Twisted Pair (Shielded)	- Higher resistance to interference- Better data integrity	- More expensive- Less flexible and harder to install	- Industrial settings- Areas with high interference	100 Mbps	10/100 Mbps (Fast Ethernet)	

RESULT: Thus the study on various network cables was conducted successfully

Ex. Nos. 2		**BASIC NETWORKING COMMANDS IN LINUX AND WINDOWS OPERATING SYSTEM**
Date :	**15-07-25**	

AIM: To execute various networking commands in windows and linux

WINDOWS COMMANDS:

1.ipconfig:

The IPCONFIG network command provides a comprehensive view of information regarding the IP address configuration of the device we are currently working on.

OUTPUT:

C:\Users\Lenovo>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet 3:

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

Wireless LAN adapter Local Area Connection* 13:

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

Wireless LAN adapter Local Area Connection* 14:

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

Wireless LAN adapter Wi-Fi 3:

Connection-specific DNS Suffix . :
Link-local IPv6 Address . . . . . : fe80::90d1:aa4b:ced6:d82d%17
IPv4 Address. . . . . : 172.16.76.93
Subnet Mask . . . . . : 255.255.248.0
Default Gateway . . . . . : 172.16.72.1

NOTE:

- IPConfig/all - Provides primary output with additional information about network adapters.
- IPConfig/renew - Used to renew the system's IP address.
- IPConfig/release - Removes the system's current IP address.

2.nslookup

The NSLOOKUP command is used to troubleshoot network connectivity issues in the system. Using the nslookup command, we can access the information related to our system's DNS server, i.e., domain name and IP address.

OUTPUT:

C:\Users\Lenovo>nslookup
Default Server: UnKnown
Address: 172.16.72.1

3.hostname

The HOSTNAME command displays the hostname of the system. The hostname command is much easier to use than going into the system settings to search for it.

OUTPUT:

C:\Users\Lenovo>hostname

DESKTOP-C01BH7D

4.ping

The Ping command is one of the most widely used commands in the prompt tool, as it allows the user to check the connectivity of our system to another host.

OUTPUT:

C:\Users\Lenovo>ping www.google.com

Pinging www.google.com [142.250.195.228] with 32 bytes of data:
Reply from 142.250.195.228: bytes=32 time=8ms TTL=119
Reply from 142.250.195.228: bytes=32 time=8ms TTL=119
Reply from 142.250.195.228: bytes=32 time=7ms TTL=119
Reply from 142.250.195.228: bytes=32 time=13ms TTL=119

Ping statistics for 142.250.195.228:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate
round trip times in milli-seconds:
    Minimum = 7ms, Maximum = 13ms, Average = 9ms

5.Tracert

The TRACERT command is used to trace the route during the transmission of the data packet over to the destination host and also provides us with the “hop” count during transmission.

OUTPUT:

C:\Users\Lenovo>tracert www.google.com

Tracing route to www.google.com [142.250.195.228] over
a maximum of 30 hops:

1 4 ms 1 ms 2 ms 172.16.72.1 2

16 ms 4 ms 5 ms 115.245.95.249 3

* * * Request timed out.

4 10 ms 9 ms 7 ms 172.16.12.64

5 15 ms 5 ms 28 ms 172.16.12.64

6 15 ms 6 ms 6 ms 72.14.217.252

7 9 ms 7 ms 7 ms 216.239.43.131

8 7 ms 5 ms 5 ms 142.250.224.7

9 13 ms 7 ms 9 ms maa03s43-in-f4.1e100.net [142.250.195.228]

Trace complete.

6.netstat

The Netstat command as the name suggests displays an overview of all the network connections in the device. The table shows detail about the connection protocol, address, and the current state of the network.

OUTPUT:

C:\Users\Lenovo>netstat

Active Connections

Proto	Local Address	Foreign Address	State
TCP	127.0.0.1:49675	DESKTOP-C01BH7D:49676	ESTABLISHED
TCP	127.0.0.1:49676	DESKTOP-C01BH7D:49675	ESTABLISHED
TCP	127.0.0.1:49677	DESKTOP-C01BH7D:49678	ESTABLISHED
TCP	127.0.0.1:49678	DESKTOP-C01BH7D:49677	ESTABLISHED
TCP	127.0.0.1:49681	DESKTOP-C01BH7D:49682	ESTABLISHED
TCP	127.0.0.1:49682	DESKTOP-C01BH7D:49681	ESTABLISHED
TCP	127.0.0.1:49683	DESKTOP-C01BH7D:49684	ESTABLISHED
TCP	127.0.0.1:49684	DESKTOP-C01BH7D:49683	ESTABLISHED
TCP	127.0.0.1:49695	DESKTOP-C01BH7D:49696	ESTABLISHED
TCP	127.0.0.1:49696	DESKTOP-C01BH7D:49695	ESTABLISHED
TCP	172.16.76.93:49408	4.213.25.240:https	ESTABLISHED
TCP	172.16.76.93:50338	pnmaaa-aq-in-f5:https	ESTABLISHED

7.arp

The ARP command is used to access the mapping structure of IP addresses to the MAC address. This provides us with a better understanding of the transmission of packets in the network channel.

OUTPUT:

C:\Users\Lenovo>arp
Displays and modifies the IP-to-Physical address translation tables used by address resolution protocol (ARP).

ARP -s inet_addr eth_addr [if_addr] ARP
-d inet_addr [if_addr]
ARP -a [inet_addr] [-N if_addr] [-v]

-a Displays current ARP entries by interrogating the current protocol data. If inet_addr is specified, the IP and Physical addresses for only the specified computer are displayed. If more than one network interface uses ARP, entries for each ARP table are displayed.

-g Same as -a.

-v Displays current ARP entries in verbose mode. All invalid entries and entries on the loop-back interface will be shown.

inet_addr Specifies an internet address.

-N if_addr Displays the ARP entries for the network interface specified by if_addr.

-d Deletes the host specified by inet_addr. inet_addr may be wildcarded with * to delete all hosts.

-s Adds the host and associates the Internet address inet_addr with the Physical address eth_addr. The Physical address is given as 6 hexadecimal bytes separated by hyphens. The entry is permanent.

eth_addr Specifies a physical address.

if_addr If present, this specifies the Internet address of the interface whose address translation table should be modified.
If not present, the first applicable interface will be used.

Example:
> arp -s 157.55.85.212 00-aa-00-62-c6-09 .... Adds a static entry.
> arp -a .... Displays the arp table.

8.systeminfo

Using the SYSTEMINFO command, we can access the system's hardware and software details, such as processor data, booting data, Windows version, etc.

OUTPUT:

C:\Users\Lenovo>systeminfo
Host Name: DESKTOP-C01BH7D
OS Name: Microsoft Windows 11 Pro
OS Version: 10.0.21996 N/A Build 21996
OS Manufacturer: Microsoft Corporation
OS Configuration: Standalone Workstation
OS Build Type: Multiprocessor Free
Registered Owner: Lenovo Registered
Organization:
Product ID: 00331-10000-00001-AA753

Original Install Date: 17-02-2024, 07:14:20 AM System

Boot Time: 15-07-2025, 08:21:33 AM System

Manufacturer: Dell Inc.

System Model: OptiPlex Tower 7010

System Type: x64-based PC

Processor(s): 1 Processor(s) Installed.

[01]: Intel64 Family 6 Model 151 Stepping 5 GenuineIntel ~3000 Mhz

BIOS Version: Dell Inc. 1.9.0, 02-10-2023

Windows Directory: C:\Windows

System Directory: C:\Windows\system32

Boot Device: \Device\HarddiskVolume1

System Locale: en-us;English (United States)

Input Locale: 00004009

Time Zone: (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi

Total Physical Memory: 16,073 MB

Available Physical Memory: 9,568 MB

Virtual Memory: Max Size: 18,505 MB

Virtual Memory: Available: 11,176 MB

Virtual Memory: In Use: 7,329 MB

Page File Location(s): C:\pagefile.sys

Domain: WORKGROUP

Logon Server: \\DESKTOP-C01BH7D

Hotfix(s): N/A

Network Card(s): 3 NIC(s) Installed.

[01]: Realtek RTL8852BE WiFi 6 802.11ax PCIe Adapter

Connection Name: Wi-Fi 3

DHCP Enabled: No

IP address(es)

[01]: 172.16.76.93

[02]: fe80::90d1:aa4b:ced6:d82d

[02]: Microsoft Wi-Fi Direct Virtual Adapter

Connection Name: Local Area Connection* 14

Status: Media disconnected

[03]: Intel(R) Ethernet Connection (17) I219-LM

Connection Name: Ethernet 3

Status: Media disconnected

Hyper-V Requirements: A hypervisor has been detected. Features required for Hyper-V will not be displayed.

9.getmac getmac is a command-line utility primarily used on Windows operating systems to display the Media Access Control (MAC) addresses of all network adapters in a computer.

OUTPUT:

C:\Users\Lenovo>getmac

Physical Address Transport Name

==========

==========

4C-82-A9-77-FF-DD \Device\Tcpip_{F3860600-35CB-4270-B177-0395BA041C16}

42-82-A9-77-FF-DD Media disconnected

20-88-10-86-BC-F4 Media disconnected

10.pathping

pathping is an indispensable tool for anyone troubleshooting network performance issues on Windows, as it provides a deeper insight into packet flow and potential bottlenecks than its simpler counterparts.

LINUX COMMANDS

1. ip command

Used to show and manipulate routing, devices, and IP addresses in Linux networking.

OUTPUT:

```
fr03@fedora:~$ ip
Usage: ip [ OPTIONS ] OBJECT { COMMAND | help }
ip [ -force ] -batch filename
where  OBJECT := { address | addrlabel | fou | help | ila | ioam | l2tp | link |
macsec | maddress | monitor | mptcp | mroute | mrule |                neighbor
| neighbour | netconf | netns | nexthop | ntable |                ntbl | route | rule
| sr | stats | tap | tcpmetrics |                token | tunnel | tuntap | vrf | xfrm
}
        OPTIONS := { -V[ersion] | -s[tatistics] | -d[etails] | -r[esolve] |
                -h[uman-readable] | -iec | -j[son] | -p[retty] |
                -f[amily] { inet | inet6 | mpls | bridge | link } |
                -4 | -6 | -M | -B | -0 |
                -l[oops] { maximum-addr-flush-attempts } | -echo | -br[ief] |
                -o[neline] | -t[imestamp] | -ts[hort] | -b[atch] [filename] |
                -rc[vbuf] [size] | -n[etns] name | -N[umeric] | -a[ll] |
-c[olor]}
```

2.ip -V command

Displays the version information of the ip command tool with verbose output.

OUTPUT:

```
kfr03@fedora:~$ ip -V
ip utility, iproute2-6.10.0, libbpf 1.4.7 kfr03@fedora:~$
ip a
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 noprefixroute

valid_lft forever preferred_lft forever

2: enp0s31f6: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc fq_codel state DOWN group default qlen 1000

link/ether 20:88:10:86:75:c9 brd ff:ff:ff:ff:ff:ff

3: wlp2s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000

link/ether e6:82:dd:5f:b2:f1 brd ff:ff:ff:ff:ff:ff permaddr 4c:82:a9:78:01:41

inet 172.16.76.82/21 brd 172.16.79.255 scope global noprefixroute wlp2s0

valid_lft forever preferred_lft forever

inet6 fe80::4f1:c483:3baa:f12f/64 scope link noprefixroute

valid_lft forever preferred_lft forever

3 .ip addr

Displays all IP addresses and network interface details on the system.

OUTPUT:

kfr03@fedora:~$ 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 noprefixroute valid_lft forever preferred_lft forever

2: enp0s31f6: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc fq_codel state DOWN group default qlen 1000

link/ether 20:88:10:86:75:c9 brd ff:ff:ff:ff:ff:ff

3: wlp2s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000

link/ether e6:82:dd:5f:b2:f1 brd ff:ff:ff:ff:ff:ff permaddr 4c:82:a9:78:01:41

inet 172.16.76.82/21 brd 172.16.79.255 scope global noprefixroute wlp2s0

valid_lft forever preferred_lft forever

inet6 fe80::4f1:c483:3baa:f12f/64 scope link noprefixroute

valid_lft forever preferred_lft forever

4.ip addr show

Shows detailed information about all network interfaces and their assigned IP addresses.

OUTPUT:

kfr03@fedora:~$ ip addr show

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 noprefixroute valid_lft forever preferred_lft forever

2: enp0s31f6: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc fq_codel state DOWN group default qlen 1000

link/ether 20:88:10:86:75:c9 brd ff:ff:ff:ff:ff:ff

3: wlp2s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000

link/ether e6:82:dd:5f:b2:f1 brd ff:ff:ff:ff:ff:ff permaddr 4c:82:a9:78:01:41

inet 172.16.76.82/21 brd 172.16.79.255 scope global noprefixroute wlp2s0

valid_lft forever preferred_lft forever

inet6 fe80::4f1:c483:3baa:f12f/64 scope link noprefixroute

valid_lft forever preferred_lft forever

5.ip link

Displays and manages network interfaces (links) on the system.

OUTPUT:

kfr03@fedora:~$ ip link

1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000

link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00

2: enp0s31f6: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc fq_codel state DOWN mode DEFAULT group default qlen 1000 link/ether 20:88:10:86:75:c9 brd ff:ff:ff:ff:ff:ff

3: wlp2s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DORMANT group default qlen 1000

link/ether e6:82:dd:5f:b2:f1 brd ff:ff:ff:ff:ff:ff permaddr 4c:82:a9:78:01:41

6.ip route

Displays the kernel's IP routing table (shows how packets are routed).

OUTPUT:

kfr03@fedora:~$ ip route

default via 172.16.72.1 dev wlp2s0 proto static metric 600

172.16.72.0/21 dev wlp2s0 proto kernel scope link src 172.16.76.82 metric 600 kfr03@fedora:~$ ip route show

default via 172.16.72.1 dev wlp2s0 proto static metric 600

7.ifconfig

Legacy Linux command used to view and configure network interfaces (now replaced by ip command).

OUTPUT:

kfr03@fedora:~$ ifconfig

enp0s31f6: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500

ether 20:88:10:86:75:c9 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

device interrupt 19 memory 0x70600000-70620000

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 794 bytes 76920 (75.1 KiB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 794 bytes 76920 (75.1 KiB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 172.16.76.82 netmask 255.255.248.0 broadcast 172.16.79.255 inet6
fe80::4f1:c483:3baa:f12f prefixlen 64 scopeid 0x20<link> ether
e6:82:dd:5f:b2:f1 txqueuelen 1000 (Ethernet) RX packets 267468 bytes
321463323 (306.5 MiB)
RX errors 0 dropped 1195 overruns 0 frame 0
TX packets 51262 bytes 13161940 (12.5 MiB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

8.dig

Performs DNS lookups and displays detailed DNS query results for a domain.

OUTPUT:

kfr03@fedora:~$ dig

; <<>> DiG 9.18.33 <<>>
;; global options: +cmd ;;
Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 50538
;; flags: qr rd ra; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494 ;;
QUESTION SECTION:

;. IN NS

;; ANSWER SECTION:

.	87203	IN	NS g.root-servers.net.
.	87203	IN	NS m.root-servers.net.
.	87203	IN	NS i.root-servers.net.
.	87203	IN	NS h.root-servers.net.
.	87203	IN	NS b.root-servers.net.
.	87203	IN	NS f.root-servers.net.
.	87203	IN	NS l.root-servers.net.
.	87203	IN	NS c.root-servers.net.
.	87203	IN	NS e.root-servers.net.
.	87203	IN	NS a.root-servers.net.
.	87203	IN	NS d.root-servers.net.
.	87203	IN	NS k.root-servers.net.
.	87203	IN	NS j.root-servers.net.

;; Query time: 256 msec

;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)

;; WHEN: Mon Jul 21 23:02:18 EDT 2025

;; MSG SIZE rcvd: 239

kfr03@fedora:~$ dig google.com

; <<>> DiG 9.18.33 <<>> google.com

;; global options: +cmd ;;

Got answer:

;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 43012

;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:

; EDNS: version: 0, flags:; udp: 65494 ;;

QUESTION SECTION:

;google.com. IN A

;; ANSWER SECTION:
google.com. 35 IN A 142.250.77.142

;; Query time: 7 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Mon Jul 21 23:02:28 EDT 2025
;; MSG SIZE rcvd: 55

9.nslookup

Queries DNS to obtain domain name or IP address mapping information.

OUTPUT:

kfr03@fedora:~$ nslookup google.com
Server: 127.0.0.53
Address: 127.0.0.53#53

Non-authoritative answer:
Name: google.com
Address: 142.250.77.142
Name: google.com
Address: 2404:6800:4007:80f::200e

10.netstat

Displays network connections, routing tables, interface statistics, masquerade connections, and multicast memberships.

OUTPUT:

kfr03@fedora:~$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address Foreign Address State

tcp 0 0 fedora:39720 203.137.36.34.bc.:https ESTABLISHED
tcp 0 0 fedora:43930 proxy14.fedorapro:https TIME_WAIT
tcp 0 0 fedora:43104 bkk03s01-in-f3.1e:https ESTABLISHED
tcp 0 0 fedora:46004 202.152.107.34.bc:https ESTABLISHED
tcp 0 0 fedora:58714 209.100.149.34.bc:https ESTABLISHED
tcp 0 0 fedora:33580 191.144.160.34.bc:https ESTABLISHED
tcp 0 0 fedora:49604 pnmaaa-aq-in-f10.:https ESTABLISHED
tcp 0 0 fedora:57424 172.66.168.9:https TIME_WAIT
kfr03@fedora:~$ netstat -at

Active Internet connections (servers and established)

Proto Recv-Q Send-Q Local Address Foreign Address State
tcp 0 0 0.0.0.0:27500 0.0.0.0:* LISTEN
tcp 0 0 0.0.0.0:llmnr 0.0.0.0:* LISTEN
tcp 0 0 _localdnsproxy:domain 0.0.0.0:* LISTEN
tcp 0 0 localhost:ipp 0.0.0.0:* LISTEN
tcp 0 0 _localdnsstub:domain 0.0.0.0:* LISTEN
tcp 0 0 fedora:39720 203.137.36.34.bc.:https ESTABLISHED
tcp 0 0 fedora:43104 lcmaaa-aq-in-f3.1:https ESTABLISHED
tcp 0 0 fedora:46004 202.152.107.34.bc:https ESTABLISHED
tcp 0 0 fedora:58714 209.100.149.34.bc:https ESTABLISHED
tcp 0 0 fedora:33580 191.144.160.34.bc:https ESTABLISHED
tcp 0 0 fedora:49604 pnmaaa-aq-in-f10.:https ESTABLISHED
tcp 0 0 fedora:41356 mirror.twds.com.t:https ESTABLISHED
tcp 0 0 fedora:38644 bkk02s02-in-f14.1:https ESTABLISHED

10.traceroute

Shows the path that packets take to reach a network host, revealing each hop along the route.

OUTPUT:

kfr03@fedora:~$ traceroute google.com

traceroute to google.com (142.250.77.142), 30 hops max, 60 byte packets

1 _gateway (172.16.72.1) 1.680 ms 1.632 ms 1.614 ms

2 static-41.229.249.49-tataidc.co.in (49.249.229.41) 5.058 ms 4.269 ms 5.028 ms

3 142.250.171.162 (142.250.171.162) 167.350 ms 166.819 ms 169.162 ms 4 * * *

5 142.251.55.30 (142.251.55.30) 169.503 ms 216.239.54.196 (216.239.54.196) 170.524 ms
142.251.60.186 (142.251.60.186) 178.759 ms 6
142.251.55.63 (142.251.55.63) 174.789 ms *^C
kfr03@fedora:~$ tracepath google.com
1?: [LOCALHOST] pmtu 1500
1: _gateway 1.807ms
1: _gateway 1.945ms
2: _gateway 1.883ms pmtu 1460
2: static-41.229.249.49-tataidc.co.in 4.591ms
3: 142.250.171.162 174.527ms asymm 7

kfr03@fedora:~$ host google.com google.com has
address 142.250.77.142 google.com has IPv6 address
2404:6800:4007:80f::200e google.com mail is handled
by 10 smtp.google.com.

11.hostname

Displays or sets the system's hostname (network name of the machine).

OUTPUT:

kfr03@fedora:~$ hostname fedora