Improved software production for the LHC tunnel cryogenics control system

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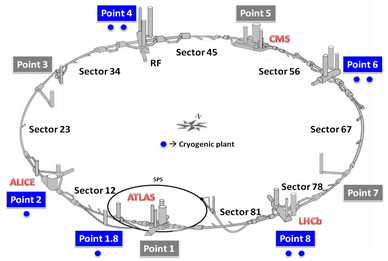
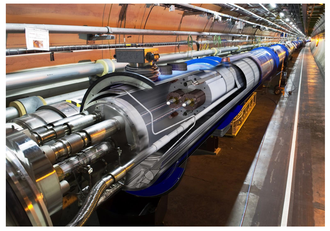
Abstract

❖ The software development for the control system of the cryogenics in the LHC is partially automatized. However, every single modification requires a sequence of consecutive and interdependent tasks to be executed manually by software developers. A large number of control system consolidations and evolution of used IT technologies lead to reviewing the software production methodology. As a result, an open-source continuous integration server has been employed integrating all development tasks, tools and technologies in a predefined time and event triggers. This paper describes the main improvements that have been made to fully automate the process of software production and achieved results

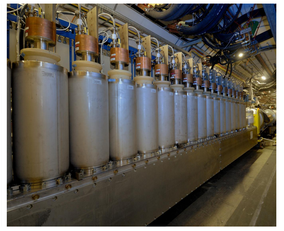
Cryogenics in the LHC tunnel





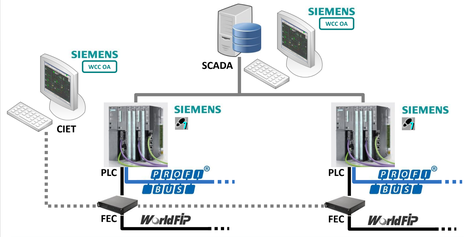
Superconducting magnets at 1.9 K

Superconducting cavities at 4.5 K



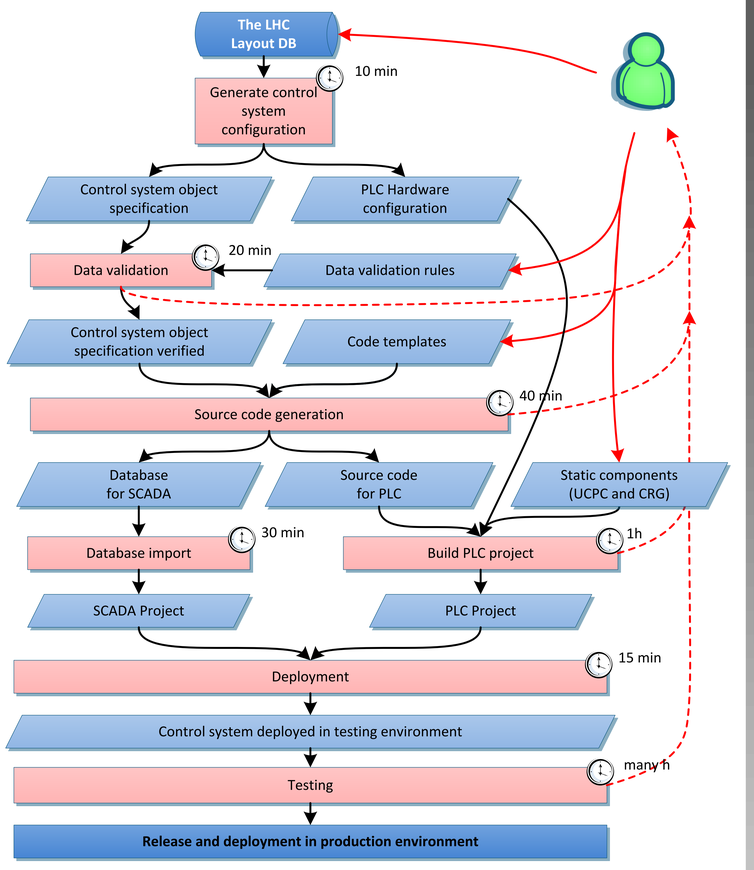
Electrical Distribution Feed Boxes at 4 K

