OPERATING SYSTEMS

COURSE OVERVIEW

Course Overview: OSs

2

What is this course about?

- Operating Systems drive the inner workings of virtually every computer in the world today
- PCs, servers, iPods, cell phones, missile guidance systems, etc. all have an OS that dictate how they operate.
- The OS manages many aspects of how programs run, and how they interact with hardware and the outside world.

Course Overview: OSs

3

Understanding the OS is essential for understanding:

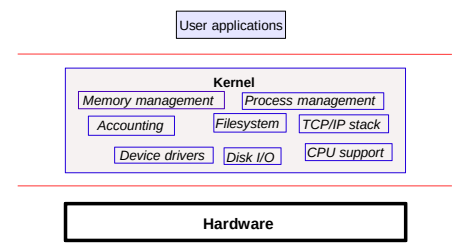
- System performance and reliability
- Resource management
- Virtualization and abstraction
- Concurrency and parallelism
- Hardware interfaces and I/O

This course is about more than just “kernel internals”. It is really about learning complex systems design.

Course Overview: OSs

4

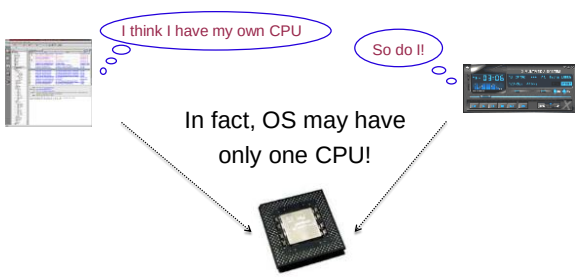
OS is a software that provides an elaborate illusion to applications.



Course Overview: OS Functions

5

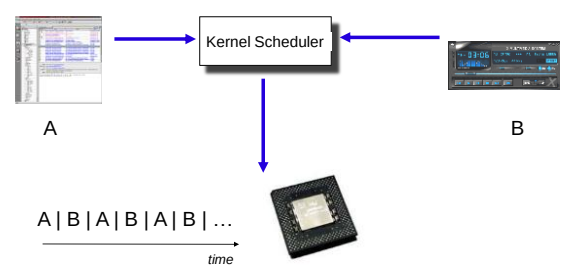
OS gives every application the illusion of having its own CPU.



Course Overview: OS Functions

6

OS timeslices each application on a single CPU. Switches between applications extremely rapidly, i.e., 100 times/sec.

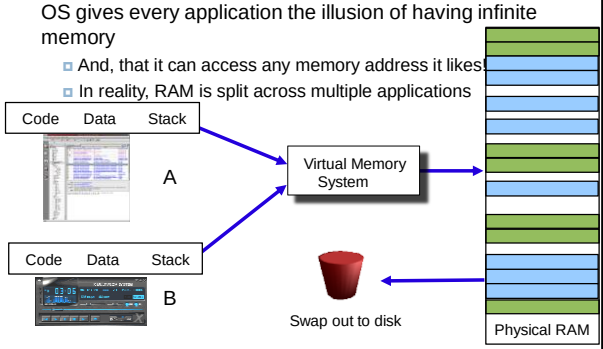


Course Overview: OS Functions

7

OS gives every application the illusion of having infinite memory

- And, that it can access any memory address it likes!
- In reality, RAM is split across multiple applications



Course Overview: OS Functions

8

Multiprocessor support

- Modern systems have multiple CPUs
- Can run multiple applications (or threads within applications) in parallel
- OS must ensure that memory and cache contents are consistent across CPUs

File systems

- Real disks have a hairy, sector-based access model
- User applications see flat files arranged in a hierarchical namespace

Network protocols

- Network interface hardware operates on the level of unreliable packets
- User apps see a (potentially reliable) byte-stream socket

Security and protection

- Prevent multiple apps from interfering with each other and with normal system operation

Expectation from the course

9

Abstract away messy details of hardware

- Give apps a nice clean view of the system
- Save programmers a lot of trouble when building applications
- Allow apps to be ported across a wide range of hardware platforms

Safety

- Don't let applications run amok – keep them in a "sandbox"
- e.g., Access to unallocated memory address crashes only the program, not the whole system
  - Segmentation fault – core dumped

Efficiency

- Share one machine across many different apps: concurrent execution
- You would be surprised how much slack there is in a typical computer system

Why study OS?

10

Most people will never write one from scratch,

- Although more people are hacking them (e.g., Linux and BSD)
- You need to understand the "big picture" in order to hack the details

This class is about much more than the kernel!

- Data structures, concurrency, performance, resource management, synchronization, networks, distributed systems...
- The ideas and skills you pick up in this class have broad applications

This course is the basis for future work in other areas of systems

- Distributed systems, Parallel Programming, etc.

Major Topics in OS

11

Lecture titles of operating systems:

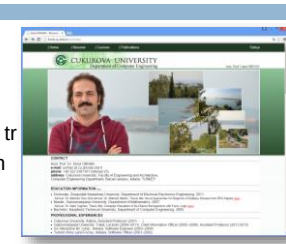
- Processes
- Threads
- Synchronization
- Semaphores
- Deadlocks
- Scheduling
- Memory Management and Virtual Memory
- Disks and Filesystems
- I/O systems

Teaching Staff

12

Instructor:

Umut Orhan, Ph.D



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office hours: by appointment

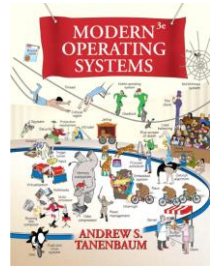
You can find some document in my web page

- lecture notes we used
- questions of exams
- student's grades in exams (of course after exams)

Textbooks

13

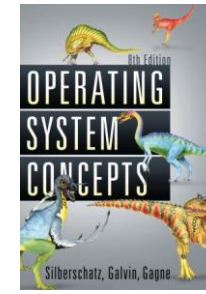
We have two main textbooks. The first one is
"Modern Operating Systems",
by Andrew S. Tanenbaum



Textbooks

14

The second one is "Operating System Concepts with Java"
by A. Silberschatz,
P.B. Galvin, and G. Gagne



Some rules about lessons

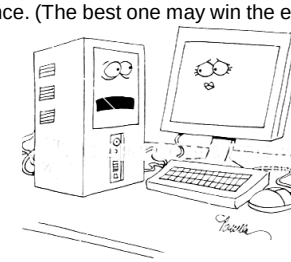
15

1. If you are late, you can enter the class without asking for permission, but silently.
2. If you want to go out early; you can likewise exit without asking.
3. I have to organize attendance list; but absenteeism won't be evaluated.
4. Unless you abuse, minor conversations is not a problem.
5. You can enter the lectures in any group you want.

Some cartoons

16

And, you can send me the caricatures about computer science. (The best one may win the extra point :)



"I never knew my fatherboard."

Let's call it a day!

17

Thank you…