Survey on Different Types of Cloud Operating System

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Abstract— **Recently, Cloud is a new thought in the area of network computing. Traditional operating system cannot fulfil all the requirements of cloud computing and cannot support heterogeneous multicore platforms. Cloud operating system provides flexible and unified programming interface to the underlying distributed hardware, set of options for the resource management and metrics to facilitate programming in the cloud. Variety of cloud OS are available today. Each of them is good for different applications. Slap OS, Eye OS, Osprey, Megha OS, vStarcloud OS, ZeroPC, iSpaces, Jolicloud, Corneli OS, AppleiCloud, Glide,ZimDeskOS, MyGoya are the variety of cloud OS. Among these Slap OS, Eye OS, Megha OS and Vstar cloud OS are included in this paper. First is Slap OS. It is an open source grid operating system and works by considering as "everything is a process". Also it provides security on the Cloud. Second cloud OS discussed here is the Megha OS. It is a cloud based operating system and a framework for mobile application development. Then we have the vStar cloudOS. It is a new network computing operating system for multicore and clouds. Final one is the Eye OS. Using the EyeOS everything inside it can be accessed from everywhere inside a Network.**

Keywords- Cloud OS, Slap OS, Megha OS, vStar cloud OS, Eye Os, Architecture, Development model, Application Model.

I. INTRODUCTION

"Cloud computing is internet-based computing whereby shared resources, software information are provided to computers and other devices on demand, like the electricity grid"-Wikipedia.

Vital role of the cloud operating system (cloud OS) is the resource management like a server operating system (server OS). The server OS manages everything inside a server's chassis, such as memory, CPU, interfaces etc. It hides the details of hardware operations and allows efficient resource sharing. Cloud OS performs the same purpose, in addition to that it manages cloud infrastructure, hides details of infrastructure from application programmers and co-ordinates resource sharing.

Individuals or organizations can efficiently rent or borrow computing resources by the support of cloud computing techniques. Users can upload their works, files with cloud irrespective of their location. In addition to that users can access variety of web based applications without booting the full scale of OS. Since cloud continues booting the main OS in the background users can quickly boot into the main OS. Cloud OS is mainly designed for PCs, mobile internet devices, netbooks etc.

This paper provides an overview of the different types of cloud operating system and different measures used to evaluate these types. A detailed study of different types of cloud OS namely, Slap OS, Eye OS, vStar cloud OS, Megha OS is done and their application areas are identified. Moreover these techniques are compared.

II. BACK GROUND

Heterogeneous multicore platforms and requirements of cloud computing applications are not supported by traditional OS. So a new network computing operating system is required. This operating system should support high level resource management, resource sharing and must support various services. Also it can push forward the formulation of new growing information system. There are different types of cloud operating system.

Cloud computing defines - a software that supports large collection of flexible infrastructures and dynamic operating environments, environment provided by an online application stored in cloud, which is run through a web browser in a user's machine. Also it can define a computing environment in which it is needed to pay only for required resources. Cloud can be installed and used as a standalone operating system. Also it can work together with other operating systems. If cloud is used as a standalone operating system then hardware requirements becomes relatively low. Cloud operating system can be referred to as Software as a service (SaaS) and platform as a service (PaaS).

Cloud operating system has certain benefits – it provides a dynamic environment to work from everywhere , resources can be easily shared between the users working from different places on same projects, users can access applications as platform independent. Also it supports users to continue their work without losing data and time when their local computer crashes.

The Cloud Operating Systems architecture includes Cloud infrastructure, Cloud Storage , Cloud Platform etc. Architecture of Cloud Computing Operating Systems is shown below.

