Computer Systems CEN591(502) Fall 2012

Sandeep K. S. Gupta
Arizona State University

Agenda

- Introductions
- Syllabus
- Survey
- Class registration issues

Computer System?

- Underlying principles for hardware, software, and networking:
  - Computer Architecture + Compiler+OS+Application

The necessary background for graduate students to pursue advanced study in the areas of computer engineering.

Course goals and topics

- **To understand fundamentals of computer systems**
  - **Introduction**
    - Technology trends in computer systems
    - Primers on computer architecture
    - Primers on computer system design
    - Fundamentals of quantitative design and analysis of computer systems
  - **Computer architecture**
    - Memory hierarchy
    - Memory protection and virtual machine memory protection
    - Instruction-Level Parallelism
    - Data level parallelism
    - GPU architecture
    - Thread –level parallelism and multi-core processors performance)
  - **Machine level representation of programs and data**
    - Representing and manipulating information
    - Machine level representation of programs

Course goals and topics-cont'd

- **To understand fundamentals of computer systems**
  - **Operating system**
    - Processes and Interrupt handling
    - Process synchronization
    - Virtual memory
    - System I/O
  - **System software**
    - Compilers
    - Linkers, and loaders
  - **Networking:**
    - MAC layer, TCP/IP, network programming
  - **Emerging computing paradigms:**
    - Warehouse-scale computers, data centers
    - Cloud computing
- **To learn the efficient way of programming**
  - Data types, Security in coding, Computer Arithmetic
  - Memory and I/O Matters
  - Codes performance

COURSE MECHANICS and policies

Reference books

- Computer Systems: A Programmer's Perspective 2ed, Randal E. Bryant and David R. O'Hallaron
- Computer Architecture: A quantitative approach, John L. Hennessy and David A Patterson.
- Operating Systems Concepts, Silberschatz et al.
- Compilers, Principles, Techniques, and Tools, Aho et al.
- Computer Networking: A Top-Down Approach, Kurose and Ross.
- Fundamentals of Mobile and Pervasive Computing, Adelstein et al.

Course Mechanics

- **Homework and Programming Assignments (one every two to three weeks) : 20%**
- **Reading assignments and Quizzes (every week): 10%**
- **Midterm and Final Exam : 70%**
  - **Two midterms (tentative dates): W Oct 10th and W Nov 7th.**
  - **final exam: F Dec 14th 9:50 to 11:40am.**

A Note about "RAQ" Hazard

- RAQ = "Read After Quiz"
- Quizzes can be unannounced
- Meant to make sure you are in SYNC with the class
- Reduce some pressure from Exam preparation
- Read the material (book, slides, paper etc.) before coming to class and/or view assigned pre-recorded lecture.

“ No Distraction” Policy

- No Laptops/Netbooks/Cell Phone/News Papers etc.
- Laptops/Netbooks may be permitted – only with instructor’s permission
  - Only for note-taking purpose (all other activities disallowed unless instructed).

Cheating/Plagarism Policy

- Strictly prohibited
- See University policy
- Minimum punishment – zero in the assignment

Class Format

- Quiz (10 min)
- Quiz review + Recap (5 min)
- Lecture (45 to 55 (when no Q) min)
  - (If used) Slides will be posted after the class
- Discussion (10)
  - Take Notes!
- Assignment Qs/Next Class (5 min)
  - Take Notes!

Class Cyberpresence

- http://impact.asu.edu/cen591fa12.html
  - slides
- Blackboard
  - Class assignments
  - Solutions
  - Discussion board
  - Reference material
- Visit regularly for latest information

What can you expect from this course?

- Lots of in-class interaction
- Interesting and challenging assignments and exam questions
- Help/Tutorials by instructor/TA on difficult material
- And lot more!

Contacting Me or TA

- Instructor
  - Email: sandeep.gupta@asu.edu
    - Subject line: CEN591Fa11
  - Office: BY 522
  - Phone: 5-3806
  - Office Hours: M W 3-4:30 pm
  - Call me || come to my office hrs || Set up an appointment
  - http://impact.asu.edu

- TA: Zahra Abbasi
  - Email: zahra.abbasi@asu.edu
  - Office BY517
  - Office Hours: MT Th 11-12 or by appointment

What do I do when I am not teaching?

IMPACT: Research

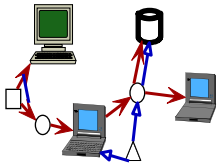
Use-inspired research in pervasive computing & wireless sensor networking

ID Assurance

Goal:
- Protect people's identity & consumer computing from viral threats

Features:
- PKI based
- Non-tamperable, non-programmable personal authenticator
- Hardware and VM based trust management

Sponsor: NSF, Consortium for Embedded Systems

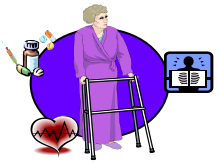


Mobile Ad-hoc Networks

Goal:
- Protocols for mobile ad-hoc networks

Features:
- Energy efficiency
- Increased lifetime
- Data aggregation
- Localization
- Caching
- Multicasting

Sponsor: NSF, Consortium for Embedded Systems

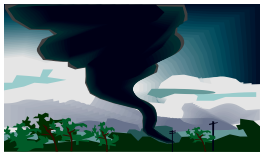


Pervasive Health Monitoring

Goal:
- Pervasive Health monitoring
- Evaluation of medical applications

Features:
- Secure, Dependable and Reliable data collection, storage and communication

Sponsor: NSF, MediServe

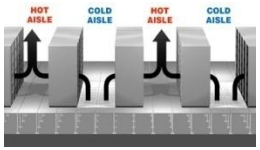


Criticality Aware-Systems

Goal:
- Evaluation of crisis response management

Features:
- Theoretical model
- Performance evaluation
- Access control for crisis management

Sponsor: MediServe



Thermal Management for Data Centers

Goal:
- Increasing computing capacity for datacenters
- Energy efficiency

Features:
- Online thermal evaluation
- Thermal Aware Scheduling

Sponsor: intel

Intelligent Container

Goal:
- Container Monitoring for Homeland Security
- Dynamic Supply Chain Management

Features:
- Integration of RFID and environmental sensors
- Energy management
- Communication security

Sponsor: intel

Medical Devices, Mobile Pervasive Embedded Sensor Networks

BOOK: Fundamentals of Mobile and Pervasive Computing, Publisher: McGraw-Hill Dec. 2004

What's Next?

- Next Class: Technology trends in computer systems
  - Computer Architecture: A quantitative approach, John L. Hennessy and David A Patterson, 5th ed. Ch 1, Sec 1-6

- Plan for next few lectures: Intro to Computer Arch., primers on computer system and organization, and quantitative analysis of computer systems
  - Computer Architecture: A quantitative approach, John L. Hennessy and David A Patterson, 5th ed. Ch 1, Sec 3
  - Computer Systems: A Programmer's Perspective 2ed, Randal E. Bryant and David R. O'Hallaron, 2nd ed, Ch 3, Sec 1