

SMU Course #: EETS 7315

DATA COMMUNICATIONS

Week #14 -- Dr. Baker

**Telecom in the
Next Five Years**

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Disclaimer:

These 5-10 year projections are based on trends already in motion without any new major scientific breakthroughs.

Disclaimer:

Synergy between technologies is often hard to foresee. Note, for example, the following pearls of wisdom ...

Pearls of Wisdom from the Past

- “This ‘telephone’ has too many shortcomings to be seriously considered as a means of communication.”

– Western Union, Internal Memo, 1876

- “I think there is a world market for maybe five computers.”

– Thomas J. Watson, Chairman, IBM, 1943

- “There is no reason anyone would want a computer in their home.”

– Ken Olsen, Founder, Digital Equipment Corp, 1977

More Pearls (?)

- “640K of RAM ought to be enough for anybody.”

– Bill Gates, Founder, Microsoft, 1981

- “People will never need more than 1 or 2 Mb/s of bandwidth to their homes.”

– Conventional Wisdom, 2010

- “Everyone has the right to hear my opinion.”

– Charles Baker, 2010

Internet Usage Today

- E-mail
- E-mail Attachments
- Web Surfing ~ Research
- File Transfers
- Recreation
- Some E-commerce
- Some Voice
- Some Teleconferencing/Videoconferencing

What is causing Internet growth?

- Obviously, more users, new applications
- Besides the WWW, the main driving factor at this time appears to be e-mail attachments. This class of usage is making a significant impact on telephone toll revenue. Music and U-Tube are the fastest growing users of b/s.
- Earlier projections assumed e-mail would be negligible – video and www were assumed to be the main source of growth

What is the present impact?

- Fax has been the main use of long-distance toll between widely separated time zones, especially trans-Pacific.
- Fax has always been inefficient
- E-mail attachments, which are more efficient and economical are killing international fax traffic today.

Mapping the Internet

- The Cooperative Association for Internet Data Analysis (CAIDA) is a useful tool for researching the Internet itself.
- CAIDA is a project of the University of California at San Diego and is funded by the National Science Foundation

CAIDA provides insight into capacity and robustness

- Go to www.caida.org
- Click on CAIDA Tools
- Click on MAPNET
- Run MAPNET
- Select Commercial Backbones
- Select View
- Select Line width
- Choose Color coding scheme
- Select Networks

Characterizing Today's Internet

- “ping” provides useful transit delay information
- “traceroute” provides useful routing information
- Hosts I checked from SMU EE Dept.:

Host	# Routers 1-way	Avg. R/T Time (ms)
post.smu.edu	5	2
entc.tamu.edu	12	15
kolind.dk	24	157
online.ru	19	167

Conclusions about Today's Internet

- Very Fast
- Short Transit Delay
- High Capacity
- Robust
- Mostly U.S.
- Internet usage in other countries is growing rapidly

Internet Traffic Growth

- During 1998-99, Internet traffic was doubling every 100 days
- That implies 1000% (or 10 times) compounded annual growth
- Now the growth is roughly doubling annually

What is the Internet's Future? (Major Growth Areas)

- Internet Appliances
- Voice
- Live Video calls
- E-Commerce
- Personal Digital Assistants (PDAs)

New Applications: Internet Appliances

- Definition: An Internet Appliance is a special-purpose Internet terminal intended for only one or two functions
- It is estimated that the number of such devices connected to the Internet already exceeds the number of computers

Examples of Internet Appliances

- Internet telephones with SIP
- iPods
- Internet printers
- Internet PBXs
- PC-based PBXs
- Internet trash cans
- Internet utility meters
- Internet SCADA devices
- Internet wireless cameras
- Internet cell phones

Voice over the Internet

- Voice over IP (“VoIP”) is now making a significant impact on telco revenues
- The key to the success of VoIP is a new architecture developed by the Internet Engineering Task Force (IETF) called Session Initiation Protocol (SIP)
- SIP’s official description is RFC #3261, 269 pages, published in June, 2002

Former Problems with VoIP

- Long transit delay
 - The delay turned out to be in MS Windows® (¼-second per computer)
- Poor voice quality
 - Voice was over-compressed for realistic sound
- No flexibility or “features”
 - Point-to-Point only
 - Inadequate public network interface

Advantages of SIP

- No computer needed, so no Windows delay
- Up to Standard 64 kb/s PCM, better than 3.1 kHz telephone quality; optionally uses G.729 standard for 8 kb/s compressed voice
- An international standard with international thrust
- SIP will have numerous features
- Gateways into legacy public telephone network and proprietary networks are being provided

Disadvantage of SIP

- It requires DSL, Cable modem, fixed broadband or some other high-speed access to the Internet *if* you want full 64 kb/s voice

If you want to try SIP ...

