What is Apache?

Apache is the most popular web server on the internet. It is used to serve more than half of all active websites.

Although there are many viable web servers that will serve your content, it is helpful to understand how Apache works because of its ubiquity.

In this article, we will examine some general configuration files and options that can be controlled within them. This article will follow the Ubuntu/Debian layout of Apache files, which is different from how other distributions build the configuration hierarchy.

The Apache File Hierarchy in Ubuntu and Debian

On Ubuntu and Debian, Apache keeps its main configuration files within the "/etc/apache2" folder:

```
cd /etc/apache2
ls -F

apache2.conf  envvars     magic            mods-enabled/  sites-available/
conf.d/       httpd.conf  mods-available/  ports.conf     sites-enabled/
```

There are a number of plain text files and some sub-directories in this directory. These are some of the more useful locations to be familiar with:

- **apache2.conf**: This is the main configuration file for the server. Almost all configuration can be done from within this file, although it is recommended to use separate, designated files for simplicity. This file will configure defaults and be the central point of access for the server to read configuration details.
- **ports.conf**: This file is used to specify the ports that virtual hosts should listen on. Be sure to check that this file is correct if you are configuring SSL.
- **conf.d/**: This directory is used for controlling specific aspects of the Apache configuration. For example, it is often used to define SSL configuration and default security choices.
- **sites-available/**: This directory contains all of the virtual host files that define different web sites. These will establish which content gets served for which requests. These are available configurations, not active configurations.
- **sites-enabled/**: This directory establishes which virtual host definitions are actually being used. Usually, this directory consists of symbolic links to files defined in the "sites-available" directory.
- **mods-[enabled,available]/**: These directories are similar in function to the sites directories, but they define modules that can be optionally loaded instead.

As you can see, Apache configuration does not take place in a single monolithic file, but instead happens through a modular design where new files can be added and modified as needed.

Looking at the Apache2.conf File

The main configuration details for your Apache server are held in the "/etc/apache2/apache2.conf" file.

This file is divided into three main sections: configuration for the global Apache server process, configuration for the default server, and configuration of Virtual Hosts.

In Ubuntu and Debian, the majority of the file is for global definitions, and the configuration of the default server and virtual hosts is handled at the end, by using the "Include ..." directive.

The "Include" directive allows Apache to read other configuration files into the current file at the location that the statement appears. The result is that Apache dynamically generates an overarching configuration file on startup.

If you scroll to the bottom of the file, there are a number of different "Include" statements. These load module definitions, the ports.conf document, the specific configuration files in the "conf.d/" directory, and finally, the Virtual Host definitions in the "sites-enabled/" directory.

We will focus on the first part of the file to learn how Apache defines its global settings.

Global Configuration Section

This section is used to configure some options that control how Apache works as a whole.

There are some interesting options you may want to modify in this section:

Timeout

By default, this parameter is set to "300", which means that the server has a maximum of 300 seconds to fulfill each request.

This is probably too high for most set ups and can safely be dropped to something between 30 and 60 seconds.

KeepAlive

This option, if set to "On", will allow each connection to remain open to handle multiple requests from the same client.

If this is set to "Off", each request will have to establish a new connection, which can result in significant overhead depending on your setup and traffic situation.

MaxKeepAliveRequests

This controls how many separate request each connection will handle before dying. Keeping this number high will allow Apache to serve content to each client more effectively.

Setting this value to 0 will allow Apache to serve an unlimited amount of request for each connection.

KeepAliveTimeout

This setting specifies how long to wait for the next request after finishing the last one. If the timeout threshold is reached, then the connection will die.

This just means that the next time content is requested, the server will establish a new connection to handle the request for the content that make up the page the client is visiting.

Install Apache Webserver

Prior to install apache server, let us update our Ubuntu server:

To do that, run:

sudo apt-get update

Now, install apache web server using the following command:

```
sudo apt-get install apache2
```

After installing apache server, let us test whether the webserver is working properly or not by navigating to the URL **http://ip-address/**.

As you see in the above picture, apache webserver is working.

Now, let us proceed to setup virtual hosts in Apache web server.

