

CALICE Software Framework



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Applying/Testing ILC Software Tools in ILC Detector Development

ILC Software Workshop Cambridge/UK April 2006

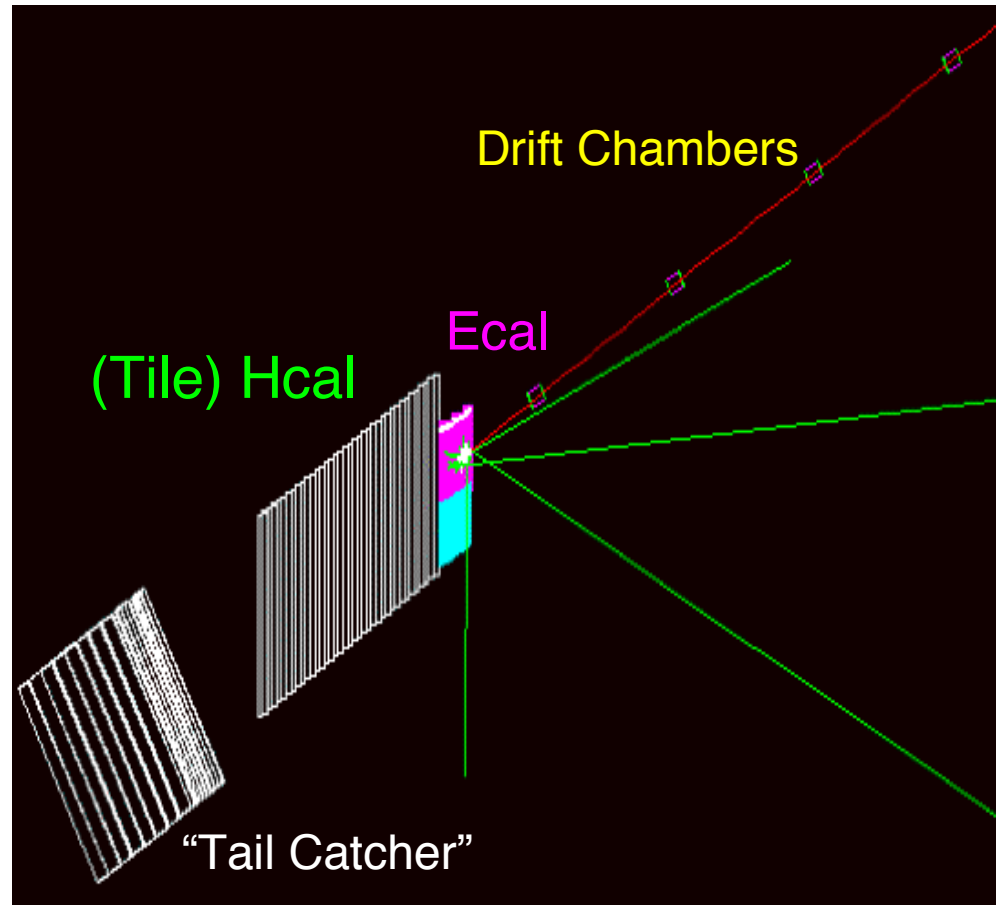
Introduction

CALICE collaboration is preparing/performing large scale testbeam

Testbeam program poses software “challenges”

- Detailed simulation of testbeam setup
- Data processing from Raw Data to final Clusters in user friendly way
- Handling of Conditions Data

