Qassim University جامعة القصيم

College of Computer | كـلـيـة الـحـاسـب

SYSTEM ADMINISTRATION AND MAINTENANCE

Course Project –
(Server Installation and Configuration Report)

2.1–INTRODUCTION

A web server is a combination of hardware and software designed to receive and respond to client requests, most commonly from web browsers, by delivering web content such as HTML pages, images, videos, or applications. These servers operate using standard web protocols like HTTP and HTTPS, allowing seamless interaction between users and websites.

In practice, every time a user visits a website, their browser sends a request to a web server, which processes the request, retrieves the requested resources from storage, and sends them back as a structured response. This process is deeply integrated into our daily digital life, often unnoticed due to how quickly and efficiently web servers function.

Web servers serve not only static content—like HTML files and images—but also dynamic content that is generated in real time based on user input or system conditions. This is achieved through integration with server-side scripting languages such as PHP, Python, or Ruby. These capabilities make web servers essential for modern interactive websites.

2.1-INTRODUCTION

Functions & Applications
Among the key functions of a web server:

- Content Delivery: Stores and delivers web pages, multimedia, and downloadable files to users.
- User Request Handling: Accepts, processes, and responds to HTTP requests from multiple users concurrently.
- Security: Protects websites and their users using tools like firewalls, SSL/TLS encryption, and defense mechanisms against common cyber threats.
- Application Support: Hosts and maintains web-based applications, including e-commerce platforms, social networks, and content management systems.
- Load Management: Supports high traffic by handling numerous simultaneous connections efficiently using techniques like multi-threading or reverse proxy setups.

2.1-INTRODUCTION

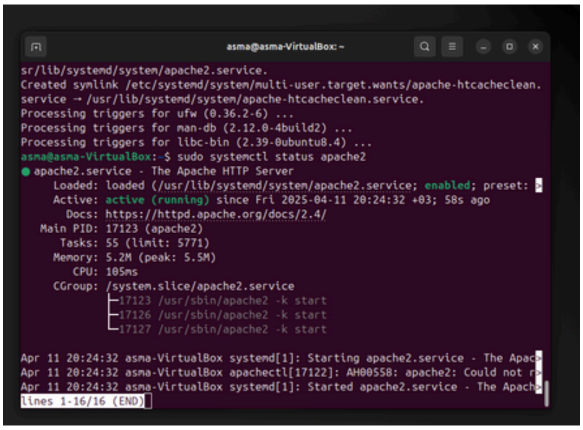
Some of the leading web server providers include:

- Apache HTTP Server: An open-source server launched in 1996 and maintained by the Apache Software Foundation. It is known for its flexibility, rich modules, and wide community support.
- Nginx: Originally created by Igor Sysoev and publicly released in 2004. It functions not only as a web server but also as a load balancer, reverse proxy, and HTTP cache. It is widely used by high-profile companies such as T-Mobile, Cisco, and Salesforce.
- Microsoft IIS (Internet Information Services): Developed by Microsoft, this web server is tightly integrated with Windows systems and often used in enterprise environments. It uses a graphical interface for management and supports ASP.NET applications.
- LiteSpeed Web Server: A commercial web server known for its high performance, efficient resource usage, and advanced security features. It is commonly used by hosting providers.

By understanding how to install, configure, and manage a web server on a Linux system, students develop essential skills in system administration and gain practical knowledge that is directly applicable to real-world IT environments.

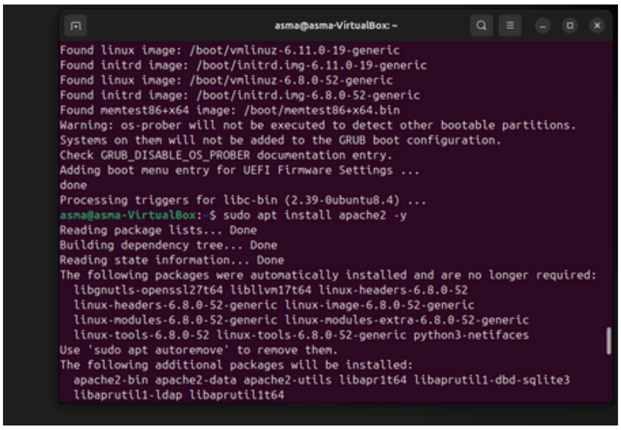
2.2-SYSTEM REQUIREMENTS, DOWNLOAD, AND INSTALLATION

