IBM Spectrum Virtualize® Products
Call Home and Remote Support Overview

Applicable Products

Product: IBM FlashSystem® 5000, 5100, 5200, 7200, 9100, 9200 and 9200R
Product: IBM Storwize® V5010, V5030, V7000
Product: IBM SAN Volume Controller® (SVC) DH8, SV1, SV2 and SA2

Product Version (s): v8.1 and higher

Version History

Version	Date	Description
1.0	20/04/2020	Initial Release
1.1	07/05/2020	Changes to email call home destinations and fixed IP addresses for IBM support sites
1.2	30/10/2020	Additions and corrections for Spectrum Virtualize code level 8.4.0
1.3	30/12/2020	Additions and corrections for Spectrum Virtualize code level 8.3.1.3
1.4	12/05/2021	Additions and corrections for FlashSystem 5200 links and email call home destinations

Table of Contents

Table of Figures

Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of IBM Corporation in the United States, other countries, or both. These and other IBM trademarked terms are marked on their first occurrence in this information with the appropriate symbol (® or ™), indicating US registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the Web at http://www.ibm.com/legal/copytrade.shtml.

The following terms are trademarks of the IBM Corporation in the United States, other countries, or both:

IBM FlashSystem® IBM Storwize® IBM Storage Insights®

The following terms are trademarks of other companies:

Microsoft, Windows, and Internet Explorer are trademarks of Microsoft Corporation in the United States, other countries, or both.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

Other company, product, or service names may be trademarks or service marks of others.

1.0 Overview

IBM® recommends and encourages you to take advantage of **IBM Call Home**, **IBM Remote Support** and **IBM Storage Insights** and all their related features to allow you and IBM to partner for your success.

1.1 IBM Call Home

IBM Call Home is a support function embedded in all IBM Spectrum Virtualize storage products. By enabling call home, the health and functionality of your system is constantly monitored by IBM. Should a software or hardware error occur, the call home function notifies IBM support of the event and then automatically opens a service request. By obtaining information in this way, IBM support is quickly informed about the issue and can quickly develop an action plan for problem resolution.

In addition, call home enables predictive support, as it allows inventory information regarding the storage system health and components to be sent to IBM support at predefined intervals. IBM analyzes the inventory information to check the system health and make recommendations to improve system health and reliability. These recommendations can be found in the “Advisor” panel in IBM Storage Insights (see section 4.0). For severe issues, IBM support will contact you directly to ensure that you have seen the message and to help you take any corrective actions.

For IBM products running the Spectrum Virtualize software v8.1 and above, there are two methods of call home available:

- Cloud Call Home (also known as Call Home with Cloud Services)
- Email Call Home (also known as Call Home with Email Notifications)

Both methods and setup will be discussed later in this document.

1.2 IBM Remote Support

The enablement of **IBM Remote Support** can further reduce time to resolution for those incidents where IBM support needs to interact with your storage system. This capability is only available if there is a suitable maintenance or warranty contract in place.

The remote support function allows IBM support to remotely, and securely, access your storage system when needed during a support call. By using remote support, the customer initiates a secure connection from the IBM Spectrum Virtualize system back to IBM as needed. The IBM remote support specialist can then connect to the system to analyze the problem, repair it remotely if possible, or assist an IBM SSR who is onsite.

1.3 IBM Storage Insights

Available at no charge, cloud-based **IBM Storage Insights** provides a single dashboard that gives you an overall view of all your IBM block storage. You can make better decisions by seeing trends in performance and capacity. With storage health information, you can focus on areas that need attention. When IBM support is needed, IBM Storage Insights simplifies uploading logs, speeds resolution with online configuration data, and provides a summary of open tickets all in one place.

1.4 Overview Summary

The following sections provide details on how IBM Call Home, IBM Remote Support and IBM Storage Insights can help you benefit from these support features in your own IBM Spectrum Virtualize storage systems. These benefits include:

- 24/7 system monitoring
- Predictive health monitoring
- Automatic notification to you and IBM support in the event of a system error
- Faster diagnosis and time to resolution

This document covers call home and remote support for most models of FlashSystem and Storwize products running

This includes the following hardware products:

- IBM FlashSystem® 5000, 5100, 7200, 9100, 9200 and 9200R
- IBM Storwize® V5010, V5030, V7000 Gen 2 and Gen3
- IBM SAN Volume Controller® (SVC) Models DH8, SV1, SV2 and SA2

When using IBM FlashSystem V9000, please refer to IBM FlashSystem V9000 Remote Support Overview:

https://www.ibm.com/support/pages/node/656323

If you are using the V9000 with a model AE3 flash array, also refer to IBM FlashSystem FS900 & FS840 Remote Support Overview:

https://www.ibm.com/support/pages/node/656321

NOTE: Some older hardware models cannot upgrade to the latest v8.1 or higher software, due to hardware limitations. Please see the Spectrum Virtualize code compatibility matrix here for further information:

https://www.ibm.com/support/pages/node/690527

With the introduction of Spectrum Virtualize software v8.3.1.3 and v8.4.0 we now have the ability to add a customer web proxy server at the client site, which allows the Spectrum Virtualize systems to connect to the internet via this web proxy, rather than the direct connect to the internet which we had previously.

NOTE: Some models of the FlashSystem series are not able to run Spectrum Virtualize software v8.3.1.3 or v8.4.0 and thus will not have the function of the customer web proxy available. Please refer to the Spectrum Virtualize software v8.3.1.3 or v8.4.0 announcement letter for details.

To describe these functions, with and without the use of the customer web proxy, the following diagrams in the document have been grouped in sections with and without the customer web proxy function.

1.4.1 Call Home and Remote Support Connections Overview without Customer Web Proxy

Figure 1 is a summary chart that shows all the of the call home and remote support connections available **without** the customer web proxy.

Each of these options is described in more detail throughout this document.

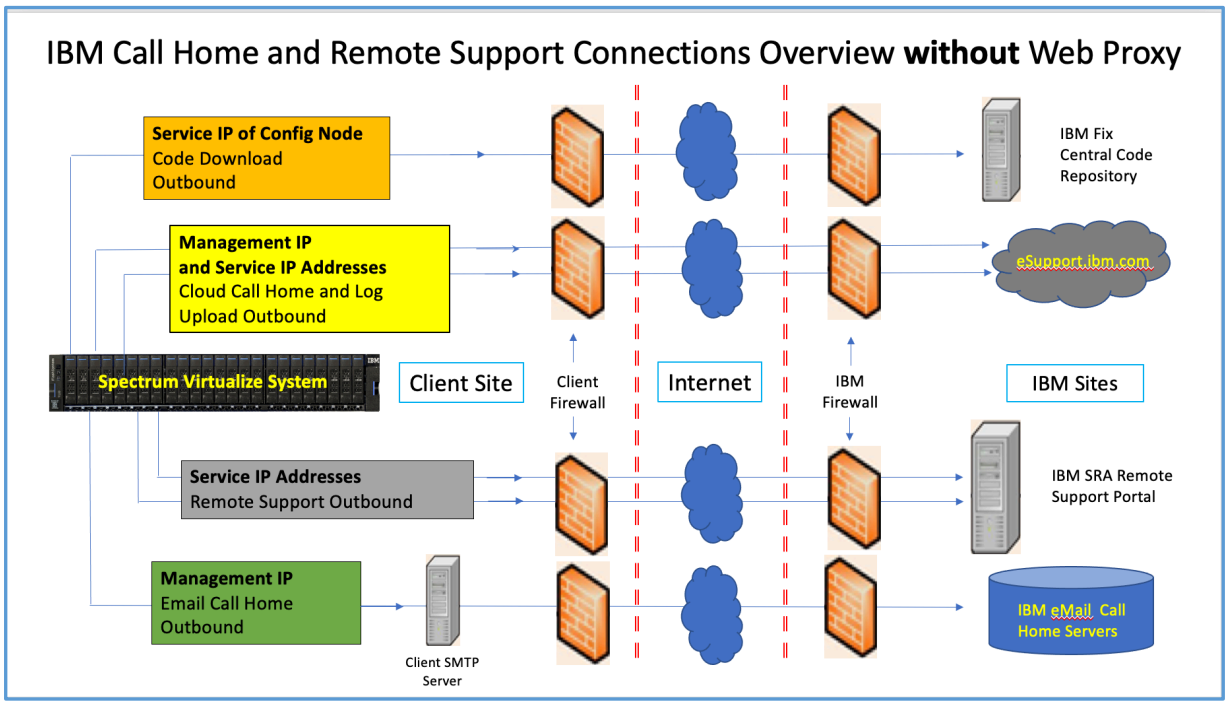

Figure 1. Call Home and Remote Support Connections Overview without customer web proxy

Call home and remote support, without web proxy, uses several network connections types to IBM for the various functions they provide as follows:

- Email call home sends email to your SMTP server over port 25
- Cloud call home using HTTS outbound via port 443
- Log and SNAP upload using HTTS outbound via port 443
- Remote support using SSH outbound via port 22
  - With Remote Support Center Proxy SSH outbound via port 443 – see Figure 3. Remote Support Connections Overview
- Code download using SFTP outbound via port 22

1.4.2 Call Home and Remote Support Connections Overview with Web Proxy

Figure 2 shows a summary chart of all the of the call home and remote support connections available **with** the customer web proxy.

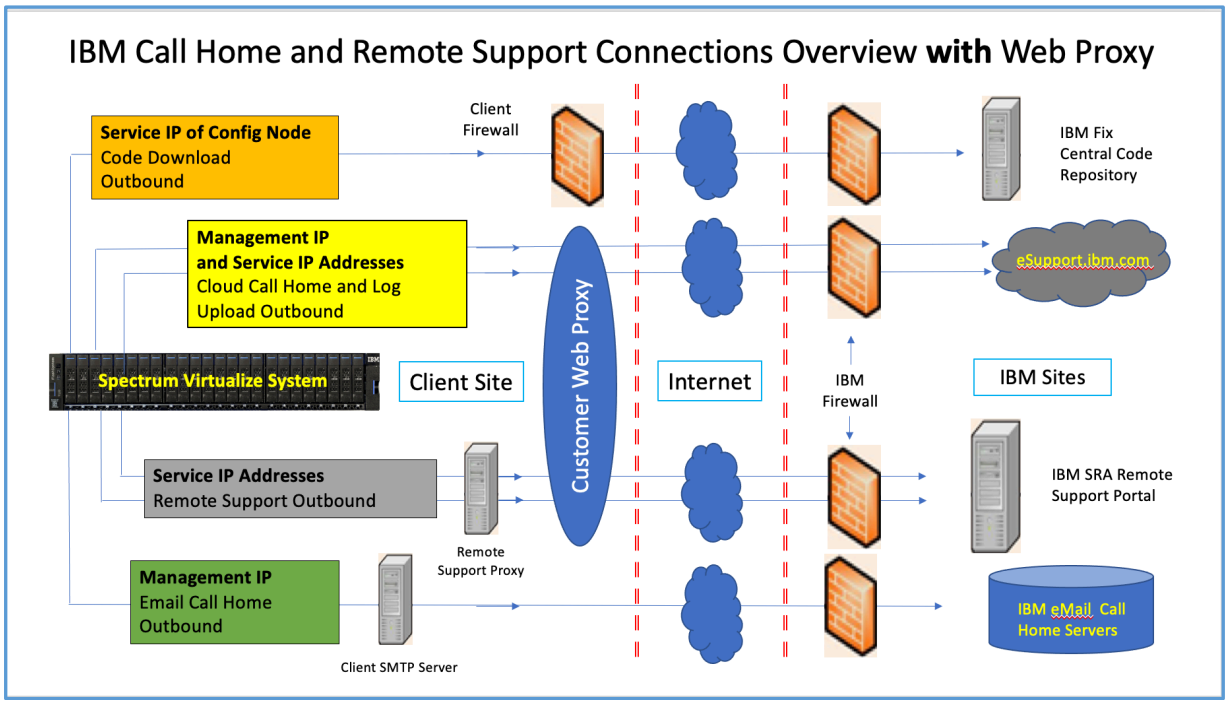

Figure 2. Call Home and Remote Support Connections Overview with customer web proxy

You can see here we have also included the Remote Support Center proxy which is mandatory if running the customer web proxy for remote support as well. This is an IBM supplied application that runs on a customer supplied server or VMware guest and adds extra capability for remote support functions, in addition to the customer web proxy.

Figure 3 shows only the connections for the Remote Support Proxy with both variations.

