ARTENUM, PARIS
Science & Groupware

EDGE 2.1.0 PRESENTATION

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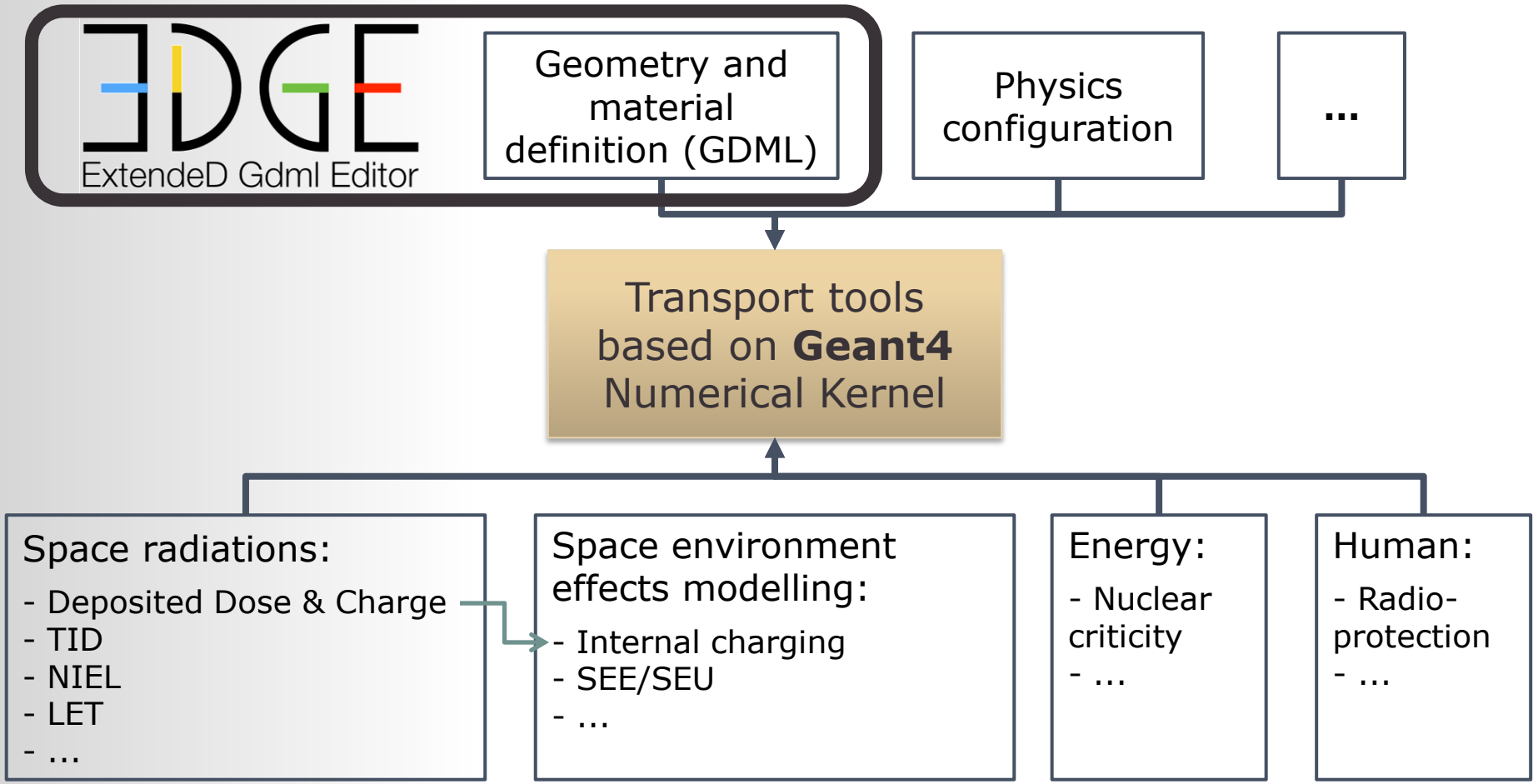
EDGE — Context



> Artenum have created in 2015 — on its own R&D effort — **EDGE** for ExtendeD Gdml Editor, a **GDML editor**

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EDGE — ExtendeD Gdml Editor

- User-friendly GUI **to create/visualise and edit GDML** based geometries with real-time **3D rendering**
- Creation/edition and application of **material properties**
- Available on **Linux, macOS and Windows**
- Version **2.1.0** released in **February 2018**
- More details on **EDGE functions** on http://space-suite.com/edge

Some EDGE versions	
Version	**Date**
2.0.11	Feb. 2016
2.0.17	Oct. 2016
2.1.0	**Feb. 2018**
2.2.0	Apr. 2018

