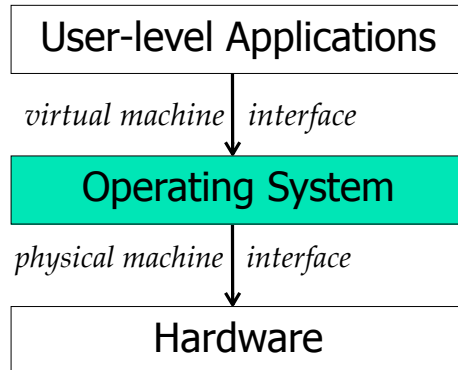
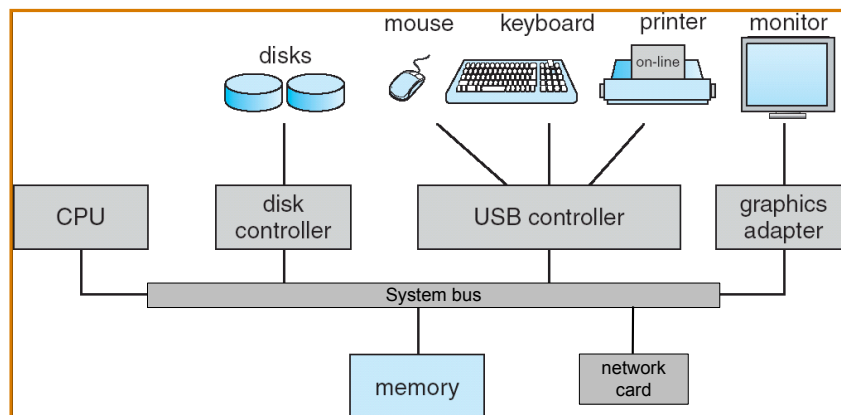


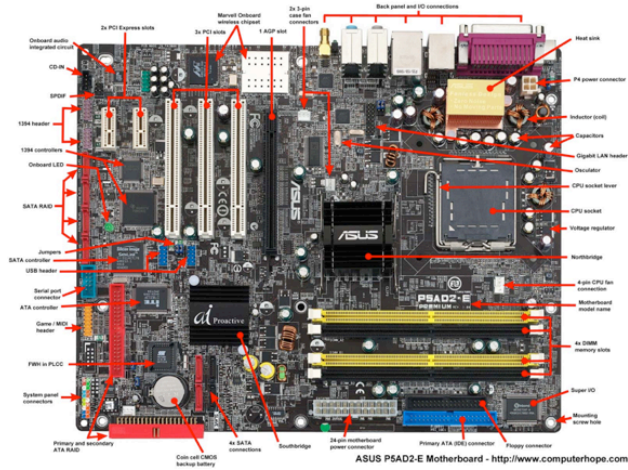
Recap: Introduction to Operating Systems



