



Chapter 1: Introduction to Switched Networks



Routing and Switching



Growing Complexity of Networks

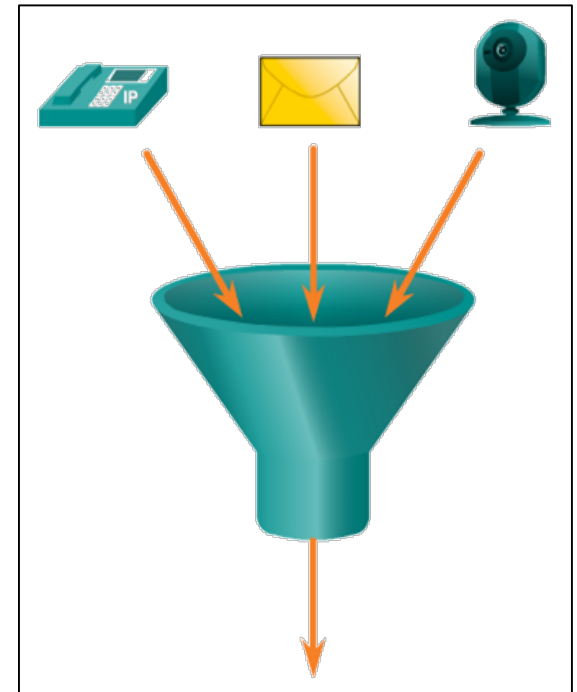
- Our digital world is changing.
- Information must be accessed from anywhere in the world.
- Networks must be secure, reliable, and highly available.





Elements of a Converged Network

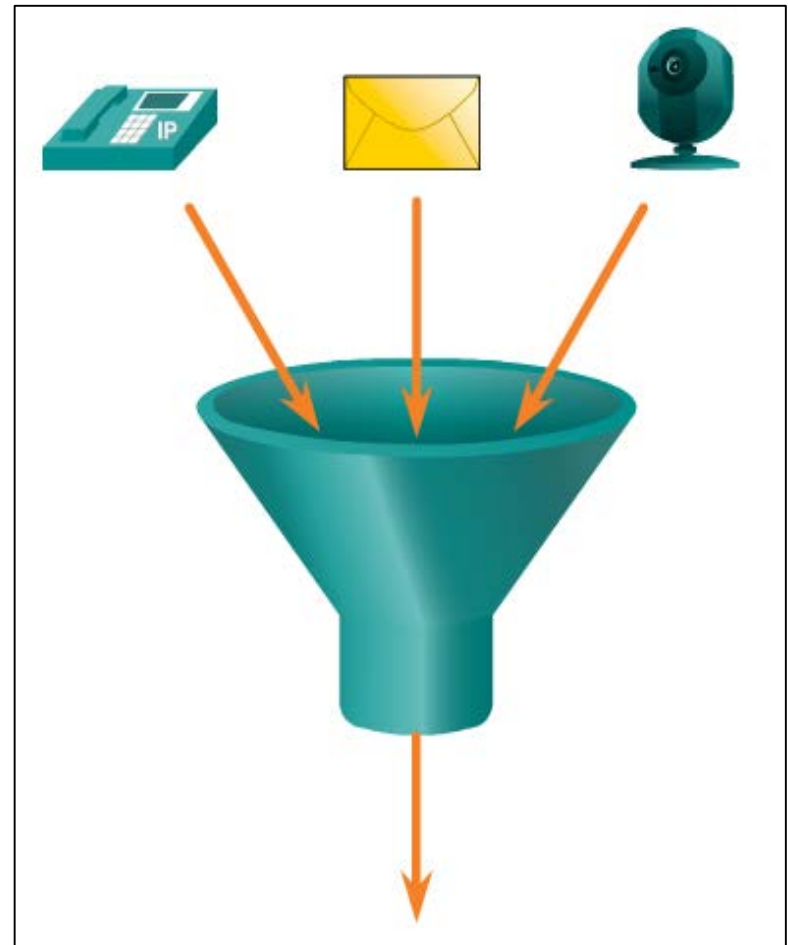
- A network that uses the same infrastructure to carry voice, data, and video signals.
- Collaboration is a requirement.
- To support collaboration, networks employ converged solutions.
- Data services include voice systems, IP phones, voice gateways, video support, and video conferencing.
- Call control, voice messaging, mobility, and automated attendant are also common features.





Benefits of a Converged Network

- 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.



