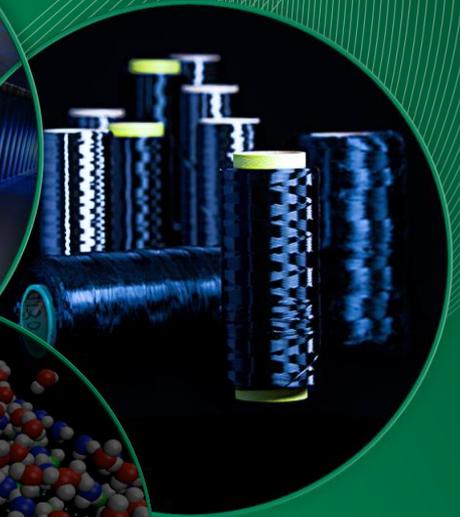


Accelerating Competitiveness for Computational Excellence

Industrial HPC
Partnership Program

Oak Ridge National Laboratory

Suzy Tichenor
Director, Industrial Partnerships
Computing and Computational
Sciences Directorate



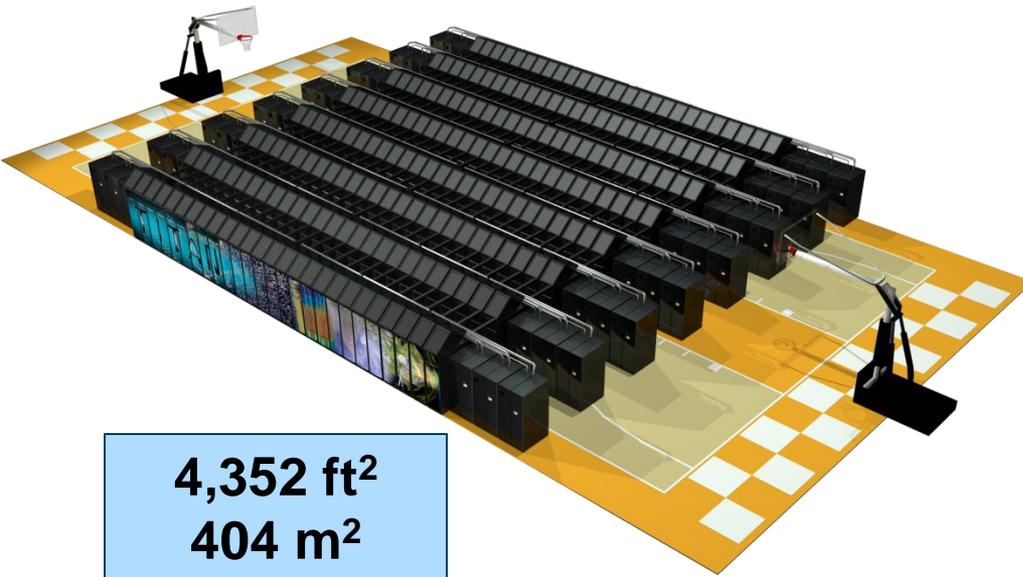


Oak Ridge Leadership Computing Facility

Who we are

ORNL's "Titan" Hybrid System: Nation's Most Powerful Computer for Open Science

#2 **TOP 500**[®]
SUPERCOMPUTER SITES



4,352 ft²
404 m²

SYSTEM SPECIFICATIONS:

- Peak performance of 27.1 PF
 - 24.5 GPU + 2.6 CPU
- 18,688 Compute Nodes each with:
 - 16-Core **AMD Opteron** CPU
 - **NVIDIA Tesla** "K20x" GPU
 - 32 + 6 GB memory
- 512 Service and I/O nodes
- 200 Cabinets
- 710 TB total system memory
- Cray Gemini 3D Torus Interconnect
- 8.9 MW peak power

Roadmap to Exascale

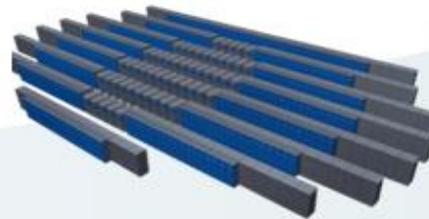
Our Science requires that we advance computational capability 1000x over the next decade.

