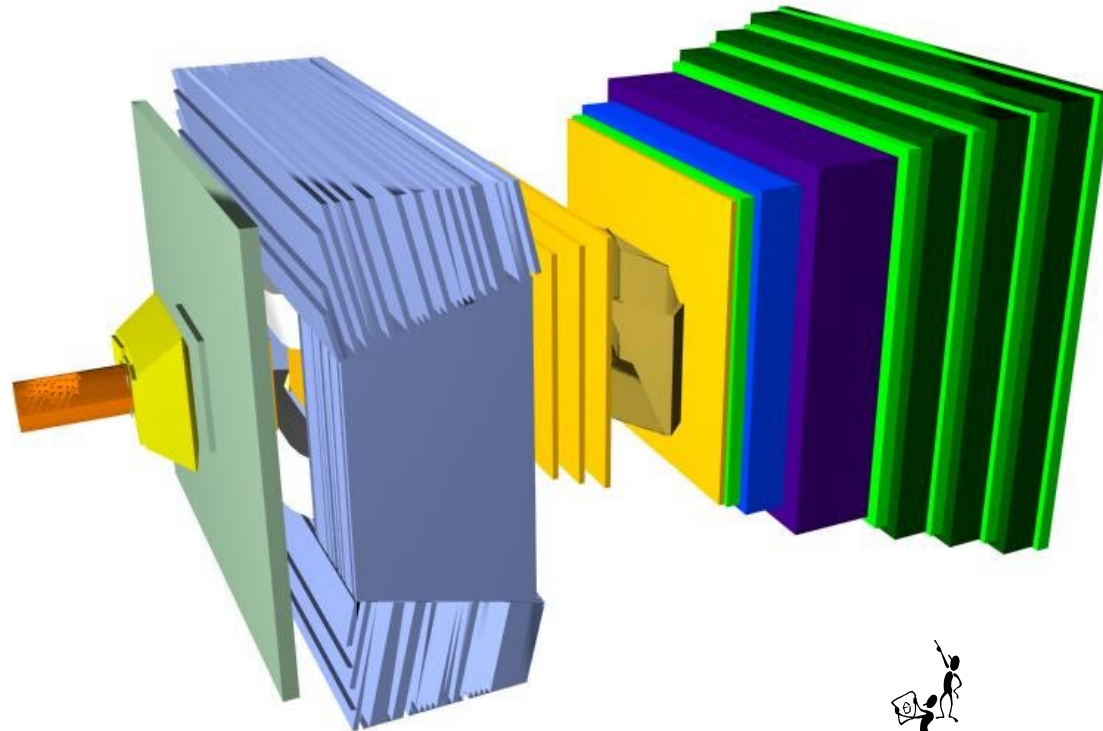


TTC in LHCb

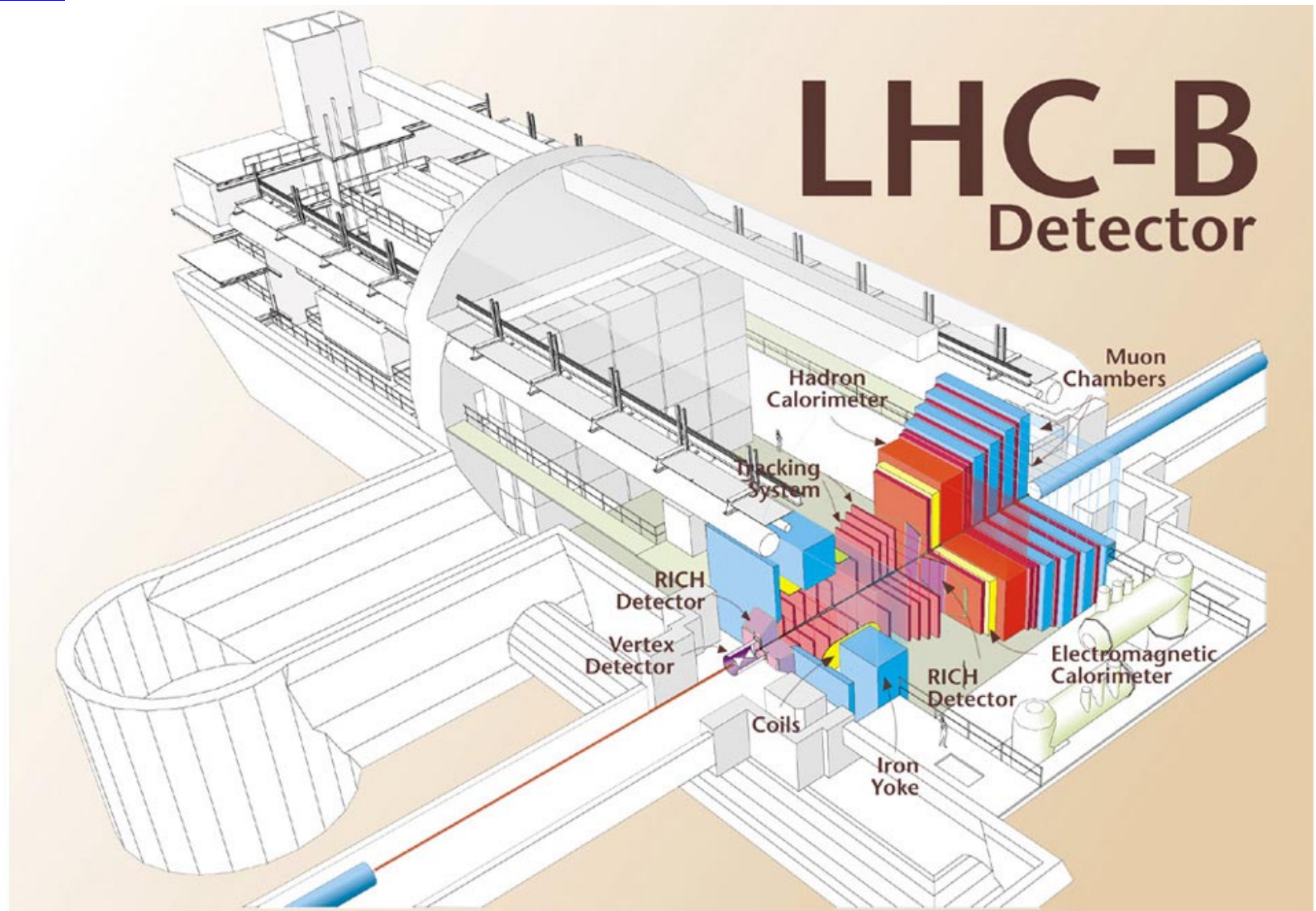




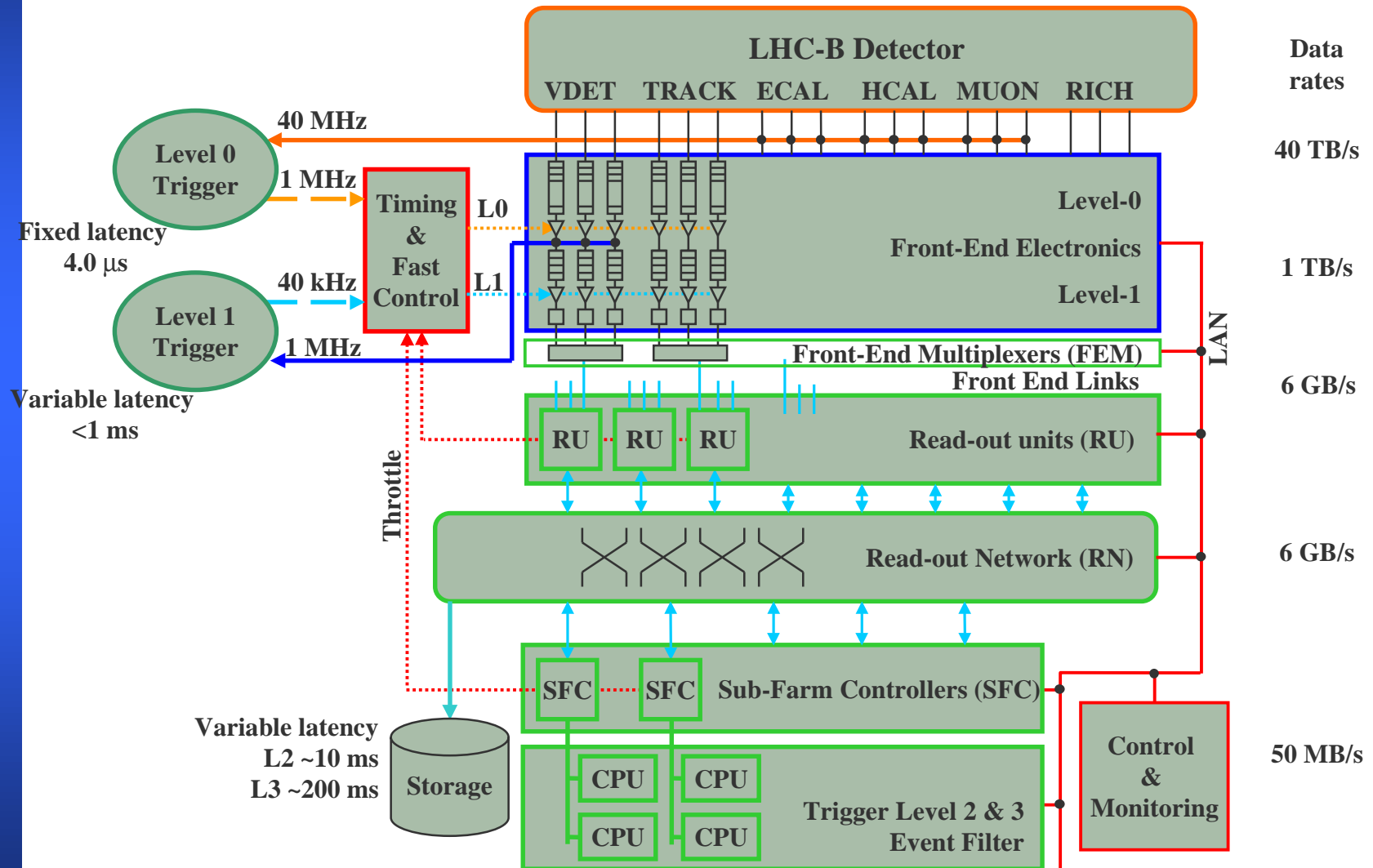
Outline

- The LHCb cavern
- Particularities of the LHCb read-out
- LHCb Timing and Fast Control
- Use of TTC
- TFC tests
- Conclusions

