

Internet economics, Internet evolution, and misleading networking 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

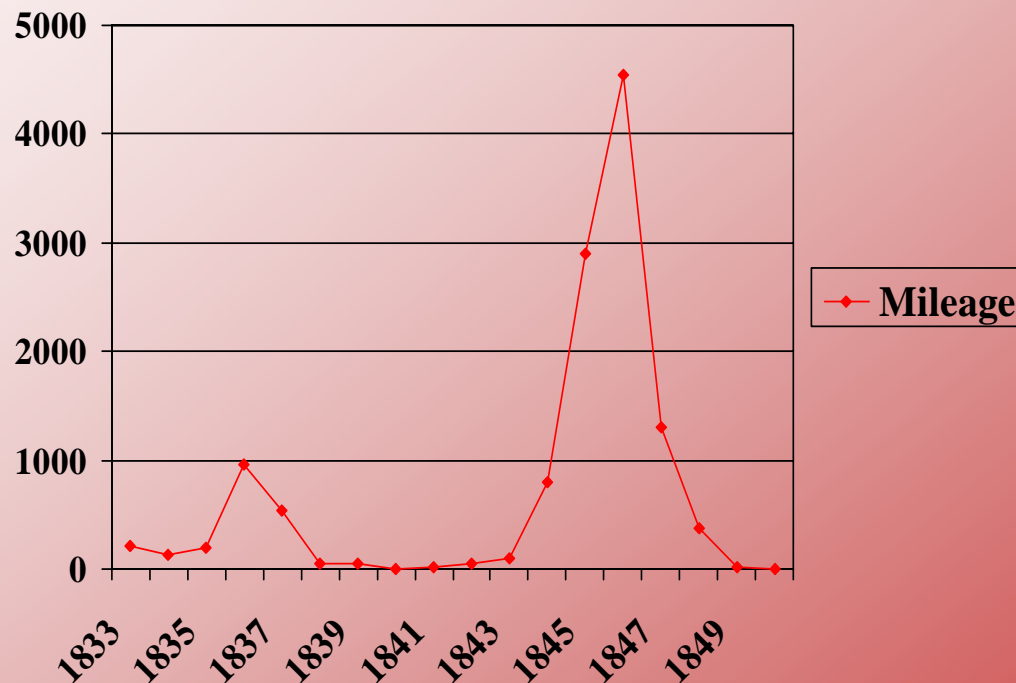
Projections/speculations:

- ◆ 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!

But need to overcome many false dogmas!

Long history of technology leading to overinvestment and crashes:

Railways authorized by British Parliament (not necessarily built)



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).

Analogy 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:

▶ 360 networks transatlantic cable

Construction cost	\$850 M
Sale price	\$18 M
Annual operating cost	\$10 M
Lit capacity	192 Gb/s
Ave. transatlantic Internet traffic (mid-2003)	70 Gb/s

Migration of Costs to Edges

→ New Business Models

- ◆ Customer-owned networks
- ◆ Outsourcing
- ◆ Analogies with multi-modal transportation model

Telecom Problems:

Notorious for

- ◆ Planning services based on incorrect assumptions about customer needs and desires
- ◆ Not looking at what customers are actually doing

WEDNESDAY, SEPTEMBER 29, 2004 **D5**

Cellphone Disconnect: Carriers Offer More, Customers Want Less

By CHRISTOPHER RHOADS

Carriers have loaded up mobile phones with new features, from instant messaging to music players, but for many consumers a phone is still a phone—and they would just as soon keep it that way.

Having video and camera features

Service Disconnect

Percentage of consumers in Europe expressing interest in certain advanced cellphone services, assuming prices were acceptable:

AGE	Percentage
15-17	64%

“Those are toys. People don’t need toys. What I need is to be in touch.”

The great telecom crash: Result of technology rising to the challenge posed by unrealistic business plans made in willful ignorance of reality

The great myth of “Internet traffic doubling every 100 days”: see, e.g., Mike O’Dell presentation at Stanford in May 2000:

<http://stanford-online.stanford.edu/optic/main.html>

contrary to all available evidence, contains blatant contradictions and implausibilities.

But nobody in the audience pointed it out!

