

Summary Lab 10.0.1 Putting It All Together

Objectives

- Create an IP addressing plan for a small network.
- Implement a network equipment upgrade.
- Verify device configurations and network connectivity.
- Configure switch port security.

Background / Preparation

In this activity, you play the role of an on-site installation and support technician from an ISP. You receive a work order specifying your responsibilities, which include analyzing the existing network configuration of the customer and implementing a new configuration to improve network performance. You use additional equipment as necessary, and develop an IP subnetting scheme to address the customer needs. On an earlier site visit, one of the ISP technicians had created a diagram of the existing network as shown below.

Required Resources

The following equipment is required:

- ISP router with two serial interfaces and one Fast Ethernet interface (preconfigured by instructor)
- Ethernet 2960 switch to connect to the ISP router (preconfigured by instructor)
- Customer 1841 router (or other router with two Fast Ethernet interfaces and at least one serial interface to connect to the ISP)
- Linksys WRT300N (or other Linksys that supports wireless)
- Ethernet 2960 switch to connect wired hosts
- Windows XP-based host to act as a wireless client (wireless NIC)
- Windows XP-based host to act as a wired client (Ethernet NIC)
- Category 5 cabling as necessary
- Serial cabling as necessary
- ISP work order (in this lab)
- Device Configuration Checklist (in this lab)
- Network Equipment Installation Checklist (in this lab)
- Configuration Verification and Connectivity Checklist (in this lab)

Part A - Review the Existing Network and Customer Work Order

You have received the following work order from the manager at the ISP. Review the work order to get a general understanding of what is to be done for the customer.

ABC-XYZ-ISP Inc.

Official Work Order

Customer: AnyCompany1 or AnyCompany2

Date: _____

(Circle the customer name assigned by the instructor)

Address: 1234 Fifth Street, Anytown,

Customer Contact: Fred Pennypincher, Chief Financial Officer

Phone number: 123-456-7890

Description of Work to Be Performed

Review the existing network, and upgrade it by adding an 1841 router and standalone 2960 switch to supplement and offload the existing Linksys WRT300N. The new switch will support connections from wired clients on one subnet. The existing Linksys will support wireless clients on another subnet. Configure the 1841 as a DHCP server for the wired network, and the Linksys to support wireless users.

The wired and wireless client traffic from each subnet is routed through the new 1841 customer router. RIPv2 is to be used between the 1841 and the ISP, and the encapsulation on the WAN link between them is PPP. The customer router must use a static address. The ISP router serial interface IP address it must communicate with is: _____

If your local network is connected to the ISP as AnyCompany1, the IP address of the ISP serial 0/0/0 interface is 10.100.1.5 /22.

If your local network is connected to the ISP as AnyCompany2, the IP address of the ISP serial 0/0/1 interface is 172.27.100.25 /22.

