



Qthreads and On-Node Run time Coordination



Stephen Olivier and Ron Brightwell
Center for Computing Research

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Qthreads Objectives and Outcomes

Qthreads: user-level library for lightweight on-node multithreading

- Be efficient for both analytics and computational science
- Be a vehicle for run time system research
 - Enable **co-design** across the system stack
 - Use modularity for flexibility, extensibility
 - Support higher level programming models, e.g., **Kokkos**
 - Interfaces to inter-node technologies (MPI, Portals, distributed AMT)
- Improve understanding of system and application behavior
- Impact deployed run time system technologies
 - Develop solutions to unsolved problems in adaptive run time systems
 - **Engage with industry** because our resources are limited
 - Vendors apply our techniques to their implementations, e.g., **OpenMP**
 - In **Chapel** language, our run time serves as Cray's on-node tasking layer

Node Resource Management

- Sandia's ATDM software stack is component-based
 - Kokkos for on-node performance portability
 - Darma for distributed asynchronous tasking
 - Data warehouse for app coupling with I/O and visualization
- Need tracking & arbitration of node resources between them
 - Cores/threads for execution
 - Memory (including DDR and HBM)
 - Network resources (research area)
- Creating a prototype in support of ATDM use case
 - Building on hwloc where possible
- Open to contributing to shared effort in this area
 - Unglamorous but necessary work