The Internet at IETF 200

Henning Schulzrinne

Columbia University

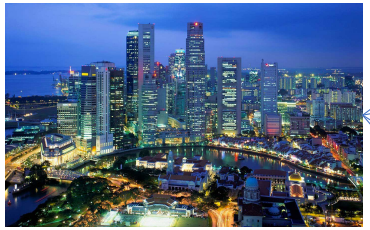
Four kinds of predictions

2047

Internet as 3rd utility (+ water + electricity)

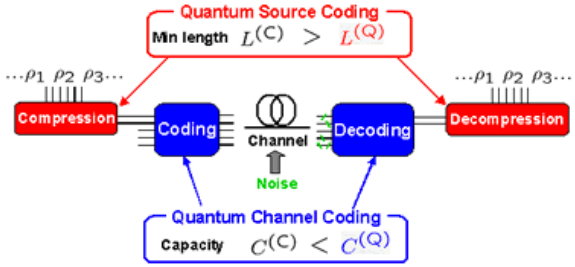
Prediction: dhc will meet (* 1989 @ IETF13)

8G

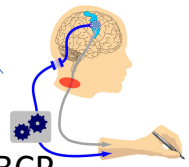


2017

new(ish) applications



QTP



BCP

Networks never die, they just drop nodes

The fax of life

It's 2017. Why does American medicine still run on fax machines?

Updated by Sarah Kliff | sarah@vox.com | Oct 30, 2017, 8:00am EDT

years of rapid growth in mobile communications, the scale of SS7 approaches Internet proportions. Today, networks based on SS7 protocols manage the circuit-switched links among hundreds of carriers for wireline and wireless services and operators serving the majority of the 7.46 billion mobile subscribers worldwide as of June 2016.[3]

