BigPanDA Status

Kaushik De

Univ. of Texas at Arlington

Alexei Klimentov

Brookhaven National Laboratory

OSG AHM, Clemson University

March 14, 2016

Outline

- BigPanDA Overview
  - Goals and Plans
  - Accomplishments over the past 3 years
- What is happening now
  - And for the next 6 months
- Future of BigPanDA

BigPanDA Project

"Next Generation Workload Management and Analysis System for BigData"

- DOE ASCR and HEP funded project started in Sep 2012
  - Generalization of PanDA Workload Management System as meta application, providing location transparency of processing and data management, for HEP and other data-intensive sciences, and a wider exascale community
  - Program Managers : Rich Carlson (ASCR), Lali Chaterjee (HEP)
- Institutions :
  - Lead Institution : Brookhaven National Laboratory
    - Pis : Alexei Klimentov*, Sergey Panitkin, Torre Wenaus and Dantong Yu
  - Argonne National Laboratory :
    - PI : Alexandre Vaniachine
  - University Texas at Arlington :
    - Pis : Kaushik De, Gergely Zaruba
- July 2015 : Project extended until Dec 31 2016

BigPanDA Work Packages

- WP1. Factorizing the code
  - Factorizing the core components of PanDA to enable adoption by a wide range of exascale scientific communities
- WP2. Extending the scope
  - Evolving PanDA to support extreme scale computing clouds and Leadership Computing Facilities
- WP3. Leveraging intelligent networks
  - Integrating network services and real-time data access to the PanDA workflow
- WP4. Usability and Monitoring
  - Real time monitoring and visualization package
- Schedule
  - Year 1. Setting the collaboration, define algorithms and metrics
  - Year 2. Prototyping and implementation
  - Year 3. Production and operations

WP1 Factorizing the core

- New Code repository.
  - Migration from CERN SVN to GitHub
  - New build system; distribution through RPMs (thanks OSG for collaborative effort)
- PanDA server improvements.
  - PanDA server consolidation: now **one** master branch that serves multiple experiments
    - Consolidated divergence into multiple branches over many years
    - Standardized installation thanks to collaboration with OSG
- PanDA pilot improvements.
  - Core pilot has been refactored to a generic (VO independent) version;
  - VO specifics are handled as plug-ins; execution backends are handled as plug-ins
- Multiple database backends.
  - Oracle database backend (ATLAS, AMS, COMPASS)
  - mySQL (running on EC2 PanDA server) – LSST, ALICE
  - New PanDA instance with MySQL backend deployed in Amazon EC2
    - Instance tuned for multi-VO support
- ~~Documented installation process for all components~~

