DUNE DAQ IB Update

Dave Newbold

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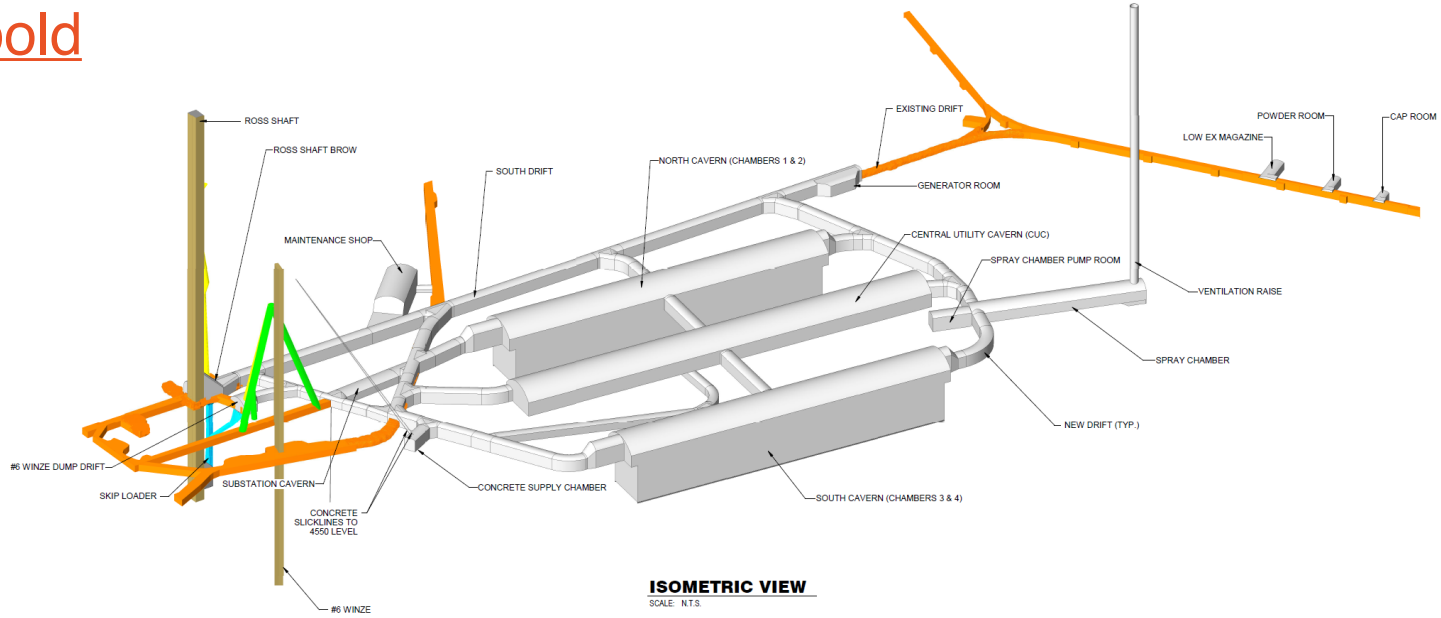

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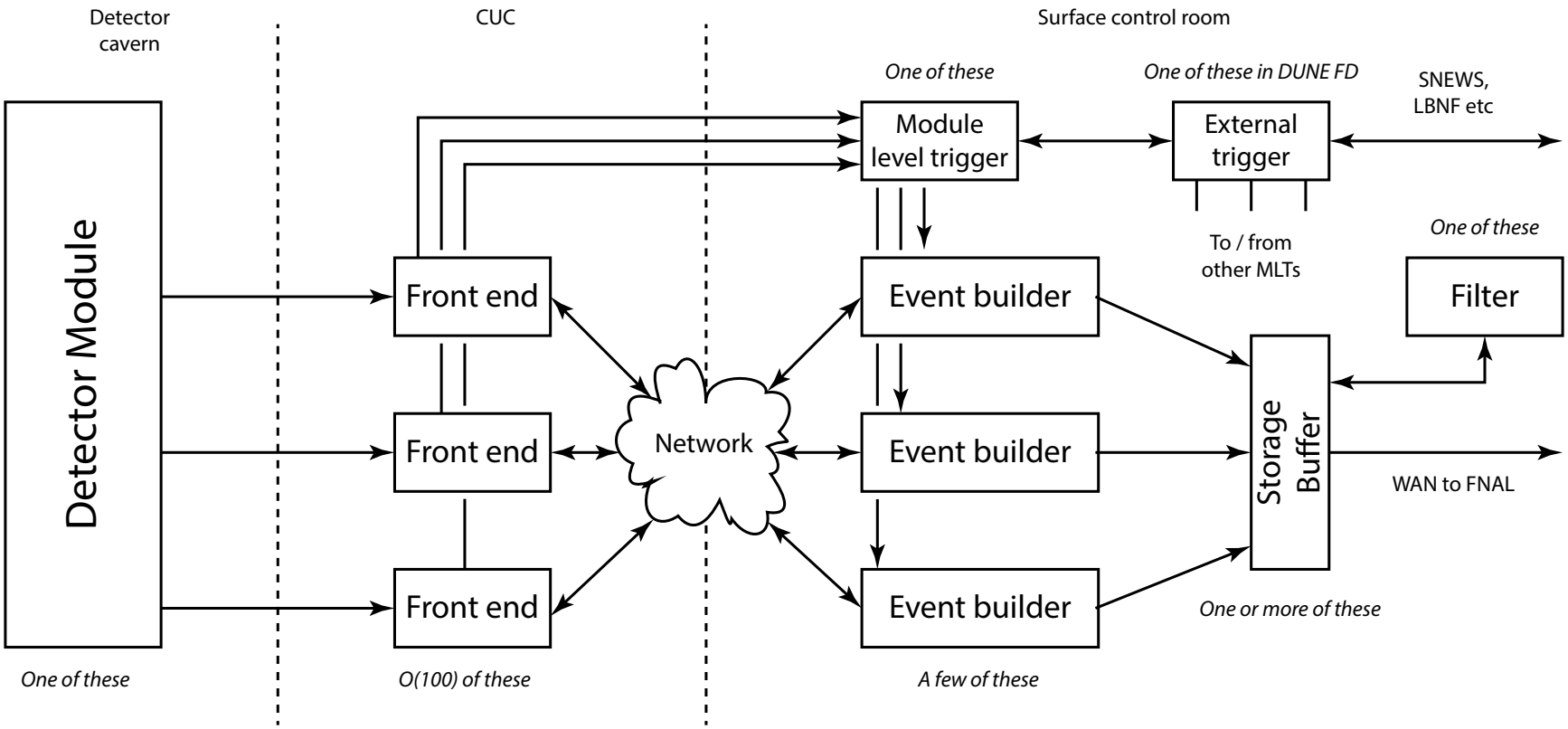
Introduction

- DAQ consortium is now 18 months old
  - Substantial progress and success; but much left to do
- Purpose of this meeting
  - Update the IB on progress over the last few months
  - Outline direction of travel for the coming two years (‘Pre-EDR period’)
  - Request IB participation in finding new resources
- Reminder of key goals for the ‘Pre-TDR period’
  - Construct ~~technical proposal~~ Interim Design Report (March 2018)
  - First feasibility studies on cost, schedule, risks (July 2018)
  - Construct and operate ProtoDUNE-SP DAQ (November 2018)
  - Identify and approve baseline DAQ design, document in TDR (March 2019)

Progress against goals

- Interim Design Report
  - Completed on time; highlighted design decisions but also choices to be made
  - Approved by LBNC in mid-2018
- Outline planning (cost, schedule, risks) completed
  - Sufficient to check consistency with international schedule and resources
  - Already clear that DAQ will be challenging and people-intensive project
- Baseline conceptual design and TDR
  - Baseline design now selected (though some implementation decisions remain)
  - TDR second draft rapidly converging (on time); exposure to LBNC in February
- Conceptual design review
  - Thorough critique of baseline design and planning; much learnt
- Consortium growing
  - Several new institutes seeking to join the effort – hear from some of them today

Baseline Conceptual Design

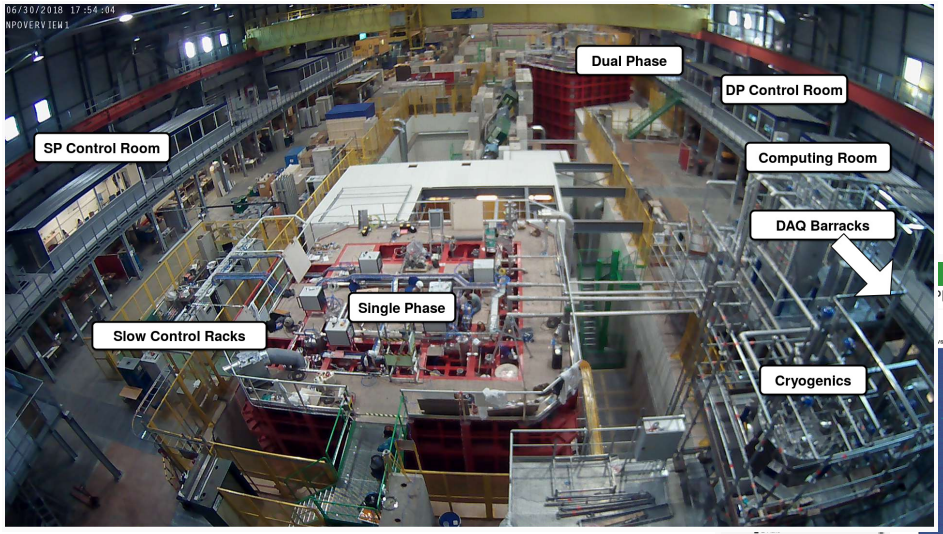


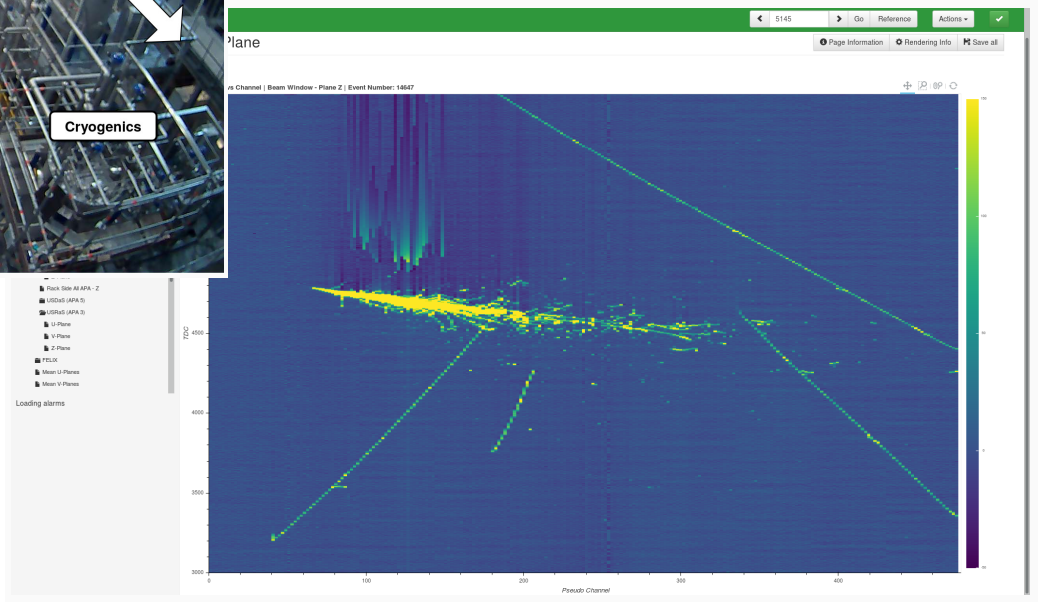
- Not shown: timing system, control paths – which are major items!

Baseline Design

- Some key decisions established in late 2018
  - Use FELIX as a uniform common interface to SP and DP sub detectors
    - Where needed, augment base FELIX with co-processor for streaming data processing (e.g. for TP extraction)
  - Allow for flexible partitioning of the back-end event builders for ease of commissioning
  - Modules will communicate trigger decisions between each other
    - And the same mechanism will be used to talk to the ‘outside world’
- Evolving requirements and constraints
  - Need for an ultra-reliable DAQ system expressed by collaboration
    - Exact numbers under study, but >99% uptime for SNB triggers is our target
    - Some concerns about single points of failure in DAQ and the infrastructure
  - Power, cooling, space constraints are tight, but appear do-able
    - Reminder: the front end part of the system is underground, the rest above ground
  - Underground construction (i.e. fit-out of CUC) is on the critical path
    - Much discussion about the overall schedule, more on this at collaboration week
  - Interface to offline computing under intensive study, via data model task force

ProtoDUNE-SP – It Worked





- Congratulations to Karol, Giovanna, Geoff, and everyone else involved
  - Recommended reading: Karol Hennessy's talk at the CDR
  - If you missed it, there'll be another one along shortly (DP)

TDR Status

- Getting there fast – please read if you haven't already

Conceptual Design Review

- Full and thorough review by external experts
  - More heavyweight than we had originally anticipated; but very useful
  - Panel was extremely incisive, much useful input obtained
- Charge to panel: review our…
  - Requirements and specifications
  - Baseline conceptual design – can it meet the requirements?
  - Organisation and resource estimates
  - Interfaces to the rest of DUNE FD
  - Planning for the next phase of the project
- Headlines
  - Review was ‘passed’, but with a large number of recommendations
    - But overall: our conceptual design is realistic and forms and appropriate basis for future planning
  - Much work to do on: planning for next year, resourcing, top-level schedule
  - Much work to do on definition and planning of a coherent online software project

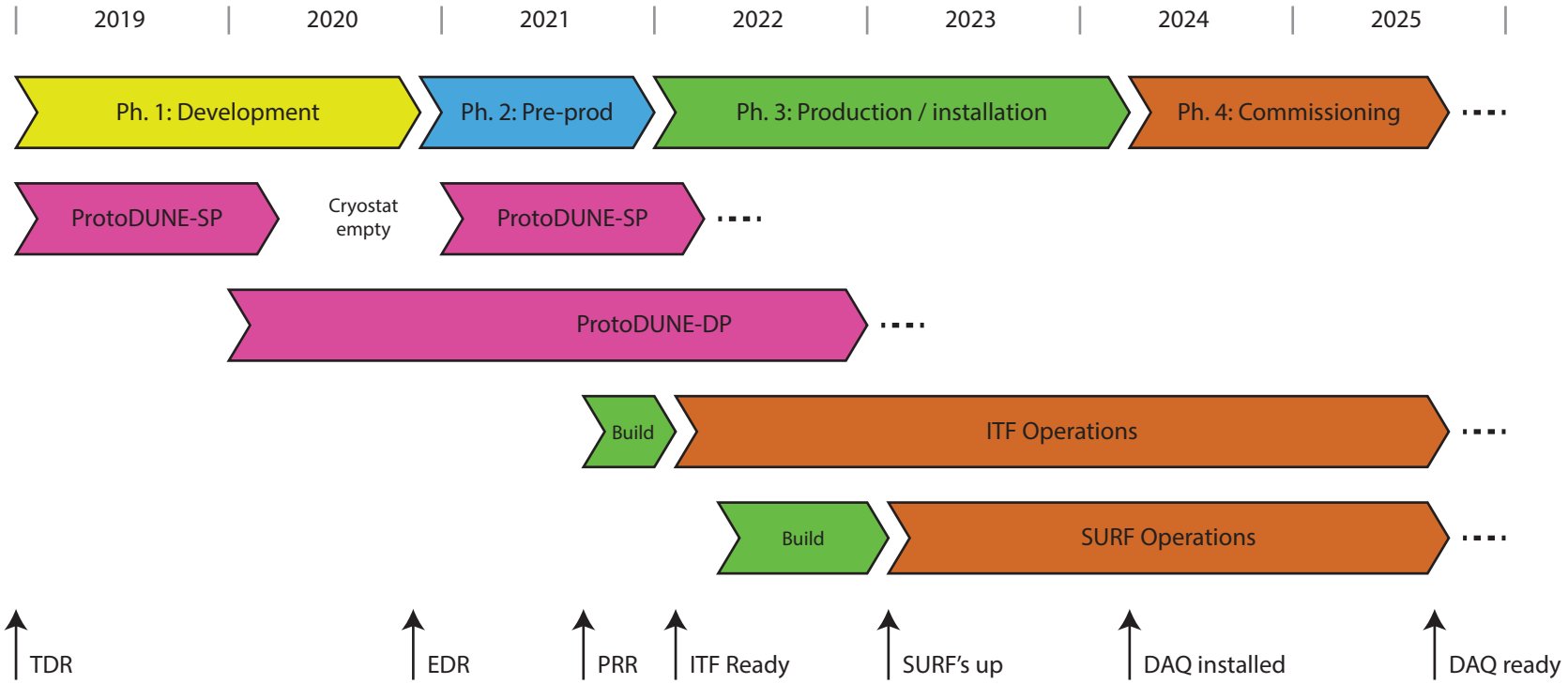
Conceptual Design Review

- R: Need a detailed project management plan
  - We are not in ‘construction’ until 2021 (post-EDR), nonetheless…
  - Accepted: put in place a detailed plan for per-EDR period, and a more detailed schedule for construction
- R: TDR should be updated to reflect most recent discussions
  - Accepted. We may require a draft 3 with more detail on online software
- R: Interface documentation needs much more detail
  - Accepted. We need to revisit who is responsible for each ‘boundary’
  - Urgent need to understand interaction with slow control of subdetector electronics
- R: A software development and sysadmin strategy is needed
  - Accepted: This is now very urgent; key topic for DAQ workshop
- R: Conditions database definition needed
  - Accepted: We need to put this in place during 2019, as next phase of ‘data model’

Conceptual Design Review

- R: Understand installation and CUC planning better
  - Accepted: Have already put in place a link person to Technical Coordination (Tim Durkin, RAL) to move this planning to the next phase
  - Many issues have already been uncovered (-> installation workshop)
- R: Use common hardware with ATLAS DAQ
  - Needs thought on practical / organisational constraints – discussions to be had
- R: Review TP generation alternatives, make a decision
  - Accepted: This is a main area of work for 2019, based on evaluation against real (i.e. noisy) ProtoDUNE data
- R: Expand ownership of project planning and schedule
  - Accepted: Need to put in place a new project structure, with realistic bottom-up planning
  - We can then tension with the top-down international schedule

Outline Schedule



- ProtoDUNE DAQ until now managed as a distinct project
  - Now in the process of establishing a single common DUNE FD DAQ project
  - ProtoDUNE operations and upgrade (SP and DP) will continue to be a key activity

The Next Steps at CERN

- Overall goal: By end of LS2, equip ProtoDUNE-SP with realistic prototype DAQ
  - We operate the detector in 2021 in self-triggered mode, as we would DUNE in 2025
- Planning phase: 19Q1
  - Establish a concrete plan for development and operations
  - This includes the current (barely defined) CCM project
- Development / support phase: 19Q2-Q4
  - Gradually improve / tune existing FELIX DAQ
  - Introduce (parasitically) and test new DAQ elements, e.g. TP processing
    - Proposal is to take one day per week (Friday) as disruptive 'DAQ days'
  - Prepare 'DAQkit' as integration exercise, and to support test platforms
- ProtoDUNE upgrade phase: 20Q1
  - Profit from empty cryostat to install new DAQ system in parallel with old
- Operations phase: 20Q2-4
  - Commission and run new hardware, test and tune self-triggering capability
  - At the end of this phase, we will be ready for the EDR
- This is a very preliminary proposal – more discussion at the DAQ workshop

Reshaping the Consortium

- Planning
  - Need to establish a new breakdown of work, for the long term
  - Current work packages should be adapted to reflect balance of tasks
    - e.g. front-end; back-end; CCM; data selection; integration; management
  - Properly laid-out schedule and task list needed for 2019-20 if we are to succeed
- Leadership
  - My term as project leader officially ends with the TDR, ~April
  - Should put thought into the most effective future split of leadership tasks
    - Split resource management / planning from technical management more cleanly? More federated structure?
    - Leadership a near-full-time job very soon, not feasible for those with other major responsibilities
  - There are some key delegated leadership tasks that we *must* find volunteers for
    - Integration / installation; ProtoDUNE lead; online systems coordination; resources and planning
  - Do we need an IB chair to balance / augment the technical leadership?
- Your views are requested on these matters before / at collaboration week

Upcoming Meetings

- Installation workshop, 24th-25th January
- Collaboration week
  - Focus on joint discussions with other consortia
  - Key topics: photon system, calibration, physics
  - Need to make progress on: PDS interface, SNB requirements on DAQ
- Wednesday of collaboration week:
  - All-day ‘computing and software interfaces’ session
- DAQ workshop, Monday / Tuesday following collaboration week
  - Planning for 2019-20
  - Restructuring of work packages
  - My goal: come out of the meeting with well-defined work packages with well-defined leadership

Actions requested of IB

- We are entering a new era in the project
  - No longer just ‘ideas’, it’s now about execution and convergence with ProtoDUNE
  - Need to develop our planning into concrete goals for 2019-20, in parallel with operations
- Institute responsibilities
  - Work in coming year is going to define who is doing what in the long term
  - Now is the time to take ownership of your long-term deliverables
  - Must identify the resources for the medium term, to match our aspirations
    - If we cannot do this, then replanning / descope of the project will be necessary
    - This will mean less flexibility, more risk
- Requests to the IB members
  - Participate in the discussions in coming weeks – they are crucial
  - Identify resources available at your institutes in the short and medium term
    - Who is available to take a practical role (local or remote) in ProtoDUNE operations?
    - Who could / should step up to leadership roles in the next phase of the project
  - Express your views on future structure / leadership of the consortium (to SP if not to me)