CA Application Performance Management

for IBM WebSphere Application Server for Distributed Environments Guide

Release 9.6
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CA Technologies Product References

This document references the following CA Technologies products and features:

- CA Application Performance Management (CA APM)
- CA Application Performance Management ChangeDetector (CA APM ChangeDetector)
- CA Application Performance Management ErrorDetector (CA APM ErrorDetector)
- CA Application Performance Management for CA Database Performance (CA APM for CA Database Performance)
- CA Application Performance Management for CA SiteMinder® (CA APM for CA SiteMinder®)
- CA Application Performance Management for CA SiteMinder® Application Server Agents (CA APM for CA SiteMinder® ASA)
- CA Application Performance Management for IBM CICS Transaction Gateway (CA APM for IBM CICS Transaction Gateway)
- CA Application Performance Management for IBM WebSphere Application Server for z/OS (CA APM for IBM WebSphere Application Server for z/OS)
- CA Application Performance Management for IBM WebSphere for Distributed Environments (CA APM for IBM WebSphere for Distributed Environments)
- CA Application Performance Management for IBM WebSphere MQ (CA APM for IBM WebSphere MQ)
- CA Application Performance Management for IBM WebSphere Portal (CA APM for IBM WebSphere Portal)
- CA Application Performance Management for IBM WebSphere Process Server (CA APM for IBM WebSphere Process Server)
- CA Application Performance Management for IBM z/OS® (CA APM for IBM z/OS®)
- CA Application Performance Management for Microsoft SharePoint (CA APM for Microsoft SharePoint)
- CA Application Performance Management for Oracle Databases (CA APM for Oracle Databases)
- CA Application Performance Management for Oracle Service Bus (CA APM for Oracle Service Bus)
- CA Application Performance Management for Oracle WebLogic Portal (CA APM for Oracle WebLogic Portal)
- CA Application Performance Management for Oracle WebLogic Server (CA APM for Oracle WebLogic Server)
- CA Application Performance Management for SOA (CA APM for SOA)
- CA Application Performance Management for TIBCO BusinessWorks (CA APM for TIBCO BusinessWorks)
- CA Application Performance Management for TIBCO Enterprise Message Service (CA APM for TIBCO Enterprise Message Service)
- CA Application Performance Management for Web Servers (CA APM for Web Servers)
- CA Application Performance Management for webMethods Broker (CA APM for webMethods Broker)
- CA Application Performance Management for webMethods Integration Server (CA APM for webMethods Integration Server)
- CA Application Performance Management Integration for CA CMDB (CA APM Integration for CA CMDB)
- CA Application Performance Management Integration for CA NSM (CA APM Integration for CA NSM)
- CA Application Performance Management LeakHunter (CA APM LeakHunter)
- CA Application Performance Management Transaction Generator (CA APM TG)
- CA Cross-Enterprise Application Performance Management
- CA Customer Experience Manager (CA CEM)
- CA Embedded Entitlements Manager (CA EEM)
- CA eHealth® Performance Manager (CA eHealth)
- CA Insight™ Database Performance Monitor for DB2 for z/OS®
- CA Introscope®
- CA SiteMinder®
- CA Spectrum®
- CA NetQoS® Performance Center
- CA Performance Center
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# Contents

## Chapter 1: Introduction

Using This Guide ................................................................. 9

## Chapter 2: Installing CA APM for IBM WebSphere Application Server Distributed

Installation Requirements .......................................................... 11
Before You Begin ........................................................................... 11
Install and Configure CA APM for IBM WebSphere Application Server Distributed ......................................................... 12
  - Running the Enterprise Installer ............................................. 12
  - Running the Java (In Process) Agent Installer ......................... 12
  - Configuring IntroscopeAgent.profile to report PMI metrics ...... 14
  - Verifying if Service Integration Bus is Enabled ....................... 15
  - Creating Custom Service and Enable the PMI Modules ............ 15
  - Verifying the ORB Interceptors Metric Collection ................... 27

## Chapter 3: Using CA APM for IBM WebSphere Application Server Distributed

Views Enabled by This Extension .................................................. 29
Viewing PMI Metrics in the Introscope Investigator ....................... 30
Using Investigator Tabs ................................................................ 30
  - AppServer Tab View .......................................................... 31
  - SIB Service Overview ....................................................... 31
  - SIB Service Views ............................................................. 32
  - Bean Module ..................................................................... 36
  - J2C Module ....................................................................... 37
Dashboards and the Investigator ..................................................... 37
  - WebSphere Distributed - EJB Container ............................... 38
  - WebSphere Distributed - EJB Pools .................................... 39
  - WebSphere Distributed - J2C Connection Pools .................... 39
  - WebSphere Distributed - JDBC Connection Pools .................. 39
  - WebSphere Distributed - JTA ............................................... 40
  - WebSphere Distributed - Message Driven Beans ................... 40
  - WebSphere Distributed - Messaging Engines ....................... 41
  - WebSphere Distributed - ORB ............................................. 41
  - WebSphere Distributed - Overview ..................................... 41
  - WebSphere Distributed - SIB Overview ............................... 42
Appendix A: Metrics

<table>
<thead>
<tr>
<th>Module</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Beans Module</td>
<td>45</td>
</tr>
<tr>
<td>JDBC Connection Pool Module</td>
<td>47</td>
</tr>
<tr>
<td>Java Transaction API (JTA) Module</td>
<td>48</td>
</tr>
<tr>
<td>Object Request Broker (ORB) Module</td>
<td>49</td>
</tr>
<tr>
<td>Servlet Session Manager Module</td>
<td>49</td>
</tr>
<tr>
<td>Thread Pool Module</td>
<td>50</td>
</tr>
<tr>
<td>JCA Connection Pools</td>
<td>51</td>
</tr>
<tr>
<td>Web Applications (WebContainer) Module</td>
<td>53</td>
</tr>
<tr>
<td>Queues</td>
<td>53</td>
</tr>
<tr>
<td>Topicspace</td>
<td>55</td>
</tr>
<tr>
<td>Mediations</td>
<td>55</td>
</tr>
<tr>
<td>Data Store</td>
<td>56</td>
</tr>
<tr>
<td>File Store</td>
<td>56</td>
</tr>
<tr>
<td>Messaging Engines</td>
<td>57</td>
</tr>
<tr>
<td>WMQ Links</td>
<td>57</td>
</tr>
</tbody>
</table>

Appendix B: Frequently Asked Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>How is the Installation and Configuration WebSphere Application Server - Distributed Simplified?</td>
<td>62</td>
</tr>
<tr>
<td>What are the WebSphere Application Server Versions Supported by the Script?</td>
<td>64</td>
</tr>
<tr>
<td>Clustered Environment</td>
<td>64</td>
</tr>
</tbody>
</table>

Appendix C: Troubleshooting

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed Instruction Set</td>
<td>67</td>
</tr>
<tr>
<td>Additional Troubleshooting</td>
<td>69</td>
</tr>
</tbody>
</table>

Index

<table>
<thead>
<tr>
<th>Index</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index</td>
<td>71</td>
</tr>
</tbody>
</table>
Chapter 1: Introduction

CA APM for IBM WebSphere Application Server Distributed is a CA APM extension, developed in cooperation with IBM, that provides advanced performance management for production WebSphere application server environments.

CA APM for IBM WebSphere Application Server Distributed monitors critical WebSphere application server resources, helps isolate application bottlenecks, and improves the availability of WebSphere application server and applications.

This section contains the following topics:

Using This Guide (see page 9)

Using This Guide

This guide provides instructions for setting up CA APM for IBM WebSphere Application Server Distributed, for example:

Install and Configure CA APM for IBM WebSphere Application Server Distributed (see page 12)

Provides information about the installation process for this extension.

Using CA APM for IBM WebSphere Application Server Distributed (see page 29)

Provides information about Workstation Investigator tab views and dashboards.

Metrics (see page 45)

Provides information about the metrics for this extension.
Chapter 2: Installing CA APM for IBM WebSphere Application Server Distributed

This chapter provides instructions for installing CA APM for IBM WebSphere Application Server Distributed.

This section contains the following topics:

Installation Requirements (see page 11)
Before You Begin (see page 11)
Install and Configure CA APM for IBM WebSphere Application Server Distributed (see page 12)

Installation Requirements

Verify that your environment includes a supported version of the IBM WebSphere Application Server Distributed.

Note: For more information about IBM WebSphere Application Server Distributed, visit www.ibm.com and www.ca.com/apm. For supported versions of IBM WebSphere Application Server Distributed, see the APM Extensions section of the Compatibility Guide.

Before You Begin

Identify the following directory locations in your Introscope environment before installation:

- The application server home directory—the home directory of your WebSphere Application Server, referred to in this guide as <WAS_Home>.
- The Wily directory—the directory where the agent is installed, referred to in this guide as <Agent_Home>.
- The CA APM directory—the directory where CA APM is installed, referred to in this guide as <EM_Home>.
Install and Configure CA APM for IBM WebSphere Application Server Distributed

The installation and configuration consists of the following steps, and are applicable for Windows or UNIX environments:

1. Running the Enterprise Manager installer from the appropriate installation archive.
2. Running the Java Agent Installer (see page 12) from the appropriate installation archive.
3. Configuring IntroscopeAgent.profile to report PMI metrics (see page 14).
4. Verifying if Service Integration Bus is enabled (see page 15).
5. Creating Custom Service and enable the PMI modules (see page 15).
6. Verifying the ORB interceptors metric collection (see page 27).

Running the Enterprise Installer

Run the Enterprise Manager installer to install CA APM for IBM WebSphere Application Server Distributed component files and the Enterprise Manager.

The installer places the files into the following directory:

<EM_Home>/examples/PowerPackForWAS_Distributed

Running the Java (In Process) Agent Installer

**Important**! Run the Java agent installer to install and configure agent information for CA APM for IBM WebSphere Application Server Distributed.

For more information about using the Java agent installer, see the *CA APM Java Agent Implementation Guide*.

Files Installed from the Agent Installer

The agent installer places the following files onto the application server in the <Agent_Home> directory.