system requirements to successfully download and install the Apache2 web server on a Linux-based system, certain minimum system requirements must be met. The operating system should be a Debian-based Linux distribution, such as Ubuntu 20.04 LTS or later. The system must have a processor with a minimum speed of 1 GHz, and at least 1 GB of RAM is recommended to ensure stable performance during installation and operation. Additionally, a minimum of 200 MB of available disk space is required for the Apache2 package and its dependencies, with additional space needed to host website content. A reliable internet connection is essential to download .



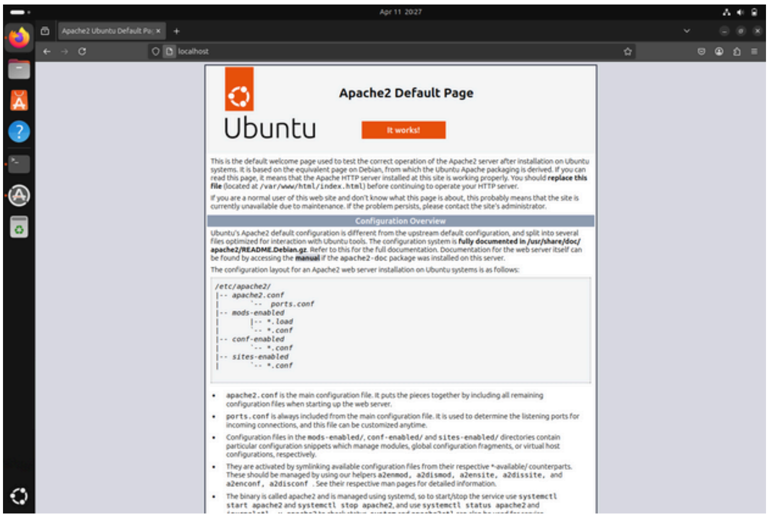
```
sr/lib/systemd/system/apache2.service.
Created symlink /etc/systemd/system/multi-user.target.wants/apache-htcacheclean.
service → /usr/lib/systemd/system/apache-htcacheclean.service.
Processing triggers for ufw (0.36.2-6) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for libc-bin (2.39-0ubuntu8.4) ...
asma@asma-VirtualBox:~$ sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
     Loaded: loaded (/usr/lib/systemd/system/apache2.service; enabled; preset: >
     Active: active (running) since Fri 2025-04-11 20:24:32 +03; 58s ago
       Docs: https://httpd.apache.org/docs/2.4/
   Main PID: 17123 (apache2)
      Tasks: 55 (limit: 5771)
     Memory: 5.2M (peak: 5.5M)
        CPU: 105ms
     CGroup: /system.slice/apache2.service
             ├─17123 /usr/sbin/apache2 -k start
             ├─17126 /usr/sbin/apache2 -k start
             └─17127 /usr/sbin/apache2 -k start

Apr 11 20:24:32 asma-VirtualBox systemd[1]: Starting apache2.service - The Apac>
Apr 11 20:24:32 asma-VirtualBox apachectl[17122]: AH00558: apache2: Could not r>
Apr 11 20:24:32 asma-VirtualBox systemd[1]: Started apache2.service - The Apach>
lines 1-16/16 (END)
```



```
Found linux image: /boot/vmlinuz-6.11.0-19-generic
Found initrd image: /boot/initrd.img-6.11.0-19-generic
Found linux image: /boot/vmlinuz-6.8.0-52-generic
Found initrd image: /boot/initrd.img-6.8.0-52-generic
Found memtest86+x64 image: /boot/memtest86+x64.bin
Warning: os-prober will not be executed to detect other bootable partitions.
Systems on them will not be added to the GRUB boot configuration.
Check GRUB_DISABLE_OS_PROBER documentation entry.
Adding boot menu entry for UEFI Firmware Settings ...
done
Processing triggers for libc-bin (2.39-0ubuntu8.4) ...
asma@asma-VirtualBox:~$ sudo apt install apache2 -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libgnutls-openssl27t64 libllvm17t64 linux-headers-6.8.0-52
  linux-headers-6.8.0-52-generic linux-image-6.8.0-52-generic
  linux-modules-6.8.0-52-generic linux-modules-extra-6.8.0-52-generic
  linux-tools-6.8.0-52 linux-tools-6.8.0-52-generic python3-netifaces
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1t64 libaprutil1-dbd-sqlite3
  libaprutil1-ldap libaprutil1t64
```

