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

Including WebSphere v9.0

IBM

WAS V7 & V8 EOS

WAS Release	WAS EOM	WAS EOS	WAS EOES
7.0 - all editions	Dec 16, 2016 [2]	Apr 30, 2018	Apr 30, 2021 [1]
8.0 - all editions	Dec 16, 2016 [2]	Apr 30, 2018	Apr 30, 2021 [1]
RFA 71777 on Sept 13, 2016 (Distributed) **RFA 71843 on Sept 13, 2016 (z/OS)**			

WAS Release	Java 6 EOS in WAS	Java 7 EOS in WAS	Java 8 EOS in WAS
7.0	April 2018	n/a	n/a
8.0	April 2018	n/a	n/a
8.5	April 2018[1][3]	Sept 2019	March 2025

Migration Links

WebSphere Migration Strategy - https://www-01.ibm.com/support/docview.wss?uid=swg27008724

Migration Decision Support Tool - http://whichwas.mybluemix.net

WebSphere Application Server Migration Discovery Tool - https://www-01.ibm.com/marketing/iwm/dre/signup?source=mrs-form-3089&S_PKG=ov50193
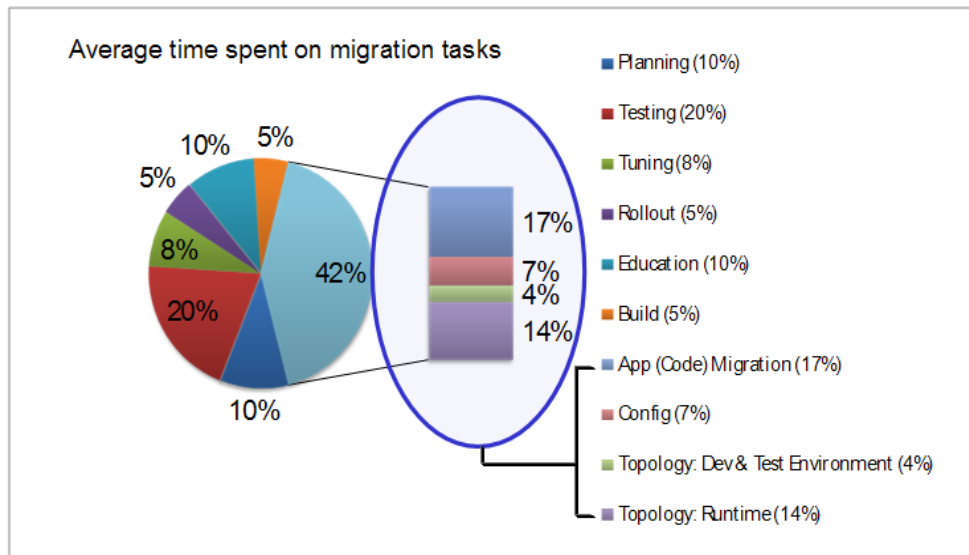
WAS Migration Toolkit overview: http://www.ibm.com/developerworks/websphere/downloads/migtoolkit/

WAS 8.5 WebSphere Migration Guide - http://www.redbooks.ibm.com/redpieces/abstracts/sg248048.html

(1) After December 2018, Java SDK 6 support is limited to 'usage & known defects'
(2) WAS on z/OS EOM will be Feb 2017. Announcement occurred in June 2016.
(3) WebSphere Application Server Liberty has a single support stream for all product versions. Support for Java SE 6 with Liberty will end in September 2017 to allow the Liberty code and included open source packages to move forward.

WebSphere v9.0

# Migration Overview

Average time spent on migration tasks

- Planning (10%)
- Testing (20%)
- Tuning (8%)
- Rollout (5%)
- Education (10%)
- Build (5%)
- App (Code) Migration (17%)
- Config (7%)
- Topology: Dev & Test Environment (4%)
- Topology: Runtime (14%)

5%
10%
5%
8%
20%
42%
10%
17%
7%
4%
14%

Migration Planning

Configuration Migration

Application Migration

Migrated environments

- 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?
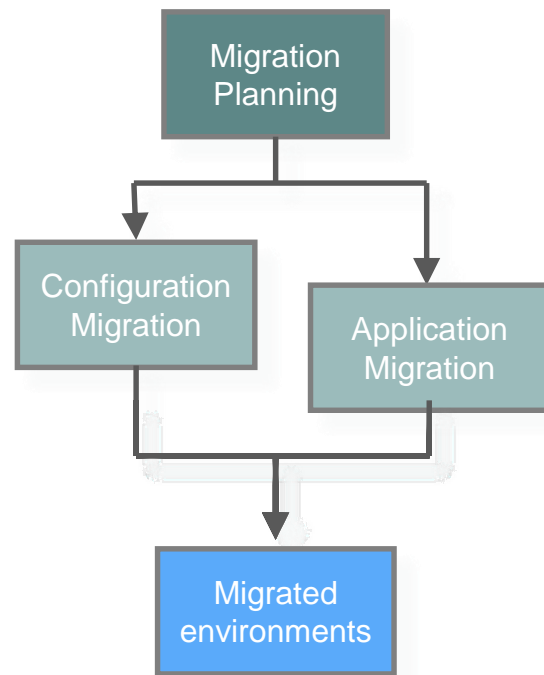
Migration impacts overview

Migration impact is gated by two overarching factors

1. The <u>versions involved</u> 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 <u>amount of change</u> 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.

v7.0 to v9.0

v6.1 to v8.5.5

v6.0.2 to v8.0
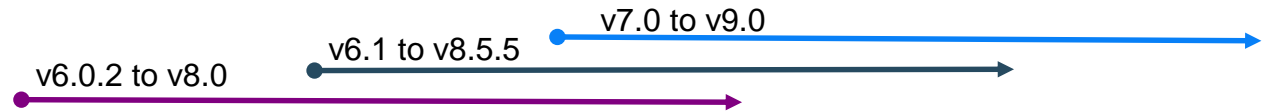
	v6.0.2	v6.1	v7.0	v8.0	v8.5	V9.0
Configuration	Port assignment	Security	None	None	Port assignments	Core group wire protocol
Application	JSP and Servlet	Java SE	Some	Minimal	**None***	Java EE 7 Java SE 8

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

WebSphere v9.0

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 Knowledge Center**

Migration Planning Roadmap

IBM

Migration Plan Roadmap

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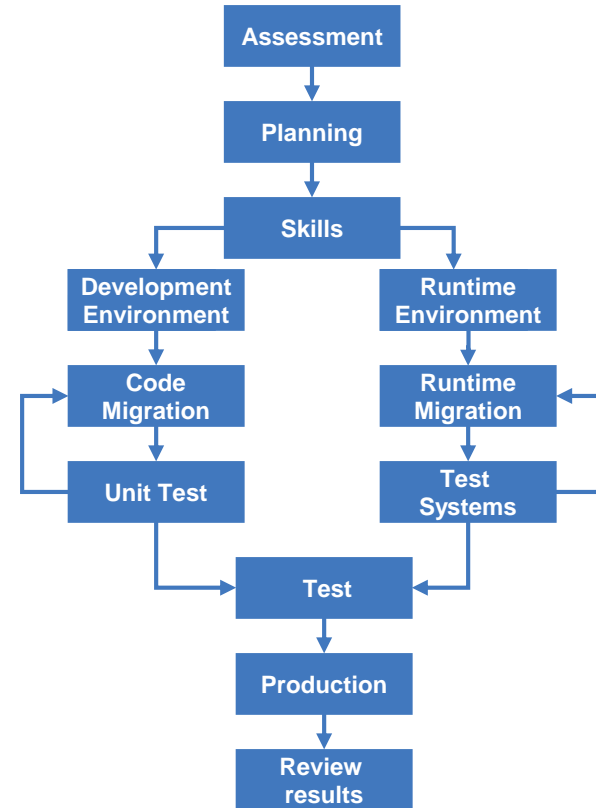
Assessment

