



DD4hep for the LHCb Upgrade Detector

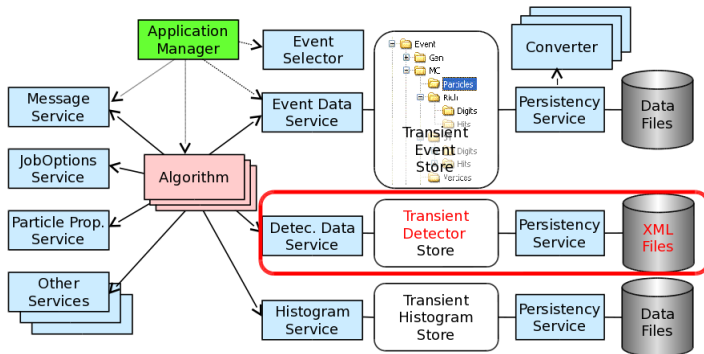
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Detector Description

Representation of the LHCb detector in the software stack:



The reasons for investigating alternatives have been discussed in previous workshops:

- Detailed review of LHCb Geometry by Gloria:

<https://indico.cern.ch/event/337568/contributions/1732965/attachments/1189318/1726143/DetDesc-GCorti-ComWksParis-20151118.pdf>

- Markus presented the DD4hep Toolkit:

<https://indico.cern.ch/event/337568/contributions/1732964/attachments/1187952/1723226/2015-11-18-DD4hep-LHCb-SW-Workshop-Paris.pdf>

What are we trying to do ?

- Determine whether features needed by LHCb are available
- If yes, prepare a migration plan

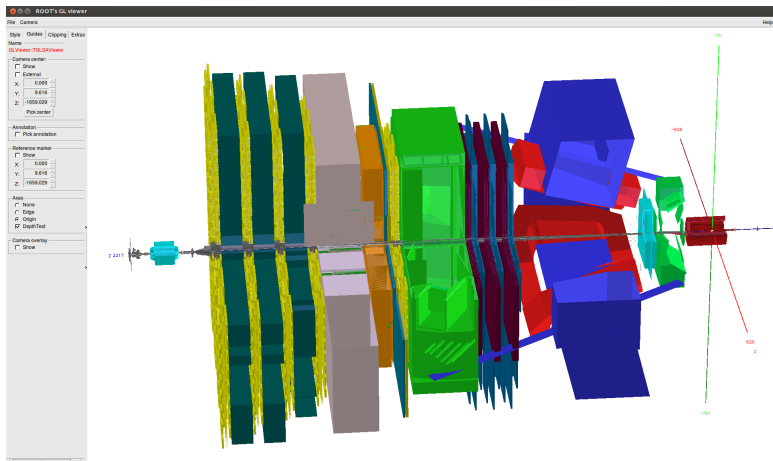


AIDA project in progress

<http://aidasoft.web.cern.ch/DD4hep>

- DDAlign and DDCond AIDA packages are improving
- Markus created the DDDDB converter that loads the LHCb Geometry into DD4hep

LHCb loaded in DD4hep

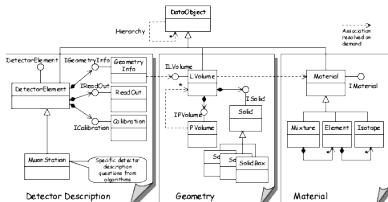
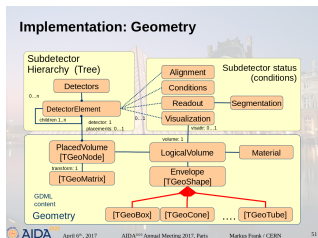


First step is to have DD4hep within the LHCb software stack:

- Hack to compile a patched DD4hep:
<https://gitlab.cern.ch/bcouturi/LbDD4hep>
- DD4hep is compiled as part of the LCG stack so full integration should not be too hard

Detector Elements and Geometry classes

Different classes but consistent concepts...



We need to validate that the representations in DD4hep and LHCb are consistent

- prototype integration of DD4hep into the LHCb stack
- with the current setup, we can load both geometry in a job for comparison purposes
- We are checking the volume hierarchies in both trees

There are a number of issues:

- We need some hacks to work with the geometry
- Some minor issues are under investigation

Encouraging results but full comparison not finished yet

Functionalities in LHCb Geometry/TGeo are equivalent but the APIs are not the same:

- have written the equivalent of the LHCb **TransportService.intersections** method
- Random and systematic scans results do not match 100% yet

After functional validation, timing/profiling have to be done carefully:

- Great care was taken for those issues in the LHCb Geometry

A long way left until we have a plan:

- Finish validation of the geometry
- Check match of the DetectorElement part of the APIs
- Check how we could deal with detector alignment using DD4hep
- Timing measurements of navigation
 - with LHCb geometry
 - with TGeo classes standard DD4hep
 - with the vectorized VecGeom
<http://aidasoft.web.cern.ch/USolids>

- We are in the process of validating the LHCb Geometry as imported by the DD4hep DDDDB plugin *with encouraging results...*
- This is the first step as the comparison with the LHCb Software has to be done as well
- *This does NOT solve the issue of the persistency of the model*

Progress limited by effort available, so contributions are welcome