

Online Monitoring of TPC Electronics for DUNE – Starting a Discussion

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Online Monitoring

- The DAQ group is asking that we specify our computing needs for online monitoring
 - They are assuming that 10 high end CPU boxes are sufficient for all the online monitoring needs for DUNE
 - How much data needs to be sent to online monitoring ? How often ? How much data are we writing out ? For how long do we want to keep it ?
- I may have some ideas, but experience from ProtoDUNE is invaluable

What do we want from OM ? (i)

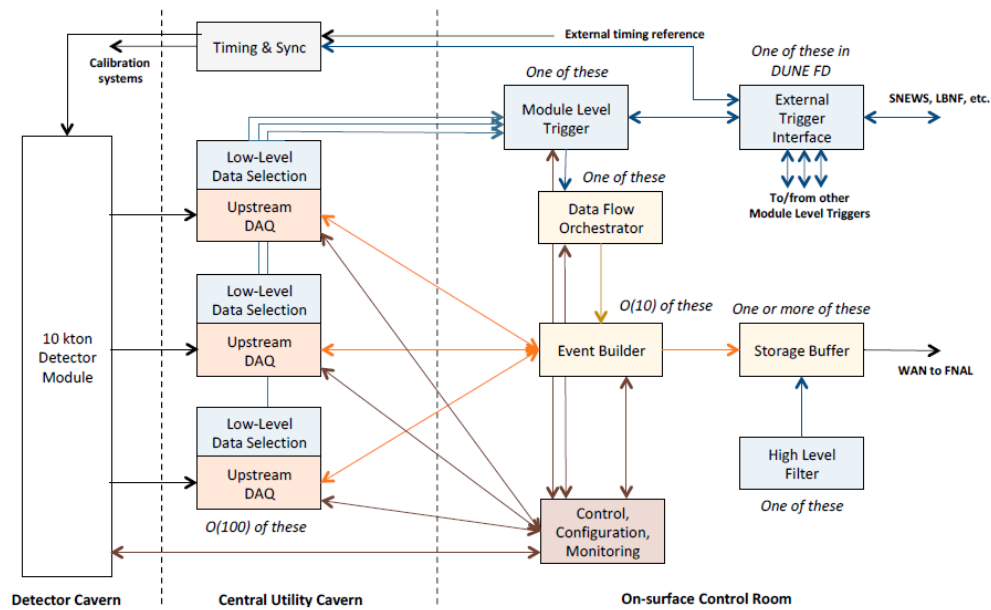
- Bare minimum:
 - A few minutes into the run demonstrate that all the wires are active
 - Example
 - Every second transmit data buffer from one APA (out of 150), calculate baseline and RMS, record it
 - Entire detector updated every 150s
 - How much data ? 1 data frame = 5 ms (~ 10k samples) * 2560 samples * 12 bits = 38.4 KB (300 Mbit/s)
 - With single Gbit/s interface we are within what the network can do (not sure about the I/O on the PC)
 - Keeping lots of connections open to different Felix boards
 - Can we process the data quickly ? Probably yes
 - Output: time profile (1 entry every 2.5 min) of baseline/rms for all the wires, identify noisy / dead channels, make summary plots for entire detector
 - Send to online presenter, record data as a function of time (not sure that we are going to have concept of run in DUNE...)

What do we want from OM ? (ii)

- More refined
 - Take longer data buffers and calculate FFT, identify noise spikes at different frequencies.....
 - Does not need to be updated on a short time scale
 - But also problem with buffering all the data for multiple time slices
 - Put all X, U, V wires together ?
 - Save at the end of the run ? Display after N time slices processed for each APA ?
 - Can we keep everything in memory ? How fast is the FFT ?

Where do we get the data ?

- Get data for online monitoring from upstream DAQ
 - This is data that has already been reordered in time (i.e. one entire data frame for 1 APA)
 - This is before triggering (i.e. non biased data)



What else do we want to do ?

- DUNE will continue to have a DQM that processes the data more slowly but still provides relevant information for one run
- Is there any thing else that we could do in the online monitoring
 - With data from 1 single frame
 - Summing up multiple frames
- Do we want to do something special for triggered data ?
 - Divide by trigger ?
- Do we want to do something special for special data ?
 - Laser calibration, neutron source calibration, radioactive source calibration ?
 - Do we want to use online monitoring to process the TPC electronics calibration data (i.e. pulser runs)
- Is there something we want to move from DQM to online monitoring

Online Monitoring in the WIB ?

- Calculating baseline / rms could be done in the WIB firmware, see all the data, update even more quickly
- Maybe we can also do FFT for all U, V, or X wires in one APA together
- If we move online monitoring in the WIB firmware, what does the online monitoring SW do ?
 - Pull the data from the WIBs and display them

Your input

- Your experience with online/offline monitoring and analysis of the ProtoDUNE-SP data gives you unique insight
 - What should go in the online monitoring
 - CPU/memory/disk/network needs
- Help develop a plan.... I may ask you to do some homework (check CPU and bandwidth requirements)