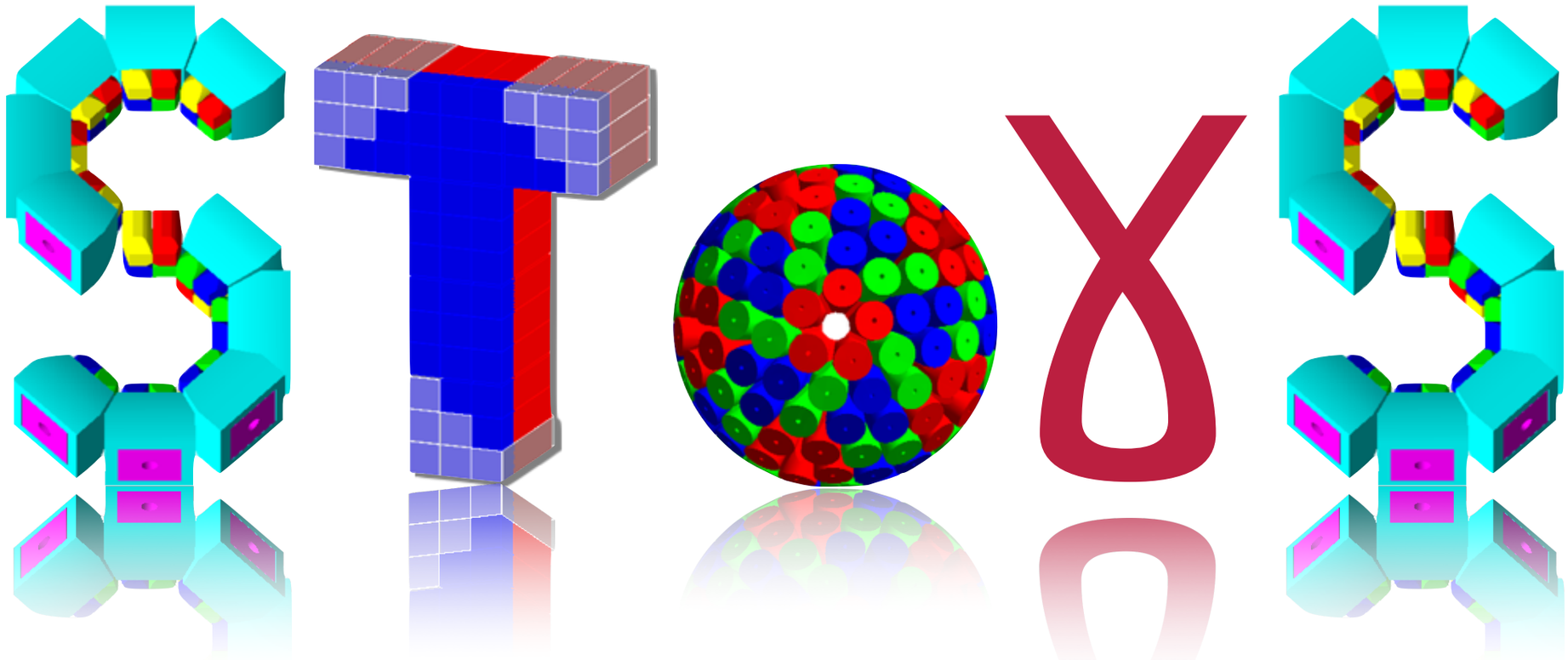

Simulation Toolkit fOr γ-ray Spectrometry

O. Stezowski, C. Ducoin, I. Companis

ICC/SPIRAL2 26/11/2014

IPNL

LIO Institut des Origines de Lyon
UNIVERSITE DE LYON

Outlines

SToGS
Objectives

SToGS
Configuration

Conclusions/
Chalenges

Objectives

1. Modular
2. Versatil
3. Flexible
4. Extensible

- design and study of response functions of new detectors
- prepare experiments with realistic simulations and analysis
- supply and improve physics generators

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The idea of SToGS

Inherited from PARIS Geant4 package

↳ modified/ new elements added

↳ Geant4.10 using Multi-threading

https://twiki.cern.ch/twiki/bin/view/Geant4/QuickMigrationGuideForGeant4V10

and previously Geant4.9 versions

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https://twiki.cern.ch/twiki/bin/view/Geant4/QuickMigrationGuideForGeant4V10

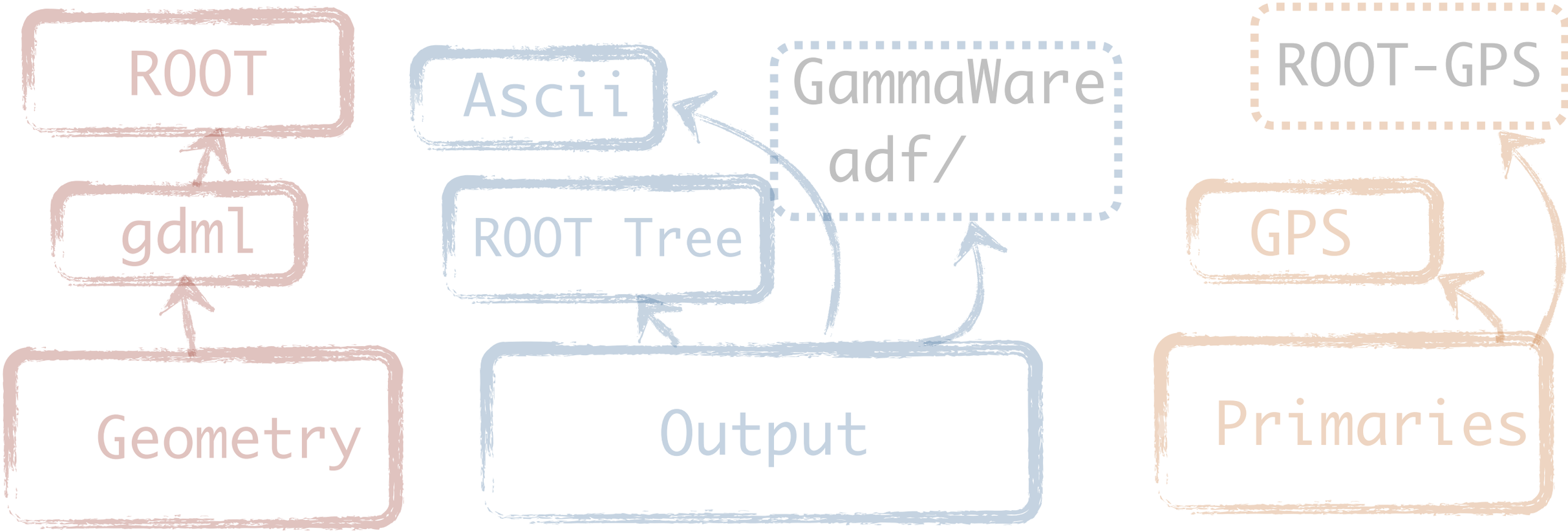
and previously Geant4.9 versions

Configured using ascii file to select the Geant4:

- Physics generator
- Physics list
- Geometry under study
- Action Manager (physics is pulled out of Geant4)

Configuration

General structure of SToGS package



Geant4 ↔ USER

Configuration

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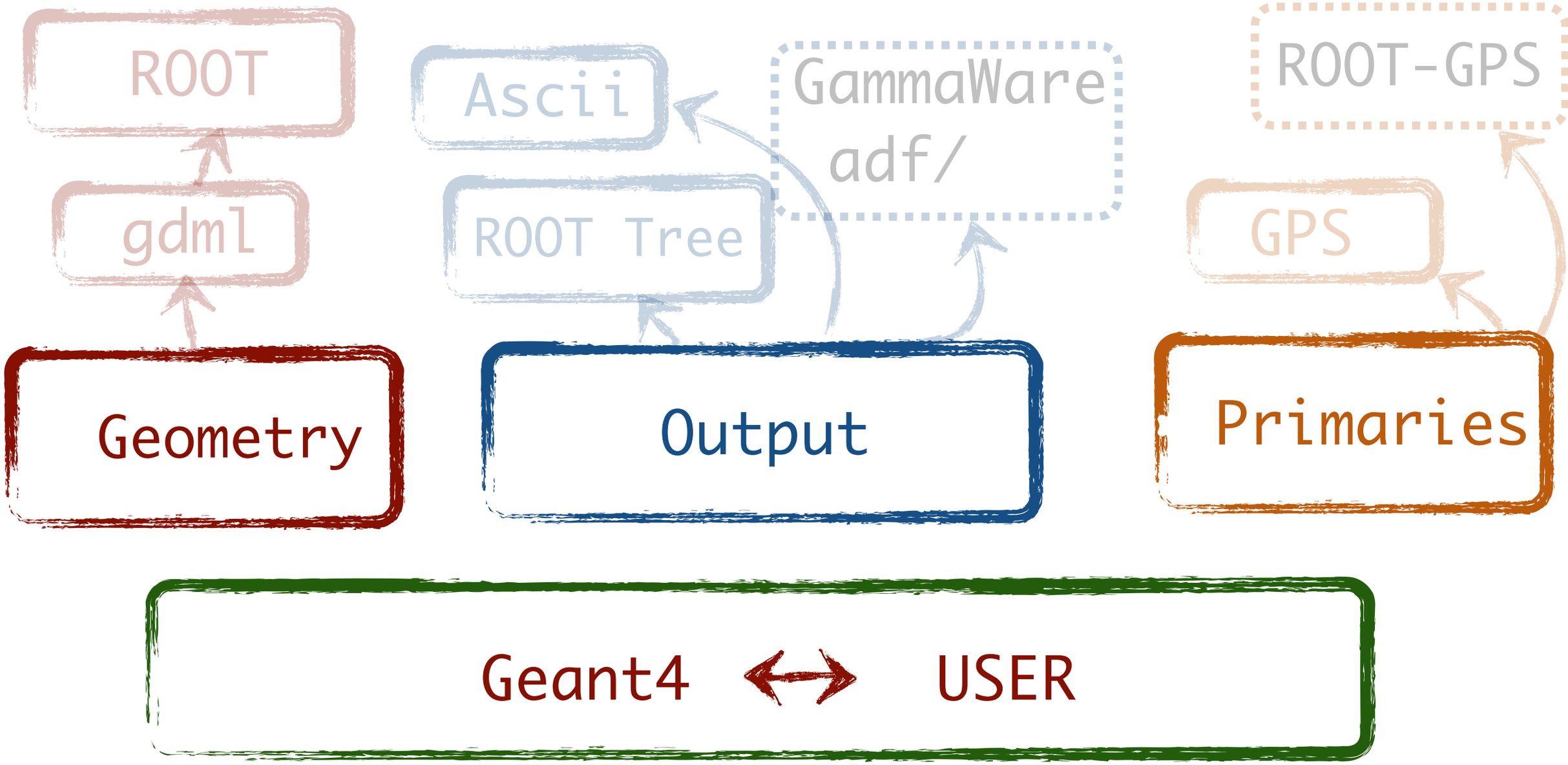

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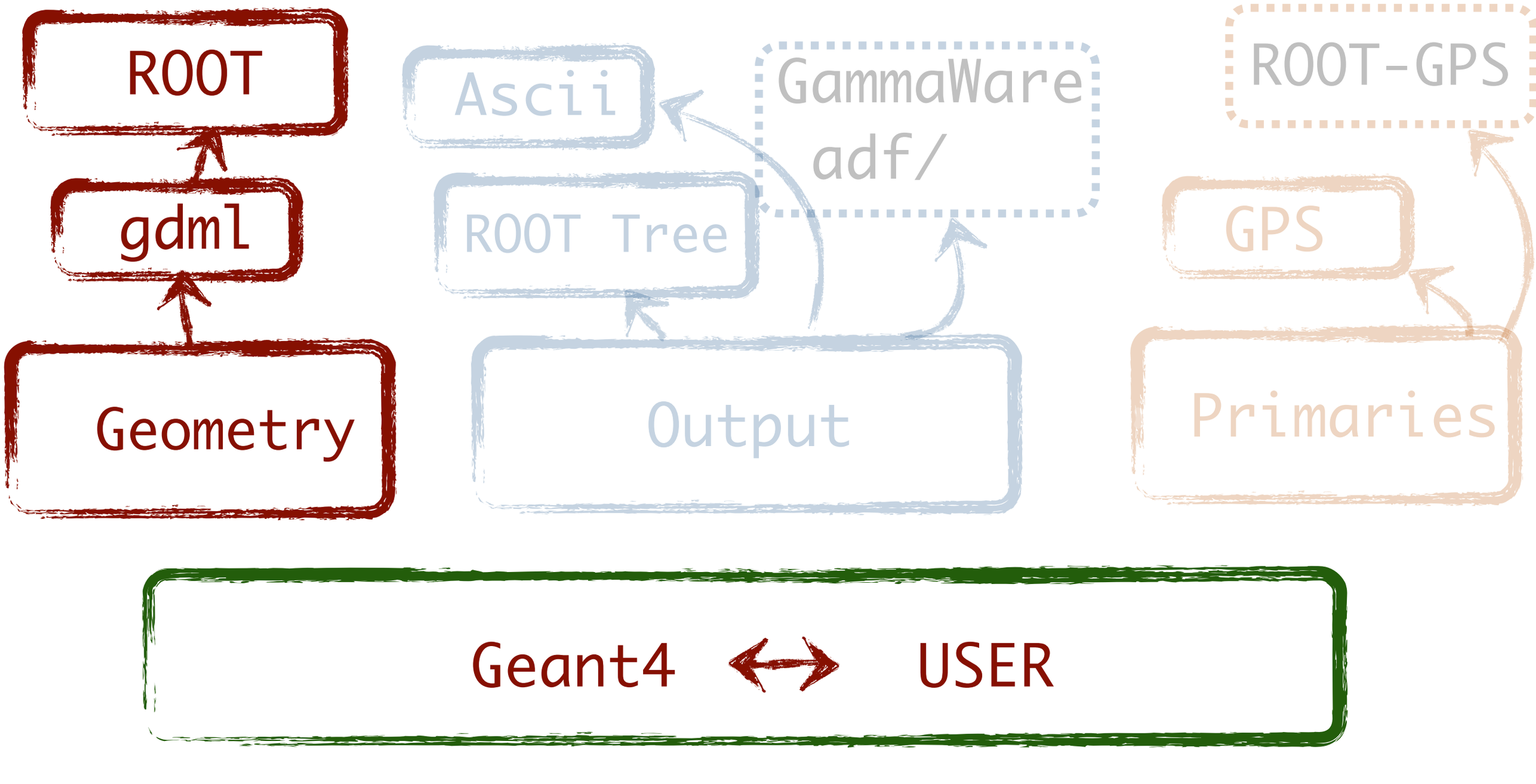

Configuration

SToGS_DetectorBuilder

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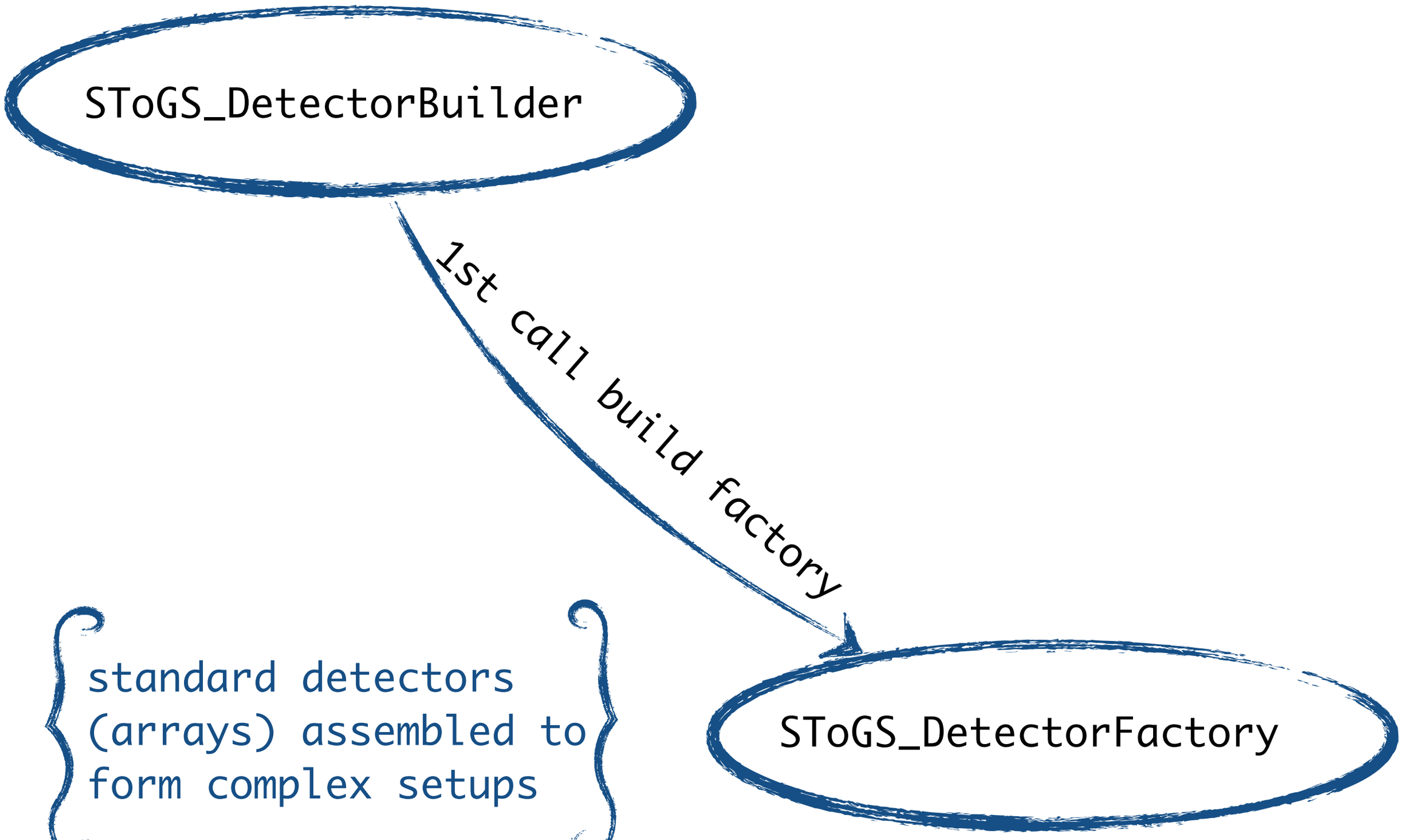

Configuration

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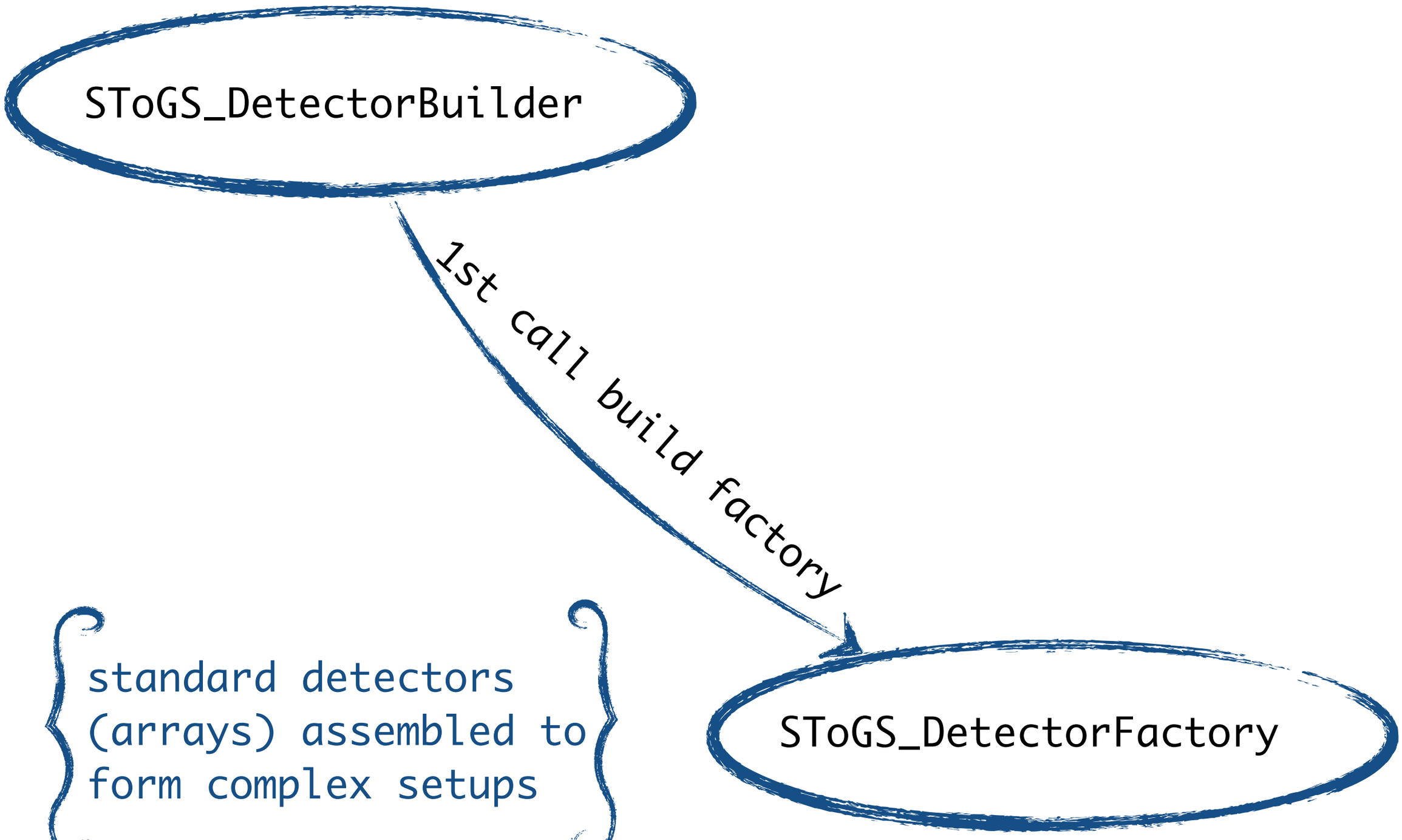

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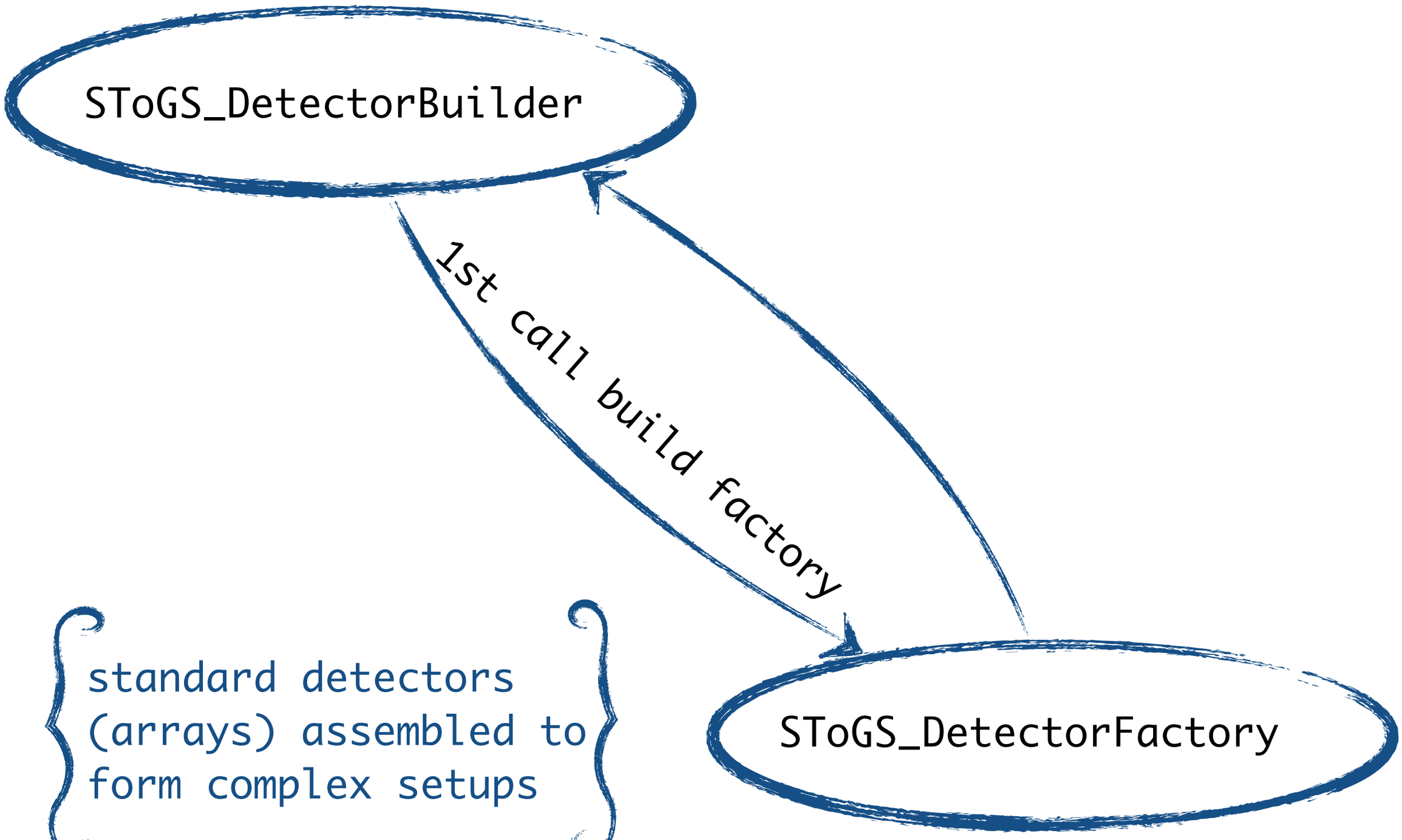

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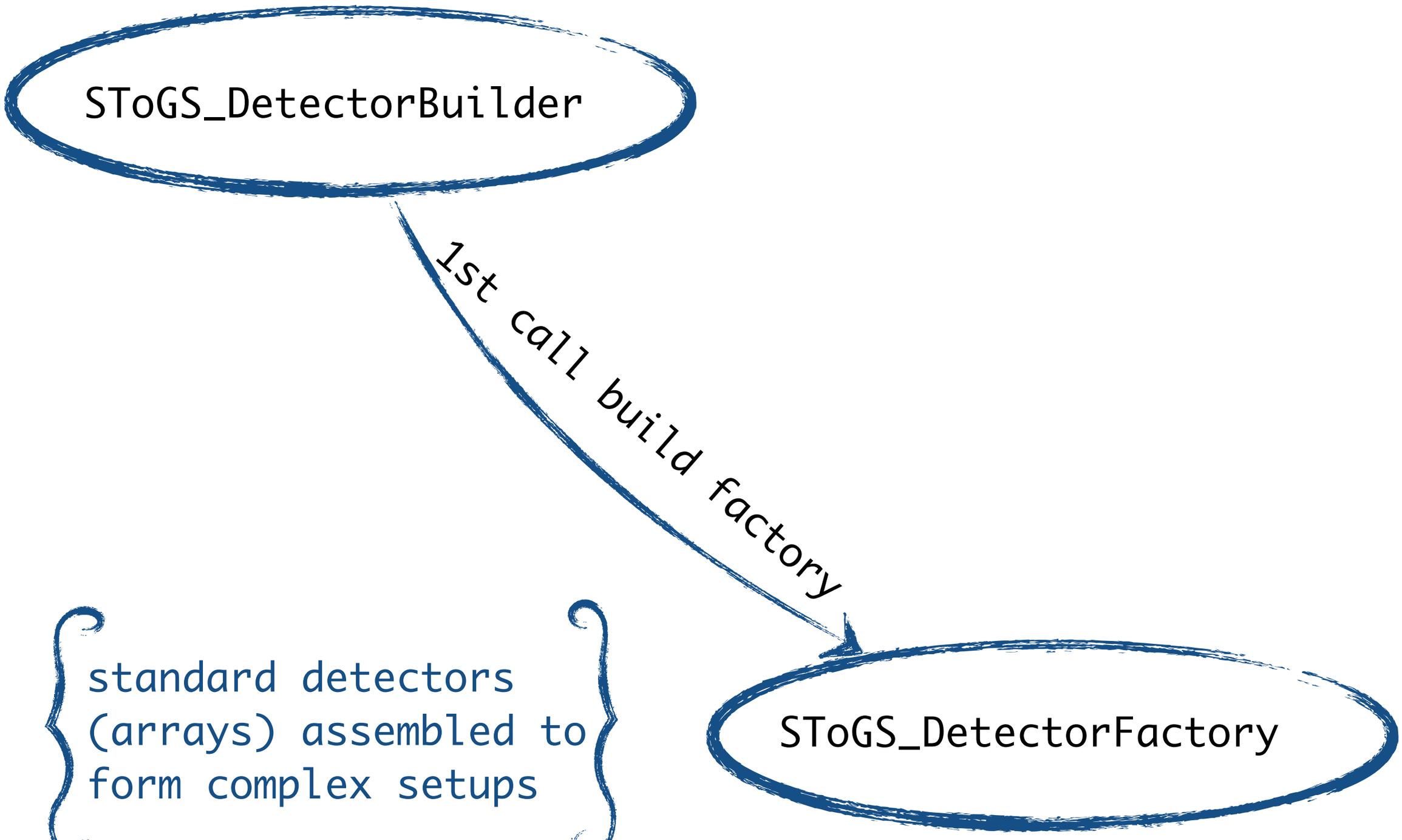

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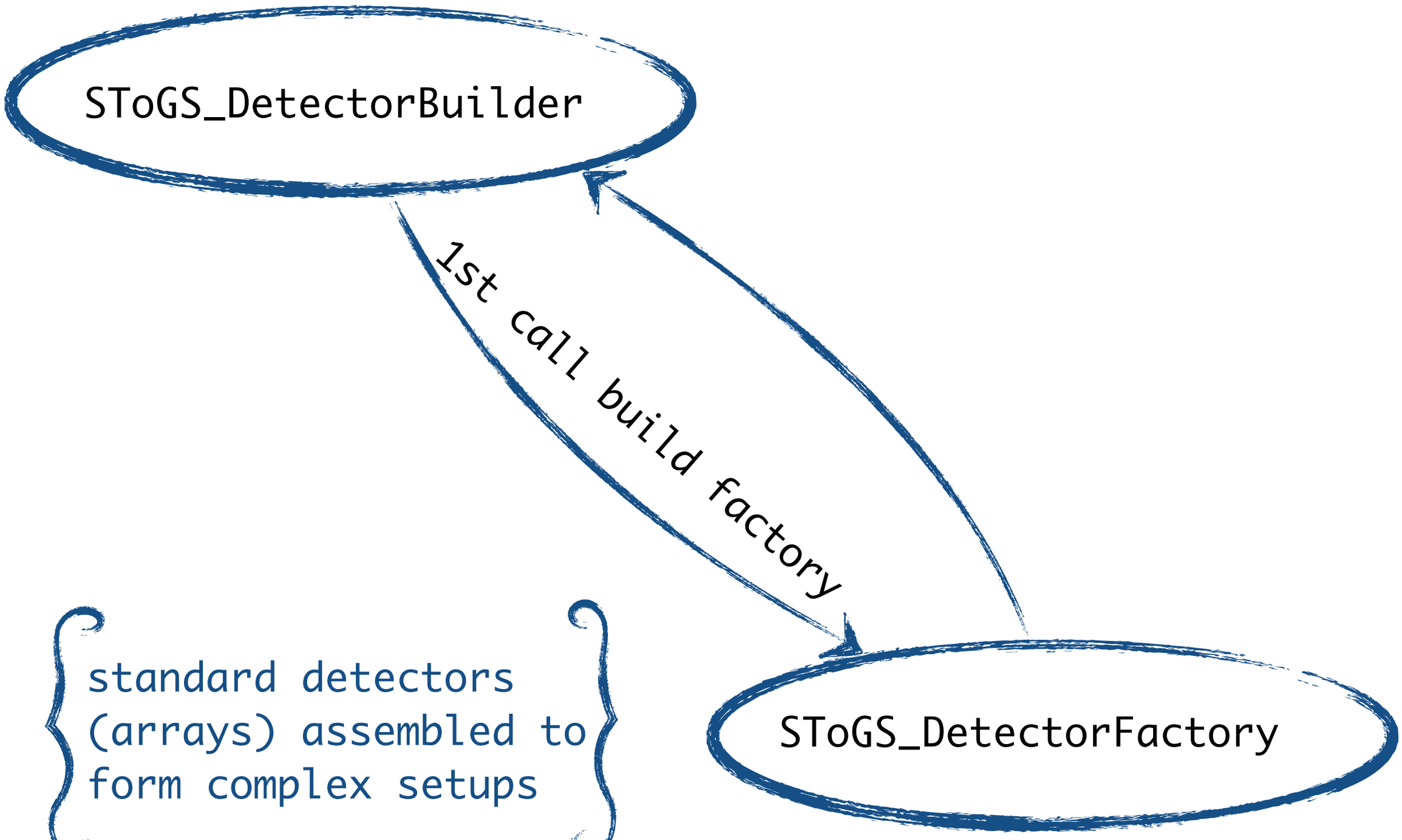

