EEHPC
The Electric Grid and HPC

Supercomputing 2013

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EE HPC Working Group Team
The Electric Grid and HPC

- Problem statement:
  - HPC centers are large kilowatt to megawatt energy consumers
  - Can benefit from improved energy efficiency
  - May benefit from participating in the electric grid-level energy management
  - May impact and/or get impacted by the electricity power quality and renewable generation

- Investigative effort:
  - Review of current research and practice
  - Top100 US sites questionnaire
  - Team output – report
    - LLNL, LANL, ORNL, ANL, LBNL, NCSA, WPAFB, NOAA, Purdue, SDSC, Intel

- Please contact Natalie Bates if you are interested in joining this team.

Challenge

- Recent installed HPC systems have raised concerns with some utilities

- Requires modeling power consumption and quality of large HPC computational block loads

- Requires the need to address operational cost increases with larger load

- Requires the ability to know what to monitor

  – Continually log events of HPC workload to include scheduled maintenance, unscheduled power interruptions, power glitches, etc. to gain broader knowledge

5.5 MW → 9 MW → 5.5 MW

5.5 MW

Sequoia at LLNL

180 KW
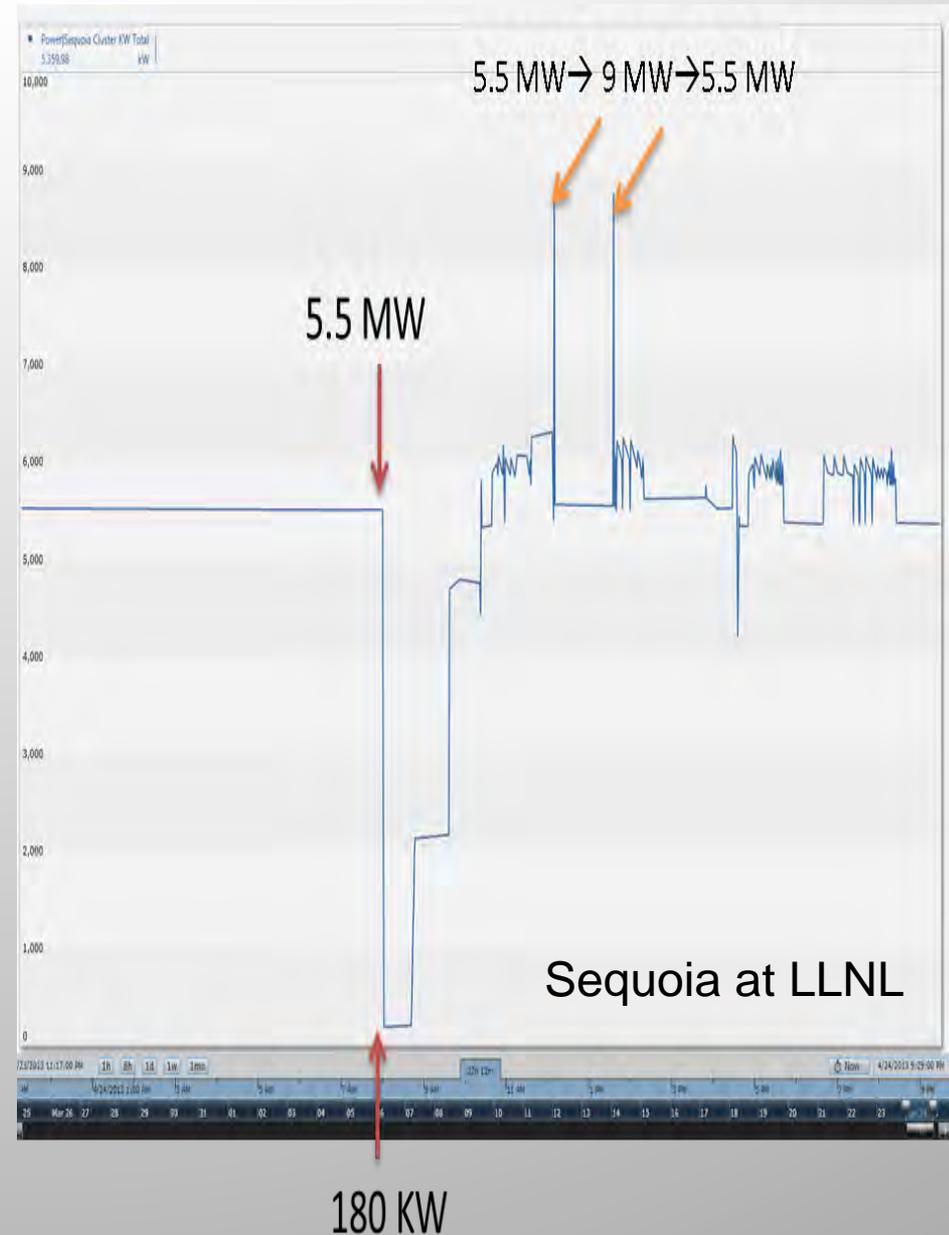
Amplified Bursty Behavior Due to Magnitude of Computer

- Scheduled maintenance can result in 5 MW load swings to the grid in a short period of time

- Bursty behavior of real workload indicated that real power fluctuations can be more abrupt

User jobs

Sequoia at LLNL

Addressing the Concerns and Challenges of HPC to the Grid

- ## Jim Rogers – ORNL
  - Discuss grid modeling of the TVA electrical grid at ORNL and how large computational block loads relate to the TVA

- ## Josip Loncaric – LANL
  - Discuss the challenge of variable power demand typical for HPC workloads, and the importance of working with the utility to minimize power costs

- ## Bob Conroy – OSI Soft
  - Discuss the benefits of benchmarking and metrics of large block loads. "You cannot improve what you do not measure".