

COMPUTER NETWORKS

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COMPUTER SCIENCE AND
ENGINEERING

Task-1

```
mnit@mnit-OptiPlex-5040:~$ sudo apt-get update
[sudo] password for mnit:
Hit:1 http://ppa.launchpad.net/wireshark-dev/stable/ubuntu focal InRelease
Hit:2 http://in.archive.ubuntu.com/ubuntu focal InRelease
Hit:3 http://security.ubuntu.com/ubuntu focal-security InRelease
Get:4 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Hit:5 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease
Fetched 114 kB in 2s (54.3 kB/s)
Reading package lists... Done
```

```
mnit@mnit-OptiPlex-5040:~$ sudo apt-get install net-tools
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  net-tools
0 upgraded, 1 newly installed, 0 to remove and 8 not upgraded.
Need to get 196 kB of archives.
After this operation, 864 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 net-tools amd64 1.60+git20180626.aebd88e-1ubuntu1 [196 kB]
Fetched 196 kB in 1s (186 kB/s)
Selecting previously unselected package net-tools.
(Reading database ... 253820 files and directories currently installed.)
Preparing to unpack .../net-tools_1.60+git20180626.aebd88e-1ubuntu1_amd64.deb ...
Unpacking net-tools (1.60+git20180626.aebd88e-1ubuntu1) ...
Setting up net-tools (1.60+git20180626.aebd88e-1ubuntu1) ...
Processing triggers for man-db (2.9.1-1) ...
```

net-tools package-

This includes **arp**, **ifconfig**, **netstat**, **rarp**, **nameif** and **route**. Additionally, this package contains utilities relating to particular network hardware types (plipconfig, slattach, mii-tool) and advanced aspects of IP configuration (iptunnel, ipmaddr). In the upstream package 'hostname' and friends are included.

```
mnit@mnit-OptiPlex-5040:~$ ifconfig
enp0s31f6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
          inet 172.18.15.27  netmask 255.255.255.0 broadcast 172.18.15.255
              inet6 fe80::cf8:2bf8:6565:53f8  prefixlen 64  scopeid 0x20<link>
                ether f4:8e:38:b0:ae:da  txqueuelen 1000  (Ethernet)
                  RX packets 64378  bytes 85456985 (85.4 MB)
                  RX errors 0  dropped 0  overruns 0  frame 0
                  TX packets 20969  bytes 2657174 (2.6 MB)
                  TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0
                  device interrupt 19  memory 0xf7000000-f7020000

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 878  bytes 96495 (96.4 KB)
                  RX errors 0  dropped 0  overruns 0  frame 0
                  TX packets 878  bytes 96495 (96.4 KB)
                  TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0
```

If interface is not yet loaded, ifconfig interface loads that interface and netstat -in lists it. In processing a

status query for interface, that interface is loaded (if not already loaded) to complete the query processing.

```
mnit@mnit-OptiPlex-5040:~$ ifconfig -a
enp0s31f6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 172.18.15.27 netmask 255.255.255.0 broadcast 172.18.15.255
        inet6 fe80::cf8:2bfc:6565:53f8 prefixlen 64 scopeid 0x20<link>
          ether f4:8e:38:b0:ae:da txqueuelen 1000 (Ethernet)
            RX packets 151895 bytes 205206911 (205.2 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 33262 bytes 4475946 (4.4 MB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
          device interrupt 19 memory 0xf7000000-f7020000

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 1357 bytes 144420 (144.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1357 bytes 144420 (144.4 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

Task-2 & 3 Changing IP address of local host using ifconfig

```
mnit@mnit-OptiPlex-5040:~$ sudo ifconfig lo 172.15.16.24
[sudo] password for mnit:
mnit@mnit-OptiPlex-5040:~$ ifconfig
enp0s31f6: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 172.18.15.27 netmask 255.255.255.0 broadcast 172.18.15.255
        inet6 fe80::cf8:2bfc:6565:53f8 prefixlen 64 scopeid 0x20<link>
          ether f4:8e:38:b0:ae:da txqueuelen 1000 (Ethernet)
            RX packets 153505 bytes 205438687 (205.4 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 33553 bytes 4529506 (4.5 MB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
          device interrupt 19 memory 0xf7000000-f7020000

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
        inet 172.15.16.24 netmask 255.255.0.0
        inet6 ::1 prefixlen 128 scopeid 0x10<host>
          loop txqueuelen 1000 (Local Loopback)
            RX packets 1375 bytes 147376 (147.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1375 bytes 147376 (147.3 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
mnit@mnit-OptiPlex-5040:~$ route
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref    Use Iface
default         _gateway       0.0.0.0        UG    100    0        0 enp0s31f6
link-local      0.0.0.0        255.255.0.0   U     1000   0        0 enp0s31f6
172.18.15.0    0.0.0.0        255.255.255.0  U     100    0        0 enp0s31f6
mnit@mnit-OptiPlex-5040:~$ ping
ping: usage error: Destination address required
mnit@mnit-OptiPlex-5040:~$ arp
Address          Hwtype  HWaddress          Flags Mask           Iface
_gateway         ether    c4:f5:7c:5e:cb:92  C                enp0s31f6
```

```
mnit@mnit-OptiPlex-5040:~$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address          Foreign Address        State
tcp      0      0 mnit-OptiPlex-504:52130  hkg12s09-in-f14.1:https ESTABLISHED
tcp      0      0 mnit-OptiPlex-504:40064  93.243.107.34.bc.:https ESTABLISHED
tcp      0      0 mnit-OptiPlex-504:42364  sd-in-f84.1e100.n:https ESTABLISHED
tcp      0      0 mnit-OptiPlex-504:40542  bom12s18-in-f14.1:https ESTABLISHED
tcp      0      0 mnit-OptiPlex-504:57620  aerodent.canonical:http TIME_WAIT
tcp      0      0 mnit-OptiPlex-504:35628  bom07s36-in-f3.1e:https ESTABLISHED
tcp      0      0 mnit-OptiPlex-504:50184  bom07s37-in-f3.1e1:http TIME_WAIT
tcp      0      0 mnit-OptiPlex-504:58522  bom12s14-in-f14.1:https ESTABLISHED
tcp      0      0 mnit-OptiPlex-504:52216  bom12s18-in-f10.1:https TIME_WAIT
tcp      0      0 mnit-OptiPlex-504:50594  bom07s16-in-f14.1:https ESTABLISHED
tcp      0      0 mnit-OptiPlex-504:34408  201.181.244.35.bc:https TIME_WAIT
tcp      0      0 mnit-OptiPlex-504:60486  bom12s15-in-f3.1e:https TIME_WAIT
tcp      0      0 mnit-OptiPlex-504:60478  bom07s37-in-f3.1e1:http TIME_WAIT
tcp      0      0 mnit-OptiPlex-504:48864  bom07s37-in-f1.1e:https ESTABLISHED
tcp      0      0 mnit-OptiPlex-504:51406  bom12s21-in-f3.1e:https TIME_WAIT
tcp      0      0 mnit-OptiPlex-504:39632  snapstore-content:https ESTABLISHED
tcp      0      0 mnit-OptiPlex-504:52210  bom12s18-in-f10.1:https TIME_WAIT
tcp      0      0 mnit-OptiPlex-504:49008  bom12s12-in-f14.1:https ESTABLISHED
udp      0      0 mnit-OptiPlex-50:bootpc  172.16.1.5:bootps ESTABLISHED
```

Task-4

```
mnit@mnit-OptiPlex-5040:~$ sudo apt install arping
Reading package lists... Done
Building dependency tree
Reading state information... Done
T 9 additional packages will be installed:
  libnet1
The following NEW packages will be installed:
  arping libnet1
0 upgraded, 2 newly installed, 0 to remove and 8 not upgraded.
Need to get 71.5 kB of archives.
After this operation, 236 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get: http://in.archive.ubuntu.com/ubuntu focal/main amd64 libnet1 amd64 1.1.6+dfsg-3.1build1 [43.3 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 arping amd64 2.20-1 [28.2 kB]
Fetched 71.5 kB in 2s (47.2 kB/s)
Selecting previously unselected package libnet1:amd64.
(Reading database ... 253869 files and directories currently installed.)
Preparing to unpack .../libnet1_1.1.6+dfsg-3.1build1_amd64.deb ...
Unpacking libnet1:amd64 (1.1.6+dfsg-3.1build1) ...
Selecting previously unselected package arping.
Preparing to unpack .../arping_2.20-1_amd64.deb ...
Unpacking arping (2.20-1) ...
Setting up libnet1:amd64 (1.1.6+dfsg-3.1build1) ...
Setting up arping (2.20-1) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.14) ...
mnit@mnit-OptiPlex-5040:~$ arp
Address          Hwtype  HWaddress          Flags Mask           Iface
_gateway         ether    c4:f5:7c:5e:cb:92  C                enp0s31f6
```

Enables the ifconfig command to use the Address Resolution Protocol in mapping between network-level addresses and link-level addresses. The arp value is the default.

Task-5

ping command checks and analyses the reachability of a remote server.

```
mnit@mnit-OptiPlex-5040:~$ ping google.com
PING google.com (142.250.194.78) 56(84) bytes of data.
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=1 ttl=115 time=50.3 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=2 ttl=115 time=56.2 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=3 ttl=115 time=65.3 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=4 ttl=115 time=55.0 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=5 ttl=115 time=51.2 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=6 ttl=115 time=50.2 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=7 ttl=115 time=74.4 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=8 ttl=115 time=66.8 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=9 ttl=115 time=50.0 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=10 ttl=115 time=54.6 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=11 ttl=115 time=51.5 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=12 ttl=115 time=72.3 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=13 ttl=115 time=62.1 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=14 ttl=115 time=57.3 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=15 ttl=115 time=52.8 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=16 ttl=115 time=48.9 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=17 ttl=115 time=73.1 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=18 ttl=115 time=49.1 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=19 ttl=115 time=49.4 ms
64 bytes from dell2s03-in-f14.1e100.net (142.250.194.78): icmp_seq=20 ttl=115 time=54.0 ms
```

```
mnit@mnit-OptiPlex-5040:~$ sudo apt install traceroute
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
traceroute
0 upgraded, 1 newly installed, 0 to remove and 4 not upgraded.
Need to get 45.4 kB of archives.
After this operation, 152 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 traceroute amd64 1:2.1.0-2 [45.4 kB]
Fetched 45.4 kB in 1s (42.4 kB/s)
Selecting previously unselected package traceroute.
(Reading database ... 253888 files and directories currently installed.)
Preparing to unpack .../traceroute_1%3a2.1.0-2_amd64.deb ...
Unpacking traceroute (1:2.1.0-2) ...
Setting up traceroute (1:2.1.0-2) ...
update-alternatives: using /usr/bin/traceroute.db to provide /usr/bin/traceroute (traceroute) in auto mode
update-alternatives: using /usr/bin/lft.db to provide /usr/bin/lft (lft) in auto mode
update-alternatives: using /usr/bin/traceproto.db to provide /usr/bin/traceproto (traceproto) in auto mode
update-alternatives: using /usr/sbin/tcptraceroute.db to provide /usr/sbin/tcptraceroute (tcptraceroute) in auto mode
Processing triggers for man-db (2.9.1-1) ...
```

```
mnit@mnit-OptiPlex-5040:~$ traceroute
Usage:
traceroute [ -46dFIInreAUDV ] [ -f first_ttl ] [ -g gate,... ] [ -i device ] [ -m max_ttl ] [ -N squeries ] [ -p port ] [ -t tos ] [ -l flow_label ] [ -w MAX,HERE,NEAR ] [ -q nqueries ] [ -s src_addr ] [ -z sendwait ] [ -fwmrk=num ] host [ packetlen ]
Options:
-4           Use IPv4
-6           Use IPv6
-d --debug   Enable socket level debugging
-F --dont-fragment  Do not fragment packets
-f first_ttl --first=first_ttl
               Start from the first_ttl hop (instead from 1)
-g gate,...  --gateway=gate...
               Route packets through the specified gateway
               (maximum 8 for IPv4 and 127 for IPv6)
-I --icmp    Use ICMP ECHO for tracerouting
-T --tcp     Use TCP SYN for tracerouting (default port is 80)
-i device   --interface=device
               Specify a network interface to operate with
-m max_ttl  --max-hops=max_ttl
               Set the max number of hops (max TTL to be
               reached). Default is 30
-N squeries --sim-queries=squeries
               Set the number of probes to be tried
               simultaneously (default is 16)
-n           Do not resolve IP addresses to their domain names
-p port     --port=port
               Set the destination port to use. It is either
               initial udp port value for "default" method
               (incremented by each probe, default is 33434), or
               initial seq for "icmp" (incremented as well,
               default from 1), or some constant destination
               port for other methods (with default of 80 for
               "tcp", 53 for "udp", etc.)
-t tos      --tos=tos
               Set the TOS (IPv4 type of service) or TC (IPv6
               traffic class) value for outgoing packets
-l flow_label --flowlabel=flow_label
               Use specified flow_label for IPv6 packets
-M MAX      --max=MAX,HERE,NEAR
               Set the maximum number of hops (TTL) to be
               reached. Default is 30

```

```
mnit@mnit-OptiPlex-5040:~$ nslookup
> google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:  google.com
Address: 142.251.42.78
Name:  google.com
Address: 2404:6800:4009:81d::200e
> |
```

THE END

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