# Integrated control and data acquisition systems

Giovanna Lehmann Miotto,
Enrico Gamberini, Roland Sipos

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EP-DT
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# Traditional approach to control systems

Rigid separation between control and Data AcQuisition (DAQ) systems for detectors

Main system requirements, i.e. high reliability vs. high speed/throughput were considered incompatible

Different technologies were applied to these types of systems: industrial protocols in general (e.g. CAN bus) vs. ethernet, optical, ...

Today, a much tighter integration between control and data acquisition can be explored

# Trends: new communication protocols

Wish to minimize the number of physical links on the on-detector electronics, to limit cabling effort and dead material

This is particularly relevant for the inner layers of the experiments at the LHC, but it is an equally important requirement also in other domains

At CERN, a bi-directional protocol (GBT) has been developed for this purpose, and is going to be used in many detector upgrades

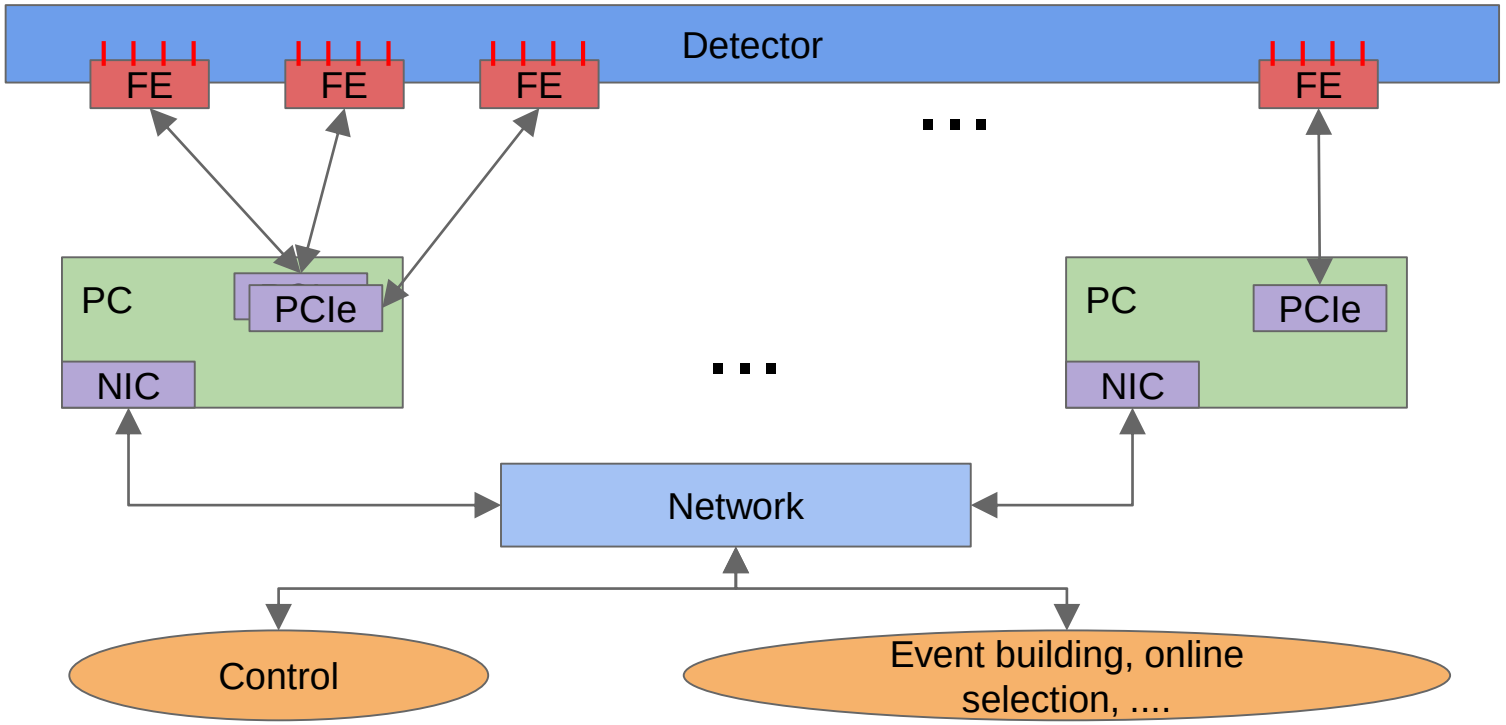
Physical layer is shared in close vicinity to the detector

Data from many front end ASICs are collected onto one link
(event data, DCS, TTC, configuration, etc.)

# The Wish: Integration of downstream DAQ and control

An architecture based on modular data acquisition systems centred on commercial networks and computer nodes (see Giovanna's presentation) allows to route all data to/from the detector to different end-points sharing a common network

DAQ and control may thus just be different peers on the network



# Making it real

Specific requirements for DAQ and control system remain: speed vs. reliability
e.g. control data should have priority over network and arrive to destination!

Carefully applied Quality of Service (QoS) methods on the network, in conjunction with the selection of appropriate communication protocols (Ethernet, InfiniBand, ...), are important ingredients to the success of such integration

Routing elements should be stateless (and reliable) as to allow continuous communication with FE

# Goal: integrate higher level software

Higher level of software could also be better harmonised: several tools are available for different applications (SCADA*, monitoring, data acquisition)

Adopt and share similar technologies at the supervisory layers of the control system and the run control of the DAQ

Uniform information and interface shared between integrated tools would allow to easily implement automated operation and error recovery

Monitoring of different components on the data path: distributed information can be aggregated from different sources

Data visualization plugins can be used to display and navigate the data

* Supervisory Control And Data Acquisition

# Summary and Outlook

If successful, the proposed study will lead to the development of a highly integrated DAQ/control system that may be adopted in a broad range of environments

This would reduce the duplication of efforts, allowing the experts to focus on the detailed aspects of their own setup and final goals

➜ time and cost effectiveness

Selection of tools from the available “jungle”, to be integrated and harmonised

Most of the control systems used at CERN come from industry… could we give something back?