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Belle II

ONSEN Status and Testbeam Performance

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for the Gießen Group

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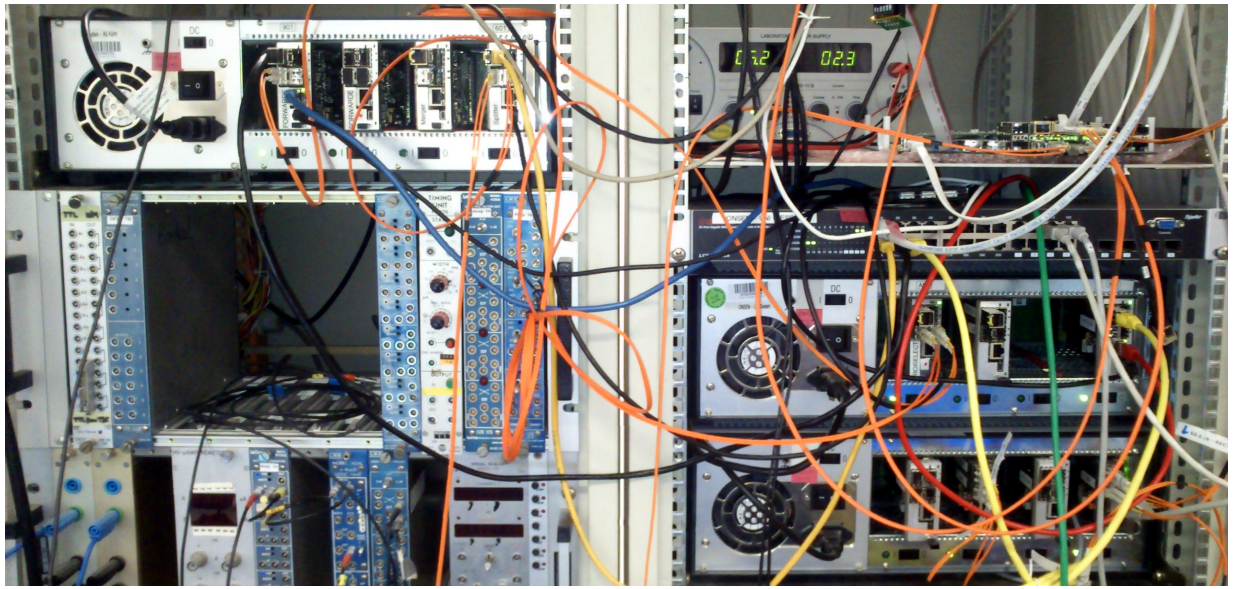
The “Pocket ONSEN” System

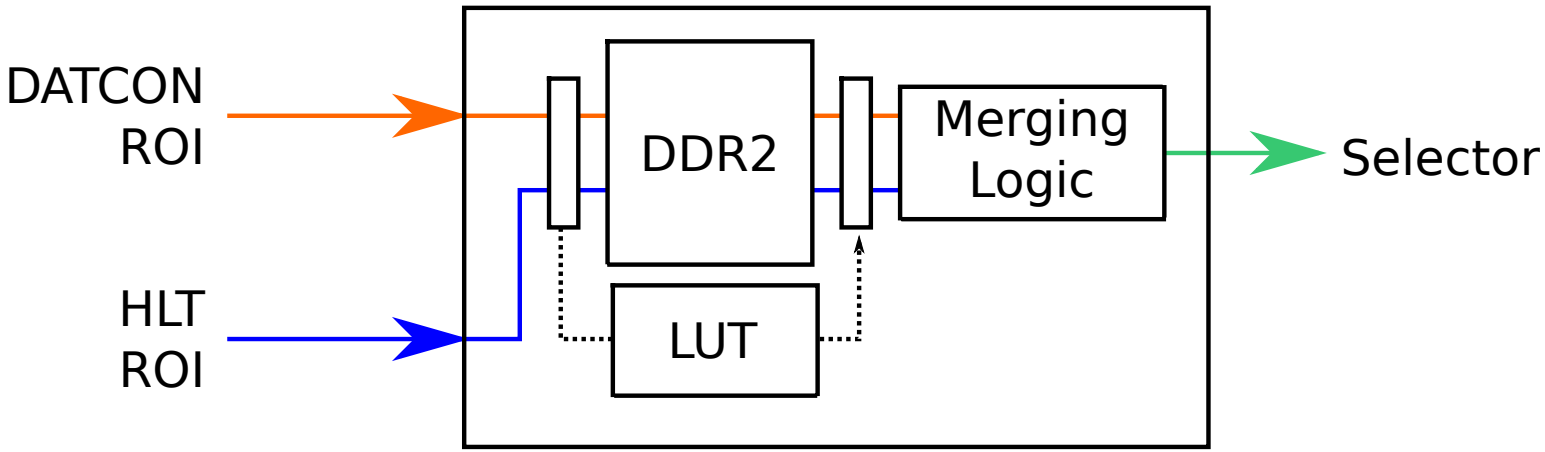
- Compact prototyping system with two to four Compute Node AMC cards in a MicroTCA shelf:
  - **Merger**
  - **ROI Selector**
  - Sender
  - Splitter



- Here divided into two shelves. (Backplane issues)
- One Pocket ONSEN will stay in Hamburg, one at KEK.

