Internet History

Brief History of the Internet

- ARPANet (1966-67)
  - Goal: Network academic computers
    - UCLA, SRI, UCSB, Utah (1969)

- NPLNet in the UK around the same time

- 1971 ➡ ~20 ARPANet nodes

Brief History of the Internet

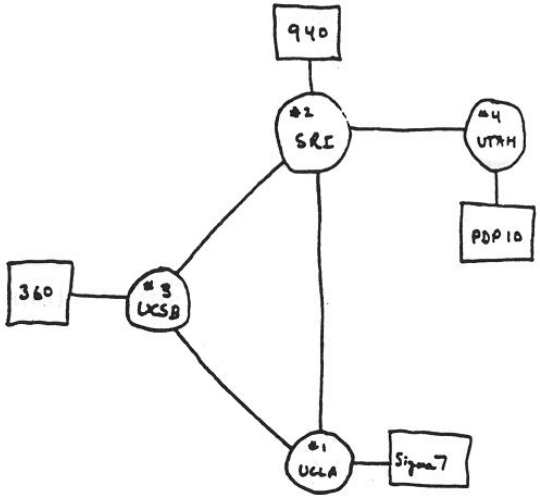
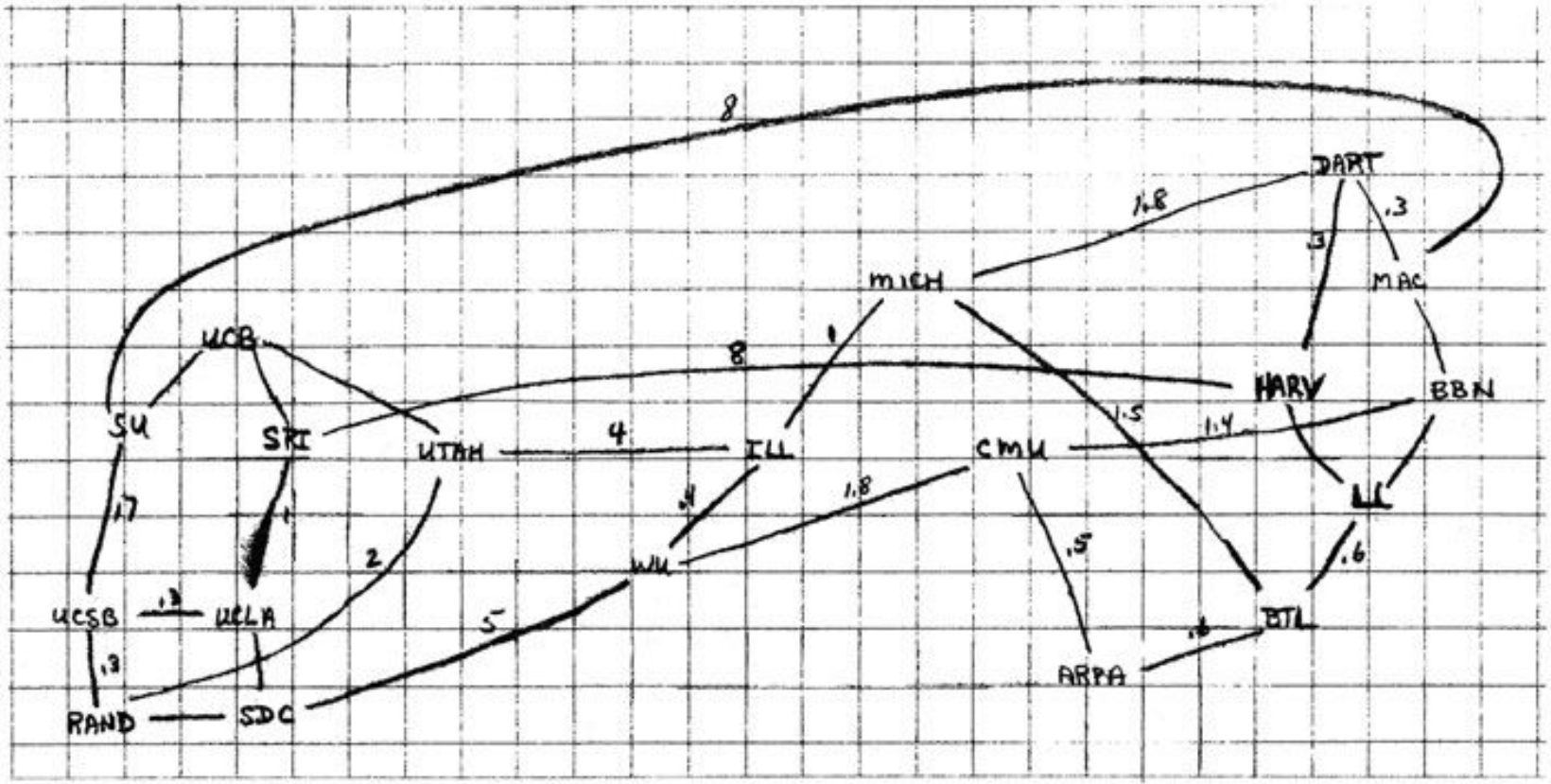