Setup Apache Virtual Hosts

1. Create Virtual Directories

Now, let us proceed to setup virtual hosts. As I mentioned earlier, I am going to host two virtual hosts called **“unixmen1.local”**, and **“unixmen2.local”**.

Create a public directory to place the two virtual hosts data.

First, let us create a directory for unixmen1.local site:

```
sudo mkdir -p /var/www/html/unixmen1.local/public_html
```

Then, create the directory for unixmen2.local site:

```
sudo mkdir -p /var/www/html/unixmen2.local/public_html
```

2. Setting Up Ownership and Permissions

The above directories are owned by root user now. We should change the ownership of these two directories to the regular user.

```
sudo chown -R $USER:$USER /var/www/html/unixmen1.local/public_html/
```

```
sudo chown -R $USER:$USER /var/www/html/unixmen2.local/public_html/
```

The **“$USER”** variable indicates the currently logged in user.

Set the read permissions to the Apache web root (/var/www/html/) directory, so that everyone can read files from that directory.

```
sudo chmod -R 755 /var/www/html/
```

We have created the directories for holding the websites data and assigned the necessary permissions and ownership to them.

4. Create Sample pages for Virtual Hosts

Now, we have to create the sample pages to be served through the websites.

First, let us create a sample page to the **unixmen1.local** virtual host.

Create a ‘index.html’ for unixmen1.local virtual host,

```
sudo vi /var/www/html/unixmen1.local/public_html/index.html
```

Add the following contents:

```
<html>
 <head>
 <title>www.unixmen1.local</title>
 </head>
 <body>
 <h1>Welcome To Unixmen1.local website</h1>
 </body>
</html>
```

Save and close the file.

Similarly, add the sample page to the second virtual host.

```
sudo vi /var/www/html/unixmen2.local/public_html/index.html
```

Add the following contents:

```
<html>
 <head>
 <title>www.unixmen2.local</title>
 </head>
 <body>
 <h1>Welcome To Unixmen2.local website</h1>
 </body>
</html>
```

Save and close the file.

5. Create Virtual Host Files

By default, Apache comes with a default virtual host file called **000-default.conf**. We will copy the 000-default.conf file contents to our new virtual host files.

```
sudo cp /etc/apache2/sites-available/000-default.conf /etc/apache2/sites-available/unixmen1.local.conf

sudo cp /etc/apache2/sites-available/000-default.conf /etc/apache2/sites-available/unixmen2.local.conf
```

Make sure the virtual host files contains **.conf** extension at the end.

Now, modify the unximen1.local.conf file to reflect with our new own values.

```
sudo vi /etc/apache2/sites-available/unixmen1.local.conf
```

Make the relevant changes that reflect to the unixmen1 site.

```
<VirtualHost *:80>
        # The ServerName directive sets the request scheme, hostname and port
that
        # the server uses to identify itself. This is used when creating
        # redirection URLs. In the context of virtual hosts, the ServerName
        # specifies what hostname must appear in the request's Host: header to
        # match this virtual host. For the default virtual host (this file) this
        # value is not decisive as it is used as a last resort host regardless.
        # However, you must set it for any further virtual host explicitly.
        #ServerName www.example.com

        ServerAdmin webmaster@unixmen1.local
        ServerName unixmen1.local
        ServerAlias www.unixmen1.local
        DocumentRoot /var/www/html/unixmen1.local/public_html

        # Available loglevels: trace8, ..., trace1, debug, info, notice, warn,
        # error, crit, alert, emerg.
        # It is also possible to configure the loglevel for particular
        # modules, e.g.
        #LogLevel info ssl:warn

        ErrorLog ${APACHE_LOG_DIR}/error.log
        CustomLog ${APACHE_LOG_DIR}/access.log combined

        # For most configuration files from conf-available/, which are
        # enabled or disabled at a global level, it is possible to
        # include a line for only one particular virtual host. For example the
        # following line enables the CGI configuration for this host only
        # after it has been globally disabled with "a2disconf".
        #Include conf-available/serve-cgi-bin.conf
</VirtualHost>
```

Like wise, modify the second virtual host file.

```
sudo vi /etc/apache2/sites-available/unixmen2.local.conf
```

