LAB 2: Network Commands for Testing and Troubleshooting

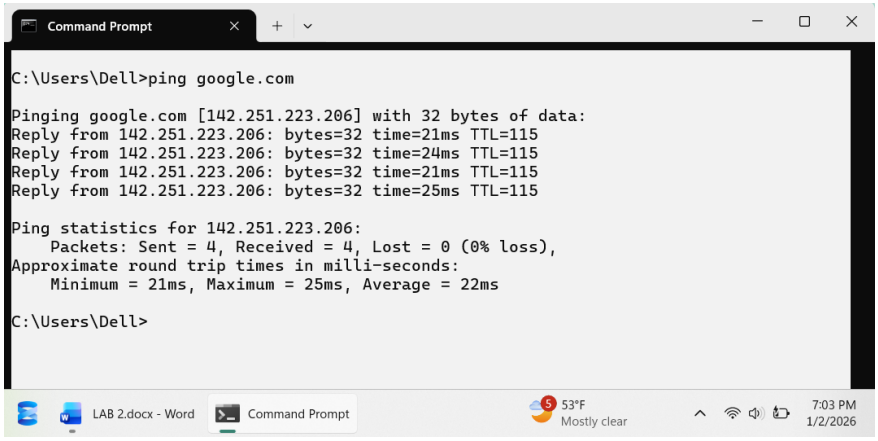
Objectives:

- To learn and practice essential network commands used for testing, monitoring, and troubleshooting network connectivity.
- To analyze network configurations, connectivity, and routing to identify and resolve potential network issues.

Theory:

In computer networks, efficient communication and troubleshooting are essential for maintaining connectivity and performance. Network commands are tools that allow users and administrators to monitor, test, and diagnose network issues. By using these commands, we can check connectivity, view configuration details, trace routes, and detect problems in both local and remote networks. This lab focuses on learning common network commands that are widely used for testing and troubleshooting purposes, providing practical skills for network management. Some network commands include:

1. ping

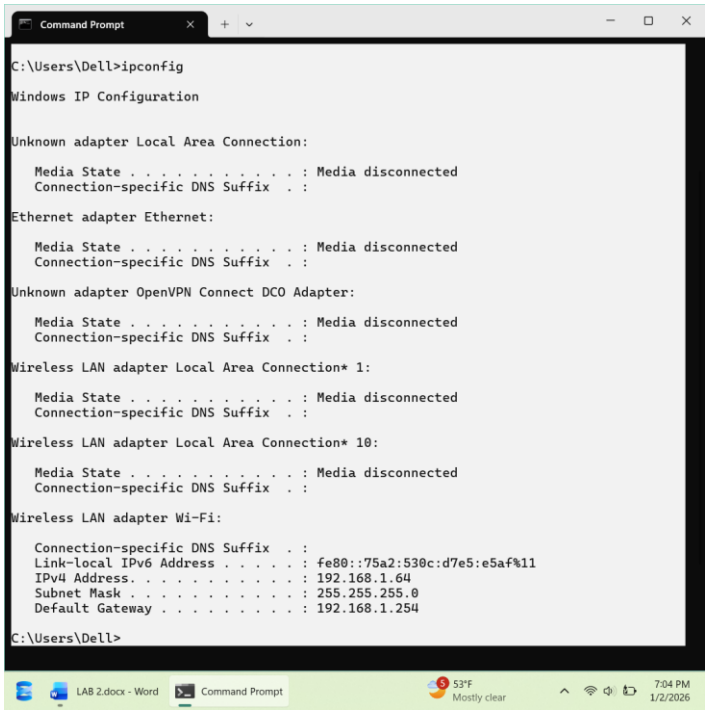


   - Tests connectivity between your computer and another host.
   - Sends ICMP packets to a destination and shows the response time.
   - Syntax:

     ping <hostname or IP>

2. ipconfig
   - Displays the current network configuration of the system.
   - Can be used to release and renew IP addresses.
   - Syntax:

     ipconfig

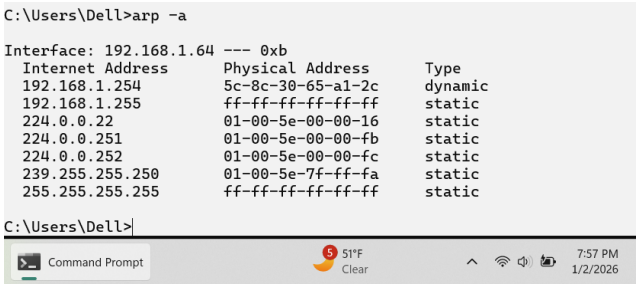


3. tracert

- Shows the path that packets take to reach a destination.
- Helps identify network delays or failures along the route.
- Syntax:

  tracert <hostname or IP>

4. arp -a

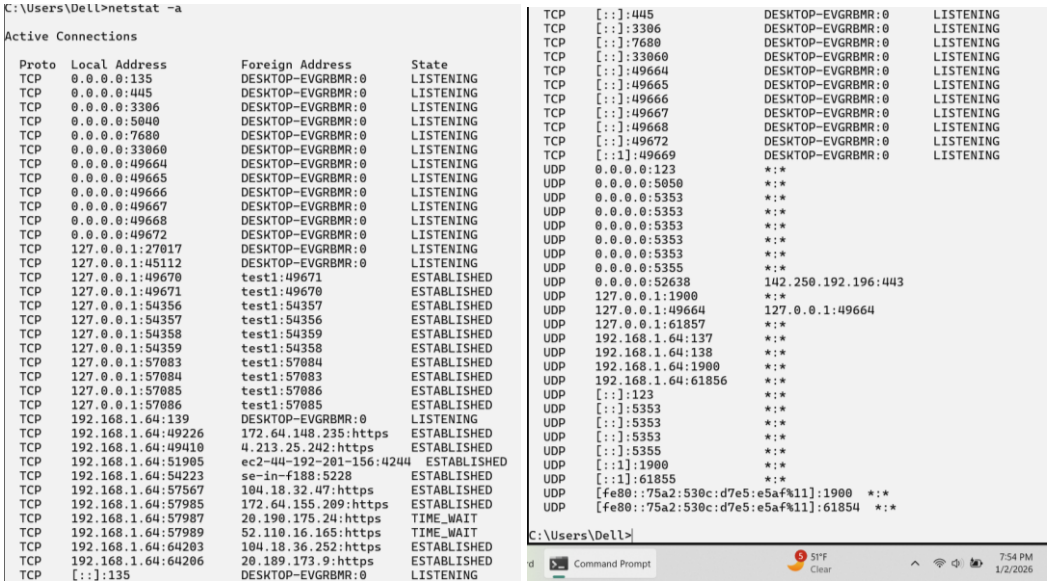


- Shows the ARP (Address Resolution Protocol) table of the system.
- Displays IP-to-MAC address mappings on the local network.

- Syntax:

  arp -a

5. netstat



```
C:\Users\Dell>netstat -a

Active Connections

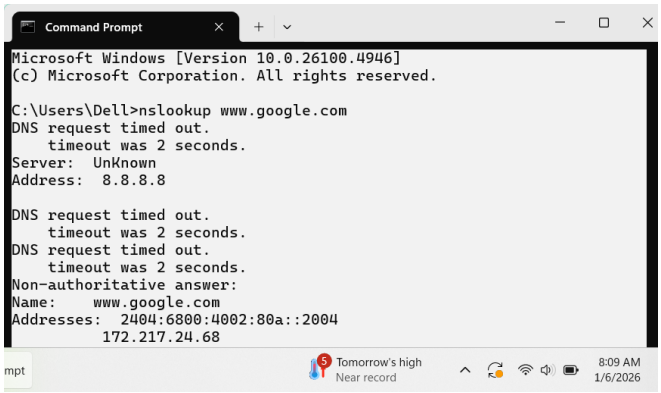
  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            DESKTOP-EVGRBMR:0      LISTENING
  TCP    0.0.0.0:445            DESKTOP-EVGRBMR:0      LISTENING
  TCP    0.0.0.0:3306           DESKTOP-EVGRBMR:0      LISTENING
  TCP    0.0.0.0:5040           DESKTOP-EVGRBMR:0      LISTENING
  TCP    0.0.0.0:7680           DESKTOP-EVGRBMR:0      LISTENING
  TCP    0.0.0.0:33060          DESKTOP-EVGRBMR:0      LISTENING
  TCP    0.0.0.0:49664          DESKTOP-EVGRBMR:0      LISTENING
  TCP    0.0.0.0:49665          DESKTOP-EVGRBMR:0      LISTENING
  TCP    0.0.0.0:49666          DESKTOP-EVGRBMR:0      LISTENING
  TCP    0.0.0.0:49667          DESKTOP-EVGRBMR:0      LISTENING
  TCP    0.0.0.0:49668          DESKTOP-EVGRBMR:0      LISTENING
  TCP    0.0.0.0:49672          DESKTOP-EVGRBMR:0      LISTENING
  TCP    127.0.0.1:27017        DESKTOP-EVGRBMR:0      LISTENING
  TCP    127.0.0.1:45112        DESKTOP-EVGRBMR:0      LISTENING
  TCP    127.0.0.1:49670        test1:49671            ESTABLISHED
  TCP    127.0.0.1:49671        test1:49670            ESTABLISHED
  TCP    127.0.0.1:54356        test1:54357            ESTABLISHED
  TCP    127.0.0.1:54357        test1:54356            ESTABLISHED
  TCP    127.0.0.1:54358        test1:54359            ESTABLISHED
  TCP    127.0.0.1:54359        test1:54358            ESTABLISHED
  TCP    127.0.0.1:57083        test1:57084            ESTABLISHED
  TCP    127.0.0.1:57084        test1:57083            ESTABLISHED
  TCP    127.0.0.1:57085        test1:57086            ESTABLISHED
  TCP    127.0.0.1:57086        test1:57085            ESTABLISHED
  TCP    192.168.1.64:139       DESKTOP-EVGRBMR:0      LISTENING
  TCP    192.168.1.64:49226     172.64.148.235:https   ESTABLISHED
  TCP    192.168.1.64:49410     4.213.25.242:https     ESTABLISHED
  TCP    192.168.1.64:51905     ec2-44-192-201-156:4244  ESTABLISHED
  TCP    192.168.1.64:54223     se-in-f188:5228        ESTABLISHED
  TCP    192.168.1.64:57567     104.18.32.47:https     ESTABLISHED
  TCP    192.168.1.64:57985     172.64.155.209:https   ESTABLISHED
  TCP    192.168.1.64:57987     20.190.175.24:https    TIME_WAIT
  TCP    192.168.1.64:57989     52.110.16.165:https    TIME_WAIT
  TCP    192.168.1.64:64203     104.18.36.252:https    ESTABLISHED
  TCP    192.168.1.64:64206     20.189.173.9:https     ESTABLISHED
  TCP    [::]:135               DESKTOP-EVGRBMR:0      LISTENING
  TCP    [::]:445               DESKTOP-EVGRBMR:0      LISTENING
  TCP    [::]:3306              DESKTOP-EVGRBMR:0      LISTENING
  TCP    [::]:7680              DESKTOP-EVGRBMR:0      LISTENING
  TCP    [::]:33060             DESKTOP-EVGRBMR:0      LISTENING
  TCP    [::]:49664             DESKTOP-EVGRBMR:0      LISTENING
  TCP    [::]:49665             DESKTOP-EVGRBMR:0      LISTENING
  TCP    [::]:49666             DESKTOP-EVGRBMR:0      LISTENING
  TCP    [::]:49667             DESKTOP-EVGRBMR:0      LISTENING
  TCP    [::]:49668             DESKTOP-EVGRBMR:0      LISTENING
  TCP    [::]:49672             DESKTOP-EVGRBMR:0      LISTENING
  TCP    [::1]:49669            DESKTOP-EVGRBMR:0      LISTENING
  UDP    0.0.0.0:123            *:*
  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    0.0.0.0:5353           *:*
  UDP    0.0.0.0:5353           *:*
  UDP    0.0.0.0:5355           *:*
  UDP    0.0.0.0:52638          142.250.192.196:443
  UDP    127.0.0.1:1900         *:*
  UDP    127.0.0.1:49664        127.0.0.1:49664
  UDP    127.0.0.1:61857        *:*
  UDP    192.168.1.64:137       *:*
  UDP    192.168.1.64:138       *:*
  UDP    192.168.1.64:1900      *:*
  UDP    192.168.1.64:61856     *:*
  UDP    [::]:123               *:*
  UDP    [::]:5353              *:*
  UDP    [::]:5353              *:*
  UDP    [::]:5353              *:*
  UDP    [::]:5355              *:*
  UDP    [::1]:1900             *:*
  UDP    [::1]:61855            *:*
  UDP    [fe80::75a2:530c:d7e5:e5af%11]:1900  *:*
  UDP    [fe80::75a2:530c:d7e5:e5af%11]:61854  *:*

C:\Users\Dell>
```

