Development of Simulation Loop for the ATLAS Geant4 Packages

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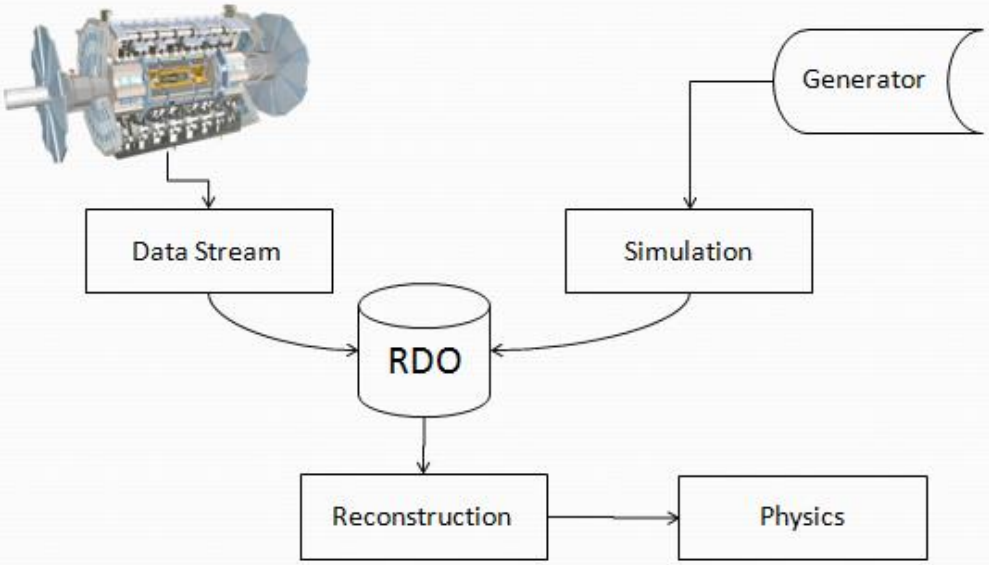
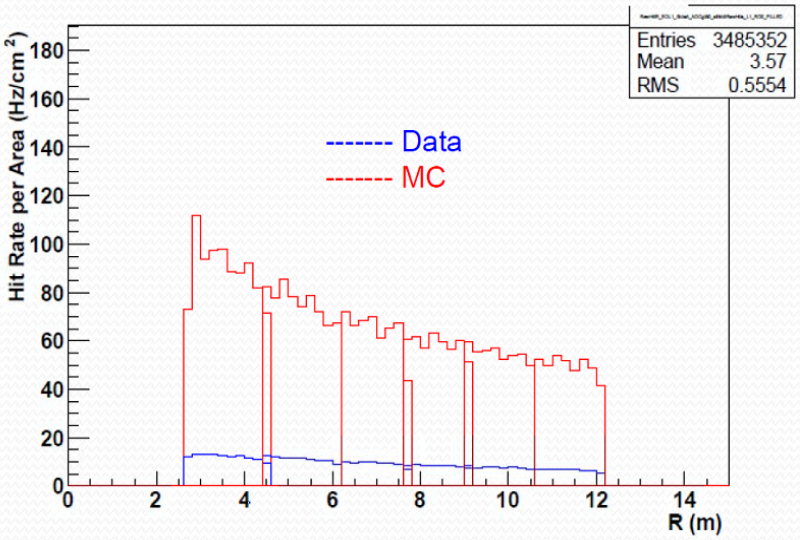
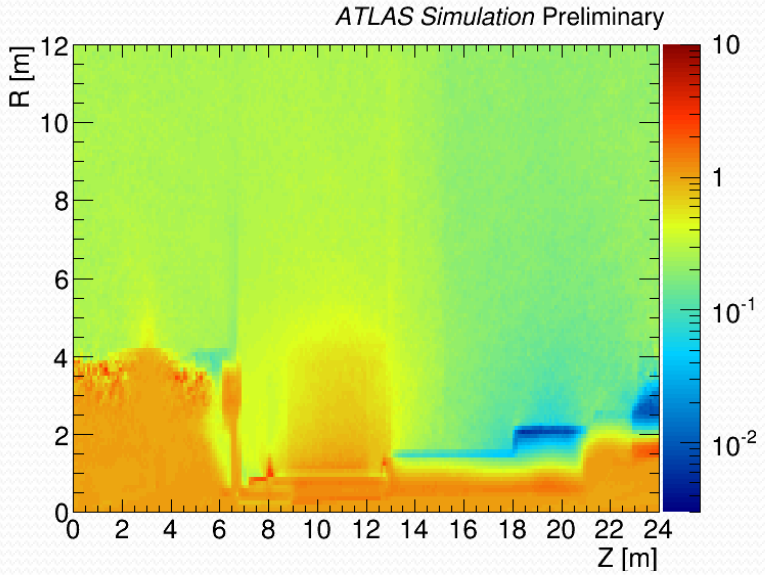
Tasks for Reconstruction / Simulation



