Host and IOS Commands

TOPIC

IP Configuration on a Windows Host

If you have used any of the tools in the previous topic to verify connectivity and found that some part of your network is not working as it should, now is the time to use more commands to troubleshoot your devices. Host and IOS commands can help you determine if the problem is with the IP addressing of your devices, where is a device located, and what path does it take.

Checking the IP addressing on host devices is a common practice in networking for verifying and troubleshooting end-to-end connectivity. In Windows 10, you can access the IP address details from the **Network and Sharing Center**, as shown in the figure. Quickly view the four important settings: address, mask, router, and DNS.

However, network administrators typically view the IP addressing information on a Windows host by issuing the **ipconfig** command at the command line of a Windows computer, as shown in the sample output.

```
C:\Users\PC-A> ipconfig
Windows IP Configuration

Ethernet adapter
   Windows LAN adapter 10:
   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::e8ed:5b45:e9c9
   IPv4 Address. . . . . . . . . . . : 192.168.10.17
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :
Ethernet adapter
   Wireless LAN adapter Wi-Fi:
   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::7d7:3f8:1a2d:
   IPv4 Address. . . . . . . . . . . : 10.10.10.15
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 10.10.10.1
C:\Users\PC-A>
```

Use the **ipconfig /all** command to view the device's MAC address, as well as a number of details regarding the Layer 3 addressing of the device, as shown in the example output.

```
C:\Users\PC-A> ipconfig /all
Windows IP Configuration
   Host Name . . . . . . . . . . . . : PC-A-PC10
   Primary Dns Suffix  . . . . . . . : cisco.com
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
   DNS Suffix Search List. . . . . . : cisco.com
Ethernet adapter
   Wireless LAN adapter Wi-Fi:
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Intel(R) Dual Band Wireless-AC 8265
   Physical Address. . . . . . . . . : 78-92-3C-D3-3A-B8
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::7d7:3f8:1a2d:f5c0%14(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.10.15(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : Friday, April 23, 2021 11:36:37 AM
   Lease Expires . . . . . . . . . . : Friday, April 23, 2021 1:36:37 PM
   Default Gateway . . . . . . . . . : 192.168.10.1
   DHCP Server . . . . . . . . . . . : 192.168.10.1
   DHCPv6 IAID . . . . . . . . . . . : 83886080
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-26-F5-F5-78-78-92-3C-D3-3A-B8
   DNS Servers . . . . . . . . . . . : 192.168.10.1
   NetBIOS over Tcp...             : Enabled
C:\Users\PC-A>
```

If a host is configured as a DHCP client, the IP address configuration can be verified using the **ipconfig /release** and **ipconfig /renew** commands, as shown in the sample output.

```
C:\Users\PC-A> ipconfig /release
Ethernet adapter
   Wireless LAN adapter Wi-Fi:
   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::e8ed:5b45:e9c9
   IPv4 Address. . . . . . . . . . . : 192.168.10.17
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :
C:\Users\PC-A> ipconfig /renew
Ethernet adapter
   Wireless LAN adapter Wi-Fi:
   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::e8ed:5b45:e9c9
   IPv4 Address. . . . . . . . . . . : 192.168.10.17
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 192.168.10.1
C:\Users\PC-A>
```

If the host is configured as a DHCP client, the IP address information can be verified using the **ipconfig /release** and **ipconfig /renew** commands, as shown in the example output.

```
C:\Users\PC-A> ipconfig /displaydns
Windows IP Configuration
   localhost.lan
   ----------------------------------------
   Record Name . . . . . : localhost.lan
   Record Type . . . . . : 1
   Time To Live  . . . . : 86400
   Data Length . . . . . : 4
   Section . . . . . . . : Answer
   A (Host) Record . . . : 192.168.10.15
Ethernet adapter
```

TOPIC

IP Configuration on a Linux Host

Verifying IP settings using the GUI on a Linux machine will differ depending on the Linux distribution (distro) and desktop interface. The figure shows the **Connection Information** dialog box on the Ubuntu distro running the Gnome desktop.

On the command line, network administrators use the **ifconfig** command to display the status of the currently active interfaces and their IP configuration, as shown in the output.

```
student@netacad:~$ ifconfig
enp0s3    Link encap:Ethernet  HWaddr 08:00:27:b5:d6:cb
          inet addr:10.0.2.15  Bcast:10.0.2.255  Mask:255.255.255.0
          inet6 addr: fe80::57c6:cd95:b3c9:2951/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:12024 errors:0 dropped:0 overruns:0 frame:0
          TX packets:8192 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:16804000 (16.8 MB)  TX bytes:1138618 (1.1 MB)
lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:1 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:1 (1.0 B)  TX bytes:1 (1.0 B)
```

The Linux **ip address** command is used to display attributes and their properties. It can also be used to add or delete IP addresses.

Note: The output displayed may vary depending on the Linux distribution.

