CMS DD Migration to DD4Hep

Ianna Osborne, FNAL
Migration Plan

• CMS is fully committed and plan to complete migration by the end of 2019
• DD4Hep has been integrated in CMSSW as an external tool
• Build rule is introduced in scram
• CMS sub-detector group geometry experts have been invited to check and port their sub-geometries
  – The feedback is expected by the end of summer
Migration Strategy

• Keep current XML description, but use DD4Hep plug-in mechanism to build DD using CMS-specific C++ algorithms
  – Most of the XML files do not need any modifications
  – Geometry configuration files (Python) will change
• Introduce CMS-specific shapes to DD4Hep
  – Shapes validation is on the way
• Assess TGeo performance impact
  – For example, there are 2104786 volumes in 2017 geometry scenario
• Introduce a compact view (DAG) if needed
TGeo Concerns

• We do have concerns about TGeo:
  – its memory size, performance, and possible loss of precision
    • For example, due to units conversion in matrices
• We cannot evaluate the impact yet - we need a full geometry port
• Hopefully, we can find a common solution if it becomes a problem
  – For example, introduce a lightweight DAG (aka DDCompactView)
CMS Detector Description

- **XML**
- **C++**
- **Parser**
- **Compact View**
- **Expanded View**
- **Filtered View**
- **TGEO**
- **G4 Geometry**
- **Reco Geometry**
- **cmsShow**
CMS DD4Hep

XML -> Parser -> Compact View -> Expanded View -> Filtered View

C++

cmsShow

TGeo

G4 Geometry

Reco Geometry
Summary

• Like:
  – DD4Hep error handling and debugging
  – Fast feedback and development cycle

• Port is a serious stress test for DD4Hep:
  – For example, there are 2104786 volumes in 2017 CMS geometry scenario

• We plan for success