- Reconstruction and Simulation providing data necessary for Physics analyses
- Simulation generates theoretical events
- Purpose of Reconstruction is collection data from the different subsystems and formation data which characterized particles

Data vs Monte Carlo Discrepancies





The difference may be caused by Geometric Discrepancies

Reasons of geometric discrepancies:

- Discrepancies between G4 and Real Geometry (See Besik Kekelia's Presentation)
- Tools which are used in simulation packages

Development of Methods and Tools for Investigation of G4 Geometry in ATLAS Simulation Packages is Actual Task.

Development of Geometry HUB on the base of CATIA

Georgian Engineering Team has developed several interfaces with CATIA:

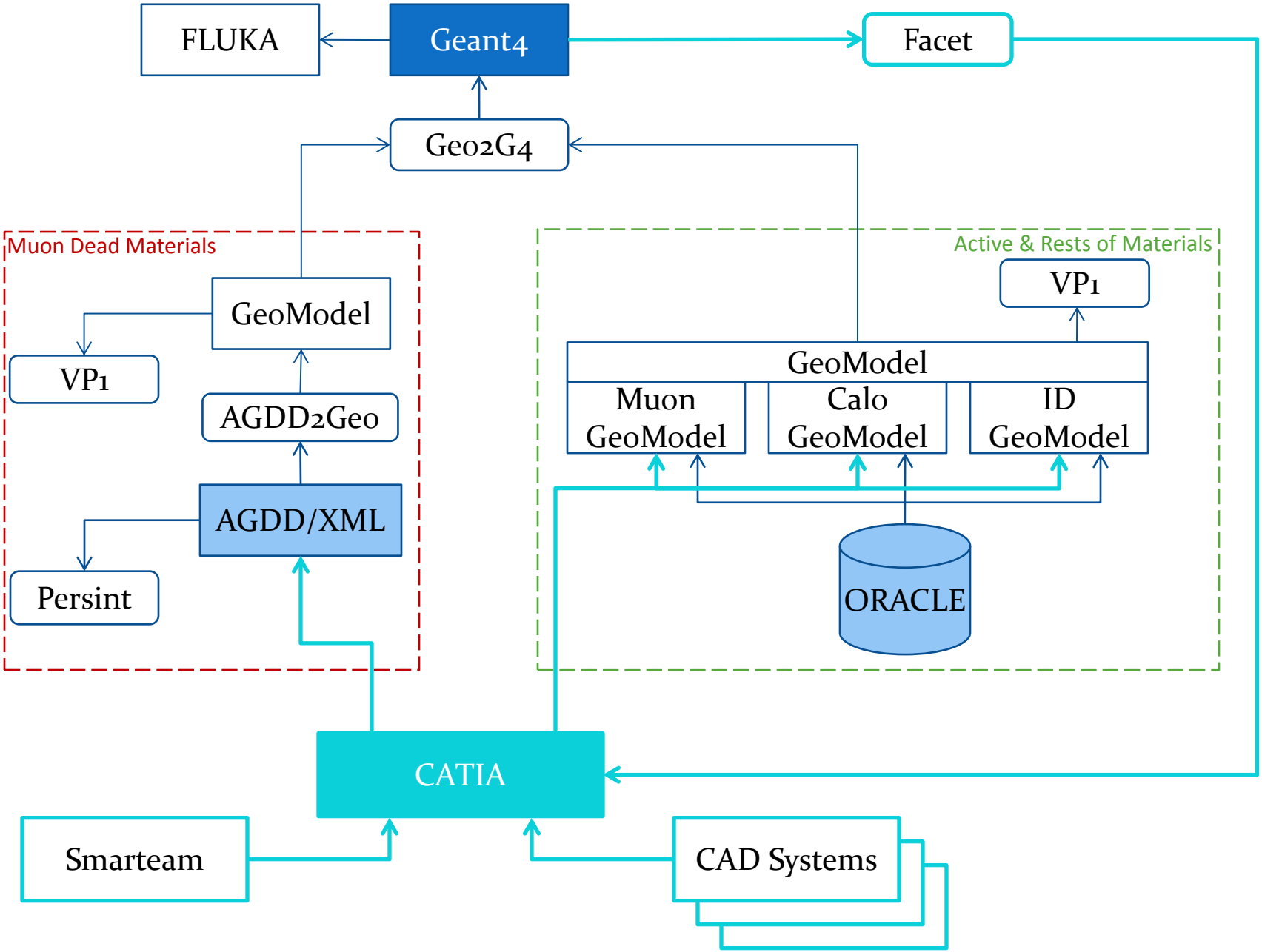
- CATIA -> XML/Persint

- CATIA -> GeoModel

- VP1 -> CATIA

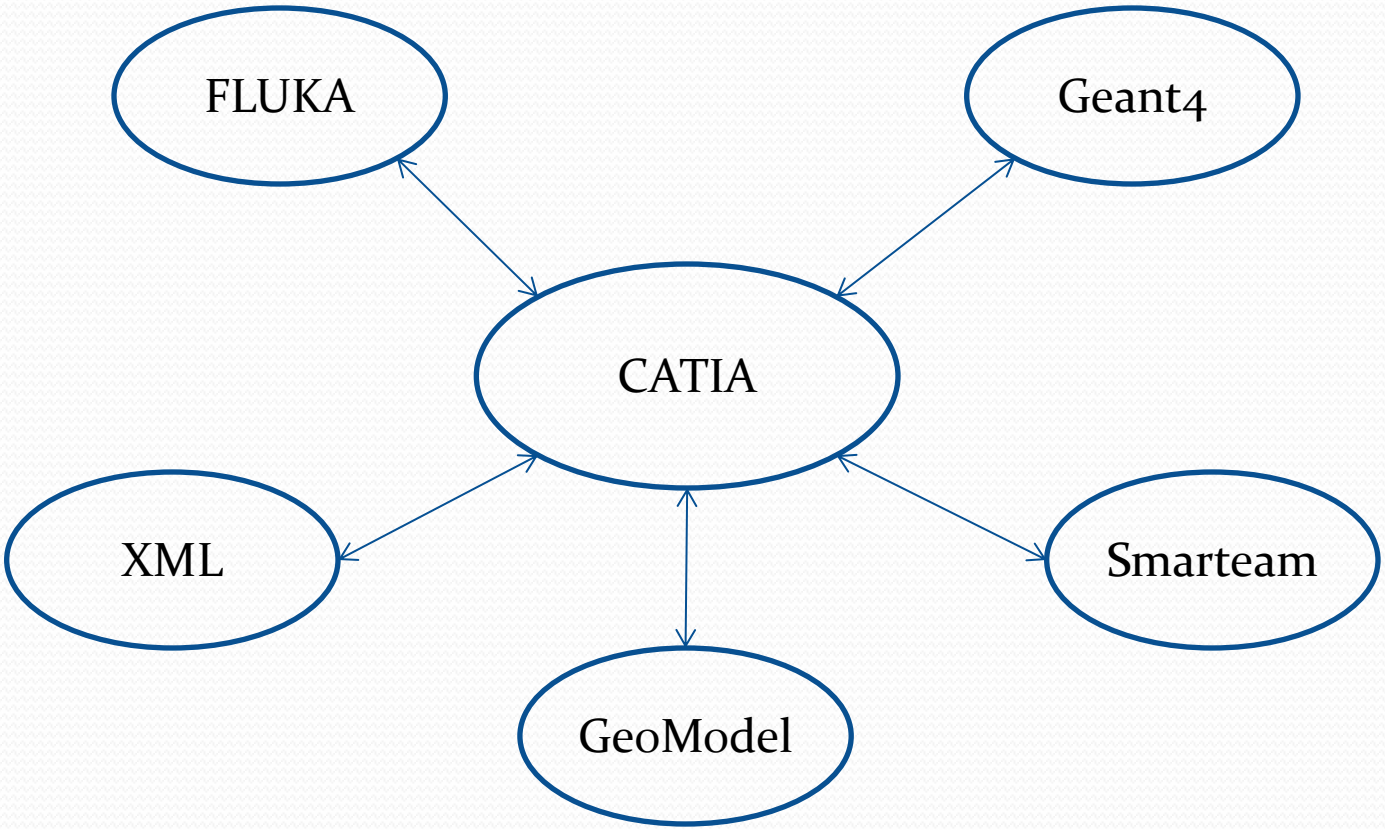
- Geant4 -> CATIA

Development of Simulation Loop



