

Concurrent & Distributed Software Systems

CS 475 Spring 2003
Prof. Sanjeev Setia

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
<http://www.cs.gmu.edu/~setia/cs475/>

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

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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

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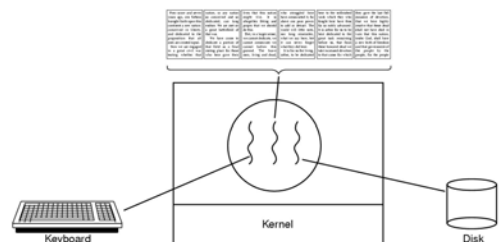
Concurrent applications

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

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Multi-threaded application



A word processor with three threads

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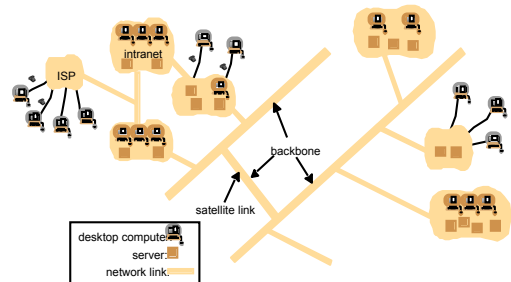
Distributed systems

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

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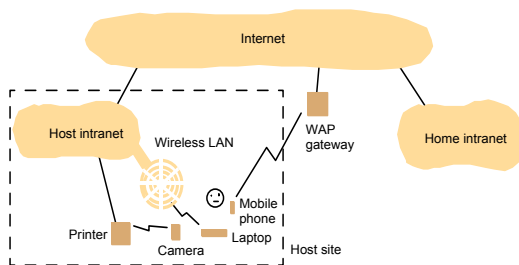
A typical portion of the Internet



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Portable and handheld devices in a distributed system



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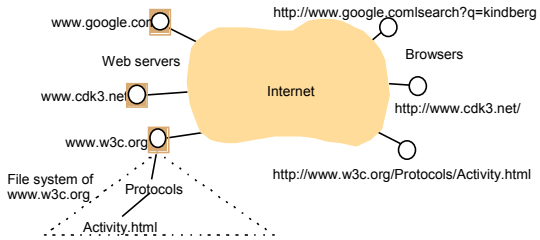
Distributed applications

- ⌘ 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

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Web servers and web browsers



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Benefits

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

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