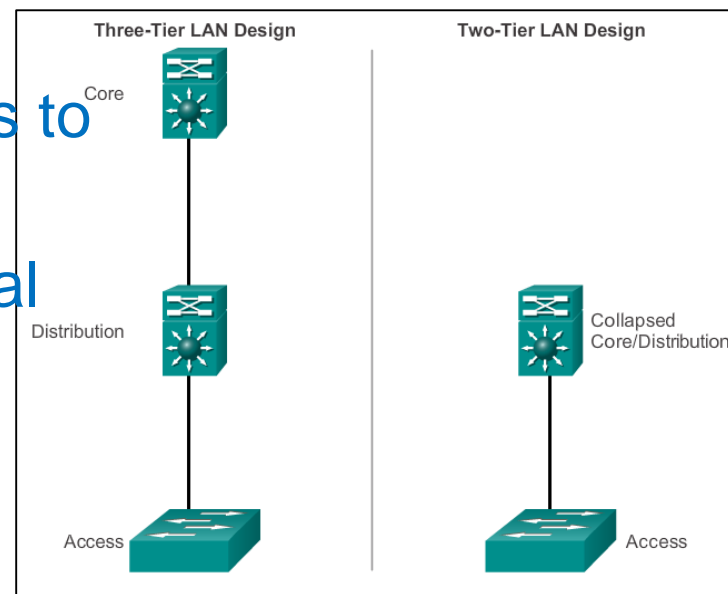


Borderless Switched Networks

- The Cisco Borderless Network is a network architecture that allows organizations to connect anyone, anywhere, anytime, and on any device securely, reliably, and seamlessly.
- Cisco Borderless Network is designed to address IT and business challenges, such as supporting the converged network and changing work patterns.

Hierarchy in the Borderless Switched Network

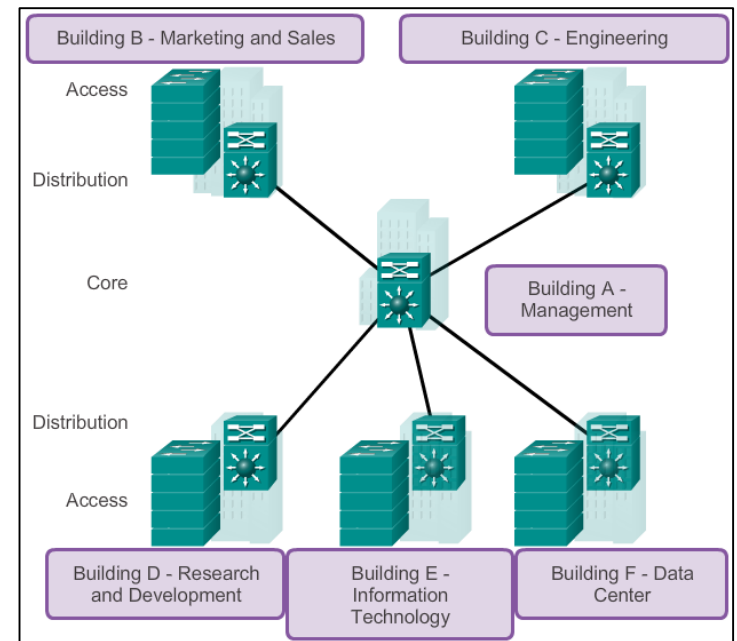
- Borderless switched network design guidelines are built upon the following principles:
 - Hierarchical
 - Modularity
 - Resiliency
 - Flexibility
- Easier to provide redundant links to ensure high availability
- Simpler deployment for additional switch equipment





Core, Distribution, Access

- Access Layer provides access to the user
- Distribution layer aggregates Layer 3 routing boundaries
- **Collapsed Core** – a combination of the functionality of the distribution and core layers





Role of Switched Networks

- Switching technologies are crucial to network design.
- Switching allow 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



Form Factor

Fixed Platform



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

Modular Platform



The chassis accepts line cards that contain the ports.

Stackable Platform



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

- Modular advantages:
 - Increased scalability
 - Need for fewer power outlets

- Stackable advantages:
 - Large port density (# of ports available)
 - Fault tolerance
 - Low price



Switching as a General Concept

- A Layer 2 switch determines which interface is used to forward a frame based on the destination MAC address.
- 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.
- **StackPower** enable the sharing of power among multiple stackable switches.



Dynamically Populating a Switch MAC Address Table

- A switch must first learn which devices exist on each port before it can transmit a frame.
- It builds a table called a MAC address or content addressable memory (CAM) table.
- The incoming source MAC and port is stored in the 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 (broadcasts) it to all ports, except the one that received the frame.



