CS 154 – Set 12

Network Design
Technical View of Network Design

- A “network” really can be thought of as three things and they all need to be considered when working on a network design project:
  - Connections
  - Communications
  - Services
Connections

- Provided by Hardware that ties or connects things together
  - Media Transport Mechanisms
  - Routers
  - Switches/Hubs
  - Computers
Communications

- Provided by Software
- Common language for 2 systems to communicate with each other
  - TCP/IP (Internet, WinNT/2K/XP, Linux)
  - IPX / SPX (Novell Netware 4)
  - AppleTalk
  - Other network OS
Services

- The Heart of Networking
- Cooperation between 2 or more systems to perform some function - Applications
  - telnet
  - ftp
  - http
  - SNMP
  - UDP
A network design project can be done on three different levels, each with separate outcomes that must come together in the end:

- Conceptual - little detail
- Logical
- Physical - most detail
Types of Network Design

- New network design
- Re-engineering a network design
- Network expansion design
Choosing a Topology

- Factors to consider include reliability, flexibility/expandability, and performance
- Bus/tree is most flexible
- Tree topology easy to lay out
- Ring provides high throughput, but reliability problems
- Star can be high speed for short distances, but has limited expandability
Selecting Transmission Media

- Capacity: Can it support expected network traffic?
- Reliability: Can it meet requirements for availability?
- Types of data supported: Is it well-suited to the applications involved?
- Environmental scope: Can it provide service in the environments required?
## Medium and Topology

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<thead>
<tr>
<th>Medium</th>
<th>Topology</th>
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<tbody>
<tr>
<td></td>
<td>Ring</td>
<td>Bus</td>
<td>Tree</td>
<td>Star</td>
</tr>
<tr>
<td>Twisted pair</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Baseband coaxial cable</td>
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<td>✓</td>
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<tr>
<td>Broadband coaxial cable</td>
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<tr>
<td>Optical fiber</td>
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<td>✓</td>
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<tr>
<td>Wireless</td>
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Structured Cabling System

- Standards for cabling within a building (EIA/TIA-568 and ISO 11801)
- Includes cabling for all applications, including LANs, voice, video, etc
- Vendor and equipment independent
- Designed to encompass entire building, so that equipment can be easily relocated
- Provides guidance for pre-installation in new buildings and renovations
Wiring Layouts

- Wiring layout is different from logical topology
- Linear layout minimizes amount of cable
- Star layout uses individual cable from concentration point to subscribers
  - Can be used for bus and ring as well as star
  - Concentration point can be wiring closet or hub (an active node that accepts frames and regenerates signals for transmission)
Security

- Security design is getting to be one of the most important aspects of network design
- Network design must ensure against loss of business data or disruption of business activity
  - Need to understand the risk of data loss
  - Need to understand ways to get to the data
  - Need to understand who wants the data
Security Threats

- Passive attacks
  - Eavesdropping on, or monitoring, transmissions
  - Electronic mail, file transfers, and client/server exchanges are examples of transmissions that can be monitored

- Active attacks
  - Modification of transmitted data
  - Attempts to gain unauthorized access to computer systems
Firewalls

- Used to provide security for computers inside of a given network
- All traffic to/from network passes through firewall
- Only authorized traffic is allowed through
  - Firewall performs authentication on users
  - Firewall itself is a secure system
Security: Key to E-Commerce

- Communications
- Encryption
- Privacy
- Payment systems
The Network Designer and the Management View

- Need to understand how the network assists the company in making money and play to that strength when developing the network design proposal.
- Try to show a direct correlation between the network design project and the companies business.
  - Management: Why do we need a faster network?
The Network Designer and the Management View

- Need to explain to management how the network design, even with the higher expense, can save money or improve the business
  - If users cannot log on to your commerce site, they will try a competitor’s site
  - If the company cannot get the information your customers are asking for due to a network that is down, they may go to your competitor
Network Design and the Customer

- A good network design must recognize the customer’s requirements - the “customer” may be your own firm.
- Need to make sure your design meets THEIR needs and not YOURS!
Questions?

- For more topics on Network Design… check out Networks II