- 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
- Review Testing practices
  - Standard practices and automation
- Vendor apps and WebSphere products
  - J2EE/JDK/WebSphere version requirements
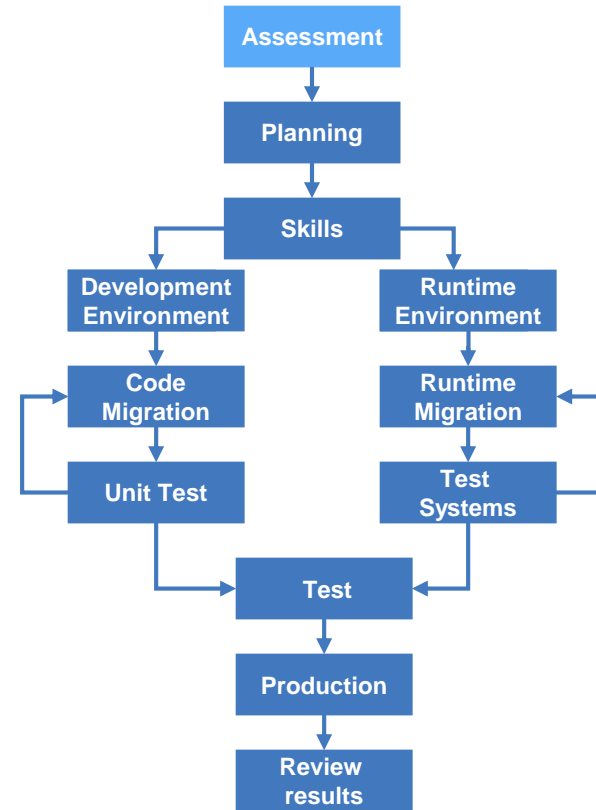
Planning - Questionnaires

- ## Runtime Environment
    - Overall Infrastructure questions
    - Hardware and Software prereqs
    - 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

- V7 Release to Release Migration Guide

http://www.redbooks.ibm.com/redpieces/abstracts/redp4635.html

- Many Detailed Questions: WAS 8.5 WebSphere Migration Guide (Appendix A)

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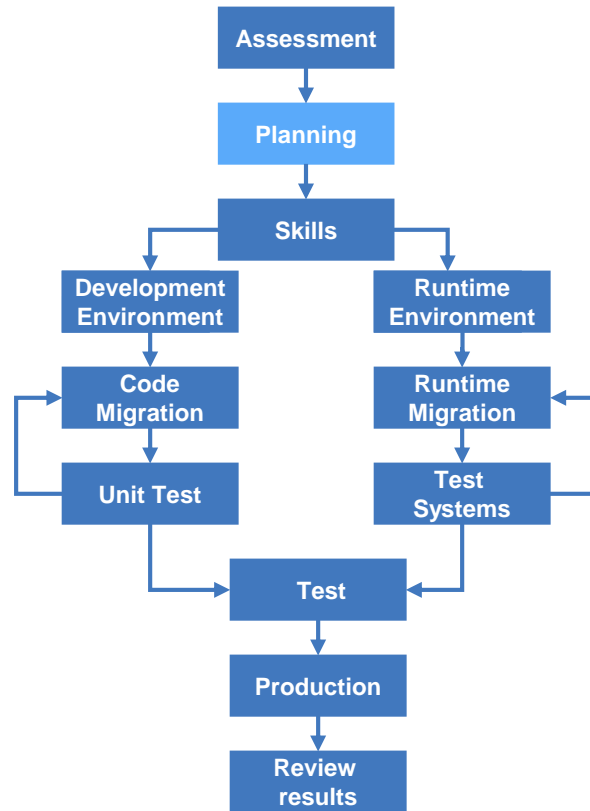
Planning

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

```
Assessment
   ↓
Planning
   ↓
Skills
   ↓
Development Environment    Runtime Environment
   ↓                           ↓
Code Migration             Runtime Migration
   ↓                           ↓
Unit Test                  Test Systems
       ↓             ↓
          Test
           ↓
       Production
           ↓
      Review results
```
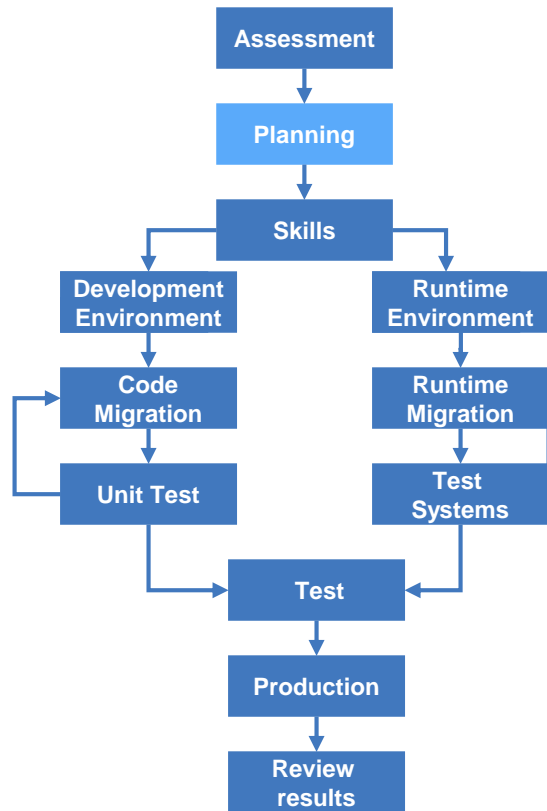
Skills

