JRA1: EUTelescope SW

Philipp Roloff (DESY) for the JRA1 analysis group

Outlook:

- Reminder
- Usability
- New features

EUDET Annual Meeting 2008, NA2 Session
NIKHEF Amsterdam, 06/10/2008

Reminder: EUTelescope

- Set of Marlin processors: Every step of the analysis chain is implemented as a separate processor

Advantages:
- If the behaviour of a given telescope setup is well understood, several steps can be merged together
- Storing intermediate data can reduce processing time

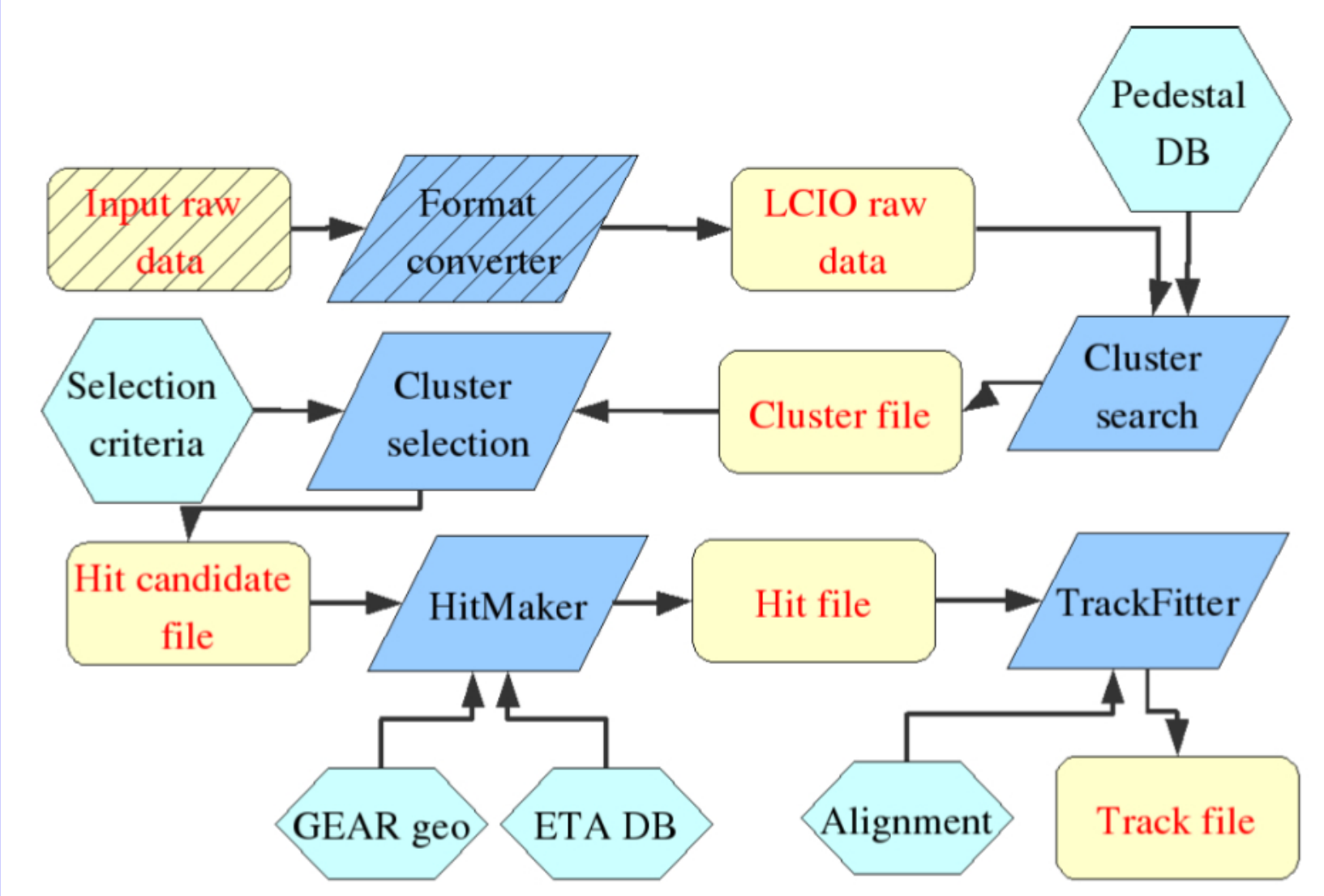
- User integration possible at different levels of the analysis

- Based on the existing ILC software framework (Marlin, LCIO, GEAR, (R)AIDA, CED, …)

- Good experience with running on the GRID

- CVS and documentation:
http://ilcsoft.desy.de/portal/software_packages/eutelescope

Reminder: analysis scheme



Usability

An increased number of detector R&D groups is adopting the EUTelescope package!

