

Computer Networks – Lab 1
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Q1)

ifconfig – configure network

```
rzeta ➤ ifconfig -a
CloudflareWARP: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST> mtu 1280
    inet 172.16.0.2 netmask 255.255.255.255 destination 172.16.0.2
    inet6 fe80::5eef:9148:2e63:b1b5 prefixlen 64 scopeid 0x20<link>
    inet6 2606:4700:110:80c6:1dbf:d09c:98a9:499d prefixlen 128 scopeid 0x0<global>
    unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00 txqueuelen 500 (UNSPEC)
    RX packets 22354 bytes 17363873 (17.3 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 20280 bytes 5091656 (5.0 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

docker0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    inet 172.17.0.1 netmask 255.255.0.0 broadcast 172.17.255.255
    ether 02:42:31:cd:da:e6 txqueuelen 0 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enp2s0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether 58:11:22:83:2b:23 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    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 22391 bytes 2534772 (2.5 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 22391 bytes 2534772 (2.5 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlp3s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 172.16.23.255 netmask 255.255.0.0 broadcast 172.16.255.255
    inet6 fe80::c275:95b2:e8d0:7254 prefixlen 64 scopeid 0x20<link>
    ether b4:8c:9d:66:49:3b txqueuelen 1000 (Ethernet)
    RX packets 256369 bytes 178687425 (178.6 MB)
    RX errors 0 dropped 69123 overruns 0 frame 0
    TX packets 115214 bytes 20812558 (20.8 MB)
```

-a == display all interfaces

```

rzeta ifconfig -s
Iface      MTU      RX-OK RX-ERR RX-DRP RX-OVR      TX-OK TX-ERR TX-DRP TX-OVR Flg
Cloudfla   1280     22845    0      0 0          20799    0      0      0 MOPRU
docker0    1500      0      0      0 0           0      0      0      0 BMU
enp2s0     1500      0      0      0 0           0      0      0      0 BMU
lo         65536    22476    0      0 0          22476    0      0      0 LRU
wlp3s0     1500    260391    0  71659 0          115945    0      0      0 BMRU

```

-s == display in short version

```

rzeta ifconfig -v
CloudflareWARP: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST> mtu 1280
  inet 172.16.0.2 netmask 255.255.255.255 destination 172.16.0.2
  inet6 fe80::5eef:9148:2e63:b1b5 prefixlen 64 scopeid 0x20<link>
  inet6 2606:4700:110:80c6:1dbf:d09c:98a9:499d prefixlen 128 scopeid 0x0<global>
  local>
  unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-00 txqueuelen 500 (UNSPEC)
  RX packets 22972 bytes 17480572 (17.4 MB)
  RX errors 0 dropped 0 overruns 0 frame 0
  TX packets 20941 bytes 5216468 (5.2 MB)
  TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

docker0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
  inet 172.17.0.1 netmask 255.255.0.0 broadcast 172.17.255.255
  ether 02:42:31:cd:da:e6 txqueuelen 0 (Ethernet)
  RX packets 0 bytes 0 (0.0 B)
  RX errors 0 dropped 0 overruns 0 frame 0
  TX packets 0 bytes 0 (0.0 B)
  TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enp2s0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
  ether 58:11:22:83:2b:23 txqueuelen 1000 (Ethernet)
  RX packets 0 bytes 0 (0.0 B)
  RX errors 0 dropped 0 overruns 0 frame 0
  TX packets 0 bytes 0 (0.0 B)
  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 22509 bytes 2549043 (2.5 MB)
  RX errors 0 dropped 0 overruns 0 frame 0
  TX packets 22509 bytes 2549043 (2.5 MB)
  TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlp3s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
  inet 172.16.23.255 netmask 255.255.0.0 broadcast 172.16.255.255
  inet6 fe80::c275:95b2:e8d0:7254 prefixlen 64 scopeid 0x20<link>
  ether b4:8c:9d:66:49:3b txqueuelen 1000 (Ethernet)
  RX packets 261708 bytes 180569470 (180.5 MB)
  RX errors 0 dropped 72568 overruns 0 frame 0

```

-v == verbose

Q2)

ping – test connectivity by sending ICMP echo requests

ICMP - Internet Control Message Protocol

```
rzeta ➤ ping www.iiitdm.ac.in
PING www.iiitdm.ac.in (173.236.205.207) 56(84) bytes of data.
64 bytes from vps36200.dreamhostps.com (173.236.205.207): icmp_seq=1 ttl=55 time=495 ms
64 bytes from vps36200.dreamhostps.com (173.236.205.207): icmp_seq=2 ttl=55 time=383 ms
64 bytes from vps36200.dreamhostps.com (173.236.205.207): icmp_seq=3 ttl=55 time=391 ms
64 bytes from vps36200.dreamhostps.com (173.236.205.207): icmp_seq=4 ttl=55 time=446 ms
64 bytes from vps36200.dreamhostps.com (173.236.205.207): icmp_seq=5 ttl=55 time=477 ms
^C
--- www.iiitdm.ac.in ping statistics ---
6 packets transmitted, 5 received, 16.6667% packet loss, time 5832ms
rtt min/avg/max/mdev = 383.411/438.591/494.975/44.756 ms
```