➔ We'll still have phone numbers and IPv4 addresses in 2047…

IETF25 (1992) looks familiar

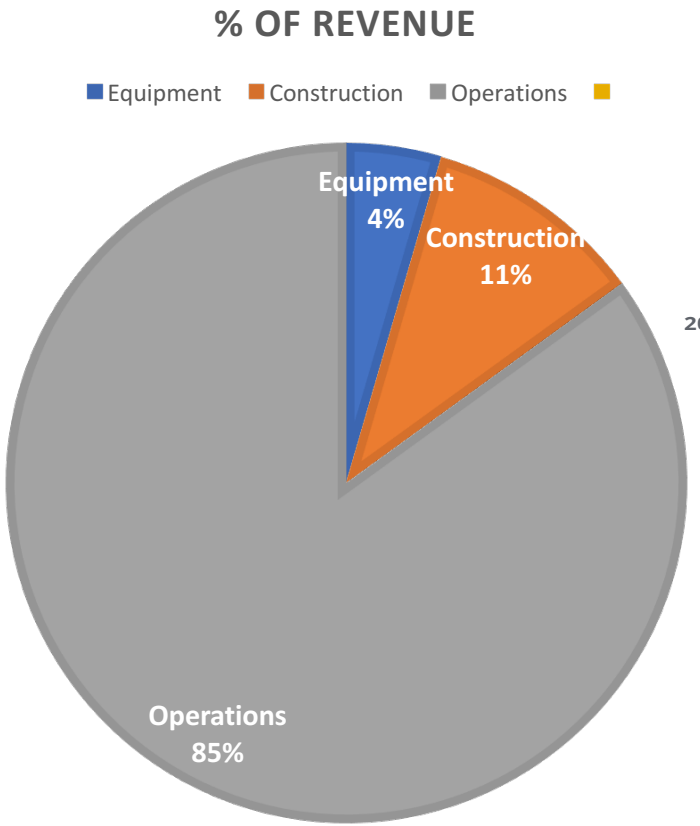
2 Area and Working Group Reports

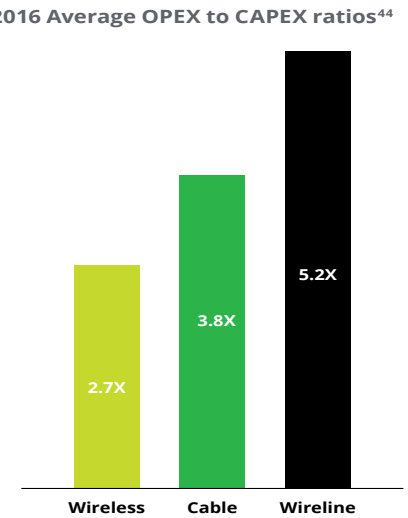
- 2.1 Applications Area
  - 2.1.1 Internet Mail Extensions (smtpext)
  - 2.1.2 Internet Message Extensions (822ext)
  - 2.1.3 Network Database (netdata)
  - 2.1.4 Network News Transport Protocol (nntp)
  - 2.1.5 Network Printing Protocol (npp)
  - 2.1.6 TELNET (telnet)
- 2.2 Internet Area
  - 2.2.1 Dynamic Host Configuration (dhc)
  - 2.2.2 IP Address Encapsulation (ipae)
  - 2.2.3 IP over AppleTalk (appleip)
  - 2.2.4 IP over Asynchronous Transfer Mode (atm)
  - 2.2.5 P. Internet Protocol (pip)
  - 2.2.6 Point-to-Point Protocol Extensions (pppext)
  - 2.2.7 Router Requirements (rreq)
  - 2.2.8 Simple Internet Protocol (sip)
  - 2.2.9 TCP/UDP over CLNP-addressed Networks (tuba)
- 2.3 Network Management Area
  - 2.3.1 Bridge MIB (bridge)
  - 2.3.2 Chassis MIB (chassis)
  - 2.3.3 DS1/DS3 MIB (trunkmib)
- 2.5 Operational Requirements Area
  - 2.5.1 BGP Deployment and Application (bgpdepl)
  - 2.5.2 Benchmarking Methodology (bmwg)
  - 2.5.3 Network Joint Management (njm)
  - 2.5.4 Operational Statistics (opstat)
  - 2.5.5 User Connectivity (ucp)
- 2.6 Routing Area
  - 2.6.1 Border Gateway Protocol (bgp)
  - 2.6.2 IP over Large Public Data Networks (iplpdn)
  - 2.6.3 IP Routing for Wireless/Mobile Hosts (mobileip)
  - 2.6.4 ISIS for IP Internets (isis)
  - 2.6.5 Inter-Domain Policy Routing (idpr)
  - 2.6.6 Multicast Extensions to OSPF (mospf)
  - 2.6.7 OSI IDRP for IP over IP (ipidrp)
  - 2.6.8 Open Shortest Path First IGP (ospf)
  - 2.6.9 RIP Version II (ripv2)
- 2.7 Security Area
  - 2.7.1 Commercial Internet Protocol Security Option (cipso)
  - 2.7.2 Common Authentication Technology (cat)
  - 2.7.3 Internet Protocol Security Protocol (ipsec)
  - 2.7.4 Network Access Server Requirements (nasreq)
  - 2.7.5 Privacy-Enhanced Electronic Mail (pem)
  - 2.7.6 SNMP Security (snmpsec)
  - 2.7.7 TCP Client Identity Protocol (ident)
- 2.8 Transport and Services Area
  - 2.8.1 Audio/Video Transport (avt)
  - 2.8.2 Distributed File Systems (dfs)
  - 2.8.3 Domain Name System (dns)
  - 2.8.4 Service Location Protocol (svrloc)
  - 2.8.5 TCP Large Windows (tcplw)
  - 2.8.6 Trusted Network File Systems (tnfs)

What drives new developments?

