

A browser-based event display for the CMS experiment at the LHC

M Hategan¹, T McCauley², and P Nguyen²

¹ University of Chicago, ² Fermi National Accelerator Laboratory

ABSTRACT: The line between native and web applications is becoming increasingly blurred as modern web browsers are becoming powerful platforms on which applications can be run. Such applications are trivial to install and are readily extensible and easy to use. In an educational setting, web applications permit a way to deploy tools in a highly-restrictive computing environment. The I2U2 collaboration has developed a browser-based event display for viewing events in data collected and released to the public by the CMS experiment at the LHC. The application itself reads a JSON event format and uses the JavaScript 3D rendering engine pre3d. The only requirement is a modern browser using HTML5 canvas. The event display has been used by thousands of high school students in the context of programs organized by I2U2, QuarkNet, and IPPOG. This browser-based approach to display of events can have broader usage and impact for experts and public alike.

Usage

The CMS collaboration has agreed to release a small fraction of data to the public for education and outreach. This includes over 300k events including dileptons, dijets, Ws and Zs.

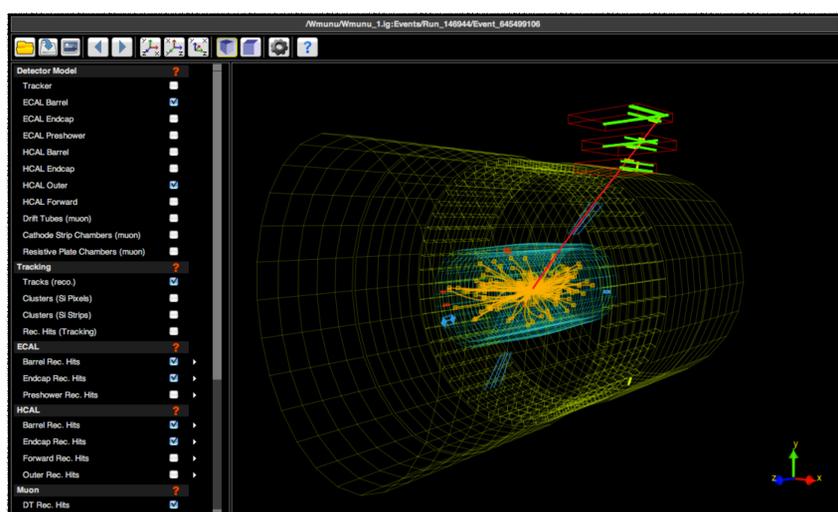
The I2U2 (Interactions in Understanding the Universe) collaboration has developed an event display for use in eLabs: web-based explorations of the datasets (<http://www18.i2u2.org/elab/cms>). The display is also used in masterclasses (physics exercises for high school students based on the datasets) organized by QuarkNet and IPPOG (International Particle Physics Outreach Group). Since its release in 2010 the display has been used by thousands of students around the world.



Students from Anecy using display in masterclass at CERN

Challenges and requirements

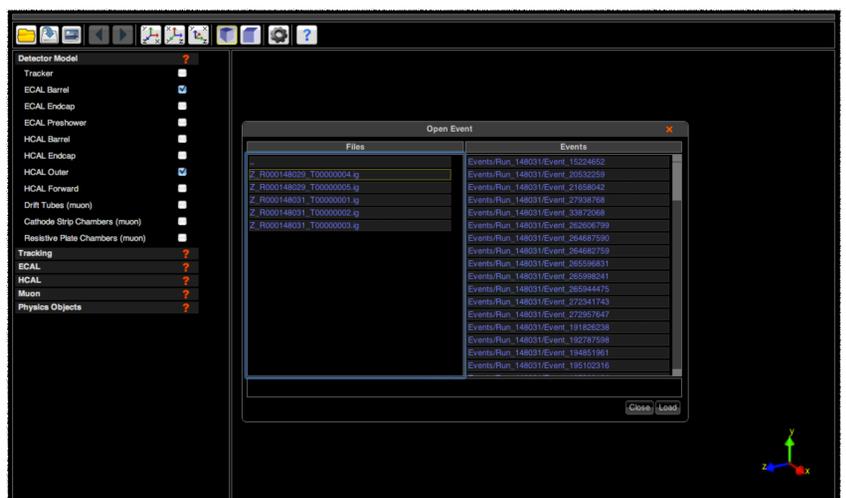
- Users are non-experts, typically high school physics students: *make interface intuitive and easy to use*
- Some facilities often use older computers and/or maintain restrictive environments: *make the data and display available through the browser*



<http://www.i2u2.org/elab/cms/event-display>

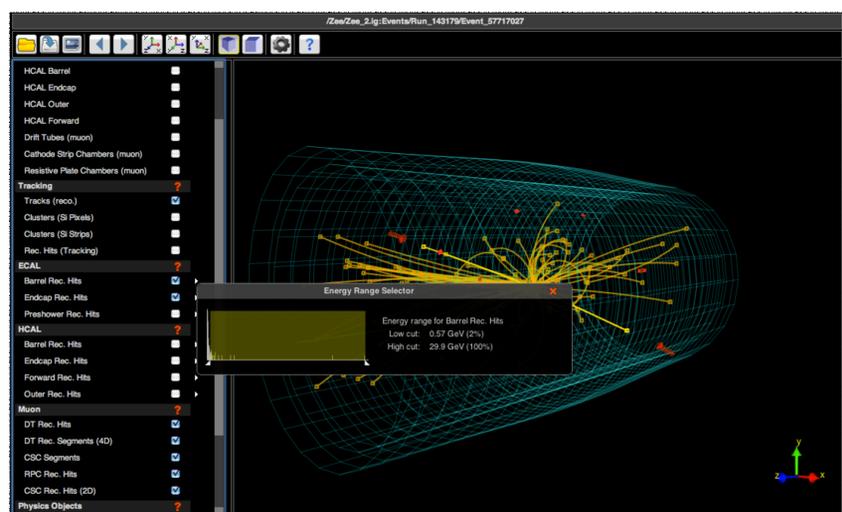
Input

- Display can be run from i2u2.org location with data loading via AJAX calls
- Stand-alone offline version can load data locally using HTML5 File API
- Input format is ig format: zip-archived JSON files
- ig format makes display in-principle experiment-independent



Features

- Simple, intuitive controls
- Tree view
- Histogram display and control of objects
- 3D view in HTML5 canvas using pre3d JavaScript rendering engine



Next steps

- RPhi and RZ views
- Prototype table view using DataTables jQuery plugin under development
- Picking
- Explore use of WebGL
- Mobile-enabled version

This project is supported in part by the National Science Foundation and the Office of High Energy Physics in the Office of Science, U.S. Department of Energy.