-4 == IPv4

```
rzeta ➤ ping -4 www.google.com
PING (142.250.4.99) 56(84) bytes of data.
64 bytes from sm-in-f99.1e100.net (142.250.4.99): icmp_seq=1 ttl=59 time=169 ms
64 bytes from sm-in-f99.1e100.net (142.250.4.99): icmp_seq=2 ttl=59 time=128 ms
64 bytes from sm-in-f99.1e100.net (142.250.4.99): icmp_seq=3 ttl=59 time=155 ms
64 bytes from sm-in-f99.1e100.net (142.250.4.99): icmp_seq=4 ttl=59 time=114 ms
^C
--- ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3004ms
rtt min/avg/max/mdev = 113.750/141.359/168.706/21.680 ms
```

-6 == IPv6

```
[~/sem5/cn]
✖ ➤ rzeta ➤ ping -6 www.iiitdm.ac.in
ping: www.iiitdm.ac.in: Address family for hostname not supported
```

```
✖ ➤ rzeta ➤ ping 172.16.3.178
ping: connect: Network is unreachable
```

When internet is turned off – showing network is unreachable

Q3)

traceroute – print the route trace to host

```
rzeta> traceroute google.com
traceroute to google.com (142.251.12.101), 30 hops max, 60 byte packets
 1 * * *
 2 * * *
 3 * * *
 4 * * *
 5 * * *
 6 * * *
 7 * * *
 8 * * *
 9 * * *
10 * * *
11 * * *
12 * * *
13 * * *
14 * * *
15 * * *
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *
```

```
✗ rzeta> traceroute -I www.google.com
traceroute to www.google.com (172.253.118.99), 30 hops max, 60 byte packets
 1 104.28.0.0 (104.28.0.0) 99.003 ms 99.028 ms 99.036 ms
 2 162.158.161.1 (162.158.161.1) 99.042 ms 99.051 ms 99.057 ms
 3 162.158.160.54 (162.158.160.54) 99.154 ms 99.164 ms *
 4 162.158.160.215 (162.158.160.215) 99.081 ms 99.086 ms 99.091 ms
 5 142.250.238.115 (142.250.238.115) 99.041 ms 99.047 ms 99.053 ms
 6 192.178.109.86 (192.178.109.86) 99.086 ms
send: No route to host
```

-I == ICMP requests

hops == the movement of data between two network devices

```
✗ rzeta> traceroute -d www.google.com
traceroute to www.google.com (142.250.195.164), 30 hops max, 60 byte packets
setsockopt SO_DEBUG: Permission denied
```

-d == socket debugging

Q4)

netstat - prints details about network connections , routing tables

```
✖ rzeta netstat -a
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 localhost:domain        0.0.0.0:*               LISTEN
tcp        0      0 localhost:postgresql    0.0.0.0:*               LISTEN
tcp        0      0 localhost:domain        0.0.0.0:*               LISTEN
tcp        0      0 localhost:domain        0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:ssh             0.0.0.0:*               LISTEN
tcp        0      0 localhost:ipp           0.0.0.0:*               LISTEN
tcp        0      0 localhost:61209         0.0.0.0:*               LISTEN
tcp        0      0 connectivity-chec:56048  server-13-33-183-:https TIME_WAIT
tcp        0      0 connectivity-chec:58840  159.203.145.121:https ESTABLISHED
tcp        0      0 connectivity-chec:55352  172.67.23.234:https  TIME_WAIT
tcp        0      0 connectivity-chec:56424  172.67.207.221:https ESTABLISHED
tcp        0      0 connectivity-chec:51702  23.175.142.34.bc.:https ESTABLISHED
tcp        0      0 connectivity-chec:33250  ec2-35-174-76-132:https ESTABLISHED
^C
```

```
rzeta netstat -r
Kernel IP routing table
Destination Gateway Genmask Flags MSS Window irtt Iface
default _gateway 0.0.0.0 UG 0 0 0 wlp3s0
link-local 0.0.0.0 255.255.0.0 U 0 0 0 wlp3s0
172.16.0.0 0.0.0.0 255.255.0.0 U 0 0 0 wlp3s0
172.17.0.0 0.0.0.0 255.255.0.0 U 0 0 0 docker0
```

-r == routing table


```
rzeta netstat -s
Ip:
  Forwarding: 1
  356954 total packets received
  2 with invalid addresses
  0 forwarded
  0 incoming packets discarded
  348088 incoming packets delivered
  279930 requests sent out
  10354 outgoing packets dropped
  36 dropped because of missing route
  158 fragments dropped after timeout
  1951 reassemblies required
  131 packets reassembled ok
  158 packet reassemblies failed
  OutTransmits: 268881
Icmp:
  825 ICMP messages received
  1 input ICMP message failed
  ICMP input histogram:
    destination unreachable: 774
    timeout in transit: 23
    echo requests: 1
    echo replies: 27
  1101 ICMP messages sent
  0 ICMP messages failed
  ICMP output histogram:
    destination unreachable: 982
    echo requests: 118
    echo replies: 1
IcmpMsg:
  InType0: 27
  InType3: 774
  InType8: 1
  InType11: 23
  OutType0: 1
  OutType3: 982
  OutType8: 118
```

-s == statistics of each protocol

Q5)

nslookup – lookup DNS(Domain Name Services)

```
rzeta ➤ nslookup www.google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   www.google.com
Address: 172.217.163.164
Name:   www.google.com
Address: 2404:6800:4007:826::2004
```

```
rzeta ➤ nslookup -query=mx www.iitm.ac.in
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
www.iitm.ac.in canonical name = waf01.iitm.ac.in.

Authoritative answers can be found from:
iitm.ac.in
    origin = dns1.iitm.ac.in
    mail addr = root.dns1.iitm.ac.in
    serial = 2024082101
    refresh = 10800
    retry = 3600
    expire = 1814400
    minimum = 86400
```

-query=mx == used to determine mail servers responsible for receiving mail

Q6)

arp - manipulate arp cache

ARP - Address Resolution Protocol , created when an IP address is resolved to a MAC address

```
rzeta ➤ arp -a
_gateway (172.16.255.250) at 70:4c:a5:ce:da:81 [ether] on wlp3s0
? (172.16.1.138) at 14:50:51:3f:c1:ae [ether] on wlp3s0
? (172.16.6.155) at ac:e2:d3:fc:63:62 [ether] on wlp3s0
? (172.16.17.244) at 08:54:bb:69:82:4f [ether] on wlp3s0
? (172.16.21.62) at bc:c7:46:ec:b5:b4 [ether] on wlp3s0
? (172.16.21.33) at 2c:58:b9:19:a8:ab [ether] on wlp3s0
? (172.16.1.73) at e4:e7:49:a4:58:e5 [ether] on wlp3s0
? (172.16.3.178) at a0:8c:fd:c0:7d:30 [ether] on wlp3s0
? (172.16.7.169) at 88:c9:e8:d9:8f:da [ether] on wlp3s0
? (172.16.6.235) at ac:e2:d3:fc:63:85 [ether] on wlp3s0
```

```
✗ rzeta ➤ arp -v
```

Address	HWtype	HWaddress	Flags	Mask	Iface
_gateway	ether	70:4c:a5:ce:da:81	C		wlp3s0
172.16.1.138	ether	14:50:51:3f:c1:ae	C		wlp3s0
172.16.6.155	ether	ac:e2:d3:fc:63:62	C		wlp3s0
172.16.19.210	ether	80:8a:bd:f2:cf:40	C		wlp3s0
172.16.17.244	ether	08:54:bb:69:82:4f	C		wlp3s0
172.16.21.62	ether	bc:c7:46:ec:b5:b4	C		wlp3s0
172.16.21.33	ether	2c:58:b9:19:a8:ab	C		wlp3s0
172.16.1.73	ether	e4:e7:49:a4:58:e5	C		wlp3s0
172.16.3.178	ether	a0:8c:fd:c0:7d:30	C		wlp3s0
172.16.7.169	ether	88:c9:e8:d9:8f:da	C		wlp3s0
172.16.6.235	ether	ac:e2:d3:fc:63:85	C		wlp3s0

Entries: 11 Skipped: 0 Found: 11

-v == verbose

```
rzeta ➤ arp -n
```

Address	HWtype	HWaddress	Flags	Mask	Iface
172.16.255.250	ether	70:4c:a5:ce:da:81	C		wlp3s0
172.16.1.138	ether	14:50:51:3f:c1:ae	C		wlp3s0
172.16.6.155	ether	ac:e2:d3:fc:63:62	C		wlp3s0
172.16.19.210	ether	80:8a:bd:f2:cf:40	C		wlp3s0
172.16.17.244	ether	08:54:bb:69:82:4f	C		wlp3s0
172.16.21.62	ether	bc:c7:46:ec:b5:b4	C		wlp3s0
172.16.21.33	ether	2c:58:b9:19:a8:ab	C		wlp3s0
172.16.1.73	ether	e4:e7:49:a4:58:e5	C		wlp3s0
172.16.3.178	ether	a0:8c:fd:c0:7d:30	C		wlp3s0
172.16.7.169	ether	88:c9:e8:d9:8f:da	C		wlp3s0
172.16.6.235	ether	ac:e2:d3:fc:63:85	C		wlp3s0