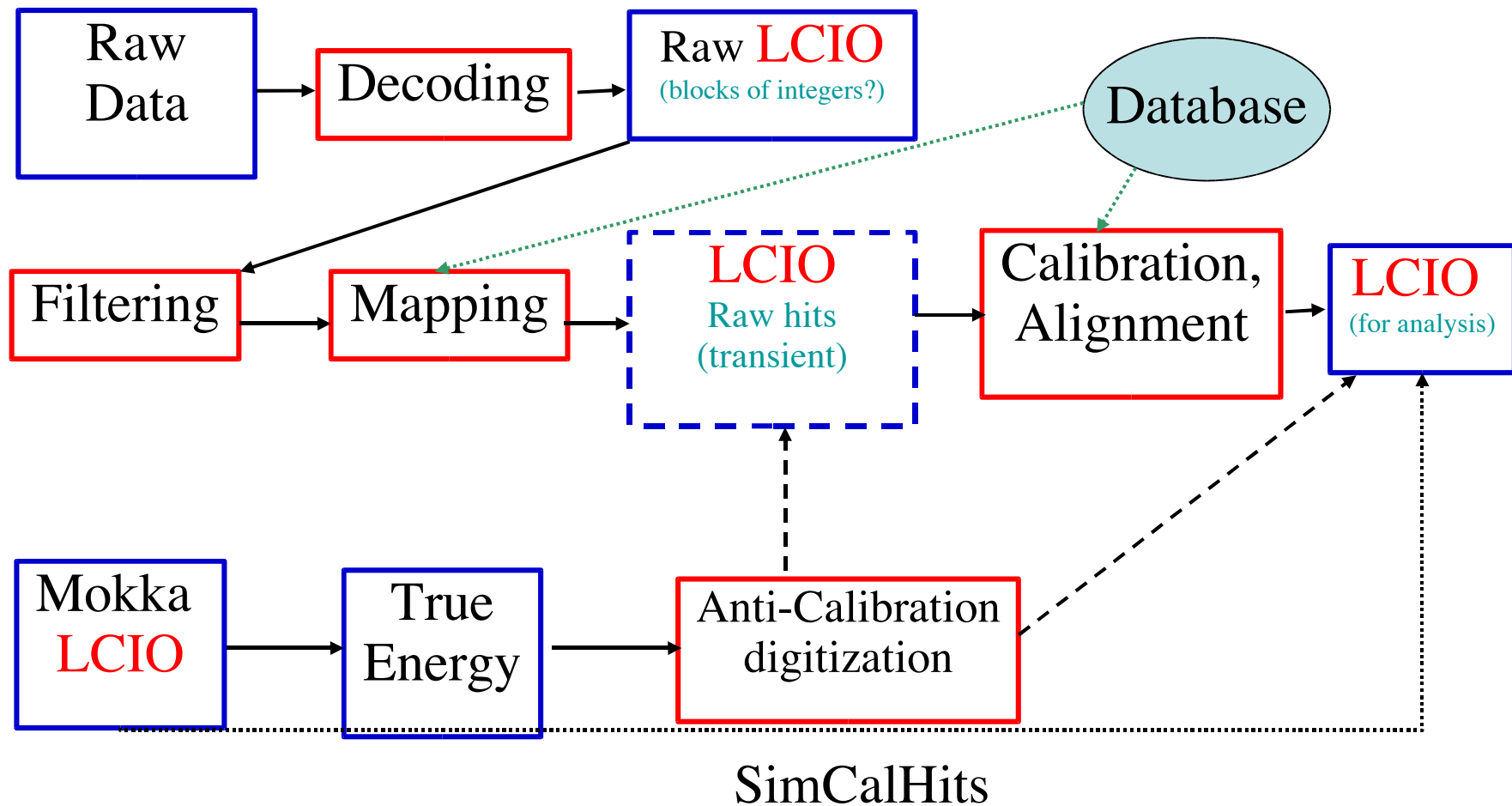
Testbeam software is to be developed within ILC framework



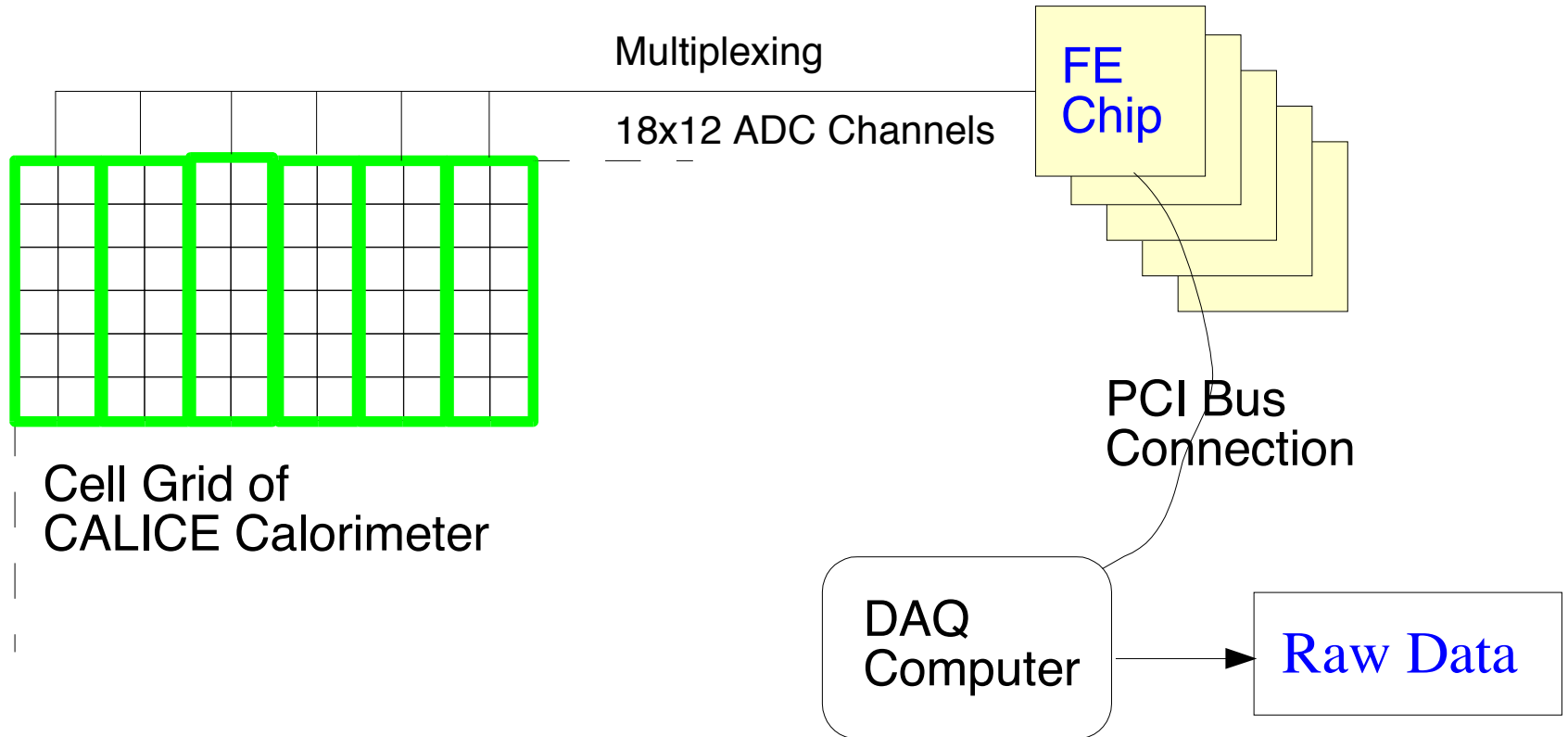
Complete testbeam setup available in Mokka TB07