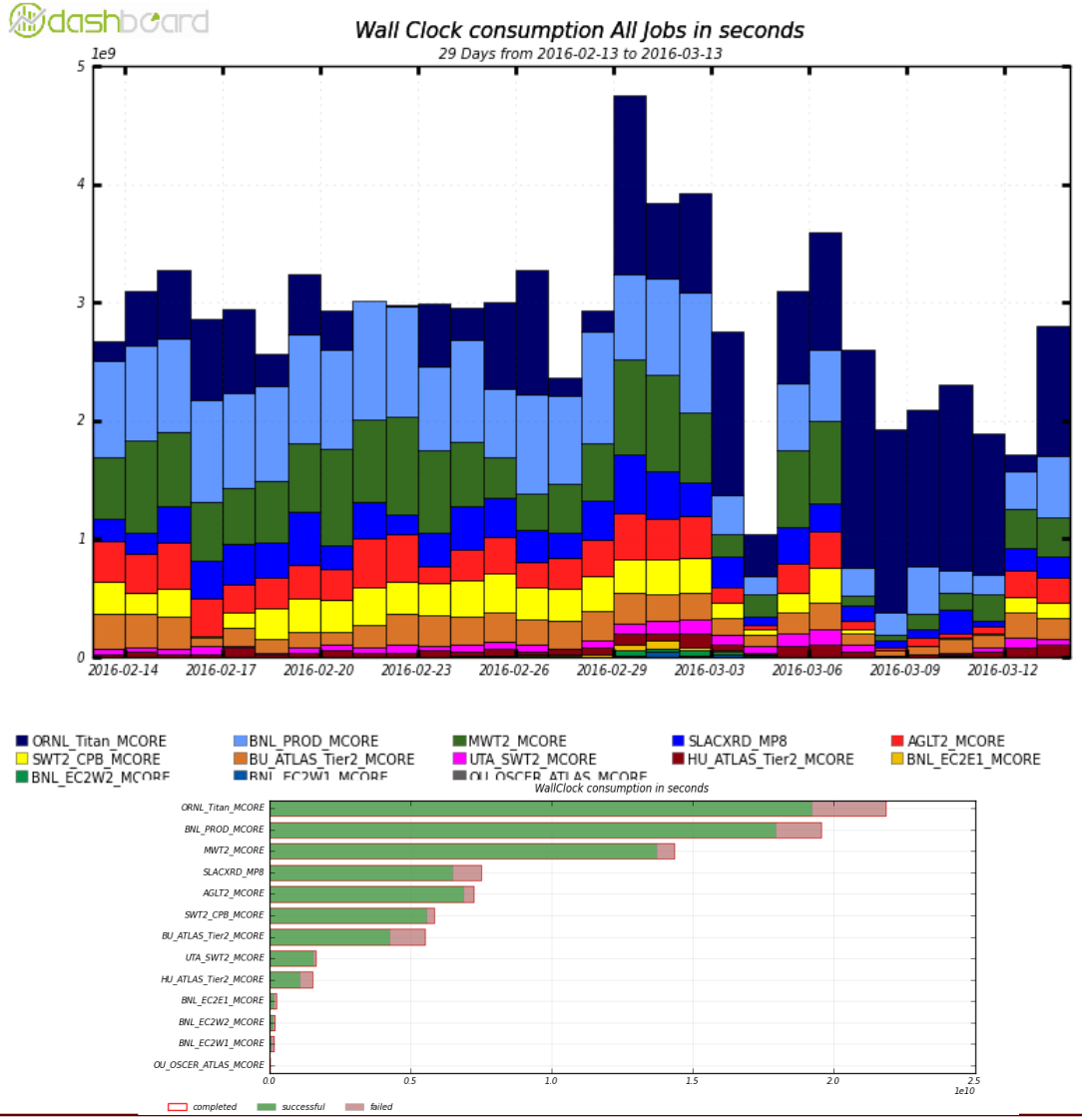
WP2 Extending the scope

- Extend PanDA job management to Clouds and HPC
  - Commercial and academic clouds
    - Google, Amazon EC2, NECTAR, etc…
  - Primary goal for HPC activity - Leadership Computing Facilities
    - Titan@OLCF – main target
    - Mira@ALCF, Ancelm, Ostrava (CZ), Archer (UK), Kurchatov (RF)
- See talk tomorrow by Frank/me on HPC's

Titan Example

- 27 PFlops (Peak theoretical performance). Cray XK-7
- 18,688 compute nodes with GPUs
- 299,008 CPU cores
- AMD Opteron 6200 @2.2 GHz (16 cores per node)
- 32 GB RAM per node
- NVidia TESLA K20x GPU per node
- 32 PB disk storage (center-wide Luster file system)
- >1TB/s aggregate FS throughput
- 29 PB HPSS tape archive

