



Prepare for Citizen Science Challenges at CERN

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CERN openlab Summer Student Report 2013



Abstract

To inspire more people to contribute to science, and educate the public about science, two Citizen Science "challenges" were prepared during summer 2013: the CERN Summer Webfest 2013 and the Virtual LHC Challenge. The first part of this report summarizes how to organize a Webfest at CERN and the outcome of the CERN Summer Webfest 2013. The second part gives an introduction to the current state of the Virtual LHC Challenge: a development of the LHC@Home Test4Theory project planned to attract many unskilled volunteers.

This work was supported by a grant from the EU Citizen Cyberlab project, with assistance from the Citizen Cyberscience Centre (CCC).

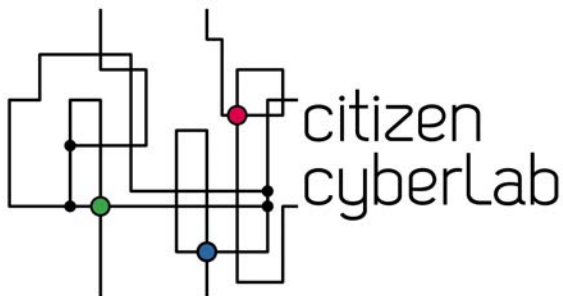


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1 Introduction

During the summer of 2013, two major Citizen Science challenges were proposed at CERN:

1. Organize the 2nd CERN Summer Webfest 2013 (before, during and after the event)

An event to stimulate creativity, and cultivate new ideas and projects, the CERN Webfest was organized again this summer. The event attracted more than 80 participants, and successfully established 12 new projects, most of which were well prototyped, free, open, and all of them had strong originality. Around the topic of “How to organize a wonderful Webfest at CERN”, three subtopics are presented:

- CERN Webfest Cookbook.
- Webfest project summary.
- Feedback and Improvements

2. Prepare for the Virtual LHC Challenge

The LHC@Home Test4Theory project (T4T) has been running a volunteer cloud on BOINC since 2011. A new web plugin (T4T-Direct) and a new frontend are under development to help users join this volunteer cloud by “one click”. In order to attract as many volunteers as possible, we are planning for a Virtual LHC Challenge. This report presents the current state of preparation for the Challenge, and major work from the author’s side: system testing of the plugin and interface, communication and outreach planning, and Web design for the Challenge.

T4T-Direct software development is partly supported by the EU Citizen Cyberlab project.

2 CERN Webfest Cookbook

2.1 Event Background

Inspired by the success of CERN Summer Webfest 2012⁵, and many other similar events that cultivated enormous new projects around the world, CERN Summer Webfest was organized again in August 2 –August 4, 2013. The event attracted more than 60 CERN summer students and staff members, and more than 20 visitors from all over the world to work together during the weekend. There were 19 project pitches, 14 of them were successful and presented during the project presentation session on August 4.

The event was co-organized by the Citizen Cyberscience Centre (CCC) and Citizen Cyber Lab. It was sponsored by the Mozilla Foundation and the Shuttleworth Foundation.

The CERN Summer Webfest 2013 is one part of the Citizen Science Challenges at CERN, which aims at communicating with people, creating new and innovative projects that bring science to the Open Web¹⁰.

The Webfest Cookbook is a manual of “how to prepare for a Webfest” that allows future organizers to prepare for the Webfest in a more orderly way.

2.2 Webfest Preparation

Publish Information

(starts from 3 months – 6 month before Webfest)

For official information (such as where/when/who, registration procedure, event schedule, project pitching information, etc.), we have a wiki site to support¹⁰.

For “dynamic information”, such as advertisement and notifications, Facebook groups are the best to get everyone informed. There is an official Facebook Group “CERN Webfest”, and every year there is a group “CERN Summer Student” setup by summer students, which has most of summer students and previous summer students involved. “Young@CERN” is another good option. In the meantime, a Facebook event will also be helpful.

Advertisement

(starts from 3 months before Webfest)

Advertisement for the event attracts most of participants. The main channels to advertise the Webfest are the following:

- Facebook Group Advertisement
- CERN Bulletin
- Summer Student Mail List
- Posters
- Personal Network

The Webfest should be officially advertised when summer students come to CERN, this will attract the first group of people. After there are enough projects proposed, another formal invitation should be sent to get more people involved (this is important because people will be interested in certain projects). Official advertisement includes CERN Bulletin and Summer Student Mail List. A letter template is prepared for this.

Facebook groups¹¹, posters will also be very helpful to expose the event to all summer students. It will be helpful to be or know an administrator of the Summer Student Facebook group, so that some important posts can be “pinned” for some time to keep them on the top.

Personal network is also a very reliable channel because the organizer can talk with people who have great ideas and skills in detail.

Participant Registration

(starts from 2 months – 3 month before Webfest, when summer students arrive)

An official way to register all participants is very important. This year we used Survey Monkey web forms, but similar tools including Google Form and any other free online survey design tools.

Important notifications (such as room change, event reminder, actions) should be sent via an email list of all participants.

Project Pitching

(starts from 2 months – 3 months before Webfest)

Project pitching should start long time before the Webfest weekend. There are two main sources of Webfest projects : from CERN staff/fellows and from summer student. Many summer students have very good ideas that could turn into projects on the Webfest. The organizer is responsible to meet as many “cool” people as possible to talk about project ideas. Many summer students would propose projects with great originality, and convince other summer students to work together even from a few weeks before the event. This year, among 19 initially pitches, 11 projects were proposed by summer students, 10 of them were succeeded in the end with very high quality.

Tutorials and Workshops

(starts from 1 week – 2 weeks before Webfest)

Tutorials and workshops can be designed when it’s close to the Webfest. As many visitors and participants have special skills that can be shared with all other participants. Useful topics include:

- Presentation/Communication skill
- Web design and web programming
- Graphics design
- Video editing
- Physics
- Hardware programming

File Sharing

A set of files is available in a Google Drive folder, which contains design files, templates that can be reused. During the preparation, all files should be shared between the organizers.

2.3 During Webfest

Opening Ceremony

- Make sure infrastructure is ready: main auditorium is open, video recorder is working, AV testing, light
- Check-In/Registration
- Organize project pitching session
- Organize networking after project pitching so that people can talk to the project pitchers
- Time control (A howler timer will be useful)

During the Event

- Check in participants
- Organize workshops and tutorials
- Coordinate with project teams if necessary
- Have fun in some projects
- Send notification to participants about Webfest schedule
- Deal with any emergencies

Project Presentation

- Organize project presentations based on project categories
- Help present award
- Time Control

2.4 Post-Webfest

After webfest, certificates should be made, with signature from CCC coordinator and stamp of CERN IT department. A LaTeX based certificate template is prepared. Some project will have plans to develop their products further, it is meaningful to keep in touch with them.

3 Webfest Outcome Summary

Based on the theme “Bring Science to the Modern Web”, the Webfest projects fall into five categories: Tools for Science, Physics/Standard Model, Data Visualization, Gaming and Education.

Before introducing the projects, an overall summary of all projects over the weekend is presented here¹³:

- 80+ participants
- 14 of 19 projects succeeded over the weekend
- 12 open-source projects
- 8 currently running online
- 7 are still developing and attracting more people
- 4 are now official CERN projects
- Projects and the event were reported by CERN Bulletin, CERN Website & Twitter, New Scientist and Quantum Diary

3.1 Tools for Science

The first topic is for people to explore new ways to convey and communicate science. Two projects were presented in the Webfest Finale.

Reproducible Science

This project tries to build an environment where scientific content can be presented easily. The project team had made a browser-based computational notebook editing system before the Webfest using iPython. During the weekend, the team released a python package to display ROOT canvases in iPython notebooks. The system has been released online, user can create/upload/download/save notebooks, and perform ROOT-based computation directly on the webpage (As an example, see Figure 1). The format of result is fairly expressive and rich^{6,7}.