Dataflow in CALICE Testbeam

LCIO as backbone of Testbeam Analysis



CALICE DAQ Scheme – Poor Man's View



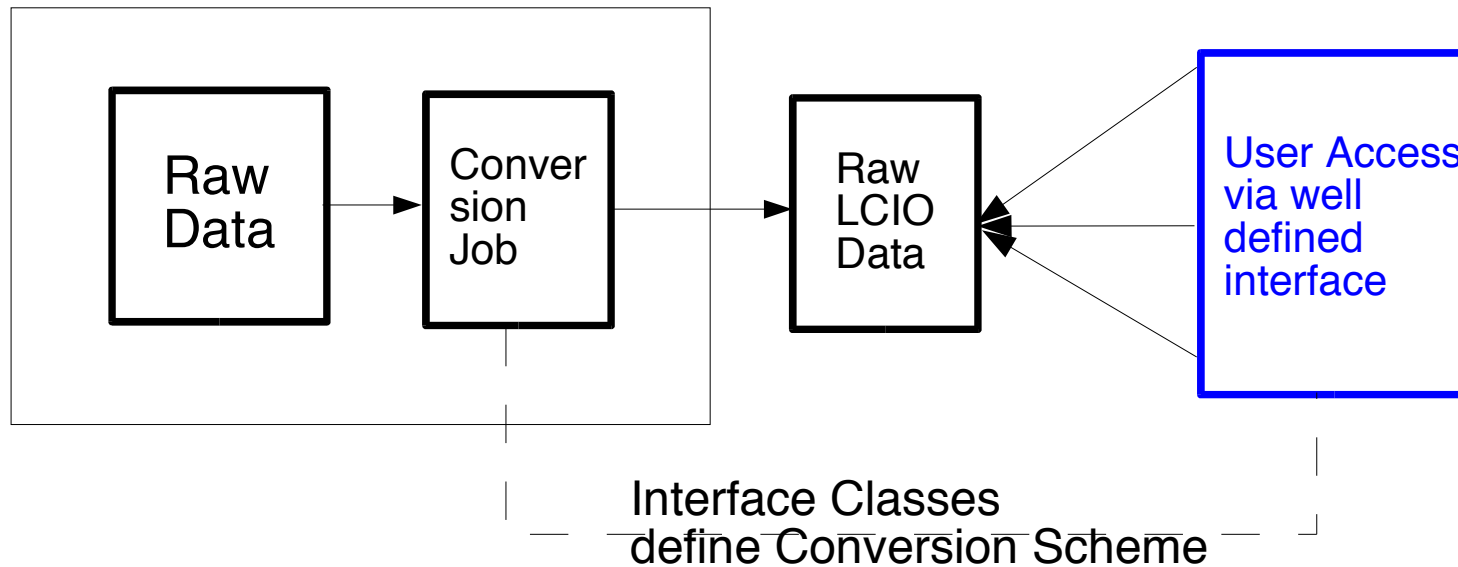
- DAQ is organized 'hardware friendly'
Data received and stored as sequence of 32 bit integers
Needs expert knowledge to analyze the data
- 'Many' people should get involved in calibration/monitoring

- Provide data in 'user friendly' format

Raw Data Conversion to LCIO

Raw Data should be made available in LCIO Format

- Requirements: - 'Intelligent' Conversion from Raw Data to LCIO Raw Data
- Provide all Info on Raw Data also in LCIO Raw Data in a user friendly way

