

LDC Core Software

Status and new developments

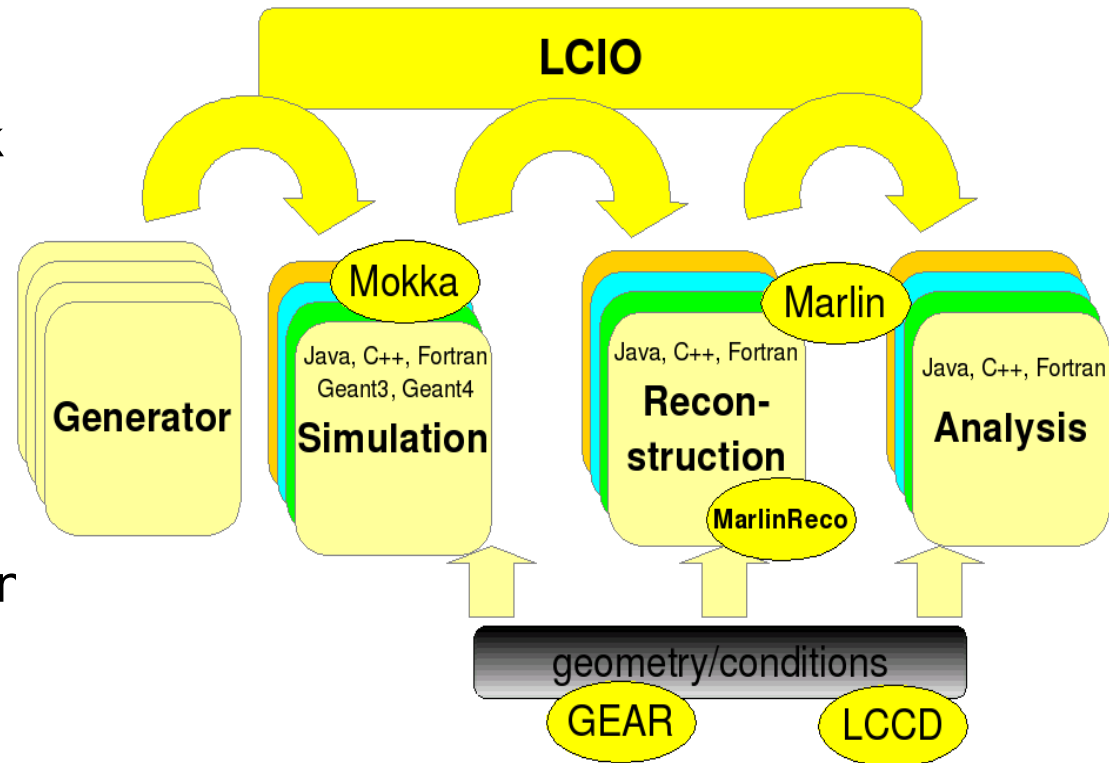
Frank Gaede
DESY

LCWS 2007

DESY, May 30-June 3 2007

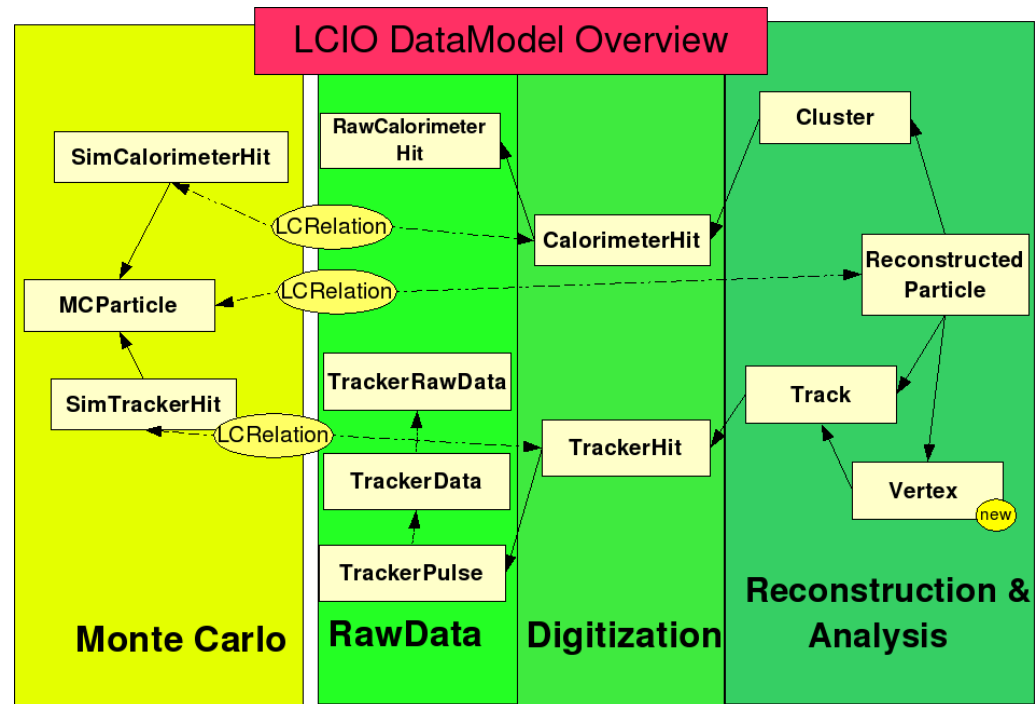
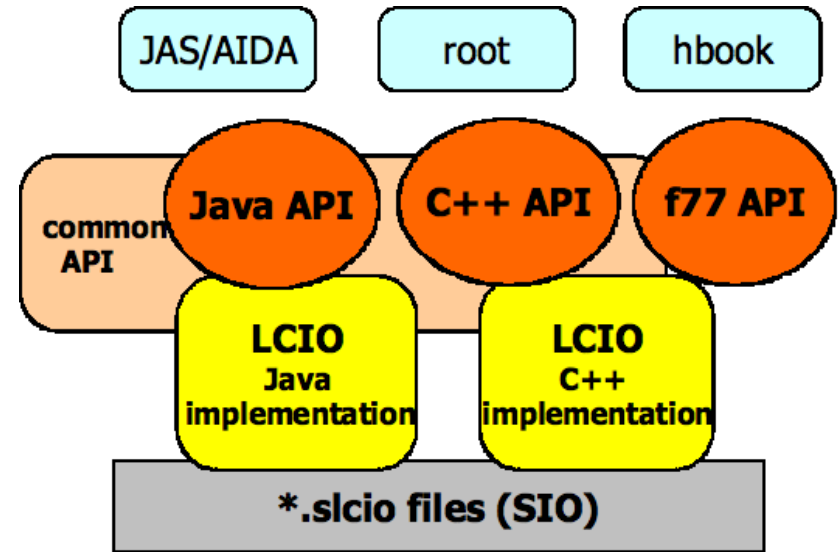
Outline

