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ThumbNail & Analysis

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ThumbNail Web page:

http://www-d0.fnal.gov/~ serban/thumbnail

ThumbNail Overall Structure

1. **Chunk history information**
   - ChunkID's of parent Chunks and their parents
   - RCPID's of reconstructors
2. **Chunk structure information**
   - number or chunks of given type
   - number of objects from a given chunk
3. **Object information**
   - Packed contents
   - Indices to related objects

Parent Chunks

- **D0PhysObj Chunks** **(can be treated uniformly):**
  - **ChargedParticleChunk**
  - **EMparticleChunk**
  - **MuonParticleChunk**
  - **TauChunk**
  - **JetChunk**
  - **MissingETChunk**
  - **bcJetChunk**
- **VertexCollChunk**
- **FPSClusterChunk**
- **CPSClusterChunk**
- **LinkedPhysObjChunk** (*not written out, regenerated at unpacking*)

All parent chunks can be fully restored from ThumbNail except that:

FPSClusterChunk, CPSClusterChunk have only associated clusters.

VertexCollChunk have no GTrack links.

GTrack links replaced by ChargedParticle links in a new chunk: VtxChLinksChunk.

What is missing:

- Only trigger information is list of triggers fired
- MC information written out but not packed need a new MC chunk

ThumbNail Files

ThumbNail files will reside on disk and store enough information/event for most analysis. The plan is to have all events on disk in ThumbNail format.

File Content:

- Event
- HistoryChunk
- ThumbNailChunk
- TMBTriggerChunk
- MCKineChunk (for MC)

Present size for $t\bar{t}$ events with 0 mbias:
8kb/event
dropping MCKineChunk & Provenance
edm Provenance overhead is 4Kb/event
MCKineChunk 25Kb/event

Thumbnail files will be generated by D0reco_x

Implementation Details

Two packages:

- ThumbNailPkg :
  framework package for packing
- UnpThumbNailPkg :
  framework package for unpacking

- ThumbNailChunk (all physics information)
  For each object type store:
  - vector<list<ChunkID>>: a list of parents from each original parent chunk.
  - vector<list<RCPID>>: a list of RCPID's for each original parent chunk.
  - vector<vector<TmbObj>>:
    Each class inheriting D0PhysObj has a corresponding class inheriting TmbObj. All persistent attributes except links are copied to TmbObj. Links are converted to indices (8 bit unsigned integers).
  - TmbObj object compression with d0om commands.

Analysis with ThumbNail Files

TMBAnalyze_x program available in t02.12.00. Includes package to unpack thumbnail files

It can be used to generate either root tuple or root tree.

Drawbacks of root tuple:

- root tuple files x3 size of ThumbNail files.
- great deal of duplicate information
- No standard links between objects
- root tuple structure only vaguely follows event structure
- does not exploit root as an object oriented analysis tool

root tree:
Still under development, almost complete. Each edm object and each LinkIndex will have a corresponding TObject and TRef. TMBAnalyze_x has 3 packages to generate the root tree:

- mc_analyze/TMBMCTreePkg: create MC makers of root objects
- tmb_tree/TMBCorePkg: create makers of root objects corresponding to objects in ThumbNailChunk
- tmb_tree/TMBTreePkg: fill the root tree

Programs to generate a root tree should be managed by each physics group and should be made adding a physics package to TMB-Analyze_x.

We expect root tree files to be bigger(x2?) than ThumbNail files. Not all events in Thumb-Nail files should be duplicated in root tree files.