



Date: 04/07/2023

Lab Practical #01:

Study of basic networking commands and IP configuration.

Practical Assignment #01:

1. Perform and explain various networking commands listed below:
 - i. ipconfig
 - ii. ping
 - iii. getmac
 - iv. systeminfo
 - v. traceroute / tracert
 - vi. netstat
 - vii. nslookup
 - viii. hostname
 - ix. pathping
 - x. Arp

Date: 04/07/2023

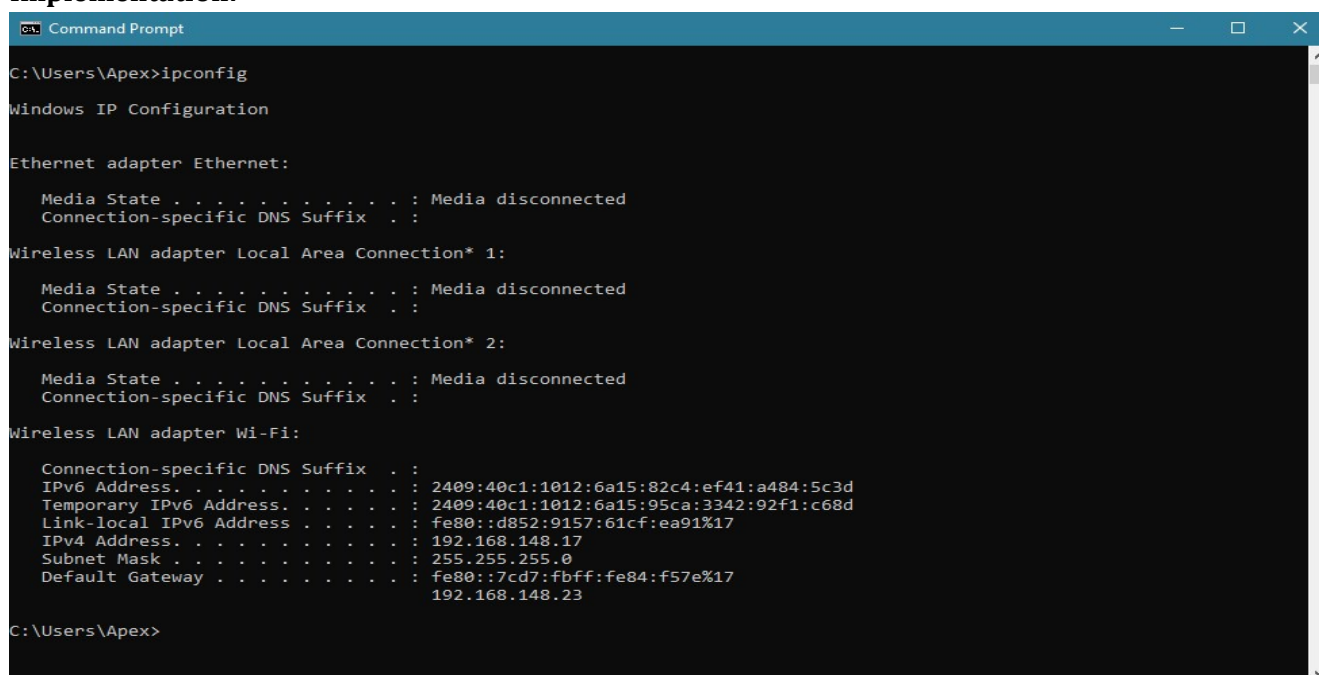
1. ipconfig

Description:

Ipconfig is a console application designed to run from the windows command prompt. This utility allows you to get the IP address of a windows computer. It also allows some control over your network adapters, IP addresses (DHCP – assigned specifically), even your DNS cache. The output of the default command contains the IP address, network mask, and gateway for all physical and virtual network adapters.

| No. | Option | Description |
|-----|--------------------------|---|
| 1 | <i>ipconfig /all</i> | <i>This option display the same IP addressing information for each adapter as the default option. Additionally, its displays DNS and WINS settings for each adapter as well as a whole host of additional information.</i> |
| 2 | <i>ipconfig /release</i> | <i>This option terminates any active TCP/IP connections on all network adapters and releases those IP addresses for use by other applications. ipconfig /release can be used with specific windows connection names.</i> |
| 3 | <i>ipconfig /renew</i> | <i>This option re-establishes TCP/IP connections on all network adapters. As with the release option, ipconfig /renew takes an optional connection name specifier. Both /renew and /release options only work on clients configured for dynamic (DHCP) addressing.</i> |

Implementation:



```
Command Prompt
C:\Users\Apex>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    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  . :
    IPv6 Address. . . . . : 2409:40c1:1012:6a15:82c4:ef41:a484:5c3d
    Temporary IPv6 Address. . . . . : 2409:40c1:1012:6a15:95ca:3342:92f1:c68d
    Link-local IPv6 Address . . . . . : fe80::d852:9157:61cf:ea91%17
    IPv4 Address. . . . . : 192.168.148.17
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : fe80::7cd7:fbff:fe84:f57e%17
                                192.168.148.23

C:\Users\Apex>
```

