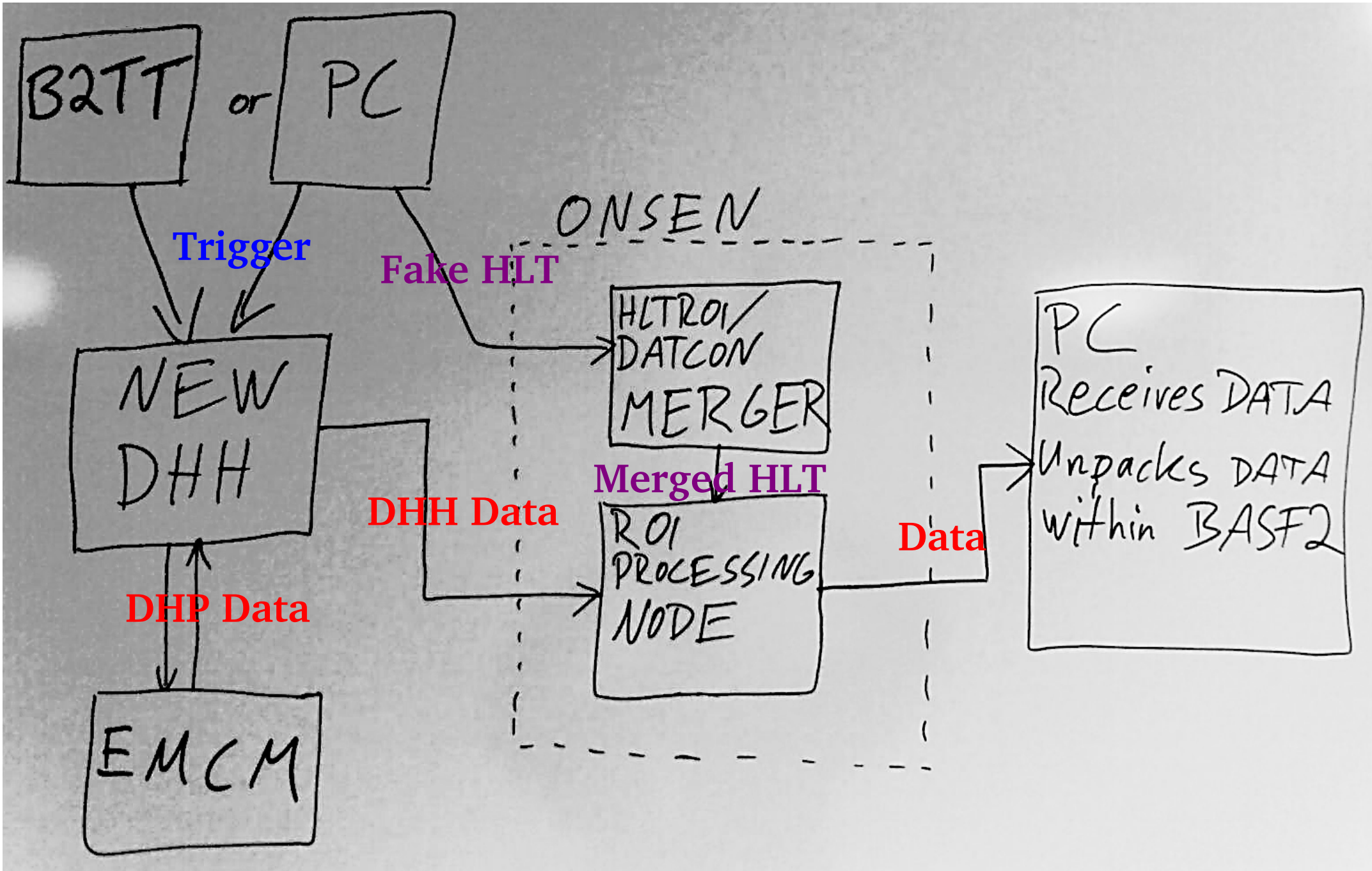
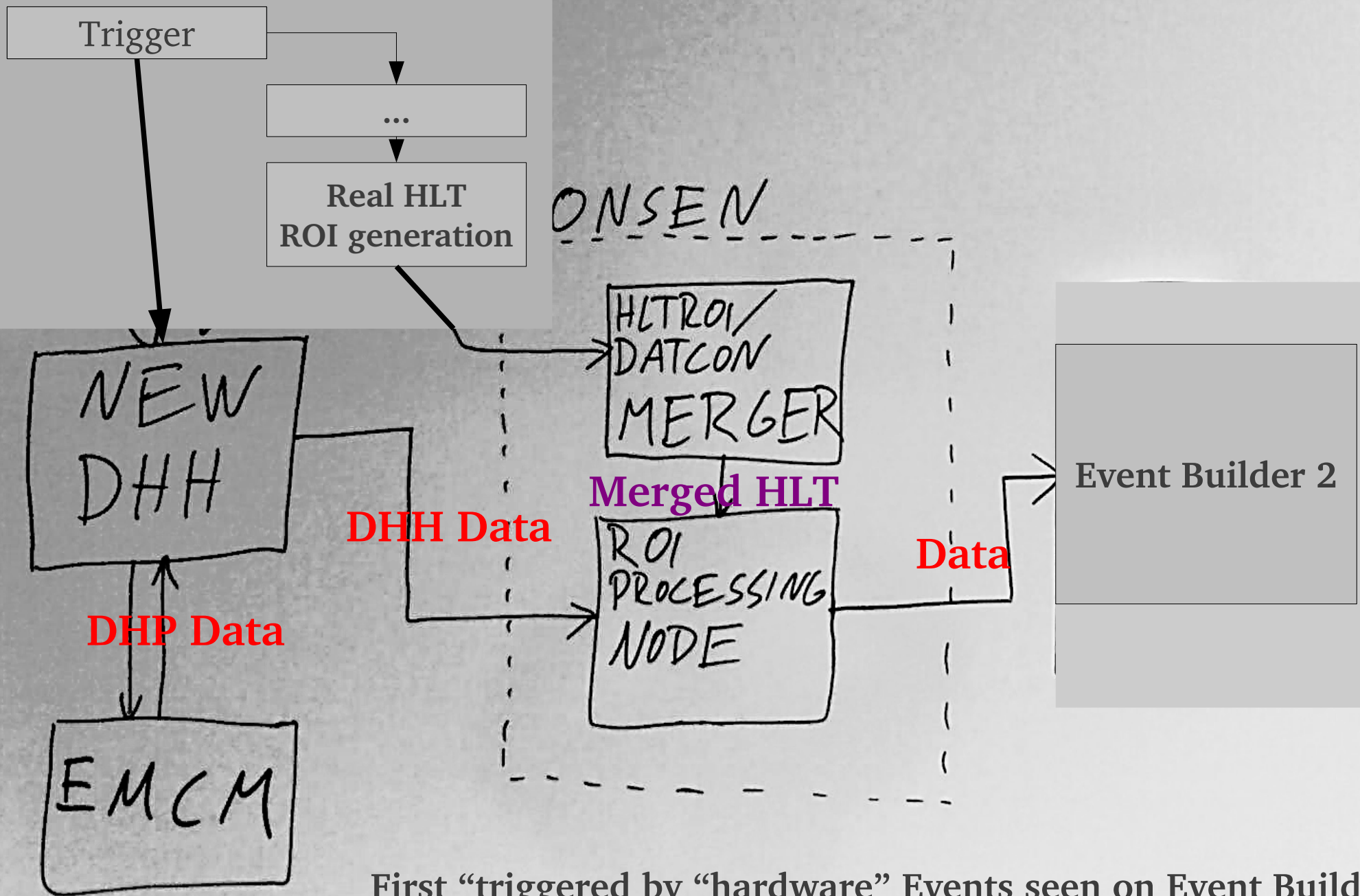


