LVL1 Central Trigger Processor (CTP) Simulation
and
LVL1 Simulation Integration

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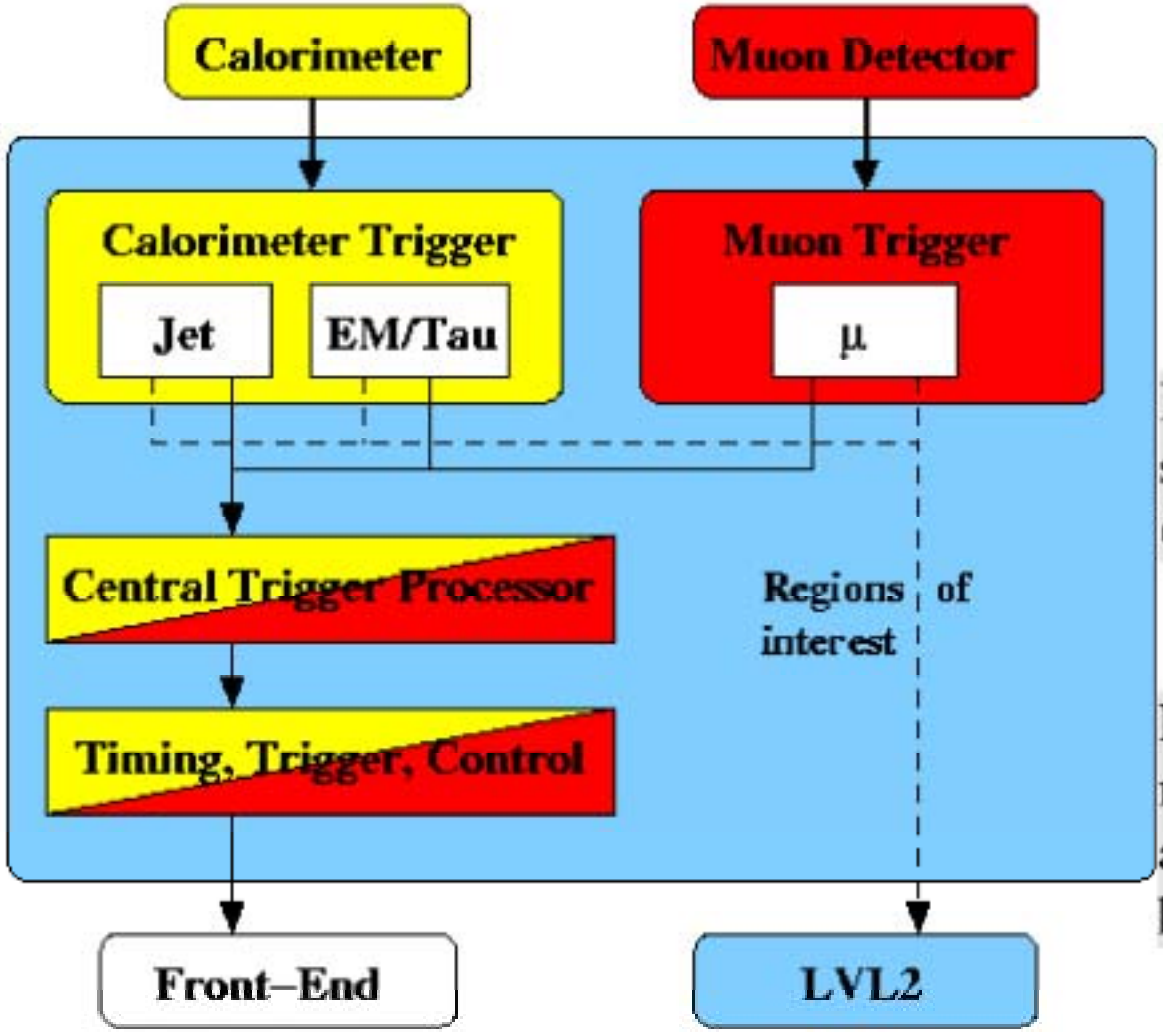
LVL1 Trigger Simulation

Aim: One offline LVL1 simulation software package. Up to now mostly outside Athena and pretty advanced (hardware tests!).

Athena: almost final; high–level => not all details of hardware.

Stand–alone: needs beautification and tests.



Muon endcap: Stand–alone, hardware tests. Design follows hardware closely.

