Design of Cloud Server Based on Godson Processors

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Abstract. Compared with the existing cloud computing systems based on high-performance processors and traditional Ethernet network, a 32 Godson processors cloud computing system based on HyperTransport switch (HT switch) is presented in this paper, which uses HT switch as its interconnection fabric. HT switch makes it possible to build a high performance-cost ratio, and high performance-watt ratio cloud server based on Godson processors, to better meet the requirements of cloud computing workloads. As a key interconnection fabric used to construct the cloud server, the HT switch architecture is discussed in details. To evaluate the performance of HT switch-based multiprocessor systems, a prototyping system followed by results of performance testing is implemented.

Keywords: cloud server, Godson processors, HyperTransport, HT switch.

1 Introduction

Cloud computing systems have been playing an important role in data center. The traditional server systems are cluster of server nodes the dedicated local storage and connected over an Ethernet network. These server nodes use their directed-attached-storage as scratch/swap space and use a storage server on the Ethernet network for primary storage. In the cloud era, on one hand, optimized TCO, compute efficiency, and fastest growing server segment will grow to dominate the server. On the other hand, cloud deployment models, big data analytics, and data center virtualization are driving highly evolving parallelized workloads. The servers in large scale data centers require high performance-cost ratio and performance-watt ratio. Furthermore, Rapid growth in dense compute shows dense compute clusters are future of volume servers.
The cloud server deployed in data center includes off-chip multiprocessor systems and chip multiprocessor systems. With the development of multi-core processor technology, the above two kinds of multiprocessor systems can coexist in cluster systems. The appreciable distinction between them is that they belong to different layers of interconnection fabric. As the high-efficiency cloud computing systems designers, we lay a strong emphasis on the researches on off-chip multiprocessor systems. Off-chip multiprocessor system has been around since the first supercomputers were constructed [1]. Conventional multiprocessing puts all of the processors on a circuit board and lets them communicate through a type of off-chip interconnect, such as traditional bus, and so on. The traces that make up this board-level connection, though, are many centimeters long and therefore must be clocked conservatively. At present, some processors have integrated on-die memory controller and HyperTransport (HT) links. All these features not only make the processor a flexible, modular, and easily connectable component for various multiprocessor configurations, but also make it feasible to construct the dense cloud server through a novel off-chip interconnect such as HyperTransport switch (HT switch).

The remainder of the paper is organized as follows. Section 2 briefly introduces the research background. Section 3 details the cloud server based on HT switch. Section 4 presents the architecture of HT Switch. A resulting prototype system is discussed in Section 5 together with the performance and the evaluation. Finally, section 6 concludes the paper and looks into future work.

2 Background

Conducted under the technologies of processors, interconnection and cloud computing workloads, we enable the research on the cloud server. The goal is to solve how to use the high performance-cost ratio, performance-watt ratio, and national security processor to build an efficient cloud server for data center.

2.1 Godson Processors Overview

Microprocessor technology is one of key technologies in IT industry, which plays an important role in the development of social economy and national security. Over the past decade, China has made great achievements in developing advanced microprocessors that meet the requirements of both civilian and security applications. Godson processors, designed by Institute of Computing Technology, Chinese Academy of Sciences, is very successful one among them. In 2010, the first multi-core CPU product in China, Godson-3A, was successfully fabricated in a 65nm CMOS process [2][3]. Godson-3A is a 64-bit MIPS64 compatible CPU consisting of four GS464 cores as Figure 1 shown [4]. Godson-3A power is about 15 Watts.