ONSEN Status
(focusing on this and last week)
System Integration at DESY

Björn Spruck
(for the Giessen Group)

New Readout Chain Worked



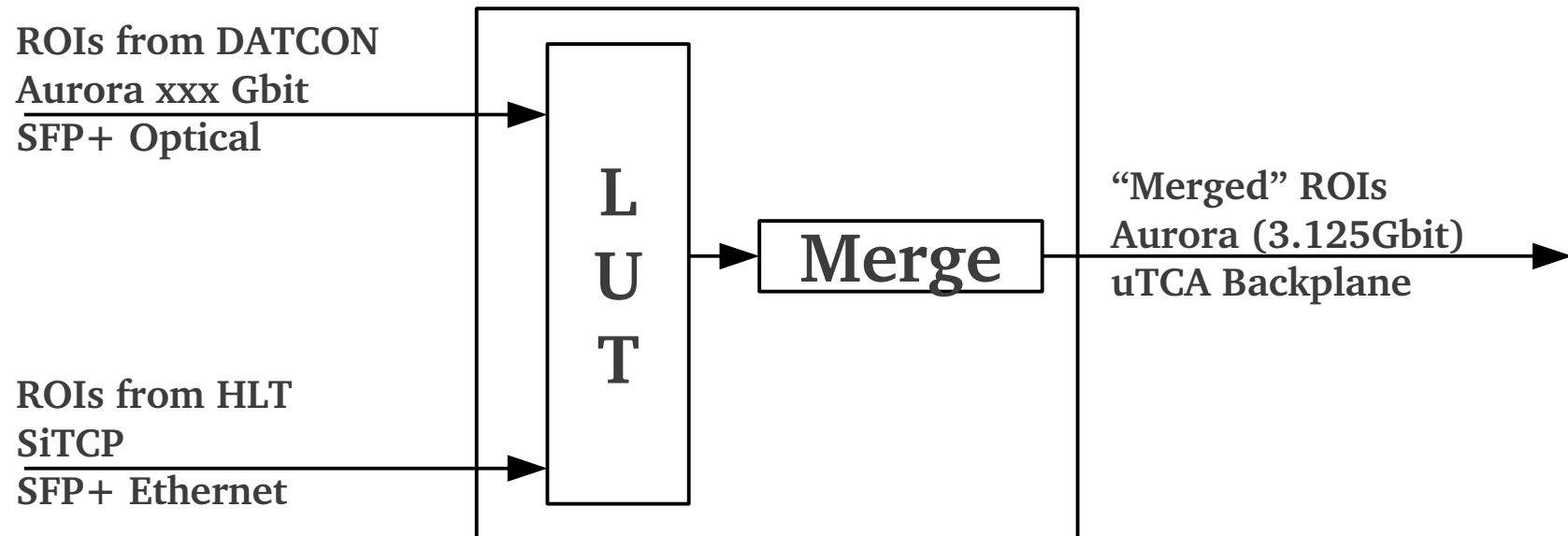


First “triggered by “hardware” Events seen on Event Builder.

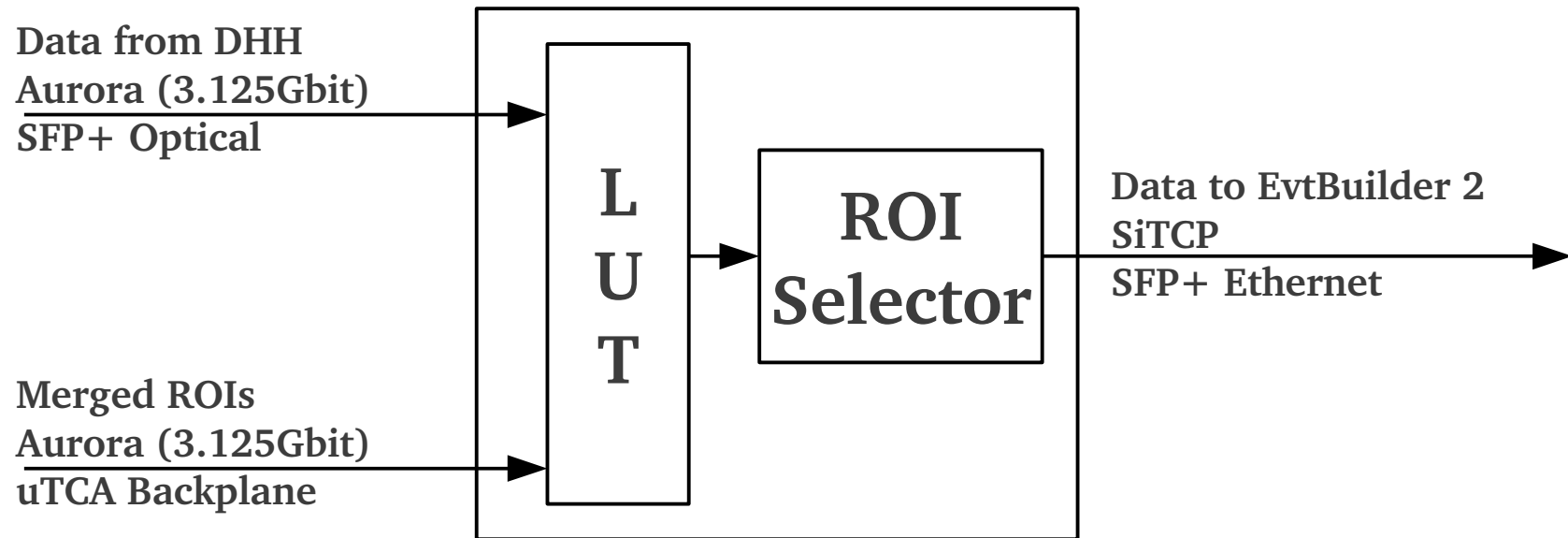
Merger (Simplified) Schematic

Task:

Store DATCON ROIs until HLT is received, then “merge” ROIs and send them to ROI Selector Node(s).