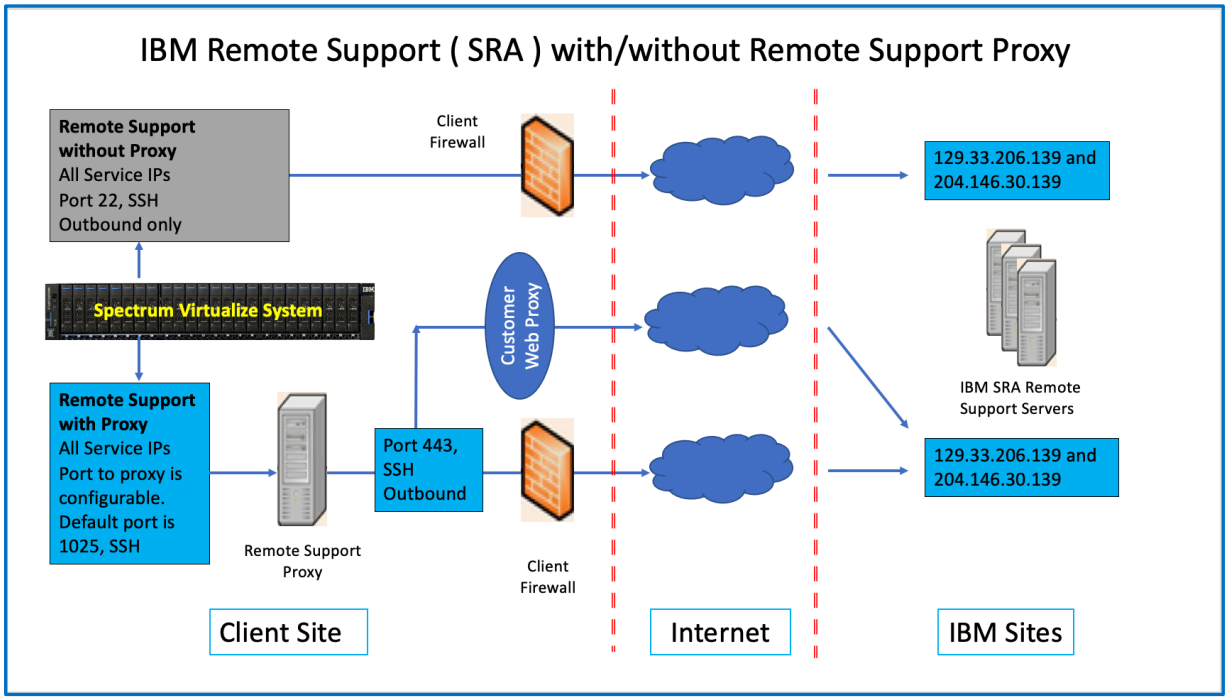

Figure 3. Remote Support Connections Overview

2.0 IBM Call Home Support

IBM is committed to servicing the IBM Spectrum Virtualize system in a secure and professional manner, whether it is warranty work, planned code upgrades, or repair of a component failure. By using call home, you minimize downtime and maximize efficiency. Predictive support is enabled allowing IBM support professionals to proactively resolve problems before a potential failure occurs

The call home function relies on a communication path back to IBM via email or REST API's.

Figure 4 shows the connections for both the cloud call home and email call home functions, when not using the customer web proxy function.

Note the cloud call home uses the management IP address, whereas the service IP addresses are required for the log upload function.

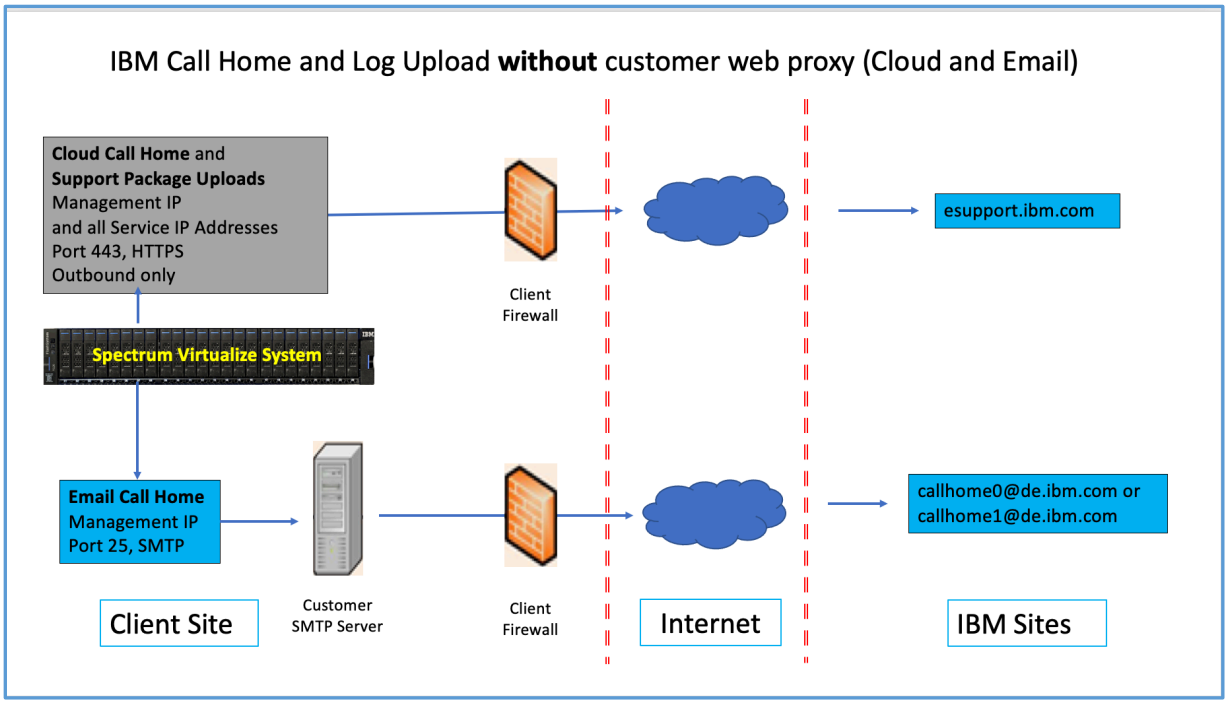

Figure 4. IBM Call Home and Log Upload without customer web proxy (Cloud and Email)

2.1 IBM Cloud Call Home

IBM Cloud Call Home utilises RESTful API to provide the most reliable call home method available today. These are industry standards for transmitting data through web services. The cloud call home adoption of this standard provides a better delivery mechanism of messages to the IBM call home servers. This way is not affected by spam filters or other technologies preventing IBM from receiving the call home messages.

Cloud call home is a key building block which IBM will continue to enhance by providing more predictive support. These features will not be available to clients using email call home. Cloud call home is the preferred call home method for the IBM Spectrum Virtualize products, to ensure the most optimal end-to-end reliable delivery mechanism.

Table 1 lists requirements that need to be met to successfully configure the cloud call home function.

Table 1: Requirements for Cloud Call Home Configuration

Call Home configuration requirement	**Value**	**Comment**
Customer Firewall port	443 Outbound Uses HTTPS and TLS for data transmission	The IBM support server must be reachable on port 443 from the management IP address..
IBM destination address	esupport.ibm.com	This destination address is the IBM strategic portal for all cloud-based call home requests.
DNS Server	Customer supplied	IP Address of a DNS server if native IBM support IP addresses not used

2.2 Cloud Call Home Customer Web Proxy

With the release of Spectrum Virtualize software v8.3.1.3 and v8.4.0, we now have a customer web proxy function that allows the cloud call home events, inventories and the log data upload function to be routed via a customer supplied web proxy. The advantages of this are:

- Reduced configuration for network administrator
- Cluster IP not disclosed to internet traffic - proxy can generate the IP
- Latest operation systems patches to proxy benefits all clusters connected through it
- History trail of support data sent to IBM
- Police contents by inspecting traffic via proxy

Figure 5 shows the connections for both the cloud call home and email call home functions, when using the customer web proxy function.

Note the cloud call home uses the management IP address, whereas the service IP addresses are required for the log upload function.

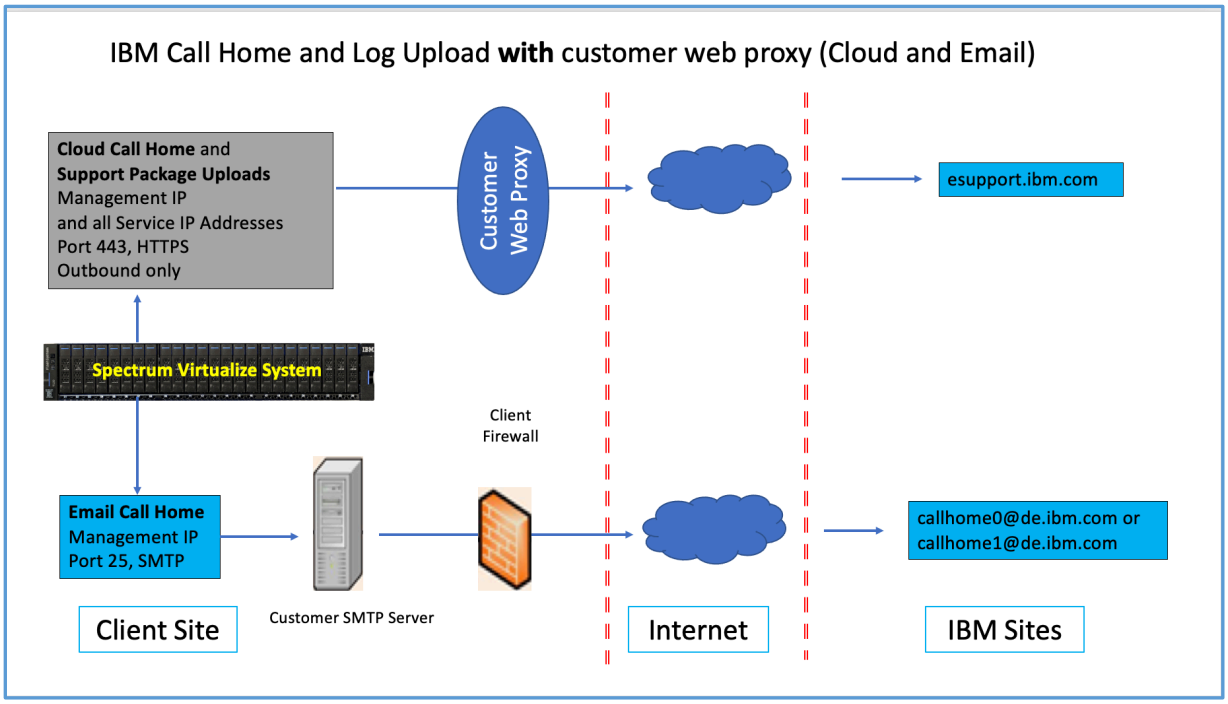

Figure 5. IBM Call Home and Log Upload with customer web proxy (Cloud and Email)

Considerations for use with customer proxy are each cluster needs a DNS server configured via a proxy URL entry name (not IPv4/IP6 ID)

Please note that the transmission of the data to IBM is fully encrypted as shown in Figure 6 below.

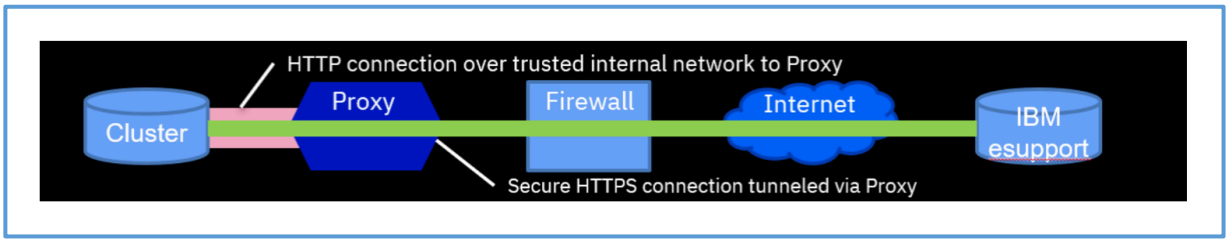

Figure 6 Data Encryption path from a Spectrum Virtualise cluster to IBM eSupport.

Figure 7 shows the connections to multiple Spectrum Virtualize systems and how these take advantage of the customer web proxy function, in that there is only one connection out to the internet.

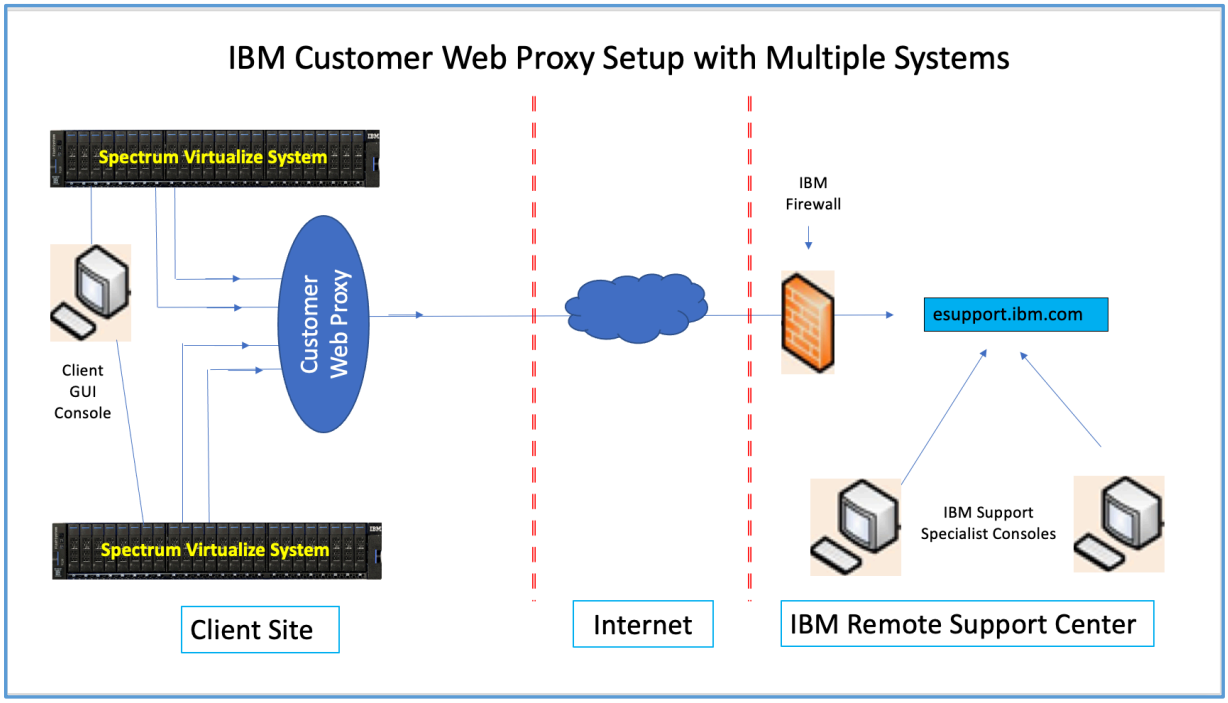

Figure 7. Customer Web Proxy showing connections to multiple system

The setting up of the DNS server and connection to the customer proxy server is performed either via the CLI command or via the GUI as shown below.

