

Workshop Concluding Remarks

2nd AACL Workshop on DAQ@LHC

Chateau de Bossey

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- ❑ All experiments have invested a lot of effort to prepare for Run2
- ❑ Alice, Atlas and CMS have installed new hardware
 - Basically because of obsolescence of Run1 hardware (death of PCI-X)
 - New PCs
 - Improved performance
 - CMS completely new event-builder and readout network!!
- ❑ LHCb did mainly software architecture changes in the HLT to maximize the quality of the physics data
 - Split HLT and quasi-online alignment and calibration
- ❑ All upgrades and changes seem to run nicely

Run-3 Systems and Upgrades (I)

- ❑ Timescales for LHCb and Alice are completely different from Atlas and CMS
 - Alice and LHCb will go through major upgrades during LS2 (2019/20)
 - Atlas and CMS will do their major upgrades mainly in-line with HL-LHC (LS3 2025/26 or so...)
- ❑ All upgrades aim at a significant increase in performance
 - LHCb will fulfil the physicists dream of trigger-free readout
 - ↳ 40 MHz DAQ, all selection in software
 - ↳ DAQ system handling ~5 TByte/s
 - ↳ Massive need for processing power to reduce event rate from 40 MHz to ~50 kHz
 - Alice will implement a continuous readout of the TPC
 - ↳ Loss of correlation between bunch crossing and event data
 - ~50 bunch crossings accumulated during the TPC drift time
 - Has to be re-established in software after reconstruction of TPC data
 - Heavy use of hardware accelerator (FPGA, GPU)

Run-3 Systems and Upgrades (II)

- ❑ Atlas Run 3 system upgrades dictated by detector upgrades (LAr Calo) which necessitates an upgraded (local) DAQ system
 - CMS has no major plans for Run 3
- ❑ Atlas and CMS will have to cope with the challenges imposed by HL-LHC
 - Surely LS3 is far away and no concrete plans are yet made
 - Some ideas are around and it's nice to brain storm
 - Surely HL-LHC will have a major impact especially on the processing requirements and data rates of the experiments

Hardware Trends (in industry)

- ❑ Presentations from Intel...
 - Intel OmniPath an interesting development, especially if it comes directly out of the CPU
 - ↳ Killer for Infiniband
 - Intel integration of FPGAs into CPU chips might be interesting for certain applications
 - ↳ Question is cost and impact on CPU performance (loss of cores, interference of memory accesses)
 - Otherwise not a lot of information from Intel besides reduction of feature size
 - ↳ Unclear what the additional gates are used for...
- ❑ ...and Seagate (very nice presentation)...
 - Disk capacity expected to increase at least until 2025 (120 TB per drive)
 - Many technical challenges
- ❑ ... and Arista
 - Main message... Moore's law still and also holds for networking
 - Deep buffering is not dead (yet)
- ❑ And Tapes will still be around for a long time
 - 140 TB tape cartridge in the lab...

Hardware Trends (in experiments)

- ❑ Strong trend towards PC-based components (PCI-Express cards)
 - LHCb/Alice Tell40
 - Felix in ATLAS
- ❑ xTCA is popular in CMS, but future (especially μ TCA) is not clear
- ❑ There is (maybe) also a trend towards common solutions for common problems.
 - Alice/Atlas new RORC
 - Tell40 (Alice and LHCb)
 - ↳ We would prob. have used Felix, had we known about it and if it had implemented some features we need
 - Actually fully commercial boards are (almost) usable
 - I still hope that Atlas and CMS could, for post LS3 era, agree on a common readout board.

- ❑ Very fashionable
- ❑ Likely to have its applications, but
 - Is not the panacea for everything
 - Very limited problem space
- ❑ Usual problem is
 - Data transfers to/from accelerator
 - Synchronisation between host/accelerator
- ❑ Do not forget to improve performance of CPU code
 - Benefits both online and offline immediately
 - ↳ There will (most probably) no accelerators on the grid/cloud...

- ❑ Many thanks to David who was the (slave)driver and main organisational wizard to make this happen
 - Thanks to Pierre for hosting the meetings for the organisers (including coffee and tea)
- ❑ Last, but not least, special thanks to Petya for the nitty-gritty organisation and setting up the agenda etc...
- ❑ I look forward to another workshop sometime
 - BUT I do hope I will not have to give the final remarks!

Thank you for attending!