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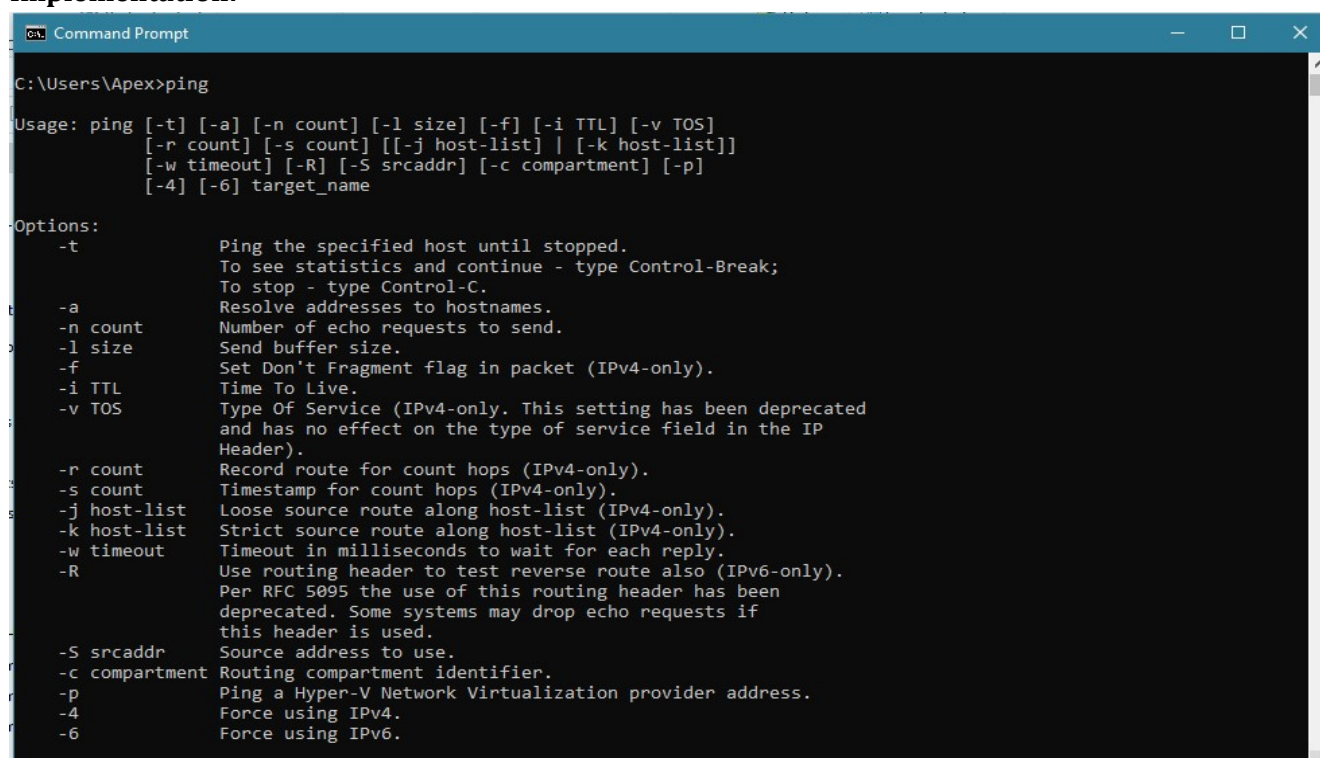
2. ping

Description:

Ping is used to test the network connectivity between two system. It's a simple way to verify that a computer can communicate with another computer or network device. Ping uses Internet Control Message Protocol (ICMP) for echo request and reply messages to check physical and logical connectivity of machines on an internet.

| No. | Option | Description |
|-----|---|--|
| 1 | <code>ping -n [count] [hostname]</code> | This option sets the number of ICMP echo request to send, from 1 to 4294967295. The ping command will send 4 default if <code>-n</code> is not used. |
| 2 | <code>ping -l [size] [hostname]</code> | Use this option to set the size in bytes of the echo request packet from 32 to 65527. The ping will send a 32-bytes echo request if you don't use the <code>-l</code> option. |
| 3 | <code>ping -t [hostname]</code> | Using this option will ping the target until you force it to stop by using <u>CTRL + C</u> . Otherwise it will sent echo requests until do not you press <u>CTRL + C</u> . |

Implementation:



```
Command Prompt
C:\Users\Apex>ping

Usage: ping [-t] [-a] [-n count] [-l size] [-f] [-i TTL] [-v TOS]
           [-r count] [-s count] [[-j host-list] | [-k host-list]]
           [-w timeout] [-R] [-S srcaddr] [-c compartment] [-p]
           [-4] [-6] target_name

Options:
  -t           Ping the specified host until stopped.
               To see statistics and continue - type Control-Break;
               To stop - type Control-C.
  -a           Resolve addresses to hostnames.
  -n count     Number of echo requests to send.
  -l size      Send buffer size.
  -f           Set Don't Fragment flag in packet (IPv4-only).
  -i TTL       Time To Live.
  -v TOS       Type Of Service (IPv4-only. This setting has been deprecated
               and has no effect on the type of service field in the IP
               Header).
  -r count     Record route for count hops (IPv4-only).
  -s count     Timestamp for count hops (IPv4-only).
  -j host-list  Loose source route along host-list (IPv4-only).
  -k host-list  Strict source route along host-list (IPv4-only).
  -w timeout   Timeout in milliseconds to wait for each reply.
  -R           Use routing header to test reverse route also (IPv6-only).
               Per RFC 5095 the use of this routing header has been
               deprecated. Some systems may drop echo requests if
               this header is used.
  -S srcaddr   Source address to use.
  -c compartment Routing compartment identifier.
  -p           Ping a Hyper-V Network Virtualization provider address.
  -4           Force using IPv4.
  -6           Force using IPv6.
```