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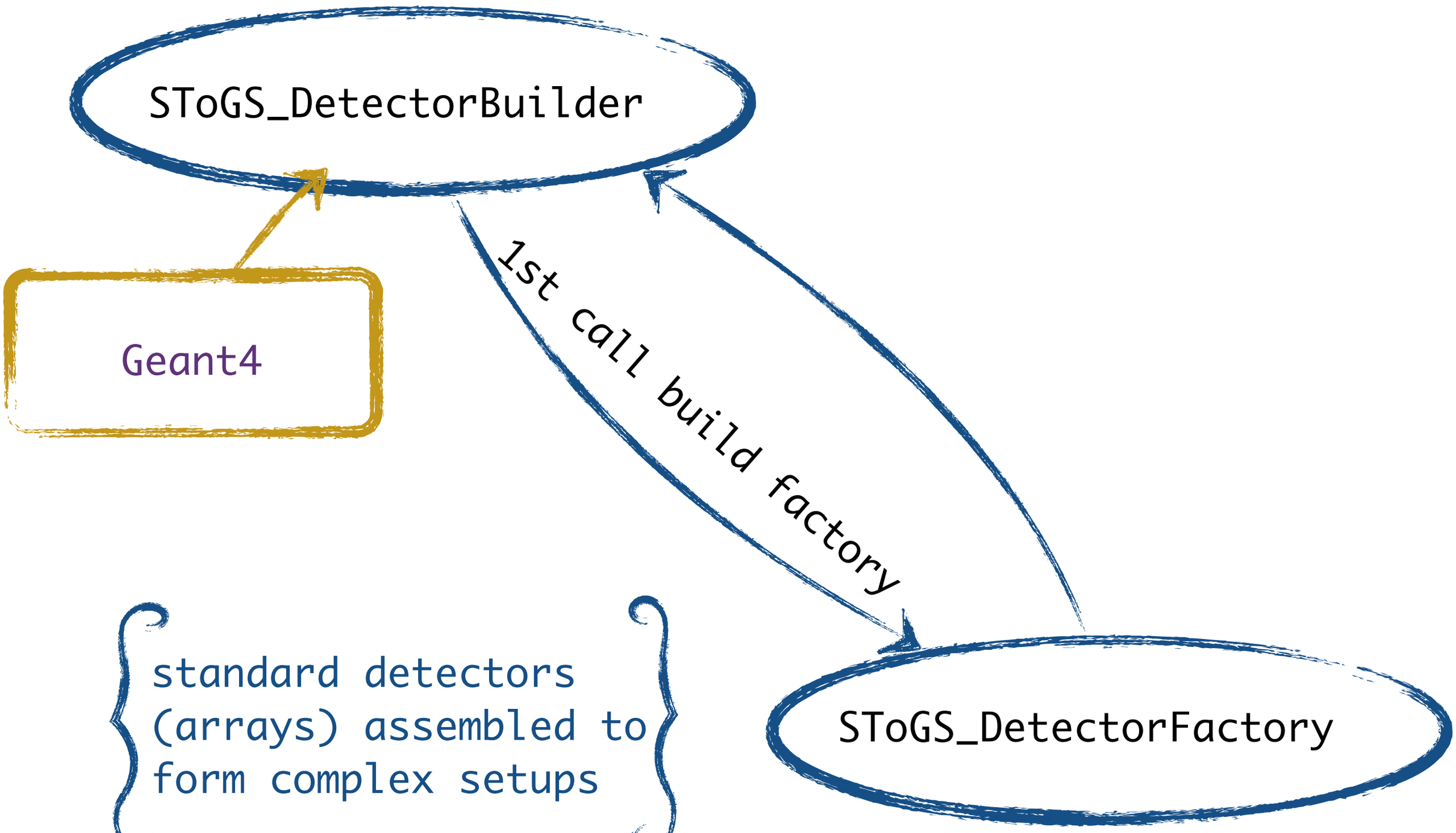

standard detectors (arrays) assembled to form complex setups

Configuration

SToGS_DetectorBuilder

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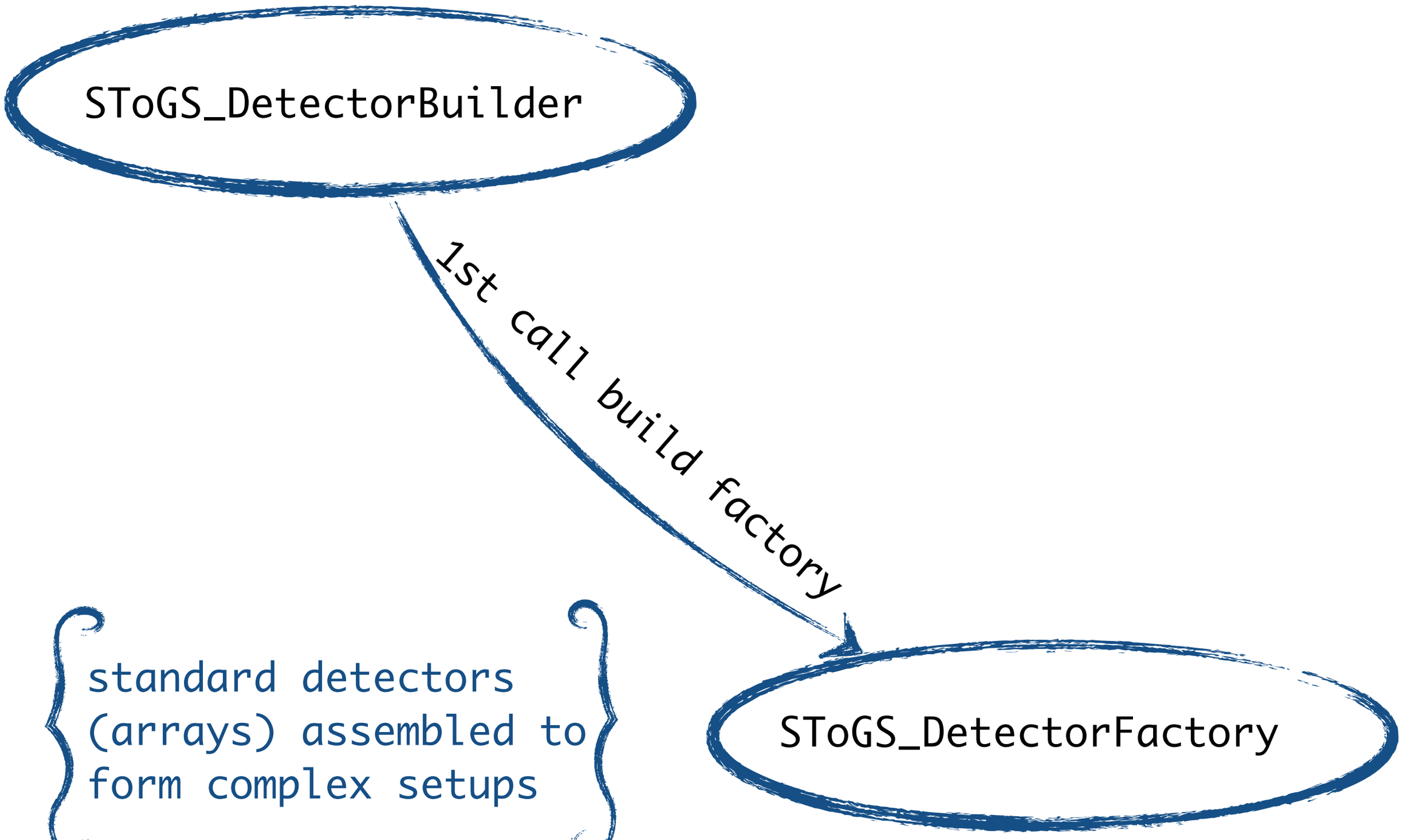

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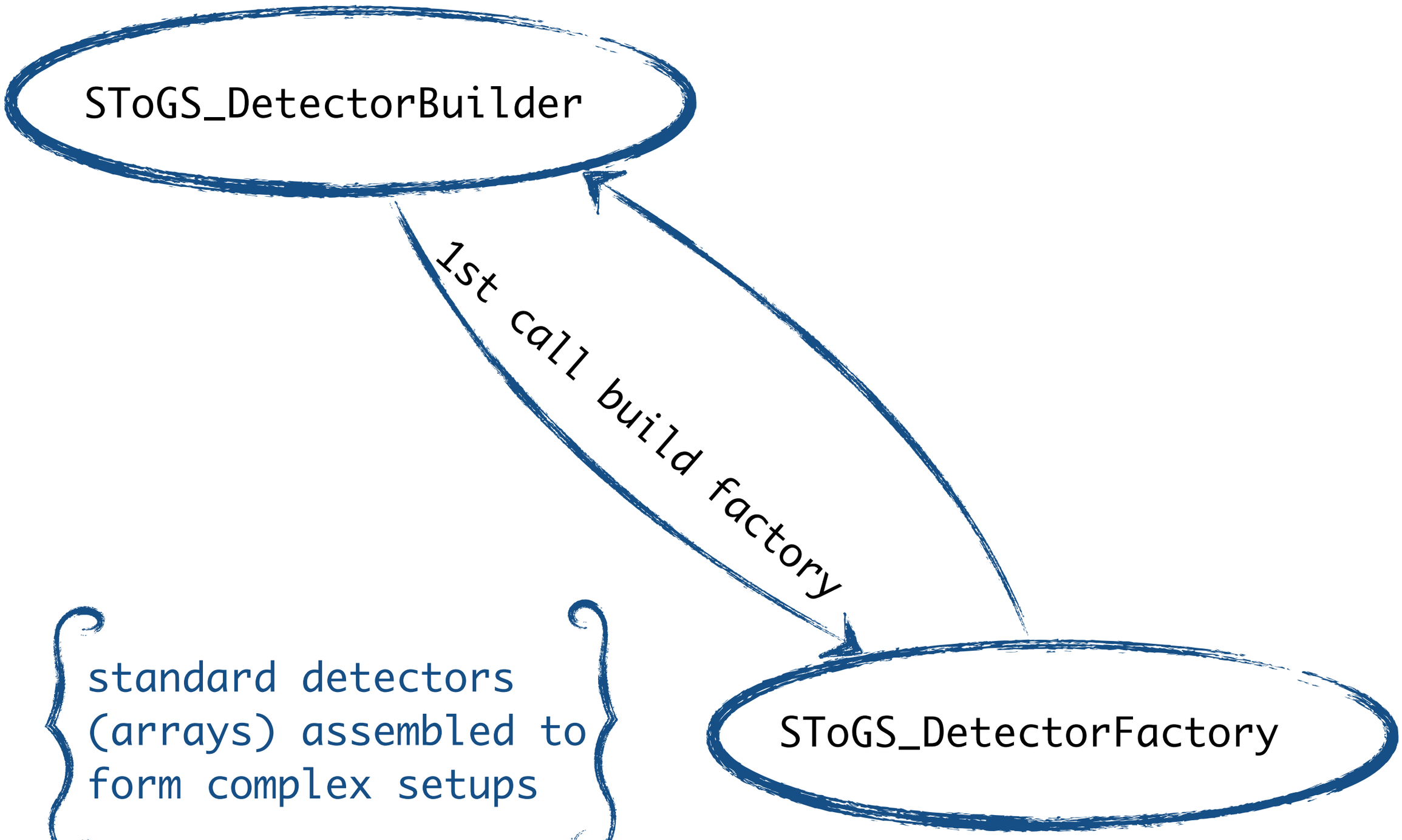

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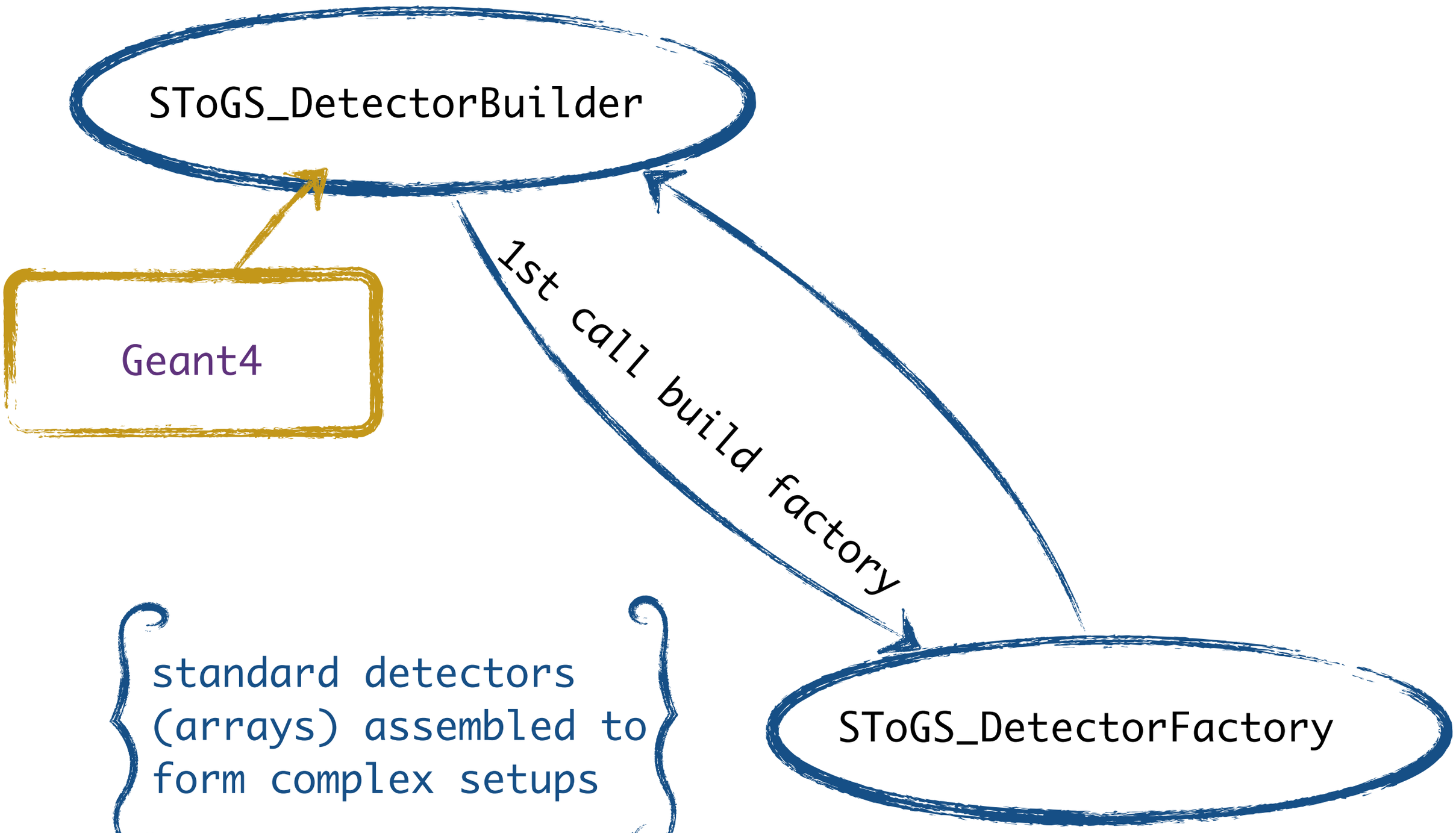

