CLAS12 Software Meeting
March 17, 2010 F113

Agenda

15:00-15:30 Update on ced12, Dave Heddle
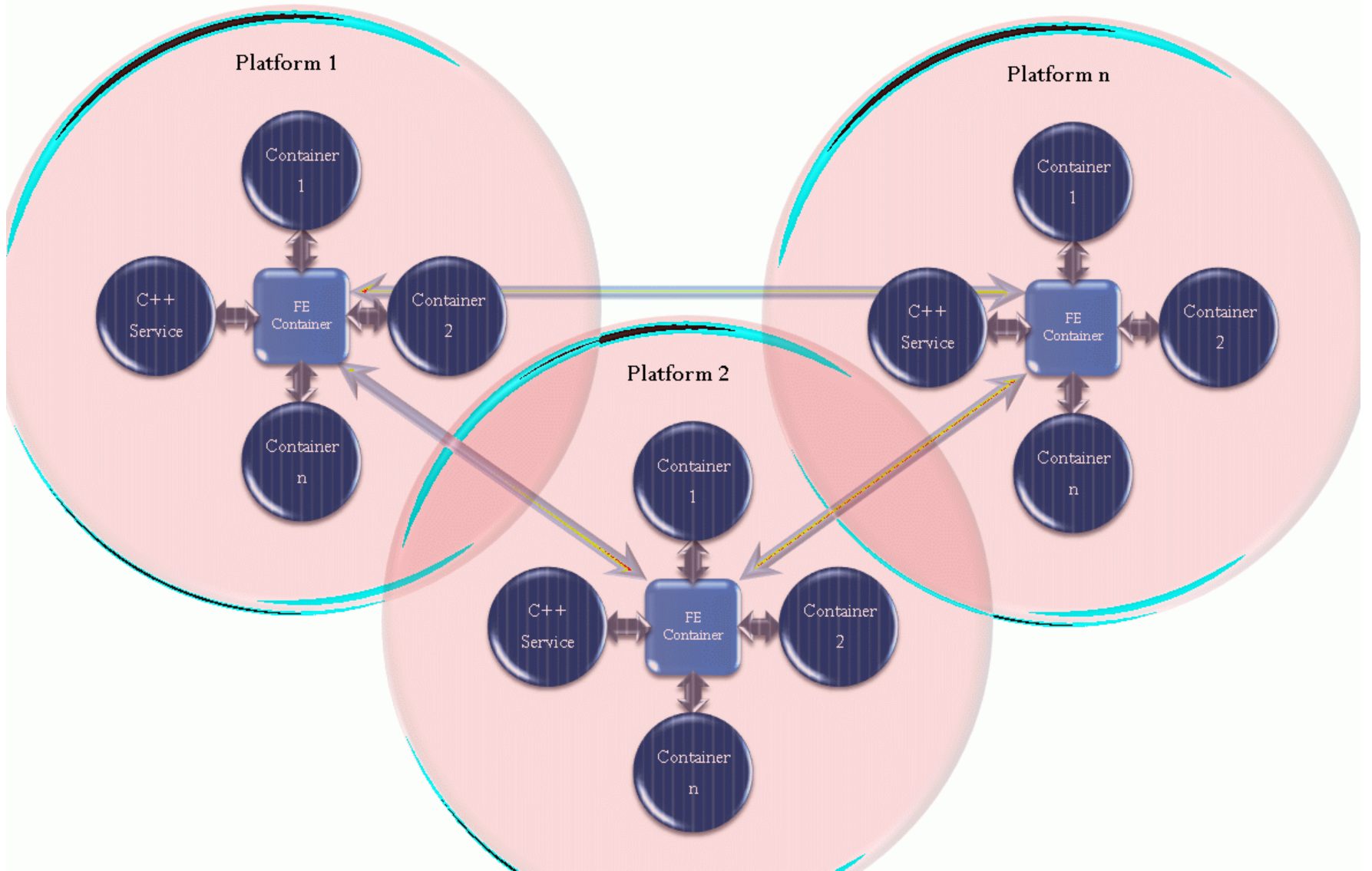15:30-16:30 CLARA – Service Oriented Architecture – Vardan Gurjyan.
16:30-16:50 gemc Demonstration – Maurizio Ungaro
16:50-17:20 Implementing the EC Simulation in gemc – Jerry Gilfoyle

CLAS12 Reconstruction and Analysis Framework

Vardan Gyurjyan

- Service-Oriented Architecture for Physics Data Processing.

    - Beyond object oriented.

    - Well-defined, reusable components.

    - OS platform and language independent (Java VM).

    - Components are loosely coupled – data are exchanged by value (not reference) and users don't see service details.

- Enforces modularity (ease of maintenance, more agile)

- Takes advantage of distributed computing.

- Used in industry and government (Amazon, DoD…).

Platform 1

Container 1

C++ Service

FE Container

Container 2

Container n

Platform n

Container 1

C++ Service

FE Container

Container 2

Container n

Platform 2

Container 1

C++ Service

FE Container
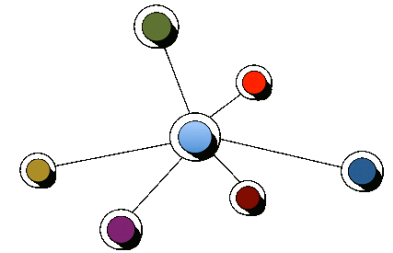
Container 2

Container n

CLARA Status

- Infrastructure now being put in place and tested.

- Geometry service being developed at CNU.

  - Yelena Prok

  - Two new machines configured at CNU (2/10).

- Java/C++ templates for services in hand.

- Physics services need to be programmed.

Clara data throughput
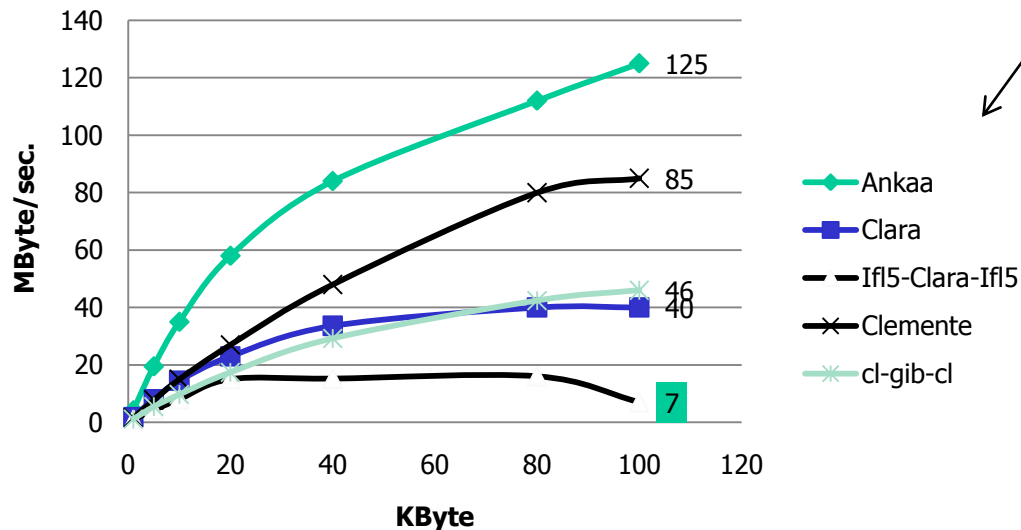
Recent Progress on Simulation and Reconstruction

*Maurizio Ungaro*

Changes to gemc since last meeting:

- FLUX type: every track has its own hit. Good for counting purposes (i.e. how many protons pass through a detector, etc). Compare with standard ADC and TDC simulations.

  - Standard Time Window ADC: all hits in the same time window are added to give a ADC.

  - Time Window TDC: the first hit within the detector time window will give the TDC.

- Particles generators: Primary particle, electron luminosity, proton luminosity (can already read files in LUND format).

- New identifiers for EC for stacks (inner/outer).

- New solenoid field.