The following screens images have been split to improve the image clarity. On the actual machine they will displayed like this as shown in Figure 8.

Note: The term “customer web proxy” is also referred to as the “Internal Web Proxy” in the FlashSystems GUI panels shown on the following screens.

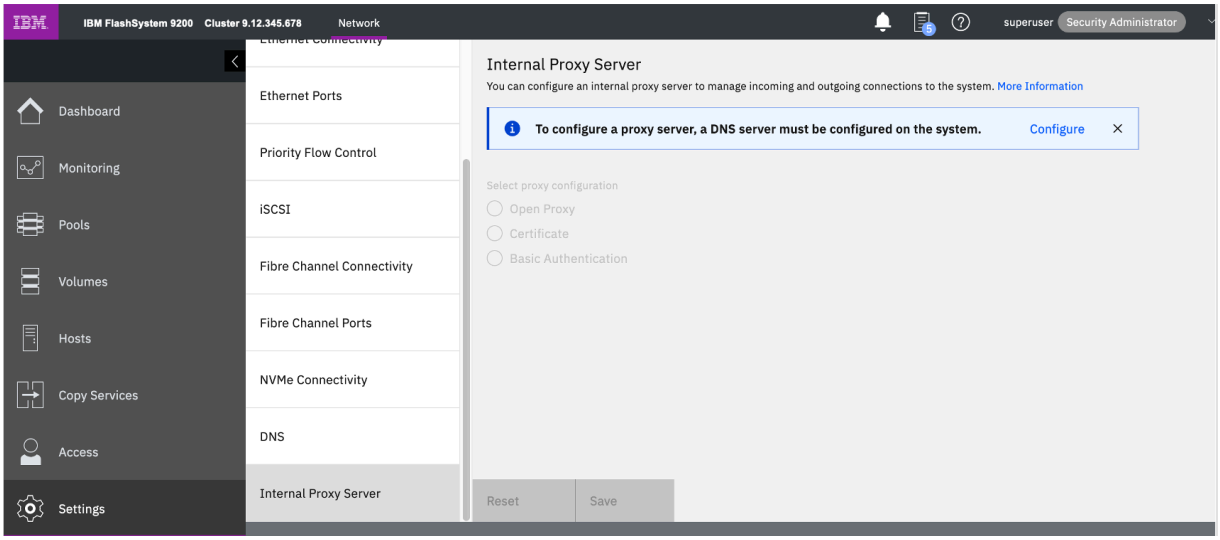

Figure 8. Full screen image example for the customer web proxy set-up

From the main GUI menu, select Settings >> Network >> Internal Proxy Server as shown in Figure 8. Full screen image example for the customer web proxy set-up. Then move on to config as shown in Figure 9. Setting up the connection of the system to the customer proxy server (1 of 2) and Figure 10. Setting up the connection of the system to the customer proxy server (2 of 2)

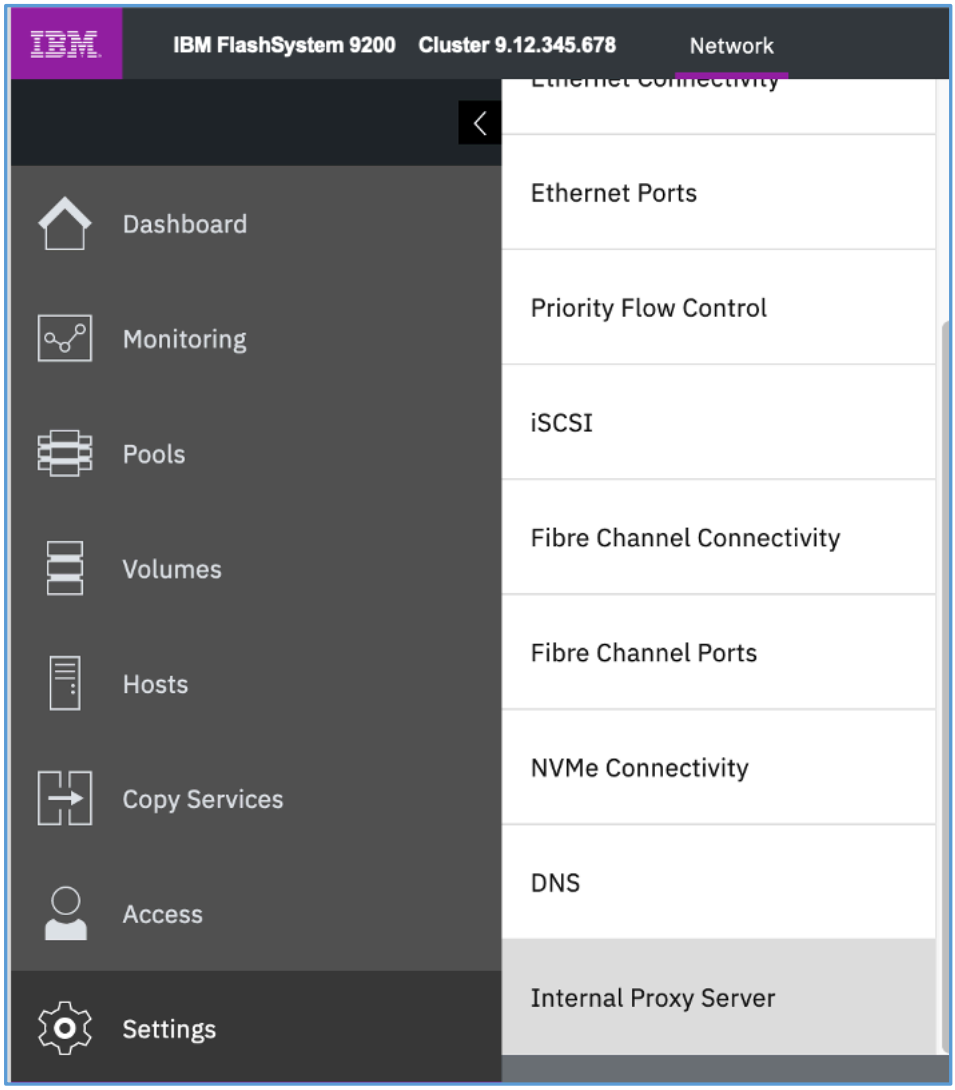

Figure 9. Setting up the connection of the system to the customer proxy server (1 of 2)

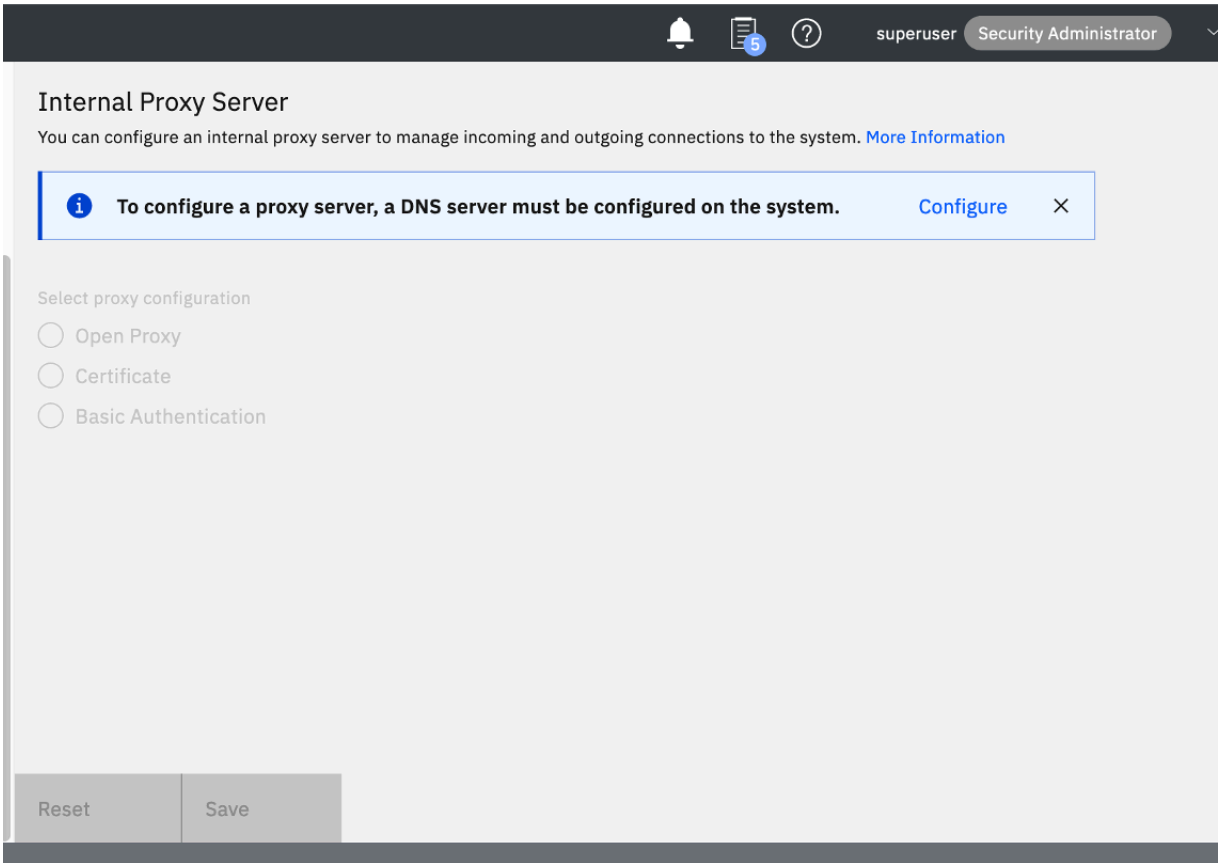

Figure 10. Setting up the connection of the system to the customer proxy server (2 of 2)

If a DNS Server needs setting up, then click on the “Configure” button and complete the details as shown in Figure 11. Setting up the DNS server.You may add more than one DNS server by clicking on the “+” symbol and adding the details of the extra servers.

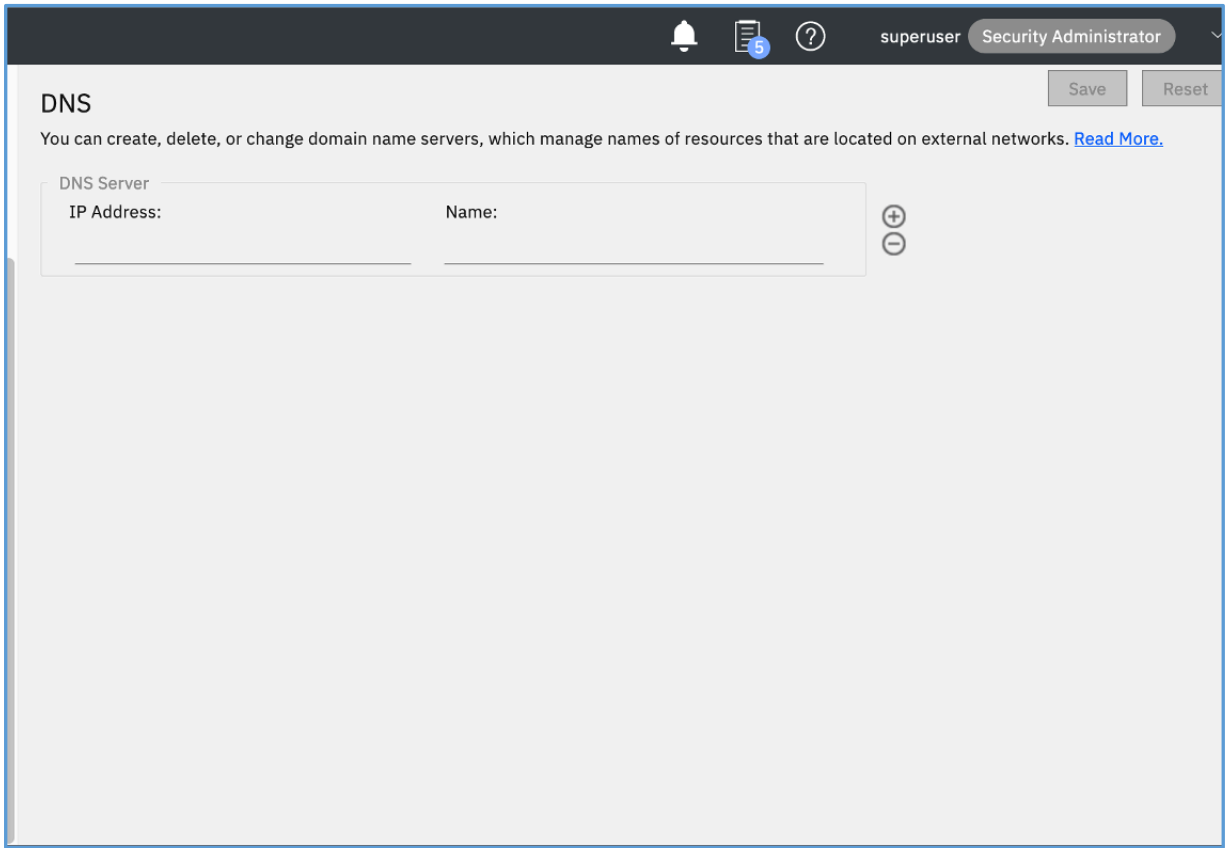

Figure 11. Setting up the DNS server

When completed and saved, the screen shown Figure 12. Setting up the customer web proxy server can be completed and the type of proxy connections also specified.