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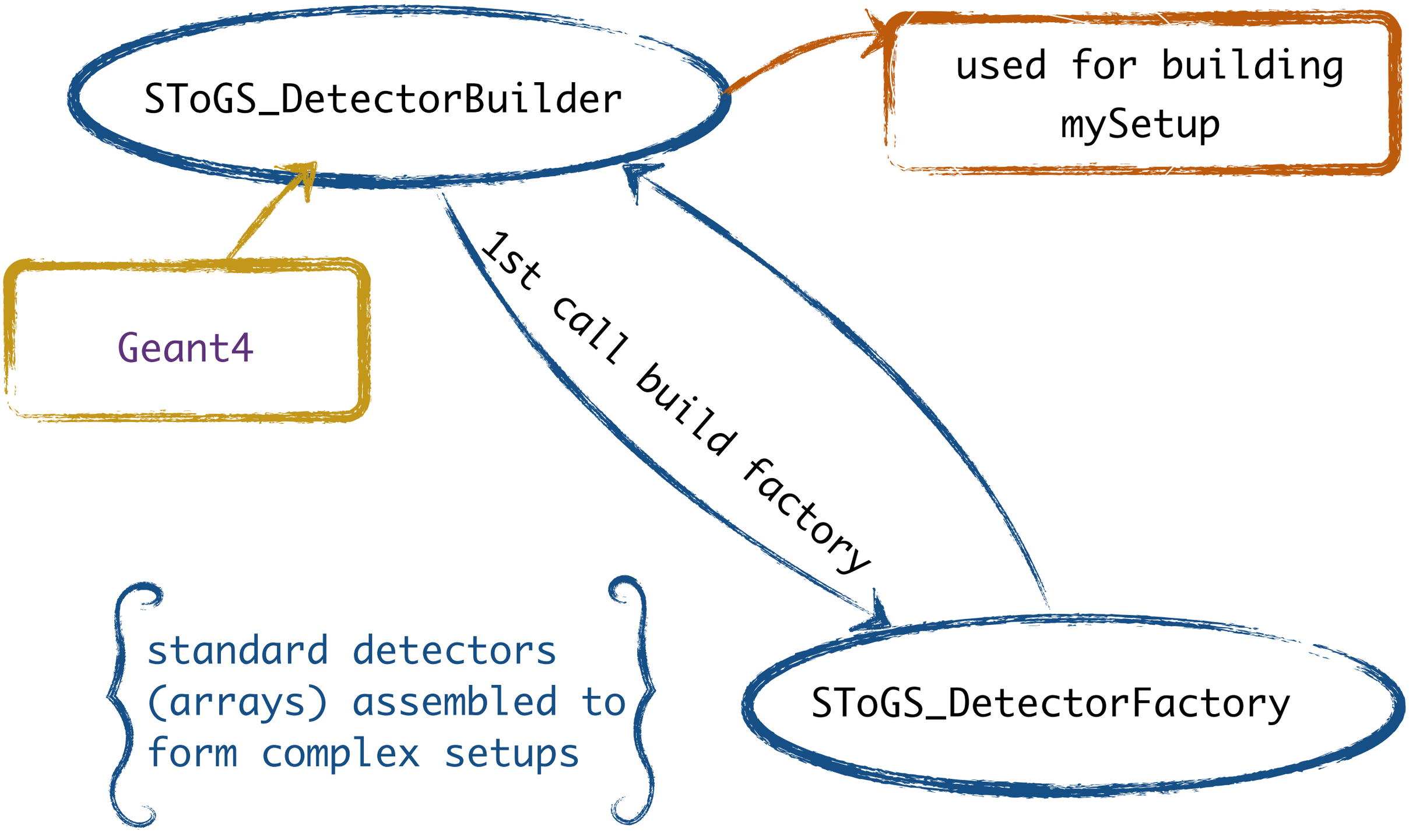

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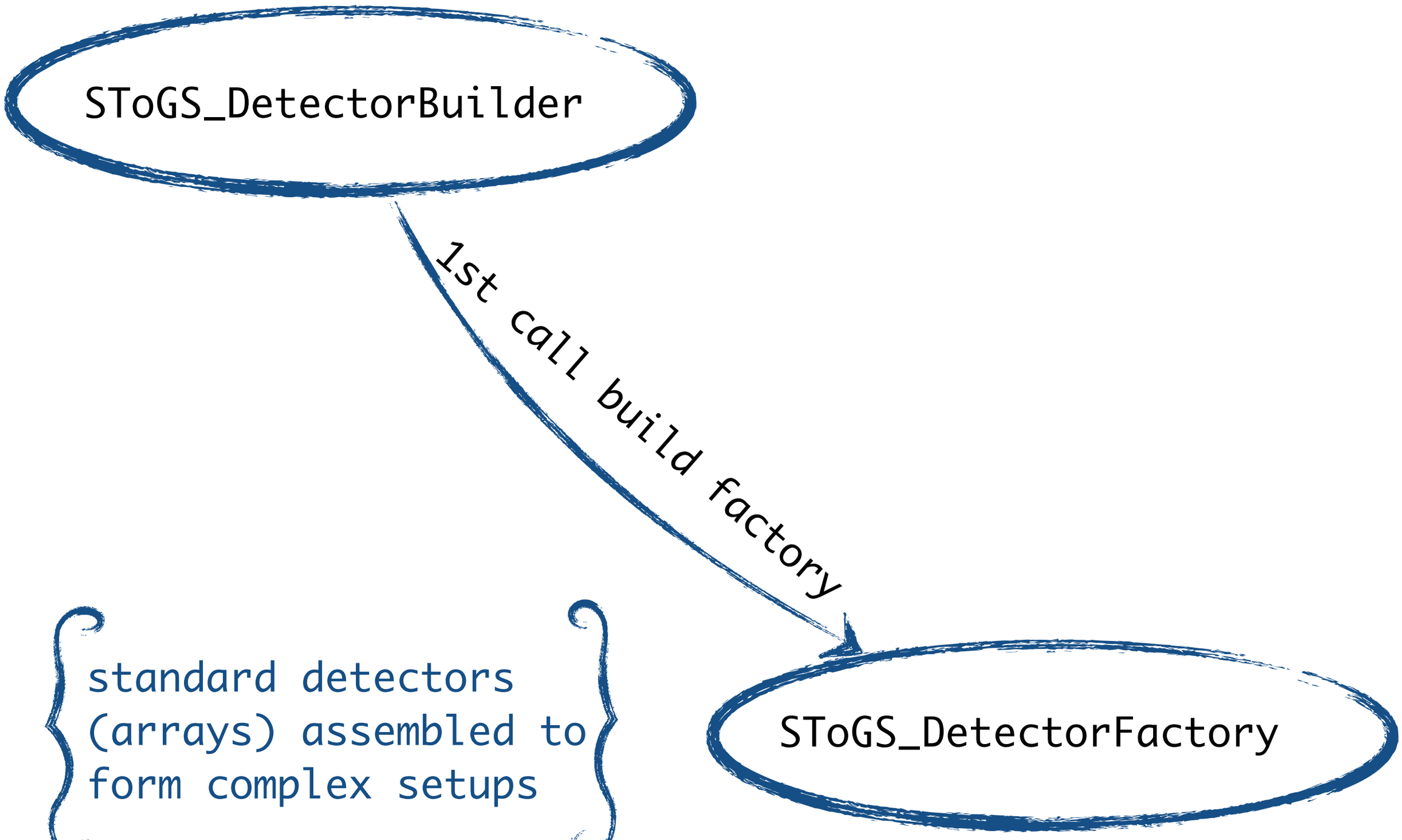

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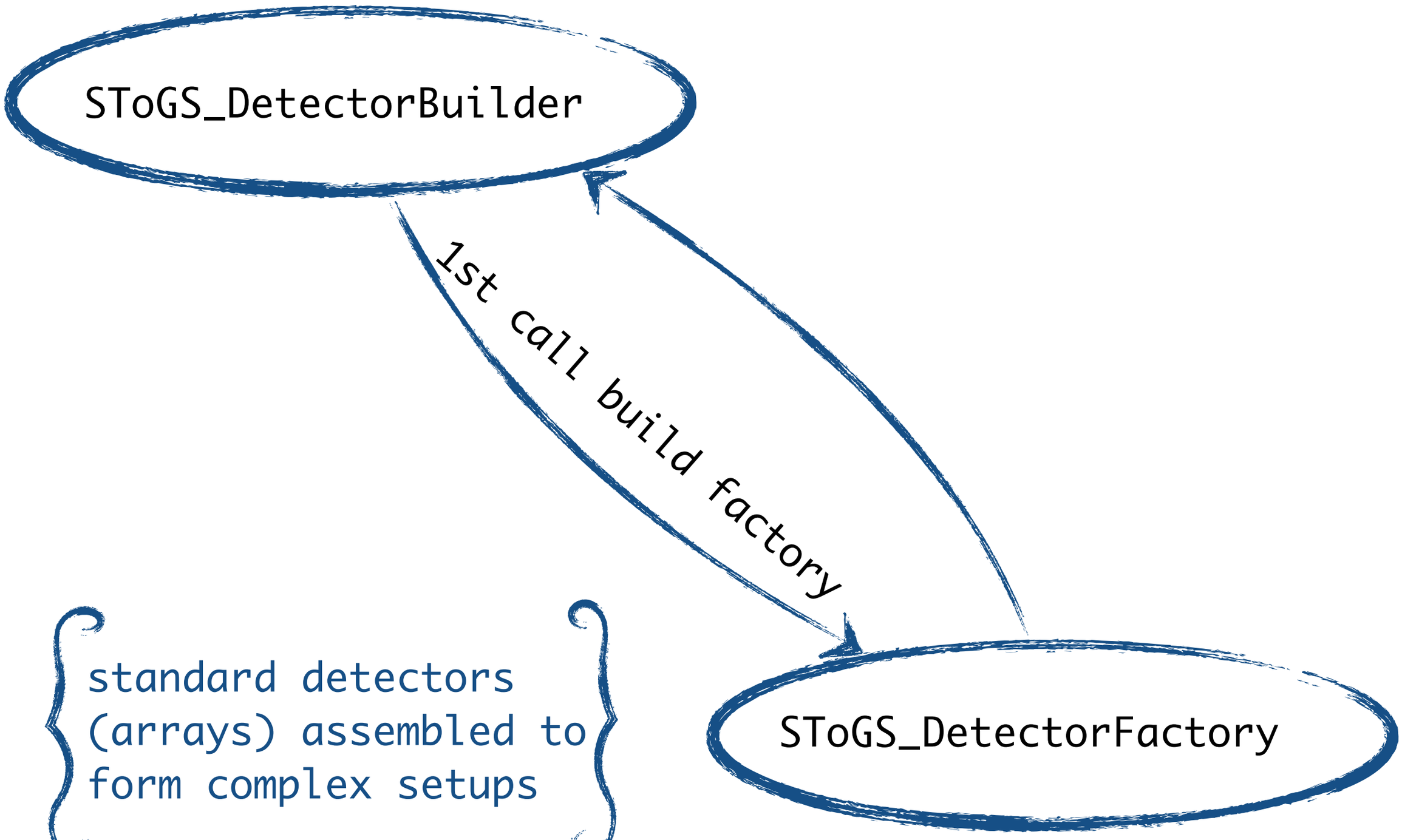

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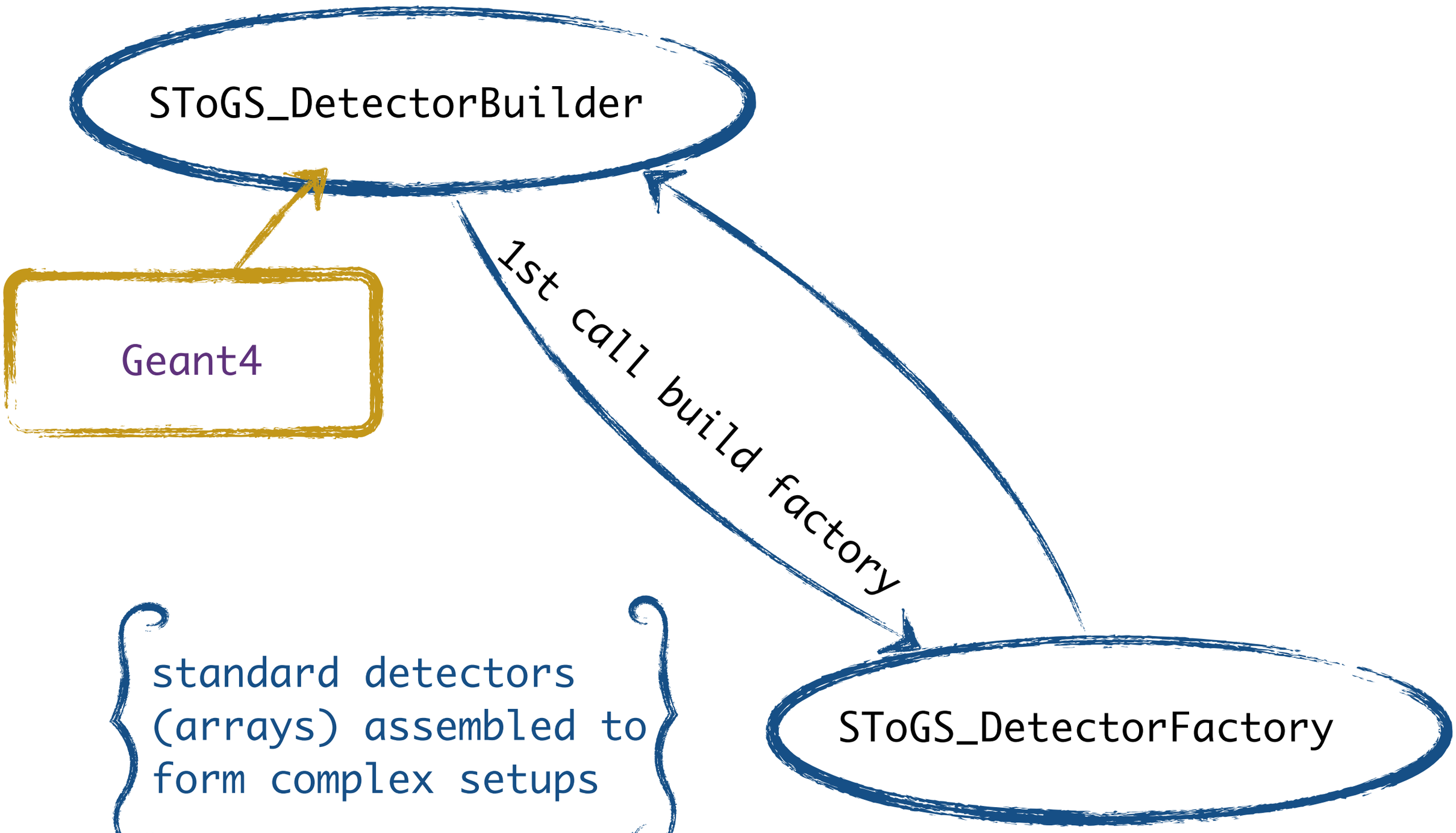

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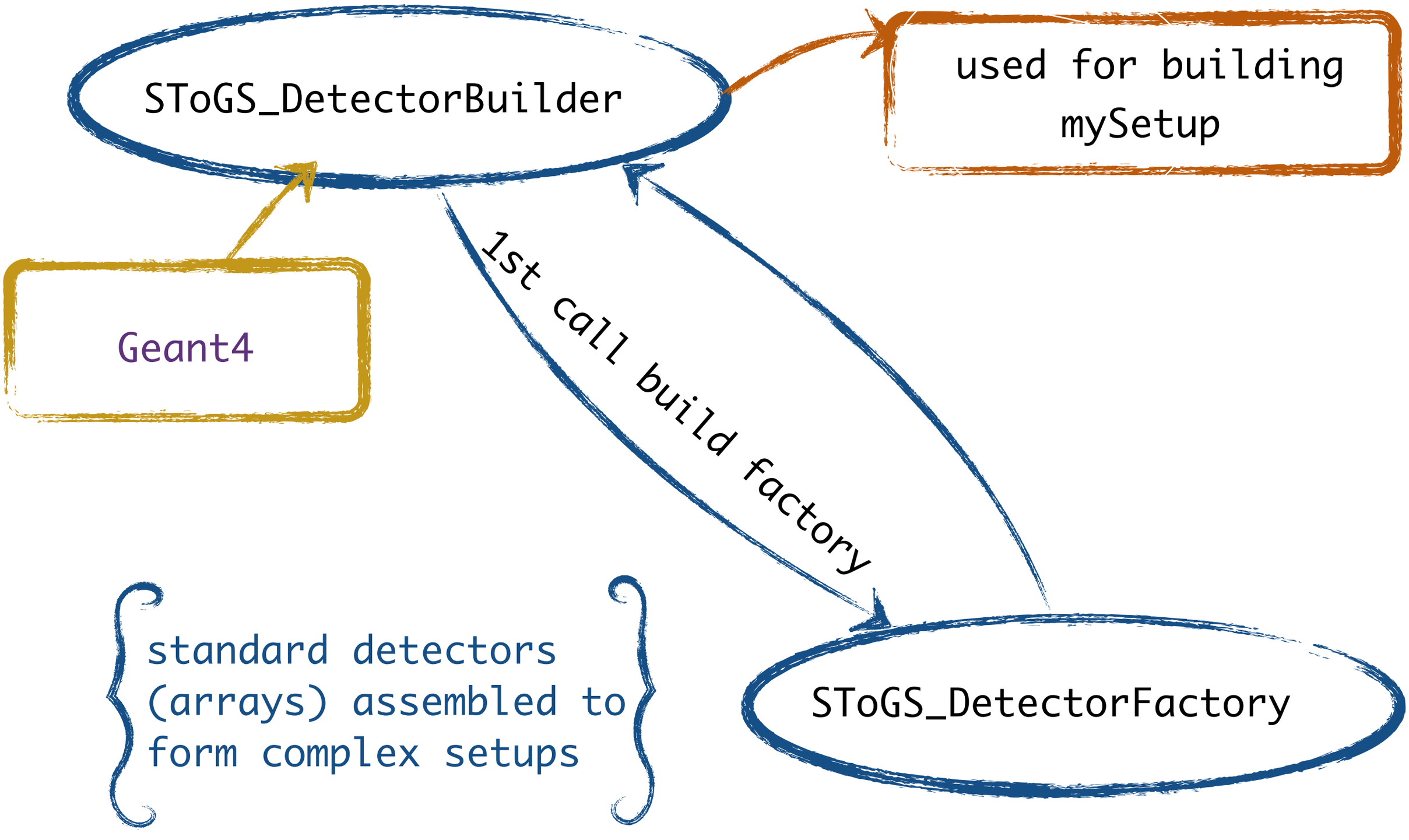

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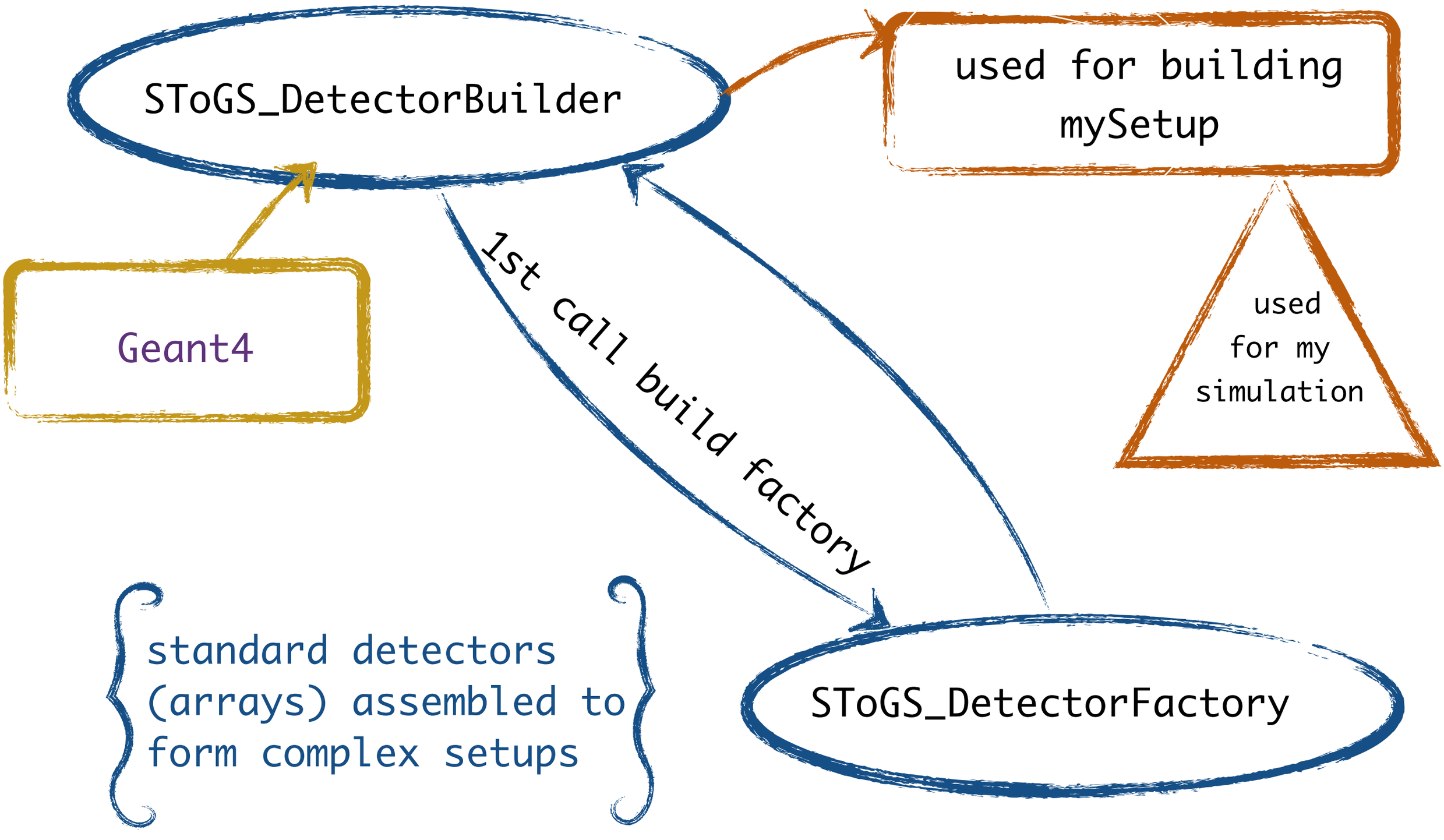

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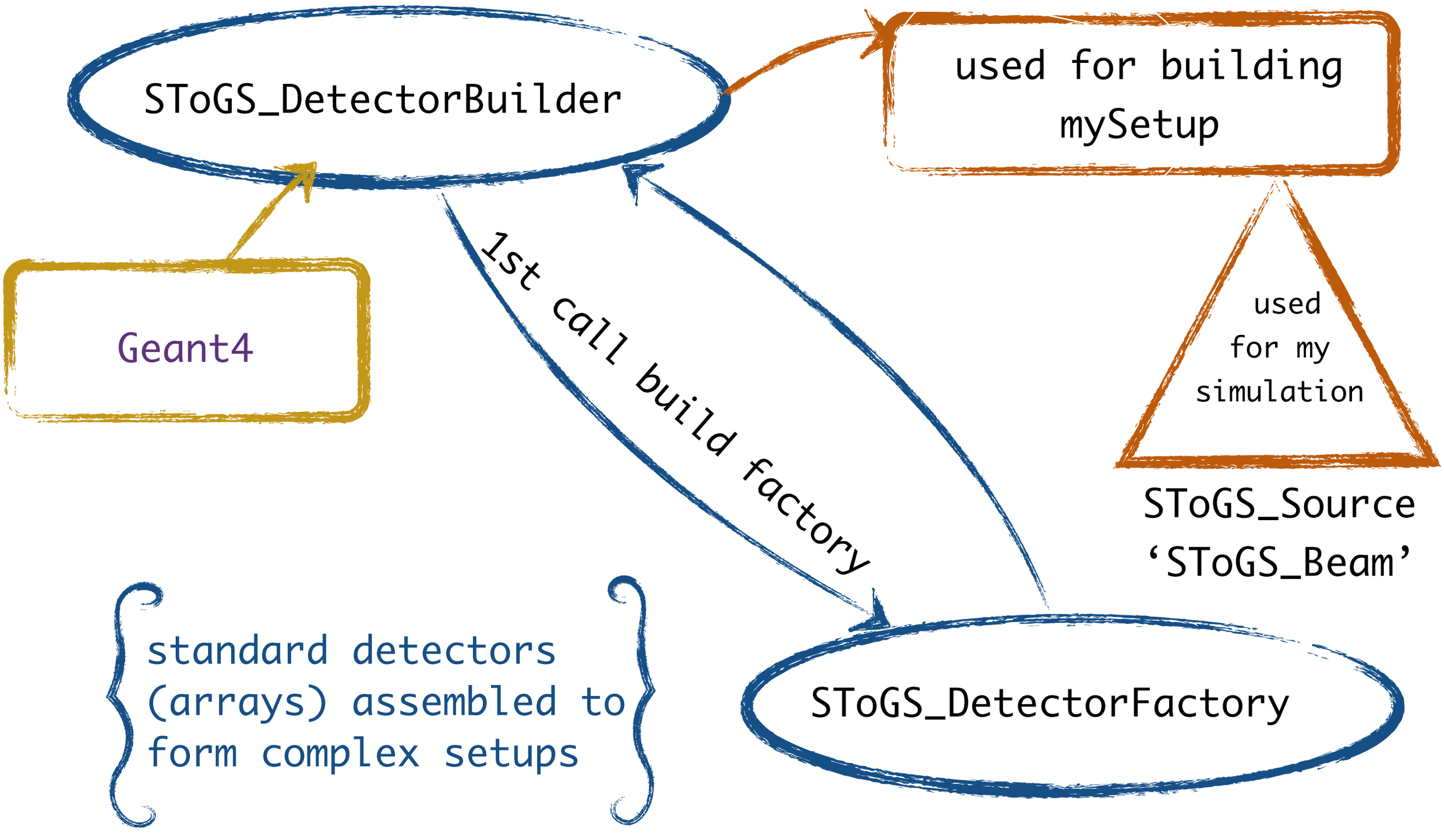
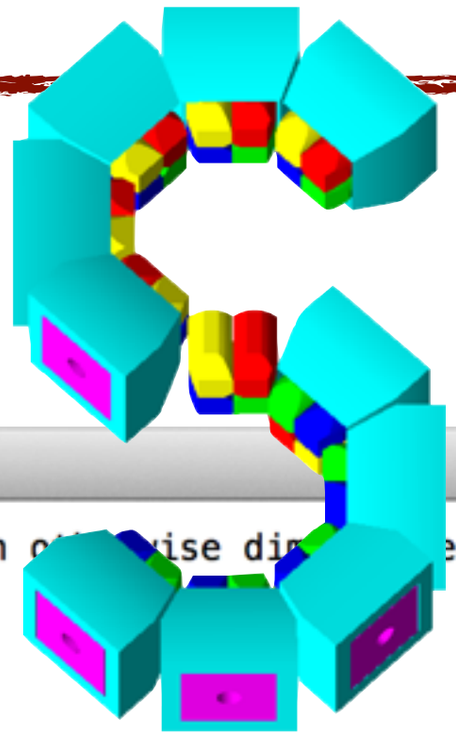


Configuration

mySetup file example



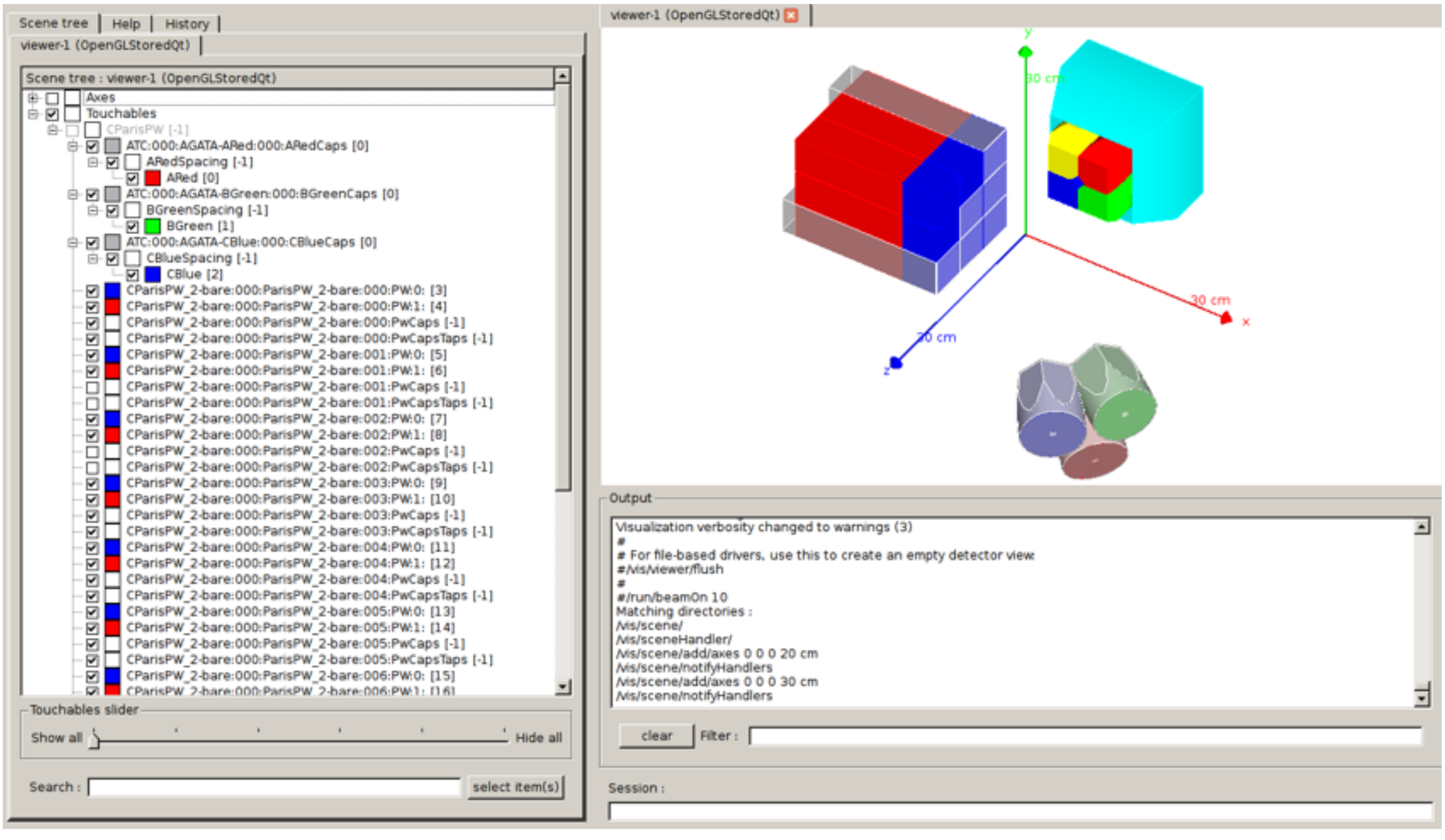
mySetup.dfb — SToGS (git: master)

```
1  # First the world / detector envelop. if detector does not exist, box with dim given o      ise di      ed
2  w EXOGAM_bare +10. +10. +10. m
3  #
4  #
5  @ 0 ->
6  #
7  *   DetectorFactory/SemiConductors/Ge/EXOCLOVER_A-bare  0.0     0.0     11.35   cm      Rz +0    Ry  0      Rt
8  *   DetectorFactory/SemiConductors/Ge/EXOCLOVER_A-bare  0.0     0.0     11.35   cm      Rz +0    Ry -45     Rt
9  *   DetectorFactory/SemiConductors/Ge/EXOCLOVER_A-bare  0.0     0.0     11.35   cm      Rz +0    Ry -90     Rt
10 *   DetectorFactory/SemiConductors/Ge/EXOCLOVER_A-bare  0.0     0.0     11.35   cm      Rz +0    Ry -135    Rt
11 *   DetectorFactory/SemiConductors/Ge/EXOCLOVER_A-bare  0.0     0.0     11.35   cm      Rz +0    Ry +45     Rt
12 *   DetectorFactory/SemiConductors/Ge/EXOCLOVER_A-bare  0.0     0.0     -23.35  cm      Rz +0    Ry -90     Rt
13 *   DetectorFactory/SemiConductors/Ge/EXOCLOVER_A-bare  25.35   0.0     -15.35  cm      Rx 180   Ry  45     Rt
14 *   DetectorFactory/SemiConductors/Ge/EXOCLOVER_A-bare  37.     0.0     10.35   cm      Rx 180   Ry  -0     Rt
15 *   DetectorFactory/SemiConductors/Ge/EXOCLOVER_A-bare  27.     0.0     37.35   cm      Rx 180   Ry  -45    Rt
16 *   DetectorFactory/SemiConductors/Ge/EXOCLOVER_A-bare  0.7     0.0     49.35   cm      Rx 180   Ry  -90    Rt
17 *   DetectorFactory/SemiConductors/Ge/EXOCLOVER_A-bare  -26.35  0.0     39.0    cm      Rx 180   Ry  -135   Rt
18 # end
```

Line: 6:3 | Plain Text | Tab Size: 4

Configuration

FullSetup in Geant4



Configuration

Files associated to DetectorFactory

.gdml file -> Full description of the Geometry

.amap file ->Detector attributes (colours, sensitivity, fields, etc….)