to check apache2 :



Apache2 Default Page

This is the default welcome page used to test the correct operation of the Apache2 server after installation on Ubuntu systems. It is based on the equivalent page on Debian, from which the Ubuntu Apache packaging is derived. If you can read this page, it means that the Apache HTTP server installed at this site is working properly. You should **replace this file** (located at `/var/www/html/index.html`) before continuing to operate your HTTP server.

If you are a normal user of this web site and don't know what this page is about, this probably means that the site is currently unavailable due to maintenance. If the problem persists, please contact the site's administrator.

Configuration Overview

Ubuntu's Apache2 default configuration is different from the upstream default configuration, and split into several files optimized for interaction with Ubuntu tools. The configuration system is **fully documented in /usr/share/doc/apache2/README.Debian.gz**. Refer to this for the full documentation. Documentation for the web server itself can be found by accessing the **manual** if the apache2-doc package was installed on this server.

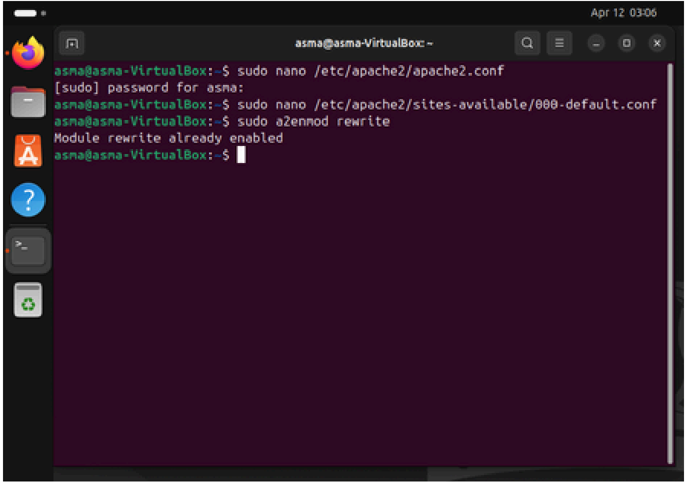
The configuration layout for an Apache2 web server installation on Ubuntu systems is as follows:

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

- `apache2.conf` is the main configuration file. It puts the pieces together by including all remaining configuration files when starting up the web server.
- `ports.conf` is always included from the main configuration file. It is used to determine the listening ports for incoming connections, and this file can be customized anytime.
- Configuration files in the `mods-enabled/`, `conf-enabled/` and `sites-enabled/` directories contain particular configuration snippets which manage modules, global configuration fragments, or virtual host configurations, respectively.
- They are activated by symlinking available configuration files from their respective *-available/ counterparts. These should be managed by using our helpers `a2enmod`, `a2dismod`, `a2ensite`, `a2dissite`, and `a2enconf`, `a2disconf` . See their respective man pages for detailed information.
- The binary is called apache2 and is managed using systemd, so to start/stop the service use `systemctl start apache2` and `systemctl stop apache2`, and use `systemctl status apache2` and `journalctl -u apache2` to check status. `system` and `apache2ctl` can also be used for service