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Date: 04/07/2023

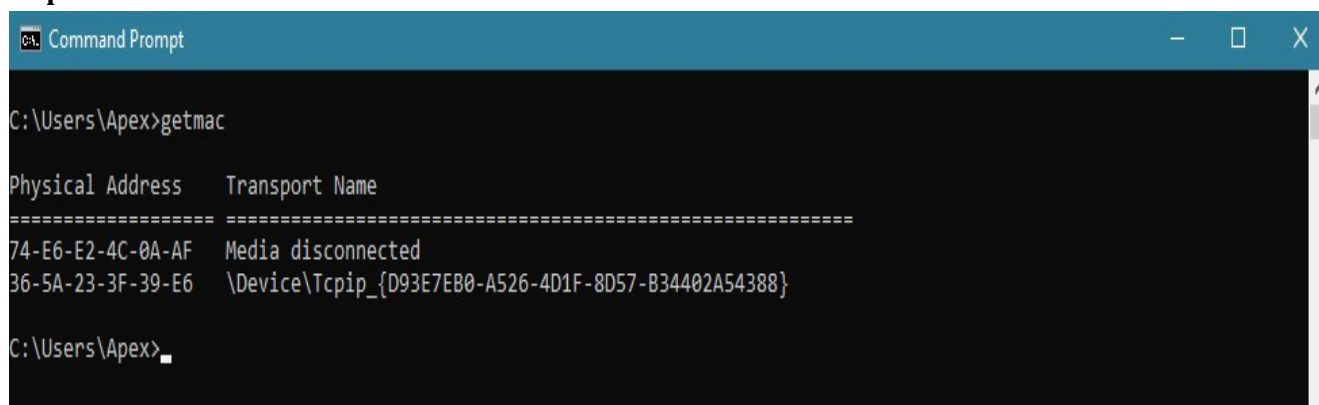
3. getmac

Description:

Getmac is a windows command used to display the Media Access Control (MAC) address for each network adapter in the computer. Using getmac command we could see the address of all media control like bluetooth, wi-fi etc.

| No. | Option | Description |
|-----|-----------------------------------|--|
| 1 | <code>getmac /s [hostname]</code> | Specifies the remote system to connect. This can be either an IP address or a host name (do not use backslashes). The default is the local computer. |
| 2 | <code>getmac /u [hostname]</code> | Specifies the user context under which the command should execute. The default is the permissions of the current logged on user on the computer issuing the command. |
| 3 | <code>getmac /fo [format]</code> | Specifies the format in which the output is to be displayed. Valid format values: "TABLE", "LIST", "CSV". default is Table. |

Implementation:



```
Command Prompt
C:\Users\Apex>getmac

Physical Address    Transport Name
=====
74-E6-E2-4C-0A-AF   Media disconnected
36-5A-23-3F-39-E6   \Device\Tcpip_{D93E7EB0-A526-4D1F-8D57-B34402A54388}
```