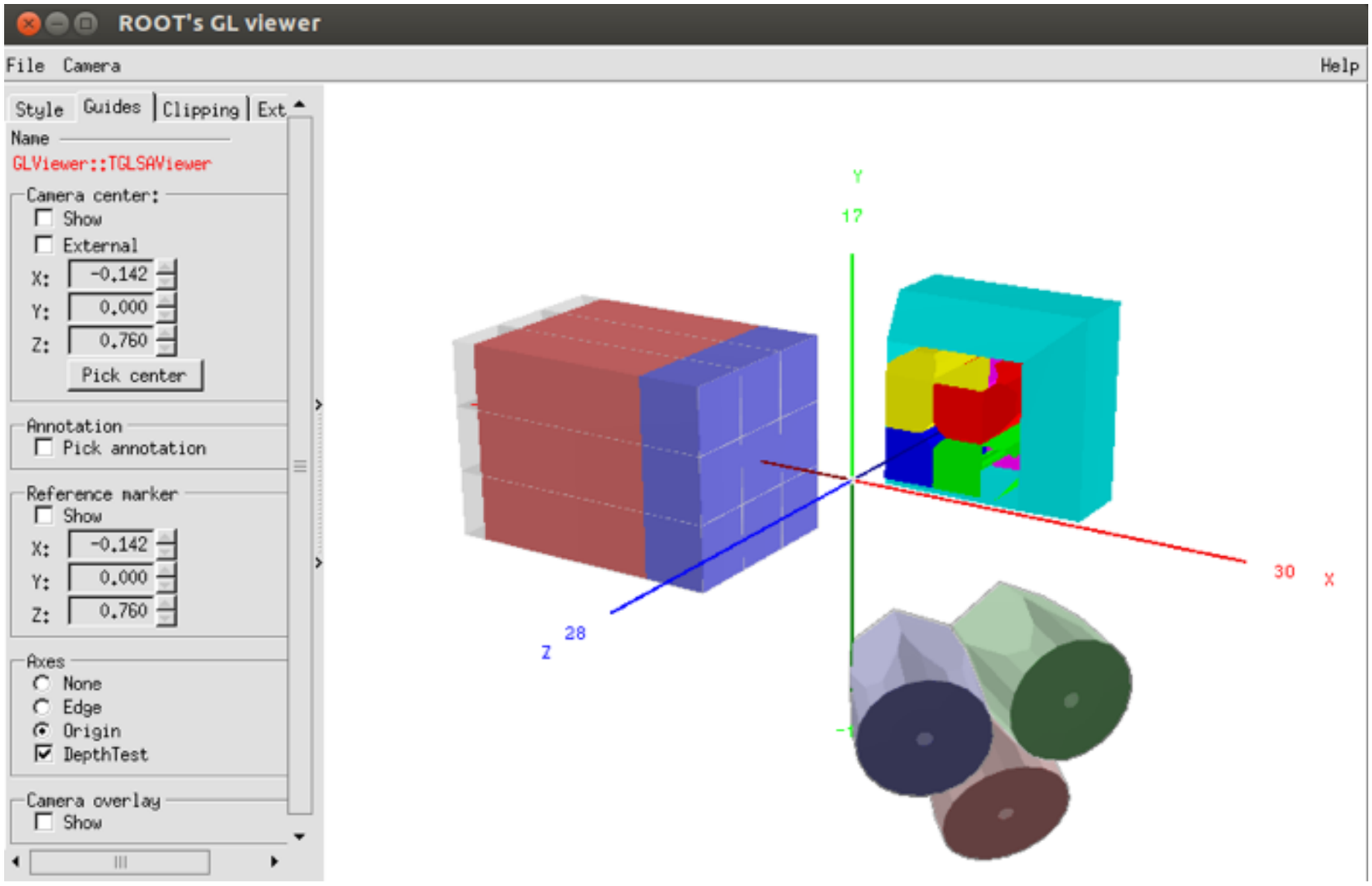
.dmap file -> Mapping of the detector (mandatory for the analysis)

Configuration

Geometry: ROOT macro

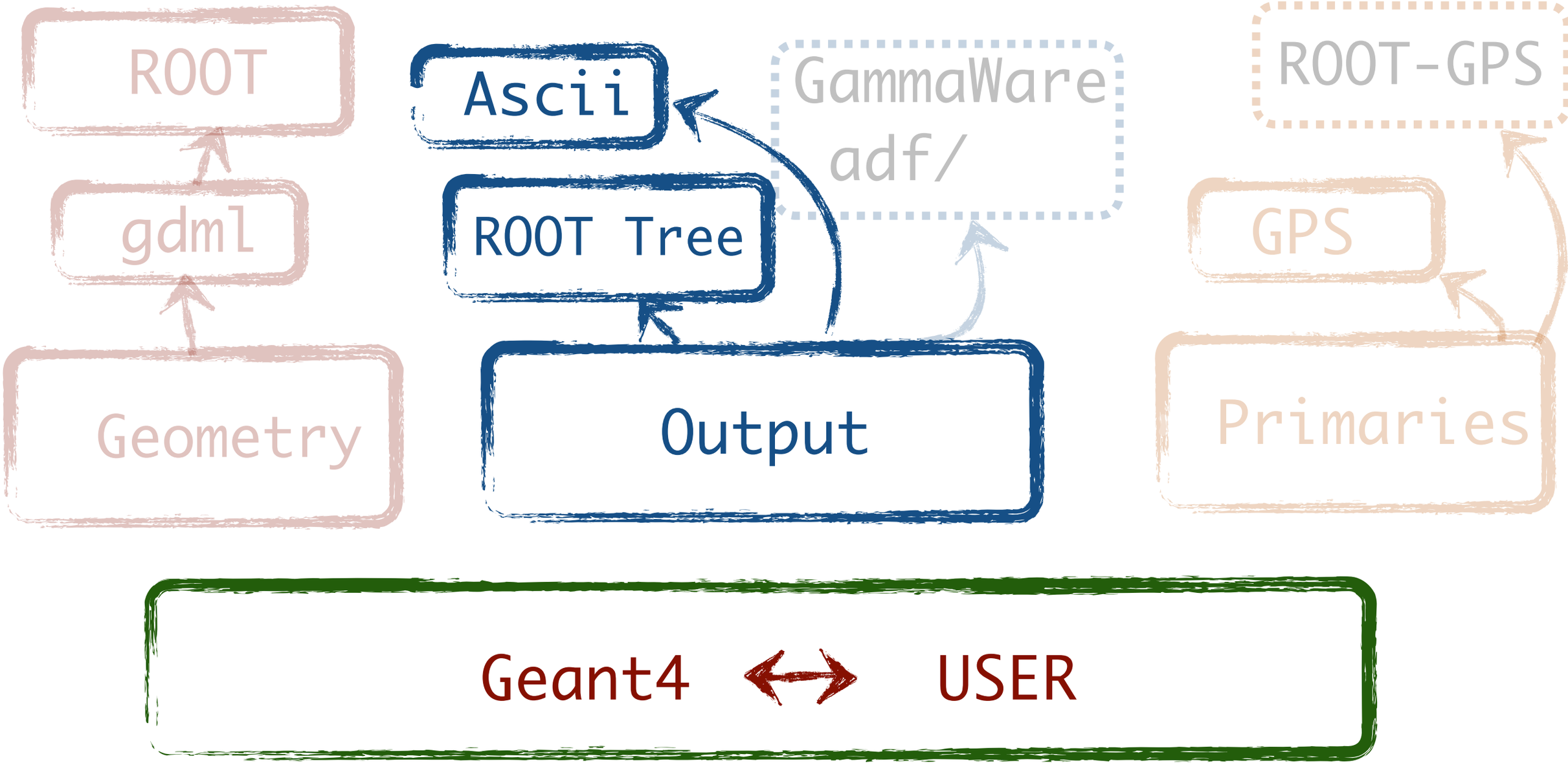
```
.L DetectorFactory/BrowserFactory.C

ShowDetector("DetectorFactory/MyStore/MySetup")
```



Configuration

General structure of SToGS package



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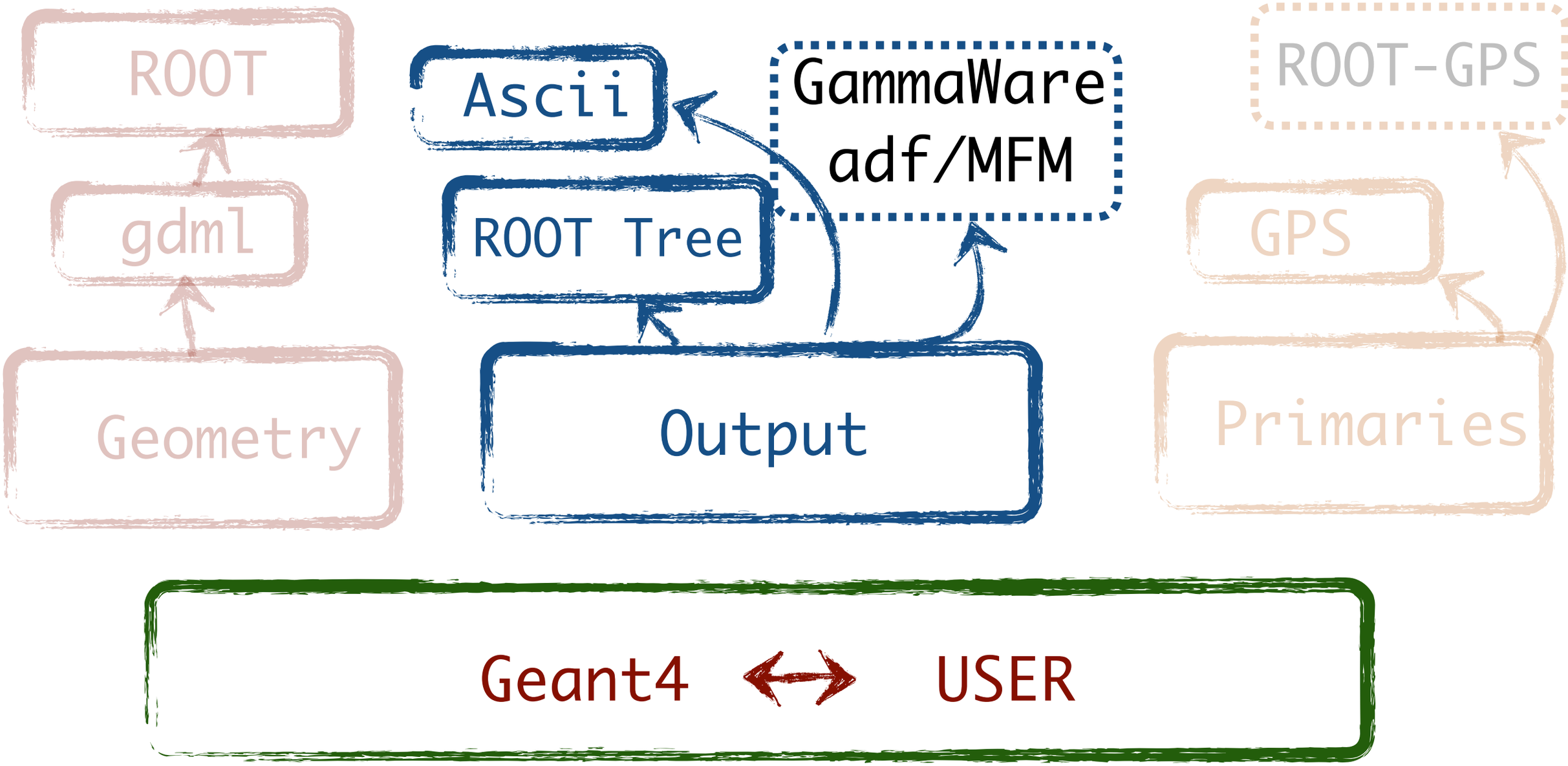


Configuration

Input file SToGS_Source.conf

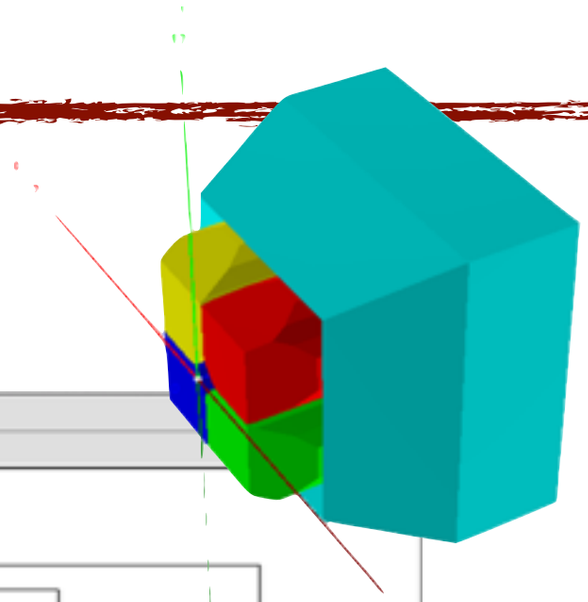
SToGS_Source.conf — SToGSDefault (git: master)

