LHC@home status

BOINC workshop 2013, Grenoble

Nils Høimyr & Pete Jones, on behalf the LHC@home team at CERN

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- Introduction, CERN and the LHC

- Status of LHC@home

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    - New LHC@home Web portal

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    - BOINC issues/wish list

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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
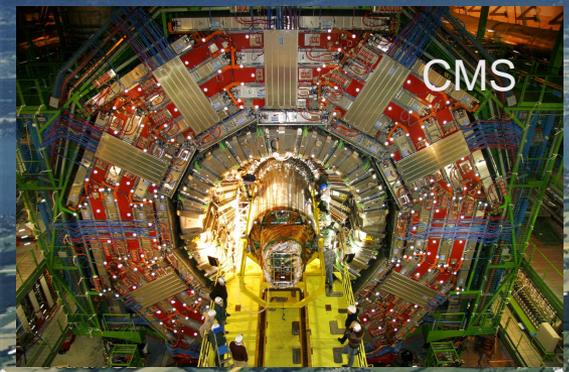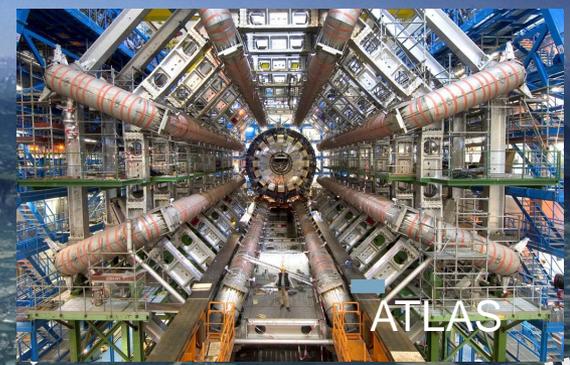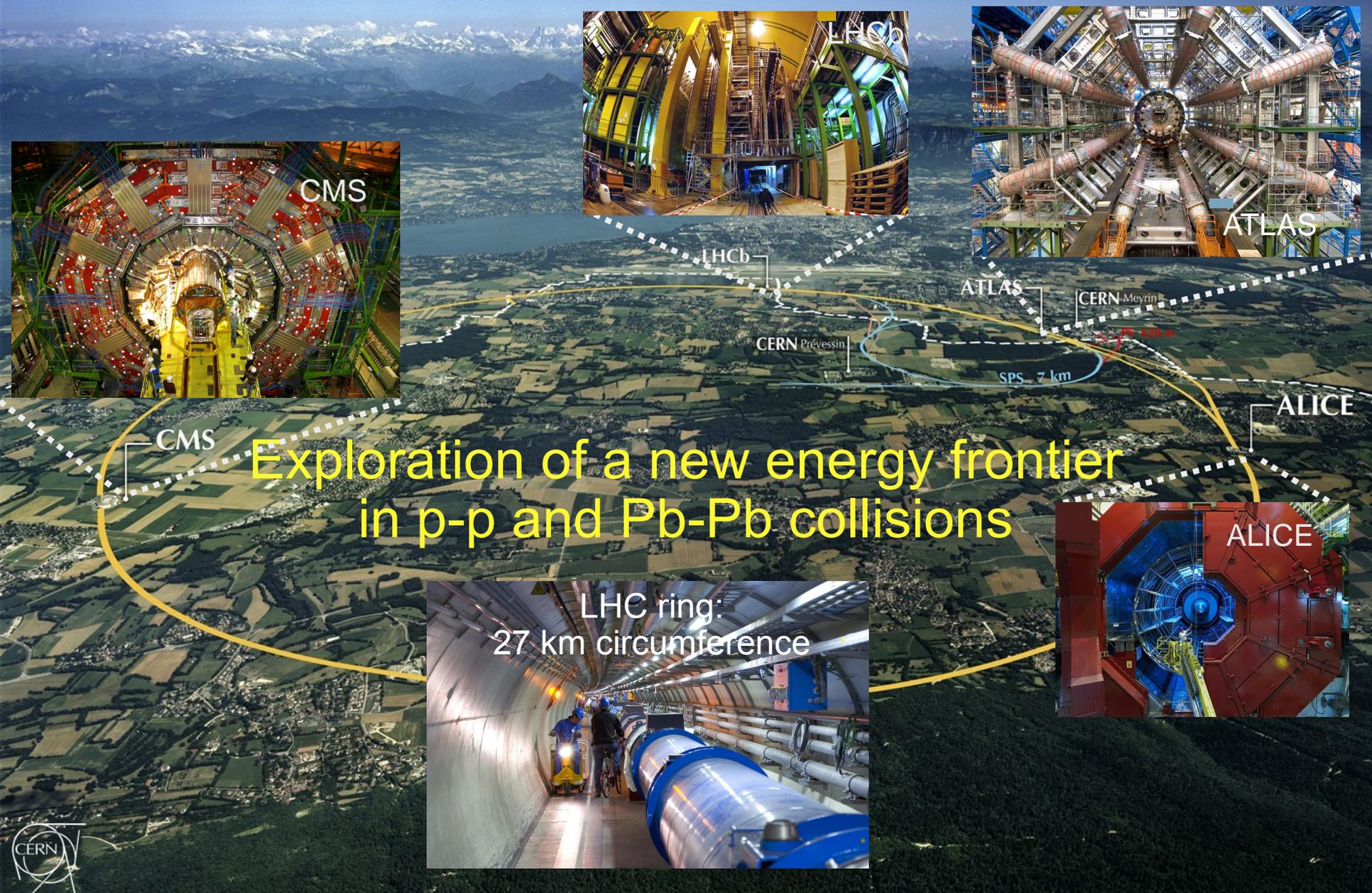
Candidate for Accession: Romania

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

LHCb

CMS

ATLAS

ALICE

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**
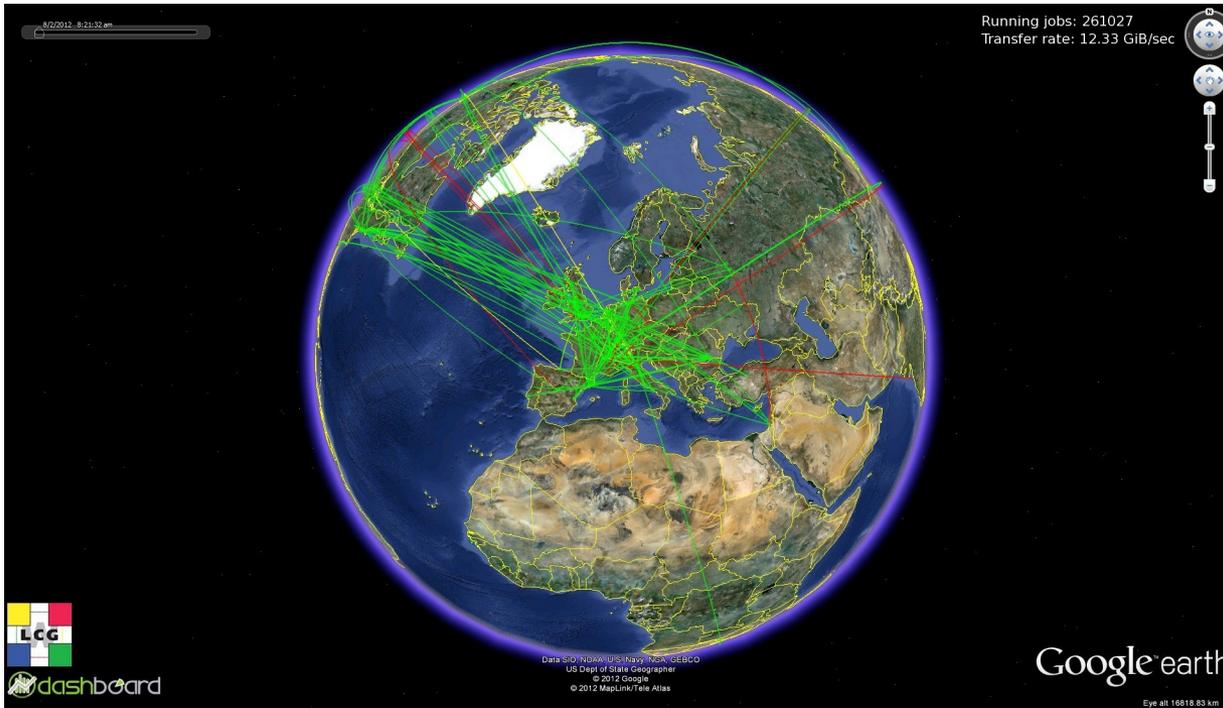- Requires many cooperating computer centres, as CERN can only provide ~20% of the capacity

