

EVOLVING THE INTERNET ARCHITECTURE



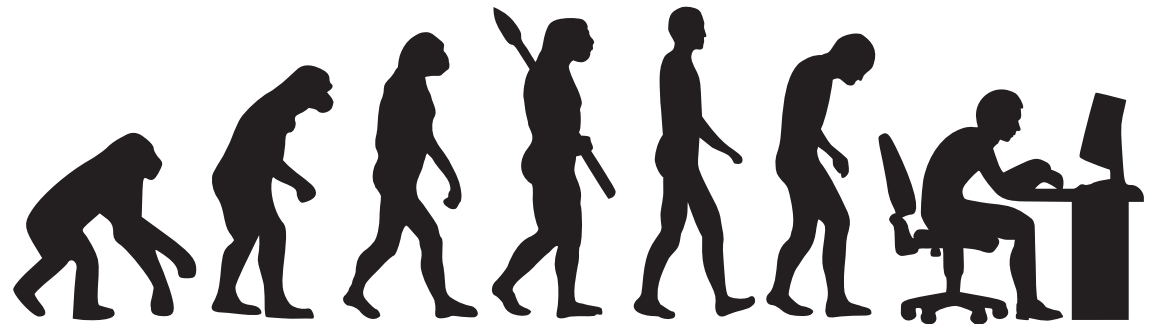
WHAT IS HAPPENING?
INGREDIENTS FOR SUCCESS
ISSUES FOR THE FUTURE

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*) Opinions expressed here are mine only

Internet Is 50 Years Old, But Is It Agile?



What happened during the pandemic?

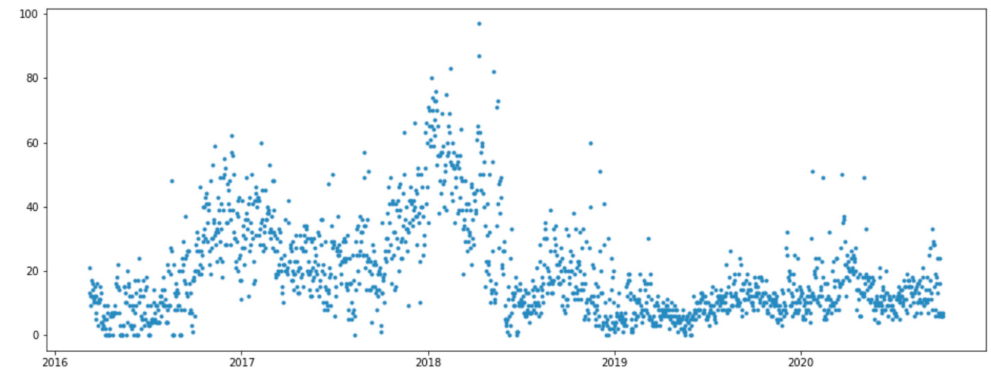
- › Capacity expansions, upgrades moved forward, motivation, etc.
- › Cloud and CDN deployment models helped re-adjustments

83%

Of the survey respondents, 83 percent claim that ICT helped them a lot, in one way or another, to cope with the lockdown.

How did the Internet do?

- › Reasonably good situation, even /w the pandemic
- › The Internet is well suited for adaptations, but:
 - Not perfect ... e.g., video conferencing troubles
 - Digital divide amplification

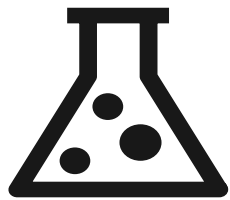


Case Encryption



Turning security on for almost all connections

- From 20% to 80% in five years
- Incentives, world events, and technology came together
- Role of web protocol evolution (e.g., HTTP/2)
- Role of Letsencrypt
- Role of business incentives



Work continues

- Transport protocol headers
- Control protocols (DNS, TLS setup phase)

Case QUIC



New transport protocol (“Quick UDP Internet Connections”)

- Standard developed by the IETF Nov 16 – May 21 (RFC 9000)
- Widely deployed in the Internet, 20+ implementations
- Optimized for HTTP and latency, multiplexing, address migration
- Designed to avoid ossification and enable future evolution
- But also impacts manageability and debugging



Side-effect: from now on, evolution will be faster

- Implementations are in user space, part of applications
- Middlebox interpretation of protocols no longer slows deployment

Key Ingredients of Internet's Success



General or optimized?

- Not particularly optimized for any application or technology generation
- Doesn't have all features

- But is available and (relatively) simple
- Can be used for new applications with asking for permission from anyone
"Permissionless innovation"

- Has managed to scale from 1.2 kbit to 1 gbit/s and to 4.7B users



"Internet doesn't support audio/video/VR/hologram/..."

- There is always a future application that cannot be used today
- Tradeoff: optimizing network or app, or waiting speeds to go up

Challenges & Vision for a Better Internet



Challenges

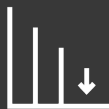
Security



Collaboration



Centralization



Possible directions

Broad approach to security

- Protecting data at rest and in use as well as in transit
- Work on resilience, reliability, fault tolerance, and DoS defences
- Security assurance practices



Collaborative Internet

- App and network awareness of each others' needs and current situation
- Explicit, engineered collaboration
- Globally interoperable applications



Distributed services for infrastructure functions

- Awareness, measurements
- Important to ensure federation, discovery, etc. are options in standards



Conclusion

- The Internet is alive and kicking!
- Speed of changes is increasing
- Changes that have clear demand can happen rapidly
- Looking forward to the next episodes in the evolution saga
- Don't always believe what it is said on the Internet, even about the Internet



