



Lawrence Berkeley  
National Laboratory



# HPCOR 2014

Visualization/In-situ Analysis

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# Top Findings

User involvement from inception is CRITICAL

## Opportunities

- Computational Steering
- Connecting experiments to simulations
- High Fidelity Analysis

## Best Practices

- Domain science involvement
- Ability to explore data
- Design for end-users
- Light-weight in resource usage

## Challenges

- Research Challenges (special-purpose, memory constraint)
- Adapting frameworks and middleware
- API for interfacing with simulations

# What are your major strategies and initiatives over the next 5 & 10 years? How do they affect staffing levels?

- Multi-Lab, Office of Science, NNSA
  - Extreme Scale Initiatives (SDAV, etc) projects are important drivers
    - Data Movement
    - Data Reduction
  - 'Big Data' initiatives
- Statistics integration
- Novel Hardware (Burst Buffers)
- UQ
- Dedicated in-transit resources are important
- Procurement strategies with attention to analysis needs

# What are your current efforts and/or site configuration in this area?

- SDAV effort
- Sandia, LANL long-term efforts
  - Catalyst integrated with Sierra simulation code and xRAGE
  - Libsim used by LLNL users
  - Pre-production phase
- Burst Buffers are being procured at the moment

# What are your constraints?

- Different needs for HPC, analysis and vis
  - “vis subsystem”
  - How does vis interact with rest of the machine
  - Burst buffer for vis and analysis
- Filesystem I/O performance not keeping pace with compute and memory
- Useful to have a high availability system

# How to do you forecast future needs and requirements?

- DOE workshops (domain science needs)
  - Mine such reports for forecasts
- Domain user input
- Upcoming architectural constraints and opportunities

# What opportunities exist for productive collaborations among DOE HPC centers?

- Joint procurements
  - Trinity/N8
  - Burst buffers: use cases
- SDAV
  - vtk-m collaboration
- NNSA joint work
- Opportunities for collaboration:
  - Lack of 'Big Data' benchmarks
  - Better co-ordination/dissemination of results
  - Better leverage from industry

# What are the biggest challenges and gaps between what you can do today and what will be required in 5 - 10 years?

- Effective mechanisms for coupling simulation and vis/analysis
  - Resource sharing constraints, dealt on a case by case basis
- Special purpose, domain specific tools
- Need for lightweight tools and libraries
- Adapt I/O frameworks and middleware for in-situ
- Loose-coupling vs. tight coupling
- API for interfacing with framework
  - Software engineering
- Co-Design
- Who is responsible for doing integration?
- Exascale hardware challenges
- Integration of in-situ with workflow technologies

## Describe some practices that you think are effective as well as lessons learned that would be helpful to other centers?

- Domain science involvement from beginning
  - Design for end-users and not CS specialists
- Interactive exploration of data is useful
- Need for lightweight resource utilization
- Automated testing