



Chapter 4: Switched Networks



Routing and Switching Essentials v6.0

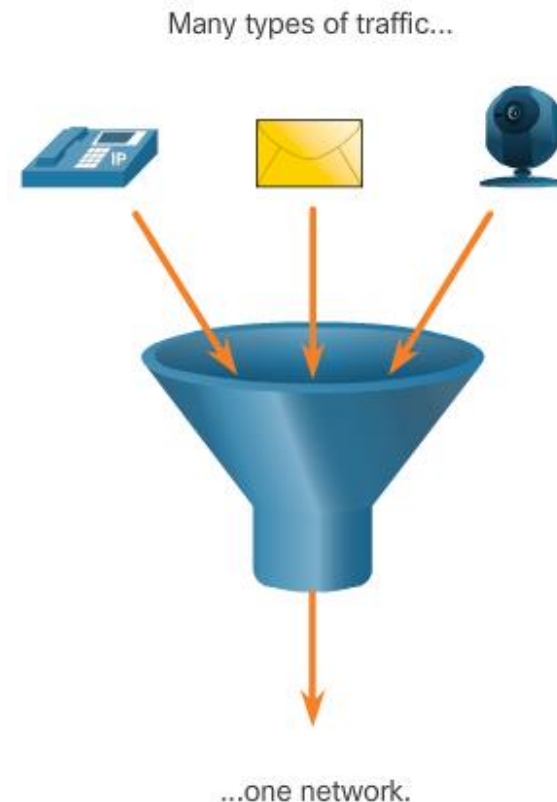
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Converged Networks

Elements of a Converged Network

- To support collaboration, networks employ converged solutions.
- Data services include voice systems, IP phones, voice gateways, video support, and video conferencing.
- Call control, voice messaging, mobility, and automated attendant are also common features.
- Multiple types of traffic; only one network to manage.
- Substantial savings over installation and management of separate voice, video, and data networks.
- Integrates IT management.

