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Q. Use of networking commands, windows / Linux Study and demonstrate basic networking command of windows and linux operating system. Prepare a document showing output of each command (screenshot), write down importance of each command and explain the output too. Note: Linux is installed in ASEL & PL lab , utilize those PC's for study of Linux command if needed.

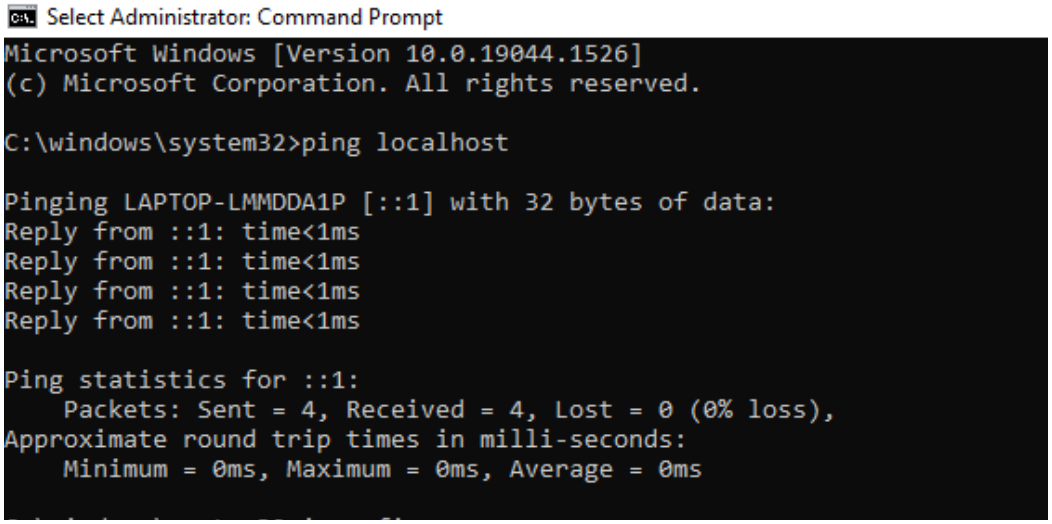
The networking commands are mainly used for getting system information and troubleshooting networking problems.

On Windows.

1. **ping command**
   - ping in networking means a signal sent from one computer to another across a network for usually determinining network speed or the status of the target computer.

   -when you ping a device ,you send that device a short message,which is then sent back.

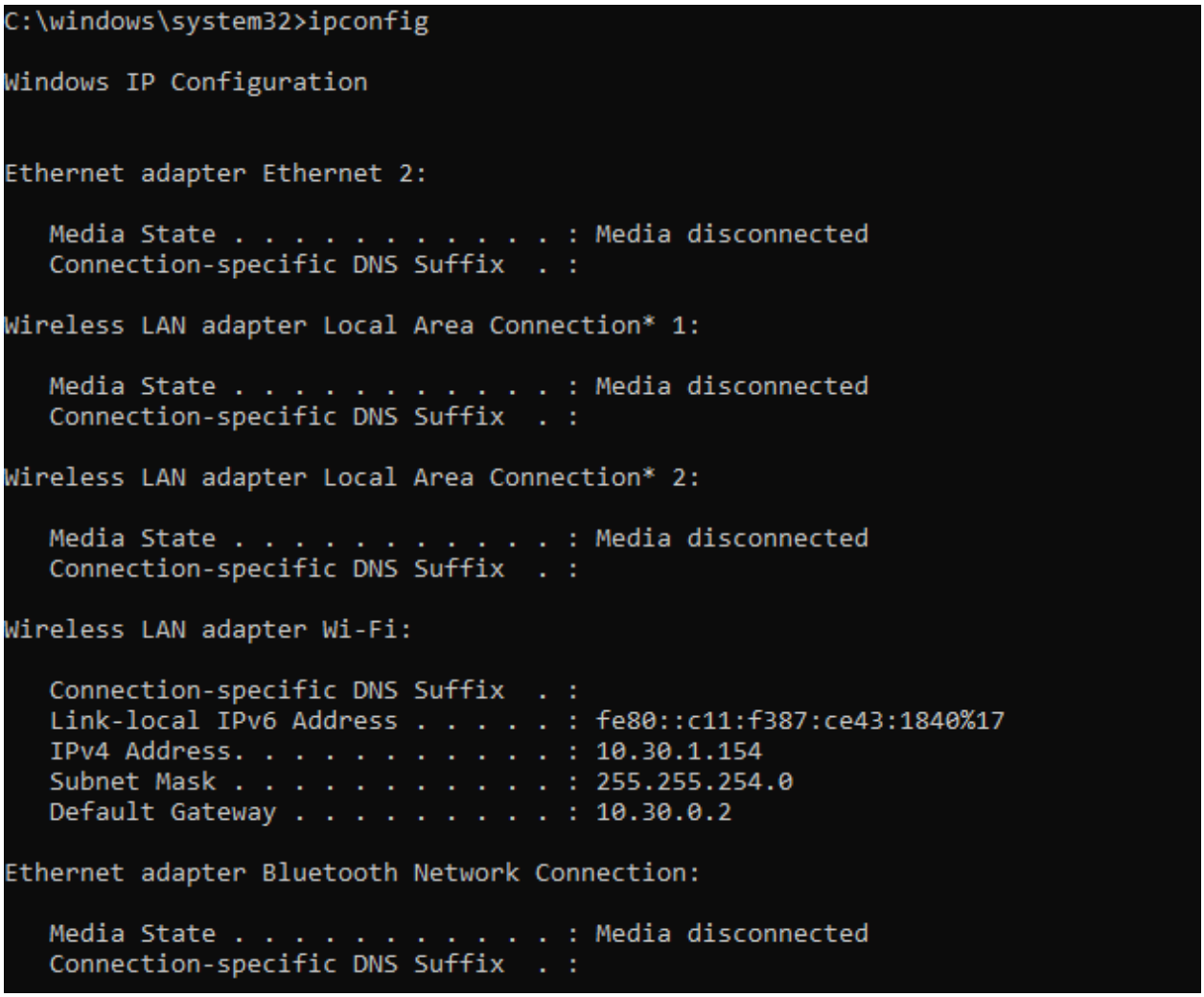
   -it is one of the most often used networking utilities for detecting devices on a network and for troubleshooting network problems.



