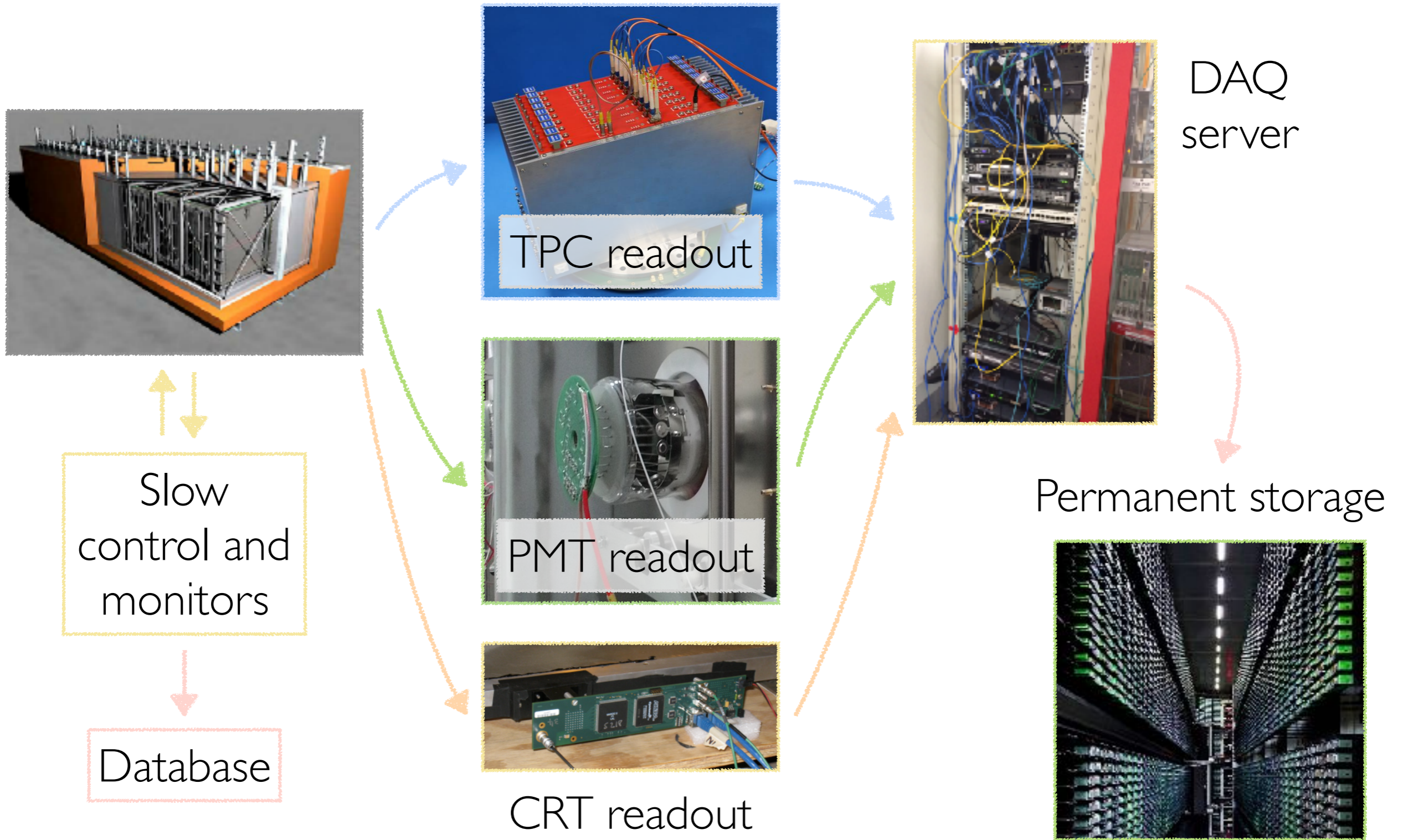# DAQ and Slow Control Commissioning

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ICARUS Collaboration Meeting

September 19th, 2018

DAQ and Slow Control

TPC readout

PMT readout

CRT readout

DAQ server

Slow control and monitors

Database

Permanent storage

2

The Overall Guidance

- May 2019: ICARUS ready to fill LAr

  - DAQ has to be capable of measuring noise level

  - Slow control hardware interface ready

- Fall 2019: ICARUS ready for beam neutrino data

  - Full DAQ operation

  - Full slow control and monitors operation

- Aim to have full DAQ and slow control system commissioned in summer 2019

Milestone December 2018

- **Servers**:

  - All EVB (event building) computers will be ready

  - One or two servers for TPC data will be ready

- **Readout**: Run TPC+PMT DAQ with one crate at ICARUS building

  - Plan B: Run TPC+PMT DAQ at the test stand

- **Trigger**: Inject external triggers

- **Logging**: Identify specifications of the event-by-event database

Milestone March 2019

- **Readout**: Demonstrate readout, synchronization, and event building at the detector scale

- **Trigger**: Specify the interface between DAQ and trigger

- **Monitoring/Control**:

  - Operational and slow control monitors set up

  - Initiate implementation of online data quality monitoring

  - Complete the development of ICARUS-specific slow control hardware interfaces

  - CSS infrastructure (slow control GUI) ready

Milestone March 2019

- Logging:
  - Implement event-by-event database and test performance
  - Initiate implementation of configuration database
  - Update DAQ process management tools and logging
  - Slow control archiver ready
- Data management: Initiate implementation (data transfer) and test
- Management: Define people and tasks required for commissioning

Milestone June 2019

- Readout: Full-scale detector tests

- Trigger: Full trigger implementation

- Monitor/Control:

  - White rabbit and timing (GPS) monitoring tools available

  - Initial version of a stable run control ready

- Logging: Offline archive of DAQ configuration database

- Data management:Throughput tests

- Management: Commissioning documentation ready

Data Acquisition

DAQ Goal

TPC readout

PMT readout

CRT readout

Develop the ICARUS-specific DAQ system based on the existing (and evolving) generic artdaq framework
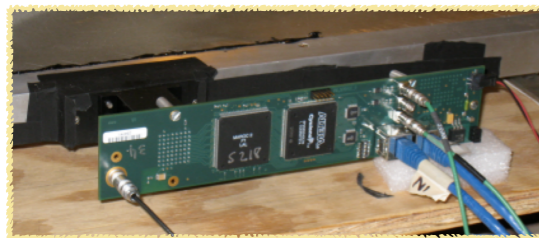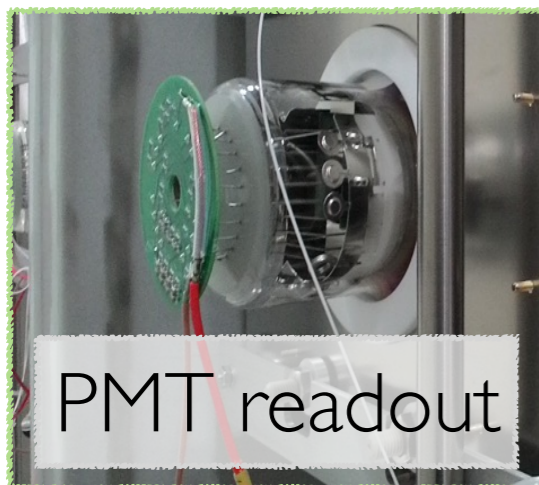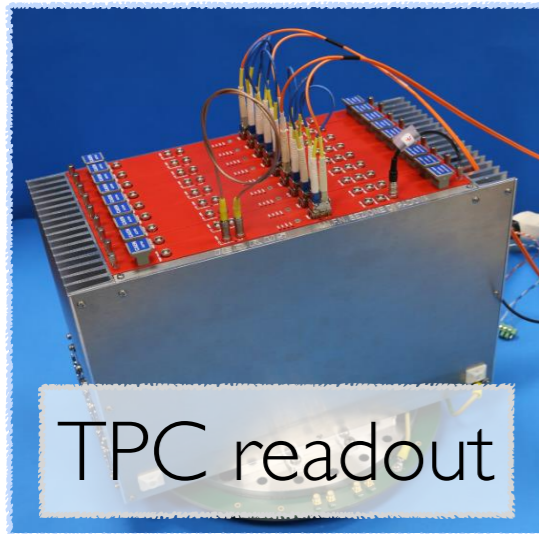
DAQ server

Permanent storage

Data management

Readout Components

- TPC
    - Multithreaded readout being tested
    - Plan to test with compressed data
- PMT
    - Multithreaded readout tested
    - Output to trigger boards tested
- CRT: to be delivered beyond summer 2019
    - Two systems of electronics (Bern/CAEN and Double Chooz) to be integrated
- Plan to test with more readout boards

