Online example: *ced*$_{12}$ †

Seeing Tracks Through Thick and Thin††

Christopher Newport University
JLAB
27 May 2011
Heavy Photon Search Meeting

---

† As in cLAS eEVENT dISPLAY (12 GeV)
†† As in *thick* and *thin* clients

Outline

1. Introduction
2. Thick & Thin
3. Architecture
4. Features
5. Extendibility
6. Availability

1. Introduction

- Modern version of 6 GeV *ced* (running virtually unmodified for ~15 years)
- It is an *event* display, not a *detector* display
  - Primary role is *not* to visualize the detector.
  - Primary roles: Help *debug* and *diagnose* the detector (online) and to assist in analysis (offline).
  - Unfaithful (to the geometry) displays are often more useful than faithful displays. Especially when there is a lot of “air.” Also, 2D often more useful than 3D.

Outline

1. Introduction
2. Thick & Thin
3. Architecture
4. Features
5. Extendibility
6. Availability

2. Thick and Thin

- Thick: Traditional, full-featured Desktop App
- Thin: **Same** full-featured "Web 2.0 app" aka "Rich Client/Internet Application" delivered in a browser†
- We'll deliver both, using (approximately) the same code base

† With, perhaps, some minor security related annoyances, such as no access to a local file system—e.g., *ced*$_{12}$ will not be able to upload your *Quicken* files to the CLAS calibration database. Honest.

Web 1.0 v. Web 2.0

- **Web 1.0**
  - Web delivers documents
  - Web apps are stateless
  - HTML based; browser *renders*
- **Web 2.0** †
  - Web delivers Rich Internet Applications (RIAs)
  - Applications maintain state
  - Data centric; browser *contains and delivers*

Rich Internet Apps

1. Browser ***delivers*** virtual machine and ***provides*** real estate.
2. Compiled application runs in vendor VM.
3. VM, not browser, renders.
4. Browser's primary role has changed! It is a VM container.

† Web 2.0 is here *now*. Sometimes providing dramatic new interfaces. Sometimes, e.g., *NetFlix*, it takes a decent site and redoes it in a way that produces a much more appealing desktop-like response and experience.

RIA Technologies

- Adobe FLEX (2004.) Uses FLASH player as VM. **~97 percent penetration across all platforms**.[1]
- Microsoft Silverlight (2007.) So far, little penetration.[666]
- SUN JavaFX (too late—little chance to succeed.)
- HTML 5 (Interesting—essentially dumps the VM responsibilities onto the browser developers.) [3]

---

[1] This is the best reason for adopting FLEX; ~nobody will have to download anything.

[666] But yes, I agree, that is one hard-to-ignore 800lb gorilla.

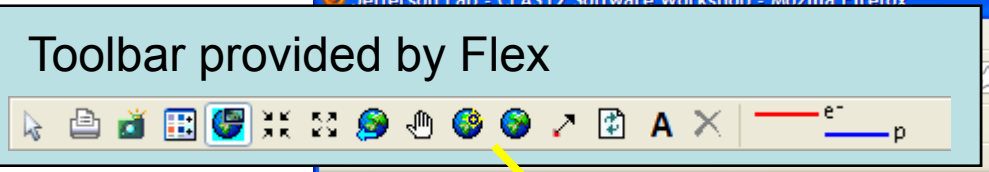
[3] Specification to reach the W3C Candidate Recommendation stage 2012, and W3C Recommendation in the year **2022** or later! However, many parts of the specification are stable and may be implemented early. (Source: *wikipedia*)

Google Maps Paradigm

Client tools overlaying server provided image

SOA Environment (Service Oriented Architecture).