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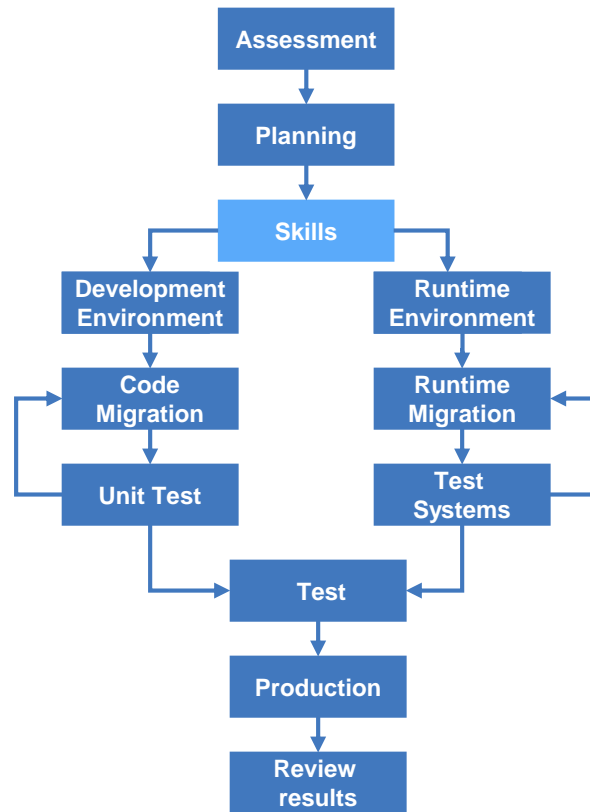
Runtime Environment

- Most likely will need to support parallel development

- Migrate test systems iteratively
  - Integration
  - System test
  - Performance
  - Pre-Production
  - Production
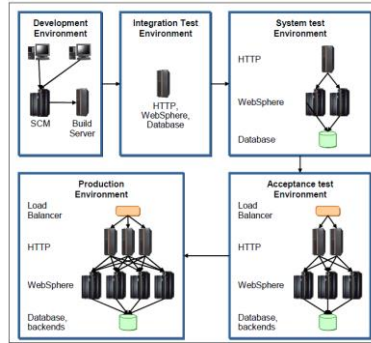
- Use the same migration process throughout if possible
 - Or at least before you do production migration…
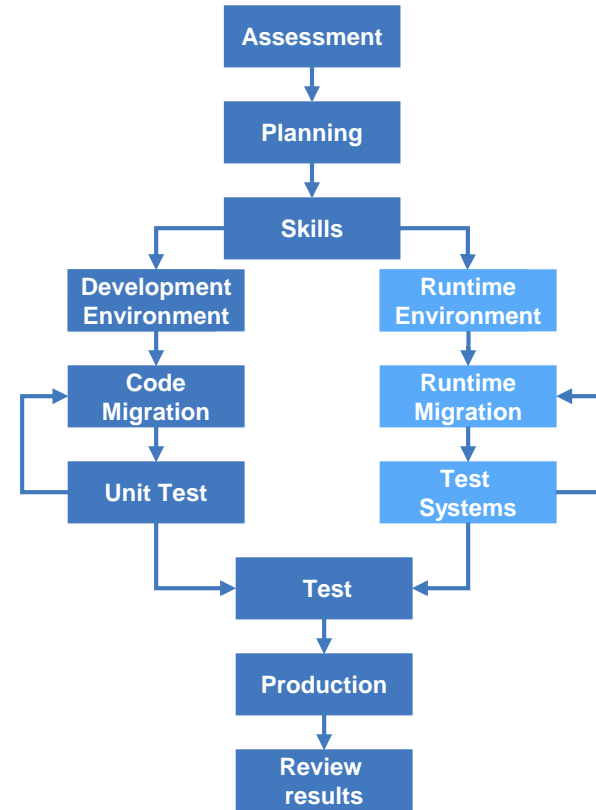
Development Environment

- 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
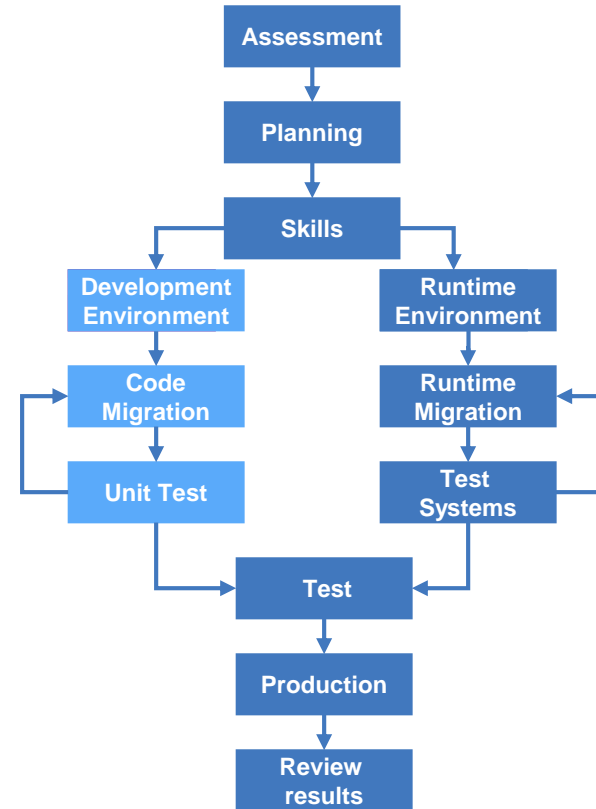
Application Migration (Iterative)

- Minimize change
    - Only make changes <u>required</u> 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
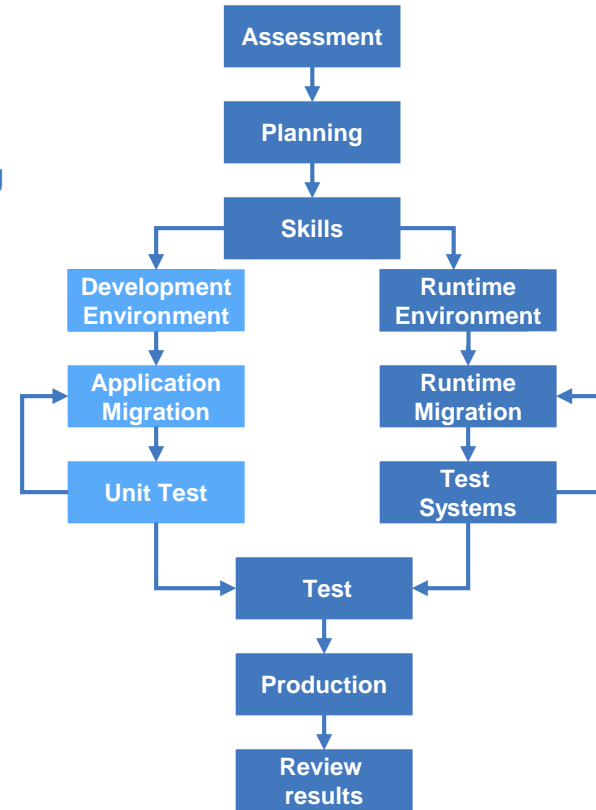
Test/Production/Review

