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Subject Code: BCSE308P

Course Title: Computer Networks Lab

Lab Slot: L31 + L32

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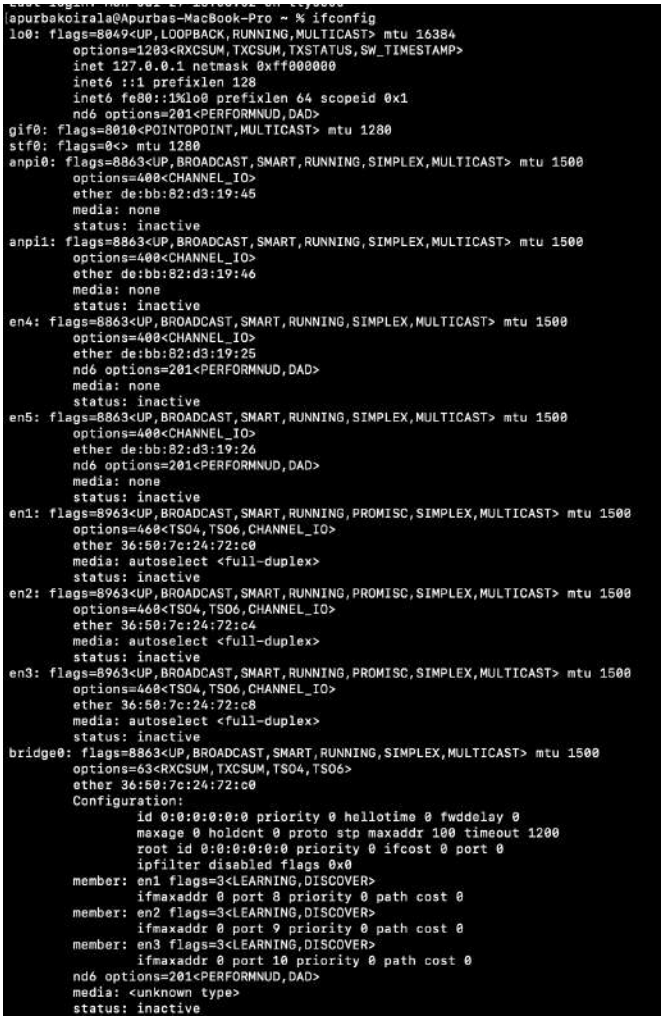
Lab Assessment 1.

1.

a) Prepare a report for the network commands (Windows/Linux) with two options. Execute the commands in prompt and include screenshot with explanation.

ifconfig: The ifconfig command, short for "interface configurator," is used to initialize network interfaces, assign IP addresses, and enable or disable interfaces as needed. It allows you to view details such as the IP address and hardware/MAC address assigned to an interface, as well as the MTU (Maximum Transmission Unit) size. Note that the ifconfig command typically shows details for specific interfaces like their IP and MAC addresses, but using the -a option will display information for all available interfaces, even those that are disabled.



```
apurbakoirala@Apurbas-MacBook-Pro ~ % ifconfig
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 16384
        options=1203<RXCSUM,TXCSUM,TXSTATUS,SW_TIMESTAMP>
        inet 127.0.0.1 netmask 0xff000000
        inet6 ::1 prefixlen 128
        inet6 fe80::1%lo0 prefixlen 64 scopeid 0x1
        nd6 options=201<PERFORMNUD,DAD>
gif0: flags=8010<POINTOPOINT,MULTICAST> mtu 1280
stf0: flags=0<> mtu 1280
anpi0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether de:bb:82:d3:19:45
        media: none
        status: inactive
anpi1: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether de:bb:82:d3:19:46
        media: none
        status: inactive
en4: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether de:bb:82:d3:19:25
        nd6 options=201<PERFORMNUD,DAD>
        media: none
        status: inactive
en5: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether de:bb:82:d3:19:26
        nd6 options=201<PERFORMNUD,DAD>
        media: none
        status: inactive
en1: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
        options=460<TSO4,TSO6,CHANNEL_IO>
        ether 36:50:7c:24:72:c0
        media: autoselect <full-duplex>
        status: inactive
en2: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
        options=460<TSO4,TSO6,CHANNEL_IO>
        ether 36:50:7c:24:72:c4
        media: autoselect <full-duplex>
        status: inactive
en3: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
        options=460<TSO4,TSO6,CHANNEL_IO>
        ether 36:50:7c:24:72:c8
        media: autoselect <full-duplex>
        status: inactive
bridge0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=63<RXCSUM,TXCSUM,TSO4,TSO6>
        ether 36:50:7c:24:72:c0
        Configuration:
                id 0:0:0:0:0:0 priority 0 hellotime 0 fwddelay 0
                maxage 0 holdcnt 0 proto stp maxaddr 100 timeout 1200
                root id 0:0:0:0:0:0 priority 0 ifcost 0 port 0
                ipfilter disabled flags 0x0
        member: en1 flags=3<LEARNING,DISCOVER>
                ifmaxaddr 0 port 8 priority 0 path cost 0
        member: en2 flags=3<LEARNING,DISCOVER>
                ifmaxaddr 0 port 9 priority 0 path cost 0
        member: en3 flags=3<LEARNING,DISCOVER>
                ifmaxaddr 0 port 10 priority 0 path cost 0
        nd6 options=201<PERFORMNUD,DAD>
        media: <unknown type>
        status: inactive
```

```
ap1: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=6460<TSO4,TSO6,CHANNEL_IO,PARTIAL_CSUM,ZEROINVERT_CSUM>
        ether 62:3e:5f:7f:6a:7b
        inet6 fe80::603e:5fff:fe7f:6a7b%ap1 prefixlen 64 scopeid 0xc
        nd6 options=201<PERFORMNUD,DAD>
        media: autoselect (<unknown type>)
        status: inactive
en0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=6460<TSO4,TSO6,CHANNEL_IO,PARTIAL_CSUM,ZEROINVERT_CSUM>
        ether 60:3e:5f:7f:6a:7b
        inet6 fe80::10ab:e8cf:5a84:8d36%en0 prefixlen 64 secured scopeid 0xd
        inet6 2409:40f4:3014:adde:817:af68:3306:b7ef prefixlen 64 autoconf secured
        inet6 2409:40f4:3014:adde:6d5a:aa82:6b50:d425 prefixlen 64 autoconf temporary
        inet 192.168.225.97 netmask 0xffffff00 broadcast 192.168.225.255
        nat64 prefix 64:ff9b:: prefixlen 96
        nd6 options=201<PERFORMNUD,DAD>
        media: autoselect
        status: active
awdl0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=6460<TSO4,TSO6,CHANNEL_IO,PARTIAL_CSUM,ZEROINVERT_CSUM>
        ether 6a:76:2e:b9:e1:ca
        inet6 fe80::6876:2eff:feb9:e1ca%awdl0 prefixlen 64 scopeid 0xe
        nd6 options=201<PERFORMNUD,DAD>
        media: autoselect
        status: active
llw0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether 6a:76:2e:b9:e1:ca
        inet6 fe80::6876:2eff:feb9:e1ca%llw0 prefixlen 64 scopeid 0xf
        nd6 options=201<PERFORMNUD,DAD>
        media: autoselect
        status: inactive
utun0: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1380
        inet6 fe80::9a1:de3c:2959:dac5%utun0 prefixlen 64 scopeid 0x10
        nd6 options=201<PERFORMNUD,DAD>
utun1: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 2000
        inet6 fe80::5943:b952:72e:8b3f%utun1 prefixlen 64 scopeid 0x11
        nd6 options=201<PERFORMNUD,DAD>
utun2: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1000
        inet6 fe80::ce81:b1c:bd2c:69e%utun2 prefixlen 64 scopeid 0x12
        nd6 options=201<PERFORMNUD,DAD>
utun3: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1500
        inet6 fe80::cc7:4355:df23:c979%utun3 prefixlen 64 scopeid 0x13
        nd6 options=201<PERFORMNUD,DAD>
utun4: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1380
        inet6 fe80::c776:3294:3881:4f94%utun4 prefixlen 64 scopeid 0x14
        nd6 options=201<PERFORMNUD,DAD>
utun5: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> mtu 1380
        inet6 fe80::9611:1893:ec03:9827%utun5 prefixlen 64 scopeid 0x15
        nd6 options=201<PERFORMNUD,DAD>
apurbakoirala@Apurbas-MacBook-Pro ~ %
```

