

Wild Wild Web: The Lay of the Land

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Argument:

The Web (in its current form) is a fad.

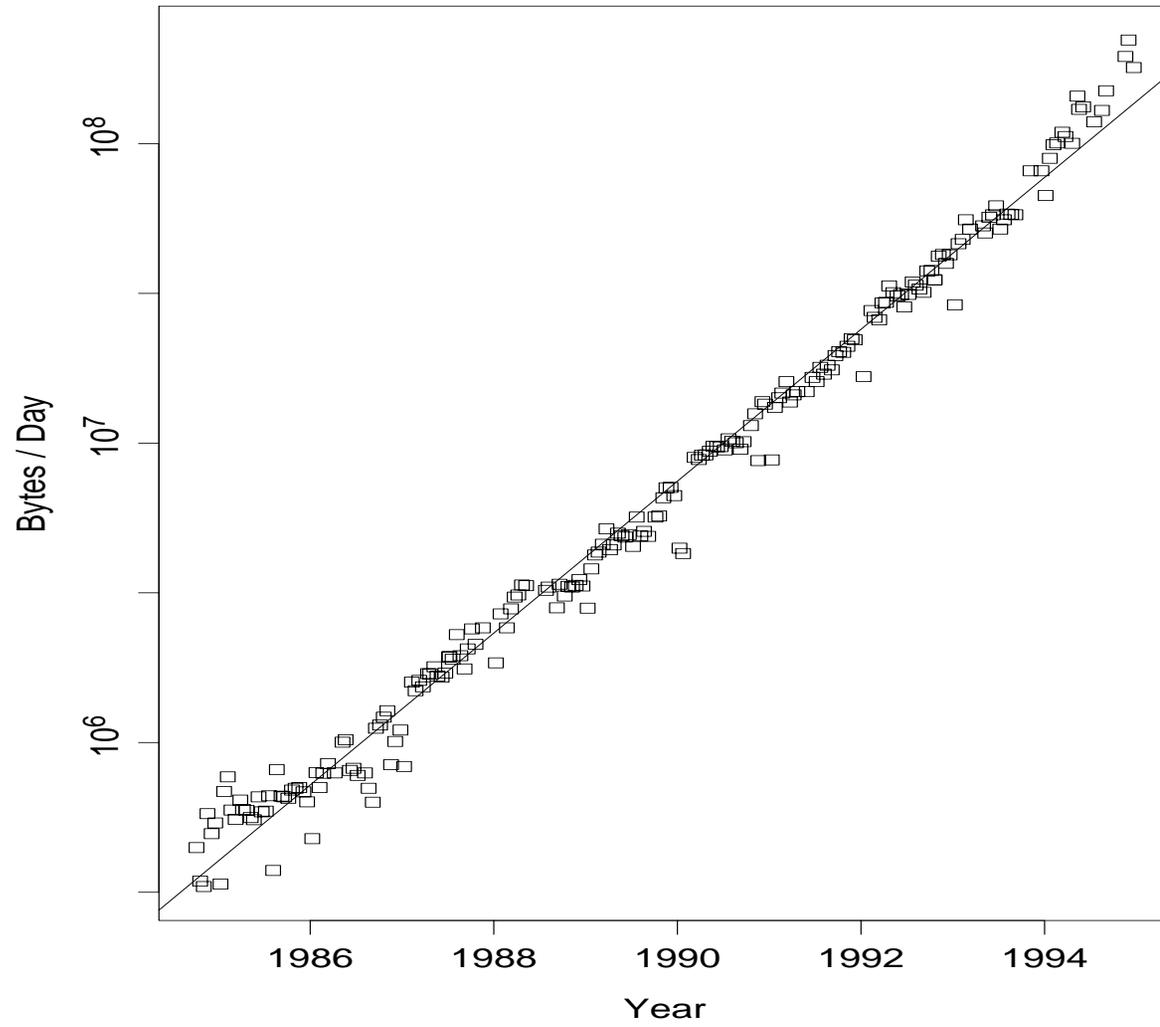
The role of the architecture is to facilitate paradigm shifts.

Beware truly distributed applications.

The gold rush is expensive.

Whither robustness?

USENET Bulletin Board Traffic Volume



Courtesy of Rick Adams.

The Internet — diverse wherever you look:

Network grows exponentially: total; per site; per user.

