Experiment 2

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1. **Aim**: Study of basic network command and Network configuration commands
2. **Objectives:**
   a) To understand the purpose and usage of basic network commands.
   b) To explore and troubleshoot network routes and configurations.
   c) To configure and manage network interfaces and settings.
   d) To capture and analyze network traffic for security and performance.
   e) To monitor network performance and bandwidth usage.
3. **Apparatus used:** OS, Command Prompt and packet tracer
4. **Theory:**

   Network troubleshooting involves diagnosing and resolving issues affecting network connectivity and performance. Key commands such as `ping`, `tracert`, and `nslookup` help identify whether a network host is reachable, trace the path of data packets, and resolve DNS queries, respectively. `ipconfig` displays network configuration details, while `netstat` provides information on active connections. `arp` manages the mapping of IP addresses to MAC addresses. `pathping` combines features of `ping` and `tracert` to offer insights into network paths and packet loss. These tools and commands are essential for diagnosing network issues and ensuring smooth network operations.

❖ **Basic Network & Configuration Commands:**

4.1. Ping: Packet Internet Groper

Usage: ping [hostname/IP address]

- **Description:** Tests connectivity to a specific IP/ Hostname. Verifies IP level connectivity to another TCP/IP by sending Internet control message protocol (ICMP) echo request messages.

4.2. ipconfig (Windows)/ ifconfig (linux)

Usage: ipconfig

- **Description:** Displays the current network configuration, including IP addresses, subnet masks, and default gateways.

4.3. traceroute (tracert Windows)

Usage: traceroute [hostname/IP Address] OR tracert [hostname/ipconfig]

- **Description:** Displays the route packets take to reach a network host.

4.4. Netstat

Usage: netsat

- **Description:** Displays network connections, routing tables, interface statistics, masquerade connections and multicast memberships.

4.5. hostname

Usage: hostname

- **Description:** displays or sets the system hostname.

4.6. Arp (Address Resolution Protocol)

Usage: arp

- **Description:** Displays the ARP table, which maps the IP address to MAC address.

4.7. route

Usage: usage (Linux) OR route print (Windows)

- **Description:** Displays or modifies the routing table.

4.8. curl or wget

Usage: curl [URL] OR wget[URL]

- **Description:** Stands for client URL, is a command line tool that developers use to transfer data to and from a server. At the most fundamental, cURL lets you talk to a server by specifying the location (in the form of a URL) and the data you want to send.

4.9. getmac

Usage: getmac

- **Description:** It reveals the unique identifiers for your network adapters, making it useful for network troubleshooting and verifying that each device has its own distinct digital fingerprint.

4.10. nslookup

Usage: nslookup [hostname]

- **Description:** Queries the DNS to obtain domain name or IP address mapping.

5. Implementation:

a) Open Command Prompt or terminal. If using packet tracer, ensure it is installed or running.

b) Go to command prompt and type the commands:-

- **Configuration commands:** ipconfig, route, hostname
- **Basic network commands:** Ping, tracert, netstat, arp, getmac

6. Output:

```
C:\Users\GAGANJOT SINGH>ping skyscanner.com

Pinging skyscanner.com [76.223.21.241] with 32 bytes of data:
Reply from 76.223.21.241: bytes=32 time=34ms TTL=249
Reply from 76.223.21.241: bytes=32 time=21ms TTL=249
Reply from 76.223.21.241: bytes=32 time=24ms TTL=249
Reply from 76.223.21.241: bytes=32 time=20ms TTL=249

Ping statistics for 76.223.21.241:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 20ms, Maximum = 34ms, Average = 24ms
```

a) ping

```
C:\Users\GAGANJOT SINGH>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  . :
   Link-local IPv6 Address . . . . . : fe80::6232:fcd1:fb4d:e4ca%16
   IPv4 Address. . . . . . . . . . . : 192.168.1.6
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::1%16
                                       192.168.1.1

Ethernet adapter Bluetooth Network Connection:

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

b) ipconfig

```
C:\Users\GAGANJOT SINGH>tracert skyscanner.com

Tracing route to skyscanner.com [76.223.21.241]
over a maximum of 30 hops:

  1     8 ms     3 ms     1 ms  192.168.1.1
  2     4 ms     4 ms     1 ms  11.41.4.1
  3    24 ms     6 ms     4 ms  103.152.40.5
  4    46 ms    17 ms    15 ms  103.172.130.1
  5    69 ms    15 ms    13 ms  as16509.del.extreme-ix.net [45.120.248.14]
  6     *        *        *     Request timed out.
  7     *        *        *     Request timed out.
  8     *        *        *     Request timed out.
  9    33 ms    21 ms    15 ms  52.93.116.31
 10    14 ms    16 ms    13 ms  52.93.116.142
 11    28 ms    14 ms    13 ms  a1354747402ef4483.awsglobalaccelerator.com [76.223.21.241]

Trace complete.
```

c) tracert

```
C:\Users\GAGANJOT SINGH>hostname
SKYLAR
```

d) hostname

e) netstat

```
C:\Users\GAGANJOT SINGH>netstat

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    127.0.0.1:5141         SKYLAR:56996           ESTABLISHED
  TCP    127.0.0.1:49674        SKYLAR:49675           ESTABLISHED
  TCP    127.0.0.1:49675        SKYLAR:49674           ESTABLISHED
  TCP    127.0.0.1:49679        SKYLAR:49680           ESTABLISHED
  TCP    127.0.0.1:49680        SKYLAR:49679           ESTABLISHED
  TCP    127.0.0.1:49681        SKYLAR:49682           ESTABLISHED
  TCP    127.0.0.1:49682        SKYLAR:49681           ESTABLISHED
  TCP    127.0.0.1:49683        SKYLAR:49684           ESTABLISHED
  TCP    127.0.0.1:49684        SKYLAR:49683           ESTABLISHED
  TCP    127.0.0.1:49685        SKYLAR:49686           ESTABLISHED
  TCP    127.0.0.1:49686        SKYLAR:49685           ESTABLISHED
  TCP    127.0.0.1:49687        SKYLAR:49688           ESTABLISHED
  TCP    127.0.0.1:49688        SKYLAR:49687           ESTABLISHED
  TCP    127.0.0.1:49690        SKYLAR:49691           ESTABLISHED
  TCP    127.0.0.1:49691        SKYLAR:49690           ESTABLISHED
  TCP    127.0.0.1:56996        SKYLAR:5141            ESTABLISHED
  TCP    192.168.1.6:49689      20.198.119.143:https   ESTABLISHED
  TCP    192.168.1.6:60399      52.98.34.194:https     ESTABLISHED
  TCP    192.168.1.6:60400      52.98.34.194:https     ESTABLISHED
  TCP    192.168.1.6:60641      52.109.124.28:https    CLOSE_WAIT
  TCP    192.168.1.6:60642      152.195.38.76:http     CLOSE_WAIT
  TCP    192.168.1.6:60997      20.187.186.89:https    ESTABLISHED
  TCP    192.168.1.6:61125      a23-32-29-99:https     CLOSE_WAIT
  TCP    192.168.1.6:61132      whatsapp-chatd-edge-shv-01-del1:https  TIME_WAIT
  TCP    192.168.1.6:61133      whatsapp-cdn-shv-01-del1:https  ESTABLISHED
  TCP    192.168.1.6:61134      whatsapp-cdn-shv-01-del1:https  CLOSE_WAIT
  TCP    192.168.1.6:61135      whatsapp-cdn-shv-02-bom2:https  CLOSE_WAIT
  TCP    192.168.1.6:61136      whatsapp-cdn-shv-02-del2:https  CLOSE_WAIT
  TCP    192.168.1.6:61137      whatsapp-cdn-shv-01-bom1:https  CLOSE_WAIT
  TCP    192.168.1.6:61138      whatsapp-cdn-shv-01-bom2:https  CLOSE_WAIT
  TCP    192.168.1.6:61139      whatsapp-cdn-shv-03-bom2:https  CLOSE_WAIT
  TCP    192.168.1.6:61140      whatsapp-cdn-shv-01-del2:https  CLOSE_WAIT
  TCP    192.168.1.6:61141      whatsapp-cdn-shv-01-bom2:https  CLOSE_WAIT
  TCP    192.168.1.6:61142      whatsapp-cdn-shv-02-bom2:https  CLOSE_WAIT
  TCP    192.168.1.6:61143      whatsapp-cdn-shv-02-bom1:https  CLOSE_WAIT
  TCP    192.168.1.6:61144      whatsapp-cdn-shv-02-bom2:https  CLOSE_WAIT
  TCP    192.168.1.6:61145      whatsapp-cdn-shv-01-del2:https  CLOSE_WAIT
  TCP    192.168.1.6:61146      whatsapp-cdn-shv-03-bom2:https  CLOSE_WAIT
  TCP    192.168.1.6:61147      whatsapp-cdn-shv-02-del2:https  CLOSE_WAIT
  TCP    192.168.1.6:61148      whatsapp-cdn-shv-01-del2:https  CLOSE_WAIT
  TCP    192.168.1.6:61149      whatsapp-cdn-shv-01-bom1:https  CLOSE_WAIT
  TCP    192.168.1.6:61150      whatsapp-cdn-shv-02-del1:https  CLOSE_WAIT
  TCP    192.168.1.6:61151      whatsapp-cdn-shv-02-bom1:https  CLOSE_WAIT
  TCP    192.168.1.6:61152      whatsapp-cdn-shv-02-del1:https  CLOSE_WAIT
  TCP    192.168.1.6:61153      whatsapp-cdn-shv-02-del1:https  CLOSE_WAIT
  TCP    192.168.1.6:61154      whatsapp-chatd-edge-shv-01-del1:https  TIME_WAIT
```

f) getmac

