Performance Monitoring of Remote Websites Using Mobile Agents

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Abstract. In this paper, a mobile agent based approach is investigated to provide the underlying framework for monitoring the performance tests at a remote website. Mobile agents are autonomous and dynamic entities that can migrate between various nodes in the network. They offer many advantages over traditional design methodologies, including: reduction in network load, overcoming network latency and disconnected operations. This research aims to explore the adaptability of the mobile agent approach for website performance testing. It analyses the applicability of mobile agents in carrying out a monitoring task. We have designed and implemented the monitoring framework. The performance of mobile agents is compared with the non-agent approach. Analyzing the results for the same purpose and environments, the mobile agent approach performs better in reducing the load on the host server and saving communication bandwidth than the traditional approaches.

Keywords: software quality assurance, mobile agent, load testing, stress testing, robustness, performance evaluation

1. Introduction

The World Wide Web (WWW) has become more and more popular and common around the world. Technically each application on WWW utilizes a different high-level network protocol but all use the same lower-level network protocol to handle network communications. For instance, web servers transfer documents to each other using HTTP (HyperText Transfer Protocol). Unfortunately there are several different variations of HTTP that a web browser may use (Splaine and Jaskiel, 2001). Furthermore, the lack of modularity in the design of HTTP has made its evaluation difficult and caused problems for other WWW applications. A new generation of HTTP (HTTP-NG) provides benefits to produce a simpler, but more capable and more flexible, protocol than the original version of HTTP. Another variation, HTTPS, uses an encryption technology to scramble HTTP information before it is sent over the WWW. Moreover, with so many web editors available with little cost or even free of charge, making website establishment is getting easier as time goes by.

The thorough testing of websites and web applications is not an easy task. Finding cost-effective, systematic and comprehensive testing techniques for ensuring the functions of a large, complicated system is always a daunting task in the field of software engineering and it requires perseverance. In order to have a quality website, we need to test the site to ensure everything is working properly.

Considering bandwidth utilization and response time as performance parameters in this research, we propose the use of mobile agents for performance monitoring of remote websites. Specifically, the mobile agent performs scheduled load and stress...
testing by executing multiple HTTP, HTTPS, XML, and SOAP web transactions simulating customers’ actions. Critical performance data is captured and results are graphically reported via online display or e-mail. Thus, the web based user interface allows us to find, fix and prevent performance bottlenecks and failures on our websites.

We believe that mobile agents are a fascinating paradigm for design and implementation of dynamic distributed systems. Mobile agents are programs capable of determining their migration to other hosts. Their high degree of autonomy and adaptability makes mobile agents a promising software pattern in WWW applications (Griss and Pour, 2001). By utilizing a mobile agent to remotely evaluate website performance, we are able to significantly cut down the bandwidth that we need to achieve the same test coverage. The mobile agent system requires a minimum amount of bandwidth to send the agent out to the tested target, and once the agent starts to perform the tests, it is on its own and requires no connection with the server. Furthermore, the agent can perform the tests automatically after the system administrator has adjusted the settings. This decreases the workload of the workers and increases their efficiency in the long run. In addition, a mobile agent can survive better under harsh conditions, and therefore it is a better approach for the Internet environment we have today.

The rest of the paper is organized as follows. In Section 2, we discuss issues related to website performance, in the respects of testing methods. In the following section, we then investigate the characteristics and advantages of mobile agent technology. Subsequently in Section 4, we propose a framework for performing and monitoring a load test of remote websites by using a mobile agent followed a numerical discussion on the proposed framework.

2. Issues related to website performance

2.1. Web environment characteristics

To access the web, we run a browser program. The browser reads documents, and can fetch documents from other sources. Information providers set up hypermedia servers from which browsers can get documents.

The browsers can, in addition, access files by FTP, gopher and an ever-increasing range of other methods. On top of these, if the server has search capabilities, the browsers will permit searches of documents and databases.

The documents that the browsers display are hypertext documents. Hypertext is text with pointers to other text. The browsers let us deal with the pointers in a transparent way—select the pointer, and we are presented with the text that is pointed to.

Hypermedia is a superset of hypertext—it is any medium with pointers to other media. This means that browsers might not display a text file, but might display images or sound or animations.

2.2. Problems on website performance

Website performance is one of the important factors in software quality assurance. Although the WWW bandwidth and web server capacity have improved in recent years,