"A Study about the Role of Web Based Operating System in Cloud Environments"

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Abstract – The cloud computing is the most efficient technology that reduces the time, cost and resources which are used by IT companies of any size from small to large companies. There are many cloud approaches existing nowadays related to store the data files and synchronize file versions. However, few of these cloud models let the user open or configure the file on cloud. Therefore, our new cloud model proposed in this paper concentrate to let the user open, execute, configure, edit, delete, and update his files online, on the cloud. It gives the user all the operating systems features and virtual desktop icons on the cloud. In addition, the proposed cloud operating system offers variety of selected applications that allow the users to write documents, draw graphs, and compile classes and programs.

With the increasing use of high-speed Internet technologies during the past few years, the concept of cloud computing has become more popular. Especially in this economy, cloud services can provide speed, efficiencies and cost savings. In cloud computing, users work with Web-based, rather than local, storage and software. These applications are accessible via a browser and look and act like desktop programs. With this approach, users can work with their applications from multiple computers. In addition, organizations can more easily control corporate data and reduce malware infections. Now, a growing number of organizations are adding to the cloud concept by releasing commercial and open source Web-based operating systems. This paper deals with how Web OS uses cloud computing concept. The Web OS goes beyond basic desktop functionality. It also includes many of a traditional OS's capabilities, including a file system, file management, and productivity and communications applications. In the case with Web-based applications, the Web OS functions across platforms from any device with Internet access. The Web OSs that run on the browser are platform-independent, since browsers are built to work across different operating systems. As users become more comfortable working over the Web, the Web OS could become more popular.

In Cloud computing environment, there are various important issues, including information security, virtual computing resource management, routing, fault tolerance, and so on. Among these issues, the virtual computing resource management has emerged as one of the most important issues in past few years. As virtualization technologies become more prevalent, each Cloud user encounters the problem of building his/her own virtual cluster with less friendly interface of virtual resource management. To help resolving this issue, an On-Demand Virtual Cluster in Cloud Web-Based OS feature has been developed by the Distributed Computing Team in the National Center for High-performance Computing (NCHC). The On-Demand Virtual Cluster system incorporates the autonomic computing and exhibits the ability to reconfigure itself to adapt to the changes in the Cloud environment. And, it can discover, diagnose, and monitor Cloud computing resources automatically. In addition, an On-Demand Virtual Cluster widget embedded in the Cloud WebOS is developed.

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INTRODUCTION

Nowadays, Cloud computing is being the number one concept in IT industry where all large IT companies such as Microsoft, Redhat and Apple are migrating their services to be delivered via the cloud, and through this high competition on cloud-driven services the user is distracted by many different services of different providers which means many different GUIs. A cloud are groups of nodes or machines whose sizes may be different from small machines to datacenters.

These machines may be located in different physical places and connected via the internet. The cloud

computing is designed to reduce the time, cost and resources that are used by companies of any size from small to large companies.

A cloud operating system is a new type of software that is designed to host many types of software that are executed over a collection of hardware distributed over the cloud. While the traditional operating system is a software that manages the hardware devices, exist in a single machine .

The cloud has three forms of models: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). In SaaS, the user uses the collections of application running in the cloud. While in PaaS the user use the tools provided by the platform from classes libraries and other language supports. However, the user has control over the operating system and the application deployed in the IaaS with changing the Infrastructure components and configurations.

In this paper, we will use the SaaS model since we are deploying a software to act as a virtual operating system of the cloud user. The SaaS model can also be accessed by any web-browser and cross-platform without any third party required at the users PCs. Our cloud web based operating system (Web OS) can be used together with any operating system. The cloud web OS will act as a separate operating system after reaching it by any web browser. Therefore, the web OS can be accessed from PCs, Laptops, Smartphones, and any device includes a web browser. A variety of web and non-web applications can be accessed in the web OS without the need to download or install them locally. In other hand, the Cloud Web OS model is not a set of distributed processors that form an OS on the Cloud but it is the software that give the user the OS functionality on the cloud.

The objectives of designed the Web OS can be summarized in these points:

- Prepare a webOS that is integrated with social media services such as (Facebook, Twitter, Flickr, etc).
- Customize the GUI to fit the social media applications needed by simplifying their appearance.
- Make manageable system that can give services, and permissions per users and groups.
- Implement compilers and editors for C++ and Java language over the web OS to let the IT people compile their programs without installing tools for them.
- Offer all of the Microsoft offices applications and utilities for the system users.
- Provide VOIP service for our cloud users.

