

IBM WebSphere Application Server Network
Deployment, Version 5.0.2



Environment

Note

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Chapter 1. Environment

Welcome to Environment

The environment of the product applies to the configuring of Web server plug-ins and of objects that you want to be consistent throughout a cell.

Web servers

In the WebSphere Application Server product, an Application Server works with a Web server to handle requests for Web applications. The Application Server and Web server communicate using a WebSphere HTTP plug-in for the Web server.

If you specify a Web server when installing the WebSphere Application Server product, the installation program changes the Web server configuration file automatically to establish a plug-in.

You do not need a Web server plug-in or Web server to start the application server or the administrative console. In a test or development environment, you can use the internal HTTP transport instead of the Web server plug-in and Web server. But, for performance reasons, you must use a Web server plug-in and Web server in a production environment.

The WebSphere Application Server documentation provides information on plug-ins but does not provide information on administering Web servers. To learn how to administer your Web server, refer to documentation for your Web server. For tips on tuning your Web server see Web server tuning parameters.

Cell-wide settings

The configuration data for Version 5.0 of WebSphere Application Server is stored in files, and those files exist in one of several directories in the configuration repository tree. The directory in which a configuration file exists determines its scope, or how broadly or narrowly that data applies. Files in an individual server directory apply to that specific server only. Files in a node level directory apply to every server on that node. And files in the cell directory apply to every server on every node within the entire cell.

Cell-wide settings are configuration data that is stored in files in the cell directory and those files are replicated to every node in the cell. There are several different configuration settings that apply to the entire cell. These include the definition of virtual hosts, shared libraries, and any variables that you want to be consistent throughout the entire cell.

Chapter 2. Web Servers

Configuring Web server plug-ins

A WebSphere application server works with a Web server to handle requests for Web applications. The Web server and application server communicate using a WebSphere HTTP plug-in for the Web server.

The installation program for WebSphere Application Server modifies the Web server configuration file automatically to establish a plug-in, provided that you specify a Web server during installation.

Plug-ins are the preferred method of communication between the Web server and the application server. A plug-in offers the following advantages:

- XML-based configuration file
- Standard protocol recognized by firewall products
- Security using HTTPS, replacing proprietary OSE over SSL

A Web server plug-in and Web server are not required in order to start the application server or the administrative console. In a test or development environment, you can use the internal HTTP transport instead of the Web server plug-in and Web server. But, for performance reasons, you must use a Web server plug-in and Web server in a production environment. An HTTP transport facilitates the connection between the Web server plug-in and a Web container of an application server.

Steps for this task

1. Administer your Web server. Refer to your Web server documentation for information on administering your Web server.

Ensure that Web servers are configured to perform operations required by Web applications, such as GET and POST. Typically, this involves setting a directive in the Web server configuration file (such as `httpd.conf` for IBM HTTP Server). Refer to the Web server documentation for instructions. If an operation is not enabled when a servlet or JSP file requiring the operation is accessed, an error message displays, such as this one from IBM HTTP Server:

HTTP method POST is not supported by this URL.

2. **(Optional)** If you encounter problems starting your Web server, check the `http_plugin.log` file in the WebSphere logs directory for information on what portion of the plug-in configuration file contained the error. The log file states the line number on which the error occurred along with other details that might help you diagnose why the Web server did not start. A frequent reason for a Web server not starting is an improper entry in a plug-in configuration file.
3. **(Optional)** Install the plug-in to a specific location.
4. **(Optional)** Check the version of your IBM HTTP Server installation.
5. **(Optional)** Manually edit the plug-in configuration file.
6. Regenerate the plug-in configuration. After changing configurations to plug-ins, transports or virtual hosts, you must regenerate your Web server plug-in for the changes to take effect.
7. Tune your Web server with Web server tuning parameters.

Web server plug-ins

Web server plug-ins enable the Web server to communicate requests for dynamic content, such as servlets, to the application server.

You have the option to install WebSphere Application Server plug-ins for your Web servers when the application server is installed.

The plug-ins use a configuration file to determine whether a request should be handled by the Web server or the application server.

Installing plug-ins to specific locations

Sometimes, you might want to install the WebSphere Application Server plug-ins for Web servers to locations other than their default locations.

Installing Web server plug-ins to non-default locations

Depending on the operating system, when you run the WebSphere Application Server installation program and select to install a Web server plug-in, the plug-in might install silently if the Web server is installed in a standard location for that Web server brand. In such a case, the WebSphere Application Server installation program does not prompt you for the configuration file location.

If you have installed two Web servers on the same machine, the plug-in operates properly for the server installed at the "standard" location, but the plug-in does not operate properly for the server that is in the non-standard location.

For example, suppose IBM HTTP Server "installation 1" is installed in the standard directory in which the Web server is installed on Solaris, `/opt/IBMHTTPD`. When the plug-in for this first Web server is installed, it silently modifies the `httpd.conf` file in `/opt/IBMHTTPD/conf`, which is appropriate.

But now suppose that you installed IBM HTTP Server "installation 2" in `/opt/IHS2`. When the Web server plug-in for this second Web server is installed, it too is installed in `httpd.conf` in `/opt/IBMHTTPD/conf`.

One way around this is to manually edit the `httpd.conf` file of the second IBM HTTP Server installation, rather than installing the plug-in. You could copy the modified configuration file from the first Web server and make it the configuration file of the second server. Of course, this approach assumes that you have not customized the configuration file of the second server, and find it acceptable for its configuration to match that of the first server.

Another way is to install both Web servers in some non-standard place, such as `/opt/IHS1` and `/opt/IHS2`. When the WebSphere Application Server installation program cannot find either `httpd.conf` file, you are prompted for the one to edit. Specify the location of one of the Web server files. Then repeat the plug-in installation, specifying the other location this time.

Installing WebSphere Application Server plug-ins on non-default IIS servers

When the product installs the WebSphere Application Server plug-in for Microsoft Internet Information Server (IIS), it assumes the user wants to attach the plug-in to the default IIS server. The following instructions explain how to attach the plug-in to an IIS server other than the default.

The procedure might be necessary for a user implementing multiple Web sites that separate the pages they serve along some logical boundary, such as security level. Follow the steps to allow a newly defined site (using an IIS instance other than the default) to exercise servlets in conjunction with an existing site or sites.

The instructions apply to IIS Versions 4.x and 5.x.

Steps for this task

1. Use the Internet Service Manager (from Microsoft IIS) to create a new site with a name, port number, and base subdirectory.
2. Go to the WebSphere Application Server administrative console and configure the virtual host to contain an alias for the port number used by the site
3. Create a virtual directory for the new site.
 - a. Open the Internet Service Manager for IIS.
 - b. Select the new site in the tree view.
 - c. Right-click to display a menu. Select **New > Virtual Directory**.
 - d. Ensure that the values are set appropriately:
 - The name of the virtual directory should be set to SEPLUGINS (using all capital letters).
 - The physical path should be set to the WebSphere Application Server bin directory (such as c:\WebSphere\AppServer\bin on Windows NT).
Note, the directory must have the EXECUTE permission set, but setting any other permissions (or allowing it to inherit other permissions) is a security risk.
4. Start the new site.
5. Issue a browser request to verify that the configuration works, such as:
`http://mymachine:8080/servlet/snoop`
6. The administrator must ensure that the SEPLUGINS retains its EXECUTE permission.
It is possible for virtual directories under a site to inherit properties from the site. Ensure that the SEPLUGINS virtual directory does not inherit permissions from changes to the site, if those changes involve withdrawing the EXECUTE permission.

Checking your IBM HTTP Server version

At times, you might need to determine the version of your IBM HTTP Server installation.

Steps for this task

1. Change directory to the installation root of the Web server.
For example, this is /opt/IBMHTTPD on a Solaris machine.
2. Locate the file named version.signature.
3. At a system command prompt in that directory, enter:
`more version.signature`

Results

The version of IBM HTTP Server is shown.

Web server tuning parameters

WebSphere Application Server provides plug-ins for several Web server brands and versions. Each Web server operating system combination has specific tuning parameters that affect the application performance.

- **IBM HTTP Server**

The IBM HTTP Server is a multi-process, single-threaded server.

- **Access logs**

- **Description:** Collects all incoming HTTP requests. Logging degrades performance because IO operation overhead causes logs to grow significantly in a short time.

- **How to view or set:**

1. Open the IBM HTTP Server `httpd.conf` file, located in the directory `IBM_HTTP_Server_root_directory/conf`.
2. Search for a line with the text **CustomLog**.
3. Comment out this line by placing `#` in front of the line.
4. Save and close the `httpd.conf` file.
5. Stop and restart the IBM HTTP Server.

- **Default value:** Logging of every incoming HTTP request is enabled.

- **Recommended value:** Disable the access logs.