- 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
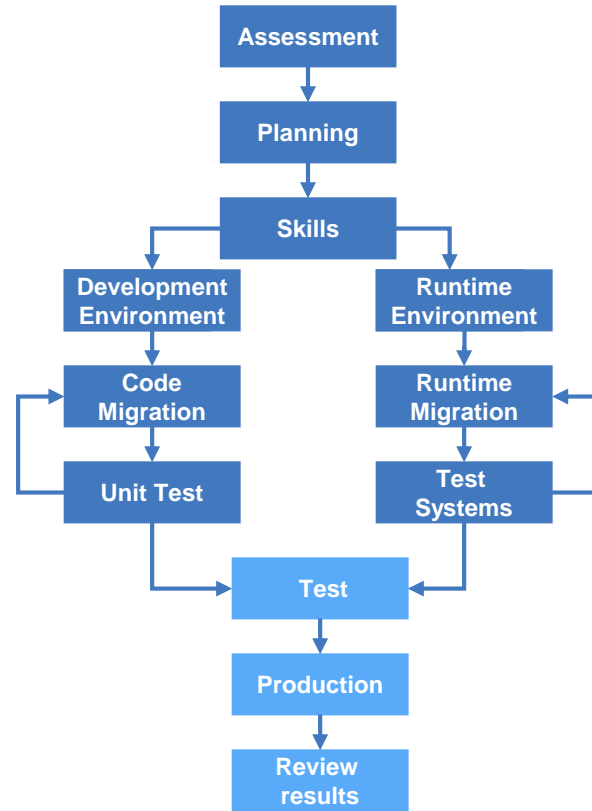
Application Migration options

IBM
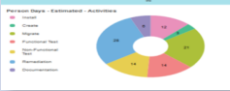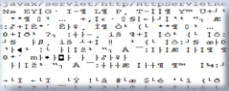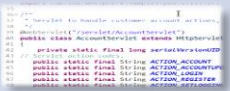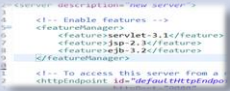
An Overview of WebSphere Migration Tools

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

Migration discovery and planning	*Binary analysis*	*Source analysis*	*Configuration migration*
WebSphere Migration Strategy Tool – online tool that helps you •Learn the options for migration including Liberty, on-premises, Docker, and cloud options **WebSphere Migration Discovery Tool** - on-line tool that helps you •Estimate the effort required to migrate your application to WebSphere Application Server from third-party application servers •Select the IBM cloud platform suited to host your application and estimate migration to that platform.	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 • Cloud migration for instant runtimes differences • Cloud connectivity analysis • Generate Liberty server configuration files with application required features	**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 from third-party applications servers • Detailed analysis for migration between versions of traditional WebSphere, Liberty, and Liberty Core • Cloud migration for instant runtimes differences • Cloud connectivity analysis	**WASPreUpgrade** and **WASPostUpgrade** commands to move WebSphere traditional configuration between profiles. **WCMT** – Eclipse plugin that helps migrate server configuration • From third-party application servers to WebSphere Application Server. • Between versions of WebSphere Application Server including traditional WebSphere to Liberty **UrbanCode** to move configuration.

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.

Migration strategy and discovery

Binary analysis

Source Migration

Config Migration

Step 1: Strategy planning and sizing tools

Migration discovery and planning

Binary analysis

Source Migration

Config Migration

WebSphere Migration Strategy Tool:

http://whichwas.mybluemix.net

Evaluate options for your WebSphere applications

WebSphere Application Server Migration Discovery Tool

http://ibm.biz/MigrationDiscovery

Size your effort and learn about WebSphere cloud migration

WebSphere v9.0

WebSphere Migration Strategy Tool

http://whichwas.mybluemix.net
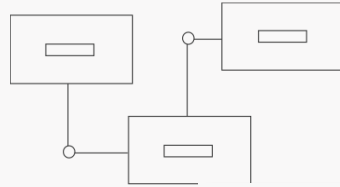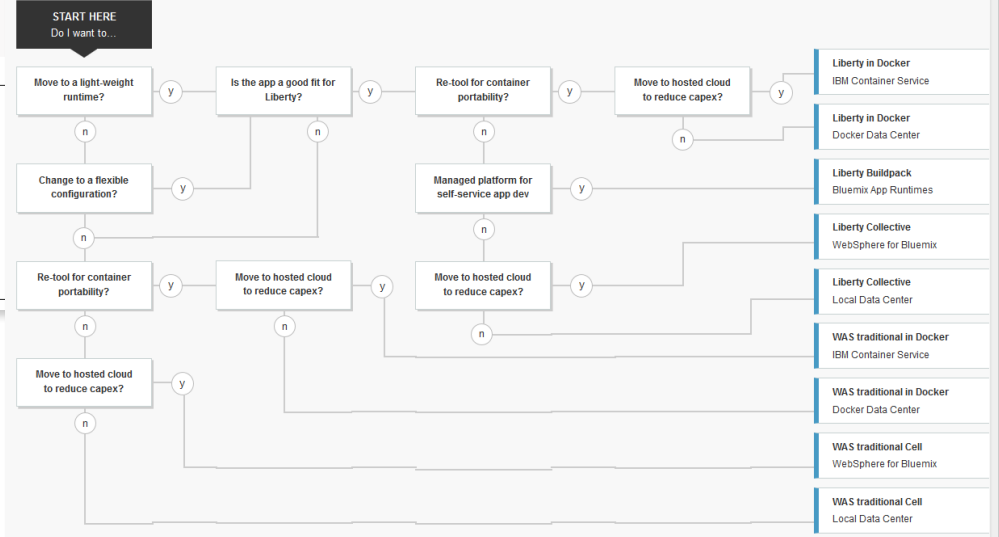
Summary and Estimate Details

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Migration Discovery - Gather Installation/Application/Test Info

Step 2: Application assessment using the binary scanner

Migration Toolkit for Application Binaries

https://developer.ibm.com/wasdev/downloads/#asset/tools-Migration_Toolkit_for_Application_Binaries

- Evaluates the binaries – EAR, WAR, JAR, RAR
- Command line convenience
- HTML or JSON output

Step 3: Make application changes

- ## WebSphere Application Server Migration Toolkit

  - https://developer.ibm.com/wasdev/downloads/#asset/tools-WebSphere_Application_Server_Migration_Toolkit

Migration discovery

Binary analysis

Source Migration

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

WebSphere Application Migration Toolkit
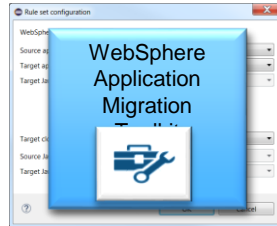
Target server

Liberty
WAS traditional

- Java EE 6 or 7
- Java SE 7 or 8
- On premises, instant runtime, WAS on Cloud, Docker

Step 4: How do I migrate configuration?

- WebSphere Version to Version Migration
  - WASPreUpgrade / WASPostUpgrade
- Traditional WebSphere to Liberty or third-party app servers
  - WebSphere Configuration Migration Tool
    - https://developer.ibm.com/wasdev/downloads/#asset/tools-WebSphere_Configuration_Migration_Tool

Migration discovery

Binary analysis

Source Migration

Config Migration

Analyze configuration

WebSphere v9.0

WCMT in Eclipse

- Lists resources, allows edit of properties
- Preview and save liberty server.xml content
- Creates Jython scripts for traditional WebSphere

- Input for traditional WebSphere is config properties file

  – wsadmin -lang jython -c "AdminTask.extractConfigProperties(['-propertiesFileName my.props'])"

What can you migrate to Liberty using WCMT?