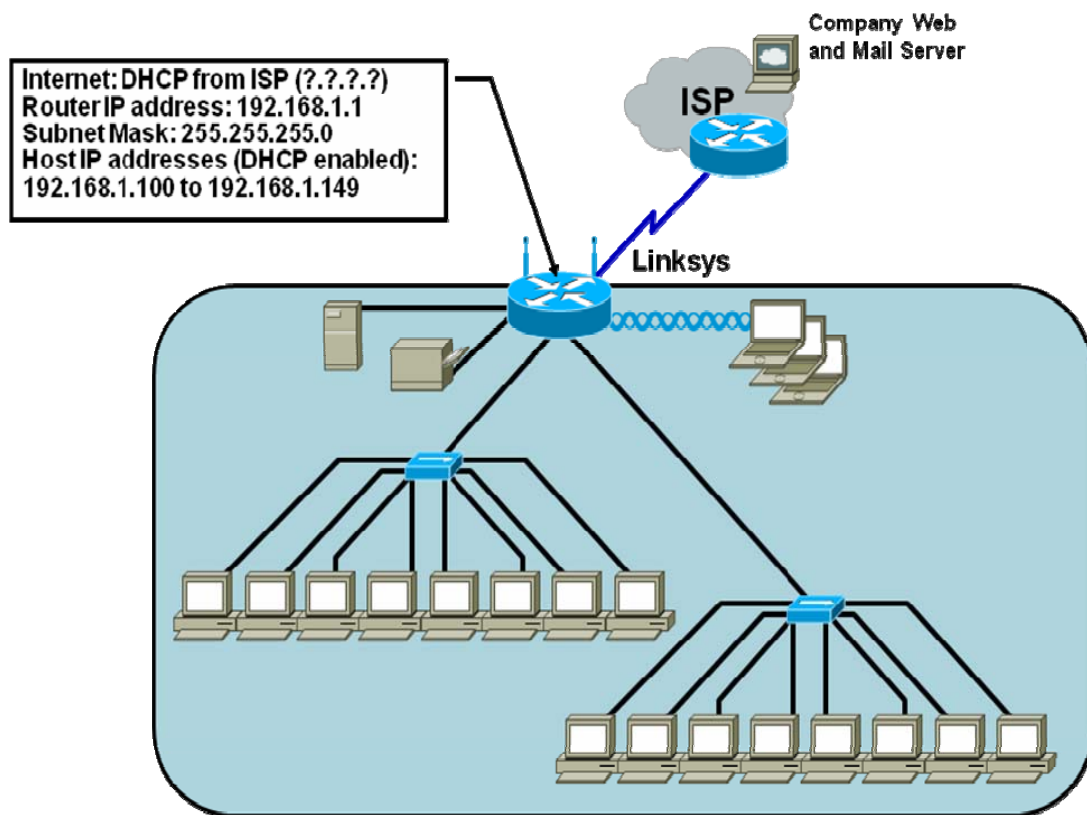
Assigned to:

Guy Netwiz

Approved by:

Bill Broadband, ISP Manager

Existing Network of the Customer



Part B – Develop the Subnet Scheme

The customer has been assigned an IP address and subnet mask _____

If the local network customer is AnyCompany1, use 192.168.111.0 /24.

If the local network customer is AnyCompany2, use 192.168.222.0 /24.

Develop a subnet scheme with this address that allows the customer network to support two subnets of up to 30 clients each, and allow for growth to as many as six subnets in the future.

The first subnet is for the wired clients. The second subnet is used to assign an IP address to the Linksys external Internet interface. The internal wireless network clients use the default IP addressing (network 192.168.1.0 /24) assigned by the Linksys. The Linksys uses NAT/PAT to convert internal wireless client addresses to the external address. The internal wireless clients do not require a subnet from the base address.

Step 1: Determine the number of hosts and subnets.

- The largest subnet must be able to support 30 hosts. To support that many hosts, the number of host bits required is _____.
- What is the minimum number of subnets required for the new network design that also allows for future growth? _____
- How many host ID bits are reserved for the subnet ID to allow for this number of subnets with each subnet having 30 hosts? _____
- What is the maximum possible number of subnets with this scheme? _____

Step 2: Calculate the custom subnet mask.

Now that the number of subnet ID bits is known, the subnet mask can be calculated. A class C network has a default subnet mask of 24 bits, or 255.255.255.0.

The custom subnet mask for this network will be _____._____._____._____, or /_____.

Step 3: Identify subnet and host IP addresses.

Now that the subnet mask is identified, the network addressing scheme can be created. The addressing scheme includes the subnet numbers, the subnet broadcast address, and the range of IP addresses assignable to hosts.

Complete the table showing all the possible subnets for the 192.168.111.0 network (if you are working with AnyCompany1) or 192.168.222.0 network (if you are working with AnyCompany2).

Subnet	Subnet Address	Host IP Address Range	Broadcast Address

Part C – Document Network Device Interfaces and Physical Topology

Step 1: Document the 1841 interfaces and host IP addresses.

Fill in the following table with the IP addresses, subnet masks, and connection information for the customer router interfaces. If an interface is not used, enter N/A. This information is used in configuring the customer router. If you are using a router other than an 1841, use the interface chart at the end of the lab to determine the proper interface designations.

Interface (1841)	IP Address / Subnet Mask	Connects to Device / Interface	Connects to Device IP Address (if applicable)
Serial 0/0/0			
Serial 0/0/1			
Fa 0/0			
Fa 0/1			

Step 2: Document the Linksys interfaces and host IP addresses.

