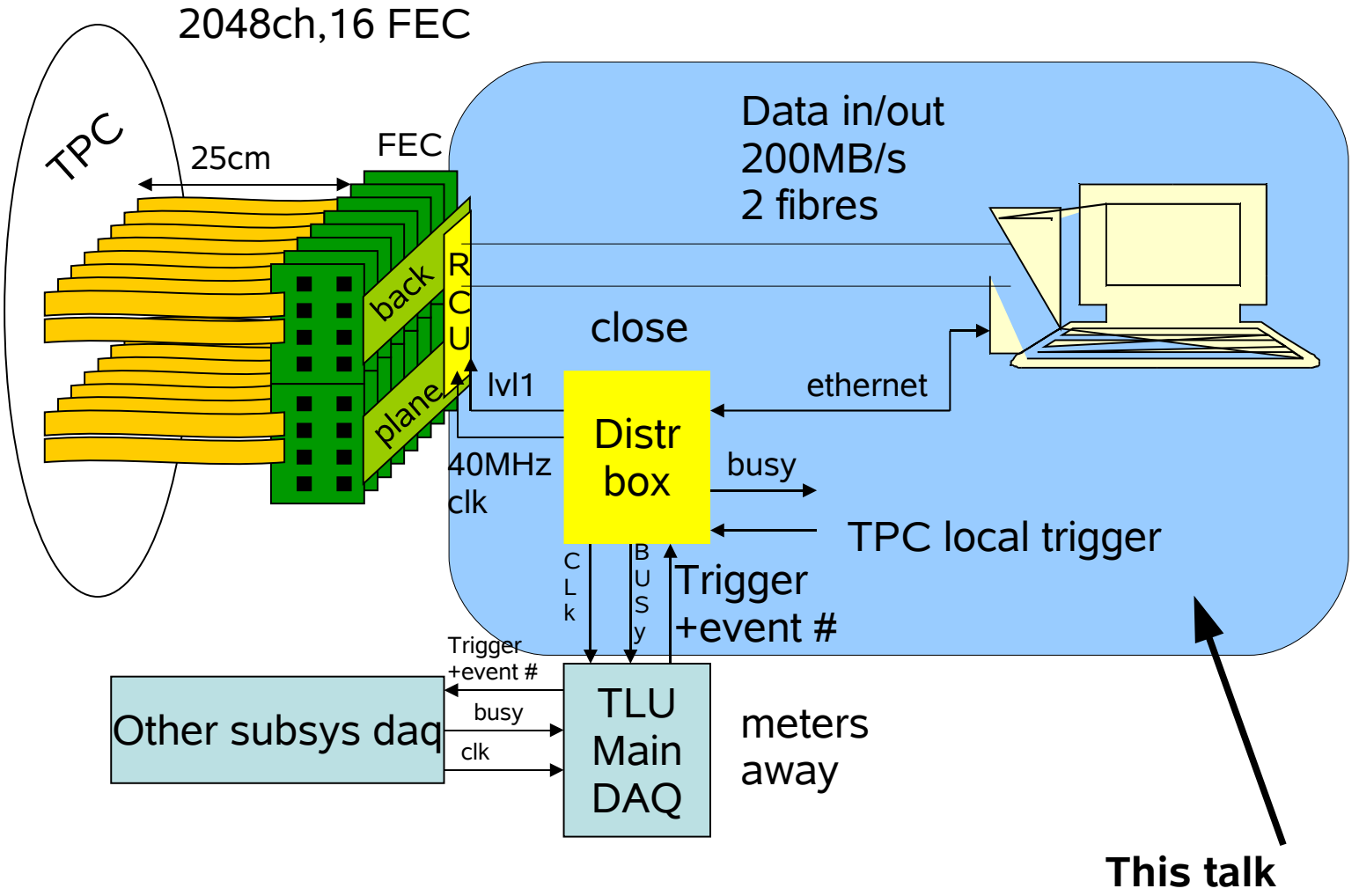
JRA2
TPC DAQ

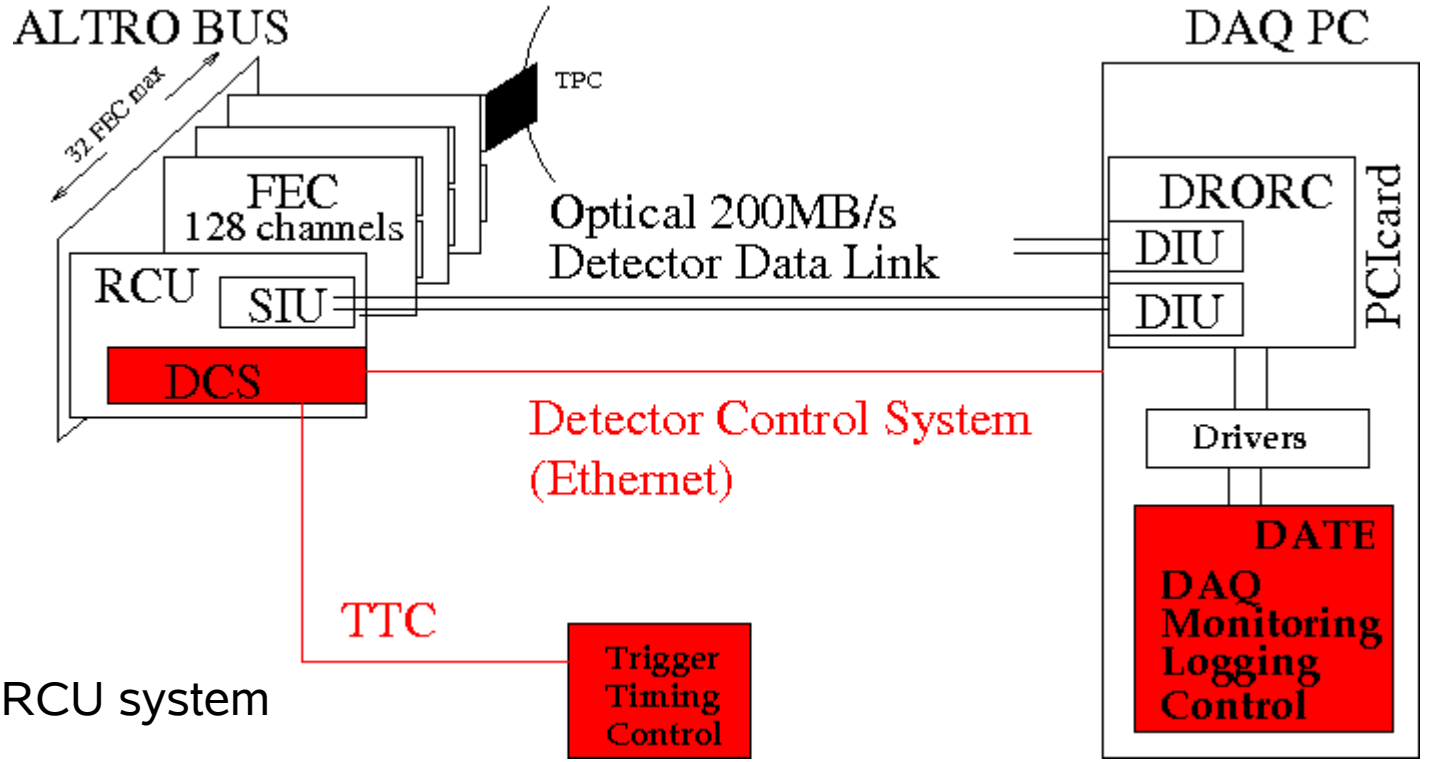
Status and plans

Ulf Mjörnmark

