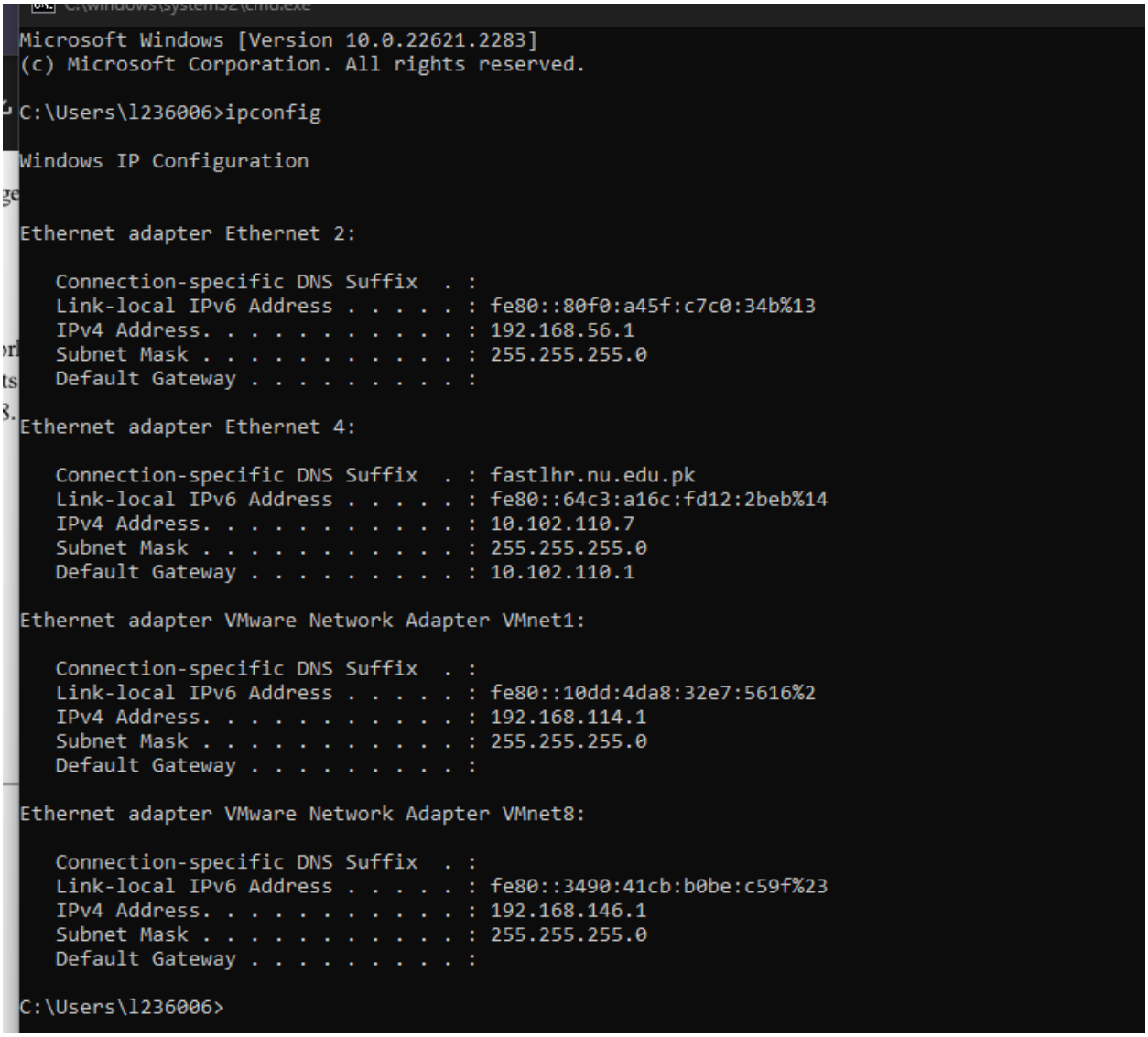
LAB 7

If config



Ping ip address

```
Microsoft Windows [Version 10.0.22621.2283]
(c) Microsoft Corporation. All rights reserved.

C:\Users\l236006>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=31ms TTL=112
Reply from 8.8.8.8: bytes=32 time=35ms TTL=112
Reply from 8.8.8.8: bytes=32 time=31ms TTL=112
Reply from 8.8.8.8: bytes=32 time=30ms TTL=112

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 30ms, Maximum = 35ms, Average = 31ms

C:\Users\l236006>
```