Balloon 30Km

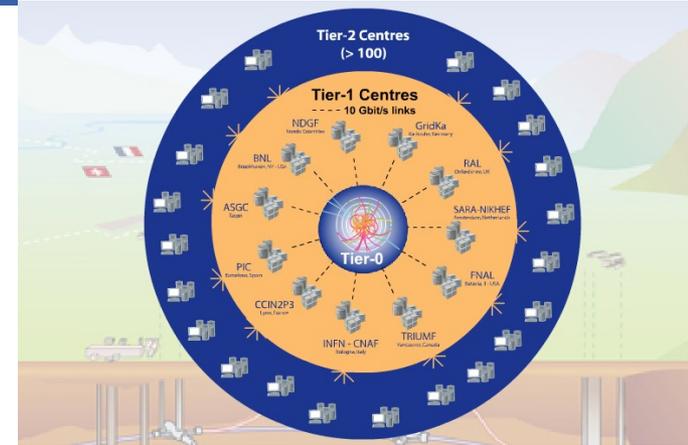Concorde 15 Km

CD stack with 1 year LHC data ~ 20 Km

Mt Blanc 4.8 km
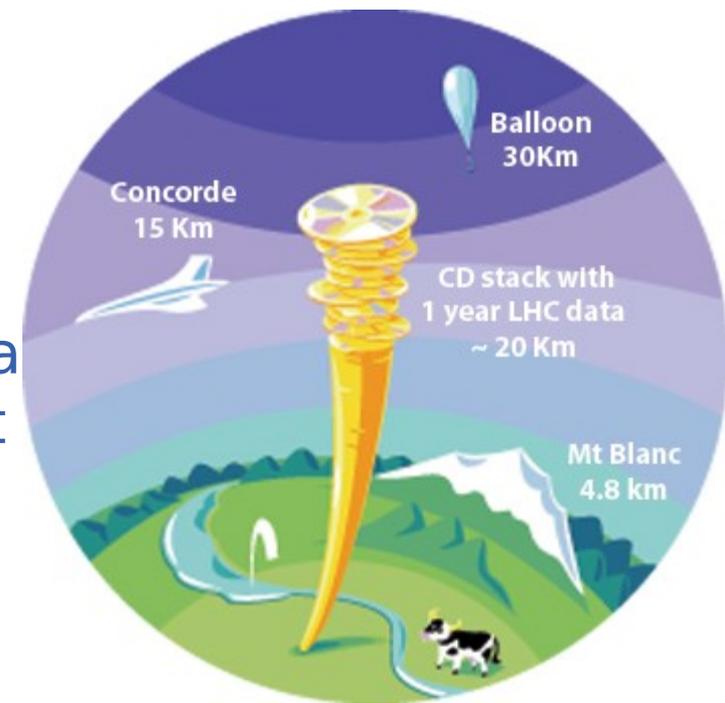
The LHC Computing Grid

- 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.

The LHC Computing Grid - Nils Høimyr

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.

- 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!*

- 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.

- "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 :-(

BOINC issues - wish list - 2

- 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/

LHC@home