Overview of CALICE DAQ system

Daniel Jeans, LLR École polytecnique

Korea-France meeting SKKU, May 2011

DAQ version1

Used in first "physics prototypes" for SiW-ECAL, Sc-ECAL, A-HCAL, TCMT

Large custom boards

DAQ version 2

Under development for a number of years

Miniaturisation of components

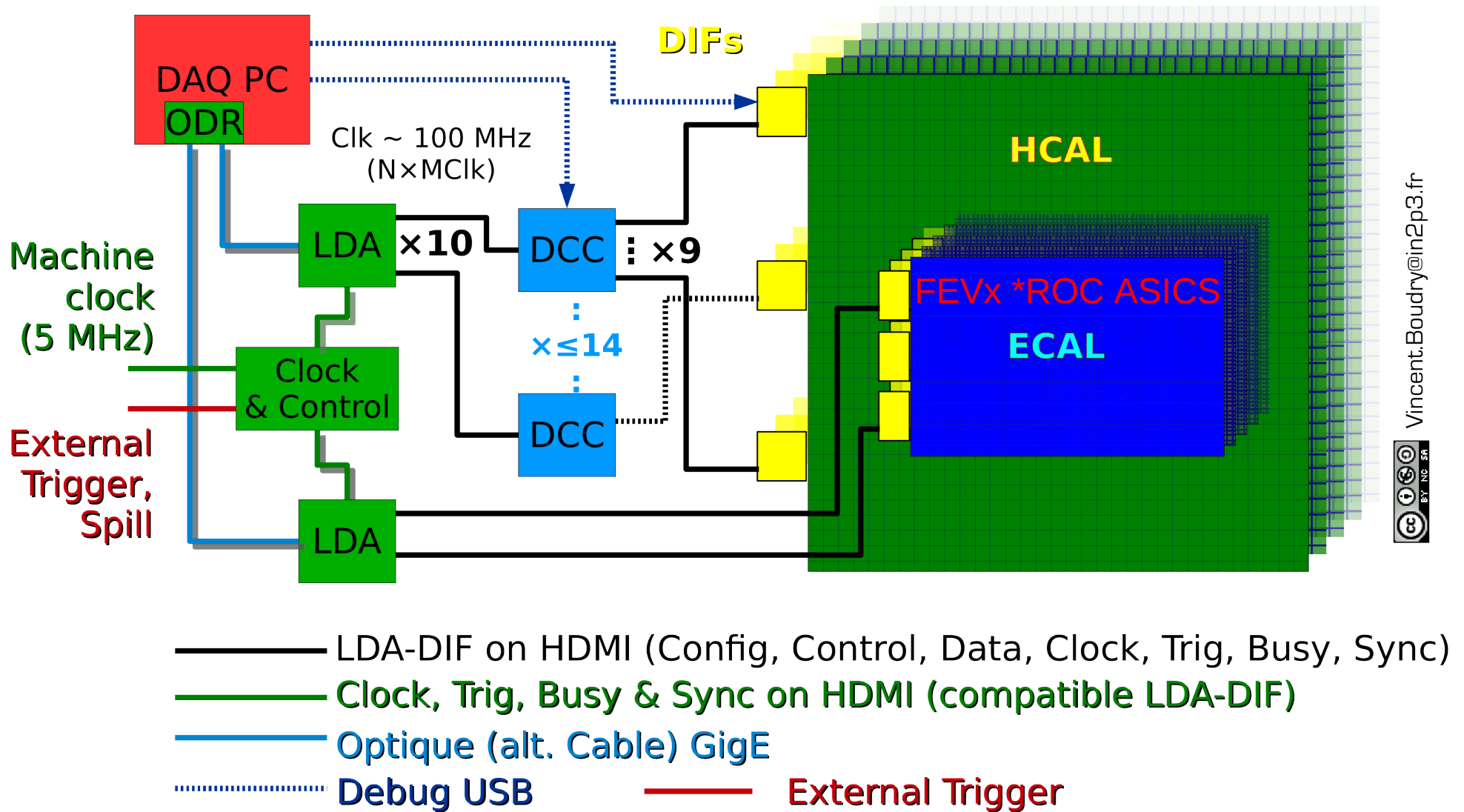"off-the-shelf" components

Scalable architecture -> towards final detector
Suitable for test-beam <1M channels
Extendable to final detector >100M channels

