

Question1: Apache2 Install

```
l00169723@ubuntu: ~  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
  
l00169723@ubuntu:~$ sudo apt-get install apache2  
[sudo] password for l00169723:  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following additional packages will be installed:  
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1  
  libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.3-0  
Suggested packages:  
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom  
The following NEW packages will be installed:  
  apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1  
  libaprutil1-dbd-sqlite3 libaprutil1-ldap liblua5.3-0  
0 to upgrade, 9 to newly install, 0 to remove and 221 not to upgrade  
Need to get 1,857 kB of archives.  
After this operation, 8,039 kB of additional disk space will be used.  
Do you want to continue? [Y/n]
```

1.: After completing the installation and full update of Ubuntu 21.04 DT edition. Installed Apache2.

2.: Created rules for Apache2 on the FW.

```
l00169723@ubuntu: ~  
Enabling module mime.  
Enabling module negotiation.  
Enabling module setenvif.  
Enabling module filter.  
Enabling module deflate.  
Enabling module status.  
Enabling module reqtimeout.  
Enabling conf charset.  
Enabling conf localized-error-pages.  
Enabling conf other-vhosts-access-log.  
Enabling conf security.  
Enabling conf serve-cgi-bin.  
Enabling site 000-default.  
Created symlink /etc/systemd/system/multi-user.target.wants/apache2.service → /lib/systemd/system/apache2.service.  
Created symlink /etc/systemd/system/multi-user.target.wants/apache-htcacheclean.service → /lib/systemd/system/apache-htcacheclean.service.  
Processing triggers for ufw (0.36-7.1) ...  
Processing triggers for man-db (2.9.4-2) ...  
Processing triggers for libc-bin (2.33-0ubuntu5) ...  
l00169723@ubuntu:~$ sudo ufw allow "Apache Full"  
Rules updated  
Rules updated (v6)  
l00169723@ubuntu:~$
```

3.: Testing service status locally an through web browser from host PC.

The screenshot shows a host PC desktop with a Ubuntu background. A web browser window is open, displaying the Apache2 Ubuntu Default Page. The browser's address bar shows the URL 192.168.136.128. The page content includes the Ubuntu logo, the heading "Apache2 Ubuntu Default Page", and a red banner that says "It works!". Below this, there is a paragraph explaining that the page is the default welcome page used to test the correct operation of the Apache2 server. A "Configuration Overview" section follows, detailing the configuration files and documentation. At the bottom of the page, there is a code block showing the configuration layout for an Apache2 web server installation on Ubuntu systems.

```
/etc/apache2/  
|-- apache2.conf  
    |-- ports.conf  
    |-- mods-enabled  
        |-- *.load  
        |-- *.conf
```

Two terminal windows are also open. The top terminal window shows the output of the `ifconfig` command, displaying network configuration details for the `ens33` and `lo` interfaces. The bottom terminal window shows the output of the `systemctl status apache2.service` command, indicating that the Apache HTTP Server is loaded and active (running).

```
l00169723@ubuntu: ~  
l00169723@ubuntu:~$ ifconfig  
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
    inet 192.168.136.128 netmask 255.255.255.0 broadcast 192.168.136.255  
    inet6 fe80::c467:6df1:32e6:1e35 prefixlen 64 scopeid 0x20<link>  
    ether 00:0c:29:fd:4b:71 txqueuelen 1000 (Ethernet)  
    RX packets 794 bytes 475418 (475.4 KB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 677 bytes 85841 (85.8 KB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536  
    inet 127.0.0.1 netmask 255.0.0.0  
    inet6 ::1 prefixlen 128 scopeid 0x10<host>  
    loop txqueuelen 1000 (Local Loopback)  
    RX packets 381 bytes 30357 (30.3 KB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 381 bytes 30357 (30.3 KB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
l00169723@ubuntu:~$  
  
l00169723@ubuntu:~$ systemctl status apache2.service  
● apache2.service - The Apache HTTP Server  
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor prese  
   Active: active (running) since Mon 2021-11-01 17:42:38 PDT; 2min 29s ago  
     Docs: https://httpd.apache.org/docs/2.4/  
   Process: 884 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SUC  
   Main PID: 919 (apache2)  
     Tasks: 55 (limit: 9427)  
    Memory: 7.7M  
    CGroup: /system.slice/apache2.service  
            └─ 919 /usr/sbin/apache2 -k start  
              920 /usr/sbin/apache2 -k start  
              921 /usr/sbin/apache2 -k start  
  
Nov 01 17:42:38 ubuntu apachectl[904]: AH00558: apache2: Could not reliably det  
Nov 01 17:42:38 ubuntu systemd[1]: Started The Apache HTTP Server.  
~  
~  
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~  
lines 1-15/15 (END)
```

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    inet6 fe80::c467:6df1:32e6:1e35 prefixlen 64 scopeid 0x20<link>  
    ether 00:0c:29:fd:4b:71 txqueuelen 1000 (Ethernet)  
    RX packets 794 bytes 475418 (475.4 KB)  
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lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536  
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