Introducing Scrat

Software for **C**LAS12 **R**econstruction **A**nd **T**racking

- Original Socrat code from S.Procureur migrated to C++ objects and factories.
- EVIO input/output.
- Bank list Filtering.
- JANA Multi-Threading, benchmarking.
- New Banks: DC_CLUSTER, DC_SEGM, DC_RSEGM, DC_TCANDIDATE.
- New banks can be read by CED12.

JANA reconstruction using factory methods allows change of modules.

http://www.jlab.org/~ungaro/maureepage/proj/scrat/doxy
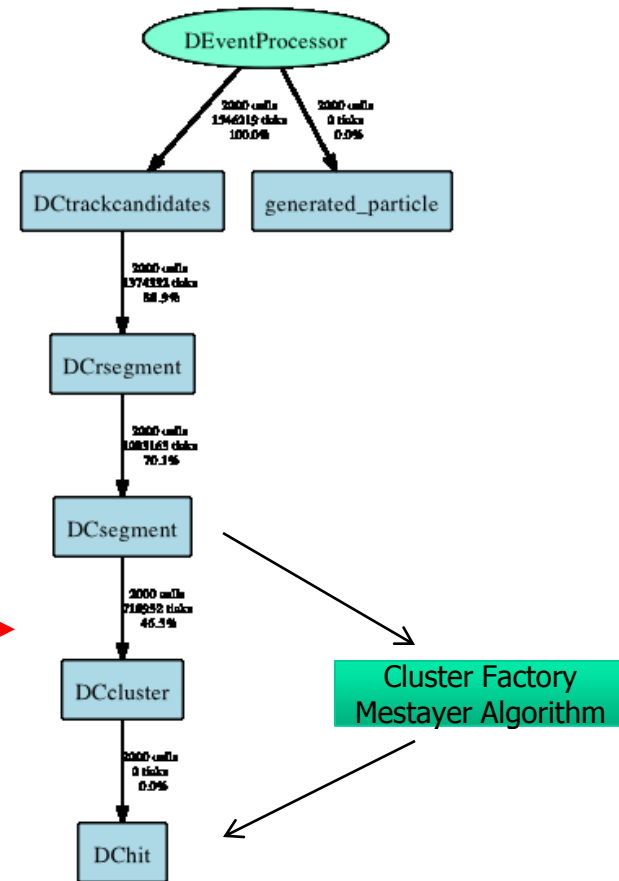
CLAS12 Event Display
Dave Heddle

- Based on Java graphics library (bCNU).
  - used in ced12 and Hall D event displays.
  - jevio (reads data, analogous to fdump, bosdump in CLAS6).

- ced12 has many of the views used in the CLAS6 ced, but adds:
  - Table of Monte Carlo events
  - Easy access to printout of banks.
  - Special tools for studying noise detection.
  - Heads-up display.
  - Auto rotate to better see how hits and tracks align.
  - No build procedure to obtain an executable.

- Development Plans:
  - Web services.
  - More geometries.
  - Image service.
  - 3D views.
  - Interprocess communication.

