Following specifies which Agents are allowed to connect to the
# primary Advisor.
agent_id_list
{
   192.10.1.1..4000       # IP address and port for sys_a
   192.10.1.2..4000       # IP address and port for sys_b
   192.10.2.1..4000       # IP address and port for sys_c
   192.10.2.2..4000       # IP address and port for sys_d
}

# Following specifies the port which the primary Advisor will listen
# on for connections from a secondary Advisor.
advisor_connection_port   8000

# Following specifies which secondary Advisors are allowed to connect
# to the primary Advisor (should contain at least the IP address of this
# host).
advisor_id_list
{
   192.10.10.1            # IP address for Advisor on primary controller
   192.10.20.1            # IP address for Advisor on secondary controller
}

# Following specifies the port the primary Advisor listens on for
# connections from load balancers. The IPv4 address in this statement
# is used by the primary Advisor to accept connection from Agents
# or the secondary Advisor.
lb_connection_v4          10.10.10.1..3860

# Following specifies which load balancers are allowed to connect to
# the primary Advisor.
lb_id_list
{
  192.100.1.1             # IP address of LB in Site1
  192.100.2.1             # IP address of LB in Site2
}

# Following specifies the IP address and site name (i.e. sysplex name)
# that identifies each z/OS sysplex distributor
# used to route the workload, the port number of the server
# application used for the workload, and the workload name.
# These entries represent the load balancer server groups
# registered by the first-tier load balancers.
cross_sysplex_list
{
  10.10.1.1..80,SITE1,WORKLOAD1     # HTTP Server on Site1
  10.10.2.1..80,SITE2,WORKLOAD1     # HTTP Server on Site2
}
```

Figure 18. Sample configuration statements for the Lifeline Advisor, part 1 of 2

```
# Following specifies the IP address and site name (i.e. sysplex name)
# that identifies each intermediary node used
# to route the workload, the port number to reach the
# intermediary node, and the workload name.
# These entries represent the load balancer server groups
# registered by the first-tier load balancers.
intermediary_node_list
{
  192.10.100.1..8000,SITE1,WORKLOAD1 # Intermediary node on Site1
  192.10.200.1..8000,SITE2,WORKLOAD1 # Intermediary node on Site2
}
```

Figure 19. Sample configuration statements for the Lifeline Advisor, part 2 of 2

Follow the same steps in Example 1 to define an OMVS segment for the Advisor and the VIPARANGE DVIPA on both stand-alone LPARs.

Sample configuration statements for the Lifeline Agent

Use the same Lifeline Agent configuration file from Example 1, and follow the same steps in Example 1 to define an OMVS segment for the Agent and the z/OS sysplex distributor in both sites.

Multi-site Workload Lifeline configuration Example 3

The following figure shows an example of a configuration of Multi-site Workload Lifeline where two workloads are defined, one as an Active/Standby workload and the other as an Active/Query workload. Both workloads use the z/OS sysplex distributor to route requests within a site. The following figure describes how to configure the Lifeline Advisors and Lifeline Agents to work in such an environment.

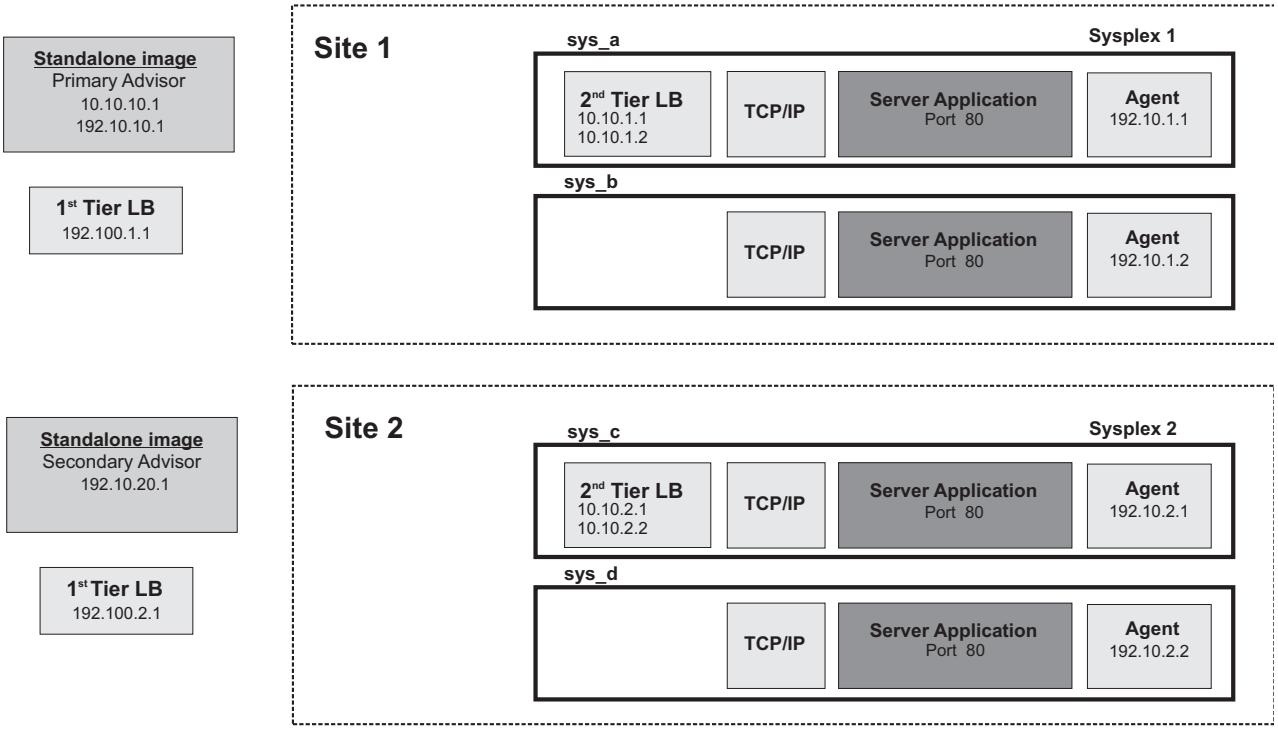


Figure 20. Multi-site Workload Lifeline configuration Example 3

To configure the sample environment shown in Figure 20 on page 307, complete the following tasks:

1. Configure and start the Lifeline Advisor on the primary controller in the primary role. The primary Advisor listens on dynamic VIPA (DVIPA) address 10.10.10.1, which is defined in the VIPARANGE statement.
2. Configure and start the Lifeline Advisor on the secondary controller, in the secondary role. The secondary Advisor uses static VIPA address 192.10.20.1 to communicate with the primary Advisor.
3. Define two distributable DVIPAs, 10.10.1.1 and 10.10.1.2, on system sys_a in sysplex Site1, and allow both sys_a and sys_b to be targets of these DVIPAs. 10.10.1.1 will be used for the Active/Standby workload and 10.10.1.2 will be used for the Active/Query workload.
4. Define two distributable DVIPAs, 10.10.2.1 and 10.10.2.2, on system sys_c in sysplex Site2, and allow both sys_c and sys_d to be targets of these DVIPAs. 10.10.2.1 will be used for the Active/Standby workload and 10.10.2.2 will be used for the Active/Query workload.
5. Configure and start the Lifeline Agents on each of the images in Site 1 and Site 2, by using the static VIPA that is defined in that image (192.10.1.1 on sys_a, 192.10.1.2 on sys_b, 192.10.2.1 on sys_c, and 192_10.2.2 on sys_d).

Sample configuration statements for the Lifeline Advisor

You can use the following sample configuration file to configure the Lifeline Advisor for Example 3. Use this configuration file for the Advisors on both the primary and secondary controllers.

