Internet charging

Andrew Odlyzko

AT&T Labs - Research

amo@research.att.com
http://www.research.att.com/∼amo

Motivation and outline:

- Point of view: economic and historical
  - technology behind the scenes

- Main points:
  - Structure of prices often more important than level of prices or technology
  - Future of the Internet: flat rate and uniformly high grade of service in the core
  - Price and quality differentiation at the edges

Internet access: predominantly flat rate, but

- in most countries, per-minute local calling fees
- usage sensitive charges for Web servers
- usage sensitive charges for Australian Telstra, UK's JANET
- corporate networking charges to subunits by usage

UUNet burstable rates

fixed rate T1 (1.5 Mbps): $2,500/month

burstable T1 (95-th percentile of 5-min averages):

< 128 Kbps	$\$1,300$
$128 - 256$	$1,900$
$256 - 384$	$2,500$
$384 - 512$	$2,750$
> 512	$3,000$

Consensus view:

Although flat-rate continues to be the predominant form in which Internet access is sold, that form of pricing is unviable. Flat-rate pricing encourages waste and requires 20 percent of users who account for 80 percent of the traffic to be subsidized by other users and other forms of revenue. Furthermore, flat-rate pricing is incompatible with quality-differentiated services.

Pravin Varaiya
INFOCOM'99 keynote

Similar consensus a century earlier about flat-rate local telephone service:

> that, so far as large cities are concerned, unlimited service is unjust to small users, favors large users unduly, impedes expansion of the telephone business, tends to inefficient service, and that, as a financial proposition, is unsound.
>
> 1905 New York City study

United States is almost alone in the world in having predominantly flat-rate local phone calling. Has that caused any serious problems?

International comparison of telephone industry revenues and usage in 1998

country	revenues as fraction of GDP	minutes of phone calls per person per day
Finland	2.88%	17.8
France	2.00	10.9
Sweden	2.06	20.7
Switzerland	2.83	14.1
U.K.	2.87	12.7
U.S.	3.05	36.6

Wall Street Journal, Oct. 29, 1999:

"Europe is edging closer to tearing down one of its biggest barriers to electronic commerce: the phone charges that users pay for every minute they stay online.

In Britain, amid a crusade by users, newspapers and Internet companies, the government's e-commerce minister and the Office of Telecommunications, of Oftel, the regulator, are preparing to tell British Communications PLC to open up its rate structure to allow Internet-service providers to offer unlimited Web access for a flat monthly price."

Newark - San Francisco round trip:

advance purchase, nonrefundable, etc.: $280

+ 20,000 mileage points for 1st class upgrade

regular coach:	$1,287
1st class:	$2,031

Price discrimination is (economically) desirable:

Charlie (consultant) has two potential customers, Alice and Bob, for a report on novel Internet services

Alice is willing to pay \$700

Bob is willing to pay \$1,000

Suppose Charlie's cost (opportunity cost, ...) is \$1,500

No uniform price will allow Charlie to cover his costs!

Modern economy increases incentives for price discrimination:

high production (first copy, fixed, ...) costs

low marginal costs

pharmaceuticals

microprocessors

Pentium prices:	\$100–500
marginal cost	$\sim$ \$30

communication satellites

information goods

communication networks

spread of “damaged goods” approach:

IBM, 1990:

Laser Printer:	10 pages/min.
Laser Printer E:	5 pages/min.

FedEx: afternoon delivery only in the afternoon

In Britain in 1889, postal officials reprimanded a Leicester subscriber for using his phone to notify the fire brigade of a nearby conflagration. The fire was not on his premises, and his contract directed him to confine his telephone "to his own business and private affairs." The Leicester Town Council, Chamber of Commerce, and Trade Protection Society all appealed to the postmaster-general, who ruled that the use of the telephone to convey intelligence of fires and riots would be permitted thenceforth.

C. Marvin, *When Old Technologies Were New*

It is not because of the few thousand francs which would have to be spent to put a roof over the third-class carriages or to upholster the third-class seats that some company or other has open carriages with wooden benches. What the company is trying to do is to prevent the passengers who can pay the second class fare from traveling third class; it hits the poor, not because it wants to hurt them, but to frighten the rich. And it is again for the same reason that the companies, having proved almost cruel to the third-class passengers and mean to the second-class ones, become lavish in dealing with first-class passengers. Having refused the poor what is necessary, they give the rich what is superfluous.