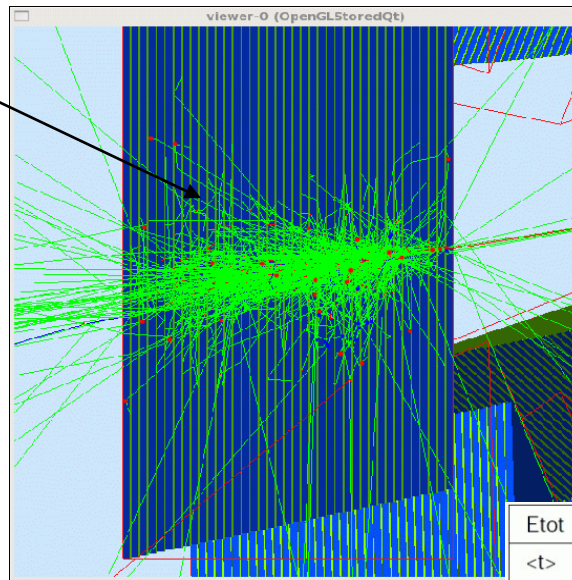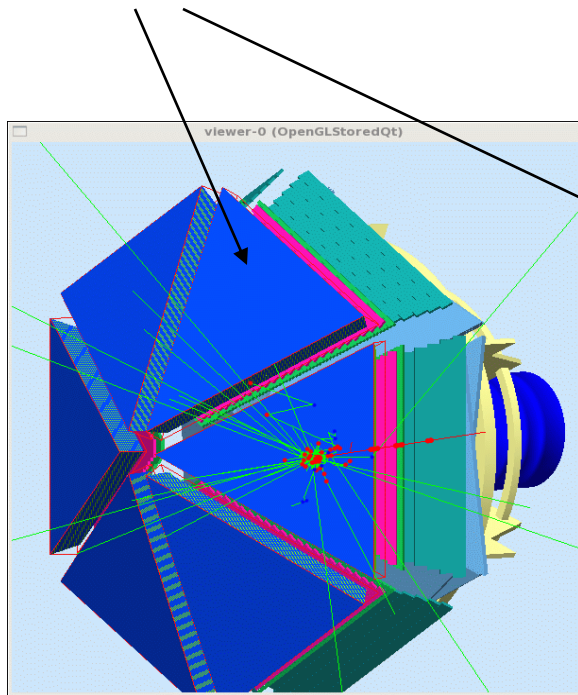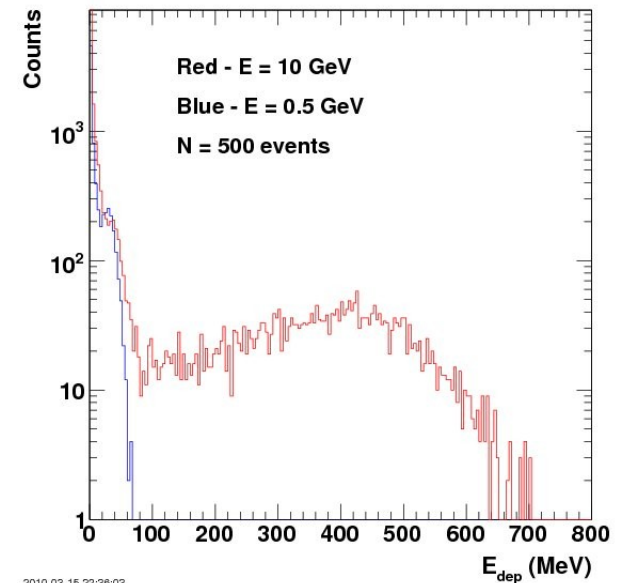# More Snapshots

Noise Analysis

And More

Implementing the EC simulation in gemc
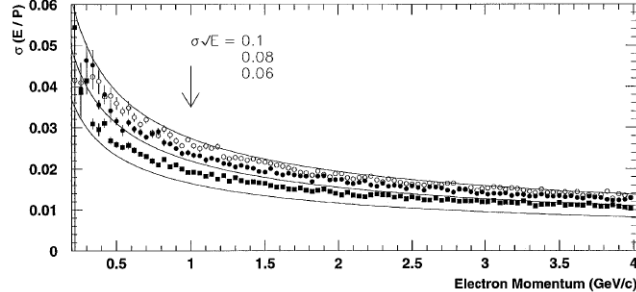
Jerry Gilfoyle

EC Geometry stored in mysql database.

Deposited energy spectrum for mono-energetic electrons at θ_e=25°, ϕ_e=0°.

Red - E = 10 GeV

Blue - E = 0.5 GeV

N = 500 events

2010-03-15 22:36:03

Etot	Deposited energy	<x>,<y>,<z>	global position
<t>	Time	<lx>,<ly>,<lz>	local position
pid	Particle ID	vx,vy,vz	vertex position
E	Track energy	mpid	mother ID
sector	Sector	mvx,mvy,mvz	mother vertex
stack	Inner, outer	view	U, V, W
EC_ADC	ADC	EC_TDC	TDC

Data bank definitions also stored in database.