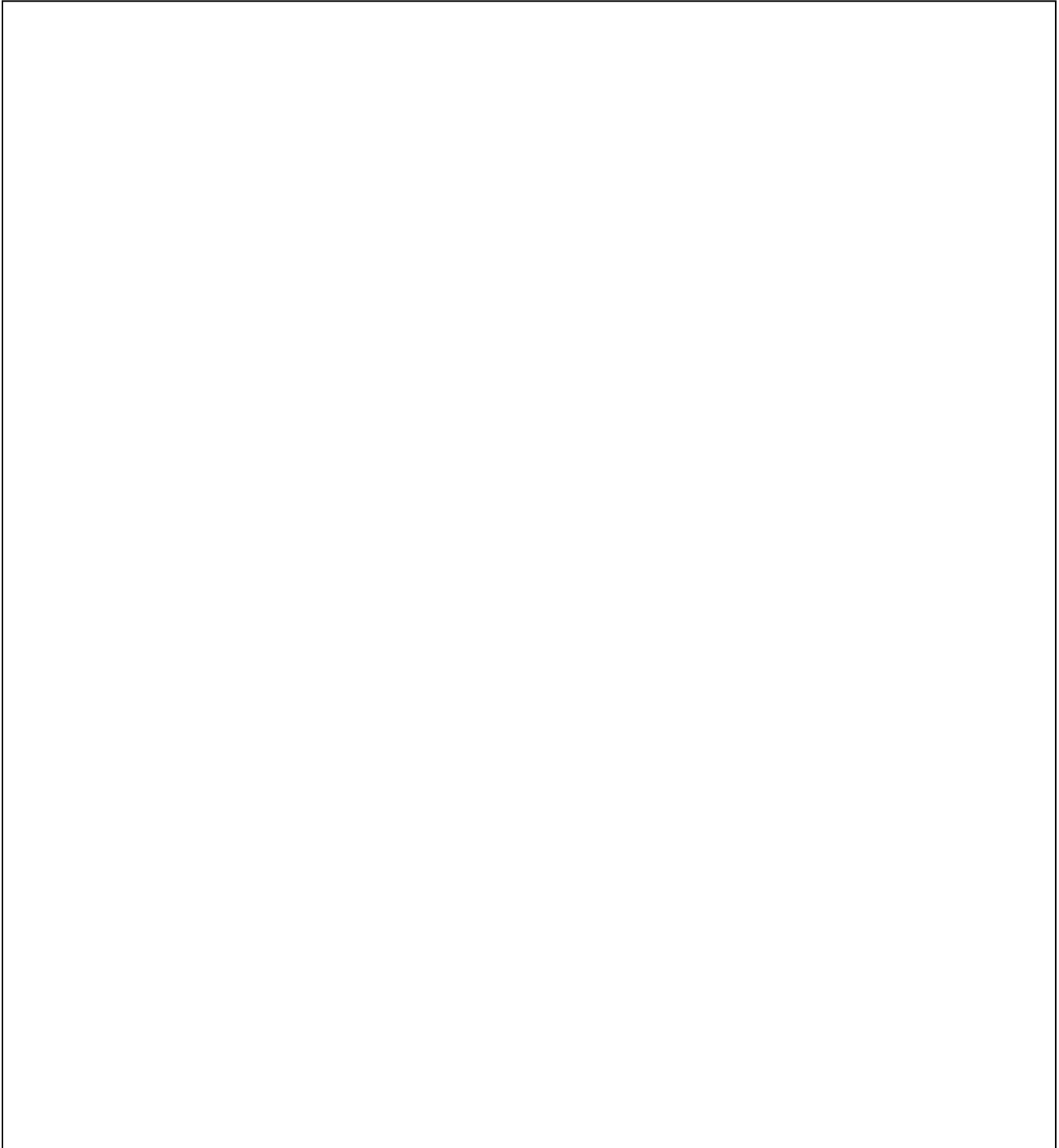
Fill in the following table with the IP addresses, subnet masks, and connection information for the Linksys interfaces.

Note: The Linksys should be reset to its factory default setting and should not be configured, except for changing the SSID.

