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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

1. ipconfig

Description:

The ipconfig command in Windows is a useful tool for network troubleshooting and configuration. It displays the current configuration of the installed IP stack on a networked computer using TCP/IP. Displays the IP address, subnet mask, and default gateway for all network adapters.

No.	Option	Description
1	ipconfig /all	Shows detailed information about all network interfaces, including DNS and DHCP details.
2	ipconfig /release	Release the IPv4 address for the specified adapter.
3	ipconfig /release6	Release the IPv6 address for the specified adapter.
4	ipconfig /renew	Renew the IPv4 address for the specified adapter.
5	ipconfig /renew6	Renew the IPv6 address for the specified adapter.



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Implementation:

```
Command Prompt

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

C:\Users\bitma>ipconfig

Windows IP Configuration

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  . : mshome.net
    Link-Local IPv6 Address . . . . . : fe80::4d2b:2012:634c:d987%14
    IPv4 Address. . . . . : 192.168.137.171
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.137.1

Ethernet adapter Bluetooth Network Connection:

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

Command Prompt

C:\Users\bitma>ipconfig /all

Windows IP Configuration

    Host Name . . . . . : krishu
    Primary Dns Suffix . . . . . :
    Node Type . . . . . : Mixed
    IP Routing Enabled. . . . . : No
    WINS Proxy Enabled. . . . . : No
    DNS Suffix Search List. . . . . : mshome.net

Wireless LAN adapter Local Area Connection* 1:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :
    Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
    Physical Address. . . . . : A4-6B-B6-11-A3-83
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 2:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :
    Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter #2
    Physical Address. . . . . : A6-6B-B6-11-A3-82
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . : mshome.net
    Description . . . . . : Intel(R) Dual Band Wireless-AC 8265
```



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```
Command Prompt
Connection-specific DNS Suffix . : mshome.net
Description . . . . . : Intel(R) Dual Band Wireless-AC 8265
Physical Address. . . . . : EA-56-2C-51-A0-3A
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::4d2b:2012:634c:d987%14(Preferred)
IPv4 Address. . . . . : 192.168.137.171(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : Monday, June 10, 2024 8:25:29 AM
Lease Expires . . . . . : Monday, June 17, 2024 8:25:29 AM
Default Gateway . . . . . : 192.168.137.1
DHCP Server . . . . . : 192.168.137.1
DHCPv6 IAID . . . . . : 250238508
DHCPv6 Client DUID. . . . . : 00-03-00-01-EA-56-2C-51-A0-3A
DNS Servers . . . . . : 192.168.137.1
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. . . . . : A4-6B-B6-11-A3-86
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes

Command Prompt

C:\Users\bitma>ipconfig /release

Windows IP Configuration

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

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::4d2b:2012:634c:d987%14
Default Gateway . . . . . :

Ethernet adapter Bluetooth Network Connection:

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

Command Prompt

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

C:\Users\bitma>ipconfig /release6

Windows IP Configuration

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

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::4d2b:2012:634c:d987%14
Autoconfiguration IPv4 Address. . . : 169.254.249.124
Subnet Mask . . . . . : 255.255.0.0
Default Gateway . . . . . :

Ethernet adapter Bluetooth Network Connection:

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

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```
Command Prompt
C:\Users\bitma>ipconfig /renew

Windows IP Configuration

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.

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  . : mshome.net
    Link-local IPv6 Address . . . . . : fe80::4d2b:2012:634c:d987%14
    IPv4 Address. . . . . : 192.168.137.205
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.137.1

C:\Users\bitma>
```

```
Command Prompt
C:\Users\bitma>ipconfig /renew6

Windows IP Configuration

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.
An error occurred while renewing interface Wi-Fi : The semaphore timeout period has expired.

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  . : mshome.net
    Link-local IPv6 Address . . . . . : fe80::4d2b:2012:634c:d987%14
    IPv4 Address. . . . . : 192.168.137.205
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.137.1
```

2. ping

Description:

The ping command in Windows (and other operating systems) is used to test the reachability of a host on an IP network and to measure the round-trip time for messages sent from the originating host to a destination computer.



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No.	Option	Description
1	ping -t [hostname or IP address]	Ping the specified host until stopped.To see statistics and continue - type Control-Break;
2	ping -n [count] [hostname or IP address]	Number of echo requests to send.
3	ping -l [size] [hostname or IP address]	Send buffer size.
4	ping -f	Set Don't Fragment flag in packet (IPv4-only).
5	ping -a	Resolve addresses to hostnames.

Implementation:

```
Command Prompt
IP address must be specified.

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

Pinging www.google.com [142.250.76.196] with 32 bytes of data:
Reply from 142.250.76.196: bytes=32 time=34ms TTL=118
Reply from 142.250.76.196: bytes=32 time=46ms TTL=118
Reply from 142.250.76.196: bytes=32 time=34ms TTL=118
Reply from 142.250.76.196: bytes=32 time=49ms TTL=118

Ping statistics for 142.250.76.196:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 34ms, Maximum = 49ms, Average = 40ms

Command Prompt - ping www.google.com -t
Reply from 142.250.76.196: bytes=32 time=49ms TTL=118

Ping statistics for 142.250.76.196:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 34ms, Maximum = 49ms, Average = 40ms

C:\Users\bitma>ping www.google.com -t

Pinging www.google.com [142.250.76.196] with 32 bytes of data:
Reply from 142.250.76.196: bytes=32 time=31ms TTL=118
Reply from 142.250.76.196: bytes=32 time=34ms TTL=118
Reply from 142.250.76.196: bytes=32 time=46ms TTL=118
Reply from 142.250.76.196: bytes=32 time=31ms TTL=118
Reply from 142.250.76.196: bytes=32 time=29ms TTL=118
Reply from 142.250.76.196: bytes=32 time=41ms TTL=118
Reply from 142.250.76.196: bytes=32 time=53ms TTL=118
Reply from 142.250.76.196: bytes=32 time=29ms TTL=118
Reply from 142.250.76.196: bytes=32 time=32ms TTL=118
Reply from 142.250.76.196: bytes=32 time=39ms TTL=118
Reply from 142.250.76.196: bytes=32 time=47ms TTL=118
Reply from 142.250.76.196: bytes=32 time=26ms TTL=118
Reply from 142.250.76.196: bytes=32 time=31ms TTL=118
Reply from 142.250.76.196: bytes=32 time=30ms TTL=118
Reply from 142.250.76.196: bytes=32 time=33ms TTL=118
Reply from 142.250.76.196: bytes=32 time=28ms TTL=118
Reply from 142.250.76.196: bytes=32 time=31ms TTL=118
Reply from 142.250.76.196: bytes=32 time=38ms TTL=118
Reply from 142.250.76.196: bytes=32 time=23ms TTL=118
Reply from 142.250.76.196: bytes=32 time=34ms TTL=118
Reply from 142.250.76.196: bytes=32 time=29ms TTL=118
```



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```
Command Prompt
C:\Users\bitma>ping www.google.com -a

Pinging www.google.com [142.250.76.196] with 32 bytes of data:
Reply from 142.250.76.196: bytes=32 time=40ms TTL=118
Reply from 142.250.76.196: bytes=32 time=35ms TTL=118
Reply from 142.250.76.196: bytes=32 time=41ms TTL=118
Reply from 142.250.76.196: bytes=32 time=30ms TTL=118

Ping statistics for 142.250.76.196:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 30ms, Maximum = 41ms, Average = 36ms

Command Prompt
C:\Users\bitma>ping www.google.com -n 2

Pinging www.google.com [142.250.76.196] with 32 bytes of data:
Reply from 142.250.76.196: bytes=32 time=28ms TTL=118
Reply from 142.250.76.196: bytes=32 time=41ms TTL=118

Ping statistics for 142.250.76.196:
    Packets: Sent = 2, Received = 2, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 28ms, Maximum = 41ms, Average = 34ms

Command Prompt
C:\Users\bitma>ping www.google.com -l 5

Pinging www.google.com [142.250.192.4] with 5 bytes of data:
Reply from 142.250.192.4: bytes=5 time=34ms TTL=59
Reply from 142.250.192.4: bytes=5 time=31ms TTL=59
Request timed out.
Reply from 142.250.192.4: bytes=5 time=109ms TTL=59

Ping statistics for 142.250.192.4:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:

Command Prompt
C:\Users\bitma>ping www.google.com -f

Pinging www.google.com [142.250.192.4] with 32 bytes of data:
Reply from 142.250.192.4: bytes=32 time=88ms TTL=59
Reply from 142.250.192.4: bytes=32 time=48ms TTL=59
Reply from 142.250.192.4: bytes=32 time=33ms TTL=59
Reply from 142.250.192.4: bytes=32 time=27ms TTL=59

Ping statistics for 142.250.192.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 27ms, Maximum = 88ms, Average = 49ms
```

3.getmac

Description:

The getmac command in Windows is used to display the MAC addresses (Media Access Control addresses) for network adapters on a system. A MAC address is a unique identifier assigned to network interfaces for communications at the data link layer of a network segment. Displays the MAC addresses and associated network transport names for all network adapters on the system.



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No.	Option	Description
1	getmac /s	Specifies the remote system to connect to.
2	getmac /v	Specifies that verbose output is displayed.
3	getmac /fo [format]	Specifies the format in which the output is to be displayed. Valid values: "TABLE", "LIST", "CSV".
4	getmac /nh	Specifies that the "Column Header" should not be displayed in the output. Valid only for TABLE and CSV formats.
5	getmac/u [domain\]user	Specifies the user context under which the command should execute.

Implementation:

```
Command Prompt
C:\Users\bitma>getmac /v

Connection Name Network Adapter Physical Address Transport Name
=====
Wi-Fi Intel(R) Dual B 32-40-D6-C6-E2-46 Media disconnected
Bluetooth Netwo Bluetooth Devic A4-6B-B6-11-A3-86 Media disconnected
Ethernet 2 Remote NDIS bas 76-78-9A-ED-E1-D5 \Device\Tcpip_{8CDA92A4-FA78-41C1-9DFE-3973F1E44B10}

C:\Users\bitma>GETMAC /FO TABLE

Physical Address Transport Name
=====
42-6E-D8-24-E9-8B Media disconnected

C:\Users\bitma>GETMAC /FO LIST

Physical Address: 42-6E-D8-24-E9-8B
Transport Name: Media disconnected

Command Prompt
C:\Users\bitma>getmac /NH

32-40-D6-C6-E2-46 Media disconnected
A4-6B-B6-11-A3-86 Media disconnected
76-78-9A-ED-E1-D5 \Device\Tcpip_{8CDA92A4-FA78-41C1-9DFE-3973F1E44B10}
```

4.systeminfo

Description:

The systeminfo command in Windows provides detailed information about the system configuration, including the operating system version, hardware resources, and network settings. It's a powerful tool for gathering comprehensive details about a computer.

