AMRITA VISHWA VIDYAPEETHAM – CHENNAI CAMPUS
AMRITA SCHOOL OF COMPUTING
23CSE302 – COMPUTER NETWORKS

EXPERIMENT 1

INTRODUCTION TO NETWORK COMMANDS

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Objectives:

1. **Student will have an in-depth understanding of thevarious Network commands and their functionality**
2. **Students will have exposure how to use these networkcommands for troubleshooting**

AIM

To understand and use basic network commands to troubleshoot and analyze network issues. The commands covered in this experiment include netstat, ipconfig, ping, telnet, ifconfig, tracert, nslookup, and pathping.

SYSTEM AND SOFTWARE REQUIREMENTS

Windows command prompt/ Linux Terminal/ Mac Terminal

PROCEDURE

Step 1: Open the Windows Command Prompt

Step 2: Type the required command.

Step 3: Observe the output, and draw inferences.

COMMANDS OUTPUT

1) netstat

- netstat (Network Statistics) is a command-line network utility tool that provides information about active connections and network status.

- It is useful for observing and troubleshooting network connections, and viewing active TCP/UDP connections, listening ports, routing tables, network interface statistics and finding which programs are using network connections. We can use specific commands to view the above mentioned like:
- netstat –a : shows all active connections
- netstat –r : shows routing table
- netstat –s : shows statistics by protocol

O/P Snapshot:

```
C:\Users\exam>netstat

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    172.19.152.138:7680    172.19.151.103:51621   ESTABLISHED
  TCP    172.19.152.138:7680    202122AUGC256:57302    TIME_WAIT
  TCP    172.19.152.138:7680    202122AUGC256:57324    TIME_WAIT
  TCP    172.19.152.138:7680    202122AUGC256:57346    TIME_WAIT
  TCP    172.19.152.138:38553   4.213.25.241:https     ESTABLISHED
  TCP    172.19.152.138:38577   adc:microsoft-ds       ESTABLISHED
  TCP    172.19.152.138:38704   a184-28-110-102:https  ESTABLISHED
  TCP    172.19.152.138:38745   20.42.65.91:https      ESTABLISHED
  TCP    172.19.152.138:38746   40.126.18.33:https     ESTABLISHED
  TCP    172.19.152.138:38748   lcmaaa-al-in-f10:https  ESTABLISHED
  TCP    172.19.152.138:38761   40.79.167.8:https      ESTABLISHED
  TCP    172.19.152.138:38763   52.109.60.25:https     ESTABLISHED
  TCP    172.19.152.138:38766   40.99.9.50:https       ESTABLISHED
  TCP    172.19.152.138:38772   52.107.253.103:https   ESTABLISHED
  TCP    172.19.152.138:38773   a23-58-41-68:https     ESTABLISHED
  TCP    172.19.152.138:38789   13.107.6.163:https     ESTABLISHED
  TCP    172.19.152.138:38796   20.42.65.89:https      ESTABLISHED
  TCP    172.19.152.138:38797   40.99.181.130:https    ESTABLISHED
  TCP    172.19.152.138:38799   52.98.73.242:https     ESTABLISHED
  TCP    172.19.152.138:38800   a23-33-114-43:https    ESTABLISHED
  TCP    172.19.152.138:38803   a23-33-114-43:https    ESTABLISHED
  TCP    172.19.152.138:38806   40.104.42.210:https    ESTABLISHED
  TCP    172.19.152.138:38807   52.123.253.104:https   ESTABLISHED
  TCP    172.19.152.138:38808   40.100.141.162:https   ESTABLISHED
  TCP    172.19.152.138:38810   pnmaaa-az-in-f10:https  ESTABLISHED
  TCP    172.19.152.138:38812   a23-34-81-32:https     ESTABLISHED
  TCP    172.19.152.138:38813   52.168.117.169:https   ESTABLISHED
  TCP    172.19.152.138:38821   52.98.84.82:https      ESTABLISHED
  TCP    172.19.152.138:38822   52.102.111.139:https   ESTABLISHED
  TCP    172.19.152.138:38823   52.98.57.114:https     ESTABLISHED
  TCP    172.19.152.138:38833   a23-208-217-189:https  ESTABLISHED
  TCP    172.19.152.138:38834   a23-208-217-189:https  ESTABLISHED
  TCP    172.19.152.138:38839   52.108.8.12:https      ESTABLISHED
  TCP    172.19.152.138:38840   52.108.147.15:https    ESTABLISHED
  TCP    172.19.152.138:38849   lcmaaa-al-in-f10:https  ESTABLISHED
  TCP    172.19.152.138:38851   20.42.65.94:https      ESTABLISHED
  TCP    172.19.152.138:38856   52.96.173.178:https    ESTABLISHED
  TCP    172.19.152.138:38866   a23-33-114-43:https    ESTABLISHED
  TCP    172.19.152.138:38867   maa05s16-in-f10:https  ESTABLISHED
  TCP    172.19.152.138:38868   bom07s31-in-f14:https  ESTABLISHED
  TCP    172.19.152.138:38873   52.108.9.12:https      ESTABLISHED
  TCP    172.19.152.138:38877   a23-34-81-66:https     ESTABLISHED
  TCP    172.19.152.138:38881   20.190.146.32:https    ESTABLISHED
  TCP    172.19.152.138:38882   a23-41-186-120:https   ESTABLISHED
  TCP    172.19.152.138:38884   pnmaaa-az-in-f10:https  ESTABLISHED
  TCP    172.19.152.138:38885   40.126.17.134:https    ESTABLISHED
  TCP    172.19.152.138:38886   13.107.42.16:https     ESTABLISHED
  TCP    172.19.152.138:38887   a23-34-81-17:https     ESTABLISHED
  TCP    172.19.152.138:38888   a23-34-81-17:https     ESTABLISHED
```

