

# Designing Cloud Computing Architecture for SOA University

**Keywords:** - Cloud Computing, AWS, Private Cloud

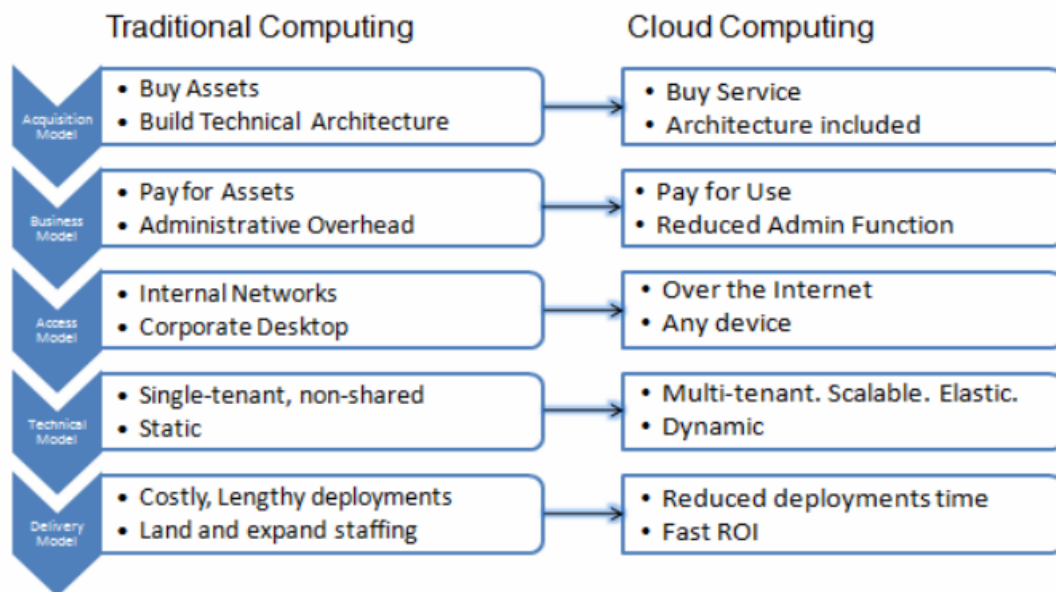
**Abstract:** - There are some problems in using and managing the educational resources of colleges and universities, such as uneven distribution of resources, Inconvenient to use, data redundancy, more maintenance personnel and low efficiency. There is often a branch in colleges and universities. There are plenty of hardware and equipment. In view of the above situation, a scheme of building the private cloud platform of educational resources in colleges and universities is given and a user management system using the private cloud is designed in this paper.

**Cloud Computing:** - Cloud computing is the delivery of different services through the Internet, including data storage, servers, databases, networking, and software. Cloud storage has grown increasingly popular among individuals who need larger storage space and for businesses seeking an efficient off-site data back-up solution.

**Advantages of Cloud Computing** Cloud Computing has many advantages, some examples are:

- Masked complexity - upgrades and maintenance of the product or service can be hidden from users, without having them to participate.
- Cost flexibility - with the cloud computing there is no need to pay dedicated software license fees, or to fund the building of hardware and installing software.
- Scalability - cloud enables enterprises to add computing resources at the time they are needed.
- Adaptability - cloud computing helps enterprises to adapt to various user groups with a various assortment of devices.
- Ecosystem connectivity – cloud facilitates external collaboration with consumers and partners which leads to improvements in productivity and increased innovation.

## Compare Traditional Computing Vs Cloud Computing For SOA University



## Key Characteristics of Cloud Computing

The main characteristics of Cloud Computing are:

- On demand self-service - consumer of the service can automatically request the service based on their needs, without the interaction with the service provider.
- Easy to access standardized mechanisms - it should be always possible to access the service from the Internet, when policies allow this.
- Resource pooling and multi-tenancy - sharing resources between multiple tenants can increase utilization, and reduce the operation cost.
- Rapid elasticity - the ability to scale in and out, provides the flexibility to provision resources on-demand.
- Measured service - monitoring condition of services, measuring services enables optimizing resources.
- Auditability and certifiability - services should provide logs and trails that allow the traceability of policies for ensuring that they are correctly enforced.