```
#====================================================================
#
#  This file contains sample configuration statements for the
#  Lifeline Advisor - using default settings in most cases.
#
#====================================================================

# Following specifies the port which the primary Advisor will
# listen on for connections from Agents.
agent_connection_port     8181

# Following specifies which Agents are allowed to connect to
# the primary Advisor.
agent_id_list
{
   192.10.1.1..4000       # IP address and port for sys_a
   192.10.1.2..4000       # IP address and port for sys_b
   192.10.2.1..4000       # IP address and port for sys_c
   192.10.2.2..4000       # IP address and port for sys_d
}

# Following specifies the port which the primary Advisor will
# listen on for connections from a secondary Advisor.
advisor_connection_port   8000

# Following specifies which secondary Advisors are allowed to
# connect to the primary Advisor (should contain at least the IP
# address of this host).
advisor_id_list
{
   192.10.10.1 # IP address for Advisor on primary controller
   192.10.20.1 # IP address for Advisor on secondary controller
}

# Following specifies the port the primary Advisor listens on for
# connections from load balancers. The IPv4 address in this
# statement is used by the primary Advisor to accept connections
# from Agents or the secondary Advisor.
lb_connection_v4          10.10.10.1..3860

# Following specifies which load balancers are allowed to
# connect to the primary Advisor.
lb_id_list
{
  192.100.1.1             # IP address of LB in Site1
  192.100.2.1             # IP address of LB in Site2
}
```

Figure 21. Sample configuration statements for the Lifeline Advisor, part 1 of 2

```
# Following specifies the IP address and site name (i.e.
# sysplex name) that identifies each z/OS sysplex distributor
# used to route the workload, the port number of the server
# application used for the workload, and the workload name.
# These entries represent the load balancer server groups
# registered by the first-tier load balancers.
cross_sysplex_list
{
  10.10.1.1..80,SITE1,WORKLOAD1     # HTTP Server on Site1 -
                                          # Active/Standby
  10.10.2.1..80,SITE2,WORKLOAD1     # HTTP Server on Site2 -
                                          # Active/Standby
  10.10.1.2..80,SITE1,WORKLOAD2     # HTTP Server on Site1 -
                                          # Active/Query
  10.10.2.2..80,SITE2,WORKLOAD2     # HTTP Server on Site2 -
                                          # Active/Query

}
# Following specifies the Active/Query workload, its
# associated Active/Standby workload, the distribution type
# and distribution option, and timeout for persistent
# connections. These entries represent the workloads defined
# in the cross_sysplex_list that are classified as
# Active/Query workloads.
query_workload_list
{
  WORKLOAD2,WORKLOAD1,DYNAMIC,TOACTIVE,0
}
```

Figure 22. Sample configuration statements for the Lifeline Advisor, part 2 of 2

Follow the same steps in Example 1 to define an OMVS segment for the Advisor and the VIPARANGE DVIPA on both stand-alone LPARs.

Sample configuration statements for the Lifeline Agent

Use the same Lifeline Agent configuration file from Example 1 to define an OMVS segment for the Agent.

Based on this example, you need to update the TCPIP profile on the image owning the distributable dynamic VIPAs in the following way:

```
VIPADYNAMIC
; Uncomment the Site1 statements or Site2 statements that apply to the image where the
; z/OS sysplex distributor is being started and the site of the z/OS sysplex distributor
;
; Site1 definitions
; VIPADEFINE 255.255.255.255 10.10.1.1
; VIPADIST DISTMETHOD SERVERWLM 10.10.1.1 PORT 80 DESTIP ALL
; VIPADEFINE 255.255.255.255 10.10.1.2
; VIPADIST DISTMETHOD SERVERWLM 10.10.1.2 PORT 80 DESTIP ALL
;
; Site2 definitions
; VIPADEFINE 255.255.255.255 10.10.2.1
; VIPADIST DISTMETHOD SERVERWLM 10.10.2.1 PORT 80 DESTIP ALL
; VIPADEFINE 255.255.255.255 10.10.2.2
; VIPADIST DISTMETHOD SERVERWLM 10.10.2.2 PORT 80 DESTIP ALL
ENDVIPADYNAMIC
```

Multi-site Workload Lifeline configuration Example 4

The following figure shows an example of the Multi-site Workload Lifeline configuration where an Active/Standby SNA workload is defined. It also shows how to configure the Lifeline Advisors and Lifeline Agents to work in such an

environment.

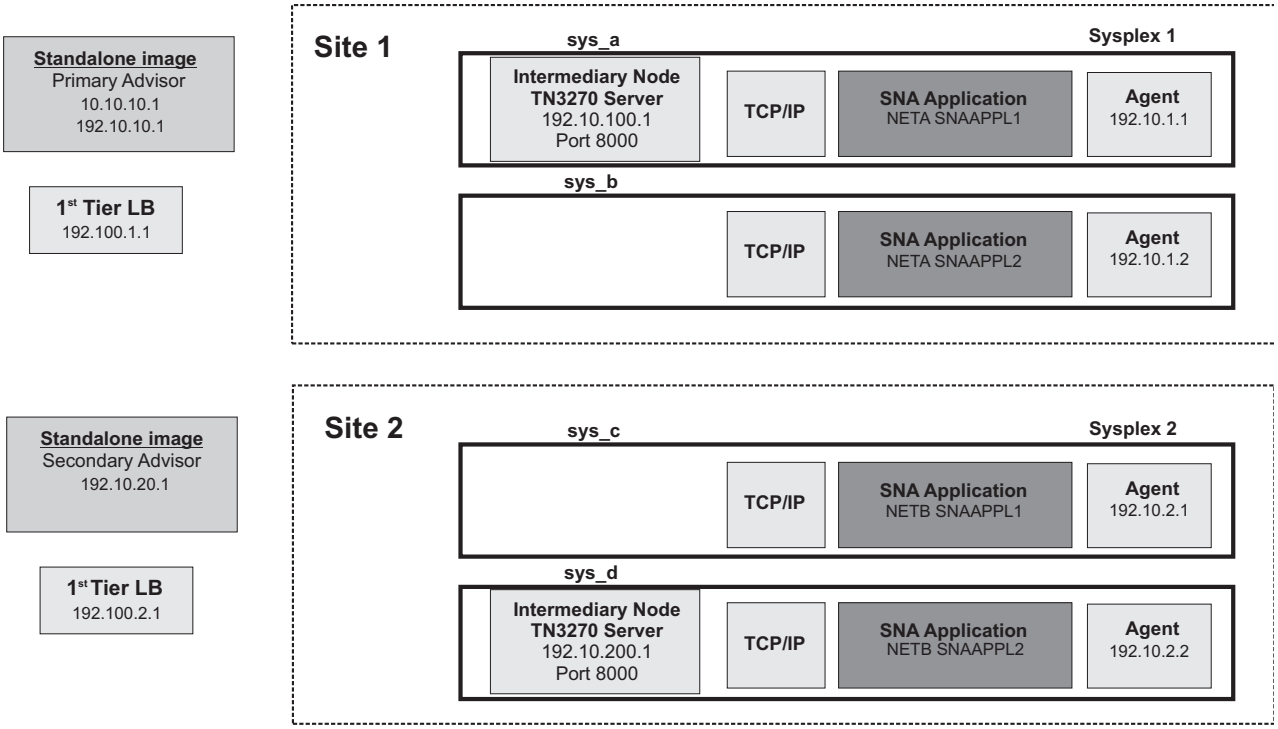


Figure 23. Multi-site Workload Lifeline configuration Example 4

To configure the previous sample environment shown in Figure 23, complete the following tasks:

1. Configure and start the Lifeline Advisor on the primary controller in the primary role. The primary Advisor listens on dynamic VIPA (DVIPA) address 10.10.10.1, which is defined in the VIPARANGE statement.
2. Configure and start the Lifeline Advisor on the secondary controller, in the secondary role. The secondary Advisor uses static VIPA address 192.10.20.1 to communicate with the primary Advisor.
3. Configure and start Lifeline Agents on each of the images in Site 1 and Site 2, using the static VIPA that is defined in that image (192.10.1.1 on sys_a, 192.10.1.2 on sys_b, 192.10.2.1 on sys_c, and 192_10.2.2 on sys_d).

Sample configuration statements for the Lifeline Advisor

You can use the following sample configuration file to configure the Lifeline Advisor for Example 4. Use this configuration file for the Advisors on both the primary and secondary controllers.

```
#====================================================================
#
#  This file contains sample configuration statements for the Lifeline
#  Advisor - using default settings in most cases.
#
#====================================================================

# Following specifies the port which the primary Advisor will listen
# on for connections from Agents.
agent_connection_port     8181

# Following specifies which Agents are allowed to connect to the
# primary Advisor.
agent_id_list
{
   192.10.1.1..4000       # IP address and port for sys_a
   192.10.1.2..4000       # IP address and port for sys_b
   192.10.2.1..4000       # IP address and port for sys_c
   192.10.2.2..4000       # IP address and port for sys_d
}

# Following specifies the port which the primary Advisor will listen
# on for connections from a secondary Advisor.
advisor_connection_port   8000

# Following specifies which secondary Advisors are allowed to connect
# to the primary Advisor (should contain at least the IP address of this
# host).
advisor_id_list
{
   192.10.10.1            # IP address for Advisor on primary controller
   192.10.20.1            # IP address for Advisor on secondary controller
}

# Following specifies  the port the primary Advisor listens on for
# connections from load balancers. The IPv4 address in this
# statement is used by the primary Advisor to accept connections
# from Agents or the secondary Advisor.
lb_connection_v4          10.10.10.1..3860

# Following specifies which load balancers are allowed to connect to
# the primary Advisor.
lb_id_list
{
  192.100.1.1             # IP address of LB in Site1
  192.100.2.1             # IP address of LB in Site2
}
```

Figure 24. Sample configuration statements for the Lifeline Advisor, part 1 of 2

