Apache

Linux System Administration
Fall 2025

What is Apache?

- One of the original web servers
  - Initially released in 1998
- Stable, very configurable and widely used
- Part of LAMP
  - **L**inux
  - **A**pache
  - **M**ysql
  - **P**HP/**P**erl/**P**ython

Alternatives to Apache

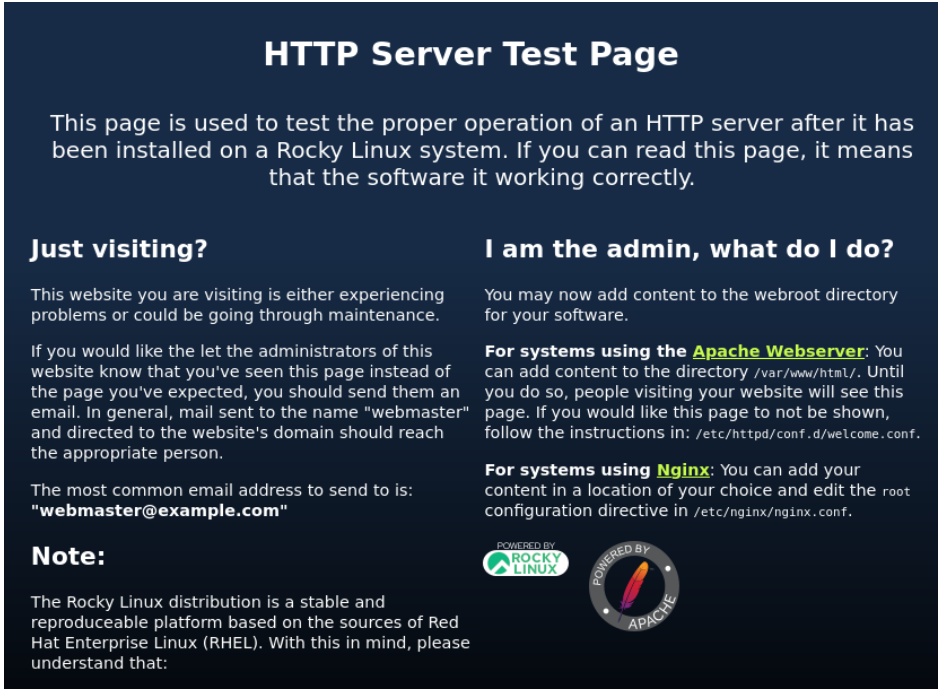
- `nginx`
  - more geared to serving static content
- `lighttpd`
  - good security and performance
- many others

Quick Start

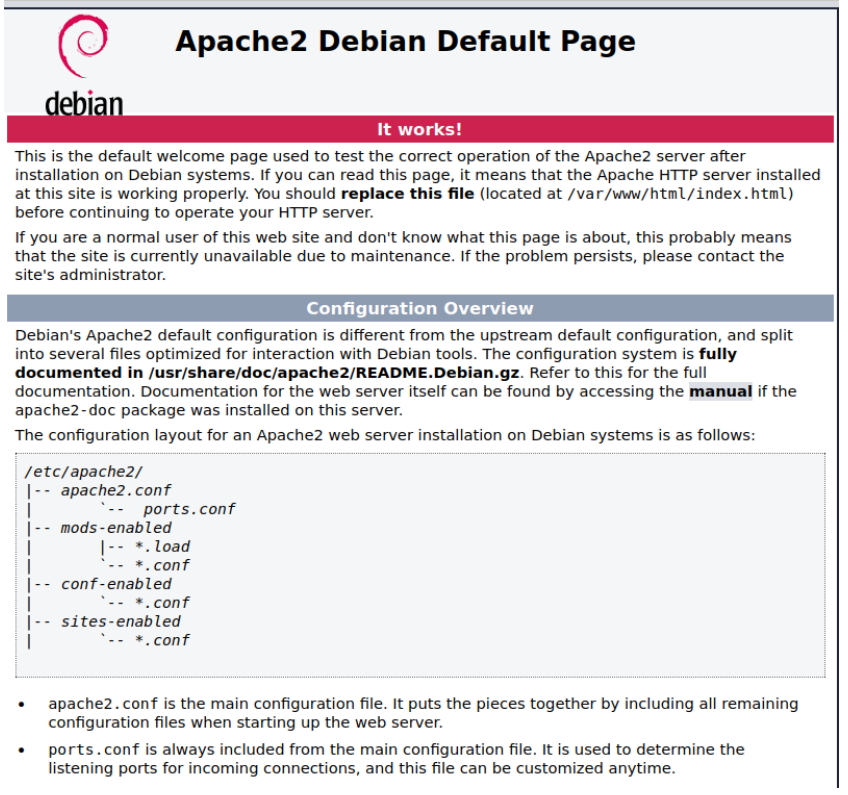
- Redhat
  - `dnf install httpd`
  - Enable and start httpd
  - `systemctl enable httpd`
  - `systemctl start httpd`
  - Disable and stop firewall
  - `systemctl disable firewalld`
  - `systemctl stop firewalld`
  - or punch a hole in the firewall
  - `firewall-cmd --zone=public --add-port=80/tcp --permanent`
  - `firewall-cmd --reload`
- Debian
  - `apt install apache2`
  - Enabled and started by default
  - No firewall
- On your Virtualbox
  - Forward (say) 800x to port 80

Connect with a browser

- RedHat



- debian



HTTP or HTTPS?

