

Computing plans for the post DBD phase

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Software status for DBD

- DBD goal
 - ◆ Develop **a realistic simulation** based on the detailed ILD design and reconstruction tools
 - ◆ **Benchmark studies** of several processes including various backgrounds
- For DBD
 - ◆ **Event generator** : → Common generations with Whizard 1.95 & Pythsim
 - ◆ **LCIO** → LCIO2 (direct access, use with root, improved the event data model)
 - ◆ **Tracking**: Fortran → C++ (Clupatora, IMarlinTrack, Kaltest, ...)
 - ◆ **PandoraPFA** → PandoraPFANew
 - ◆ **LCFIVertexing** → LCFIPlus
 - ◆
- Despite complexity in the simulation model, ILD performs better than LOI in $\Delta E/E$, $\Delta pt/pt$, ... → **beautiful benchmarking results**

There remains issues, not addressed in DBD.

Progress in detector studies require updates of software as well in post DBD era

LC soft in post DBD era

- LC software experts meeting in Jan 31-Feb 02
 - ◆ a plan for post DBD era was discussed. For detail report, please see a report by F.Gaede, Feb 13 ILD Analysis/Software meeting
- Toward more common software tools for LC studies
 - ◆ Simulations
 - ◆ common tools for tracking, PFA, flavor tagging
 - ◆ GRID production and management
 - ◆ generator tools
 - ◆ common tools

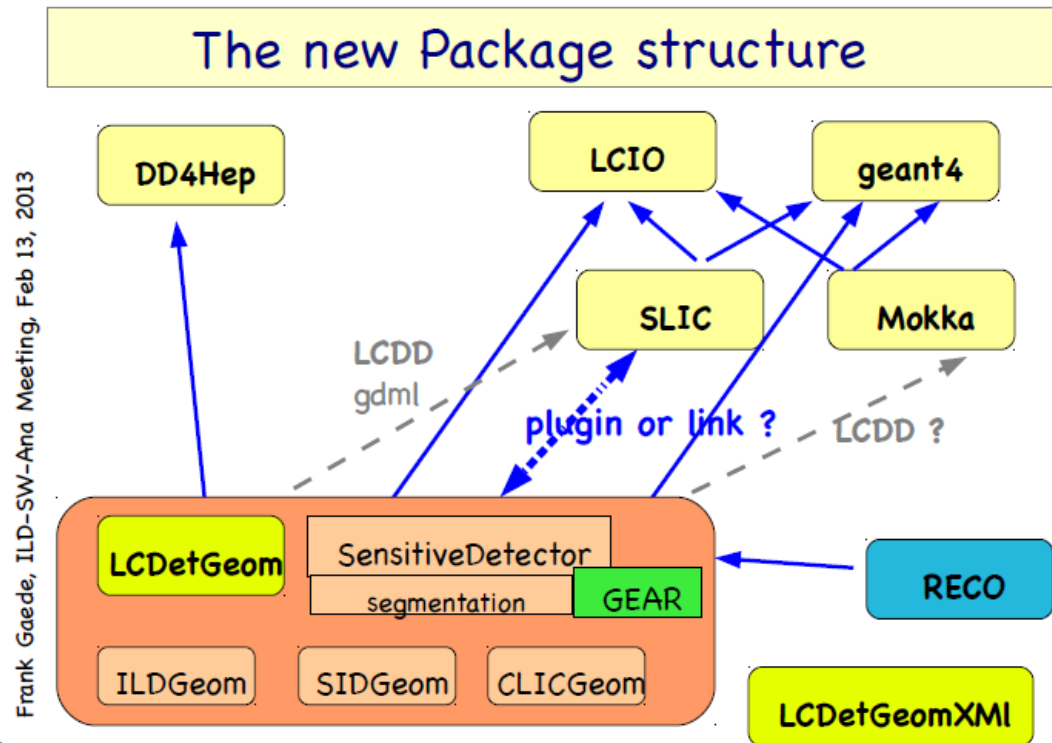
DD4Hep

■ DD4Hep: Detector Description for High Energy Physics

- ◆ **tool kit** developed mainly in CERN in the context of AIDA WP2
- ◆ based on concepts of LC framework and makes use of ROOT's TGeo for geometry description
- ◆ The goal: a replacement of existing **geometry description** in LC software

■ Both SiD and ILD are now working towards DD4Hep based tools.

- ◆ Geometry package "LCDetGeom"
- ◆ ILD needs to **re-implement geometry in DD4Hep**
- ◆ SiD: move XML based geom. to DD4Hep



ILD simulation

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)

Report by V. Boudry
at LC software experts
meeting (Jan 2013)

- **Mokka support** will be limited to maintenance of existing models
- Effectively no development of new features except a plan to move to xml/DD4Hep like description of current models (ILD_oX_v05)
- In mid. term, we may move **to a common LC simulation** program. **SLIC** is a candidate, but requires a support from SLAC for ILD

Tracking

- A big step in DBD era: Fortran → complete re-write with C++
 - ◆ **CLUPATRA**: TPC track finder
 - ◆ **IMarlinTrack**: Tracking framework
 - ◆ **KalTest** : Track fitter
 - ◆ **SiliconTracking**: supports strip ← LCIO track data model improvement

- Not done
 - ◆ TPC tracking with **non-uniform field** by anti-DID, field charge (?), **with realistic module-pad structure** ← we need eventually.
 - ◆ Silicon tracking with **inclined strip, petal shape, ...**
 - ◆ **Efficient standalone** silicon pattern recognition
 - ◆ **Vertex tracking with pair backgrounds**

 - ◆ New geometry tool by **DD4Hep** will help to address these new challenges.

PFA and Flavour tag.

■ Pandora

- ◆ Used successful in DBD
- ◆ Support both analog HCAL(ILD_o1) and semi-digital HCAL(ILD_o2).
Physics benchmarking with ILD_o2 ?
- ◆ Tuning to scinti. ECAL (ILD_o3) has improved.
Hybrid of tile-silicon and strip-scinti ECAL in progress

■ LCFIPlus

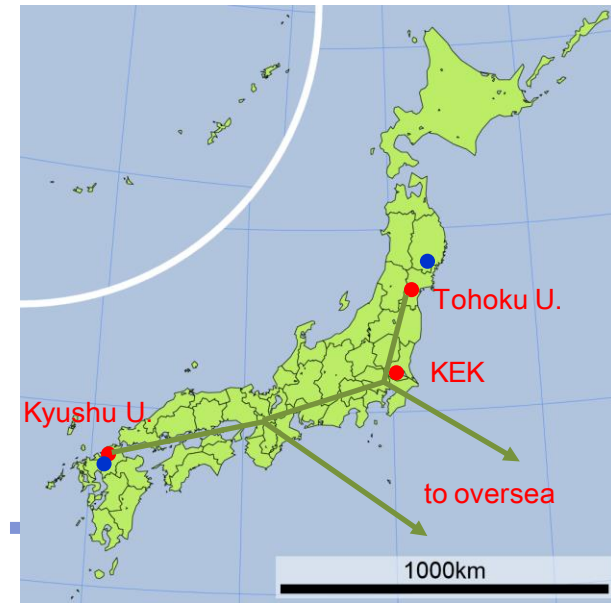
- ◆ Used successfully in DBD
- ◆ Currently being addressed : effect of beam-related backgrounds, vertex charge, speed in vertex finding.
- ◆ Suggestion to use of track hit information for re-fit vertex

MCProduction

- “MC production coordinator” : Jan Engels → Eduard Avetisyan
- Use of GRID tools for DBD production will be faded out → ILCDirac
 - ◆ New 250 GeV & 350 GeV samples have been produced partially using ILCDirac tools
- ILCDirac
 - ◆ DIRAC runs on LCG grid system, provides a system for automatic job submission, jobs rescheduling, data management with its own catalog, web interface, etc.
 - ◆ ILCDirac has been developed by CLIC group to run ILCSoft on DIRAC system. Used successfully for productions of CLIC_ILD, CLIC_SiD and SiD production.
 - ◆ A few ILD member have been using ILCDirac to run ILD software.
 - ◆ ILDProduction script has been developed in last several months and should be tested in large scale production.
 - ◆ ILD MC data base has been ported to Dirac meta data
- Issues for ILD to fully moves to ILCDirac,
 - ◆ LCG Catalog vs ILCDirac catalog
 - ◆ Resource (CPU & storage) managements

Computing infrastructure

- Need a plan in preparation, construction, and data taking period
 - ◆ In last few years, **computing resources** have been provided with voluntary bases. But, it may not true in coming years.
 - ◆ **Costs for computing** has been neglected in LOI and DBD, but we should not forget its cost when start the project.
 - Preparation for 5 year plan of KEKCC system upgrade will start early next year. May be similar situation in other sites
 - Japanese network backbone have been upgraded with 5 year cycle.
 - How much **on site storage and processing, data replication to over sea**
- We need a computing model from DAQ to user analysis
 - ◆ How we process raw data ?
 - ◆ Where do we store raw data ?
 - ◆ How many sites are necessary to process raw data ?
 - ◆ Do we use tier0-tier1-tier2 models ?
- **Support of software infrastructure** are equally important. requests to to help support GRID soft, Geant4, ... may/will come



Event generators

- Whizard1.95 & stdhep has been the standard. But,
 - ◆ No more official support to stdhep
 - ◆ Whizard 1.95 → **Whizard 2.xx**
 - ◆ Do we use Icio as the new standard ? Whizard 2 will support Icio
 - From physics point of view,
 - ◆ QCD and EW interference had been neglected in DBD samples
 - ◆ Whizard is not optimum for QED processes. Multi photon emission in QED processes
 - ◆ We could not generate 10 fermions or more. Not a full diagram in 8 fermion processes.
- **Improve precisions of event generator**

Summary

- Our software tools have improved significantly during DBD era.
- We met the DBD requirement and reported a beautiful benchmark result.

- In post DBD era, we will move to more common software
 - ◆ DD4Hep → common simulation framework
 - ◆ We need to insure smooth transition from Mokka to SLIC
 - ◆ Production tools : ILCDirac

- Time to develop a plan of computing infrastructure.