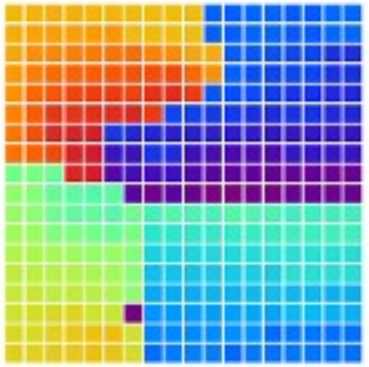


Calicoes

Calice OnlinE System

Frédéric Magniette

ÉCOLE POLYTECHNIQUE ParisTech

ilc international linear collider

LAL

cnrs dépasser les frontières

AGENCE NATIONALE DE LA RECHERCHE ANR

AIDA

CALICE Calorimeter for ILC

IN2P3 Institut National de Physique Nucléaire et de Physique des Particules

ANR-2010-BLANC-0429-01

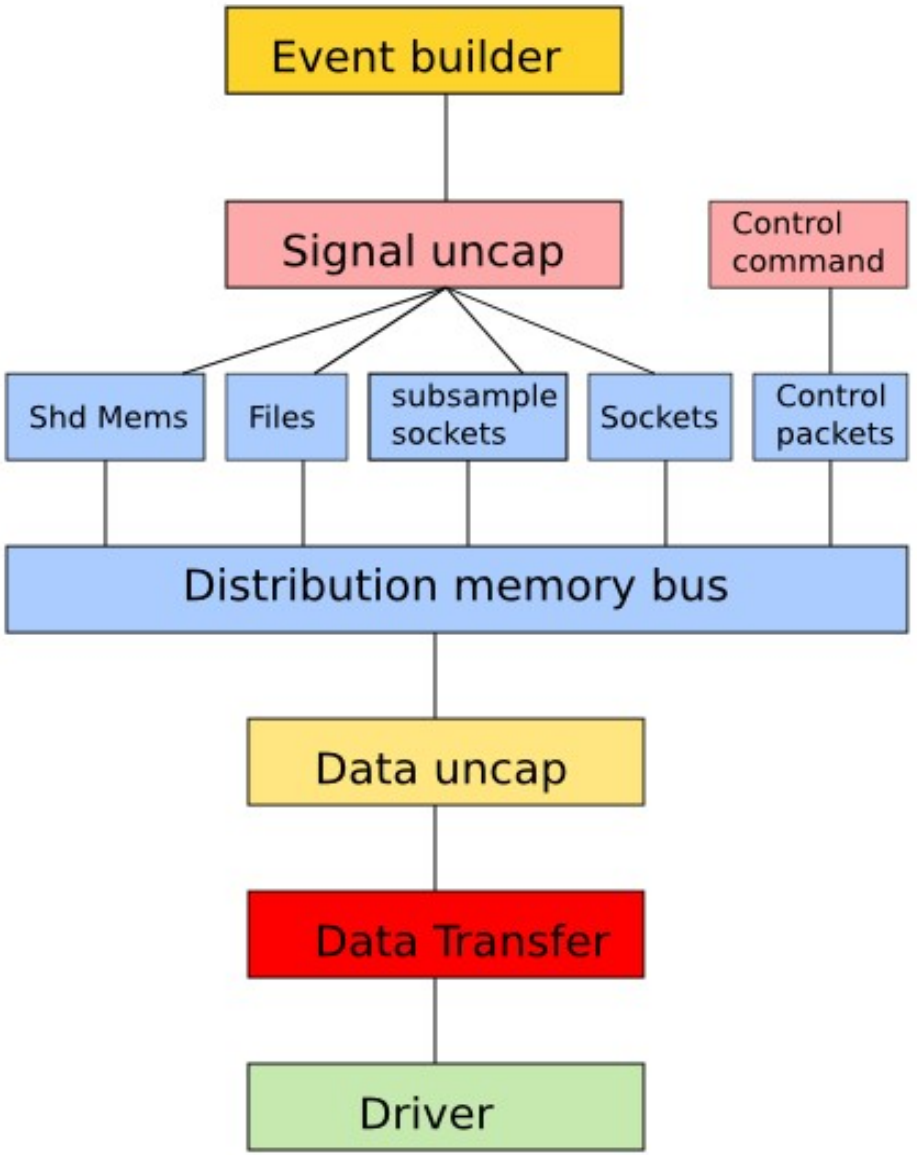
The Needs

- Acquisition Chain : developpement from scratch
- Control-Command Chain (replacement for buggy Liblda)
- Human-Machine interfaces
  - For DAQ debugging
  - For data acquisition
- Properties
  - Calice compatible (DIF-LDA-Ethernet Calice format – can use different Omega Rocs)

Design Concepts

- Internal Modularity
  - Functional blocks with easy communication channels (on the Unix model)
  - Every block is making few but making it fast and good
  - Easy evolutivity
- Parallelism
  - Massively multi-threads approach
  - Pipelined treatments

Acquisition Chain



Global BD

Skiroc

Generic

LDA/ GCC/ DIF

Raw socket

Ethernet Usb PCI(e)

building events

(de)coding ASIC signal and control

Offering various distribution mode

Checking Uncapping Reordering Tagging

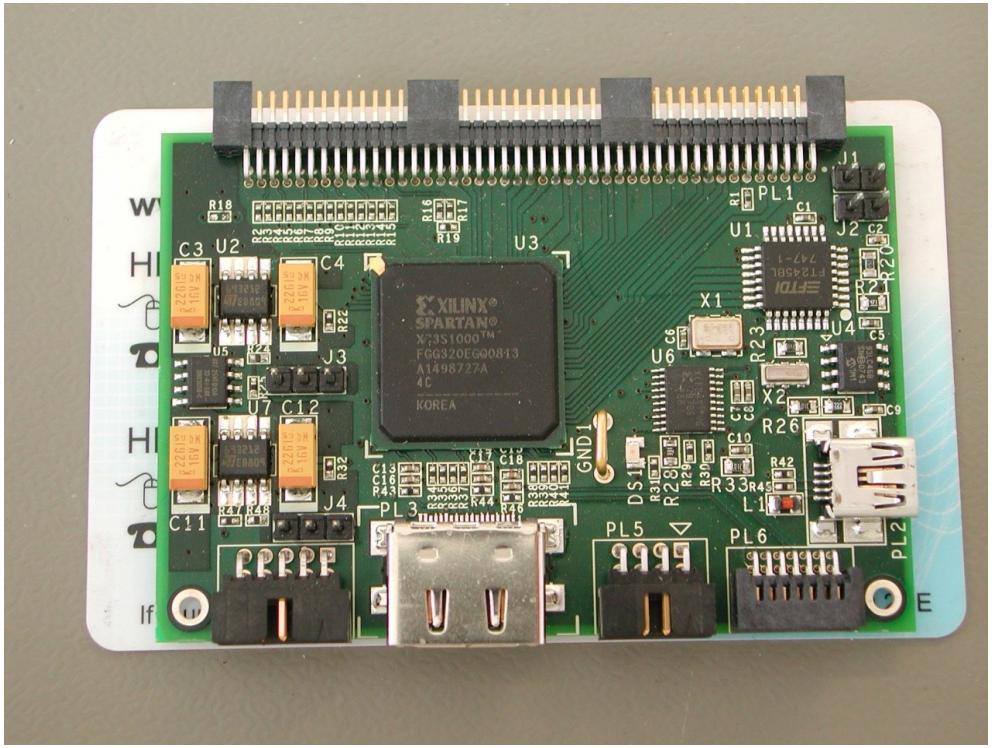
Transfering from/to media

Interfacing kernel and hardware

Low level Transfer

- Standard Ethernet driver (e1000)
- Low-level socket (SOCK_RAW)
- Limited in rate by the SOCK_RAW implementation
- Projects to speed up: integrating UDP in GDCC