Titan Usage Last Month



WP3 PanDA and Networking

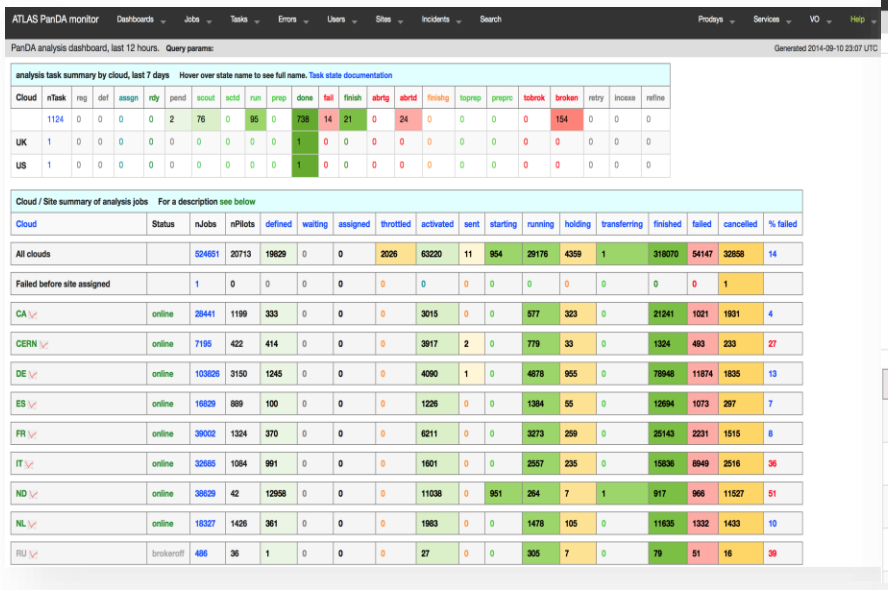
- Goal for PanDA
  - Direct integration of networking with PanDA workflow – never attempted before for large scale automated WMS systems
- Pick a few use cases
  - Cases which are important to PanDA users
  - Enhance workload management through use of network
- Case 1: Improve User Analysis workflow
- Case 2: Improve Tier 1 to Tier 2 workflow
- Step by step approach
  - Collect network information
  - Storage and access
  - Using network information

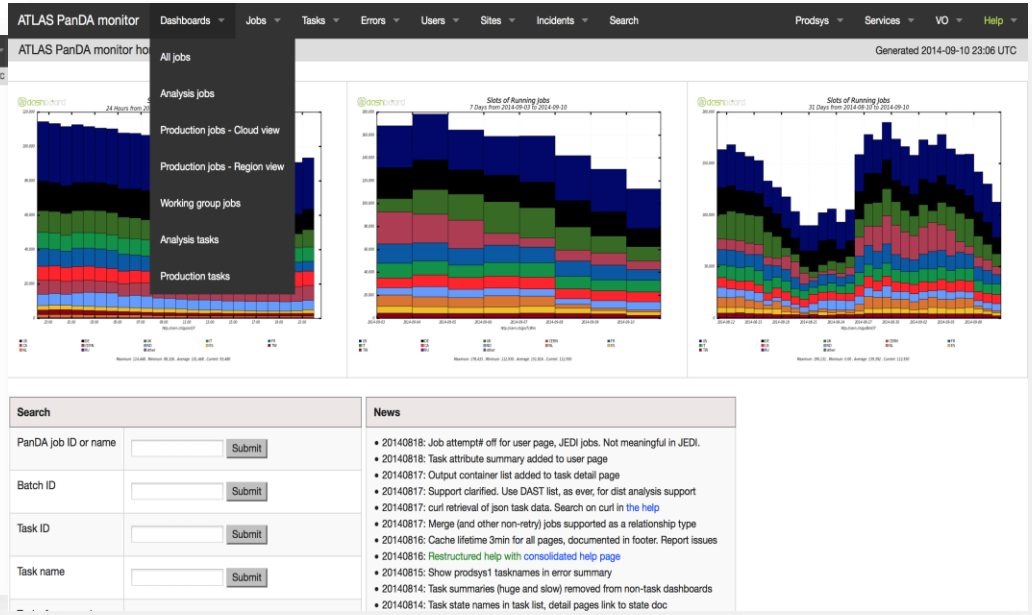
Network Summary

- All work completed in first 2 years
  - Successful demonstrations – overflow and automatic MCP
  - Results shown at SC15 and other meetings
- New implementation underway for “World Cloud”
  - Details in Fernando’s talk earlier
  - Moving from demonstration to operation

