



U.S. DEPARTMENT OF
ENERGY

Office of
Science

Recovery Act Projects

-- Update --

ASCAC Meeting
August 23-24, 2011
Washington, DC

Vincent Dattoria
Advanced Scientific
Computing Research

ASCR's Recovery Act Projects (\$153.9M)

- Leadership Computing Facility Upgrades (\$19.9M) Six-core upgrade to Oak Ridge LCF machine to take the OLCF to ~2 Petaflops peak -- **COMPLETED**
- Advanced Networking Initiative (\$66.8M) 100Gbps optical networking demonstration prototype, research testbed, and tools
- Advanced Computer Architectures (\$5.2M) Research on next generation technologies
 - **P7 Board delivered; Planning underway for incorporating into OLCF**
- Magellan (\$32.8M) Research to demonstrate viability of cloud computing for mid-range computational science
- SciDAC-e (\$29.2M)
 - Supplement and leverage existing SciDAC investments to advance the high performance computational capabilities of the BES - Energy Frontier Research Centers (EFRCs)
 - Applied math research on electric grids
 - Post docs at NERSC, ALCF and OLCF

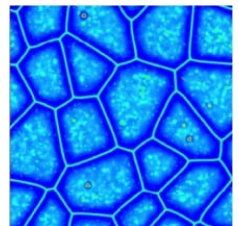
SciDAC-e

Progress since August 2010:

- Supplemental awards to SciDAC Centers and Institutes: to support BES Energy Frontier Research Centers (EFRCs) to develop a high-performance computing capability relevant to the goals of the EFRC
 - 14 projects awarded in FY2010
 - Interim reports due in August; reviews by ASCR and BES PMs
- Applied Math projects: to advanced the Department's goals for smart grid.
 - research ongoing and early research results reported
- Postdocs at ALCF, OLCF, and NERSC: to hire post-doctoral researchers for a ~24 month period to work on key areas supporting DOE's energy mission including energy-related research and ARRA funded projects EFRCs
 - 9 PDs hired at NERSC (goal: 8 PDs)
 - 1 completed the two-year term and has started a new job, number on board = 8
 - 7 PDs on board at OLCF (goal: 9 PDs)
 - 1 to start in August, 1 to start in September
 - 11 PDs on board at ALCF (goal: 10 PDs)

Next Steps:

- Joint ASCR-BES programmatic review of SciDAC-e by end of FY11



Reduced Measurement-space Dynamic State Estimation for Power Systems

Zhenyu Huang, Pacific Northwest National Laboratory

Jinghe Zhang, Greg Welch and Gary Bishop, University of North Carolina at Chapel Hill

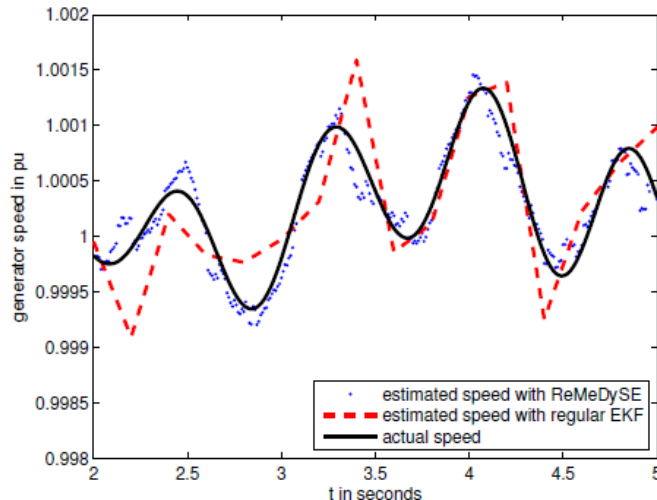
Objectives

- Improve the performance of dynamic state estimators in large-scale and wide-area interconnected power systems
- Dynamically analyze the uncertainties in the state space, and quantify the uncertainty reduction ability of each measurement
- Optimally select a much smaller subset of measurements during each estimation cycle

Impact

- Bring dynamic information into real-time computations to transform power grid operation
- Reduce the computational burden without sacrificing the tracking quality
- Suitable for real-time and massive calculations in any large-scale state tracking systems
- Employ modern parallel computation techniques for further improvements

Estimate generator rotor speed using ReMeDySE and regular Extended Kalman Filter



Accomplishments

- Developed a lightweight yet efficient estimation approach to capture the dynamic states in power systems
- Parallelized dynamic measurement selection procedure incorporates only the most critical measurements into computation, resulting in higher reporting rate and accuracy
- “Reduced Measurement-Space Dynamic State Estimation (ReMeDySE) for Power Systems.” IEEE Trondheim PowerTech 2011 (Trondheim, Norway), 19-23 June 2011



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Magellan Cloud Computing Testbed

- **Outreach activities and presentations**
 - Large Scale Networking and High End Computing working groups
 - National Reconnaissance Office
 - ScienceCloud and MoabCon workshops
- **Science use of Magellan resources**
 - NP – STAR project analysis jobs
 - German E-Coli outbreak: researchers ran DNA comparisons to identify specific E-coli strain, reduced work from months to 3 days
 - ANL OpenStack cluster running numerous science codes with 60% - 80% utilization
- **100 Gbps testing**
 - ANL has purchased and installed 100 Gbps router for future testing
 - NERSC has issued RFP for 100 Gbps router
 - Both teams working with science communities to demonstrate 100 Gbps technologies



ANI Demonstration Prototype

- **Contracts**
 - **Completed \$47M contract with Internet2, which includes:**
 - National prototype network built with 4.4+ Terabit optical capacity
 - National dark fiber facility for research including ANI 100G Testbed
- **Deployment Progress**
 - DOE supercomputing sites and International Exchange Point (MAN LAN) connected at 100G by December
 - Dark fiber for research accepted by mid-Fall
- **ANI testbed**
 - 17 active research projects



ANI Prototype Network
PHASE I



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ANI Testbed Access...

.. Granted through merit review

- **Proposal submission process:**
<https://sites.google.com/a/lbl.gov/ani-testbed/>
- **Eligibility**
 - Researchers funded by DOE or other Federal Agencies
 - Industry
- **Testbed Users**
 - 17 active research projects
 - 5 from Industry; 4 from DOE labs; 8 from Universities
- **Bi-annual cycle**
 - Next round of proposals due October 1, 2011