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The Large Hadron Collider (LHC) is a particle accelerator being commissioned near Geneva in a 27km circular tunnel, between the Jura and the Leman Lake. The LHC will produce head-on collisions between two particle beams, either protons or lead ions. When the LHC will begin operations, it will produce roughly 15 petabytes (15 million gigabytes) of data per year (enough to fill 100000 DVDs). This poster shows an overview of the Data Storage and Data Analysis using ROOT, an Object-Oriented Data Analysis Framework (<http://root.cern.ch>) especially designed to handle LHC data.

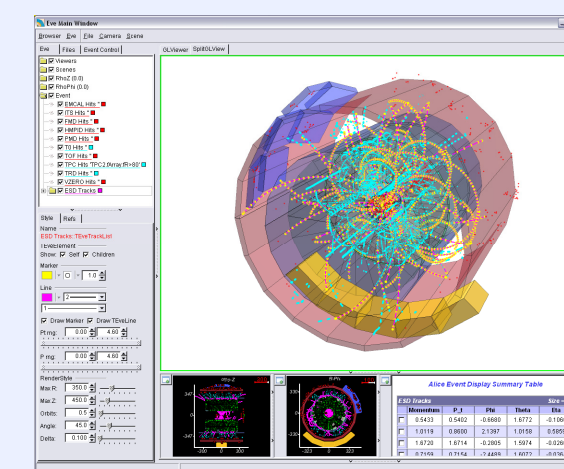
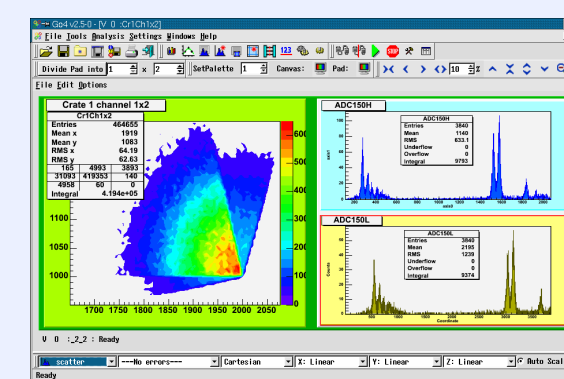
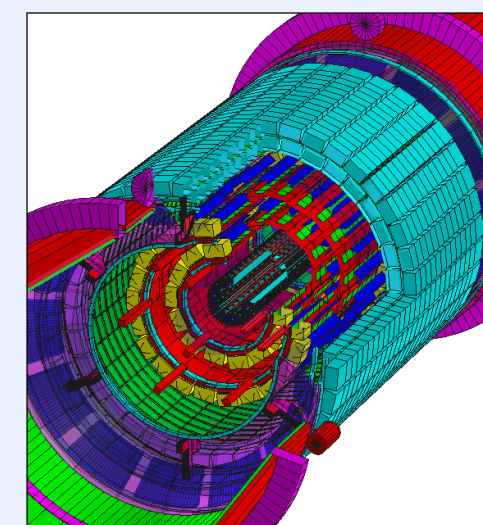
## ROOT in a Nutshell

Object Oriented framework for large scale data handling applications, written in C++

Provides, among others,

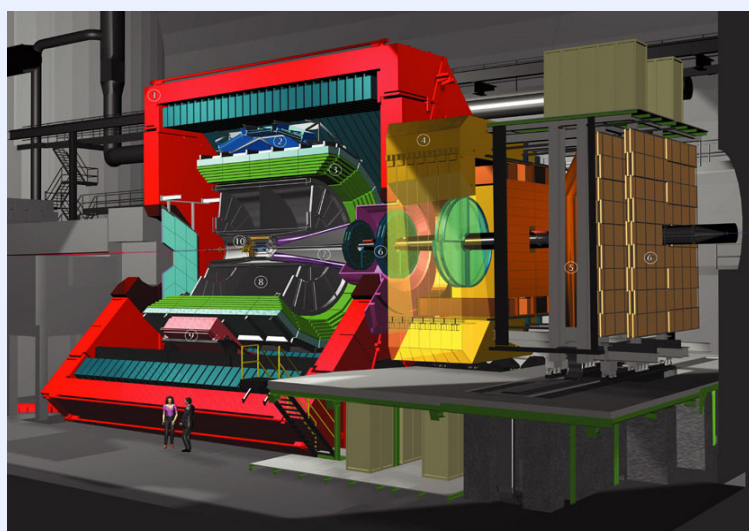
- an efficient data storage, access and query system (Petabytes)
- a C++ interpreter
- advanced statistical analysis algorithms (multi dimensional histogramming, fitting, minimization and cluster finding)
- scientific visualization: 2D and 3D graphics, Postscript, PDF, LaTeX
- geometrical modeler
- PROOF parallel query engine