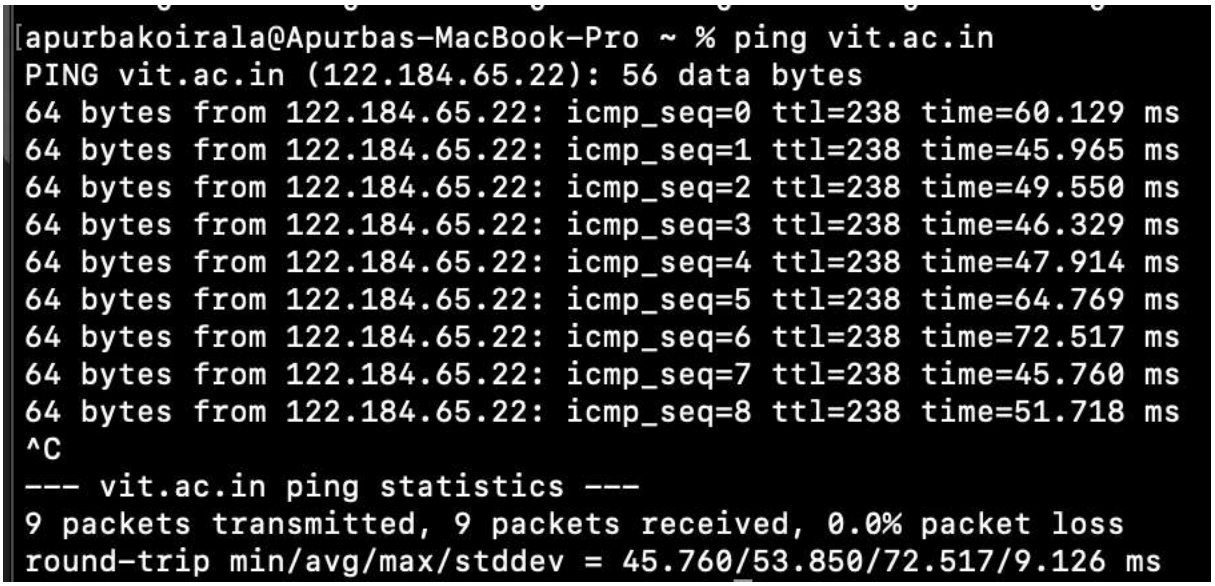
```
C:\Users\Apurba>ipconfig

Windows IP Configuration


Ethernet adapter Ethernet:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Unknown adapter Local Area Connection:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 1:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   IPv6 Address. . . . . . . . . . . : 2409:40f4:3014:adde:fa9:3b8f:4d23:6621
   Temporary IPv6 Address. . . . . . : 2409:40f4:3014:adde:f4bb:dc14:6247:b5a1
   Link-local IPv6 Address . . . . . : fe80::b9b2:45b2:73e1:9b3c%8
   IPv4 Address. . . . . . . . . . . : 192.168.225.95
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::bcc8:70ff:fe72:491b%8
                                       192.168.225.137
```

ifconfig en0: The command ifconfig en0 is used to display the configuration and status of the network interface named en0 on a Unix-like operating system, such as macOS or Linux. The en0 interface typically corresponds to the primary Ethernet interface or the primary Wi-Fi interface on a Mac, depending on the hardware configuration.

```
[apurbakoirala@Apurbas-MacBook-Pro ~ % ifconfig en0
 en0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=6460<TSO4,TSO6,CHANNEL_IO,PARTIAL_CSUM,ZEROINVERT_CSUM>
        ether 60:3e:5f:7f:6a:7b
        inet6 fe80::10ab:e8cf:5a84:8d36%en0 prefixlen 64 secured scopeid 0xd
        inet6 2409:40f4:3014:adde:817:af68:3306:b7ef prefixlen 64 autoconf secured
        inet6 2409:40f4:3014:adde:6d5a:aa82:6b50:d425 prefixlen 64 autoconf temporary
        inet 192.168.225.97 netmask 0xffffff00 broadcast 192.168.225.255
        nat64 prefix 64:ff9b:: prefixlen 96
        nd6 options=201<PERFORMNUD,DAD>
        media: autoselect
        status: active
```

PING- Packet Internet Groper:

The PING command is widely regarded as the most effective method for assessing connectivity between nodes, whether within a Local Area Network (LAN) or across a Wide Area Network (WAN). It utilizes ICMP (Internet Control Message Protocol) packets to establish communication with other devices. PING allows users to verify connectivity using either host names or IP addresses, making it a versatile tool for network troubleshooting and ensuring that devices can reliably communicate over networks of varying scales and configurations.



The command ping -c 5 vit.ac.in is used to test connectivity between your device and the server associated with the domain vit.ac.in. The -c 5 flag specifies that the ping utility should send exactly 5 ICMP Echo Request packets to the server. After sending these packets, the command will report the results, including the response times and any packet loss. This allows you to determine the connectivity status and measure the round-trip time for messages sent from your device to the server and back.

```
apurbakoirala@Apurbas-MacBook-Pro ~ % ping -c 5 vit.ac.in
PING vit.ac.in (122.184.65.22): 56 data bytes
64 bytes from 122.184.65.22: icmp_seq=0 ttl=243 time=203.027 ms
64 bytes from 122.184.65.22: icmp_seq=1 ttl=243 time=142.400 ms
64 bytes from 122.184.65.22: icmp_seq=2 ttl=243 time=398.237 ms
64 bytes from 122.184.65.22: icmp_seq=3 ttl=243 time=189.486 ms
64 bytes from 122.184.65.22: icmp_seq=4 ttl=243 time=236.085 ms

--- vit.ac.in ping statistics ---
5 packets transmitted, 5 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 142.400/233.847/398.237/87.532 ms
apurbakoirala@Apurbas-MacBook-Pro ~ %
```

