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Application of a Software Engineering Methodology in the Control System Design of a Single Detector in a High Energy Physics (HEP) Experiment

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Content

The Detector Control System (DCS) is one of the most important elements to allow the control, configuration and monitoring of the elements that integrate a High Energy Physics (HEP) experiment. The DCS oversees coordinating of all processes in the experiment, according to the status of the systems and subsystems, as well as monitoring data. In addition, the DCS ensures safe, reliable, and uninterrupted operation of the experiment. It also serves as an important communication exchange point, providing vital: a) data for detector operation, b) physics analysis, c) safety systems, d) external services (including the accelerator).

Due to the relevance of the DCS in a HEP experiment, mentioned previously, is important to develop a standardized methodology to model the design and operation process of a control software using software-engineering techniques. This proposal uses Rational Unified Process (RUP) to model a control system of a detector considering the workflow of requirements, analysis, coding and tests for all phases of this model; through application of associated UML (Unified Modeling Language) models. This methodology to model a DCS is presented from point of view of the three main actors (stakeholders) involved in the software development process of this system applying five UML diagrams that contain the essentials of the system development. Finally, the models provide insight into system requirements, in this case, a control system of a detector for a HEP experiment and can generate an abstraction to simplify and gather the most important characteristics of this system; despite huge conceptual and structural differences between one detector and another.

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