Hall B: Software Utilization

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12 GeV Upgrade Software Review
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CLAS12 Software User Environment

- Introduction: Software tasks, users, projects.
- Tools.
- Simulation.
- Reconstruction.
- Visualization
- Physics Analysis.
- Summary.
Introduction - Tasks and Users

- Software Categories:
  - Calibration (not discussed here)
  - Simulation
  - Reconstruction
  - Visualization
  - Physics analysis

- User Categories
  - B - service developers.
  - C - physics users.

- Focus on off-site physics users.

- Access, ease-of-use, extent of use, support.
Experience with Richmond cluster, offsite users.

Simulations for CLAS12 neutron magnetic form factor $G_{Mn}$ experiment (E12-07-104).

- **Quasielastic neutron detection from $^2$H** with forward Time-of-Flight (TOF) (CN 2011-015).
- **Calorimeter (EC) simulation** (CN 2011-019).
- **EC geometry simulation** (BAPS, DNP, 2012).
- **$G_{Mn}$ target simulation** (BAPS, DNP, 2011).

CLAS12 TOF Subsystems Reconstruction Software
- Forward and central TOFs.
- Tested with *gemc*.
- Deep-inelastic scattering event generator.

Richmond cluster is development and test bench for CLARA – used by environment developers.
# Software Tools

## General

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<tr>
<th>Tool</th>
<th>Description</th>
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<tbody>
<tr>
<td>subversion</td>
<td>Version control utility</td>
<td>scons</td>
<td>software construction tool</td>
</tr>
<tr>
<td>mysql</td>
<td>Open source database</td>
<td>qt4</td>
<td>widget toolkit</td>
</tr>
<tr>
<td>clhep</td>
<td>C++ library of utility classes for HEP</td>
<td>geant4</td>
<td>simulation of particles passing through matter</td>
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## Locally Developed

<table>
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<tr>
<th>Tool</th>
<th>Description</th>
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<tbody>
<tr>
<td>Clara</td>
<td>CLAS12 analysis environment</td>
<td>clasJLib</td>
<td>CLAS12 utilities - JMath, ced, cMsg</td>
</tr>
<tr>
<td>JToolbox</td>
<td>evio, bank handling classes, property lists</td>
<td>ccdb</td>
<td>mysql geometry and calibration database</td>
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Simulation

- Event Generators
  - pythia
  - local programs: disgen, ppgen, genev, ...
  - Use - Pythia is a mature, widely-used program. Other codes vary in ease of use.
  - Support - Pythia well supported by Lund and CERN. Varied support for others.
  - Point-of-contact JLab staff (H. Avakian).

- CLAS12 Simulation - gemc
  - JLab program for CLAS12 and others.
  - Uses evio data format common among the halls.
  - Use - Scripts for offsite installation: time-consuming, but reliable: being improved.
  - Support - Complete web-page, bug reporting.
  - JLab staff member (M. Ungaro).
  - See Veronique Ziegler’s talk.
Reconstruction

- Socrat (SOftware for Clas12 Reconstruction And Tracking)
  - Local, generation one, C++ code for electrons in forward detector (S. Procureur author).
  - Use - Compiled with Root libraries (ACLiC), complex code.
  - Support - CLAS-NOTE 2008-015, limited Collaboration support.

- TRAC (Track Reconstruction Application for CLAS12)
  - Current focus of main development effort on full CLAS12 reconstruction.
  - See Veronique Ziegler's talk.
  - Use - Applied to other reconstruction projects - Forward tagger (offsite) - R. De Vita, Barrel Silicon Tracker - Y. Gotra.
  - Support - CLAS-NOTE in preparation.
ced12 (cLAS eVENT dISPLAY) is the 12 GeV version of the 6 GeV application.

Use - Built on top of the bCNU libraries. Easy to use.

Support - Single Collaboration member (D.Heddle).
evio2root

- Converts evio data into root ntuples.
- Generation 2 version in development.
- Use - Generation 1 is easy to build, but cumbersome to adapt to new banks.
- Generation 2 being developed by one JLab staff member (M. Ungaro). Generation 1 no longer supported.
Summary

- Event generators - pythia, ppgen, disgen, and other locally developed ones.
- Simulation - gemc is complete, mature and in wide use.
- Reconstruction - generation 3 development far along.
- Visualization - ced12 event display well developed and widely used.
- Physics analysis – evio2root gives access to root; improved, generation two version being developed.
- Ease-of-Use - Many packages accessible to offsite users. TRAC just starting to spread offsite.
- Support - Faculty or JLab staff contacts for each major software subsystem (often the original author).