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EDGE — I/O

Import

.gdml

.geo

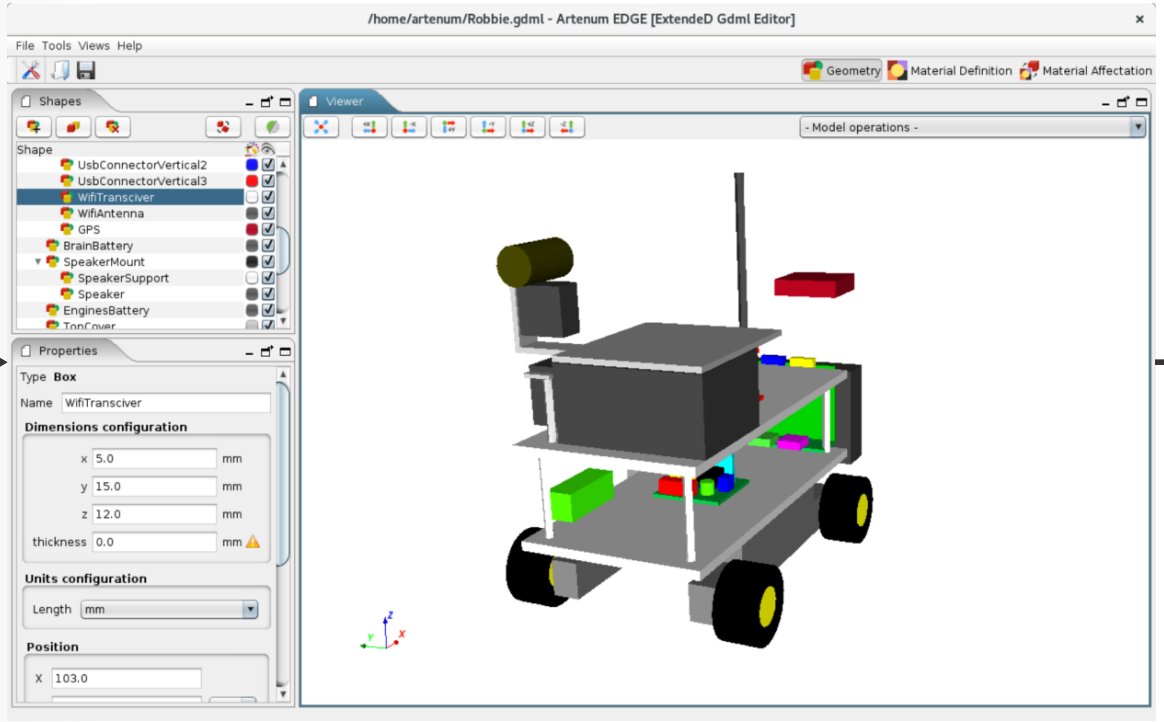
.stp

.stl

.msh

.unv

(via tessellation)



Export

.gdml

.geo

EDGE – Under the hood

EDGE

is based on

also uses

VTK Gmsh PENELOPE

Frida DockingFrames GNUTrove

Java™ OSGi™ ...

KERIDWEN
INTEGRATED MODELLING ENVIRONMENT

Artenum **open-source modular** toolbox of interoperable software modules providing a structured set of **key functions** common to most **scientific software**.

also powers → SPIS MOORA ...

Standard/shared components:
› improve efficiency/speed of developments
› **enhance quality of software**
› Keridwen improvements benefits all tools

More info at http://www.keridwen.org

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Activity context

- ESA contract **4000122289/17/NL/LF**
  - supply of a time-unlimited, multi-users **EDGE 2.1.0 license** for internal use at TEC-EPS
  - improvements performed on EDGE to suit ESA/community needs
  - **technical officers**: Giovanni Santin and David Rodgers
  - **study team**: Artenum SARL, France
    - Arnaud Trouche
    - Julien Forest
    - Amandine Champlain
    - Benjamin Jeanty-Ruard

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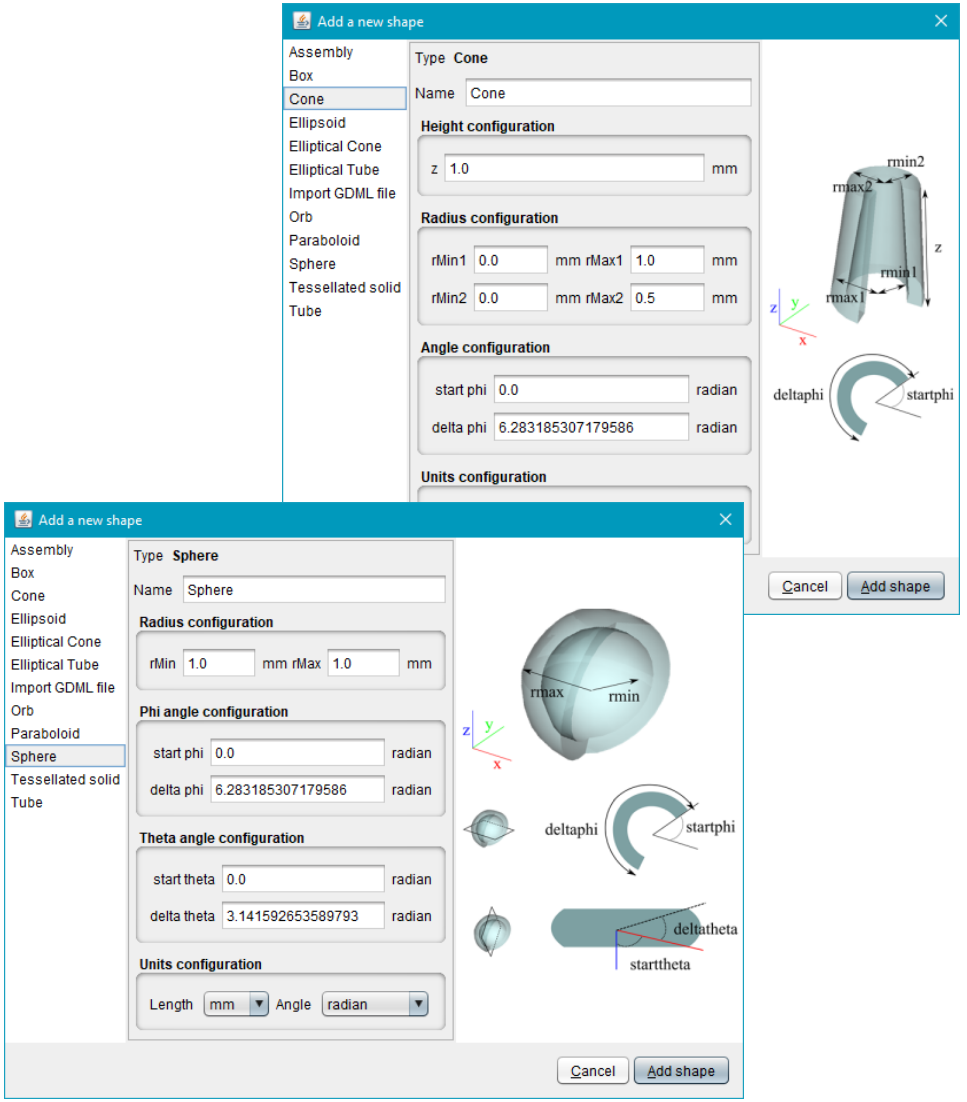
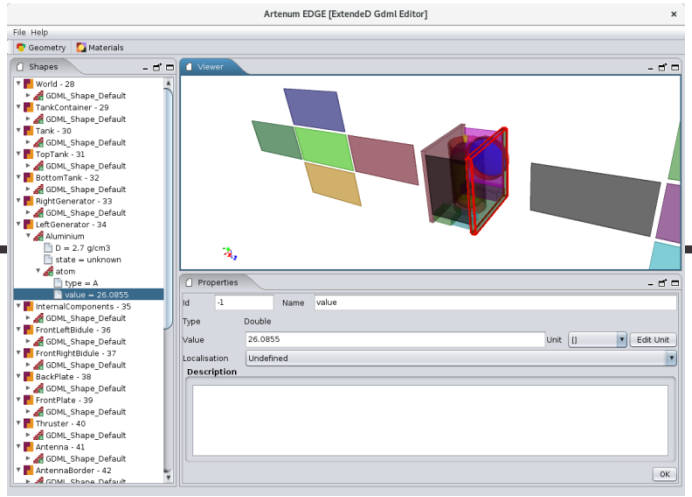
Global usability improvements

- Shortcut to display the user manual in the software
- Display images describing the shapes parameters
- Remember the opened file (“new” / ”save” / ”save as” functions available)
- New preferences menu:
  - change default materials
  - change GDML writing options
  - change global usability options



New material perspectives

- Material perspective split into

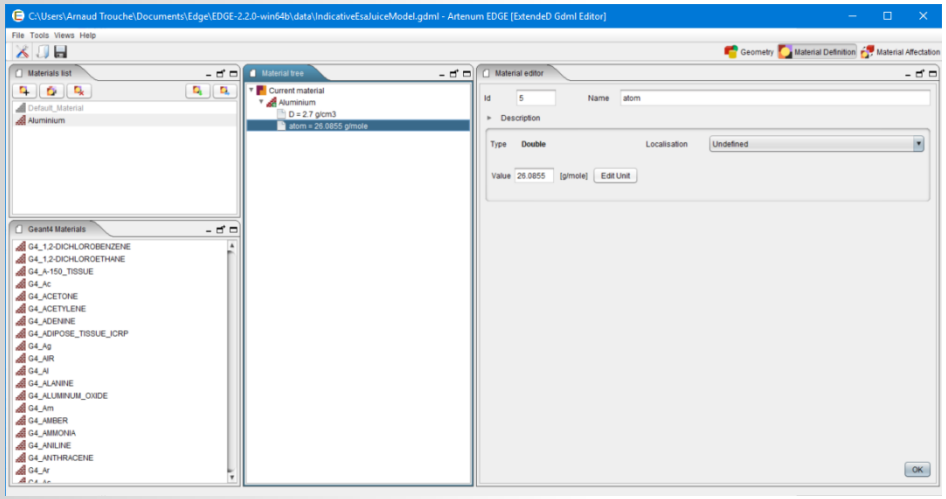


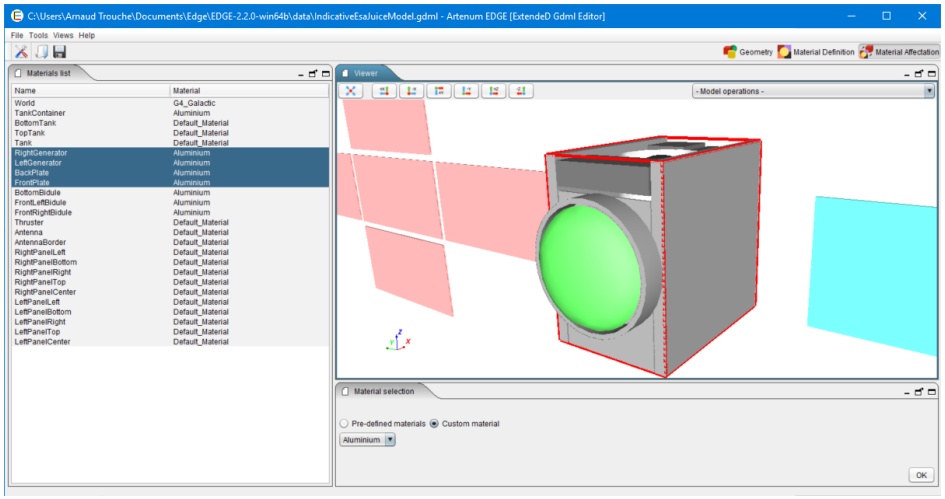
Material **definition**

create/modify/import materials

Material **assignment**

apply material to each shape





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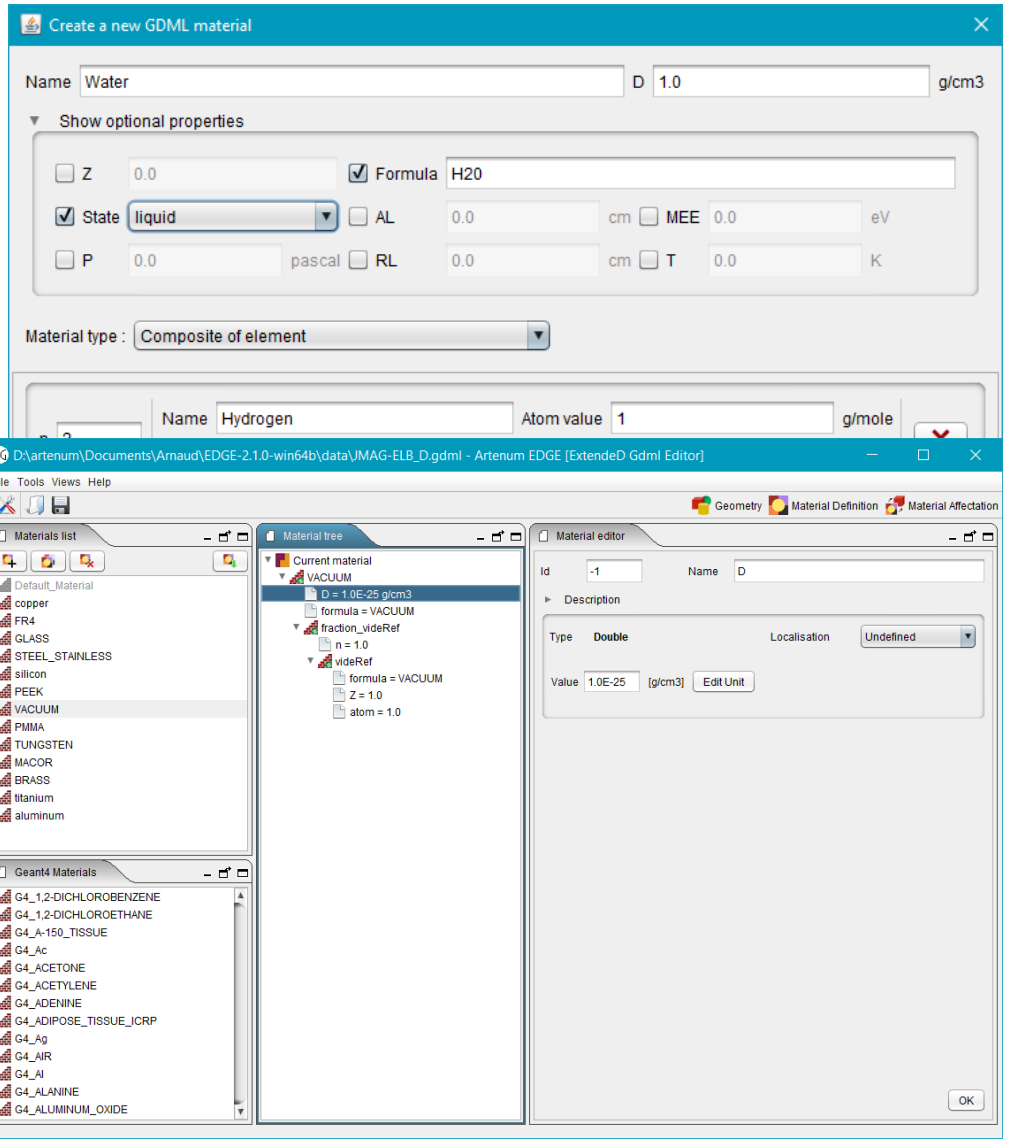
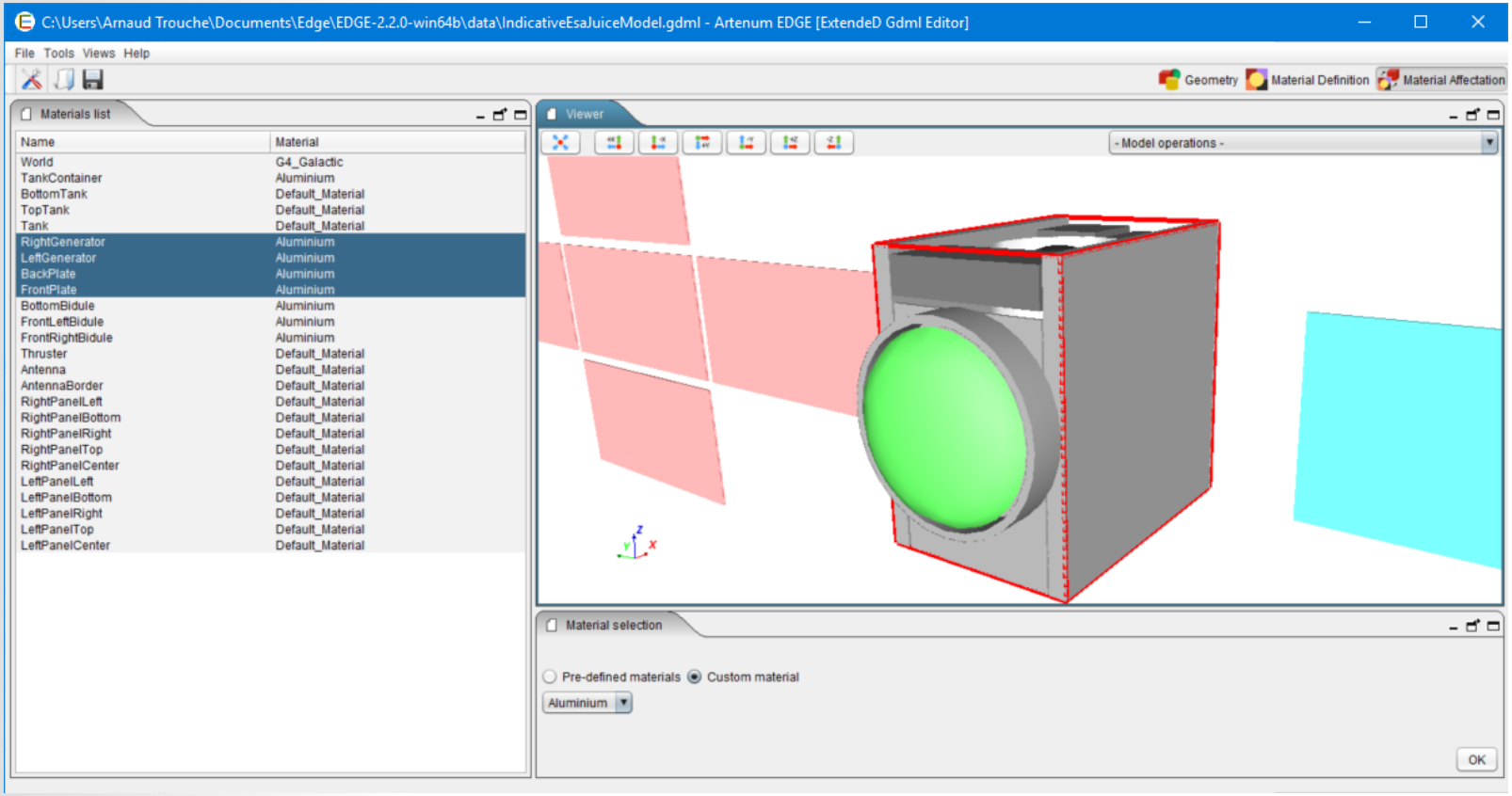
New material perspective: definition

