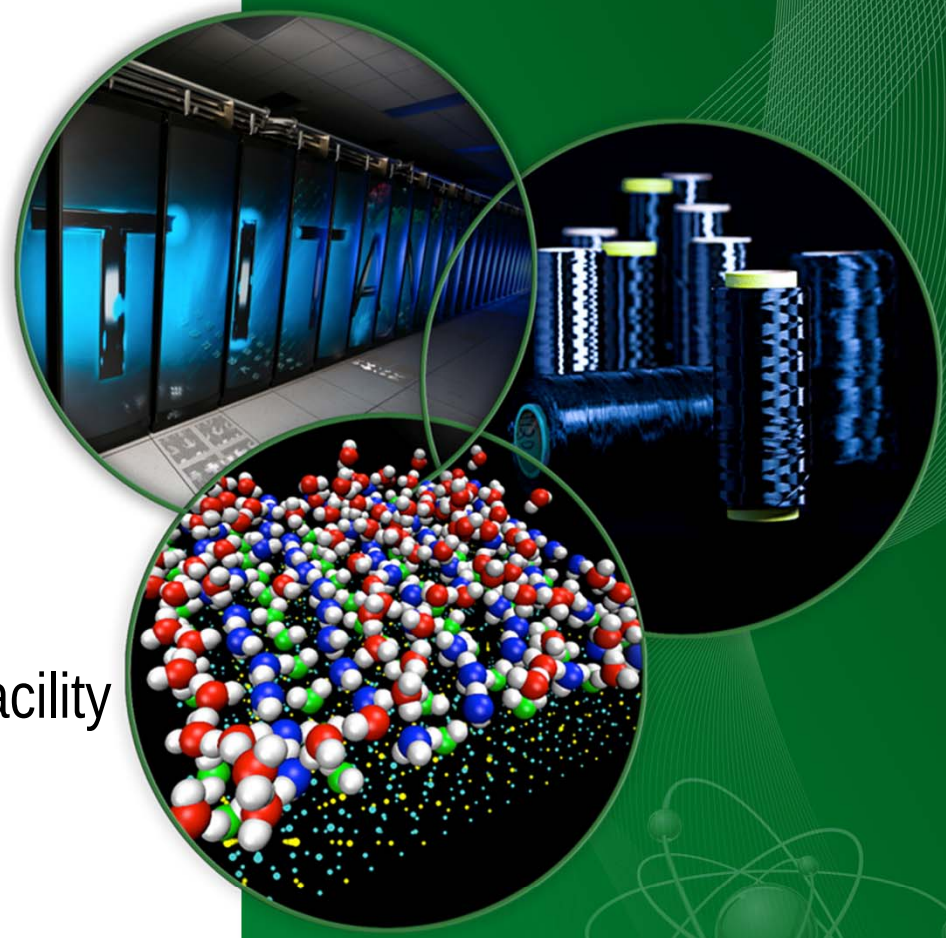
The OLCF Looking Forward: What's Next After Titan



