Algorithmic Optimization of Cloud Services for Micro-users—Efficient Resource Provisioning via Optimal Workload Allocation

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Abstract

Today, cloud computing is widely accepted and utilized in the business world. From the perspective of businesses that utilize the cloud, it is critical to deliver services with high performance and reliability that meet their customers’ requirements. Hence, the ability to characterize and optimize the service performance is of great importance. In this presentation a stochastic multi-tenant framework is proposed to model the service of customer requests in a cloud infrastructure comprising of heterogeneous virtual machines. Two cloud-service performance metrics are mathematically characterized, namely the percentile and the mean of the stochastic response time of a customer request. Based on the multi-tenant model, a workload allocation algorithm, termed the max-min-cloud algorithm, is devised to optimize the performance of the cloud service. Furthermore, the resource provisioning problem in cloud services is also studied in light of the max-min-cloud algorithm and the performance metrics. In particular, an efficient resource-provisioning strategy is proposed for serving the dynamically-incoming customer requests. With the help of this work, we hope that businesses can have a better understanding of how much virtual resources they need in the cloud to optimize their cloud-service performance and meet customers’ expectations subject to a cost constraint.

Bio

Majeed M. Hayat is a professor of electrical and computer engineering at the University of New Mexico, where he is also Associate Director of The Center for High Technology Materials. Dr. Hayat received his B.S. degree (summa cum laude) in 1985 in electrical engineering from the University of the Pacific, and he received his M.S. and Ph.D. degrees in electrical and computer engineering from the University of Wisconsin-Madison in 1988 and 1992, respectively. Dr. Hayat’s research contributions cover a broad range of topics in the areas of avalanche photodiodes, optical communication, statistical signal/image processing, algorithms for spectral sensing, complex interdependent networks, networked and distributed computing, as well as statistical communication theory. Prof. Hayat has authored over 90 peer-reviewed journals (with over 3,400 citations and an H-Index of 29), 9 book chapters, and 10 patents (5 commercialized). He was Associate Editor of Optics Express from 2004 to 2010, and he is presently Associate Editor for the IEEE Transactions on Parallel and Distributed Computing. Dr. Hayat is a recipient of the CAREER Award from the National Science Foundation (1997). He is Fellow of IEEE, SPIE and OSA.