- New user-friendly **material creation dialog**
- Duplicate user-defined materials
- **Import materials** from
  - the <material> tag of a .gdml file
  - external .xml GDML material file
- List of the available Geant4 default materials



New material perspective: assignment

- Possible to assign default Geant4 materials
- Material assignment of several elements at the same time

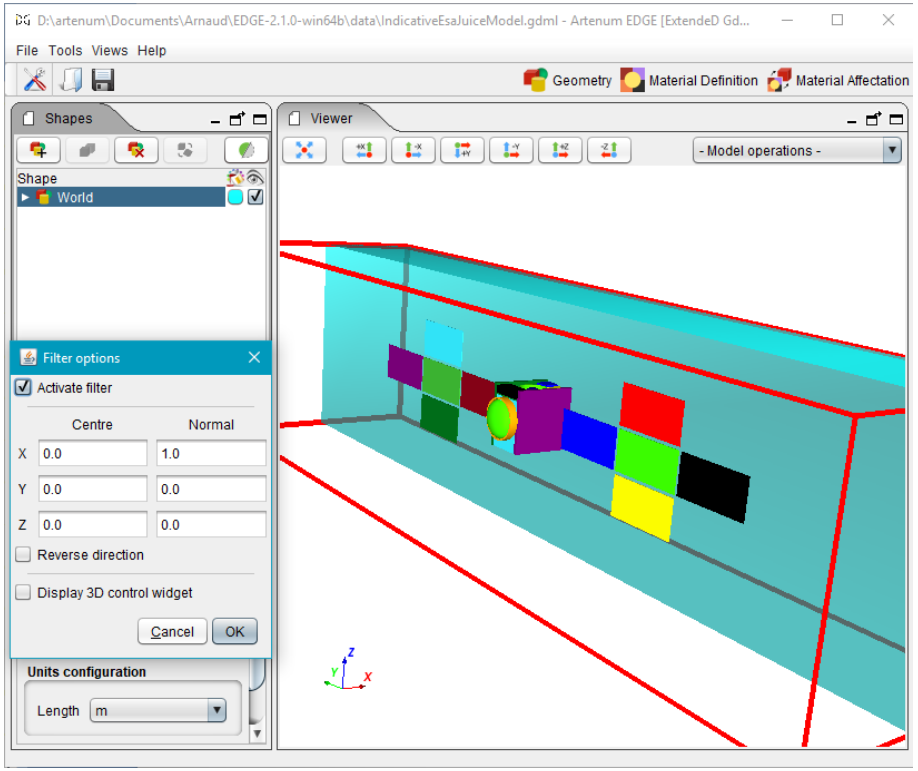


New functions (1/4)

Viewer functions

- Additional **3D controls** (align along axis and reset camera)

- Add **clipping** filter, useful to see inside an element by seeing only parts of it. Set it:
  - with centre and normal or
  - using interactive 3D component



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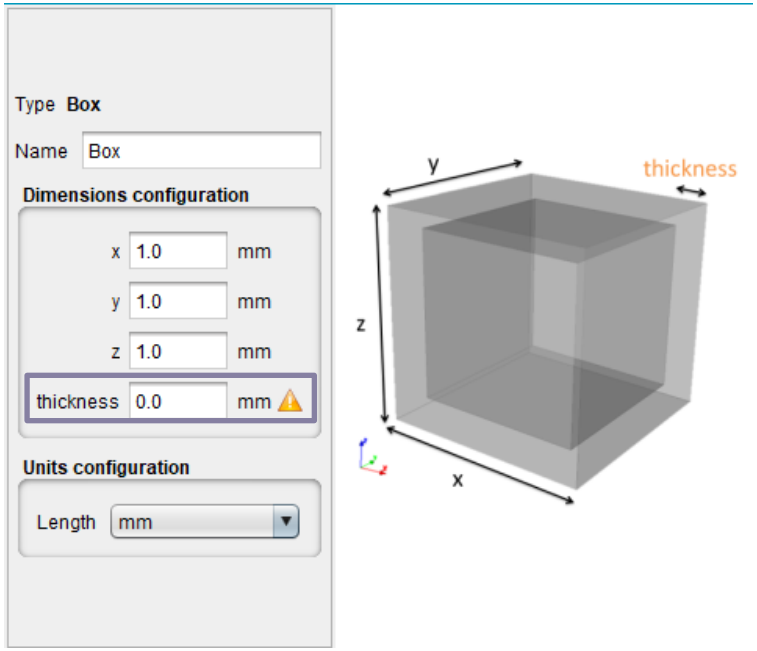
New functions (2/4)

New geometry elements

- Handle **assembly** element
- Add a "**thickness**" parameter on some shape to create easily "hollow" elements (cavity inside)
- Possibility to **reorganise** the **hierarchy** of elements with a drag and drop function



