DAQ system hardware status

David Ward (Cambridge)
for UK DAQ groups: Cambridge, Manchester, RHUL and UCL

EUDET Annual Meeting, Geneva, 19–21 October 2009

Outline

- System overview and recent progress
- Status of the individual (hardware) components
- System tests
- Numbers of each component and availability
- Summary and issues

DAQ system overview

(**Detector Unit**: ASICs)

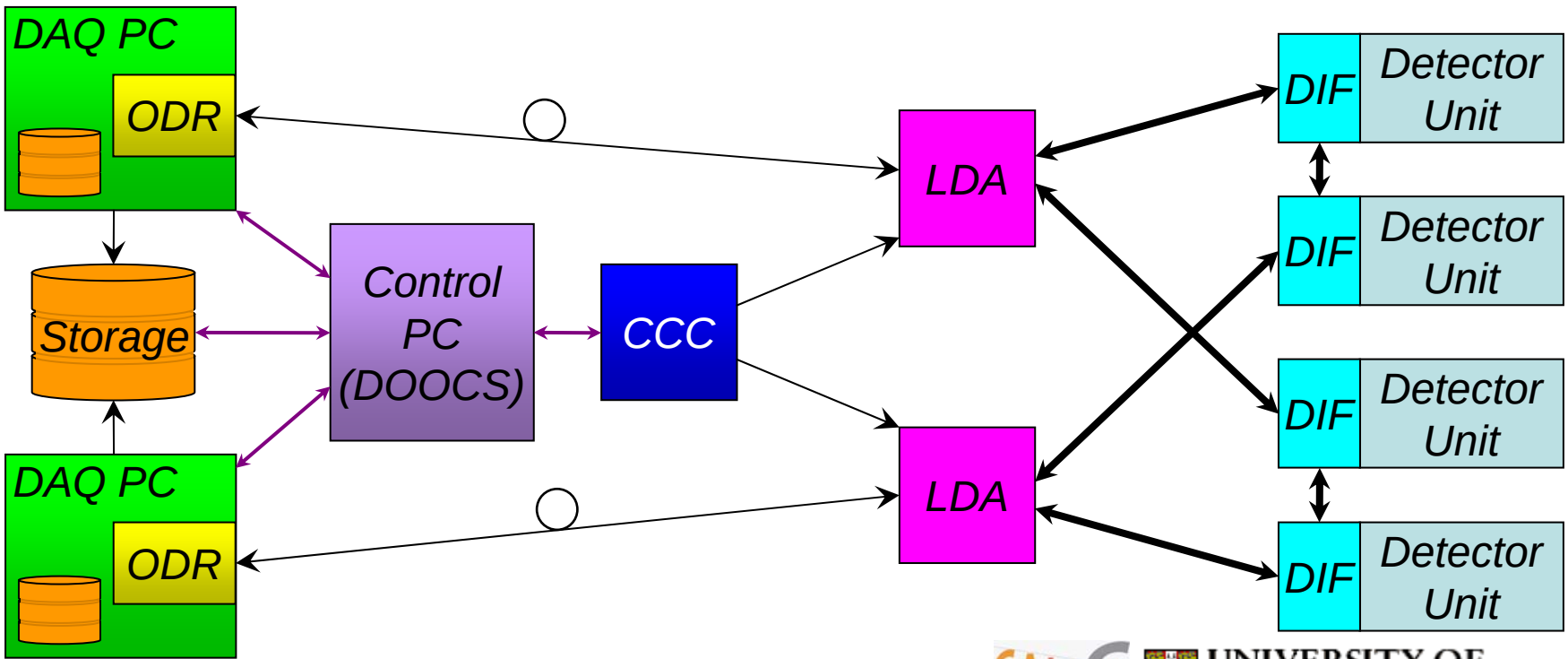
DIF: Detector InterFace connects generic DAQ and services

LDA: Link/Data Aggregator fansout/in DIFs and drives links to ODR

ODR: Off-Detector Receiver is PC interface

CCC: Clock and Control Card fans out to ODRs (or LDAs)