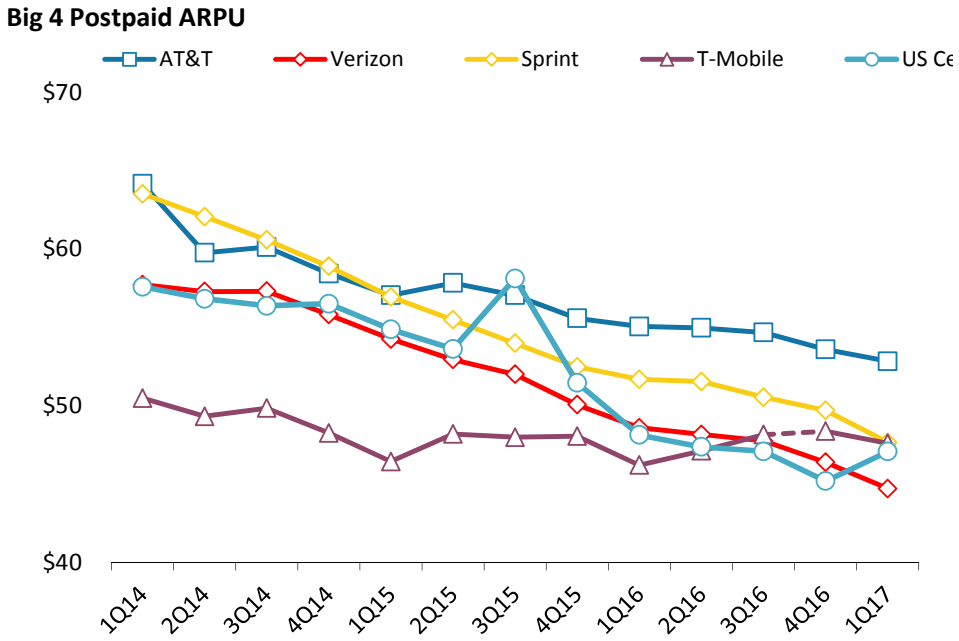
- Economics
  - change from hardware cost to software to operations
- Functionality or engineering needs, e.g.,
  - 1970s: voice → data → Internet
  - 1995ish: fixed → mobile; address space exhaustion
  - 2000s: ASCII → I18N, serious security (TLS, ssh)
  - 2010s: privacy against in-network threats
  - *2020s: shared infrastructure? automation?*
  - *2020s: higher—level abstractions (blockchain, containers, …)*
- Societal and regulatory requirements
  - security, privacy