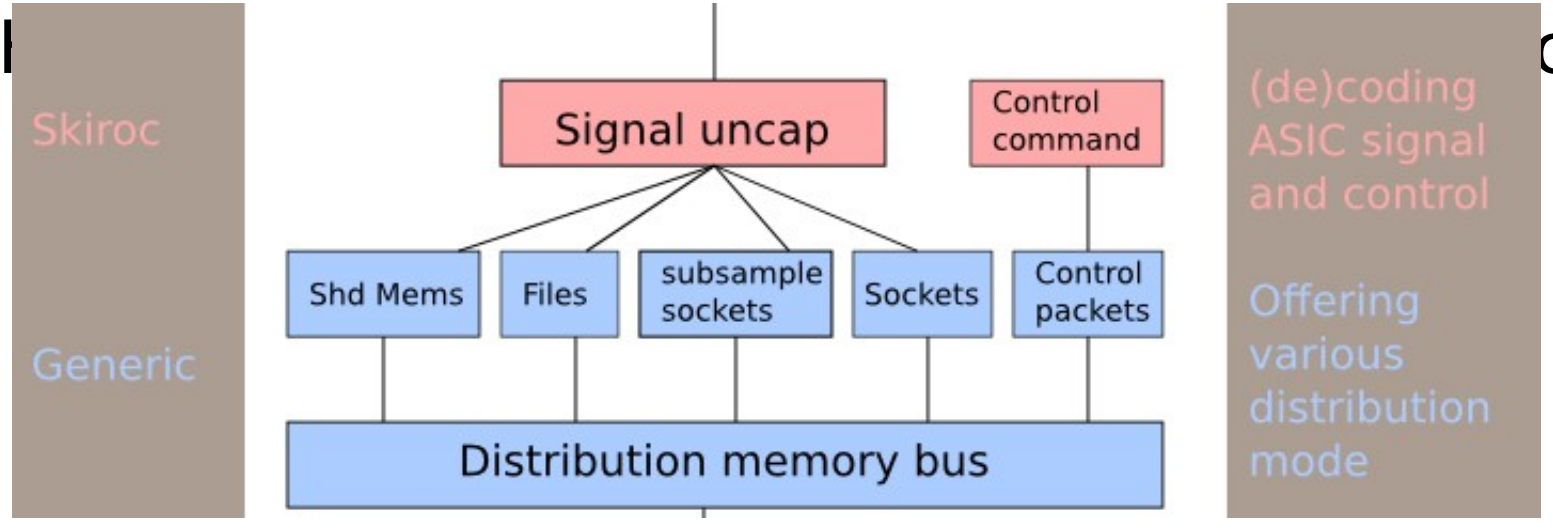
LDA/DIF Readout uncap



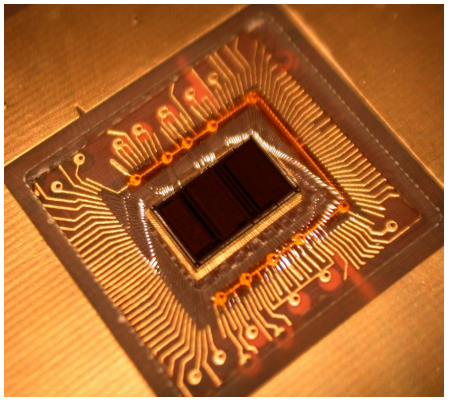
- One of the two specific parts of the system (dependant of the DIF Firmware version)
- Functionalities : uncapping packets, DIF tagging, loss control, integrity control
- Implemented in an external library for genericity and maintainability

The distribution bus

- Split data into beams (by dif)
- Offer the maximum flexibility in data treatment
  - Offline through files
  - Remote online through sockets
  - Subsampling sockets for slow online analysis programs
  - I ory



Signal Uncap



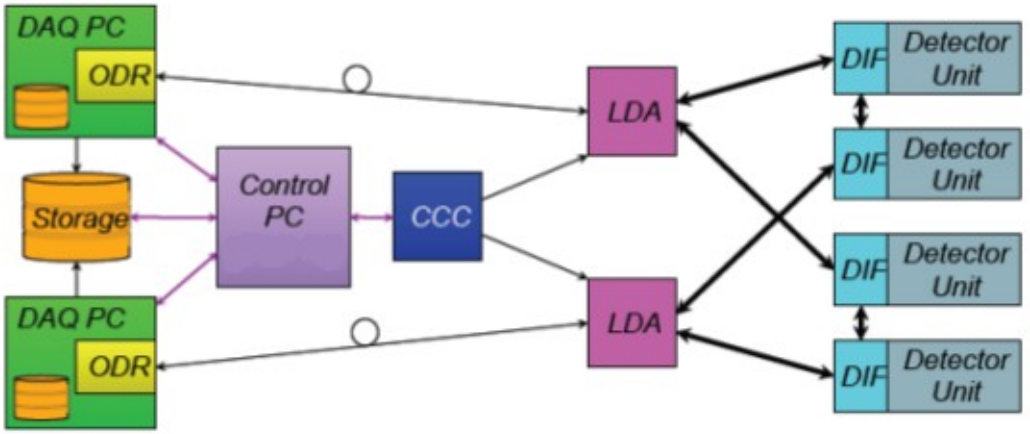
- The second specific block of the system (dependant on the roc chip version)
- Actually adapted for skiroc, can be ported easily to spiroc or any other Omega chip
- Uncaps the skiroc data to produce isolated physical events
- Output a plain text format (without loss of information)

