Progress on the RCU Prototyping

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CERN PH/ED

- Overview
  - Architecture
  - Trigger and Clock Distribution
  - Instruction Sequences
  - Current Capabilities
  - Present Status

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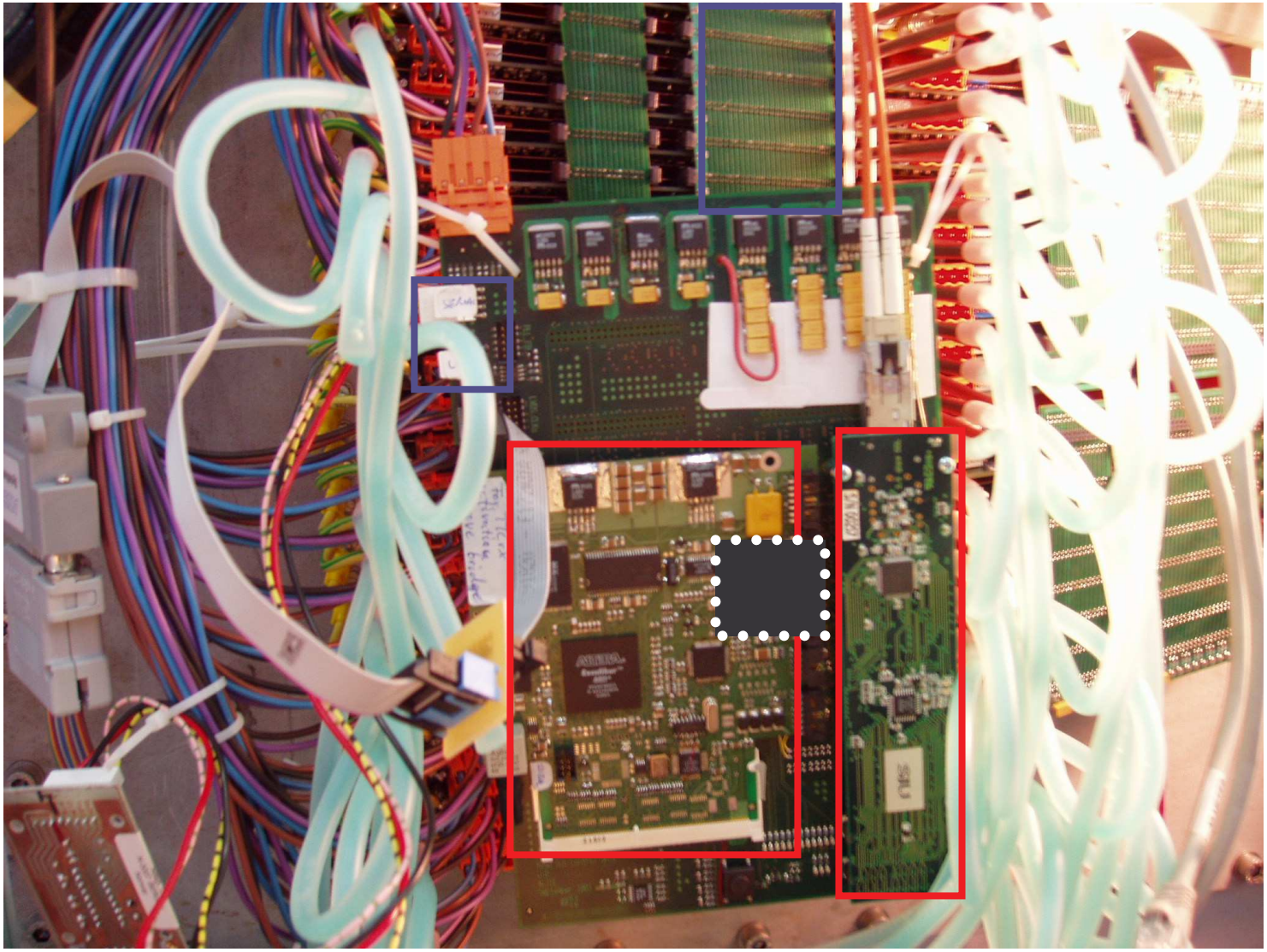
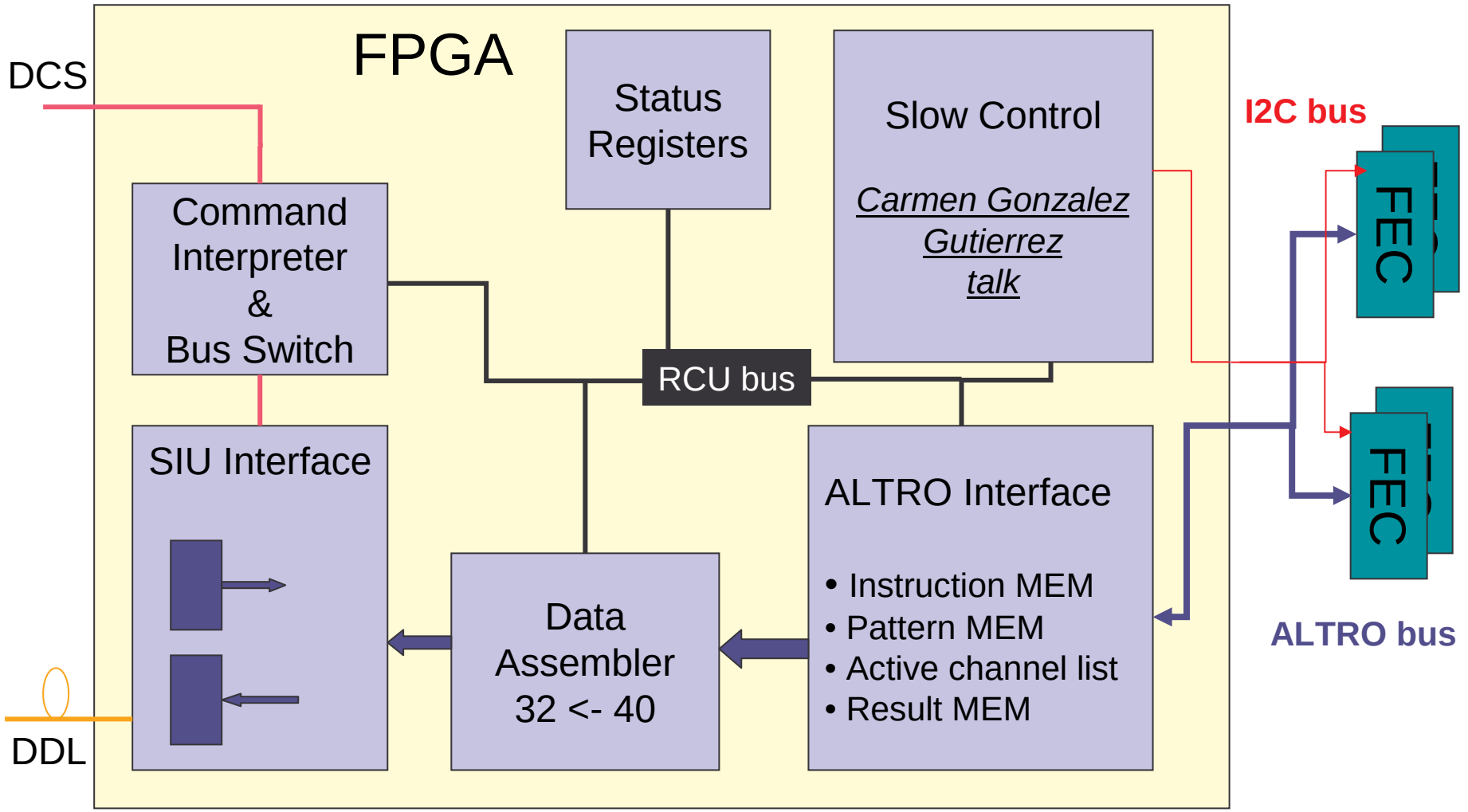
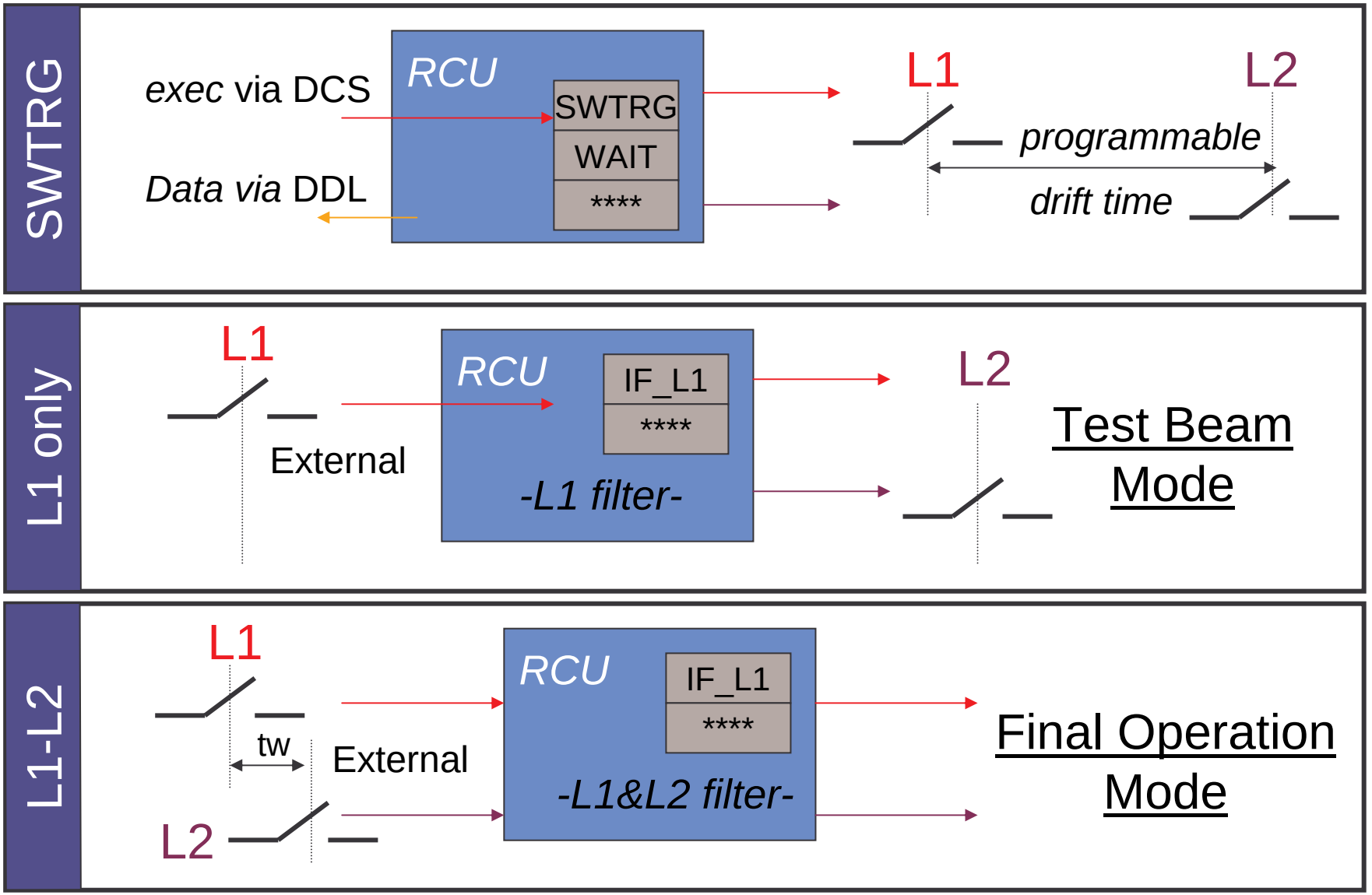
Overall Frontend System



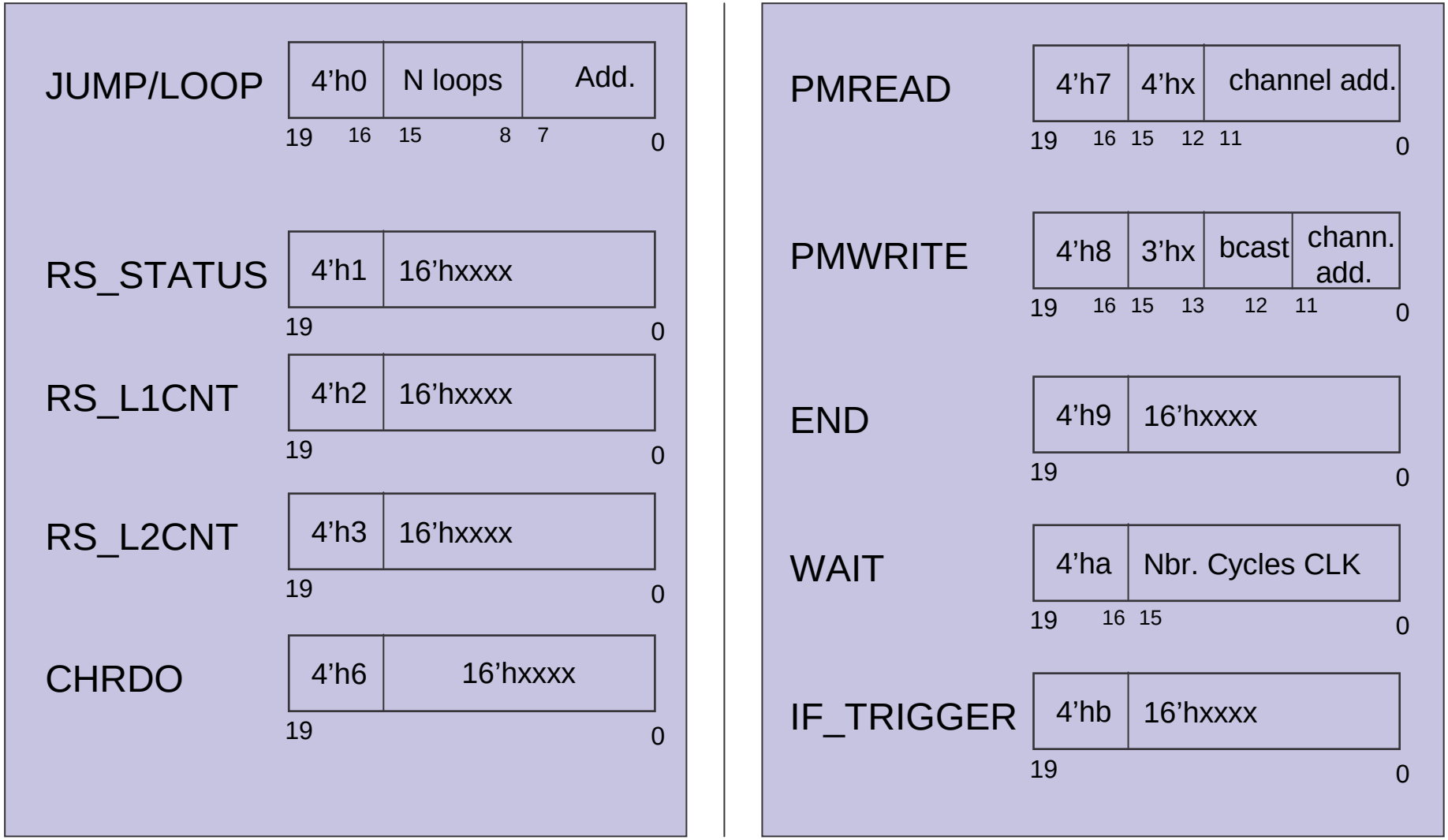
Architecture



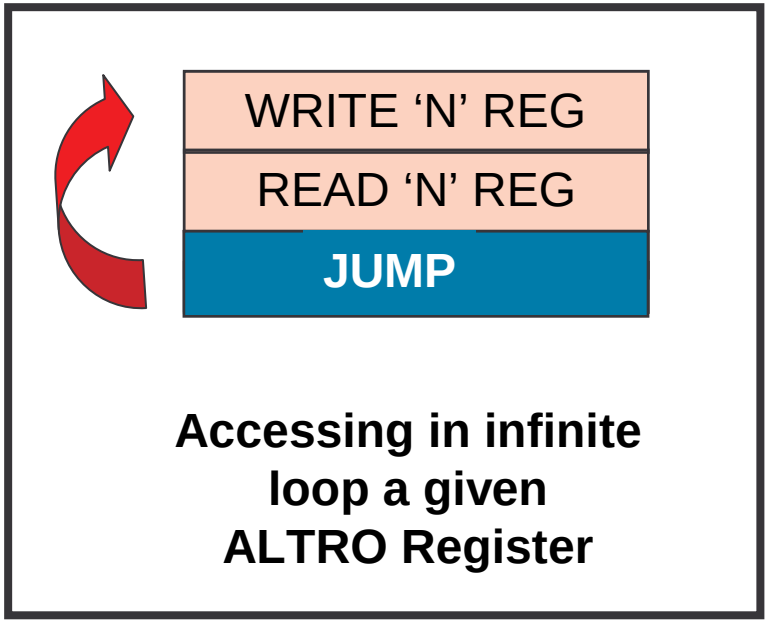
ALTRO Interface: Trigger Modes



Instruction Codebook



Examples of Instruction Sequences



Accessing in infinite loop a given ALTRO Register

Scope probing for electrical integrity check

Testing Multi-Event Buffer & Readout with software trigger

SWTRG (*L1*)
WAIT
WPINC (*L2*)
CHRDO (*Readout*)
RPINC
END

From ALTROs to DAQ w/ software trigger

Examples of Instruction Sequences

Cardio Test

READ HWADD ‘0’
READ HWADD ‘1’
- - -
READ HWADD ‘i-1’
READ HWADD ‘i’
END

Which cards are responding to basic register access?

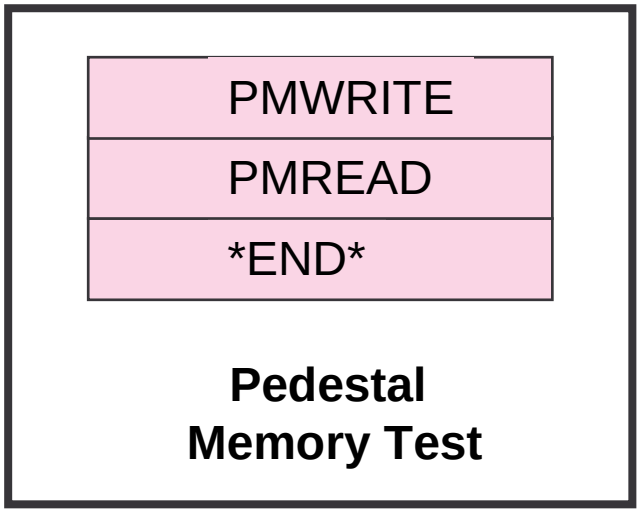
Test Beam Mode

IF_TRIGGER (*L1*)
CHRDO (*Readout*)
RPINC
JUMP

From ALTROs to DAQ w/ external L1-trigger:

- ADC sampled data
- Pattern stimuli

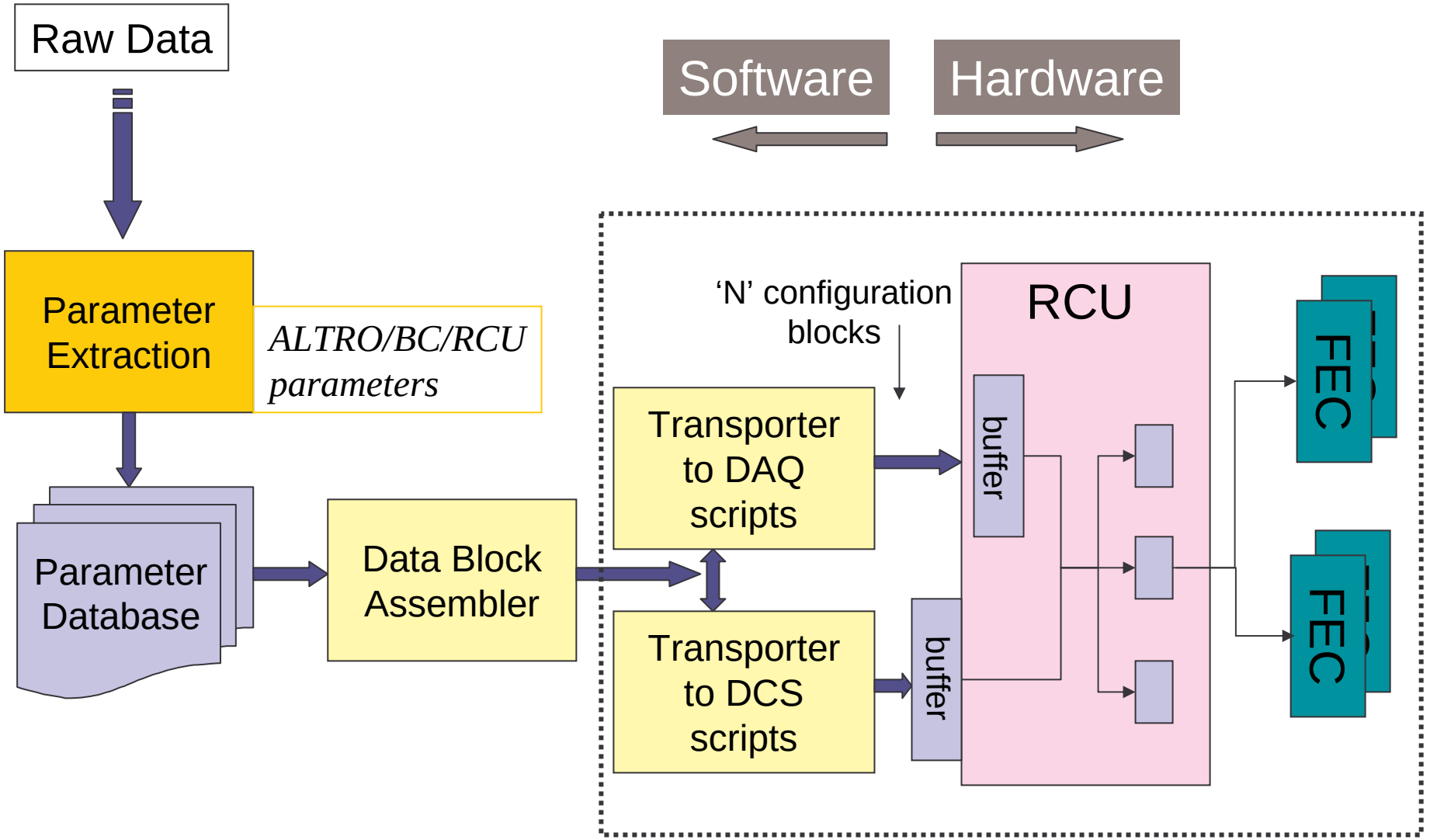
Examples of Instruction Sequences



Read Error register for mismatch error

Checking ALTRO Pedestal memory access in a fast way

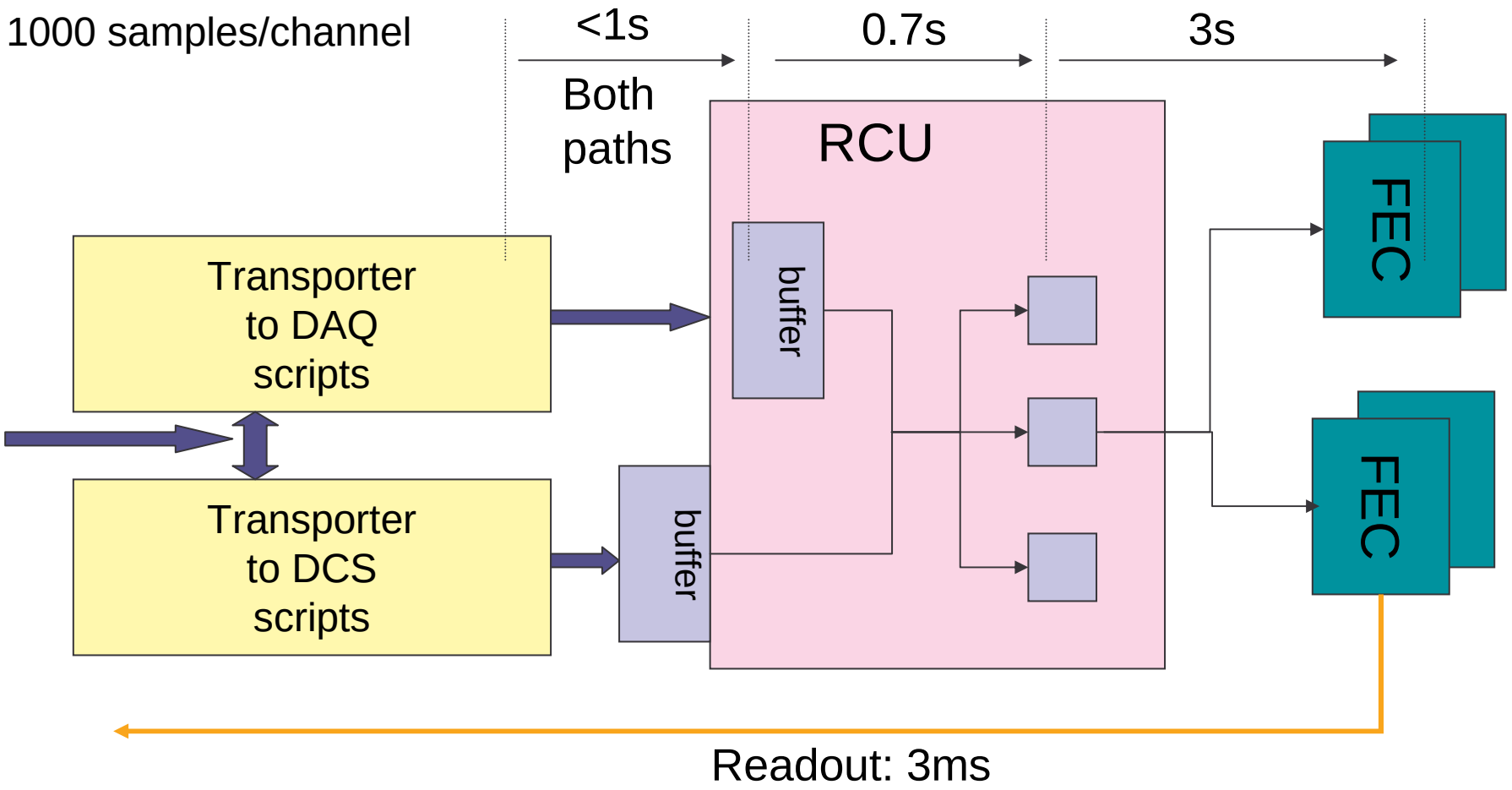
Current Configuration Paths



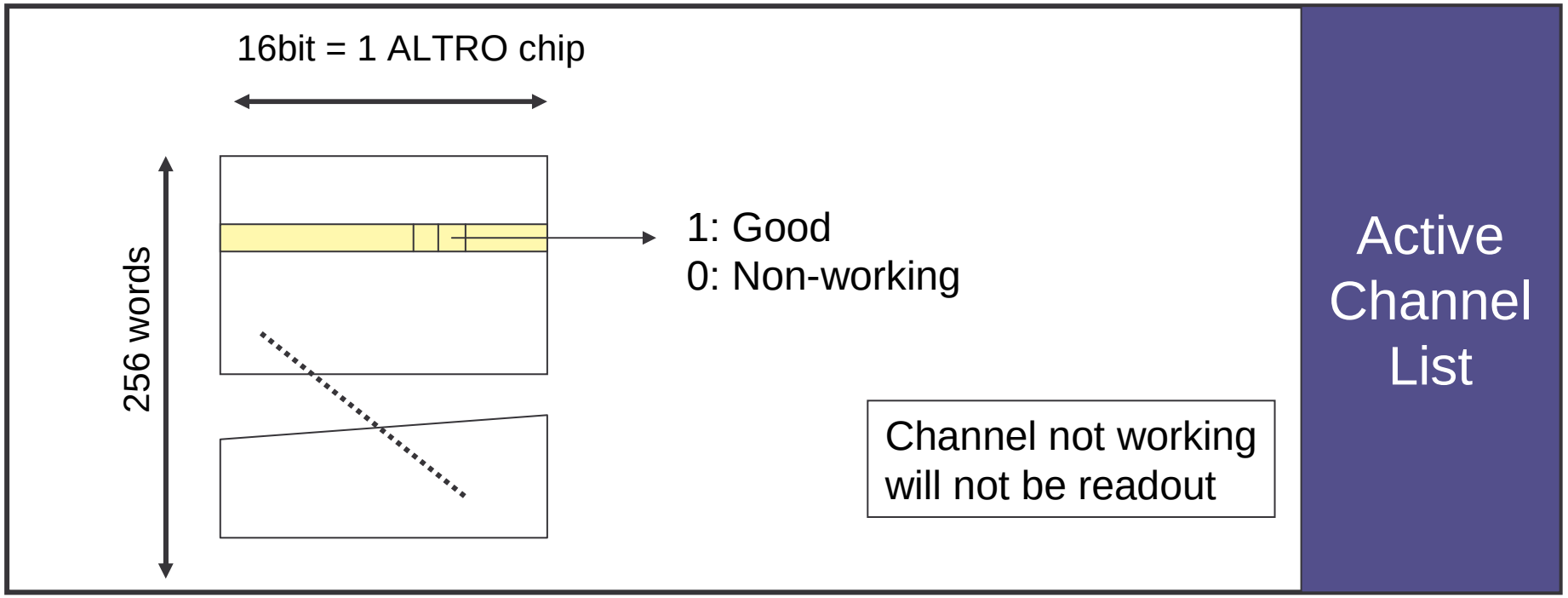
Configuration and Readout Time

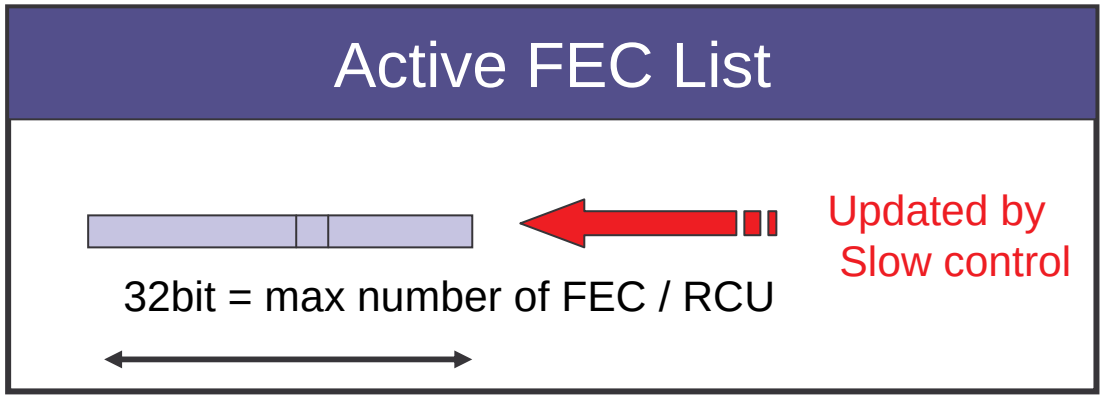
Overall configuration data: 7MByte/RCU - Worst case scenario:

- 3200 active channels
- 1000 samples/channel



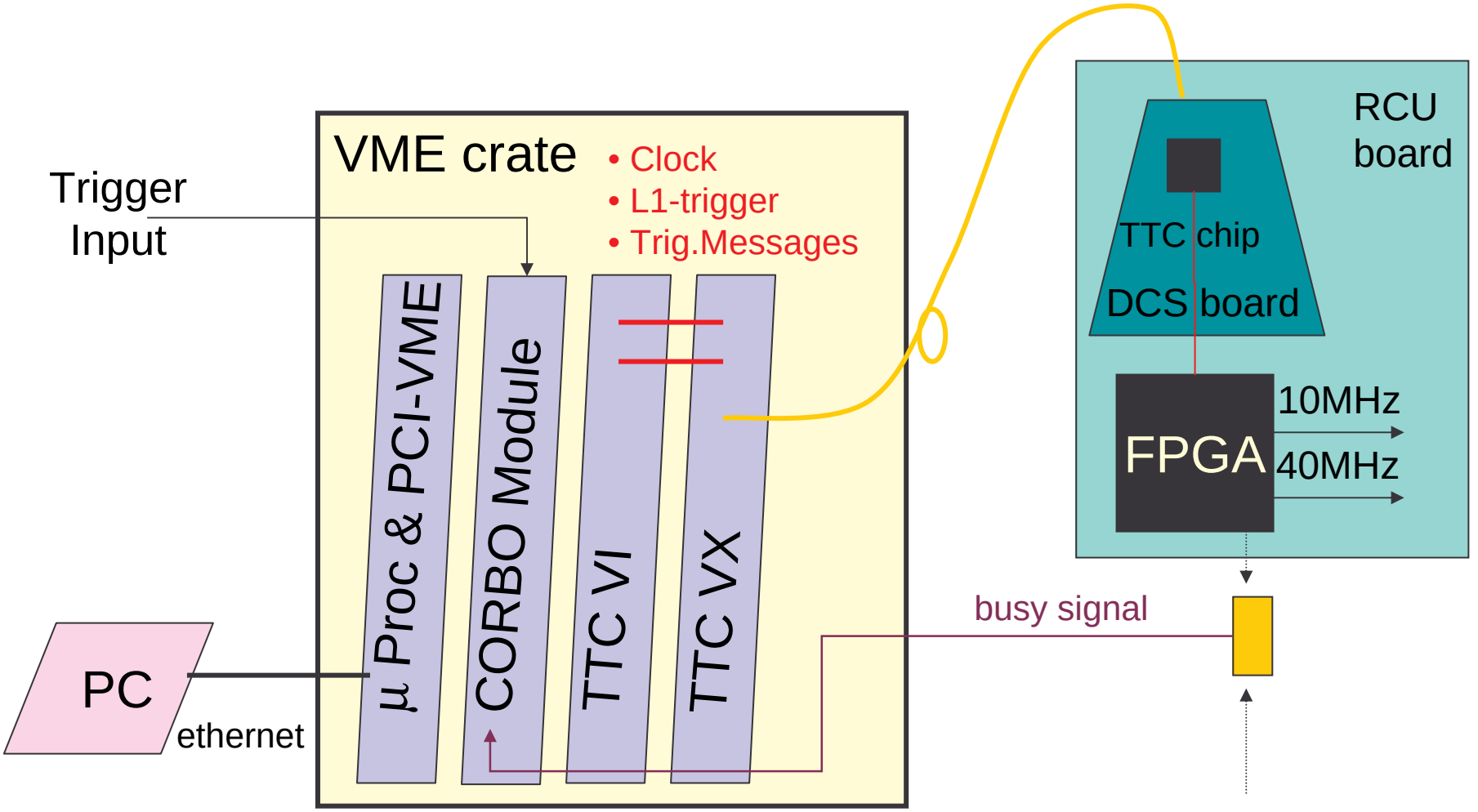
Active Channel / FEC List



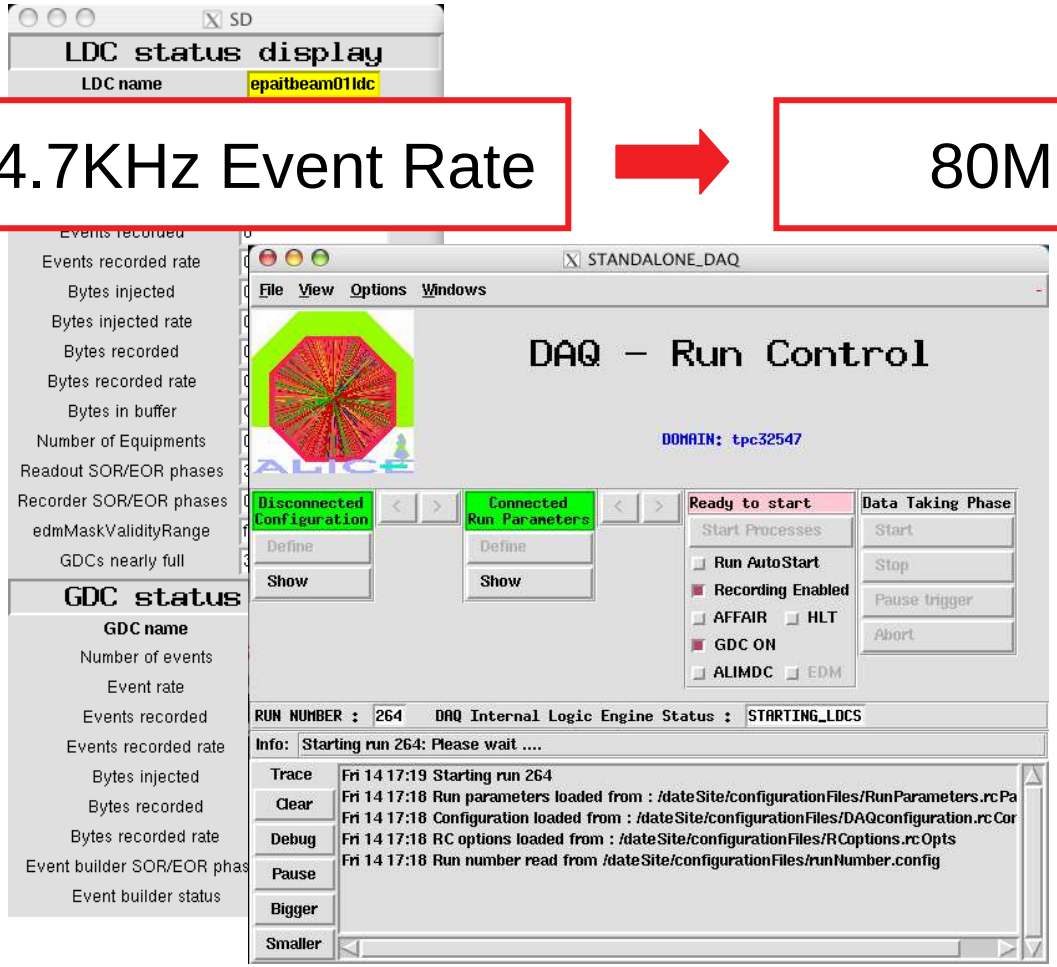


Improving readout efficiency by storing the current status of one channel or board

Current Trigger and Clock Distribution



Operation in High Trigger Rate



4.7KHz Event Rate → 80MByte/s

Conditions:

- 100 samples/channel
- 128 channels
- 40MHz Readout clk
- 10MHz Sampling clk

Exercise of full Readout Chain was performed successfully at KHz range trigger

Present Status

RCU Development

√ System fully tested and operational:

- 2 branches (12 + 13 frontend cards) in a total of 3200 channels
- DCS board running Linux on ARM processor and Ethernet link (*Torsten Alt talk*)
- DAQ with both DATE system and lower level script language for config.
- Communication between RCU and HLT fully operational
- Installed in the T10 Area, ready for beam (*Roberto Campagnolo talk*)

√ ALTRO Configuration tested using both the DCS board and the DDL link

√ Slow Control through I^2C fully operational measuring T^o, Currents and Voltages (*Carmen Gonzalez Gutierrez talk*)

√ Configuration of the RCU firmware from the DCS Board close to completion

? Improvement in readout time by a factor of 2: Replication of readout logic