Report from LC-Software Meeting 2013

Frank Gaede, DESY

ILD Analysis & Software Meeting

February 13, 2013

Overview

- Linear Collider Software Meeting 2013
  - CERN, Jan 31-Feb 02
  - 3rd meeting of this kind - previous meetings: 2010, 2012
  - organized by Akiya Miyamoto, Norman Graf, Jan Strube, FG
- Goal: work towards more common software tools for linear collider studies
- Topics:
  - DD4Hep geometry system
  - SLIC, Mokka -> new common simulation
  - common tools for tracking, PFA and flavor tag
  - Grid production
  - generator tools
  - concurrency for LC software
  - general software tools

Meeting Agenda

Linear Collider Software Meeting

from Thursday, January 31, 2013 at **09:00** to Friday, February 1, 2013 at **17:00** (Europe/Zurich)
at **CERN (304-1-001)**

Description This meeting brings software experts from ILD, SiD and CLIC together to discuss future directions in the technical development of LC software frameworks and tools. This is intended as a working meeting with limited attendance. In case you have questions in relation to this meeting, please contact Frank Gaede, Norman Graf, Akiya Miyamoto or Jan Strube. The objectives of this meeting are closely linked to AIDA work package 2 (common software tools) with focus on Linear Collider detector studies.

Go to day

Thursday, January 31, 2013

09:00 - 12:30 DD4Hep and new Simulation

- 09:00 **DD4Hep - hands on presentation** *1h0'*
  - walk through examples, code, ...
  Speaker: Markus Frank (CERN)
  Material: Slides
- 10:00 coffee *30'*
- 10:30 **Status and Plans for SLIC** *20'*
  Speaker: Norman Anthony Graf (SLAC National Accelerator Laboratory (US))
  Material: Slides
- 10:50 **Status and Plans for Mokka** *20'*
  Speaker: Vincent Boudry (Ecole Polytechnique (FR))
  Material: Slides
- 11:10 **Discussion: Interface DD4Hep to GEANT4** *30'*
  - LCDD (gdml) files vs. in memory conversion from TGeo to G4-Shapes
  - sensitive detectors
  Speakers: Markus Frank (CERN), all
  Material: Slides
- 11:40 **Discussion: Towards a common LC Simulation** *40'*
  Speaker: all

12:30 - 13:30 lunch

13:30 - 17:00 Common Tracking Tools

- 13:30 **ILD/AIDA Tracking Tools: status and plans** *40'*
  Speaker: Christoph Rosemann (DESY Hamburg)
  Material: Slides
- 14:10 **SID/org.lcsim Tracking Tools: status and plans** *40'*
  Speaker: Norman Anthony Graf (SLAC National Accelerator Laboratory (US))
  Material: Slides
- 14:50 coffee *20'*
- 15:10 **Discussion: Interface DD4Hep to Tracking (Reconstruction)** *40'*
  - GEAR-like API
  - org.lcsim - Reco-API
  - Navigation Functionality
  - other ?
  Speaker: all
- 15:50 **Discussion: Towards Common Tracking Tools** *1h0'*
  Speaker: all

19:30 - 21:30 Dinner (304-1-001)
Software Workshop Dinner at Café de l'aviation, http://www.laviation.ch/
Tram 14 or 18, Stop "Blandonnet"

Friday, February 1, 2013

09:00 - 12:10 Reconstruction and other Software Tools

- 09:00 **Particle Flow: status and plans** *40'*
  Speaker: John Stuart Marshall (University of Cambridge (GB))
  Material: Slides
- 09:40 **Flavor Tagging Tools: status and plans** *40'*
  Speakers: Tomohiko Tanabe, Tomohiko Tanabe
  Material: Slides
- 10:20 coffee *30'*
- 10:50 **Common Generator Tools for LC** *40'*
  Speaker: Akiya Miyamoto (High Energy Accelerator Research Organization (JP))
  Material: Slides
- 11:30 **Overview Concurrent Programming Forum** *40'*
  Speaker: Dr. Pere Mato Vila (CERN)
  Material: Slides

12:00 - 13:00 lunch

13:00 - 16:00 Reconstruction and other Software Tools

- 13:00 **ILCDIRAC: status and plans** *40'*
  usage for all LC: production and user jobs
  Speaker: Stephane Guillaume Poss (Centre National de la Recherche Scientifique (FR))
  Material: Slides
- 13:40 **Towards more common software infrastructure** *40'*
  - documentation
  - Wikis (Confluence)
  - portal
  - nightly builds
  - test infratructure
  - ticket system
  - common software releases, installations,
  - ..
  Speaker: Jan Fridolf Strube (S)
- 14:20 coffee *20'*
- 14:40 **Closeout** *1h20'*
  Speaker: all

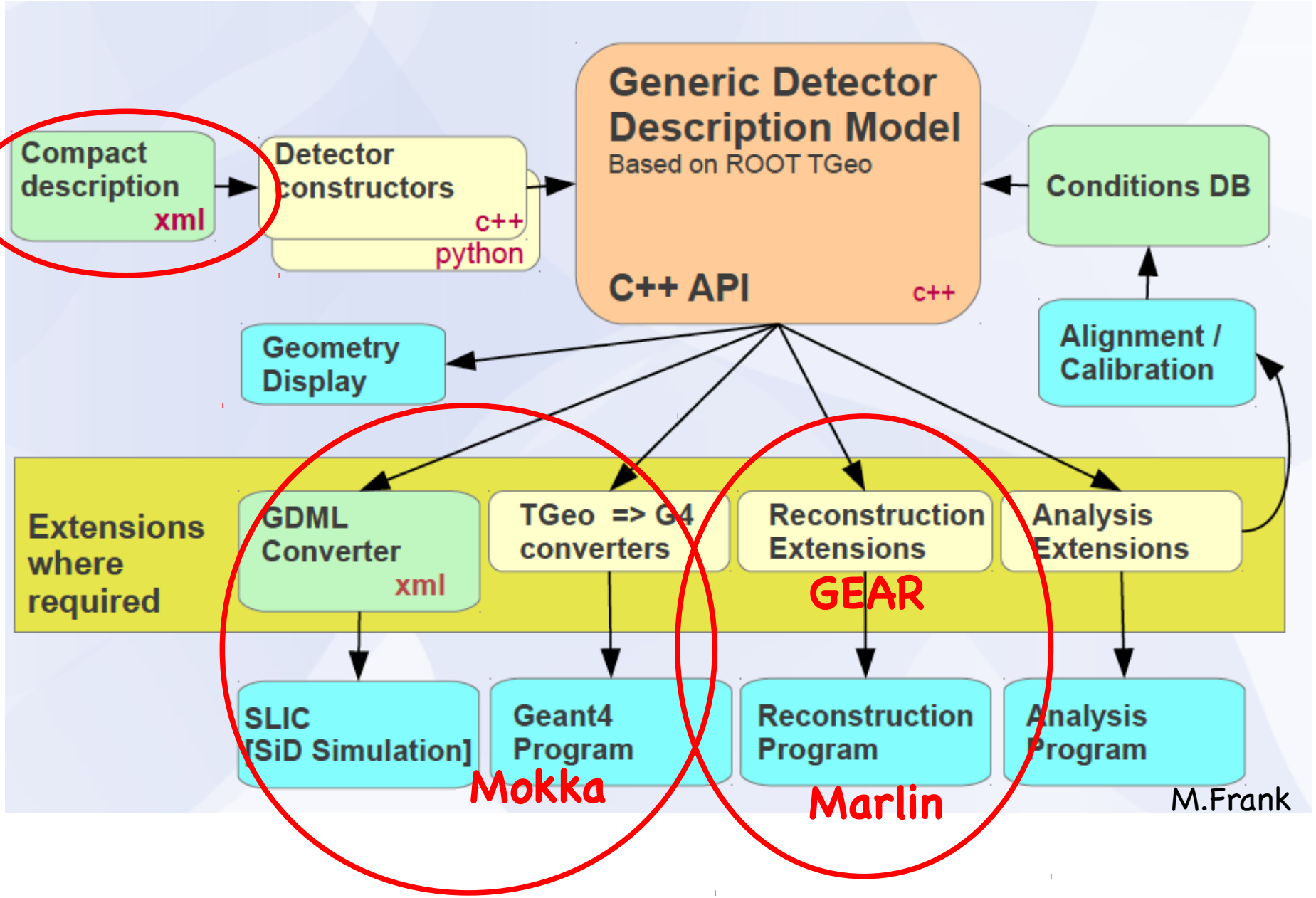
http://indico.cern.ch/conferenceDisplay.py?confId=228477

DD4Hep

- DD4Hep: Detector Description for High Energy Physics
- toolkit developed mainly CERN-SFT (P.Mato, M.Frank) in the context of AIDA WP2
- the goal is a replacement of existing geometry description in LC software
- while being applicable to generic HEP detector studies
- DD4Hep is based on concepts from both LC frameworks and makes use of ROOT's TGeo classes for the description of the detailed placement of material volumes

- at the LC-SW meeting we had detailed hands on tutorial and walk through by M.Frank
- -> see slides

DD4Hep - The Big Picture



Status Mokka

Status & Plans

- Decision of LLR to stop support of Mokka beyond the DBD studies (recentering on SiW ECAL studies support)
  - Expertise still there: G. Musat (→ CMS),
  - Emilia Becheva gain experience on ECAL mods
- AIDA WP2 commitment: consulting + adaptation of Mokka to the new geometry package *(just started)*
- DB management for the ILD models to be taken care of by IPNL *(in discussion)* with event[ly] *if needed:*
  - improvement of DB resilience (versioning, backups, ...)
  - Move of DB server to CC IN2P3 (central support)

V.Boudry

- Mokka support will be reduced considerably to maintenance of existing models (ILD, ILD-CLIC, Calice)
- effectively no development of new features, except:
- plan to move to xml/DD4Hep like description of current models (ILD_oX_v05)

Status SLIC

- SLIC geant4 application developed at SLAC for SID
- geometry defined in compact XML and geomConverter (Java) to create LCDD (gdml+) files that feed into SLIC
- rather generic sensitive detectors live in SLIC

- SLIC is candidate for a common LC simulation program in the mid term
- issues to be addressed:
  - incorporation of DD4Hep in SLIC
  - sensitive detectors for engineering level of detail sub detectors a la Mokka

moving towards DD4Hep

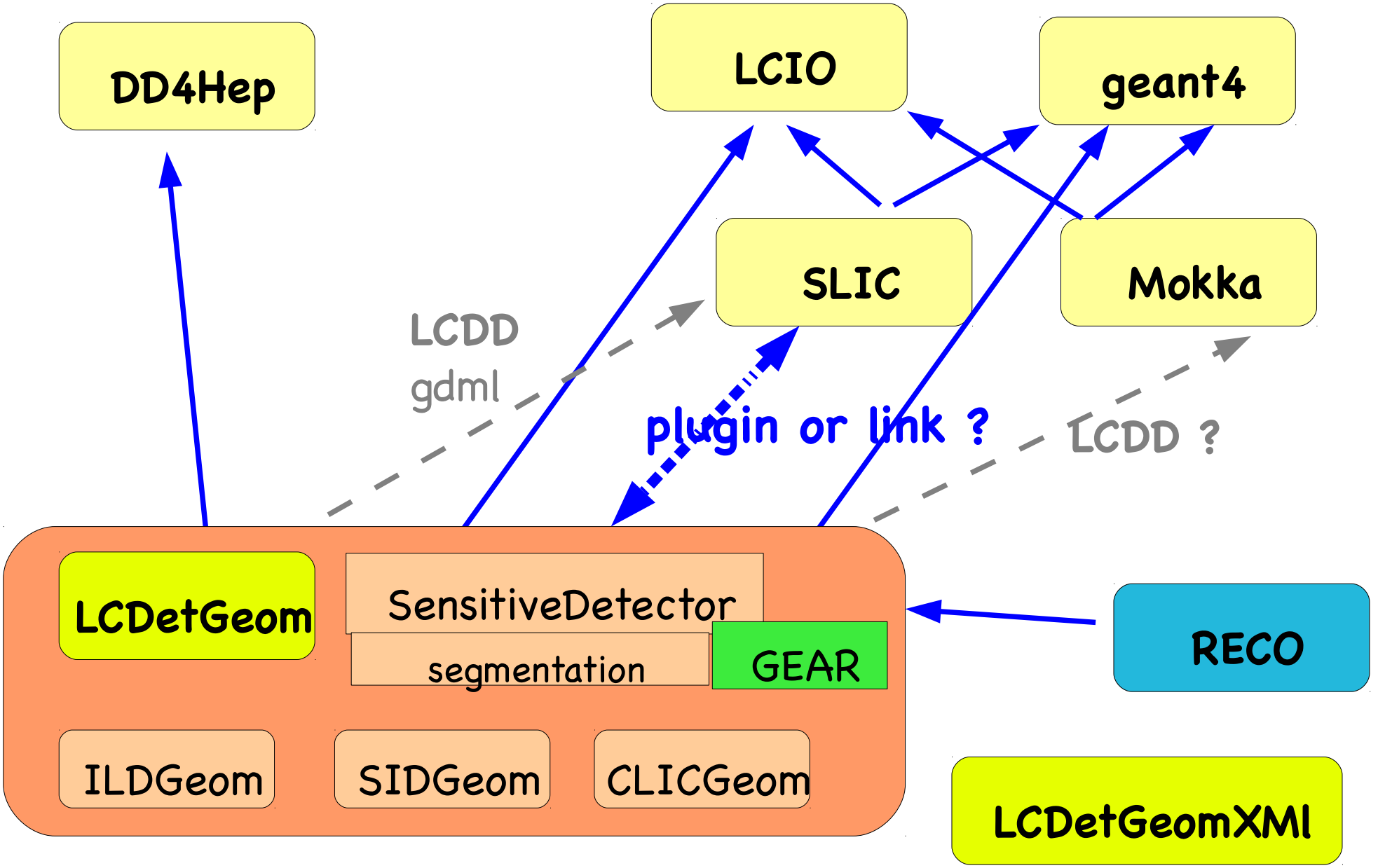
- general agreement to move towards DD4Hep for defining the detector geometry
- useful to have Design Review as soon as we have most demonstrator prototypes available

- agreement to have single package "LCDetGeom" (need name) and a separate package with xml files "LCDetXML" (name?)
- => who is going to develop and maintain these packages ?

