Distributed computing project

Progress report

Fabio HERNANDEZ on behalf of

IHEP: CHEN Gang, QI Fazhi, WANG Lu, ZHANG Xiaomei, KAN Wenxiao
CC-IN2P3: Ghita RAHAL, Vanessa HAMAR
CPPM: Andrei TSAREGORODTSEV

7th FCPPL Workshop
Clermont-Ferrand, April 8-10, 2014

Background: project goals

- To establish a pilot of a DIRAC-based heterogeneous **distributed computing** system
- To demonstrate the feasibility for a running physics experiment to integrate **cloud storage** technologies in its workflow

Distributed computing

fabio hernandez
fabio@in2p3.fr
CAS/IHEP Computing Centre
CNRS/IN2P3 Computing Centre

BES III distributed computing

- BES III selected DIRAC for managing its distributed computing infrastructure

  participating sites: China (7), Italy (1), Russia (1), USA (1)

- Use case

  perform simulation at remote sites

  transfer data to central repository at IHEP computing center

- BES III developments on top of DIRAC

  dataset management

  system monitoring for sites

BES III simulation

- 4 simulation campaigns since Nov. 2013

  20 kCPU days, 150 kjobs, 1.3 billion events, 10TB

  90% job success rate

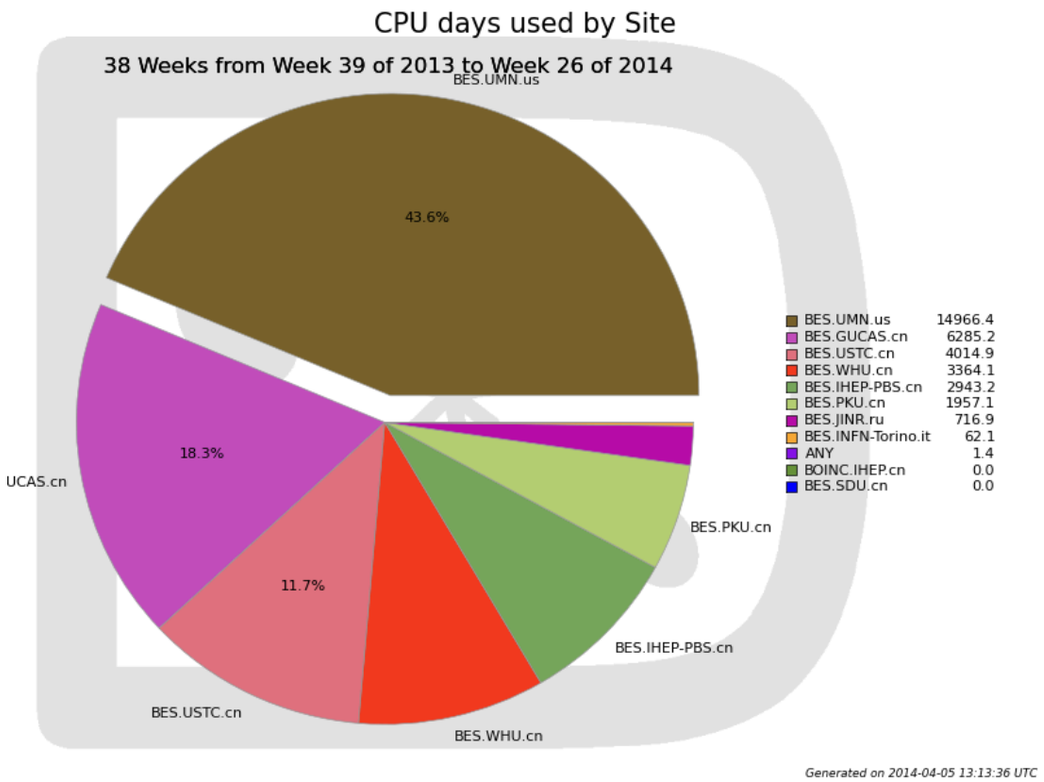
- Initial tests of private simulation very encouraging