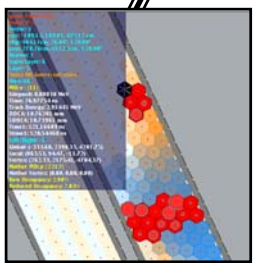
Toolbar provided by Flex



Headless event display

User zoom to extent

OK here's a new pic



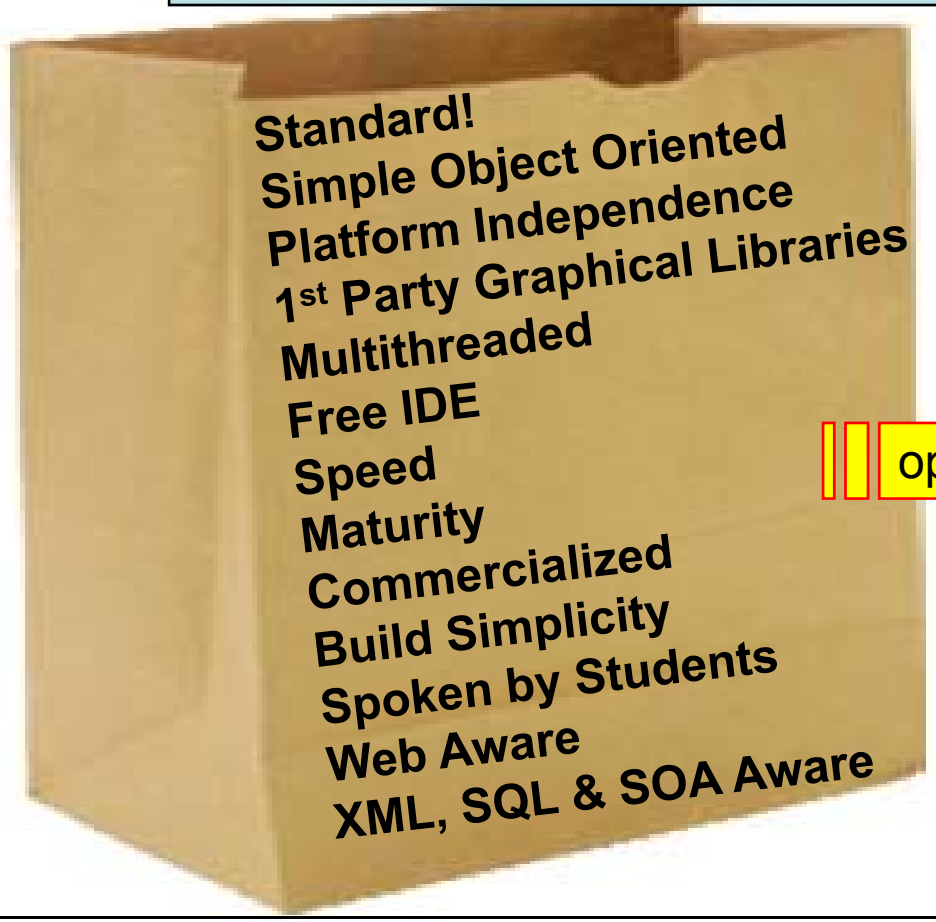
Other Service

Outline

1. Introduction
2. Thick & Thin
3. Architecture
4. Features
5. Extendibility
6. Availability

3. Architecture

CLAS 6 (and 12?) Software Motto:
"Standard is Better than Better" †



optimize

† If you were to say: "in *practice* it appears that the CLAS 6 motto was: ***Complicated** is Better than Better*," I, for one, could not say that you were being uncharitable.

Two Plus One Libraries

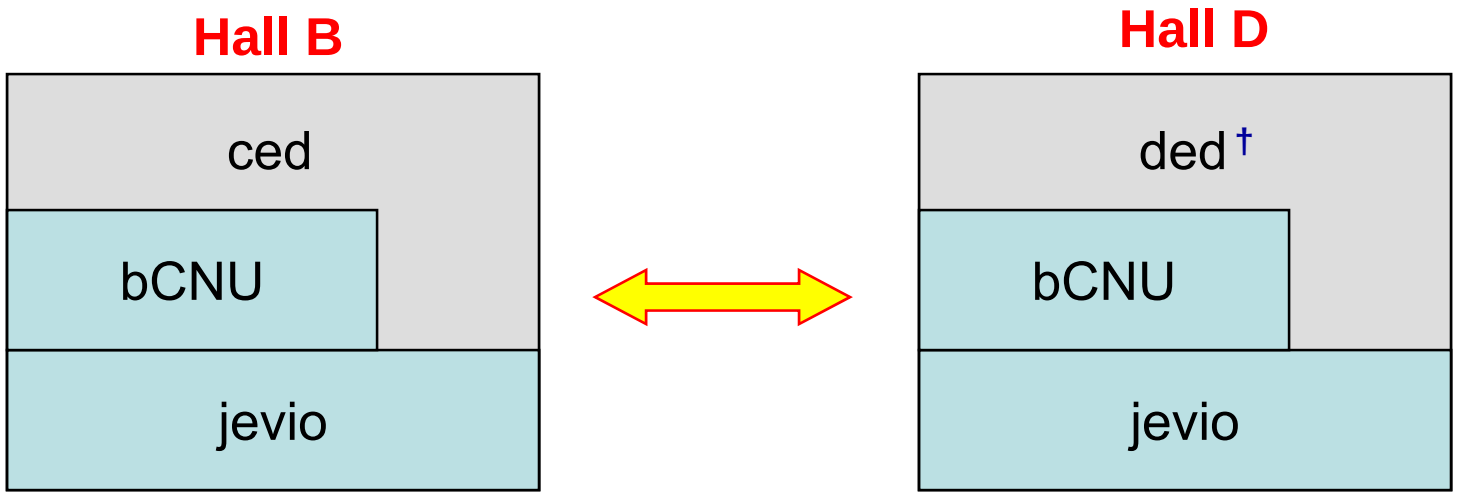
Library	*Purpose*	*Comments*
jevio	JAVA I/O for JLab evio format	Originally developed by—adopted and taken-over by JLAB DAQ
bCNU [1]	Multiple Doc Interface (MDI) Framework	JAVA based graphical package. *bCNU* provides framework and base classes, *but knows nothing about any specific detector*.
jogl [2]	JAVA bindings to OpenGL (3D)	One of two free 3D JAVA solutions. Requires platform specific jars and shared libs.

On this platform we are building Hall B and Hall D event displays

[1] bCNU, i.e., "be seein' you!" (unless that is too cheesy, in which case it stands for Hall **b** and **CNU** collaboration. Your call.)

[2] This is the "plus one." It differs from the other two in that a) we didn't develop it and, more importantly, b) it is quasi-platform dependent.

Shared Hall B/D Code Base

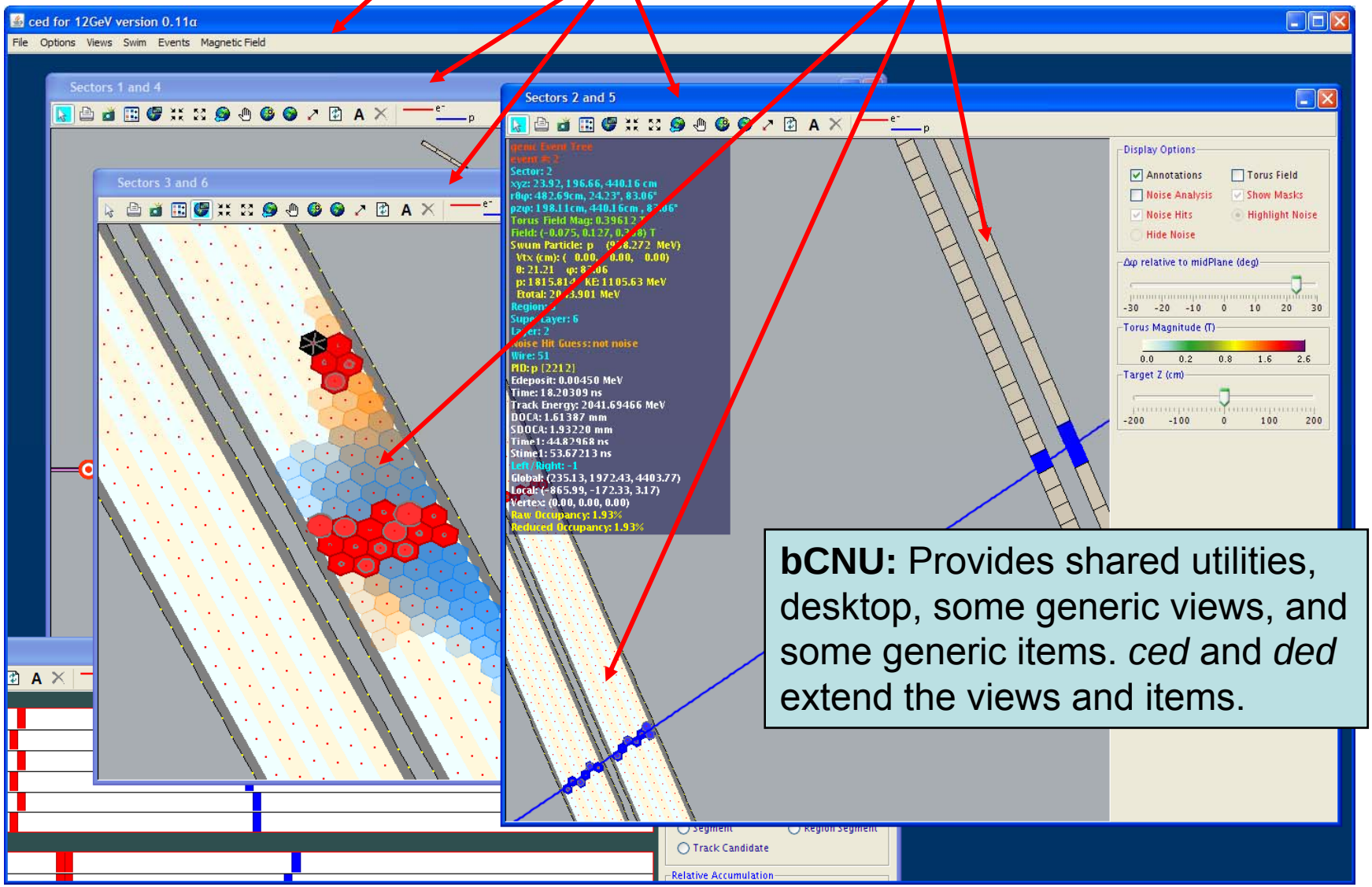


Goal: common (or potentially common) features are developed in *bCNU* (or migrated to *bCNU*) with the intent that the *ced* and *ded* code bases are <~ ¼ the size of the *bCNU* code base.

---

† *ded* (pronounced "*dee-e-dee*") is the Hall D event display. This naming convention is bloody awful, since you would then think *ced* is the Hall C event display, and that *ced* should really be *bed*. But it is what it is.

Multiple Document Interface (MDI): Desktop, Views, & Items



bCNU: Provides shared utilities, desktop, some generic views, and some generic items. *ced* and *ded* extend the views and items.

Outline

1. Introduction
2. Thick & Thin
3. Architecture
4. Features
5. Extendibility
6. Availability

4. Features (Current *ced* Views)

View	*Comment* **generic**
All DC	All the drift chambers—approximate geometry
Sector	Split sectors 1/4, 2/5, 3/6. Faithful geometry. Currently DC and OTOF.
Monte Carlo	Table of “event generator” records (if any present) showing what tracks were generated
Event	Drag ‘n drop, expandable tree-view of evio events so that banks can be examined quickly **(bCNU)**
Noise	A view with fake data used for testing/explaining the noise detection algorithm.
Log	Info/Warning/Error messages for debugging **(bCNU)**
Socket	Establish and manage evio over a socket **(bCNU)**
XML	Drag ‘n drop, tree-view of any XML file **(bCNU)**

Some Selected Features

CHRISTOPHER NEWPORT UNIVERSITY

Feature	***Comment***
Zoom, pan, etc	Expected features for view manipulation **(bCNU)**
Snap shot	High quality **.png** image of active area **(bCNU)**
Heads-up	Mouse-over information displayed on a semi-transparent heads-up display (to preserve real estate) **(bCNU)**
Moving target	Trivial: target z-location can be changed
Magnetic Field	Uses same field as GEMC
Accumulate	Accumulation mode for looking for hot spots/dead zones
Swim	Runge-Kutta 4^{th} order for swimming particles **(bCNU)**
Noise	Improved display of results of noise detection
Clusters/ segments/ candidates	Highlight clusters, segments, track candidates, etc. from the *socrat* family of track-finders (or any track-finder that stores results in same banks)
Auto rotate	Rotate to initial ϕ of track to see if it lines up with DOCAs

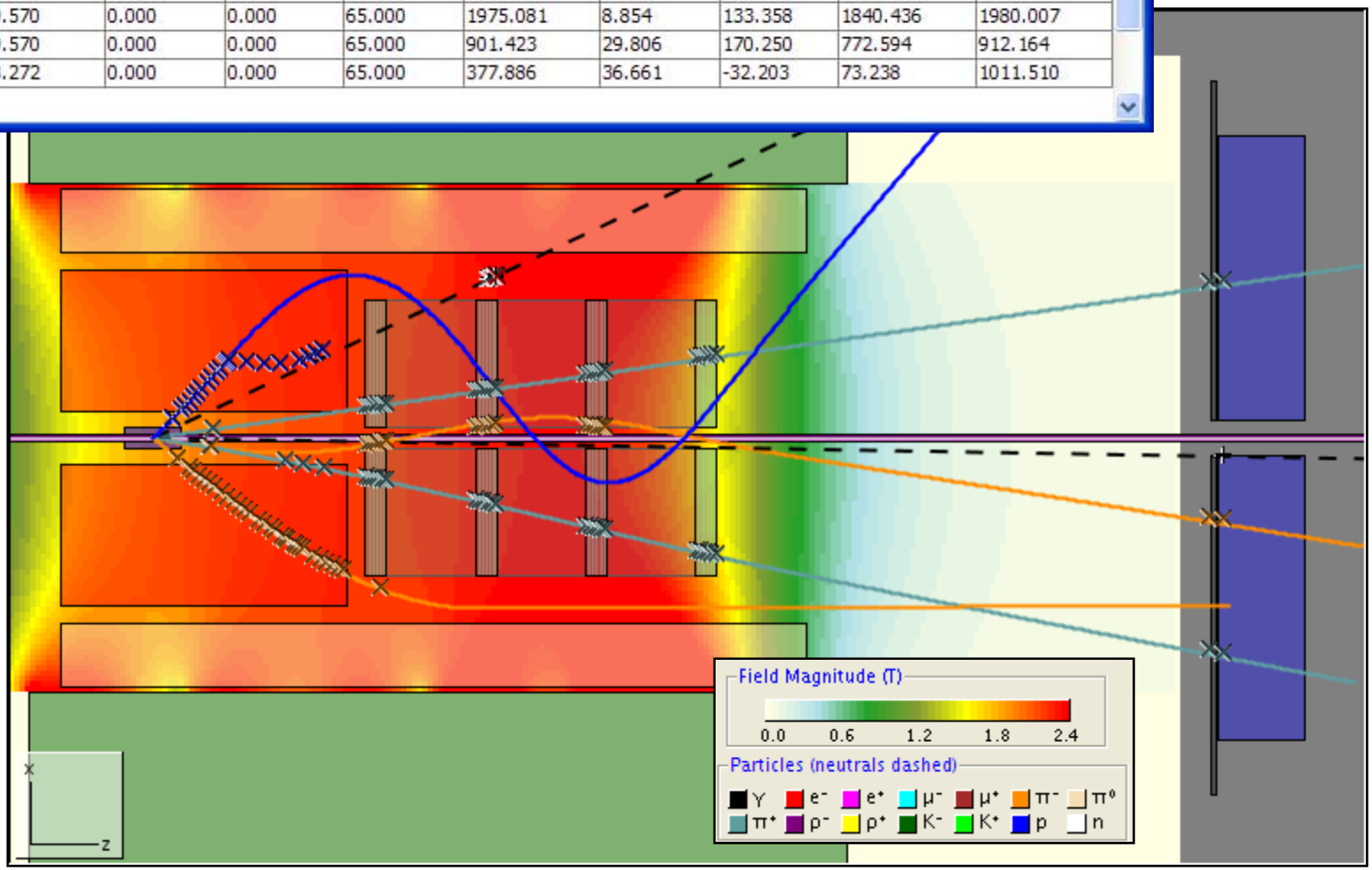
Some Snapshots

Monte Carlo View

Monte Carlo Events

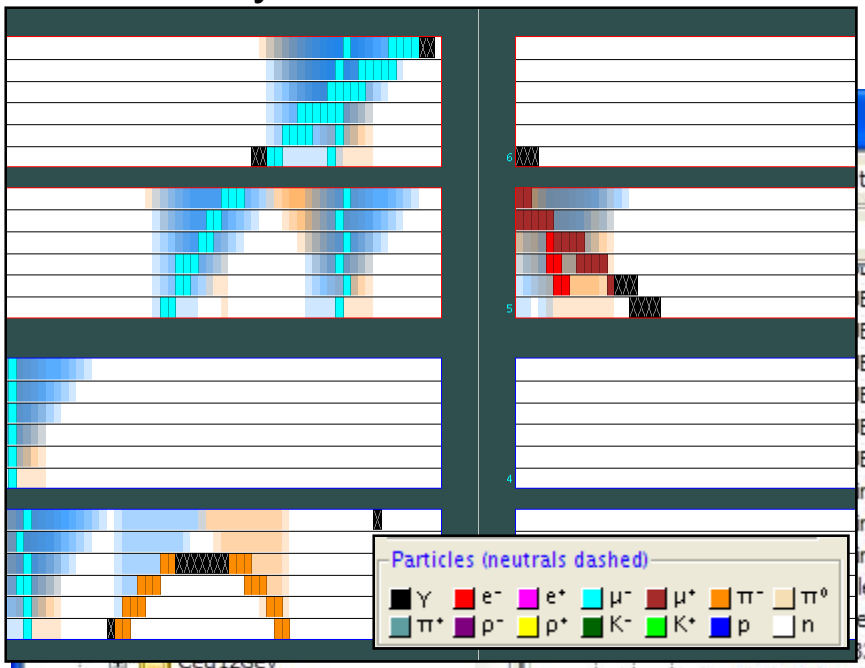
Id	name	m (MeV)	x₀ (cm)	y₀ (cm)	z₀ (cm)	p (MeV)	θ	φ	KE (MeV)	Et (MeV)
211	n^+	139.570	0.000	0.000	65.000	4760.691	5.539	-15.289	4623.166	4762.736
-211	n^-	139.570	0.000	0.000	65.000	299.873	7.415	168.100	191.192	330.762
22	γ	0.000	0.000	0.000	65.000	209.421	20.266	-31.128	209.421	209.421
22	γ	0.000	0.000	0.000	65.000	731.363	2.132	-107.388	731.363	731.363
211	n^+	139.570	0.000	0.000	65.000	1975.081	8.854	133.358	1840.436	1980.007
-211	n^-	139.570	0.000	0.000	65.000	901.423	29.806	170.250	772.594	912.164
2212	p	938.272	0.000	0.000	65.000	377.886	36.661	-32.203	73.238	1011.510

