cherenkov telescope array

NectarCAM Processing WP

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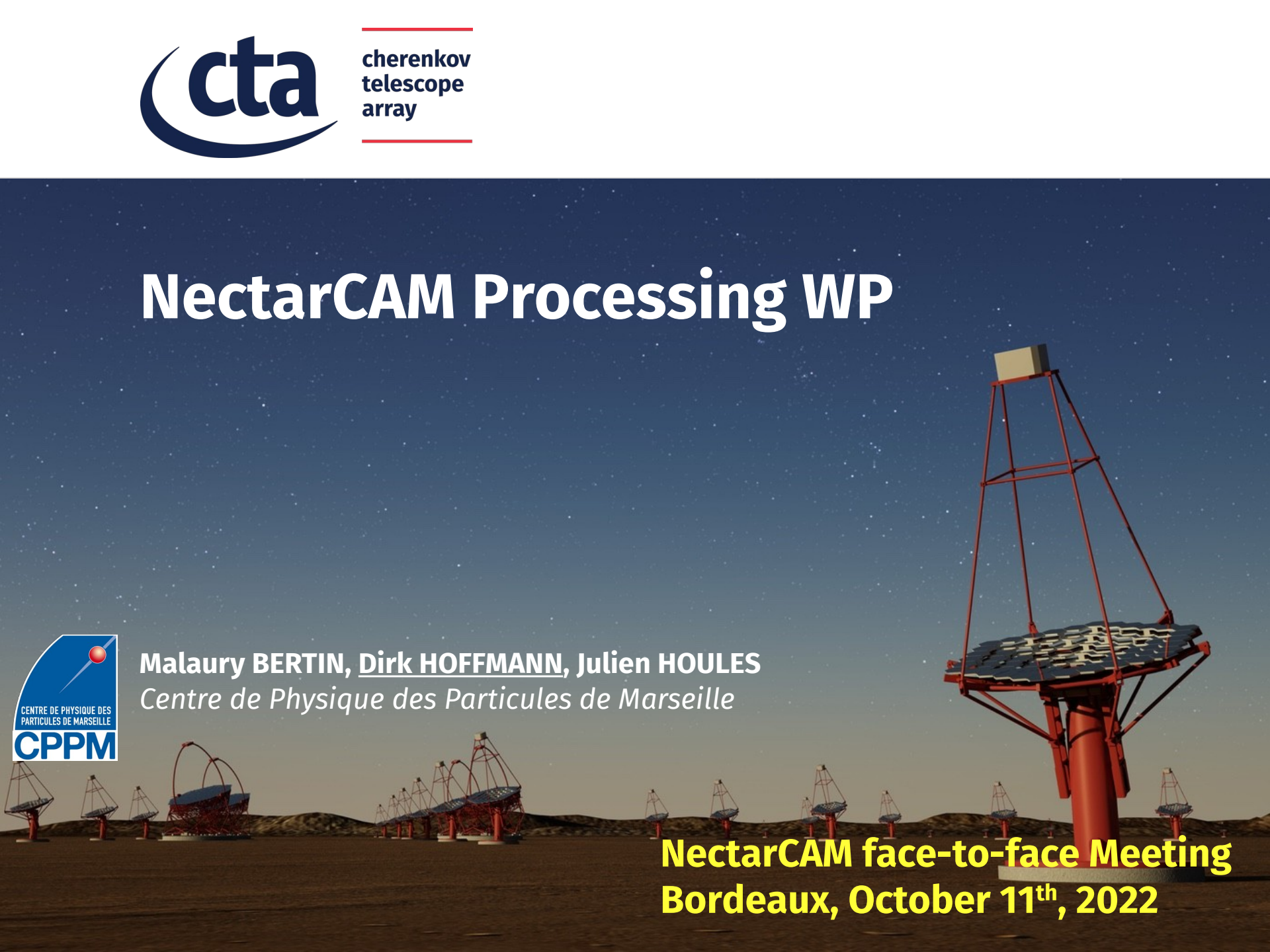

NectarCAM face-to-face Meeting
Bordeaux, October 11th, 2022

Barcelona, 2013

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Outline

- Event-Builder: v5
- Trigger dependent processing (TDP) and other pending questions
- Data Storage (DIRAC)
- Switches
- RIX / CDMR status
- UCTS/SWAT CRE

Event-Builder, some history ...

- **Version 3**
  - **Reorganisation of inputs, better performance**
  - **Algorithms**
- **Version 4**
  - **Trigger-dependent event-handling**
    - Not used up to now!
- **Version 5**
  - **Removal of netmap (and mtcp) dependency**
  - **Tested in LST**

Event-Builder, version 5!

- **Historically …**
  - **Small packets at high rate are a problem.**
  - **Solved by using** netmap **(and** mtcp **for LST)**
  - **Hence, kernel was frozen (3.10 instead of 5.16)**
- **Version 5: maintenance facilitation** (30 years!)
  - **In-depth Linux network parametrisation:**
    - interrupts, core affinity, NIC buffers, driver rules, …
    - 700 lines of shell code
    - but no more kernel dependency
  - **Reorganisation of tasks in cores**
  - **Tested in LST**
  - **Work started for implementation in NectarCAM.**

Event-Builder, version 5!

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  - **Small packets at high rate are a probl**
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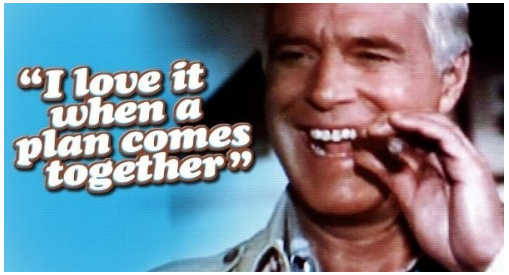
task	core	task	core
receptionTask	1	preProcTask	19
receptionTask	2	preProcTask	19
receptionTask	3	preProcTask	19
receptionTask	4	preProcTask	20
receptionTask	5	preProcTask	20
receptionTask	6	preProcTask	20
receptionTask	7	preProcTask	21
receptionTask	8	preProcTask	21
receptionTask	9	preProcTask	21
receptionTask	10	preProcTask	22
receptionTask	11	preProcTask	22
receptionTask	12	preProcTask	22
receptionTask	13	preProcTask	23
receptionTask	14	preProcTask	23
receptionTask	15	preProcTask	23
receptionTask	16	preProcTask	24
receptionTask	17	preProcTask	24
receptionTask	18	preProcTask	24
		preProcTask	25
		preProcTask	25
processingTask	31	preProcTask	25
processingTask	32	preProcTask	26
outputTask	33	preProcTask	26
socketTask	33	preProcTask	26
outputTask	34	preProcTask	27
socketTask	34	preProcTask	27
IoOutputTask	35	preProcTask	27
IoOutputTask	36	preProcTask	28
IoOutputTask	37	preProcTask	28

Event-Builder: pending questions

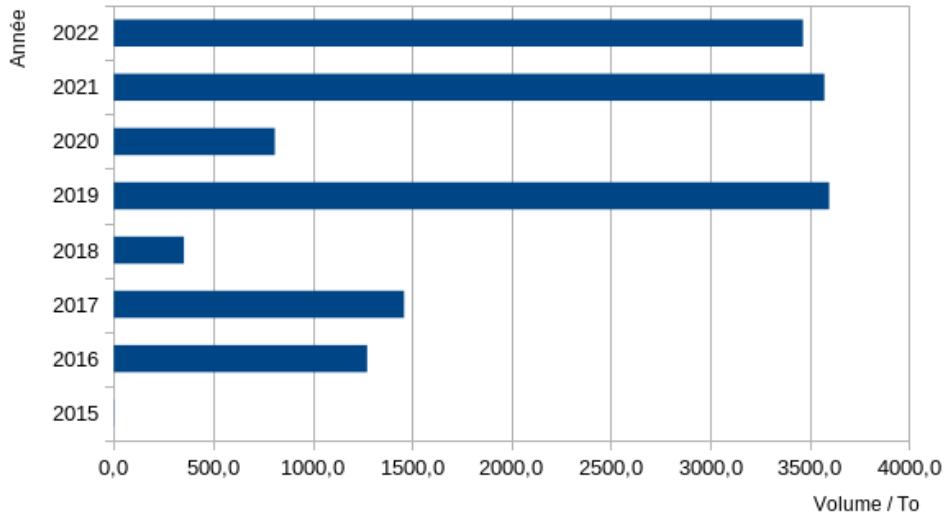
- **Trigger dependent processing:**
  - **"EVB ICD"** MSTLST-ICD-20191206
    MST-CAM-ICD-0358-CPPM
  - **Configuration proposal, *tbd*** LSTMST-TN-20220524
    CERN-EDMS 2748842 v.2, draft, 2022-06-17
- **Meeting on June 22nd**
  [https://indico.cta-observatory.org/e/4153/]
  - **Pedestal correction, muon tags, gain selection**
    explained, to be decided soon
- **Flat fielding (correction factors ADC→PE)**
  to come very soon
- **Unclear, who takes the initiative of proposal here!**

Data Storage on DIRAC

- **Practically all the legacy data transferred**
  - **25220 files as of today**
  - **14.5 terabytes**



- **Big thanks to Jean-Philippe, Luisa and Patrick!**
- **Crosscheck with CPPM data revealed 2 corrupted files (out of 25k).**
- ***Likely to be the NectarCAM solution for OHP!***



But how do I get my data from DIRAC?

Four-step procedure

- Only the last step needs to be iterated (for each file)!

- Request GRID certificate (CERN, Renater, CNRS, ...)
- Register with vo.in2p3.fr/nectarcam
- Install DIRAC (or use it from CernVM FS)
- Initialise DIRAC, copy file to local node and/or submit analysis job

Description: https://redmine.cta-observatory.org/projects/cta_dirac/wiki/CTA-DIRAC_Users_Guide

The switches saga

- Three types of Ethernet switches in NectarCAM
- DATA1 (44-45 1Gb inputs, 4 10Gb outputs)
  - Purchased for 9 cameras (available: 56+9+7)
- DATA2 (24 10Gb inputs, 4 10Gb outputs, deep buffer for O(2k) events)
  - To be purchased: 2 IRFU + 9 IN2P3 after open call for tender *delayed, not critical (1 year delivery time though)*
- SLOW control ("industrial" switch, 24 1Gb inputs)
  - Purchased 2 pc. of selected model for MSTN-1
  - One broke in spring 2022, going totally dark!

The “SLOW” switch

- O’Ring RGS-PR9000 broken after <5 years operation, total loss of control (!)
  - “Identical” replacement is not compatible.
  - Repaired by “magic healing”
    (disassemble, reassemble, done) in August
  - No explanation from manufacturer, waiting for return from vendor
  - Lost confidence in the product.
  - May be bad luck. But how to handle incompatible firmware???
- Alternative products to be studied
  - Very interesting offer from FS, but no MTBF measurements. Trying again.
  - Eventually look for other manufacturers. Back to square 1.
- This is the most critical switch now.
  - Can operate with any low cost model, but must survive negative temperatures to fulfill CTA requirements.

CDMR: RIX status

- “Only” reminders from the last meeting …

Paperwork 2: CDMR, to be done

- **7 RIXes**
  - **None of them critical**

#	Status	Subject	Assignee
42642	Assigned	DD124_LSTMST-ICD-20191206-3.pdf	~~Montanari Chiara~~ Andrea
42457	Assigned	Comments on DD127_LMST-CAM-UM-0361.pdf	~~Houles Julien~~ Dirk
41802	Suspended	DD128_LMST-CAM-LI-0475_DAQ_CIDL: inconsistent document versions in CIDL	~~Whyborn Nick~~ Dirk
42843	Closed	DD126 NectarCAM DAQ and Processing Test Plan	Whyborn Nick
42463	Closed	DD122_MST-CAM-SP-0357-CPPM_Processing_RequirementsSpecifications.pdf	Whyborn Nick
42456	Closed	Comments on DD125_LMST-CAM-TN-0476.pdf	Houles Julien
42455	Closed	Comments on DD123_MST-CAM-TN-0360-CPPM_Processing_ConceptionV1.0-2.pdf	Houles Julien

- **#42457:**
  Requires better instructions for a system not yet finalised

Paperwork 3: PAP

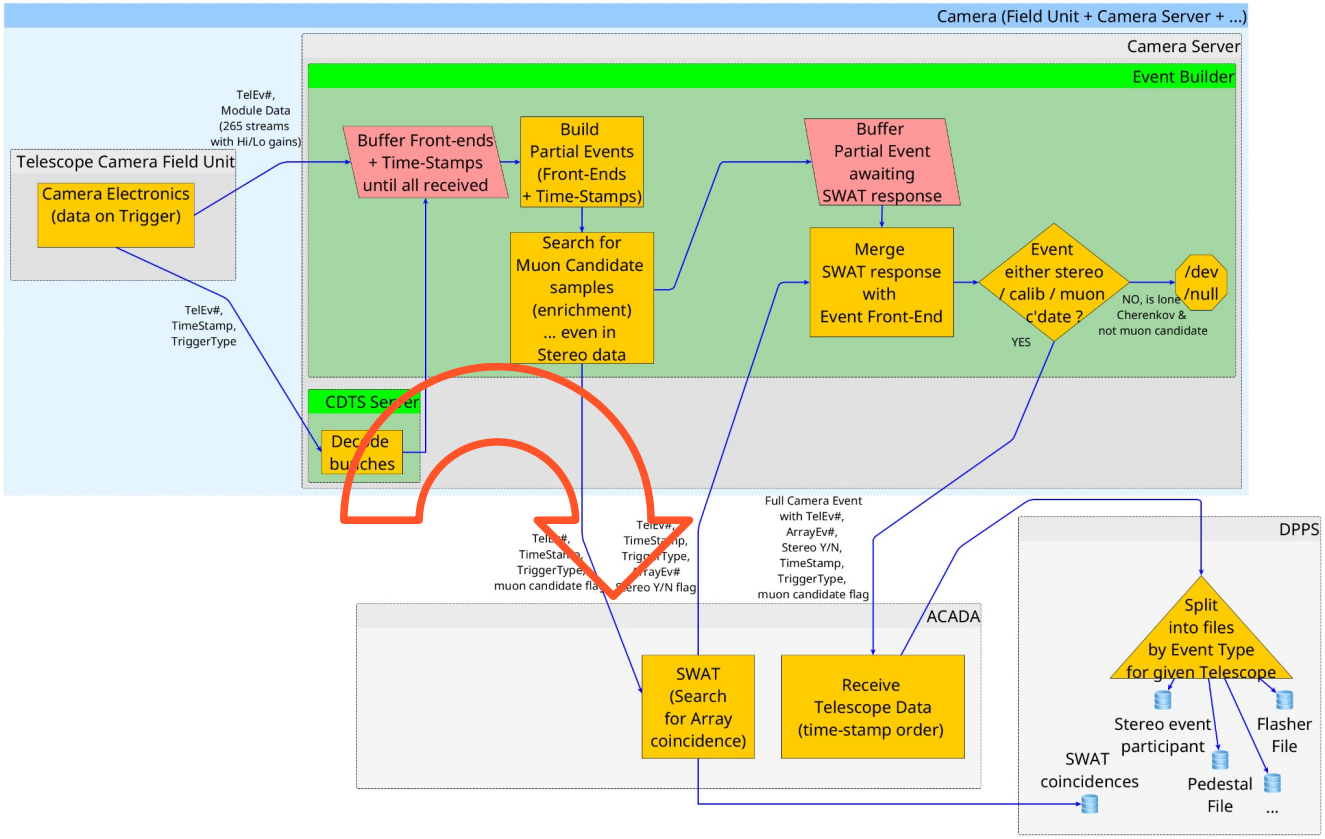
- **First meeting September 2019**
  - https://indico.cta-observatory.org/event/2397
  - **Minutes available, but no followup?**
- **Second meeting**
  - https://indico.cta-observatory.org/event/2517
- **PAP drafted without further interaction**
  - **Does not fully represent reality**
  - **Need to converge now**

CDMR: RIX status

- For the RIX (#42457), information should be mature by now (usage of git missing).
  - On the list after the current priorities (EVB v5)
- For the PAP (critical RIX!), we had another iteration beginning of 2022.
  - Comments sent, some implemented
  - Most stringent: There is no mention of C programming language! → Cannot accept.
  - Answers unsatisfactory up to now ("CTA does not mention C.")

UCTS data path

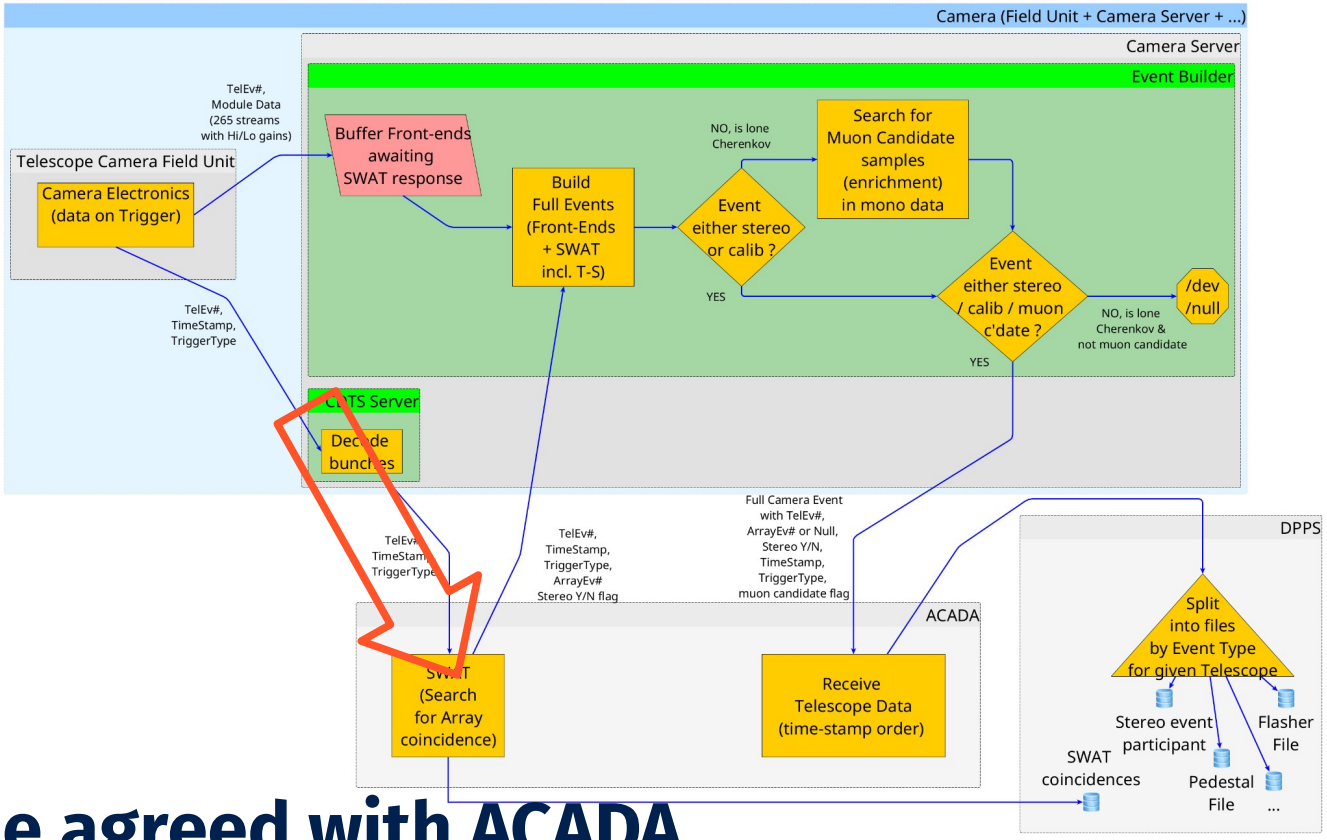
- **The current CTAO solution bears the risk of not fulfilling the timestamp delivery requirement.**



B-TEL-1420
500 ms

UCTS data path

- **Simplified schema without impact on other cameras**



- **In principle agreed with ACADA.**
  Need to make formal “change request” (CRE).

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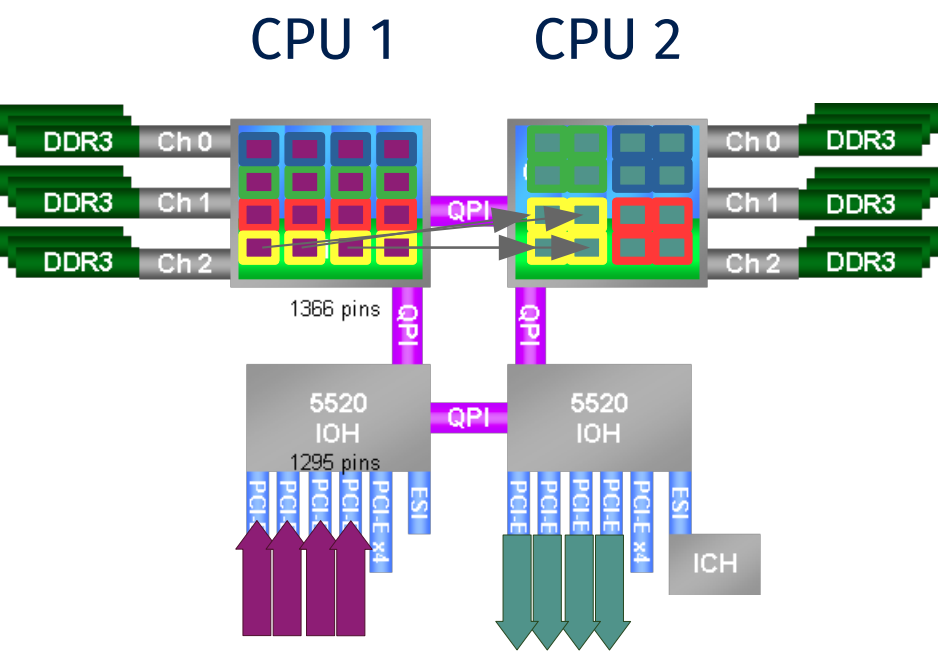
Summary

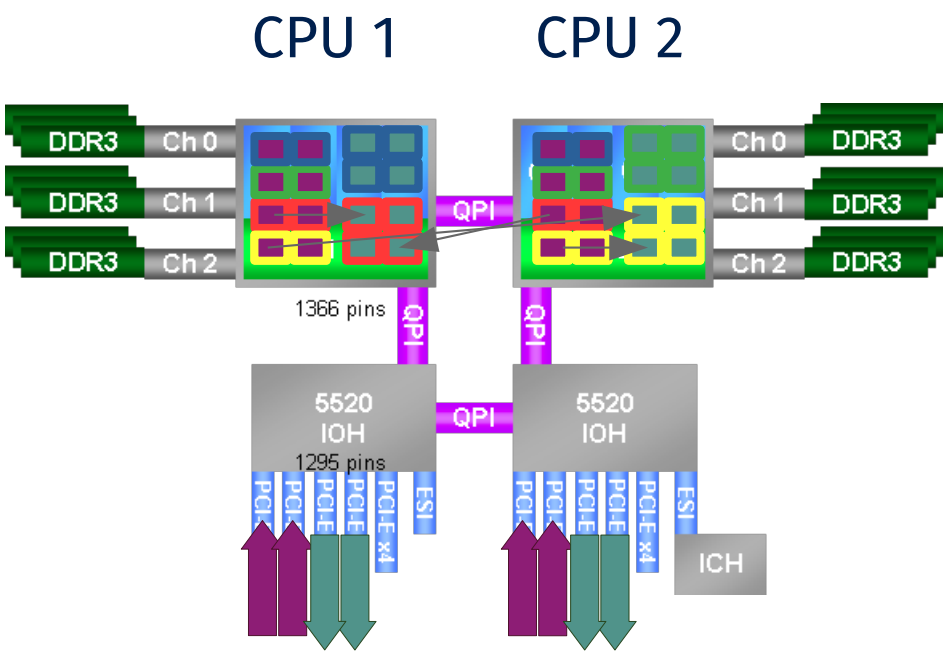
- Event-Builder v5 coming
- Data Storage on DIRAC
  - Get used to it!
- Switches
  - on the critical path!
- RIXes, PAP and other paperwork
  - necessary, but not highest priority
  - except UCTS/SWAT protocol (blocking!)

Event-Builder

- **Version 3: Reorganisation of inputs**
  simplified schema, neglecting memory transfers



separate I/O CPUs



distributed I/O CPUs

Event-Builder

- **Version 3**
  - **Reorganisation of inputs, better performance**
  - **Algorithms:**
    - **Baseline Subtraction** (LST only)
    - **Gain Selection**
    - **Delta-T correction** (DRS4, LST only)
    - **Interleaved pedestals** (NectarCAM only)
    - **Muon conservation (10%)**
- **Version 4**
  - **Trigger-dependent event-handling**