Lab - Observe DNS Resolution

Objectives

Part 1: Observe the DNS Conversion of a URL to an IP Address

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

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

Background / Scenario

The Domain Name System (DNS) is invoked when you type a Uniform Resource Locator (URL), such as **http://www.cisco.com**, into a web browser. The first part of the URL describes which protocol is used. Common protocols are Hypertext Transfer Protocol (HTTP), Hypertext Transfer Protocol over Secure Socket Layer (HTTPS), and File Transfer Protocol (FTP).

DNS uses the second part of the URL, which in this example is www.cisco.com. DNS translates the domain name (www.cisco.com) to an IP address to allow the source host to reach the destination server. In this lab, you will observe DNS in action and use the **nslookup** (name server lookup) command to obtain additional DNS information.

Required Resources

1 PC (Windows with internet and command prompt access)

Part 1: Observe the DNS Conversion of a URL to an IP Address

a. Open a Windows command prompt.

b. At the command prompt, ping the URL for the Internet Corporation for Assigned Names and Numbers (ICANN) at **www.icann.org**. ICANN coordinates the DNS, IP addresses, top-level domain name system management, and root server system management functions. The computer must translate www.icann.org into an IP address to know where to send the Internet Control Message Protocol (ICMP) packets.

The first line of the output displays **www.icann.org** converted to an IP address by DNS. You should be able to see the effect of DNS, even if your institution has a firewall that prevents pinging, or if the destination server has prevented you from pinging its web server.

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

Record the IP addresses for www.icann.org.

c. Type the IPv4 addresses from step b into a web browser, instead of the URL. Enter **https://192.0.32.7 in the web browser. If your computer has an IPv6 address you can enter the** IPv6 address. **https://[2620:0:2d0:200::7]** in the web browser.

d. Notice that the ICANN home web page is displayed without using DNS.

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. Additionally, 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?

e. At a command prompt, **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
C:\> ping -4 www.cisco.com
```

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

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

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

a. At the command prompt, type the **nslookup** command. Your result will be different than the example.

```
C:\> nslookup
```

What is the default DNS server used?

b. 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.

c. At the nslookup prompt, type **www.cisco.com**.

```
> www.cisco.com
Default Server:  one.one.one.one
Address:  1.1.1.1

Non-authoritative answer:
Name:    e2867.dsca.akamaiedge.net
Addresses:  2600:1404:a:395::b33
            2600:1404:a:38e:::b33
```

```
            172.230.155.162
   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 IPv4 address?

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?

Under addresses, in addition to the 172.230.155.162 IP address, there are the following numbers: 2600:1404:a:395::b33 and 2600:1404:a:38e:::b33. What are these?

d. At the nslookup 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.

```
> 172.230.155.162
Default Server:  one.one.one.one
Address:  1.1.1.1

Name:    a172-230-155-162.deploy.static.akamaitechnologies.com
Address:  172.230.155.162
```

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**.

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

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

```
> set type=mx
```

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

```
> cisco.com
Server:  one.one.one.one
Address:  1.1.1.1
```

```
Non-authoritative answer:
cisco.com       MX preference = 20, mail exchanger = rcdn-mx-01.cisco.com
cisco.com       MX preference = 30, mail exchanger = aer-mx-01.cisco.com
cisco.com       MX preference = 10, mail exchanger = alln-mx-01.cisco.com
```

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**. 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?

c. At the nslookup prompt, type **exit** to return to the regular PC command prompt.

d. At the PC command prompt, type **ipconfig /all**.

Write the IP addresses of all the DNS servers that your school uses.

Reflection Question

What is the fundamental purpose of DNS?