

Common DAQ issues for AHCAL

Applications in the CALICE AHCAL and ScECAL

- AHCAL DAQ Overview
- CALICE DAQ Proposal
- Common DAQ Integration

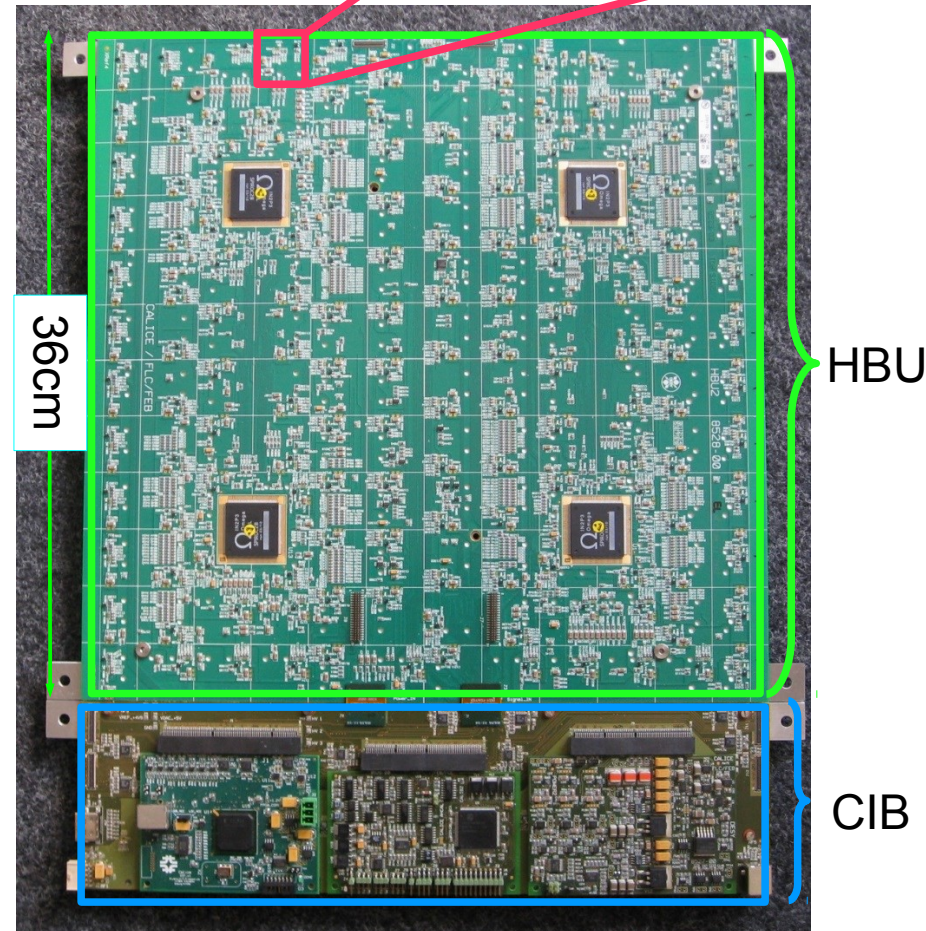
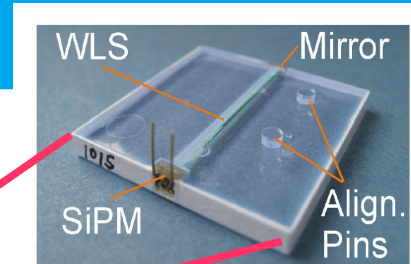


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AHCAL Readout

- Plastic Scintillator
- Readout by Silicon Photomultipliers
- SPIROC2b ASICs
 - Designed by OMEGA
 - 36 channels per ASIC
 - 16 analog memory per channel
 - 12 bit ADC and TDC
 - Auto trigger
- Integrated SiPM calibration system
 - 1 LED per channel
- Each layer has a Central Interface Board (CIB)
 - DAQ interface (DIF)
 - Calibration board
 - Power board



AHCAL DAQ System Architecture

> DAQ system consists of a few main subsystems:

