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Approach to Problem Determination in WebSphere Application Server V6

This paper introduces problem determination strategies for WebSphere Application Server V6. It discusses how to prevent problems, how to plan and prepare for problems that can occur, and what to do when a problem does occur so that it is resolved as quickly as possible. It then guides you to the more detailed information that can help you diagnose the cause of the type of problem that you are experiencing.

Introduction to problem determination

Keeping your enterprise applications highly available to your customers is crucial in today's on demand business environment. WebSphere Application Server V6 has many new features and tools that are designed to minimize problem occurrences. However, if a problem does occur that might negatively impact your business, you need to be able to respond quickly and effectively.

We have prepared a series of papers that provide guidelines for specific issues that you might experience with WebSphere Application Server V6. The goal of this series of papers is to help you form strategies to quickly identify the root cause of problems that do occur to minimize their business impact. You can find these papers at:

<http://www.redbooks.ibm.com/abstracts/sg246798.html>

We show you the path to get from an initial problem symptom (for example, "Users cannot log onto our Web site!") to the root cause of the problem (for example, "Our newly installed application code caused a deadlock."). Although it is impossible to show a resolution for every conceivable problem that might occur, we outline a general problem determination process that you can use to discover the root cause of a problem.

Note: The methodologies discussed in this series of papers will not necessarily provide a resolution to the problem. However, when you have determined the root cause, you will understand what needs to be changed or fixed to resolve the problem.

We assume that readers of this series of papers already have a basic understanding of and experience with WebSphere Application Server V6. We focus specifically on problem determination. If you need more general information about using the product, consult the following material:

▶ IBM® Training Courses

<http://www-304.ibm.com/jct03001c/services/learning/ites.wss/us/en?pageType=page&contentID=a0000048>

▶ IBM WebSphere® Training and Certification

<http://www-306.ibm.com/software/info1/websphere/index.jsp?tab=education/index>

▶ WebSphere Information Center

<http://publib.boulder.ibm.com/infocenter/ws60help/index.jsp>

▶ IBM Education Assistant

<http://www-306.ibm.com/software/info/education/assistant>

- ▶ IBM Education Assistant: WebSphere Application Server problem determination

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg27005460>

Causes of problems

When a problem occurs, your first inclination might be to call IBM Support so that they can provide a fix that resolves the problem. In some cases, contacting IBM is necessary. However, the experience of the WebSphere Application Server Support team has shown that a small percentage of client-reported problems are actually due to defects with WebSphere Application Server code. Most problems are caused by configuration issues, environment issues, application code defects, or a misunderstanding of WebSphere Application Server. Many of these problems can be resolved easily without calling IBM Support to open a problem management record (PMR). In addition, many issues can be resolved by following the problem determination procedures that are discussed in this series of papers.

Each problem that you encounter has a different level of complexity and a different level of impact on your business. These factors determine how closely you follow the procedures in this series of papers. For less complex problems, it might only be necessary to follow the most basic procedures. More complex problems can involve multiple components and maybe even multiple software products and systems. These problems require more time and effort with more thorough problem determination techniques. Obviously, the impact that the problem has on your business influences the urgency to resolve the problem and that also determines which problem determination techniques you follow.

Types of problem symptoms

When a user of an application that is running on WebSphere Application Server first notices a problem, a problem symptom is observed. Sometimes the problem symptom provides clues about the cause of the problem. Other times, a significant amount of problem determination is needed to determine the problem's root cause.

Here are the common types of symptoms that you might see. Almost every symptom falls into one of these categories:

- ▶ You cannot install or migrate WebSphere Application Server or install an application into WebSphere Application Server.
- ▶ You experience difficulties in WebSphere Application Server system management or configuration.

- ▶ An application or WebSphere Application Server process (for example, an application server, node agent, or deployment manager) is unable to start.
- ▶ An application does not respond to incoming requests.
- ▶ An application produces unexpected results (possibly errors or exceptions).
- ▶ An application cannot connect to an external system or resource.
- ▶ An application performs slowly or its performance degrades over time.

Preparing for and preventing problems

In any enterprise computing system, you can expect that some problems — large or small — will occur at times. In a best case scenario, the problems that you encounter will not be severe and will not result in critical business impact. However, it is a best practice to prepare and plan for the worst.

This section discusses how you can develop a detailed plan to prepare for problems. By developing such a plan, you can mitigate the effects of problems when they do occur, and you can even prevent problems from occurring in the first place.

Applying WebSphere maintenance

Although many problems are caused by factors other than WebSphere Application Server code defects, the WebSphere Application Server Support team does find product defects when working through PMRs with clients. When a defect is found, the support team opens an authorized program analysis report (APAR). Each APAR has a unique identifier, a string that contains two letters (either PQ or PK) and five numbers. You can search for a particular APAR or a problem symptom reported in an APAR on the WebSphere Application Server Support site (Figure 1 on page 5). The site is available at:

<http://www-306.ibm.com/software/webservers/appserv/was/support>

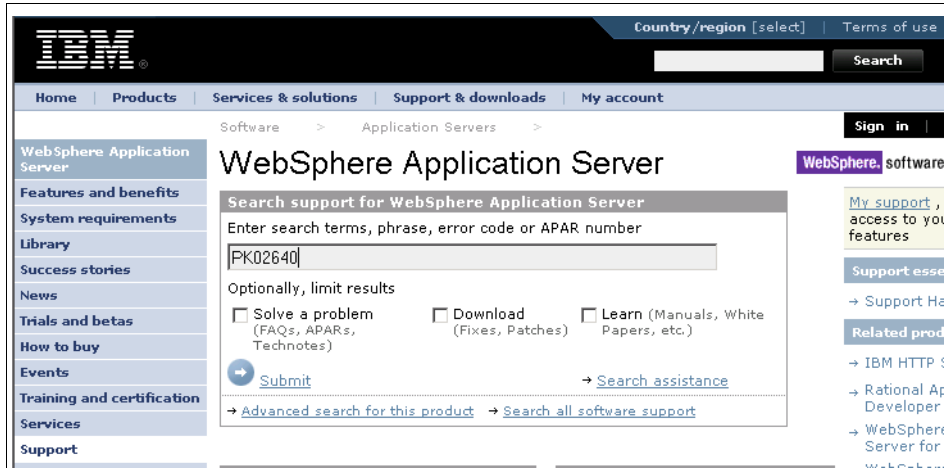


Figure 1 Searching for an APAR on the WebSphere Application Server Support site

Fixes for APARs are included in fix packs and refresh packs, which are regularly published to the support site. Fix packs for Version 6 are equivalent to cumulative fixes for Version 5 and 5.1. Refresh packs for Version 6 are equivalent to fix packs for Version 5 and 5.1. See Figure 2.

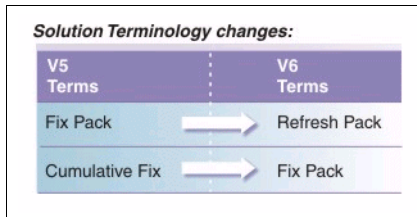


Figure 2 Changes in terminology for WebSphere maintenance between V5 and V6

Fix packs for Version 6 are delivered on a regular basis, about once every three months. They only contain fixes for APARs, and they do not introduce any new features or functionality to the product. You can think of a fix pack as preventive maintenance. Each fix pack includes a list of defects, which lists every APAR that is fixed in that fix pack. It contains all of the APAR fixes that were included in the previous fix pack as well as fixes for APARs that have been opened since the last fix pack. The fix packs add a fourth number to your WebSphere Application Server version. For example, if you were to install fix pack 2 for WebSphere Application Server 6.0.1, you would be upgrading to WebSphere Application Server 6.0.1.2.

Fix packs do not contain upgrades to the Java™ Software Development Kit (SDK). They are tested with the latest Java SDK service release, but the

upgrades to the Java SDK are delivered as separate fixes. You can also download the SDK fixes from the WebSphere Application Server Support site.

Because fix packs do not introduce new functionality to the product and because they have been fully regression tested, we recommend installing new fix packs as soon as they become available. However, we also recommend some level of testing with your applications.

Proactively installing fix packs as soon as they become available is an effective way to prevent problems from occurring. When you install a fix pack, you can be assured that you will not encounter any of the WebSphere Application Server code defects that are fixed in the fix pack. This saves the time and frustration of seeing one of these problems occur on your system.

Refresh packs for Version 6 are considerably larger upgrades than fix packs. In addition to containing fixes for APARs, all refresh packs contain some new features and functionality. They also upgrade the Java SDK. Refresh packs add a third number to your WebSphere Application Server version. For example, if you were to install refresh pack 1 for WebSphere Application Server 6.0, you would be upgrading to WebSphere Application Server 6.0.1.

We recommend that all clients install refresh packs when they become available. However, you should never install a refresh pack immediately on a production system. All applications should be fully regression tested with the new refresh pack. Upgrading to a new refresh pack level should be planned when there is sufficient time in the development cycle to test it.

For more information about the WebSphere Application Server V6 Update Strategy, you can review the Update Strategy document, which is available on the Support site:

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21191989>

You can learn when fix packs and refresh packs are scheduled to be released by reviewing the *Recommended Updates for WebSphere Application Server Base and Network Deployment editions*:

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg27004980>

To determine which fix packs and refresh packs have been installed on your system, you can usually just check the version of the product. This is available on the Welcome page of the administrative console (Figure 3 on page 7) and at the top of all SystemOut.log files for each WebSphere Application Server process. You can also use the **historyInfo** and **versionInfo** commands in the `<WAS_install_root>/bin` directory.



Figure 3 Checking the refresh pack and fix pack level from the administrative console

Checking the prerequisites

Another strategy for preventing problems is to ensure that all software and hardware in your environment meets the prerequisites of WebSphere Application Server V6. WebSphere Application Server has been tested with specific software and hardware configurations. It is known to work successfully in these configurations and to integrate well with the products with which it has been tested. You can find the software and hardware with which WebSphere Application Server has been tested and that it supports at:

<http://www-306.ibm.com/software/webservers/appserv/doc/latest/prereq.html>

If some of the software or hardware in your environment is not listed or if you are using older versions than the versions listed, you are at a greater risk for problems to occur. If you need to open a PMR, the support team will recommend moving to a supported configuration before proceeding with any other problem determination steps. Therefore, proactively ensuring that all of the software and hardware in your environment meets WebSphere Application Server's prerequisites is an important problem prevention and preparation technique.

Testing the application

The best strategy to prevent problems from occurring when running WebSphere Application Server in production is thorough testing. You should develop a detailed testing strategy for your application and make sure that the strategy is followed every time that you install a new version of the application or that you upgrade WebSphere Application Server.

There are countless methods of software testing that you can employ, and we could fill an entire series of papers discussing every method. Instead, we discuss the basic types of tests that every client should perform. In addition, we provide links to other documentation that might be useful in developing your testing strategy. Testing methods include the following:

- ▶ Unit testing

Unit testing ensures that each method in each class of the application provides the expected output for all possible input. There are several unit testing frameworks that can be used to make unit testing easier. One popular framework is JUnit, which is open-source software.

- ▶ Functional testing

Functional testing ensures that the application performs as the user expects it to. It tests the entire application to make sure that every component works together correctly. Functional testing is sometimes called integration testing. There are several functional testing frameworks available. JFunc is an extension to JUnit for functional testing.

- ▶ Performance testing

Performance testing ensures that the application's performance is acceptable to users. WebSphere Application Server V6 includes an enhanced Tivoli® Performance Viewer, which is accessible within the administrative console. In Version 5 and 5.1, the Tivoli Performance Viewer is run in a separate graphical user interface (GUI).

To use the Tivoli Performance Viewer, enable the Performance Monitoring Infrastructure (PMI) metrics that you want to view in the administrative console. Log onto the administrative console, select your application server, and then select **Performance Monitoring Infrastructure (PMI)**. PMI monitoring can be done in a production environment using the Basic set (default configuration) or the Extended set with minimal impact.

After selecting a statistic set, you can then use the Tivoli Performance Viewer to monitor the current performance of the system, log the performance data, or view data that had been previously logged. You can access the Tivoli Performance Viewer by expanding **Monitoring and Tuning** in the administrative console, then expanding **Performance Viewer**, and selecting to view the current activity or previously logged performance data.

The charts and graphics in the Tivoli Performance Viewer can give the administrator clues about where performance bottlenecks exist. They can then tune the appropriate WebSphere Application Server properties to relieve the problem.

Another feature included in WebSphere Application Server V6 is the Tivoli Performance Advisor. The Advisor analyzes the performance data from your system and provides suggestions on which WebSphere configuration

properties to change to improve the performance. To enable the Advisor, select your application server in the administrative console and then select **Runtime Performance Advisor Configuration**.

For more information about the Tivoli Performance Viewer and Advisor, review the following WebSphere Information Center sections:

- *Why use Tivoli Performance Viewer?*

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/cprf_tpv.html

- *Monitoring performance with Tivoli Performance Viewer (TPV)*

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/tprf_tpvmonitor.html

- *PMI data organization*

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rprf_datacounter6.html

In addition to the Tivoli Performance Viewer and Advisor, there are several other tools, both open-source and proprietary, that are available to make performance testing easier. You can read an overview of the performance tools that are available in the technical article *Comment lines from Ruth Willenborg: Selecting WebSphere performance tools*, which is available at:

http://www-128.ibm.com/developerworks/websphere/techjournal/0410_col_willenborg/0410_col_willenborg.html

- ▶ **Load and scalability testing**

Load testing involves testing your application with a simulated workload that corresponds to the amount of load that you expect your application to be able to handle in production. Scalability testing involves testing your application with increasingly higher amounts of load to determine if the application is scalable for future growth.

There are several popular tools for simulating load during load and scalability testing. One such tool is Apache JMeter. You should coordinate your load and scalability testing with the tools that you use for performance testing so that you can tune WebSphere Application Server to provide better performance with higher levels of load.

We recommend using the WebSphere Application Server V6 Test Environment within Rational® Application Developer, Version 6 to develop and test all of your application code before installing it on your WebSphere Application Server environment.

As you design your tests, consider the following:

- ▶ Your test scenarios should focus on the most used code path, but you should comprehensively test all possible code paths.
- ▶ Testing should be done with multiple users (not just the same one, over and over).
- ▶ Tests should be done with multiple functions in parallel. In production, several functions are executed at the same time. Some problems might only occur when the functions are run in parallel. It is important to test your application's functions together and not in isolation.

Ensuring that your application has been rigorously tested before it is put into production greatly reduces the chance of application defects causing problems in your production environment. For more information about various software testing methods and advice about testing, review the article *Recommended reading list: Software testing at:*

http://www-128.ibm.com/developerworks/websphere/library/techarticles/0402_polozoff/0402_polozoff.html

Setting up a test environment

We strongly recommend that you maintain a test environment that is configured exactly the same as your production environment. The WebSphere Application Server maintenance level (including refresh packs and fix packs), the versions of your applications, and your configuration should all be the same on both systems. There are many benefits to doing this:

- ▶ When you successfully test an application in your test environment, it gives you an accurate reflection of how the application will perform in production.
- ▶ When you need to make a change to an application or apply maintenance to WebSphere Application Server, you can fully test these changes in the test environment to be sure that there are no problems before you make any changes to your production environment.
- ▶ When a problem does occur in production, you can reproduce the problem in the test environment and perform problem determination in the test environment. This ensures that your users will not experience down time with the production environment.
- ▶ You can collect any diagnostic data that is needed to determine the root cause of a problem in the test environment. Because some diagnostic methods can impact performance or necessitate restarting one or more WebSphere Application Server processes, it is usually beneficial to collect the data in your test environment.

