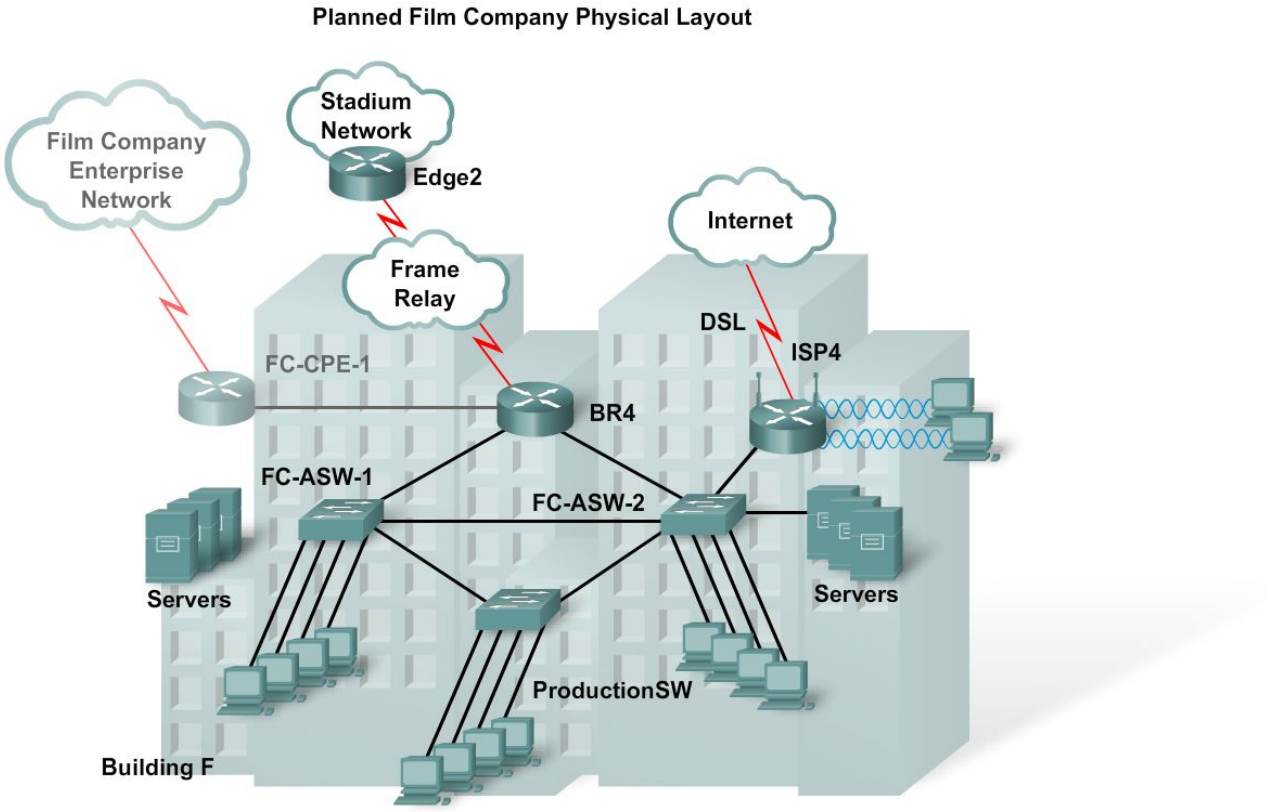
Lab 6.2.1 Determining an IP Addressing Scheme



Objective

- Determine an appropriate IP addressing strategy for the FilmCompany network.

640-802 CCNA Exam Objectives

This lab contains skills that relate to the following CCNA exam objectives:

- Describe the operation and benefits of using private and public IP addressing.
- Implement static and dynamic addressing services for hosts in a LAN environment.

Expected Results and Success Criteria

Before starting this lab, read through the tasks that you are expected to perform. What do you expect the result of performing these tasks will be?

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Background / Preparation

This lab is part of a series of labs in which you design the IP addressing scheme for the new FilmCompany network. This series includes Determining an IP Addressing Scheme (Lab 6.2.1), Determining the Number of IP Networks (Lab 6.2.2) and Creating an Address Allocation Spreadsheet (Lab 6.2.5).

In this lab, you will start to plan an IP addressing scheme that satisfies the new network design of the branch office of FilmCompany. This scheme will be applied to the network over the following two labs.

The IP address scheme has to meet the network requirements to support scalability and a hierarchical design model.

With the acquisition of AnyCompany and the new contract with the StadiumCompany, the network infrastructure of this branch office of FilmCompany needs to change significantly.

To begin planning the addressing scheme, you will examine the topology in conjunction with the different user types and traffic types. The different users and services will be grouped into VLANs and subnets. The IP addressing scheme will then be applied to the subnets.

Step 1: Consider VLAN issues

The initial step in determining the required VLANs is to group users and services into VLANs. Each of these VLANs will represent an IP subnet.

A VLAN can be considered to be a group of switch ports assigned to a broadcast domain. Grouping the switch ports confines broadcast traffic to specified hosts so that bandwidth is not unnecessarily consumed in unrelated VLANs. It is therefore a recommended best practice to assign only one IP network or subnetwork to each VLAN.

When determining how to group users and services, consider the following issues:

Flexibility
The employees and hardware of the former AnyCompany will move into the building with the FilmCompany in the near future. The network from this newly acquired company needs to be tightly integrated with the FilmCompany network and a structure put in place to enhance the security of the network.

