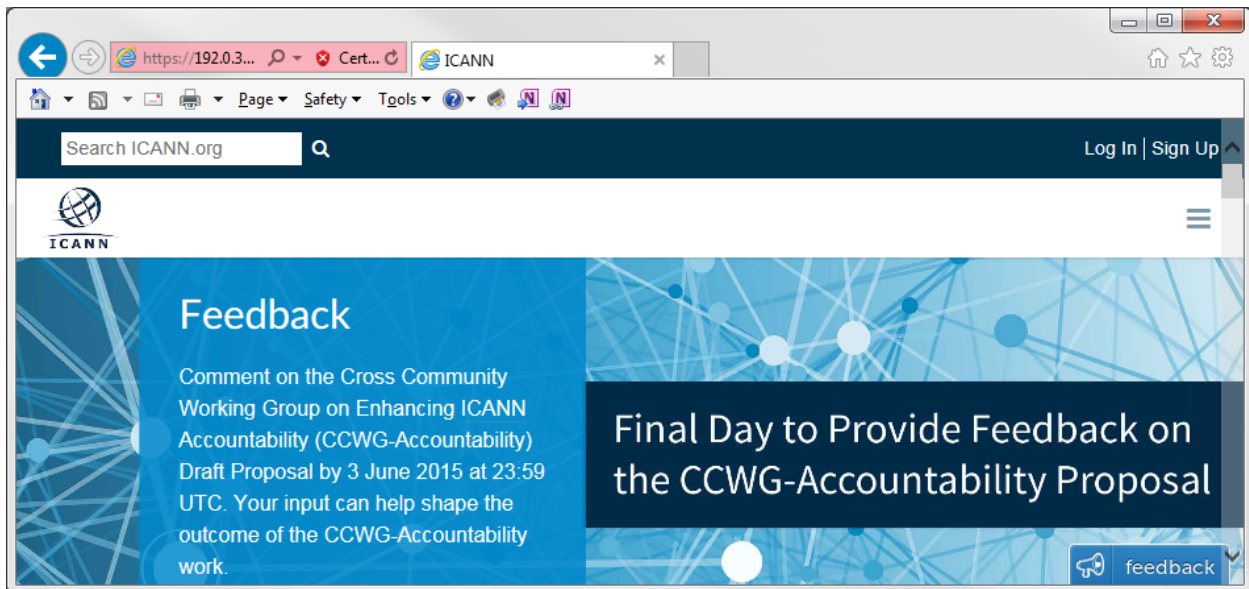


d. Notice that the ICANN home web page is displayed.



Most humans find it easier to remember words, rather than numbers. If you tell someone to go to **www.icann.org**, they can probably remember that. If you told them to go to 192.0.32.7, they would have a difficult time remembering an IP address. Computers process in numbers. DNS is the process of translating words into numbers. There is a second translation that takes place. Humans think in Base 10 numbers. Computers process in Base 2 numbers. The Base 10 IP address 192.0.32.7 in Base 2 numbers is 11000000.00000000.00100000.00000111. What happens if you cut and paste these Base 2 numbers into a browser?

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The web site does not display. The software code used in web browsers recognizes Base 10 numbers. It does not recognize Base 2 numbers.

- e. Now type **ping** www.cisco.com.

Note: If the domain name is resolved to an IPv6 address, use the command **ping -4 www.cisco.com** to translate into an IPv4 address if desired.

```
C:\>ping www.cisco.com

Pinging e144.dscb.akamaiedge.net [23.1.144.170] with 32 bytes of data:
Reply from 23.1.144.170: bytes=32 time=51ms TTL=58
Reply from 23.1.144.170: bytes=32 time=50ms TTL=58
Reply from 23.1.144.170: bytes=32 time=50ms TTL=58
Reply from 23.1.144.170: bytes=32 time=50ms TTL=58

Ping statistics for 23.1.144.170:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 50ms, Maximum = 51ms, Average = 50ms
```

- f. When you ping www.cisco.com, do you get the same IP address as the example? Explain.

Answer will vary depending upon where you are geographically. Cisco hosts its web content on a series of mirror servers. This means that Cisco uploads the exact same content to geographically diverse (spread out all over the world) servers. When someone tries to reach www.cisco.com, the traffic is directed to the closest mirror server.

- g. Type the IP address that you obtained when you pinged www.cisco.com into a browser. Does the web site display? Explain.

The [cisco.com](http://www.cisco.com) web site does not display. There are at least two possible explanations for this: 1. Some web servers are configured to accept IP addresses sent from a browser and some are not. 2. It may be a firewall rule in the Cisco security system that prohibits an IP address from being sent via a browser.

