Status of the Trigger Simulation

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Overview of the Simulator

- Why have a trigger simulator?
- Implementation
- Status of the simulation effort

  UnpDataChunks

  Packages
- The Future
- Conclusions

Note:

- Meeting Time

  On-week Wed. from 2:30-4:00PM, 9th Circle.
- Central Web Page

  www-dØ.fnal.gov/~toback/trigger_sim.html

Goals of the Trigger Simulator

- Read in real or MC data and simulate L1, L2 and L3
- Compare online trigger results with a simulation
- Create raw data and trigger decisions for Monte Carlo

Why have a trigger simulation?

Before the run:

- Helps define I/O for the trigger components

  e.g, L2 Preprocessor → L2Global

- Defines/tests the same data used in the trigger
- Helps determine trigger rates/menu ←

  e.g. What quantities are available for L1Framework?

  e.g. What is the rate for a given electron threshold?

- Helps groups (ID groups, Algorithms, Physics etc..) design online and offline code

  e.g. What are the L2 electron finding algorithms?

- Helps give quantitative answers to remaining technical hardware issues

  e.g. What are the physics effects of only sending partial track lists to L2 Global

Why have a trigger simulation?

During the run:

- Natural tool for detector/trigger shakedown

  e.g. Calorimeter quantities calculated correctly?

  e.g. Trigger firing on the correct events?

  e.g. Trigger rejecting background appropriately?

- Natural way to do online monitoring

  e.g. L1 tracking efficiency/inefficiency as expected?

  e.g. Do we understand the jet turn-on curves?

- Helps determine new trigger thresholds

  e.g. When the luminosity goes up, what do we need to change the thresholds to?

  e.g. Now that we've installed the L2STT is it integrated correctly?

Why have a trigger simulation?

After the run:

- A tool for determining efficiencies

  e.g. Fraction of top events written to tape?

  e.g. Efficiency for finding Higgs $\rightarrow$ WW

  e.g. Efficiency for finding SUSY $\rightarrow$ Trileptons

  e.g. Trigger efficiency for W/Z Cross Section

- A tool for determining trigger biases

  e.g. Trigger bias in the inclusive jet spectrum?

  e.g. Trigger bias in the W-mass measurement?

- A standard tool for comparing analyses

  e.g. Two groups can start from the same simulation NTuple to compare results

Trigger Simulation Needs

TRIGSIM needs to:

- Take input from real data and MC

  Unpack a RawDataChunk

  MC output is Digitized Data
- Compare to online trigger results
- Create raw data and trigger decisions for MC

  Create (Pack) a RawDataChunk

Implications of the Requirements

Different Types of Data in RunII

Different Groups have different needs

- Level 3 uses a RawDataChunk
- Monte Carlo writes out digitized data (Digi Chunk)
- Groups need to get data (unpack) from an RDC
  - Examine
  - RECO
  - L3
  - Trigger Simulation
- TSIM needs to create a RawDataChunk for L3sim
  - Online we create in 'one fell swoop'

Goal: Solve this problem once for everyone!!!