Official government statistics collection finally starting:

MB (megabytes) of data downloaded per person per month

Australia

<u>month</u>	<u>MB/person</u>
Mar 2002	31
Sep 2002	49
Mar 2003	52
Sep 2003	79
Mar 2004	108

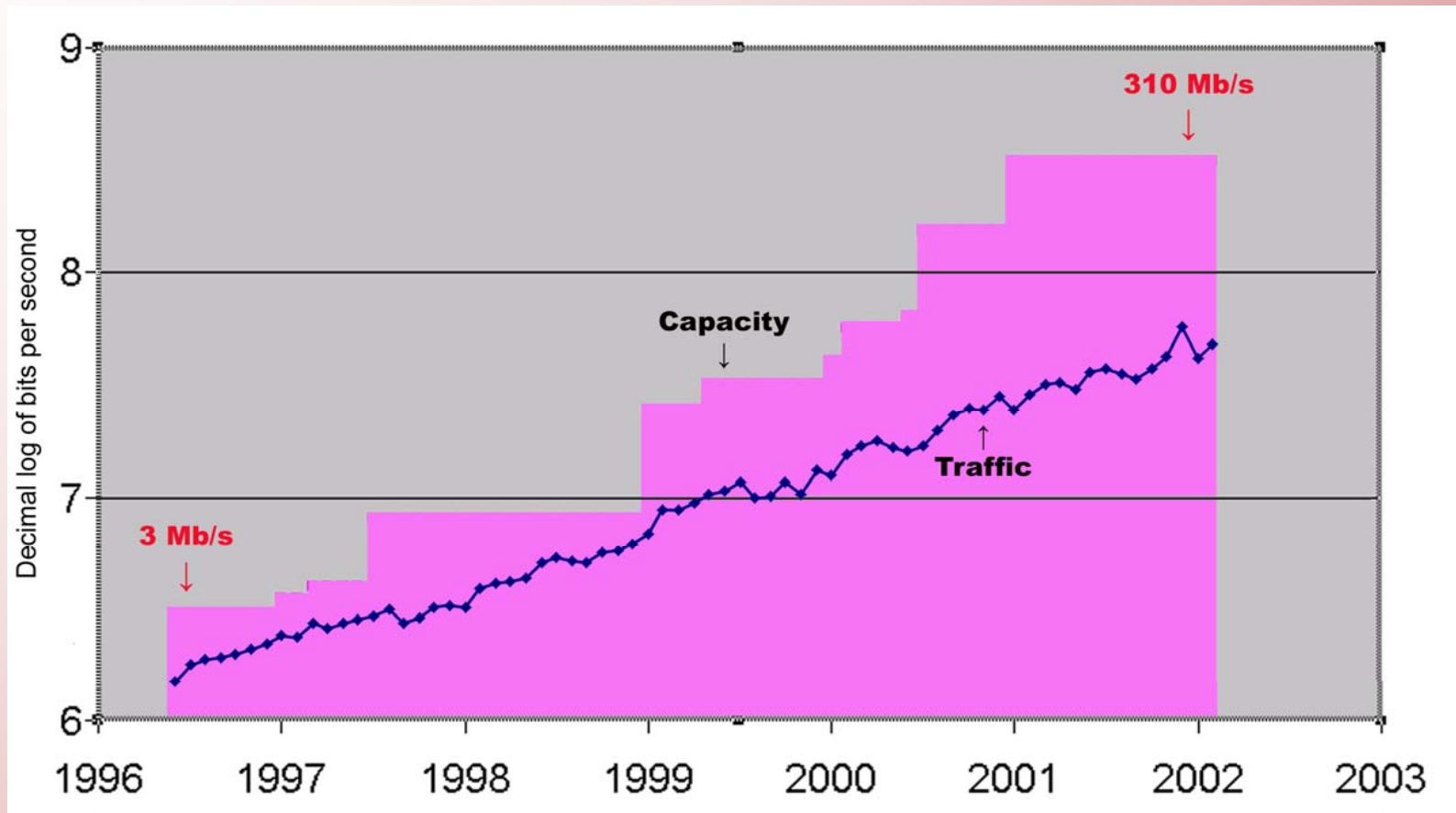
Hong Kong

<u>month</u>	<u>MB/person</u>
Jan 2002	212
Jul 2002	327
Jan 2003	581
Jul 2003	1,598
Jan 2004	2,855
Jul 2004	4,529

rough estimates for other countries today (Jan 2005):

US:	1,000 MB/person
Japan:	1,000 MB/person
S. Korea	5,500 MB/person

SWITCH traffic and capacity across the Atlantic



Insatiable demand for bandwidth vs. need to stimulate usage:

Internet growth hype:

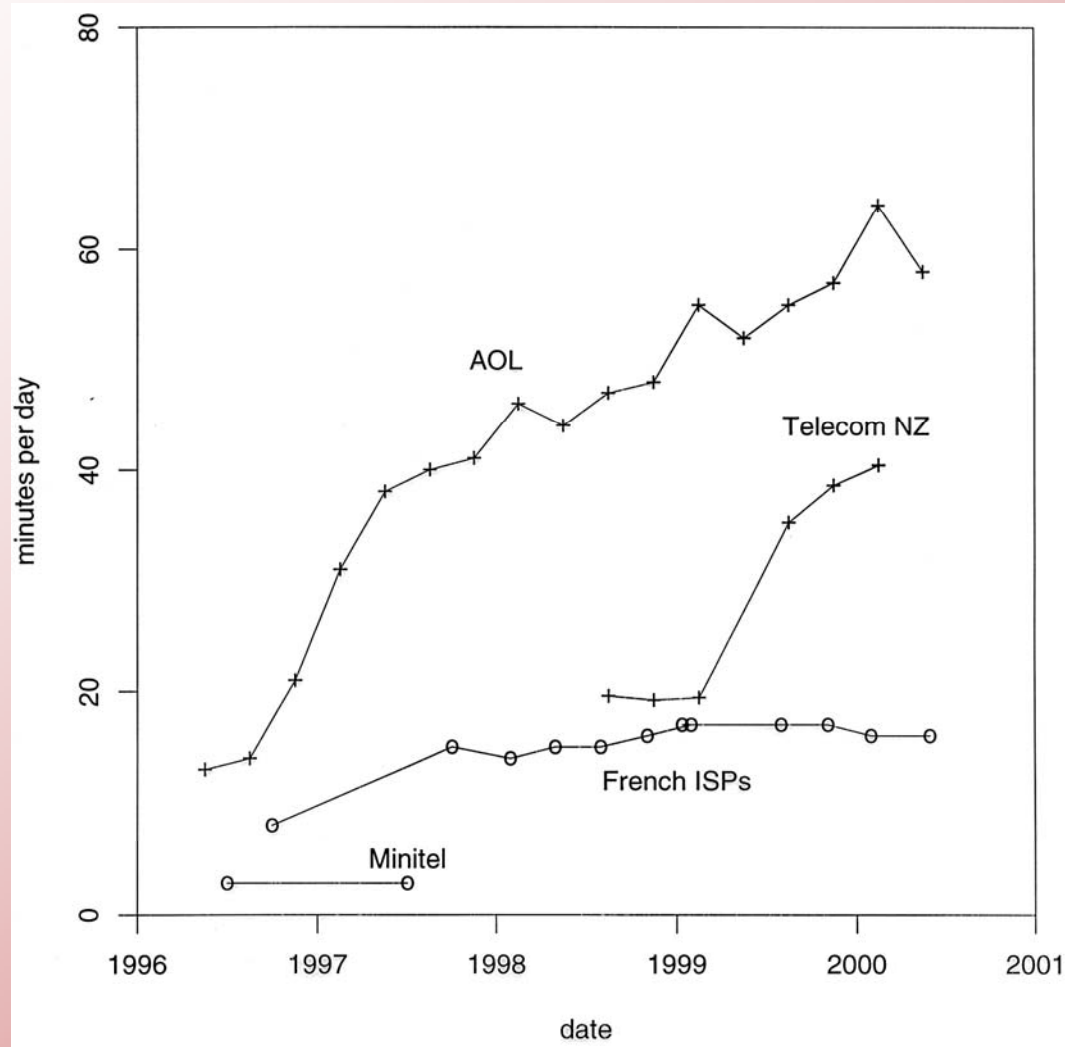
“... bandwidth ... will be chronically scarce. Capacity actually creates demand in this business...bandwidth-centric names are good values at any price since nobody can predict the true demand caused by growth.”

-- Jack Grubman, April 1988

Reality: service providers' main imperative is to stimulate usage to fill the constantly-expanding pipes

Many measures well-suited for environment of chronic shortage (such as fine-grained usage sensitive prices) inappropriate

Subscriber time online as function of pricing



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.

Human communication:

One picture is worth a thousand words

Human communication:

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

Harold Stark, 1970

Voice is extremely important in human communication. Much more can be done with it (such as higher quality, or several levels of quality).