```
# Following specifies the network qualified application
# name, site of each SNA application, and the workload that
# the SNA application belongs in.
# These entries are mapped by intermediary_node_list
# entries of type SNA.
sna_application_list
{
  NETA.SNAAPPL1,SITE1,WORKLOAD4
  NETA.SNAAPPL2,SITE1,WORKLOAD4
  NETB.SNAAPPL1,SITE2,WORKLOAD4
  NETB.SNAAPPL2,SITE2,WORKLOAD4
}

# Following specifies the IP address and site name (i.e. sysplex name)
# that identifies each intermediary node used
# to route the workload, the port number to reach the
# intermediary node, and the workload name.
# These entries represent the load balancer server groups
# registered by the first-tier load balancers.
# The application type is SNA because SNA applications process
# this workload.
intermediary_node_list
{
  192.10.100.1..8000,SITE1,WORKLOAD4,SNA   # Intermediary node on Site1
  192.10.200.1..8000,SITE2,WORKLOAD4,SNA   # Intermediary node on Site2
}
```

Figure 25. Sample configuration statements for the Lifeline Advisor, part 2 of 2

Follow the same steps in Example 1 to define an OMVS segment for the Advisor and the VIPARANGE DVIPA on both stand-alone LPARs.

Sample configuration statements for the Lifeline Agent

Use the same Lifeline Agent configuration file from Example 1, and follow the same steps in Example 1 to define an OMVS segment for the Agent.

Multi-site Workload Lifeline configuration Example 5

The following figure shows an example of the Multi-site Workload Lifeline configuration where an Active/Standby Linux on z Systems workload is defined. It also shows how to configure the Lifeline Advisors and Lifeline Agents to work in such an environment.

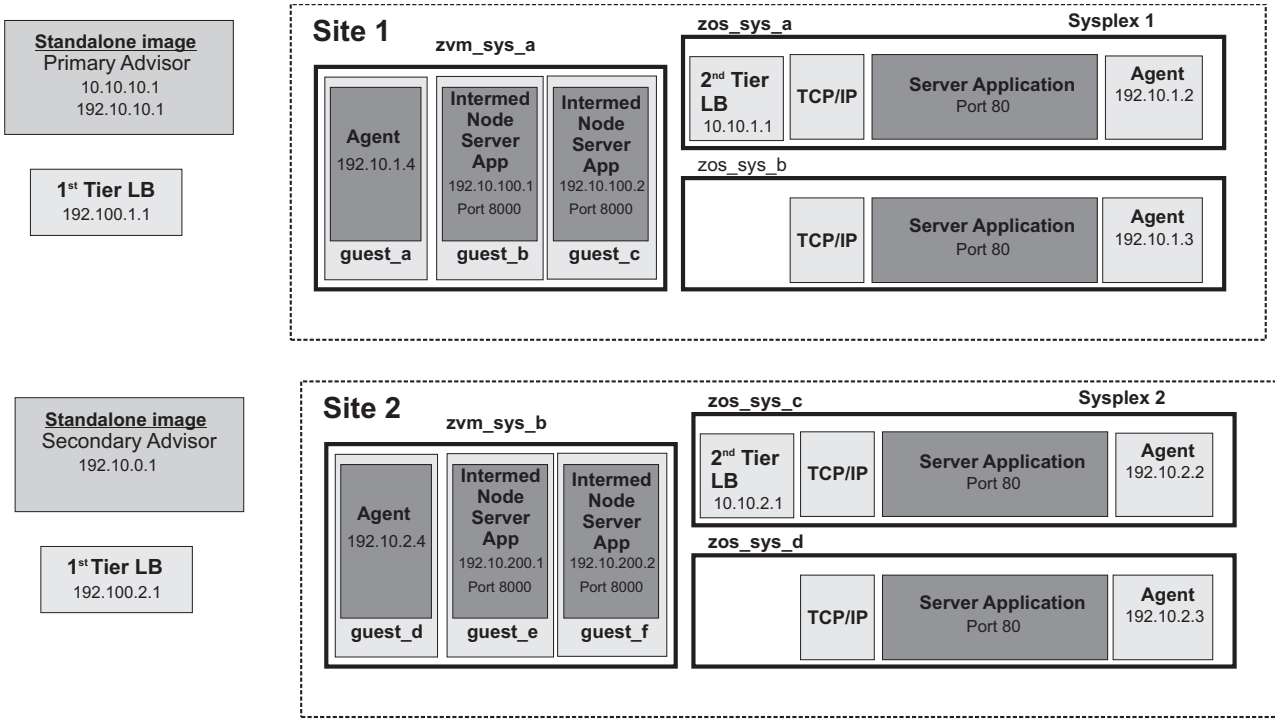


Figure 26. Multi-site Workload Lifeline configuration Example 5

To configure the previous sample environment shown in Figure 26, first repeat the initial five tasks in Figure 14 on page 301.

Sample configuration statements for the Lifeline Advisor

You can use the following sample configuration file to configure the Lifeline Advisor for Example 5. Use this configuration file for the Advisors on both the primary and secondary controllers.

