Data Status and Pre-process

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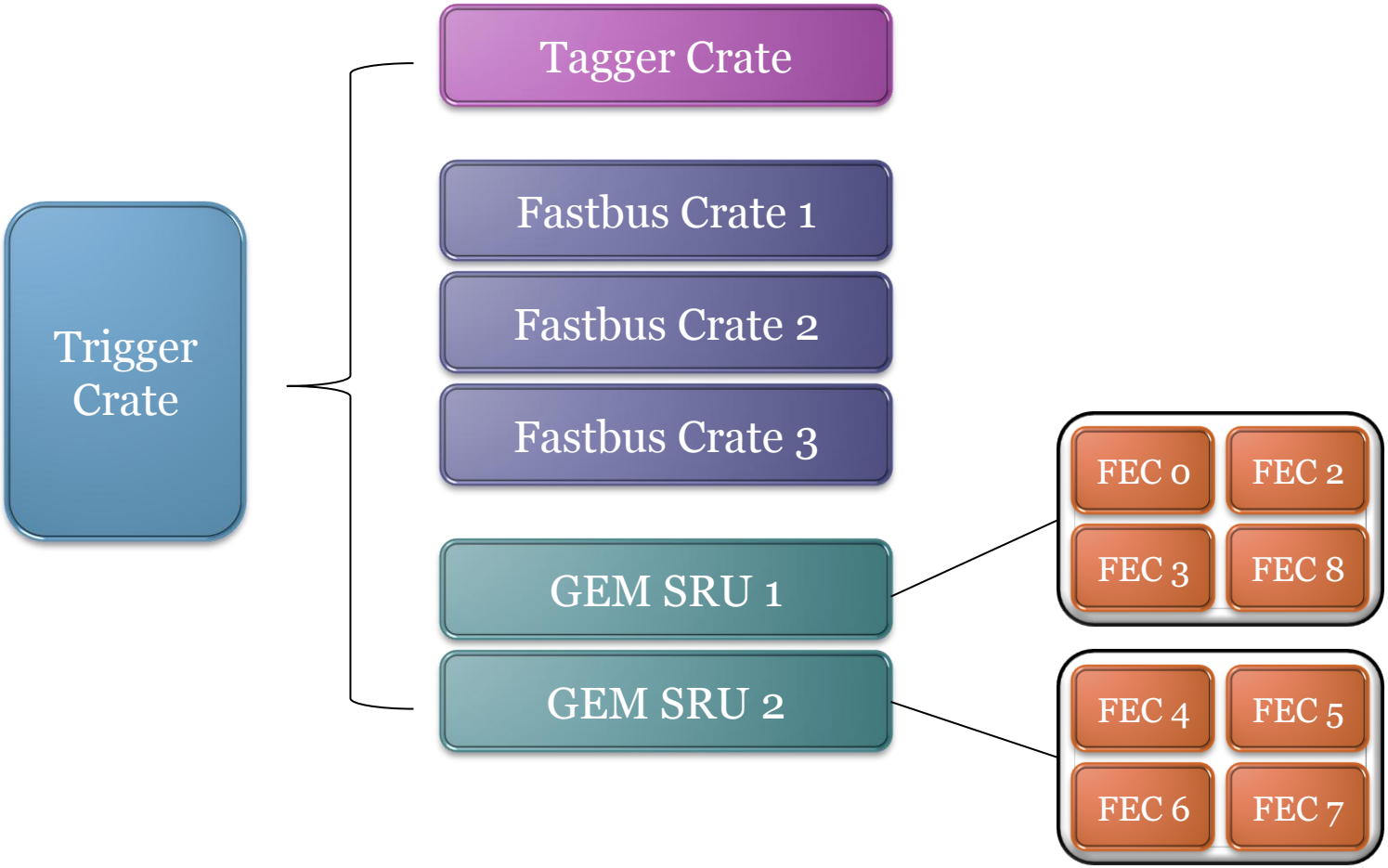
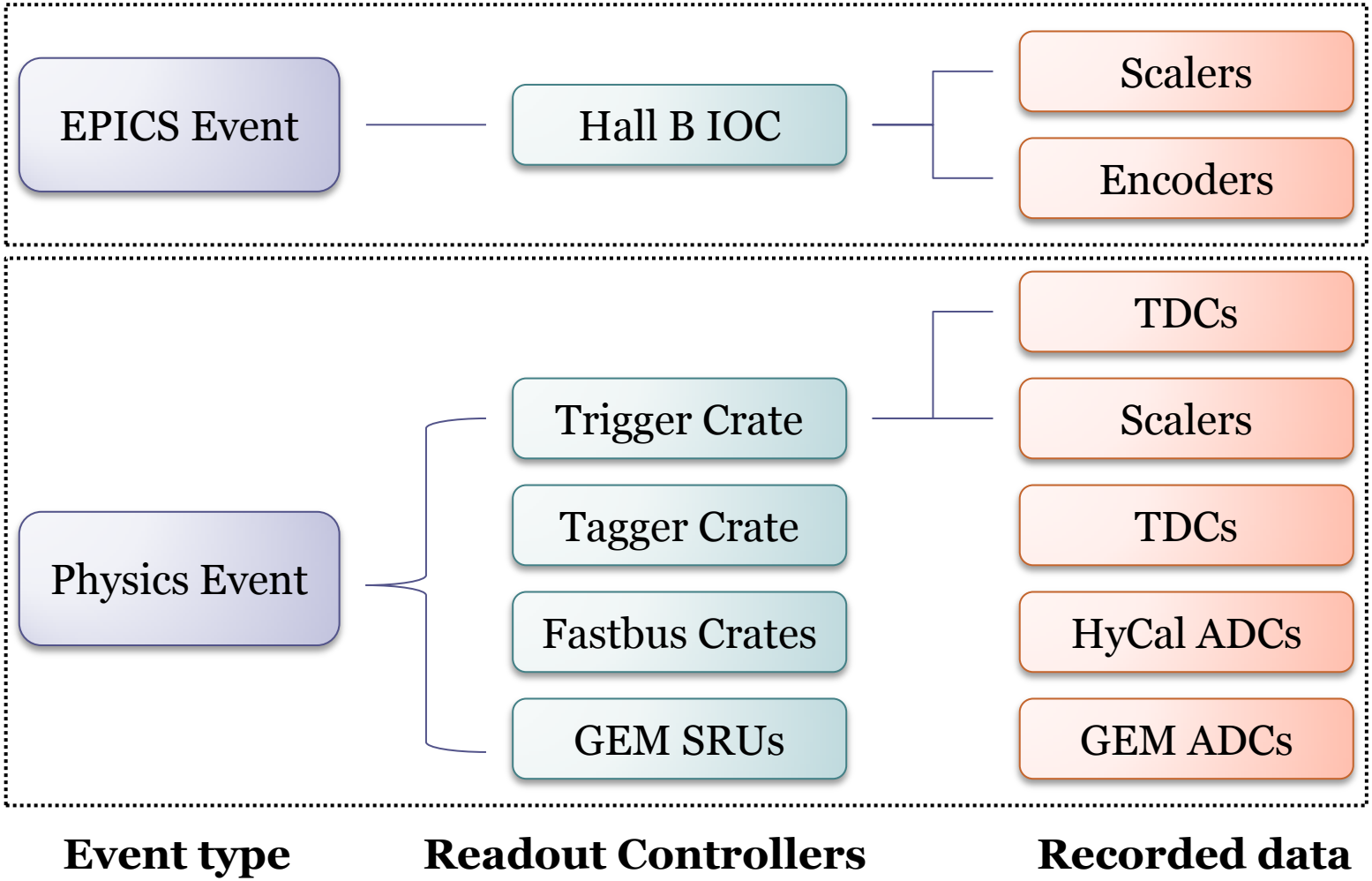
Outline

- DAQ System
- Data Structure
- Data Status
- Pre-process of data
- Summary

DAQ System


Trigger Crate
Tagger Crate
Fastbus Crate 1
Fastbus Crate 2
Fastbus Crate 3
GEM SRU 1
GEM SRU 2
FEC 0
FEC 2
FEC 3
FEC 8
FEC 4
FEC 5
FEC 6
FEC 7

Data Structure



EPICS Event

- Special event, triggered every 2 seconds
- Total 47 epics channels
  - Beam energy, beam line scalers
  - Target gas flow rate and cell position
  - Cell/chamber/tank pressures and temperatures
  - HyCal position

Physics Event

- Different type of triggers
  - Dynode signal sum
  - Dynode signal sum of Lead glass modules
  - LMS led signal
  - LMS alpha source signal
  - Master or signal
  - External pulser
- Trigger configuration for data-taking
  - Pedestal at the beginning: LMS led (phase 1), LMS alpha source (phase 2)
  - Calibration: dynode sum or lead glass dynode sum or master or
  - Production/empty run: dynode sum or lead glass dynode sum

Physics Events

- Trigger Crate
  - Timing information for all triggers, HyCal groups, and scintillators
  - Scalers for triggers, Faraday cup (beam current) and external pulser (live time)
- Tagger Crate
  - Timing information for all E/T channels
- Fastbus Crates
  - ADC signals from HyCal Modules, reference PMTs, and scintillators
- GEM SRUs
  - ADC signals from GEM strips (Zero-suppressed data before run 1155)

Data Status

- 1.1 GeV
  - 81 production runs, 600M events in total
  - 26 empty target cell runs, 58M events in total
  - 13 background test runs, including 9 empty cell and chamber runs (10M events)
  - 1 carbon run, 24M events in total
- 2.2 GeV
  - 79 production runs, 756M events in total
  - 24 empty target cell runs, 42M events in total
  - 5 background test runs, 4M events in total
  - 2 carbon runs, 24M events in total

Data Status

- Issue on the run list
  - Many inconsistent comments (described the run as empty target run, but the trigger rate and total events should be full target run)
  - Run list is NOT a reliable source, one should get the run information from the experimental data (EPICS events)

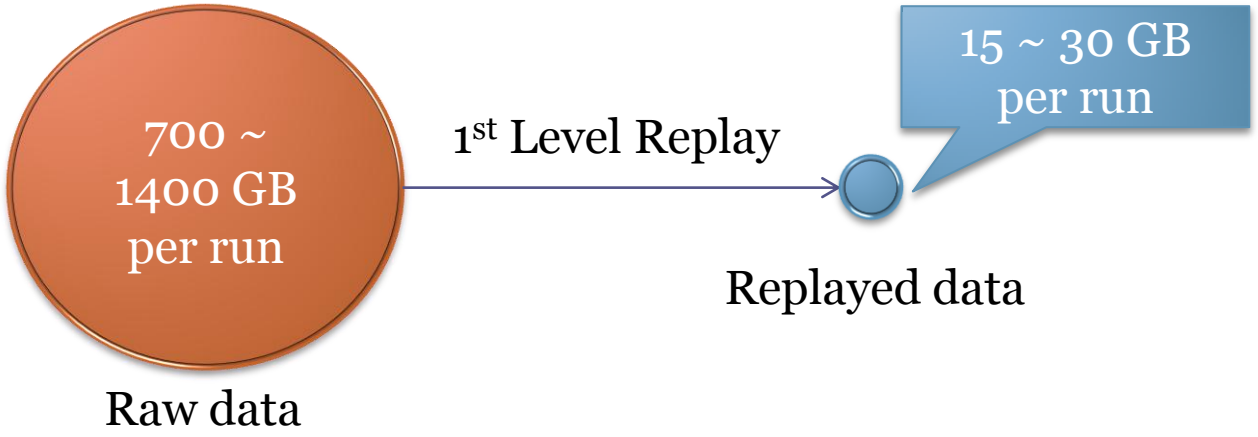
- Issue on the size of raw data
  - 1 run took around 1 TB space on disk, impossible to store all runs on work disk
  - Copy 1 run from silo takes about 4 hours
  - Decoding and analyzing 1 run takes another several hours

Data Status

- Some known issues
  - Trigger counts for lead-glass dynode sum is not reliable, since there always is an unknown signal larger than the threshold
  - W835/G775/G900 are dead, W628 has no LMS signal, G16/G107 has overflowed LMS signal

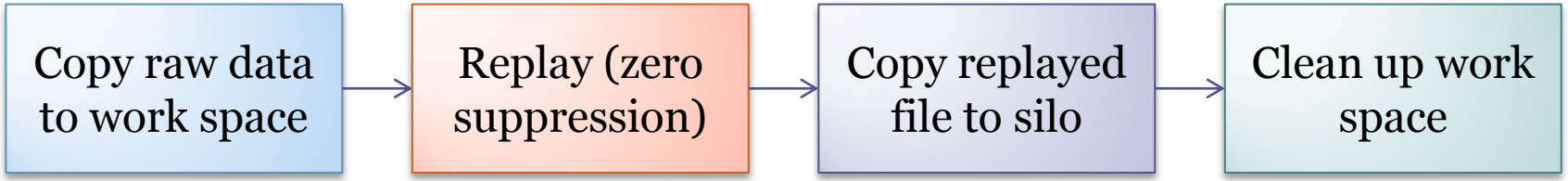
Pre-process of data

- Analysis of raw data, heavily time and space consuming
- First-level replay, decoding and zero suppression
  - No cuts applied, saved maximum information



Pre-process of data

- Automated procedure



- Current status
  - Over 60 runs are replayed, will be finished in 7~10 days

- Planned second-level replay
  - Based on the replayed files
  - Basic cut for to select good events
    - Beam trip off cut (>85% of the run average)
    - Live time cut (> 85% of the run average)
    - Cell status (temperature, pressure)
  - Hits reconstruction for both HyCal and GEM

Second-level Replay

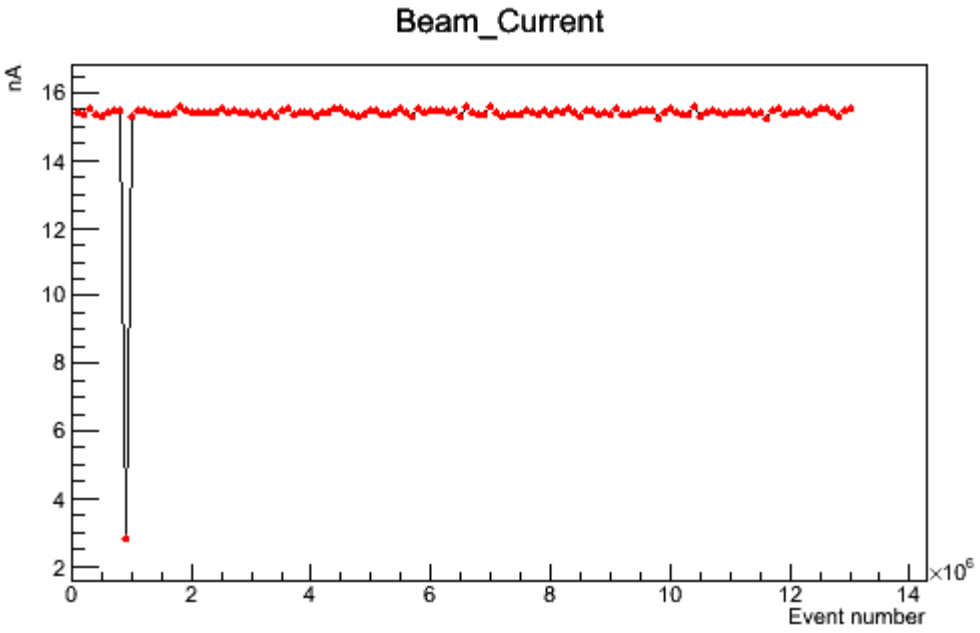
- Beam trip off during data-taking
  - This can be studied by the Faraday cup counts, we can cut off the data with beam current < 80% ~ 90% of the average value
- Large beam position shift
  - Occasionally the beam is off position and might hit the window, it results in a drop of live time (since trigger rates increased), this can be cut off by live time < 80% ~ 90% of the average value.
- Live time drop in run 1492
  - The live time dropped to around 50% due to short of usable memory on the DAQ computer, need further study

Second-level Replay

- Dead/Bad HyCal modules
  - Some of the HyCal modules are dead or bad, this needs to be considered during the reconstruction
- GEM APV crash
  - Occasionally one of the GEM APV was not working properly, this needs to be cut off during the reconstruction

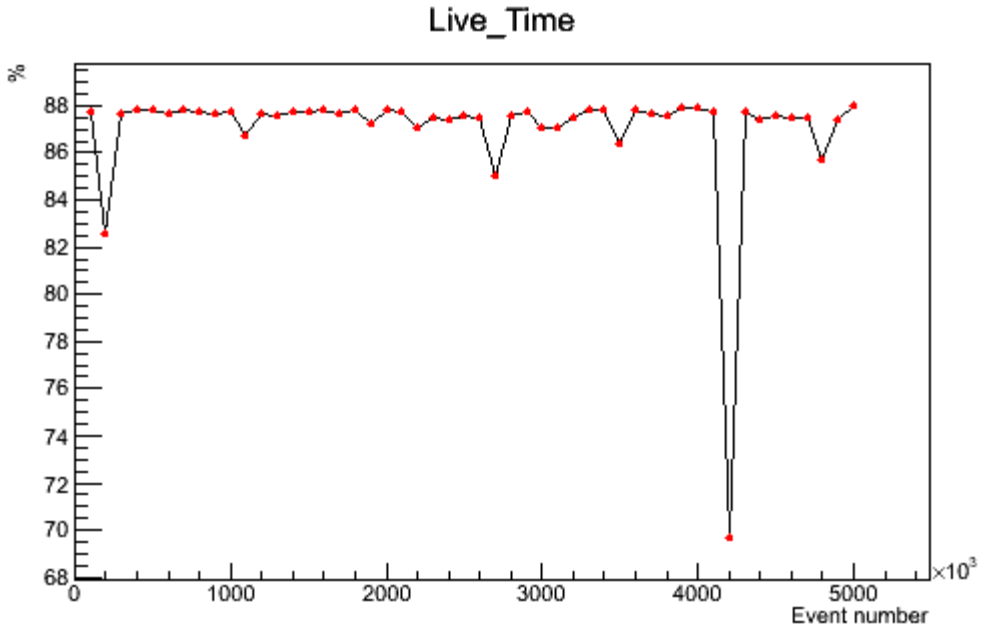
Second-level Replay

- Beam current of run 1331
  - Beam trip off, cut off the affected events



Second-level Replay

- Live time of run 1301
  - Drop may be due to the off-position of beam, cut off the affected events



Summary

- First-level replay is about to be finished
  - 60 runs are ready for preliminary analysis
- Plan on second-level replay
  - Based on the first-level replayed files
  - Basic events selection according to the run status
  - Reconstruction of hits for HyCal (Weizhi) and GEM (Xinzhan)