QtROOT package extension with Coin3D lib

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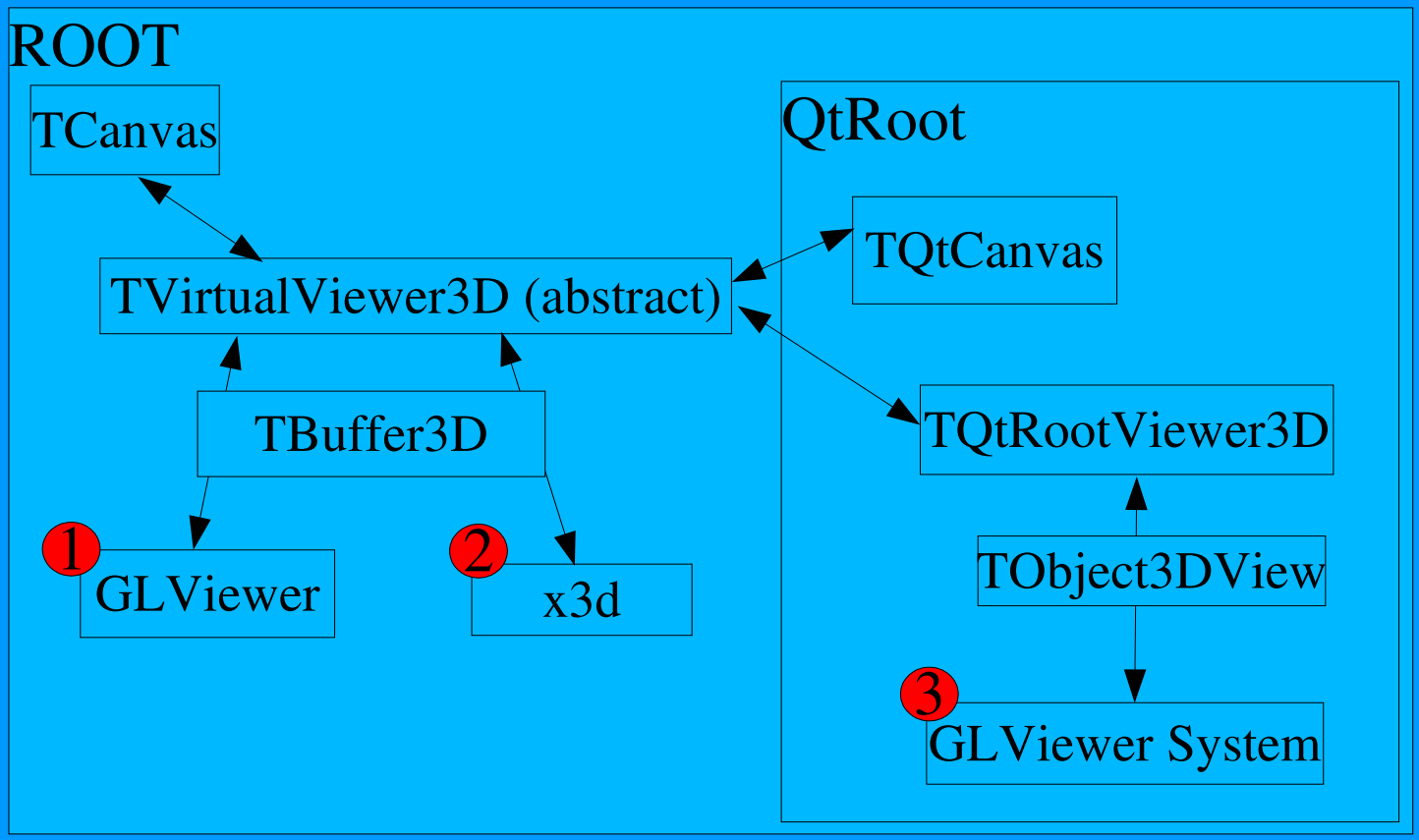
Outline