```
#====================================================================
#
#  This file contains sample configuration statements for the Lifeline
#  Advisor by using default settings in most cases.
#
#====================================================================

# Following specifies the port which the primary Advisor will listen
# on for connections from Agents.
agent_connection_port     8181

# Following specifies which Agents are allowed to connect to the
# primary Advisor.
agent_id_list
{
   192.10.1.2..4000       # IP address and port for sys_a
   192.10.1.3..4000       # IP address and port for sys_b
   192.10.2.2..4000       # IP address and port for sys_c
   192.10.2.3..4000       # IP address and port for sys_d
   192.10.1.4..4000       # IP address and port for guest_a
   192.10.2.4..4000       # IP address and port for guest_d
}

# Following specifies the port which the primary Advisor will listen
# on for connections from a secondary Advisor.
advisor_connection_port   8000

# Following specifies which secondary Advisors are allowed to connect
# to the primary Advisor (should contain at least the IP address of this
# host).
advisor_id_list
{
   192.10.10.1            # IP address for Advisor on primary controller
   192.10.20.1            # IP address for Advisor on secondary controller
}

# Following specifies the port the primary Advisor listens on for
# connections from load balancers. The IPv4 address in this
# statement is used by the primary Advisor to accept connections
# from Agents or the secondary Advisor.

lb_connection_v4          10.10.10.1..3860

# Following specifies which load balancers are allowed to connect to
# the primary Advisor.
lb_id_list
{
  192.100.1.1              # IP address of LB in Site1
  192.100.2.1              # IP address of LB in Site2
}
```

Figure 27. Sample configuration statements for the Lifeline Advisor, part 1 of 2

```
# Following specifies the IP address and site name (i.e. sysplex name)
# that identifies each z/OS sysplex distributor
# used to route the workload, the port number of the server
# application used for the workload, and the workload name.
# These entries represent the load balancer server groups that are
# registered by the first-tier load balancers.
cross_sysplex_list
{
  10.10.1.1..80,SITE1,WORKLOAD5     # HTTP Server on Site1
  10.10.2.1..80,SITE2,WORKLOAD5     # HTTP Server on Site2
}

# Following specifies the IP address and site name (i.e. sysplex name)
# that identifies each intermediary node used
# to route the workload, the port number to reach the
# intermediary node, and the workload name.
# These entries represent the load balancer server groups
# registered by the first-tier load balancers.
# The application type is IP because TCP/IP applications process
# this workload.
intermediary_node_list
{
  192.10.100.1..8000,SITE1,WORKLOAD5,IP   # Linux on z Systems server on Site1
  192.10.100.2..8000,SITE1,WORKLOAD5,IP   # Linux on z Systems server on Site1
  192.10.200.1..8000,SITE2,WORKLOAD5,IP   # Linux on z Systems server on Site2
  192.10.200.2..8000,SITE2,WORKLOAD5,IP   # Linux on z Systems server on Site2
}

# These entries represent the Linux on z Systems z/VM guests hosting the
# application-tier intermediary node server applications.
management_guest_list
{
  guest_b,192.10.100.1,WORKLOAD5
  guest_c,192.10.100.2,WORKLOAD5
  guest_e,192.10.200.1,WORKLOAD5
  guest_f,192.10.200.2,WORKLOAD5
}
```

Figure 28. Sample configuration statements for the Lifeline Advisor, part 2 of 2

Follow the same steps in Example 1 to define an OMVS segment for the Advisor and the VIPARANGE DVIPA on both stand-alone LPARs.

Sample configuration statements for the Lifeline z/OS Agent

Use the same Lifeline Agent configuration file from Example 1 for the z/OS Agents, and follow the same steps in Example 1 to define an OMVS segment for the z/OS Agents and the z/OS sysplex distributor in both sites.

Sample configuration statements for the Lifeline Linux on z Systems Management Agent

You can use the following sample configuration file to configure the Lifeline Linux on z Systems Management Agents for Example 5.

```
#====================================================================
#
#  This file contains sample configuration statements for the
#  Lifeline Linux on z Systems Management Agent - most
#  defaults are selected.
#
#====================================================================
# Following specifies the IP address and port of the primary Advisor
# that this Agent connects to.
advisor_id 10.10.10.1..8181

# Specifies the local IP address and port this agent binds to before
# connecting to the primary advisor. Uncomment the statement that
# applies to the image that the Agent is running on.
#host_connection 192.10.1.4..4000   # guest_a
#host_connection 192.10.2.4..4000   # guest_d

# Specifies the site name the Agent should be associated with when
# communicating with the primary Advisor. Uncomment the statement that
# corresponds to the site that the Agent is running in.
#site_name SITE1
#site_name SITE2
```

Figure 29. Sample configuration statements for the Linux on z Systems Management Agents

Multi-site Workload Lifeline configuration Example 6

The following figure shows an example of the Multi-site Workload Lifeline configuration where an Active/Standby MQ cluster workload is defined. It also shows how to configure the Lifeline Advisors and Lifeline Agents to work in such an environment.

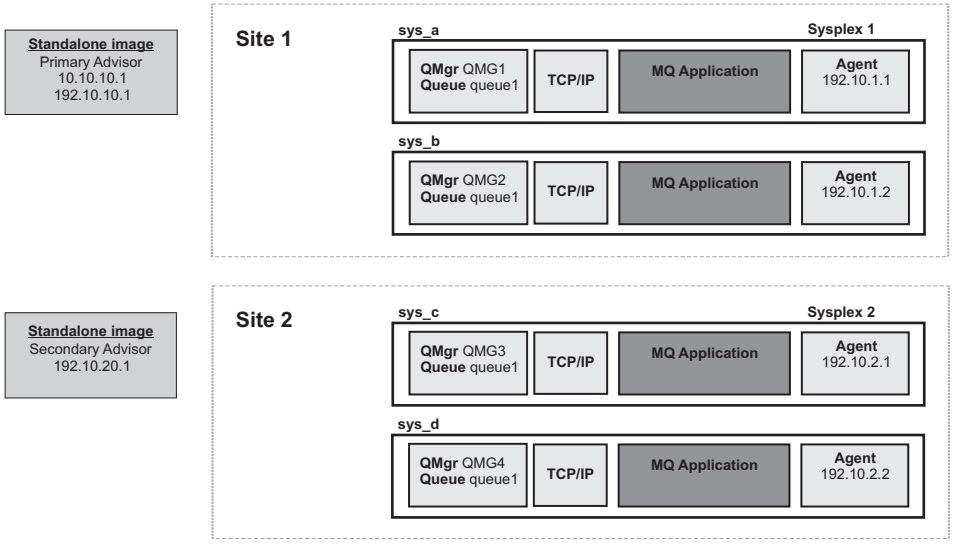


Figure 30. Multi-site Workload Lifeline configuration Example 6

To configure the previous sample environment shown in Figure 30, first repeat the initial five tasks in Figure 14 on page 301.

Sample configuration statements for the Lifeline Advisor

You can use the following sample configuration file to configure the Lifeline Advisor for Example 6. Use this configuration file for the Advisors on both the

primary and secondary controllers.

