

# CADES

Compute & Data Environment for Science

## **ALICE T2 ORNL CADES Site**

Kenneth Read, Galen Shipman, Pete Eby (ORNL)  
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# T2 Compute and Storage

- CADES will provide
  - High performance compute cores (Intel Xeon or equivalent)
  - Storage and compute network backplane at 10Gbe or greater
  - High performance block storage
  - High performance WAN connectivity via ESNet
- T2 service delivery will be integrated within CADES
  - VO-Box images will be provisioned on **dedicated** ALICE compute and storage nodes via OpenStack bare metal provisioning
  - Block storage will be presented to the VO-Box images via SAS (high performance, low overhead protocols)
  - Integration in CADES will allow elastic compute and storage in the future while reducing administrative costs today
- Integration of OLCF resources within CADES provides exciting future opportunities

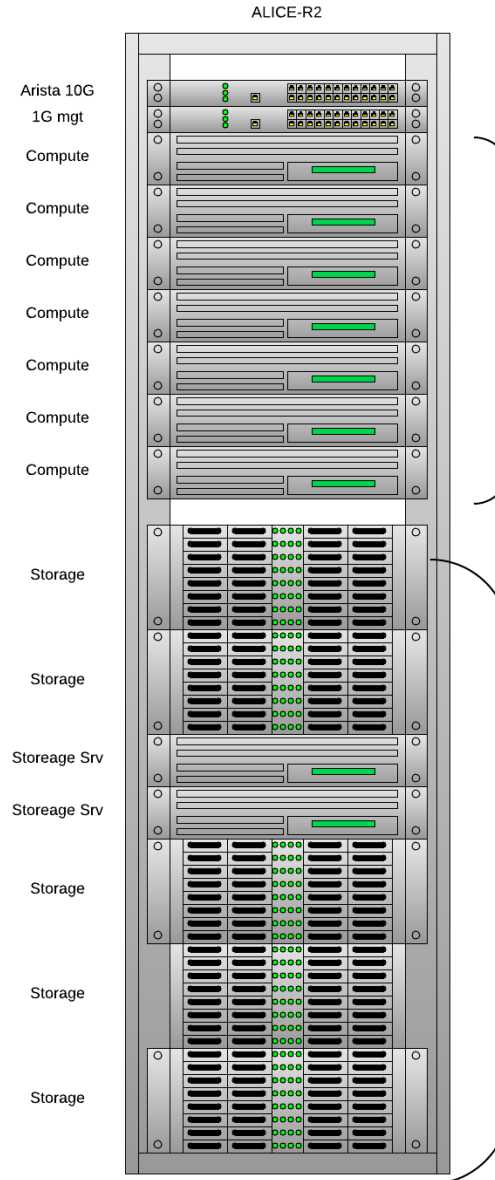
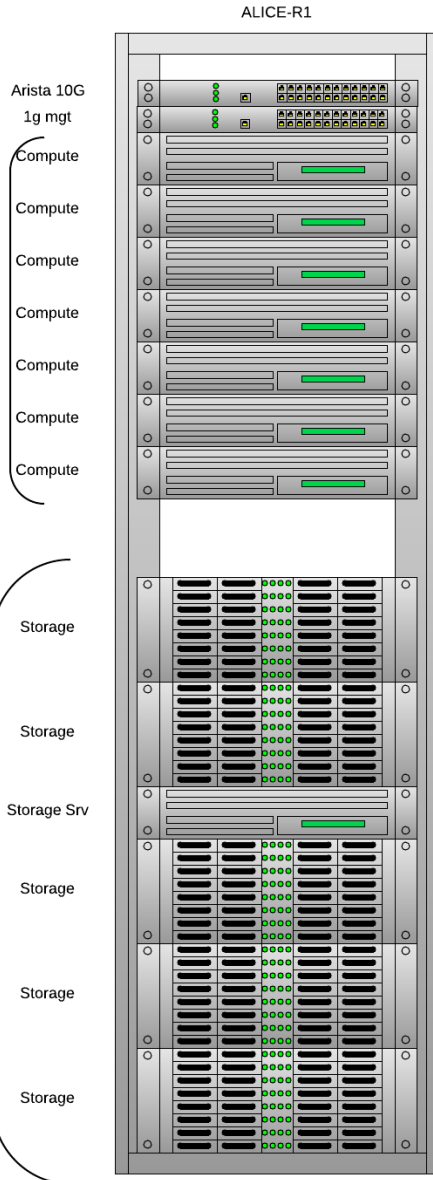
# T2 Compute details

- We plan to use the same compute platform that we have deployed for many other CADES users providing economies of scale in managing the infrastructure
- Dell C6620 Quad Node Servers
  - 14 4U C6620s, 56 compute nodes
  - Provides 896 cores for compute (17.92 kHS06 min) – *Or better*
  - Dual socket 8 core Intel Xeon E5-2640v2 2.0GHz - *Or better*
  - 64GB total, 4GB per core (8 x 8GB RDIMM, 1600MT/s) - *Or better*
  - Dual 1TB local drives
  - 10Gbit Ethernet connectivity for compute/data, 1Gbit management network

# T2 Storage details

- We plan to use similar storage infrastructure that we have deployed for many other CADES users providing economies of scale in managing the infrastructure
- Sanmina Storage JBODS
  - 10 - 60 Bay storage JBODS
  - 3 Terabyte Enterprise SAS 7.2K drives
  - Provides 1.8 Petabytes raw, 1.44PB usable assuming 80% or raw
  - SAS connectivity – 1x SAS IO module with 4x x4 (24 Gbps) ports
  - 10 Storage server nodes total – each direct connected to the storage
  - Server node hardware configuration same as compute

# T2 Rack layout



# T2 CADES floor space diagram

- ORNL T2 site will leverage significant investments at ORNL
  - 65,000 square feet of datacenter space
  - 40 Megawatts of power, 6K tons of cooling (after latest upgrade)
  - Connectivity to major research networks (ESNet 100G, Internet2 100G, XSEDEnet 10G)
  - Significant expertise across ORNL in delivering similar solutions
- Allows ease of expansion over time
- Provides potential for ALICE workloads to elastically scale to other CADES compute and storage resources

*CADES New home in Magenta, ALICE system will reside in highlighted area*



ORNL CACS - Cold Aisle Containment System



# T2 Other Details

- ORNL cybersecurity considerations all appear OK. All necessary ports already specified and will be open. Ports are already open for the VO Box.
- ORNL will be prepared to sign an acceptable standard T2 MOU, including turn-around responsiveness and quality-of-service. ORNL already has service level agreements with a variety of third parties.
- VO Box presently online. Could further arrange small storage demonstration when desired/convenient.

# T2 Costs

	FY15	FY16	FY17
CPU (\$k/kHS06)	21	20	19
CPU change (+kHS06)	+18.0	0	0
CPU costs (\$M)	0.40	0	0
Disk (\$M/PB)	0.28	0.27	0.20
Disk change (+PB)	+0.6	+0.4	+0.4
Disk costs (\$M)	0.18	0.11	0.10
FTE (\$M)	0.31	0.315	0.32
Operations (\$M)	0.20	0.205	0.21
CADES Total (\$M)	0.780	0.315	0.310