Switch Forwarding Methods

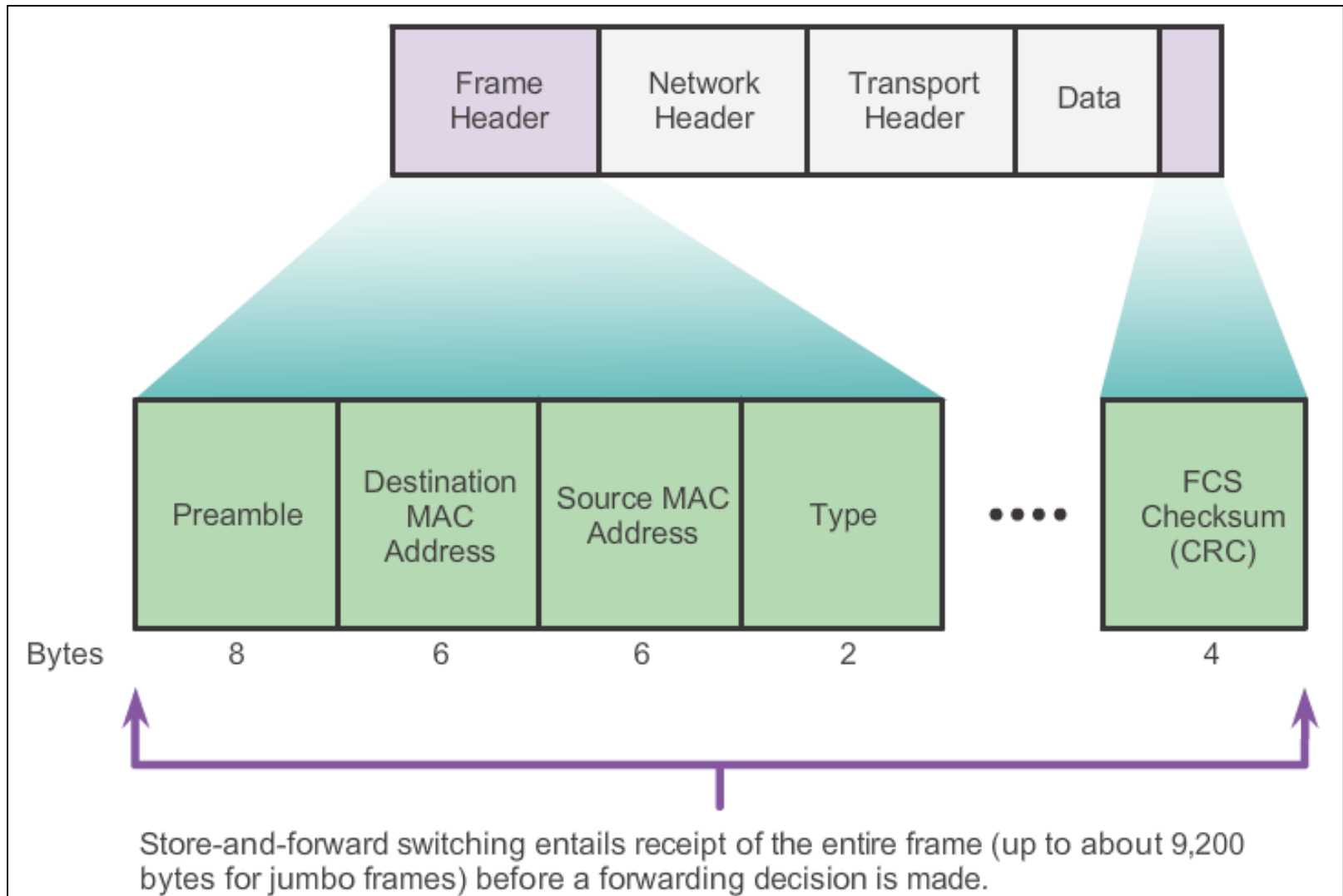
Store-and-Forward

- Switch receives the entire frame, and computes the Cyclic Redundancy Check (CRC). If the CRC is valid, the switch looks up the destination address to determine the outgoing interface. The frame is then forwarded out the correct port
- Allows the switch to:
 - Check for errors (via FCS check)
 - Perform automatic buffering
- Slower forwarding process (latency)





Store-and-Forward Switching (cont.)