The key to this strategy is ensuring that the test environment and production environment are configured *exactly* the same in every way. This includes:

- ▶ The hardware and network configuration.
- ▶ The operating system level and operating system patches.
- ▶ The other software that is used in conjunction with WebSphere Application Server. This might include Web servers, databases, and messaging systems.
- ▶ The WebSphere Application Server level, including refresh packs, fix packs, Java SDK fixes, and any individual APAR fixes that you might have downloaded or obtained from the WebSphere Application Server Support team.
- ▶ The versions of all applications that are installed.
- ▶ The WebSphere Application Server edition (Base, Network Deployment, or Express).
- ▶ The WebSphere Application Server configuration. WebSphere Application Server V6 includes functionality to create configuration archive files with a .car extension. You can export the configuration from one machine to a .car file and then import that .car file to another system. Any configuration information that is specific to one system (for example, the host name) is removed in the configuration archive. It is a good practice to use configuration archive files to replicate the same WebSphere Application Server configuration on your test environment and production environment.

Configuration archives are exported and imported with the wsadmin tool. To export the configuration of a WebSphere Application Server V6 profile or application server, use these wsadmin commands:

```
$AdminTask exportWasprofile {-archive c:\myDirectory\myCell.car}  
$AdminTask exportServer {-archive c:\myDirectory\myServer.car -nodeName  
node1 -serverName server1}
```

Use the target directory, node name, and server name that is appropriate for your system.

To import the configuration of a profile or application server into a WebSphere Application Server V6 environment, use these commands:

```
$AdminTask importWasprofile {-archive c:\myDirectory\myCell.car}  
$AdminTask importServer {-archive c:\myDirectory\myServer.car  
[-nodeInArchive node1] [-serverInArchive server1] [-nodeName  
node1] [-serverName server1]}
```

Again, use the target directory, node names, and server names that are appropriate for your system.

You can also automate changes to your test and production environments with scripts that run in wsadmin. Automation is advantageous if changes must be

done during non-peak hours (typically late nights or on weekends). The scripts can be scheduled to run at those times so that no one has to run the scripts manually during those hours. You might also want to run scripts to update the configuration of other software on your system at the same time. You can also use the scripts as part of your change log (see “Establishing safe operational procedures” on page 12).

Any time you make a change to either the test environment or the production environment, you should synchronize the two environments so that they remain identical.

It is a good idea to establish a baseline configuration, meaning a configuration that has been tested successfully and found to be stable. When you make any type of change, you can test it. If the change is successful and does not cause any problems, you can then add the change to the baseline. If the change does cause a new problem, you can revert to the safe baseline configuration.

If you set up a test environment following these guidelines, you can prevent many problems, because your testing is done in an environment that is identical to your production environment. In addition, you will be better prepared to follow the problem determination methodologies that are described in this series of papers, because you have an ideal test environment ready for use.

Establishing safe operational procedures

Another important facet of problem prevention and preparation is establishing a set of safe operational procedures for your organization. These procedures should outline the proper processes for making any types of changes to your test and production environments. The WebSphere Application Server Support team has found that many problems occur as a result of configuration or code changes made by one person in an organization of which other people in the organization were not aware. A strategy to eliminate these occurrences greatly reduces the chance of unexpected problems.

It is important to define security roles for people in your organization and to ensure that only people who are authorized or part of the appropriate role can make changes to your configuration, upgrade your software, install applications, or do anything else that could potentially introduce problems. WebSphere Application Server V6 provides a comprehensive security infrastructure that you can use to define roles, authenticate, and authorize users. You should also take advantage of the security features of your operating system. This series of papers does not discuss security. However, you can learn more about security in the security section of the WebSphere Information Center at:

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc_concepts_csec.html

In addition to restricting the configuration of your environment, you should also implement a change control system for your application code. There are several change control software products available. However, we recommend Rational ClearCase®, which integrates seamlessly with Rational Application Developer. You can get more information about Rational ClearCase at its product Web site:

<http://www-306.ibm.com/software/awdtools/clearcase>

A key to any strategy for configuration or code changes is documentation. It is vitally important to document any and all changes that are made to your production and test environments. We call this documentation a *change log*. Many problems surface after an application has been running successfully in production for a long time. When you carefully document all changes that were made to your environment in one location, such as the change log, it is much easier to determine why a problem might have occurred at a certain time or date. Ensure that each person in your organization is aware of the process for updating the change log when any change is made to the environment and that they follow the process. They should include the precise time and date of any changes when they update the change log. Maintaining the change log and ensuring strict compliance with this process can save many hours of investigation and frustration when a problem occurs.

Another process that is important to establish is one for keeping the test and production environments synchronized at all times. If changes of any kind are rare, you might want to make the changes manually in both environments at the same time or make the change to production immediately after it has been tested in the test environment. On the other hand, if there are several changes during the course of a day, it might be easier to synchronize several changes at one time. As discussed in “Setting up a test environment” on page 10, you might want to create a configuration archive in one environment and then import it into the other environment.

Finally, you should select a procedure for scheduling changes to your production environment. You want to make sure that any changes to production do not cause your application to be unavailable to your users. You can determine the off-peak hours for your application. In many cases, the off-peak hours are late night and early morning hours or weekends. Schedule your production changes at a certain time, and make sure that everyone in your organization is aware of the schedule.

Establishing safe operational procedures is an essential part of the planning process. A good set of procedures that are agreed upon and acted upon by everyone in your organization can prevent problems from occurring and make you more prepared when problems do occur.

High availability and failover

As discussed earlier, even the most sophisticated problem prevention techniques cannot guarantee that problems will never occur in your WebSphere Application Server V6 environment. Given this, it is logical to develop a contingency plan for when a WebSphere Application Server process or service becomes unavailable. Fortunately, new features in the area of high availability and failover are included with Version 6.

Workload balancing enables your applications to serve more users and achieve better performance by distributing client requests to servlets and EJBs on multiple application servers in a cluster. Application servers that are clustered are called *cluster members*. Failover allows the work that is processed by one cluster member to failover to another cluster member if the first cluster member is down. Also, new requests are then routed to the other cluster members. These features make it easier for production environments to recover from failures.

New in WebSphere Application Server V6 is the high availability manager feature to provide failover for all applications and WebSphere Application Server services. It is configured automatically when you install WebSphere Application Server Network Deployment Version 6. The high availability manager runs critical WebSphere services (such as WLM and the transaction manager) on any available WebSphere Application Server processes.

In Version 6, WLM and other services can run on any deployment manager, node agent, application server, or cluster member process. The high availability manager tracks the status of each WebSphere process and the services that they run. When it detects a failure, it can start the service in another process in less than a second.

To make the WebSphere Application Server transaction manager highly available in Version 6, you must store the transaction logs (located by default in the `<WAS_install_root>/profiles/<profile>/tranlog` directory) on a network attached storage (NAS) system that is accessible to all of the WebSphere processes to which your transactions could failover (members of the core group). You also must select `Enable high availability for persistent services` for your cluster in the administrative console. When this is done, and a cluster member fails, its in-flight transactions are recovered on another cluster member.

A *core group* is a group of WebSphere Application Server processes (deployment managers, node agents, application servers, and cluster members) within a cell that can participate in high availability together. That is, a service running on one member of the core group can failover to another member of the core group. By default, all processes in a cell are part of one core group (called *DefaultCoreGroup*). This is also the recommended scenario for most production environments, although it is possible to have multiple core groups within one cell.

A process can only be a member of one core group. System services, such as the WLM service, PMI, and the high availability coordinator itself, can failover to any member of the core group. Other services, such as the transaction manager and messaging engine, must failover another cluster member in the same cluster in which they were running when they failed. This is because the transaction manager and messaging engine need the same applications to be installed on the process that they failover to in order to recover.

The WLM service in Version 6 provides tload balancing functionality that is comparable to Version 5 and 5.1. The addition of the high availability manager significantly enhances the failover capabilities in Version 6, making it no longer necessary to run third-party high availability tools with WebSphere Application Server.

Understanding and taking advantage of the high availability and failover features in WebSphere Application Server V6 is an essential part of problem planning strategies. In the event that a problem does occur, it is reassuring to know that your WebSphere Application Server environment is configured in such a way that the essential functions failover and users will not be impacted.

For more information about high availability in Version 6, review the following:

▶ *High availability manager*

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/crun_ha_hamanager.html

▶ *Setting up a high availability environment*

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/trun_ha_environment.html

▶ *WebSphere Application Server V6 Network Deployment: High Availability Solutions, SG24-6688*

<http://www.redbooks.ibm.com/redpieces/abstracts/sg246688.html>

Monitoring

When you prepare for possible problems, you must consider how you will know when a problem has actually occurred. At first, this might seem trivial. However, a well-planned monitoring strategy can significantly increase the satisfaction of the application's users and customers.

For some enterprises, realization of a new problem occurs when a customer calls in or sends an e-mail explaining a problem that they have encountered with your production application. Usually, their explanation is simple, such as "I cannot log onto the Web site" or "the banking application does not do anything when I enter my account number and hit enter." It is normal for a customer to feel frustrated

and possibly dissatisfied with your company when these types of situations occur.

A good monitoring strategy can help you to identify problems *before* your customers experience them.

The most important part of your monitoring strategy is to monitor the WebSphere Application Server logs. You can find detailed information about managing the logs in *WebSphere Application Server V6: Diagnostic Data* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4085.pdf>

You should monitor the SystemOut and SystemErr logs for each WebSphere Application Server process in your environment. SystemOut and SystemErr logs are created for every WebSphere process (application server, cluster member, node agent, and deployment manager). These logs are also known as JVM™ logs. The System.Out and System.Err streams for each JVM are redirected to the SystemOut and SystemErr logs. You can find the logs in the `<WAS_install_root>/profiles/<profile>/logs/<process>` directory.

You notice several system messages in the SystemOut log. WebSphere Application Server V6 includes a wide variety of system messages that are designed to provide you with information, warnings, and notifications of errors. You also find many system messages in WebSphere Application Server traces. Each system message has a unique message identifier that is nine characters in length and is in the form CCCC1234X. The first four characters (CCCC) indicate the WebSphere Application Server component that issued the message. The next four characters (1234) indicate the specific message that is being issued by the component. The last character (X) indicates the severity of the message. Its value is either I (informational), W (warning), or E (error).

Here are examples of the different types of system messages:

```
SECJ0231I: The Security component's FFDC Diagnostic Module
com.ibm.ws.security.core.SecurityDM registered successfully: true.
ADMN0001W: The service is unable to parse the MBean descriptor file
com/ibm/ws/management/descriptor/xml/mbeans.xml.
SRVE0068E: Could not invoke the service() method on servlet
/com.ibm.ws.console.probdetermination/loggingSettingsGroups.jsp. Exception
thrown : java.lang.NullPointerException
```

These system messages are useful for monitoring purposes. Informational messages usually are not indicative of a problem. However, if an informational message is unexpected, it might alert you to an unusual occurrence that can result in a problem. Warnings and error messages are definitely signs that a problem has occurred.

The SystemErr log does not contain WebSphere system messages, but it does show exceptions that are thrown by WebSphere Application Server or by an application. It is a good idea to monitor the SystemErr log entries in addition to the system messages in the SystemOut log.

An administrator can monitor these logs and take appropriate action based on the output. It is also common for a production environment to be instrumented so that a major error or problem occurrence generates an e-mail message or a page to the required people, so that they are notified of the problem even if they are not actively monitoring the system.

It is also a good practice to add logging to your application. There are several APIs that you can use for logging. A popular API is the Java Logging API (the `java.util.logging` package), which is standardized in Java Specification Request (JSR) JSR-047. You can find detailed information about Java logging in *Logging and tracing with Java logging* at the WebSphere Information Center at:

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/ttrb_javalogging.html

You can use this or another logging API to best suit your needs. You can design your application to output certain messages, errors, or exceptions when various problems occur. You can direct your application logging output to the WebSphere Application Server SystemOut and SystemErr logs or to separate logs that are used only by your application. You can log specific information that will make it easier for the system monitor to detect problems with the application.

By monitoring the SystemOut and SystemErr logs and adding your own application logging, you can discover proactively a majority of the problems that are covered in this series of papers.

In addition to viewing the logs, you can monitor for configuration problems and runtime events within the administrative console. To do this:

1. Log onto the administrative console.
2. Expand **Troubleshooting**.
3. Expand **Configuration Problems or Runtime Messages**.

You can view errors, warnings, and informational messages directly in the administrative console (Figure 4).

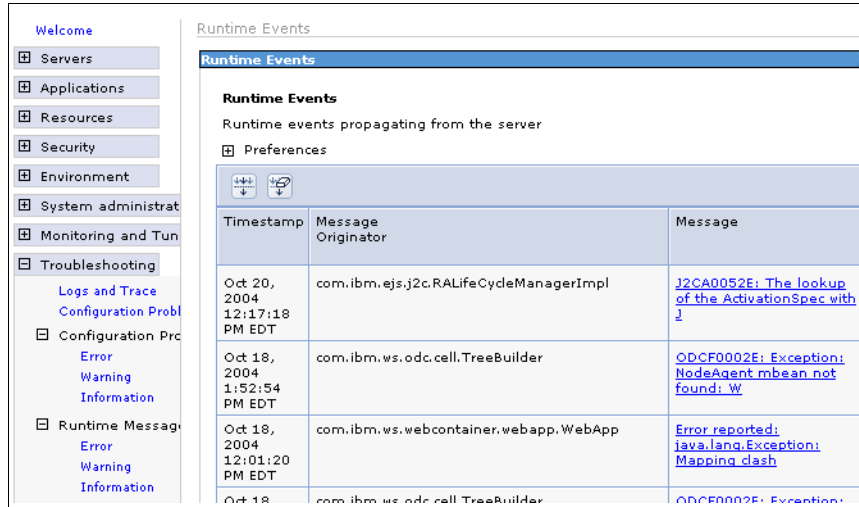


Figure 4 Viewing Runtime Events in the administrative console

You can select each message that you see to get more details about the message, the source of the message, and the reason why it occurred (Figure 5 on page 18).