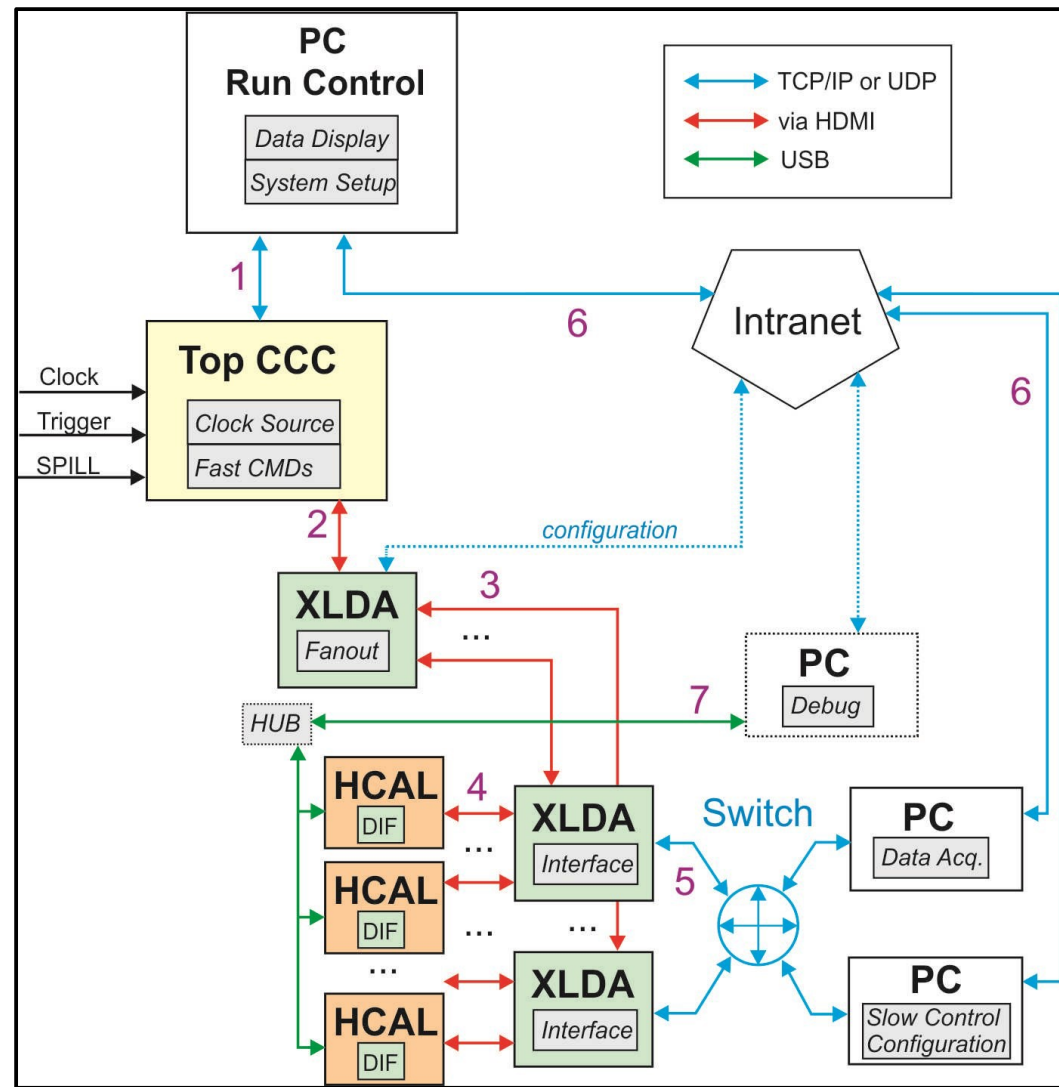
- PCs and Software Package
- Clock and Control Card
- Link and Data Aggregator

> Communicate over

- Ethernet
- HDMI
- USB (debugging purposes)