Control PC: Using DOOCS



Overall status—progress in last year

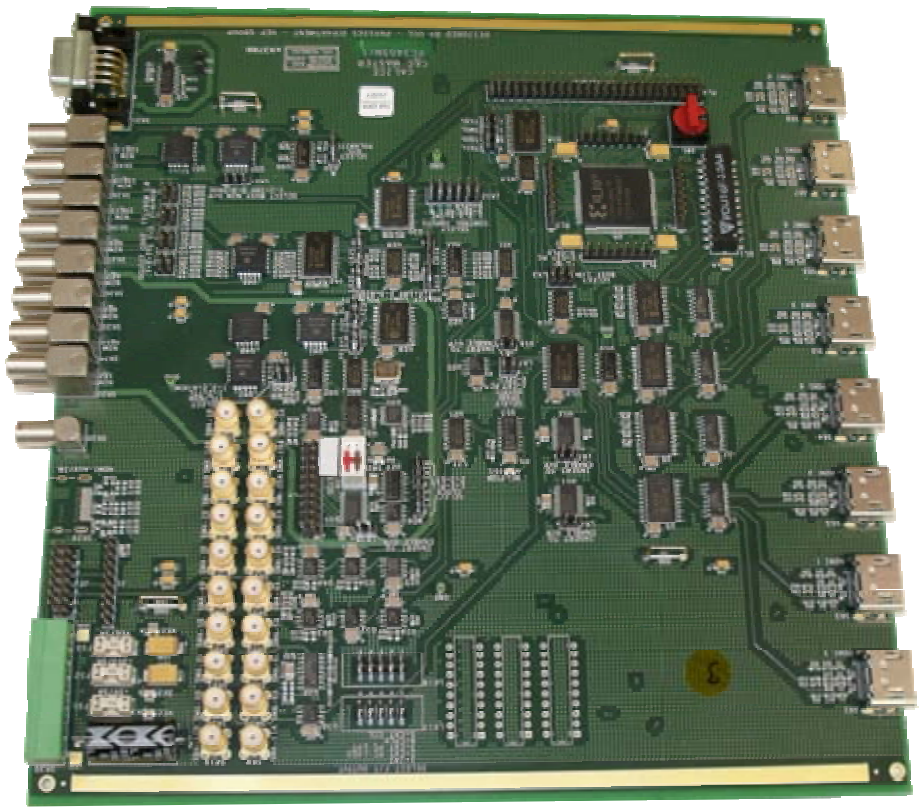
- Final hardware tweaks and production versions of relevant components.
- Hardware orders so as to have enough systems available for lab and beam tests.
- Firmware improvements and finalisation.
- Delivered a full set of components to LLR for use and testing.
- System tests getting DAQ chain running are ongoing.

ECAL DIF

- The ECAL DIF developed by the Cambridge group; HCAL DIFs developed by other groups, but all within the DIF task force.
- Produced a prototype board which worked well, in use at LLR. Have reduced number of components, whilst maintaining functionality (e.g. FPGA).
- Two DIFs have been produced and being used in system tests. Will now produce full run of 40 ECAL DIFs—all PCBs and components in-house.
- Not time critical but will start soon.
- Firmware being debugged in DAQ system tests.

C&C card

- Incorporates all needs and connectors requested by calorimeter groups.
- Full complement of 10 boards with power supplies tested (one of which in LLR).
- CCC link to LDA still needs to be done : simple PCB attached to LDA.



- [Functionality
- CLOCK : machine
- FAST_OUT : transfer asynchronous triggers
- FAST_IN : used by DIFs to “stop acquisition”
- TRAINSYNC_OUT : synchronisation of all front-end slow clocks]

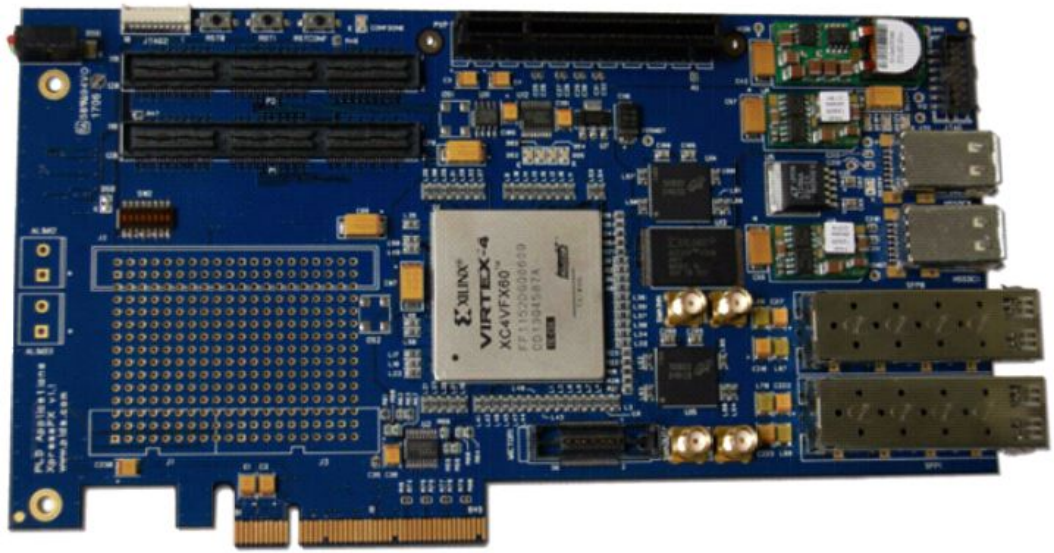
LDA

- The LDA (from Enterpoint) consists of : a Mulldonoch2 baseboard; an add-on HDMI board to connect to 10 DIFs; and an add-on ethernet board to connect to an ODR.
- Have 20 baseboards in-house.
- Have 5 ethernet boards in-house, 20 being manufactured.
- Have 5 HDMI boards in-house, 20 being manufactured.
- Firmware development ongoing :
- get DIF <=> LDA link running
- general improvements (different compilers)
- new code posted
- Hardware problems have been fixed by Enterpoint and new add-on boards should be delivered in two weeks (hopefully).
- Slightly complicated by Marc Kelly's departure.

