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Regression Based Performance Modeling and Provisioning for NoSQL Cloud Databases

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Abstract

Cloud computing is a successful and emerging paradigm that supports on-demand services with pay-as-you-go model. Because of the exponential growth of data, NoSQL databases have been used to manage data in the cloud. In this scenario, it is fundamental for cloud providers guarantee Quality of Service (QoS) by avoiding violations to Service Level Agreement (SLA) contract while reducing the operational costs related to overprovisioning and underprovisioning. In this regard, elastic provisioning mechanisms are employed to maintain QoS by dynamically adding and removing resources to handle workload fluctuations. These mechanisms can also take more accurate provisioning decisions based on performance predictions of the cluster shrinkage and growth. Performance prediction is a challenging task since concurrent access of distributed data can cause non-linear effects on performance. This paper presents a performance modeling approach for NoSQL databases in terms of SLA-based metrics capable of capturing non-linear effects caused by concurrency and distribution aspects. Moreover we present a elastic provisioning strategy that takes advantage on performance models to deliver a reliable resource provisioning. We carried out experiments in order to evaluate our performance modeling and provisioning approaches. The results confirmed that our performance modeling can accurately predict throughput and SLA violations measurements under a wide range of workload settings and also that our elastic provisioning approach can ensure QoS while using resources efficiently.

Keywords: Cloud Computing, Performance Modeling, NoSQL Databases, Workload Analysis

1. Introduction

Cloud computing is a paradigm of remarkable success for service-oriented computing. Scalability, elasticity, pay-per-use pricing and economy of scale are the major reasons for this

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