- Core software tools - status and latest developments
 - LCIO
 - data model & persistency
 - Marlin
 - C++ application framework
 - LCCD
 - conditions data toolkit
 - GEAR
 - geometry description
 - MarlinReco
 - Marlin based reconstruction
 - *ilc sw-installation*
- Summary



LCIO Status

- **LCIO v01-08**
 - new Vertex class
 - **C++ runtime (user) extensions and relations**
 - new java command line tool
- **LCIO v01-08-01**
 - patch release – bug fixes
 - storing large arrays (SIO/C++)
 - enforce valid collection names
- **LCIO v01-08-02**
 - patch release – bug fixes
 - several issues with templates and gcc 4.x fixed
 - introduced cmake support (experimental)



LCIO runtime extensions (C++)

- long pending user request:
 - attach user objects to LCObjects
 - fast and easy creation of links (relations) between various LCObject subtypes, eg. TrackerHits and Track
- features
 - extension of the object with arbitrary (even non-LCObject) classes
 - extension of single objects or vectors, lists of objects
 - optionally ownership is taken for extension objects (memory management)
 - bidirectional relations between LCObjects
 - one to one
 - one to many
 - many to many

LCIO runtime extensions

```
// a simple int extension
struct Index : LCIntExtension<Index> {};

// a many to many relationship between MCParticles
struct ParentDaughter : LCNTNRelation<ParentDaughter,MCParticle,MCParticle> {}
//...
MCParticle* mcp = dynamic_cast<MCParticle*>( mcpcol->getElementAt(i) );
//...

mcp->ext<Index>() = i; // set an int

const MCParticleVec& daughters = mcp->getDaughters();

for(unsigned j=0 ; j< daughters.size() ; j++ ){

    // ---- set biderctional relation
    add_relation<ParentDaughter>( mcp, daughters[j] );
}

//-----

cout << " myindex = " << mcp->ext<Index> << endl ;

ParentDaughter::to::rel_type daulist = mcp->rel<ParentDaughter::to>();

for( ParentDaughter::to::const_iterator idau = daulist->begin();
    idau != daulist->end(); ++idau){

    cout << (*idau)->ext<Index>() << ", " ;
}
cout << endl ;
```

extensions and relations
identified through a
tagging **class T**

for extensions use
ext<T>()
for relations use
rel<T::to>() and
rel<T::from>()