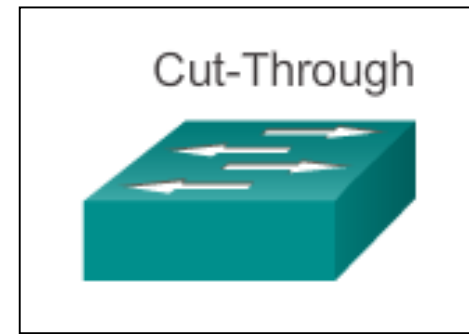




Switch Forwarding Methods

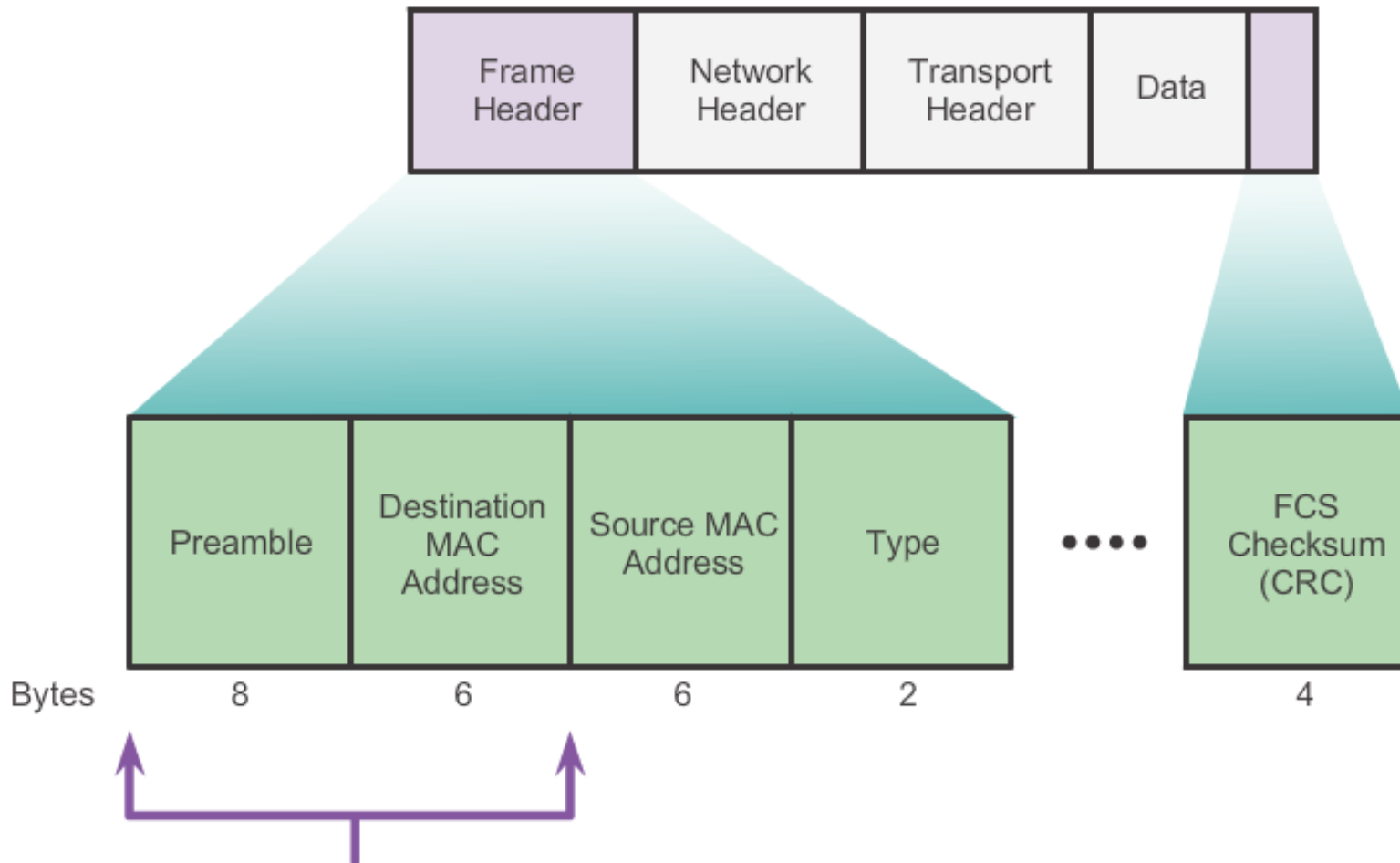
Cut-Through

- Switch forward the frame before it is entirely received.
- The destination address of the frame must be read before the frame can be forwarded.
- Lower latency allows the switch to start forwarding in about 10 microseconds
- No FCS check
- No automatic buffering





Cut-Through Switching (cont.)



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



Collision Domains

A **collision domain** is the segment where devices must compete to communicate.

