Migrating Java EE applications to WebSphere Application Server: Part 1: FAQs about migrating from other application servers to WebSphere Application Server

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Part 1 of this two-part article series answers frequently asked questions (FAQs) that we get from customers who are moving their Java EE applications to WebSphere Application Server from other application servers, such as JBoss and WebLogic. Part 2 describes common technical challenges during migration and provides solutions to them.

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Introduction

Most of this article applies to both IBM® WebSphere® Application Server V8.5.5 Full Profile and WebSphere Application Server V8.5.5 Liberty Profile. If a statement applies only to one or the other, then that will be clearly indicated.

List of FAQs

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1. Are there detailed comparisons between WebSphere Application Server and other application servers?

Yes. The WhyWebSphere blog has several articles that compare the features of WebSphere Application Server with those of other application servers. An IBM Sales representative can also take you through the major features of WebSphere Application Server and illustrate how Total Cost of Ownership (TCO) is lower for WebSphere Application Server compared to other application servers. Here are some articles that compare other application servers:

- Comparing IBM WebSphere and Oracle WebLogic
- How to cut your WebLogic license and maintenance costs in half
- WebLogic 12c on Oracle SPARC T5-8 delivers half the transactions per core at double the cost of WebSphere Application Server on IBM Power7
- WebSphere vs. JBoss license cost calculator

2. Are there reference customers for migration to WebSphere Application Server?

Yes. Many customers have successfully migrated to WebSphere Application Server and seen concrete benefits, including a higher availability, better scalability, and lower costs. This article lists a few of these reference accounts. Contact an IBM Sales representative for additional references.

- Why Topdanmark chose WebSphere Application Server over JBoss
- PT Bank ANZ Indonesia: Migrating to WebSphere Application Server from WebLogic
- Ohio National Financial Services: Migrating to WebSphere Application Server from JBoss

3. What are the risks of migrating to WebSphere Application Server?

Complex migrations carry a variety of risks, as described below:

**Commitment and availability of internal and external resources**

Success of the migration project depends on the commitment of the relevant personnel, who may have many different commitments to the business. Migration activities must be scheduled to avoid conflicts that may affect the timeline. The impact of this risk is high, but it can be mitigated by strong executive focus and by skilled project managers who have experience dealing with resource challenges.

**Heavy use of proprietary APIs**

Applications that strictly follow JEE specifications are easily portable and will have fewer issues when migrated to WebSphere Application Server. But some applications heavily use vendor-
specific, proprietary APIs. For example some applications use com.sun.*, com.weblogic.*, or org.jboss.* APIs, and these applications must be enhanced to use Java EE standard APIs or WebSphere-equivalent APIs.

**Heavy use of CMP beans**

Although EJB1 and EJB2 programming APIs are standard, CMP beans require object relational mappings in non standard deployment descriptors. These deployment descriptors must be rewritten, which can be time consuming when you have a lot of CMP beans.

**Use of non-standard JMX APIs or MBeans**

The JMX programming API is standard and there are standard MBeans to access application server resources such as JMS destinations and JDBC data sources. But application servers may also expose non-standard JMX MBeans, which will make the application more difficult to port if they are accessed by it. Some vendors such as JBoss provide “value-added extensions” to the JMX API that make it "easier" to develop MBeans, but also make the code non-portable.

**Importing non-standard JSSE providers**

The JSSE API can be portable as long as the use of vendor-specific information is not embedded in the code. For instance, IBM JSSE includes IBM's providers; other vendors have their own providers. Therefore, application code that assumes any particular provider is not portable. A common example is explicitly importing a vendor-specific encryption provider, instead of configuring a specific provider’s JSSE security properties and Java system properties.

**Heavy use of third-party libraries**

Some applications may be heavily dependent on third-party libraries. These libraries should be confirmed to work with JRE 7 and WebSphere Application Server V8.5.5. For instance, **SEAM 2.2, Drools, and Java 7 are incompatible**, and **Play Framework does not work with WebSphere Application Server V8**.

