Contribution ID: **63**   Type: **not specified**

High-throughput Custom Monitoring for the Mu2e TDAQ System

In this project we are studying the application of programmable network hardware to provide a custom monitoring capability for the Mu2e Trigger and Data Acquisition System (TDAQ) system. 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. This experiment is intended to improve by four orders of magnitude the search sensitivity reached so far.

We have a working prototype of a system that provides high-throughput, custom monitoring for the Mu2e TDAQ system. The custom Mu2e network packet header format is parsed as it crosses the network switch. Parsing extracts bits that convey information about error states at read-out controllers (ROCs). This information is periodically relayed to the switch controller, which in turn alerts experiment operators.

Future work includes: (1) generalizing the prototype to support the detection of other error or performance conditions, and (2) runtime reconfiguration of the TDAQ system as a response to detecting such conditions. This reconfiguration would be used to mitigate error or performance conditions.

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Session Classification: Poster Session