



Lund University



Lund



Skåne

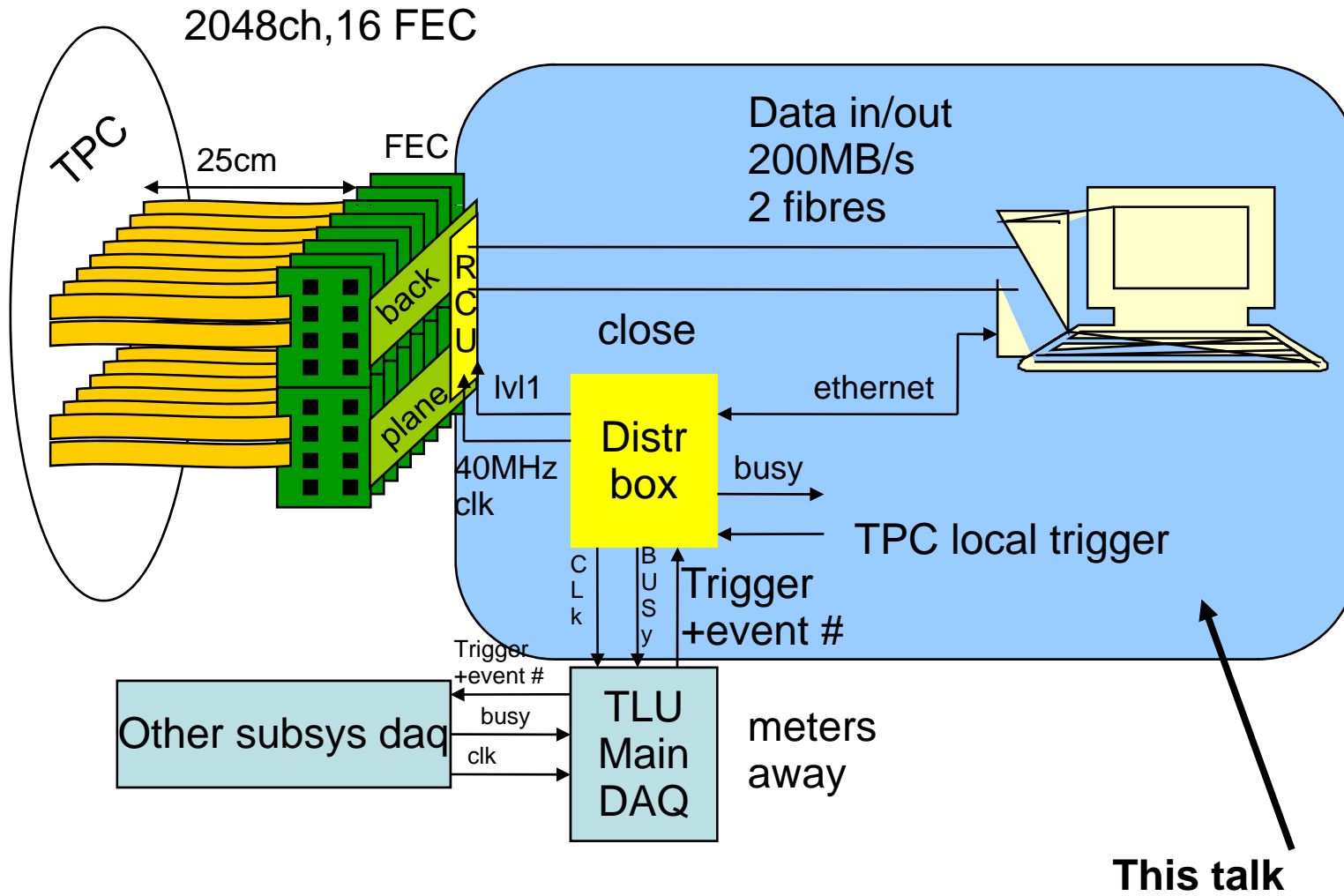


Sweden

JRA2 TPC DAQ

Status and plans

Ulf Mjörnmark



Based on the ALICE TPC readout:

Front End Card (FEC), to be modified for new amplifier

Readout Control Unit (RCU), modified for clock/trigger/25Mhz sample clock

Source Interface Unit (SIU)

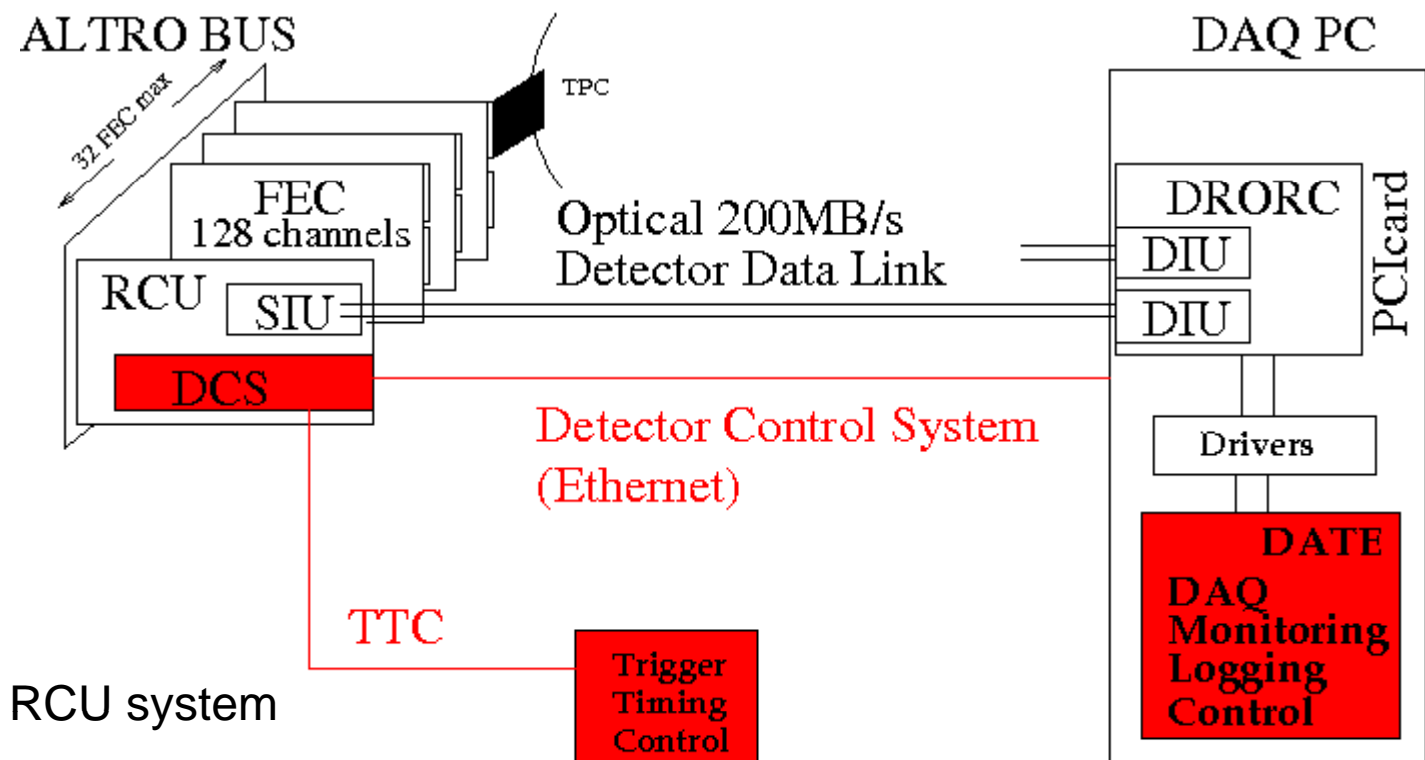
Read Out Receiver Card (DRORC), Destination Interface Unit (DIU)

ALICE API/drivers

Build our own DAQ on top

Distributor Box (DBOX) to distribute clock/trigger/busy

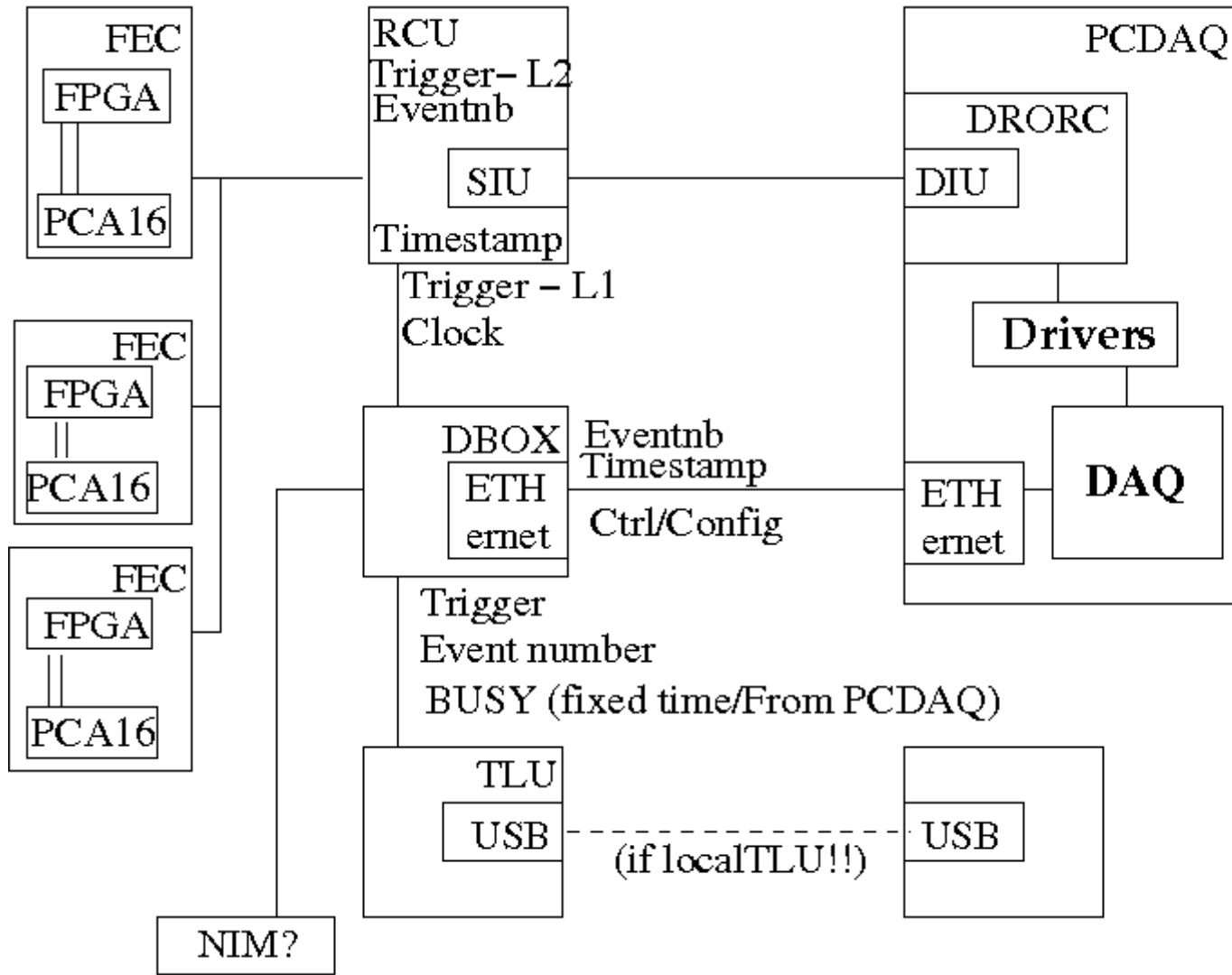
Interface to common DAQ



EUDET: 1 RCU

10000 ch: 4 RCU

possible to distribute 1 RCU system



Hardware overview

- FrontEndCard
- ReadoutControlUnit
- ReadOutReceiverCard
- DistributorBOX

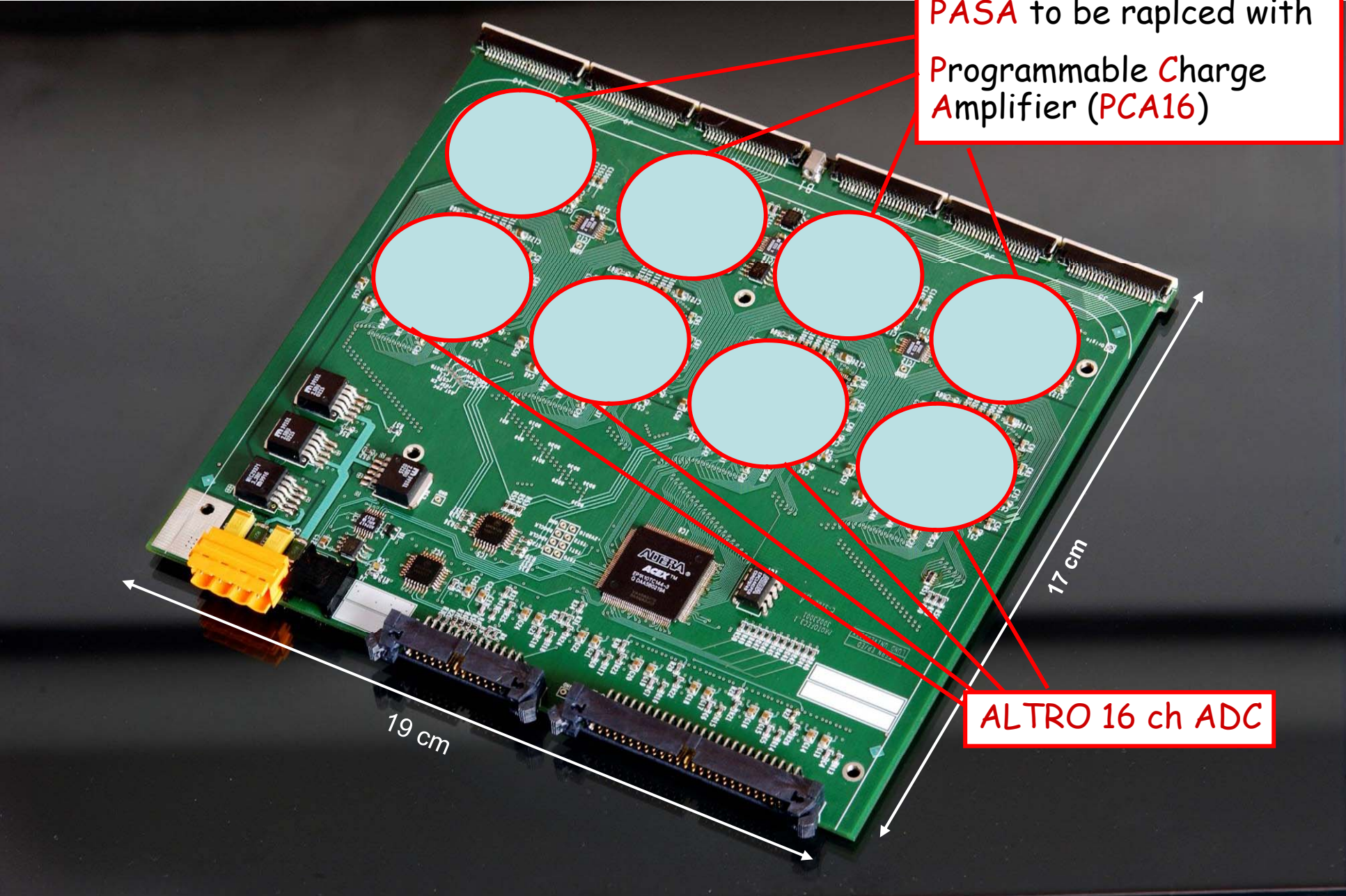
Local h/w trigger

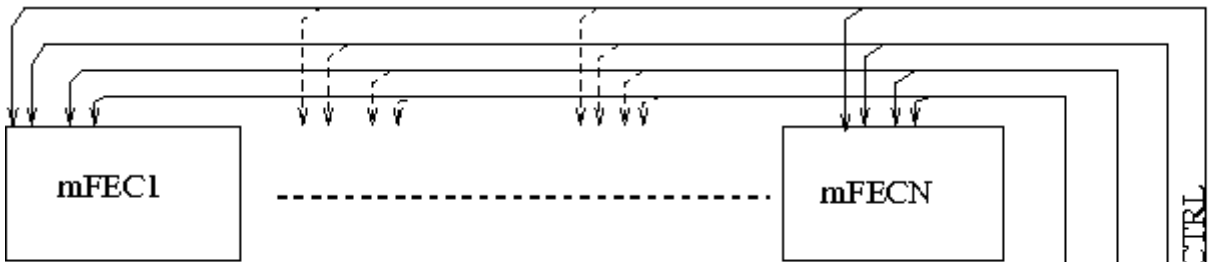
Local triggers: PMT, DBOX generator, local TLU, ETHernet
 External triggers: TLU

ALICE TPC Front End Card

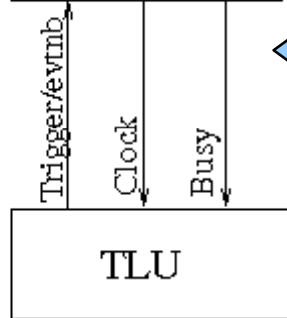
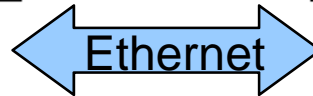
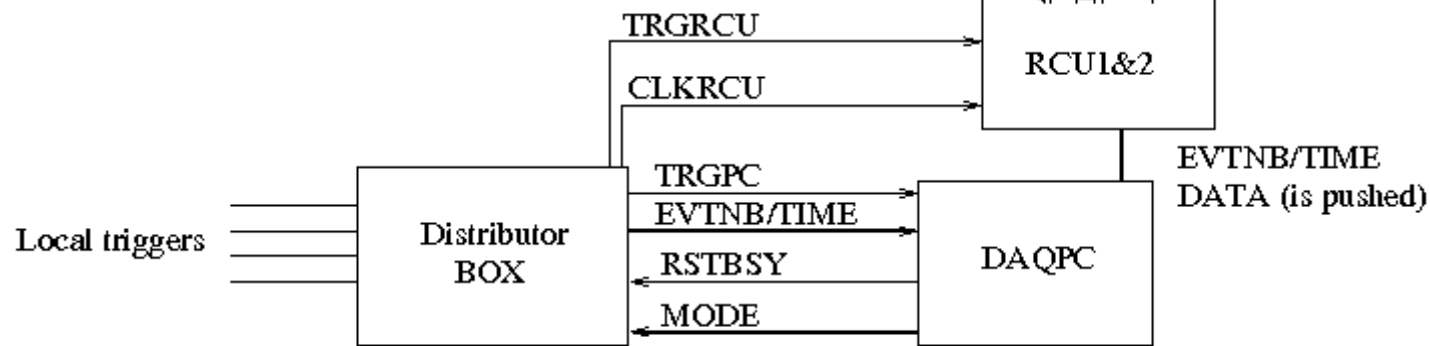
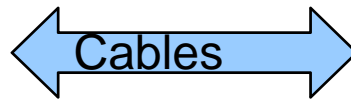
PASA to be replaced with Programmable Charge Amplifier (PCA16)

ALTRO 16 ch ADC





Trigger/Busy system



synchronization:
 compare event number
 compare time stamps
 from RCU/TLU/DAQPC

busy logic:
 trigger sets system busy
 busy reset either:
 1) DAQPC via ethernet
 2) Fixed time in distributor box

Power

TEST SETUP

**Busy/Control
(Parallel port)**

DRORC

Trigger

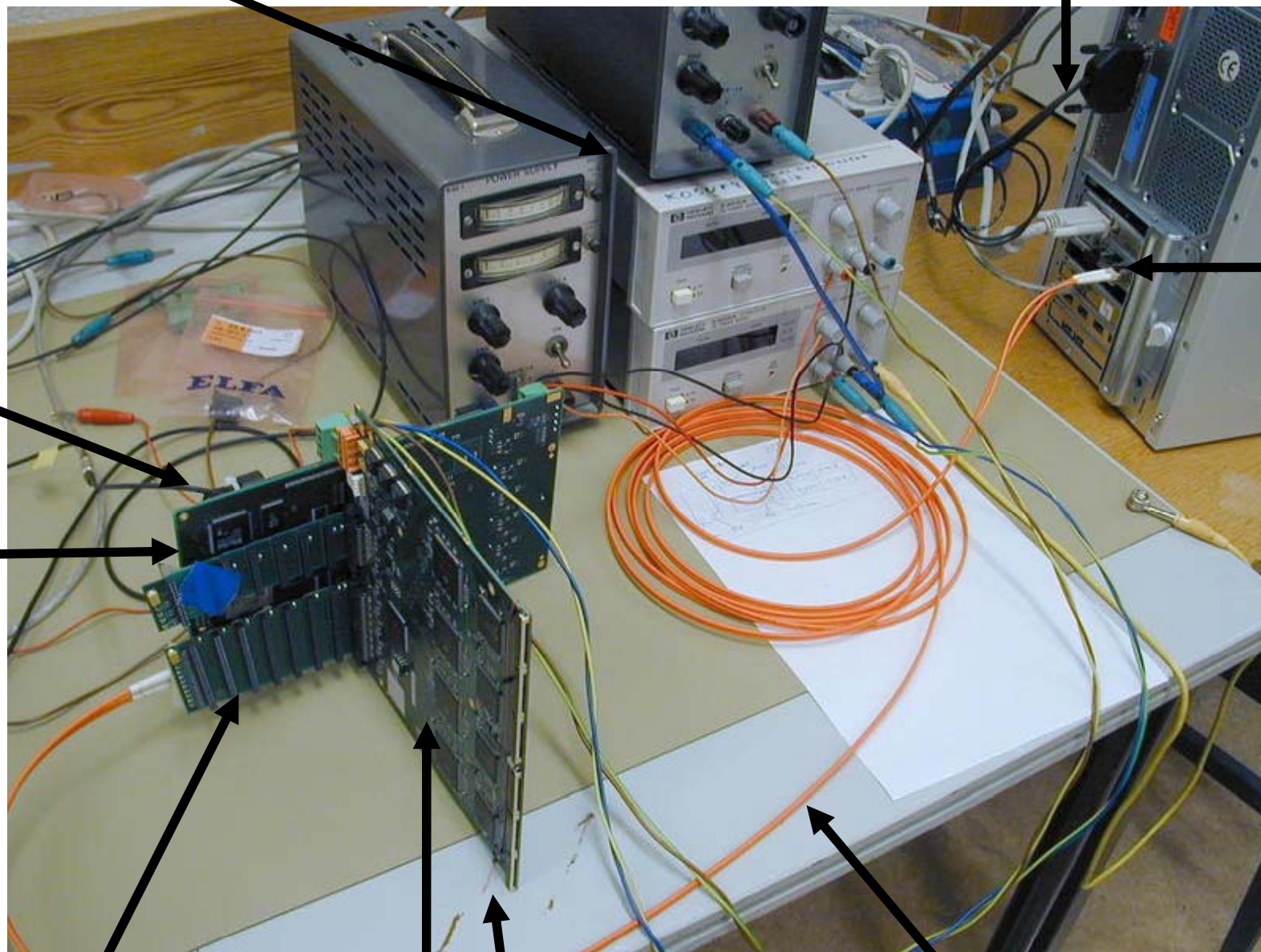
RCU

Backplane

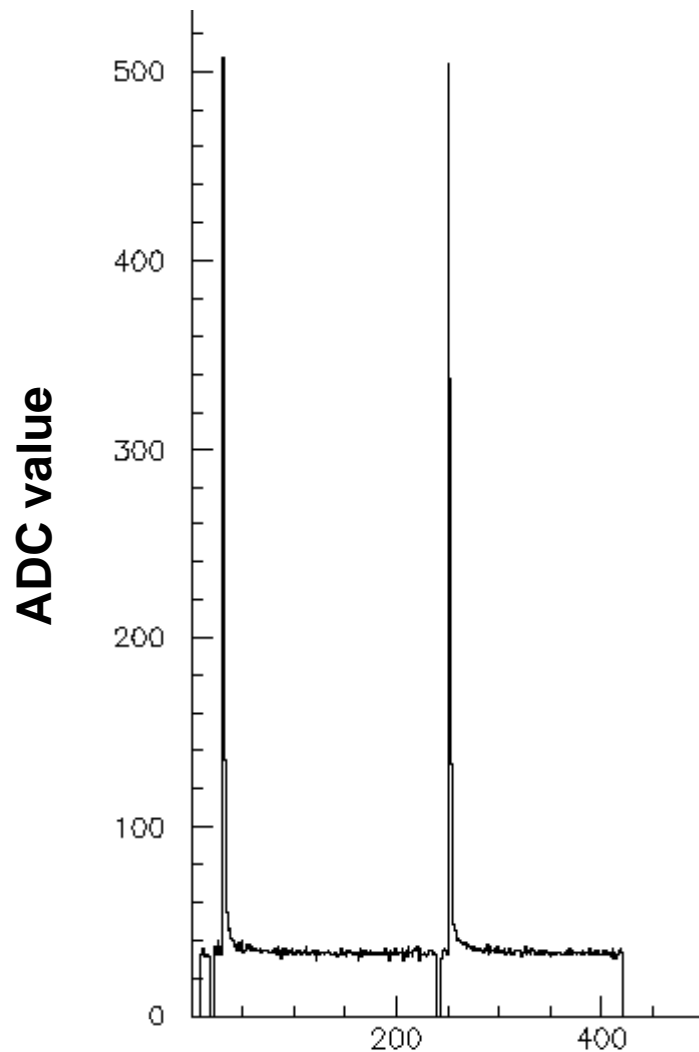
ALICE FEC

Pulser

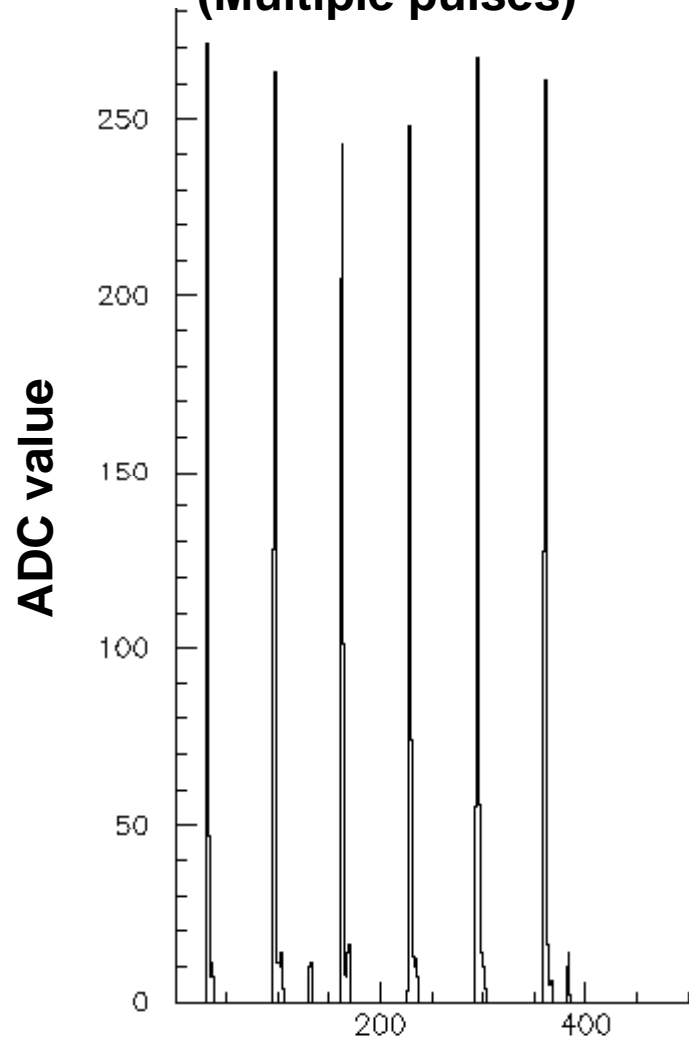
Optical fiber



Raw data (double pulse)

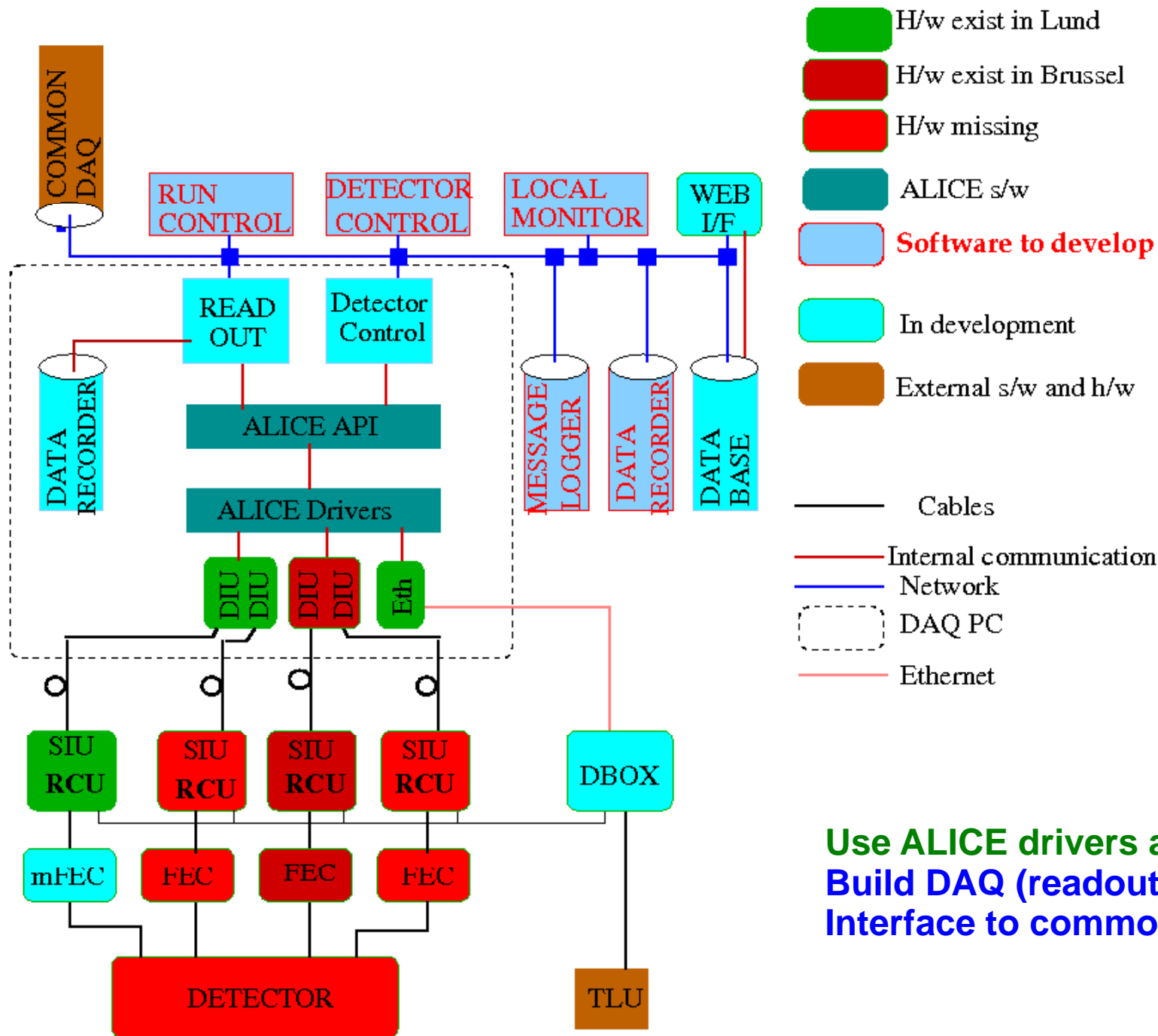


**Pedestal subtracted
Zero suppressed
(Multiple pulses)**



**D
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S
E
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P**

**TIME = 100ns per bin (10 MHz sample clock)
410 samples**



Use ALICE drivers and APIs as is
Build DAQ (readout/control) on top
Interface to common DAQ

RAW EVENT FORMAT (32-bit words)

| |
|---|
| Total event length (exclusive, added by software) |
| Header length (exclusive, added by software) |
| Block identifier = BLOCK_EVENT (=2) (added by software) |
| Software event number (incremented by software for each read event) |
| Hardware trigger number (read from distributor box) |
| Time stamp (read from distributor box) |
| RCU block length (exclusive, added by software) |
| RCU identifier (added by software) |
| RCU HEADER – 8 words |
| ALTRO DATA – N40 = # of 40 bit words = (N40*5)/4 32 bit words = N32 |
| ... |
| ... |
| RCU block length (exclusive, added by software) |
| RCU identifier (added by software) |
| RCU HEADER – 8 words |
| ALTRO HW DATA – N40 40 bit words = (N40*5)/4 32 bit words = N32 |

RCU HEADER

| | | | |
|----------------------------------|--|----------------------------------|---------------------|
| BLOCK LENGTH [31..0] = FFFFFFFF | | | |
| FORMAT [31..24] = 1 | L1 Type [23..16] | [15:129] = 0 | EVT ID1 [11..0] = 0 |
| [31..24] = 0 | EVT ID2 [23..0] = N => 0 ?? | | |
| [31..24] = 0 | Participating subdetectors [23..0] = 0 | | |
| [31..28] = 0 | Status/Error [27..12] | Bunch [11..0] | |
| Trigger classes low [31..0] = 0 | | | |
| ROI [31..28] | [27..18] = 0 | Trigger classes high [17..0] = 0 | |
| Region Of Interest (ROI) [31..0] | | | |

ALTRO HW 40 bit word DATA example for one channel:

40 30 20 10

| | | | |
|-----|--------------|------------------|--------------|
| S05 | S04 | S03 | S02 (sample) |
| S10 | 007 (length) | T06 (time stamp) | S06 |
| 005 | T12 | S12 | S11 |

....

| | | | |
|-----------------|--------------------------|------------------|-------------------------|
| S91 | S90 | S89 | S88 (sample) |
| 2AA | 007 (length) | T92 (time stamp) | S92 |
| 2AAA (14 -bits) | # 10 bit words (10 bits) | A (4 bits) | 12-bit hardware address |

SUMMARY

Based on ALICE TPC readout
New preamplifier on front end card
Using ALICE drivers
Build simple DAQ on top
Distributor box to distribute trigger/clock/busy

Simple test setup working

Work in progress on:

front end cards
distributor box
readout of hardware
readout configuration

Missing:

run control
monitoring
detector control
data transfer and format