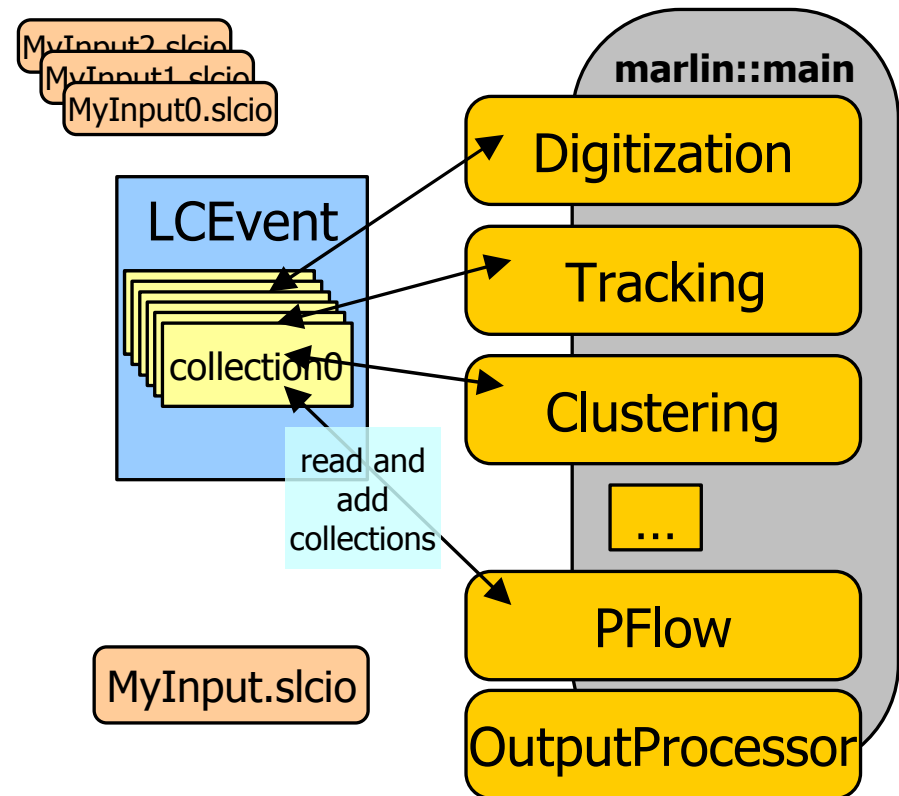
see online API
documentation
for details

LCIO plans

- cmake as default build tool for C++ (to be released)
- working on new C++ implementation of SIO:
 - provide direct access to events
 - allow splitting of event data across files
 - improve I/O performance
 - allow for persistency of user defined classes
 - needed by DAQ systems !
 - work in progress – however manpower is an issue

Marlin recent developments v00-09-07

- MarlinGUI (v00-09-06)
- creation of flow charts (B. Jeffrey)
- new logging mechanism
- **support for runtime plugins**
- shared libraries with processors loaded at program start up
- no relinking necessary
- support for cmake



- modular C++ application framework
- LCIO as transient data model
- xml steering for program flow
- Plug&Play of processors

example: MarlinGUI

Frank Gaede, LCWS2007, DESY, May30-June 3, 2007

The screenshot displays the Marlin GUI interface with the following components:

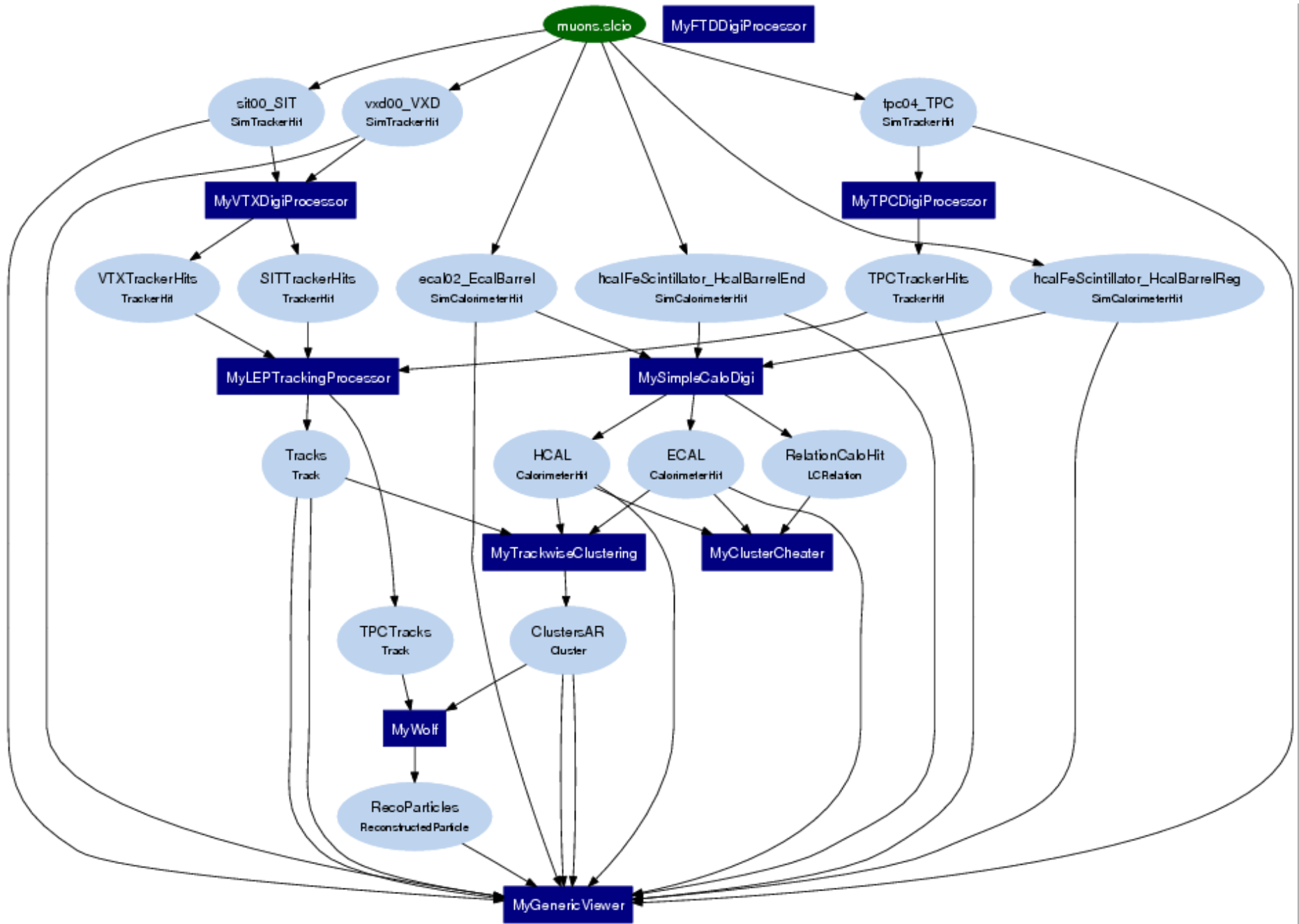
- List of all Collections Found in LCIO Files:** A table listing 15 collections with their names and types.
- Active Processors:** A table showing 5 active processors, with 'MyFTDDigiProcessor' highlighted in red.
- Active Processor Operations:** A set of buttons for managing active processors, including 'Add New Processor', 'Edit Selected Processor', 'Delete Selected Processor', 'Deactivate Selected Processor', 'Move Selected Processor Up', and 'Move Selected Processor Down'.
- Error Description from selected Processor:** A text area containing error messages about unavailable collections and processor configurations.
- Inactive Processors:** A table showing 2 inactive processors, with 'MySimpleCaloDigi' highlighted in black.
- Inactive Processor Operations:** A set of buttons for managing inactive processors, including 'Add New Processor', 'Edit Selected Processor', 'Delete Selected Processor', and 'Activate Selected Processor'.
- LCIO Files:** A list of files ('muons.slcio', 'zpole1.slcio') with buttons for 'Add New LCIO File' and 'Remove LCIO File'.
- View Options:** Buttons for 'Hide Inactive Processors' and 'Hide Active Processor Errors'.

