

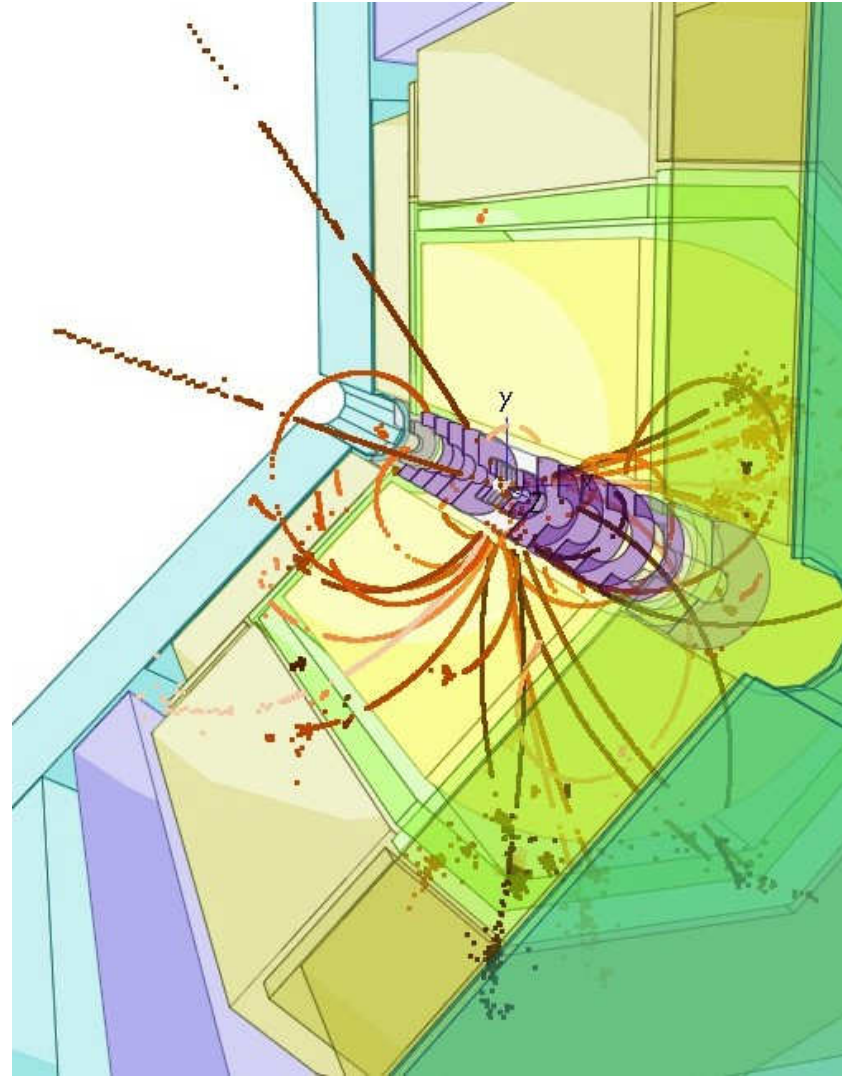
iLCSoft

Status and Plans

Frank Gaede, DESY
ECFA Workshop 2013
DESY, May 27-31, 2013

Outline

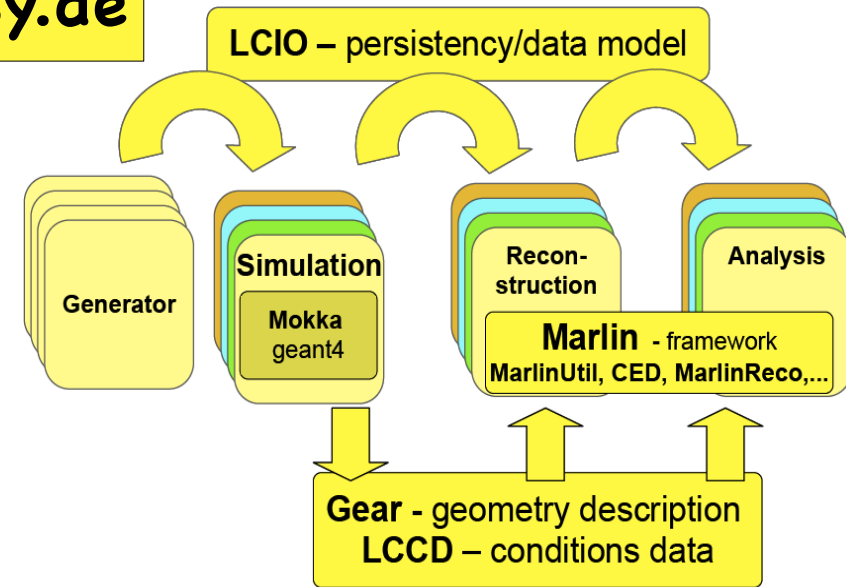
- Overview of iLCSoft
 - software packages and tools
- Recent Developments
 - CED, LCIO, Marlin, Clupatra,...
- Grid production system
- Future plans
- Summary & Outlook