DAQ Integration/Trigger

- Future work on integrating all the components

  - Calculate the timing for each fragment

  - Synchronize all the fragments

  - Stress test

- Future work on trigger

  - Integrate trigger data in the software DAQ system

  - Establish and exercise mechanisms interfacing trigger and various sub-systems

Monitoring/Control

- Plans on DAQ performance monitoring

  - Develop and exercise operational readout/DAQ performance monitors based on the existing hooks

- Plans on online data quality monitoring

  - Develop online data quality monitors based on the existing framework

- Plans on run control

  - Develop GUI run control interfacing DAQ, run configuration database and catalog, and logs for shifters

Logging

- Plans on event-by-event database

  - Identify the specifications

  - Implement and test the performance

- Plans on run configuration database

  - Develop and implement

- Offline archive of the databases

Teststand

- Currently have
  - TPC boards
  - PMT readout cards
  - CRT boards
  - White rabbit timing system
  - DAQ servers
- Plan on
  - Build and assemble a TPC crate
  - Possibly a vertical slice of the integrated DAQ
  - Maintain and perform tests

Data Management

- Initiate a dedicated group in charge of

  - Transferring data collected by the online DAQ system to permanent storage

  - Cataloguing the data

  - Providing collaborators with the access to the data

Summary
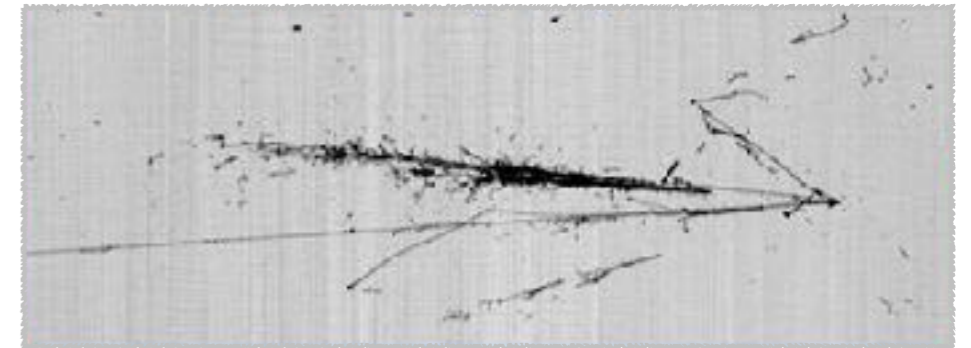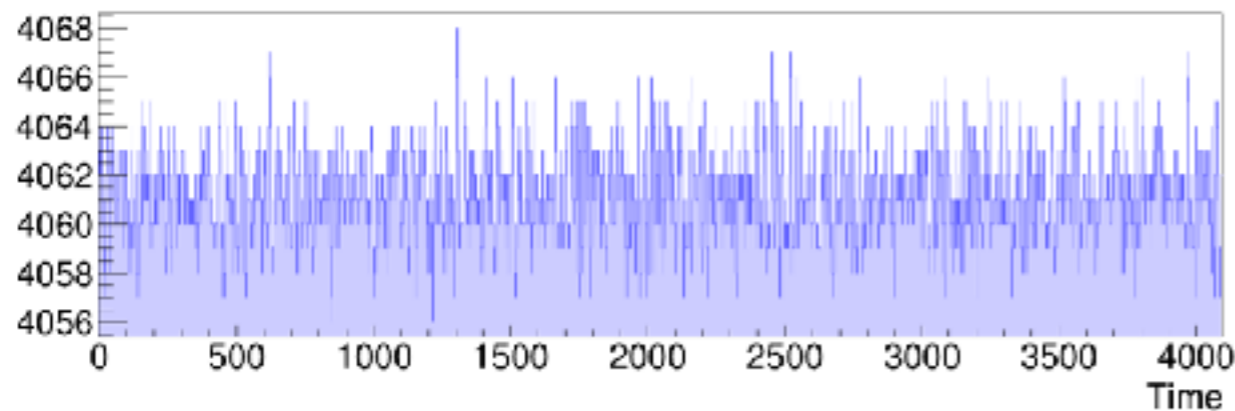
- Plenty of work to do - you are more than welcome to join!

- Regular DAQ group meetings at 10:30am CDT on Mondays tri-weekly (next on on Oct. 1st)

  - Mailing list: ICARUS-DAQ@fnal.gov

- Slow control group mailing list (common SBN): sbnd-dcs@fnal.gov

Backup

DAQ Roles

- TPC

- PMT

- CRT

- Trigger interface

- Teststand

- Run control

- Monitoring metrics/database

- Data management