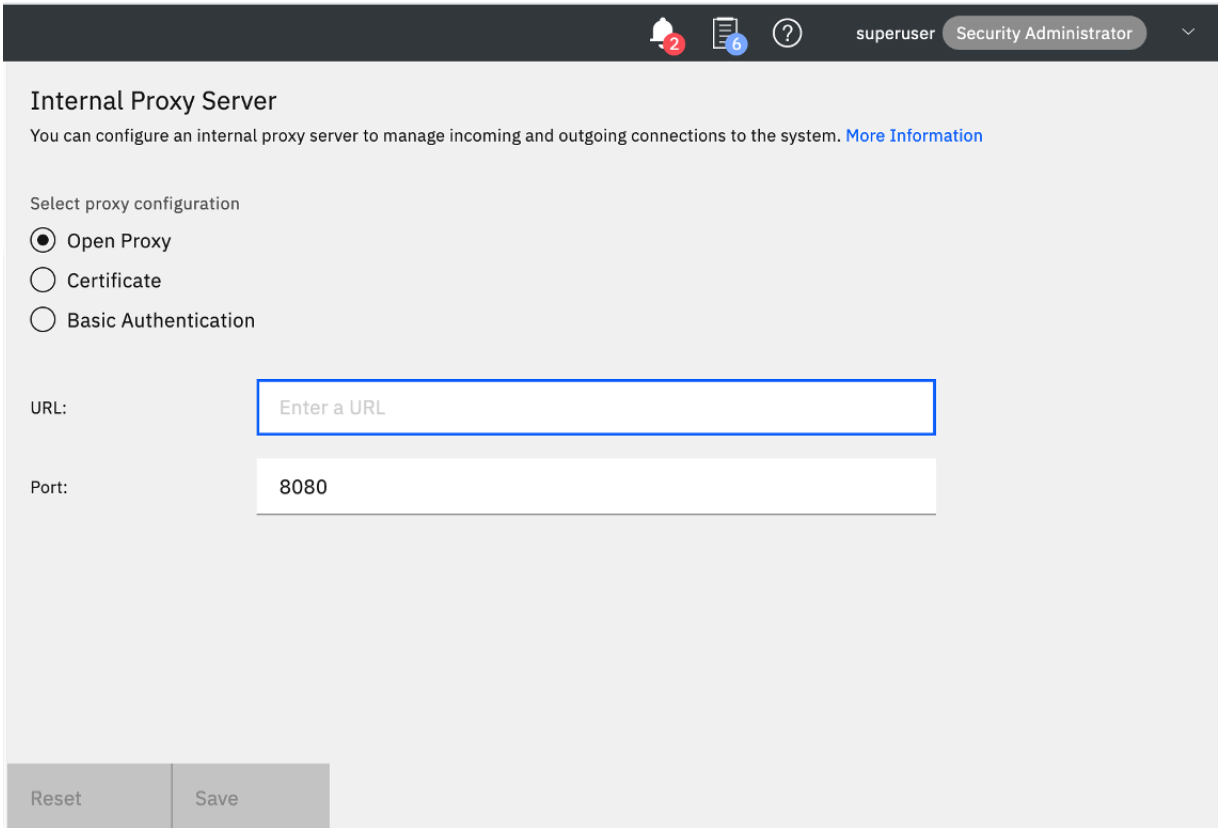

Figure 12. Setting up the customer web proxy server

2.3 Email Call Home

To utilise the email call home option, you must have an SMTP email system available that the Spectrum Virtualize system can use to send outgoing call come emails to IBM. Table 2 lists requirements that need to be met to successfully configure the email call home function.

Important: It is the customer's responsibility to configure the SMTP email system to enable IBM Spectrum Virtualize system to send outgoing emails for the call home function. The email configuration rules must not inhibit call home emails from being sent in real time. For example, IBM Spectrum Virtualize system emails must not be placed in a queue for later delivery or filtered for priority. The administrator must verify correct configuration and function of the email system before installation. Failure to verify the email system might delay the successful implementation of Call Home.

Table 2: Requirements for Email Call Home Configuration

Call Home configuration requirement	Value	Comment
Customer SMTP port	Default: 25 Outbound	The customer SMTP server must be reachable from the management IP address. If the customer wishes, the outbound port number can be changed from the Settings->Notifications menu.
Customer email server address	IP address	This IP address is supplied by the customer.
Email destination address	callhome0@de.ibm.com or callhome1@de.ibm.com NOTE 1	Customer SMTP server must allow relaying to the following IBM email address.
Email source address	customer-defined (Spectrum Virtualize Name@company.com)	The email address of the Spectrum Virtualize system, from which the email is sent. This email address can be customer-defined to conform to the customer email relay rules.

Notes

1) The selection of the IBM call home address is based on locale of where the machine is installed. The GUI will automatically reassign this address based on the following criteria:
   - For products located in North America, Latin America, South America or the Caribbean Islands, its uses callhome1@de.ibm.com
   - For products located anywhere else in the world, it uses callhome0@de.ibm.com

Call home for the IBM Spectrum Virtualize products is designed to always use cloud call home as the primary method and email / SMTP as the secondary one or backup method. If both cloud call come and email call home are configured, the system will use cloud call home as long as it is available.

2.4 Inventory Records

IBM strongly encourages call home to be configured to send inventory information to IBM. This is called an inventory call home and contains only contains basic product information. IBM uses this information to verify that the storage system is operational and capable of calling home an error. Additionally, support services will check the configuration against a list of known issues and best practices and will send

notifications to you using the Storage Insights “Advisor” tab (see section 4.0 for more information). Critical issues will generate a support ticket and you will be contacted by a support representative.

The predictive support technology is reliant on having a complete picture of the system to give the most helpful and accurate alerts. This detailed configuration data is only sent to IBM if you enable the “Configuration Reporting” feature (which is enabled by default). This can be set on as shown in the GUI screen below in in Figure 2 below.

The feature is also known as enhanced inventory call home.” and if you have a concern or question about what is being sent to IBM, you can configure the system to email you a copy of the inventory call home.

This configuration data is always sanitised to remove IP addresses, usernames etc. If you are still concerned, we encourage you to enable “censor” mode - which removes all object names from the configuration (e.g. the volume names). This can be configured by ticking the checkbox at the bottom of the screenshot below as shown Figure 13. Enhanced Inventory Reporting.

Enabling the additional censoring allows you to continue to benefit from the automated analytics and predictive support processes which would be lost if you disable the configuration reporting entirely. However, adding this censoring can sometimes delay the failure before invoking this feature.

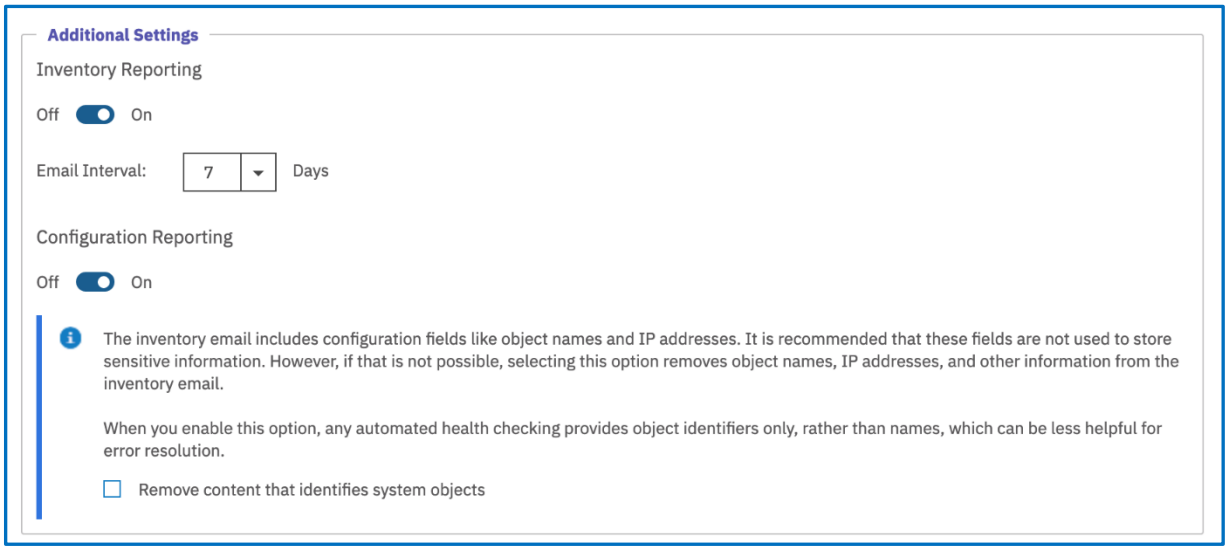

Figure 13. Enhanced Inventory Reporting

2.5 Information sent to IBM via Call Home

The only data provided to IBM is machine specific information essential in the diagnostic and repair process. The information *does not* include any of the data stored on the storage array.

The machine specific information transmitted includes machine type, model, serial number, customer contact information and specific details related to the configuration and health of the storage system. In the case of a call home event, this data will also include specific error codes.

Although troubleshooting is the primary reason for sending call home data, IBM may also use the information to improve products and services. Additionally, individualized analysis of call home data enables customized assistance from IBM Support team, such as proactive account management and applicable code upgrades.

See Appendix A for a detailed list of inventory, enhanced inventory and call home data contents.

3.0 IBM Remote Support

Remote access to your storage system is the most interactive level of assistance from IBM. After a review of the diagnostic data, direct interaction with your IBM Spectrum Virtualize system may be necessary to resolve your issue. To minimize system downtime and provide the most efficient support session, an IBM support engineer may request access to your storage system. Depending on the severity of the issue, remote access to the system can provide enhanced problem resolution or minimize the effects of an impacting event, while a service representative is dispatched to the local worksite

To provide remote assistance to IBM Spectrum Virtualize storage systems, IBM authorized support engineers use IBM Secure Remote Access (SRA) protocol the network interface. IBM Support engineers can neither access nor see customer data during a Remote Support session. Remote access is always subject to customer approval and can be revoked at any time by the customer.

The following sections describe the SRA management system in more detail.

3.1 Remote Support Prerequisites

To perform remote support, the IBM Spectrum Virtualize system must be able to initiate an outbound SSH connection to IBM.

If the system does not have direct access to the Internet (for example, due to customer firewall restrictions or policies), you can use the IBM Remote Support Center Proxy to facilitate the connection to IBM (see section 3.3 for more information).

Important: The type of access that is required for a remote support connection is "**outbound port 22/ssh**" from IBM Spectrum Virtualize system network ports.

The IBM Spectrum Virtualize system version 8.1 and higher, has the following IP addresses built into its code that are the target outbound addresses it uses:

- 129.33.206.139
- 204.146.30.139

3.2 Remote Support Components

IBM Secure Remote Access consists of three components:

- IBM Remote Support is a software component within the IBM Spectrum Virtualize system version 8.1 (and above) that handles remote support connectivity. It relies on a single outgoing Transmission Control Protocol (TCP) connection and is not able to receive inbound connections of any kind. The remote support client is controlled by using the GUI or the command-line

interface (CLI) commands and starts a connection, terminates a connection (due to timeout or customer request), and attempts to reconnect when the connection is terminated unexpectedly.

- The front servers are a hub at which the storage system and the remote support back server connect. The front servers receive and maintain connections from the remote support client and the back server. The front servers are strictly inbound and do not initiate any outbound communication.

  NOTE: No sensitive information is stored on the front server, and all data passing through the front server from the client to the back server is encrypted, so the front server, or a malicious entity in control of a front server, cannot access this data.

- One or more back servers are located within the IBM intranet. Only IBM service representatives that are authorized to perform remote support of the storage system can access these servers. The back server authenticates the IBM service representative, provides the IBM service representative with a user interface through which to choose a system to support, and manages the remote support session. The IBM service representative connects to the back server by using a Secure Shell (SSH) client or an HTTPS connection with any browser.