iLCSoft framework - Overview

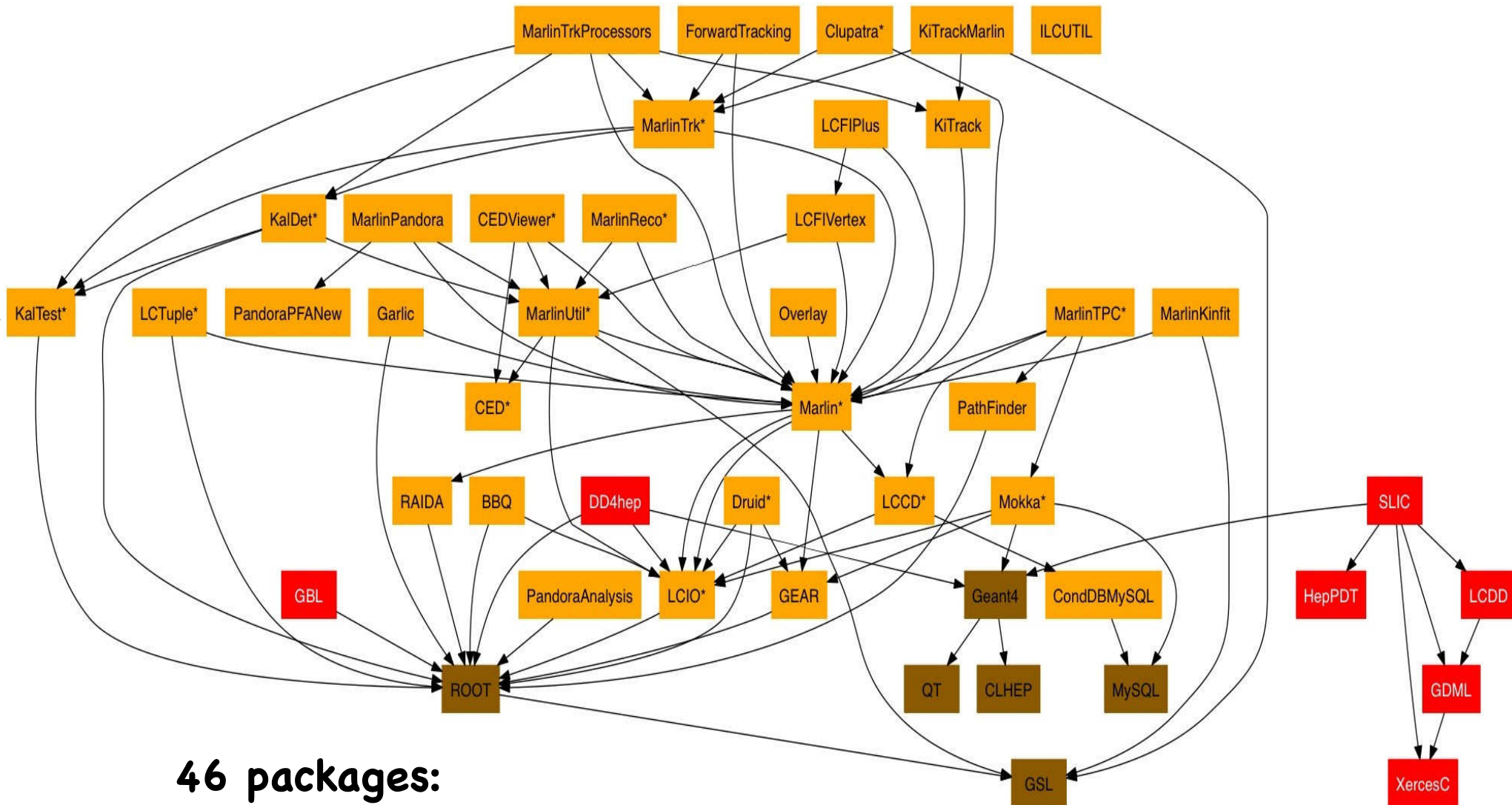
<http://ilcsoft.desy.de>

- **Mokka** geant4 simulation - LLR
- **LCIO** EDM and persistency
- **Marlin** application framework
- **GEAR** geometry description
- **LCCD** conditions data
- **CED** event display
- reconstruction packages:
 - **MarlinReco**
 - **MarlinTrk, Clupatra, ForwardTracking,...**
 - **MarlinPandoraPFA**
 - **LCFIVertex, LCFIPlus**
 - **MarlinKinFit**
- many more (see next slide)



- complete sw framework used in Monte Carlo & 'real experiments':
 - **ILD & CLIC** detector concept studies
 - **Calice, LC-TPC, EUTelescope** testbeams
- **synergies between testbeam and global detector optimization**

iLCSoft packages in release v01-17-01



46 packages:

8 external (non-LC)

6 added since v01-16

***updated since v01-16**

afs reference installations

- provide reference installations in afs for usage from **anywhere** on ScientificLinux and compatible platforms:

/afs/desy.de/project/ilcsoft/sw/_OS_/v01-17-01

OS: **x86_64_gcc41_sl5** # i686 CPU, 64 bit, gcc4.1, SL5 and compatible
x86_64_gcc44_sl6 # i686 CPU, 64 bit, gcc4.1, **SL6** and compatible

(32 bit no longer supported)

- you can directly run from these installations, .eg:

```
./afs/desy.de/project/ilcsoft/sw/x86_64_gcc41_sl5/v01-17-01/init_ilcsoft.sh  
Marlin mysteer.xml
```

- you can link your own libraries against these
- plan to have other OSs in the future (as requested !?)
- you can use ilcinstall tool for your own installation
-> <https://svnsrv.desy.de/viewvc/ilctools/ilcinstall/tags/v01-17-01>

ILD standard simulation/reconstruction

```
gaede — ssh — 88x55
#####
#
# HOWTO run Mokka and Marlin examples
# with standard configuration
#
# F.Gaede, DESY
# 12/2011: F.G.: updated to new ILD_01_dev model
# 01/2012: J.E.: updated to new ILD_0{1,2,3}_v01 models
#####
# These little examples server as an ultra quick introduction on
# how to run ilcsoft programs and as a mini-test after installation
# of a new (complete) ilcsoft release.
#
# Have a look at the scripts (mokka-wrapper.sh) and the
# steering files (bbudsc_3evt_stdreco.xml) for more details.
#
# 1. ---- initialize the current ilcsoft release, e.g. ----
. /afs/desy.de/project/ilcsoft/sw/x86_64_gcc41_sl5/v01-13-05/init_ilcsoft.sh
#-- this sets:
# MARLIN_DLL=libMarlinReco.so:libPandoraAnalysis.so:libMarlinPandora.so:libLCFIVertex.
so:libCEDViewer.so:libEutelescope.so:libMarlinTPC.so:libOverlay.so
#-- so these packages need to be present in the release for the standard examples
# 2. ---- run a Mokka example ----
a)
export PATH=$PWD/../../MokkaDBConfig/scripts:$PATH
export MOKKA_DUMP_FILE=$PWD/../../MokkaDBConfig/mokka-dbdump.sql.tgz
mokka-wrapper.sh -M ILD_01_v02 bbudsc_3evt.steer
# b)
# the above starts a MySQL server and populates it with a dump of the Mokka central DB
# you can also run Mokka directly (using the central DB):
Mokka -M ILD_01_v02 bbudsc_3evt.steer
# c)
# to make sure that the extra partice tables (for SUSY etc) is loaded:
Mokka -M ILD_01_v02 -e ../../MokkaDBConfig/particle.tbl bbudsc_3evt.steer
# OR:
mokka-wrapper.sh -M ILD_01_v02 -e ../../MokkaDBConfig/particle.tbl bbudsc_3evt.steer
#-- this creates the file: bbudsc_3evt.slcio
#- example: examine the collections in the file:
anajob bbudsc_3evt.slcio
1,1 Top
```

```
gaede — ssh — 88x38
# 3. ---- reconstruct these events: ----
Marlin bbudsc_3evt_stdreco.xml
#-- creates: bbudsc_3evt_REC.slcio
# and bbudsc_3evt_DST.slcio
#- example: dump the details of the 2nd event in the DST file:
dumpevent bbudsc_3evt_DST.slcio 2 | less
# 4. ---- view the result in the event display
# a)
#-- start the event display (server) first:
glced &
#-- view rec or DST events:
Marlin bbudsc_3evt_viewer.xml
Marlin bbudsc_3evt_viewerDST.xml
# b) (new in v01-10)
# or start both, glced and Marlin in one go:
ced2go -d GearOutput.xml bbudsc_3evt_REC.slcio
93,0-1 98%
```

- StandardConfig/current sub package with current steering files for ILD
- defines **canonical ILD simulation and reconstruction**
- **README** is "shortest introduction to running iLCSoft for ILD"

pre-DBD activities in iLCSoft

- the timeline for iLCSoft developments since LOI (2008) was driven by the requirements for the ILD-DBD
- successfully used to produce $O(10^7)$ Monte Carlo Events

- **improve/adapt core tools**

- LCIOv2, GEAR, CED,...

- **improve realism of the simulation**

- include gaps, imperfection and services

- **complete re-write of tracking code**

- improvements and re-write of reconstruction algorithms

PandoraPFA and **LCFIVertex/LCFIPlus**

- develop and use **GridProductionSystem**

- not covered in this talk

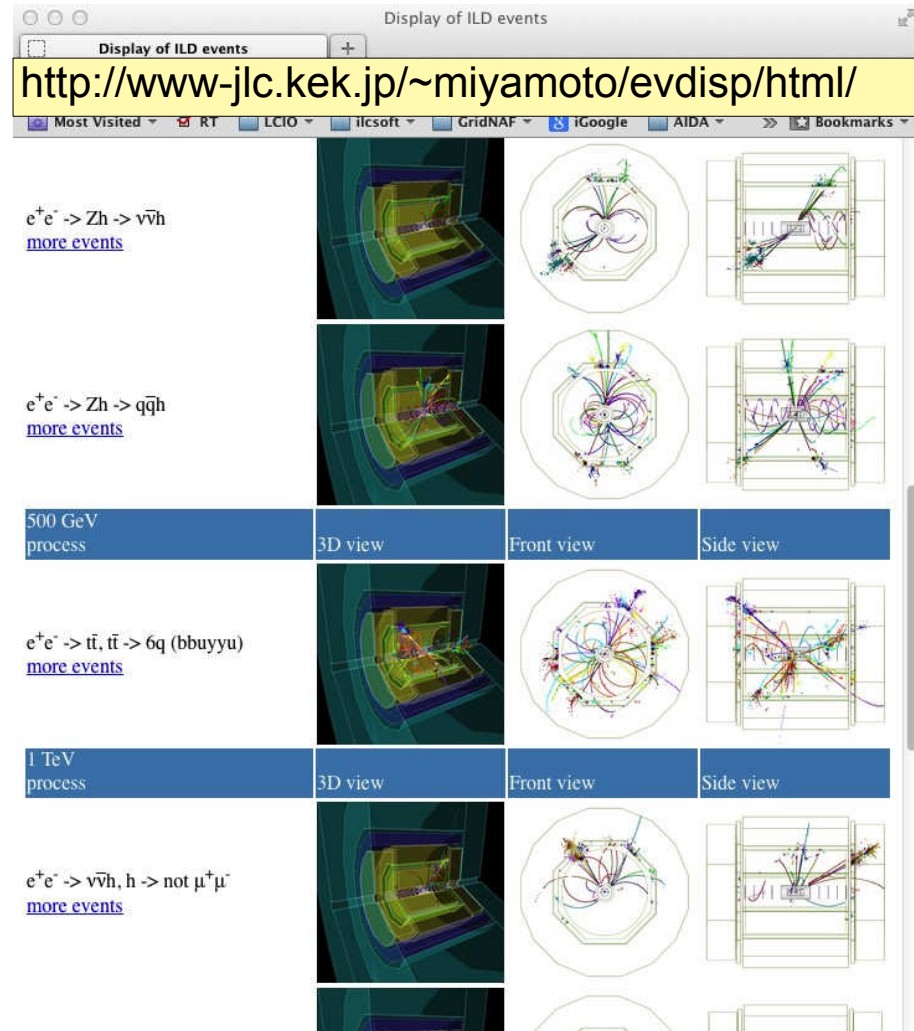
- -> focus on new developments and plans

Updates and Bug Fixes v01-17-01

- packages updated in v01-17-01 wrt. v01-16:
 - lcio, lccd, gear, CED, Marlin, MarlinUtil, Mokka, MarlinReco, CEDViewer, LCTuple, MarlinTrk, Clupatra, KalTest, KalDet, MarlinTPC
 - many (small) new features, bug fixes (e.g identified by coverity static code checker)
- packages added to iLCSoft (including ilcinstall support):
 - GBL: General Broken Lines (K.Kleinworth, Ch.Rosemann)
 - DD4hep: Geometry description (M.Frank, P.Mato)
 - SLIC, XercesC, HepPDT, GDML, LCDD (J.McCormick)
- for details see complete release notes at:
 - https://svnsrv.desy.de/viewvc/ilctools/ilcinstall/tags/v01-17-01/doc/release_notes_ilcsoft_v01-17-01.txt
- see next slides for some new features...

CED v01-09

- new "Auto Shot" feature in CED event display (A.Miyamoto) :
- automatically save a screen shot for every event that is displayed to a local file
- glced-N.tga or $\${CED_IMAGEFILE}$ -N.tga if env. variable is set
- allows to create nice sets of event displays for physics channels



- made libCED.so "C"-like again, i.e. w/o C++ name mangling
- -> can easily use CED from python using ctypes

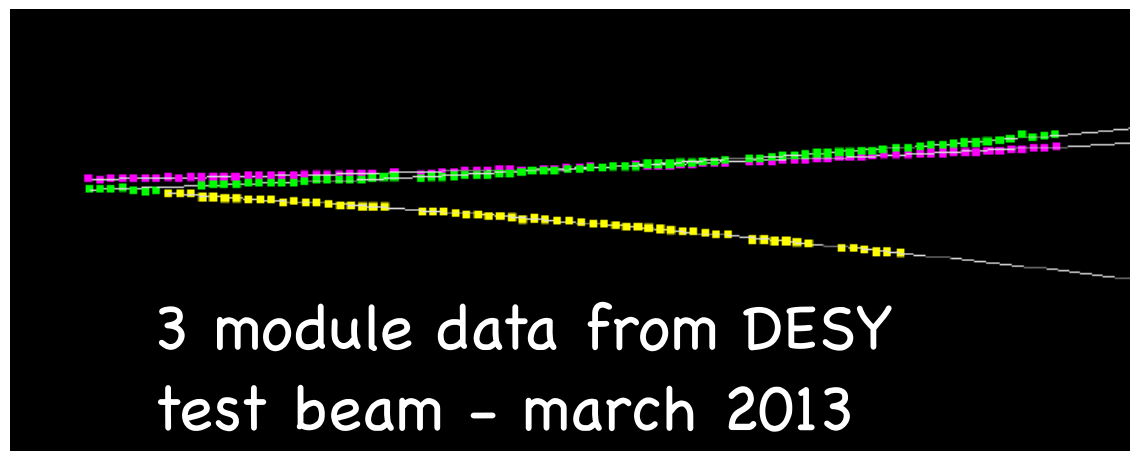
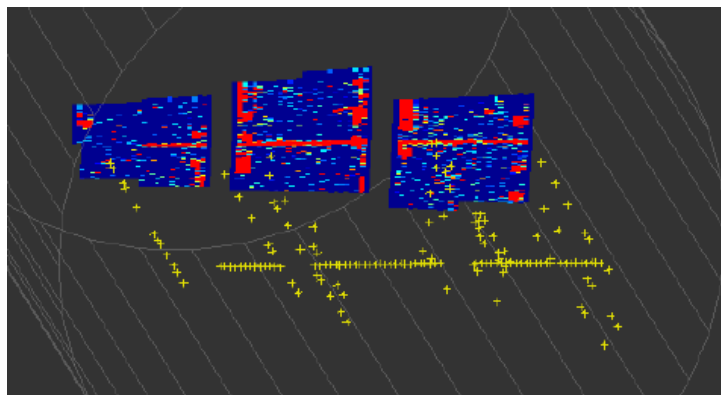
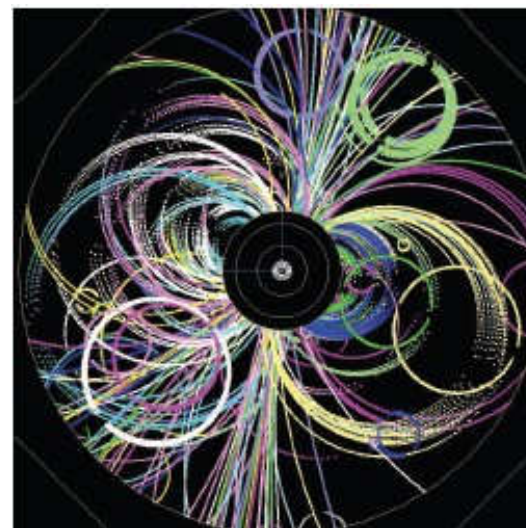
LCIO v02-04

- new python binding: `pyLCIO` - see talk by Christian Grefe
- added build option for C++ only builds
 - `cmake -DLCIO_GENERATE_HEADERS=OFF ..`
- added a new C++ method to limit the collections that are going to be read from a file:
 - `LCReader::setReadCollectionNames(const std::vector<std::string>& cn)`
 - `anajob` and `dumpevent` now read variable `LCIO_READ_COL_NAMES` with space separated list of collection names to read only these
 - an Exception is thrown if a null pointer is found in a subset collection unless `LCIO_IGNORE_NULL_IN_SUBSET_COLLECTIONS=1`
- -> can considerably improve performance when reading e.g. only `MCParticles` and `PFOs` from a REC file (~five times)

Marlin v01-05

- new optional global parameter: "LCIOReadCollectionNames"
allows to restrict the collection that are read from the LCIO file(s) to the ones given (needs LCIO v02-04)
- new command line option (H.Perrey, DESY):
 - u : consistency check and updated version of xml file
- fixed problem w/ ROOT seg fault at program end (A.Sailer):
 - do not call dlclose on shared libraries anymore
 - MARLIN_DEBUG environment variable is obsolete

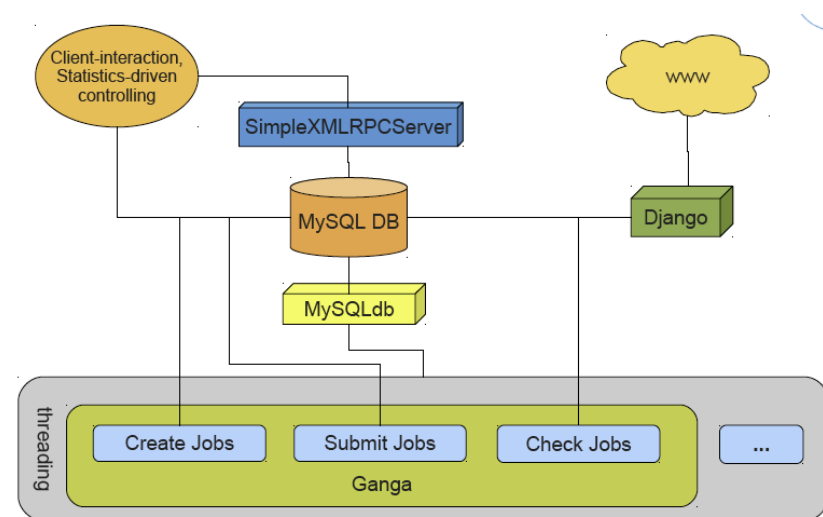
- Clupatra updated to work with real test beam data from Large TPC prototype
 - originally developed for ILD simulation:
 - re-implementation of geometry description in KalDet
 - small adaptation of algorithm and configuration



used successfully for march test beam at DESY

Grid production - ILCDirac

- ILD had developed a Grid production system based on python and MySQL
- successfully used for DBD mass production
- main developer and maintainer has left
- decided to join with SID/CLIC to use the **ILCDirac** tool maintained at CERN



ID	Status	AgentT...	Type	Name	Files	Processed (%)	Created
2453	Active	Automatic	MCRReconstructi...	ttz-ln4q-all_140...	296	100.0	302
2452	Active	Automatic	MCSimulation	ttz-ln4q-all_140...	256	100.0	352
2451	Active	Automatic	Split	ttz-ln4q-all_140...	5	60.0	5
2450	Active	Automatic	MCRReconstructi...	ttz-6q-all_1400...	283	100.0	291
2449	Active	Automatic	MCSimulation	ttz-6q-all_1400...	259	100.0	319
2448	Active	Automatic	Split	ttz-6q-all_1400...	6	83.3	6
2447	Active	Automatic	MCRReconstructi...	ttz-2l2nbb-all_1...	264	100.0	273
2446	Active	Automatic	MCSimulation	ttz-2l2nbb-all_1...	257	100.0	288
2445	Active	Automatic	Split	ttz-2l2nbb-all_1...	4	100.0	4
2444	Active	Automatic	MCRReconstructi...	tth-ln4q-hnonbb...	277	100.0	287
2443	Active	Automatic	MCSimulation	tth-ln4q-hnonbb...	259	100.0	305
2442	Active	Automatic	Split	tth-ln4q-hnonbb...	5	100.0	5
2441	Active	Automatic	MCRReconstructi...	tth-ln4q-hbb_14...	278	99.6	344