- Displays active network connections, listening ports, and protocol statistics.
- Useful to identify network activity and open connections.
- Syntax:

  netstat -a

6. nslookup



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Command Prompt
Microsoft Windows [Version 10.0.26100.4946]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Dell>nslookup www.google.com
DNS request timed out.
    timeout was 2 seconds.
Server:  UnKnown
Address:  8.8.8.8

DNS request timed out.
    timeout was 2 seconds.
DNS request timed out.
    timeout was 2 seconds.
Non-authoritative answer:
Name:    www.google.com
Addresses:  2404:6800:4002:80a::2004
          172.217.24.68
```

- Queries DNS servers to find the IP address of a domain or vice versa.
- Helps troubleshoot DNS-related issues.
- Syntax:

  nslookup <domain>

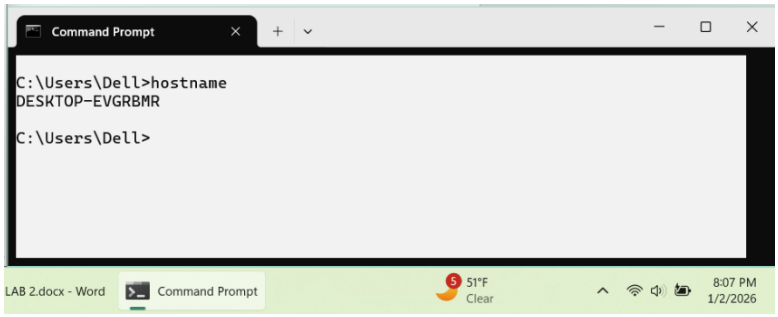
7. telnet

   - Tests TCP connectivity to a specific port on a remote host.
   - Useful to verify if a service is running on a specific port.
   - Syntax:

     telnet <hostname> <port>

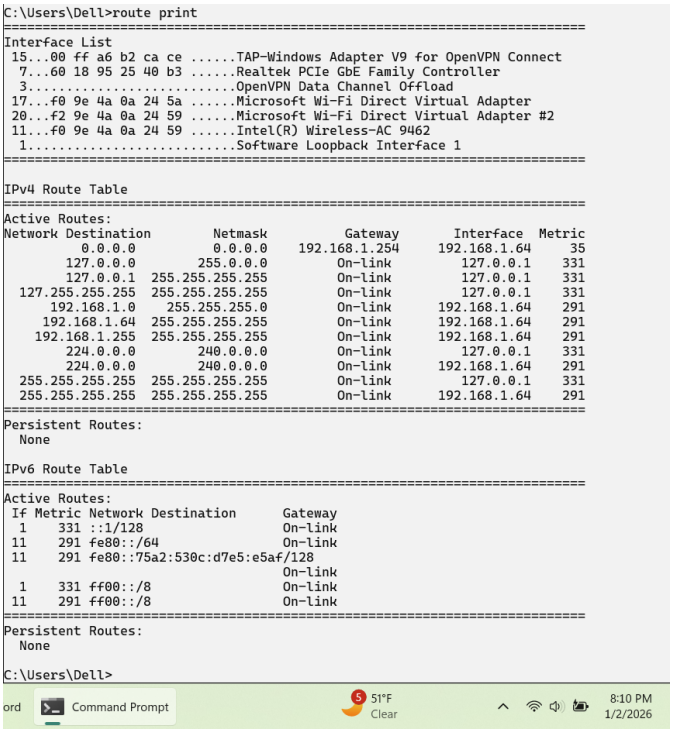
8. hostname
   - Displays the name of the local computer.
   - Syntax:

     hostname



9. route print

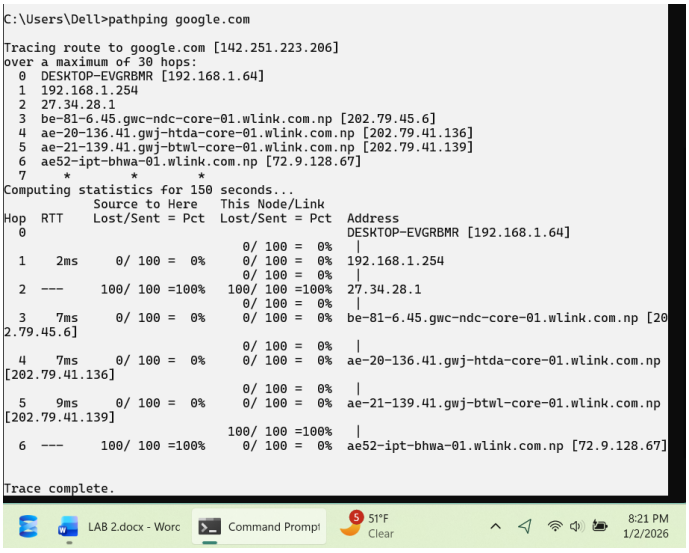
- Shows the routing table of the system.



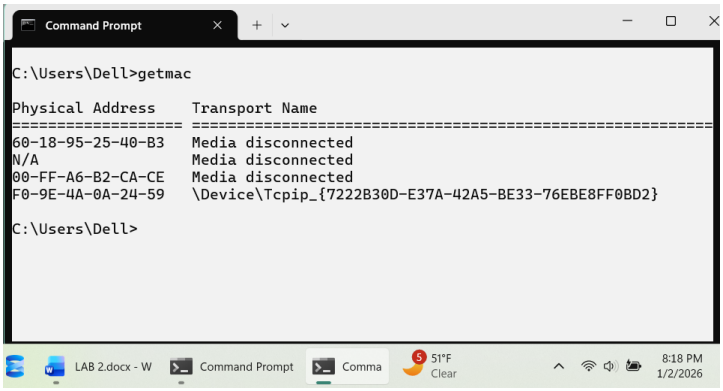
10. pathping