```
C:\Users\GAGANJOT SINGH>getmac

Physical Address    Transport Name
=================== ============================================================
C0-18-50-B0-98-B6   Media disconnected
A0-59-50-99-B6-6E   \Device\Tcpip_{A41A8586-30A1-44C5-94FA-B62BC9CCFFB7}
A0-59-50-99-B6-72   Media disconnected
```

```
C:\Users\GAGANJOT SINGH>arp -a

Interface: 192.168.1.6 --- 0x10
  Internet Address      Physical Address      Type
  192.168.1.1           1c-18-4a-73-49-70     dynamic
  192.168.1.255         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
```

g) arp

```
C:\Users\GAGANJOT SINGH>pathping skyscanner.com

Tracing route to skyscanner.com [76.223.21.241]
over a maximum of 30 hops:
  0  SKYLAR [192.168.1.6]
  1  192.168.1.1
  2  11.41.4.1
  3  103.152.40.5
  4  103.172.130.1
  5  as16509.del.extreme-ix.net [45.120.248.14]
  6     *        *        *
Computing statistics for 125 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           SKYLAR [192.168.1.6]
                                    0/ 100 =  0%   |
  1   20ms     0/ 100 =  0%     0/ 100 =  0%  192.168.1.1
                                    0/ 100 =  0%   |
  2   16ms     1/ 100 =  1%     1/ 100 =  1%  11.41.4.1
                                    0/ 100 =  0%   |
  3   22ms     0/ 100 =  0%     0/ 100 =  0%  103.152.40.5
                                    0/ 100 =  0%   |
  4   27ms     0/ 100 =  0%     0/ 100 =  0%  103.172.130.1
                                    0/ 100 =  0%   |
  5   25ms     0/ 100 =  0%     0/ 100 =  0%  as16509.del.extreme-ix.net [45.120.248.14]

Trace complete.
```

h) pathping

i) nslookup

```
C:\Users\GAGANJOT SINGH>nslookup skyscanner.com
Server:  UnKnown
Address:  192.168.1.1

Non-authoritative answer:
Name:    skyscanner.com
Addresses:  76.223.21.241
          13.248.155.102
```

7. **Learning Outcome:**
   - To use ping and traceroute to check network connectivity and diagnose connection issues.
   - To view and understand network configurations with ipconfig (Windows) and ifconfig (Linux).
   - To utilize nslookup for DNS queries and hostname to manage system names.
   - To manage routing tables and view IP-to-MAC address mappings using route and arp.
   - To download content from web servers using curl and wget commands.