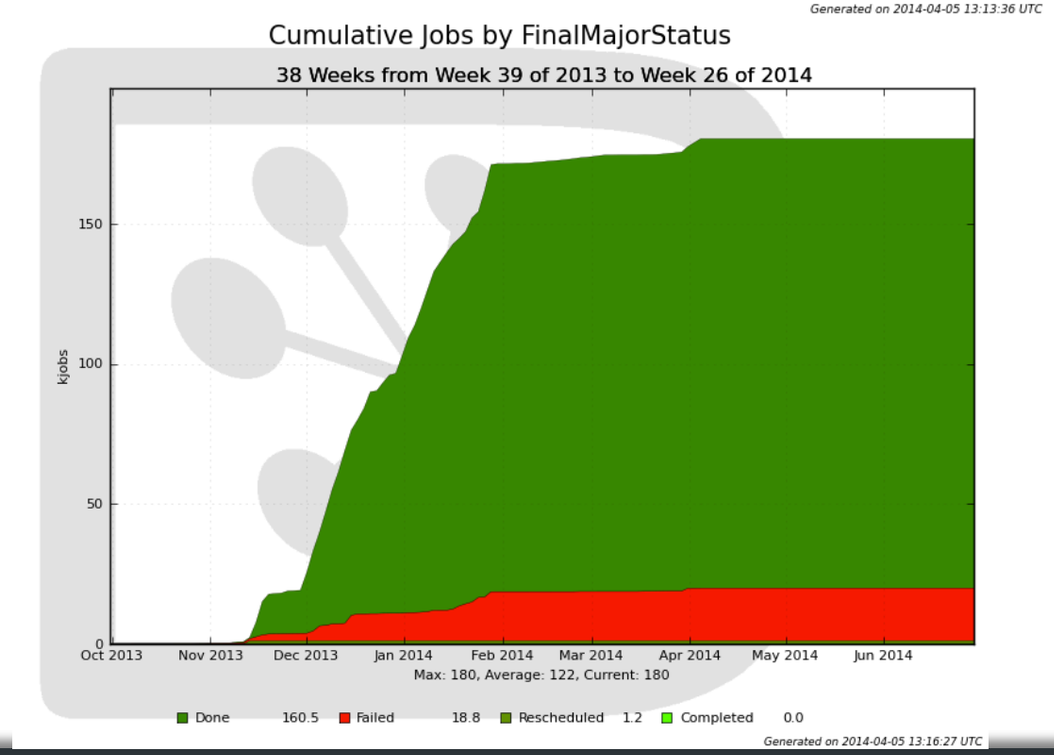
  99% job success rate

- Volunteer computing nodes integrated to the platform

  integration work performed by IHEP PhD students WU Jie and KAN Wenxiao

  both of them did a 1 year-long stay at CPPM, funded by CSC





Training

- Can other IHEP experiments benefit of BES III experience with DIRAC?
- Organized a 3 days-long hands-on tutorial on DIRAC at IHEP in Nov. 2013

target audience: end-users and administrators

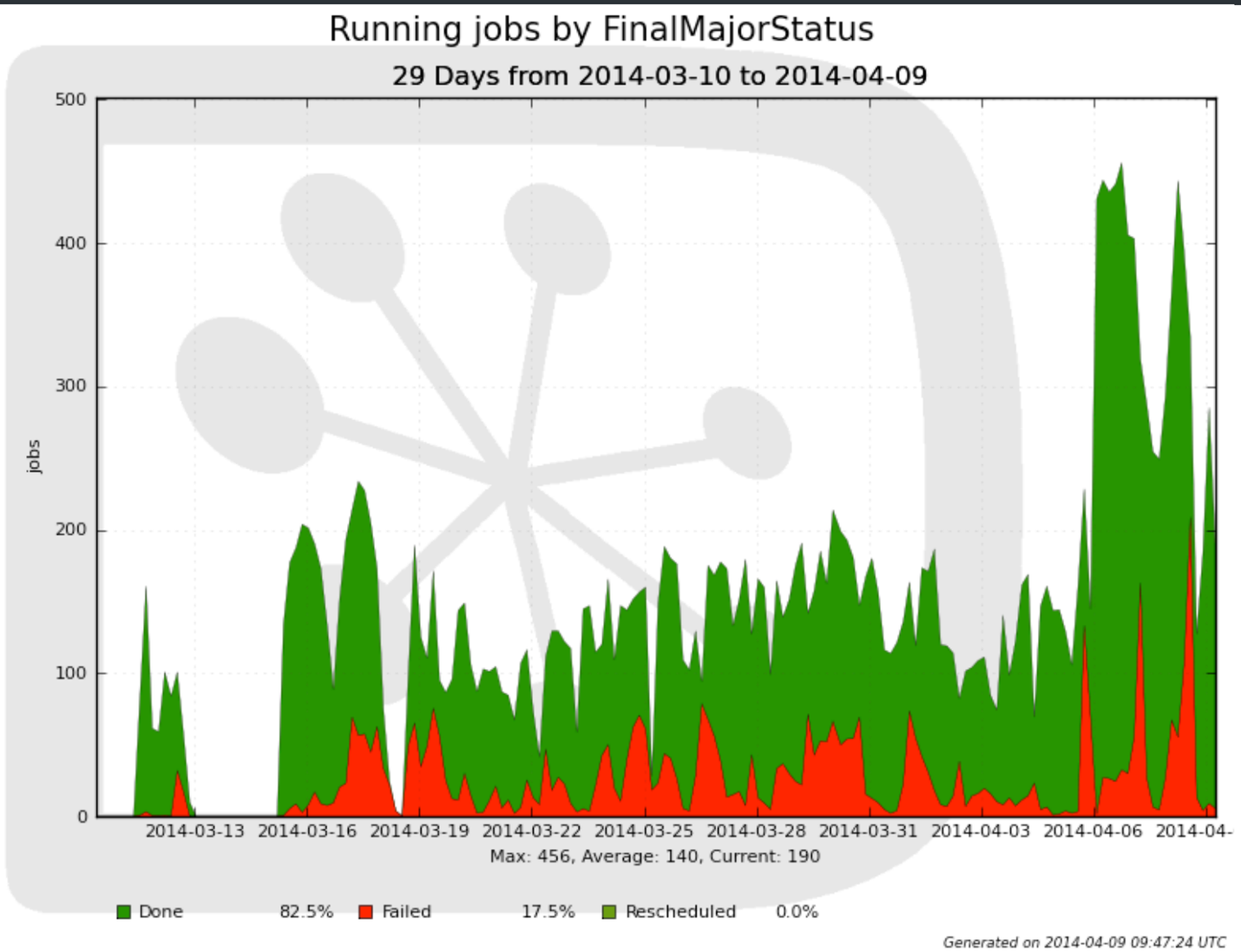
tutors: Vanessa HAMAR (CC-IN2P3), Andrei TSAREGORODTSEV (CPPM)

attendees: BES III, Daya Bay/Juno, TREND

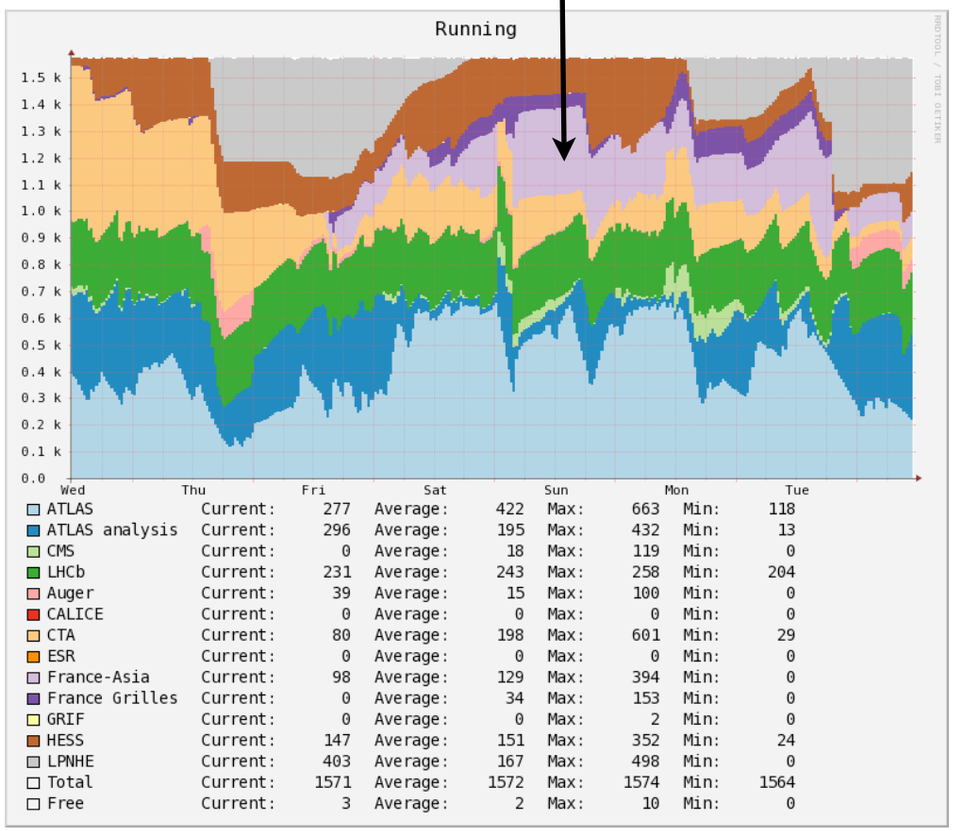
https://indico.in2p3.fr/conferenceDisplay.py?confId=9051

Training (cont.)