Traceroute: Traceroute is a network troubleshooting tool that displays the number of hops required to reach a destination and reveals the path taken by packets as they travel through the network. It provides valuable insights into the route and potential issues encountered along the way. An alternative tool, tracepath, offers similar functionality but is simpler to use, as it does not involve complex options. For example, by using traceroute to track the route to a global DNS server's IP address, you can identify the path the packets take and confirm successful delivery to the destination.

```
apurbakoirala@Apurbas-MBP ~ % traceroute 4.2.2.2
traceroute to 4.2.2.2 (4.2.2.2), 64 hops max, 40 byte packets
 1  172.20.10.1 (172.20.10.1)  4.535 ms  4.223 ms  3.850 ms
 2  192.168.29.10 (192.168.29.10)  167.191 ms  349.562 ms  78.044 ms
 3  192.168.28.33 (192.168.28.33)  66.258 ms
    192.168.28.37 (192.168.28.37)  42.602 ms  31.210 ms
 4  192.168.31.11 (192.168.31.11)  87.993 ms  24.875 ms  49.747 ms
 5  * * *
 6  * * *
 7  nsg-corporate-173.101.187.122.airtel.in (122.187.101.173)  52.195 ms
    nsg-corporate-169.101.187.122.airtel.in (122.187.101.169)  39.075 ms
    nsg-corporate-173.101.187.122.airtel.in (122.187.101.173)  31.959 ms
 8  116.119.61.126 (116.119.61.126)  123.403 ms
    116.119.36.60 (116.119.36.60)  128.076 ms
    116.119.61.126 (116.119.61.126)  92.744 ms
 9  116.119.68.158 (116.119.68.158)  68.503 ms
    116.119.106.132 (116.119.106.132)  69.596 ms *
10  182.79.149.246 (182.79.149.246)  170.258 ms *
    182.79.137.2 (182.79.137.2)  145.392 ms
11  ae-12.edge3.singapore3.level3.net (4.68.70.113)  174.298 ms  112.162 ms  82.851 ms
12  ae5.3601.ear1.singapore3.level3.net (4.69.218.86)  98.542 ms * *
13  * * *
14  * b.resolvers.level3.net (4.2.2.2)  112.632 ms *
apurbakoirala@Apurbas-MBP ~ %
```

```
C:\Users\Apurba>tracert www.youtube.com

Tracing route to youtube-ui.l.google.com [2404:6800:4009:801::200e]
over a maximum of 30 hops:

  1     4 ms     4 ms     2 ms  2409:40f4:3014:adde::98
  2    79 ms    40 ms    30 ms  2405:200:5218:23:3924:110:3:106
  3    33 ms    37 ms    27 ms  2405:200:5218:23:3925::ff21
  4    73 ms    25 ms    31 ms  2405:200:801:4a00::ee
  5     *        *        *     Request timed out.
  6     *        *        *     Request timed out.
  7    35 ms    38 ms   100 ms  2001:4860:1:1::168
  8    50 ms    45 ms    40 ms  2001:4860:1:1::168
  9    34 ms    45 ms    39 ms  2404:6800:8132::1
 10    36 ms    34 ms    39 ms  2001:4860:0:1::55d6
 11    37 ms    38 ms    39 ms  2001:4860:0:1::1840
 12    55 ms     *        *     2001:4860::9:4001:7733
 13    57 ms    63 ms    51 ms  2001:4860:0:1::870d
 14    80 ms    64 ms    53 ms  2001:4860:0:1::11c3
 15    63 ms    51 ms    50 ms  bom12s03-in-x0e.1e100.net [2404:6800:4009:801::200e]

Trace complete.
```

