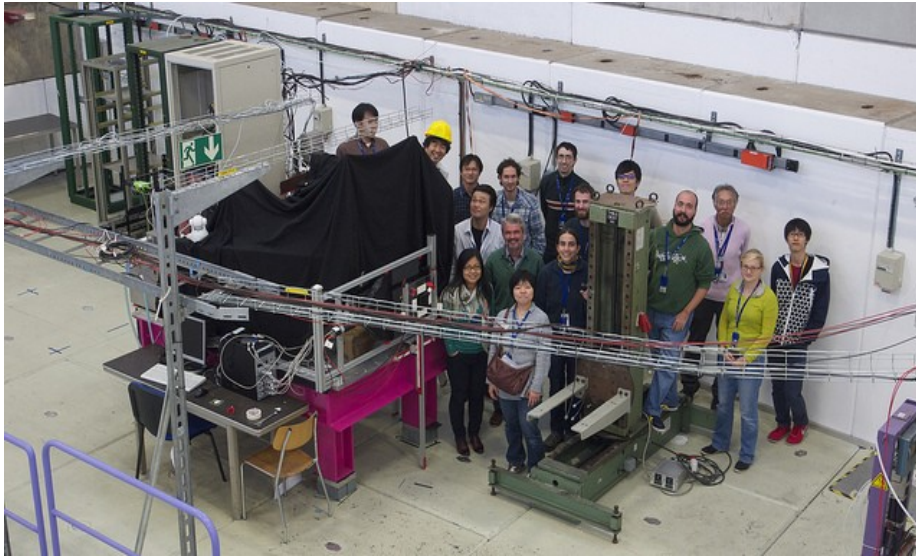


EUDAQ for combined test beams



Nov-Dec '14 Beam test period

Adrian Irles

Asian Linear Collider Workshop ALCW2015
20th April 2015,
KEK Tsukuba, Japan

Introduction

> Combined DAQ: towards “real” detector...

... and test beams: combined Silicon+Scintillator , calorimetry+tracking, etc

- Common data formats → LCIO
- Common global control → EUDAQ
- Common timing (CCC, TLU)

> What it is done?

- EUDAQ running the Silicon and Scintillator calorimeter layers together (Dec. 2014, T. Suehara)
- Same configuration used in DESY testbeam (only Sc-AHCAL)

> EUDAQ team is working in a new version (EUDAQ1 → EUDAQ2)

- mini-TLU developed in AIDA
- Fresh push in AIDA-2020



> Data Acquisition (DAQ) framework, modular and portable.

- Originally developed for pixel telescope in the ILC targeted EUDET initiative, since then successfully and widely used by LHC community too

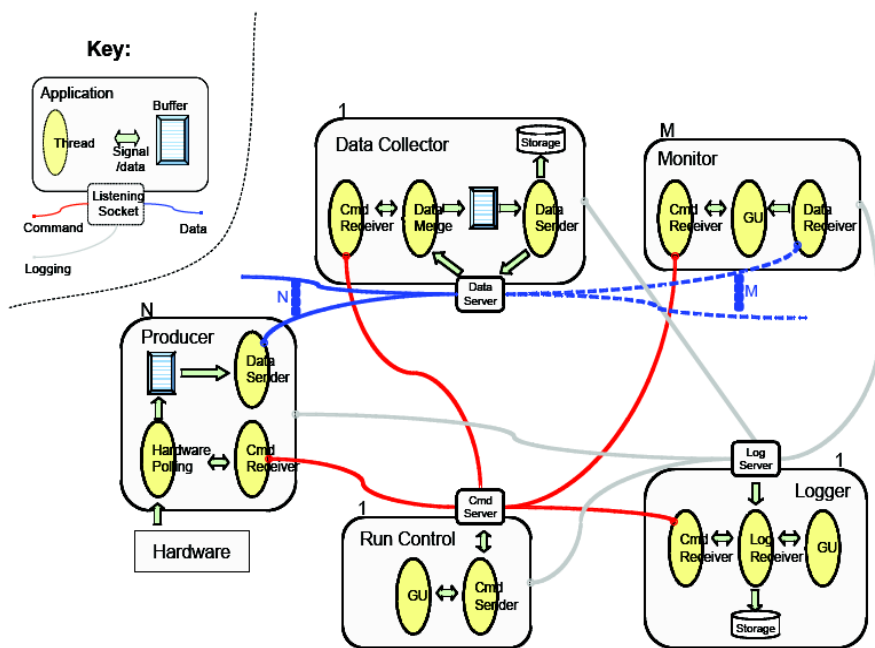


Figure 1: Schematic of the DAQ architecture.

> Central Run Control

- (commands and status)

> Producer processes

- configure hardware, read out the data, send it to the Data Collector.

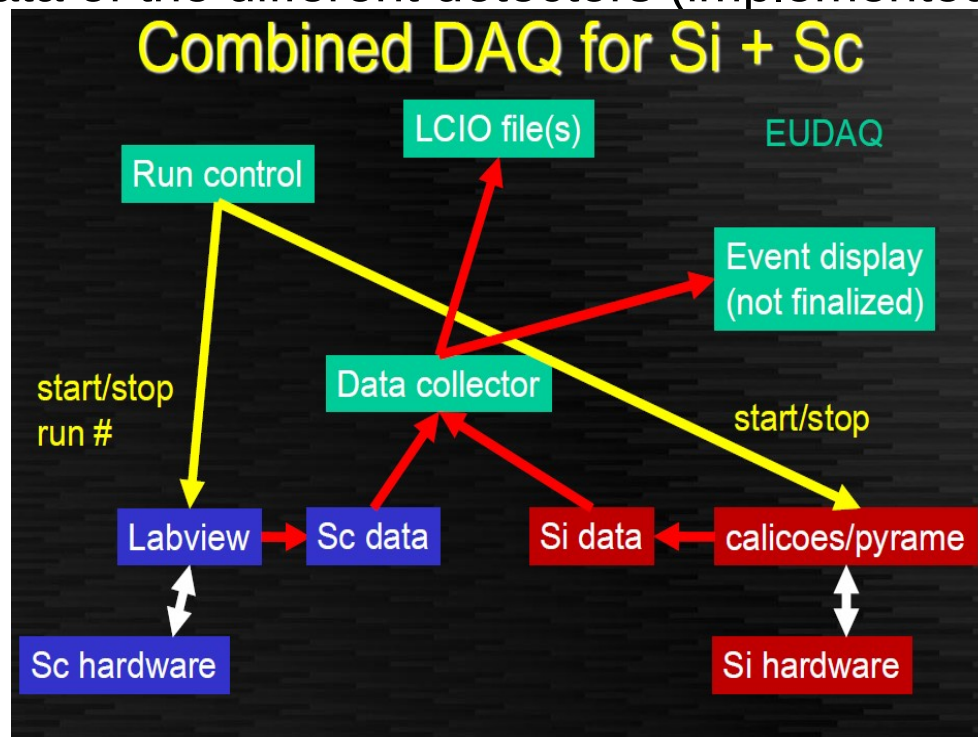
> The Data Collector

- receives all the data streams from the producers and combines them into a single stream.

> Easy and flexible conversion of the raw output data to other formats (LCIO)

EUDAQ (1.X): combined DAQ for ILC calorimeters

- > First time with different ILC calorimeters running together, **Nov-Dec'14 testbeam**. Using EUDAQ v1.3.1 and T. Suehara implementations
 - Sc layers (3 EBU + 12 HBU), 1 Si layer (FEB8 from Kyunshu) (See E. Brianne talk on 19/04/15)
- > The EUDAQ sends the START/STOP commands to the DAQs and collects the data of the different detectors (implemented by T. Suehara)

