

# Geant 4

*IEEE Nuclear Science Symposium and Medical Imaging Conference  
Short Course*

## **Simulation Techniques Using Geant4**

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<http://www.ge.infn.it/geant4/events/nss2008/geant4course.html>

This course exploits training material developed by several Geant4  
Collaboration members: thanks to all of them!

# Analysis

In a Geant4-based simulation application

# Strategy

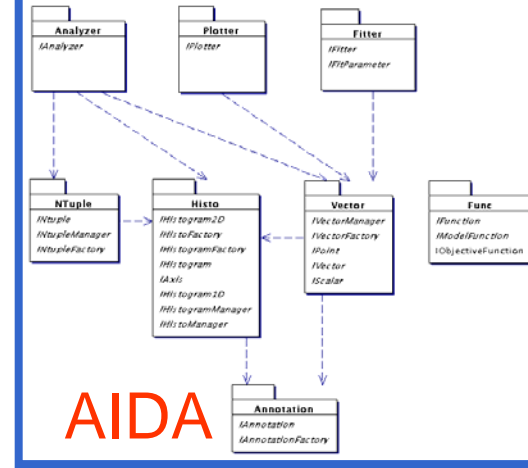
- **Geant4 does not contain any analysis tools**
- Geant4 is a particle transport simulation package: Data analysis is not its primary objective
- A user must introduce his/her own analysis functionality
  - Many advanced tools exist, which may be used for analysis of the simulation output
- **Basic strategy**
  - Store simulation output in an appropriate format
- Adopt your own approach
- Use advanced packages: AIDA-compliant tools, ROOT, ...
- Process the data after the simulation using analysis tools
- Gnuplot, Matlab, Octave, ...
- AIDA-compliant tools (JAS, OpenScientist, ...), ROOT, PAW...
- **Choose an analysis tool according to your needs**

# Interface to AIDA

Through abstract interfaces

No dependence  
Minimize coupling of  
components

## AIDA & Analysis Tools



```

G4VAnalysisManager
+~G4VAnalysisManager()
+RegisterAnalysisSystem(G4VAnalysisSystem *):bool
+GetHistogramFactory(const string &):IHistogramFactory *
+Store(IHistogram *):void
+Plot(IHistogram *,const string &):void
    
```

```

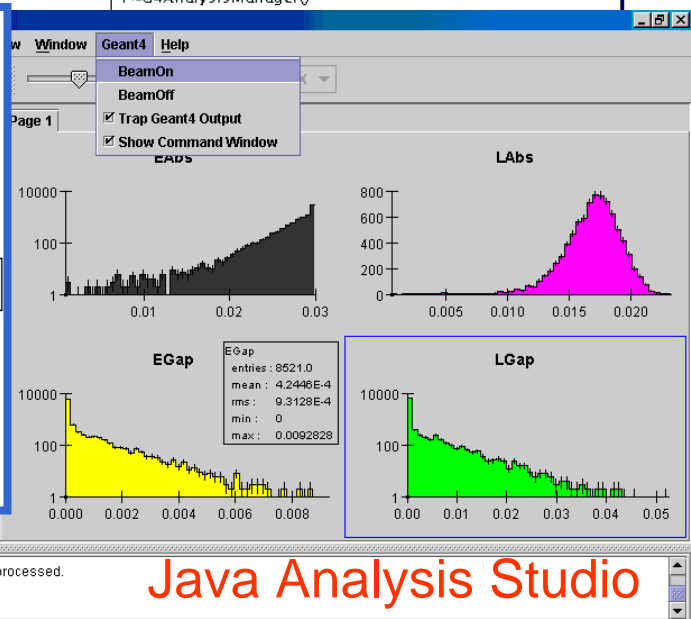
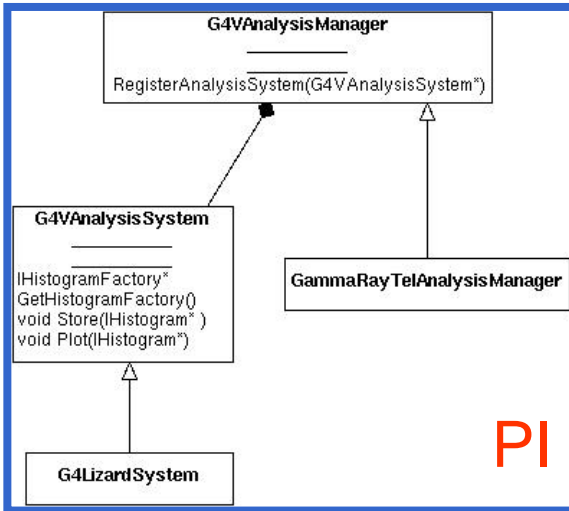
G4AnalysisManager
-fSystems:std::vector <G4VAnalysisSystem *>
-fCurrentSystem:G4VAnalysisSystem *
+RegisterAnalysisSystem(G4VAnalysisSystem *):bool
+GetHistogramFactory(const string &):IHistogramFactory *
+Store(IHistogram *):void
+Plot(IHistogram *,const string &):void
+G4AnalysisManager()
+~G4AnalysisManager()
    
```

```

G4VAnalysisSystem
+~G4VAnalysisSystem()
+RegisterAnalysisSystem(G4VAnalysisSystem *):bool
+GetHistogramFactory(const string &):IHistogramFactory *
+Store(IHistogram *):void
+Plot(IHistogram *,const string &):void
    
```

```

G4AnalysisSystem
+~G4AnalysisSystem()
+G4AnalysisSystem()
+RegisterAnalysisSystem(G4VAnalysisSystem *):bool
+GetHistogramFactory(const string &):IHistogramFactory *
+Store(IHistogram *):void
+Plot(IHistogram *,const string &):void
    
```



## Java Analysis Studio

# Interfacing to Geant4

- AIDA (Abstract Interfaces for Data Analysis) can be used in Geant4 by selecting the environmental variable `G4ANALYSIS_USE`
  - Requires AIDA headers installed in the system
  - Requires an AIDA compliant tool for analysis
- Tools for analysis compliant with AIDA interfaces currently are:
  - iAIDA (C++)
  - JAS (Java Analysis Studio)
  - Open Scientist Lab (C++)
  - PAIDA (Python)