TREND simulation



TREND activity at LPNHE



- Ongoing campaign

  data repository at CC-IN2P3

  use of DIRAC to steer jobs to sites supporting France-Asia VO: CC-IN2P3 (FR), IHEP(CN), KEK (JP)

  LPNHE site just joined

Virtual machines and DIRAC

- Mechanism for spawning and shutting down virtual machines for running DIRAC jobs demonstrated

  specs of virtual machine dynamically determined based on the requirements of the queued jobs

- Benefits

  shorter job startup time since virtual machine image already includes the necessary software components e.g. compilers, python interpreter, DIRAC client, etc.

  better support for jobs requiring multi-core machines

- Next steps

  validate for latest version of OpenStack deployed at CC-IN2P3

Cloud storage

Background

- Goal: determine how we can exploit cloud storage for physics experiments and individual users

- Early 2013, contributed code to improve support of cloud storage protocols in ROOT

  included in the distribution of ROOT since v5.34.05 (Feb. 2013)

- Some experiments, including BES III, need previous versions of ROOT

Extending ROOT I/O

- Developed an **extension** to allow experiment using legacy versions of ROOT to transparently read files using cloud protocols

  currently both OpenStack Swift and S3

  tested against several providers and implementors: Amazon S3, Google Storage, Rackspace, OpenStack Swift, Huawei UDS

  backwards compatible with all versions of ROOT since v5.24 (Oct. 2009)

  no modification to ROOT source code nor to experiment code is required

- Experiment-neutral, open source, hosted by Github

  https://github.com/airnandez/root-cloud

Evaluation

- OpenStack-based cloud storage testbed deployed at IHEP
- Evaluation campaign using unmodified BES III physics analysis jobs

  observed performance comparable to traditional file storage systems, such as Lustre
- Detailed results presented in CHEP 2013, Amsterdam (Oct. 2013) and BES III winter collaboration meeting 2013 (Nov. 2013)

Evaluation (cont.)

- Currently preparing evaluation for remote access of data hosted at IHEP

  random trigger BES III data

  wide area network

  medium to high latency, low(ish) bandwidth network links

- Goal: run reconstruction jobs at remote sites

Cloud for personal storage

- Working prototype re-implemented from scratch

  exploiting concurrency for better usage of available network bandwidth

  file system interface in read-only mode operational

- Ongoing work

  read-write mode

  caching mechanism

  validate as personal software repository

Perspectives

Project proposal

- Submitted a proposal to continue our work in both fronts: DIRAC-based distributed computing and cloud storage

  partners: CC-IN2P3, CPPM, IHEP

- Goals

  explore the interest of other communities within CAS to share a common DIRAC-based infrastructure operated by IHEP

  center of expertise at IHEP eventually covering other Asia-Pacific countries

  initiative presented at ISGC 2014 in Taipei two weeks ago
  http://indico3.twgrid.org/indico/contributionDisplay.py?contribId=190&confId=513

  DIRAC end-user tutorial at ISGC 2014 in Taipei
  http://indico3.twgrid.org/indico/contributionDisplay.py?contribId=278&confId=513

Associated actions

- IHEP staff and PhD student to stay at CC-IN2P3 during 6 months

  joint work on software-defined networks (network virtualization)

  currently in the process of applying for funding via CSC call

- Ongoing work for organizing a 3 weeks-long visit by 6 young researchers from IHEP to several IN2P3 sites in France

  secured funding provided by CAS

ATLAS-specific computing activities

7th France China Particle Physics Laboratory (FCPPL) Workshop

ATLAS@home

- Volunteer computing as additional opportunistic resources to complement WLCG
- Interface to WLCG developed thanks to CAS experience in volunteer computing
  - Same interface also foreseen for usage of HPC centres
- From prototype to production by summer
  - Presentations at : ATLAS week & GDB (Grid Deployment Board)
- Will be used for ATLAS outreach activities
  - Web portal currently designed by professional
- Can also be used by local batch clusters (Tier-3) to participate to ATLAS production
  - No need to install the full (heavy) grid middleware
  - No need of local storage

irfu
cea
saclay
Eric Lançon

1

Source: Eric Lançon

Details: https://indico.in2p3.fr/contributionDisplay.py?contribId=69&confId=8719

Questions & Comments