Queen Mary
University of London

Calorimeter trigger offline simulation

Edward Moyse

e.moyse@qmul.ac.uk

·Jet/Energy Triggers

·LVL1/LVL2 integration

·ROD algorithm

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Jet & Energy Triggers

- **JetTrigger**:
  - Finished (but not tested/debugged yet)
    - reads in TriggerTowers and performs Jet algorithms
    - Produces JetRoIs

- **Energy Trigger**
  - not yet operating
  - … but work has started on it, and it is closely linked to JetTrigger (so hopefully development will be swift).

LVL1/LVL2 Integration

- **Latest Commitments:**
  - Produce 'ROD' Athena Algorithm which produces correctly formatted Slink data (ROD to RoIB) and CMM to CTP data.
  - Provide 'hardware coordinate' decoder to convert RoI crate number etc. into an eta/phi coordinate.
  - Integrate with TrigT1CTP, the Level 1 CTP sim.
- **Status**
  - See following ROD slides, but briefly for the rest:
    - Hardware decoder : almost finished for EmTauRoIs
    - Integration with the CTP : done. TrigT1Calo now outputs CTP info and reads the TriggerMenu set by CTP.
      - The target for this integration was the end of last month, a target we more or less met (I finished ironing out bugs yesterday)

ROD Algorithm Status:

- **Function**
  - Take RoIs and create Slink words.
  - Also produce CP CMM to CTP output (i.e. For the CP system 16 3bit theshold multiplicities)

- **Status**
  - **DONE**: CP CMM to CTP objects produced (Thomas now uses these in his CTP decision.)
  - **DONE:** CP Slink data produced (Thomas as uses this in his RoIB simulation)
  - Need to finish JEP CTP CMM and JEP RoI ROD output, but essentially the ROD sim is finished.

ROD Algorithm: Slink output

Slink words stored in following format:

- One `ObjectVector<SlinkWord>` for each Slink cable.

- ... where `SlinkWord` is a lightly wrapped `unsigned int`, with methods to integrate with StoreGate.

Beginning of fragment	B0F00000x
Start of header marker	EEEEEEEEx
Header size	8
Format	1
Source_ID	
ROD_L1ID	24bit Lvl1 ID (may be 32bit soon)
ROD_BCID	12bit bunch crossing ID (not available yet)
L1 Trigger Type	0
Det. specific event type	0
RoI words	(see RoI word definitions)
Status word 1	0 (I'm not simulating errors yet)
Status word 2	0
Number of data elements	
Status block position	
End of fragment	E0F00000x
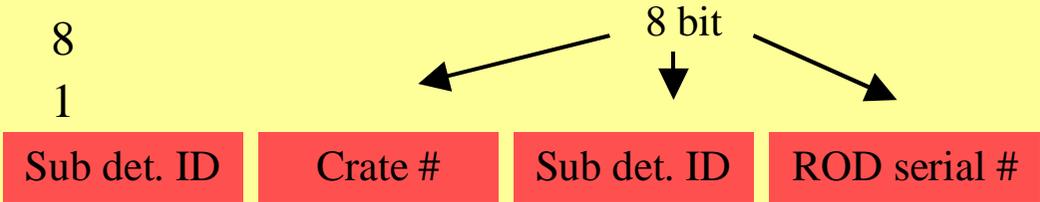
8 bit

Sub det. ID	Crate #	Sub det. ID	ROD serial #

Output summary

Following on from LVL1 integration meeting,
object interfaces have been reviewed.

**All objects will return a "data word" that mimics
data transmitted by hardware.**

- **EmTau Trigger:**
  - **EmTauRoIs**
  - **TriggerTowers**
- **JetTrigger**
  - **JetRoIs**
  - **JetElements**
- **EnergyTrigger**
  - **(EnergyRoIs)**

- **ROD**
  - **CP CMM to CTP**
  - **(JEP CMM to CTP)**
  - **CP Slink**
  - **(JEP Slink)**

```
                EmTauROI
m_TriggerTowers: SmartRefVector<TriggerTower>
m_eta: double
m_phi: double
m_ROIword: unsigned int
ROIword(): unsigned int
thresholdPassed(threshold_number:int): bool
eta(): double
phi(): double
Towers(): SmartRefVector<LVL1::Towers> &
saturated(): bool
```

```
                TriggerTower
-m_eta: double
-m_phi: double
-m_emEnergy: double
-m_hadEnergy: double
+eta(): double
+phi(): double
+emEnergy(): int
+hadEnergy(): int
+emEnergyFull(): double
+hadEnergyFull(): double
+containedCells(): SmartRefVector<Cell> &
```

Brackets = not fully implemented yet

Data Challenge 1

Code needed for DC1:
   Em/Tau trigger
   ROD sim (which produces both CTP and RoIB outputs)
   RoI Decoder

With the exception of the RoI Decoder class, this is finished.

However it needs validation, for instance by reproducing the TDR plots. Hopefully Alan will be able to help me with this.

Outlook and Timing

- **Todo:**
  - Finalise & test ROD/RoIDecoder code
  - Test Jet Trigger
  - Finish Energy Trigger
  - Validate by reproducing TDR plots

- **Timing**
  - I aim to finish the Energy Trigger & ROD/RoI coding within a month
  - TDR plots .... ? Not sure, but hopefully Alan will be able to help me.