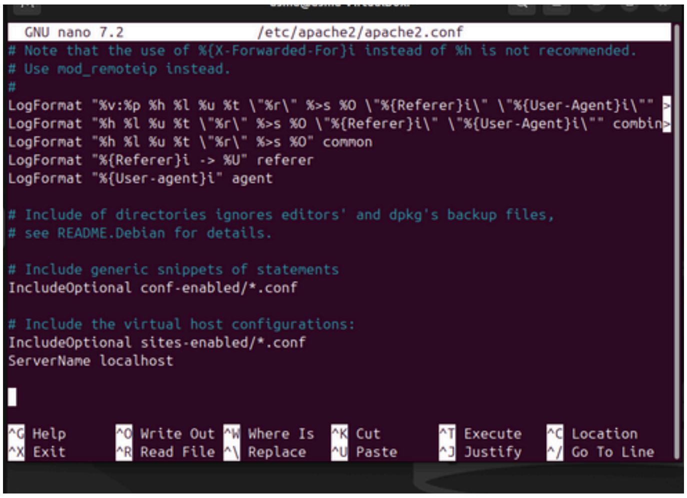
2.3–SERVER CONFIGURATION

Apache settings were edited in apache2.conf and 000-default.conf, and the mod_rewrite module was already enabled.



```
asma@asma-VirtualBox:~$ sudo nano /etc/apache2/apache2.conf
[sudo] password for asma:
asma@asma-VirtualBox:~$ sudo nano /etc/apache2/sites-available/000-default.conf
asma@asma-VirtualBox:~$ sudo a2enmod rewrite
Module rewrite already enabled
asma@asma-VirtualBox:~$ 
```

The apache2.conf file defines log formats, includes extra config files and virtual host settings, and sets ServerName to localhost.



```
  GNU nano 7.2                    /etc/apache2/apache2.conf
# Note that the use of %{X-Forwarded-For}i instead of %h is not recommended.
# Use mod_remoteip instead.
#
LogFormat "%v:%p %h %l %u %t \"%r\" %>s %O \"%{Referer}i\" \"%{User-Agent}i\"" >
LogFormat "%h %l %u %t \"%r\" %>s %O \"%{Referer}i\" \"%{User-Agent}i\"" combin>
LogFormat "%h %l %u %t \"%r\" %>s %O" common
LogFormat "%{Referer}i -> %U" referer
LogFormat "%{User-agent}i" agent

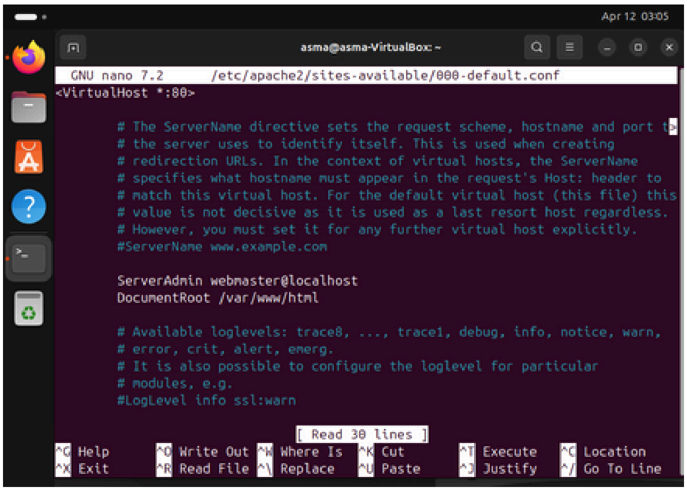
# Include of directories ignores editors' and dpkg's backup files,
# see README.Debian for details.

# Include generic snippets of statements
IncludeOptional conf-enabled/*.conf

# Include the virtual host configurations:
IncludeOptional sites-enabled/*.conf
ServerName localhost


^G Help      ^O Write Out ^W Where Is  ^K Cut       ^T Execute   ^C Location
^X Exit      ^R Read File ^\ Replace   ^U Paste     ^J Justify   ^/ Go To Line
```