Several issues have been adressed to ease the installation and usage of EUTelescope:

- **Installation procedure:**
  - Encourage usage of ilcinstall
  - *Dependencies*: Marlin and LCIO
  Optional: MarlinUtil, GEAR, AIDA, ROOT, LCCD, CED, eudaq
  (it is possible to compile without these for minimal features)
  - install.cfg files are provided for minimal and complete installations

- **Keep documentation updated**

- **A tutorial was held in May 2008** (availabe on the JRA1 webpage)

Usability II

- **Preparing the transition from CVS to SVN:**
  - R/W access to the repository can be provided by the project leader(s) and not anymore by the CVS responsible in Zeuthen
  - R/W access will be based on personal SSL certificates (like for the GRID)
  - Users can create their own branches and when their code is mature enough it can be merged into the main trunk

- **GRID operation:**
  - The submission scripts were rewritten to use the new ILCSoft installation on the CE
  - In the future we aim for a unique submission script for execution on the local machine as well as on the GRID

- **Stability:** In general the package is stable and runs without crashes

New feature: universal reader

Most common scenarios for user integration in the DAQ system:
- *Integration at DAQ SW level*: The user provides own DAQ hardware, but the data are treated by the EUDAQ software
- *Integration at trigger level*

In the first case EUDAQ allows to include DUT data in the native output file → safest possible synchronisation

Universal native reader:
- Very general data reading and conversion processor
- Automatically detects from the native EUDAQ files which sensors were used and converts the information from the native format to LCIO
- Users are invited to provide a small piece of code to read their sensors

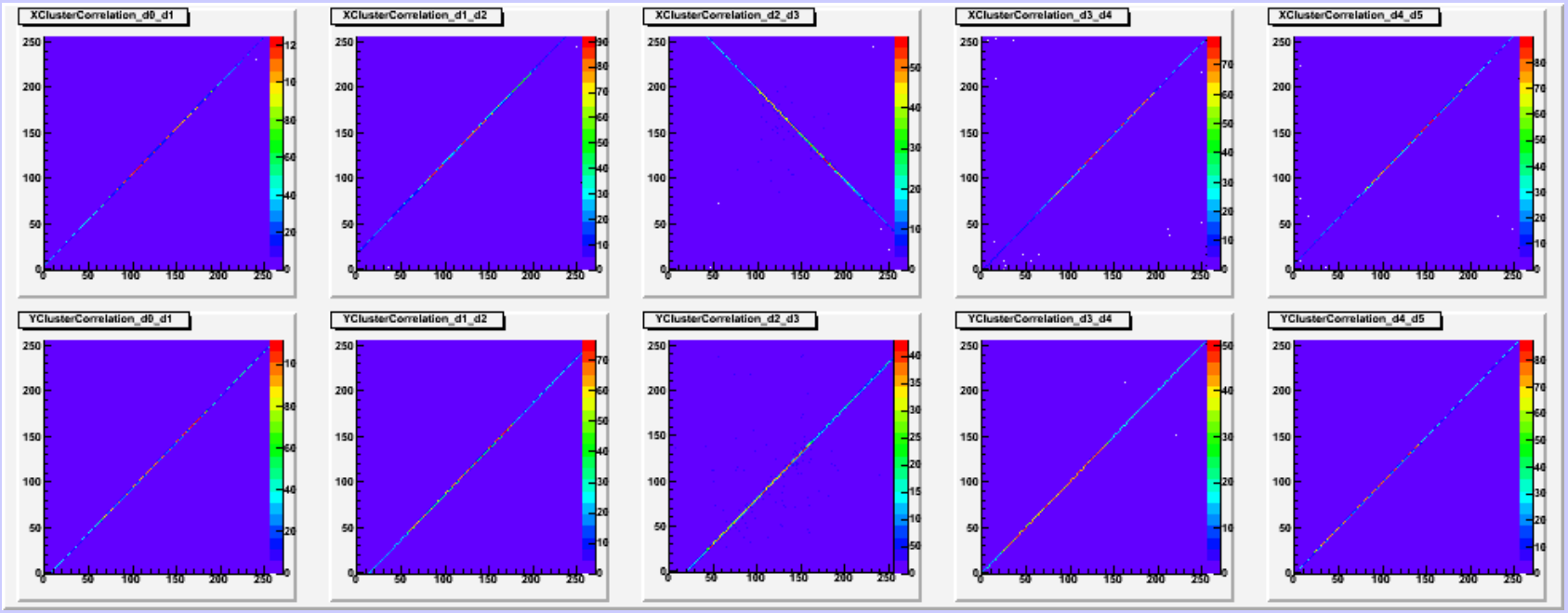
Alternative: EUDAQ now able to write LCIO files

