Review of Computer Organization and OS Concepts

44-550: Operating Systems

Computer Org

- Computer consists of hardware and software
- Three steps:
  - Input
  - Transformation (Processing)
  - Output
- Hardware: Things that hurt if thrown at you
  - CPU
  - RAM
  - Bulk Storage
  - I/O
  - System Bus

Interrupts

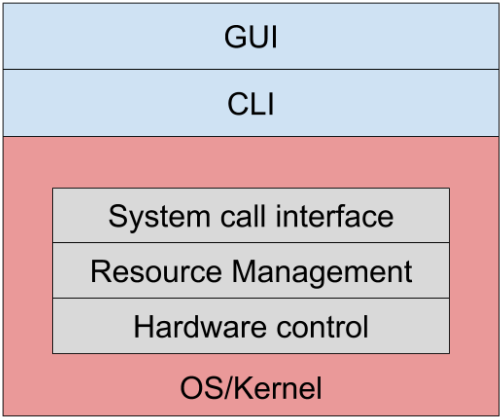
- Mechanisms by which HW sends a signal to the CPU to stop normal execution so the CPU can handle the component's needs
- Synchronous interrupts
  - Similar (in timing) to calling a function and returning
- Retrieving data from disk is *asynchronous*
  - we don't know order of reads and writes, or when it happens
- The OS is responsible for providing scheduling and interrupt handling.
  - Very low level functionality

OS Tools

- The OS provides many other services
- Consists of many different programs
  - Process management
  - Memory management
  - Device management
  - Security and protection
  - File management
  - Network management
  - ...

Structure of an OS

This course will focus on a "generic" (general purpose) Operating System



Kernel Software Components

- System calls: functions to interact with HW and SW (printf, fork, ...)
- Process (running program) manager
  - creation
  - suspension/blocking
  - termination
  - killing/destruction

Note: lots of programs run at the same time in active memory by switching between tasks frequently. This operation is also known as a ***context switch***

Kernel Software Components

- Memory manager: controls allocation and deallocation of memory
  - policies for memory management
  - includes paging, segmentation, virtual memory
- Resource manager: controls allocation and deallocation of resources
  - files
  - CPU
  - Memory words
  - IO
  - ...
- File manager
  - Interesting to note: devices in Linux are represented as files
- Device manager: handles and abstracts away from device operations

Types and Categories of OSs

- Types
  - Batch
  - Interactive
  - Real-time
  - Hybrids
- Categories
  - General purpose
  - Application dependent
  - Single/multi-user

Types of Kernels

- Monolithic
- Layered
- Modular
- Micro-kernel

Jobs

- Units of work submitted to the OS
  - A process or a group of processes
  - could be a sequence of OS commands, a program in source or binary, user input...

Some Current OSs

- UNIX
- MS Windows
- OSX
- Android (Android/Linux)
- iOS
- TinyOS
- Debian Linux
  - Knoppix
  - BCCD
- Ubuntu
- CentOS
- RedHat
- Fedora
- Mint (based on Ubuntu)
- OSE
- QNX
- LynxOS
- VxWorks
- *BSD
- Oh so very many more...
  - Including one called Liquid Lemur
- `http://distrowatch.com/`