5.1.4 Subnet Facts

Subnetting is the process of dividing a large network into smaller networks called *subnets*. When you subnet a network, each network segment has a different network address, or subnet address. In practice, the terms network and subnet are used interchangeably to describe a physical network segment with a unique network address.

Functions of Subnetting

From a physical standpoint, subnetting is necessary because network architectures impose a limit on the number of hosts allowed on a single network segment. As your network grows, you will need to create subnets (physical networks) to:

- Increase the number of devices that can be added to the LAN (to overcome the architecture limits)
- Decrease the number of devices on a single subnet (to reduce traffic congestion)
- Reduce the processing load placed on computers and routers
- Isolate sensitive systems on the network

Subnetting is also used to efficiently allocate available IP addresses. For example, an organization with a class B network ID is allocated enough addresses for 65,536 hosts. However, if the organization in practice uses only 10,000 of those host IDs, over 55,000 IP addresses are going unused. Subnetting provides a way to break the single class B network ID into multiple smaller network IDs.

- Subnetting uses custom subnet masks instead of the default subnet masks (e.g., using 255.255.255.0 with a Class B address instead of the default 255.255.0.0).
- When you subnet a network by using a custom mask, you can divide the IP addresses between several subnets. However, you also reduce the number of hosts available on each network.
- Using custom subnet masks is often called *classless* addressing because the subnet mask cannot be inferred simply from the class of a given IP address. The address class is ignored, and the mask is always supplied to identify the network and host portions of the address.

The following table shows how a Class B address can be subnetted to provide additional subnet addresses. Notice that by using a custom subnet mask, the Class B address looks like a Class C address.

Subnetting Class B Addresses

	Default Example	Custom Example
Network Address	188.50.0.0	188.50.0.0
Subnet Mask	255.255.0.0	255.255.255.0
# of Subnet Addresses	One	254
# of Hosts per Subnet	65,534	254 per subnet
Subnet Address(es)	188.50.0.0 (only one)	188.50.1.0 188.50.2.0 188.50.3.0 (and so on)
Host Address Range(s)	188.50.0.1 to 188.50.255.254	188.50.1.1 to 188.50.1.254 188.50.2.1 to 188.50.2.254 188.50.3.1 to 188.50.3.254 (and so on)

Remember that the last valid host address ends with 254 because 255 is a broadcast address and is not available as a host address. For example:

- For the class A network address 115.0.0.0, the host range is 115.0.0.1 to 115.255.255.254.
- For the class B network address 154.90.0.0, the host range is 154.90.0.1 to 154.90.255.254.
- For the class C network address 221.65.244.0, the host range is 221.65.244.1 to 221.65.244.254.

While subnetting divides a large address space into multiple subnets, *supernetting* combines multiple small network addresses into a single larger network. Supernetting allows multiple Class C addresses to be combined into a single network.