CLAS12 Software Organization and Documentation

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CLAS Collaboration Meeting
March 28, 2017
Jefferson Lab

Outline

- Current release
- Online software
- Simulations
- Common tools
- Reconstruction
- Data processing
- Organization plans
- Summary

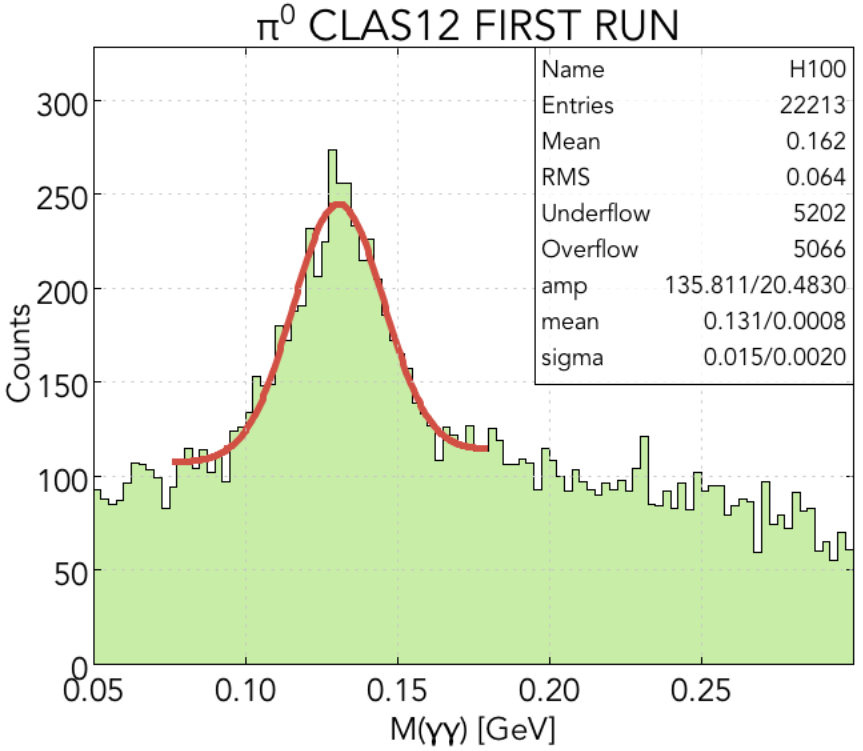
Current Release

- GEMC 4a.0.1

  - compatible with KPP

- COATJAVA 4a.0.0

  - used to cook pass1 of KPP



Online Software

- CEBAF Online Data Acquisition (CODA)

  Expert: Sergey Boyarinov

  See talk later today (16:20)

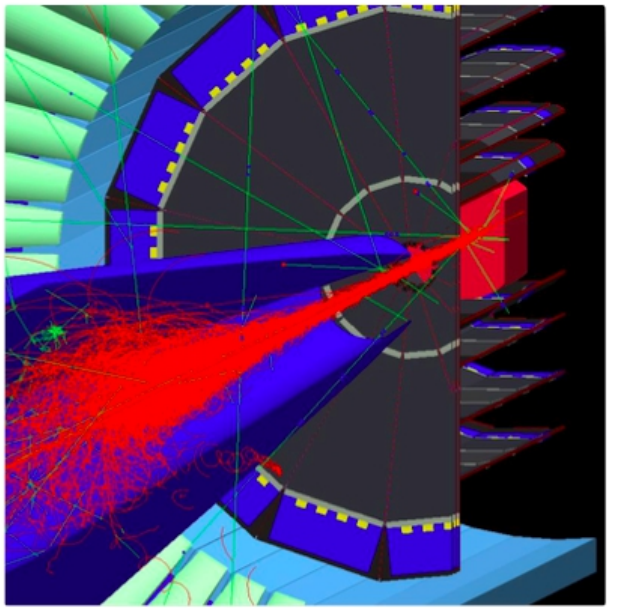
* Great performance during KPP

- Slow Controls

  Expert: Nathan Baltzell

  See talk later today (16:40)

Simulations



- GEant4 Monte Carlo (GEMC)

  Expert: Maurizio Ungaro

  Documentation: gemc.jlab.org

  Source code and release tags: github.com/gemc

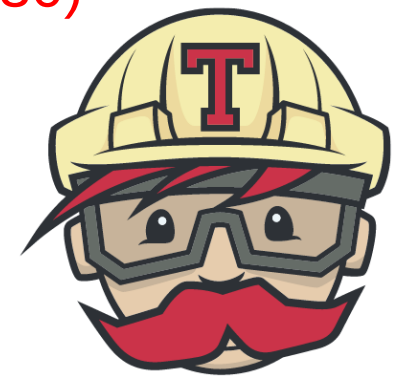
  See talk later today (15:30)

* There will be a hands-on GEMC demo during the CLAS12 Software Tutorial (Friday at 13:30)

Common Tools

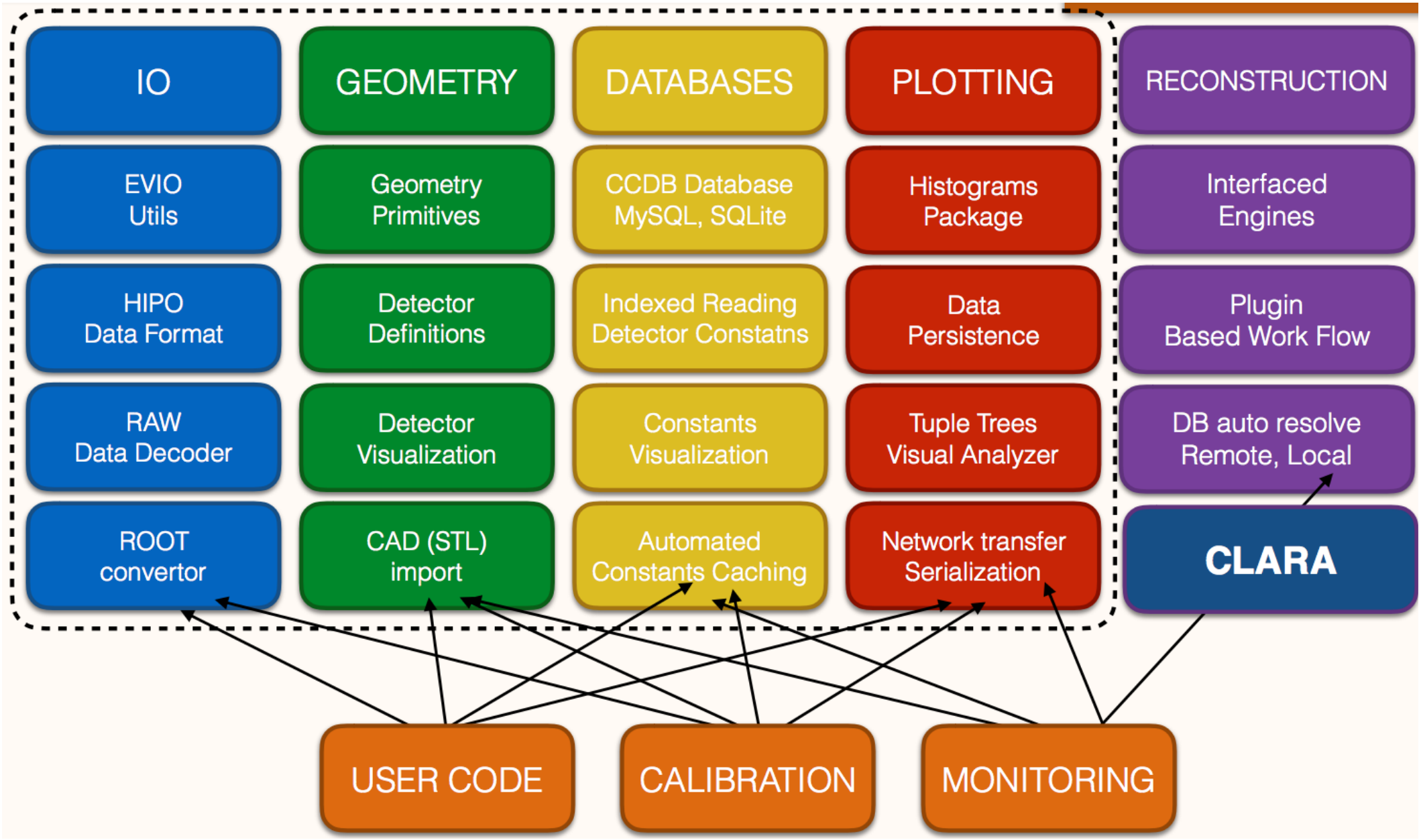
- Geometry, calibration, and run conditions databases – CCDB/RCDB
  - Hall-D development
  - Hall-B contact: Harut Avakian
  - Contains run number and variation dependence
  - sqlite versions available
- CLAS Offline Analysis Tools (COATJAVA) * Great performance during KPP
  - Allows for fast application development
  - Written in Java, version control by git
  - Contains I/O tools, plotting/fitting, geometry, and reco/calibration engines
  - Built with Maven build system
  - Tests and deployment done by Travis CI
  - Documentation and downloads: http://clasweb.jlab.org/clas12offline/distribution/coatjava/

* There will be a hands-on demo of the common tools during the CLAS12 Software Tutorial (Friday at 13:30)



Common Tools

Software Structure



G. Gavalian

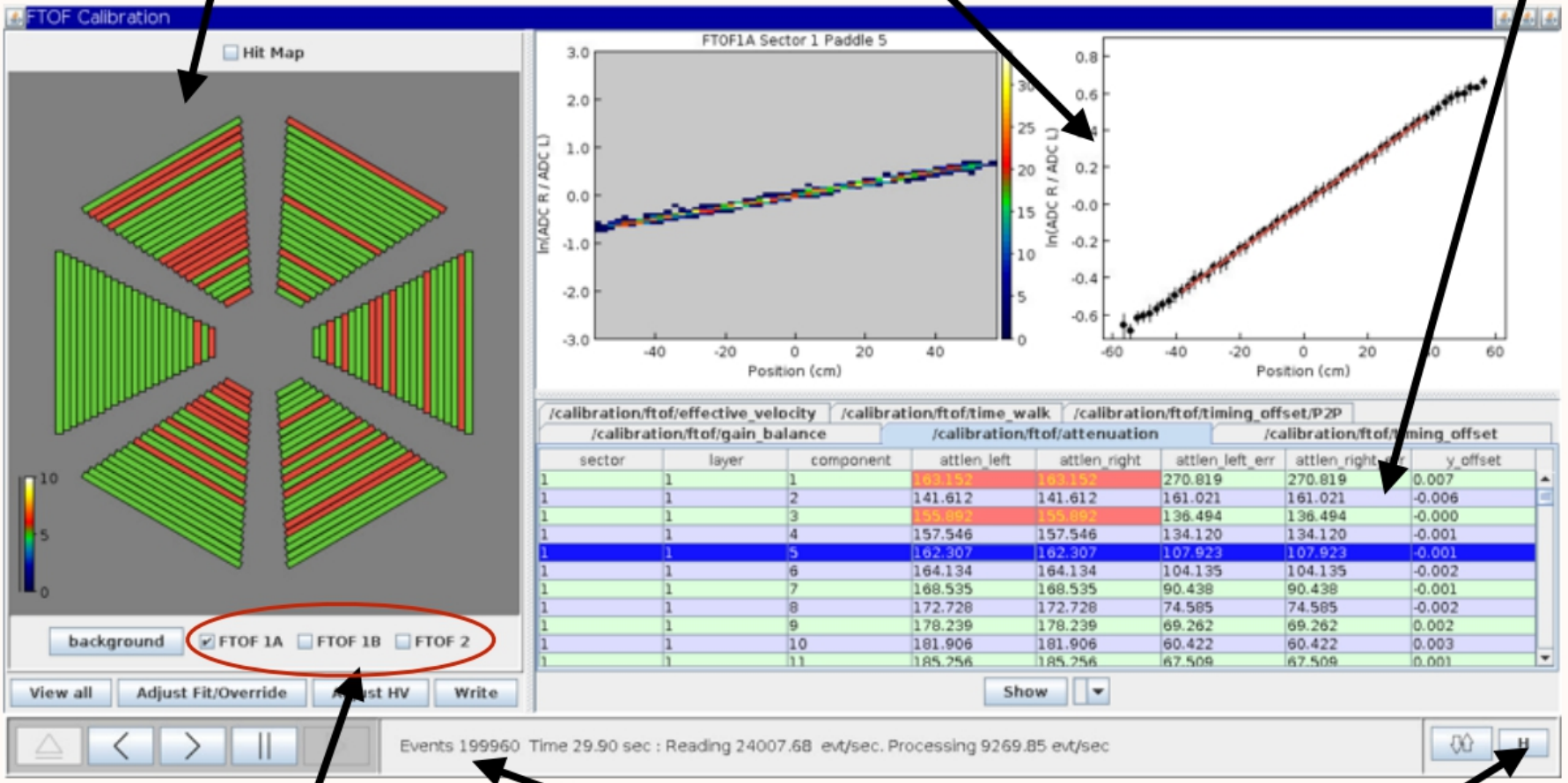
Common Tools

User Code

Detector Visualization
callback on clicks
coloring by occupancy

Data Canvas
callback for detector
callback for table

Database Table
component callback
constraint coloring
comparison utils



Detector Visualization
Layers

Event Processing Pane
event by event,or whole
opens: File, ET ring, CLOUD

G. Gavalian

Common Tools

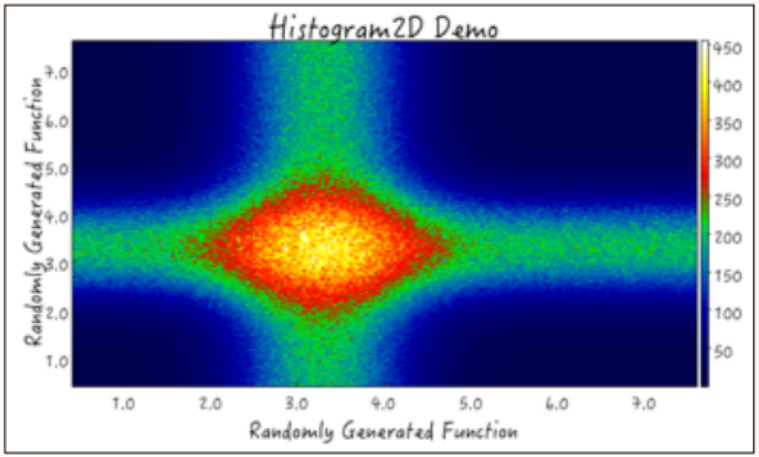
Development: G. Gavalian, W. Phelps

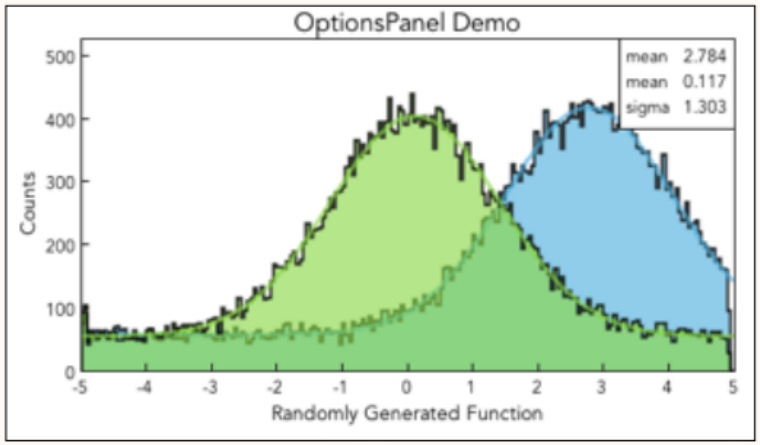
Data Visualization Package:

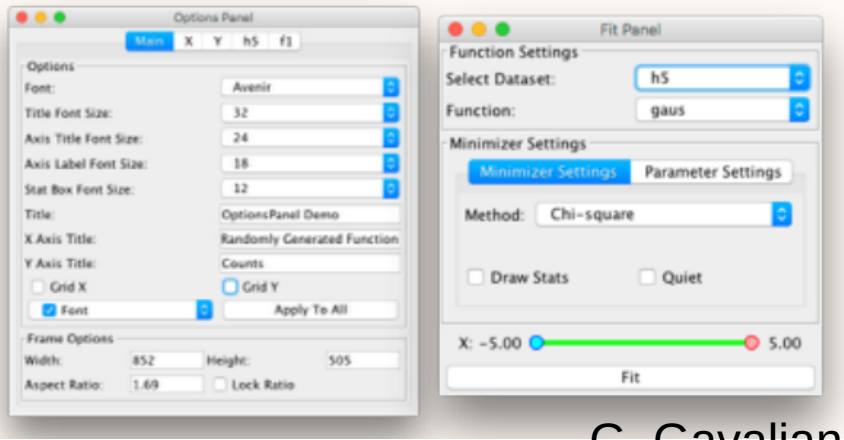
- pure Java implementation of plotting
- histograms 1D, 2D and GraphErrors
- functions and MINUIT fitting
- interactive styles and property editors
- tuple tree implementation
- saves data to HIPO files (compressed)
- data serialization for network transfer

Studio UI

- analysis studio for visual data analysis
- interactive fitting, custom function builder
- interactive data set comparison algorithms
- ASCII tuple import/export
- serialized data export with analysis procedure



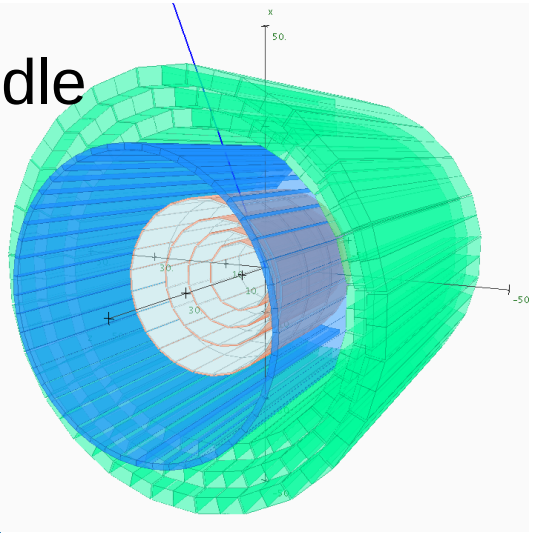


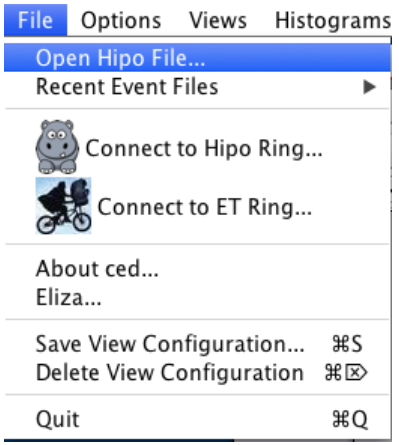


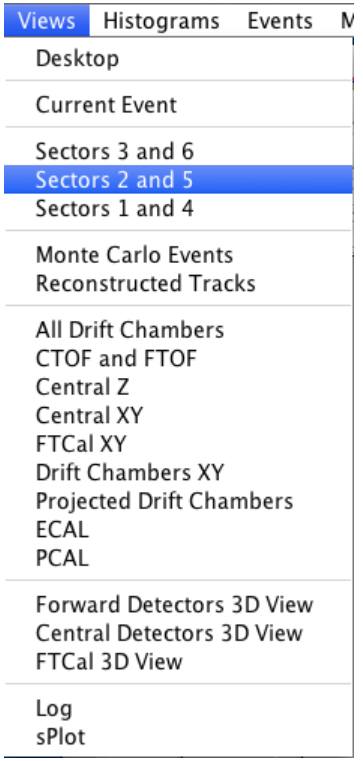
G. Gavalian

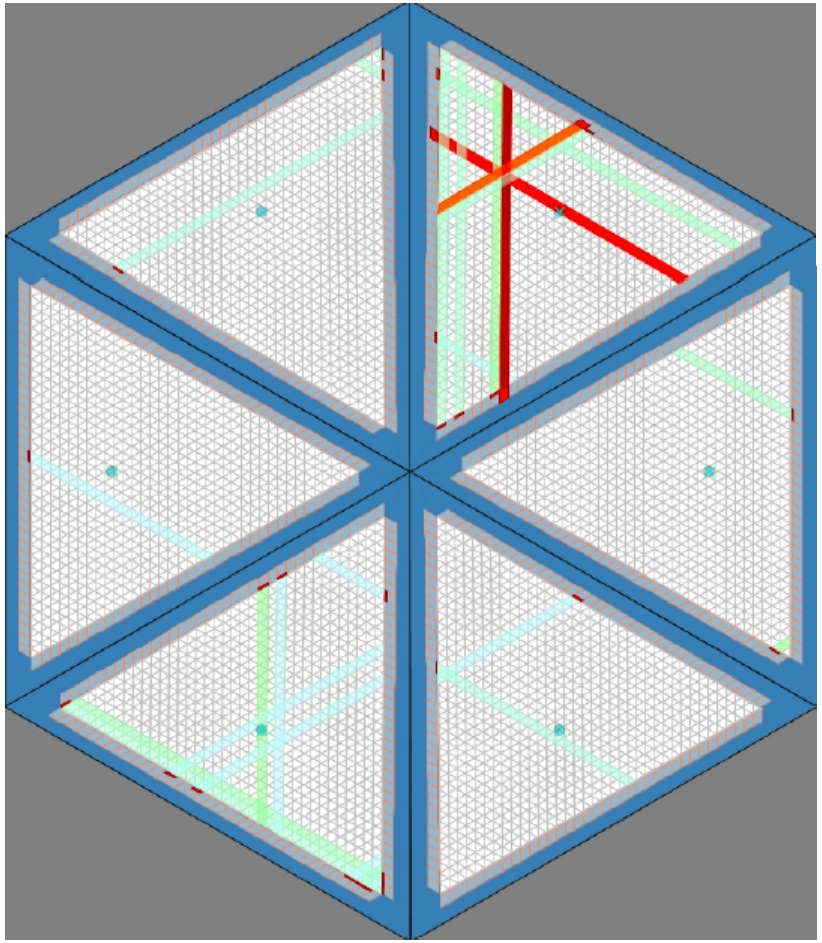
Common Tools

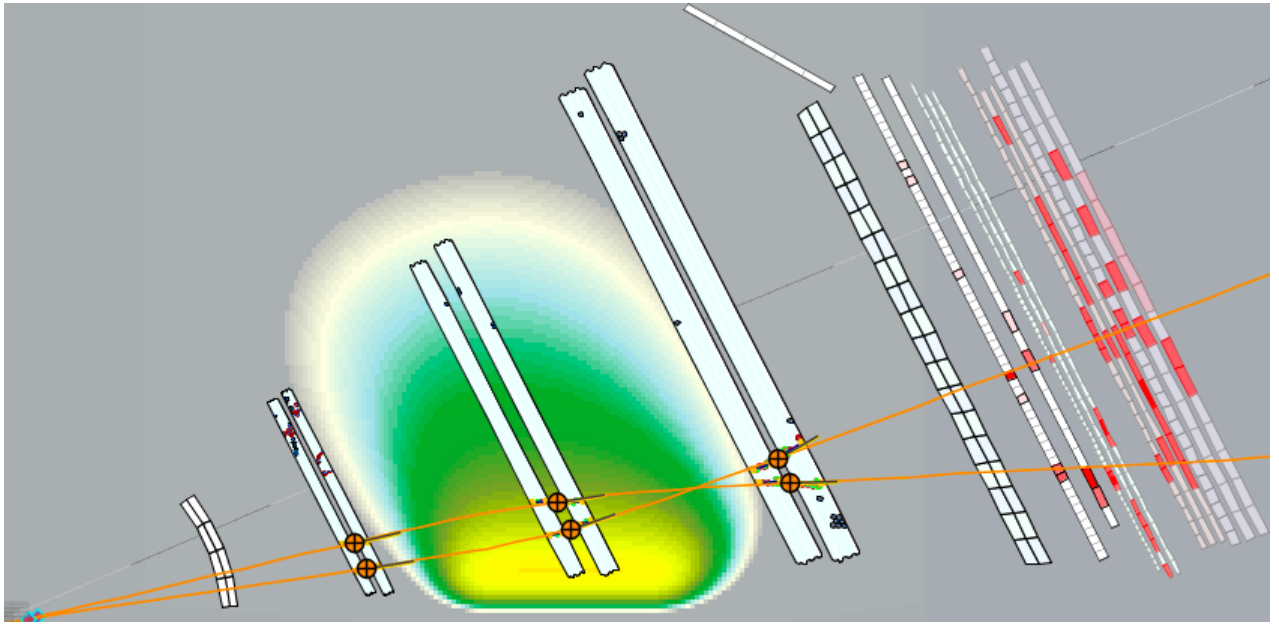
- CLAS12 Event Display (ced)
  Expert: Dave Heddle
  Download: jlab.org/~heddle