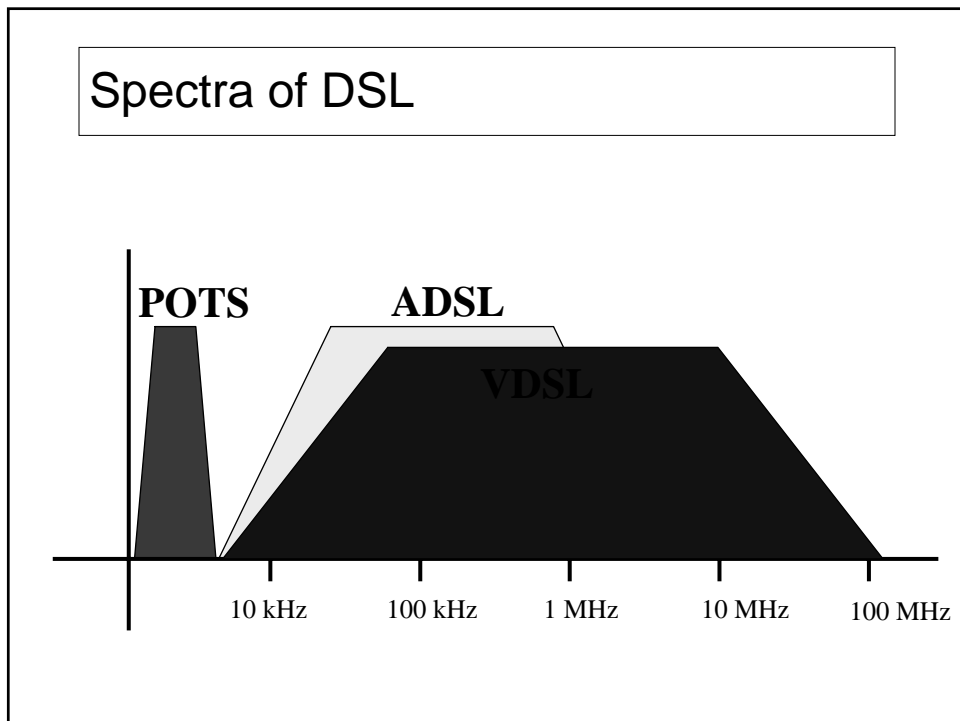
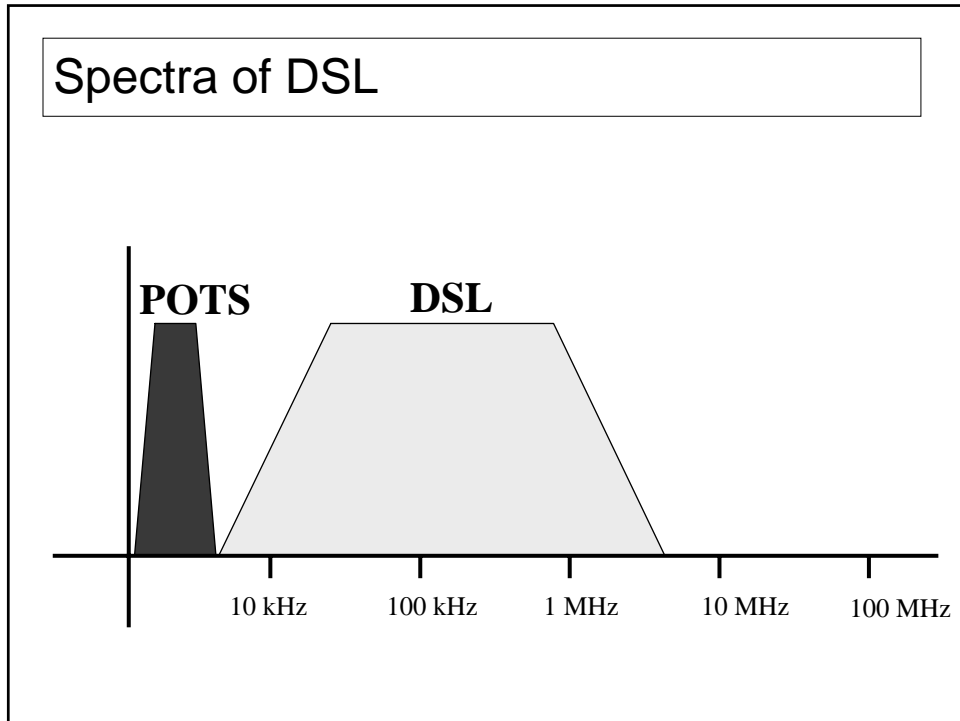
<http://vonage.com>

Introduction to DSL

Maximum Downstream rates for 24 Gauge UTP

18 kft	1.5 Mb/s	ADSL
16 kft	2 Mb/s	
12 kft	6 Mb/s	
9 kft	9 Mb/s	
----- 4.5 kft -----	----- 13 Mb/s -----	VDSL
3 kft	26 Mb/s	
1 kft	52 Mb/s	

All of this is in addition to POTS!



Coden's Law:

The most important technical parameter in any system is **COST**.

Linus' Syndrome:

If it works don't change it.

DSL vs. Cable Modems for Internet Access

DSL has three inherent advantages over cable:

- Reliability track record
- Privacy (shared media)
- Speed (one user or household per medium)

There is yet another reason for Telcos rushing to DSL ...

- The telecommunications industry is already facing an Internet overload crisis
- More users and longer holding time are causing up to 16% busy hour blockage on even local calls, and it's still increasing
- DSL provides a way to off-load Internet usage from the public network. This is **crucial** to keeping regulators and lawmakers at bay!

5-10 years out:

- ❖ There is a growing school of thought that advocates eliminating ATM and SONET, and putting *everything* into IP Datagrams, encapsulating into Ethernet frames, and letting that flow directly into the fiber without SONET.

Thought for the Day:

Eagles may soar,
but weasels aren't
sucked into jet
engines.