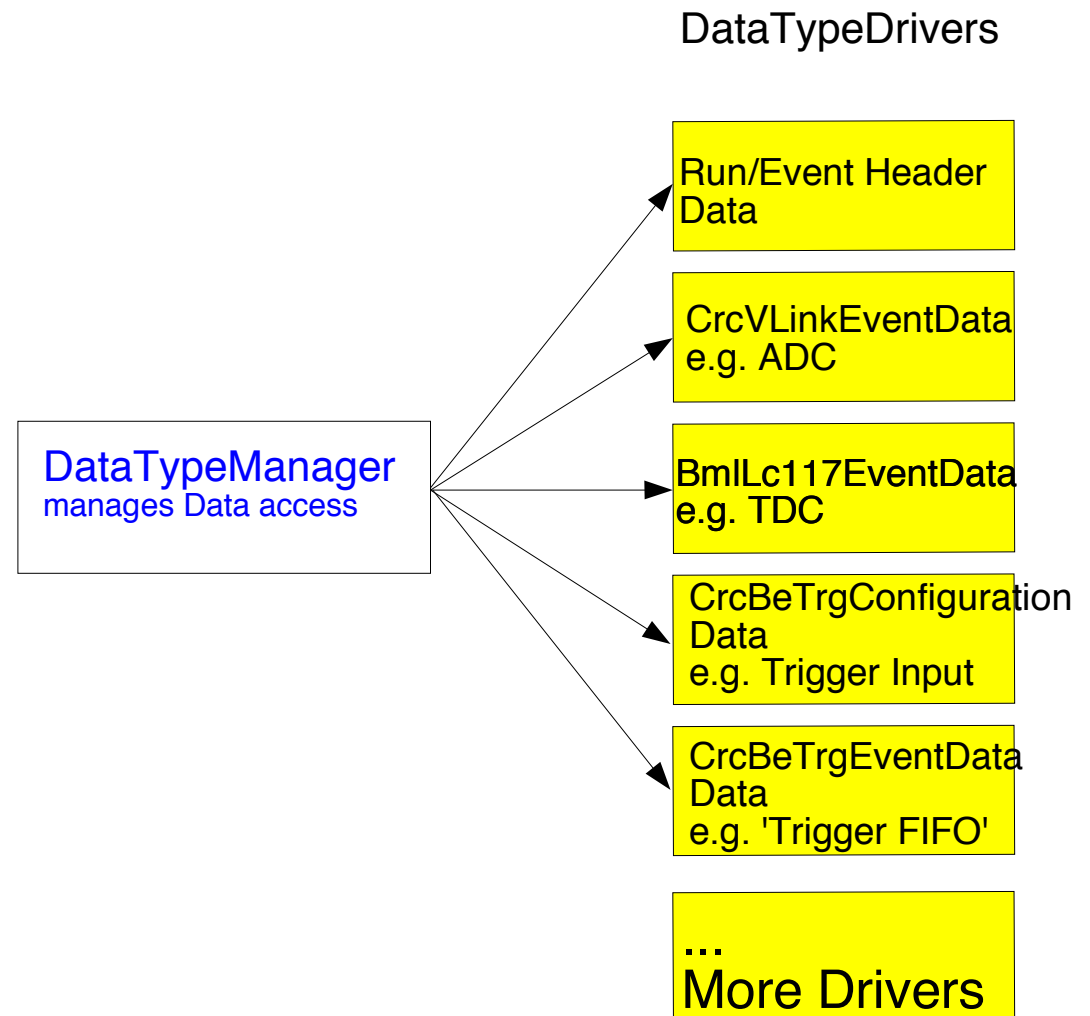
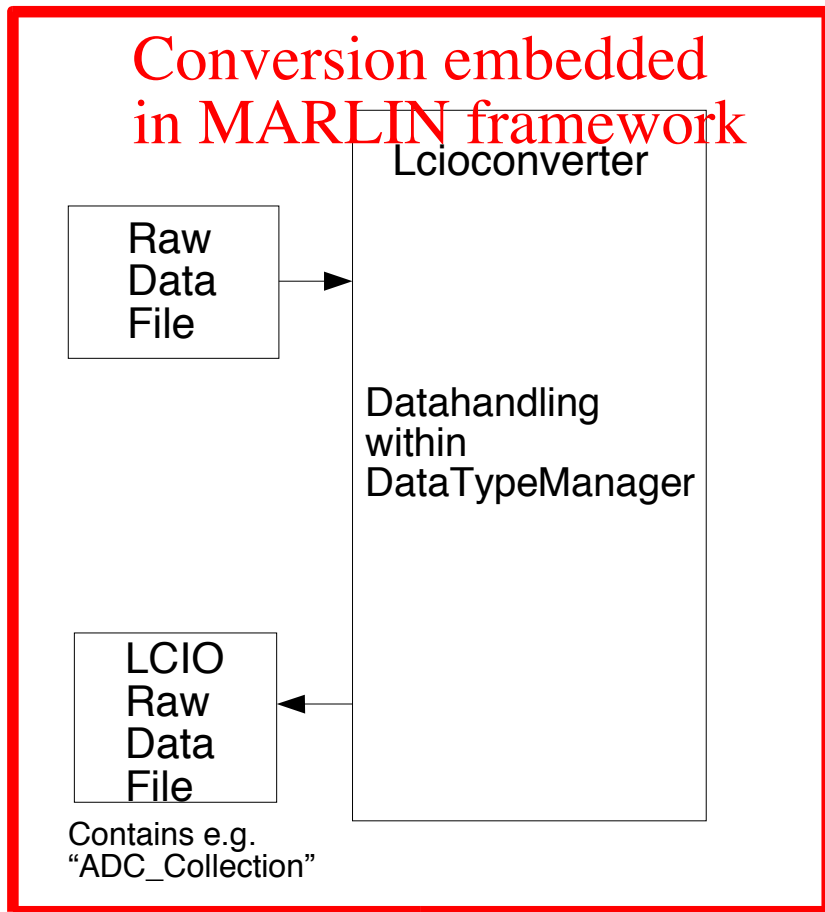


Interface is to be completely decoupled from online software

Dedicated Interface Classes are defined using LCIOGenericObjects

Conversion to LCIO

Documentation: http://www-flc.desy.de/store/hcal/simsoft/calice_soft/lcioconverter/v01-03/doc/



Datatypes currently available after conversion

- ADC Data

- TDC Data

- Event Data

- (Trigger Data)



Persistent in LCIO file

- Hardware Configuration Data
(Conditions Data)
Made Persistent in Database

(Main) Software Packages

Release comprises four packages

1) calice_lcioconv v03-10: Conversion of native Raw Data to LCIO

Linked against marlin-00-09-03

=> Large LCIO files can be splitted

Most interesting for users:

2) calice_userlib: v03-05: Interface classes to access the converted data

3) calice_reco: Reconstruction software under development
Versions for Ecal exist

4) calice_online v03-01: Software tools needed to access the native raw data in the conversion job










5) calice_cddata v01-01: Small routines to populate the Calice database with conditions data entries
More on database issues later

Software 'Management'

Central cvs repository: www-zeuthen.desy.de/linear_collider

No account at Zeuthen needed, safe access via ccvssh

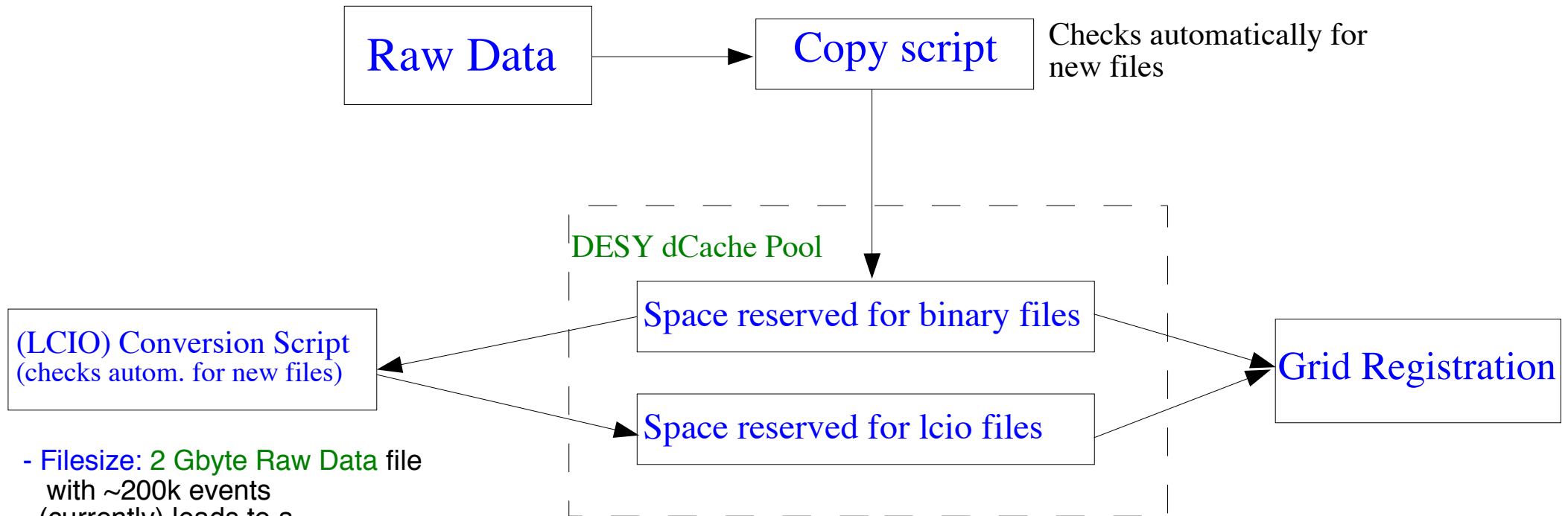
Snapshot of Webinterface

File	
 CVSROOT/	
 calice/	Pool for misc. software goodies and tools
 calice Icioconv/	Contains Icioconverter
 calice online/	
 calice userlib	Contains userlib (i.e. Interface classes)
 calice sim/	Contains Hcal Ganger
 lcsoft/	
 log/	
 test_project/	

Software installation (currently) via env scripts

Goetz developed system to install Calice/ILC Software using GNU autotools

Data Processing (as currently done at DESY)



- Filesize: 2 Gbyte Raw Data file
with ~200k events
(currently) leads to a
~1.3 Gbyte LCIO File

- Conversion time: 15 Minutes per 2 GByte
Intel(R) Pentium(R) 4 CPU 2.40GHz

Data Processing will have to be modified outside DESY
Employment of Grid Tools (see next slide)

Accessing/Handling the Data Using Grid Tools

Binary data and LCIO files are registered on the Grid

Using the LCG software together with (new) LFC file catalogue
Organized in a unix-like directory structure

e.g. `lfc-ls /grid/calice/tb-desy/native/dat`

Centralized access to members of virtual organisation '*calice*' hosted by DESY

e.g. `lcg-cp -vo calice lfn:/grid/calice/tb-desy/native/dat/RunXXXXXX.nnn.bin file:<myfile>`

Don't need account at particular institute but only grid certificate

Avoids (excessive) duplication of data

So far Calice has produced $\sim O(\sim 1 \text{ Tbyte})$ of raw data

Recent tests showed that the access to data works

(Hopefully) encouraging to extend employment of Grid Tools

Using Grid tools data can be made available independent of the site of data taking

