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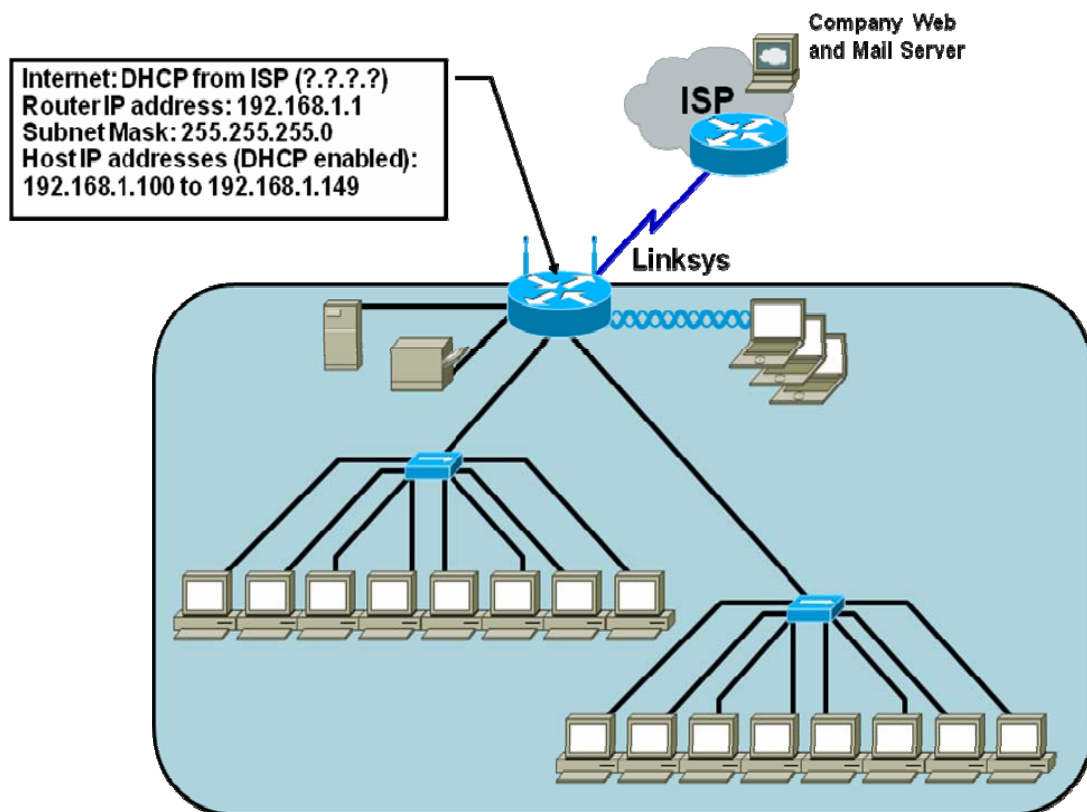# Lab 4.1.5 Subnetting a Network

## Objective

- Create an IP addressing plan for a small network.

## Background / Preparation

In this activity, you will play the role of an onsite installation and support technician from an ISP.

A customer has called the ISP complaining of e-mail problems and occasional poor Internet performance. On an earlier site visit, the technician had created diagram of the customer's existing network shown here.

### Existing Network



Internet: DHCP from ISP (?.?.?.?)
Router IP address: 192.168.1.1
Subnet Mask: 255.255.255.0
Host IP addresses (DHCP enabled):
192.168.1.100 to 192.168.1.149

The ISP is preparing a design for a network upgrade. The interim topology diagram for the proposed network is shown below.
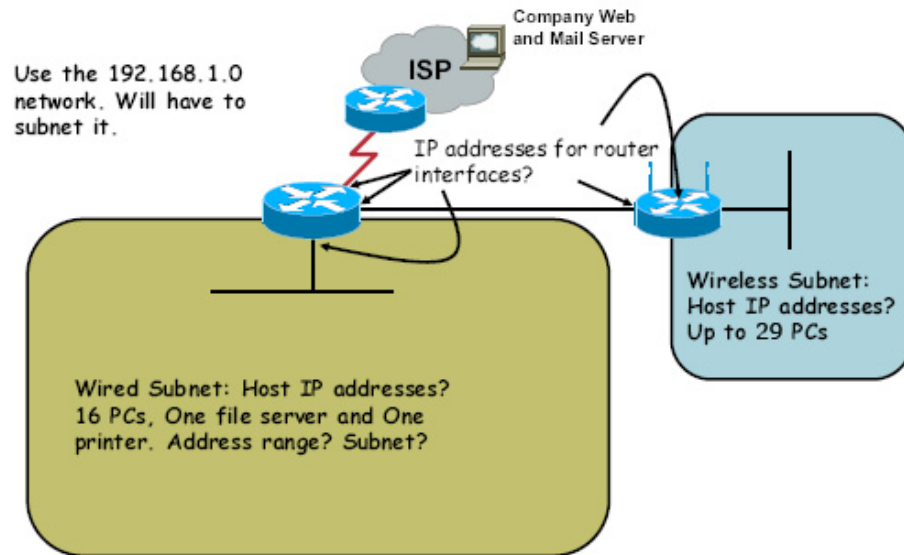
## Proposed Network
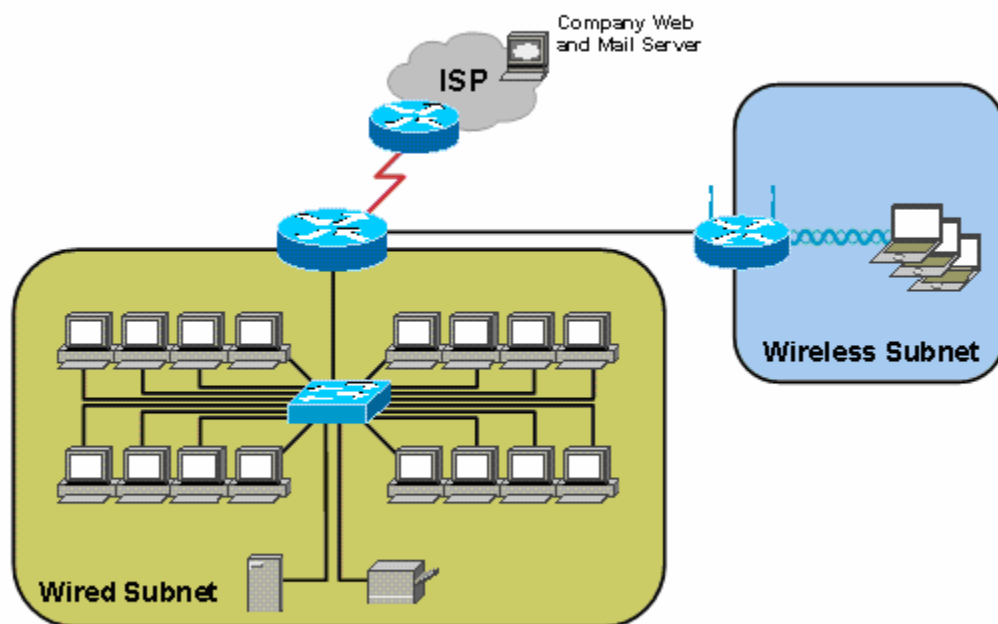


