MeghaOS: A Framework for Scalable, Interoperable Cloud Based Operating System

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ABSTRACT

Cloud computing is becoming relevant due to increase in speed of Internet and reduction in its access cost. Desktop computing demands expensive hardware and software suits which become obsolete too often. Ownership of Personal Computers has always remained low in developing countries mainly due to its prohibitive cost. Alternate models of Computer usage like Public-Access Kiosks and low cost Laptops have been tried with limited success. Issues like security and privacy are major concerns in pubic computing. Laptops and other mobile devices lack required hardware support to run computing intensive applications. Increased penetration of Internet and mobile phones are providing new opportunities to bring computing closer to people. Cloud based Operating Systems are an effort in this direction. The present system, named MeghaOS, provides a framework for Desktop-like Operating System (OS) on a Web Browser. The Cloud becomes a metaphor for Operating System services accessed through Internet. Unlike traditional Operating System, MeghaOS can be accessed on any device having just a Web Browser. Since applications developed using this framework will be cached in Client’s machine, network utility will be low. Since data and applications are hosted remotely users can use them without transferring data into local device. MeghaOS provides scalable, multi-device compatible, browser accessible framework for Cloud based Operating System demonstrating next generation computing paradigm.

Keywords: Cloud Computing, Cross-Platform, Internet, Operating System, Web Browser

1. INTRODUCTION

With the ongoing transition in Web technologies and Cloud computing, there is a considerable shift towards Cloud-based software/service as these applications are becoming increasingly interactive and allow the use of desktop-style applications on the Web. The examples include Google Docs - online word processing and spreadsheet applications (http://docs.google.com/), instant messaging systems and online games. In this upcoming era of Cloud-based software, applications live on the Cloud as service and they can be accessed via a simple

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Web browser. The services consist of data, computation and other resources that can be located anywhere in the world. The services and applications require no installation and make the deployment of applications on the Cloud server exceptionally simple and rapid. Ideally, applications should also support user interaction and collaboration, by allowing multiple client devices to interact and share the same data and application set over the Internet (Pianese, Bosch, Duminuco, Janssens, Stathopoulos, & Steiner, 2010). There is another parallel transition currently occurring where mobile devices are becoming an important application platform and a gateway to the Web. While the Web has conventionally been accessed from a personal computer, the increasing network bandwidth, processor speed, memory capacity and network service plans are rapidly increasing the mobile web usage. The two transitions, towards Cloud-based software usage and Web-enabled mobile devices are transforming present era in many important ways. It is thought that in the long run the popularity of the Cloud will make it the well used application platform all over the world. It is also predicted that with the growing popularity of mobile devices and users, a common application platform will emerge for the unified usage with different computing gadgets from desktop to mobile devices.

The structure of this paper is as follows. Section 2 briefs the background on mobile web applications and few existing solutions in the domain along with the comparison studies. Section 3 gives the overview of proposed framework along with mobile browser optimization in Cloud computing platform. Section 4 briefs the architecture of the proposed framework. Sections 5, describes the various optimization approaches such as dynamic content caching and offloading of computations. Section 6 discusses the experimental results showing the power of Cloud computing, compatibility of system for various network capabilities and the effect of caching. Finally, Section 7 concludes the paper along with future directions.

2. RELATED WORK

With the rapid development of new forms of Cloud and mobile computing paradigms, it is necessary that a generic operating system must evolve with a virtual OS framework and a common set of applications to cater the needs of all the internet enabled computing gadgets (Steinke, 2008). As a result, the Internet or the Cloud could potentially support and manage a virtual OS that can be accessed by all the devices connected by a network. The various contemporary systems with similar goal of a Web OS are described below.

Google Chrome OS: It is a popular open source operating system developed by Google and runs typically on netbooks. It is widely known as Chromium OS. The user interface is austere and resembles the Google Chrome web browser. On being an open source project, Chromium OS is prone to changes by budding developers while the Chrome OS is specific and runs only on the supporting hardware (Barth, Jackson, & Reis, 2009). The architecture has three significant components of which the firmware forms an integral part. The firmware helps to boot the OS in a jiffy. The verified booting process takes care of security. System recovery option helps in reinstallation. The services are differentiated for system level and user level. The user land services managed by Upstart assist in running only the critical services. The user interaction with multiple client windows is successfully managed by the Window Manager which is similar to X window managers. The X-Composite Extension is used to handle windows and pixmaps to draw final and composite images. In addition to this, it shelters the computer against the numerous forms of viruses and malwares. But this entire system is web centric and thus requires a very reliable internet connection to support data centric applications and multitasking. Despite supporting the development and
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