Advanced Systems Lab
(Intro and Administration)

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Systems Group
http://www.systems.ethz.ch
Overview of the Course

• Focus on project
  – Individual project during semester (2 milestones)

• This is a project based course not a lecture:
  – Organized around tutorials
  – Self-studying
  – Learning by doing
Objective of this course

• Quantitative evaluation of computer systems
• Basics of performance evaluation
• Basics of queuing theory
• Learn how to answer questions of the form...
  – What is better: A or B?, Is A good enough?
  – What are the limits of A?, How can I improve A?
• A, B, C, ... are computer systems
  – software + hardware
  – often only components of a bigger system
Goals

• Things you will know at the end of the course
  – System building principles
  – Experimental design and analysis
  – Answering quantitative questions about systems
  – Experiments presentation
  – Queuing theory applied to system performance analysis
  – Insights on the systems used in the project
Communication

• Web page
  http://www.systems.ethz.ch/courses/fall2014/ASL

• E-mail list (not public)
  sg-asl@lists.inf.ethz.ch

• Assistants (all have taken the course as students):
  Jana Giceva
  Markus Pilman
  Zsolt Istvan
  Claude Barthels (Simon Lösing)
Recommended reading

• Raj Jain: The Art of Computer Systems Performance Analysis, John Wiley & Sons
  – (we will not cover Part V „Simulation“)
  – Library has copies. Nevertheless, worth buying.
  – Crucial reading for project
  – Book exercises useful to prepare exam
Tutorials

- Examples, basic guidance, and overview of needed tools through tutorials
- I - System Design and messaging systems
- II – Experimental design and statistics
- III – Queuing theory
- IV – Examples of applying queuing theory
- Amazon tutorial + Tools
Help with the project

• Regular Q&A sessions with assistants
  – Send questions in advance
  – Discuss your project
  – Get feedback
  – Learn from others

• You need to make your own design decisions, please do not ask us to make them for you and do not demand we validate them. That is your job!
THE PROJECT
Requirements

• Things we assume you know:
  – Programming (Java)
  – Basic statistics and probability theory
  – Operating systems (threads, scheduling, memory management)
  – Databases (SQL)
  – Networks (RPC, TCP/IP, routing, sockets)

• If you do not have the necessary background, you need to acquire it before taking this course
Build a system *and* explain it

• The project is to build a small message passing system
• Miniature version of real ones
• The goal is to:
  – Build it
  – Measure it
  – Explain it
  – Analyze it
Project for this course

• Individual project
• Two milestones
  * Milestone 1 – Part 1: Build System
    - persistent messaging system
  * Milestone 1 – part 2: Performance Experiments
    - study performance of the system you have implemented under various parameters

* Milestone 2: Modeling
  - estimate/model performance of the system you have implemented based on queuing models; compare with experimental results
“How to” suggestions

• Design architecture, produce design document
  – Discuss design with assistant at Q&A session
• Incremental and iterative development
  – Always have a working system, then add to it
  – Continuous testing
• Detailed time plan (and stick to it)
  – Development, deployment, testing
  – Experiments
  – Data processing
  – Report writing
“How to” suggestions

• Initial development on your own laptop
• Then move to course’s cluster (distributed version)
• Then move to Amazon cloud services (larger scale, longer experiments)
• Start early (experiments take longer than you think and bring surprises) !!!!
A word of caution

• The project is in itself not difficult
• It can, however, become very, very difficult if:
  – You do not allocate enough time
  – You do not know what you are programming
  – You make things more complex than necessary
  – You do not understand what you what to do with the experiments
• We are not after perfect systems but about the ability to explain what has been done in a professional and mature way.
Final warning

• One of the course assistants got this today: