LUXE SAS meeting, 6th March 2023

LUXE software status

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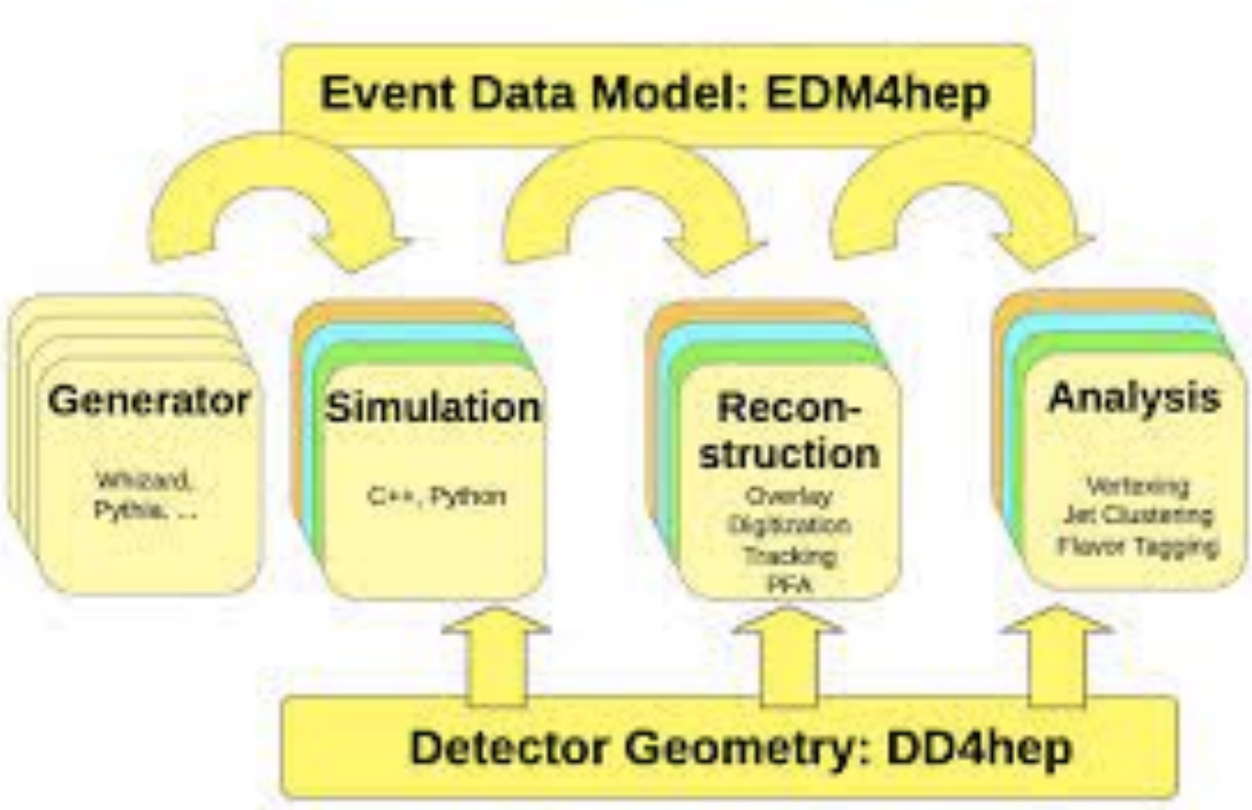
Key4hep

- See Thomas's introduction.