If you enable CA APM for IBM WebSphere Application Server Distributed when using the agent installer, the installer copies the contents to the <Agent_Home> directory.
<table>
<thead>
<tr>
<th>File</th>
<th>Description</th>
<th>Installation Server</th>
<th>Installation Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>WebAppSupport.jar</td>
<td>Installation archive file that contains agent extensions.</td>
<td>WebSphere server</td>
<td>&lt;Agent_Home&gt;/wily/common</td>
</tr>
<tr>
<td>setPmiModules.jacl</td>
<td>Script to enable PMI modules for WebSphere.</td>
<td>WebSphere server</td>
<td>&lt;Agent_Home&gt;/tools</td>
</tr>
<tr>
<td>configurePMI.bat</td>
<td>Batch file for Windows that configures PMI modules by executing setPmiModules.jacl script.</td>
<td>WebSphere server</td>
<td>&lt;Agent_Home&gt;/tools</td>
</tr>
<tr>
<td>configurePMI.sh</td>
<td>Shell script for UNIX that configures PMI modules by executing setPmiModules.jacl script.</td>
<td>WebSphere server</td>
<td>&lt;Agent_Home&gt;/tools</td>
</tr>
<tr>
<td>listServers.bat</td>
<td>Batch file for Windows to retrieve a list of server instances for clustered environment.</td>
<td>WebSphere server</td>
<td>&lt;Agent_Home&gt;/tools</td>
</tr>
<tr>
<td>listServers.sh</td>
<td>Shell script for UNIX to retrieve server instances for clustered environment.</td>
<td>WebSphere server</td>
<td>&lt;Agent_Home&gt;/tools</td>
</tr>
</tbody>
</table>
**Configuring IntroscopeAgent.profile to report PMI metrics**

Perform the following procedure to set the properties in the `IntroscopeAgent.profile` file to enable PMI metrics reporting:

1. Open `IntroscopeAgent.profile` and set the following property:
   
   ```
   introscope.agent.pmi.enable=true
   ```

2. For each of the following PMI categories, ensure that the corresponding property is set to `true`.
   - `introscope.agent.pmi.enable.threadPool`
   - `introscope.agent.pmi.enable.servletSessions`
   - `introscope.agent.pmi.enable.connectionPool`
   - `introscope.agent.pmi.enable.bean`
   - `introscope.agent.pmi.enable.transaction`
   - `introscope.agent.pmi.enable.webApp`
   - `introscope.agent.pmi.enable.orbPerf`
   - `introscope.agent.pmi.enable.j2c`

3. To display SIBus related PMI metrics, add the following line at the end of the list:
   
   ```
   introscope.agent.pmi.enable.SIB\ Service=true
   ```

4. Optional: If you have CA APM for SOA to monitor WebSphere Process Server, also set:
   - `introscope.agent.pmi.enable.WBIStats.RootGroup=true`
   - `introscope.agent.pmi.enable.SCAStats.RootGroup=true`

5. Save `IntroscopeAgent.profile`.

6. This step is optional:
   
   If IBM adds a PMI module in the future, add an entry for the module to the existing list in `IntroscopeAgent.profile`.
   
   For example, if you add module `New Module`, add it to the existing list as follows:
   
   ```
   introscope.agent.pmi.enable.New\ Module=true
   ```
   
   Also, the module name is case-sensitive. If the module name has a space, use a backslash "\". For example:
   
   ```
   SIB\ Service
   ```

**Note:** In Linux environments the default SIB service name is StatGroup.SIBService. Add the property in the IntroscopeAgent.profile as follows:

```
introscope.agent.pmi.enable.StatGroup.SIBService=true
```
Verifying if Service Integration Bus is Enabled

To report Service Integration Bus (SIBus) PMI metrics, verify that SIBus Service is enabled in WebSphere Application Server Administrative Console.

**Note:** This Service can be enabled only if SIBus is configured in WebSphere Application Server.

Perform the following steps to verify that SIBus Service is enabled:
1. Open the Administrative Console of IBM WebSphere Application Server.
2. Click Servers > Application Servers on the left pane. A table that lists the available servers is displayed under Application Servers on the right pane.
3. Click the name of the server to configure.
5. Under General Properties, verify that the "Enable service at server startup" check box is selected.
6. Click OK.

Creating Custom Service and Enable the PMI Modules

Create custom service and enable PMI metrics in WebSphere Application Server using one of the following procedures:

- **Through Automated JACL scripts (Recommended)** (see page 15)
  
  **Note:** Using this script saves considerable time by not having to browse through the user interface to enable PMI modules. The PMI modules are enabled automatically through the script.

- **Through the WebSphere Application Server Administration Console (Manual setup)** (see page 21)

Through Automated JACL Scripts (Recommended)

For standalone servers, the `configurePMI` script configures the CA APM for IBM WebSphere Application Server Distributed custom service extension in WebSphere Application Server. The script enables PMI metrics without going through the WebSphere Application Server Administration Console user interface.
For a clustered environment, execute the listServers script before executing the configurePMI script. The listServers script takes `<Agent_Home>` as an argument and writes instance names of the servers in a cluster. These servers are configured with the Introscope Agent and running when the listServers script is executed to the `apply_profiles.properties` file. The servers that are listed in the `apply_profiles.properties` file are considered for configuring the custom service for this extension and enabling PMI metrics.

The JACL script enables selective metrics of PMI modules that are listed as follows:

- **Module Name:** J2C Module
  - **Metric Counter Ids:** 3,6,7,8,9,13,12

- **Module Name:** Bean Module
  - **Metric Counter Ids:** 10,27,26,12,29,32,25,9,33

- **Module Name:** SIB Service Module
  - **Metric Counter Ids:** 18,21,19,20,11,5,22,110,119,101,117,105,507,506,513,512,811,810,804,803,812,81,4,813,1556,1557,1558,1540,1001,1002,1003

- **Module Name:** JDBCConnectionPool Module
  - **Metric Counter Ids:** 3,6,22,12,13,7

- **Module Name:** Transaction Module
  - **Metric Counter Ids:** 4,18,6,5,19,7

- **Module Name:** ORBPerf Module
  - **Metric Counter Ids:** 3,1,2,11
■ **Module Name:**
    ServletSessions Module
    **Metric Counter Ids:**
    6,10,12,7,18

■ **Module Name:**
    ThreadPool Module
    **Metric Counter Ids:**
    3,1,2,5,4

■ **Module Name:**
    WebApp Module
    **Metric Counter Ids:**
    1,2,12,14

For detailed descriptions of the metric against the counter IDs, see:

■ **WebSphere Application Server 7.0**

The `setPmiModules.jacl` script is extracted as part of agent installation for CA APM for IBM WebSphere Application Server Distributed.

For Windows, `configurePMI.bat` and `listServers.bat` are extracted as part of agent installation for CA APM for IBM WebSphere Application Server Distributed.

For UNIX, `configurePMI.sh` and `listServers.sh` are extracted as part agent installation for CA APM for IBM WebSphere Application Server Distributed.

**For standalone environment**, [Execute configurePMI file](#) (see page 20).

**For clustered environment** perform the following steps:

1. [Execute listServers file](#) (see page 17).
2. [Execute configurePMI file](#) (see page 20).

### Execute listServers File

The `listServers` script can be executed from any server with an agent. Successful execution of this script creates the `apply_profiles.properties` file in the `<Agent_Home>` directory. The `apply_profiles.properties` file records instance names of the servers in a cluster that are configured with the agent and running when the `listServers` script gets executed.
<Agent_Home> is passed as an argument for the listServers script as follows:

- In a clustered environment: To write to apply_profiles.properties file in the <Agent_Home> directory.
- For a standalone server, to create the custom service: The extension-specific JAR file such as WebAppSupport.jar is searched for in the <Agent_Home> directory.
- For log files: The script.log file is written to <Agent_Home>/logs/script.log.

Execute the listServers script at least once for clustered environment to get the details of servers that are currently running in the cluster. After first execution, it is not necessary for you to execute it again on same server instance.

Perform the following steps to execute the listServers script:

**Note:** If you want to add server instances manually to the apply_profiles.properties file without executing the listServers script, see Optional: Adding details of Server instances manually (see page 19) for details.

1. Verify that all the servers that are intended to be configured with CA APM for IBM WebSphere Application Server Distributed are up and running while executing listServers script.
   
   **Note:** If the server is not up and running, it is not added to the apply_profiles.properties file.

   - For Windows, copy listServers.bat in the <WAS_Home>/profiles/<profile-name>/bin directory.
   - For UNIX, copy listServers.sh in the /<WAS_Home>/profiles/<profile-name>/bin directory.

2. Open the command prompt and navigate to the WebSphere Application Server <WAS_Home>/profiles/<profile-name>/bin directory. This server must be a member of the cluster.

3. Type the following command, substituting the path to your <Agent_Home> directory, and press ENTER.
   
   For Windows: listServers.bat <Agent_Home>
   
   For UNIX: listServers.sh <Agent_Home>
   
   **Important!** <Agent_Home> must be enclosed in quotes.

   For example:

   listServers.bat "C:\Program files\IBM\WebSphere\Appserver\wily"

   This command creates apply_profiles.properties file under the <Agent_Home> directory.

   A server instance is added in the following format to the apply_profiles.properties file:

   <serverName>=<cellName>|<nodeName>|<Agent_Home>
**Chapter 2: Installing CA APM for IBM WebSphere Application Server Distributed**

**Note:** | (pipe symbol) is the delimiter for the entries in the *apply_profiles.properties* file.

For example:

```
server1_WAS=cellwas61|nodewas61| C:/IBM/WebSphere/AppServer/wily/
```

You can comment an entry using the # symbol. The commented entries are not considered during the extension configuration.

For example, the following line is commented:

```
#server1_WAS=cellwas61|nodewas61| C:/IBM/WebSphere/AppServer/wily/
```

**Optional: Adding Details of Server Instances Manually**

You can also enter the details of the server instances manually into the *apply_profiles.properties* that is present in the `<Agent_Home>` directory. The entries must be in the following format:

```
<serverName>=<cellName>|<nodeName>|<Agent_Home>
```

where:

- **serverName** is the name of the server in the cluster to which the configurations have to be applied
- **cellName** is the cell name to which the server belongs
- **nodeName** is the node name to which the server belongs
- **<Agent_Home>** is the absolute path of the CA APM home directory where the server resides to which the configuration has to be applied

This path is used to create the custom service where the *WebAppSupport.jar* is required to add the custom service. The | (pipe symbol) is the delimiter for the entries of the property file.

**Note:** Only running instances of servers in a cluster with configured agents must be considered when you add them manually to the *apply_profiles.properties* file.

**Example of a manual entry in *apply_profiles.properties***:

- For Windows:

  ```
  server1_WAS=cellwas61|nodewas61| C:/IBM/WebSphere/AppServer/wily/
  ```

- For UNIX:

  ```
  server1_WAS=cellwas61|nodewas61|/usr/wily/
  ```
Execute configurePMI File

Perform the following steps to execute the `configurePMI` file and the JACL script to create custom service and enable PMI metrics:

**Note**: For clustered environments, perform the following steps from the profile where the agent is configured.

1. Copy the script to the bin directory:
   - For Windows, copy `configurePMI.bat` to the `<WAS_Home>/profiles/<profile-name>/bin` directory.
   - For UNIX, copy `configurePMI.sh` to the `/<WAS_Home>/profiles/<profile-name>/bin` directory.

2. Open the command prompt and navigate to the WebSphere Application Server `<WAS_Home>/profiles/<profile-name>/bin` directory.

3. Type the following command and press ENTER.
   - For Windows: `configurePMI.bat <Agent_Home>`
   - For UNIX: `configure.sh <Agent_Home>`

   **Note**: The `<Agent_Home>` path must be enclosed in quotes. For example:
   ```
   configurePMI.bat "C:/Program files/IBM/WebSphere/Appserver/Wily"
   ```

   - This command adds the custom service 
     `(com.wily.powerpack.websphere.agent.PPCustomService)`, and automatically enables the PMI metrics.

   - If the server instance already has a previous CA APM service
     `(com.wily.introscope.api.websphere.IntroscopeCustomService)`, the script disables this service. Then, the script creates a custom service, and automatically enables the PMI metrics.

   - If the custom service exists, the script automatically enables PMI modules and exits.

4. Restart the server.

   **Note**: Automated script operations are logged to `script.log` in the `<Agent_Home>/logs` directory on the server where the script is executed.

5. Optional: To verify that the custom service has been created and the PMI metrics have been enabled, follow these steps:
   a. Open the Administrative Console of IBM WebSphere Application Server.
   b. Navigate to Servers > Applications Servers > `<Server_Name>` > Performance > Performance Monitoring Infrastructure (PMI).
   c. Click the Runtime tab and verify if the PMI metrics are enabled.

   Refer to [Metrics](see page 45) for the entire list of metrics.
Install and Configure CA APM for IBM WebSphere Application Server Distributed

Chapter 2: Installing CA APM for IBM WebSphere Application Server Distributed

Through the WebSphere Application Server Administration Console (Manual setup)

This procedure consists of the following steps:

1. Configure the Custom Service
2. Enable PMI module through WebSphere Application Server Administration Console (see page 22)
3. Enable the SIBus related metrics (see page 25)

Important: SIB Service cannot be configured from the Configuration tab. SIB Service can only be configured from the Runtime tab. See the Readme file for further details.

Configure a Custom Service in WebSphere

You can create or modify a custom service in the WebSphere Application Server. The custom service enables the Java agent to collect additional information from the application server. If you configure a custom service, the Java agent can automatically determine its name. The custom service also enables the Java agent to report JMX and Performance Monitoring Infrastructure (PMI) metrics. The Introscope Workstation on the Application Overview tab uses these metrics to determine application health.

Note: To view SIBus metrics or new PMI modules, disable the existing Custom Service and then create a Custom Service.

Follow these steps:

1. Open the WebSphere Administrator Console.
2. Select the server that you want to configure and navigate to Server Infrastructure > Administration > Custom Services.
3. Modify the custom service that you want or create one.
4. Complete the following fields on the Configuration page and click OK.

   - **Enable service at server startup**
     Specifies that the service starts during the server startup.

   - **Classname**
     Specifies the name of the custom service class.
     com.wily.introscope.api.websphere.IntroscopeCustomService
Install and Configure CA APM for IBM WebSphere Application Server Distributed

**Display Name**

Specifies the name to display in CA Introscope®, for example: Introscope Custom Service.

**Classpath**

Specifies the fully qualified pathname of the properties file, for example:

<Agent_Home>/wily/common/WebAppSupport.jar

5. Restart the application server.

**Enable PMI Module Through WebSphere Application Server Administration Console**

Perform the following steps to enable the PMI module:

1. Open the Administrative Console of IBM WebSphere Application Server.

2. Click Servers > Application Servers on the left pane.

   A table that lists the available servers is displayed under Application Servers on the right pane.

3. Click the name of the server to configure.

   The Application Servers dialog appears with two tabs, namely, Runtime and Configuration. The Configuration tab is active by default.

4. Under Performance, click Performance Monitoring Infrastructure (PMI).

   The General Properties dialog appears.

5. Ensure that you select the Enable Performance Monitoring Infrastructure (PMI) check box.


   On the Configuration tab, the tree structure of PMI modules is displayed in the left pane. When you select a module, the metrics are displayed in the right pane.
7. To enable metrics for a module, click the module link in the left pane. And in the table on the right, select the check boxes next to the metrics in the Select column and click Enable.
   
a. For the Enterprise Beans PMI module, click Enterprise Beans, select the following metrics and click Enable at the top of the table:
   - LiveCount
   - LoadTime
   - MessageBackoutCount
   - MessageCount
   - MethodResponseTime
   - PooledCount
   - ReadyCount
   - ServerSessionPoolUsage
   - StoreTime

b. For the JDBC Connection Pools PMI module, click JDBC Connection Pools, select the following metrics, and click Enable at the top of the table:
   - AllocateCount
   - FreePoolSize
   - JDBCTime
   - UseTime
   - WaitTime
   - WaitingThreadCount

c. For the JCA Connection Pools PMI module, click JCA Connection Pools, select the following metrics, and click Enable at the top of the table:
   - AllocateCount
   - FaultCount
   - FreePoolSize
   - PercentUsed
   - UseTime
   - WaitingThreadCount
   - WaitTime

d. For the ORB PMI module, click ORB, select the following metrics, and click Enable at the top of the table:
   - ConcurrentRequestCount
   - LookupTime
■ ProcessingTime
■ RequestCount

e. For the Servlet Session Manager PMI module, click Servlet Session Manager, select the following metrics, and click Enable at the top of the table:
■ ActiveCount
■ ExternalReadTime
■ ExternalWriteTime
■ LiveCount
■ SessionObjectSize

f. For the Thread Pools PMI module, click Thread Pools, select the following metrics, and click Enable at the top of the table:
■ ActiveCount
■ CreateCount
■ DestroyCount
■ PercentMaxed
■ PoolSize

g. For the Transaction Manager PMI module, click Transaction Manager, select the following metrics, and click Enable at the top of the table:
■ ActiveCount
■ GlobalTimeoutCount
■ GlobalTranTime
■ LocalActiveCount
■ LocalTimeoutCount
■ LocalTranTime

h. For the Web Applications PMI module, click Web Applications, select the following metrics, and click Enable at the top of the table:
■ ConcurrentRequests
■ ErrorCount
■ LoadedServletCount
■ ReloadCount

8. Click Save at the top of the window.
Enable the SIBus Metrics

**Note:** SIBus related metrics can be enabled only if SIBus is configured in WebSphere Application Server.

Perform the following steps to enable SIBus related metrics:

1. Open the WAS Administrative Console of IBM WebSphere Application Server.
2. Click Servers > Application Servers on the left pane.
   - A table that lists the available servers is displayed under Application Servers on the right pane.
3. Click the name of the server to configure.
   - The Application Servers dialog appears with two tabs, namely, Runtime and Configuration. The Configuration tab is active by default.
4. Under Performance, click Performance Monitoring Infrastructure (PMI).
5. Click the Runtime tab page.
   - The General Properties dialog appears.
6. Ensure that you select the Persist my changes check box.
7. Under the Currently monitored statistic set, click Custom.
   - On the Runtime tab, the tree structure of PMI modules is displayed in the left pane. When you select a module, metrics are displayed in the right pane.
8. To enable SIB metrics, click the SIB Service link in the left pane and select the module to configure. To enable a metric for the module, in the table on the right, select the check box for the metric in the Select column and click Enable.

a. For Queues, click SIB Messaging Engines > <bus instance name> > Destinations > Queues. Select the following metrics and click Enable at the top of the table:
   - QueueStats.AggregateMessageWaitTime
   - QueueStats.AvailableMessageCount
   - QueueStats.LocalMessageWaitTime
   - QueueStats.LocalOldestMessageAge
   - QueueStats.TotalMessagesConsumedCount
   - QueueStats.TotalMessagesProducedCount
   - QueueStats.UnavailableMessageCount

b. For Topicspaces, click SIB Messaging Engines > <bus instance name> > Destinations > Topicspaces. Select the following metrics and click Enable at the top of the table:
   - TopicspaceStats.AssuredPersistentMessagesPublishedCount
   - TopicspaceStats.IncompletePublicationCount
   - TopicspaceStats.LocalPublisherCount
   - TopicspaceStats.ReportEnabledPublicationExpiredCount
   - TopicspaceStats.TotalMessagesPublishedCount

c. For Mediations, click SIB Messaging Engines > <bus instance name> > <application mediation name>. Select the following metrics and click Enable at the top of the table:
   - MediatedMessagesCount
   - MediationTime

d. For Data Store, click SIB Messaging Engines > <bus instance name> > Storage Management > Data Store. Select the following metric and click Enable at the top of the table:
   - MessageStoreStats.JDBCOpenCount

e. For File Store, click SIB Messaging Engines > <bus instance name> > Storage Management > File Store. Select the following metrics and click Enable at the top of the table:
   - MessageStoreStats.FileStoreLogSpace
   - MessageStoreStats.FileStorePermanentObjectStoreSpace
   - MessageStoreStats.FileStoreTemporaryObjectStoreSpace
Install and Configure CA APM for IBM WebSphere Application Server Distributed

Chapter 2: Installing CA APM for IBM WebSphere Application Server Distributed

f. For Messaging Engines, click SIB Communications > Messaging Engines > Standard Statistics. Select the following metrics and click Enable at the top of the table:
   ■ MEStats.MessageBytesReadCount
   ■ MEStats.MessageBytesWrittenCount
   ■ MEStats.ReadsBlockedCount
   ■ MEStats.WritesBlockedCount

g. For WMQ Links, click SIB Communications > WMQ Links > Standard Statistics. Select the following metrics and click Enable at the top of the table:
   ■ MQLinkStats.CommsErrorsCount
   ■ MQLinkStats.LongRetriesCount
   ■ MQLinkStats.MessagesReceivedCount
   ■ MQLinkStats.MessagesSentCount
   ■ MQLinkStats.QMAttachedCount
   ■ MEStats.ReadsBlockedCount
   ■ MEStats.WritesBlockedCount

You have now enabled the SIBus modules in WebSphere Application Server Administrative Console.

9. Click OK and restart the application server.

Verifying the ORB Interceptors Metric Collection

The ORB Interceptors Processing Time metric must be enabled.

Verify that the metric is enabled, and perform the following steps:

1. Open the Administrative Console of IBM WebSphere Application Server.
2. Click Servers > Application Servers on the left pane.
   A table that lists the available servers is displayed under Application Servers on the right pane.
3. Click the name of the server to configure.
   The Application Servers dialog appears with two tabs, namely, Runtime and Configuration. The Configuration tab is active by default.
4. Under Performance, click Performance Monitoring Infrastructure (PMI).
5. Click the Runtime tab.
   The General Properties dialog appears.
6. Under the Currently monitored statistic set, click Custom.

On the Runtime tab, the tree structure of PMI modules is displayed in the left pane. When you select a module, the metrics are displayed in the right pane.

7. Click ORB > Interceptors.

8. In the table on the right, verify that the Status of the ProcessingTime displays is Enabled. If not, select the check box for ProcessingTime metric in the Select column and click Enable at the top of the table.
Chapter 3: Using CA APM for IBM WebSphere Application Server Distributed

This chapter discusses how to use CA APM for IBM WebSphere Application Server Distributed.

This section contains the following topics:

Views Enabled by This Extension (see page 29)
Viewing PMI Metrics in the Introscope Investigator (see page 30)
Using Investigator Tabs (see page 30)
Dashboards and the Investigator (see page 37)

Views Enabled by This Extension

CA APM for IBM WebSphere Application Server Distributed allows you to view metrics in the Workstation Investigator and Workstation Console. For general information about using the Workstation, see the CA APM Workstation User Guide.

To see these standard views:

1. Verify that Enterprise Manager is running.
2. Start Workstation and log in to the Enterprise Manager.
3. Navigate to the Introscope Investigator.
   Metrics that are specific to WebSphere Application Server appear in the Metric Browser tree, under the WebSpherePMI node.
4. Open the Workstation Console.
   The extension provides a number of preconfigured dashboards for displaying WebSphere Application Server performance metrics.

See Viewing PMI metrics in the Introscope Investigator (see page 30) for the full list of WebSphere Application Server performance metrics.
Viewing PMI Metrics in the Introscope Investigator

The following WebSphere Application Server PMI Metrics appear under a WebSpherePMI node in the Metric Browser tree:

- **SIB Service**—Metrics include Queues, Topics, Messaging Engine, WMQ Links, Persistence, and Mediations. Examples include PercentUsed, MEStats.MessageBytesReadCount, MEStats.MessageBytesWrittenCount, and Mediation Time. Information is provided for SIBus Service module and related metrics.

- **Enterprise bean module**—Metrics include load values, response times, and lifecycle activities for enterprise beans. Examples include the average number of active beans and the number of times bean data is loaded or written to the database. Information is provided for enterprise bean methods and the remote interfaces for the enterprise bean. For example, the number of times a method is called and the average response time for the method.

- **JDBC and JCA connection pools**—Connection pool Metrics include the average size of a connection pool, the number of connections, the average number of threads waiting for a connection, the average wait time in milliseconds for a connection, and the average time for the connection.

- **Servlet session manager**—HTTP session Metrics include the total number of accessed sessions, the average amount of time it takes for a session to perform a request, and the average number of concurrently active HTTP sessions.

- **Thread pool**—Metrics are reported for Object Request Broker (ORB) threads and the Web container pools to process HTTP requests. Examples include the number of threads that were created and destroyed, the maximum number of pooled threads allowed, and the average number of active threads in the pool.

- **Java Transaction API (JTA)**—JTA Metrics include the average number of active transactions, the average duration of transactions, and the average number of methods per transaction.

- **Web applications (Web Container)**—Web application Metrics include the number of loaded servlets, the average response time for completed requests, and the number of requests for the servlet.

- **Object Request Broker (ORB)**—ORB Metrics include the object reference lookup time, the total number of requests, and the processing time for each interceptor.

Using Investigator Tabs

You can change the view that is presented in the Investigator Viewer pane using the tabs at the top pane. The tabs available vary, depending on the resource or Metric currently selected in the Investigator tree. Tabs available for the WebSphere PMI node are General, Traces, Search, Metric Count, AppServer, and SIB.
AppServer Tab View

The AppServer tab view is specific to this extension. This tab is available when you select the WebSpherePMI node in the Investigator tree. The page dynamically reports on key indicators of application server resources and availability:

- **HTTP Session Count**—The number of local servlet sessions that are currently cached in memory, presented in graphical form. This number corresponds to the value of the servletSessionsModule:LiveCount Metric.

- **ThreadPool Availability**—The average percent of the time that all threads are in use, which corresponds to the value of the threadPoolModule:PercentMaxed Metric. The value is displayed graphically and a traffic light reflects status.

- **JDBC Connection Pool Availability**—The average waiting time in milliseconds until a connection is granted, which corresponds to the connectionPoolModule:WaitTime Metric. The value is displayed graphically and a traffic light reflects status.

SIB Service Overview

To see the SIB service overview tab:

1. Select WebSpherePMI.
2. Select the SIB tab.

This view displays key indicators of SIBus Service such as Destinations, WMQ Links, and Persistence. The SIB Service overview displays the following metrics over time:

- JDBC connections open for a Messaging Engine.
- Space in bytes left in the File Store log file.
- Time by messages in the SIB bus at consumption.
- Number of communication errors in a network connection due to a WebSphere MQ Queue Manager being disconnected.
- Average percent of the J2C connection pool that is in use.
- Aggregate of concurrent live Message Driven Beans (MDB).
SIB Service Views

To see SIB Service metrics:
1. Click the WebSpherePMI > SIB Service node.
2. Click the tabs to view details about Destinations, Mediations, Messaging Engines, WMQ Links, and Persistence of all the buses.

Note: When you navigate to any node under the SIB Service node, the view for that node is displayed in the viewer pane of the Investigator.

Destinations view

When you click a Queue and a corresponding metric for the Queue, the data for that metric is displayed in a graphical format. Similarly, when you click a Topicspace and a corresponding metric for the Topic space, the data for that metric is displayed in a graphical format.

Note: In the Destinations view, you see the Queues and Topicspaces for all the buses. When you navigate to an individual bus, the queues and topicspaces for that bus are displayed. And the name of the messaging engine for the bus is displayed in the top panel of the typeview.

Data for an individual bus

Navigate through the Metric Browser tree to see data for an individual bus. For example, WebSpherePMI > SIB Service > SIB Messaging Engine > <name of the bus> > Destinations > Queues. All the queues for the particular bus are displayed.

This view displays queues the counters use for monitoring the performance of the queues configured in the SiBus.

QueueStats.AggregateMessageWaitTime

This metric represents the time by messages in the bus at consumption. If this time is more than expected, view the message through the IBM Administrative console to see the details.

QueueStats.AvailableMessageCount

This metric represents the number of messages available for a queue for consumption. If this number is close to the destination high messages threshold value, review the high messages threshold value through the IBM Administrative console.
QueueStats.LocalOldestMessageAge

This metric is the time that a message has been in the queue. If this time is more expected, view the message through the IBM Administrative console to see the details.

Navigate through the Metric Browser tree to see data for an individual bus. For example, WebSpherePMI > SIB Service > SIB Messaging Engine > <name of the bus> > Destinations > Topicspace. All the topicspaces for the particular bus are displayed.

TopicspaceStats.IncompletePublicationCount

This metric is the number of publications that are not received for all current subscribers. If this number is unexpected, view the publication through the IBM Administrative console.

LocalOldestPublicationAge

This metric represents the time that a publication has spent on this topicspace. If this time was expected, view the message through the IBM Administrative console.

Mediations view

- Click WebSpherePMI > SIB Service. On the right pane, click Mediations.

This typeview displays the number of messages that have been mediated, and the time in milliseconds to mediate a message at a mediated destination.

Note: On the Mediations view, when you navigate to an individual bus, the mediations for that bus are displayed. And the name of the messaging engine for the bus is displayed in the top panel of the typeview.

Persistence view

- Click WebSpherePMI > SIB Service. On the right pane, click Persistence.

Service integration bus destinations can be configured as mediated destinations. A new mediation point is associated with the destination. Mediation problems are by the following symptoms:

- The application does not consume the mediated messages.
- Messages are mediated incorrectly.
- Messages are mediated, but slowly.

These problems can lead to a continuous increase in message depth, without any indication of the messages being processed. This results in a drop in values of MediatedMessagesCount metric.

There could be two primary reasons: messages are queued on the correct destination but are waiting to be mediated, or messages are being sent to wrong destination. A diagnosis is required to determine what is causing the messages to wait.
This view displays Data Store metrics such as Open JDBC Counts, and File Store metrics such as the log and storage space counts.

**Note:** When you navigate to an individual bus, the data store and filestore metrics for that bus are displayed.

WebSphere Application Server provides two configuration options for storing persistent message data:

- **File Store:** This mechanism uses flat files on a local or remote file system to store all persistent data.
- **Data Store:** This mechanism lets you use an existing relational database management system (RDBMS) to store all persistent data.

Navigate through the investigator tree to see data store metrics for the individual bus. For example, WebSpherePMI > SIB Service > SIB Messaging Engine > <name of the bus> > Storage Management > Data Store. All the data store metrics for the particular bus are displayed.

This view displays the data store counters for monitoring performance of data store persistent mechanism. A data store uses an existing RDBMS to store all persistent data for the WebSphere Application Server default messaging system.

**MessageStoreStats.JDBCOpenCount**

This metric represents the number of JDBC connections open for a messaging engine. If the messaging engine encounters a limitation in the size of the connection pool for the data source, a timeout message appears. This problem can be fixed by configuring the size of your connection pool to ensure that database supports the required number of concurrent sessions.

**Filestore metrics**

Navigate through the Metric Browser tree to see filestore metrics for an individual bus. For example, WebSpherePMI > SIB Service > SIB Messaging Engine > <name of the bus> > Storage Management > File Store. All the filestore metrics for the particular bus are displayed.
WebSphere Application Server uses flat files, on a local, or remote file system, to store all persistent data for the WebSphere Application Server default messaging system. Filestore is the default persistence mechanism for new messaging engines that the user creates. Log, Permanent Object Store, and Temporary Object Store are three files which make up a working filestore.

Problems with filestore include running out of space in filestore files. MessageStoreStats.FileStoreLogSpace, MessageStoreStats.FileStorePermanentObjectStoreSpace, and MessageStoreStats.FileStoreTemporaryObjectStoreSpace represent the space left in bytes in respective filestore files and can be used to tune the sizes of files to match the requirements of the workload.

**Messaging Engines view**

A messaging engine is a component of the WebSphere Application Server providing messaging functionality within an SIBus.

- Click WebSpherePMI > SIB Service. On the right pane, click Messaging Engines.

This view displays metrics for all messaging engines connected the application server such as the number of bytes read and written to the messaging engine.

**MEStats.MessageBytesReadCount and MEStats.MessageBytesWrittenCount**

These metrics denote the number of bytes of message data received from, or sent to the application server processes, respectively, hosting messaging engines over network connections.

**MEStats.ReadsBlockedCount and MEStats.WritesBlockedCount**

These metrics denote number of read or write operations, respectively, that could not be completed immediately. This number can be used as an indicator of network congestion when communicating with the application server processes hosting messaging engines.

**WMQ Links typeview**

- Click WebSpherePMI > SIB Service. On the right pane, click WMQ Links.

This view displays metrics for the WebSphere MQ Links, such as the number of messages that are sent and received, and the errors during communication. You can identify problems for the WebSphere MQ link component of the default messaging provider in WebSphere Application Server.
Using Investigator Tabs

**MQLinkStats.CommsErrorsCount**

This metric signifies number of communication errors that resulted in a network connection to a WebSphere MQ Queue Manager being disconnected.

**MQLinkStats.LongRetriesCount**

This metric signifies number of long retries. This metric indicates the number of times sender and receiver channels were disconnected and could not be reestablished for longer periods of time.

**MQLinkStats.QMAttachedCount**

This metric represents the total number of WebSphere MQ Queue Managers currently network-attached to the current application server.

**MEStats.ReadsBlockedCount and MEStats.WritesBlockedCount**

These metrics represent number of read or write operations, respectively, that could not be completed immediately. This number can be used as an indicator of network congestion when communicating with WebSphere MQ Queue Managers.

### Bean Module

To see metrics for Enterprise Java Beans:

- Click WebSpherePMI > beanModule

Data counters for this category reports load values, response times, and lifecycle activities for enterprise beans.

This view displays the performance metrics for Enterprise Java Beans (EJB). EJBs include Entity Beans, Session Beans and Message Driven Beans (MDB). Message-driven beans (MDBs) are EJBs that connect to a messaging engine and act as message consumers.

**LiveCount**

This metric represents the number of concurrent live beans. If the number of concurrent live message-driven beans exceeds the maximum number of concurrent MDB instances, increase the maximum concurrency setting.
**J2C Module**

To see metrics for Connection Pools:
- Click WebSpherePMI > j2cModule

The metrics in this view include:
- The average size of a connection pool.
- The number of connections.
- The average number of threads waiting for a connection.
- The average wait time in milliseconds for a connection.
- The average time the connection is in use.

**FreePoolSize**

This metric represents number of free connections in the J2C connection pool.

**WaitingThreadCount**

This metric represents average number of threads concurrently waiting for a connection per connection factory.

**WaitTime**

This metric represents average waiting time in milliseconds until a connection is granted.

When you see high values for *WaitingThreadCount* and *WaitTime*, review the total number of connections per pool.

**Dashboards and the Investigator**

All the dashboards for CA APM for IBM WebSphere Application Server Distributed begin with "WebSphere Distributed" to distinguish them from dashboards from other Management Modules already installed in Introscope.

The dashboards contain visual elements like alert indicators and graphs that display performance metrics specific to WebSphere Application Server that is being monitored.

Alert indicators indicate if metrics have exceeded predefined thresholds. Graphs display metric values over time. Alerts occur when warning and danger threshold levels are triggered.
To view CA APM for IBM WebSphere Application Server Distributed dashboards:

1. Launch APM Workstation.
2. Open the Workstation Console window.

The extension provides preconfigured dashboards for displaying WebSphere Application Server performance metrics.

- WebSphere Distributed - EJB Container
- WebSphere Distributed - EJB Pools
- WebSphere Distributed - J2C Connection Pools
- WebSphere Distributed - JDBC Connection Pools
- WebSphere Distributed - JTA
- WebSphere Distributed - Message Driven Beans
- WebSphere Distributed - Messaging Engines
- WebSphere Distributed - ORB
- WebSphere Distributed - Overview
- WebSphere Distributed - SIB Overview
- WebSphere Distributed - Servlet Sessions
- WebSphere Distributed - Thread Pools
- WebSphere Distributed - Web Container
- WebSphere Distributed - WebSphere MQ Links

**WebSphere Distributed - EJB Container**

The WebSphere - EJB Container dashboard contains the following graphs that show the performance of the EJB Container:

- Health and Performance
  - Concurrent Live Bean Count
  - Ready Bean Count
  - Persist Entity Bean Time
  - Restore Entity Bean Time
WebSphere Distributed - EJB Pools

The WebSphere - EJB Pools dashboard contains the following graphs that show the performance of the EJB Pools:

- Tuning Message Driven Bean Pools
  - Average Wait Time
  - Pool Usage %
- Health of the Pools (Entity & Stateless)
  - Average Pool Size

WebSphere Distributed - J2C Connection Pools

The WebSphere – J2C Connection Pools dashboard contains the following graphs that show the performance of J2C Connection Pools:

- Tuning J2C Connection Pools
  - Pools Availability
- Health and Performance
  - Allocated Connections
  - Fault Count
- Applications' Usage of the Connection Pools
  - Average Wait Time
  - Waiting Thread Count
  - Average Connection Use Time

WebSphere Distributed - JDBC Connection Pools

The WebSphere - JDBC Connection Pools dashboard contains the following graphs that show the performance of JDBC Connection Pools:

- Tuning JDBC Connection Pools
  - Pools Availability
- Health and Performance
  - Allocated JDBC Connections
  - JDBC Drivers Operation Time
■ Applications’ Usage of the Connection Pools
  ■ Average Wait Time
  ■ Waiting Request Count
  ■ Average Connection In-Use Time

**WebSphere Distributed - JTA**

The WebSphere - JTA dashboard contains the following graphs that show the performance of the JTA Java Transaction API (Transaction Manager):

■ Global Transaction Performance
  ■ Active Global Transaction Count
  ■ Global Transaction Process Time
  ■ Global Transaction Timeout Count

■ Local Transaction Performance
  ■ Active Local Transaction Count
  ■ Local Transaction Process Time
  ■ Local Transaction Timeout Count

**WebSphere Distributed - Message Driven Beans**

The WebSphere - Message Driven Beans dashboard contains the following graphs that show the health and performance of Message Driven Beans:

■ Health and Performance:
  ■ Method Response Time
  ■ Message Count
  ■ Live Count
  ■ Message Backout Count
WebSphere Distributed - Messaging Engines

The WebSphere - Messaging Engines dashboard contains the following graphs that show the performance of Messaging Engines:

- Health and Performance of Destinations and Mediations:
  - Queues - Available Message Count
  - Topic Spaces - Incomplete Publication Count
  - Mediations - Mediation Time

- Tuning Persistent Storage
  - File Store - Temporary Storage Space
  - File Store - Permanent Storage Space
  - Data Store - Open JDBC Count

WebSphere Distributed - ORB

The WebSphere - ORB dashboard contains the following graphs that show the performance of Object Request Broker (ORB):

- Health and Performance
  - Reference Lookup Time
  - Interceptors' Process Time
  - Concurrent Request Count
  - Total Request Count

- ORB Thread Pool
  - % of Maximum Usage
  - Active Thread Count

WebSphere Distributed - Overview

The WebSphere - Overview dashboard is the top-level dashboard showing the overall health of the WebSphere Application Server. The Overview dashboard monitors WebSphere Application Server resources in three categories labeled: Thread Pool Usage, JDBC Connection Pool Availability, and Active Servlet Session Count. A SIB Overview link has been provided to navigate to the SIB Overview dashboard. Traffic light viewers show the status at a glance.

The Overview dashboard contains operational notes explaining the meaning of a red (danger) alert indicator with suggestions for corrective action.
To find out more about the performance of different WebSphere Application Server subsystems, use one of the secondary dashboards to drill down into that particular subsystem.

On the WebSphere - Overview dashboard, click any of the alert indicators to jump to the related dashboard.

**WebSphere Distributed - SIB Overview**

SIB Overview dashboard shows the overall health of Service Integration Bus (SIBus). SIB Overview dashboard monitors SIBus resources in categories labeled:

- MDB – Live Count
- Messaging Engines – Aggregate Message Wait Time
- SIB Resource Adapter Pool – Percent Used and Free Pool Size
- MQ Links – Communication Errors Count and Messages Sent/Received Count.

