TrimCloud: An Analysis of a SaaS Hypervisor Solution to Traditional VDIs

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ABSTRACT

Virtual desktop infrastructures (VDIs) are a system on a server platform that hosts multiple virtual machines (VMs). Traditionally, VDIs are on-premise and thus are completely supported and maintained internally by an organization; hence, they can be costly and inefficient to maintain and support. In this paper, TrimCloud is proposed as a Software-as-a-Service (SaaS) solution to on-premise VDIs by reducing the costs, labor, and the worries of installing, implementing, and maintaining a VDI. TrimCloud, which uses the VirtualBox program as its hypervisor, delivers isolated virtual environments through the cloud using OpenVPN for added security. The TrimCloud Web App offers a point of access where the client manages the administrative duties including selecting the specifications for their virtual machines. The prototype implementation of TrimCloud is currently available at the TrimCloud website. This paper examines the capabilities, advantages, and limitations of using the SaaS solution TrimCloud.

Keywords: Cloud Computing, SaaS, Software-as-a-Service, VDI, Virtual Desktop Infrastructures, Virtual Machines, VirtualBox, Web App

1. INTRODUCTION

Software-as-a-Service (SaaS) “reduces the hardware requirements for end-users” (Sureshkumar, Kannan, & Purniemaa, 2013) as well as for institutions and organizations that require a virtual desktop infrastructure (VDI) by placing the work of deployment and maintenance on the service provider (Nadeau & Gray, 2013). Institutions that have their virtual desktop infrastructure managed by a Software-as-a-Service provider instead of the traditional method save time and money (Nadeau & Gray, 2013) and can increase production. One of the most defining characteristics of Software-as-a-Service is that the software activities are “managed from central locations . . . including architecture, pricing, partnering, and management characteristics” (Microsoft, 2011a). In the context of this paper, the central location of administrative duties will be coined the software control panel (SCP). The SCP of the TrimCloud system is the TrimCloud Web App.

The TrimCloud Web App is the point of access to manage virtual machines, administer access level permissions, receive information

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to download software for end-users to remotely connect to virtual machines (VMs), and access tutorials for using TrimCloud. The SCP is an important entity of TrimCloud because it is where the client performs all of their administrative duties. It is important to note that in the context of this paper the words “institution”, “organization”, and “company” are interchangeable and the word “client” is the individual(s) of the institution/organization/company that has sole discretion of all administrative duties of managing the virtual desktop infrastructures.

Cloud computing is the current trend for new, upcoming software and as a critical add-on for existing software. Storing information in the cloud allows users to access their information from anywhere (Jadeja & Modi, 2012). Cloud computing opens the door for software developers to offer services like Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS), and Platform-as-a-Service (PaaS) (Rimal, Choi, & Lumb, 2009). This has created a new age of information storage and retrieval and has increased the need for more sophisticated security. Developers of systems that are in the cloud must consider the efficiency, cost, requirements of the new system, and limitations of the hardware (Rimal et al., 2009). These factors are also considered by an organization that needs a traditional desktop infrastructure model. When these factors are considered, a common approach is to virtualize resources. By virtualizing resources, the system is defined by many flexible software layers as opposed to being limited by the hardware which is cumbersome to manipulate and expand upon (Nadeau & Gray, 2013). Thus, the concept of virtualization was ported into VDIs, and this breakthrough solved many problems with the desktop infrastructure model. With the advancements of and improvements in technology, possible solutions to problems of existing technologies also increase. For example, though on-premise VDIs are an excellent replacement of the desktop infrastructure, the best practice now is having a SaaS VDI. This paper analyzes the architecture, implementation of TrimCloud, a SaaS VDI and investigates and evaluates the benefits it can bring to an organization.

Hence, this paper introduces TrimCloud as a new method of providing a virtual desktop infrastructure to an institution, as a SaaS. As a solution to the traditional virtual desktop infrastructure, TrimCloud is a seamless integration of the following concepts: cloud computing, software defined systems (including software defined networking, software defined security, and software defined storage), software-as-a-service, and virtualization. This methodology of software design is the basis of TrimCloud; thereby the architecture, the prototype implementation, and security implications of TrimCloud will be explored.

2. VIRTUAL DESKTOP INFRASTRUCTURES

2.1. Overview of VDIs

Virtual desktop infrastructures are an excellent solution for the desktop infrastructure model. By using a VDI, an organization can provide more desktops at less cost to the organization (Bibi, Katsaros, & Bozanis, 2010). VDIs also provide more flexibility in managing each desktop workspace, reduce the office space needed, reduce electricity requirements, make infrastructure expansion easier, and provide remote access to a VM by the end-user (Srivastava, 2011). An important characteristic of a VDI is to virtualize hardware resources and efficiently allocate these resources to VMs and other necessary operations of the infrastructure. In a hypothetical example, a company with 30 employees (end-users) using a typical desktop infrastructure, would have to provide 30 computers to each end-user, giving each employee his/her own access to the company network. Additionally, the company would have to provide staff and training to set up each computer and provide on-site support. However, if the company uses a VDI, they will have a central location (the servers) of all of the virtual desktop workspaces and software. The CPUs needed for each user is now only a thin client; thus, hypothetically the company does not have to spend money on unnecessary CPU power, a large IT department to manage each
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