Testing and Results

Red - No threshold
Blue - E_{dep} > 1 MeV
Black curve - f_s=0.274(E - 21 MeV)/p
500 events

0.274×(E−0.021 GeV)/P
λ=∞   3.5 pe/MeV
λ=376 cm 3.5 pe/MeV
λ=376 cm 1000 pe/MeV

Blue - E > 1 MeV
Red - No threshold
$\sigma\sqrt{E}$ = 0.08

$\sigma\sqrt{E}$ = 0.1
0.08
0.06
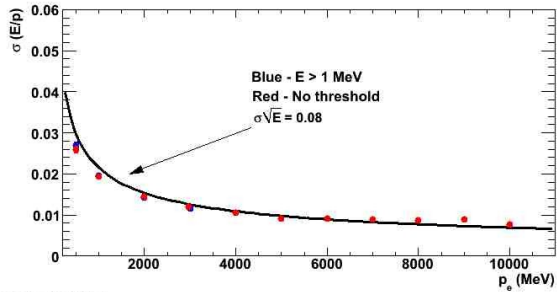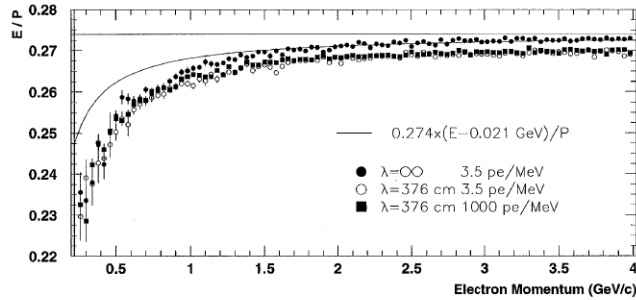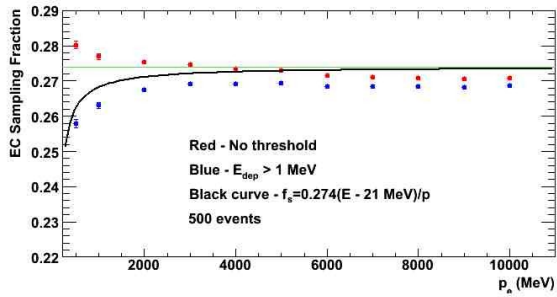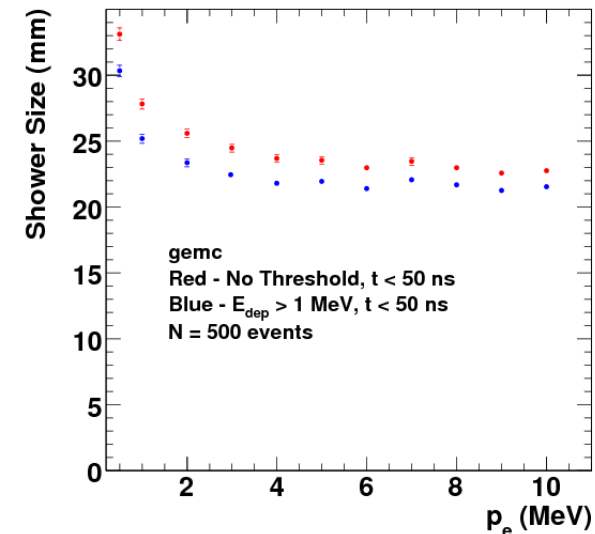
Sampling fraction extracted from deposited energy .

Used mono-energetic electrons at θ=25°, ϕ=0°, no field.

Shower size taken from RMS of total deposited energy spectrum.

gemc consistent with GSIM within 10-15%.

gemc
Red - No Threshold, t < 50 ns
Blue - E_{dep} > 1 MeV, t < 50 ns
N = 500 events

