Syntax highlighting
for exam

CS 3214 lecture # 16 "multithreaded performance"

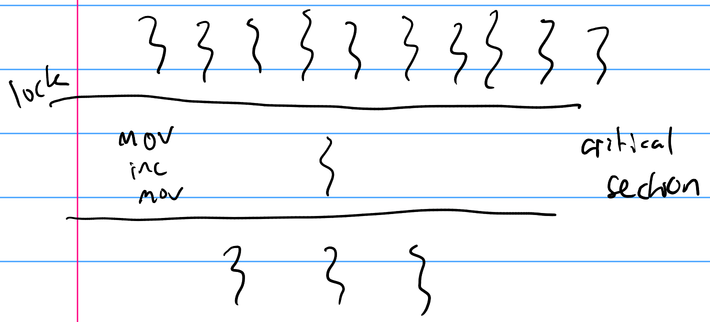
[Performance]

[thread-local storage]

[thread pools]

[exam questions]

"indirect costs"



how to make go fast

1. shrink lock regions
critical sections

Splitting up locks

when? ~~multiple locks protecting same data~~ breaks mutex

independent global variables

→ a lock for each

Dangers: 1. atomicity violation
2. deadlock

direct costs: more locking

pthread_mutex_lock
unlock } futex → fast user

fast path
atomic cmpxchg
tas

slow path
syscall

Thread-local $\overset{\text{memory}}{\text{storage}}$ TLS

{ tid, name

TCB PCB
control block

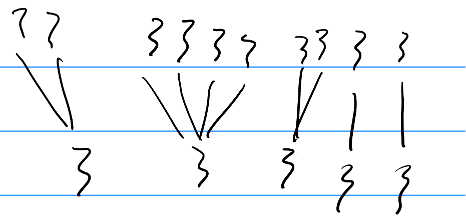
__thread int x; gcc

_Thread_local int x; C 11

compiler, linter, runtime

Thread Pools   user/kernel ...

pthread_create → idle CPUs



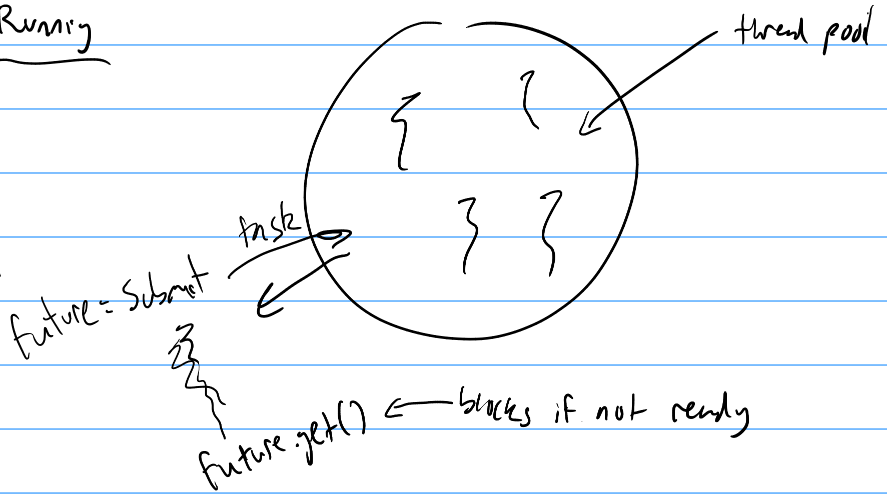
[M:N threading models]

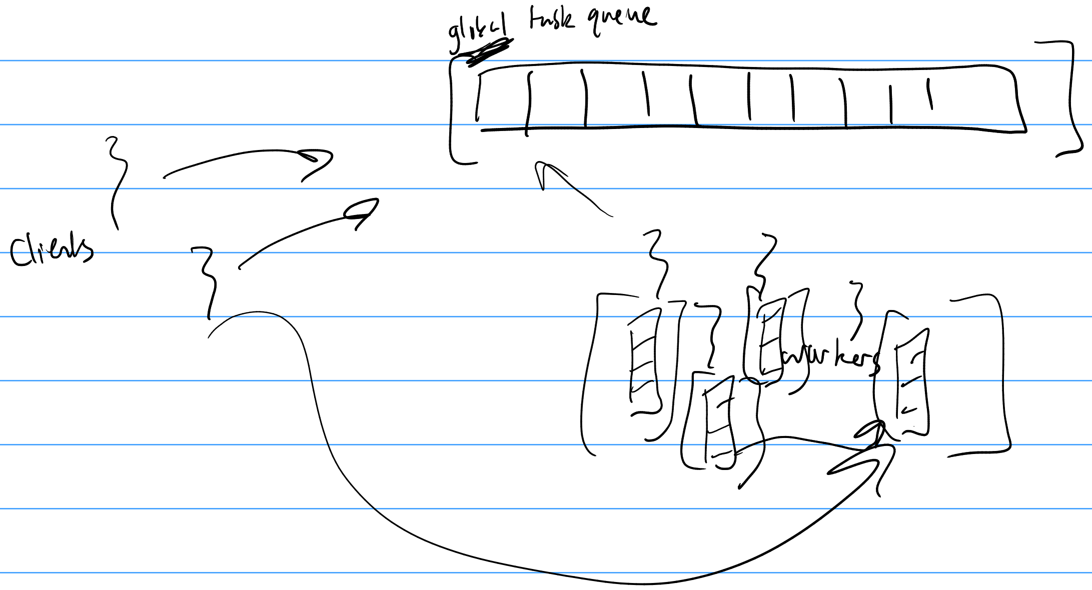
|| [<< # CPUs] best #threads?

|| [>> # CPUs] x run out of resources

CPU cores ≈ Ready + Running

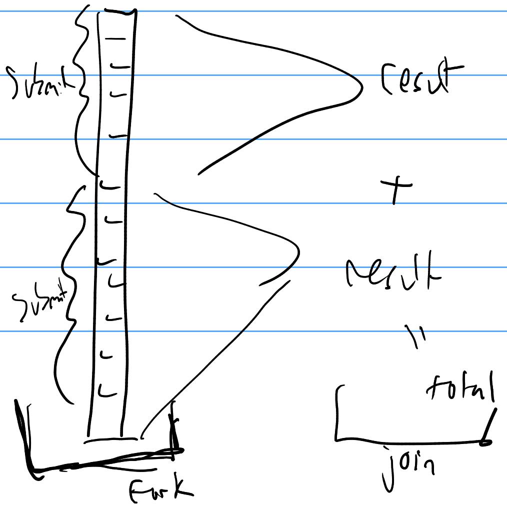
Futures abstraction built on top of thread pool





fork/join

Divide + Conquer



submit
submit
result
+
result
=
total
join
fork