netstat: Netstat, short for network statistics, is a fundamental tool used for monitoring network connections, both incoming and outgoing, as well as for viewing routing tables and interface statistics. It is highly useful for diagnosing network issues and assessing network traffic performance. However, the ss command is a more advanced alternative to netstat. It provides more detailed information and operates more quickly, as it retrieves data directly from the kernel's user space, making it a more efficient tool for network analysis and troubleshooting.

```
apurbakoirala@Apurbas-MacBook-Pro ~ % netstat
Active Internet connections
Proto Recv-Q Send-Q  Local Address          Foreign Address        (state)
tcp6       0      0  2409:40f4:3014:a.62614 2403:300:1364::2.https ESTABLISHED
tcp4       0      0  192.168.225.97.62613   13.69.109.131.https    ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62611 64:ff9b::142a:41.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62608 bom05s09-in-x0a..https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62607 e2-ha.ycpi.ina.y.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62606 e2-ha.ycpi.inb.y.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62605 2606:4700:3032::.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62604 ats1.l7.search.v.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62597 2606:4700:3032::.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62583 2606:4700:3032::.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62567 2606:4700:3032::.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62530 2600:9000:24d9:5.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62524 2603:1046:1400:1.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62521 2600:1901:0:47fc.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62498 0.128.128.34.bc..https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62497 0.128.128.34.bc..https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62493 2600:1901:0:47fc.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62487 sc-in-f188.1e100.5228  ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62451 2600:1901:0:47fc.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62241 2603:1046:1400:1.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62034 64:ff9b::11f2:d0.5223  ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62014 instagram-p36-sh.https ESTABLISHED
tcp6       0     36  2409:40f4:3014:a.62004 edge-dgw6-shv-01.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.61967 whatsapp-chatd-e.jabbe ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.61812 se-in-f188.1e100.5228  ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.61749 instagram-p36-sh.https ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.61729 sh-in-f188.1e100.5228  ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.60600 2409:40f4:3014:a.58195 ESTABLISHED
tcp6       0      0  apurbas-macbook-.cap   fe80::6392:1e43:.1025  ESTABLISHED
tcp6       0      0  apurbas-macbook-.1024  fe80::6392:1e43:.1024  ESTABLISHED
tcp6       0      0  2409:40f4:3014:a.62609 2603:1046:1406::.https TIME_WAIT
tcp6       0      0  2409:40f4:3014:a.62610 2603:1046:1406::.https TIME_WAIT
udp6       0      0  2409:40f4:3014:a.53194 bom12s16-in-x0e..https
udp6       0      0  *.55097                *.*
udp6       0      0  *.59982                *.*
udp6       0      0  *.56644                *.*
udp6       0      0  *.56414                *.*
udp46      0      0  *.16394                *.*
udp46      0      0  *.16393                *.*
udp4       0      0  *.*                    *.*
udp6       0      0  *.xserveraid           *.*
udp46      0      0  *.54030                *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
```

```
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.61242                *.*
udp4       0      0  *.53999                *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp46      0      0  *.52517                *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
```

```
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp6       0      0  *.mdns                 *.*
udp4       0      0  *.mdns                 *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp46      0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.netbios-ns           *.*
udp4       0      0  *.netbios-dgm          *.*
Active Multipath Internet connections
Proto/ID  Flags      Local Address          Foreign Address        (state)
icm6       0      0  *.*                    *.*
Active LOCAL (UNIX) domain sockets
Address          Type   Recv-Q Send-Q            Inode             Conn             Refs          Nextref Addr
6bee150ac8caed45 stream      0      0                0 4cb910fb6877e87b                0                0 /var/run/mDNSResponder
4cb910fb6877e87b stream      0      0                0 6bee150ac8caed45                0                0
6fec4da8caf627c1 stream      0      0                0 fabf59d68a3527e8                0                0 /var/run/mDNSResponder
fabf59d68a3527e8 stream      0      0                0 6fec4da8caf627c1                0                0
260085adc98d941d stream      0      0                0 9d1b598427c054bf                0                0 /var/run/mDNSResponder
9d1b598427c054bf stream      0      0                0 260085adc98d941d                0                0
f7e6d8df5fa64d46 stream      0      0                0 e06559de14678076                0                0 /var/run/mDNSResponder
e06559de14678076 stream      0      0                0 f7e6d8df5fa64d46                0                0
b138523075ea1351 stream      0      0                0 be461df887772f7a                0                0 /var/run/mDNSResponder
be461df887772f7a stream      0      0                0 b138523075ea1351                0                0
4625ba77a986d054 stream      0      0                0 b14174a31a3d323b                0                0 /var/run/mDNSResponder
b14174a31a3d323b stream      0      0                0 4625ba77a986d054                0                0
426f2a247076d467 stream      0      0                0 58e50e7a3f6b906f                0                0 /var/run/mDNSResponder
58e50e7a3f6b906f stream      0      0                0 426f2a247076d467                0                0
dd11d315af73a9cf stream      0      0                0 510fc56ad5c4d722                0                0 /var/run/mDNSResponder
510fc56ad5c4d722 stream      0      0                0 dd11d315af73a9cf                0                0
```

```
unexpected kind 224 which 0xe0
8c500e45af2a9765 dgram       0      0                0 be9ca17ef0103b88                0 6fb69e698f96f86b
e602c939cf9453ed dgram       0      0                0 8c06d056d41932fb 8c06d056d41932fb                0
8c06d056d41932fb dgram       0      0                0 e602c939cf9453ed e602c939cf9453ed                0
6fb69e698f96f86b dgram       0      0                0 be9ca17ef0103b88                0 3b7abe9c09b26188
3b7abe9c09b26188 dgram       0      0                0 be9ca17ef0103b88                0 855da081d3f9a466
855da081d3f9a466 dgram       0      0                0 be9ca17ef0103b88                0 6140ecec21aa9afb
6140ecec21aa9afb dgram       0      0                0 be9ca17ef0103b88                0 834148f23dcfbd00
eb68cd64db97b8c8 dgram       0      0                0 8c9d7e3c47d0cb37 8c9d7e3c47d0cb37                0
8c9d7e3c47d0cb37 dgram       0      0                0 eb68cd64db97b8c8 eb68cd64db97b8c8                0
834148f23dcfbd00 dgram       0      0                0 be9ca17ef0103b88                0 a827a78b7538240e
dbec5980de43d20b dgram       0      0                0 558ac601891d4e76 558ac601891d4e76                0
558ac601891d4e76 dgram       0      0                0 dbec5980de43d20b dbec5980de43d20b                0
a827a78b7538240e dgram       0      0                0 be9ca17ef0103b88                0 b031c0b8f3c4dc22
b031c0b8f3c4dc22 dgram       0      0                0 be9ca17ef0103b88                0 587bdd497dae9794
587bdd497dae9794 dgram       0      0                0 be9ca17ef0103b88                0 4074b5bb212371e6
4074b5bb212371e6 dgram       0      0                0 be9ca17ef0103b88                0 5b44369126e75bbf
aa31566dcf1c62de dgram       0      0                0 a2b3f5db3da4c4cc a2b3f5db3da4c4cc                0
a2b3f5db3da4c4cc dgram       0      0                0 aa31566dcf1c62de aa31566dcf1c62de                0
```

```
cc3ebd56b708254b dgram       0      0                0 be9ca17ef0103b88                0 4a69c1161061c47e
4a69c1161061c47e dgram       0      0                0 be9ca17ef0103b88                0                 0
be9ca17ef0103b88 dgram       0      0 6e2b245322cd339c                0 8c500e45af2a9765                0 /private//var/run/syslog
unexpected kind 224 which 0xe0
Registered kernel control modules
id       flags    pcbcount rcvbuf   sndbuf   name
      1       5        0     8192    32768 com.apple.network.tcp_ccdebug
      2      28        1     8192   131072 com.apple.flow-divert
      3       1       46    65536    65536 com.apple.net.netagent
      4       9        0   524288   524288 com.apple.content-filter
      5      29        6   524288   524288 com.apple.net.utun_control
      6      21        0    65536    65536 com.apple.net.ipsec_control
      7       0       94     8192     2048 com.apple.netsrc
      8      18        3     8192     2048 com.apple.network.statistics
      9       1        0     8192     2048 com.apple.network.advisory
      a       1        0    65536    65536 com.apple.net.rvi_control
      b       1        1    16384     2048 com.apple.nke.sockwall
      c       4        0    65536     2048 com.apple.uart.wlan-debug
      d       4        0     8192     2048 com.apple.uart.sk.wlan-debug
      e       4        0    65536     2048 com.apple.spmi.nfc
Active kernel event sockets
Proto Recv-Q Send-Q vendor  class  subcl
kevt       0      0      1      1      9
kevt       0      0      1      1      2
kevt       0      0      1      1     10
kevt       0      0   1001      5     11
kevt       0      0      1      6      1
```