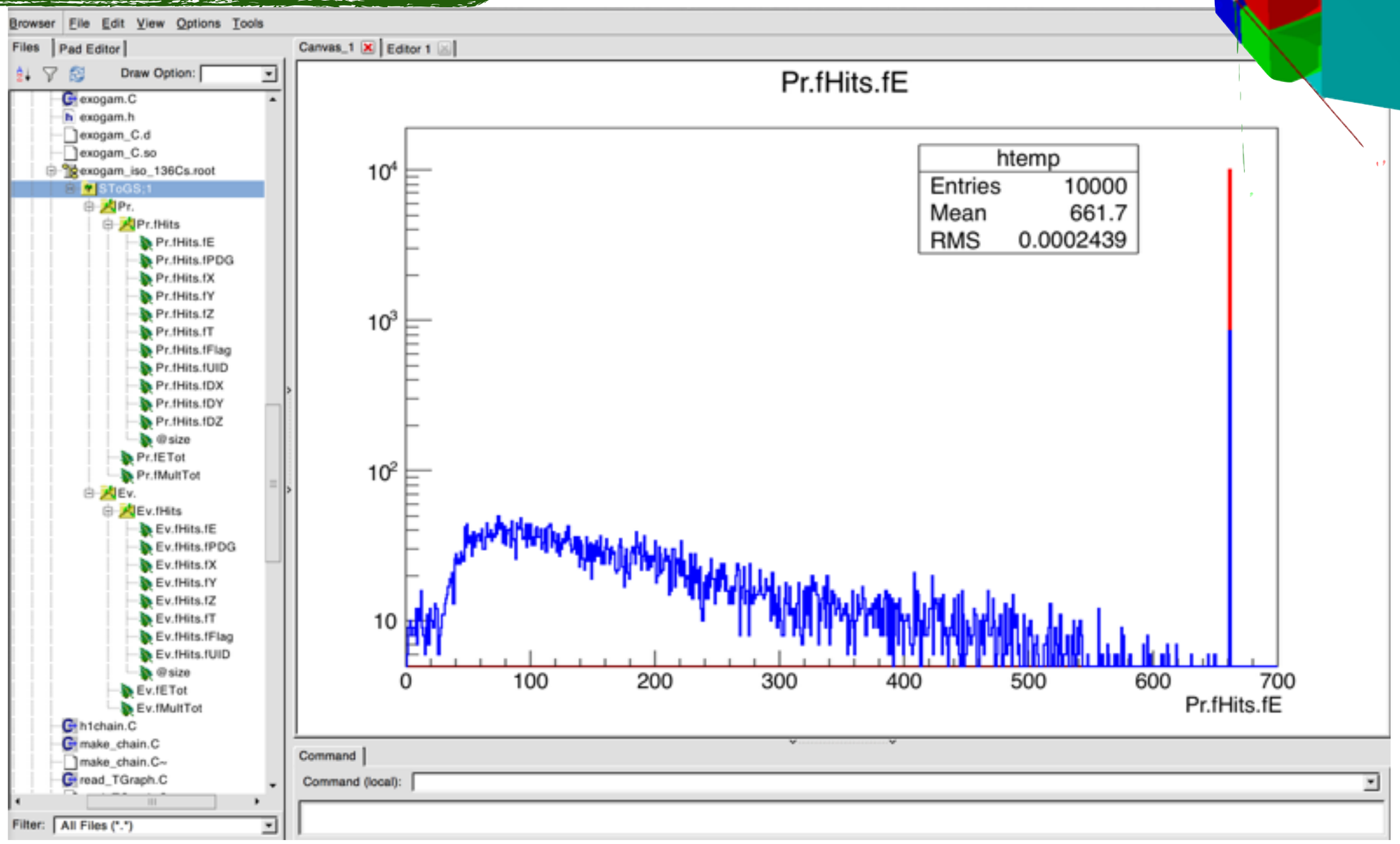
```
3  #
4  # The UserActionInitialization (which deals without outputs and the generator [thread local objects])
5  #
6  #actions: printout run;event;track;step
7  #actions: ascii setup/SToGS_ascii_actions.conf
8  actions: stogstree setup/SToGS_tree_actions.conf
9  #
10 # Detector geometry
11 #
12 #setup: factory DetectorFactory/Generics/TwoShells$toto
13 #setup: factory DetectorFactory/Scintillators/ParisPW_2
14 setup: factory DetectorFactory/SemiConductors/Ge/EXOCLOVER_A-bare
15 #setup: factory DetectorFactory/Arrays/AGATA_180
16 #
17 # The Physics list
18 #
19 physics: stogs_m general0;emstandard_opt0;
20 #physics: stogs_m general0;emstandard_opt0;Optical;
21 #physics: stogs_m general0;emstandard_opt0;ParisHadron0
22 #
23 # generator
24 #
25 generator: GPS G4Macros/GPS_Cs137.mac
26 #
27 # In case of MT, allows the user to specify the number of threads
28 #
29 nbthread: 2
30 #
```