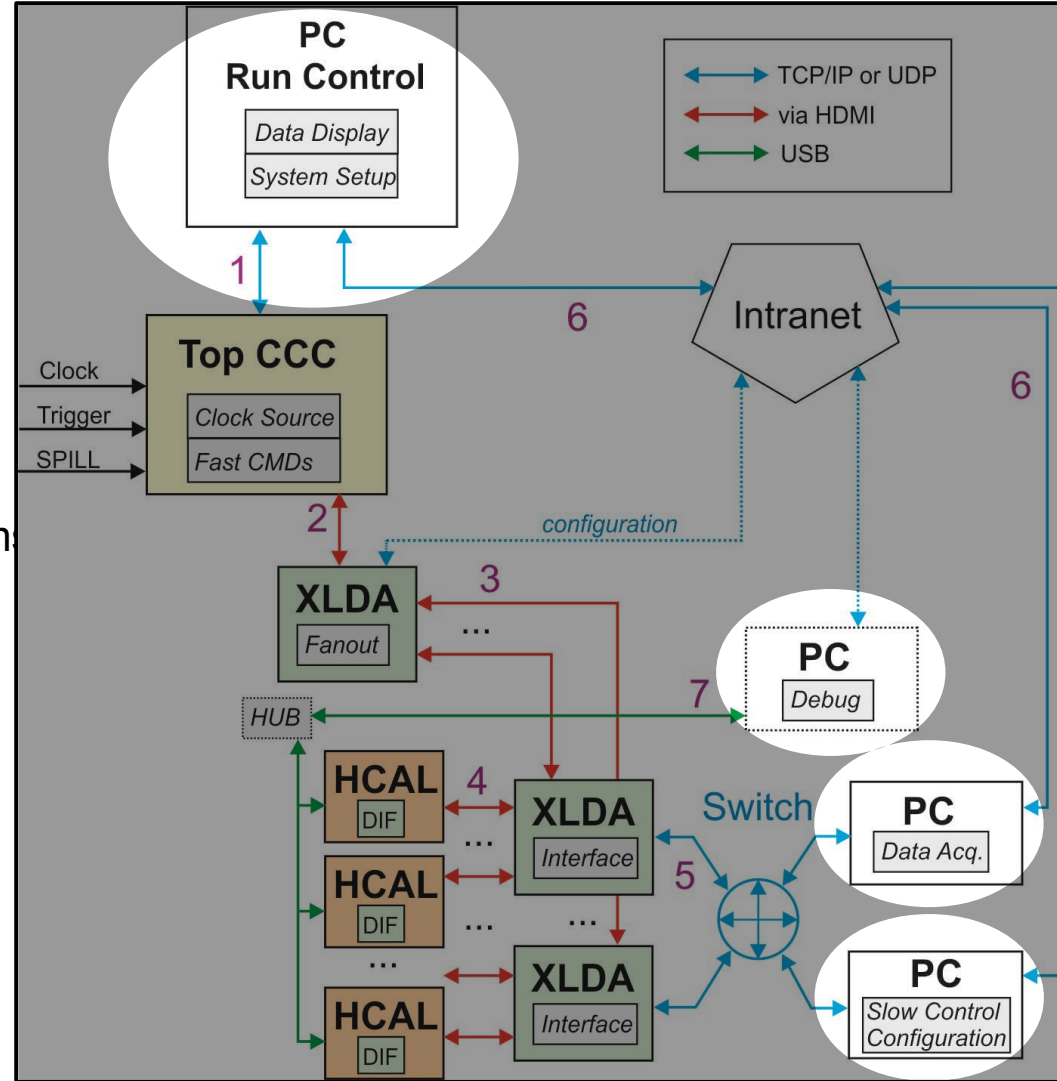
> Master of operation is the Run Control PC

