Procedure to Create a Sub-LAN Network:

1. Physical Setup: Make sure the PCs are connected to the switch.

2. Configure Network Interfaces on Each PC:

Step 1: Identify the network interfaces of each PC using the command:
ip a

Step 2: Assign IP addresses to each PC, grouping 2 PCs in one subnet and the 3rd PC in a different subnet.

For PC1 (subnet 1):

sudo ip addr add 192.168.10.2/24 dev enp2s0
sudo ip link set enp2s0 up

For PC2 (subnet 1):

sudo ip addr add 192.168.10.3/24 dev enp2s0
sudo ip link set enp2s0 up

For PC3 (subnet 2):

sudo ip addr add 192.168.20.2/24 dev enp2s0
sudo ip link set enp2s0 up

Explanation: PC1 and PC2 are in the same subnet 192.168.10.0/24, allowing them to communicate directly with each other. PC3 is in a different subnet 192.168.20.0/24 and cannot directly communicate with PC1 and PC2 without routing.

3. Verifying Network Configuration:

Step 1: Check the assigned IP addresses:
ip a

Step 2: Test connectivity within the same subnet:

From PC1, ping PC2:

Eg: ping 192.168.10.3

From PC2, ping PC1:
Eg: ping 192.168.10.2

From PC3, ping PC1 or PC2 (should fail):
Eg: ping 192.168.10.2

Procedure to setup and configure DHCP:

DHCP Server setup:
<space> means a real space

1. Updating app packages:

COMMAND: sudo apt update
Explanation: This command updates the list of available packages and their versions.

2. Installing isc-dhcp-server package

COMMAND: sudo apt install isc-dhcp-server
Explanation: This command installs the isc-dhcp-server package, which provides the DHCP server functionality needed to assign IP addresses to devices on your network.

3. Checking isc-dhcp-server is installed correctly or not

      a. Check the version of the isc-dhcp-server
      COMMAND : dhcpd<space>- -version
      OUTPUT : isc-dhcpd-4.4.1   (or any version)

      b. Check the status of DHCP server
      COMMAND : sudo systemctl status isc-dhcp-server
      ⇨ If the **ACTIVE: failed** is showed, then you need to configure the **config** file

4. Configuring the DHCP server:

a.) Enter the config file of dhcpd:

COMMAND : sudo nano<space>/etc/dhcp/dhcpd.conf
Explanation: This opens the DHCP server's main configuration file in the nano text editor. Here, you will define the network settings for your DHCP server.

b.) Enter the following configuration code:

subnet 192.168.10.0 netmask 255.255.255.0 {
        range 192.168.10.0<space>192.168.10.150;
        option routers 192.168.10.1;
        option subnet-mask 255.255.255.0;
        option domain-name-servers 192.168.10.1;
}
Save File : CTRL + O

c.) Test the config file:

COMMAND: sudo dhcpd -t -cf /etc/dhcp/dhcpd.conf
Explanation: This command checks the syntax of the DHCP configuration file to ensure there are no errors before starting the server.

d.) Open default file:

COMMAND: sudo nano /etc/default/isc-dhcp-server
ENTER:
INTERFACESv4="enp2s0" (Replace empty "" with enp2s0)

Explanation: This file defines the network interface that the DHCP server should listen on. Replace the empty quotes with enp2s0 to specify the network interface that the DHCP server will use to serve IP addresses.

5. Start the service

COMMAND: sudo systemctl start isc-dhcp-server
Explanation: This command starts the DHCP server so it can begin assigning IP addresses to clients on the specified subnet.

6. Check the status again (Command at point 3-b.)

If the DHCP port is disabled, enable it with the following command:
COMMAND : sudo systemctl enable isc-dhcp-server
Explanation: This command ensures that the DHCP server starts automatically on boot.

If, still the dhcp status shows error, enter the following Command:
COMMAND: sudo journalctl -u isc-dhcp-server
Explanation: The above command will give details for the cause of error.

7. Check the IP

COMMAND : ip a
Explanation: If the ip for enp2s0 is absent, it means the network interface does not have an IP assigned, so now reassign the IP manually.

8. Reassign IP

COMMAND: sudo ip addr add 192.168.10.29/24 dev enp2s0
RECOMMENDED IP: 192.168.10.<System No.>

9. Restart the DHCP service

COMMAND: sudo systemctl restart isc-dhcp-server
Explanation: Restart the DHCP server to apply any changes made during the configuration process.

10. Check the status again (Command at point 3-b.)

11. ACTIVE: failed? Check whether the system was used as a DHCP client, then undo the process you did for DHCP client. (i.e do it for DHCP Server from the beginning)

DHCP Client Setup:

1. Enter the file '/etc/network/interfaces'

COMMAND: sudo nano /etc/network/interfaces
Explanation: This file defines the network settings for your system. For a DHCP client, you need to configure it to obtain an IP address automatically from a DHCP server.

2. Content to add in conf file

auto enp2s0
iface enp2s0 inet dhcp
Explanation: This configuration sets up the enp2s0 interface to use DHCP to obtain an IP address automatically.

3. Restart Network manager and systemd-networkd services to apply the changes
COMMAND: sudo systemctl restart NetworkManager
COMMAND: sudo systemctl restart systemd-networkd

4. Check status of both of above:
COMMAND : sudo systemctl status NetworkManager
COMMAND : sudo systemctl status systemd-networkd

5. Manually obtain IP Address

For flushing out the already assigned/engaged IP and requesting new IP manually.
COMMAND : sudo dhclient -r
COMMAND : sudo dhclient enp2s0
Explanation: This command manually requests an IP address from the DHCP server for the enp2s0 interface.

6. Verify the address obtained from DHCP server
COMMAND : ip addr show

7. To check the network interface status

COMMAND : ip link show
Explanation: This command shows the status of the network interface, which can help determine if the interface is up and running. It's working depends on the network connectivity

LINK: github.com/ManishPraa24/Computer-Networks