Figure 14. Remote Support Proxy overview shows the setup of the remote support with and without the use of the proxy

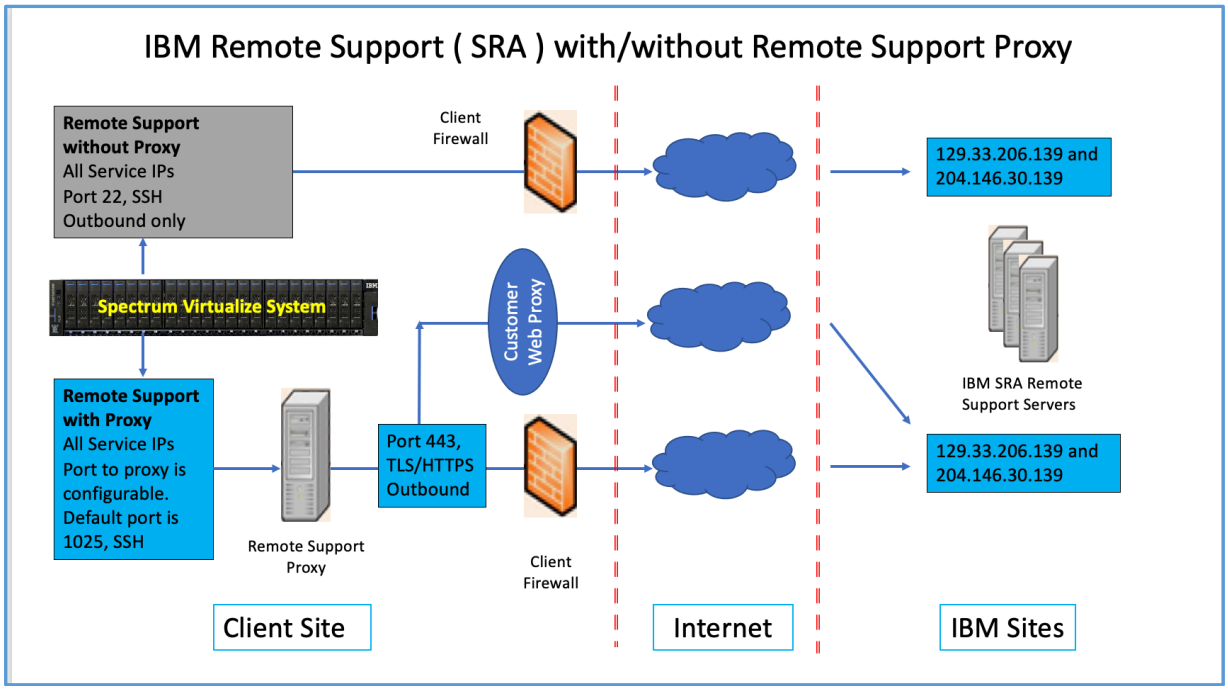

Figure 14. Remote Support Proxy overview

3.3 Remote Support Center Proxy (optional)

The remote support system for IBM storage systems requires TCP/IP communication between the storage system and the IBM Secure Remote Access. When a storage system does not have direct access to the Internet (for example, due to customer security firewall) rules etc , you can use the Remote Support Center Proxy to facilitate that connection. This solution is also useful where the customer has several systems in the datacentre needing access to IBM remote support and call home services. It allows several systems to connect to it and one outbound connection to IBM, via the internet.

The IBM Remote Support Center Proxy utility creates a network proxy that connects one or more IBM storage systems to IBM remote support servers in the IBM Secure Remote Access. It establishes a service on a Linux system that has Internet connectivity to the IBM Secure Remote Access and local network connectivity to the storage system. The connection to the IBM Secure Remote Access is initiated by the storage system through its management graphical user interface (GUI) or command-line interface (CLI).

The figure above illustrates a typical network configuration that uses the Remote Support Center Proxy. The communication between the storage system and the Remote Support Center Proxy uses Secure Shell (SSH). The communication between the Remote Support Center Proxy and the Remote Support Center is encrypted with an additional layer of security.

Figure 15. Remote Support Proxy with multiple systems shows an overview of the Remote Support Center Proxy and the ability to have one or more Spectrum Virtualize systems using this function.

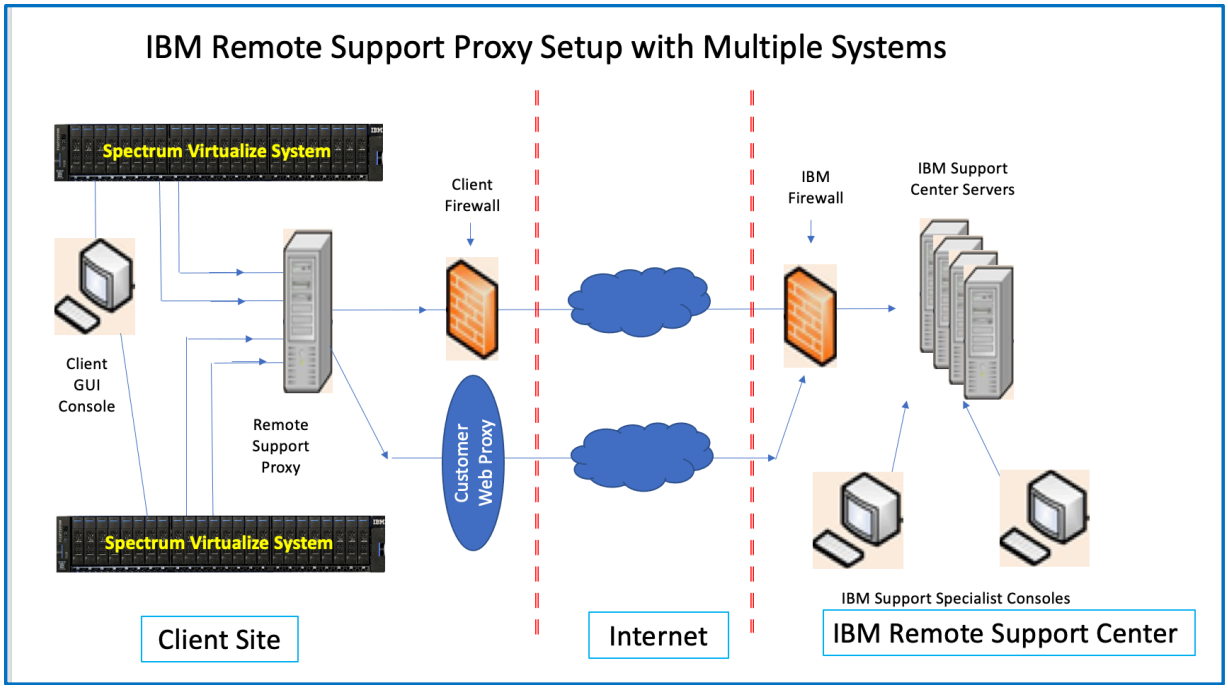

Figure 15. Remote Support Proxy with multiple systems

For installation, management, and release notes of the Remote Support Proxy, please turn to the IBM Documentation Center for IBM Spectrum Virtualize System the customer has installed. Alternatively, it can be accessed and downloaded via this link here:

https://www.ibm.com/support/pages/node/6262375

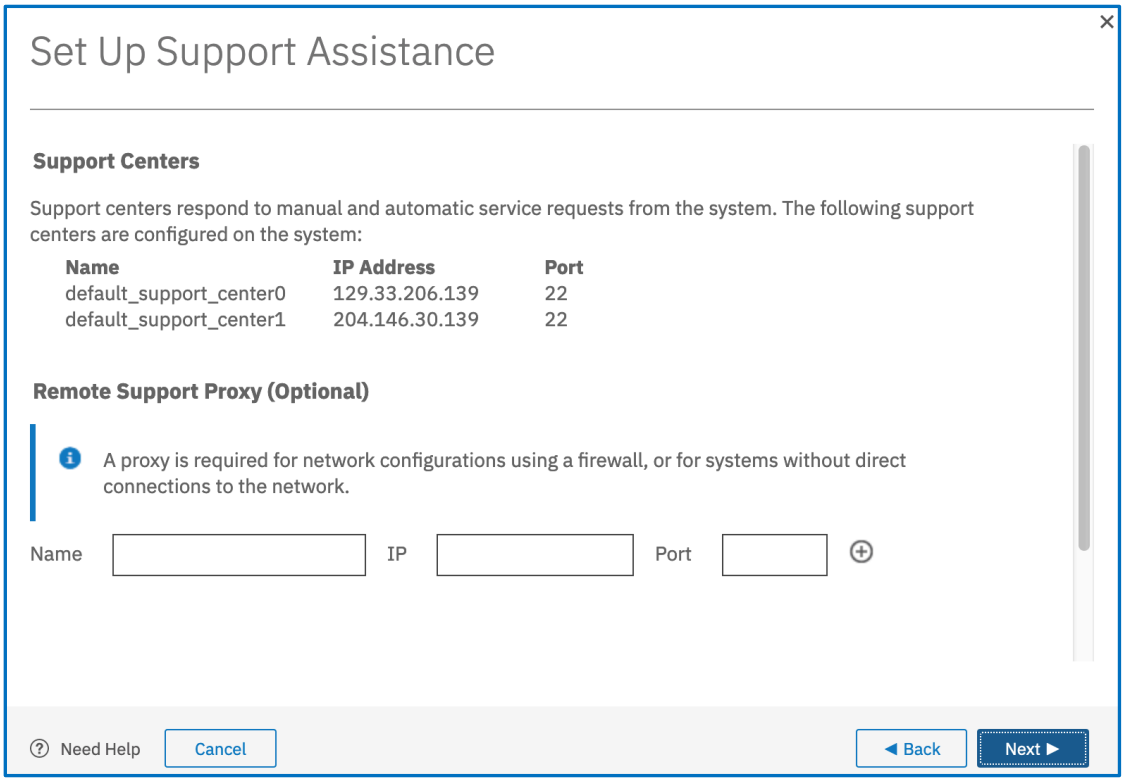

Figure 16. Support Setup Assistance

Figure 16 shown above is the remote support configuration wizard dialog from the IBM Spectrum Virtualize system GUI. It illustrates the IBM remote support servers (IP address, port), as well as how you would capture the information of the proxy that you can optionally use.

3.4 Remote Support Security Features

Security and privacy are fundamental concerns when granting remote access to support personnel. Remote support relies on standard, proven security technologies and was designed to meet these security concerns.

The following features ensure that the data being exchanged between you and the IBM support engineers are completely secure:

- Encryption of all data flowing from the customer system to the remote support servers.
- Front servers are security-hardened machines and strictly inbound. No sensitive information is ever stored on them and they cannot access the encrypted data that are passing through them.

For those instances, where IBM Spectrum Virtualize System support personnel need to log into a system remotely for a real time diagnostic session, the following security features are handled by the logic of the back server within the IBM Intranet:

- Access control
- Authentication logic: Only authorized support personnel is eligible for remote support tasks.
- Audit logging and managing of the support session
- Connection to the back server is only possible through Secure Shell (SSH) client or an HTTPS connection via any browser.

Remote access is always subject to customer approval, and can be revoked at any time by the customer

Once you decide to enable remote support on your system, you have the choice between:

- Always on
- For a specified, limited amount of time

IBM strongly suggests enabling remote support during installation of the system, while IBM SSR personnel is still onsite to guide you, as well as to test the remote support capability. Figure 17 shows the first panel of the support setup wizard.

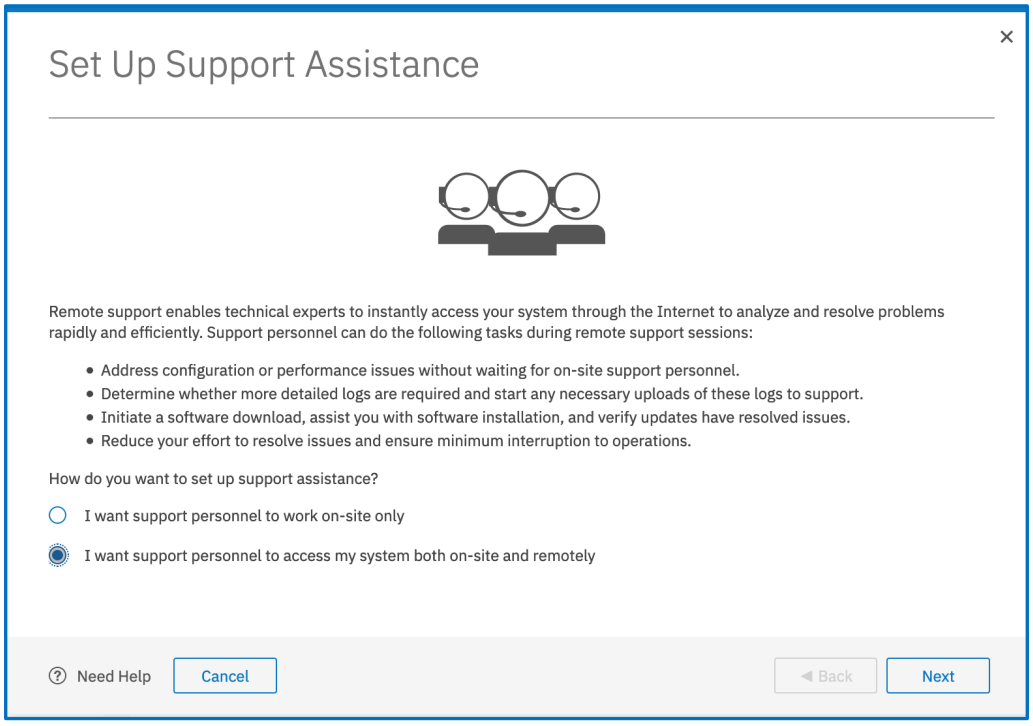

Figure 17. Support Setup Configuration

Figure 18 shows the final page of the remote support configuration wizard, allowing you to select the time setting you prefer. You can always return to the wizard and reconfigure if your preferences change. The example shown is selecting to use a specific time duration, and below is what the screen looks like when using a time window to control how long to permit remote support.