- Initialization
- Detector configuration
- Data taking



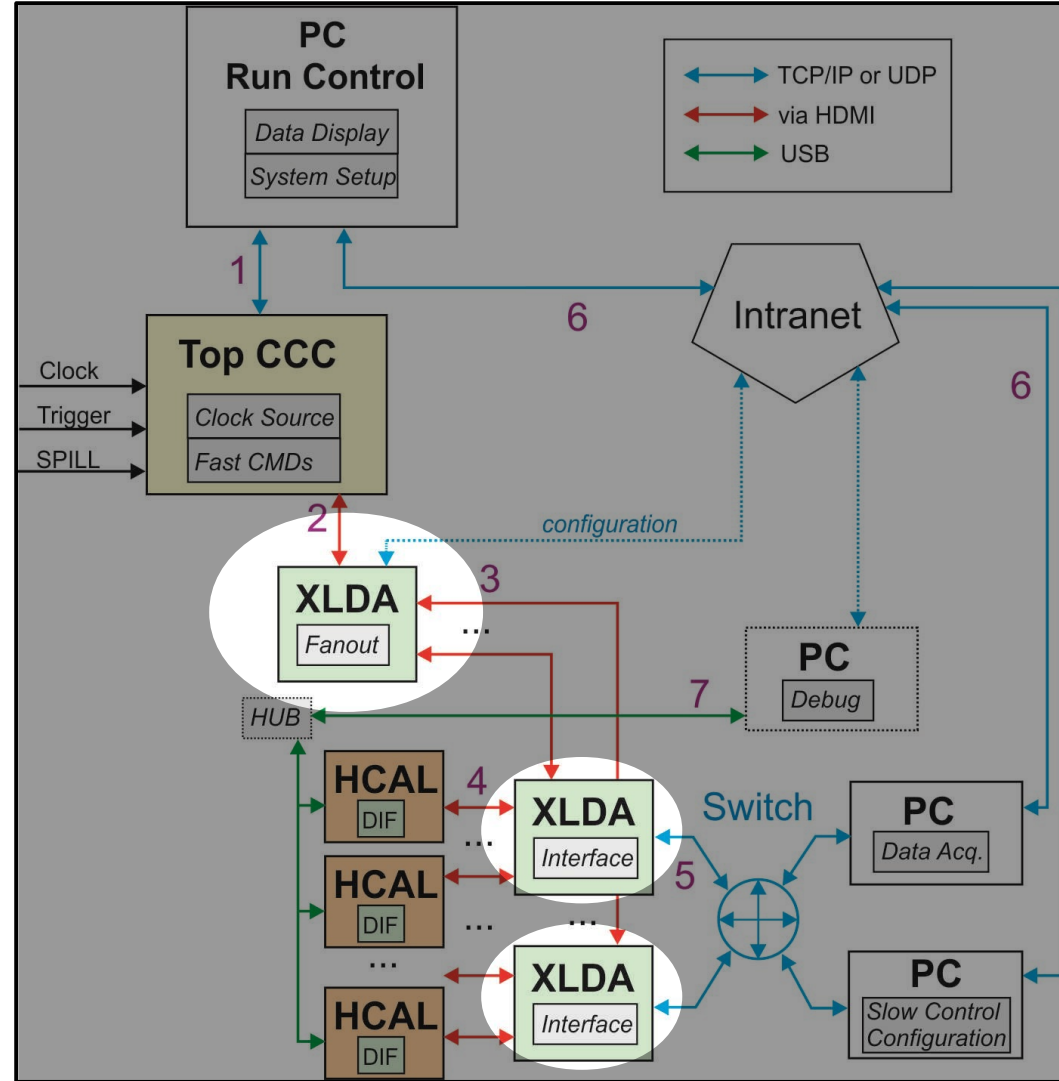
AHCAL DAQ Software Package

- > Consists of a few tools
- > Each can be hosted on a separate PC
- > Main DAQ Software
 - System Initialization
 - Control other software
 - Controls other DAQ subsystems
- > System Setup
 - Configures the detector
- > Data taking and storage
 - Receives data from the detectors
 - Decode
 - Store in appropriate formats
- > Online monitoring

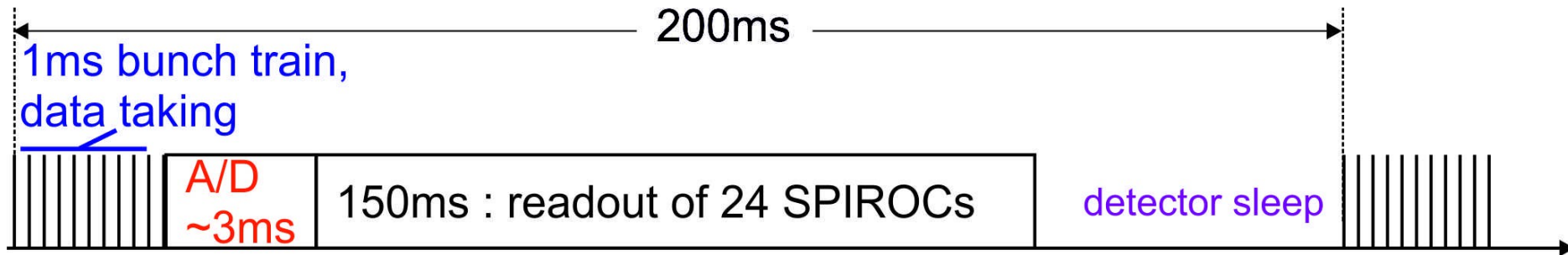


Link and Data Aggregator

- > X-LDA connections
 - HDMI to CCC
 - HDMI to the DIFs
 - Ethernet to Data Acq.
- > Distributes fast signals
- > Transfers Fast Commands
- > Handles Data readout from the layers and transfer to Data Acq. PC



