CRU core firmware

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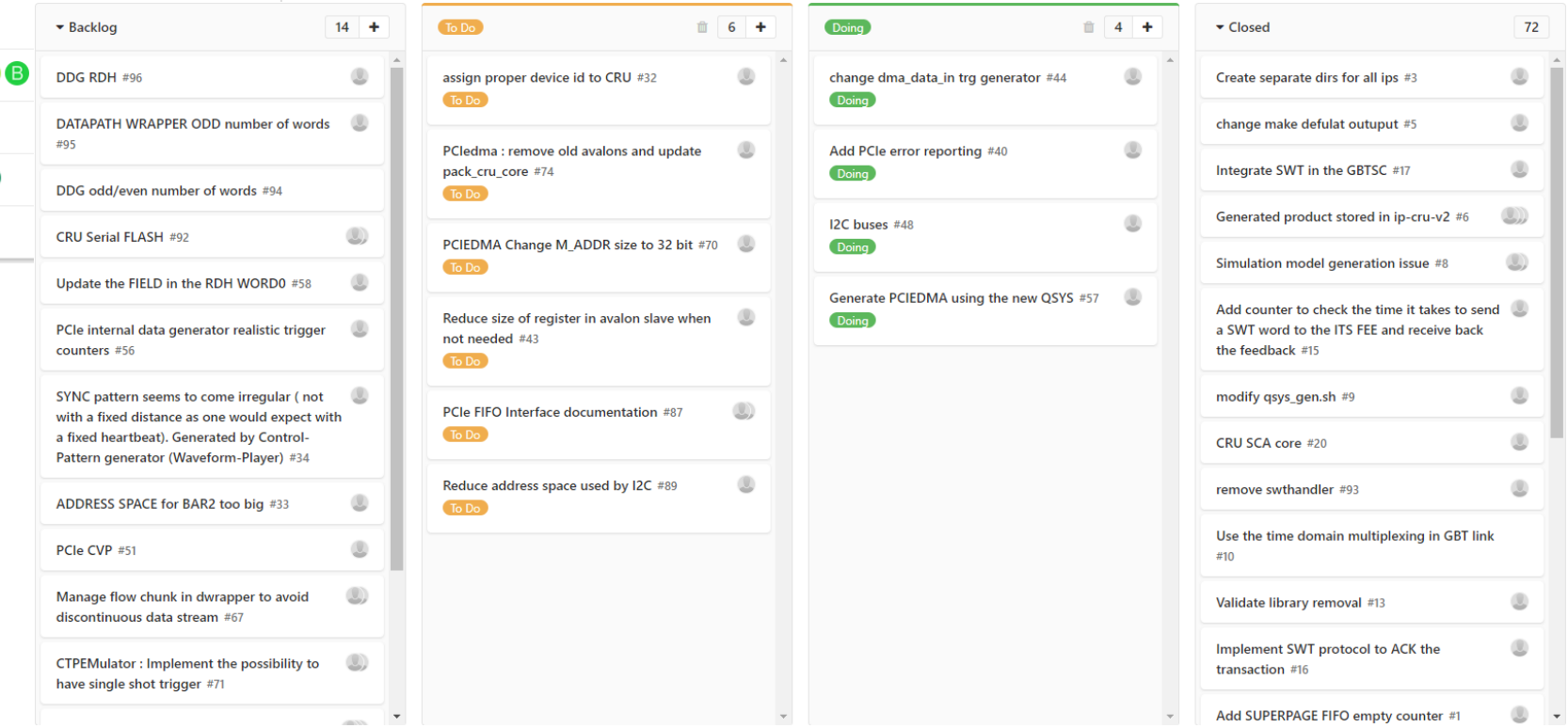
CRU

Feedback report with several detector groups

https://alice-talk.web.cern.ch/c/o2-cru

Topic	Users	Replies	Views	Activity
About the O² CRU category		0	20	Jun 12
TPC Readout with CRU	T C	17	7	3d
Which avalon_mm_slave and how to use it? 3	S C B	14	29	Aug 2
CRUv2 not recognized by FLP 2	J C	8	12	Jul 27
CRU USB cable	C	1	8	Jul 25
CRU hardware	C L			
CRU firmware compilation error	S T C B			
Is flpproto no longer supported/needed?				
Hardware setting recommendations for FLP prototypes?	S			
CRU firmware	C			

https://gitlab.cern.ch/alice-cru/pcoresng-cru/boards?=



Firmware TAG releases

v2.6.0
9bf047b2 · Addition of start/stop run override · 6 days ago

v2.5.0
910ae122 · Removed LINKID offset in datapath_wrappers · 3 weeks ago

v2.4.0
5168b6b8 · add information into the GBT configuration 1 description (· 1 month ago

v2.3.0
873c9ab1 · Issue #111 : changes to sync the TIC input with the one in output · 2 months ago

2.6.0 - 2018-11-09

- Addition of CRUid and dwrapper ID in word 0 of RDH for raw readout
- Patplayer alwyas sends IDLE during configuration
- Addition of trig counter monitors
- Addition of start/stop run override

2.5.0 - 2018-10-26

- Add trigger re-routing option
- Add enable for runen trigger in patplayer
- Add TPC FEC emulator and ttc trigger select
- DDG send only RDH when SOT/EOT
- Add software controlled reset for clock related component and dwrapper
- Removed a reset in the SWT component to improve timing
- Simplified DMA internal data generator
- Add clk240 alive checker
- Applied fix for timing error in SWT
- CTPEMUCORE removed a critical warning
- Reduced reset fanout in PCIe to improve timing
- Removed unused monitoring logic to improve timing
- Add control for IDLEs between DDG packets
- Start of data taking enabled by SOx
- Add throughput counter to dwrapper
- Removed LINKID offset (both dwrappers are equivalent)

Main feature currently implemented

- Readout :
  - Continuous.
  - Packet.
- TRIGGER :
  - CTP emulator : HB and Triggers (Sox, Eox, PHYSICS).
  - LTU communication.
  - PatPlayer : detector “triggered” specific pattern.
  - MID trigger.
- Slow Control :
  - SCA.
  - SWT.
- Integration of Detector User Logic.
- DDG (Detector Data Generator) : continuous/packet mode.

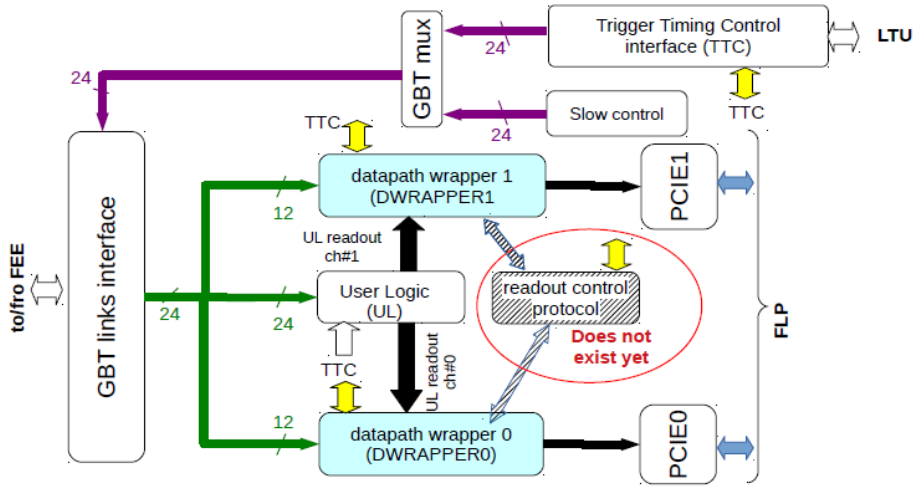
Next milestone

During the last ***SYSTEM UPGRADE*** the CRU Team presented the “Update on the readout control protocol”

For more details click here

Major highlights

- Implementation of the new “readout control protocol” in the CRU



Interfaces

- with FEE through GBT (wide or standard)
- with Central Trigger Processor (CTP) through the Local Trigger Unit (LTU)
- with Detector Control System (DCS) and DAQ through PCie

⇒ Talk will focus on DWRAPPERs and readout control protocol

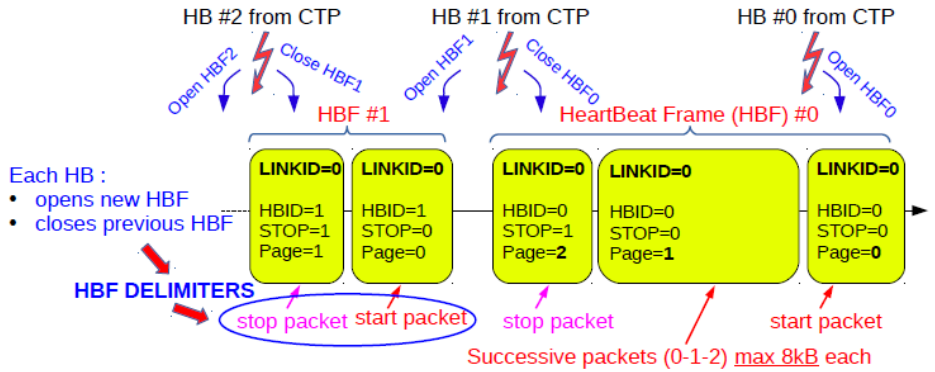
Major highlights

- Implementation of the new “readout control protocol” in the CRU
- Modification to the data transmission protocol

To be able to scrutinize the interleaved packets as they fly-by, we need delimiters to assess full and complete Heartbeats Frame transmission.

For all Heartbeats Frame (HBF) a min. of 2 packets should be emitted

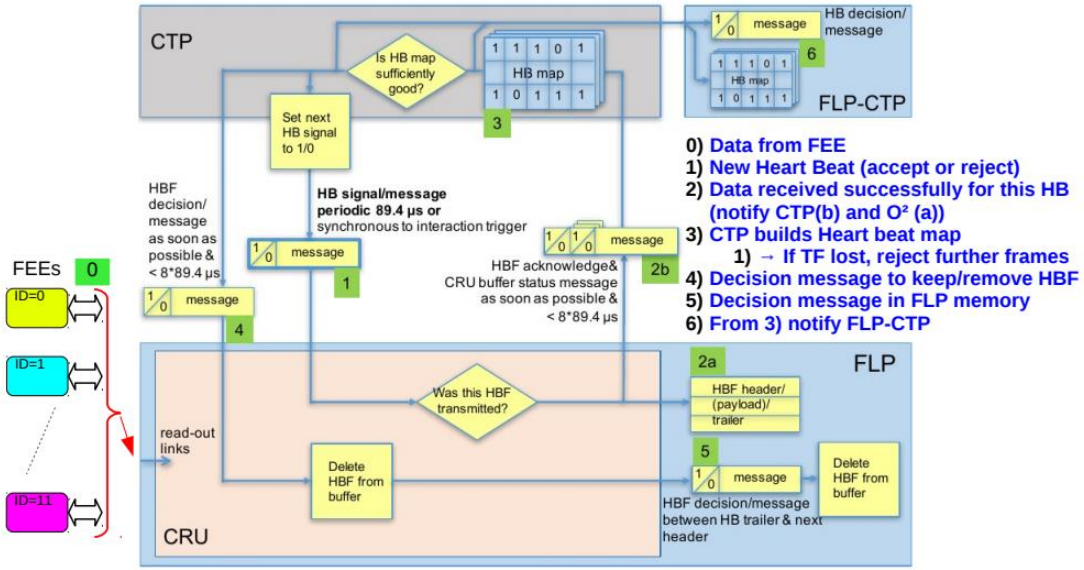
- Start packet: 1st packet of a HBF → page #0
- Stop packet: last packet of a HBF → page #n and STOP at 1 (may contain some status, **TBD**)
- Both packets can be RDH only!



For continuous readout detectors, this will be taken care of by CRU

Major highlights

- Implementation of the new “readout control protocol” in the CRU
- Modification to the data transmission protocol
- CONLCUSIONs



- A solution exists for implementing the flow control protocol
- New HeartBeat Frame (HBF) must be introduced (step #0)
- Definition of HeartBeat Accept Message (HBam) and HeartBeat Decision Message (HBdm) were introduced by CTP and will be implemented

- Detectors must implement the communication protocol described
  - ⇒ This is for FEE with packet type **AND** for user logic
- Is geographical decision in CRU necessary ?
  - ⇒ If yes, please limit the number: 2? (impact on 2b message)
- Is a status word useful ?
  - ⇒ Could be used as payload in the stop packet, used by whom (CTP, O^2, both?)

1. Validate the new communication protocol with FEE (step #0)
2. Validate the CRU→CTP→CRU communication loop (steps 2b, 4, 5)
3. Validate the flow control with CTP