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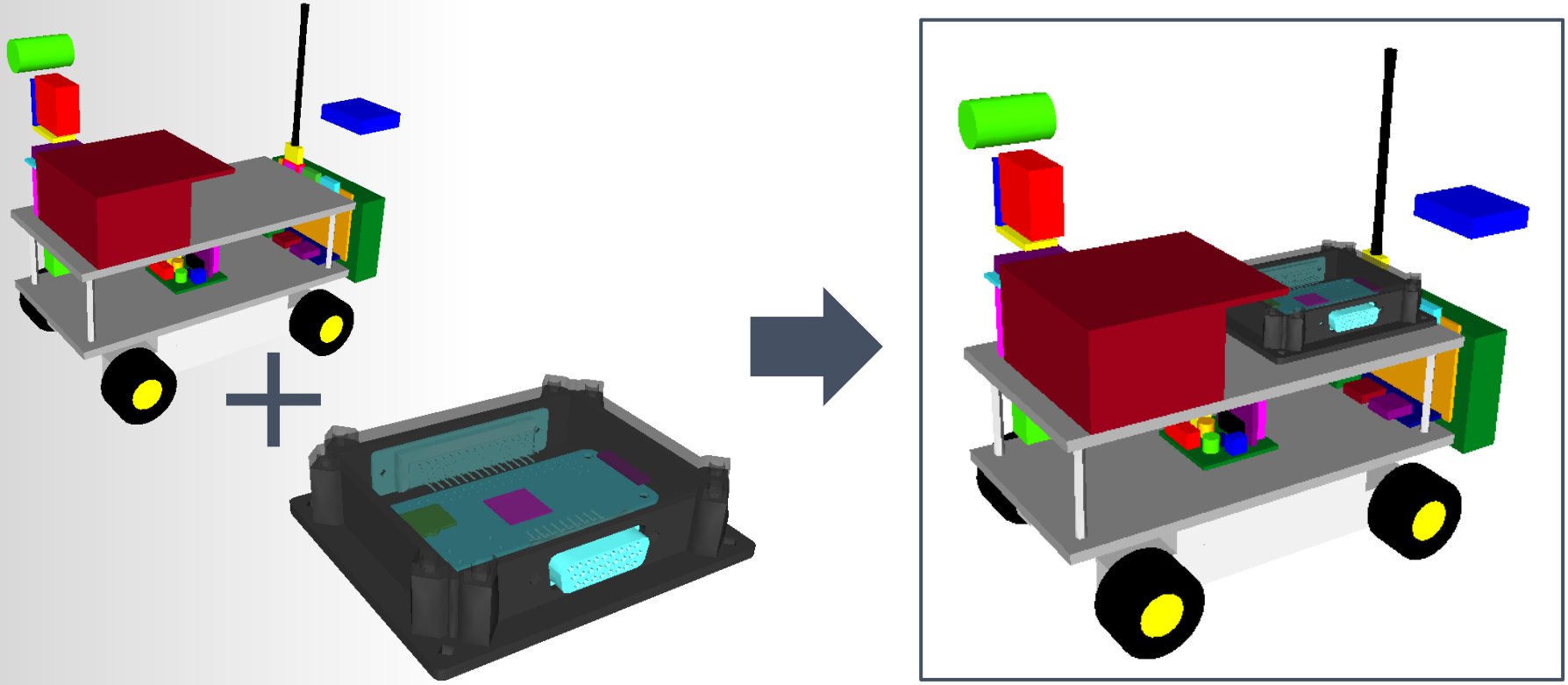
New functions (3/4)

Import external GDML file as a children element



- Handles name conflicts by renaming conflicting imported elements
- Allows importing sub-systems (i.e payload) into the global modelled geometry (i.e spacecraft)

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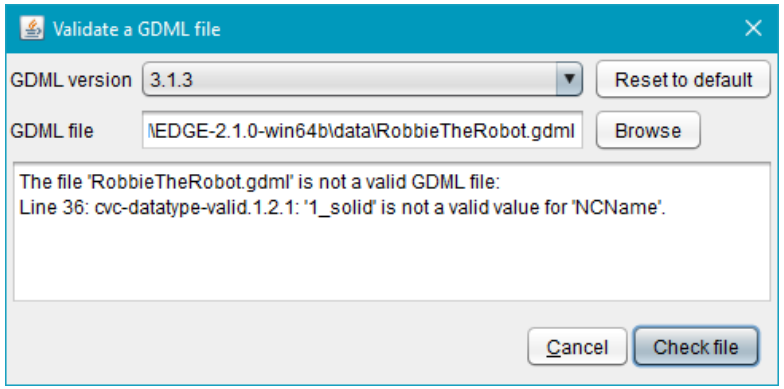
New functions (4/4)

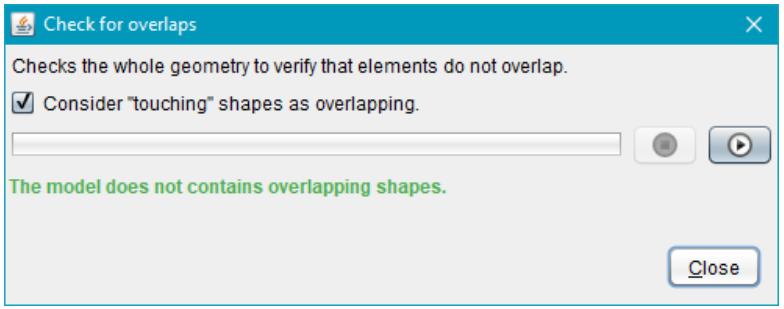
New tools and operations

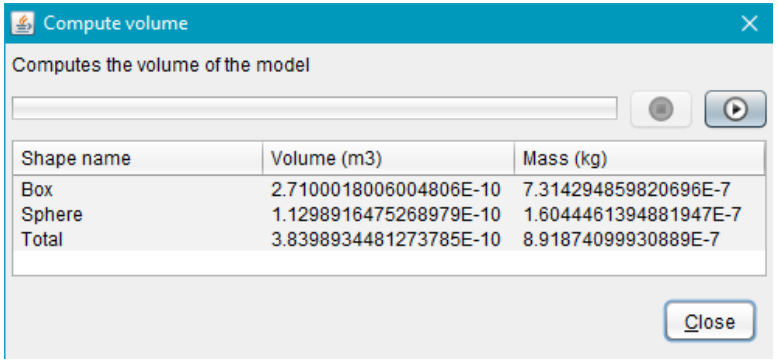
- Tool to check the **validity of a GDML file** against the GDML File Schemas (XSD)

- Tool to check that solids do not **overlap** each others
  - uses Artenum's Penelope ray-tracer engine — already used in other projects

- Tool to compute the **volume** and **mass** of the geometry using the material density
  - computes the volumes using Penelope mesh volume computation engine







Issues resolution

- Improve **name conflicts check** when loading a GDML file
  - warning when several shapes have the same name, only the first loaded
- Resolve **issue** with **rotation** interpretation:
  - was not correctly represented by EDGE 2.0.17
- Resolve several issues with **positions/rotations**:
  - inside the hierarchy
  - when using the multi-transformation dialog
  - inside Boolean operations
- Resolve various issues with the **3D Viewer**
  - improve viewer reactivity
  - resolve issues of consistency between the view and the model

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Optimisation

- Various improvements on file parsing/loading and on 3D view creation/update speeds