This is Apache's default configuration file, setting the DocumentRoot`to `/var/www/html` and `ServerAdmin`to webmaster@localhost. Comments explain optional directives like `ServerName`for server identification



```
  GNU nano 7.2       /etc/apache2/sites-available/000-default.conf
<VirtualHost *:80>

        # The ServerName directive sets the request scheme, hostname and port t>
        # 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

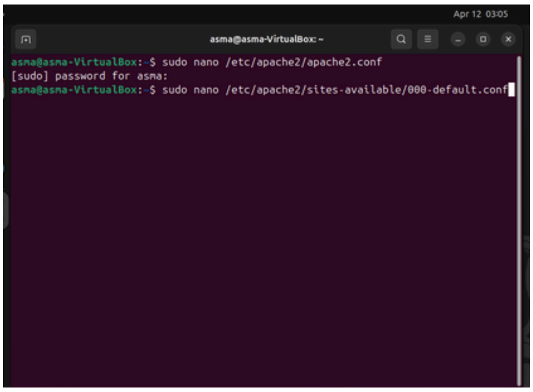
        ServerAdmin webmaster@localhost
        DocumentRoot /var/www/html

        # 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

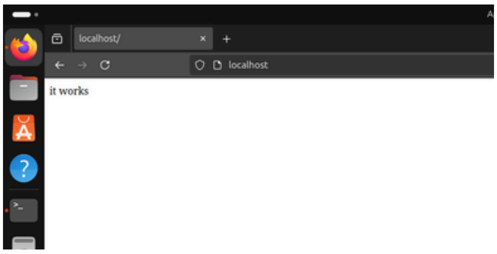
                              [ Read 30 lines ]
^G Help      ^O Write Out ^W Where Is  ^K Cut       ^T Execute   ^C Location
^X Exit      ^R Read File ^\ Replace   ^U Paste     ^J Justify   ^/ Go To Line
```

2.3–SERVER CONFIGURATION

The first image shows editing Apache's configuration file (àpache2.conf) with s̀udo nano` in Ubuntu. The seconed image displays Apache's default page when accessing l̀ocalhost,` indicating the server is functioning correctly.

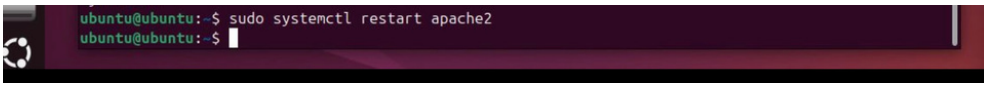


```
Apr 12 03:05
asma@asma-VirtualBox: ~
asma@asma-VirtualBox:~$ sudo nano /etc/apache2/apache2.conf
[sudo] password for asma:
asma@asma-VirtualBox:~$ sudo nano /etc/apache2/sites-available/000-default.conf
```