```
#====================================================================
#
#  This file contains sample configuration statements for the Lifeline
#  Advisor - using default settings in most cases.
#
#====================================================================

# Following specifies the port which the primary Advisor will listen
# on for connections from Agents.
agent_connection_port     8181

# Following specifies which Agents are allowed to connect to the
# primary Advisor.
agent_id_list
{
   192.10.1.1..4000       # IP address and port for sys_a
   192.10.1.2..4000       # IP address and port for sys_b
   192.10.2.1..4000       # IP address and port for sys_c
   192.10.2.2..4000       # IP address and port for sys_d
}

# Following specifies the port which the primary Advisor will listen
# on for connections from a secondary Advisor.
advisor_connection_port   8000

# Following specifies which secondary Advisors are allowed to connect
# to the primary Advisor (should contain at least the IP address of this
# host).
advisor_id_list
{
   192.10.10.1            # IP address for Advisor on primary controller
   192.10.20.1            # IP address for Advisor on secondary controller
}

# Following specifies the IPv4 address the primary Advisor uses
# to accept connections from Agents or the secondary Advisor.
lb_connection_v4          10.10.10.1..3860

# Following specifies the MQ Queue Manager name, MQ cluster name,
# MQ cluster queue, and the site name (i.e. sysplex name) that
# identifies each MQ Queue Manager used to route the workload.
mq_manager_list
{
  QMG1,CLUSTER1,QUEUE1,SITE1,WORKLOAD1  # MQ Queue Manager on Site1
  QMG2,CLUSTER1,QUEUE1,SITE1,WORKLOAD1  # MQ Queue Manager on Site1
  QMG3,CLUSTER1,QUEUE1,SITE2,WORKLOAD1  # MQ Queue Manager on Site2
  QMG4,CLUSTER1,QUEUE1,SITE2,WORKLOAD1  # MQ Queue Manager on Site2
}
```

Figure 31. Sample configuration statements for the Lifeline Advisor

Follow the same steps in Example 1 to define an OMVS segment for the Advisor and the VIPARANGE DVIPA on both stand-alone LPARs.

Sample configuration statements for the Lifeline z/OS Agent

Use the same Lifeline Agent configuration file from Example 1 for the z/OS Agents, and follow the same steps in Example 1 to define an OMVS segment for the z/OS Agents and the z/OS sysplex distributor in both sites.

Multi-site Workload Lifeline configuration Example 7

The following figure shows an example of the Multi-site Workload Lifeline configuration where an Active/Standby workload is defined to use Distributed Relational Database Architecture™ (DRDA®) to access Db2. It also shows how to configure the Lifeline Advisors and Lifeline Agents to work in such an environment.

Workloads that use DRDA with Sysplex Workload Balancing (WLB) support require multiple IP addresses to be configured for each of the Db2 instances that is running in a site. A distributable DVIPA is used to access any Db2 instance in the site, and local IP addresses are used to access a specific Db2 instance in the site.

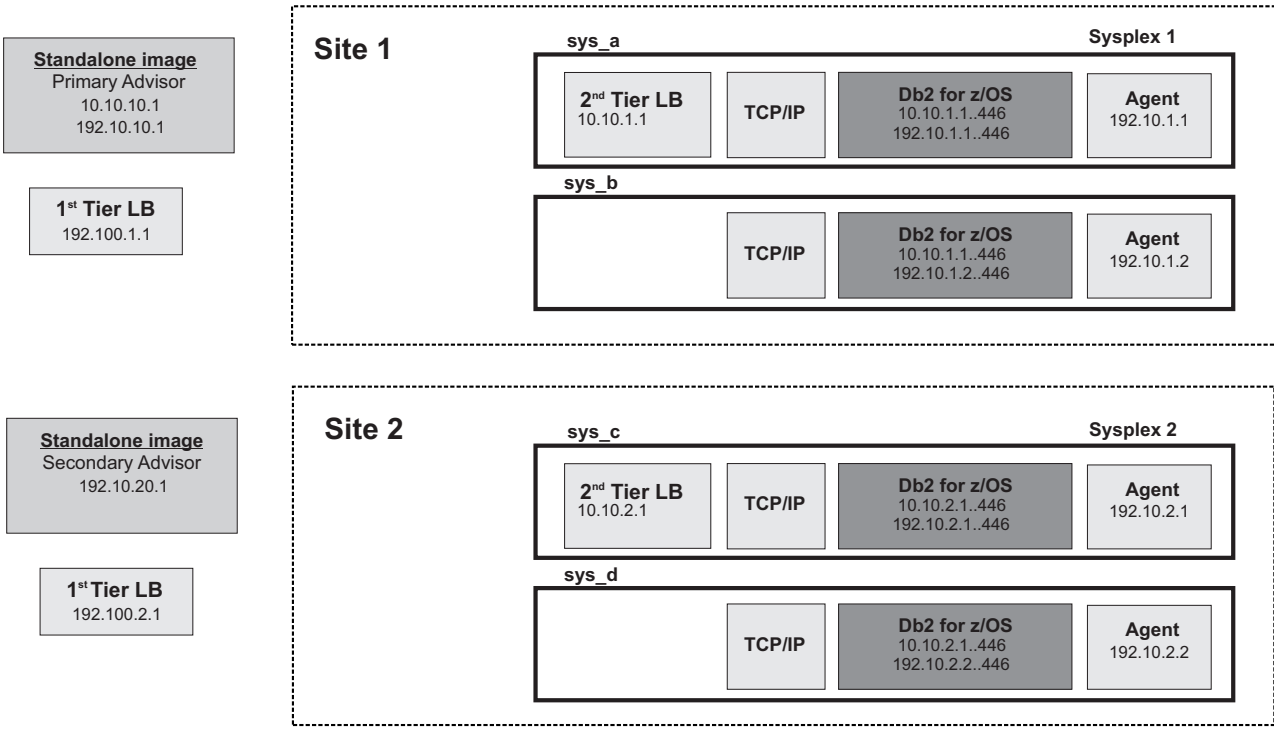


Figure 32. Multi-site Workload Lifeline configuration Example 7

To configure the previous sample environment shown in Figure 32, first repeat the initial five tasks in Figure 14 on page 301.

Sample configuration statements for the Lifeline Advisor

You can use the following sample configuration file to configure the Lifeline Advisor for Example 7. Use this configuration file for the Advisors on both the primary and secondary controllers.

