

Summary Thoughts

ALICE, ATLAS, CMS & LHCb joint workshop on DAQ
Château de Bossey
14 March 2013
Beat Jost / Cern

First of All

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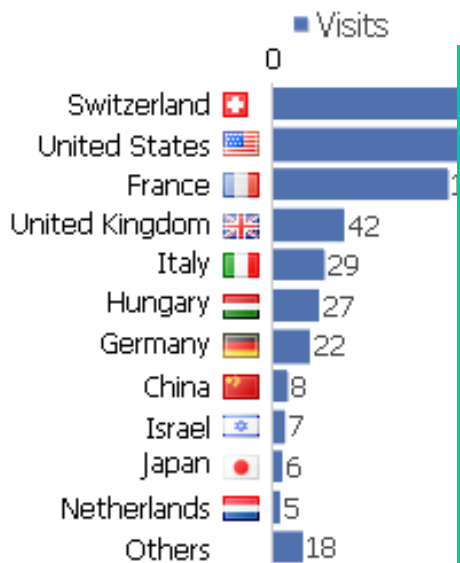
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☐ Last

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☐ Personal Notes

Visitors Geography



Participant:

ALICE	22
ATLAS	38
CMS	24
LHCb	10
Other	3
total	97

Not bad...

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From David's Introductory Remarks

DAQ @ LHC: Introduction

- ❑ Technical scope of the workshop
 - ❑ Data Acquisition
 - Including ALL software functionality, i.e. not just Data Flow
- ❑ Anticipated audience
 - ❑ DAQ/HLT groups of the four LHC experiments
 - ❑ Assume participants have a working knowledge of DAQ @ LHC
- ❑ Aim at providing a forum to:
 - ❑ share experiences on operating data acquisition systems at the LHC
 - ❑ share vision(s), ideas and plans for the evolution of these systems
 - ❑ exchange ideas and status of ongoing R&D
 - ❑ Look for synergies and not technical solutions
- ❑ Go beyond what is offered existing conferences
 - ❑ More detailed technical exchange across experiments
 - ❑ Bring colleagues working on similar topics together
 - ❑ Facilitate exchange ... and If I was in HR Networking

- ❑ In general everyone is quite happy with their systems up to now
- ❑ Upgrades during LS1, i.e. for Run 2 are stimulated more by replacing old/obsolete hardware/technologies (PCI-X) than really new requirements
 - New technologies, e.g. $\geq 10\text{GbE/IB}$ allow simplifications and rationalizations, especially for the event building networks (CMS, Atlas uniform network)

- ❑ Tomorrow \equiv Run 3+
- ❑ Atlas and CMS no major upgrades (prob) in the DAQ systems, besides the standard 5-year replacement cycle (maybe taking advantage of newer technologies)
- ❑ Alice and LHCb are foreseeing a major upgrade for this period
 - Alice: ~ 2 orders of magnitude higher data rates
 - ↳ Continuous TPC readout
 - ↳ Full online reconstruction throwing away raw data (ambitious/daring)
 - ↳ Making Online computing infrastructure a GP Alice computing centre used online and offline
 - LHCb: eliminate hardware trigger in the long run (LLT as intermediate stage)
 - ↳ ~ 40 times higher data rate
 - ↳ No architectural changes foreseen, just application of modern technologies, if they work... \rightarrow R&D
 - As usual higher rate to tape (somehow reoccurring theme)

❑ Major steps for Atlas and CMS

- Introduction of new trigger level (Track trigger) after high p_T trigger
- Higher readout rates (500-1000 kHz) compared with 100 kHz today
- And again... higher rate to tape

❑ Personal note

- I would hope that the two experiments can come together and find a solution based on a common effort
- This is a unique opportunity

HLT Developments

- ❑ Demands on CPU power will always be increasing
 - Higher multiplicity
 - Do more in HLT to increase sensitivity/purity
- ❑ What can we do to match
 - Moore's law still helps
 - ↳ Not in clock speed
 - ↳ More cores per chip
 - Memory is the bottle neck (amount and bandwidth)
 - Forking (checkpointing) and COW help for some time (surely till LS2)
 - One event one process (maybe some parallel algorithms) is still the most efficient
 - ↳ Have to make sure that we use the capabilities of the CPUs to their maximum
 - 'Coprocessors' (GPU, XEON-PHI)...
 - ↳ Very sexy (fashion only?)
 - ↳ Needs a lot of work to get the code running efficiently and producing identical results
 - Use 'non-physics' time of LHC (deferred triggering)

❑ Parallel buses are dead

- Already for a long time for data (performance)
- Now also for controls

❑ Fashion for boards nowadays xTCA

➤ Features:

- ↳ Support for high-power boards (cooling, power)
- ↳ Board-board communication paths (PtP, star/mesh topologies)
 - Only used in trigger applications
- ↳ Very small form factor

❑ Links

- If GBT comes in time and works, will most likely be used for transferring data out of detector
 - ↳ Lot of effort invested. Performance?

❑ Storage

- Disks get bigger and bigger
- Problem is to organize the data over the disks (RAID, ODS)
 - ↳ Recovery from failures
- In general we will always be able to write out our data
 - ↳ Maybe not for free but surely affordable

❑ System Monitoring and management

- Very wide field and myriad of approaches
 - ↳ Often fashion driven
 - ↳ Looks as if convergence will happen eventually, maybe, with some luck to some degree

Conclusion (1)

- ❑ I think the workshop was useful
 - If only to 'learn' what others are doing
 - ↳ Actually I learned a lot even of what happens in LHCb...
- ❑ Can we find common solutions to common problems?
 - Yes and no...
 - Seems to have some new motivation to do it in the young generation
- ❑ LS1: Share experience (e.g. on common tools)
- ❑ LS2: further common discussion about choices
 - Some topics have clearly been suggested
 - DQM/Histogramming
 - Control
 - Technology tracking and tools testing
 - PON
 - Dataflow Monitoring

Conclusion (2)

- ❑ Should we repeat it?
 - Well... up to you!
 - Maybe not every 2 weeks, but maybe in 12 months (well before the end of LS1) or in 18 months (just before beam)?
- ❑ Groups talking to each other between now and the next edition
 - Either on specific topics as suggested during the workshop
 - Or make a joint wrap-up brainstorming between a few people to propose the next steps
- ❑ I was missing the controls (DCS) community.
Maybe a consequence of the title of the workshop.