FIGURE 6.2 Drawing of 4 Node Network
(Courtesy of Alex McKenzie)

Brief History of the Internet



Brief History of the Internet

Aloha Communications System Connects Hawaii to Arpanet

By Sasha Yasinin
CW Hawaii Correspondent

HONOLULU — The University of Hawaii's Aloha system is scoring innovative advances in satellite computer communications with an experimental satellite system which went on-line here recently.

The university also is involved in a joint study with the Advanced Research Projects Agency (Arpa), Bolt Beranek and Newman, Xerox and UCLA to design suitable protocol for packet communications via satellite.

Experimenting With Aloha

As part of this project, Aloha becomes the first subscriber to a digital communications subsystem installed between the Comsat ground stations at Paumalu, Hawaii, and Jamesburg, Calif., last year.

With this installation Aloha becomes the first operational satellite node on Arpanet, via the Intelsat IV satellite over the Pacific.

The Comsat system enables data to be transmitted at the rate of 50 kbit/sec over a single voice-grade channel.

The single satellite channel can provide two up-link and two down-link data channels and each of these four channels could be simultaneously available to any Comsat ground station in sight of the satellite.

Aloha's director, Norman Abramson, sees this use of voice-grade channels as a big money-saver for computer communications.

As an example of the system's cost-saving potential, Abramson pointed to the possibilities in the next generation domestic satellite system.

"Each of these satellites," he told *Computerworld*, "will have 12 transponders with a bandwidth of 45MHz or so. If one of the potential carriers were to devote one transponder on the satellite to packet communications, it would be possible to transmit data at about 10 million baud. This single transponder could handle some five million on-line terminals.

"Converting to this kind of communications could save a lot of money. For example, Arpa spends in excess of $1 million per year for line charges. With this much money it could buy a transponder on a domestic satellite.

"If computer users are ever going to be free of incredibly high costs of transmitting data, some system similar to this has got to be set up," Ahrenson said.

But Abramson foresees difficulties with potential carriers in the next generation system devoting a transponder to packet data communications. He sees problems with regulatory agencies in determining how to charge for the service.