Date: 04/07/2023

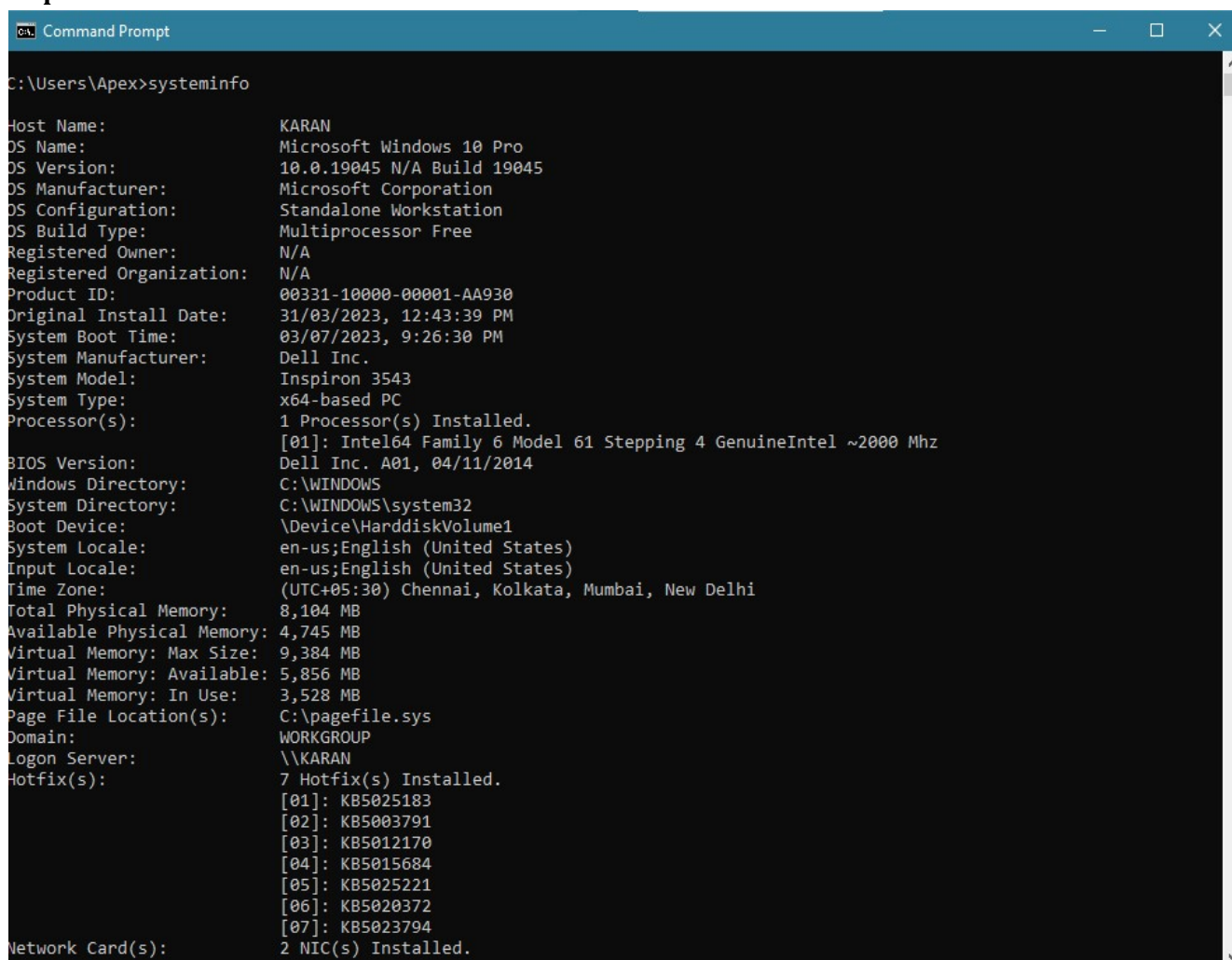
4. systeminfo

Description:

This command displays detailed configuration information about a computer and its operating system, including operating system configuration, security information, product ID and hardware properties (such as RAM, disk space and network cards).

| No. | Option | Description |
|-----|---------------------------------------|--|
| 1 | <code>systeminfo /s [hostname]</code> | Specifies the name or IP address of a remote computer (do not use backslashes). The default is the local computer. |
| 2 | <code>systeminfo /p [hostname]</code> | Specifies the password of the user account that is specified in the <code>/u</code> parameter. |
| 3 | <code>systeminfo /fo [format]</code> | Specifies the format in which the output is to be displayed. Valid format values: "TABLE", "LIST", "CSV". default is List. |

Implementation:



```
Command Prompt
C:\Users\Apex>systeminfo

Host Name:                KARAN
OS Name:                  Microsoft Windows 10 Pro
OS Version:              10.0.19045 N/A Build 19045
OS Manufacturer:        Microsoft Corporation
OS Configuration:       Standalone Workstation
OS Build Type:            Multiprocessor Free
Registered Owner:        N/A
Registered Organization: N/A
Product ID:               00331-10000-00001-AA930
Original Install Date:    31/03/2023, 12:43:39 PM
System Boot Time:         03/07/2023, 9:26:30 PM
System Manufacturer:      Dell Inc.
System Model:             Inspiron 3543
System Type:              x64-based PC
Processor(s):             1 Processor(s) Installed.
                          [01]: Intel64 Family 6 Model 61 Stepping 4 GenuineIntel ~2000 Mhz
BIOS Version:             Dell Inc. A01, 04/11/2014
Windows Directory:        C:\WINDOWS
System Directory:          C:\WINDOWS\system32
Boot Device:              \Device\HarddiskVolume1
System Locale:             en-us;English (United States)
Input Locale:              en-us;English (United States)
Time Zone:                (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi
Total Physical Memory:    8,104 MB
Available Physical Memory: 4,745 MB
Virtual Memory: Max Size: 9,384 MB
Virtual Memory: Available: 5,856 MB
Virtual Memory: In Use:   3,528 MB
Page File Location(s):    C:\pagefile.sys
Domain:                   WORKGROUP
Logon Server:              \\KARAN
Hotfix(s):                7 Hotfix(s) Installed.
                          [01]: KB5025183
                          [02]: KB5003791
                          [03]: KB5012170
                          [04]: KB5015684
                          [05]: KB5025221
                          [06]: KB5020372
                          [07]: KB5023794
Network Card(s):          2 NIC(s) Installed.
```

