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CMS CSC Expert System: towards the detector control automation

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Cathode strip chambers (CSC) compose the endcap muon system of the CMS experiment at the LHC. Two years of data taking have proven that various online systems like Detector Control System (DCS), Data Quality Monitoring (DQM), Trigger, Data Acquisition (DAQ) and other specialized applications are doing their task very well. But the need for better integration between these systems is starting to emerge. Automatic and fast problem identification and resolution, tracking detector performance trend, maintenance of known problems, current and past detector status and alike tasks are still hard to handle and require a lot of efforts from many experts. Moreover, this valuable expert knowledge is not always well documented.

CSC Expert System prototype is aiming to fill in these gaps and provides a solution for online systems integration and automation. Its design is based on solid industry standards –Service Bus and Application Integration, Data Warehouse and Online analytical processing (OLAP), Complex Event Processing (CEP, i.e. Rule Engine) and ontology based Knowledge Base. CSC Expert system receives and accumulates Facts (i.e. detector status, conditions, shifter/expert actions), derives and manages Conclusions (i.e. hot device, masked chamber, weak HV segment, high radiation background), stores detector inventory –Assets (i.e. hardware, software, links) and outputs Conclusions, Facts and Assets for other applications and users. CEP engine allows experts to describe their valuable knowledge in SQL-like language and to execute it taking subsequent action in real time (e.g. sends emails, SMS'es, commands and fact requests to other applications, raise alarms).

A year of running the CSC Expert System has proven the correctness of the solution and displays its applicability in detector control automation.

Summary

Cathode strip chambers (CSC) compose the endcap muon system of the CMS experiment at the LHC. Two years of data taking have proven that various online systems like Detector Control System (DCS), Data Quality Monitoring (DQM), Trigger, Data Acquisition (DAQ) and other specialized applications are doing their task very well. But the need for better integration between these systems is starting to emerge. Automatic and fast problem identification and resolution, tracking detector performance trend, maintenance of known problems, current and past detector status and alike tasks are still hard to handle and require a lot of efforts from many experts. Moreover, this valuable expert knowledge is not always well documented.

CSC Expert System prototype, which is based on solid industry standards, is aiming to fill in these gaps and provides a solution for online systems integration and automation. A year of running the CSC Expert System has proven the correctness of the solution and displays its applicability to this task.

Primary authors: JUSKA, Evaldas (Fermi National Accelerator Lab. (US)); Mr RAPSEVICIUS, Valdas (Fermi National Accelerator Lab. (US))

Co-author: BANICZ, Karoly (Fermi National Accelerator Lab. (US))

Presenter: JUSKA, Evaldas (Fermi National Accelerator Lab. (US))

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