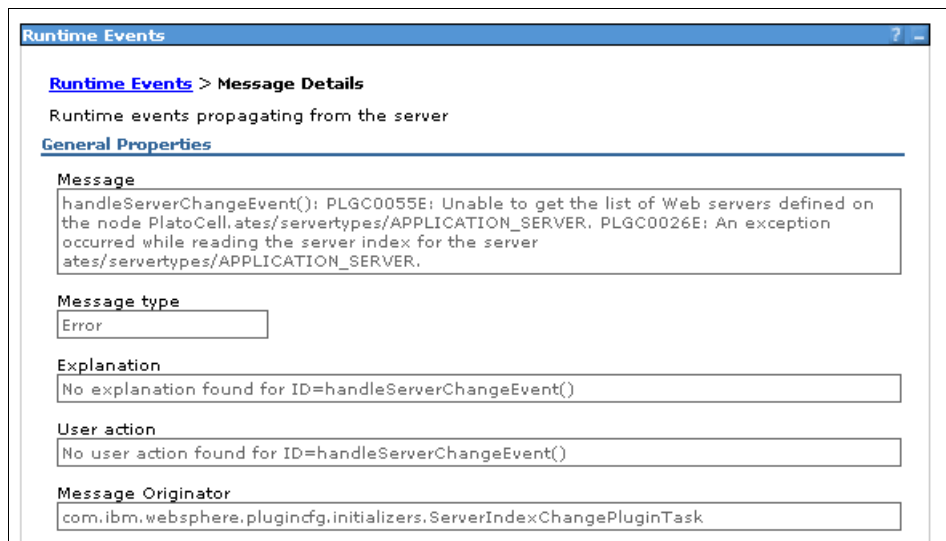


Figure 5 Viewing message details in the administrative console

Another way to monitor your application is by using the Tivoli Performance Viewer, discussed in “Testing the application” on page 7. You can observe

performance metrics, such as average response time, number of requests, thread pool sizes, connection pool sizes, JVM memory, CPU, I/O, and system paging, to monitor the health of WebSphere Application Server and your applications. You can log the performance data from a time when everything is running normally and then compare that data to the current performance data to see if there are major discrepancies. Unexpected discrepancies are an indication of a problem. When you see signs that a problem might be occurring, you can perform the specific problem diagnostic steps that are described within this series of papers.

Your monitoring needs might become more complex if your application runs in a multi-tiered environment involving many different software products. In this scenario, the IBM Tivoli Monitoring for Transaction Performance product might be useful to you. You can get more information about this at:

<http://www-306.ibm.com/software/tivoli/products/monitor-transaction>

A well-planned monitoring strategy, especially when combined with a good high availability and failover strategy, should enable you to diagnose and resolve problems that occur, possibly before your users and customers know about them.

System documentation

In the event that a problem occurs in your environment, it is possible that you will need to enlist the help of other people, either internal or external to your organization, to determine the root cause of the problem. When that happens, you will want everyone involved to understand thoroughly the details of the systems that are involved in your environment.

To this end, it is important to document the details of your configuration. In “Establishing safe operational procedures” on page 12, we discussed documenting all of the changes that have been made to your environment. In addition to that, you should maintain a high-level description of your basic topology. We call this *system documentation*. System document is useful in the following circumstances:

- ▶ A problem occurs and you need to get assistance from others who might not be as familiar with your application and topology as you are. The system documentation allows you to bring them up to speed as quickly as possible.
- ▶ A problem occurs and you want to identify from which parts of your environment you should collect diagnostic data or monitor. Your system documentation shows the software components that are involved and the flow of your application, that is how different software components are used when your application processes a request.

Your system documentation should consist of written documents and diagrams. Which information is included in the written documents and which is included in diagrams is a matter of preference. Overall, the information should be detailed and should show the specific versions and maintenance levels of the operating system and all software products involved, the hardware and network configuration, and specific host names and IP addresses of the systems that are involved.

A common and important component of system documentation is the topology diagram. It gives a quick overview of your system topology and application flow. Figure 6 on page 20 illustrates an example.

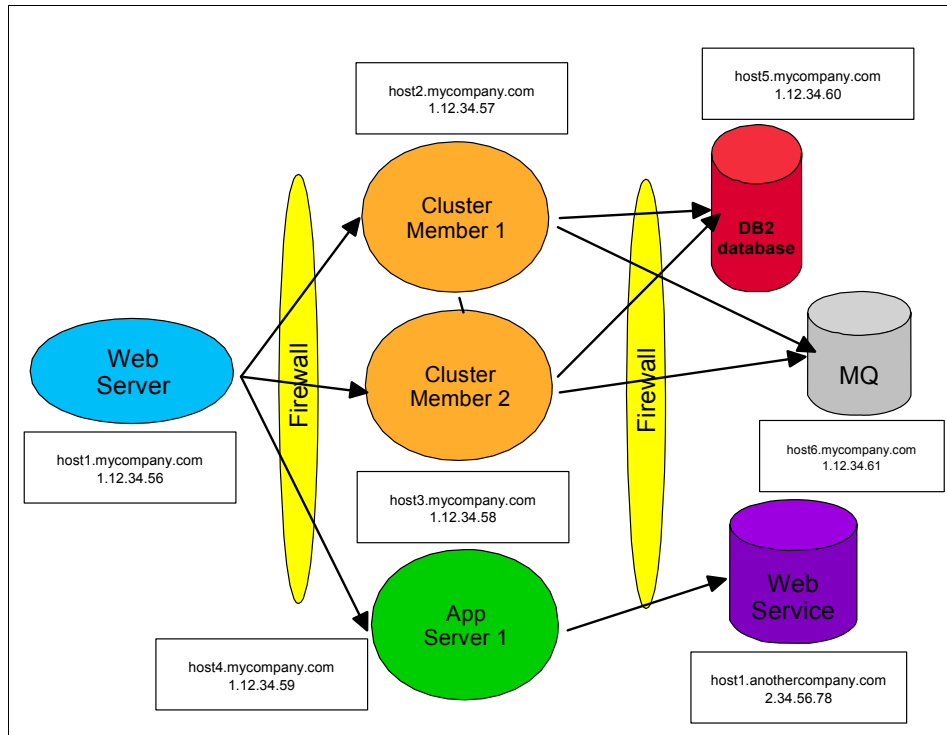


Figure 6 Example of a topology diagram

With a quick look at the diagram, you can see that the application is receiving HTTP requests from a Web server. Some requests are sent to a cluster, which in turn sends data to a DB2® database and an MQ messaging system. Other requests are sent to an application server which interacts with an external Web service.

In this scenario, the accompanying written documentation should include the specific software and hardware levels that are involved.

Detailed system documentation is an integral part of your problem planning strategy that should not be overlooked.

Diagnostic data collection

Finally, to prepare for a problem occurrence, you should plan what diagnostic data to collect for various problem scenarios. In “Types of problem symptoms” on page 3, we discussed several broad categories of problem symptoms. In “What to do when a problem occurs” on page 24 and other papers in this series, we elaborate on how to determine the cause of a problem for each of the problem symptoms. We also include information about what data to collect for different types of problems. It is a good idea to identify the most common problems that have occurred in the past in your environment and those that you believe might occur the most in the future. Then, you can form a diagnostic data collection plan so that you are prepared to collect the necessary data if a problem does occur.

There are some recommendations that apply to your diagnostic data collection plan regardless of the types of problems for which you are preparing. For example:

- ▶ Ensure that the clocks on all systems in your environment are synchronized. This helps in the analysis of diagnostic logs and traces. Often, a request is sent from one system to another, and it helps to match up the time stamps from both systems when analyzing the diagnostic data. If some systems are located in different time zones, make sure that this is documented in your system documentation (as discussed in “System documentation” on page 19).
- ▶ Configure WebSphere Application Server logging and tracing so that it captures a sufficient amount of data when a problem occurs. The WebSphere Application Server Support team has found that many times, the diagnostic data needed to determine the root cause of a problem has been overwritten before a client realizes that the problem has occurred. This type of situation can be prevented by increasing the amount of log and trace data that is saved before the files are rolled over. For both logging and tracing, you can configure file rotation properties for this purpose.

You can find the instructions for configuring logging and tracing, including the file rotation properties, in *WebSphere Application Server V6: Diagnostic Data* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4085.pdf>

- ▶ Plan to have extra disk space available on your system to store diagnostic data when problems occur. Many of the most severe problems, such as application server crashes, hangs, and out of memory conditions, require the largest amount of diagnostic data. If enough disk space is not available when a problem such as this occurs, you might need to reproduce the problem

several times to collect the necessary data. To avoid this situation, it is recommended that you have between 2 GB and 5 GB of extra disk space available on each system.

- ▶ After you resolve a problem, either delete or archive the diagnostic data that you collected for the problem. This will prevent the old diagnostic data from being confused with the new diagnostic data the next time that a problem occurs.
- ▶ Configure the thread monitor for hang detection. WebSphere Application Server V6 includes a thread monitor feature. This is also included in Version 5.1.1. The thread monitor is notified when the Web container, ORB, or asynchronous bean thread pools give work to a thread. By default, the thread monitor checks the status of all active threads every three minutes. If it finds a thread that has been active for more than ten minutes, it outputs a warning to the SystemOut log, similar to the following:

```
WSVR0605W: Thread threadname has been active for hangtime and may be hung.  
There are totalthreads threads in total in the server that may be hung.
```

The thread monitor makes it easier to determine that a problem has occurred. If you see a WSVR0605W warning in your SystemOut log, you out know that a thread has stopped responding. You can then perform further diagnostic steps to determine the cause of the hung thread. The thread monitor does not take any action to fix the problem beyond notifying you of the problem.

In preparing for diagnostic data collection, you might want to change the default thread monitor behavior. You can change the interval that the thread monitor checks the status of threads (this is three minutes by default) and the amount of time that a thread can be active before it is reported by the thread monitor (this is ten minutes by default). To alter these properties:

- a. Log onto the administrative console.
- b. Select your application server.
- c. Under Server Infrastructure, select **Administration**.
- d. Select **Custom Properties** and then click **New**.
- e. Create these properties and provide the desired values for them:
 - `com.ibm.websphere.threadmonitor.interval` (the interval that the thread monitor checks the status of threads)
 - `com.ibm.websphere.threadmonitor.threshold` (the amount of time that a thread can be active before it is reported by the thread monitor)

For more information about the thread monitor, see the following sections in the WebSphere Information Center:

- *Detecting hung threads in J2EE™ applications*

http://publib.boulder.ibm.com/infocenter/ws60help/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/ctrb_hangdetection.html

– *Configuring the hang detection policy*

http://publib.boulder.ibm.com/infocenter/ws60help/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/ttrb_confighangdet.html

- ▶ Consider enabling verbose garbage collection on each application server. The performance impact of enabling verbose garbage collection is minimal, and the data is often useful when performance problems occur. To enable verbose garbage collection:
 - a. Log onto the administrative console.
 - b. Select your application server.
 - c. Under Server Infrastructure, expand Java and Process Management, and then select **Process Definition**.
 - d. On the resulting screen, select **Java Virtual Machine** under Additional Properties.
 - e. Select Verbose garbage collection.

When verbose garbage collection is enabled, the output appears in the native_stderr.log file for your application server.

- ▶ Become familiar with the WebSphere Application Server collector tool. The collector tool is run as an executable in the `<WAS_install_root>/bin` directory. It produces a Java archive (jar) file that contains all of the logs and XML configuration files from your system. The resulting jar file is very useful to the WebSphere Application Server Support team and any others who are involved in the problem determination process. It allows them to view quickly your WebSphere Application Server configuration and to see any errors or exceptions that have occurred.

You can find more information about the collector tool in *WebSphere Application Server V6: Diagnostic Data* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4085.pdf>

The WebSphere Application Server Support team has compiled a comprehensive list of MustGather documents for different types of WebSphere Application Server problems. For more information, see *IBM - MustGather: Read first for all WebSphere Application Server products* at:

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21145599>

The files listed in the MustGather documents are useful in determining the cause of your problem. You can use these documents to as part of your diagnostic data collection plan.

Consider all the types of problems that you might be likely encounter in your environment while reading this series of papers. Based on the types of problems that have occurred in your environment in the past, you might be able to predict what types of problems can occur in the future. Take note of the diagnostic data that is needed to determine the root cause of each problem type. Make sure that this is documented so that everyone in your organization knows what data to collect. This will make the problem determination process simpler and less stressful.

What to do when a problem occurs

You have prepared, and you have planned. Your application is now running in your production environment, and it is being used successfully by your customers. Just as you are ready to celebrate, you get a call that a problem has occurred. What do you do now?

In this section, we start by discussing the first steps for any problem scenario. Then, we introduce some problem determination methodologies that you can use for any problem. This section leads to the following section, which helps you make that leap from symptom to problem description and points you to information that can help you determine the root cause of your specific problem.

Revert to safe conditions

When any problem occurs, your first action should be to consider the business impact of the problem. Depending on the business impact, it might be necessary to take steps to limit the business impact before beginning your problem determination efforts. If the problem occurred in your test environment, the business impact is relatively low when compared to the potential impact of a production outage. In that case, making an effort to work around the problem while looking for a permanent solution is probably not necessary. You can use the test environment to execute all of the necessary problem determination steps.

However, if the problem occurred in production, you will probably want to consider how to quickly alleviate the problem symptoms so that customers and users will experience the least possible negative effects. In this section, we refer to this process as *reverting to safe conditions*. You will want to do this in parallel with your problem determination efforts.

Techniques for reverting to safe conditions include:

- ▶ Making your test environment or another similar environment where the problem is not occurring your temporary production environment. Configure

your systems so that incoming requests are processed by an environment where the problem does not occur.

- ▶ Installing an older version of application code where the problem does not occur. If the problem started to occur after an application code change was introduced, it might be a good idea to go back to an earlier working version of the application.
- ▶ Changing any recent configuration changes back to your baseline configuration. As discussed in “Setting up a test environment” on page 10, the baseline configuration should be a configuration that is fully tested and is known to be stable.
- ▶ Removing any WebSphere Application Server maintenance that was recently installed before the problem occurred. This would temporarily resolve the problem if it is caused by a WebSphere Application Server code defect introduced by the latest maintenance package.
- ▶ Making the application function that produced the problem inaccessible to customers and users. You can post a notification on your Web site that the function is temporarily unavailable or under maintenance. You can provide an estimated time for when it will be available again.

Establishing safe conditions to which you can revert when a problem occurs and then reverting to those conditions when a production problem occurs is a good way to reduce the business impact of your problem. After you have evaluated whether reverting to safe conditions is necessary and taken the appropriate steps, you can begin the problem determination process.

Identify problem symptoms

When you are first notified about the problem, you might only receive a vague, non-specific set of problem symptoms. You might be told that users cannot access your application at all or possibly that a specific action taken by your users is resulting in an error message.

You should collect specific details about the problem symptom in order to form a detailed and thorough problem description. You can ask the following questions in order to get as specific a problem description as possible:

- ▶ What were the specific problem symptoms that were observed? Did an error occur? Did the application produce an unexpected result? Did the application fail to respond to an incoming request?
- ▶ What was the context under which the problem occurred? Did the user execute a specific function? Did the problem happen only after there was an unusually high workload on the system? Did it occur immediately after the application was restarted?

- ▶ How do you know when this particular problem occurs? Is there something specific to watch for in order to recognize if the problem occurs again?
- ▶ How would you know that the problem was resolved? Would it be that an error message no longer occurred? Would the application behave differently? What specifically would confirm a problem resolution?
- ▶ Where did the problem occur? Did the problem occur only in your test environment, only in your production environment, or on both? Did it only occur on one system in your environment? Did it occur on multiple systems? Did it occur on every cluster member or only one?
- ▶ When did the problem occur? What was the time stamp of the error or unexpected behavior? Did the problem occur only once or many times? How often did the problem occur? Did it occur at certain intervals, or did it seem to occur at random times? Was there some event that occurred that might have triggered the problem? For example, did the user attempt a specific application function?
- ▶ Why might the problem have occurred? You might not be able to answer this right away. Was this the first time something specific was tried? Was there a recent change to the application code or the configuration of your environment? Does it happen in all of your environments or only one? If it only happens in one environment, how is this environment different from the others?
- ▶ Has the diagnostic data that is identified in your diagnostic data collection plan been collected? Does the data provide any other details about the problem or offer immediate clues as to why the problem occurred?

