Assignment No 1

DNS Configuration

Creating one DNS Server, one Web Server and one Client accessing host using domain name.

- Group Members:

Sr. no	Name	Roll no.	PRN
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❖ Introduction:

1. DNS Server (PC2)

- Runs the **BIND9** service.

- Responsible for **resolving domain names into IP addresses**.

- Maintains a **zone file** for the domain mywebsite.local.

- Contains mapping:

    o www.mywebsite.local → 172.25.6.37

2. Web Server / HTTP Host (PC1)

- Runs **Apache web server**.

- Hosts a website inside /var/www/mywebsite.

- Configured with a **Virtual Host** so it responds to requests for www.mywebsite.local.

- When accessed via its IP or domain name, it serves index.html page.

3. Client (PC3)

- A normal user machine.

- Configured to use the **DNS Server (PC2)** as its nameserver in /etc/resolv.conf.

- When user types www.mywebsite.local, the client first queries DNS Server.

- After getting IP address, it sends HTTP request to Web Server.

Working of DNS Configuration:

☐ **User Request**

- Client enters www.mywebsite.local in browser.

☐ **DNS Query**

- The client contacts **DNS Server (PC2)**.

- DNS Server looks into its **zone file** and finds:

- www.mywebsite.local → 172.25.6.37

☐ **IP Address Returned**

- DNS server replies back to the client with IP 172.25.6.37.

☐ **HTTP Request**

- Client now knows the IP.

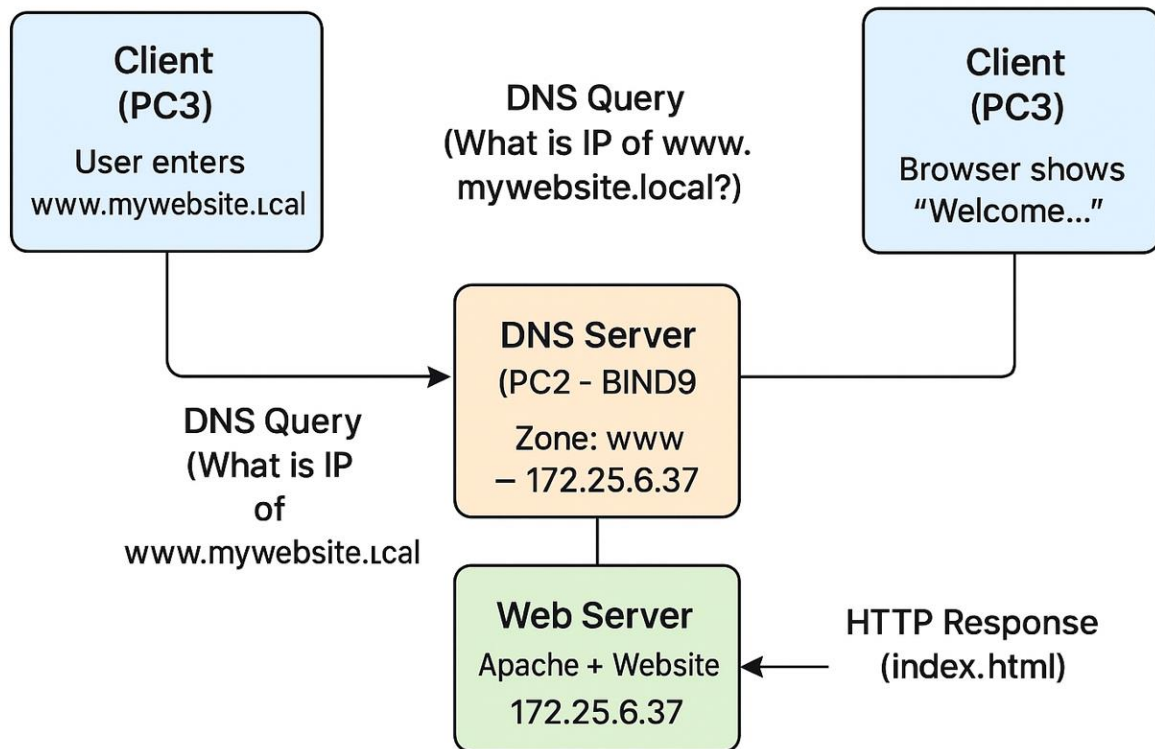- It sends an **HTTP GET request** to **Web Server (PC1)** at 172.25.6.37.

☐ **Web Page Response**

- Apache on PC1 receives the request.

- Finds index.html inside /var/www/mywebsite.

