IBM WebSphere Application Server Migration: Benefits, Planning and Best Practices

Including WebSphere v9.0 and Liberty

September 2021

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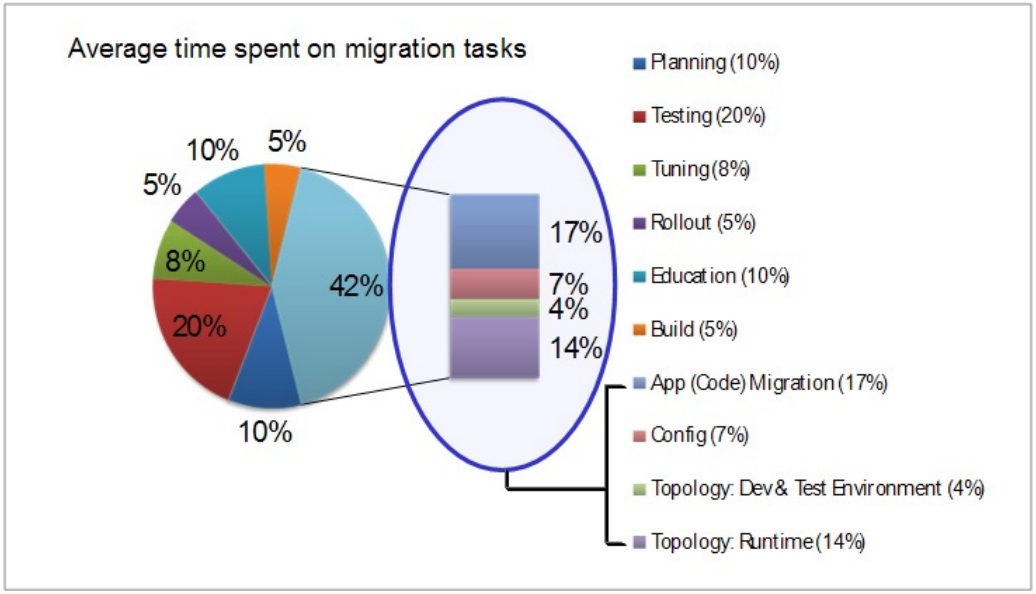
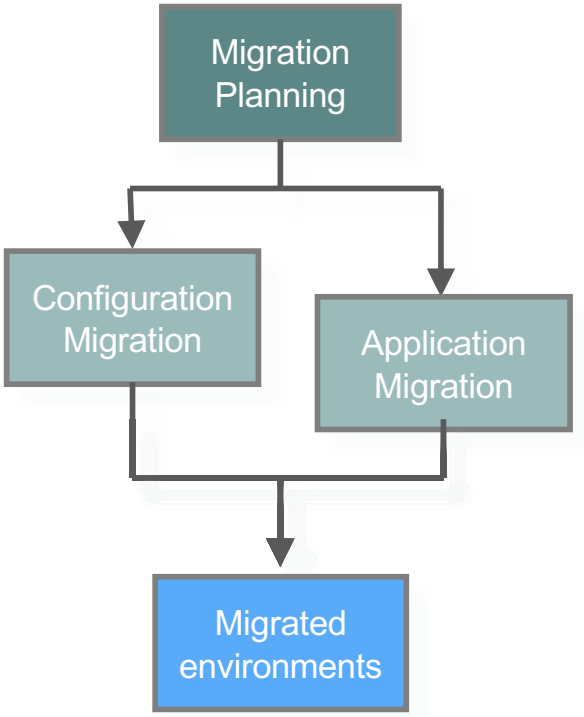
Migration Overview

Introduction

- This presentation is intended to educate and assist in performing WebSphere Application Server version to version migrations as well as information on moving to Liberty
- It contains overall planning guidelines as well as migration concerns for your awareness
- It does not prescribe one migration path
  - Varies with customer policies
  - Varies with versions involved
  - Varies with customer procedures
- Use this information as a guide to build your own plan
- Get assistance if needed

Migration Overview



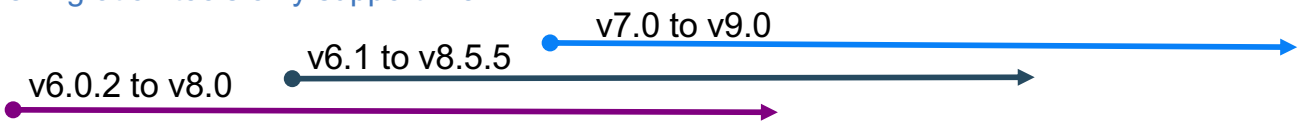


- The whole migration process involves a variety of steps
- Application changes and testing is 37%
- Migrating configuration is 25%
- What if you could make this easier?

Migration impacts overview

Migration impact is gated by two overarching factors

1. The versions involved in the customer Migration scenario
   - Moving from v7.0 to v9.0 is different than moving from v6.0.2 to v9.0
2. The amount of change introduced in and between these versions
   - Moving from v7.0 to v9.0 involves changes introduced by v8.0, v8.5 and v9.0.
   - Moving from v6.1 to v9.0 involves changes introduced by v7.0, v8.0, v8.5 and v9.0 and would require a double migration, since the migration tools only support n-3.



	v6.0.2	v6.1	v7.0	v8.0	v8.5.5	v9.0
Configuration	Port assignments	Security	None	None	Port assignments	Core group wire protocol
Application	JSP and Servlet	Java SE	Same	Minimal	None*	Java EE 7 Java SE 8

None means no required code changes with default of JRE6 when using traditional WAS runtime*

Externals Summary

	v5.x (EOS)	v6.0.2 (EOS)	v6.1 (EOS)	v7.0 EOS announced	v8.0 EOS announced	V8.5.5	Liberty CD	V9.0
IDE	WSAD 5.1- RAD v7.0	RAD v6.0- RAD v8.0	RAD v7.0- RAD v8.0	RAD v7.5- RAD v9.1 WDT for WAS V7	RAD v8.0- RAD v9.1 WDT for WAS V8	RAD v8.5.5- RAD v9.5 WDT for WAS 8.5	RAD v8.5.5- RAD v9.5 WDT for WAS	RAD V9.6 Beta WDT for WAS
Code	J2EE 1.3 JRE 1.3 (v5.0) JRE 1.4 (v5.1)	J2EE 1.4 JRE 1.4	J2EE 1.4 JRE 5	JEE 5 JRE 6	JEE 6 JRE 6	JEE 6/ JEE 7 JRE ~~6,7~~, 8 Liberty Liberty Core	JEE 6/ JEE 7 Jakarta EE 8, 9 JRE ~~6,7~~, 8, 11+	JEE 7 JRE 8
Deploy	EAR	EAR Config in EAR	EAR Config in EAR	EAR/BLA Config in EAR EBA(FeP)	EAR/BLA Config in EAR EBA	EAR/BLA Config in EAR EBA Liberty	EAR WAR EBA	EAR/BLA Config in EAR EBA

Notes:
Rational Application Developer (RAD) – The latest version that supports your server version is recommended.
WebSphere Development Tools (WDT) – Available on the latest 2 Eclipse levels. The latest available is recommended.

Choosing the “right” version

Question: “Which WebSphere Application Server version should I migrate to?”

- We used to talk about which is the best version. Now consider which is the best platform.
  - Liberty
  - Traditional WebSphere Application Server: either V8.5 for JEE 6, v9.0 for JEE 7
  - On-premises / cloud
- Recent end of service announcements need consideration

- End of Service dates
  - WebSphere Application Server
    - v5.1 was September 2008
      v6.1 was September 2013
      v8.0 was April 2018
      v6.0.2 was September 2010
      v7.0 was April 2018
- Both v8.5.5 and v9.0.5 have a revised statement of standard support through at least 2030.
  - There is no support need to move from v8.5.5 to v9.0. For an enhanced programming model, choose Liberty.

- Characteristics of your targeted platform
  - Do you want the simplest possible migration
  - Stability in lifecycle
  - JEE/JDK levels relative to targeted version
  - Need new WebSphere Application Server features?
  - Version requirements of vendor or IBM stack products
  - Version your Enterprise has committed towards
  - Want to move to light-weight Liberty runtime with flexible configuration
  - Want to re-tool for container portability (Docker)
  - Want to move to hosted cloud to reduce CAPEX

Best practices, offers, incentives

- **PVU Waiver offer**: IBM will now grant customers no charge, temporary use Software Subscription & Support (S&S) rights to continue using their current licenses in production while also using up to 2x those license entitlements for migration to a later WAS Version.
- **Migration Assist**: is available for customers on Support and Maintenance. Customers can call Support with migration questions
- **ISSW Assessments**: are available to assist customers with their migration planning and execution activities
- **IBM Software Accelerated Value Program**: provides expertise in custom version to version migrations.
- **Website IBM Documentation**

What is Liberty?

- Lightweight, flexible Java EE runtime within the WebSphere Application Server (WAS) product set
- Comes with every edition of WAS….
  - WebSphere App Server (“Base”)
  - WebSphere App Server Network Deployment (“ND”)
  - WebSphere App Server z/OS
- ….including its own, low-end edition
  - WebSphere App Server Liberty Core
- Liberty consists of a kernel and a set of pluggable features
  - each product editions has a different set of features

Product Terminology

What you buy Product/Edition/License	**What you install** Runtime / features
WebSphere Application Server Liberty Core	WAS Liberty Java EE Web profile
WebSphere Application Server	WAS Liberty Java EE and WAS traditional Java EE
WebSphere Application Server Network Deployment (& z/OS)	WAS Liberty Java EE + Advanced Management and WAS traditional Java EE + Advanced Management

6 reasons why Liberty

Lightweight, highly-efficient runtime

CI/CD optimized operational experience

Simple true-to-production developer experience

Just enough runtime	80% disk and 56% memory saving
Low operating cost	4x increased density over Tomcat & Spring Boot
Continuous delivery	Zero-effort security fixing & zero technical debt
Zero migration	100% v2v & fixpack migration saving
Kubernetes optimized	Self-tuned optimal perf, production-ready, kube-native
Developer experience	Container & kube-native experience, rapid inner loop

Zero Migration with Liberty

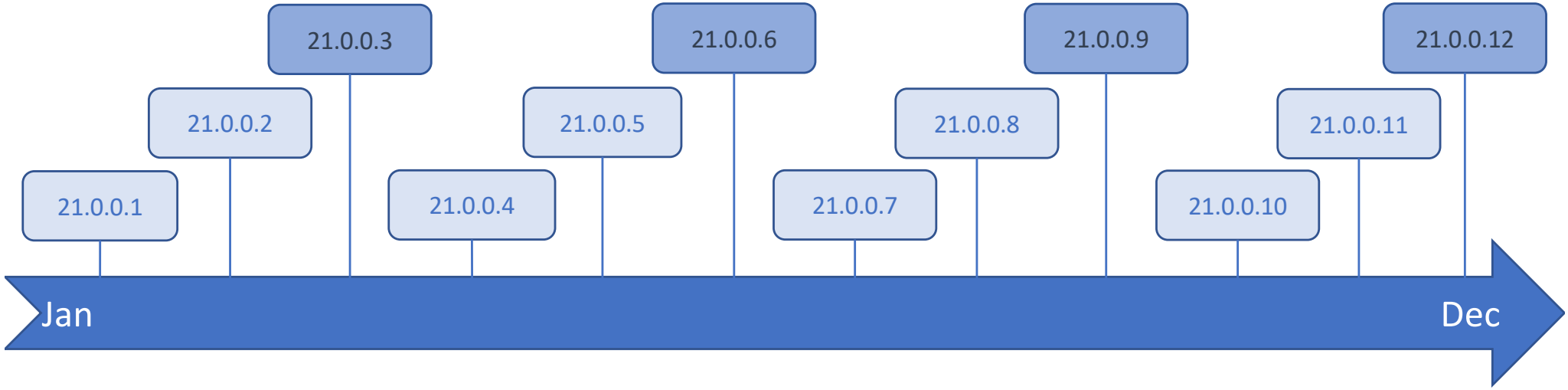
- ✓No configuration behavior changes
- ✓No runtime feature behavior changes
- ✓No removals

Stay current with a rebuild
(no app or config changes necessary)

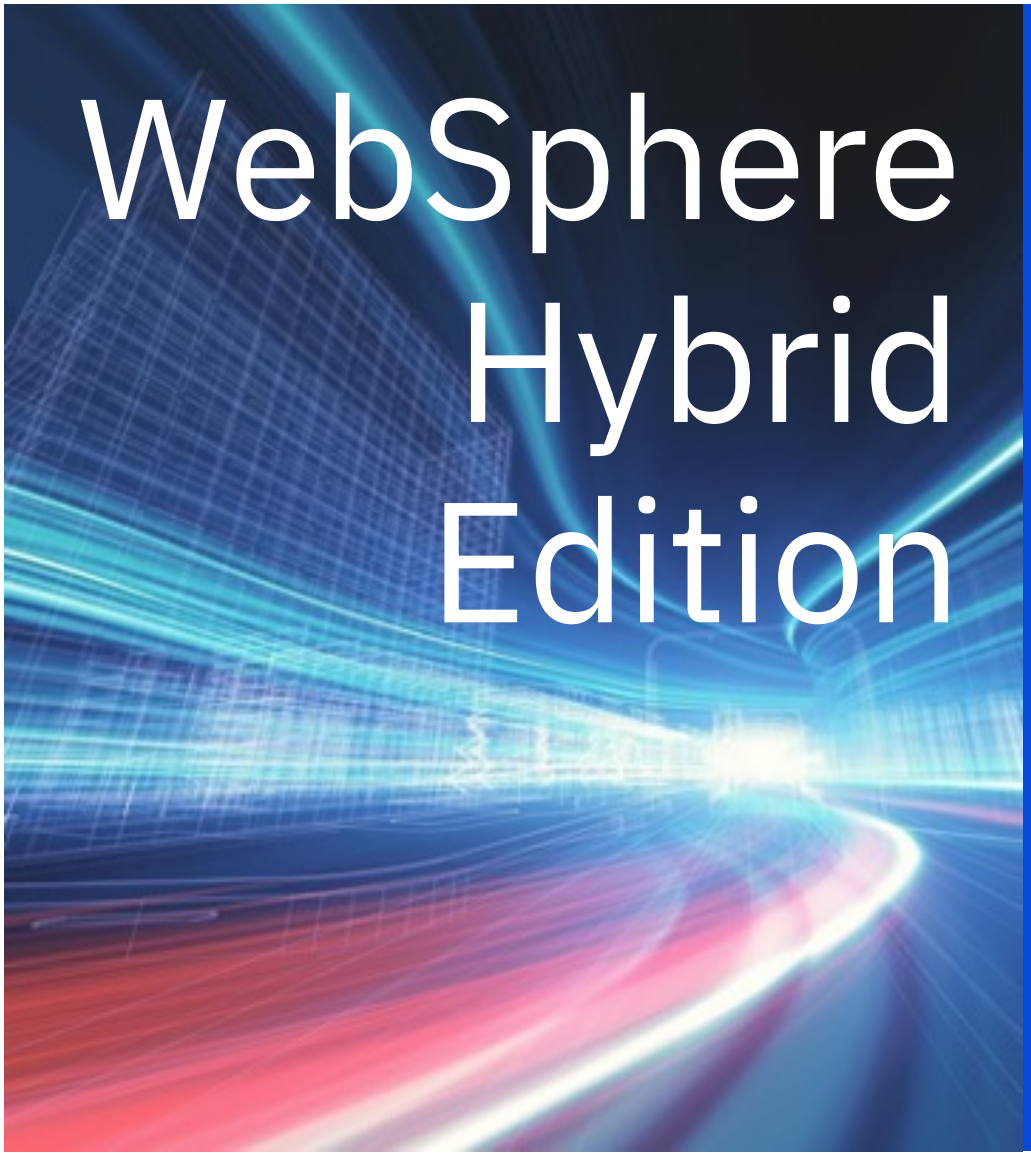
Skipping a release does not introduce additional migration work

Never apply an ifix again

Liberty Continuous Delivery



	All CD releases	CD releases ending .3 .6 .9 .12
Support Provided	5 years	5 years
iFixes	24 weeks	2 years
Proactive Security iFixes	Most recent	Most recent 2



WebSphere Hybrid Edition

A leaner, more economical solution enabling clients to optimize WebSphere applications for immediate gains while also positioning their business for higher, near-term future value

IBM WebSphere Hybrid Edition: bill of materials

WebSphere Application Server

- WebSphere ND
- WebSphere Base
- Liberty Core
- Open Liberty

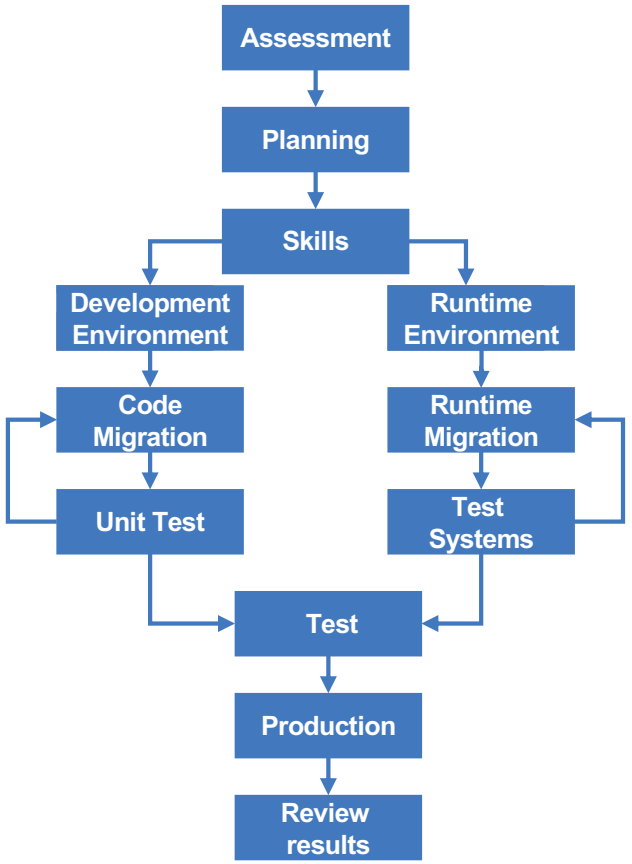
Modernization & Developer Tools

- Transformation Advisor
- Mono2Micro
- WebSphere Migration Toolkit

Migration Planning Roadmap

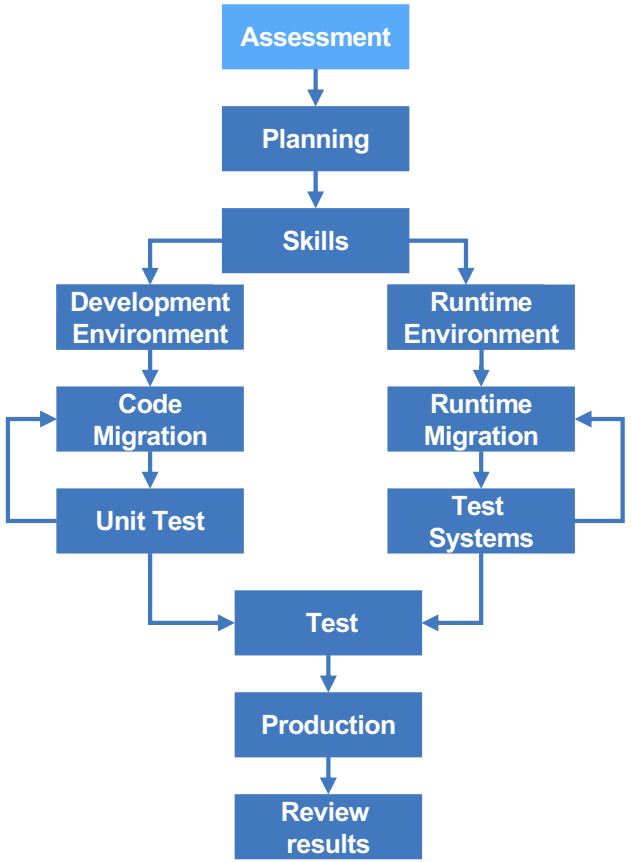
Migration Plan Roadmap

- Assessment
- Planning
- Skills
- Development Environment
- Application Code Migration
- Runtime Environment Migration
- Test
- Production
- Review the results



Assessment

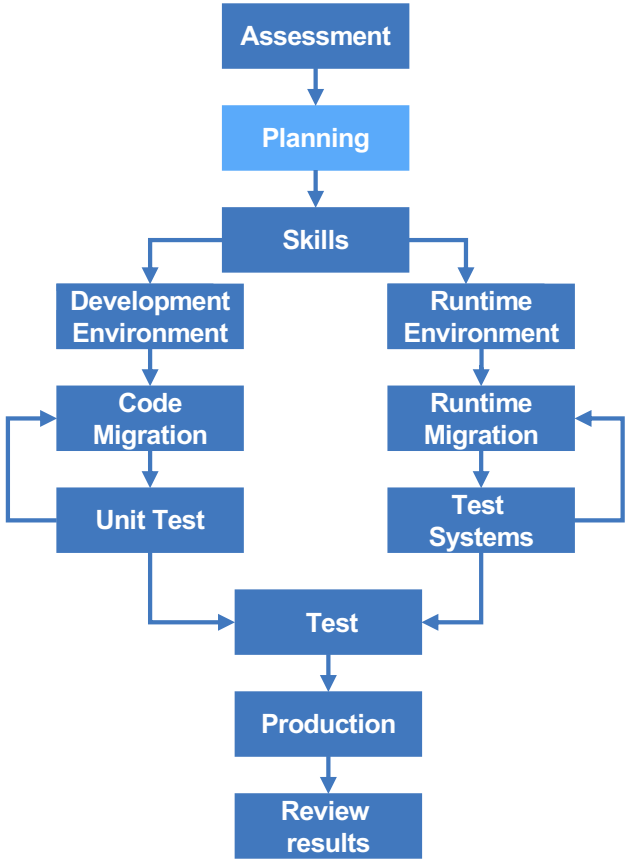
- Gather the stakeholders
  - Communications with clients, peers, and leadership
  - Consider a core Migration team for larger scale
- Identify education requirements
  - Developer, Administrator…
- Hardware requirements
  - Possible Upgrades, 64 bit versus 32 bit
- Topology assessment
  - Downtime tolerance, Failover support
- Application architecture
  - Tightened JEE specifications
  - Dependencies between apps
  - API removal, JRE changes
  - Liberty – MicroProfile, Jakarta EE 8
- Review Testing practices
  - Standard practices and automation
- Vendor apps and WebSphere products
  - J2EE/JDK/WebSphere version requirements



Planning - Questionnaires

- Runtime Environment
  - Overall Infrastructure questions
  - Hardware and Software prereqs
  - Cloud strategy and Liberty
  - HTTP Server, Network Edge
  - Availability requirements
  - Rollout plans
  - Administration
  - Security
  - Test Practices and tools
- Development Environment
  - Workstations and IDEs
  - Test configurations
  - Software development skills
  - Development methodology
  - Build, Packaging Tooling and Process
- Many Detailed Questions: WAS 8.5 WebSphere Migration Guide (Appendix A)

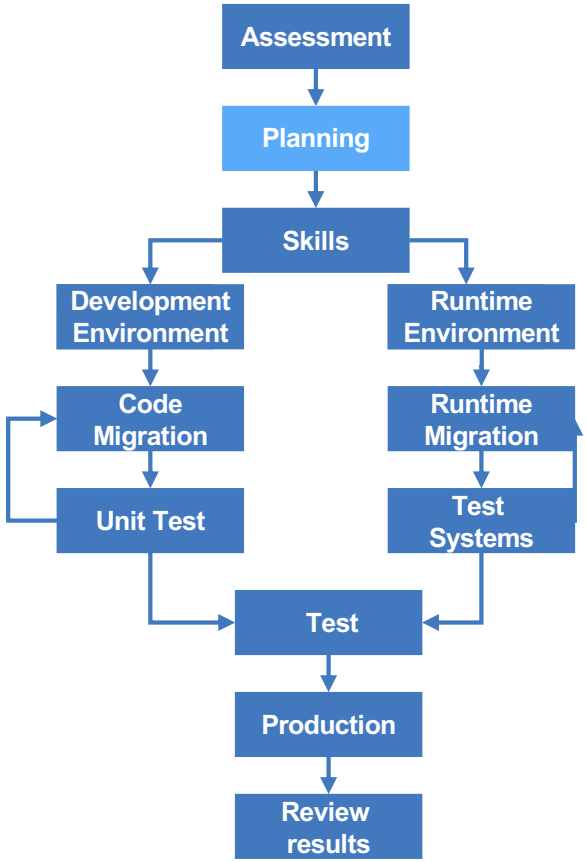
http://www.redbooks.ibm.com/redpieces/abstracts/sg248048.html



Planning

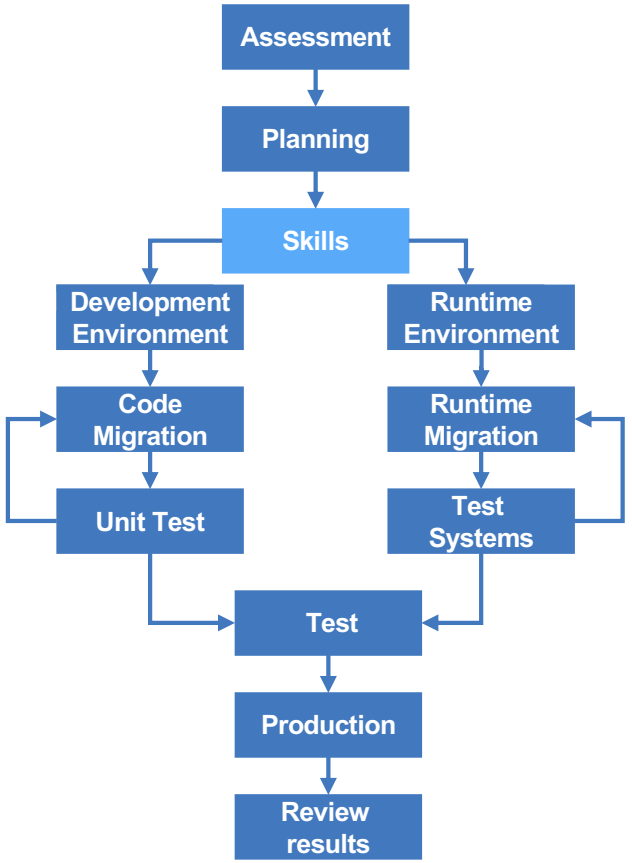
Build a plan based on assessment

- Hardware and license requirements
- Prerequisite and requisite software
  - Check with “Clarity” website
- Education
  - IBM Education Assistant, IBM Education, …
- Account for many applications and multiple development teams?
  - Identify early adopters
  - Identify Pilot projects
  - Migration as an initiative or project?
- Application rollout strategies
  - “Stealth”, “Train”, Voluntary, Continuous…
- Consider timeline factors
  - Availability, maintenance windows, lockdowns
- Plan for High Availability
  - Mixed version clusters requires dual app compatibility
- Create an execution timeline
- Include a rollback plan



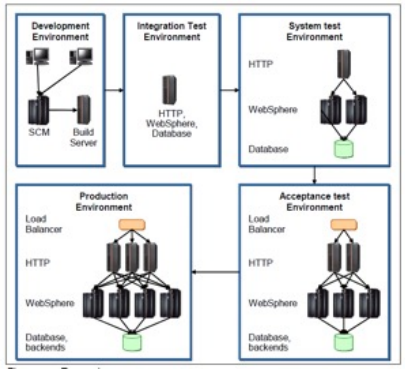
Skills

- Plan for education
  - New development tooling
  - Enhancements in WebSphere administration model
  - Changes in the latest WebSphere version
  - New standards

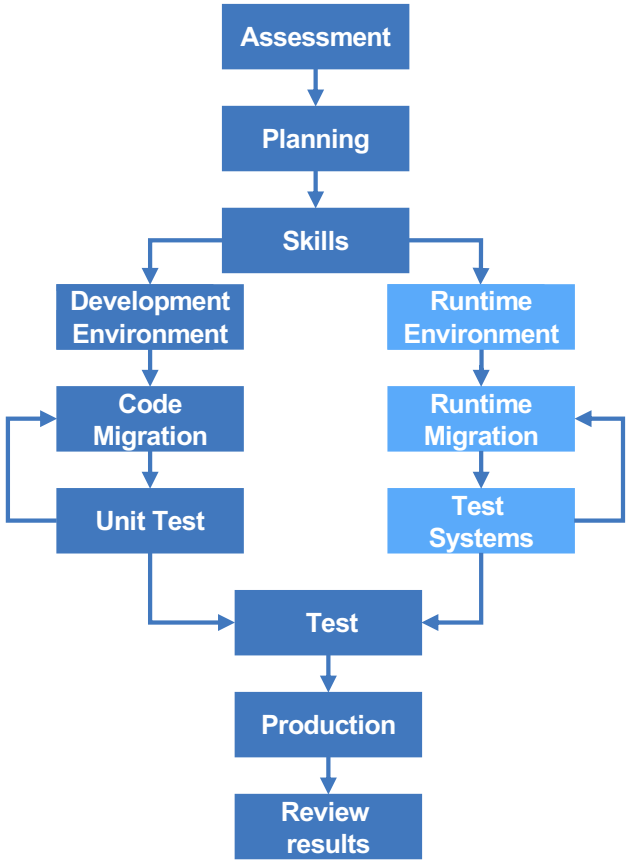


Runtime Environment

- Most likely will need to support parallel development
- Migrate test systems iteratively
  - Integration
  - System test
  - Performance
  - Pre-Production
  - Production

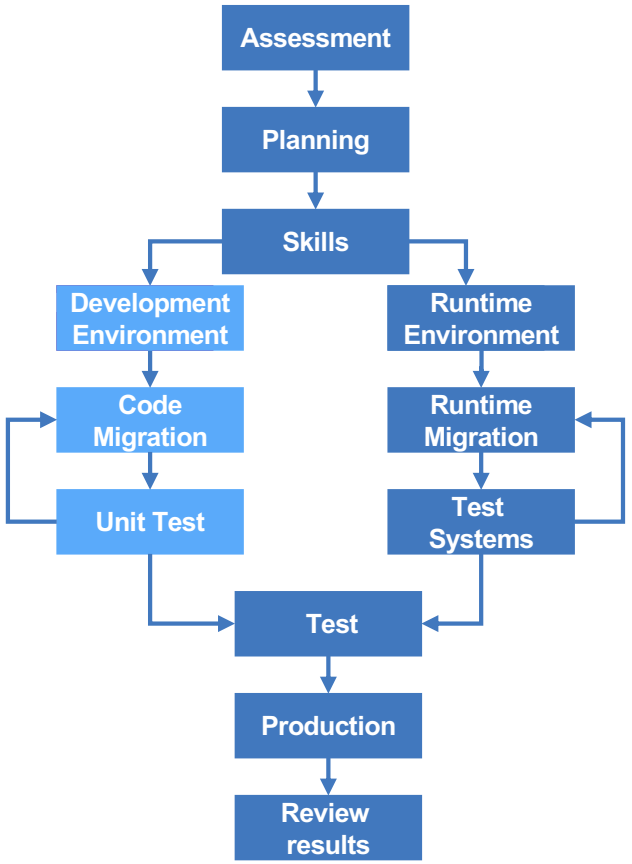


- Use the same migration process throughout if possible
  - Or at least before you do production migration…



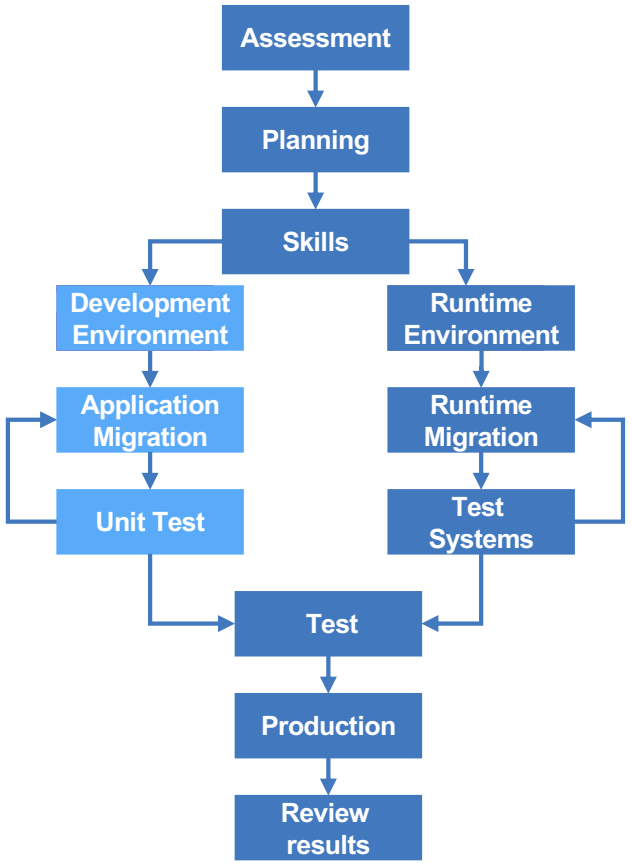
Development Environment

- Upgrades needed for IDEs
  - Progress iteratively, expand outward
  - Can migrate the WAS configuration using WAS configuration migration tools
- Assume good but not complete application compatibility
  - Assess apps, based on known issues
  - If no changes required, perform standard regression



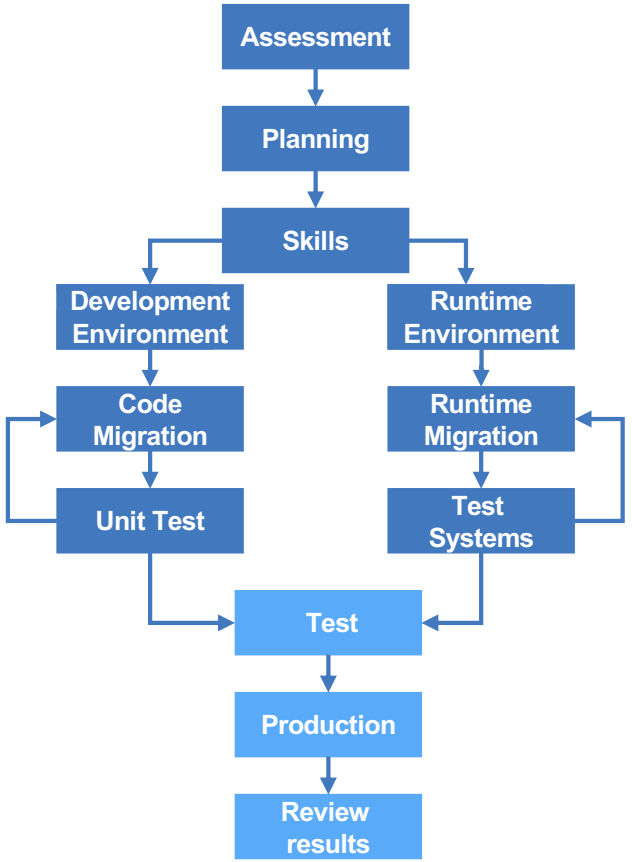
Application Migration (Iterative)

- Minimize change
  - Only make changes required to support version migration
    - Reduces complexity of planning, diagnosis and debug - "**Keep it Simple**"
  - Require application code to be dual-compatible to support mixed version clusters
  - Test to the depth of test environment that fits your comfort level
- Then Optimize and Enhance
  - Java EE Spec migration
  - New programming models
  - Application upgrades
  - Depreciations
- Iterate following your standard practices



Test/Production/Review

- Run your standard test processes
  - Progress applications normally through the test environments
- Ensure Performance is measured
  - Differences exist between versions
  - JDK changes may have occurred
- Have a rollback plan for production
  - Practice on another system earlier in the cycle
- Review the results of the Migration
  - Update the plan for next time

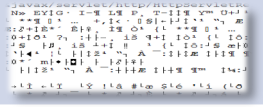
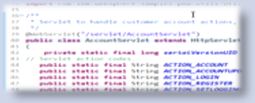
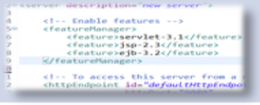


Application Modernization options

An Overview of WebSphere Modernization Tools

A set of tools that help you:

- Migrate between versions of WebSphere Application Server
- Migrate from traditional WebSphere to Liberty
- Move your applications to cloud platforms
- Migrate from third-party application servers to WebSphere

Transformation Advisor	*Binary scanner*	*Source scanner*	*Configuration migration*
			
Transformation Advisor – analyze your on-premises workloads for modernization. • Gain application insights • Classify your applications' modernization complexity • Estimate the effort to modernize your applications • Generate migration artifacts to get you moving to WebSphere Hybrid Edition quickly • Generate all binary scanner migration reports • Modernize from traditional WebSphere, WebLogic, JBoss and Tomcat • Liberty containerization	Command-line **binary scanner** that provides • High level evaluation report • Inventory report that provides content and structure of your application and potential deployment problems • Detailed analysis for migration between versions of traditional WebSphere, Liberty, and Liberty Core • Detailed analysis for migration from JBoss, WebLogic, Tomcat • Cloud migration or instant runtimes differences • Cloud connectivity analysis • Available from the WebSphere admin console	**WAMT** - Eclipse plugins that scans application source to provide • High level evaluation report showing the Java EE technologies your application uses • A line-by-line analysis of code changes required • Detailed analysis for migration between versions of traditional WebSphere, Liberty, and Liberty Core • Detailed analysis from third-party applications servers • Cloud migration for instant runtimes differences • Cloud connectivity analysis	**WASPreUpgrade** and **WASPostUpgrade** commands to move WebSphere traditional configuration between profiles. **Binary scanner** and **Transformation Advisor** generates Liberty server configuration and traditional WebSphere wsadmin scripts to help you modernize to containers easier. **Transformation Advisor** also assists in generating Liberty configuration when moving from WebLogic, JBoss, or Tomcat.

Application Modernization Tools

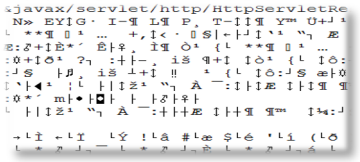
Features	Transformation Advisor	Binary Scanner	Source Scanner	WebSphere Admin Console	Mono2Micro
Enterprise scope	●				
Application detailed migration analysis	●	●	●	●	
Application inventory report	●	●		●	
Application technology report	●	●	●	●	
Liberty configuration	●	●		●	
Traditional WebSphere configuration	●	●			
Graphical user interface	●		●	●	●
Command line interface		●		●	●
Complexity rating and development costs	●				
Shared library analysis	●				
Container migration artifacts	●				
Interaction with GitHub repos	●				
Cross product analysis – WAS, MQ, IIB	●				
Business application grouping	●				
APIs for retrieving data	●				
WebLogic, JBoss, Tomcat application analysis	●	●	●		●
WebLogic, JBoss, Tomcat config analysis	●		●		
Containerized infrastructure	●				●
Source code analysis and generation			●		●
Microservice partitioning					●

How do I use the application migration tools?

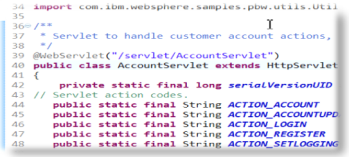
Let’s walk through using the migration tools to gain insights of your applications and details on your migration concerns.

Transformation Advisor

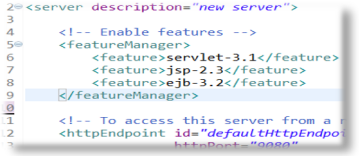
Binary scanner



Source scanner

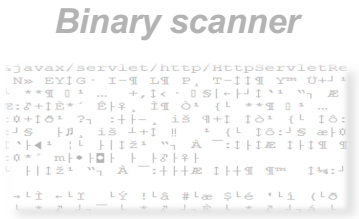


Config Migration



1. Full analysis with Transformation Advisor

Transformation Advisor



Transformation Advisor:

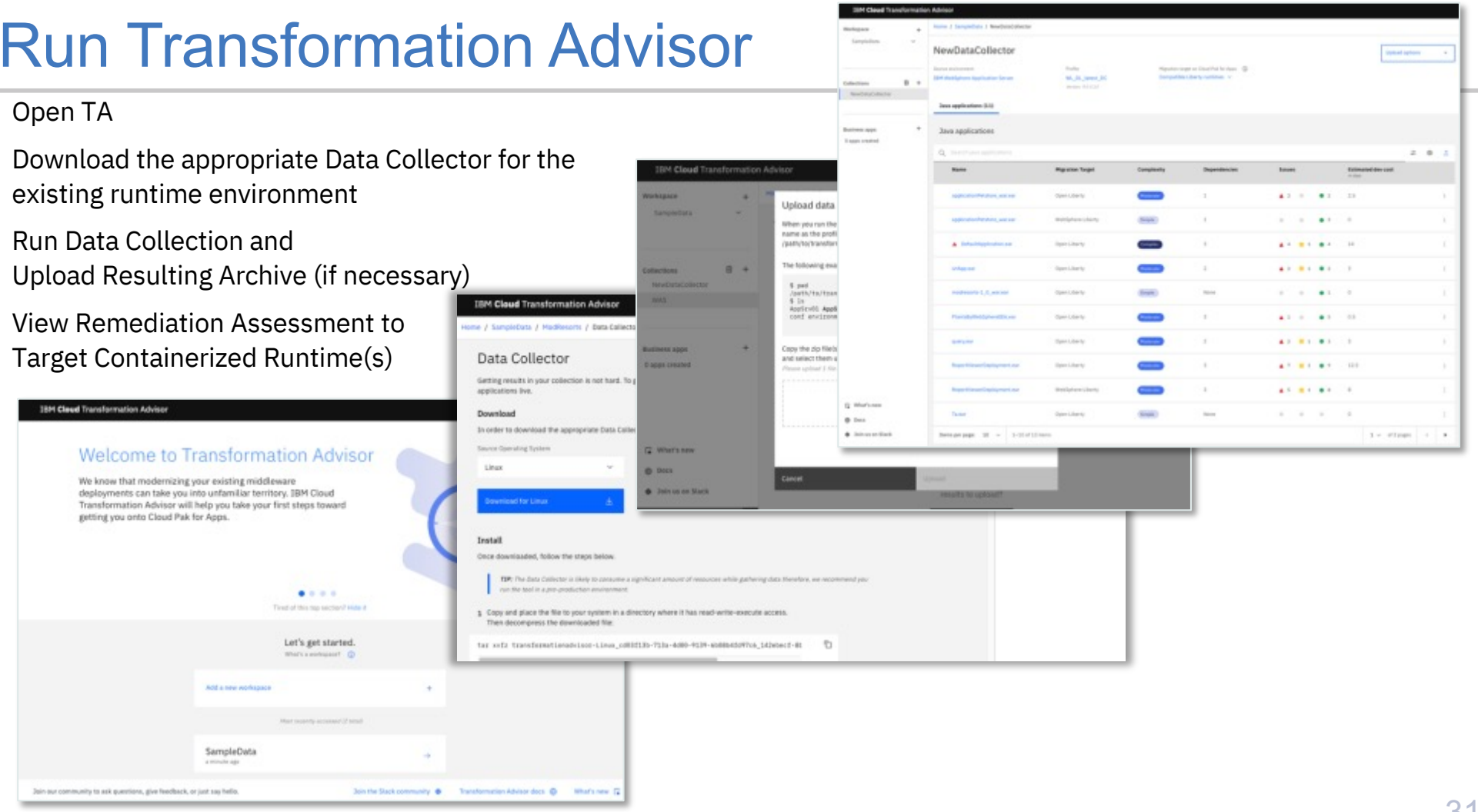
http://ibm.biz/cloudta

Evaluate all applications in your WebSphere Application Server cell

Migration assistance with no source code needed.

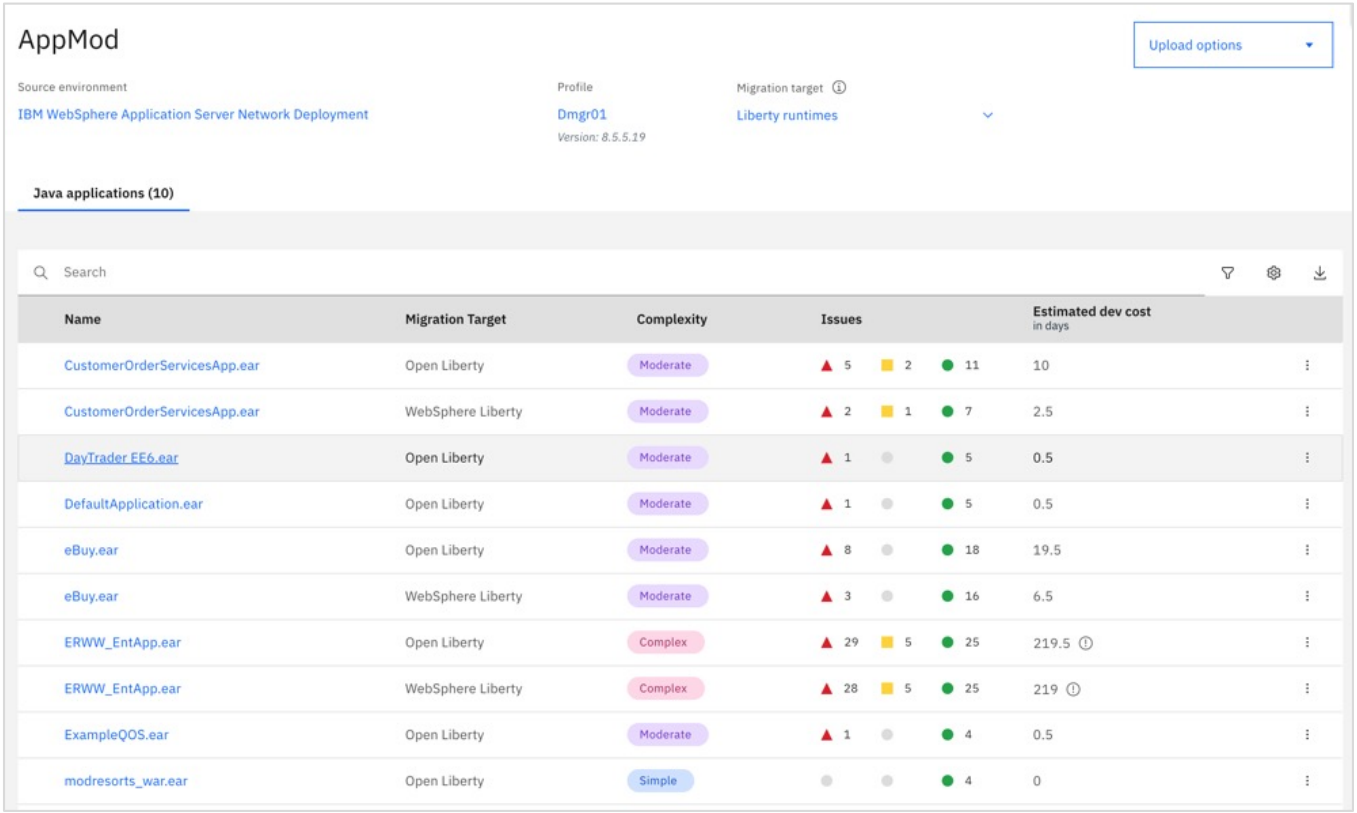
Run Transformation Advisor

- Open TA
- Download the appropriate Data Collector for the existing runtime environment
- Run Data Collection and Upload Resulting Archive (if necessary)
- View Remediation Assessment to Target Containerized Runtime(s)

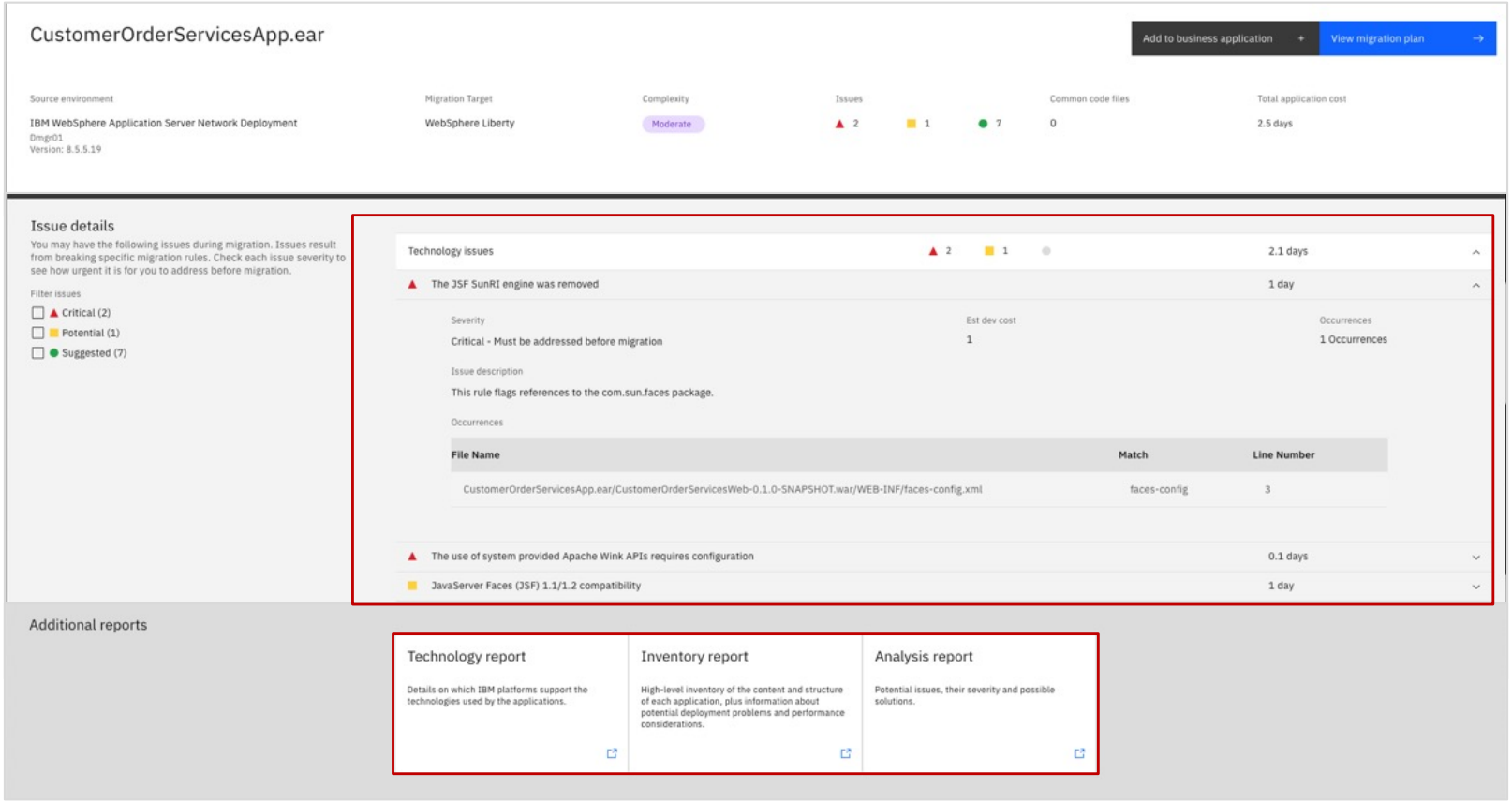


Transformation Advisor – Estate view

- Rates applications as simple, moderate, complex
- Provides development cost estimates
- Gives deep dive into analysis



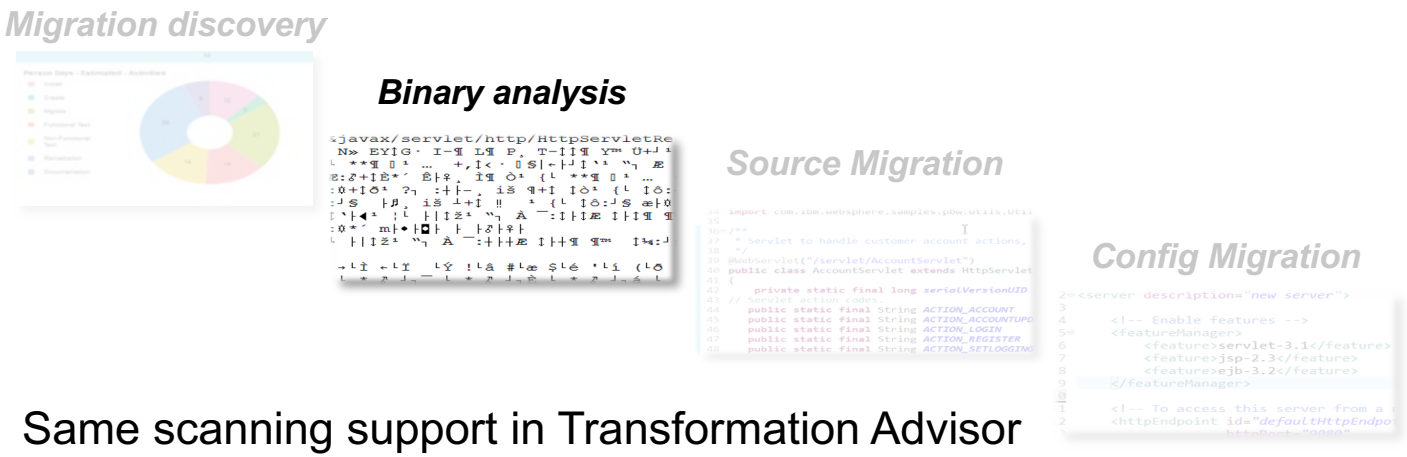
Analysis from Transformation Advisor



2. Application assessment using the binary scanner reports

Migration Toolkit for Application Binaries

https://www.ibm.com/support/pages/migration-toolkit-application-binaries



- Same scanning support in Transformation Advisor
- Evaluates the binaries – EAR, WAR, and JAR files
- Command line convenience when scanning a few files
- HTML or JSON output

Evaluate the best-fit platform

- Use the Technology Evaluation Report during your initial assessment and planning.
- Report shows the Java EE technologies your application uses. Help determine the right platform by answering
  questions like:
  - Does my application use deprecated Java EE technologies?
  - Will my application run on Open Liberty?
  - Should I continue using traditional WebSphere?

Application Technology Evaluation Report

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`/apps/PlantsByWebSphereV7.ear`

Scan options: `--baseEdition --coreEdition --liberty --libertyBuildpackEdition --ndEdition --traditional --zosEdition`

Technology Evaluation

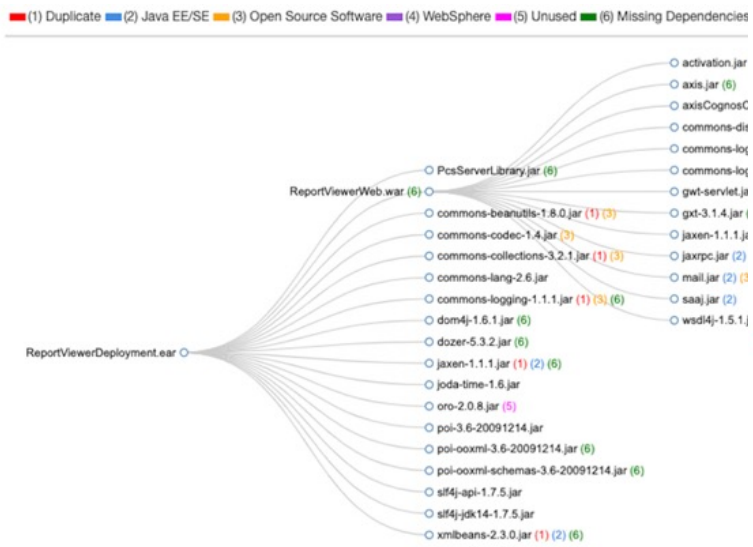
The highlighted columns indicate which IBM platforms fully support the technologies used by the included application.

Recommendation: Detailed migration analysis should be used to determine if there are migration issues that must be addressed before deploying your application.

	Open Liberty	Liberty for Java on IBM Cloud	Liberty Core	Liberty	WebSphere traditional	Network Deployment Liberty	Network Deployment traditional	Liberty for z/OS	WebSphere traditional for z/OS
WEB SERVICES TECHNOLOGIES									
Java API for XML-based RPC (JAX-RPC)					✓		✓		✓
WEB APPLICATION TECHNOLOGIES									
Java Servlet	✓	✓	✓	✓	✓	✓	✓	✓	✓
JavaServer Pages / Expression Language (JSP/EL)	✓	✓	✓	✓	✓	✓	✓	✓	✓
ENTERPRISE APPLICATION TECHNOLOGIES									
Enterprise JavaBeans (EJB) 2.x and 1.x	✓	✓		✓	✓	✓	✓	✓	✓
Enterprise JavaBeans (EJB) Lite subset	✓	✓	✓	✓	✓	✓	✓	✓	✓
Remote Enterprise JavaBeans (EJB)	✓			✓	✓	✓	✓	✓	✓
Java Persistence (JPA)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Common Annotations for the Java Platform	✓	✓	✓	✓	✓	✓	✓	✓	✓
JavaMail	✓	✓	✓	✓	✓	✓	✓	✓	✓
JAVA EE-RELATED SPECIFICATIONS IN JAVA SE									
Java Database Connectivity (JDBC)	✓	✓	✓	✓	✓	✓	✓	✓	✓

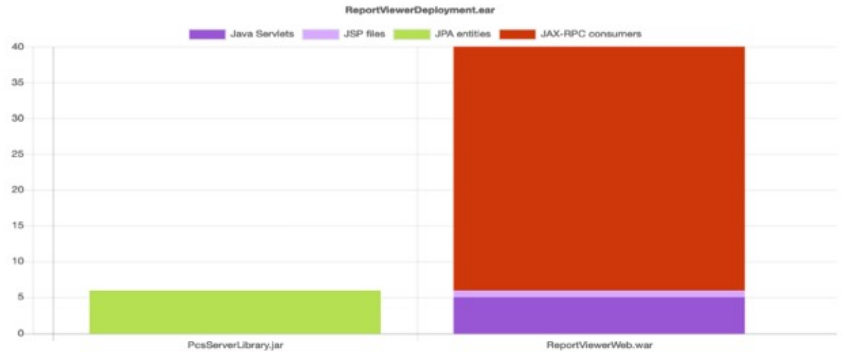
Inventory

- Better understand your application
  - Structure
  - Dependencies
  - Contents



Summary

Technology	Count
Java Servlets	5
JSP files	1
JPA entities	6
BMP entity beans	0
CMP entity beans	0
Message-driven beans	0
Singleton session beans	0
Stateful session beans	0
Stateless session beans	0
Web Services	34



Inventory Details by Archive

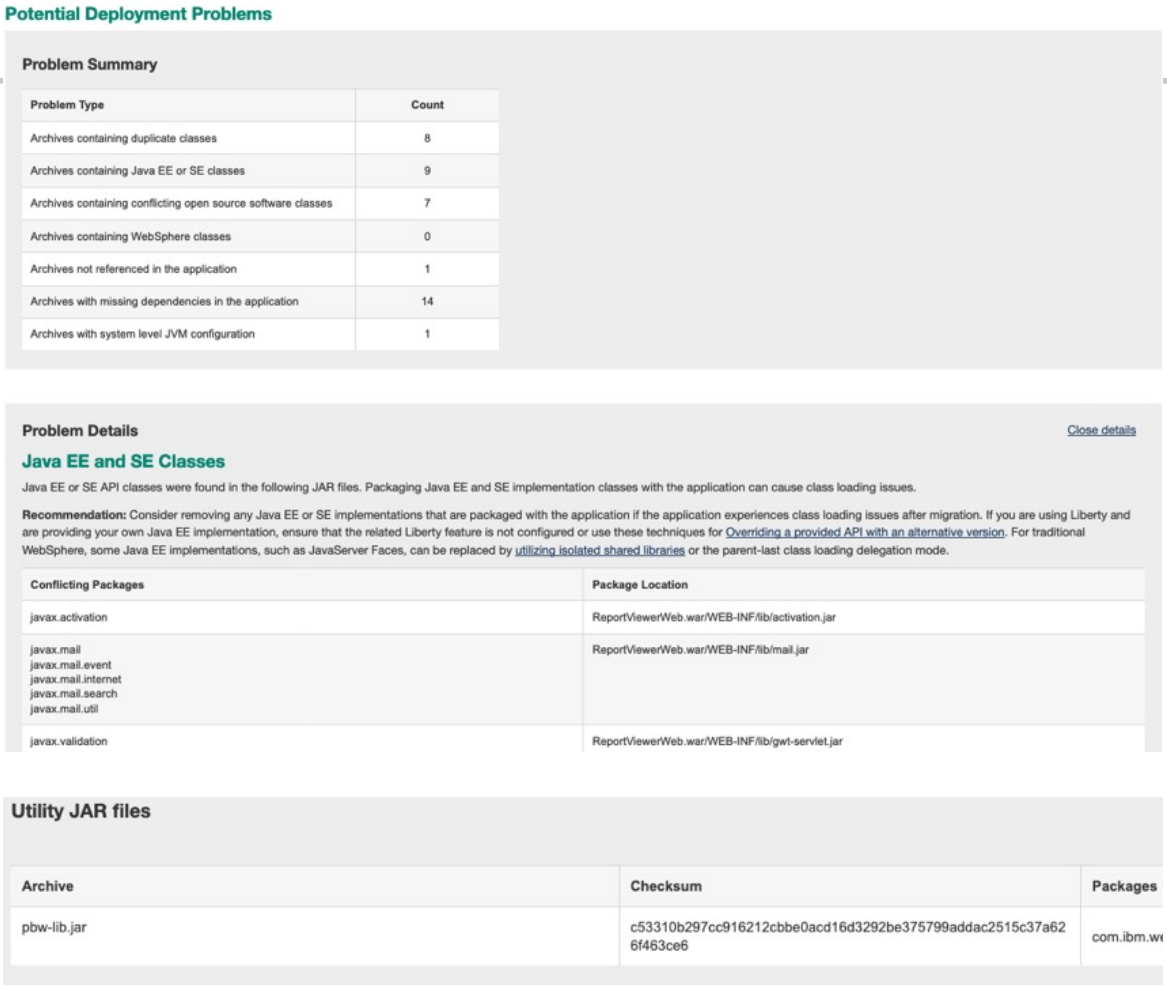
Archive	Java Servlets	JSP files	JPA entities	BMP entity beans	CMP entity beans	Message-driven beans	Singleton session beans	Stateful session beans	Stateless session beans
PcsServerLibrary.jar	0	0	6	0	0	0	0	0	0
ReportViewerWeb.war	5	1	0	0	0	0	0	0	0

Web Service Details by Archive

Archive	JAX-RPC consumers	JAX-RPC providers	JAX-RS consumers	JAX-RS providers	JAX-WS consumers	JAX-WS providers
ReportViewerWeb.war	34	0	0	0	0	0

Inventory

- Understand potential problems and clean up
  - Duplicate classes
  - Java SE/EE classes
  - WebSphere classes
  - Conflicting open source classes
  - Unused archives
  - Missing dependencies



Potential Deployment Problems

Problem Summary

Problem Type	Count
Archives containing duplicate classes	8
Archives containing Java EE or SE classes	9
Archives containing conflicting open source software classes	7
Archives containing WebSphere classes	0
Archives not referenced in the application	1
Archives with missing dependencies in the application	14
Archives with system level JVM configuration	1

Problem Details Close details

Java EE and SE Classes

Java EE or SE API classes were found in the following JAR files. Packaging Java EE and SE implementation classes with the application can cause class loading issues.

Recommendation: Consider removing any Java EE or SE implementations that are packaged with the application if the application experiences class loading issues after migration. If you are using Liberty and are providing your own Java EE implementation, ensure that the related Liberty feature is not configured or use these techniques for Overriding a provided API with an alternative version. For traditional WebSphere, some Java EE implementations, such as JavaServer Faces, can be replaced by utilizing isolated shared libraries or the parent-last class loading delegation mode.

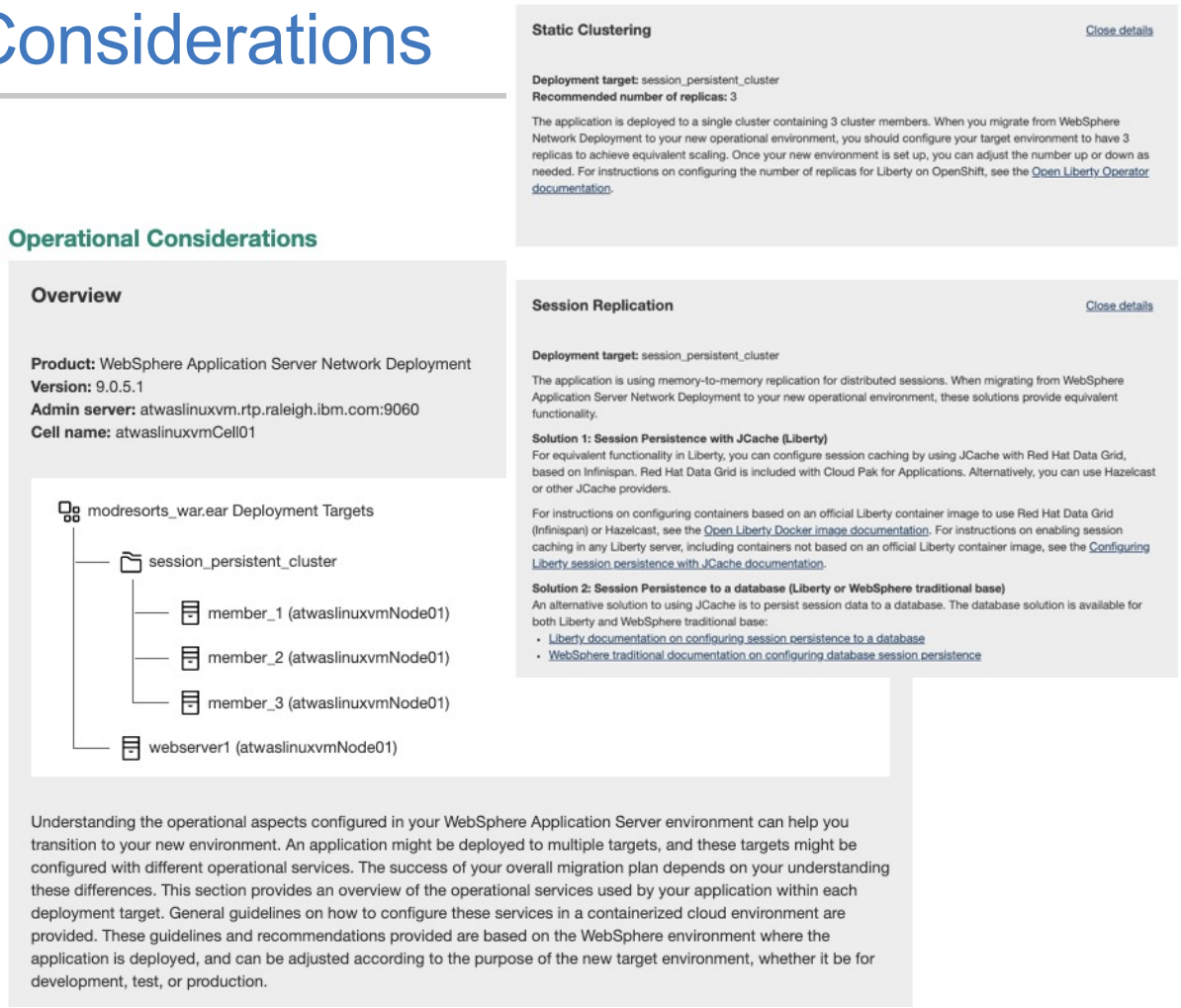
Conflicting Packages	Package Location
javax.activation	ReportViewerWeb.war/WEB-INF/lib/activation.jar
javax.mail javax.mail.event javax.mail.internet javax.mail.search javax.mail.util	ReportViewerWeb.war/WEB-INF/lib/mail.jar
javax.validation	ReportViewerWeb.war/WEB-INF/lib/gwt-servlet.jar

Utility JAR files

Archive	Checksum	Packages
pbw-lib.jar	c53310b297cc916212cbbe0acd16d3292be375799addac2515c37a626f463ce6	com.ibm.w

Inventory Operational Considerations

- Understand the WebSphere Network Deployment qualities of service used by your application and how to migrate them
  - Static clustering
  - Session Replication



Static Clustering Close details

Deployment target: session_persistent_cluster
Recommended number of replicas: 3

The application is deployed to a single cluster containing 3 cluster members. When you migrate from WebSphere Network Deployment to your new operational environment, you should configure your target environment to have 3 replicas to achieve equivalent scaling. Once your new environment is set up, you can adjust the number up or down as needed. For instructions on configuring the number of replicas for Liberty on OpenShift, see the Open Liberty Operator documentation.

Operational Considerations

Overview

Product: WebSphere Application Server Network Deployment
Version: 9.0.5.1
Admin server: atwaslinuxvm.rtp.raleigh.ibm.com:9060
Cell name: atwaslinuxvmCell01

modresorts_war.ear Deployment Targets
- session_persistent_cluster
  - member_1 (atwaslinuxvmNode01)
  - member_2 (atwaslinuxvmNode01)
  - member_3 (atwaslinuxvmNode01)
- webserver1 (atwaslinuxvmNode01)

Session Replication Close details

Deployment target: session_persistent_cluster

The application is using memory-to-memory replication for distributed sessions. When migrating from WebSphere Application Server Network Deployment to your new operational environment, these solutions provide equivalent functionality.

Solution 1: Session Persistence with JCache (Liberty)
For equivalent functionality in Liberty, you can configure session caching by using JCache with Red Hat Data Grid, based on Infinispan. Red Hat Data Grid is included with Cloud Pak for Applications. Alternatively, you can use Hazelcast or other JCache providers.

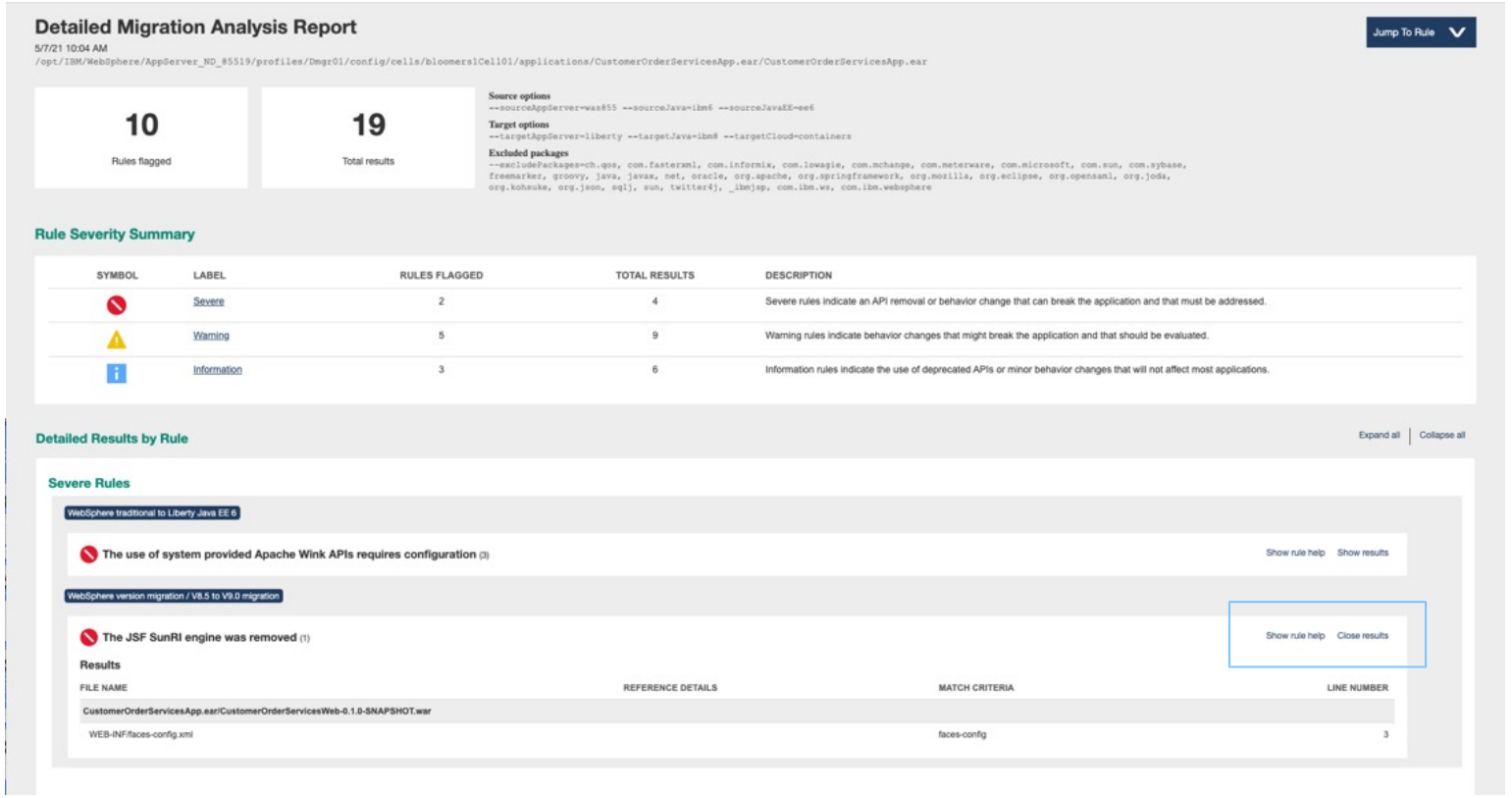
For instructions on configuring containers based on an official Liberty container image to use Red Hat Data Grid (Infinispan) or Hazelcast, see the Open Liberty Docker image documentation. For instructions on enabling session caching in any Liberty server, including containers not based on an official Liberty container image, see the Configuring Liberty session persistence with JCache documentation.

Solution 2: Session Persistence to a database (Liberty or WebSphere traditional base)
An alternative solution to using JCache is to persist session data to a database. The database solution is available for both Liberty and WebSphere traditional base:
- Liberty documentation on configuring session persistence to a database
- WebSphere traditional documentation on configuring database session persistence

Understanding the operational aspects configured in your WebSphere Application Server environment can help you transition to your new environment. An application might be deployed to multiple targets, and these targets might be configured with different operational services. The success of your overall migration plan depends on your understanding these differences. This section provides an overview of the operational services used by your application within each deployment target. General guidelines on how to configure these services in a containerized cloud environment are provided. These guidelines and recommendations provided are based on the WebSphere environment where the application is deployed, and can be adjusted according to the purpose of the new target environment, whether it be for development, test, or production.

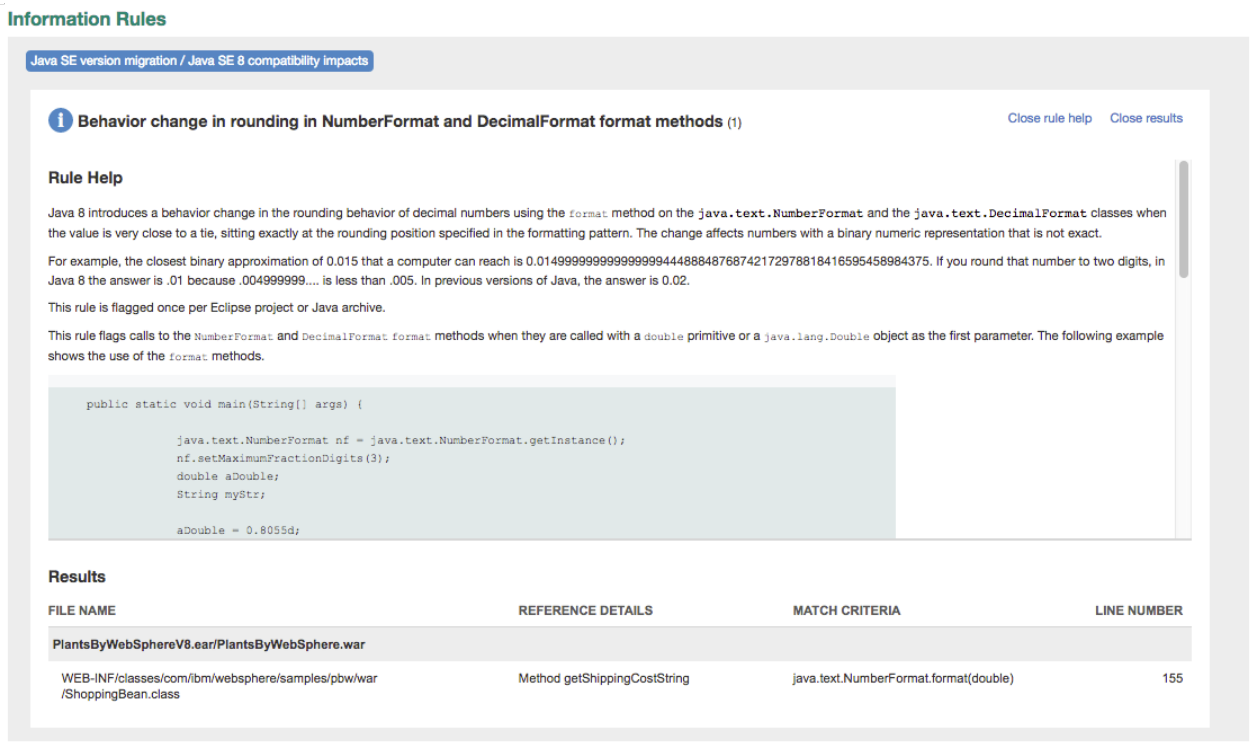
Analysis Report – getting to the details

- Source and target application server
- Source and target Java
  Up to Java 16 for Liberty
- Source and target Java EE
  Up to EE8 for Liberty



Learn about the issues

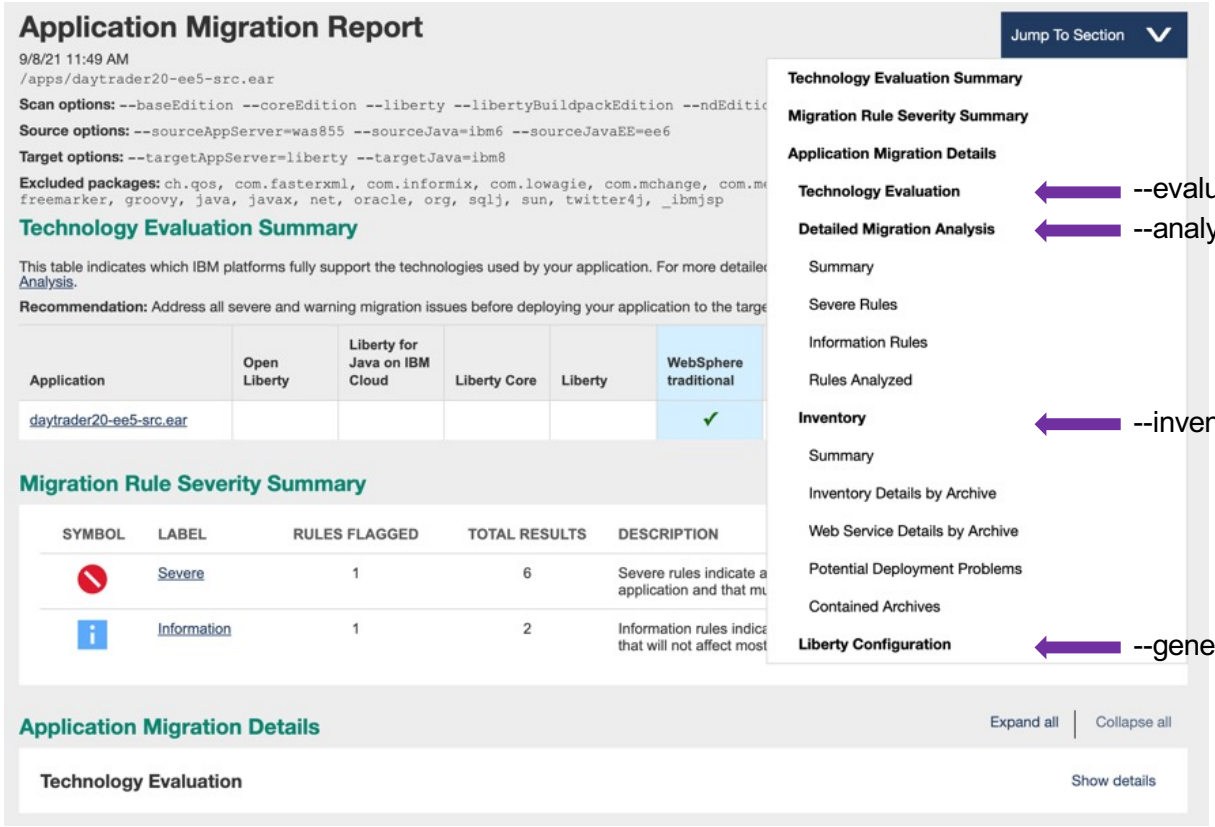
Rule help and the results are presented together so that you can learn and quantify the migration effort.



Scans the included JAR files, but you can control the report content with the **--includePackages** and **--excludePackages** options.

Binary Scanner - consolidated Application Migration Report

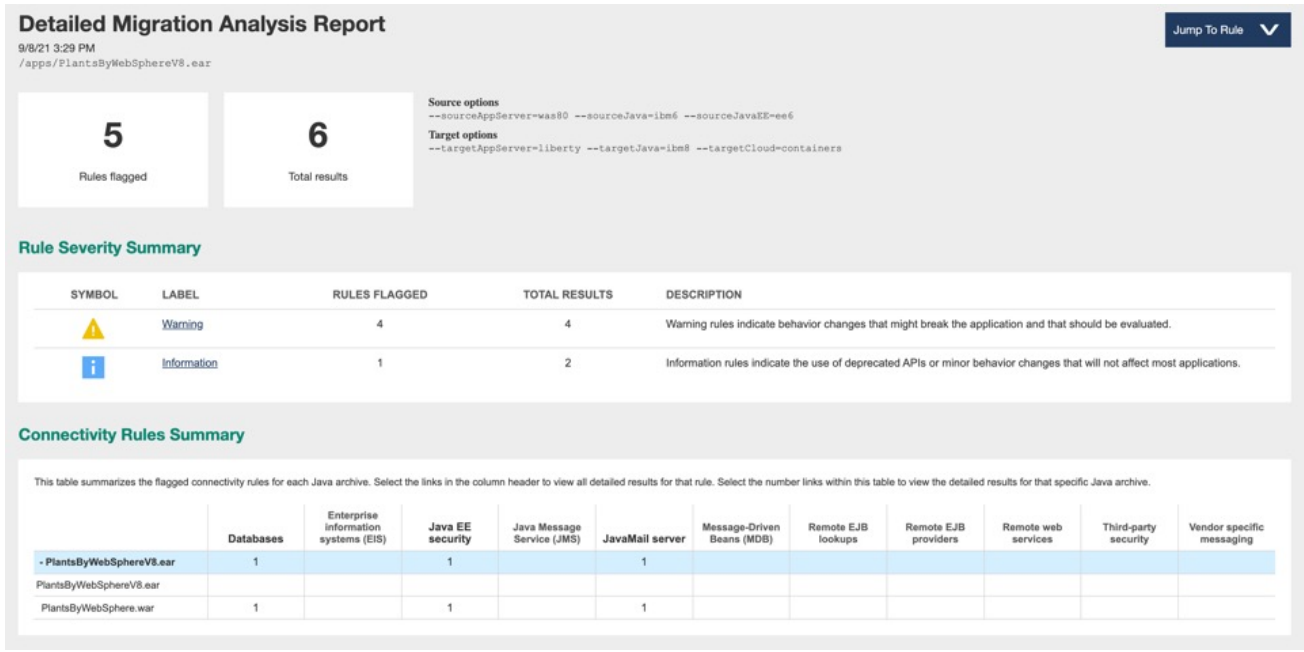
- The default action **--all** generates the consolidated Application Migration Report.
- It includes sections for:
  - Technology Evaluation
  - Detailed Migration Analysis
  - Inventory
  - Liberty Configuration



Evaluate target cloud options quickly

Can generates a summary of cloud connectivity considerations.

java –jar binaryScanner.jar ./PlantsByWebSphereV8.ear --analyze
--sourceAppServer=was80 –targetAppServer=liberty --targetCloud=containers



Detailed Migration Analysis Report

9/8/21 3:29 PM
/apps/PlantsByWebSphereV8.ear

Jump To Rule

5	6
Rules flagged	Total results

Source options
--sourceAppServer=was80 --sourceJava=ibm6 --sourceJavaEE=ee6

Target options
--targetAppServer=liberty --targetJava=ibm8 --targetCloud=containers

Rule Severity Summary

SYMBOL	LABEL	RULES FLAGGED	TOTAL RESULTS	DESCRIPTION
⚠	Warning	4	4	Warning rules indicate behavior changes that might break the application and that should be evaluated.
ℹ	Information	1	2	Information rules indicate the use of deprecated APIs or minor behavior changes that will not affect most applications.

Connectivity Rules Summary

This table summarizes the flagged connectivity rules for each Java archive. Select the links in the column header to view all detailed results for that rule. Select the number links within this table to view the detailed results for that specific Java archive.

	Databases	Enterprise information systems (EIS)	Java EE security	Java Message Service (JMS)	JavaMail server	Message-Driven Beans (MDB)	Remote EJB lookups	Remote EJB providers	Remote web services	Third-party security	Vendor specific messaging
- PlantsByWebSphereV8.ear	1		1		1						
PlantsByWebSphereV8.ear											
PlantsByWebSphere.war	1		1		1						

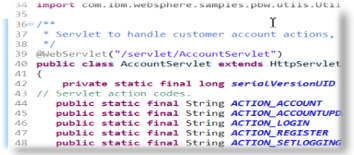
Step 3: Make application changes

- WebSphere Application Server Migration Toolkit
  https://www.ibm.com/support/pages/websphere-application-server-migration-toolkit

Transformation Advisor

Binary scanner

Source scanner



Config Migration

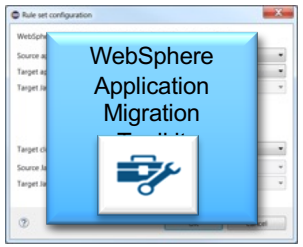
- Evaluates Java, JSP, XML, and other files
- Eclipse IDE

Analyze application source code in Eclipse

Source server

- Liberty
- WAS traditional 5.1+
- JBoss
- WebLogic
- Tomcat
- Oracle

- Java EE 1.4, 5 or 6
- Java SE 1.4, 5, 6 or 7



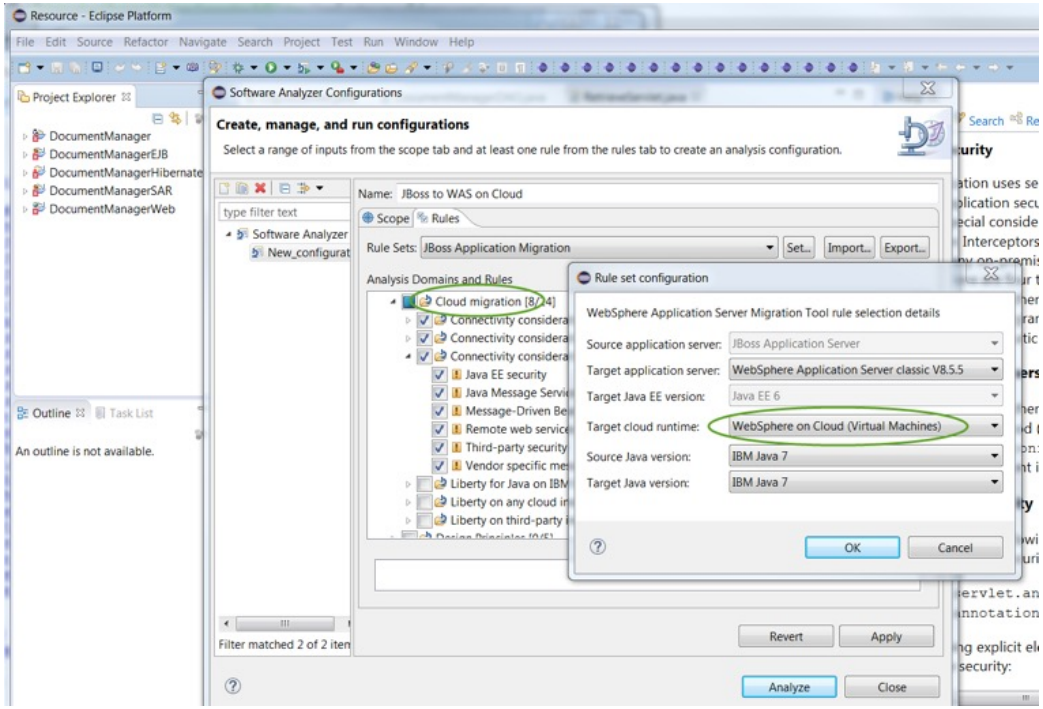
Target server

- Liberty
- WAS traditional

- Java EE 6 or 7
- Java SE 7 or 8
- Containers, VMs, IBM cloud runtimes

See the details on how to update the source

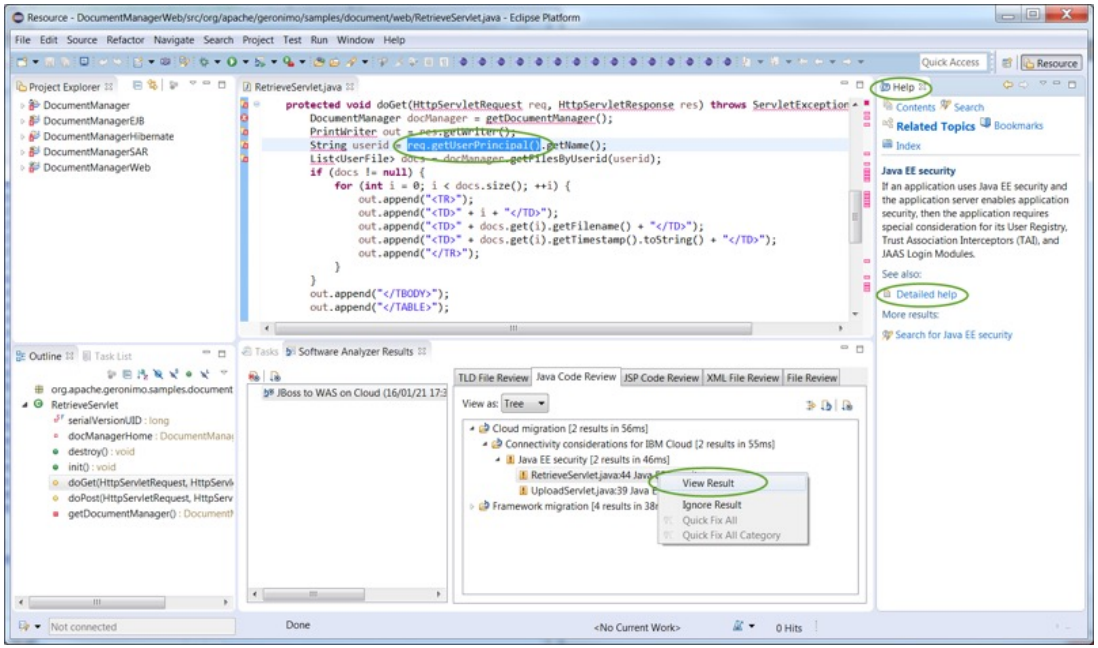
- Configure analysis rules appropriate for your source and target application server and cloud platform.
- Choose your Java SE source and target
- Choose your Java EE source and target



Jump to the source code

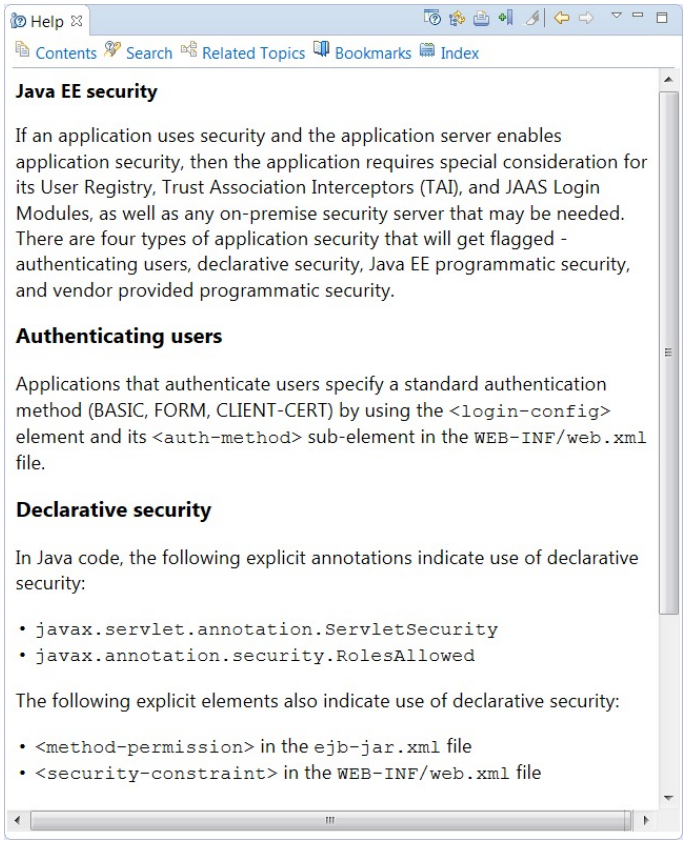
After running analysis…

- Open the code from the analysis result
- Each issue has detailed help for guidance for issue mitigation.
- If possible, a quick fix is provided.



Learn about the issues

- Detailed information and advice is provided
- Code quick fixes where possible
- Pointers to the knowledge center and external resources



What can detailed analysis detect?

- WebSphere Version Migration
  - Identify issues in applications moving to newer versions of WebSphere
    - Migrate applications from v6.1, v7.0, v8.0, v8.5.5 (source scanner goes back farther)
    - Migrate applications to v8.5.5, v9.0
  - Liberty
    - Identify programming models not available in Liberty
    - Behavior changes between WebSphere traditional and Liberty
  - Java EE 7 differences
  - Java SE differences
- Cloud Migration
  - Optimize your application for Bluemix and Liberty PaaS
  - Instant runtimes, Docker, and WAS on Cloud targets
  - Connectivity considerations
- Third-party application servers (Eclipse tool only)
  - Migrate applications from Oracle (WebLogic & Oracle AS), JBoss or Tomcat to Liberty and traditional WebSphere

What's new in the migration tools for traditional WebSphere V9

Detects the use of deprecated features

- Enterprise JavaBeans (EJB) entity beans
- Java API for XML-based RPC (JAX-RPC)
- Java API for XML Registries (JAXR)
- Java EE Application Deployment
- The CommonJ Timer and Work Manager APIs
- The WebSphere Asynchronous Beans API

What's new in the migration tools for traditional WebSphere V9

Detects the use of removed features

- Apache HTTP client API
- CDI OpenWebBeans API
- CEA system application
- Common Event Infrastructure API
- JSF SunRI engine
- SCA programming models

What's new in the migration tools for Java EE 7

- Java EE compatibility
  - Newer Java EE versions intend to support older Java EE versions
  - Java EE supports incremental upgrade
    - Modules within an application can be earlier versions
  - In some cases, breaking clarifications exist
  - The migration tools help with Java EE version differences but not Java EE exploitation

What's new in the migration tools for Java EE 7

- Changing the underlying Java EE implementation affects behavior
  - Java EE 7 has some new providers in WAS Liberty
    - JPA 2.1 – EclipseLink (was OpenJPA)
    - JAX-RS 2.0 – CXF (was Apache Wink)
    - CDI 1.2 – Weld implementation (was OpenWebBeans)
  - The toolkit also provides assistance for Java EE 7 differences in:
    - Expression Language (EL)
    - JMS
    - Servlet

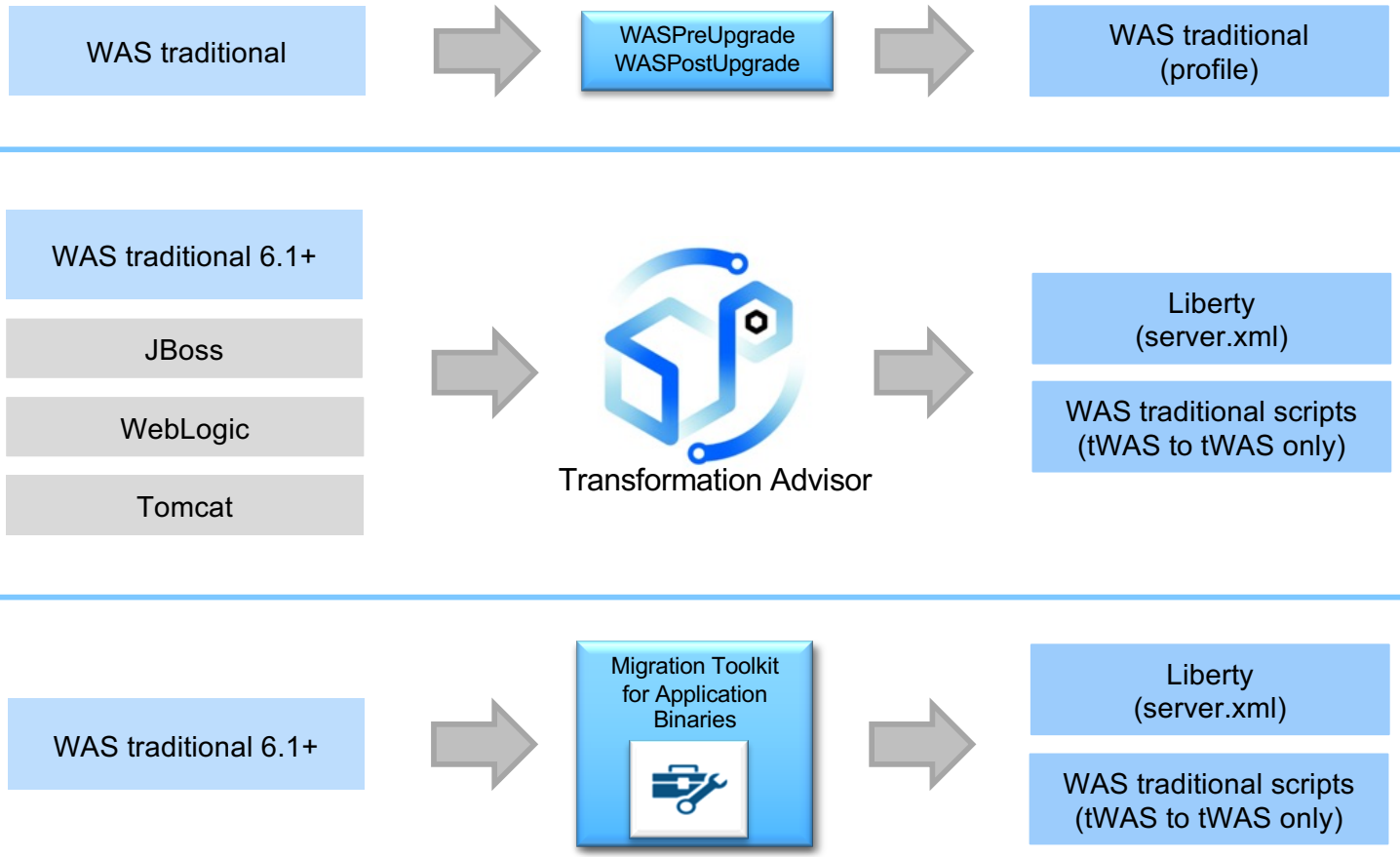
What's new in the migration tools for Java SE

- WebSphere V9 runs on Java SE 8
- Java Runtime compatibility (JRE)
  - JREs focus on binary compatibility and are normally very good
  - However new APIs and behavior changes can cause migration work
    - Interface changes
    - Exception differences
    - Null
  - Source scanner helps migrate from Java 1.4 up to Java 8
  - Binary scanner helps migrate from Java 5 to Java 8

4. How do I migrate configuration?

- WebSphere Version to Version Migration
  - WASPreUpgrade / WASPostUpgrade
- Traditional WebSphere to Liberty
  - Transformation Advisor
  - Binary scanner
- Third-party app servers – Tomcat, WebLogic, JBoss
  - Transformation Advisor

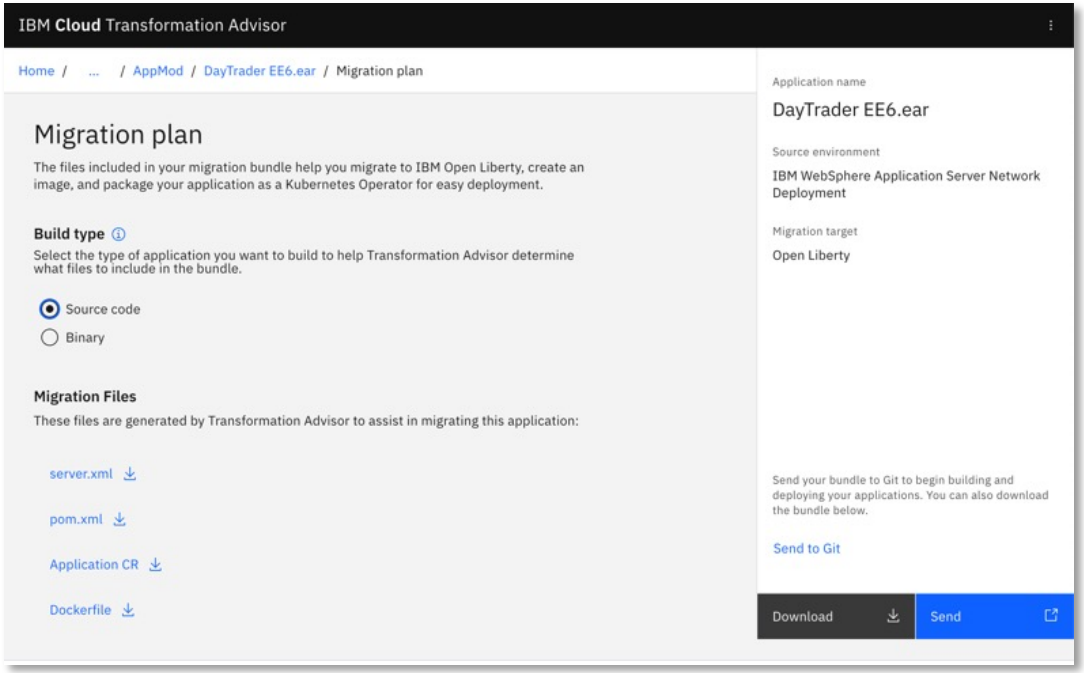
Analyze configuration



Transformation Advisor Configuration

TA jump starts your modernization with the migration plan to build and deploy to containers

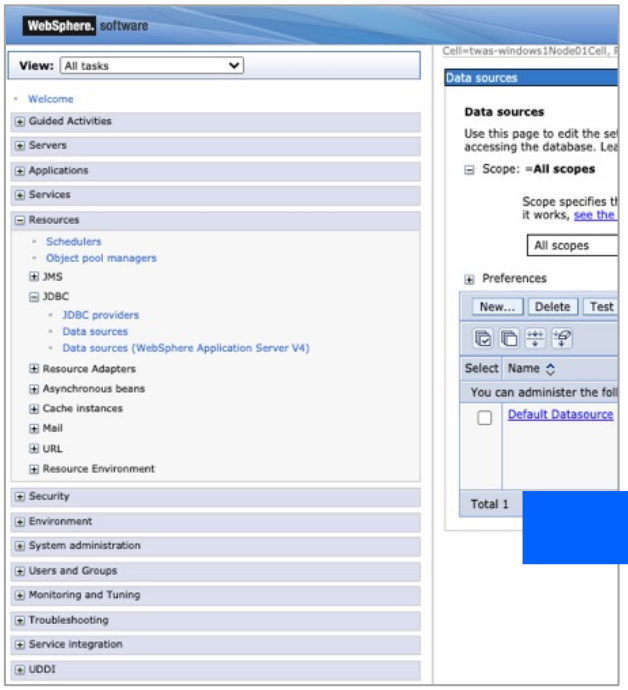
- Liberty server.xml
- Traditional WebSphere scripts
- Dockerfile
- OpenShift deployment YAML



Binary Scanner Configuration

Runs within TA but you can also scan single applications

WebSphere traditional



Liberty

```
<?xml version="1.0" encoding="UTF-8"?>
<server description="Configuration generated by binaryAppScanner">
    <featureManager>
        <!--The following features are available in all editions of Liberty.-->
        <feature>appSecurity-2.0</feature>
        <feature>ejbLite-3.1</feature>
        <feature>jdbc-4.0</feature>
        <feature>jsp-2.2</feature>
        <feature>servlet-3.0</feature>
    </featureManager>

    <!-- This configuration was migrated on 6/11/21 at 9:36:55 AM from the following location: /Users/alexmotley/dev/demos/may_19_playback/Dmgr01_windc
    <!-- The binary scanner does not support the migration of all WebSphere traditional configuration elements. Check the binary scanner documentation
    <applicationManager autoExpand="true"/>

    <httpEndpoint host="${httpEndpoint_host_1}" httpPort="${httpEndpoint_port_1}" httpsPort="${httpEndpoint_secure_port_1}" id="defaultHttpEndpoint"/>

    <!-- Some or all of the bindings that are migrated for this application might exist in the application archive. If so, the duplicate bindings can b
    <enterpriseApplication location="DefaultApplication.ear">
        <web-ext context-root="/" moduleName="DefaultWebApplication"/>
    </enterpriseApplication>

    <jdbcDriver id="Derby_JDBC_Provider">
        <library>
            <file name="${DERBY_JDBC_DRIVER_PATH}/derby.jar"/>
        </library>
    </jdbcDriver>

    <dataSource id="Default Datasource" jdbcDriverRef="Derby_JDBC_Provider" jndiName="DefaultDatasource" type="javax.sql.ConnectionPoolDataSource">
        <properties.derby.embedded connectionAttributes="upgrade=true" databaseName="${Default_Datasource_databaseName_1}"/>
        <connectionManager connectionTimeout="180" maxPoolSize="10"/>
    </dataSource>

    <keyStore id="CellDefaultKeyStore" location="${CellDefaultKeyStore_location_1}" password="${CellDefaultKeyStore_password_1}"/>

    <keyStore id="CellDefaultTrustStore" location="${CellDefaultTrustStore_location_1}" password="${CellDefaultTrustStore_password_1}"/>
```