Option for (future) data taking outside of DESY

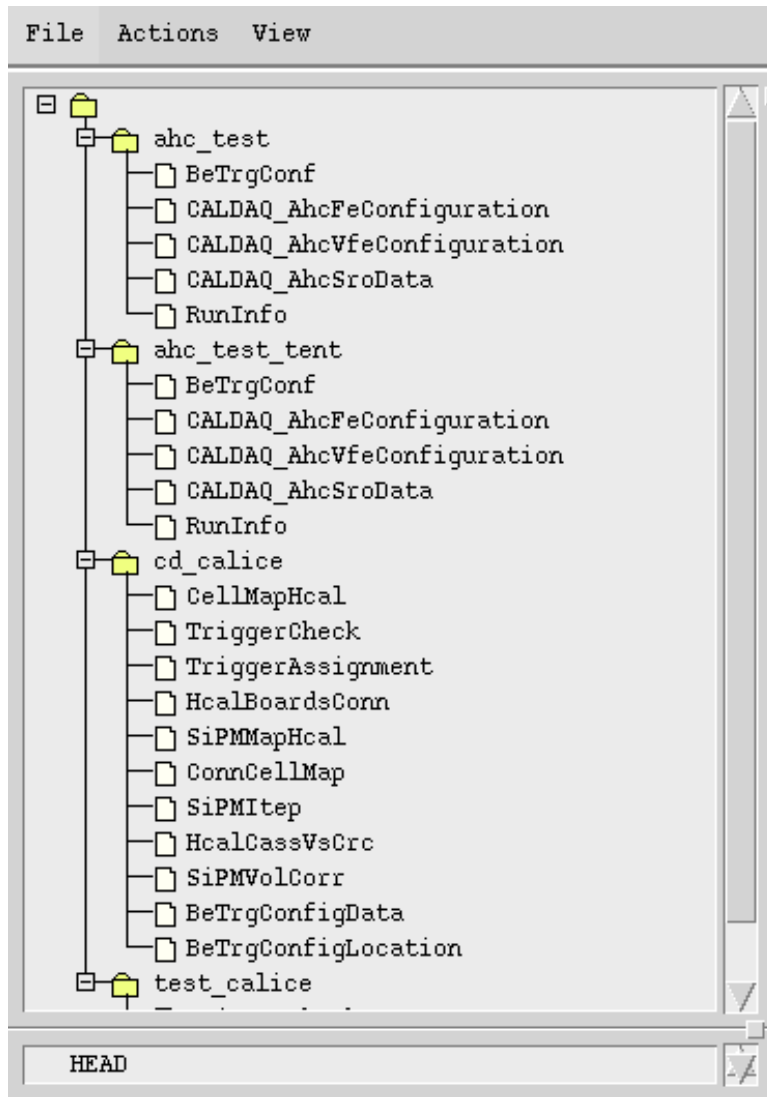
Handling of Conditions Data

Application of LCCD for Testbeam Data Processing

- LCCD — Linear Collider Conditions Data Framework:
 - Software package providing an Interface to conditions data
 - database
 - LCIO files

Author Frank Gaede, DESY
- Conditions Data:
 - all data that is needed for analysis/reconstruction besides the actual event data
 - typically has lifetime (validity range) longer than one event
 - can change on various timescales, e.g. seconds to years
 - need for tagging mechanism, e.g. for calibration constants
 - Realized by using [CondDBMySQL package \(Lisbon ATLAS Group\)](#)
- Conditions Data for CALICE are centrally stored in a MySQL database which is hosted by DESY

Current Content of Database



Trigger Info: Assignment of triggerbits
Trigger Configuration
Info to validate Trigger
information

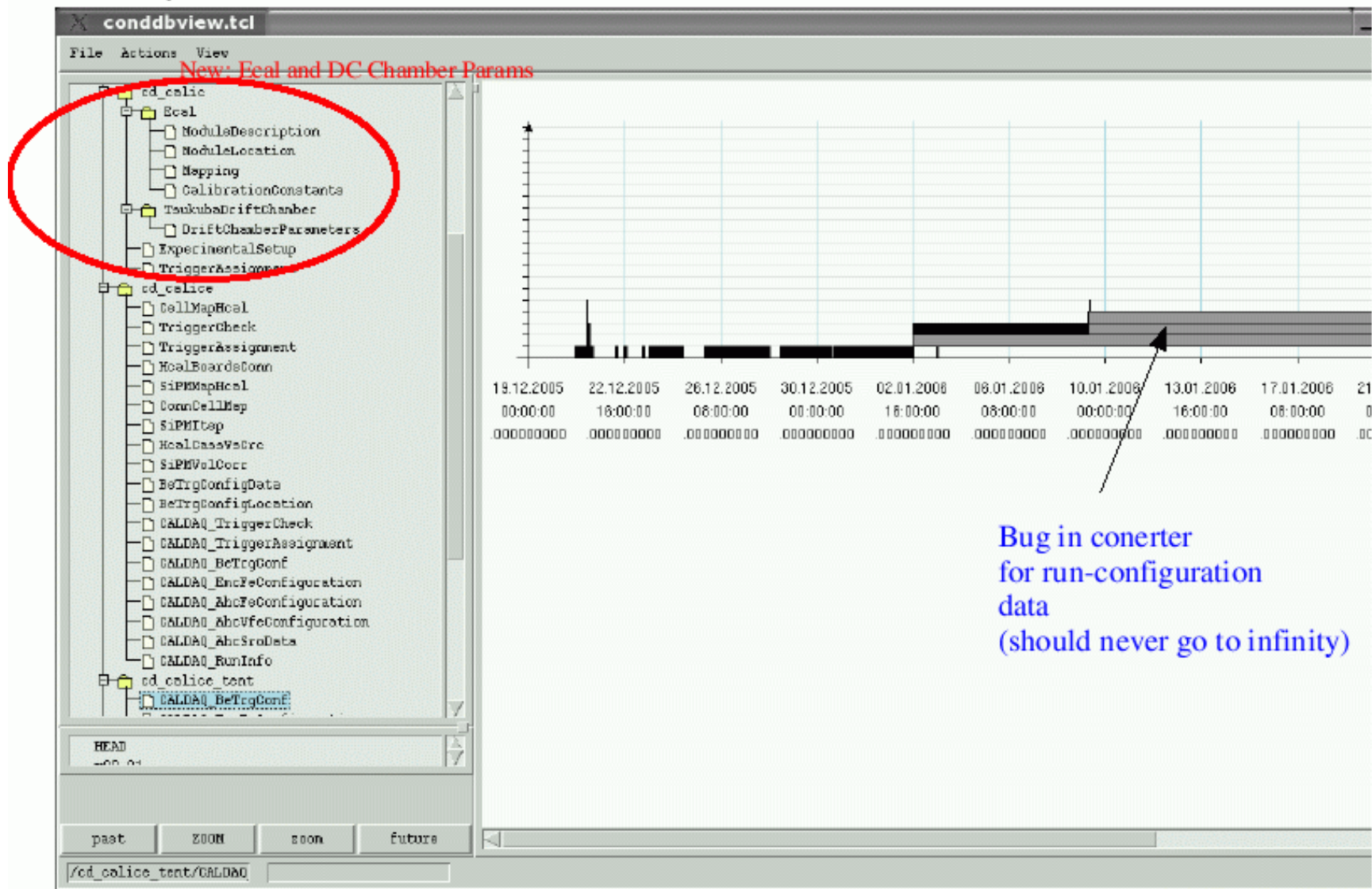
Cell Mappings: Relation electronic channel
and
geometrical channel
Relation SiPM Number
and geometrical channel
Dedicated info on SiPMs

