

基于 FPGA 的可堆叠存储阵列设计与优化

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摘 要: 提出一种新型的可堆叠磁盘存储阵列以及基于 FPGA 的直接控制存储阵列的存取技术, 在 FPGA 中实现磁盘控制器和阵列管理模块, 用于控制磁盘阵列读写; 为解决存储阵列的元数据和数据的读写访问问题, 设计了高速缓存和多通道读写控制机制, 处理模块将同一逻辑地址单元映射到 q 个通道中, SATA 控制模块将数据映射到通道内 p 个磁盘上, 实现了数据的并发读写访问. 实验结果表明, 可堆叠存储阵列不仅灵活高效, 而且可大幅提高整个存储系统的容量和带宽, 具有较大的应用价值.

关键词: 存储系统; FPGA 逻辑; 并行读写; 磁盘阵列; 可堆叠

Design and Optimization of Stackable Storage

Array Based on FPGA

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Abstract: In order to improve the system bandwidth and storage capacity of the storage system, designing a stackable disk storage array model, and the controller and the disk array management module was implemented in the FPGA; To solve the problem of metadata and data, designing cache and multi-channel read and write control mechanism, processing module with a logic unit address mapping to the q channel, and SATA control module data mapping to channel P on the disk, realizing the parallel read and write access of the data. The experimental results show that the stackable storage array is efficient and flexible, and can greatly improve the storage capacity and bandwidth, and has great application value.

Key words: storage system; FPGA logic; parallelizing reads and writes; disk array; stackable

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