DAQ software

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DAQ software overview

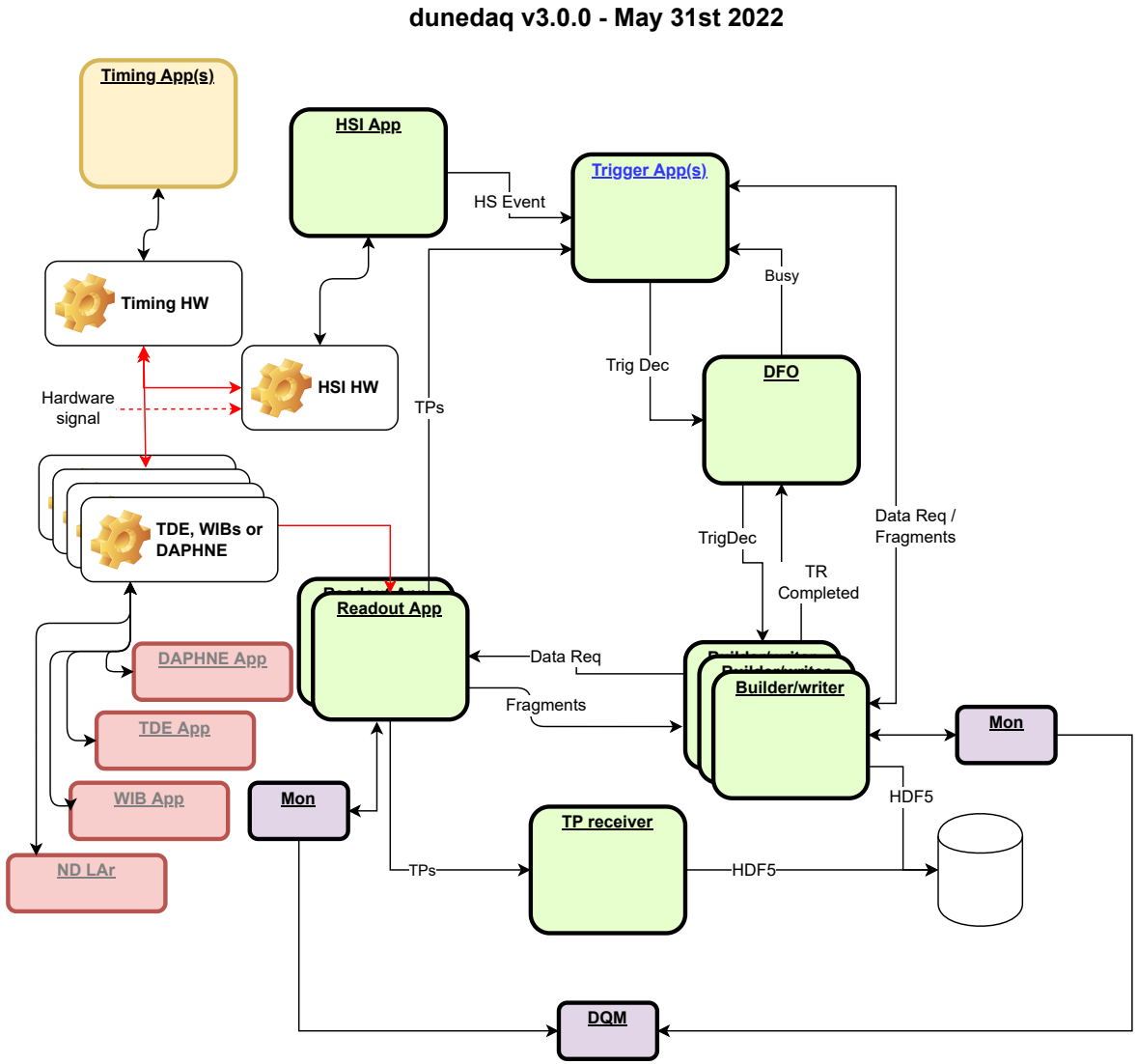
- Requirements for DAQ software:
  - Flexibility and configurability to run on multiple detectors, prototypes
  - High uptime (close to 100%)
  - Scalability for large FDs
- Build/setup system based on CMake and spack
- `appfwk` package provides the base framework: `DAQModules` which communicate via queues and respond to commands from RC (eg configure, start run, stop run)
- Other functionality built on top of `appfwk`, separated into multiple packages

Partial list of software components

- `iomanager` provides transparent network/in-app communication between modules
- `nanorc` command-line run control (GUI being worked on)
- Kubernetes-based application control (more from Pierre)
- Online monitoring of DAQ system itself, and data quality monitoring (more from Pip)
- Applications to control hardware (WIBs, timing, HSI, ND LAr)
- DAQ data handling applications: HSI, readout apps, trigger, DFO, event builders, TP writer

Full system, v3.0.0 (June 2022)

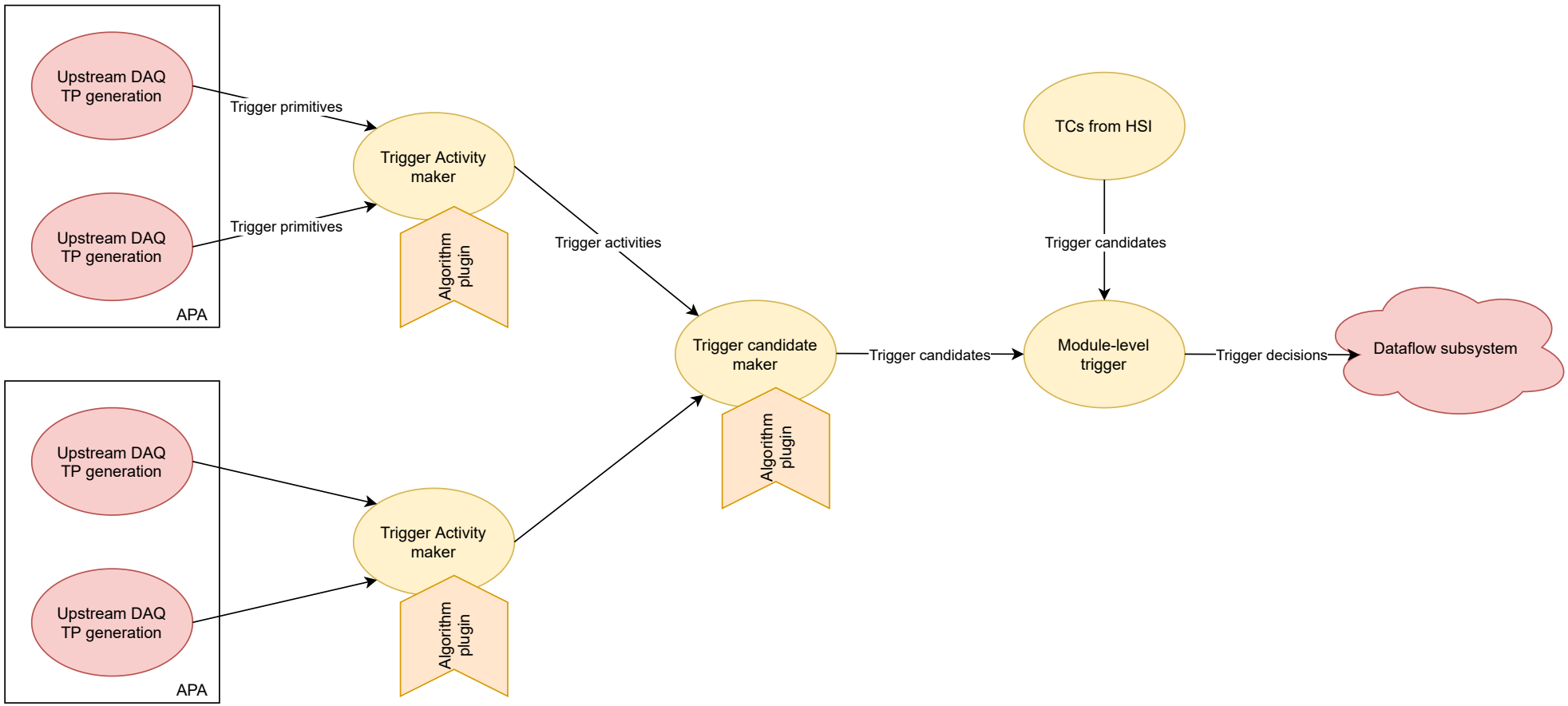
- Complete DAQ system, successfully tested at VD coldbox
- Periodic triggers from HSI and/or activity-based triggers from data selection system
- Raw data and DS objects buffered, sent as fragments in response to data requests
- Trigger primitives continuously streamed to disk



(Tentative) near future plans

- Release v3.1.0 (July 29th):
  - Several CCM features (see Pierre's talk)
  - VD Top detector electronics integration
  - DAPHNE (PDS readout) integration
  - Pending bug fixes from v3.0.0
- Release v3.2.0 (September 15th):
  - Update C++ compiler
  - First inclusion of FPGA ethernet readout into dunedaq
  - Updates to HDF5 file layout
  - Clean run stop via extra commands
  - Automated restart of crashed applications

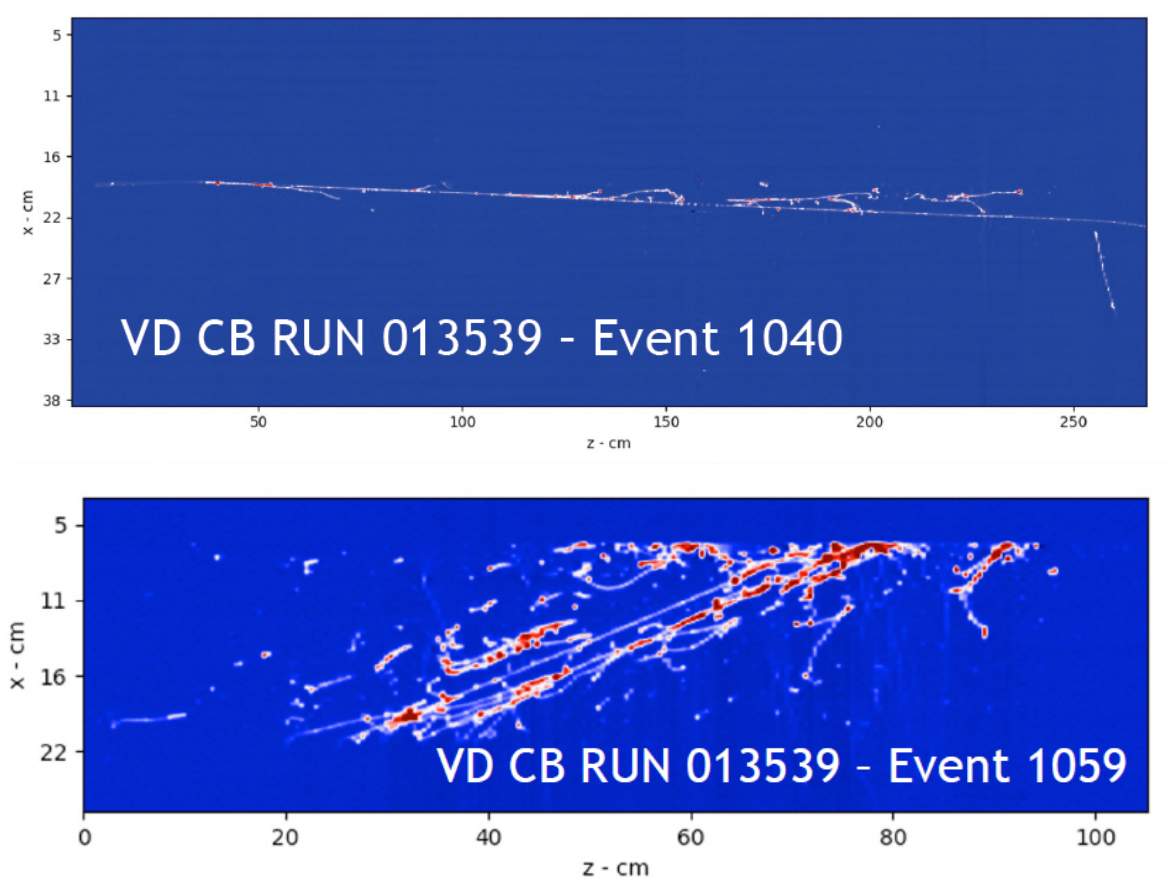
Data selection system overview



- Hierarchical system: trigger primitives, activities, and candidates
- Pluggable algorithms at each stage
- (Eventually) multiple “paths”

June 2022 VD coldbox tests 1

- Tests using live data from VD coldbox
- Successfully triggered on long, ∼horizontal tracks that hit many consecutive channels



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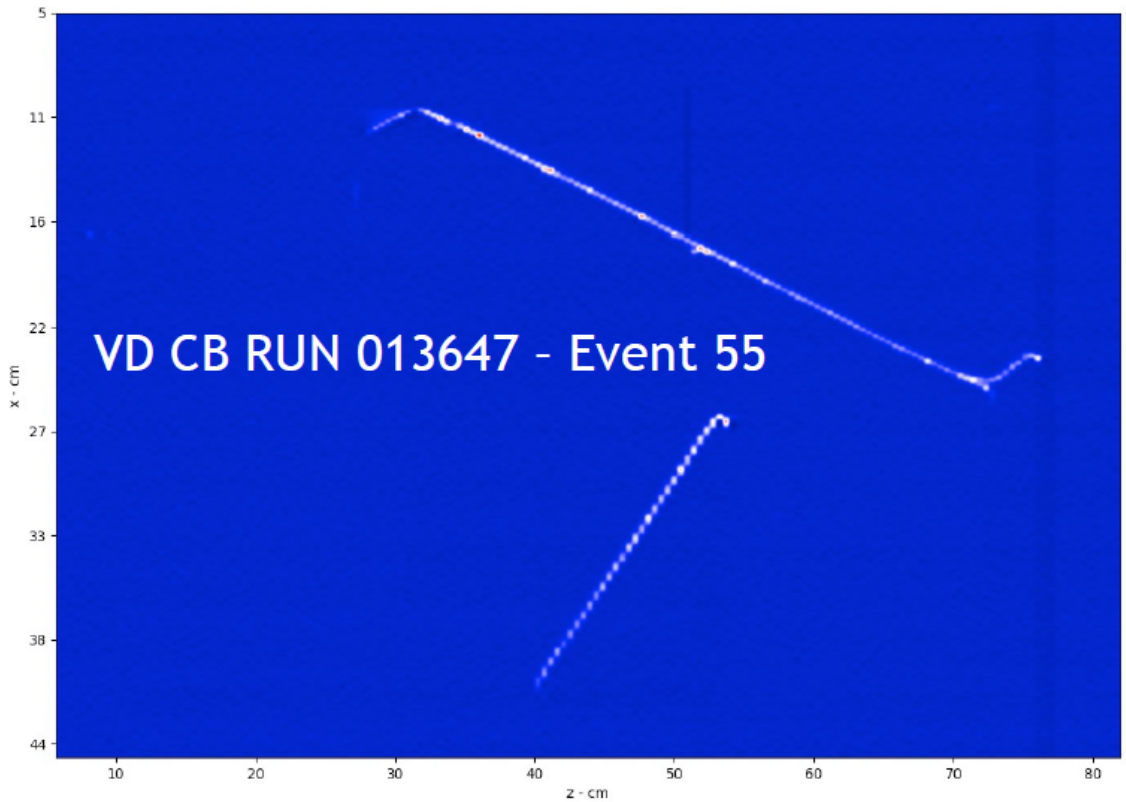
June 2022 VD coldbox tests 2

- Some success triggering on Michel electrons
- Algorithm developed at Columbia and Edinburgh: find Bragg peak (high ADC hit) and kink in track



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