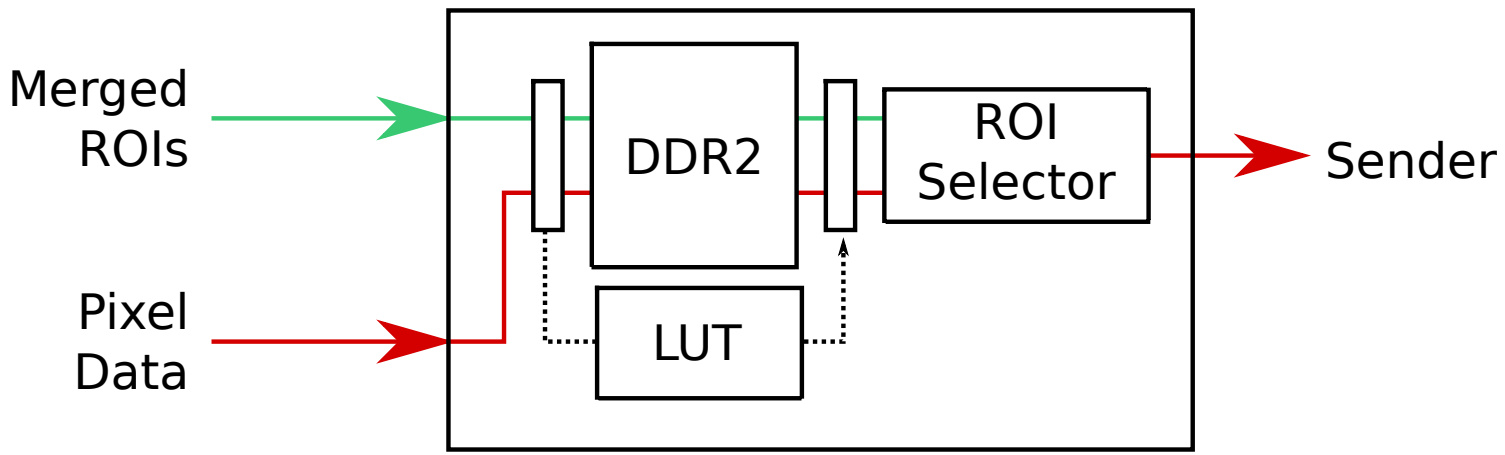
Merger Node

- Principle:
  1. **DATCON ROIs** arrive (much faster than HLT tracking). (*1.5625 Gbps Aurora optical*) They are stored to memory.
  2. **HLT ROIs** arrive some time later. (*SiTCP*) DATCON ROIs with same trigger number are read back from memory.
  3. ROIs from HLT and DATCON are **merged** into one frame.
  4. Merged ROIs are passed **to Selector Node**. (*3.125 Gbps Aurora via backplane*)



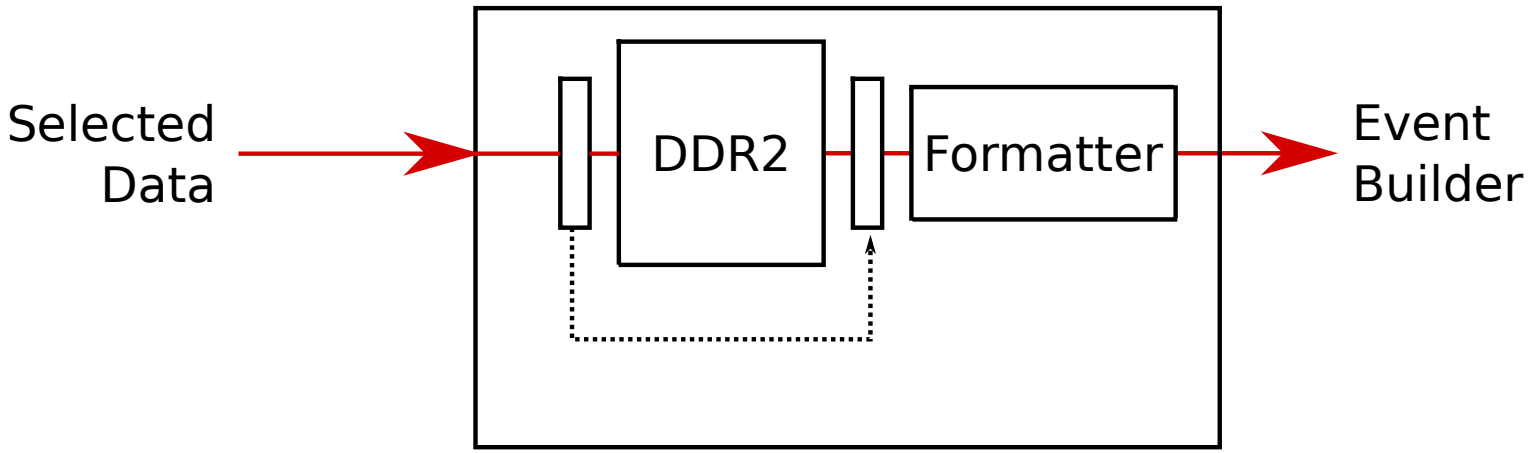
Selector Node

- Principle:
  1. DHHC **pixel data** arrive. (*3.125 Gbps Aurora optical*) They are stored to memory.
  2. **Merged ROIs** from the Merger arrive some time later. Pixel data with the same trigger number are read back from memory.
  3. Pixel data is reduced according to ROIs.
  4. *Debugging*: An ROI frame in inserted in the pixel data stream.
  5. **Processed data** are passed **to Sender Node**. (*3.125 Gbps Aurora optical*)



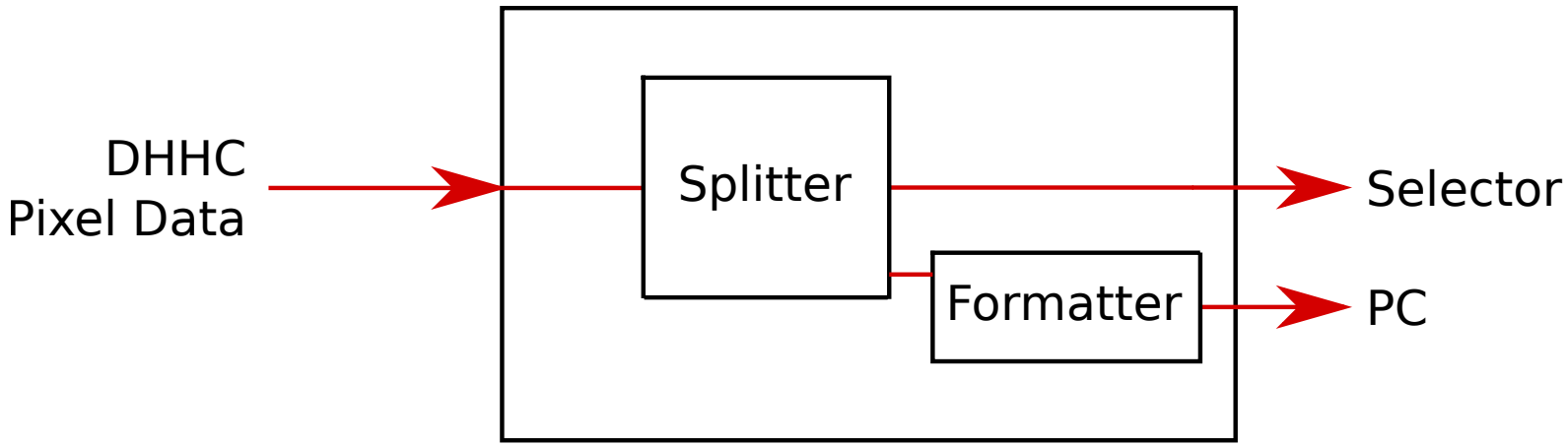
Sender Node

- Principle:
  1. Processed data from Selector Node arrive. (*3.125 Gbps Aurora optical*)
  2. They are buffered it in RAM and read it back as soon as SiTCP FIFO is not full.
  3. Data are formatted and sent sent **to Event Builder**. (*SiTCP*)



Splitter Node

- Used for “spying” on the data sent by DHHC, before it is passed through the Selector.
- Data are sent to the Selector **and** to a PC via SiTCP
- Data sent by **HLT to ONSEN** and data sent by **ONSEN to EVB** can also be intercepted and stored for debugging.
- This makes it possible to judge later if ONSEN is processing ROIs correctly.



Testbeam Status

- Problems were encountered with most current Selector firmware.
- Processing may become slow or stall at high trigger rates.
- They disappear when downgrading to an older version (Jan 15).
- Problem: This does not allow more than 14 frames per event. Problematic with more than one DHH (i.e. now).
- Cause has most likely been found (related to steering software on PowerPC). Fix will be tried today.

Testbeam Status

- High-Level Trigger may send ROIs from last run at the beginning of a new run.
- ONSEN processes the ROIs normally and sends them to the Event Builder.
- Event Builder expects only data from the new run. It cannot distinguish, because ONSEN frame does not contain run number.
- Events are built incorrectly. This must be avoided.
- At the moment, this requires HLT and EVB restart.
- Discussion with DAQ experts has been started to find a nicer solution.

Testbeam Status

- During runs, the system is very stable.
- Output data from ONSEN appears to be complete and have the correct format. It can be correcly processed by the RwaPXD Unpacker.
- Output data must still be cross-checked with collected “spy data”.
- Merging of HLT and DATCON ROIs was not yet tested successfully. (Only with test data in Gießen.)
- ROI selection works (see David’s talk).