CS 201 Lecture 17
Operating Systems, System Calls, and Input/Output
Spring 2014
Plan for the rest of the term

• Major objectives of system design
  – Performance
  – Security / Protection
  – Sharing and Privatization (i.e. not sharing)

• Primary system design tools
  – Virtualization: present an easy-to-grasp picture of the way things look, with a layer of translation to the way things really are
  – Concurrency: do more than one thing at once
Plan for today

• Why do we need an operating system?
• Devices and device input/output
• Polling vs. Interrupts
The OS is the processor’s government

• Security
  – Protect the system and the programs that run on it from harmful actions (accidental or purposeful)

• Law enforcement
  – Make sure programs obey the rules of sharing the system with each other
  – Make each program, as much as possible, behave as if it had the system to itself

• Arbitration of shared resources
  – What gets the display right now? Where is the keyboard active? How do you share the hard disk?
Accessing Devices: instructions

• Isolated / Port-based Input-Output
  – Separate instructions for accessing devices
  – Devices attached to “ports,” which are numbered, and could be read from or written to, depending on device

• Memory-mapped I/O
  – “Steal” some memory addresses, and have those memory addresses go to devices instead
  – Assumption is that we have lots of them, so losing a few isn’t a problem

• Tradeoffs of opcodes vs. clarity
Accessing Devices: policy

• It’s time to access the device, which is slow

Policy 1: polling
while (device not ready)
  check if device is ready
access device

• Might be waiting a long time
• While waiting, the processor is doing nothing useful, and burning energy
Accessing Devices: policy

Policy 2: Interrupt
If (device not ready)
  go to sleep, or do something else
When (device ready)
  access device

• May introduce a response delay
• Processor time and energy is not wasted
• Best policy depends on how slow the device is, how important it is to respond right away