The Last Word

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What we learned

The classics: how the networks work
The problems: how networks fail to work
The latest: how networks could work

so you now can go forth and do research...

...but why would you want to?
Why I’m excited about networking
1. It’s relevant

Majority of new developments in computer systems are dependent on networking

Far-reaching impacts beyond systems & networking
1. It’s relevant

- Algorithms
- Information theory
- Distributed systems
- Databases
- Operating systems
- Human-computer interaction
- Social sciences
- Economics
- Policy
- Security
- Forensics
- Game theory
- Networking
2. It’s new

~40 years since the birth of the field

But only ~15 years since networks in widespread use

- tussles between businesses, P2P, malware, DDoS, government Internet censorship, CDNs all fundamental but relatively new!

Operating systems: ~30 years in widespread use

Physics: ~13.75 billion years in widespread use
Network new people, new technologies, connect disciplines, “make order out of chaos” (– Jen Rexford)

Start a new area!

- In the last decade: Internet architecture, data centers, cloud, energy, big data, next-gen cell networks, software-defined networking, NFV, IoT, containers…
- A new subfield almost every year!

You can change not just the technology, but the field!
Over half the world not yet online!
It is anticipated that the whole of the populous parts of the United States will, within two or three years, be covered with network like a spider's web.

— The London Anecdotes, 1848
3. It’s changing

It’s changing per cent in the developing countries and less than 15 per cent in LDCs (Chart 6.6). Globally, 47 per cent of the world’s population is using the Internet. Available data show that although Internet usage in LDCs has tripled in the past five years, Internet penetration levels in LDCs today have reached the level enjoyed by developed countries in 1998.

Chart 6.5: Distribution of Wikipedia articles by language 2003-2016

Note: The Internet users by language data are from Internet World Statistics, which assigns a single language to each individual in order to add up to the total world population; however, it is unclear how it assigns people’s first language in countries where large proportions of the population are bilingual or multilingual.


Chart 6.6: Proportion of individuals using the Internet by level of development (left) and by region (right)

Note: * Estimate.

Source: ITU.

LDCs = Least Developed Countries
CIS = Commonwealth of Independent States
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The Internet is also becoming more multilingual. The increase in Internet users outside the primarily English- or Chinese-speaking world is further diversifying the languages used on the Internet, reflected by what appears to be a relative decline in the use of English and Chinese on the Internet. Estimates published by Internet World Statistics suggest that 47 per cent of the world’s Internet users are now English or Chinese speakers, down from 51 per cent in 2011.

Wikipedia can also be used as an indication of the availability of content in different languages (Chart 6.5). In 2003, two years after Wikipedia was founded, 60 per cent of all articles were in English. By 2016, this proportion had decreased to 13 per cent. The number of articles on Wikipedia has grown by 50 per cent from 2013 to 2016, with five out of every six new articles written in languages other than the six official UN languages (Arabic, Chinese, English, French, Russian and Spanish). In 2016, 73 per cent of all articles on Wikipedia were written in languages other than the official UN languages.

Many other indicators can be used to highlight the spread and growth of the Internet, and the Internet economy. These include the growing number of social media outlets and users, such as Facebook accounts, number of tweets, online searches, and the increase in the number and types of applications, or apps. The commercial value of this information has created new business models with private companies gathering, analysing and selling data for revenue optimization, for example using Internet users’ content history to target advertisements to a certain type of online user. However, because of the business value of such data, not all information on how people use the Internet is necessarily freely available to the public, even though such information is important to understanding how more people can be brought online to benefit from the Internet’s opportunities. Using big data from the ICT industry could provide such insights in the future, and ITU recently launched an ITU project on “Big Data for Measuring the Information Society”, which is exploring ways to use big data to help understand who uses the Internet, and where and how, as well as the benefits it delivers.

6.2 Socio-economic factors that determine Internet use

Although the number of Internet users is increasing continuously in all regions and countries of the world, major differences remain. In the world’s developed countries about 80 per cent of the population is online, as against only about 40 per cent.
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3. It’s changing

Over half of the world not yet online!

Innovation more possible now than ever

- Clouds
- Global-scale testbeds
- Software-defined networking
- Programmable hardware
What it all adds up to...

You have the opportunity for big impact!
What’s next
Presentations: Tue May 9, 11am - 2pm

• Room 3403 SC
• Pizza served

Content

• What problem are you solving?
• Why has past work not addressed the problem?
• What is your approach for solving it?
• What are the key metrics for evaluation to answer the question of whether your design works?
• What are the experimental results that provide answers?
• What are the unanswered questions?
Final Project Extravaganza

“Pecha Kucha” format

• 20 slides x 20 seconds
• Automatic transitions slide-to-slide
• Optional alternate: 6 min 40 sec freeform talk

Your group should send me one email:

• Slide deck
• Presentation format
• Send by 11:59 pm Monday May 8
Thank you!
One more thing...

ICES forms!