

ECPS: An Application-Specific VM Scheduler Basing on CPU Pool Mechanism for Big Data Environment

Xiaodong Liu*, Jian Li*

*Shanghai Key Laboratory of Scalable Computing and Systems, The School of Software, SJTU (Shanghai Jiao Tong University), China

liuxiaodong@sjtu.edu.cn, li-jian@sjtu.edu.cn

Abstract—Virtualization systems (e.g. Xen) provide powerful, flexible and scalable infrastructures for big data processing. In the virtualization system, the virtual machine (VM) scheduler is the key component to efficiently consolidate the multiple VMs on the virtual machine monitor (VMM), a.k.a. hypervisor. Xen employs the CPU pool mechanism to improve the adaptability of the VM scheduler for tasks of enormous variability and variety in the environment of big data. However, the CPU pool mechanism contains no algorithms to classify VMs or the time-slice allocation strategy, which are indispensable for a complete implementation of a high-adaptive VM scheduler. In this paper, we discuss the optimizing opportunities and introduce an application-specific VM scheduler, called ECPS (Enhanced CPU Pool Scheduler), which is a CPU-pool-based VM scheduler enhanced with VM multi-classification model and a reasonable time-slice allocation strategy. The experimental evaluation shows that ECPS can remarkably improve the performance of Xen virtualization system.

Keyword—Big Data, CPU Pool, Time-slice, VM Scheduler, Xen



Xiaodong Liu received the BS degree in Computer Science from Nanjing University of Aeronautics and Astronautics, China, in 2015, respectively. He is studying for his MS degree in Shanghai Jiao Tong University from 2015. His major is cloud computing and virtualization.



Jian Li received the BS degree in electronics and information technology from TianJin University, China, in 2001, the MS degree in telecommunication and computer science from the University of Henri Poincare, France, in 2003, and the PhD degree in computer science from the Institute National Polytechnique de Lorraine (INPL), Nancy, France, in 2007. He is an associate professor in the School of Software at Shanghai Jiao Tong University. He has worked as a postdoctoral researcher at the University of Toronto and as an associated researcher at McGill University in 2007 and 2008, respectively. His research interests include real-time scheduling theory, Cyber-Physical system, real-time communication, network protocol design and quality of service, real-time computing and embedded system. He is a member of the IEEE.