- first successful usage of ILCDirac by individuals for dedicated channels and complete 250/350 GeV samples
- ported all **meta data** from gridprod to **ILCDirac data catalogue**
- first version of productions scripts developed (S.Poss)
- new ILD Monte Carlo coordinator E.Avetisyan will start exercising them

LC-Software future plans

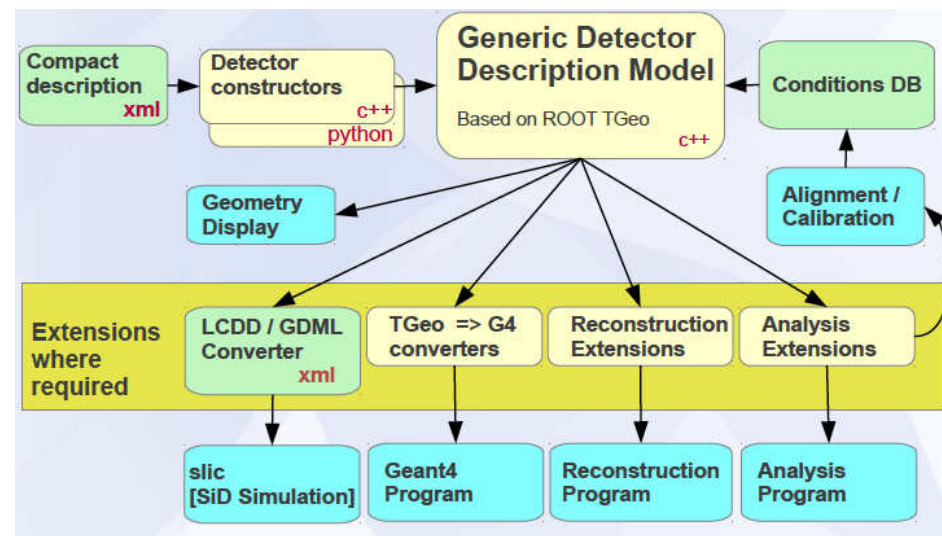
- broad agreement that the only way forward is **to move to common software tools**
- process already started after the LOI with:
 - Software Common Task Group
 - many common tools used by CLIC, ILD and SID:
 - LCIO - common EDM provides base for common tools
 - geant4, PandoraPFA, LCFIVertex/LCFIPlus, Root
- loose series of Linear Collider Software Meetings at CERN with software experts from all groups:
 - 2009, 2012 and 2013

LC Software Meetings

- in closeout of 2012 meeting reached general consensus to work towards
 - a common simulation application based on the geometry description developed in AIDA WP2
 - a common C++ tracking package in the context of AIDA WP2
- meeting in early 2013
 - <http://indico.cern.ch/conferenceDisplay.py?confId=228477>
- focused on the details of how these goals can be achieved
 - interface between geometry description and simulation and reconstruction (tracking)
 - common software infrastructure (documentation, installations, releases, ...)

Geometry, Simulation, Reconstruction

- agreement to use DD4hep as the common geometry description
- interface to geant4 application
 - lcdd/gdml files
 - geant4 converters (code)
- midterm goal:
 - all use **SLIC** simulation
 - -> need transition phase for ILD to port **Mokka** simulation models to DD4hep



- started to work on a prototype for tracking:
 - simple ILD tracking detectors
 - learn how interface should work
- issues:
 - cellIDs, segmentations, sensitive detectors
 - -> address in expert meeting on thursday

Summary & Outlook

- development activities in iLCSoft framework in the last 2-3 years where driven by preparation for the ILD DBD
 - improved realism in simulation and performance of reconstruction tools
- first developers release(s) since then provide some new features in core tools and some new packages:
 - GBL, DD4hep and SLIC et al
- work towards a **common simulation and reconstruction framework for Linear Collider** studies
 - depending on what the manpower situation permits
- we have a window of opportunity now to improve and consolidate the LC software before the next big report
 - while we have to keep the current software chain functional for physics studies and detector optimization