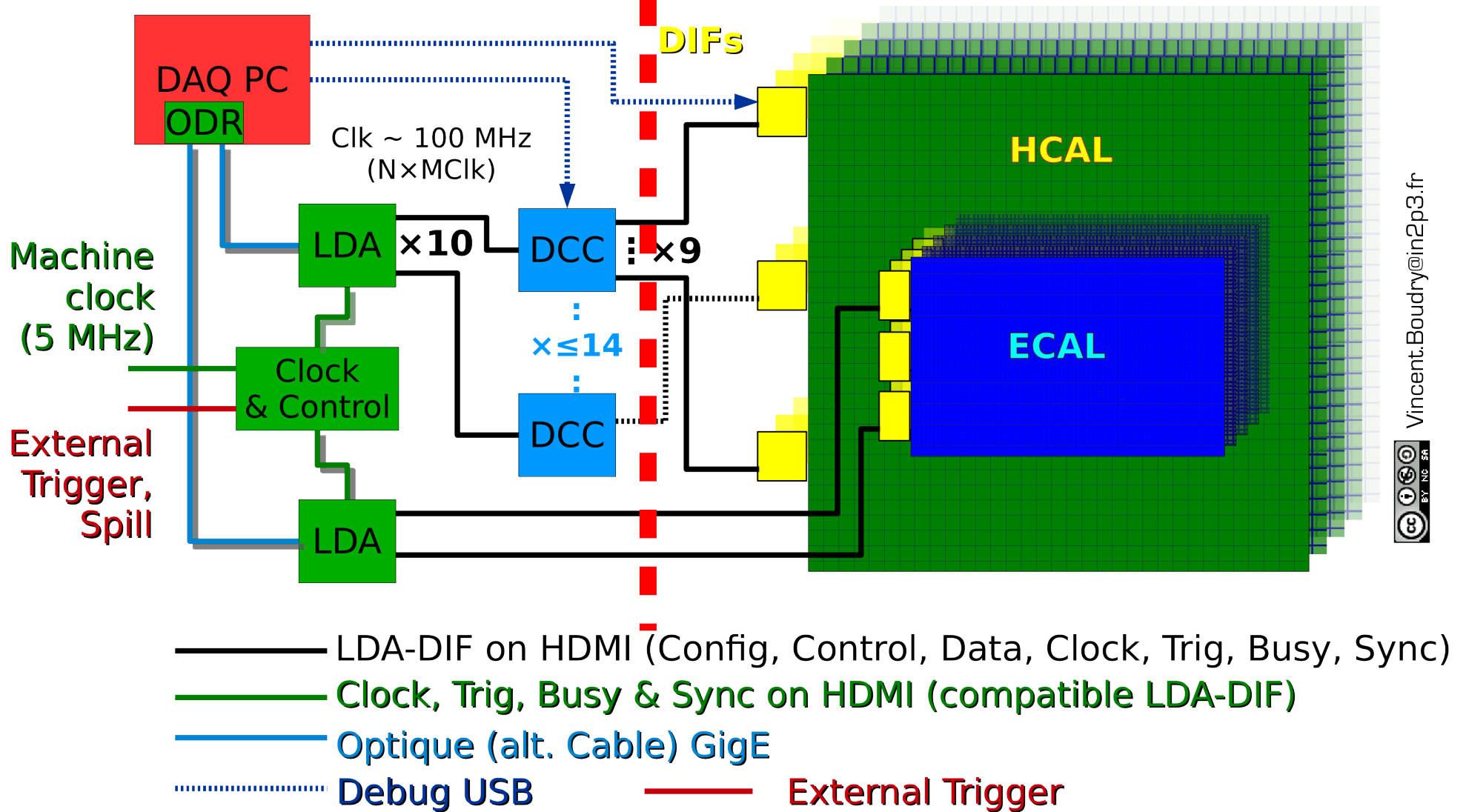Generic: suitable for all CALICE prototype technologies

DAQ v2 overview

DIFs

DAQ PC
ODR

Clk ~ 100 MHz
(N×MClk)

HCAL

Machine
clock
(5 MHz)

LDA ×10   DCC ⋮ ×9

×≤14

Clock
& Control

DCC

External
Trigger,
Spill

LDA

FEVx *ROC ASICS

ECAL

Vincent.Boudry@in2p3.fr

─────── LDA-DIF on HDMI (Config, Control, Data, Clock, Trig, Busy, Sync)

─────── Clock, Trig, Busy & Sync on HDMI (compatible LDA-DIF)

─────── Optique (alt. Cable) GigE

·············· Debug USB   ─────── External Trigger

DCC: Data Concentrator Card   LDA: Local Data Aggregator   DIF: Detector InterFace
ODR: Off Detector Receiver

Common system

Detector specific

DIFs

DAQ PC
ODR

Clk ~ 100 MHz
(N×MClk)

HCAL

LDA ×10 **DCC** ×9

Machine clock (5 MHz)