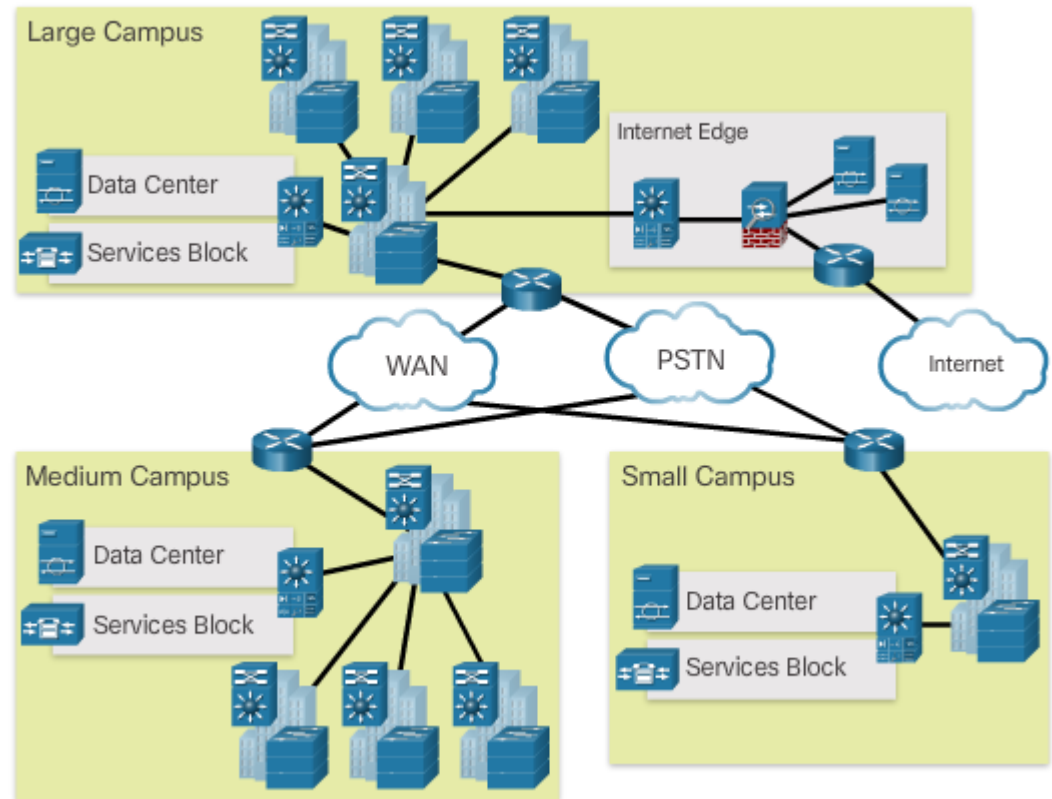




Converged Networks

Cisco Borderless Networks

- A network architecture that allows organizations to connect anyone, anywhere, anytime, and on any device securely, reliably, and seamlessly.
- Designed to address IT and business challenges, such as supporting the converged network and changing work patterns.



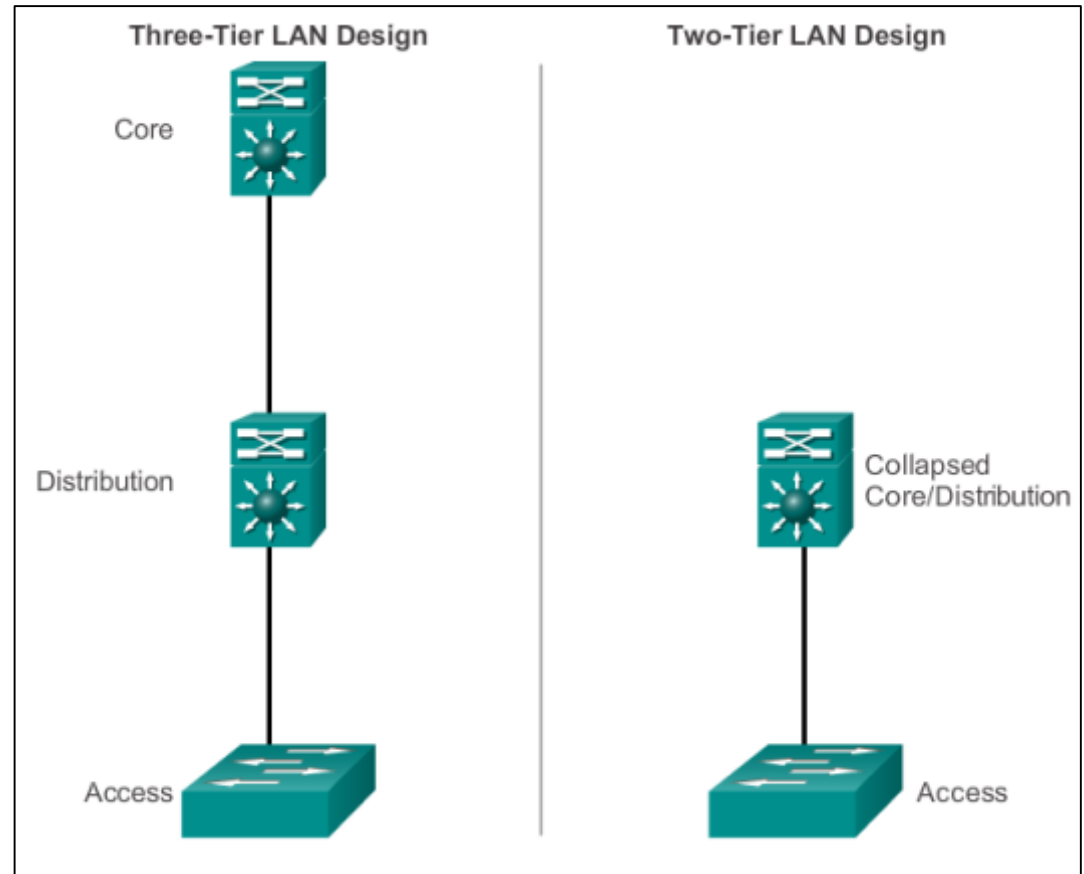


Converged Networks

Hierarchy in the Borderless Switched Network

Borderless switched network design guidelines are built upon the following principles:

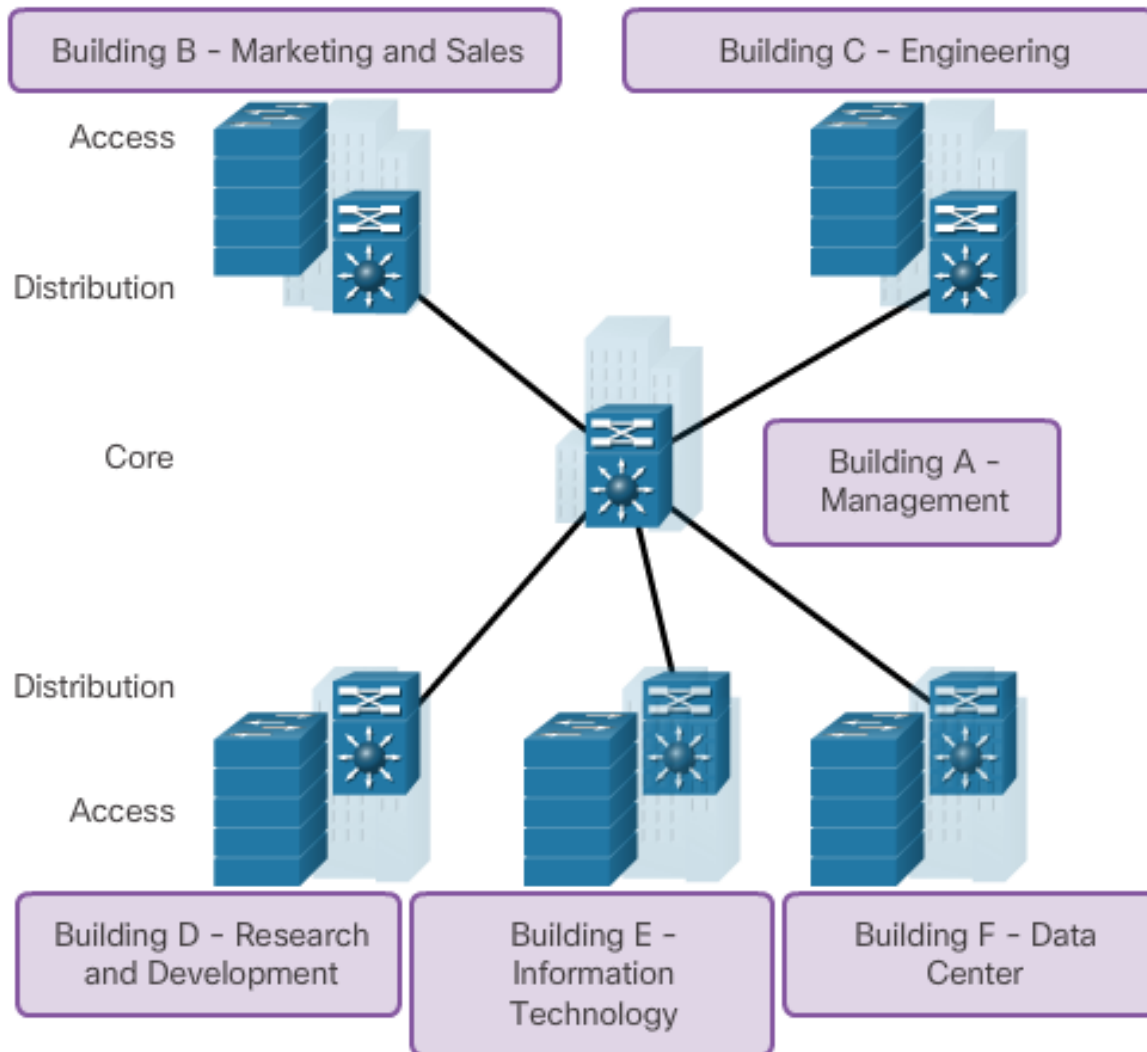
- Hierarchical
- Modularity
- Resiliency
- Flexibility





Converged Networks

Access, Distribution, and Core Layers

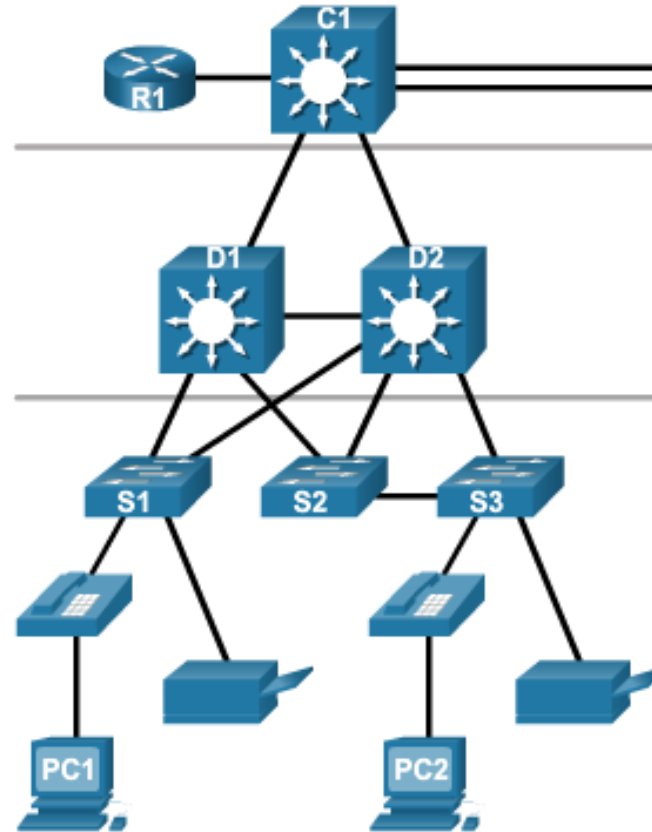




Switched Networks

Role of Switched Networks

- Switching technologies are crucial to network design.
- Switching allows traffic to be sent only where it is needed in most cases, using fast methods.
- A switched LAN:
 - Allows more flexibility
 - Allows more traffic management
 - Supports quality of service, additional security, wireless, IP telephony, and mobility services





Switched Networks

Form Factors

Fixed Configuration Switches



Features and options are limited to those that originally come with the switch.



Switched Networks Form Factors

Modular Platform



The chassis accepts line cards that contain the ports.



Switched Networks

Form Factors

Stackable Configuration Switches



Stackable switches, connected by a special cable, effectively operate as one large switch.



4.2 The Switched Environment



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Frame Forwarding

Switching as a General Concept in Networking and Telecommunications

- A switch makes a decision based on ingress and a destination port.
- A LAN switch keeps a table that it uses to determine how to forward traffic through the switch.
- Cisco LAN switches forward Ethernet frames based on the destination MAC address of the frames.



Frame Forwarding

Dynamically Populating a Switch MAC Address Table

- A switch must first learn which devices exist on each port before it can transmit a frame.
- As a switch learns the relationship of ports to devices, it builds a table called a MAC address or content addressable memory (CAM) table.
- CAM is a special type of memory used in high-speed searching applications.
- The information in the MAC address table is used to send frames.
- When a switch receives an incoming frame with a MAC address that is not found in the CAM table, it floods it to all ports, except the one that received the frame.



Frame Forwarding

Switch Forwarding Methods

Store-and-Forward



A store-and-forward switch receives the entire frame, and computes the CRC. If the CRC is valid, the switch looks up the destination address, which determines the outgoing interface. The frame is then forwarded out the correct port.

