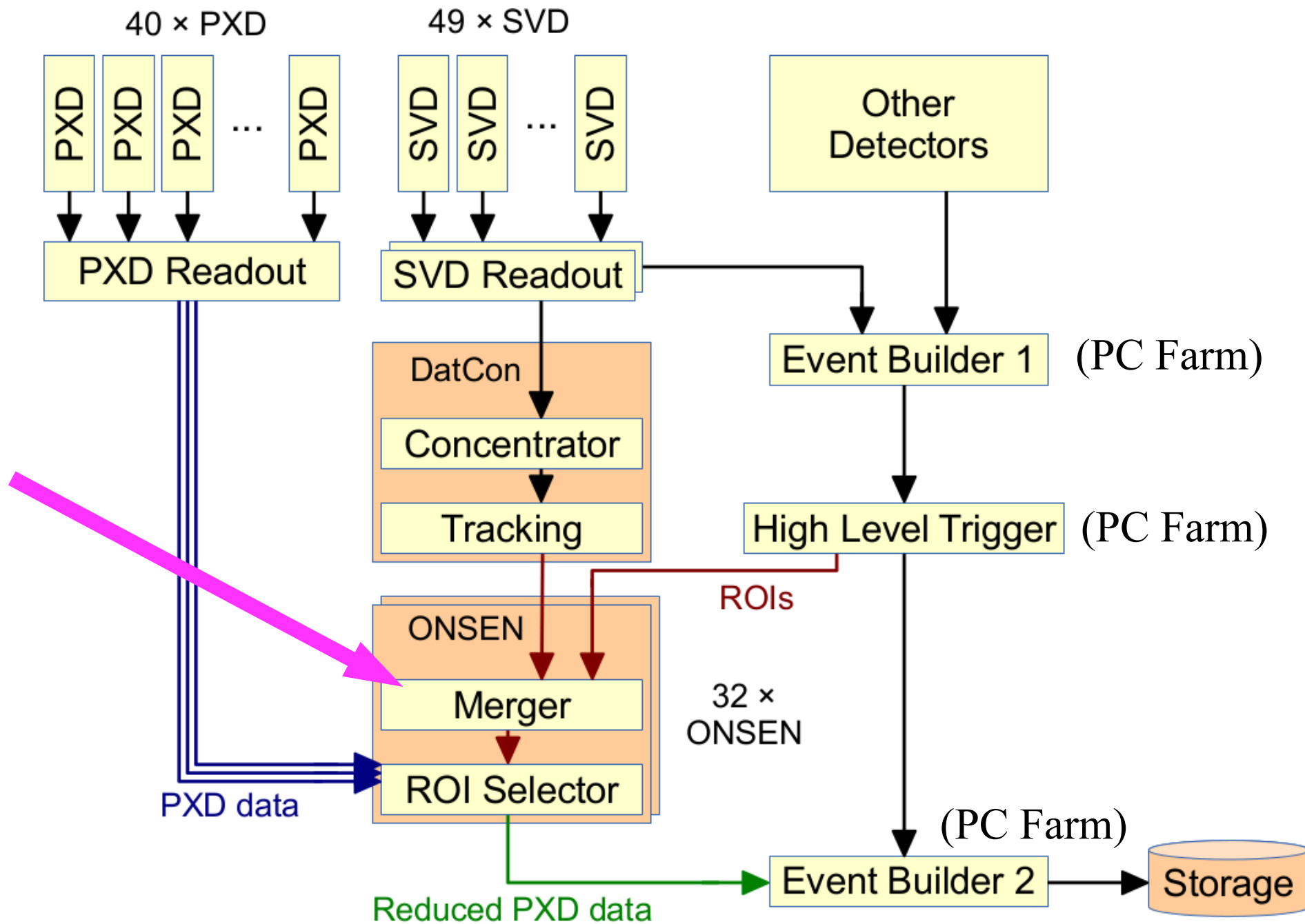# ONSEN
HLT/DatCON Merger and
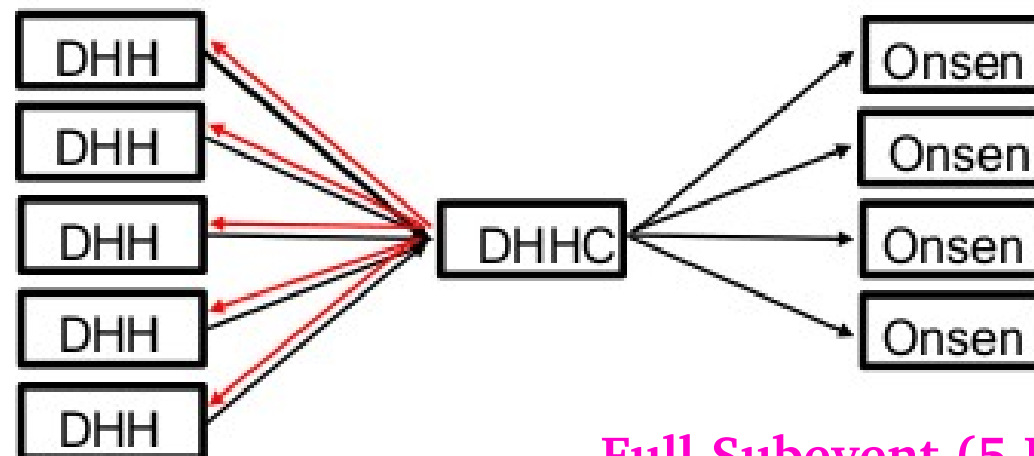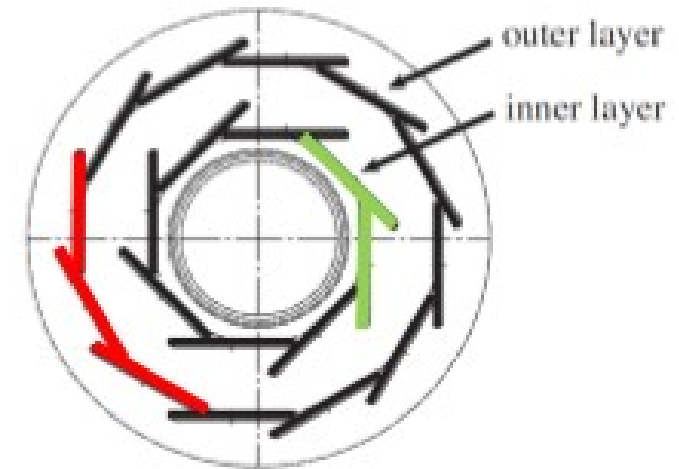# Trigger/ROI Distributor

