

Intro to Computer Networking

CH 1

What is a network?

A network is an arrangement of computers and systems that are interconnected and working together to enable communication amongst each other. This allows the sharing of data between all of the devices.

An excellent example of a *network* is what we know as the internet, connecting millions of people around the world. And it grows with the use of technological devices such as phones, computers, etc.

What is the CCNA?

The CCNA (Cisco Certified Network Associate) is an IT Certification from Cisco. The certification test is based on computer networking. It tests someone's knowledge on being able to support and install medium-sized networks. When someone has acquired this certification, it opens up doors to numerous opportunities. These can include internships, jobs, or even a starting a small business of your own.



❖ **FUN FACT:** The name Cisco Systems is often thought to be an acronym, but it actually derives from **San Francisco** -- another Silicon Valley-inflected name. This is the reason why, during the company's early days, they insisted on the lowercase cisco.

Why are computer networks so important?

There are numerous obstacles when it comes to communicating information between people and especially in businesses. To be able to communicate efficiently can result in success, something everyone wants. A solution to this issue is computer networks. Computer networks can manage to put down the barriers between information held on several (not only computer) systems. Only with the help of computer networks can a borderless communication and information environment be built.

Computer networks allow the user to access remote programs and remote databases either of the same organization or from other enterprises or public sources. Computer networks provide communication possibilities faster than other facilities. Because of these optimal information and communication possibilities, computer networks may increase the organizational learning rate, which many authors declare as the only fundamental advantage in competition.

Currently, we are literally surrounded by technology. Computers, phones, laptops, routers, etc. are everywhere now and it is unavoidable. Because this is the case, it allows us to communicate efficiently with friends, family, and associates around the world. We are all interconnected through technology and technology has been proven extremely helpful in our everyday life.



Network Devices

CH 2

Hubs

A hub is a Layer 1 (Physical Layer) devices that are just multiple port repeaters. They are commonly used to connect segments together in a LAN. A hub is constructed of multiple ports. When a packet is received at one port, it gets copied to all other ports so that all segments of the LAN can see all packets.

Hubs have been primarily replaced by switches. Hubs and switches serve as a central connection for all your network equipment and handles a data type known as frames. Frames carry data. In a hub, a frame is transferred or broadcast to all other ports. It's sent to every port even though it has only one destination. The hub cannot distinguish the port a frame should be sent to. If frames are sent to each port, it will ensure that it will reach its proper destination.

Advantages of using hubs:

- Cost: Less expensive than switches
- Simplicity: They simply broadcast information received, to all ports on the network
- Speed: They do less processing, since they can't analyze received data.

Disadvantages of using hubs:

- The more devices there are, the slower the network becomes.
- Traffic problems and collision problems arise easily, due to the splitting of bandwidth

Switches

A switch in networking, is a device responsible for multiple functions such as filtering, flooding, and sending frames. It operates by using the destination address of individual frames. Switches operate at the Data Link Layer (Layer 2) of the OSI model. A switch can replace a hub, breaking up *collision domains*.

Advantages of using a switch:

- **Packet Handling:** Designates specific destinations, preventing collisions for occurring
- **Collision Management:** Improves performance and efficiency, increasing bandwidth
- **Bandwidth Utilization:** Enables switches to send and receive data at the same time
- **Problem Isolation:** Makes it easy to pinpoint a problem and allows normal functionality

Disadvantages of using a switch:

- It can be difficult to install and use
- Often require extensive repair if the network goes down
- If configuration is necessary, it can be complicated

Routers

A router is a physical device that connects various networks together. Routers take data/information, decipher it and deliver it to either your computer, phone, or its destination. They enable a quick transfer of information by choosing the best route for the data to be sent. They are also the primary devices used to join networks due to their efficient methods of transferring data. Routers can also be referred to as a gateway, which work at the Network Layer (Layer 3) of the OSI model.

There are many types of routers, but two main ones are broadband routers and wireless routers. A broadband router is “a device that provides access to the Internet for multiple computers. It typically includes a network switch with four or more Ethernet ports for wired connections to desktop and laptop computers.” They can be used to connect different computers, two computers to the internet, or even create a phone connection.

A wireless router is a device that acts just like a router, but it includes a wireless access point. It is generally used to access the internet or computer networks and it allows for greater mobility for portable computers and hand held devices.

Some benefits of using a router in your network:

- They don't forward broadcasts by default
- They can filter the network based on Network Layer (Layer 3) information.



Network Models/Ethernet Networking

CH 3

The Hierarchical Network Model

This network design is a divided network of discrete layers. The three layer design provides major functional responsibilities that define their role in the network. This design represents their roles in any network and provides a basis for understanding a scalable network.

