

# Cloud Computing and its Impact on Operating Systems

Submitted By

**Aryan Jigneshbhai Bhagat**

NetID: sl5310

Email: abhagat4@horizon.csueastbay.edu

Master of Science (MS), Computer Science

California State University, East Bay

## **Abstract**

In last decade internet usage has increased tremendously. Internet subsequently the Web has changed the way how people think about using computers in their daily life. This enormous shift towards the Web is made possible by many internet enable electronic gadgets which provide access virtually from anywhere to the Web. In this paper, we have studied different Web operating systems in terms of designs, architecture, and functionalities. A positive association has been found how cloud computing affects the traditional desktop operating system and shifting it to the cloud, Web, and mobile. To consolidate our arguments, we have presented case studies of different cloud operating systems like Windows Azure, Chrome OS, Eye OS, and you OS. However, cloud based operating system would be main focus in future with involvement of intelligent agents.

**Keywords:** Cloud computing, Mobile computing, Traditional operating system, Web OS

# 1 Introduction

## 1.1 Background

Web is the most emerging platform of this era. It's a chain of interlinked hypertext documents placed on Internet, which may contains various information in the form of text, images, videos, and various other resources. Web and Internet are two different terms that are often mistakenly used together. Internet is a global network of interconnected computers that uses TCP/IP protocol suite and Web is actually something that is available by internet, just like e-mail and many other services. Fast speed emerging Web technologies have provided a way to access distinct architectures and helped a lot to migrate towards Web-based hypermedia systems.

Operating systems (OS) are experiencing great changes with rapid technology advancements. Initially operating systems were design to meet basic requirement of users but as time passes user requirements have changed and are not limited to local system base programs or services. In order to fulfill user needs, operating system has evolved to meet the latest challenges.

In this paper, we discuss in detail in how operating system behavior changes from traditional towards Web based computing, cloud, and mobile computing and how it affects the architectural changes in operating systems with point in focus Web has positively influence on operating system. The structure of rest of the paper is as follows. Section no 2 reviews key literature in detail focusing especially on the influence of Web on OS, and cloud computing. In Section 3, we discuss the pros and cons of Web OS and presented the solution for challenges faced by traditional OS and Web OS. To justify our idea, we present the case study on different popular Web OS in Section no 4. Furthermore, Web OS Features are shown in Section 5. Finally, Section 6 concludes the paper along with future directions.

## 2 Literature Review

The increase in use of internet subsequently the Web has changed the traditional view of operating system. **K. G. Srinivas et al**, in their paper, mentioned that with excessive use of internet and with advancements in technology, operating system also changes. The key concept is to move the operating system to Web without dependency of platform and device so that the users can access it easily from anywhere giving rise to concept of Web OS. One driving force to move towards Web OS is the use of Web applications massively like remote access of file systems, emails, Web based processing, and communication means.

According to **George Lawton**, Web OS is much like traditional operating system as Web applications are accessed by Web browsers which uses it as an interface. It can be remotely accessed via browser through URL based file system from any location unlike traditional operating systems that can be access from only one machine. Web OS is platform independent

operating system which removes compatibility issues of Web applications and traditional desktop operating systems. The same operating system runs on windows, Mac, or Linux with internet and Web access and does not require any hardware drivers. Web OS has variations in the same architecture. The SGD uses 3-tier architecture in which one is application server that is used to host virtual machines responsible for running programs and pushing them to presentation server that manages client connection. The thin client is responsible for running application and then response back to application server. Similarly, eyeOS uses 2-tier architecture combining application and presentation server. **Nabil Abdennadher, Gilbert Gabin and Peter Krofp** mentions that Web OS provides users to request service without knowing about which kind of request they are requesting and fulfilled user's desired goals showing that these are open access. Open Access and versatility make the Web OS an interactive environment for Meta computing.

**David Geer** writes in his paper, that the three new approaches virtualization, cloud computing, and application development changes the importance of traditional operating system. The effect of virtualization on operating system is that now user is not dependent of a single operating system rather than it, they can use multiple operating systems according to their choice. The effect of cloud computing on operating system is that cloud base users, access the applications via browser. They have no need of operating system just have to run the browser. Memory, disc space, and other resources are shared by cloud system. Virtualization technology allows a PC or a server to run multiple operating system or multiple sessions of single operating system at the same time. This allows users to put number of applications running even those who are on different operating system. That's why this approach is used in business to optimize the use of hardware. This enables us to use many operating systems on a single machine. With advancement in operating systems from start, **Reed** reported in his survey "The Future of the OS for Internet Applications", that with passage of time and with new emerging Web technologies, it becomes the need of time to move OS towards Web by allowing remote access of applications. The operating system becomes more scalable, reliable and platform independent due to fulfilling needs of Web. Their performance improved as one can see different improved versions of operating system for desktop as well as for Web.