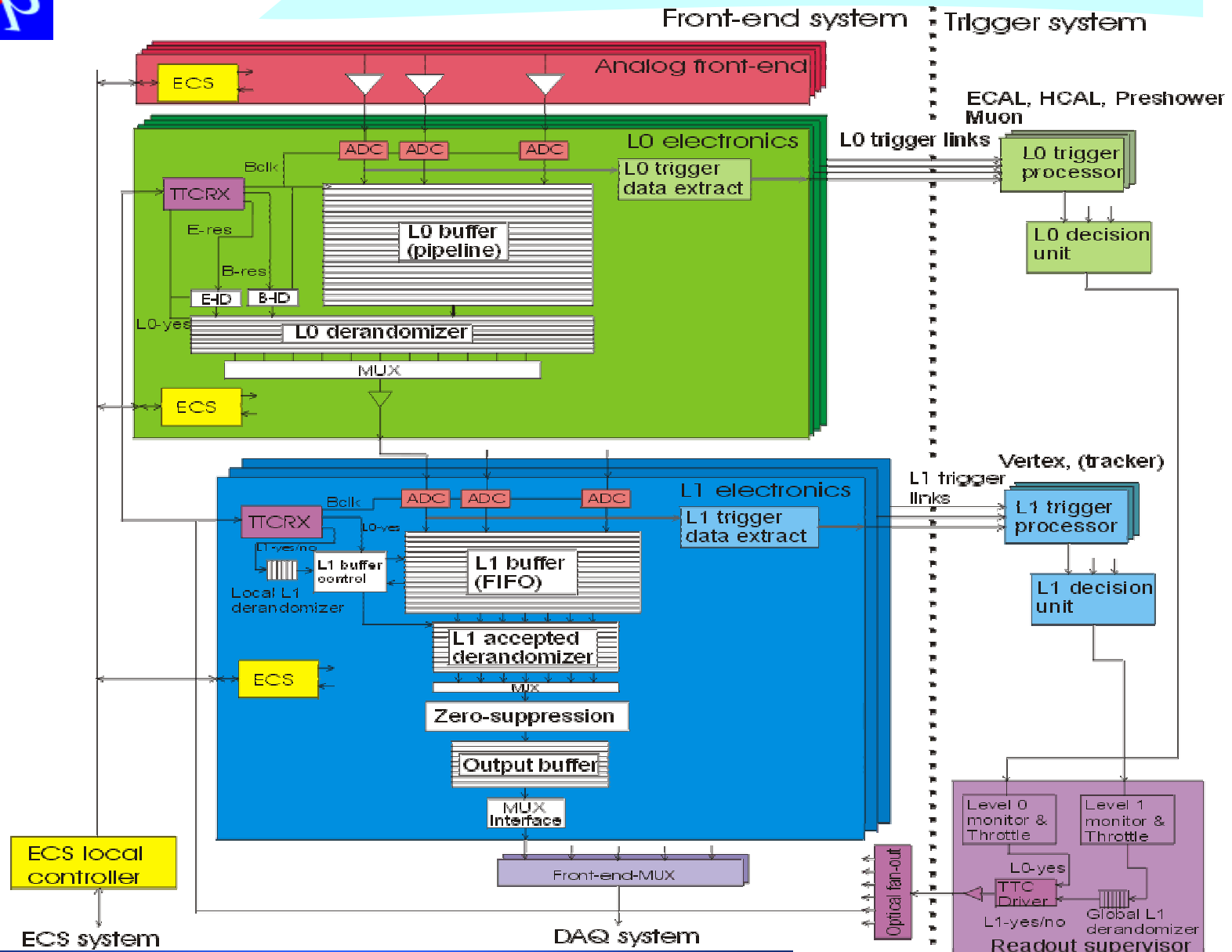
LHCb cavern



LHCb Read-out

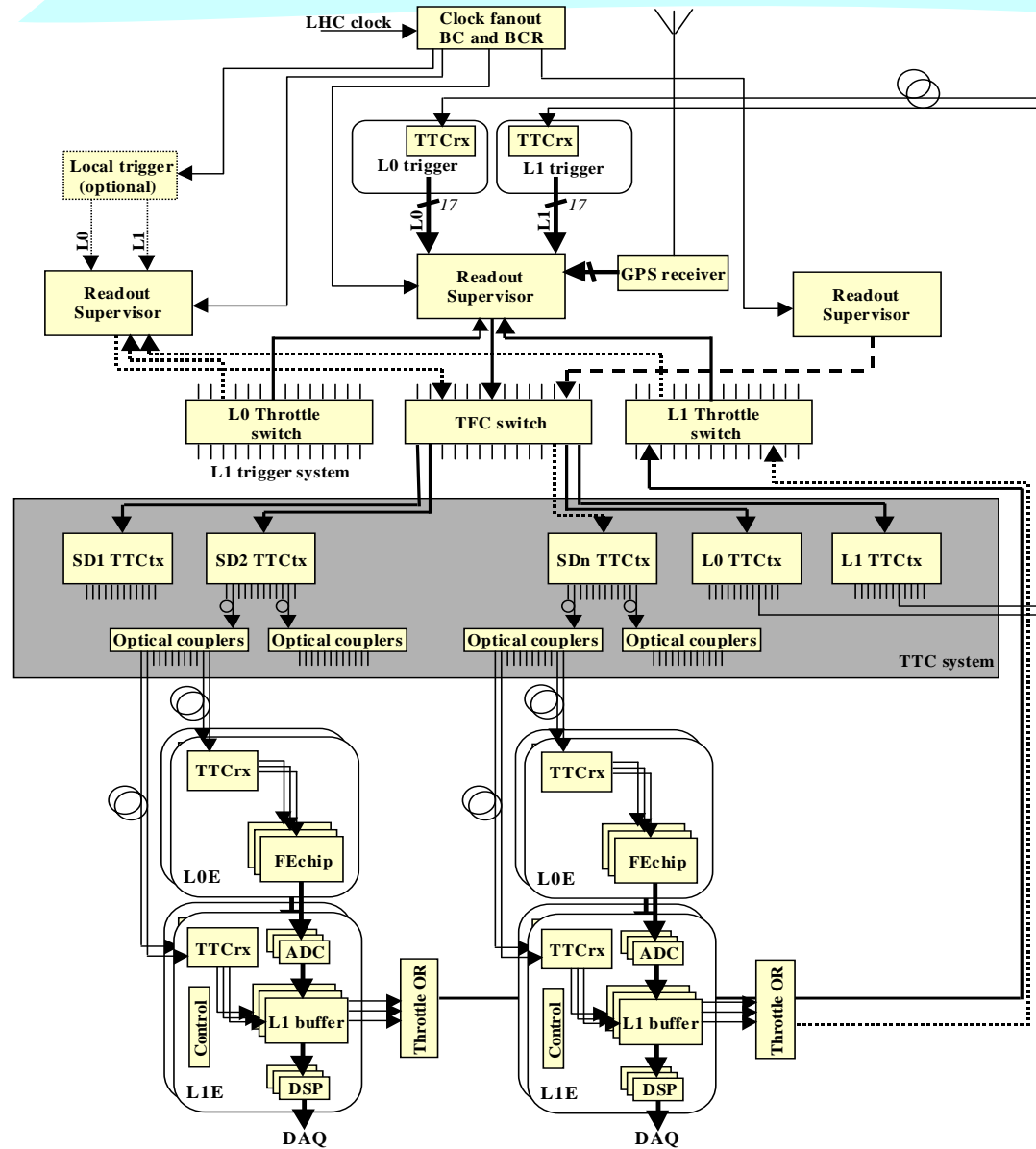


Front-End electronics

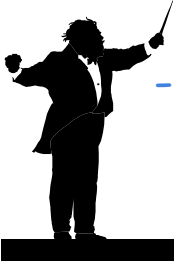


Richard Jacobsson, CERN

Timing and Fast Control

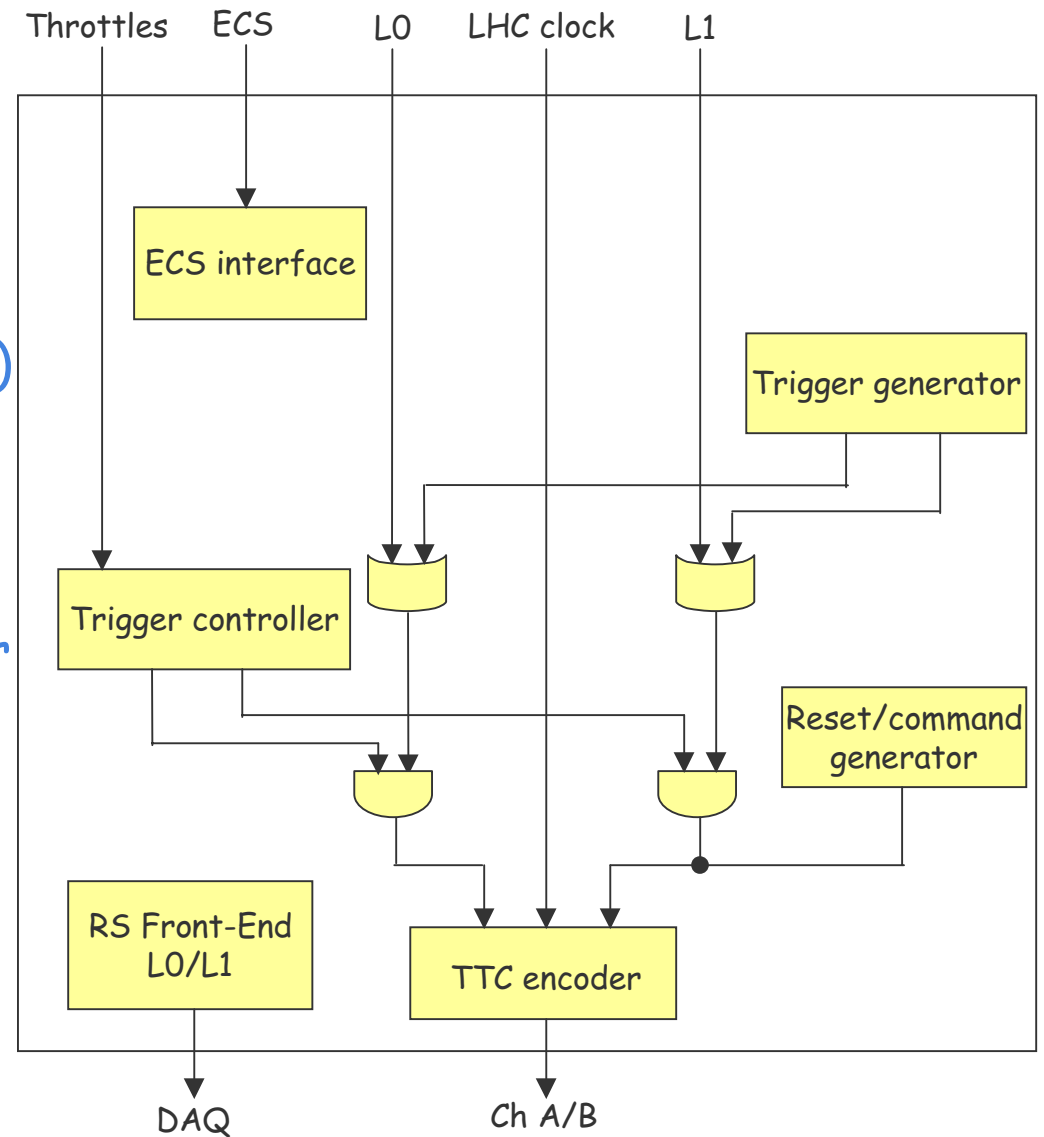


Endemic TFC components

- Experiment orchestra director -  - all mastership in single module
 - Readout Supervisor
- Clock, trigger and command distribution and support partitioning
 - TFC switch
- Throttle feed-back
 - Throttle Ors and Throttle switches (L0 & L1)

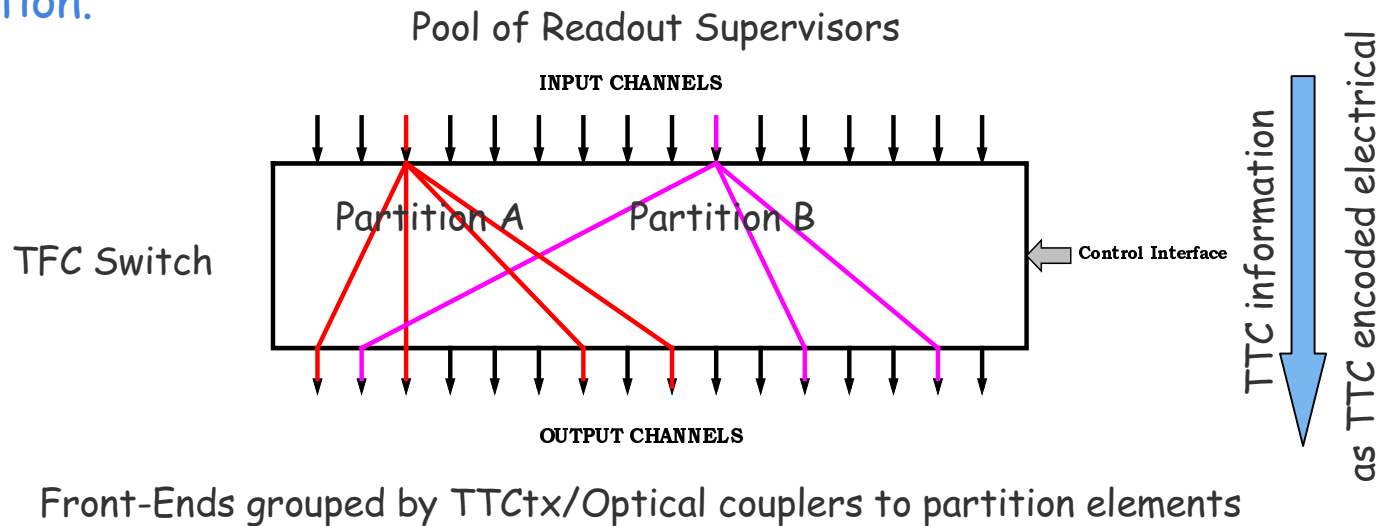
Readout Supervisor

- Module
- Clock distribution (TTC)
- L0 distribution (TTC)
- L1 distribution (TTC)
- Auto-trigger generator
- Trigger controller
- Reset/cmd generator
- "RS Front-End"
- ECS interface



LHCb partitioning

- Partition (TFC) *Def.* Generic term for a configurable ensemble of parts of a sub-detector, an entire sub-detector or a combination of sub-detectors that can be run in parallel, independently and with a different timing, trigger and control configuration than any other partition.

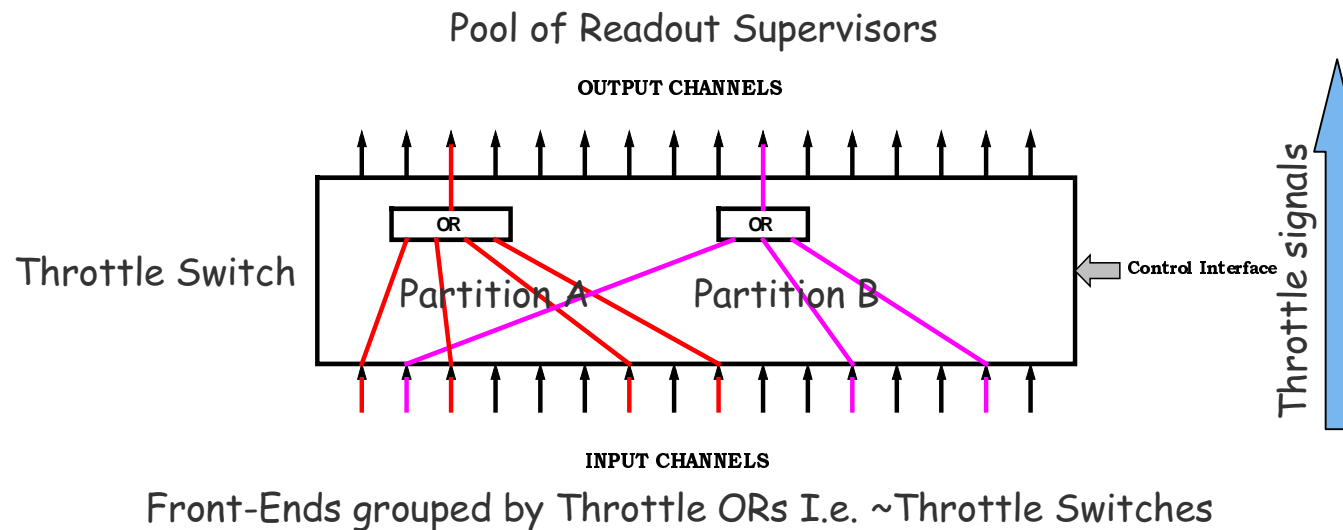


- Option: 16 or 32 partitions
- Crucial: Equal internal propagation delays



Buffer overflows

- Throttle signals fed back electrically (LVDS) or optical? to appropriate RS in control



- Two Throttle Switches:
 - Throttle signals to L0
 - Throttle signals to L1

Use of TTC

- Timing, Trigger and Control distributed using the TTC system:
 - Channel A used to distribute (accept/reject signal)
 - L0 trigger (40 MHz --> 1MHz accept rate)
 - Channel B used to distribute (short broadcasts):
 - L1 trigger (1 MHz --> 40-60 kHz accept rate)
 - BCR/ECR
 - Control commands (FE resets, calibration pulses)

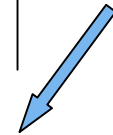
Bit/Broadcast	7	6	5	4	3	2	1	0
L1 trigger	1	Trigger type			EvID(2-bit)		0	0
Reset	0	1	R	L1 EvID	L1 F-E	L0 F-E	ECR	BCR
Calibration	0	0	0	1	Pulse type		0	0
Command	0	0	1	R	R	R	0	0

- Broadcast order is handled according to priorities

Standard TTC components

- Very preliminary numbers without spares:

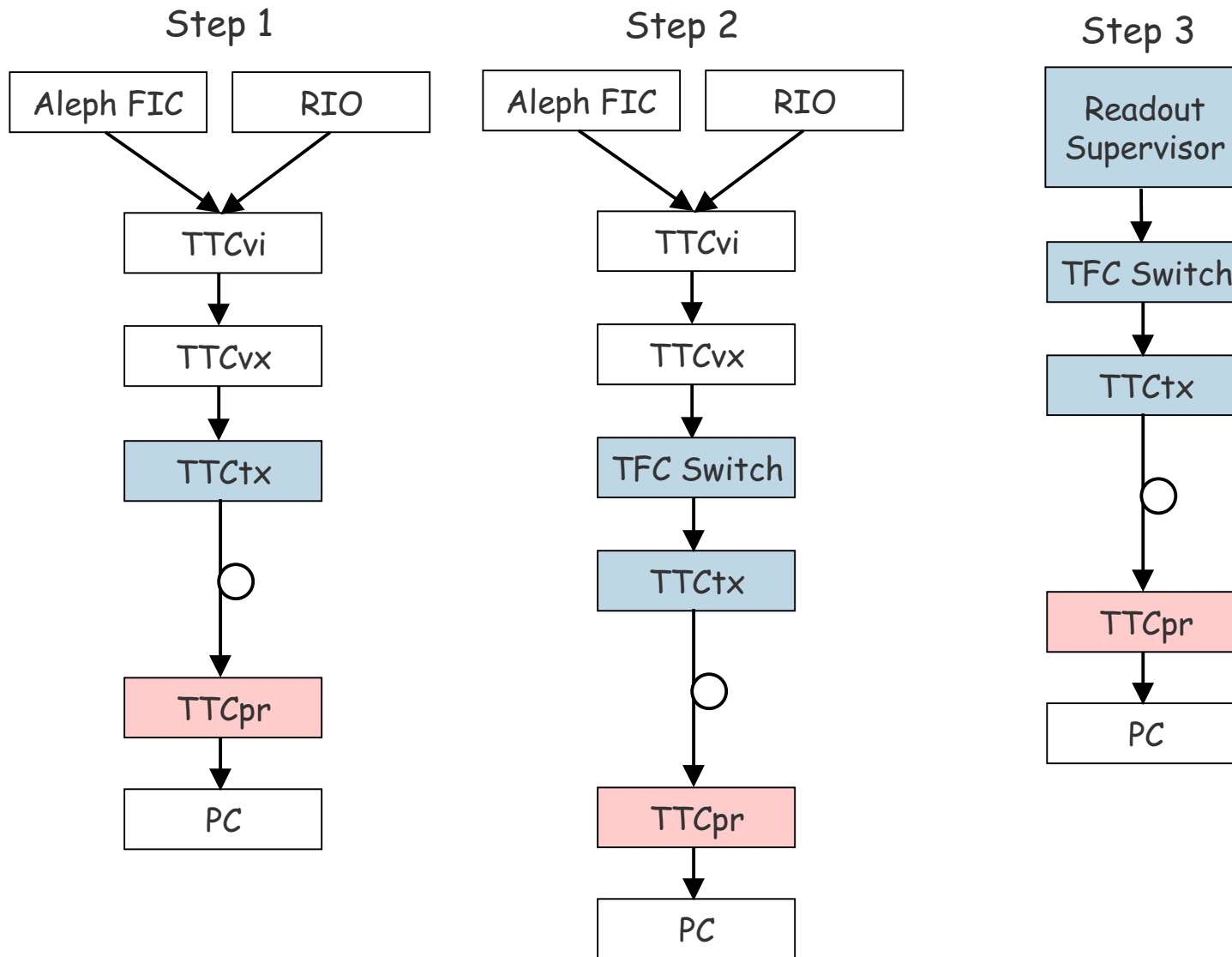
	VELO	RICH1	RICH2	IT	OT	PRS+ ECAL+ HCAL	MUON	
#TTCrx	200	100	200	100	200	50	60	~1000
#Optical coup	10	8	10	4	10	6	8	~60
#partitions	2	4	2	1	10	6	5	30 + 2(trig)



TTCtx ~ 20

- TTCbi to receive beam information and GPS time?

TFC tests



Conclusions

- DAQ TDR end of the year, a lot of work ahead
- TFC system architecture and use of TTC well established
- Prototype production and tests in progress
- Number of standard TTC components required known only roughly
- TTCpr very useful !! Second version? Future?