To support this integration, with improvements in security and performance, additional VLANs need to be created on the network. These VLANs will also allow the personnel to move to the buildings without additional network changes or interruption in network services.

Security
Security can be better enforced *between* VLANs than *within* VLANs.

- Access control lists can be applied to the Distribution Layer router subinterfaces that interconnect the VLANs to enforce this security.
- The interfaces on the switches can be assigned to VLANs as appropriate to support the network for the connected device.
- Additional Layer 2 security measures can also be applied to these switch interfaces.

WANs and VPNs
The contract with StadiumCompany adds a number of new requirements. Some FilmCompany personnel will be located at the stadium. Additional personnel and contract workers will also be present at the stadium during live events. These employees will use laptops and the wireless LAN at the FilmCompany branch as well as the wireless LAN at the stadium. To provide network connectivity for these laptops, they will be in their own VLAN. At the stadium, the FilmCompany laptop users will connect to a secure wireless VLAN and use a VPN over the Frame Relay connection between stadium and the FilmCompany branch. With this connection, the laptop users can be attached to the internal FilmCompany network regardless of physical location.

To support the video feeds, FilmCompany will need resources available at the stadium. Some of the servers providing these resources will be located at the stadium. Other servers will be located at the branch office of the FilmCompany. For security and performance reasons, these servers, regardless of location, will be on

secured VLANs. A separate VPN over the Frame Relay link will be created to connect the servers at the stadium to the servers located at the FilmCompany office.

What are the advantages and disadvantages of using a VPN to extend the wireless and video server networks over the Frame Relay connection from FilmCompany to the stadium?

Advantages:

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Disadvantages:

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Redundancy

The VLAN structure will support load balancing and redundancy, which are major needs of this new network design. With such a large portion of the FilmCompany operations and revenues dependent on the network operation, a network failure could be devastating. The new VLAN arrangement allows the FC-ASW1 and FC-ASW2 switches to share the load of the traffic and be backups for each other.

This redundancy is accomplished by sharing the RSTP primary and secondary root duties for the traffic for the different VLANs:

- FC-ASW1 will be the primary root for approximately one-half of the VLAN traffic (not necessarily one-half of the VLANs) and FC-ASW2 will be the secondary root for these VLANs.
- The remaining VLANs will have FC-ASW2 as the primary root and FC-ASW1 as the secondary root.

Step 2: Group network users and services

Examine the planned network topology. Applying the issues considered in Step 1, list all the possible groupings of users and services that may require separate VLANs and subnets.

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Step 3: Tabulating the groupings

The new addressing design needs to be scalable to allow easy inclusion of future services, such as voice.

The current addressing scheme does not allow for managed growth. Correcting this scheme will mean that most devices will be placed on new VLANs and new subnets. In some cases, a device address may not be able to be changed; for example, some of the servers have software registered to their IP addresses. In such cases, the server VLAN will keep its current addressing even though it may not be consistent with the remaining addressing scheme. Other addresses that cannot be changed are the addresses used with the WAN links and the addresses for NAT pool used to access the Internet.

This table shows a possible grouping and addressing scheme. The number of hosts required for the FilmCompany branch office, including growth, has been determined. Assigning one subnet to each VLAN, the host count for each has been rounded up to the next logical network size supported by the binary patterns used in the subnet mask. Rounding up prevents underestimating the total number of host addresses required.

VLAN Number	Network Name	Number of host addresses	Predetermined Network Address	Description
1	default	14		Default VLAN for the Layer 2 devices
10	voice	254		Voice VLAN to support Voice over IP
20	management	14		Management hosts and secure peripherals (payroll printer)
30	administrative	62		Administrative hosts
40	support	126		Support hosts
50	production	126		High performance production workstations (stationary)
60	mobile	62		Mobile production hosts
70	net_admin	14		Network support
80	servers	65534	172.17.0.0 /16	Servers to support video services and storage
90	peripherals	62		Peripherals for general use (printers, scanners)
100	web_access	14		VLAN for servers that are publicly accessible
120	future	126		VLAN for future services
999	null	126		VLAN for terminating unwanted or suspicious traffic
NA	NAT_pool	6	209.165.200.224 /29	Addresses for NAT pool for BR4 or interface to ISP4
NA	DSL_Link	2	192.0.2.40 /30	DSL link to the ISP
NA	Frame_Link	2	172.18.0.16/30	Address of the FR link to the stadium

NOTE: For this exercise, VLANs 60 and 80 have been extended over VPNs to support hosts and services to the stadium. As discussed in Step 1, this may not be an optimal solution.

Step 4: Determine the total number of hosts to be addressed

To determine the block of addresses to be used, count the number of hosts. To calculate the addresses, count only the hosts that will receive addresses from the new block. Use the information in the table in Step 3 to complete this chart to calculate the total number of hosts in the new FilmCompany network requiring addresses.

Network/VLAN Name	#Number of host addresses
Total	

What is the smallest address block size that can potentially satisfy the FilmCompany network needs?

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NOTE: Often, when adding the total number off addresses needed, the total count may not accurately reflect the number of addressing blocks required. This discrepancy can occur when the host counts for the networks have not been rounded up to the next logical network size. Because the individual counts represent rounded values, you can be confident that this block size can satisfy the network requirements.

File this information in your design portfolio for use in the next lab.

Reflection / Challenge

This lab provided a step-by-step process for determining an addressing scheme for a corporate network. Discuss and consider the issues that would arise if this planning process was not methodically used.

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