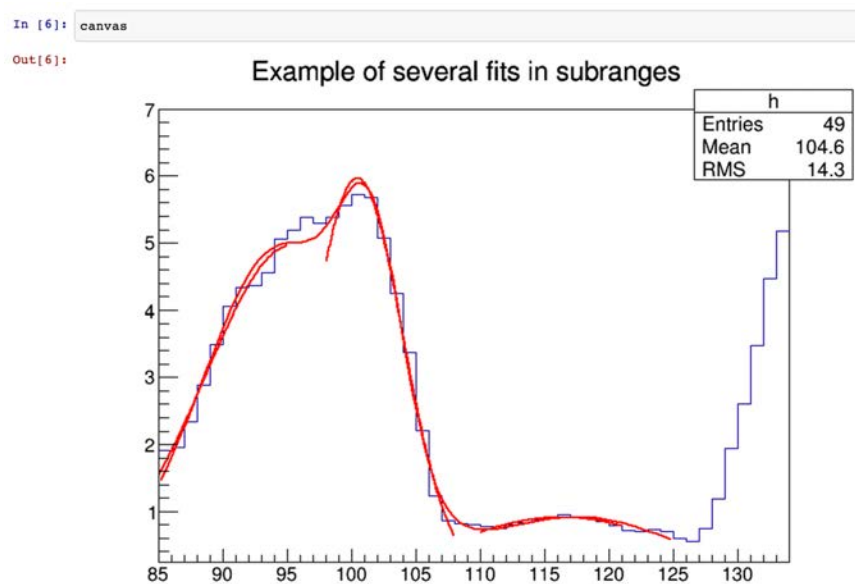


Figure 1. Online Computational Notebook Output Example.

Just Publish – Platform to Make Science 2.0 Simple

Science 2.0 has advantages such as faster sharing ideas, experience and mistakes, making open collaboration creditable, giving funding to the ones with the best ideas. Building such a platform is a long range project, where open science can be shared between people. During the Webfest, the project team prototyped a few scientific knowledge graphs on Pearltrees website.

3.2 Physics/Standard Model

Antimatter Application for Crowdcrafting

This project is proposed by Michael Doser (spokesperson of AEgiS) and Daniel Lombrana (lead developer of Crowdcrafting), to create a Crowdcrafting application that helps analyze where the annihilations are supposed to be based on a sample. The sample is the new gel poured on glass plate covered by a gas barrier film, and the annihilations are supposed to be at the surface of gas barrier film. The data set is a collection of images (1240 x 1024 pixels) grabbed by a CMOS camera during a run of emulsion film scanning. For a given horizontal (X,Y) position, a tomographic scanning along the vertical (Z) axis is performed. Data are grouped in "views", each of them corresponding to a fixed (X,Y) position and containing 40 images taken at different depths. The data taking is organized in this way: the microscope horizontal stages moves to a X,Y position and stops there, the vertical stage moves along Z and the camera grabs the tomographic images, then the horizontal stage moves to next view and so on.

In 48 hours, the project team created a fully operational prototype that loads the data images into an HTML5 Canvas, then using the Kinetic.JS library the images are animated in a loop, creating the effect of a movie. Using the canvas, the volunteers can start drawing tracks by clicking in the starting point of the track and clicking again to mark the end of it. This will draw a line, that will be converted in real time into a 3D model using HTML5 WebGL technology in the info page¹³ (See Figure 2).

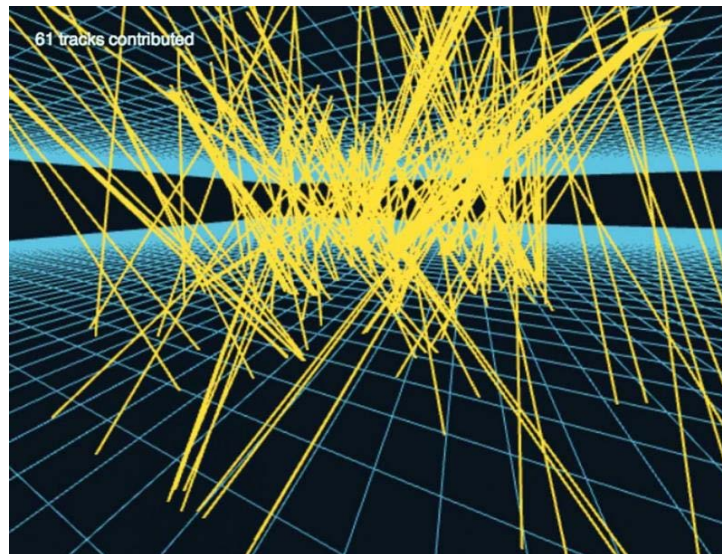


Figure 2. *Online Computational Notebook Output Example. (Image : AEGIS)*

The project immediately attracted many volunteers after its launching, and has been reported by CERN and New Scientist³.

State Generator

The state generator project team created a website that allows to display baryonic and mesonic states of quarks. The user will apply transformation operators to them and will be asked to find a state symmetric under some transformations. This project is open-source, and the finished site is available online²².

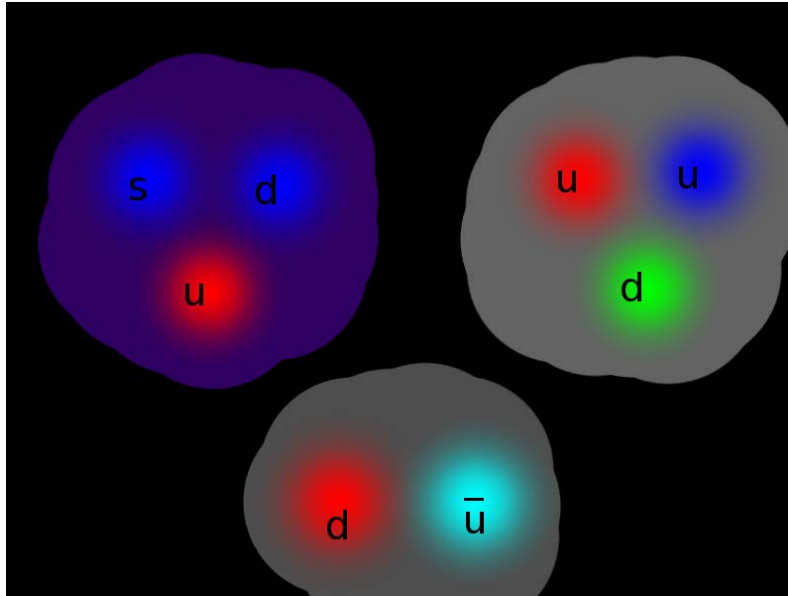


Figure 3. State Generating Interface.

3.3 Data Visualization

Popular Physics in History

This project involves the development of an interactive visualization, which correlates topics published by physicists and collaboration between these physicists over time.

The project team retrieved data from CERN Document Server (CDS), an INVENIO based database. Based on keywords, and co-authoring relation, a graph-based visualization can be generated, in which users can discover the relations between physicists and their collaboration (see Figure 4).

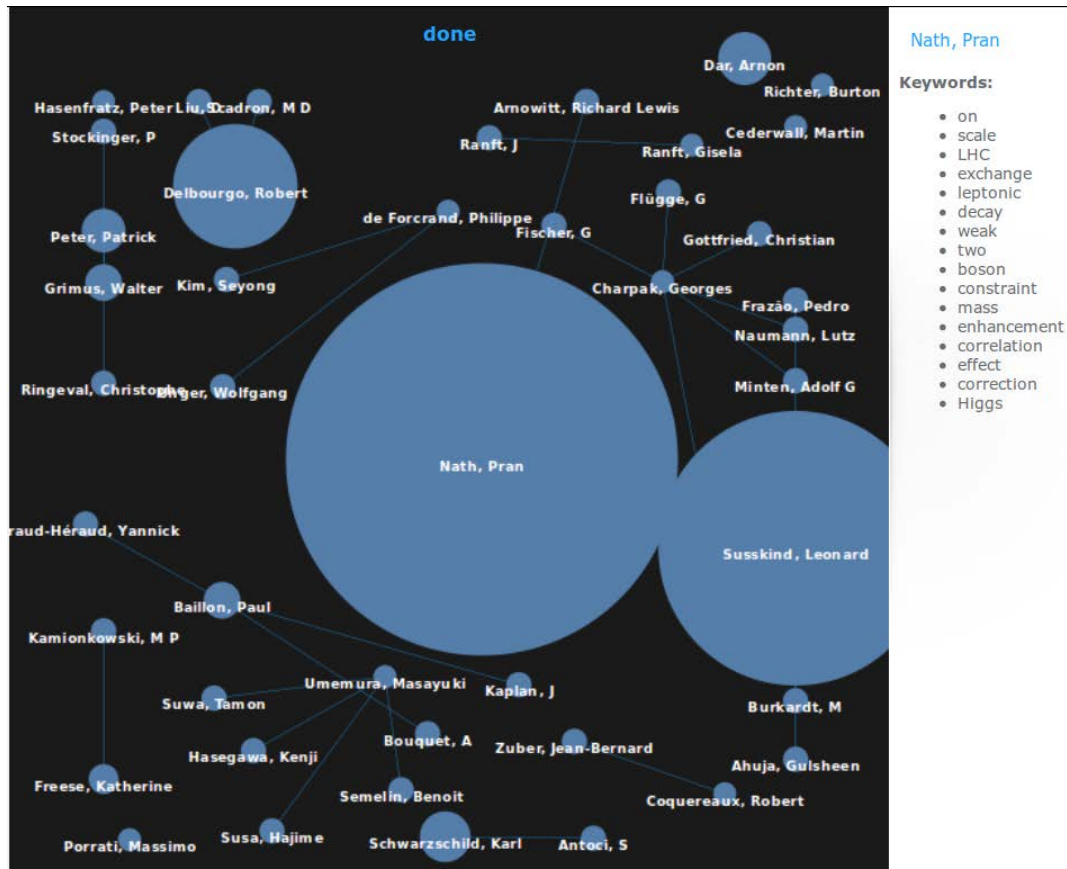


Figure 4. Visualization of Physicists' Collaboration and Research Topics (Image : Archit Sharma).

The project team is trying to taking a larger database dump from both CERN CDS and INSPIRE, and converting them to a local instance. A better optimized searching algorithm is going to be built to reduce the long processing time. Better visualization format and richer visualization content are also going to be designed.

Easyflow : Simple Workflow Management & Visualization Tool

Easyflow is a simple workflow management and visualization tool, it allows users to define and create simple workflows and make them available for users to view and follow.

The project team created a Web application that allows its users to manage and visualize their complicated workflows, with simple interfaces.

3.4 Gaming

Prepare the Virtual LHC Challenge using CernVM WebAPI

LHC@Home Test4Theory allows volunteers to use their personal computers' spare CPU cycles to process data generated from CERN's accelerators or Monte-Carlo simulations, so that CERN physicists can compare their latest theoretical models with real experimental data. It is based on a new front end, which requires no effort on installing and configuring virtual machines. The goal of this project is to attract as many volunteers as possible, in the meantime, to make the system educational so that the general public can get access to the knowledge of particle physics and accelerators while they are contributing to the data processing at CERN.

On the CERN Open Day (September 28 – September 29), there will be a virtual challenge prepared around the LHC@Home Test4Theory. Ioannis Charalampidis (a fellow from CernVM group) developed a new website to achieve these¹⁵ (See Figure 5, 6, 7). Now the project is still in the development.

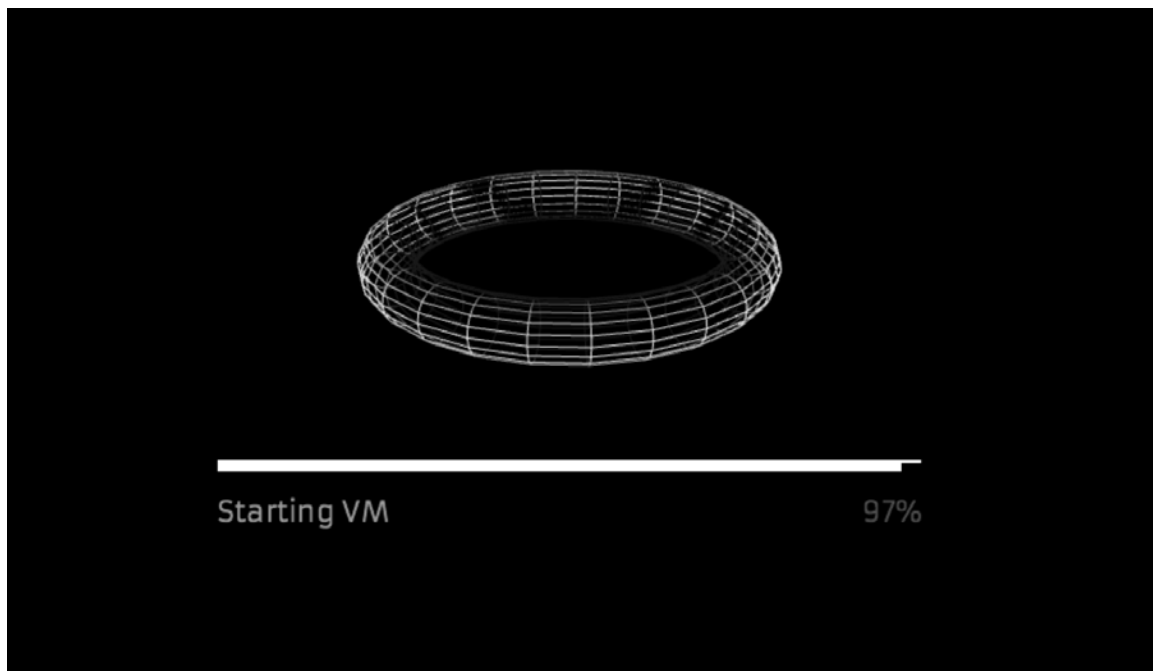


Figure 5. Interface of preparing CernVM and browser plugin.

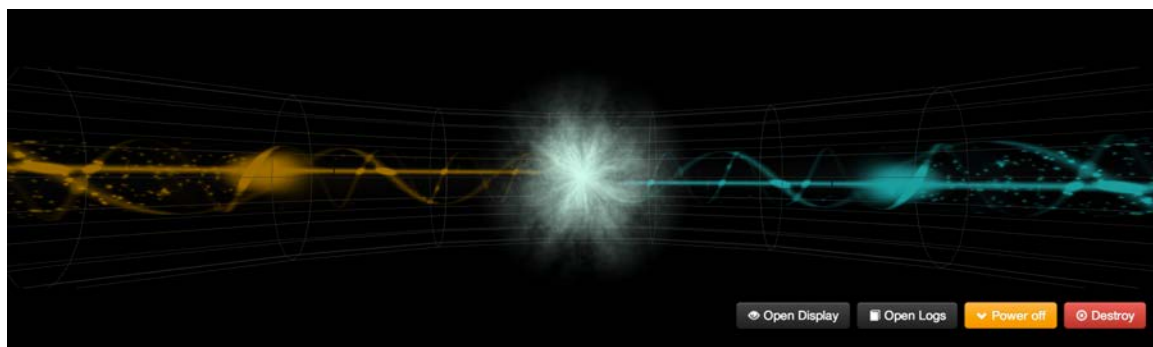


Figure 6. Interface Prototype – CernVM Starts Computation.

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Oracle RDP Web Client 1.2.8
(c) 2009-2010 Oracle Corporation 2013 [debug] Got ACK for c46ac078-6491-450f-b06f-5b25d4190319
[Tue Aug 13 14:15:55 2013] [debug] Got nsq with ID: 46d0035f-82c7-4dba-aa7e-bebec8945ab from jhoicnc-lb0copilot-messaging.cern.ch/hoicnc-jnit-09
[Tue Aug 13 14:15:55 2013] [debug] Got msg with ID: e06ea7ff-e6a2-4b10-b5cc-80e45a0f2310 from jhoicnc-lb0copilot-messaging.cern.ch/hoicnc-jnit-08
[Tue Aug 13 14:15:55 2013] [debug] Sending ACK message to jhoicnc-lb0copilot-messaging.cern.ch/hoicnc-jnit-09 (from agent_d-s-1_7_e10af3dd-a3a9-499c-a46f-0fb0dd03440a_g0copilot-messaging.cern.ch/05819b48494c36eff5b09435d190a94e) for the messages ID:46d0035f-82c7-4dba-aa7e-bebec8945ab)
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[Tue Aug 13 14:15:55 2013] [info] Got have_getJob from jhoicnc-lb0copilot-messaging.cern.ch/hoicnc-jnit-09
[Tue Aug 13 14:15:55 2013] [info] Job manager (jhoicnc-lb0copilot-messaging.cern.ch/hoicnc-jnit-09) requires /cumfs/sft.cern.ch/icg/external/boost/1.44.0.python2.6/1686-slc5-gcc43-opt/include/boost-1.44/boost/type_traits/renoue_cv.hpp to be present. Doing the check.
[Tue Aug 13 14:15:55 2013] [info] The file is present. Proceeding with the job request
[Tue Aug 13 14:15:55 2013] [info] Job manager (jhoicnc-lb0copilot-messaging.cern.ch/hoicnc-jnit-09) requires /cumfs/sft.cern.ch/icg/external/boost/1.44.0.python2.6/1686-slc5-gcc43-opt/include/boost-1.44/boost/type_traits/renoue_cv.hpp to be present. Doing the check.
[Tue Aug 13 14:15:55 2013] [info] The file is present. Proceeding with the job request
[Tue Aug 13 14:15:55 2013] [info] Asking jhoicnc-lb0copilot-messaging.cern.ch/hoicnc-jnit-09 for a job
[Tue Aug 13 14:15:55 2013] [debug] Will wait for runJob for a minute.
[Tue Aug 13 14:15:55 2013] [debug] Sending message to jhoicnc-lb0copilot-messaging.cern.ch/hoicnc-jnit-09 for the component (Msg ID:01b31118-4c6f-4ac4-a4dc-23f607272051)
[Tue Aug 13 14:15:55 2013] [debug] Got ACK for 01b31118-4c6f-4ac4-a4dc-23f607272051
[Tue Aug 13 14:15:55 2013] [debug] Got nsq with ID: c8c3764e-9665-45d5-ac74-e99448ea45c3 from jhoicnc-lb0copilot-messaging.cern.ch/hoicnc-jnit-09
[Tue Aug 13 14:15:55 2013] [debug] Sending ACK message to jhoicnc-lb0copilot-messaging.cern.ch/hoicnc-jnit-09 (from agent_d-s-1_7_e10af3dd-a3a9-499c-a46f-0fb0dd03440a_g0copilot-messaging.cern.ch/05819b48494c36eff5b09435d190a94e) for the messages ID:c8c3764e-9665-45d5-ac74-e99448ea45c3)
[Tue Aug 13 14:15:55 2013] [info] Got runJob
[Tue Aug 13 14:15:55 2013] [info] Got job to run with ID 36d7dbfd-b06a-4cf8-bcf4-b3f858fb6d4b
[Tue Aug 13 14:15:56 2013] [info] Starting fetching input files for job (ID: 36d7dbfd-b06a-4cf8-bcf4-b3f858fb6d4b)
[Tue Aug 13 14:15:56 2013] [info] Fetching input files for job (ID: 36d7dbfd-b06a-4cf8-bcf4-b3f858fb6d4b) is finished
[Tue Aug 13 14:15:56 2013] [info] Creating working directory /tmp/agentworkdir/36d7dbfd-b06a-4cf8-bcf4-b3f858fb6d4b for the job.
[Tue Aug 13 14:15:56 2013] [info] Create wrapper script for job (ID: 36d7dbfd-b06a-4cf8-bcf4-b3f858fb6d4b)
[Tue Aug 13 14:15:56 2013] [debug] Got ACK for a0893205-8026-4092-b1d4-a452540ca3e2
[Tue Aug 13 14:15:56 2013] [debug] Got ACK for c46ac078-6491-450f-b06f-5b25d4190319
[Tue Aug 13 14:15:56 2013] [info] Starting child process (PID: 24593) to execute the command for job (Job ID: 36d7dbfd-b06a-4cf8-bcf4-b3f858fb6d4b)
[Tue Aug 13 14:16:05 2013] [debug] Purging previously scheduled getJobOutputDir request
[Tue Aug 13 14:16:55 2013] [debug] Got reply for want_getJobOutputDir. Purging previously scheduled job output directory request
[Tue Aug 13 14:16:55 2013] [info] Got reply for want_getJob. Purging previously scheduled jobs.
[Tue Aug 13 14:16:55 2013] [debug] Purging previously scheduled getJob request

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Figure 7. Console Display of the Interface, with Details of Jobs.

Bizarre Accelerator

In this game players will design a simplified accelerator : given initial position of the particle and position of the target, the player will use magnetic field and electric field to direct the particles to reach the target with certain amount of energy (See Figure 8).

This game is open source, and is released online. The project team did very productive work, achieved basic page design, basic game play, two particle sources (proton and electron), 5 physics elements, 16 puzzles along with the tutorials, and a popular Facebook page to promote the game (<https://www.facebook.com/bizarre.accelerator>). The game is currently online²¹.

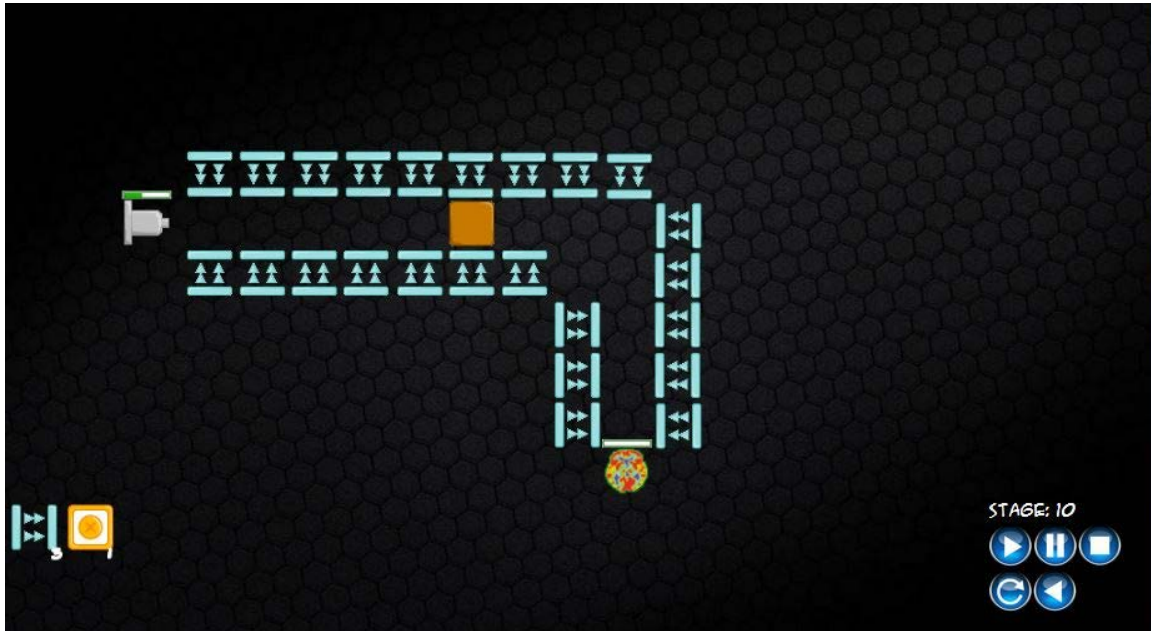


Figure 8. Game Snapshot of Stage 10.

HEP Game : MadParticles and RunningCollider

With 18 members from different areas, the project team tries to attract more people from around the world to learn about CERN and particle physics with easy learning curve which can encompass all sorts of people from children, students, teenagers, adolescents, physicists, engineers, and other people in general. The game aims to simulate the process heppened inside CERN and the management process of CERN facilities, by playing the game, people will have fun and also gain a lot of knowledge. To create the game, the team used C++ with Cocos2D-x library for development, Xcode 4.6 for debugging, and Adobe Illustrator for graphics design.

The game has two parts, MadParticle teaches players about collision results and the probabilities to produce different kinds of new particles from the colision. Players will also learn eath particle's characteristics and their decay mechanisms. In the running collider part, players will learn about the trajectory and behavior of particles in detector, detection process and so on (See Figure 9, Figure 10).

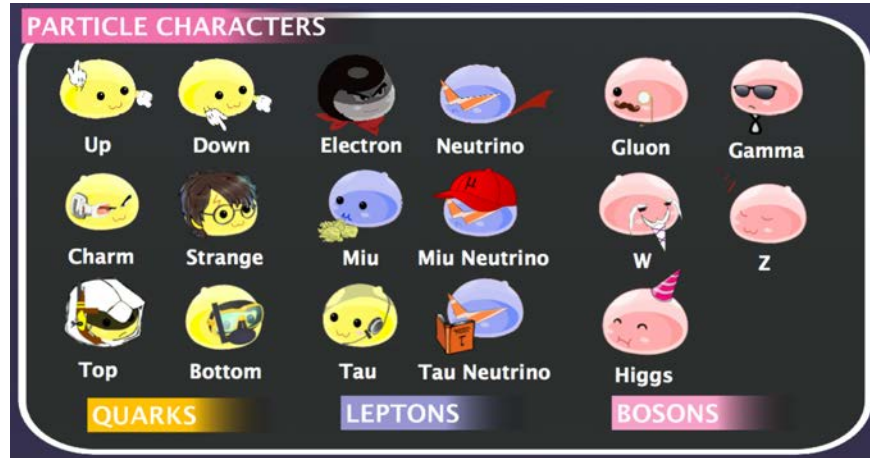


Figure 9. Particle Characters in HEP Game.



Figure 10. Game Interface and More Graphic Designs (Image: Nathaniel Harjanto).

The game has been an official project for CERN outreach, and all team members are still in collaboration to finish the game.

HEP Tycoon

HEP Tycoon is a fun and educational game. Players will manage an HEP research facility and she needs to build and upgrade her accelerators, particle detectors and data centres, hire or fire scientists and engineers, and turn data into scientific research publications. While playing the game, the player will learn a lot of particle physics from educational text, and the player will discover new particles along the way.

Over the weekend, the project team made a simple playable prototype and put the game online. This game is open source (See Figure 11).

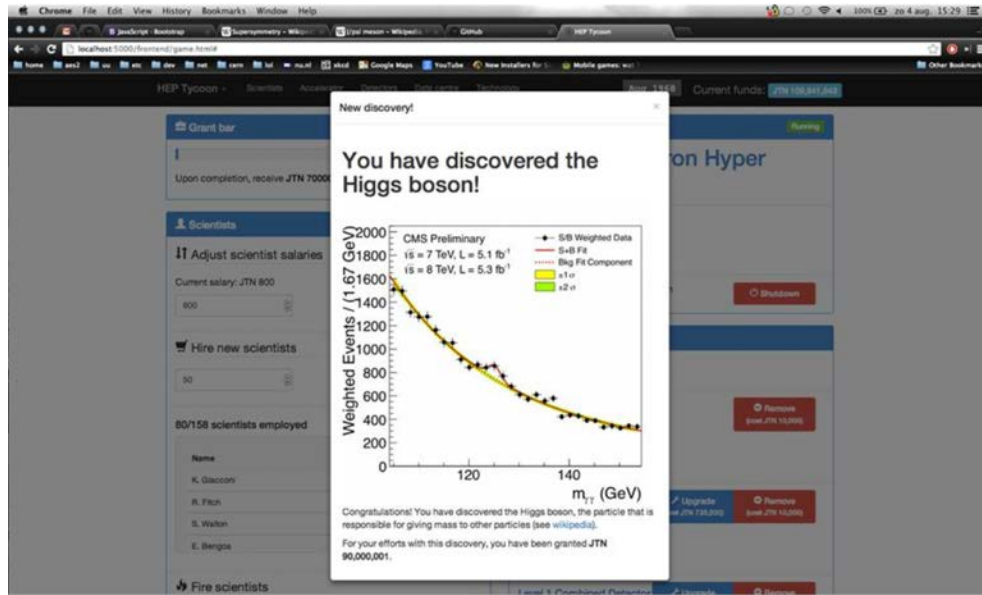


Figure 11. HEP Tycoon.

Mother Hunting (寻找 妈妈)

The project team has physicists, coders, graphic designers. They built a game based on CERN 3D model provided by CERN Media Lab and ATLAS group. The game presents an end state particle exploring CERN and try to reconstruct her family history of decay mothers and ancestors. When playing with the game, the player will search for certain particles, they will learn the physics by reading some text (hints).

During the Webfest, this game attracted 5 physicists, 1 programmer and 1 graphics designer to work together. It used Unity3D to build the environment and used Javascript to implement the logic of the game (See Figure 12).



Figure 12. Game Interface of Mother Hunting Game (Image : Ryan Badman).

Particle Pop

This game is of the style of Bejeweled. Back to the time right after the Big Bang, when the universe consists of elementary particles, some hadrons and atoms. The player is going to combine particles to form larger particles, or make matter and anti-matter collide to gain energy. The game is developed in one day using Python with Pygame.

The game is not open, the project team is currently dealing with license issues before publish it online. A screenshot of the game running on local machine is available. (See Figure 13).

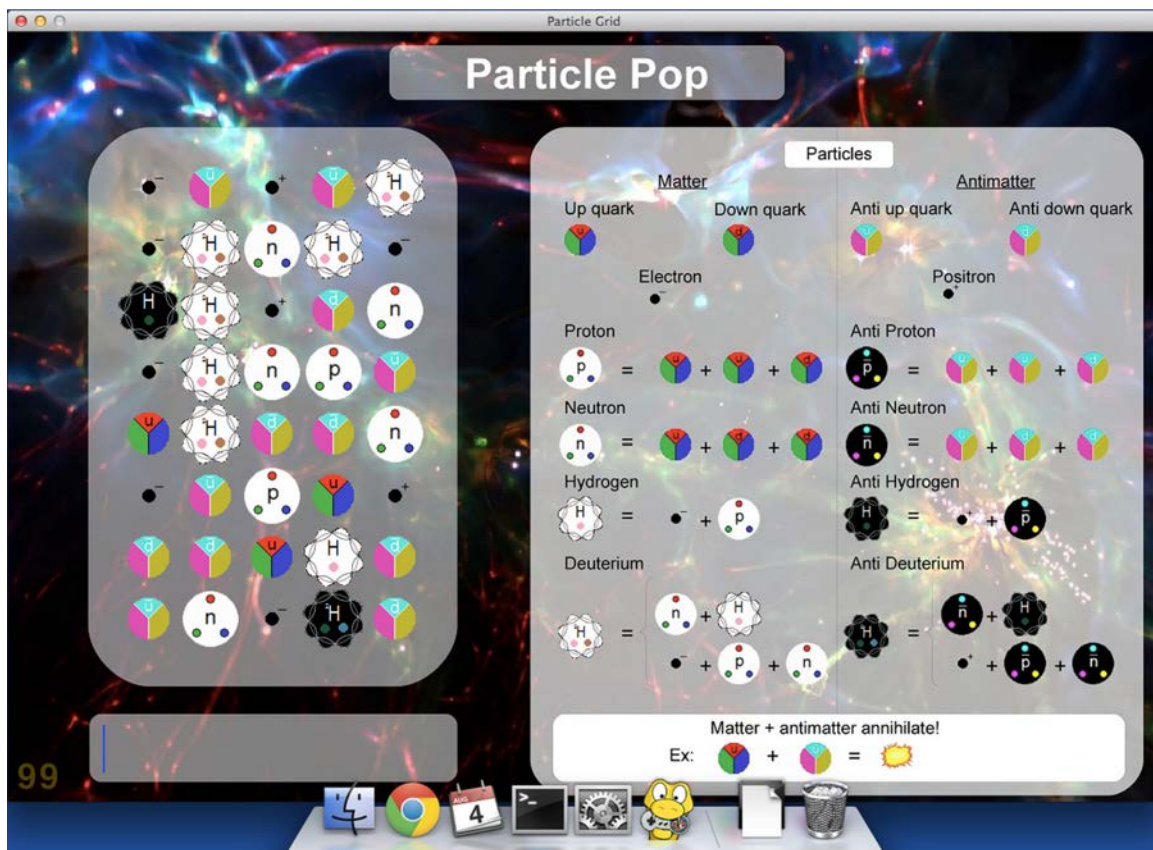


Figure 13. Particle Pop (Image: David Wind)

3.5 Education

LinkingScience (Former “LeProject”)

LinkingScience is a platform for creating new ideas and software where researchers can find volunteers to help them in their research, and programmers have more opportunities to contribute to cool open source projects. Over the weekend, the project team implemented a nice interface and designed the database structure of the website. Now

user sign-in, user page, project creation, and most of the static content has been accomplished.

The project team is still working on more features of the website, including smart project creator, project community, built-in accounting system and reward system, and so on. A snapshot of the current front page is attached (See Figure 14).

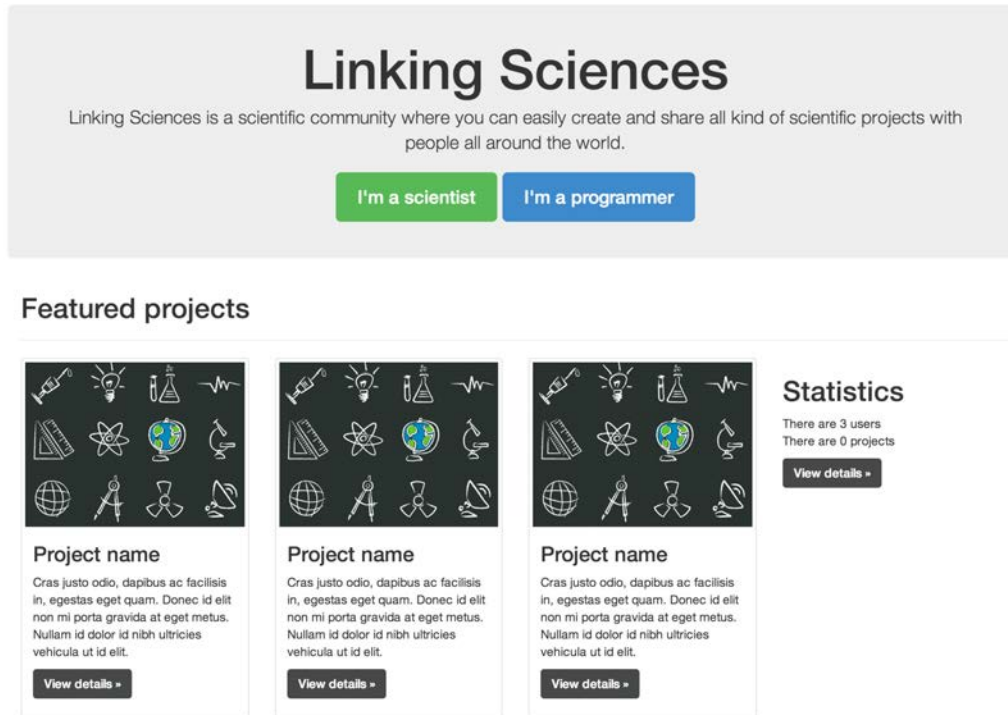


Figure 14. Front Page Prototype of LinkingScience (Image : Guillaume Lastecoueres).

3.6 Summary of Tutorials

In addition to all projects, there was a series of tutorials organized during the Webfest¹⁰.

Making Science-y Media using Mozilla Popcorn Maker

Mozilla PopcornMaker is an easy tool to “remix” media content and distribute it on the Web. Users can easily create new media using existing YouTube video clips, Wikipedia paragraphs, pictures, and add events to the video. Michael Kohler from Mozilla Foundation gave this lecture.

Introduction to Crowdcrafting and Citizen Cyberscience

This tutorial is an introduction to Citizen Cyber Science by Crowdcrafting and Pybossa, and how to make applications that allow citizens to contribute to Science. The tutorial showed how to create an application, upload some tasks and analyze them in the CrowdCrafting.org server. It was given by Daniel Lombrana González.

Facemash Clone : Introduction to Web Programming using Web2Py

In the movie “The Social Network”, Mark Zuckerberg built the Facemash using one night. It randomly shows two photos of two people, and the user gets to select which one is better. And as more and more people make such selections from random combinations of photos, the application generates a “RANKLIST” of all the photos , and the photo on the top is the hottest. This workshop taught participants to make Facemash clone in an hour and a half using Web2Py. It was given by S.P. Mohanty.

Hardware Programming using Arduino

This workshop is the most popular one, where participants can have hands-on experience to program an Arduino. James Devine gave this introductory course of hardware programming.

Communicating Your Science

This workshop focused on pitching an idea, aimed specifically at pitching the completed projects to the judges at the end of the Webfest. Julie Gould from Mobile Collective organized this workshop.

Master Class of Particle Physics

During this master class participants got introduced to different ways of looking at LHC proton/proton collisions. Andrey Ustyuzhanin from “Reproducible Science” project introduced how to calculate lifetime property of D0 particle, and check if it complies with standard values.

4 Feedback and Improvement of Future Webfest

4.1 Summary of Feedback

A feedback survey was designed immediately after the Webfest. We designed four questions, and received feedback from 19 participants. A summary of feedback is listed below :

What did you like most about the Webfest ?

- Short and challenging
- Meet people have different background/skills, but same interests
- Dedicate in one project and really realize it
- Cultivate creativity
- Friendly and collaborative atmosphere
- Geared up participants

- Enthusiasm and freedom to code
- Good organization
- Tutorials and workshops
- Prize
- Team working
- Had a lot of fun
- High quality of projects

In what way (if any) did the Webfest enable you to be creative?

- Many projects involved
- Competition itself
- Project contribution
- Develop ideas of projects
- Brain storming sessions
- Contact with other people from various background
- No limitations on the outcome
- Learned many tools (version control/programming)
- Make movie with scarce resources

What aspects of the Webfest could be improved?

- Organize dinners/parties to help people build network and talk to project pitchers
- More official award ceremony and common dinner/party
- More free food supply
- Free coffee and food at night
- Free t-shirts
- A fixed, big and cool place for all teams to work together
- Invitations could be extended to participants from all over the world

What did you learn from participating in the Webfest? (new skills, technologies etc.)

- New Skills
- Programming
- Physics
- Organizing and planning a project
- Graphical Design
- Web Design/Web Programming
- How to organize a project
- GitHub
- Working in a team and communication
- Play
- Social management
- Video Editing

- Presentation

4.2 Recommendations for Future Webfests

Project

Hardware projects should be proposed early because it requires more preparation on material, chips and so on. An earlier coordination with James Devine could be done next year.

Licensing

12 of 14 presented projects of this year are open-source and free to use. Still there are two projects having license issues that could not open : Mother Hunting (used CERN 3D Model), and Particle Pop (used a non-open package to build the game). Also a clear license for every project is important to distribute the project clearly in the future. A tutorial could be organized around this topic, a very good candidate is Daniel Lombrana, who is an expert of open-source software.

Tutorial

We organized a tutorial on communication and presentation, which was taught by Julie Gould. However the quality of final presentation could be even improved further. Presentation skills could be emphasised more next year.

From the feedback, participants also want to learn more about Web Programming even though we had organized one this year about Web2Py Facemash Prototyping. This could be better designed next year.

Another issue is that some participants cannot take part in the tutorials because they have to work on their projects. So one potential solution is to move some tutorials to evenings before the Webfest.

Auditorium Access

As auditorium was closed both this year and last year for the Sunday presentation, despite the promise from room management team. So it is essential to get a key ahead! But summer students have difficulty to obtain keys, thus a CERN Staff member should ask for the key before the Webfest.

Working Space

The best place for team working is the glass box of R1, but in August it is usually very hot during daytime. A better place could be found next year for all teams to work together. The place should be cool, and has enough extension cables.

Food Supply

More food should be supplied rather than only one meal. As R1 food is expensive, the organizers could coordinate with Mozilla to get some cheaper pizza from outside CERN.

Also as many participants suggested, there should be coffee and snacks at night, because many teams would work for the whole night.

5 Prepare for Virtual LHC Challenge

The LHC@Home Test4Theory project helps CERN LHC data processing using computation resources from volunteers worldwide. The development has been through several versions, previous development was based on the Berkeley BOINC, which needs relatively complicated installation and configuration procedures, thus not easy to reach people who are not computer-savvy.

So the idea of “Test4Theory-Direct” (T4T-Direct) was proposed to have a browser-based system that communicates with CernVM, installs all required software and completes all necessary configurations for the user at once, making the installation process extremely simple and independent of platforms. All of this is done by a web plugin together with a user interface program.

The first user interface implementation used the Crowdcrafting toolkit¹². A more recent development has a more “fantastic” frontend, and allows a new user to join on one click. Both are currently under development on Chrome and Firefox¹⁵.

The idea of holding a Virtual LHC Challenge is to “gamify” the process and announce the new development during a certain period of time (such as the CERN Open Days). On the Virtual LHC Challenge Days, a series of LHC@Home Test4Theory jobs will be run that simulate events from a historic collection of accelerator experiments, up to and including Higgs events from the LHC. Hopefully this will help us to attract as many volunteers as possible to contribute to the LHC data processing, and in the meantime we hope they will learn something about CERN, the LHC, and Particle Physics.

To prepare for the Challenge and improve the current system, several tasks from my side were undertaken during the summer.

- Cross-platform system testing of Plugin and User Interfaces
- Prepare for communication and outreach, including Chinese communities
- Web design for the Virtual LHC Challenge

5.1 System Testing of Plugin and User Interfaces

As it is expected that the system will bear up to around 20K users, the stability of the system is extremely important. Since the system was initially designed to automate the installation and configuration processes for users, the prototype was inevitably problematic. Unpredicted errors occurred on various systems, including the Windows, Mac OS, and Unix/Linux versions. Around this, a testing group was formed to give feedback to the system. The testing group consisted of geographically distributed “fresh users”, mostly students, with different levels of knowledge on computer technologies. The group reported several severe bugs on different operating systems, and gave the development team valuable feedback about the web design and the workflow itself.

In particular, the testing results revealed problems with the T4T-Direct web plugin, which led to several new more stable releases. The fixed bugs included configuration errors, installation/download time-outs with slow network speed in Asian countries, multiple bugs on Windows releases, and others on the volunteer map, challenge countdown page and so on.

5.2 Communication and Outreach

Currently, there are on average 1500 – 2000 users globally running their machines in the BOINC Test4Theory volunteer cloud²³.



Figure 15. Volunteer Map during different time of a day.

From the volunteer map, we see that most of the users are from Western European countries and the United States (See Figure 15). However, there are much less volunteers in other countries such as Russia, Australia, Japan, Canada and China. Among them, China has greatest potential. Up to the year 2012, there are 513 million users on the Internet, almost 50% of the total population, and the number is still rapidly growing. According other statistics in 2009, there were 29.3 million college students and 97.45 million secondary school students, and the number is also slowly growing (See Figure 16).

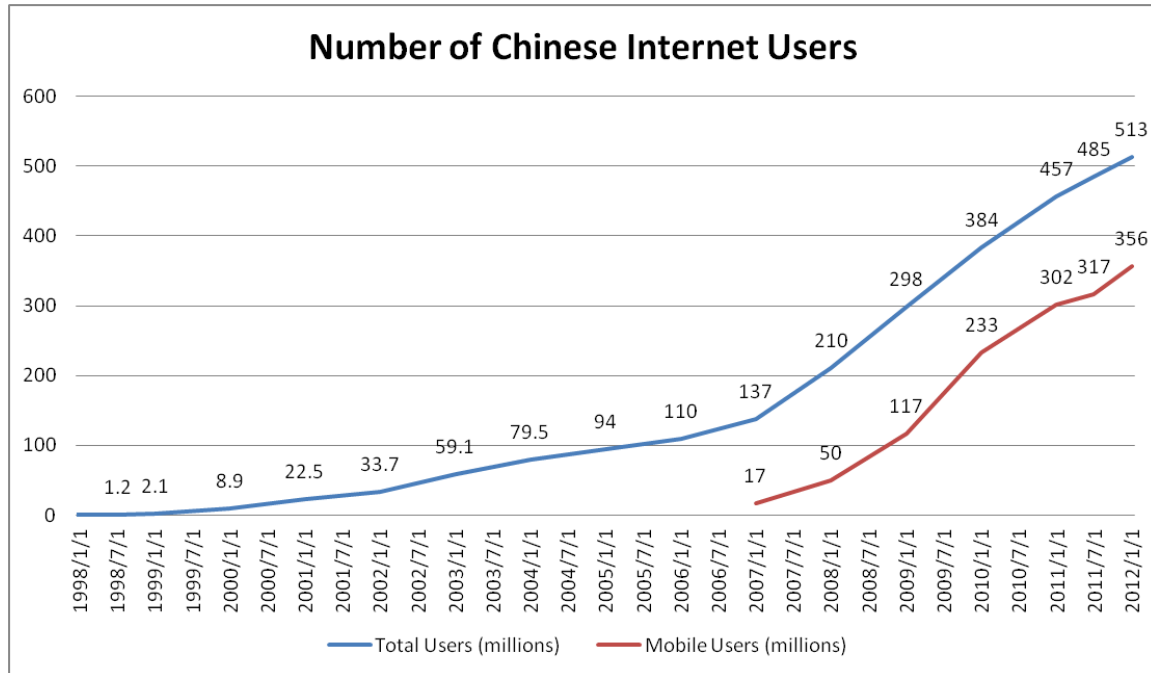


Figure 16. Chinese Internet Users up to 2012.

