

# CAD to GDML converter

(September 12 2012)

To provide an opensource CAD  
software with GDML support

[Http://cad-gdml.in2p3.fr](http://cad-gdml.in2p3.fr)

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Review by : Jürgen Riegel, Werner Mayer,  
FreeCAD authors

<http://sourceforge.net/apps/mediawiki/free-cad/>

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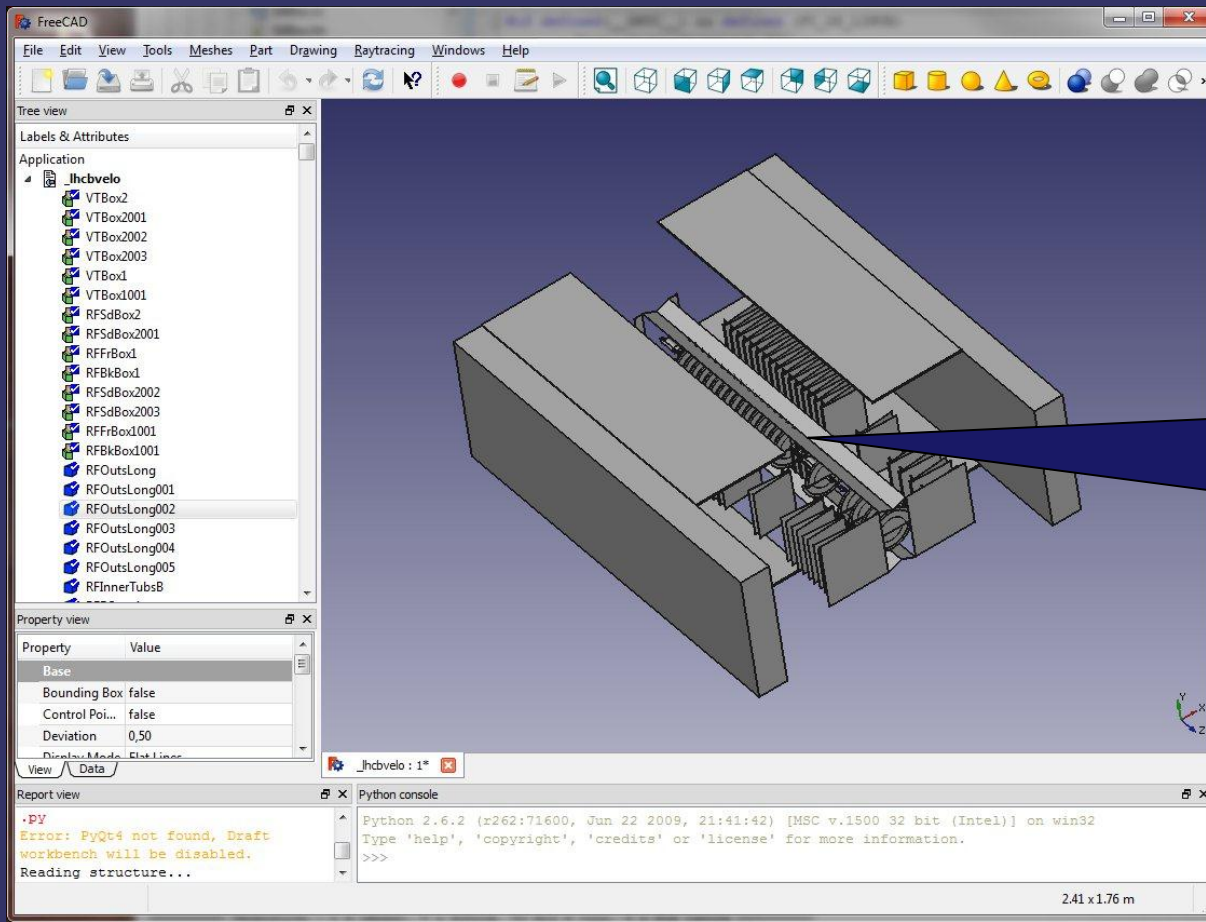
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# *SUMMARY*

- FreeCAD Development,
  - Code structure,
  - Main class for GDML module,
  - Current development status,
  - Possible steps and scheduling,
  - Sustainability
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# FreeCAD Development

- Open source CAD software
- Efficient modularity, reactive forum, easy to dev.
- Languages: C++ and Python
- Libraries: OpenCascade, Coin3D, Qt, **XercesC**,...
- Supported platforms: Windows, Linux, Mac OSX



LHCb Vertex detector under FreeCAD (boxes and full tubes only)

# FreeCAD Development

## Re: Support for importing/exporting GDML file format in FreeCAD

by [wmayer](#) » Mon Aug 06, 2012 9:16 am

“

Part::Boolean, Boolean operation are widely used inside GDML and because 'tube' could be a subtraction between two

This is straightforward. Just create a Part::Cut assign the bigger cylinder to "Base" and the smaller one to "Tool".

