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Big Data Analytics for the Future Circular Collider Reliability and Availability Studies

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European Strategy for Particle Physics update 2013, the study explores different designs of circular colliders for the post-LHC era. Reaching unprecedented energies and luminosities require to understand system reliability behaviour from the concept phase onwards and to design for availability and sustainable operation. The study explores industrial approaches to model and simulate the reliability and availability the entire particle collider complex. Estimates are based on an in-depth study of the CERN injector chain and LHC collider and are carried out as a cooperative effort with the HL-LHC project. The work so far has revealed that a major challenge is obtaining accelerator monitoring and operation data with sufficient quality, to automate the data quality annotation and calculation of reliability distribution functions for systems, subsystems and components where needed. A flexible data management and analytics environment that permits integrating the heterogenous data sources, the domain-specific data quality management algorithms and the reliability modelling and simulation suite is a key enabler to complete this accelerator operation study. This paper describes the Big Data infrastructure and analytics ecosystem that has been put in operation at CERN, serving as the foundation on which reliability and availability analysis and simulations can be built. This contribution focuses on data infrastructure and data management aspects and gives practical data analytics examples.

Tertiary Keyword (Optional)

Visualization

Primary Keyword (Mandatory)

Analysis tools and techniques

Secondary Keyword (Optional)

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