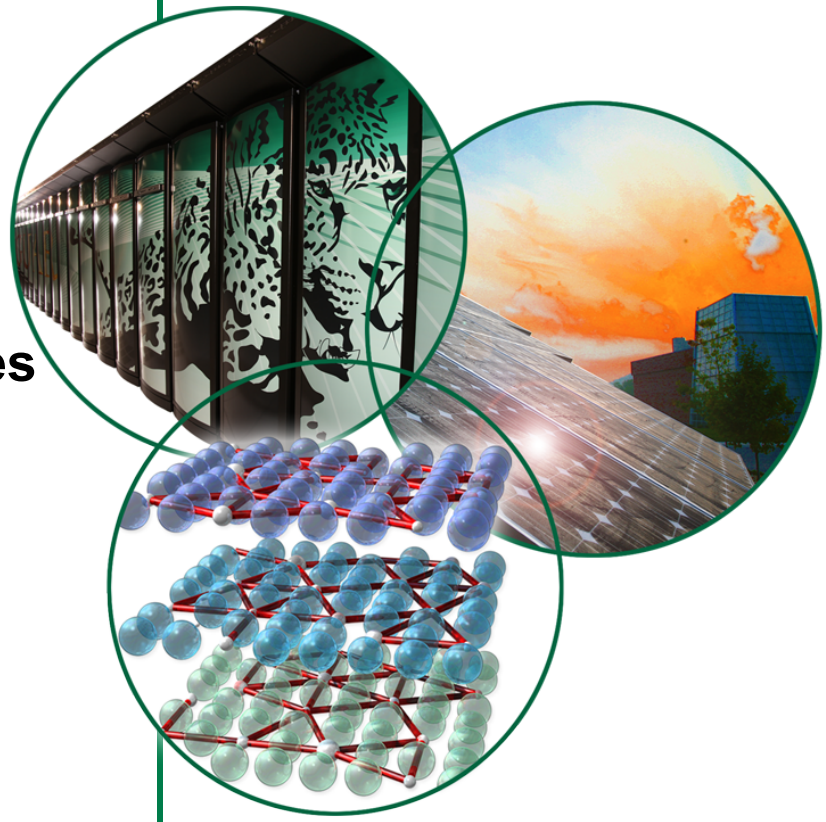
National Lab Day in Mississippi

DOE Office of Science

Compute and Neutron Science Facilities

Jeff Nichols
Associate Laboratory Director
Computing and Computational Sciences

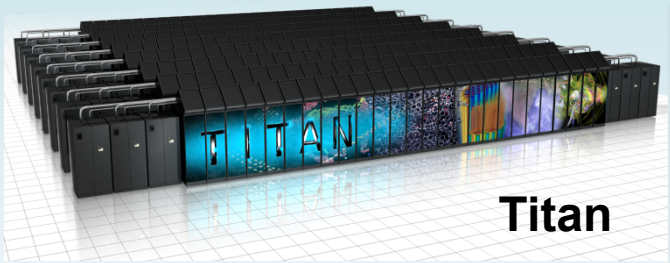


National Lab Day in Mississippi
November 8, 2012

U.S. DEPARTMENT OF ENERGY

OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

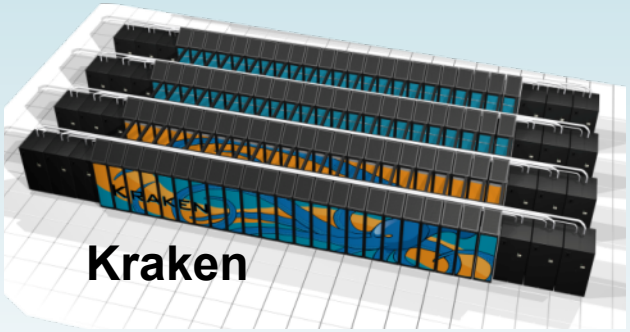
The National Center for Computational Sciences is one of the world's most powerful computing facilities



Titan

Peak performance	20+ PF/s
Memory	710 TB
Disk bandwidth	240 GB/s
Square feet	5,000
Power	8.8 MW