Line: 6:2 | Apache | Tab Size: 4

Configuration

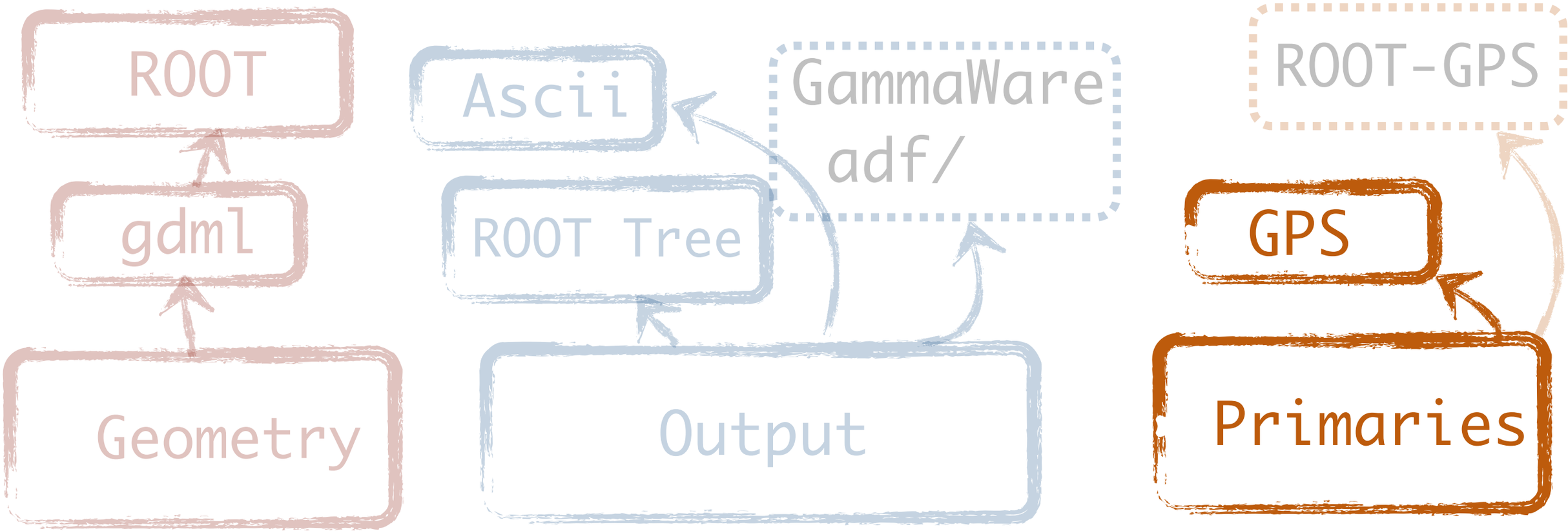
Output root file





Configuration

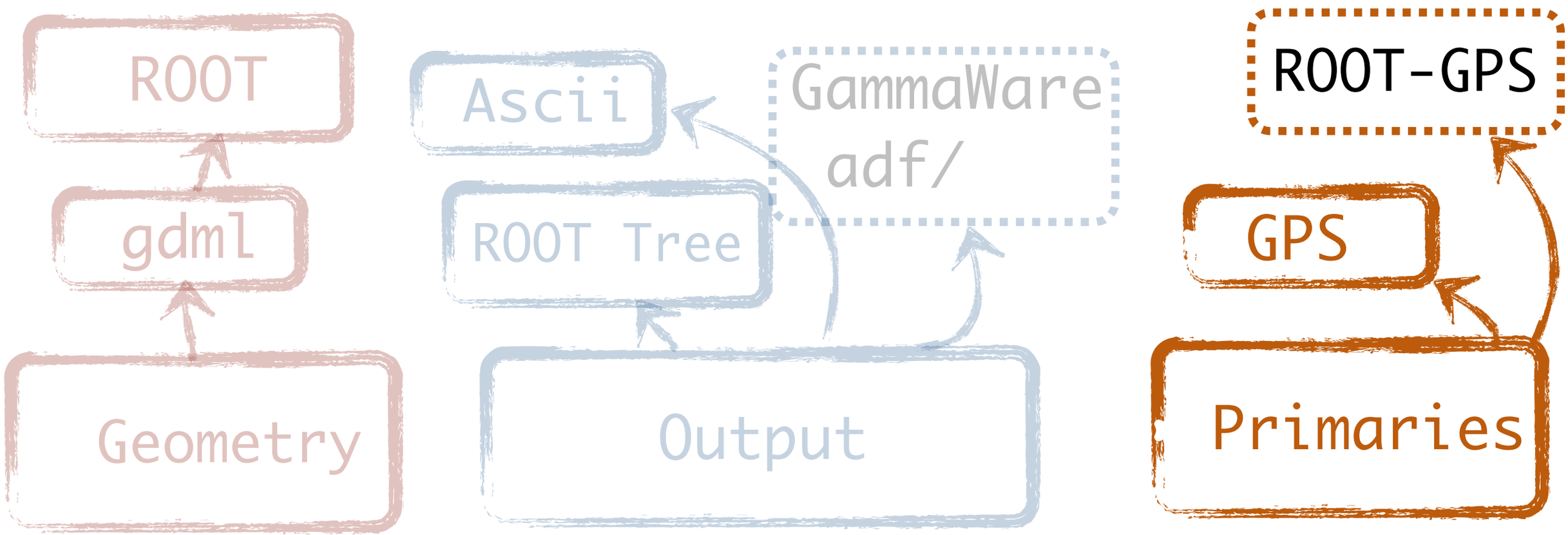
General structure of SToGS package



Geant4 ↔ USER

Configuration

General structure of SToGS package

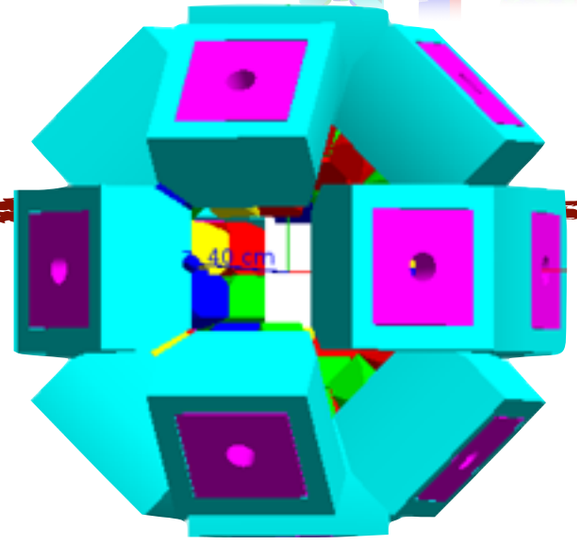


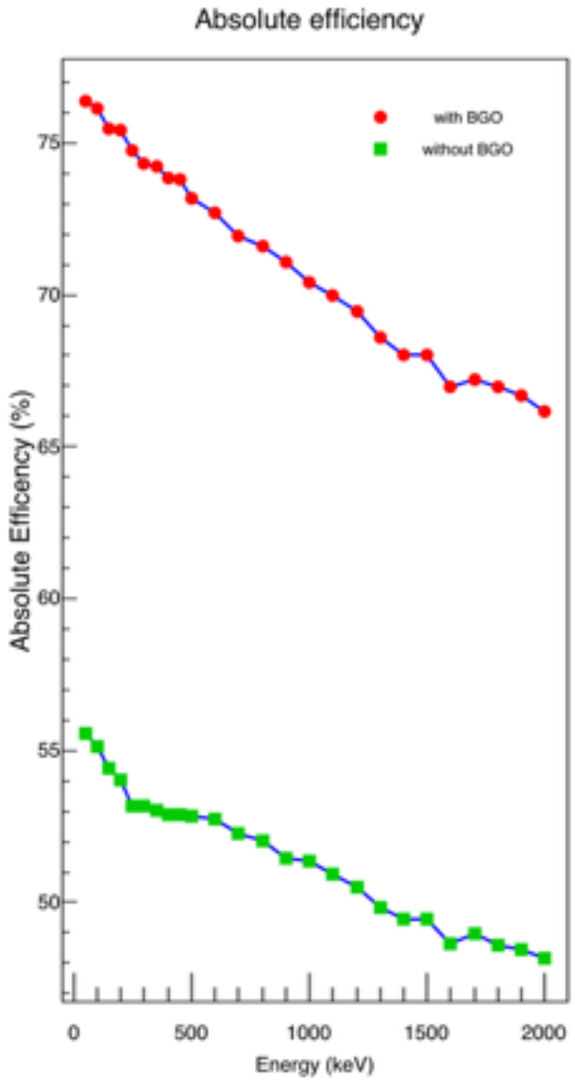
Geant4 ↔ USER

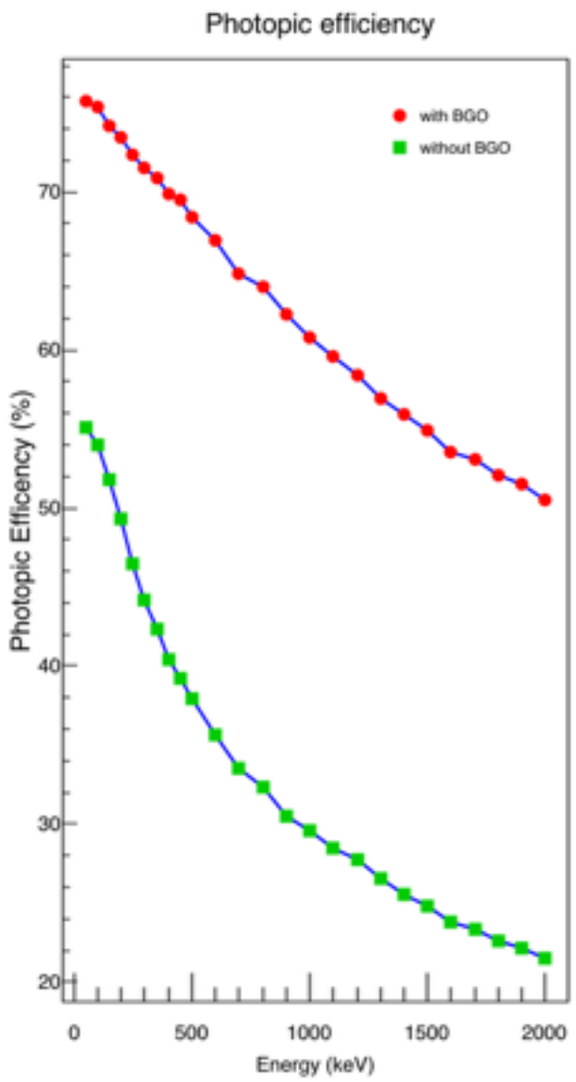
Results

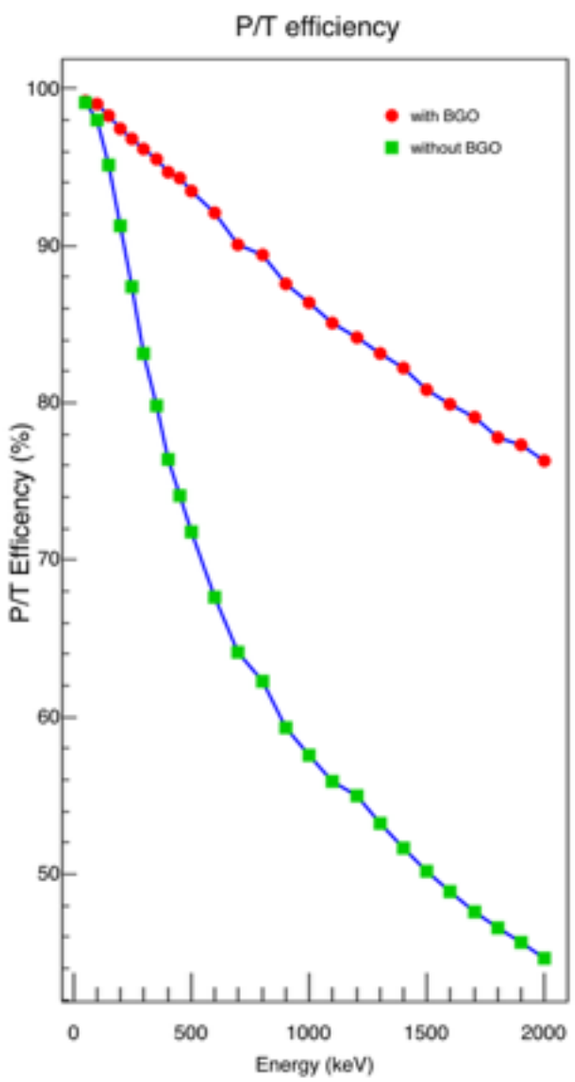
EXOGAM detector ^{137}Cs source

d = 11.35 cm from the center





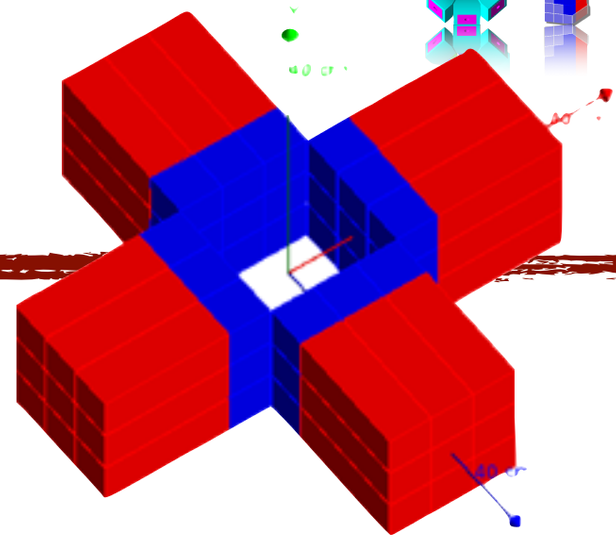




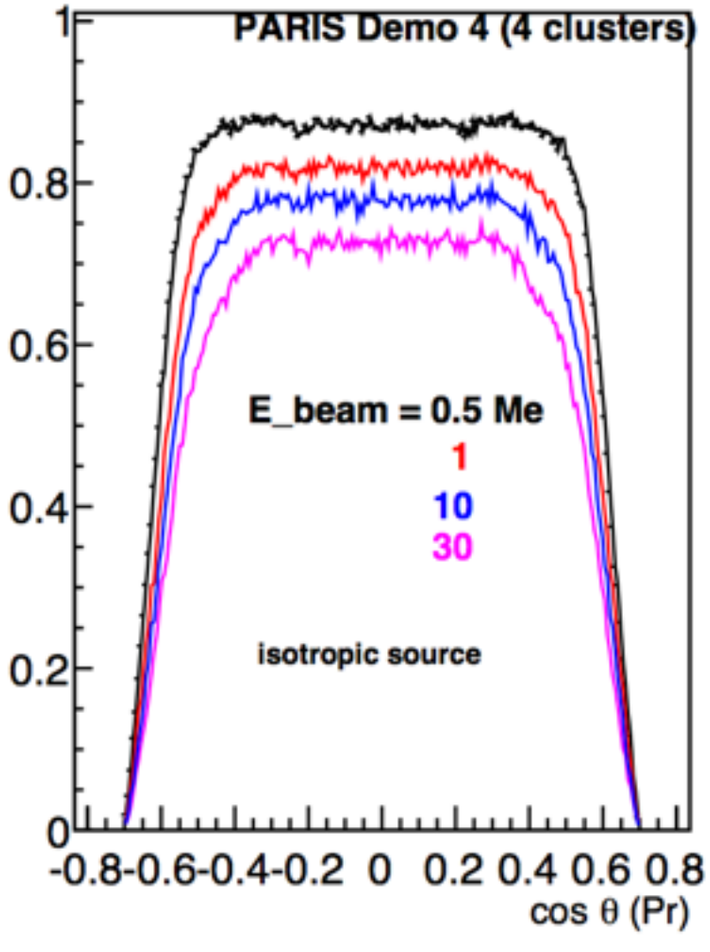
Results

PARIS Demonstrator 4 clusters at 90°

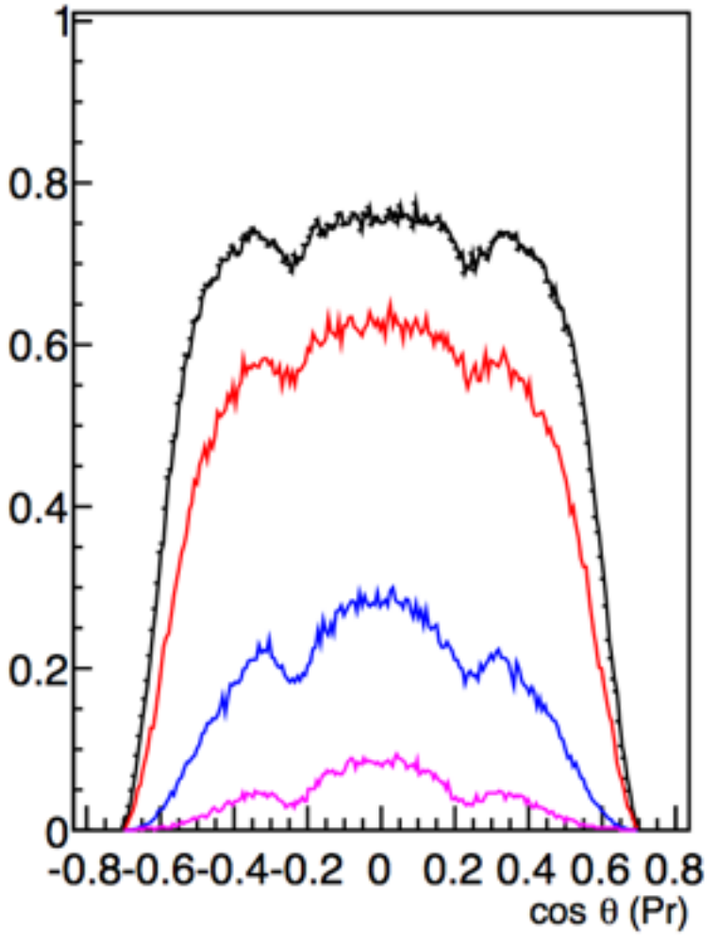
d = 7.7701 cm from the center



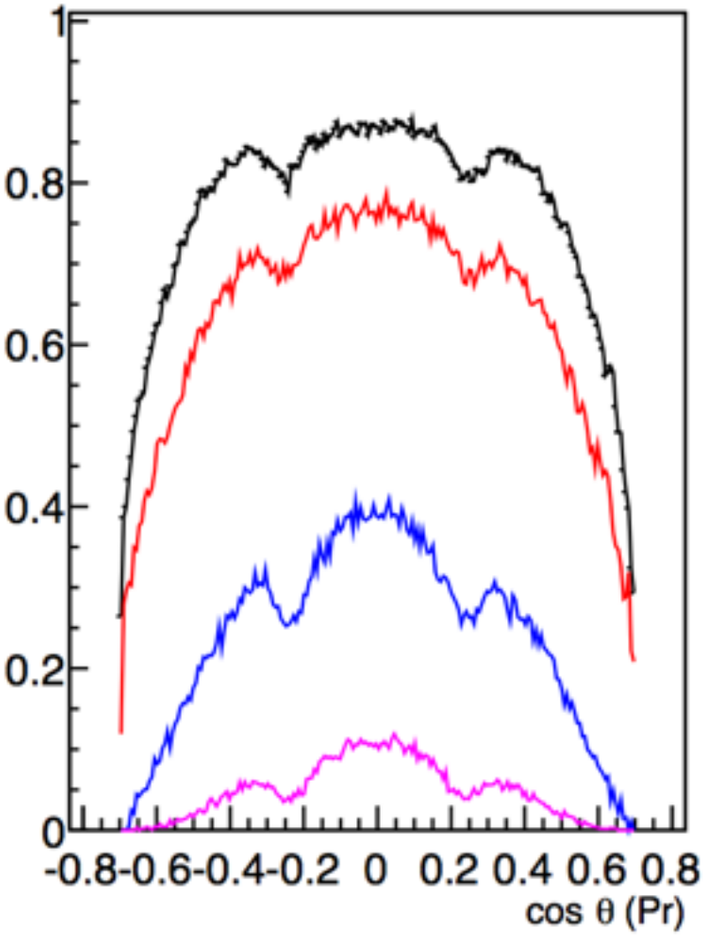
Total/Sent (absolute efficiency)



Peak/Sent (photopic efficiency)



Peak/Total



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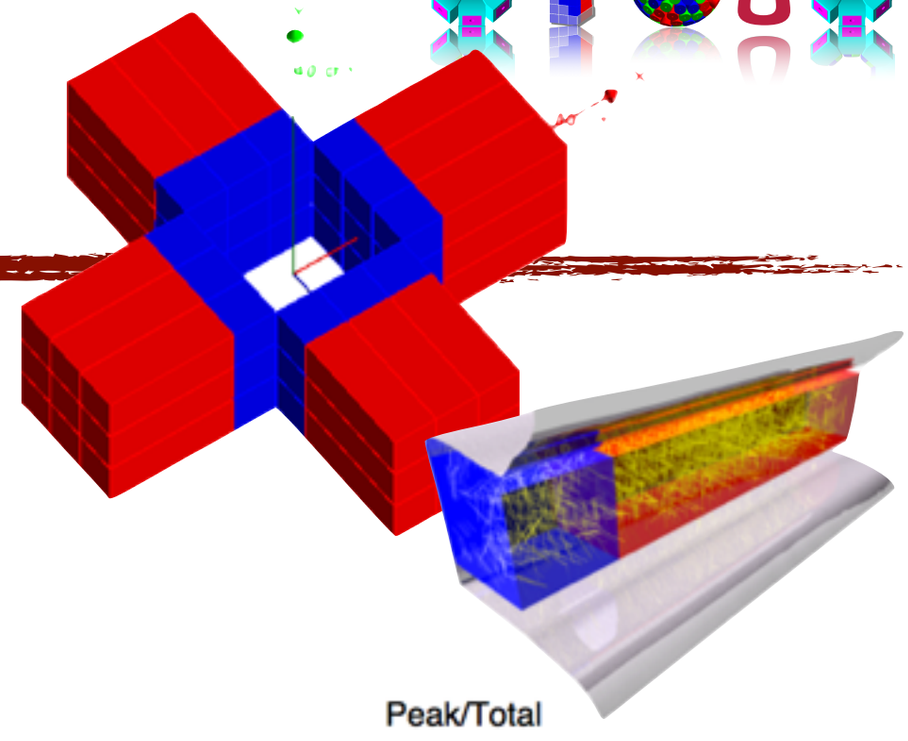

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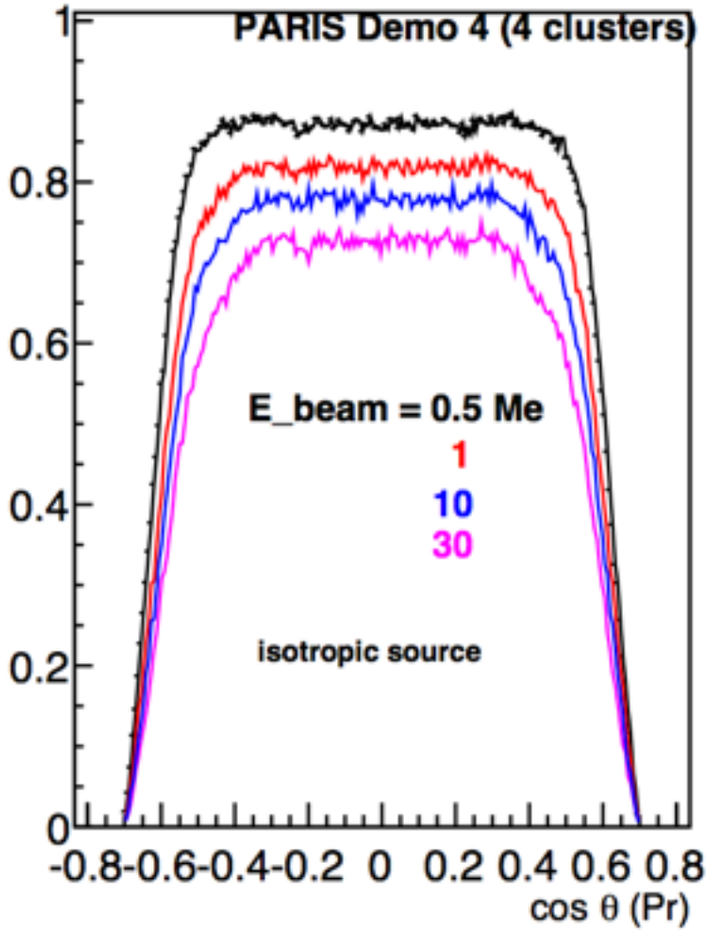

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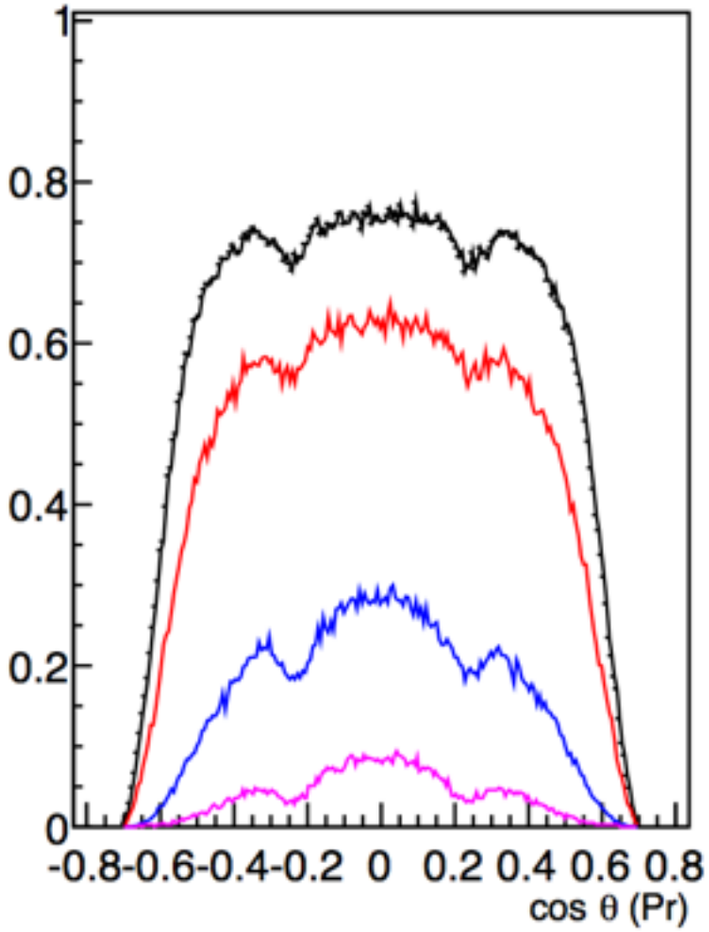

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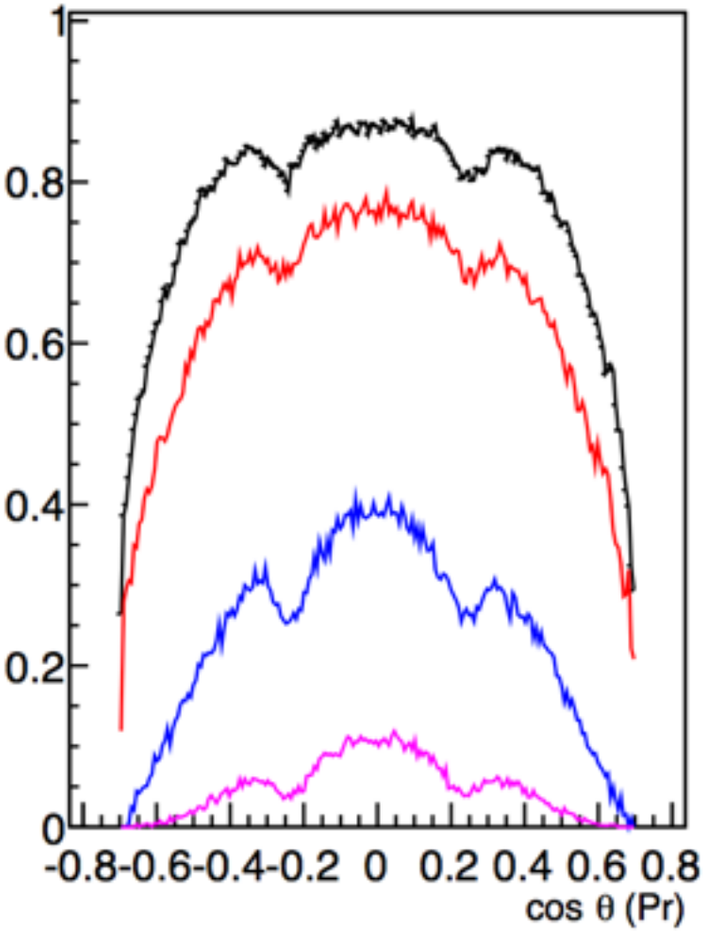

Conclusions

Documentation

User guide ->In progress

Geometry

- based on facility to import-export set-up
- at the user level

More detectors to be added in the Factory

Physics

Output: plugging system i.e. ascii, root tree…

Input: ROOT tree interface (GPS like)

Nuclear reactions, exotic beam in Geant4

The End

Configuration

Installation

git https://github.com/stezow/stogs

cmake

a version of Geant4 installed with the GDML module compiled

git clone https://github.com/stezow/stogs.git SToGS