author: Jan Engels

bin Marlin GUI Tue Oct 17, 16:41

example: Marlin Flow Chart

Frank Gaede , LCWS2007, DESY, May30-June 3, 2007



loggin mechanism

- Processor has a method `message<VERB>()` that can be called with one of
- **DEBUG, MESSAGE, WARNING, ERROR**
- output controlled with global steering “Verbosity”

```
message<MESSAGE>( log()
```

```
    << " processing event " << evt->getEventNumber()
```

```
    << " in run "           << evt->getRunNumber()
```

```
);
```

- **DEBUG will not be compiled if not in MARLINDEBUG mode !**

- -> no runtime overhead in production code

Marlin – to be released soon

- macros for simplified logging syntax:

```
m_out(MESSAGE) << " processing event " << evt->getEventNumber()  
                << " in run "           << evt->getRunNumber()  
                << m_end ;
```

- **use plugin mechanism as default**, ie.
 - all packages will be optionally loaded at runtime
 - no relinking necessary
 - could configure application as needed
- **cmake will become default build tool**

Gear status - v00-05

- new: LCal (B.Pawlik)
- added implementation of simple 3D vector with
 - scalar product, addition
 - coordinate transforms (cartesian, cylindrical and spherical).
 - automatic conversion to CLHEP and others (templates)
- new: SiPlanes (T.Klimkovich)
 - pixel telescope
 - FTD
 - to be released soon

GEometry **API** for **R**econstruction

- geometry for reconstruction
- abstract interface per subdetector:
VXD, TPC, Ecal, Hcal, LCal
- implementation using xml files
- create xml files from Mokka
-> one source of geometry

- added global Bfield map - so far constant only, i.e. use:

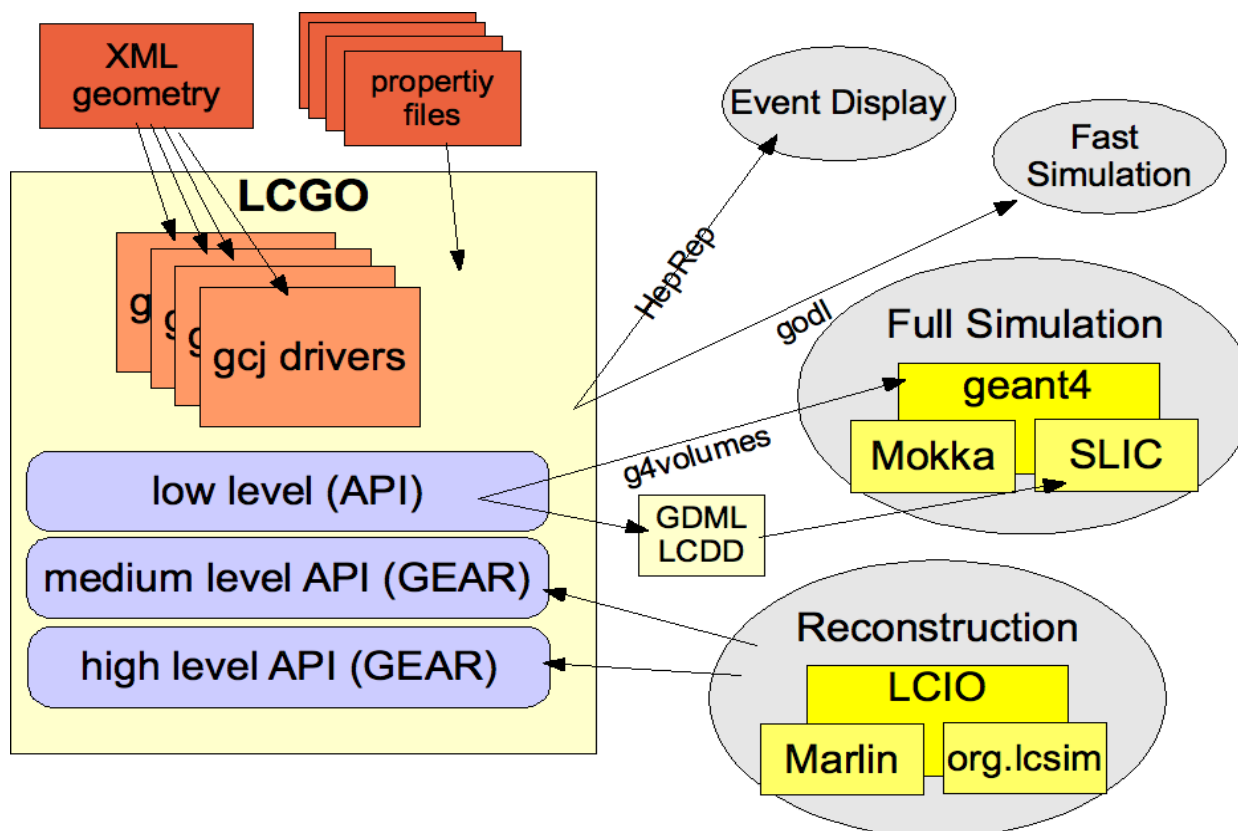
```
double bfield = gearMgr->getBField().at(Vector3D(0,0,0) ).z() ;
```

- can implement full field map if needed

all tracking/reconstruction
code should use this !

outlook: LCGO a new geometry system

- common geometry to be used in all ILC frameworks
 - SLAC-DESY project – (of course open for all collaborators)
- goals for LCGO:
 - be at least as functional as existing systems (LCCD/SLIC, GEAR/Mokka)
 - enable smooth transition path from existing systems
 - encourage/increase interoperability between systems
 - have no known principle shortcomings: “everything should be possible”



work in progress - issues:

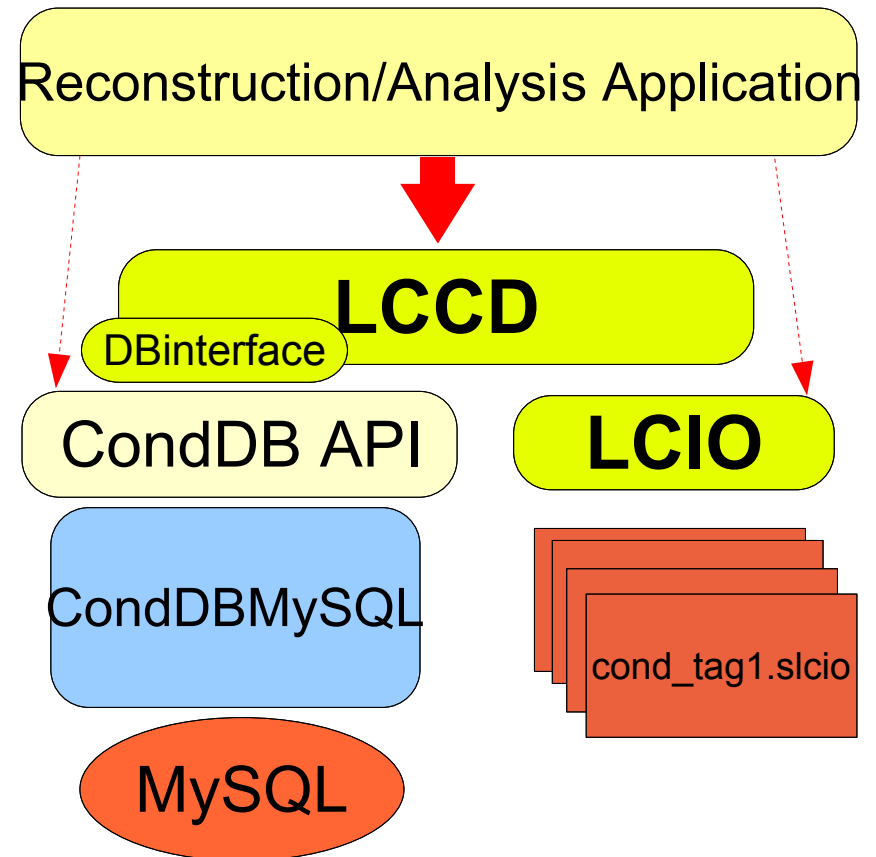
- manpower
- does this still fit into the new world of 'proto-collaborations' ?