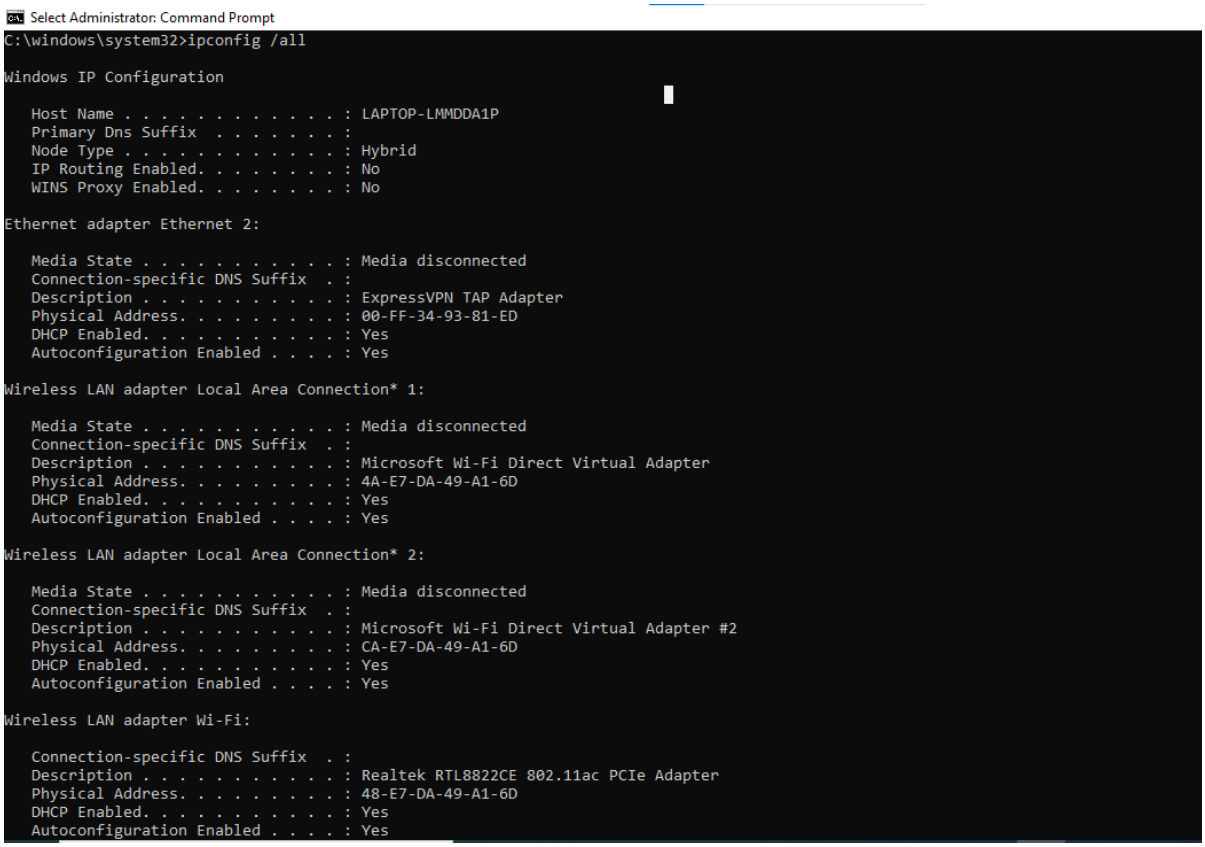
2. **ipconfig command.**

   -it is used for finding network information about your local machine like IP addresses, DNS addresses,etc.

   -basic use : finding the default gateway (A default gateway is part of how computers and different networks communicate. On the internet, a computer sends a request for information to another network's website, and a default gateway helps route the information.)

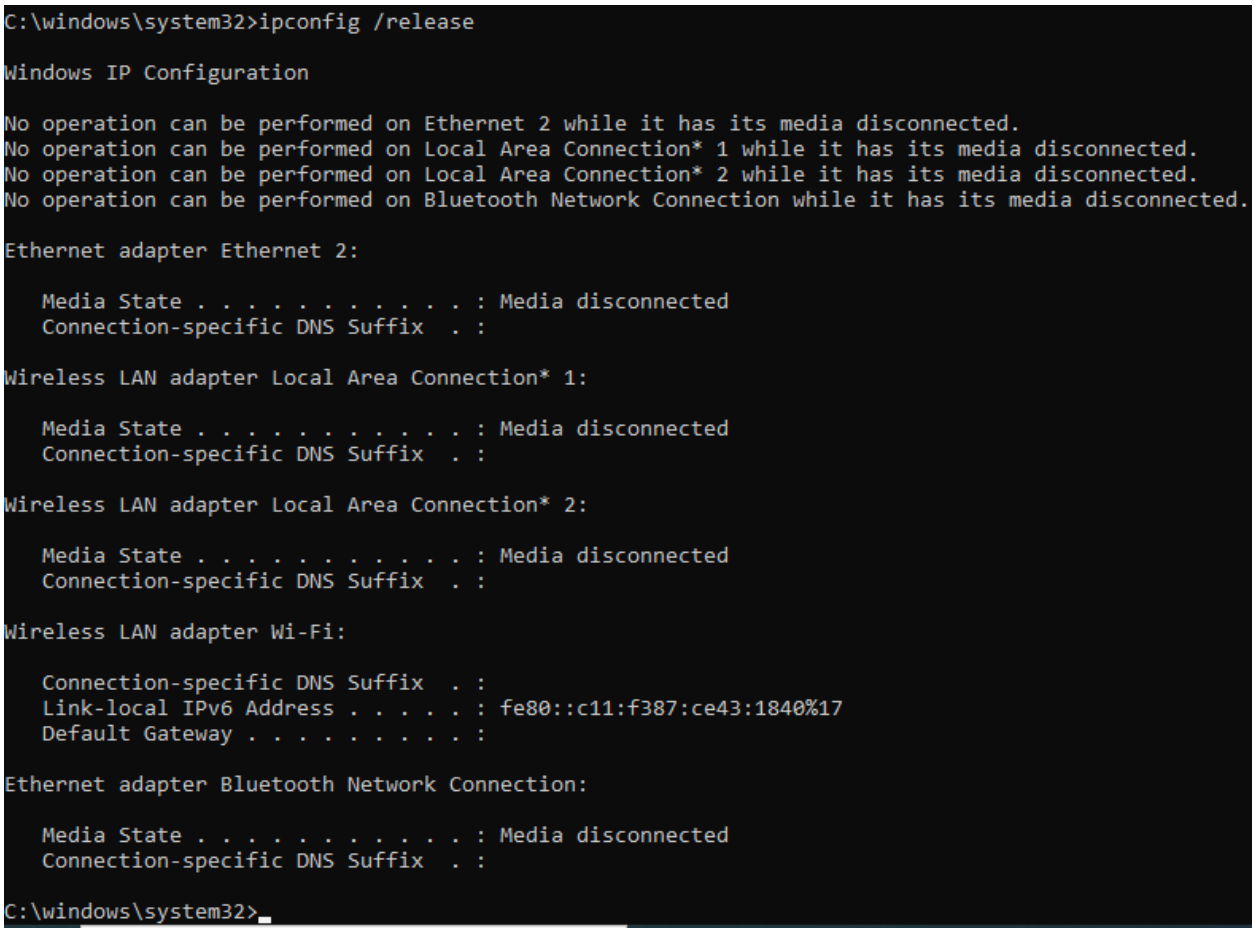


ipconfig /all – displays more information about the network setup on your systems including the MAC address.



```
Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Realtek RTL8822CE 802.11ac PCIe Adapter
   Physical Address. . . . . . . . . : 48-E7-DA-49-A1-6D
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::c11:f387:ce43:1840%17(Preferred)
   IPv4 Address. . . . . . . . . . . : 10.30.1.154(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.254.0
   Lease Obtained. . . . . . . . . . : 03 March 2022 15:48:59
   Lease Expires . . . . . . . . . . : 03 March 2022 18:49:21
   Default Gateway . . . . . . . . . : 10.30.0.2
   DHCP Server . . . . . . . . . . . : 10.30.0.2
   DHCPv6 IAID . . . . . . . . . . . : 172550106
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-28-8A-C5-08-00-E0-4C-68-CA-DF
   DNS Servers . . . . . . . . . . . : 192.168.1.8
   NetBIOS over Tcpip. . . . . . . . : Enabled

Ethernet adapter Bluetooth Network Connection:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Bluetooth Device (Personal Area Network)
   Physical Address. . . . . . . . . : 48-E7-DA-49-A1-6C
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

C:\windows\system32>
```

ipconfig /release – release the current IP address



ipconfig /renew – renew IP address

```
C:\windows\system32>ipconfig /renew

Windows IP Configuration

No operation can be performed on Ethernet 2 while it has its media disconnected.
No operation can be performed on Local Area Connection* 1 while it has its media disconnected.
No operation can be performed on Local Area Connection* 2 while it has its media disconnected.
No operation can be performed on Bluetooth Network Connection while it has its media disconnected.

Ethernet adapter Ethernet 2:

   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  . :
   Link-local IPv6 Address . . . . . : fe80::c11:f387:ce43:1840%17
   IPv4 Address. . . . . . . . . . . : 10.30.1.154
   Subnet Mask . . . . . . . . . . . : 255.255.254.0
   Default Gateway . . . . . . . . . : 10.30.0.2

Ethernet adapter Bluetooth Network Connection:

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

C:\windows\system32>
```

ipconfig /? -shows help

Administrator: Command Prompt

```
C:\windows\system32>ipconfig /?

USAGE:
    ipconfig [/allcompartments] [/? | /all |
                                 /renew [adapter] | /release [adapter] |
                                 /renew6 [adapter] | /release6 [adapter] |
                                 /flushdns | /displaydns | /registerdns |
                                 /showclassid adapter |
                                 /setclassid adapter [classid] |
                                 /showclassid6 adapter |
                                 /setclassid6 adapter [classid] ]

where
    adapter             Connection name
                       (wildcard characters * and ? allowed, see examples)

    Options:
       /?               Display this help message
       /all             Display full configuration information.
       /release         Release the IPv4 address for the specified adapter.
       /release6        Release the IPv6 address for the specified adapter.
       /renew           Renew the IPv4 address for the specified adapter.
       /renew6          Renew the IPv6 address for the specified adapter.
       /flushdns        Purges the DNS Resolver cache.
       /registerdns     Refreshes all DHCP leases and re-registers DNS names
       /displaydns      Display the contents of the DNS Resolver Cache.
       /showclassid     Displays all the dhcp class IDs allowed for adapter.
       /setclassid      Modifies the dhcp class id.
       /showclassid6    Displays all the IPv6 DHCP class IDs allowed for adapter.
       /setclassid6     Modifies the IPv6 DHCP class id.
```

Administrator: Command Prompt

```
The default is to display only the IP address, subnet mask and
default gateway for each adapter bound to TCP/IP.

For Release and Renew, if no adapter name is specified, then the IP address
leases for all adapters bound to TCP/IP will be released or renewed.

For Setclassid and Setclassid6, if no ClassId is specified, then the ClassId is removed.

Examples:
    > ipconfig                      ... Show information
    > ipconfig /all                 ... Show detailed information
    > ipconfig /renew               ... renew all adapters
    > ipconfig /renew EL*           ... renew any connection that has its
                                        name starting with EL
    > ipconfig /release *Con*       ... release all matching connections,
                                        eg. "Wired Ethernet Connection 1" or
                                            "Wired Ethernet Connection 2"
    > ipconfig /allcompartments     ... Show information about all
                                        compartments
    > ipconfig /allcompartments /all ... Show detailed information about all
                                        compartments
```

ipconfig/flushdns – flush the dns cache

```
C:\windows\system32>ipconfig/flushdns

Windows IP Configuration

Successfully flushed the DNS Resolver Cache.

C:\windows\system32>
```

3. Hostname command

-a simple command that displays the hostname of your machine.

```
C:\windows\system32>hostname
LAPTOP-LMMDDA1P

C:\windows\system32>
```

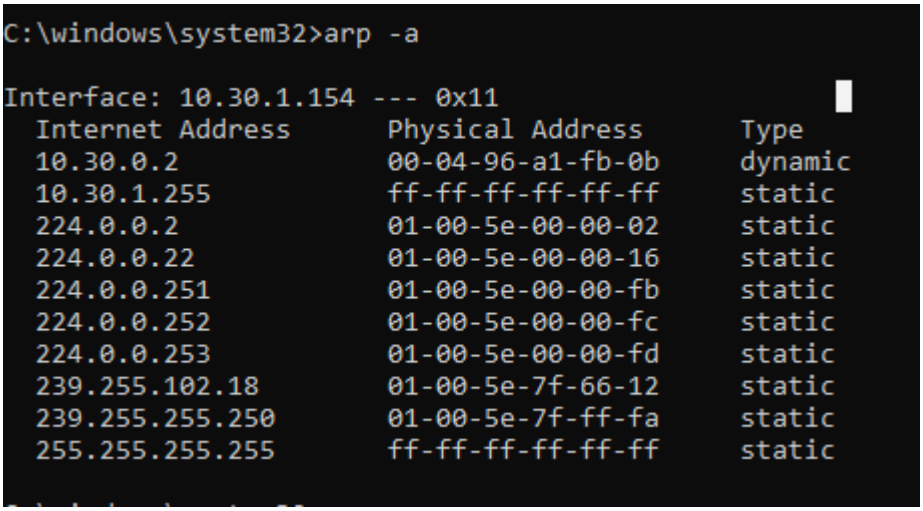
4. getmac command

-it shows the MAC address of your network interfaces.

```
C:\windows\system32>getmac

Physical Address    Transport Name
=================== ============================================================
48-E7-DA-49-A1-6D   \Device\Tcpip_{C64A5278-D1B9-4172-841F-FD251C390E6A}
48-E7-DA-49-A1-6C   Media disconnected
00-FF-34-93-81-ED   Media disconnected

C:\windows\system32>
```

5. arp command

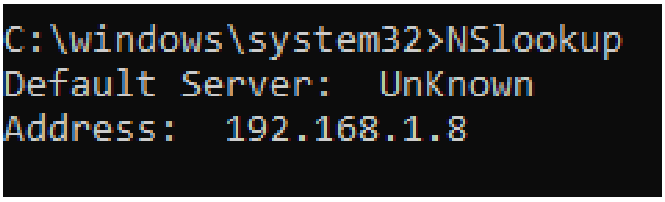
-This is used for showing the address resolution cache.
-used with a command line switch arp -a is the most common.
-it's function is to translate IP address to physical address.



-ARP finds the hardware address, also known as Media Access Control (MAC) address, of a host from its known IP address.

6. nslookup command

-Used for checking DNS record entries.

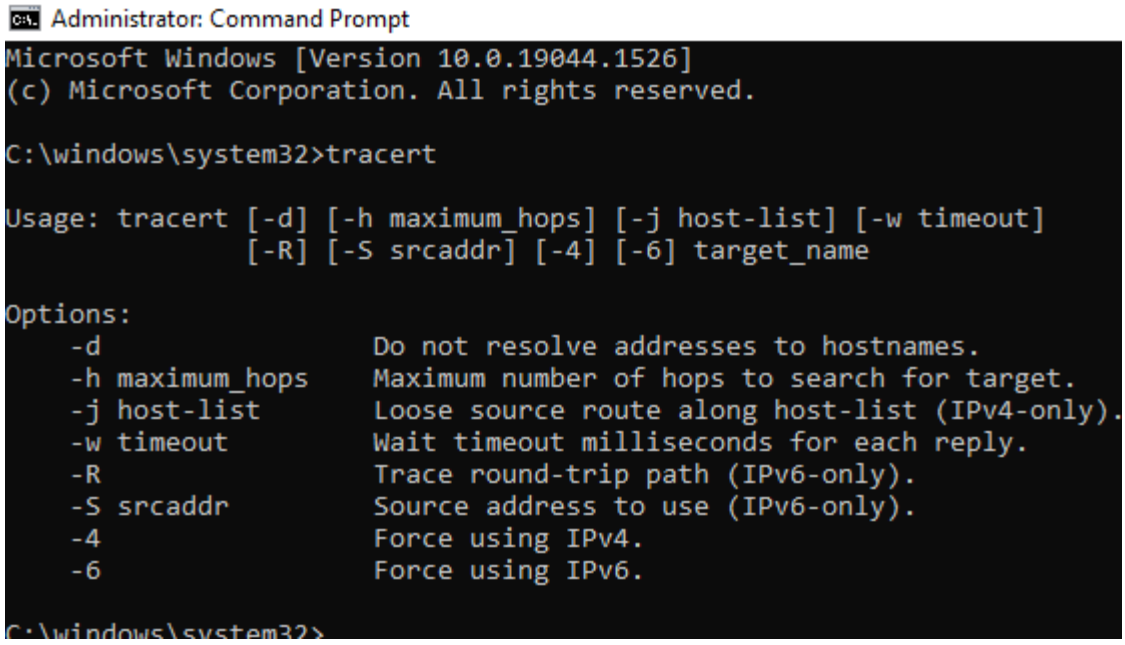


7. tracert command

-Used for troubleshooting network connections.

-This command will trace the route a data packet takes before reaching its destination, displaying information on each hop along the route.

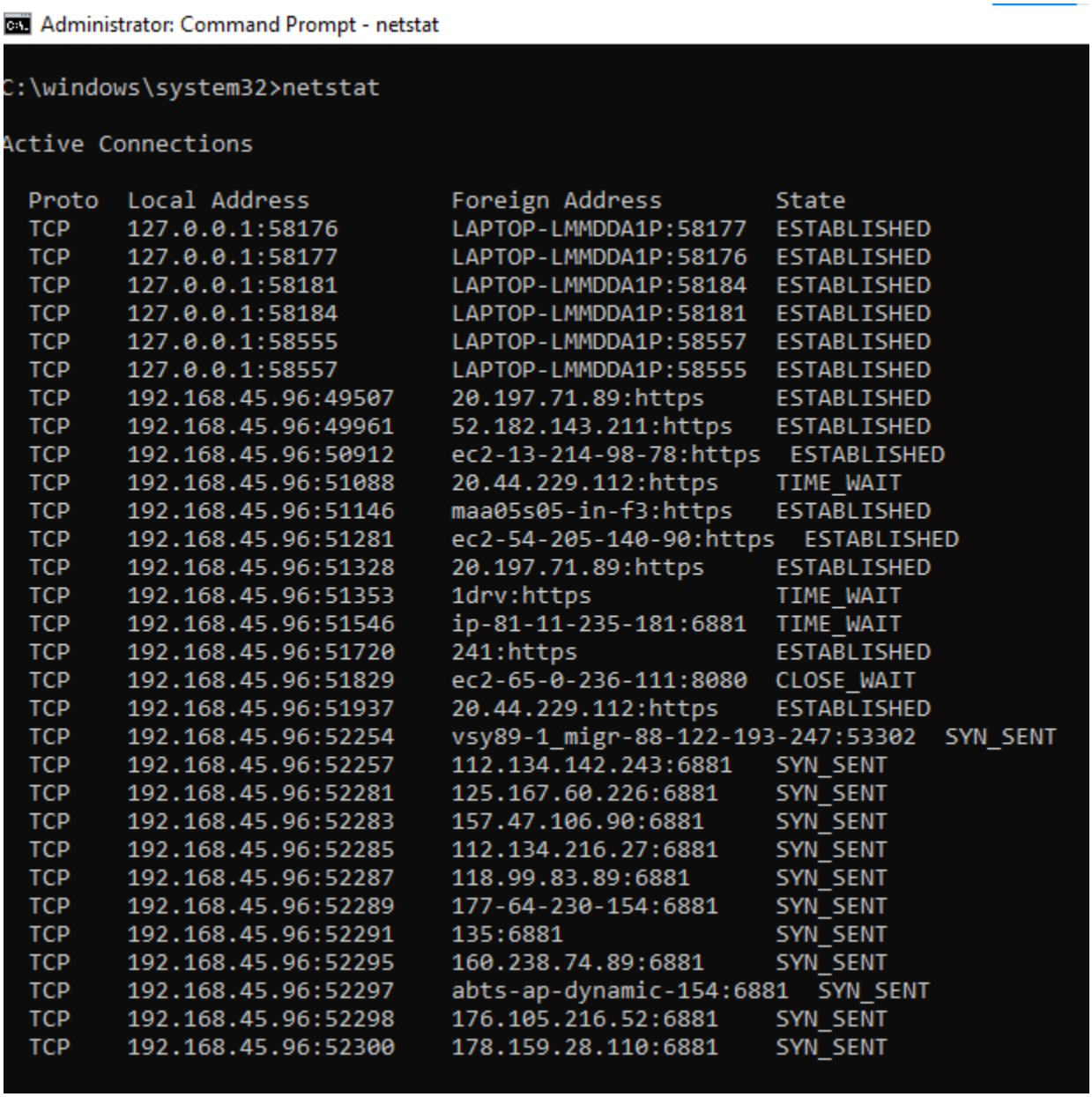
-Each hop of the route will display the latency between your device and that particular hop and the IP address of the hop



8. Netstat command

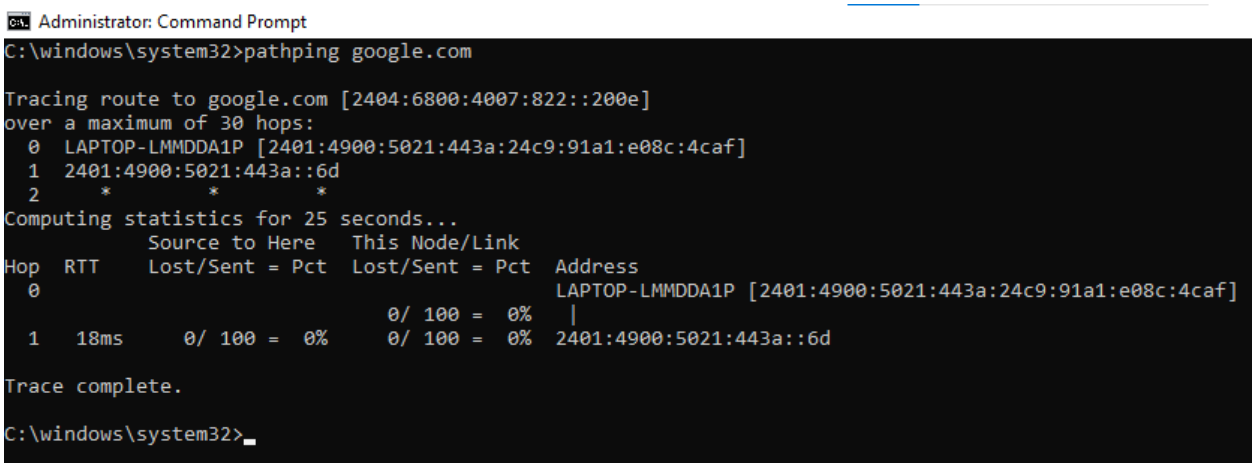
-This command displays active TCP connections,ports on which the computer is listening, Ethernet statistics, the IP routing table, IPv4 statistics, and IPv6 statistics.

-It allows you to understand open and connected ports to monitor and troubleshoot networking problems for systems or applications.



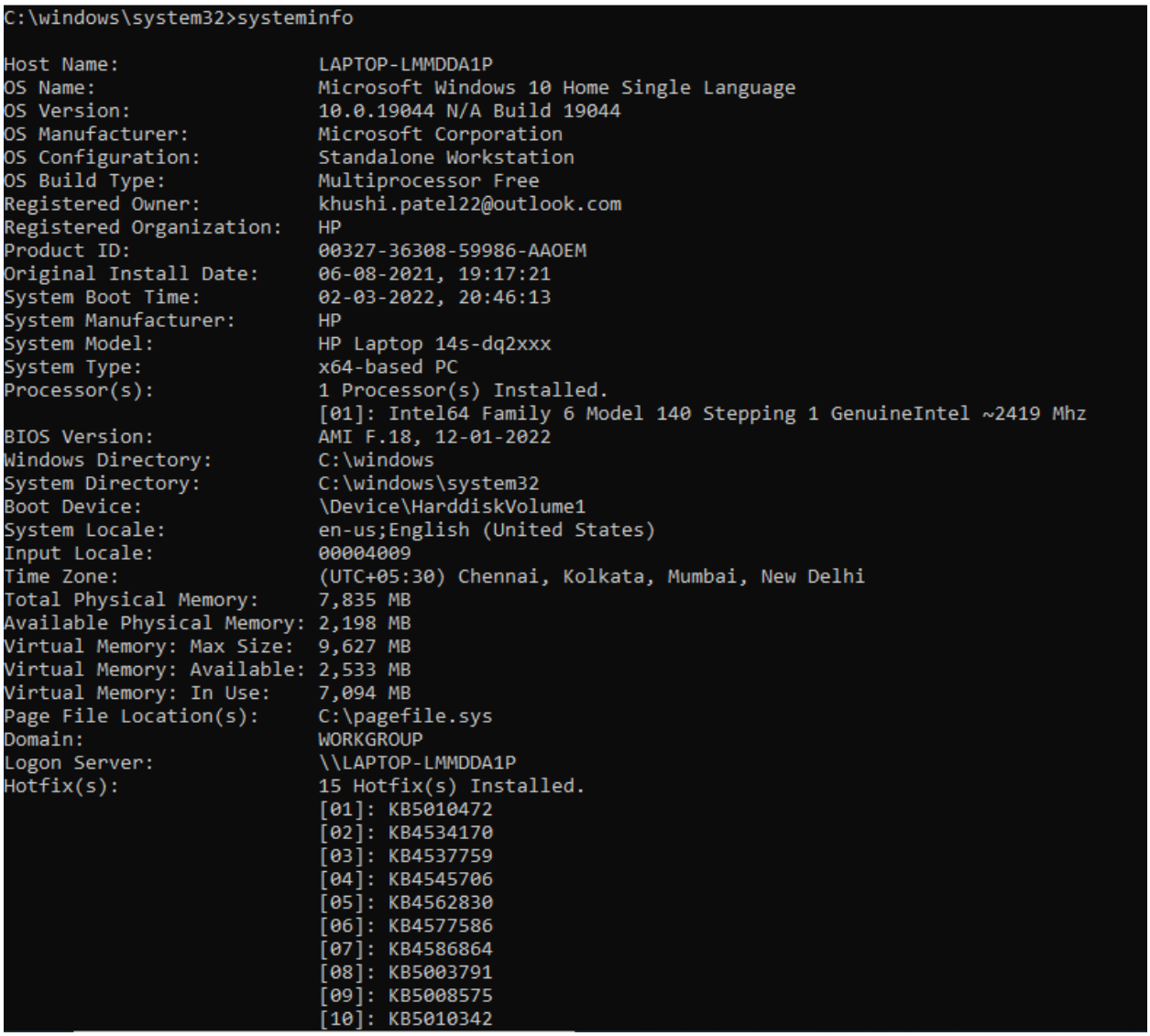
9. pathping command

-It is used to locate spots that have network latency and network loss.



10. systeminfo command

-displays a list of details about your operating system, computer hardware and software components.



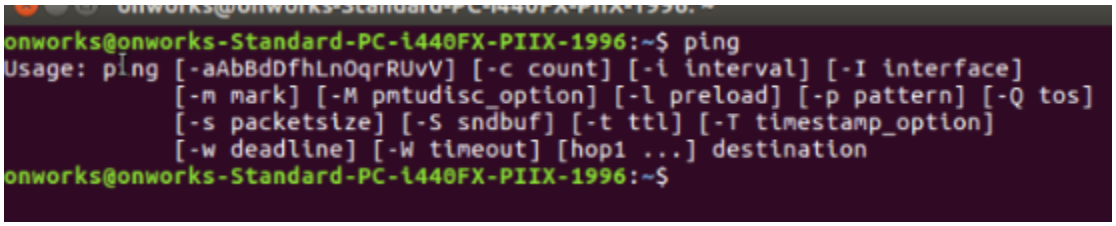
```
C:\windows\system32>systeminfo

Host Name:                 LAPTOP-LMMDDA1P
OS Name:                   Microsoft Windows 10 Home Single Language
OS Version:                10.0.19044 N/A Build 19044
OS Manufacturer:           Microsoft Corporation
OS Configuration:          Standalone Workstation
OS Build Type:             Multiprocessor Free
Registered Owner:          khushi.patel22@outlook.com
Registered Organization:   HP
Product ID:                00327-36308-59986-AAOEM
Original Install Date:     06-08-2021, 19:17:21
System Boot Time:          02-03-2022, 20:46:13
System Manufacturer:       HP
System Model:              HP Laptop 14s-dq2xxx
System Type:               x64-based PC
Processor(s):              1 Processor(s) Installed.
                           [01]: Intel64 Family 6 Model 140 Stepping 1 GenuineIntel ~2419 Mhz
BIOS Version:              AMI F.18, 12-01-2022
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:     7,835 MB
Available Physical Memory: 2,198 MB
Virtual Memory: Max Size:  9,627 MB
Virtual Memory: Available: 2,533 MB
Virtual Memory: In Use:    7,094 MB
Page File Location(s):     C:\pagefile.sys
Domain:                    WORKGROUP
Logon Server:              \\LAPTOP-LMMDDA1P
Hotfix(s):                 15 Hotfix(s) Installed.
                           [01]: KB5010472
                           [02]: KB4534170
                           [03]: KB4537759
                           [04]: KB4545706
                           [05]: KB4562830
                           [06]: KB4577586
                           [07]: KB4586864
                           [08]: KB5003791
                           [09]: KB5008575
                           [10]: KB5010342
```

```
                           [11]: KB5006753
                           [12]: KB5007273
                           [13]: KB5009636
                           [14]: KB5011352
                           [15]: KB5005699
Network Card(s):           2 NIC(s) Installed.
                           [01]: Realtek RTL8822CE 802.11ac PCIe Adapter
                                 Connection Name: Wi-Fi
                                 DHCP Enabled:    Yes
                                 DHCP Server:     192.168.45.176
                                 IP address(es)
                                 [01]: 192.168.45.96
                                 [02]: fe80::c11:f387:ce43:1840
                                 [03]: 2401:4900:5021:443a:24c9:91a1:e08c:4caf
                                 [04]: 2401:4900:5021:443a:c11:f387:ce43:1840
                           [02]: ExpressVPN TAP Adapter
                                 Connection Name: Ethernet 2
                                 Status:          Media disconnected
Hyper-V Requirements:      VM Monitor Mode Extensions: Yes
                           Virtualization Enabled In Firmware: Yes
                           Second Level Address Translation: Yes
                           Data Execution Prevention Available: Yes

C:\windows\system32>
```

On Linux.

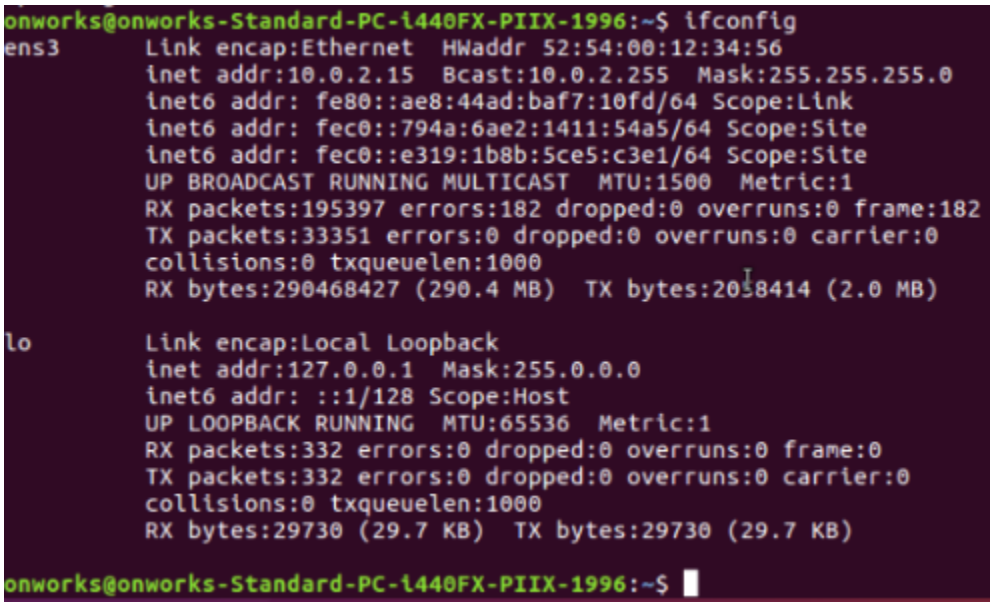
1. **ping command**

   -The Linux ping command is a simple utility used to check whether a network is available and if a host is reachable.



2. **ifconfig command**

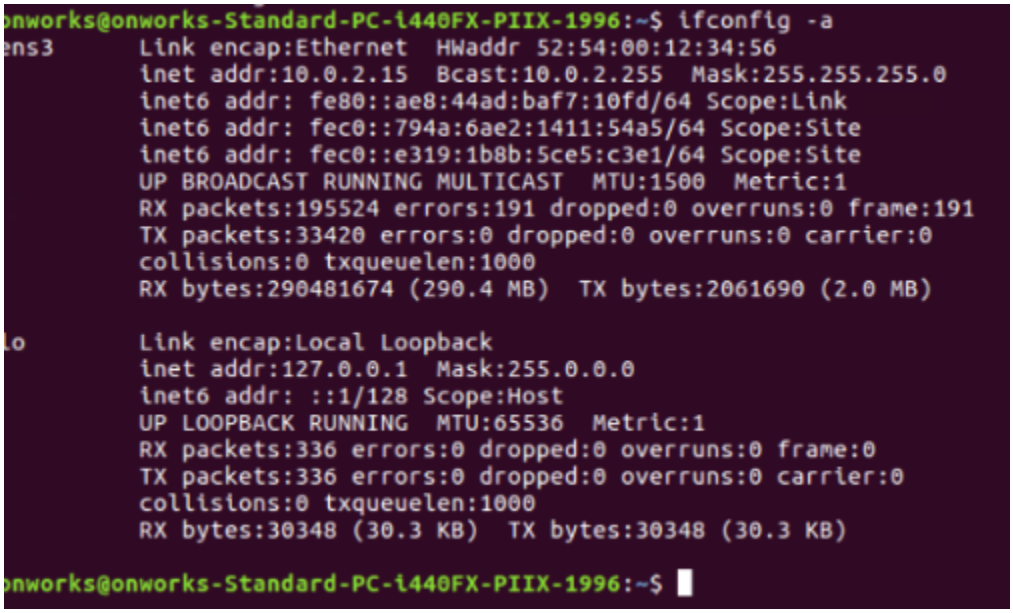
   -The “ifconfig” command is used for displaying current network configuration information, setting up an ip address, netmask, or broadcast address to a network interface, creating an alias for the network interface, setting up hardware address, and enable or disable network interfaces.