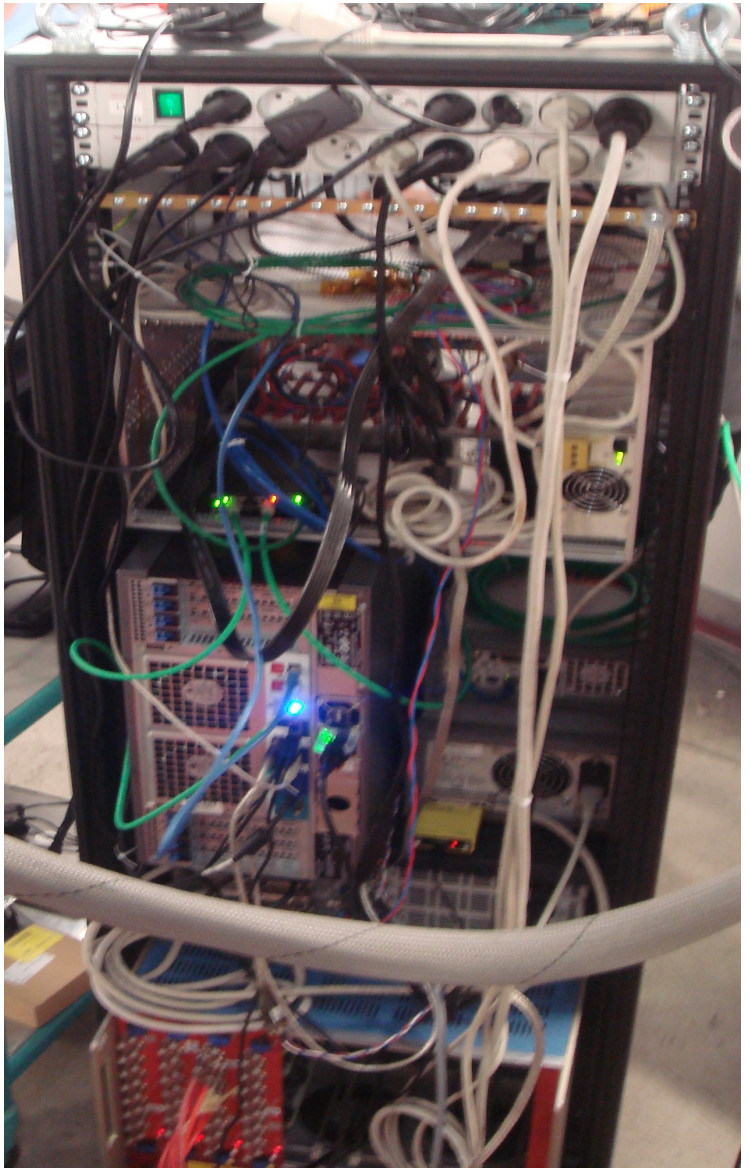
The Control-Command chain

- All devices has their module in the control-command
- Based on the pyrame framework (LLR)
- All accessible through the pyrame GUI

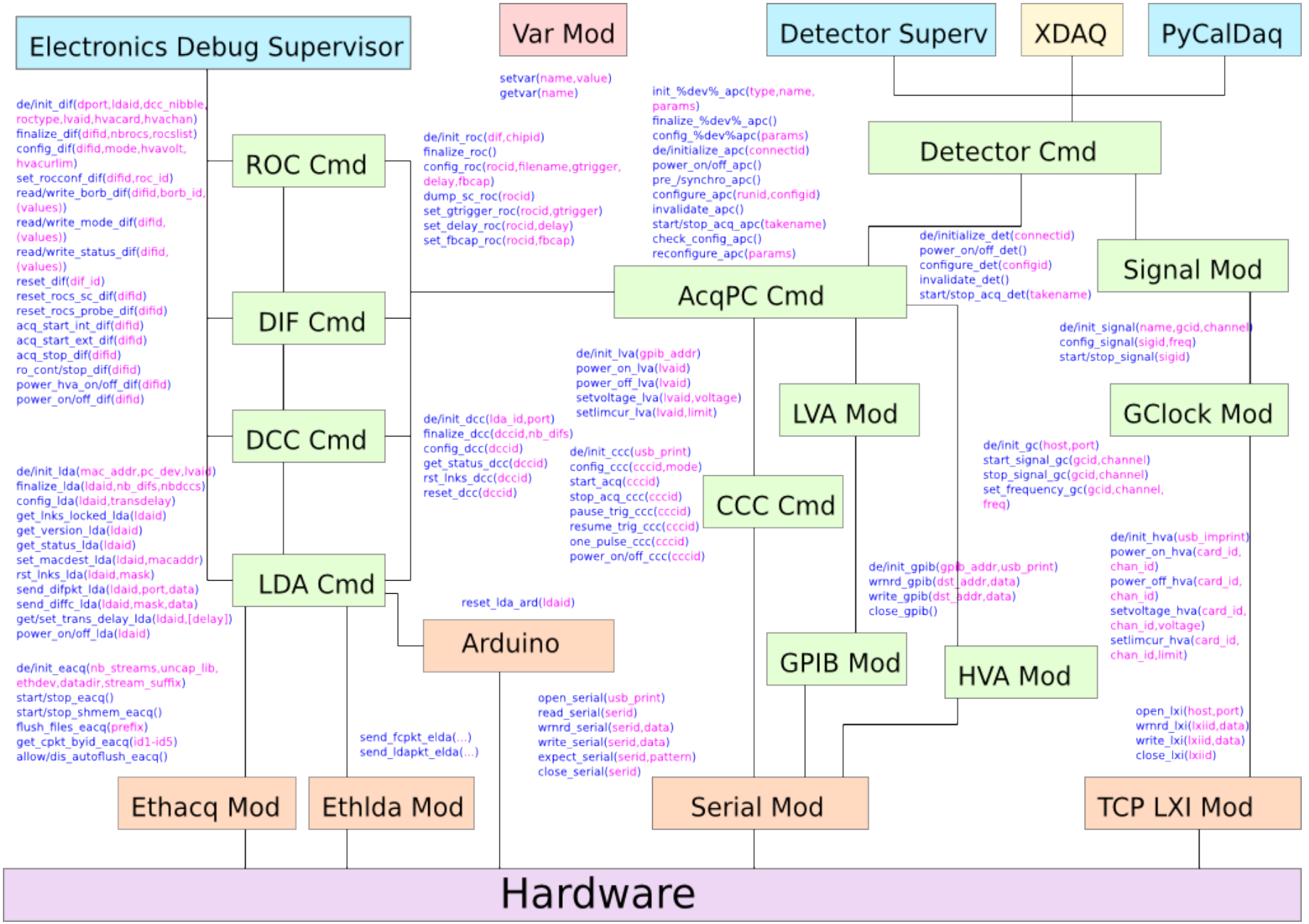
The actual ECAL hardware

Hardware	Comm Bus
Pulse generator	Ethernet LXI/TCP
High Voltage power supply	RS232
Low Voltage power supplies	GPIB
LDA Reset device	Arduino
CCC	RS232/USB
LDA/DIF	Ethernet



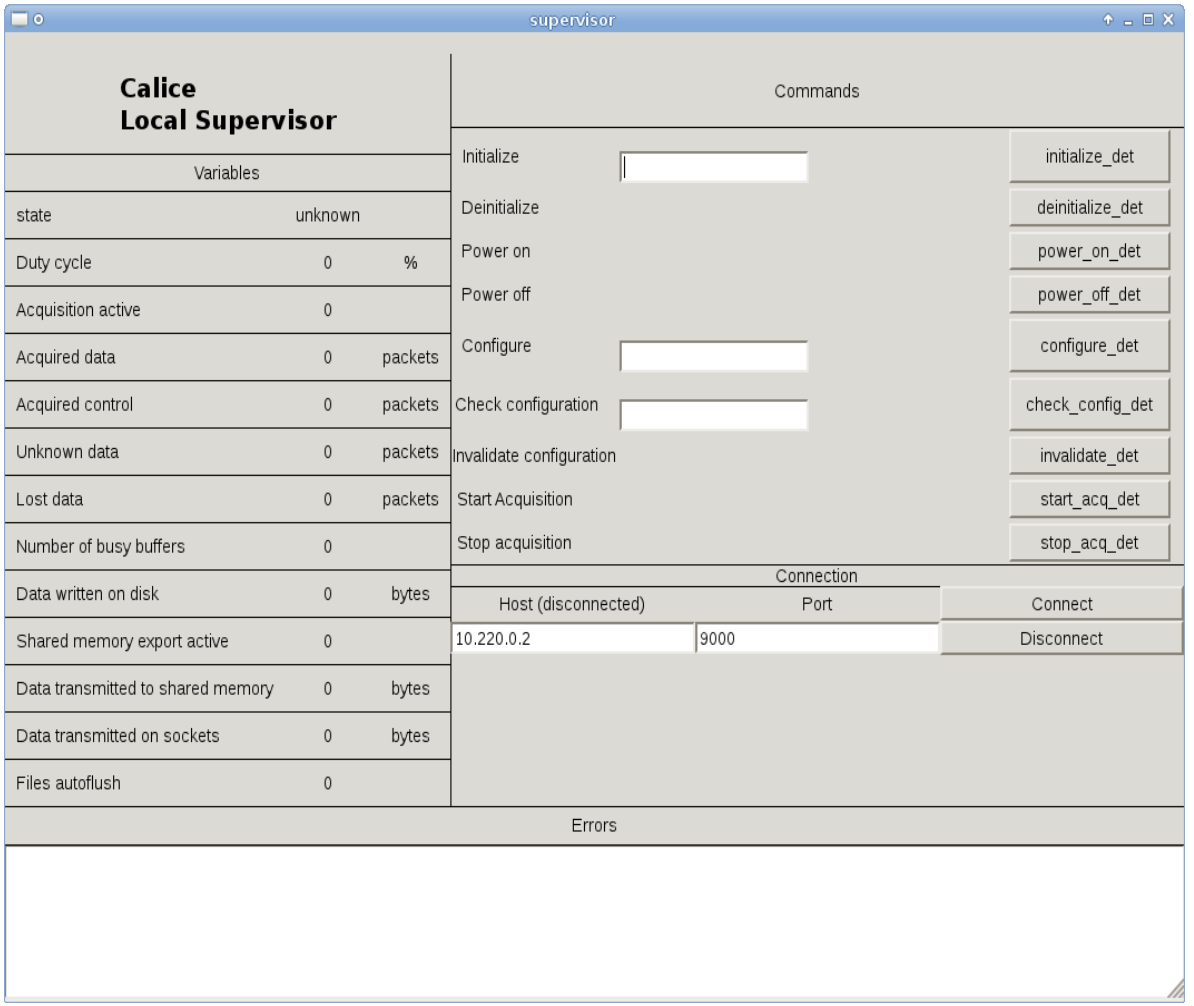


The Big Picture

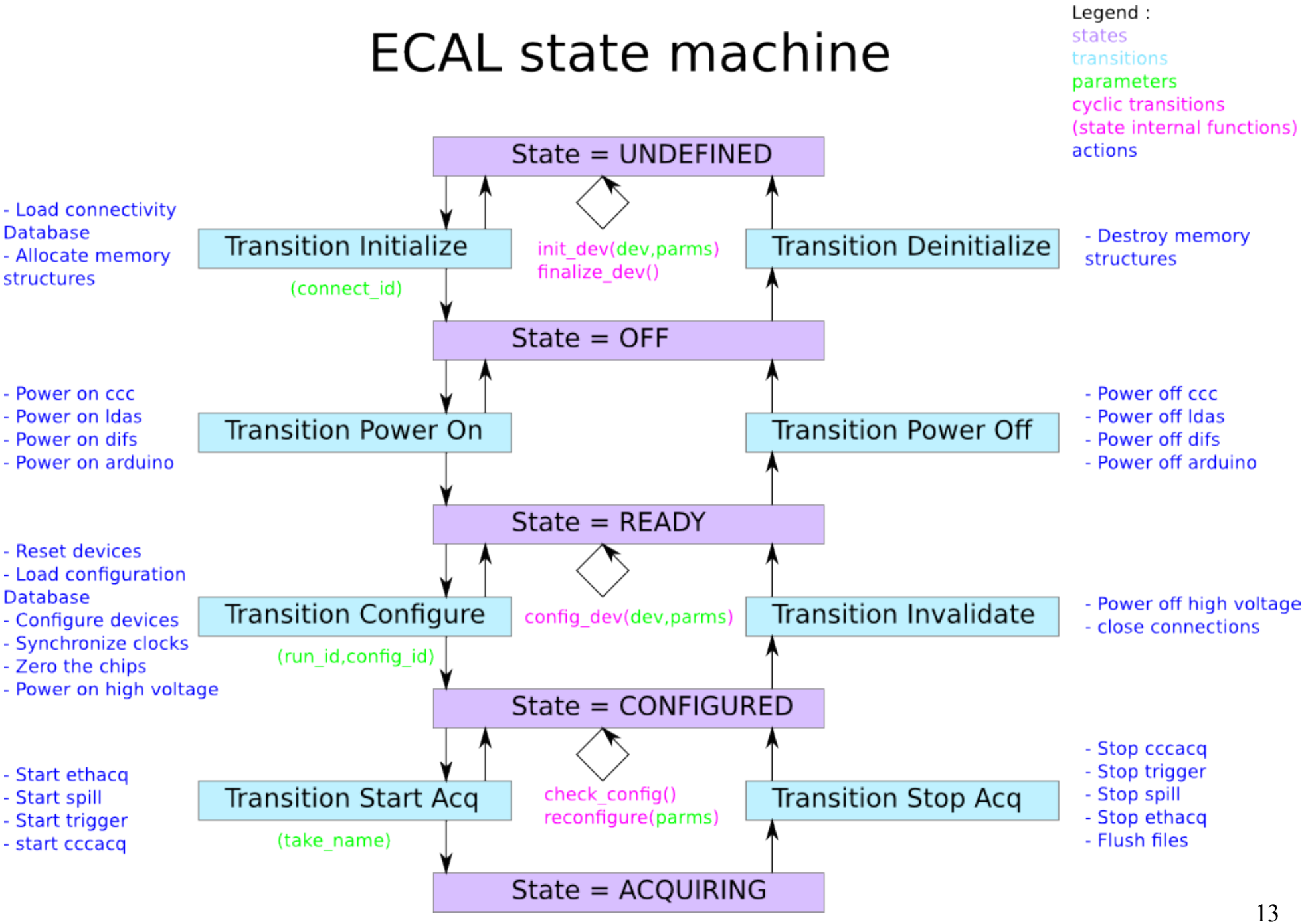


The detector control command

- Detector Abstraction Layer
- Allows only the global detector transitions with integrity checks
- Commands all the other blocks
- Based on a state machine