Cut-Through



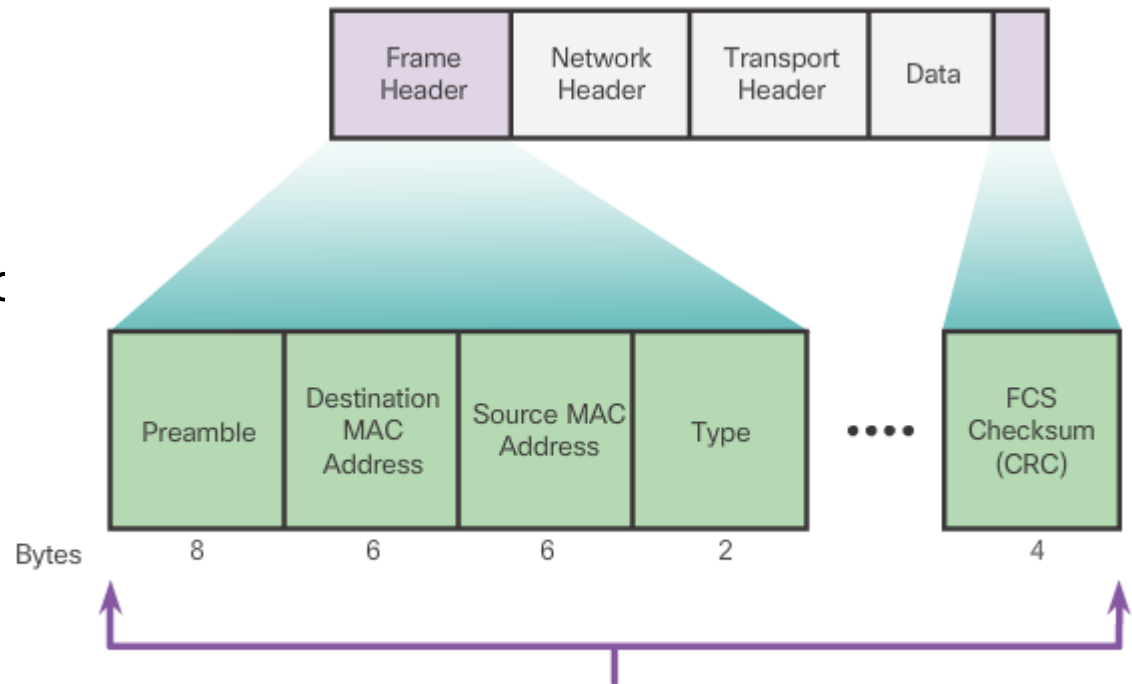
A cut-through switch forwards the frame before it is entirely received. At a minimum, the destination address of the frame must be read before the frame can be forwarded.



Frame Forwarding

Store-and-Forward Switching

- Allows the switch to:
 - Check for errors (via FCS check)
 - Perform automatic buffering
- Slower forwarding process