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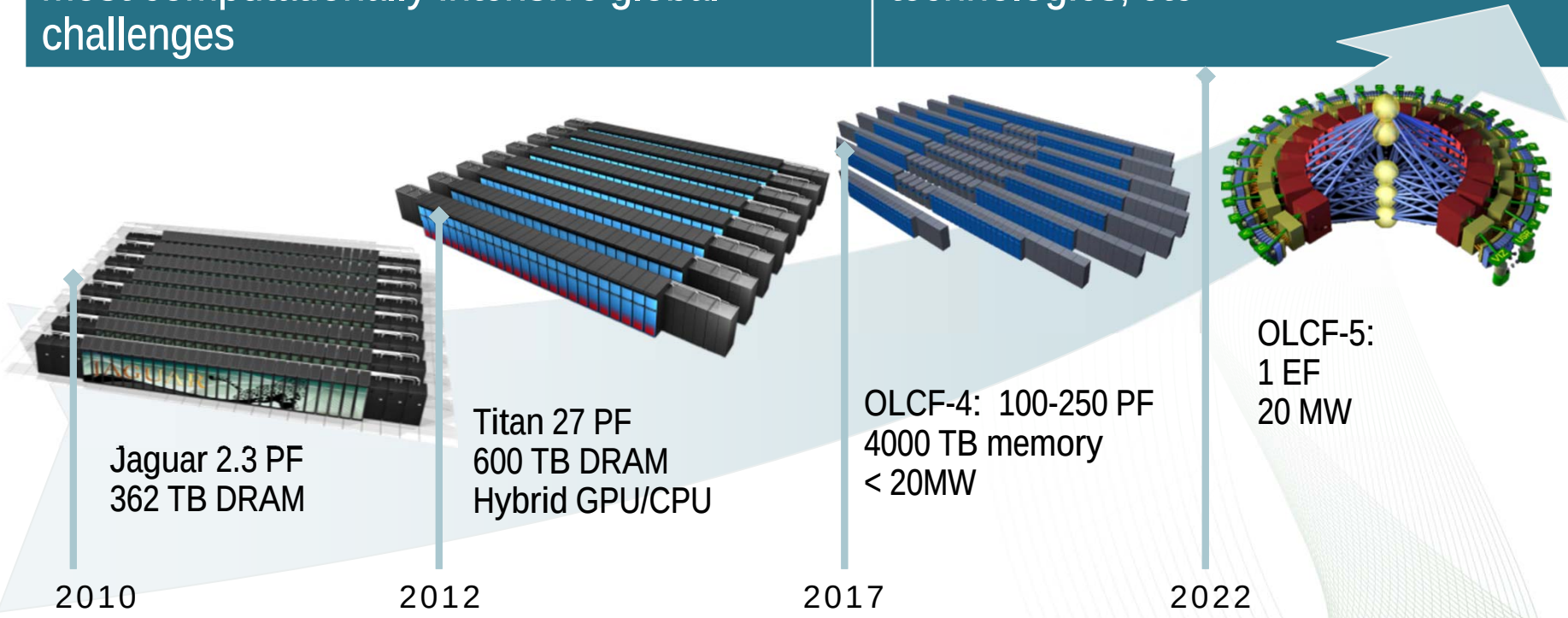
2014 OLCF User Group Meeting
Oak Ridge
24 July 2014

ORNL is managed by UT-Battelle
for the US Department of Energy

OAK RIDGE National Laboratory | OAK RIDGE LEADERSHIP COMPUTING FACILITY

Our Science requires that we advance computational capability 1000x over the next decade.

Mission:	Vision:
Providing world-class computational resources and specialized services for the most computationally intensive global challenges	Deliver transforming discoveries in climate, materials, biology, energy technologies, etc



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Leadership Computing Mission Need for 150 PF to 400 PF Capability System in 2017-2018

DOE Mission Need Statement was approved 12/2012 and revised in 7/2013:

- 150-400 PF Capability System with delivery in 2017-2018
  - Capability will be divided between two Oak Ridge and Argonne Leadership Computing Facilities
  - Architectural Diversity among the LCF systems is required

LCF's next systems, OLCF-4 & ALCF-3 are being procured through CORAL

- CORAL: Collaboration of Oak Ridge, Argonne, Livermore
- Created to jointly acquire leadership computing systems for DOE's National Nuclear Security Administration (NNSA) and Office of Science (SC)
- Formed on the basis of common acquisition timings
- Offers a "win-win":
  - Reduces number of RFPs for vendors
  - Allows pooling of R&D funds
  - Supports sharing of technical expertise among labs
  - Strengthens SC/NNSA alliance for exascale

CORAL procurement: Execution process

- February 18, 2014: Vendor proposals submitted
- Proposals were evaluated in a 2 step process
  - 8 teams of technical experts assessed responsiveness to Draft Statement of Work and proposal instructions
  - Buying team selected 2 proposals providing best value
- Announcement of results will be made once contracts have been negotiated
- Each system is expected to deliver 100–200 PF

Technical team focus areas
• Project management
• System hardware
• System software
• System performance
• Programming environment
• File system
• Facilities and operations
• NRE

