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Batch-C

Experiment No. 3

Aim : Execution of basic networking commands in terminal.

Theory :

What Are Networking Commands?

Every system is connected to various networks and systems through internal or external network channels. These network configurations can sometimes encounter issues, impacting the system's performance. To resolve such network problems, 'networking commands' are used. These commands are designed to troubleshoot network issues with minimal complexity using the Windows Command Prompt tool.

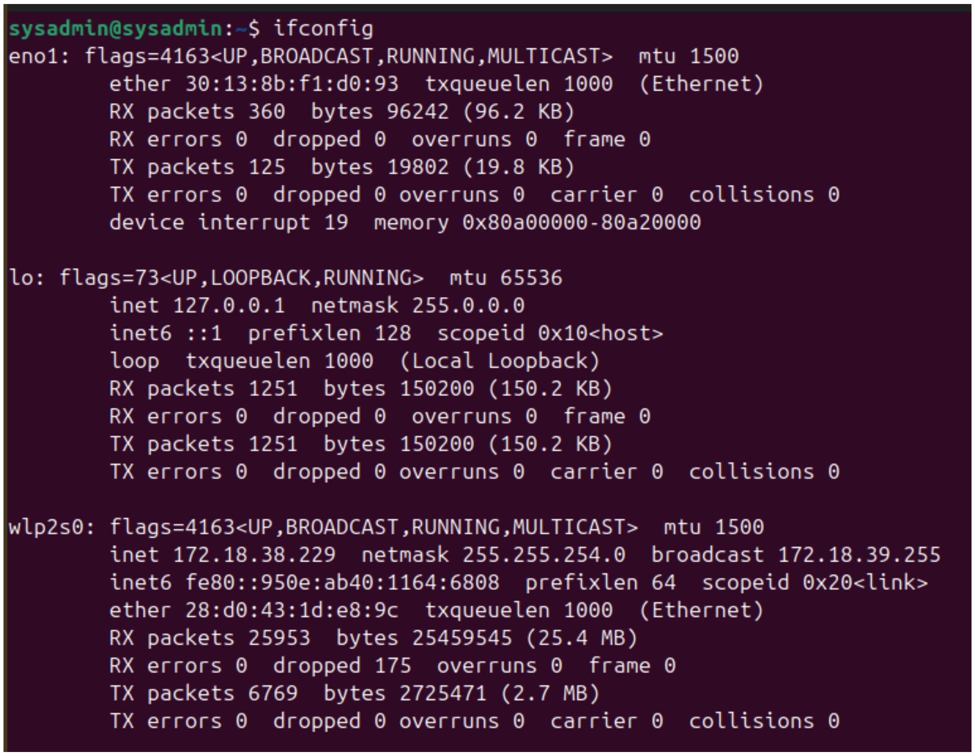
1. IPCONFIG

- When you enter ipconfig in the Command Prompt, it displays the current IP address, subnet mask, and default gateway for each network adapter on your system. This basic information is often enough to identify network configuration problems, such as incorrect IP addresses or subnet masks.
- The IPCONFIG network command offers a detailed overview of the IP address configuration for the device in use. It also provides variations of the primary command to target specific system settings or data, including:

ipconfig /all - Displays the primary output along with additional information about network adapters.

ipconfig /renew - Renews the system's IP address.

ipconfig /release - Releases the system's current IP address.