As the days progresses, the web applications and the usage of web also increases. This lead to the development of many computing technologies and the recent computing technology is Cloud Computing. Since cloud computing operates only with internet, this leads to the development of Web OS. Cloud computing makes collaboration easier and can reduce platform-incompatibility problems. While the idea isn't new, the proliferation of users and applications distributed over the Web, including those at scattered corporate sites, has made it more interesting, relevant, and, vendors hope, commercially viable. In addition, distributed groups can collaborate via the technology. Currently, available Web Os include G.ho.st Inc.'s Global Hosted Operating System (http://g.ho.st), Fearsome Engine's Zimdesk (www. zimdesk.com), WebShaka Inc.'s experimental YouOS (www.youos. com), the eyeOS Project's open source eyeOS (www.eyeos.com), Sun Microsystems' Secure Global Desktop (SGD, www.sun.com/ software/products/sgd/index.jsp), and Sapotek's Desktoptwo (English language, https://d esktoptwocom) and Computadora.de (Spanish, https://computadora.de). Of course, the Web OS won't replace the traditional operating system any time soon. But as users become more comfortable working over the Web, the Web OS could become more popular.

Cloud OS is a simple operating system that runs just a web browser that provides access to a variety of web-based applications that allow the user to perform many simple tasks without booting a full-scale operating system. Because of its simple structure, Cloud OS can boot in just a few seconds. The operating system is designed for Mobiles as well as PC's. The cloud has three forms of models: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). The cloud web desktop (Cloud Me) is also a Web OS provided that it offers a virtual desktop for its clients, however it cannot be offered through the web.

Cloud computing is a technology deployment approach that has the potential to help organizations better use IT resources to increase flexibility and performance. The underlying automation of cloud-based technology helps organizations access the right computing resource at the right time for an economical price. In addition, cloud-based services can be packaged so that specific workloads can be more easily provisioned through the use of sophisticated automation software. Users of these cloud services are experiencing dramatic improvements in

productivity as a result of having consistent access to the right mix of technology to solve business problems.

While these productivity improvements result from cloud computing's ability to lift complexity away from the individual user, the cost and productivity benefits of the cloud depend on a highly sophisticated underlying infrastructure.

One of the most important ways to support the underlying complexity of well-managed cloud computing resources is through the operating system. Operating systems such as Linux are designed to support these requirements so that cloud services and application services do not have to recreate underlying technologies tailored for each specific deployment. Users gain control, predictability, scalability, and security by having critical shared infrastructure at the operating system level. In addition, an operating system such as Linux supports important standards that enhance portability and interoperability across cloud environments. Operating system platforms are designed to hide much of the complexity required to support applications running in complex

and federated environments. Much of the functionality required for the efficient operation of many applications is built in to the operating system. It needs to work competently in the background to ensure that all the right resources (such as processing power, required memory and storage) are available when needed. In addition, the operating system implements the level of security and quality of service to ensure that applications are able to access the resources needed to deliver an acceptable level of performance.

THE USE OF WEB OS

A Web Operating System or an Online Operating System is a user interface that allows users to access a desktop and applications installed on the Web. It is considered being similar to the user interface of traditional computer operating systems like Windows or Linux but it does not directly interact with the computer's hardware resources or the system architecture.

Our primary objective is to develop a Web based OS with core functionalities that can be integrated with social media. The secondary objective includes a provision to provide VOIP service for cloud OS users. We know that, there are many operating system available on web. The commonly available Web OS are: XML based lucid web operating system, Cloud OS, SEWOS, Virtual remote web desktop, Megha OS. The cloud web OS has a virtual desktop that let the users access their files and photos in folders and icons such as most of the regular OS desktops, while, most of the other cloud applications don't have virtual desktop.

It is easy to develop and add any feature in future to this system. So any service or application that needed to be added in future, can be developed alone then can be added to the cloud web OS. Some of the advantages of existing operating systems are: We can access our desktop from anywhere, where it supports client devices. No need to change multiple clients. Administrator has the responsibility and resources to control the application and the users can access the data from anywhere. The OS can be accessed irrespective of hardware limitations of the system used. They ensure all users are running the updated versions of all applications.

Web OS is a new form of operating system in which the virtual desktop on the web is accessible by browsers with multiple integrated built in applications that allow user to easily manage and organize the data from any location. Desktop on the web can be termed as WEBtop.

