Command Line Tools

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NTW102: Foundations of Network Engineering

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October 2nd, 2022

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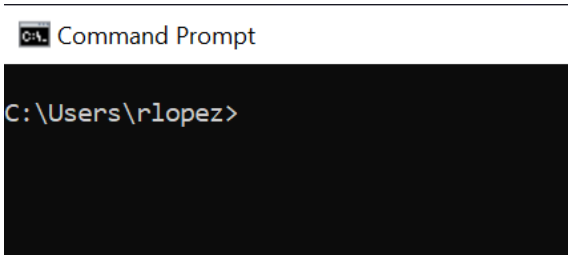
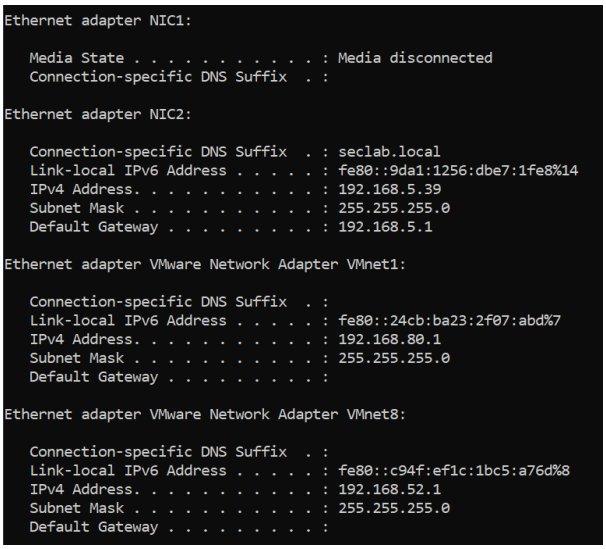
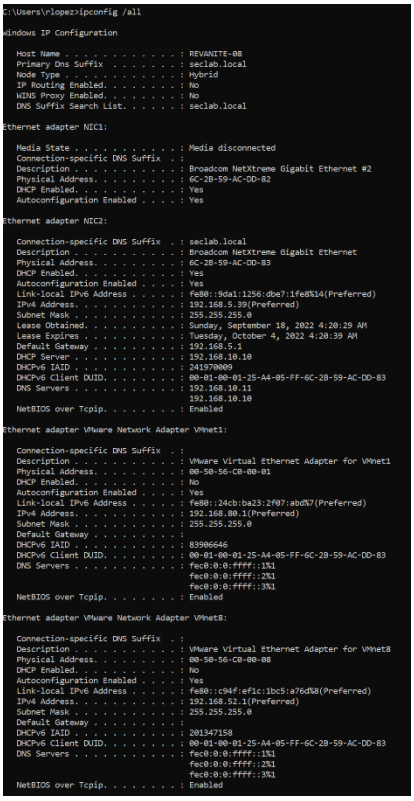


This assignment explored the use of Windows Command Line Interface (CLI) tools to gather essential network configuration information, perform connectivity tests, and understand how systems communicate over a network. The tasks included using key commands such as ipconfig, ping, and netstat—tools foundational to any network technician or cybersecurity analyst. To begin, I accessed the Command Prompt by pressing the Windows key and typing either “cmd” or “Command Prompt.” This utility opens a text-based interface that allows direct interaction with the operating system's network stack and diagnostic tools.



Using ipconfig

- The ipconfig command displays the current TCP/IP network configuration values. It revealed critical network information such as the Subnet Mask and Default Gateway.
- Additionally, the presence of a VMware Network Adapter in the output indicated that the system had a virtual machine environment installed.



Detailed Configuration: ipconfig /all

- Running ipconfig /all provided a more comprehensive view, including:
    - **Windows IP Configuration**
    - **Physical (MAC) Addresses**
    - **DHCP & DNS Server details**

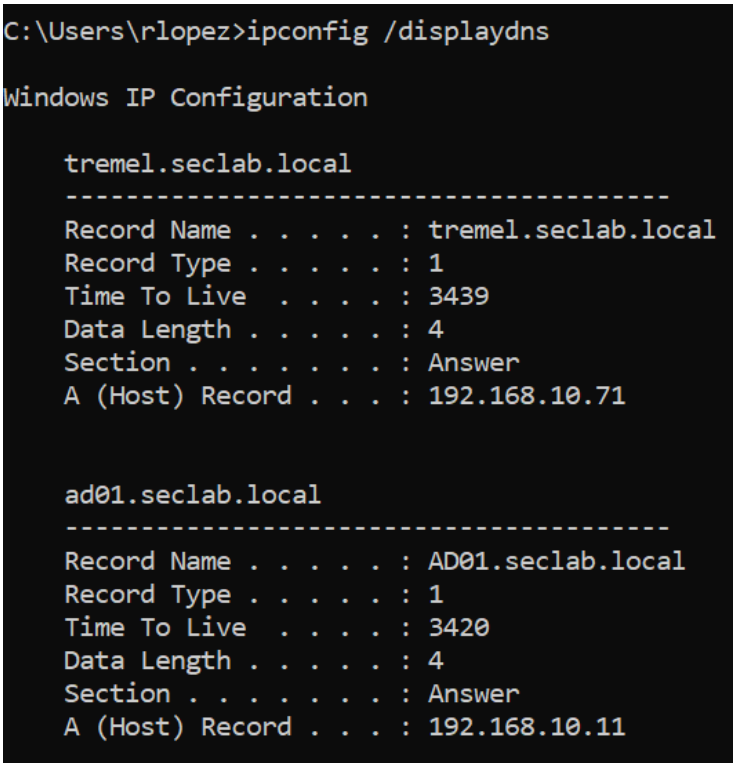
- Multiple network adapters and their statuses

This information is crucial when troubleshooting IP conflicts, DNS issues, or identifying devices on a network.

```
C:\Users\rlopez>ipconfig /?

USAGE:
    ipconfig [/allcompartments] [/? | /all |
                                 /renew [adapter] | /release [adapter] |
                                 /renew6 [adapter] | /release6 [adapter] |
                                 /flushdns | /displaydns | /registerdns |
                                 /showclassid adapter |
                                 /setclassid adapter [classid] |
                                 /showclassid6 adapter |
                                 /setclassid6 adapter [classid] ]

where
    adapter             Connection name
                       (wildcard characters * and ? allowed, see examples)

    Options:
       /?               Display this help message
       /all             Display full configuration information.
       /release         Release the IPv4 address for the specified adapter.
       /release6        Release the IPv6 address for the specified adapter.
       /renew           Renew the IPv4 address for the specified adapter.
       /renew6          Renew the IPv6 address for the specified adapter.
       /flushdns        Purges the DNS Resolver cache.
       /registerdns     Refreshes all DHCP leases and re-registers DNS names
       /displaydns      Display the contents of the DNS Resolver Cache.
       /showclassid     Displays all the dhcp class IDs allowed for adapter.
       /setclassid      Modifies the dhcp class id.
       /showclassid6    Displays all the IPv6 DHCP class IDs allowed for adapter.
       /setclassid6     Modifies the IPv6 DHCP class id.


The default is to display only the IP address, subnet mask and
default gateway for each adapter bound to TCP/IP.

For Release and Renew, if no adapter name is specified, then the IP address
leases for all adapters bound to TCP/IP will be released or renewed.

For Setclassid and Setclassid6, if no ClassId is specified, then the ClassId is removed.

Examples:
    > ipconfig                      ... Show information
    > ipconfig /all                 ... Show detailed information
    > ipconfig /renew               ... renew all adapters
    > ipconfig /renew EL*           ... renew any connection that has its
                                        name starting with EL
    > ipconfig /release *Con*       ... release all matching connections,
                                        eg. "Wired Ethernet Connection 1" or
                                            "Wired Ethernet Connection 2"
    > ipconfig /allcompartments     ... Show information about all
                                        compartments
    > ipconfig /allcompartments /all ... Show detailed information about all
                                        compartments
```

Understanding Commands: ipconfig /?

- This command outputs help documentation and available flags for the ipconfig utility.
- It explains each switch and provides usage examples, including:
  - /release, /renew, /flushdns, and more.
- Such documentation is essential for adapting commands to various networking scenarios.