- **STAR Needs & Current Tools**
- **Coin3D lib Advantages**
- **Implementation**
  - Steps
  - New QtRoot Class Tree
  - Examples of New Viewer Using
    - Different Styles
    - Selection (Picking)
    - Manipulation
- **Summary**

Introduction: STAR needs

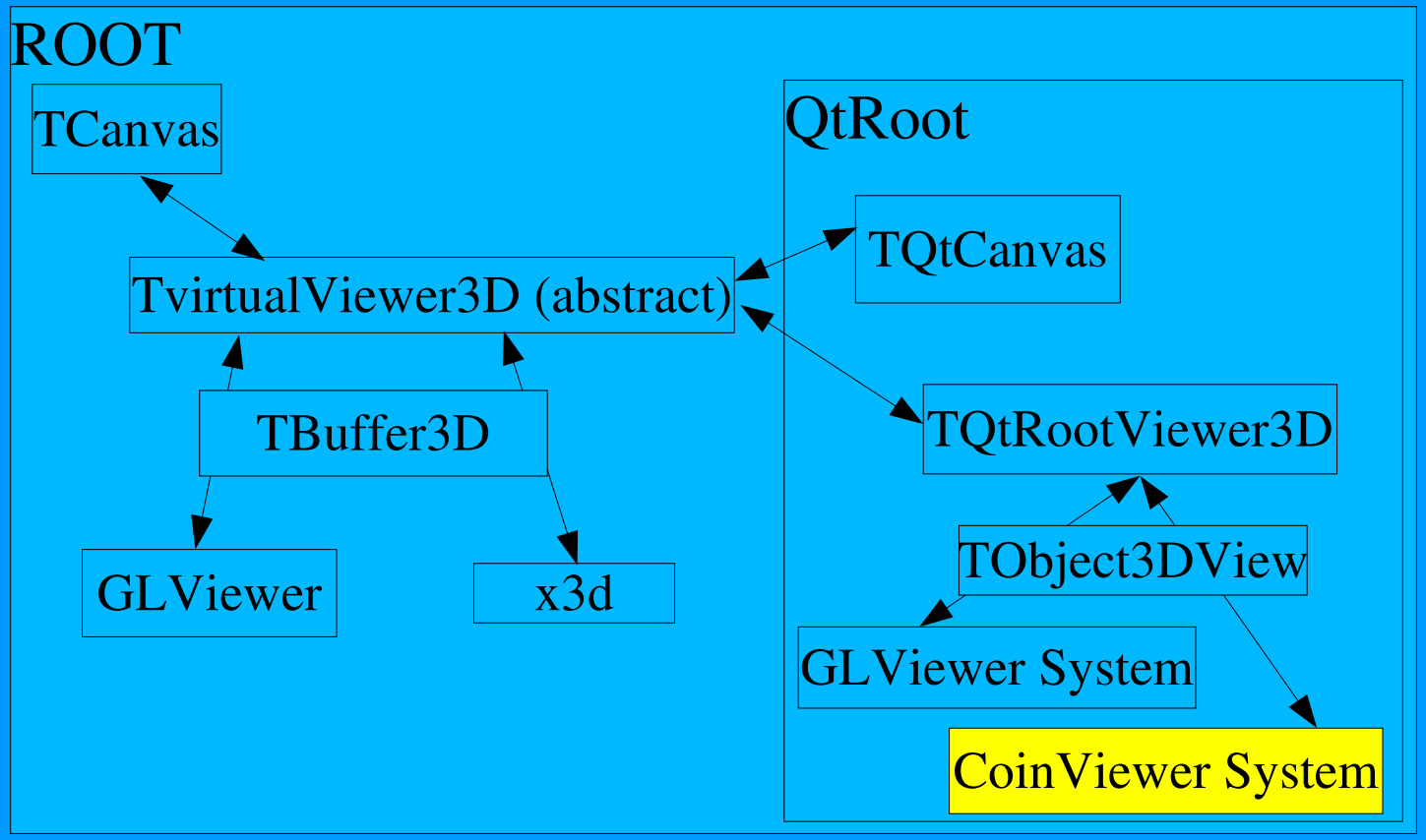
- **Online display**
  - Multiple scene representation modes
- **Event reconstruction**
  - Detector & Tracks detailed information retrieval
- **Simulation**
  - Geometry checks
  - Easy navigation through detector structure: e.g. transparency etc.