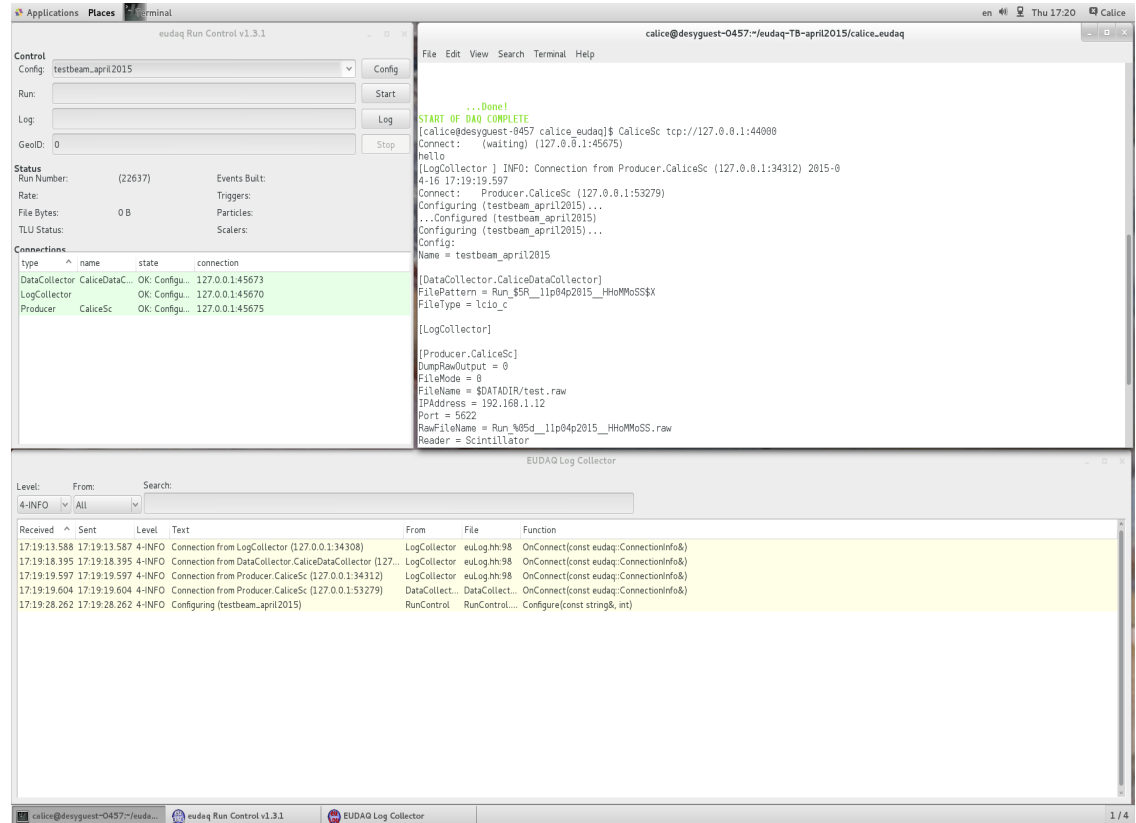


EUDAQ (1.X): combined DAQ for ILC calorimeters

- > Same configuration (with minimal modifications) and EUDAQ version has been used in last DESY testbeam (7-12 April 2015)



- UHH Ketek “repaired”
- UHH new Ketek
- UHH/UHD SensL
- 2 new ITEP boards
- SMD Mainz board



See E. Brienne talk on 19/04/15

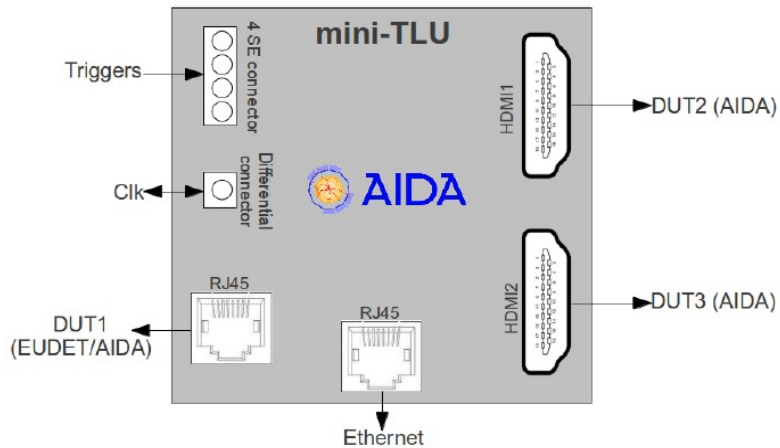


Common DAQ: integration with EUDAQ (1.3.1)

- > Same configuration (with minimal modifications) and EUDAQ version has been used in last DESY testbeam (7-12 April 2015)
- > Obtaining the data in LCIO format:
 - converted from the raw data produced by the **Labview** DAQ or created directly by **EUDAQ** (see H.L. Tran talk on 19/04/2015)
 - Both sets of data should be equal (comparison is under progress)
- > LCIO format is event based
 - Real event-time definition is done offline (see slide 9)
- > To do (short term):
 - Check 1.4 and 1.5 tags (stable release)
 - Converge to an unique LCIO format and definition of events
 - Online monitor (?)



