Performance Evaluation of Hierarchical SOAP Based Web Service in Load Balancing Cluster-Based and Non-Cluster-Based Web Server

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ABSTRACT

Evaluating the implementation techniques of web service and analysing their performance in load balancing cluster-based and non-cluster-based web server is necessary from the perspective of web service developer, researchers as well as users. As such the authors propose to develop and implement a SOAP based hierarchical web service using load balancing cluster-based and non-cluster based Apache Tomcat web server to study the web service performance metrics. The performance of overall system is tested using the load testing tool Mercury Load runner and a comparative investigation is carried out using the stability, load and performance metrics of both services. In this paper, the authors present, in detail, the methodology of experiment, comparative testing results, and statistical analysis on performance metrics.

Keywords: JAVA, Load Balancing Cluster-Based Web Server, MySQL, SOAP, Web Service

1. INTRODUCTION

Web Services (WS) are standards for binding, publishing, describing and discovering application interfaces over internet. The set of standards includes a Simple Object Access Protocol (SOAP) as distributed object communication protocol, Universal Description Discovery and Integration (UDDI) as a standard specification for public registries, Web Service Description Language (WSDL) as a description language, and eXtended Markup Language (XML) (Saddik, 2006) for a dynamic and self-defining information-specification language with semantic support. WS constitute an emerging technology for which potential applications are unlimited. In simplest
terms: “if a provider can imagine a way of delivering something of value to a customer to provide some usefulness, they have a viable WS” (Stafford, 2003). Every WS may play the role of being a requester, service provider or a broker. World Wide Web (WWW) Consortium (W3C) defines it as software service that can support interoperability over a network communication system (Booth, 2004). With rapid growth of internet user, it is a good practice to serve consumers of WS without any server over load errors. The load balancing technique of clustering web server enhances the web server capacity to increase the server performance. However clustering web server may impute some impact on the performance aspect of hosting WS. The performance enhancement involves the costly investment in new hardware and maintenance.

In this paper we perform a comparative study for the stability and performance measurement of a hierarchical WS by implementing it in cluster based and non cluster based web server.

2. RELATED WORK


This work is unique from the previous work as we have performed a comparative investigation on performance and stability of WS using load balancing cluster-based and non cluster-based web servers. The novelty of this work is its’ emphasizes on overall performance of hierarchical WS from end users point of view, simply by monitoring the performance metrics of the system.

3. OBJECTIVE, METHODOLOGY AND ARCHITECTURE

The study proposes to implement and perform a comparative study of the performance and stability of hierarchical WS by hosting them in cluster-based and non cluster-based web server. We consider the hierarchical system, because WS may work as a broker, consumer or service provider that can be invoked by other browser based WS client. The load balancing cluster-based web server is configured using apache hyper text transfer protocol (http) web server (Apache Web Server, 2014) mod_jk tomcat connector (Mod jk connector, 2014) and apache tomcat application server (Tomcat Web Server, 2014). We use Java programming language, apache tomcat and MySQL database server to develop and implement the hierarchical WS. The hierarchical WS includes: (i) Child WS (CWS), (ii) the parent WS (PWS), and (iii) the client of PWS, and hosted at apache tomcat web server. The data base size is 1500. The testing tool Mercury Load Runner is configured to generate a virtual user (VU) script that can access the WS and monitor the overall WS performance metrics. We follow the various steps for the test which are presented and discussed elsewhere (Kalita & Bezboruah, 2011). We follow an architecture that retrieves
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