LCCD

Linear **C**ollider **C**onditions **D**ata Toolkit

- Reading conditions data
 - from conditions database
 - from simple LCIO file
 - from LCIO data stream
 - from dedicated LCIO-DB file
- Writing conditions data
 - tag conditions data
- Browse the conditions database
 - through creation of LCIO files
 - vertically (all versions for timestamp)
 - horizontally (all versions for tag)

- v00-03-05
 - added cmake support
 - made compatible w. SL4



LCCD is used by Calice for the conditions data of the ongoing testbeam studies

MarlinReco

MarlinReco is a Marlin based **toolkit** providing reconstruction algorithms for the detector concept studies - packages:

- **TrackDigi**

- TPCDigi
- VTXDigi

- **CaloDigi**

- LDCCaloDigi

- **Tracking**

- LEPTracking (f77)
- VTXTTracking
- TrackCheater

- new** • FullLDCTracking

- **Clustering**

- TrackwiseClustering
- ClusterCheater
- PhotonFinderKit **new**

- **Pflow**

- Wolf
- TrackBasedPFlow **new**

- **Analysis**

- EventShapes
- SatoruJetFinder

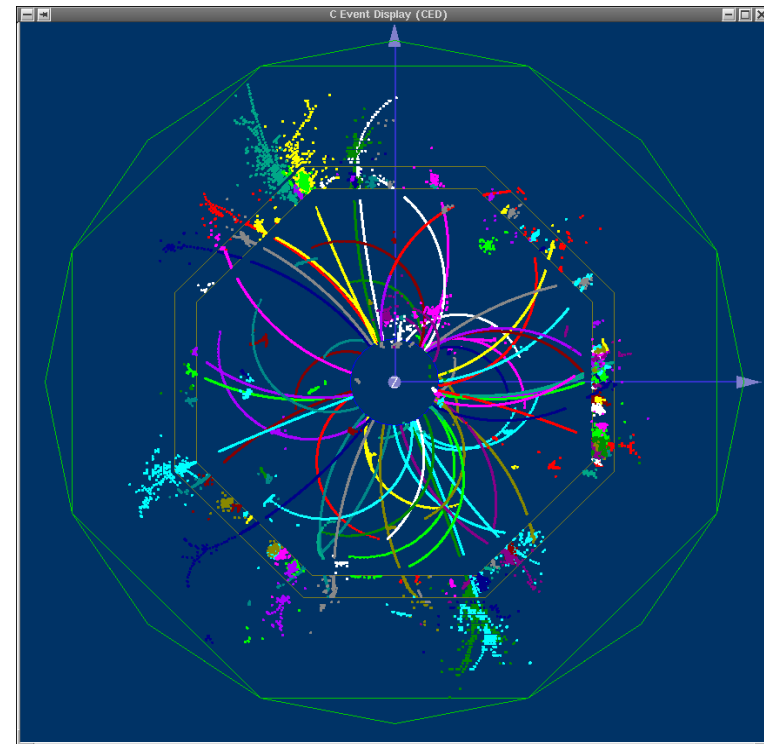
v00-03

- MarlinReco supports distributed development of reconstruction code
- packages can be seamlessly integrated with other packages, e.g.
 - **PandoraPFA** (M.Thomson)
 - **LCFIVertex** (S.Hillert/LCFI)
 - **SiliconDigi** (S.Shulga)

now part of MarlinReco
cvs repository !

MarlinReco support packages

- **MarlinUtil** (O. Wendt, T.Kraemer, ...) **v00-03**
 - Utility and Helper classes
 - helix fitter, cluster shapes,...
 - trajectory class / extrapolation
- **RAIDA** (T.Kraemer) **v01-02**
 - AIDA root implementation
- **CED** (A. Zhelezov) **v00-01**
 - event display based on GLUT/ OpenGL
 - client server architecture
- **CEDViewer** **v00-02**
 - event display client processors
 - CEDViewer, GenericViewer



managing ILC (LDC) software

- **ilcinstall tool:** (author: J.Engels)
 - python script to install all of the ILC-LDC core software incl. Marlin packages (PandoraPFA, LCFIVertex,...) and supporting tools like gsl, CLHEP,...
 - configure script for package versions, download source, installation paths, use of existing packages
- **used for versioned reference installations:**
 - for standard platforms **SL3 and SL4**
 - **`/afs/desy.de/group/it/ilcsoft/v01-00`**
 - defines set of tags that **inter operate**
 - allows to run binaries w/o installation
 - could link the core packages and only install some packages locally for development

ilcinstall example

```
# ILCSOFT( "install path for ILC software")
ilcsoft = ILCSOFT("/scratch/ilcsoft/test")
ilc_home = "/afs/desy.de/group/it/ilcsoft/" # define a python variable called ilc_home
ilcsoft.debug = True # global debug flag
ilcsoft.buildDoc = True # global documentation flag

# Marlin
ilcsoft.install( Marlin( "HEAD" ))
ilcsoft.module( "Marlin" ).env["MARLIN_USE_DLL"] = 1 # define environmet
# variable for Marlin installation

# Marlin Packages
ilcsoft.install( MarlinReco( "HEAD" ))
ilcsoft.install( MarlinUtil( "HEAD" ))
ilcsoft.install( CEDViewer( "HEAD" ))

# LCIO
ilcsoft.install( LCIO( "v01-08-01" ))

# GEAR
ilcsoft.install( GEAR( "v00-04-01" ))

# CERNLIB
ilcsoft.link( CERNLIB( ilc_home + "cernlib/2006" ))

# CLHEP
ilcsoft.link( CLHEP( ilc_home + "CLHEP/2.0.2.2" ))

# GSL
ilcsoft.link( GSL( ilc_home + "gs/1.8" ))

# If your package is in a cvs repository define required cvs settings, for example:
MyPackage.download.env["CVSROOT"] = ":pserver:anonymous@cvs.freehep.org:/marlinpkgs/mypackage"
MyPackage.download.type = "cvs"
#MyPackage.download.type = "ccvssh"

# MyPackage dependencies
MyPackage.addDependency( [ "Marlin", "LCIO" ] ) # MyPackage cannot be built without Marlin and LCIO
MyPackage.buildWith( [ "GEAR" ] ) # build MyPackage with GEAR (if available)
```

