



# FriDAQ Software Discussion

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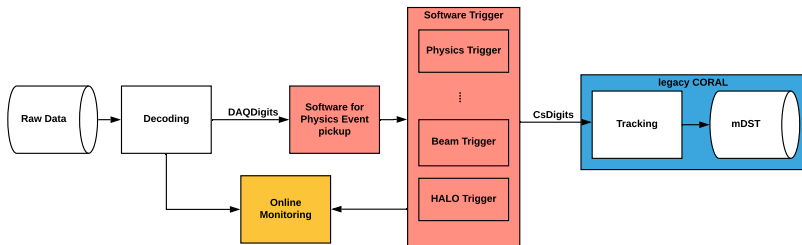
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Federal Ministry  
of Education  
and Research

# Reconstruction of continuous Data Stream (DAQWS2020)

For the **Free Running Mode** we have to define the “Events” and timing after the recording in software:

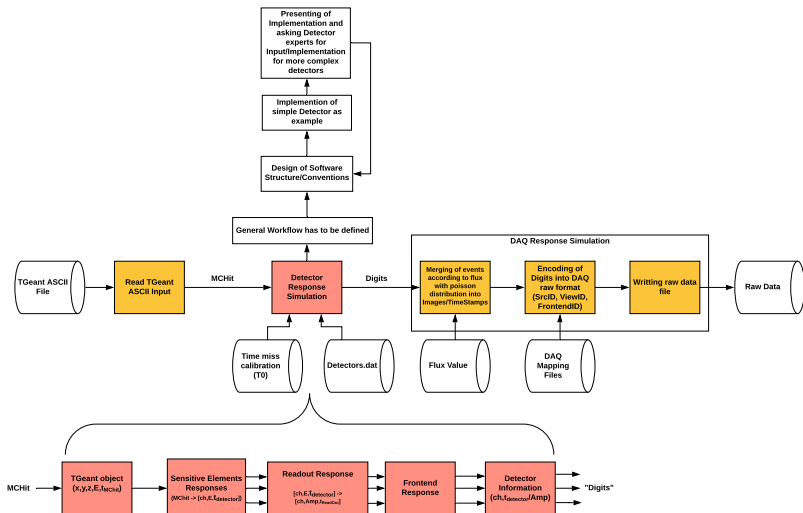


Two Options:

- Short Term: Application to convert continuous data to event data to reuse CORAL (red boxes).
- Long Term: Rewrite CORAL in the scope of the new scheme.

(lot of Man-power will be needed!)

# Generating RAW data from MC Simulation (DAQWS2020)



# Status I

- **MC Chain** has to be extended by an application which creates an continuous raw data stream out of the MC truth.
  - Needed for validation and testing of the new DAQ scheme.
  - Mandatory for development of the new reconstruction

A framework for data generator is in quite advanced state

(see previous talk)

Mainly help of experts needed to implement different equipment!

- **Software Trigger**

A framework for HLT is in quite advanced state

(see previous talk)

Mainly help of experts needed to implement different algorithm and testing!

- **Decoding** has to be adapted to the new data formats

A library to apply channel mapping (decoding/encoding) exists.

For the moment only for TDC format → Help of experts needed!

## Status II

- **Reconstruction** (CORAL) has to be adapted to deal with the free-running data

No progress on this point!

- New **Monitoring tools**

A tool for monitor the HLT is under development!

Man power for the rewriting of MurphyTV is identified!

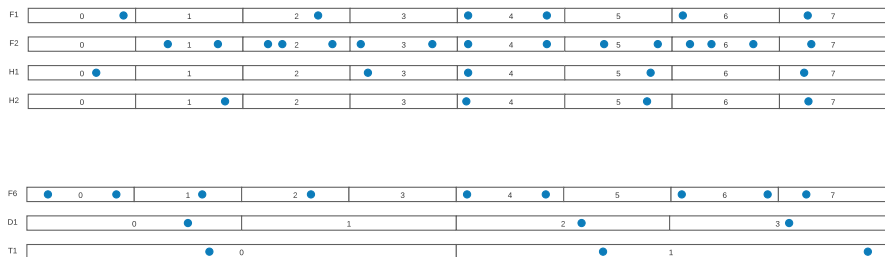
No progress of online monitoring of event based data  
(COOOL,EventDisplay,...)

**DAQ group does not have the resources to target all of this projects. For many things expertise of detector experts and analysis people is needed!**

**Urgent problem of man power for this projects has to be solved to be ready in time for the first recorded data!**

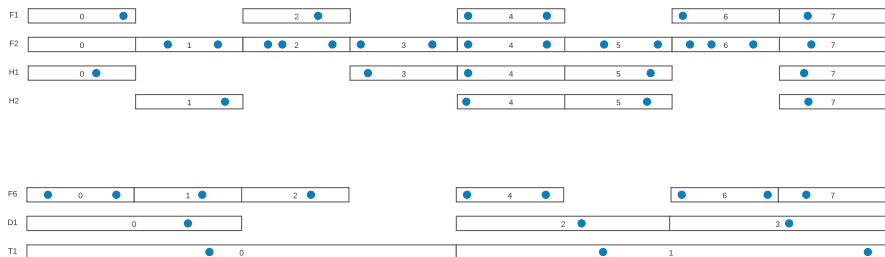
How to go from continuous data stream to events ?

# Example Spectrometer Setup



- Four Trigger Detectors: F1, F2, H1, H2
- Three normal Detectors: Fiber (F4), Drift Chamber (D1), TPC (T1)

# Empty Images

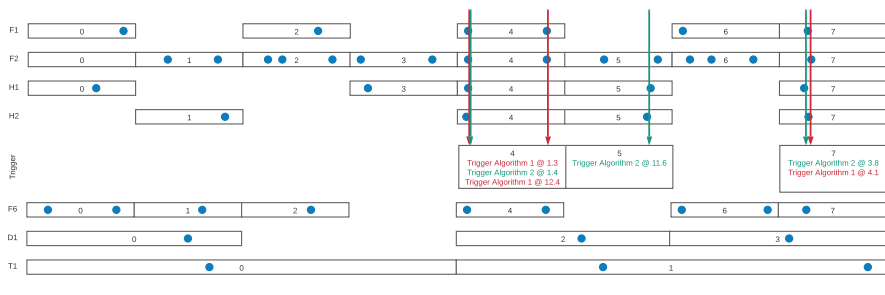


Empty Images are not transmitted from the front-ends.

Data as it arrives at the HLT/Digital Trigger ...



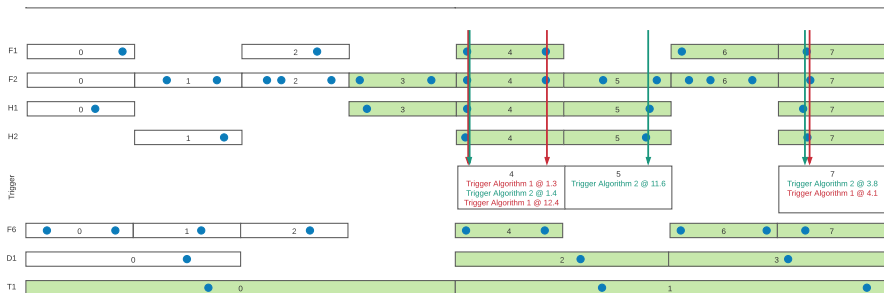
# Trigger Algorithm applied



- Trigger algorithm 1: Coincidence in F1 and F2
- Trigger algorithm 2: Coincidence in H1 and H2

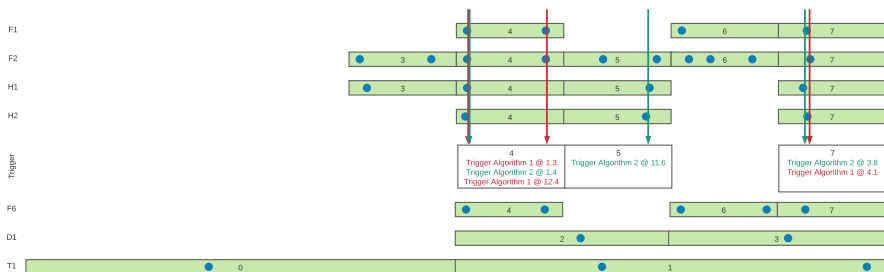
Trigger adds new time slice with trigger information.

# Selecting relevant Images



In green: All images which are correlate with the trigger conditions.

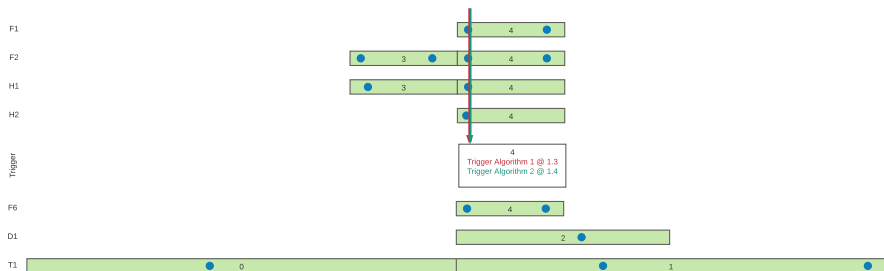
# Removing uncorrelated Images



LV2 MUX / HLT removes all images which have no correlation.  
→ Data reduction!

Special case for streamed TPC data: We can not do the data reduction on the image level!  
Solution: HLT goes over the samples, calculates sum and applies an threshold on the sum to  
remove samples out of the image for zero suppression.

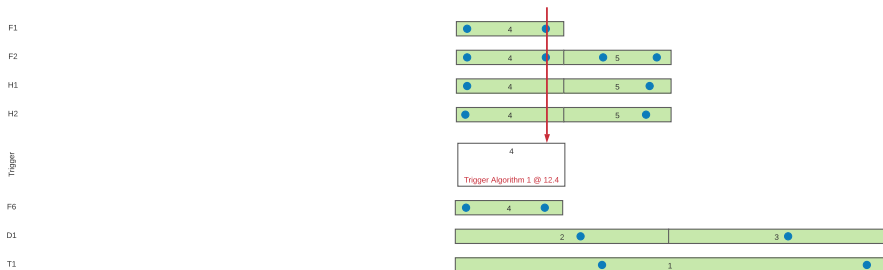
# Building of Event1



Trigger algorithm 1 and 2 fires in each others uncertainty → One Event!

Trigger fires in first half of the image  
→ trigger Image + previous Image belongs to event.

# Building of Event2



Trigger algorithm 1 fires in second half of the image  
→ trigger Image + next Image belongs to event.

# Building of Event3



Trigger algorithm 2 fires in second half of the image  
→ trigger Image + next Image belongs to event.

## Decoding of data to Events

- The added trigger information (trigger type + trigger time) in the data stream is used to select images which belongs to one event.
- Trigger time is used to correct all hit times in the image to be relative to the trigger time → Timing as we have it in our current events.
- Hit time window cut is applied (like it is done in CORAL)
- **Option1:** Dumping event information in the old event based file format which can be understood by CORAL.
- **Option2:** Event building functionality is integrated in new DAQdecoding Library
  - Coral/COOOL can directly read continuous raw data which is extended by trigger information by the HLT.
  - Events are build "on the fly"

Option2 would allow us to reuse COOOL/EventDisplay to monitor event based data during data taking.

How to solve the problem of man-power ?