

Web Application Security

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Outline

Web Server Architecture:

- 1 What is Web Server
- 2 Common features of a Web Server
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What is Web Server:

- 1 A web server is an information technology that processes requests via HTTP, the basic network protocol used to distribute information on the World Wide Web.
- 2 The term can refer either to the entire computer system, an appliance, or specifically to the software that accepts and supervises the HTTP requests.
- 3 The primary function of a web server is to store, process and deliver web pages to clients.
- 4 Web servers can also be found embedded in devices such as printers, routers, webcams. The web server may be used as a part of a system for monitoring and/or administering the device.

Common features of a Web Server:

- 1 Virtual hosting: To serve many web sites using one IP address.
- 2 Large file support: To be able to serve files with large size(more than 2 GB).
- 3 Bandwidth throttling: To limit the speed of responses in order to not saturate the network and to be able to serve more clients
- 4 Server-side scripting: To generate dynamic web pages, still keeping web server and website implementations separate from each other
- 5 Path translation: Web servers are able to map the path component of a Uniform Resource Locator (URL) into:
 - A local file system resource (for static requests)
 - An internal or external program name (for dynamic requests)

Common features of a Web Server:

- 6 Load limits: A web server has defined load limits, because it can handle only a limited number of concurrent client connections (usually between 2 and 80,000, by default between 500 and 1,000) per IP address (and TCP port) and it can serve only a certain maximum number of requests per second depending on:
- its own settings,
 - the HTTP request type,
 - whether the content is static or dynamic,
 - whether the content is cached, and
 - the hardware and software limitations of the OS of the computer on which the web server runs.

Market Share:

Below are the latest statistics of the market share of the top web servers on the Internet by Netcraft Survey April, May 2015

Product	Vendor	April 2015	Percent	May 2015	Percent	Change
Apache	Apache	333,285,741	39.25%	336,813,959	39.26%	0.0%
IIS	Microsoft	236,288,843	27.83%	247,784,668	28.88%	+1.05%
nginx	NGINX, Inc.	126,274,778	14.87%	123,697,645	14.42%	-0.45%
GWS	Google	20,051,433	2.36%	20,103,068	2.34%	-0.02%

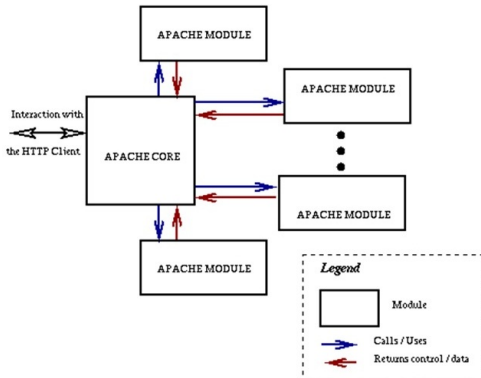
Apache, IIS and Nginx are the most used web servers on the Internet.

Web Server: Apache HTTP Server

- 1 Apache HTTP Server is a free open-source Web server developed under the governance of the Apache Software Foundation.
- 2 Apache is a key component in what's known as the "LAMP" stack, which comprises the Linux operating system; the Apache Web server; the MySQL database; and either PHP, Perl, or Python programming language.
- 3 While people often perceive Apache as a Linux Web server, it also runs on Windows.
- 4 Apache is comprised of two main building blocks with the latter being comprised of many other little building blocks. The Building Blocks are the Apache Core and then the Apache Modules that in a sense extend the Apache core.

Web Server: Apache HTTP Server

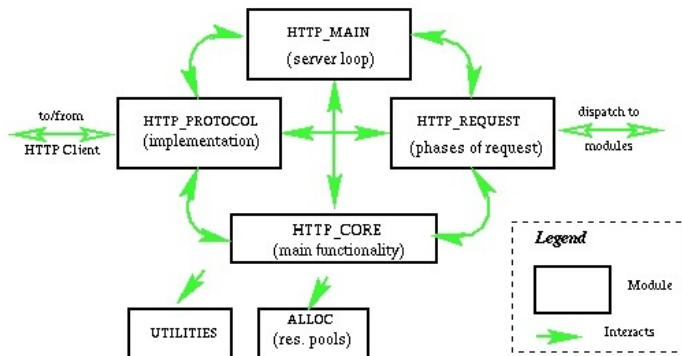
As you can see the designers of Apache decided to take a modular approach so that anyone can add to the basic functionality of the server without disturbing the basic Core implementation.