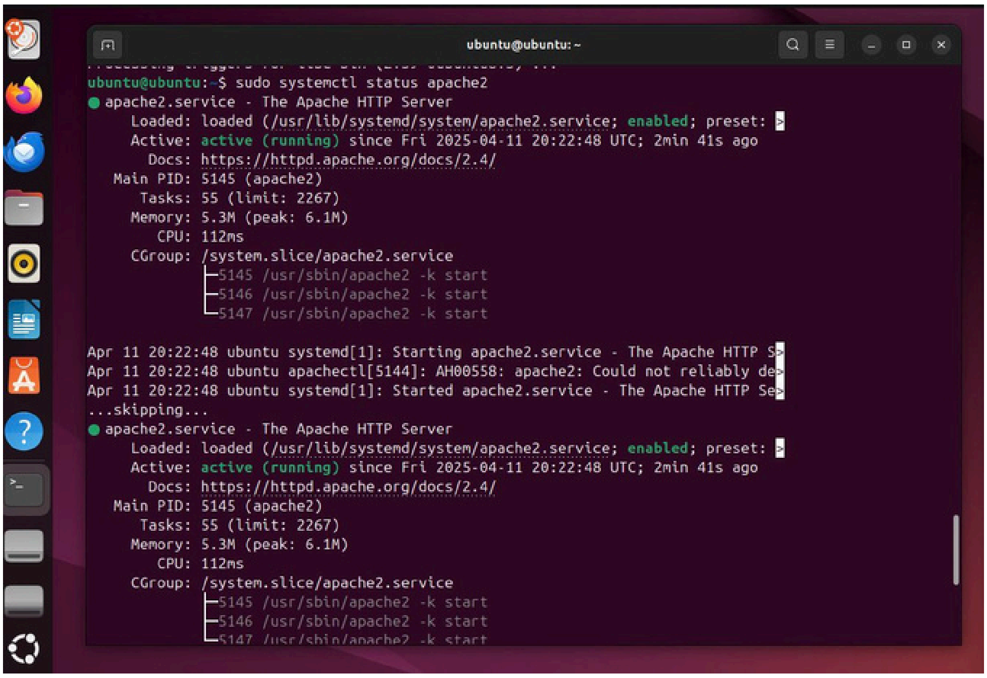


it works

The first image shows restarting the Apache server using the command s̀udo systemctl restart apache2.` The second image displays the server's status after restart, confirming it's successfully running ("active (running)") with details like memory usage and uptime



```
ubuntu@ubuntu:~$ sudo systemctl restart apache2
ubuntu@ubuntu:~$ 
```



```
ubuntu@ubuntu: ~
ubuntu@ubuntu:~$ sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
     Loaded: loaded (/usr/lib/systemd/system/apache2.service; enabled; preset: >
     Active: active (running) since Fri 2025-04-11 20:22:48 UTC; 2min 41s ago
       Docs: https://httpd.apache.org/docs/2.4/
   Main PID: 5145 (apache2)
      Tasks: 55 (limit: 2267)
     Memory: 5.3M (peak: 6.1M)
        CPU: 112ms
     CGroup: /system.slice/apache2.service
             ├─5145 /usr/sbin/apache2 -k start
             ├─5146 /usr/sbin/apache2 -k start
             └─5147 /usr/sbin/apache2 -k start

Apr 11 20:22:48 ubuntu systemd[1]: Starting apache2.service - The Apache HTTP S>
Apr 11 20:22:48 ubuntu apachectl[5144]: AH00558: apache2: Could not reliably de>
Apr 11 20:22:48 ubuntu systemd[1]: Started apache2.service - The Apache HTTP Se>
...skipping...
● apache2.service - The Apache HTTP Server
     Loaded: loaded (/usr/lib/systemd/system/apache2.service; enabled; preset: >
     Active: active (running) since Fri 2025-04-11 20:22:48 UTC; 2min 41s ago
       Docs: https://httpd.apache.org/docs/2.4/
   Main PID: 5145 (apache2)
      Tasks: 55 (limit: 2267)
     Memory: 5.3M (peak: 6.1M)
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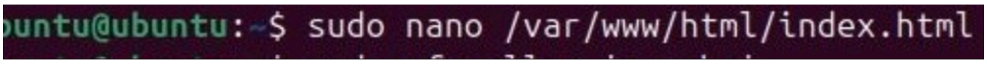
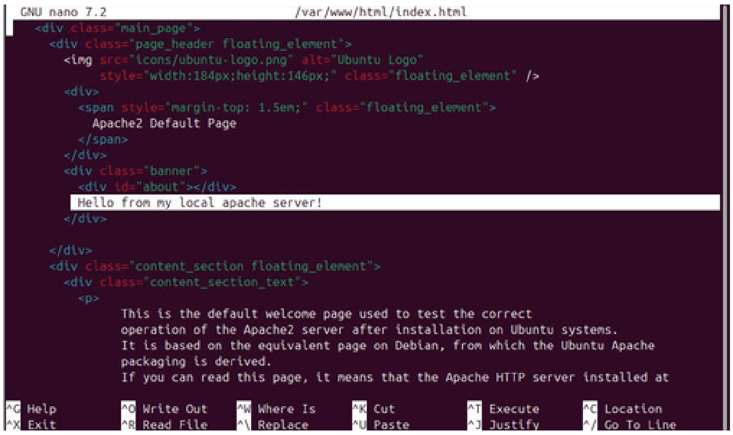
     CGroup: /system.slice/apache2.service
             ├─5145 /usr/sbin/apache2 -k start
             ├─5146 /usr/sbin/apache2 -k start
             └─5147 /usr/sbin/apache2 -k start
```