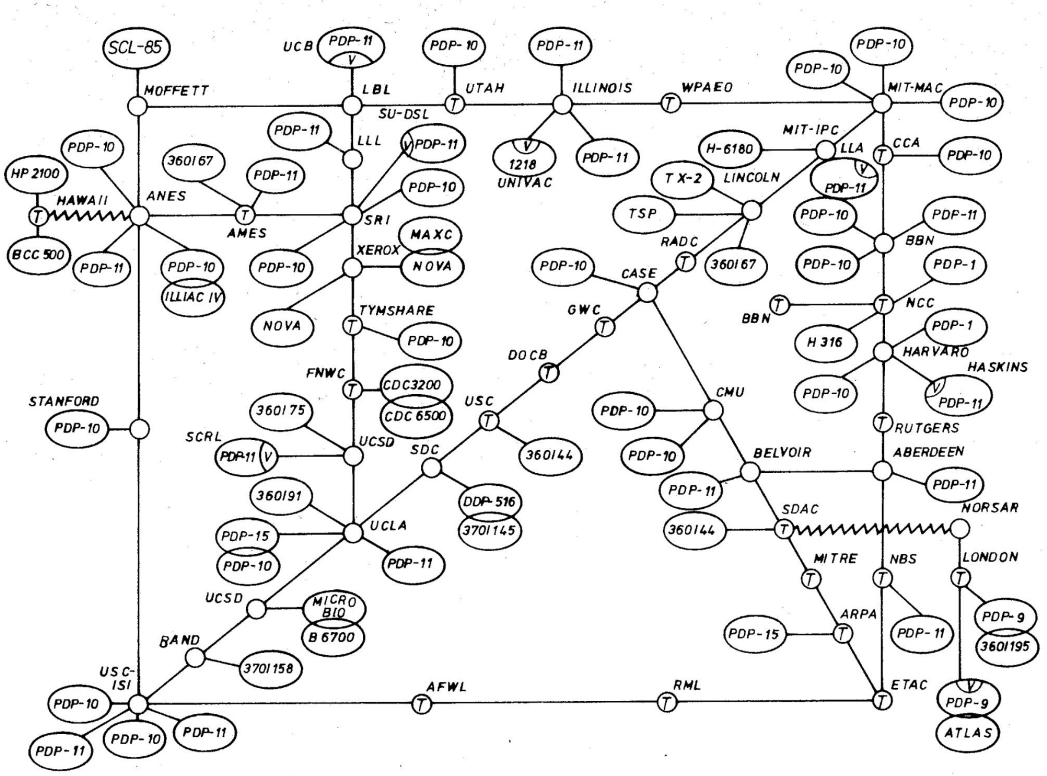
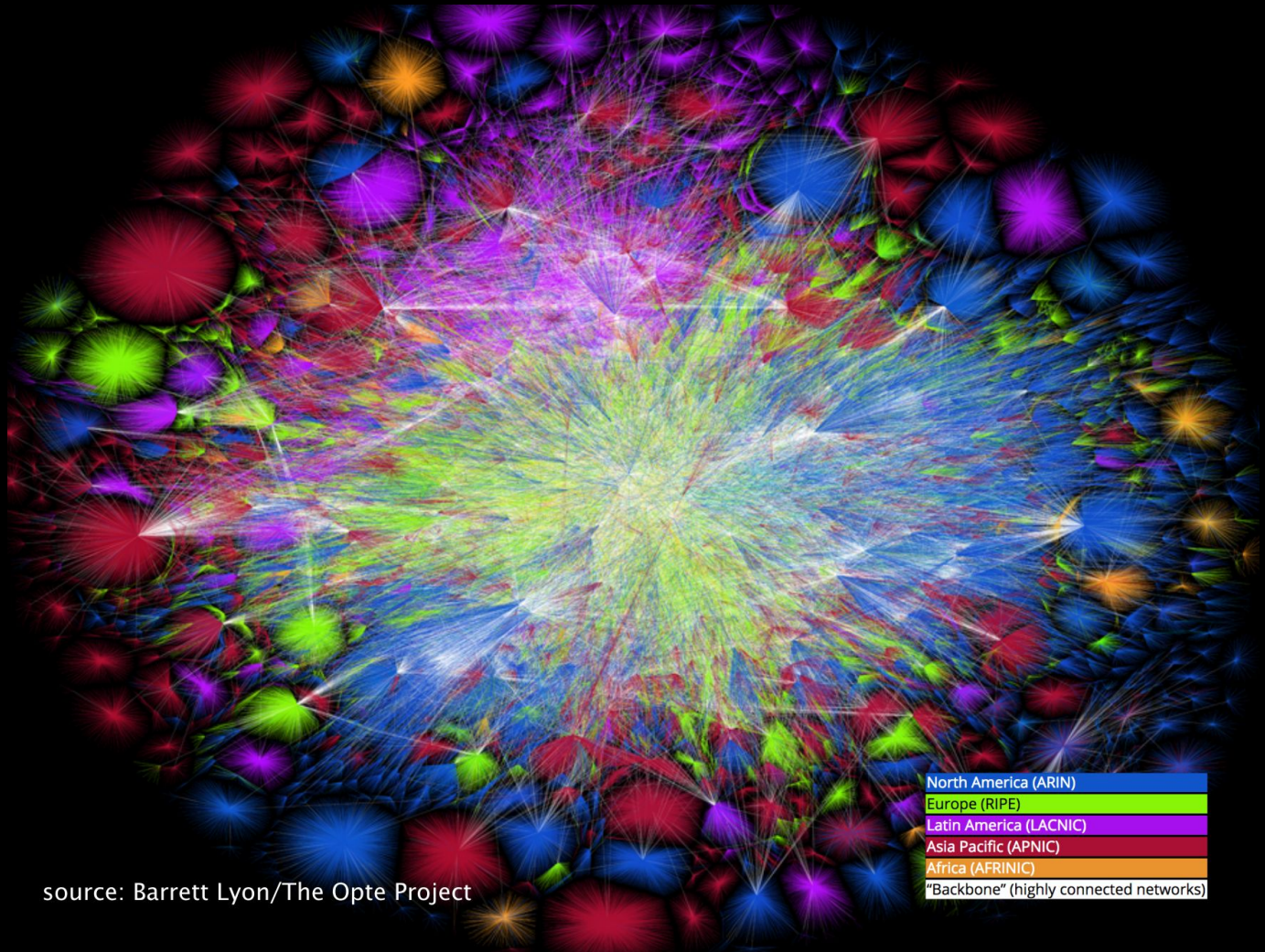