WP4 Usability and monitoring

- New PanDA monitoring web application was developed based on Django framework
  - All of you know this daily as BigPanDA monitoring
  - Allows rapid development and easy extension





http://bigpanda.cern.ch http://pandawms.org

"BigPanDA" Collaborations

- Through ASCR project, PanDA has moved well beyond ATLAS
  - Collaborating with RADICAL group of Rutgers University and Oak Ridge LCF team (Shantenu Jha and Jack Wells)
    - Many joint papers and invited talks
- Collaboration between ATLAS, ALICE, nEDM experiments for efficient usage of opportunistic resources, especially HPC and LCF
- LSST evaluating PanDA for distributed data processing
- COMPASS and AMS02 installed their own PanDA instances
- Other communities getting involved

BigPanDA - Generalizing PanDA Beyond Grid and ATLAS

COMPASS

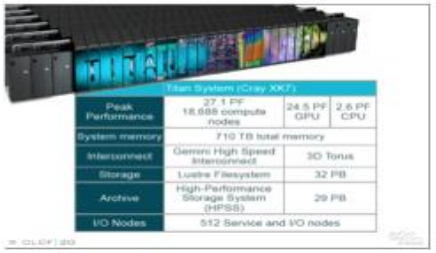
Google Cloud Platform

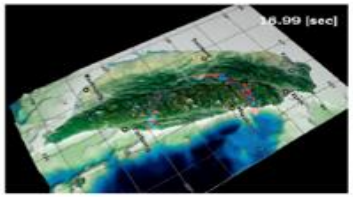
ALICE

