Analysis Tools

An update

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Discussion on "Interactivity in LHC++"

- Where are we now?
  - **LHC++**
    - **IRIS Explorer/HEPExplorer:** not accepted by experiments
    - **HTL:** used by CMS, ATLAS, LHCb, NA45
    - **GEMINI/HEPFitting:** not widely used but somehow accepted
    - **Objectivity/DB Tags:** used by NA45, ATLAS (ATLFAST++/Objy), ATLAS Tile testbeam, accepted in principle

Where are we now?

- **Other tools:**
  - **PAW:** can read HTL histos from Objy
  - **JAS:** V2.0 Alpha almost ready, attractive but still not complete, C++ interface?
  - **ROOT:** used by ALICE/FNAL/BNL, monolithic architecture
  - **Open Scientist:** attractive modular architecture, one man solution

Basic user requirements

- Easy access to ntuple−like data
- Access to more complex data
- Histogram manipulation
- Fitting
- PAW−like graphics
- Vector Postscript output
- Persistence
- Scripting
- Remote/parallel analysis
- Other

Some "software" requirements and the "ideal tool"

- Use of standards: C++ STD libraries, Corba etc
- Robustness: good design, thorough testing
- Flexibility, modularity: design for change

==> **Ideal tool**:

- modular but integrated
- lightweight but complete
- easy to use but powerful
- supports multiple languages
- supports some parallelism and remote execution, etc etc

A proposal

- OO mantra: Design for interfaces
- Can we define a set of abstract interfaces for major analysis components?
  - Histograms and Histogram service
  - Vectors
  - Fitting
  - Plotting
  - Ntuple−like data access
  - User code execution

A proposal (cont’d)

- With such interfaces in place we could mix and match parts from different packages as long as they obey to the interface
  e.g. An Objy Tag visualised with Open Scientist SoFree
- Scripting binding would be easier
  use SWIG against interfaces
- Remote execution could be hidden
  use different methods: ORB, RMI,...
- Might even ease Java/C++ integration
  only write Java adapters to interfaces

Starting points

- **Fitting**
  GEMINI/HEPFitting could easily be repackaged
- **Histograms**
  HTL interfaces
- **Histogram service**
  LHCb, ATLAS HistoManager
- **Ntuple−like data**
  JAS DIM, Objy Tags
- **Other?**

First steps...

- Select classes (histogram, fitter,...) that will be exposed to users and design the corresponding user interfaces
- Prepare early prototype(s) of module interfaces and user interface (not necessarily the same) and give to real users for feedback (even if functionality is missing)
- The user interface should present a PAW−like "look and feel" for histogram manipulation and presentation
- Allow for the distributed processing of data: analysis close to the data, visualisation of the resulting information (histograms, vectors, functions etc) locally − without inhibiting local analysis on smaller data sets

First steps (cont’d)

- The user interface (not the framework!) should present a "monolithic" view to the end user (i.e. not modularity a la IRIS Explorer), allow the execution of (usually pre−edited) sequences of operations (scripting) and provide a logging (history) facility
- At the same time, the end user should be able to exploit the underlying modularity for development purposes. The interface of the framework should use the interfaces of the underlying packages. User feedback from early prototype(s) will be used to define which objects should be exposed to the user.
- Present a more precise outline of these requirements for HepVis ’99
- Provide early prototype with (very) limited functionality for feedback by LCB workshop

What do we (ATLAS) do?

- Clear message from physics community:
  Need something now!
  Can we use ROOT − for interactive analysis only?
- In principle yes. BUT interactive analysis (PAW−like) part of ROOT strongly coupled to ROOT I/O... Would this compromise the architecture and database efforts?
- Please let’s make one thing clear: PEOPLE WILL NOT LEARN C++ BY USING ROOT!
- If we do "adopt" ROOT now, how do we combine this with longer−term efforts with LHC++/JAS/OpenScientist?
- Floor open for discussion...