DAQ Status Report

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DAQ consortium PI meeting, 14-Dec-17

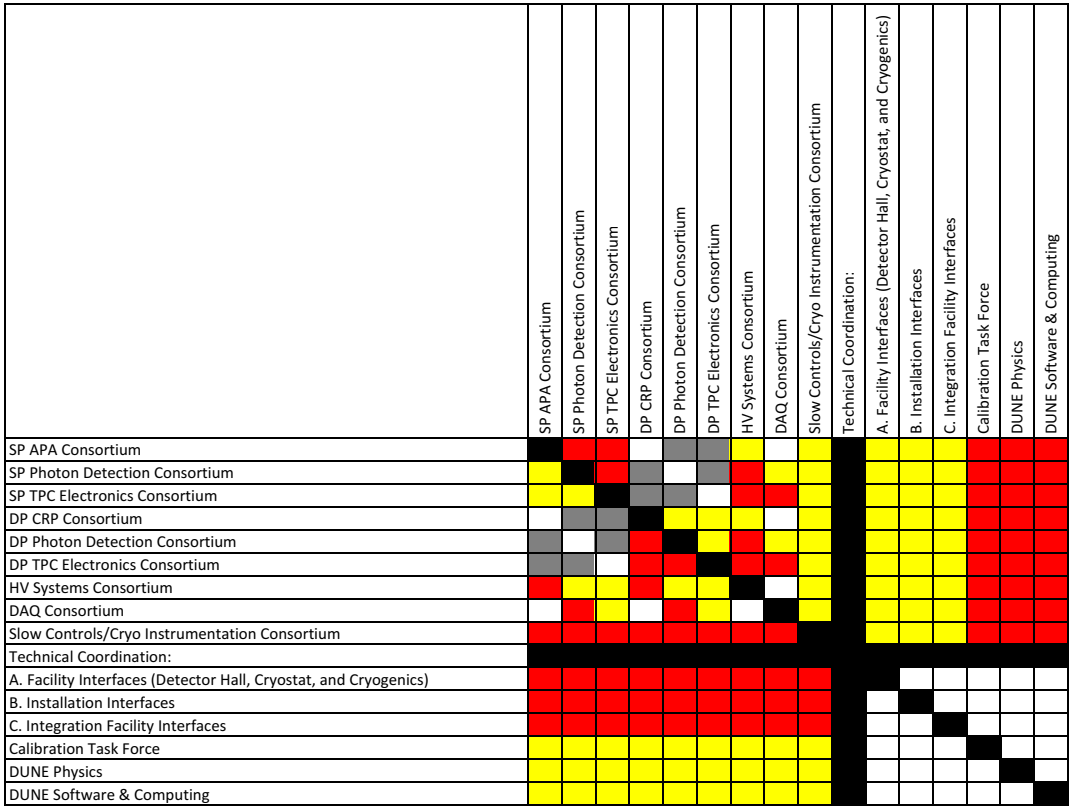
Topics and Goals

- Items for discussion
  - Recent progress in working groups
  - Planning process for pre-TDR era
  - Planning for TP
  - Baseline dataflow proposal
  - Institute responsibilities
- Goals
  - Approve the direction of travel towards baseline architecture for TP
  - Action institutes on the responsibilities list

Recent Progress

- Working groups
  - All groups now up and running productively, regular meetings
  - It has not been easy to cleanly ‘split’ the work so that we can parallelise
    - In the DAQ, everything affects everything else; but the boundaries are now becoming clear – see next talk
- November workshop
  - Attracted participation from >30 people; highly productive discussions
  - It was clear that we have much work to do before TP, efforts from all institutes are required
  - Follow-up workshop in a similar format in Oxford in January
- Interfaces
  - Establishing interface definitions with other consortia in 2017 is vital
    - This means both technical definitions and decisions on costs / responsibilities
- High-level requirements
  - Starting to tabulate (and revisit) the high-level DAQ requirements, for sign-off in January
- Baseline dataflow
  - In working meetings, have started to converge on a definite structure for DAQ
  - Sign-off on this is now essential to allow us to allocate work and proceed to the TP

Interface documents



- In fact, we will not have a distinct DP-PD / DAQ document
- HW working group (Graham / Cussans) have responsibility here
  - First drafts of interface documents with SP / DP consortia due next week

Draft Schedule

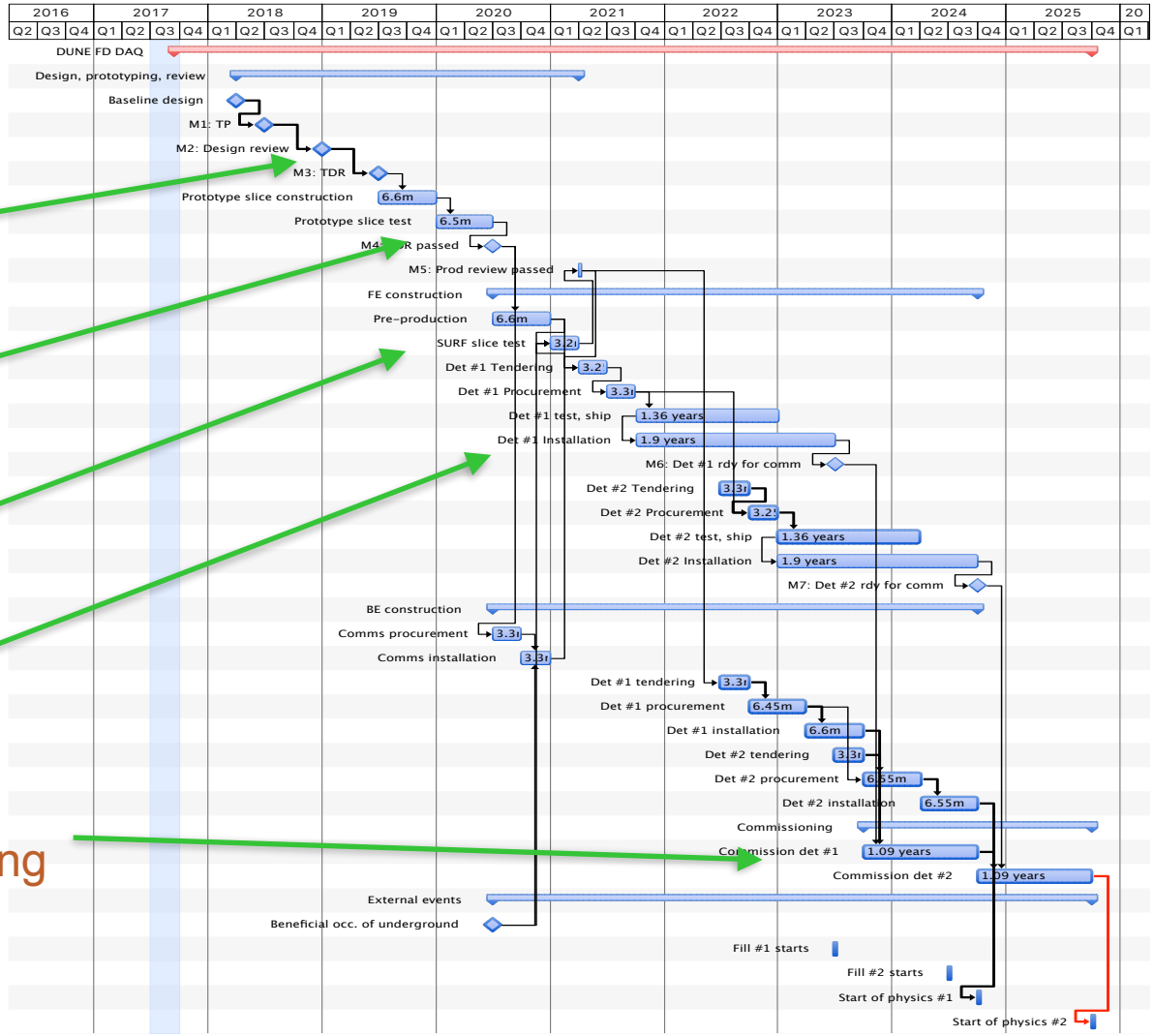
Test (PD) & review

Slice test (lab)

Slice test (SURF)

Start of install

Start of commissioning



WBS

3	Dual-Phase Far Detector			
3.9	Data Aquistion (DP-DAQ)			
3.9.1	Management			
3.9.1.1	Technical design documentation			
3.9.1.2	Reviews organization			
3.9.1.3	Cost, schedule, logistics, procurement			
3.9.1.4	Change control, QA, QC, documentation			
3.9.1.5	Integration and installation			
3.9.1.6	Tests, commissioning and operations			
3.9.2	Physics and Simulation			
3.9.2.1	Parameters and requirements tracking			
3.9.2.2	Data flow simulation and performance estimation			
3.9.2.3	DAQ emulation			
3.9.2.4	DQM tools and visualisation			
3.9.3	Design, Engineering, and R&D (includes subsystem test facilities and QA)			
3.9.3.1	Online Software			
3.9.3.2	Computing and Network			
3.9.3.3	Run Control and Data Management			
3.9.3.4	Trigger and Timing			
3.9.3.5	Readout Hardware and Firmware			
3.9.3.5.1	Hardware spec, design and prototyping			
3.9.3.5.2	Hardware procurement / fabrication for prototype phase			
3.9.3.5.3	Hardware test stands build			
3.9.3.5.4	Firmware tools design, and validation			
3.9.3.5.5	Infrastructure firmware design and pre-production			
3.9.3.5.6	Data handling firmware design and pre-production			
3.9.3.5.7	Control software and monitoring design and pre-production			
3.9.3.5.8	Firmware/software deployment at small teststands and pre-production tests			
3.9.3.5.9	Final design			
3.9.4	Production Setup (includes tooling)			
3.9.5	Production (includes component production, assembly, testing and QC)			
3.9.6	Integration (contributions to activities at global integration facility)			
3.9.7	Installation (contributions to activities at SURF)			

- Complete (first iteration) WBS for SP & DP DAQ prepared
  - You can find it attached to the agenda
- Now important to establish that all the broad tasks are covered
  - This means asking for institution ‘indications’ of responsibility, starting now

Institute Responsibilities

- We need to start on the process of responsibility assignment
  - To make sure that the broad areas are all covered
  - To allow institutes to start working towards the TP (and beyond)
  - To parallelise effort and avoid duplication
- Information is currently patchy
  - Much information on the plans of some institutes / groups of institutes
  - Much less on others – in some cases, has been waiting for technical decisions
- We are aware that many institutes can have only ‘aspirations’
  - Since funding agency approval is still pending
  - Nonetheless, we do need indication at this point of where you will be heading
  - Note that the emphasis at this point is on the people and work, not the capital funds
- It is very likely that we will have gaps / insufficient resource
  - First step in covering the gaps is to find out where they are…

TP and TDR

- TP and TDR are the two major milestones in the coming years
- Technical Proposal
  - Describe the requirements and specifications of the DAQ
  - Outline the interfaces to other subsystems
  - Present a baseline architecture and an outline implementation (incl. cost)
  - Describe the work and ongoing R&D towards the TDR
    - Noting that R&D on the DAQ will be an ongoing activity for a long time
- Technical Design Report
  - Full, detailed, system description with technical details
  - Full cost and risk matrix
  - Responsibility matrix, showing that the project is fully covered

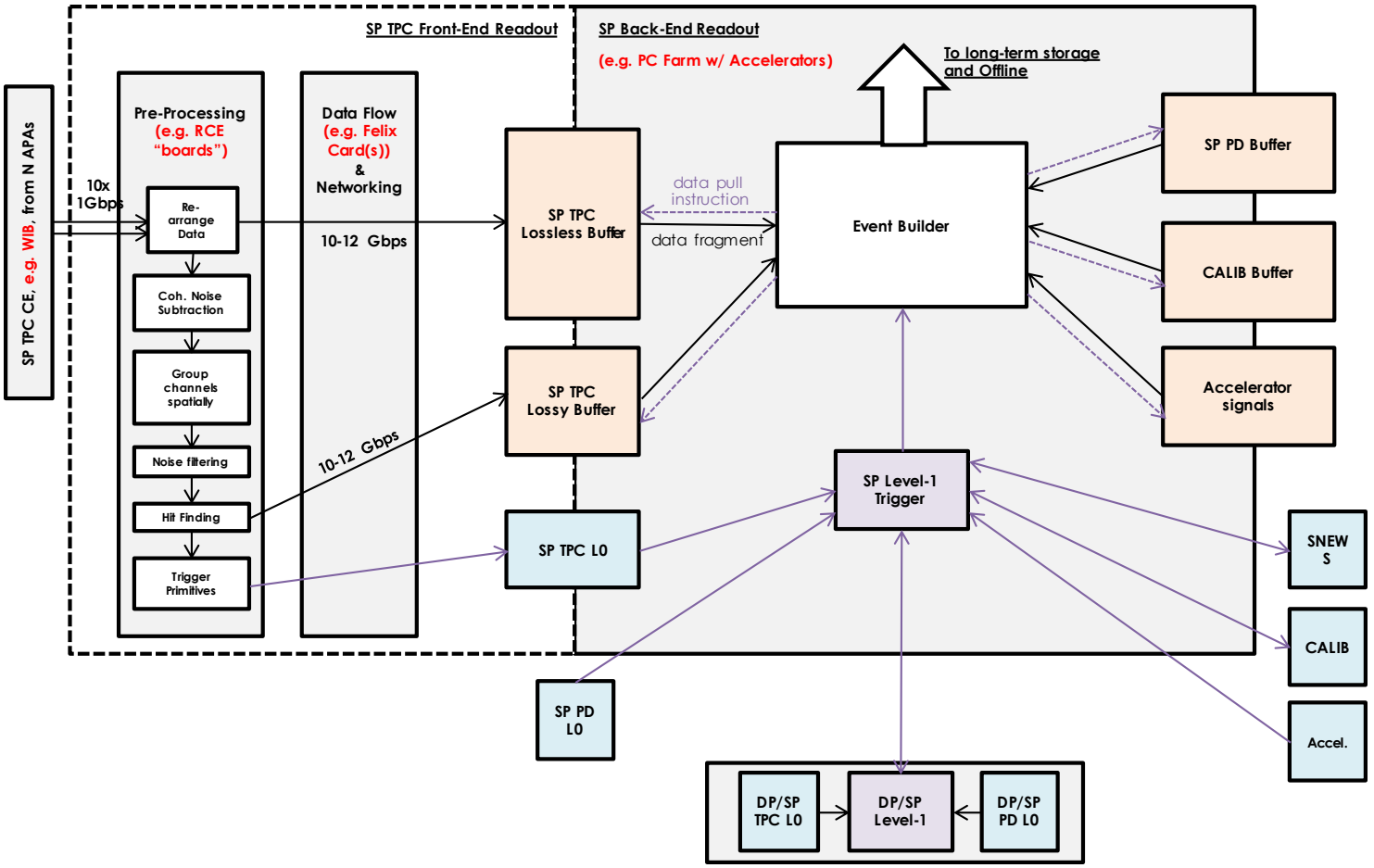
Pre-TDR Milestones

- M1 (Dec 2017): Interface documents completed
- M2 (Jan 2018): Performance and functional specifications document completed
- M3 (Mar 2018): DAQ cost and infrastructure requirements document completed
- M4 (April 2018): DAQ TP sections completed
- M5 (September 2018): First SP prototype DAQ hardware available
- M6 (December 2018): TDR structure and institute construction-phase responsibilities defined
- M7 (January 2019): Slice test with SP cold electronics completed
- M8 (January 2019): Internal review of baseline TDR DAQ design
- M9 (July 2019): DAQ TDR completed

Preparations for TP

- Editorial team now in place
  - Brett Viren and Jim Brooke have volunteered as editors and contact people
- DAQ will contribute to SP & DP documents
  - Explicit goal to build a single common DAQ system as far as possible
  - Clearly much overlap between the two documents
  - Around ~50 page limit for DAQ section in each document
- Steps towards TP
  - Devise section / subsection breakdown
  - Assign writing responsibilities
    - This will be driven by the working groups, with some addition sections (e.g. requirements)
    - We expect / hope that institutes will volunteer effort towards this in their areas of expertise
  - Review section outlines at January workshop
    - So the thinking (if not writing) needs to start now
    - Note that in some areas, we can present multiple options for implementation

Baseline Dataflow



- Figure 1 in the TP! Georgia will give details shortly

Key Decisions / Information

- There are a few major issues yet to be decided
  - Some of these are needed for the TP (as a ‘baseline’); some we may push back a little
  - Agreed answers need to come out of the January workshop
- What is the final data rate to storage?
  - This is really a question about the offline computing model and operations costs
  - Tension between difficulty of data handling and data selection
  - Decision needs to be driven by physics requirements
- Is the DAQ entirely underground, or partially above ground?
  - Baseline of below-ground may not be practical due to cost / power
  - This is a significant cost driver for DAQ (both upfront and operations)
    - Much complexity / cost associated with both power and data distribution from surface <-> underground
- What are ‘reasonable assumptions’ on detector performance
  - Some parameters of DAQ are highly sensitive to these assumptions
  - Our stated policy is to make a ‘reasonable assumption’ but provide for a worse outcome
  - We now need to agree what this means in numbers (and how to express it…)

January Workshop

- Next DAQ workshop will be 25-26th January, Oxford, UK
  - Thanks to Giles / Alfons for hosting us
  - This is the end of the week before the collaboration meeting at CERN
  - We would like a strong attendance, as crucial decisions will be made
- Goals of workshop
  - Address the key decisions outlined previously (and others…)
  - Review progress on implementation plans / costs
  - Review high-level specifications
  - Review / sign off on TP plans
- The TP will need to be finalised only ~six weeks later

Next Steps

- Your views on all these matters are eagerly sought
  - You can always contact Georgia or myself to discuss any DAQ matter

- Next steps
  - Agree with consortium the baseline data flow
  - Finalise interface documents and establish our boundaries
  - Begin dialogue with computing group on ‘back end’ interface
  - Start process of defining institutional responsibilities
  - Agree with management the milestones for 2018-19
  - Begin the significant work needed for the TP by end of March 2018