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A ROOT **TPad** containing 3D shapes and primitives can be rendered using a 3D graphics system (viewer) like OpenGL, X3d, ...

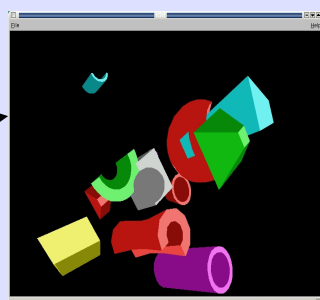
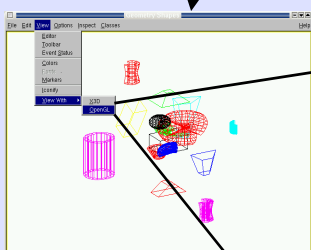
The ROOT 3D classes are independent from the underlying 3D package used. This is achieved thanks to:

- a common abstract interface to the 3D viewers (**TVirtualViewer3D**)
- the ROOT plug-in manager facility
- the **TBuffer3D** class allowing description of any 3D shape or primitive in a standardized format

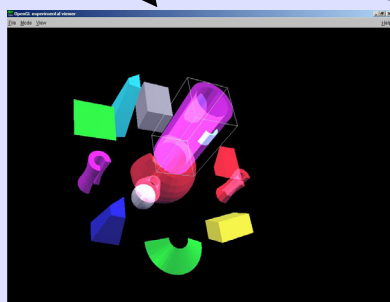
A "3D viewer" is opened with **TPad::x3d(option)** (or from **TPad** "View" pull down menu). The option defines the viewer's type (x3d, ogl). Thanks to the plug-in manager, the right concrete **TVirtualViewer3D** implementation is loaded as defined in the `$ROOTSYS/etc/system.rootrc` file:

```
Plugin.TVirtualViewer3D: x3d TViewerX3D X3d "TViewerX3D(TVirtualPad*)"
+Plugin.TVirtualViewer3D: ogl TViewerOpenGL OGL "TViewerOpenGL(TVirtualPad*)"
```

root[0].x shapes.C

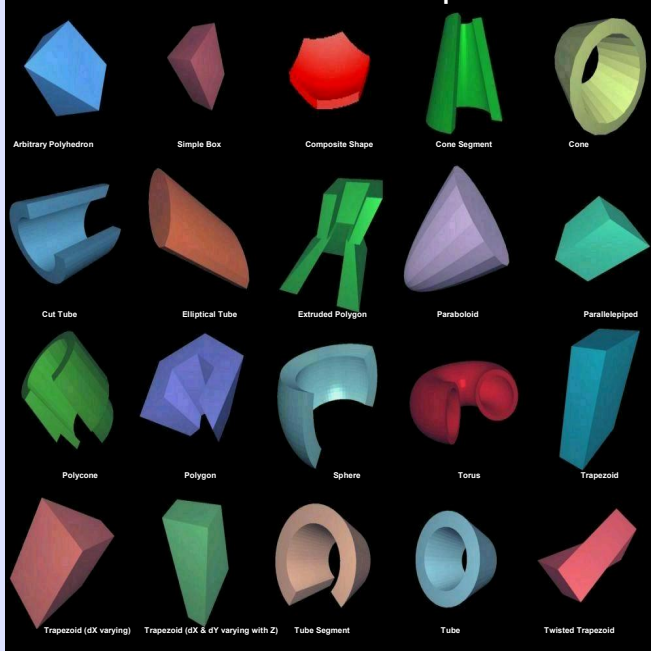


X3d Viewer

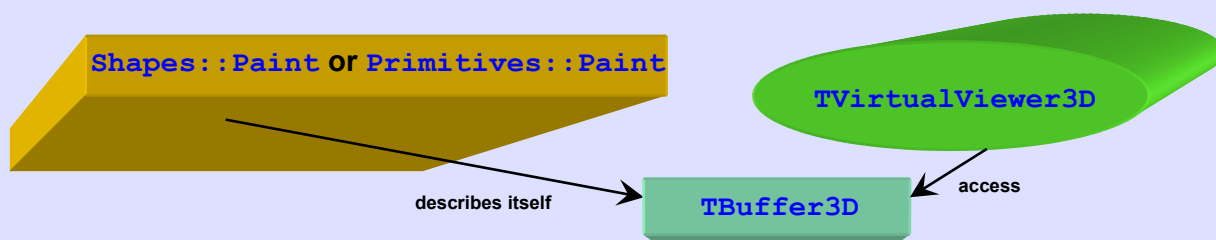


OpenGL Viewer

The ROOT basic 3D shapes



The **Paint** method of a 3D shape or primitive, describes itself in the **TBuffer3D** contained in the **TPad**. This description consists of points, edges, polygons or special shapes. The concrete implementation of **TVirtualViewer3D** can then access this description and render the shapes and primitives in the 3D viewer.





The ROOT **TGeo** classes are used to describe very complex detector geometries, such as the large detectors at LHC, RHIC or detectors flown in space such as AMS or Integral.

The **TGeo** classes support also tracking operations and have been interfaced with simulation programs such as Geant3 or Fluka. ROOT **TGeo** classes can be used as input for Geant4. We are planning a direct interface from Geant4 to use directly **TGeo** at tracking time.

The pictures on this page have been obtained

- via the Virtual Monte Carlo for the Alice detector (see: <http://root.cern.ch/root/vmc/VirtualMC.html>)
- from Geant3 files automatically converted to **TGeo** classes via the **g2root** utility.

The detectors can be visualized in a ROOT pad, with the X3D viewer or the GL viewer.

In the case of the GL viewer (used to produce the pictures in this page), it is possible to pick and edit any detector component with the mouse and change its properties (color, transparency, visibility). All these pictures can be rotated in real time on any of today's laptops.