There is still a requirement for an IP addressing plan. One of the ISP network designers has made some notes on a simplified sketch of the proposed network, and has written some requirements. The designer asks you to create an IP address plan for the network upgrade.

Rough Design Notes:



**Step 1: Analyze the network**

a. Referring to the Rough Design Notes, determine the minimum number of hosts that a subnet needs to support the new network design.

1) The largest subnet must be able to support _____ hosts.

2) To support that many hosts, the number of host bits required is _____.

b. What is the minimum number of subnets required for the new network design? _____

c. Can this network be subnetted according to the requirements? _____

For example: If four subnets are required and the largest subnet has to support 128 hosts, this is a problem, because a subnet in a class C network that has been partitioned four ways can support only 62 hosts.

d. Fill in the blanks to summarize the subnetting requirements of this new network design:

This network requires _____ subnets, each supporting 29 hosts. Therefore, _____ host ID bits are reserved for the subnet ID. With those values, this network supports _____ subnets, each subnet having _____ hosts.

**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. What will the custom subnet mask be?

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

## Step 3: Specify the host IP addresses

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

a.  Complete the table showing all the possible subnets for the 192.168.1.0 network.

| Subnet | Subnet Address | Host IP Address Range | Broadcast Address |
|--------|----------------|-----------------------|-------------------|
|        |                |                       |                   |
|        |                |                       |                   |
|        |                |                       |                   |
|        |                |                       |                   |
|        |                |                       |                   |
|        |                |                       |                   |
|        |                |                       |                   |
|        |                |                       |                   |

b.  for it to be completed. Hosts will be assigned IP addresses as follows: (fill in the table below)

| Device | Interface | IP Address | Connects to | IP Address |
|--------|-----------|------------|-------------|------------|
| 1841 | Serial 0/0/0 | 11.11.11.100 | ISP Router | 11.11.11.1 |
|  | Fa 0/0 | ____.____.____.____ | Wired hosts | Wired host Range:<br>____.____.____.____<br>To<br>____.____.____.____ |
|  | Fa 0/1 | ____.____.____.____ | Linksys Internet | ____.____.____.____ |
| Linksys | Internet | ____.____.____.____ | 1841 Fa 0/1 | ____.____.____.____ |
|  | LAN Gateway | ____.____.____.____ | Wireless Hosts | Wireless host Range:<br>____.____.____.____<br>To<br>____.____.____.____ |

## Step 4: Consider other subnetting options

What if there were more than 30 hosts that needed to be supported on either the wired or wireless portion of the network. You could borrow fewer bits, which would create fewer subnets, but each one would support a greater number of hosts per subnet.

a.  How many bits would be borrowed to create four subnets? _____

b.  How many bits would be left for hosts on each subnet? _____

c.  What is the maximum number of hosts each subnet could support?

_____

d.  What would the subnet mask be in dotted decimal and slash number (/#) format?

_____

e. If you start with the same 192.168.1.0 network as before and subnet it into four subnets, what would the subnet numbers be?

_____

**Step 5: Reflection**

a. Does subnetting help reduce the problem of IP address depletion? Explain your answer.

_____

_____

_____

_____

_____

b. The Rough Design Notes diagram noted that the wireless subnet would have up to 30 PCs connecting. In pairs or in small groups, discuss whether or not that creates a situation in which IP addresses might get wasted. Does it matter, and why or why not?

c. There are alternate methods of subnetting using CIDR and VLSM. Would VLSM be a worthwhile option for subnetting this network? Discuss in small groups.