Compile your answers in a document that gives as much specific detail about the problem occurrence as possible. We refer to this document as the *problem log*. Ensure that everyone who is involved in the problem determination process has access to the problem log and can update it with new information as it is uncovered. Also ensure that the problem log lists the location of the diagnostic data. It might be a good idea to coordinate the problem log with the change log as discussed in “Establishing safe operational procedures” on page 12.

It is possible that the answers themselves will reveal the cause of the problem. For example, the original problem symptom could have been that the user received an error message when accessing a specific servlet in the application. You might have found that a new version of this servlet was just installed in the environment where the problem occurs but was not installed in other environments that are still functioning as expected. This could lead you to determine that an application code change caused the problem.

On the other hand, the answer might require more investigation. If this is the case, you have developed a solid and complete problem description to use as the basis for more problem determination efforts.

Investigate and research the problem

While investigating the problem, you should form a list of all of the problem symptoms that occurred within your problem log. Sometimes, there is only one symptom. If this is the case, your job is easier. However, often several symptoms occur, and it can be difficult to determine which symptoms characterize the problem and which symptoms are simply the result of the problem. It is a good idea to organize the symptoms into a time line. You can also include details about what was happening in your environment in your time line. For example, your time line might look similar to the following:

```
10:00 - Peak workload reached
10:07:53 - ConnectionWaitTimeoutException in SystemOut.log for server1
10:08:24 - ConnectionWaitTimeoutException in SystemOut.log for server1
10:14:09 - ConnectionWaitTimeoutException in SystemOut.log for server2
10:20:46 - Users cannot log onto Web site, application is not responding
```

Because the `ConnectionWaitTimeoutException` was the first symptom that was observed, it is a good starting point for your investigation. However, it is possible that your investigation might reveal that a symptom is actually a different problem that is unrelated to the problem that you are investigating.

In this example, the problem that you want to resolve is that the application stops responding. It is possible that the `ConnectionWaitTimeoutException` is actually a second problem that happens to occur around the same time. On the other hand, it is also possible that multiple symptoms are all the result of the same underlying problem. During the course of your investigation, you will be able to identify which symptoms are related and which ones are not.

When forming your list of symptoms and your time line, you might notice several WebSphere system messages in your logs. These include informational messages, warnings, and errors. We discussed the details of WebSphere system messages in “Monitoring” on page 15.

WebSphere system messages are useful in your problem determination efforts. Informational messages and warnings provide context. They show you what was occurring immediately before or immediately after a problem. Error messages are significant problem symptoms. The message identifier for an error message is useful for entering into search engines.

When you choose a symptom to investigate, you can begin researching it. A good place to start is your organization’s internal documentation. It is possible

that someone else has already seen the same problem or a similar problem in your environment. If they have, it is likely that the root cause of the problem is the same. If this is the first time that a problem similar to this has been seen in your organization, the next place to research is online documentation that is available from IBM. We recommend using the following resources to research your symptoms:

- ▶ **WebSphere Information Center**

<http://publib.boulder.ibm.com/infocenter/ws60help/index.jsp>

The WebSphere Information Center includes detailed information about the features and configuration of the product. It also includes descriptions of every WebSphere Application Server system message identifier, and it contains a troubleshooting guide that might aid your problem determination efforts:

http://publib.boulder.ibm.com/infocenter/ws60help/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc_concepts_ctrb.html

- ▶ **WebSphere Application Server Support site**

<http://www-306.ibm.com/software/webservers/appserv/was/support>

You can search the support site for APARs and technotes that might be related to your problem symptom. As discussed in “Applying WebSphere maintenance” on page 4, APARs are reports of known WebSphere Application Server code defects. If an APAR description matches your problem symptom, you should install the WebSphere Application Server fix pack that contains the fix for the APAR. The APAR description explains which fix pack includes the fix. Technotes are documents that are created and maintained by the WebSphere Application Server Support team and knowledge engineering team. They document known problems and the solutions to those problems. Technotes are usually created for problems that are solved by a configuration change rather than a code change.

- ▶ ***WebSphere developerWorks®***

<http://www-130.ibm.com/developerworks/websphere>

The developerWorks site contains many articles written by IBM developers and other technical staff members. Many articles discuss application programming best practices and provide tips for avoiding and resolving problems with WebSphere Application Server.

- ▶ ***IBM Support Assistant***

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21192593>

The IBM Support Assistant is a downloadable tool that is used to simplify the problem determination process for many IBM software products. There are several product plug-ins for the Support Assistant, including one for WebSphere Application Server V6. It includes a federated search interface

that allows you to search for your problem symptoms at multiple IBM Web sites simultaneously. It also provides easy access to product education modules, including the IBM Education Assistant. If you need to open a PMR with IBM Support, the tool collects pertinent information that is needed by the support team. You can even open a PMR within the tool.

This series of papers also provides valuable information as you research your problem.

Problem determination strategies

At this point, you have identified specific and detailed problem symptoms, reverted to safe conditions so that you have minimized the business impact of the problem, and begun your investigation of the problem. The next step is to start determining the root cause of the problem, which is the main focus of this series of papers.

This section discusses general problem determination strategies that you can use for any type of problem. The following section discusses classifying the problem and then using specific problem determination methodologies for each problem classification.

For any problem that occurs, there are two major strategies that you can use to determine the root cause: the analysis strategy and the isolation strategy.

The *analysis strategy* involves analyzing the diagnostic data, possibly through several iterations, until the cause of the problem is found, as illustrated in Figure 7 on page 30. To be successful with this strategy, you must have a good understanding of the diagnostic data. This is the strategy used most often by the WebSphere Application Server Support team. There are many diagnostic tools that are available to help you. For example, the ThreadAnalyzer helps you to analyze Java thread dumps, and the HeapRoots tool is useful in analyzing out of memory issues. You can review and download the most current diagnostic tools at:

- ▶ *WebSphere Application Server Support site*
<http://www-306.ibm.com/software/webservers/appserv/was/support>
- ▶ *WebSphere developerWorks*
<http://www-130.ibm.com/developerworks/websphere>

Often, when analyzing one set of diagnostic data, you discover information that requires that you collect more diagnostic data for further analysis. You begin to follow an iterative process. After each iteration, you are closer to determining the root cause of the problem, and after enough iterations, you will find it.

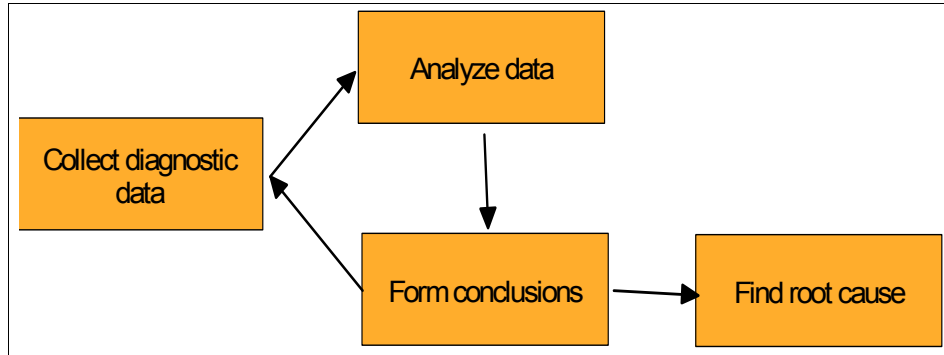


Figure 7 The analysis strategy

The *isolation strategy*, on the other hand, involves removing variables from the problem scenario until you have isolated the problem to the one variable that is causing the problem, as shown in Figure 8 on page 31. Variables can include application code, configuration, and software maintenance levels. You need to be able to reproduce the problem in order to use this strategy. Most often, you will reproduce the problem in your test environment. You need to have a thorough understanding of the topology of the environment. You can refer to the topology diagram as a reference.

The isolation strategy is often employed when there is an error or exception. In the SystemOut or SystemErr log for the application server, you see the Java stack trace of the exception. The stack trace is read from the bottom to the top. At the bottom, you see the thread that is allocated by the thread pool. Reading the stack trace upwards, you see every method that is called (including WebSphere Application Server code, application code, and possibly other third-party utilities) until the exception is thrown. You can use the stack trace to identify the different variables in the problem scenario and then remove them.

It might also help to insert print statements into the application to print debugging information as the application executes.

Similar to the analysis strategy, the isolation strategy is an iterative process. You keep removing variables until you have isolated the variable that is causing the problem.

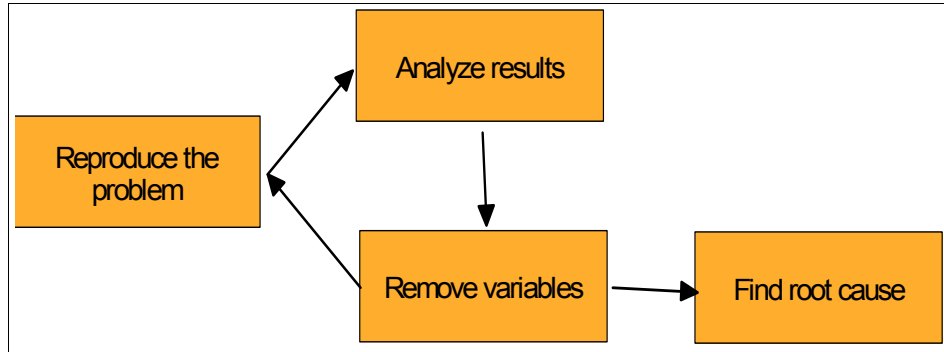


Figure 8 The isolation strategy

Now that we have discussed the general strategies for problem determination, we focus on the specific strategies for each problem classification.

Classify the problem and determine the root cause

The next step in the problem determination process, and a very important one, is classifying the problem. This series of papers refers to many different classifications of problems. You need to identify which classification the problem fits into.

To get started, decide if your problem fits any of the following symptom categories:

- ▶ You cannot install or migrate WebSphere Application Server.
This would occur during the installation or migration of the WebSphere Application Server product itself. See “Installation or migration” on page 34 for more information.
- ▶ You cannot install an application into WebSphere Application Server.
This would occur when you attempt to install an application by using the administrative console or wsadmin interface. See “Application packaging and deployment” on page 35 for more information.
- ▶ You experience difficulties in WebSphere Application Server system management or configuration.

During normal administrative activities, an unexpected problem occurs. This might occur when configuring WebSphere Application Server through the administrative console or wsadmin, or when using any administrative scripts that are included with the product (for example, **addNode**, **collector**, **dumpNameSpace**, **ejbdeploy**, **keyman**, **Java2WSDL**, **wasprofile**, and so forth).

This also includes problems with security, application assembly, and performance monitoring. See “System management and configuration” on page 37 for more information.

- ▶ An application or WebSphere Application server process (for example, an application server, node agent, or deployment manager) is unable to start.

When running the **startServer**, **startNode**, or **startManager** commands to start a WebSphere Application Server process or when using the administrative console or wsadmin to start a process or an application, a problem occurs that causes the process or application to fail to start. See “Application or WebSphere process is unable to start” on page 42 for more information.

- ▶ An application does not respond to incoming requests.

This could occur due to a Web server, Edge component, or Web server plug-in problem, application server crash, hang, out of memory condition, or 100% CPU utilization condition. See “Application does not respond to incoming requests” on page 43 for more information about determining the root cause of the problem.

- ▶ An application produces unexpected results (possibly errors or exceptions).

An error is seen or an exception is thrown when certain application code is executed or when certain conditions (for example, heavy load) are met. The application could also behave differently than expected, but produce no error or exception. There are several components of WebSphere Application Server in which this type of problem could occur. See “Unexpected results from an application” on page 48 for more information.

- ▶ An application cannot connect to an external system or resource.

The application might need to access an external system or resource. This could be a database, a messaging system, an enterprise information system accessed through the Java Connector Architecture (JCA), an Enterprise JavaBeans™ (EJB™) running on a remote system, or a Web service. There might be a problem establishing a connection to the external system or resource, or an error might occur when the application interacts with it. See “Application cannot connect to an external system or resource” on page 63 for more information.

- ▶ An application performs slowly or its performance degrades over time.

Although performance problems fall outside the scope of this series of papers, we do provide some external resources for performance problems. In general, performance problems can be corrected by tuning WebSphere Application Server, the other software products with which it interacts, and the operating system. Thorough performance testing and tuning should be completed before an application is put into production. See “Application is slow or its performance degrades over time” on page 69 for more information.

The WebSphere Application Server Support team has found that the majority of problems encountered by clients fit into one of these problem classifications. In this series of papers, we provide comprehensive information about problem determination strategies for some of these common problem areas. For the problem classifications that are not covered in this series of papers, we provide links to external resources that discuss problem determination for each problem type.

If you have already examined the WebSphere logs and have determined that a particular error message holds the key to the problem, use Table 1 as a quick reference to find information based on the message prefix.

Table 1 Error message prefix to topic mapping

| Message prefixes | Topic |
|--|---|
| INST, ADMU (during profile creation) or WSVRT (during IVT) | "Installation" on page 34 |
| MIGR | "Migration" on page 35 |
| ADMA | "Application packaging and deployment" on page 35 |
| SECJ, SECG, JSAS, JSSL, WSEC, or WSSK | "Security" on page 39 |
| ADFS, ADMB, ADMC, ADMD, ADME, ADMF, ADMG, ADMK, ADML, ADMN, ADMR, ADMS, ADMU, BNDE, CHKC, CHKP, CHKS, CHKW, ECNS, ODCF, PROC, WACT, WSVM, WASX | "System management and configuration" on page 37 |
| PLGN, PLGC, and PLPR | "Web server plug-in" on page 45 |
| SRVE (Web container), JSPG (JSPs), or JSFG (JSFs) | "Web container" on page 50 |
| CNTR, PMGR, and ACIN | "EJB container" on page 51 |
| SESN | "Session management" on page 52 |
| DYNA | "Dynamic cache" on page 54 |
| WTRN, WLTC | "Transaction manager" on page 55 |
| WWLM | "Workload management" on page 56 |
| HMGR, CWRCB, CWWCW | "High availability manager" on page 57 |
| CWWDR | "Data replication service" on page 58 |
| WACS, APPR, ASYN, OBPL, SCHD, STUP, ACWA | "Program model extensions" on page 59 |

| Message prefixes | Topic |
|---|---|
| I18N, LTXT | "Internationalization/Double byte character set" on page 61 |
| CHFW, DCSV, HTPC, SSLC, TCPC, WSSC, and XMEM | "Transport channel service" on page 62 |
| J2CA, WSCL (WebSphere client) | "JCA connection manager" on page 63 |
| DSRA or CONM | "Database connections" on page 64 |
| CWSIA, CWSIB, CWSIC, CWSID, CWSIE, CWSIF, CWSIH, CWSII, CWSIJ, CWSIK, CWSIL, CWSIM, CWSIN, CWSIO, CWSIP, CWSIQ, CWSIR, CWSIS, CWSIT, CWSIU, CWSIV, CWSIW, CWSIX, CWSIY, CWSIZ, CWSJA, CWSJB, CWSJC, CWSJD, CWSJO, CWSJQ, CWSJR, CWSJU, CWSJW, CWSWS, WMSG | "Messaging" on page 64 |
| NMSV | "JNDI naming" on page 65 |
| CORBA COMM_FAILURE ORBX | "ORB" on page 66 |
| WSWS, SOAP, WSIF, CWMSG | "Web services" on page 66 |
| PMON | "PMI and Tivoli Performance Viewer" on page 41 |

Installation or migration

This section addresses problems related to the installation of WebSphere Application Server or the migration from previous releases.

Installation

Symptom: You are having problems installing WebSphere Application Server, creating profiles, or running install verification tests (IVT). Symptoms include:

- ▶ The launchpad or installation wizard will not start or fails immediately.
- ▶ The installation wizard hangs.
- ▶ You have a problem creating a profile.
- ▶ The installation verification test (IVT) fails.
- ▶ You get error or warning messages during the installation process that begin with INST, ADMU (during profile creation), or WSVRT (during IVT).

Note: For problem determination strategies for installation problems, see *WebSphere Application Server V6: Installation Problem Determination* at: <http://www.redbooks.ibm.com/redpapers/pdfs/redp4068.pdf>

Migration

Symptom: You are having problems migrating to WebSphere Application Server V6 from an earlier version of the product using the WebSphere Application Server migration tools. You might receive WebSphere system messages that begin with MIGR.

For problem determination strategies for migration problems, please review the following resources:

- ▶ WebSphere Information Center: *Migrating, coexisting, and interoperating*
<http://publib.boulder.ibm.com/infocenter/ws60help/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6topmigrating.html>
- ▶ WebSphere Information Center: *Troubleshooting migration*
http://publib.boulder.ibm.com/infocenter/ws60help/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/tmig_troubleshoot.html
- ▶ WebSphere Information Center: *Explanation of MIGR system messages*
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/MIGR.html>
- ▶ *MustGather: Migration problems*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21141284>
- ▶ *WebSphere Application Server V6 Migration Guide, SG24-6369*

Application packaging and deployment

Symptom: You are having problems deploying an application to WebSphere Application Server using the administrative console or wsadmin. You might receive WebSphere system messages that begin with ADMA.

For problem determination strategies for application installation and deployment problems, review the following resources:

- ▶ WebSphere Information Center: *Developing and deploying applications*
<http://publib.boulder.ibm.com/infocenter/ws60help/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6topdeveloping.html>
- ▶ WebSphere Information Center: *Troubleshooting deployment*

http://publib.boulder.ibm.com/infocenter/ws60help/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/ttrb_deploy.html

- ▶ WebSphere Information Center: Explanation of ADMA system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/ADMA.html>
- ▶ *MustGather: Problems during Deployment of EAR/JAR/WAR files*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21199344>
- ▶ *MustGather: Enhanced EAR file problems for V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21199181>

WebSphere Rapid Deployment

Symptom: You are trying to use WebSphere Rapid Deployment to develop and are trying to test an application. You cannot connect to an application server or WebSphere Rapid Deployment does not create or update the applications.

Note: For issues with WebSphere Rapid Deployment, see *WebSphere Application Server V6: System Management Problem Determination* at:
<http://www.redbooks.ibm.com/redpapers/pdfs/redp4067.pdf>

Application Server Toolkit

Symptom: You have a problem when using the Application Server Toolkit (AST) to assemble your applications. This encompasses all possible problems with the AST, including starting it, any problems that you experience with application assembly, and any errors that occur.

You can find problem determination strategies for AST in the following resources:

- ▶ WebSphere Information Center: *Overview of WebSphere Application Server Toolkit*
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.welcome.ast.doc/topics/astoverview.html>
- ▶ *MustGather: Application Server Toolkit V5 and V6 problems*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21194926>

System management and configuration

Symptom: You experience difficulties in WebSphere Application Server system management or configuration. This includes problems with the following system management tools or functions:

- ▶ Configuration and management using administration tools
- ▶ Security
- ▶ JMX clients
- ▶ PMI and Tivoli Performance Viewer

Configuration and management using administration tools

Symptom: You have a problem accessing or using the administrative console, wsadmin scripting tool, or command line scripts. This would include the following symptoms:

- ▶ You are not able to access the administrative console.
- ▶ You cannot access server processes using wsadmin or the management scripts such as stopServer.
- ▶ You are getting errors performing system management functions, for example managing application servers, node agents, Web servers, or applications.
- ▶ You cannot federate a node with a deployment manager.
- ▶ You are getting save conflict messages in the administrative console.
- ▶ Your enterprise applications no longer appear in the administrative console.

Note: For problem determination strategies for these system management problems, see *WebSphere Application Server V6: System Management Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4067.pdf>

Resources for problems with scripting tools

You can find problem determination strategies for issues with administrative scripting tools in the following resources:

- ▶ WebSphere Information Center: *Using Ant to automate tasks*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/tovr_ant.html
- ▶ WebSphere Information Center: *Using command line tools*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/xml_command.html
- ▶ WebSphere Information Center: *Troubleshooting administration*

http://publib.boulder.ibm.com/infocenter/ws60help/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/ttrb_admin.html

- ▶ WebSphere Information Center: Explanation of WASX system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/WASX.html>
- ▶ *MustGather: ws_ant problems on V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21196231>
- ▶ *MustGather: WebSphere configuration archive functionality*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21200348>

Resources for other system management problems

You can find problem determination strategies for other system management issues in the following resources:

- ▶ WebSphere Information Center: *Setting up the administrative architecture*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/tagt_admin.html
- ▶ WebSphere Information Center: *Administering application servers*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/trun_svr_conf.html
- ▶ WebSphere Information Center: *Troubleshooting administration*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/ttrb_admin.html
- ▶ WebSphere Information Center: Explanations of ADFS, ADMB, ADMC, ADMD, ADME, ADMF, ADMG, ADMK, ADML, ADMN, ADMR, ADMS, ADMU, BNDE, CHKC, CHKP, CHKS, CHKW, ECNS, ODCF, PROC, WACT, and WSVM system messages
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.express.doc/info/exp/ae/welc_ref_trb_msg.html
- ▶ *MustGather: System management functionality for V5.0, V5.1 and V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21199596>
- ▶ *MustGather: Synchronization problems in V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21196219>
- ▶ *MustGather: Federation or Removal of a Node Issues for Version V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21196227>
- ▶ *MustGather: Profile Creation/Removal Issues for V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21196228>
- ▶ *MustGather: Usage and creation of templates fail on V6.0*

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21195439>

- ▶ *MustGather: Node agent and Deployment Manager discovery problems for all releases and editions of V6.0*

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21196220>

- ▶ *MustGather: Port Management for V6.0*

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21196226>

- ▶ *WebSphere Application Server V6 System Management & Configuration Handbook, SG24-6451.*

Security

Symptom: You have a problem configuring security in WebSphere Application Server, a problem that only occurs when security is enabled, or you have an error or exception related to security. You might receive WebSphere system messages that begin with SECJ, SECG, JSAS, JSSL, WSEC, or WSSK.

Note: For information about problems with SSL configuration see *WebSphere Application Server V6: System Management Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4067.pdf>

You can find problem determination strategies for other security problems in the following resources:

- ▶ WebSphere Information Center: *Securing applications and their environments*

<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6topsecuring.html>

- ▶ WebSphere Information Center: *Troubleshooting security configurations*

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/tsec_trouble.html

- ▶ WebSphere Information Center: *Troubleshooting authentication and authorization for Web services security based on Web Services for J2EE*

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rwbs_trbauth.html

- ▶ WebSphere Information Center: Explanation of SECJ system messages

<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/SECJ.html>

- ▶ WebSphere Information Center: Explanation of SECG system messages

<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/SECG.html>

- ▶ WebSphere Information Center: Explanation of JSAS system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/JSAS.html>
- ▶ WebSphere Information Center: Explanation of JSSL system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/JSSL.html>
- ▶ WebSphere Information Center: Explanation of WSEC system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/WSEC.html>
- ▶ WebSphere Information Center: Explanation of WSSK system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/WSSK.html>
- ▶ *MustGather: Problems using Global Security for all Releases of V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21199336>
- ▶ *MustGather: Problems using JAAS Web logins for all Releases of V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21199332>
- ▶ *MustGather: Problems using Web services Security for all Releases of V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21199335>
- ▶ *MustGather: Java Secure Socket Extension (JSSE), SSL or Java Cryptography Extensions (JCE) problems*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21162961>
- ▶ *WebSphere Application Server V6 Security Handbook, SG24-6316.*

JMX clients

Symptom: Your organization has developed its own administrative client using the Java Management Extensions (JMX™) API. You have any kind of problem connecting to WebSphere Application Server or performing any JMX API operation.

You can find problem determination strategies for problems with JMX clients in the following resources:

- ▶ WebSphere Information Center: *Using administrative programs (JMX)*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/tjmx_programming.html
- ▶ WebSphere Information Center: *Troubleshooting administration*
http://publib.boulder.ibm.com/infocenter/ws60help/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/ttrb_admin.html

- ▶ *MustGather: JMX API client for V6.0*

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21196218>

PMI and Tivoli Performance Viewer

Symptom: You have a problem with the Performance Monitoring Infrastructure (PMI) or the Tivoli Performance Viewer. You might receive WebSphere system messages that begin with PMON. You might also have problems configuring PMI or performing any operation with the Tivoli Performance Viewer in the administrative console.

The PMI is instrumented by WebSphere Application Server V6 to monitor performance through several counters and statistics. You can view the performance data using the Tivoli Performance Viewer within the administrative console. For information about these features, see “Testing the application” on page 7.

You can find problem determination strategies for PMI and Tivoli Performance Viewer problems in the following resources:

- ▶ WebSphere Information Center: *Monitoring*

<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6topmonitoring.html>

- ▶ WebSphere Information Center: *Tuning performance*

<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6toptuning.html>

- ▶ WebSphere Information Center: Explanation of PMON system messages

<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/PMON.html>

- ▶ *MustGather: Performance monitoring infrastructure (PMI) and performance tool problems*

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21141193>

Runtime

Problems that occur after installation of WebSphere Application Server or application deployment can include:

- ▶ Application or WebSphere process is unable to start
- ▶ Application does not respond to incoming requests
- ▶ Unexpected results from an application
- ▶ Application cannot connect to an external system or resource
- ▶ Application is slow or its performance degrades over time

Application or WebSphere process is unable to start

Symptom: An application or WebSphere Application Server process (for example an application server, node agent, or deployment manager) is unable to start.

Note: For problems with the **startServer**, **stopServer**, **startNode**, **stopNode**, **startManager**, and **stopManager** commands, see *WebSphere Application Server V6: System Management Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4067.pdf>

You can find problem determination strategies for other startup issues in the following resources:

- ▶ WebSphere Information Center: *Starting servers*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/trun_svr_start.html
- ▶ WebSphere Information Center: *Running application servers from a non-root user*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/trun_svr_nonroot.html
- ▶ WebSphere Information Center: *Running an Application Server and node agent from a non-root user*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/trun_nodeagent_nonroot.html
- ▶ WebSphere Information Center: *Running an application server from a non-root user and the node agent from root*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/trun_svr_msg_nonroot.html
- ▶ WebSphere Information Center: *The server process does not start or starts with errors*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/rtrb_apprvstart.html
- ▶ *MustGather: Application Server, dmgr and node agent Start and Stop Problems for all Releases of V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21204943>

Application does not respond to incoming requests

Symptom: An application does not respond to incoming requests. The fault could lie with any of the following components or conditions:

- ▶ IBM HTTP Server
- ▶ Edge components
- ▶ Web server plug-in
- ▶ Application server crash
- ▶ Application server hang
- ▶ 100% CPU utilization
- ▶ Out of memory

IBM HTTP Server

Symptom: An application server does not respond to incoming requests and static HTML pages are not being served by the IBM HTTP Server.

The IBM HTTP Server V6 is included with WebSphere Application Server V6. It can be administered within the administrative console. Other Web servers can be configured with WebSphere Application Server, and in general, the same problem scenarios occur with other Web servers.

When an application server does not respond to incoming requests, check to see if static HTML pages can be served by the HTTP Server. If not, the problem is probably caused by the HTTP Server. The HTTP Server process might have stopped unexpectedly (a crash), or it might be running but not responding to requests (a hang). You can check to see if the apache process is running on your operating system to determine if the process has crashed or if it is hanging. Other possible problems with HTTP Server include configuration issues, caching issues, authentication problems, and SSL problems. If the HTTP Server is able to serve static pages, the root cause of the problem is probably with the Web server plug-in or the application server itself.

Note: There is a possibility that the HTTP Server could fail to start due to a Web server plug-in problem. For more information about this, see *WebSphere Application Server V6: Web Server Plug-in Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4045.pdf>

You can find problem determination strategies for IBM HTTP Server issues in the following resources:

- ▶ IBM HTTP Server Support site
<http://www-306.ibm.com/software/webservers/httservers/support>

- ▶ IBM HTTP Server, Version 6 Information Center
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.ihs.doc/info/welcome_ihs.html
- ▶ IBM HTTP Server, Version 6 Information Center, *Troubleshooting IBM HTTP Server*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.ihs.doc/info/aes/ae/welc_troub.html
- ▶ *MustGather: Read first for IBM HTTP Server*
<http://www-1.ibm.com/support/docview.wss?rs=177&uid=swg21192683>

Edge components

Symptom: An application does not respond to incoming requests. The application responds when accessed through the Web server but not when accessed through the Edge component.

The WebSphere Edge components (Load Balancer and Caching Proxy) are also included with WebSphere Application Server V6. The Edge components run on the *edge* of an enterprise system, that is the boundary between the external Internet and your Web server. The load balancer directs network traffic so that an equal workload arrives at each Web server in your environment. The caching proxy caches static and dynamic Web content from the Web server and WebSphere Application Server and serves the cached content in order to improve performance.

Potential problems from the Edge components include crashes, hangs, slow performance, unexpected patterns of workload distribution, and failover problems. To determine if your application is not responding due to an Edge problem, try issuing an HTTP request directly to your Web server (without going through either Edge component). If you get a response, the problem is likely with one of the Edge components. If not, then continue investigating the Web server, Web server plug-in, and application server.

You can find problem determination strategies for issues with Edge components in the following resources:

- ▶ WebSphere Edge Components Support site
<http://www-306.ibm.com/software/webservers/edgeserver/support.html>
- ▶ IBM WebSphere Edge Components, Version 6 Information Center
<http://www-306.ibm.com/software/webservers/appserv/doc/v60/ec/infocenter/index.html>

- ▶ Load Balancer, Version 6 *Troubleshooting*

<http://www-306.ibm.com/software/webservers/appserv/doc/v60/ec/infocenter/edge/LBguide.htm#HDRTRB>

Web server plug-in

The Web server plug-in enables the Web server to send requests for dynamic content to Web applications (servlets and JSPs) that are installed in WebSphere Application Server.