- JDBC providers
- Data sources
- JMS destination
- JMS topic
- JMS queue
- JMS connection
- JMS topic connection factory
- Foreign JMS connection factory
- Activation specification
- Queue activation specification
- Topic activation specification

- MQ topic
- MQ queue
- MQ activation specification
- MQ connection factory
- MQ queue connection factory
- JCA authentication alias
- Service integration bus
- Global security
- LDAP user registry
- WebSphere variables

Tomcat migration

Tomcat Configuration Migration Tool
Included with WAMT
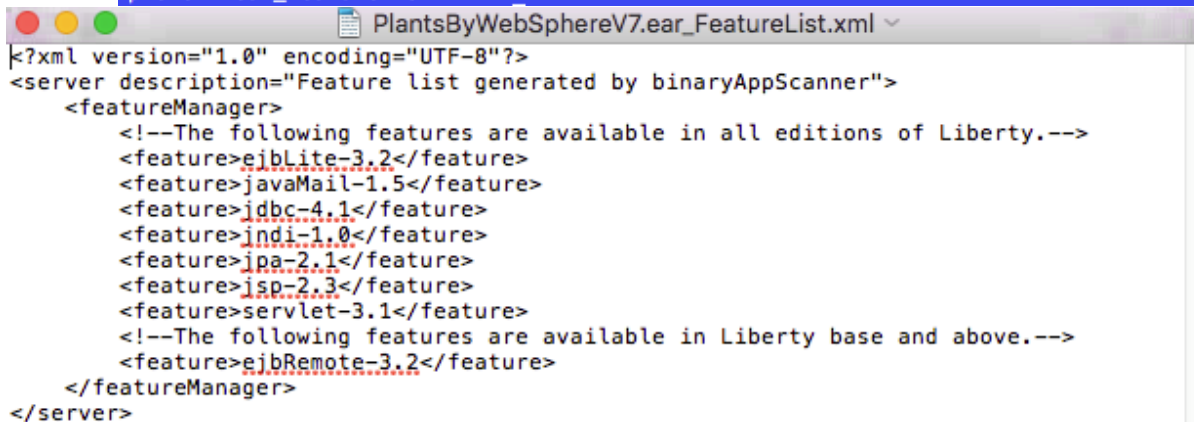
- Migrates common Tomcat configuration elements to Liberty profile

- Simplifies developer experience – Integrated experience in Eclipse for both app and configuration migration to Liberty

- Uses WDT for server definitions and deploy

Binary Scanner - Liberty server configuration

- Scans the application binaries and generates a Liberty server configuration file that contains the features required by the application

- Simplifies developer experience – assists with configuring the Liberty server

```
cheryls-mbp:wamt cherylking$ java -jar binaryAppScanner.jar /apps/PlantsByWebSph
ereV7.ear --featureList
Processing the PlantsByWebSphereV7.ear application.
Scanning files.......................................................
..............
The report was saved to the following file: /binaryScannerNext/wamt/PlantsByWebS
phereV7.ear_FeatureList.xml
```

PlantsByWebSphereV7.ear_FeatureList.xml

```xml
<?xml version="1.0" encoding="UTF-8"?>
<server description="Feature list generated by binaryAppScanner">
    <featureManager>
        <!--The following features are available in all editions of Liberty.-->
        <feature>ejbLite-3.2</feature>
        <feature>javaMail-1.5</feature>
        <feature>jdbc-4.1</feature>
        <feature>jndi-1.0</feature>
        <feature>jpa-2.1</feature>
        <feature>jsp-2.3</feature>
        <feature>servlet-3.1</feature>
        <!--The following features are available in Liberty base and above.-->
        <feature>ejbRemote-3.2</feature>
    </featureManager>
</server>
```

WebSphere v9.0

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

- New JEE level
- New DBs
- Security enhancements
- . . .

Starting Point
Source Profile 1
V7.0, V8.0, V8.5 Server Profile

Step 1
WASPreUpgrade

Migration Backup Directory

Step 2a
Create New Profile

Step 2b
WASPostUpgrade

Goal
Target Profile 1
V9.0 Migrated Server Profile
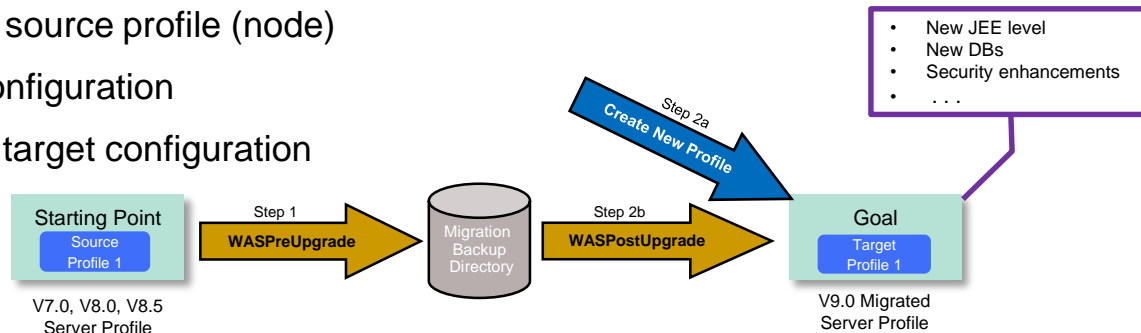
Traditional WebSphere Configuration Migration

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

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

WebSphere v9.0

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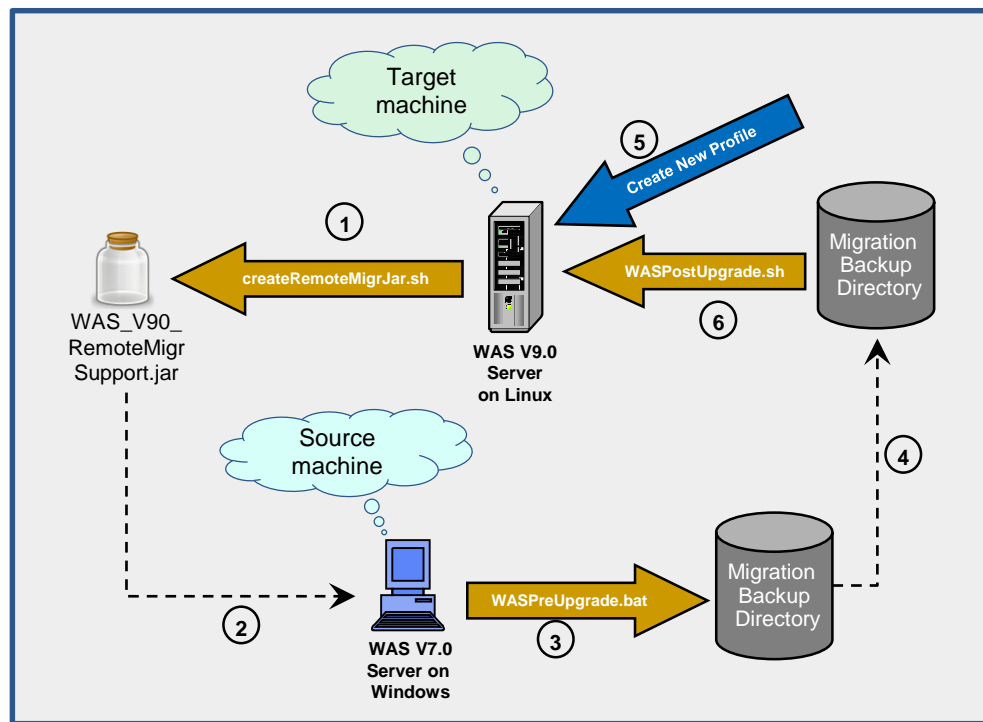
Use createRemoteMigrJar command to avoid having to install WebSphere V9.0 on your source machine just to run the WASPreUpgrade command!

