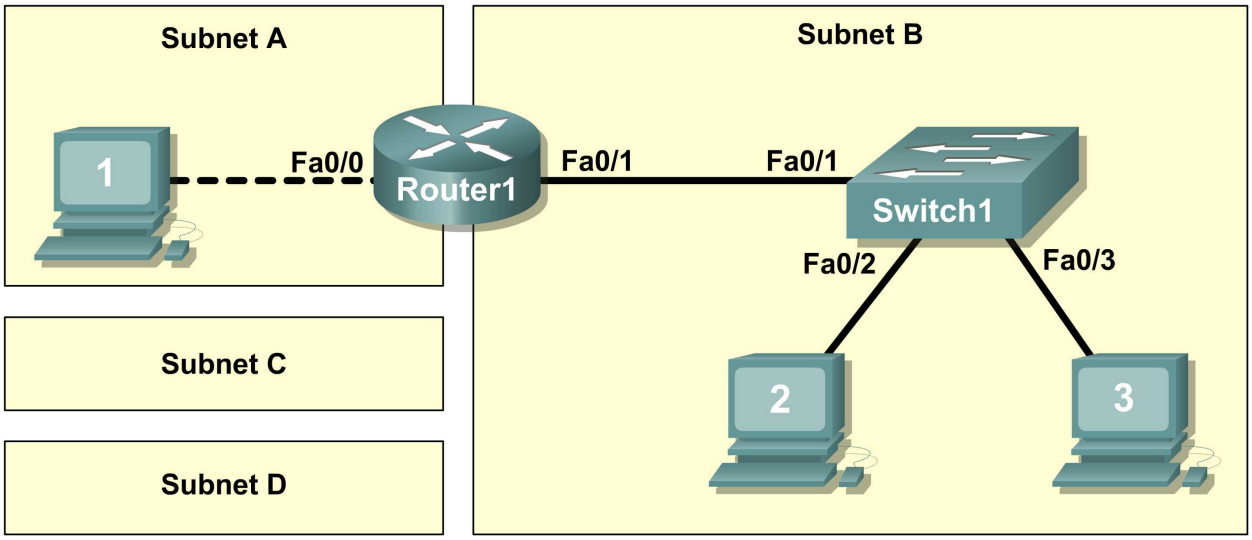
Lab 10.6.1: Creating a Small Lab Topology

Topology Diagram



Learning Objectives

Upon completion of this lab, you will be able to:

- Design the logical network.
- Configure the physical lab topology.
- Configure the logical LAN topology.
- Verify LAN connectivity.

Background

Hardware	Qty	Description
Cisco Router	1	Part of CCNA Lab bundle
Cisco Switch	1	Part of CCNA Lab bundle
*Computer (host)	3	Lab computer
Cat-5 or better straight-through UTP cables	3	Connects Router1 and computers Host1 and Host2 to Switch1
Cat-5 crossover UTP cable	1	Connects computer Host1 to Router1

Table 1. Equipment and Hardware for Lab

Gather the necessary equipment and cables. To configure the lab, refer to the equipment and hardware listed in Table 1.

Scenario

In this lab you will create a small network that requires connecting network devices and configuring host computers for basic network connectivity. SubnetA and SubnetB are subnets that are currently needed. SubnetC and SubnetD are anticipated subnets, not yet connected to the network. The 0th subnet will be used.

Note: Appendix 1 contains a subnet chart for the last IP address octet.

Task 1: Design the Logical Network.

Given an IP address and mask of `172.20.0.0 / 24 (address / mask)`, design an IP addressing scheme that satisfies the following requirements:

Subnet	Number of Hosts
SubnetA	2 maximum
SubnetB	6 maximum
SubnetC	47 maximum
SubnetD	125 maximum

Host computers from each subnet will use the first available IP address in the address block. Router interfaces will use the last available IP address in the address block.

Step 1: Design SubnetD address block.

Begin the logical network design by satisfying the requirement of SubnetD, which requires the largest block of IP addresses. Refer to the subnet chart, and pick the first address block that will support SubnetD.

Fill in the following table with IP address information for SubnetD:

Network Address	Mask	First Host Address	Last Host Address	Broadcast

What is the bit mask? _____

Step 2: Design SubnetC address block.

Satisfy the requirement of SubnetC, the next largest IP address block. Refer to the subnet chart, and pick the next available address block that will support SubnetC.