Data Storage
- Spider File System
  - 10 PB capacity
  - 240 GB/s bandwidth
- HPSS Archive
  - 240 PB capacity
  - 5 Tape libraries

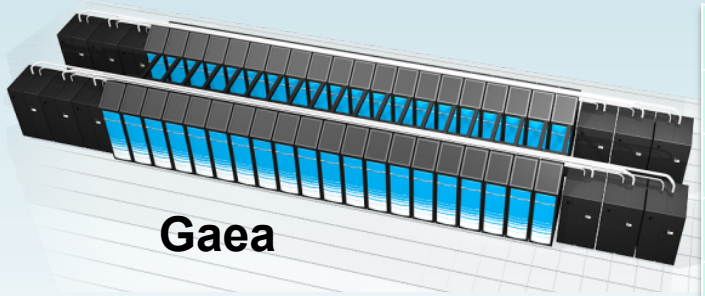


Kraken

Peak performance	1.17 PF/s
Memory	147 TB
Disk bandwidth	> 50 GB/s
Square feet	2,300
Power	3.5 MW

Data Analytics & Visualization

- LENS cluster
- Ewok cluster
- EVEREST facility
- uRiKA data appliance


Gaea

Peak Performance	1.1 PF/s
Memory	240 TB
Disk Bandwidth	104 GB/s
Square feet	1,600
Power	2.2 MW

Networks
- ESnet – 100 Gbps
- Internet2 – 10 Gbps
- XSEDEnet – 10 Gbps
- Private dark fibre

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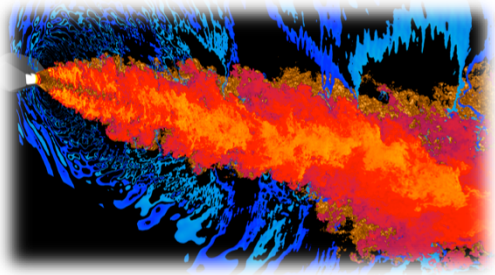
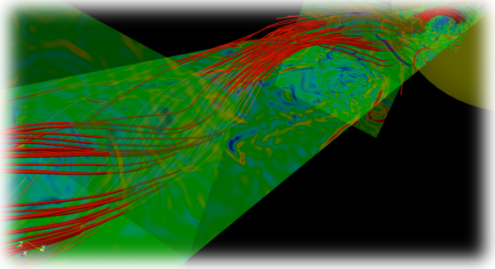
Argonne **Leadership Computing** Facility

Overview



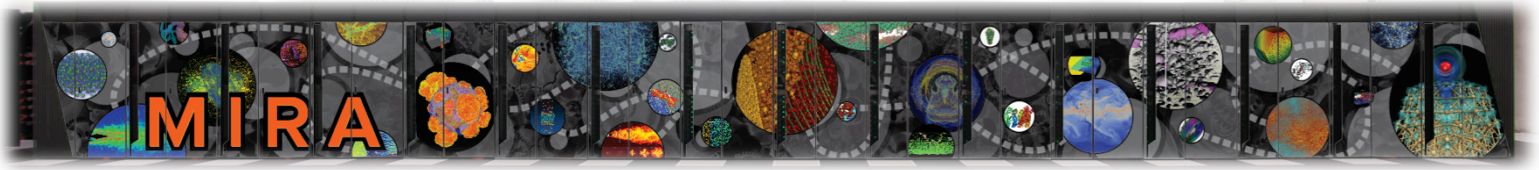
- Currently
  - 557 TF Intrepid IBM BG/P
    - 40 racks, 160K cores
    - 7.5 PB storage
  - 100 TF (SP) Eureka Analysis Cluster

- Production 2013
  - 10 PF Mira IBM BG/Q
    - 48 racks, 786K cores
    - 35 PB storage
  - 100 TF (DP) Tukey Analysis Cluster



- All 16 early sciences projects on Mira

Argonne NATIONAL LABORATORY



Current NERSC Systems

Large-Scale Computing Systems

Hopper (NERSC-6): Cray XE6

- 6,384 compute nodes, 153,216 cores
- 144 Tflop/s on applications; 1.3 Pflop/s peak