Access Layer

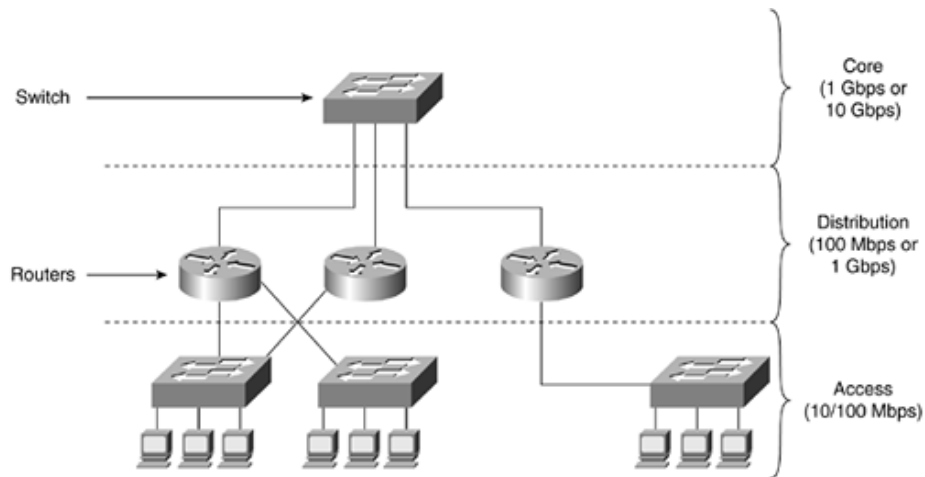
This layer provides local and remote user access by connecting end users to the network. This occurs with the use of hubs or switches to which PC's are connected, a wireless access point, a remote office connection, etc.

Distribution Layer

This layer helps control the flow in data between the access and core layer. It provides packet filtering, QoS (quality of service), routing and WAN access.

Core Layer

This layer is all about high-speed. Here, usually fast switches transfer data from the distribution layer to centralized resources such as database servers.



Ethernet Cabling

Three types of Ethernet Cables are available:

- Straight-through cable
- Crossover cable
- Rollover cable

Straight-through Cable

The straight-through cable is used to connect:

- A host to switch or hub
- A router to switch or hub

Four wires are used in straight-through cables to connect Ethernet devices. It's quite simple to create this type of cable.

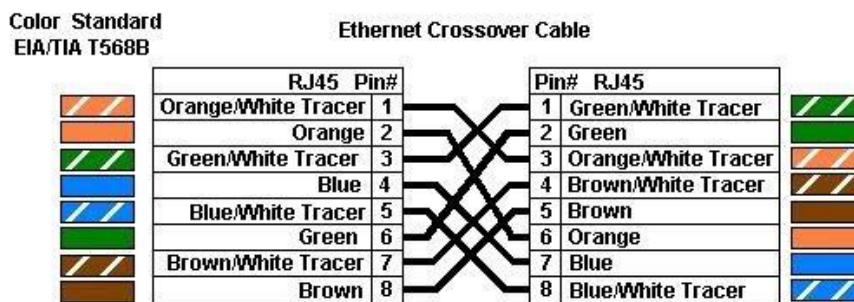
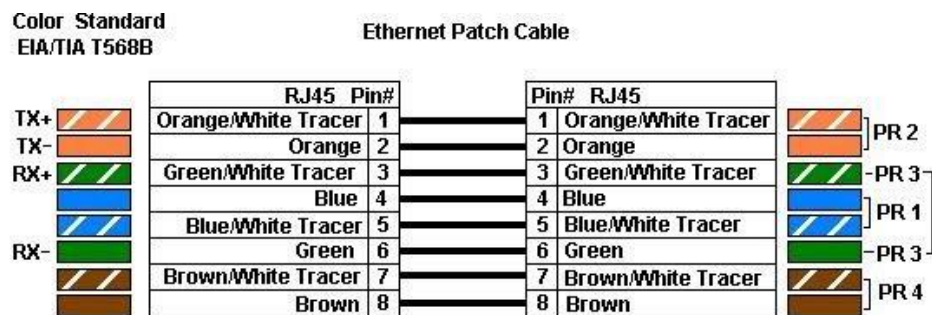
Crossover Cable

The crossover cable is used to connect:

- Switch to switch
- Hub to hub or switch
- Host to host
- Router direct to host

Rollover Cable

The rollover cable isn't used to connect any Ethernet connections together. It can be used to connect a host to a router console serial connection port. Eight wires are used in this cable to connect serial devices, even though not all eight are used to send information.



This is the standard color charts of a straight-through and crossover cable. This diagram is used when creating these cables. To make this cable, you will need CAT-5, non-plenum Ethernet wire, RJ-45 (Ethernet) male connectors, wire cutters, and a crimping tool for RJ-45 connection.

