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The development of a general purpose ARM-based Processing Unit for the ATLAS TileCal sROD

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The Large Hadron Collider at CERN generates enormous amounts of raw data which present a serious computing challenge. It is proposed that a cost-effective, high data throughput Processing Unit (PU) can be developed by using several consumer ARM processors in a cluster configuration to allow aggregated processing performance and data throughput while maintaining minimal software design difficulty for the end-user. An overview of the PU is given and the results for performance and throughput testing of Freescale i.MX6 quad-core ARM Cortex-A9 processors are presented.

Summary

The Large Hadron Collider at CERN generates enormous amounts of raw data which present a serious computing challenge. After planned upgrades in 2022, the data output from the ATLAS Tile Calorimeter will increase by 200 times to 41 Tb/s! ARM processors are common in mobile devices due to their low cost, low energy consumption and high performance. It is proposed that a cost-effective, high data throughput Processing Unit (PU) can be developed by using several consumer ARM processors in a cluster configuration to allow aggregated processing performance and data throughput while maintaining minimal software design difficulty for the end-user. This PU could be used for a variety of high-level functions on the high-throughput raw data such as spectral analysis and histograms to detect possible issues in the detector at a low level. High-throughput I/O interfaces are not typical in consumer ARM System on Chips but high data throughput capabilities are feasible via the novel use of PCI-Express as the I/O interface to the ARM processors. An overview of the PU is given and the results for performance and throughput testing of Freescale i.MX6 quad-core ARM Cortex-A9 processors are presented.

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