Date: 04/07/2023

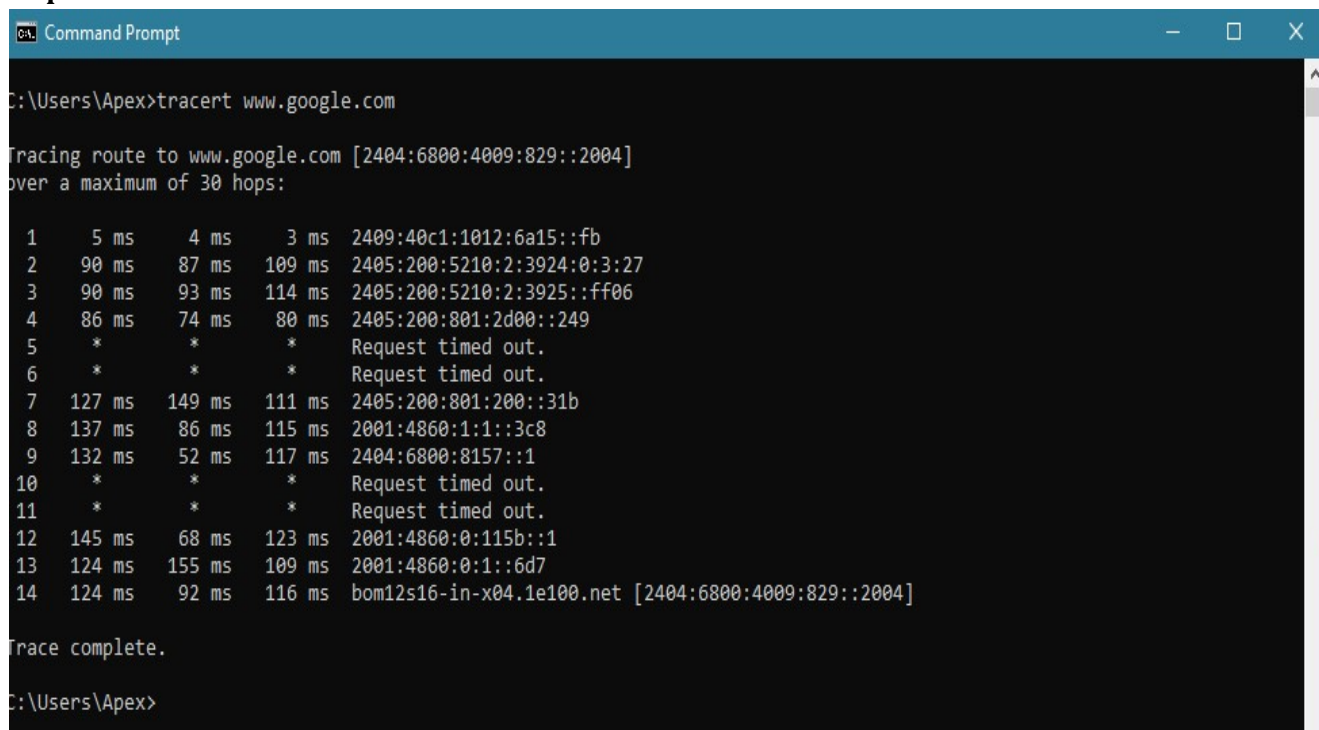
5. tracert / traceroute

Description:

The *tracert* command is a Command Prompt command that's used to show several details about the path that a packet takes from the computer or device you are on to whatever destination you specify. You might also sometimes see the *tracert* command referred to as the *trace route* command or *traceroute* command.

| No. | Option | Description |
|-----|---|---|
| 1 | <i>tracert -d [hostname]</i> | This option prevents <i>tracert</i> from resolving <u>IP addresses</u> to <u>hostnames</u> , often resulting in much faster results.. |
| 2 | <i>tracert -h [number of hops] [hostname]</i> | This <i>tracert</i> option specifies the maximum number of <u>hops</u> in the search for the target. If you do not specify <i>MaxHops</i> , and a target has not been found by 30 hops, <i>tracert</i> will stop looking. |
| 3 | <i>tracert -w [mili-seconds] [hostname]</i> | You can specify the time, in milliseconds, to allow each reply before timeout using this <i>tracert</i> option. |

Implementation:



```
Command Prompt
C:\Users\Apex>tracert www.google.com

Tracing route to www.google.com [2404:6800:4009:829::2004]
over a maximum of 30 hops:

  1  5 ms    4 ms    3 ms    2409:40c1:1012:6a15::fb
  2  90 ms   87 ms   109 ms   2405:200:5210:2:3924:0:3:27
  3  90 ms   93 ms   114 ms   2405:200:5210:2:3925::ff06
  4  86 ms   74 ms   80 ms    2405:200:801:2d00::249
  5  *        *        *        Request timed out.
  6  *        *        *        Request timed out.
  7  127 ms  149 ms  111 ms   2405:200:801:200::31b
  8  137 ms  86 ms   115 ms   2001:4860:1:1::3c8
  9  132 ms  52 ms   117 ms   2404:6800:8157::1
 10  *        *        *        Request timed out.
 11  *        *        *        Request timed out.
 12  145 ms  68 ms   123 ms   2001:4860:0:115b::1
 13  124 ms  155 ms  109 ms   2001:4860:0:1::6d7
 14  124 ms  92 ms   116 ms   bom12s16-in-x04.1e100.net [2404:6800:4009:829::2004]

Trace complete.
C:\Users\Apex>
```


Date: 04/07/2023

6. netstat

Description:

The `netstat` command generates displays that show network status and protocol statistics. You can display the status of TCP and UDP endpoints in table format, routing table information and interface information. Its used to display very detailed information about how your computer is communicating with other computers or network devices. Since `netstat` is a cross-platform command, it's also available in other operating systems like macOS and Linux.

| No. | Option | Description |
|-----|-------------------------|--|
| 1 | <code>netstat -a</code> | This switch displays active TCP connections, TCP connections with the listening state, as well as UDP ports that are being listened to. |
| 2 | <code>netstat -o</code> | A handy option for many troubleshooting tasks, the <code>-o</code> switch displays the process identifier (PID) associated with each displayed connection. |
| 3 | <code>netstat -r</code> | Execute <code>netstat</code> with <code>-r</code> to show the IP routing table. This is the same as using the <code>route</code> command to execute route print . |

