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Exploring RapidIO technology within a DAQ system event building network

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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 basestations worldwide. RapidIO is often used in embedded systems that require high reliability, low latency and deterministic operations in a heterogeneous environment. RapidIO has several offloading features in hardware, therefore relieving the CPUs from time-consuming work. Most importantly, it allows for remote DMA and thus zero-copy data-transfer. In addition it lends itself readily to integration with FPGAs.

In this paper we investigate RapidIO as a technology for high-speed DAQ networks, in particular the DAQ system of an LHC experiment. In addition to basic measurements of network throughput and server utilization we present measurements using a generic, multi-protocol event-building emulation tool which 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 leads to an instantaneous overcommitment of the output buffers of the switches. We test how the congestion control in RapidIO can cope with these conditions.

We will present results from implementing a event building cluster based on RapidIO interconnect, focusing on the bandwidth capabilities of the technology as well as the scalability.

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