

CompTIA A+ 11.0 Networking

11.1.3 Networking Facts

A network is a group of interconnected computers and devices that can share information with each other. Networks can range in size from two devices up to the largest network in the world, the internet.

This lesson covers the following topics:

- Networking components
- Network addressing
- Networking benefits
- Network types

Networking Components

Multiple components are required to setup and configure a network. These components include:

- Devices - Devices can include a computer, tablet, mobile phone, gaming console, IoT device, and server. The devices are typically referred to as network nodes or hosts.
- Transmission medium - The transmission medium connects network devices. Examples include twisted pair cabling, fiber optics, and wireless radio signals.
- Network interface (NIC) - The network interface converts the digital data into a signal that can be transmitted along the transmission medium.
- Specialized devices are used to connect host devices together. These connection devices include:
 - Routers to connect multiple networks together.
 - Switches to connect multiple computers inside of a network together.
 - Access point to connect wireless network hosts.
- Networking protocols - These are standards that define how data is formatted and how the network hosts will talk to each other.

Network Addressing

Every device on a network requires a unique address. The Internet Protocol version 4 (IPv4) formats the unique address using four octets that are each separated by a period. The IPv4 address is split into two components:

- The *network ID* defines the network address. Every host on the device has the same network ID.
- The *host ID* is a unique value that is different for each device.

The *subnet mask* defines the octets that belong to the network ID and the octets that belong to the host ID. The standard subnet mask consists of four octets that match to each octet in the IPv4 address. Each octet in the subnet mask consists of two values, usually 255 or 0, but not always. Octets with 255 represent the network ID and 0's represents the host ID. For example:

The IP address 192.168.0.5 with a subnet mask of 255.255.0.0 shows that the first two octets in the IP address are the network ID and the last two octets are the host ID.

Often, a large network is split into smaller networks called subnets. The subnet mask defines which network a host belongs to. Two devices need to be on the same subnet to communicate. If they are on different subnets, the traffic has to be sent through a router which will forward it onto the other network.

Benefits of Networking

Despite the costs of implementation and maintenance, networks save organizations money by allowing them to:

- Consolidate (centralize) data storage.
- Share peripheral devices such as printers.
- Increase internal and external communications.
- Increase productivity and collaboration.
- Provide a centralized management location for user accounts and security.
- Allow a network technician to remotely troubleshoot issues.

Network Types

There are several ways to classify networks. The following table describes several of these ways.

Type	Classification	Description
Host role	Peer-to-peer	<p>In a peer-to-peer network, each host can provide network resources to other hosts or access resources located on other hosts. Each host controls access to the resources located on it.</p> <p>Advantages of peer-to-peer networks include:</p> <ul style="list-style-type: none"> • Easy implementation • Inexpensive <p>Disadvantages of peer-to-peer networks include:</p> <ul style="list-style-type: none"> • Difficult to expand (not scalable) • Difficult to support • Lack centralized control • No centralized storage
	Client-server	<p>In a client-server network, hosts have specific roles. For example, some hosts are assigned server roles, which allow them to provide network</p>

Type	Classification	Description
Geography		<p>resources to other hosts. Other hosts are assigned client roles, which allow them to consume network resources.</p> <p>Advantages of client-server networks include:</p> <ul style="list-style-type: none"> • Easy to expand (scalable) • Easy to support • Centralized services • Easy to back up <p>Disadvantages of client-server networks include:</p> <ul style="list-style-type: none"> • Expensive server operating systems • Extensive advanced planning required
	Body area network (BAN)	A <i>body area network</i> is a very small network that consists of wearable or implanted devices such as a smart watch, fitness trackers, or medical implants.
	Personal area network (PAN)	<p>A <i>personal area network</i> is a very small network used for communication between personal devices.</p> <p>For example, a PAN may include a pair of wireless earbuds and a smartphone. A PAN is limited to a few feet in range. A PAN is typically created using Bluetooth wireless technologies.</p>
	Local area network (LAN)	A <i>local area network</i> is a network in a small geographic area, like an office. A LAN typically uses wires to connect systems together.
	Wireless local area network (WLAN)	A wireless LAN covers an area that is roughly the same size as a standard LAN. It uses radio signals to connect systems instead of wires.
	Campus area network (CAN)	<p>A <i>campus area network</i>, sometimes referred to as a <i>corporate area network</i>, is established when multiple LANs are connected within a limited area.</p> <p>An example is a college campus or multiple</p>

Type	Classification	Description
		buildings that are owned by the same organization.
	Metropolitan area network (MAN)	<p>A <i>metropolitan area network</i> is a network that covers an area as small as a few city blocks to as large as an entire metropolitan city. MANs are typically owned and managed by a city as a public utility.</p> <p>Be aware that many IT professionals do not differentiate between a wide area network and a MAN, because both use most of the same network technologies.</p>
	Wide area network (WAN)	<p>A <i>wide area network</i> is a group of LANs that are geographically isolated, but are connected to form a large internetwork.</p> <p>A <i>wireless mesh network</i> is a group of wireless mesh nodes that communicate with one another to share the network connection across a large area.</p>
	Wireless mesh network (WMN)	<p>WMNs provide the ability to stream voice, data, and video between arbitrary pairs of devices. Each device in the WMN uses the other devices in the WMN as relays to avoid the need for infrastructure.</p> <p>A <i>wireless wide area network</i> covers a large geographical area by connecting separate areas wirelessly. WLAN and WWAN both connect to the internet wirelessly, but they use different technologies to do it.</p>
	Wireless wide area network (WWAN)	<p>WWANs are often referred to as 4G, 5G, or LTE networks because they usually use cellular network technologies as connection types.</p> <p>The term <i>network</i> often describes a computer system controlled by a single organization. This could be a local area network at a single location or a wide area network used by a single business or organization.</p> <p>If two companies connect their internal networks</p>
Management Network		

Type	Classification	Description
		<p>to share data, you could call it one network. However, it is two networks, because each network is managed by a different company.</p> <p>A <i>subnet</i> is a portion of a network. All devices on the subnet share a common network address.</p> <ul style="list-style-type: none"> • All devices on the subnet share the same network address, but each has a unique host address. • Each subnet in a larger network has a unique subnet address. • Devices connected through hubs or switches are on the same subnet. Routers are used to connect multiple subnets.
	Subnet	
		<p>An <i>internetwork</i> is a network with geographically dispersed WAN connections that connect multiple LANs.</p> <p>Additionally, connecting two networks under different management is a form of internetworking because data must travel between two networks.</p>
	Internetwork	
		<p>A special type of network that provides high-speed access to storage across the network. Specialized hardware is used to store and provide access to needed data.</p>
	Storage attached network (SAN)	
		<p>The <i>internet</i> is a large, world-wide, public network. The network is public because virtually anyone can connect to it. Users or organizations make services freely available on the internet.</p> <ul style="list-style-type: none"> • Users and organizations connect to the internet through an internet service provider (ISP). • The internet uses a set of communication protocols (TCP/IP) for providing services. • Individuals and organizations can make services (such as a website) available to other users on the internet.
Participation	Internet	

Type	Classification	Description
	Intranet	<p>An <i>intranet</i> is a private network that uses internet technologies. Services on an intranet are available only to hosts that are connected to the private network.</p> <p>For example, a company might have a website that only employees can access.</p>
	Extranet	<p>An <i>extranet</i> is a private network that uses internet technologies and makes its resources available to external trusted users.</p> <p>For example, you might create a website on a private network that only users from a partner company can access.</p>