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The ROOT's GUI classes support an extensive and rich set of widgets. These widget classes interface to the underlying graphics system and OS via abstract classes - TVirtualX and TSystem. Concrete versions were implemented for X11/*nix, Win32, Qt and **now Mac OS X**:

ROOT GUI applications (browsers, canvases, treeplayers, event displays) and user GUI applications.

ROOT GUI framework (windows/widgets/controls classes)

Abstraction layer: TSystem, TVirtualX

TMacOSXSystem: event handling/dispatch (mouse/keyboard/geometry change/repaint events, I/O activity, etc.)

TGCocoa/TGQuartz: 2D/3D graphics (“graphical back-end”), window management, font management, cursors, drag and drop, etc.

New graphical back-end for Mac OS X:

- Is a complete implementation of TVirtualX interface;
- uses **native APIs directly**, no external X11-server application (XQuartz) required;
- 2D graphics – font, line, polygon anti-aliasing;
- 2D graphics – transparency and gradients;
- “retina friendly”;
- can mix with native GUI-controls (Apple’s Aqua UI)
- In future can support multi-threaded GUI;
- Implemented in Objective-C++

Availability:

- **Mac OS X v >= 10.7**
- **XCode >= 4.x** (Apple-provided clang version??)
- Part of **ROOT v. 5-34** (--enable-cocoa configure option)
- **Default in the trunk version** (still can be disabled with **-disable-cocoa**).

Components (implementation):

- **Window manager** uses Apple’s **Cocoa** framework (object oriented framework written in Obj-C) and Apple’s **Quartz Window Server API**.
- **I/O activity, GUI events, event loop** - based on **Cocoa** and Apple’s **Core Foundation framework**
- “**Event translator**” – translates native GUI events into “X11-like” events/emulates X11 events (X11 events required by ROOT’s GUI to work)
- **2D graphics** – implemented with Apple’s **Quartz 2D API**, **Core Image** and **Core Text** frameworks
- **3D graphics (OpenGL)**: window/context/pixel format management – **Cocoa** framework.

Examples:

