

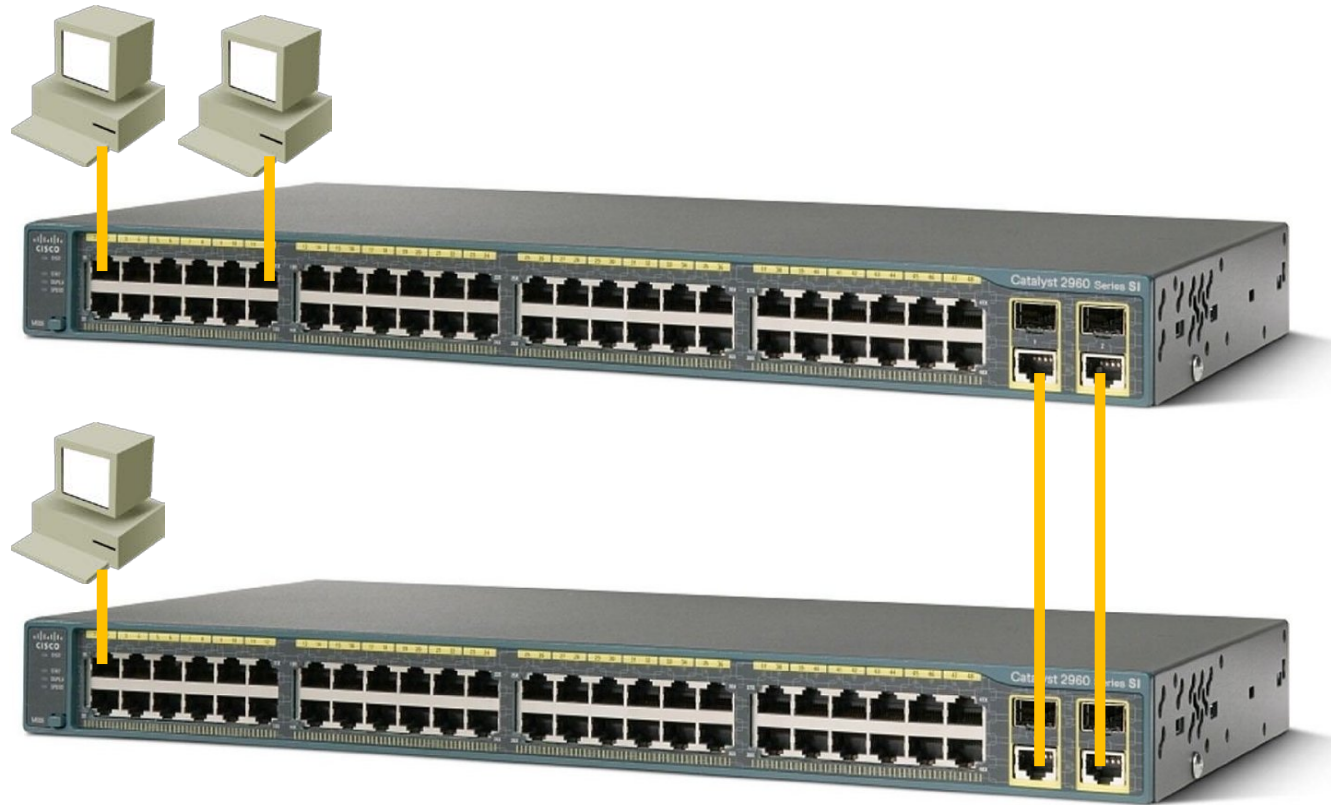
Hubs and Switches



- Hubs and switches perform a similar function.
- End hosts in a Local Area Network such as PCs, servers and printers plug into them with an Ethernet cable.
- The end hosts can then communicate with each other through the hub or switch.



Hubs and Switches



Hubs – Half-Duplex and Shared Collision Domain

- Hubs operate in **half-duplex** mode.
- Attached hosts cannot send and receive data at the same time, they can only do one or the other.
- All hosts share the same **collision domain** – only one device can transmit at a time.
- If two hosts send at the same time a collision will occur.
- Hosts use Carrier-Sense Multiple Access with Collision Detection (CSMA/CD) to detect collisions and resend.

Switches – Full-Duplex and Separate Collision Domains

- Switches can operate in either **full-duplex** or **half-duplex** mode.
- In practice they always operate as full-duplex.
- Attached hosts can both send and receive data at the same time.
- All hosts have their own dedicated **collision domain**.
- Collision Detection is not required.

Cisco Device Functions



Layer	Name	Includes	Devices
7	Application		
6	Presentation		
5	Session		
4	Transport	TCP/UDP, Port	
3	Network	IP Address	Routers
2	Data-Link	Ethernet MAC Address	Switches
1	Physical		Hubs

Hubs operate at OSI Layer 1



- Hubs operate at Layer 1 of the OSI model.
- They are not MAC address aware.
- Whenever a frame is received it is flooded out all ports apart from the one it was received on.
- All attached hosts must process all packets.

Switches operate at OSI Layer 2



- Switches operate at Layer 2 of the OSI model.
- (They also operate at Layer 1.)
- They are MAC address aware.

Switches operate at OSI Layer 2



- Whenever a frame is received the switch will look at the source MAC address in the Layer 2 Ethernet header.
- The learned MAC address will be added to the switch's MAC address table, which maps MAC addresses to ports.
- If a unicast frame is later received with a known MAC address as the destination, the switch will send the frame out only the relevant port.
- This is better for performance and security as frames only go where they are required.
- Whenever a frame is received for the broadcast address or an unknown unicast destination (because the switch hasn't learned the MAC address yet) it will be flooded out all ports apart from the one it was received on.