

Web OS in Cloud Computing: A Case study

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ABSTRACT

Like a Server Operating System (SOS) and a Cloud Operating System (COS) are responsible for computing resources. In a server the OS is responsible for managing the various hardware resources inside a server's frame. A Web Operating System serves the same purpose like traditional server does. Instead of managing a single machine's resources, a cloud Operating System is responsible for managing the cloud infrastructure. But unlike a traditional Operating System, a Web Operating System has to do everything at scale. In present paper we would discuss and study Web OS.

Keywords: Web OS, Cloud Computing, Cloud OS, Virtual Desktop

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I. INTRODUCTION

A Web Operating System is a Web platform which allows the user to use a virtual Desktop through a Web browser over the Internet rather than using any particular local traditional operating system. This incredible technology allows a user to access their own virtual desktop from anywhere around the world, without even using a network like with a remote PC. In addition, user are essentially using the Internet to work as a desktop, rather than an actually desktop computer.

Web Operating System is an open source Web desktop following the cloud computing concept. It acts as a platform for Web applications composed by using the Cloud Computing concepts. It includes a desktop environment with applications and system. It is accessible by portable devices via smart phone also. Every Cloud Operating System lets user to upload files and work with them no matter where user is. It contains applications like Word Processor, PDF reader, and many more developed by the Cloud vendors.

Development of an OS enabling worldwide computing is a current issue nowadays. Such an OS is called the Web OS. Most Internet users use Web OS to download applications remotely. The common model of these services consists of client-server or master-slave configuration with a network as a media. The use of Web resources is highly motivated by different reasons. These include reliability, availability, fault tolerance, load sharing, function sharing, and performance

aggregation. The many various real applications exhibit very different requirements.

However, the heterogeneous and dynamic nature of the Web infrastructure ensures that it is impossible to provide a complete catalog of all resources available on the Web. Web OS has applications that are geographically distributed, available, scalable, and reconfiguring. It will include features for resource discovery, collaboration, storage, execution, management, authentication and security.

II. AN OVERVIEW OF CLOUD COMPUTING:

Cloud is a simplified Operating System running on a Web browser providing access to a variety of Web-based applications that allow the user to perform many simple tasks without booting a full-scale Operating System. The Operating System is designed for Mobile Internet Devices and PCs that are mainly used to browse the Internet. From Cloud the user can quickly boot into the main OS, because Cloud continues booting the main OS in the background.

Cloud computing is anything or/and everything in online. Online is all in Cloud Computing. Cloud Computing is all based on Internet. Cloud computing refers to a system in online where services are delivered over the Internet. Anybody can access through Internet into cloud computing world.

Cloud computing is known as Internet based computing, with shared resources, software and information is provided to computers and other devices. Cloud Computing is a computing in which services and software are provided over the Internet which is very cheap and affordable.

Cloud computing is a technology that uses the internet and central remote servers to maintain data and applications. Cloud computing allows consumers and businesses to use applications without installation and access their personal files at any computer with internet access.

Example of cloud computing is salesforce.com, Yahoo mail or Google mail etc. Clients does not need software or a server to use them. The server and email management software is all over the Internet and is totally managed by the cloud service provider Yahoo, Google etc. The consumer gets to use the software alone and enjoy the benefits. Cloud computing is on demand access to virtualized IT resources that are housed outside of clients own data center, shared by others, simple to use, paid for via monthly subscription which is very low in cost, and accessed over the Web with many features in it. The basic concept of cloud computing is using software via the Internet instead of installing it.

Cloud Computing defines a software that manages collections of infrastructure as an Operating environment created in a user's computer from an on-line application stored on the cloud and run through a Web browser.

III. VIRTUAL DESKTOP:

1. A virtual desktop is an individual user's interface in a virtualized environment. The virtualized desktop is stored on a remote server rather than locally.

Desktop virtualization system is a software that separates the physical machine from the software and presents an isolated operating system for users. Desktop virtualization tools include Microsoft Virtual PC, VMware Workstation and Parallels Desktop for Mac.

The benefits of include:

Cost savings because resources can be shared and allocated on an as-needed basis.

More efficient use of resources and energy.

Improved data integrity because backup is centralized.

Centralized administration.

Fewer compatibility issues.