No.	Option	Description
1	systeminfo /s	Specifies the remote system to connect to.
2	systeminfo /u [domain\]user	Specifies the user context under which the command should execute.
3	systeminfo /fo [format]	Specifies the format in which the output is to be displayed. Valid values: "TABLE", "LIST", "CSV".
4	systeminfo /nh	Specifies that the "Column Header" should



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		not be displayed in the output. Valid only for "TABLE" and "CSV" formats.
5	systeminfo /p [password]	Specifies the password for the given user context. Prompts for input if omitted.

Implementation:

```
Select Command Prompt
C:\Users\bitma>systeminfo

Host Name: KRISHU
OS Name: Microsoft Windows 11 Home Single Language
OS Version: 10.0.22631 N/A Build 22631
OS Manufacturer: Microsoft Corporation
OS Configuration: Standalone Workstation
OS Build Type: Multiprocessor Free
Registered Owner: bitmap_jam_201@outlook.com
Registered Organization:
Product ID: 00327-36295-61099-AAOEM
Original Install Date: 4/8/2024, 11:23:59 PM
System Boot Time: 6/24/2024, 12:22:25 PM
System Manufacturer: ASUSTEK COMPUTER INC.
System Model: VivoBook_ASUSLaptop X509DA_M509DA
System Type: x64-based PC
Processor(s): 1 Processor(s) Installed.
[01]: AMD64 Family 23 Model 24 Stepping 1 AuthenticAMD ~2600 Mhz
BIOS Version: American Megatrends Inc. X509DA.309, 10/8/2021
Windows Directory: C:\WINDOWS
System Directory: C:\WINDOWS\system32
Boot Device: \Device\HarddiskVolume5
System Locale: en-us;English (United States)
Input Locale: 00004009
Time Zone: (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi
Total Physical Memory: 3,535 MB
Available Physical Memory: 589 MB
Virtual Memory: Max Size: 12,751 MB
Virtual Memory: Available: 7,951 MB
Virtual Memory: In Use: 4,800 MB
Page File Location(s): D:\pagefile.sys
Domain: WORKGROUP
Logon Server: \KRISHU
Domain: WORKGROUP

Upcoming
Earnings

Select Command Prompt
Virtual Memory: Max Size: 12,751 MB
Virtual Memory: Available: 7,951 MB
Virtual Memory: In Use: 4,800 MB
Page File Location(s): D:\pagefile.sys
Domain: WORKGROUP
Logon Server: \KRISHU
Hotfix(s): 4 Hotfix(s) Installed.
[01]: KB5037591
[02]: KB5027397
[03]: KB5039212
[04]: KB5037959
Network Card(s): 3 NIC(s) Installed.
[01]: Intel(R) Dual Band Wireless-AC 8265
Connection Name: Wi-Fi
Status: Media disconnected
[02]: Bluetooth Device (Personal Area Network)
Connection Name: Bluetooth Network Connection
Status: Media disconnected
[03]: Remote NDIS based Internet Sharing Device
Connection Name: Ethernet 2
DHCP Enabled: Yes
DHCP Server: 192.168.188.104
IP address(es)
[01]: 192.168.188.169
[02]: fe80::b3f:5a1c:1f31:e537
[03]: 2409:4080:ce81:8899:6c23:a2d:f0ae:41de
[04]: 2409:4080:ce81:8899:ffb0:d613:eb4:6229
Hyper-V Requirements: A hypervisor has been detected. Features required for Hyper-V will not be displayed.

Command Prompt
C:\Users\bitma>systeminfo /fo csv
"Host Name","OS Name","OS Version","OS Manufacturer","OS Configuration","OS Build Type","Registered Owner","Registered Organization","Product ID","Original Install Date","System Boot Time","System Manufacturer","System Model","System Type","Processor(s)","BIOS Version","Windows Directory","System Directory","Boot Device","System Local e","Input Locale","Time Zone","Total Physical Memory","Available Physical Memory","Virtual Memory: Max Size","Virtual Memory: Available","Virtual Memory: In Use","Page File Location(s)","Domain","Logon Server","Hotfix(s)","Network Card(s)","Hyper-V Requirements"
"KRISHU","Microsoft Windows 11 Home Single Language","10.0.22631 N/A Build 22631","Microsoft Corporation","Standalone Workstation","Multiprocessor Free","bitmap_jam_201@outlook.com","","00327-36295-61099-AAOEM","4/8/2024, 11:23:59 PM","6/24/2024, 12:22:25 PM","ASUSTEK COMPUTER INC.,""VivoBook_ASUSLaptop X509DA_M509DA",""x64-based PC","1 Processor(s) Installed.,"[01]: AMD64 Family 23 Model 24 Stepping 1 AuthenticAMD ~2600 Mhz","American Megatrends Inc. X509DA.309, 10/8/2021","C:\WINDOWS","C:\WINDOWS\system32","Device\HarddiskVolume5","en-us;English (United States)","00004009","(UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi","3,535 MB","665 MB","12,751 MB","7,951 MB","4,819 MB","D:\pagefile.sys","WORKGROUP","\KRISHU","4 Hotfix(s) Installed.,"[01]: KB5037591,"[02]: KB5027397,"[03]: KB5039212,"[04]: KB5037959","3 NIC(s) Installed.,"[01]: Intel(R) Dual Band Wireless-AC 8265,""Connection Name: Wi-Fi,""Status: Media disconnected,"[02]: Bluetooth Device (Personal Area Network),""Connection Name: Bluetooth Network Connection,""Status: Media disconnected,"[03]: Remote NDIS based Internet Sharing Device,""Connection Name: Ethernet 2,""DHCP Enabled: Yes,""DHCP Server: 192.168.188.104,""IP address(es),"[01]: 192.168.188.169,"[02]: fe80::b3f:5a1c:1f31:e537,"[03]: 2409:4080:ce81:8899:6c23:a2d:f0ae:41de,"[04]: 2409:4080:ce81:8899:ffb0:d613:eb4:6229","A hypervisor has been detected. Features required for Hyper-V will not be displayed"
```




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```
Command Prompt
C:\Users\bitma>systeminfo /fo CSV /nh
"KRISHU","Microsoft Windows 11 Home Single Language","10.0.22631 N/A Build 22631","Microsoft Corporation","Standalone Workstation","Multiprocessor Free","bitmap_jam.201
@outlook.com","","00327-36295-61999-AAOEW","4/8/2024, 11:23:59 PM","6/24/2024, 12:22:25 PM","ASUSTek COMPUTER INC.,""VivoBook ASUSLaptop X509DA M509DA","x64-based PC","
1 Processor(s) Installed,[01]: AMD64 Family 23 Model 24 Stepping 1 AuthenticAMD ~2600 Mhz,""American Megatrends Inc. X509DA.300, 10/8/2021","C:\WINDOWS","C:\WINDOWS\sy
stem32","Device\HarddiskVolume5","en-us;English (United States)","00004009","(UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi","3,535 MB","626 MB","12,751 MB","7,885 MB
","4,806 MB","Device\HarddiskVolume5","WORKGROUP","KRISHU","4 Hotfix(es) Installed,[01]: KB5037591,[02]: KB5027397,[03]: KB5039212,[04]: KB5037959","3 NIC(s) Installed,[01]
: Intel(R) Dual Band Wireless-AC 8265, Connection Name: Wi-Fi, Status: Media disconnected,[02]: Bluetooth Device (Personal Area Network), Connec
tion Name: Bluetooth Network Connection, Status: Media disconnected,[03]: Remote NDIS based Internet Sharing Device, Connection Name: Ethernet 2,
DHCP Enabled: Yes, DHCP Server: 192.168.188.104, IP address(es), [01]: 192.168.188.169, [02]: fe80::b3f:5a1c:1f31:e537, [03]: 2409:400
8:ce81:8899:6c23:a2d:f0ae:41de, [04]: 2409:4008:ce81:8899:ffb0:d613:eb4d:6229","A hypervisor has been detected. Features required for Hyper-V will not be displayed
"
```

5. tracert/traceroute

Description:

The traceroute (Linux/macOS) or `tracert` (Windows) command is a network diagnostic tool used to trace the path that data packets take from one computer to another over a network. It helps identify the route and measure transit delays of packets across an IP network.

No.	Option	Description
1	<code>tracert -d [hostname or IP address]</code>	Do not resolve addresses to hostnames.
2	<code>tracert -h [maximum_hops] [hostname or IP address]</code>	Maximum number of hops to search for target.
3	<code>tracert -w [timeout] [hostname or IP address]</code>	Wait timeout milliseconds for each reply.
4	<code>Tracert -6</code>	Force using IPv6.
5	<code>Tracert -4</code>	Force using IPv4.

Implementation:

```
Command Prompt
C:\Users\bitma>tracert -d google.com

Tracing route to google.com [2404:6800:4009:80e::200e]
over a maximum of 30 hops:

  1  <1 ms    <1 ms    <1 ms    2409:4080:ce81:8899::3c
  2  *         *         *         Request timed out.
  3  35 ms     27 ms     37 ms     2405:200:324:eeee:20::210
  4  40 ms     27 ms     38 ms     2405:200:801:2700::6a
  5  *         *         *         Transmit error: code 1214.

Trace complete.

Command Prompt
C:\Users\bitma>tracert -h 5 google.com

Tracing route to google.com [2404:6800:4009:80e::200e]
over a maximum of 5 hops:

  1  <1 ms     <1 ms     <1 ms     2409:4080:ce81:8899::99
  2  *         *         *         Request timed out.
  3  69 ms     58 ms     58 ms     2405:200:324:eeee:20::210
  4  58 ms     54 ms     58 ms     2405:200:801:2700::6a
  5  *         *         *         Request timed out.