Network economics, (over)simplified



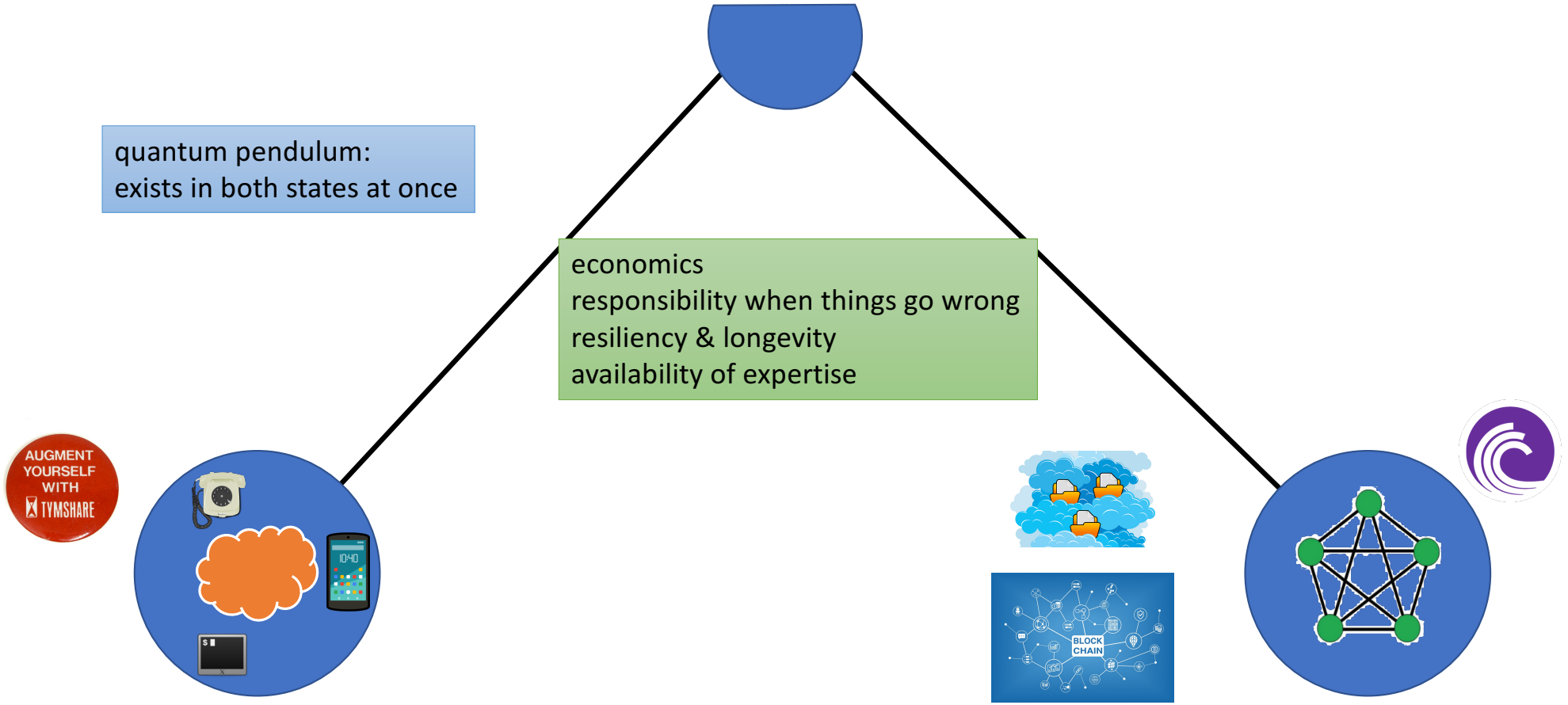


Wireless and wireline networks are becoming like airlines

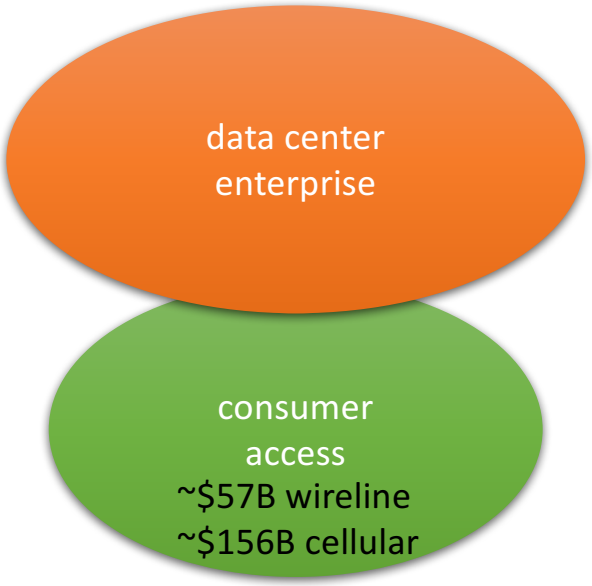


- safety and reliability matter
- buying equipment from a small set of vendors
- R&D = marketing & system integration
- use public spaces (“ether”)
- equally popular…

The architecture pendulum



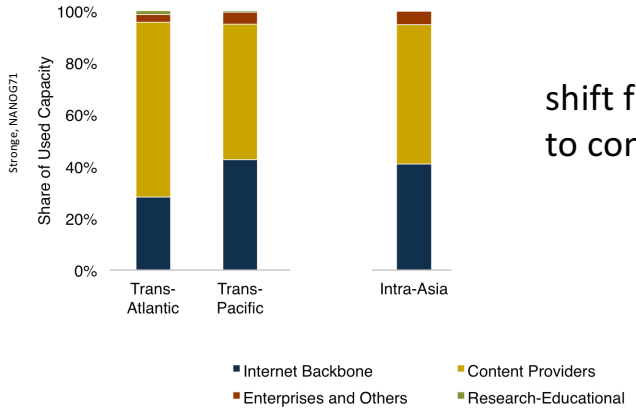
The three tribes – but only two are growing