Knowledge workers who use mostly business software applications are good candidates for desktop virtualization. The model is not generally viable for users with high resource demands.

2. On a single host machine, a user may have separate virtual desktops for different applications. One desktop might feature applications for graphic design, for example, and another might feature business applications.

IV. WEB OS OVERVIEW

Web OS is designed as a distributed system. The Web OS framework enables a new paradigm for Internet services. Web OS goal is to provide a platform which allows the user to benefit from the computational potential offered by the Web. It's aimed is to make available to all sites of the network resources to execute computations for which local resources are missing[1].

The kernel of a Web OS node is a system, a reactive system responding to requests from users or system. A Web OS-node integrates user, server, and applications. It is capable of providing a set of services, which can pass on to each other requests when appropriate. Again, because of Web is dynamically changing, there exist some warehouses that associated with the Web OS node provide the necessary information and components for meeting requested services. Each Web OS node is using its own warehouses to store and continuously update information about the node and available services and resources.

IV.1.WEB OS

A Web OS is a Web-based app that emulates the application capabilities of an operating system. It's basically a virtual desktop that gives user communication tools (like email), productivity tools (like word processing) and ability to play games and any other application that user would find on a typical OS like Microsoft Windows. But that's not all - a Web OS should be an expandable platform (just like Windows) that gives developers the right tools (like APIs) to develop new applications and add new utilities.

Web OS is network based service where a user can access his system through network. It is an introduction of one or more operating system in the category of Web operating systems. **Web OS** was introduced as a thought that one might be able to play with application, store data, for sharing on the web from anywhere. So a Web OS does. Today Web OS are capable of storing large amount of data as large as 30 GB. User can share applications.

IV.2.THAT WEB OS DOES

In these systems, a company provides computer services to users through an Internet connection. The provider runs a system of computers that include application servers and databases. With some systems, people access the applications using Web browsers. With other systems, users must download a program that creates a system-specific client. A client is software that accesses information or services from other software. In either case, users access programs that are stored not on their own computers, but on the Web.

In traditional operating systems, user has to install applications to computer. The applications would exist on computer's hard disk drive. A Web OS might look a lot like a traditional OS, but it doesn't manage user computer's hardware or software. A Web OS allows user to access applications stored not on user computer, but on the Web. The applications exist wholly or in part on Web servers within a particular provider network. When user saves information in an application, user might not store it on user computer. Instead, user saves the information to databases connected to the Internet. Some Web operating systems also give user the option to save information to user local hard disk drive.

IV.3.HISTORY OF WEB OS

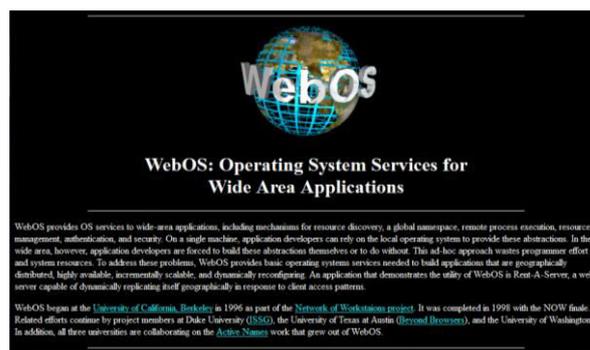
The Web OS is a computing research project which started in 1996 at the University of California, Berkeley and Continued at Duke University, University of Texas at Austin, and the University of Washington.

The Web OS is first named as HyperOffice and then as MyWebOS and then after one year it has been named as Web OS. Web Operating Systems are also commonly referred to as Web desktops or Webtops. It is a multiple integrated built-in applications that allow the user to easily manage and organize her data from any location.

IV.4.WEB OS MOTIVATION

The goal of our project is to provide a set of OS services to wide area applications, including mechanisms, process execution, resource management, authentication, and security. On a user single machine, application developers can depend on the local operating system to provide these abstractions. In the wide area application developers are forced to build these abstractions or to do without. This ad-hoc approach wastes programmer effort and system resources. To address these problems, Web OS provides basic operating systems services needed to build applications that are geographically distributed, available, scalable, and configuring.

V. WEBOS IMPLEMENTATION:



Our initial implementation is split into the following pieces:

Web OS: A system allowing applications to read and write to the URL name space. Consistency is available to applications requiring it through protocol.