Application Migration Tools Demo

Traditional Configuration Migration Options

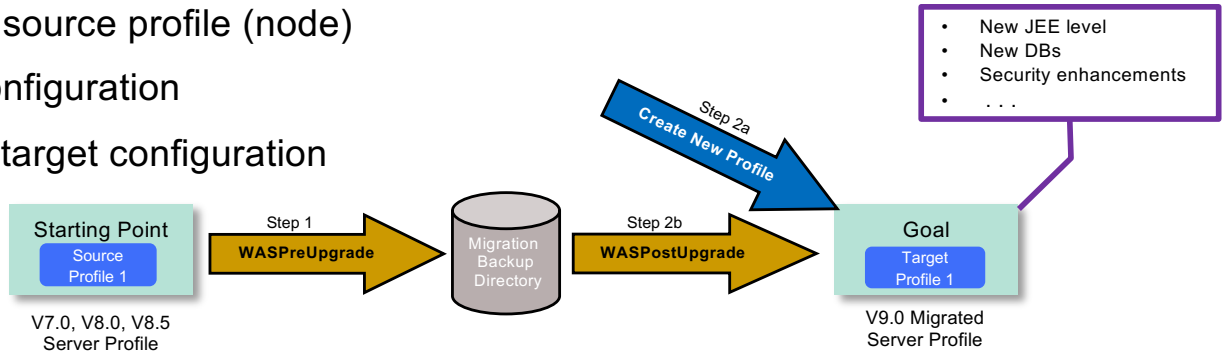
Traditional WebSphere Configuration Migration

Configuration migration goals:

- ❑ Upgrade to new release – new features, functions and the latest technologies (Java, JEE, WebSphere)
- ❑ Maintain a stable environment – new environment behaves as close as possible to old environment
- ❑ Install applications “as-is” – no code changes, deployed using same options (must be fully tested)

Configuration migration overview:

- ❑ Capture configuration data from source profile (node)
- ❑ Create target profile with new configuration
- ❑ Merge source configuration into target configuration
  - ❑ merge, purge, add, adjust



Traditional WebSphere Configuration Migration

WebSphere migration strategies:

- Remote versus Local – Source and target profiles are on different machines
- Standard(replace) versus clone – Source is replaced by target, thus the source servers are stopped and disabled. Clone allows for the old environment to continue to run during and after migration
- Other – Script based, Property-File Based Configuration

WebSphere migration tools:

- WASPreUpgrade and WASPostUpgrade – Capture and merge the source and target profile configuration
- createRemoteMigrJar – Captures the WASPreUpgrade command from a V9.0 install. Used for remote migration when you do not want to install the new WebSphere release on the old source machine
- WASMigrationAppInstaller – Tool to run the application install scripts generated by the WASPostUpgrade command
  - By default WASPostUpgrade will install the applicaitons, but the application installs can be deferred and controlled by this command line tool
  - The CMMT wizard also supports splitting-out the application installs into a separate process
- Configuration Migration Management Tool (CMMT wizard) – Runs WASPreUpgrade, manageprofiles, WASPostUpgrade and optionally the WASMigrationAppInstaller
- z/OS Migration Management Tool (zMMT wizard) – Creates the jobs and instructions for running a WebSphere migration on zSeries. This tool is part of the WebSphere Configuration Toolset (WCT) and runs on linux and windows

What's new for WebSphere V9.0 Migration

What's New for V9.0 Migration??? (See the WebSphere Knowledge Center for more details)

- –Logging and Trace Improvements
  - • Reduced size, separate command logs, AboutThisMigratedProfile.txt, …
- –Better Control of Ports when Migrating
  - • Distributed and zMMT
- –Migration Properties File
  - • Guide to migration options, save and reuse settings
- –Integrated Migration for Batch and Intelligent Management
  - • Handles both conditions: integrated features in V855 OR stack product prior to V855
- –New Application Migration Install Tool
  - • Reentrant, concurrent, selective, Jee level tolerant, …
- –CreateRemoteMigrJar Improvements (V9.0.0.2)
  - • Smaller size, create once/run on any distributed platform, -includeJava option
- **–New Clone Migration Option** (not available on zOS or iSeries)
  - • Zero downtime, concurrent running environments, …

Migration Properties File

- Provides many advantages to the migration process including:
  - A quick reference to the WASPreUpgrade and WASPostUpgrade migration options.
  - A guide to help you define your migration strategy.
  - Reduce the number of command line parameters you have to remember and type.
  - Make your migration process repeatable.
  - Provides for better customer support and communication.
    - Provides control for debugging certain aspects of the migration process.
    - Provides control for debugging other tools called during the migration process.
    - Provides a quick way to inject system properties into the migration process.
- A template migration.properties is located in the ${**WAS_INSTALL_ROOT**}/properties directory.
  - Copy to new location and tailor to your migration needs.
- Use with the WASPreUpgrade and WASPostUpgrade commands:
  - Example: WASPreUpgrade C:\migrBU C:\v8install –oldProfile dmgr ***–properties <prof_file>***

Migration of WVE and CG Stack Products

- WebSphere Compute Grid and WebSphere Virtual Enterprise
  - Prior to v8.5.5, they were installed as stack products with separate migration tools.
  - In release v8.5.5, they were integrated as features of the WebSphere Application Server product.
    - Batch
    - Intelligent Management
  - Prior to v9.0, both the WVE and CG stack products required multiple steps to migrate.
    - First run the WAS migration process
    - Next run the stack product's migration process.
  - Now for v9.0, use only the WAS migration tools to migrate WCG and WVE!
    - CG and WVE stack product migration commands are obsolete when migrating to WAS v9.0. Use WASPreUpgrade and WASPostUpgrade to migrate from:
      - WAS v7.0 or v8.0 with the WVE and/or CG stack products installed to WAS v9.0 seamlessly.
      - WAS v8.5.5 with integrated Batch and IM features to WAS v9.0.

WASMigrationAppInstaller Tool

- Replaces the old *install_all_apps.jy* script
- Relies on WASPostUpgrade –includeApps options
  - true – create install scripts for each app, then runs WASMigrationAppInstaller to install them
  - script – create install scripts only
  - false – do neither
- Run manually after WASPostUpgrade
  - By default runs all install scripts found in migration backup directory
  - Includes option to select the applications to install to migrated server
  - Checks if app is already installed
  - Tries at new JEE level and if fails at old JEE level
- Reminder – Applications are installed “as-is” to the new release.
  - Use WebSphere Application Migration Toolkit to determine if application needs to be migrated to new JEE, java or WebSphere level

Application Deployment Issues

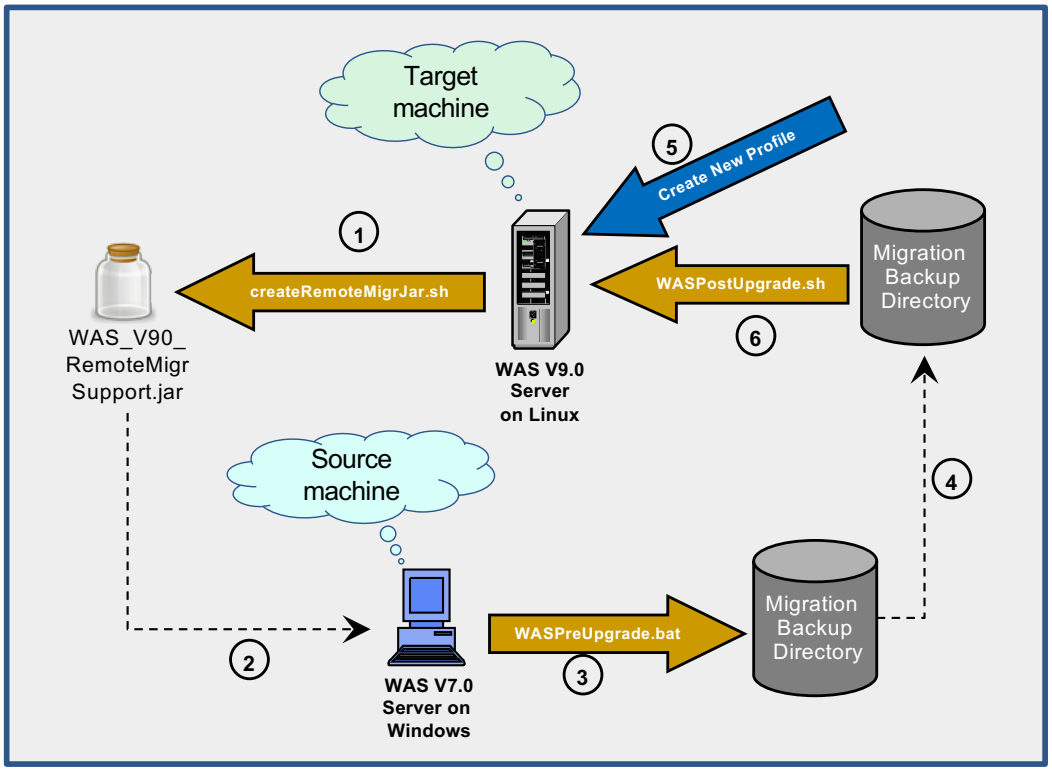
- "I deployed it before on my v8 Deployment Manager (dmgr), now my v9.0 dmgr tells me that the v8 nodes won't support that level of the application! The application did not change -- What happened?"
  - **NEW for V9.0 ➔ automatic retry of application install at the old JEE level, if application fails to deploy at the JEE 7 level.**
- "Finally, I was able to deploy the application, but now it is behaving differently. Why?"
- Answer, in both situations is usually annotations introduces at the new JEE level.
  - These annotations were not recognized by the old deployment tool nor by the old server runtime environment. They were basically ignored.
  - They may have been introduced by third-party jar files.
- For a more in depth explanation of these issues see the following white paper.
  https://www.ibm.com/support/pages/system/files/inline-files/ApplicationMigrationIssues_0.pdf

createRemoteMigrJar Tool

Remote migration overview

1. Run createRemoteMigrJar on target machine
   - Gathers from v9.0 WASPreUpgrade support files
   - No need to install v9.0 on source
2. Send jar to source machine and unzip
3. Run WASPreUpgrade command
4. Zip migration backup directory and send to target machine
5. Create target profile
6. Run WASPostUpgrade command

Note: -includeJava option packages the jre shipped with WebSphere v9.0 into the remote jar.



Use createRemoteMigrJar command to avoid having to install WebSphere V9.0 on your source machine just to run the WASPreUpgrade command!

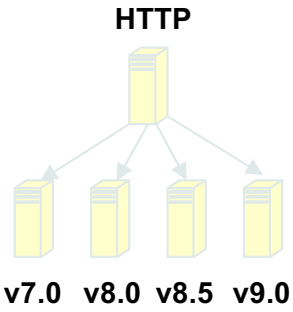
Migration Tools for Administrators

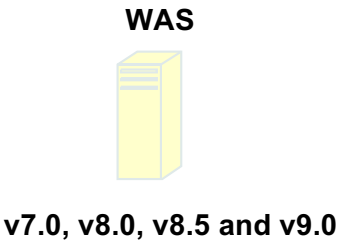
WebSphere Application Server configuration migration tools

- Configuration Migration Tool (CMT) for distributed
  - Move existing configurations between versions on same machine
- z/OS Migration Management Tool (zMMT) – for z/OS
  - Creates jobs to perform the migration (WCT product)
- Command line tools for configuration migration
  - For distributed and iSeries (WASPreUpgrade, WASPostUpgrade)
  - Local and cross-platform version migration support (createRemoteMigrJar)
  - Delayed application deployment (WASMigrationAppInstaller)

Coexistence configuration for migration

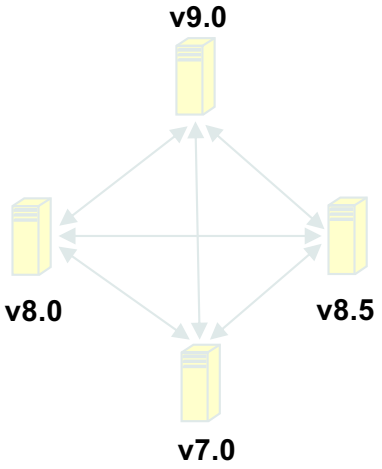
- Cross version plug-in support
  - Higher level Web Server plug-in can work to multiple WebSphere versions
    - The URI for a machine must be unique in the routing rules for the plug-in
    - Support for n-3 (v7.0, v8.0 and v8.5 for v9.0)
- Coexistence
  - Different versions of WAS: same machine, same LPAR, same time
    - Requires port conflict resolution
    - Support for n-3 (v7.0,v8.0,v8.5 and v9.0)





Interoperability

- Different versions of WebSphere can communicate
- Support for applications that are Secure, Transactional, EJB and WLM-able
- Support for n-3
  (v7.0, v8.0, v8.5 and v9.0)

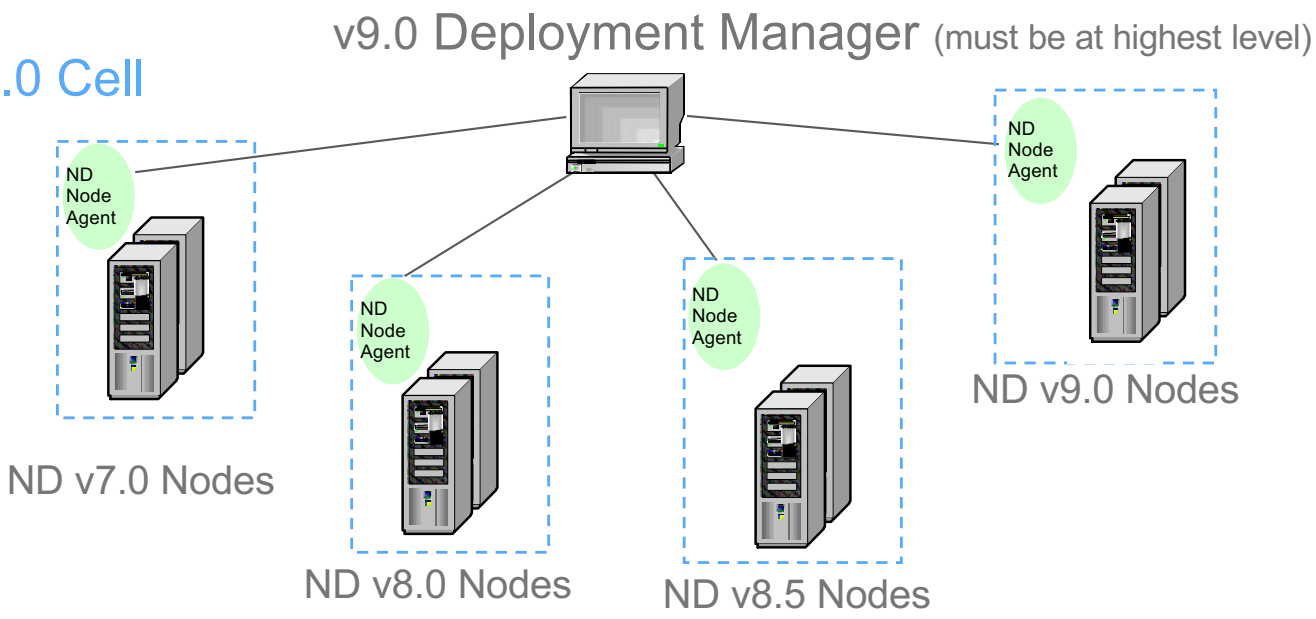


Mixed version cell support

Support for existing infrastructure in new deployments

Business Value: Adopt newer infrastructure as your plans require, saving time and money

WAS Network Deployment v9.0 Cell



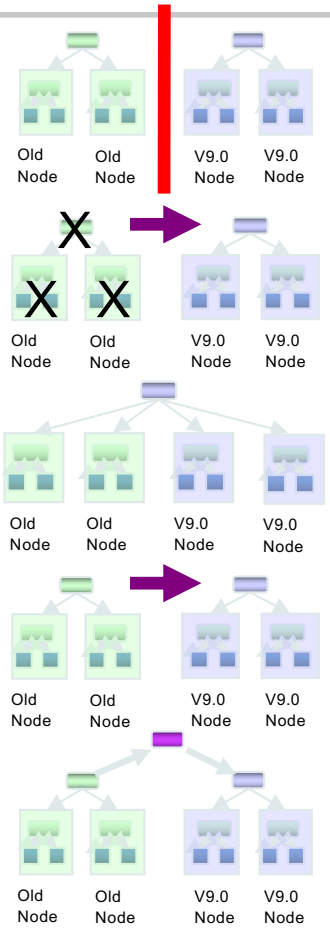
v9.0 Cell can contain v7.0, v8.0, v8.5 and v9.0 nodes: for continued operation as well as staging of upgrades.
Note – Precompile options are not available for application deploy to back level nodes

Administration

- WebSphere traditional
  - Administration model consistent since V6
    - Stable config model, some new added each release
    - Consistent operations model, some new in V7
    - Same app deploy capability, some validation improvements
  - Scripting model consistent since V6
    - Stable scripting strategy starting v5.0
    - Small number of changes in some later versions
    - Jython v2.1 upgraded to v2.7 and set as default for wsadmin command in WebSphere V9.0
    - As of V9, JACL has moved to being deprecated
  - Migration tooling consistent and enhanced each release
- Liberty
  - Simplified configuration model and application deploy
  - Differences in admin model (JMX, Admin Center, Collectives)

Five Strategies for Migrating Network Deployment

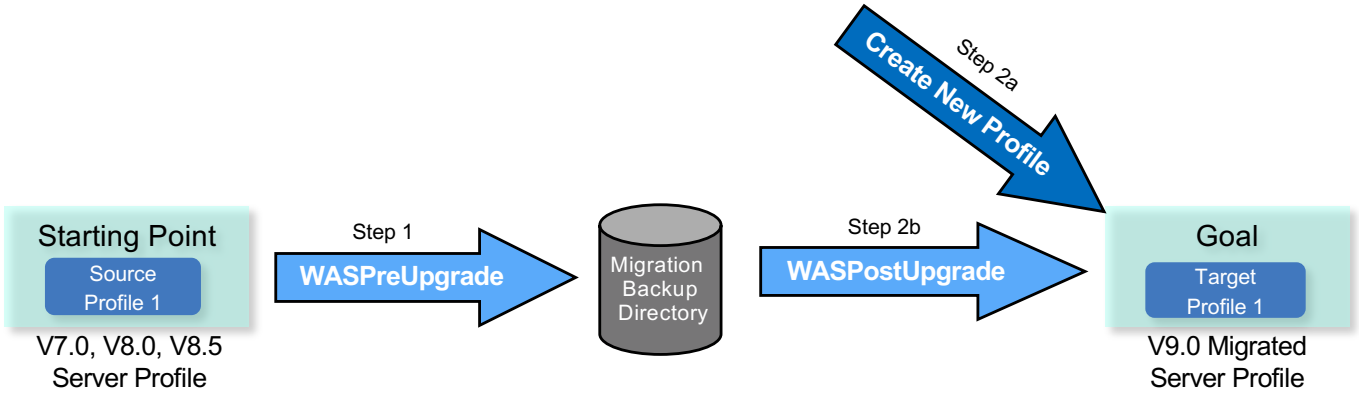
1. Manual Side by Side (Scripted)
   - Create a new cell and populate with tools or manually
   - No runtime migration tools
2. In Place - Copy and replace the cell (Standard)
   - Recreates the **exact** existing configuration in new cell
   - The old dMgr and nodes are disabled when migrated.
3. In Place - Copy and replace the DMgr (Hybrid)
   - Recreates the **exact** existing configuration in new cell
   - Add new nodes and move incrementally
4. In Place - Copy and coexist (Clone – new for v9)
   - Recreates the **exact** existing configuration in new cell
   - All ports in the new cell will be changes.
   - New cell can coexist with the old cell.
5. Side by Side - Fine Grained (Fine Grained)
   - Create a new cell and incrementally copy configuration
   - Uses an intermediate profile, runtime migration and wsadmin tools



Runtime Migration Strategies

- Each of the five strategies have pros and cons
- The new v9 clone option provides the greatest flexibility.
- Pick the strategy that is right for you.
- Get all the technical details:
  - Charts in reference section
  - IBM Documentation:
    https://www.ibm.com/docs/en/was-nd/9.0.5?topic=90-migrating-coexisting-interoperating
  - Knowledge Collection:
  - https://www.ibm.com/support/pages/websphere-migration-knowledge-collection-migrating-websphere-traditional-versions