Clock & Control

×≤14

ECAL

External Trigger, Spill

DCC

LDA

Vincent.Boudry@in2p3.fr

—— LDA-DIF on HDMI (Config, Control, Data, Clock, Trig, Busy, Sync)

—— Clock, Trig, Busy & Sync on HDMI (compatible LDA-DIF)

—— Optique (alt. Cable) GigE

········· Debug USB   —— External Trigger

outside

Inside detector volume

DAQ PC

ODR

DIFs

HCAL

Clk ~ 100 MHz
(N×MClk)

LDA ×10

DCC ⋮ ×9

ECAL

Machine
clock
(5 MHz)

×≤14

Clock
& Control

DCC

External
Trigger,
Spill

LDA

Vincent.Boudry@in2p3.fr

——— LDA-DIF on HDMI (Config, Control, Data, Clock, Trig, Busy, Sync)

——— Clock, Trig, Busy & Sync on HDMI (compatible LDA-DIF)

——— Optique (alt. Cable) GigE

·········· Debug USB   ——— External Trigger

Minimise cables exiting detector: "dead" un-instrumented regions

Full detector

ECAL

HCAL
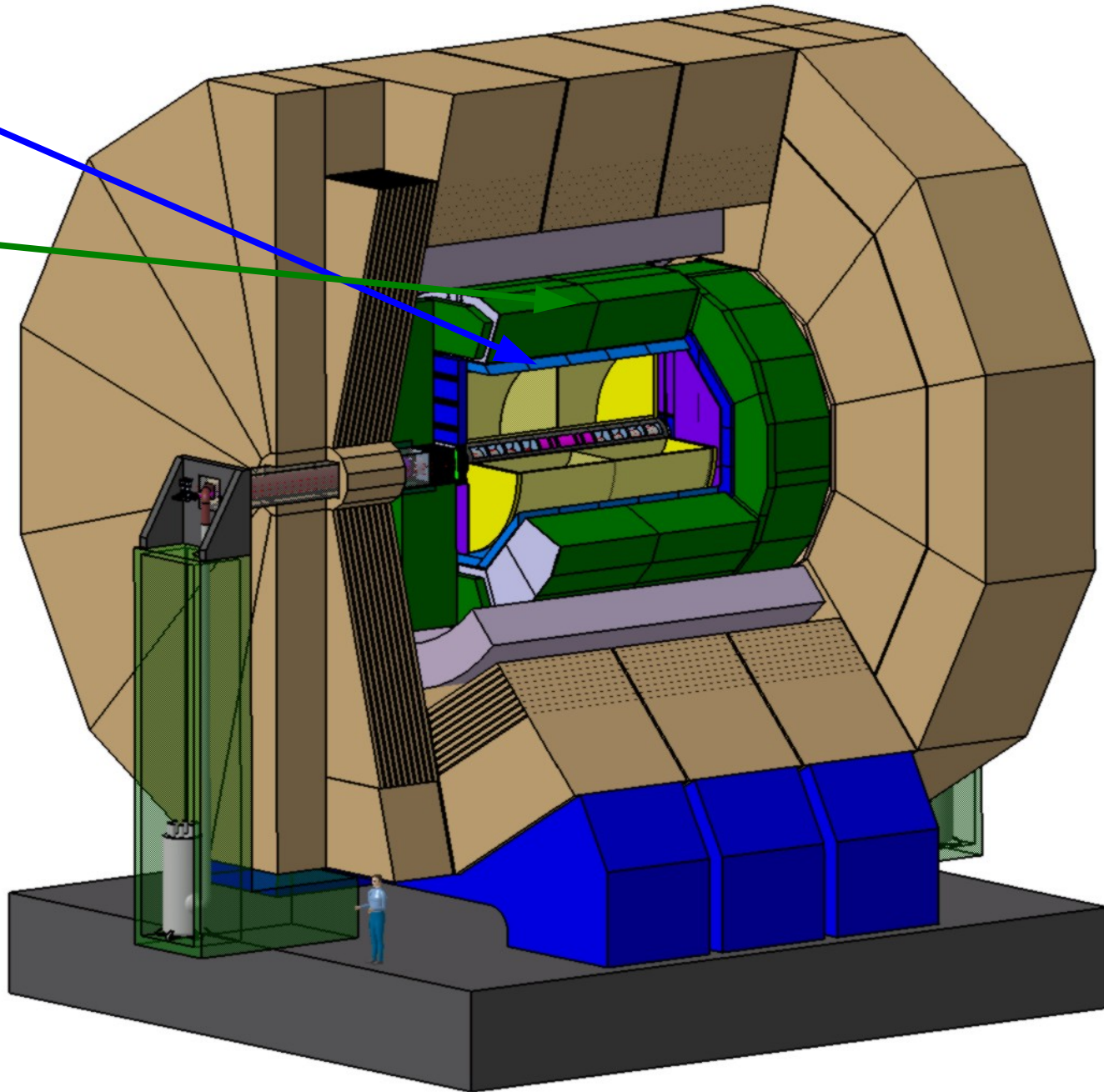
Hardware has been produced by mostly UK groups: UCL, RHUL, Cambridge
ready since ~2010