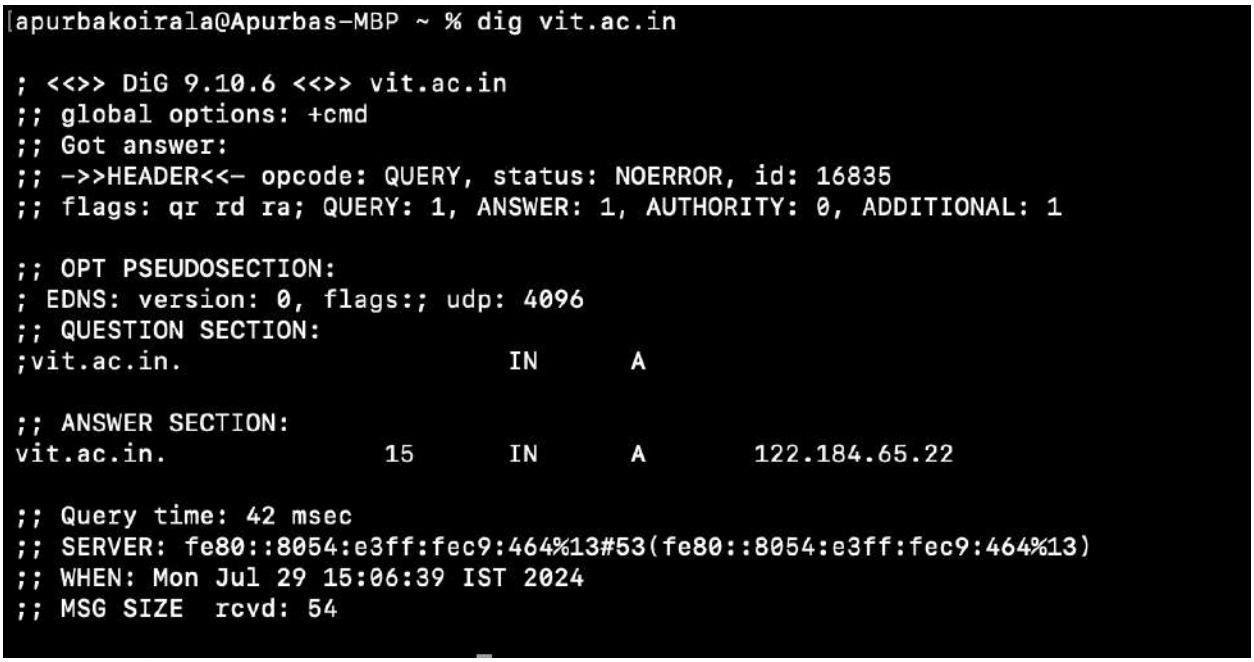
```
C:\Users\Apurba>netstat

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    127.0.0.1:49734        bib:50222              ESTABLISHED
  TCP    127.0.0.1:49933        bib:50221              ESTABLISHED
  TCP    127.0.0.1:49933        bib:50280              ESTABLISHED
  TCP    127.0.0.1:49933        bib:50326              ESTABLISHED
  TCP    127.0.0.1:49934        bib:50220              ESTABLISHED
  TCP    127.0.0.1:49934        bib:50279              ESTABLISHED
  TCP    127.0.0.1:49934        bib:50325              ESTABLISHED
  TCP    127.0.0.1:49941        bib:65001              ESTABLISHED
  TCP    127.0.0.1:50220        bib:49934              ESTABLISHED
  TCP    127.0.0.1:50221        bib:49933              ESTABLISHED
  TCP    127.0.0.1:50222        bib:49734              ESTABLISHED
  TCP    127.0.0.1:50279        bib:49934              ESTABLISHED
  TCP    127.0.0.1:50280        bib:49933              ESTABLISHED
  TCP    127.0.0.1:50325        bib:49934              ESTABLISHED
  TCP    127.0.0.1:50326        bib:49933              ESTABLISHED
  TCP    127.0.0.1:65001        bib:49941              ESTABLISHED
  TCP    192.168.225.95:49318   152.199.39.108:https   CLOSE_WAIT
  TCP    192.168.225.95:49319   152.199.39.108:https   CLOSE_WAIT
  TCP    192.168.225.95:49320   152.199.39.108:https   CLOSE_WAIT
  TCP    192.168.225.95:50283   237:4070               ESTABLISHED
  TCP    192.168.225.95:50286   40:https               ESTABLISHED
  TCP    192.168.225.95:50310   155.133.225.20:27030   ESTABLISHED
  TCP    192.168.225.95:62040   49.44.116.88:http      TIME_WAIT
  TCP    192.168.225.95:62041   49.44.116.88:http      TIME_WAIT
  TCP    [::1]:5426             bib:49952              ESTABLISHED
  TCP    [::1]:5426             bib:49955              ESTABLISHED
  TCP    [::1]:5426             bib:49959              ESTABLISHED
  TCP    [::1]:5426             bib:49962              ESTABLISHED
  TCP    [::1]:5426             bib:49978              ESTABLISHED
  TCP    [::1]:5426             bib:50198              ESTABLISHED
  TCP    [::1]:5426             bib:50200              ESTABLISHED
  TCP    [::1]:5426             bib:50206              ESTABLISHED
  TCP    [::1]:5426             bib:50211              ESTABLISHED
  TCP    [::1]:5426             bib:50260              ESTABLISHED
  TCP    [::1]:49952            bib:5426               ESTABLISHED
  TCP    [::1]:49955            bib:5426               ESTABLISHED
  TCP    [::1]:49959            bib:5426               ESTABLISHED
  TCP    [::1]:49962            bib:5426               ESTABLISHED
  TCP    [::1]:49978            bib:5426               ESTABLISHED
  TCP    [::1]:50198            bib:5426               ESTABLISHED
  TCP    [::1]:50200            bib:5426               ESTABLISHED
  TCP    [::1]:50206            bib:5426               ESTABLISHED
  TCP    [::1]:50211            bib:5426               ESTABLISHED
  TCP    [::1]:50260            bib:5426               ESTABLISHED
  TCP    [2409:40f4:3014:adde:f4bb:dc14:6247:b5a1]:49284  [64:ff9b::98c3:264c]:http  CLOSE_WAIT
  TCP    [2409:40f4:3014:adde:f4bb:dc14:6247:b5a1]:49661  [2603:1046:1400:1::1]:https  ESTABLISHED
  TCP    [2409:40f4:3014:adde:f4bb:dc14:6247:b5a1]:49674  [2603:1063:2202:14::3]:https  ESTABLISHED
  TCP    [2409:40f4:3014:adde:f4bb:dc14:6247:b5a1]:49700  [64:ff9b::a29f:85ea]:https  ESTABLISHED
  TCP    [2409:40f4:3014:adde:f4bb:dc14:6247:b5a1]:49862  [2600:1901:1:7c5::]:https  ESTABLISHED
  TCP    [2409:40f4:3014:adde:f4bb:dc14:6247:b5a1]:49902  [2606:2800:247:1cb7:261b:1f9c:2074:3c]:https  CLOSE_WAIT
  TCP    [2409:40f4:3014:adde:f4bb:dc14:6247:b5a1]:49903  [2606:2800:247:1cb7:261b:1f9c:2074:3c]:https  CLOSE_WAIT
  TCP    [2409:40f4:3014:adde:f4bb:dc14:6247:b5a1]:49904  [2606:2800:247:1cb7:261b:1f9c:2074:3c]:https  CLOSE_WAIT
  TCP    [2409:40f4:3014:adde:f4bb:dc14:6247:b5a1]:49905  [2606:2800:247:1cb7:261b:1f9c:2074:3c]:https  CLOSE_WAIT
  TCP    [2409:40f4:3014:adde:f4bb:dc14:6247:b5a1]:49906  [2606:2800:247:1cb7:261b:1f9c:2074:3c]:https  CLOSE_WAIT
```

Netstat -a | more: The command netstat a | more used to display all network connections and listening ports in a paginated format. The -a flag instructs netstat to show all active connections and listening ports, while the | more part of the command pipes the output through the more command, which allows you to view the information one page at a time. This is particularly useful for examining large amounts of data by scrolling through the results incrementally.

