iLCSoft
Status, Plans and Open Issues

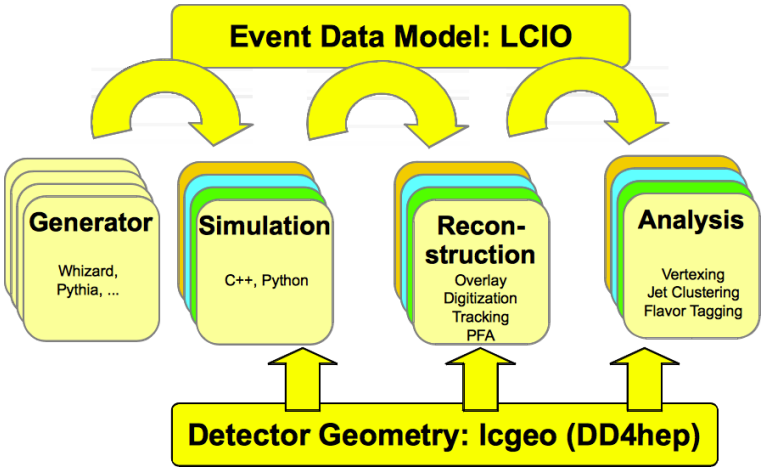
Frank Gaede, DESY
ECFA Linear Collider Meeting
Santander, Spain, May 30-Jun 5, 2016

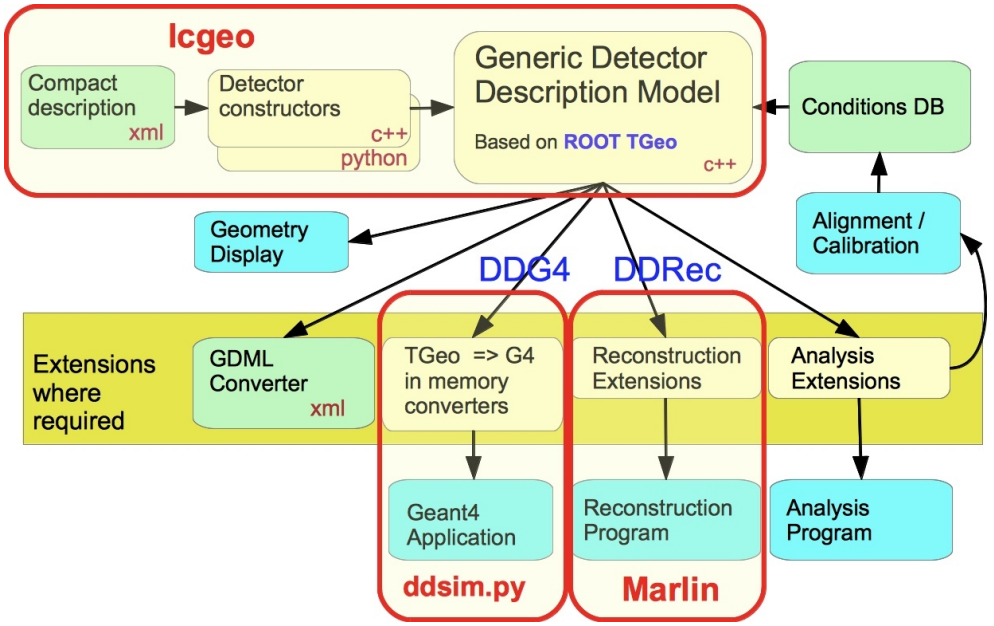
Outline

- Introduction and goals for software workshop
- brief summary from ILD Software and Optimization Workshop in February
- iLCSoft
  - transition to c++11 and ROOT6
  - ilcsoft releases
  - migration to git

new DD4hep based LC software

- LC community moved to common software tools
  - DD4hep detector geometry description
  - DDG4/ddsim for simulation
  - DDRec as interface for reconstruction
  - new MarlinTrk tracking
  - PandoraPFA
  - ...
- iLCSoft now used by **ILD, CLICdp and SiD**





goals for this software meeting

- review the status of all aspects of LC software tools
  - core tools
  - simulation
  - tracking
  - PFA/calo
  - MC production
- focus in particular on issues that are relevant for all three detector concepts
- should have enough time for discussions in order to address open issues (slot on Wed. afternoon)

program Tuesday

iLCSoft Status and Plans	*Frank Gaede*	
Santo Mouro	11:00 - 11:30	
DD4hep/lcgeo/ddsim	*Andre Sailer*	
Santo Mouro	11:30 - 12:00	
Continious Integration	*Marko Petric*	
Santo Mouro	12:00 - 12:30	
Diskussion: Moving iLCSoft to git		
Santo Mouro	12:30 - 13:00	

core tools

Tau lepton final states separation study and the impact of varying ECal cell sizes	*Boruo Xu*	
Santo Mouro	14:30 - 15:00	
Status of Arbor PFA	*Vincent Boudry*	
Santo Mouro	15:00 - 15:20	
Software compensation	*Lan Tran Huong*	
Santo Mouro	15:20 - 15:40	
Restructuring of Calo Digitizers	*Daniel Jeans*	
Santo Mouro	15:40 - 16:00	

calorimeter reconstruction

Status of MarlinTrk	*Frank Gaede*	
Santo Mouro	16:30 - 16:50	
CLICdp pattern recognition	*Daniel Hynds*	
Santo Mouro	16:50 - 17:10	
ILD VXD optimization studies	*Georgios Voutsinas*	
Santo Mouro	17:10 - 17:30	
Vertex charge reconstruction in ILD	*Mr. Sviatoslav Bilokin*	
Santo Mouro	17:30 - 17:50	

track reconstruction

program Wednesday

iLCDirac status and plans	*Andre Sailer*
Santo Mouro	11:00 - 11:20
ILD MC production	*Akiya Miyamoto*
Santo Mouro	11:20 - 11:40
CLICdp simulation model	*Marko Petric*
Santo Mouro	11:40 - 12:00
ILD simulation model	*Dr. Shaojun (DESY) LU*
Santo Mouro	12:00 - 12:20
SiD Simulation model - tbc	*Aidan Robson*
Santo Mouro	12:20 - 12:40

simulation and MC production

Status of LCFIPlus flavor tagging	*Dr. Taikan Suehara*
Santo Mouro	14:30 - 15:00
High Level Reconstruction tools and application to Higgs and SUSY analyses	*Dr. Masakazu Kurata*
Santo Mouro	15:00 - 15:30

high level reconstruction

General Discussion and Overflow	
Santo Mouro	16:30 - 18:30

general discussion and overflow

if needed ...

ILD Software and Optimization Workshop

- one week meeting at DESY (Feb 22-26)
- two days software expert meeting ILD and friends
  - addressed complete iLCSoft software chain
- one day software summary (focus ILD)
- two days of ILD optimization topics

- very useful workshop that triggered interesting discussions and activity for developments
  - will see some of this during this meeting

DD4hep, lcgeo, ddsim

- DD4hep is basically feature complete
- open issues identified:
  - MC-Truth link needed tests and validation
  - nice to have: being able to store the geometry in a ROOT file for faster loading at startup
    - M.Frank: requires ROOT6 and C++11

talk by A.Sailer

- ddsim: feature complete

- lcgeo: feature complete
  - individual models for ILD, CLIC and SiD are currently implemented and improves

talks by S.Lu, M.Petric, A.Robson on simulation models

iLCDirac and Grid Productions

- iLCDirac supported by CERN group
  - works nicely for CLICdp and ILD (also SiD ?)

talks by A.Sailer and A.Miyamoto

- Grid production general topics
  - allocation of enough Grid resource
    - should not be a problem (few % of LHC requirements)
    - nevertheless we need coordinate large MC production between detector concept groups CLIC, ILD and SiD
  - dropping of LFC file catalogue
    - iLCDirac catalogue provides everything needed
    - need one final cross cross check if all of DBD samples are available - still to be done

could come back to this in discussion session on Wednesday

iLCSoft

- main topic discussed at workshop
  - moving to C++11 and ROOT6

- agreement:
  - move to v01-19 series of developers releases
    - using gcc4.8, c++11 and ROOT6 and DD4hep (no GEAR !?)
  - prepare v01-18 (series) of legacy release(s)
    - compatible w/ ROOT5, gcc4.4, Mokka
    - being able to re-reconstruct large sample of DBD data files

see later this talk

Tracking Tools

- Si-digitizer and TPC digitizers exist
  - need code for TPC module gaps → LCTPC
- track fitting code w/ DDKalTest/DDRec
  - observed some issues w/ pull distributions
  - material description and surface navigation

talk FG

- ILD pattern recognition
  - needs to be made compatible w/ DD4hep
  - review FullLDCTracking
- V0 and KinkFinder
  - old code (2008/2010) needs review → currently not addressed
- Vertex charge reconstruction
  - improvements observed w/ CellsAutomatonMV

talk S.Bilokin

Calorimeter Reconstruction

- Calo digitizers
  - need to be made compatible with DD4hep and restructured

talk D.Jeans

- DDMarlinPandora
  - need to bring/keep in synch w/ MarlinPandora

no talk
discuss Wed.