Firmware first version also supplied with hardware

UK groups no longer active due to budget cuts (CALICE not supported)
some "unofficial" support continuing

Firmware in particular has required significant adaptation and debugging
development / system testing now in progress in France (LLR, LAPP...)

First real large-scale tests planned for next month
(SD-HCAL test beam at CERN)
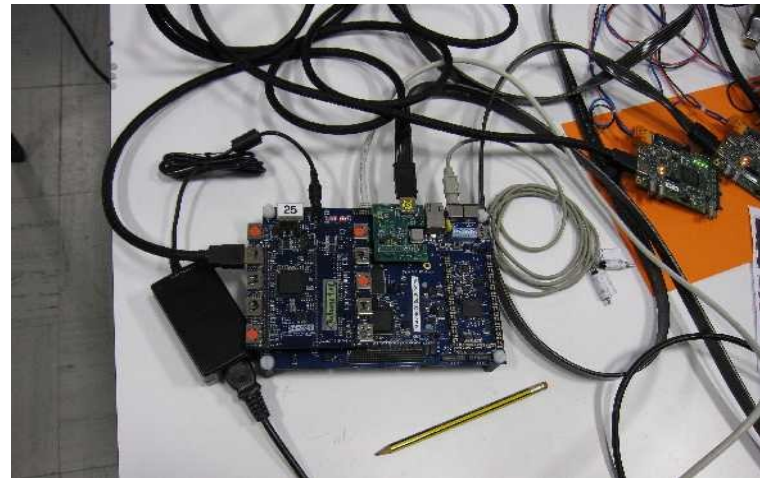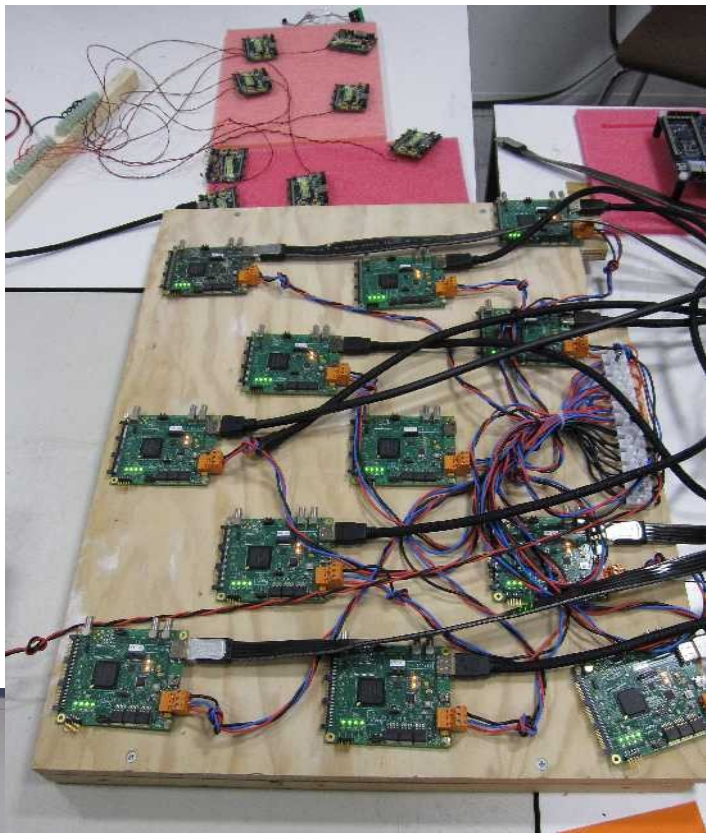
Software is under development...

 system tests and commissioning

 data taking with real detectors in lab (cosmic rays) and particle beams

 Based on XDAQ framework
  (also used @ CMS, experience in France)

 Databases for ASIC configurations and similar

Medium term plans

 Integrate/synchronise with other DAQ systems for ILC
  (within European Union AIDA programme)

 Redesign LDA card (not robust mechanically)

Summary

CALICE DAQ system designed to readout different calorimeter detectors

Based on "off-the-shelf" components and industrial standards

Scalable to large detector systems

Hardware is produced

Firmware is almost complete

Software is under development

First real large-scale tests later this summer