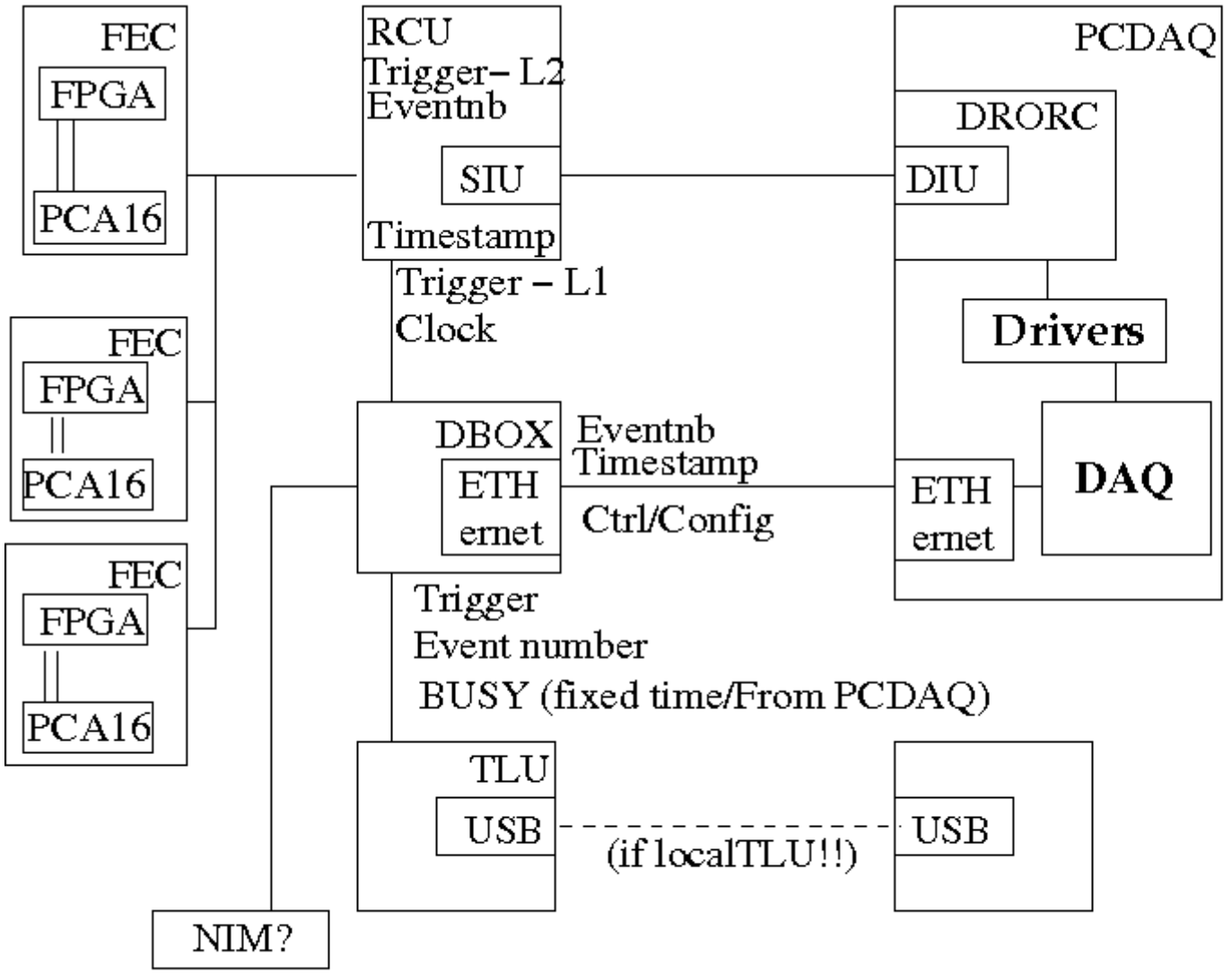

2048ch,16 FEC
TPC
25cm
FEC
back
plane
RCU
Data in/out
200MB/s
2 fibres
close
lvl1
ethernet
Distr
box
40MHz
clk
busy
TPC local trigger
CLk
BUSy
Trigger
+event #
Trigger
+event #
busy
clk
Other subsys daq
TLU
Main
DAQ
meters
away
This talk

