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A sequential pattern mining model for application workload prediction in cloud environment

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Abstract

The resource provisioning is one of the challenging problems in the cloud environment. The resources should be allocated dynamically according to the demand changes of the applications. Over-provisioning increases energy wasting and costs. On the other hand, under-provisioning causes Service Level Agreements (SLA) violation and Quality of Service (QoS) dropping. Therefore the allocated resources should be close to the current demand of applications as much as possible. For this purpose, the future demand of applications should be determined. Thus, the prediction of the future workload of applications is an essential step before the resource provisioning. To the best of our knowledge, for the first time, this paper proposes a novel Prediction mOdel based on Sequential pATtern mINinG (POSITING) that considers correlation between different resources and extracts behavioural patterns of applications independently of the fixed pattern length explicitly. Based on the extracted patterns and the recent behaviour of the application, the future demand of resources is predicted. The main goal of this paper is to show that models based on pattern mining could offer novel and useful points of view for tackling some of the issues involved in predicting the application workloads. The performance of the proposed model is evaluated based on both real and synthetic workloads. The experimental results show that the proposed model could improve the prediction accuracy in comparison to the other state-of-the-art methods such as moving average, auto-regression, neural networks and hybrid prediction approaches.

Keywords: Cloud Computing, Prediction, Application, Workload, Sequential Pattern Mining.

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