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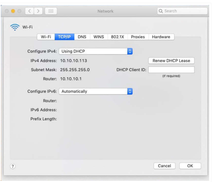
IP Configuration on a macOS Host

In the GUI of a Mac host, open **Network Preferences** > **Advanced** to get the IP addressing information, as shown in the figure.



However, the **ifconfig** command can also be used to verify the interface IP configuration as shown in the output.

```
Macbook-Air:~ admin$ ifconfig en0
en0: flags=8863<UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        options=400<CHANNEL_IO>
        ether 78:92:3c:d3:3a:b8
        inet6 fe80::1c0:b362:108b:dedd%en0 prefixlen 64 secured scopid 0x4
        inet 10.10.10.113 netmask 0xffffff00 broadcast 10.10.10.255
        nd6 options=201<PERFORM_NUD,DAD>
        media: autoselect
        status: active
Macbook-Air:~ admin$
```

Until recently, **netstat -rn** command is used to verify the host IP settings. Instead, **networksetup -listallhardwareports** and the **networksetup -getinfo** <network service> are shown in the following output.

```
Macbook-Air:~ admin$ networksetup -listallhardwareports
An asterisk (*) denotes that a network service is disabled.
Hardware Port: Wi-Fi
Device: en0
Ethernet Address: 78:92:3c:d3:3a:b8
Macbook-Air:~ admin$ networksetup -getinfo Wi-Fi
DHCP Configuration
IP address: 10.10.10.113
Subnet mask: 255.255.255.0
Router: 10.10.10.1
Client ID:
IPv6 IP address: none
IPv6 Router: none
Wi-Fi additional IP addresses:
IP address: fe80::1c0:b362:108b:dedd%en0
Macbook-Air:~ admin$
```

TOPIC

The arp Command

The **arp** command is executed from the Windows, Linux, or Mac command prompt. The command lists all devices currently in the ARP cache of the host, which includes the IP address, physical address, and the type of addressing (static/dynamic) for each device.

For instance, refer to the topology in the figure.

The output of the **arp -a** command on the Windows PC-A host is displayed.

```
C:\Users\PC-A> arp -a
Interface: 10.0.0.6 --- 0x4
  Internet Address      Physical Address      Type
  10.0.0.1              00-0c-29-ae-ae-b0     dynamic
  10.0.0.2              00-50-56-f6-a8-ff     dynamic
  10.0.0.3              00-50-56-ed-b5-37     dynamic
  10.0.0.4              00-50-56-ed-b5-37     dynamic
  10.0.0.5              00-50-56-ed-b5-37     dynamic
```

The **arp -a** command displays the known IP addresses and MAC address pairs of the local network interfaces. Notice how IP address 10.0.0.5 is not included in the list. This is because the ARP cache only displays information from devices that have been recently contacted by the host.

To ensure that the ARP cache is populated, **ping** a device so that it will have an entry in the ARP table. For instance, if PC-A pings 10.0.0.5, then the ARP cache would contain an entry for that IP address.

The cache can be cleared by using the **netsh interface ip delete arpcache** command in the event the network administrator wants to repopulate the cache with updated information.

Note: You may need administrator privileges on the host to be able to use the **netsh interface ip delete arpcache** command.

TOPIC

Common show Commands Revisited

In the same way that commands and utilities are used to verify a host configuration, commands can be used to verify the interfaces of intermediary devices. The Cisco IOS command line interface (CLI) is used to access the IOS command line.

The Cisco IOS CLI **show** commands display information about the configuration and operation of the router. Network technicians use **show** commands extensively for viewing configuration files, checking the status of device interfaces and processes, and verifying the device operational status. The status of events every process is a function of the router can be displayed using a **show** command.

Commonly used **show** commands and what to look for are listed in the table.

Command	Used to do…
show running-config	To verify the current configuration set and settings
show interfaces	To verify the status of all interfaces on the device along with interface messages
show ip interface	To verify the Layer 3 information of all interfaces
show arp	To verify the list of known hosts on the local Ethernet LANs
show ip route	To verify the Layer 3 routing information
show protocols	To verify which processes are operational
show version	To verify the memory, interfaces, and licenses of the device

Click the buttons to see example output from each of these show commands Note: The output of some commands has been edited to focus on pertinent settings and remove screens.

show running-config | show interfaces | show ip interface | show arp | show ip route | show protocols | show version

show version

Verifies the memory, interfaces, and licenses of the device

```
PC-A#show version
Cisco IOS XE Software, Version 16.09.1 - Extended Support Release
Cisco IOS Software [Fuji], ISR4331/K9 Software (ISR4331/K9-UNIVERSALK9), Version 16.12.4, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2019 by Cisco Systems, Inc.
Compiled Wed 08-May-19 06:36 by mcpre

Cisco IOS XE Software, Version 16.09.01 - Extended Support Release

ROM: IOS-XE ROMMON
PC-A uptime is 1 hours, 19 minutes
Uptime for this control processor is 1 hours, 17 minutes
System returned to ROM by reload
System image file is "bootflash:isr4331-universalk9.16.09.01.SPA.bin"
Last reload reason: LocalSoft

cisco ISR4331/K9 (1RU) processor with 1843456K/6147K bytes of memory.
Processor board ID FLM2040K4L7
4 Gigabit Ethernet interfaces
2 Serial interfaces
32768 bytes of non-volatile configuration memory.
4194304K bytes of physical memory.
3145728K bytes of flash memory at bootflash:.
Configuration register is 0x2102
PC-A#
```