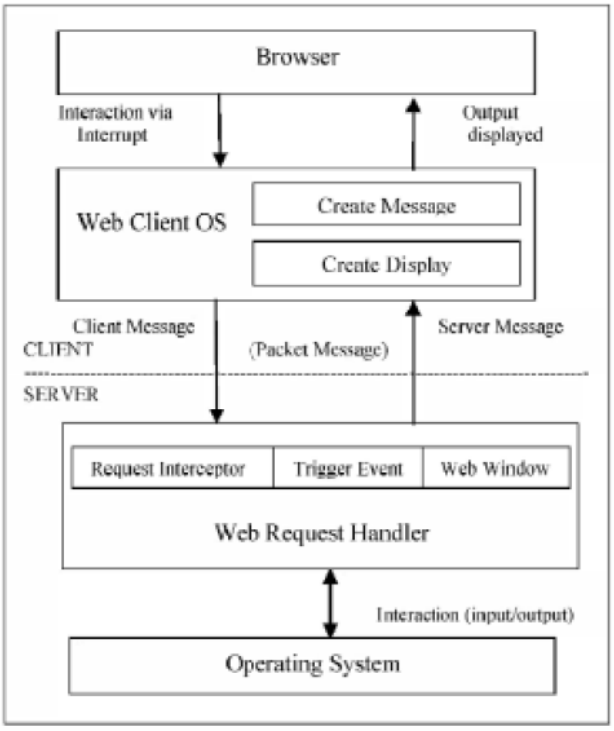

Fig 1. Basic architecture of Virtualized Remote Web Desktop

A. User Interface

User interface should be of the form that uses the minimal space by combining applications and standards into Web pages of single tab strip, rather than separating the two. Secondary tasks are handled by "panels', floating windows

at the bottom of the screen for chat and music players. There are many cloud services that serves as a wide range from business use to social use and from learning purposes to news and media purposes, but the problem with these services are that they are scattered which makes the user distracted by many pages and many GUIs in such way that it is not time efficient for hard core web users.

B. Cloud Computing

The cloud in cloud computing is a set of hardware and software that combine to deliver aspects of computing as a service.

There are many types of cloud computing that provide various kinds of service areas that are classified into 4: Public Cloud, Private Cloud, Community Cloud, Hybrid Cloud.

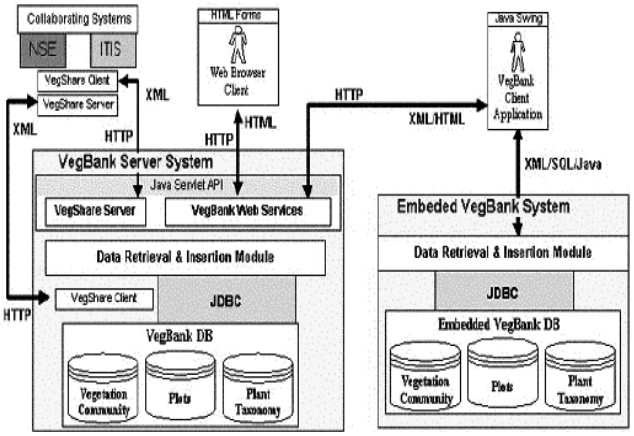

Fig 2. Framework of Web based Operating System

C. The Underlying Technologies

The Cloud OS has a Web Desktop, which has a GUI that is capable of containing multiple windows and that allow users to make their normal cloud activities with friendly interfaces. The user side of Web OS software, that can run through a Web browser or a system-specific client, runs on top of the computer's OS.

While programming the software, the system ultimately has to act like a desktop OS and its look and feel retained. Normally a Web OS might look a lot like a traditional OS, but it does not resemble the computer's hardware or software. While the goal of a Web OS is to provide a feeling which is similar to in using a desktop OS, there are no rules for how to make this happen. The two most popular strategy now we employ is the Flash technologies or Asynchronous JavaScript and XML (AJAX) technologies.

PROPOSED CLOUD WEB OS MODEL

Our focus in this model is to develop new evolving model of cloud computing which is called webOS or webtop, when the term and the model is extremely new in the era of cloud computing there are a controversy about its definition because of the controversy on what is the limit of its functionalities. Nevertheless, we can define it by: It is a virtual OS desktop running in a web browser. Where the applications, data, files, configuration, settings, and access privileges reside remotely over the network or the internet. Most of the computing operations take place remotely at the server side. The browser is primarily used for displaying file and setting and used for input purposes. After we have made an in-depth research about the web 2.0, cloud computing and social media, we have found that there are many services on the cloud that are scattered here and there which makes it difficult on the user to manage them in one solution. Therefore, we decided to unify these services in one desktop by making a social webOS, which can interact with the existing social communities such as Facebook, Twitter and Flickr in addition to the various application services that it can support.