Abb. 4 ARPA NETwork, topologische Karte. Stand Juni 1974.



source: Barrett Lyon/The Opte Project

The Internet is Massive

- ~22 billion estimated # of Internet connected devices in 2020
- ~30 billion estimated # of Internet connected devices in 2023
- ~4 exabytes daily global traffic in 2017

The Internet is Massive

If 

= 1 Gigabyte

The Internet is Massive

The Internet is Massive

- ~22 billion estimated # of Internet connected devices in 2020
- ~30 billion estimated # of Internet connected devices in 2023
- ~4 exabytes daily global traffic in 2017
- ~13 exabytes daily global IP traffic in 2022

The Internet is Massive

- ~75% of all Internet traffic is video in 2017

The Internet is Massive

- ~75% of all Internet traffic is video in 2017

Upstream		Downstream		Aggregate	
BitTorrent	18.37%	Netflix	35.15%	Netflix	32.72%
YouTube	13.13%	YouTube	17.53%	YouTube	17.31%
Netflix	10.33%	Amazon Video	4.26%	HTTP - OTHER	4.14%
SSL - OTHER	8.55%	HTTP - OTHER	4.19%	Amazon Video	3.96%
Google Cloud	6.98%	iTunes	2.91%	SSL - OTHER	3.12%
iCloud	5.98%	Hulu	2.68%	BitTorrent	2.85%
HTTP - OTHER	3.70%	SSL - OTHER	2.53%	iTunes	2.67%
Facebook	3.04%	Xbox One Games Download	2.18%	Hulu	2.47%
FaceTime	2.50%	Facebook	1.89%	Xbox One Games Download	2.15%
Skype	1.75%	BitTorrent	1.73%	Facebook	2.01%
	69.32%		74.33%		72.72%

sandvine

Table 1 - Top 10 Peak Period Applications - North America, Fixed Access

http://bit.ly/2GlwI8G

The Internet is Massive

- ~75% of all Internet traffic is video in 2017

- ~82% of all Internet traffic is video in 2022

The Internet is Political

The Internet is Political

BBC | Sign in | Home | News | Sport | Reel | Worklife | Trav

NEWS

Home | Coronavirus | Video | World | UK | Business | Tech | Science | Stories | Entertainment & Arts | Health

