COMPUTER SCIENCE COLLOQUIUM

PLOVER: Fast, Multi-core Scalable Virtual Machine Fault-tolerance

SPEAKER **Dr Heming CUI**

Assistant Professor
Department of Computer Science
University of Hong Kong
Hong Kong

DATE 29 April 2019 (Monday)
TIME 10:30 am - 11:30 am
VENUE CS Seminar Room, Y6405
6th Floor, Yellow Zone
Yeung Kin Man Academic Building
City University of Hong Kong
83 Tat Chee Avenue
Kowloon Tong

ABSTRACT

Cloud computing enables a vast deployment of online services in virtualized infrastructures, making it crucial to provide fast fault-tolerance for virtual machines (VM). Unfortunately, despite much effort, achieving fast and multi-core scalable VM fault-tolerance is still an open problem. A main reason is that the dominant primary-backup approach (e.g., REMUS) transfers an excessive amount of memory pages, all of them, updated by a service replicated on the primary VM and the backup VM. This approach makes the two VMs identical but greatly degrades the performance of services.

State machine replication (SMR) enforces the same total order of inputs for a service replicated across physical hosts. This makes most updated memory pages across hosts the same and they do not need to be transferred. We present Virtualized SMR (VSMR), a new approach to tackle this open problem. VSMR enforces the same order of inputs for a VM replicated across hosts. It uses commodity hardware to efficiently compute updated page hashes and to compare them across replicas. Therefore, VSMR can efficiently enforce identical VMs by transferring only divergent pages. An extensive evaluation on PLOVER, the first VSMR system, shows that PLOVER's throughput on multi-core is 2.2X to 3.8X higher than three popular primary-backup systems. Meanwhile, PLOVER consumed 9.2X less network bandwidth than both of them. PLOVER's source code and raw results are released on github.com/ hku-systems/plover.

BIOGRAPHY

Dr Heming Cui is an assistant professor in Computer Science of the University of Hong Kong (www.cs.hku.hk/~heming) since January 2015. His research interests are in distributed systems, blockchains, and cloud computing, with a particular focus on building software infrastructures and tools to improve reliability and security of real world applications. His recent research has led to a series of open source projects as well as publications in premier systems conferences and journals (e.g., SOSP, NSDI, ATC, SOCC, JSAC, and TPDS). Dr. Cui receives several competitive research awards, including a Croucher Innovation Award in 2016, a best paper award from ACSAC 2017, and two collaboration research grants from the Huawei Innovation Research Program in 2017 and 2018. Before joining HKU, he obtained his master and bachelor degrees from Computer Science of Tsinghua University in Beijing, and PhD degree from Computer Science of Columbia University in New York in December 2014.

All are welcome!