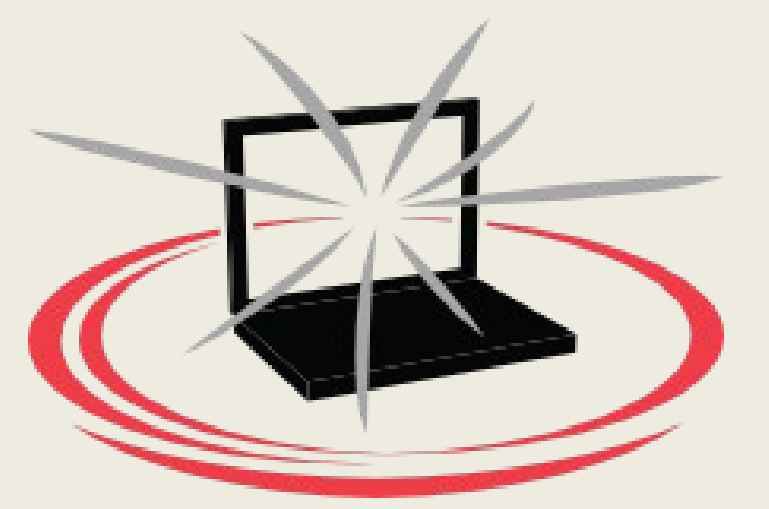




BOINC service for volunteer cloud computing



Alvaro Gonzalez Alvarez, Nils Høimyr, Peter L. Jones, Miguel A. Marquina, Ben Segal (CERN/IT)
Predrag Buncic, Jakob Blomer, Artem Harutyunyan, Anton Karneyeu, Peter Skands (CERN/PH)
Massimo Giovannozzi, Eric McIntosh, (CERN/BE), Igor Zacharov (EPFL)
Daniel Lombráña González, Francois Grey (Citizens Cyberscience Centre)

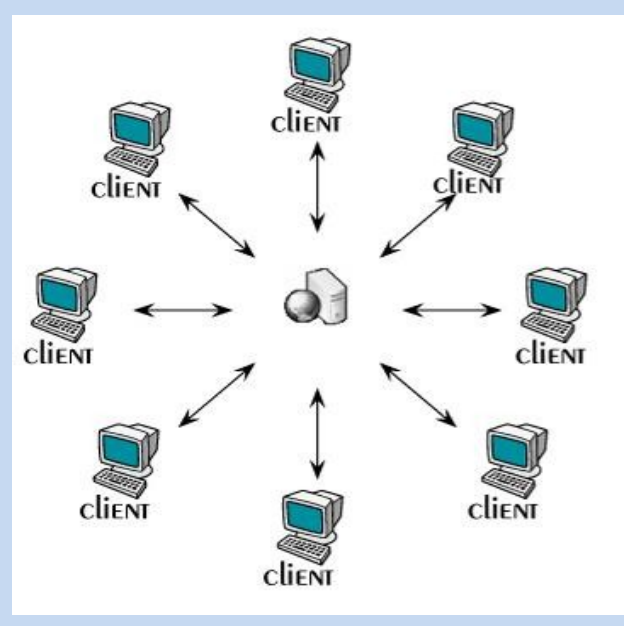
Introduction

At CERN, the European Laboratory for High Energy Physics, Volunteer computing has been used for LHC beam dynamics studies with Sixtrack since 2004. Some 60 000 volunteers with more than 100 000 PCs have actively contributed computing power for LHC simulations since 2004.

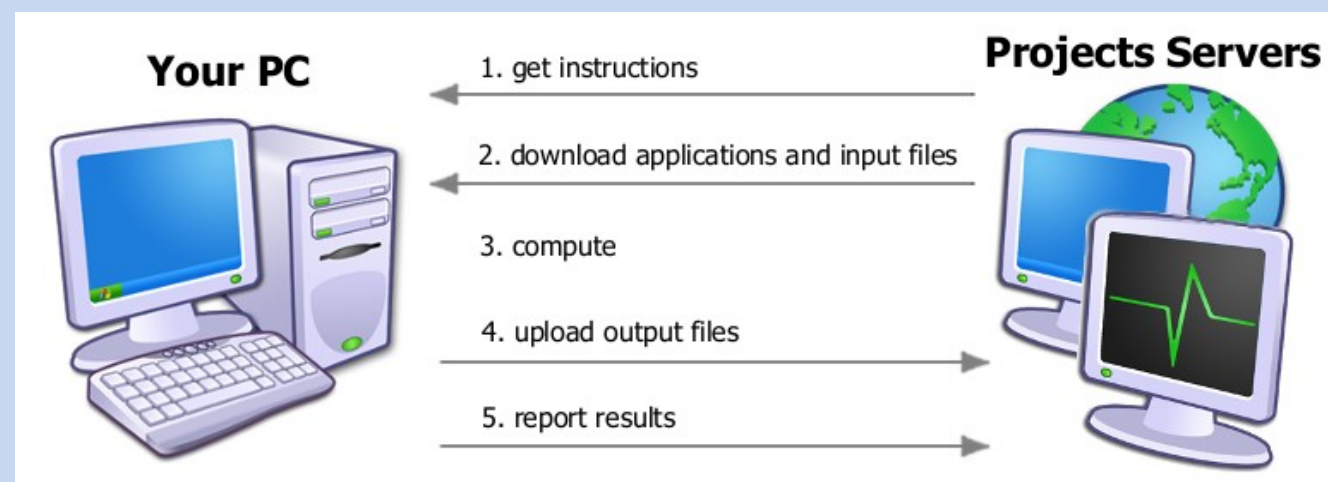
Thanks to developments with CernVM and virtualisation, now also physics simulations are running under BOINC. Monte Carlo event generation of collisions at the LHC are running on Volunteer PCs connected to the Test4Theory project, with results for users available on the site: <http://mcplots.cern.ch/>

BOINC, how does it work?

The Berkeley Open Infrastructure for Network Computing (BOINC) allows scientists to harness computing power from thousands of volunteer PCs for their scientific computing projects.



The clients connect to a central BOINC server via the web and download jobs from there.



When the computations on the volunteer PC are finished, the resulting output files are uploaded to the BOINC server and the results reported. The user gets *BOINC Credit* for his work.

Virtualisation with BOINC

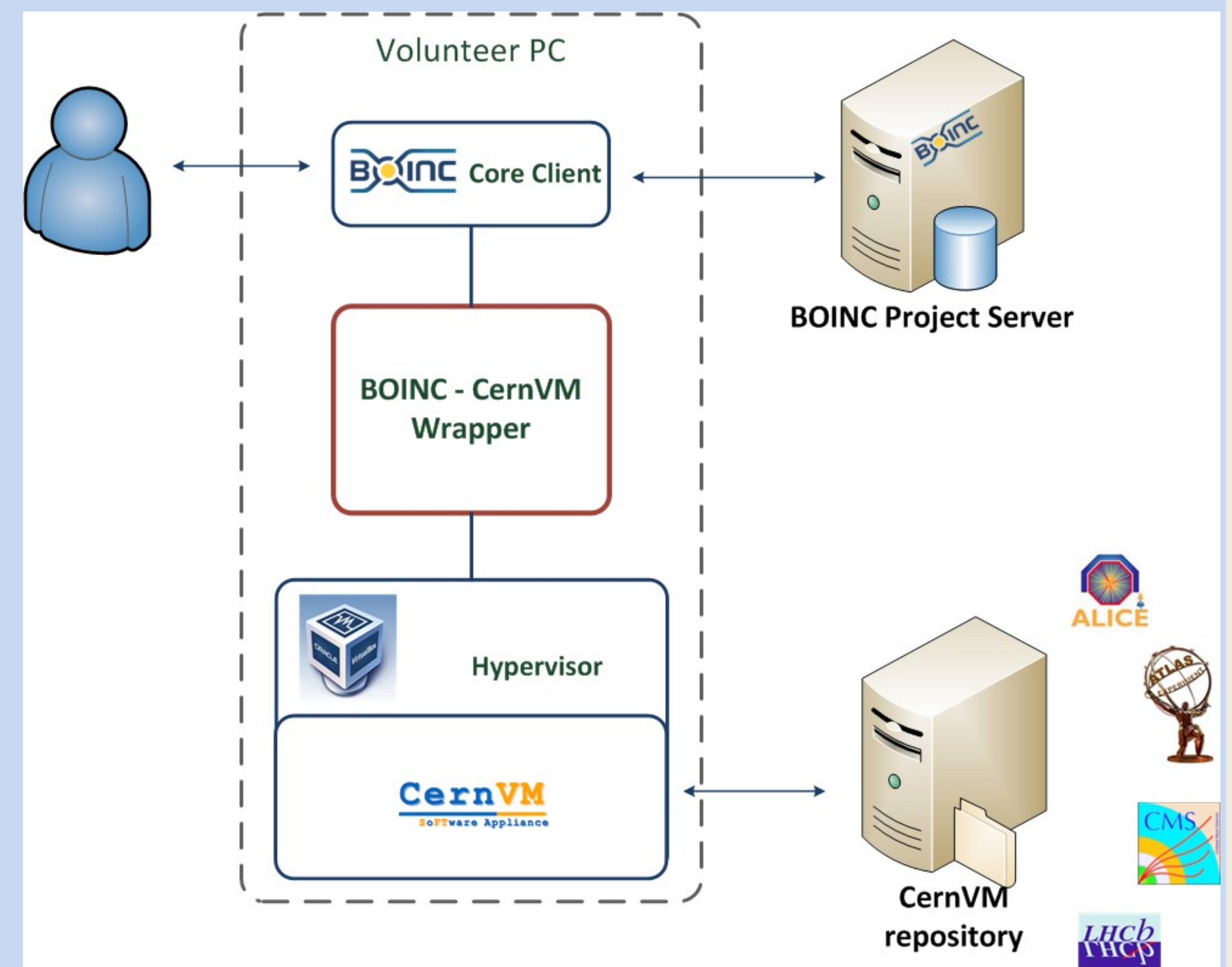
Use of virtualisation technology with BOINC frees the scientists from the constraints of porting their software to different architectures of volunteer PCs.

The BOINC client downloads a BOINC – CernVM wrapper from the BOINC project server.

CernVM runs under the Hypervisor of the Volunteer PC, and downloads tasks from the project via the Co-Pilot job management framework.

This scheme is suitable for all kinds of simulation or analysis with small data sets pr. job.

Any physics software that can run under CernVM can benefit from volunteer computing power under BOINC.



See also Artem Harutyunyan's presentation on CernVM Co-Pilot and the talk on CernVMFS by Jakob Blumer.

BOINC projects

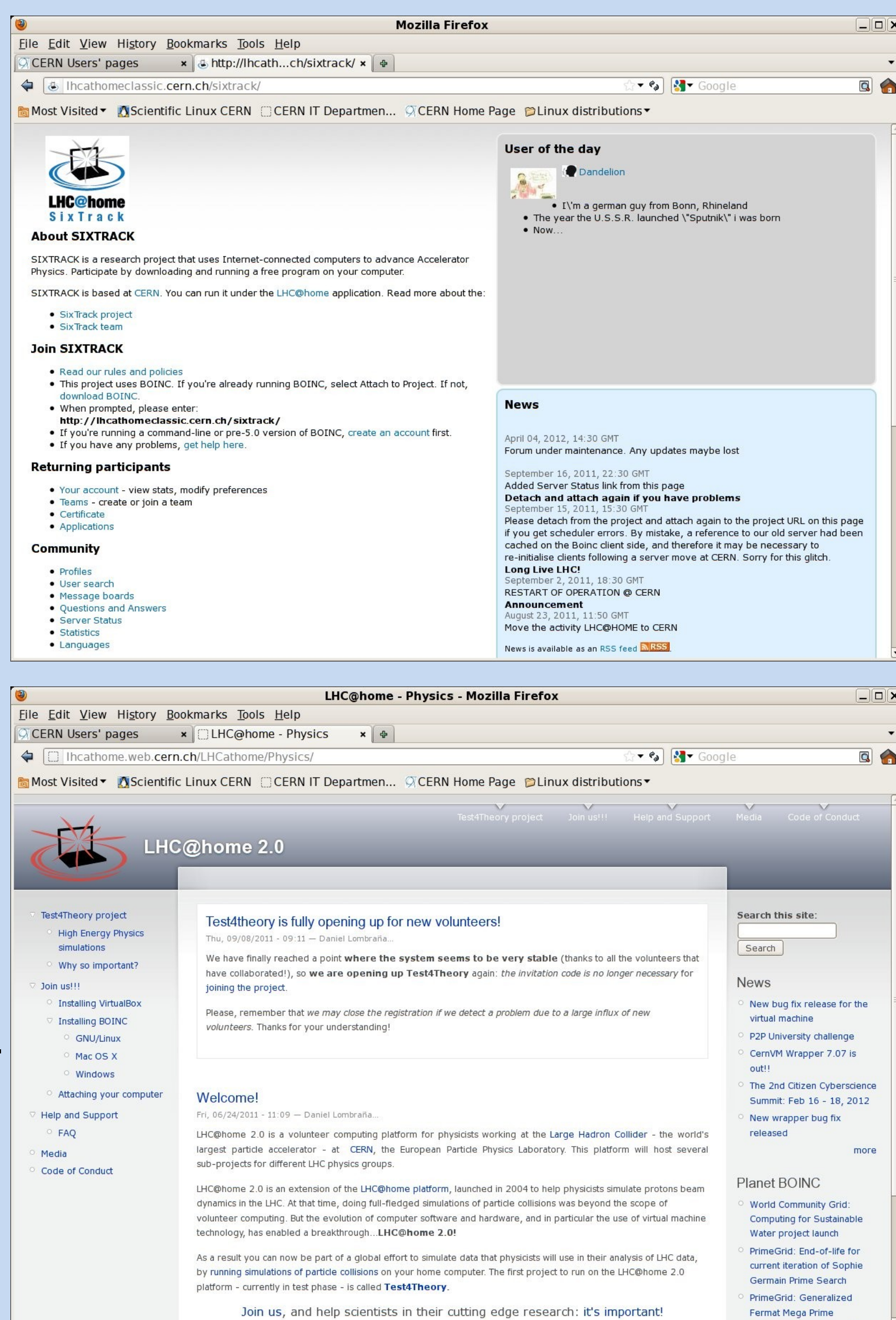
At CERN, there are currently 2 BOINC projects, both within the LHC@home platform:

