

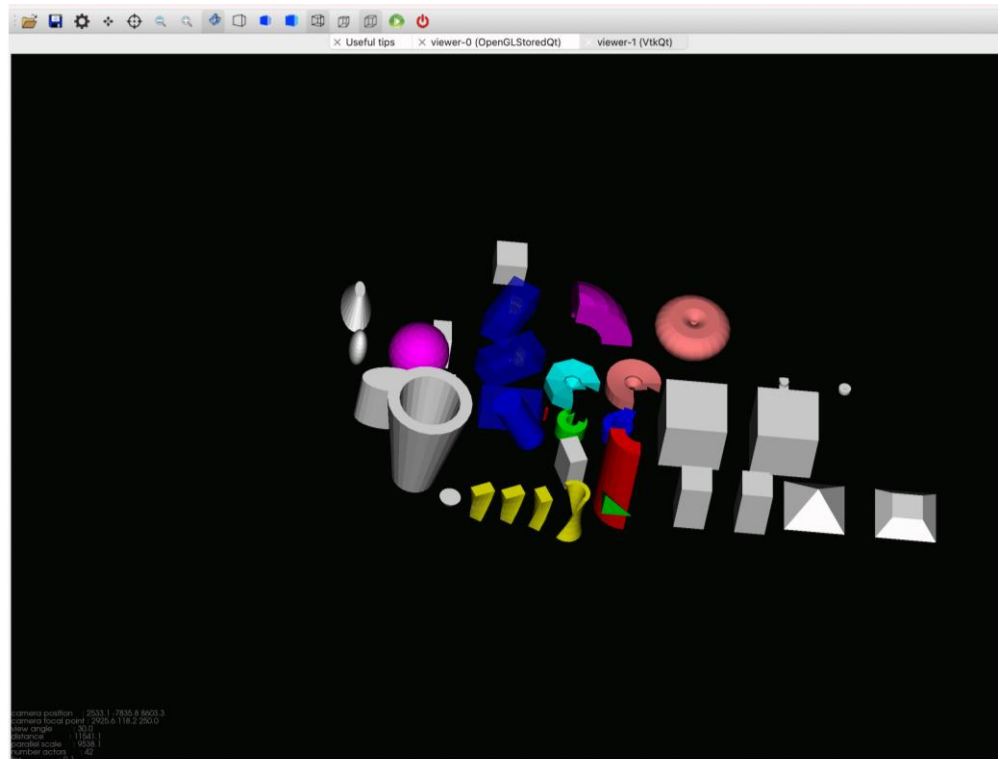
VTK visualisation driver (1)



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<https://vtk.org>

- **Visualisation Tool Kit (VTK)**
 - De facto standard in large scale 3D scientific data visualisation
- **Status of VTK in G4**
 - Usable driver with QT and without QT
 - Obeys most /vis/viewer/set commands



