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The FEROL40, a MicroTCA Card Interfacing Custom Point-To-Point Links and Standard TCP/IP.

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In order to accommodate new back-end electronics of upgraded CMS sub-detectors, a new FEROL40 card in the microTCA standard has been developed. The main function of the FEROL40 is to acquire event data over multiple point-to-point serial optical links, provide buffering, perform protocol conversion, and transmit multiple TCP/IP streams (4x 10Gbps) to the Ethernet network of the aggregation layer of the CMS DAQ event builder. The design of the FEROL40 and experience from operation will be discussed.

Summary

The CMS experiment has installed a new Pixel detector during the end of year technical stop 2016-2017. A new custom card (FEROL40) card has been developed to be able to readout the 112 10Gbps links of the new Pixel back-end electronics.
This new microTCA based card is an evolution of the FEROL card developed in 2013 which interfaces the back-end electronics of the sub-detectors to Ethernet networking technology of switches and computing nodes. The input links connecting to the sub-detector back-end electronics are point-to-point serial links using the CMS custom SlinkExpress protocol. The FEROL40 card is based on the microTCA environment with an architecture aimed to achieve a high number of links per card. It is able to aggregate 4 SlinkExpress data streams (up to 10 Gbps), buffer, and transmit the data to the DAQ Ethernet network with an on chip reduced TCP/IP implementation using 4 x 10Gbps Ethernet links. The memory used for TCP socket buffer is based on DDR3 modules with a bandwidth of 100 Gb/s. The FEROL40 can also receive the TCDS (Trigger Control and Distribution System) information (triggers, command) enabling to check the synchronisation of the event fragments coming from each link and to emulate event fragment to test the complete DAQ infrastructure. The software for configuration, control and monitoring can access the FEROL40 on-board resources via a commercial memory mapped PCIe link from the microTCA MCH and a control PC. Experience from operation will be discussed.

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