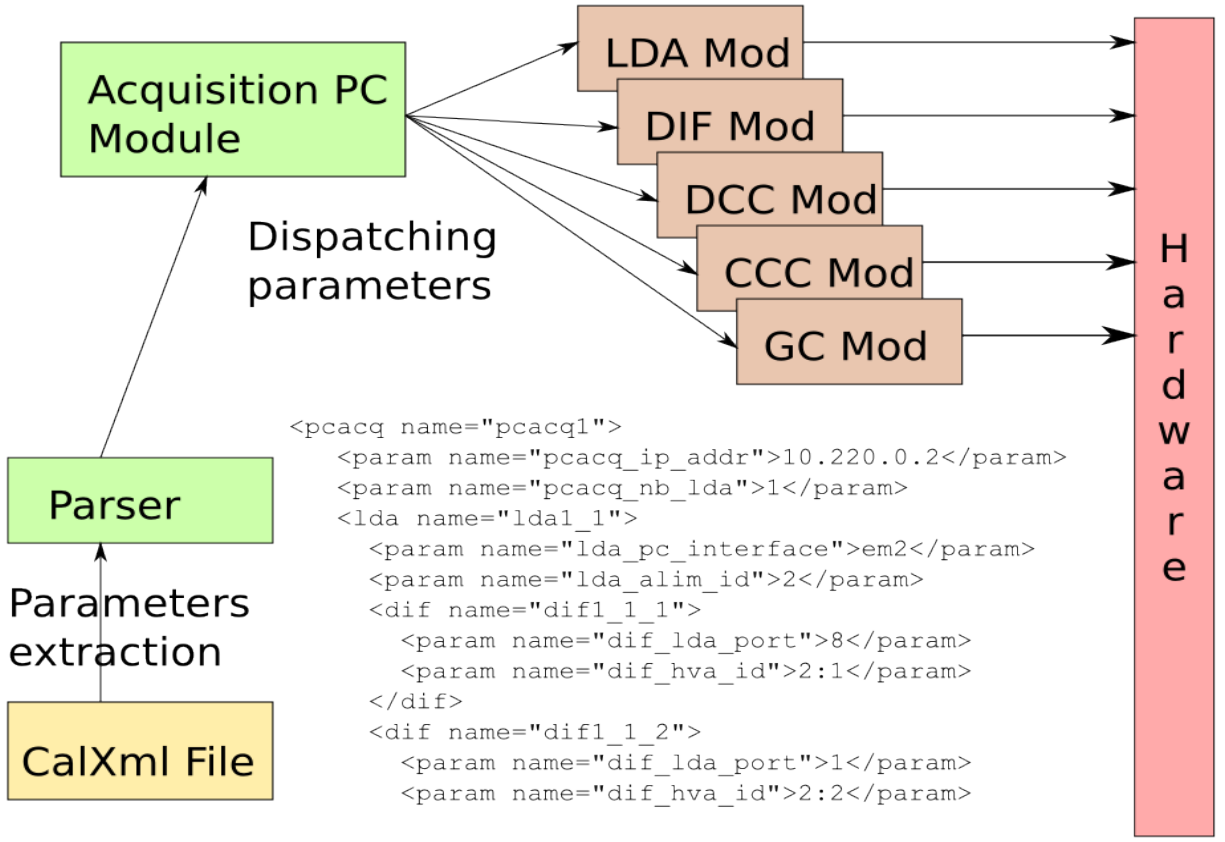


ECAL state machine



Unified XML configuration format

Parser sends « init » and « config » orders to every modules



Pycaldaq : a scripting interface

- Embedded Python scripts to pilot the whole detector
- Programmed or interractive sessions
- Very useful for calibration

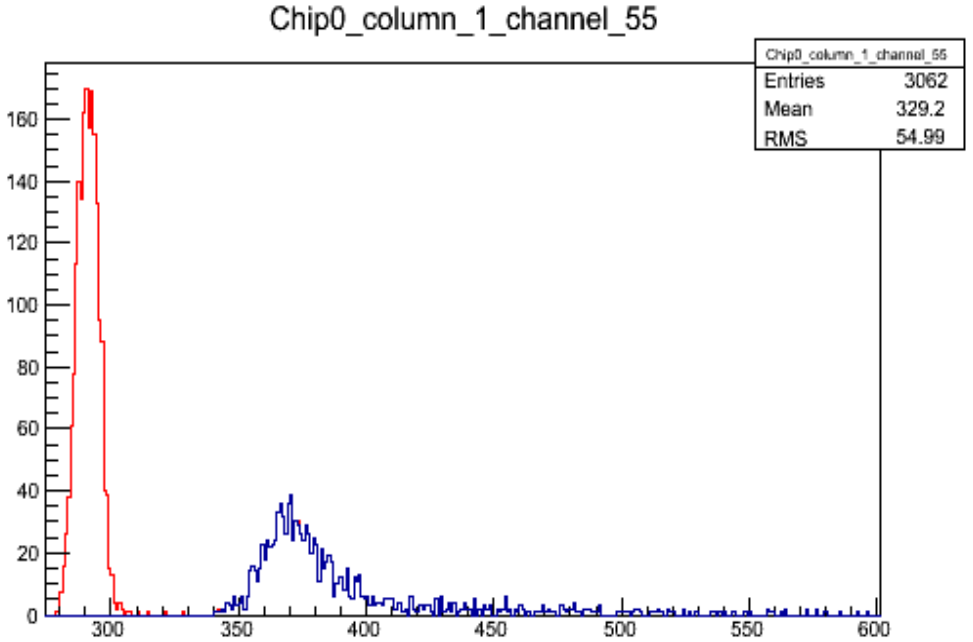
```
import caldaq

def acq_run():
    caldaq.start_acq()
    caldaq.start_spill()
    caldaq.start_trigger()
    time.sleep(15)
    caldaq.stop_trigger()
    caldaq.stop_spill()
    caldaq.stop_acq()


caldaq.flush_files("trash")
for trig in range(150,401,15):
    caldaq.set_gtrigger(trig)
    acq_run()
    caldaq.flush_files("calib_trig%d" % (trig))
```

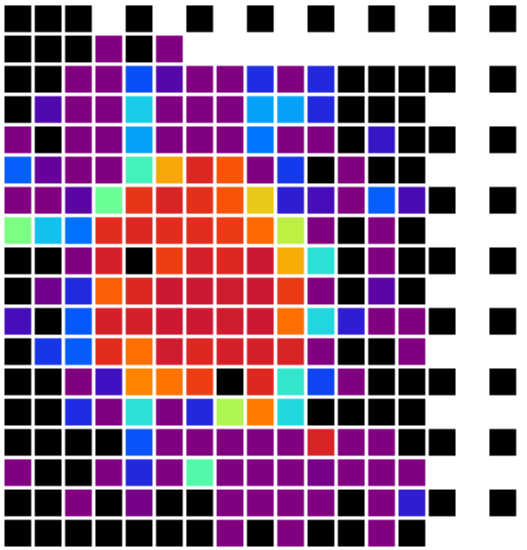
Online Monitoring

- Ongoing work
- Integrating online data in a circular buffer
- Allows to display real-time physics histograms and curves
- Soon available for Root and R