- File loading **time comparison***
  - for a ~**110Ko** GDML file with **~290 elements**
  - for a ~**28Mo** GDML file with **~236 elements** (mainly tessellated elements)

Edge Version	Loading Time
2.0.17	48 min
2.1.0	**32 sec**

Edge Version	Loading Time
2.0.17	22 min
2.1.0	**2 min**

› EDGE can load realistic geometries / complex systems

*on a Fedora 27 64b desktop computer (4 cores i5 / with 2Go of available RAM for the application)

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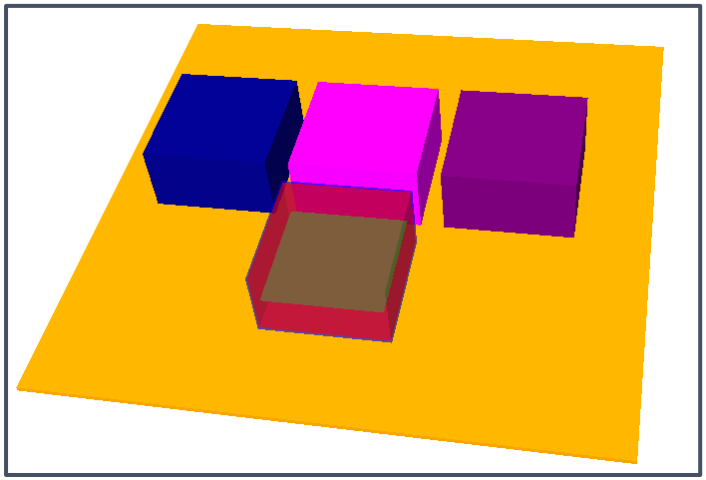
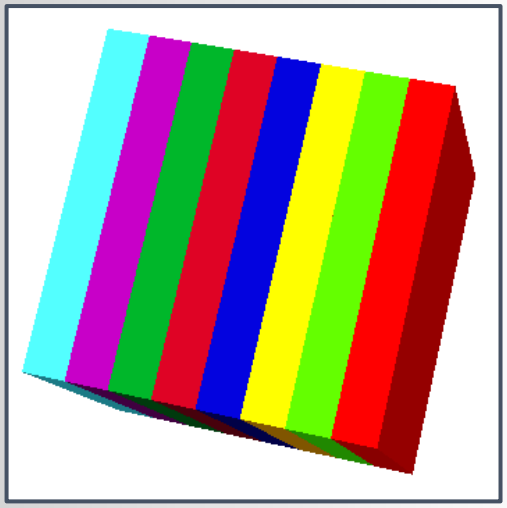
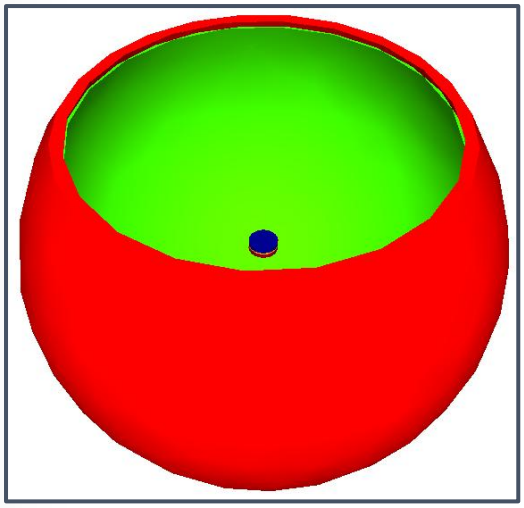
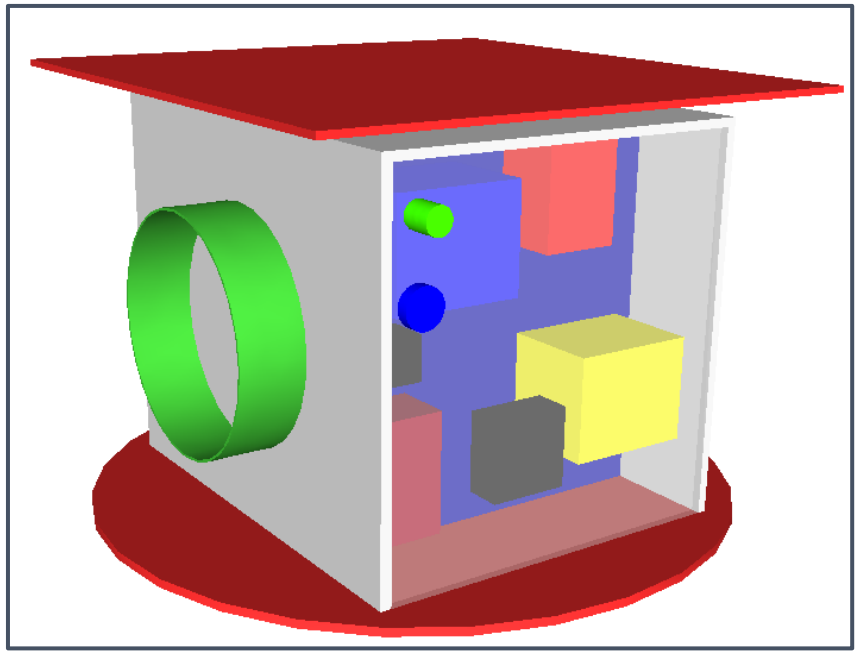
Validation (1/2)

- Loaded all **GRAS 03-04 example files**:
  - **33** files OK
  - **1** file loaded with warnings:
    - <loop> tag not handled currently
  - **1** file incorrectly loaded:
    - EDGE does not correctly interpret a variable with degree unit used in a solid with radian angle unit and the resulting interpretation is incorrect