## Cloud Computing Deployment Models

There are four main Cloud computing models: public, private, hybrid and community cloud.

- **Public cloud:** “The cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services “. Consumers need to pay only for the time duration they use the service, i.e., pay-per-use which helps in reducing costs. They are less secure comparing to other cloud models since all the applications and data are more opened to malicious attacks. Proposed solution to this concern is security validation check on both sides.

- **Private cloud:** “The cloud infrastructure is operated solely for an organization. It may be managed by the organization or a third party and may exist on premise or off premise“. It is a data centre owned by a cloud computing provider. “The main advantage is that it is easier to manage security, maintenance and upgrades and also provides more control over the deployment and use.

Compared to public cloud where all the resources and applications are managed by the service provider, in private cloud these services are pooled together and made available for the users at the organizational level. The resources and applications are managed by organization itself “.

- **Community cloud:** “The cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be managed by the organizations or a third party and may exist on premise or off premise “.

- **Hybrid cloud:** “The cloud infrastructure is a composition of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability(e.g., cloud bursting for load-balancing between cloud)“. Hybrid cloud is more secure way to control data and applications and allows the party to access information over the internet.

## Cloud Computing Service Models

There are three main different layers of Cloud Computing Architecture: client, application, platform, infrastructure, and server.

- **Software as a Service (known as SaaS)** is a service which allows the end user (consumer) to access and use a provider software application owned and managed by the provider. Software as a service allows software to be

licensed to a user on demand. The consumer does not own a software but rents it, e.g. for a monthly fee.

- Platform as a Service (known as PaaS) is a service hosted in the cloud and accessed by users through their web browser. Platform as a service is a provisioning model that allows the creation of web applications without the need to buying and maintaining expensive infrastructure like hardware and software. PaaS allows users to create software applications using tools given by the provider.

- Infrastructure as a Service (known as IaaS) is a service which allows the service consumer to rent infrastructure capabilities based on demand. Consumers do not have direct access to resources but have the ability to select and configure resources as required based on their needs.

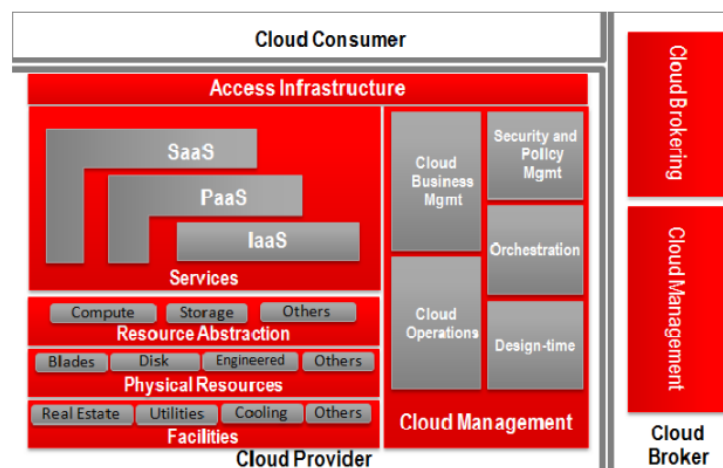
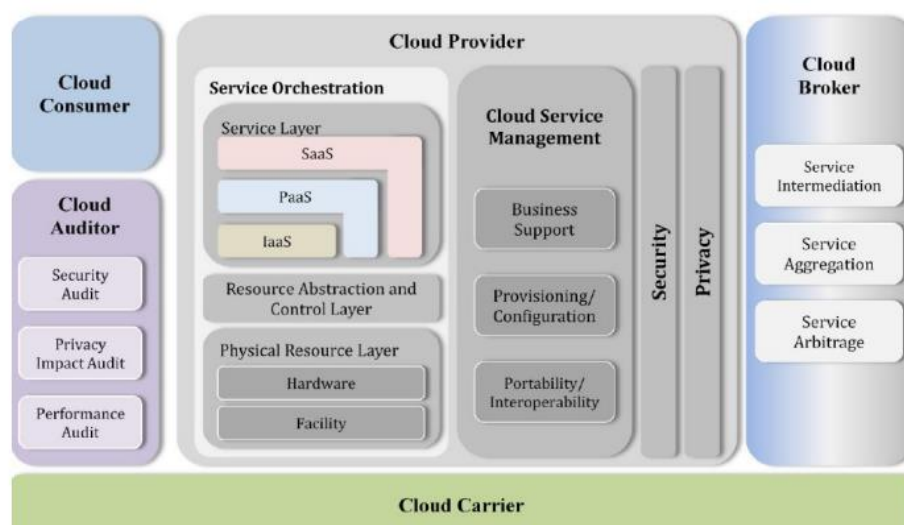