So this is an example of commercially-available, off-the-shelf equipment ... all of which needed some corrections / additions / modifications from ourselves...

ODR and DAQ PC

- System has generally been stable for a while :
- Firmware written.
- Control software.
- Linked to LDAem, LDA, etc..
- Performance optimised.
- Working on documentation and code repository in SVN.
- Interfaced with DAQ software.
- Customised DAQ PCs.



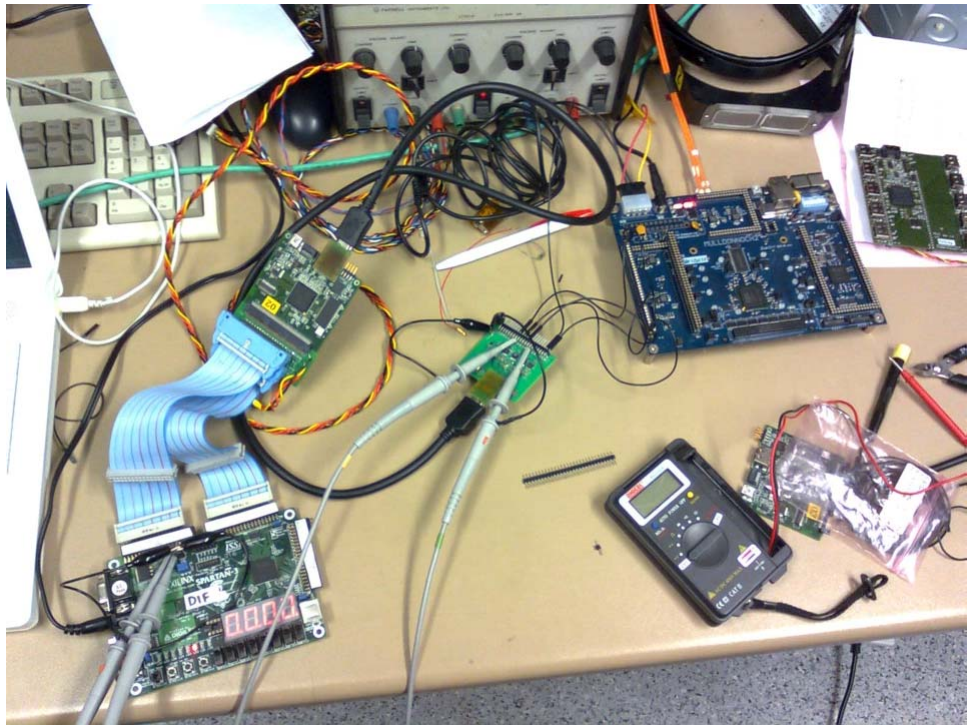
- Have 8 ODRs in house along with 6 DAQ PCs, one of each is at LLR.

DAQ Software

- Started development using DOOCS software mainly by V.Bartsch and T.Wu.
- They have both left and David Decotigny (LLR) has taken over.
- Discussions ongoing also within context of FP7 bid for ideas as to the best way to go.
- We (UK) will be able to provide some additional effort for next ~6 months to help.

System tests

- Have a system set-up in UCL : DAQ PC with ODR <=> LDA <=> DIF :
  - using network analyser and 'scope to check signals
  - using both prototype and production DIF
  - this highlighted bugs and improvements...
  - have sent commands ODR => LDA and received data back LDA => ODR
  - have sent commands all the way up to the DIF, ODR => LDA => DIF
  - link DIF => LDA has not yet been established—firmware updated and being debugged
  - hopefully just a matter of a weeks until working.



Hardware numbers needed

- Detectors' requirements :

- ECAL : 30 layers → 30 DIFs, 3 LDAs, 1 ODR and DAQ PC, 1 CCC
- AHCAL : 48 layers ⟶ (48 DIFs), 5 LDAs, 2 ODRs and 1 DAQ PC, 1 CCC
- DHCAL : 40 layers ⟶ (120 DIFs, 14 DCCs), 2 LDAs, 1 ODR and DAQ PC, 1 CCC

- In general UK DAQ groups have to provide :

- 30 ECAL DIFs, 10 LDAs, 4 ODRs, 3 DAQ PCs, 3 CCCs;
- sufficient spares for test-beam running;
- additional systems for tests in labs.

- Our procurement schedule is :
- 40 ECAL DIFs (have 2, components for 40)
- 20 LDAs (baseboards in-house, add-on boards expected in couple of weeks)
- 8 ODRs and 8 DAQ PCs (have 8+6)
- 10 CCCs (have 10)

Summary

- Progress made (firmware, purchasing, developing) for all components and system as a whole.
- We are gradually building up a stock of components which should be sufficient for lab and beam tests. Complete very soon.
- Completion of EUDET milestone, “DAQ system available” satisfied by having production versions of hardware and a system at another institute.
- We need to have a debugged system within the next few weeks, then make sure the system at LLR is also running and stable and then provide systems to other groups.
- By the end of the year, UK effort will decrease rapidly.
- Work is and will be thoroughly documented on the wiki and archived in a code repository