

# TDAQ Subgroup White Paper Status Report

---

Darin Acosta (Rice), Allison Deiana (SMU), and Wes Ketchum (FNAL)

18 February 2022

# Recall: TDAQ Paper Organization Meeting Nov.9

- Held our white paper kick-off and Snowmass reawakening meeting Nov.21: <https://indico.fnal.gov/event/51566/>
- Included a survey for people to express their interest in contributing to or leading a TDAQ white paper, and in what areas
- Meeting goals:
  - Get a sense of who will be submitting TDAQ white papers
  - Facilitate common white papers on topics of broad interest
    - Allow contributions from those who may not be able to commit to a full stand-alone white paper
    - Show community-driven input on pressing needs
    - Identify (co)-editors for these efforts
- Had about 18 participants, and one presentation on an already complete white paper (Fast ML)

# The Proposed Common TDAQ White Papers

## 1. “Artificial Intelligence and Machine Learning in Trigger and DAQ”

- Big and popular topic, so depending on community feedback consider split to two white papers? e.g. “AI/ML at the edge” and “AI/ML in High-level triggers, event-filtering, and detector control”
- Work closely with **IF07** (especially on the former) and **computing frontier** (especially on the latter)

This area already has one white paper completed, as reported by Allison Deiana:

- **Applications and Techniques for Fast Machine Learning in Science**, [arXiv:2110.13041](https://arxiv.org/abs/2110.13041)
- Currently in press

# The Proposed Common TDAQ White Papers

## 2. “Innovating Trigger and DAQ for the next generation of detectors”

- Include TDAQ architecture and infrastructure (e.g. streaming DAQ), fast computation on heterogeneous computing, fast timing, trigger-aware ASIC development (work with IF07)
- “Self-driving” triggers
- Natural place for ideas not specific to AI/ML (e.g. fast tracking triggers, fast spectral analysis), and a way to tie-in needs of future experiments

General catch-all for innovative ideas. David Miller, Catrin Bernius, Rainer Bartoldus kindly agree to coordinate and edit

## 3. “Readout technologies for future detectors”

- Include wireless readout, rad-hard links, multiplexed high-speed readout (**with IF07**)

Jinlong Zhang, Michael Begel, Jonathan Eisch kindly agree to help coordinate

# DAQ White Paper Status Meeting, Feb.10

<https://indico.fnal.gov/event/53123/>

- **TDAQ Readout technologies:**

- Started overleaf project and identified a few initial contributors.
- Will have a brief meeting once they have enough content to steer the scope
- Electronics group (IF07) will focus on detector readout transmission to next layer
- Need to stay synchronized on the content of IF04, IF07 white papers on link technology needs

- **Innovations in TDAQ:**

- Overview of abstract and outline shown and discussed
- Sketches out concepts, largely but not solely focused on collider physics, organized around LOIs but more thematically to give a more holistic approach
- Emphasizing also **operating** large scale systems in addition to designing and building
- Added a section to the white paper on **building and retaining domain knowledge and technical expertise**, even though there is not a specific LOI in TDAQ.
  - This is supported by the conveners as an important concern for TDAQ !

# DAQ White Paper Status Meeting, Discussion

- We should keep track of which LOIs are incorporated into a white paper in some manner, and any TDAQ ones that are not
- Writers should let us know if any topics may cut across other groups or frontiers (e.g. wireless control of large-scale systems?), as it may strengthen the arguments for such R&D
- Conveners need to stay abreast of any overlaps with other frontiers, such as with computing, or topics that cut across frontiers, and ensure all are aware
- Some repetition in white papers in different domains would be okay, worse is to have something fall through the cracks.
- Bibliography file of LOIs: Wes has volunteered to do this.

# Backup

---

# Broad Timeline for white papers

- 19 Nov 2021: White paper kickoff for IF
  - Goal to share plans on white papers/advertise contributions
- ~~14-17 Feb 2022: White paper wrap up~~
  - ~~Part of CPAD workshop~~ [cancelled]
- New → 18 Feb: Virtual Snowmass IF community workshop
- 15 March 2022: White paper final deadline
  - An executive summary will be really helpful to us
  - Late papers may be considered, at discretion of conveners (Let us know if this ends up being the case)



# What happens after that

- Preliminary topical group reports: end of May 2022
- Preliminary frontier reports: end of June 2022
- Snowmass community summer study: 17-27 July 2022 @ UW-Seattle
  - This then leads into the final executive summaries and group/frontier reports, to be finished by ~Oct 2022