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A Overview on Cloud Computing Platforms and Issues

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Abstract: ***Cloud computing is the improvement of parallel computing, distributed computing and grid computing. It has been one of the most hot research topics. Currently many corporations have involved in the cloud computing related techniques and many cloud computing platforms have been put forward. But there are also some complications for so many platforms. The characteristics, architectures and applications of several popular cloud computing platforms are analyzed and discussed in detail in this paper. From the comparison of these platforms, users can better understand the different cloud platforms.***

Keyword**: *virtualization; utility computing; IaaS; PaaS; SaaS;IDass;Naas;***

I. INTRODUCTION

Cloud computing is a powerful technology to perform massive-scale and complex computing. It eliminates the need to maintain expensive computing hardware, dedicated space and software. Cloud computing is a Pay-per-Use-On-Demand mode that can conveniently access shared IT resources through internet, where it includes network, server, storage, application, service and etc. Cloud computing provides five types service models, such as IaaS, PaaS, SaaS, IDaaS and. Naas. Infrastructure-as-a-service provides access to fundamental resources such as physical machines, virtual machines, virtual storage, etc. It also offers Virtual machine disk storage, Virtual local area network, Load balancers, IP addresses ,Software bundles are made available to end user via server virtualization. Platform-as-a-service offers the runtime environment for applications. . Software-as–a-Service model allows to provide software application as a service to the end users. It refers to a software that is deployed on a host service and is accessible via Internet. Identity-as–a-Service offers management of identity information as a digital entity. Network-as-a-Service allows us to access to network infrastructure directly and securely. NaaS makes it possible to deploy custom routing protocols.

Cloud computing service provider such as, EC2 from Amazon , Azure from Microsoft, AppEngine from Google, Blue cloud from IBM, Force.com from Salesforce.com, heroku, Openstack from HP, Rackspace, Redhat, VMware and so on in use. A brief introduction and comparison of several popular cloud platforms and issues is presented in this paper.

II. OPENNEBULA CLOUD COMPUTING PLATFORM

OpenNebula provides the most simple but feature-rich and flexible solution for the comprehensive management of virtualized data centers to enable private, public and hybrid Iaas clouds. OpenNebula interoperability makes cloud an evolution by leveraging existing IT assets protecting your investments, and avoiding vendor lock-in. OpenNebula is a turnkey enterprise-ready solution that includes all the features needed to provide an on-premises (private) cloud offering, and to offer public cloud services. OpenNebula is also an open source cloud service framework [6]. It allows user deploy and manage virtual machines on physical resources and it can set user's datacenters or clusters to flexible virtual infrastructure that can automatically adapt to the change of the service load. The main difference of OpenNebula and nimbus is that nimbus implements remote interface based on EC2 or WSRF through which user can process all security related issues, while OpenNebula does not.

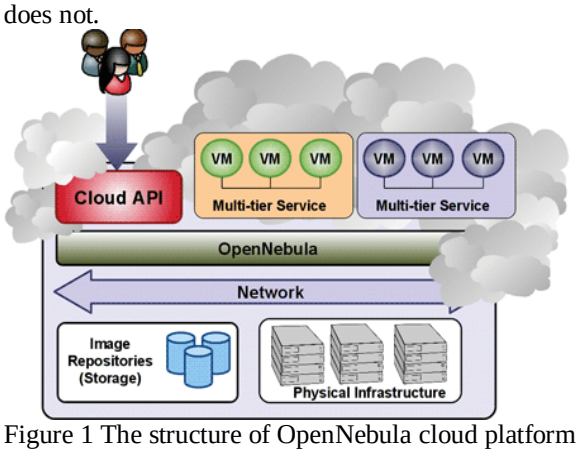

Figure 1 The structure of OpenNebula cloud platform

Figure 1 The structure of OpenNebula cloud platform OpenNebula is also an open and flexible virtual infrastructure management tool, which can use to synchronize the storage, network and virtual techniques, and let users dynamically deploy services on the distributed infrastructure according to the allocation strategies at data center and remote cloud resources. OpenNebula is mainly used to manage the data center of private cloud and infrastructure of cluster, and it also support hybrid cloud to connect the local and public infrastructure. This is very useful to build high scalable cloud computing environment. Besides, OpenNebula also supports public cloud platform by providing interfaces and functions to virtual machines, storage and network management and so on. OpenNebula cloud computing platform has many advantages. It can dynamically adjust the scale of the infrastructure of the cloud platform by increasing the number of hosts and partition clusters to meet different requirements. It can centralized manage all the virtually and physically distributed infrastructures and can create infrastructure with the heterogeneous resources at data center.

