Lab A: Planning an IPv4 network

Scenario

A. Datum Corporation is an international organization with its North American regional office located in Toronto. They are planning to open three branch offices in different cities in North America. The branch offices will be located in Houston, Mexico City, and Portland.

The following table describes the planned computer distribution in the branch offices.

Location	Computer and device requirements
Houston	300 desktop computers 100 laptop computers connecting to both the wireless and wired networks 50 tablet computers connecting only to the wireless network
Mexico City	100 desktop computers 50 laptop computers connecting to both the wireless and wired networks 20 tablet computers connecting only to the wireless network
Portland	100 desktop computers 75 laptop computers connecting to both the wireless and wired networks 150 tablet computers connecting only to the wireless network

A. Datum is using Microsoft Office 365 for all email and file access for the North American branch offices, with some shared folders located in the Toronto regional office on servers running the Windows Server operating system. Because all offices have fast and highly available network connections to the Toronto office, A. Datum is not planning to deploy any servers in the branch offices at this point.

The A. Datum network team has assigned the subnets 172.16.18.0/18 to the Toronto regional office. The Toronto office is currently using the network assignments shown in the following table.

IP subnet	Purpose
172.16.18.0/24	Network devices and network printers
172.16.19.0/24	Servers
172.16.20.0/24 to 172.16.52.0/24	Desktop computers
172.16.53.0/24 to 172.16.60.0/24	Wireless devices

You need to plan an IPv4 address assignment for each of the branch offices, using IP addresses from the list of addresses assigned to the Toronto office. You also need to ensure that the IP addresses assigned

to computers connected to wired connections differ from the IP addresses assigned to devices connected to the wireless networks.

Objectives

After completing this lab, you will be able to plan an IPv4 implementation.

Lab Setup

Estimated Time: 30 minutes

You do not need any virtual machines to complete this lab.

For this lab, you will not use a virtual machine environment.

Exercise 1: Planning the IPv4 address assignments

Scenario

You need to plan the IP address assignment for each North American branch office. Your IP addressing scheme must meet the following requirements:

• Wired and wireless clients must be assigned IP addresses from different IP address ranges.

• Each branch office location should have dedicated IP address ranges.

• Keep subnets in branch office locations as simple as possible.

• Ensure that branch office subnets have IP addresses for all potential wired and wireless clients that might request an IP address.

The main tasks for this exercise are as follows:

1. Plan the IPv4 implementation

▶ Task 1: Plan the IPv4 implementation

1. How will you determine the number of IP addresses required for each location?

   A: Each device should have their IP addresses to have connectivity. The number of computers, including desktop, laptop, and tablet, determine the number of IP addresses

2. How do the laptops that have both wired and wireless network adapters affect the number of IP addresses required?

   A: There are potential IP addresses required for wired and wireless network adapters because the clients would be either. The laptops should have both wired and wireless adapters with different IP addresses.

3. What is the simplest subnet class to use when planning an IP addressing scheme for each of the North America branch locations?

   A: Class C is the best option for the North America branch locations because each branch location will have internal connections. From the A. Datum headquarters, /18 subnet is assigned to the regional office. When giving out the IP addresses to other branch offices, the IP addresses should be in the range of the assigned with /24 subnet.

4. In the Houston office, what is the number of potential wired and wireless clients?

A: There are 300 desktop computers and 100 wired laptops potentially. In wired network adapters, they need 400 potential clients. For wireless network adapters, they have 50 tablets and 100 wireless laptops, which add up to 150 potential clients.

5. In the Houston office, how many /24 subnets are required for wired connections? How many are required for wireless?

   A: Since each /24 subnet supports 253 clients, two /24 subnets would provide the minimum requirement for wired connections. For wireless, one /24 subnets would be enough for the wireless clients.

6. In the Mexico City office, what is the number of potential wired and wireless clients?

   A: There are 100 desktops and 50 laptops with wired connections. It needs about 150 potential wired connections. Also, there are 50 laptops and 20 tablets, a total of 70 wireless connections.

7. In the Mexico City office, how many /24 subnets are required for wired connections? How many for wireless?

   A: In /24 subnets, the maximum of the devices is 254 (1 for reserved). The wired and wireless connections have less than 254 devices so that each connection should have one /24 subnet each. One /24 subnet from the range of desktop devices in the regional office falls into the Mexico City office for wired connections. The range of wireless devices is assigned to the wireless devices in the Mexico City office.

8. In the Portland office, what is the number of potential wired and wireless clients?

   A: In the Portland office, they need 175 potential wired connections at a minimum because they have 100 desktops and 75 laptops. For wireless connections, they need 225 connections because they have 75 laptops and 150 tablets.

9. In the Portland office, how many /24 subnets are required for wired connections? How many for wireless?

   A: For the potential wired connections, they require at least one /24 subnet because it is less than 254 connections. Also, a one /24 subnet is enough for the wireless connections, but for, in any case, two /24 subnets are recommended.

10. Given the assigned IP range of 172.16.20.0/24 – 172.16.52.0/24 for wired clients, which subnets will you use for the Houston, Mexico City, and Portland offices?

    A: the solution will vary because it depends on the decision of DHCP or administrators. These are the possible ways to assign the IP address range to each office. For the Houston office, they need to have two /24 subnets because it has 400 devices, and they are in the range of 172.16.32.0 /24 to 172.16.33.0 /24. For the Mexico City office, they need one subnet so that the admin might put them in 172.16.37.0 /24. Lastly, the Portland office would have one as well, which falls into 172.16.40.0 /24.

11. Given the assigned IP range of 172.16.53.0/24 – 172.16.60.0/24 for wireless clients, which subnets will you use for the Houston, Mexico City, and Portland offices?

    A: For wireless connections, each office needs one subnet for the minimum. The Houston office can have 172.16.56.0 /24 because it only has 150 devices that need the IP addresses. For Mexico City, they need one subnet, which is 172.16.57.0 /24. The Portland office has the highest number of wireless devices; it reaches almost the maximum number of devices per subnet. For now, they would require one subnet, which can be in the IP address of 172. 16.58.0 /24

Results: After completing this exercise, you should have planned an IPv4 network.

Question: How many default gateways will be required?

A: They need to have at least seven default gateways because each subnet should have a default gateway. Three default gateways should be in the Houston office, and the other gateways should be in the other offices with two gateways each.

Question: What other factors would you take into consideration when designing a network?

A: Each branch office has the minimum number of subnets, but it is better to have more than they have because of the security purpose. For example, the Portland office has 225 wireless connections, which almost reaches the maximum number for one subnet. If possible, assigning one more subnet will increase the security from the threats.