New features: Correlator

New simple processor to display correlations of hits and clusters in different telescope planes

Useful to:
- Monitor the data quality
- Verify the geometry description
- Check alignment

Next step:
Correlate telescope planes with the DUT



New feature: Alignment

- The new alignment procedure is based on the Millepede II package by V. Blobel

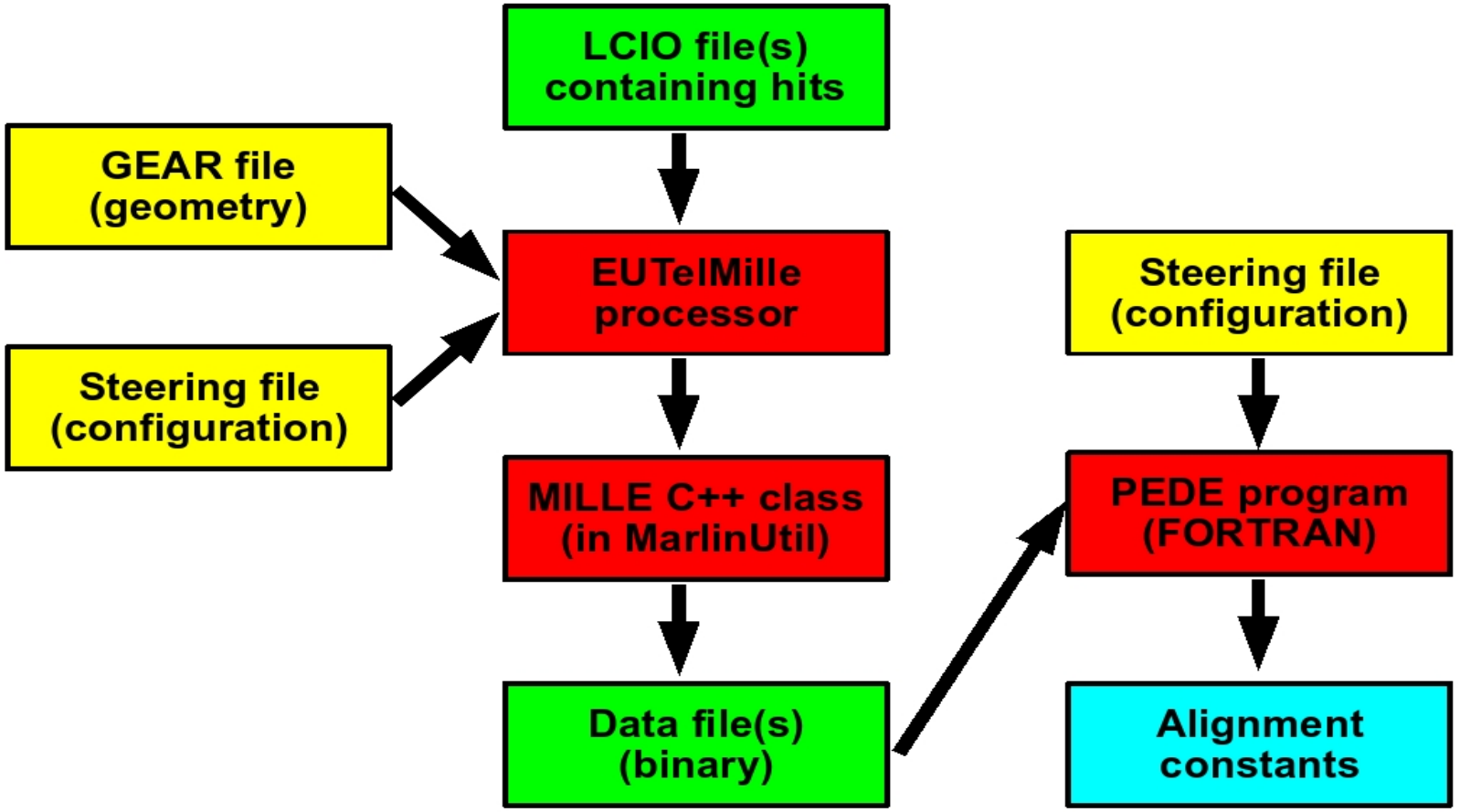
- A simultaneous fit using full tracks is performed to derive the alignment constants