-n == in form of numerical addresses

Q7)

route - manipulate routing tables

routing tables - data table stored in a router or a network host that lists the routes

```
rzeta> route -n
Kernel IP routing table
Destination      Gateway          Genmask          Flags Metric Ref    Use Iface
0.0.0.0          172.16.255.250  0.0.0.0          UG        600    0      0 wlp3s0
169.254.0.0      0.0.0.0         255.255.0.0      U         1000   0      0 wlp3s0
172.16.0.0       0.0.0.0         255.255.0.0      U         600    0      0 wlp3s0
172.17.0.0       0.0.0.0         255.255.0.0      U         0      0      0 docker0
```

-n == show numerical addresses

```
rzeta> route -F
Kernel IP routing table
Destination      Gateway          Genmask          Flags Metric Ref    Use Iface
default          _gateway        0.0.0.0          UG        600    0      0 wlp3s0
link-local       0.0.0.0         255.255.0.0      U         1000   0      0 wlp3s0
172.16.0.0       0.0.0.0         255.255.0.0      U         600    0      0 wlp3s0
172.17.0.0       0.0.0.0         255.255.0.0      U         0      0      0 docker0
```

-F == operate on the kernel's FIB (Forwarding Information Base) routing table (default)

Q8)

ip - shows routing , devices , interfaces

```
rzeta> ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp2s0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc fq_codel state DOWN group default qlen 1000
    link/ether 58:11:22:83:2b:23 brd ff:ff:ff:ff:ff:ff
3: wlp3s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether b4:8c:9d:66:49:3b brd ff:ff:ff:ff:ff:ff
    inet 172.16.23.255/16 brd 172.16.255.255 scope global dynamic noprefixroute wlp3s0
        valid_lft 26379sec preferred_lft 26379sec
    inet6 fe80::c275:95b2:e8d0:7254/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
4: docker0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default
    link/ether 02:42:31:cd:da:e6 brd ff:ff:ff:ff:ff:ff
    inet 172.17.0.1/16 brd 172.17.255.255 scope global docker0
        valid_lft forever preferred_lft forever
```

ip addr - ip addresses of the host system

```
rzeta ➤ ip route show
default via 172.16.255.250 dev wlp3s0 proto dhcp metric 600
169.254.0.0/16 dev wlp3s0 scope link metric 1000
172.16.0.0/16 dev wlp3s0 proto kernel scope link src 172.16.23.255 metric 600
172.17.0.0/16 dev docker0 proto kernel scope link src 172.17.0.1 linkdown
```

ip route show == current routing table

Q9)

hostname - system's host name

```
rzeta ➤ hostname
rzeta
```

```
rzeta ➤ hostname -f
rzeta

[~/sem5/cn]
rzeta ➤ hostname -s
rzeta
```

-f == fullname

-s == shortform

Q10)

whois - client for the whois directory service

whois searches for the object in the RFC 3912 database . whois command tries to reach ARPANET host

```
[ ~ - ssh@07.ch ]
✖ rzeta whois google.com
Domain Name: GOOGLE.COM
Registry Domain ID: 2138514_DOMAIN_COM-VRSN
Registrar WHOIS Server: whois.markmonitor.com
Registrar URL: http://www.markmonitor.com
Updated Date: 2019-09-09T15:39:04Z
Creation Date: 1997-09-15T04:00:00Z
Registry Expiry Date: 2028-09-14T04:00:00Z
Registrar: MarkMonitor Inc.
Registrar IANA ID: 292
Registrar Abuse Contact Email: abusecomplaints@markmonitor.com
Registrar Abuse Contact Phone: +1.2086851750
Domain Status: clientDeleteProhibited https://icann.org/epp#clientDeleteProhibited
Domain Status: clientTransferProhibited https://icann.org/epp#clientTransferProhibited
Domain Status: clientUpdateProhibited https://icann.org/epp#clientUpdateProhibited
Domain Status: serverDeleteProhibited https://icann.org/epp#serverDeleteProhibited
Domain Status: serverTransferProhibited https://icann.org/epp#serverTransferProhibited
Domain Status: serverUpdateProhibited https://icann.org/epp#serverUpdateProhibited
Name Server: NS1.GOOGLE.COM
Name Server: NS2.GOOGLE.COM
Name Server: NS3.GOOGLE.COM
Name Server: NS4.GOOGLE.COM
DNSSEC: unsigned
URL of the ICANN Whois Inaccuracy Complaint Form: https://www.icann.org/wicf/
>>> Last update of whois database: 2024-08-21T11:27:37Z <<<

For more information on Whois status codes, please visit https://icann.org/epp

NOTICE: The expiration date displayed in this record is the date the
registrar's sponsorship of the domain name registration in the registry is
currently set to expire. This date does not necessarily reflect the expiration
date of the domain name registrant's agreement with the sponsoring
```

```
rzeta whois 1.1.1.1
% [whois.apnic.net]
% Whois data copyright terms    http://www.apnic.net/db/dbcopyright.html

% Information related to '1.1.1.0 - 1.1.1.255'

% Abuse contact for '1.1.1.0 - 1.1.1.255' is 'helpdesk@apnic.net'

inetnum:        1.1.1.0 - 1.1.1.255
netname:        APNIC-LABS
descr:          APNIC and Cloudflare DNS Resolver project
descr:          Routed globally by AS13335/Cloudflare
descr:          Research prefix for APNIC Labs
country:        AU
org:            ORG-ARAD1-AP
admin-c:        AIC3-AP
tech-c:         AIC3-AP
abuse-c:        AA1412-AP
status:         ASSIGNED PORTABLE
remarks:        -----
remarks:        All Cloudflare abuse reporting can be done via
remarks:        resolver-abuse@cloudflare.com
remarks:        -----
mnt-by:         APNIC-HM
mnt-routes:     MAINT-APNICRANDNET
mnt-irt:        IRT-APNICRANDNET-AU
last-modified:  2023-04-26T22:57:58Z
mnt-lower:      MAINT-APNICRANDNET
source:         APNIC

irt:            IRT-APNICRANDNET-AU
address:        PO Box 3646
address:        South Brisbane, QLD 4101
address:        Australia
```

