Readout of DPS/FEXes

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- L1Calo View

Readout Requirements (1)

- What do we need for LDPS & FEX system as a whole?
- What is TDAQ readout for?
  - Ensure trigger branch is working correctly on every event
    - Compare trigger (LTDB/LDPS) energy with full calo energy
      - Check nothing has failed or become intolerably noisy after the shapers
  - Need supercell Et at input of FEXes to check FEX algorithms
    - Look for rare pathologies, eg saturation behaviour
    - Also in case of saturation (too many objects) HLT wants to rerun L1Calo
      - For that they would need the digitised FEX inputs
  - Readout of supercell energies may have other uses
    - Eg the present "level 1.5" jet trigger uses L1Calo data in HLT
- Clear need for readout of final supercell Et per event
  - L1Calo considers this essential
    - Ideally L1Calo would like to cross check its input data
      - Eg read out inputs from LDPS too - at least at startup
      - Also considering some checksum scheme to ensure we correctly receive LDPS data

Readout Requirements (2)

- Readout of ADC samples (LDPS inputs from LTDB)
  - Required initially for tuning filters (5 samples)
    - Check pulse shapes from the front end
    - NB to check filter + peak finder (BCMUX) needs 7 samples (test only)
  - Need to be able to check behaviour with real data (pileup)
    - For efficiency studies to have clean samples eg Z->ee (requires full event & tracking etc)
  - Obviously a lot of data...
- Suggestion: several DPS readout modes
  - At startup, read ADCs every event ("transparent mode"?)
  - Later perhaps only for sample of events
- Partial event building
  - We have used partial event building (high pileup test runs)
  - Could read full data only for some HLT streams
    - Suppress ADCs from full event for other streams
    - But data would still need to be read out from the DPS...

Readout Volume

- Present L1Calo PPM readout:
  - 5 ADC samples + final Et from Lookup Table per tower
    - 7200 towers * 6 values with ~10 bits/value (includes error bits)
    - About 50 kBytes/event - actually less due to compression
- DPS Calibrated Supercell Energies
  - 32k supercells + 3600 hadronic towers
    - ~36k values with ~12 bits/value
    - Also ~50 kBytes/event - should be less with zero suppression (BCMUX!)
- LTDB samples
  - 32k supercells * 5 samples @ 12 bits
    - ~250 kBytes/event (before compression)

Where to Read Out?

- L1Calo view:
  - LDPS should be able to read out both ADCs and supercell Et
    - At least for testing/startup
  - FEXes should be able to read out input Et and trigger results
    - At least for testing/startup
  - Which system reads out which data in regular running could be discussed...