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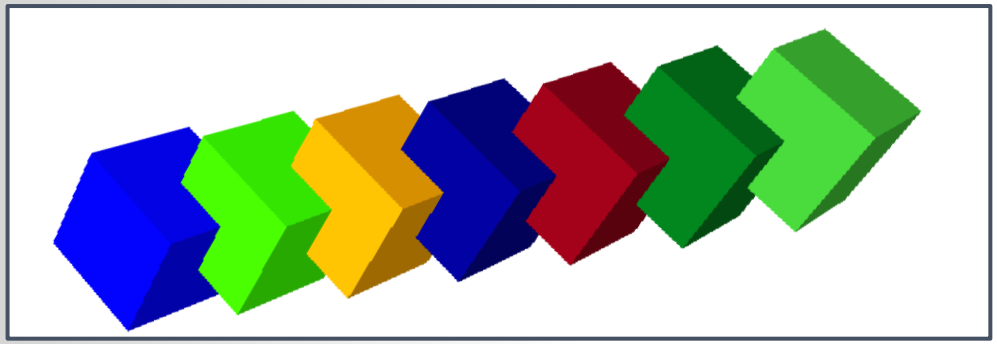
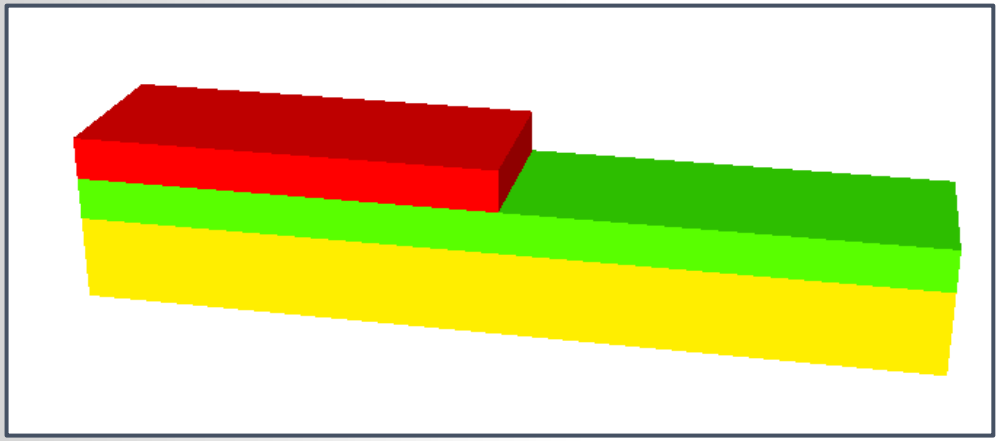
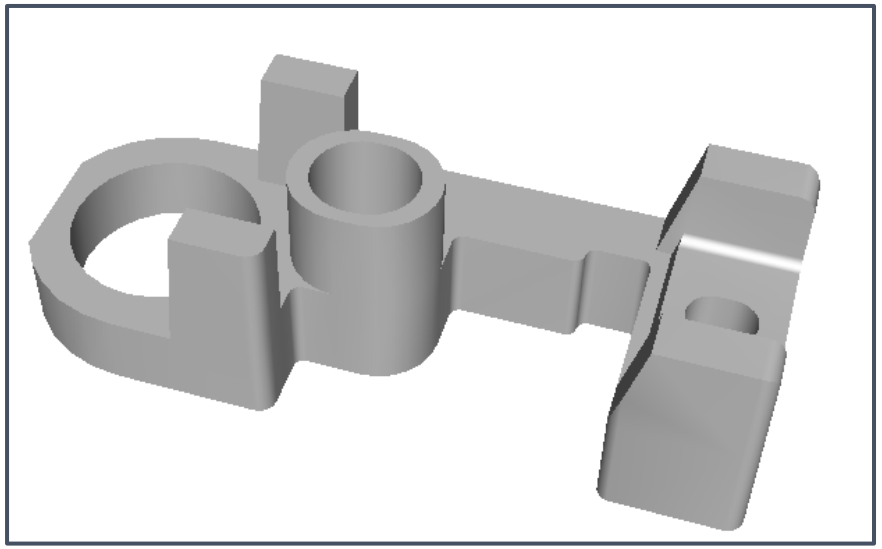
Validation (2/2)

- Loaded additional **example files from others Gras versions**:
  - **35** files OK
  - **2** files loaded with warnings:
    - some solids are not interpreted by Edge







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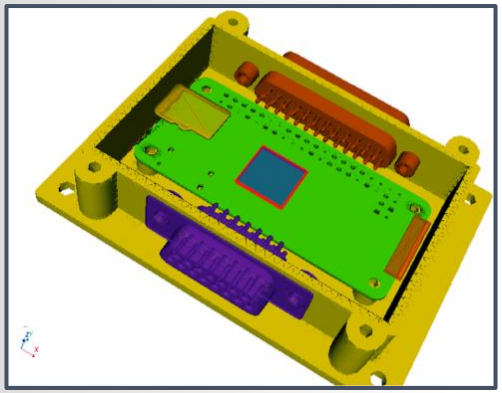
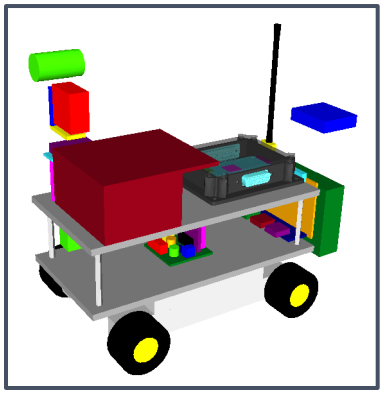
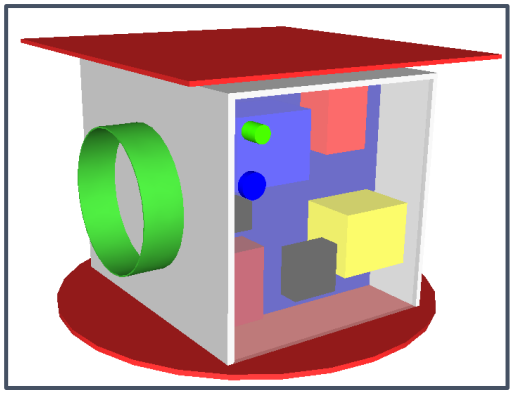
Conclusion

EDGE
ExtendeD Gdml Editor

- EDGE is functional and now used by ESA thanks to this activity
- Artenum continues to put efforts to improve the software
- EDGE is available on http://www.space-suite.com/edge







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