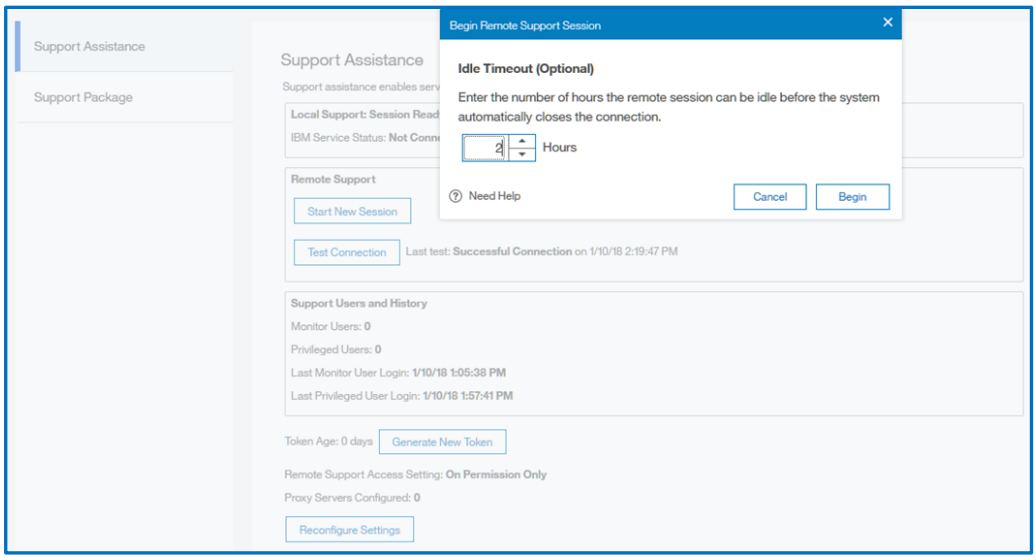

Figure 18. Support Connection Time Selection

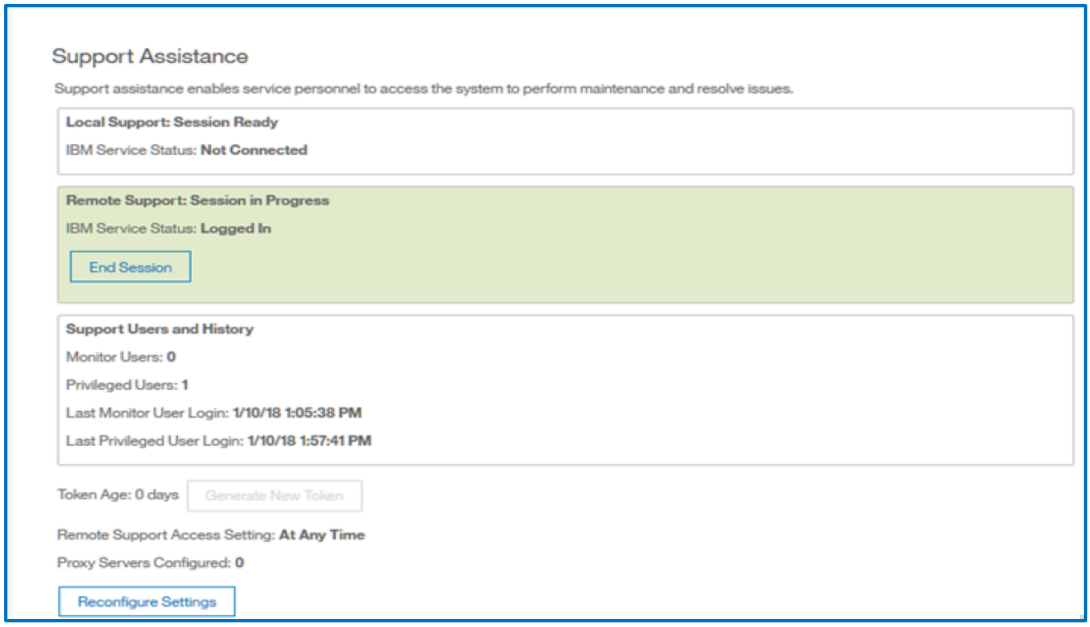

Figure 19. Support Connection Monitor

Figure 19 shows you can monitor any IBM Remote Support sessions from that same GUI panel, as well as take action and “End Session” at any time.

You will also be able to see if a remote support session is active on any GUI screen, with a banner message visible at the top on the screen, as shown in Figure 20.

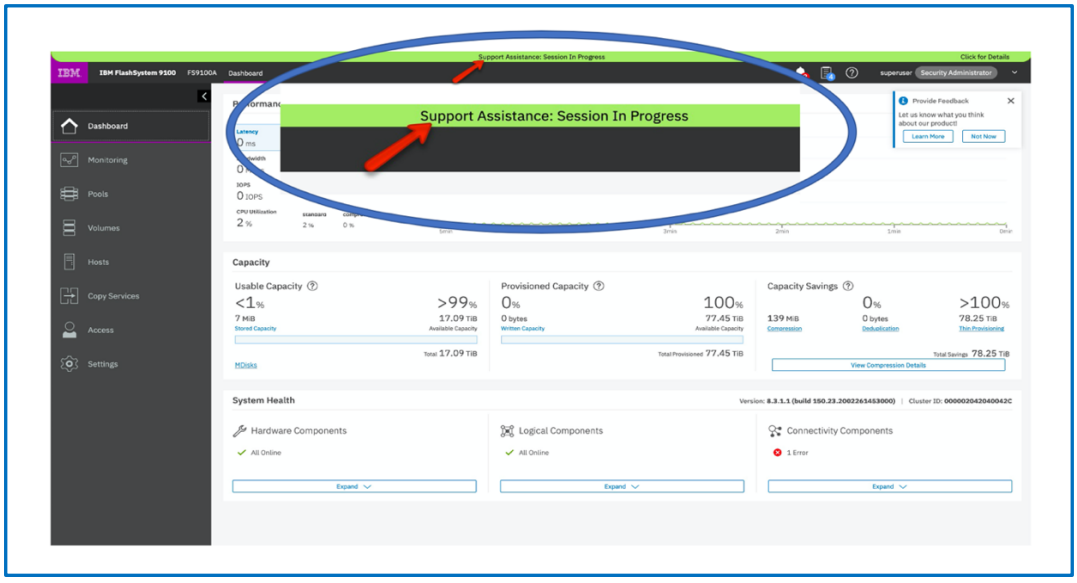

Figure 20. Remote Support Active Banner

4.0 IBM Storage Insights

IBM Storage Insights is a cloud-based service that provides a single dashboard giving you an overall view of all your IBM block storage.

4.1 Dashboard

Figure 21 shows an example of the Storage Insights Dashboard page, displaying a one stop overview of the customers IBM block storage estate.

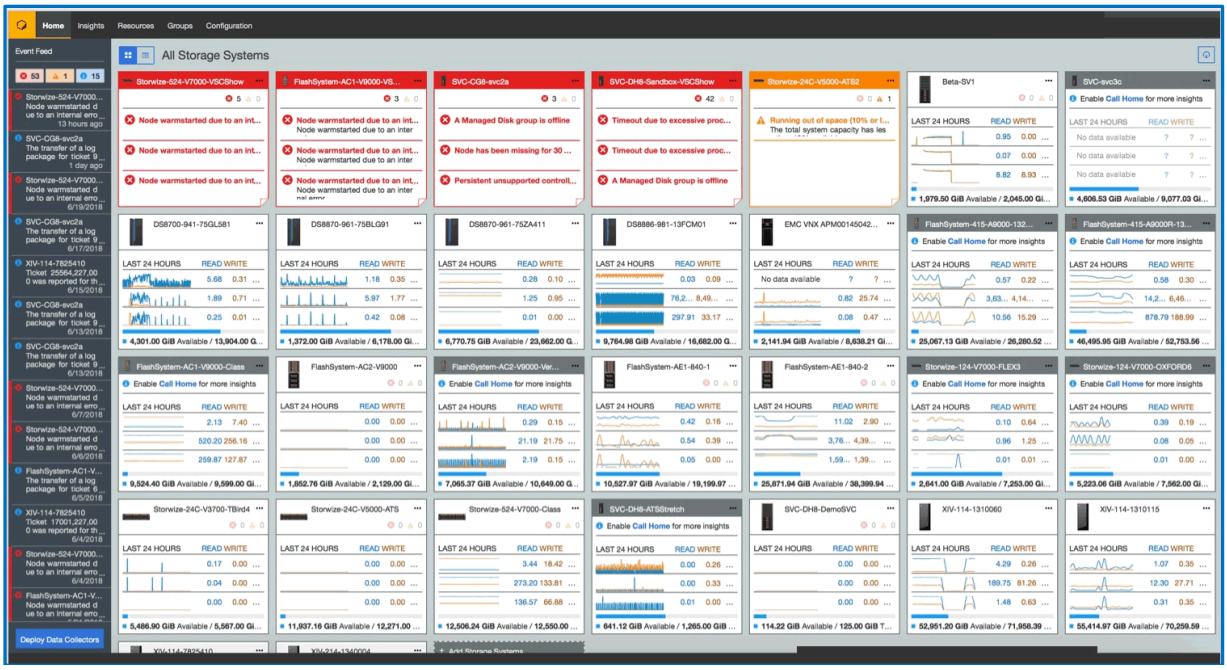

Figure 21. Storage Insights Dashboard

Some of these features are:

- A unified dashboard view of IBM storage systems
- Provides real-time system reporting of capacity and performance.
- Overall storage health and preferred best practices.
- System resource management and proactive recommendations
- View support tickets, open and close them, and track trends.
- Autolog collection capability and send to IBM speeds up time to resolve the case.

4.1 Data Collection

IBM Storage Insights is a cloud service offering that uses a data collector installed at the customer site. The data collector is a lightweight application that collects and

sends asset, configuration, capacity, and performance metadata to the IBM cloud. The data can then be viewed and analysed by both you and IBM.

Collection of metadata from the storage systems is added by the customer providing the name and password of a user with privileges to collect the metadata. The credentials that are provided are encrypted before they are stored in the database for the instance, and the database is also encrypted. Communication from the storage systems to the data collector is via SSH on port 22 inbound to the device.

All communication between the data collector and the IBM Storage Insights data center uses encryption based on HTTPS. The communication between the data collector and the IBM Storage Insights GUI also uses HTTPS connections. HTTPS connections are signed by DigiCert Inc., which uses TLS 1.2 with 128-bit keys.

The data collector application can run on any computer that can access the internet over an outbound TCP connection to port 443. Port 443 is the standard port for HTTPS connections. Figure 22 shows the data collection overview for Storage Insights.

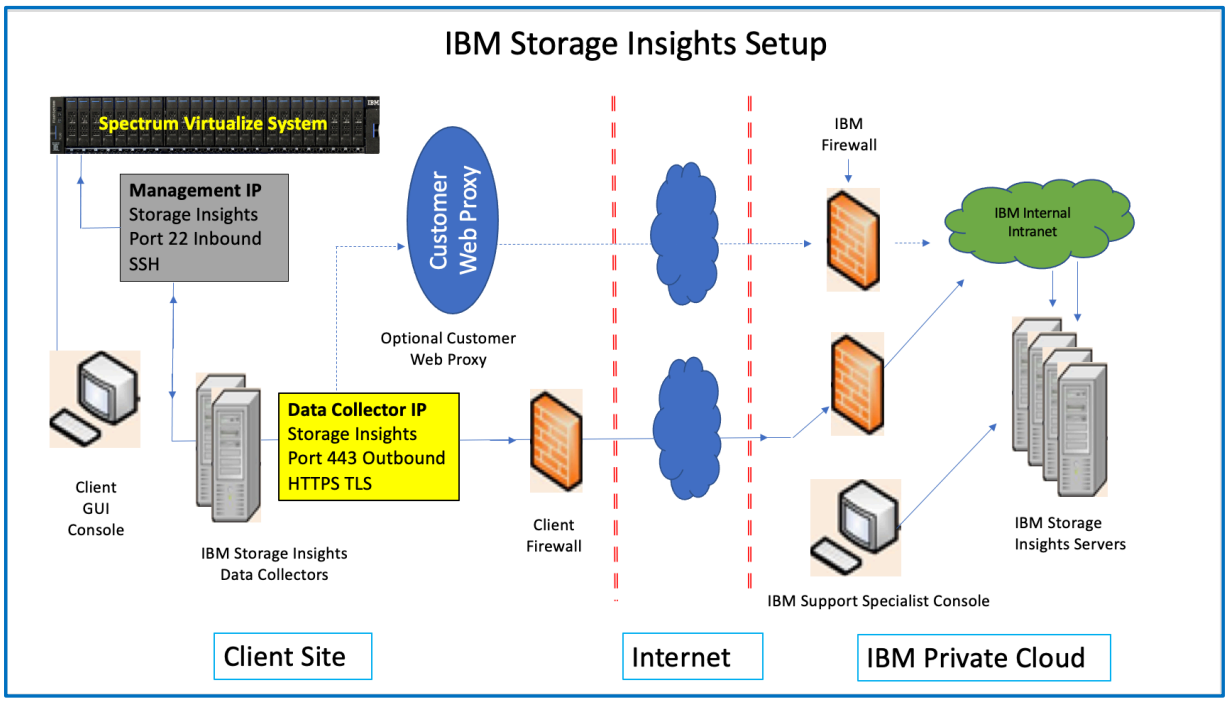

Figure 22. Storage Insights Data Collection Overview

Storage Insights also uses elements of the cloud call home data sent in to further enhance its reports.

In addition to the no-charge version of Storage Insights, IBM also offers Storage Insights Pro, which is a subscription service that provides additional features. These

include longer historical views of data, more reporting and optimization options and support for other storage products.

4.2 Useful Information

For more information about IBM Storage Insights (SI), see the following websites. The last link can be used to register for this free service.