Introduction: Existing Tools



1. Great, but lacks features that STAR needs right away: transparency problem, no object selection ("pick" scene object ability)
2. Great, but no hardware acceleration support means no online display!
3. Excellent, a bit hard to extend and implement new features required by growing STAR needs!

Solution: Coin3D integration into default Root environment



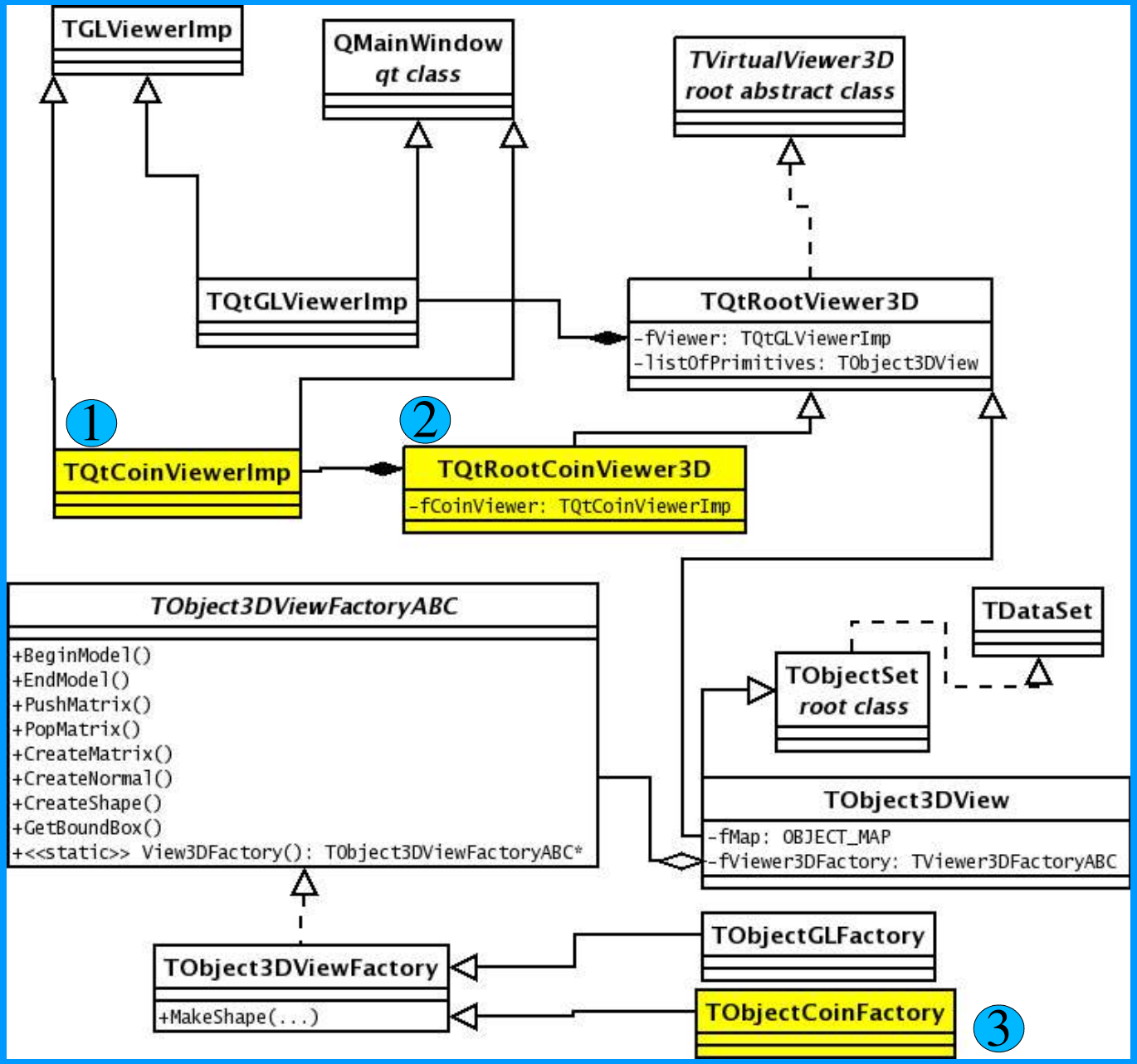
When you use a high level graphic library (like Coin3D), you don't need to think about creating simple things which request a lot of coding.