Trace complete.
```



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```
Command Prompt

C:\Users\bitma>tracert -w 1000 google.com

Tracing route to google.com [2404:6800:4009:82c::200e]
over a maximum of 30 hops:

  1  <1 ms    <1 ms    <1 ms    2409:4080:ce81:8899::99
  2  *         *         *         Request timed out.
  3  40 ms     37 ms     37 ms     2405:200:324:eeee:20::210
  4  48 ms     46 ms     35 ms     2405:200:801:2700::6c
  5  *         *         *         Request timed out.
  6  73 ms     70 ms     79 ms     2405:200:801:200::31b
  7  65 ms     57 ms     53 ms     2001:4860:1:1::3c8
  8  69 ms     62 ms     58 ms     2404:6800:80eb::1
  9  70 ms     58 ms     57 ms     2001:4860:0:1::49e4
 10  66 ms     65 ms     59 ms     2001:4860:0:1::876a
 11  56 ms     62 ms     61 ms     2001:4860:0:1::3fe5
 12  54 ms     56 ms     60 ms     2001:4860:0:1::269d
 13  58 ms     57 ms     58 ms     bom07s35-in-x0e.1e100.net [2404:6800:4009:82c::200e]

Trace complete.
```

```
Command Prompt

C:\Users\bitma>tracert -4 google.com

Tracing route to google.com [142.250.66.14]
over a maximum of 30 hops:

  1  <1 ms    <1 ms    <1 ms    192.168.188.104
  2  *         *         *         Request timed out.
  3  *         *         *         Request timed out.
  4  *         *         *         Request timed out.
  5  44 ms     41 ms     48 ms     172.17.185.2
  6  38 ms     37 ms     56 ms     192.168.168.10
  7  *         *         *         Request timed out.
  8  *         *         *         Request timed out.
  9  61 ms     64 ms     59 ms     173.194.121.8
 10  72 ms     147 ms    161 ms     192.178.111.159
 11  62 ms     65 ms     57 ms     72.14.236.219
 12  67 ms     66 ms     70 ms     bom07s35-in-f14.1e100.net [142.250.66.14]

Trace complete.
```

```
Command Prompt

C:\Users\bitma>tracert -6 google.com

Tracing route to google.com [2404:6800:4009:82f::200e]
over a maximum of 30 hops:

  1  <1 ms    <1 ms    <1 ms    2409:4080:ce81:8899::99
  2  *         *         *         Request timed out.
  3  50 ms     37 ms     40 ms     2405:200:324:eeee:20::210
  4  48 ms     37 ms     43 ms     2405:200:801:2700::6c
  5  *         *         *         Request timed out.
  6  *         *         *         Request timed out.
  7  80 ms     57 ms     66 ms     2405:200:802:760::8
  8  71 ms     57 ms     69 ms     2405:200:802:760::8
  9  *         *         *         Request timed out.
 10  75 ms     77 ms     78 ms     2001:4860:1:1::a14
 11  73 ms     65 ms     57 ms     2404:6800:8113::1
 12  74 ms     132 ms    77 ms     2001:4860:0:1::fb4
 13  105 ms    72 ms     77 ms     2001:4860:0:1::443
 14  67 ms     71 ms     65 ms     bom12s19-in-x0e.1e100.net [2404:6800:4009:82f::200e]

Trace complete.
```



Date: 28/6/2024

6.netstat

Description:

The netstat command in Windows, Linux, and macOS is a network utility that provides information about network connections, routing tables, interface statistics, masquerade connections, and multicast memberships. It is useful for network troubleshooting and performance measurement. Displays a list of active connections and listening ports.

No.	Option	Description
1	Netstat -a	Displays all connections and listening ports.
2	netstat -x	Displays NetworkDirect connections, listeners, and shared endpoints.
3	netstat -t	Displays the current connection offload state.
4	netstat -s	Displays per-protocol statistics. By default, statistics are shown for IP, IPv6, ICMP, ICMPv6, TCP, TCPv6, UDP, and UDPv6; the -p option may be used to specify a subset of the default002E
5	netstat -r	Displays the routing table.



