EUDAQ

Status of the EUDET JRA1 DAQ software

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Outline

- VME Speed
  - The problem
  - The fix
  - Measurements and predictions
- DAQ stability
- User Integration
- Other Issues
  - 64-bit Linux compatibility
  - TLU v0.2

VME Speed: the problem

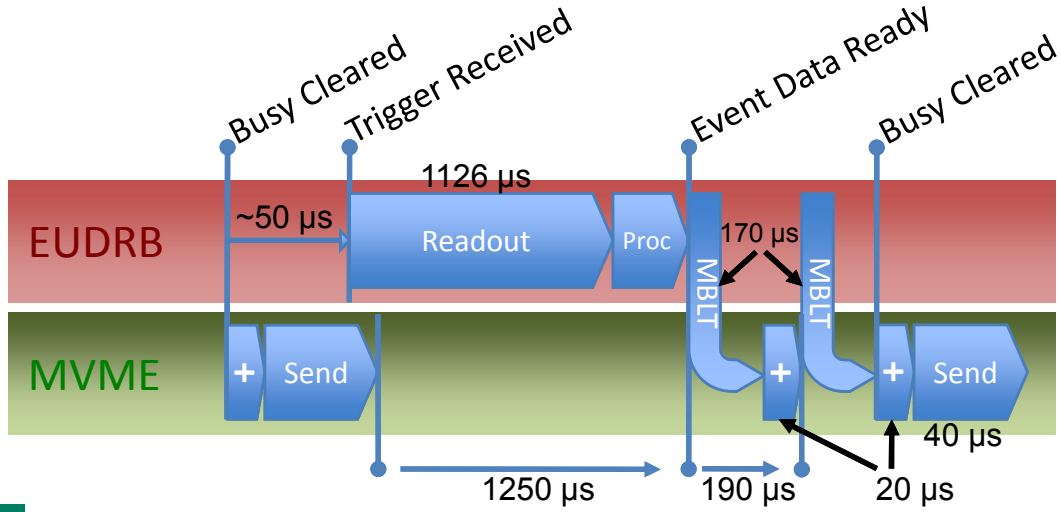
- VME driver works by mapping “windows” of VME address space into memory
- Software was remapping this window each time a new card was accessed
- Remapping takes 2-3 ms each time, so 6 times per event with a full telescope
- This was severely limiting the readout speed

VME speed: the fix

- The VME driver provides 7 “windows”
- So we map one window per board, and they no longer need to be remapped
- Tested in the lab:
  - Two EUDRB boards
  - MimoTEL configuration, but no sensors
  - Zero Suppressed mode
  - 10 kHz random triggers
  - Readout speed increases from 150 Hz to 600 Hz

VME speed: measurements

- MVME clears busy flag
- Next trigger is received (average 50 µs)
- EUDRBs read out one frame (MimoTEL at 15 MHz: 1126 µs)
- EUDRBs process data and write it to output buffer
- EUDRBs set EventDataReady flag
- MVME performs block transfer on first board (170 µs)
- MVME adds data to event (20 µs)
- Repeat last 2 steps for all boards, clearing busy after last MBLT
- MVME sends event to DAQ (40 µs)



Predicted speed with 6 boards:

1250 + 40 + 6*190
= 2430 µs
➔ 410 Hz

VME Speed: further improvements

- Increase sensor clock speed
  - Readout 845 µs @ 20 MHz instead of 1126 µs @ 15 MHz
  - Predicted speed: 1 / 2150 µs = 460 Hz
- Buffering (at least) 1 event on the EUDRB:
  - Busy can be cleared at EventDataReady
  - MBLTs happen in parallel to readout of next event
  - Readout + processing: 1250 + 60 = 1310 µs
  - MBLTs + sending: 6*190 + 40 = 1180 µs
  - Predicted speed: 1 / 1310 µs = 760 Hz

VME speed: the future

- With on-chip zero suppression, sensor readout time is reduced: bottleneck will then be MBLT
- Predicted speed: 1 / 1180 µs = 840 Hz
- Implementing a faster transfer mode, like 2eVME, becomes interesting
- If transfer time ~halves from 170 µs to 90 µs
  - Predicted speed:
    6 * (90+20) + 40 = 700 µs ➔ 1.4 kHz

DAQ Stability

- DAQ has a tendency to crash during restart of runs
- Difficult to debug, since it is intermittent
- Believe it has to do with threading:
  - Some resources are not properly protected with mutexes
  - Two threads can access them simultaneously
  - They get corrupted and the DAQ crashes
- Proper protection is being implemented, but:
  - Not ready yet
  - Won't be sure it is fixed until proven with a few testbeams

User Integration

- Creating new Producers for users is harder than it needs to be
- Currently each Producer requires it's own Event data type, but they all do the same thing
- Need to provide a generic RawDataEvent
  - Can store arrays of raw data of variable size
  - Has a tag with the format of the data (EUDRB / DEPFET etc.)

Other Issues

- Compatibility with 64-bit Linux
  - Should be portable, but hasn't been fully tested on 64-bit Linux
  - Data seems to be written correctly, so data files are OK
  - Files cannot be read: bug in decoding
- TLU
  - TLU v0.2 is available, needs integrating into software
  - Should be easy, interface is similar to previous version
  - Improved firmware for TLU v0.1 needs testing

Conclusions

- Significant improvement in VME readout speed
  - But measurements only taken with two boards, and without any sensors attached, so take exact numbers with a pinch of salt
- Other improvements on the way
  - DAQ stability (hopefully)
  - Easier integration of users
  - Compatibility with 64-bit Linux
  - Support for new TLU