Fill in the following table with IP address information for SubnetC:

Network Address	Mask	First Host Address	Last Host Address	Broadcast

What is the bit mask? _____

Step 3: Design SubnetB address block.

Satisfy the requirement of SubnetB, the next largest IP address block. Refer to the subnet chart, and pick the next available address block that will support SubnetB.

Fill in the following table with IP address information for SubnetB:

Network Address	Mask	First Host Address	Last Host Address	Broadcast

What is the bit mask? _____

Step 4: Design SubnetA address block.

Satisfy the requirement of SubnetA. Refer to the subnet chart, and pick the next available address block that will support SubnetA.

Fill in the following table with IP address information for SubnetA:

Network Address	Mask	First Host Address	Last Host Address	Broadcast

What is the bit mask? _____

Task 2: Configure the Physical Lab Topology.

Step 1: Physically connect devices.

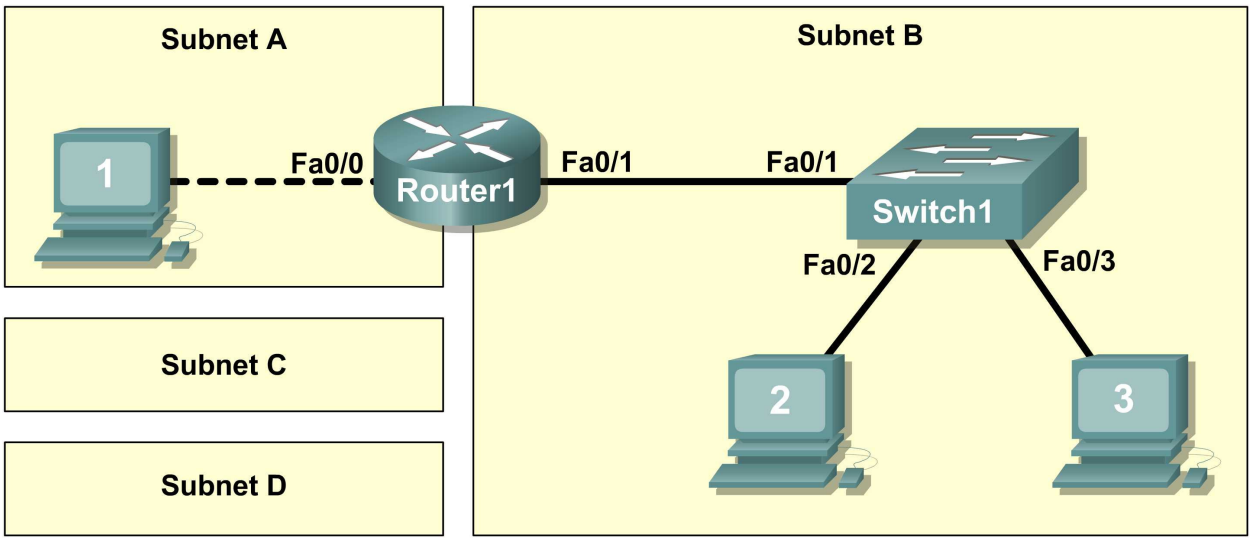


Figure 1. Cabling the Network

Cable the network devices as shown in Figure 1.

What cable type is needed to connect Host1 to Router1, and why? _____

_____

What cable type is needed to connect Host1, Host2, and Router1 to Switch1, and why? _____

_____

_____

If not already enabled, turn power on to all devices.

Step 2: Visually inspect network connections

After cabling the network devices, take a moment to verify the connections. Attention to detail now will minimize the time required to troubleshoot network connectivity issues later. Ensure that all switch connections show green. Any switch connection that does not transition from amber to green should be investigated. Is the power applied to the connected device? Is the correct cable used? Is the correct cable good?

What type of cable connects Router1 interface `Fa0/0` to Host1? _____

What type of cable connects Router1 interface `Fa0/1` to Switch1? _____

What type of cable connects Host2 to Switch1? _____

What type of cable connects Host3 to Switch1? _____

Is all equipment turned on? _____

Task 3: Configure the Logical Topology.

Step 1: Document logical network settings.

The host computer Gateway IP address is used to send IP packets to other networks. Therefore, the Gateway address is the IP address assigned to the router interface for that subnet.

From the IP address information recorded in Task 1, write down the IP address information for each computer:

Host1	
IP Address	
IP Mask	
Gateway Address	

Host2	
IP Address	
IP Mask	
Gateway Address	

Host3	
IP Address	
IP Mask	
Gateway Address	

Step 2: Configure Host1 computer.

On Host1, click **Start > Control Panel > Network Connections**. Right-click the **Local Area Connection** device icon and choose **Properties**.

On the **General** tab, select **Internet Protocol (TCP/IP)**, and then click the **Properties** button.

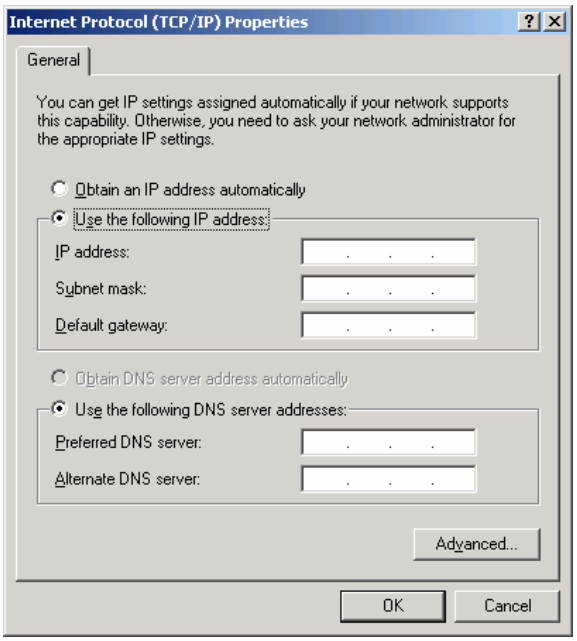


Figure 2. Host1 IP Address and Gateway Settings

Refer to Figure 2 for Host1 IP address and gateway settings. Manually enter the following information, recorded in Step 1, above:

```
IP address: Host1 IP address
Subnet mask: Host1 subnet mask
Default gateway: Gateway IP address
```

When finished, close the Internet Protocols (TCP/IP) Properties window by clicking **OK**. Close the Local Area Connection window. Depending on the Windows operating system, the computer may require a reboot for changes to be effective.

Step 3: Configure Host2 and Host3 computers.

Repeat Step 2 for computers Host2 and Host3, using the IP address information for those computers.

Task 4: Verify Network Connectivity.

Verify with your instructor that Router1 has been configured. Otherwise, connectivity will be broken between LANs. Switch1 should have a default configuration.

Network connectivity can be verified with the Windows **`ping`** command. Open a windows terminal by clicking **Start > Run**. Type **`cmd`**, and press **Enter**.

Use the following table to methodically verify and record connectivity with each network device. Take corrective action to establish connectivity if a test fails:

From	To	IP Address	Ping Results
Host1	Gateway (Router1, `Fa0/0`)		
Host1	Router1, `Fa0/1`		
Host1	Host2		
Host1	Host3		
Host2	Host3		
Host2	Gateway (Router1, `Fa0/1`)		
Host2	Router1, `Fa0/0`		
Host2	Host1		
Host3	Host2		
Host3	Gateway (Router1, `Fa0/1`)		
Host3	Router1, `Fa0/0`		
Host3	Host1		

Note any break in connectivity. When troubleshooting connectivity issues, the topology diagram can be extremely helpful.

In the above scenario, how can a malfunctioning Gateway be detected?

_____

_____

Task 5: Reflection

Review any physical or logical configuration problems encountered during this lab. Be sure that you have a thorough understanding of the procedures used to verify network connectivity.

This is a particularly important lab. In addition to practicing IP subnetting, you configured host computers with network addresses and tested them for connectivity.

It is best to practice host computer configuration and verification several times. This will reinforce the skills you learned in this lab and make you a better network technician.

Task 6: Challenge

Ask your instructor or another student to introduce one or two problems in your network when you aren't looking or are out of the lab room. Problems can be either physical (wrong UTP cable) or logical (wrong IP address or gateway). To fix the problems:

1. Perform a good visual inspection. Look for green link lights on Switch1.

2. Use the table provided in Task 3 to identify failed connectivity. List the problems:

_____

_____

_____

_____

_____

3. Write down your proposed solution(s):

_____

_____

_____

_____

_____

4. Test your solution. If the solution fixed the problem, document the solution. If the solution did not fix the problem, continue troubleshooting.

_____

_____

_____

_____

_____

_____

_____

_____

Task 7: Clean Up

Unless directed otherwise by the instructor, restore host computer network connectivity, and then turn off power to the host computers.

Carefully remove cables and return them neatly to their storage. Reconnect cables that were disconnected for this lab.

Remove anything that was brought into the lab, and leave the room ready for the next class.

Appendix 1

	1 bit- 1 subnet, 126 hosts	2 bits- 3 subnets, 62 hosts	3 bits- 7 subnets, 30 hosts	4 bits- 15 subnets, 14 hosts	5 bits- 31 subnets, 6 hosts	6 bits- 63 subnets, 2 hsots
.0	.0	.0 (.1- .62)	.0 .1- .30)	.0 (.1- .14)	.0 (.1- .6)	.0 (.1-.2)
.4						.4 (.5-.6)
.8					.8 (.9- .14)	.8 (.9-.10)
.12						.12 (.13-.14)
.16				.16 (.17- .30)	.16 (.17- .22)	.16 (.17-.18)
.20						.20 (.21-.22)
.24					.24 (.25- .30)	.24 (.25-.26)
.28						.28 (.29-.30)
.32			.32 .33- .62)	.32 (.33- .46)	.32 (.33- .38)	.32 (.33-.34)
.36						.36 (.37-.38)
.40					.40 (.41- .46)	.40 (.41-.42)
.44						.44 (.45-.46)
.48				.48 (.49- .62)	.48 (.49- .54)	.48 (.49-.50)
.52						.52 (.53-.54)
.56					.56 (.57- .62)	.56 (.57-.58)
.60						.60 (.61-.62)
.64		.64 (.65-.126)	.64 (.65- .94)	.64 (.65- .78)	.64 (.65- .70)	.64 (.65-.66)
.68						.68 (.69-.70)
.72					.72 (.73- .78)	.72 (.73-.74)
.76						.76 (.77-.78)
.80				.80 (.81- .94)	.80 (.81- .86)	.80 (.81-.82)
.84						.84 (.85-.86)
.88					.88 (.89- .94)	.88 (.89-.90)
.92						.92 (.93-.94)
.96			.96 (.97- .126)	.96 (.97- .110)	.96 (.97- .102)	.96 (.97-.98)
.100						.100 (.101-.102)
.104					.104 (.105- .110)	.104 (.105-.106)
.108						.108 (.109-.110)
.112				.112 (.113- .126)	.112 (.113- .118)	.112 (.113-.114)
.116						.116 (.117-.118)
.120					.120 (.121- .126)	.120 (.121-.122)
.124						.124 (.125-.126)
.128	.128	.128 (.129-.190)	.128 (.129- .158)	.128 (.129- .142)	.128 (.129- .134)	.128 (.129-.130)
.132						.132 (.133-.134)
.136					.136 (.137- .142)	.136 (.137-.138)
.140						.140 (.141-.142)
.144				.144 (.145- .158)	.144 (.145- .150)	.144 (.145-.146)
.148						.148 (.149-.150)
.152					.152 (.153- .158)	.152 (.153-.154)
.156						.156 (.157-.158)
.160			.160 (.161- .190)	.160 (.161- .174)	.160 (.161- .166)	.160 (.161-.162)
.164						.164 (.165-.166)
.168					.168 (.169- .174)	.168 (.169-.170)
.172						.172 (.173-.174)
.176				.176 (.177- .190)	.176 (.177- .182)	.176 (.177-.178)
.180						.180 (.181-.182)
.184					.184 (.185- .190)	.184 (.185-.186)
.188						.188 (.189-.190)
.192		.192 (.193-.254)	.192 (.193- .222)	.192 (.193- .206)	.192 (.193- .198)	.192 (.193-.194)
.196						.196 (.197-.198)
.200					.200 (.201- .206)	.200 (.201-.202)
.204						.204 (.205-.206)
.208				.208 (.209- .222)	.208 (.209- .214)	.208 (.209-.210)
.212						.212 (.213-.214)
.216					.216 (.217- .222)	.216 (.217-.218)
.220						.220 (.221-.222)
.224			.224 (.225- .254)	.224 (.225- .238)	.224 (.225- .230)	.224 (.225-.226)
.228						.228 (.229-.230)
.232					.232 (.233- .238)	.232 (.233-.234)
.236						.236 (.237-.238)
.240				.240 (.241- .254)	.240 (.241- .246)	.240 (.241-.242)
.244						.244 (.245-.246)
.248					.248 (.249- .254)	.248 (.249-.250)
.252						.252 (.253-.254)

