Level - 1 Central Trigger
- operations report -

ATLAS TDAQ week - Krakow, September 2018

Kristof Schmieden,
on behalf of the L1CT team:

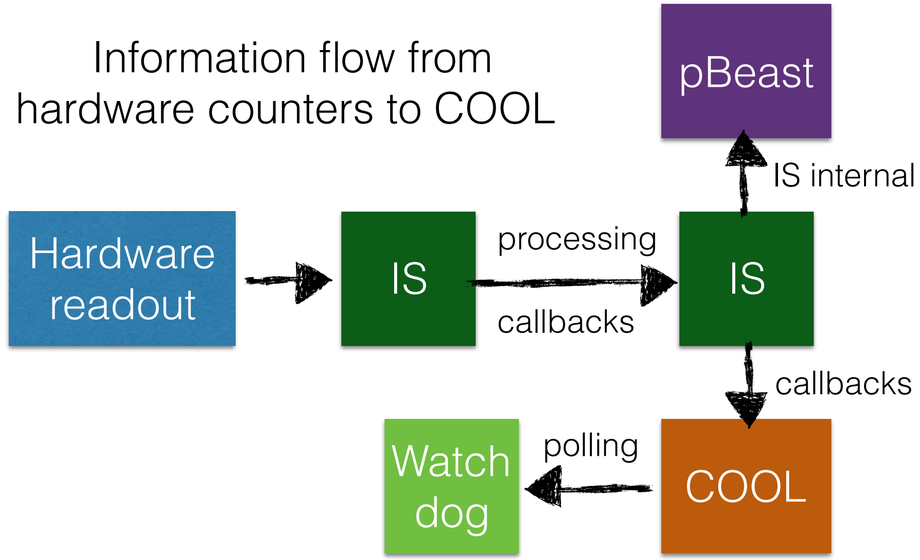
Aaron Armbruster, Magda Chelstowska, Patrick Czodrowski, Pier-Olivier DeViveiros,Till Eifert, Stefan Haas, Louis Helary, Predrag Kuzmanovic, Antoine Marzin, Marcos Oliveira, Thilo Pauly, Vladimir Ryjov, Kristof Schmieden, Ralf Spiwoks, Joerg Stelzer, Paschalis Vichoudis, Thorsten Wengler

Introduction

- Level 1 central trigger running very smooth during the year
  - No Hardware issues
  - No operational problems
- Only Issues observed related to monitoring:
  - Related to conditions data being written to COOL
  - One IS hick-up

Operational issues & updates - concerning COOL conditions database

- Reminder: What do we use COOL for in the L1CT system:
  - Conditions data
    - Beam position
    - Detector configuration
    - …
  - Lumiblock based information relevant for Luminosity calculation / data processing:
    - Busy rates
    - Trigger rates, average and per bunch
      - Cool writing must not fail => closely monitored



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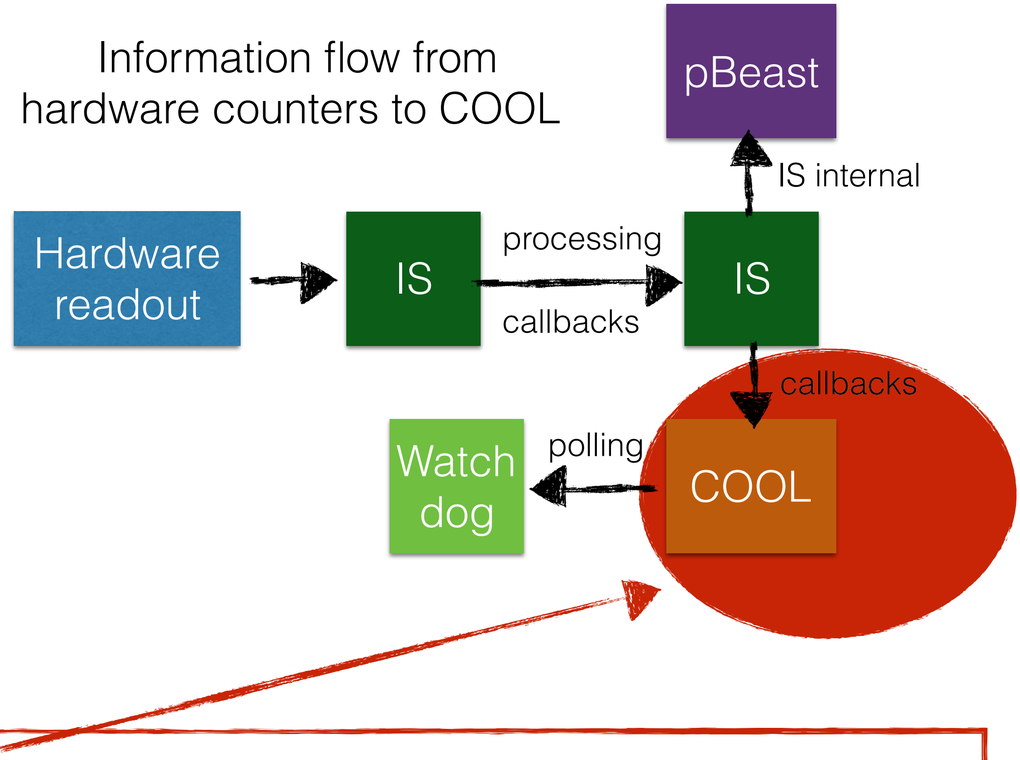

- Cool failure - I => Blocking connections
  - On 21/June writing operation to COOL took > 20 sec!
    - Caused two **simultaneous write access** operation, leading to one hanging (blocking) COOL session
      - All subsequent write attempts hang until blocking session is removed, without error message or timeout (COOL feature)
      - Simultaneous access caused by bug in serialization of COOL write requests
        - Now fixed - should not hit us again
  - Manuel intervention needed to kill blocking DB sessions & restart applications writing to COOL (luckily during COSMIC runs)
  - Investigated in this JIRA but cause of DB slowness could not be traced

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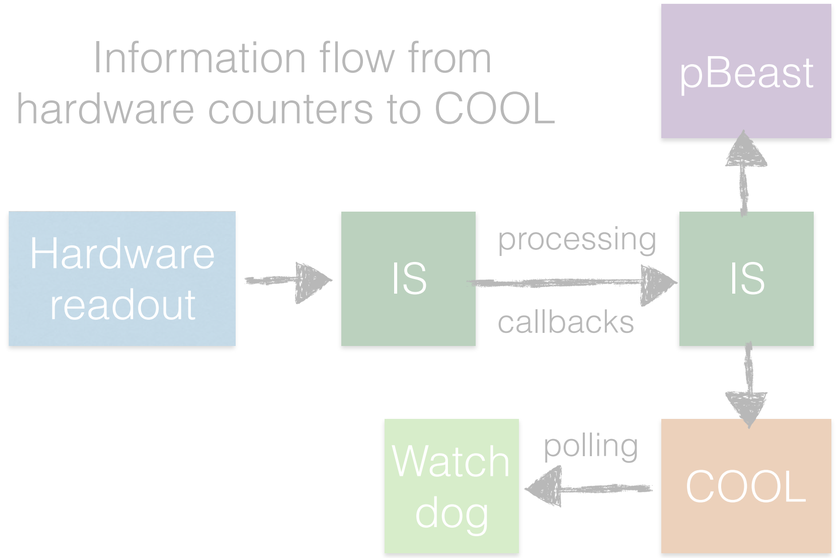

- Cool failure - Ib => Blocking connections
  - BeamSpotController sent 2 ~ simultaneous commands to update conditions in COOL
  - Leading to **2 threads concurrently accessing COOL**
    - Infinitely hanging COOL connection, without throwing any error
  - CTP holds LB generation until beam spot update completed
    - No new LBs in this run!
- Manual cleanup of DB connections needed & restart of run
- Happened during 3b run - no physics data lost
- Protection added to BeamSpotController & CTP software to avoid a reoccurance

Operational issues & updates - concerning COOL conditions database

- Difficult to spot reason for missing LB update!
  - Added new ERS INFO messages for beam conditions, luminosity and HLT PS keys update in COOL
  - Easy to spot if COOL update completes

03:35:07 Aug 20 2018	INFO	**L1CT::ConditionCoolUpdate**	CtpController	Condition update in COOL completed
03:35:07 Aug 20 2018	INFO	**L1CT::ConditionCoolUpdate**	CtpController	request to update condition in COOL with folderIndex = 0 corresponding to: BeamSpot, lb= 217
03:30:07 Aug 20 2018	INFO	**L1CT::ConditionCoolUpdate**	CtpController	Condition update in COOL completed
03:30:07 Aug 20 2018	INFO	**L1CT::ConditionCoolUpdate**	CtpController	request to update condition in COOL with folderIndex = 1 corresponding to: Luminosity, lb= 211

06:39:19 Aug 31 2018	INFO	**L1CT::HLTPrescalesUpdate**	CtpController	HLT prescale update completed in LB 268
06:39:19 Aug 31 2018	INFO	**L1CT::HLTPrescalesUpdate**	CtpController	request to update the HLT prescale key to 17678 in LB 267
06:16:20 Aug 31 2018	INFO	**L1CT::HLTPrescalesUpdate**	CtpController	HLT prescale update completed in LB 244
06:16:20 Aug 31 2018	INFO	**L1CT::HLTPrescalesUpdate**	CtpController	request to update the HLT prescale key to 17679 in LB 243

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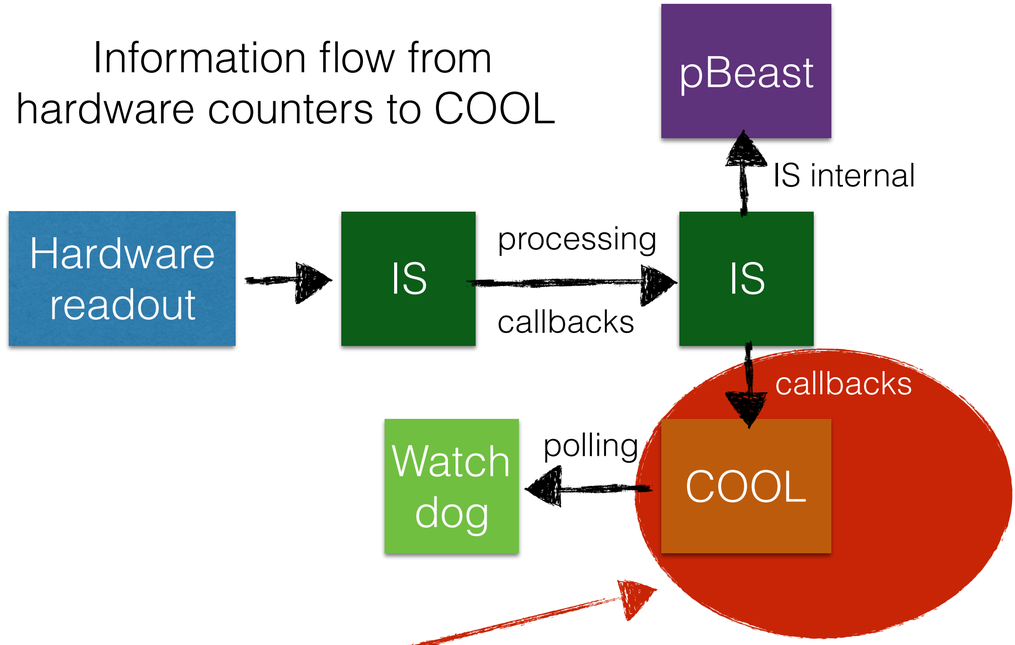

- Cool failure - II => Out of order insertion into COOL
  - 14/June (MD): Run with 3s LB length
    - After 7h of running: write operation to COOL took >3s instead of usual 2s :
      - **Simultaneous access to COOL** from 2 threads + order of LBs to be written to COOL mixed up
      - Hanging session, manual clean up needed
  - Should also be fixed by removing bug in serialization

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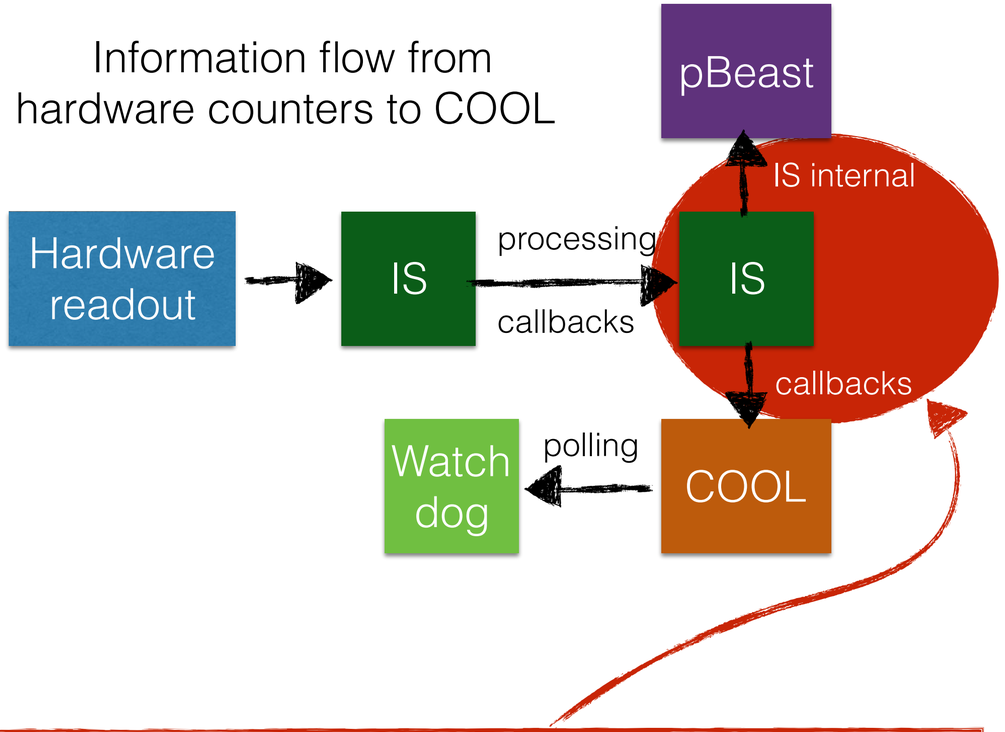

- Cool failure - III => IS callbacks stopped
  - On 01/Aug: At start of run IS values for BUSY rates and status were not updating→ no callbacks
    - Watchdogs complaining about missing information in COOL
    - Busy panel showed ALL subdetectors as masked after start of run
  - Cured by restart of run (which also restarted the IS server)

Operational issues & updates - High trigger rates

- **Issue**: AFP trigger rates in MHz range due to unconfigured trigger board
  - Not trivial to spot!
    - Updated trigger rates webpage shown in ACR (left most screen)
      - Trigger items with trigger after prescale (TAP) > 150 kHz displayed now in red

Physics Live Fraction (L1_TAU8): NaN%, Trigger Keys: SMK: , L1PSK: 235, HLTPSK: , BGK: 51, AutoPrescaler L1PSK History:

Items PITs Enabled Search

Type	ID	Name	PITrate	PS	TBP	TAP	TAV	Enabled	TBP/TAP	TAV/TAP
Item	200	L1_RD0_FILLED	-	5000.66	157437	157437	44982.0	True	1	0.285714

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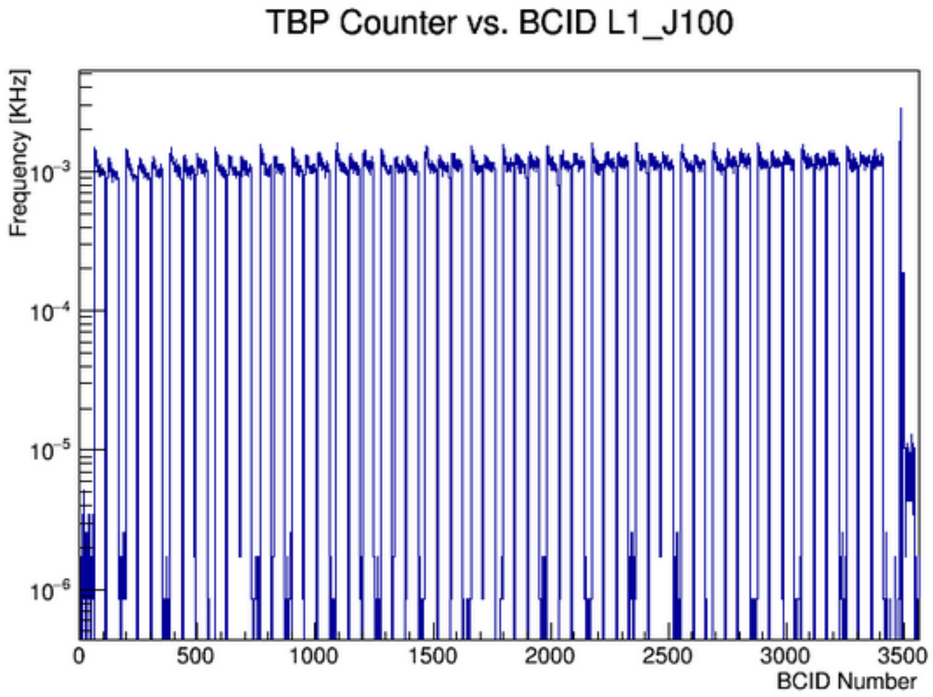
- New back-up trigger item for Luminosity monitoring:
  - Added L1_J12 in the high-freq per-bcid monitoring and in COOL

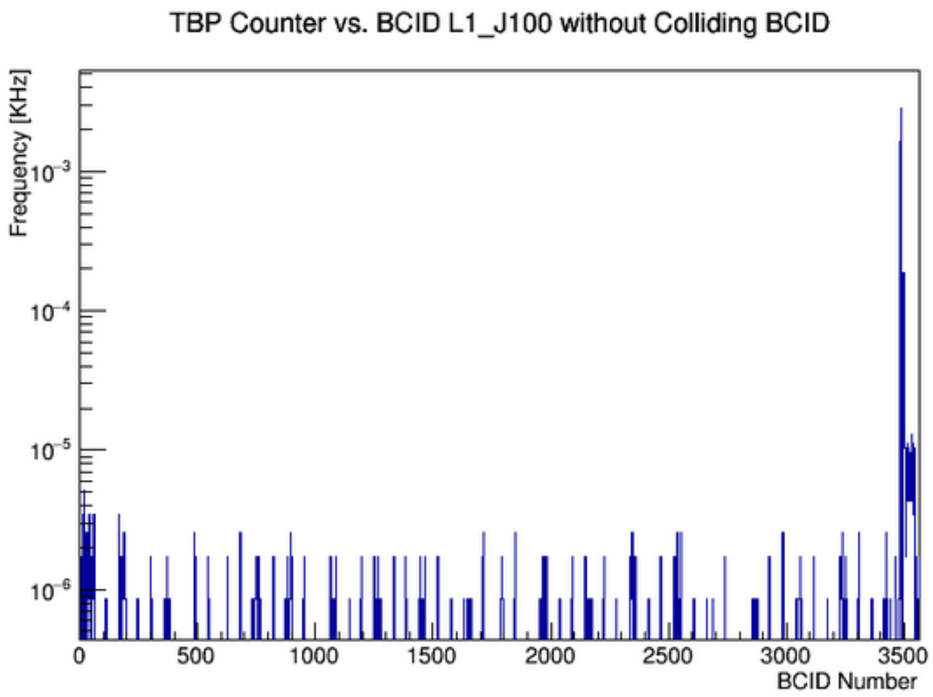
New Webpage: per BCID trigger rate monitoring

- https://atlas-l1ct.cern.ch/perbunch/
  - Shows per BCID trigger rates for each run, only the stable beams period (summer student project of Erez Zimmerman)
    - Left hand side: normal trigger rates
    - Right hand side: trigger rate in non-colliding BCIDs only
      - Easy to spot mistimed trigger items!

PBM lowFreq TBPperBCID L1 J100



PBM lowFreq TBPperBCID L1 J100 without Colliding BCID



Summary

- Several times hit by concurrent COOL accesses blocking data base
  - Rare occurrence - never during physics data taking!
    - Seems to be understood and solved in software

- Otherwise smooth running

- Few updates to Monitoring & Shifter assistant
- New Monitoring web pages

- No further development planned

- Phase - I installation is approaching fast
  - See talk by: Patrick (yesterday & later today)