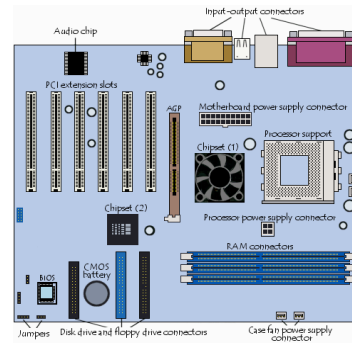
Today: OS and Computer Architecture



Computer Architecture



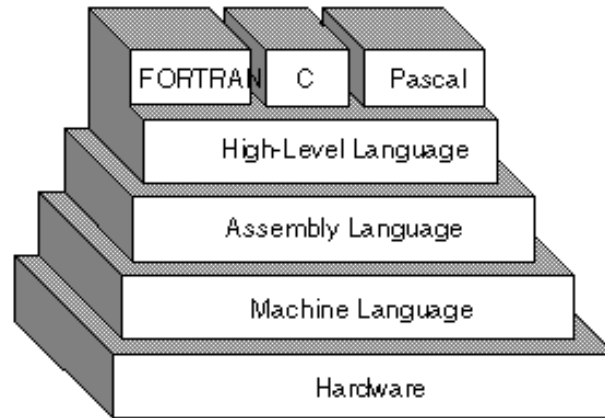
Logic board



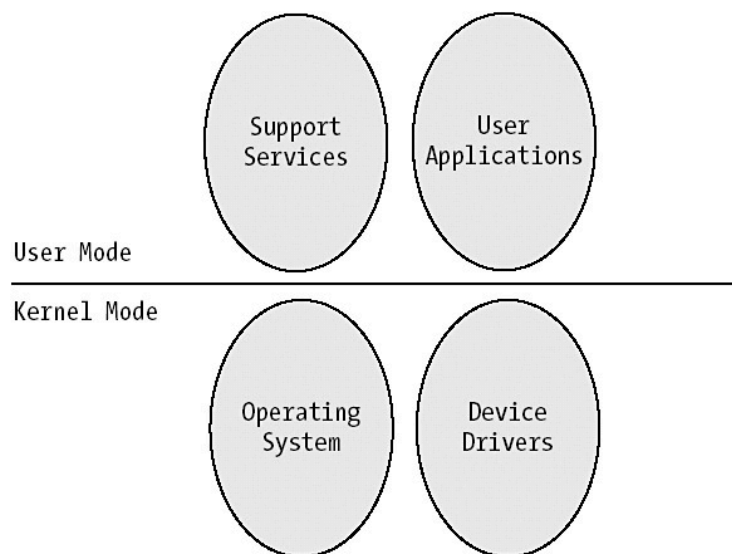
Protection



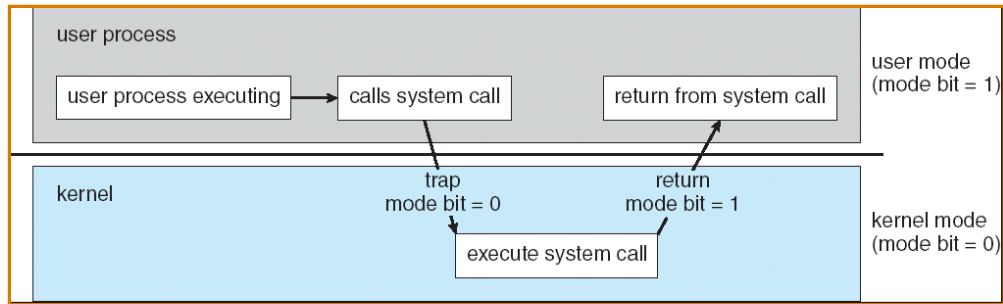
Assembly Instructions



User and Kernel Mode



System Calls



Traps



Trap Vector

0: 0x00080000	Illegal address
1: 0x00100000	Memory violation
2: 0x00100480	Division by zero
3: 0x00123010	System call
⋮	

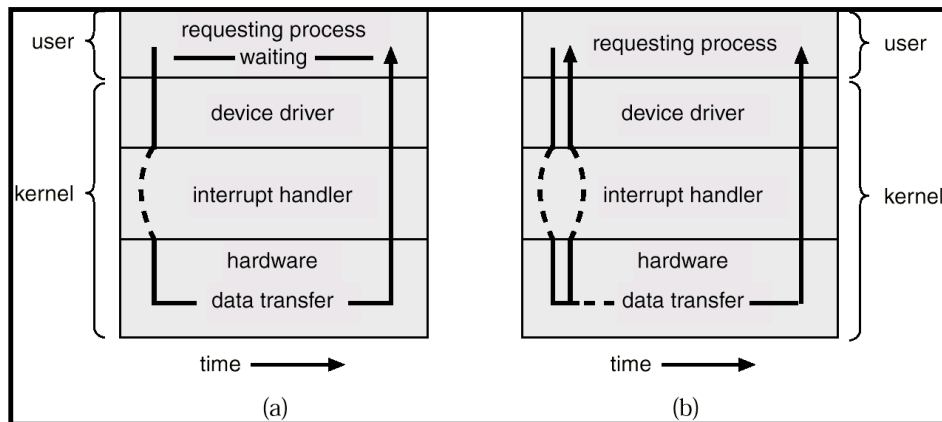
I/O Control & Interrupts



Interrupt
Vector

0: 0x2ff080000	keyboard
1: 0x2ff100000	mouse
2: 0x2ff100480	timer
3: 0x2ff123010	disk 1

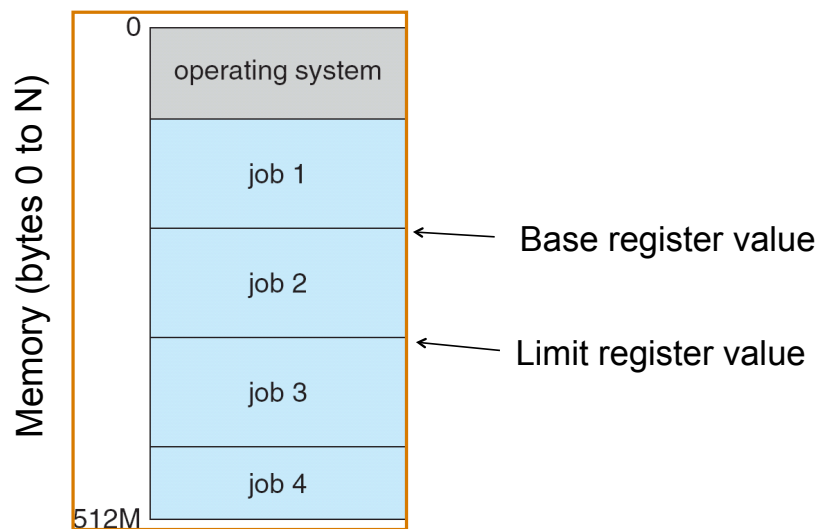
Synchronous & Asynchronous I/O



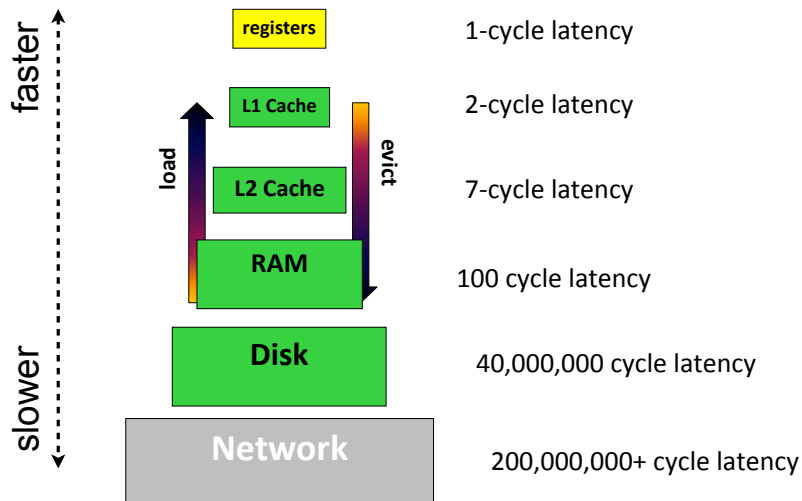
Hardware Timer



Memory Protection



Caches in the Memory Hierarchy



Summary of Architecture Support

OS Service	Hardware Support
Protection	Kernel/user mode, protected instructions, base/limit registers
Interrupts	Interrupt vectors
System calls	Trap instructions and trap vectors
I/O	Interrupts
Scheduling, error recovery, accounting	Timer
Synchronization	Atomic instructions
Virtual memory	Translation look-aside buffers

Summary

- Architecture matters for OS!
- OS provides interface to architecture, but has help from the architecture
- Sometimes necessary for the OS to work, other times just a performance enhancement
- OS is interrupt-driven!