Highlights from Track 7

Middleware, Monitoring and Accounting

Randall Sobie
University of Victoria

Farida Fassi
Mohammed V University, Rabat, Morocco

Jeremy Coles
University of Cambridge / GridPP

With help from
Ian Collier (STDC RAL) and Rolf Seuster (Victoria)

68 abstracts: 25 oral
Monitoring

“The act of observing something (and sometimes keeping a record of it)”

http://www.thefreedictionary.com/monitoring

“A systematic process of observing, tracking, and recording activities or data for the purpose of measuring program or project implementation and its progress towards achieving objectives.”

http://www.investorwords.com/19314/monitoring.html
Accounting

“(and sometimes keeping a record of it)”
Accelerator Infrastructure

Detectors
Data quality

Workflow
Data management

Computing facilities

WLCG infrastructure
Technical Infrastructure: A lot of systems to control

- Controls
- Computers
- Electricity
- Cryogenics
- Magnets

85'000 Devices
> 2 Million I/O Endpoints

Safety
Cooling
Ventilation
Vacuum

Much more when including subsystems!

189 The CERN Control and Monitoring Platform (C2MON): a modern open-source platform for data acquisition, monitoring and control
521 Web Based Monitoring project at CMS experiment

AMS Data Flow
- Data transferred via relay satellites to Marshall Space Flight Center, then to CERN, nearly real-time, in form of one-minute frame
- Preproduction: Frames → runs (RAW): 1 run = ¾ orbit (~23 minutes)

49 Evolution of Monitoring System for AMS Science Operation Centre

469 Trigger Menu-aware Monitoring for the ATLAS experiment
234 Monitoring performance of a highly distributed and complex computing infrastructure in LHCb

IceCube Computing

Medium size collaboration

- 2 data centers and several smaller clusters
- Most CPU compute is opportunistic
- Diverse computing infrastructure

508 IceProd 2 usage experience
Local or experiment facilities

The MonALISA Architecture

- Regional or Global High Level Services, Repositories & Clients
- Secure and reliable communication
- Dynamic load balancing
- Scalability & Replication
- AAA for Clients
- Distributed System for gathering and analyzing information based on mobile agents: Customized aggregation, Triggers, Actions
- Distributed Dynamic Registration and Discovery-based on a lease mechanism and remote events

Fully Distributed System with no Single Point of Failure

"MonALISA Monitoring for the LHC Experiments", Dorian Kcira, Caltech

Introduction
Components
Architecture
Conclusion

Numbers

CNAF resources in numbers
- Core ~22000.
- Disk storage ~20PB.
- Tape storage ~34PB.
- Racks > 180.
- kHS06 ~250.

CNAF staff
- 50 persons
- 5 functional units

Architecture

463 MonALISA, An Agent-Based Monitoring and Control System for the LHC Experiments

018- The evolution of monitoring system: the INFN-CNAF case study
There are many sources of data and many options for monitoring.
The Current WLCG IS

- The WLCG IS is needed for service discovery, operations, monitoring and accounting
- BDII is the main building block of the WLCG IS
- OSG will stop publishing in the BDII on 31.03.2017
- EGI will keep on relying on the BDII
- LHC VOs only rely on the BDII for computing information

Highlights

- CRIC consists of
  - Core CRIC: contains information of existing resources as they are provided by the sites
  - Experiment CRIC: contains the resources used by the experiment with extra configuration information to enable integration with experiment workflows and internal tools
Middleware

“Software that connects two otherwise separate applications”

“Middleware is used to describe separate products that serve as the glue between two applications”

http://www.webopedia.com/TERM/M/middleware.html
Existing infrastructure

Middleware

Enabling us to use non-HEP facilities, clouds, HPC centres

Opportunistic resources
Synergy Architecture

Exploiting cloud computing

Run jobs on Virtual Computing Cluster

- A virtual layer is constructed between the physical machines and the RMS (resource management system such as HTCondor or PBS)
- In the case of free resources in the pool, a job queue can use more than it owns

288 Elastic Computing Resource Management Based on HTCondor

367 INDIGO-Datacloud

98 Interfacing HTCondor-CE with OpenStack

Scenario 2

GRID Site

Submit a job

Launch a VM

98 Interfacing HTCondor-CE with OpenStack
Work load management systems that can utilize all types of resources

Accommodating different requirements: Developed with extensibility in mind

“Horizontal” extensibility
- For specific requirements

“Vertical” extensibility
- Community driven

217 DIRAC in Large Particle Physics Experiments
CMS use of allocation based HPC resources

Dirk Hufnagel (FNAL) for CMS Offline&Computing
CHEP 2016 San Francisco
13th October 2016

563 CMS use of allocation based HPC resources

194 Integration of Titan supercomputer at OLCF with ATLAS production system

27 PFlops (Peak theoretical performance). Cray XK-7
18,688 compute nodes with GPUs
32 GB RAM per node
32 PB disk storage (center-wide Luster file system)
>1TB/s aggregate FS throughput
29 PB HPSS tape archive

Track 7 Summary  Randall Sobie  Victoria
Integrating Containers in the CERN Private Cloud

Ricardo Rocha
( on behalf of the CERN Cloud team )

Goals and Timeline

- Integrate containers in the CERN cloud
  - Shared identity, networking integration, storage access, …
- Agnostic to container orchestration engines
  - Docker Swarm, Kubernetes, Mesos
- Fast, easy to use

227/918 Integrating Containers in the CERN Private Cloud
Track 7 Summary

• Significant development of monitoring capabilities
  – Trend toward the use of open-source tools
  – Exchange of information between the different systems
  – Active, intelligent, context-aware, self-healing systems

• Middleware
  – Focused on software that is helping us integrate opportunistic resources into our infrastructure