### 3 Web OS Architecture

Web OS has features much more than traditional operating system, having capabilities of traditional operating system and web based functionalities. Traditional operating system capabilities includes file systems, file management, productivity and communication applications. Web OS features include; functioning across platforms from any device with only internet access. Web OS comprises of traditional operating system with some variations in it. The SGD uses 3-tier architecture for security and virtualization. The application server hosts virtual machines that run programs and push them to presentation server, which manages client connection. The thin

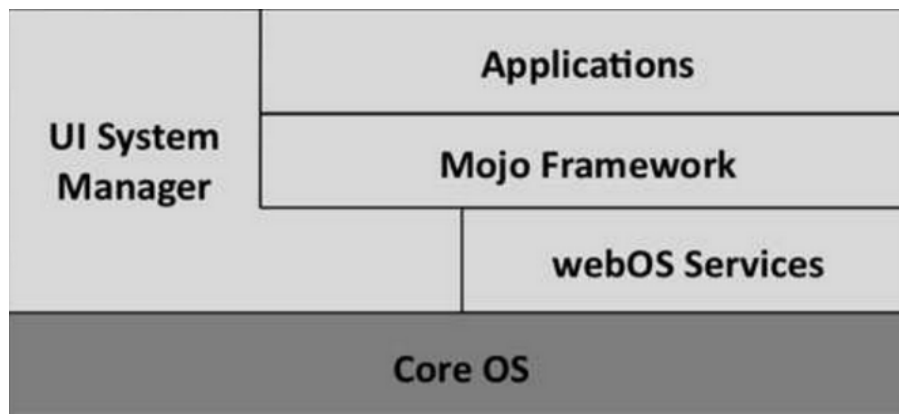


Figure 1: Basic Web OS Architecture

client runs the application and passes user input back to application server. As web OS moved to browser and across platforms, it eliminated hardware dependency and compatibility issues between applications as one can remotely access them from anywhere. There is no doubt that Web OS removes hardware and platform dependency, but there is still a need of traditional operating system in order to access web OS on the cloud. A simplified basic architecture of Web OS is shown in Figure 1.

### 3.1 Advantages of Web OS

1. Web operating system can run on any device or computer that has an internet connection. This helps those people who don't have any personal computer or device and they can work from offices, colleges and internet cafes.
2. In Web OS user can work from any available computer, need of dependency on one physical computer is ended.
3. In Web OS users store and manage their files, services and applications on provider's web servers rather than on their local machines, this prevents loss of data and theft of data at user end as data is being maintained at server level with much better security and storage capacity.
4. Web OS users don't have to take backup of their data as it is being done at web server.
5. In Web OS most of the heavy processing is done at server end, this results in user long term computer and device cost reduction.
6. One of the most important features of Web OS is that it operates across platform, this eliminates the compatibility issues of operating system and applications and same Web OS can be run on Mac, Windows or Linux machine.

### **3.2 Disadvantages of Web OS**

1. Web OS face network related problems like bandwidth limitations and latency constraints that traditional operating system do not have.
2. As Web OS operates on web browser that runs on host machine operating system so this requires extra overhead like power demands and additional processing of keyboard, mouse, audio and video devices.
3. In case web user caches the data locally they are working with, than web browser will have access to data and security can be compromised as if hacker access the browser.
4. Generally there is very limited number of applications developed for web based operating systems as compared to traditional.
5. As user must be online to access the Web OS so one must have a good internet connection all the time to work on web based operating system.

## **4 Case Studies**

### **4.1 Windows Azure**

Window Azure is cloud based and is launched by Microsoft. Three services are provided in window azure named as Compute, Storage and Management. There is no need to buy expensive software and hardware for application. Fabric controller is responsible for managing applications. Whenever there is possibility of a crash, fabric controller identifies the problem and manages it. Windows azure is designed in such a way that it needs at least two instances to run for each role to handle load-balancing between the instances which may interrupt state full applications.

### **4.2 Chrome OS**

The architecture of chrome operating system consists of windows manager, browser, firmware, user land and system- level software. Firmware increases boot time by probing hardware, like floppy disk which are not commonly used on a computer. It verifies every step during the boot process and increases security. Windows manager manages the interaction of users with more than one client. System-level software includes Linux kernel which increases boot performance. Chrome operating system utilizes less system resources and frees up those resources preventing the system from being slow. It stores in very small locality. There is no need to install anti-virus as secure data is transferred. It automatically updates the system and stores everything on the clouds. Chrome OS is mostly used in notebooks, tablets and laptops.

### 4.3 You OS

You operating system tries to bring together conventional and web operating system to form a shared virtual computer. YouOS and its application runs inside the browser but have a look and feel of desktop applications. The code of the application and the data resides on servers remotely but their execution is done at client side locally, due to this user is free to do editing of word file at home and can access the same edited file at office or other place for further use. Everything in youOS is built upon a set of open restful server APIs. The default YouOS client implementation is based on (AJAX), the developer portal, the IDE and open XML - everything is built on simple and is accessible through the http protocol. It means that anyone can write a code of his own. Administering and delivering applications within YouOS is very easy. As a developer, one can control who can develop and release apps. And when it comes time to release, it's as simple as clicking a button before the app is immediately available for execution.