Part 2: Observe DNS Lookup Using the nslookup Command on a Web Site

- a. At the command prompt, type the **nslookup** command.

```
C:\>nslookup
Default Server:  dslrouter.westell.com
Address:  192.168.1.1
>
```

What is the default DNS server used? _____

Site dependent

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Notice how the command prompt changed to a greater than (>) symbol. This is the **nslookup** prompt. From this prompt, you can enter commands related to DNS.

At the prompt, type ? to see a list of all the available commands that you can use in **nslookup** mode.

- b. At the prompt, type **www.cisco.com**.

```
> www.cisco.com
Server: dslrouter.westell.com
Address: 192.168.1.1

Non-authoritative answer:
Name: e144.dscb.akamaiedge.net
Addresses: 2600:1408:7:1:9300::90
           2600:1408:7:1:8000::90
           2600:1408:7:1:9800::90
           23.1.144.170
Aliases: www.cisco.com
          www.cisco.com.akadns.net
          wwwds.cisco.com.edgekey.net
          wwwds.cisco.com.edgekey.net.globalredir.akadns.net
```

What is the translated IP address? _____

From a specific location, 23.1.144.170.

Note: The IP address from your location will most likely be different because Cisco uses mirrored servers in various locations around the world.

Is it the same as the IP address shown with the **ping** command? _____ **Yes**

Under addresses, in addition to the 23.1.144.170 IP address, there are the following numbers: 2600:1408:7:1:9300::90, 2600:1408:7:1:8000::90, 2600:1408:7:1:9800::90. What are these?

IPv6 (IP version 6) IP addresses at which the web site is reachable.

- c. At the prompt, type the IP address of the Cisco web server that you just found. You can use **nslookup** to get the domain name of an IP address if you do not know the URL.

```
> 23.1.144.170
Server: dslrouter.westell.com
Address: 192.168.1.1

Name: a23-1-144-170.deploy.akamaitechnologies.com
Address: 23.1.144.170
```

You can use the **nslookup** tool to translate domain names into IP addresses. You can also use it to translate IP addresses into domain names.

Using the **nslookup** tool, record the IP addresses associated with www.google.com.

Answers may vary. At the time of writing, the IP addresses are 173.194.75.147, 173.194.75.105, 173.194.75.99, 173.194.75.103, 173.194.75.106, and 173.194.75.104.

```
> www.google.com
Server: dslrouter.westell.com
Address: 192.168.1.1

Non-authoritative answer:
Name: www.google.com
Addresses: 2607:f8b0:400c:c01::93
           173.194.75.147
           173.194.75.105
           173.194.75.99
           173.194.75.103
           173.194.75.106
           173.194.75.104
```

Part 3: Observe DNS Lookup Using the nslookup Command on Mail Servers

- a. At the prompt, type **set type=mx** to use **nslookup** to identify mail servers.

```
> set type=mx
```

- b. At the prompt, type **cisco.com**.

```
> cisco.com
Server: dslrouter.westell.com
Address: 192.168.1.1

Non-authoritative answer:
cisco.com      MX preference = 10, mail exchanger = rcdn-mx-01.cisco.com
cisco.com      MX preference = 15, mail exchanger = alln-mx-01.cisco.com
cisco.com      MX preference = 15, mail exchanger = ams-mx-01.cisco.com
cisco.com      MX preference = 15, mail exchanger = rtp-mx-01.cisco.com

ams-mx-01.cisco.com  internet address = 64.103.36.169
rcdn-mx-01.cisco.com internet address = 72.163.7.166
```

A fundamental principle of network design is redundancy (more than one mail server is configured). In this way, if one of the mail servers is unreachable, then the computer making the query tries the second mail server. Email administrators determine which mail server is contacted first by using **MX preference** (see above image). The mail server with the lowest **MX preference** is contacted first. Based upon the output above, which mail server will be contacted first when the email is sent to cisco.com?

`rcdn-mx-01.cisco.com`

- c. At the nslookup prompt, type **exit** to return to the regular PC command prompt.
d. At the PC command prompt, type **ipconfig /all**.
e. Write the IP addresses of all the DNS servers that your school uses.

`Site-dependent`

Reflection

What is the fundamental purpose of DNS?

Lab - Observing DNS Resolution

People process in words. Computers process in numbers. People have a difficult time remembering a long string of numbers. Therefore, DNS exists to translate the “numbers” world of computers to the “words” world of people.