EVOLVING THE INTERNET THROUGH COVID-19 AND BEYOND

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INTERNET EVOLUTION



- Past and present evolution & future challenges
- > What was the impact of COVID-19?
- >How Internet evolution happens
- > What can we learn from all this?

COVID-19 & INTERNET



Highest traffic level increase Traffic levels Highest traffic similar level decrease



Immediate changes in March

- Fixed networks Comcast +30%
 NCTA +20%
- Mobile networks Vodafone
 +15-30%
- > IXPs +10-30%

> ...

 Some more predictable growth later

Numbers: Comcast, Vodafone, NCTA, Ciscoc

COVID-19 & INTERNET



Meeting services (Cisco 2-24x, Microsoft +200%, ...)



Net change in app usage (the difference between the increase and decrease in app usage)



COVID-19 & INTERNET OBSERVATIONS

- > Fairly big immediate shifts
- > Relatively smooth process (?)
 - Why? Capacity & other improvements in the background, but also cloud/cdn deployment models + Internet model
- > Likely long-term impacts
 - Even further growth of video, new user groups & organizations & more familiarity with new apps
 - Importance of resiliency

Figure 3: Share of smartphone users who consider ICT has helped them a lot with different tasks in their daily lives during the COVID-19 pandemic



Base: Smartphone users aged 15–69 who claim their daily life is highly impacted by the lockdown restrictions, in Brazil, China, France, Germany, India, Italy, South Korea, Spain, Sweden, the UK and the US

Graph: Ericsson Mobility Report June 2020

IAB WORKSHOP ON COVID-19 IMPACTS



Interested on this topic?

Submit a paper to the upcoming IAB workshop!

- > Measurements
- > Experiences with changes & operations
- > Lessons for operations, preparedness, architecture

Deadline October 9

https://www.iab.org/activities/workshops/covid-19-networkimpacts-workshop-2020/



EXAMPLES OF EVOLUTION



> DNS > IPv6

- > Web protocol stack
 > Transport protocols
 > Encryption
- Cloud
- > CDN
- > Mobile + apps
- Consolidation

- > Virtualization
- > Open source



SPEED OF EVOLUTION



- > Version updates now and before
- > Necessary enablers
- Consolidation
- > Who can change code
- > Protocol engineering (wire image, greasing)



TLS 1.3





KEYS TO SUCCESSFUL EVOLUTION



- "Changing engines in flight"

Was Internet designed to evolve?

Keys:

- Solves a concrete and immediate need
- Business incentive alignment for everyone who has to make a change (e.g., encryption)
 - Implies minimization of involved parties?
- Community with implementations, testing, applications adopting, etc.

KEYS TO SUCCESSFUL EVOLUTION

- "Changing engines in flight"

Was Internet designed to evolve?

Protocol success per RFC 5218







UPCOMING CHALLENGES



Security

- -Not just about communications!
 - › IAB threat model "Model-T" program
- -Collecting data about users
- -Resilience, denial-of-service
- > Performance
- > Device diversity
- Consolidation
- > Centralization



What about:
QoS
Clean-slate
Programmability

EVALUATING DIFFERENT CHANGES

Warning signs:

- > No involvement from those who have to change
- > Top down approach, not collaboration
- > Lack of justification data ("of course we need XYZ")
- > Misunderstanding or ignoring business aspects
- Deployment incentives exist, but in conflict with user interests

And remember: Details matter!

Examples

 Various security improvements

SUMMARY



- > The Internet is alive and kicking! $\textcircled{\odot}$
- > Speed of changes is increasing
- > Changes that have clear demand can happen rapidly
 - -Other changes may go slow or not happen at all
- Looking forward to the next episodes in the evolution saga many opportunities but also challenges ahead
- Don't always believe what it is said on the Internet, even about the Internet!