A key misleading myth: streaming real-time traffic

Keynote speech by SIGCOMM 2004 lifetime contribution award winner Simon Lam,

<http://www.acm.org/sigs/sigcomm/talks/lam-sigcomm04.pdf>

Lam's conclusions:

1. Overprovisioning not a solution
2. Flow-oriented service needed
3. More QoS research is needed
4. Widespread commercial deployment of QoS within 10 years

All 4 are almost surely wrong! (And go counter to the correct statement on Slide #2 of Lam's presentation that "IP won the networking race.")

Dominant form of traffic now and in the future: file transfers

multimedia to go faster than real-time (with no obvious limit on speed or bandwidth needed to get low transaction latency)

even with limited memory, buffers substitute for QoS

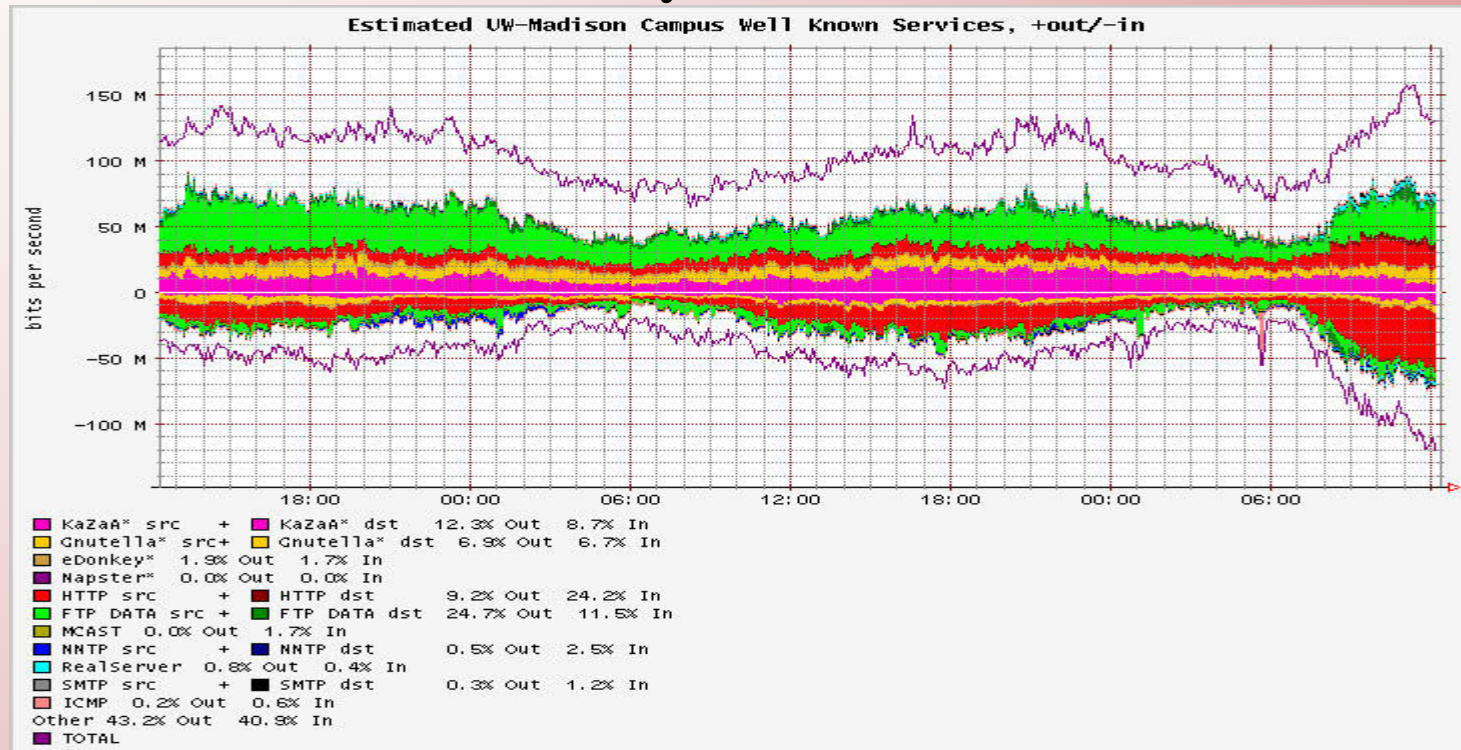
small fraction of traffic that is inherently real-time (voice telephony, videoconferencing) can be handled in several ways

responds to human impatience, which is the driving force behind development of data networks

predicted long ago
vindicated by Napster, ...

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

Internet traffic at the University of Wisconsin in Madison



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>