Jules Dupuit, 1849

In communications, the historical trend has been towards simpler pricing, leading to frustration among experts:

... Clearly a movement to a positive per call charge would increase aggregate economic efficiency. Yet nearly all proposals for a move to [usage-sensitive pricing] have met stiff consumer resistance. The reluctance seems to persist even when customers face the prospect of a [usage-sensitive pricing] plan that would, on average, result in a lower monthly bill.

J. Panzar, 1979

International telegraph rates from New York City (per word)

year	London	Tokyo
1866	$10.00	-
1868	1.58	-
1880	0.50	$7.50
1890	0.25	1.82
1901	0.25	1.00
1924	0.20	0.50
1950	0.19	0.27
1970	0.23	0.31

CompuServe Pricing with Internet Access in the US, Feb. 1995

Monthly membership fee and on-line charges	\$9.95/month: US \$4.80/hour for extended services
Free hours included in on-line pricing	Unlimited access to 120 basic services
Electronic mail	90 three page messages were included; extra charge for Internet mail
Internet access	3 free hours; \$2.50 for each additional hour

First defense of flat rate pricing in conventional economic terms:

Fixed fee versus unit pricing for information goods: competition, equilibria, and price wars, P. C. Fishburn, A. M. Odlyzko, and R. C. Siders, *First Monday* 2(7) (July 1997).

Also references to Bell System studies of non-economic reasons for public preference for flat rate.

Flat rate pricing as bundling: Alice is interested in downloading 1 MB per month from each of 10 Web sites

site	willingness to pay
1	\$ 0.40
2	0.80
3	1.20
4	1.60
5	2.00
6	2.40
7	2.80
8	3.20
9	3.60
10	4.00
total	\$22.00

If charge per byte, maximal revenue is \$12.00

“What was the biggest complaint of AOL users? Not the widely mocked and irritating blue bar that appeared when members downloaded information. Not the frequent unsolicited junk e-mail. Not dropped connections.

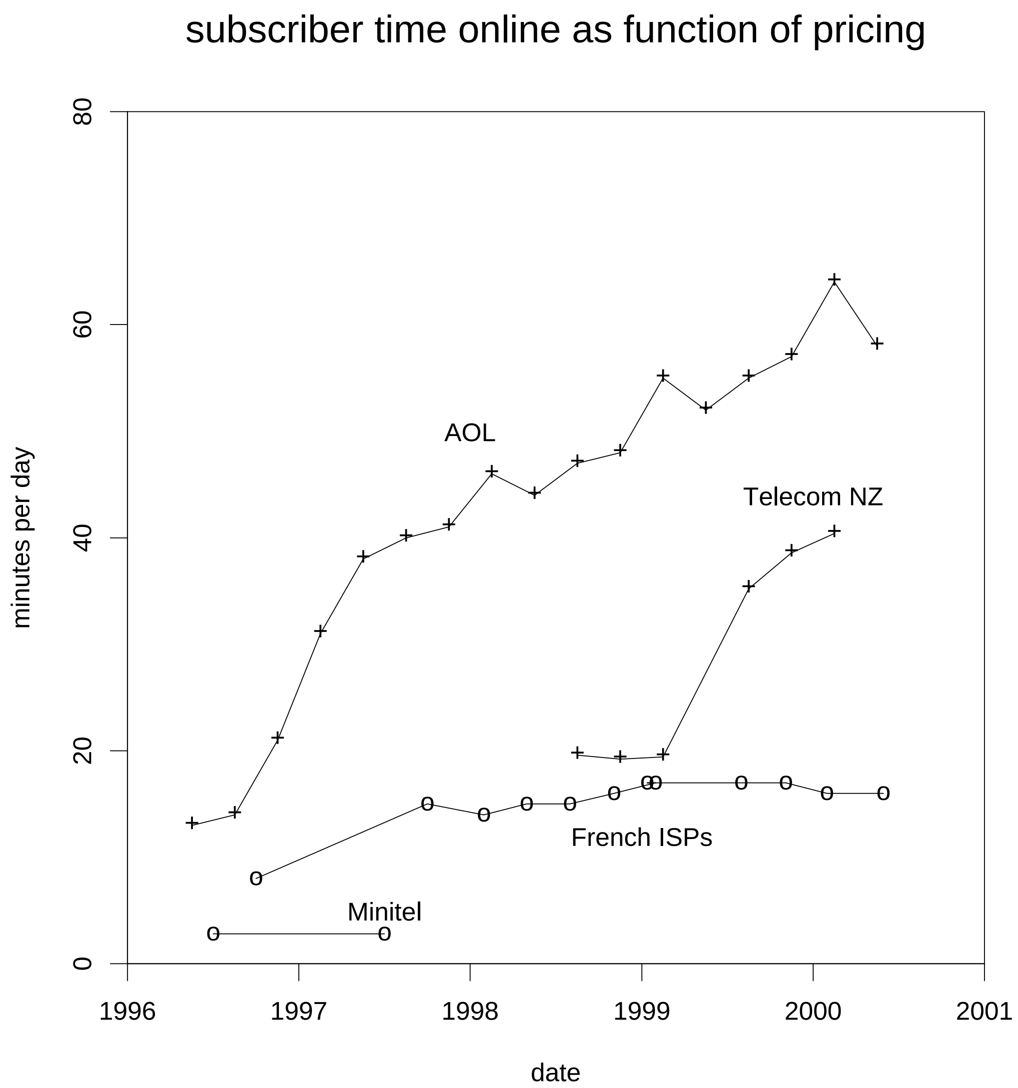
Their overwhelming gripe: the ticking clock. Users didn’t want to pay by the hour anymore.”

“Case had heard from one AOL member who insisted that she was being cheated by AOL’s hourly rate pricing. When he checked her average monthly usage, he found that she would be paying AOL more under the flat-rate price of $19.95. When Case informed the user of that fact, her reaction was immediate.

‘I don’t care,’ she told an incredulous Case. ’I am being cheated by you.’ ”

> from “aol.com: How Steve Case Beat Bill Gates, Nailed the Netheads, and Made Millions in the War for the Web,” Kara Swisher, 1998.

Effects of flat rates on usage:



Reasons for flat rate preferences:

1. Insurance (what if my son shows up and starts making lots of calls?)

2. Overestimate of usage (ratio of estimated to actual usage log normal)

3. Hassle factor (calls charged on per-call basis shorter than under flat-rate)

Reference:

P. C. Fishburn, A. M. Odlyzko, and R. C. Siders, "Fixed fee versus unit pricing for information goods: competition, equilibria, and price wars," First Monday 2(7) (July 1997).

Technology is increasing available bandwidth at rates faster than Moore's Law for semiconductors

Therefore increasing usage is the main imperative

Contrasting attitudes to usage:

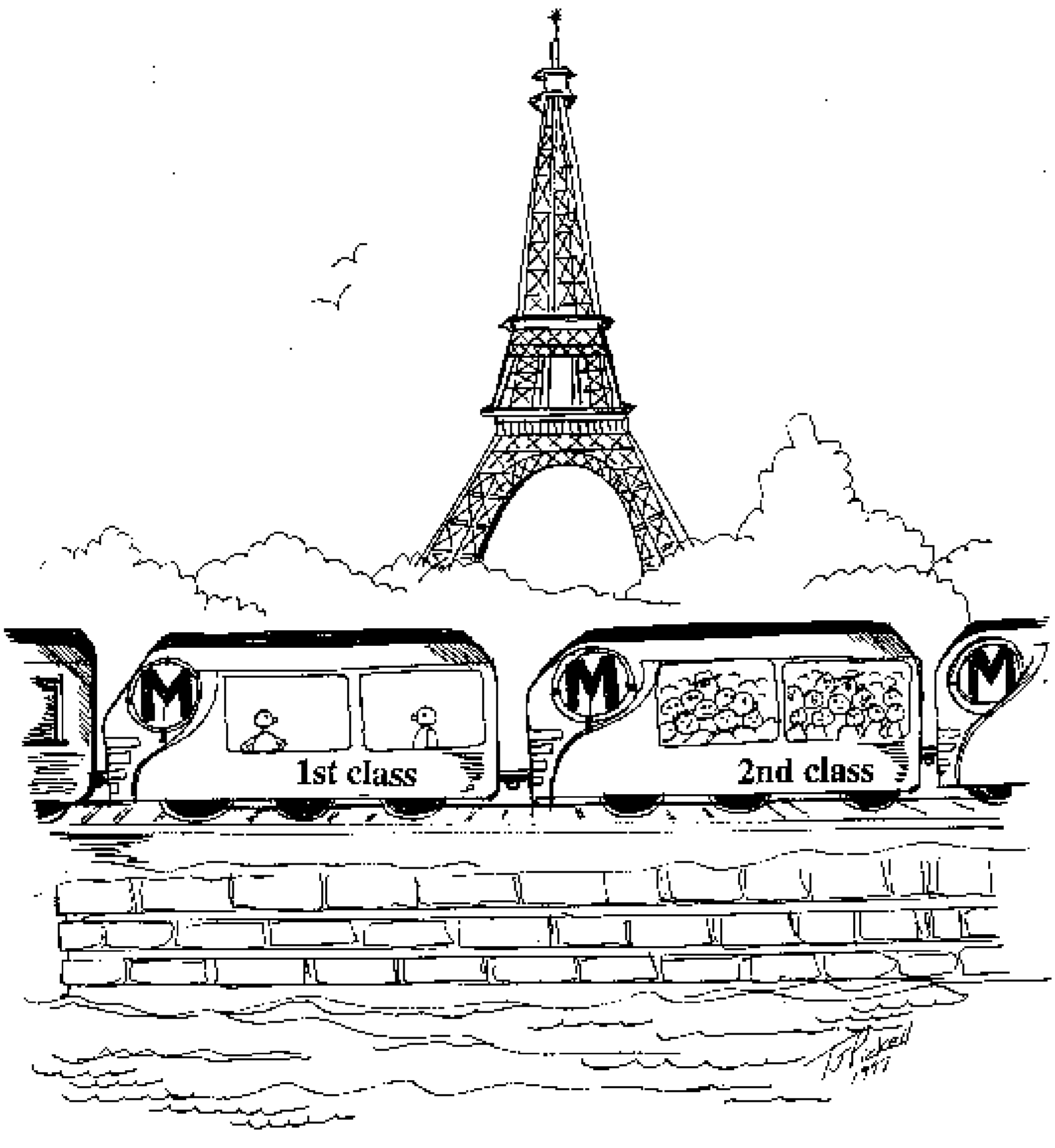
The unlimited use of the telephone leads to a vast amount of unnecessary occupation of the wires, and to much borrowing of telephones by parties who are not subscribers. Thus the telephone system is so encumbered with calls which are unnecessary, and largely illegitimate, that the service is greatly impaired, and subscribers, to whom prompt connection is essential, become dissatisfied.

Bell company announcement, 1880s

[Elsevier's] goal is to give people access to as much information as possible on a flat fee, unlimited use basis. [Elsevier's] experience has been that as soon as the usage is metered on a per-article basis, there is an inhibition on use or a concern about exceeding some budget allocation.

K. Hunter of Elsevier, 2000

Paris Metro Pricing (PMP): quality differentiation through pricing alone



ExciteHome offers Home and Work solutions, at about \$40 and \$100 per month, respectively.

Both are best-effort services (a form of PMP).

The terms for leasing two telephones for social purposes, connecting a dwelling house with any other building, will be \$20 a year; for business purposes \$40 a year, payable semi-annually in advance, ...

Bell Telephone Association, 1877

In the U.S., the phone system consumes about 3% of GDP, with about a third paid by households, two thirds by businesses.

As the Internet becomes the dominant network, it may be necessary to exploit the differences in willingness to pay between business and residential users.

Conclusions/predictions:

- Structure of prices often more important than level of prices or technology
- Efficiency of network operations secondary to imperative to encourage usage
- Future of the Internet: flat rate and uniformly high grade of service in the core
- Price and quality differentiation at edges

More data and detailed arguments:

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