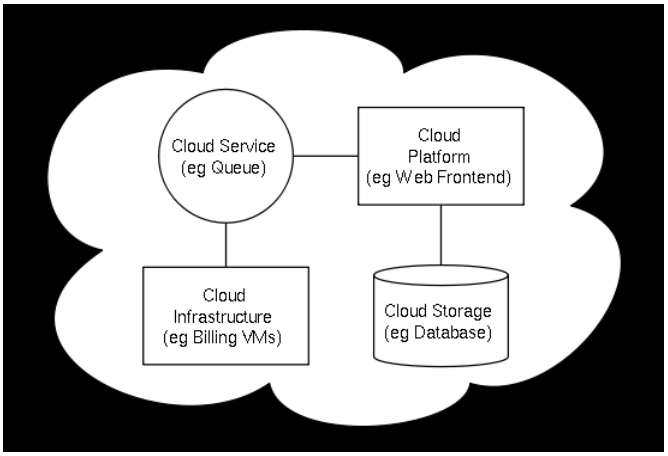

Fig 1: Architecture of Cloud OS

III. DIFFERENT TYPES OF CLOUD OS

Today, varieties of cloud operating systems are available for users. Some of them are, SlapOS, vStarCloudOS, MeghaOS, EyeOS, Glide, Amoeba, My Goya, Zimdesk, Ghost, Joli, Cloudo, Corneli, Lucid. Among these first four types are considered here.

A. SLAP OS

SLAPOS is the abbreviation of Simple Language for Accounting and provisioning operating system. This operating system is designed for distributed cloud computing. It supports automating the deployment, accounting and billing of cloud computing services. SLAPOS[1] works by considering as "everything is a process".

Grid computing and enterprise resource modelling can be combined by SLAPOS. Any user can become a cloud provider and they can sell software as platform as a service, software as a service and interface as a service.

SLAPOS architecture is composed of two components SLAPOS master and SLAPOS nodes. These nodes are usually installed at home or inside data centers and they are used to run processes or to install software. Master knows location of each and every nodes and software installed on each node.

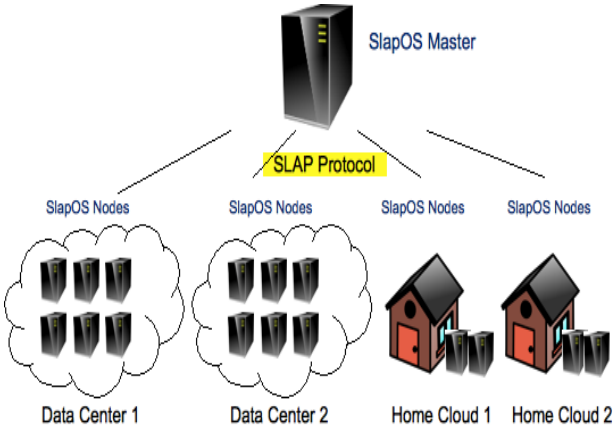

Fig 2 : SLAPOS Architecture.

SLAPOS has two models developer model and accounting model.

1) Developer Model: Developer Model is designed for the end users or developers. In this model the application programming interface (API) of the SLAPOS is based on **REQUEST**,[1] which is a single core API method. Parameter called **instance type** is defined by the **REQUEST** method. This parameter is used to specify the software service which should be instantiated and started. Additional two methods provided by the developer model are **initialize connection** and **register computer partition.** Using these two methods SLAPOS defines software configuration and Service Level Agreement (SLA) information. Location of software, where it should be installed can be specified by the SLA parameter. Reliability of a cloud hosted environment can be increased by allocating software instances on different LANs and continents. Software instances on same LAN or host can optimize the performance of distributed storage.

2) Application Model: This model is designed for the business applications. It is an application of ERP5 Unified Business Model (UBM) [1]. Resource, Movement, Item, Node and Path are the five concepts defined by ERP5. People and organization registered to the SLAPOS portal is called as nodes. After registration they can request any type of resource. Today SLAPOS has commercial production, which helps the users to protect their strategic data with low operating cost.

B. vSTAR CLOUD OS

Traditional operating system cannot satisfy the requirements of cloud computing and cannot support heterogeneous multicore platforms. So vStar cloudOS [2] is designed as a new network computing operating system for multicore and clouds. Design of vStar cloudOS for network computing has following challenges. They are,

- Scalability : Traditional operating system is not sufficient for supporting network computing environment. Also they have limitations in scalability such as locality aliasing, lock mechanism, message mechanism. So, network computing operating system with scalability is needed to be designed.
- Flexibility : Operating system must be able to support any type of changes in the underlying hardware and in the upper applications effectively.
- Dependability : Network computing operating system must be dependable. ie; self accuracy must be guaranteed and the user won't be aware of system breakdown even if a failure occurs.