OpenNebula is scalable and can rapid response to user's requirements from the point of infrastructure users, Compared with Eucalyptus, OpenNebula is more strength in the support of private cloud platform and dynamic management of the scalability of the virtual machines on clusters. To hybrid cloud, it provide on-demand access and elastic mechanisms as Amazon EC2 does.

III. EUCALYPTUS CLOUD PLATFORM

Eucalyptus is an acronym for "Elastic Utility Computing Architecture for Linking your Programs to Useful Systems" developed at the university of California, Santa Barbara. Eucalyptus is a Linux-based open source software architecture that implements efficiency – enhancing private and hybrid clouds within an enterprise's existing IT infrastructure. Eucalyptus is engineered according to design principles that ensure compatibility with existing Linux-based data center installations. Eucalyptus can be developed without modifications on all major Linux OS distribution, including Ubuntu, RHEL, Centos and Debain. Now Ubuntu include Eucalyptus software core as the key component of the Ubuntu Enterprise Cloud.

There are five high-level components 1 Cloud Controller (CLC), 2 Cluster Controller(CC), 3 Node Controller(NC) 4. Storage Controller, 5.Warlus . Cloud controller (CLC) is the entry-point into the cloud for administrations, developers, project Managers, and end-users. The CLC is responsible for querying the node managers for information about resources, making high level scheduling decisions, and implementing them by making requests to cluster controller. Cluster Controller(CC) generally executes on a cluster front-end machine or any machine that has network connectivity to both the nodes running NCs and to the machine running the CLC. CCs gathers information about a set of VMs and schedules VM execution on specific NCs. Node Controller(NC) runs on each node and controls the life cycle of instance running on the node.

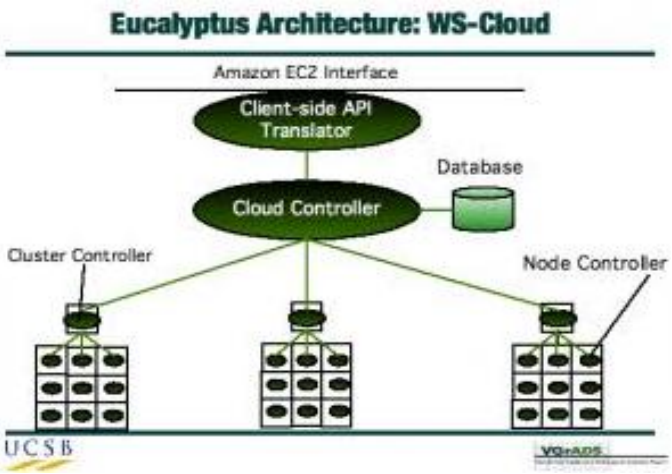

Figure 2: Structure of Eucalyptus

The NC interacts with the OS and the hypervisor running on the node on one side and the CC on the other side. Storage Controller (SC) implements block-accessed network storage(Amazon Elastic block storage – EBS) and is capable of interfacing with various storage systems(NFS, iSCSI). An elastic block store is a Linux block device that be attached to a virtual machine but sends disk traffic across the locally attached networks to a remote storage. Walrus(put/get storage) allows users to store persistent data, organized as eventually-consistent buckets and objects. It allows users to create, delete, list buckets, put, get, and delete objects, and set access control policies. Walrus is interface compatible with Amazon's S3 and supports the Amazon machine Image(AMI).

IV. ABICLOUD CLOUD COMPUTING PLATFORM

Abicloud is an open source cloud computing platform manager developed by Abiquo. Abicloud is an open source infrastructure software for the creation and integral management of public & private clouds based on heterogeneous environment. It allows to quickly create a private cloud inside an organization 's firewall and manage it with a rich user interface. The tool mainly offers users the capacity for scaling, management, automatic and immediate provision of servers, storage, networks, virtual network devices as well as applications. The main difference between Abicloud and other cloud computing platforms is its powerful web-based management function and its core

encapsulation manner. Using the Abicloud, user can finish deploying a new service by just dragging a virtual machine with mouse. Every cloud provider has his own management tools, say monitor, billing and so on, normally it is very hard to install a cloud platform according to user's requirement and constraint.

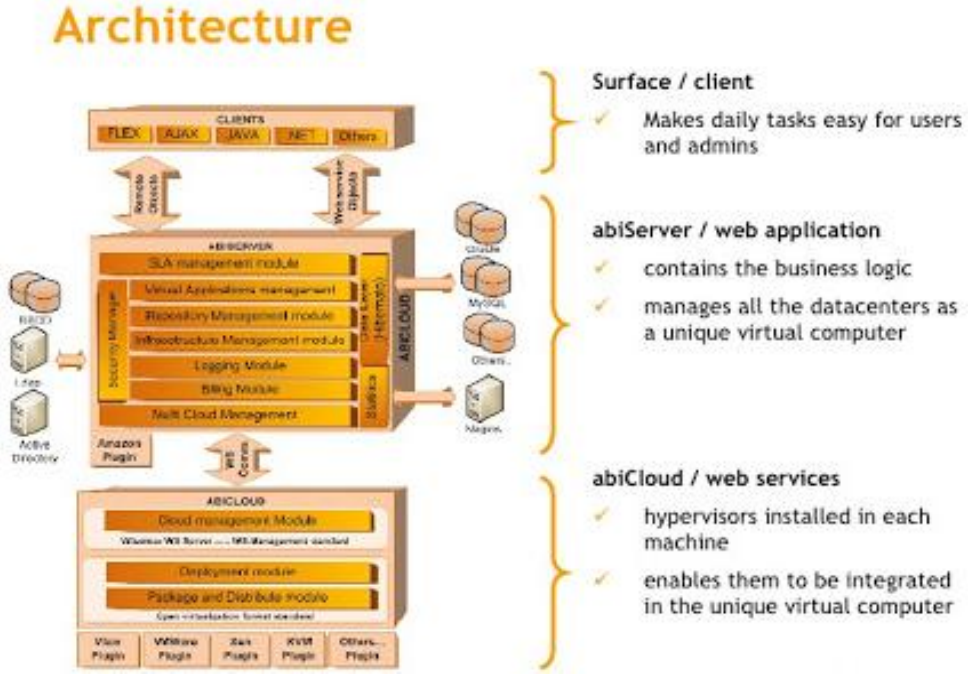

Figure 3 The structure of AbiCloud platform

Abicloud can be used to deploy and implement private cloud as well as hybrid cloud according to the cloud provider's request and configuration. It can also manage EC2 according to the rules of protocol. Besides, apply the Abicloud, a whole cloud platform based on Abicloud can be packed and redeployed at any other Abicloud platform. This is much helpful for the transformation of the working environment and will make the cloud deployment process much easier and flexible. The architecture of Abicloud is illustrated in figure 3. It can easily figure out that Abicloud is built based on Java, which set it irrelevant to the platform and easy to transplant. Actually, Abicloud can support many different virtual machine platforms which include vBox, VMware, Xen, KVM and so on which make it very flexible.

V. NIMBUS CLOUD COMPUTING PLATFORM

Nimbus platform is an integrated set tools that deliver the power and versatility of infrastructure clouds to scientific users. Nimbus allows us to combine Nimbus, Open stack ,Amazon and other Clouds. Nimbus Infrastructure is an open source EC2/S3 – compatible infrastructure-as-a-service implementation specifically targeting features of interest to the scientific community such as support for proxy credentials, batch schedulers, best-effort allocations and others.

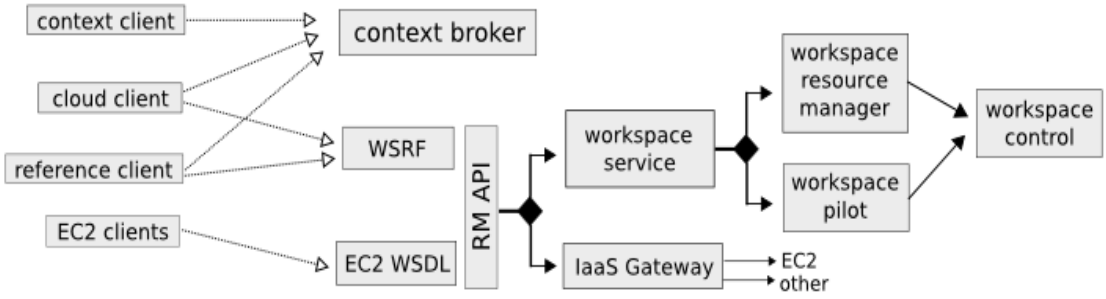

Figure 4: The structure of Nimbus cloud platform

The Workspace Service site manager is a standalone site VM manager that different remote protocol frontends can invoke. The current supported protocols (WSRF and EC2) happen to both be Web Services based and happen to both run in the Apache Axis based GT Java container. A WSRF based remote protocol implementation in longstanding use by previous workspace services and clients including the popular cloud-client. A full protocol guide enumerating differences is forthcoming. An EC2 based remote protocol implementation (partial) of the Amazon Elastic Compute Cloud (EC2) web services description (WSDL) that allows you to use clients developed for the real EC2 system against Nimbus based clouds. The RM API bridge between remote protocols/security and specific site manager implementations. The cloud client aims to get users up and running in minutes with instance launches and one-click clusters. The reference client exposes the entire feature set in the WSRF protocol as a command line client (with underlying Java client library. The workspace-control agent implements VMM and network specific tasks on each hypervisor. The Context Broker allows clients to coordinate large virtual cluster launches automatically and repeatedly. The Context Agent lives on VMs and

interacts with the Context Broker at VM boot. The EC2 backend allows the service to turn around and secure remote resources from off-site. The components are lightweight and self-contained so that they can be selected and composed in a variety of ways.

