CLAS12 Software Organization and Documentation

Nathan Harrison Jefferson Lab

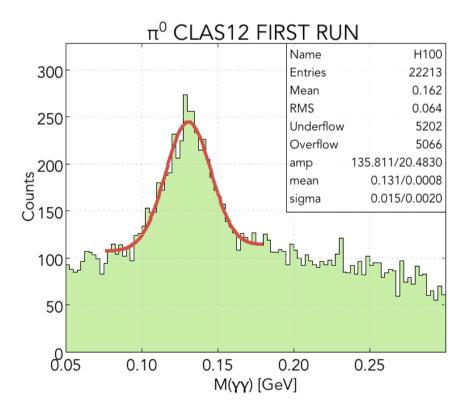
CLAS Collaboration Meeting March 28, 2017 Jefferson Lab

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

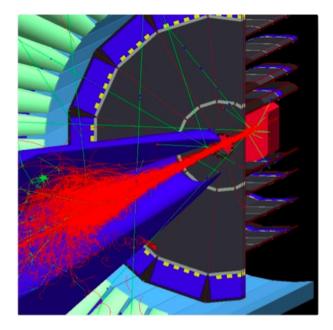
See talk later today (16:40)

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)

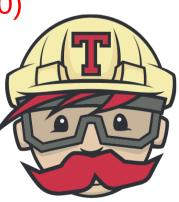
- Geometry, calibration, and run conditions databases CCDB/RCDB
 - Hall-D development
 - Hall-B contact: Harut Avakian
 - Contains run number and variation dependence
 - sqlite versions available
- CLAS Offline Analysis Tools (COATJAVA)
 - Allows for fast application development
 - Written in Java, version 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)

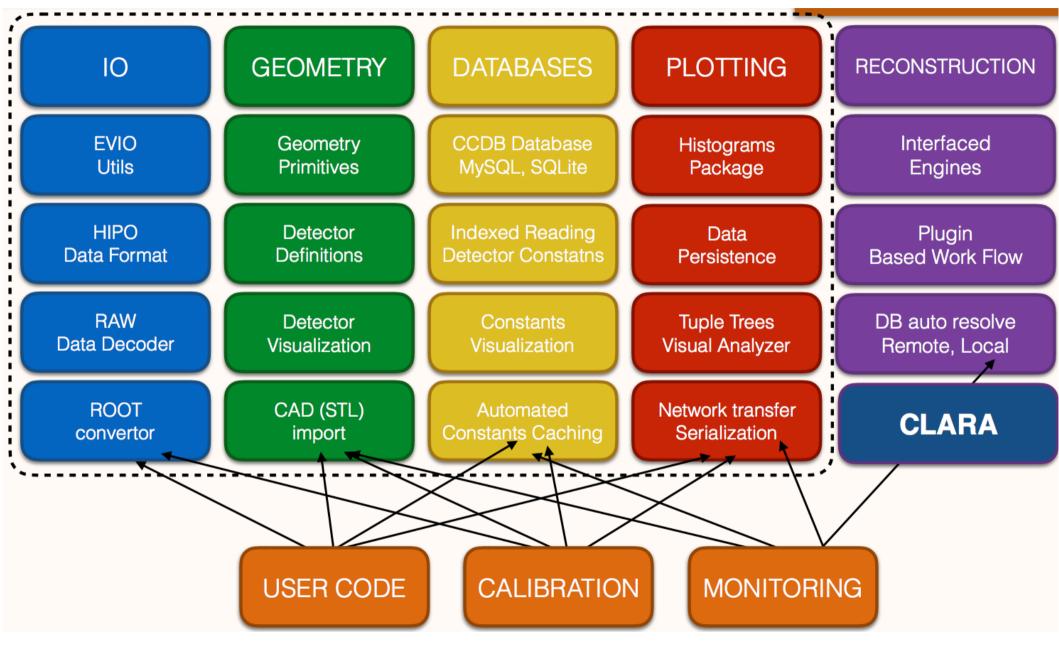






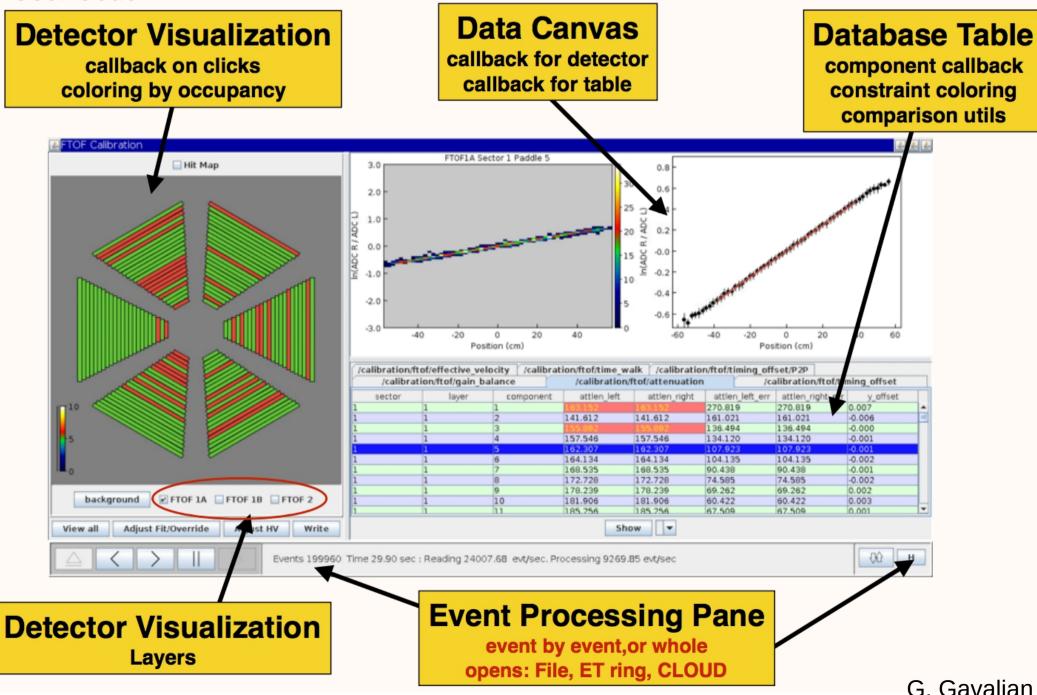
* Great performance during KPP

Software Structure



G. Gavalian





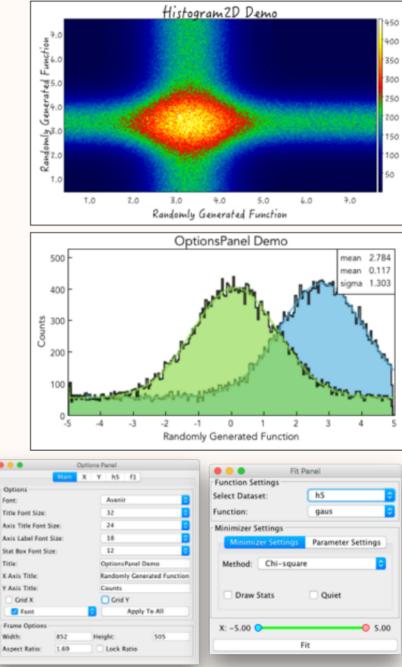
Common Tools Development: G. Gavalian, W. Phelps

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

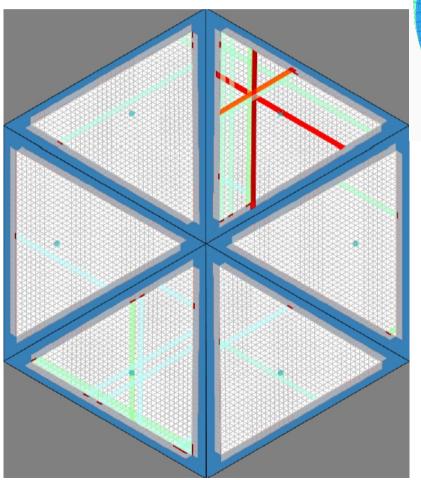
 CLAS12 Event Display (ced) Expert: Dave Heddle Download: jlab.org/~heddle

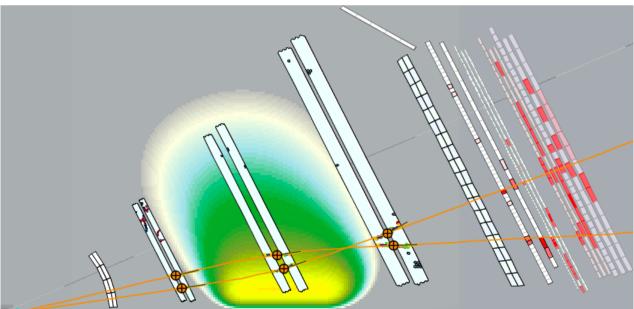
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Histograms

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Events N





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

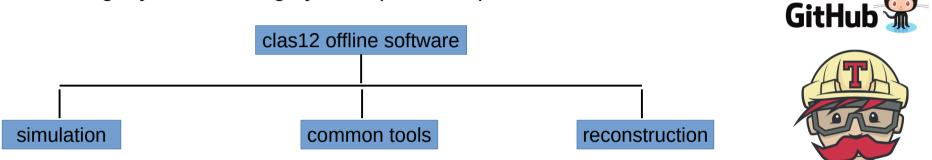
- CLAS12 Reconstruction and Analysis framework (CLARA)
 - Base on service oriented architecture
 - Services can be written in Java, C++, and Python
 - Efficiently runs CLAS12 reconstruction code multi-threaded
 - Expert: Vardan Gyurjyan
 - Documentation: claraweb.jlab.org

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

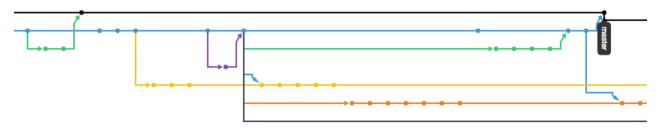
Organization Plans

• 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!