A Test-bed for the Assessment of Power Management Strategies in Tiered Storage Systems

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Categories and Subject Descriptors C.5.5 [*Computer System Implementation*]: Servers

General Terms Design, Performance, Measurement

Keywords storage server, power, data centers, test bed

1. Abstract

Cloud computing systems require a huge number of storage servers, with growing implications for power bills, carbon emissions and the logistics of data centers. These considerations have motivated researchers to improve the energy efficiency of storage servers. Most servers use a lot of power irrespective of the amount of computing that they are doing, and one important goal is to redesign servers to be power-proportional, meaning that the power consumption is in step with the workload. Research on large-scale storage systems is hampered by their cost (Wang et al. 2014). It is therefore desirable to develop a scalable test-bed for evaluating the power consumption of large-scale storage systems. We are building on two open-source projects to construct a test-bed which will contribute to the assessment of power consumption in tiered storage systems.

2. Design

Our test-bed is a small-scale storage system based on the Cold Storage server, from the Open Compute Project (Yan 2013), and Arduino; these are both open-source projects. As depicted in Fig. 1, the test-bed is a 1:3 scale replica of a Cold Storage server, and consists of 10 disks, a workstation motherboard, and a 500 W power supply. Current Sensor Boards (CSBs) measure the current drawn by the 3, 5, and 12 V supplies to each disk, using Texas Instruments INA226 power monitors. An Arduino control shield (CS) receives current measurements from the CSBs, shows their values on a display, and transmits them onward to a PC running a database. The code and schematic diagrams for the test-bed can be found from the open-source site (`https://github.com/jaemyoun/CurrentSensor`).

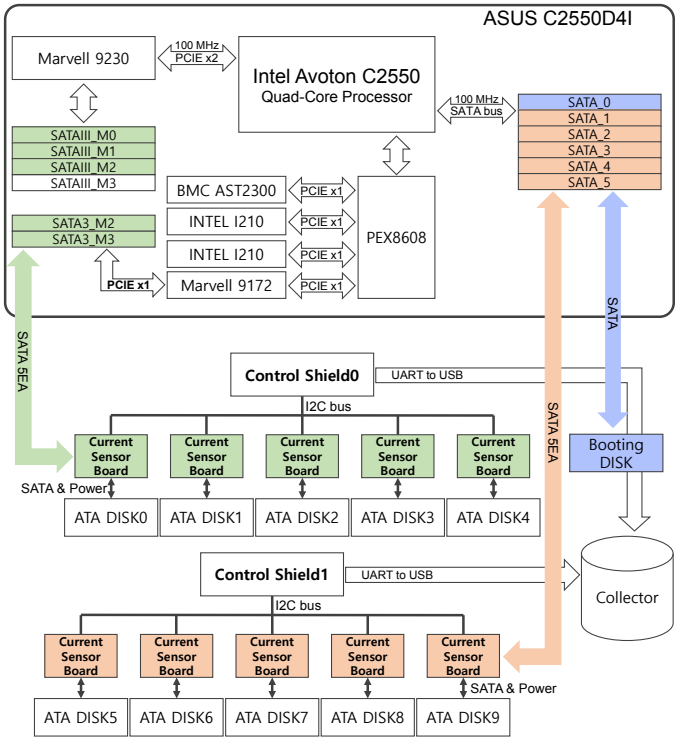

Figure 1. Layout of our scalable storage server.

Acknowledgments

This research was supported by the MSIP (Ministry of Science, ICT and Future Planning), Korea and NAVER Corp., under ICT/SW Creative research program supervised by the NIPA (National IT Industry Promotion Agency) (NIPA-2014-H0511-14-1002). *(Corresponding author: K. Kang)*

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