Level(3) COMMUNICATIONS

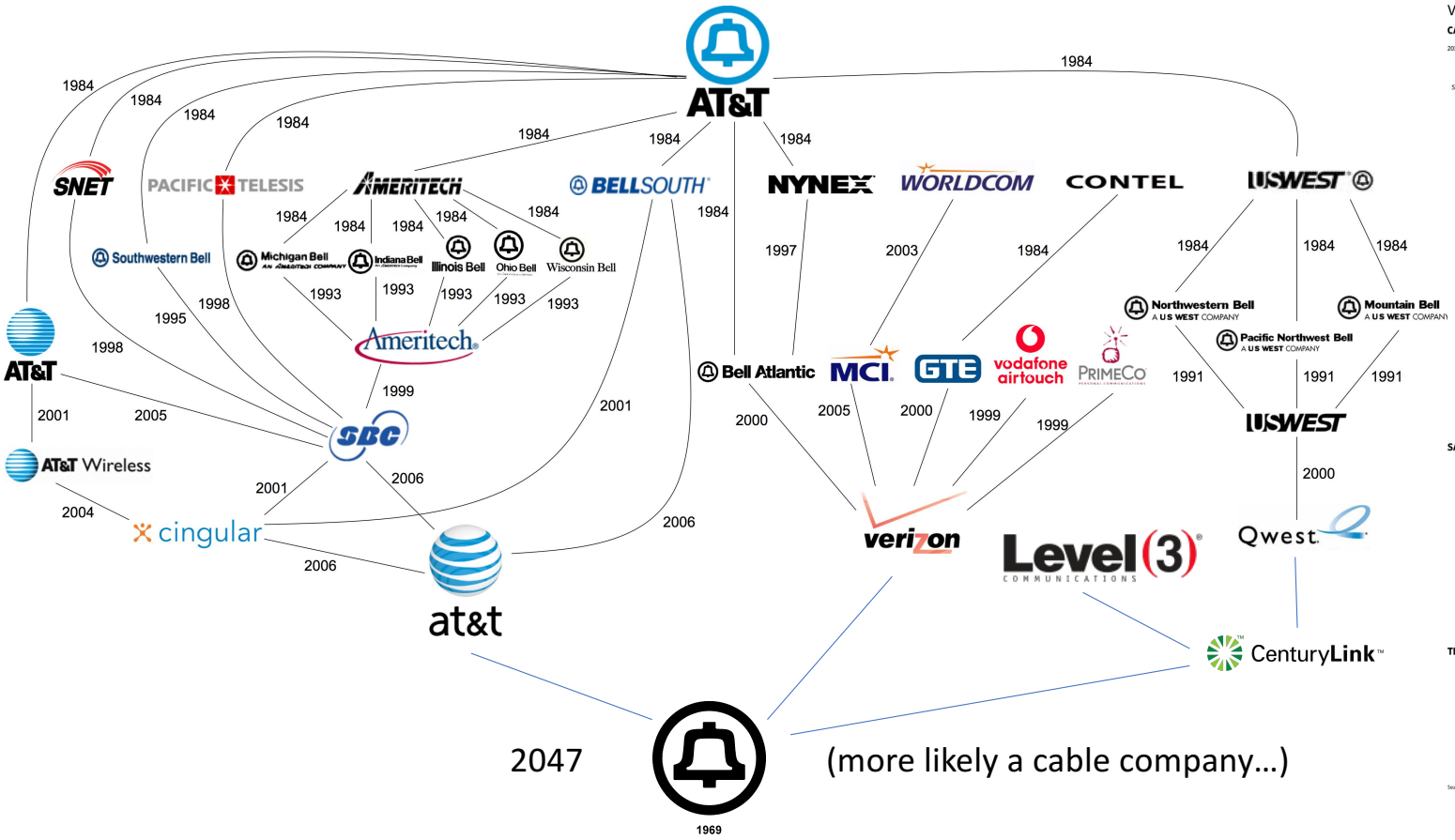
cogent

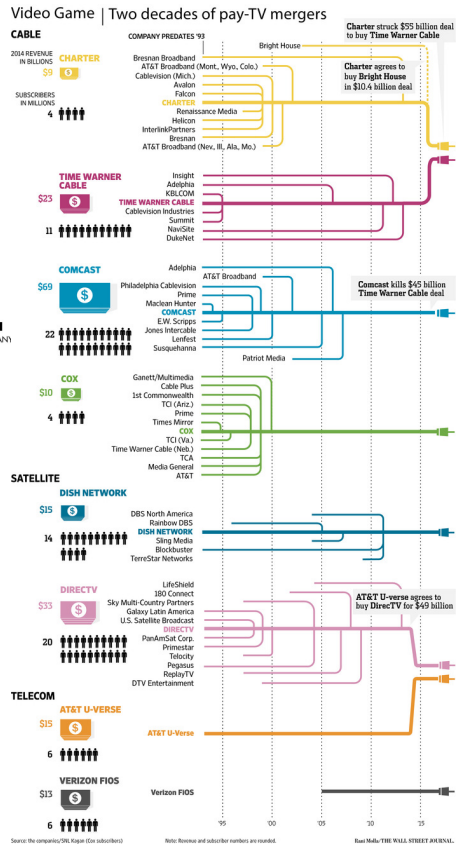
$5.5B



shift from backbone
to content providers

The telecom industry is consolidating (US)





The classical policy layering

keeping people
from abusing technology

content
media

applications
(email, web)

privacy
piracy

services
IT

global, with a few
temporary white spots

L4-L7

patents
anti-trust

operating systems

L2-L3

L0-L1
(ducts + wires + spectrum)

openness (NN)
universal service
interconnection
resiliency & restoration
(privacy)

carriers
telecom

We had it (too) easy

From afterlife to machine transcendence, Digitalism offers a new promise of paradise. 2017

Our national broadband policy seeks to promote investment in diverse, faster and more sophisticated Internet and related digital technologies. This, in turn, will foster economic growth, innovation and empower American consumers to make more choices in how they live, work and play. (M. Powell, FCC, 2004)

"Once the rockets are up
who cares where they come down
that's not my department,"
says Wernher von Braun.
Tom Lehrer, in lyrics to "Wernher von Braun"

A Declaration of the Independence of Cyberspace

1996

by John Perry Barlow

Governments of the Industrial World, you weary giants of flesh and steel, I come from Cyberspace, the new home of Mind. On behalf of the future, I ask you of the past to leave us alone. You are not welcome among us. You have no sovereignty where we gather.

- *Cyber-libertarianism*: anything bad (spam, lack of privacy, …) can be fixed with another crypto algorithm. If anything still goes wrong, it's the user's or society's fault.
