Chapter 11
Performance Evaluation of Public IaaS Clouds for Web 2.0 Applications Using CloudStone Benchmark

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ABSTRACT

Web 2.0 applications have become ubiquitous over the past few years because they provide useful features such as a rich, responsive graphical user interface that supports interactive and dynamic content. Social networking websites, blogs, auctions, online banking, online shopping and video sharing websites are noteworthy examples of Web 2.0 applications. The market for public cloud service providers is growing rapidly, and cloud providers offer an ever-growing list of services. As a result, developers and researchers find it challenging when deciding which public cloud service to use for deploying, experimenting or testing Web 2.0 applications. This study compares the scalability and performance of a social-events calendar application on two Infrastructure as a Service (IaaS) cloud services – Amazon EC2 and HP Cloud. This study captures and compares metrics on three different instance configurations for each cloud service such as the number of concurrent users (load), as well as response time and throughput (performance). Additionally, the total price of the three different instance configurations for each cloud

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service is calculated and compared. This comparison of the scalability, performance and price metrics provides developers and researchers with an insight into the scalability and performance characteristics of the three instance configurations for each cloud service, which simplifies the process of determining which cloud service and instance configuration to use for deploying their Web 2.0 applications. This study uses CloudStone – an open-source, three-tier web application benchmarking tool that simulates Web 2.0 application activities – as a realistic workload generator and to capture the intended metrics. The comparison of the collected metrics indicates that all of the tested Amazon EC2 instance configurations provide better scalability and lower latency at a lower cost than the respective HP Cloud instance configurations; however, the tested HP Cloud instance configurations provide a greater storage capacity than the Amazon EC2 instance configurations, which is an important consideration for data-intensive Web 2.0 applications.

1. INTRODUCTION

Web applications have evolved over the past two decades from static content files to the dynamically-generated user-interactive web pages. Traditional Web 1.0 applications had several limitations including static, read-only files that only supported passive, one-way communication between a website and its clients. Web 1.0 applications also had limited scalability capabilities; therefore, as the number of clients requesting data from a website increased, the response time – the time required for the client to receive data from the website – increased; resulting in a decrease in the website's performance and causing communication delays. Conversely, Web 2.0 applications allow users to interact with the content of a web page rather than simply consuming the content. Such dynamic applications provide important features such as a rich user interface and active, two-way communication that supports collaboration amongst the application and its users. The social networking services Facebook and Twitter are two examples of popular Web 2.0 applications (Helmy, 2013).

As Web 2.0 applications became an integral part of the daily activities of people throughout the world, providers migrated their applications to large-scale distributed computing platforms capable of supporting the increasing demand for online services. One such distributed platform is the Cloud, which is emerging as the dominant computing platform for Web 2.0 applications. Cloud computing provides a number of benefits to providers, as well as their customers, that make it a better choice over other distributed computing platforms (Goundar, 2012). One benefit of cloud computing is that the bulk of the data associated with an application and its customers resides in the cloud, which means customers can access their data regardless of their location or the device with which they connect. Another benefit of cloud computing is that policy can be established to maintain acceptable levels of load and latency as the demand on the system fluctuates. A final, but likely the most important, benefit of cloud computing is that it provides scalability, which allows the resources, assigned to an application to expand and contract as the number of concurrent users fluctuates.

As cloud computing has emerged as the dominant platform for Web 2.0 applications, researchers have begun to study public cloud services to help application developers choose the cloud service that best supports their applications. This study provides measurements such as the number of concurrent users (scalability), response time and throughput (performance), and total cost for various virtual machine instances on the Amazon EC2 and HP Cloud Infrastructure as a Service (IaaS) providers. The CloudStone