

The CMS event-builder system for LHC run 3 (2021-23)

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The data acquisition system (DAQ) of the CMS experiment at the CERN Large Hadron Collider (LHC) assembles events of 2 MB at a rate of 100 kHz. The event builder collects event fragments from about 740 sources and assembles them into complete events which are then handed to the high-level trigger (HLT) processes running on O(1000) computers. The aging event-building hardware will be replaced during the long shutdown 2 of the LHC taking place in 2019/20. The future data networks will be based on 100 Gb/s interconnects using Ethernet and Infiniband technologies. More powerful computers may allow to combine the currently separate functionality of the readout and builder units into a single I/O processor handling simultaneously 100 Gb/s of input and output traffic. It might be beneficial to preprocess data originating from specific detector parts or regions before handling it to generic HLT processors. Therefore, we will investigate how specialized co-processors, e.g. GPUs, could be integrated into the event builder. We will present the envisioned changes to the event-builder compared to today's system. Initial measurements of the performance of the data networks under the event-building traffic pattern will be shown. Implications of a folded network architecture for the event building and corresponding changes to the software implementation will be discussed.

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