Traffic light viewers show the status at a glance.

To find out more about performance of different SIBus components, use secondary dashboards to drill down to individual subsystems.

Click any alert indicator to jump to the related dashboard.

**WebSphere Distributed - Servlet Sessions**

The WebSphere - Servlet Sessions dashboard contains the following graphs that show the performance of Servlet Sessions:

- Tuning System Resources For Servlet Sessions
  - Active Session Count
  - In-Memory Session Count
  - Session Object Size
- Performance of Persistence Storage
  - Average Persist Session Time
  - Average Restore Session Time
- Servlet Thread Pool
  - % of Maximum Usage
  - Active Thread Count
**WebSphere Distributed - Thread Pools**

The WebSphere - Thread Pools dashboard contains the following graphs that show the performance of Thread Pools:

- Tuning Thread Pools
  - % of Maximum Usage
- Health and Performance:
  - Active Thread Count
  - Thread Pools Size
  - Created Thread Count
  - Destroyed Thread Count

**WebSphere Distributed - Web Container**

The WebSphere - Web Container dashboard contains the following graphs that show the health and performance of the Web Container:

- Health and Performance:
  - Concurrent Servlet Request Count
  - Servlet/JSP Error Count
  - Loaded Servlet Count
  - Servlet Reload Count

**WebSphere Distributed - WebSphere MQ Links**

The WebSphere Distributed - WebSphere MQ Links dashboard contains the following graphs that show the performance of MQ Links:

- Health and Performance
  - Communication Errors Count
  - Long Retries Count
  - Queue Managers Attached Count
- Application's Usage of WebSphere MQ Links
  - Messages Sent/Received
  - Reads Blocked Count
  - Writes Blocked Count
Customizing Alerts

CA APM for IBM WebSphere Application Server Distributed is shipped with default caution or danger alert thresholds for many of the performance metrics displayed in dashboards. See the CA APM Workstation User Guide for information about customizing these alerts and thresholds.

**Note:** Thresholds for alerts in Investigator tab views cannot be customized.
Appendix A: Metrics

This chapter describes the extension metrics. All metrics appear in the Introscope Investigator under the WebSpherePMI node in the format:

<modulename>|<metricname>

The topics in this chapter describe the metric names per module, and their definitions.

Note: For more information about PMI metrics, visit the IBM WebSphere Application Server site at www.ibm.com.

Enterprise Beans Module

Data counters for this category reports load values, response times, and lifecycle activities for enterprise beans. Examples include the average number of active beans and the number of times bean data is loaded or written to the database. Information is provided for enterprise bean methods and the remote interfaces for an enterprise bean. Examples include the number of times a method is invoked, and the average response time for the method.

- Metric:
  LiveCount
  Description:
  Number of concurrent live beans. The average time in milliseconds for loading the bean data from persistent storage (entity).

- Metric:
  MessageBackoutCount
  Description:
  The number of messages that failed to be delivered to the bean on Message method (message driven beans).

- Metric:
  MessageCount
  Description:
  The number of messages that are delivered to the bean on Message method (message driven beans).
■ Metric:
  MethodResponseTime
  Description:
  The average response time in milliseconds on the bean methods (home, remote, local).

■ Metric:
  PooledCount
  Description:
  The number of objects in the pool (entity and stateless).

■ Metric:
  ReadyCount
  Description:
  The number of bean instances in ready state.

■ Metric:
  ServerSessionPoolUsage
  Description:
  The percentage of the server session pool in use (message driven).

■ Metric:
  StoreTime
  Description:
  The average time in milliseconds for storing the bean data to persistent storage (entity).
JDBC Connection Pool Module

Data counters for this category contain usage information about connection pools for a database. Examples include:

- The average size of the connection pool or number of connections
- The average number of threads waiting for a connection
- The average wait time in milliseconds for a connection
- The average time the connection is in use.

- **Metric:** AllocateCount
  - **Description:** Total number of connections allocated.

- **Metric:** FreePoolSize
  - **Description:** Number of free connections in the pool.

- **Metric:** JDBCTime
  - **Description:** Time (in milliseconds) spent running in the JDBC driver (includes time spent in the JDBC driver, network, and database).

- **Metric:** UseTime
  - **Description:** Average time a connection is used. Difference between the time at which the connection is allocated and returned. This value includes the JDBC operation time.

- **Metric:** WaitingThreadCount
  - **Description:** Number of threads that are currently waiting for a connection.

- **Metric:** WaitTime
  - **Description:** Average waiting time (in milliseconds) until a connection is granted.
Java Transaction API (JTA) Module

Data counters for this category contain performance information for the transaction manager. Examples include the average number of active transactions, the average duration of transactions, and the average number of methods per transaction.

- **Metric:**
  - **ActiveCount**
  - **Description:**
    Number of concurrently active global transactions.

- **Metric:**
  - **GlobalTimeoutCount**
  - **Description:**
    Number of global transactions timed out.

- **Metric:**
  - **GlobalTranTime**
  - **Description:**
    Average duration of global transaction.

- **Metric:**
  - **LocalActiveCount**
  - **Description:**
    Number of concurrently active local transactions.

- **Metric:**
  - **LocalTimeoutCount**
  - **Description:**
    Number of local transactions timed out.

- **Metric:**
  - **LocalTranTime**
  - **Description:**
    Average duration of local transactions.
Object Request Broker (ORB) Module

Data counters for this category contain information for the ORB. Examples include the object reference lookup time, total number of requests, and processing time for each interceptor.

- **Metric:** ConcurrentRequestCount  
  **Description:** Number of requests that the ORB concurrently processes.

- **Metric:** LookupTime  
  **Description:** The time (in milliseconds) to look up an object reference before method dispatch can be carried out.

- **Metric:** ProcessingTime  
  **Description:** The time (in milliseconds) it takes a registered portable interceptor to run.

- **Metric:** RequestCount  
  **Description:** Total number of requests the ORB receives.

Servlet Session Manager Module

Data counters for this category contain usage information for HTTP sessions. Examples include:

- Total number of accessed sessions
- Average amount of time it takes for a session to perform a request
- Average number of concurrently active HTTP sessions

- **Metric:** ActiveCount  
  **Description:** Number of concurrently active sessions. A session is active if the WebSphere Application Server is currently processing a request that uses that session.
Metric: ExternalReadTime

Description:
Time (milliseconds) taken in reading the session data from the persistent store. For multirow sessions, the metrics are for the attribute; for single row sessions, the metrics are for the entire session. Applicable only for persistent sessions. When using a JMS persistent store, you can serialize the replicated data. The counter shows only for serialized data.

Metric: ExternalWriteTime

Description:
Time (milliseconds) taken to write the session data to the persistent store. Applicable only for (serialized) persistent sessions. Similar to ExternalReadTime.

Metric: LiveCount

Number of sessions that are currently cached in memory.

Metric: SessionObjectSize

Description:
The size in bytes of (the serializable attributes of) in-memory sessions. Only session objects that contain at least one serializable attribute object is counted. A session can contain some attributes that are serializable and some that are not. The size in bytes is at a session level.

Thread Pool Module

Data counters for this category contain information about the thread pools for Object Request Broker (ORB) threads, and the Web container pools for processing HTTP requests. Examples include:

- Number of threads that are created and destroyed
- Maximum number of pooled threads allowed
- Average number of active threads in the pool

Metric: ActiveCount

Description:
Number of concurrently active threads.
- **Metric:** CreateCount
  **Description:** Total number of threads created.

- **Metric:** DestroyCount
  **Description:** Total number of threads destroyed.

- **Metric:** PercentMaxed
  **Description:** Average percent of the time that all threads are in use.

- **Metric:** PoolSize
  **Description:** Average number of threads in the pool.

### JCA Connection Pools

The metrics include:

- Average size of a connection pool
- Number of connections
- Average number of threads waiting for a connection
- Average wait time in milliseconds for a connection
- Average time the connection is in use

- **Metric:** AllocateCount
  **Description:** The total number of times that a managed connection is allocated to a client (the total is maintained across the pool, not per connection).
- **Metric:** FaultCount
  **Description:** Number of faults like timeouts.

- **Metric:** FreePoolSize
  **Description:** Number of Connections free in the pool.

- **Metric:** PercentUsed
  **Description:** Average percent of the pool that is in use. The value is the total number of configured connections in the ConnectionPool, not the current number of connections.

- **Metric:** UseTime
  **Description:** Average time in milliseconds that connections are in use.

- **Metric:** WaitingThreadCount
  **Description:** Number of Threads waiting to get a connection.

- **Metric:** WaitTime
  **Description:** Average time a thread waits before getting a connection.
Web Applications (WebContainer) Module

Data counters for this category contain information for the selected server. Examples include the number of loaded and reloaded servlets, concurrent requests, and error counts.

- **Metric:** ConcurrentRequests
  **Description:** Number of requests that are concurrently processed.

- **Metric:** ErrorCount
  **Description:** Total number of errors in a servlet or JavaServer Page (JSP).

- **Metric:** LoadedServletCount
  **Description:** Number of loaded servlets.

- **Metric:** ReloadCount
  **Description:** Number of reloaded servlets.

Queues

Message queues metrics include:

- **Metric:** QueueStats.AggregateMessageWaitTime
  **Description:** The time that messages are in the bus at consumption. If this time is not expected, view the message in the admin console.
QueueStats.AvailableMessageCount

**Description:**
The number of messages available for a queue for consumption. If this number is close to the destination high messages value, review the high messages value.

QueueStats.LocalMessageWaitTime

**Description:**
The time that messages are on this queue at consumption. If this time is unexpected, view the message on the Administration Console.

QueueStats.LocalOldestMessageAge

**Description:**
The longest time any message has been in the queue. If this time is unexpected, view the message on the admin console.

QueueStats.TotalMessagesConsumedCount

**Description:**
The total number of messages that are consumed from this queue, for the lifetime of this messaging engine.

QueueStats.TotalMessagesProducedCount

**Description:**
The total number of messages that are sent to this queue, for the lifetime of this messaging engine.

QueueStats.UnavailableMessageCount

**Description:**
The number of messages that are locked or uncommitted. The metric means that messages are added or removed, but the transaction has not been committed. If this number is high, verify if messages are locked.
Topicspace

The metrics in this category deal with publishing messages in the destination queue.

