



# Using Switched LAN Technology

## Basic LAN Switching

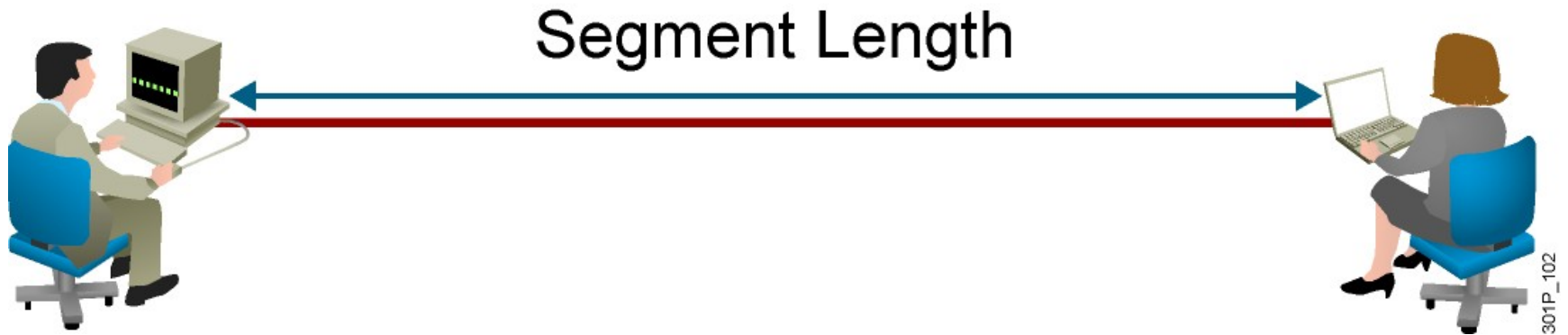


# Objectives

- Define Ethernet LAN segments and their distance limitations
- Describe how a hub can be used to extend Ethernet LAN segments
- List the characteristics and functions of a hub in an Ethernet LAN
- Describe and compares collision domains and broadcast domains
- Identify the typical causes of network congestion on an Ethernet LAN, describe how a bridge or switch alleviates network congestion
- Describe the purpose and operation of Ethernet bridges
- Describe the purpose and operation of Ethernet switches
- Describe the features of modern Ethernet switches
- Describe how a modern Ethernet switch forwards packets
- Describe the purpose of microsegmentation in an Ethernet LAN
- Describe how modern Ethernet LANs are designed

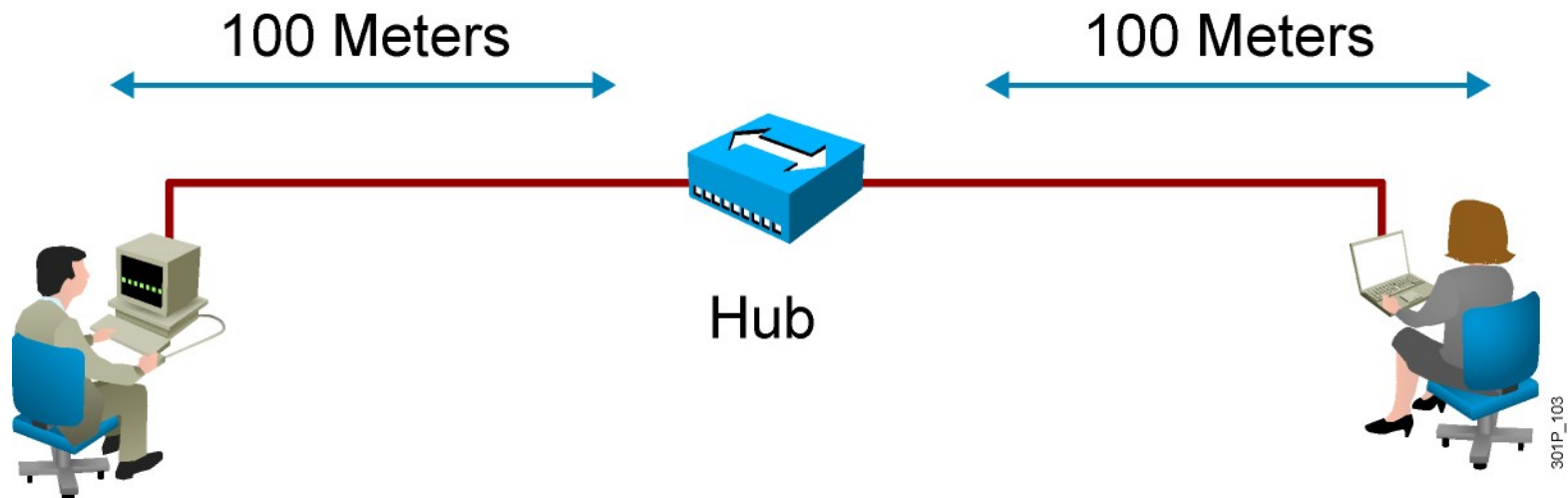
# Ethernet Limitations

- Signals degrade with transmission distance.
- Each Ethernet type has a maximum segment length.