Make the relevant changes that reflect to the unixmen2 site.

```
<VirtualHost *:80>
        # The ServerName directive sets the request scheme, hostname and port
that
        # the server uses to identify itself. This is used when creating
        # redirection URLs. In the context of virtual hosts, the ServerName
        # specifies what hostname must appear in the request's Host: header to
        # match this virtual host. For the default virtual host (this file) this
        # value is not decisive as it is used as a last resort host regardless.
        # However, you must set it for any further virtual host explicitly.
        #ServerName www.example.com

        ServerAdmin webmaster@unixmen2.local
        ServerName unixmen2.local
        ServerAlias www.unixmen2.local
        DocumentRoot /var/www/html/unixmen2.local/public_html

        # Available loglevels: trace8, ..., trace1, debug, info, notice, warn,
        # error, crit, alert, emerg.
        # It is also possible to configure the loglevel for particular
        # modules, e.g.
```

```
        #LogLevel info ssl:warn

        ErrorLog ${APACHE_LOG_DIR}/error.log
        CustomLog ${APACHE_LOG_DIR}/access.log combined

        # For most configuration files from conf-available/, which are
        # enabled or disabled at a global level, it is possible to
        # include a line for only one particular virtual host. For example the
        # following line enables the CGI configuration for this host only
        # after it has been globally disabled with "a2disconf".
        #Include conf-available/serve-cgi-bin.conf
</VirtualHost>
```

After modifying the virtual hosts files, disable the default virtual host (000.default.conf), and enable new virtual hosts as shown below.

```
sudo a2dissite 000-default.conf

sudo a2ensite unixmen1.local.conf

sudo a2ensite unixmen2.local.conf
```

Finally, restart the apache service.

In Ubuntu 15.10/15.04:

```
sudo systemctl restart apache2
```

In Ubuntu 14.10 and earlier versions:

```
sudo service apache2 restart
```

That’s it. Now, we successfully configured the apache virtual hosts on our Ubuntu server.

Testing Virtual Hosts

Edit file **/etc/hosts**,

```
sudo vi /etc/hosts
```

Add the virtual domain names one by one as shown below.

```
[...]
192.168.1.103   unixmen1.local
192.168.1.103   unixmen2.local
```

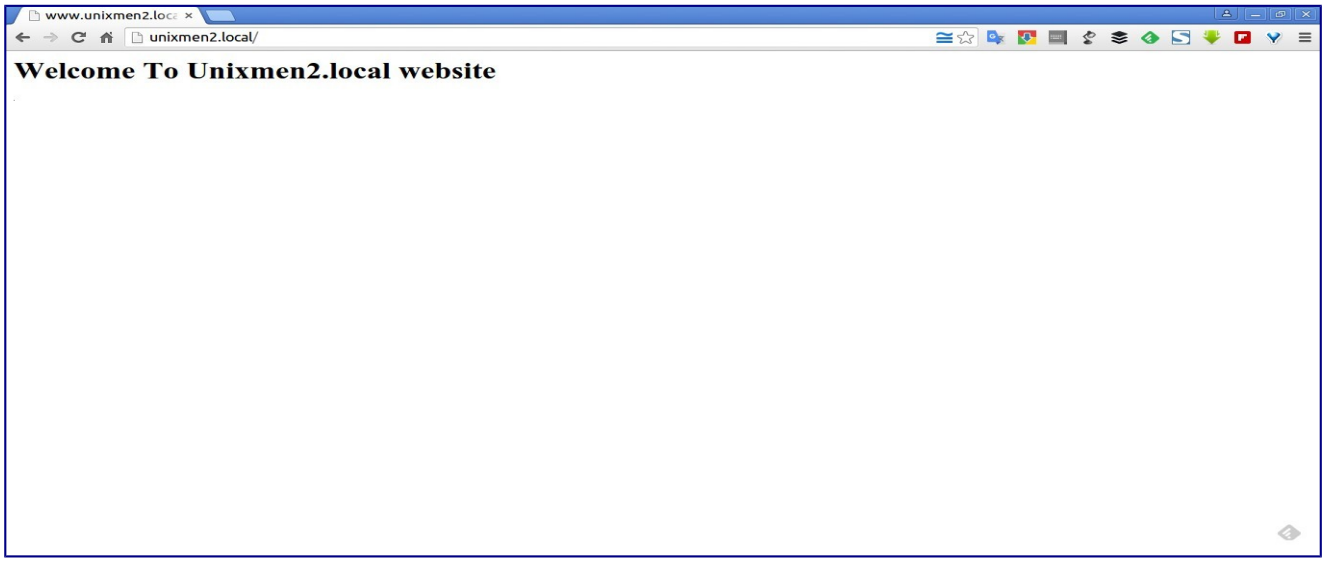
Save and close the file.