## Visualization

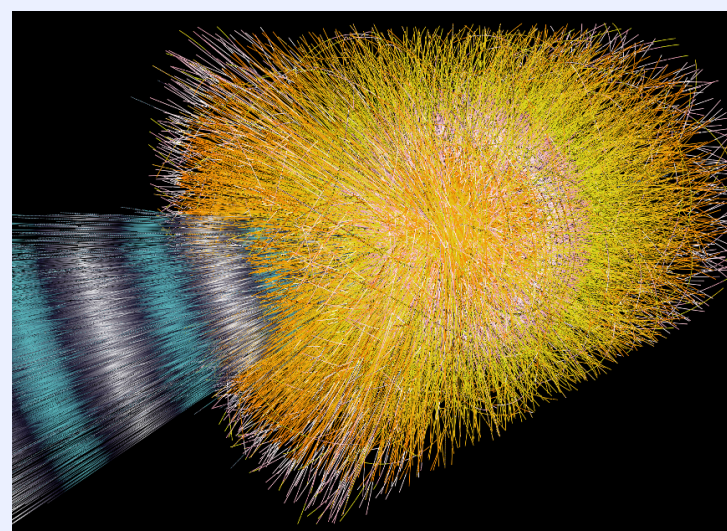


## Typical Data Flow in HEP Experiments

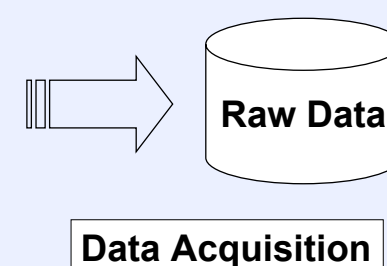
### The Alice Detector



### One Event

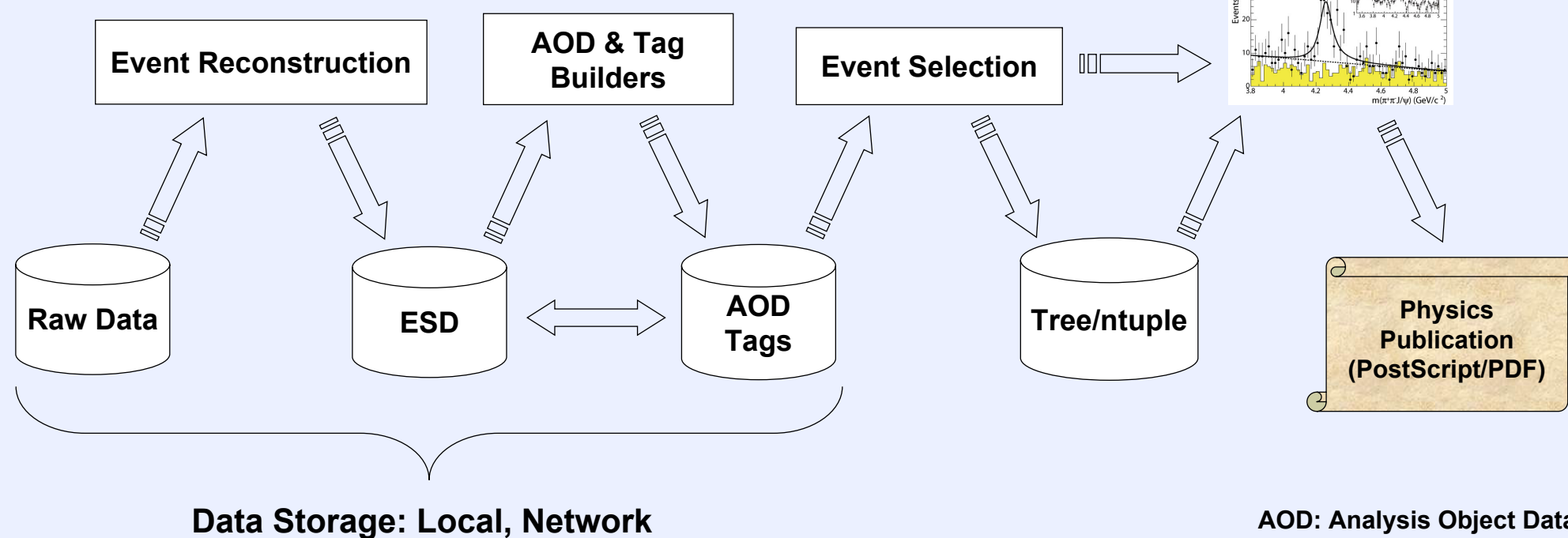


### On-line Software



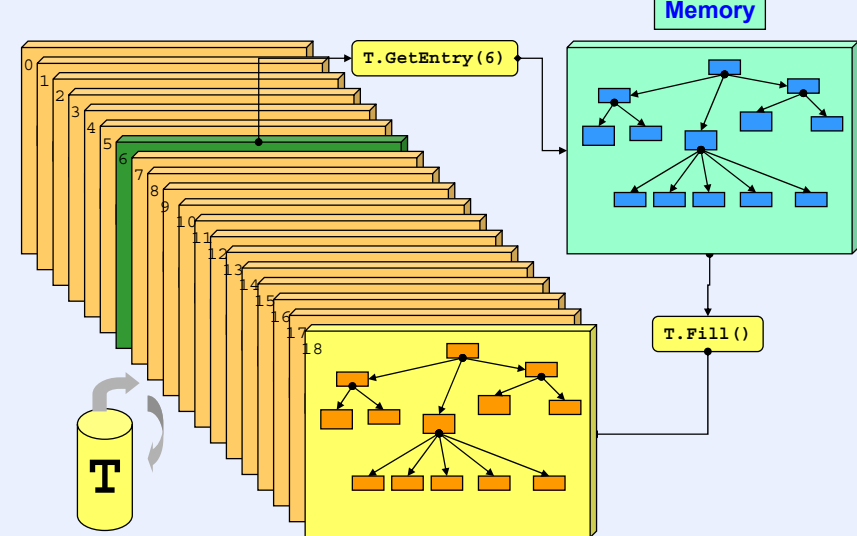
## Off-line Software

## Data Analysis & Visualization



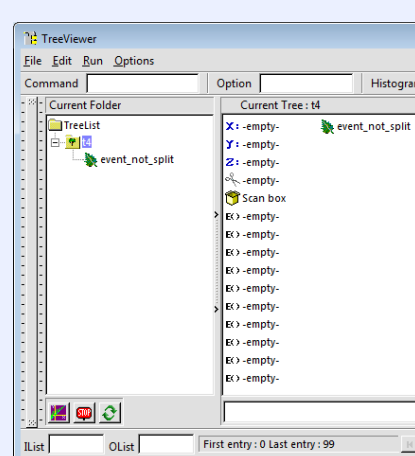
## ROOT Data Format - Trees

Each Node is a branch in the Tree

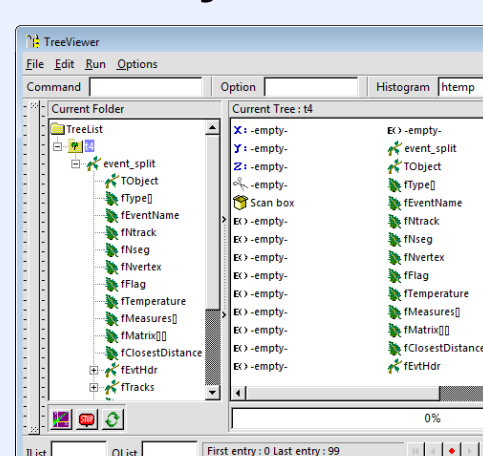


- Extremely efficient Write Once, Read Many ("WORM") HEP events' data set.
- Designed to store more than  $10^9$  HEP events.
- Trees allow a fast direct access to any event in the data set (sequential access is more efficient).
- Trees are build with "branches" and "leaves". One can read a subset of all branches.
- High level functions like TTree::Draw loop on all events with selection expressions.

## Interactive Tree Analysis



Split level = 0



Split level = 99

## PROOF