Edison (NERSC-7): Cray Cascade

- To be delivered in 2013
- Over 200 Tflop/s on applications, 2 Pflop/s peak

Midrange

140 Tflops total

Carver

- IBM iDataplex cluster
- 9884 cores; 106TF

PDSF (HEP/NP)

- ~1K core cluster

GenePool (JGI)

- ~5K core cluster
- 2.1 PB Isilon File System

NERSC Global Filesystem (NGF)

Uses IBM's GPFS

- 8.5 PB capacity
- 15GB/s of bandwidth

HPSS Archival Storage

- 240 PB capacity
- 5 Tape libraries
- 200 TB disk cache

Analytics & Testbeds

Euclid

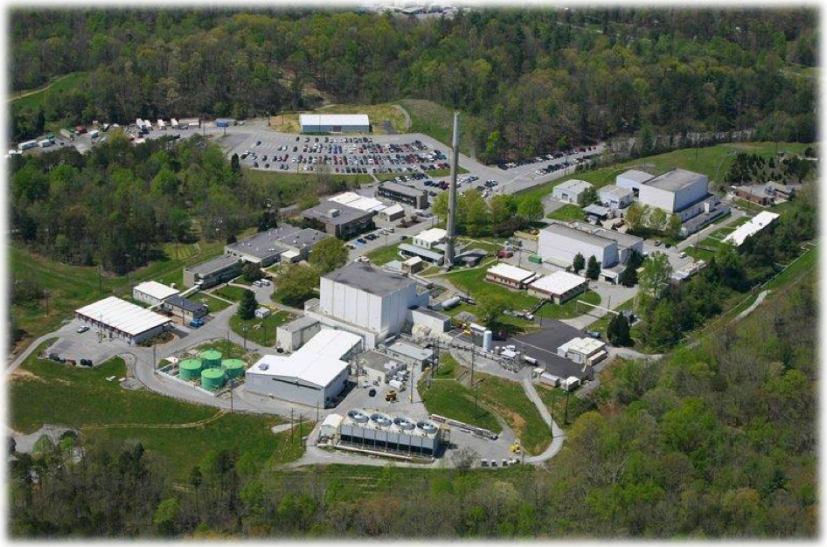
(512 GB shared memory)

Dirac 48 Fermi GPU nodes

Magellan Hadoop

ORNL's neutron sources are key tools for energy research and development

High Flux Isotope Reactor:
Intense steady-state neutron flux
and a high-brightness cold neutron source



Spallation Neutron Source:
World's most powerful pulsed
accelerator-based neutron source

Facilities have unique capabilities spanning physics, chemistry, biology, and materials science

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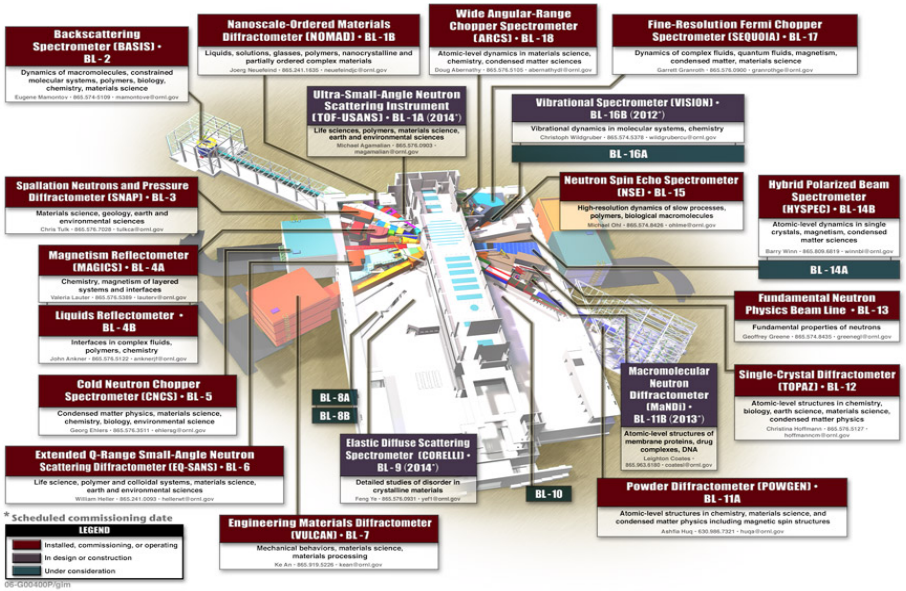
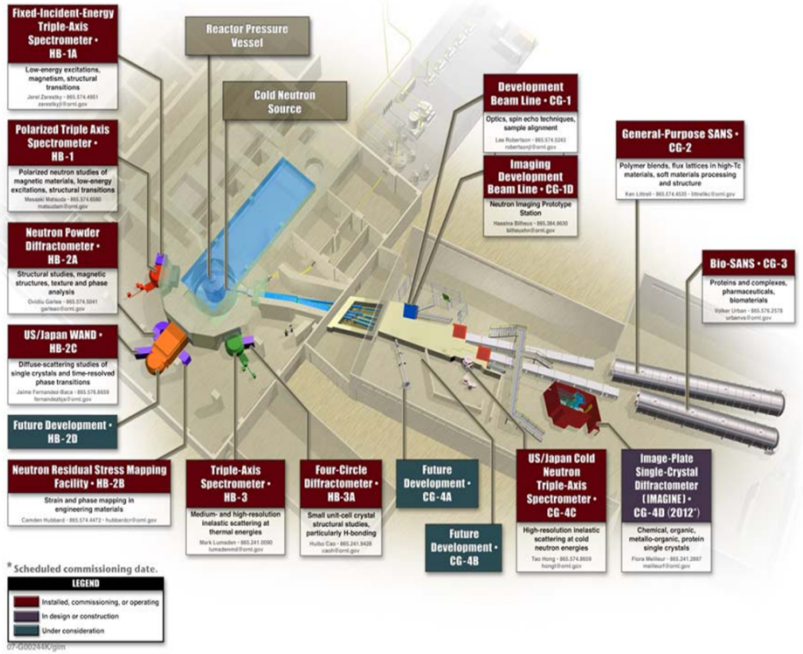
Twenty-six instruments available to support a range of scientific fields





Additional capacity exists for expansion

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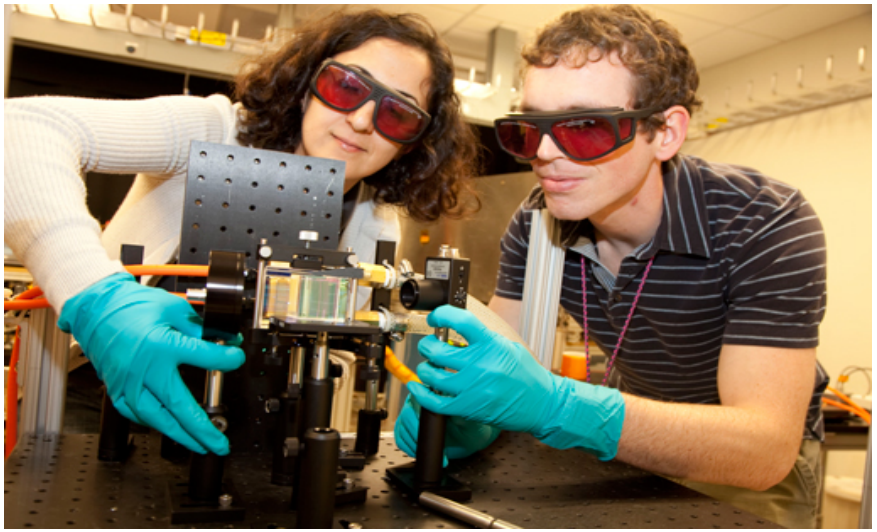
ORNL's neutron scattering facilities are DOE User Facilities

- DOE User Facilities are funded by DOE to serve U.S. and international scientific community
- Access to ORNL User Facilities is through the review and approval of User proposals



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