

Configurable Crossbar Switch for Deterministic, Low-latency Inter-blade Communications in a MicroTCA Platform

Thursday 7 December 2017 09:20 (15 minutes)

As MicroTCA expands into applications beyond the telecommunications industry from which it originated, it faces new challenges in the area of inter-blade communications. The ability to achieve deterministic, low-latency communications between blades is critical to realizing a scalable architecture. In the past, legacy bus architectures accomplished inter-blade communications using dedicated parallel buses across the backplane. Because of limited fabric resources on its backplane, MicroTCA uses the carrier hub (MCH) for this purpose. Unfortunately, MCH products from commercial vendors are limited to standard bus protocols such as PCI Express, Serial Rapid IO and 10/40GbE. While these protocols have exceptional throughput capability, they are neither deterministic nor necessarily low-latency. To overcome this limitation, an MCH has been developed based on the Xilinx Virtex-7 690T FPGA. This MCH provides the system architect/developer complete flexibility in both the interface protocol and routing of information between blades. In this paper, we present the application of this configurable MCH concept to the Machine Protection System under development for the Spallation Neutron Sources's proton accelerator. Specifically, we demonstrate the use of the configurable MCH as a 12x4-lane crossbar switch using the Aurora protocol to achieve a deterministic, low-latency data link. In this configuration, the crossbar has an aggregate bandwidth of 48 GB/s.

Primary author: Mr BREEDING, Eric (Oak Ridge National Laboratory)

Co-authors: Mr JUSTICE, Alan (Oak Ridge National Laboratory); Mr KARAMOOZ, Saeed (Vadatech, Inc.)

Presenter: Mr BREEDING, Eric (Oak Ridge National Laboratory)

Session Classification: Session 5

Track Classification: Application in research facilities and industry