3. **Ifconfig -a command**

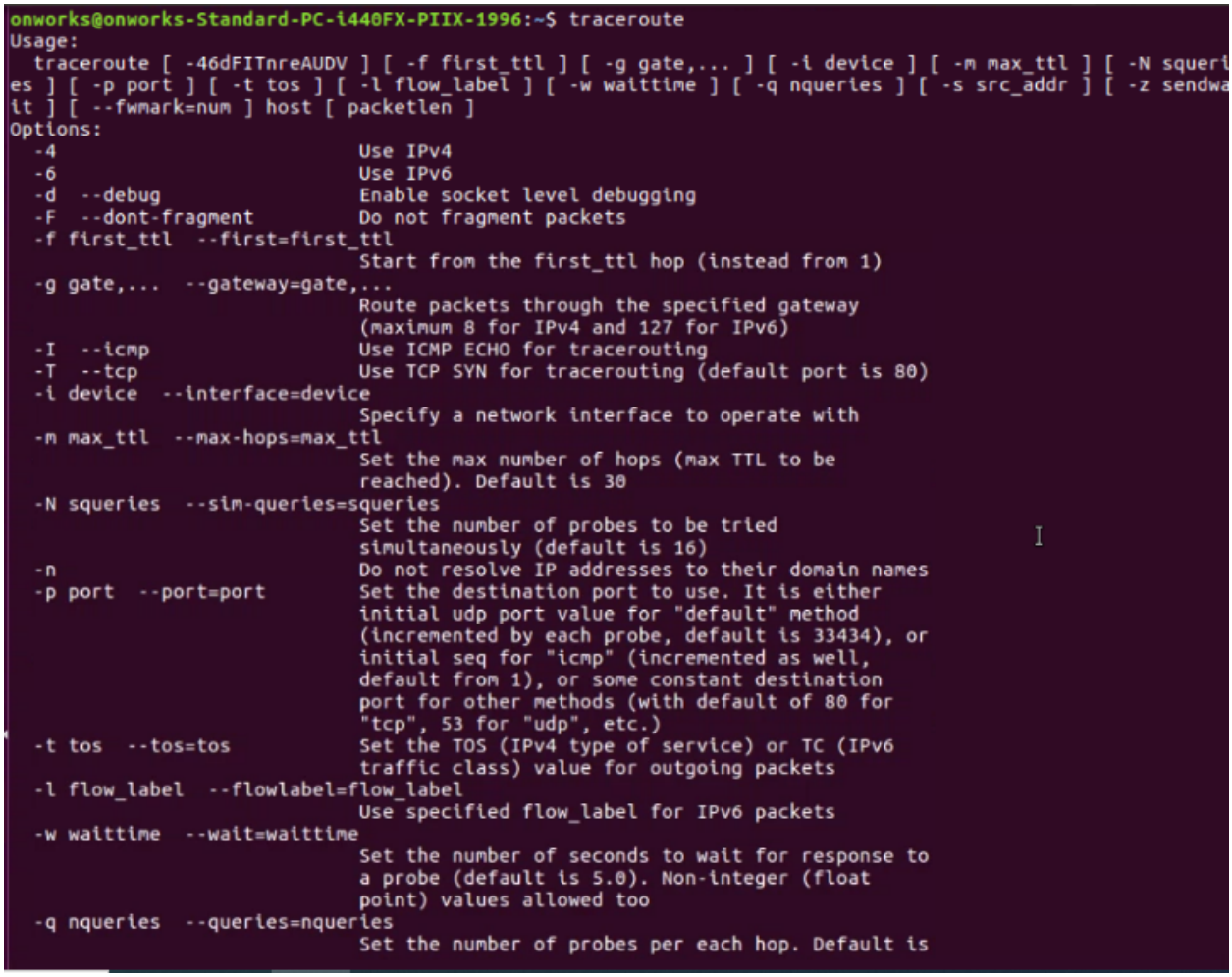
-It displays MAC address of your PC.

-HWaddr or ether or lladdr is the device's MAC address.



4. traceroute command

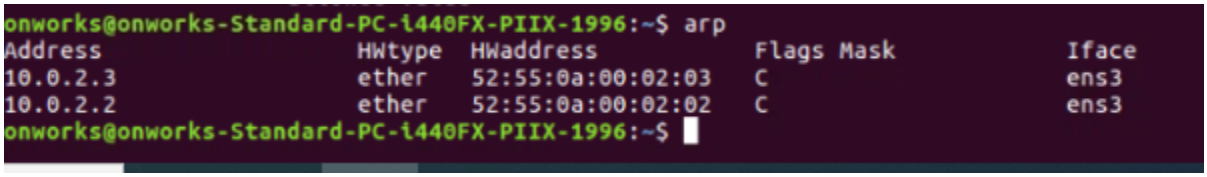
-traceroute command in Linux prints the route that a packet takes to reach the host.



```
onworks@onworks-Standard-PC-i440FX-PIIX-1996:~$ traceroute
Usage:
  traceroute [ -46dFITnreAUDV ] [ -f first_ttl ] [ -g gate,... ] [ -i device ] [ -m max_ttl ] [ -N squeri
es ] [ -p port ] [ -t tos ] [ -l flow_label ] [ -w waittime ] [ -q nqueries ] [ -s src_addr ] [ -z sendwa
it ] [ --fwmark=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
  -w waittime  --wait=waittime
                              Set the number of seconds to wait for response to
                              a probe (default is 5.0). Non-integer (float
                              point) values allowed too
  -q nqueries  --queries=nqueries
                              Set the number of probes per each hop. Default is
```

