Concurrent & Distributed Software Systems

CS 475 Spring 2003
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About this Class

- Distributed systems are ubiquitous
- Focus: designing and writing moderate-sized concurrent & distributed applications
- Prerequisites:
  - CS 471 (Operating Systems)
  - High level of competence in C/C++/Java

What you will learn

"I hear and I forget, I see and I remember, I do and I understand" – Chinese proverb
- Issues that arise in the development of distributed software
- Foundations of concurrent and distributed software
- Concurrent Programming
  - Threads, semaphores, condition variables...
- Middleware technology
  - Sockets, RPC/RMI
  - Web services

Logistics

- Grade: 65% projects, 35% exams (15% midterm, 20% final)
  - Midterm in March
  - Final probably a take-home exam
- Slides, assignments, reading material on class web page
Logistics cont’d

- 3 or 4 small (2 week) programming assignments + 1 larger project
  - concurrent programming, sockets, RPC/RMI
  - project can be done in a group of two whereas assignments have to be done individually
- Use any UNIX platform; all the necessary software will be available on the Sun workstations in the IT&E lab
  - DO NOT USE OSF1/MASON2
  - You can use Windows platforms subject to my approval
- Strict enforcement of honor code

Schedule

- Concurrent/Multi-threaded Programming
- Distributed Systems – Overview
- Application-level network protocols
  - network programming using sockets
- Client-server application design
- Middleware technology
  - RPC/RMI/CORBA
  - Web Services aka using SOAP/XML for distributed applications
- Advanced Topics (depends upon time available)
  - Parallel programming, P2P systems

Concurrent applications

- Multi-threaded Programs
  - Processes/Threads on same computer
  - Window systems, Operating systems
- Distributed applications
  - Processes/Threads on separate computers
  - File servers, Web servers

Multi-threaded application

A word processor with three threads
**Distributed systems**

- "Workgroups"
- ATM (bank) machines
- WWW
- Computing landscape will soon consist of ubiquitous network-connected devices
  - "The network is the computer"

**A typical portion of the Internet**

**Portable and handheld devices in a distributed system**

**Distributed applications**

- Applications that consist of a set of processes that are distributed across a network of machines and work together as an ensemble to solve a common problem
  - In the past, mostly "client-server"
  - Resource management centralized at the server
  - "Peer to Peer" computing represents a movement towards more "truly" distributed applications
Web servers and web browsers

- www.google.com
- www.cdk3.net
- www.w3c.org

Internet

- Web servers
- Browsers

File system of www.w3c.org

Protocols

Activity.html

Benefits

- Resource sharing
- Fault tolerance and availability
- Performance
  - Parallel computing can be considered a subset of distributed computing
- Scalability