- HTTP
  - Insecure
  - Port 80
  - Plain TCP/IP connection
- HTTPS
  - Secure
  - Port 443
  - TLS (was SSL)
    - Transport Layer Security
    - Requires PKI certs

Where do I find things?

- Redhat
  - Configuration
    - `/etc/httpd`
  - HTML files
    - `/var/www/html`
  - CGI files
    - `/var/www/cgi-bin`
  - Logs
    - `/var/log/httpd`
- debian
  - Configuration
    - `/etc/apache2`
  - HTML files
    - `/var/www/html`
  - CGI files
    - `/usr/lib/cgi-bin`
  - Logs
    - `/var/log/apache2`

Apache Security

- Web services are a common target
- The server runs as a non-priviliged user
  - Redhat `apache`
  - Debian `www-data`
- Directories must be readable by user or group
  - CGI programs sometimes need write access

Apache Concepts

- Static files are in the DocumentRoot
  - File are served verbatim
- Dynamic content is the result of running a program (CGI)
  - Common Gateway Interface
  - Request on `stdin`
  - Response on `stdout`
  - `stderr` to error log
- Modules to perform various actions
  - Access control
  - Rewriting URLs
  - Proxy and load balancing
- Named and IP based Virtual web servers
  - One server, many sites
  - Highly parallel

Basic configuration

- Configuration files looks like HTML
  - `<Directory "/var/www/cgi-bin">`
  - `<VirtualHost "foo.bar.com:80">`
- RedHat puts everything in `httpd.conf`
  - Does include files in `/etc/httpd/conf.d`
- debian spreads configuration over multiple files and directories
  - Provides `a2en* a2dis*` commands to modify
  - `apachectl`
    - `-S` shows content
    - `-t` checks syntax

Important Keywords

- `ServerName` FQDN for this host
- `ServerRoot` Root directory root for configuration
- `Listen` IP and port to bind to
- `DocumentRoot` Root directory for files
- `SSLEngine` Enable SSL/TLS
- `SSL*Cert*` Certificates

Directory Directives

- `<Directory` *`path`*`>` select directory
- `Options` control apache behavior for this path
  - `Indexes` allow directory listing
  - `FollowSymLinks` follow symbolic links
  - `ExecCGI` allow CGI
- `AllowOverride` controls .htaccess
- `Require` set authorization restrictions

HTTP Exchange

Request sent to TCP port 80

```
GET / HTTP/1.1
Host: dundermifflin.com
User-Agent: Mozilla/5.0
Accept: text/html;
Connection: keep-alive
```

Response

```
HTTP/1.1 200 OK
Date: Mon, 23 May 2005 22:38:34 GMT
Content-Type: text/html; charset=UTF-8
Content-Length: 155
Last-Modified: Wed,08Jan2003 23:11:55 GMT
Server: Apache/1.3.3.7 (Red-Hat/Linux)
Connection: close

<html>.....</html>
```

Adding a virtual Host

`<VirtualHost *:80>`	IP adddress (`*`) and port
`ServerName`	FQDN of virtual host
`ServerAlias`	Alternative FQDN of virtual host
`ServerAdmin`	email of admin
`DocumentRoot`	directory containing HTML files
`ErrorLog`	error log file
`CustomLog`	access log file

`</VirtualHost>`

Rewriting Rules

- Permanent remap (HTTP to HTTPS)
  - `Redirect permanent / https://dm.com/`
- Replace URL
  - `RewriteEngine on`
  - `RewriteRule ^/?old([a-z/.]*)$ /new$1 [R=301,L]`
    - Changes `oldxxxx` to `newxxxx`
- Requires mod_rewrite

icons

- Images are stored in /usr/share
  - Debian `/usr/share/apache2/icons`
  - RedHat /`usr/share/httpd/icons`
- Used in index and HTML files
- Varies between machines

CGI scripts

Python

```
#!/usr/bin/python

import os;

print("Content-type: text/html\r\n\r\n");
print("<H2>Environment</H2>\r\n");

for param in os.environ.keys():
   print("%s=%s<br>\n" % (param,os.environ[param]));
```

Perl

```
#!/usr/bin/perl

print "Content-type: text/html\r\n\r\n";
print "<H2>Environment</H2>\r\n";

while (my ($key,$val) = each %ENV)
{
   print "$key=$val<br>\n";
}
```

Hardening Apache

- `fail2ban`
  - blocks IP using iptables based on logs
- `selinux` (RedHat)
- `apparmor` (Debian)
  - limits Apache access to certain directories