The Last Word

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What we learned

• **The classics:** how the networks work
• **The problems:** how networks fail to work
  • a large and growing category!
• **The latest:** how networks *could* work
• so you now can go out 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
1. It's relevant

Networking

Information theory

Distributed systems

Databases

Operating systems

Human-computer interaction

Social sciences

Security

Forensics

Policy

Economics

Game theory

Algorithms
1. It’s relevant

- What we learned matters too!
- April 18, 2010: Interception bug (?) sends 50,000 prefixes through China

1. <our host> 0.785ms # London
2. 195.66.248.229 1.752ms # London
3. 195.66.225.54 1.371ms # London
4. 202.97.52.101 399.707ms # China Telecom
5. 202.97.60.6 408.006ms # China Telecom
6. 202.97.53.121 432.204ms # China Telecom
7. 4.71.114.101 323.690ms # Level3
8. 4.68.18.254 357.566ms # Level3
9. 4.69.134.221 481.273ms # Level3
10. 4.69.132.14 506.159ms # Level3
11. 4.69.132.78 463.024ms # Level3
12. 4.71.170.78 449.416ms # Level3
13. 66.174.98.66 456.970ms # Verizon
14. 66.174.105.24 459.652ms # Verizon
[.. four more Verizon hops ..]
19. 69.83.32.3 508.757ms # Verizon
20. <last hop> 516.006ms # Verizon [USA]

[James Cowie / Renesys]
2. It’s new

• We know how to do a lot of things pretty well, but they break when pushed to extremes
  • and these “extremes” happen every day

• ~35 years since the birth of the field

• But only ~15 years since networks in widespread use
  • tussles between businesses, P2P, malware, DDoS, etc. all fundamental but relatively new!

• Operating systems: ~30 years in widespread use

• Physics: ~13.75 billion years in widespread use
2. It’s new

You can change not just the technology, but the field!

• Network new people, new technologies, connect disciplines, “make order out of chaos” (–Jen Rexford)

• Start a new subfield!

  • In the last decade: Peer-to-peer, sensor networks, cloud / data centers, energy, Internet architecture
  • A new subfield every 2-3 years – rapid change
3. It’s changing

- About 3/4 of the world not yet online!
- One trend: networks becoming more like operating systems
  - Simple to complex; open to secure; vertically integrated to virtualized
- Innovation more possible now than ever
  - Big innovative companies changing the Net
  - Build networked systems with software-defined networks, FPGAs, on global testbeds, etc.
What it all adds up to...

You have the opportunity for big impact!
Where to go from here

• Find inspiration in the top conferences: SIGCOMM, NSDI, Hotnets, CoNext, IMC, ...

• "10 Networking Papers" series in CCR

• Chat with me anytime

• Do great research

• Courses
Opportunity for more depth in Internet-related research

- Security
- Operations and management
- Diagnosing and debugging faults
- Hot Topics: social networks, energy awareness, cloud computing on the network, ...
• Organized by Klara, Indy, & Brighten

• Survey a set of topics, e.g.: Statistics, game theory, streaming algorithms, queueing theory, control theory, ...

• Learn the basics, key results, taste of a full course

• One hr/week, 1-2 lectures on each topic

• Big success last spring!
What remains

• Sunday 11:59 pm: project report
  • submit as PDF via email

• Thursday Dec 16 1-4pm: poster session
  • in the 2nd floor atrium outside 2405 SC
  • free food
Thank you!
One more thing...

• ICES forms!