Chapter 2

Network Design Essentials

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

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