Asia | China | India

Myanmar coup: How the military disrupted the internet

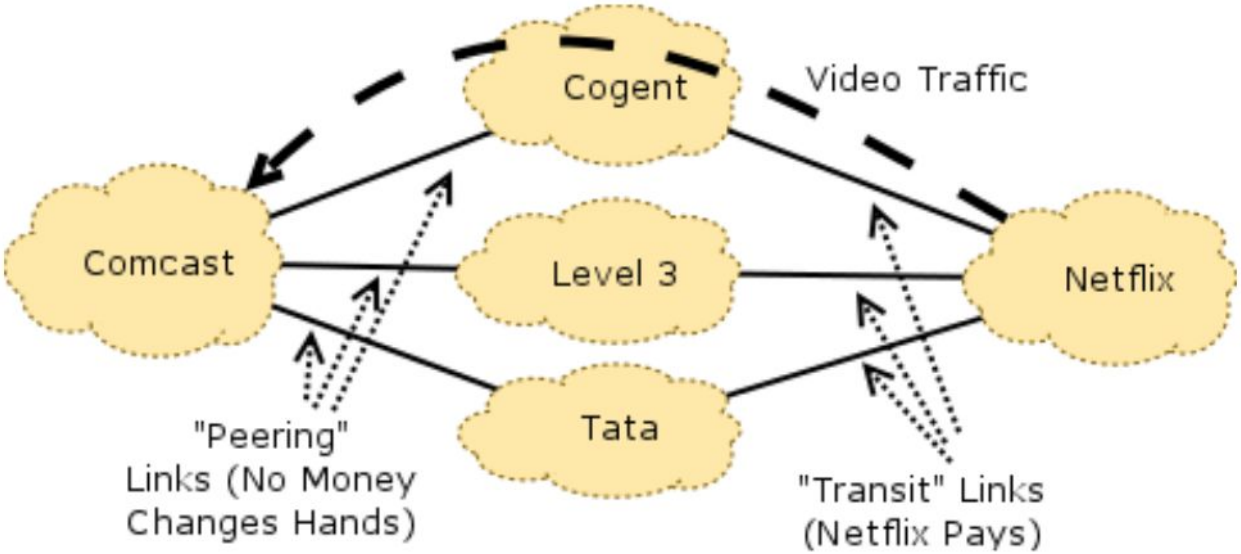
By Christopher Giles
BBC Reality Check

4 February

