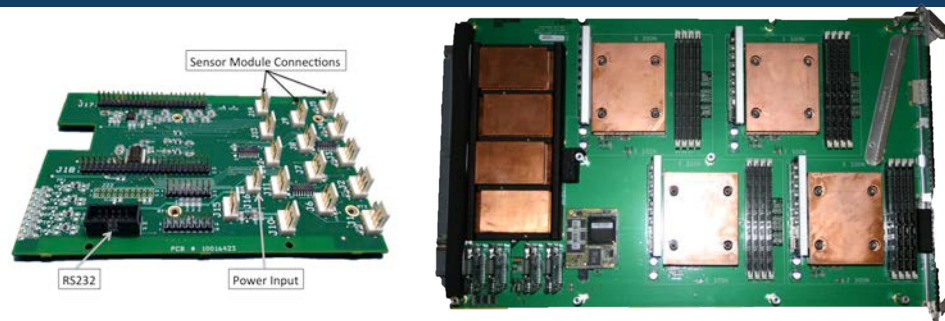


Building Energy Efficient HPC: 4th Annual Energy Efficient HPC WG Workshop

James H. Laros III
Sandia National Laboratories
jhlaros@sandia.gov

*Exceptional service
in the national interest*



National Leadership in High Performance Computing

**COMPUTING
RESEARCH**

Robert W. Leland, Director



Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

SAND No. 2013-9869P

Moving State of the Art Forward

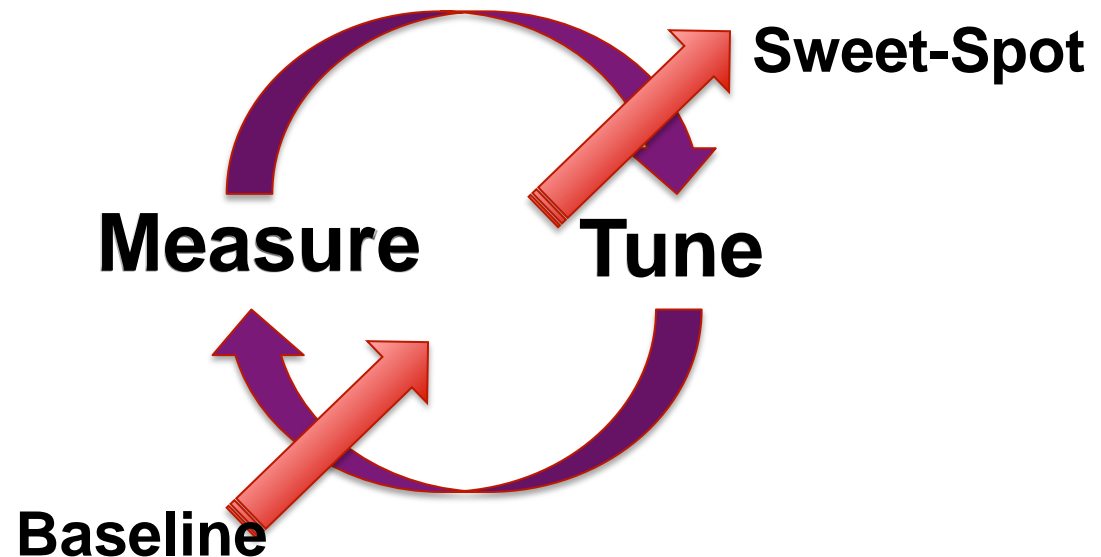
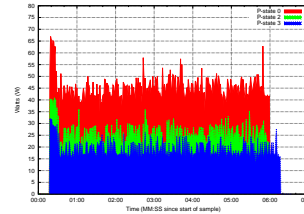
- Trinity procurement requirements intentionally vague
 - Vendor capabilities all over the map
- Invest NRE to push state of the art
 - Approach:
 - Vendor delivers base capability
 - Collaborate on Advanced Capabilities
 - Advanced relative to base
- Accelerates path from Research to Production capability
- Future procurements will require specifics
- Leveraged **Scenarios** to describe what we were looking for

Scenarios and Procurement

- Scenarios can be very useful in procurements
 - At RFP
 - Communicate motivations, needs, intentions, etc. to Vendors
 - Avoids proscribing the solution
 - Describes what we want not how to accomplish it
 - At acceptance
 - Scenarios become test cases
 - Verify a number of base requirements using a single test scenario

Scenario Goal: Increase Energy Efficiency

- ① Run Application
 - Collect Data – “Energy Profile”
 - ② Analyze Data
 - ③ Run Application with new settings (e.g. P-state change)
 - Collect Data
 - ④ Analyze Data
 - Good? Bad?
- 😊 Repeat



We are ALL blazing the trail

- Other Scenarios for power capping and power aware scheduling
 - Overloaded terms
- Move towards Standards
 - Power API

