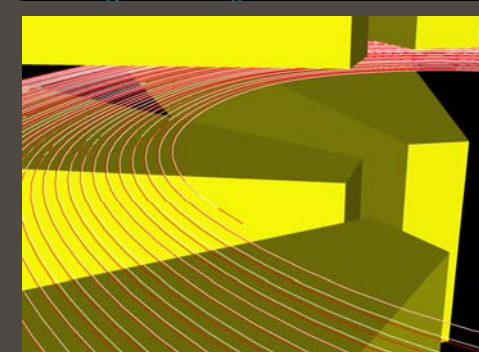
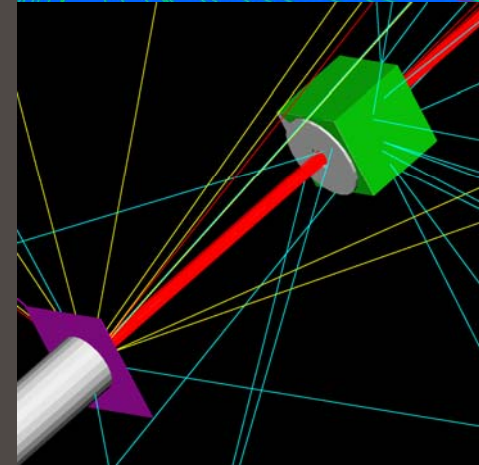
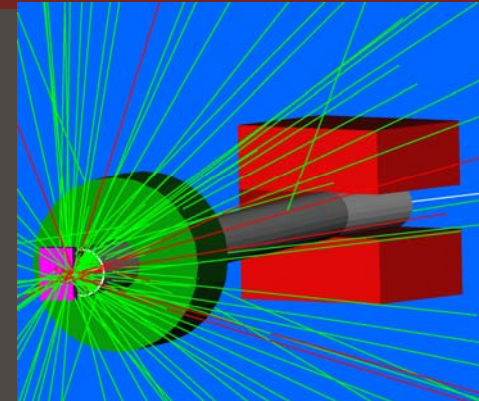


Open Inventor Qt VisualizationDriver

Frederick Jones, TRIUMF

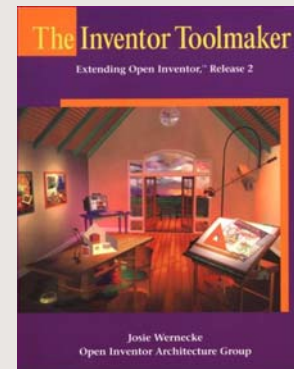
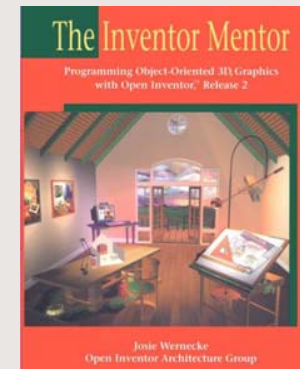
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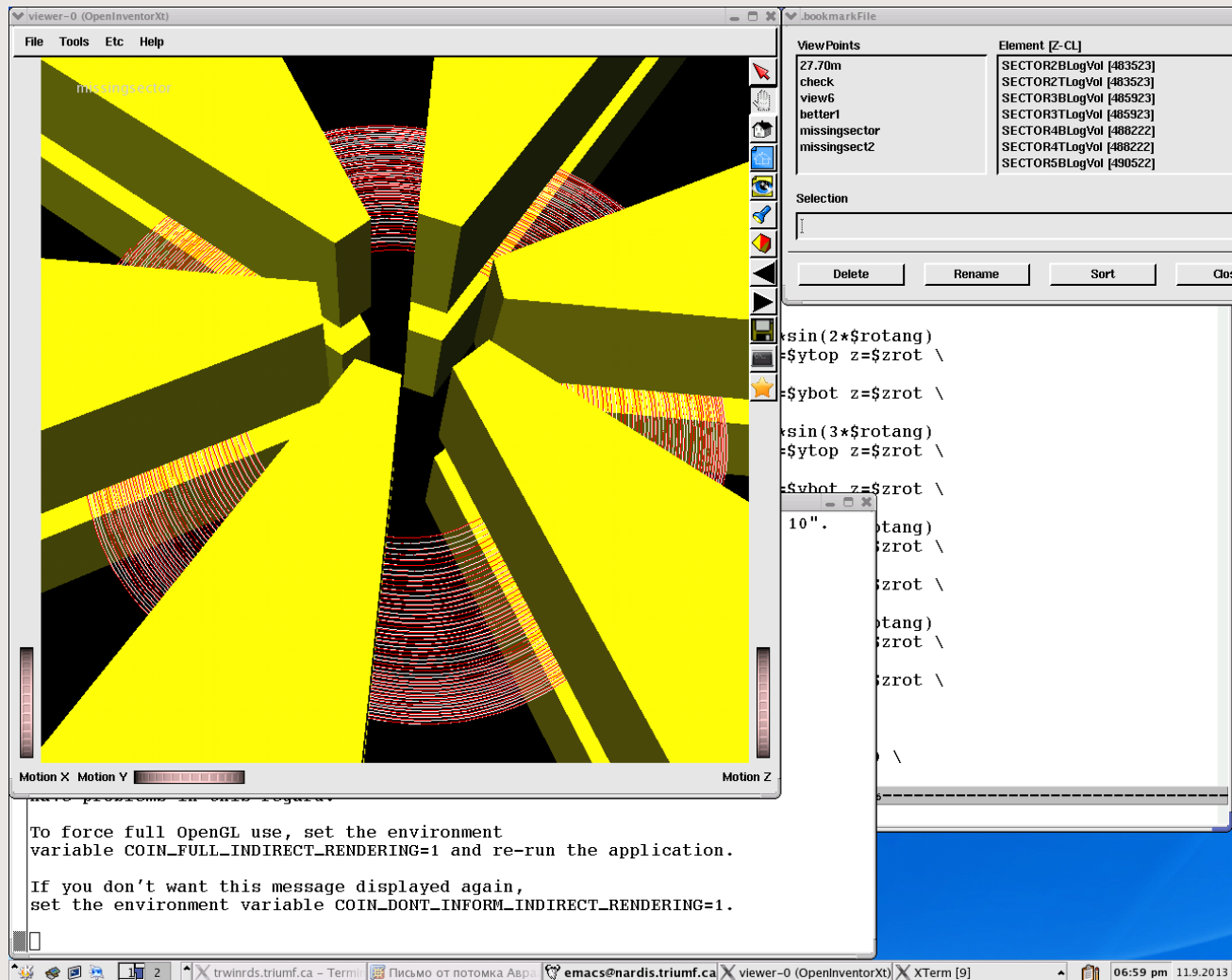
What is Open Inventor?

- [This slide courtesy of J.Boudreau et al. CHEP 2006]
- The Open Inventor is a free, object-oriented 3D modeling toolkit, developed [originally] by SGI
- The Open Inventor is a library of objects and methods used to create interactive 3D applications [including powerful 3D viewers]
- The Open Inventor uses OpenGL for rendering, takes advantage of hardware acceleration in the graphics card
- It can be extended to meet new needs
- And it is very well documented. Two books by J. Wernecke and The Open Inventor Architecture group
 - “The Inventor Mentor” – toolkit description
 - “The Inventor Toolmaker” – guide to extending
- [Key aspects:]
 - Scene graph technology
 - Independent bindings for different toolkits
 - E.g. SoXt, SoQt, SoWin

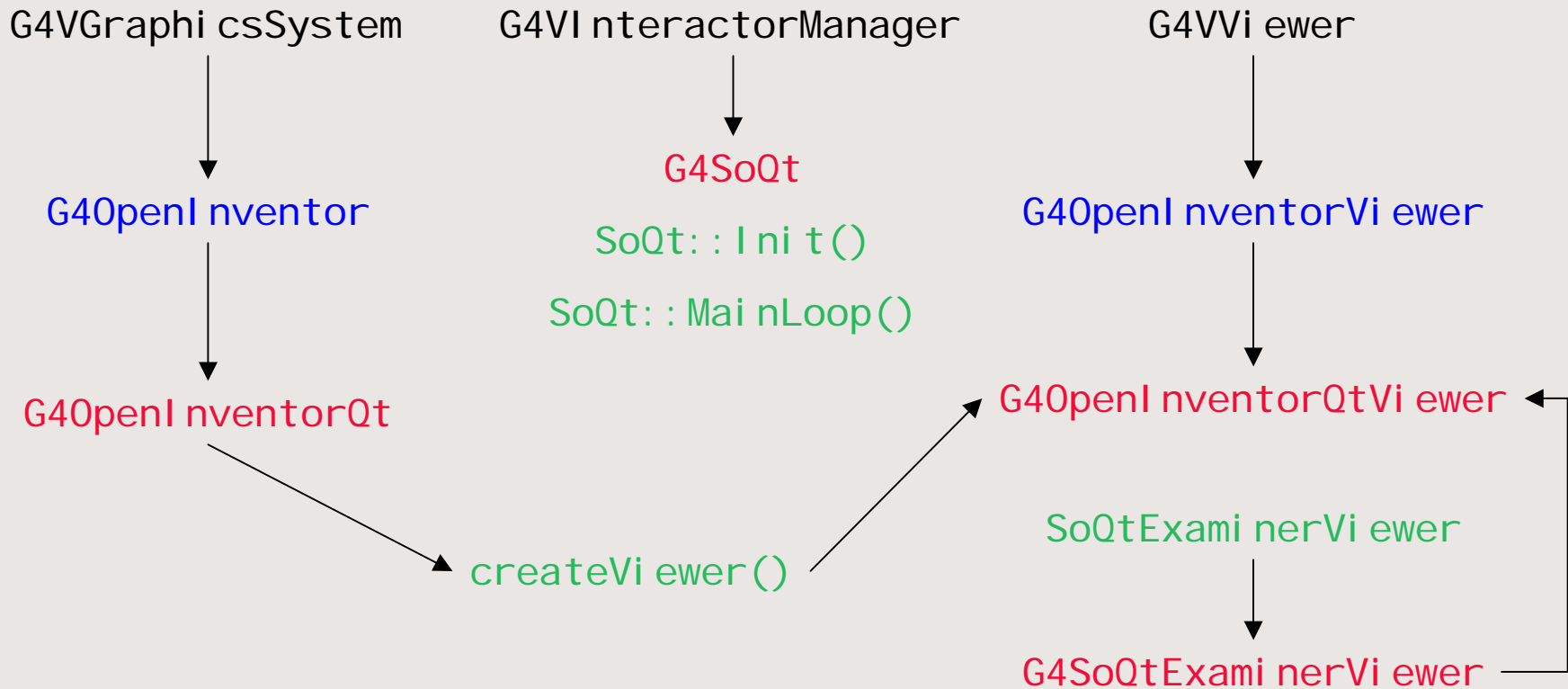


- Some physics uses outside Geant4: event displays for Atlas, CMS, LHCb, LHC++, D0, STAR, Root
- Other applications: Notably FreeCAD, and several commercial software products.
- The Coin3D package implements the Open Inventor API in a modern version with many valuable extensions.
- For our purposes **OI = Coin3D**
- Users of OI viewer in Geant4: not many! (based on personal experience and the G4 forum activity). Why?
Some guesses:
 - General avoidance of third-party libraries.
 - Difficulty (or perceived difficulty) of installing Coin3D.
 - Dependency on X11, Xt, Xm, and numerous auxiliary X libraries.
 - On MacOS, difficulty with installation and/or configuration of Xquartz.
 - Configuration issues, CMake problems with application linking.

- The original Open Inventor viewer (OIX) has been extended (OIXE) with features including element navigation, orientation controls, trajectory following, animations, and saving and restoring viewpoints and camera settings.



- A “translation” of the OIXE extended viewer from SoXt to SoQt.
- Why?
 - To make OI viewer more accessible to MacOS users
 - To move away from Xt+Xm to a multi-platform toolkit (Qt)
- Dependencies of OIX and OIXE (Linux & MacOS):
 - Coin3D, SoXt, OpenGL
 - Xm, Xt, X11, X auxiliary libraries
- Dependencies of OIQT (Linux):
 - Coin3D, SoQt, Qt, OpenGL, X11, X auxiliary libraries
- Dependencies of OIQT (MacOS):
 - Coin3D, SoQt, Qt, OpenGL



Four new classes are required.

Minimal other changes: register OI QT in **G4VisExecutive** and make **G4VInteractorManager::secondaryLoop()** virtual.

G4SoQtExaminerViewer is the Qt equivalent of **G4SoXtExaminerViewer**

- The prototype implements the basic viewer (SoQtExaminerViewer) and an “escape” key (E) to exit the event loop and return control to G4 session.
- Next to do:
 - Add the menu bar and drop-down menus
 - Add the pop-up menus for rendering options
- And then add the extensions:
 - Bookmark (viewpoints) and element navigation panel
 - Viewer buttons for bookmark, element stepping, mouse-over functions and reference trajectory picking.
 - Translate methods from G4OpenInventorXtExaminerViewer to G4OpenInventorQtExaminerViewer.
 - So---- methods should go over as-is.
 - Most SoXt---- methods have SoQt counterparts.

- CMake support for OIQT is on the way.
- There are configuration challenges:
 - Can't build an application with both OIXT and OIQT viewers due to naming clashes (but no one needs to since the viewers will be virtually identical in appearance and functionality).
 - Consequences (presently unknown) of having a Qt session (with OpenGL viewer) and an Open Inventor Qt viewer open in the same run of an application. Can Qt tolerate it?
 - Increasing complexity of build options in the OpenInventor subcategory. We should review this.
 - Possible compatibility issues between SoQt and Qt5 (unconfirmed rumors). But the FreeCAD application (Linux, MacOS, Win) is a counterexample to this.

- A new Qt-based viewer should make Open Inventor accessible to many more Geant4 users and allow them to experience its unique capabilities of Open Inventor (including the Geant4 extensions).
- There are many opportunities for further development, if the motivation (increased user base) is there. Integration with Qt Session is also a possibility.
- The dependence on obsolescent libraries (Xt, Xm) can be removed.
- There are new issues raised with configuration and usage. It may take some iterations to get it right.