Note: In case, you want to access the above sites from a remote system, you need to add the above two lines to your remote system’s **/etc/hosts/** file as well. Don’t forget to replace the IP address with your own.

Open up your browser and point to the URL **http://unixmen1.local** or **http://unixmen2.local**. You should see the sample pages which we created earlier.

Unixmen1.local Test page:

Unixmen2.local Test page:



Alias and ScriptAlias Statements

Directory definitions are sometimes preceded by "Alias" or "ScriptAlias" statements. Alias maps a url path to a directory path.

ScriptAlias operates in the same way, but is used to define directories that will have executable components in them.

For instance, this line in a Virtual Host that handles request to "example.com" would allow access to content within "/path/to/content/" by navigating to "example.com/content/":

```
Alias /content/ /path/to/content/
```

Following the alias, you should remember to define the directory with access privileges as discussed in the previous section.

Enabling Sites and Modules in Apache

Once you have a Virtual Host file that meets your requirements, you can use the tools included with Apache to transition them into live sites.

To automatically create a symbolic link in the "sites-enabled" directory to an existing file in the "sites-available" directory, issue the following command:

```
sudo a2ensite virtual_host_file_name
```

After enabling a site, issue the following command to tell Apache to re-read its configuration files, allowing the change to propagate:

```
sudo service apache2 reload
```

There is also a companion command for disabling a Virtual Host. It operates by removing the symbolic link from the "sites-enabled" directory:

```
sudo a2dissite virtual_host_file_name
```

Again, reload the configuration to make the change happen:

```
sudo service apache2 reload
```

Modules can be enabled or disabled by using the "a2enmod" and "a2dismod" commands respectively. They work in the same way as the "site" versions of these commands.

Remember to reload your configuration changes after modules have been enabled or disabled as well.

How To Create a SSL Certificate on Apache for Ubuntu 14.04

Introduction

TLS, or transport layer security, and its predecessor **SSL**, secure sockets layer, are secure protocols created in order to place normal traffic in a protected, encrypted wrapper.

These protocols allow traffic to be sent safely between remote parties without the possibility of the traffic being intercepted and read by someone in the middle. They are also instrumental in validating the identity of domains and servers throughout the internet by establishing a server as trusted and genuine by a certificate authority.

In this guide, we'll cover how to create a **self-signed SSL certificate** for Apache on an Ubuntu 14.04 server, which will allow you to encrypt traffic to your server. While this does not provide the benefit of third party validation of your server's identity, it fulfills the requirements of those simply wanting to transfer information securely.

Step One — Activate the SSL Module

SSL support actually comes standard in the Ubuntu 14.04 Apache package. We simply need to enable it to take advantage of SSL on our system.

Enable the module by typing:

```
sudo a2enmod ssl
```

After you have enabled SSL, you'll have to restart the web server for the change to be recognized:

```
sudo service apache2 restart
```

With that, our web server is now able to handle SSL if we configure it to do so.

Step Two — Create a Self-Signed SSL Certificate

Let's start off by creating a subdirectory within Apache's configuration hierarchy to place the certificate files that we will be making:

```
sudo mkdir /etc/apache2/ssl
```

Now that we have a location to place our key and certificate, we can create them both in one step by typing:

```
sudo openssl req -x509 -nodes -days 365 -newkey rsa:2048 -keyout
/etc/apache2/ssl/apache.key -out /etc/apache2/ssl/apache.crt
```

Let's go over exactly what this means.