Development of Simulation Loop

Simulation Loop permits to make several crosschecking of volumes geometry descriptions, weights and materials presented in different sources.



Investigation of Quality of Simulation Loop

For ATLAS Detector components inaccuracies caused by transactions in the loop should be investigated:

- Checking of dimensions inaccuracies
- Checking of Forms inaccuracies
- Checking of Positioning inaccuracies
- Performance Checking

For this Purpose Test Examples for checking have to be selected

Selection of Special Test Examples

- Separation of unique cases of ATLAS detector geometry:
  - Geometric Primitives
  - Typical Joining
  - Combined Objects
- It was analyzed existing methods of AGDD/XML and GeoModel
- Special selection criteria was created

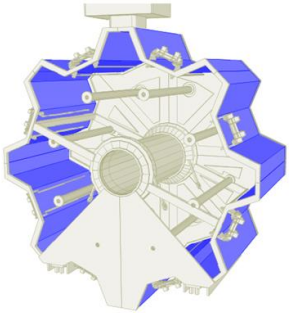
Finally 79 unique test examples have been Selected

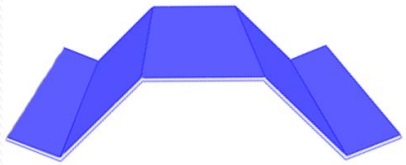
1. AGDD / XML Geometric Primitives