Symptom: An application does not respond to incoming requests. The application responds when accessed directly through the application server but not when accessed through the Web server. High-level symptoms of a Web server plug-in problem include:

- ▶ Users cannot access an application through the Web server
- ▶ Load balancing and failover not working properly
- ▶ Session data is being lost
- ▶ Slow or intermittent application response
- ▶ The Web server will not start after plug-in installation or configuration

When your application fails to respond to requests, first check to see if your Web server is responding to requests for static HTML pages. If it is, you can narrow your focus to the plug-in and the application server.

To determine if it is a plug-in problem, try to access a servlet or JSP™ directly on the application server, bypassing the plug-in. You can do this by using the application server's HTTP transport port (port 9080 by default) in the URL to access the servlet or JSP. For example, you can try to access the snoop servlet, which is one of the WebSphere Application Server samples:

`http://localhost:9080/snoop`

If the servlet or JSP can be accessed through the HTTP transport but not through the Web server plug-in, you are likely experiencing a problem with the plug-in. On the other hand, if it cannot be accessed through the HTTP transport or the plug-in, it is probably an application server problem. Potential Web server plug-in problems include configuration issues (especially with the `plugin-cfg.xml` configuration file) and failures to send requests to an application server. WebSphere system messages for the plug-in begin with PLGN, PLGC, and PLPR.

Note: For problem determination strategies for the Web server plug-in, see *WebSphere Application Server V6: Web Server Plug-in Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4045.pdf>

Application server crash

Symptom: An application is not responding to incoming requests. The application server process is no longer running.

If an application is not responding to incoming requests and if you have ruled out the HTTP Server, Edge components, and Web server plug-in as the cause of the problem, you must be encountering an application server *crash* or *hang*. In both cases, the application server is unresponsive. The difference is that for a crash the application server process dies unexpectedly and for a hang the process is still running.

You should check to see if the application server process is running to determine if you are experiencing a crash or a hang. To do this, you need to know the process ID of the application server. You can find the process ID in the `<server>.pid` file in the `<WAS_install_root>/profiles/<profile>/logs/<server>` directory.

Open the `<server>.pid` file in a text editor. You see a four-digit number. This is the process ID. You can then use the appropriate operating system command to check to see if the process is running. If it is not running, the problem is a crash. If it is running, the problem is a hang.

Note: For problem determination strategies for application server crashes, see *WebSphere Application Server V6: Application Server Crash Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4059.pdf>

Application server hang

Symptom: An application is not responding to incoming requests but the application server process is still running.

If an application is not responding to incoming requests, you have ruled out the Web server, Edge components, and Web server plug-in as possible causes of the problem, and you have found that the application server process is still running, the classification of the problem is an application server hang.

You can find problem determination strategies for hang issues in the following resources:

- ▶ *IBM Developer Kit and Runtime Environment, Java 2 Technology Edition, Version 1.4.2 Diagnostics Guide, SC34-6358*
<http://www-106.ibm.com/developerworks/java/jdk/diagnosis>
- ▶ *Detecting hung threads in J2EE applications*

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/ctrb_hangdetection.html

- ▶ *Web module or application server dies or hangs*

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rtrb_appdies.html

- ▶ IBM Education Assistant: WebSphere Application Server problem determination

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg27005460>

- ▶ You can find a list of MustGather documents for hangs with the following search argument

<http://www-1.ibm.com/support/search.wss?rs=180&tc=SSEQTP&tc1=SSCMPB9&q=MustGatherDocument>

100% CPU utilization

Symptom: You observe that a WebSphere Application Server process (an application server, cluster member, node agent, or deployment manager) reaches 100% or an unusually high percentage of CPU utilization.

You might notice this by using your operating system utilities to check the CPU use of each process on the system, or you might have an application server hang caused by the high CPU use.

You can find problem determination strategies for 100% CPU usage issues in the following resources:

- ▶ *MustGather: 100% CPU Usage on AIX Platforms*

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21116458>

- ▶ *MustGather: 100% CPU Usage on HP-UX*

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21166017>

- ▶ *MustGather: 100% CPU usage on Linux®*

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21132699>

- ▶ *MustGather: 100% CPU Usage on Solaris™ platforms*

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21115625>

- ▶ *MustGather: 100% CPU Usage on Windows® Platforms*

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21137447>

Out of memory

Symptom: You observe that a WebSphere Application Server process (an application server, cluster member, node agent, or deployment manager) consumes all of the available memory on your system, or you see a

java.lang.OutOfMemoryError in the SystemOut or SystemErr log for the process.

You might notice this by checking the memory usage that is using your operating system utilities, by checking the logs, or by having an application server hang that is caused by an out of memory problem.

You can find problem determination strategies for out-of-memory problems in the following:

- ▶ For information about how IBM JVM components work and related diagnostic techniques see *IBM Developer Kit and Runtime Environment, Java 2 Technology Edition, Version 1.4.2 Diagnostics Guide*, SC34-6358
<http://www-106.ibm.com/developerworks/java/jdk/diagnosis>
- ▶ For information about how the Virtual Memory Manager works on AIX, see *Performance Management Guide* article *Performance Overview of the Virtual Memory Manager (VMM)*
http://publib16.boulder.ibm.com/pseries/en_US/aixbman/prftungd/resmgmt2.htm
- ▶ Articles on the IBM Research site about garbage collection
<http://www.ibm.com/Search/?v=11&lang=en&cc=us&q=gc>
- ▶ *The Truth About Garbage Collection*
http://java.sun.com/docs/books/performance/1st_edition/html/JAppGC.fm.html
- ▶ *Identifying memory leaks with the WebSphere Studio Profiler and the JDK™ Heapdump utility*
http://www-128.ibm.com/developerworks/websphere/library/techarticles/0411_persichetti/0411_persichetti.html
- ▶ *How to read heapdump generated in .phd format*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21190476>
- ▶ *Memory Dump Diagnostic for Java technical preview*
http://www-128.ibm.com/developerworks/websphere/downloads/memory_dump.html
- ▶ MustGather documents
<http://www-1.ibm.com/support/search.wss?rs=180&tc=SSEQTP&tc1=SSCMPCY&q=MustGatherDocument>

Unexpected results from an application

An application produces unexpected results (possibly errors or exceptions). This is a broad category that includes problems that can occur in any of the following runtime components or services:

- ▶ Just-In-Time (JIT) compiler

- ▶ Web container
- ▶ EJB container
- ▶ Classloader
- ▶ Session management
- ▶ Dynamic cache
- ▶ Transaction manager
- ▶ Workload management
- ▶ High availability manager
- ▶ Data replication service
- ▶ Program model extensions
- ▶ Internationalization/Double byte character set
- ▶ Transport channel service

Just-In-Time (JIT) compiler

Symptom: You receive intermittent unexpected results from an application. Disabling the JIT compiler resolves the problem.

Unexpected results or intermittent failures can indicate a problem with the JIT compiler. If possible, perform repeated runs through the application, both with a fresh restart and within an existing application process to determine if one of the following is true:

- ▶ Output is correct for initial few runs, and incorrect afterwards
 - In this case, the code generated by the JIT compiler might be producing code that generates the incorrect results.
- ▶ Output is always incorrect
 - This could be a JVM or JIT problem. A simple test is to narrow the problem to disable the JIT compiler and see if it goes away.

JIT uses the Mixed Mode Interpreter (MMI) execution mode to increase its performance. With MMI, methods are not compiled by the JIT until they have run the number of times specified by the `IBM_MIXED_MODE_THRESHOLD` setting. The default for this setting is 2000. That is why JIT problems might not show up immediately. If you are recreating a problem that you suspect might be a JIT-related problem, you can lower this threshold to speed up the time that the error occurs. Setting the threshold to 0 means that each method is compiled the first time it runs. Lowering the threshold has a performance impact, so remember to set it back when you are done.

For more information about mixed mode threshold, see:

<http://www.ibm.com/developerworks/java/jdk/diagnosis>

You can test to see if there is a problem with JIT by disabling JIT on the application server. It is important to note that disabling JIT causes performance

degradation. Therefore, you should only disable JIT in your test environment. As soon as you test to see if the problem still occurs with JIT disabled, you should enable JIT again.

To disable JIT:

1. Log onto the administrative console.
2. Select **Servers** → **Application servers**.
3. Select your application server name.
4. On the resulting page, under Server Infrastructure, expand Java and Process Management, click **Process Definition**.
5. Select **Java Virtual Machine**.
6. Select **Disable JIT** and click **OK**.
7. Save your configuration and restart the application server.

If the problem does still occur when JIT is disabled, review the other problem classifications described here, determine into which classification the problem fits, and follow the problem determination steps for that classification.

Web container

Symptom: You receive intermittent unexpected results from an application and the problem appears to originate with a Web resource (servlet, JSP). High-level symptoms include the following:

- ▶ Users cannot access a Web resource
- ▶ Unexpected behavior when running a Web resource
- ▶ Errors starting a Web module
- ▶ Problems with JSP compilation
- ▶ Errors or exceptions thrown in a Web module
- ▶ Error or warning messages that begin with SRVE (Web container), JSPG (JSPs), or JSFG (JSFs)

Problems areas that are related to the Web container also include session management problems and character encoding problems. For session management problem determination strategies, see the “Session management” on page 52. For character encoding problem determination strategies, see “Internationalization/Double byte character set” on page 61.

Note: For problem determination strategies for Web container problems, see *WebSphere Application Server V6: Web Container Problem Determination* at: <http://www.redbooks.ibm.com/redpapers/pdfs/redp4058.pdf>

EJB container

The EJB container is the runtime environment for EJBs in WebSphere Application Server and it handles all EJB requests from clients.

Symptom: You receive intermittent unexpected results from an application and the problem appears to originate with an EJB (entity beans, session beans, and message-driven beans). High-level symptoms can include any of the following:

- ▶ Unexpected behavior when an EJB runs
- ▶ Problems with the EJB life cycle and caching provided by the EJB container
- ▶ Any errors or exceptions that occur when running an EJB
- ▶ Error or warning messages with the following prefixes: CNTR, PMGR, and ACIN

Many errors might be related to data access and transactions.

You can find problem determination strategies for EJB container problems in the following resources:

- ▶ WebSphere Information Center: *EJB applications*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_ejb.html
- ▶ WebSphere Information Center: *Enterprise bean and EJB container troubleshooting tips*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rtrb_ejbcntrcomp.html
- ▶ WebSphere Information Center: *Cannot access an enterprise bean from a servlet, a JSP file, a stand-alone program, or another client*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rtrb_ejbaccessprobs.html
- ▶ WebSphere Information Center: *Enterprise beans: Resources for learning*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rejb_r41n.html
- ▶ WebSphere Information Center: Explanation of CNTR system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/CNTR.html>
- ▶ WebSphere Information Center: Explanation of PMGR system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/PMGR.html>
- ▶ WebSphere Information Center: Explanation of ACIN system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/ACIN.html>

- ▶ *MustGather: EJB container for releases of V4.0, V5.0, V5.1 and V6*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21153218>
- ▶ *MustGather: Persistence Manager*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21200344>

ClassLoader

Symptom: You experience a problem with the loading of classes and resources by WebSphere Application Server. Symptoms include:

- ▶ `ClassCastException`, `ClassNotFoundException`, `NoClassDefFoundError`, or `UnsatisfiedLinkError` in the `SystemOut` or `SystemErr` log. Your application might catch these exceptions and throw its own exceptions when they occur.
- ▶ Unexpected application behavior as a result of a class not being loaded or the wrong version of a class might be loaded if there are multiple classes with the same name on your system.

You can find problem determination strategies for classloader problems in the following resources:

- ▶ WebSphere Information Center: *Class loading*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/trun_classload.html
- ▶ WebSphere Information Center: *Class loading: Resources for learning*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rrun_classload_rlinks.html
- ▶ WebSphere Information Center: *Troubleshooting class loaders*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/ttrb_classload_viewer.html
- ▶ *MustGather: Classloader Issues in V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21196187>

Session management

A session (sometimes called an HTTP session) is a series of HTTP requests to a servlet from the same user using the same Web browser. WebSphere Application Server provides session management functionality to keep track of each user and enable applications to provide personalized content.

Symptom: You experience a problem relating to the management of HTTP sessions by WebSphere Application Server. This can include any of the following:

- ▶ Unexpected session behavior

- ▶ Session time outs
- ▶ Problems with session storage (database persistence or memory-to-memory sessions)
- ▶ Session data being lost
- ▶ Errors or exceptions from the WebSphere Application Server session manager
- ▶ Problems with personalized Web content
- ▶ Error or warning messages with the prefix SESN

Note: For information about session management problems, see *WebSphere Application Server V6: Web Container Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4058.pdf>

Note: When there is a session management problem in a clustered environment, there might be an underlying Web server plug-in problem. For more information about this, see *WebSphere Application Server V6: Web Server Plug-in Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4045.pdf>

You can find other problem determination strategies for session management issues in the following resources:

- ▶ WebSphere Information Center: *Task Overview: Managing HTTP sessions*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/tpres_sep1.html
- ▶ WebSphere Information Center: *Best practices for using HTTP Sessions*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rprs_sess.html
- ▶ WebSphere Information Center: *HTTP session manager troubleshooting tips*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rtrb_httpsesncomp.html
- ▶ WebSphere Information Center: *Problems creating or using HTTP sessions*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rtrb_httpssessprobs.html
- ▶ WebSphere Information Center: *Managing HTTP sessions: Resources for learning*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rprs_r41n.html

- ▶ WebSphere Information Center: Explanation of SESN system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/SESN.html>
- ▶ *MustGather: Sessions and session management problems in V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21192604>

Note that problems with the data replication service can cause session management problems (see “Data replication service” on page 58).

Dynamic cache

The dynamic cache feature caches the output of servlets, JSPs, and external Web services that are called by clients within WebSphere Application Server.

Symptom: You experience a problem with the dynamic cache feature of WebSphere Application Server. Potential problems can include any of the following:

- ▶ Unexpected or incorrect cache behavior
- ▶ Errors and exceptions from the dynamic cache component
- ▶ Dynamic cache configuration issues
- ▶ Slow performance
- ▶ Error or warning messages with the prefix DYNA

You can find problem determination strategies for dynamic cache issues in the following resources:

- ▶ WebSphere Information Center: *Dynamic caching*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_dyn.html
- ▶ WebSphere Information Center: *Troubleshooting the dynamic cache service*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/tdyn_probd.html
- ▶ WebSphere Information Center: *Troubleshooting tips for the dynamic cache service*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rdyn_trb.html
- ▶ WebSphere Information Center: Explanation of DYNA system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/DYNA.html>
- ▶ *MustGather: Dynamic cache problems in V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21193837>

Note that problems with the data replication service can cause dynamic cache problems (see “Data replication service” on page 58).

Transaction manager

A transaction is a unit of work that is done within your application where updates can be made to multiple resources so that the updates are either committed or rolled back together as one unit of work. The WebSphere Application Server service that coordinates transactions is called the transaction manager.

Symptom: You experience a problem relating to the management of transactions by WebSphere Application Server. This includes any of the following symptoms:

- ▶ Unexpected transaction behavior
- ▶ Transaction time outs
- ▶ Unexpected transaction rollbacks
- ▶ Problems with transaction recovery
- ▶ Any errors or exceptions from the transaction manager
- ▶ Error or warning messages that have the prefixes WTRN or WLTC

Transaction problems might also be related to database, messaging, or enterprise information system connection problems, which are described in “Application cannot connect to an external system or resource” on page 63.