- ILD/CLIC: have to re-implement the ILD-like detector models in DD4Hep with the full engineering level of detail

- SID: move/copy current models to DD4Hep (straight forward)

The new Package structure



Tracking Tools

- C.Rosemann
- new ILD C++ tracking with MarlinTrk/KalTest
- first step towards a more generic tracking toolkit in context of AIDA WP2
- N.Graf
- FTF: fast track finder
- based on conformal mapping techniques - as used for STAR
- Marlin processor exists (S.Aplin)
  - currently under investigation for VTX @ ILD
- TRF: track fitter (Javva/C++)- based on simple propagators to surfaces

- => need to see how tools can be interfaced to DD4Hep and what navigation/propagation one can expect

Pandora and LCFI status

- Pandora: library restructured in SVN: algorithms split up into
  - FineGranularityContent and LArContent
- for iLCSoft standard with cmake:
  - PandoraPFANew, FineGranularityContent, PandoraMonitoring (optional)
- no open issues identified
- LCFIPlus: used successfully in DBD (SiD&ILD)
  - Currently being addressed: effect of beam-related backgrounds, vertex charge, vertex finder kernel (speed vs. performance)
- Plans, ideas, nice-to-have's:
  - use of track hit information for refit vertex
  - check if this can be also done w/o the hits by using the TrackState @FirstHit -> could be used on DSTs !!
  - use of cluster information: particle ID ?
  - need example how external jet finder can be used with LCFI+

Concurrency

- P. Mato gave overview on activities of Concurrency Forum:
- mainly software experts from LHC experiments that investigate concurrency:
  - parallel simulation: geant4-MT, Geant Vector Prototype
  - heterogenous computing: GPUs for trigger and track seeding
  - memory and parallelism: compression, identifying duplicate pages, transactions
  - concurrent frameworks
  - e.g.: GaudiHive allows parallelism on: event, algorithms and sub-algorithm level (TBB)
- for LC: no immediate need however should observe the development (and participate ?)
  - try to parallelize Marlin ?
  - GPUs ?
  - probably no need (best for trigger - ILC is un-triggered)
  - maybe track seeding in ILD VTX (pair bg)

Grid production - ILCDirac

- GridProd system used successfully for ILD DBD
  - J.Engels main developer/maintainer no longer working for ILC
  - no successor yet
- might not be possible to further provide this service at DESY

- CERN groupd has developed and maintains ILCDirac
- can ILD switch to use ILCDirac ?
  - need to move/copy ILD data catalogue to Dirac
  - understand if this is possible (meta data)
  - need to be able to control resource usage
  - ...

- currently only option for any (large scale) production for ILD
- already some experience in ILD at KEK
- plan to use ILCDIRAC from KEK for 250/350 GeV samples

ILC VO

- handling of ILC-VO membership requests is often slow as people are unknown to many of the admins (US, Asia, EU - SID, ILD, CLIC)

- new users should provide a statement with
  - Name, Institute, Working group, Supervisor and planned ILC related work
- to the ilc-vo-support@desy.de mailing list

Common generator tools

- for DBD used
  - Whizard for 2->n, n=2-6
  - Physim for ttH
  - Guineapig for pair bg
- full 8-fermion final state generator would be desirable
  - ME calculation in Whizard 2.0 - generation needs huge memory
- would like to move to Whizard 2
- plan for Whizard2.x to write LCIO
  - still planned, no development so far (should be straight forward)
- Generator Common Task Group should resume regular meetings

Common Software Infrastructure I

- documentation:
  - Doxygen, JavaDoc
- Wikis:
  - Confluence (SLAC), TWiki(CERN),...Calice,FLC,Pandora,...
- Tests:
  - Code tests: Coverity (CERN) static checker
  - Unit Tests: Junit, CTest
  - Integration Tests: (Jenkins), CDash (->AIDA CDash)
- Bug report:
  - forum.linearcollider.org
  - Jira @ SLAC
- need to update documentation and point (new) users to it
- please actively use these tools !

Common Software Infrastructure II

- Nightly builds and tests:
  - exist for iLCSoft and for org.lcsim
- common software releases
  - aim for common releases/installations of iLCSoft for ILD and CLIC (requirement for ILCDirac)
- do we want to provide software tutorials ?
  - check with LC community if there is demand

Next steps

- have small expert meeting at ECFA Workshop (27.-31.05.2013) in Hamburg to follow up on to do items from this meeting
- also report on progress in software sessions of the ECFA Workshop
- additional software meeting in summer ?
- interest from ILD ?