The library provide **many** embedded nice opportunities.

Main features provided by Coin3D :

- True transparency. (10 transparency types)
- More scene representation modes (7)
- Arbitrary count of interactive light sources
- Selectors & Manipulators
- Level of Details support (distance objects displayed in low quality)
- Engines to create Animated scene

Implementation: QtRoot Class Tree, new modules created



1. Main viewer window: sweet GUI design
2. Interface, to have chance to work like ROOT plugin
3. Coin3D factory: it creates a Coin3D specific object tree

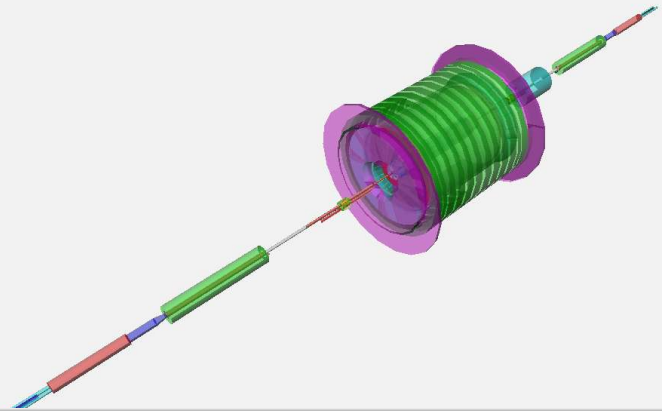
Integrated as standard ROOT viewer!

Does not need any extra steps to use within STAR framework!

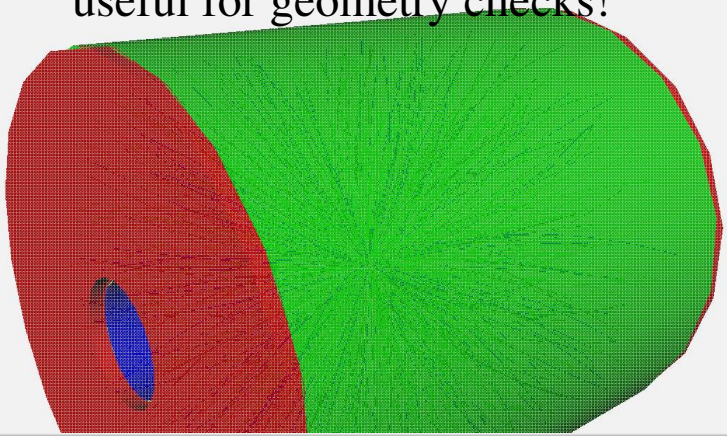
Created modules

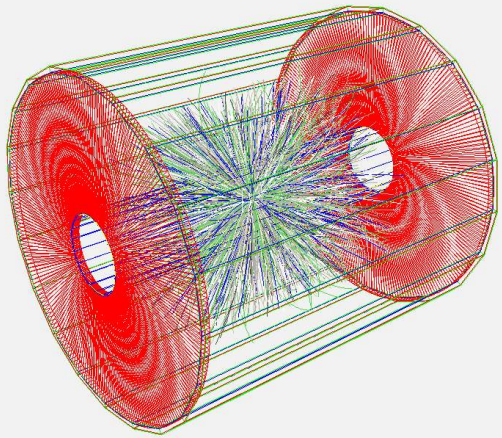
Implementation: new features available for STAR collaboration

Basic geometry view: as good as existing tools (even better quality available!)