2.3–SERVER CONFIGURATION

The command `sudo nano /var/www/html/index.html` opens the web server's default index file in nano editor with admin rights, enabling direct modification of the website's main page via terminal.



```
buntu@ubuntu:~$ sudo nano /var/www/html/index.html
```

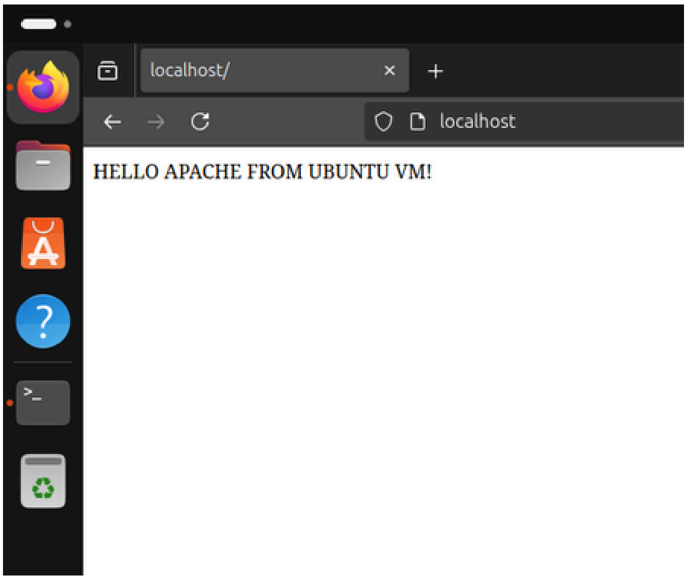


```
GNU nano 7.2                         /var/www/html/index.html
  <div class="main_page">
    <div class="page_header floating_element">
      <img src="icons/ubuntu-logo.png" alt="Ubuntu Logo"
           style="width:184px;height:146px;" class="floating_element" />
      <div>
        <span style="margin-top: 1.5em;" class="floating_element">
          Apache2 Default Page
        </span>
      </div>
      <div class="banner">
        <div id="about"></div>
        Hello from my local apache server!
      </div>

    </div>
    <div class="content_section floating_element">
      <div class="content_section_text">
        <p>
              This is the default welcome page used to test the correct
              operation of the Apache2 server after installation on Ubuntu systems.
              It is based on the equivalent page on Debian, from which the Ubuntu Apache
              packaging is derived.
              If you can read this page, it means that the Apache HTTP server installed at

^G Help          ^O Write Out     ^W Where Is      ^K Cut           ^T Execute       ^C Location
^X Exit          ^R Read File     ^\ Replace       ^U Paste         ^J Justify       ^/ Go To Line
```

Accessing `http://localhost`and seeing "Hello Apache from Ubuntu VM!" confirms Apache is running

