Summary of Detector Requirements for DAQ in the ROD Crate

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Abstract

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1 Introduction

1.1 Purpose of the Document

This document presents a short summary of the main requirements of the detector groups specifically related to DAQ at the level of the ROD crate.

2 Areas of DAQ Functionality Identified as Required in the ROD Crates

2.1 Local Data Acquisition System

All the detectors have expressed a need for a local data acquisition system per ROD crate. This should allow local detector work to be done independently of the main DAQ system, in particular, in the shorter term for local testing purposes, and also in the longer term, in the early stages of the experiment's setting up & commissioning. It should however also try to foresee the eventual integration of all the detectors' DAQ systems into the global DAQ in a coherent way. Clearly, if all detectors use the same basic system from an early stage in their ROD crates, this will assist enormously the final integration. It should be noted that the overall ATLAS milestones, the DAQ and High Level Trigger system construction is due to be completed by December 2003, with integration of the Trigger/DAQ/DCS with the detectors by December 2004.

There is some perceived need (from the SCT and LAr in particular) to be able to build, at the ROD crate level, composite detector events from event fragments residing in different ROD crates. This need would be modest ("complex" event building not needed and data rates are not high). It should also be possible to collect summary data (e.g. histograms) from a series of crates. This implies the need for a standalone multi-crate DAQ system at the ROD level. It will be particularly necessary for some calibration tasks and, in the SCT case, X-ray alignment work to be performed on the surface before the detector installation. A multi-crate environment would also be useful for pre-installation cosmic running on the surface. Again, data rates would not be high. The event building could probably be done over ethernet between the ROD crates and a controlling workstation. Note that the timescale for this multi-crate functionality from the ID TDR is ~2003.

2.2 Database Access

The requirement of database access (read & write) was expressed by all detectors. This refers particularly to "offline" databases containing detector calibration constants as well as detector specific parameter databases. Direct access from the ROD crate to a database containing previously calculated calibration and initialisation parameters for upload into the RODs is for example required. Access to previous versions of calibration files may be required (i.e. not simply the most recent version). Direct write access to a calibration databases is also required in order to store calibration data and parameters calculated at the ROD level. There are no strong preferences from the detectors on the technical means of implementing this database access. "Light" versions of the database tools for laboratory testing of limited amounts of hardware would be useful (this requirement needs to be better defined).

Calibration database design and tools for accessing and interfacing to them are expected in the long term to be the responsibility of the Atlas database group.

2.3 Monitoring

Event monitoring (physics or other triggers) is required at the ROD level. This is seen as complementary to any further monitoring which may be done at the ROB level or further down the DAQ chain. It was pointed out that the events available for monitoring purposes at the ROD level would only be those which have been accepted by the LVL1 trigger. In general, parameters of monitored events will be stored in simple histograms and the histograms may then be transferred elsewhere for subsequent analysis.

2.4 Calibration

Most of the calibration scenarios envisaged by the detectors are foreseen to be done at the ROD crate level rather than by using the full DAQ chain with analysis done in the Event Filter or offline. The RODs themselves are seen as playing an important role in many calibration procedures. There are some exceptions to this, namely global detector alignment and physics monitoring, and any other procedures which require coherent data from two or more ROD crates from one or more sub-detectors.

Flexibility is required as to the deployment of the software calibration “apparatus”. Part of the functions will be performed in the RODs and some (typically histogram collection and analysis) at the crate level.

Some calibration procedures will require a partition of several detector parts, e.g. muon cosmic running will require a partition of all the relevant muon trigger chambers.

2.5 Partitions

In general, a partition maybe a subset of the experiment (a detector) or a subset of a detector. For example, the TRT envisages 4 TTC partitions, and the LAr calorimeter 8 (each containing a maximum of 16 ROD crates). Each partition requires independent TTC and dead-time control. Each partition should be individually controllable.

In the specific LAr case, each partition would be controlled by a ‘LAr master crate’. It is desirable for this LAr master crate to come under direct control of the Backend run control. Database access for the ROD crates would be seen as passing through these master crates. The master crate would also collect monitoring histograms and event fragments for monitoring if required. Communication between each master crate and its ROD crates will pass over Ethernet.

A description of the TTC application to partitions (with examples from the TRT) and slides from the LAr & SCT can be found on the DIG webpage under the minutes from the DIG meeting of 25/02/99 [1].

3 References

[1]DIG Webpage: http://atddoc.cern.ch/Atlas/DetfeIf/Welcome.html