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)

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

Five Strategies for Migrating Network Deployment

1. Manual Side by Side (Scripted)
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Standard Migration Strategy (In Place - Copy and replace the cell)
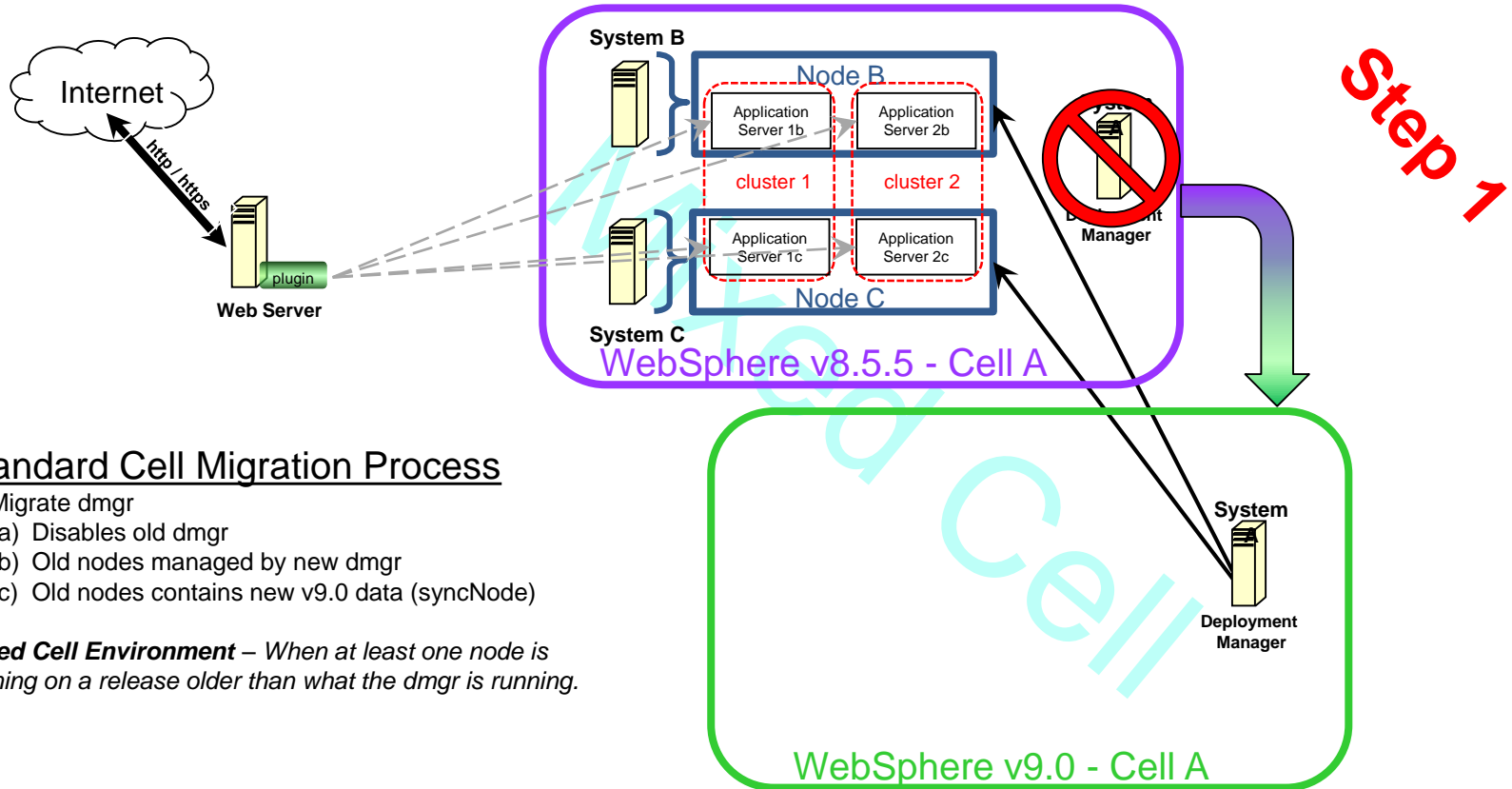
Standard Cell Migration Process

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)
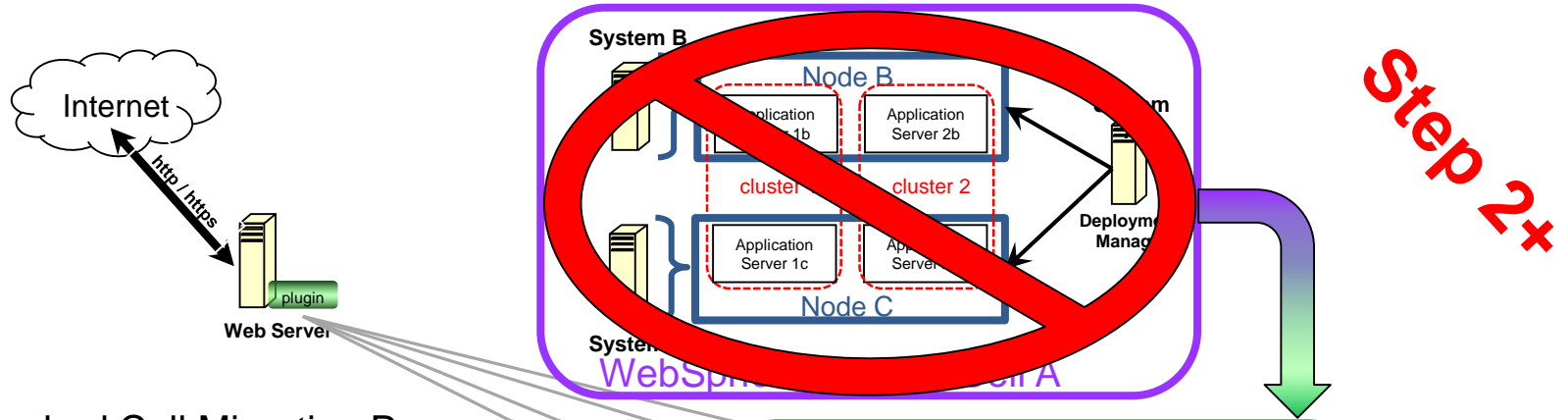
Standard Cell Migration Process

