

CQ Ethernet Switch Implementation on the NetFPGA Platform

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Abstract In this paper, we present an original design for an Ethernet switch with cross-point-queued crossbar switching fabric and analyze its performance. Recently, significant progress has been made on performance analysis of crosspoint queued crossbar switches using analytical and simulation methods. We propose a hardware implementation on the NetFPGA platform that can provide reliable results obtained in an experimental environment. It is shown that the proposed design performs as expected and outperforms reference design under some incoming traffic conditions.

Keywords Crossbar switching fabric · Lookup table · NetFPGA · Output controller · Register pipeline

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Cq Ethernet Switch Implementation On The Netfpga Platform

Caiyi Chen



Cq Ethernet Switch Implementation On The Netfpga Platform:

Implementation of an Open Flow Switch on Netfpga Chung Yik Ee,2012 **Implementation of IBM J-type Ethernet Switches and Routers** Sangam Racherla,2011 PCI Express-based Ethernet Switch Caiyi Chen,2012

A new type of Ethernet switch based on the PCI Express switching fabric is being presented. The switch leverages PCI Express peer to peer communication protocol to implement high performance Ethernet packet switching. The advantages and challenges of using the PCI Express as the switching fabric are addressed. The PCI Express is a high speed short distance communication protocol largely used in motherboard level interconnects. The total bandwidth of a PCI Express 3.0 link can reach as high as 256 gigabit per second Gb/s per 16 lanes. Concerns for PCI Express such as buffer speed address mapping Quality of Service and power consumption need to be considered. An overview of the proposed Ethernet switch architecture is presented. The switch consists of a PCI Express switching fabric and multiple adaptor cards. The thesis reviews the peer to peer P2P communication protocol used in the switching fabric. The thesis also discusses the packet routing procedure in P2P protocol in detail. The Ethernet switch utilizes a portion of the Quality of Service provided with PCI Express to ensure guaranteed transmission. The thesis presents a method of adapting Ethernet packets over the PCI Express transaction layer packets. The adaptor card is divided into the following two parts: receive path and transmit path. The commercial off the shelf Media Access Control MAC core and PCI Express endpoint core are used in the adaptor. The output address lookup logic block is responsible for converting Ethernet MAC addresses to PCI Express port addresses. Different methods of providing Quality of Service in the adaptor card include classification flow control and error detection with the cooperation of the PCI Express switch are discussed. The adaptor logic is implemented in Verilog hardware description language. Functional simulation is conducted in ModelSim. The simulation results show that the Ethernet packets are able to be converted to the corresponding PCI Express transaction layer packets based on their destination MAC addresses. The transaction layer packets are then converted back to Ethernet packets. A functionally correct FPGA logic of the adaptor card is ready for implementation on real FPGA development board.

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