- Modular implementation:
  - The Mille class has been included in MarlinUtil
  - It is used by the EUTelMille processor to generate binary files
  - The actual minimisation is done by the pede program (Fortran)

- EUTelMille can execute pede and generate the needed steering file
→ The alignment can be fully controlled in the Marlin XML-File

- It is possible to redirect the output of pede into a condition that can be stored in LCCD and read by Marlin using a conditions processor

Alignment scheme

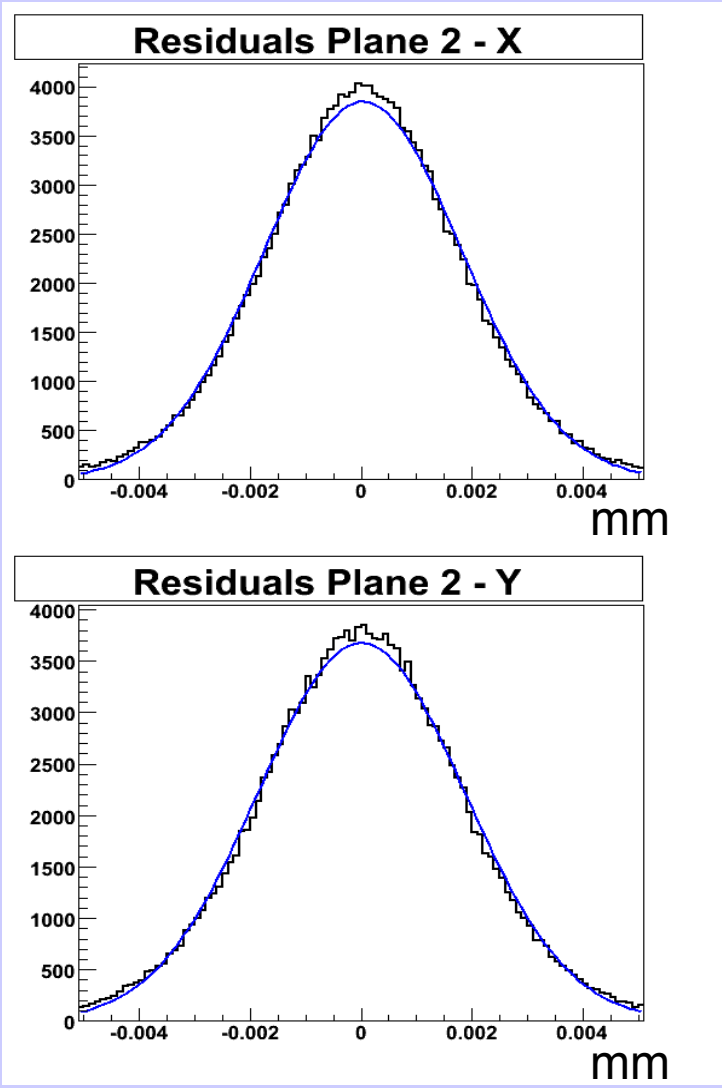


Example alignment

- 3 GeV electron data recorded at DESY

- Typical values of the Alignment constants:
  - shifts in X and Y: a few hundred μm
  - Rotation around the beam axis: a few mrad

Sensor	Residuals X Mean [μm]	Residuals Y Mean [μm]
0	-0.003±0.002	-0.023±0.002
1	-0.012±0.004	0.036±0.005
2	0.032±0.004	0.005±0.005
3	-0.020±0.004	-0.005±0.005
4	0.001±0.002	-0.002±0.002

