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A true real-time success story: the case of collecting beauty-ful data at the LHCb experiment.

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The LHCb experiment at CERN is currently completing its first big data taking campaign at the LHC started in 2009. It has been collecting data at more than 2.5 times its nominal design luminosity value and with a global efficiency of ~92%. Even more striking, the efficiency between online and offline recorded luminosity, obtained by comparing the data quality output, is close to 99%, which highlights how well the detector, its data acquisition system and its control system have been performing despite much harsher and more variable conditions than initially foreseen.

In this paper, the excellent performance of the LHCb experiment will be described, by transversally tying together the timing and data acquisition system, the software trigger, the real-time calibration and the shifters interaction with the control system. Particular attention will be given to their real-time aspects, which allow performing an online reconstruction that is at the same performance level as the offline one through a real-time calibration and alignment of the full detector. In addition, the various solutions that have been chosen to operate the experiment safely and synchronously with the various phases of the LHC operations will also be shown. In fact, the quasi-autonomous control system of the LHCb experiment is the key to explain how such a large detector can be operated successfully around the clock by a pool of ~300 non-expert shifters. Finally, a critical review of the experiment will be presented in order to justify the reasons for a major upgrade of the detector.

Description

system

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Minioral

No

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