- **Metric:**
  - `TopicspaceStats.AssuredPersistentMessagesPublishedCount`
  - **Description:**
    - The number of Assured Persistent messages published.

- **Metric:**
  - `TopicspaceStats.IncompletePublicationCount`
  - **Description:**
    - The number of publications that are not received for all current subscribers. If this number is unexpected, view the publication on the admin console.

- **Metric:**
  - `TopicspaceStats.LocalPublisherCount`
  - **Description:**
    - The number of local publishers to topics in this topicspace.

- **Metric:**
  - `TopicspaceStats.ReportEnabledPublicationsExpiredCount`
  - **Description:**
    - The number of report-enabled, incomplete publications that expired on this topicspace.

- **Metric:**
  - `TopicspaceStats.TotalMessagesPublishedCount`
  - **Description:**
    - The total number of publications to this topicspace.

Mediations

The metrics in this category include messages that have been mediated at a mediated destination.

- **Metric:**
  - `MediatedMessageCount`
  - **Description:**
    - The number of messages that have been mediated at a mediated destination.
Data Store

- **Metric:**
  MediationTime

  **Description:**
  The amount of time in milliseconds taken to mediate a message at a mediated destination.

Data Store

The metrics in the category talk about JDBC transactions.

- **Metric:**
  MessageStoreStats.JDBCOpenCount

  **Description:**
  JDBC connections open.

File Store

The metrics in this category include filestore log spaces, and filestore permanent storage spaces.

- **Metric:**
  MessageStoreStats.FileStoreLogSpaces

  **Description:**
  Space in bytes left in the filestore log.

- **Metric:**
  MessageStoreStats.FileStorePermanentObjectStoreSpace

  **Description:**
  Space in bytes left in the filestore permanent store.

- **Metric:**
  MessageStoreStats.FileStoreTemporaryObjectStoreSpace

  **Description:**
  Space in bytes left in the filestore temporary store.
Messing Engines

The metrics in this category include:

- **Metric:**
  
  MEStats.MessageBytesReadCount
  
  **Description:**
  Number of bytes of message data from the application server processes hosting messaging engines over network connections. This metric does not include data for negotiating the transmission of messages.

- **Metric:**
  
  MEStats.MessageBytesWrittenCount
  
  **Description:**
  Number of bytes of message data sent to the application server processes hosting messaging engines over network connections. This metric does not include data for negotiating the transmission of messages.

- **Metric:**
  
  MEStats.ReadsBlockedCount
  
  **Description:**
  Number of read operations that could not be completed immediately. This number can be used as an indicator of network congestion when communicating with the application server processes hosting messaging engines.

- **Metric:**
  
  MEStats.WritesBlockedCount
  
  **Description:**
  Number of write operations that could not be completed immediately. This number can be used as an indicator of network congestion when communicating with the application server processes hosting messaging engines.

WMQ Links

The metrics in this category include:

- **Metric:**
  
  MQLinkStats.CommsErrorsCount
  
  **Description:**
  Number of communication errors that resulted in a network connection to a WebSphere MQ Queue Manager being disconnected.
- **Metric:**
  MQLinkStats.LongRetriesCount
  **Description:**
  Number of long retries. Long retries are the times channels were disconnected and could not be reestablished for periods of time.

- **Metric:**
  MQLinkStats.MessagesReceivedCount
  **Description:**
  Number of messages that were received from network attached WebSphere MQ Queue Managers.

- **Metric:**
  MQLinkStats.MessagesSentCount
  **Description:**
  Number of messages that were sent to network attached WebSphere MQ Queue Managers.

- **Metric:**
  MQLinkStats.QMAssociatedCount
  **Description:**
  Total number of WebSphere MQ Queue Managers that are currently network-attached to this application server.

- **Metric:**
  MEStats.ReadsBlockedCount
  **Description:**
  Number of read operations that could not be completed immediately. This number can be used as an indicator of network congestion when communicating with WebSphere MQ Queue Managers.

- **Metric:**
  MEStats.WritesBlockedCount
  **Description:**
  Number of write operations that could not be completed immediately. This number can be used as an indicator of network congestion when communicating with WebSphere MQ Queue Managers.
Appendix B: Frequently Asked Questions

This appendix contains Frequently Asked Questions.

This section contains the following topics:

- **Installation and Configuration** (see page 59)
- **Configuration Using Scripting** (see page 62)
- **How is the Installation and Configuration WebSphere Application Server - Distributed Simplified?** (see page 64)
- **What are the WebSphere Application Server Versions Supported by the Script?** (see page 64)
- **Clustered Environment** (see page 65)

### Installation and Configuration

What operating systems does WebSphere Application Server - Distributed support?

Windows, AIX, UNIX, and Linux.

Does CA APM for IBM WebSphere Application Server Distributed support clustered environment?

Yes, the extension supports clustered environment, WebSphere Network Deployment (ND,) and WebSphere Extended Deployment (XD) environments.

How do I know if the extension is installed properly?

If the following entries are found in the agent log file, the extension is properly installed:

- Activating PMI Data Collection
- PMI data collection activated

If the expected entries are not found in the log file, what does it mean?

The extension is not configured properly. Verify the following steps:

- The extension JAR files are copied at the appropriate locations mentioned in this guide.
- The file size and timestamp match the corresponding files in the installation archive.
  - If the extension is configured manually, verify that the classpath for the custom service is correctly set.
When I start a server, I get the error, "ClassNotFoundException" in SystemOut.log. What could be wrong?

Verify that the classpath is set to the correct location. The JAR file must be at the same location as specified in the classpath for the custom service. The classpath separator for Windows is ";" and for UNIX environment is ":".

In the ffdc log file for a WebSphere Application Server, I get the error, "MissingResourceException." Is it a configuration issue?

This IBM bug is APAR 64217. The bug is fixed in fixpack 7.0.0.1 for 7.0 of WebSphere Application Server.

Why is the configuration of SIB Service from Runtime tab different from other PMI modules configuration from Configure tab?

In IBM WebSphere Application Server 7.0, there is a bug so enabling SIB does not work from Configuration tab. This IBM bug is, APAR PK7606. The fix is expected in the next fixpack for 7.0 (7.0.0.3). Until the fix, enable SIB Service metrics from Runtime tab.

For IBM WebSphere Application Server versions, the SIB Service is not displayed under the Configuration tab. If SIBus is configured, the service is displayed only under the Runtime. So, enable SIB Service metrics on the Runtime tab for WebSphere Application Server versions 7.0 and higher.

I am not able to see SIB Service node on my Investigator. What could be wrong?

If you are not able to see SIB Service node on Investigator, check the following items:

- The custom service is configured properly. Check the custom service classpath, which contains the location of the JAR file.
- Service Integrated Bus (SIBus) is configured in the IBM WebSphere Application Server.
  - SIB Service is enabled to start at WebSphere Application Server startup.

While manually enabling PMI metrics for SIB Service from WebSphere Application Server Admin console for WebSphere Application Server - Distributed v7.0, PMI Counters for WMQLinks are found under WMQClientLinks. How do I enable PMI metrics?

This IBM bug is fixed in WebSphere Application Server - Distributed v7.0.0.1. The right counters are in place on applying IBM fixpacks.
If I want to see metrics other than the recommended list, can I get them on the Investigator?

You can view all the metrics that have been enabled from the WebSphere Application Server Administrative console in the Investigator. But only recommended metrics, that are listed in Appendix A of the User Guide, are displayed in the typeviews.

Why am I not able to see the typeviews for other modules like connectionPool module or threadPoolModule?

The critical metrics from both these modules have been covered under the AppServer typeview. SIB Service, Bean module, and J2c modules have their customized typeviews.

Is there any way to install the WebSphere Application Server Distributed Management Modules at the runtime?

Yes. Copy the new Management Modules to the `<EM_HOME>\deploy` directory. The hot deploy feature loads the new management modules at runtime.

After deploying the WebSphere Application Server Distributed Management Modules, must I log out and in to the Workstation to see the new dashboards?

No. The new dashboards are visible after the Enterprise Manager loads the deployed management modules.
Configuration Using Scripting

What are the prerequisites for executing the JACL script?

IBM WebSphere Application Server version 7.0 or higher must be already installed.

What are the privileges required to execute the JACL script?

The WSAdmin tool of WebSphere Application Server interprets the supplied JACL script. If security is enabled, you must have the necessary privileges to execute WSAdmin of the WebSphere Application Server.

What does the JACL script do?

- The JACL script disables the existing Introscope custom service, creates a custom service, and enables PMI metrics for the PMI Modules.

If I do not want to use the JACL script, how do I achieve the same result?

Follow these steps:

1. Log in to the IBM Administrative console.
2. Go to Monitoring and Tuning section.
3. Click the Performance Monitoring Infrastructure (PMI).
4. Select the server instance for which user wants to monitor the metrics.
5. Select Runtime tab.
6. Click Custom.
7. Enable the PMI metrics.
Note: Enabling of PMI metrics persists only for the currently running instance. If you want the changes to persist for the server restart, select Persists my changes check box in the Runtime tab.

Are JACL script steps logged?

Yes. All JACL script steps are logged in: <Agent_Home>/logs/script.log.

What are the advantages of the JACL script?

The JACL script automatically enables the PMI metrics. In Network Deployment (ND) and Extended Deployment (XD) environments, the JACL script enable the PMI metrics for all configured instances. The script also provides these savings:

- Metric Count – 83
- User Clicks saved – 107
- Manually adding these lines during custom service configuration – Display Name, Classname and Classpath

I want to remove all the SIBus related PMI metrics? Can the configuration script do it?

No. Disable SIBus PMI metrics in to the Administration Console.

Does WebSphere Application Server need a restart after executing the script?

If the custom service is added and the PMI is enabled, it requires a restart. Changes to custom service require a restart. PMI enabling is done at runtime so the server does not require a restart.

Is the JACL script platform independent?

Yes. The process that invokes the JACL script (configurePMI.bat / configurePMI.sh) is compatible with Windows and UNIX versions. But the JACL script does not differ based on the underlying platforms.