Sixtrack, is a classic BOINC project with executables for Linux and Windows.

The forums and outreach are handled by the Sixtrack team in BE Department and at EPFL.

Test4Theory, a VM based BOINC project running Monte Carlo event generators like ALPGEN, HERVIG++ and PYTHIA. All the programs are running under CernVM on hypervisors on the volunteer PCs.

The site contains an active outreach part and notably links to scientific work of the scientists involved in the project. (<http://mcplots.cern.ch>)



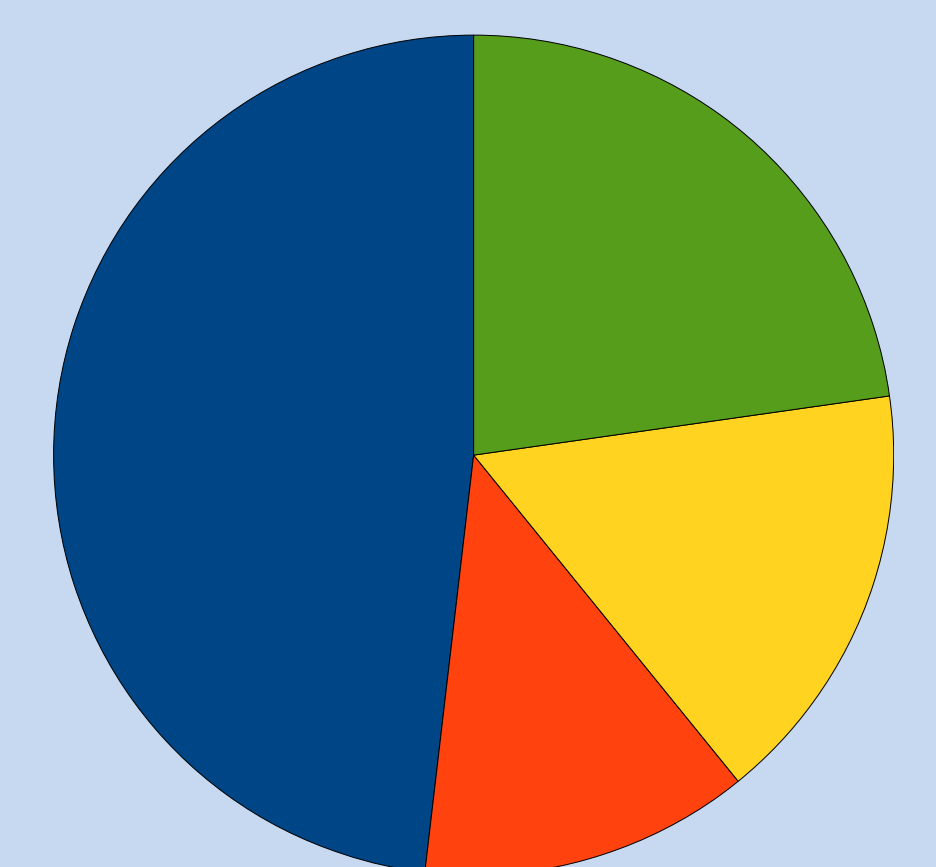
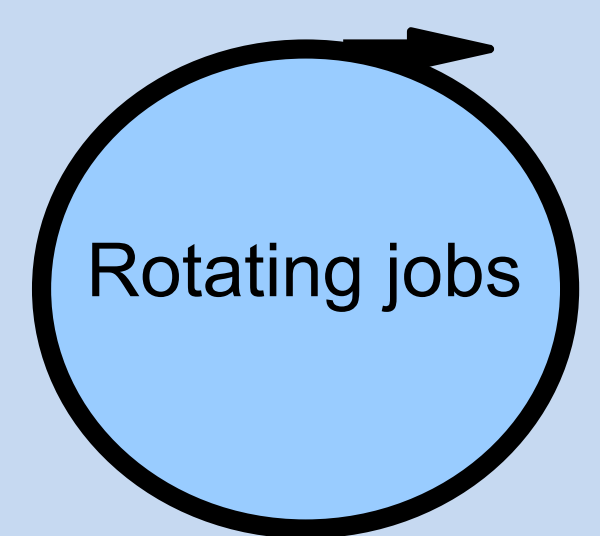
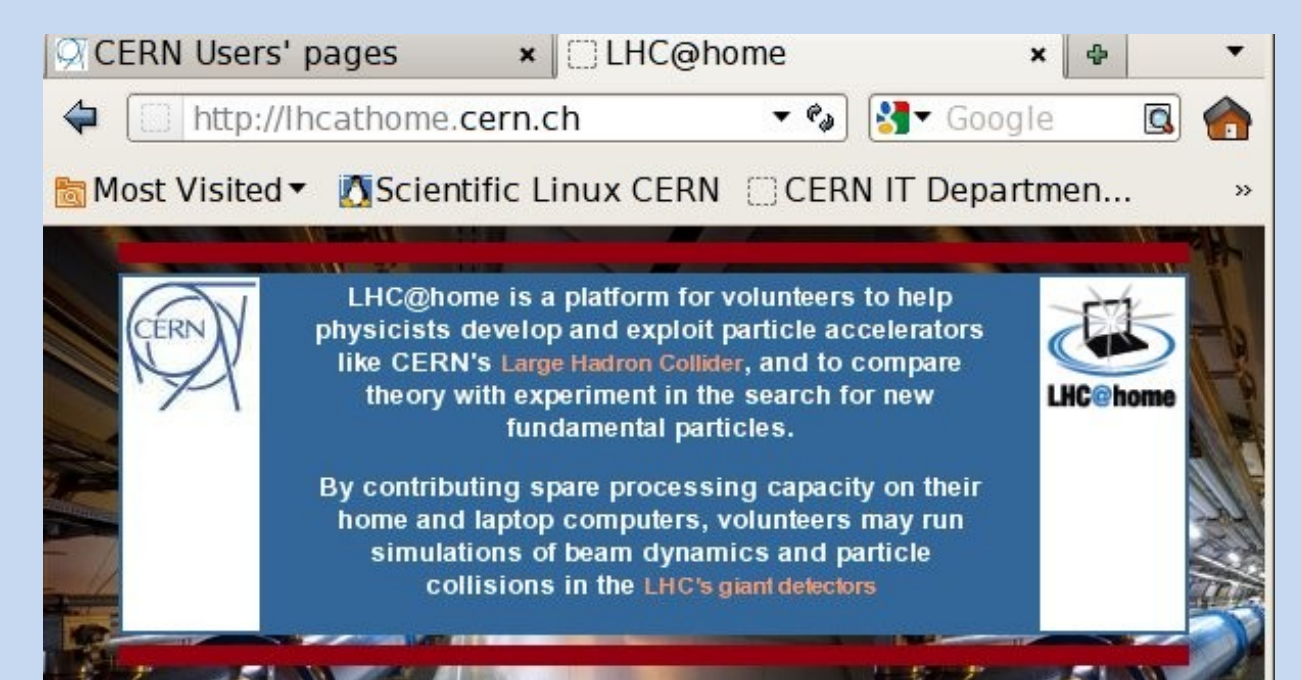
Outlook for a BOINC service

Shared front-end LHC@home portal

Distribution of different types of jobs to the volunteer cloud would all go via CernVM, no need for dedicated BOINC executables.

Jobs from different projects can be dispatched to volunteers via a rotating job scheme.

Depending of processing needs from the service customers, there would be jobs from the Theory group, LHC accelerator studies, or from Alice, Atlas, CMS, LHCb etc.



Summary

Use of Virtualisation Technology with Volunteer Computing overcomes the principal obstacle for using volunteer PCs as a computing resource in High Energy Physics. The current project-based approach to Volunteer Computing at CERN will gradually evolve towards a general service, where the Volunteer Cloud can be considered as a computing resource. The outreach aspect of Volunteer Computing has a lot of potential, and we should not neglect this communication channel.

Acknowledgements to our colleagues providing the underlying IT services and applications. And last, but not least, to the thousands of volunteers who are donating computing power.