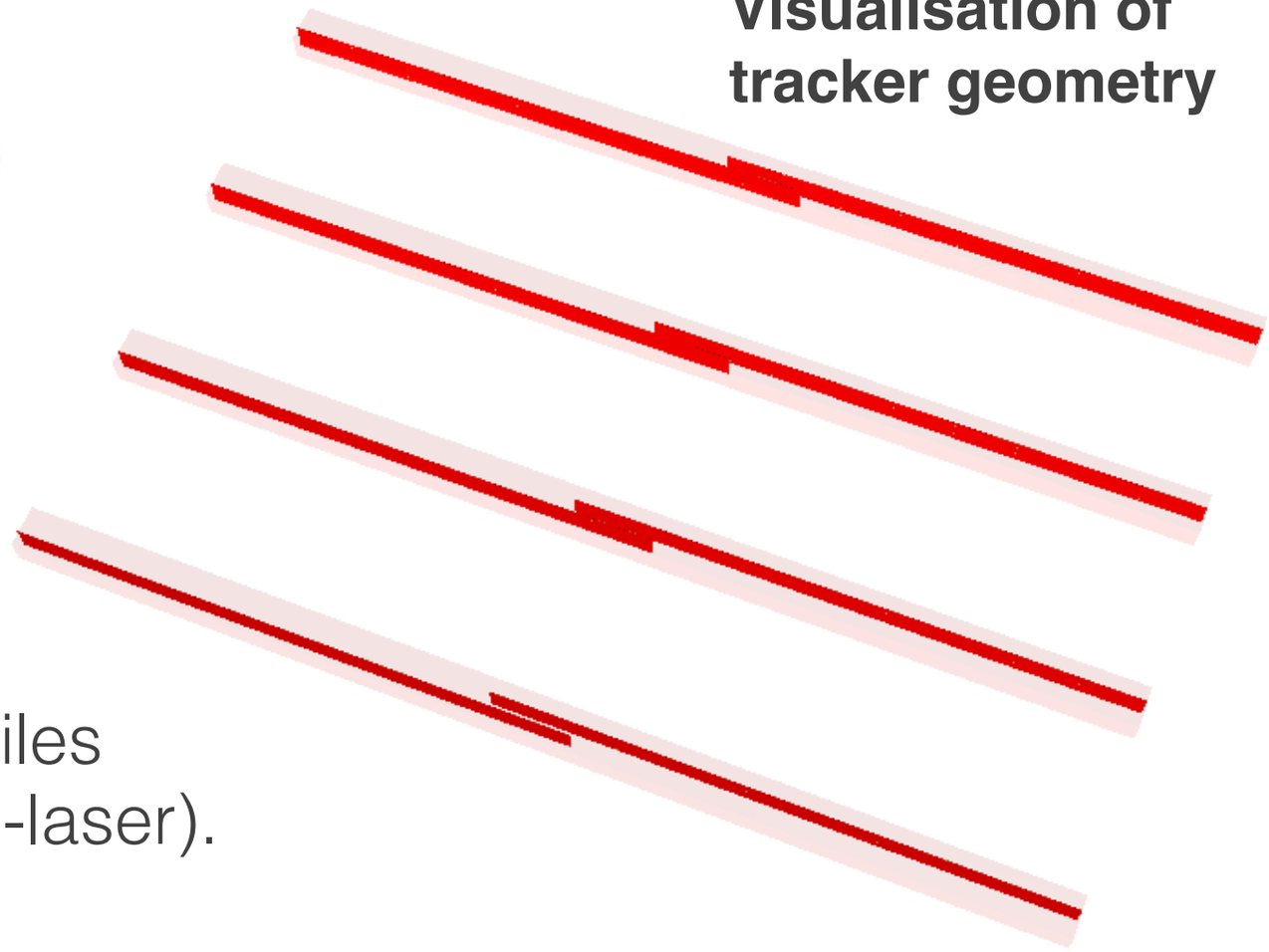
Reminder

- Key4hep uses Gaudi as data processing framework.
- Marlin is used by linear collider.
  - LCIO data model.

	Marlin	Gaudi
Language	C++	C++
Working unit	Processor	Algorithm
Config. language	XML	Python
Set-up function	init	initialize
Working function	process	execute
Wrap-up function	end	finalize
Transient Data Format	LCIO	anything

Detector geometry

- Repository: https://github.com/LUXEsoftware/luxegeo
- Contains dipole field and positron tracker (simplified) written in DD4hep.
- Next steps:
  - Cross check with lxsim or CAD exact dimension, material, etc.
  - Improve tracker geometry with supports and services.
  - Add other detectors.
  - Envisage 2 different main xml files (one for e-laser, one for photon-laser).



Visualisation of tracker geometry

Simulation input

- Particle gun or PTARMIGAN as input.
- David made a conversion script (https://github.com/LUXEsoftware/utility/blob/main/h5_to_slcio.py) to take the particles from .h5 and transform into .slcio file.
  - Can select specific particle species to save time/space.
- Next steps:
  - Perhaps other format than LCIO?
    (.stdhep, .slcio, .HEPEvt, .hepevt, .hepmc, .pairs files are supported)
  - Integrate reading of h5 files directly into software.

Simulation

- Simulation can be run using ddsim. Mandatory to specify the xml compact file, input (gun or from MC generator) and number of events.
- Example command:

```
ddsim --compactFile LUXETracker.xml --inputFiles
e0gpc_3.0_0000_particles.h5.slcio -N 1 --outputFile e0gpc_3.0_0000.edm4hep.root
```

- Output in LCIO or in EDM4hep possible.

Tracker digitisation and tracking

- Repository: https://github.com/LUXEsoftware/MarlinACTSTracking
- For tracking using A Common Tracking Software (ACTS), but currently limited to just digitisation.
  - Marlin-based digitiser that smears the true simulated hit positions with a Gaussian function.
  - Example command:

```
Marlin digi_steer.xml
```

- Work ongoing to implement ACTS tracking.

Summary

- LUXE software using key4hep is taking form.
- Limited features so far but we have demonstrated the process from generator -> simulation -> digitisation.
  - Propagation of particles from PTARMIGAN through the dipole field and the tracker with tracker hits smeared.
- Still a lot of work left to do.
- You’re welcome to start contributing!