It's All about Cache

SPEAKER **Dr Ming ZHAO**

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TIME 10:30 am - 11:30 am
VENUE CS Seminar Room, Y6405, 6th Floor
Yellow Zone, Academic 1
City University of Hong Kong
83 Tat Chee Avenue
Kowloon Tong

ABSTRACT

This talk is about cache, and more specifically, solid-state storage based cache for large-scale computing systems such as cloud computing and big data systems. With the increasing workload data intensity and increasing level of consolidation in such systems, storage is becoming a serious bottleneck. Emerging solid-state storage devices such as flash memory and 3D Xpoint have the potential to address this scalability issue by providing a new caching layer between main memory and hard drives in the storage hierarchy. However, solid-state storage has limited capacity and endurance, and needs to be managed carefully when used for caching. This talk will present several recent works done by the ASU VISA Research Lab for addressing these limitations and making effective use of solid-state caching.

First, the talk will introduce CloudCache, an on-demand cache allocation solution for understanding the cache demands of workloads and allocating the shared cache capacity efficiently. It is able to reduce a workload's cache usage by 78% and the amount of writes sent to cache device by 40%, compared to traditional working-set-based approach. Second, the talk will present CacheDedup, an in-line cache deduplication solution that integrates caching and deduplication with duplication-aware cache replacement to improve the performance and endurance of solid-state caches. It can reduce a workload's I/O latency by 51% and the amount of writes sent to cache device by 89%, compared to traditional cache management approaches. Finally, the talk will be concluded with a brief overview of the systems research at the VISA lab.

BIOGRAPHY

Ming Zhao is an associate professor of the Arizona State University (ASU) School of Computing, Informatics, and Decision Systems Engineering (CIDSE), where he directs the research laboratory for Virtualized Infrastructures, Systems, and Applications (VISA, http://visa.lab.asu.edu). His research is in the areas of experimental computer systems, including distributed/cloud, big-data, and high-performance systems as well as operating systems and storage in general. He is also interested in the interdisciplinary studies that bridge computer systems research with other domains. His work has been funded by the National Science Foundation (NSF), Department of Homeland Security, Department of Defense, Department of Energy, and industry companies, and his research outcomes have been adopted by several production systems in industry. Dr Zhao has received the NSF Faculty Early Career Development (CAREER) award, the Air Force Summer Faculty Fellowship, the VMware Faculty Award, and the Best Paper Award of the IEEE International Conference on Autonomic Computing. He received his bachelor's and master's degrees from Tsinghua University, and his PhD from University of Florida.

All are welcome!

In case of questions, please contact Dr XUE Chun Jason at Tel: 3442 9815, E-mail: jasonxue@cityu.edu.hk, or visit the CS Departmental Seminar Web at http://www.cs.cityu.edu.hk/news/seminars/seminars.html.