Migration Tooling – Standard Local Migration



- Migrate on the same platform, same machine
  - Both the old and new versions of WebSphere coexist.
  - However, for cell migrations the old nodes will be disabled.
- Use either the command-line tools or the migration wizard

Five Strategies for Migrating Network Deployment

1. Manual Side by Side (Scripted)
   - Create a new cell and populate with tools or manually
   - No runtime migration tools
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   - Recreates the **exact** existing configuration in new cell
   - Add new nodes and move incrementally
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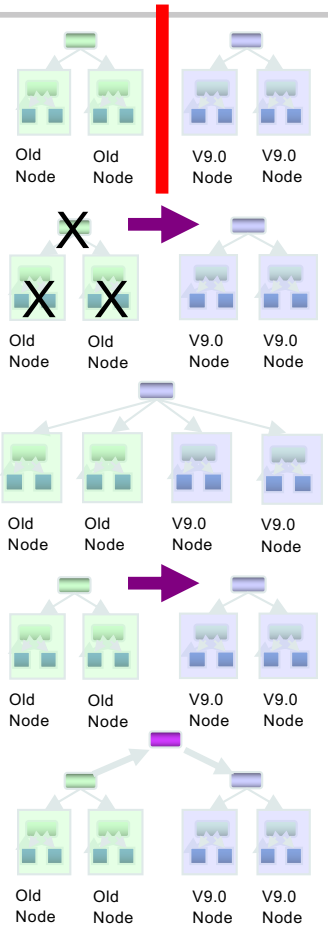
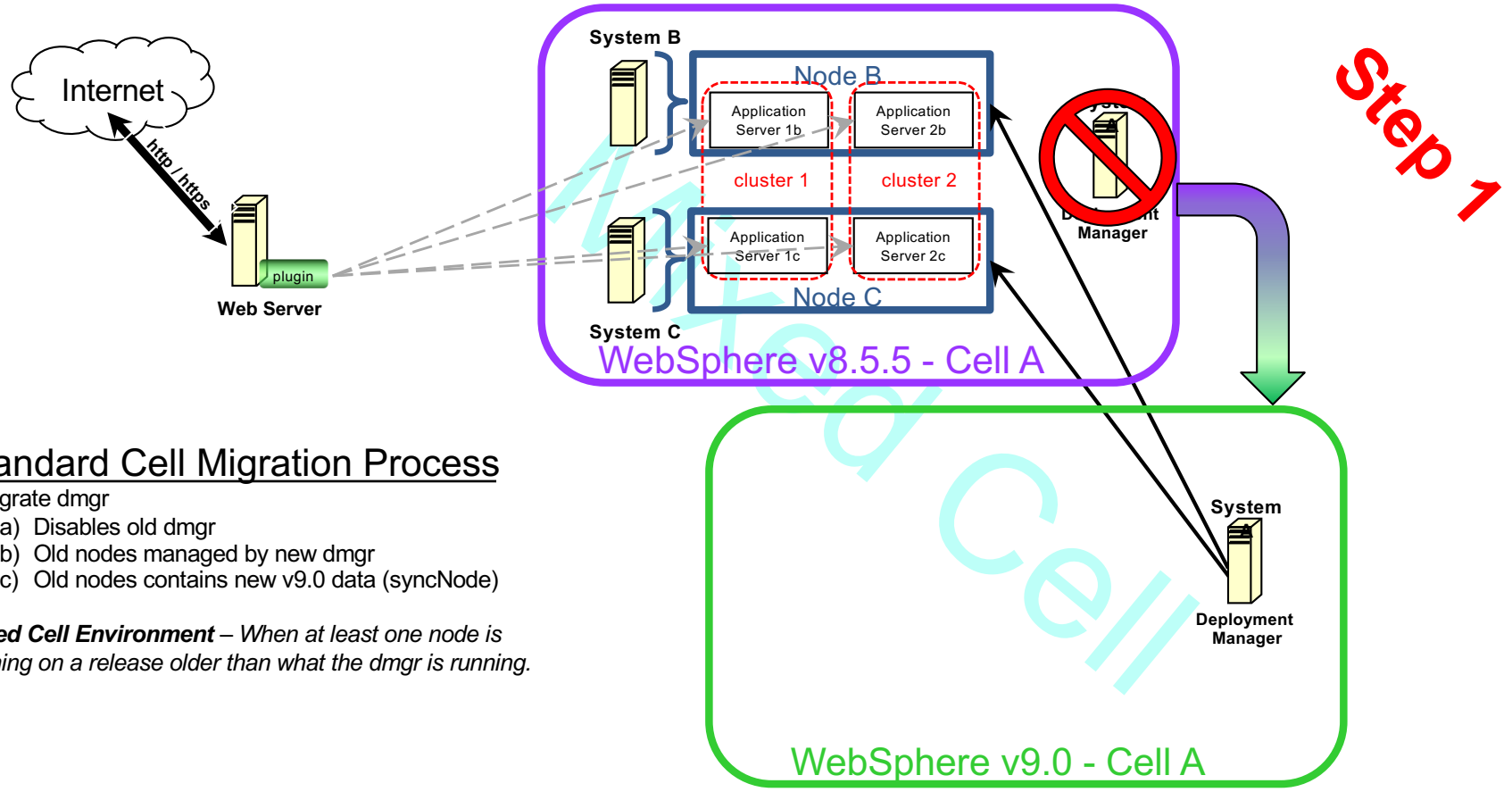


Standard Migration Strategy (In Place - Copy and replace the cell)



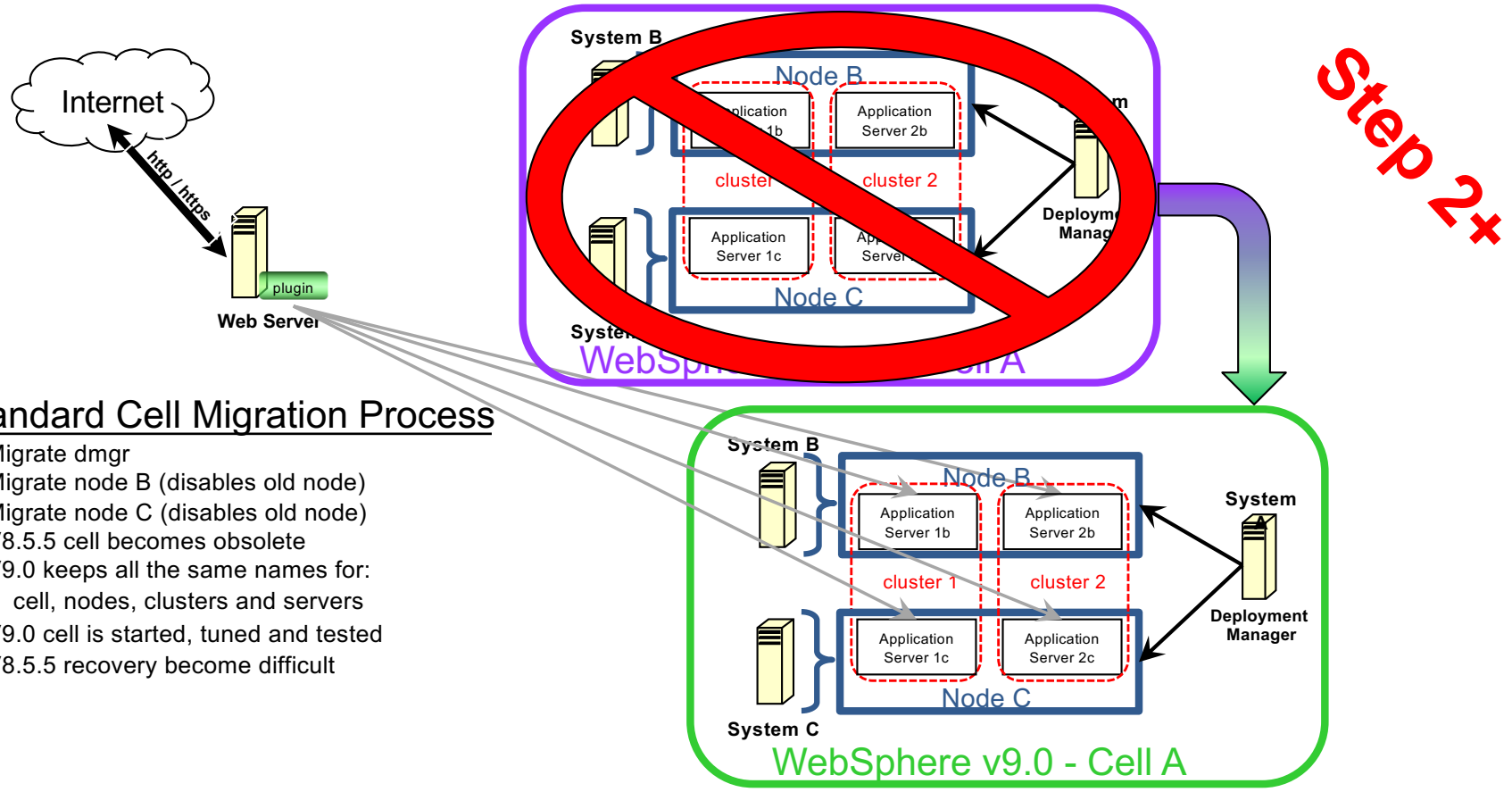
Standard Cell Migration Process

1.Migrate dmgr

a) Disables old dmgr
b) Old nodes managed by new dmgr
c) Old nodes contains new v9.0 data (syncNode)

Mixed Cell Environment *– When at least one node is running on a release older than what the dmgr is running.*

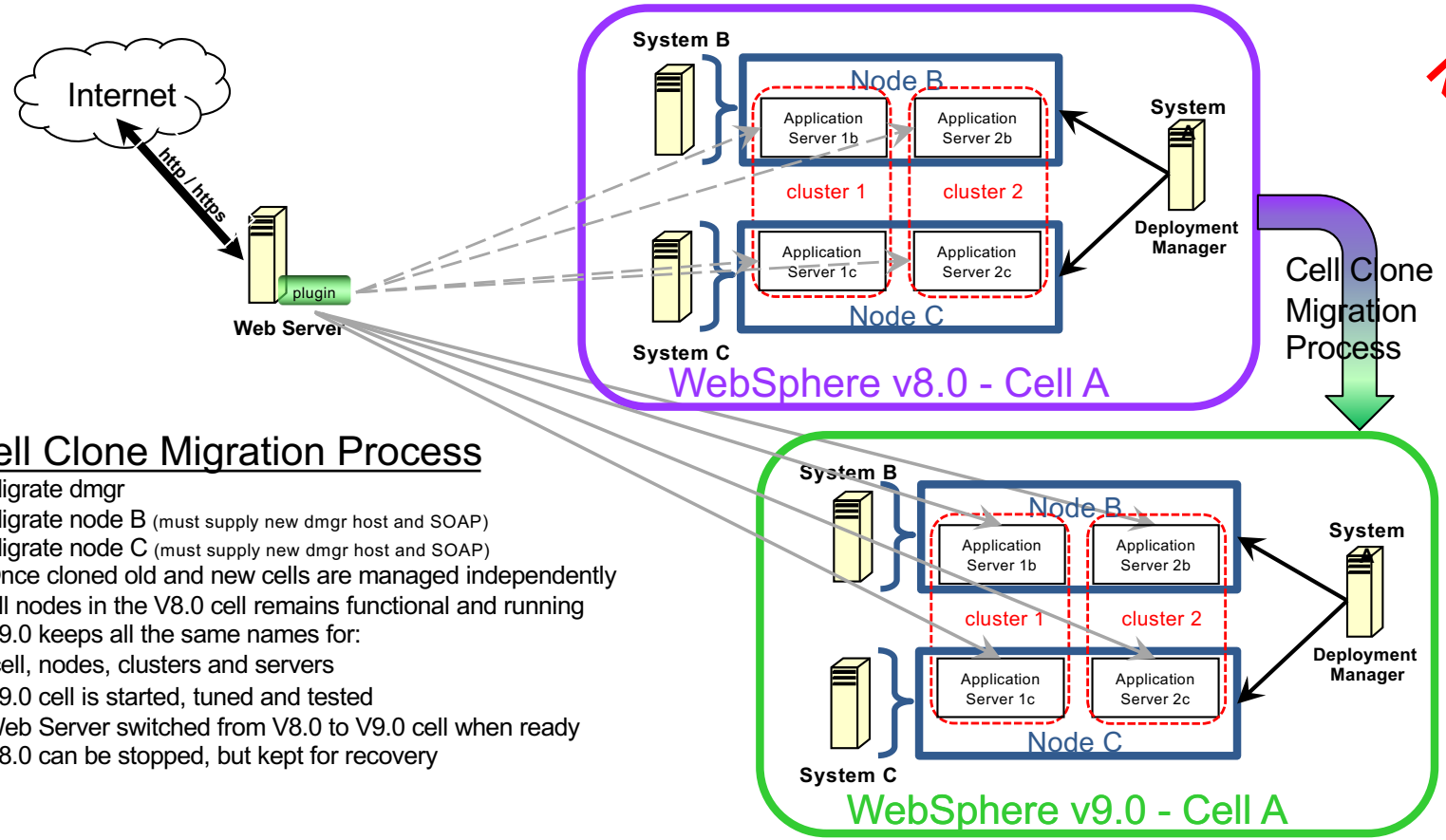
Standard Migration Strategy (In Place - Copy and replace the cell)



Standard Cell Migration Process

1. Migrate dmgr
2. Migrate node B (disables old node)
3. Migrate node C (disables old node)
4. V8.5.5 cell becomes obsolete
5. V9.0 keeps all the same names for:
   cell, nodes, clusters and servers
6. V9.0 cell is started, tuned and tested
7. V8.5.5 recovery become difficult

Clone Migration Strategy (In Place - Copy and coexist)



Cell Clone Migration Process

1. Migrate dmgr
2. Migrate node B (must supply new dmgr host and SOAP)
3. Migrate node C (must supply new dmgr host and SOAP)
4. Once cloned old and new cells are managed independently
5. All nodes in the V8.0 cell remains functional and running
6. V9.0 keeps all the same names for:
   cell, nodes, clusters and servers
7. V9.0 cell is started, tuned and tested
8. Web Server switched from V8.0 to V9.0 cell when ready
9. V8.0 can be stopped, but kept for recovery

Advantages of using the Clone Migration Strategy

- Practice and throw away. Flesh out the issues.
- No scheduling of weekend or weeknight outages in order to migrate.
- Zero down time for old release.
- Concurrent functional environments at both the old and new release levels.
- Verify and test newly migrated cell before bringing it online.
- Quick fall back strategy to old release.
- Reduce cost in planning and carrying out a migration.

Clone Migrations – other notes

- Does not support a mixed cell environment.
  - If Dmgr is cloned then all nodes in the cell must also be cloned!
  - A node may not be cloned unless its DMgr is cloned!
- All endpoint ports in new cell are completely independent of old cell.
- Supports the remote migration option. (-machineChange true)
- Currently not supported on iSeries or zOS.
- Supports all profile types except:

  Job Manager and Managed App Servers.
- For a federated node migration, the host and SOAP or RMI port of the new deployment manager must be provided.

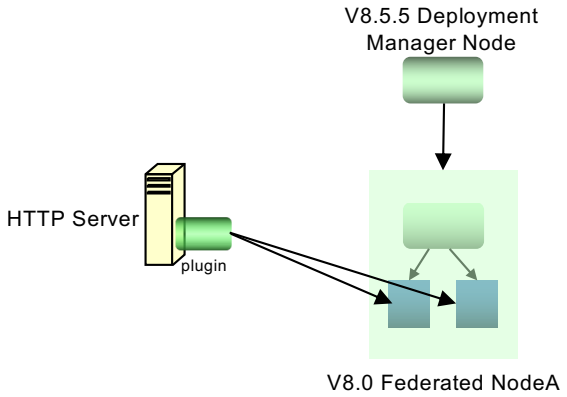
V9 Clone Migration Demo Overview

Demo

- Use the Clone Migration strategy on a simple cell
  - Local migration using CMMT wizard
  - All nodes in the cell are on the same machine
    - Dmgr
    - 1 Node
    - 1 Server
      - 1 App
  - 15-20 minutes

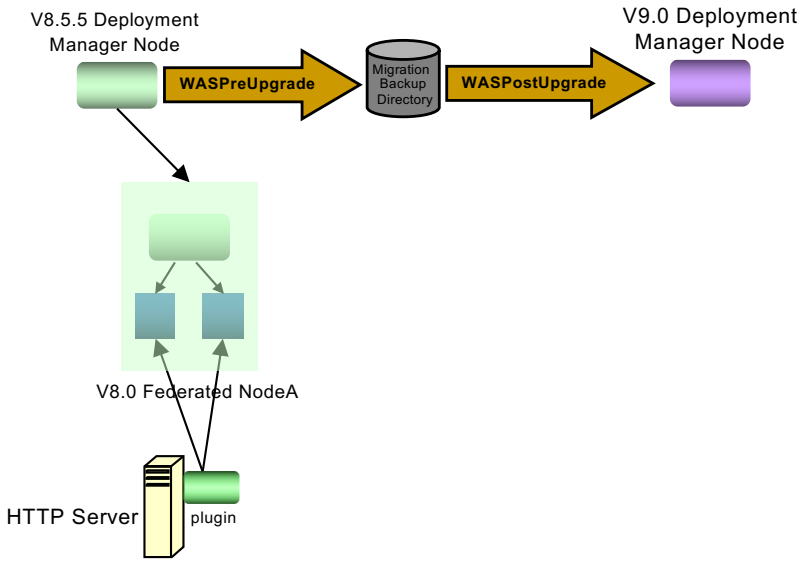
Migration Scenario – Cloning a Simple Cell

- Goals for Migrating this Topology:
  - Keep old cell in tact and running during and after migrating all nodes.
  - Clone all profiles in the cell to WebSphere Application Server V9.0.
  - Profiles are migrated to the new release on the same machine.
  - Switch HTTP Server to new cell when complete.



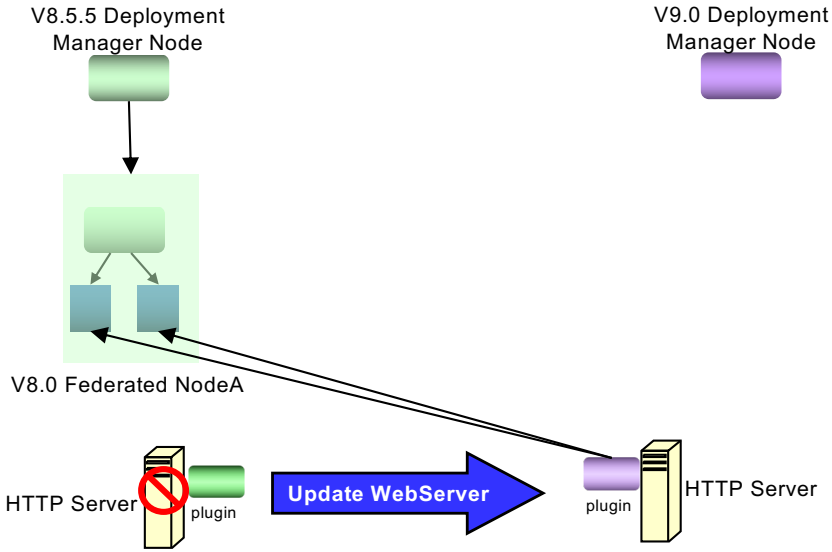
Migration Scenario – Cloning a Simple Cell (cont.)

- Step 1
  - –Migrate the Deployment Manager with -clone true option.
    - All new ports will be assigned to new Deployment Manager.
    - The old node will be “hidden” from the new Deployment Manager.
  - –Start the new Deployment Manager.
    - New NodeA appears to be inactive.
    - Do not allow any config changes to old cell until entire cell is cloned. (all nodes are migrated)
    - Old cell continues running.



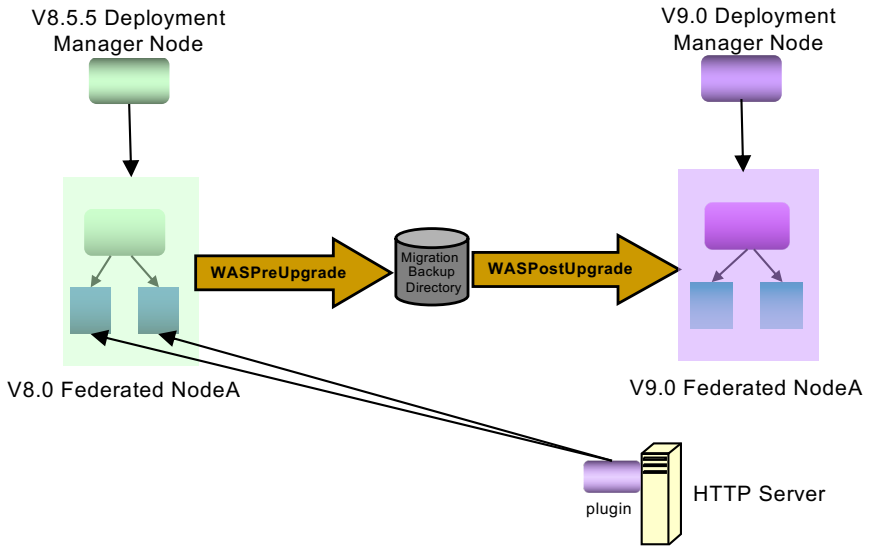
Migration Scenario – Cloning a Simple Cell (cont.)

