DD4hep
Detector Description Toolkit for High Energy Physics
http://dd4hep.cern.ch

**Introduction**
- Complete Detector Description: Providing geometry, materials, visualization, readout, alignment, calibration...
- Supports full experiment life cycle: Concept development, optimization, operation – easy transition stages
- Single source of information → consistent description: Use in reconstruction, simulation and analysis, etc.
- Licensed under: LGPL v3 Free Software Free as in Freedom

**Detector Description**
- Description of a tree-like hierarchy of detector elements
- Detector Element describes: Geometry, environmental conditions... and extensions

**Condition**
- Provides access to consistent set of values to a given time and accompanying data
- Supports for hosting alignment results and application to geometry: Global and Local (mis-)alignment
- Supports multi-threading

**Plugins**
- Factory mechanism to instantiate implementations of abstract interfaces
  - Providing palette of most ‘common’ sensitive components for trackers and calorimeters
- Several IO handlers: LCIO, ROOT StdHep, HepEvt, HepMC

**Alignments**
- In-memory translation of geometry TGeo → Geant4
  - Materials, solids, limit sets, regions, logical volumes, placed volumes and physical volumes
- External configuration via plugin mechanism
  - Supports configuration via XML, Python or ROOT-AClick
  - Property mechanism to configure plugin instances
- Provides out of the box MC truth handling w/o record reduction

**Detector Element Tree vs. Geometry Hierarchy**
- Logical Volumes used to build geometrical hierarchy
  - geometry part delegated to the ROOT classes
- Relationship between DetElement and placements through full path from top of geometry
- DetElement tree is fully expanded: each DetElement is placed only once in the DetElement tree

**LHC Users**

**Option 1**
- Several IO handlers: LCIO, ROOT StdHep, HepEvt, HepMC

**Option 2**
- Factory mechanism to instantiate implementations of abstract interfaces
  - Providing palette of most ‘common’ sensitive components for trackers and calorimeters

**Option 3**
- Provides out of the box MC truth handling w/o record reduction