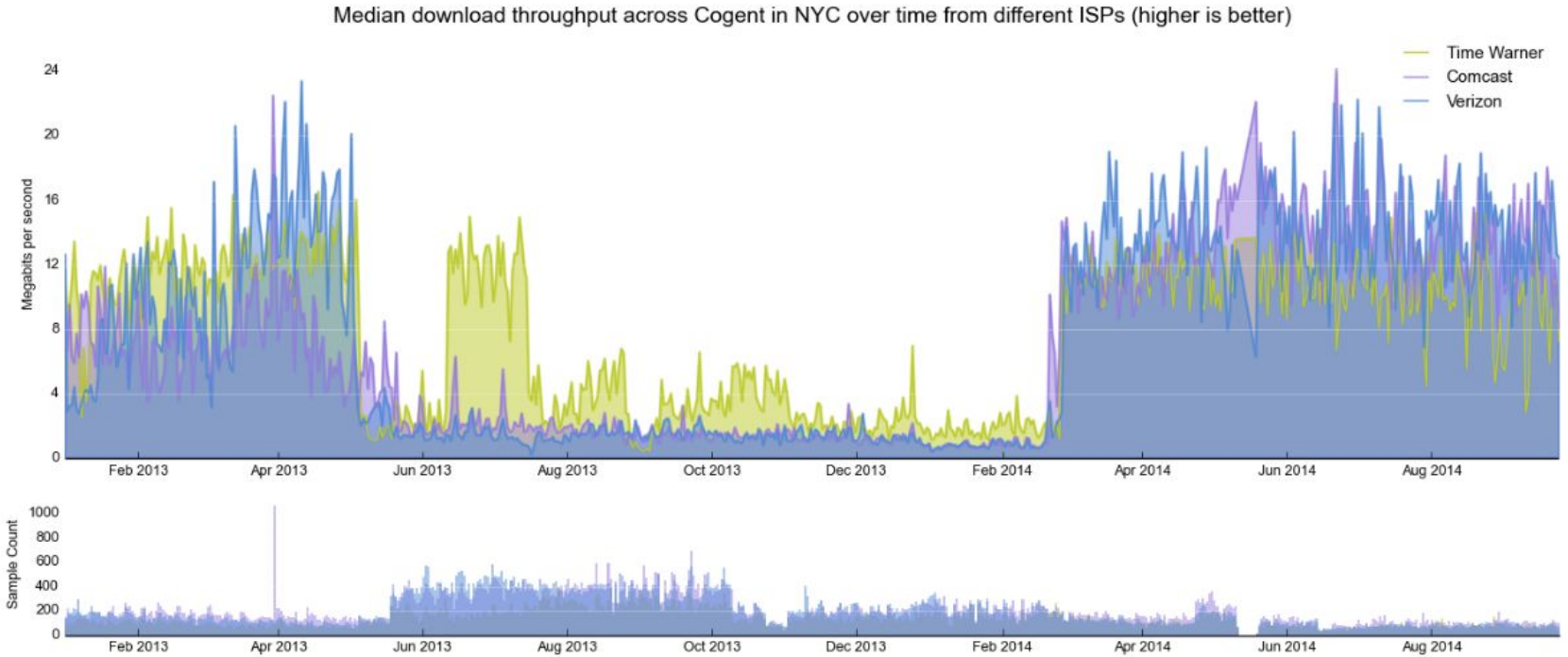
Reality Check

https://www.bbc.com/news/world-asia-55889565

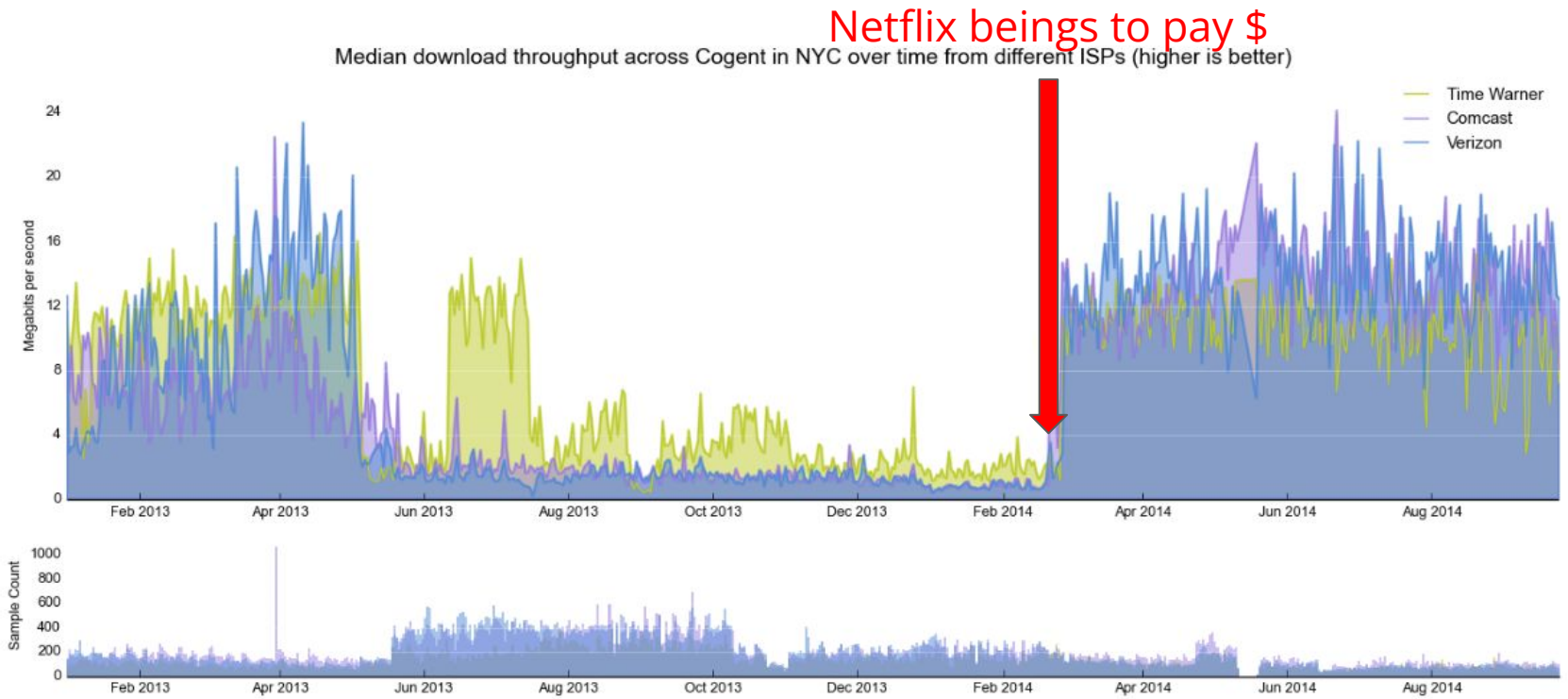
The Internet is Contentious