You can find problem determination strategies for transaction manager problems in the following resources:

- ▶ WebSphere Information Center: *Transactions*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_jta.html
- ▶ WebSphere Information Center: *Troubleshooting transactions*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/tjta_probd.html
- ▶ WebSphere Information Center: *Tips for troubleshooting transactions*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rjta_prob0.html
- ▶ WebSphere Information Center: *Transaction service exceptions*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rjta_except.html
- ▶ WebSphere Information Center: Explanation of WTRN system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/WTRN.html>
- ▶ WebSphere Information Center: Explanation of WLTC system messages

<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/WLTC.html>

- ▶ *MustGather: Java Transaction Service (JTS) problems in V4.0, V5.0, V5.1 and V6.0*

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21153216>

Workload management

The workload management (WLM) functionality within WebSphere Application Server distributes client requests to the application servers that can process the requests most efficiently and also improves availability of applications by providing failover when application servers are not available. WLM is discussed more in “High availability and failover” on page 14.

Symptom: You experience a problem with the WLM features of WebSphere Application Server, including load balancing and failover of an EJB request or HTTP request. Potential problems include:

- ▶ Workload between cluster members not being balanced correctly
- ▶ A cluster member that is down does not failover
- ▶ Workload is not routed to a cluster member that is running
- ▶ An EJB client cannot reach any cluster members (a CORBA NO_IMPLEMENT error is issued)
- ▶ Any errors or exceptions relating to WLM
- ▶ Error or warning messages with the prefix WWLM

Note: You can find problem determination strategies for issues with WLM of HTTP requests in *WebSphere Application Server V6: Web Server Plug-in Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4045.pdf>

You can find problem determination strategies for problems with WLM of EJB requests in the following resources:

- ▶ WebSphere Information Center: *Workload management (WLM) for distributed platforms*

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/crun_wlm.html

- ▶ WebSphere Information Center: *Workload management component troubleshooting tips*

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/rtrb_wlmcomp.html

- ▶ WebSphere Information Center: *Workload is not getting distributed*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/topic/com.ibm.websphere.nd.doc/info/ae/ae/rtrb_wlmprobs.html
- ▶ WebSphere Information Center: *Workload management run-time exceptions*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/rrun_wlm_exceptions.html
- ▶ WebSphere Information Center: *Clustering and workload management: Resources for learning*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/rrun_wlm_rlinks.html
- ▶ WebSphere Information Center: Explanation of WWLM system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/WWLM.html>
- ▶ *MustGather: Enterprise JavaBeans (EJB) workload management*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21052165>

High availability manager

The high availability manager in WebSphere Application Server V6 eliminates single points of failure and provides failover for all applications and WebSphere Application Server services. It manages the availability of your applications and services. It is discussed in detail in “High availability and failover” on page 14.

Symptom: You experience a problem with the high availability manager in WebSphere Application Server, including

- ▶ One process in your core group fails and its services are not started on another process as expected.
- ▶ Errors or exceptions from the high availability manager.
- ▶ Error or warning messages that begin with HMGR, CWRCB, or CWWCW.

You can find problem determination strategies for high availability manager problems in the following resources:

- ▶ WebSphere Information Center: *Setting up a high availability environment*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/trun_ha_environment.html
- ▶ WebSphere Information Center: *High availability manager*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/crun_ha_hamanager.html
- ▶ WebSphere Information Center: *Troubleshooting high availability environment problems*

http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/rtrb_ha_env_trbl.html

- ▶ **WebSphere Information Center: *Learning about high availability***
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.pmc.nd.doc/tasks/tjt0014_.html
- ▶ **WebSphere Information Center: Explanation of HMGR system messages**
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/HMGR.html>
- ▶ **WebSphere Information Center: Explanation of CWRCB system messages**
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/CWRCB.html>
- ▶ **WebSphere Information Center: Explanation of CWWCW system messages**
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/CWWCW.html>
- ▶ ***MustGather: High Availability and the High Availability (HA) Manager***
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21201016>

Data replication service

The data replication service transfers information between cluster members, enabling memory-to-memory session replication, dynamic cache, and stateful session bean failover.

Symptom: You experience a problem with the data replication service in WebSphere Application Server. Potential problems include:

- ▶ Unexpected data replication behavior (might appear as workload management, dynamic cache, or session management problems).
- ▶ Any errors or exceptions from the data replication service.
- ▶ Error or warning messages that begin with CWWDR.

You can find problem determination strategies for data replication service problems in the following resources:

- ▶ **WebSphere Information Center: *Replicating data across application servers in a cluster***
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/trun_drs_replication.html
- ▶ **WebSphere Information Center: *Replication***
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.nd.doc/info/ae/ae/crun_drs_replication.html
- ▶ **WebSphere Information Center: Explanation of CWWDR system messages**

<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/CWWDR.html>

Program model extensions

Programming model extensions (PMEs) enhance application capability and performance, and make programming and deployment faster and more productive.

Symptom: You have any type of problem with the WebSphere Application Server extensions to the J2EE programming model. Potential problems include:

- ▶ Unexpected behavior, errors, or exceptions that occur when running an application that takes advantage of PMEs. These problems only occur with applications that use PMEs.
- ▶ Error or warning messages related to PMEs: (WebSphere system messages for each PME are in parentheses):
 - Activity session service (WACS)
 - Application profiling (APPR)
 - Asynchronous beans (ASYN)
 - Object pooling (OBPL)
 - Scheduler service (SCHD)
 - Startup beans (STUP)
 - Work area service (ACWA)
 - Internationalization service (I18N)

You can find problem determination strategies for PME problems in the following resources:

- ▶ WebSphere Information Center: *ActivitySessions*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_as.html
- ▶ WebSphere Information Center: *Troubleshooting ActivitySessions*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ass/tasks/tas_probd.html
- ▶ WebSphere Information Center: *ActivitySession service: Resources for learning*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ass/ref/ras_rlinks.html
- ▶ WebSphere Information Center: Explanation of WACS system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/WACS.html>
- ▶ WebSphere Information Center: *Application profiling*

- http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_appprof.html
- ▶ WebSphere Information Center: Explanation of APPR system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/APPR.html>
 - ▶ WebSphere Information Center: *Asynchronous beans*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_asb.html
 - ▶ WebSphere Information Center: Explanation of ASYN system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/ASYN.html>
 - ▶ WebSphere Information Center: *Object pools*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_objp.html
 - ▶ WebSphere Information Center: *Object pools: Resources for learning*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/asynbns/ref/rasb_objpoolsrlinks.html
 - ▶ WebSphere Information Center: Explanation of OBPL system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/OBPL.html>
 - ▶ WebSphere Information Center: *Scheduler service*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_sch.html
 - ▶ WebSphere Information Center: Explanation of SCHED system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/SCHED.html>
 - ▶ WebSphere Information Center: *Startup beans*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_sub.html
 - ▶ WebSphere Information Center: Explanation of STUP system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/STUP.html>
 - ▶ WebSphere Information Center: *Work area*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_wa.html
 - ▶ WebSphere Information Center: Explanation of ACWA system messages

<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/ACWA.html>

Internationalization/Double byte character set

Symptom: You have any type of problem with character encoding or the internationalization of your application (producing output in the language, time zone, currency, and cultural conventions for different regions or locales). This can include:

- ▶ Problems displaying double byte characters for certain languages.
- ▶ Problems that only occur with internationalized applications.
- ▶ Error or warning messages that begin with I18N and LTXT.

Note: Character encoding problems are discussed in *WebSphere Application Server V6: Web Container Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4058.pdf>

You can find problem determination strategies for other internationalization problems in the following resources:

- ▶ WebSphere Information Center: *Internationalization service*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_in.html
- ▶ WebSphere Information Center: *Internationalization service errors*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/i18n/ref/rin_troubleshoot.html
- ▶ WebSphere Information Center: *Internationalization: Resources for learning*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rin_resources.html
- ▶ WebSphere Information Center: Explanation of I18N messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/I18N.html>
- ▶ WebSphere Information Center: Explanation of LTXT system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/LTXT.html>
- ▶ *MustGather: i18n (Internationalization)/Double Byte Character Set (DBCS)*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21141732>

Transport channel service

The transport channel service is a new feature in WebSphere Application Server V6. It manages client connections and I/O processing for HTTP and JMS requests based on the new non-blocking I/O features in Java 1.4.

Symptom: Problems with the transport channel service would most likely manifest themselves as:

- ▶ Performance issues (where the transport channel service settings could be tuned)
- ▶ Unexpected results
- ▶ Error or warning messages that begin with CHFW, DCSV, HTPC, SSLC, TCPC, WSSC, and XMEM

You can find problem determination strategies for transport channel service problems in the following resources:

- ▶ WebSphere Information Center: *Configuring transport chains*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/trun_chain_transport.html
- ▶ WebSphere Information Center: *Transport chains*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/crun_chain_transport.html
- ▶ WebSphere Information Center: *Troubleshooting transport chain problems*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rtrb_chain_trbl.html
- ▶ WebSphere Information Center: Explanation of CHFW system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/CHFW.html>
- ▶ WebSphere Information Center: Explanation of DCSV system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/DCSV.html>
- ▶ WebSphere Information Center: Explanation of HTPC system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/HTPC.html>
- ▶ WebSphere Information Center: Explanation of SSLC system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/SSLC.html>
- ▶ WebSphere Information Center: Explanation of TCPC system messages

<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/TCPC.html>

- ▶ WebSphere Information Center: Explanation of WSSC system messages

<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/WSSC.html>

- ▶ WebSphere Information Center: Explanation of XMEM system messages

<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/XMEM.html>

Application cannot connect to an external system or resource

These problems include:

- ▶ JCA connection manager
- ▶ Database connections
- ▶ Messaging
- ▶ JNDI naming
- ▶ ORB
- ▶ Web services

JCA connection manager

Symptom: You have any problem connecting to an external resource through the Java Connector Architecture (JCA) connection manager. This includes data sources (which are used to obtain JDBC™ database connections), JMS connection factories, and connections to enterprise information systems with an installed JCA resource adapter. The JCA connection manager pools and manages connections to these systems.

Potential problems include general connection pooling problems or configuration issues, problems establishing a connection, problems with activation specifications that get messages from your back-end systems. JCA connection symptoms are observed through WebSphere error messages with prefixes DSRA, WSCL, J2CA, WTRN, CONM, SQLException, or database error codes.

Problems caused by JCA components or JCA connection configuration errors can appear as one or more of the following initial symptoms:

- ▶ A connection hangs or incorrectly returns data to application
- ▶ An application connect to or access a database or EIS

Note: For problem determination strategies for JCA connection manager problems, see *WebSphere Application Server V6: JCA Connection Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4080.pdf>

Database connections

You have a problem that occurs when your application interacts with a database through JDBC. The connection to the database is obtained either through a data source (with the JCA connection manager) or a Version 4 data source (with the existing connection manager). Only J2EE 1.2 applications can use a Version 4 data source. These problems include JDBC Provider or data source configuration issues and any errors or WebSphere system messages that begin with DSRA or CONM.

Note: For problem determination strategies for database connection problems, see *WebSphere Application Server V6: JCA Connection Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4080.pdf>

Messaging

Symptom: You have a problem that occurs when your application interacts with the default messaging provider, a WebSphere MQ system, or a Generic JMS Provider through JMS. The connection to the messaging system is obtained through a JMS connection factory defined in the administrative console or wsadmin.

If you are using the Default messaging provider, problems might occur with the service integration bus. Symptoms of a problem in this area include :

- ▶ Problems sending and receiving messages
- ▶ Messaging engine startup problems
- ▶ Message data store connectivity or configuration issues
- ▶ Problems interacting with external messaging systems
- ▶ Configuration problems with a bus, messaging engine, destination, or mediation
- ▶ Error or warning messages generated by the service integration bus with the following prefixes:

CWSIA, CWSIB, CWSIC, CWSID, CWSIE, CWSIF, CWSIH, CWSII, CWSIJ, CWSIK, CWSIL, CWSIM, CWSIN, CWSIO, CWSIP, CWSIQ, CWSIR, CWSIS, CWSIT, CWSIU, CWSIV, CWSIW, CWSIX, CWSIY, CWSIZ, CWSJA, CWSJB, CWSJC, CWSJD, CWSJO, CWSJQ, CWSJR, CWSJU, CWSJW, and CWSWS. Note that these messages contain ten characters instead of nine.
- ▶ Problems with the WebSphere MQ JMS provider or a generic JMS provider might include JMS connection factory or destination configuration issues, message listener service and message-driven bean problems, and WebSphere system messages that begin with WMSG.

Note: For problem determination strategies for messaging problems, see *WebSphere Application Server V6: Default Messaging Provider Problem Determination* at:

<http://www.redbooks.ibm.com/redpapers/pdfs/redp4076.pdf>

JNDI naming

The Java Naming and Directory Interface™ (JNDI) is used by applications to access EJBs and WebSphere resources such as data sources, JMS connection factories and destinations, and JCA connection factories.

Symptom: Your application experiences a problem when accessing any resource through a JNDI lookup. Indications of a JNDI problem include:

- ▶ JNDI naming error or exception in the SystemOut or SystemErr log.
- ▶ Problems using the dumpNameSpace tool.
- ▶ Error or warning messages that begin with NMSV.

You can find problem determination strategies for JNDI naming problems in the following resources:

- ▶ WebSphere Information Center: *Naming*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_nam.html
- ▶ WebSphere Information Center: *Troubleshooting name space problems*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/tnam_troubleshoot_jndi.html
- ▶ WebSphere Information Center: *dumpNameSpace tool*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rnam_dump_utility.html
- ▶ WebSphere Information Center: *Naming and directories: Resources for learning*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/topic/com.ibm.websphere.base.doc/info/aes/ae/rnam_r41n.html
- ▶ WebSphere Information Center: *Explanation of NMSV system messages*
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/NMSV.html>
- ▶ *MustGather: Java Naming and Directory Interface (JNDI) and naming problems for all releases*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21143296>

ORB

The ORB enables an EJB client to access an EJB running in WebSphere Application Server. An EJB client call to an EJB will go through the ORB unless the EJB client and EJB are running in the same WebSphere process.

Symptom: Your application experiences a problem when accessing an EJB through the Object Request Broker (ORB). Indications of an ORB problem include:

- ▶ ORB errors or exceptions in SystemOut or SystemErr log. Most likely, these would be CORBA error codes (such as a CORBA COMM_FAILURE).
- ▶ Error or warning messages that begin with ORBX.

You can find problem determination strategies for ORB problems in the following resources:

- ▶ WebSphere Information Center: *Object Request Broker (ORB)*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_orb.html
- ▶ WebSphere Information Center: *Object Request Broker component troubleshooting tips*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rtrb_orbcomp2.html
- ▶ WebSphere Information Center: *Object Request Broker communications trace*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rorb_traceo.html
- ▶ WebSphere Information Center: *Object Request Brokers: Resources for learning*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rorb_r41no.html
- ▶ WebSphere Information Center: Explanation of ORBX system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/ORBX.html>
- ▶ *MustGather: Object Request Broker (ORB) for all releases*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21157005>

Web services

Web services are used to make an application or component available over the Internet, either within an organization or globally. WebSphere Application Server V6 supports the Web Services for J2EE standards.