Does JACL restart of the server?

No. Manually restart the server if you make configuration changes to custom services.

How are PMI metrics enabled through the JACL script?

The Performance MBean accesses the PMI Modules and enables the metrics.

Does the JACL script enable all PMI metrics?

No. The script enables only the recommended metrics listed in Appendix A (see page 45).
How do I verify the JACL script changes on the server?

The administration console displays the message, 'workspace has been refreshed' for all JACL script changes to the application server. The custom service and the PMI metrics can be verified through the WebSphere Application Servers Administrative Console.

What tool interprets the JACL script?

The WSAdmin tool (packaged with the WebSphere Application Server installation) interprets the JACL script.

How is the Installation and Configuration WebSphere Application Server - Distributed Simplified?

Symptom:

What are the changes done in the WebSphere Application Server - Distributed to simplify the installation and configuration?

Solution:

A batch file (configurePMI.bat) for Windows and shell script (configurePMI.sh) for UNIX execute a JACL script that automates the manual configuration steps. The script can be executed from WSAdmin prompt of WebSphere Application Server.

The following tasks are automated through JACL script:

- Custom service creation
- PMI metric enabling

What are the WebSphere Application Server Versions Supported by the Script?

Symptom:

Does the JACL script support all versions of the WebSphere Application Server?

Solution:

The script supports all WebSphere Application Server versions that are listed in the Compatibility Guide.
Clustered Environment

Are the execution steps of the JACL script different for a cluster and a standalone WebSphere Application Server?

Yes, the steps are different. For details, see Creating Custom Service and enable the PMI modules (see page 15).

What are the prerequisites for executing the script in a clustered environment?

The servers must be up and running at the time of executing listServers.bat / listServers.sh. The configurePMI.bat / configurePMI.sh file adds the custom service and enable PMI for the listed servers in apply_profiles.properties.

What steps are required to automate the extension configuration in a WebSphere cluster setup?

Follow these steps:

1. Execute listServers.bat for Windows and listServers.sh for the UNIX environment. These files write the details of servers in the cluster to the apply_profiles.properties in the <WILYHome> directory. You can comment a particular entry in the property file using '#' symbol. The commented entries are not considered for applying the custom service and PMI enabling.

2. Execute configurePMI.bat for Windows and configurePMI.sh for UNIX to apply the custom service and enable PMI for the servers listed in the apply_profiles.properties file.

What happens if only configurePMI.bat or configurePMI.sh is executed first time in a WebSphere cluster setup without executing listServers.bat or listServers.sh?

You are prompted to run the listServers.bat or listServers.sh file.

Is it mandatory to execute listServers.bat or listServers.sh every time in a clustered environment?

No. After the listServers.bat or listServers.sh file is executed for the first time in a clustered environment, the apply_profiles.properties file is created with details of the servers. You can either comment server entries that do not require PMI configuration, or add new entries manually in the property file in the required format.

Does apply_profiles.properties list all servers in the WebSphere cluster at any time?

No. The apply_profiles.properties file lists only the running servers with configured agents when the listServers.bat or listServers.sh file is executed.

How can I identify servers in the cluster that are configured with the extension?
View the `script.log` file in the Agent log folder. The log files contain information only for the script execution, not manual removal of extensions.

**Can I execute the .bat or .sh file from any server in a cluster?**

No. The batch file or shell script can be executed only from a server that is configured with Introscope Agent. The server must have the wily directory within its installation directory.
Appendix C: Troubleshooting

To determine if WebSphere Application Server PMI and this extension are correctly configured to monitor SIBus, follow these steps:

1. Verify that the CA APM for IBM WebSphere Application Server Distributed is set up and the JVM is restarted.

2. Verify that the SIB Service is enabled in the WebSphere Application Server Administrative console.

3. Verify that the SIBus PMI metrics are enabled. If SIB metrics are enabled manually from the Administrative console through the Runtime tab, Persist my changes checkbox must be checked. Otherwise, the PMI enabling changes are not persisted when you restart the product.

4. If you are upgrading from an older version of the extension, IntroscopeCustomService must be disabled and the new PPCustomService must be enabled.

5. Verify that the SIBus is configured on the server or cluster-member.

This section contains the following topics:

Detailed Instruction Set (see page 67)
Additional Troubleshooting (see page 69)

Detailed Instruction Set

1. Verify that the SIB Service is enabled in the WebSphere Application Server Administrative console.
The checkbox for **Enable service at server startup** must appear selected. You can also check in `sib-service.xml` at:

```xml
<WAS_Home>/profiles/<profile-name>/config/cells/<cell-name>/nodes/<node-name>/servers/<server-name>/
```

Entry:
```xml
```

2. If SIB metrics are enabled manually from the WebSphere Application Server Administrative console through the Runtime tab, **Persist my changes** checkbox must appear selected. Otherwise, the PMI enabling changes are not persisted when the product is restarted.

- On the product restart, this checkbox does not remain checked, but the metric list is persisted and can be verified if it is enabled.
- The status of the PMI counters whether they are enabled can be seen in `pmi-config.xml` at:

```xml
WASProfileHome>/profiles/<profilename>/config/cells/<cellname>/nodes/<nodename>/servers/<servername>/pmi-config.xml
```

3. To upgrade from an older version of CA APM for IBM WebSphere Application Server Distributed, disable IntroscopeCustomService, and enable PowerPackCustomService. Perform the following checks:

a. This entry is present in `server.xml` at:

```xml
<WAS_Home>/profiles/<profile-name>/config/cells/<cell-name>/nodes/<node-name>/servers/<server-name>/server.xml
```

b. The entry is present in the following form: Highlighted in italics signifies an entry for the older version of the extension (for Introscope service). Highlighted in bold signifies an entry for the custom service. The old entry is present only if you are using an older version of CA APM for IBM WebSphere Application Server Distributed.

```xml
<customServices xmi:id="CustomService_1213859763032" enable="false" classname="com.wily.introscope.api.websphere.IntroscopeCustomService" displayName="Introscope Custom Service" classpath="C:/ibm/WebSphere/AppServer/wily/WebAppSupport.jar"/>
<customServices xmi:id="CustomService_1229337493375" enable="true" classname="com.wily.powerpack.websphere.agent.PPCustomService" displayName="CA Wily Custom Service for WAS distributed 9.0" description="Custom service for CA Wily WAS distributed 9.0" classpath="C:/Program Files/IBM/WebSphere/AppServer/wily/WebAppSupport.jar"/>
```

4. Verify that the SIBus is configured on the server or cluster-member.
5. On the left navigation pane, click Service Integration > Buses. On right hand side you will see the list of SIBus that are configured. There must be at least one SIBus configured to get performance metrics on SIBus with CA APM for IBM WebSphere Application Server Distributed.

**Additional Troubleshooting**

For additional troubleshooting, you can also check
- `server.xml` for custom service entry,
- `sib-service.xml` for SIB Service (whether it is enabled) and
- `pmi-config.xml` for list of PMI metrics that have been enabled.
Index

A
Additional Troubleshooting • 69
AppServer Tab View • 31

B
Bean Module • 36
Before You Begin • 11

C
CA Technologies Product References • 3
Clustered Environment • 65
Configuration Using Scripting • 62
Configure a Custom Service in WebSphere • 21
Configuring IntroscopeAgent.profile to report PMI
metrics • 14
Contact CA Technologies • 5
Creating Custom Service and Enable the PMI
Modules • 15
Customizing Alerts • 44

D
Dashboards and the Investigator • 37
Data Store • 56
Detailed Instruction Set • 67

E
Enable PMI Module Through WebSphere Application
Server Administration Console • 22
Enable the SIBus Metrics • 25
Enterprise Beans Module • 45
Execute configurePMI File • 20
Execute listServers File • 17

F
File Store • 56
Files Installed from the Agent Installer • 12
Frequently Asked Questions • 59

H
How is the Installation and Configuration WebSphere
Application Server - Distributed Simplified? • 64

I
Install and Configure CA APM for IBM WebSphere
Application Server Distributed • 12
Installation and Configuration • 59
Installation Requirements • 11
Installing CA APM for IBM WebSphere Application
Server Distributed • 11
Introduction • 9

J
J2C Module • 37
Java Transaction API (JTA) Module • 48
JCA Connection Pools • 51
JDBC Connection Pool Module • 47

M
Mediations • 55
Messaging Engines • 57
Metrics • 45

O
Object Request Broker (ORB) Module • 49
Optional
Adding Details of Server Instances Manually • 19

Q
Queues • 53

R
Running the Enterprise Installer • 12
Running the Java (In Process) Agent Installer • 12

S
Servlet Session Manager Module • 49
SIB Service Overview • 31
SIB Service Views • 32

T
Thread Pool Module • 50
Through Automated JACL Scripts (Recommended) • 15
Through the WebSphere Application Server
   Administration Console (Manual setup) • 21
Topicspace • 55
Troubleshooting • 67

U
Using CA APM for IBM WebSphere Application
   Server Distributed • 29
Using Investigator Tabs • 30
Using This Guide • 9

V
Verifying if Service Integration Bus is Enabled • 15
Verifying the ORB Interceptors Metric Collection • 27
Viewing PMI Metrics in the Introscope Investigator • 30
Views Enabled by This Extension • 29

W
Web Applications (WebContainer) Module • 53
WebSphere Distributed - EJB Container • 38
WebSphere Distributed - EJB Pools • 39
WebSphere Distributed - J2C Connection Pools • 39
WebSphere Distributed - JDBC Connection Pools • 39
WebSphere Distributed - JTA • 40
WebSphere Distributed - Message Driven Beans • 40
WebSphere Distributed - Messaging Engines • 41
WebSphere Distributed - ORB • 41
WebSphere Distributed - Overview • 41
WebSphere Distributed - Servlet Sessions • 42
WebSphere Distributed - SIB Overview • 42
WebSphere Distributed - Thread Pools • 43
WebSphere Distributed - Web Container • 43
WebSphere Distributed - WebSphere MQ Links • 43
What are the WebSphere Application Server
   Versions Supported by the Script? • 64
WMQ Links • 57