$CLOUD^{CLOUD}$: general-purpose instrument monitoring and data managing software

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January 13, 2016

Abstract

An effective experiment is dependent on the ability to store and deliver data and information to all participant parties regardless of their degree of involvement in the specific parts that make the experiment a whole. Having fast, efficient and ubiquitous access to data will increase visibility and discussion, such that the outcome will have already been reviewed several times, strengthening the conclusions. The $CLOUD^{CLOUD}$ project aims at providing users with a general purpose data acquisition, management and instrument monitoring platform that is fast, easy to use, lightweight and accessible to all participants of an experiment. This work is now implemented in the CLOUD experiment at CERN and will be fully integrated with the experiment as of 2016. Despite being used in an experiment of the scale of CLOUD, this software can also be used in any size of experiment or monitoring station, from single computers to large networks of computers to monitor any sort of instrument output without influencing the individual instrument's DAQ. Instrument data and meta data is stored and accessed via a specially designed database architecture and any type of instrument output is accepted using our continuously growing parsing application. Multiple databases can be used to separate different data taking periods or a single database can be used if for instance an experiment is continuous. A simple web-based application gives the user total control over the monitored instruments and their data, allowing data visualization and download, upload of processed data and the ability to edit existing instruments or add new instruments to the experiment. When in a network, new computers are immediately recognized and added to the system and are able to monitor instruments connected to them. Automatic computer integration is achieved by a locally running python-based parsing agent that communicates with a main server application guaranteeing that all instruments assigned to that computer are monitored with parsing intervals as fast as milliseconds. This software (server+agents+interface+database) comes in easy and ready-to-use packages that can be installed in any operating system, including Android and iOS systems. This software is ideal for use in modular experiments or monitoring stations with large variability in instruments and measuring methods or in large collaborations, where data requires homogenization in order to be effectively transmitted to all involved parties. This work presents the software and provides performance comparison with previously used monitoring systems in the CLOUD experiment at CERN.