The control system

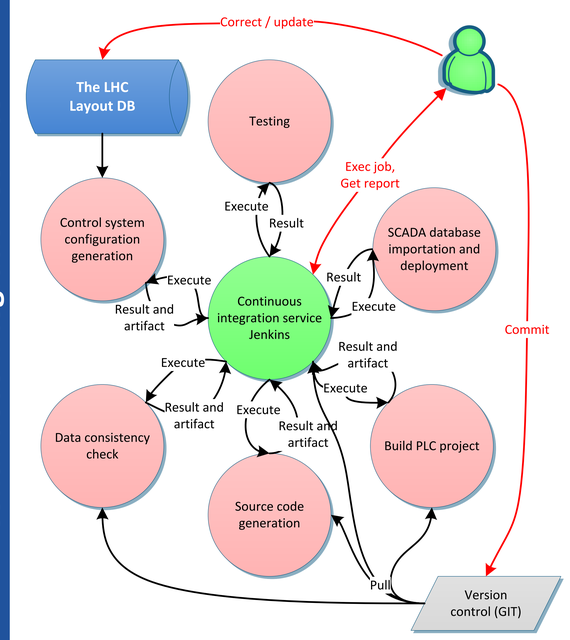


← The architecture of one sector [3.3 km] →

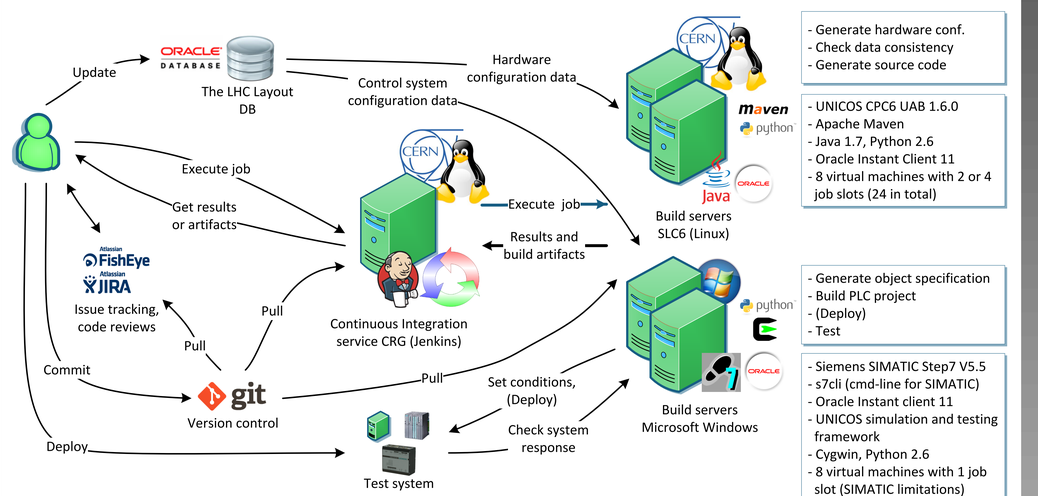
Software development process



Development process with Continuous Integration service



The architecture of Continuous Integration system for control system software development.



Conclusions

❖ The solution allowed to produce and to successfully deploy control software in all sectors of the cryogenics systems of the LHC tunnel and also to implement all requested last-minute changes. Until now two sectors are being cooled down while others are operational, in recommissioning phase.

❖ Continuous Integration practice, including automated builds and tests, is used successfully in software engineering since many years. Discussed developments, experiences and results of applying this approach to improve process of producing control system software for cryogenics in the LHC tunnel proved that the methodology can be equally useful in the field of industrial automation. It allows significantly optimize development process and (with help of hardware simulation devices) raise quality of the software produced for large-scale control systems.

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