Figure 4, shows that nimbus cloud computing platform includes many different components, say client, agent, and resource manager and so on. Generally, all these functional components can be classified as three kinds. One kind is client- supported modules which are used to support all kinds of cloud clients. Context client module, cloud client module, reference client module and EC2 client module are all belong to this kind of component. The second kind of component is mainly service-

supported modules of cloud platform, providing all kinds of cloud services. It includes context agent module, web service resource framework module, EC2 WSDL module and remote interface module. The third kind of component is the background resource management modules which are mainly used to manage all kinds of physical resources on the cloud computing platform, including work service management module, IaaS gateway module, EC2 and other cloud platform support module, workspace pilot module, workspace resource management module and workspace controller.

VI. COMPARISON OF CLOUD PLATFORMS

At present there are different kind of cloud computing platforms, each one has its own characteristics and advantages. To better understand these platforms, we have analyzed in detail and given a comparison from different implementation aspects. The characteristics and implementation of these platforms are summarized as table 1 shows. From table 1, it can figure out that though the implementation of these cloud platforms is quite different, there are much common between them. For example, they are all scalable, all provide IaaS, all support dynamic deployment of the platform, all support Xen virtualization technology, and all support linux operation system and the development of application with Java. Abicloud stands out. As this cloud platform can be deployed with mouse under graphic user interfaces compared others with command line. This will be much simple to users and decrease the effort of the platform deployment. From the point of reliability, OpenNebula is more mature. It has considered rollback and fault tolerance mechanisms in the cloud implementation while others do not.

Table 1 The comparison of several cloud computing platforms

	Abicloud	Eucalyptus	Nimbus	OpenNebula
cloud character	publich/private	public	public	private
scalability	scalable	scalable	scalable	Dynamical, scalable
cloud form	IaaS	IaaS	IaaS	IaaS
compatibility	Not support EC2	support EC2, S3	support EC2	open, multi-platform
deployment	pack and redeploy	dynamical deployment	dynamical deployment	dynamical deploymentt
deployment manner	web interface drag	commandline	commandline	commandline
Transplant-ability	easy	common	common	common
VM support	VirtualBox, Xen, VMware, VM	VMWare, Xen, KVM	Xen	Xen, VMWare
web interface	libvirt	Web Service	EC2 WSDL, WSRF	libvirt, EC2, OCCI API
structure	open platform encapsulate core	module	Lightweight components	module
reliability	-	-	-	rollback host and VM
OS support	Linux	Linux	Linux	Linux
development language	ruby, C++, python	Java	Java, Python	Java

VII. ISSUES IN CLOUD COMPUTING

Issues of cloud computing can summarize as follows:

A. Privacy

Cloud computing utilizes the virtual computing technology, users' personal data may be scattered in various virtual data centers rather than stay in the same physical location, users may leak hidden information when they are accessed cloud computing services. Attackers can analyze the critical task depend on the computing task submitted by the users.

B. Reliability

The cloud servers also experience downtimes and slowdowns as our local server.

C. Compliance

Numerous regulations pertain to the storage and use of data requires regular reporting and audit trails. In addition to the requirements to which customers are subject, the data centers maintained by cloud providers may also be subject to compliance requirements.

D. Issues in Cloud Interoperability

1) Intermediary Layer

A number of recent works address the interoperability issue by providing an intermediary layer between the cloud consumers and the cloud-specific resources.

2) Open Standard

Standardization appears to be a good solution to address the interoperability issue. However, as cloud computing just starts to take off, the interoperability problem has not appeared on the pressing agenda of major industry cloud vendors.

3) SaaS and PaaS Interoperability

While the aforementioned solutions generally tackle with IaaS interoperability problems, SaaS interoperability often involves different application domains such as ERP, CRM, etc..

VIII. CONCLUSIONS

Cloud computing is a new technology widely studied in recent years. Now there are many cloud platforms both in industry and in academic circle. How to understand and use these platforms is a big issue. Focused on the aspects such as the architectures, characteristics, application and so on, a detailed comparison has been presented in this paper. From the analysis and summarization, users can better understand the characteristics and better choose of cloud computing platforms according to the cloud types, interfaces, compatibility, implementation, deployment requirement, and development support and so on. Though each cloud computing platform has its own strength, one thing should be noticed is that no matter what kind of platform there is lots unsolved issues. For example, continuously high availability, dealt mechanisms of cluster failure in cloud environment, consistency guaranty, Synchronization in different clusters in cloud platform, interoperation and standardization, the security of cloud platform and data in transmission and so on are all among the issue to be better solved.

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