- Sends the HTML page back to the client.

☐ **User View**

- Client's browser displays:

Welcome to MyWebsite

❖ **Implementation Steps:**

We are using **three Ubuntu systems** in the same network.

- **PC1 (HTTP Server / Web Host)**
  - IP Address: 172.25.6.37
  - Runs Apache web server (mywebsite.local)
- **PC2 (DNS Server)**
  - IP Address: 172.25.6.38
  - Runs BIND9 DNS service, resolves domain names
- **PC3 (Client)**
  - IP Address: 172.25.6.39
  - Uses DNS Server (PC2) to resolve and access the website

Step 1: Configure the HTTP Host (PC1)

1. **Install Apache Web Server**
   sudo apt update
   sudo apt install apache2 -y

2. **Create a Website Directory**
   sudo mkdir /var/www/mywebsite
   sudo nano /var/www/mywebsite/index.html

index.html:

<h1>Hello From Aarti, Tanvi, Payal</h1>

3. **Create Apache Virtual Host File**

sudo nano /etc/apache2/sites-available/mywebsite.local.conf

Add:

```
<VirtualHost *:80>
    ServerAdmin admin@mywebsite.local
    ServerName www.mywebsite.local
    DocumentRoot /var/www/mywebsite

    <Directory /var/www/mywebsite>
        Options Indexes FollowSymLinks
        AllowOverride All
        Require all granted
    </Directory>

    ErrorLog ${APACHE_LOG_DIR}/mywebsite_error.log
    CustomLog ${APACHE_LOG_DIR}/mywebsite_access.log combined
</VirtualHost>
```

4. **Enable Site and Restart Apache**

sudo a2ensite mywebsite.local.conf
sudo systemctl reload apache2

5. **Test locally in PC1:**

curl http://localhost

```
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ echo "<h1> Welcome to My Website</h1>" | sudo tee /var/www/html/index.html
<h1> Welcome to My Website</h1>
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ curl http://localhost
Command 'curl' not found, but can be installed with:
sudo apt install curl
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ sudo apt install curl
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libboost-filesystem1.74.0 liborcus-0.17-0 liborcus-parser-0.17-0 libreoffice-ogltrans libxmlsec1 libxmlsec1-nss
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  curl
0 upgraded, 1 newly installed, 0 to remove and 216 not upgraded.
Need to get 194 kB of archives.
After this operation, 455 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 curl amd64 7.81.0-1ubuntu1.20 [194 kB]
Fetched 194 kB in 4s (52.7 kB/s)
Selecting previously unselected package curl.
(Reading database ... 204494 files and directories currently installed.)
Preparing to unpack .../curl_7.81.0-1ubuntu1.20_amd64.deb ...
Unpacking curl (7.81.0-1ubuntu1.20) ...
Setting up curl (7.81.0-1ubuntu1.20) ...
Processing triggers for man-db (2.10.2-1) ...
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ curl http://localhost
<h1> Welcome to My Website</h1>
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$
```

Step 2: Configure the DNS Server (PC2)

1. **Install BIND9**
   sudo apt update
   sudo apt install bind9 -y

2. **Configure Forward Zone File**
   Edit BIND config:
   sudo nano /etc/bind/named.conf.local
   Add:
   zone "mywebsite.local" {
      type master;
      file "/etc/bind/db.mywebsite.local";
   };

3. **Create Zone File**
   Copy template and edit:
   sudo cp /etc/bind/db.local /etc/bind/db.mywebsite.local

   sudo nano /etc/bind/db.mywebsite.local

   Example zone file:
   @   IN SOA ns.mywebsite.local. admin.mywebsite.local. (
        1; Serial
        604800; Refresh
        86400; Retry
        2419200; Expire
        604800); Negative Cache TTL

   @   IN NS ns.mywebsite.local.
   ns   IN   A   172.25.6.38
   www IN A   172.25.6.37

4. **Restart BIND Service**
   sudo systemctl restart bind9
   sudo systemctl enable bind9

