Chapter 8

Information Feedback Based Architecture for Handling the Scalability Issues in the Reusable Cloud Components

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ABSTRACT

With the evolution of the paradigm of cloud computing in every field of application, the demand on the reusable resources while providing the service has increased substantially. Although it is transparent to the user through virtualization, that is also a strength of cloud computing, the runtime scalability of resources to cater for a variety of services is to be addressed to meet the critical factor of the agreed quality of service. In this work, an architecture based on information feedback is presented to address this issue. The findings have been supported by the simulation results. The scalable architecture makes use of a hierarchy of resources, each level capable of providing a different degree of services. The demand for resources at each level, which is also equivalent to contention for resources or service drops, is computed using Random Early Detection (RED) or similar algorithms and used as feedback signal. The effectiveness of this signal may be enhanced by predicting the same several steps ahead of time. The prediction ensures the availability of a breathing time for the allocation of the resources.

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INTRODUCTION

In order to meet the requirements of reuse and re-configurability, software architecture with scalable & extensible components will be very useful. However, it involves increased message handling and inter-process communication. The addition of new components to the scalable and extensible software architecture poses the issue of increased memory requirements, delay/latencies, blockheads in the queue etc. It is predominant in the distributed software architecture. In this work, a novel mechanism based on information feedback is suggested to control these parameters while the architecture is scaled up. Accurate models are required to catch up the performance with the scaling of the software components. Although a good amount of literature exists on the effect of scaling on the performance, they do not provide an insight for improving or retaining the performance. In this work, the scaling is linked to the time shifts of the feedback signal provided to the source component through active control mechanism such as Random early detection (RED). Simulation results indicate that, by controlling the shifts given to the predicted version of the feedback signal, the performance of the scaled architecture may be improved. In order to link the quality of service with the organization of the content, a hierarchical organization of the same spanning multiple levels of abstractions is proposed. Inter component communication over the internet makes them vulnerable to hacking and poses security issues that requires serious attention. The suggested mechanism of the organization of the component is addresses this problem.

The paradigm of Component based software engineering (G. T. Heineman and W. T. Councill, ed, 2001) has significantly reduced the software development cycle time and the cost. It comes with the attractive features such as parallel development, software reuse, pluggable maintenance etc. In the distributed software architecture, the inter-component communication has increased burden over the available resources such as bandwidth, buffer space etc. The supporting network provides limited infrastructure. With the addition of every component in to the network, the contention for the resources increases.

Through advance prediction of the status of the network as proposed in this work, it should be possible to overcome the issue of the network load. The delay as well as the loss rate gets reduced which otherwise would be substantial.

The goal of this chapter is to provide a model for effective deployment of the resources in the cloud. The underlying resources for the SaaS, PaaS and IaaS (W. Kim, 2009) are organized in to hierarchical model based on the priority of the invoking application as detected by the SLA. The hierarchies are mapped on to these service parameters as well as to the availability of the results at each level.

BACKGROUND

Components in a cloud cluster the reusable portions of the code together and provide the appropriate interfaces to the external world. The programmer can use them with the right configuration minimizing the code. As a result, the efforts towards the software development have been greatly reduced.

The Cloud Model for QoS

Cloud computing supports services over the network, providing scalability and quality of service (qos) guaranteed on demand. The on demand service ensures the users can customize and personalize their settings. The hardware, software and the data of the cloud (B. Rochwerger, D. Breitgand, E. Levy, A. Galis, K. Nagin, I. Llorente, et al 2009) can get reconfigured automatically. As a result, cloud computing has shortened the software development cycle.