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

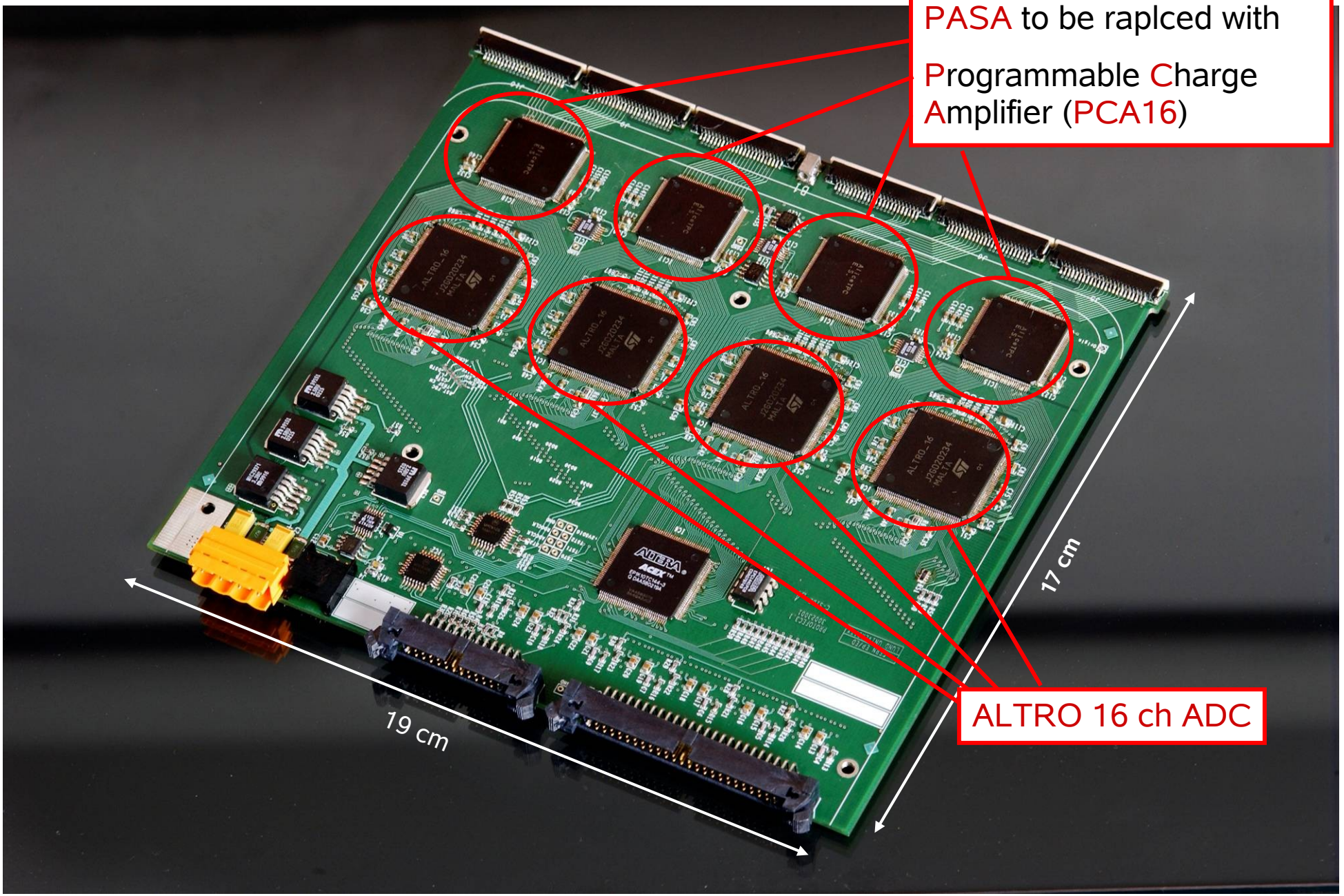


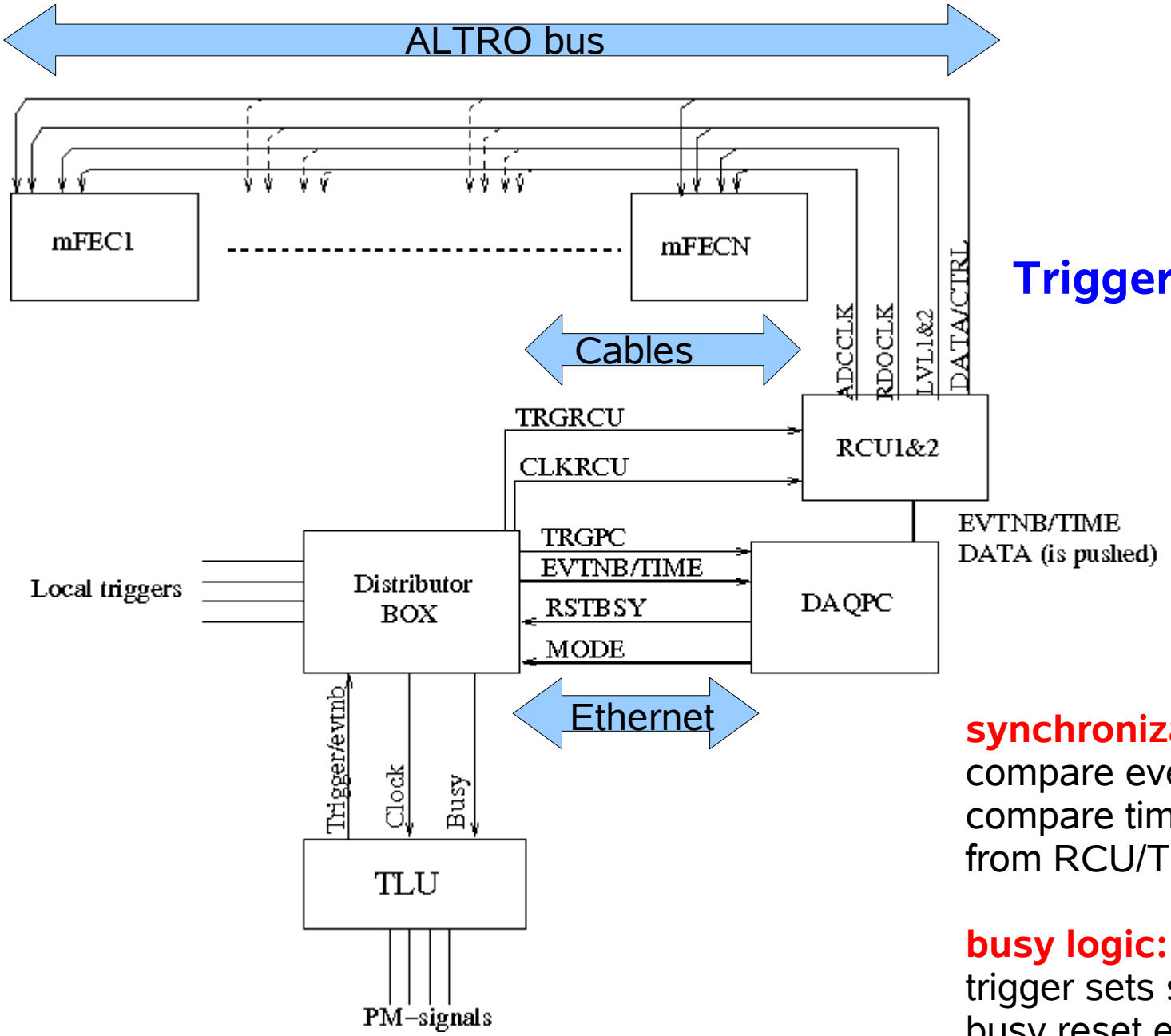
Local triggers: PMT, DBOX generator, local TLU,ETHernet
External triggers: TLU

Hardware overview

FrontEndCard
ReadoutControlUnit
ReadOutReceivrCard
DistributorBOX

ALICE TPC Front End Card



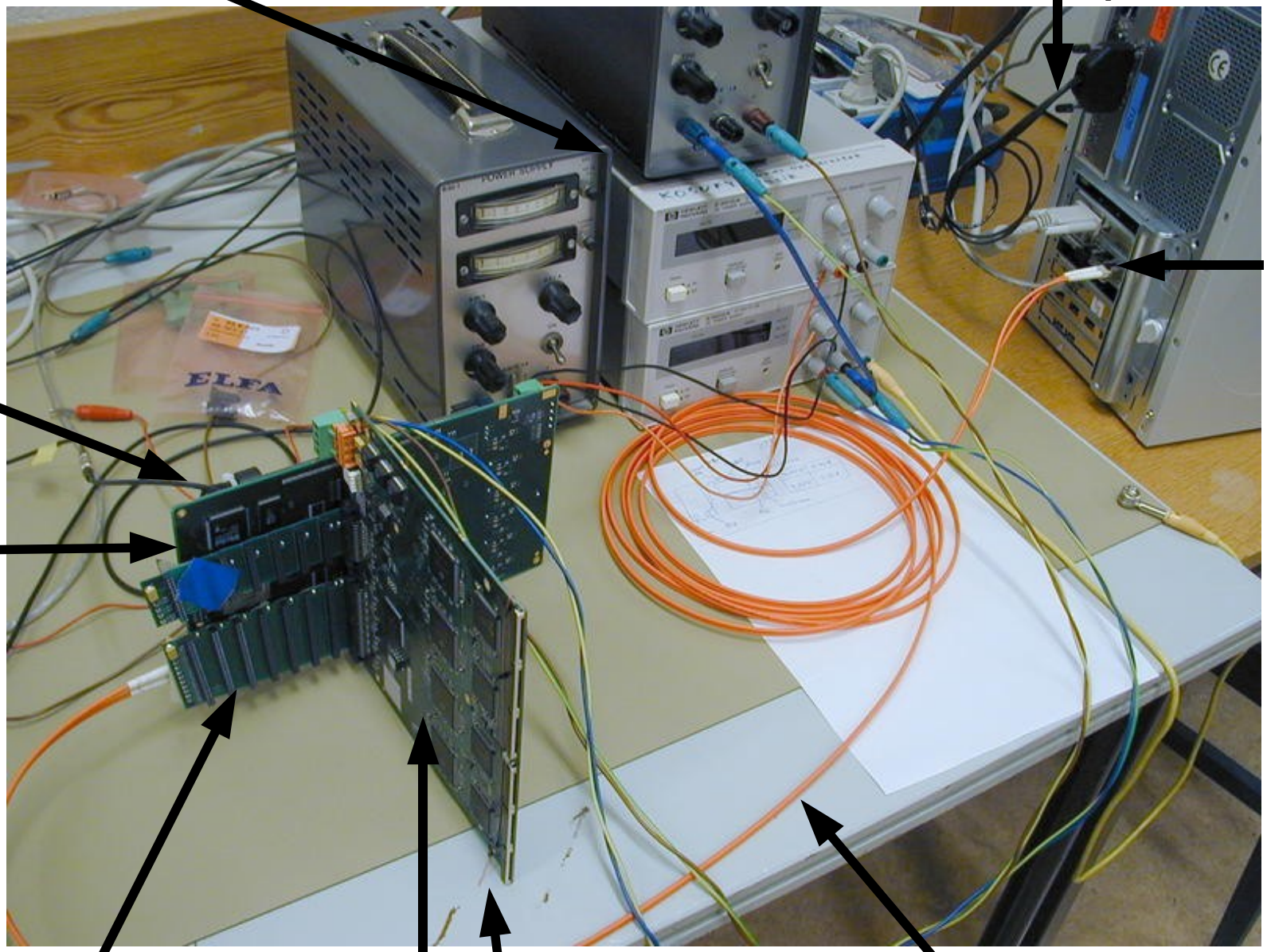


Trigger/Busy system

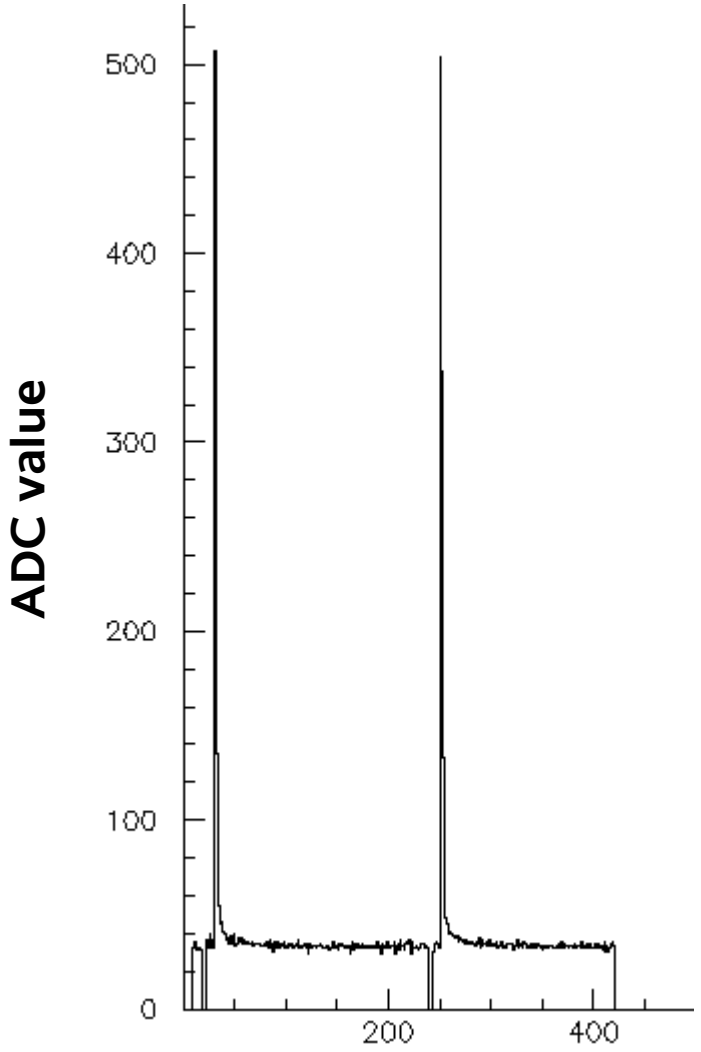
synchronization:
compare event number
compare time stamps
from RCU/TLU/DAQPC

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

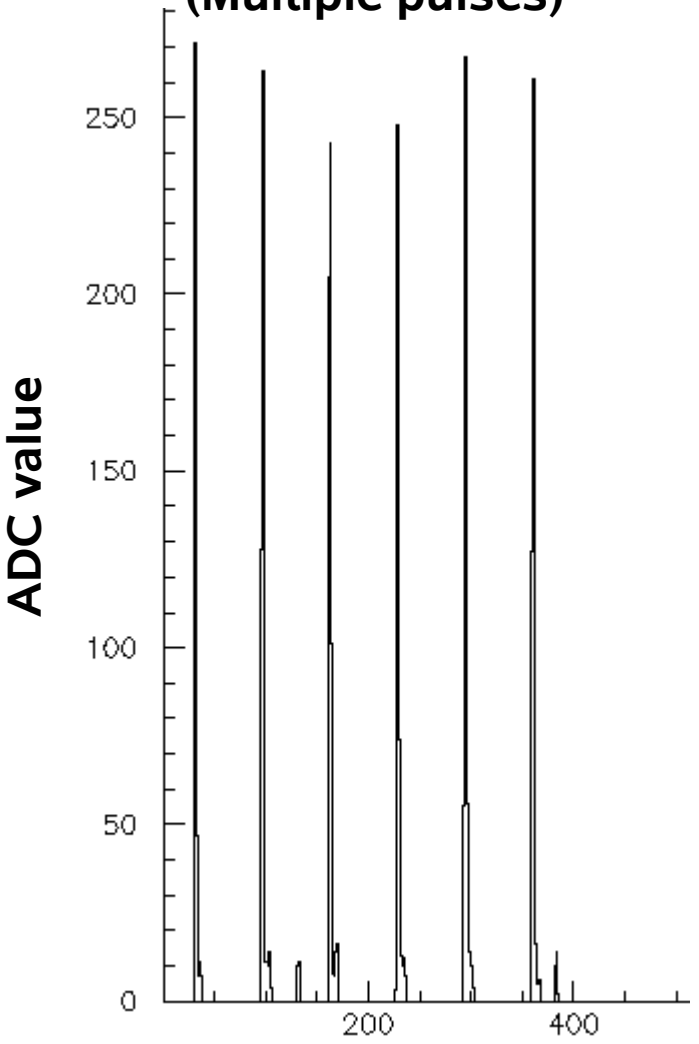
TEST SETUP


Power
Busy/Control
(Parallel port)
DRORC
Trigger
RCU
Backplane
ALICE FEC
Pulser
Optical fiber

Raw data (double pulse)

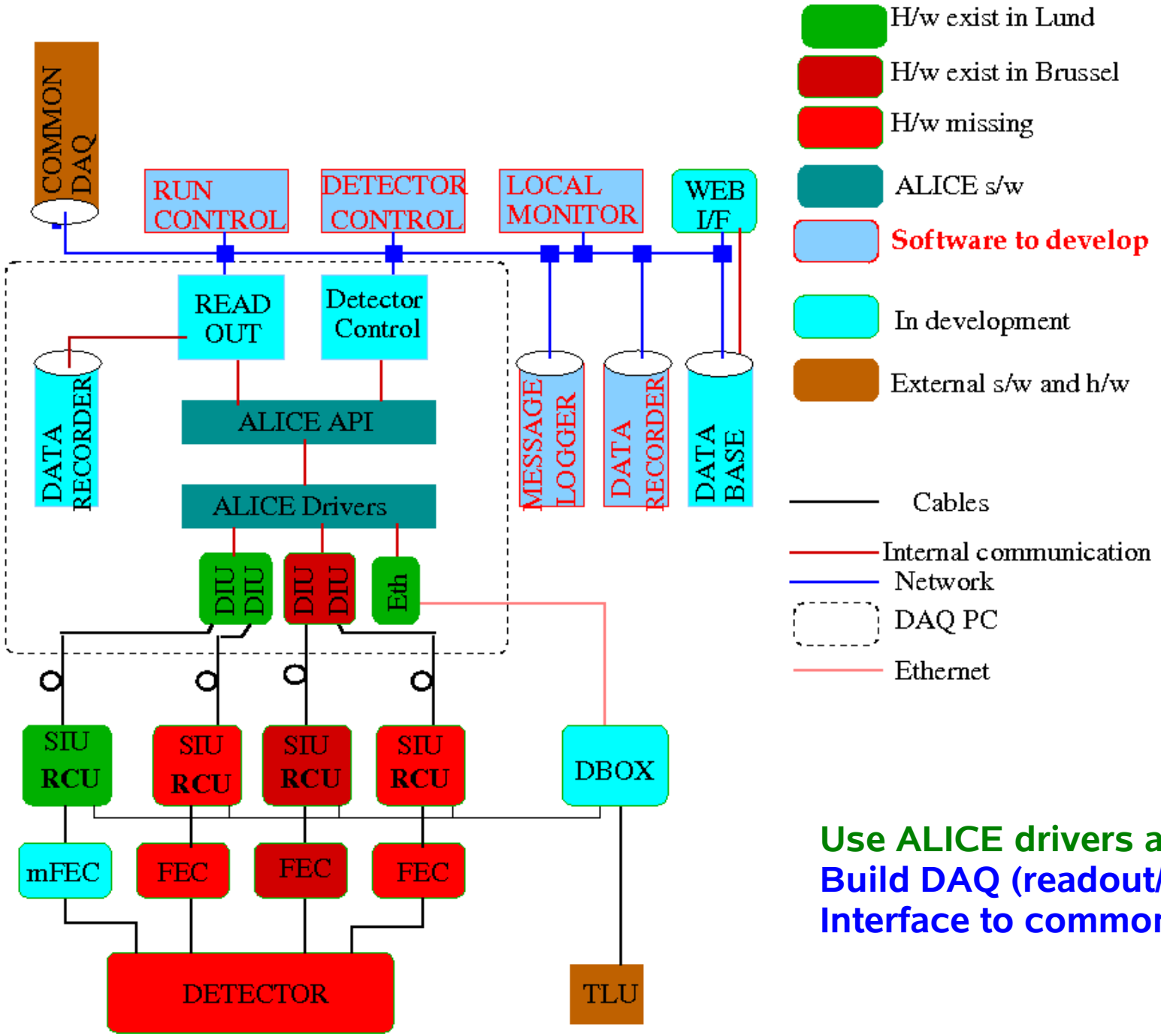


Pedestal subtracted
Zero suppressed
(Multiple pulses)



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

DATA from TEST SETUP



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