TOPIC

The show cdp neighbors Command

There are several other IOS commands that are useful. The Cisco Discovery Protocol (CDP) is a Cisco proprietary protocol that runs at the data link layer. Because CDP operates at the data link layer, two or more Cisco network devices, such as routers and switches, that support different network layer protocols, can learn about each other. Most of Layer 3 commands may not need establishment.

Cisco Discovery Protocol (CDP) is a Cisco proprietary protocol. CDP automatically discovers neighboring Cisco devices running CDP, regardless of which Layer 3 protocol or suites are running. CDP exchanges hardware and software device information with other directly connected CDP neighbors.

CDP provides the following information about each CDP neighbor device:

- **Device identifier** - The configured hostname of a switch, router, or other device
- **Address list** - Up to one network layer address for each protocol supported
- **Port identifier** - The port on which the CDP broadcast is made, identified by a CDP interface name, such as FastEthernet 0/0
- **Capabilities list** - For example, whether a specific device is a router or a switch or a router and a switch
- **Platform** - The hardware platform of the device - for example, a Cisco 1841 series router.

Note: In the topology and the **show cdp neighbor** command output.

```
PC-A#show cdp neighbors
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
                  D - Remote, C - CVTA, M - Two-port Mac Relay
Device ID        Local Intrfce     Holdtme    Capability  Platform  Port ID
R3               Gig 0/0/1         150          R S I     ISR4331   Gig 0/0/1
S3               Gig 0/0/1         150          S I       WS-C2960  Fa0/5
S4               Gig 0/0/1         150          S I       WS-C2960  Fa0/5
PC-A#
```

The output displays that the R3 (hostname) is the connected neighbor device on the local interface (Gig0/0/1) of the router, with a Cisco IOS Software, ISR4331 platform, listed that the port connected remotely is Gig0/0/1. The S3 device is also directly connected to the router on the same interface (Gig0/0/1) and S4 is connected to the switch.

The **show cdp neighbors detail** command reveals the IP address of a neighboring device, as shown in the output. CDP will reveal the IP address of the neighbor regardless of how many hops away it is. The information displayed by the **show cdp neighbors detail** command could be very useful when trying to establish a Layer 3 connection across from shared links. The **show cdp neighbors detail** command will only determine if one of the CDP neighbors has an IP configuration.

It is helpful to CDP, it can also be a security risk because it can provide useful network information to hackers. For, for example, by default many IOS versions send CDP advertisements out all enabled ports. However, best practice suggest that CDP should be enabled only on interfaces that are connecting to other Cisco devices. Network administrators should consider disabling CDP on other interfaces.

Many new IOS versions ship with CDP advertisements by default. It is important to know how to disable CDP. To disable CDP globally, use the global configuration command **no cdp run**. To disable CDP on an interface, use the interface command **no cdp enable**.

TOPIC

The show ip interface brief Command

One of the most frequently used commands is the **show ip interface brief** command. This command provides a more abbreviated output than the **show ip interface** command. It provides a summary of the key information for all the interfaces on the router.

For example, the **show ip interface brief** output displays all interfaces on the router, their IP address assigned to each interface, if any, and the operational status of the interface.

```
PC-A#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0/0   unassigned      YES unset  administratively down down
GigabitEthernet0/0/1   192.168.10.1    YES manual up                    up
Serial0/1/0            unassigned      YES unset  deleted               down
Serial0/1/1            unassigned      YES unset  deleted               down
Vlan1                  unassigned      YES unset  administratively down down
PC-A#
```

Verify Switch Interfaces

The **show ip interface brief** command can also be used to verify the status of the switch interfaces, as shown in the output.

```
PC-A#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
Vlan1                  unassigned      YES unset  administratively down down
FastEthernet0/1        unassigned      YES unset  down                  down
FastEthernet0/2        unassigned      YES unset  down                  down
PC-A#
```

The Cisco1 switches is assigned an IPv4 address of 192.168.254.250. Use show vlanbrief, and is operational.

The output displays that the FastEthernet0/1 and FastEthernet0/2 interfaces are operational. This is indicated by both the status and protocol being shown as up.

TOPIC

Video – The show version Command

The **show version** command can be used to verify and troubleshoot some of the basic hardware and software components used during the boot process. Cisco Play to view a video from earlier in the course, which reviews an explanation of the **show version** command.

TOPIC

Packet Tracer – Interpret show Command Output

This activity is designed to reinforce the use of basic **show** commands. You are not required to configure, but rather examine, the output of several show commands.

Interpret show Command Output

Interpret show Command Output