Implementation:

```
Command Prompt
C:\Users\Apex>netstat

Active Connections

Proto Local Address          Foreign Address         State
TCP   [2409:40c1:1012:6a15:95ca:3342:92f1:c68d]:57933 [64:ff9b::14c6:7754]:https ESTABLISHED
TCP   [2409:40c1:1012:6a15:95ca:3342:92f1:c68d]:57993 [64:ff9b::14c6:7754]:https ESTABLISHED
TCP   [2409:40c1:1012:6a15:95ca:3342:92f1:c68d]:58078 [64:ff9b::14c6:7754]:https ESTABLISHED
TCP   [2409:40c1:1012:6a15:95ca:3342:92f1:c68d]:58109 [64:ff9b::14c6:2b5]:https  TIME_WAIT
TCP   [2409:40c1:1012:6a15:95ca:3342:92f1:c68d]:58111 [2405:200:1630:ff8a:face:b00c:3333:7020]:https CLOSE_WAIT
TCP   [2409:40c1:1012:6a15:95ca:3342:92f1:c68d]:58112 whatsapp-cdn6-shv-01-bom1:https CLOSE_WAIT
TCP   [2409:40c1:1012:6a15:95ca:3342:92f1:c68d]:58113 whatsapp-cdn6-shv-01-pnq1:https CLOSE_WAIT
TCP   [2409:40c1:1012:6a15:95ca:3342:92f1:c68d]:58114 whatsapp-cdn6-shv-02-bom1:https CLOSE_WAIT
TCP   [2409:40c1:1012:6a15:95ca:3342:92f1:c68d]:58118 [64:ff9b::142c:e570]:https ESTABLISHED

C:\Users\Apex>
```

Date: 04/07/2023

7. nslookup

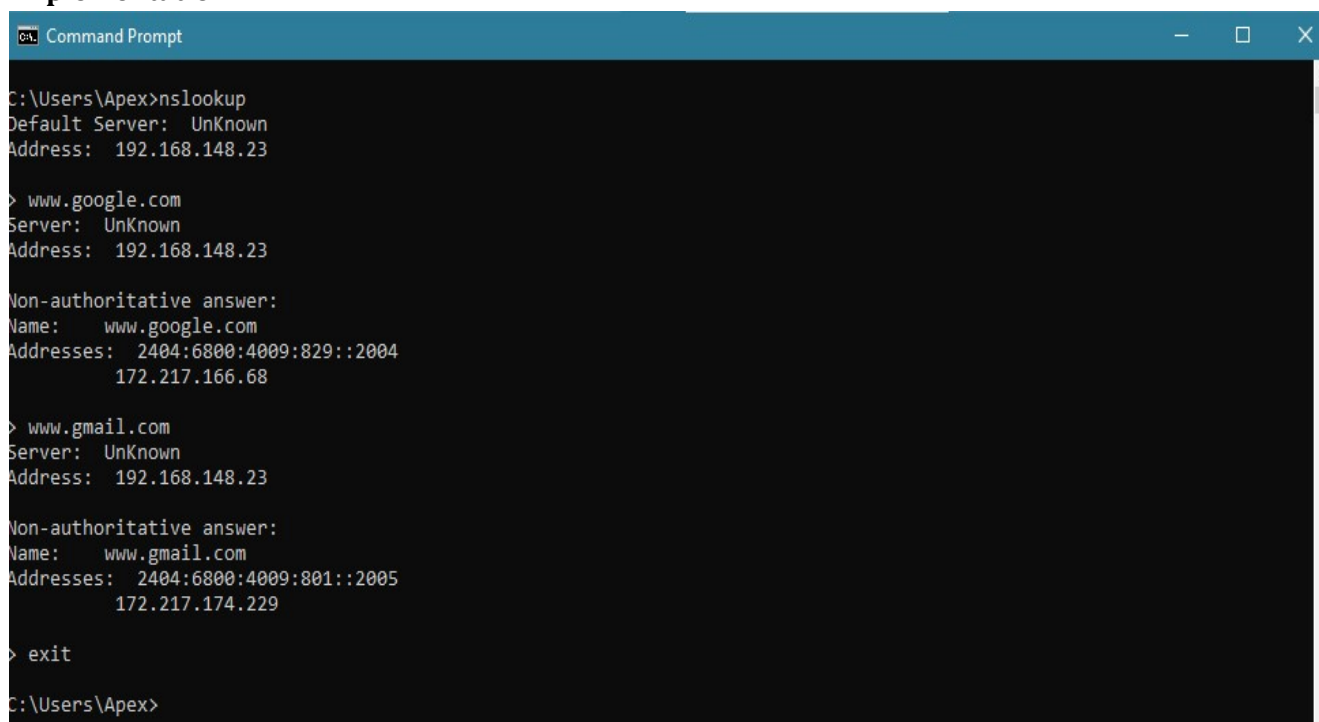
Description:

Microsoft Windows includes a tool called NSLOOKUP that you can use via the command prompt. This tool can be used to check DNS records propagation and resolution using different servers and perform other troubleshooting steps. NSLOOKUP can be use in interactive and non-interactive mode.