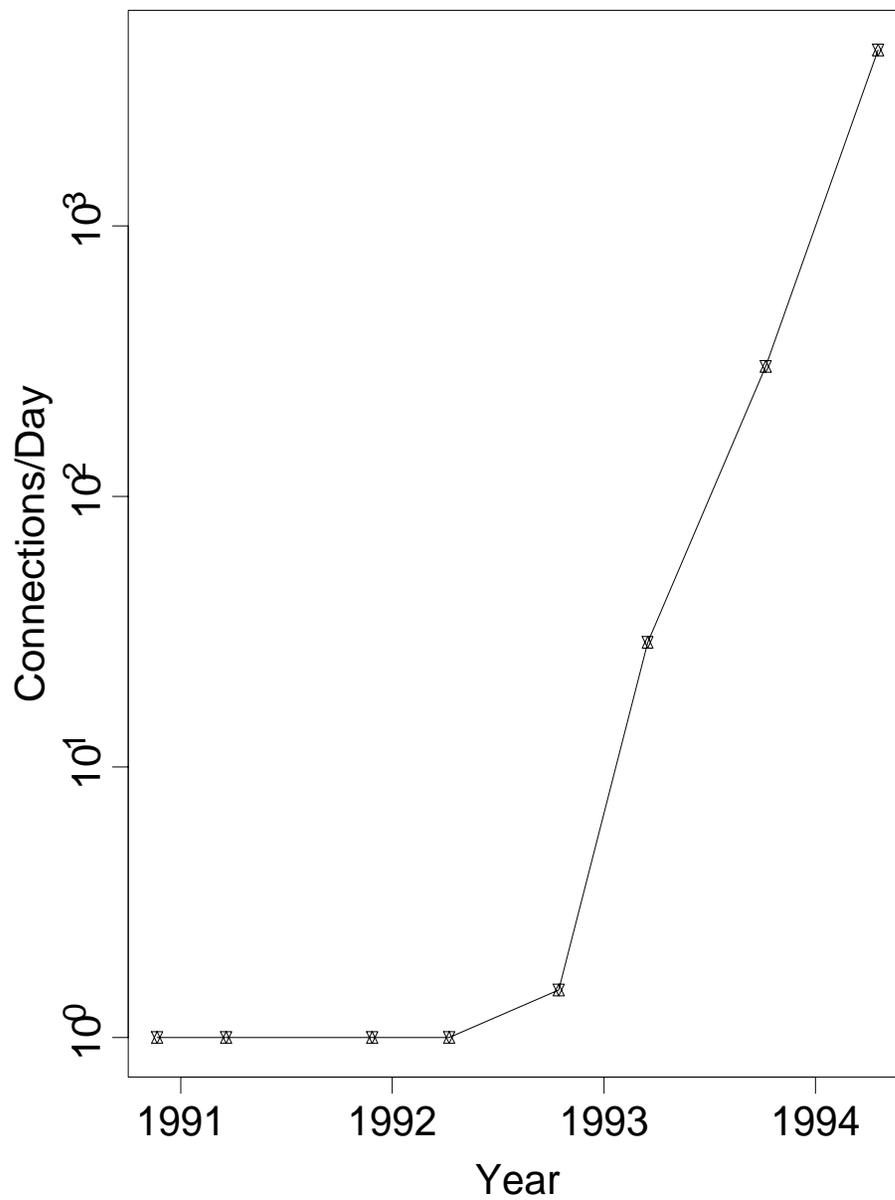
There's no such thing as “typical”: robust statistics fail.

Sizes, durations exhibit infinite variance — immense range!