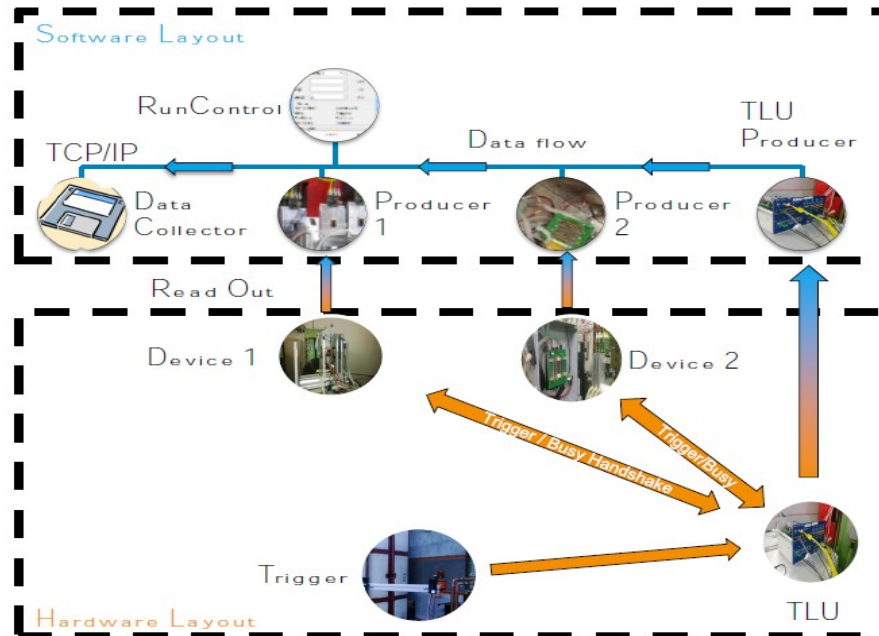
EUDAQ2 and the miniTLU



- > Successor of the TLU Trigger/Timing Logic Unit
- > Hardware developed in AIDA, Bristol, D. Cussans
- > Simple and flexible interface for fast timing and triggering signals.
 - Can accept or provide a system clock
 - Accepts asynchronous trigger signals from external sources
 -
 - Converts them in synchronous signals (to send to the device, triggers, etc)
 - Records timestamps
- > Generic design

EUDAQ2 and the miniTLU

- > EUDAQ2 is in beta release.
 - Synchronous readout with a common trigger → TLU/mini-TLU (Trigger Logic Unit)
 - Every Data Stream is stored separately → the TLU is the central authority of merging
- > Event building need to be done
- > Plans to have a stable and documented release of EUDAQ2 by ~ summer 2015



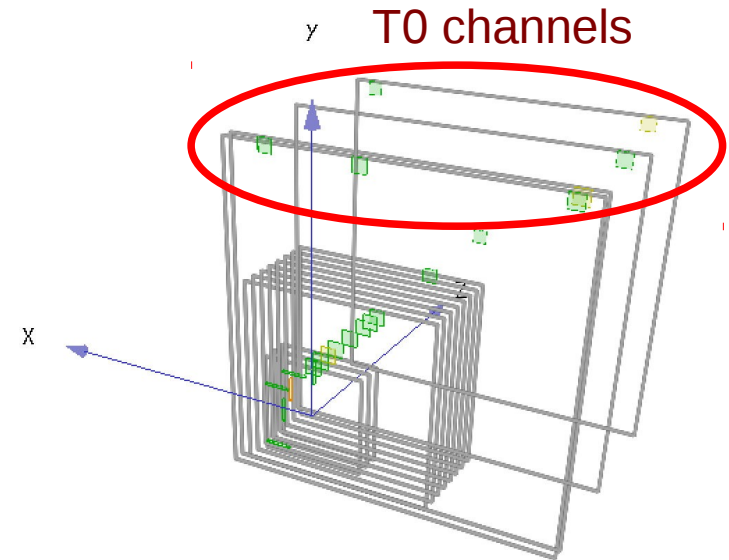
Moving to EUDAQ2

> In our test beams we not use a trigger to timestamp the event.

- Auto trigger mode: we just look for a cluster in time dimension to define the time event.
- Correlating these time events with an external trigger scintillator to avoid backgrounds.

→ for example, Sc AHCAL approach:

Feeding the trigger signal into a SiPM channel



Muon

One example of muon event after simple cut of 0.5 MIP

HLTran - ALCW2015 - CALICE Collaboration Meeting 19/04/2015

Moving to EUDAQ2

- > A Beam InFormation module is needed to do this in a more robust & flexible way
- > The new **mini-TLU** implemented in **EUDAQ2** can be used as **BIF**
- > **Needs work to implement a new firmware** that takes the trigger and timing out from the TLU. (J. Kvasnicka will work on this)



Summary

- > The integration of a **common DAQ** for CALICE is in progress.
 - First combined runs at the end of 2014
 - Same setup used in 2015
- > Common DAQ for Linear Collider gets a **fresh push in AIDA-2020**
 - EUDAQ2
 - mini-TLU
- > To be discussed further at AIDA-2020 kickoff meeting at CERN June 3-5