Björn Spruck

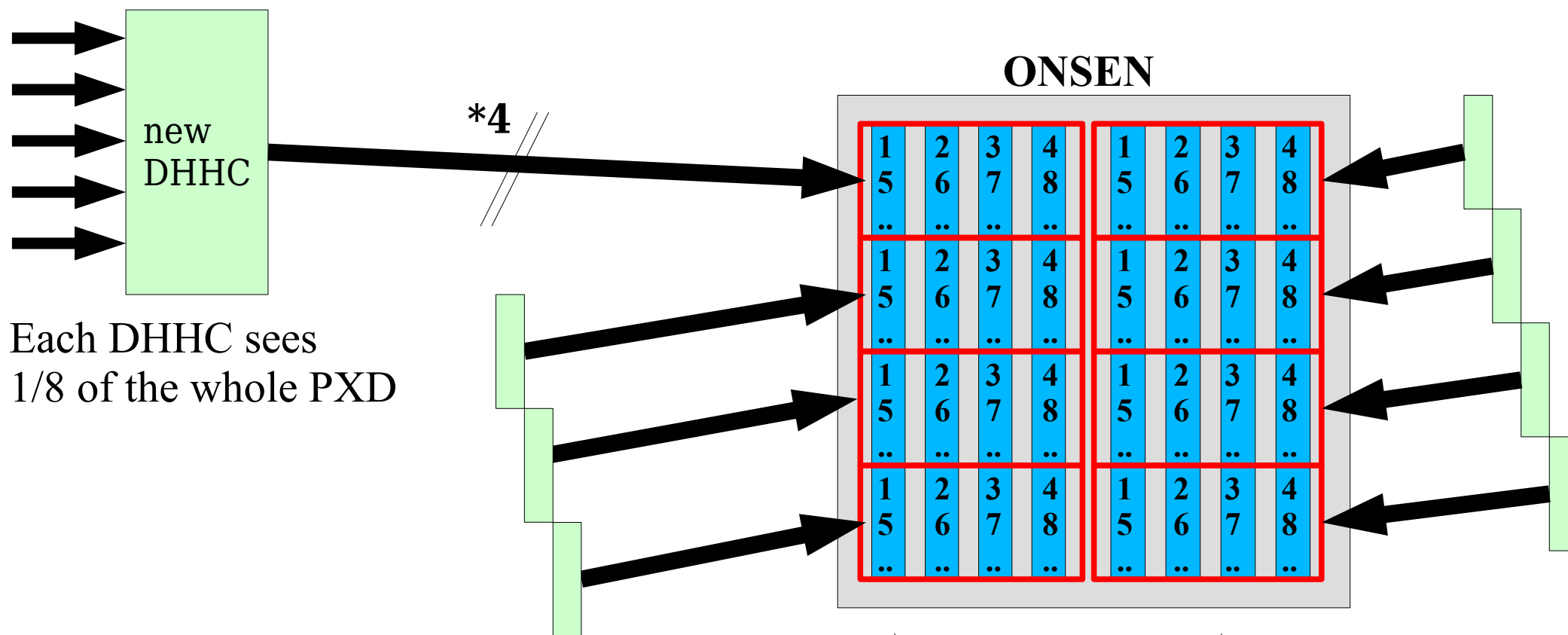Talk held somewhere
Once upon a time after 30.4.2014