Active Names: A mechanism for logically moving service functionality (such as load balancing) from the server into the network.

Secure Remote Execution: We believe applications will be running on remote nodes for users. Assurances must be provided ensuring that applications are not able to violate the integrity of the remote server.

Security and Authentication: Applications accessing remote files must authenticate their identities before access to protected files.

Transactions: Applications must have well-defined failure modes. For example, an aborted remote agent should not leave a user's local file system in an inconsistent state.

CLIENT-SERVER COMMUNICATION.

Web OS use a two-tier architecture in which one machine acts as both application and presentation server. The client is the second tier. The application server hosts virtual machines that run programs and push them to a presentation server, which manages the client connection.

The client runs application and passes user input back to the application server.

Client-side WEB OS makes use of several technologies on the client side:

- └ XHTML and CSS are used to display the user interface.
- └ The local engine handles communication with the server asynchronously, using AJAX.
- └ Not all interactions require communication with the server. JavaScript is used to provide client-side-only interactions.

Server-side

Web OS is written in PHP on the server side, and provides multiple high level abstractions. The goal of these is to make it easy to write new applications, and avoid dealing with low-level primitives. Web OS is also a Web application development framework.

VI. THE GOAL OF WEB OPERATING SYSTEMS

Being able to work from everywhere, regardless of whether or not user are using a full-featured, modern computer, a mobile gadget, or a completely obsolete PC. Sharing resources easily between different work centers at company, or working from different places and countries on the same projects.

Always enjoying the same applications with the same open formats, and forgetting the usual compatibility problems between office suites and traditional operating systems. Being able to continue working if you have to leave user local computer or if it just crashes, without losing data or time: Just log in to user Cloud Operating System from another place and continue working.

EXAMPLES OF WEB OPERATING SYSTEM

Web OS site: <http://www.Beta.cloudo.com>

<http://www.Oos.cc>

<http://www.eyeos.info>

<http://www.lucid-desktop.org/>

<http://www.amoebaos.org/>

Email site: <http://www.gmail.com>

Online storage site: <http://www.mega.com>

VII. FEATURES AVAILABLE IN WEBOS:

Open API: the typology of Application Programming Interface that it uses

Open-source: the possibility for users and developers to contribute to the enrichment of the Web OS by creating new applications and widgets

Integrated apps: the applications that the Web OS features by default (text editor)

Audio-video Player: the availability of a media player within the Web OS

Photo editing tool: the availability of a tool that allows the user to edit images.

E-mail client: the presence of an email client.

Instant Messaging: the availability of an integrated instant messenger.

Calendar: the existence of a calendar.

Collaboration - Conferencing tools: the presence of online collaboration tools (such as VoIP)

Mini-Browser: the integration of a Web browser

File storage: the amount of space if available to store files online

File sharing support: the support for file sharing with other users.

Desktop Search: the presence of a desktop search engine within the Web OS

VII.1. CHARACTERISTICS OF WEB OPERATING SYSTEM:

Free **sign up** for personal use

Online application services

No **maintain** charge and **security** cost

Access to any Website

Work as a social networking

While the operating system will work as well as the **Website**.

VIII. BENEFITS OF THE CLOUD OPERATING SYSTEM:

Worldwide availability of Cloud Operating Systems: As it's available through internet.

Requires only browser: A browser with Java support is more than enough.

Dynamic content and design: Interface can be customized according user needs, windows are floating so that they can be repositioned.

Extensive list Applications: Office applications, Multimedia applications, Network applications and Chat applications etc. all are available.

Remote storage facility: Through the file browser user can store files over the internet and edit them as user want.

Browser and Platform independent: All browsers and all operating systems are supported.

SERVICES OF WEB OS PROVIDES:

Web OS provides:

Calendars,

E-mail,

File management,

Games,

Instant messaging programs,

Photo, video and audio editing programs,

Spreadsheet programs,

Word processing programs etc.