(<http://www.east-west-connect.com/chinese-internet-user-demographics-jan-2012>)

Test4Theory is a very good project to outreach to these communities and involve many people, especially students, into the LHC computing cloud. In the mean time, it is also a distinct opportunity to teach the public about Particle Physics. Using the simpler T4T-Direct interface, we can support many more volunteers, which led to the idea of holding the Challenge.

A rough calculation shows that currently the 2000 BOINC computers process about 400,000 events per second. With T4T-Direct, and 10,000 people connected, the volunteer computers could process 1 million events per second, and with 100,000 people, 10 million events could be processed per second, which is about the amount LHC produced during 2011. This is the dream of the Virtual LHC Challenge.

Equin.com is a big Chinese volunteer computing community, currently with many projects online, such as the BOINC version of LHC@Home, CAS@Home, GPUGRID, Einstein@Home, Rosetta@Home and so on. The Equin.com forum is pretty active, thus it would be a very good place to advertise the Challenge. From the feedback on the forum, and the few volunteers on the map, the current LHC@Home users, at least in China, do suffer from the complex installation of the BOINC version, and many failures were not properly addressed, thus many users actually failed to use the system even though they would like to. We hope that using the simpler T4T-Direct system, this problem would be solved.

Many other Chinese college student groups also show great interest, such as Physics, Mathematics, and Science related associations in Sun Yat-sen University, Tsinghua University, Jiaotong University. And there are numerous other student groups in hundreds of colleges in China.

High schools and secondary schools are also good and meaningful targets, but those students are usually less exposed to Internet, so it is technically more challenging.

5.3 Web Design for the Virtual LHC Challenge

A simple workflow is designed for the challenge. All users have three simple options: join the volunteer computing cloud, look at others on the volunteer map, and learn more about physics and computing at CERN via “Learn More” (See Figure 17).

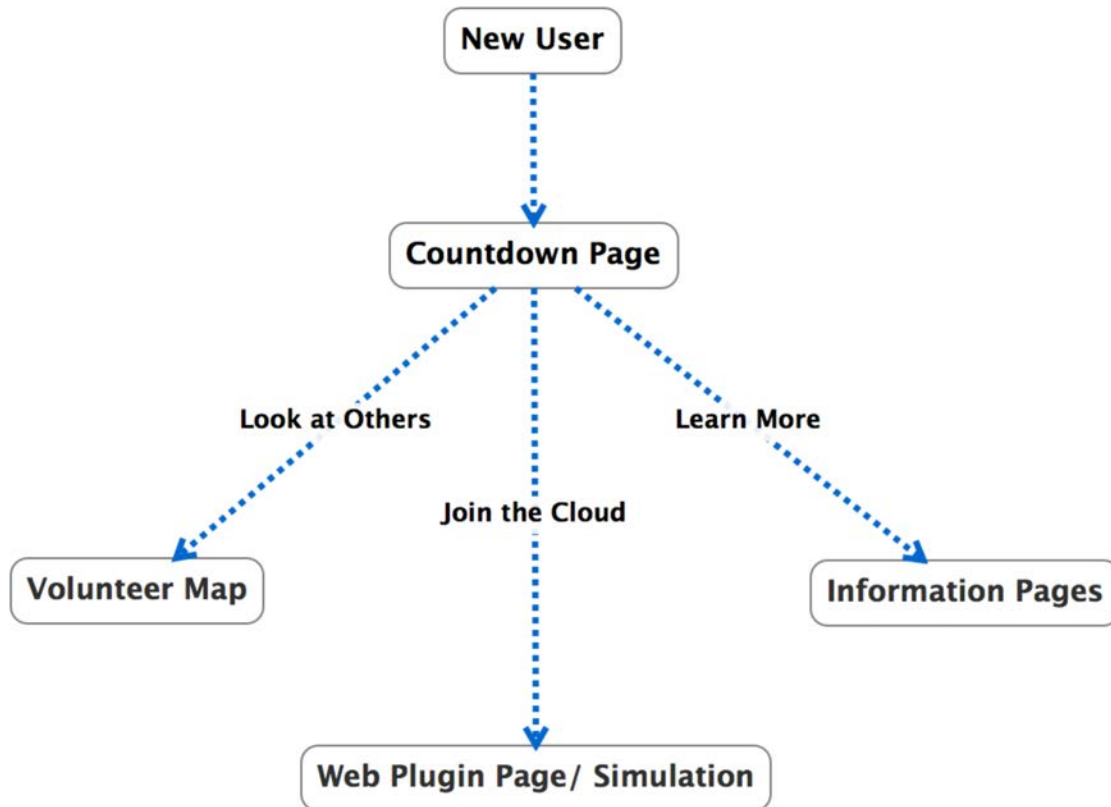


Figure 17. Simplified Workflow for the Challenge Web Pages.

- Countdown page¹⁷ serves as entrance to direct users, currently hosted on CERN’s webserver (See Figure 18).
- Volunteer map shows users who are doing volunteer computing with them.
- The T4T-Direct frontend is linked with “Join Now”.
- Information pages (not finished) will help users know more about the challenge and particle physics. Unfortunately, lack of time prevented me from helping more with this important work for the Challenge.

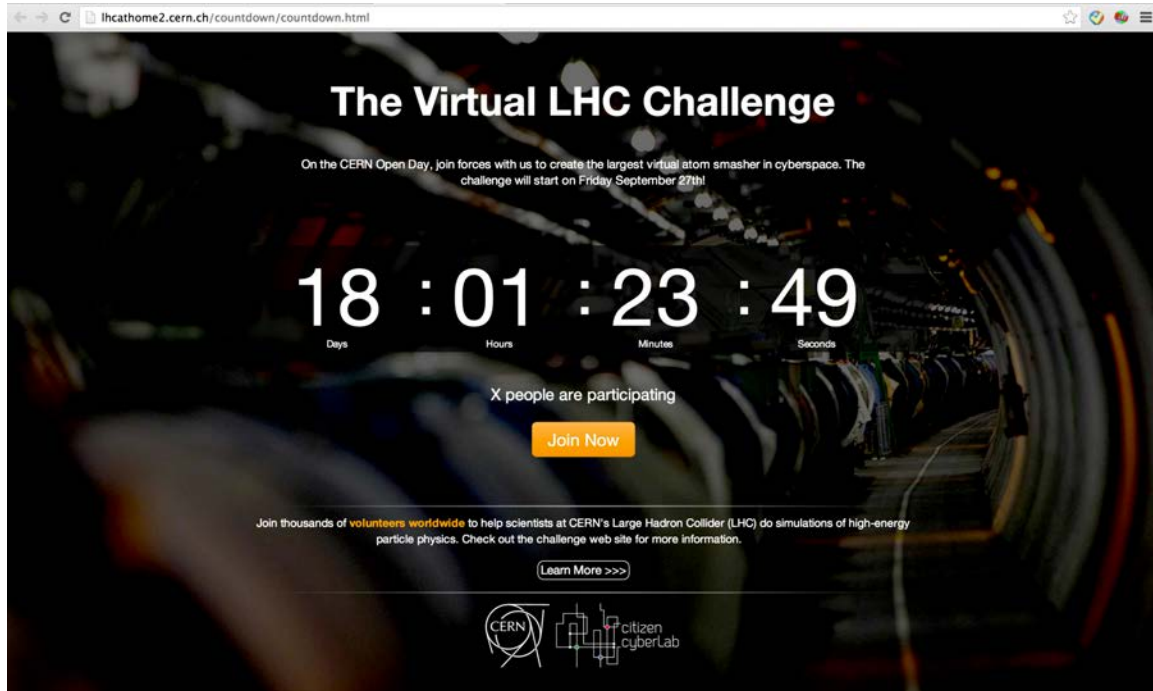


Figure 18. A Countdown Page (Entry Point) Prototype for the Challenge.

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