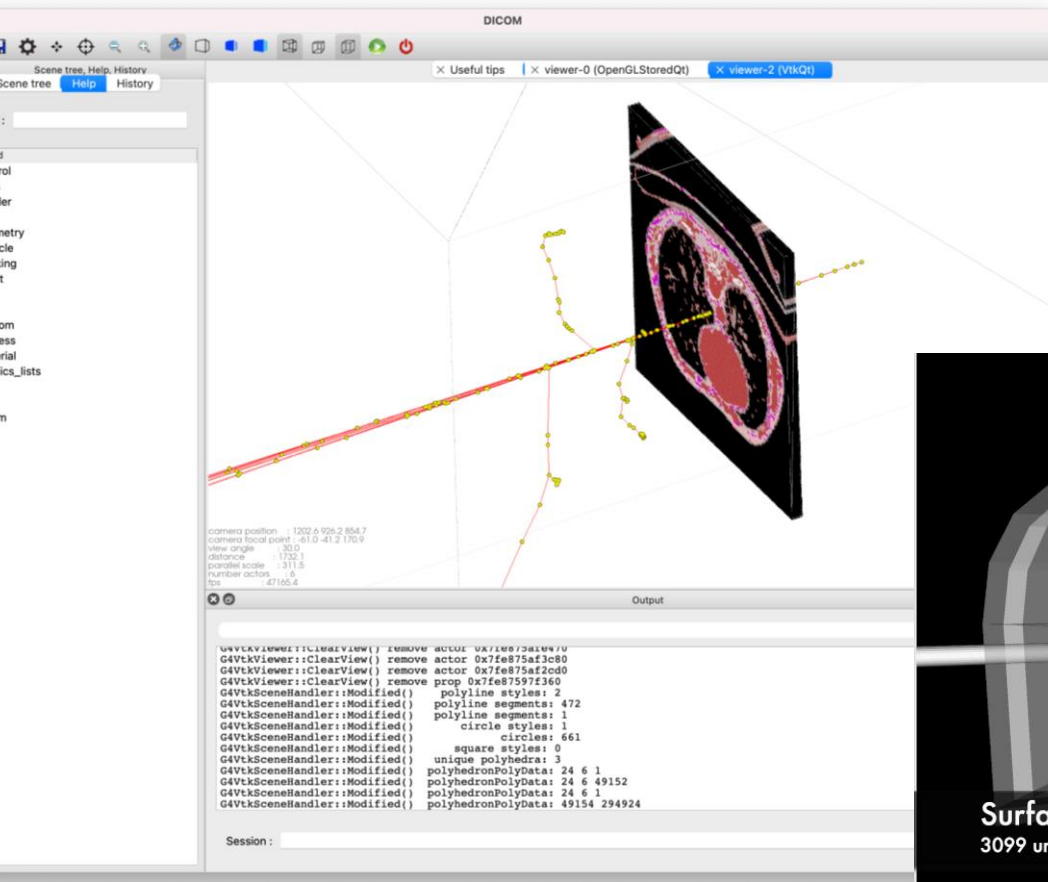
- **Benefits of VTK**
 - Excellent performance (pipelined)
 - Users can write own specialist algorithms
 - Lots of [examples](#) and high-level constructs and algorithms
 - Significant adoption in engineering, medical and space application domains
 - Lots of geometry export types (OBJ, GLTF, etc.)
 - Insulates users (partially) from underlying changes in OpenGL/Vulkan/Metal
 - Picking and UI components
 - Many different forms of rendering possible
 - Physically based rendering ([PBR](#)), Raytracing ([OSPRay](#)), Virtual reality (AR/VR)
 - Pathway to Paraview (VTK file format etc)

VTK visualisation driver (2)

