Electronic Systems Engineering Section

Status of the non-Accelerator,

non-BTeV Engineering Support & DAQ Projects

February 9, 2005

Engineering Support (50.02.04) Areas of Work

- D0 VRB Controller (VRBC) Support.
- D0 L1 ECal Test Wave Form Generator.
- D0 Detector Vertex Board Luminosity Monitor Firmware.
- D0 Trigger Distribution System Support.
- D0 Fiber Tracker Mixer System Support.
- D0 Analog Front End Module Upgrade.
- CDF Crowbar Module Support.
- High-speed data link R&D for both new experiments & internal ESE projects
- Farms evaluations and PREP support as needed

D0 VRB Controller (VRBC) Support

- Description:
  - D0 asked ESE to get VRBC modules into serviceable condition. After getting VRBC's to meet their original performance specs, ESE addressed technical improvements increasing the overall experimental trigger rate. ESE now supports the ESE-designed VRBC firmware currently at D0.
- Scope:
  - ESE does not support this module beyond patching our firmware.
    ESE will do necessary firmware ECO's and maintain a VRBC test stand.
  - We have been repairing suspect VRBC's on a time-available basis.
  - D0 has request ESE assistance on any VRBC ECO's that increase the D0 trigger rate further.
- Schedule:
  - Interrupt driven on a management prioritized basis.
- ESE Effort:
  - About 20 FTE Days/Year (4 FTE Weeks/Yr), decreasing.
- StakeHolders:
  - Ted Zmuda, Thinh Pham, Don Lincoln (D0)

D0 L1 ECal Test Waveform Generator.

- Description:
  - In collaboration with D0, design, fabricate & commission a specialized Arbitrary Waveform Generator to meet D0's need to test the ADF Module in the Level-1 ECal system.
- Scope:
  - Generate the initial system, followed by any necessary hardware and/or firmware ECO's.
- Schedule:
  - A recent (October 2004) decision was taken to assemble the system from commercial components. This system was delivered to UMich Jan05.
  - Based on his Windows Software design, Stefano helped D0 get their Linux software to run the commercial unit. This project is now considered **delivered**. http://www-ese.fnal.gov/D0Cal_TWG/
- ESE Effort:
  - **Complete** but for minor consulting, perhaps summing to <2 FTE weeks/yr.
- StakeHolders:
  - Stefano Rapisarda & Neal Wilcer, Hal Evens (Nevis), Maris Abolins (MSU)

D0 Vertex Board Luminosity Monitor Firmware

- Description:
  - D0 designed new Level 1 Trigger Detector Luminosity Monitor hardware, and requested ESE help getting the firmware operational.
- Scope:
  - Generate firmware to meet D0's specifications and fit in their hardware.
  - Assisting D0 with commissioning of their Hardware & our new Firmware.
  - Iterate testing and debugging thru completion of requirements.
- Schedule:
  - Interrupt driven, on a D0 available and management prioritized basis.
- ESE Effort:
  - 15 FTE days since June 2004 (6 FTE Weeks/Yr)
  - Oct 2004 Firmware package delivered purports to meet all requirements
  - Assisting in intermittent debugging on their schedule
  - Currently about 30 FTE Days/Year (6 FTE Weeks/Yr)
- StakeHolders:
  - Rick Kwarciany, Dave Slimmer, Rich Partridge (D0), Brendan Casey (D0)

D0 Fiber Tracker Mixer System Support

- Description:
  - ESE designed new hardware & extensive firmware to reorder the inputs from the D0 Level 1 Trigger Detector.
- Scope:
  - Support the previously deployed Mixer system by diagnosing/repairing failed modules.
  - Assisting D0 with the debugging and enhancing of the system.
- Schedule:
  - Construction completed in 2003. http://www-ese.fnal.gov/D0_CTT_Mixer
  - Support is interrupt driven, on a management prioritized basis.
- ESE Effort:
  - was: 15 FTE days in Fy2004 (3 FTE Weeks/Yr) (repairs & replace memory's).
  - expect about 10 FTE Days/Year (2 FTE Weeks/Yr) and decreasing (repairs),
  - any major ECO's will have to be fed thru the justification and approval process.
- StakeHolders:
  - Stefano Rapisarda & Neal Wilcer, Fred Borcherding (D0), Marv Johnson (D0)

D0 Trigger Timing Distribution System

- Description:
  - Trigger hub for distributing over 1000 L1 and L2 signals and clocks to up to 128 front-end subsystems & returning status from the front-end subsystems**.** Built and Deployed in 2000.
- Scope:
  - Firmware updates & broken module repair since this is not a PREP system.
  - D0 recently requested a firmware upgrade to utilize new status information added recently to front end modules.
- Schedule:
  - A fiber optic version was designed and delivered in 2004.
  - Latest firmware upgrade request remains pending.
- ESE Effort:
  - Firmware Updates and repairs: 30 FTE days/year.
- StakeHolders:
  - Ted Zmuda & Thinh Pham, xxx(D0)
  - http://www-ese.fnal.gov/d0trig/default.htm

D0 AFE VLSB (VME LVDS Serdes Buffer)

- Description and Scope:
  - Spec, Design, Fabricate and Deploy a Test Module for the new D0 AFE module. The same board is also used by Japanese MICE (M&S support).
- Schedule:
  - 6 boards are done (4 for MICE, 2 for D0 AFE testing).
  - Firmware is being completed.
- ESE Effort:
  - Needs approximately 30 days of Neal & Stefano to complete.
  - Support for MICE needs to be defined via MOU.
  - Support for D0 needs to be defined via MOU (coupled to new AFE).
- StakeHolders:
  - Stefano Rapisarda & Neal Wilcer, Paul Rubinov (D0).
  - http://www-ese.fnal.gov/D0_VLSB/

D0 Analog Front End (AFE) Module

- Description:
  - D0 is proposing reengineering the AFE modules. They've requested ESE's services (specifically Stefano Rapisarda) for this task. D0 is looking for funding while management discussions continue.
- Scope:
  - This module is at the very core of the D0 detector. The design is extremely sensitive. This is a very high profile project. Deliverables include new boards with new firmware. The prototype exists and they need a project engineer to move this to completion.
- Schedule:
  - To be determined. D0 collaboration must agree this is a priority.
- ESE Effort:
  - Initial guestimates are from 12-24 months of Stefano, depending on resources provided.
  - Some management discussions. Our involvement is just starting.
- StakeHolders:
  - Stefano Rapisarda, Paul Rubinov (D0)

CDF High Voltage Crowbar support.

- Description:
  - CDF requested protection against beam incident overcurrents damaging the Port Cards. ESE responded with High Voltage Crowbar PC boards with picofuses for protection. Following deployment, ESE provided support of the crowbar boards within the scope of the ongoing diagnosis of these beam incidents.
- Scope:
  - Support the Crowbar boards by replacing blown picofuses.
- Schedule:
  - Interrupt driven.
- ESE Effort:
  - <2 FTE Weeks/Yr.
- StakeHolders:
  - John Chramowicz, Rong-Shyang Lu (AS, CDF SPL).

High-speed data link R&D for both new experiments & internal ESE projects.

- Description:
  - Apply newly available technology to develop the next generation of high speed data link for HEP experiments.
- Scope:
  - Develop and Deploy high speed data links for HEP customers.
- Schedule:
  - Customer driven
- ESE Effort:
  - Background filler, until a project gains approved status.
- StakeHolders:
  - Bill Haynes, ESE, HEP customers.

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THE END

JDEM R&D

- Description and Scope:
  - Spec and Design a Data Compression algorithm and prototype module.
  - Support characterization of reprogrammable electronics for the spacecraft data acquisition system.
  - Hardware support for the PPD investigations into radiation tolerant memory.
- Schedule:
  - Specifications documents and prototype this year.
- ESE Effort:
  - Ongoing meetings and support for test beam efforts.
  - Test beam in Russia this year
- StakeHolders:
  - Guilherme Cardoso, Alan Prosser(+ others), John Mariner.
  - http://snap.fnal.gov/

ESE Section Personnel

- **Engineers & Engineering Associates - 13**
  - Mark Bowden Gustavo Cancelo
  - Guilherme Cardoso de Cardoso
  - Bob Forster (Associate Section Head)
  - Bill Haynes Rick Kwarciany
  - Vince Pavlicek (Section Head) Alan Prosser
  - Stefano Rapisarda Marcos Turqueti Ted Zmuda
  - Greg Deuerling Ken Treptow

- **Guest Scientist**
  - Lorenzo Uplegger

- **Technical Staff - 5**
  - Jeff Andresen John Chramowicz Jim Franzen
  - Thinh Pham Neal Wilcer