2) ipconfig

- ipconfig (Internet Protocol Configuration) is a command-line network utility tool that provides information about network configuration of a computer.
- It is commonly used to display and manage the IP address configuration of a computer's network interfaces. This includes information such as the IP address, subnet mask and default gateway.
- **Ipconfig/all** : Provides more detailed view of network configuration including DHCP status, MAC address and DNS servers. It is useful for in-depth network diagnostics.

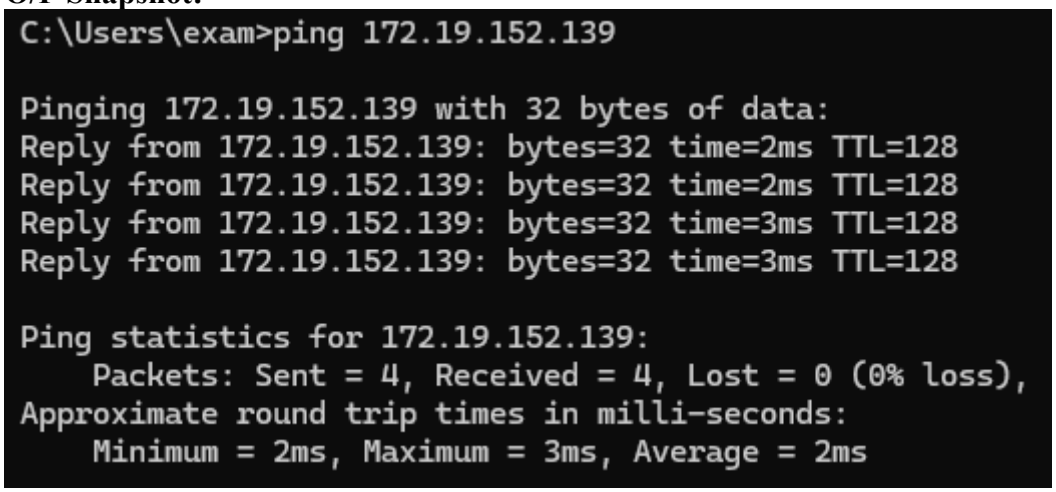
O/P Snapshot:

```
C:\Users\exam>ipconfig

Windows IP Configuration


Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . : ch.amrita.edu
   Link-local IPv6 Address . . . . . : fe80::cc4:6a17:2a02:bde5%13
   IPv4 Address. . . . . . . . . . . : 172.19.152.138
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 172.19.152.1

C:\Users\exam>ipconfig/all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : 202122AUGC278
   Primary Dns Suffix  . . . . . . . : ch.amrita.edu
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
   DNS Suffix Search List. . . . . . : ch.amrita.edu

Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . : ch.amrita.edu
   Description . . . . . . . . . . . : Intel(R) Ethernet Connection (11) I219-LM
   Physical Address. . . . . . . . . : 00-68-EB-C9-07-5F
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::cc4:6a17:2a02:bde5%13(Preferred)
   IPv4 Address. . . . . . . . . . . : 172.19.152.138(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : 16 June 2025 10:21:00
   Lease Expires . . . . . . . . . . : 16 June 2025 18:50:56
   Default Gateway . . . . . . . . . : 172.19.152.1
   DHCP Server . . . . . . . . . . . : 172.19.18.4
   DHCPv6 IAID . . . . . . . . . . . : 218130667
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2E-CE-84-14-00-68-EB-C9-07-5F
   DNS Servers . . . . . . . . . . . : 172.19.18.2
                                       172.19.18.4
   Primary WINS Server . . . . . . . : 172.19.18.2
   Secondary WINS Server . . . . . . : 172.19.18.4
   NetBIOS over Tcpip. . . . . . . . : Enabled
```

3) ping

- ping is a command-line network utility tool used to test the reachability of a host on a network.
- It measures the round-trip time for messages sent from the originating host to a destination computer.
- It is used for:
  - Checking internet connectivity where users ping a well-known server to verify internet connections.
  - Local network testing: To check status of devices like routers within local network.
  - Performance monitoring: By continuously pinging a server, users monitor network performance

O/P Snapshot:



4) telnet

- telnet is a network protocol used for remote communication and management of devices using the Telnet protocol.
- It allows users to log into another computer on the local network or the internet
- It has largely been replaced by more secure methods like SSH (Secure shell)

Process:

1. **Connection Establishment**: The user initiates a Telnet session by connecting to a remote server using a Telnet client, establishing a TCP connection on port 23.
2. **Negotiation**: The client and server negotiate options and capabilities, such as terminal type and character set, to ensure compatibility during the session.
3. **User Authentication**: The server prompts the user for a username and password, which are sent in plain text for verification. Successful authentication grants access to the remote system.
4. **Command Execution**: The user enters commands in the command-line interface, which are transmitted to the server. The server processes these commands and sends back the output to the client.
5. **Session Termination**: The session remains active until the user logs out or the connection is lost. The user can terminate the session, which closes the TCP connection and frees up resources.

5) ifconfig

- ifconfig (expand interface configuration) is a command-line utility in Unix-based operating systems for viewing and configuring network interface parameters.
- It is used to assign IP addresses, enable or disable network interfaces, and configure other network interface settings.

O/P Snapshot:

6) tracert

- tracert (Trace Route) is a network diagnostic tool that traces the path that an IP packet takes to reach a destination host.
- It lists all the router (hops) that the packet passes through and provides information about the time taken for each hop.
- It is useful for troubleshooting network connectivity issues.

O/P Snapshot:

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

Tracing route to www.google.com [142.251.42.4]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  172.19.152.1
  2     2 ms     2 ms     2 ms  136.232.19.1
  3    31 ms    31 ms    31 ms  49.44.59.153
  4    29 ms    29 ms    29 ms  74.125.51.62
  5    29 ms    29 ms    29 ms  74.125.37.7
  6    29 ms    29 ms    29 ms  209.85.248.61
  7    27 ms    27 ms    27 ms  bom12s19-in-f4.1e100.net [142.251.42.4]

Trace complete.
```

7) nslookup

- nslookup (Name Server Lookup) is a command-line network utility used to query Domain Name System (DNS) servers to obtain domain name or IP address mapping information.
- It is useful for troubleshooting DNS issues and verifying DNS configurations.

O/P Snapshot:

```
C:\Users\exam>nslookup
Default Server:  pdc.ch.amrita.edu
Address:  172.19.18.2

> nslookup www.google.com
Server:  www.google.com
Addresses:  2404:6800:4009:82f::2004
          142.251.42.4

*** www.google.com can't find nslookup: No response from server
> |
```

8) pathping

- pathping is a network diagnostic tool that combines the features of ping and tracert.
- It provides information about the latency taken by packets to reach a destination and tests packet loss on the way.
- It gives detailed statistics on each hop along the route, making it useful for network diagnostics.

O/P Snapshot:

```
C:\Users\exam>pathping www.google.com

Tracing route to www.google.com [142.251.221.228]
over a maximum of 30 hops:
  0  202122AUGC278.ch.amrita.edu [172.19.152.138]
  1  172.19.152.1
  2  136.232.19.1
  3  49.44.59.153
  4  74.125.51.62
  5  142.251.76.23
  6  209.85.240.55
  7  pnbomb-bk-in-f4.1e100.net [142.251.221.228]

Computing statistics for 175 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           202122AUGC278.ch.amrita.edu [172.19.152.138]
                                   0/ 100 =  0%   |
  1    1ms     0/ 100 =  0%     0/ 100 =  0%  172.19.152.1
                                   0/ 100 =  0%   |
  2    1ms     0/ 100 =  0%     0/ 100 =  0%  136.232.19.1
                                   0/ 100 =  0%   |
  3   31ms     0/ 100 =  0%     0/ 100 =  0%  49.44.59.153
                                   0/ 100 =  0%   |
  4   29ms     0/ 100 =  0%     0/ 100 =  0%  74.125.51.62
                                   0/ 100 =  0%   |
  5   29ms     0/ 100 =  0%     0/ 100 =  0%  142.251.76.23
                                   0/ 100 =  0%   |
  6   32ms     0/ 100 =  0%     0/ 100 =  0%  209.85.240.55
                                   0/ 100 =  0%   |
  7   32ms     0/ 100 =  0%     0/ 100 =  0%  pnbomb-bk-in-f4.1e100.net [142.251.221.228]

Trace complete.
```

RESULT

Learned and implemented basic network commands to troubleshoot and analyze network issues. The commands covered in this experiment include netstat, ipconfig, ping, telnet, ifconfig, tracert, nslookup, and pathping.

INFERENCE:

1. ipconfig and ifconfig have similar usage but used in different operating systems – ipconfig (windows) and ifconfig (linux), and the key difference between them being ipconfig is primarily focused on displaying and managing IP configuration, while ifconfig provides more extensive control over network interfaces, including enabling/disabling interfaces and configuring various parameters.
2. pathping is a network diagnostic tool that combines the features of ping and tracert.
3. Telnet protocol sends data as plain text making it vulnerable and thereby replaced by Secure shell protocol which encrypts the transferred data.