Operating Systems
Lecture 19: Locks

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Locks

Thread 1

cc7:	mov 0x20135f,%eax
ccd:	add $0x1,%eax
cd0:	mov %eax,0x20135f

Thread 2

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Locks

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- Is not free; does not execute till lock free

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- Thread 2 checks (keeps on doing so) for lock being free
- Thread 2 executes and unlocks

Goals of a Lock

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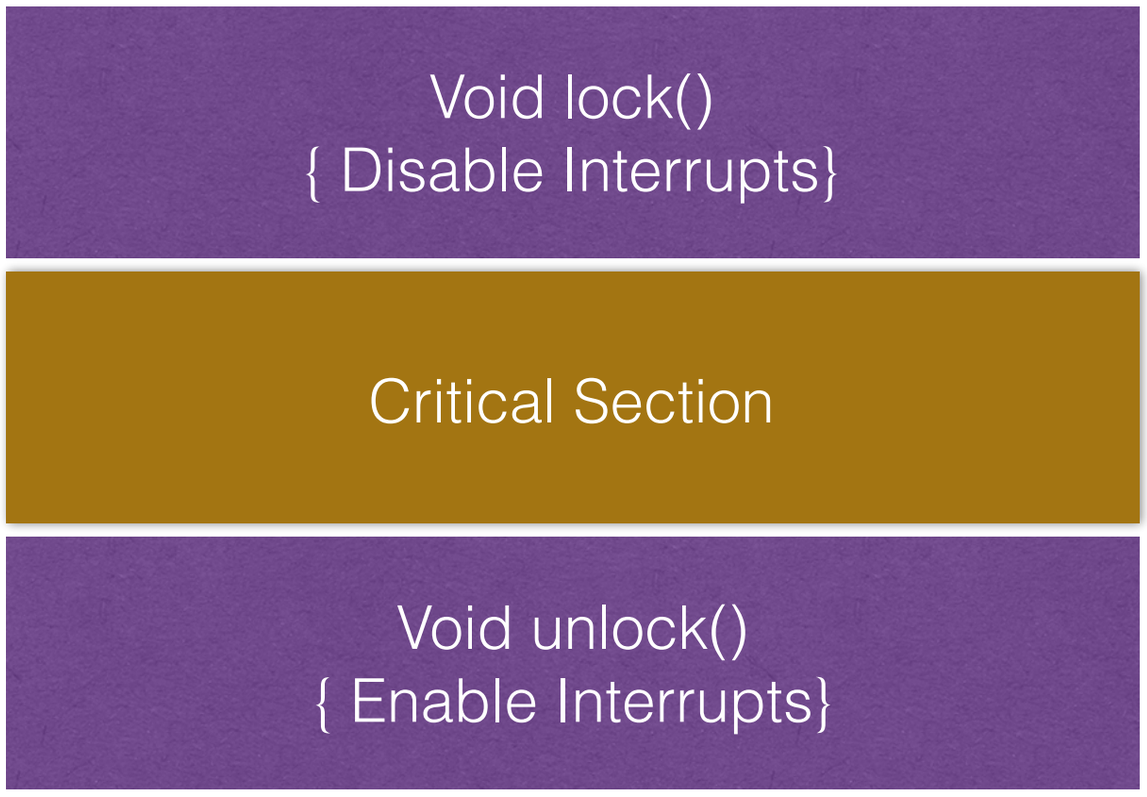
Building a Lock - Disable Interrupts



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    1. Each processor will have own interrupts?!
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4. Inefficient - Interrupt routines can be slow

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- Thread calls lock before entering critical section
  - Is flag set? (some other thread has critical section control)
  - Yes - Spin waiting
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    - set flag, execute critical section
    - After completion of critical section, unset flag

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void lock(lock_t *mutex) {
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void unlock(lock_t *mutex) { mutex->flag = 0; }
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Need Hardware Support!

Atomic Instructions - Test & Set

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2   int old = *ptr;  // fetch old value at ptr
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- **Performed Atomically and by Hardware!**
  - The above is just a software depiction

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Define lock structure

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Init by setting flag to 0

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Case 1: Lock not held by any thread

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- No spin waiting for current thread

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- Spin waiting for current thread since it goes in while loop

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Once out of critical section, unset flag

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- Performance: Spin Waiting is bad!
  - Single core: Each thread spins away its allotted time slot, eating away the time for the thread holding the critical section
  - Multi core: If num threads ~ num cores
    - Each thread waiting to acquire lock can spin on its core, not eating up the time needed (quick) for the critical section to execute on other

Atomic Instructions - Compare & Swap

```
1 int CompareAndSwap(int *ptr, int expected, int new) {
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