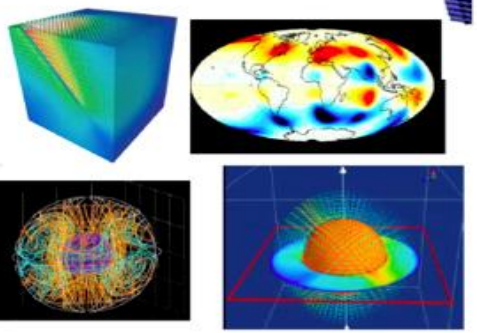
NICA

nectar

amazon web services™ EC2



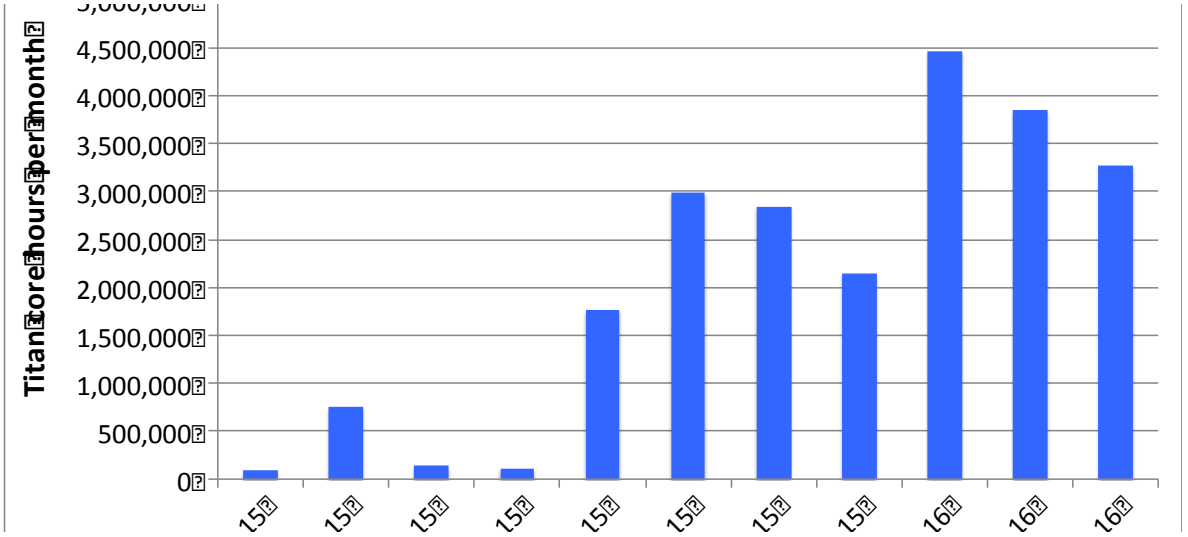


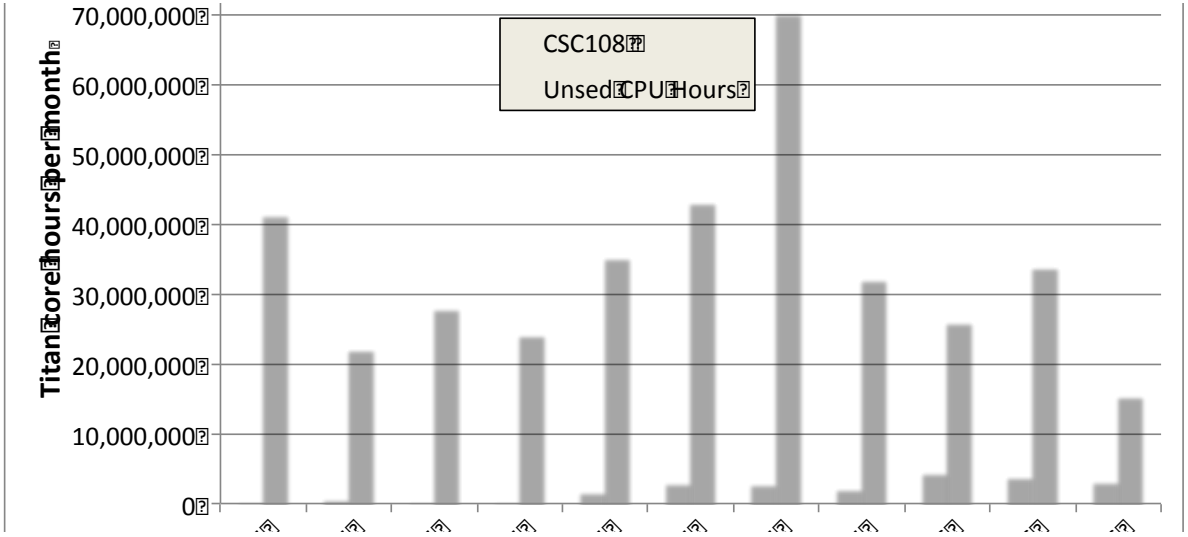


What Are We Doing Now?

- WP1 – continuing to improve packaging
  - Bi-weekly meetings, focusing on non-ATLAS experiments
  - Work carried out by core PanDA and people from other experiments
- WP3 – networking demonstration completed
  - Ongoing work done by core PanDA and ADC teams
  - World Cloud, NWS, Configurator…
- WP4 – BigPanDA monitoring big focus
  - New features being added continuously
- WP3 – increasing LCF usage
  - Heavy focus of work
  - Collaborating with Rutgers CSE team and OLCF operations

Titan Backfill





Future of BigPanDA

- Submitted proposal to ASCR for continuation
  - Hope to hear back before summer
  - Focus on BNL+UTA+Rutgers+OLCF collaboration on Titan
  - Setup PanDA as a service on Titan for ‘all’ users
  - ATLAS (and ALICE) will benefit from big increase in CPU cycles