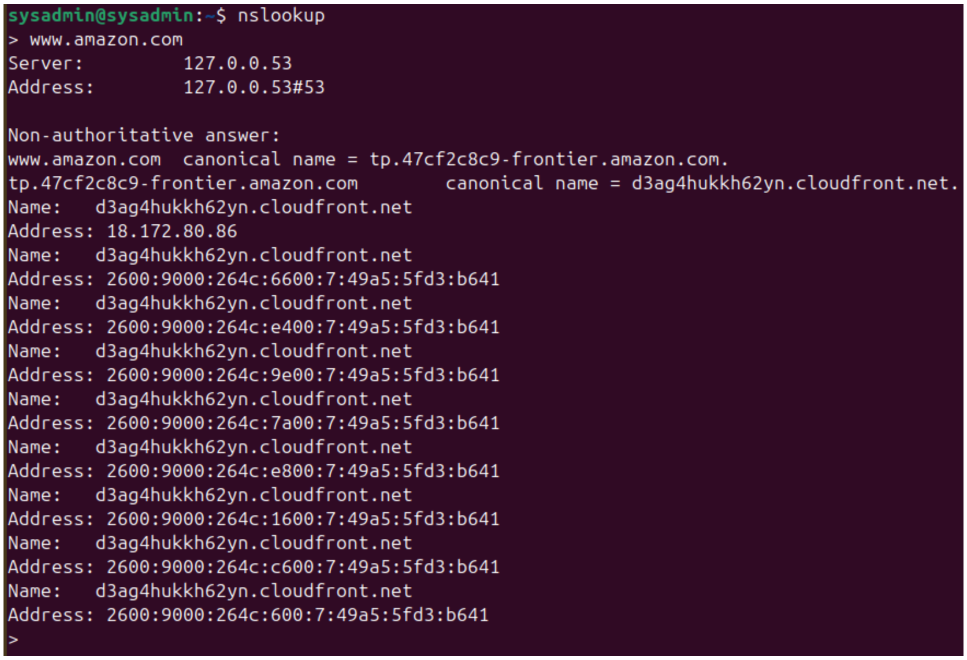
```
sysadmin@sysadmin:~$ ifconfig
eno1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        ether 30:13:8b:f1:d0:93  txqueuelen 1000  (Ethernet)
        RX packets 360  bytes 96242 (96.2 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 125  bytes 19802 (19.8 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
        device interrupt 19  memory 0x80a00000-80a20000

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 1251  bytes 150200 (150.2 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1251  bytes 150200 (150.2 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.18.38.229  netmask 255.255.254.0  broadcast 172.18.39.255
        inet6 fe80::950e:ab40:1164:6808  prefixlen 64  scopeid 0x20<link>
        ether 28:d0:43:1d:e8:9c  txqueuelen 1000  (Ethernet)
        RX packets 25953  bytes 25459545 (25.4 MB)
        RX errors 0  dropped 175  overruns 0  frame 0
        TX packets 6769  bytes 2725471 (2.7 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

2. NSLOOKUP

- The NSLOOKUP command is a valuable tool for troubleshooting network connectivity issues, particularly those related to DNS (Domain Name System) resolution.
- By using the nslookup command, you can obtain detailed information about your system's DNS server, including the domain name and its corresponding IP address. This command is especially useful for diagnosing issues where a domain name fails to resolve to an IP address or when verifying the current DNS settings.
- Check for issues in DNS propagation, ensuring that changes to DNS records have been properly updated and disseminated across the network.
- Verify which DNS server your system is currently using, aiding in diagnosing network configuration issues.



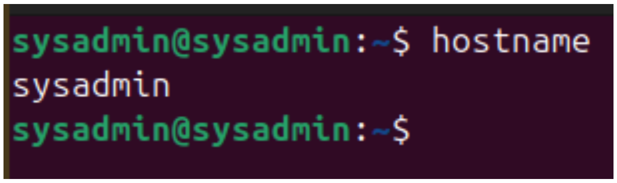
```
sysadmin@sysadmin:~$ nslookup
> www.amazon.com
Server:         127.0.0.53
Address:        127.0.0.53#53

Non-authoritative answer:
www.amazon.com  canonical name = tp.47cf2c8c9-frontier.amazon.com.
tp.47cf2c8c9-frontier.amazon.com        canonical name = d3ag4hukkh62yn.cloudfront.net.
Name:   d3ag4hukkh62yn.cloudfront.net
Address: 18.172.80.86
Name:   d3ag4hukkh62yn.cloudfront.net
Address: 2600:9000:264c:6600:7:49a5:5fd3:b641
Name:   d3ag4hukkh62yn.cloudfront.net
Address: 2600:9000:264c:e400:7:49a5:5fd3:b641
Name:   d3ag4hukkh62yn.cloudfront.net
Address: 2600:9000:264c:9e00:7:49a5:5fd3:b641
Name:   d3ag4hukkh62yn.cloudfront.net
Address: 2600:9000:264c:7a00:7:49a5:5fd3:b641
Name:   d3ag4hukkh62yn.cloudfront.net
Address: 2600:9000:264c:e800:7:49a5:5fd3:b641
Name:   d3ag4hukkh62yn.cloudfront.net
Address: 2600:9000:264c:1600:7:49a5:5fd3:b641
Name:   d3ag4hukkh62yn.cloudfront.net
Address: 2600:9000:264c:c600:7:49a5:5fd3:b641
Name:   d3ag4hukkh62yn.cloudfront.net
Address: 2600:9000:264c:600:7:49a5:5fd3:b641
>
```

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.

Command to enter in Prompt – hostname



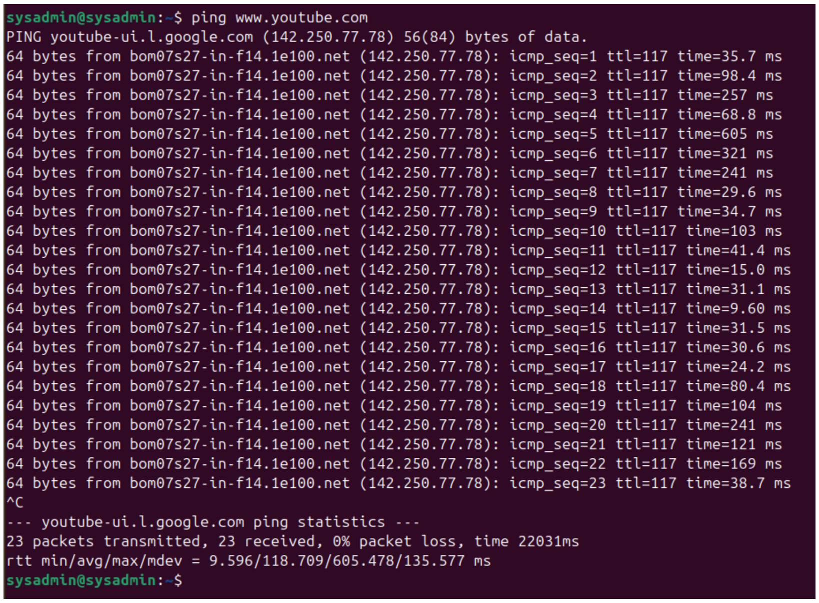
```
sysadmin@sysadmin:~$ hostname
sysadmin
sysadmin@sysadmin:~$
```

4.PING

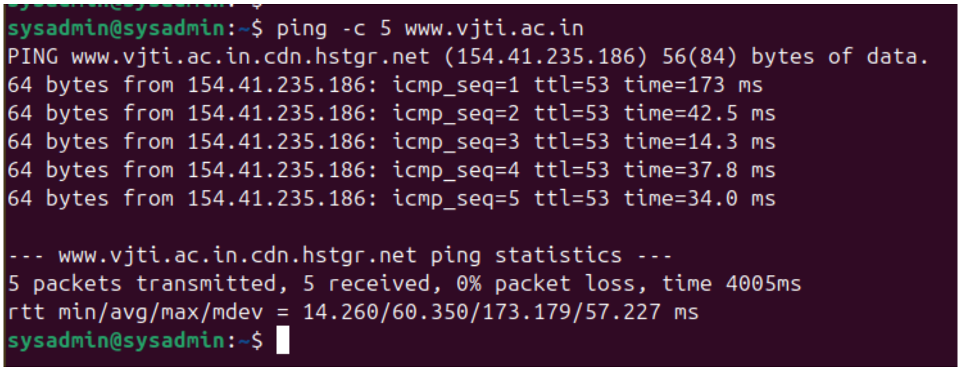
The Ping command is one of the most widely used commands in the prompt tool, as it allows the user to check the connectivity of our system to another host.

This command sends four experimental packets to the destination host to check whether it receives them successfully, if so, then, we can communicate

with the destination host. But in case the packets have not been received, that means, no communication can be established with the destination host.
Command to enter in Prompt - ping www.destination_host_name.com



```
sysadmin@sysadmin:~$ ping www.youtube.com
PING youtube-ui.l.google.com (142.250.77.78) 56(84) bytes of data.
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=1 ttl=117 time=35.7 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=2 ttl=117 time=98.4 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=3 ttl=117 time=257 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=4 ttl=117 time=68.8 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=5 ttl=117 time=605 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=6 ttl=117 time=321 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=7 ttl=117 time=241 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=8 ttl=117 time=29.6 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=9 ttl=117 time=34.7 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=10 ttl=117 time=103 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=11 ttl=117 time=41.4 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=12 ttl=117 time=15.0 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=13 ttl=117 time=31.1 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=14 ttl=117 time=9.60 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=15 ttl=117 time=31.5 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=16 ttl=117 time=30.6 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=17 ttl=117 time=24.2 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=18 ttl=117 time=80.4 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=19 ttl=117 time=104 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=20 ttl=117 time=241 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=21 ttl=117 time=121 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=22 ttl=117 time=169 ms
64 bytes from bom07s27-in-f14.1e100.net (142.250.77.78): icmp_seq=23 ttl=117 time=38.7 ms
^C
--- youtube-ui.l.google.com ping statistics ---
23 packets transmitted, 23 received, 0% packet loss, time 22031ms
rtt min/avg/max/mdev = 9.596/118.709/605.478/135.577 ms
sysadmin@sysadmin:~$
```



```
sysadmin@sysadmin:~$ ping -c 5 www.vjti.ac.in
PING www.vjti.ac.in.cdn.hstgr.net (154.41.235.186) 56(84) bytes of data.
64 bytes from 154.41.235.186: icmp_seq=1 ttl=53 time=173 ms
64 bytes from 154.41.235.186: icmp_seq=2 ttl=53 time=42.5 ms
64 bytes from 154.41.235.186: icmp_seq=3 ttl=53 time=14.3 ms
64 bytes from 154.41.235.186: icmp_seq=4 ttl=53 time=37.8 ms
64 bytes from 154.41.235.186: icmp_seq=5 ttl=53 time=34.0 ms

--- www.vjti.ac.in.cdn.hstgr.net ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 14.260/60.350/173.179/57.227 ms
sysadmin@sysadmin:~$
```

5. TRACERT

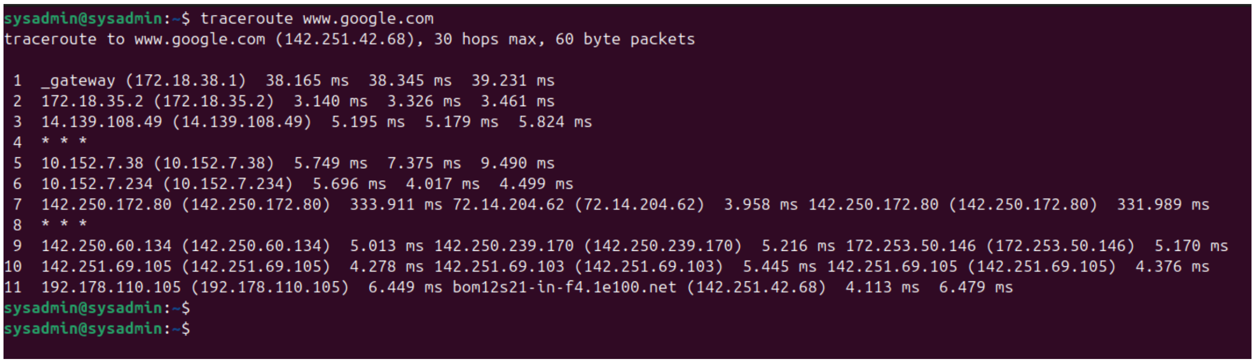
The TRACERT command is used to trace the route during the transmission of the data packet over to the destination host and also provides us with the “hop” count during transmission.

Using the number of hops and the hop IP address, we can troubleshoot network issues and identify the point of the problem during the transmission of the data packet.

Command to enter in Prompt- tracert IP-address

OR

tracert www.destination_host_name.com



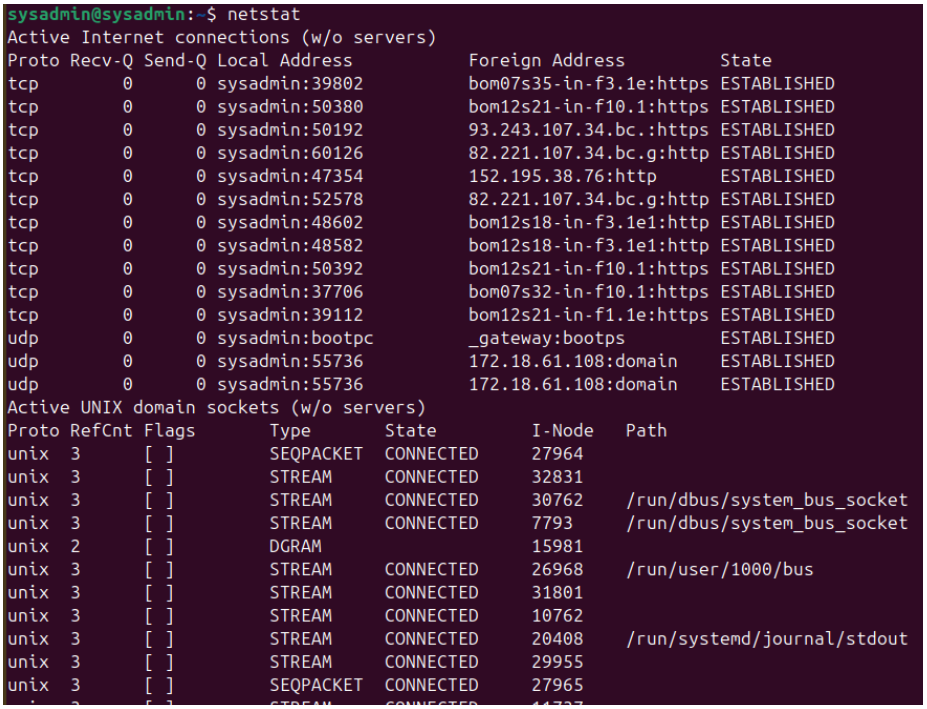
```
sysadmin@sysadmin:~$ traceroute www.google.com
traceroute to www.google.com (142.251.42.68), 30 hops max, 60 byte packets

 1  _gateway (172.18.38.1)  38.165 ms  38.345 ms  39.231 ms
 2  172.18.35.2 (172.18.35.2)  3.140 ms  3.326 ms  3.461 ms
 3  14.139.108.49 (14.139.108.49)  5.195 ms  5.179 ms  5.824 ms
 4  * * *
 5  10.152.7.38 (10.152.7.38)  5.749 ms  7.375 ms  9.490 ms
 6  10.152.7.234 (10.152.7.234)  5.696 ms  4.017 ms  4.499 ms
 7  142.250.172.80 (142.250.172.80)  333.911 ms 72.14.204.62 (72.14.204.62)  3.958 ms 142.250.172.80 (142.250.172.80)  331.989 ms
 8  * * *
 9  142.250.60.134 (142.250.60.134)  5.013 ms 142.250.239.170 (142.250.239.170)  5.216 ms 172.253.50.146 (172.253.50.146)  5.170 ms
10  142.251.69.105 (142.251.69.105)  4.278 ms 142.251.69.103 (142.251.69.103)  5.445 ms 142.251.69.105 (142.251.69.105)  4.376 ms
11  192.178.110.105 (192.178.110.105)  6.449 ms bom12s21-in-f4.1e100.net (142.251.42.68)  4.113 ms  6.479 ms
sysadmin@sysadmin:~$
sysadmin@sysadmin:~$
```

6. NETSTAT

The netstat command provides a comprehensive overview of all network connections on a device. It displays a detailed table that includes information about the connection protocol (such as TCP or UDP), local and foreign addresses, and the current state of each network connection (like ESTABLISHED, LISTENING, or TIME_WAIT). This information is crucial for monitoring network activity, diagnosing connectivity issues, and identifying potential security threats such as unauthorized connections or unusual traffic patterns.

Beyond basic connection information, netstat offers various options to display more specific data. For example, netstat -a lists all active connections and listening ports, netstat -n shows addresses and port numbers in numerical form, and netstat -o includes the Process ID (PID) of each connection, allowing users to trace connections back to specific applications. Using these options, administrators and users can gain insight into the system's network behavior, troubleshoot network-related problems, and ensure that no unauthorized services are running.

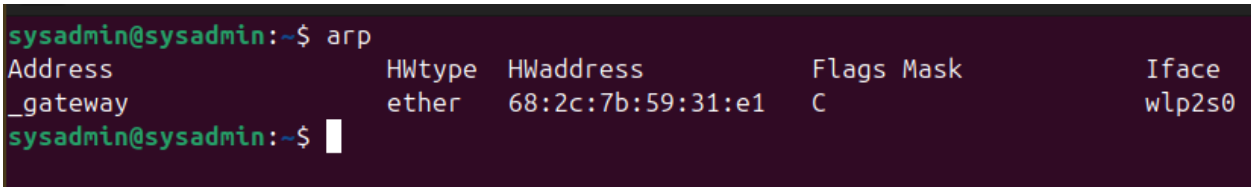


```
sysadmin@sysadmin:~$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 sysadmin:39802          bom07s35-in-f3.1e:https ESTABLISHED
tcp        0      0 sysadmin:50380          bom12s21-in-f10.1:https ESTABLISHED
tcp        0      0 sysadmin:50192          93.243.107.34.bc.:https ESTABLISHED
tcp        0      0 sysadmin:60126          82.221.107.34.bc.g:http ESTABLISHED
tcp        0      0 sysadmin:47354          152.195.38.76:http      ESTABLISHED
tcp        0      0 sysadmin:52578          82.221.107.34.bc.g:http ESTABLISHED
tcp        0      0 sysadmin:48602          bom12s18-in-f3.1e1:http ESTABLISHED
tcp        0      0 sysadmin:48582          bom12s18-in-f3.1e1:http ESTABLISHED
tcp        0      0 sysadmin:50392          bom12s21-in-f10.1:https ESTABLISHED
tcp        0      0 sysadmin:37706          bom07s32-in-f10.1:https ESTABLISHED
tcp        0      0 sysadmin:39112          bom12s21-in-f1.1e:https ESTABLISHED
udp        0      0 sysadmin:bootpc         _gateway:bootps         ESTABLISHED
udp        0      0 sysadmin:55736          172.18.61.108:domain    ESTABLISHED
udp        0      0 sysadmin:55736          172.18.61.108:domain    ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type       State         I-Node   Path
unix  3      [ ]         SEQPACKET  CONNECTED     27964
unix  3      [ ]         STREAM     CONNECTED     32831
unix  3      [ ]         STREAM     CONNECTED     30762    /run/dbus/system_bus_socket
unix  3      [ ]         STREAM     CONNECTED     7793     /run/dbus/system_bus_socket
unix  2      [ ]         DGRAM                    15981
unix  3      [ ]         STREAM     CONNECTED     26968    /run/user/1000/bus
unix  3      [ ]         STREAM     CONNECTED     31801
unix  3      [ ]         STREAM     CONNECTED     10762
unix  3      [ ]         STREAM     CONNECTED     20408    /run/systemd/journal/stdout
unix  3      [ ]         STREAM     CONNECTED     29955
unix  3      [ ]         SEQPACKET  CONNECTED     27965
```

7. ARP(Address Resolution Protocol)

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.

Command to enter in Prompt - **arp**

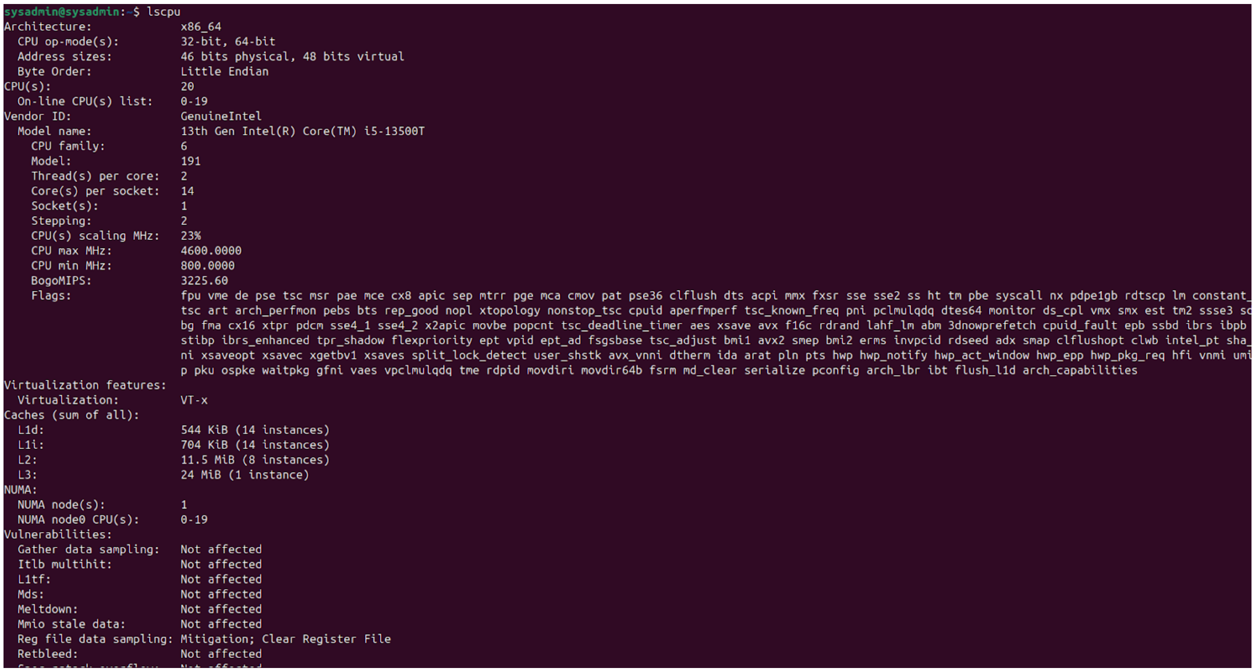


```
sysadmin@sysadmin:~$ arp
Address                  HWtype  HWaddress           Flags Mask            Iface
_gateway                 ether   68:2c:7b:59:31:e1   C                     wlp2s0
sysadmin@sysadmin:~$
```

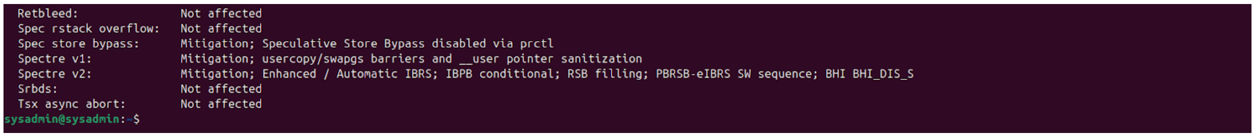
8. SYSTEMINFO

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

Command to enter in Prompt - systeminfo



```
sysadmin@sysadmin:~$ lscpu
Architecture:            x86_64
  CPU op-mode(s):        32-bit, 64-bit
  Address sizes:         46 bits physical, 48 bits virtual
  Byte Order:            Little Endian
CPU(s):                  20
  On-line CPU(s) list:   0-19
Vendor ID:               GenuineIntel
  Model name:            13th Gen Intel(R) Core(TM) i5-13500T
    CPU family:          6
    Model:               191
    Thread(s) per core:  2
    Core(s) per socket:  14
    Socket(s):           1
    Stepping:            2
    CPU(s) scaling MHz:  23%
    CPU max MHz:         4600.0000
    CPU min MHz:         800.0000
    BogoMIPS:            3225.60
    Flags:               fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_
                         tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sd
                         bg fma cx16 xtpr pdcm sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb ssbd ibrs ibpb
                         stibp ibrs_enhanced tpr_shadow flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms invpcid rdseed adx smap clflushopt clwb intel_pt sha_
                         ni xsaveopt xsavec xgetbv1 xsaves split_lock_detect user_shstk avx_vnni dtherm ida arat pln pts hwp hwp_notify hwp_act_window hwp_epp hwp_pkg_req hfi vnmi umi
                         p pku ospke waitpkg gfni vaes vpclmulqdq tme rdpid movdiri movdir64b fsrm md_clear serialize pconfig arch_lbr ibt flush_l1d arch_capabilities
Virtualization features:
  Virtualization:        VT-x
Caches (sum of all):
  L1d:                   544 KiB (14 instances)
  L1i:                   704 KiB (14 instances)
  L2:                    11.5 MiB (8 instances)
  L3:                    24 MiB (1 instance)
NUMA:
  NUMA node(s):          1
  NUMA node0 CPU(s):     0-19
Vulnerabilities:
  Gather data sampling:  Not affected
  Itlb multihit:         Not affected
  L1tf:                  Not affected
  Mds:                   Not affected
  Meltdown:              Not affected
  Mmio stale data:       Not affected
  Reg file data sampling: Mitigation; Clear Register File
  Retbleed:              Not affected
```



```
  Retbleed:              Not affected
  Spec rstack overflow:  Not affected
  Spec store bypass:     Mitigation; Speculative Store Bypass disabled via prctl
  Spectre v1:            Mitigation; usercopy/swapgs barriers and __user pointer sanitization
  Spectre v2:            Mitigation; Enhanced / Automatic IBRS; IBPB conditional; RSB filling; PBRSB-eIBRS SW sequence; BHI BHI_DIS_S
  Srbds:                 Not affected
  Tsx async abort:       Not affected
sysadmin@sysadmin:~$
```

Conclusion

In this article on ‘Networking Commands’, we understood the need of using network commands and the way to implement them in the Windows command prompt. We also learned about the different network commands to troubleshoot and configure.