Interface (Linksys)	IP Address / Subnet Mask	Connects to Device / Interface	Connects to Device IP Address (if applicable)
Internet interface (external address)			
LAN gateway (internal address)			
DHCP wireless hosts address range			

Step 3: Diagram the upgraded network.

In the space provided here, draw a physical network diagram, showing all network devices, hosts, and cabling. Identify all devices and interfaces according to the interface chart, and indicate the IP address and subnet mask (using /xx format) for each interface, based on the entries from the previous steps.

A large, empty rectangular box with a thin black border, intended for drawing a physical network diagram. The box occupies the majority of the page below the instructions.

Part D – Configure Devices and Verify Default Settings

Step 1: Verify default settings for the 1841 customer router.

- Connect to the customer router and verify that it is in the factory default state.
- If using SDM to configure basic settings, use the Reset to Factory Defaults option from the SDM main menu. Also verify that the router has SDM version 2.4 or later installed. If not, contact the instructor.
- If using the Cisco IOS CLI to configure the router, erase the startup-config and issue the **reload** command from privileged mode.

Note: If the startup-config is erased on an SDM router, SDM no longer comes up by default when the router is restarted. It is then necessary to build a basic config. Contact the instructor if this is the case.


Step 2: Configure the 1841 customer router.

Use the following checklist to assist in configuring the 1841 customer router. Check off the configuration items as you complete them. Note that some of the basic router settings can be configured using SDM if available.

Display the running-config of the router and save it as a file for reference.

Device Configuration Checklist

Device Manuf. / Model Number: _____ IOS version: _____

	Configuration Item	Configuration Value	Notes / Commands or SDM Used
	Configure the router host name	AnyCompany1 or AnyCompany2	
	Configure passwords	Console: cisco Enable: cisco Enable Secret: class vty terminals: cisco	
	Configure Fast Ethernet interface 0/0	IP Addr: _____ SN mask: _____	
	Configure Fast Ethernet interface 0/1	IP Addr: _____ SN mask: _____	
	Configure the WAN interface serial 0/0/0 (ISP provides clock rate, encapsulation PPP)	IP Addr: _____ SN mask: _____	
	Configure DHCP server for internal networks (wired and Linksys wireless pools)	Subnet 1: _____ Subnet 2: _____	
	Configure static route to the wireless network		
	Configure a default route to the ISP router		

	Configure RIPv2 to advertise the customer networks	Net: _____ Net: _____ Net: _____	
	Display the running-config and verify all settings		
	Save running-config to startup-config		

Step 3: Verify default settings for the Linksys and set the SSID.

- Log in to the Linksys and verify that it is in the factory default state. Use the factory default of no user ID and password of admin. Set the router internal IP address to 192.168.1.1, with a subnet mask of 255.255.255.0. The DHCP address range is 192.168.1.100 through 192.168.1.149. All security settings are set to the default, with no MAC filtering, and so on.
- If necessary, reset the ISR using the **Administration** tab and the **Factory Defaults** option.
- Change the default Service Set Identifier (SSID) of the Linksys to AnyCompany1 (or AnyCopmany2) and ensure that it is broadcast.

Step 4: Verify the default settings for the 2960 switch.

Log in to the switch and verify that it is in the factory default state. Use the Cisco IOS CLI to reset the switch by deleting vlan.dat, erasing the startup-config, and issuing the **reload** command from privileged mode. It may be necessary to power cycle the switch for the changes to take effect.

Step 5: Verify that the hosts are DHCP clients.


Use the **Control Panel > Network Connections** option to verify that both the wired and wireless hosts are set to obtain their IP addresses automatically via DHCP.

Part E – Connect Network Devices and Verify Connectivity

Step 1: Connect the network devices.

Use the following checklist to assist in connecting network devices using the proper cables. Check off the installation items as you complete them.

Network Equipment Installation Checklist


	Devices Connected	From Device/ Interface	To Device/ Interface	Cable Type
	Connect the Linksys to the 1841			
	Connect the 1841 to the ISP router			
	Connect the 1841 to the switch			
	Connect the wired host to			

	switch			
	Connect the wireless host to Linksys SSID entered in Part D, Step 3			

Step 2: Verify device configurations and network connectivity.