While, all the scenes now are toward a new cloud service, which simplifies the usage of cloud services. In addition to the cloud basically meant to give the end user the utmost amount of functionalities with the minimal technical knowledge which give us the opportunity to invent a new model of desktops that are delivered via the web browser that unifies the user's interaction with the web by merging it with other cloud services such as emails, social media and blogging avoiding the distraction of multiple many tabs and windows.

There are many cloud services that serves a wide range of uses which varies from business use to social use and from learning purposes to news and media purposes, but the problem with these services that they are scattered which makes the user distracted by many pages and many GUIs in a way that is not time efficient for hardcore web users.

In this case, the user will still stuck to the traditional way of using desktop applications and carrying his storage with him in the laptop, and this way have many problems such as applications installation issues and license issues etc.

There were some cloud providers that tried to solve these issues but they ended up with a high cost and complicated systems that do not suit individual and non-savvy web users. Since the cloud services are delivered through web

browsers then the best way to interact with them is in the same method, using a web OS to integrate all services in one window with an SSO approach, and finally attract customers by free services and charge them for extra services.

As we mention before the SaaS (software as a service) is the scope of our model. At the stages of developing our model, the final product will provide the following functions for users:

The Root user, which is an administrator who can manage all users and assign permissions and roles to the other client users. The Client Users are the normal Users who can access their desktop icons and use all the authenticated services and applications assigned by the administrator root user. The Cloud OS has a Web Desktop, which is a nice GUI that is capable to contain multiple windows and allow users to make their normal cloud activities with friendly interfaces. The following context diagram of figure 3 shows the briefs of the users' roles on the cloud server.

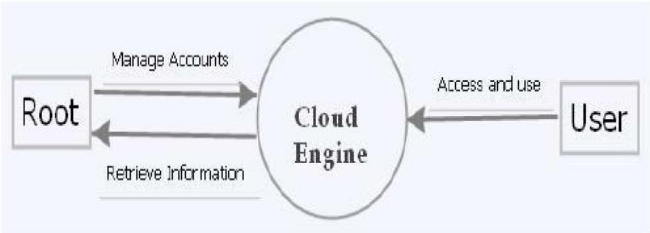

Figure 3 Our cloud OS Model Context diagram

Both users should use their usernames and passwords to login to the cloud OS System throw any web browser on a pc, mac, or even smart phones. A user-friendly desktop will then appears to the user with all the services and applications allowed to him based on his role. This desktop is very similar to the Ubuntu, Windows and Mac operating systems' desktops.

The users can then change the desktop view like wallpaper, themes and icons styles. In addition, he can also save his social web sites account on this cloud OS in order to let him easily access and update his profile there from the cloud web OS. The user can do that also throw the web browser which is also exist in our cloud web OS model, so there is no need to close that and get back to the regular OS.

Figure 4 Cloud Web OS VOIP client.

ON-DEMAND VIRTUAL CLUSTER IN CLOUD WEB-BASED OS

By integrating virtualization technologies and Web-based Operating System (WebOS), we have come up with an approach to acquiring Cloud services via Cloud Widgets in the Cloud WebOS environment. Currently, it integrates the Cloud, WebOS, and virtual machine to build a virtual computer in distributed computing environment . This progress helps to lower the barrier for using Cloud Computing Environment. The designed Cloud WebOS has become necessary to provide Cloud users with an interface that is both user-friendly and straightforward. In order to develop an autonomic virtual computing resources management system based on decentralized resource discovery architecture, we propose the On-Demand Virtual Cluster system based on Cloud WebOS. This research focuses on virtual resources management with an interactive graphical user environment.

In the Cloud WebOS environment, upon receiving a Cloud job request from the end users via Web Browser, the system provides the lightweight approach to acquire Cloud Services via Cloud Widgets, which in turn connect the Image Creator Widget, Virtual Machine (VM) Creator Widget, VM Monitor Widget, and VM Control Widget, within On-Demand Virtual Cluster system as shown in the figure 5. The proposed system helps creating the most adaptive computing resources automatically based on the demands from the end users. These Widgets of On-Demand Virtual Cluster system in Cloud WebOS also drive the Cloud middleware to operate physical computing resources and storages.