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
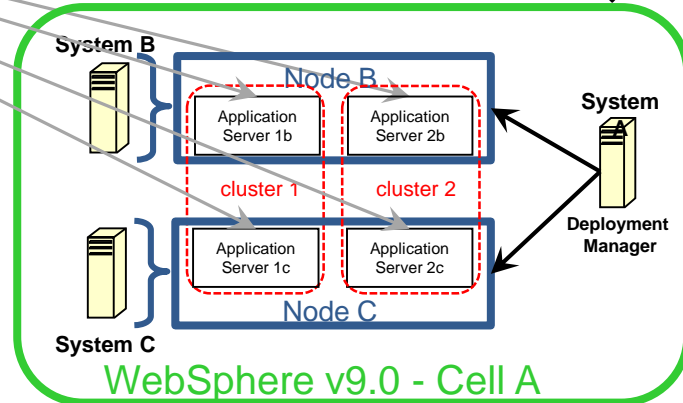
Clone Migration Strategy (In Place - Copy and coexist)
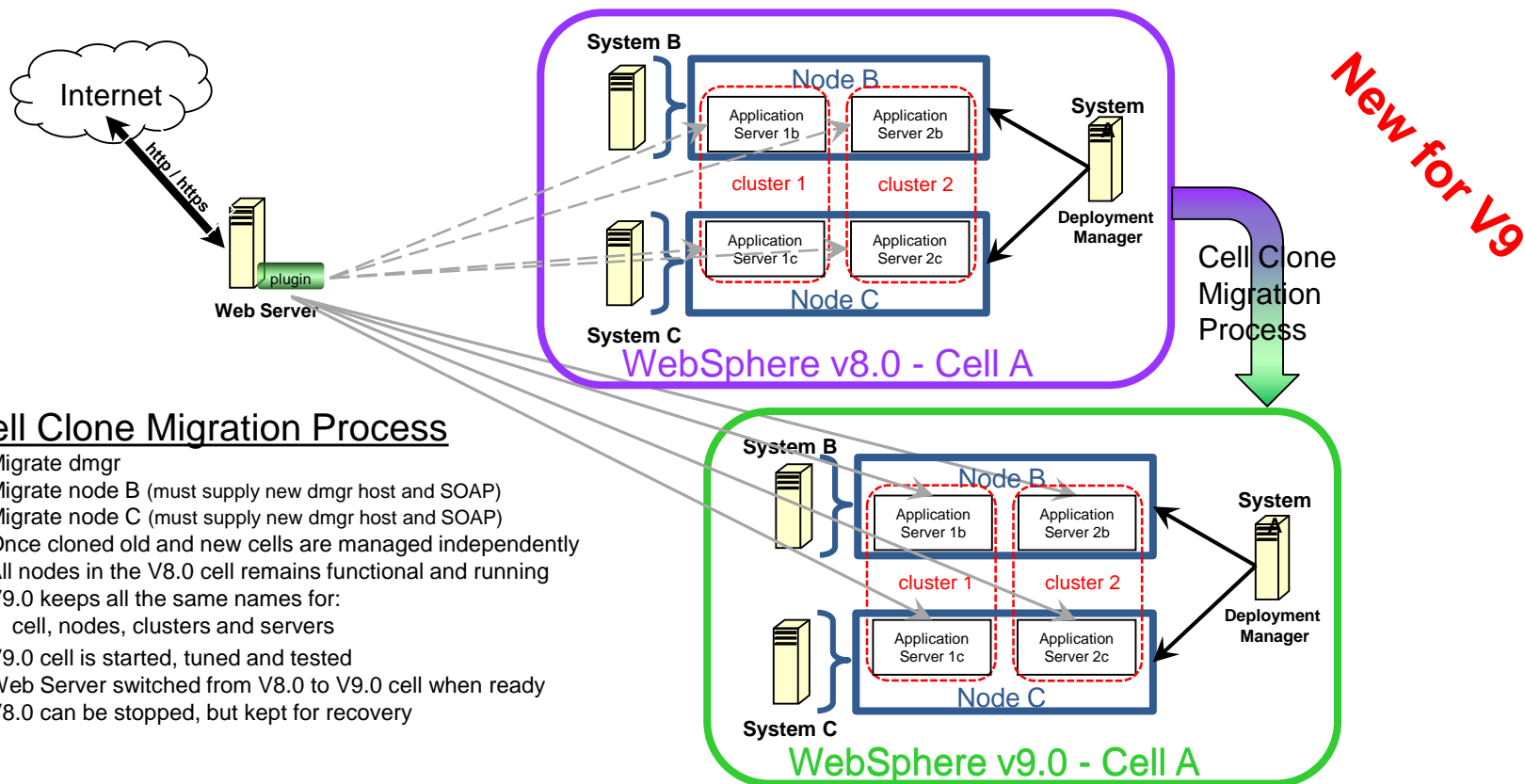
Cell Clone Migration Process

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.

WebSphere v9.0

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

- 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

IBM UrbanCode Deploy speeds WAS applications to Hybrid Cloud

including **Bluemix**

UrbanCode automates your application deployment process

UrbanCode deploys all the application components so you can set up environments painlessly in minutes versus hours.

Use Cloud Blueprints to deploy the entire application environment to hybrid cloud

With the blueprinting capability of UrbanCode Deploy you can blueprint your target environments and quickly reuse them for any cloud.

Benefits: *Automated, Fast, Repeatable*

- **Reduced Risk:** Automated, consistent deployments and rollbacks of applications
- **Repeatable Process:** Orchestration of changes across servers, tiers and components
- **Consistent:** Configuration and security differences across environments
- **Traceable:** Clear visibility: what is deployed where and who changed what
- **Integrated:** With middleware, provisioning and service virtualization

UrbanCode also automatically configures the environment to support the application

Eliminate the manual configuration steps to reduce risk and speed applications from Dev to QA to Prod consistently and in a repeatable fashion. UrbanCode deploys, tracks and versions WAS configurations.

Development   SCM   Build   Package Repo   Deploy   Test   Stage   Prod
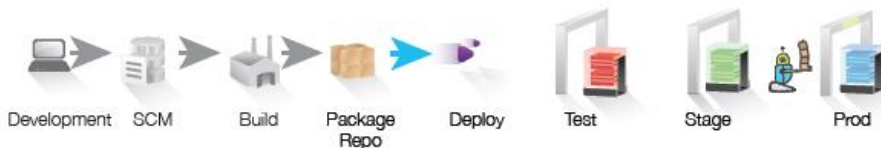
UCD WebSphere Automation

Why choose UrbanCode to manage WebSphere?

- **Reduced Risk**

- **Repeatable Process**

- **Consistent**

- **Visible & traceable**

- **Portable**

- **Integrated with cloud**
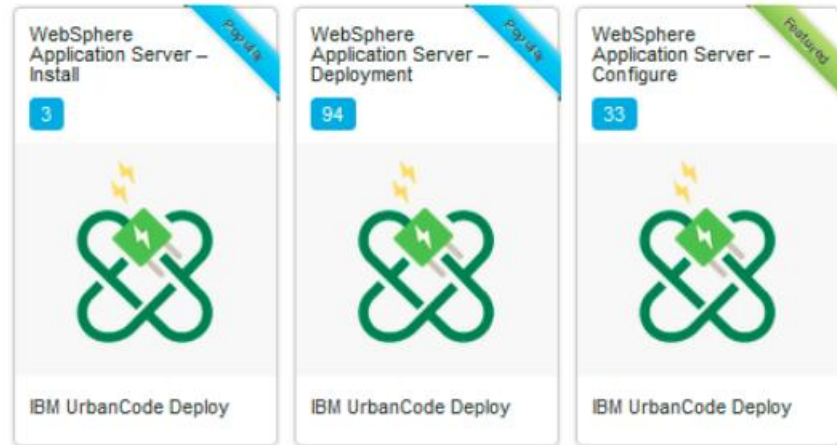
Summary

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

Enablement: IBM Migration Knowledge collection

- This information and more is available <u>online</u>!