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Implementation:

```
Command Prompt
C:\Users\bitma>netstat -a

Active Connections

Proto Local Address           Foreign Address         State
TCP    0.0.0.0:135              krishu:0               LISTENING
TCP    0.0.0.0:445              krishu:0               LISTENING
TCP    0.0.0.0:5040             krishu:0               LISTENING
TCP    0.0.0.0:7070             krishu:0               LISTENING
TCP    0.0.0.0:8733             krishu:0               LISTENING
TCP    0.0.0.0:49664            krishu:0               LISTENING
TCP    0.0.0.0:49665            krishu:0               LISTENING
TCP    0.0.0.0:49666            krishu:0               LISTENING
TCP    0.0.0.0:49667            krishu:0               LISTENING
TCP    0.0.0.0:49668            krishu:0               LISTENING
TCP    0.0.0.0:49669            krishu:0               LISTENING
TCP    127.0.0.1:27017          krishu:0               LISTENING
TCP    192.168.188.169:139      krishu:0               LISTENING
TCP    192.168.188.169:60678    relay-5166bfb0:https    ESTABLISHED
TCP    [::]:135                 krishu:0               LISTENING
TCP    [::]:445                  krishu:0               LISTENING
TCP    [::]:8733                 krishu:0               LISTENING
TCP    [::]:49664                krishu:0               LISTENING
TCP    [::]:49665                krishu:0               LISTENING
TCP    [::]:49666                krishu:0               LISTENING
TCP    [::]:49667                krishu:0               LISTENING
TCP    [::]:49668                krishu:0               LISTENING
TCP    [::]:49668                krishu:0               LISTENING

TCP    [::]:49669                krishu:0               LISTENING
TCP    [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:50333 sb-in-f188:5228         ESTABLISHED
TCP    [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60664 [2603:1040:a06:6::]:https ESTABLISHED
TCP    [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60728 160:https              TIME_WAIT
TCP    [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60729 160:https              TIME_WAIT
TCP    [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60732 25:https               TIME_WAIT
TCP    [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60737 117:https              TIME_WAIT
TCP    [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60738 117:https              TIME_WAIT
TCP    [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60741 160:https              TIME_WAIT
TCP    [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60742 160:https              TIME_WAIT
TCP    [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60747 [2405:200:1630:ff19::12]:https TIME_WAIT
TCP    [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60748 bom12s04-in-x03:https  TIME_WAIT
UDP    0.0.0.0:5050             *:.*                   *:*
UDP    0.0.0.0:5353             *:.*                   *:*
UDP    0.0.0.0:5353             *:.*                   *:*
UDP    0.0.0.0:5353             *:.*                   *:*
UDP    0.0.0.0:5355             *:.*                   *:*
UDP    0.0.0.0:50001            *:.*                   *:*
UDP    0.0.0.0:52168            *:.*                   *:*
UDP    0.0.0.0:56445            0.0.32.14:443         *:*
UDP    0.0.0.0:57629            *:.*                   *:*
UDP    0.0.0.0:59622            0.0.32.14:443         *:*
UDP    0.0.0.0:64663            0.0.0.18:443          *:*
UDP    127.0.0.1:1900           *:.*                   *:*
UDP    127.0.0.1:49664          127.0.0.1:49664       *:*
UDP    127.0.0.1:53610         *:.*                   *:*
UDP    192.168.188.169:137      *:.*                   *:*
UDP    192.168.188.169:138      *:.*                   *:*
UDP    192.168.188.169:1900     *:.*                   *:*
UDP    192.168.188.169:53609    *:.*                   *:
```



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```
Command Prompt
UDP 0.0.0.0:52168 *: *
UDP 0.0.0.0:56445 0.0.32.14:443
UDP 0.0.0.0:57629 *: *
UDP 0.0.0.0:59622 0.0.32.14:443
UDP 0.0.0.0:64663 0.0.0.18:443
UDP 127.0.0.1:1900 *: *
UDP 127.0.0.1:49664 127.0.0.1:49664
UDP 127.0.0.1:53610 *: *
UDP 192.168.188.169:137 *: *
UDP 192.168.188.169:138 *: *
UDP 192.168.188.169:1900 *: *
UDP 192.168.188.169:53609 *: *
UDP [::]:5353 *: *
UDP [::]:5353 *: *
UDP [::]:5355 *: *
UDP [::]:52168 *: *
UDP [::]:56445 [2404:6800:4009:81f::200e]:443
UDP [::]:57629 *: *
UDP [::]:59622 [2404:6800:4009:81e::200e]:443
UDP [::]:64663 [2405:200:1630:ff19::12]:443
UDP [::1]:1900 *: *
UDP [::1]:53608 *: *
UDP [fe80::b3f:5a1c:1f31:e537%15]:1900 *: *
UDP [fe80::b3f:5a1c:1f31:e537%15]:53607 *: *
```

```
Command Prompt
C:\Users\bitma>netstat -x

Active NetworkDirect Connections, Listeners, SharedEndpoints

Mode IfIndex Type Local Address Foreign Address PID
```

```
Command Prompt
C:\Users\bitma>netstat -t

Active Connections

Proto Local Address Foreign Address State Offload State
TCP 192.168.188.169:60678 relay-5166bfb0:https ESTABLISHED InHost
TCP [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:50333 sb-in-f188:5228 ESTABLISHED InHost
TCP [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60664 [2603:1040:a06:6::]:https ESTABLISHED InHost
TCP [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60760 [64:ff9b::348c:761c]:https TIME_WAIT InHost
TCP [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60765 [2603:1046:1406::5]:https TIME_WAIT InHost
TCP [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60769 [2620:1ec:bdf::72]:https TIME_WAIT InHost
TCP [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60771 [2603:1046:1400::1]:https ESTABLISHED InHost
TCP [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60775 os-in-x5e:https TIME_WAIT InHost
TCP [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]:60777 [64:ff9b::312c:8ce3]:https ESTABLISHED InHost
```

```
Command Prompt
C:\Users\bitma>netstat -s

IPv4 Statistics
Packets Received = 522761
Received Header Errors = 6
Received Address Errors = 1
Datagrams Forwarded = 0
Unknown Protocols Received = 0
Received Packets Discarded = 4896
Received Packets Delivered = 628184
Output Requests = 502610
Routing Discards = 0
Discarded Output Packets = 24
Output Packet No Route = 251
Reassembly Required = 0
Reassembly Successful = 0
Reassembly Failures = 0
Datagrams Successfully Fragmented = 0
Datagrams Failing Fragmentation = 0
Fragments Created = 0

IPv6 Statistics
Packets Received = 2501240
Received Header Errors = 0
Received Address Errors = 10
Datagrams Forwarded = 0
Unknown Protocols Received = 5
```



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```
Command Prompt
Unknown Protocols Received      = 5
Received Packets Discarded      = 139
Received Packets Delivered      = 2505409
Output Requests                 = 1028498
Routing Discards                = 0
Discarded Output Packets        = 0
Output Packet No Route         = 1189
Reassembly Required             = 0
Reassembly Successful           = 0
Reassembly Failures             = 0
Datagrams Successfully Fragmented = 0
Datagrams Failing Fragmentation = 0
Fragments Created              = 0

ICMPv4 Statistics

Received Sent
Messages      789 2143
Errors         0   0
Destination Unreachable 768 2104
Time Exceeded   18   0
Parameter Problems  0   0
Source Quench   0   0
Redirects       0   0
Echo Replies    3   0
Echos          0  39
Timestamps      0   0
Timestamp Replies 0   0
Address Masks   0   0
Address Mask Replies 0   0

Command Prompt
Timestamp Replies    0   0
Address Masks       0   0
Address Mask Replies 0   0
Router Solicitations 0   0
Router Advertisements 0   0

ICMPv6 Statistics

Received Sent
Messages      2134 2010
Errors         0   0
Destination Unreachable 12 39
Packet Too Big  0   0
Time Exceeded   136  0
Parameter Problems  0   1
Echos          0  188
Echo Replies    12   0
MLD Queries     0   0
MLD Reports     0   0
MLD Dones       0   0
Router Solicitations 0  25
Router Advertisements 318 0
Neighbor Solicitations 1571 136
Neighbor Advertisements 85 1621
Redirects        0   0
Router Renumbers 0   0

TCP Statistics for IPv4

Active Opens      = 6549
```



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```
Command Prompt

Active Opens           = 6549
Passive Opens          = 937
Failed Connection Attempts = 4086
Reset Connections      = 472
Current Connections    = 1
Segments Received      = 574890
Segments Sent          = 422082
Segments Retransmitted = 6338

TCP Statistics for IPv6

Active Opens           = 15647
Passive Opens          = 22
Failed Connection Attempts = 2497
Reset Connections      = 969
Current Connections    = 4
Segments Received      = 854699
Segments Sent          = 668332
Segments Retransmitted = 13530

UDP Statistics for IPv4

Datagrams Received     = 50024
No Ports               = 4157
Receive Errors         = 0
Datagrams Sent         = 55700

UDP Statistics for IPv6

Datagrams Received     = 1653212
No Ports               = 124
Receive Errors         = 3
Datagrams Sent         = 314515
```

```
Command Prompt

C:\Users\bitma>netstat -r

=====
Interface List
15...76 dc 5e 31 7c 79 .....Remote NDIS based Internet Sharing Device #2
14...26 3f b8 e9 2b bf .....Intel(R) Dual Band Wireless-AC 8265
11...a4 6b b6 11 a3 83 .....Microsoft Wi-Fi Direct Virtual Adapter
20...a6 6b b6 11 a3 82 .....Microsoft Wi-Fi Direct Virtual Adapter #2
16...a4 6b b6 11 a3 86 .....Bluetooth Device (Personal Area Network)
1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination        Netmask          Gateway           Interface        Metric
0.0.0.0                    0.0.0.0          192.168.188.104   192.168.188.169   25
127.0.0.0                  255.0.0.0        On-link          127.0.0.1         331
127.0.0.1                  255.255.255.255  On-link          127.0.0.1         331
127.255.255.255            255.255.255.255  On-link          127.0.0.1         331
192.168.188.0               255.255.255.0    On-link          192.168.188.169   281
192.168.188.169            255.255.255.255  On-link          192.168.188.169   281
192.168.188.255            255.255.255.255  On-link          192.168.188.169   281
224.0.0.0                  240.0.0.0        On-link          127.0.0.1         331
224.0.0.0                  240.0.0.0        On-link          192.168.188.169   281
255.255.255.255            255.255.255.255  On-link          127.0.0.1         331
255.255.255.255            255.255.255.255  On-link          192.168.188.169   281
=====
Persistent Routes:
```

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```
Command Prompt
Persistent Routes:
None

IPv6 Route Table
=====
Active Routes:
  If Metric Network Destination      Gateway
  15     41 ::/0                    fe80::dc76:88ff:fea4:d75c
  1     331 ::1/128                  On-link
  15     41 2409:4080:ce81:8899::/64 On-link
  15    281 2409:4080:ce81:8899:6c23:a2d:f0ae:41de/128
                                On-link
  15    281 2409:4080:ce81:8899:ffb0:d613:ebe4:6229/128
                                On-link
  15    281 fe80::/64                  On-link
  15    281 fe80::b3f:5a1c:1f31:e537/128
                                On-link
  1     331 ff00::/8                    On-link
  15    281 ff00::/8                    On-link
=====
Persistent Routes:
None
```

