



Queen Mary
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Calorimeter trigger offline simulation

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- Move to CMT
- Status.
- TriggerMenu
- ROD
- LVL1-CTP interface
- Conclusion

Move to CMT:

- **CMT**
 - CMT is new ATLAS software management tool: replacement for SRT
 - All Athena software required to move to CMT
- **Not as easy as expected**
 - The move involved re-writing code, and lots of reorganisation
 - CMT itself is documented well, but ATLAS extensions are not. The sw-developers mailing list seems to be the best source of information.
 - Trial and error process, but TrigT1Calo works now with Athena releases up to 3.0.1
 - Took far too long – and I'm certainly not the only person discovering this.
 - As usual, some time spent on producing and maintaining documentation would save time for ATLAS as a whole.
 - I've put some useful links on my webpage.

(aside: CMT oddities)

Imagine I check out a package to do private work on it:

`~/work/AtlfastAnalysis/AtlfastAnalysis-00-01-00`

Now I'm using a release that contains anywhere in it, a newer version i.e.

`AtlfastAnalysis-00-01-01`

CMT will use this instead of my private release **WITHOUT TELLING ME***

So we're told to rename our `AtlfastAnalysis-00-01-00` to

`AtlfastAnalysis-99-99-99` (which produces lots of errors but works)

This is a common problem with (I think) a very clumsy solution.

*CMT does warn you of a conflict, but you'll only find the warning if you look very hard, and are expecting it! And CMT (in Athena) produces TONS of errors like "version of CLHEP incompatible" because the LHCb's Gaudi uses a different naming convention from us. So you get in the habit of ignoring CMT errors.

Status (1): EmTauTrigger

- **EmTau Trigger functional:**
 - It can accept data from several data sources
 - **ATLFAST** calo cells (no use for this trigger until they simulate em/hadronic layering)
 - **GEANT**-produced cells for more detailed work.
 - **Test Vectors** (Alan's text files, used to test hardware design)
 - Code has been tested using Alan Watson's hardware test vectors: 807 "events" produced correct ROI words.
 - Produces EmTauRoI and TriggerTower objects, which are stored in StoreGate (SG).
- **However:**
 - Does not yet produce CMM-CTP information (see later).
 - Does not yet support coordinate-dependant thresholds.
 - No plan (yet) to support coordinate-dependant algorithms

Status (2): Jet & Energy Triggers

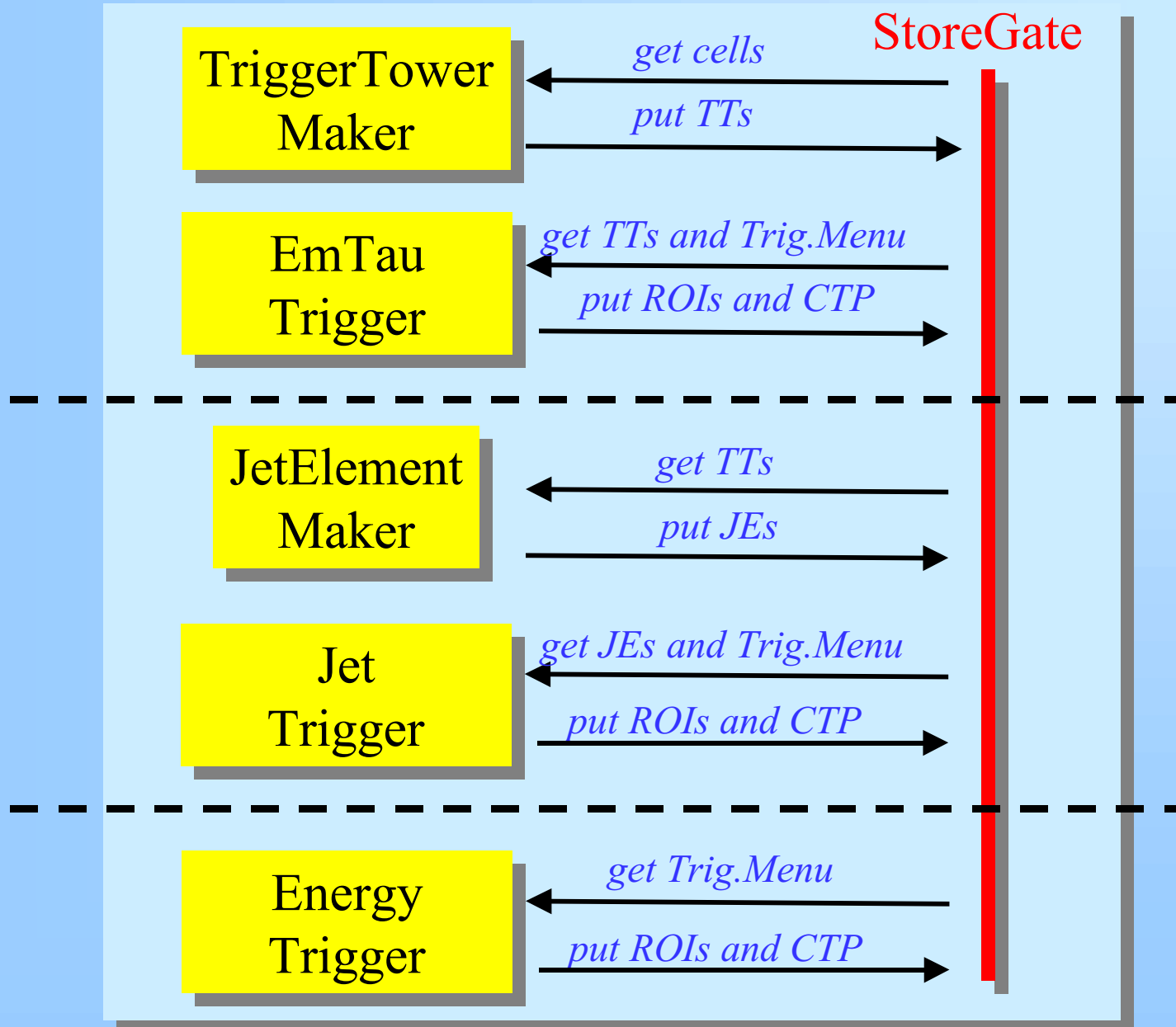
- **JetTrigger:**

- almost finished
 - reads in TriggerTowers and produces JetElements (again, stored in SG)
 - produces 2x2 clusters
 - E_T Max algorithm written and being tested.
- trigger algorithms being re-written and debugged at the moment

- **Energy Trigger**

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

New Software layout



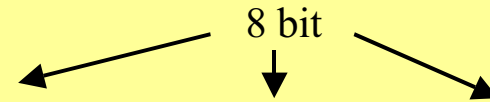
TriggerMenu issues:

- **TriggerMenu/Thresholds : needs attention**
 - currently set in jobOptions.txt, via unwieldy text interface....
 - ... which prevents us setting up coordinate dependant thresholds (though our design supports this)
 - need a better approach, one that links with the rest of LVL1
 - Internally we have a flexible trigger menu representation : so in the short term we could just interface to whatever Thomas provides/uses.

ROD simulation:

- **Need to create Slink words :**
 - Requested by LVL2. Will take RoIs and create Slink words.
 - Currently the ROD simulation will produce (32bit words):

Beginning of fragment	B0F00000x
Start of header marker	EEEEEEEEEx
Header size	8
Format	1
Source_ID	Sub det. ID
ROD_L1ID	Crate #
ROD_BCID	Sub det. ID
L1 Trigger Type	ROD serial #
Det. specific event type	24bit Lv11 ID (may be 32bit soon)
	12bit bunch crossing ID (not available yet)
	0
	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



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

24bit Lv11 ID (may be 32bit soon)

12bit bunch crossing ID (not available yet)

0

0

(see RoI word definitions)

0 (I'm not simulating errors yet)

0

E0F00000x

LVL1-CTP interface:

Last month we had a meeting in CERN discussing Trigger Simulation integration.

The key points (from my point of view) were that:

- We're going to use Athena for offline sim. (Thomas SS and I had a go at setting up Athena in his afs space. Had some unresolved problems)
- All simulations will produce "data objects", and these will all return a "data word" that mimics data transmitted by hardware.
- Thomas is producing a CTP simulation, and a Trigger Menu definition. I will create an interface between this and the TrigT1Calo internal TriggerMenu representation.

LVL1-CTP interface:

Output objects:

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
 - (EmTauCTP)
 - TriggerTowers
- **JetTrigger**
 - (JetRoIs)
 - (JetCTP)
 - JetElements
- **EnergyTrigger**
 - (EnergyRoIs)
 - (EnergyCTP)

```
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

Conclusion:

- JetTrigger is nearing completion
- Links to CTP and HLT are underway
- I will interface TrigT1Calo to whatever TriggerMenu structure Thomas produces.
- Look at hepwww.ph.qmul.ac.uk/~moyse/atrig for more info.