CERN Batch System, Monitoring and Accounting
HEPiX Fall 2012

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Context

- Growing community
- Busier batch system
- Agile Infrastructure project
Outline

1. Batch System Challenges
2. Batch Monitoring Tools
3. Batch Accounting Overhaul
Section 1

Batch System Challenges
CERN Batch Setup

- Platform LSF 7.0.6
- All resources to one cluster
- Different shares for different customers: public, grid and several for CERN experiments

Diagram:

- LSF Master Node
- NFS Server
- LSF Master Failover
- WN
- WN
- WN
- WN
- WN
- WN
- WN
- WN
- WN
- Local Jobs
- Grid Jobs
A Large Batch System

- > 4,000 physical nodes
- > 60,000 cores, some SMT-enabled (25% overcommit)
- > 55,000 job slots, > 400,000 jobs/day:
Future of the Batch Service

Agile Infrastructure Project:
- Virtualise resources in CC: batch nodes to be fat VMs
- Uniform IaaS layer
- Configuration management with Puppet
Today’s Operational Issues

- High submission and query load → Slow response
- Ensuring fairshare scheduling
- Complex LSF setup
- Poor dynamism requiring daily reconfiguration
- Scalability
Possible Alternatives to LSF

Goal for 5 years:
- 4 000 → 12 000 physical nodes
- 60 000 → 300 000 cores
- Support frequent structural changes

Possible alternatives (unordered):
- LSF 8
- Condor
- Grid Engine
- Torque
- SLURM ←
Evaluating SLURM

From the SLURM Web site:

- Free
- 65,000 physical nodes
- 120,000 jobs/hour
- Active community
- Extensible via plug-ins

Test bed:

- Implement and test hierarchical fairshare model
- Controllably submit queries and jobs
- Reproducible load
- Scale number of hosts, jobs, slots and queries
Section 2

Batch Monitoring Tools
Technology Overview

- Oracle, Python, Matplotlib & Django → Stats
- Cassandra → Fairshare monitoring
- OpenTSDB → Live monitoring
- Splunk → Historical usage
Live Monitoring with OpenTSDB

Time Series Database

From: 2012/10/02-09:49:00  To: 2012/10/09-09:49:41

Metric: batchsub.timing
Tags: 

3967 points retrieved, 3926 points plotted in 213ms.
Historical Usage with Splunk

In the Last Week

- **Number of Jobs**
  - Legend: grid, local
  - Time: Wed Oct 3 2012 to Tue Oct 9

- **Time (h)**
  - Legend: sumCpuTime, sumWallTime, efficiency
  - Time: Tue Oct 2 2012 to Mon Oct 8
Section 3

Batch Accounting Overhaul
New Batch Accounting: Goals

- Make portable to other schedulers
- Publish local job information
- Publish correct normalisation factor per job
- Use the new APEL software
- Remove complexity, improve consistency
Old vs. New Batch Accounting

CEs → BLAH File → Filter → Local APEL

LRMS → Acct. File

Daily → Acct.

Reports

Acct. Page

Acct. Portal
Old vs. New Batch Accounting

CEs → BLAH File → Filter → Local APEL

LRMS → Acct. File

Acct. File → Daily → Acct.

Reports → Acct.

Acct. Page → APEL

APEL → Acct. Portal
Old vs. New Batch Accounting

CEs -> BLAH File
LRMS -> Acct. File

Real-Time

SSM Messaging

Reports
Acct. Page
Acct. Portal

APEL

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Conclusion

- We need to scale
- We’re moving to new infrastructure tools
- CERN batch service being prepared for future challenges
Questions?