Presentation Contents

• Chapter 2 – A walkthrough
  – Introduction
  – Key technologies
  – Impact of competition
  – Four traffic hypotheses
  – Synergy: future projections

• Summary

• Questions – Discussion
Introduction

- Efficient transport of information is a key factor the today’s information society
- The user’s primary interest is in services
- Chapter 2: a view of the future, timescale 1997-2012 (10-15yrs)
- Technologies / Traffic types / Competition
Key technologies

• What will be the technology that succeeds?
• Depends on the type of traffic that will become dominant
• Rough grouping of communication technologies
  – Electronic
  – Optical
Electronic technologies

- Synchronous Optical Network (SONET/SDH)
- Asynchronous Transfer Mode (ATM)
- Integrated Services Digital Network (ISDN/B-ISDN)
- Internet (TCP/IP)
- TV, Wireless
Optical technologies

- Wavelength Division Multiplexing (WDM)
  - point-to-point
  - static networking
  - dynamic
- Optical Time-Division Multiplexing (OTDM)
- Solitons
### Technologies & traffic attributes

<table>
<thead>
<tr>
<th></th>
<th>Latency</th>
<th>Bit rate</th>
<th>Suitable for bursty traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>SONET/SDH</td>
<td>Controlled</td>
<td>High</td>
<td>No</td>
</tr>
<tr>
<td>ATM</td>
<td>Variable, small</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>IP</td>
<td>Variable, large</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>ISDN</td>
<td>Low</td>
<td>Low</td>
<td>Yes</td>
</tr>
<tr>
<td>Optics</td>
<td>Lowest</td>
<td>Highest</td>
<td>No</td>
</tr>
</tbody>
</table>
Impact of competition

• Service convergence -> companies have to offer service bundles
  – Internet over voice network
  – Voice over Internet network
  – Video over Internet network
  – Video over wireless network
• Roughly two options
  – Heterogenous network
  – Integrated network
Four traffic hypotheses

- Hypothesis 1: Conventional Growth
- Hypothesis 2: The Internet Age
- Hypothesis 3 & 4: The Digital Video Age
Hypothesis 1: Conventional growth

Growth: 10% telephone, 30% Internet

- Telephone
- Internet
- Digital video
Hypothesis 2: The Internet age

Growth: 10% telephone, 60% Internet
Hypothesis 3: The digital video age

Growth: 10% telephone, 30% Internet
### Hypotheses & traffic attributes

<table>
<thead>
<tr>
<th></th>
<th>Latency</th>
<th>Bit rate</th>
<th>Holding time</th>
<th>Burstiness</th>
<th>Directionality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Telephony</strong></td>
<td>Sensitive</td>
<td>64kb/s</td>
<td>Minutes-hours</td>
<td>Low</td>
<td>Bi-directional</td>
</tr>
<tr>
<td><strong>Internet</strong></td>
<td>Not sensitive</td>
<td>&gt; 56kb/s</td>
<td>One hour</td>
<td>High</td>
<td>Highly directional</td>
</tr>
<tr>
<td><strong>Digital video</strong></td>
<td>Not sensitive</td>
<td>Several Mb/s</td>
<td>Hours</td>
<td>Medium/high</td>
<td>Highly directional</td>
</tr>
<tr>
<td><strong>communications</strong></td>
<td>Sensitive</td>
<td>110kb/s – 1Mb/s</td>
<td>Minutes-hours</td>
<td>Medium/high</td>
<td>Bi-directional</td>
</tr>
</tbody>
</table>
Hypotheses mapped to technologies

Backbones

Optics

Internet

IP

ATM

ISDN

Optics

Backbones

Optics

Internet

IP

ATM

ISDN
Synergy: Future Projections

• Topologies
  – Backbones: rings
  – Distribution: stars / double-stars
• Optical & Wireless technologies are becoming more common and challenge copper-based technologies
• Direction of traffic developments dictates prevailing technologies
• Link speeds will rise, 20-40Gb/s on trunk lines
• HDTV / Digi-TV
Summary

- To cope on the market companies have to offer service-bundles to the consumers
- Finding the suitable data transmission technology relies on identifying the characteristics of the traffic in the network
- Promising technologies for transmission are ATM, WDM and SDH and for the network-side IP and SDH.
- For client-side connections ISDN, B-ISDN (ATM), DTV, DSL and wireless technologies are to be considered.
Inconsistencies and quibbling

- "ATM may or may not be needed, but ISDN is not really necessary, although it might be used as well"
- Loose facts presented in an incoherent manner without proper justifications
- References to data tables mixed up & many typos
- Outdated and somewhat US-centered
Thank you for listening!

Questions / Discussion