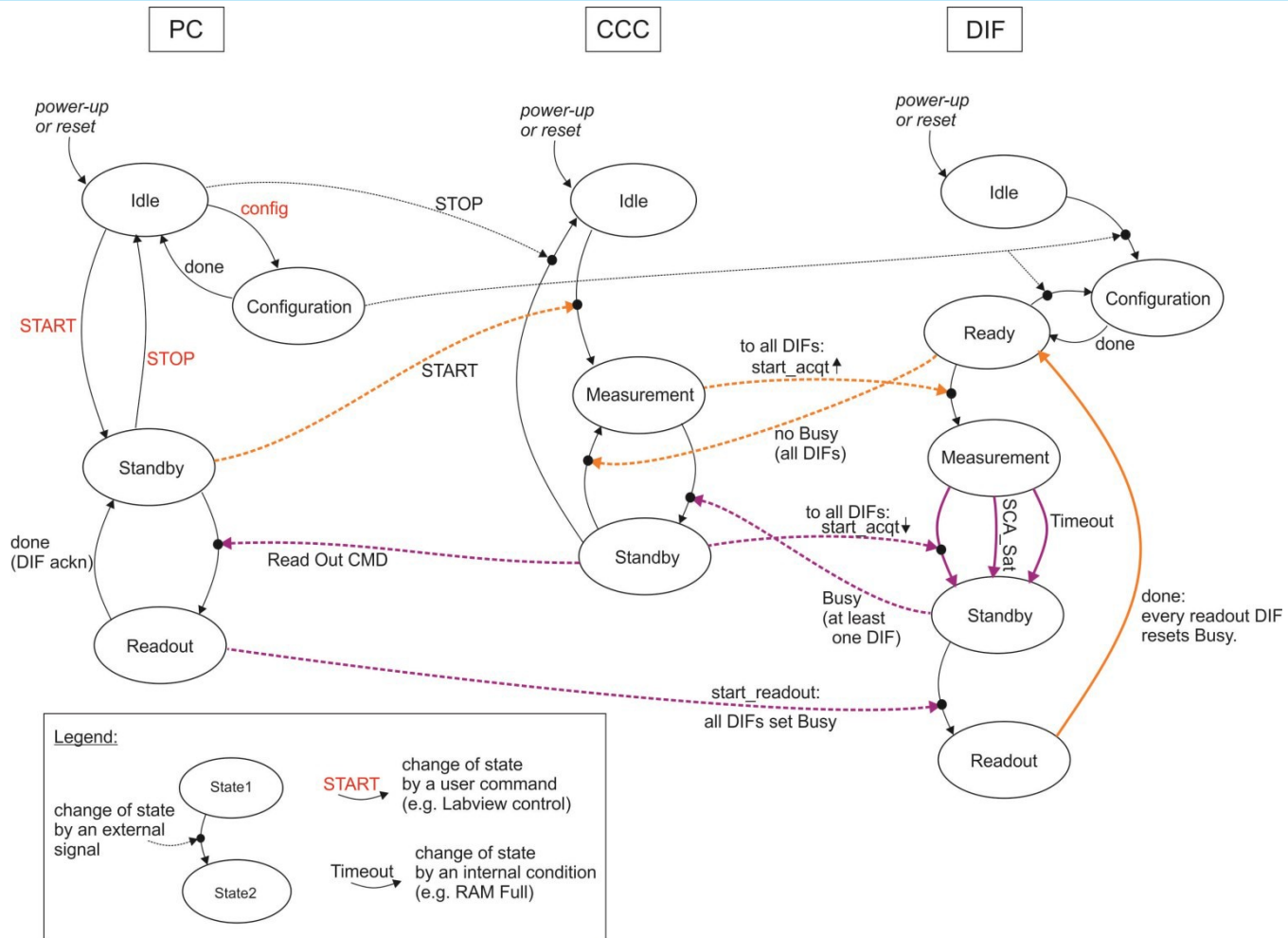
Data Taking Procedure



- > 1ms long bunch train
- > A measurement stops on
 - Full memory
 - Timeout
 - Stop command
- > 150ms of readout (dead time)
- > Since every layer is dead for undefined amount of time, a BUSY signal is used to ensure all layers are synchronized



DAQ State Diagram

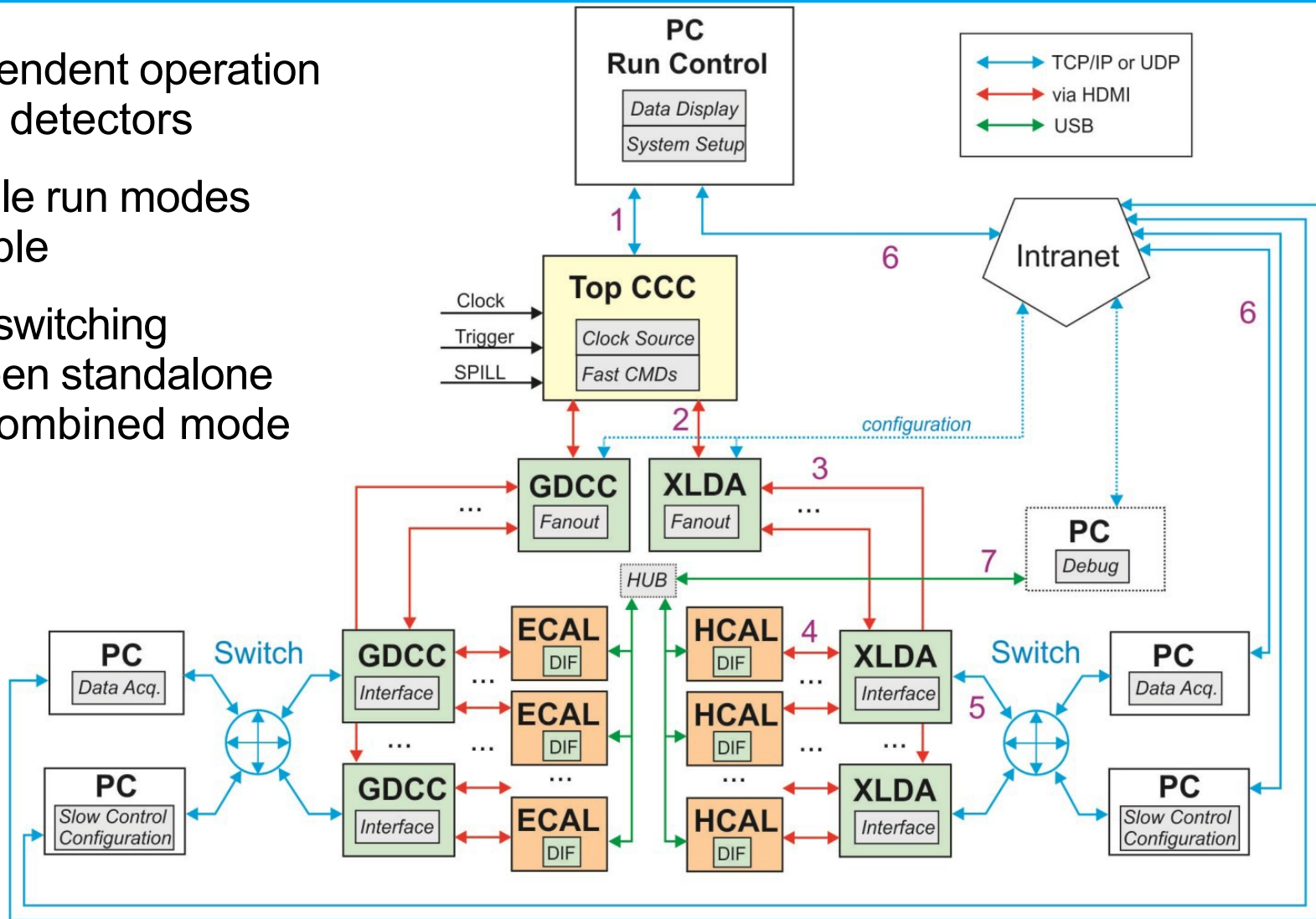


- > Flow controlled by BUSY signal from the DAQ Interface (DIF) to the CCC
- > All layers active at the same time



Common DAQ for CALICE

- Independent operation of the detectors
- Multiple run modes possible
- Easy switching between standalone and combined mode



Further Development

> In a later stage, for a detector-wide DAQ:

- Common event builder
- Common detector-wide monitoring and slow control/configuration data storage for future reference
 - > Temperature at different locations
 - > Voltages
 - > ...

> Integration to a common DAQ:

- Clocking and synchronization: not an issue, AHCAL DAQ can work with an external clock, external spill and trigger
- Run Start/Stop: not an issue, as long as the common DAQ software sends the command on ethernet. Otherwise some changes are required
- Flow control: depends on the flow control scheme used in the common DAQ, AHCAL DAQ will be able to handle flow control using a BUSY signal or using timeout. CCC modification may be necessary.
- Software written in C/C++ should be portable to the common DAQ with minimum effort