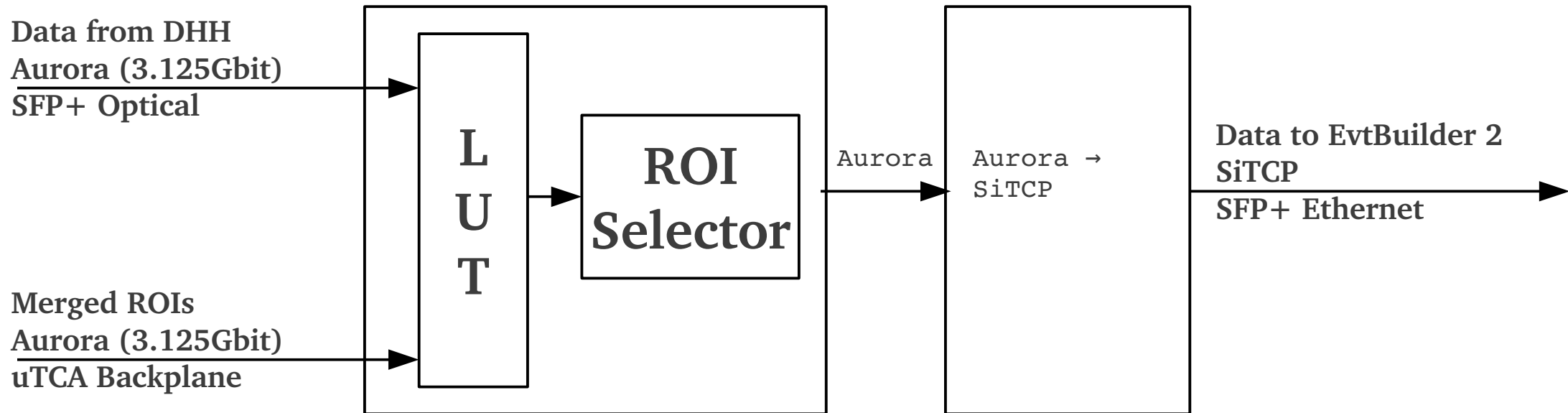
(using similar LUT than ROI selector node)



(using similar LUT than Merger node)

ROI Selector (Simplified) Schematic

Third note workaround, as we still have issues with the out format (some missing words)

