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Monitoring tools of COMPASS experiment at CERN

Nowadays, all modern high energy physics experiments are substantially dependent on fast and reliable data acquisition systems that are able to collect large quantities of data supplied by various detectors. To ensure smooth and errorless operation, it is necessary to control and monitor the behavior and state of processes running in the system.

COMPASS is a high energy particle experiment with fixed target located at SPS at CERN laboratory in Geneva, Switzerland. This poster briefly introduces the data acquisition system of COMPASS and is mainly focused on the part that is responsible for the monitoring of the nodes in the whole newly developed data acquisition system of the experiment.

The technical shutdown of CERN during years 2013 and 2014 has been used to upgrade the data acquisition system of the COMPASS experiment. Both new hardware, which uses FPGA cards for event building, and new software has been developed and deployed. The monitoring of the system is managed by tools called Message Logger and Message Browser.

The Message Logger is a simple console application that collects informative and error messages. The messages are received via standard switched network and the communication is handled by the DIM library. The DIM library is a communication tool originally designed and developed for the DELPHI experiment at CERN. It provides C++, JAVA, and Python interfaces. The relevant collected messages are then saved into the central COMPASS DAQ MySQL database.

The Message Browser is a tool with a graphical user interface created in Qt framework based upon a MVC (model - view - controller) design pattern. It is used to fetch and display messages previously stored by the Message Logger. It also features so called "online mode" which serves for acquisition of new messages via network at the time of their origin (this works similarly to the Message Logger). This functionality saves time and system resources - the new messages are displayed immediately and the program does not need to poll the database for new messages. Even though the Message Browser is connected to other nodes via the DIM service, it is designed to run independently from the other nodes (it requires only the database to be connected). Therefore it allows quicker response from the operators of the experiment in case of unexpected behavior or crash of the data acquisition system of the experiment. The Message Browser is also equipped with ordering and rich and intuitive filtering options (by all parameters of the messages).

The central data acquisition database stores system configuration and the messages. The Message_log table is expected to be the largest table in the database. Because the Message Browser requires high amount of data from the database, the Message_log table uses the MyISAM storage engine that is optimized for environments with heavy read operations. For further increase in speed, several indices are created on some of the columns, most importantly on the Stamp column (ordering by the time of the creation of the message is most important).

The poster also contains performance tests of the created monitoring tools.

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