- Combines ping and tracert functionalities to detect packet loss along a path.
- Syntax:

  route print



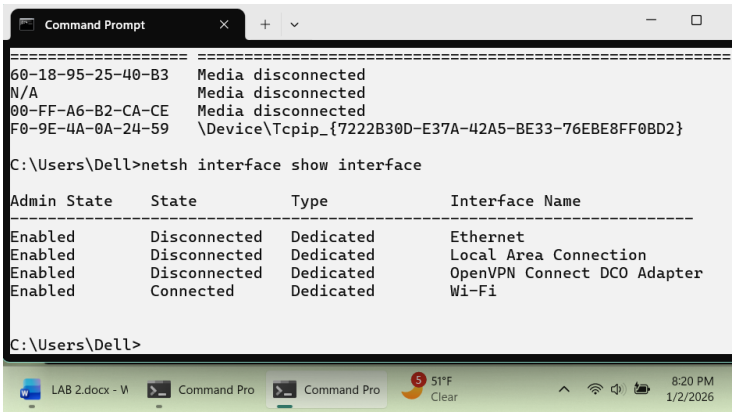
11. getmac



- Displays the MAC address of the network interfaces.
- Syntax:

  getmac

12. netsh



- Configures network interfaces, firewall, and other network settings from the command line.
- Syntax:

  netsh interface show interface

  netsh interface ip show config

Discussion and Conclusion:

In this lab, we explored essential network commands to test and troubleshoot connectivity and configurations. Commands like ping and tracert helped verify reachability and trace the path of data packets, while ipconfig, getmac, and hostname provided insight into local network settings. Tools such as nslookup, arp -a, and netstat allowed us to check DNS resolution, IP-to-MAC mappings, and active connections, which are vital for diagnosing network problems. Commands like telnet and pathping helped test service availability and packet loss along routes, enhancing our troubleshooting skills.

Overall, using these commands gave practical experience in identifying network issues, understanding connectivity, and monitoring performance. Mastery of these tools equips network users and administrators with the ability to quickly detect, analyze, and resolve problems, ensuring reliable and efficient communication across networks.