Ping -t ip address

```
C:\Users\l236006>ping -t 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=30ms TTL=112
Reply from 8.8.8.8: bytes=32 time=30ms TTL=112
Reply from 8.8.8.8: bytes=32 time=30ms TTL=112
Reply from 8.8.8.8: bytes=32 time=30ms TTL=112
Reply from 8.8.8.8: bytes=32 time=30ms TTL=112
Reply from 8.8.8.8: bytes=32 time=46ms TTL=112
Reply from 8.8.8.8: bytes=32 time=31ms TTL=112

Ping statistics for 8.8.8.8:
    Packets: Sent = 7, Received = 7, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 30ms, Maximum = 46ms, Average = 32ms
Control-C
^C
C:\Users\l236006>
```

Ping -n count ip address

```
C:\Users\l236006>ping -n 10 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=29ms TTL=112
Reply from 8.8.8.8: bytes=32 time=30ms TTL=112
Reply from 8.8.8.8: bytes=32 time=35ms TTL=112
Reply from 8.8.8.8: bytes=32 time=30ms TTL=112
Reply from 8.8.8.8: bytes=32 time=32ms TTL=112
Reply from 8.8.8.8: bytes=32 time=30ms TTL=112
Reply from 8.8.8.8: bytes=32 time=30ms TTL=112
Reply from 8.8.8.8: bytes=32 time=30ms TTL=112
Reply from 8.8.8.8: bytes=32 time=33ms TTL=112
Reply from 8.8.8.8: bytes=32 time=30ms TTL=112

Ping statistics for 8.8.8.8:
    Packets: Sent = 10, Received = 10, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 29ms, Maximum = 35ms, Average = 30ms

C:\Users\l236006>
```

Tracert >tracerthostname

```
C:\Users\l236006>tracert www.google.com

Tracing route to www.google.com [142.250.202.36]
over a maximum of 30 hops:

  1     1 ms     1 ms     4 ms  10.102.110.1
  2     1 ms    <1 ms    <1 ms  10.101.50.5
  3    <1 ms    <1 ms    <1 ms  10.101.20.1
  4    <1 ms    <1 ms    <1 ms  116-58-41-145.nexlinx.net.pk [116.58.41.145]
  5     1 ms    <1 ms    <1 ms  10.224.53.229
  6     2 ms     1 ms    <1 ms  FE-3-0-100M-CORE.nexlinx.net.pk [202.59.80.2]
  7     1 ms     1 ms     1 ms  10.10.80.11
  8     1 ms     1 ms     1 ms  110.93.202.169
  9    28 ms    17 ms    18 ms  110.93.255.26
 10    23 ms    23 ms    24 ms  110.93.252.146
 11    25 ms    34 ms    21 ms  110.93.252.246
 12    33 ms    34 ms    32 ms  110.93.192.111
 13    33 ms    33 ms    32 ms  216.239.41.83
 14    32 ms    32 ms    32 ms  192.178.87.251
 15    37 ms    37 ms    38 ms  lcmcta-ah-in-f4.1e100.net [142.250.202.36]

Trace complete.

C:\Users\l236006>
```

Briefly explain what do you understand from the output?

The tracert is a windows command line prompt which is used to track the real-time pathway taken by a packet on a network from source to destination, reporting the IP addresses of all the routers it pinged in between, therefore tracing the path between two systems.

www.nu.edu.pk

```
C:\Users\l236006>tracert www.nu.edu.pk

Tracing route to nu.edu.pk [203.124.44.78]
over a maximum of 30 hops:

  1     2 ms    <1 ms    <1 ms  10.102.110.1
  2    16 ms    11 ms    10 ms  10.101.50.5
  3    <1 ms    <1 ms    <1 ms  10.101.20.1
  4    <1 ms    <1 ms    <1 ms  116-58-41-145.nexlinx.net.pk [116.58.41.145]
  5     1 ms    <1 ms    <1 ms  10.224.53.229
  6     1 ms     1 ms     1 ms  FE-3-0-100M-CORE.nexlinx.net.pk [202.59.80.2]
  7     1 ms     1 ms     1 ms  10.10.80.11
  8     5 ms     8 ms     4 ms  lhr63.pie.net.pk [202.125.140.25]
  9     3 ms     1 ms     1 ms  10.253.8.42
 10     5 ms     6 ms     5 ms  10.253.12.14
 11     5 ms     5 ms     5 ms  10.253.12.37
 12     5 ms     5 ms     5 ms  10.253.13.41
 13     7 ms     6 ms     5 ms  touchstone-4.rwp44d1.pie.net.pk [202.125.149.58]
 14     *        *        *     Request timed out.
 15     7 ms     6 ms     6 ms  host2021228.comsatshosting.com [203.124.44.78]

Trace complete.

C:\Users\l236006>
```

