CS3844 Operating Systems

Context Switching

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Objectives

- Explain how a CPU Context switch occurs
- Explain how the hardware may impact the time necessary for a context switch (i.e. Sun Ultra Sparc)
- List reasons why a context switch would occur
- Explain why context switching can be bad
- Compare and contrast IO Bound and CPU Bound processes

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Basic Context Switch

- Store current state to a PCB
  - Store contents of Micro general purpose registers
  - Store the Stack pointer
  - Store the program counter
- Load different PCB to the micro
  - Program counter
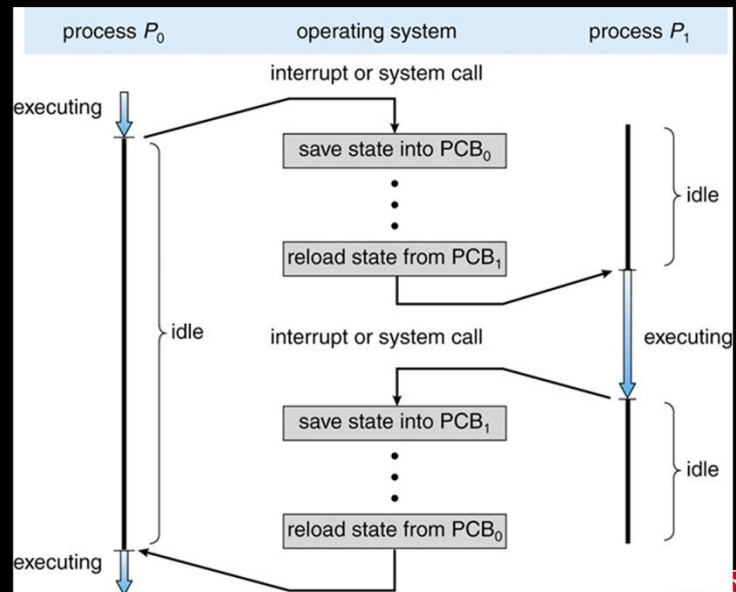 - General Purpose registers
  - Status register

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Note that this must occur in the equivalent of an interrupt.

More complex on pipelined processors

CPU Context Switching

process P_0	operating system	process P_1

interrupt or system call

executing

save state into PCB_0

idle

reload state from PCB_1

idle

interrupt or system call

executing

save state into PCB_1

idle

reload state from PCB_0

executing

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IO Process necessary

Process waits for subprocess to complete

Process forcibly removed from the CPU via interrupt

-> Timer expired

-> Preemptive versus cooperative

Assume a process spends 10ms running and is swapped out

A context switch takes 10 ms

Second process runs for 5ms before being swapped out

Two processes repeat back and forth 10 times.

What percentage of time was spent doing real work?

Why can context switching be bad?

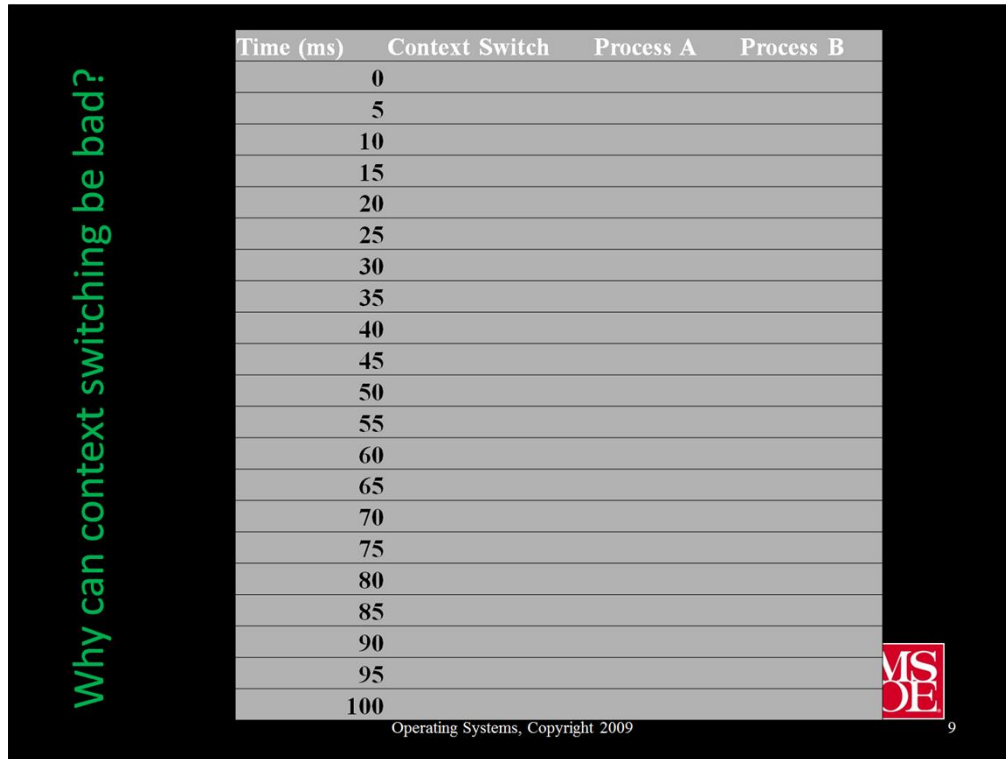| Time (ms)	Context Switch	Process A	Process B
0			
5			
10			
15			
20			
25			
30			
35			
40			
45			
50			
55			
60			
65			
70			
75			
80			
85			
90			
95			
100			

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Time (ms)	Context Switch	Process A	Process B
0		X	
5		X	
10	X		
15	X		
20			X
25			x
30	x		
35	x		
40		x	
45		x	
50			x
55			x
60	x		
65	x		
70		X	
75		x	
80	x		
85	x		
90			X
95			x
100	x		

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CPU versus IO Bound Processes

- IO Bound Process
  - A process which spends most of its time doing input and output instead of CPU computations
  - Too many IO processed may result in CPU doing nothing

- CPU Bound Process
  - A process which spends most of its time doing computations
  - Too many CPU bound processes may result in device queues going empty and ready queue overflowing

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