7.nslookup

Description:

The nslookup command is a network utility used for querying the Domain Name System (DNS) to obtain domain name or IP address mapping information. It helps troubleshoot DNS-related issues by allowing users to look up the IP address associated with a domain name and vice versa.

```
Command Prompt
C:\Users\bitma>nslookup youtube.com
Server: UnKnown
Address: 192.168.188.104

Non-authoritative answer:
Name: youtube.com
Addresses: 2404:6800:4009:81f::200e
          142.250.182.238
```

8.hostname

Description:

The hostname command is used to display the name of the current host (the computer you are using). It's a simple utility that shows the network name of the machine.

Implementation:

```
Command Prompt
C:\Users\bitma>hostname
krishu

C:\Users\bitma>hostname /?

Prints the name of the current host.

hostname
```




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9.pathping

Description:

The pathping command is a network utility in Windows that combines the functionality of `ping` and `tracert` to provide detailed information about network latency and packet loss at each hop between a source and destination.

No.	Option	Description
1	Pathping -n	Do not resolve addresses to hostnames.
2	Pathping -4	Force using IPv4.
3	Pathping -6	Force using IPv6.
4	Pathping -g	Loose source route along host-list.
5	Pathping -p peroid	Wait period milliseconds between pings.



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Implementation:

```
Command Prompt
C:\Users\bitma>pathping -n youtube.com

Tracing route to youtube.com [2404:6800:4009:805::200e]
over a maximum of 30 hops:
  0  2409:4080:ce81:8899:6c23:a2d:f0ae:41de
  1  2409:4080:ce81:8899::99
  2  * * *
Computing statistics for 25 seconds...
Hop  RTT      Source to Here   This Node/Link
    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0
  1    0ms      0/ 100 = 0%      0/ 100 = 0%    2409:4080:ce81:8899:6c23:a2d:f0ae:41de
  2
Trace complete.

Command Prompt
C:\Users\bitma>pathping -4 youtube.com

Tracing route to youtube.com [142.250.70.110]
over a maximum of 30 hops:
  0  krishu [192.168.188.169]
  1  192.168.188.104
  2  * * *
Computing statistics for 25 seconds...
Hop  RTT      Source to Here   This Node/Link
    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0
  1    0ms      0/ 100 = 0%      0/ 100 = 0%    krishu [192.168.188.169]
  2
Trace complete.

Select Command Prompt
C:\Users\bitma>pathping -6 youtube.com

Tracing route to youtube.com [2404:6800:4009:81f::200e]
over a maximum of 30 hops:
  0  krishu [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]
  1  2409:4080:ce81:8899::99
  2  * * *
Computing statistics for 25 seconds...
Hop  RTT      Source to Here   This Node/Link
    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0
  1    0ms      0/ 100 = 0%      0/ 100 = 0%    krishu [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]
  2
Trace complete.

Command Prompt
C:\Users\bitma>pathping -g youtube.com

Tracing route to youtube.com [142.250.70.110]
over a maximum of 30 hops:
  0  krishu [192.168.188.169]
  1  * * *
Computing statistics for 0 seconds...
Hop  RTT      Source to Here   This Node/Link
    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0
  1    0ms      0/ 100 = 0%      0/ 100 = 0%    krishu [192.168.188.169]
  2
Trace complete.
```



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```
Command Prompt
C:\Users\bitma>pathping -p 1000 youtube.com

Tracing route to youtube.com [2404:6800:4009:81f::200e]
over a maximum of 30 hops:
  0  krishu [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]
  1  2409:4080:ce81:8899::99
  2  * * *
Computing statistics for 100 seconds...
Hop  RTT      Source to Here   This Node/Link   Address
  0                                     krishu [2409:4080:ce81:8899:6c23:a2d:f0ae:41de]
  1    0ms      0/ 100 = 0%      0/ 100 = 0%      2409:4080:ce81:8899::99
Trace complete.
```

10.arp

Description:

The arp command is used to display and modify the ARP (Address Resolution Protocol) cache, which contains mappings of IP addresses to MAC (Media Access Control) addresses.

No.	Option	Description
1	Arp -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.
2	arp -g	Same as -a

Implementation:

```
Command Prompt
C:\Users\bitma>arp -a

Interface: 192.168.188.169 --- 0xf
Internet Address      Physical Address      Type
192.168.188.104       de-76-88-a4-d7-5c     dynamic
192.168.188.255       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
239.255.102.18        01-00-5e-7f-66-12     static
239.255.255.250       01-00-5e-7f-ff-fa     static
255.255.255.255       ff-ff-ff-ff-ff-ff     static

Command Prompt
C:\Users\bitma>arp -g

Interface: 192.168.188.169 --- 0xf
Internet Address      Physical Address      Type
192.168.188.104       de-76-88-a4-d7-5c     dynamic
192.168.188.255       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
239.255.102.18        01-00-5e-7f-66-12     static
239.255.255.250       01-00-5e-7f-ff-fa     static
255.255.255.255       ff-ff-ff-ff-ff-ff     static
```