SCD NO*v*A Electronics Engineering Projects

29 August 2012

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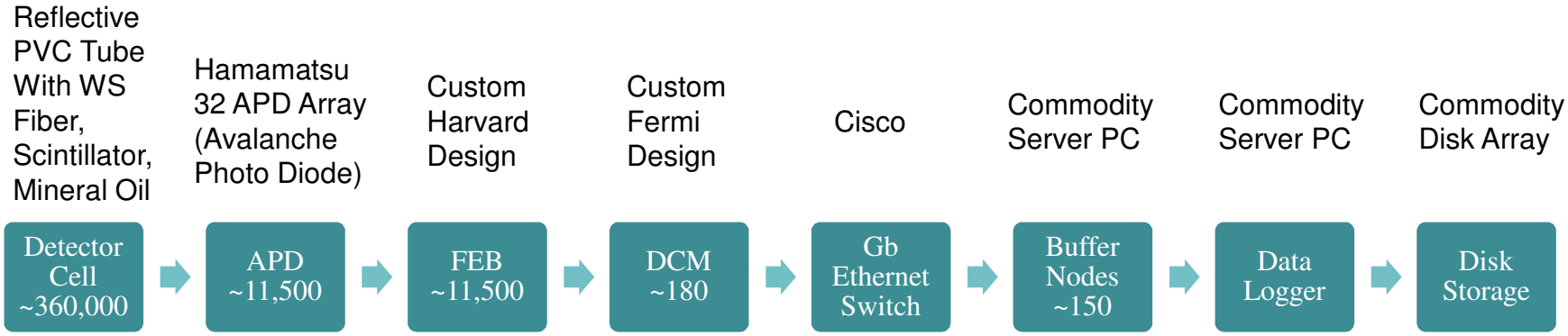
DAQ and Timing Overview

- Need to digitize, event build, and store ~360,000 channels worth of APD data.
- Triggerless and deadtimeless DAQ – Store all data sampled in a specified time window.
- Far Detector in Northern Minnesota requires remote lights-out operation.
- Smaller but similar system in place on Near Detector in Minos hall.
- Near and Far detectors must by synchronized.
- Mix of custom and COTS hardware.

NOvA DAQ Data Flow



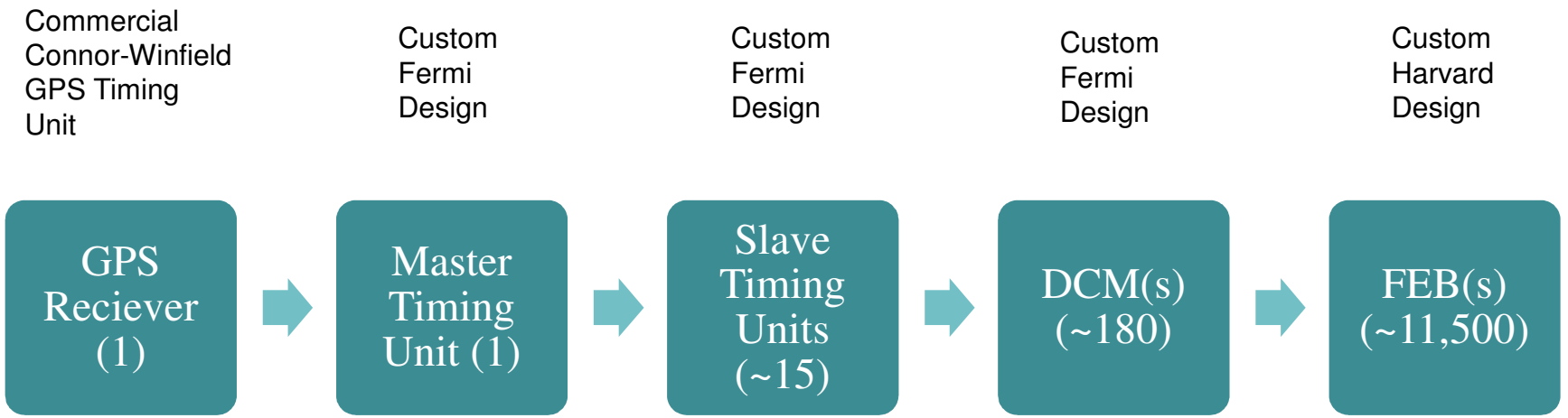
Data Concentrator Module

Data Concentrator Module

- SCD Developed module.
- FPGA accepts and buffers data from up to 64 APD/FEBs.
- Passes control and timing information from the Timing System to FEBs.
- PPC CPU builds sub-events and packetizes data for transmission to Buffer Nodes.
- Interfaces with run control.
- Project represents approximately 4 FTE years of work.