- **MaxPoolThreads, PoolThreadLimit**

- **Description:** `MaxPoolThreads` controls the number of threads per CPU in the thread pool available for Internet Information Services (IIS) to run Common Gateway Interface (CGI) processes (each process takes one thread). `PoolThreadLimit` specifies the upper limit for `MaxPoolThreads`. The default thread limit that IIS can create on a machine is twice the number of MB in RAM on a machine (for example, a server with 512MB of RAM is limited to 1024 threads).

- **How to view or set:**

1. Use a command prompt to issue the **regedit** command to access the operating system registry.
2. In the registry window, locate the parameter in the following directories: (split for publication)

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\  
InetInfo\Parameters\MaxPoolThreads
```

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\  
InetInfo\Parameters\PoolThreadLimit
```

3. Set the parameter.

- **Default value:** This value is IIS level dependent.

- **Recommended value:** Set the parameter according to the server load.

- **MaxClients**

- **Description:** The value of the `MaxClients` parameter can significantly impact the application, particularly if too high. More is not always better. Setting `MaxClients` too high can cause swapping if there is insufficient RAM.

- **How to view or set:** Edit the `MaxClients` directive in the IBM HTTP Server `httpd.conf` file, located in the directory `IBM_HTTP_Server_root_directory/conf`.

- **Default value:** 150

- **Recommended value:** The optimum value depends on the application.

- **MinSpareServers, MaxSpareServers, and StartServers**
 - **Description:** Pre-allocates and maintains the specified number of processes so that few processes are created and destroyed as the load approaches the specified number of processes. Specifying similar values reduces the CPU usage for creating and destroying HTTPD processes. Adjust this parameter if the time waiting for IBM HTTP Server to start more servers, so that it can handle HTTP requests, is not acceptable.
 - **How to view or set:** Edit the MinSpareServers, MaxSpareServers and StartServers directives in the httpd.conf file located in the *IBM_HTTP_Server_root_directory/conf* directory.
 - **Default value:** MinSpareServers 5, MaxSpareServers 10, StartServers 5
 - **Recommended value:** For optimum performance, specify the same value for the MinSpareServers and the StartServers parameters. If MaxSpareServers is set to less than MinSpareServers, IBM HTTP Server resets MaxSpareServer=MinSpareServer+1. Setting the StartServers too high can cause swapping if memory is not sufficient, degrading performance.
- **ListenBackLog**
 - **Description:** Sets the length of a pending connections queue. When several clients request connections to the IBM HTTP Server, and all threads used, a queue exists to hold additional client requests. However, if you use the default Fast Response Cache Accelerator (FRCA) feature, the ListenBackLog directive is not used since FRCA has its own internal queue.
 - **How to view or set:** For non-FRCA: Edit the IBM HTTP Server httpd.conf file. Then, add or view the ListenBackLog directive.
 - **Default value:** For HTTP Server 1.3.26: 1024 with FRCA enabled, 511 with FRCA disabled
 - **Recommended value:** Use the defaults.
- **IBM HTTP Server - Linux**
 - **MaxRequestsPerChild**
 - **Description:** Sets the limit on the number of requests that an individual child server process handles. After the number of requests reaches the value set for the MaxRequestsPerChild parameter, the child process dies. Adjust this parameter if destroying and creating child processes is degrading your Web server performance.
 - **How to view or set:**
 1. Edit the IBM HTTP server httpd.conf file located in the *IBM_HTTP_Server_root_directory/conf* directory.
 2. Change the value of the parameter.
 3. Save the changes and restart the IBM HTTP server.
 - **Default value:** 500
 - **Recommended value:** If there are no known memory leaks with Apache and Apache's libraries, set this value to zero (0) for best performance.
- **IBM HTTP Server - Windows NT and Windows 2000**
 - **ThreadsPerChild**
 - **Description:** Sets the number of concurrent threads running at any one time within the IBM HTTP Server.
 - **How to view or set:** Edit the IBM HTTP Server file httpd.conf file located in the directory *IBM_HTTP_Server_root_directory/conf*. Change the value of the parameter. Save the changes and restart the IBM HTTP Server.
There are two ways to find how many threads are used under load:

1. Use the Windows NT and Windows 2000 Performance Monitor under the desktop Start menu:
 - a. Right-click the status bar on your desktop. Click **Task Manager**.
 - b. Select the **Processes** tab.
 - c. Click **View > Select Columns**.
 - d. Select **Thread Count**.
 - e. Click **OK**.

The **Processes** tab shows the number threads for each process under the column name **Threads**, including Apache.

2. Use the IBM HTTP Server server-status (this choice works on all platforms, not just Windows NT and Windows 2000):
 - a. Edit the IBM HTTP Server httpd.conf file as follows: Remove the comment character # from the following lines: #LoadModule status_module, modules/ApacheModuleStatus.dll, #<Location/server-status>, #SetHandler server-status, and #</Location>.
 - b. Save the changes and restart the IBM HTTP Server.
 - c. In a Web browser, go to the URL: http://*yourhost*/server-status. Alternatively,
 - d. Click **Reload** to update status.
 - e. (Optional) If the browser supports refresh, go to http://*your_host*/server-status?refresh=5 to refresh every five seconds. You will see five requests currently processing 45 idle servers.

- **Default value:** 50 for IBM HTTP Server 1.3.26.

- **Recommended value:** Set this value to prevent bottlenecks, allowing just enough traffic through to the application server.

- **Web server configuration reload interval**

- **Description:** Tracks a variety of configuration information about WebSphere Application Server resources. The Web server needs to understand some of this information, such as Uniform Resource Identifiers (URIs) pointing to WebSphere Application Server resources. This configuration data is pushed to the Web server through the WebSphere Application Server plug-in at intervals specified by this parameter. Periodic updates add new servlet definitions without having to restart any of the WebSphere Application Server servers. However, the dynamic regeneration of this configuration information is costly in terms of performance. Adjust this parameter in a stable production environment.

- **How to view or set:** This parameter, <config RefreshInterval=xxx>, where xxx is the time interval in seconds, is specified in the plugin-cfg.xml file located in the %WAS_HOME%\config\cells directory.

- **Default value:** The default reload interval is 60 seconds.

- **Recommended value:** Increase the reload interval to a value that represents an acceptable wait time between the servlet update and the Web server update.

For more information about the plugin-cfg.xml file see the topic plugin-cfg.xml file.

- **Sun ONE Web server, Enterprise Edition (formerly iPlanet) - Solaris operating environment**

The default configuration of the Sun ONE Web server, Enterprise Edition provides a single-process, multi-threaded server.

– **Active threads**

- **Description:** Specifies the current number of threads active in the server. After the server reaches the limit set with this parameter, the server stops servicing new connections until it finishes old connections. If this setting is too low, the server can become throttled, resulting in degraded response times. To tell if the Web server is being throttled, consult its perfdump statistics. Look at the following data:
 - **WaitingThreads count:** If WaitingThreads count is getting close to zero, or is zero, the server is not accepting new connections.
 - **BusyThreads count:** If the WaitingThreads count is close to zero, or is zero, BusyThreads is probably very close to its limit.
 - **ActiveThreads count:** If ActiveThreads count is close to its limit, the server is probably limiting itself.
- **How to view or set:** Use the Maximum number of simultaneous requests parameter in the Enterprise Server Manager interface to control the number of active threads within Sun ONE Web server, Enterprise Edition. This setting corresponds to the RqThrottle parameter in the magnus.conf file.
- **Default value:** 512
- **Recommended value:** Increase the thread count until the active threads parameters show optimum behavior.

• **Microsoft Internet Information Server (IIS) - Windows NT and Windows 2000**

– **IIS permission properties**

- **Description:** The Web server has several properties that dramatically affect the performance of the application server. The default settings are usually acceptable. However, because other products can change the default settings without user knowledge, make sure to check the IIS settings for the Home Directory permissions of the Web server. The permissions should be set to Script and not to Execute. If the permissions are set to Execute, no error messages are returned, but the performance of WebSphere Application Server is decreased.
 - **How to view or set:** To check or change these permissions, perform the following procedure in the Microsoft management console:
 1. Select the Web site (usually default Web site).
 2. Right-click and select the **Properties** option.
 3. Click the **Home Directory** tab. To set the permissions of the Home Directory:
 - a. In the **Application** settings, select the **Script** check box in the **Permissions** list and clear the **Execute** check box.
 - b. (Optional) Check the permissions of the sePlugin:
 - 1) Expand the Web server.
 - 2) Right-click the sePlugin and select **Properties**.
 - 3) Confirm that the **Execute** permissions are set to **Execute**.
 - **Default value:** Script
 - **Recommended value:** Script
- **Number of expected hits per day**
- **Description:** Controls the memory that IIS allocates for connections.