ADVANTAGES OFFERED BY A WEB OS

A cloud OS is not simple to implement. There are two reasons for this. *First, the sheer scale of the cloud infrastructure pushes the technology limit.* Few companies have had the experience of managing such a big infrastructure, and the cloud providers are forced to build new solutions from the ground up. For example, Google designed Big Table to store a large amount of semi structured data. Similarly, Amazon designed Dynamo to manage storage and built their own management infrastructure to support their Web services API. *Second, a cloud has to be robust and scalable because it is designed to be shared by hundreds or thousands of people instead of just a few users on a PC.* Some advantages are as follows:

- Need not to install OS
- No hard drive with more memory
- No external hard disk
- No one software to be installed
- No times loss to install software
- No extra charge to buy software
- Software to be updated latest version always
- Piracy decreased
- No crash any software
- One type of software will be used at a time (like media player, either vlc or wmp)
- No software will be shared by copy among users
- Always time saving to direct use application software
- No carry laptop from home to workplace
- Online Backup.

DISADVANTAGES

- There is always to be online.
- Slow bandwidth hazard
- Risky for service provider shutdown

IX. FUTURE THOUGHTS OF CLOUD OPERATING SYSTEMS

In near future, most people won't do their work with software running on a general-purpose PC. Instead, they will work with Internet-based applications running from smart phones and tablets.

Cloud computing allows customers to have easy, instant, and access to tools, data and applications they need when they want to use from any networked computer even mobile devices like laptop, smart phone or tablet. We introduced the Cloud operating system or Web operating system that aims to provide an expressive set of resource management options and metrics to applications to facilitate programming in the Cloud, while at the same time exposing a programming interface providing developers with an access to a scalable computing and networking environment, allowing the implementation of robust, elastic and reliable distributed applications.

X. CONCLUSION

Building a highly scalable system is not a very easy task. We have to invest in a great deal of engineering efforts to make sure not only the overall system, but also every single component are robust and scalable. In this paper, we want to show a new way of making the systems, a cloud vendor has to spend a large amount of efforts to make services scalable, reliable than other implementations.

Web OS has the potential of being an important distributed computing system for the Internet. It promises supporting applications that are geographically distributed with high reliability, security, scalability, and manageability.

Some research and prototyping of Web OS have been underway to overcome some of the challenges and difficulties pertaining to the design and implementation of such a system.

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REFERENCES

- [1]: Oliver Krone, Simon Schubiger. WebRes: Towards a Web Operating System. Kommunikation in Verteilten Systems 1999: 418-429.
- [2]: Peter G Kropf. Overview of the Web Operating System (Web OS) project, 1999
- [3]: Nazib A. Kofahi, Ahmad T. Al-Taani web operating system and computing on the web. Information Technology journal 4(4), 2005. 360-366.
- [4]: MohitJain,Mohd. Danish, HemantYadav, "Cloud Computing and Online Operating System", IJCTA, Mohit Jain et al, Int. J. Comp. Tech. Appl., Vol 2 (6), pp-1795-1799.
- [5]: www.wikipedia.com
- [6]: www.eyeos.com
- [7]: www.glideos.com
- [8]: www.startforce.com
- [9]: www.technical.com

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Annexure: I

Types of Web OS

There are many WebOS.

AstraNOS, BeDesk, cmyOS, Desktoptwo, DoxBoard, GCOE X, eyeOs, Glide, G.ho.st, goowy, jooce, mybooo, myGoya, OOS, Parakey, Psych Desktop, Purefect Desktop, SSOE, StartForce, Xindesk, Nivio, Webdesk, Webdows, Widgets Gadgets, YouOS, ZimDesk, DesktopOnDemand, Free Live OS Zoo.

1. Cloudo



Cloudo is a free Cloud Operating System that lives on the Internet. This means that we can reach our documents, photos, music and all other files no matter where we are, from any computer or mobile phone or tablet. It features an open, powerful, stable and versatile development environment. We can easily share a set of files, images or set up a joint account with friends and colleagues.

Link: <http://www.cloudo.com/>

2. eyeOS



eyeOS is a disruptive desktop totally usable from a Web browser. It includes an office suite and some collaboration applications, as well as a full framework. It is Open Source so we can host our own system, keeping all our data under control.

eyeOS is one of the most used Web Operating System. With eyeOS we can build our private Cloud Desktop. Using **eyeOSWeb Runner** we can open our eyeOS files from our browser with our local apps and save them automatically on our cloud. In eyeOS 2.0 we can work collaboratively with other users simultaneously in the same document. We will get privacy and cloud computing at its best.