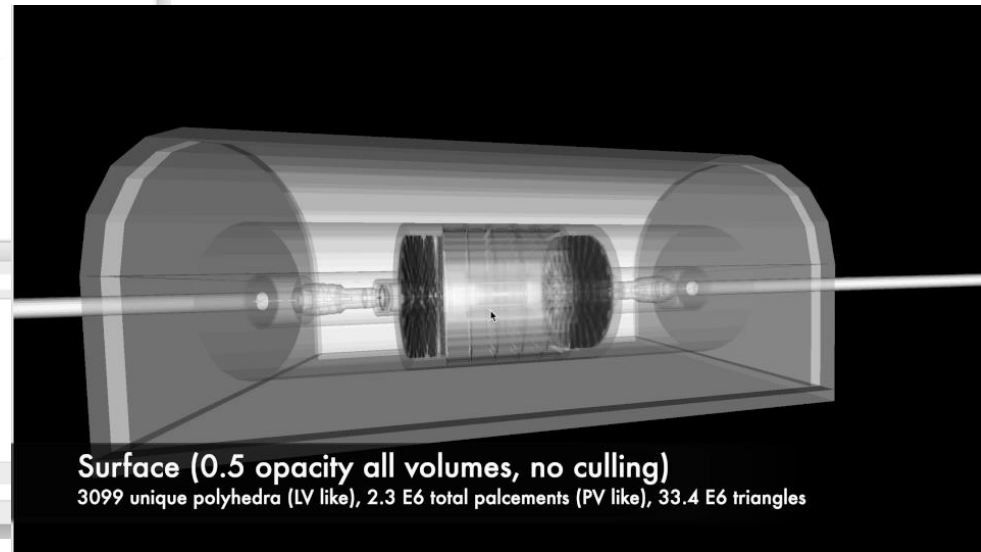


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- Example in action
(extended/medical/DICOM example)



- Stretch example (CMS)
 - Large GDML file (from JA)
 - Slow to interactively view in GL and Open Inventor
 - Usable performance on laptop
 - Performance scales with GPU



Need to implement “special” mesh rendering
for nested PVs

VTK visualisation driver (3)



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- Interactive 3D in PowerPoint! Vtk → OBJ/GLTF → Powerpoint



This is not a movie but the actual 3D model. Download the PowerPoint and manipulate (rotate, zoom etc.)

CGAL Boolean engine

<https://www.cgal.org>

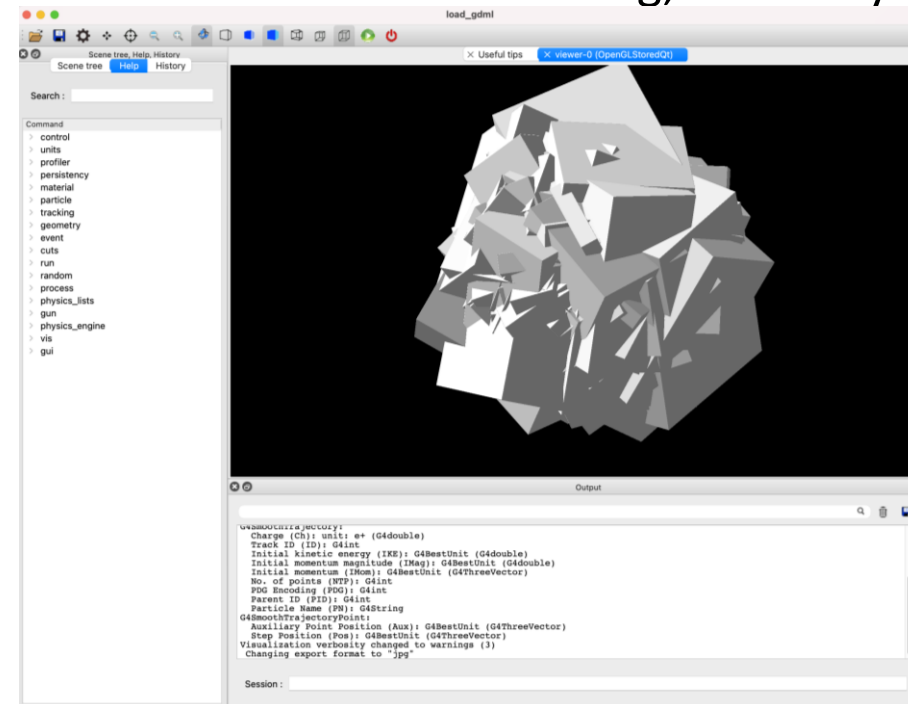


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- **Processing using Computational Geometry Algorithms Library (CGAL)**
 - Open source and header only library (+ boost headers)
 - So can be packaged with G4 if required
 - Replace algorithms in
 - G4Polyhedron & G4PolyhedronArbitrary
 - G4(Union,Subtraction,Intersection)Solid
 - G4MultiUnion
 - Question about thread safety
 - Use G4RecursiveAutoLock

• Benefits of CGAL

- Very robust algorithms
- Manipulate tessellated data within G4
 - tetrahedralization
 - detect non-manifoldness, uniform remeshing, Delaunay



Union of 250 random (size and orientation) cubes