Q11)

ftp – file transfer protocol

```
rzeta ➤ ftp google.com
Trying 142.250.205.238:21 ...
Connected to google.com.
```

```
rzeta ➤ ftp localhost

Connected to localhost.
220 (vsFTPD 3.0.5)
Name (localhost:rzeta): rzeta
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp>
```

Q12)

scp – OpenSSH file copy

```
✖ rzeta ➤ sudo scp -r ~/sem5/cn localhost:/iitm
The authenticity of host 'localhost (127.0.0.1)' can't be established.
ED25519 key fingerprint is SHA256:SMGoPdKSzkdb4lSIzjd9h7EAd4uE4UBpWit2Ra/hL6c.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'localhost' (ED25519) to the list of known hosts.
rzeta@localhost's password:
Final Fee structure B tech and DD 2024-25 29.05.202 100% 592KB 314.0MB/s 00:00
```

Q13)

curl – transfer a URL (uniform resource locator)

```
x rzeta curl www.google.com
<!doctype html><html itemscope="" itemtype="http://schema.org/WebPage" lang="en-IN"><head><meta content="text/html; charset=UTF-8" http-equiv="Content-Type"><meta content="/images/branding/googleg/1x/googleg_standard_color_128dp.png" itemprop="image"><title>Google</title><script nonce="KroHms0CG0eQHtvG0aa9rg">(function(){var _g={kEI:'EtTFZovZBb7a1sQP3t2K6Q8',kEXPI:'0,3700254,1127,7,90,541439,2891,8349,98967,145698,2,16737,21269,1755,6699,41949,57734,2,2,1,6959,3998,15675,8155,23351,22435,9779,62658,33564,39614,3030,15816,1804,7734,27535,12155,1293,9707,3785,15784,11106,4558,11419,5212676,998,146,5991286,2841018,324,4,55,32,2,26675057,1305643,1008,13290,2374,43887,3,318,4,1281,3,2124363,23029351,8163,10336,10736,84045,11737,10886,12952,2212,8181,150,10657,9908,8131,20584,21669,6755,155,2,1741,5,736,13504,7735,9140,1993,2606,328,517,2700,4,1233,5,1766,2947,16727,409,518,7389,5634,686,6677,1119,3,5,2829,181,2695,4479,1916,9951,682,451,208,5849,1340,6519,352,1137,723,2,9,3997,3,5,4562,294,4547,2379,445,121,918,799,181,308,221,2767,1793,175,7704,1824,7174,1145,463,1962,134,4,561,53,45,2637,3147,1871,2499,607,565,455,62,11,181,59,441,126,496,167,219,2209,386,2,222,4,3,501,10667,1184,1226,245,886,2,5,2,323,19,189,63,287,2,3,493,7,44,1067,160,1567,7,148,188,559,483,295,3,569,52,1905,670,1901,635,517,399,384,15,251,612,140,120,1,347,364,177,3,2,80,755,180,2,111,571,36,638,3,38,119,1441,206,19,226,755,14,77,108,182,250,264,166,336,338,135,3,523,122,153,379,730,733,2,2,2,3,538,923,41,1153,760,4,2,3,191,1,8,1,1,4,1,4,923,3,230,2,187,393,349,4,110,1139,70,24,539,882,1134,170,21,21493710,3,14475,3,7053,275,837,47,8460',kBL:'gaBl',kOPI:89978449};(function(){var a;((a=window.google)==null?0:a.stvsc)?google.kEI=_g.kEI:window.google=_g;}).call(this);})();(function(){google.sn='webhp';google.kHL='en-IN';})();(function(){var h=this||self;function l(){return window.google!==void 0&&window.google.kOPI!==void 0&&window.google.kOPI!==0?window.google.kOPI:null};var m,n=[];function p(a){for(var b;a&&(!a.getAttribute)||!(b=a.getAttribute("eid")));a=a.parentNode;return b||m}function q(a){for(var b=null;a&&(!a.getAttribute)||!(b=a.getAttribute("leid")));a=a.parentNode;return b}function r(a){/^http:\/i.test(a)&&window.location.protocol==="https:"&&(google.ml&&google.ml(Error("a"),!1,{src:a,glmm:1}),a="");return a}function t(a,b,c,d,k){var e="";b.search("&ei=")===-1&&(e="&ei="+p(d),b.search("&lei=")===-1&&(d=q(d))&&(e="&lei="+d));d="";var g=b.search("&cshid=")===-1&&a!="slh",f=[];f.push(["zx",Date.now().toString()]);h._cshid&&g&&f.push(["cshid",h._cshid]);c=c();c!=null&&f.push(["opi",c.toString()]);for(c=0;c<f.length;c++){if(c===0||c>0)d+="&";d+=f[c][0]+"="+f[c][1]}return"/"+(k||"gen_204")+"?atyp=i&ct="+String(a)+"&cad="+(b+e+d)};m=google.kEI;google.getEI=p;google.getLEI=q;google.ml=function(){return null};google.log=function(a,b,c,d,k,e){e=e===void 0?l:e;c||(c=t(a,b,e,d,k));if(c=r(c)){a=new Image;var g=n.length;n[g]=a;a.onerror=a.onload=a.onabort=function(){delete n[g]};a.src=c};google.logUrl=function(a,b){b=b===void 0?l:b;return t("",a,b)};}).call(this);(function(){google.y={};google.sy=[];var d;(d=google).x||(d.x=function(a,b){if(a)var c=a.id;else{do c=Math.random();while(google.y[c])}google.y[c]=[a,b];return!1});var e;(e=google).sx||(e.sx=function(a){google.sy.push(a)});google.lm=[];var f;(f=google).plm||(f.plm=function(a){google.lm.push.apply(google.lm,a)});google.lg=[];var g;(g=google).load||(g.load=fun
```