- **How to view or set:** Using the performance window, set the parameter to More than 100000 in the Web site properties panel of the Microsoft management console.
- **Default value:** Fewer than 100000
- **Recommended value:** More than 100000
- **ListenBackLog parameter**
 - **Description:** Alleviates failed connections under heavy load conditions, if you are using IIS on Windows NT and Windows 2000. Failure typically occurs when you are using more than 100 clients. ListenBackLog increases the number of requests that IIS keeps in its queue. Consider raising this value if you see intermittent Unable to locate server errors in the Netscape browser.
 - **How to view or set:**
 1. Use a command prompt to issue the **regedit** command to access the operating system registry.
 2. In the registry window, locate the parameter in the (split for publication)
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\InetInfo\Parameters\ListenBackLog directory.
 3. Right-click the parameter to adjust the setting according to the server load.
 - **Default value:** 25 (decimal)
 - **Recommended value:** You can set the ListenBackLog parameter can be set as high as 200, without negative impact on performance and with an improvement in load handling.

Modifying the WebSphere plug-in to improve performance

You can improve the performance of IBM HTTP Server 1.3 (with the WebSphere Web server plug-in) by modifying the plug-in's RetryInterval configuration. The RetryInterval is the length of time to wait before trying to connect to a server that has been marked temporarily unavailable. Making this change can help the IBM HTTP Server 1.3 to scale higher than 400 users.

The plug-in marks a server temporarily unavailable if the connection to the server fails. Although a default value is 60 seconds, it is recommended that you lower this value in order to increase throughput under heavy load conditions. Lowering the RetryInterval is important for IBM HTTP Server 1.3 on UNIX operating systems that have a single thread per process, or for IBM HTTP Server 2.0 if it is configured to have fewer than 10 threads per process.

How can lowering the RetryInterval affect throughput? If the plug-in attempts to connect to a particular application server while the application server threads are busy handling other connections, which happens under heavy load conditions, the connection times out and the plug-in marks the server temporarily unavailable. If the same plug-in process has other connections open to the same server and a response is received on one of these connections, the server is marked again. However, when you use the IBM HTTP Server 1.3 on a UNIX operating system, there is no other connection since there is only one thread and one concurrent request per plug-in process. Therefore, the plug-in waits for the RetryInterval before attempting to connect to the server again.

Since the application server is not really down, but is busy, requests are typically completed in a small amount of time. The application server threads become available to accept more connections. A large RetryInterval causes application servers that are marked temporarily unavailable, resulting in more consistent application server CPU utilization and a higher sustained throughput.

Note: Although lowering the RetryInterval can improve performance, if all the application servers are running, a low value can have an adverse affect when one of the application servers is down. In this case, each IBM HTTP Server 1.3 process attempts to connect and fail more frequently, resulting in increased latency and decreased overall throughput.

For more information about tuning heavy-loaded Web servers, see Performance: Resources for learning

Manually editing the plug-in configuration

If your use of the WebSphere Application Server product requires a plug-in configuration more advanced than what the default plug-in configuration provides, you can edit the plug-in configuration file manually.

Steps for this task

1. Find the plug-in configuration files. By default, the working or active versions of the plugin-cfg.xml file reside in the directory *install_root/config/cells*.
2. Manually edit the plug-in configuration files. Open an editor on a file, change the plug-in settings as needed, and save the file.

A plugin-cfg.xml created using either the Update Web Server Plugin Configuration page in the administrative console, or the GenPluginCfg.sh script is in ASCII format.

CAUTION: If the plug-in configuration is regenerated, your manual edits to the plug-in configuration file are overwritten.

This does not mean, however, that you should never manually edit a configuration file. Regenerating the plug-in configuration cannot guarantee a correct configuration file for advanced configuration scenarios. If you see strange behavior after triggering a regeneration of the plug-in configuration, consider manually editing the configuration.

3. If you edited the plugin-cfg.xml files on federated nodes, turn off automatic synchronization of nodes on the File Synchronization Service page to prevent the edited files from being overwritten. Because a plugin-cfg.xml file on a Network Deployment machine is stored in the configuration repository, the plugin-cfg.xml file is overwritten on all federated nodes in your network whenever the Network Deployment machine updates the configuration repository on these nodes. If you need to regenerate the plugin-cfg.xml file on the Network Deployment machine:
 - a. Save your edited plugin-cfg.xml files on the federated nodes.
 - b. Force node synchronization of each federated node.
 - c. Replace the updated plugin-cfg.xml file with the saved copy or merge the customized pieces of the saved copy into the new plugin-cfg.xml file.

plugin-cfg.xml file

The plugin-cfg.xml file includes the following elements and attributes:

Config (exactly one)

This element starts the WebSphere HTTP plug-in configuration file. It contains all other elements and attributes of the configuration.

This section resembles the following in the file:

```
<Config IgnoreDNSFailures="true" RefreshInterval="240">
```

IgnoreDNSFailures (zero or one attribute for each Config)

Specifies whether the plug-in ignores DNS failures within a configuration when starting. When set to true, the plug-in ignores DNS failures within a configuration and starts successfully if at least one server in each ServerCluster is able to resolve the host name. The server is marked *unavailable* for the life of the configuration. No attempts to resolve the host name are made later on during the routing of requests. If a DNS failure occurs, a log message is written to the plug-in log file and the plug-in initialization continues rather than causing the Web server not to start. The default value is false, meaning DNS failures cause the Web server not to start.

Refresh interval (zero or one attribute for each Config)

The time interval (in seconds) at which the plug-in should check the configuration file to see if updates or changes have occurred. The plug-in checks the file for any modifications that have occurred since the last time the plug-in configuration was loaded.

In a development environment in which changes are frequent, a lower setting than the default setting of 60 is preferable. In production, a higher value than the default is preferable because updates to the configuration will not occur so often. If the plug-in reload fails for some reason, a message is written to the plug-in log file and the previous configuration is used until the plug-in config reloads successfully. If you are not seeing the changes you made to your plug-in configuration, check the plug-in log file for indications of the problem.

ASDisableNagle (zero or one attribute for each Config)

Specifies whether the user wants to disable nagle algorithm for the connection between the plug-in and the application server. By default, nagle algorithm is enabled.

The value can be true or false.

IISDisableNagle (zero or one attribute for each Config)

The nagle algorithm is enabled by default on Microsoft Internet Informations Services (IIS). This attribute can be used to disable the nagle algorithm.

The value can be true or false.

ResponseChunkSize (zero or one attribute for each Config)

The plug-in reads the response body in 64k chunks until all of the response data is read. This causes a performance problem for requests whose response body contains large amounts of data.

The ResponseChunkSize attribute allows the users to specify the maximum chunk size to use when reading the response body. For example, <Config ResponseChunkSize="N">, where N equals the chunk size in kilobytes.

If the content length of the response body is unknown, a buffer size of N kilobytes is allocated and the body is read in N kilobyte size chunks, until the entire body is read. If the content length is known, then a buffer size of either content length or N (whichever is less) is used to read the response body.

The default chunk size is 64k.

Log (zero or one element for each Config)

The log describes the location and level of log messages that are written by the plug-in. If a log is not specified within the config, then, in some cases, log messages are written to the Web server error log.

This section resembles the following in the file (split for publication) :

```
<Log LogLevel="Error" Name="/opt/WebSphere/AppServer50/logs/
http_plugin.log"/>
```

Name (exactly one attribute for each Log)

The fully qualified path to the log file to which the plug-in will write error messages.

If the file does not exist then it will be created. If the file already exists then it will be opened in append mode and the previous plug-in log messages will remain.

LogLevel (zero or one attribute for each Log)

The level of detail of the log messages that the plug-in should write to the log. Values for this attribute are one of the following:

- Trace
- Warn
- Error

If a LogLevel is not specified with the Log, then the default value is Error.

Trace allows you to see the steps in the request process in detail. Warn and Error means that only information about abnormal request processing will be logged.

Be careful when setting the level to Trace. A lot of error messages are logged at this level which can cause the disk space to fill up very quickly. A Trace setting should never be used in a normally functioning environment as it affects performance.

ServerCluster (one or more elements for each Config)

A group of servers that are generally configured to service the same types of requests.

In the simplest case, the cluster contains only one server definition. In the case in which more than one server is defined, the plug-in will load balance across the defined servers using either a Round Robin or a Random algorithm. The default is Round Robin.

This section resembles the following in the file (split for publication) :

```
<ServerCluster Name="Servers">
<ClusterAddress Name="ClusterAddr">
<Transport Hostname="192.168.1.2" Port="9080" Protocol="HTTP"/>
<Transport Hostname="192.168.1.2" Port="9443" Protocol="HTTPS">
<Property Name="Keyring"
value="c:/WebSphere/AppServer/keys/keyring.kdb"/>
<Property Name="Stashfile"
value="c:/WebSphere/AppServer/keys/keyring.sth"/>
</ClusterAddress>
<Server Name="Server1">
<Transport Hostname="192.168.1.3" Port="9080" Protocol="HTTP"/>
```

```

<Transport Hostname="192.168.1.3" Port="9443" Protocol="HTTPS">
<Property Name="Keyring" value="c:/WebSphere/AppServer/keys/keyring.kdb"/>
<Property Name="Stashfile" value="c:/WebSphere/AppServer/keys/keyring.sth"/>
</Server>
<Server Name="Server2">
<Transport Hostname="192.168.1.4" Port="9080" Protocol="HTTP"/>
<Transport Hostname="192.168.1.4" Port="9443" Protocol="HTTPS">
<Property Name="Keyring"
value="c:/WebSphere/AppServer/keys/keyring.kdb"/>
<Property Name="Stashfile"
value="c:/WebSphere/AppServer/keys/keyring.sth"/>
</Server>
<Server Name="Server3">
<Transport Hostname="192.168.1.5" Port="9080" Protocol="HTTP"/>
<Transport Hostname="192.168.1.5" Port="9443" Protocol="HTTPS">
<Property Name="Keyring"
value="c:/WebSphere/AppServer/keys/keyring.kdb"/>
<Property Name="Stashfile"
value="c:/WebSphere/AppServer/keys/keyring.sth"/>
</Server>
<PrimaryServers>
<Server Name="Server1"/>
<Server Name="Server2"/>
</PrimaryServers>
<BackupServers>
<Server Name="Server3"/>
</BackupServers>
</ServerCluster>

```

Name (exactly one attribute for each ServerCluster)

The logical or administrative name to be used for this group of servers.

LoadBalance (zero or one attribute for each ServerCluster)

The default load balancing type is Round Robin.

The Round Robin implementation has a random starting point. This means that the first server picked will be done so randomly and then round robin will be used from that point forward. This is so that in multiple process based Web servers all of the processes don't start up by sending the first request to the same application server.

RetryInterval (zero or one attribute for each ServerCluster)

An integer specifying the length of time that should elapse from the time that a server is marked down to the time that the plug-in will retry a connection. The default is 60 seconds.

RemoveSpecialHeaders (zero or one attribute for each ServerCluster)

The plug-in adds special headers to the request before it is forwarded to the application server. These headers store information about the request that will need to be used by the application. By default the plug-in will remove these headers from incoming requests before adding the headers it is supposed to add.

The value can be true or false. Setting the attribute to false introduces a potential security exposure by not removing headers from incoming requests.

CloneSeparatorChange (zero or one attribute for each ServerCluster)

Some pervasive devices cannot handle the colon character (:) used to separate clone IDs in conjunction with session affinity. This attribute for the server group tells the plug-in to expect the plus character (+) as the clone separator. You must change application

server configurations so that an application server separates clone IDs with the plus character as well.

The value can be true or false.

PostSizeLimit (zero or one attribute for each ServerCluster)

The maximum number of bytes of request content allowed in order for the plug-in to attempt to send the request to an application server. If a request is received that is greater than this size, the plug-in fails the request. The default value is 10 million bytes.

Server (one or more elements for each ServerCluster)

A WebSphere Application Server instance that is configured to handle requests routed to it given the routing rules of the plug-in configuration. The Server should correspond to an application server running on either the local machine or a remote machine.

Name (exactly one attribute for each Server)

The administrative or logical name for the server.

CloneID (zero or one attribute for each Server)

If this unique ID is present in the HTTP Cookie header of a request (or the URL if using URL rewriting), the plug-in routes the request to this particular server, provided all other routing rules are met. If a CloneID is not specified in the Server, then session affinity is not enabled for this server.

This attribute is used in conjunction with session affinity. When this attribute is set, the plug-in checks the incoming cookie header or URL for **JSESSIONID**. If **JSESSIONID** is found then the plug-in looks for one or more clone IDs. If clone IDs are found and a match is made to this attribute then the request is sent to this server rather than load balanced across the cluster.

If you are not using session affinity then it is best to remove these clone IDs from the configuration because there is added request processing in the plug-in when these are set. If clone IDs are not in the plug-in then it is assumed that session affinity is not on and the request is load balanced across the cluster.

WaitForContinue (zero or one attribute for each Server)

Specifies whether to use the HTTP 1.1 100 Continue support before sending the request content to the application server. Possible attribute values are true or false. The default value is false; the plug-in does not wait for the 100 Continue response from the application server before sending the request content because it is a performance hit.

Enable this function (set to true) when configuring the plug-in to work with certain types of proxy firewalls.

LoadBalanceWeight (zero or one attribute for each Server)

The weight associated with this server when the plug-in does weighted round robin load balancing. The algorithm for this attribute decrements all weights within the server cluster until all weights reach zero. Once a particular server's weight reaches zero, no more requests are routed

to that server until all servers in the cluster have a weight of zero. After all servers reach zero, the weights for all servers in the cluster are reset and the algorithm starts over.

ConnectTimeout (zero or one attribute for each Server)

The ConnectTimeout attribute of a Server element enables the plug-in to perform non-blocking connections with the application server. Non-blocking connections are beneficial when the plug-in is unable to contact the destination to determine if the port is available or unavailable.

If no ConnectTimeout value is specified, the plug-in performs a blocking connect in which the plug-in sits until an operating system times out (as long as 2 minutes depending on the platform) and allows the plug-in to mark the server *unavailable*. A value of 0 causes the plug-in to perform a blocking connect. A value greater than 0 specifies the number of seconds you want the plug-in to wait for a successful connection. If a connection does not occur after that time interval, the plug-in marks the server *unavailable* and fails over to one of the other servers defined in the cluster.

ExtendedHandshake (zero or one attribute for each Server)

The ExtendedHandshake attribute is used when a proxy firewall is between the plug-in and the application server. In such a case, the plug-in is not failing over, as expected.

The plug-in marks a server as down when the connect() fails. However, when a proxy firewall is in between the plug-in and the application server, the connect() will succeed, even though the back end application server is down. This causes the plug-in to not failover correctly to other application servers.

The plug-in performs some handshaking with the application server to ensure that it is started before sending the request. This enables the plug-in to failover in the event the application server is down.

The value can be true or false.

Transport (one or more elements for each Server)

The transport for reading and writing requests to a particular WebSphere application server instance. The transport provides the information needed to determine the location of the application server to which the request will be sent. If the Server has multiple transports defined to use the same protocol, the first one will be used.

It is possible to configure the Server to have one non-secure transport and one that uses SSL. In this configuration, a match of the incoming request protocol will be performed to determine the appropriate transport to use to send the request to the application server.

Hostname (exactly one attribute for each Transport)

The host name or IP address of the machine on which the WebSphere application server instance is running.

By default, the MaxConnections is set to zero. If the value is zero, then, there is no limit to the number of pending connections to the application servers.

Port (exactly one attribute for each Transport)

The port on which the WebSphere application server instance is listening.

Protocol (exactly one attribute for each Transport)

The protocol to use when communicating over this transport — either HTTP or HTTPS.

Property (zero, one, or more elements for each Transport)

When the Protocol of the Transport is set to HTTPS, use this element to supply the various initialization parameters, such as password, keyring and stashfile.

Name (exactly one attribute for each Property)

The name of the Property being defined. Supported names recognized by the transport are keyring, stashfile, and password.

Note: password is the only name that can be specified for the WebSphere HTTP Plug-in for z/OS. keyring, and stashfile, if specified, will be ignored.

Value (exactly one attribute for each Property)

The value of the Property being defined.

ClusterAddress (zero or one element for each ServerCluster)

A ClusterAddress is like a Server element in that you can specify the same attributes and elements as for a Server element. The difference is that you can only define one of them within a ServerCluster. Use a ClusterAddress when you do not want the plug-in to perform any type of load balancing because you already have some type of load balancer in between the plug-in and the application server.

If a request comes in that does not have affinity established, the plug-in routes it to the ClusterAddress, if defined. If affinity has been established, then the plug-in routes the request directly to the clone, bypassing the ClusterAddress entirely. If no ClusterAddress is defined for the ServerCluster, then the plug-in load balances across the PrimaryServers list.

PrimaryServers (zero or one element for each ServerCluster)

Lists defined servers to which the plug-in routes requests for this cluster. If a list of PrimaryServers is not specified, the plug-in routes requests to servers defined for the ServerCluster.

BackupServers (zero or one element for each ServerCluster)

Lists servers to which requests should be sent to if all servers specified in the PrimaryServers list are unavailable. The plug-in does not load balance across the BackupServers list but traverses the list in order until no servers are left in the list or until a request is successfully sent and a response received from an application server.

VirtualHostGroup (zero, one, or more elements for each Config)

A group of virtual host names that will be specified in the HTTP Host header. Enables you to group virtual host definitions together that are configured to handle similar types of requests.

This section resembles the following in the file:

```
<VirtualHostGroup Name="Hosts">  
<VirtualHost Name="www.x.com"/>  
<VirtualHost Name="www.x.com:443"/>  
<VirtualHost Name="*:8080"/>  
<VirtualHost Name="www.x.com:*/>  
<VirtualHost Name="*:*/>  
</VirtualHostGroup>
```

Name (exactly one attribute for each VirtualHostGroup)

The logical or administrative name to be used for this group of virtual hosts.

VirtualHost (one or more elements for each VirtualHost)

The name used for a virtual or real machine used to determine if incoming requests should be handled by WebSphere Application Server or not. Use this element to specify host names that will be in the HTTP Host header which should be seen for requests that need to be handled by the application server. You can specify specific host names and ports that incoming requests will have or specify a * for either the host name, port, or both.

Name (exactly one attribute for each VirtualHost)

The actual name that should be specified in the HTTP Host header in order to match successfully with this VirtualHost.

The value is a host name or IP address and port combination, separated by a colon.

You can configure the plug-in to route requests to the application server based on the incoming HTTP Host header and port for the request. The Name attribute specifies what those combinations are.

You can use a wildcard for this attribute. The only acceptable solutions are either a * for the host name, a * for the port, or a * for both. A * for both means that any request will match this rule. If no port is specified in the definition the default HTTP port of 80 is assumed.

UriGroup (zero, one or more elements for each Config)

A group of URIs that will be specified on the HTTP request line. The same application server must be able to handle the URIs. The route will compare the incoming URI with the URIs in the group to determine if the application server will handle the request.

This section resembles the following in the file:


```

<UriGroup Name="Uris">
<Uri Name="/servlet/snoop"/>
<Uri Name="/webapp/*"/>
<Uri Name="*.jsp"/>
</UriGroup>

```

Name (exactly one attribute for each UriGroup)

The logical or administrative name for this group of URIs.

Uri (one or more elements for each UriGroup)

The virtual path to the resource that will be serviced by WebSphere Application Server. Each URI specifies the incoming URLs that need to be handled by the application server. You can use a wildcard in specify these definitions.

Name (exactly one attribute for each Uri)

The actual string that should be specified in the HTTP request line in order to match successfully with this URI. You can use a wildcard within the URI definition. You can specify rules such as *.jsp or /servlet/* to be handled by WebSphere Application Server. When you assemble your application, if you specify **File Serving Enabled** then only a wildcard URI is generated for the Web application, regardless of any explicit servlet mappings. If you specify **Serve servlets by classname** then a URI having <Uri Name="Web_application_URI/servlet/*"> is generated.

AffinityCookie (zero or one attribute for each Uri)

The name of the cookie the plug-in should use when trying to determine if the inbound request has session affinity to a particular clone. The default value is **JSESSIONID**. (See the description of the CloneID attribute for additional session affinity information.)

Route (one or more elements for each Config)

A request routing rule by which the plug-in will determine if an incoming request should be handled by a WebSphere application server.

The route definition is the central element of the plug-in configuration. It specifies how the plug-in will handle requests based on certain characteristics of the request. The route definition contains the other main elements: a required ServerCluster, and either a VirtualHostGroup, UriGroup, or both.

Using the information that is defined in the VirtualHostGroup and the UriGroup for the route, the plug-in determines if the incoming request to the Web server should be sent on to the ServerCluster defined in this route.

This section resembles the following in the file:

```

<Route VirtualHostGroup="Hosts" UriGroup="Uris" ServerCluster="servers"/>

```

VirtualHostGroup (zero or one attribute for each Route)

The group of virtual hosts that should be used in route determination. The incoming host header and server port are matched to determine if this request should be handled by the application server.

It is possible to omit this from the route definition. If it is not present then every request will match during the virtual host match portion of route determination.

UriGroup (zero or one attribute for each Route)

The group of URIs to use for determining the route. The incoming URI for the request is matched to the defined URIs in this group to determine if this request should be handled by the application server.

It is possible to omit this from the route definition. If it is not present than every request will match during the URI match portion of route determination.

ServerCluster (exactly one attribute for each Route)

The cluster to which to send request that successfully match the route.

The cluster that should be used to handle this request. If both the URI and the virtual host matching is successful for this route then the request is sent to one of the servers defined within this cluster.

RequestMetrics (zero or one element for each Config)

This element is used to determine if request metrics is enabled, and how to filter the requests based on the Internet protocol (IP) and Uniform Resource Identifiers (URI) filters when request metrics is enabled.

This section resembles the following in the file:

```
<RequestMetrics armEnabled="false" newBehavior="false"
  rmEnabled="false" traceLevel="PERF_DEBUG">
```

armEnabled (zero or one attribute for RequestMetrics)

This attribute is currently ignored by the plug-in. It is for the future usage.

newBehavior (zero or one attribute for RequestMetrics)

This attribute is currently ignored by the plug-in. It is for the future usage.

rmEnabled (exactly one attribute for RequestMetrics)

This attribute indicates whether or not the request metrics is enabled in the plug-in. When it is true, the plug-in request metrics will look at the filters and log the request trace record in the plug-in log file. This is performed if a request passes the filters.

traceLevel (exactly one attribute for RequestMetrics)

When rmEnabled is true, this attribute indicates how much information is logged. When it is NONE, there is no request logging. When it is not NONE, the request response time (and other request information) is logged when the request is done.

filters (zero, one, or two attributes for RequestMetrics)

When rmEnabled is true, the filters control which requests are traced.

enable (exactly one attribute for each filter)

When enable is true, the type of filter is on and requests must pass the filter.

type (exactly one attribute for each filter)

There are two types of filters: SOURCE_IP (for example., client IP

address) and URI. For the SOURCE_IP filter type, requests are filtered based on a known IP address. You can specify a mask for an IP address using the asterisk (*). If the asterisk is used, the asterisk must always be the last character of the mask, for example 127.0.0.*, 127.0.*, 127*. For performance reasons, the pattern matches character by character, until either an asterisk is found in the filter, a mismatch occurs, or the filters are found as an exact match.

For the URI filter type, requests are filtered based on the URI of the incoming HTTP request. The rules for pattern matching are the same as matching SOURCE_IP address filters.

If both URI and client IP address filters are enabled, Request Metrics requires a match for both filter types. If neither is enabled, all requests are considered a match.

filterValues (one or multiple attribute for each filter)

The filterValues show the detailed filter information.

value (exactly one attribute for each filterValue)

Specifies the filter value for the corresponding filter type. This could be either a client IP address or a URI.

Situations requiring manual editing of the plug-in configuration

The following situations require manual editing of the plugin-cfg.xml file:

- If the Web server and plugin-cfg.xml file are installed on a separate remote system, you must change the paths in plugin-cfg.xml file if:
 - The plug-in was generated on a Win32 system and needs to be copied to a remote UNIX system with an HTTP Server and a WebSphere Application Server Version 5 plug-in.
 - The plug-in was generated on a UNIX system and needs to be copied to a remote Win32 system with an HTTP Server and a WebSphere Application Server Version 5 plug-in.
 - The plug-in was generated on one UNIX distribution and needs to be copied to a remote UNIX system that is a different distribution. For example, the plug-in was generated on a system having a single-server (base) or Network Deployment installation on AIX in the default path, and the remote HTTP Server and plug-in are installed on a Solaris or Linux distribution with the plug-in installed in the default location.
- In a Network Deployment environment, if the single-server (base) product, Network Deployment product, plug-in, and HTTP Server are all on the same machine, you must change the paths in plugin-cfg.xml if:
 - The plugin-cfg.xml file is located in the *install_root/DeploymentManager/config/* directory, and not the *install_root/AppServer/config/* directory. During installation of the base product, you must copy the plugin-cfg.xml file to *install_root/AppServer/config/* directory because the plug-in and modifications to the HTTP Server configuration files are looking for plugin-cfg.xml in the *install_root/AppServer/config* directory.
 - The paths in the plugin-cfg.xml file specify *install_root/DeploymentManager/...* These paths exist because the deployment manager runs the plugin-update procedure. You must change the paths to

install_root/AppServer/config. *install_root*/AppServer is the default path for the base product, if the base product is installed in a different location, change the paths to that location.

- If the single-server (base) or Network Deployment product, or the plug-in, are installed in a non-default location, you must change the paths in `plugin-cfg.xml`. The plug-in generator assumes that the plug-in path is the same as the base product's path structure. For example, if you install the base product in `c:\myApps\WebSphere\AppServer50` and install the plug-in on a remote Win32 system in `c:\WebSphere\AppServer50`, you must generate the plug-in using the administrative console on the base product and then edit the plug-in at `c:\myApps\WebSphere\AppServer50\config`. You must change all of the `c:\myApps\WebSphere\AppServer50\...` path structures to `c:\WebSphere\AppServer50\...`
- When the deployment manager is installed on a machine that is remote from the base WebSphere Application Server installation, one of the following solutions must be implemented in order for the `plugin-cfg.xml` file to retain the *install_root*/AppServer directory structures, and not assume those of the *install_root*/Deployment Manager, after a regeneration of the plug-in and full synchronization. The `plugin-cfg.xml` file is located in the *install_root*/AppServer/config directory.
 - **Command line:**

At a command prompt, change to the Deployment Manager/bin directory and type `GenPluginCfg -destination.root<install_root>` on the machine where Deployment Manager is installed. This creates or updates the `plugin-cfg.xml` file. This will change all of the directories in the `plugin-cfg.xml` file to the *install_root*/AppServer directories. For example, run the `GenPluginCfg -destination.root "E:\WebSphere\AppServer"` command at the deployment mgr/bin directory.
 - **plugin-cfg.xml file:**

Edit the deployment manager/config/cells `plugin-cfg.xml` file to point to the correct directory structure for the log file, keyring, and stashfile. Perform a full sync so the `plugin-cfg.xml` file is replicated in all the WebSphere Application Server nodes. The Deployment Manager `plugin-cfg.xml` file can point to the application server directories without any conflict.

