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Techniques to Control Memory Hogging by Web Browsers: An in-Depth Review

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Abstract: The Web Browser is to date a popular piece of software in modern computing systems. They are the main interface for vast information access from the Internet. Browsers technologies have advanced to a stage where they do more than before. They now parse not only plaintext and Hypertext Markup Language (HTML), but also images, videos and other intricate protocols. These advancements have increased demand for memory. This increased demand poses a challenge in multiprogramming environments. The contemporary browser reference model does not have a memory control mechanism that can limit maximum memory a browser can use. This leads to hogging of memory by contemporary browsers. This paper is a review on emergent techniques that have been used to control memory hogging by browsers based on the contemporary reference architecture. We review major browsers architectures including Mozilla Firefox, Google Chrome and Internet explorer. We give an in-depth study on techniques that have been adopted with a view to solve this problem. From these reviews we derive the weaknesses of the contemporary browser architecture and inefficiency of each technique used.

Keywords: Browser reference architecture, memory hogging, web browser

1. INTRODUCTION

The Internet is progressively becoming an indispensable component of today's life. Most often than not, people largely rely on the expediency and elasticity of Internet-connected devices in learning, shopping, entertainment, communication and in broad-spectrum activities, that would otherwise necessitate their physical presence (Sagar A. et. al., 2010). Access to information or services via the Internet requires a medium; a browser operates as a medium. It is the prime component of a computer system when the Internet services are required. A browser retrieves, displays and traverses information resources on the web (World Wide Web Consortium, 2004).

Information resources comprise text, image, video, or other piece of content. These resources are accessed and indentified by a Uniform Resource Identifier (URI). The first browser known as WorldWideWeb was made in the early 1990s by Tim Berners-Lee (Tim Berners-Lee, 1999). Since then, browsers have seen tremendous advancements in their architectures and usage. The earliest browsers; Nexus, Mosaic and Netscape were less complex and used considerably low computer memory. However, they were commonly used for viewing basic HTML pages. With the birth of the Internet, browsers have gained a lot of popularity globally.

1.1 Motivation

Today, the browser is the most used computer application (Allan and Michael, 2006; Antero et. al., 2008). This phenomenon may be attributed to its various usages in everyday life. With limited computer power to process voluminous data generated from various sources, users have resorted to other technologies like the cloud computing and other online solutions where there is robust computer processing power, vast storage, scalability, reliability and on demand services. In these cases, resources are accessed as services via the Internet with thin clients especially the browsers.

Originally, Web information comprised a set of documents that in most cases contained text and hyperlinks to other related documents, having little or no client-side code. All rendered content originated from a single source. Web content has increasingly become more complex in pursuit to incorporate interactive features. Today, web programs have advanced to become highly interactive applications that execute on both the server side and client machine. With these advancements, modern web pages are no longer simple documents. They comprise highly dynamic contents that work together with each other. In other words, a Web page is now said to be a "system"– having dynamic contents as programs running in it, interacting