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Evaluation of a high-performance storage buffer with 3D XPoint devices for the DUNE data acquisition system

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The DUNE detector is a neutrino physics experiment that is expected to take data starting from 2028. The data acquisition (DAQ) system of the experiment is designed to sustain several TB/s of incoming data which will be temporarily buffered while being processed by a software based data selection system.

In DUNE, some rare physics processes (e.g. Supernovae Burst events) require storing the full complement of data produced over 1-2 minute window. These are recognised by the data selection system which fires a specific trigger decision. Upon reception of this decision data are moved from the temporary buffers to local, high performance, persistent storage devices. In this paper we characterize the performance of novel 3DXPoint SSD devices under different workloads suitable for high-performance storage applications. We then illustrate how such devices may be applied to the DUNE use-case: to store, upon a specific signal, 100 seconds of incoming data at 1.5 TB/s distributed among 150 identical units each operating at approximately 10 GB/s.

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