see: <http://ilcsoft.desy.de> for details
and download

[note: cvs repository changed since Orsay!]

the future of ILC (LDC) software

- the new road map for detector R&D with the LOIs due in 2008 and EDRs due in 2010 together with the decided merger of GLD and LDC will have a rather large impact on our software strategy
- GLD and LDC will need a common and coherent software framework – asap !?
- our strategy so far was international **cross concept collaboration with framework interoperability** based on LCIO and the planned LCGO
- is this still true or are we (slowly?) moving into an area of friendly competition ?
- **IMHO there is clearly need for broad discussions within and across concepts/proto-collaborations and eventually for management structures that decide on our road map for ILC software frameworks**

Summary

- recent developments in the ILC/LDC core software framework with (LCIO, Marlin, LCCD, GEAR):
 - runtime user extensions and relations in LCIO (C++)
 - plugin mechanism and logging method and gui in Marlin
 - B field in Gear (Lcal, SiPlanes - soon)
 - ilcinstall tool
 - versioned reference software installations in afs
- plans – ongoing work
 - improve build process to use cmake (to be released soon)
 - improve LCIO I/O (timescale unclear)
 - LCGO geometry framework (timescale unclear)

priority of work to do items depends on future software strategy !

Backup Slides

ILC software portal

Frank Gaede, LCWS2007, DESY, May30-June 3, 2007

Software packages — ILC Software Portal - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www-flc.desy.de/ilcsoft/ilcsoftware/plonessoftwarecenter_view

simulation/geant4 LCIO Linux Conferences DESY IT Group LEO English/Ger... Google MyHome Ctime HOWTO: Remaste...

navigation

- Home
- Software packages
- Brahms
- CEDViewer
- Gear
- LCIO
- Marlin
- MarlinReco
- MarlinUtil
- Mokka
- CED

log in

Name
gaede

Password

Software packages

This portal contains information for software for ILC detector development. [log in to add software project](#)

The latest releases in each category. To see all projects in a specific category, click "Show all".

detector simulation	reconstruction software	tools and utilities
Mokka 05.03	MarlinReco v00-01	LCIO v1.06
Mokka 05.02	Show all projects in this category...	Marlin v00-09-02
Mokka 05-01		CEDViewer v00-01
Brahms 3.1.3		MarlinUtil v00-01
Show all projects in this category...		CED v00-01
		Show all projects in this category...

Powered by Plone Software Center

MarlinReco/ - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www-zeuthen.desy.de/ilc-cgi-bin/cvsweb.cgi/MarlinReco/?cvsroot=ilc

simulation/geant4 LCIO Linux Conferences DESY IT Group LEO English/Ger... Google MyHome Ctime

Powered by APACHE

MarlinReco/

Click on a directory to enter that directory. Click on a file to display its revision history and to get a chance to display diffs between revisions.

To download this directory as zipped tarball - click on tarball at the bottom of this page.

Current directory: [MarlinReco/](#) / MarlinReco

Current tag: v00-01

File	Rev.	Age	Author	Last log entry
Parent Directory				
Analysis/				
CaloDist/				
Clustering/				
Pflow/				
TrackDist/				
Tracking/				
doc/				
examples/				
examples_LDC/				
src/				
GNUmakefile	1.1.1.1	4 months	aplin	Initial version
env.sh	1.1	2 weeks	kraemer	Environment script for building MarlinReco as a collection of packages together ...

Show only files with tag: v00-01 Module path or alias: MarlinReco/ Go

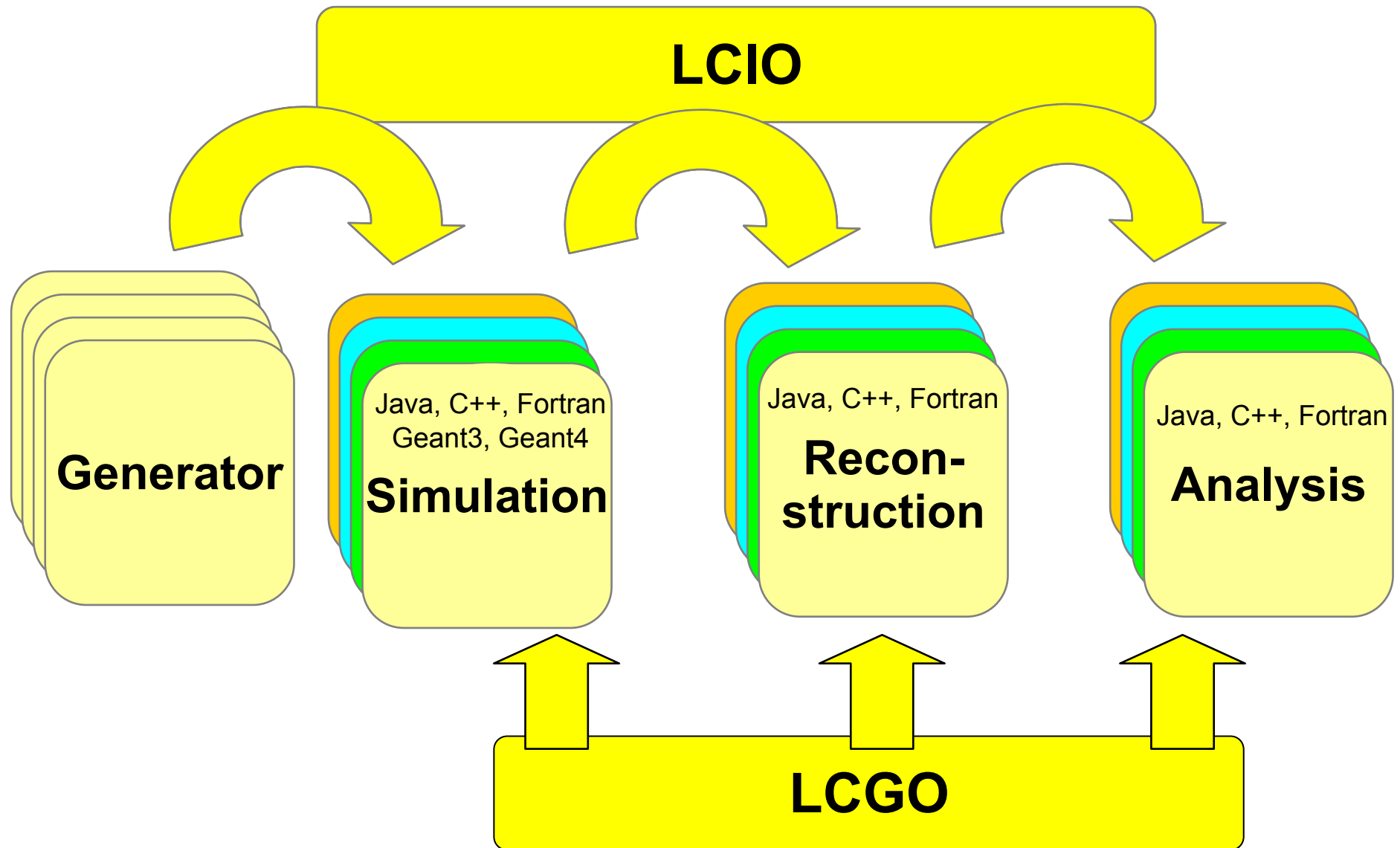
Download this directory in [tarball](#) or [zip archive](#)

<http://ilcsoft.desy.de>
[aka: <http://www-flc.desy.de/ilcsoft>]

- documentation
- new releases
- downloads (cvs/tar)
- bug reports

note: some recent releases will be available after workshop

ILC interoperable software chain



ilcsoft release (SL3/SL4)

- /afs/desy.de/group/it/ilcsoft/v01-00/QT/4.2.2
- /afs/desy.de/group/it/ilcsoft/v01-00/**lccd/v00-03-05**
- /afs/desy.de/group/it/ilcsoft/v01-00/CondDBMySQL/CondDBMySQL_ILC-0-5-10
- /afs/desy.de/group/it/ilcsoft/v01-00/MySQL/5.0.26
- /afs/desy.de/group/it/ilcsoft/v01-00/**lcio/v01-08-02**
- /afs/desy.de/group/it/ilcsoft/v01-00/**gear/v00-05**
- /afs/desy.de/group/it/ilcsoft/v01-00/**CED/v00-01**
- /afs/desy.de/group/it/ilcsoft/v01-00/**RAIDA/v01-02**
- /afs/desy.de/group/it/ilcsoft/v01-00/root/5.08.00
- /afs/desy.de/group/it/ilcsoft/v01-00/java/1.5.0
- /afs/desy.de/group/it/ilcsoft/v01-00/cernlib/2006
- /afs/desy.de/group/it/ilcsoft/v01-00/CLHEP/2.0.2.2
- /afs/desy.de/group/it/ilcsoft/v01-00/gsl/1.8
- /afs/desy.de/group/it/ilcsoft/v01-00/**Marlin/v00-09-07**
- /afs/desy.de/group/it/ilcsoft/v01-00/**CEDViewer/v00-02**
- /afs/desy.de/group/it/ilcsoft/v01-00/**MarlinReco/v00-03**
- /afs/desy.de/group/it/ilcsoft/v01-00/**MarlinUtil/v00-03**
- /afs/desy.de/group/it/ilcsoft/v01-00/**LCFIVertex/v00-01**
- /afs/desy.de/group/it/ilcsoft/v01-00/**SiliconDigi/v00-01**
- /afs/desy.de/group/it/ilcsoft/v01-00/**PandoraPFA/v01-01**