- Transition in economics: homo economicus → behavioral economics
- Four regulators (Lessig): laws, norms ("tao"), market, architecture
- Negating the importance of community – but we wouldn't be here in person otherwise!

Ashamed to work in Silicon Valley: how techies became the new bankers

Wall Street has long been the industry people love to hate. But as big tech's reputation plummets, suddenly a job at Facebook doesn't seem so cool

We may not like the journey

- Economics → competition and investment for carriers
  - don't want to be utilities, but that may be best hope for investment
- Increasing concerns about content
  - not just in North Korea & China & not just for kids
- National, not international, with transnational impact
  - privacy (GDPR)
  - speech restrictions (e.g., election advertising and hate speech)
  - competition policies & fear of foreign domination
- Increasingly, goal is to restrict communications, not enable it
  - default-off, rather than default-on
  - transition **open** phone, email, web → **closed** messaging systems & apps, NATs

What's our role?

- We don't get to just claim the good stuff
- Many of us no longer have the excuse of being just junior programmers paying off student loans
- We should be like rocket scientists: we know how powerful this stuff is
  - and others expect us to act accordingly
- We are also citizens, voters, share holders, parents, neighbors, drivers, …
- We may not be comfortable with some solutions
  - they are messy, imperfect and may not be ideal for us
  - "not our problem" doesn't cut it
- **The goal of the IETF is to make the Internet work better.** - *for people*