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The Data Quality Monitoring Software for the CMS experiment at the LHC

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The Data Quality Monitoring (DQM) Software is a central tool in the CMS experiment. Its flexibility allows for integration in several key environments: Online, for real-time detector monitoring; Offline, for the final, fine-grained data analysis and certification; Release-Validation, to constantly validate the functionalities and the performance of the reconstruction software; in Monte Carlo productions. Since the end of data taking at a center of mass energy of 8 TeV, the environment in which the DQM lives has undergone fundamental changes. In turn, the DQM system has made significant upgrades in many areas to respond to not only the changes in infrastructure, but also the growing specialized needs of the collaboration with an emphasis on more sophisticated methods for evaluating data quality, as well as advancing the DQM system to provide quality assessments of various Monte Carlo simulations versus data distributions, monitoring changes in physical effects due to modifications of algorithms or framework, and enabling regression modeling for long-term effects for the CMS detector. The central tool to deliver Data Quality information is an interactive web site for browsing data quality histograms (DQMGUI), and its transition to becoming a distributed system will also be presented. In this contribution the usage of the DQM Software in the different environments and its integration in the CMS Reconstruction Software Framework (CMSSW) and in all production workflows are presented, with emphasis on recent developments and improvement in advance of the LHC restart at 13 TeV. The main technical challenges and the adopted solutions to them will be also discussed with emphasis on functionality and long-term robustness.

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