New operator assistance features in the CMS Run Control System

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The Run Control System of the Compact Muon Solenoid (CMS) experiment at CERN is a distributed Java web application running on Apache Tomcat servers. During Run-1 of the LHC, many operational procedures have been automated. When detector high voltages are ramped up or down or upon certain beam mode changes of the LHC, the DAQ system is automatically partially reconfigured with new parameters. Certain types of errors such as errors caused by single-event upsets may trigger an automatic recovery procedure. Furthermore, the top-level control node continuously performs cross-checks to detect sub-system actions becoming necessary because of changes in configuration keys, changes in the set of included front-end drivers or because of potential clock instabilities. The operator is guided to perform the necessary actions through graphical indicators displayed next to the relevant command buttons in the user interface. Through these indicators, consistent configuration of CMS is insured. However, manually following the indicators can still be inefficient at times. A new assistant to the operator has therefore been developed that can automatically perform all the necessary actions in a streamlined order. If additional problems arise, the new assistant tries to automatically recover from these. With the new assistant, a run can be started from any state of the subsystems with a single click. An ongoing run may be recovered with a single click, once the appropriate recovery action has been selected. We review the automation features of the CMS run control system and discuss the new assistant in detail including first operational experience.

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