

Internet Services

Conclusion to Internet Services

Richard Martin

Rutgers University
Department of Computer Science

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Course Structure

- Critique Papers : ↔
 - Examples of good and poor research
- Student Presentations: ↑
 - Practice presenting ideas
- Position Papers ↑
 - Practice writing and reviewing
- Project ?
 - Practice experimentation and evaluation

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Themes in the Course

- Availability & Reliability
- Network Performance
- End System Performance
- Location Based Services
- Not Covered:
 - Content distribution
 - Security
 - User access
 - Architectures (hardware and software)

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Availability

- Hard to model at right level of accuracy
 - Stochastic reasoning appropriate?
 - Probabilistic reasoning appropriate?
- Little empirical data to supporting work
 - Beginning to understand these tradeoffs
- 10 years on, software and operators still major sources of outages
 - still at 3'9s?
- "Time heals all wounds"?

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Human Impact

- Hard to quantify availability
 - Analytic models of operator actions
 - State machines
 - Fault trees
 - Action grammars
 - Likelihood's of errors & impact
- Restricting actions?
 - How to do this in a computer system?
 - E.g. Complexity of user interface for shell vs. car
 - Is this possible?

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Software Availability

- 30 years of software engineering
 - People still use print to debug
 - Software still horrible
 - Mythical man-month still relevant
 - Xtreme programming good, but doesn't attack essence

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Software Availability

- What's gone wrong?
 - Looking in the wrong places?
 - "monolithic" and "component" models?
 - "interaction" models?
 - State verification?
 - Not enough "demand" for quality software?
 - But what about supply-side argument?
 - Level of abstraction wrong?
 - C vs. Java vs. Python
 - Fortran vs. Matlab
 - Swing vs. Tcl/Tk vs. Director

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Quantify Intuition

High availability software exists

- What is being programmed?
- How is it created?
- What is its architecture?
- What is not done?

Can these processes be

- Described?
- Checked?
- Automated?

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Internet Tomography

- Measuring the real internet
- Creating realistic models
- Understanding current situation
- Implications for services?
 - How can you use this information?
 - # of access points?
 - Distribution of access points?
 - Likelihood of failure?
 - 5 nines not such a big deal? (4 is OK?)

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End Performance

- Is performance a solved problem?
 - Under normal operating conditions?
- When do other problems demand more attention?
 - Security, availability, billing ...
- Performance under overload not well understood

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Overload and QoS

- Over-engineering the worst case by safety factor
 - traditional engineering approach
- computer systems have other options
 - Denial of service
 - Admissions control
 - Drop
 - Degradation of service
 - lower QoS over load
- How to easily implement?

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Location based Services

- All talk, poor motivation
 - Still no "killer app"
 - Compelling reason to care about user's location
- Most likely will come from something "stupid"
 - geocaching
 - graffiti
- Will drive a lot of infrastructure
 - Change the way people perceive location

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not covered: WAN content distribution

- Is this theme played out?
 - Akamai, Fast-forward, Inktomi
 - Squid
- What happened to VoD?
 - One student paper on multi-cast
 - Bandwidth savings vs. “other stuff”

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Not Covered: Security

- Hard to “due justice” in this class
- Huge problem or red-herring?
 - Headache for everyone
 - permeates all levels and systems (language, net, OS)
- Quantify “how secure” a given system is?
- A global methodology for securing systems

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Not Covered: Architectures

- SMP/MPP/Cluster debate is over?
- Software architectures “ossified”
 - 2-3 Tiers
 - Historical Accident?
 - What if we had a “clean slate”?

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New Themes

- Personal Search and Retrieval
 - I have too much stuff
- What environments or systems make services more programmable?
 - Can your grandmother set-up a web page?
 - Run a service?
 - Create a web-store (ebay?)
- Web Services
 - Offer client/server over the web in a standardized way.

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Summary

Good luck on the projects!

Due Sunday May 11th