1) vSTAR cloud architecture

vStar cloud architecture mainly composed of two parts, terminal operating system and a cloud operating system. Foundational operating system and client access service components are the parts of terminal operating system. This cloud operating system is named as vStar cloud which is the core part. It contains network service layer and the foundational service layer. VStarEnv [2] and vStarOS are the parts of foundational service layer, which are the

infrastructure service layer and the meta operating system respectively.

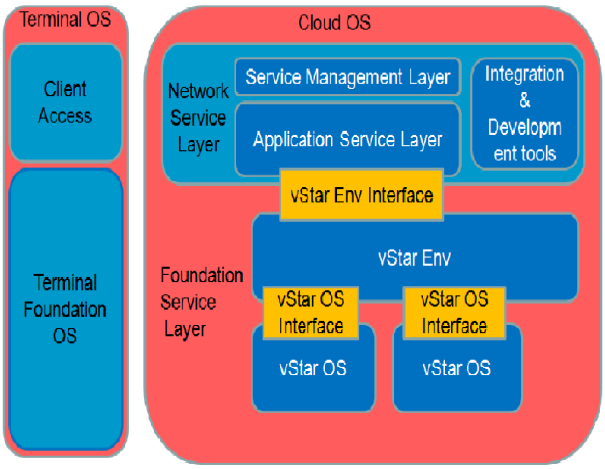

Fig 3:vStarCloud OS architecture

2) Layered Structure Of vSTAR cloud OS

Layered architecture of the vStar cloud OS has two levels of structures, vStar kernel and vStar OS core engine. vStar kernel provides message protection layer, time multiplexing of processors, support for virtualized processor, safety mechanisms and application programming interface. Other complicated functions in traditional operating system are supported by the upper layer of this structure.

vStar kernel is composed of Coordinator, Vdriver, vStar kernel, Core driver, Communicator. Coordinator used for coordinating and managing the overall state, Vdriver provide support to set up system virtualization environment, core driver manages processor cores and finally communicator provides communication between cores in CPU [2].

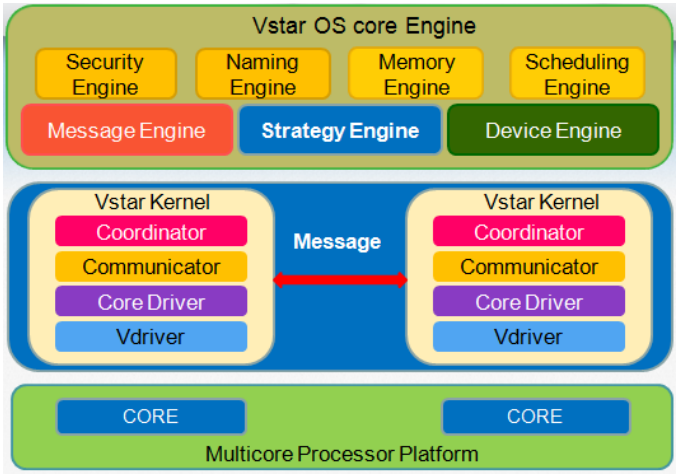

Fig 4: Layered Structure of vSTAR cloud os

Next is the vStar OS core engine, which runs above the kernel mode. This engine module provides flexible foundational runtime environment for the vStar OS. This vStar core engine is composed of security engine, strategy engine, message engine, memory engine, device engine, name engine, scheduling engine. Traditional micro kernel operating system and distributed operating systems are similar to vStar cloud operating system.

C. MEGHA OPERATING SYSTEM

In Sanskrit megha means Cloud. Megha is a cloud based operating system. It provides common storage, common platform and common application. Megha OS [3] can provide high security for applications. By using megha OS no additional plugins are needed to execute applications. Interface provided by megha OS is more user friendly as compared to others. Also megha OS has less bandwidth utilization. So it is usable for Mobile Application Development.

