Threads and Cores

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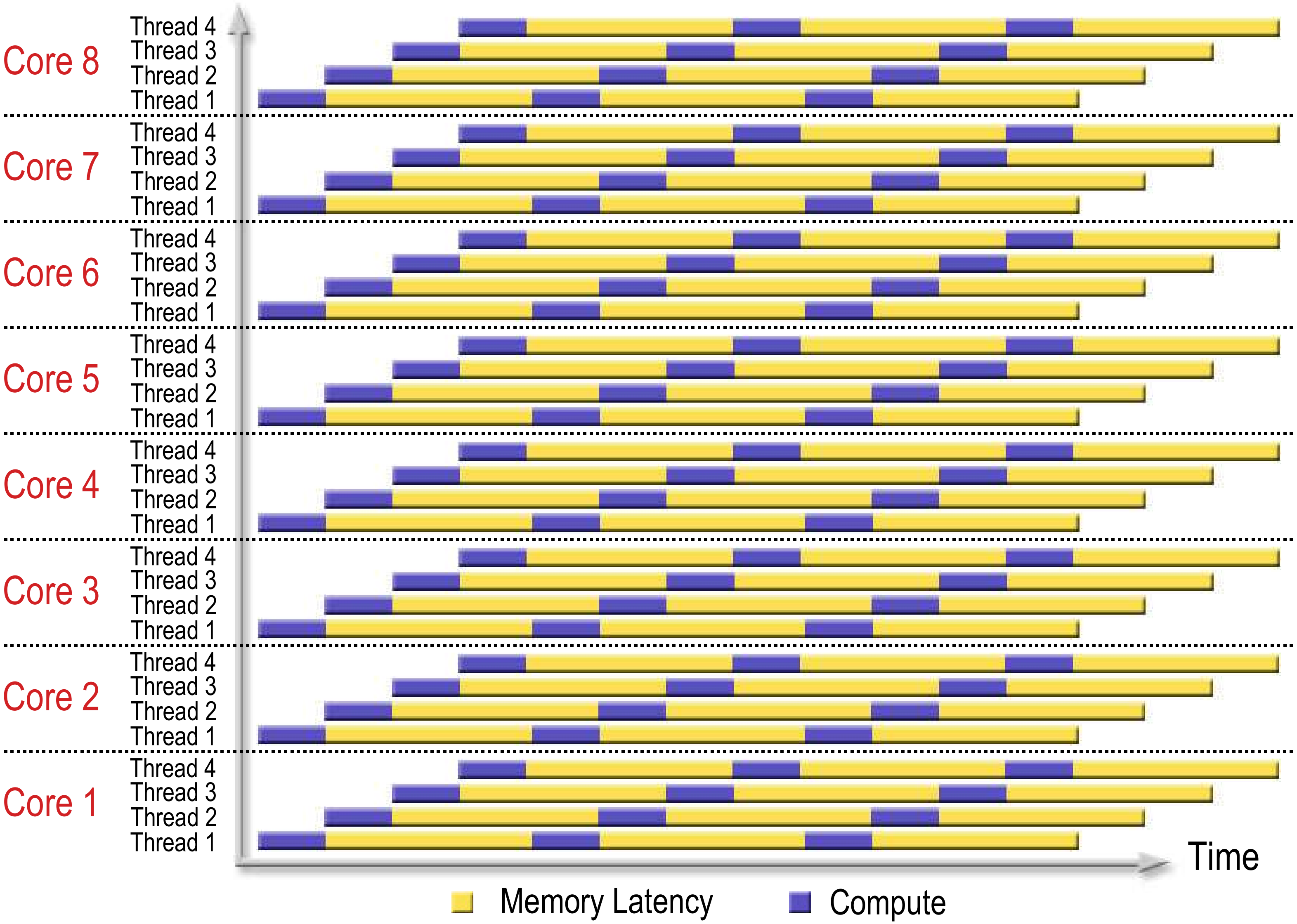
Niagara – 32 threads



Servers

- Tons of threads available
  - > Multi-threaded is also multi-process
- Examples
  - > J2EE based application server
    - > Already scales to tens of threads today
  - > Large database
    - > Easily scales to tens of threads today
  - > ECAD
    - > 100k jobs per day in our server ranch
  - > Searches
    - > Billions of threads/processes

Single Application

- MAJC started in 1995
  - Dual core, running Java, lots of “compute”
  - Multithreaded program “will be there”
  - Not so on the desktop -> speculative multithreading (Space Time Computing)
- Current simulator for high-end Sparc CMT which has tens of threads
  - Written in Java
  - Cores are instantiated
  - Not multithreaded yet!

Opportunities

- Communication latency is much better
  - From 300-500 cycles (off-chip), to single digit (in core) to 20-25 (on-chip)
  - Economics of parallelizing, amortizing thread creation are greatly improved
  - Scalability is much better
  - Software bottlenecks are exposed!

Opportunities

- Synchronization
  - > Lots of work on transactional memory, lock elision, etc.
  - > Great for
    - > JVM
    - > Thread-safe (too safe) libraries
    - > Kernel
    - > Multi-threaded programs
  - > Also great for thread-level speculation
    - > Space Time Computing relied on tight atomics between on-chip cores...

Conclusion

- We have to help programmers
  - > Language
  - > Transactional memory
  - > Automatic parallelization
  - > Speculative multithreading