

DAQ Status Report

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DAQ consortium PI meeting, 11-Sep-18

Topics and Goals

- Items for discussion
 - ▶ Progress in recent months
 - ▶ Convergence with ProtoDUNE
 - ▶ News from LBNC
 - ▶ Schedule update
 - ▶ WBS and resources
 - ▶ Institute responsibilities
 - ▶ TDR
- Goals for this meeting
 - ▶ Approve plans for TDR preparation
 - ▶ Agree deadlines for institute responses on responsibilities
- Apologies to those who could not make the meeting
 - ▶ Zoom recording will be available

The 'Big Chunks' of DAQ

- Consortium working groups were set up last year
 - Architecture; hardware / interfaces; back end; data selection; integration
 - Have now evolved this to better reflect 'big pieces' of the DAQ deliverables
- Back-end
 - Event builder framework, event builder, storage buffer, computing interface
- 'Middle end' (need to find a better name)
 - FELIX hardware and computing, data buffering and event builder network
- 'Front end'
 - Detector data links; system (FPGAs) for data pre-processing for SP TPC
- Data selection (aka trigger)
- Timing system and external interfaces
- Run control and data management
- Integration and installation

Recent Progress: Highlights

- Back End
 - ARTDAQ working reliably at ProtoDUNE; discussions on service computing & offline computing interface
- Mid end
 - FELIX working well at ProtoDUNE, though more tuning and development to go
 - Studies of SP TPC data processing on CPUs progressing well; successful workshop at BNL in summer
- Front end
 - RCE system working reliably at ProtoDUNE; debugging rare edge cases
 - Work on prototype FPGA platform continues; boards and demonstrator firmware in the next few weeks
 - Detector links infrastructure and specification now becoming well defined (-> cavern planning)
- Timing system
 - Much progress on beam trigger and timing at ProtoDUNE; proposal on system parameters for DUNE
- Data selection
 - New estimates of data volumes from physics and calibration data
 - New studies on trigger primitive algorithms and performance; successful workshop at Penn in summer
- Integration / installation
 - Master installation schedule for ITF and SURF becoming mature; plans for CUC taking shape (maybe)

Convergence with ProtoDUNE

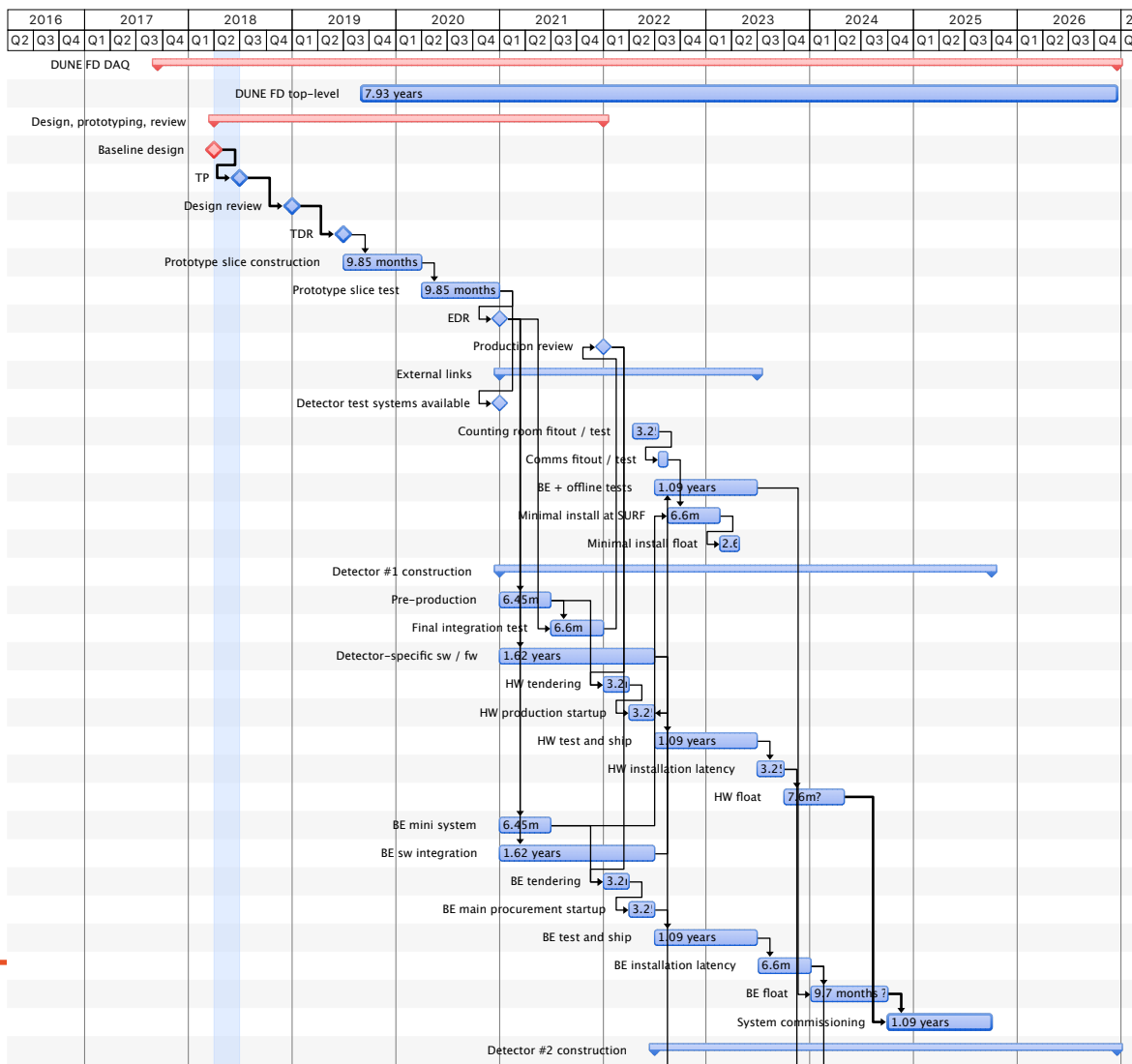
- Unsurprisingly, ProtoDUNE-SP is a focal point in last few weeks
 - System is rapidly becoming mature, taking beam data reliably
 - Significant work left to do; system is complex, and nothing is simple!
 - Valuable lessons for DUNE (simplicity, controls and monitoring, homogeneity, reliability...)
- ProtoDUNE-SP run ends in mid-November
 - We assume a ProtoDUNE-DP run starting 2020
 - Assumption: continue to operate detector and DAQ during LS2; SPSC proposal in progress
- Convergence of projects
 - From November, no more 'ProtoDUNE DAQ project', but only consortium; may imply change of mgmt structure
 - We will have to support continued running; but hope for an influx of personnel and expertise from ProtoDUNE
- Plans for 2020-21
 - Parasitically equip existing system with new prototype hardware, firmware software
 - Key goal (aspirationally, before TDR): demonstrate self-triggering from recorded data rather than beam trigger
 - Carry out stability runs, provide testbed for new prototype detectors and electronics
 - Carry out first tests with realistic calibration systems (lasers, etc) – no possibility to do this elsewhere
- This (along with test stands) will be the key facility for validating our final DAQ design by 2021

News from LBNC

- DAQ plans presented in detail as successive LBNCs
 - There seems to be a meeting every few weeks...
- The basic viewpoint of LBNC
 - What we are doing is difficult and ambitious – we agree
 - Interfaces with calibration, computing need more work – we agree
 - Have not justified from physics all our parameters and decisions – we partially agree
 - Some semi-random decisions were taken in the past (e.g. on CUC space) – we agree
 - It's going to be tough to write a TDR – we agree, but have no degree of freedom
 - Funding has to be balanced over the collaboration proactively – we strongly agree
- Latest LBNC report will be public before collab. meeting
- Additional LBNC meeting in October for DAQ
 - We are not being singled out, this is an opportunity for a 'informal' discussion
 - No date set yet – might be good to do this at CERN, showing that DAQ is not a 'paper exercise'
- New LBNC chair (Hugh Montgomery) – we expect change of style

Master Schedule

- Full version attached to agenda; no changes since ~May



Short-Term Schedule

- M1 (Dec 2017): Interface documents completed – **DONE**
- M2 (Jan 2018): Performance and functional specifications document completed – **DONE**
- M3 (Mar 2018): DAQ cost and infrastructure requirements document completed – **DONE** (cost as part of RRB process)
- M4 (April 2018): DAQ TP sections completed – **DONE**
- M5 (September 2018): First SP prototype DAQ hardware available – **Pending**
- M6 (December 2018): TDR structure and institute construction-phase responsibilities defined – **Next key step**
- M7 (January 2019): Slice test with SP cold electronics completed
- M8 (January 2019): Internal review of baseline TDR DAQ design
- M9 (March 2019): DAQ TDR completed (**note change of date**)

WBS Revision

- Substantial revision of previous DAQ WBS
 - ▶ Linked from agenda
 - ▶ Now fits with overall DUNE nomenclature, style, costing assumptions
 - ▶ Resource loaded with both capital (M&S) costs and effort
- Resource estimates
 - ▶ We have deliberately been conservative in our costings
 - The costing ratchet only works in one direction...
 - ▶ SP module: \$6.3M, 285SY; DP module: \$2.0M, 96SY
 - Yes, you read those numbers correctly.
- State of play with resources
 - ▶ `Neutrino cost group' (Rameika et al) taking a first pass before RRB
 - ▶ Expect to receive significant push back, since as things stand this level of effort does not exist in the consortium
 - ▶ Before end of year, we need a realistic plan for the RDR, meaning:
 - Institute commitments (even if aspirational); critical examination of assumptions; descoping if necessary

Institute Responsibilities

- Our task at this point
 - ▶ Show that our consortium is capable of carrying out the project
 - ▶ Looks like we will be OK for M&S if all hopes are realised
 - ▶ Looks like we will be very right for effort
- Responsibility matrix
 - ▶ By end of October, need all institutes to express their intended work areas
 - All work areas are now documented, with effort estimates, in the WBS
 - ▶ Include estimates of available effort (and its category), and funding sources for it
 - ▶ Need to make an effort to cover all DAQ areas in at least shallow depth
 - Some critical areas (notably: run control and data management) are essentially not covered
 - ▶ Georgia and I will be proactively pushing this, starting at the collaboration mtg
 - ▶ Near-final chance for institutes to mark out their territory for the next decade...
- Stop press: new DAQ institute – Imperial College, London
 - ▶ We are pushing the SPs to target DAQ in their discussions with new institutes

Technical Design Report

- What is the document for?
 - ▶ Document the detailed design of our proposed system for first two modules
 - The definition of 'detailed' is still under discussion; less stringent than CERN-style TDR
 - ▶ Justify our decisions from evidence, present alternatives where relevant
 - Where alternatives exist, also present an R&D plan that will allow us to make a decision
 - ▶ Document a coherent plan of activity that can deliver that system
 - ▶ Show that we have the resources to conduct the plan, document risks
- Proposed editorial team: Georgia Karagiorgi, Brett Viren
 - ▶ Both have invaluable experience on the DAQ and in the preparation of IDR
- We will be holding a 'TDR workshop' after collaboration week
 - ▶ Define the scope and structure of the documents
 - ▶ Explore where we will present a single design, and where alternatives exist
 - ▶ Assign responsibilities for sections

TDR Schedule

- As proposed to us:
 - ▶ September 1 - editors appointed
 - ▶ October 1 - outlines due
 - ▶ November 1 – first drafts due
 - ▶ December 1 – second drafts due
 - ▶ February 1 – input from independent reviews of second drafts
 - ▶ March 1 – final drafts due
 - ▶ April 1 – independent reviews of second drafts complete
 - ▶ April 15 – submit final drafts to LBNC
- This is not agreed / decided
 - ▶ I am sceptical that a useful first draft is possible on this time line
 - ▶ We are pushing back on this fairly hard

Next Steps / Actions

- Upcoming events
 - ▶ Collaboration meeting, week of 24th September
 - Including 'FPGA-centric workshop', in parallel with mtg, 28th September
 - ▶ DAQ TDR workshop, weekend following collaboration meeting
 - Expect a series of regular TDR meetings from October onwards
- Actions
 - ▶ Approval of TDR editorial team, and start of work
 - Please, sign up for responsibilities where asked to – this is crucial
 - ▶ Institutes to inspect WBS, define their areas of activity
 - ▶ Responsibility matrix first draft by end of October