Its used to find the IP address of a host, domain name of an IP address and mail servers for a domain.

| No. | Option | Description |
|-----|-----------------|---|
| 1 | nslookup finger | Connects with the finger server on the current computer. |
| 2 | nslookup ls | Lists information for a DNS domain. |
| 3 | nslookup root | Changes the default server to the server for the root of the DNS domain name space. |

Implementation:



```
Command Prompt
C:\Users\Apex>nslookup
Default Server: UnKnown
Address: 192.168.148.23

> www.google.com
Server: UnKnown
Address: 192.168.148.23

Non-authoritative answer:
Name: www.google.com
Addresses: 2404:6800:4009:829::2004
          172.217.166.68

> www.gmail.com
Server: UnKnown
Address: 192.168.148.23

Non-authoritative answer:
Name: www.gmail.com
Addresses: 2404:6800:4009:801::2005
          172.217.174.229

> exit
C:\Users\Apex>
```


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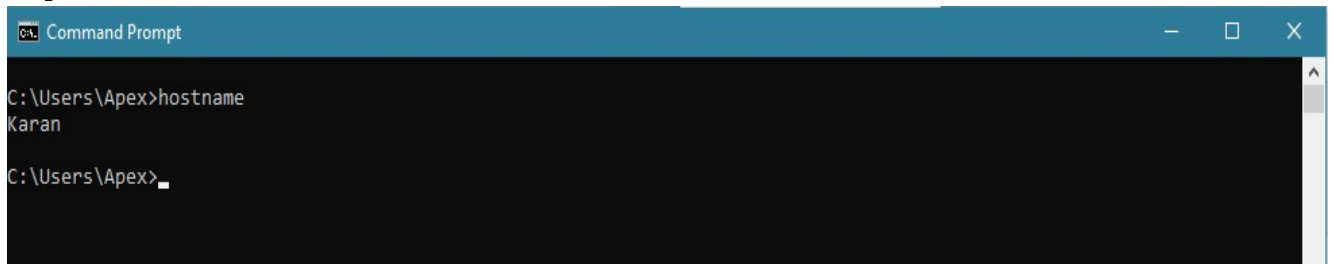
Date: 04/07/2023

8. hostname

Description:

Prints the name of the current host of the specific device

Implementation:



```
Command Prompt
C:\Users\Apex>hostname
Karan
C:\Users\Apex>_
```

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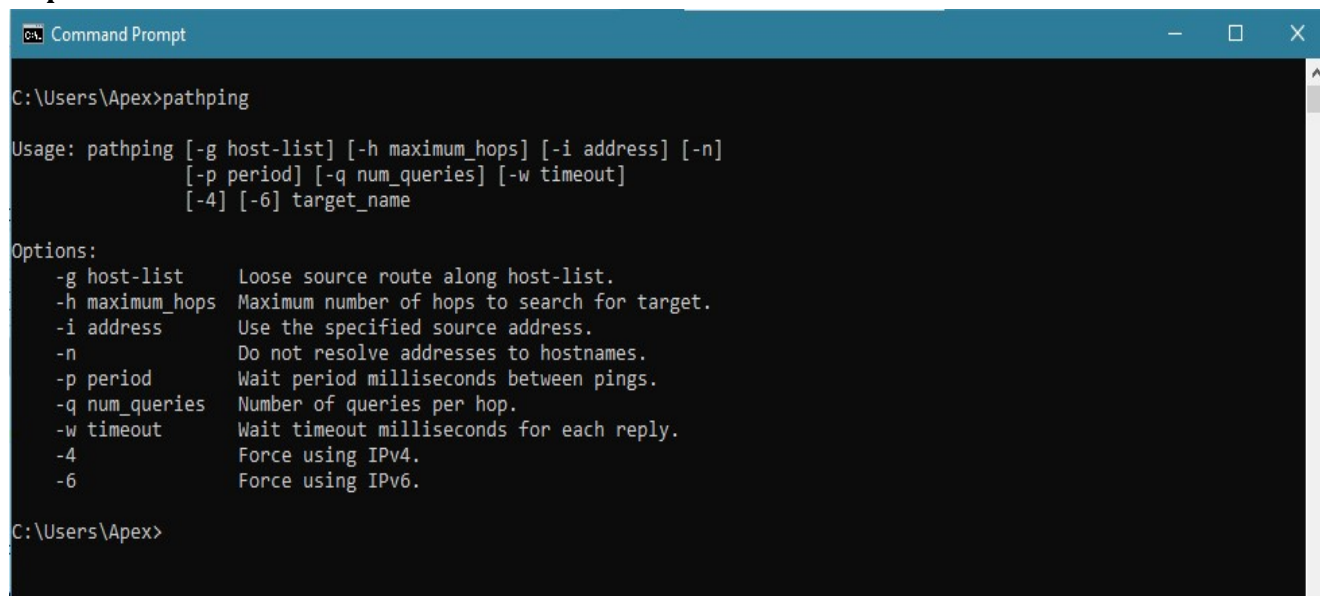
9. pathping

Description:

Provides information about network latency and network loss at intermediate hops between a source and destination. This command sends multiple echo Request messages to each router between a source and destination, over a period of time, and then computes results based on the packets returned from each router. Because this command displays the degree of packet loss at any given router or link, you can determine which routers or subnets might be having network problems. Used without parameters, this command displays help.

| No. | Option | Description |
|-----|-------------------------------------|--|
| 1 | <code>pathping /n [hostname]</code> | Prevents pathping from attempting to resolve the IP addresses of intermediate routers to their names. This might expedite the display of pathping results. |
| 2 | <code>pathping /q [hostname]</code> | Specifies the number of echo Request messages sent to each router in the path. The default is 100 queries. |
| 3 | <code>pathping /h [hostname]</code> | Specifies the maximum number of hops in the path to search for the target (destination). The default is 30 hops. |