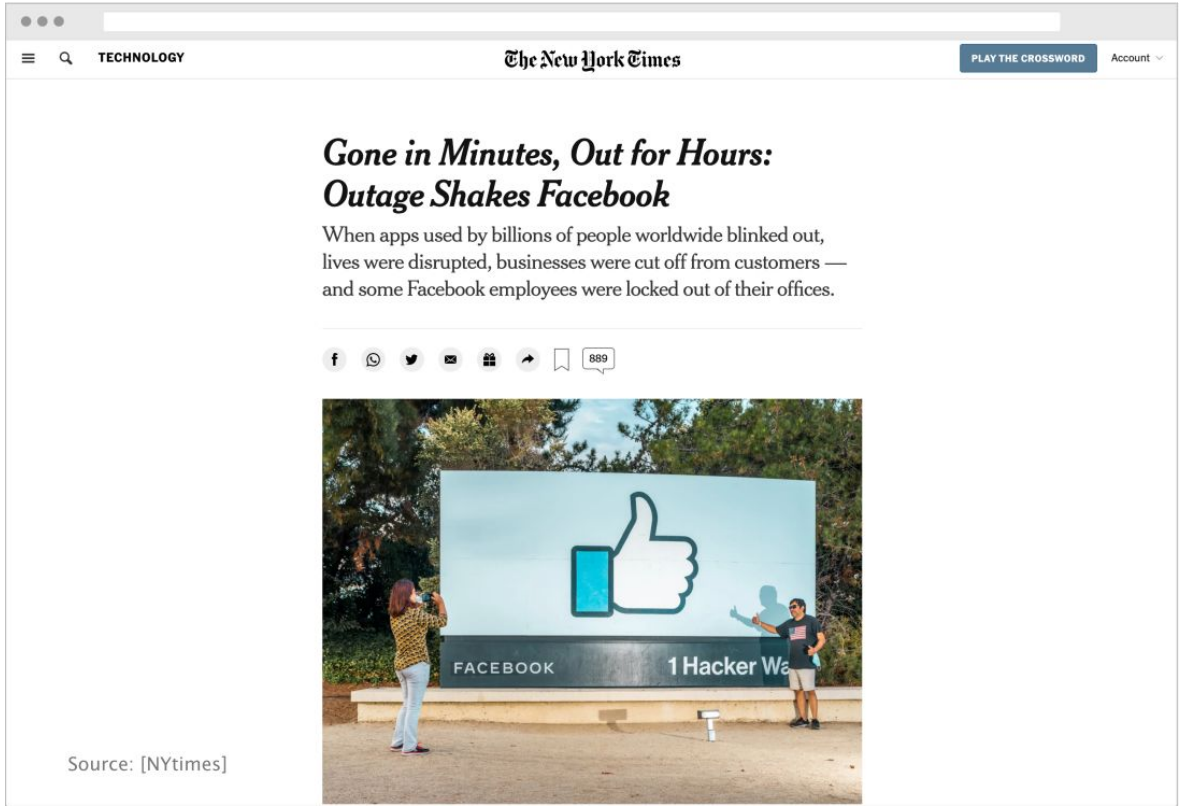
The Internet is Contentious



The Internet is Contentious



The Internet is Fragile



Source: [NYtimes]