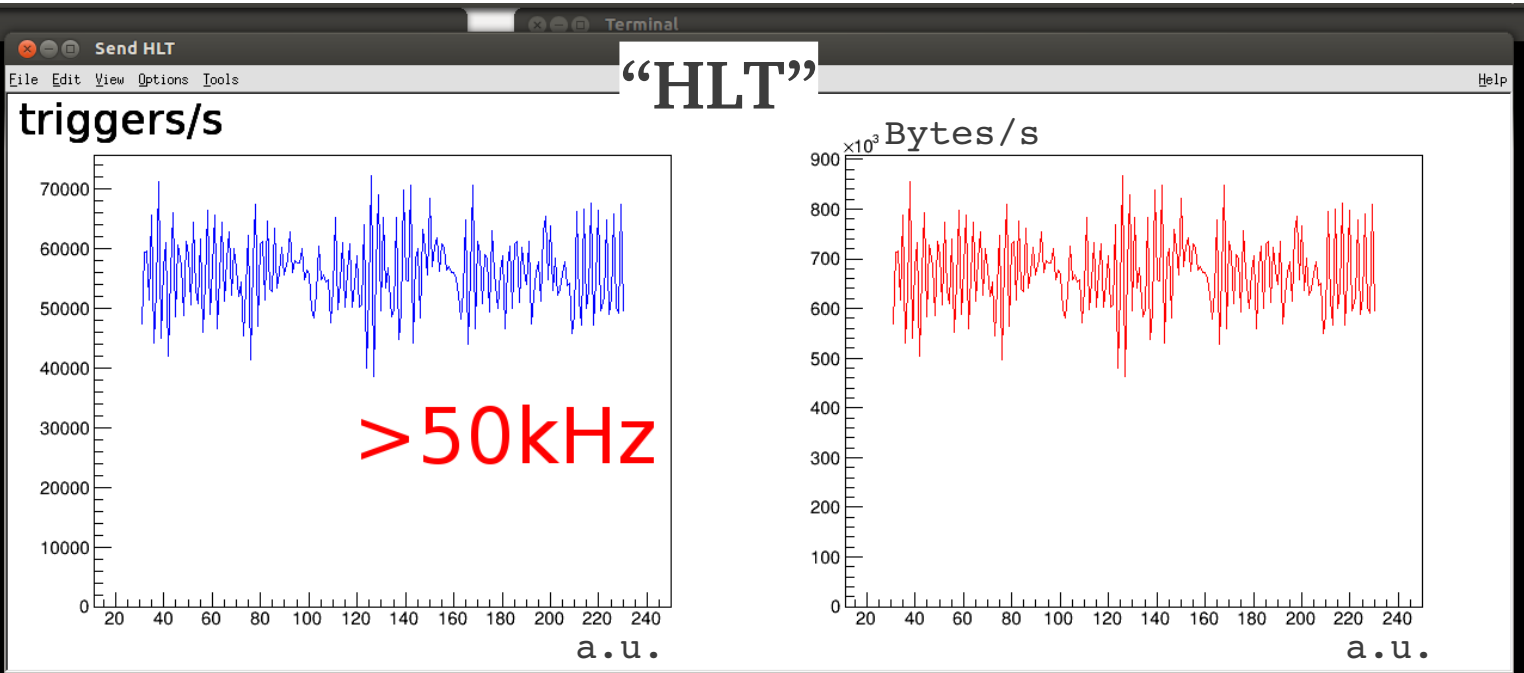


Lab test with "DATCON" and "HLT" ROIs send from a PC

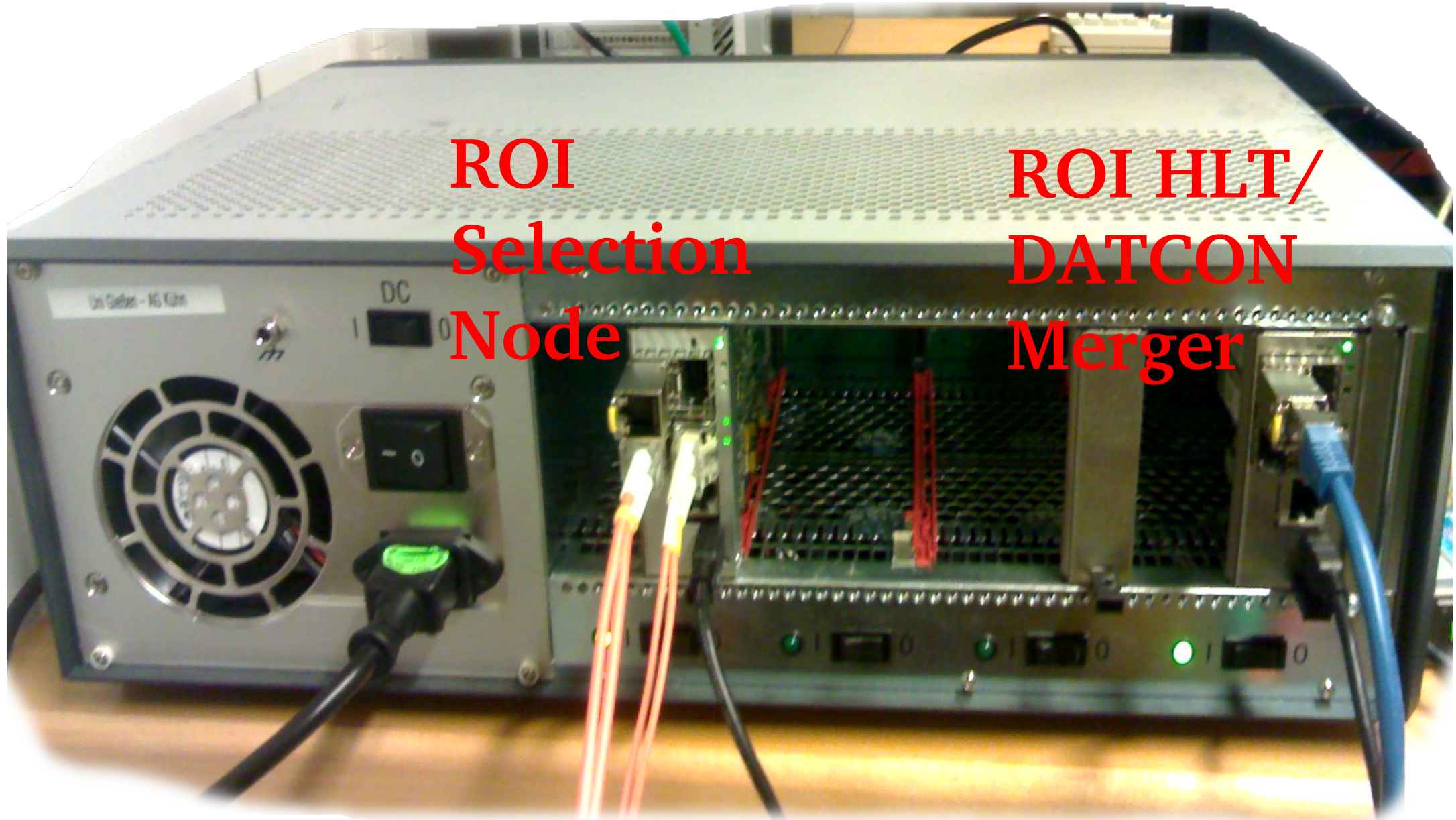
```
Terminal
HLT got hlt 17CF000
HLT got hlt 17D7000
HLT R Lock
HLT got hlt 17E1000
HLT got hlt 17DE000
HLT got hlt 17E3000
HLT R Lock
DATCON add hlt 181E000
HLT got hlt 17E0000
HLT got hlt 17D4000
HLT got hlt 17E8000
DATCON add hlt 181F000
HLT got hlt 17EA000
HLT got hlt 17ED000
HLT R Lock
DATCON add hlt 1820000
DATCON add hlt 1821000
DATCON add hlt 1822000
DATCON add hlt 1823000
DATCON add hlt 1824000
DATCON add hlt 1825000
DATCON add hlt 1826000
DATCON add hlt 1827000
DATCON add hlt stalled...@ 1827580
HLT got hlt 17E2000
HLT got hlt 17DD000
HLT got hlt 17E6000
HLT got hlt 17EB000
HLT got hlt 17DC000
HLT got hlt 17EE000
DATCON add hlt 1828000
DATCON add hlt 1829000
HLT got hlt 17F8000
DATCON add hlt 182A000
HLT got hlt 17F1000
DATCON add hlt 182B000
DATCON add hlt 182C000
DATCON add hlt 182D000
HLT got hlt 17EC000

int top;
double c;
c=Timestamp();
if( hlt_write<hlt_read) top=MAX_HLT; else top=hlt_write;
// printf("--- %d %d -- %d %d --\n",hlt_read,hlt_write,top,c,hlt_read);
for(int i=hlt_read; i<top; i++){
if(hlt times[i]<=c){
int id;
id=hlt_ids[i];
hlt_ids[i]=hlt_ids[hlt_read];
hlt_times[i]=hlt_times[hlt_read];
hlt_ids[hlt_read]=0;
hlt_times[hlt_read]=0;
hlt_read++;
hlt_read%=MAX_HLT;
return id;
}
}
Line: 182 Col: 6 INS LINE UTF-8 gui_hlt_datcon.cpp
```

25MEvts
A



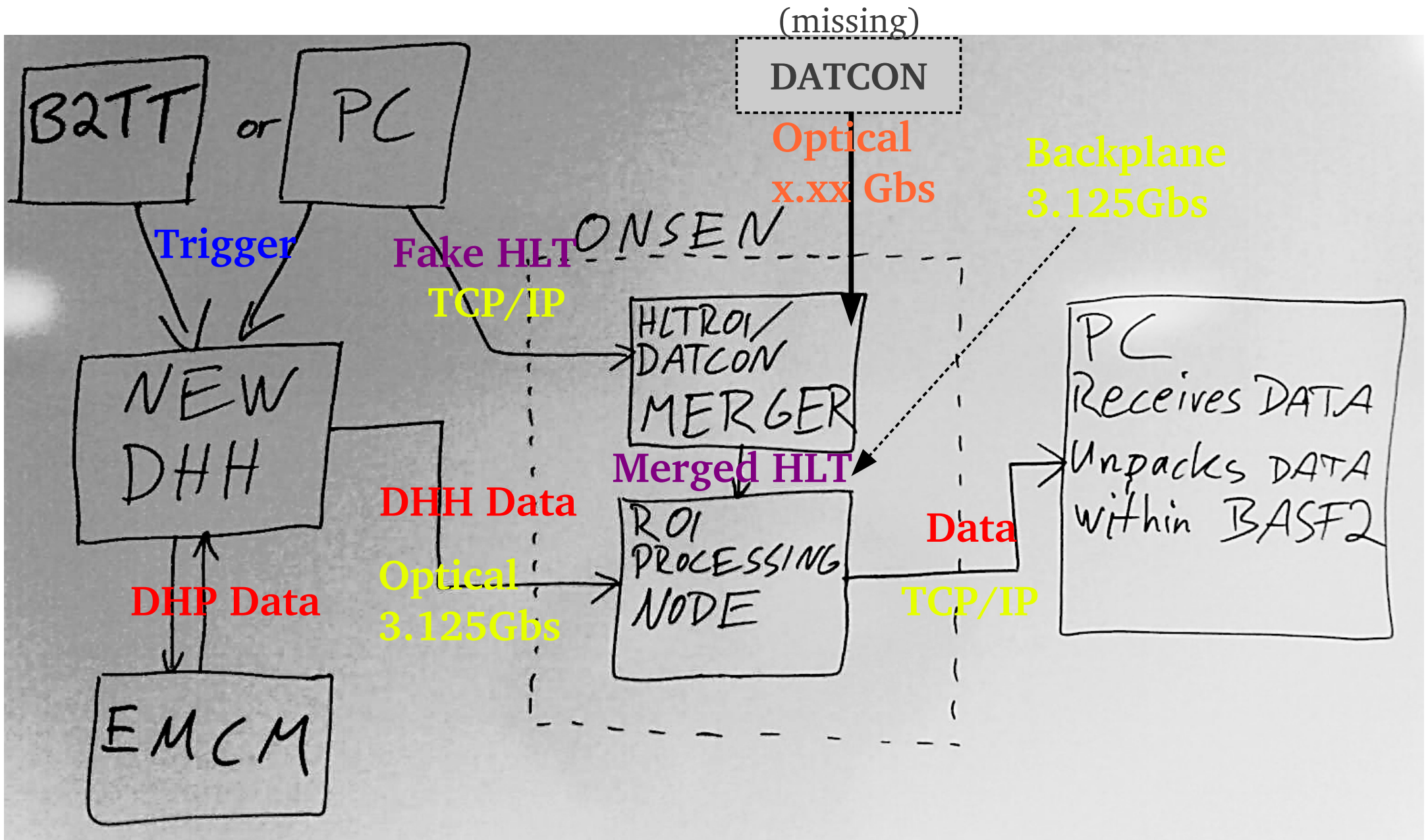
*mostly



**ROI
Selection
Node**

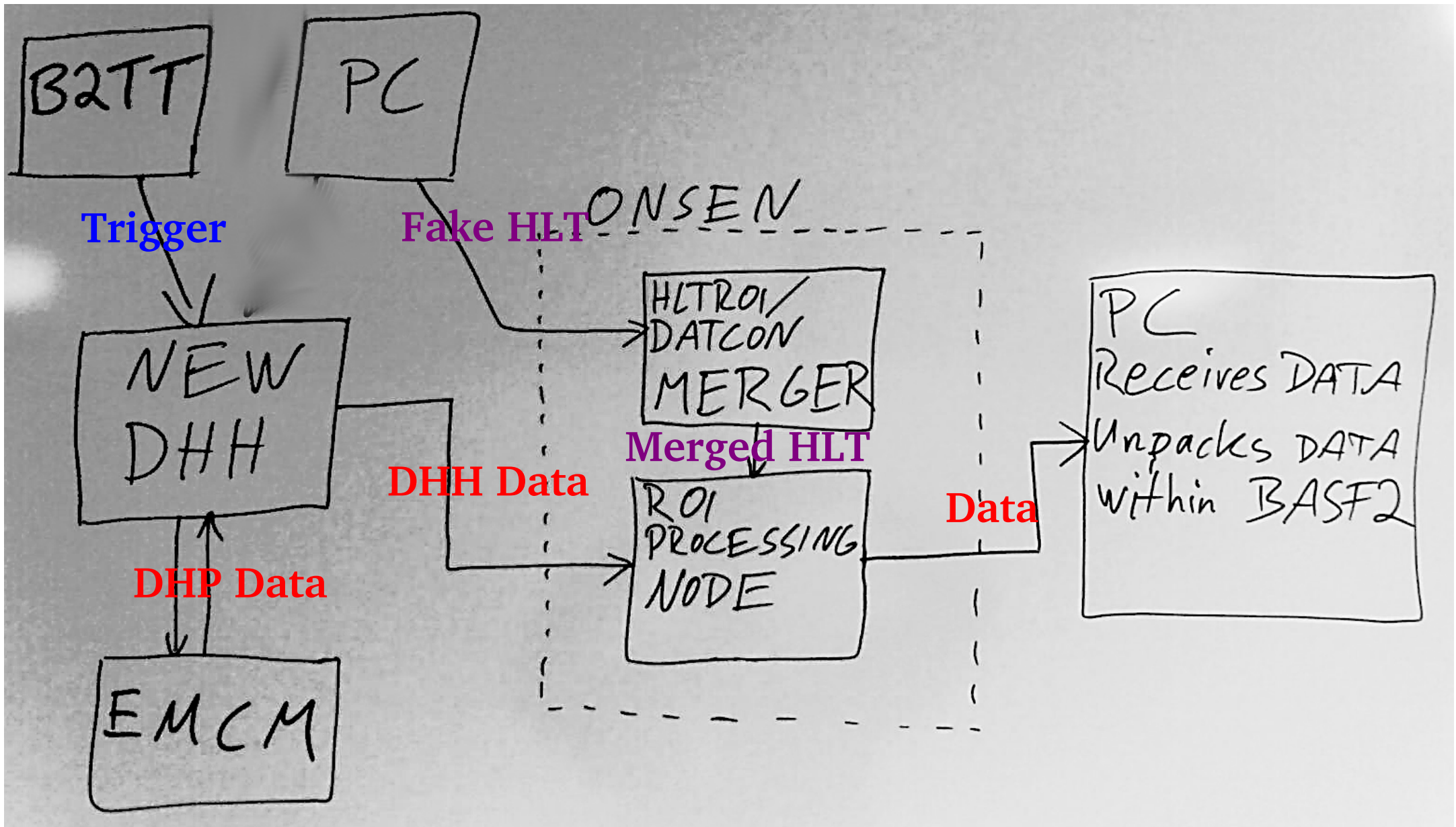
**ROI HLT/
DATCON
Merger**

New Readout Chain Worked



New Readout Chain Worked

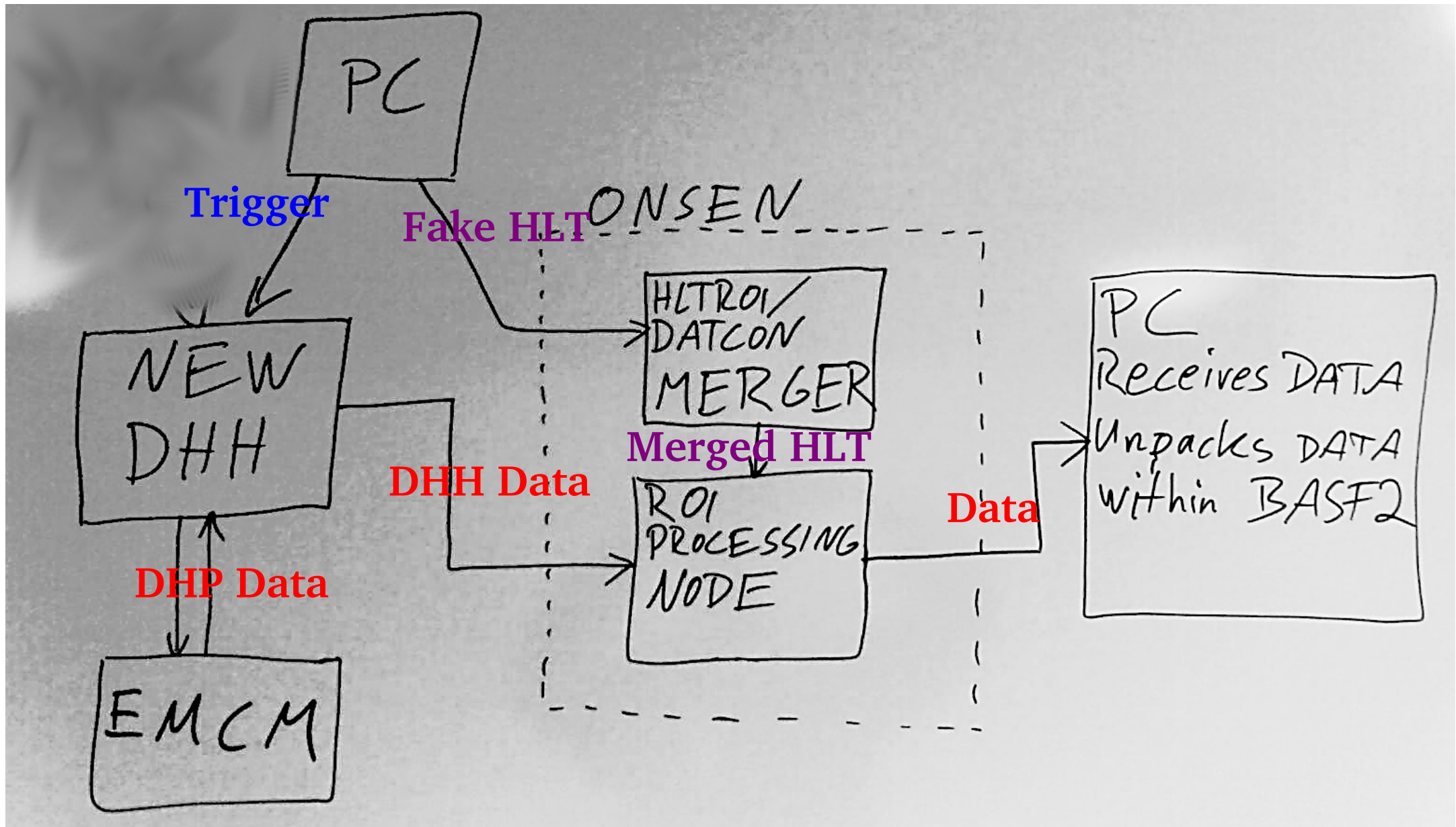
Worked with 18kHz and DHP

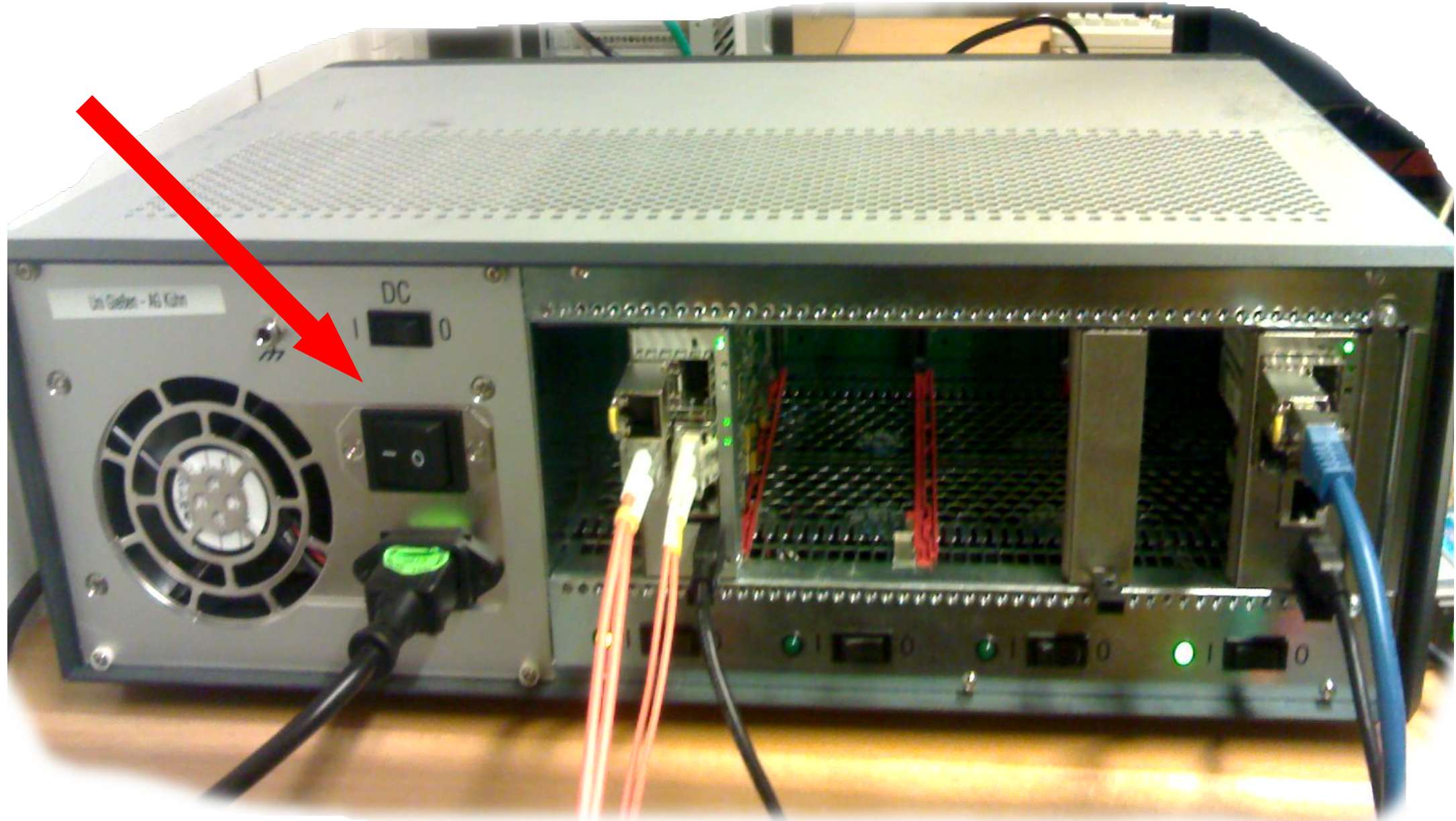


(excluding ROI Selection)

New Readout Chain Worked

Worked with 1.2kHz and DHP or with 1Hz pedestals





Bitstream and Software stored in PROM and loaded after power cycle.

```
GtkTerm - /dev/ttyUSB1 115200-8-N-1
File Edit Log Configuration Controlsignals View Help

= Mrtschrnde = 00000000 00000000 00000000
RL: 0002105c 0001082e ffffffff 5bdf8000 c001081b 7fffffff ffffffff 80000000
WL: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 80000000
PR: 00000000 00000000 1801fdcc 0001fe00 00007ff3 00000000 00000000 00000000
TE: 00000000 00000000 19000000 00000000 00000000 00000000 00000000 00000000
R1: 00000000 0000000a 00000000 00000000 R2: 00000000 0000000a 00000000 00000000
W1: 00000000 00000000 00000000 00000000 W2: 00000000 00000000 00000000 00000000
AL: 00c000cc 00000000 00000000 A2: 28002800 20002000 00000000
00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffff
00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffff
00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffff
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00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffff
00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffff

GtkTerm - /dev/ttyUSB0 115200-8-N-1
File Edit Log Configuration Controlsignals View Help

= Vive le ROI Aout = 00000000 00000000 00000000
RL: 0002105c 0001082e ffffffff 20a90000 8001081b 7fffffff ffffffff 80000000
WL: 00000000 00000000 00000000 00000000 00000000 00000000 00000000 80000000
PR: 00000000 00000000 1801fdcc 0001fe00 00007ff3 00000000 00000000 00000000
TE: 00000000 00000000 19000000 00000000 00000000 00000000 00000000 00000000
R1: 00000000 0000000a 00000000 00000000 R2: 00000000 0000000a 00000000 00000000
W1: 00000000 00000000 00000000 00000000 W2: 00000000 00000000 00000000 00000000
AU: 28c028cc 00800080 00000000
00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffff
00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffff
00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffff
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00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffff
00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffffff 00000000 ffffff
```

```
Please press Enter to activate this console.

Compute Node Linux Dev System
(builtroot initramfs)
Linux Kernel 3.9.0+ on a ppc

cn_10_10 login: root
Password:
# insmod flash/uio_pdrv_genirq.ko
# flash/ot
=== init ===
=== sleep and wait ===
ERROR: /sys/class/uio/uio8/name not available!!
ERROR: /sys/class/uio/uio9/name not available!!
Device /dev/uio0 with type cn3-amc-mgt-aurora-ll / 3 ready @0x4d009000!
Device /dev/uio0 DIRS value : 0x00000000
Device /dev/uio0 IpStatus : 0x00000300
Device /dev/uio6 with type pix-write-lut / 4 ready @0x4d019000!
Device /dev/uio6 DIRS value : 0x00000000
Device /dev/uio6 IpStatus : 0x00000000
Device /dev/uio3 with type npv-read-ll / 0 ready @0x4d029000!
Device /dev/uio3 DIRS value : 0x00000000
Device /dev/uio3 IpStatus : 0x00000000
Device /dev/uio7 with type sitcp-ll / 2 ready @0x4d039000!
Device /dev/uio7 DIRS value : 0x00000000
Device /dev/uio7 IpStatus : 0x00000000
Device /dev/uio2 with type npv-read-ll / 0 ready @0x4d049000!
Device /dev/uio2 DIRS value : 0x00000000
Device /dev/uio2 IpStatus : 0x00000000
Device /dev/uio1 with type hlt-lookup / 5 ready @0x4d059000!
Device /dev/uio1 DIRS value : 0x00000000
Device /dev/uio1 IpStatus : 0x00000000
Device /dev/uio4 with type npv-write-ll-0 / -1 ready @0x4d069000!
Device /dev/uio4 DIRS value : 0x00000000
Device /dev/uio4 IpStatus : 0x00000000
Device /dev/uio5 with type npv-write-ll-1 / -1 ready @0x4d079000!
Device /dev/uio5 DIRS value : 0x00000000
Device /dev/uio5 IpStatus : 0x00000000

/dev/uio6 pix-write-lut OK: 4 00000001
Device Interrupt! DIRS value : 0x00000000
IpStatus : 0x00000003
Lost Pointer
CRC or PTR/ID error

/dev/uio1 hlt-lookup OK: 4 00000001
Device Interrupt! DIRS value : 0x00000000
IpStatus : 0x00000001
Lost Pointer, ID mismatch

/dev/uio3 npv-read-ll OK: 4 00000001
Device Interrupt! DIRS value : 0x00000000
IpStatus : 0x00000001
Header Error

/dev/uio2 npv-read-ll OK: 4 00000001
Device Interrupt! DIRS value : 0x00000000
IpStatus : 0x00000001
Header Error

/dev/uio5 npv-write-ll-1 OK: 4 00000001
Device Interrupt! DIRS value : 0x00000000
IpStatus : 0x00000001

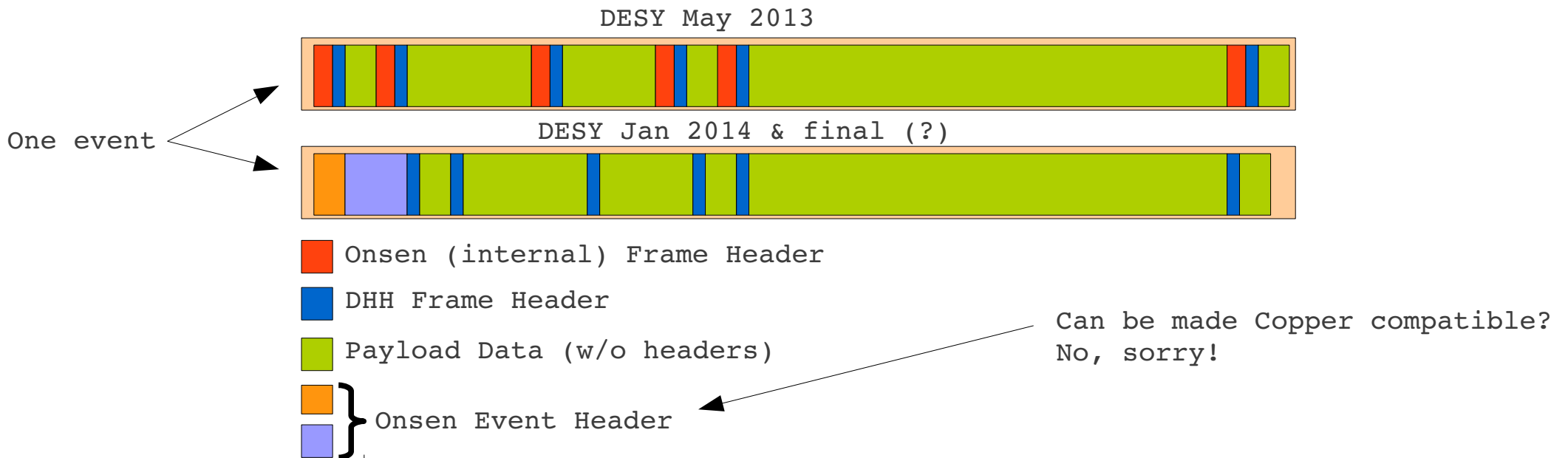
/dev/uio4 npv-write-ll-0 OK: 4 00000001
Device Interrupt! DIRS value : 0x00000000
IpStatus : 0x00000001
```

- For Lab test now, just monitoring by console output
- But Linux is supported by the current firmware.
- Interrupt handlers for errors are existing and fffferred in software.
- EPICs interface still missing

- As reported at previous workshop at B2GM:
 - SiTCP can send data at ~110 MiB/s over copper and SFP
 - Receiving is problematic in some configurations (network cards, switches, SFP transceivers)
- After many tests the reason was discovered: SiTCP rejects Ethernet packets, if the idle time (interframe gap) before the packet is shorter than 12 byte lengths
- Data is sent with 12-byte gaps, but due to clock differences, the gap can become smaller in the network (this is still within Ethernet specifications!)
- After reporting to Uchida-san, we immediately received a new version
- **Receiving now works in all configurations with ~110 MiB/s**
- EEPROM emulator for encrypted MAC addresses and configuration

- Aurora can be used over:
 - SFP/optical fibre and backplane in our uTCA shelf between two boards:
- Tested frequencies::
 - 3.125 Gbps and 6.250 Gbps with 156.25 MHz MGT clock
 - 1 Gbps with 100 MHz fabric clock
- It was tested that each SFP pair and the backplane can be used independently using SiTCP or Aurora with different frequencies at the same time
- This makes it possible to:
 - Receive ROIs from DATCON (~~1 Gbps Aurora~~*) and SiTCP on one board and send it over the back plane (3.125 Gbps Aurora) to another board
 - On the other board, combine ROIs from the back plane with pixel data from DHH (6.25 Gbps Aurora) and send out with SiTCP
- (*) DATCON and ONSSEN have different clocks on SFP (127 vs 156 MHz)
 - Solved only yesterday by routing the RTM clock to SFP on DATCON

- Definition of data format (extra headers, checksums etc.)
 - For May test we used frame based output, which is not the best idea for real experiment: DHH frames plus (internal) ONSEN header
 - Several (small!) DHH frames per event
 - Now: 1 package per event. (reflecting the format of our internal storage)
 - Needs additional information to find the (end of) frames inside the event data. (DHH/DHP frames have variable length)
- For testing, we have converted the DESY data to that format

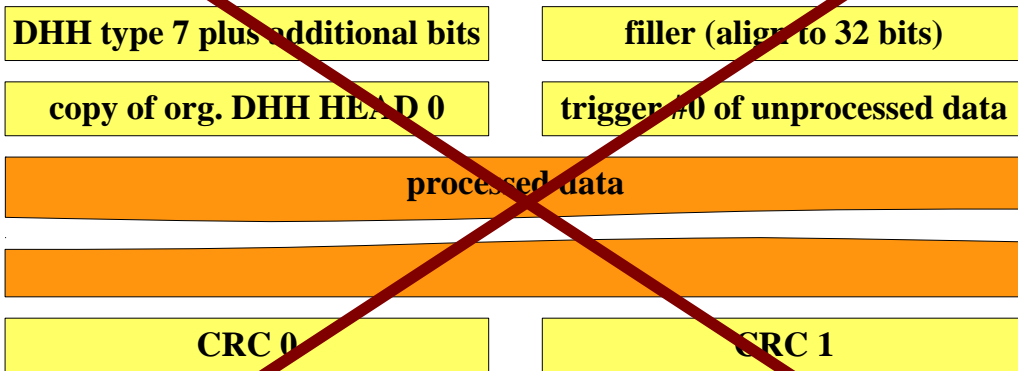


- Hickups with new Output Format (***)
- Recheck “large” events, concat. Buffer (***)
- DATCON frequency problem solved, further test ongoing (***)
- New DHH(C) Format for handling of two DHH inputs (***)
- ROI selection core needs more, esp a long term test (***)
- MPMC/NPI related huge chip resource usage (memory controller) (**)
- Slow Control (**)
- Merger checksumming (*)
- ROI Node checksumming of modified frames (*)

***=essential **=important *=we could survive without for upcoming test

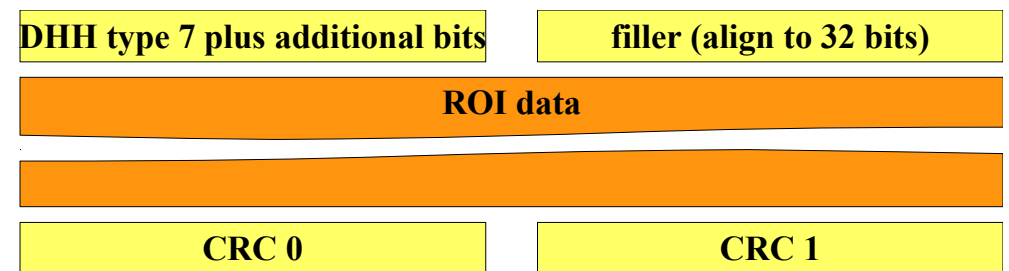
- Onsen specific data (~~processed~~, ROIs and error flags) be put into unused DHH frame type=7)
 - This has been approved by Dima
 - Additional bits needed for Onsen data type (reduced data, error flags, original ROIs, ...)
 - But what happens for “new” Clusterfinder format?

Output data after ROI selection:

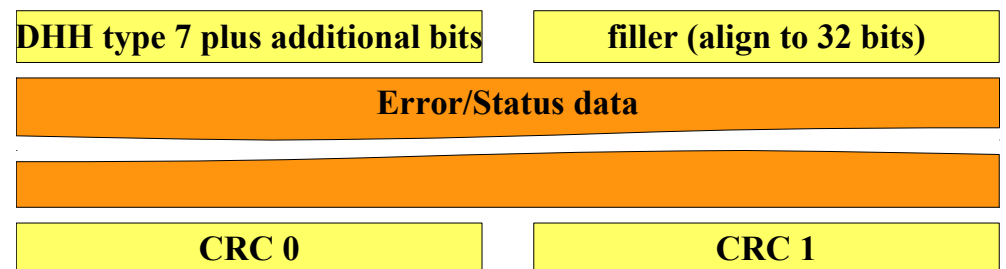


David decided to use original DHP Header

Debug output: ROI data:



Debug output: Error/Status:



- TCP or UDP
 - TCP! (=> SiTCP for HLT input and output to EvtBuilder)
 - Reason: UDP has some firmware bug, which is not yet found. If we want to start testing things in september this might be too late if fixing this takes longer.
 - This might affect TCP bypass as well. (not proven, but hangups observed which I attributed to software problems until now)
 - SiTCP proved to work over SFP transceivers (see Thomas slides)
 - In addition to Linux kernel based Ethernet for run/slow control on the on-board Ethernet.