www.mit.edu

```
C:\Users\l236006>tracert www.mit.edu

Tracing route to e9566.dscb.akamaiedge.net [23.58.1.151]
over a maximum of 30 hops:

  1     1 ms    <1 ms     1 ms  10.102.110.1
  2    <1 ms    <1 ms    <1 ms  10.101.50.5
  3    <1 ms    <1 ms    <1 ms  10.101.20.1
  4    <1 ms    <1 ms    <1 ms  116-58-41-145.nexlinx.net.pk [116.58.41.145]
  5     1 ms     1 ms     1 ms  10.224.53.229
  6     1 ms     1 ms     1 ms  FE-3-0-100M-CORE.nexlinx.net.pk [202.59.80.2]
  7     1 ms    <1 ms     1 ms  10.10.80.11
  8     2 ms     1 ms     1 ms  110.93.202.169
  9     4 ms     3 ms     2 ms  110.93.255.127
 10    20 ms    20 ms    19 ms  110.93.252.48
 11    22 ms    22 ms    21 ms  110.93.252.224
 12    30 ms    29 ms    31 ms  134.0.219.214
 13     *        *        *     Request timed out.
 14   103 ms   104 ms   106 ms  213.202.6.194
 15   102 ms   104 ms   102 ms  134.0.219.245
 16    98 ms    99 ms    98 ms  unknown.telstraglobal.net [202.126.128.53]
 17   209 ms   210 ms   210 ms  ix-be-8.ecore4.esin4-singapore.as6453.net [180.87.54.6]
 18     *        *        *     Request timed out.
 19   216 ms     *        *     if-bundle-19-2.qcore1.svw-singapore.as6453.net [63.243.180.131]
 20   209 ms   227 ms   212 ms  if-ae-33-2.tcore1.svw-singapore.as6453.net [209.58.82.130]
 21   213 ms   216 ms   213 ms  180.87.12.34
 22     *        *        *     Request timed out.
 23     *        *        *     Request timed out.
 24   235 ms   235 ms   236 ms  a23-58-1-151.deploy.static.akamaitechnologies.com [23.58.1.151]

Trace complete.
```

Ipconfig/all

```
C:\Users\l236006>ipconfig/all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : LAB10-18
   Primary Dns Suffix  . . . . . . . : fastlhr.nu.edu.pk
   Node Type . . . . . . . . . . . . : Mixed
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
   DNS Suffix Search List. . . . . . : fastlhr.nu.edu.pk

Ethernet adapter Ethernet 2:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : VirtualBox Host-Only Ethernet Adapter
   Physical Address. . . . . . . . . : 0A-00-27-00-00-0D
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::80f0:a45f:c7c0:34b%13(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.56.1(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :
   DHCPv6 IAID . . . . . . . . . . . : 722075687
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2C-9D-42-F2-6C-3C-8C-50-5A-3C
   NetBIOS over Tcpip. . . . . . . . : Enabled

Ethernet adapter Ethernet 4:

   Connection-specific DNS Suffix  . : fastlhr.nu.edu.pk
   Description . . . . . . . . . . . : Intel(R) Ethernet Connection (17) I219-LM #3
   Physical Address. . . . . . . . . : E8-CF-83-42-53-C4
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::64c3:a16c:fd12:2beb%14(Preferred)
   IPv4 Address. . . . . . . . . . . : 10.102.110.7(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : Monday, October 20, 2025 11:25:43 AM
   Lease Expires . . . . . . . . . . : Tuesday, October 21, 2025 11:25:43 AM
   Default Gateway . . . . . . . . . : 10.102.110.1
   DHCP Server . . . . . . . . . . . : 172.16.99.6
   DHCPv6 IAID . . . . . . . . . . . : 468242307
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2C-9D-42-F2-6C-3C-8C-50-5A-3C
   DNS Servers . . . . . . . . . . . : 172.16.99.2
                                       172.16.99.10
                                       172.16.99.5
   NetBIOS over Tcpip. . . . . . . . : Enabled

Ethernet adapter VMware Network Adapter VMnet1:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : VMware Virtual Ethernet Adapter for VMnet1
   Physical Address. . . . . . . . . : 00-50-56-C0-00-01
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::10dd:4da8:32e7:5616%2(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.114.1(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : Monday, October 20, 2025 11:25:27 AM
```

```
Ethernet adapter VMware Network Adapter VMnet1:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : VMware Virtual Ethernet Adapter for VMnet1
   Physical Address. . . . . . . . . : 00-50-56-C0-00-01
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::10dd:4da8:32e7:5616%2(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.114.1(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : Monday, October 20, 2025 11:25:27 AM
   Lease Expires . . . . . . . . . . : Monday, October 20, 2025 12:55:52 PM
   Default Gateway . . . . . . . . . :
   DHCP Server . . . . . . . . . . . : 192.168.114.254
   DHCPv6 IAID . . . . . . . . . . . : 687886422
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2C-9D-42-F2-6C-3C-8C-50-5A-3C
   NetBIOS over Tcpip. . . . . . . . : Enabled

Ethernet adapter VMware Network Adapter VMnet8:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : VMware Virtual Ethernet Adapter for VMnet8
   Physical Address. . . . . . . . . : 00-50-56-C0-00-08
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::3490:41cb:b0be:c59f%23(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.146.1(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : Monday, October 20, 2025 11:25:24 AM
   Lease Expires . . . . . . . . . . : Monday, October 20, 2025 12:55:52 PM
   Default Gateway . . . . . . . . . :
   DHCP Server . . . . . . . . . . . : 192.168.146.254
   DHCPv6 IAID . . . . . . . . . . . : 704663638
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2C-9D-42-F2-6C-3C-8C-50-5A-3C
   Primary WINS Server . . . . . . . : 192.168.146.2
   NetBIOS over Tcpip. . . . . . . . : Enabled

C:\Users\l236006>
```

Physical Address MAC : 0A-00-27-00-00-0D

Arp -a

```
C:\Users\l236006>arp -a

Interface: 192.168.114.1 --- 0x2
  Internet Address      Physical Address      Type
  192.168.114.254       00-50-56-f6-ad-30     dynamic
  192.168.114.255       ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

Interface: 192.168.56.1 --- 0xd
  Internet Address      Physical Address      Type
  192.168.56.255        ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  224.2.2.2             01-00-5e-02-02-02     static
  239.255.255.250       01-00-5e-7f-ff-fa     static

Interface: 10.102.110.7 --- 0xe
  Internet Address      Physical Address      Type
  10.102.110.1          00-1f-9e-0c-10-ff     dynamic
  10.102.110.11         e8-cf-83-42-52-35     dynamic
  10.102.110.27         e8-cf-83-42-50-d9     dynamic
  10.102.110.255        ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

Interface: 192.168.146.1 --- 0x17
  Internet Address      Physical Address      Type
  192.168.146.254       00-50-56-f3-25-b2     dynamic
  192.168.146.255       ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

C:\Users\l236006>
```

Q1: Why we need both IP and MAC addresses?

Internet Protocol (IP) is a network layer protocol which is used for routing and transmission of data packets over and across networks such as internet. The IP address of a device can change depending on from where are you connected into the network. However, MAC Address is a data link layer protocol which is simply a globally unique address assigned to any networking hardware (e.g., network interface card). MAC addresses may be used for local communication within a network.
MAC addresses work locally within a LAN, while IP addresses are used for broader internet communication. IP addresses allow devices to communicate across different networks, whereas MAC addresses help direct traffic within a specific network.

Q2: What is the purpose of “Maximum hop limit” in tracert command?

The “maximum hop-limit” indicates the lifetime of packets and specifies the maximum number of hops that the packets can pass through to reach their destination. It is used to control the number of hops (or routers through which the packet passes) before it is discarded.
If there's a routing issue or a misconfiguration, packets could circulate indefinitely. The maximum hop limit helps to avoid this by terminating the packet after a specified number of hops.
The maximum hop limit is set to a default value of 30 hops.

Q2: Why is a “rarp” command not needed?

Reverse Address Resolution Protocol (RARP) is a protocol a physical machine in a local area network (LAN) can use to request its IP address.
In today’s age of computer networking, we are now utilizing much more sophisticated and smarter approaches for IP address management. Some of them include:
- DHCP (Dynamic Host Configuration Protocol)
- Static IP Address Assignment
- ARP
- NAT Routing & IP Assignment

RARP used to assign IP addresses to devices based on their MAC addresses in a static and limited manner whereas now the above-mentioned methods and protocols are used for better and smart IP address management thus making RARP redundant