Displaying DNS Cache: ipconfig /displaydns

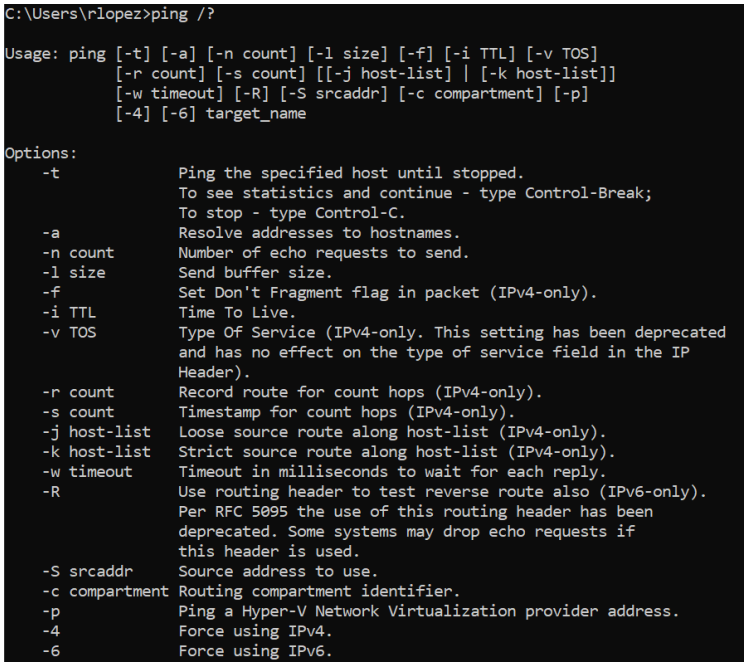
- This command reveals a list of cached DNS entries.
- For instance, the record tremel.seclab.local was shown with attributes:
  - **Record Type**: 1 (Host Record)
  - **TTL (Time to Live)**: 3439 seconds
  - **Data Length**: 4
  - **A Record IP Address**: 192.168.10.71

Analyzing the DNS cache allows users to verify name resolution and inspect previously visited domains.

```
C:\Users\rlopez>ping 192.168.10.10

Pinging 192.168.10.10 with 32 bytes of data:
Reply from 192.168.10.10: bytes=32 time<1ms TTL=127
Reply from 192.168.10.10: bytes=32 time<1ms TTL=127
Reply from 192.168.10.10: bytes=32 time<1ms TTL=127
Reply from 192.168.10.10: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\rlopez>ping 192.168.10.11

Pinging 192.168.10.11 with 32 bytes of data:
Reply from 192.168.10.11: bytes=32 time<1ms TTL=127
Reply from 192.168.10.11: bytes=32 time<1ms TTL=127
Reply from 192.168.10.11: bytes=32 time<1ms TTL=127
Reply from 192.168.10.11: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.10.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Testing DNS Servers with ping

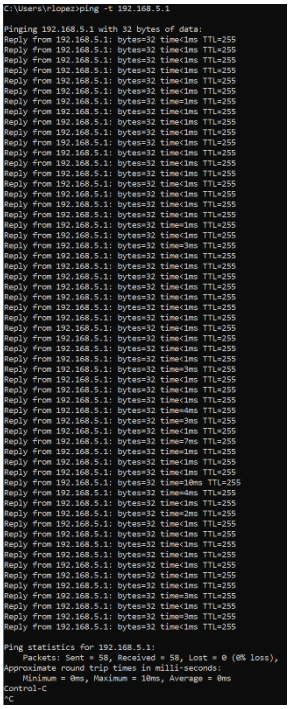
- Using DNS addresses (e.g., 192.168.10.10 and 192.168.10.11), I performed ping tests.
- Each test sent 4 packets, all of which were received successfully—indicating stable connectivity with the DNS servers.



```
C:\Users\rlopez>ping /?

Usage: ping [-t] [-a] [-n count] [-l size] [-f] [-i TTL] [-v TOS]
            [-r count] [-s count] [[-j host-list] | [-k host-list]]
            [-w timeout] [-R] [-S srcaddr] [-c compartment] [-p]
            [-4] [-6] target_name