Hall D view using same bCNU framework

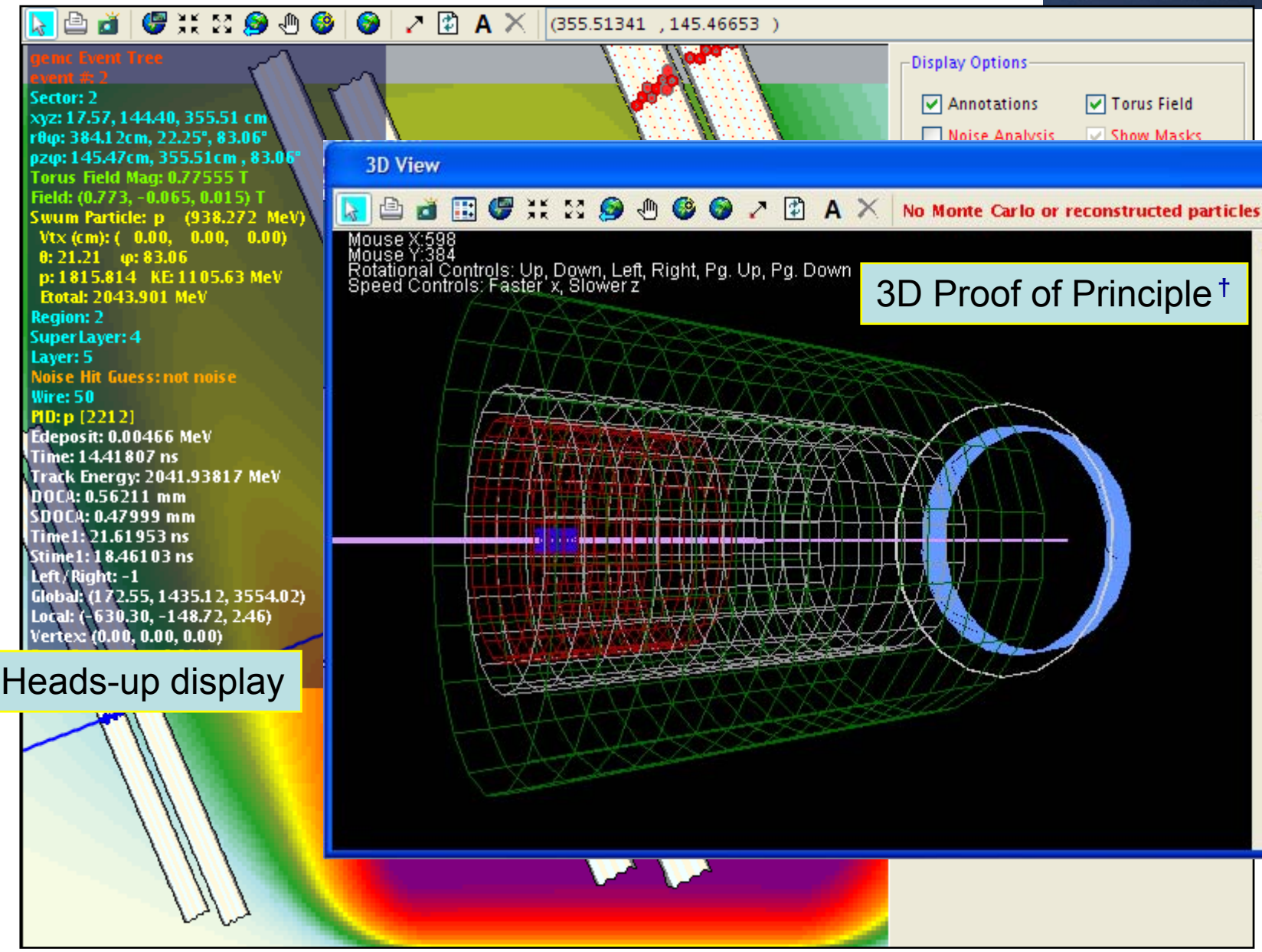


More Snapshots

Noise Analysis



Event View



† For those who know about such things, the “lightweight *v.* heavyweight” issue is not a problem.

Outline

1. Introduction
2. Thick & Thin
3. Architecture
4. Features
5. Extendibility
6. Availability

5. Extendibility

Two steps to adapt another experiment:

1) Geometry → bCNU graphical primitives
2) Events → evio

These follow step 0, which is the hardest:
design what you want to see.

6. Availability: Obtaining *ced* †

CHRISTOPHER NEWPORT UNIVERSITY

`svn scheckout` [URL] Where [URL] is:

https://clas12svn.jlab.org/repos/trunk/clas12/cedExport

→ *cedExport*, with *ced.sh* for launching on linux, unix or Mac OS X. And *ced.bat* for launching on the other 95% of all computers. **There is no build procedure--**such is the beauty of Java.

From then on, use **`svn update`** → the latest.

On linux, launch the script via: `bash ced.sh`

---

† You need a JLab CUE account.
<rant> Forgot your password? Look on the little piece of paper in your desk! Since we all have multiple accounts, all with out-of-phase über-unbreakable mandatory password shelf lives, we (well, not me) have resorted to writing them down. Everything is *much* more secure! **</rant>**