**Heavy use of open source projects that have been archived**

For instance, Apache Beehive, Apache SOAP, and Apache iBatis have all been archived, while Apache Axis and Axis2 have been replaced by other open-source projects. Although applications can continue to use those open-source frameworks, most customers do not. Replacing these non-standard open-source APIs with alternative solutions can be time consuming.

**JDBC driver incompatibility**

The JDBC driver used by the application may not be certified to run in the new JRE. When you're migrating applications, you often run it in a different JRE. Doing so may require that you also upgrade the driver to one that is recommended for the specific database version, JRE, and JDBC level. Your database vendor will generally have a table that specifies the supported database versions, the supported JDK versions, and the compliant JDBC. Contact your database vendor for
the supported JDBC driver. If one is not available then contact IBM Technical support to determine the implications of using an unsupported driver with WebSphere Application Server.

Packaging duplicate classes in your applications

If an application uses certain frameworks like Spring, then it may include the Spring libraries as well as a number of other libraries that Spring depends on. Some of these libraries may be present in WebSphere Application Server, and including additional copies (perhaps in different versions) of them in the application may cause class-loading issues. You can reduce this risk by identifying and not including duplicate classes. Potential duplicate classes:

1. – commonj
2. – org.apache.axiom
3. – org.apache.axis2
4. – org.apache.bval
5. – org.apache.http
6. – org.apache.wink
7. – org.apache.xerces
8. – org.apache.commons.[beanutils | codec | collections | digester | discovery | el | fileupload | httpclient | io | jxpath | lang | lang3 | logging | pool].

This problem is a general one, but it applies more often with WebSphere Application Server V8.5.5 Full Profile than it does with Liberty Profile.

4. What is the best way to migrate the WebSphere Application Server runtime environment?

There are two possible approaches to migrating the runtime environment:

- Migrate using existing hardware only
- Migrate by adding (at least temporarily) additional hardware.

Migrating using existing hardware

Migration using existing hardware requires that the existing application server be shut down and WebSphere Application Server installed in its place. Shutdown may require a significant amount of downtime if the existing application server is not running in a horizontal cluster. Here is the procedure:

1. Remove half of the machines from the existing application server cluster; install WebSphere Application Server on those machines; and deploy the migrated application.
2. Configure and test WebSphere Application Server and the migrated application on those machines.
3. Flip the machines (redirect the traffic to the machines that are running WebSphere Application Server and the migrated application).
4. Remove the existing application server from the other machines and install WebSphere Application Server on them.
5. Repartition the application across all of the machines in the cluster now running WebSphere Application Server.

**Migrating by adding additional hardware**

Migrating by adding additional hardware enable the existing applications to continue running while the production rollout to the WebSphere Application Server environment takes place. Once the new environment is configured and tested, the environments are switched.

This option is far simpler to implement. The application must be installed only once, and does not need to be changed after it is configured and running. This option allows the migrated application to be tested in a closed (safe) environment before it is brought live. Should problems occur in the new environment, it is easy to return to the old environment (readily available backout solution).

The downside to this option is that it does require that new hardware be acquired, at least temporarily. Ideally, the old hardware can be reprovisioned for use by some of the other applications that are being migrated.

5. What are the system requirements for WebSphere Application Server?

WebSphere Application Server detailed system requirements. It is recommended (though not required) that an HTTP Server sit in front of WebSphere Application Server. It supports a number of HTTP Servers, including Apache and the IBM HTTP Server (IHS), which is shipped with all versions of WebSphere Application Server. There is no a web server plug-in for Netty servers bundled with the Play framework, so be sure to check your system requirements at the beginning of the project. It will save you some time later on.

6. How long will it take to migrate my applications to WebSphere Application Server?

Migration time depends on the complexity of the migrated applications. For the purposes on this article, complexity is defined for separately deployable artifacts (EAR and/or WAR files) as follows:

**Low complexity**

These applications make significant use of servlets, JSPs, or JSFs; and limited use of Session Beans, JPA Entity Beans, BMP Entity Beans, or Message Driven Beans. They do not use CMP Entity Beans, Web Services, JMX MBeans, JAAS Login Modules, JCA APIs, JMS APIs, or Proprietary APIs. Low complexity applications can be migrated in a matter of days.