“

Create a new part of type trapezoid (which is oftenly used with GDML ) Part::trapezoid

Have a look to the Wedge. I think this can also be used to model a trapezoid. Just play a bit with the parameters.

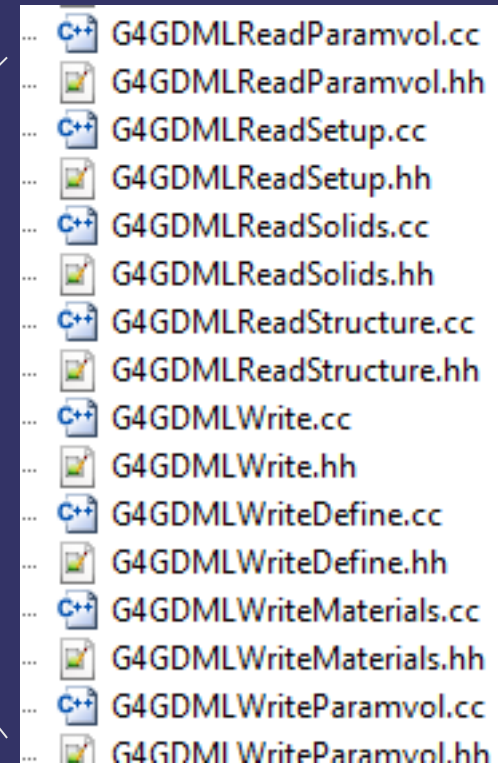
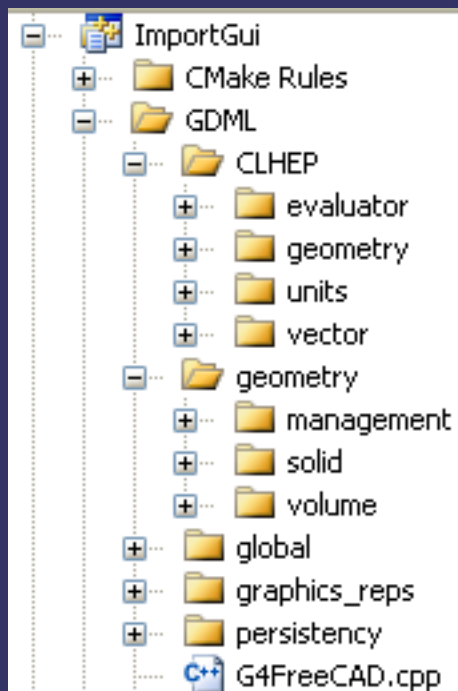
“

Convert most of other CAD shapes into tesselated solids (a set of closed facets).

You mean a triangle mesh? Why that and not using a generic part object?

# Code structure

- I integrated the necessary Geant4 files into FreeCAD code keeping the same directory tree.
- To make the development safer, I will re-implement the interface with the GDML independent library.




## Main class for GDML module

G4FreeCAD class role is to « interface » selected Geant4 source code to FreeCAD:

- ➔ G4FreeCAD class instance **reads** (boxes and full tubes) recursively geometry parsed from G4GDMLParser and **converts it into FreeCAD internal shape representation** (Document/View architecture)
  - ➔ G4FreeCAD class instance **writes** boxes and full tubes to GDML.
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# Current development status

## What is working?

- To read boxes and full tubes solids from GDML files,
  - To read placement and rotation (transformation)
  - To create boxes and full tubes solids,
  - To modify placement and rotation,
  - To write GDML files with boxes and full tubes,
  - To export STEP...
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# Possible steps and scheduling

	FTE (months)
➤ Verbosity implementation	0.5
➤ Prevent unrecognized solids	0.5
➤ Boolean solids implementation	1
➤ Write a developer documentation.	1
➤ STEP, STL or PLY to GDML conversion (tessellated solids only).	1
➤ Hierarchy and material implementation	6
➤ Full GEANT4 geometry implementation...	x

Need further  
investigation to be  
correctly estimated



# Sustainability

Still missing a user friendly interface to import in Geant4 a CAD geometry file keeping alive the volume's hierarchy and the solids shapes.

GDML support with FreeCAD is very promising.

- Proposal : to use FreeCAD
  - **Evaluation of this solution by G4 collaboration** expert's before going on
  - If positive
    - =>Request to be a G4 related project
    - =>Link from GEANT4 web site?
    - =>Develop a GEANT4 driver?
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