

Intelligent Workload Management Software for HPC and Cloud Environments

### Best of Breed HPC Tools on Torque & Slurm

CUG 2017 Nick Ihli

5/11/13

# Moab Intelligence Engine + Torque

## **Moab HPC Suite**

- 15+ years battle tested
- Patented (70+ Patents)
- Mimics real-world decision-making

### **Multi-dimensional Policies Optimize Across:**

- Workload/application requirements
- Priorities and SLAs
- Time (real-time and future, predictive)
- Heterogeneous resources





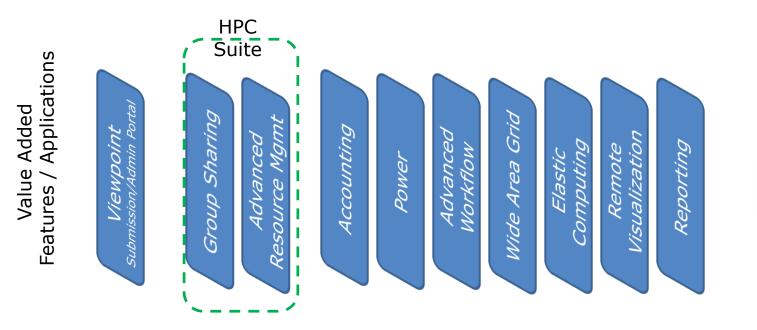
### Torque – Open Source Resource Manager

Executes decisions made by Moab



## **Product Offerings**

**Flexible Choice** 



Nitro High Throughput



## Moab/Torque Unification

- Moab directly communicates with Torque node daemons (pbs\_mom)
- A faster communication framework
  - Faster:
    - Submission
    - Job start and teardown
    - MOM communication
    - Performance at scale
- Eliminates race conditions
- Simplifies Everything!
  - Synched JobIDs
  - Configuration
  - Debugging
  - Etc.

## Enhanced Power Management

### Workload-aware Power Management

- Reduce power state of idle nodes
- Maintain high response times with green pool buffer policy
  - Set quantity of available nodes in power-ready state "buffer pool"
  - Dynamically increase power state of power reduced nodes to maintain "buffer pool" target

### Per Application CPU Speed Throttling

(New Initiative with Department of Energy)

### System Power Cap, Floor and Power Ramp Management

- Dynamic control over system energy consumption
  - Conform energy use to electrical power contracts
- Job-level energy use data





## **Other Notable Features**

- Datawarp Integration
- KNL
- Docker Integration
- Singularity Integration
  - Coming the summer



## **Open Platform**

Get the **best-of-breed HPC tools** on **your choice of scheduler**. "Open Platform" enables organizations to **unify** the user, admin, and manager experience across multi-scheduler environments on a per-service basis.

### Best-of-Breed HPC Tools:

- Viewpoint Submission Portal
- Remote Visualization
- Reporting & Analytics
- Nitro High Throughput
- Moab Accounting Manager
- Grid Management

### Cross Scheduler/RM Support:

- Torque
- Slurm
- SGE/UGE
- PBS Pro
- LSF







### User

- Increase productivity of end users with easier and faster portal-based submission of tasks/jobs
- Expand HPC user base to include non-IT skilled personnel
- Automate best practices

   information into submission process in
   order to speed submission, reduce
   error and optimize processing speed

### Admin

- Enable admins to manage user requests with less time due to best practices based templates, and user feedback which helps users help themselves
- Admins gain quick visibility into system and workload status and workload troubleshooting







## Viewpoint Ease-of-use Driven Productivity

#### End User Submission Portal

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#### **Resource Job Timeline**



## **Remote Visualization**

Avoid purchasing expensive licenses and GPU's for all worker, by rendering applications remotely and visualizing locally through an integrated portal.

### Improve Productivity

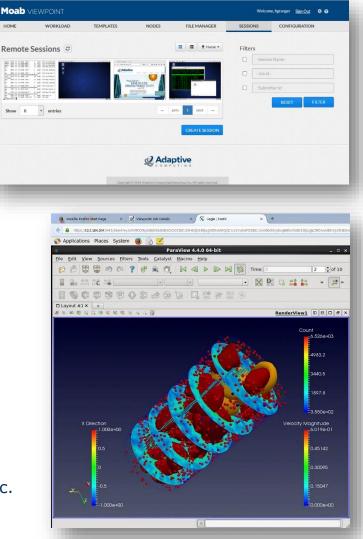
- Avoid waiting for file transfers
- Collaborate on shared projects
- Improve access to high value resources

### Save Resources Integration

- Avoid purchasing individual high-end desktops
- Share memory resources, accelerators, etc.
- Share expensive application licenses

### Improves Manageability

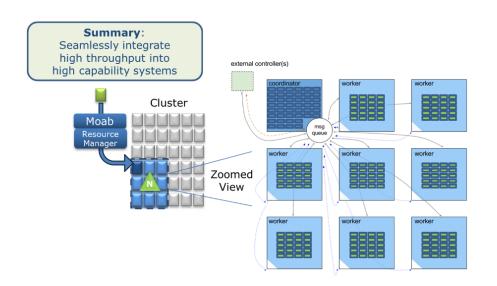
- Easier to launch, find, and manage sessions from submission portal
- Schedule, prioritize, and guarantee SLAs between users and groups
- Integrate into full HPC workflows, including notifications
- Administrative controls over usage, security, sharing, etc.



# Nitro High Throughput

Accelerate launch times for short computing jobs by scheduling only once for large sets of jobs. At **500 tasks/second/core**, Nitro eliminates bottlenecks and puts high throughput performance into your computing system.

- Supports thousands to millions of tasks
- Provides simple user job submission
- Sessions can grow and shrink
- Integrates with all common scheduler
- Applicable Workloads:
  - Job arrays
  - Regression tests
  - Embarrassingly parallel workloads like Blast, Monte Carlo, and mass simulations
  - Anytime there are thousands and thousand of short run jobs

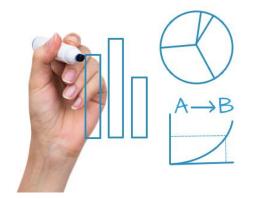




## **Reporting & Analytics**

**Gain insights** by streaming resource usage and workload data into **custom reports** and **personalized dashboards**. This drives improved resource utilization and efficiency, **better capacity planning**, and greater **alignment of resources to mission objectives**.

- **Stream** data with lightning-fast Apache Spark processing engine and flexible Mongo database.
- Process data to ensure relevance with traditional analytical functions (group, reduce, join, filter, etc.)
- **Visualize** aggregated information in chart-based reports or structured tables.
- **Monitor** key indicators in customizable dashboards
- Drive better decision-making & policy enforcement.







# **Reporting & Analytics**

#### 1. Data Stream Pipelines



& Adaptive

## Public Grant Program Buy Support – Get Licenses Free

**Eligibility:** Government and Education Organizations

- Education organizations must be diploma issuing entities
- Systems must not be used by commercial organizations (e.g. hosting)

**Included Products**: Moab HPC Suite, Viewpoint Submission Portal on Torque or Slurm



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