2010-03-16 16:00:33

Joint Software Development Effort
Eliot Wolin

- Main players: DAQ group, Hall B and Hall D
- Effort focused now on offline projects.
- Great potential for online collaboration.
- Some of the software used outside Jlab.
- Software resides in SVN repositories.
  - 12GeV (read/write for all)
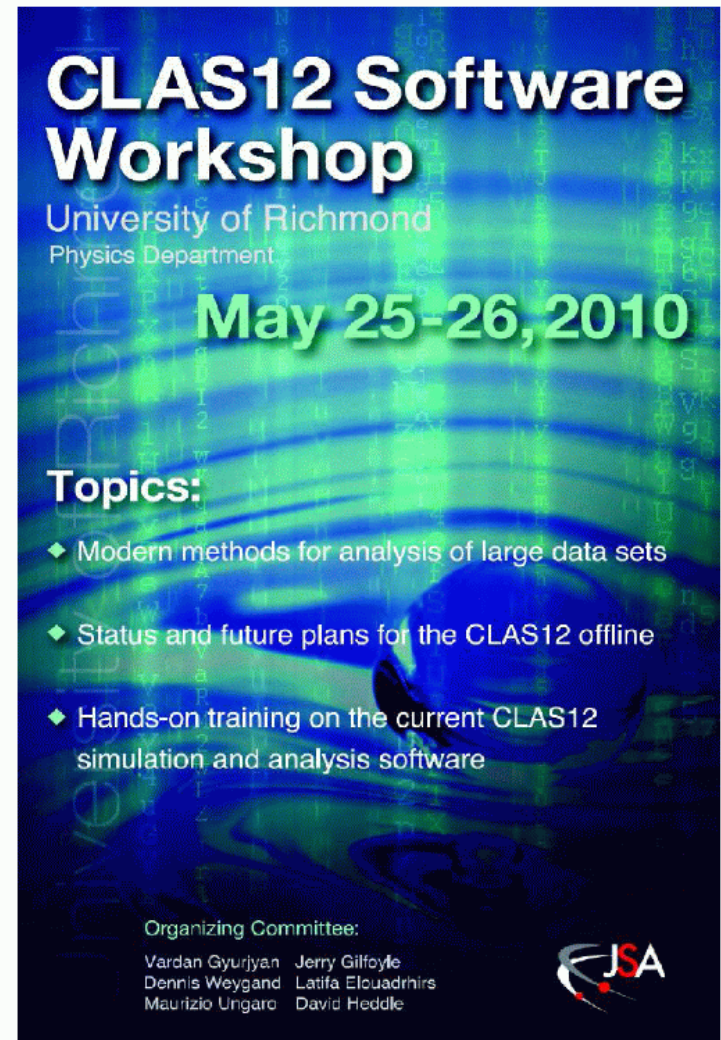 - DAQ repository (read-only except to DAQ group)

Current Joint Software Projects

- JANA (Dave Armstrong)
  - C++ event reconstruction/analysis framework.
  - Being used in Hall D (a lot) and Hall B (started).

- Event Display (Dave Heddle)
  - Java-based, experiment independent framework with 3-D!
  - Hall dependent implementations (CED and DED).

- EVIO (DAQ group, Dave Heddle)
  - Object-oriented representation with binary I/O.
  - Used in Hall B (CLAS12 Geant4 simulation and input format, Hall D simulation and reconstruction results).

- cMsg (DAQ group)
  - Publish/subscribe interprocess communication.
  - Used in CODA3 runcontrol, CLARA Service Oriented Architecture, ROOTSPY, codelite.

CLAS12 Software Workshop*

- Goals:
  - Broad view of the state-of-the-art in offline analysis.
  - Status of the CLAS12 software program.
  - Opportunities for users to join that program.

- Tutorials on CLAS12 software; free DVD for participants.

- To be held at the University of Richmond, May 25-26, 2010.

- Travel funding available for students and post-docs.

*Supported by the JSA/SURA Initiatives Fund.

CLAS12 Software Workshop
University of Richmond
Physics Department

May 25-26, 2010

Topics:
- Modern methods for analysis of large data sets
- Status and future plans for the CLAS12 offline
- Hands-on training on the current CLAS12 simulation and analysis software

Organizing Committee:
Vardan Gyurjyan   Jerry Gilfoyle
Dennis Weygand   Latifa Elouadrhirs
Maurizio Ungaro   David Heddle

Website: `http://conferences.jlab.org/CLAS12Software/index.html`