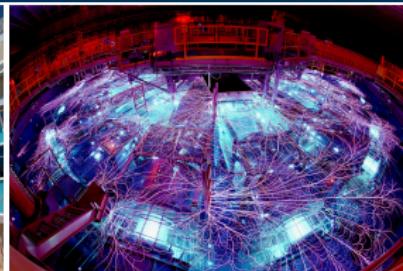


Exceptional service in the national interest



SAND2016-7280PE



Qthreads for Chapel

George Stelle

7/26/16

What is qthreads?

C library for creating and scheduling userspace threads

How does Chapel use qthreads?

begin, cobegin
forall, coforall
sync variables, sync statements
reductions

Features

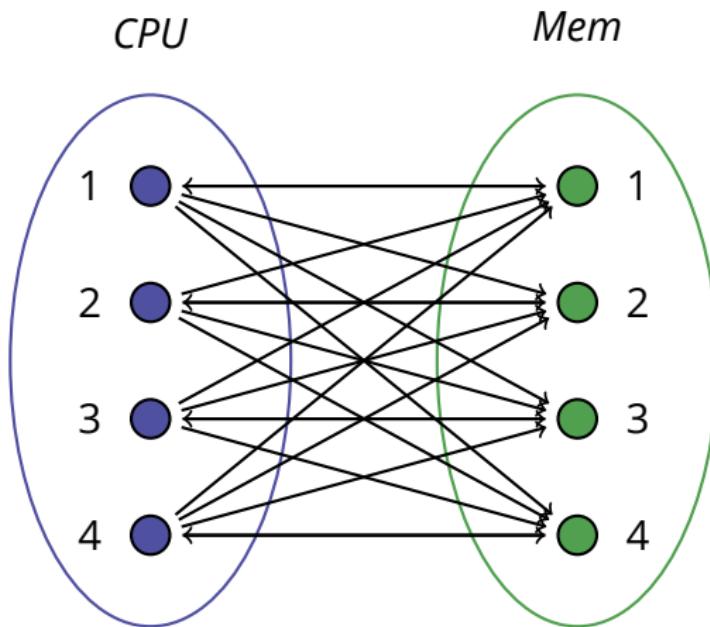
- Load balancing
- Hardware-aware
- full/empty-bit (FEB) semantics

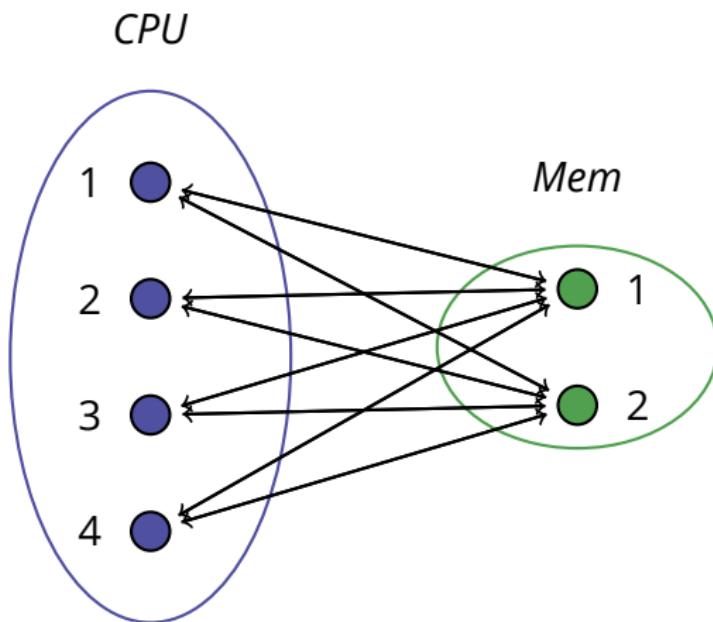


Scheduler Semantics

- No preemption
- No guarantee of ordering (necessarily)
- Multiple options (nemesis, sherwood)

Nemesis





Advantages

- Nemesis
 - Low contention
 - `pthread_cond_wait`
- Sherwood
 - Load balancing
 - Locality aware

distrib scheduler

- Low/adjustable contention ✓
- `pthread_cond_wait` ✓
- Load balancing ✓
- Locality aware ✗
- Cost of features : <≈ 20%

Conclusion

Managing thread pools is *tricky*