**Medium complexity**

These applications make significant use of Session Beans, JPA Entity Beans, BMP Entity Beans, or Message Driven Beans; and limited use of CMP Entity Beans, Web Services, JMX MBeans, JAAS Login Modules, JCA APIs, JMS APIs, or Proprietary APIs. Medium complexity applications can be migrated in a matter of weeks.
High complexity

These applications make significant usage of CMP Entity Beans, Web Services, JMX MBeans, JAAS Login Modules, JCA APIs, JMS APIs, or Proprietary APIs. These applications may require a number of changes to source code and deployment descriptors, and therefore may take several weeks to several months to migrate.

To drive down costs, IBM has a performance guide and playbook that documents the tools and techniques used during the migration. Start the migration with this playbook, and update and improve it throughout the life of the project based on feedback from the migration teams. Doing so will enable subsequent migrations will go more quickly, with increased quality, consistency, repeatability, and productivity.

However, IBM recognizes that all migrations are different and so is the time needed to complete them. For a no-cost time estimate for your specific migration, contact a local IBM representative, or send an e-mail to wascmt@us.ibm.com.

7. Are there any tools to help migrate my applications?

Yes. The following tools can help you migrate your Java EE application artifacts and the Java EE server configurations required to run the application on WebSphere Application Server:

- **WebSphere Application Server Migration Toolkit** -- Helps you quickly identify any porting issues in moving your application to WebSphere Application Server. It statically analyzes the application source code to determine the list of changes required for migration, and in some cases even provides quick fixes.
- **WebSphere Configuration Migration Tool** -- Helps you quickly and cost effectively migrate Java EE resources to WebSphere Application Server from WebLogic Server or JBoss Server, and also from WebSphere Application Server V7 or later Full Profile to Liberty Profile.
- **IBM Rational Application Developer** – Helps you quickly and cost-effectively migrate J2EE 4+ applications to WebSphere Application Server V8.5.5 Full Profile. It has many wizards to help migrate the J2EE 4+ deployment descriptors.
- **WebSphere Developer Tools for Eclipse Luna** – Provides all the wizards that you need to quickly and effectively migrate Java EE 5+ applications to WebSphere Application Server V8.5.5.

8. How do we train our administrators and developers?

An IBM Sales representative can arrange for a no-cost **WebSphere Competitive Migration workshop**. In many cases, it is all the education required to jumpstart your team for migrating applications to WebSphere Application Server. Some administrators want additional training, since the administration model varies across application servers. IBM offers a five-day instructor-led training course on WebSphere Application Server V8.5.5 Administration that covers the following topics:

- Installing, configuring, and maintaining WebSphere Application Server V8.5.5 base, Network Deployment (ND), and Liberty Profile.
• Deploying enterprise Java applications in a single computer or clustered configuration.
• Working with features of WebSphere Application Server V8.5.5, such as IBM Installation Manager, WebSphere Customization Toolbox, security enhancements, Intelligent Management, and centralized installation.
• Working with IBM Support Assistant (ISA) and the ISA Data Collector.

Architects and developers won't require much education if they are already familiar with the latest Java EE 6 specifications. But if not, then they should take instructor-led training that covers:

• EJB 3 development
• JAX-WS development
• JAX-RS development
• JSF2 development
• JPA2 programming

The following online resources are also available:

• WebSphere Application Server Knowledge Center
• IBM Education Assistant for WebSphere
• IBM Redbooks
• IBM developerWorks WebSphere

9. How will migration to WebSphere Application Server affect my development environment?

Developers can continue to use Eclipse as their IDE. However, it is recommended to use IBM Rational Application Developer or the WebSphere Developer Tools for Eclipse Luna plug-in during the migration so that you can take advantage of the built-in tools for WebSphere Application Server development.

10. Can my applications be migrated to run on WebSphere Application Server Liberty Profile?

The applications that conform to the Web Profile of the Java EE 6 specification can run on WebSphere Application Server Liberty Profile with little change. You can use the Liberty Profile Technology Preview to analyze the application source and determine its suitability for running on Liberty Profile.

Another resource for determining whether an application conforms to the Web Profile of the Java EE 6 specification is the developerWorks article Making the move to Liberty profile, Part 1: Determining migration suitability using Liberty Technology Preview.

11. Will migration to WebSphere Application Server compromise application performance?

No. In all cases, applications will have equal or better performance and scalability.
Several no-cost tools are available to help you monitor and tune your applications, and to identify performance bottlenecks:

- IBM Whole-system Analysis of Idle Time (WAIT)
- IBM Support Assistant V5 and Health Center
- WebSphere Application Server Performance Tuning Toolkit

Here are the typical bottlenecks you may encounter during performance testing. You can easily identify and fix these bottlenecks using the above tools and running your load test to the saturation point:

- Java
- Garbage collection
- CPU
- I/O
- Resource locking
- Native memory
- Threads
- Memory leak
- Operating system
- Database
- Web server

For details about available performance-related tools and a complete list of tuning options available for a given bottleneck, see WebSphere Application Server Performance Cookbook.

12. Will migration to WebSphere Application Server interfere with ongoing development activities?

Migration activities will not destabilize your ongoing development activities if you schedule development and migration activities to reduce their overlap, and if you use separate code streams. Adding new features to the application and migrating at the same time may introduce potentially incompatible changes, and therefore it is strongly recommended that development and migration be scheduled as two separate efforts with minimal overlap. Migration work should begin when the original non-migrated application enters a code freeze, which might occur prior to releasing the code to functional testing or performance testing. In any event, use careful release planning to determine the optimal time to create the code branch so as to limit the code changes made to the original application during the migration.

If a code freeze is not possible, then assess the impact of those changes to the code base, and prioritize migration items accordingly. For instance, are the changes just bug fixes, or are there also new features? If you are adding features, then what parts of the code are most likely to be impacted? This information will help you to schedule migration of the more stable parts of the code, and defer migration of the less stable parts until the end.

It is also important to understand the difference between the merging strategy for normal development versus the merging strategy for migrations. For normal development, you would
generally merge deltas from the branch back into the trunk. But for migration projects, committing branch deltas back into the trunk may not be possible, especially if you need to support both versions of the application for some period of time. There may be significant differences between the libraries, configuration files, and project structure between the original and migrated code bases, and the migrated code base may be very different from the original trunk code.

Therefore, the full replacement of the trunk with the branch is the more likely scenario for migration projects. In the case of continued support for the older platform, two different trunks will have to be maintained. Any delta afterward will have to be evaluated and performed for both trunks until the original application is decommissioned. There may even be some cases in which a delta for one trunk may not be valid for the other trunk. A well thought-out code branching and merging strategy is essential for a successful migration.

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Resources

- Learn
  - What's new in WebSphere Application Server V8.5
  - WebSphere Application Server detailed system requirements
  - WebSphere Application Server Knowledge Center
  - IBM Education Assistant for WebSphere
  - IBM developerWorks WebSphere
  - Making the move to Liberty Profile, Part 1: Determining migration suitability using the Liberty Technology Preview
  - WebSphere Application Server Performance Cookbook
  - WebSphere Application Server V8.5 Migration Guide
  - Knowledge collection: Migration planning for WebSphere Application Server
  - Knowledge collection: Migrating from other application servers to WebSphere Application Server

- Get products and technologies
  - WebSphere Application Server Migration Toolkit
  - WebSphere Configuration Migration Tool
  - IBM Rational Application Developer
  - WebSphere Application Server Developer Tools

- Discuss
  - Liberty Profile Technology Preview
  - WhyWebSphere blog
  - Software migrations made easy
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