Test Examples for Simulation Loop

Dodecagonal Prism

#01:

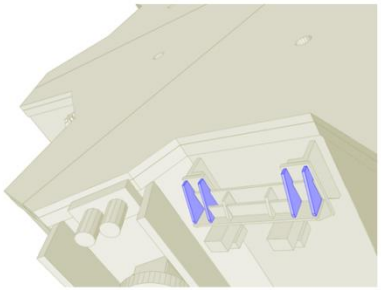


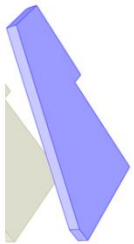


```
Pyramid
Pyramid
Move
Subtraction
Move
Rotation
Subtraction
Move
Rotation
Subtraction
Pyramid
Move
Rotation
Subtraction
Move
Rotation
Subtraction
Move
Rotation
```

Heptagonal Prism

#02

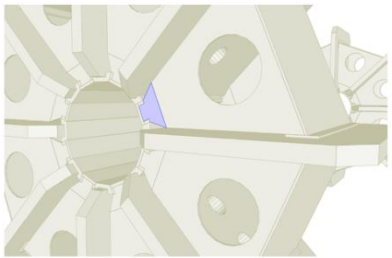


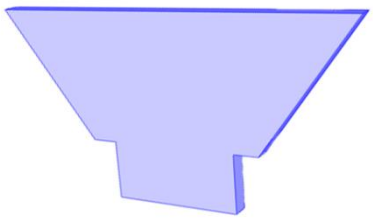


```
Cube
Cube
Move
Rotation
Subtraction
Move
Subtraction
Move
Rotation
```

Octagonal Prism

#03

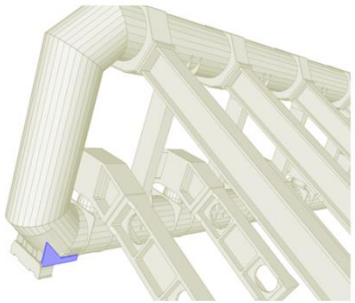




```
Symmetric
Move
Rotation
```

Pentagonal Prism

#04



```
Cube
Arbitrary
Subtraction
Move
Rotation
```

Future Intentions

- Investigation of quality of Simulation Loop

Simulation Loop will be used for:

- Investigation of existing simulated geometry
- Create new geometry for ATLAS Simulation Packages
- Add new geometry in ATLAS Simulation Packages

Thank you for attention