Regenerating Web server plug-in configurations

At times, you might need to instruct the WebSphere Application Server plug-in to regenerate its configuration. You should regenerate the plug-in configuration after, for example, installing or removing an enterprise application, adding or removing servlets and mappings from a particular application, or changing the configuration for the plug-in, a virtual host or a transport. Failure to regenerate the plug-in after introducing a new application likely results in a *404 File Not Found* error when a user tries to access the new Web application.

CAUTION: Regenerating the plug-in configuration can overwrite manual configuration changes that you might want to preserve instead. Before performing this task, understand its implications as described in the article about configuring Web server plug-ins.

To regenerate the plug-in configuration, you can either use the Update Web Server Plugin Configuration page in the administrative console, or run the following script:

```
install_root/bin/GenPluginCfg.sh|bat
```

Note: Both methods for regenerating the plug-in configuration will create a `plugin-cfg.xml` file in ASCII format, which is the proper format for execution.

To use the Update Web Server Plug-in Configuration page in the administrative console:

Steps for this task

1. Go to the Update Web Server Plugin page. Click **Environment > Update Web Server Plugin** in the console navigation tree.
2. Click **OK**.
3. You might need to stop the server and then start the server again before the changes to the plug-in configuration go into affect.

Results

Regenerating the configuration might take a while to complete. After it finishes, all objects in the administrative cell use their newest settings, of which the Web server is now aware. Whether triggered manually or occurring automatically, plug-in regeneration requires about 30 to 60 seconds to complete, when the application server is on the same physical machine (node) as the Web server. In other cases, it takes more time.

The delay is important because it determines how soon the new plug-in configuration takes effect. Suppose you add a new served path for a servlet, then regenerate the plug-in configurations. The regeneration requires 40 seconds, after which a user should be able to access the servlet by the new served path.

For an HTTP plug-in, the length of the delay is determined by the Refresh Interval attribute of the Config element in the `plugin-cfg.xml` file. The plug-in polls the disk at this interval to see whether the configuration has changed. The default interval is 60 seconds. To regenerate the plug-in configurations requires twice the refresh interval.

In a development environment in which you are frequently changing settings in the administrative console, it is recommended that you set the refresh interval to 3 to 5 seconds.

In a production environment, set a longer refresh interval, perhaps as long as 30 minutes, depending on the frequency of changes.

Note:

When the deployment manager is installed on a machine that is remote from the base WebSphere Application Server installation, one of the following solutions must be implemented in order for the `plugin-cfg.xml` file to retain the `install_root/AppServer` directory structures, and not assume those of the `install_root/Deployment Manager`, after a regeneration of the plug-in and full synchronization. The `plugin-cfg.xml` file is located in the `install_root/AppServer/config` directory.

• **Command line:**

At a command prompt, change to the `Deployment Manager/bin` directory and type `GenPluginCfg -destination.root<install_root>` on the machine where Deployment Manager is installed. This creates or updates the `plugin-cfg.xml` file. This will change all of the directories in the `plugin-cfg.xml` file to the

install_root/AppServer directories. For example, run the GenPluginCfg -destination.root "E:\WebSphere\AppServer" command at the deployment mgr/bin directory.

- **plugin-cfg.xml file:**

Edit the deployment manager/config/cells plugin-cfg.xml file to point to the correct directory structure for the log file, keyring, and stashfile. Perform a full sync so the plugin-cfg.xml file is replicated in all the WebSphere Application Server nodes. The Deployment Manager plugin-cfg.xml file can point to the application server directories without any conflict.

Usage scenario

After using the administrative console to make configuration changes that involve the served paths of Web applications, manually trigger the regeneration of the plug-in configuration (or manually edit the file if that is what you have been doing), the plug-in configuration regenerates. The Web server is aware of the new Web application configuration. If a user requests the servlet using the path specified by the new Web resource, the request should be successful.

Plug-ins: Resources for learning




Use the following links to find relevant supplemental information about Web server plug-ins. The information resides on IBM and non-IBM Internet sites, whose sponsors control the technical accuracy of the information.

These links are provided for convenience. Often, the information is not specific to the IBM WebSphere Application Server product, but is useful all or in part for understanding the product. When possible, links are provided to technical papers and Redbooks that supplement the broad coverage of the release documentation with in-depth examinations of particular product areas.


View links to additional information about:




- Programming model and decisions
- Programming instructions and examples

Programming model and decisions

-  **Best Practice: WebSphere Plug-in Configuration Regeneration**
http://www7b.boulder.ibm.com/webapp/dd/transform.wss?URL=/wsdd/library/bestpractices/plug_in_configuration_regeneration.xml&xs1URL=/wsdd/xs1/bestpractice.xsl
-  **WebSphere Application Server V4.0 and V4.0.1 for zOS and OS/390: Configuring Web Applications**
ftp://ftp.software.ibm.com/software/mktsupport/techdocs/was4_configuring_web_apps.pdf
-  **Best Practice: Configuring Web Applications on WebSphere Application Server for z/OS and OS/390**
http://www7b.software.ibm.com/webapp/dd/transform.wss?URL=%2Fwsdd%2Flibrary%2Fbestpractices%2Fws_zos390_config_webapps.xml&xs1URL=%2Fwsdd%2Fxs1%2Fbestpractice.xsl

Programming instructions and examples

-  **IBM HTTP Server documentation**
<http://www-3.ibm.com/software/webservers/httpservers/library.html>

-  **WebSphere Application Server education**
<http://www.ibm.com/software/webservers/learn/>
-  **Listing of all IBM WebSphere Application Server Redbooks**
<http://publib-b.boulder.ibm.com/Redbooks.nsf/Portals/WebSphere>
-  **Redbook on IBM WebSphere V4.0 Advanced Edition Scalability and Availability**
<http://publib-b.boulder.ibm.com/Redbooks.nsf/9445fa5b416f6e32852569ae006bb65f/ff31072025dcf5de85256aca00781918?OpenDocument&Highlight=0,plug-in>

Chapter 3. Cell-wide settings

Configuring the cell-wide environment

To assist in handling requests among Web applications, Web containers, and application servers, you can configure cell-wide settings for virtual hosts, variables and shared libraries.

Steps for this task

1. Configure virtual hosts.
2. Configure variables.
3. If your deployed applications will use shared library files, define the shared library files needed.

Virtual hosts

A virtual host is a configuration enabling a single host machine to resemble multiple host machines. Resources associated with one virtual host cannot share data with resources associated with another virtual host, even if the virtual hosts share the same physical machine.

Each virtual host has a logical name and a list of one or more DNS aliases by which it is known. A DNS alias is the TCP/IP hostname and port number used to request the servlet, for example `yourHostName:80`. When no port number is specified, 80 is assumed.

When a servlet request is made, the server name and port number entered into the browser are compared to a list of all known aliases in an effort to locate the correct virtual host and serve the servlet. If no match is found, an error is returned to the browser.

An application server provides a default virtual host with some common aliases, such as the machine's IP address, short host name, and fully qualified host name. The alias comprises the first part of the path for accessing a resource such as a servlet. For example, it is `localhost:80` in the request `http://localhost:80/myServlet`.

A virtual host is not associated with a particular node (machine). It is a configuration, rather than a "live object," explaining why it can be created, but not started or stopped. For many users, virtual host creation is unnecessary because the `default_host` is provided.

Why and when to use virtual hosting

Virtual hosts allow the administrator to isolate, and independently manage, multiple sets of resources on the same physical machine.

Suppose an Internet Service Provider (ISP) has two customers whose Internet sites it would like to host on the same machine. The ISP would like to keep the two sites isolated from one another, despite their sharing a machine. The ISP could associate the resources of the first company with `VirtualHost1` and the resources of the second company with `VirtualHost2`.

Now suppose both company's sites offer the same servlet. Each site has its own instances of the servlet, which are unaware of the other site's instances. If the

company whose site is organized on VirtualHost2 is past due in paying its account with the ISP, the ISP can refuse all servlet requests that are routed to VirtualHost2. Even though the same servlet is available on VirtualHost1, the requests directed at VirtualHost2 will not be routed there.

The servlets on one virtual host do not share their context with the servlets on the other virtual host. Requests for the servlet on VirtualHost1 can continue as usual, even though VirtualHost2 is refusing to fill requests for the same servlet.

