GMT Monitoring

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CMS Trigger Monitoring Workshop
16 January 2007

Firmare based monitoring

- **Part of the firmware**
- **Information is accessed via VME registers using Trigger Supervisor**
- **Each input muon line (4x4) contains in addition to actual data:**
  - **1 bit parity**
  - **1 bit synchronization error**
  - **3 bit bx-number (lower 3 bits)**
- **These are checked and errors counted in the firmware per orbit and a status flag for each bit is raised if an error occurs**
- **An input muon can be canceled if one of these errors occurs (configurable) - how often a muon is canceled can be also monitored**

Data based monitoring

- **Based on the readout record of the GMT (part of GT ro rec.)**
- **Ideas for a starting set of plots:**
  - **Plot basic distributions (spatial, pT) of GMT muons and compare with reference (can be split for different quality codes or trigger types) - detect local instabilities**
  - **Plot distance between GMT muons of the same event - detect muon merging and ghost rejection problems**
  - **Plot e.g. the average number of GMT muons per trigger as a function of time - detect time-wise instabilities**
  - **Use HLT to reconstruct muons in prescaled low bias triggers and plot the efficiency of GMT as a function of time - monitor overall performance stability**
- **Raw2digi, Digi2raw basic code exists in cvs**
- **In contact with Bill Badgett and Jeffrey Berryhill for DQM modules - work frozen until GTFE module ready (this or next month)**

Monitoring based on the Emulator

- **The emulator will validate a sub-sample of L1A triggers (or possibly all) by comparing individual L1 decision bits of the hardware against the calculated ones**

- **It is possible always or only on request (if above validation fails) to compare the whole GMT output (as well as input and intermediate results) bit-by-bit with the calculated data. The emulator and unpacker outputs are stored in a CMSSW container of identical format which simplifies the comparison.**