Implementation:



```
Command Prompt
C:\Users\Apex>pathping

Usage: pathping [-g host-list] [-h maximum_hops] [-i address] [-n]
               [-p period] [-q num_queries] [-w timeout]
               [-4] [-6] target_name

Options:
  -g host-list      Loose source route along host-list.
  -h maximum_hops  Maximum number of hops to search for target.
  -i address        Use the specified source address.
  -n               Do not resolve addresses to hostnames.
  -p period         Wait period milliseconds between pings.
  -q num_queries    Number of queries per hop.
  -w timeout        Wait timeout milliseconds for each reply.
  -4               Force using IPv4.
  -6               Force using IPv6.

C:\Users\Apex>
```

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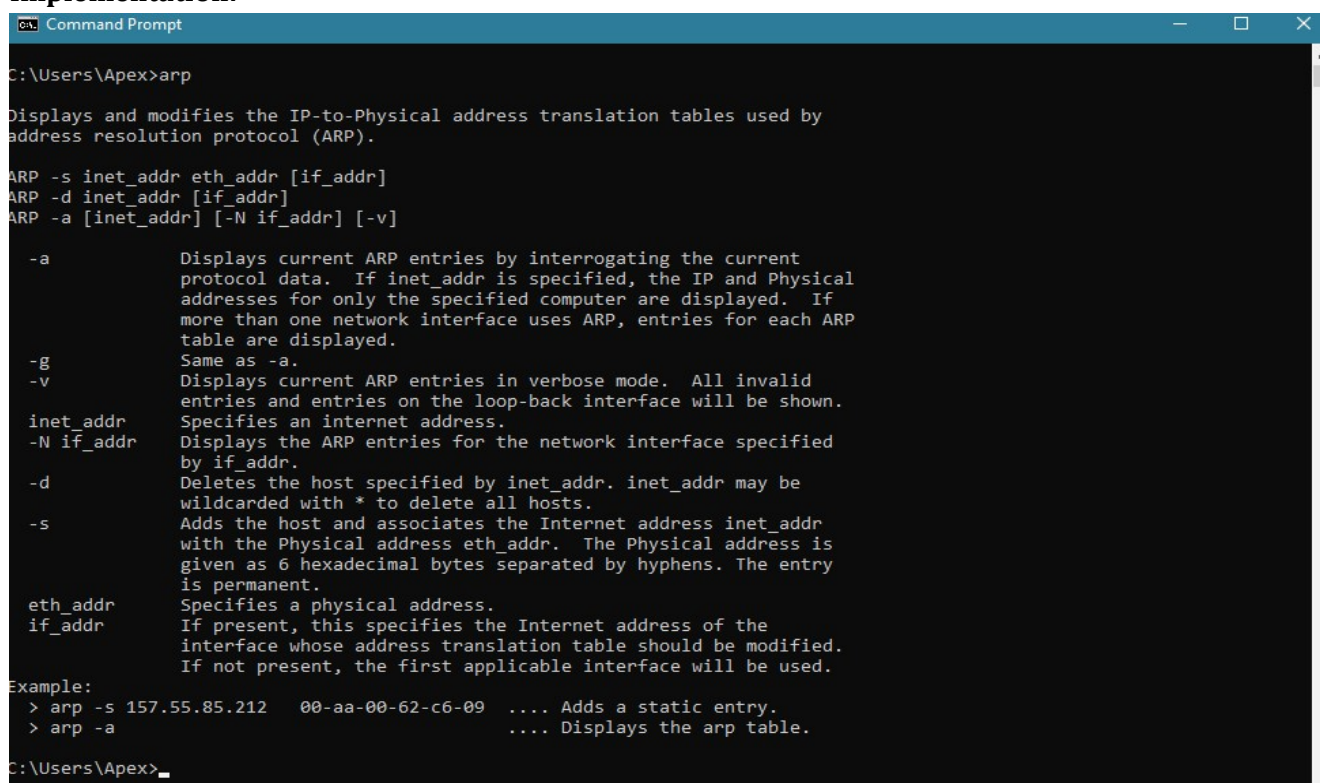
10.arp

Description:

*Displays and modifies entries in the Address Resolution Protocol (ARP) cache. The ARP cache contains one or more tables that are used to store IP addresses and their resolved Ethernet or Token Ring physical addresses. There is a separate table for each Ethernet or Token Ring network adapter installed on your computer. Used without parameters, **arp** displays help information.*

| No. | Option | Description |
|-----|---------------------|---|
| 1 | <code>arp -a</code> | <i>Displays current ARP entries by interrogating the current protocol data. If <code>inet_addr</code> is specified, the IP and Physical for only the specified computer are displayed. If more than one network interface uses ARP, entries for each ARP table are displayed.</i> |
| 2 | <code>arp -v</code> | <i>Displays current ARP entries in verbose mode. All invalid entries and entries on the loop-back interface will be shown.</i> |
| 3 | <code>arp -s</code> | <i>Adds the host and associates the Internet address <code>inet_addr</code> with the Physical address <code>eth_addr</code>. The Physical address is as 6 hexadecimal bytes separated by hyphens. The entry permanent.</i> |

Implementation:



```
Command Prompt
C:\Users\Apex>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.

C:\Users\Apex>
```