The default virtual host (default_host)

The product provides a default virtual host (named default_host).

The virtual host configuration uses wildcard entries with the ports for its virtual host entries.

- The default alias is *:80, using an internal port that is not secure.
- Aliases of the form *:9080 use the secure internal port.
- Aliases of the form *:9443 use the external port that is not secure.
- Aliases of the form *:443 use the secure external port.

Unless you specifically want to isolate resources from one another on the same node (physical machine), you probably do not need any virtual hosts in addition to the default host.

How requests map to virtual host aliases

When you request a resource, WebSphere Application Server tries to map the request to an alias of a defined virtual host.

Mappings are case insensitive, but the match must be alphabetically exact. Also, different port numbers are treated as different aliases.

For example, the request `http://www.myhost.com/myservlet` maps successfully to `http://WWW.MYHOST.COM/MYSERVLET` and to `http://Www.Myhost.Com/Myservlet`. But it does not map successfully to `http://myhost/myservlet` or to `http://myhost:9876/myservlet`.

You can use wildcard entries for aliases by port and specify that all valid hostname and address combinations on a particular port map to a particular virtual host.

If you request a resource using an alias that cannot be mapped to an alias of a defined virtual host, you receive a 404 error in the browser used to issue the request. A message states that the virtual host could not be found.

Configuring virtual hosts

Virtual hosts enable you to isolate, and independently manage, multiple sets of resources on the same physical machine.

Steps for this task

1. Create a virtual host using the Virtual Hosts page of the administrative console. Click **Environment** > **Virtual Hosts** from the navigation tree of the console, click **New** and, on the settings page for a virtual host that displays, specify an administrative name for the virtual host.

When you create a virtual host, a default set of 90 MIME entries is created for the virtual host.

2. Determine whether you need a virtual host alias for each HTTP transport port. There must be a virtual host alias corresponding to each port used by an HTTP transport. There is one HTTP transport in each Web container, with one Web container in each application server.

You must create a virtual host for each HTTP port in the following cases:

- You are using the internal HTTP transport with a port other than the default of 9080, or for some reason the virtual host does not contain the usual entry for port 9080.
- You have created multiple application servers (either stand-alone or in a cluster) that are using the same virtual host. Because each server must be listening on a different HTTP transport port, you need a virtual host alias for each one's transport port.

If you determine that you need one or more virtual host aliases, on the HTTP Transports page, note the **Port** values, such as 9080 or 9082.

3. If necessary, create a virtual host alias for each HTTP transport port.

From the Virtual Hosts page, click on your virtual host and, on the settings page for a virtual host, click **Host Aliases**. For each virtual host alias that you need, on the Host Aliases page, click **New**; then, on the settings page for a virtual host alias, specify a host name and port. Configure the virtual host to contain an alias for the port number. For example, specify an alias of *:9082 if 9082 is the port number in use by the transport.

4. When you enter the URL for the application into a Web browser, include the port number in the URL.

For example, if 9082 is the port number, specify a URL such as `http://localhost:9082/wlm/SimpleServlet`

5. If MIME entries are not specified at the Web module level, define MIME object types and their file name extensions. For each needed MIME entry, on the MIME Types page, click **New**; then, on the settings page for a MIME type, specify a MIME type and extension.
6. After you configure a virtual host alias or change a configuration, you must regenerate the Web server plug-in configuration and restart WebSphere Application Server.

Virtual host collection

Use this page to manage virtual hosts.

To view this administrative console page, click **Environment > Virtual Hosts**.

Name: Specifies a logical name used for configuring Web applications to a particular host name. The default virtual host is suitable for most simple configurations.

A virtual host configuration enables a single host machine to resemble multiple host machines. Resources associated with one virtual host cannot share data with resources associated with another virtual host, even if the virtual hosts share the same physical machine.

Virtual host settings: Use this page to configure a virtual host instance.

To view this administrative console page, click **Environment > Virtual Hosts > *virtual_host_name***.

Name: Specifies a logical name used for configuring Web applications to a particular host name. The default virtual host is suitable for most simple configurations.

Data type	String
Default	default_host

Host alias collection: Use this page to manage hostname aliases defined for a virtual host. An alias is the DNS host name and port number used by a client to form the URL request for a Web application resource.

To view this administrative console page, click **Environment > Virtual Hosts > virtual_host_name > Host Aliases**.

Host Name: Specifies the IP address, DNS host name with domain name suffix, or just the DNS host name, used by a client to request a Web application resource (such as a servlet, JSP, or HTML page). For example, a host alias name might be myhost in a DNS name of myhost:8080.

Port: Specifies the port for which the Web server has been configured to accept client requests. For example, a port might be 8080 in a DNS name of myhost:8080. A URL would refer to this DNS as follows: http://myhost:8080/servlet/snoop.

Host alias settings: Use this page to view and configure a host alias.

To view this administrative console page, click **Environment > Virtual Hosts > virtual_host_name > Host Aliases > host_alias_name**.

Host Name: Specifies the IP address, DNS host name with domain name suffix, or just the DNS host name, used by a client to request a Web application resource (such as a servlet, JSP file, or HTML page).

For example, the host alias name might be myhost. In such a case, the DNS name might be myhost:8080, where 8080 is the port. A URL would refer to this DNS as follows: http://myhost:8080/servlet/snoop.

For existing instances, the default reflects the value specified when the product was initially set up. For new instances, the default might be *, meaning any value allowed, or there might be no value specified.

Data type	String
Default	*

Port: Specifies the port for which the Web server has been configured to accept client requests. Specify a port value in conjunction with the host name.

The default reflects the value specified when the product was initially set up. The default might be 80, 9080 or some similar value.

Data type	Integer
Default	80

MIME type collection: Use this page to view and configure MIME object types and their file name extensions.

The list shows a collection of MIME type extension mappings defined for a virtual host. If MIME entries are not specified at the Web module level, these MIME entries apply.

To view this administrative console page, click **Environment > Virtual Hosts > *virtual_host_name* > MIME Types**.

MIME Type: Specifies a MIME type to which the type's file name extensions map. The type might be text, image, or application. An example value for MIME type is text/html.

Extensions: Lists file extensions that map to the MIME type. Example file extensions for a text/html MIME type include .htm, .html, and .txt.

MIME type settings: Use this page to configure a MIME object type.

To view this administrative console page, click **Environment > Virtual Hosts > *virtual_host_name* > MIME Types > *MIME_type***.

MIME Type: Specifies a MIME type to which the type's file name extensions map.

The type might be text, image, or application. An example value for MIME type is text/html. A default value is given only if you are viewing the configuration for an existing instance.

Data type String

Extensions: Lists file extensions that map to the MIME type.

Example file extensions for a text/html MIME type include .htm, .html, and .txt. A default value is given only if you are viewing the configuration for an existing instance.

Data type String

Variables

A variable is a configuration property that can be used to provide a parameter for any value in the system. A variable has a name and a value to be used in place of that name wherever the variable name is located within the configuration files.

Variables have a scope, which is the range of locations in the WebSphere Application Server network where the variable is applicable. A variable with a cell-wide scope applies across the entire WebSphere Application Server cell. A variable with node-level scope applies only on the node for which it is defined. If a node-level variable has the same name as a cell-wide variable, the node-level variable value takes precedence. A server variable only applies to the one server process, and takes precedence over any wider scoped variable with the same name.

When you use variables in configuration values such as file system path settings, the following syntax refers to the variable, using the variable's name:

```
${variable_name}
```

If the value of a variable contains a reference to another variable, the value of the variable is computed by substituting the value of the referenced variable recursively. For example:

Variable name	Variable value
ROOT_DIR	/
HOME_DIR	\${ROOT_DIR}home
USER_DIR	\${HOME_DIR}/myuserdir

In this example, the variable reference `${USER_DIR}` resolves to the value `/home/myuserdir`.

Variables are often useful where configured paths cannot contain *and*.

Configuring variables

You might want to define a WebSphere Application Server variable to provide a parameter for a value in the system. After you define the name and value for a variable, the value is used in place of that name wherever the variable name is located within the configuration files. The scope of a variable can be cell-wide, node-wide, or applicable to only one server process.

Steps for this task

1. Click **Environment > Manage WebSphere Variables** in the console navigation tree. On the WebSphere Variables page, click **New**.
2. On the Variable page, specify a name and value for the variable. So other people can understand what the variable is used for, also specify a description for the variable. Then click **OK**.
3. Verify that the variable is shown in the list of variables.
4. Save your configuration.
5. **(Optional)** To have the configuration take effect, stop the server and then start the server again.

WebSphere variables collection

Use this page to view and change a list of substitution variables with their values and scope.

To view this administrative console page, click **Environment > Manage WebSphere Variables**.

For information on a variable, click on the variable and read the value entered for the **Description** field.

Name: Specifies the symbolic name representing a physical path or URL root.

Value: Specifies the absolute path that the symbolic name represents.

