Software Construction Sites
Personal Selection

Björn Spruck

Changes

- See my talk from 23.1.2018 (for comparison → backup)
  - Some issues already open for longer time
- But a lot of things have been either done or are now worked on
  - I will not go through all of them as what is open mainly fall into one category: close-to-hardware (unpacking and low level data checks)
- Some (invisible) change: Code quality improvement (forced by software shifter/ group)

Open Issues – Improvements or WIP

- Unpacking
  - Continuous support, changes in data format, modification needed for new DHH firmware → iterative process, gated mode, hardware clustering
  - Driven by firmware changes
  - Several man-weeks to month (for this year)
- Data consistency checks
  - Find and mark bad data (sensors which deliver no data, broken data, link down, etc…), over-noisy data (like in cosmics?)
  - Preserve that information to reconstruction and analysis
  - Parameters from database if they change from run to run (like in phase 2)
- Changes **must** preserve Phase2 compatibility, each change has to be verified!
  - Time consuming → often not done.
- I do not see “huge” code changes ahead, but continuous support is needed.
- But I cannot say to much about situation of calibration etc.

Support

- Simulation of “new” features & xchecks
  - Clustering
  - Gated Mode (improvement, consistency, check against data?)
    - New item: gated mode info not in PXD low level data
    - Simulation, PXD → trigger package??
    - Rework storing of information to reconstruction stage
- DQM
  - Iterate and improve
- Software QM plots, (class) tests, etc
  - High level checks (like efficiency)
- Code cross-checks: Pull Request reviewers needed
- Taking care about calibration
- Check data, sign-off runs automatically?

(selected) PXD Software Issues

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Belle2 PXD Workshop, DESY
23.1.2018

PXD Software Issues

- PXD “efficiency” issue in last TB
- → For analysis several changes have been done in a software branch, but never merged to the master
  - Reasons: quick and dirty hacks; redundant and excessive information added to data objects
  - TB (and Phase2 prep) analysis done with “private” code.
- Code quality issues (not only) reported by basf2 shifter.
  - identical #defines in several modules
  - copy n paste → duplicated code, etc. Different (potentially different) definitions of same objects lead to hidden linker problems.
- Most of these changes useful (if done in a cleaner way)
  - Additional consistency/error checking
  - Easier (not-expert) access to some properties.

PXD Software Issues

- Missing features
  - Quality of DAQ data ("Is the PXD data of this event o.k. for analysis?")
    - If part of the PXD is not usable (f.e. one DHC, DHE, ...).
  - Was the sensor gated?
- Evaluation of code and proposed changes
  - → Quiet some changes needed as it cannot be implemented a clean way in the current code.
  - Improve the "private" version and replace code in master
  - Documentation!!!
  - PxdRawHit contains redundant (unneeded?) items → performance issue.
- Add more DQM for information currently lost on unpacking level.

PXD Software Issues – Detailed Discussion

- Common Mode is stored for each PxdRawHit
  - Common Mode was said to be an important monitoring property
  - But is common for all columns in one DHP row, we need to store it only once
- If we remove (=store it separated) it: we loose the direct connection between CM and the pixel hit. But who needs that?
- StartRow and FrameNumber (DHE, DHP) are stored for each PxdRawHit
  - Highly redundant as its common for the whole frame.
  - The way Frame Nr is stored in PxdHit is questionable (e.g. made quiet some trouble for analysis).
    - Not seen a valid use case until now.
- If we remove (= store it separated) it, we loose the information which pixel was in which readout frame IF we read out more than one readout cycle
- Clustering will not propagate that information anyway…
- Common Mode in hardware clustering requires a separate storage anyway.

PXD Software Issues – Simulation

- Request from software/tracking:
  - Proper simulation of PXD data reduction (“ONSEN”), including simulation of
    - HLT ROI creation – already done (Giulia, BS)
    - (DATCON ROI creation)
    - ROI processing on pixel data – already done (Giulia, BS)
    - ROI processing on cluster mode data for phase 3 simulation.
  - Question about simulation of gated mode, how to notice in analysis
- WIP: Simulation for ROI processing on cluster mode data for phase 3 simulation can be done based on current software clusters (but not yet properties) – in development trunk, but not in release v01.00.00 (BS)
- Problem:
  - Hardware cluster format/properties are not well defined.
  - (Problem for unpacker and data store objects, too)

Summary

- Code cleanup, documentation, etc.
- More monitoring capabilities (learned from last TB)
    - Usability of data (“gated mode”) for analysis
- Proper simulation of “pxd data reduction”
- Cluster mode needs simulation and checking – before phase 3!