```
#====================================================================
#
#  This file contains sample configuration statements for the Lifeline
#  Advisor - using default settings in most cases.
#
#====================================================================

# Following specifies the port which the primary Advisor will listen
# on for connections from Agents.
agent_connection_port     8181

# Following specifies which Agents are allowed to connect to the
# primary Advisor.
agent_id_list
{
   192.10.1.1..4000       # IP address and port for sys_a
   192.10.1.2..4000       # IP address and port for sys_b
   192.10.2.1..4000       # IP address and port for sys_c
   192.10.2.2..4000       # IP address and port for sys_d
}

# Following specifies the port which the primary Advisor will listen
# on for connections from a secondary Advisor.
advisor_connection_port   8000

# Following specifies which secondary Advisors are allowed to connect
# to the primary Advisor (should contain at least the IP address of this
# host).
advisor_id_list
{
   192.10.10.1            # IP address for Advisor on primary controller
   192.10.20.1            # IP address for Advisor on secondary controller
}

# Following specifies the port the primary Advisor listens on for
# connections from load balancers. The IPv4 address in this
# statement is used by the primary Advisor to accept connections
# from Agents or the secondary Advisor.
lb_connection_v4          10.10.10.1..3860

# Following specifies which load balancers are allowed to connect to
# the primary Advisor.
lb_id_list
{
  192.100.1.1             # IP address of LB in Site1
  192.100.2.1             # IP address of LB in Site2
}

# Following specifies the IP address and site name (i.e. sysplex name)
# that identifies each z/OS sysplex distributor
# used to route the workload, the port number of the server
# application used for the workload, and the workload name.
# These entries represent the load balancer server groups
# registered by the first-tier load balancers.
cross_sysplex_list
{
  10.10.1.1..446,SITE1,WORKLOAD1     # Db2 on Site1
  10.10.2.1..446,SITE2,WORKLOAD1     # Db2 on Site2
}
```

Figure 33. Sample configuration statements for the Lifeline Advisor, part 1 of 2

```
# Following specifies the IP address and site name (i.e. sysplex name)
# that identifies each intermediary node (Db2 instance) used
# to route the workload, the port number to reach the
# intermediary node (Db2 instance), and the workload name.
# These entries represent the load balancer server groups
# registered by the first-tier load balancers.
intermediary_node_list
{
  10.10.1.1..446,SITE1,WORKLOAD1     # LB group1 member on Site1
  10.10.2.1..446,SITE2,WORKLOAD1     # LB group1 member on Site2
  192.10.1.1..446,SITE1,WORKLOAD1    # LB group2 member on Site1
  192.10.2.1..446,SITE2,WORKLOAD1    # LB group2 member on Site2
  192.10.1.2..446,SITE1,WORKLOAD1    # LB group3 member on Site1
  192.10.2.2..446,SITE2,WORKLOAD1    # LB group3 member on Site2
}

# Following specifies grouping of load balancer application groups
# into failure detection groups. By default, each registered load
# balancer application group is defined as its own failure detection
# group.
failure_detection_groups
{
  10.10.1.1..446,GROUPA              # LB group1 member in GROUPA
  10.10.2.1..446,GROUPA              # LB group1 member in GROUPA
  192.10.1.1..446,GROUPB             # LB group2 member in GROUPB
  192.10.2.1..446,GROUPB             # LB group2 member in GROUPB
  192.10.1.2..446,GROUPB             # LB group3 member in GROUPB
  192.10.2.2..446,GROUPB             # LB group3 member in GROUPB
}
```

Figure 34. Sample configuration statements for the Lifeline Advisor, part 2 of 2

In the sample configuration in Figure 33 on page 320, the two load balancers register three load balancer application groups, which are labeled as group1, group2, and group3. By default, workload failure detection occurs when all members of any of the load balancer application groups fails. As a result, a workload failure occurs if a single Db2 instance fails in the site. To ensure that a workload failure occurs only when both Db2 instances fail, the registered load balancer application groups, group2 and group3, for these Db2 instances are grouped into a larger failure detection group, GROUPB, in the failure_detection_groups statement. The members of load balancer application group group1 are configured in its own failure detection group, GROUPA, for completeness. This is optional, since all the members of GROUPA are being registered in a single load balancer application group.

Follow the same steps in Example 1 to define an OMVS segment for the Advisor and the VIPARANGE DVIPA on both stand-alone LPARs.

Sample configuration statements for the Lifeline Agent

Use the same Lifeline Agent configuration file from Example 1 for the z/OS Agents, and follow the same steps in Example 1 to define an OMVS segment for the z/OS Agents and the z/OS sysplex distributor in both sites.

Appendix D. Sample AT-TLS configuration policies

Use AT-TLS to enable TLS before starting the TCP/IP stacks and the Lifeline Advisor and Lifeline Agent applications.

Example AT-TLS Policy for a Lifeline Advisor to peer Lifeline Advisor connection