Unpacker

Many people need to unpack from a RawDataChunk

Build one "Unpacker" for everyone

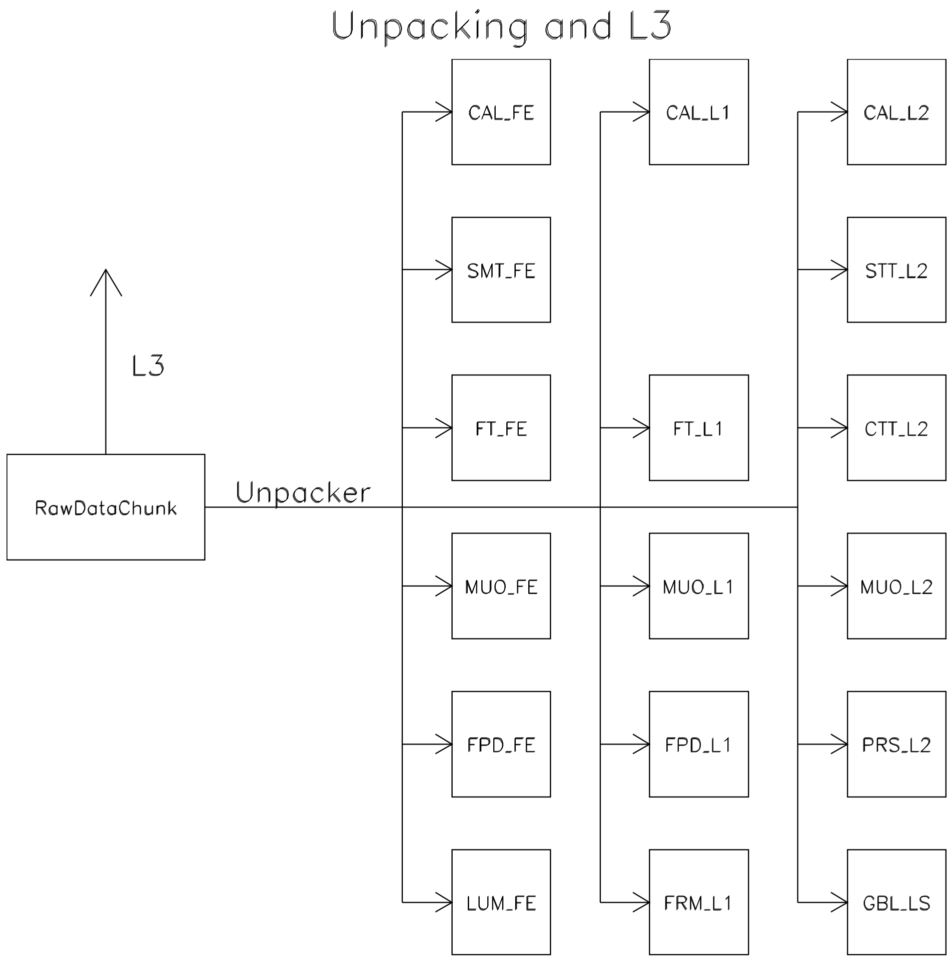
→ Unpack and put the results in a Chunk for easy access

Call this an "Unpacked Data Chunk"

(Too slow for L3. Oh well...3 out of 4 ain't bad)

Purely for convenience. Nothing fundamental

Unpacker


Unpacking and L3
L3
RawDataChunk
Unpacker
CAL_FE
SMT_FE
FT_FE
MUO_FE
FPD_FE
LUM_FE
CAL_L1
FT_L1
MUO_L1
FPD_L1
FRM_L1
CAL_L2
STT_L2
CTT_L2
MUO_L2
PRS_L2
GBL_LS

Packer

Need to confirm that Unpacker works correctly!!!

Recreate a RawDataChunk from UnpDataChunks: Pack!!

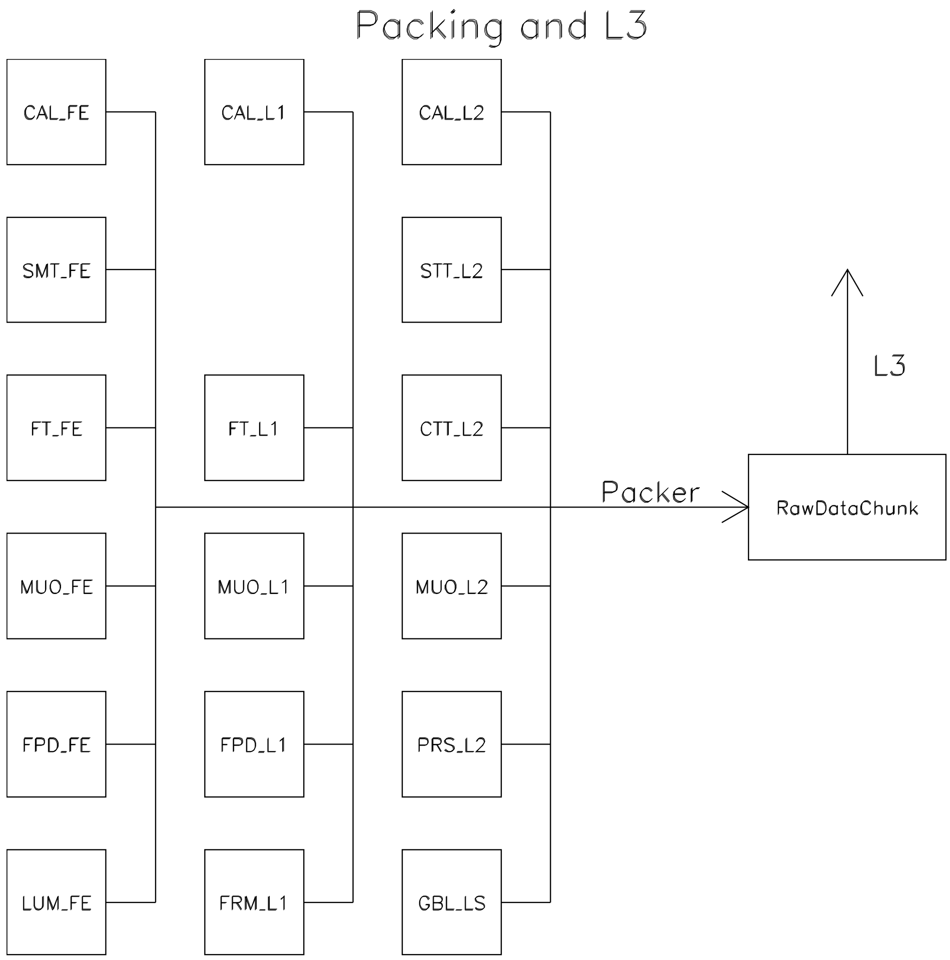
Need a Packer

Makes creation of a RawDataChunk from Simulation easy

$\rightarrow$ have simulation make a set of UnpDataChunks

$\rightarrow$ have Packer make a RawDataChunk for L3 and anyone else who wants it

Packing


Packing and L3
CAL_FE
SMT_FE
FT_FE
MUO_FE
FPD_FE
LUM_FE
CAL_L1
FT_L1
MUO_L1
FPD_L1
FRM_L1
CAL_L2
STT_L2
CTT_L2
MUO_L2
PRS_L2
GBL_LS
Packer
RawDataChunk
L3

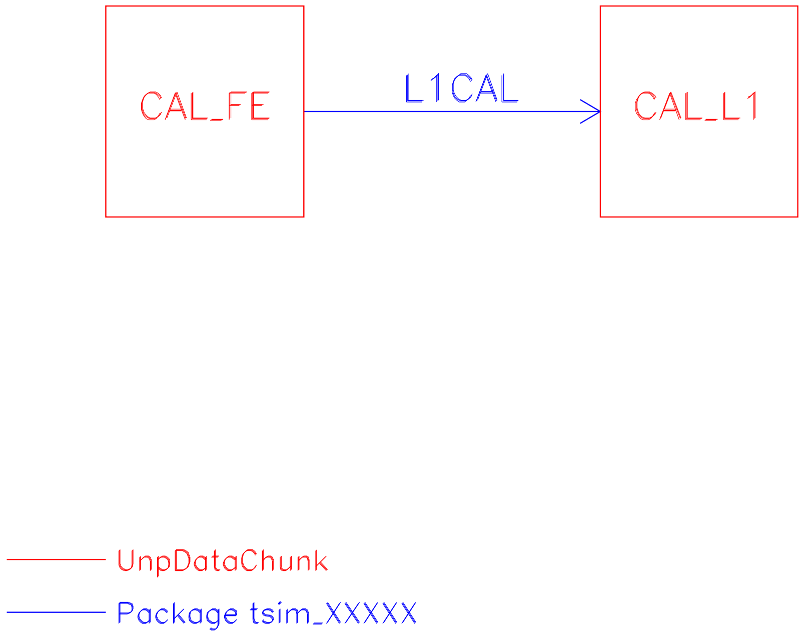
Trigger Simulator Implementation

- Use a series of framework 'Packages' which are run in the offline enviorment
- Each trigger component (e.g. L1CAL) will be simulated in a single Package (e.g. tsim_l1cal)
- The input to each component Package will be one or more 'UnpDataChunk''s

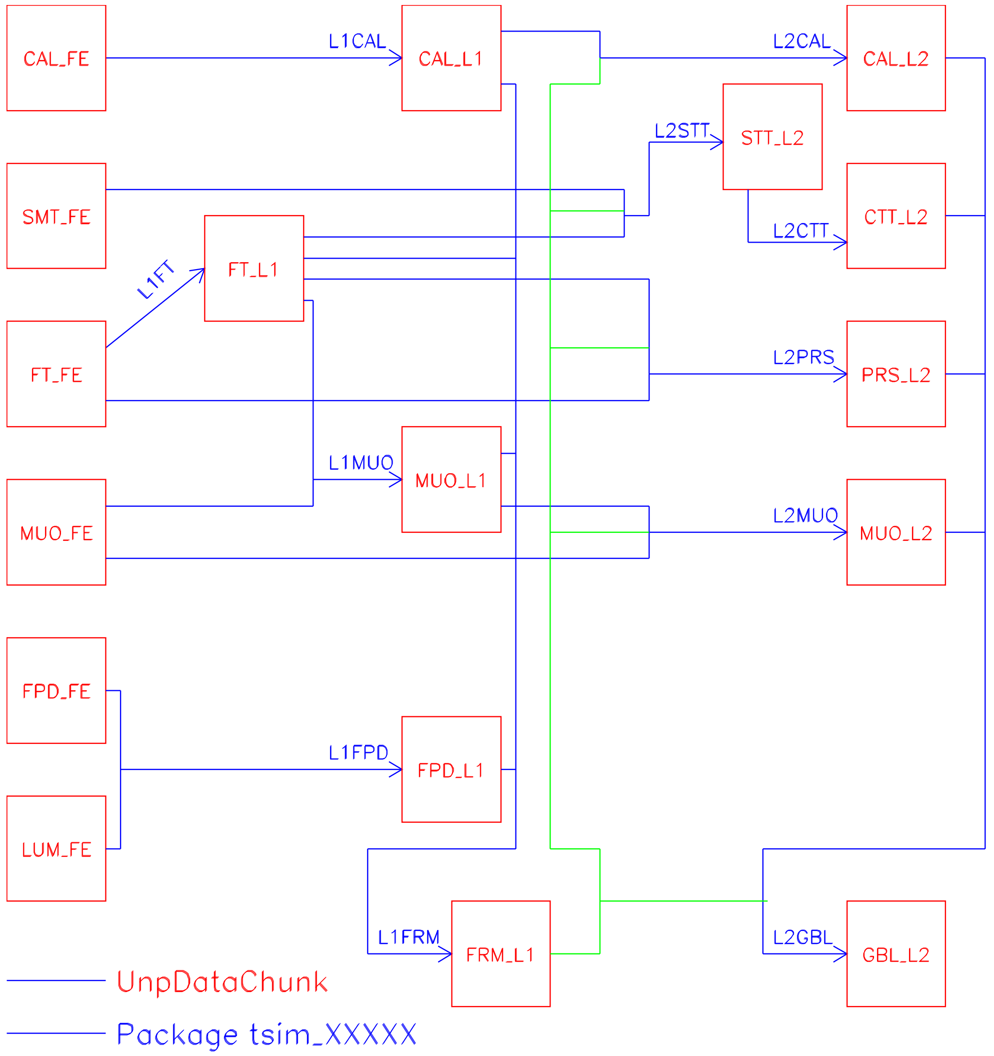
  e.g. CAL_FE $\rightarrow$ tsim_l1cal
- The output of each component Package will be an UnpDataChunk

  e.g. tsim_l1cal $\rightarrow$ CAL_L1

Example: L1CAL

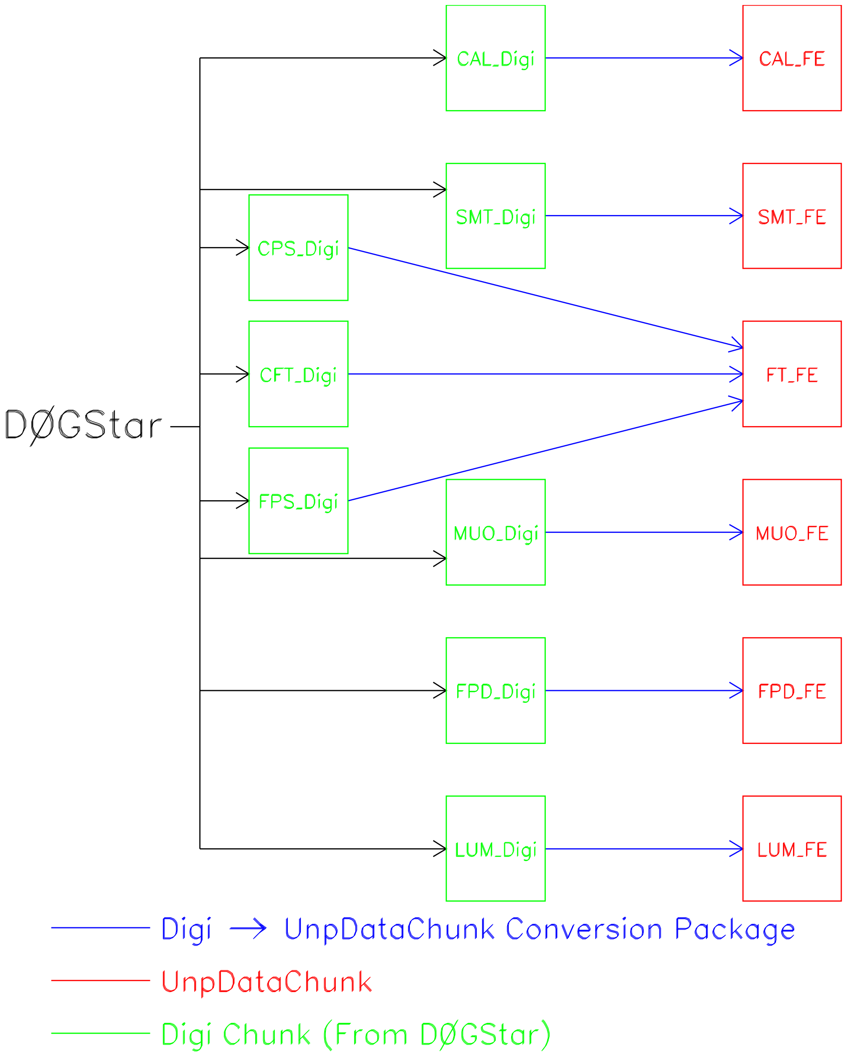


Extending the Example

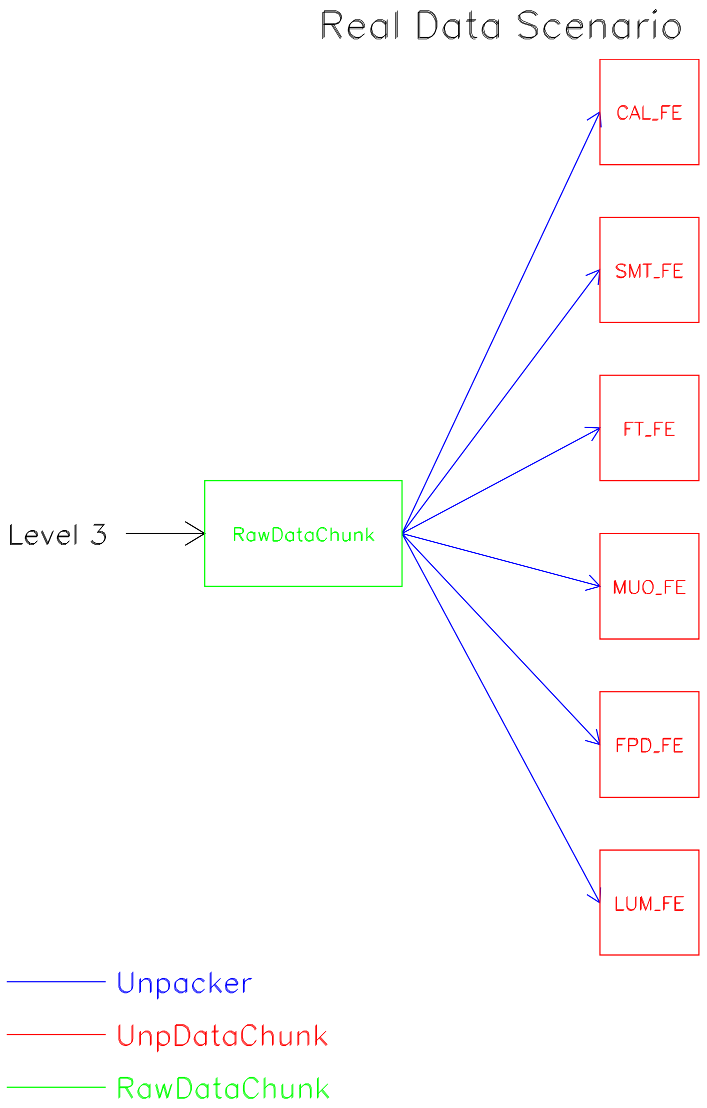


UDC's From Monte Carlo

MC Input Scenario



Real Data as Input



Status of the Project

Major Accomplishments:

- Overview Document (Updated 7/99, DØNote 3555)
- A framework for the simulation exists
- All Packages have been identified
- The I/O UDC's for all Packages are identified
- A detailed 'data flow' description is complete
- Centralized Web Page exists
- A Trigger Ntuple maker exists (Landers & Toback)
  How-to Run Document DØNote 3666
- Progress on many UnpDataChunks and Packages
- Integration testing in progress
- How-to document in progress

Status: Chunks

There are 17 identified UnpDataChunks needed to make a RawDataChunk

- Front End:

  MUO_FE, CAL_FE, SMT_FE, FPD_FE, LUM_FE

- Level 1:

  MUO_L1, CAL_L1, FT_L1, FPD_L1, FRM_L1

- Level 2:

  STT_L2, MUO_L2, CAL_L2, PRS_L2, CTT_L2, G-BL_L2

Status: Front End Chunks

- Domain of Algorithms group
- Digi→ UnpDataChunk conversion routines
- All work in t56
- Versions exist in t57. No beta testing yet

Status:

- CAL_FE: done and being tested (Womersley)
- SMT_FE: done and being tested (Narain, Connolly, Tentindo-Repond)
- MUO_FE: done and being tested (Yasuda, Fortner, Sirotenko)
- FT_FE: CFT done, FPS and CPS in progress (Yip, Coppage, Shpakov)
- FPD_FE and LUM_FE: in progress (Brandt, Partridge)

Status: L1 and L2 Chunks

Simulation group responsible for the L1 and L2 UnpDataChunks

L1:

- FT_L1:

  CFT: draft done for 56 and 57 (Yip)

  CPS and FPS: in progress (Lucotte, Shpakov & Bhattacharjee)
- MUO_L1: in progress (Nang, Johns)
- FRM_L1: in progress (Gonzalez-Pineiro, Opazo)
- CAL_L1: in progress (Kalk, Cummings)
- FPD_L1: Started (Brandt)

L2:

- MUO_L2: draft design (Fortner)
- FT_L2: draft done in t56 (Toback)
- STT_L2: draft design (Tentindo-Repond, Connolly)
- CAL_L2: Output chunk, but not in UDC format (Hirosky)
- PRS_L2: CPS draft, FPS started (Mrinmoy)
- GBL_L2: started (Casey)

Status: Packages

There are 12 tsim_xxxxx Packages

- L1:

  L1CAL, L1FT, L1FPD, L1MUO, L1FRM

- L2:

  L2CAL, L2STT, L2PS, L2MUO, L2CTT, L2GBL

- L3

Status: Packages

Packages in CVS: tsim_l1cal, tsim_l1ft, tsim_l1muo, tsim_l2cal, tsim_l2ctt, tsim_l2muo & tsim_l2stt

L1:

- tsim_l1ft

  CFT: Almost finished!!! (Yip)

  CPS and FPS: In progress (L, S & B)
- tsim_l1muo: In progress (Nang)
- tsim_l1fpd: Hardware/MC issues (Brandt)
- tsim_l1cal: In progress (Kalk, Cummings)
- tsim_l1frm: In progress (Gonzalez-Pineiro, Opazo)

L2:

- tsim_l1cal: Complete in t56 (Toback)
- tsim_l2stt: Moving nicely (Connolly, Tentindo-Repond)
- tsim_l2cal: Draft done in t55 (Hirosky)
- tsim_l2muo: In progress (Fortner, Maciel)
- tsim_l2prs: CPS done, FPS started (L, S & B)
- tsim_l2gbl: Started (Casey)

The Future

- Finish UnpDataChunks for FE, L1 and L2
- Test Digi$\rightarrow$ UnpDataChunk converters
- For all Packages in L1 and L2

  Read in UnpDataChunks

  Simulate functionality

  Write output UnpDataChunk
- Integration tests as packages become available
- UnpDataChunk$\rightarrow$ Ntuple as they become available
- Build a RawDataChunk for L3

Conclusions

- The framework for the trigger simulator has been spec'ed
- A great deal of progress has been made in many areas

  Chunks

  Packages
- Integration tests in progress
- Big physics gains to be made if we can finish quickly
- Still a long way to go

Bottom Line: While most of the people working on the simulation project are over-committed, the tasks are well specified, and with some dedicated 'CPU Cycles' this project could move VERY quickly and make a big impact on the experiment.