The Internet is Fragile

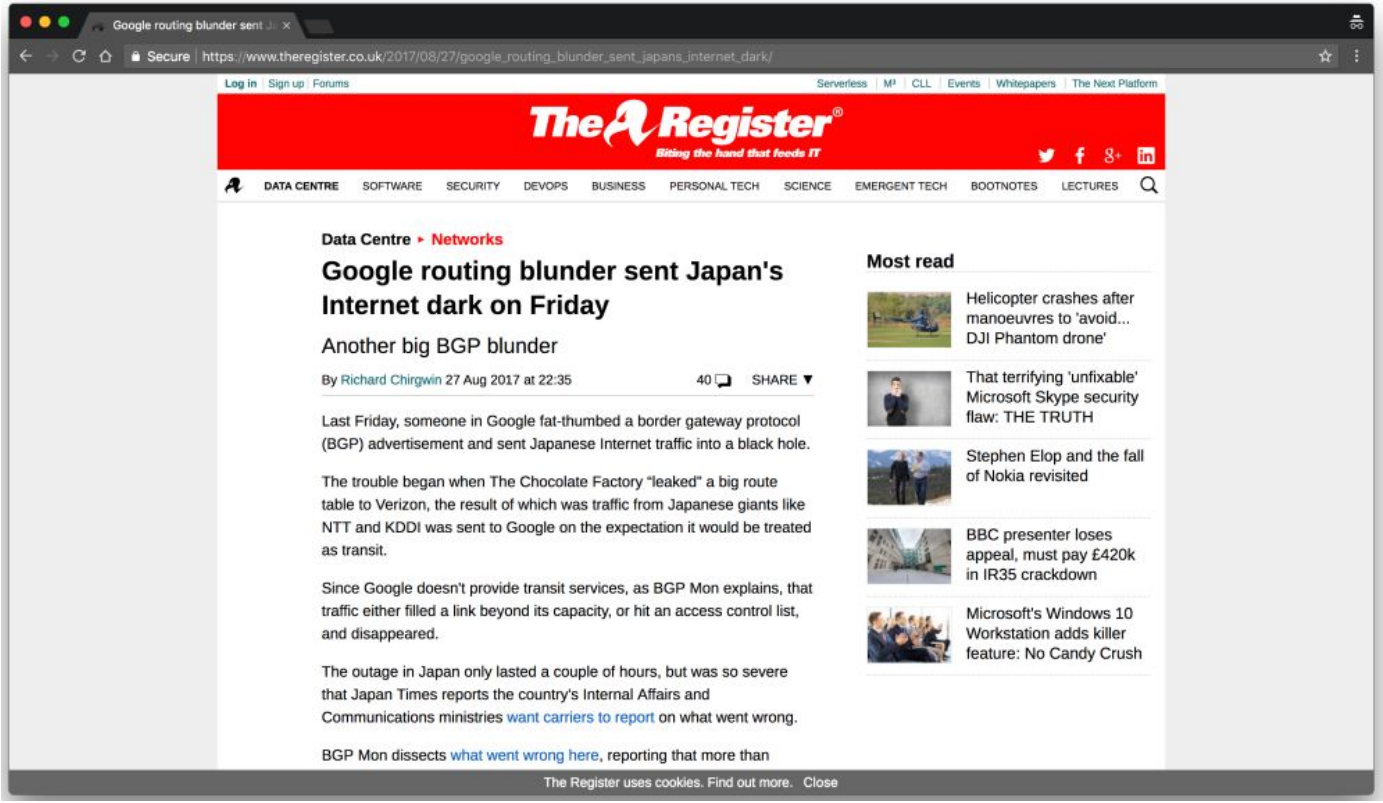
"Our engineering teams have learned that configuration changes on the backbone routers that coordinate network traffic between our data centers caused issues that interrupted this communication.

This disruption to network traffic had a cascading effect on the way our data centers communicate, bringing our services to a halt."

[fb.com]

The Internet is Fragile

The Internet is Fragile



The Internet is Fragile

Someone in Google fat-thumbed a Border Gateway Protocol (BGP) advertisement and sent Japanese Internet traffic into a black hole.

[...] the result of which was traffic from Japanese giants like NTT and KDDI was sent to Google on the expectation it would be treated as transit.

The outage in Japan only lasted a couple of hours, but was so severe that [...] the country's Internal Affairs and Communications ministries want carriers to report on what went wrong.

The Internet is Fragile

"Human factors are responsible

for 50% to 80% of network outages"

Protocols

What is a Protocol?

Human protocol:

- “Do you have the time?”

Network protocol:

- Computers rather than humans
- All Internet communications governed by protocols (IETF RFCs)

Rules for:

- specific messages sent
- specific actions taken when message received, or other events

Protocols define the format, order of messages sent and received among network entities, and actions taken on message transmission, receipt

What is a Protocol?