LHC@home status

BOINC workshop 2013, Grenoble

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CERN was founded 1954: 12 European States “Science for Peace”

Today: 20 Member States

~ 2300 staff
~ 1050 other paid personnel
> 11000 users
Budget (2012) ~1000 MCHF

Member States: Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, the Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom

Candidate for Accession: Romania

Associate Members in the Pre-Stage to Membership: Israel, Serbia

Applicant States: Cyprus, Slovenia, Turkey

Observers to Council: India, Japan, the Russian Federation, the United States of America, Turkey, the European Commission and UNESCO
LHC accelerator and experiments

Exploration of a new energy frontier in p-p and Pb-Pb collisions

LHC ring:
27 km circumference
The LHC Data Challenge

• The accelerator will run for 20 years
• Experiments are producing about **25 Million Gigabytes** of data each year (about 3 million DVDs – 850 years of movies!)
• LHC data analysis requires a computing power equivalent to **~100,000 of today's fastest PC processors**
• Requires many cooperating computer centres, as CERN can only provide **~20% of the capacity**
The LHC Computing Grid

• LHC computing grid (collection of data centers) fully devoted to LHC data analysis and simulation, with large data sets.

No capacity for additional simulations for accelerator physics or theory.
LHC@home - SixTrack

- Started as an outreach project for CERN 50th Anniversary 2004; used for Year of Physics (Einstein Year) 2005.

- Objectives: extra CPU power for accelerator physics simulations (Sixtrack) and raising public awareness of CERN and the LHC - both successfully achieved.

- Calculates stability of proton orbits in the LHC accelerator.

- SixTrack Fortran program, simulating particle trajectories.
  - Client runs on Linux, Mac and Windows platforms.
  - Renewed effort on Sixtrack for LHC upgrade studies (HL-LHC).
    - Recently new executables, Sixtrack 4463 for High Luminosity LHC Dynamic aperture scans.
LHC@home - Test4Theory

- Application case from the Theory group at CERN
  - Launched in 2011 in partnership with the Citizen Cybercience Centre – CCC.
  - Theoretical fitting of all past experimental data (including LHC) using Monte Carlo simulation based on Standard Model
  - One trillion events simulated by volunteers since 2011!

- Uses a virtual machine on the volunteer computers
  - User installs Virtual Box
  - User installs the BOINC client
    - Attach to project and ready to go with application on CernVM (de-facto standard VM image for High Energy Physics)
    - The BOINC client downloads vboxwrapper that gets the image and the job to run on the VM
    - Successful migration from CERN wrapper to BOINC native “Vboxwrapper’ this year.

- Special thanks to Rom Walton and the BOINC team at Berkeley for their active contributions to debug and improve Vboxwrapper!
LHCb: Beauty@LHC

• New application in test phase for the LHCb experiment
  – Currently running as a desktop grid within the LHCb collaboration, running rather long jobs.
  – Vboxwrapper application, with CernVM image.
  – Applications via CvmFS (as for Test4Theory and other CERN projects).
  – Job management via DIRAC, the LHCb experiment collaboration's cloud and grid computing management solution.
Other volunteer computing activities

- “Adopt a Neuron” project between CERN and EPFL to share experience on BOINC and Virtualisation.

- **Antimatter project on Crowdcrafting.**
  - Developed at the CERN Webfest, another initiative of the CCC
  - Based on the technology PyBossa developed by the CCC and Open Knowledge Foundation, inspired by Bossa from David Anderson.

- **Citizen Cyberlab**, an EU project for e-learning and to improve communications between citizen volunteers and science. (Test4Theory team involved on the CERN side).
LHC@home consolidation

- New Drupal entry portal for LHC@home
  - Allows the different project teams to publish content
    - Drupal-BOINC integration tested but not used yet
- Common and more robust BOINC infrastructure
  - Servers under Puppet and shared NFS and DB backend
  - Merge Sixtrack and Test4Theory projects into a single BOINC project, with multiple applications:
    - Sixtrack – for classic BOINC users
    - Test4Theory Vboxwrapper
    - Beauty Vboxwrapper
    - Other Vboxwrapper...

Anyone got experience merging BOINC databases?
BOINC issues - wish list - 1

• Virtualisation support by BOINC
  • Virtual Box installation packaged with the BOINC client.
    − Today, only advanced volunteer users can contribute to BOINC projects using Virtual Box.
  • BOINC 7.x clients should be pushed to all the major Linux distributions.

• Release policy: The Git master branch should be stable
  • Reports that the boinc-api breaks across releases :-(

• Distributed machines
  - All BOINC project files to be network based
    • (e.g. not include hostname)

• MySql
  - Allow configuration to run MySql on a different port
    • mysql -h boincdb.cern.ch -P 5500 -u boincadm -p
  - Allow configuration of different table types. (The CERN DbOnDemand service requires **InnoDB** instead of the **MyISAM** engine)

• Forums
  - Better integration of BOINC forums in Drupal
  - Allow several applications to use the same forums.
Questions?

If you are not going hiking this weekend:
http://opendays2013.web.cern.ch/