- Step 2
  - Migrate the WebServer
    1. Update the WebServer and install new plugin
    2. Stop the old WebServer
    3. On old Deployment Manager regenerate the plugins and copy to WebServer
    4. Start the new WebServer



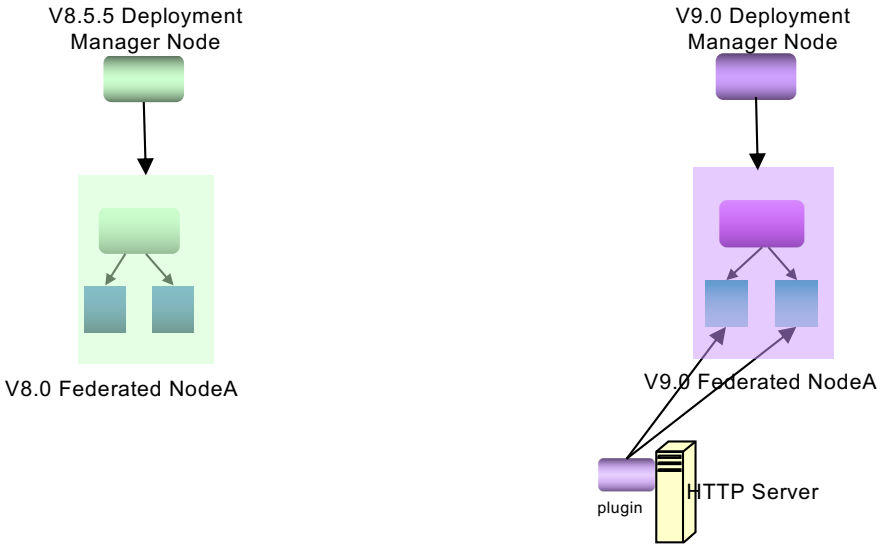
Migration Scenario – Cloning a Simple Cell (cont.)

- Step 3
  - –Migrate the Federated NodeA with the -clone true option.
    - Supply the hostname and SOAP or RMI port of the new Deployment Manager.
    - All new ports will be assigned to the nodeagent and servers of the new NodeA.
    - New NodeA will be synced with the new Deployment Manager.
  - –Bring up the nodeagent and servers on new NodeA.
    - Old cell continues running.



Migration Scenario – Cloning a Simple Cell (cont.)

- Step 4
  - –Switch the WebServer to the new cell.
    1. On new Deployment Manager regenerate the plugins and copy to WebServer
    2. Start the WebServer
  - –Dismantle the old cell when new cell is completely working.
    - Or keep for recovery if new cell encounters problems.



Problem Determination

Problem Determination

- Migration can be very memory and file intensive depending on the topology. Some general system problems are:
  - OOM
  - File Handles
  - Disk Space
- Other problems may include changes to the old WebSphere install and/or profile data.
  - Check that the userid has proper permissions.
  - Connectivity – network, certificates exchanged, …
  - Check for unexpected symlinks under the WebSphere installation and profile directories.
  - Hand edited xml and property files with invalid formats can cause problems.
  - Check for changes to the profile's setupCmdLine script.
  - Check the profileRegistry.xml file for valid profiles.
  - Verify each profile has a valid entry in the properties/fsdb directory.

Problem Determination (cont.)

- Other problems can be determined by looking at the trace log.
  - Generally these are config data problems that are not understood or handled properly.
  - Gather the appropriate information and engage L3 if needed.
  - Security and signer prompts can also cause delays and issues.

- Sometimes migration will complete successfully but the server or applications will not start.
  - Gather the appropriate trace data for these situations.
  - If it can be isolated to certain config data, then also gather the migration data.
  - Generally support will need the migration backup directory and the migrated profile.

Problem Determination (cont.)

- More Helpful Hints
  - Become familiar with the tools and what they do. Run it, throw it away, start again.
  - Migrate only one profile at a time when using the WASPreUpgrade and WASPostUpgrade commands.
  - Migrate to a clean migration backup directory.
  - Migrate into a clean target profile. Do not use the same profile already migrated into before.
  - Separate the application installs from the WASPostUpgrade migration step by using the –includeApps script parameter.
  - In a complex topology always perform backups of all cell profiles prior to migrating it - save as a recovery point.
  - After migrating a profile, ensure that the topology is fully functional before moving to the next profile.
  - Use the migration wizards to help guide you through your migrations.
  - Use the –setPorts ##### to assign all new ports to the migrated profile.
  - Use the –resolvePortConflicts ##### option to identify new or conflicting ports.
  - Use the -requestTimeout option to increase the connection timeout to the Deployment Manager.
  - Use the -javaoption option to specify the java maximum and minimum heap sizes.
  - The exchangeSignerPrompt is automatically performed during WASPostUpgrade if needed.
    - See the ssl.enableSignerExchangePrompt property in the $PROFILE_HOME/properties/ssl.client.props file.

UCD WebSphere Automation

https://www.urbancode.com/plugins/?search=WebSphere+

Why choose UrbanCode to manage WebSphere?

- **Reduced Risk**
- **Repeatable Process**
- **Consistent**
- **Visible & traceable**
- **Portable**
- **Integrated with cloud**

Migration Assist Program

What is the Migration Assist Program

- It is an extension of the clients current Support and Subscription (S&S)/Passport Advantage (PPA) at no additional cost. Its FREE, FREE!
- Provides proactive assistance to help IBM clients achieve business objectives, minimize risks and maximize return on investment
- Level 2 can draw on their experience, provide recommendations, identify risks, provide advice on best practices, point to technical documentation, field client questions and alert the support teams of critical periods when the client will perform their cut over
- Focus is on a single client environment
- It does not
  - cover where WebSphere is embedded in a stacked product
  - replace programs such as Services or Accelerated Value Program
  - assist with application design, business logic, client data, environment setup, performance tuning or system health check to complete the migration
- For further detailed information review the following link
  https://www.ibm.com/developerworks/community/blogs/aimsupport/entry/websphere_application_server_migration_assist_Program_Information_on_participation?lang=en
  To sign up, just email ma@us.ibm.com. Provide your contact info, client # and any details
  WE LOOK FORWARD TO WORKING WITH YOU!!!

Summary

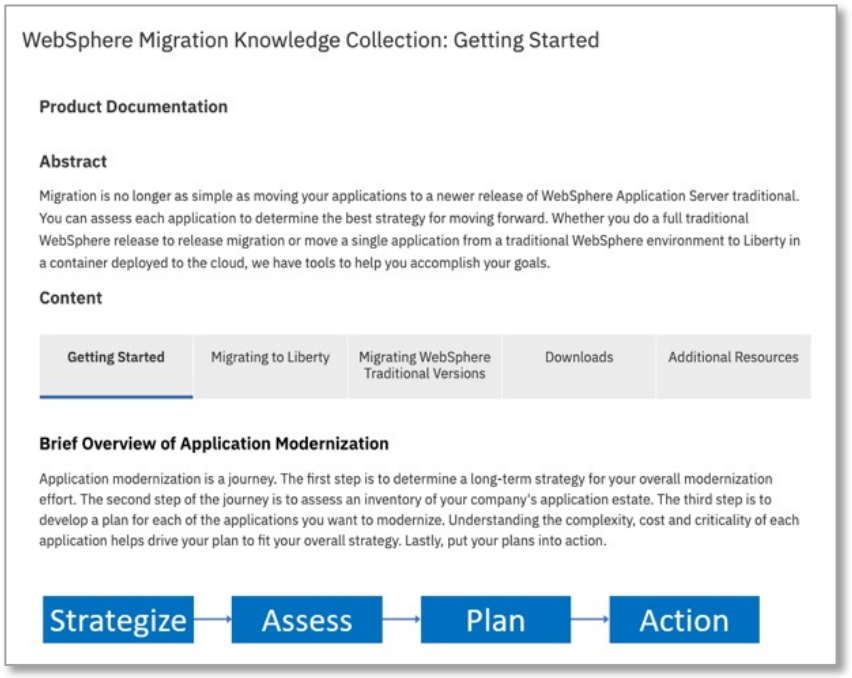
Summary

- Migration needs to be a pragmatic, well designed and repeatable process

- WebSphere Application Server migration is becoming easier!
  - More tools
  - More techniques
  - Minimizing Application changes

WebSphere Migration Knowledge Collection

- This information and more is available online!
- General planning with detailed notes and WebSphere AppServer version specific information
- Updated with timely information
- Search: "websphere migration knowledge collection"



https://www.ibm.com/support/pages/websphere-migration-knowledge-collection-getting-started

Questions ?

References

Reference Information

- Migration Information
- Planning
- Planning for Liberty
- Training
- Configuration Migration
- Development
- Operations
- 5 Runtime migration strategies
- Differences between versions
- Application planning example

Migration information

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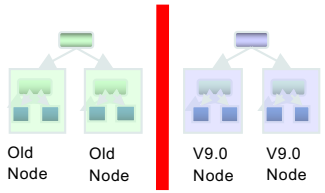
Five Runtime Migration Strategies

For Network Deployment

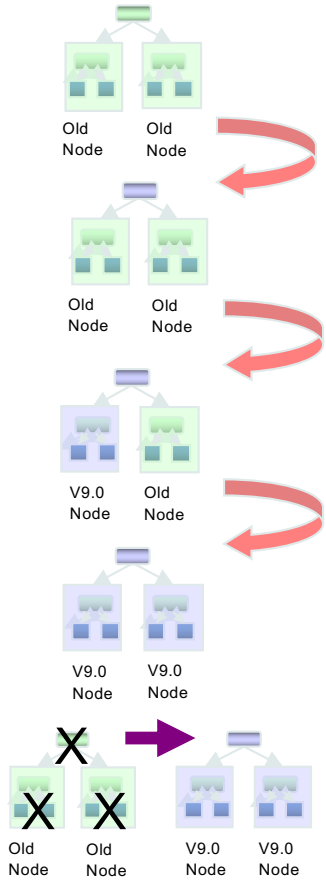
Side by Side

- Ignores the existing configuration
- Create a new cell and populate with administration scripts or manually
- Best results with a comprehensive set of scripts or tools for configuration automation
- Pros
  - No dependencies on tooling
  - Least risk assuming existing scripts are comprehensive
  - Can easily migrate applications singly
- Cons
  - Comprehensive set of scripts and ongoing maintenance of those scripts can be expensive
  - Any required changes to these scripts must be done before migrating
  - Tuning of the old configuration is not carried forward



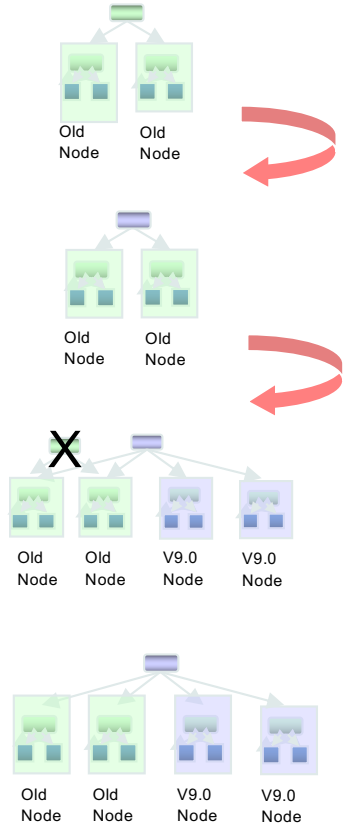
In Place - Copy and replace Cell (Standard)

- Use Runtime migration tools on DMgr
  - Recreates the **exact** existing configuration in the new cell
- Later migrate the existing nodes using the runtime migration tools
  - All applications on a managed node are migrated at the same time
- Pros
  - Does not require comprehensive set of scripts
  - All configuration is moved forward
- Cons
  - Dependency on using the runtime migration tools
  - Requires all applications on a node be ready to migrate at the same time
  - Limited value if you are refactoring your topology
  - Carries default values forward from the old cell



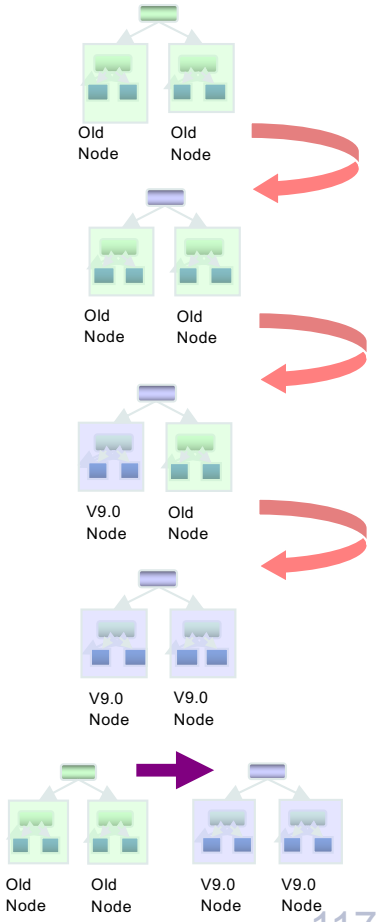
In Place - Copy and replace DMgr

- Use Runtime migration tools on DMgr
  - Recreates the **exact** existing configuration in the new cell
- Add new nodes
  - Applications can be migrated singly when ready
  - Remove old nodes when no longer needed
- Pros
  - Does not require comprehensive set of scripts
  - All configuration is moved forward
  - Cell and cluster level configuration accessible by older nodes
- Cons
  - Dependency on using the runtime migration tools
  - Limited value if you are refactoring your topology
  - Carries default values forward from the old cell



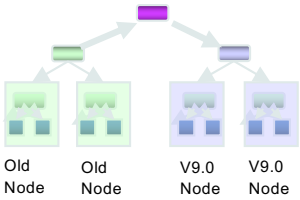
In Place - Copy and coexist (Clone)

- Same steps as “Copy and replace Cell” except:
  - Use the ***NEW*** –clone option of the runtime migration WASPostUpgrade tool to migrate the Dmgr.
  - No need to stop or disable the old Dmgr – leave it running.
  - Start new DMgr
  - Migrate all the nodes using the –clone option and provide the new Dmgr’s host name and RMI or SOAP port.
  - Migration will resolve all port conflicts.
  - Start each node in the new cell as it is migrated.
  - See Migration redpiece for example
    http://www.redbooks.ibm.com/redpieces/abstracts/redp4635.html?Open



Side by Side - Fine Grained

- Uses a combination of tools
  - An intermediate profile
  - The runtime migration tools
  - Properties based configuration tool (PBC)
- Approach
  - Migrate the existing data to an intermediate profile
  - Extract portions of the configuration from that profile
  - Import them into the final DMgr profile using PBC
- See Migration redpiece for example
  - http://www.redbooks.ibm.com/redpieces/abstracts/redp4635.html?Open



Overview changes by version

Migration impacts (worst case scenario)

Potential Impact areas	v6.0	v6.1	v7.0	v8.0	v8.5.x	v9.0
Java Runtime (v8.5 has JRE6 and 7)	n/a	6	2	n/a	0/20/19 note	19
JEE - JSP	8	n/a	1	1	0	0
JEE - Servlet	5	n/a	0	2	0	9
JEE - Other	3	n/a	5	7	1	50
WAS Specific	1	6	0	4	0	3
3rd party packages	2	0	1	0	0	3
Development total	**19**	**12**	**9**	**13**	**0/20/19**	**64**
Administrative script	4	3	2	0	0	1
WAS directory structure	1	1	0	0	0	1
Other administrative	5	2	6	7	0	1
Total administrative	**10**	**6**	**8**	**7**	**0**	**3**
Total potential impact areas	**29**	**18**	**17**	**20**	**0/20/19**	**67**

Note: V8.5 supports Java 6, 7 and 8. Java7 and Java 8 introduces a number of behavior changes. “0” represents Java6 and “20” is for Java7. Not all breaking changes will impact all applications

Migration impacts - Liberty

Potential Impact areas	Java SE	Traditional to Liberty	Liberty Core	Java EE 7
Java Runtime – Java SE 7	16			
Java Runtime – Java SE 8	14			
Third-party APIs		14		
WebSphere API differences		3		
WebSphere API unavailable		55		
JEE – behavior difference		15		
JEE / Java technology – unavailable		13	12	
JEE – CDI				11
JEE – EL				1
JEE – JAX-RS				11
JEE – JMS				2
JEE – JPA				25*
JEE – JSF				1
JEE - Servlet				9
Development total		**102**	**12**	**60**

*JPA 2.0 can be used with other Java EE 7 features.

http://www14.software.ibm.com/webapp/wsbroker/redirect?version=phil&product=was-nd-dist&topic=rwlp_prog_model_jee7behaviors

Changes in v9.0

- Administration changes
  - Default Jython version
  - New default coregroup wiring protocol
  - New java extensions directory - **$WAS_HOME/javaext**
  - Other miscellaneous changes

- Development changes
  - Development tool changes
  - Java SE 8 upgrade
  - Java EE 7 upgrade
    - CDI, JAX-RS, JPA implementation change
    - Servlet, EL, JMS behavior changes
  - API removals
  - API deprecations

Changes in v8.5.5

- WAS traditional
  - No change in product configuration!
  - No need to install in a new directory!
  - No need to migrate configuration!
- Liberty
  - Now Java EE 6 Web Profile Compliant
  - Updating v8.5.0 installed images that have Liberty
    - v8.5.0 image that has just Liberty
      - Must install the new standalone Liberty offering
      - Can then continue using the user data and server configurations currently used by this original install
    - v8.5.0 image that has combined WAS traditional and Liberty
      - User is advised that Liberty will be backed up.
      - To obtain v8.5.5 Liberty and future service, install the standalone offering.
      - Can then continue using the user data and server configurations currently used by this original install.
      - WAS traditional updates as normal.

Changes in v8.5.0

- Administration changes
  - Some new ports defined
  - A number of minor default setting changes
    - Information provided in the v8.5 InfoCenter
- Development changes
  - Development tool changes
  - Java7 upgrade – Java6 is the default
    - Breaking changes: (AWT, Internationalization, IO, JAXP, Language, Networking, Text and Utilities)
  - JPA (2)
    - Custom settings are provided to provide compatibility
- Liberty introduced
  - Simplified configuration
  - Programming model subset (webapp focused)

Changes in v8.0

- Administration changes
  - Installation changes
  - Centralized Install Manager
  - Install Factory alternative
  - WebServer Plug-in installation and configuration
  - Java Garbage collection and dump format changes
  - Security default changes
  - Other miscellaneous changes
- Development changes
  - Development tool changes
  - JEE 1.6
  - WebSphere API changes

Changes in v7.0

- Administration changes
  - SessionInitiationProtocol(SIP) Migration Considerations
  - zOS Migration tool
  - Administration script required changes
  - Port usage
  - Security Migration considerations
  - Mixed version considerations

- Development changes
  - Development tool change
  - JRE 6 impacts
  - JEE 5 impacts
  - WebSphere removed features
  - Support for WebServices included in WAS
  - Embedded WebServices implementation and conflicts with existing applications

Changes in v6.1

- Administration changes
  - Migration and Feature Packs
  - zOS Migration tool
  - Administration script required changes
  - Install response file format changes
  - Port usage
  - Profile directory structure
  - New administrative tool IDE
  - Migration tools and v6.1 Security model
- Development changes
  - Development tool change
  - JRE 5 impacts
  - WebSphere changes and removed features

Application planning example

Migration Project

App Owners - Develop a Wave Formula

- **Create Application Rating System**
  - Least Complex ➔➔➔ to Most Complex
  - Least Critical ➔➔➔ to Most Critical
- **Separate Tracks**
  - Validated VS. Non-Validated
  - Custom Built VS. Vendor Application
- **Factor in**
  - Core Technology Requirements (JSF, EJBs, JSP, Servlets, JAX-WS, Spring, Hibernate, etc…)
  - Dependencies - Applications that Must Migrate together
  - Business Benefit (Application Enhancements Requested)
  - Group into Tier3, Tier2 and Tier1 Type Applications

Migration Project

Expectations

- Many Applications will be easy (little or no changes)
- Some Applications will be difficult (moderate to large amount of changes)
- Some will be in-between

Consider these factors

- Identify Candidates for “Decommissing” - save yourself some work
- Enhance the Application Features
- Correct Flaws
- Port “As-Is” doing only what is required for migration

Migration Project – Rank Your Applications

“Hypothetical” Ranking – Developing a Formula

Complexity			Mission Critical			
Low (1)	Medium (3)	High (5)	Low (1)	Medium (5)	High (10)	Total Score
1			1			2
	3		1			4
1				5		6
		5	1			6
	3			5		8
		5		5		10
1					10	11
	3				10	13
		5			10	15

Migration Project

	Complexity			Mission Critical			Total	JSF	EJB	JSP	Servlet	JAX-WS	Total	Overall
	Low	Med	High	Low	Med	High	Score	Used?	Used?	Used?	Used?	Used?	Score	Score
App A	1			1			2			1	1		2	6
App B		3		1			4	3					3	10
App C	1				5		6		3				3	12
App D			5	1			6			1		3	4	14
App E		3			5		8		3		1	3	7	22
App F			5		5		10	3	3			3	9	28
App G	1					10	11	3		1	1	3	8	27
App H		3				10	13	3	3		1		7	27
App I			5			10	15	3	3	1	1	3	11	37

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