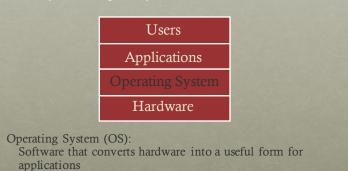


WHAT IS AN OPERATING SYSTEM?

Not easy to define precisely...



WHAT DOES OS PROVIDE?

Role #1: Abstraction - Provide standard library for resources What is a resource? Anything valuable (e.g., CPU, memory, disk) What abstraction does modern OS typically provide for each resource? CPU: process and/or thread Memory: address space Disk: files Advantages of OS providing abstraction? Allow applications to reuse common facilities Make different devices look the same Provide higher-level or more useful functionality Challenges What are the correct abstractions? How much of hardware should be exposed?

WHAT DOES OS PROVIDE?

Role #2: Resource management – Share resources well

Advantages of OS providing resource management? Protect applications from one another Provide efficient access to resources (cost, time, energy) Provide fair access to resources

Challenges What are the correct mechanisms? What are the correct policies?

OS ORGANIZATION

• How to cover all the topics relevant to operating systems?

THREE PIECES: FIRST

• Virtualization

- · Make each application believe it has each resource to itself
- Demo
 - · Virtualize CPU and memory

THREE PIECES: SECOND

- Concurrency:
- Events are occurring simultaneously and may interact with one another
- · OS must be able to handle concurrent events
- · Easier case
 - · Hide concurrency from independent processes
- Trickier case
 - · Manage concurrency with interacting processes
 - Provide abstractions (locks, semaphores, condition variables, shared memory, critical sections) to processes
 - Ensure processes do not deadlock
- Demo
 - · Interacting threads must coordinate access to shared data

THREE PIECES: THIRD

- · Persistence: Access information permanently
 - · Lifetime of information is longer than lifetime of any one process
 - Machine may be rebooted, machine may lose power or crash unexpectedly
- Issues:
 - Provide abstraction so applications do not know how data is stored : Files, directories (folders), links
 - Correctness with unexpected failures
 - Performance: disks are very slow; many optimizations needed!
- Demo
 - File system does work to ensure data updated correctly

ADVANCED TOPICS

• Current systems

Multiprocessors

- Networked and distributed systems
- Virtual machines

WHY STUDY OPERATING SYSTEMS?

Build, modify, or administer an operating system

Understand system performance

- · Behavior of OS impacts entire machine
- · Tune workload performance
- · Apply knowledge across many layers
 - Computer architecture, programming languages, data structures and algorithms, and performance modeling

Fun and challenging to understand large, complex systems

TO DO

Take a look at course web page

Take a look at first programming project

Watch video of previous discussion section before Wednesday's discussion section