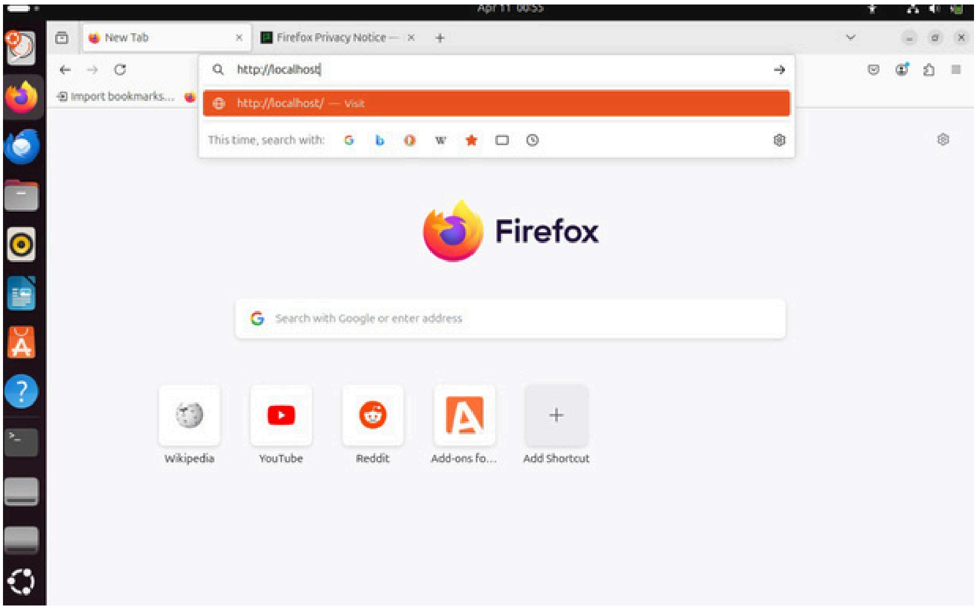


HELLO APACHE FROM UBUNTU VM!

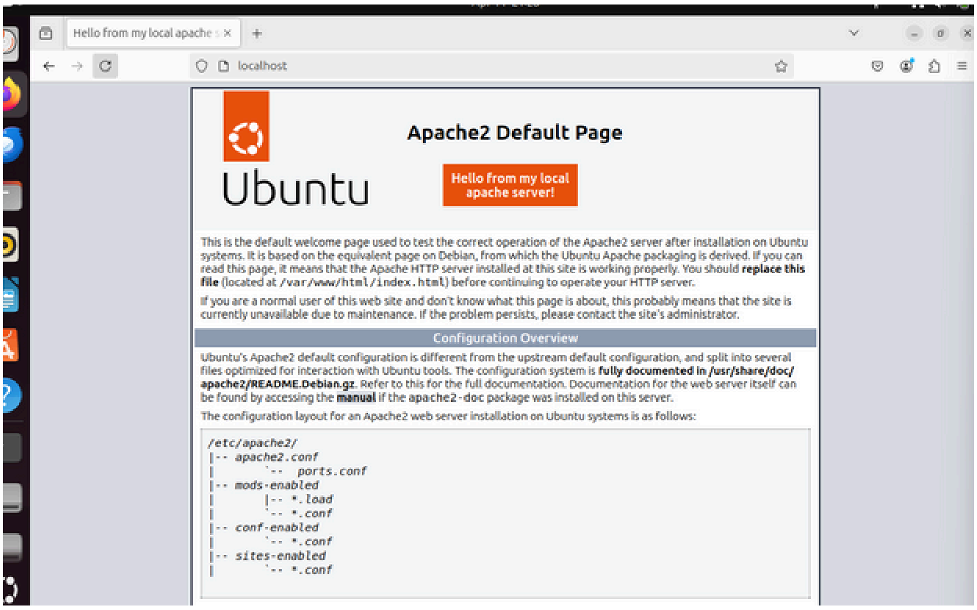
2.4—SERVER TESTING

To verify that the Apache web server is working correctly, we opened the Firefox browser and typed http://localhost in the address bar.

As shown in the screenshot below, this step is used to test whether the server responds and serves the default web page.



After pressing Enter, the Apache default web page appeared successfully with the changes we made to it, confirming that the server is running properly.



Apache2 Default Page

Hello from my local apache server!

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|       |-- *.load
|       `-- *.conf
|-- conf-enabled
|       `-- *.conf
|-- sites-enabled
|       `-- *.conf
```

REFERENCES

- DigitalOcean. “How To Install the Apache Web Server on Ubuntu 20.04.” https://www.digitalocean.com/community/tutorials/how-to-install-the-apache-web-server-on-ubuntu-20-04

- https://ubuntu.com/server/docs/web-servers-apache

- https://ubuntu.com/tutorials/install-and-configure-apache#2-installing-apache

- https://httpd.apache.org/docs/2.4/configuring.html

- https://httpd.apache.org/docs/