Reconstruction

- Reconstruction code is written in Java and version controlled with git

- Reconstruction package comes with the COATJAVA download and includes:

  - Descriptors for data banks

  - Local copy of calibration database (sqlite)

  - Magnetic map definitions and swimmers

  - YAML file specifying different run configurations

- Can be run multi-threaded within the CLARA framework

- Many talks throughout the rest of today on the status of reconstruction for each detector sub-system

Data Processing

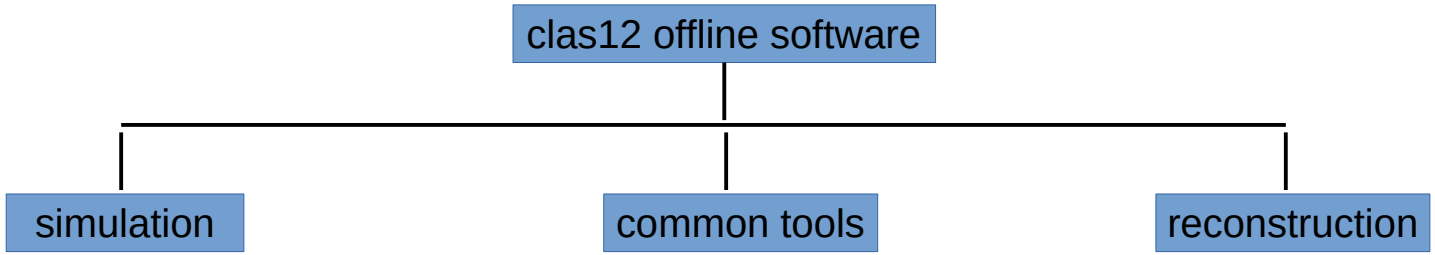
- CLAS12 Reconstruction and Analysis framework (CLARA)
  - Base on service oriented architecture
  - Services can be written in Java, C++, and Python
  - Efficiently runs CLAS12 reconstruction code multi-threaded
  - Expert: Vardan Gyurjyan
  - Documentation: claraweb.jlab.org

* There will be a hands-on demo of running reconstruction with CLARA during the CLAS12 Software Tutorial (Friday at 13:30)

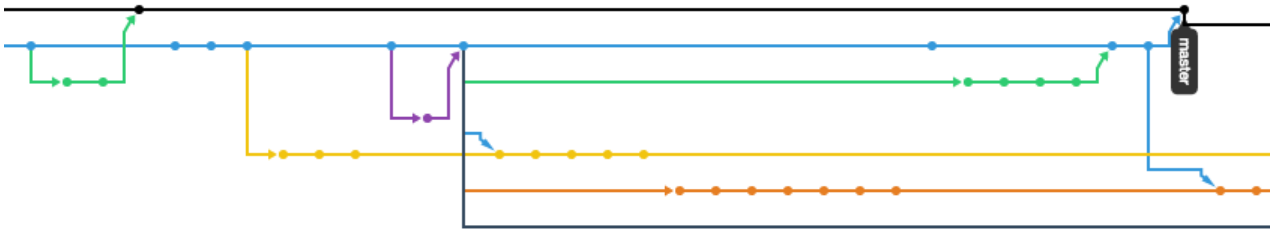
Organization Plans

● Currently, the different pieces of COATJAVA (common tools, reconstruction engines, ...) are in different git repositories; each release is compiled “by-hand”

● In the upcoming weeks, these repositories will continue to be merged into a single, common repository with a nightly build/testing system (Travis CI)



● Features can be added and debugged by using branches without breaking the stable code in the master branch



● Create sets of best practices and policies for code management and development

● Minor renaming and restructuring (e.g. “clas12rec” does not contain any reconstruction code)

● Continue to create documentation and tutorials

● Create an online Q&A forum to replace drupal

Summary

- CLAS12 software has reached a high level of maturity and performed very well during the KPP run

- Improvements in organization, validation, documentation and user friendliness will be coming in the upcoming weeks and months

- More in-depth talks on each software component will take place throughout the rest of today

- A 2-hour hands-on software tutorial will take place on Friday at 13:30 – input and requests are welcome!