Design of Hybrid Storage System for server Consolidation environments (HSSC)

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CCS Concepts: • **Computer systems organization** → **Heterogeneous (hybrid) systems**; • **Information systems** → **Storage architectures**; • **Software and its engineering** → **n-tier architectures**.

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This research proposes a storage system capable of operating multiple IO-intensive applications on server integration using virtualization technologies. Despite the widespread adoption of virtualization technologies such as VMs and containers, some IO-intensive applications are still being operated on physical servers. This is because it is difficult to estimate changes in the IO access locality of operational applications and to ensure that they do not interfere with the IO performance of other applications.

Yu et al. [2] proposed the Online-Model based Scheme for Cache Allocation (OSCA) with the aim of optimizing cache resource management shared across multiple instances of Cloud Block Storage (CBS). OSCA calculates the miss ratio curve (MRC) for each instance in realtime and adjusts the cache allocation to each instance based on the results of the MRC. The replacement algorithm used is a traditional list-based cache such as LRU.

Our research result, the ATSMF replacement algorithm, is not a traditional list-based cache, but it has been reported to significantly outperform LRU, ARC, and LARC [1].

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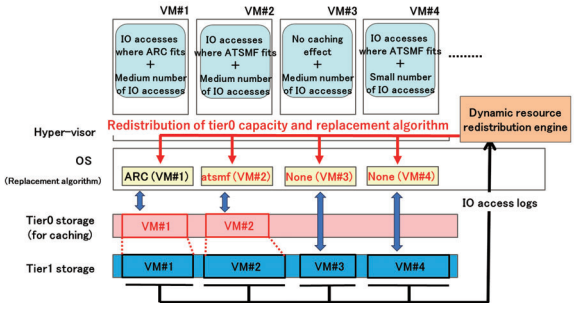

Figure 1. HSSC overview

Hybrid Storage System for server Consolidation environments(HSSC) collects and analyzes the IO access logs of applications such as VMs and containers in realtime. It uses the results of this analysis to determine suitable replacement algorithms and the size of tier0, which is high-speed storage, for each application. These determinations are then integrated into the storage system (Figure 1). The analysis of HSSC IO access logs was achieved by running multiple simulators simultaneously. This approach allows for the use of replacement algorithms other than traditional list-based caches, such as ATSMF. The OS component was implemented as a driver that operates on the Linux device-mapper. Based on the analysis results, it is possible to change the replacement algorithm and cache size during operation.

Using a prototype system implemented on Linux, we conducted performance evaluations and found that the cache access ratio improved by up to 64.1% compared to using only the LARC algorithm. This improvement is due to HSSC's ability to appropriately switch replacement algorithms based on the analysis of IO access log results.

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References

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