- General planning with detailed notes and WebSphere AppServer version specific information

- Updated with timely information

- Google: "websphere application server migration"

<u>http://www.ibm.com/support/docview.wss?uid=swg27008728</u>

Questions ?

IBM

References

Reference Information

- Migration Information
- Planning
- Migrating from competitors application servers
- Moving to the cloud
- Training
- Configuration
- Development
- Operations
- 5 Runtime migration strategies
- Differences between versions
- Application planning example

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- WAS 8.5 WebSphere Migration Guide
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- Talk with your IBM representative !

References - Planning

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  - http://www.ibm.com/developerworks/websphere/techjournal/0312_beaton/beaton.html
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Migrating from a Competitive Application Server?

- Certain migrations could include free services available
  - Migration Assessment Report
  - Workshops
  - Proof of Concept

- Contact your IBM rep

IBM WebSphere Application Server

Why Pay More And Get Less?

The business case for the value, robustness, scalability, and enterprise grade attributes of WebSphere is compelling.

Consider The Facts:

With IBM WebSphere, you can improve your overall total cost of ownership taking into account licenses and support, performance, availability and usability, administrative and development tools.

• With IBM WebSphere, you only pay for software on the server cores you use.
• You can realize savings of 57% on first year licensing and support, compared to Oracle WebLogic.
• Since 2010 over 400 Oracle WebLogic clients have chosen IBM WebSphere.
• Hands-on analysis of capabilities reveal that over 5 years, JBoss is 49% more expensive than WebSphere.
• WebSphere beats Tomcat hands down on features that are important to any sized business.

Get Started Now:

• I would like an IBM migration expert to give me, at no charge, a high level estimate of to what it will take to migrate (requires 2-3 hours.)
• I would like an IBM migration expert to come on-site for a free deep evaluation of my environment and applications and provide a full migration assessment report at no charge.
• I am interested in a Proof of Concept (PoC) where an IBM migration expert comes on-site to migrate 1 or 2 of my applications to WAS on our test environment using their proven methodology and automation tools – all at no charge.
• I would like several of my company's technical personnel or management to attend a free 1, 2, or 3 day Migration Workshop to get an introduction WAS v8.5 and do hands-on labs to learn about the business value and migration process.

If you said YES to any of these options, our migration experts would like to talk to you. They can help you save money now!

Contact your local IBM representative, or send an e-mail to wascmt@us.ibm.com.

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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

Old Node   Old Node   V9.0 Node   V9.0 Node
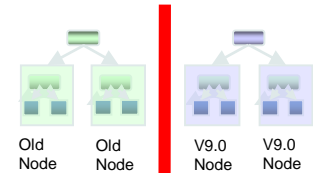
In Place - Copy and replace Cell (Standard)

- 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
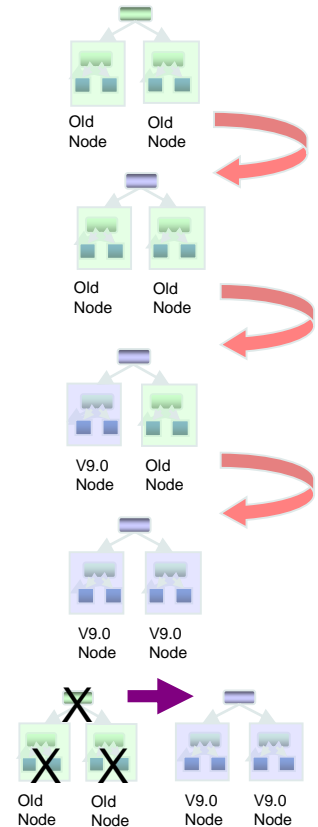
In Place - Copy and replace DMgr

- 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
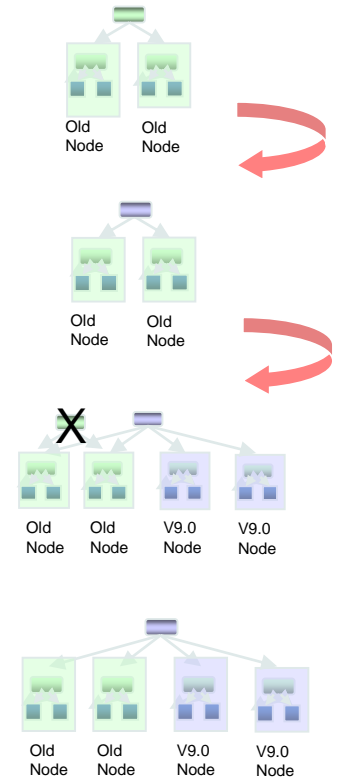
In Place - Copy and coexist (Clone)

- 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
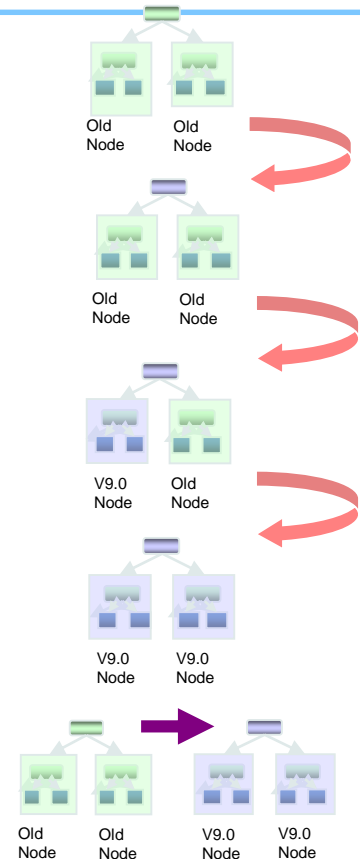
Side by Side - Fine Grained

- 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

Old Node   Old Node   V9.0 Node   V9.0 Node
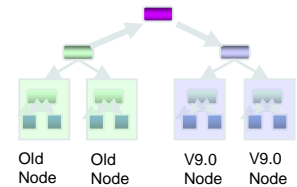
Overview changes by version

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

WebSphere v9.0

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.

WebSphere v9.0

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

"Hypothetical" Ranking – Developing a Formula

Complexity			Mission Critical			Total Score
Low (1)	Medium (3)	High (5)	Low (1)	Medium (5)	High (10)	
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 Score	JSF Used?	EJB Used?	JSP Used?	Servlet Used?	JAX-WS Used?	Total Score	Overall Score
	Low	Med	High	Low	Med	High								
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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