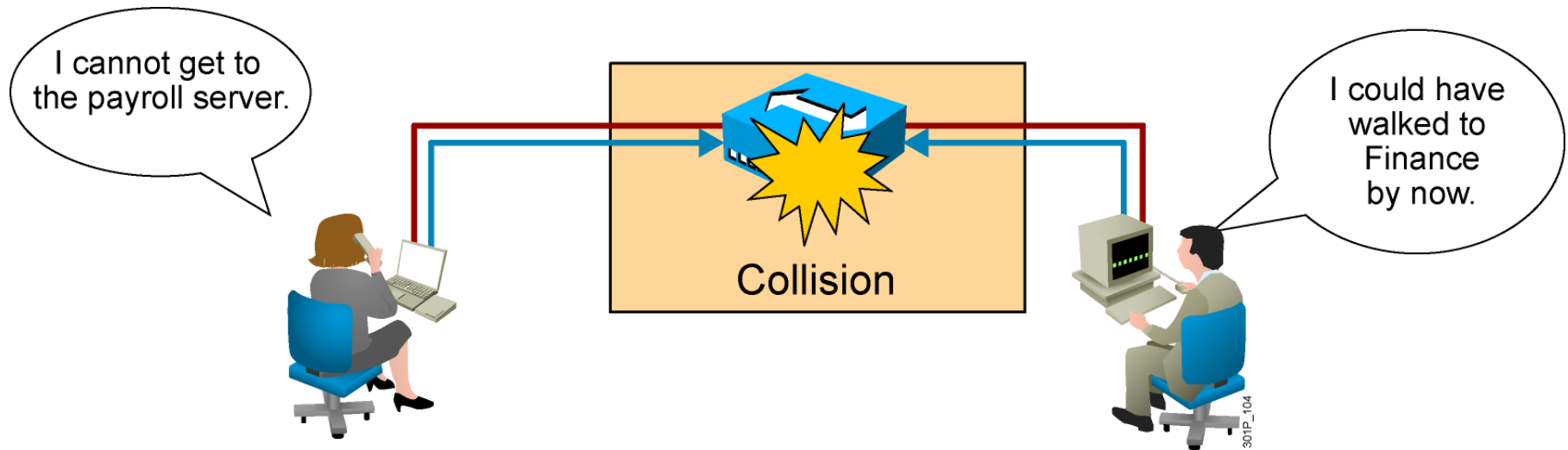
# Extending LAN Segments

- Shares bandwidth
- Extends cable distances
- Repeats or amplifies signal
- Number of repeaters/hubs is limited

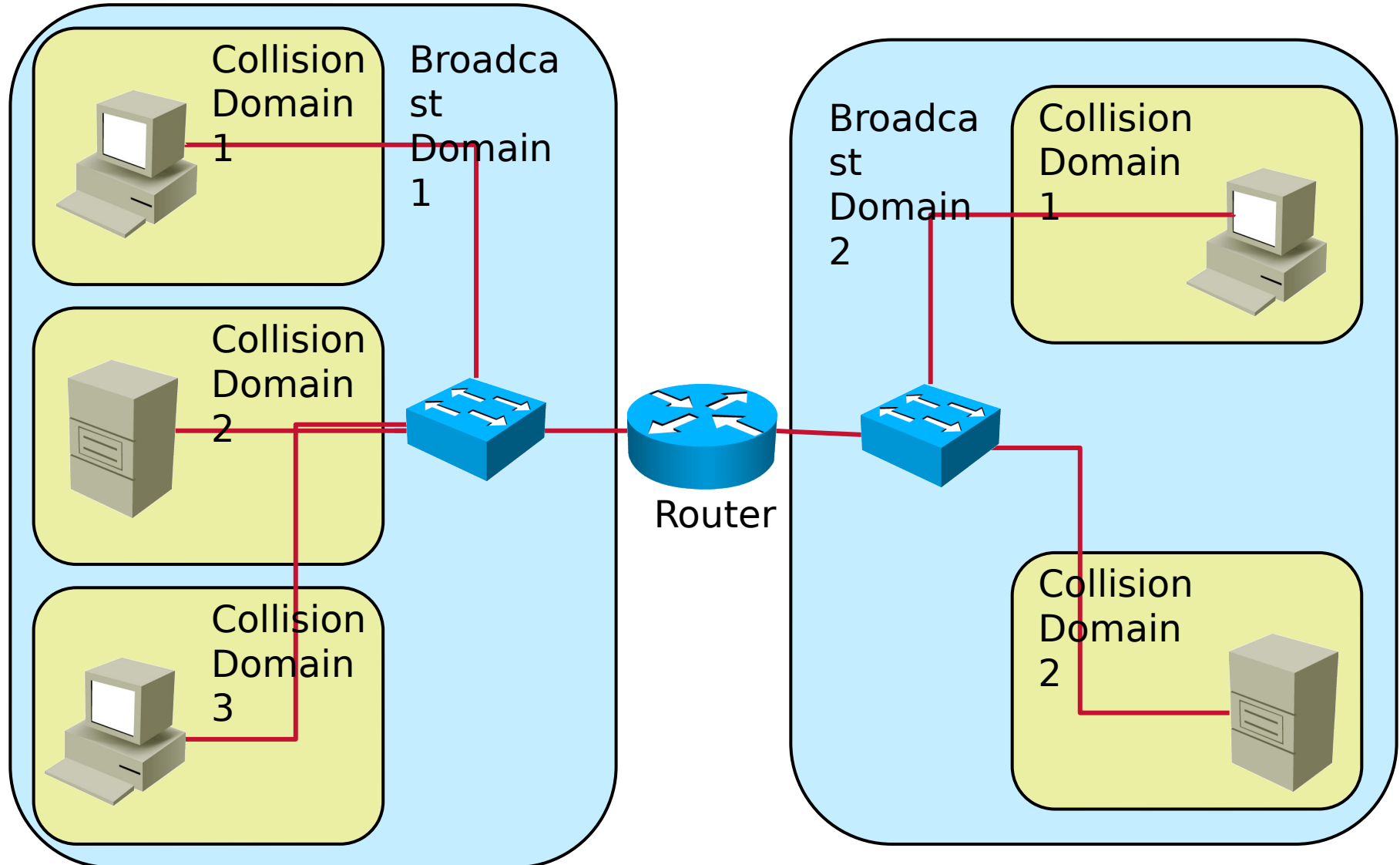


# Hubs and Collisions

- Stations may transmit simultaneously, collisions can occur.
- The more collisions that occur, the worse the congestion becomes.
- Hubs cannot improve collision issues.



# Collision Domains and Broadcast Domains



# Historical Overview

Development of network devices on Layer 1 and Layer 2 of OSI model

- **Hub**

- Device for connecting multiple devices together and making them act as a single network segment
- Not used anymore



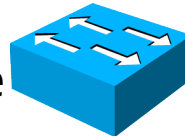
- **Bridge**

- Connects multiple network segments at the data link layer (Layer 2) of the OSI model
- Has only few ports
- Not used anymore



- **Switch**

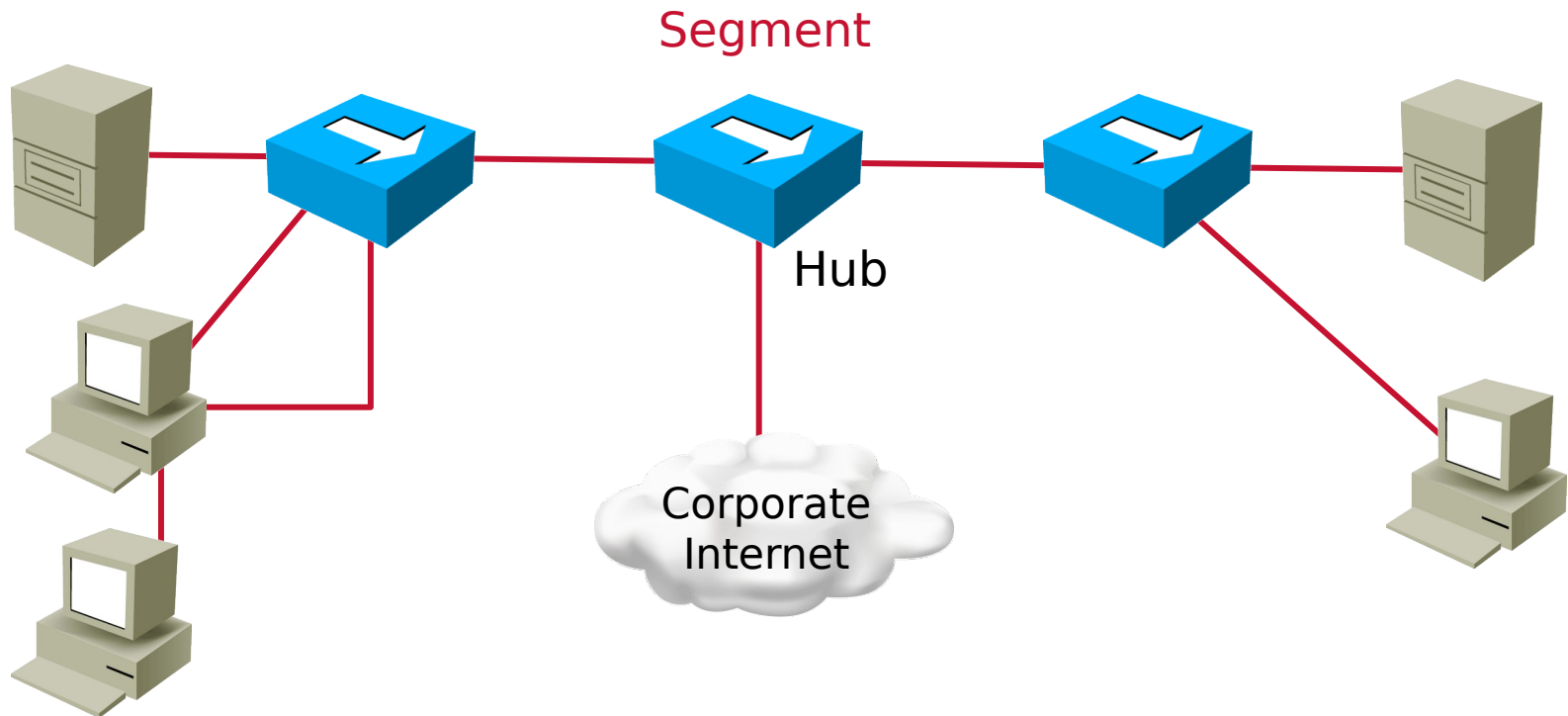
- Has more ports than bridge
- Used currently



# Network Congestion

Most common causes of network congestion:

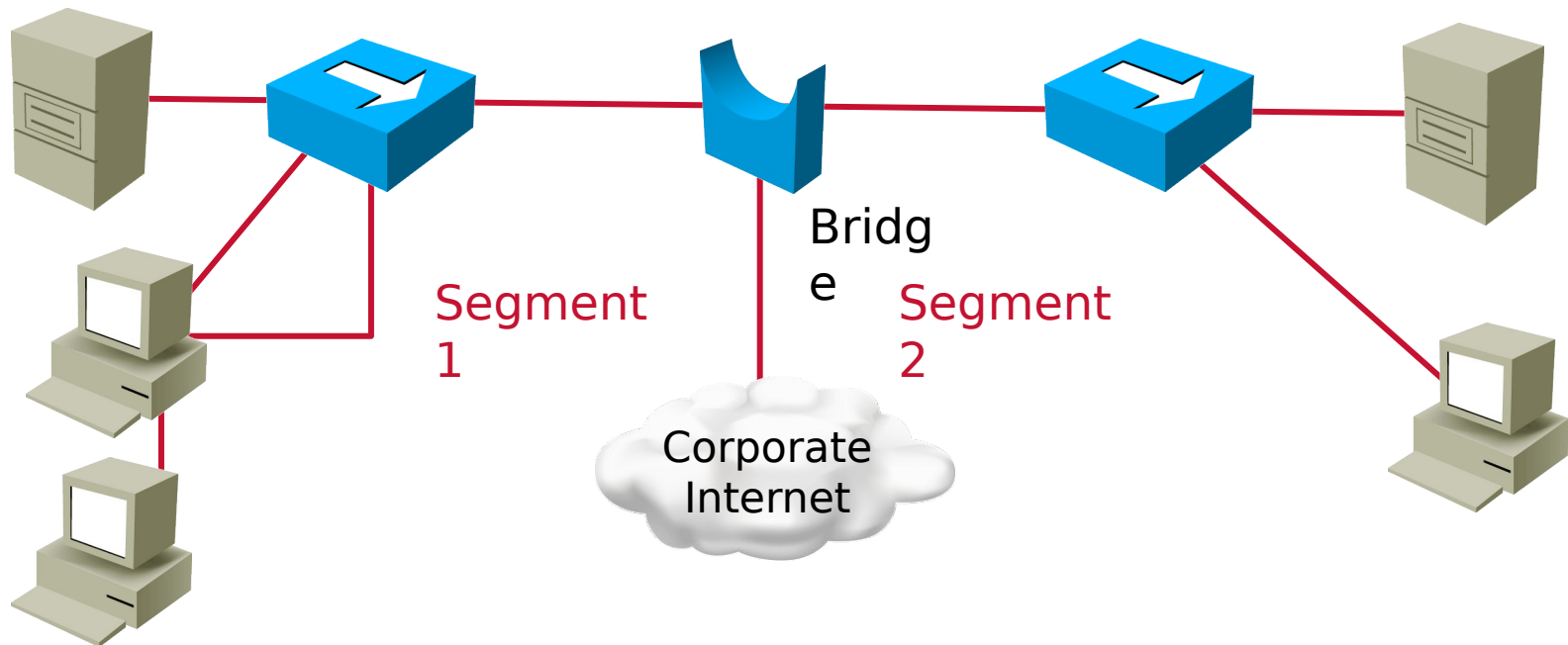
- Increasingly powerful computer and network technologies
- High volume of network traffic
- High-bandwidth applications



