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## Chapter 2

### Network Design Essentials



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## Good Network Design

- Analyzing network requirements
- Selecting network topology
- Selecting equipment to match topology

## Designing a Network Layout

- Decide on a topology
  - physical layout of resources
  - how resources communicate
  - allow for expansion
  - meet security requirements

## Standard Topologies

Three basic connection topologies:

- Bus
  - Single cable segment
- Star
  - Central connection point
- Ring
  - Forming a loop

## Bus Topology

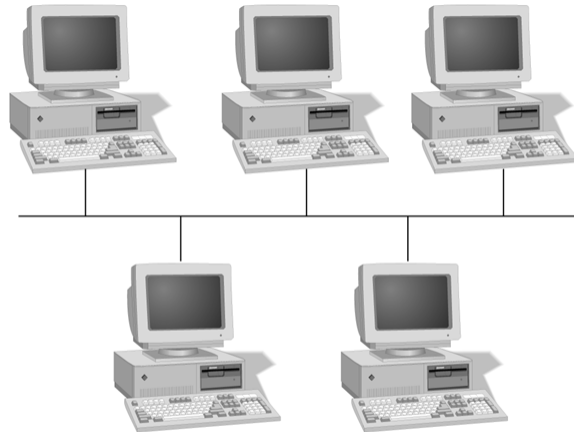


Figure 2-1 Typical bus topology network

## Bus Communication

- How the signal is sent
- Signal bounce
- Cable termination to prevent bounce

## Sending the Signal

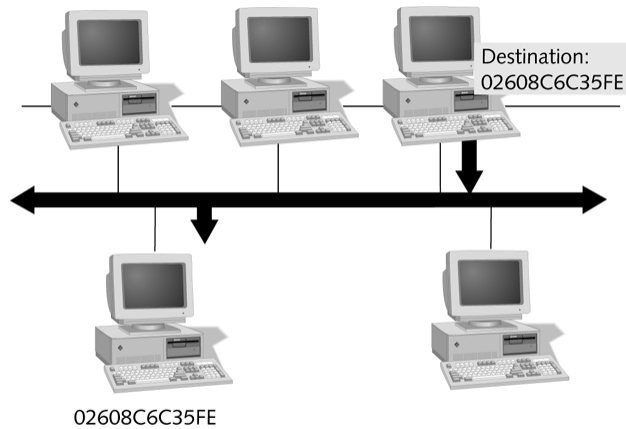


Figure 2-2 Data communication on a bus network

## Bus Environment

- One computer sends at a time
- Passive topology
  - only listen for data
- Adding computers slows network
- Cable failure downs entire network

# Signal Bounce

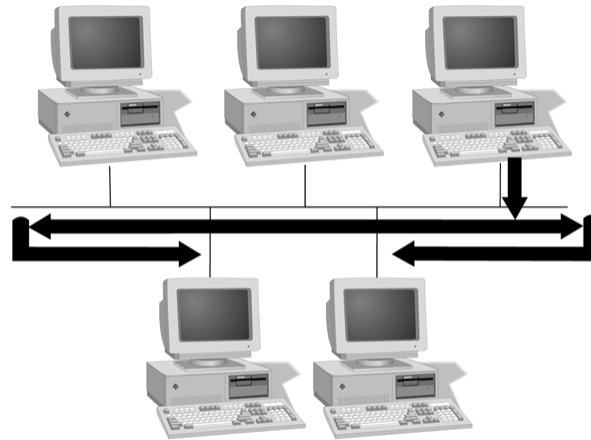


Figure 2-3 Signal bounce on an unterminated network

# Cable Termination

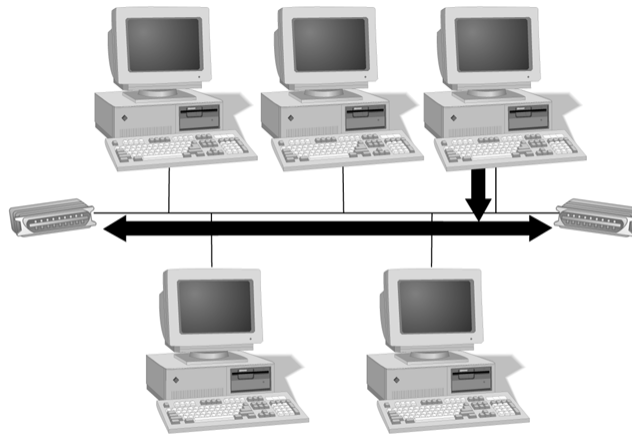


Figure 2-4 A terminated bus network

## Cable Failure

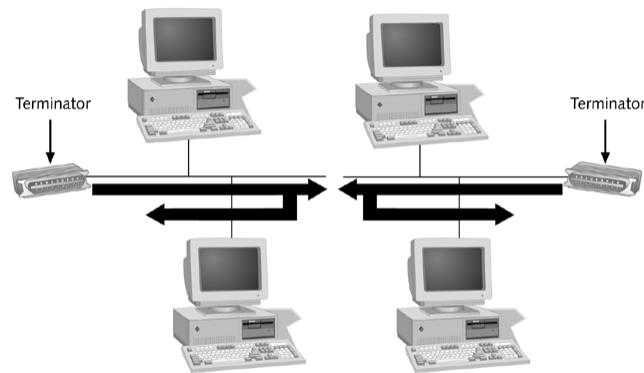


Figure 2-5 Cable break and subsequent signal bounce

## Bus Network Expansion

- Ethernet 10Base2 ( thinnet )
- Expanded by BNC barrel connector
- Distance causes signal to weaken
  - attenuation
- A repeater boost signal strength
  - amplifies errors

## Star Topology

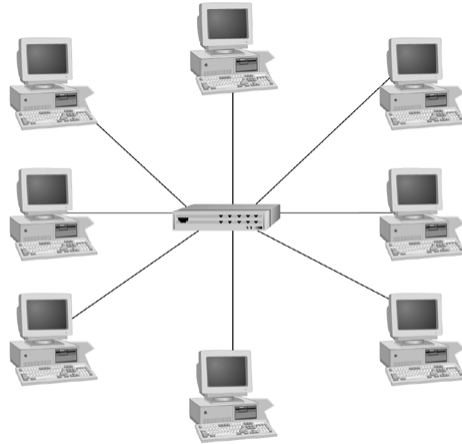


Figure 2-6 Typical star topology network

## Star Environment

- Central connection point
  - hub or concentrator
- each device has separate wire
  - home run
- More cable required
- Cable failure is device isolated
  - except for hub

## Ring Topology

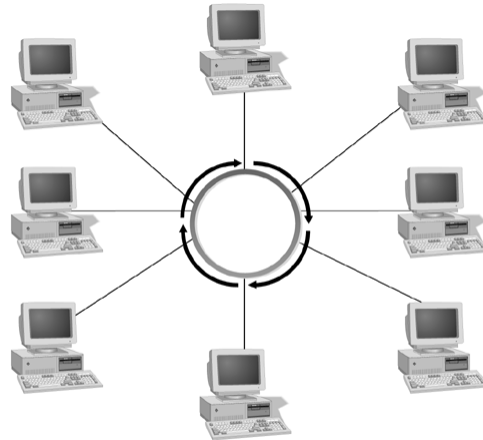


Figure 2-7 Typical ring topology network

## Ring Environment

- Device connects to next in line
- Circle of cable
- Device receives signal
  - acts on signal
  - or passes signal along
- Signals travel in only one direction

## Token Passing

- Active topology
  - each device receives / sends
  - Packet of data is passed around ring
  - receipt of token is acknowledged
- Single ring / dual ring
- Fair sharing of network resources

## Hubs

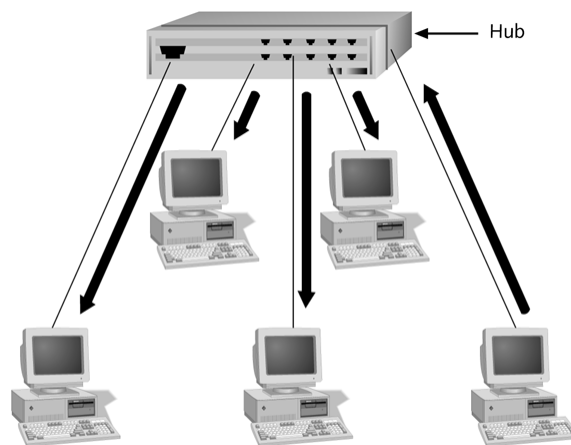


Figure 2-8 Hub communications

## Hub Environment

- Also known as concentrator
- Star network
- Central point of connection
- Active hubs
- Passive hubs

## Active Hubs

- Majority of installed hubs today
- Receive, regenerate, pass on signals
- Have many ports, 8 or more
- “Multiport repeaters”
- Electrical power required

## Passive Hubs

- Central connection point
- Wiring panel
- Punch down block
- Passes along signals
- No electrical power required

## Hybrid Hubs

- Connect different cable types
- Maximize network efficiency
- Utilize different topologies
- Enjoy the benefits of each topology