2012



Titan 27 PF
600 TB DRAM
Hybrid GPU/CPU

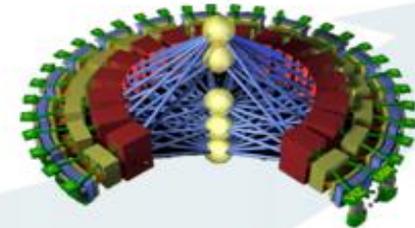
2017



OLCF-4: 100-250 PF
4000 TB memory



2022



OLCF-5: 1 EF
20 MW

What are the
Challenges?



Industrial HPC Partnership Program

Why do we have one?

It's a triple win!

For ORNL



For Industry



For the Country

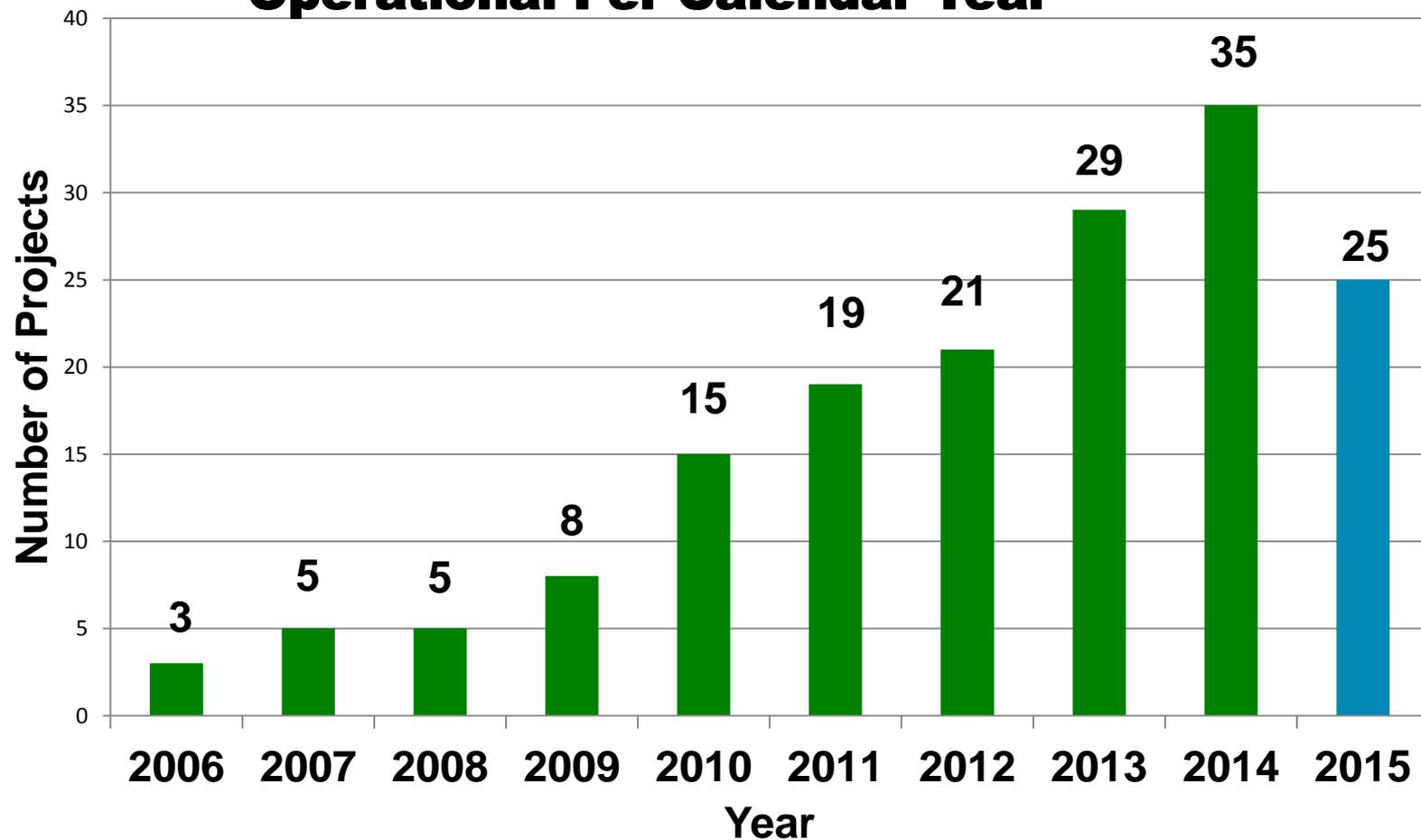




Industrial HPC Partnership Program

Some Program Statistics

Number of OLCF Industry Projects Operational Per Calendar Year



Who's Been Working With Us?



Bringing energy and the environment into harmony.®



Some ACCEL Successes



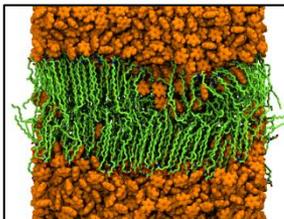
- Launching our program
- Launching a new industry user agreement
 - Permits a blend of proprietary and non proprietary output.
 - User must agree to still publish meaningful science results but the proprietary data remains confidential.
 - Particularly helpful for small businesses but large firms are using it for high impact projects they can't solve but would not have run externally before this was available.
- Companies are gaining experience through DD and competing successfully for ALCC and INCITE
- Companies are expanding their internal HPC investments after using OLCF

Innovation through Industrial Partnerships



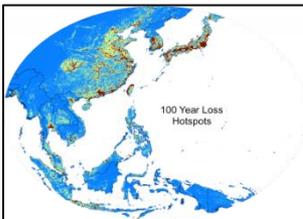
Human skin barrier

Demonstrated small molecules can have large and varying impact on skin permeability depending on their molecular characteristics—important for product efficacy and safety