```
TTLSRule AdvisorToPeerRule
{
LocalPortRange 8000
Direction Inbound
TTLSGroupActionRef AdvisorGroup
TTLSEnvironmentActionRef AdvisorToPeerEnvironment
}
TTLSGroupAction AdvisorGroup
{
TTLSEnabled On
}
TTLSEnvironmentAction AdvisorToPeerEnvironment
{
TTLSKeyRingParms
{
Keyring advisor_key_ring
}
TTLSEnvironmentAdvancedParms
{
# TTLS will verify a user ID is associated with certificate
ClientAuthType SAFCheck
ApplicationControlled On
}
HandshakeRole ServerWithClientAuth
Trace 7
}

TTLSRule PeerToAdvisorRule
{
RemotePortRange 8000
Direction Outbound
TTLSGroupActionRef AdvisorGroup
TTLSEnvironmentActionRef PeerToAdvisorEnvironment
}
TTLSGroupAction AdvisorGroup
{
TTLSEnabled On
}
TTLSEnvironmentAction PeerToAdvisorEnvironment
{
TTLSKeyRingParms
{
Keyring advisor_key_ring
}
HandshakeRole Client
Trace 7
}
```

Example AT-TLS Policy for a Lifeline Advisor to Lifeline Agent connection

```
TTLSRule AdvisorToAgentRule
{
LocalPortRange 8181
Direction Inbound
```

```
TTLSGroupActionRef AdvisorGroup
TTLSEnvironmentActionRef AdvisorToAgentEnvironment
}
TTLSGroupAction AdvisorGroup
{
TTLSEnabled On
}
TTLSEnvironmentAction AdvisorRoAgentEnvironment
{
TTLSKeyRingParms
{
Keyring advisor_key_ring
}
TTLSEnvironmentAdvancedParms
{
# TTLS will verify a user ID is associated with certificate
ClientAuthType SAFCheck
ApplicationControlled On
}
HandshakeRole ServerWithClientAuth
Trace 7
}

TTLSRule AgentToAdvisorRule
{
RemotePortRange 8181
Direction Outbound
TTLSGroupActionRef AgentGroup
TTLSEnvironmentActionRef AgentToAdvisorEnvironment
}
TTLSGroupAction AgentGroup
{
TTLSEnabled On
}
TTLSEnvironmentAction AgentToAdvisorEnvironment
{
TTLSKeyRingParms
{
Keyring agent_key_ring
}
HandshakeRole Client
Trace 7
}
```

Example AT-TLS Policy for a Lifeline Advisor to load balancer connection

```
TTLSRule AdvisorToLBRule
{
LocalPortRange 3860
LocalAddr 10.10.10.1
Direction Inbound
TTLSGroupActionRef AdvisorGroup
TTLSEnvironmentActionRef AdvisorToLBEnvironment
}
TTLSGroupAction AdvisorGroup
{
TTLSEnabled On
}
TTLSEnvironmentAction AdvisorToLBEnvironment
{
TTLSKeyRingParms
{
Keyring advisor_key_ring
}
TTLSEnvironmentAdvancedParms
{
```

```
# TTLS will verify a user ID is associated with certificate
ClientAuthType SAFCheck
ApplicationControlled On
}
HandshakeRole ServerWithClientAuth
Trace 7
}
```

Appendix E. Sample Display Command API application

Use the sample AQSDPCMD in SAQSSAMP to send a Lifeline Advisor DISPLAY command and retrieve the response.

In this sample, a single DISPLAY command is being requested before the connection with the Lifeline Advisor is closed. If multiple DISPLAY commands are being issued, or a DISPLAY command is being issued periodically, it is recommended that the connection with the Advisor remain open across the different DISPLAY command requests.

As an example of the output generated, running the sample application as is would display the following results:

```
Request:
--------
  DISPLAY,WORKLOAD,STATUS

Response:
---------
 AQS0149I WORKLOAD STATUS
 TYPE : ACTIVE/STANDBY
  WORKLOAD NAME : WORKLOAD1
   SITE : PLEX1     STATE : DEACTIVATED  STATUS : AVAIL
   SITE : PLEX2     STATE : ACTIVE       STATUS : AVAIL
  WORKLOAD NAME : WORKLOAD3
   SITE : PLEX1     STATE : ACTIVE       STATUS : AVAIL
   SITE : PLEX2     STATE : DEACTIVATED  STATUS : AVAIL
  WORKLOAD NAME : WORKLOAD4
   SITE : PLEX1     STATE : ACTIVE       STATUS : AVAIL
   SITE : PLEX2     STATE : DEACTIVATED  STATUS : UNAVAIL
  WORKLOAD NAME : WORKLOAD5
   SITE : PLEX1     STATE : ACTIVE       STATUS : AVAIL
   SITE : PLEX2     STATE : DEACTIVATED  STATUS : AVAIL
 TYPE : ACTIVE/QUERY
  WORKLOAD NAME : WORKLOAD2
   SITE : PLEX1     STATE : ACTIVE       STATUS : AVAIL
   SITE : PLEX2     STATE : ACTIVE       STATUS : AVAIL
 5 OF 5 RECORDS DISPLAYED
```

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- Use assistive technologies such as screen readers and screen magnifier software
- Operate specific or equivalent features using only the keyboard
- Customize display attributes such as color, contrast, and font size

Using assistive technologies

Assistive technology products, such as screen readers, function with the user interfaces found in z/OS. Consult the assistive technology documentation for specific information when using such products to access z/OS interfaces.

Keyboard navigation of the user interface

Users can access z/OS user interfaces using TSO/E or ISPF. See *z/OS TSO/E Primer*, *z/OS TSO/E User's Guide*, and *z/OS ISPF User's Guide Vol I* for information about accessing TSO/E and ISPF interfaces. These guides describe how to use TSO/E and ISPF, including the use of keyboard shortcuts or function keys (PF keys). Each guide includes the default settings for the PF keys and explains how to modify their functions.

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