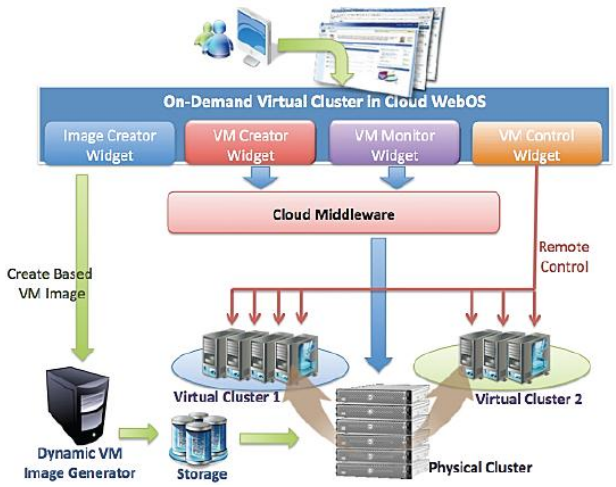

Figure 5. The System Architecture of On-Demand Virtual Cluster in Cloud WebOS

The NCHC Distributed Computing team not only built Cloud WebOS platform, along with the framework of EyeOS , but also incorporated self-developed Cloud Widgets into the Cloud WebOS platform. Therefore, the On-Demand Virtual Cluster system focuses on leveraging virtualization techniques combined with WebOS.

THE TRENDS OF Web OPERATING SYSTEM

The existing operating system has several features which have several advantages and disadvantages. With the existing operating system, it is found that there are some limitations, so that we have designs for a new Web OS with similar as well as new features. The existing Web OS can be used from anywhere with a browser. It provides the simplicity in usage as well user friendly interface.

When we look at the XML based Lucid Web OS, the main features are:

1. OS will not store any application on device itself.
2. Support for both x86 and ARM architecture
3. Smooth execution of VM.
4. Management of workload placement.
5. Management of VM images.
6. Dynamic creation and movement of VM and associated storage.
7. Definition of security policies on the users of the system.
8. Management of Remote Cloud Capacity.

Some other similar characteristics of Cloud OS when compared with other Web OS are:

1. The cloud web OS has a virtual desktop that let the users access their files and photos in folders and icons.
2. The cloud web OS can be accessed from any web browser on PC, Mac, and Linux and also can be accessed from any Mobile device has a web browser.
3. It is easy to develop and add any feature in future to our system.
4. There is no need to pay license for any product since it's available or we have similar applications in cloud server.
5. The cloud server can also act as router in the internal network.

Cloud web operating system includes some features:

1. Access to Cloud-wide object and process naming via DNS and/or other distributed naming services
2. Distributed reliable storage functionality
3. Automated Cloud application deployment, horizontal scaling, and lifecycle management
4. High availability failover support with check pointed replicated process execution.

Wed Desktop includes some additional features:

1. Software and hardware management.
2. Constant API.
3. Interruption.
4. Execution of programs.
5. Managing memory
6. Networking.
7. Security.

CONCLUSION

There are many cloud applications and web OS that become used in various fields recently. Most of these

applications are used to synchronies files and photos on different device using a third party device which is the cloud server. Our proposed cloud model is a complete OS web based application that enables the users not only to synchronize their file but also they can manage them at the cloud server side. This cloud web OS can be also used by developer to compile and run Java and C++ applications. It can be also used to edit and update documents, sheets and office applications files. Social web account can be defined on the cloud web OS to simplify the access of the social media web sites. E-mail accounts can be also added on the e-mail software with allowing to make voice call via the VOIP tools implanted inside our cloud system. All of that and more can be added to let the user access the cloud web OS and keep use it, basically, it gives the user all the traditional OS gives to the user. In addition, it can be accessed from any web browser on any device.

Cloud OS aims to provide an expensive set of resource management options and metrics of applications to facilitate programming in cloud. The use of commands make load lighter in the network providing the GUI interface. This can lead to better performance in service.

There are many cloud applications and web OS that are used in various fields. Most of these applications are used to synchronise files and photos on different device using a third party device which is the cloud server. This cloud web OS can be also used by developer to compile and run Java and C++ applications. It can be also used to format documents, sheets and office applications files. Social web account can be integrated on the cloud web OS to simplify the access of the social media web sites. It also provides facility to access from any web browser on any device.

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