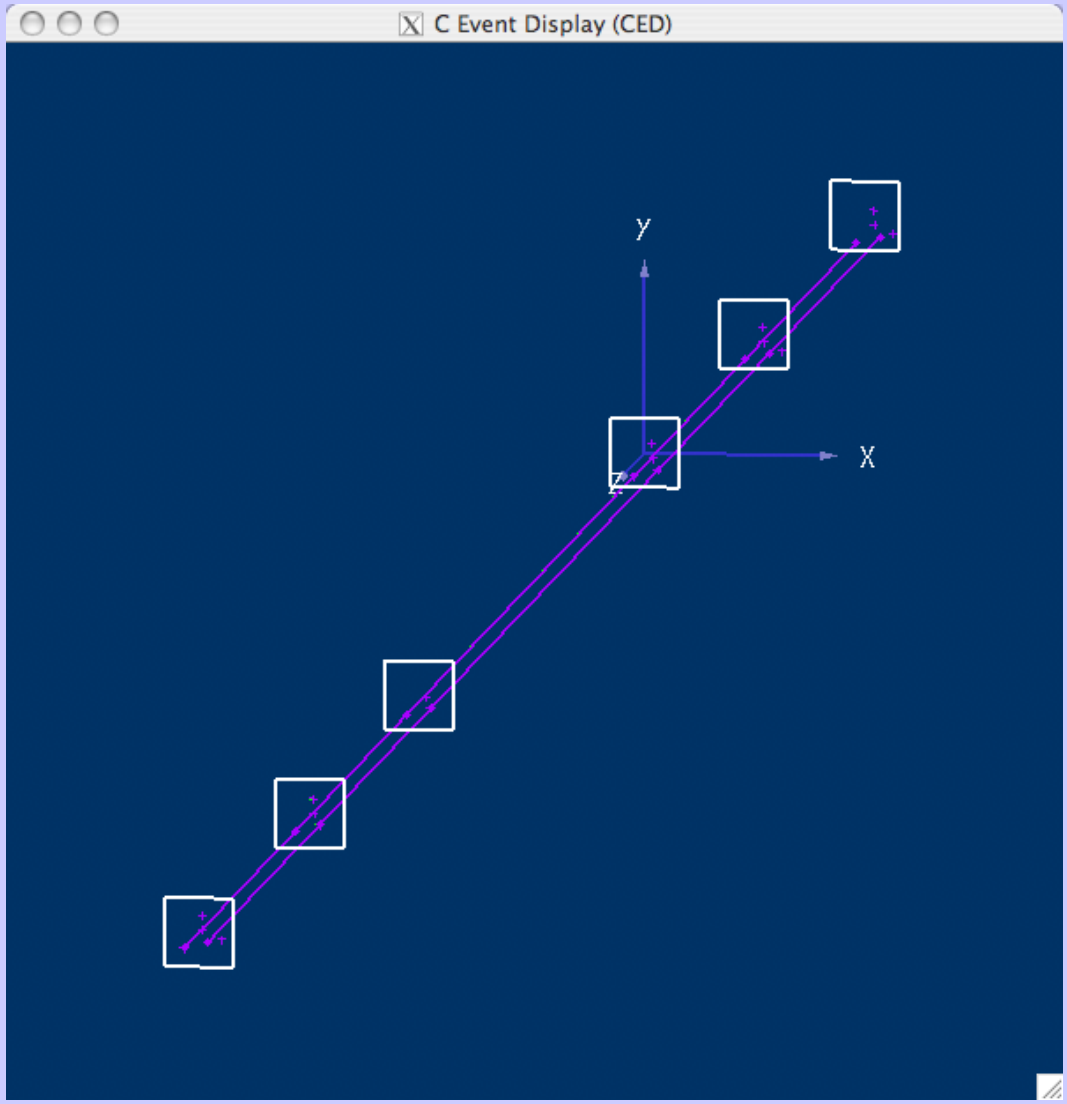


Improved event viewer

- Based on CED and CEDViewer

- Allows to display any set of hits (before / after alignment)

- New feature: draw tracks and impact positions of tracks in the telescope planes



Summary

- The package EUTelescope is in good shape and is utilised by an increasing number of groups

- During the last year lot of effort to increase the usability

- New features:
  - Universal reader
  - Correlator
  - Alignment
  - Improved event viewer