Top-Down Network Design

Chapter Three

Characterizing the Existing Internetwork

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What’s the Starting Point?

• According to Abraham Lincoln:
  – “If we could first know where we are and whither we are tending, we could better judge what to do and how to do it.”
Where Are We?

• Characterize the existing internetwork in terms of:
  – Its infrastructure
    • Logical structure (modularity, hierarchy, topology)
    • Physical structure
  – Addressing and naming
  – Wiring and media
  – Architectural and environmental constraints
  – Health
Get a Network Map

- Medford: Fast Ethernet, 50 users
- Eugene: Ethernet, 20 users
- Grants Pass HQ: Fast Ethernet, 75 users
- Roseburg: Fast Ethernet, 30 users
- Grants Pass: Gigabit Ethernet
- Gigabit Ethernet
- Frame Relay: CIR = 56 Kbps, DLCI = 5
- Frame Relay: CIR = 56 Kbps, DLCI = 4
- Frame Relay: CIR = 56 Kbps, DLCI = 5
- Frame Relay: CIR = 56 Kbps, DLCI = 4
- T1
- Internet
- FEP (Front End Processor)
- IBM Mainframe
- Web/FTP server
Characterize Addressing and Naming

- IP addressing for major devices, client networks, server networks, and so on
- Any addressing oddities, such as discontiguous subnets?
- Any strategies for addressing and naming?
  - For example, sites may be named using airport codes
    - San Francisco = SFO, Oakland = OAK
Discontiguous Subnets

Area 0
Network
192.168.49.0

Router A

Area 1
Subnets 10.108.16.0 - 10.108.31.0

Router B

Area 2
Subnets 10.108.32.0 - 10.108.47.0
Characterize the Wiring and Media

- Single-mode fiber
- Multi-mode fiber
- Shielded twisted pair (STP) copper
- Unshielded-twisted-pair (UTP) copper
- Coaxial cable
- Microwave
- Laser
- Radio
- Infra-red
Architectural Constraints

• Make sure the following are sufficient
  – Air conditioning
  – Heating
  – Ventilation
  – Power
  – Protection from electromagnetic interference
  – Doors that can lock
Architectural Constraints

• Make sure there’s space for:
  – Cabling conduits
  – Patch panels
  – Equipment racks
  – Work areas for technicians installing and troubleshooting equipment
Issues for Wireless Installations

- Reflection
- Absorption
- Refraction
- Diffraction
Check the Health of the Existing Internetwork

- Performance
- Availability
- Bandwidth utilization
- Accuracy
- Efficiency
- Response time
- Status of major routers, switches, and firewalls
Characterize Availability

<table>
<thead>
<tr>
<th></th>
<th>MTBF</th>
<th>MTTR</th>
<th>Date and Duration of Last Major Downtime</th>
<th>Cause of Last Major Downtime</th>
<th>Fix for Last Major Downtime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Segment 1</td>
<td></td>
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</tr>
<tr>
<td>Segment 2</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Segment $n$</td>
<td></td>
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</tbody>
</table>
Network Utilization in Minute Intervals

![Network Utilization Graph]
Network Utilization in Hour Intervals
# Bandwidth Utilization by Protocol

<table>
<thead>
<tr>
<th></th>
<th>Relative Network Utilization</th>
<th>Absolute Network Utilization</th>
<th>Broadcast Rate</th>
<th>Multicast Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol 1</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Protocol 2</td>
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<tr>
<td>Protocol 3</td>
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<tr>
<td>Protocol ( n )</td>
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</table>
Characterize Packet Sizes
## Characterize Response Time

<table>
<thead>
<tr>
<th></th>
<th>Node A</th>
<th>Node B</th>
<th>Node C</th>
<th>Node D</th>
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</thead>
<tbody>
<tr>
<td>Node A</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Node B</td>
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<td>X</td>
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</tr>
<tr>
<td>Node C</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Node D</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Check the Status of Major Routers, Switches, and Firewalls

- show buffers
- show environment
- show interfaces
- show memory
- show processes
- show running-config
- show version
Tools

- Protocol analyzers
- Multi Router Traffic Grapher (MRTG)
- Remote monitoring (RMON) probes
- Cisco Discovery Protocol (CDP)
- Cisco IOS NetFlow technology
- CiscoWorks
Summary

• Characterize the existing internetwork before designing enhancements
• Helps you verify that a customer’s design goals are realistic
• Helps you locate where new equipment will go
• Helps you cover yourself if the new network has problems due to unresolved problems in the old network
Review Questions

• What factors will help you decide if the existing internetwork is in good enough shape to support new enhancements?

• When considering protocol behavior, what is the difference between relative network utilization and absolute network utilization?

• Why should you characterize the logical structure of an internetwork and not just the physical structure?

• What architectural and environmental factors should you consider for a new wireless installation?