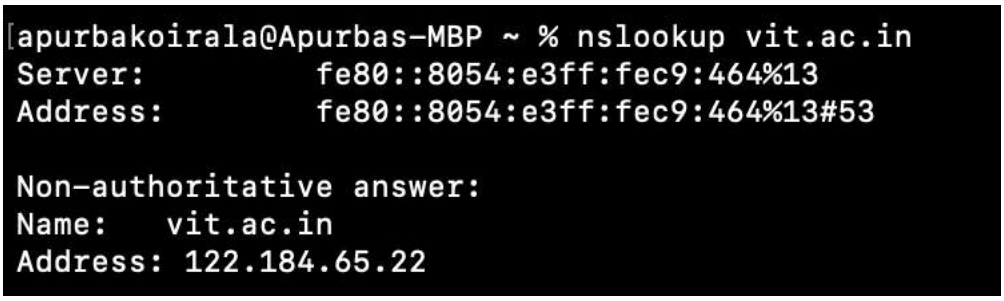
```
apurbakoirala@Apurbas-MBP ~ % netstat -a|more
Active Internet connections (including servers)
Proto Recv-Q Send-Q  Local Address          Foreign Address        (state)
tcp6       0      0  2401:4900:6282:5.57131 2603:1046:1406::.https ESTABLISHED
tcp6       0      0  2401:4900:6282:5.57129 2600:1901:1:7c5:.https ESTABLISHED
tcp6       0      0  2401:4900:6282:5.57125 2600:1901:1:7c5:.https ESTABLISHED
tcp6       0      0  2401:4900:6282:5.57120 2600:1901:1:7c5:.https ESTABLISHED
tcp6       0     31  2401:4900:6282:5.57115 2606:4700:3032::.https ESTABLISHED
tcp4       0      0  172.20.10.3.57113      39.224.186.35.bc.https ESTABLISHED
tcp4       0      0  172.20.10.3.57095      104.21.70.66.https     ESTABLISHED
tcp6       0      0  2401:4900:6282:5.57071 2606:4700:3032::.https CLOSING
tcp6       0      0  2401:4900:6282:5.57055 2600:1901:1:388:.https FIN_WAIT_1
tcp6       0    656  2401:4900:6282:5.57051 2600:1901:1:7c5:.https FIN_WAIT_1
tcp6       0      0  2401:4900:6282:5.57043 2603:1046:1400:1.https ESTABLISHED
tcp6       0    375  2401:4900:6282:5.57021 2600:1901:1:7c5:.https FIN_WAIT_1
tcp6       0      0  2401:4900:6282:5.57016 2600:1900:4110:8.http  ESTABLISHED
tcp4       0      0  172.20.10.3.57011      52.111.252.7.https     ESTABLISHED
tcp6       0     46  2401:4900:6282:5.56955 whatsapp-chatd-e.https ESTABLISHED
tcp6       0      0  2401:4900:6282:5.56927 2600:1901:0:47fc.https ESTABLISHED
tcp6       0      0  2401:4900:6282:5.56421 sh-in-f188.1e100.5228  ESTABLISHED
tcp46      0      0  *.dpap                 *.*                    LISTEN
tcp4       0      0  172.20.10.3.56327      17.242.13.6.5223       ESTABLISHED
tcp6       0      0  2401:4900:6282:5.56050 se-in-f188.1e100.5228  ESTABLISHED
tcp4       0      0  *.55777                *.*                    LISTEN
tcp4       0     11  172.20.10.3.55768      237.240.199.104..4070  ESTABLISHED
tcp6       0      0  apurbas-macbook-.55712 fe80::8054:e3ff:.57658 ESTABLISHED
tcp4       0     28  172.20.10.3.55766      39.224.186.35.bc.https FIN_WAIT_1
tcp6       0      0  *.55712                *.*                    LISTEN
tcp4       0      0  *.55712                *.*                    LISTEN
tcp4       0      0  *.57621                *.*                    LISTEN
tcp6       0      0  2409:40f4:8:8b88.53845 64:ff9b::12cd:44.https ESTABLISHED
tcp6       0      0  apurbas-macbook-.cap   fe80::6392:1e43:.1025  ESTABLISHED
tcp6       0      0  apurbas-macbook-.1024  fe80::6392:1e43:.1024  ESTABLISHED
tcp6       0      0  *.commplex-main        *.*                    LISTEN
tcp4       0      0  *.commplex-main        *.*                    LISTEN
tcp6       0      0  *.afs3-fileserver      *.*                    LISTEN
tcp4       0      0  *.afs3-fileserver      *.*                    LISTEN
tcp6       0      0  2401:4900:6282:5.57105 2603:1046:1406::.https TIME_WAIT
tcp4       0      0  172.20.10.3.57109      17.57.12.243.https     TIME_WAIT
tcp4       0      0  172.20.10.3.57110      17.57.12.242.https     TIME_WAIT
tcp6       0      0  2401:4900:6282:5.57114 2603:1046:1406::.https TIME_WAIT
tcp6       0      0  2401:4900:6282:5.57116 2603:1046:1406::.https TIME_WAIT
tcp6       0      0  2401:4900:6282:5.57033 2606:4700:3032::.https TIME_WAIT
udp6       0      0  2401:4900:6282:5.51860 2600:1901:1:388:.https
udp6       0      0  2401:4900:6282:5.53962 maa03s46-in-x0a..https
udp4       0      0  *.*                    *.*
udp6       0      0  *.mdns                 *.*
udp6       0      0  *.mdns                 *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp6       0      0  *.64312                *.*
udp6       0      0  *.59417                *.*
udp6       0      0  *.mdns                 *.*
udp6       0      0  *.mdns                 *.*
udp6       0      0  *.mdns                 *.*
udp6       0      0  *.mdns                 *.*
udp4       0      0  *.mdns                 *.*
udp4       0      0  *.ssdp                 *.*
udp4       0      0  *.55063                *.*
udp4       0      0  *.57621                *.*
udp6       0      0  *.xserveraid           *.*
udp46      0      0  *.59919                *.*
udp6       0      0  *.62200                *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
udp4       0      0  *.*                    *.*
```

dig: dig, which stands for Domain Information Groper, is a command-line tool used for querying Domain Name System (DNS) servers. It is valuable for verifying and troubleshooting DNS issues, as well as performing DNS lookups to display the responses from the queried name servers. Part of

the BIND domain name server software suite, dig has largely replaced older tools like nslookup and host. It is widely available across major Linux distributions.



nslookup: nslookup is a command-line administrative tool designed for testing and troubleshooting Domain Name System (DNS) servers. It allows users to query specific DNS resource records (RR) to retrieve information about domain names and IP addresses. This tool is useful for diagnosing DNS-related issues and verifying DNS configurations. nslookup provides detailed responses about DNS queries, making it a valuable resource for network administrators and IT professionals.



```
C:\Users\Apurba>nslookup www.youtube.com
Server:  UnKnown
Address:  192.168.225.137

Non-authoritative answer:
Name:    youtube-ui.l.google.com
Addresses:  2404:6800:4009:82a::200e
          2404:6800:4009:810::200e
          2404:6800:4009:801::200e
          2404:6800:4009:804::200e
          142.250.192.110
          142.251.42.14
          142.250.71.110
          142.250.70.110
          142.250.70.78
          142.250.70.46
          142.250.183.46
          142.250.76.206
          142.250.76.174
          142.250.67.206
          142.250.67.174
          172.217.166.78
          216.58.196.78
          216.58.203.14
          172.217.174.238
          172.217.167.174
Aliases:  www.youtube.com
```

