What Did You Learn This Semester?

■ From class syllabus:

"The goal of this course is to provide an introduction to distributed operating systems. The first third of the course emphasizes *communication methods* that the OS must provide in a distributed system. The second third of the course considers how OS support for *synchronization and mutual exclusion* — central concepts in any operating system — must change in a distributed system. The final third of the course examines additional OS support required for a practical distributed system.

Note that this is a course in distributed <u>operating systems</u>, not a course in distributed <u>computing</u> algorithms. …"

What Did You Learn This Semester? (cont.)

■ Overview

● Distributed OS vs. network OS, etc.

● Distributed system vs. parallel system

■ Communication between processes in a distributed system

● Network topologies

● Network communication protocols

● Message-passing

● Client / server model

● Remote procedure call (RPC)

● Threads

● Distributed shared memory and consistency models

● CORBA

What Did You Learn This Semester? (cont.)

■ Synchronization and mutual exclusion in a distributed system

● Review of semaphores

● Locks and condition variables

● Synchronizing physical clocks

● Synchronizing logical (and vector) clocks

● Distributed mutual exclusion
  ■ Centralized algorithms
    – Central coordinator
  ■ Distributed algorithms
    – Time-based event ordering
      » Lamport's algorithm
      » Ricart & Agrawala's algorithm
      » Suzuki & Kasimi's algorithm
    – Token passing
      » Le Lann's token ring
      » Raymond's tree
  ■ Election algorithms
  ■ Agreement

What Did You Learn This Semester? (cont.)

■ Deadlock in a distributed system

● Deadlock conditions

● Resource allocation graph, cycles, knots

● Deadlock detection
  ■ Centralized algorithms
    – Central coordinator
    – Ho & Ramamoorthy's one & two phase algs.
  ■ Distributed algorithms
    – Obemarck's path pushing
    – CMH's edge-chasing
  ■ Hierarchical algorithms
    – Menasce & Muntz's controllers
    – Ho & Ramamoorthy's clustering

● Deadlock prevention

● Atomic transactions & concurrency control
  ■ Centralized concurrency control
    – Various locking algorithms
    – Optimistic concurrency control
  ■ Distributed transactions

What Did You Learn This Semester? (cont.)

- Load distribution / distributed scheduling
  - Process migration
  - Classifying load distribution algorithms, components of a load distrib. algorithm
  - 3 sender-initiated algorithms
  - 1 receiver-initiated algorithm
  - Adaptive symmetrically-initiated algorithm

- Distributed file systems
  - Naming
  - Cache location, modification, & validation
  - Sun's NSF
  - CMU's Andrew

- Real-time systems

Final Exam

- The final exam will be held:
  - Wednesday, May 12
    from 5:45pm– 8:00pm
    in the usual classroom (MSB 120)

- The final exam is comprehensive, although the emphasis will be on the last set of material (Lectures 17–26)
  - It will be approximately 150% of the length of the regular in-class exams
  - It comprises 25% of your course grade

- Course grades are determined as:

  A = 90 – 100   D = 60 – 69.99

  B = 80 – 89.99   F = <60

  C = 70 – 79.99
  - I do not "curve" final course grades

You've (Almost) Finished AOS — What Comes Next?

- Distributed computing:
  - Nothing else planned in near future
  - http://www.mcs.kent.edu/~distrib

- Parallel computing:
  - 5/73995 Parallel & Dist. Computing (F'99)
  - 6/76105 Parallel Algorithms   (S'00)
  - http://www.mcs.kent.edu/~parallel

- Networking:
  - 4/55201 Comp. Comm. Networks   (S'00)
  - 6/75201 Dist. Proc. & Interc. Nwks   (S'01)
  - 6/75202 Adv. Comm. Networks   (S'00)
  - 6/73201 Syst. Mod. & Perf. Eval.   (F'00)
  - http://www.mcs.kent.edu/~networks

- Thesis projects available in each group!

Course Evaluations

- Use a #2 pencil to fill out the form
  - Write "12489" (the course call number) in the **_top left corner_** of the form
  - Fill out all the questions on the front **_and_** back of the form
  - Student monitor will return the forms to the MCS office; I won't see the results until **_after_** I hand in the course grades

- In the "additional comments" area:
  - Tell me what you *like* about the course (so that I'll keep doing it)
  - Tell me what you *do not like* about the course (so that I can consider changing it)

- Take these these evaluations very seriously — we (the faculty) certainly do!