Use the following checklist to verify the IP configuration of each host and test network connectivity. Also display the various running-configs and routing tables. Check off the items as you complete them.

Configuration Verification and Connectivity Checklist

	Verification Item	Record Results Here
	From command prompt of wired host, display the IP address, subnet mask, and default gateway	
	From command prompt of wireless host, display the IP address, subnet mask, and default gateway.	
	Log in to Linksys GUI from wireless host and record the LAN IP address and subnet mask, Internet IP address, subnet mask, and default gateway	
	Ping from the wired host to 1841 default gateway	
	Ping from the wired host to ISP S0/0 interface	
	Ping from the wired host to ISP Lo0 interface	
	Ping from the wireless host to 1841 default gateway	
	Ping from the wireless host to ISP S0/0 interface	
	Ping from the wireless host to ISP Lo0 interface	
	Display the IP routing table for the customer router. What routes are known and how were they learned?	
	Capture the running-config from the customer 1841 router in a text file on the desktop to show to the instructor. Name the file using your initials.	

Part F – Configure Port Security for the Switch

Step 1: Display the MAC address table entry for the port to which the wired host is connected.

Use the **show mac-address-table int fa0/X** command, where X is the port number to which the wired host is connected. You may need to ping from the host to the router default gateway IP address to refresh the MAC address table entry. In this example, the port number is Fa0/2.

```
S1#show mac-address-table int f0/2
      Mac Address Table
```

Vlan	Mac Address	Type	Ports
----	-----	-----	-----
1	000b.db04.a5cd	DYNAMIC	Fa0/2

Total Mac Addresses for this criterion: 1

Step 2: Clear the dynamically learned MAC address entry.

Issue the **clear mac-address-table dynamic interface fa0/X** command, where X is the port number to which the wired host is attached.

Step 3: Shut down the port, configure it as an access port, and then issue the port security commands.

The **switchport port-security** command enables security on the port using the defaults. The defaults are one allowed MAC address, and shutdown is the violation action to be taken.

The **switchport port-security mac-address sticky** command allows the switch to learn the MAC address currently associated with the port. This address becomes part of the running configuration. If the running-config is saved to the startup-config, the MAC address is retained when the switch is reloaded.

To setup sticky port security perform the following steps:

First shut down the port to which the wired host is attached.

Use the **switchport mode access** command to force the port to be an access port to configure port security.

Use the **switchport port-security** command to enable port security

Use the **switchport port-security mac-address sticky** command to enable the port to learn the MAC address of the connected host.

Finally, enter the **no shutdown** command to re-enable the port so that it can learn the MAC address of the host.

Step 4: Ping from the wired host to the AnyCompanyX router default gateway.

Allow some time to pass and then issue the **show running-config interface Fa0/X** command to see the MAC address that the switch learned. Replace the X with the port number to which the wired host is attached.

Step 5: Display the port security using the show port-security interface command.

Issue the **show port-security interface Fa0/X** command, and replace the X with the port number to which the wired host is attached.

What is the port status? _____

What is the security violation count? _____

What is the source Address? _____

Step 6: Remove the wired host cable from the switch port and connect the cable from another PC.

a. Ping from the new wired host to any IP address to cause a security violation on port Fa0/X. You should see security violation messages.

b. Issue the **show port-security interface** command again for Fa0/X.

What is the port status? _____

What is the security violation count? _____

What is the source address? _____

Step 7: Reconnect the original host to its port and restore the port.

- a. Clear the sticky address entry for port Fa0/X using the command **clear port-security sticky interface fa0/X access**. Replace the X with the port number to which the wired host is attached.
- b. To return the interface from **error disable** to **administratively up**, enter the **shutdown** command followed by the **no shutdown** command.

Router Interface Summary				
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)		
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
1700	Fast Ethernet 0 (FA0)	Fast Ethernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)
1800	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
2600	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)
Note: To find out exactly how the router is configured, look at the interfaces. The interface identifies the type of router and how many interfaces the router has. There is no way to effectively list all combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart does not include any other type of interface, even though a specific router may contain one. An example of this might be an ISDN BRI interface. The information in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface.				