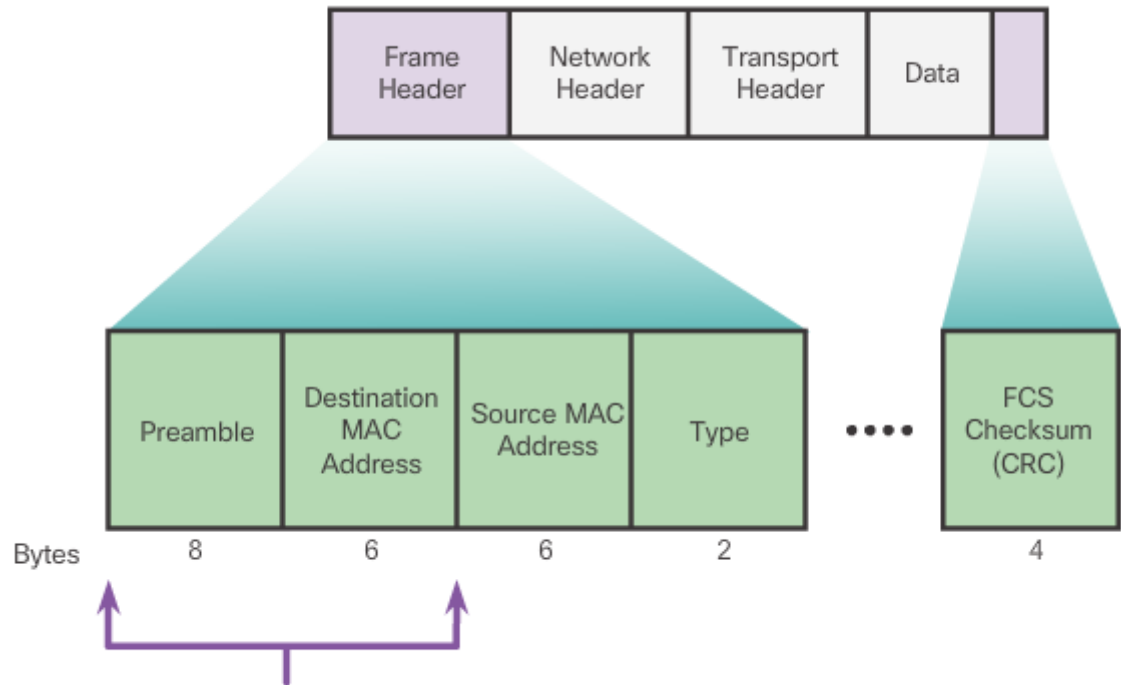
Store-and-forward switching entails receipt of the entire frame (up to about 9,200 bytes for jumbo frames) before a forwarding decision is made.



Frame Forwarding

Cut-Through Switching

- Allows the switch to start forwarding in about 10 microseconds
- No FCS check
- No automatic buffering



Frames can begin to be forwarded as soon as the Destination MAC is received.

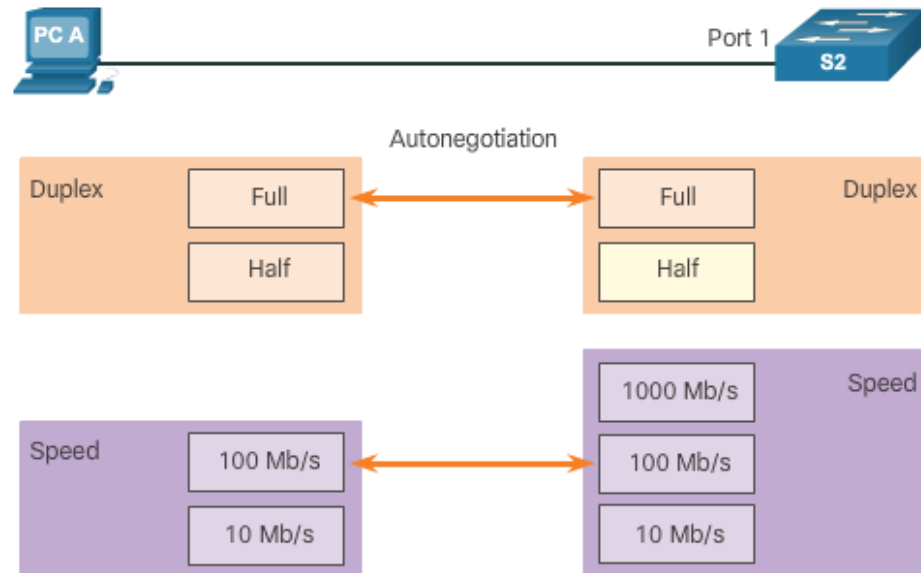
Switching Domains

Collision Domains

Collision domain - Segment where devices compete to communicate.

Ethernet switch port:

- Operating in half duplex, each segment is in its own collision domain.
- Operating in full duplex eliminates collisions.
- By default, will auto-negotiate full duplex when the adjacent device can also operate in full duplex.





Switching Domains

Broadcast Domains

A broadcast domain is the extent of the network where a broadcast frame can be heard.

- Switches forward broadcast frames to all ports; therefore, switches do not break broadcast domains.
- All ports of a switch, with its default configuration, belong to the same broadcast domain.
- If two or more switches are connected, broadcasts are forwarded to all ports of all switches, except for the port that originally received the broadcast.