# Bridges

Bridge characteristics:

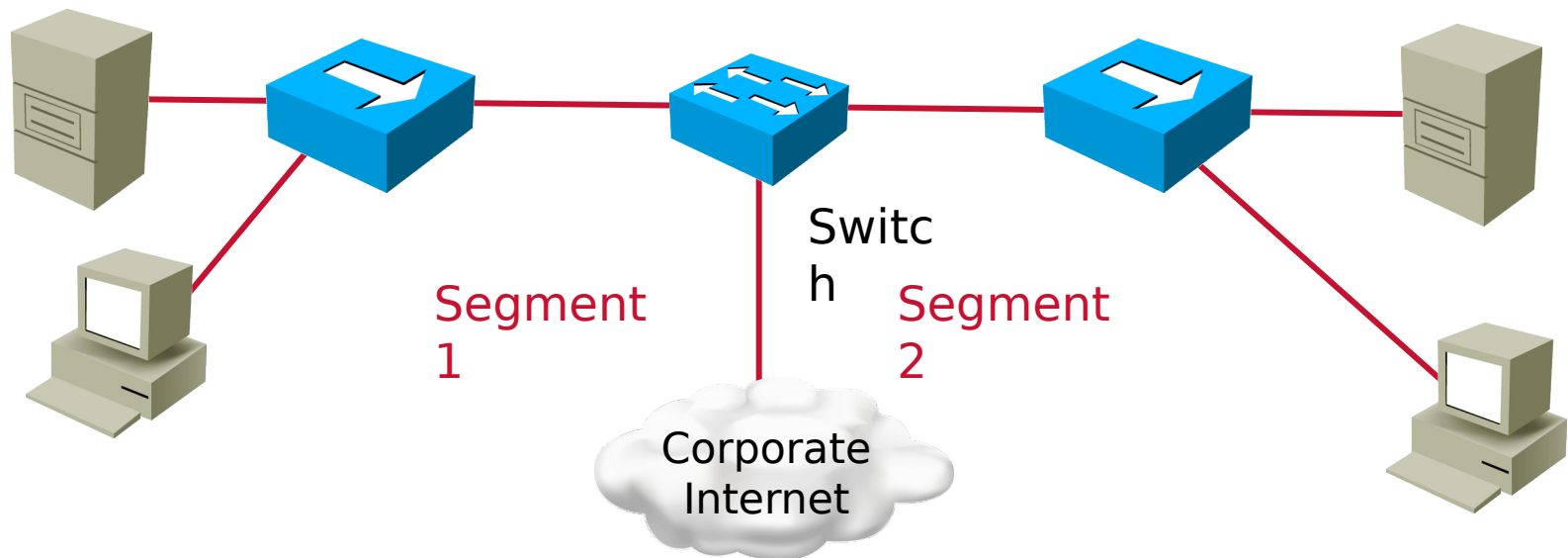
- Operate at Layer 2 of the OSI model
- Forward, filter, or flood frames
- Has only few ports
- Lacks high performance



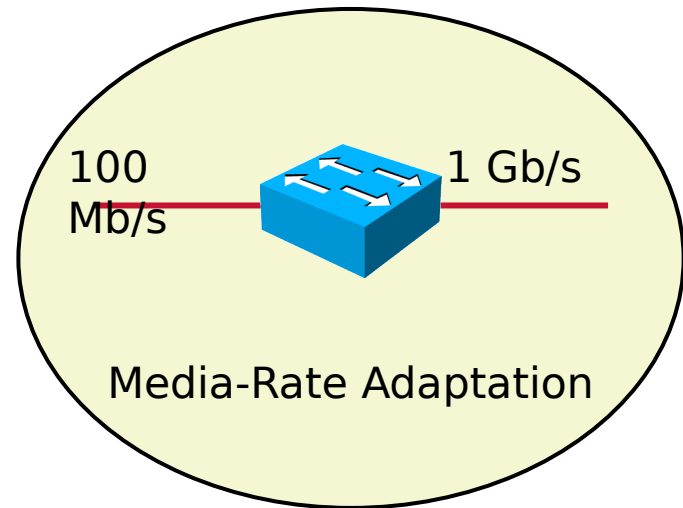
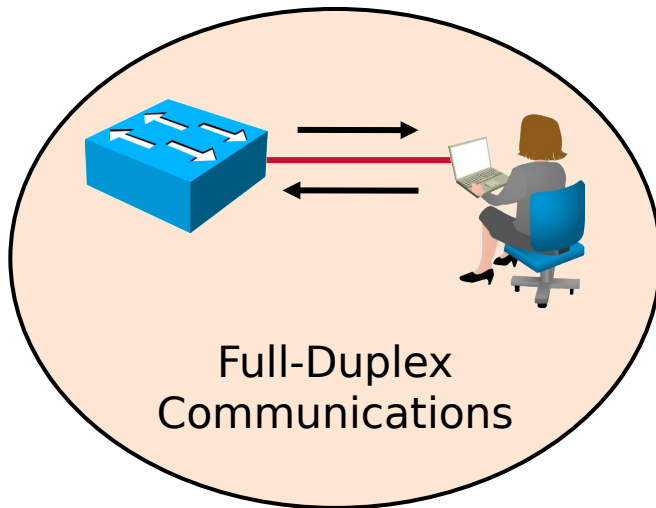
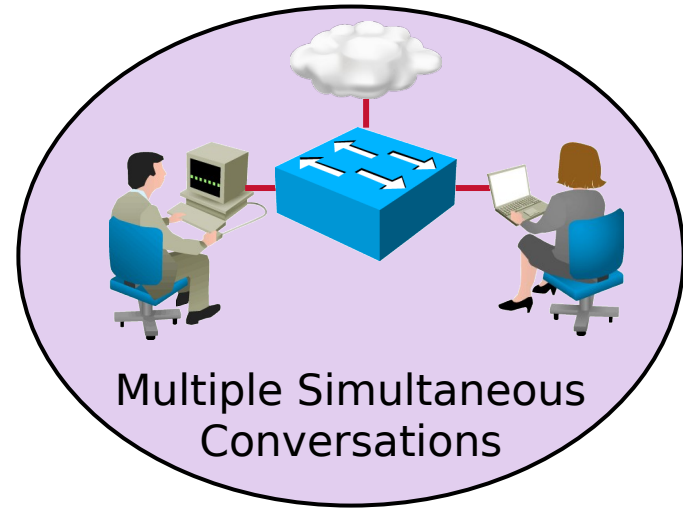
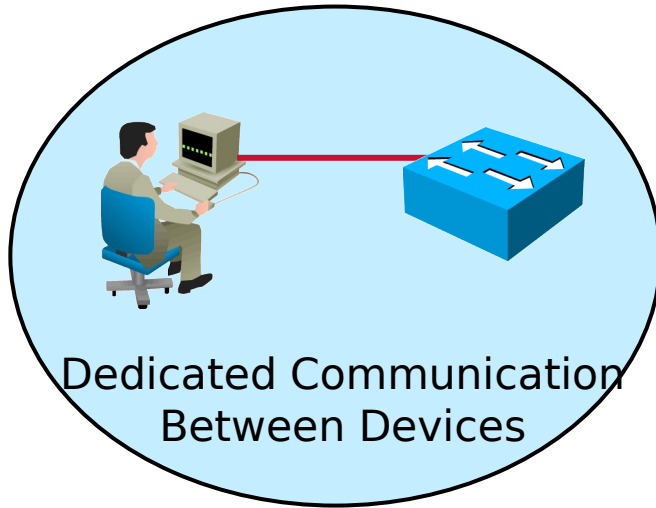
# Switches

Switch characteristics:

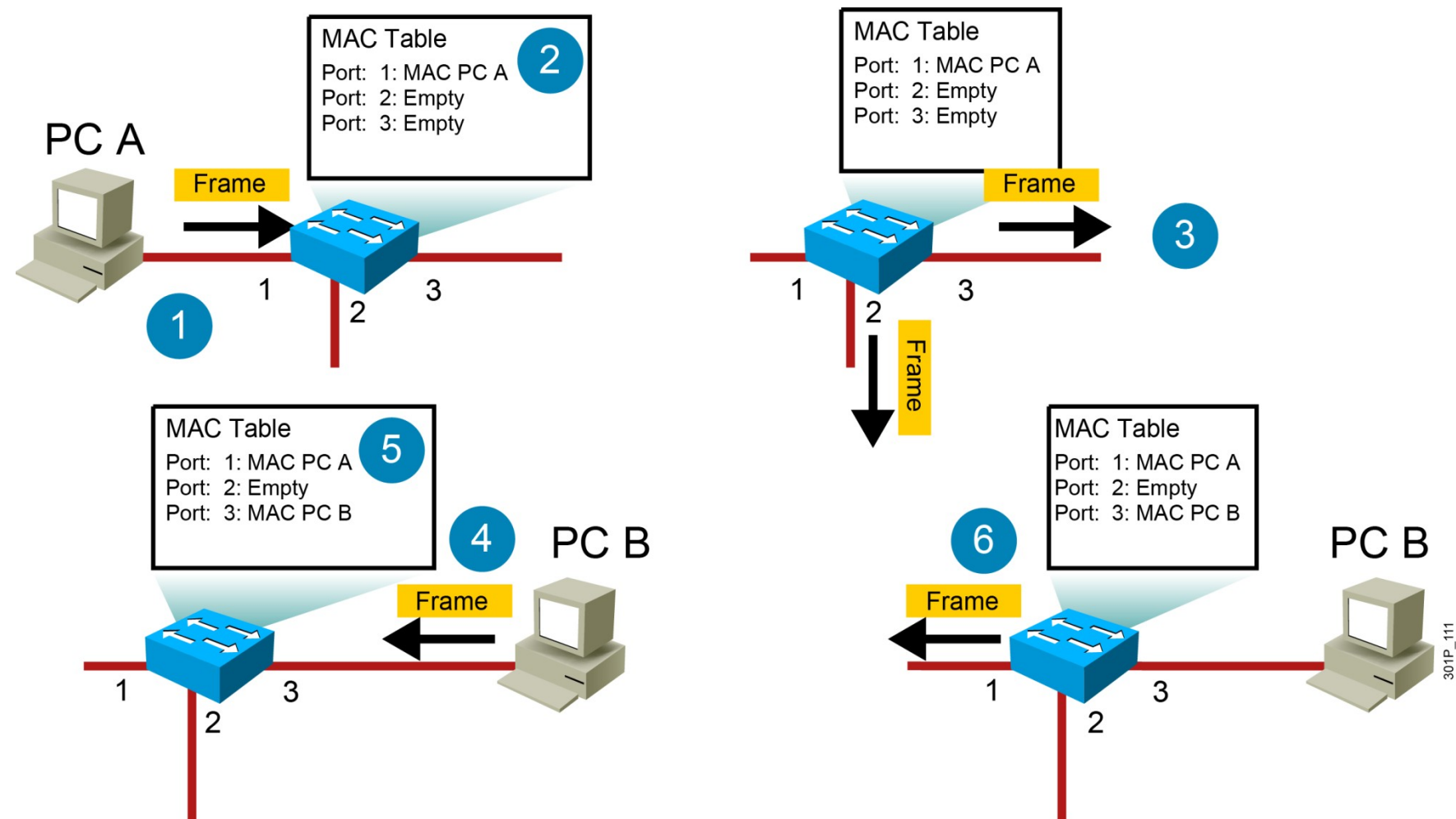
- High port density
- Large frame buffers
- Mixture of port speeds
- Fast internal switching (high performance)
- Forward, filter, or flood frames



# Switch Features

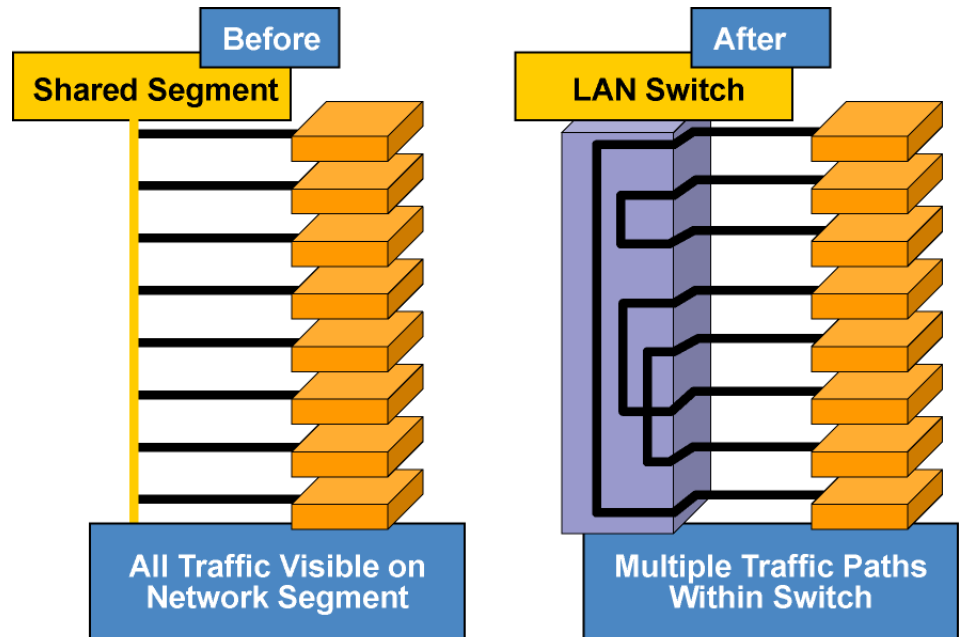


# Switching Operation



# Microsegmentation

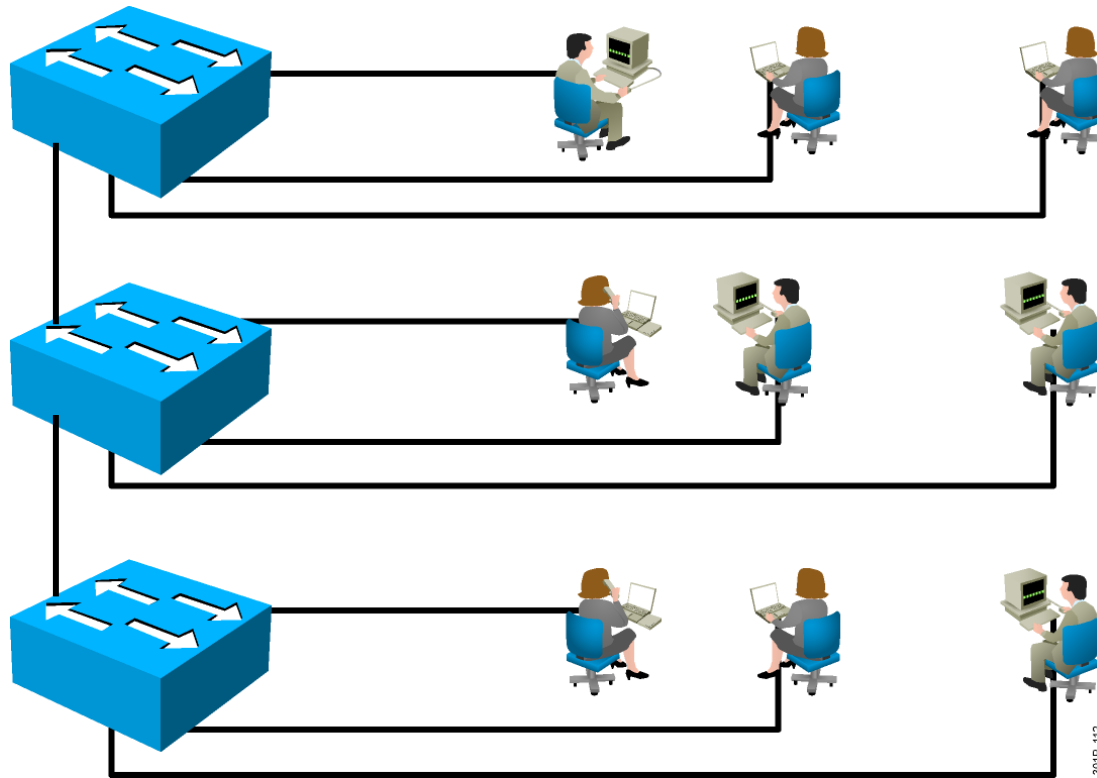
## Microsegmentation of the Network



**Dedicated paths between sender and receiver hosts**

# Modern LANs

- Users grouped by physical location
- More switches added to the network
- Switches connected by high-speed links



# Summary

- Ethernet cables and segments can span only a limited physical distance, after which transmissions become degraded.
- A hub extends network segments by receiving incoming bits, amplifying the electrical signal, and transmitting these bits.
- The network segments that share the same bandwidth are called collision domains.
- A Layer 3 device is needed to terminate a Layer 2 broadcast domain.
- A switch offers greater benefits for eliminating network congestion than bridges.
- Ethernet bridges are used to divide a single LAN into multiple collision domains.

# Summary (Cont.)

- Switches operate at much higher speeds than bridges and support more advanced functionalities.
- A switch provides dedicated communication between devices, multiple simultaneous conversations, full-duplex communication, and media-rate adaptation.
- Switches build a table of learned MAC addresses, which are associated with individual port.
- Microsegmentation eliminates the possibility of collisions on a network segment.
- To accommodate more users and higher demand for network resources and bandwidth, add more switches to the network.

