



All
Experimenters
Meeting

C.L. McGivern

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Introduction

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Manpower

MINERνA Operations Report and MINERνA DAQ CROC-E Upgrades

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Operations Update

from H. Budd

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- Running shifts starting 3:30PM weekdays for about 1.5 hours
 - We are still leaving HV off except for shifts
 - All boards operating
 - Run PEDs and Light Injection to determine if there has been any change in the detector
 - There appears to be no change in the detector or PMTs
- Started running DAQ over longer periods
 - We have the CROC board throwing a hardware error after several hours of running, causes the run to stop
 - Almost certainly due to a FEB board
 - Software reset of VME crate fixes it



Detector Experts, PMT Box Replacements

from H. Budd

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- Dan Ruggiero only expert and has been doing this since the assembly of the detector
 - Dan can look at the tube to replace and decide how you approach replacing this tube
- Dan is training Steve Chappa, Kevin Kuk, Roberta Davila from PPD EE Dept.
 - In Lab G, Dan built simulated replacement setup
 - The optical cables and light injector fibers are plugged in blind
 - After much practice, we will have them do some tubes on the detector
 - Difficult job especially for PMTs in certain places. Sometimes to replace a PMT you have to remove 2 PMTs



DAQ Upgrade Introduction

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- During low energy running, the DAQ system took ~ 1.4 s to read out one physics gate and a single calibration gate
 - Due to large hit activity in the detector, it was not uncommon for a calibration gate to be skipped due to time constraints
- In the Numi-NOVA running regime, the MI cycle time will be faster and there will be an increase in beam intensity
 - Our current readout time is not fast enough
 - We also need to be able to handle more data



DAQ Upgrade Introduction

CROC : Chain ReadOut Controller

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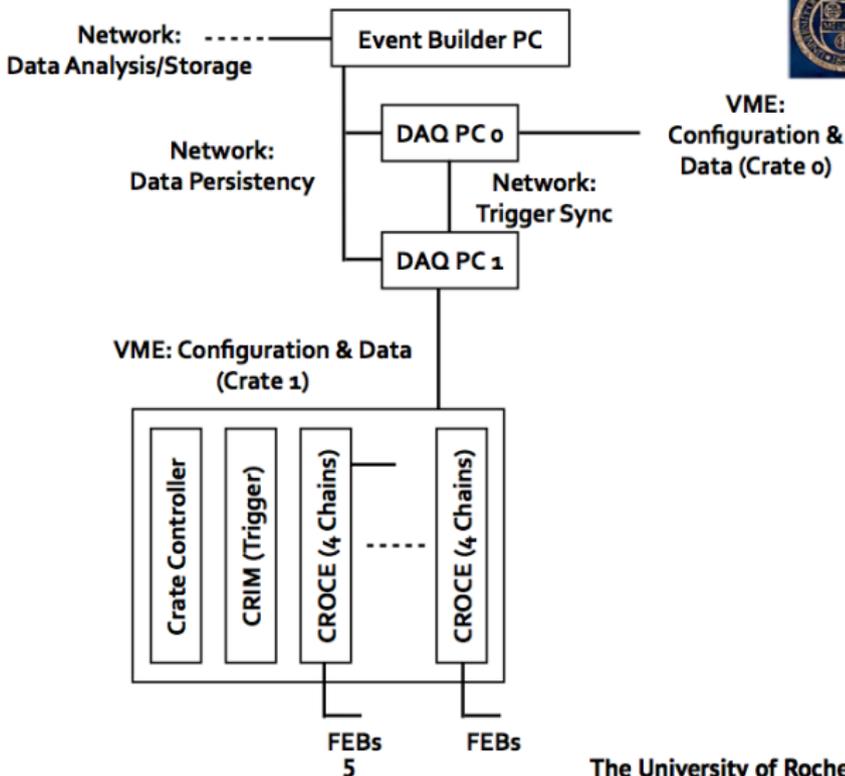
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DAQ Upgrade Introduction

CROC-E : Chain ReadOut Controller with Ethernet Interface

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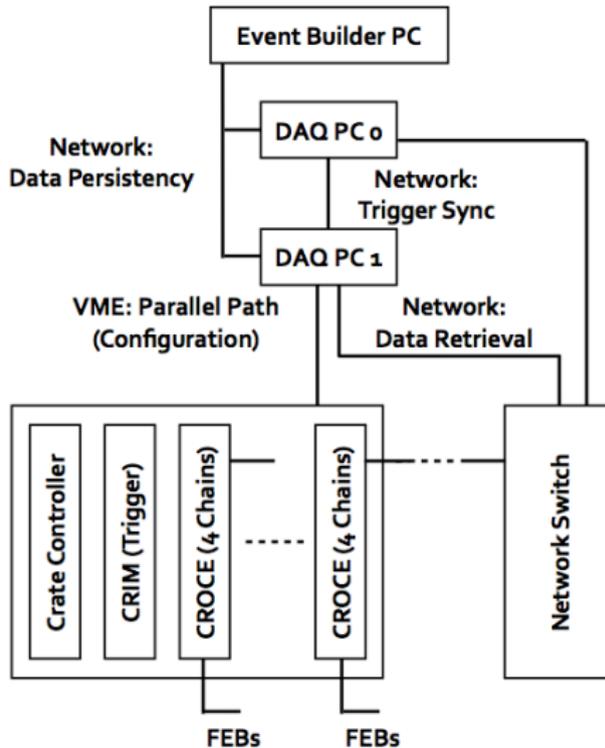
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Gabriel N. Perdue

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The University of Rochester



Completed Work

Finished January 7, 2013

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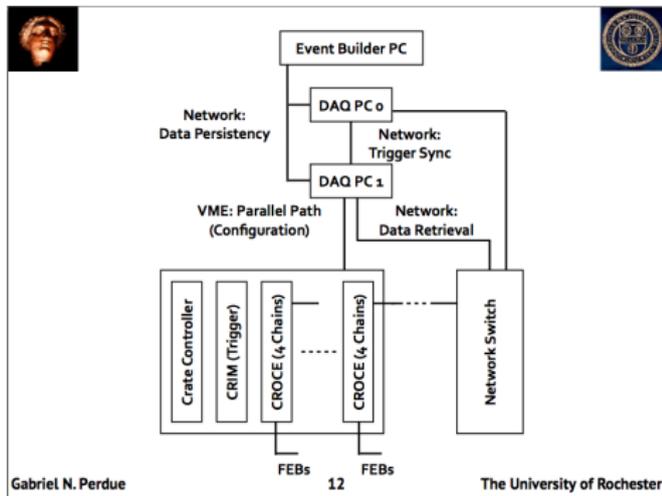
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- Primary testing of two prototypes in the CROC+ stage (new CROC-E but not using the ethernet option)
 - The front end board readout sequence is implemented in the CROC-E firmware, not the DAQ PC
 - All front end boards are read out in parallel
 - Faster memory retrieval





Completed Work

Finished January 7, 2013

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Made two measurements:

- Readout time from the front end boards to the CROC-E
 - Since readout of the front end boards is done in parallel, this is now almost negligible
- Readout time from the CROC-E to the PCs
 - Dominates the readout time at 0.277 s, but still significantly shorter than the MI cycle time
- One front end board can hold 4934 bytes of information, with 509 boards \rightarrow 2.51 MB (for 8 hits)
- A readout of a completely saturated detector (18 MB/s) requires only ~ 0.3 s, leaving plenty of time for calibration and light injection gates



Current and Future Work

estimated finished by April 5, 2013

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- Current Work (estimated finished by March 15, 2013)
 - On Jan. 7th, ok was given to fabricate the rest of the boards
 - Fabrication of the CROC-E boards (March 15, 2013)
 - Update the current DAQ software to incorporate the new CROC-E format (March 1, 2013)
- Future Work (estimated finished by April 5, 2013)
 - Teststand verification of the CROC-E boards once finished (March 22, 2013)
 - Installation of the CROC-E boards once tested (March 29, 2013)
 - DAQ testing and verification with the new CROC-E boards in the detector (April 5, 2013)
 - Buy and replace existing underground DAQ nodes (age, dust, vibration) (June 15, 2013!!)



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- Well on our way...
- Initial calculations have us well within our timing window for a physics gate and many calibration and light injection gates
- The new CROC-E modules have hardware flexibility for an even faster mode of operation, but at the cost of significant firmware development work
 - We've decided to delay that implementation for now



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- Primary testing and implementation
 - Carrie McGivern (Pittsburgh), Gabe Perdue (Rochester), Geoff Savage (Fermilab)
- CROC-E Board/Firmware design and building
 - Cristian Gingu (Fermilab), Boris Baldin (Fermilab)
- Possibly involved in the future
 - Donatella Torretta (Fermilab), Bill Badgett (Fermilab) - when time allows (as Minos responsibilities wind down)



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Backup Slides

Backup Slides



Completed Work

Finished January 7, 2013

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Backup Slides

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- A readout of a completely saturated detector (18 MB/s) requires only ~ 0.3 s, leaving plenty of time for calibration and light injection gates

Trigger types and timing values for one spill

Gate Type	ADC Frames (est)	Time Required (s)	Running Sum (s)
Physics	6	0.1856	0.1856
Pedestal	1.1	0.0361	0.2217
LI	5	0.1551	0.3767

- With our new CROC-E readout boards, we can now take a single physics gate and up to 5 calibration gates and 5 Light Injection gates in less than ~ 1.2 s
- We are also able to increase the number of hits that we can readout from 8 to 16, which will improve data quality