RootMaker
v1.0.0

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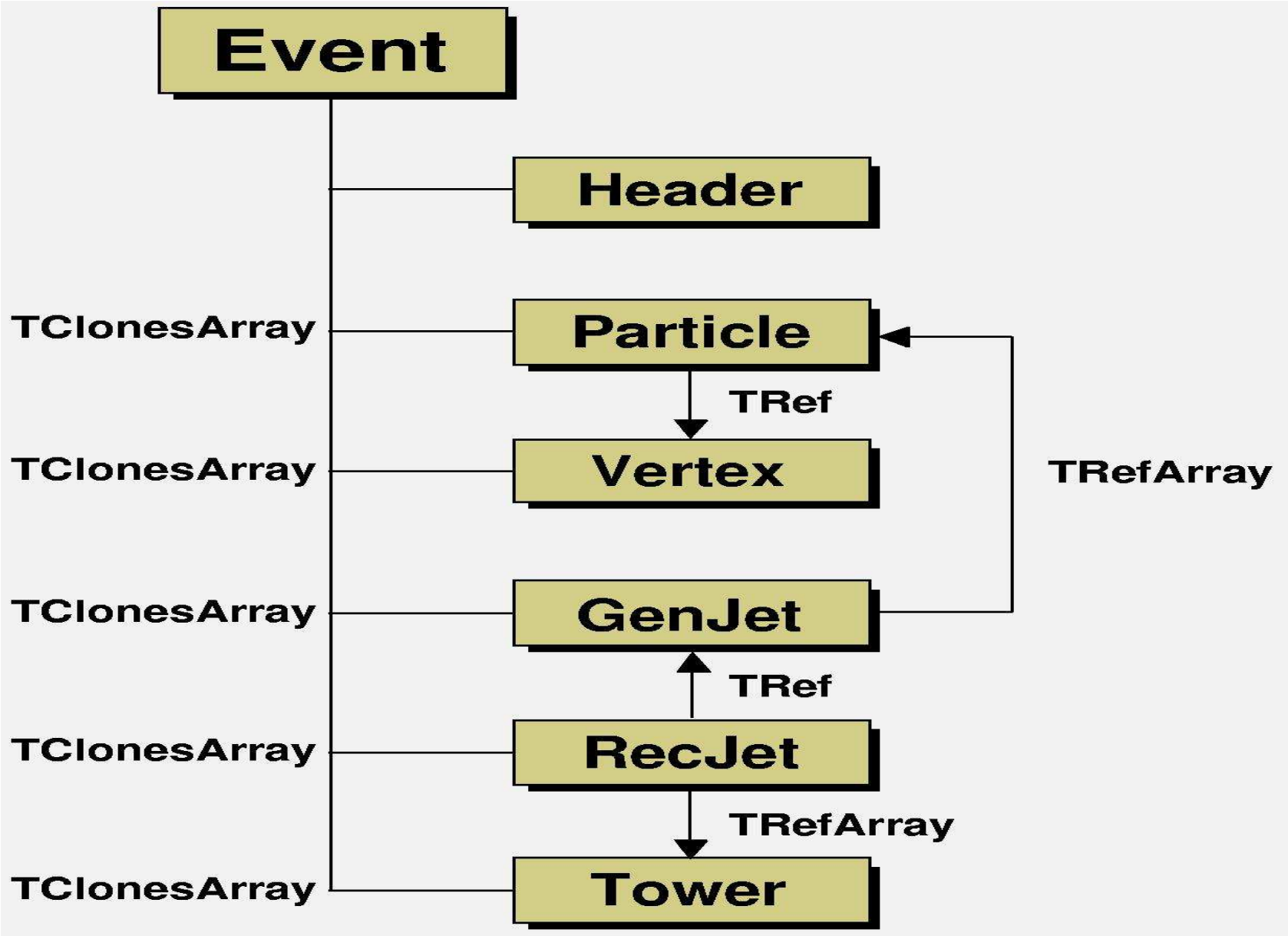
Introduction

Root advantages:

- No space limit like for ntuples
- Faster data access
- Object-oriented
- System of references
- Secondary root files - friend trees mechanism
- Convenient GUI for browsing of root files
  - expressions and cuts
- Physics library - Tvector

Root file structure

Using tree structure - branches, leafs



Root file contents

- Ntuple-like part

- Tracker part

  Pixel lines
  Pixel vertices
  PixelTracks - using pixel lines as seed
  Tracks - using 2 consecutive hits as seed