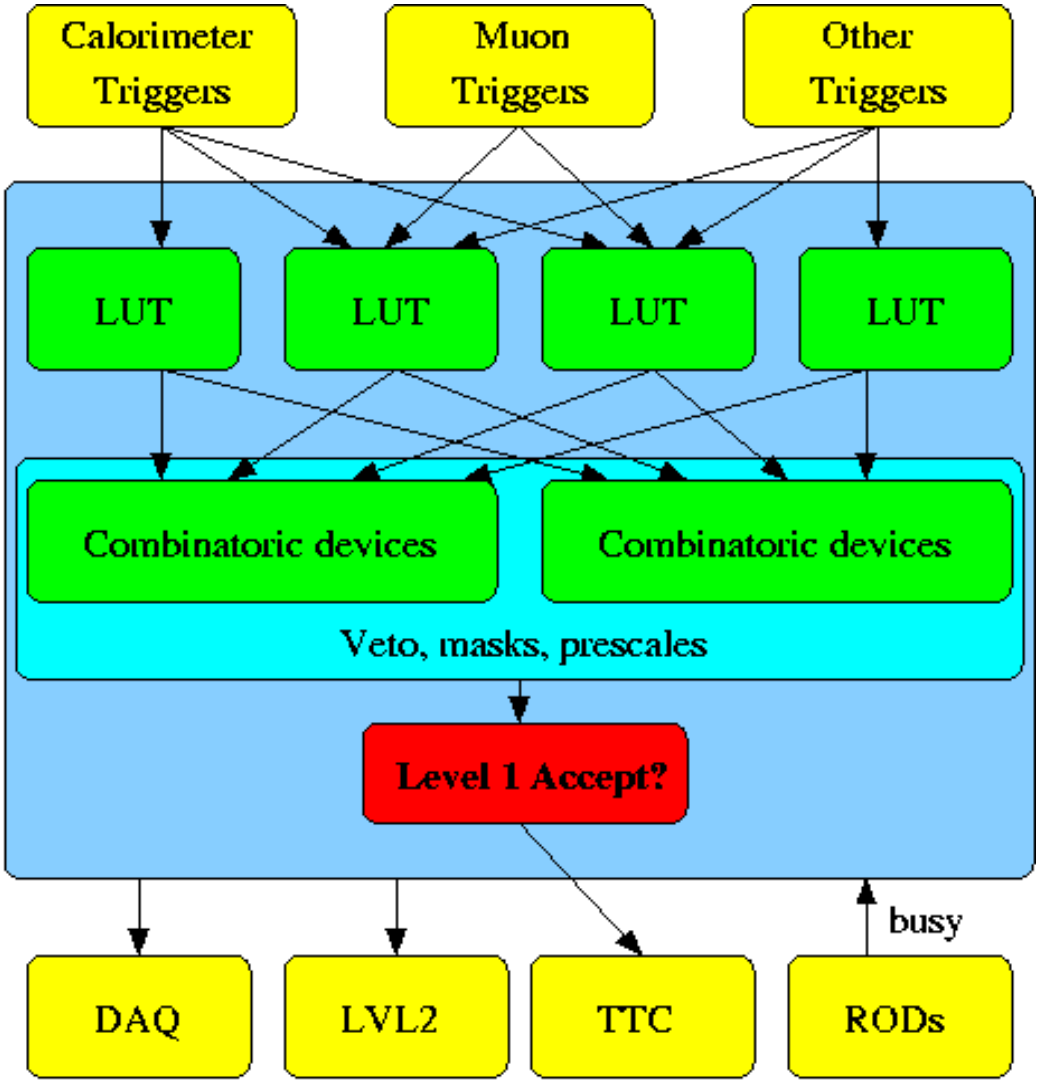
Muon barrel: Still some work needed (stand–alone).

MUCTPI: basically ready. Stand–alone, used in hardware tests.

LVL1 Trigger Simulation

- Framework:
  Decided to go for Athena although currently most components outside.
  Start by combining calo trigger and CTP. Status: Putting CTP simulation into Athena.
- Interfaces:
  No complete picture of LVL1 EDM yet. But have to follow hardware closely (readout of test vectors etc.). Additional information via separate methods.
- Database issues:
  Up to now configuration mainly via (many) ASCI files. Start collecting requests and requirements. ATLAS–wide solution?
- Region–of–Interest builder:
  Probably on LVL1 side.

LVL1 CTP Hardware



Deliver multiplicities.

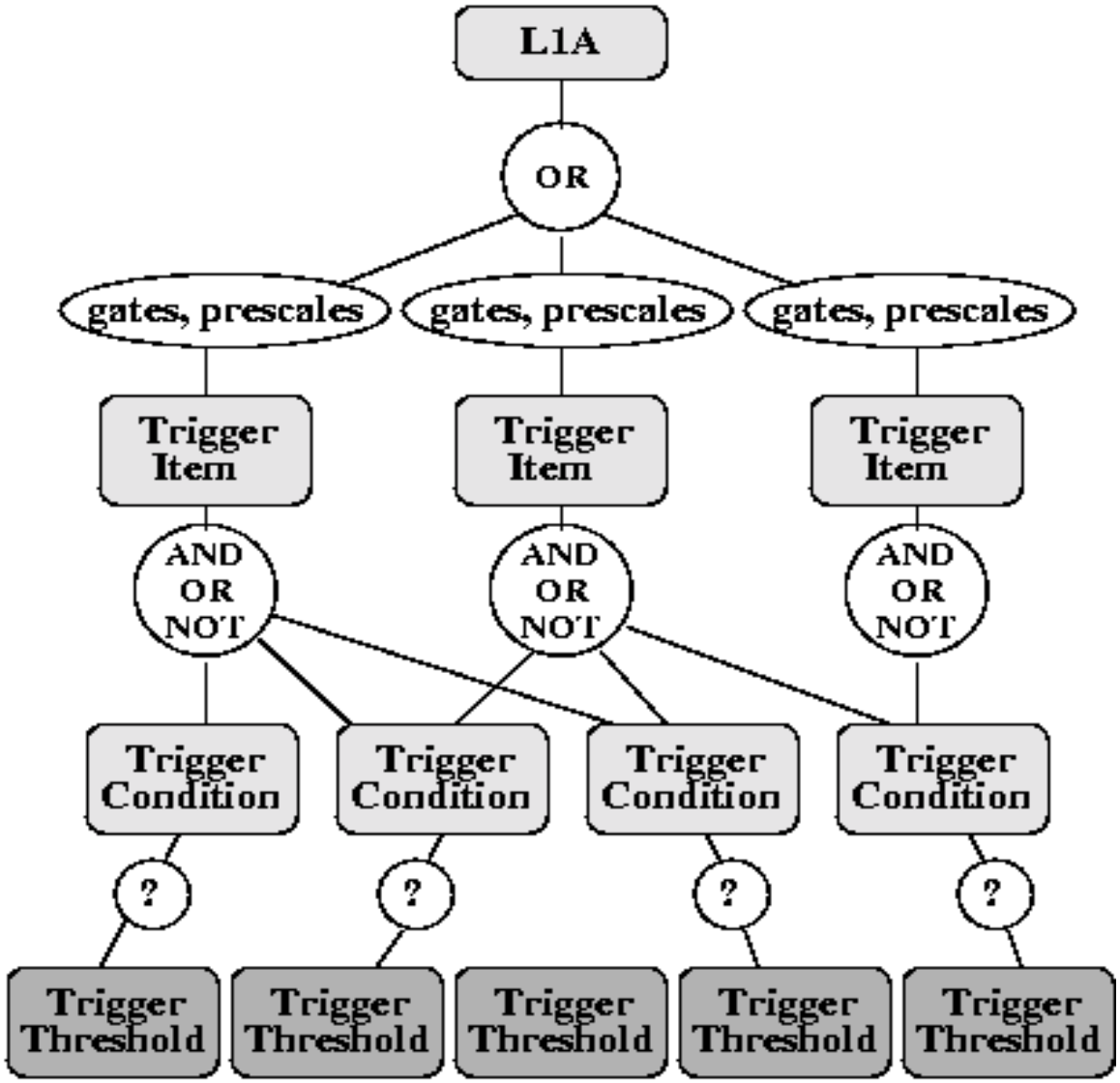
Discriminate multiplicities against requirements => conditions.

Form logical combinations of conditions => items.

Logical 'OR' of all items after prescales and masks.

Output to L2 etc.

LVL1 CTP Logic



Items values needed before and after masks/prescales.

Items probably quite simple.

Conditions are either 0 or 1.

Discrimination

Inputs from calo, muon etc.

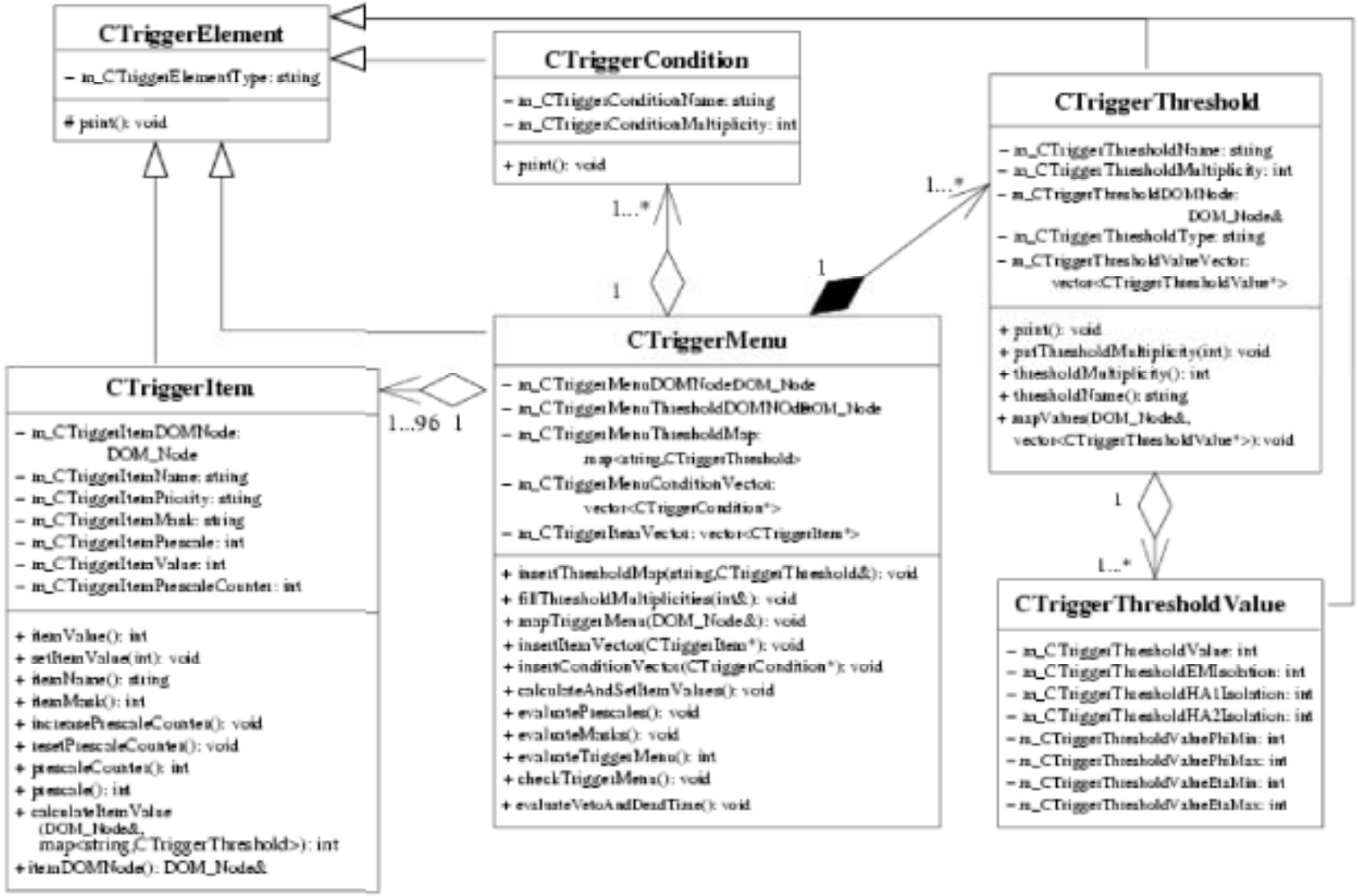
CTP Simulation Requirements

- ➔Simulation must read hardware description and trigger menu and configure hardware (CTP, calo, muon) accordingly.
  - ➔LUT/CMB configuration 'easy'.
  - ➔How about calo and muon triggers (CTP needs to know which 'threshold' is delivered on which physical line and with which threshold value)?
- ➔Simulation must deliver trigger items before/after vetos/masks/prescales (problem of dead time veto simulation!).
- ➔Simulation does not have to deliver trigger conditions (not accessible in CTP demonstrator).
- ➔Timing: currently 7ms per event (XML!) ?????
- ➔To be used in slice test in autumn.

Current Approach

- ➔Hardware description and trigger menus in XML.
  - ➔Trigger menu procedure well understood.
  - ➔Up to now LUTs configurable. CMBs ready in principle but need tests.
- ➔Parsed to C++ objects using XML DOM API.
  - ➔Class structure follows logical elements (trigger element, condition, item), not hardware.
- ➔Up to now random inputs for multiplicities.
- ➔No C++ crack, so code needs beautification.
- ➔ Started integration into Athena. Not completely straight forward

Class Diagram



Interfaces to other components

➔MUCTPI:

one 32 bit word (essentially 3*6 bits for the 6 thresholds).

➔Calorimeter trigger

➔LVL2/DAQ:

TBV/TAV/TAP, inputs (multiplicities), LVL1 Accept

➔Have to take care of formats in near future.