route: The route command is used to display and modify the IP routing table. It allows users to view the current routes and adjust routing settings as needed. To view the default routing table in Linux, you can use the route command. Additionally, the command route -n get default provides a more specific output by displaying the default route in a numeric format, which includes details about the destination, gateway, and interface. This can be particularly useful for troubleshooting and understanding the routing path of network traffic.

```
apurbakoirala@Apurbas-MacBook-Pro ~ % route -n get default

   route to: default
destination: default
       mask: default
    gateway: 192.168.225.137
  interface: en0
      flags: <UP,GATEWAY,DONE,STATIC,PRCLONING,GLOBAL>
 recvpipe  sendpipe  ssthresh  rtt,msec    rttvar  hopcount      mtu     expire
       0         0         0         0         0         0      1500         0
apurbakoirala@Apurbas-MacBook-Pro ~ %
```

```
C:\Users\Apurba>route PRINT
===========================================================================
Interface List
 13...98 28 a6 44 eb 7f ......Killer E2500 Gigabit Ethernet Controller
  4...00 ff 1f a3 4f 9c ......Private Internet Access Network Adapter
 19...a4 c3 f0 e1 42 e6 ......Microsoft Wi-Fi Direct Virtual Adapter
 20...a6 c3 f0 e1 42 e5 ......Microsoft Wi-Fi Direct Virtual Adapter #2
  8...a4 c3 f0 e1 42 e5 ......Intel(R) Wireless-AC 9560 160MHz
  1...........................Software Loopback Interface 1
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0  192.168.225.137   192.168.225.95     35
        127.0.0.0        255.0.0.0         On-link         127.0.0.1    331
        127.0.0.1  255.255.255.255         On-link         127.0.0.1    331
  127.255.255.255  255.255.255.255         On-link         127.0.0.1    331
    192.168.225.0    255.255.255.0         On-link    192.168.225.95    291
   192.168.225.95  255.255.255.255         On-link    192.168.225.95    291
  192.168.225.255  255.255.255.255         On-link    192.168.225.95    291
        224.0.0.0        240.0.0.0         On-link         127.0.0.1    331
        224.0.0.0        240.0.0.0         On-link    192.168.225.95    291
  255.255.255.255  255.255.255.255         On-link         127.0.0.1    331
  255.255.255.255  255.255.255.255         On-link    192.168.225.95    291
===========================================================================
Persistent Routes:
  None

IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
  8     51 ::/0                     fe80::bcc8:70ff:fe72:491b
  1    331 ::1/128                  On-link
  8     51 2409:40f4:3014:adde::/64 On-link
  8    291 2409:40f4:3014:adde:fa9:3b8f:4d23:6621/128
                                    On-link
  8    291 2409:40f4:3014:adde:f4bb:dc14:6247:b5a1/128
                                    On-link
  8    291 fe80::/64                On-link
  8    291 fe80::b9b2:45b2:73e1:9b3c/128
                                    On-link
  1    331 ff00::/8                 On-link
  8    291 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None
```

host: The host command is used to resolve domain names to IP addresses and vice versa, supporting both IPv4 and IPv6. It can also be employed to query DNS records, providing a straightforward way to obtain information about domain name resolutions and DNS configurations.

```
apurbakoirala@Apurbas-MBP ~ % host vit.ac.in
vit.ac.in has address 122.184.65.22
vit.ac.in mail is handled by 1 aspmx.l.google.com.
vit.ac.in mail is handled by 10 alt3.aspmx.l.google.com.
vit.ac.in mail is handled by 10 alt4.aspmx.l.google.com.
vit.ac.in mail is handled by 5 alt1.aspmx.l.google.com.
vit.ac.in mail is handled by 5 alt2.aspmx.l.google.com.
apurbakoirala@Apurbas-MBP ~ %
```

arp: ARP (Address Resolution Protocol) is a tool used to view and modify the contents of the kernel's ARP tables, which map IP addresses to MAC addresses on a local network. To display the current ARP table, including a list of IP addresses and their corresponding MAC addresses, you can use the command arp -a. This command provides a snapshot of the ARP cache, showing which IP addresses have been resolved to MAC addresses, helping in troubleshooting and network management.