5. **Test DNS Resolution in PC2**
   dig @127.0.0.1 www.mywebsite.local

```
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC: $ sudo apt update
Hit:1 http://in.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://security.ubuntu.com/ubuntu jammy-security InRelease [129 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease [127 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [2,799 kB]
Get:6 http://security.ubuntu.com/ubuntu jammy-security/main i386 Packages [681 kB]
Get:7 http://in.archive.ubuntu.com/ubuntu jammy-updates/main i386 Packages [852 kB]
Get:8 http://in.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [442 kB]
Get:9 http://in.archive.ubuntu.com/ubuntu jammy-updates/main amd64 DEP-11 Metadata [112 kB]
Get:10 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [2,549 kB]
Get:11 http://in.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [4,144 kB]
Get:12 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [378 kB]
Get:13 http://in.archive.ubuntu.com/ubuntu jammy-updates/restricted Translation-en [749 kB]
Get:14 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 DEP-11 Metadata [212 B]
Get:15 http://security.ubuntu.com/ubuntu jammy-security/main amd64 DEP-11 Metadata [54.5 kB]
Get:16 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe i386 Packages [780 kB]
Get:17 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [3,984 kB]
Get:18 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1,226 kB]
Get:19 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-en [721 kB]
Get:20 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [304 kB]
Get:21 http://in.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 DEP-11 Metadata [359 kB]
Get:22 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 DEP-11 Metadata [208 B]
Get:23 http://in.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 DEP-11 Metadata [940 B]
Get:24 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [993 kB]
Get:25 http://in.archive.ubuntu.com/ubuntu jammy-backports/main amd64 DEP-11 Metadata [7,056 B]
Get:26 http://in.archive.ubuntu.com/ubuntu jammy-backports/restricted amd64 DEP-11 Metadata [212 B]
Get:27 http://in.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 DEP-11 Metadata [14.0 kB]
Get:28 http://security.ubuntu.com/ubuntu jammy-security/universe i386 Packages [671 kB]
Get:29 http://in.archive.ubuntu.com/ubuntu jammy-backports/multiverse amd64 DEP-11 Metadata [212 B]
Get:30 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en [216 kB]
Get:31 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 DEP-11 Metadata [125 kB]
Get:32 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 DEP-11 Metadata [208 B]
Fetched 22.5 MB in 7s (3,172 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
24 packages can be upgraded. Run 'apt list --upgradable' to see them.
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ sudo apt install bind9 -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
bind9 is already the newest version (1:9.18.30-0ubuntu0.22.04.2).
0 upgraded, 0 newly installed, 0 to remove and 24 not upgraded.
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ sudo nano /etc/bind/named.conf.local
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ sudo cp /etc/bind/db.local /etc/bind/db.mywebsite.local
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ sudo nano /etc/bind/db.mywebsite.local
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ sudo systemctl restart bind9
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ sudo ufw allow 53
Rules updated
Rules updated (v6)
```

```
Jul 30 21:05:50 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './NS/IN': 2001:503:ba3e::2:30#53
Jul 30 21:05:50 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './DNSKEY/IN': 2001:500:2f::f#53
Jul 30 21:05:50 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './NS/IN': 2001:500:2f::f#53
Jul 30 21:05:50 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './DNSKEY/IN': 2001:7fd::1#53
Jul 30 21:05:50 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './NS/IN': 2001:7fd::1#53
Jul 30 21:05:50 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './DNSKEY/IN': 2001:500:9f::42#53
Jul 30 21:06:00 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './NS/IN': 2001:500:9f::42#53
Jul 30 21:06:00 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: resolver priming query complete: timed out
Jul 30 21:06:00 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: managed-keys-zone: Unable to fetch DNSKEY set '.': timed out
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ sudo named-checkconf
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ sudo named-checkzone mywebsite.local /etc/bind/db.mywebsite.local
zone mywebsite.local/IN: loaded serial 2
OK
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ sudo systemctl status bind9
[sudo] password for ubuntu:
● named.service - BIND Domain Name Server
     Loaded: loaded (/lib/systemd/system/named.service; enabled; vendor preset: enabled)
     Active: active (running) since Wed 2025-07-30 21:05:50 IST; 38min ago
       Docs: man:named(8)
    Process: 7506 ExecStart=/usr/sbin/named $OPTIONS (code=exited, status=0/SUCCESS)
   Main PID: 7508 (named)
      Tasks: 38 (limit: 18711)
     Memory: 11.3M
        CPU: 534ms
     CGroup: /system.slice/named.service
             └─7508 /usr/sbin/named -u bind

Jul 30 21:43:49 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './NS/IN': 2001:500:a8::e#53
Jul 30 21:43:49 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './NS/IN': 2001:500:2::c#53
Jul 30 21:43:51 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: resolver priming query complete: timed out
Jul 30 21:43:51 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './NS/IN': 2001:7fd::1#53
Jul 30 21:43:51 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './NS/IN': 2001:dc3::35#53
Jul 30 21:43:51 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './NS/IN': 2001:500:2f::f#53
Jul 30 21:43:51 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './NS/IN': 2001:500:1::53#53
Jul 30 21:43:52 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './NS/IN': 2001:7fe::53#53
Jul 30 21:43:53 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving 'com/NS/IN': 2001:503:ba3e::2:30#53
Jul 30 21:43:53 ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC named[7508]: network unreachable resolving './NS/IN': 2001:500:2d::d#53
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ sudo named-checkzone mywebsite.local /etc/bind/db.mywebsite.local
zone mywebsite.local/IN: loaded serial 2
OK
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$ cat /etc/bind/db.mywebsite.local
;
; BIND data file for local loopback interface
;
$TTL    604800
@       IN      SOA     ns1.mywebsite.local. admin.mywebsite.local. (
                              2         ; Serial
                         604800         ; Refresh
                          86400         ; Retry
                        2419200         ; Expire
                         604800 )       ; Negative Cache TTL
;
@       IN      NS      ns1.mywebsite.local.
ns1     IN      A       172.25.6.38
www     IN      A       172.25.6.37
ubuntu@ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC:~$
```