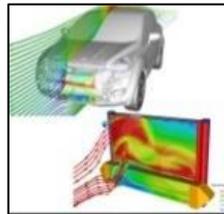
Global flood maps

Developed fluvial and pluvial high resolution global flood maps to enable insurance firms to better price risk and reduce loss of life and property



Underhood cooling

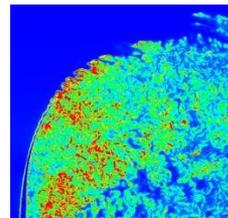
Developed a new, efficient and automatic analytical cooling package optimization process leading to one of a kind design optimization of cooling systems



United Technologies Research Center

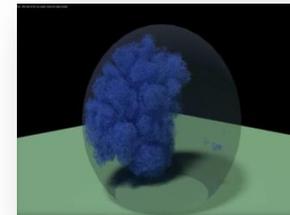
Jet engine efficiency

Accurate predictions of atomization of liquid fuel by aerodynamic forces enhance combustion stability, improve efficiency, and reduce emissions



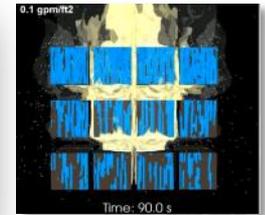
Wind turbine resilience

First time simulation of ice formation within million-molecule water droplets is expanding understanding of freezing at the molecular level to enhance wind turbine resilience in cold climates



Industrial fire suppression

Developing high-fidelity modeling capability for fire growth and suppression; fire losses account for 30% of U.S. property loss costs



Some Challenges to Growing the Program

- Outreach (no marketing budget, hard to find small and medium sized firms who may need access).
- Industry often requires additional support from our user assistance team or our scientific computing group.
- Business timetable not always aligned with ours and can “stress” the system when speedy access is requested.