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Workload modeling for resource usage analysis and simulation in cloud computing

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ABSTRACT

Workload modeling enables performance analysis and simulation of cloud resource management policies, which allows cloud providers to improve their systems' Quality of Service (QoS) and researchers to evaluate new policies without deploying expensive large scale environments. However, workload modeling is challenging in the context of cloud computing due to the virtualization layer overhead, insufficient tracelogs available for analysis, and complex workloads. These factors contribute to a lack of methodologies and models to characterize applications hosted in the cloud. To tackle the above issues, we propose a web application model to capture the behavioral patterns of different user profiles and to support analysis and simulation of resources utilization in cloud environments. A model validation was performed using graphic and statistical hypothesis methods. An implementation of our model is provided as an extension of the CloudSim simulator.

1. Introduction

Clouds are being used as a platform for various types of applications with different Quality of Service (QoS) aspects, such as performance, availability and reliability. These aspects are specified in a Service Level Agreement (SLA) negotiated between cloud providers and customers. The failure to comply with QoS aspects can compromise the responsiveness and availability of service and incur SLA violations, resulting in penalties to the cloud provider. The development of resource management policies that support QoS is challenging and the evaluation of these policies is even more challenging because clouds observe varying demand, their physical infrastructure has different sizes, software stacks, and physical resources configurations, and users have different profiles and QoS requirements [1]. In addition, reproduction of conditions under which the policies are evaluated and control of evaluation conditions are difficult tasks.

In this context, workload modeling enables performance analysis and simulation, which brings benefits to cloud providers and researchers. Thereby, the evaluation and adjustment of policies can be performed without deployment of expensive large scale environments. Workload models have the advantage of allowing workload adjustment to fit particular situations, controlled

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