DCMs Installed at NDOS

NOvA Timing System



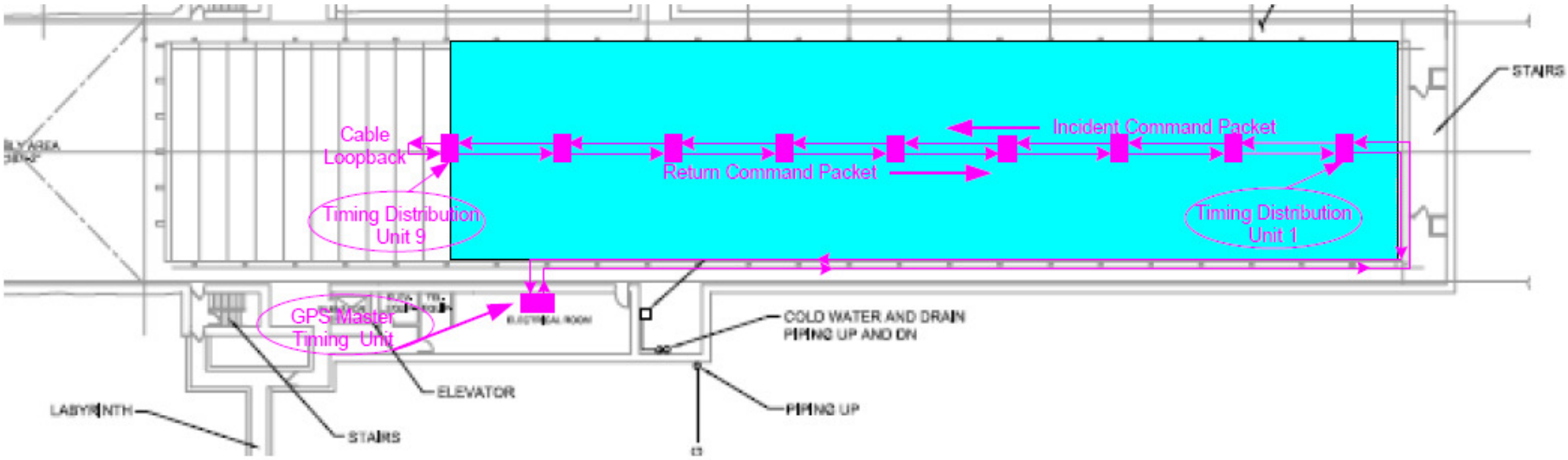
Timing Distribution Unit

NO*v*A Timing System

- SCD Developed modules.
- GPS based.
- Allows accurate correlation of timing for two DAQ systems separated by more than 500 miles.
- Two module flavors developed:
  - Master Timing Distribution Unit (MTDU).
  - Slave Timing Distribution Unit (STDU).
- Modules share hardware.
  - MTDU is an STDU with GPS and CPU modules, and unique firmware.
- Project represents approximately 2 FTE years of work.

TDUs on the Far Detector

- Multiple STDUs needed to avoid long cable runs.
- MTDU to STDU connection is fiber.



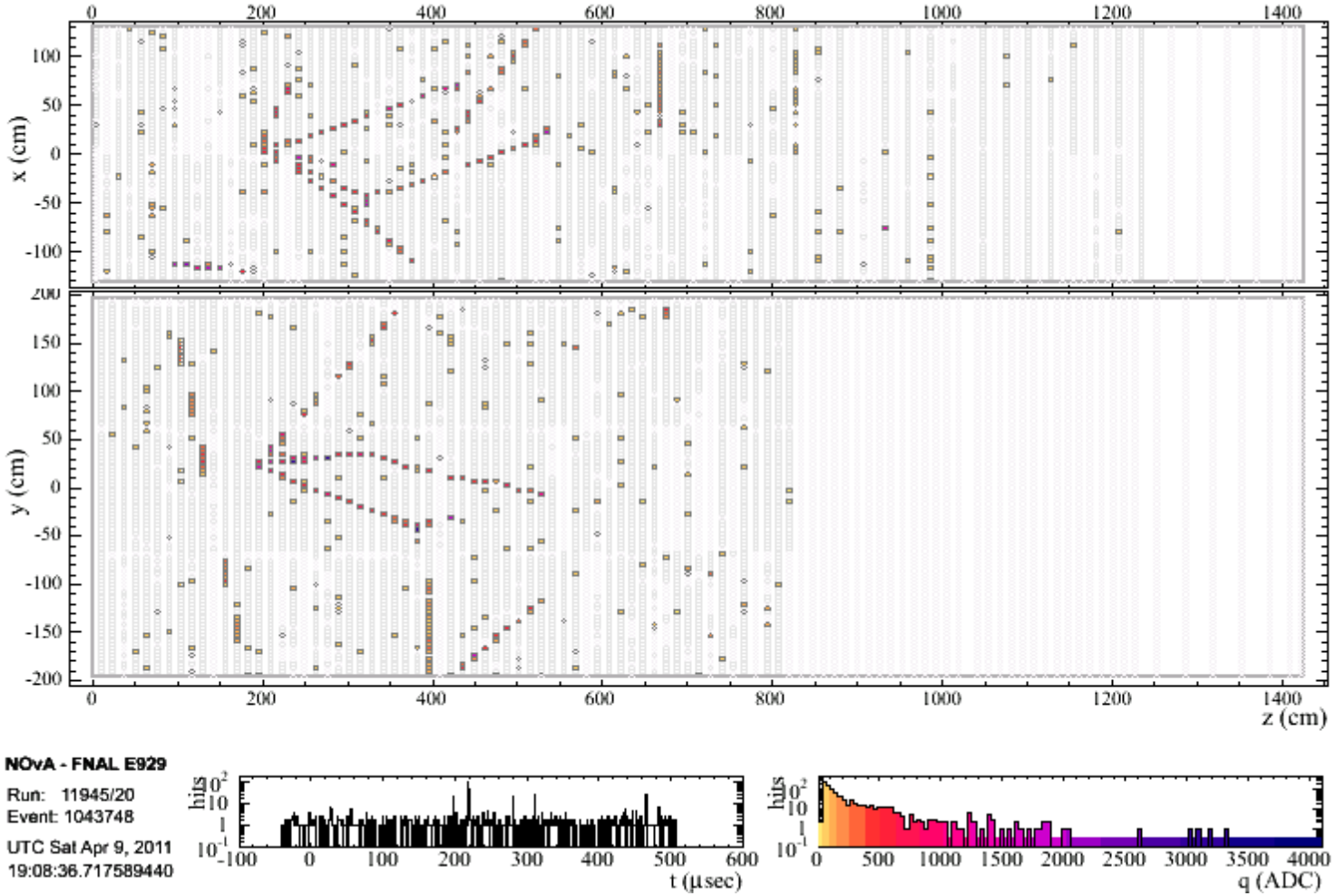
Timing Calibration System

- Will allow verification of detector synchronization without relying on cosmic rays.
- One detector module connected to each DCM will be outfitted with an LED.
- LEDs flashed by centrally triggered power supply modules with equal length cables to a trigger module.
- Timing based on a Rubidium or Cesium clock.
- System will be designed to be simple and robust.
- Will borrow heavily from the COUPP LED flasher system.
- Project in specification phase.

Other Possible Uses

- LBNE is seriously considering the use of both the NO*v*A Timing System and the DCM for LArTPC.
- Timing System may be usable with minimal changes.
- DCM will likely need firmware changes and probably front end I/O changes (there is no spec yet).
- Hopefully much of the NO*v*A developed software can be used as well.
- LBNE DAQ and Timing requirements are evolving.
- We estimate ½ to 1 FTE year for DCM mods (hard to pin down right now).

NDOS Neutrino Event



Watch the Fun

- http://vmsstreamer1.fnal.gov/live/novacam02.htm
- http://vmsstreamer1.fnal.gov/live/novacam01.htm