ROOT GL / EVE
AliEVE
Fireworks

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HSF CWP Workshop Jan 25 2017, UCSD

ROOT GL

:) Graphics engine fully driven by the needs of HEP visualization:

- Multi-view / multi-scene design, instancing, clipping, view frustum culling, LOD
- Direct rendering, e.g., Data: TEveTrack, GL renderer: TEveTrackGL
- Can draw all TGeo shapes, including Boolean shapes (CSG code from Blender)
- Object highlighting, selection, sub-object selection

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- No hierarchical scene graph in renderer (supported on EVE side, rarely used)
- Limited to mostly OpenGL 1.5 to support sad state of GL on Linux / SLC
- No external contributions to the code

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- Have to deal with window system interface, low level GL context management
- Some dependence on ROOT main event loop, GUI, TPad graphics

ROOT EVE

:) Used by many experiments: ALICE, CMS, FAIR, Belle2, T2K, ILC

- Full set of visual objects required by the community -- **with outside contributions**
  - Including track propagator, calorimeter classes, digit/hit visualization classes
- Automatic 2D projections (r-phi, r-z) including fisheye and linear scaling
- Complete management of objects and derived representations (ref counting + pointers)
- High-level selection management and propagation over all representations
- “Window manager”, allowing easy movement of GUI components & window undocking

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- Eve base classes “polluted” with ROOT GUI integration
  - It made things easy for most people, also good for debugging

AliEVE

:) Thin layer over EVE (well, technically, EVE was taken out of AliEVE)

- Few visualization subclasses needed for ALICE specific things: V0s, kinks, raw-data / digits
- **ROOT macros used for conversion of ALICE data into EVE objects**

A lot was achieved with relatively little man power

- I worked with all detector & physics groups and HLT to ge

:(Lacked good backward navigation to original data source

- Could get a pointer into CINT and use ROOT command line to poke at it ...

}:) I guess current ALICE people will tell you that ....

Fireworks

:) The most complete Physics Event Display Application

- Standalone version uses FWLite, has full access to EDM and can call all methods
- Internal event representation links EDM object to EVE and GUI object views
  - Full backward navigation
  - You interact with the real data from real data formats
- Completely custom GUI, including Table view and Geometry browser
- Special Full Framework Version -- allows also editing of algorithm configuration!

:(Major manpower investment

- Both initial development (~ 10 FTE) and support + maintenance (at ~ 0.75 FTE / year)

}:) Fireworks versions are tied to major CMSSW releases

CMS Physics Oriented Event Display Plans

1. Continue supporting ROOT GL / EVE (for us and community)
2. Continue supporting all features of Fireworks
    a. Be more aggressive with supporting new os-es natively (esp. osx and new linux releases)
3. Explore Web based interfaces
4. ROOT-7, HSF -- we hope we can find commonality and help each other out

Two points from 10+ years in the event display business

1. **Physics Event Display == CAD application**
2. **Access to Event Data in native format is crucial for Physics Usage**