A Common Run Control System for AGATA and EXOTIC Data Acquisition Systems

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INTRODUCTION

This late year EXOTIC collaboration started to use the same approach to the Run Control and Monitor System already chosen for the demonstrator of AGATA; in this report we briefly describe how this common architecture has been fit in these two different scenarios.

OVERVIEW

The Run Control and Monitoring System (RCMS) has the main purpose to coordinate the several activities necessary a data acquisition system and its potential ancillary detectors into operational state. Actions like initialization, setup of the several components, start and stop of the data acquisition, are performed by the operator through the Run Control system.

The run control developed for AGATA and EXOTIC experiments is based on the middleware produced by the European funded project GRIDCC [1]. Adopted by the LHC CMS experiment for its Run Control and Monitor System (RCMS) [2, 3], is being used since years for the data acquisition tests with cosmic rays and was operating when the first LHC beam was circulating in September 2008.

The GRIDCC middleware is built around the concept of Instrument Element (IE), a set of coherent services for the control and monitoring of complex remote instrumentation. In the case of a physics experiments, the instrumentation is basically the data acquisition system and the front-end electronics.

The IE component that interacts with the data acquisition and the front-end electronics is the Instrument Manager, or Function Manager (FM), a Java based controller that provides a clear and well-defined interface to customize its behavior and define the proper control actions. Control actions are performed on an event-driven basis. Control commands, like start and stop of the DAQ, are events generated by the operator on shift; errors or other information messages are instead events generated by the DAQ or by the electronics. The incoming events trigger the execution of custom procedures implemented in the FM. The procedures include control actions, error handling and message logging functionalities.

A customizable Finite State Machine engine is used to define the basic behavior of the Function Manager.

RUN CONTROL FOR AGATA

Figure 1 shows the top-level layout of the control and monitoring system of the AGATA apparatus.

![AGATA Run Control Layout](image)

Fig. 1. AGATA Run Control Layout.

The Run Control provides the services to configure the system (Resource Service), to monitor the DAQ behaviour, and to log information and error messages (Logging Collector). The interaction with the several components to control and monitor is performed through the Function Managers (FMs). A two level hierarchy of Function Managers has been chosen (see fig. 1). The Top Manager orchestrates the whole system. The GUI a shifter can use to send commands to the system and to monitor it, is a custom part of CRACOW program [4], which interacts with the Top FM thanks to a well-defined WSDL (Web Service Description Language) interface. The complexity of the detector and of the DAQ has been divided in a number of “sub-systems”, each one having its own FM. The Top FM is directly interfaced to the subsystem FMs. Each subsystem FM interacts with the subsystem resources dispatching the control commands and managing the status, error and monitoring messages coming from them.

The “Narval Manager” is dedicated to the control and monitor of the data acquisition. Developed in Ada language, Narval [5] is the software framework used for the AGATA DAQ. Narval actors make available their control options and their monitoring parameters through a...
The WSDL interface and the Narval FM acts as a client of this web service.

The “Ancillary Managers” are a number of FMs (one per ancillary detector) dedicated to the control and monitor of the specific detector. In the Legnaro campaign the Prisma detector will be coupled with AGATA. Its control manager will interact with the Prisma DAQ, developed in XDAQ [6].

The “Slow Managers” are dedicated to the interface to the AGATA Slow Control system. A “Slow Manager” for each component (GTS, carrier, digitizers, core and segment mezzanines) will be provided. A standard WSDL interface for all the slow control components has been defined. The Run Control acts as a web service client of such a WSDL.

The “Storage Manager” is dedicated to the management of the disk arrays where acquired data are stored, while the “Grid Manager” is dedicated to the control of the Grid based procedures to transfer acquired data to INFN CNAF, for permanent storage on tapes.

RUN CONTROL FOR EXOTIC

The architecture of the whole EXOTIC data acquisition system and the role played by RCMS are depicted in figure 2.

As for the ancillary part of AGATA data acquisition system, even here a XDAQ application performs the readout from the electronics through a VME crate. XDAQ provides a well-defined SOAP interface for control and monitoring purposes, and the RCMS software already provides the code to interface to XDAQ applications. Data acquired with XDAQ, represented by dashed arrows, are archived on disk and simultaneously sent to a TCP socket to enable the online analysis.

For this purpose the EXOTIC experiment takes advantage from the CRACOW program that, unlike the AGATA case, where it is employed as a Graphical User Interface for the Run Control, here is used for online and offline visualization and analysis.

As depicted in figure 2, for EXOTIC experiment this part of the job is essentially carried out by two programs: i) Exotic Spy, which reads data both from file and from disk, builds the spectra and periodically saves them to file; ii) CRACOW, which is a complete graphical tool that provides facilities for 1D and 2D spectra generation and calibration and allows the user to execute some preliminary data analysis like integration, peaks and centroid detection, etc. The program has been furthermore customized according to some needs of EXOTIC experiment: one example is a particular graph which shows the amplitude of the signal coming out from one detector in an “oscilloscope” fashion.

In the EXOTIC deployment RCMS uses a more straightforward structure: in fact is only one Function Manager, called ExoticFM, responsible for the control of the underlying XDAQ application. The user can interact with this system by means of a web based GUI, visible in a browser.

At the moment both XDAQ and Exotic Spy exploit text files to read parameters they use to configure the data acquisition and analysis. In the future a graphical and interactive tool will be developed to ease this part of the job.

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