Pixel Vertex

- Z in mm
- Z error
- Pt : sum of Pixel Lines Pt
- ID : 1=PV
- Number of Pixel Lines

Pixel Line

- Pt
- Eta
- Phi
- VertexID
- Charge

Tracks

Vertex	*Outer* (last RecHit)	*ECAL face* (GEANE propagation)
VertexP	OutP	ECALP
VertexPt	OutPosition	ECALPosition
VertexEta		
VertexPhi	Tvector3 *	
VertexZ		

Nhits

Chi2

Charge

* Tvector3: X(),Y(),Z(),Eta(),Phi(),Theta(),Mag(),Perp(),...

File size, CPU time

CPU: AMD 2000+ MP (1.66 Ghz) = 2.5x Pentium III 700 Mhz

jm_2x1033PUjm602_TkMu_g125_UCSD jm02_hlt80-120 :

root file size = 62k/event CPU time = 17.7s/event
ntuple file size = 47k/event
56 PixelTracks;72 Tracks

jm_1034PUjm602_TkMu_g125_UCSD jm02_hlt80-120 :

root file size = 172k/event CPU time = 142s/event
113 PixelTracks;420 Tracks

without Tracks :
root file size = 137k/event CPU time = 7.8s/event

without PixelLines, PixelVertices, PixelTracks, Tracks :
root file size = 124k/event CPU time = 2.3s/event

without Pile-up particles, PixelLines, PixelVertices, PixelTracks, Tracks :
root file size = 59.5k/event CPU time = 2.2s/event

Example for root file analysis (Example.C)

```
  gROOT->Reset();                    // Reseting ROOT
  gSystem.Load("libPhysics.so"); // Loading Physics library (TVector3)
  gSystem.Load("libEvent");      // Loading Event library (libRM100.so) RootMaker classes
  TFile *f = new TFile("Event.root"); // Openig Event root file
  TTree *T = (TTree*)f->Get("JetMet");   //Seting T pointer to JetMet tree

  JetMetRootEvent *event = 0 ;   // Pointer to Event object
  T->SetBranchAddress("Event",&event);   //Seting Event pointer
//Booking some histograms ...
  Int_t nevent = (Int_t) T->GetEntries();        // Geting number of entries(Events)
 for (int i=0;i<nevent;i++)          // Loop over Events
{        T->GetEntry(i);                  //Read complete event in memory
// Analysis code
  int ngenjet5 = event->getNGenJet5();
  for (int j=0;j<ngenjet5;j++)  //loop over GenJet5
   {
    JetMetRootGenJet5 *genjet5 = event->GenJet5(j);
    h1->Fill(genjet5->getNParts());
    if (genjet5->RecJet5())
      {
        h1->Fill(genjet5->getEt() , genjet5->RecJet5()->getEt());
        h2->Fill(genjet5->RecJet5()->getNTowers());
      }
   }
// Drowing histograms
            h1->Draw();
 ...
            c1->Modified();
            c1->Update();
// Printing PS file each 100 events
c1->Print("Example.ps");
// End of analysis code
      event->clear();                //clear event
}
  f.Close(); //Closing root file
```

Root files production

sundev.cern.ch:/shift/shift19/data3/zh/rootmaker/rm100_orca611_10Jun2002

jm_2x1033PUjm602_TkMu_g125_UCSD :

1000 events 2e33/jm02_hlt20-30_0_0.root
1000 events 2e33/jm02_hlt50-80_0_0.root
1000 events 2e33/jm02_hlt120-170_0_0.root
1000 events 2e33/jm02_hlt170-230_0_0.root
1000 events 2e33/jm02_hlt230-300_0_0.root

jm_2x1033PUjm602_TkMu_g125_FNAL :

1000 events 2e33/jm02b_hlt380-470_0_0.root

Speed estimation:

Low luminosity : 12 000 events/24h
High luminosity : 1 000 events/24h

Documentation

- RootMaker home page:
  http://home.fnal.gov/~jdamgov/rootmaker

- Root home page:
  - User guide
  - Reference guide
  - Tutorials
  - HOWTOs

  http://root.cern.ch

Conclusion

- Tracks reconstruction is needed of additional tuning.
- New objects: MidConeARecJets ...
- Need of switches for turning on/off of some data.
- Root files analysis using root like external tool.
- Root files production