Hardware configuration during data taking.
Input to 'run info ntuple' (under construction)

Started Project to visualize
Conditions Data
(S.Schmidt, M.Schenk, R.P.)

DB Visualisation Tool

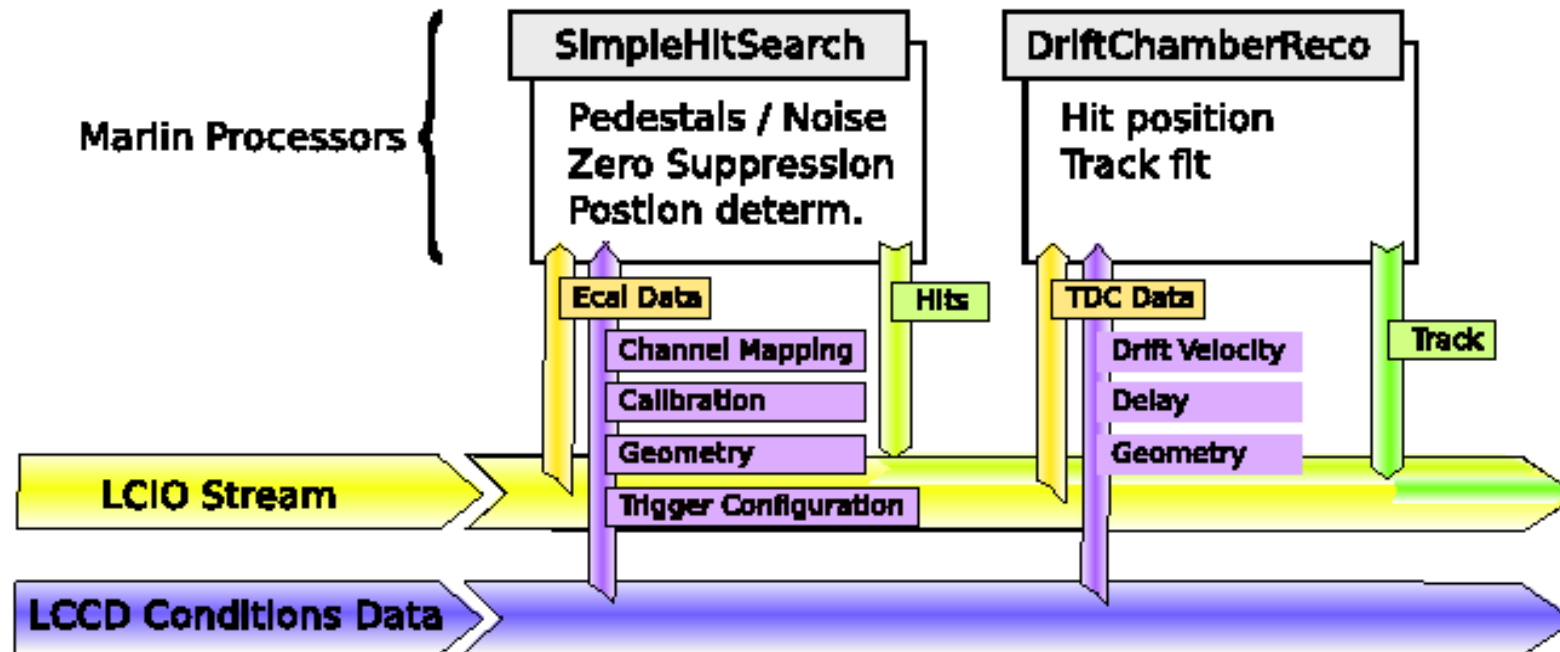
Viewer by S. Schmidt



Reconstruction Software

Reconstruction uses LCIO objects as input

Runs in Marlin framework:



G. Gaycken, LLR

Plan to provide a set of calibrated data for high level analysis
e.g. Clustering using MAGIC or gNIKI

Online Tools

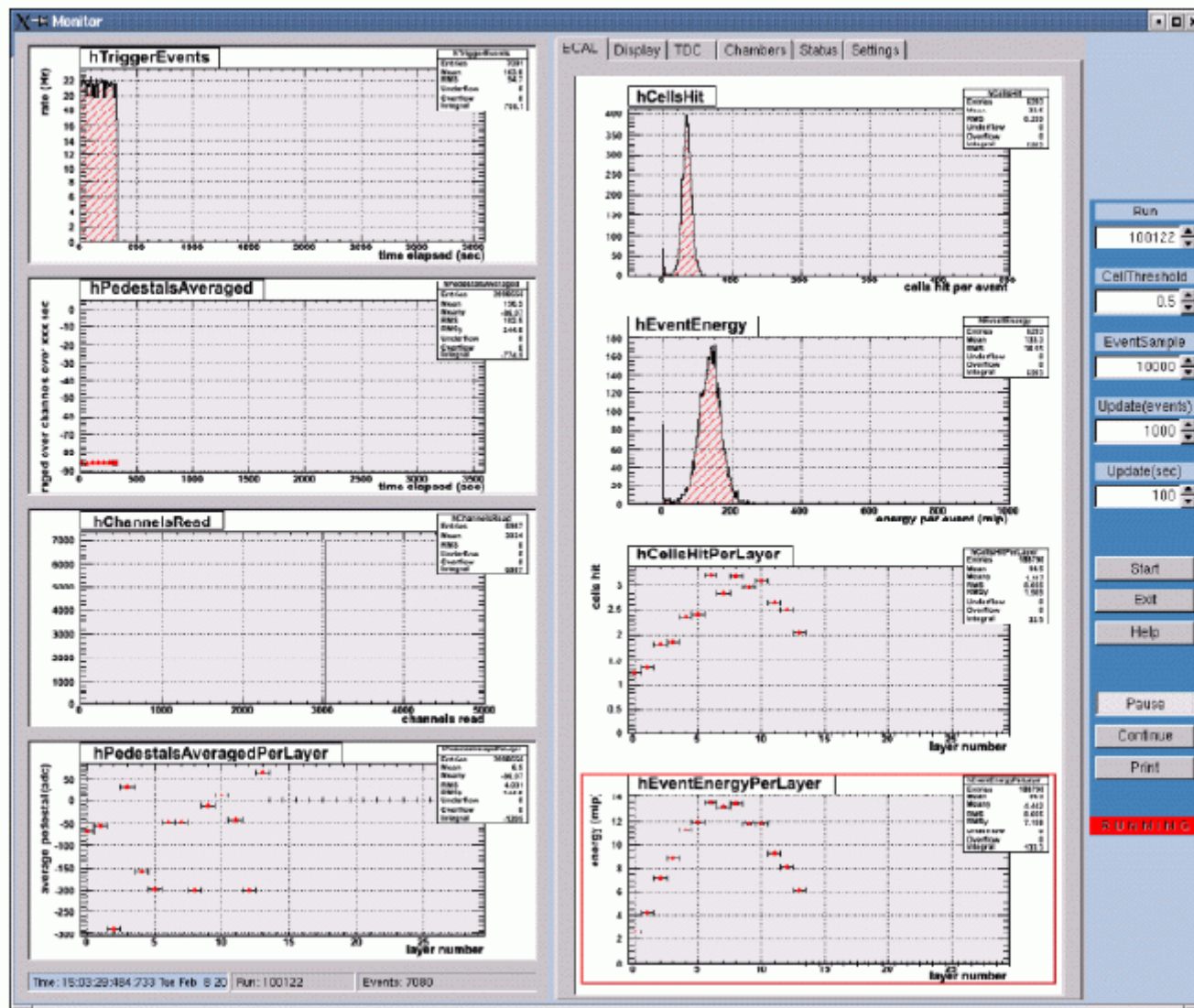
Root based online histogramming

Produces root and lcio output

Strategy for efficient data analysis under discussion

Three elements:

- 1) Online checks
- 2) Quasi Online
i.e. on the fly conversion and reconstruction output
- 3) Offline
Based on converted files



Conclusion and Outlook

- CALICE uses general ILC Software tools for data processing
- Major release of calice software middle of march
Next major release in preparation, e.g. Reconstruction Processors
- Database server installed at DESY
flccaldb01.desy.de
- Tests of complete chain were successful
Automized chain used for conversion of Data taken at DESY
Heading towards major testbeam at CERN Summer/Autumn 2006
- Calice Data are available on the Grid
- Need to make the data processing more homogeneous
 - Many analysis are still on the rawdata (i.e. non-lcio data)
since it is difficult to trace and embed hardware modifications
 - Lesson: Need to think early about integrating LCIO (or whatever) into the DAQ scheme for the ILC