- Fact Sheet >> https://ibm.biz/insightsstart
- Demonstration >> https://ibm.biz/insightsdemo
- IBM Storage Insights Security Guide >> https://ibm.biz/insightssecurity
- IBM SI Documentation Center >> https://ibm.biz/insightsknowledge
- Registration >> https://ibm.biz/register

Appendix A: Heartbeat data contents and Call Home examples

This appendix illustrates the nature of the information sent home during inventory data sending and call home, using actual records transmitted by IBM Spectrum Virtualize System. There are 3 examples shown here:

- Inventory data
- Enhanced inventory data
- Call home event

The following list outlines all information sent by the IBM Spectrum Virtualize System along with a **daily regular inventory:**

- Timestamp of Record
- Customer contact information (name, address, phone number, email address, country…)
- System name and serial numbers
- Code version and cluster address
- Time zone of the system
- Cluster VPD
  (detailed information about the hardware levels of the system, usage and free space)

A.1 Example of a Daily Inventory Record

The following shows an example of a Daily Inventory record:

```
# Timestamp = Mon Mar 2 02:00:03 2020
# Timezone = +0000, GMT
# Organization = IBM Development Labs
```

```
# Machine Address = Hursley
# Machine City = Winchester
# Machine State = XX
# Machine Zip = PO2 3AL
# Machine Country = GB
# Contact Name = Storage
# Alternate Contact Name = N/A
# Contact Phone Number = +123456789
# Alternate Contact Phone Number = N/A
# Offshift Phone Number = +123456789
# Alternate Offshift Phone Number = N/A
# Contact Email = IBM_FS9150@ibm.mgsops.com
# Machine Location = Datacentre
# Machine Type = 9848AF8
# Serial Number = 78E0099
# Machine Part Number =
# System Version = 8.2.1.8 (build 147.19.1911061502000)
# Record Type = 6
# Frequency = 1
# Cluster Alias = 0x204204006ea
# IBM Customer Number =
# IBM Component ID =
# IBM Country Code =
# Spectrum Virtualize Unique ID = 204206006ea

# Cluster VPD:

id:00000204204006EA
name:IBM-FS9150
location:local
partnership:
bandwidth:
total_mdisk_capacity:430.9TB
space_in_mdisk_grps:430.9TB
space_allocated_to_vdisks:278.17TB
total_free_space:152.7TB
statistics_status:on
statistics_frequency:1
required_memory:196608
cluster locale: en_US
time_zone:375 Europe/London
code_level:8.2.1.8 (build 147.19.1911061502000)
FC_port_speed:8Gb
id_alias:00000204204006EA
gm_link_tolerance:300
gm_inter_cluster_delay_simulation:0
gm_intra_cluster_delay_simulation:0
```

```
email_reply:IBM_FS9150@ibm.mgsops.com
email_contact:Storage
email_contact_primary:+123456789
email_contact_alternate:+ :+123456789
email_contact_location:Datacentre
email_state:running
inventory_mail_interval:1
total_vdiskcopy_capacity:359.07TB
total_used_capacity:278.05TB
total_overallocation:83
total_vdisk_capacity:359.07TB
iscsi_auth_method:none
auth_service_configured:yes
auth_service_enabled:yes
auth_service_pwd_set:no
auth_service_cert_set:no
relationship_bandwidth_limit:25
gm_max_host_delay:5
tier:tier0_flash
tier_capacity:430.87TB
tier_free_capacity:151.69TB
tier:tier1_flash
tier_capacity:0.00MB
tier_free_capacity:0.00MB
tier:tier_enterprise
tier_capacity:0.00MB
tier_free_capacity:0.00MB
tier:tier_nearline
tier_capacity:0.00MB
tier_free_capacity:0.00MB
email_contact2:
email_contact2_primary:
email_contact2_alternate:
total_allocated_extent_capacity:279.18TB
has_nas_key:no
auth_service_type: ldap
layer: storage
rc_buffer_size:48
cache prefetch: on
email organization: IBM Development Labs
email_machine_address: IBM Hursley
email_machine_city: Winchester
email_machine_state:XX
email_machine_zip:PO2 3AL
email_machine_country:GB
high_temp_mode: off
```

```
# End
```

NOTE: there is a lot more data sent detailing each individual hardware component in the system, but this has been left out to save space in this document. The full example can be made available on request.

A.2 Example of a Call Home Event

The following shows an example of a call home of a single event via e-mail (SMTP):

```
Date: Mon, 3 March 2020 00:14:36 -0000
From: Tester@uk.ibm.com
To: call home1@de.ibm.com
Subject: 2145 Error Notification (Power42)

# Organization = IBM
# Machine Address = Hursley Labs
# Machine City = Winchester
# Machine State = NA
# Machine Zip = PO2 3AL
# Machine Country = UK
# Contact Name = Dave
# Alternate Contact Name = N/A
# Contact Phone Number = 5551234
# Alternate Contact Phone Number = N/A
# Offshift Phone Number = 5551234
# Alternate Offshift Phone Number = N/A
# Contact Email = Tester@uk.ibm.com
# Machine Location = lab
# Record Type = 1
# Machine Type = 9848AF8
# Serial Number = SERNLUM
# Machine Part Number =
# Component =
# Component Release =
# Group Name =
# Hardware MT =
# Hardware SN =
# Error ID = 60002 : Space Efficient Virtual Disk Copy offline due to
corrupt metadata
# Error Code = 1862 : Virtual Disk Copy offline due to corrupt metadata
# Error Type = software
# System Version = 8.3.0.2 (build 137.5.1710311524090)
# FRU = None
# System Name = Power42
# Node ID = 1
# Error Sequence Number = 451
# Timestamp = Mon, 3 March 2020 00:14:21 2017
# Timezone = -0000, BST
# Object Type = vdisk
# Object ID = 1
# Object Name = Level_17_thin
# Cluster Alias = 0x2007d801224
```

```
# Copy ID = 0
# Has NAS Key = no
# Additional Data (0 -> 63) =
2B00000042547265654E6F64652E7374616765496F446F6E65323A20496E76616C6964204C5
2432030783437633332303020737 46F7265643A20307830206361
# Additional Data (64 -> 127) =
6C633A2030783237353138306300000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000000000000000
# IBM Customer Number =
# IBM Component ID =
# IBM Country Code =
# Spectrum Virtualize Unique ID = 2007da01224
```

A.3 Example of an Enhanced Inventory Data Record

The main difference between the inventory and enhanced inventory records is the inclusion of some compressed JSON data at the end of the report. Here is an example of the date sent.

This additional data contains the output of most of the ls commands (e.g. lsvdisk) run on the system. However, the output is always filtered to remove IP addresses and another sensitive information such as account details etc.

```
# JSON:

eNrsvftzI8eR7/uvMPTTPbErqN4PRJy4hxzOyLO7M5b1sL0+OsEAQZADCwRogJzR2Of+77cbDaCflUCT
ACrRTIV2LaILjerOT387qyoz61/fzEeL2dN8OLoa33zTP/uGLf/hb6w/Z5xx8c2/n33zeTRfjGfT9DDv
sfST+egfT6PF49Xj+H6UfiwYd98y/a2QZ8z3pe5Ld/b9h5/TpjeDx0HS5F/fTBafZ5On+9H1YPjb08PD
fHaX/PQiOfS//8+/JwdHn0fTx0/jxeNs/jX98F9n36z+WvWMp2dbpD88TXo7fbq/Hs2Xn7PlkeX3rx6/
Piw7NJ7ezub3g8e025uD2Xm8Y0Lwb87+v3+v/YQI/oSo/8R8MF6MbqpnZ5ZZaxvPLoNnl3s4uwqe3e98
duaZFo1n16Gzc7mHs5s2fb8d/97q5DbYdbf7bVeMNZ/dtbkxbbvuQycXYg9d5yx4er0Ho3Le5vRtbw0P
PquS7ePeBB9WuQ/gefBplWbn0zuXKHXz6YOPq7QtpEYb1Xx60+bmtLZs8IGV+1AyHnxiFW9xb5zzzaf3
bU7ffG/CZxeszb1pe+dF8IlVZg/PlAg+sprtwbBCtjl963sTfGL1Xu5N8InV+4BeBJ9Ysw85E7ZN71vf
+uATa/w+bn3wibViD2IpWZtb3/beyOAja9Ue1EwGH1mr93H64CNrd3+oNGOq2Z2XwWfW7gMcGXxm3T5c
EBl8Zt3uLyrBgqcPPrNO7OP0wYfWyX2cPvjQOrWH0yvWhvu2b3HV6qFtfXbR5qFqPnv4mVLBR9bt/kzx
5MbL5tMHH1nP9nF63eaZar43ADWmzSPV+uy2zRPV+uyuzQPV+uzBx9XLNmZVze9YHXxcvdvH6YPPq/f7
OL1oc3Oabz1wdtnm3rQ+u2pza1qfXbdxzUJCGfLMdOhxFfuZMrNtBuGtO+/azCA0nz08gaB9m1vT1mk1
ocdV7GVKzvDg6dvbdTk3PR89DMbzzzfjxW/D2cPX2tz18sji63RYPJL0a/n5ZhSz7Fb20XSQzZt/nk2u
Hh/ur6TO7mt69uJ0d+F836weqMXj+H7wOLq5Gs7uHyajdIZ7Mw2fOJ5aSM6kV+tJ4mIXJGvows3o5ulh
2YlknKwrnWAH6EQ299XUiWHahwyB/fXBNfUhm4oI3QihmTmCNYTa0gm33064Nc7JLw5nn0fzr4vHwePT
GtbC3U4Or57s4dXt4Ho+Hqafvv/j1d18lnQva1n6aN3/5bfXZ/1mPB0MH8efR+sffpjNkyPX9R+czm5G
xYtc/r0+Z/pH/ulifJN1bT6bPi5vSHLS0hJR/efTmzQdzr8+LG9N2mDT2cLnt+PJqHQdo/nncSIgefvM
iNV+vrzf4oj9Fnvstzxiv+Uz+z0fDeYRMVH76/YxKdH76/YxITH767Y6YrddpduisdsCnQb6Pfb7mHRz
tseOH5Nvzp/Z8e0qCPf682Ayvkl9jJd1X+yv+0flRe6v30fFRe2v38fUQ17VcdnYb4kVc7u/7h/VNazi
```


```
ohr7rZDedqH31/3D3/blgCgd3JUGYeGx02A+H3y9H6VzGXezwSSffFgeqE4+ZGefPC0eR/P0nMXzb+5G
OlxMv5B2efjwdPWwHOYtBukg8mr0MBt+ytZwhWXG8dVyV3qC4dN8PkpehJvxYvrhw2jwW/2T+kBUF060
bNH0S5ldy719Zg95rYerGI1wF1dzaMEuWudNUxeT4fL99T7uITfCbOmjYgy+jUyxQB/Hs/Z99FrUeim8
sVwcqJ+LwWJPN/NQQKY9fM6tPF4Px4vhYoz8LmZ9xH0fv8zHj6Or4WD4afQ8CeINz87W50Zve24a+/o4
exxMXtBXXb+t+lD3NZv73A+fq3iG/QvRas52L4B6bdlBu3m/2Ec3lVZb7+Y2kzMLmHx+Gkafn4rZ56di
+C/I30brXuJ+H23u5QJzL+/3+qibrc/6c732+70+61ZovrWjfFtHOXhD92L2rY672qZIjoV7ua8H3Xi9
7W6qLWb3zED93I/ZpXGWHxTQL8eyO98m8Lrxcb+Zjz+P9va4H0qU1r3ELfCbe7nA38svJ2HxLydhceyv
9PHDZDz9DfuMQtbJ59hbqrpcWreln0xve51rDvQznYVFfkeHk9nTzdXT6XRzgb+bN7Mv05O4n1lHMd3R
LIgtFcynh7v54GbUXExgMru7eppmwamr1Y9gav9ksKpmkPz2/cOmU4I75bKBx+z676NhHjaaLiAVPi4s
eq0+qQWcFAL5shIK6XLTeHp3VY1XqRypnWg+mz1eNVxKHsM6nD1V1j5Wq3CT0XwZvrC+KclJAyUG0k/n
89k8OVe2SMaZX376aTa5SX798ekh//7NaDGcj5drX+mHP/z0y1likuvJ6D49evnhh6vbwf148jX7xvTq
/cWHNW/Bcgj7sYgIWETsahGxxSLiVVhEwxbRjjVZZDlNUTeJVw1GWUdCK50F51QDgLEaxzvDsqzssnF2
NMzPn8bTbxPLfB6nq7Cjm7OsRspZevlni4fBcHT2ZTCfJlf3LLuZmHbjZLfn2s1usxtvYbcs2bXRbmni
gd35cUPwdkJttix1IWg2z5TY+cUlAy8uueuLS24xljzGi2uZo1MzlmBZUvwOBns/fRzNp4PJ2fIMzzGK
```


The decode of this data involves using base64 and gunzip the output to be able to read it.

