

Blackboard Help

Learn / Administrator / Self- and Managed-Hosting / Release Notes / Individual Releases / 9.1 SP 12 / Performance and Scalability

Apache 2.2 HTTP Server

Starting with Learn 9.1 SP 8, Blackboard Learn recommends swapping out the shipped Apache 1.3 Web server for an external Apache 2.2 distribution. The instructions can be found in `config/apache2/README.txt` file under the Blackboard Learn install. Apache 2.2 is required under one of the following circumstances:

- Shibboleth authentication provider is used
- SSL and Compression are used together

Process Model in Apache

Apache 1.3 serves requests using preforked processes. When the server's parent process is started, it forks a number of child processes that are responsible for accepting connections on the listening sockets. When a connection is received, the system wakes up one of the processes to handle the connection.

Apache 2.x supports pluggable concurrency models called Multi-Processing Modules (MPMs). When building Apache, you must choose MPM. Two of the important MPMs are Worker MPM and Prefork MPM. Worker MPM uses multiple child processes, each with multiple threads. Each thread handles one connection at a time. Worker is generally a good choice for high-traffic servers because it has smaller memory footprint than Prefork MPM. Prefork MPM uses multiple child processes with one thread each. Each process handles one connection at a time. Prefork is comparable in speed to worker, but it uses more memory. Prefork's threadless design can be used with non-thread-safe third-party modules and it is easier to debug on platforms with poor thread debugging support.

Apache 2.2 runs with Prefork MPM as the default. Follow the below instructions to switch to Worker MPM. Blackboard recommends using the Worker MPM.

To determine which MPM is running:
`/usr/sbin/apachectl -l`

To determine if Apache has worker MPM compiled in:

```
/usr/sbin/httpd.worker -l
```

Uncomment HTTPD=/usr/sbin/httpd.worker in /etc/sysconfig/httpd

Restart Apache

KeepAlive

The Keep-Alive extension to HTTP/1.0 and the persistent connection feature of HTTP/1.1 provide long-lived HTTP sessions. They allow same TCP connections to be used by multiple requests. Performance tests have shown reduced latency times. As a result, Blackboard recommends leaving the default setting, `KeepAlive On` in `httpd.conf`.

`KeepAliveTimeout` specifies the amount of time the server waits for subsequent requests on a persistent connection. This directive is set to `5` by default. Blackboard's internal tests suggest increasing the value to `15` for optimal performance.

Estimating MaxClients for Optimal Performance

`MaxClients` sets the limit on simultaneous requests so connection attempts beyond the configured number of `MaxClients` are queued. `MaxClients` defaults to `256` with the Prefork MPM and `400` (`ServerLimit` multiplied by the value of `ThreadsPerChild`) for the Worker MPM. Blackboard recommends setting `MaxClients` to `200` as a starting point. When using the Prefork MPM, `ServerLimit` must always be the same as `MaxClients`.

Use the formula below to achieve a more precise calculation of `MaxClients`. The formula aligns to the tunable capacity of Tomcat application server. `MaxClients` must not exceed the `MaxThreads` configured by `bbconfig.appserver.maxthreads`.

```
MaxClients = minimum(
  "RAM Memory allocated to Apache web server" /
  "Max child process size",
  bbconfig.appserver.maxthreads)
```

To calculate the `Max child process size`, use the following command during a server busy time.

```
ps -ylC httpd --sort:rss
```

It is also important to ensure that you have enough RAM memory on the server for Apache by using the following formula:

"RAM Memory dedicated to Apache web server" =
MaxClients * "Max child process size"

An example configuration for the Worker MPM:

```
<IfModule worker.c>
StartServers          2
MaxClients            200
MinSpareThreads       25
MaxSpareThreads       75
ThreadsPerChild       25
MaxRequestsPerChild   0
</IfModule>
```

An example configuration for the Prefork MPM:

```
<ifmodule prefork.c>
StartServers          8
MinSpareServers       5
MaxSpareServers       20
ServerLimit           200
MaxClients            200
MaxRequestsPerChild   4000
</IfModule>
```

Compression

This extension compresses content before it is delivered to the client. Blackboard recommends enabling the extension by following the [Apache 2.2 documentation](#).