On the Performance of Multithreading Applications under Private Cloud Conditions

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Abstract. *Cloud computing paradigm is changing the way that services are delivered over the Internet, providing elastic resource capabilities and ensuring QoS [Vogel et al. 2016]. Through virtualization technologies such as KVM or LXC, a cloud can dynamically abstract computational resources and offer them on-demand. Our goal is to compare two cloud environments (*dedicated *- one instance with full machine resources scaling up to 8 threads and* shared *- two instances with half machine resources scaling up to 4 threads) and native (Ubuntu 14.04) as baseline, using different virtualization technologies (LXC v.1.0.8 and KVM v.2.0.0) under a private cloud (CloudStack 4.8). The tests were performed with a well-known benchmark suite of multithreading applications (PARSEC 3.0), in which five benchmarks compiled with native inputs (`Canneal, Ferret, x264, Bodytrack and Dedup`) were chosen. This work extends the studies on cloud performance evaluation of [Griebler et al. 2018]. In addition, the number of threads were limited to the number of vCPUs available and Hyperthreading was intentionally disabled. The results demonstrated that performance in cloud varies according to specific characteristics of each application, environment, and virtualization technology. In some applications, a negligible overhead is noticed in both cloud scenarios. On the other hand, specific characteristics like memory locality and management, and I/O bound operations tend to introduce significant overheads both in KVM-based (`Canneal` about 18% in* dedicated *and 12% in* shared machine resources *with 2 threads) and LXC-based cloud (`Dedup` overhead up to 53% with 7 threads) instances.*

Keywords— *Cloud Computing, Virtualization, IaaS, Performance, Cloustack, PARSEC.*

References

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