- **openssl**: This is the basic command line tool provided by OpenSSL to create and manage certificates, keys, signing requests, etc.
- **req**: This specifies a subcommand for X.509 certificate signing request (CSR) management. X.509 is a public key infrastructure standard that SSL adheres to for its key and certificate managment. Since we are wanting to *create* a new X.509 certificate, this is what we want.
- **-x509**: This option specifies that we want to make a self-signed certificate file instead of generating a certificate request.
- **-nodes**: This option tells OpenSSL that we do not wish to secure our key file with a passphrase. Having a password protected key file would get in the way of Apache starting automatically as we would have to enter the password every time the service restarts.
- **-days 365**: This specifies that the certificate we are creating will be valid for one year.
- **-newkey rsa:2048**: This option will create the certificate request and a new private key at the same time. This is necessary since we didn't create a private key in advance. The `rsa:2048` tells OpenSSL to generate an RSA key that is 2048 bits long.
- **-keyout**: This parameter names the output file for the private key file that is being created.
- **-out**: This option names the output file for the certificate that we are generating.

When you hit "ENTER", you will be asked a number of questions.

The most important item that is requested is the line that reads "Common Name (e.g. server FQDN or YOUR name)". You should enter the domain name you want to associate with the certificate, or the server's public IP address if you do not have a domain name.

The questions portion looks something like this:

```
Country Name (2 letter code) [AU]:US
State or Province Name (full name) [Some-State]:New York
Locality Name (eg, city) []:New York City
Organization Name (eg, company) [Internet Widgits Pty Ltd]:Your Company
Organizational Unit Name (eg, section) []:Department of Kittens
Common Name (e.g. server FQDN or YOUR name) []:your_domain.com
Email Address []:your_email@domain.com
```

The key and certificate will be created and placed in your `/etc/apache2/ssl` directory.

Step Three — Configure Apache to Use SSL

Now that we have our certificate and key available, we can configure Apache to use these files in a virtual host file. You can learn more about how to set up Apache virtual hosts here.

Instead of basing our configuration file off of the `000-default.conf` file in the `sites-available` subdirectory, we're going to base this configuration on the `default-ssl.conf`

file that contains some default SSL configuration.

Open the file with root privileges now:

```
sudo nano /etc/apache2/sites-available/default-ssl.conf
```

With the comments removed, the file looks something like this:

```
<IfModule mod_ssl.c>
    <VirtualHost _default_:443>
        ServerAdmin webmaster@localhost
        DocumentRoot /var/www/html
        ErrorLog ${APACHE_LOG_DIR}/error.log
        CustomLog ${APACHE_LOG_DIR}/access.log combined
        SSLEngine on
        SSLCertificateFile /etc/ssl/certs/ssl-cert-snakeoil.pem
        SSLCertificateKeyFile /etc/ssl/private/ssl-cert-snakeoil.key
        <FilesMatch "\.(cgi|shtml|phtml|php)$">
                        SSLOptions +StdEnvVars
        </FilesMatch>
        <Directory /usr/lib/cgi-bin>
                        SSLOptions +StdEnvVars
        </Directory>
        BrowserMatch "MSIE [2-6]" \
                        nokeepalive ssl-unclean-shutdown \
                        downgrade-1.0 force-response-1.0
        BrowserMatch "MSIE [17-9]" ssl-unclean-shutdown
    </VirtualHost>
</IfModule>
```

This may look a bit complicated, but luckily, we don't need to worry about most of the options here.

We want to set the normal things we'd configure for a virtual host (ServerAdmin, ServerName, ServerAlias, DocumentRoot, etc.) as well as change the location where Apache looks for the SSL certificate and key.

In the end, it will look something like this. The entries in red were modified from the original file:

```
<IfModule mod_ssl.c>
    <VirtualHost _default_:443>
        ServerAdmin admin@example.com
        ServerName your_domain.com
        ServerAlias www.your_domain.com
        DocumentRoot /var/www/html
        ErrorLog ${APACHE_LOG_DIR}/error.log
        CustomLog ${APACHE_LOG_DIR}/access.log combined
        SSLEngine on
        SSLCertificateFile /etc/apache2/ssl/apache.crt
        SSLCertificateKeyFile /etc/apache2/ssl/apache.key
        <FilesMatch "\.(cgi|shtml|phtml|php)$">
                        SSLOptions +StdEnvVars
        </FilesMatch>
        <Directory /usr/lib/cgi-bin>
                        SSLOptions +StdEnvVars
        </Directory>
        BrowserMatch "MSIE [2-6]" \
                        nokeepalive ssl-unclean-shutdown \
                        downgrade-1.0 force-response-1.0
        BrowserMatch "MSIE [17-9]" ssl-unclean-shutdown
    </VirtualHost>
</IfModule>
```

Save and exit the file when you are finished.

