Next Generation Network, Next Generation Services, and Misleading Telecom Myths

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Telecom: bright future (if historical precedents apply) but much turmoil:

- Suffering from gross overinvestment and malinvestment of the bubble years

- Moving into major restructuring phase

Projections/speculations:

Continuing strong traffic growth
Resumption of service revenue growth
Faster growth on supplier side
Restructuring of the industry
Long haul to stay small
More to be done with voice
Simplicity wins!

End of traditional universal service:

POTS:

- **homogeneous service for all**
- **vertically integrated industry**

Future:

- **heterogeneous collection of networks and services**
- **heterogeneous demands (from single mobile phone to OC12)**
- **horizontal layers**

Long history of technology leading to over investment and crashes:

Power of new technology:

In spite of the crash of late 1840s, traffic (freight-miles and passenger trips) as well as revenues all grew 10x between 1850 and 1900

Railway mileage growth 1850-1900: 3x

Analogies with railroads:

U.S. railroad industry

Year	Revenues	Fraction of GDP
1900	$1.5 B	8%
2000	$35 B	0.4%

Transportation industry as a whole has thrived; railroads do play a vital role (occasionally even a profitable one). Many intriguing analogies between telecom and transportation (but to be treated with caution).

Analogies with computer industry:

Mainframe: Vertically integrated, developing proprietary software and hardware

Distributed (PC, …): Horizontal layers

Telecom often appears to dream of going back to the analog of the mainframe era

Long-haul is not where the action is:

360networks transatlantic cable

Construction cost	**$850 M**
Sale price	**$18 M**
Annual operating cost	**$10 M**
Lit capacity	**192 Gb/s**
Ave. transatlantic Internet traffic	**70 Gb/s**

Migration of Costs to Edges

→ *New Business Models*

Customer-owned networks

Outsourcing

Analogies with multi-modal transportation model

Misleading dogmas impeding reform and restructuring:

- Carriers can develop innovative new services
- Content is king
- Voice is passe
- Streaming real-time multimedia traffic will dominate
- There is an urgent need for new "killer apps"
- Death of distance
- QoS and measured rates

A depressing litany of duds among major recent networking research initiatives:

ATM

RSVP

Smart markets

Active networks

Multicasting

Streaming real time multimedia

3G

And (largely encompassing all of these): QoS

All technical successes, but failures in the marketplace

All recent "killer apps" created by users, not carriers:

email

World Wide Web

browser

search engines

Napster

Dominant types of communication: business and social, not content, in the past as well as today

Thirty years ago you left the city of Assur. You have never made a deposit since, and we have not recovered one shekel of silver from you, but we have never made you feel bad about this. Our tablets have been going to you with caravan after caravan, but no report from you has ever come here.

circa 2000 B.C.

A fine thing you did! You didn't take me with you to the city! If you don't want to take me with you to Alexandria, I won't write you a letter, I won't talk to you, I won't say Hello to you even. ... A fine thing you did, all right. Big gifts you sent me - chicken feed! They played a trick on me there, the 12th, the day you sailed. Send for me, I beg you. If you don't, I won't eat, I won't drink. There!

circa 200 A.D.

One picture is worth a thousand words

One picture is worth a thousand words, provided one uses another thousand words to justify the picture.

Harold Stark, 1970

There are still unexploited opportunities in voice, especially in 3G (with differentiated voice quality levels, etc.). The success of Nextel's push-to-talk should not have been a surprise (nor SMS).

