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A local event builder for the COMET CDC with ZeroMQ

An experiment to search the charged lepton flavor violation named COMET is prepared at the J-PARC research facility. The COMET experiment searches for the coherent neutrinoless conversion of a muon to an electron in muonic atoms.

The data acquisition system of the COMET detector is a network-based system that consists of two layers, the front-end network, and the back-end network. The front-end PC on the front-end network takes data from the detectors.

A central detector of the COMET detector is a Cylindrical Drift Chamber (CDC). The number of front-end readout electronics of the CDC is 104.

To take care of the 104 readout electronics, we tried to develop a local event-builder using ZeroMQ. ZeroMQ is an open-source universal messaging library that provides useful functions for data acquisition. The local event builder uses many-to-one communication in ZeroMQ's PUSH/PULL patterns with fair queueing for inter-thread communication.

In this way, we didn't need to take care of the data buffering, because the message queue of ZeroMQ works as the data buffer. And also, the non-blocking interface of ZeroMQ functions is easy to use to implement the control mechanism on the data acquisition programming.

We could develop the local event builder easily with these ZeroMQ features.

In addition to this, we developed the control method of the readout electronics in the front-end network from the PC in the back-end network.

This report explains the structure and behavior of the local event builder and its performance.

Minioral

Yes

IEEE Member

No

Are you a student?

No

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