Thread Synchronization

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Examples
Example 1

- Make program
  - 5 Reader + 1 Writer
  - Writer updates value 1,000,000 times
  - Each reader reads value 10,000,000 times

- Use pthread_mutex
Example 2

- Implement same thing using pthread_spinlock
  - pthread_spinlock_t s
  - pthread_spin_init(&s, PTHREAD_PROCESS_PRIVATE)
  - pthread_spin_[un]lock(&s)
  - pthread_spin_destroy(&s)

- What is the difference?
Readers-Writer Lock

- Reader blocks other reader
  - Do we need this?

- Implementation
  - Using two mutexes ($r$, $g$)
  - The counter $b$ tracks the number of blocking readers
  - One mutex $r$ protects $b$ and is only used by readers
  - The other mutex $g$ ensures mutual exclusion of writers
Readers-Writer Lock

**Pseudocode**

**Begin Read**

- Lock $r$.
- Increment $b$.
- If $b = 1$, lock $g$.
- Unlock $r$.

**End Read**

- Lock $r$.
- Decrement $b$.
- If $b = 0$, unlock $g$.
- Unlock $r$.

**Begin Write**

- Lock $g$.

**End Write**

- Unlock $g$. 
Example 3

- Implement same thing with readers-writer lock