Step 3: Configure the Client (PC3)

1. **Set DNS Server in /etc/resolv.conf**
2. **Ubuntu Server (Netplan)**
   Persistent and good for servers.
   Find your interface name (e.g., enp3s0):
   ip link

   Edit your netplan YAML:

   sudo nano /etc/netplan/01-netcfg.yaml
   network:
     version: 2
     ethernets:
       enp3s0:
         dhcp4: yes
         nameservers:
           addresses: [172.25.6.38]
   Apply:
   sudo netplan apply

3. sudo nano /etc/resolv.conf

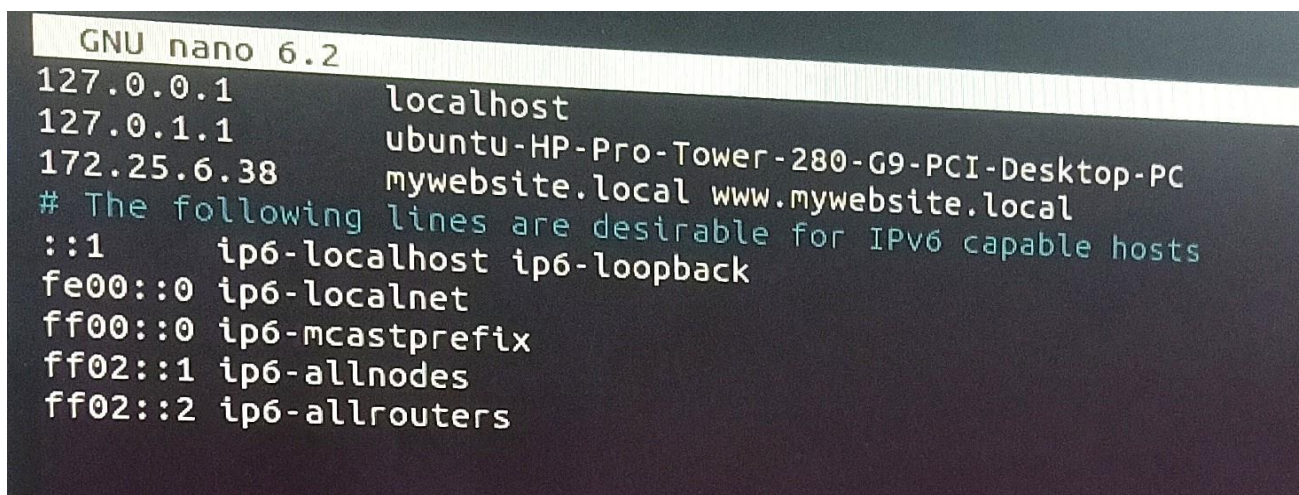   Add: nameserver 172.25.6.38

4. **Test DNS Resolution**
5. nslookup www.mywebsite.local
6. **Access Website via Browser or curl**
7. curl http://www.mywebsite.local

   You should see:

   <h1>Welcome to MyWebsite</h1>

```
  GNU nano 6.2
127.0.0.1              localhost
127.0.1.1              ubuntu-HP-Pro-Tower-280-G9-PCI-Desktop-PC
172.25.6.38            mywebsite.local www.mywebsite.local
# The following lines are desirable for IPv6 capable hosts
::1       ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
```

Final Output on Client(Browser) Machine: