**Meeting Minutes: Discussion on Features to Implement in TDAq Client and OPCUA Server**

**Attendees:** Clément Camincher, Fatih Bellachia, Ferio E. Rasambatra, Olivier Arnaez, Jean Jacquemier

Indico: https://indico.in2p3.fr/event/37552/

**Date:** October 17, 2025

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# 1. Presentation of the OPCUA Server Status by Olivier

Slides indico:

**Remarks:**

- Documentation written by Lucas and Omega exists at a very low level (https://twiki.cern.ch/twiki/pub/LAr/LArPhaseIIElectronicsCalibration/DATASHEET_LADOC2_20221117.pdf), describing how to communicate with the LADOCs (on the calibration board) in I2C.
- While access is privileged for high-level functions, low-level functions (R/W register) are also exposed by the OPCUA server for flexibility (super-expert/electronicians actions).
- The configuration of the chips on the calibration board could be done either by the OPCUA server at startup or by the TDAq client. The preferred solution is for the OPCUA server to perform this configuration at startup, and the TDAq client will verify it and adjust the settings to vary during calibration procedures.

Olivier informs us that the full configuration time (not a unique set_dac which, approximately, would take half a second) is 4.5 seconds for a complete calibration board. This configuration can also be done LADOC by LADOC but multiplies the number of transactions (by ~32).

**Four objects are useful in the OPCUA server for calibration for the TDAq client:**

- Latournet
- Calibration
- LPGbt
- I2CSlaveLadoc

The configuration of LPGBt is done in the OPCUA server as required pre-data-taking for DCS purposes.

Need to rename "reconfigure" to "reset_and_configure." (and similarly for other functions)

**ResetLADOC:** Forces LADOCs into the initial state (~power cycle of the board). Afterward, LADOCs no longer have the server's/default configuration values, so it must be followed by a "Configure."

**Note:** LADOC resets are done per line, not per LADOC, potentially dangerous as impacts the configuration of multiple chips (proposes to leave the reset logics to within the server, callable by the TDAQ clients of course)

Everything fixed by hardware design must be encoded by the OPCUA server, not the TDAq client in order to let the latter focus on relevant user actions without taking the risk of mistakes with technicalities.

High level functions localisation: Several parameters must be considered when deciding where to place the code for high-level functions between the OPCUA server and the TDaq clients:

- The access we wish to give to the users/developers of the TDaq clients in order to protect the materials and respect the procedures.

- The ease of modifying one of these high-level functions and using it in production. It seems simpler to modify/install/restart a TDaq client than the OPCUA server.

Clément informs us that he has implemented a proto-partition for the LASp card.

**Clément's comments:**

- **set_dac per chip:** About 400 sequences need to be performed for a calibration. Be mindful of execution time when scaling up. Example: 400 * 4.5 seconds of configuration. (note that calibration procedures don't require a full reconfiguration at each step but merely adjustment of one or two settings so probably ~0.5s of configuration per step)
- **LPGBt:** Need to modify the clock delay + certain clock lines in LPGBt. Will likely interface the future corresponding firmware features when implemented.
- For precise pulse measurements, only one LaDOC channel should be used at a time and the LADOC "default" configuration can be used. Otherwise, when running "pulse all" procedures, the OTA ("ampli op") needs to be switched through the setting of one LADOC register (calibration board's level function available to optimize the setting on all 32 chips at once)
- The TDAq client knows what type of RUN will be performed, so it must cross-check and adjust the board settings accordingly.
- A review of the server's method names will be necessary at some point (meanwhile, enhanced communication among developers using relevant -gitlab?- tools are required).

Fatih proposes to report internal OPCUA server errors to experts via the TDAq client ; right now the full granularity of the error message remains only on the server side and clients only get a ~success/failed status. Olivier and Etienne have already initiated a discussion about

this. A meeting with Olivier, Fatih, and Etienne will be set up to discuss possible technical solutions and plan developments.

**Note:** Etienne is l(a priori) leaving the project at the end of November.

Clément informs us that TDAq partitions are becoming important because there are multiple hardware configurations for data acquisition and testing calibration/FEB2. Partitions make hardware usage procedures more robust.

Olivier informs us that about 90% of the OPCUA server implementation is complete concerning the calibration board (leaving aside the aspect of the propagation of error messages up to TDAQ clients).

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## Summary of Next Steps:

**1. OPCUA Server:**

- Rename fonctions.
- Move functions concerning the (LATOURNETT) internal pulse generator.
- Implement finer error handling. (The solution needs to be discussed with Oliver/Etienne/Fatih)

**2. TDAq Proto-partition Client:**

- Implement a TDAq proton-partition for the Calibration board without LargOnlineSw.
- Report detailed hardware errors reported by the OPCUA server, on the TDAq IGUI (ERS messages, logging, GUI,...).
- Test the Calibration client/proton-partition  at EMF up to data acquisition.

**3. Performance Tool:**

Notes: Clément emphasizes the relevance of this tool. There is a need to know the execution times of high-level methods to anticipate scaling up. Clément also requests knowledge of internal execution times for Latournett/Calibration and FEB boards. This work should be done in collaboration with electronics experts.

- Conduct a campaign to measure the execution times of OPC UA functions towards the Latournett/Calibration and Feb2 boards @EMF.

**4. Scalability**

- Test the OPCUA server at scale, which does manage mutex mechanisms but noIPBUS request scheduling. For this, emulating LATOURNETT/CALIB and FEB2 boards should be necessary.
- Estimate/test the number of TDAq application per machine.

**5. calibration manager**

- Implement a calibration manager Draft (TDAq client). The content will be discussed in the coming weeks with the collaboration.

**6. Data format**

Olivier notes that it is also possible to participate in the data format discussions if interest (not per se an institute commitment, but relates).