### 4.4 Eye OS

Eye OS is based on the idea that whole system lives in the web browser. It is built on client server architecture in which web browser acts as client having access to all applications, files and documents. It is written in PHP, XML and JavaScript and acts as a platform for web applications with just internet access from anywhere in the world. It is also available for mobiles. It tries to remove compatibility issues between applications and operating system. Also, eye OS provides us with resource sharing and access from different centers without any hardware, platform and browser dependency. It also provides access to extensive applications like office applications, multimedia, networking and chat application through browser. Eye OS is micro-kernel based platform, the kernel is supposed to unify the system services. Eye OS has many services for specific tasks and the kernel is responsible for its communication and location. It provides us with good and wide usage of operating system on cloud but this operating system is not recommended and considered as failed due to load and latency on server through communication from client. It can be used with some restrictions like low bandwidth, networking delays and limited usage of applications.

## 5 Comparison of Web OS Features

We have created a simple comparison table of the most interesting Web OS available by providing detailed information of their features. While reviewing these Web OS we have selected the following fifteen features as comparison criteria.

1. **Open source:** Possibility of contribution of users and developers to contribute by developing applications.
2. **Integrated Apps:** Applications of the web operating system by default.

Features	Cloudo	EyeOS	Ghost	Glide	Lucid	Icloud	JoliCloud	Xindesk	YouOS
Open Source	Yes	Yes	No	No	Yes	No	No	Yes	Yes
Integrated Apps	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Audio/Video Player	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No
Email Client	No	No	No	Yes	No	Yes	Yes	Yes	No
Instant Messaging	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Calendar	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No
Collaboration Support	Yes	Yes	Yes	No	No	No	No	No	No
Virtual Space	No	No	5Gb	30Gb	25Mb	3Gb	No	No	No
Offline Mode	No	Yes	No	No	Yes	No	Yes	No	No
Multilanguage	No	Yes	No	No	Yes	Yes	No	No	No
Mobile Support	Yes	No	No	Yes	No	Yes	Yes	Yes	No
App Manager	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Developer Tools	Yes	Yes	No	No	Yes	Yes	No	Yes	No
Games	Yes	No	No	No	No	No	No	Yes	Yes
Widgets Support	Yes	No	No	No	Yes	Yes	No	No	Yes

Figure 2: Comparison between different Cloud Operating

3. **Audio - Video Player:** Presence of Media Player within the Web OS.
4. **Email Client:** Availability of Email Client in Web OS.
5. **Instant Messaging:** Presence of integrated messenger.
6. **Calendar:** Existence of Calendar
7. **Collaboration Support:** To allow multiple users to access and work on web applications.
8. **Virtual space:** Space available to users.
9. **Offline Mode:** To work On Web OS even if the internet connection is not available.
10. **Multilanguage:** Support of different languages.
11. **Mobile support:** If the users can work on OS from there mobiles.
12. **App Manager:** Permission to users to add or remove applications.
13. **Developer Tools:** Availability of tools for developers to develop applications themselves.
14. **Games:** Availability of games on Web OS.
15. **Widgets Support:** Support of widgets.

## 6 Conclusion

With the passage of time, as Web grows, it leads to architectural changes in operating systems and hence shifted the operating system to Web, cloud and mobile from traditional operating systems, minimizing the platform dependency and virtualization of resources. One can easily



remote access browser via internet available. This makes the traditional operating system almost obsolete. We have presented case studies of different Web operating systems like windows 8, windows Azure, Chrome OS, Eye OS and youOS.

One thing is for certain and that is our reliance on the cloud will not be lessened by this evolution, but rather tightened, hopefully making a less painless computing experience for everyone. With excellent results and positive feedback, cloud computing is really set to shape our future. In future, one can use different intelligent agents or knowledge based discovery rules to automate the selection of Web based Cloud operating systems.

## References

1. David Geer, "The OS Faces a Brave New World", In Proceedings of 2009 Journals of Computer, Vol. 2, Issue. 10, pp. 15 – 17
2. George Lawton, "Moving the OS to Web", In Proceedings of 2008 IEEE Computer Society, pp. 16 - 19
3. K G Srinivasa, Harish Raddi C S, Mohan Krishna S H, and Nidhi Venkatesh; "MeghaOS: Cloud based Operating System and a Framework for Mobile Application Development", In proceedings of 2011 World Congress on Information and Communication Technologies, pp. 858-863
4. <http://www.howstuffworks.com/web-operating-system.html>
5. [http://www.webopedia.com/TERM/W/windows\\_8.html](http://www.webopedia.com/TERM/W/windows_8.html)
6. <http://www.studymode.com/essays/Windows-8-1121655.html>
7. <http://www.hongkiat.com/blog/windows-8-new-features-you-will-love/>
8. <http://www.slideshare.net/manasavarada/eye-os-cloud-operating-system>
9. [https://www.academia.edu/72626620/Cloud\\_Computing\\_Influence\\_on\\_Operating\\_System](https://www.academia.edu/72626620/Cloud_Computing_Influence_on_Operating_System)