- All ports of a hub belong to the same collision domain.
- Every port of a switch is a collision domain on its own. Increases the number of collision domains.
- A switch breaks the segment into smaller collision domains, easing device competition.
- Microsegmentation
 - Enhances user bandwidth
 - Isolates traffic between segments



Broadcast Domains

A broadcast domain is entire 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.
- Routers stop broadcasts and break up broadcast domains.



Alleviating Network Congestion

Switches help alleviating network congestion by:

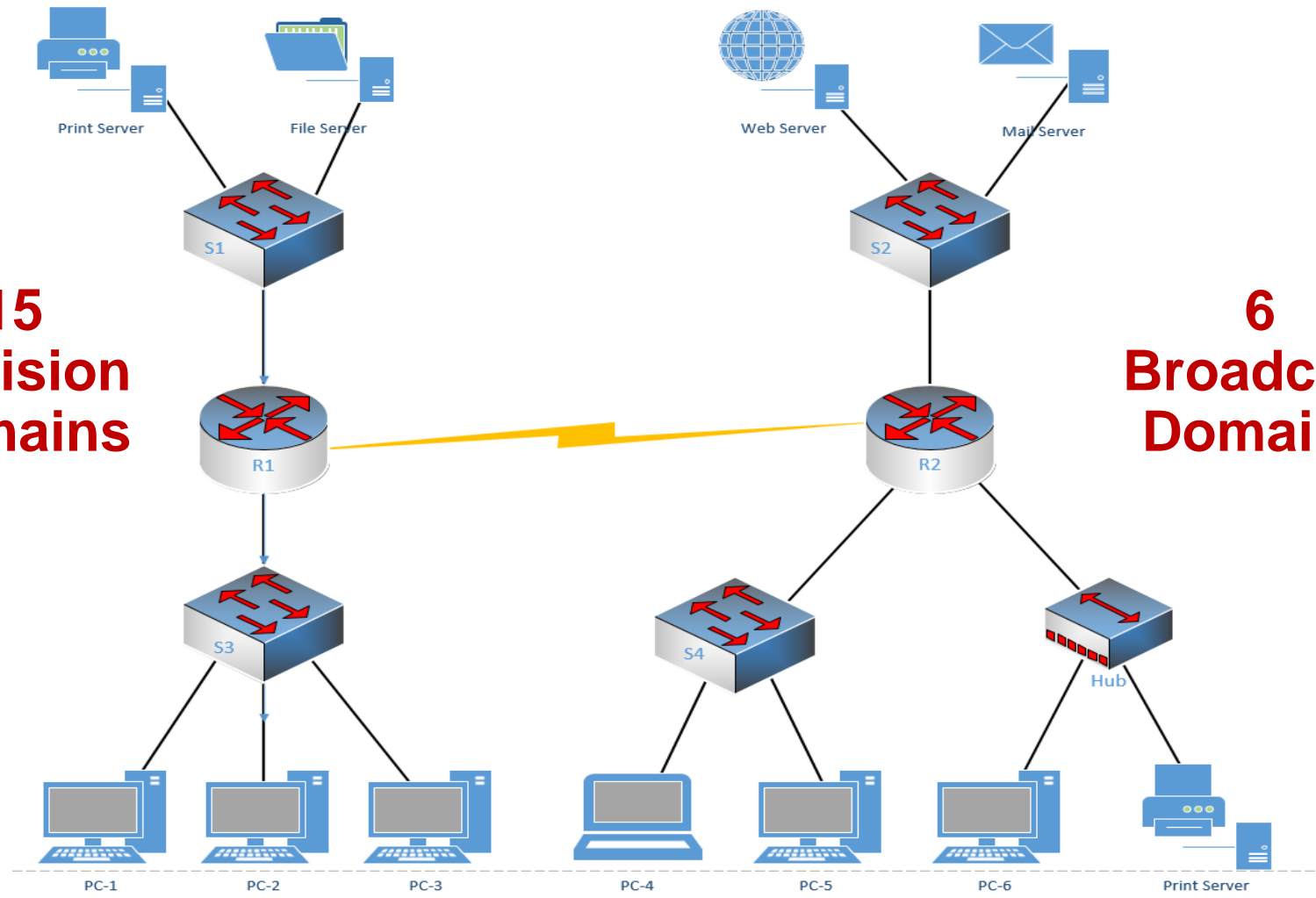
- Facilitating the segmentation of a LAN into separate collision domains
- Providing full-duplex communication between devices
- Taking advantage of their high-port density
- Buffering large frames
- Employing high-speed ports
- Taking advantage of their fast internal switching process
- Having a low, per-port cost



How many collision and broadcast domains are shown?

**15
Collision
Domains**

**6
Broadcast
Domains**



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