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DAQ Architecture for the LHCb Upgrade

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LHCb will have an upgrade of its detector in 2018. After the upgrade, the LHCb experiment will run at a high luminosity of $2 \times 10^{33} \text{ cm}^{-2} \cdot \text{s}^{-1}$. The upgraded detector will be read out at 40 MHz with a highly flexible software-based triggering strategy. The Data Acquisition (DAQ) system of LHCb reads out the data fragments from the Front-End Electronics and transports them to the High-Lever Trigger farm at an aggregate throughput of $\sim 32 \text{ Tbit/s}$. The DAQ system will be based on high speed network technologies such as InfiniBand and/or 10/40/100 Gigabit Ethernet.

Independent of the network technology, there are different possible architectures for the DAQ system.

In this paper, we present our studies on the DAQ architecture, where we analyze size, complexity and (relative) cost. We evaluate and compare several data-flow schemes for a network-based DAQ: push, pull and push with barrel-shifter traffic shaping. We also discuss the requirements and overall implications of the data-flow schemes on the DAQ system.

Summary

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