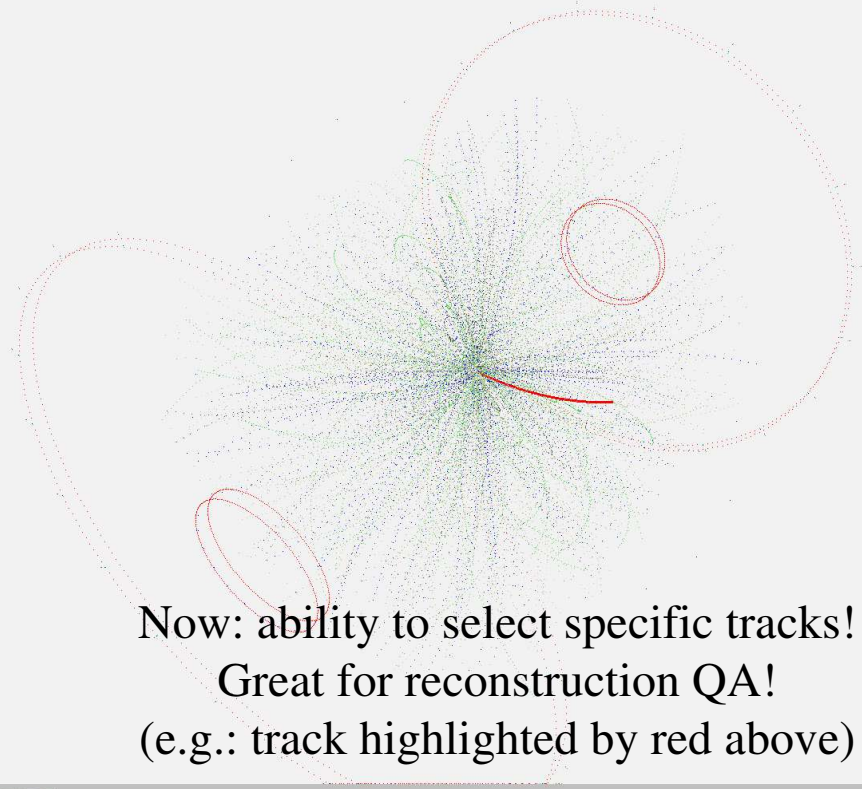


Simple transparency example, useful for geometry checks!



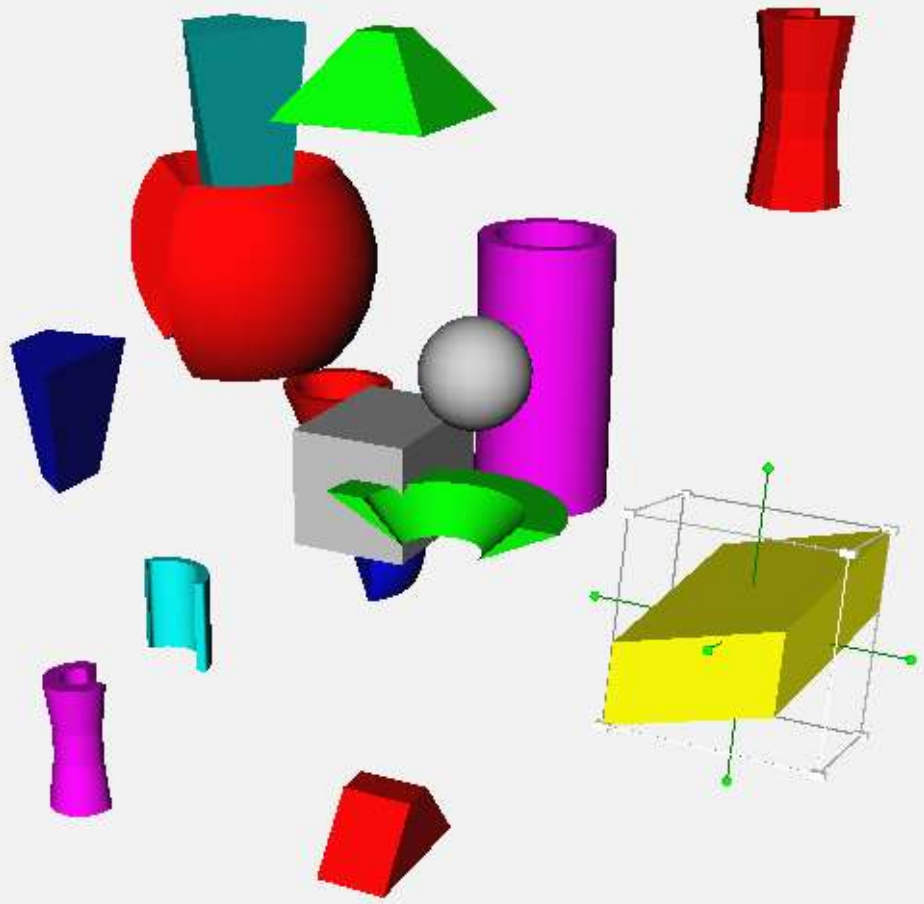


Many new draw styles: great for publications!



Now: ability to select specific tracks!
Great for reconstruction QA!
(e.g.: track highlighted by red above)

Possible future advance : object manipulators



Near future : powerful object manipulation.
Great for detector R&D projects!

Summary

Done:

- **Main question answered**: Can we use Coin3D to help physicists in visualization? **YES!**
- **"Smart" Viewer developed** (part of QtRoot package) as *standard dynamic load ROOT library:*
  - Draws geometry from ROOT, WRL, IV files. Stores back in WRL, IV formats
  - Selects scene objects (detectors parts, tracks).
  - Nice pictures for publications: export to JPG, PS formats
  - Qt-based: emits proper signals (supports Signal-Slot mechanism). Base requirement for Object Editor.
- **Can be used in STAR right away!** NO extra efforts needed, "one-liner" config change to allow STAR-wide usage.

Possible To Do List (to be decided by STAR S&C council) :

- Create Object Editor. Additional tool for changing properties of selected objects (color, style, size)
- Add "Track filter" option, see only interesting tracks
- Add "Geometry filter" option, see only interesting geometry parts
- Complete Event Display application with new viewer features

Work will be continued in Dubna, Russia. PPL-STAR review deadline: Feb'07

Information sources

"C++ GUI Programming with Qt3" by Jasmin Blanchette and Mark Summerfiled

The Inventor Mentor: Programming Object-Oriented 3D Graphics with Open Inventor™, Release 2

ROOT User's Guide: ftp://root.cern.ch/root/doc/Users_Guide_5_12.pdf

Qt class reference: http://www.trolltech.com/developer/documentation

Coin3D class reference: http://doc.coin3d.org/Coin-dev/

SoQt class reference: http://doc.coin3d.org/Coin-dev/

Qt Reference Documentation (programming techniques): http://doc.trolltech.com/4.1/

QtRoot package: http://root.bnl.gov/

Qt & ROOT by V.Fine

"Cross-Platform Qt-Based Implementation of the Low Level GUI Layer of ROOT " talk by V.Fine

Information

This package is the part of the QtRoot package, see installation guide at :
http://root.bnl.gov/QtRoot/How2Install4Unix.html#installroot

Documentation available at:
http://www.star.bnl.gov/~zubanov/

ROOT available at:
http://root.cern.ch/

Coin3D and SoQt available at:
http://www.coin3d.org/lib/