Options:
    -t             Ping the specified host until stopped.
                   To see statistics and continue - type Control-Break;
                   To stop - type Control-C.
    -a             Resolve addresses to hostnames.
    -n count       Number of echo requests to send.
    -l size        Send buffer size.
    -f             Set Don't Fragment flag in packet (IPv4-only).
    -i TTL         Time To Live.
    -v TOS         Type Of Service (IPv4-only. This setting has been deprecated
                   and has no effect on the type of service field in the IP
                   Header).
    -r count       Record route for count hops (IPv4-only).
    -s count       Timestamp for count hops (IPv4-only).
    -j host-list   Loose source route along host-list (IPv4-only).
    -k host-list   Strict source route along host-list (IPv4-only).
    -w timeout     Timeout in milliseconds to wait for each reply.
    -R             Use routing header to test reverse route also (IPv6-only).
                   Per RFC 5095 the use of this routing header has been
                   deprecated. Some systems may drop echo requests if
                   this header is used.
    -S srcaddr     Source address to use.
    -c compartment Routing compartment identifier.
    -p             Ping a Hyper-V Network Virtualization provider address.
    -4             Force using IPv4.
    -6             Force using IPv6.
```

Exploring ping /? Options

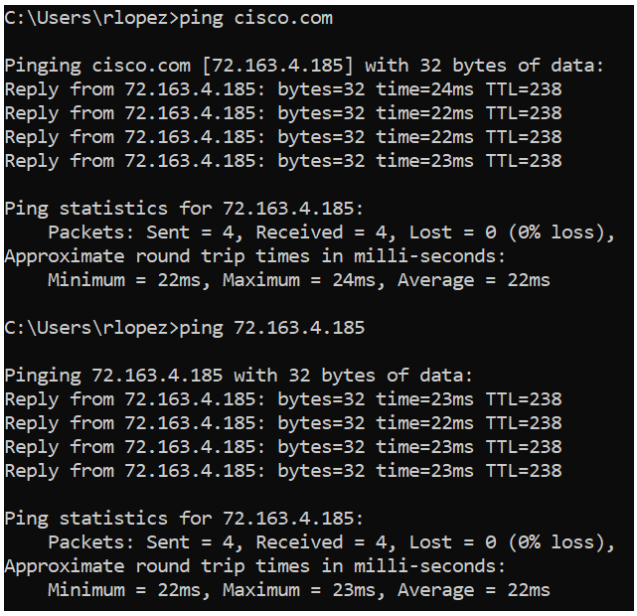
- This command displayed available options for ping, such as:
    - -t for continuous pinging
    - -l for changing packet size
    - -n for specifying the number of echo requests
- Knowing these parameters is valuable for customizing tests depending on network performance or stress testing needs.



Pinging the Default Gateway Continuously

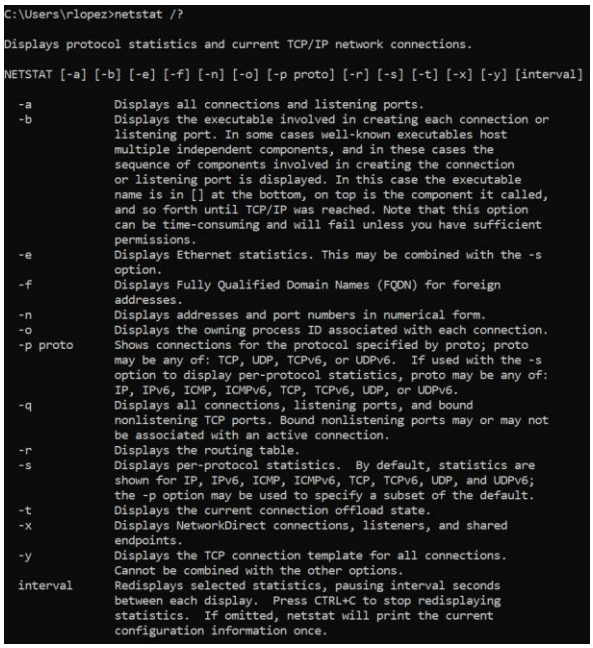
- I executed ping -t 192.168.5.1 to send a continuous stream of ping requests.
- The process was stopped using Ctrl + C, which summarized:
    - **Total Pings Sent**: 58
    - **Minimum/Maximum/Average RTT**: 0 to 10 ms

This test helps validate consistent communication with the gateway/router over time.



Pinging a Website and Its IP

- I first pinged cisco.com, receiving 4 successful replies with an average round-trip time of 22 ms.
- Then, I pinged the resolved IP address 72.163.4.185, which returned identical results.
- The exercise emphasized that pinging DNS names gives more context than IPs alone—particularly when the IP’s origin isn't known.



Using netstat /? for Network Statistics

- The command netstat /? provided a list of switches for viewing real-time network connections.
- Notable options included:
  - -a: Displays all active connections and listening ports
  - -n: Shows numerical IP addresses and port numbers
- This tool is crucial for identifying open ports, active sessions, and potential unauthorized connections.