Streaming multimedia vs. file transfers:

File transfer for local storage and transfer to other devices the most natural evolution (giving edge to Ethernet)

Predicted long ago

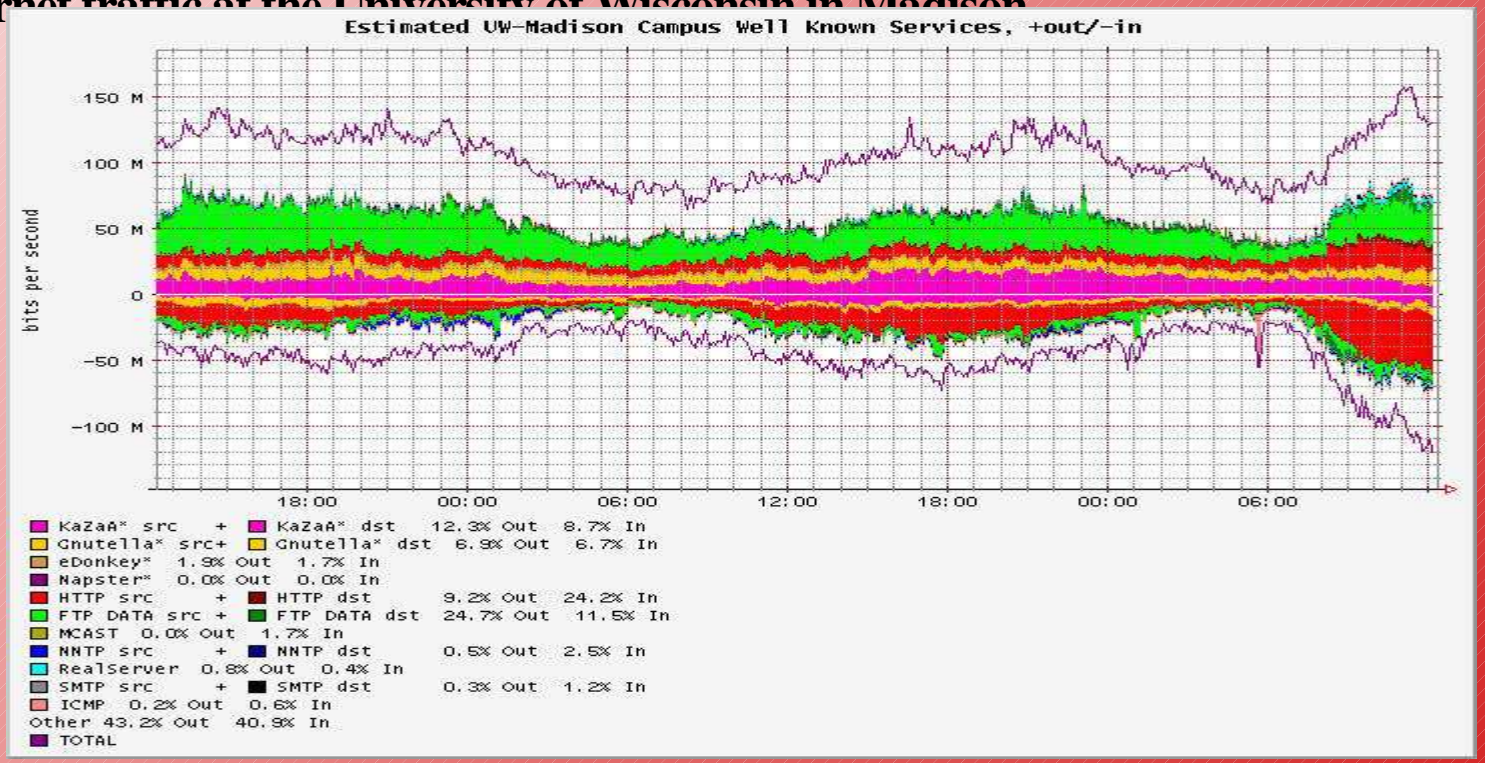
Confirmed by Napster, . . .

Want high bandwidth for faster-than-real-time

Destroys case for QoS

Multimedia file transfers a large fraction of current traffic, streaming traffic in the noise:

Internet traffic at the University of Wisconsin in Madison

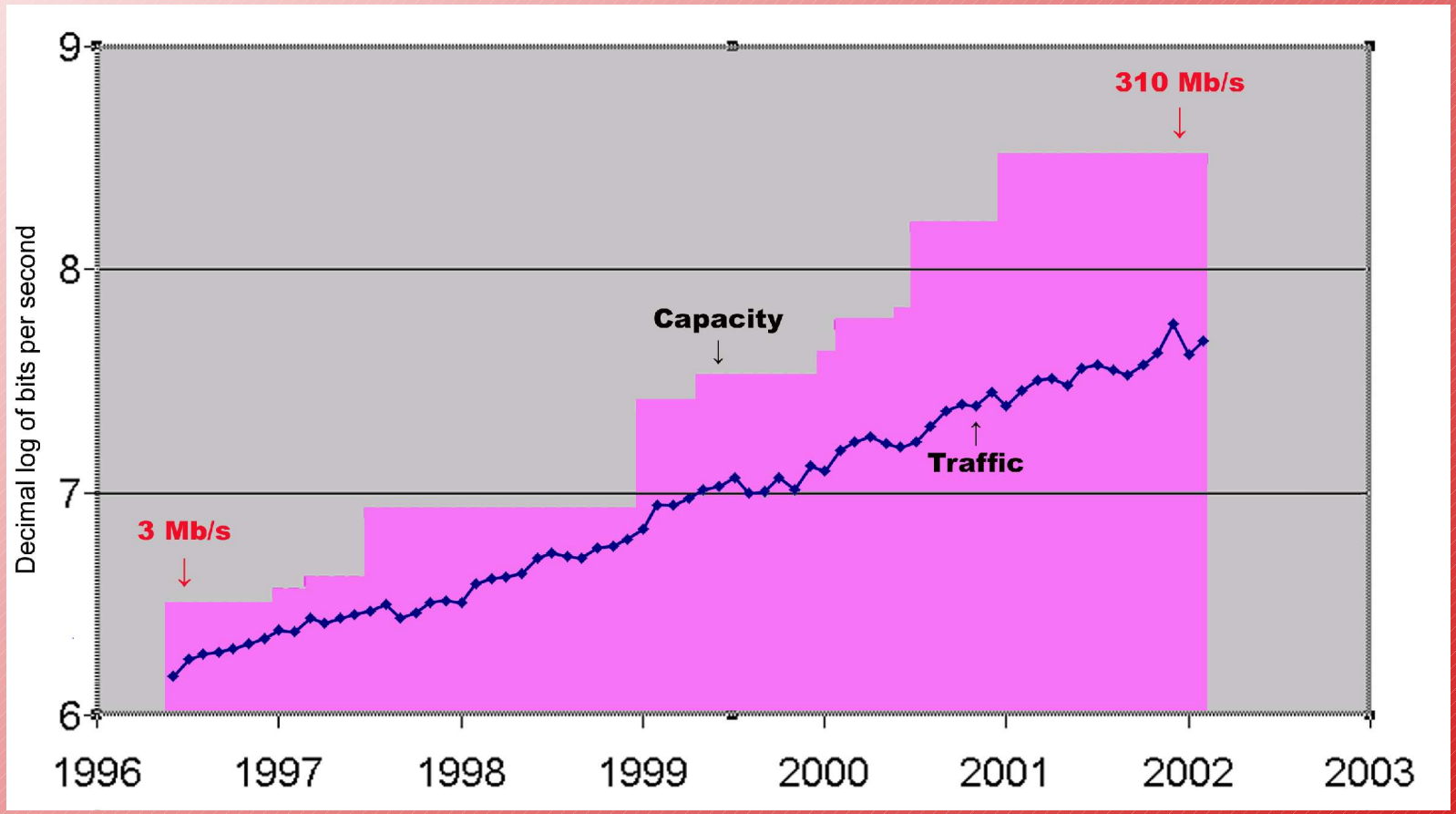


"Moore's Law" for data traffic:

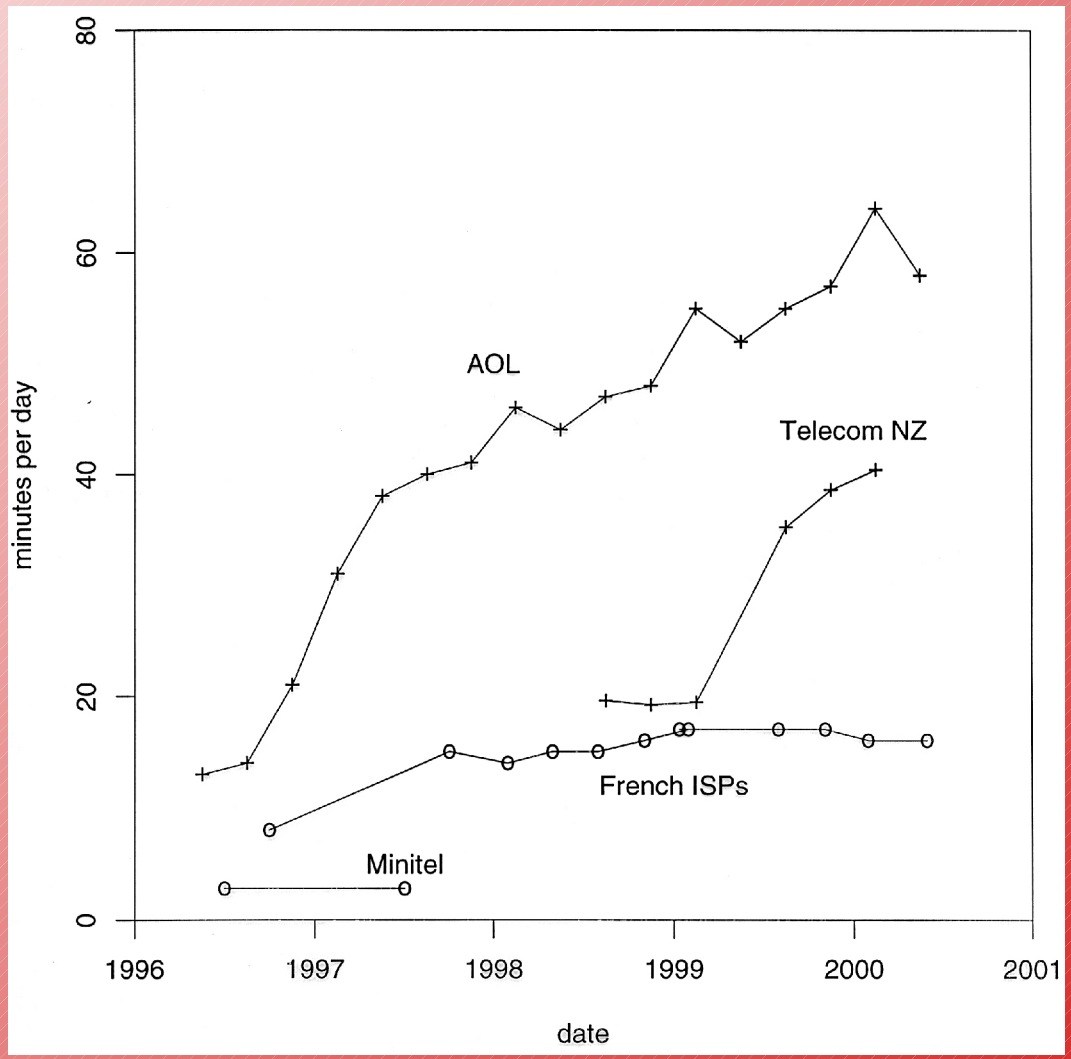
Usual pattern of large, well-connected institutions: approximate doubling of traffic each year

Note: Some large institutions report growth rates of 30-40% per year, the historical pre-Internet data traffic growth rate

SWITCH traffic and capacity across the Atlantic



Subscriber time online as function of pricing



Suggestions:

- pay attention to voice
- think local
- imitate Microsoft (don't rely on internal innovation, incorporate what arises and flourishes outside into a platform)
- exploit local storage (and de-emphasize streaming real-time)
- promote social interactions (no oppressive DRM, maximize content availability)
- encouraging usage is the main imperative (so flat or at least simple rates, no QoS or other hindrances)
- fight complexity inside network and in user services

Further data, discussions, and speculations in papers and presentation decks at:

http://www.dtc.umn.edu/~odlyzko