

## 6.4.2 Ethernet Facts

Ethernet is the most common local area networking standard for wired networks. The following table describes the various components that compose an Ethernet network:

Component	Description
Network Interface Card	<p>A network interface card (NIC) creates the signals that are sent along the networking medium.</p> <ul style="list-style-type: none"> <li>A transceiver built into the network adapter formats the binary data for transmission on the network medium.</li> <li>Ethernet devices are identified using the MAC address, which is burned into the network interface card.</li> </ul>
Networking Media	<p>Ethernet supports the following cable types:</p> <ul style="list-style-type: none"> <li>Unshielded twisted-pair cables (UTP) with RJ45 connectors. This is the most common transmission medium used for Ethernet.</li> <li>Fiber optic cables, which are used in high-speed applications (such as servers or streaming media).</li> <li>Coaxial cable with F-type connectors for cable internet services. Coaxial cable is also used for older Ethernet implementations ( which are often called <i>thinnet</i> or <i>thicknet</i> networks).</li> </ul>
Connectivity Devices	<p>Ethernet uses the following connectivity devices:</p> <ul style="list-style-type: none"> <li>A hub provides a central connection for multiple media segments on the same subnet. When a hub receives a signal, it is repeated out to all other ports. Hubs operate in half-duplex mode, meaning devices can either send or receive data at any given time. <p style="text-align: center;">Hubs are rarely used in networking environments. You should avoid them if possible.</p> </li> <li>A switch provides a central connection for multiple media segments on the same subnet. When a switch receives a signal, it forwards that signal only to the port where the destination device is connected. <ul style="list-style-type: none"> <li>Switches use the MAC address to send frames to the destination device.</li> <li>Switches operate in full-duplex mode, meaning devices can send and receive data at the same time because transmission paths are dedicated to only the communicating devices.</li> <li>When possible, use switches instead of hubs.</li> </ul> </li> <li>A router connects two network segments that have different subnet addresses. <ul style="list-style-type: none"> <li>A router has multiple network connections. Each connection is on a different subnet.</li> <li>Routers use the IP address within a packet to move packets between networks.</li> </ul> </li> <li>A bridge connects two segments within the same subnet that use different media types. For example, you can use a bridge to connect wireless clients to wired clients on the same network.</li> <li>A patch panel is a device that is commonly used to connect individual stranded wires into female RJ45 connectors. For example, you might connect four pairs of wires from a punchdown block to a port on the patch panel. On the patch panel, you then connect drop cables (cables with RJ45 connectors) to the patch panel on one end and a computer on the other end.</li> <li>An Ethernet over power device allows network communications to be transmitted over existing AC power lines. An Ethernet over power device is plugged in to one AC power outlet, and a second Ethernet over power device is connected to the same AC circuit. These devices multiplex the AC copper power lines to transmit digital network signals at a frequency higher than the AC electrical power already on the circuit.</li> </ul>
Standards	<p>Ethernet standards identify the transmission speed and the cable type. Data transfer rates range from 10 Mbps (very old Ethernet networks) up to 10 Gbps. Between 100 and 1000 Mbps are the most common speeds for most networks.</p>
Distance	<p>Ethernet standards define the maximum distance for cable lengths between two devices.</p> <ul style="list-style-type: none"> <li>The maximum cable length for UTP Ethernet "T" implementations is 100 meters for all standards.</li> <li>The length for fiber optic cables varies depending on the cable type and specification, but typically ranges from 100 meters to 40 kilometers.</li> </ul>
Power over Ethernet	<p>Power over Ethernet (PoE) technology is used to distribute electrical power along with network data on twisted-pair Ethernet cabling (CAT 5 or higher). Power is usually supplied by a PoE-enabled Ethernet switch. PoE is commonly used to power network devices that are located where physical access to a power outlet may not be available. For example, a PoE-enabled surveillance camera mounted on a tall pole can be powered via its Ethernet cabling.</p> <p>You can use a Power over Ethernet (PoE) injector to add PoE capability to regular non-PoE network links. PoE injectors can be used to upgrade existing LAN installations to PoE and provide a solution where fewer PoE ports are required. To upgrade a network connection to PoE, patch it through the PoE injector. Power injection is controlled and automatic.</p>