Here is the decode of the section shown above to allow the user to see the contents.


```
{"resource_id": "0000001C79A01012", "version": "1.0", "request_time": "2018-05-23
09:35:38 GMT", "data": {"lsvolumebackupprogress": [],"lseventhistory": [{
"history_id": "1", "sequence_number": "101", "event_type": "information",
"event_id": "980221" },{ "history_id": "2", "sequence_number": "102", "event_type":
"raised", "event_id": "070777" },{ "history_id": "3", "sequence_number": "103",
"event_type": "raised", "event_id": "070777" },{ "history_id": "4",
"sequence_number": "109", "event_type": "raised", "event_id": "009052" },{
"history_id": "5", "sequence_number": "113", "event_type": "raised", "event_id":
"009052" },{ "history_id": "6", "sequence_number": "109", "event_type": "fixed",
"event_id": "009052" },{ "history_id": "7", "sequence_number": "118", "event_type":
"raised", "event_id": "074002" },{ "history_id": "8", "sequence_number": "113",
"event_type": "fixed", "event_id": "009052" },{ "history_id": "9",
"sequence_number": "122", "event_type": "raised", "event_id": "074002" },{
"history_id": "10", "sequence_number": "125", "event_type": "raised", "event_id":
"009052" },{ "history_id": "11", "sequence_number": "125", "event_type": "fixed",
"event_id": "009052" },{ "history_id": "12", "sequence_number": "130", "event_type":
"raised", "event_id": "074002" },{ "history_id": "13", "sequence_number": "133",
"event_type": "raised", "event_id": "009052" },{ "history_id": "14",
"sequence_number": "136", "event_type": "raised", "event_id": "088000" },{
"history_id": "15", "sequence_number": "137", "event_type": "raised", "event_id":
```


"070564" },{ "history_id": "16", "sequence_number": "133", "event_type": "fixed",
"event_id": "009052" },{ "history_id": "17", "sequence_number": "139", "event_type":
"raised", "event_id": "009052" },{ "history_id": "18", "sequence_number": "141",
"event_type": "raised", "event_id": "070889" },{ "history_id": "19",
"sequence_number": "141", "event_type": "fixed", "event_id": "070889" },{
"history_id": "20", "sequence_number": "139", "event_type": "fixed", "event_id":
"009052" },{ "history_id": "21", "sequence_number": "146", "event_type": "raised",
"event_id": "074002" },{ "history_id": "22", "sequence_number": "150", "event_type":
"raised", "event_id": "009052" },{ "history_id": "23", "sequence_number": "150",
"event_type": "fixed", "event_id": "009052" },{ "history_id": "24",
"sequence_number": "156", "event_type": "raised", "event_id": "074002" },{
"history_id": "25", "sequence_number": "159", "event_type": "raised", "event_id":
"009052" },{ "history_id": "26", "sequence_number": "163", "event_type": "raised",
"event_id": "009052" },{ "history_id": "27", "sequence_number": "159", "event_type":
"fixed", "event_id": "009052" },{ "history_id": "28", "sequence_number": "169",
"event_type": "raised", "event_id": "074002" },{ "history_id": "29",
"sequence_number": "172", "event_type": "raised", "event_id": "070564" },{
"history_id": "30", "sequence_number": "163", "event_type": "fixed", "event_id":
"009052" },{ "history_id": "31", "sequence_number": "174", "event_type": "raised",
"event_id": "070889" },{ "history_id": "32", "sequence_number": "175", "event_type":
"raised", "event_id": "070889" },{ "history_id": "33", "sequence_number": "176",
"event_type": "raised", "event_id": "050041" },{ "history_id": "34",
"sequence_number": "179", "event_type": "raised", "event_id": "074002" },{
"history_id": "35", "sequence_number": "180", "event_type": "raised", "event_id":
"074002" },{ "history_id": "36", "sequence_number": "181", "event_type": "raised",
"event_id": "020002" },{ "history_id": "37", "sequence_number": "182", "event_type":
"raised", "event_id": "020002" },{ "history_id": "38", "sequence_number": "183",
"event_type": "raised", "event_id": "020002" },{ "history_id": "39",
"sequence_number": "184", "event_type": "raised", "event_id": "020002" },{
"history_id": "40", "sequence_number": "175", "event_type": "fixed", "event_id":
"070889" },{ "history_id": "41", "sequence_number": "174", "event_type": "fixed",
"event_id": "070889" },{ "history_id": "42", "sequence_number": "176", "event_type":
"fixed", "event_id": "050041" },{ "history_id": "43", "sequence_number": "189",
"event_type": "raised", "event_id": "010003" },{ "history_id": "44",
"sequence_number": "190", "event_type": "raised", "event_id": "010003" },{
"history_id": "45", "sequence_number": "181", "event_type": "fixed", "event_id":
"020002" },{ "history_id": "46", "sequence_number": "182", "event_type": "fixed",
"event_id": "020002" },{ "history_id": "47", "sequence_number": "183", "event_type":
"fixed", "event_id": "020002" },{ "history_id": "48", "sequence_number": "184",
"event_type": "fixed", "event_id": "020002" },{ "history_id": "49",
"sequence_number": "193", "event_type": "raised", "event_id": "010044" },{
"history_id": "50", "sequence_number": "198", "event_type": "raised", "event_id":
"010044" },{ "history_id": "51", "sequence_number": "199", "event_type": "raised",
"event_id": "010044" },{ "history_id": "52", "sequence_number": "193", "event_type":
"fixed", "event_id": "010044" },{ "history_id": "53", "sequence_number": "198",
"event_type": "fixed", "event_id": "010044" },{ "history_id": "54",
"sequence_number": "199", "event_type": "fixed", "event_id": "010044" },{
"history_id": "55", "sequence_number": "172", "event_type": "fixed", "event_id":
"070564" },{ "history_id": "56", "sequence_number": "209", "event_type": "raised",
"event_id": "009052" },{ "history_id": "57", "sequence_number": "137", "event_type":
"fixed", "event_id": "070564" },{ "history_id": "58", "sequence_number": "136",
"event_type": "fixed", "event_id": "088000" },{ "history_id": "59",

```
"sequence_number": "209", "event_type": "fixed", "event_id": "009052" },{
"history_id": "60", "sequence_number": "218", "event_type": "raised", "event_id":
"074002" },{ "history_id": "61", "sequence_number": "219", "event_type": "raised",
"event_id": "009052" }],"lsrepairvdiskcopyprogress": [],"lsvdisksyncprogress": [{
"vdisk_id": "281", "vdisk_name": "vol_tpm_3509", "copy_id": "1", "progress": "99",
"estimated_completion_time": "180523103947" },{ "vdisk_id": "301", "vdisk_name":
"dedup_tpm_1505", "copy_id": "0", "progress": "99", "estimated_completion_time":
"180523103947" },{ "vdisk_id": "314", "vdisk_name": "dedup_cm_1518", "copy_id": "0",
"progress": "99", "estimated_completion_time": "180523103948" },{ "vdisk_id": "322",
"vdisk_name": "dedup_tpm_2506", "copy_id": "1", "progress": "99",
"estimated_completion_time": "180523103947" },{ "vdisk_id": "324", "vdisk_name":
"dedup_tpm_2508", "copy_id": "1", "progress": "99", "estimated_completion_time":
"180523103948" }],"lsdiscoverystatus": [{ "id": "0", "scope": "fc_fabric",
"IO_group_id": "", "IO_group_name": "", "status": "inactive" }],"lsportusb": [{
"id": "0", "node_id": "1", "node_name": "node1", "node_side": "front", "port_id":
"1", "status": "inactive", "encryption_state": "", "encryption_filename": "",
"service_state": "" },{ "id": "1", "node_id&...
Collapse
```


This snippet was truncated for display

If you wish to view the enhanced json in one of your own emails – the following bash command should decode the json into readable text (as long as there are no additional email footers after the end of the json.

Example 1: Decode the data as json, where the email is contained in a file called enh_email2.txt:

```
 cat enh_email2.txt | grep -A 100000 JSON | grep -v '#' | tr -d
'[:space:]' | base64 -d  | sed -e
's/^/\x1f\x8b\x08\x00\x00\x00\x00\x00/' | zcat  -f | less
```

Example 2: Decode the data as json and print the json data in a method that is easier to read. The email is still stored in a file called enh_email2.txt

```
cat enh_email2.txt | grep -A 100000 JSON | grep -v '#' | tr -d
'[:space:]' | base64 -d  | sed -e
's/^/\x1f\x8b\x08\x00\x00\x00\x00\x00/' | zcat  -f | python -m
json.tool | less
```

Appendix B: Additional publications and resources

How to access IBM Redbooks publications

You can search for, view, or download IBM Redbooks® publications, Redpaper™ publications, Hints and Tips, draft publications, and additional materials, as well as order hardcopy IBM Redbooks publications or CD-ROMs, at this website: www.ibm.com/redbooks

IBM Redbooks publications

For information about ordering this publication, see “How to Access IBM Redbooks Publications” in the section above. Note that the following documents might be available in softcopy only.

- *IBM FlashSystem FS9200 Product Guide, REDP-5317*
- *IBM FlashSystem FS7200 Product Guide*, REDP-5587
- *IBM FlashSystem 9200 and 9100 Best Practices and Performance Guidelines, SG24-8448-00*
- *IBM FlashSystem 9100 Architecture, Performance, and Implementation, SG24-8425-00*
- *IBM System Storage SAN Volume Controller, IBM Storwize V7000, and IBM FlashSystem 7200 Best Practices and Performance Guidelines, SG24-7521-06*

Online resources

These websites are also very relevant as further information sources:

IBM FlashSystem FS5000 Documentation Center: https://ibm.biz/BdfyMW

IBM FlashSystem FS5200 Documentation Center: https://ibm.biz/BdfyMt

IBM FlashSystem FS9200 Documentation Center: https://ibm.biz/BdqqNs

IBM FlashSystem FS7200 Documentation Center: https://ibm.biz/BdqqNm

IBM SAN Volume Controller Documentation Center: https://ibm.biz/BdqqNa

IBM San Volume Controller and IBM Storwize Call Home, Email Alert, and Inventory Configuration: https://ibm.biz/BdzNGJ

Appendix C: Connections and Rules Summary for Call Home and Remote Support

Here is a summary list of all connections required and the rules needed to ensure the call home and remote support connections are fully operational.

These examples assume the following management and service IP addresses of the Spectrum Virtualize system you are working on.

Example IP Addresses

10.4.18.224 < management IP
10.4.18.226 < service IP 1
10.4.18.227 < service IP 2

The firewalls rules need to be as follows:

Remote Support

10.4.18.226 outbound to 129.33.206.139 and 204.146.30.139 on port 22
10.4.18.227 outbound to 129.33.206.139 and 204.146.30.139 on port 22

Uploading logs:

10.4.18.226 outbound to esupport.ibm.com on port 443
10.4.18.227 outbound to esupport.ibm.com on port 443

FixCentral: (for code downloads)

10.4.18.224 outbound to delivery04.dhe.ibm.com on port 22

Email Call Home

10.4.18.224 outbound to callhome0@de.ibm.com or callhome1@de.ibm.com on port 25

Cloud Call Home

10.4.18.226 outbound to esupport.ibm.com on port 443
10.4.18.227 outbound to esupport.ibm.com on port 443

If you are configuring a multi-node node (clustered systems) then you will need to config each node in the cluster as follows

Remote Support:
<service IP, node 0> outbound to 129.33.206.139 and 204.146.30.139 on port 22
<service IP, node 1> outbound to 129.33.206.139 and 204.146.30.139 on port 22
<service IP, node 2> outbound to 129.33.206.139 and 204.146.30.139 on port 22
<service IP, node 3> outbound to 129.33.206.139 and 204.146.30.139 on port 22
<service IP, node 4> outbound to 129.33.206.139 and 204.146.30.139 on port 22
<service IP, node 5> outbound to 129.33.206.139 and 204.146.30.139 on port 22
<service IP, node 6> outbound to 129.33.206.139 and 204.146.30.139 on port 22
<service IP, node 7> outbound to 129.33.206.139 and 204.146.30.139 on port 22

Uploading logs / Cloud Call home:
<service IP, node 0> outbound to esupport.ibm.com on port 443
<service IP, node 1> outbound to esupport.ibm.com on port 443
<service IP, node 2> outbound to esupport.ibm.com on port 443
<service IP, node 3> outbound to esupport.ibm.com on port 443
<service IP, node 4> outbound to esupport.ibm.com on port 443
<service IP, node 5> outbound to esupport.ibm.com on port 443
<service IP, node 6> outbound to esupport.ibm.com on port 443
<service IP, node 7> outbound to esupport.ibm.com on port 443

FixCentral:
<management IP> outbound to delivery04.dhe.ibm.com on port 22

NOTE: If you need to use actual IP addresses for the above, and not the symbolic names, then refer to this information and also this page in the Documentation Center:

- esupport.ibm.com = 129.42.56.189, 129.42.54.189 and 129.42.60.189
- delivery04.dhe.ibm.com = 170.225.15.105, 170.225.15.104, 170.225.15.107, 129.35.224.105, 129.35.224.104, and 129.35.224.107

IBM Documentation Center: https://ibm.biz/BdfySd

Email Call Home:

<management IP> outbound to callhome0@de.ibm.com or call home1@de.ibm.com on port 25

The service IPs are part of one of the installation worksheets: https://ibm.biz/BdfySR

The worksheets for remote support can be found here: https://ibm.biz/BdfySF

Acknowledgements:

The following IBM personnel created and assisted in the production of this document

Authors

- Jon Herd – Executive Technical Advisor and FlashSystems SME - IBM UK
- Andrew Martin - STSM, SVC Service Architect – IBM Hursley Development

Development Support and Reviewers

- Dave Gimpl - STSM, FlashSystems Architect – IBM Houston Development
- Duane Bolland - Storage Technical Advisor - IBM USA
- Evelyn Perez – Spectrum Virtualize Architect - – IBM Hursley Development
- Alex Ainscow – STSM, Spectrum Virtualize – IBM Hursley Development