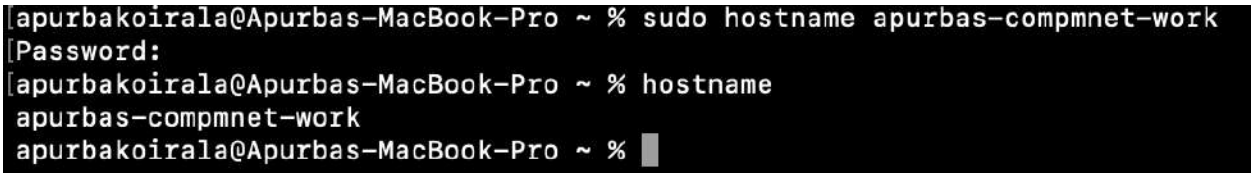
```
apurbakoirala@Apurbas-MBP ~ % arp -a
? (172.20.10.1) at 82:54:e3:c9:4:64 on en0 ifscope [ethernet]
? (172.20.10.2) at a4:c3:f0:e1:42:e5 on en0 ifscope [ethernet]
? (172.20.10.3) at 60:3e:5f:7f:6a:7b on en0 ifscope permanent [ethernet]
? (172.20.10.15) at ff:ff:ff:ff:ff:ff on en0 ifscope [ethernet]
mdns.mcast.net (224.0.0.251) at 1:0:5e:0:0:fb on en0 ifscope permanent [ethernet]
? (239.255.255.250) at 1:0:5e:7f:ff:fa on en0 ifscope permanent [ethernet]
```

```
C:\Users\Apurba>arp -a

Interface: 192.168.225.95 --- 0x8
  Internet Address      Physical Address      Type
  192.168.225.137       be-c8-70-72-49-1b     dynamic
  192.168.225.255       ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

Hostname:

The hostname command is used to identify a device within a network by displaying its current hostname. To view the hostname of your system, simply execute the hostname command. To set a hostname permanently, you can modify the /etc/sysconfig/network file. After setting a new hostname, you will need to reboot the system for the changes to take effect.

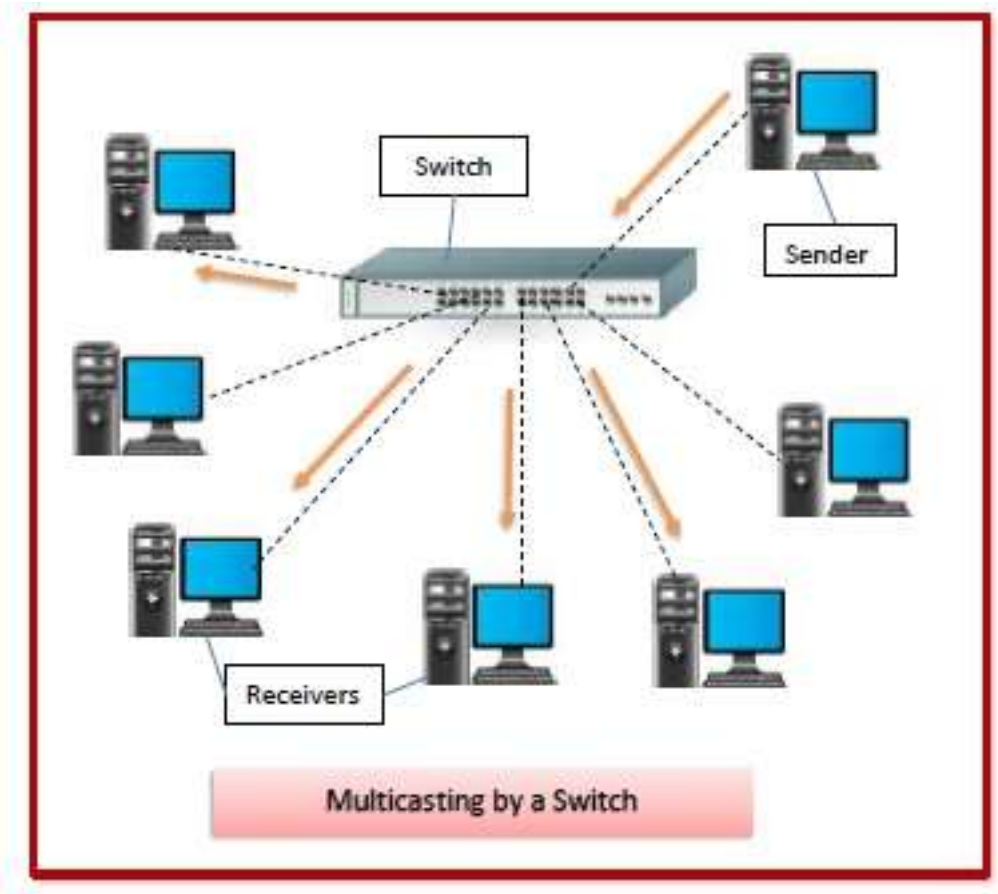
Use sudo command to set a new hostname for the machine



b)

Prepare a report on anyone networking device. The report contains image of the device and the details of components.

Network Switches



Network switches are integral devices in modern networking environments. They operate primarily at the data link layer (Layer 2) of the OSI model but can also function at the network layer (Layer 3) in more advanced configurations. Switches are designed to optimize network efficiency by managing and directing data traffic between devices within a local area network (LAN).

2. Purpose of Network Switches

Network switches serve several key purposes in a network:

Efficient Data Transmission: Switches reduce network congestion by ensuring that data packets are only sent to the intended recipient rather than all devices on the network.

Enhanced Performance: By creating separate collision domains for each connection, switches prevent data packet collisions, leading to improved network performance.

Segmentation and Isolation: Switches can segment a network into multiple virtual LANs (VLANs), isolating traffic and improving security and performance.

Scalability: Switches allow networks to grow by providing additional ports for connecting more devices.

3. Types of Network Switches

Network switches come in various types, each suited to different needs:

Unmanaged Switches:

Description: These are simple, plug-and-play devices that require no configuration. They are best suited for small networks or home environments.

Features: Fixed configuration, no VLAN support, basic functionality.

Use Case: Suitable for straightforward networking needs where advanced features are not required.

Managed Switches:

Description: Managed switches offer extensive configuration options and advanced features for network management. They can be configured via a web interface, command-line interface, or network management software.

Features: VLAN support, Quality of Service (QoS), network monitoring, security features, and SNMP (Simple Network Management Protocol) support.

Use Case: Ideal for medium to large networks where control, performance optimization, and detailed monitoring are necessary.

Smart Switches:

Description: Smart switches provide a middle ground between unmanaged and fully managed switches. They offer some degree of configuration and management but with less complexity.

Features: Basic VLAN support, limited QoS capabilities, and sometimes basic network monitoring.

Use Case: Suitable for small to medium-sized businesses that need more control than unmanaged switches offer but do not require the full range of features provided by managed switches.

Layer 3 Switches:

Description: These switches have routing capabilities, allowing them to operate at Layer 3 of the OSI model in addition to traditional switching functions.

Features: Inter-VLAN routing, static and dynamic routing protocols, advanced routing capabilities.

Use Case: Useful in environments where routing between different VLANs or subnets is required, often seen in larger, more complex network architectures.

4. Functions of Network Switches

Network switches perform several critical functions that are essential for network operation:

Data Forwarding:

How It Works: Switches use MAC addresses to determine the destination of data packets. Each port on the switch has an associated MAC address table that maps device MAC addresses to specific ports.

Efficiency: By forwarding data only to the port associated with the destination MAC address, switches minimize unnecessary network traffic.

MAC Address Learning:

How It Works: When a switch receives a data packet, it records the source MAC address and the port from which it was received in its MAC address table.

Efficiency: This dynamic learning process helps the switch build an accurate table of MAC addresses, improving the efficiency of data packet delivery.

Collision Domain Separation:

How It Works: Each port on a switch represents a separate collision domain. This separation helps to prevent collisions that would occur in a shared network environment like a hub.

Efficiency: This feature enhances network performance by allowing multiple devices to transmit data simultaneously without interference.

Broadcast and Multicast Management:

How It Works: Switches handle broadcast and multicast traffic by sending data packets to multiple devices as needed. Managed switches can provide more granular control over how this traffic is handled.

Efficiency: Proper management of broadcast and multicast traffic helps to reduce network congestion and ensures that data reaches the intended recipients.

5. Key Considerations for Selecting Network Switches

When selecting a network switch, several factors should be considered to ensure it meets the needs of the network:

Port Density:

Consideration: The number of ports on a switch determines how many devices can be connected. Consider future growth and the need for additional ports.

Recommendation: Choose a switch with sufficient ports to accommodate current and anticipated network devices.

Speed and Performance:

Consideration: Switches come with different speed capabilities, such as 10/100/1000 Mbps (Gigabit) or 10 Gbps. Higher-speed switches provide better performance for data-intensive applications.

Recommendation: Match the switch speed with the network's performance requirements and the capabilities of connected devices.

Managed Features:

Consideration: Managed switches offer advanced features like VLAN support, QoS, and network monitoring. Determine the need for these features based on network complexity and management requirements.

Recommendation: Opt for a managed switch if advanced network management and control are needed.

Scalability:

Consideration: Evaluate the switch's ability to support network growth and additional devices. Consider future expansion plans and the need for stackable or modular switches.

Recommendation: Choose switches that can be easily expanded or upgraded to accommodate growing network demands.

Budget:

Consideration: The cost of switches varies based on features and capabilities. Balance the budget with the need for performance, management features, and future scalability.

Recommendation: Select switches that provide the best value for the required features and performance within the budget constraints.

6. Conclusion

Network switches are fundamental to the operation of local area networks, providing efficient data forwarding, collision domain separation, and advanced network management capabilities. By understanding the different types of switches and their functions, as well as considering key factors in the selection process, organizations can optimize their network infrastructure for performance, scalability, and reliability.

Selecting the right switch involves assessing the specific needs of the network, including the number of devices, performance requirements, and budget constraints. Whether opting for unmanaged, managed, smart, or Layer 3 switches, understanding their features and functions ensures that the network operates efficiently and meets the demands of modern communication.