Data Load Balancing

- Proposal to average data for 5 half ladders:
  - 2 inner half ladders
  - 3 outer half ladders on opposite side
- Data rate reduction:

Rate = (2x1 + 3x0.5)/5 = 0.7

outer layer

inner layer

Full Subevent (5 DHH) to one output. Selected by trigger number!

Belle II

ONSEN

new
DHHC

*4

1 5 ..	2 6 ..	3 7 ..	4 8 ..	1 5 ..	2 6 ..	3 7 ..	4 8 ..
1 5 ..	2 6 ..	3 7 ..	4 8 ..	1 5 ..	2 6 ..	3 7 ..	4 8 ..
1 5 ..	2 6 ..	3 7 ..	4 8 ..	1 5 ..	2 6 ..	3 7 ..	4 8 ..
1 5 ..	2 6 ..	3 7 ..	4 8 ..	1 5 ..	2 6 ..	3 7 ..	4 8 ..

Each DHHC sees
1/8 of the whole PXD

**4*4 DHH
every 4th event
=> 1/2 PXD
f.e. upstream part**

**4*4 DHH
every 4th event
=> 1/2 PXD
f.e. downstream part**

These are the
Event Numbers!

= Carrier with 4 AMCs

= 4 AMCs served by one DHHC

- Be flexible, don't use "just" the lower two bits as selection.

- The following was decided by Igor, Dima and Björn:

- **We use a lookup table with 64 entries.**

    - 6 lower bits of trigger number as index in table which selects then one of the four outputs

    - Table can be changed "on the fly" by Slow Control

    - Easily adaptable if we cannot use all four outputs in a test

    - Deactivate one output w/o loosing data

    - Generate lower or higher data rates on one output

- Because of the delayed HLT trigger, modifying the table is only possible during a stopped DAQ (e.g. HLT queue/fifos must be completely empty!)

DatCon   HLT

xFP AMC

Merger

Carrier Board #0

Distributor

Distributes HLT Trigger by Event Number in exactly the same way as the DHHC does it. Configurable!

Duplicates the each data to two outputs. (e.g. forward/ backward)
Selects fw/bw ROIs within data (optional)

Carrier Board #1

Carrier Board #2

Carrier Board #3

Carrier Board #4

Carrier Board #5

Carrier Board #6

Carrier Board #7

Carrier Board #8

- Implemented in VHDL including PLB registers for LUT configuration

- Tested with 1GEvents (32GB) with different LUT setup

  - Checksums, events number selection and continuity are O.K.

- SITCP in → Distributor → (SITCP out 1, nirvana, nirvana, SITCP out 2) on an AMC board (Virtex 5).

- But

  - Not checked with four **real** outputs (can only use two or three for sitcp)

  - Not checked on Virtex 4, not checked on carrier board (connectivity...)

  - Not checked with backplane (AURORA)

Forward/Backward ROI Sorting

- ROIs for forward/backward part of PXD are distinguishable by their DHH-ID

  - We can reduce the HLT data which is send to each node by sending only ROI data which the node needs

  - Remark: Data rate is already low, just double the output (aka DESY test) will work, too.

  - But: We would save some memory bandwidth on the Selector nodes.

- Results:

  - Works. Checked with 1,6 GEvts Input (=570 GB) → 2*400 MEvts Output (=2*70 GB), Rate ~112 MB/s Input

  - Checksum is recalculated as HLT/ROI content of package changes by selecting FW/BW ROIs only.

- But:

  - Not checked with eight **real** outputs (can only use two or three for sitcp)

  - Not checked on Virtex 4, not checked on carrier board (connectivity...)

  - Not checked with backplane (AURORA)
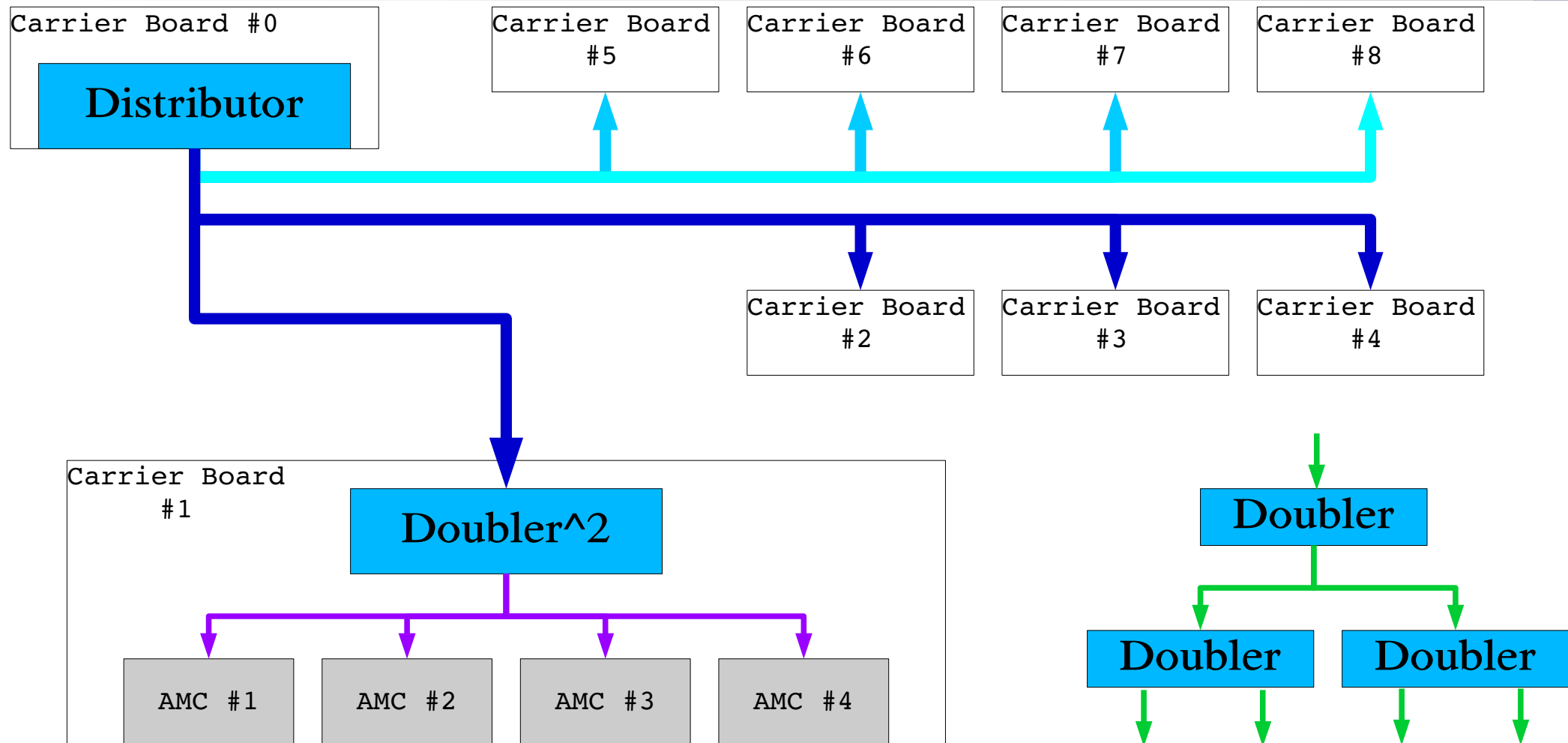
Remark: All AMC in one Carrier process sub-events of the same Event Number. Thus no further selection necessary needed. The data just has to be clones to four outputs (or doubled two times; doubled like in "DESY test")
One could select further on the DHH IDs, but thats not needed, data rate is already low. (nevertheless, it would save memory bandwidth...)