- Pandora calibration
  - fully automatized procedure in iLCDirac → status ?

- Software compensation
  - existing procedure improves low energy jets
  - need integration in clustering algorithms

talk L.Tran

- Arbor PFA
  - alternative to Pandora - two implementations exist

talk V.Boudry

High Level Reconstruction Tools

- many improvements in FlavorTagging
  - Adaptive Vertex Finding, Vertex Mass recovery, pi0 ,...
  - code needs to implemented in LCFIPlus
    - requires finalization of PID tools

talk T.Suehara

- improvements of likelihood PID (using dE,dX, shower shapes) are ongoing
  - aiming for a release in ~1-2 months

talk

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Other Topics

- pi0 reconstruction
  - new pi0 reconstruction developed
  - improved efficiencies for di-photons

talk A.Miyamoto in joint physics session

- generator status
  - whizard 2.0 almost ready

- DST file format
  - need for review ?
  - try to align the output between concepts ?

discuss Wed ?

- background simulation tools
  - need for creating pair-bg with reconstructable tracks

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porting iLCSoft to C++11 (and ROOT6)

- had to disable setting of CXX_FLAGS in CMakeList.txt files of practically all iLCSoft packages
  - now set externally in ilcinstall (or manually by the user):

```
if( use_cpp11 ):
    CMAKE_CXX_FLAGS = '-Wall -std=c++11'
else:
    CMAKE_CXX_FLAGS = '-Wall -ansi -pedantic -Wno-long-long'
```

- issues:
  - some packages (ROOT, Geant4, DD4hep,...) have their own configure flags for using c++11 → partially solved in ilcinstall
  - what about other CXX_FLAGS that individual packages want to set ?
    - some packages reset CXX_FLAGS others append …
  - should try an find a common solution that is used in iLCSoft packages
  - could have canonical set of iLCSoft CMAKE_CXX_FLAGS defined in ilcutil and then use this in all packages
  - which ?

porting iLCSoft to C++11 (and ROOT6)

- after setting compiler flags only very minor code changes were needed in iLCSoft packages, e.g.
  - errors in float array initializer lists (narrowing from double to float)

- ROOT6 related porting issues
  - new library content files are created for dictionaries: namespace_rdict.pcm
  - these need to be installed in ./lib di~rectory for all packages that use dictionaries
  - ROOT C++-macros now have to follow the C++ syntax more strictly
  - nothing else observed ….

- for last two month we are regularly building iLCSoft with c++11 and ROOT6 (nightlies and HEAD installations)
  - using gcc4.8 provided by CERN SFT group
- used for recent tracking code validation
- no issues (related to c++11/ROOT6) so far observed → it works

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iLCSoft releases

- so far we have made iLCSoft compatible w/ C++11
- but (almost) no C++11 features used yet
- → would like to start programming in C++11 => when ?

- could/should create one more release with current state
  - working w/ ROOT5/ansi and ROOT6/c++11
    before making the switch to mandatory c++11 (v01-17-10)

- when splitting into v01-19 (c++11) and v01-18 (ansi), we need to clearly identify packages that need to work in their HEAD versions in both worlds (MarlinReco, LCFIVertex,...)
  - these packages cannot use C++11 features in their code
  - also need to use GEAR for geometry

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Moving to Git ?

Git vs. SVN

- have worked for ~10 years w/ SVN
  - most iLCSoft packages stored in desy svn
  - some packages already moved to git, e.g. PandoraPFA

- advantages of Git
  - distributed code repository (no master repo needed)
  - full history available locally
  - much faster branching merging and switching between versions
  - better version control
  - ...

- disadvantages of Git
  - quite steep learning curve
  - bewildering number of commands and workflows
  - no central repository !
  - ,,,

more and more
open source packages
use Git
→ in the long run we probably have to do this as well
→ when ?

iLC SOft

possible git services

- github
  - commercial service
    - free for open source projects
  - largest repo in open source community
  - every one can sign up for an account

- gitlab
  - git service provided by CERN-IT
  - need CERN account to access
    - can also do this w/ lightweight account ?

- stash
  - git service provided by DESY
  - need (special) DESY account
  - can be given to callaborators

possible migration to Git

- if we decide to move to Git we need to
- establish a migration procedure
- choose a Git service that everyone can use
- establish a canonical workflow, e.g.
  - one librarian per package (!)
  - developers develop in clone repos
  - create pull requests
  - merged by librarian
  - considerable overhead wrt. SVN !

your thoughts ?

- find the right time to do this
- ILD is planning a large MC production early next year
- how about CLIC and SiD ?