Argonne NATIONAL LABORATORY

... for a brighter future

ALCF

Argonne Leadership Computing Facility

U.S. Department of Energy

UChicago ▶ Argonne LLC

Office of Science U.S. DEPARTMENT OF ENERGY

A U.S. Department of Energy laboratory managed by UChicago Argonne, LLC

Argonne Leadership Computing Facility

Near Term Plans and Opportunities

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Argonne National Laboratory and
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Mission and Vision for the ALCF

Our Mission

Provide the computational science community with a world leading computing capability dedicated to breakthrough science and engineering.

Our Vision

A world center for computation driven scientific discovery that has:

- outstandingly talented people,
- the best collaborations with computer science and applied mathematics,
- the most capable and interesting computers and,
- a true spirit of adventure.

See http://www.alcf.anl.gov/ for info and openings

ALCF Timeline

2004

- Formed of the Blue Gene Consortium with IBM
- Argonne - ORNL - PNNL partnership awarded Leadership Computing Facility

2005

- Installed 5 teraflops Blue Gene/L for evaluation

2006

- Began production support of 6 INCITE projects, with BGW
- Continued code development and evaluation

2007

- Increased to 9 INCITE projects; continue development projects
- Install 100 teraflops next gen. Blue Gene system (late 2007)

2008

- Begin support of INCITE projects on next gen. Blue Gene
- Add 250-500T teraflops Blue Gene system

The Blue Gene Family of Computers

- Puts processors + memory + network interfaces on same chip.
- Achieves good compute-communications balance.

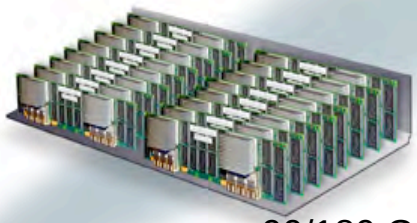
System
64 Racks, 64x32x32

180/360 TF/s
32 TB

Rack
32 Node Cards

2.8/5.6 TF/s
512 GB

Node Card
(32 chips 4x4x2)
16 compute, 0-2 IO cards



90/180 GF/s
16 GB

Compute Card
2 chips, 1x2x1

5.6/11.2 GF/s
1.0 GB

Chip
2 processors

2.8/5.6 GF/s
4 MB

- High packaging density.
- Low system power requirements.
- Low cost per flops.

Record 280TF Linpack benchmark on 64K node BG/L at LLNL

Blue Gene Programming Environment

- Fortran, C, C++ with MPI
- Compute Node OS:
  very small, selected services, I/O forwarding
- Space sharing - one parallel job (user) per partition of machine, one process per processor of compute node
- Single executable image is replicated on each node
- Virtual memory limited to physical memory

Blue Gene/P Node Card Prototype
32 Compute Processors
2 I/O Processors
2 10-Gb/s Ethernet Ports

U.S. Department of Energy

Office of Science

Since 2004

INCITE

Innovative and Novel Computational Impact on Theory and Experiment

- Solicits large computationally intensive research projects
  - to enable high-impact scientific advances
- Open to all scientific researchers and organizations
- Provides large computer time & data storage allocations
  - to a small number of projects for 1-3 years

INCITE Project Proposals

- **Scientific Discipline Peer Review**
  - Scientific quality
  - Proposed impact of the science
  - Ability of the PI and team
  - Computational plan
  - Relation to the Office of Science mission-related research
- **Computational Readiness Review**
  - Reasonableness and appropriateness of resource request
  - Appropriateness of approach
  - Technical readiness - has code run at scale on target system?
  - Progress in previous year (for renewals)
- **Nonproprietary Research**
  - Must sign user agreement (non-negotiable)
- **Proprietary Research is permitted**
  - Full cost recovery; user agreement required; data protection considerations

INCITE 2008

- **Call for proposals issued May 16**
  - **Proposals due August 8**
  - **See http://hpc.science.doe.gov**

- **Spans 250M hours of computing at**

Argonne	IBM Blue Gene	www.alcf.anl.gov
ORNL	Cray X1e and XT4	www.nccs.gov
NERSC/LBNL	Opteron Cluster, SGI Altix, IBM Power 3+5	www.nersc.gov
PNNL	HP-MPP	mscf.emsl.pnl.gov

- For guidance on submitting a proposal, contact
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