Link: <http://www.eyeos.org>

3. Glide OS



Glide OS is a cloud computing solution. Glide is a free web os with 30GBs of storage. Users can upgrade extra storage with cost per year. The Glide OS provides automatic file and application compatibility across devices and operating systems. With Glide OS user also get the Apps helping user to synchronize home and work files.

Link: <http://www.glideos.com/>

4. Lucid Desktop



Lucid comes with lots of applications. Customer can browse photos, listen to music, and edit documents. It also comes with an RSS feed reader, some games, a calculator, and a bash-like terminal application. We can install additional third-party applications.

Lucid is a **free, open source Web desktop**, or **WebOS** that lets us access users media, office documents, and other files anywhere stay up to date with Twitter, RSS feeds, and what's happening on the Web create great Web applications in ridiculously short amounts of time

Link: <http://www.lucid-desktop.org>

5. OOS



iCube OOS is a free Online Operating System that provides an amazing number of useful applications and services: Organize users files, documents and personal data from anywhere around the world. The primary goal is to provide to users the highest level of usability and all necessary means to facilitate online collaboration. For instance, intuitive drag and drop operations are used wherever they are expedient and user can share user data with other users.

Link: <http://oos.cc/>

6. myGOYA



myGOYA is a Flash based online desktop that allows to access to all data anywhere in the world. It doesn't require installation and contains the following tools: Webmail, Calendar, Private Messenger, Contacts, Chat, Notes and more.

Link: <http://www.mygoya.de/us/>

7. Xindesk



Xindesk is a free, solution for making all our files, calendars, contacts and other data accessible and in sync wherever we are. It's pretty much like accessing our computer from any standard Web browser, from a computer, a mobile phone or any other device connected to the Internet. The core of Xindesk is a Web OS featuring application that opens and saves the standard office formats.

Xindesk is the first Web operating system that works easily, even for people without deep computer knowledge. The Web OS is an open platform, just like Windows and Mac OS. This enables anyone to develop new applications.

Link: <http://www.xindesk.com/>

8. Starforce



With **Starforce** user can run Windows apps such as MS Office, pdf etc. We can also stitch in Web apps such as Google. Starforce also contains native apps such as Email and Calendar. The combination of Windows Apps, Web Apps, and Starforce Apps makes Starforce Web Desktop the most comprehensive and functional virtual desktop solution on the market.

Starforce Web Desktop offers a familiar user interface with a full desktop experience within a Web browser. Starforce supports multi-windowing, drag and drop, right click icons, themes, start menu, shortcuts, etc. IT can onboard users rapidly without any additional burden from a training and support perspective.

Link: <http://www.starforce.com/>

Annexure: II

Comparison Table

Before we take an in depth look at Web applications, we have created a simple comparison table with some important features of each Web application. More precisely, we have included in the table the following characteristics:

Virtual Space (if it's specified) – most of the services does not specify in registration step the available space

Live Collaboration Support – if this service allows multiple user to access and work with files stored on Web OS

Offline Mode – this service allows user to use the OS also when the Web connection isn't available

Localization – if the Web OS is available in multiple languages

Mobile Support – if users can access to data also with mobile devices

Apps Manager – if the Web OS allows users to add/remove applications

Developer Tools – if application provides tools or documentation that developers can use to build their own apps.

Service	Virtual Space	Live collaboration Support	Offline Mode	Localization	Mobile Support	App Manager	Developer Tools
Cloudo		Yes			Yes	Yes	Yes
eyeOs		Yes	Yes	Yes		Yes	Yes
Ghost	5GB	Yes					
Glide	Up to 30GB				Yes	Yes	
Lucid	25MB		Yes	Yes		Yes	Yes
OOS	1GB	Yes		Yes		Yes	Yes
qWiki Office			Yes				
SilveOs			Yes			Yes	Yes
iCloud	Up to 3GB			Yes	Yes	Yes	Yes
Jolicloud			Yes		Yes	Yes	
myGOYA		Yes					
ZimdeskOS						Yes	
CorneliOS		Yes	Yes			Yes	Yes
AstraNOS						Yes	
Xindesk					Yes		Yes
Starforce		Yes			Yes	Yes	
Cloudo		Yes			Yes	Yes	Yes