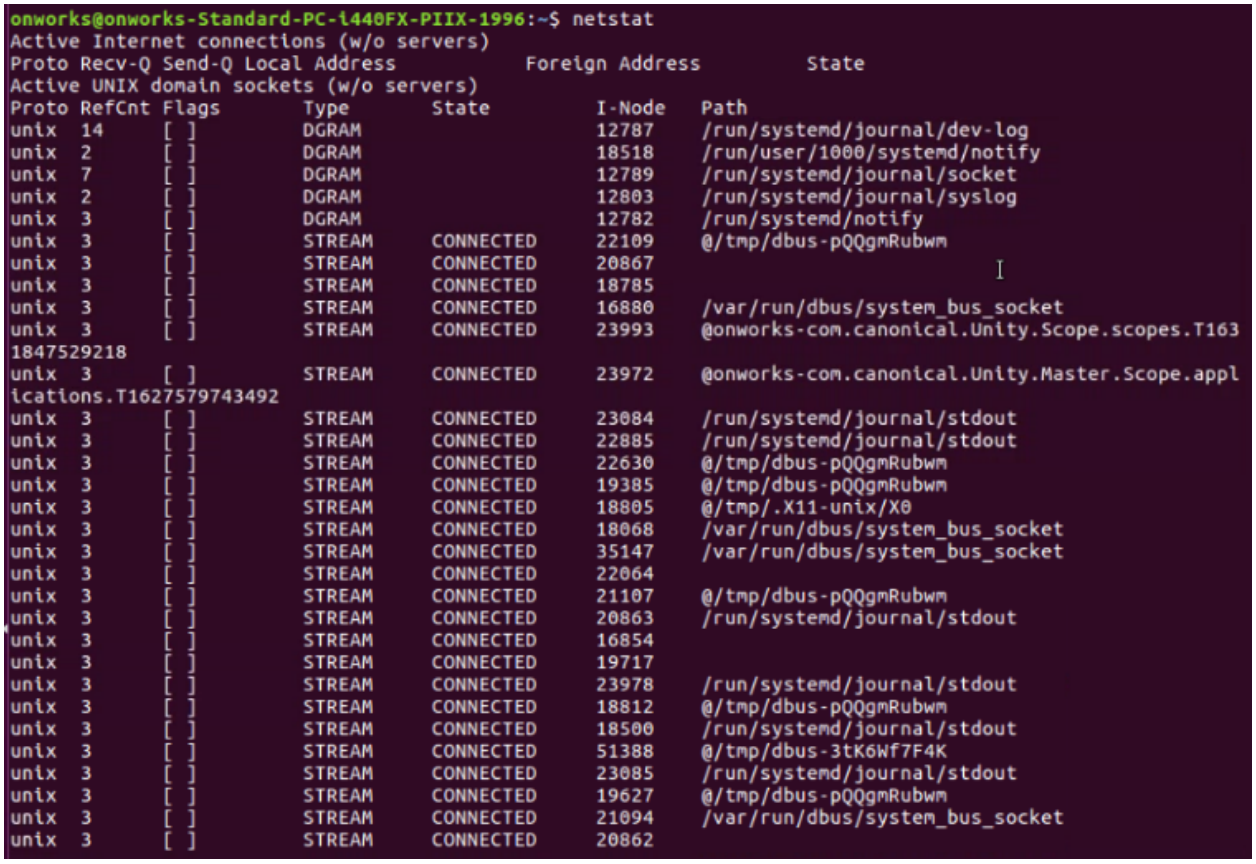
5. **arp command**

   -On Linux operating systems, the arp command manipulates or displays the kernel's IPv4 network neighbour cache. It can add entries to the table, delete one, or display the current content.



6. **netstat command**

   -Netstat command displays various network related information such as network connections, routing tables, interface statistics, masquerade connections, multicast memberships etc.



7. dig command

-The dig command in Linux is used to gather DNS information. It stands for Domain Information Groper, and it collects data about Domain Name Servers. The dig command is helpful for troubleshooting DNS problems, but is also used to display DNS information.

```
onworks@onworks-Standard-PC-i440FX-PIIX-1996:~$ dig

; <<>> DiG 9.10.3-P4-Ubuntu <<>>
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 53058
;; flags: qr rd ra ad; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;.                              IN      NS

;; ANSWER SECTION:
.                       56937   IN      NS      m.root-servers.net.
.                       56937   IN      NS      a.root-servers.net.
.                       56937   IN      NS      b.root-servers.net.
.                       56937   IN      NS      c.root-servers.net.
.                       56937   IN      NS      d.root-servers.net.
.                       56937   IN      NS      e.root-servers.net.
.                       56937   IN      NS      f.root-servers.net.
.                       56937   IN      NS      g.root-servers.net.
.                       56937   IN      NS      h.root-servers.net.
.                       56937   IN      NS      i.root-servers.net.
.                       56937   IN      NS      j.root-servers.net.
.                       56937   IN      NS      k.root-servers.net.
.                       56937   IN      NS      l.root-servers.net.

;; Query time: 1 msec
;; SERVER: 127.0.1.1#53(127.0.1.1)
;; WHEN: Sun Mar 06 11:48:10 CET 2022
;; MSG SIZE  rcvd: 239

onworks@onworks-Standard-PC-i440FX-PIIX-1996:~$
```

8. route

-route command in Linux is used when you want to work with the IP/kernel routing table.

-It is mainly used to set up static routes to specific hosts or networks via an interface.

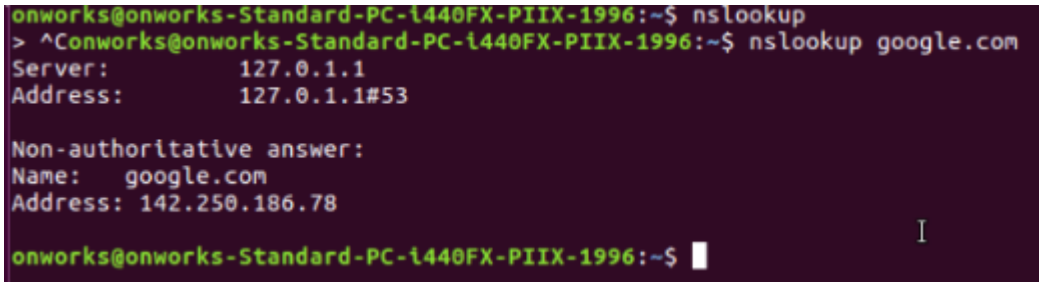
- It is used for showing or update the IP/kernel routing table.

```
onworks@onworks-Standard-PC-i440FX-PIIX-1996:~$ route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         10.0.2.2        0.0.0.0         UG    100    0        0 ens3
10.0.2.0        *               255.255.255.0   U     100    0        0 ens3
link-local      *               255.255.0.0     U     1000   0        0 ens3
[redacted]tandard-PC-i440FX-PIIX-1996:~$
```

9. **nslookup command**

   -nslookup (stands for “Name Server Lookup”) is a useful command for getting information from the DNS server.

   -It is a network administration tool for querying the Domain Name System (DNS) to obtain domain name or IP address mapping or any other specific DNS record.



10. sudo lshw command

-this command displays the device's hardware configuration information.

-While using this command in a terminal, you will get a print of CPU version, memory configuration, cache information, bus speed, and other PowerPC machines running on the backend.