Hitcam

- Graphical visualisation of hits
- Online visualisation tool
- Adjustable gain
- Can be used offline : video generation
- Useful for :
  - beam spotting
  - online visual data control
  - beam supervision



Results

- Good data rate : perfect for 10 Hz
- Very good reliability
  - 15 days of beamtest at DESY without bugs
  - 3 weeks of calibration without a problem
- Easy to use
  - Multiples graphical interfaces
  - Programming interface
- Good evolutivity
  - Any block can be improved and modified easily by anybody

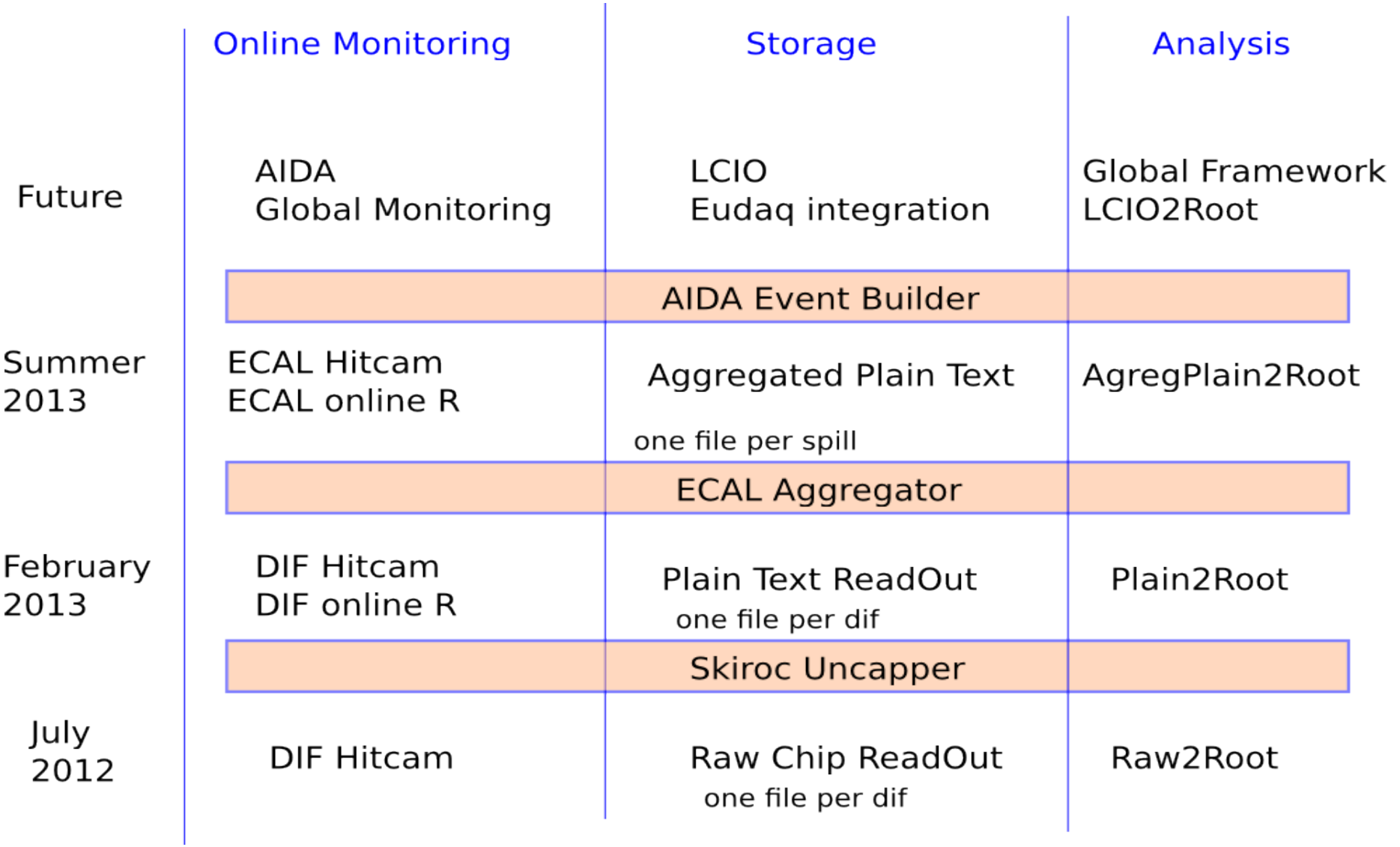
Perspectives ?

- Increasing the flow rate by specific modification : plan to use UDP in GDCC
- Online event building : Eudaq / AIDA
- Integrating the system in a global SCADA system (XDAQ / AIDA)

The Framework connection

- Not implemented now
- Connection to XDAQ for Lyon SDHCAL compatibility
- Can be easily compatible with any other framework Doocs, Tango...
- High level integration : replacing the detector GUI (the state machine steering)

Output Perspectives



Thank you for your attention, any questions ?