CORAL Procurement Model

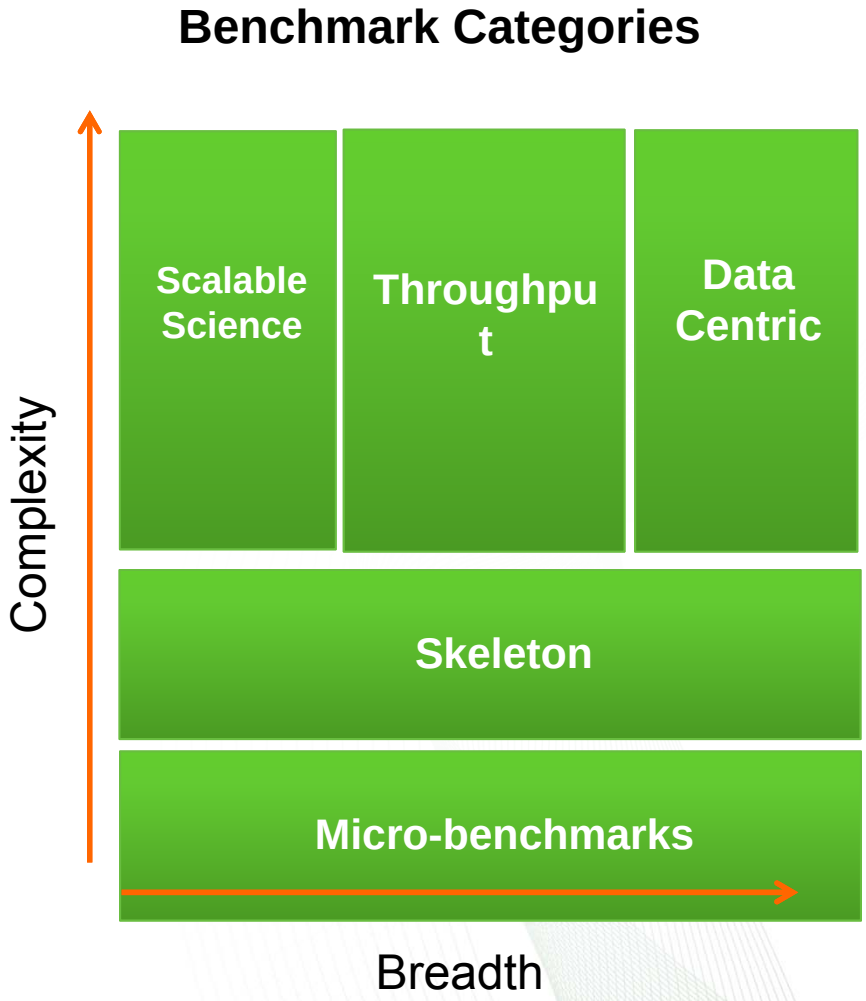
Two Diverse Architecture Paths

High Level System Targets

- Target speedup over current systems of 4x on Scalable benchmarks and 6x on Throughput benchmarks
- Peak Performance ≥ 100 PF
- Aggregate memory of 4 PB and ≥ 1 GB per MPI task (2 GB preferred)
- Maximum power consumption of system and peripherals ≤ 20MW
- Mean Time Between Application Failure that requires human intervention ≥ 6 days
- Data centric capabilities

CORAL benchmark categories represent DOE workloads and technical requirements

- Scalable science benchmarks
  - Expected to run at full scale on systems
- Throughput benchmarks
  - Represent large ensemble runs
- Data centric benchmarks
  - Represent emerging data intensive workloads
  - Integer operations, instruction throughput, indirect addressing
- Skeleton benchmarks
  - Investigate network performance, threading overheads, I/O, memory, memory hierarchies, system software, and programming models
- Micro benchmarks
  - Small code fragments that represent expensive compute portions of some of the scalable science and throughput applications



CORAL benchmarking suite uses mini-apps and a few larger applications

Categories	Scalable Science	Throughput	Data Centric	Skeleton
Marquee (TR-1)	LSMS QBOX NEKbone HACC	CAM-SE UMT2013 AMG2013 MCB	Graph500 Int sort Hashing	CLOMP IOR CORAL MPI Memory CORAL loops
Elective (TR-2)		QMCPACK NAMD LULESH SNAP miniFE	SPECint_ peak2006	Pynamic HACC I/O FTQ XSBench miniMADNESS
Elective Micro-Benchmarks (TR-3)	NEKbonemk HACCmk	UMTmk AMDmk MILCmk GFMCmk		

More information on CORAL

https://asc.llnl.gov/CORAL

- Provides all documents for the bidders

https://asc.llnl.gov/CORAL-benchmarks/

- Provides all information on the benchmark codes

Questions?

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