Step Four — Activate the SSL Virtual Host

Now that we have configured our SSL-enabled virtual host, we need to enable it.

We can do this by typing:

```
sudo a2ensite default-ssl.conf
```

We then need to restart Apache to load our new virtual host file:

```
sudo service apache2 restart
```

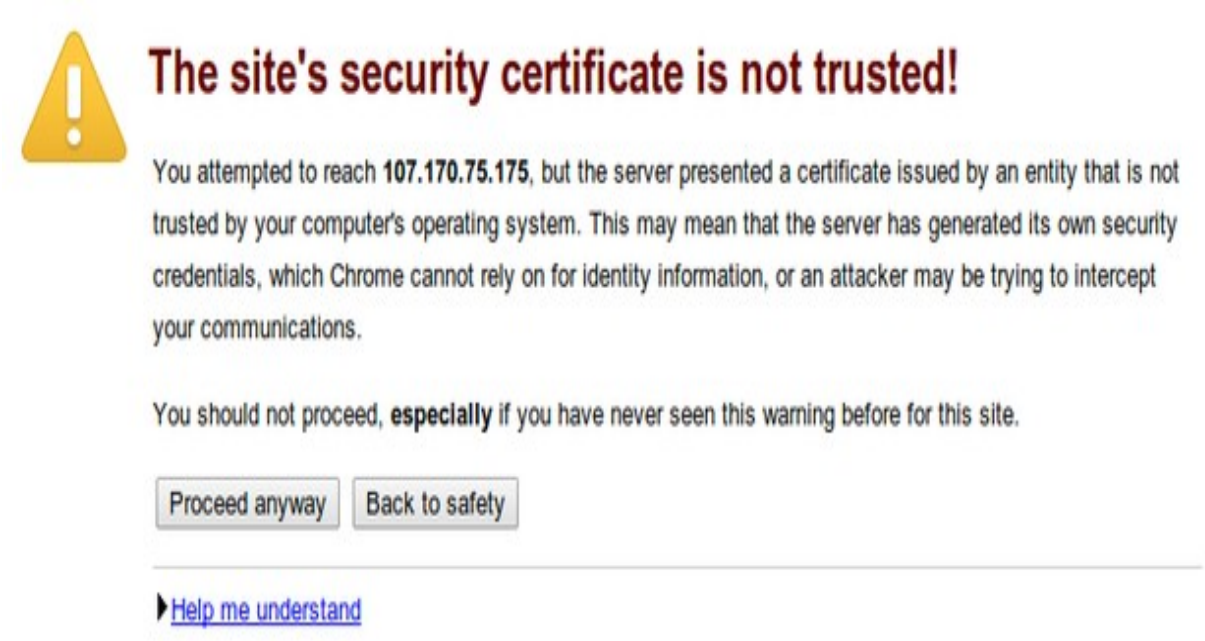
This should enable your new virtual host, which will serve encrypted content using the SSL certificate you created.

Step Five — Test your Setup

Now that you have everything prepared, you can test your configuration by visiting your server's domain name or public IP address after specifying the `https://` protocol, like this:

```
https://server_domain_name_or_IP
```

You will get a warning that your browser cannot verify the identity of your server because it has not been signed by one of the certificate authorities that it trusts.



This is expected since we have self-signed our certificate. While our certificate will not validate our server for our users because it has had no interaction with a trusted certificate authority, it will still be able to encrypt communication.

Since this is expected, you can hit the "Proceed anyway" button or whatever similar option you have in your browser.

You will now be taken to content in the `DocumentRoot` that you configured for your SSL virtual host. This time your traffic is encrypted. You can check this by clicking on the lock icon in the menu bar: