ONSEN status: PERSY, RC, SC, Alarms, Future plans

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- 1 Activities at PERSY
- 2 Run Control and Alarms





- 1 Activities at PERSY
- 2 Run Control and Alarms
- **3** Future plans for ONSEN



Activities at PERSY - Short reminder on the setup



Activities at PERSY - what we searched for

Errors occured during Test Beam

- 1: Long absence of ONSEN PVs after cold start (Disconnected in CSS)
- 2: Inconsistent Run Control states betweeen HLT/EVB2/ONSEN
- 3: Most important trigger mismatch (mm) in the data

Debugging approach at PERSY

- 1: Reproducible every time
- 2: Reproducible
- 3: Very hard to reproduce
 - mm occured in very first runs taken unfortunately unknown starting conditions!
 - after cold start no mm in more than 150 runs!
 - exclude ONSEN from RC and reset it manually and assynchronus \rightarrow led to ERROR states in RC (what should happen) but no mm
 - \blacksquare exclude DHH from RC \rightarrow led to mm once, then only back pressure in ONSEN

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ightarrow will be further investigated with fixed ONSEN firmware (see talk by

Thomas)



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Activities at PERSY - Solution and conclusion

Solution

- 1: Solved by implementing linux shutdown (clean connection cut), 2 ways IPMI-program and IOC
- \blacktriangleright 2: Solved by implementing clean connection cut for SiTCP \rightarrow HLT/EVB2 know when connection to ONSEN is lost and will try to reconnect
- 3: Missmatch can not be reproduced reliably at PERSY, but when all systems are included to RC we never observed it. New firmware tested in Giessen with errors induced to the system on purpose was running succesfully (see talk by Thomas)

Conclusion

We are confident that all errors occured during test beam are solved with the new Firmware, the DHH reset and the clean connection cut done in the RC (later more).

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Run Control and alarms - *Alarms*

Meeting in Giessen

- A dedicated RC and Alarms meeting with Michael and Björn was held in Giessen
- The outcome of that meeting is documented in the pxd_sc_documents git repository as ONSEN-RC.pdf and alarms.pdf https://stash.desy.de/projects/B2G/repos/pxd_sc_documents/browse

Alarms for ONSEN

- In total we agreed on 29 alarms for ONSEN
- Alarms which inform about broken links can only be triggered in LOADING state
 in all other states the RC will directly go to ERROR if a link goes down, recoverable by ABORT/LOAD
- All other alarms can only occur during RUNNING state since they are related to data quality or buffer management

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Run Control and alarms - Run Control



Important changes

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- All connections are now enabled during LOADING!
 - \rightarrow HLT, EVB2, DHC and all internal ONSEN links can not connect before!
- All connections are disconnected cleanly during ABORT/UNLOADING!
- Reset counters during LOADING

Run Control and Alarms - Top overview of the ONSEN shelf in CSS

S(TOP)	ğ.	~ .		A	ONSEN Ove	rview verview	< °		 3
Menu buttons									
ONSEN Run Control	PXD Run Control	Link Statu	s Disconnect JTAG	IPMI She	If Rate Plots	DQM	Update Shelf		
Global RC Disconnected PXD RC Disconnected Disconnected Consest RC LOADING HLT DATCON	ONSEN OOM Flow[20] Flow	OR25 Flow) [P11 Reprog.] CO250 CO250 CO251 CO252 CO25 CO25	COOS Flow JEL Reprog. Coosing	COGS Freenow Free Free	COSS Flow EL Reproz Cossing Co	E E E P P P P P Y U U V Y	0105 Flow/ [1] Romain Reprog 0105 1000001 1000001 1000001 1000001 1000001 1000001 1000001 1000001 1000001 1000001 1000000	O115 Flowi RL Reproz outrast constant c	Oras Forwi RI Reprog.
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Near future plans for ONSEN - (Almost) Full system test in Giessen

Phase 2 is almost there...

- Beam Tests at DESY were successful, 10⁹ events and stable data taking over hours (one run over 18h)!
- \blacktriangleright We learned a lot about our systems \rightarrow fix bugs, even some which were unexpected
- Source of missmatches understood and fixed... (we are pretty sure)
- Next step → Scale up system

Plans for Giessen

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- ► Use simulated Ŷ(4S) events, VXDTF2 (1) and the ROI generator of basf2
- PXD data can be packed with the basf2 PXDPackerModule to satisfy the DHH data format
- ► ROIs need to be extracted from ROOT file, read ROI coordinates out of ROOT Tree → generate data with these informations

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Near future plans for ONSEN - (Almost) Full system test in Giessen

Why almost?

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- Only 6 instead of 8 selector Carrier boards in Giessen, no DHH
- Use as many AMC cards as possible to receive PXD data
- We can not use all AMC cards we have since some of them are used as DHC emulator

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Future plans for ONSEN - Data transmitting to EVB2



Current Solution

- ► Each selector card transmitts data via SiTCP to EVB2 → 32 cables
- In addition 32 cables for slow control and 32 for DHC input
- Merger comes also with 3 cables
- In total ONSEN needs 99 cables!!!

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Future plans for ONSEN - Data transmitting to EVB2



Current ONSEN @Giessen

- ► if i counted correctly 40 cables in picture → already very messi
- imagin there are 99...



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Far future plans for ONSEN - Data transmitting to EVB2

Combiner Idea

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- Place a 10th module, the combiner, in ONSEN shelf
- Receives reduced data via backplane MGT inks
- Events distribution among the combiner's xFP-cards accodirng to trigger number
- Data is further transmitted to a C-RORC card (Master Thesis Simon Reiter) and from there to a PC → EVB2, 1 cable!!!



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Far future plans for ONSEN - Data transmitting to EVB2

Benefits

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- Only 1 cable going to EVB2
- Save 24 cables for ONSEN
- Data transmitted via stable Aurora protocol to C-RORC and from there via PC/TCP to EVB2

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- SiTCP core on selector nodes not needed anymore → save FPGA resources
- All needed Hardware already in Giessen

Still some developements to work on...

- Firmware development for additionall Carrier and AMCs
- Implementation of Aurora to the C-RORC card
- Develop Software on the PC carrying the C-RORC card
- RC and SC for all new modules
- Nice to have: DQM on PCs GPU

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Far future plans for ONSEN - Data transmitting to EVB2, the C-RORC card



REF: A. Borga et al., JINST 10 (2015) 02, C02022



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Far future plans for ONSEN - Data transmitting to EVB2, the C-RORC card, test results

- Tested with 12 connections simultaneously (4 needed) @1Gbps
- Average transfer speed 1149.6 MB/s, limited by 450MB/s SSD



Thank you for your attention...

... and the organizers for this awsome meeting location!