Web Server: Apache HTTP Server:Apache Core

- 1 Apache Core interacting with all the other components that surround it.
- 2 The purpose for this was that the designers wanted to keep every component that didn't need each other separate so they made them into modules. So this is the Basic "brain" of the Apache Web Server.
- 3 The Apache Core is comprised of many different little components that handle the Basic implementation of what a web server should be doing.
- 4 The core components are a series of classes that handle specific tasks.
- 5 The Apache Core provides us with the Main functionality of a HTTP web server. Without it or allowing a change to it will remove its modularity, but also remove some of the security.

Web Server: Apache HTTP Server: Apache Core



Web Server: Apache HTTP Server:Apache Core

The core components of make up the Apache core are as follows:

- 1** `http_protocol.c`: This is the component that handles all of the routines that communicate directly with the client by using the HTTP protocol. This is the component that knows how to also handle the socket connections through which the client connects to the server. All data transfer is done through this component.
- 2** `http_main.c`: This component is responsible for the start-up of the server and contains the main server loop that waits for and accepts connections. It is also in charge of managing timeouts.
- 3** `http_request.c`: This component handles the flow of request processing, passing control to the modules as needed in the right order. It is also in charge of error handling.

Web Server: Apache HTTP Server:Apache Core

- 4 `http_core.c`: The component implementing the most basic functionality, it just bairly serves documents.
- 5 `alloc.c`: The component that takes care of allocating resource pools, and keeping track of them.
- 6 `http_config.c` : This component provides functions for other utilities, including reading configuration files and managing the information gathered from those files (), as well as support for virtual hosts. An important function of `http_config` is that it forms the list of modules that will be called to service during different phases of the requests that are going on within the server.

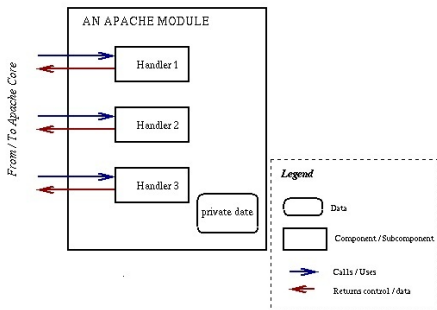
Web Server: Apache HTTP Server: Apache Modules

- 1 Modules were made to extend/overwrite and implement the functionality of the Apache web server.
- 2 However modules do not directly extend each other or “know” directly about each other.
- 3 Modules since they do not know directly about each other must pass all information back to the core & then the core sends that information to another appropriate module through the use of the `HTTP_REQUEST` component of the Apache Core. This does not allow any changing of the stable Apache Core, but also implements a layer of security, because no process can move on without passing the information to the Core & the core checks & handles errors through the `HTTP_REQUEST` component.

Web Server: Apache HTTP Server: Apache Modules

- 4 The functionality of Apache can be easily changed by writing new modules which complements/replace the existing one.
- 5 Apache allows for initialization of modules Dynamically. So not every module is started when the server starts up which really allows for a giant speed boost.
- 6 Modules have something inside them that are called Handlers.
- 7 A handler is for Apache the action that must be performed in some phase of servicing a request. For example a handler that requests a file must open the file then read the file then send it to the Apache core to then be sent to the client.
- 8 Handlers are defined by the modules depending on when they are needed to fulfill a request then the Handlers are the ones that send back the processing from the Apache Module to the Apache Core HTTP_REQUEST component.

Web Server: Apache HTTP Server: Apache Modules



The Handler does what it needs to do to fulfill a request then the sends that process back to the HTTP_REQUEST component of the Apache core in order to be sent to another module for processing or back to the client.