1) MEGHA OS Architecture

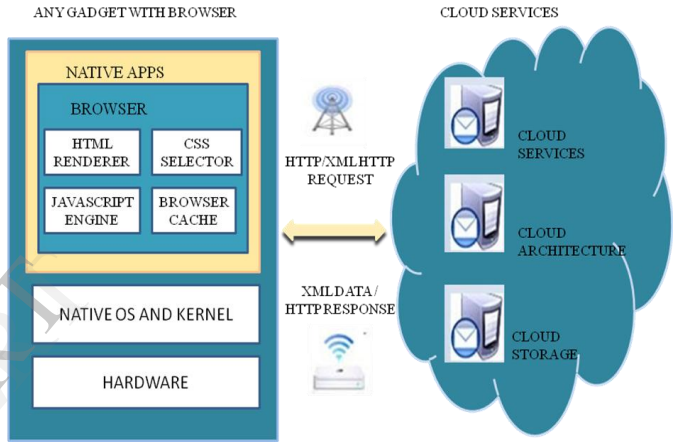

Fig 5 : Megha OS Architecture.

Cloud computing provided by megha OS is divided into three parts. They are cloud platforms(CP), cloud services(CS) and cloud storage(CSt) [3]. For the users cloud platform is provided by Megha OS architecture along with the web browser. Kernel is designed to unify system services and the general utilities provided by the operating system. Megha OS provides certain services for specific tasks and their communication and location is supported by the kernel.

Services offered by the Megha OS are,

- Account Manager: It is used to manage the registering and logging of application users.
- File Manager : This module is used to manage downloading and uploading of files, sharing of files and image hosting.
- Message Exchanging: Megha OS provide communication through message passing. It is fulfilled using HTTP/XML request and response.
- Communication Manager: It manages communication between client and cloud.
- Manager: It manages launching, listing and ending of process.

D. EYE OPERATING SYSTEM

Using eye operating system users inside a network can access everything inside the Eye OS [4]. Eye OS toolkit is used to design the platform for web applications. Applications are commonly written in PHP, XML and Javascript. Eye OS provides a desktop environment with 67 applications and system utilities. User require only one web browser for accessing eye operating system and all its applications. All applications can be accessed by using portable devices via its mobile front end. Eye OS is used to centralize all works and to help the user to experience as working from single place.

Eye OS has certain goals such as it should allow the users to work from everywhere, easy sharing of resources must be possible between different work centers, it should allow the users to continue their work even if their system crashes without losing data.

1) Benefits of Eye OS

- World wide availability
- Browser is the only requirement
- Dynamic content and design
- Extensive list applications
- Remote storage facility
- Browser and platform independent
- Rich text editing facility

2) Eye OS Architecture

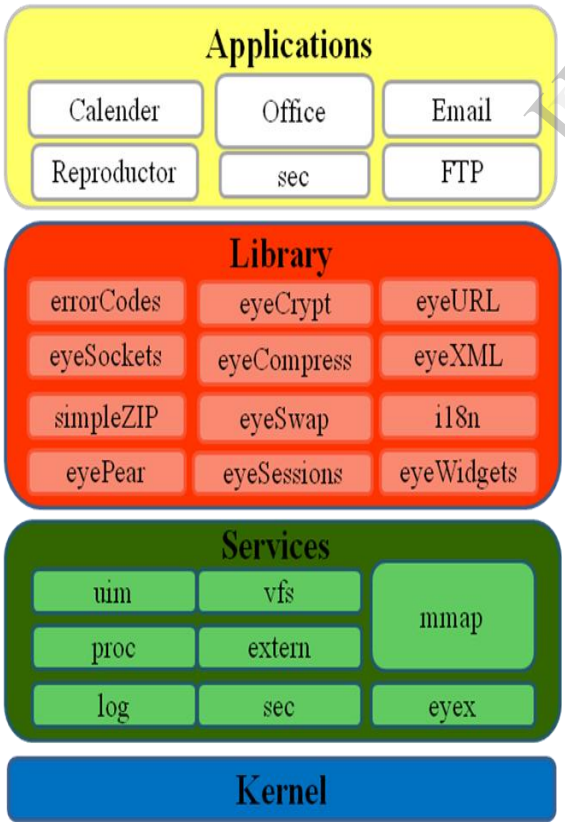

Fig 6: Eye os architecture

EyeOS architecture contains mainly four parts. They are kernel, services, library and applications. Kernel is used to coordinate all the system services. Services indicate the functions of the lower level. Library helps the user to develop applications easily but they donot handle low level tasks.. Applications are able to call a function of any part.