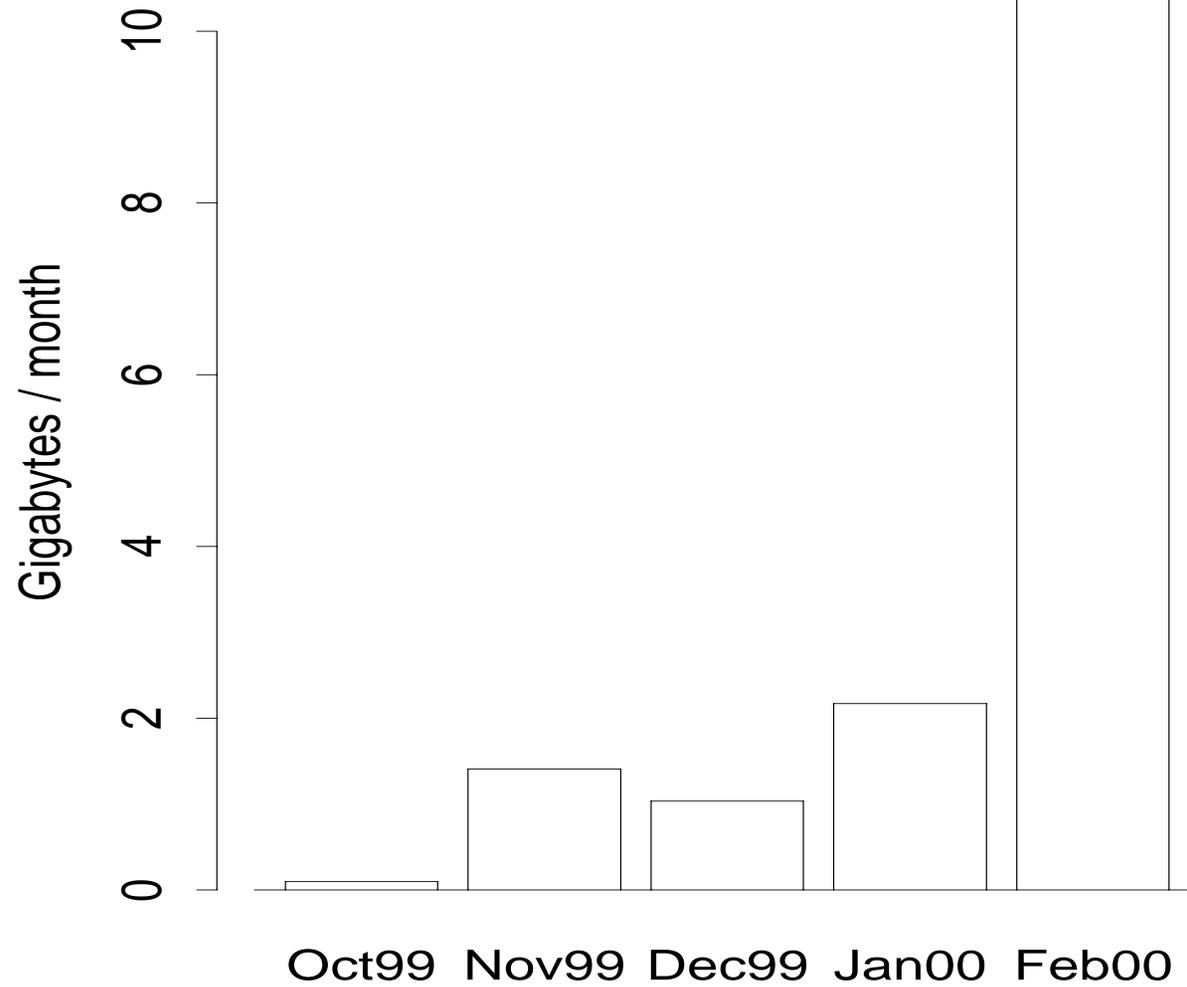
From 100's of msec on up, traffic exhibits a fractal structure.

New applications radically alter the landscape . . .

Growth of LBNL's WWW Traffic



One Site's Napster Traffic



Paradigm shift: Broadly distributed applications

With centralized elements:

- Web search engines
- Napster (MP3s; 50% of bytes @ UCSC)
- Imesh (publish your whole PC)
- SETI@Home (15% of packets, UCB)

Paradigm shift: Broadly distributed applications, con't

Without centralized elements:

- Gnutella (open-source Imesh — the arms race is on!)
- Distributed denial of service (could be improved!)
- Content distribution networks
- GRID forum (distributed scientific computing)
- MBone/multicast (enabling technology)

⇒ We're still figuring out the possibilities.

The high price of all those IPOs:

Gold rushes tend to lead to strip mining.

Today's land grab = tomorrow's fences:

Firewalls hardwire limited models of connectivity.

NAT boxes restrict application flexibility.

“Transparent” (interception) proxies redefine service model.

End-to-end security undermined.

Fast routers \Rightarrow no incremental extensibility (options).

Architectural evolves ad hoc, driven by short-term market forces.

Whither robustness?

The great success of IP is due not to its efficiency, but its robustness, in the face of: outages, administrative diversity, link technologies, unforeseen applications.

Missing: robustness to attack.

Developing robustness requires a coherent architecture.

Where is the paydirt in that?