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Integrated control and data acquisition systems

Traditionally there has always been a rigid separation between control and Data AcQuisition (DAQ) systems for detectors. This comes from the fact that historically very different technologies were applied to these types of systems and that the main system requirements, i.e. high reliability vs. high speed, were considered incompatible. The situation is different today, and this proposal aims at exploring a much tighter integration between control and data acquisition.

The starting point for this study derives from the 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.

Once the physical layer is shared in close vicinity to the detector, it becomes natural to start thinking on how the downstream part of the DAQ and control systems may be further integrated as well. To this purpose, an architecture as proposed in Abstract 78 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. Certainly, carefully applied Quality of Service (QoS) methods on the network, in conjuntion with the selection of appropriate communication protocols, are important ingredients to the success of such integration.

Last but not least, higher levels of the software could also be better harmonised, by adopting and sharing similar technologies at the supervisory layers of the control system and the run control of the DAQ.

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, thus reducing the duplication of effort and allowing the experts to focus on the detailed aspects of their own setup and final goals.

Signal processing, data acquisition

data acquisition, control systems, modular design, supervisory software

System integration and engineering

integration of data acquisition and control

Computing

Software and imaging

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