3) APPLICATIONS

- Eye OS provides system and toolkit for users. This system can be used to work with eyeOS and all its applications and the toolkit helps the users to create new applications easily.
- This operating system has applications in schools and universities. It provides web platforms with collaborative desktops for students, teachers and parents to work and communicate between themselves.
- With the support of private server EyeOS can provide free internet points, public library networks and other web places for their users to work and communicate with network managers. After the one time registration users can access these services from anywhere.

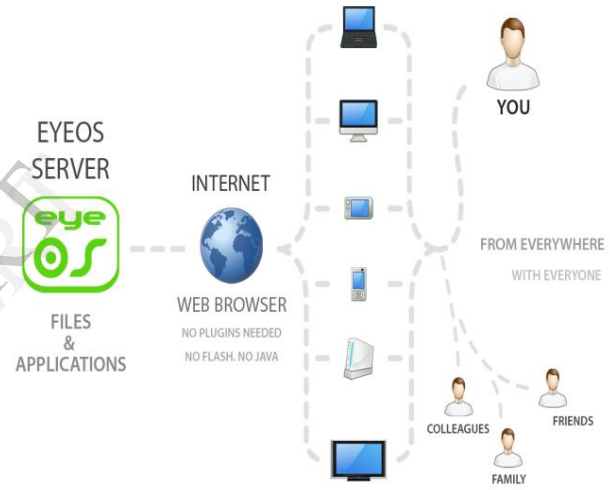

Fig 7 : Applications of Eye OS

IV. COMPARISON

By comparing earlier microkernel operating system and vStar cloud operating system it is clear that vStar can offer multilevel and fine grained services. Also these services are more flexible as compared to the simple services provided by earlier microkernel operating systems which are tightly coupled with microkernel.

Systems such as Tornado are designed only for SMP and NUMA. As compared to vStar cloud this system is smaller, not applicable for cloud computing and not loosely coupled micro processor. That is this system is less scalable than vStar cloud systems.

vStar cloud uses system virtualization techniques in addition to the usage of all ideas of FOS. FOS provides common operating system functions through the distributed services.

By comparing vStar cloud and typical IaaS system such as Amazon it is clear that vstar provides single Iaas

system image on the virtual machine and there is no unified programming model for the resources in it, where Amazon provides Linux kernel image and computing resources through Virtual Machine.

Comparison of the Megha OS [3] with Google chrome operating system results the following table.

TABLE I. COMPARISON TABLE

Parameter	**Megha OS**	**Google Chrome OS**
Service Type	Cloud Based	Web Based Applications
Plugins	No plugins needed.	Preinstalled with the chromium Browser.
Device specificity	No	Yes
Large computing Applications	Possible with computational offloading to cloud.	Not very suitable.
Programming Environment	Simple JavaScript Files.	Need chromium API's
Mobile Optimization	Suitable based on the mobile version.	Not Suitable.

TABLE II. ADVATAGES OF CLOUD OS

Type	**Advantage**
SlapOS	Provide security on the cloud.
vStar CloudOS	Designed for multicore systems.
Megha OS	Mobile application Development.
EyeOS	Everything inside it can be accessed from everywhere inside a Network.

V. CONCLUSION

Recently, Cloud is a new thought in the area of network computing. Traditional operating system cannot fulfil all the requirements of cloud computing and cannot support heterogeneous multicore platforms. Cloud operating system provides flexible and unified programming interface to the underlying distributed hardware, set of options for the resource management and metrics to facilitate programming in the cloud. Four types of cloud operating systems were discussed and compared here. They are SlapOS, vStar cloud OS, Megha OS and EyeOS.

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