Symptom: Your application experiences a problem when acting as a Web services client to a remote Web service or when acting as a Web service that is accessed by external clients. This would include:

- ▶ Web services errors and exceptions that appear in the SystemOut and SystemErr logs
- ▶ Unexpected Web services behavior
- ▶ Configuration issues
- ▶ Problems with Web services tooling, such as the Java2WSDL and WSDL2Java scripts
- ▶ Problems that occur when configuring Web services or Web services gateway instances with the service integration bus.
- ▶ Error or warning messages that begin with WWSWS, SOAP, WSIF (for Web services), or CWWSG (for Web services gateway)

You can find problem determination strategies for Web services problems in the following resources:

- ▶ WebSphere Information Center: *Web services*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc6tech_wbs.html
- ▶ WebSphere Information Center: *Troubleshooting Web services*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/twbs_troubleshootwbs.html
- ▶ WebSphere Information Center: *Troubleshooting Web services command-line tools*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rwbs_trbcommand.html
- ▶ WebSphere Information Center: *Troubleshooting Web services compiled bindings*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rwbs_trbjavacompiler.html
- ▶ WebSphere Information Center: *Troubleshooting the runtime for a Web services client*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rwbs_trbclientruntime.html
- ▶ WebSphere Information Center: *Troubleshooting serialization and deserialization in Web services*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rwbs_trbserialize.html

- ▶ **WebSphere Information Center: *Troubleshooting the Web Services Invocation Framework***
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/twsf_trouble.html
- ▶ **WebSphere Information Center: *UDDI Registry troubleshooting***
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/twsu_probdet.html
- ▶ **WebSphere Information Center: *Universal Discovery, Description, and Integration, Web Service, and SOAP component troubleshooting tips***
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rtrb_svsccomp.html
- ▶ **WebSphere Information Center: *Errors returned to a client sending a SOAP request***
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rtrb_soapprobs.html
- ▶ **WebSphere Information Center: *Tracing Web services***
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/twbs_tracewscomp.html
- ▶ **WebSphere Information Center: *Tracing SOAP messages with tcpmon***
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/twbs_tracews.html
- ▶ **WebSphere Information Center: *Frequently asked questions about Web services***
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rwbs_faq.html
- ▶ **WebSphere Information Center: *Web services: Resources for learning***
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rwbs_resourceslearning2.html
- ▶ **WebSphere Information Center: *Explanation of WSWs system messages***
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/WSWS.html>
- ▶ **WebSphere Information Center: *Explanation of SOAP system messages***
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/SOAP.html>
- ▶ **WebSphere Information Center: *Explanation of WSIF system messages***
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/WSIF.html>

- ▶ WebSphere Information Center: Explanation of CWSG system messages
<http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.messages.doc/doc/CWSG.html>
- ▶ *MustGather: Web Services Engine problems for all releases and editions of WebSphere Application Server V5.0.2, V5.1 and V6.0*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21198363>
- ▶ *MustGather: Problems with the Web services gateway*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21159216>
- ▶ *MustGather: Problems with the Web Services Invocation Framework (WSIF)*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21159155>
- ▶ *MustGather: Problems with UDDI*
<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21164764>

Application is slow or its performance degrades over time

This broad classification covers all problems with slow or degrading performance.

You can find problem determination strategies for performance problems in the following resources:

- ▶ WebSphere Information Center: *Tuning Performance*
http://publib.boulder.ibm.com/infocenter/ws60help/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/welc_concepts_cprf.html
- ▶ WebSphere Information Center: *Troubleshooting performance*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/tprf_troubleshoot.html
- ▶ WebSphere Information Center: *Performance: Resources for learning*
http://publib.boulder.ibm.com/infocenter/wasinfo/v6r0/index.jsp?topic=/com.ibm.websphere.base.doc/info/aes/ae/rprf_resourceslearning.html
- ▶ *WebSphere Application Server Performance information*
<http://www-306.ibm.com/software/webservers/appserv/was/performance.html>
- ▶ *WebSphere Application Server V6 Scalability and Performance Handbook, SG24-6392.*

Note that several runtime component failures can also cause overall system performance problems. These are discussed in:

- ▶ “Dynamic cache” on page 54
- ▶ “Workload management” on page 56
- ▶ “Transport channel service” on page 62

- ▶ “Web server plug-in” on page 45

Contacting IBM for support

As you might have realized by now, many potential problems with WebSphere Application Server V6 can be resolved without the help of the WebSphere Application Server Support team. By carefully preparing for and preventing problems and by following your problem determination strategy, you have the ability to resolve most problems on your own. However, there might be instances where invoking the Support team will be necessary, especially if a WebSphere Application Server code defect is the cause of a problem. This section explains the IBM support process and how you can work with the Support team most effectively.

In addition to the information that we provide here, there are two excellent resources on the Web about the IBM support process:

- ▶ *IBM Software Support Handbook*
<http://techsupport.services.ibm.com/guides/handbook.html>
- ▶ *Steps to getting support for WebSphere Application Server*
http://www-106.ibm.com/developerworks/websphere/support/appserver_support.html

IBM support structure

In order to get the most out of the IBM support process, it is important to understand how the support organization is structured. There are several groups of support personnel with whom you might work for each problem:

- ▶ Front office (Problem entry) team

If you report a problem by phone, the first person you speak with is a member of the *front office* (also called *problem entry*) team. The people on this team work with you in your national language. They are usually located in the same region of the world from where you are calling.

The main goals of the front office team are to get a detailed problem description from you, confirm your contact information and availability, open a problem management record (PMR), and then route your PMR to the appropriate product support team.

- ▶ Front end (Level 1) team

The next step in the process is for the *front end* team (called the *Level 1* support team in the United States) to work on your PMR. If you open your PMR electronically, this would be the first team with whom you would work.

This team also works with you in your national language, and they are usually located in the same region of the world as you.

The people on the front end team in many countries have broad skills in many IBM software products, and they work PMRs for several products. The Level 1 team in the United States only works WebSphere Application Server PMRs. They have broad skills in WebSphere Application Server, and they support the entire product. The support analysts obtain more details about the problem. They are likely to request files or logs that aid in determining the cause of the problem. They then conduct an investigation into the problem and provide possible solutions. If they are unable to provide a solution to the problem, they escalate the PMR to the next level of support.

► Back end (Level 2) team

Your PMR is escalated to the *back end* (Level 2) support team if it cannot be resolved by the front end or Level 1 team. The Level 2 team for WebSphere Application Server is located only in the United States, and they work only in English. The front end team asks you if you are able to work with the Level 2 team in English. If you would prefer to work in your own language, the front end team can translate the communication from the Level 2 team for you.

The Level 2 team is composed of a group of specialized teams. Each team works only on certain areas of the product, and they develop expertise in those areas. They conduct a more extensive analysis of the problem and the files that you have sent, and they obtain more information about the problem if it is required. The Level 2 team might also ask for more detailed diagnostic data, such as traces for a specific component, to help in their investigation. After analyzing all of the information and conducting research, the Level 2 team either provides a solution to the problem or works with the next level of support if they believe that the problem is caused by a WebSphere Application Server code defect. In that case, an authorized program analysis report (APAR) is opened.

► Change team (Level 3)

If the Level 2 team's analysis shows that the problem is caused by a defect with WebSphere Application Server code, they send your PMR to the *change team*, also known as the Level 3 team. The change team is part of the WebSphere Application Server development team that is specifically focused on fixing defects. The members of the Level 3 team work only on one specific component of WebSphere Application Server. They have very deep knowledge of that particular component. The Level 3 team does not communicate directly with clients. Instead, they provide updates to the Level 2 team, and the Level 2 team communicates updates to the client.

Research the problem

Before you open a PMR, we recommend that you will follow all of the problem determination strategies discussed in this series of papers. The most important thing to do is to research the problem. The WebSphere Application Server Support team has found that a large percentage of problems have already been reported by other clients. In these cases, you can save a great deal of time and effort by reviewing IBM documentation to make sure that the problem is not a known problem before you open a PMR. You can review the list of Web sites in “Investigate and research the problem” on page 27 to conduct your research.

Collect MustGather files

We first mentioned MustGather documents in “Diagnostic data collection” on page 21. These documents are useful guides when developing your diagnostic data collection plan, and they are also important when you open a PMR with the WebSphere Application Server Support team. The support team needs certain diagnostic data to investigate each type of WebSphere Application Server problem. In “Classify the problem and determine the root cause” on page 31, we listed each problem classification, and we included the links to the MustGather documents for each classification. You can review the specific document for the type of problem that you are experiencing, or you can start with the general MustGather document for all types of problems, *IBM - MustGather: Read first for all WebSphere Application Server products*, at:

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21145599>

In either case, it is important that you provide the information and diagnostic data that is mentioned in the appropriate MustGather document when you open a PMR. You should expect that the front end or Level 1 support team will request it if they have not already received it.

Determine the severity

When you open a PMR, you provide a severity level for the PMR. The severity levels are in the range of 1 to 4, with 1 being the most severe and 4 being the least severe. The severity level reflects the business impact and, therefore, the urgency of the problem. Although it is tempting to open all PMRs at the Severity 1 level, it is very important to determine an accurate severity level for the situation. IBM support prioritizes PMRs according to the severity level. When you have a true Severity 1 issue, you do not want the support team to have to prioritize it at the same level as other issues that are not as critical. Table 2 provides the official descriptions of each severity level from the *IBM Software Support Handbook*.

Note: Although IBM support analysts might sometimes ask you if a severity level can be changed, it is ultimately your decision (or the decision of others in your company) as to what the severity level is.

Table 2 Guidelines of PMR severity levels

| Severity level | Description |
|-------------------|--|
| Severity 1 | Critical business impact: You are unable to use the program, resulting in a critical impact on operations. This condition requires an immediate solution. |
| Severity 2 | Significant business impact: The program is usable but is severely limited. |
| Severity 3 | Some business impact: The program is usable with less significant features (not critical to operations) unavailable. |
| Severity 4 | Minimal business impact: The problem causes little impact on operations, or a reasonable circumvention to the problem has been implemented. |

To put these guidelines in WebSphere Application Server terms:

- ▶ **Severity 1** PMRs are typically situations where the availability of your production environment is affected.

In a case where your production system is down, the support team's first priority is to help you restore your production functionality, as discussed in "Revert to safe conditions" on page 24. It can be any situation where there is a high level of business impact. For example, it could be a problem that causes a loss of revenue or productivity for your organization. For Severity 1 PMRs, there is no work around or solution that is currently available. The support team works around the clock on your PMR, as long as they are able to contact you at any time of day, until the problem is resolved.
- ▶ **Severity 2** PMRs are the most common levels of PMRs. In this case, the problem has a significant impact, but the application is still running in your production environment. It can also include situations where your application is not yet in production.

These include situations where you have a deadline for resolving the problem, and situations where the problem delays when your application goes into production. Severity 2 PMRs are considered severe and are prioritized highly by the support team but the problems are not considered as

critical as Severity 1 problems. The support team works with you during the normal business hours in your time zone.

- ▶ **Severity 3** PMRs indicate that a problem is not severely impacting your business.

Almost all Severity 3 problems occur in your test environment and do not affect production. If it does impact production, it has only a minor impact, and you might have a work around for the problem. Although you expect the problem to be resolved in a timely manner, you do not have a deadline for resolving the problem and the problem is not delaying the production date for your application. The support team works with you during the normal business hours in your time zone.

- ▶ **Severity 4** PMRs indicate that a problem has almost no business impact. This includes technical questions and requests to update documentation. It can also include problems that occur only in your test environment where a work around has already been provided.

The severity is sometimes lowered to Severity 4 when a solution is provided, but you need some time to test the solution before closing the PMR. It is expected that Severity 4 PMRs are not impacting your production environment. You do not have a deadline for resolving the problem and you are able to wait a longer period of time to receive a solution. The support team will work with you during the normal business hours in your time zone and updates by the support team might not be frequent.

Create a PMR

Now that you are familiar with the IBM support structure, you have researched the problem, collected the MustGather data, and determined the severity of the problem, it is time to open a PMR.

You can currently open a PMR in two ways, electronically or by phone. We have found that opening PMRs electronically is more convenient for most clients. We recommend that you use that method. However, phone support is still available.

Open a PMR electronically

To open a PMR electronically on the Web, you can use the Electronic Service Request (ESR) problem submission tool at:

<http://www-306.ibm.com/software/support/probsub.html>

When you open a PMR with the ESR tool, the PMR is placed on the queue of the front end or Level 1 support team. A queue is a list of PMRs that need the attention of a particular support team, which are organized according to the PMR severity.

The ESR tool allows you to use your own words to describe the problem as thoroughly as you can. This ensures that the problem details are recorded accurately because you do not have to rely on someone else typing the description for you. You can also update the PMR whenever you want to, and you can log onto the ESR tool to view updates that have been made by the support team. You are notified by e-mail when the PMR has been updated. In addition, the ESR tool allows you to attach files to the PMR. These files are uploaded automatically to the FTP server that is used by the support team. The PMR is updated with the names and location of your files on the FTP server. This enables the support team to start reviewing your files immediately after you open the PMR.

Open a PMR by phone

Your other option is to open a PMR by phone. The phone number that you call to open a PMR varies by country and changes from time to time. To find the phone number for your country, check this link from the *IBM Software Support Handbook*:

<http://techsupport.services.ibm.com/guides/contacts.html>

When you open a PMR by phone, you speak with a member of the front office or problem entry team. They open the PMR and provide you with the PMR number. They ask you for a problem description and then record that problem description in the PMR. They obtain your contact information, availability, and the severity level of the problem. Then, they forward the PMR to the front end or Level 1 team that will begin working with you on the problem.

If you do not use the ESR tool, you cannot view updates to the PMR. You can call the IBM support phone number for your country and ask them to update the PMR on your behalf when necessary. You also cannot attach files to the PMR. You need to either e-mail or FTP files to the support team.

Send data to IBM

In the course of working a PMR, it might be necessary to send many different types of data to the WebSphere Application Server Support team. As discussed in “Create a PMR” on page 74, using the ESR tool to attach files to your PMR makes this process easy. However, if you do not use the ESR tool, you can still send data through e-mail or FTP. As a general rule, you should use e-mail if the total size of the data is less than 10 MB, and you should use FTP if the data is more than 10 MB in size. Also, when you FTP data, your PMR is updated automatically so that the support team is aware that you sent the data and they can begin analyzing it right away. However, if you send an e-mail, be sure to either update your PMR electronically or call the IBM support phone number for

your country and ask to have the PMR updated, so that the support team knows that you sent the data.

We recommend that you send all e-mail related to your PMR to `web1ev2@us.ibm.com`. This is a shared e-mail address. The entire WebSphere Application Server Level 1 and Level 2 teams have access to this e-mail address. If you only send an e-mail to a specific support analyst, only that analyst has access to your e-mail. This can be disadvantageous, especially if the analyst is out of the office or if you need help outside of normal business hours.

For the complete and up-to-date instructions on sending e-mail or sending data via FTP to the WebSphere Application Server Support team, see *Submitting Diagnostic Information to IBM Technical Support for Problem Determination* at:

<http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg21153852>

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