Scope: Specifies whether the variable applies across a cell, node, or server.

Variable settings: Use this page to define the name and value of a WebSphere substitution variable.

To view this administrative console page, click **Environment > Manage WebSphere Variables > WebSphere_variable_name**.

Name: Specifies the symbolic name representing a physical path or URL root.

This name is substituted into path names configured in the system. For example, "CONFIG_ROOT" could be the symbolic name representing the path "C:\WebSphere\AppServer\Config" on a Windows system.

Data type String

Value: Specifies the absolute path that the symbolic name represents.

For example, the absolute path "C:\WebSphere\AppServer\Config" on a Windows system could be represented by the symbolic name "CONFIG_ROOT."

Data type String

Description: Provides additional documentation of the purpose for your variable.

Data type String

IBM Toolbox for Java JDBC driver

WebSphere Application Server supports the **IBM Toolbox for Java** JDBC driver. The IBM Toolbox for Java JDBC driver is included with the IBM Toolbox for Java product.

IBM Toolbox for Java is a library of Java classes that are optimized for accessing iSeries and AS/400 data and resources. You can use the IBM Toolbox for Java JDBC driver to access local or remote **DB2 UDB for iSeries 400** databases from server-side and client Java applications that run on any platform that supports Java.

IBM Toolbox for Java is available in these versions:

IBM Toolbox for Java licensed program

The licensed program is available with every OS/400 release, starting with Version 4 Release 2 (V4R2). You can install the licensed program on your iSeries 400 system, and then either copy the IBM Toolbox for Java JAR file (*jt400.jar*) to your system or update your system *classpath* to locate the server installation. Product documentation for IBM Toolbox for Java is available from the iSeries Information Center:

<http://publib.boulder.ibm.com/series/v5r1/ic2924/index.htm> Locate the documentation by traversing the following path in the left-hand navigation window of the iSeries information center: **Programming > Java > IBM Toolbox for Java**.

JTOpen

JTOpen is the open source version of IBM Toolbox for Java, and is more frequently updated than the licensed program version. You can download JTOpen from []. You can also download the *JTOpen Programming Guide*. The guide includes instructions for installing JTOpen and information about the JDBC driver.

The JDBC driver for both versions supports JDBC 2.0. For more information about IBM Toolbox for Java and JTOpen, see the product Web site at <http://www-1.ibm.com/servers/eserver/series/toolbox/index.html>.

Note: If you are using WebSphere Application Server 5.0 on platforms other than iSeries, use the **JTOpen** version of the Toolbox JDBC driver.

Configure and use the jt400.jar file

Steps for this task

1. Download the *jt400.jar* file from the **JTOpen** URL at []. Place it in a directory on your work station such as *C:\JDBC_Drivers\Toolbox*.
2. Open the administrative console.
3. Select **Environment**.
4. Select **Managed WebSphere Variables**.
5. Set the managed variable *OS400_TOOLBOX_JDBC_DRIVER_PATH* at the **Node** level.
6. Double click **OS400_TOOLBOX_JDBC_DRIVER_PATH**.
7. Set the value to the full directory path to the *jt400.jar* file downloaded in step one. Do not include *jt400.jar* in this value.

For example,

```
OS400_TOOLBOX_JDBC_DRIVER_PATH == "C:\JDBC_Drivers\Toolbox"
```

When you choose a Toolbox driver from the list of possible resource providers the **Classpath** field looks like:

```
Classpath == ${OS400_TOOLBOX_JDBC_DRIVER_PATH}/jt400.jar
```

Shared library files

Shared library files in WebSphere Application Server consist of a symbolic name, a Java classpath, and a native path for loading Java Native Interface (JNI) libraries.

You can define a shared library at the cell, node, or server level. Defining a library at one of the three levels does not cause the library to be placed into the application server's class loader. You must associate the library to an application or server in order for the classes represented by the shared library to be loaded in either a server-wide or application-specific class loader.

A separate class loader is used for shared libraries that are associated with an application server. This class loader is the parent of the application class loader, and the WebSphere Application Server extensions class loader is its parent. Shared libraries that are associated with an application are loaded by the application class loader.

Managing shared libraries

If your deployed applications use shared library files, set variables for the library files and associate the files with specific applications or with an Application Server, which associates the files with all applications on the server. Use the Shared Libraries page to define new shared library files to the system and remove them.

Steps for this task

1. Identify library files and their classpaths.
 - a. Click **Environment > Shared Libraries** in the console navigation tree to access the Shared Libraries page.
 - b. **(Optional)** Change the scope of the collection table to see what shared libraries are in a cell, node, or server. Select the cell, a node, or a server and click **Apply**.
 - c. Click **New**.
 - d. On the settings page for a shared library, specify the name, classpath, and any other variables for the library file that are needed.
 - e. Click **Apply**.

Repeat this step until you define a shared library instance for each library file that your applications need.

2. **(Optional)** Associate shared library files with an application that must use one or more shared libraries.

Use this step to associate a file with an application or perform the next step to associate a file with an Application Server, which associates the file with every application on the server.

- a. Click **Applications > Enterprise Applications** in the console navigation tree.
- b. Click on the installed application that uses the shared libraries.
- c. Click **Libraries** to access the Library Ref page.
- d. Click **Add**.
- e. On the settings page for a library reference, specify variables for the library reference as needed.
- f. Click **Apply**.

Repeat this step until you define a library reference instance for each library file that your application requires.

3. **(Optional)** Click **Servers > Application Servers > *server_name*** to associate a shared library with an Application Server for the run-time environment.

Use this step to associate a file with an Application Server, which associates the file with every application on the server, or perform the previous step to associate a file with an application.

- a. Set the application class-loader (sometimes referred to as classloader) policy and application class-loader mode on the settings page for an application server as described in "Class loading" (not in this document).
- b. **(Optional)** Click **Libraries** on the settings page for a class loader.
- c. Click **Add** from the Library Ref page.
- d. Specify variables for the library reference as needed on the settings page for a library reference and click **OK**.

Repeat this step until you define an Application Server for each library file that your application needs.

4. **(Optional)** Remove a library file from the collection of shared library files by placing a checkmark beside the library you want removed on the Shared Libraries page and clicking **Delete**.

Shared library collection

Use this page to define a list of shared library files for use by deployed applications.

To view this administrative console page, click **Environment > Shared Libraries**.

By default, a shared library is accessible to applications deployed (or installed) on the same node as the shared library file. Use the **Scope** field to change the scope to a different node or to a specific server.

Name: Specifies a name for the shared library.

Description: Describes the shared library file.

Shared library settings: Use this page to specify a library file usable by deployed applications.

To view this administrative console page, click **Environment > Shared Libraries > *shared_library_name***.

Name: Specifies a name for the shared library.

Data type String

Description: Describes the shared library file.

Data type String

Classpath: Specifies the class path used to locate the JAR files for the shared library support.

Data type String
Units Class path

Native Library Path: Specifies the class path used to locate native library files for the shared library support; for example, .dll or .so files

Data type String
Units Class path

Library reference collection

Use this page to view and manage library references that define how global libraries are used. You can use this page to, for example, associate shared library files with a deployed application.

To view this administrative console page, click **Applications > Enterprise Applications > *application_name* > Libraries**.

Library Name: Specifies a name for the library reference.

Library reference settings: Use this page to define library references, which specify how global libraries are used.

To view this administrative console page, click **Applications > Enterprise Applications > *application_name* > Libraries > *library_reference_name***. A shared library must be defined to view this page.

Library Name: Specifies the name of the shared library to use for the library reference.

Data type String

Environment: Resources for learning

Use the following links to find relevant supplemental information about configuring the WebSphere Application Server cell-wide environment. The information resides on IBM and non-IBM Internet sites, whose sponsors control the technical accuracy of the information.




These links are provided for convenience. Often, the information is not specific to the IBM WebSphere Application Server product, but is useful all or in part for

understanding the product. When possible, links are provided to technical papers and Redbooks that supplement the broad coverage of the release documentation with in-depth examinations of particular product areas.

View links to additional information about:

- Programming instructions and examples
- Administration

Programming instructions and examples

-  **WebSphere Application Server education**
<http://www.ibm.com/software/webservers/learn/>
-  **WebSphere Application Server V4.0 and V4.0.1 for zOS and OS/390: Configuring Web Applications**
ftp://ftp.software.ibm.com/software/mktsupport/techdocs/was4_configuring_web_apps.pdf
-  **Best Practice: Configuring Web Applications on WebSphere Application Server for z/OS and OS/390**
http://www7b.software.ibm.com/webapp/dd/transform.wss?URL=%2Fwsdd%2Flibrary%2Fbestpractices%2Fws_zos390_config_webapps.xml&xslURL=%2Fwsdd%2Fxs1%2Fbestpractice.xsl

Administration

-  **Listing of all IBM WebSphere Application Server Redbooks**
<http://publib-b.boulder.ibm.com/Redbooks.nsf/Portals/WebSphere>