High-throughput Custom Monitoring for the Mu2e TDAQ System

Thursday, 25 April 2024 12:35 (20 minutes)

This talk describes the use of programmable network hardware to provide a custom monitoring capability for the Mu2e Trigger and Data Acquisition System (TDAQ) system. This system is being designed as part of research that supports the design and deployment of specialized network support for physics experiments.

The goal of the Mu2e experiment is to search for a charged-lepton flavor violating processes where a negative muon converts into an electron in the field of an aluminum nucleus. The TDAQ system of the Mu2e project consists of the detector’s read-out controllers (ROC) that stream digitized readings through a commodity Ethernet network to reach Data Transfer Controllers (DTC), which consist of a commercial, PCIe FPGA card attached to commercial, off-the-shelf (COTS) servers.

The custom Mu2e header format contains a series of bit-fields that are used to convey information about error states at ROCs. At full line rate, we parse and examine these fields and update registers on the switch dataplane to count the errors we observe, and for which parts of the detector they are being observed. This information is periodically relayed to the switch controller, and used to populate a dashboard to alert operators.

We have a working prototype of the monitoring system described in earlier sections, and the next steps for this work include generalizing this monitor to support the detection of other conditions and support their processing in the network’s dataplane.

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Yes

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Yes

Are you a student?

No

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Session Classification: Poster B

Track Classification: Data Acquisition and Trigger Architectures