wget – network downloader

```
[~/sem5/cn]
rzeta ➤ wget https://old.iiitdm.ac.in/img/academics/Final%20Fee%20structure%20B%20tec
h%20and%20DD%202024-25%2029.05.2024.pdf
--2024-08-21 17:14:42-- https://old.iiitdm.ac.in/img/academics/Final%20Fee%20structur
e%20B%20tech%20and%20DD%202024-25%2029.05.2024.pdf
Resolving old.iiitdm.ac.in (old.iiitdm.ac.in)... 173.236.205.207
Connecting to old.iiitdm.ac.in (old.iiitdm.ac.in)|173.236.205.207|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 606304 (592K) [application/pdf]
Saving to: 'Final Fee structure B tech and DD 2024-25 29.05.2024.pdf'

Final Fee structure B 100%[=====>] 592.09K  381KB/s   in 1.6s

2024-08-21 17:14:45 (381 KB/s) - 'Final Fee structure B tech and DD 2024-25 29.05.2024
.pdf' saved [606304/606304]
```

Q14)

telnet – connect two network devices using TELNET protocol

```
✖ ➤ rzeta ➤ telnet localhost

Trying 127.0.0.1...
telnet: Unable to connect to remote host: Connection refused
```

ssh -

Terminal 1 -

```
[~]
rzeta ➤ python3 -m http.server
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
□
```

Terminal 2 -

```
rzeta ➤ ssh localhost
rzeta@localhost's password:
Welcome to Ubuntu 22.04.4 LTS (GNU/Linux 6.8.0-40-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

33 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

Last login: Fri Aug 16 19:35:03 2024 from 127.0.0.1
```

Advanced Commands -

Q1)

tcpdump – dumps traffic on a network

```
x rzeta sudo tcpdump -i wlp3s0
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on wlp3s0, link-type EN10MB (Ethernet), snapshot length 262144 bytes
17:27:30.613084 00:04:96:59:24:e1 (oui Unknown) > 01:a0:f8:00:00:01 (oui Unknown), eth
ertype Unknown (0x8783), length 108:
    0x0000: c00c 005a 100a 0961 ffff ffff 4659 24e1 ...Z...a....FY$.
    0x0010: 0002 0002 000b 0002 d737 0200 0000 ffff .....7.....
    0x0020: ffff ffff f8e4 3b55 1dfc 8100 000b 0806 .....;U.....
    0x0030: 0001 0800 0604 0001 f8e4 3b55 1dfc ac11 .....;U....
    0x0040: 02d2 0000 0000 0000 ac11 0346 0000 0000 .....F....
    0x0050: 0000 0000 0000 0000 0000 0000 0000 .....
17:27:30.613444 00:04:96:59:25:7b (oui Unknown) > 01:a0:f8:00:00:01 (oui Unknown), eth
ertype Unknown (0x8783), length 134:
    0x0000: c005 0074 100a 0129 ffff ffff 4659 257b ...t...)....FY%{
    0x0010: 0002 0002 000a 0000 61d3 0200 0000 0100 .....a.....
    0x0020: 5e00 00fb 40ed 0027 37e0 8100 000a 0800 ^...@...'7.....
    0x0030: 4500 0048 a03f 4000 0111 3b20 ac10 113a E..H.?@...;....:
    0x0040: e000 00fb b306 14e9 0034 406c 6b61 0000 .....4@lka..
    0x0050: 0001 0000 0000 0000 0331 3038 0231 3902 .....108.19.
    0x0060: 3136 0331 3732 0769 6e2d 6164 6472 0461 16.172.in-addr.a
    0x0070: 7270 6100 000c 0001 rpa.....
17:27:30.613872 00:04:96:59:24:e1 (oui Unknown) > 01:a0:f8:00:00:01 (oui Unknown), eth
ertype Unknown (0x8783), length 265:
    0x0000: c00b 00f7 100a 0159 ffff ffff 4659 24e1 .....Y....FY$.
    0x0010: 0002 0002 000b 0000 d738 0200 0000 0100 .....8.....
    0x0020: 5e7f fffa 40ed 001c dc77 8100 000b 0800 ^...@....w.....
    0x0030: 4500 00cb c54e 0000 0111 568a ac11 013e E....N....V....>
    0x0040: efff fffa d2cc 076c 00b7 1f87 4d2d 5345 .....l....M-SE
    0x0050: 4152 4348 202a 2048 5454 502f 312e 310d ARCH.*.HTTP/1.1.
    0x0060: 0a48 4f53 543a 2032 3339 2e32 3535 2e32 .HOST:.239.255.2
    0x0070: 3535 2e32 3530 3a31 3930 300d 0a4d 414e 55.250:1900..MAN
    0x0080: 3a20 2273 7364 703a 6469 7363 6f76 6572 :."ssdp:discover
    0x0090: 220d 0a4d 583a 2031 0d0a 5354 3a20 7572 "...MX:1..ST:ur
    0x00a0: 6e3a 6469 616c 2d6d 756c 7469 7363 7265 n:dial-multiscre
    0x00b0: 656e 2d6f 7267 3a73 6572 7669 6365 3a64 en-org:service:d
    0x00c0: 6961 6c3a 310d 0a55 5345 522d 4147 454e ial:1..USER-AGEN
    0x00d0: 543a 2047 6f6f 676c 6520 4368 726f 6d65 T:.Google.Chrome
    0x00e0: 2f31 3237 2e30 2e36 3533 332e 3132 3020 /127.0.6533.120.
    0x00f0: 5769 6e64 6f77 730d 0a0d 0a Windows....
```

wireshark – interactive dumping and analyzing of networks



Q2)

iftop - displays the bandwidth usage

-i == interface

```
rzeta ➤ sudo iftop -i wlp3s0
interface: wlp3s0
IP address is: 172.16.23.255
MAC address is: b4:8c:9d:66:49:3b
```

		12.5Kb	25.0Kb	37.5Kb	50.0Kb	62.5Kb		
rzeta	=>		dns.google		4.52Kb	1.82Kb		
	<=				5.16Kb	2.07Kb		
rzeta	=>		172.16.21.62		0b	285b		
	<=				2.10Kb	932b		
rzeta	=>		172.16.19.210		0b	0b		
	<=				3.45Kb	1.15Kb		
rzeta	=>		172.16.18.20		0b	0b		
	<=				2.02Kb	691b		
mdns.mcast.net	=>		172.16.1.137		0b	0b		
	<=				0b	560b		
rzeta	=>		239.255.255.250		1.57Kb	536b		
	<=				0b	0b		
rzeta	=>		172.16.17.244		0b	285b		
	<=				0b	216b		
239.255.255.250	=>		172.16.9.5		0b	0b		
	<=				0b	469b		
255.255.255.255	=>		0.0.0.0		0b	0b		
	<=				0b	437b		
rzeta	=>		whatsapp-cdn-shv-02-bom1.fbc		0b	69b		
	<=				0b	163b		
rzeta	=>		time.cloudflare.com		0b	101b		
	<=				0b	0b		
rzeta	=>		time.cloudflare.com		304b	101b		
	<=				0b	0b		
TX:	cum:	2.38KB	peak:	6.39Kb	rates:	6.39Kb	3.17Kb	3.17Kb
RX:		4.96KB		12.7Kb		12.7Kb	6.61Kb	6.61Kb
TOTAL:		7.33KB		19.1Kb		19.1Kb	9.78Kb	9.78Kb

Q3)

mtr – network diagnostics tool

```
My traceroute [v0.95]
rzeta (172.16.23.255) -> www.iiitdm.ac.in (173.236.205.202) 2024-08-21T17:36:47+0530
Keys: Help  Display mode  Restart statistics  Order of fields  quit

  Host                          Loss%  Snt   Last   Avg    Best  Wrst  StDev
1.  _gateway                     0.0%    2    13.6   29.3   13.6   45.0   22.2
2.  47.247.143.177               0.0%    2     3.2   58.8    3.2  114.5   78.7
3.  (waiting for reply)
4.  103.198.140.170              0.0%    2   153.9  153.9  153.9  153.9    0.0
5.  49.45.4.85                   0.0%    2  270.9  270.9  270.9  270.9    0.0
6.  49.45.4.85                   0.0%    1  217.8  217.8  217.8  217.8    0.0
7.  (waiting for reply)
8.  be3359.ccr42.lax01.atlas.cogentco. 0.0%    1   224.1  224.1  224.1  224.1    0.0
9.  be2932.ccr32.phx01.atlas.cogentco. 0.0%    1   260.4  260.4  260.4  260.4    0.0
10. be5473.ccr22.elp02.atlas.cogentco. 0.0%    1   326.2  326.2  326.2  326.2    0.0
11. (waiting for reply)
12. be5027.ccr42.atl01.atlas.cogentco. 0.0%    1   261.3  261.3  261.3  261.3    0.0
13. be2113.ccr42.dca01.atlas.cogentco. 0.0%    1   270.0  270.0  270.0  270.0    0.0
14. be3084.ccr41.iad02.atlas.cogentco. 0.0%    1   428.3  428.3  428.3  428.3    0.0
15. (waiting for reply)
16. (waiting for reply)
17. (waiting for reply)
18. ip-208-113-156-219.dreamhost.com  0.0%    1   305.1  305.1  305.1  305.1    0.0
19. vps36200.dreamhostps.com         0.0%    1   266.6  266.6  266.6  266.6    0.0
```

Q4)

iwconfig – configure wireless network interfaces

```
rzeta ➤ iwconfig
lo          no wireless extensions.

enp2s0     no wireless extensions.

wlp3s0     IEEE 802.11  ESSID:"IIITDM"
          Mode:Managed  Frequency:2.412 GHz  Access Point: E0:46:EE:68:20:21
          Bit Rate=206.5 Mb/s   Tx-Power=3 dBm
          Retry short limit:7   RTS thr:off   Fragment thr:off
          Power Management:on
          Link Quality=70/70  Signal level=-31 dBm
          Rx invalid nwid:0  Rx invalid crypt:0  Rx invalid frag:0
          Tx excessive retries:6  Invalid misc:8  Missed beacon:0

docker0    no wireless extensions.
```

Q5)

dig - DNS lookup utility

-x == gets simplified reverse lookup

```
rzeta ➤ dig -x www.iiitdm.ac.in

; <<>> DiG 9.18.28-0ubuntu0.22.04.1-Ubuntu <<>> -x www.iiitdm.ac.in
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NXDOMAIN, id: 64082
;; flags: qr rd ra; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;in.ac.iiitdm.www.in-addr.arpa. IN      PTR

;; AUTHORITY SECTION:
in-addr.arpa.          3028      IN      SOA      b.in-addr-servers.arpa. nstld.iana
.org. 2022094849 1800 900 604800 3600

;; Query time: 176 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Wed Aug 21 17:39:15 IST 2024
;; MSG SIZE rcvd: 126
```

Q6)

ss - utility to investigate sockets

```
rzeta ➤ ss -tuln
```

Netid	State	Recv-Q	Send-Q	Local Address:Port	Peer Address:Port	Process
udp	UNCONN	213248	0	224.0.0.251:5353	0.0.0.0:*	
udp	UNCONN	0	0	0.0.0.0:5353	0.0.0.0:*	
udp	UNCONN	0	0	127.0.0.53%lo:53	0.0.0.0:*	
udp	UNCONN	0	0	0.0.0.0:631	0.0.0.0:*	
udp	UNCONN	0	0	0.0.0.0:58128	0.0.0.0:*	
udp	UNCONN	0	0	[::]:37232	[::]:*	
udp	UNCONN	0	0	[::]:5353	[::]:*	
tcp	LISTEN	0	200	127.0.0.1:5432	0.0.0.0:*	
tcp	LISTEN	0	4096	127.0.0.53%lo:53	0.0.0.0:*	
tcp	LISTEN	0	128	0.0.0.0:22	0.0.0.0:*	
tcp	LISTEN	0	128	127.0.0.1:631	0.0.0.0:*	
tcp	LISTEN	0	5	127.0.0.1:61209	0.0.0.0:*	
tcp	LISTEN	0	128	[::1]:631	[::]:*	
tcp	LISTEN	0	32	*:21	*:*	
tcp	LISTEN	0	128	[::]:22	[::]:*	

Q7)

tracpath - traces path to network host , better than traceroute since it doesn't require sudo privileges

```
x rzeta > tracpath google.com
1?: [LOCALHOST] pmtu 1500
1: _gateway 3.286ms
1: _gateway 2.667ms
2: 47.247.143.177 4.147ms
3: 10.119.236.173 10.883ms asymm 4
4: 10.163.251.49 3.780ms
5: 10.163.254.1 111.496ms asymm 10
6: 10.255.232.217 19.223ms asymm 8
7: 10.255.239.141 30.310ms asymm 8
8: 142.250.172.80 106.182ms asymm 12
9: 142.250.172.80 164.403ms asymm 12
10: no reply
11: no reply
12: no reply
13: no reply
^C
```