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Exploring RapidIO Technology Within a DAQ System Event Building Network [1]

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RapidIO (http://rapidio.org/) technology is a packet-switched high-performance fabric, which has been under active development since 1997. The technology is used in all 4G/LTE base stations worldwide. RapidIO is also used in embedded systems that require high reliability, low latency, and deterministic operations in a heterogeneous environment. RapidIO has several of?oading features in hardware, therefore relieving the CPUs from time- and power-consuming work. Most importantly, it allows for remote direct memory access and thus zero-copy data transfer. In addition, it lends itself readily to integration with ?eld-programmable gate arrays. In this paper, we investigate RapidIO as a technology for high-speed data acquisition (DAQ) networks, in particular the DAQ system of an LHC experiment. We present measurements using a generic multiprotocol event-building emulation tool that was developed for the LHCb experiment. Event building using a local area network, such as the one foreseen for the future LHCb DAQ, puts heavy requirements on the underlying network as all data sources from the collider will want to send to the same destinations at the same time. This may lead to an instantaneous overcommitment of the output buffers of the switches. We will present results from implementing an event building cluster based on RapidIO interconnect, focusing on the bandwidth capabilities of the technology as well as its scalability. Index Terms? Communication systems, data acquisitionprotocol independent performance evaluator (DAQPIPE), DAQ networks, data analysis, interconnected systems, RapidIO, ROOT, scalability.
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