Figure 2.2 Conceptual view of the architecture [3]

## Cloud Computing Reference Architecture



## **1. Problems of the use and management in Colleges and Universities.**

Education resources in colleges and universities mainly has the following several aspects, Software resources, all kinds of office online system, department website, online courses, excellent courses, library system, etc.

Hardware resources: In the office, there are some computers, wireless router, printer, copier, etc. used for daily work. In the laboratory room, there are many computers, switches, routers, etc. used for learning. In the classroom, there are some multimedia equipment. However, there are some problems in using the software and hardware resources.

### **1.1 In Software Resources**

Software from different developers, due to the use of web technology, supported by the browser also there is a difference, so that teachers and students in the use of the software, may need to meet the needs of the software, to switch back and forth the browser or a new browser installed. Update of office software and software development, training rooms of experimental environment, temporary, cyclical is stronger, the different curriculum requires that difference is very big, the environment is preparing a more time-consuming thing, need the teacher complete software per semester, each training rooms because of changes in the curriculum arrangement all teachers need to collect the software she'll need, then according to the needs of teachers looking for software to install. This process will be requires a lot of manpower.

### **1.2 In Hardware Resources**

Resource allocation imbalance, some departments configuration of computer is new, and some departments configuration of computer due to reasons such as renewal, older, or the quantity is not enough to use, or cannot be used due to the software requirement is higher. Data redundancy and waste of resources, the teacher teaching in different classrooms or offices or office, need to copy the relevant teaching courseware or other software resources to the U disk, to the venue, copied or installed on the computer used in class, again have the same teacher allows multiple multimedia classroom computer duplicate data and software, data redundancy and waste of resources. Repeated investment,

the relatively independent research, when computing resources is not enough, often need to purchase a server, on the one hand, the server whether in time or in efficiency, utilization rate is very low. On the other hand, the server cannot be Shared between the various research, eventually led to the school. To sum up, in the current college information resources on the use and management of the main contradictions are:

- 1) Insufficient resources and waste of resources.
- 2) Use inconvenience and data 4th National Conference on Electrical, Electronics and Computer Engineering (NCEECE 2015) © 2016. The authors - Published by Atlantis Press 991 redundancy
- 3) low maintenance personnel with more efficiency. The essential reason is resource utilization efficiency is low.

Cloud computing is a good way to solve these contradictions, one of the aims of cloud computing is the flexible configuration and make full use of resources. Repeated investment, the relatively independent research, when computing resources is not enough, often need to purchase a server, on the one hand, the server whether in time or in efficiency, utilization rate is very low.

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## **2. Introduction of AWS**

Cloud computing is a style of computing in which dynamically scalable and often virtualized resources are provided as a service over the Internet.

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

### **2.1 Cloud Computing Services**

Cloud computing services provided by the resource type is divided into three categories: infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS). IaaS: hardware equipment basic resources in service for users. In IaaS environment, the user is equivalent to in the use of bare-metal and disk, can let it run Windows, also can let it run Linux. IaaS biggest advantage is that it allows the user to dynamic application or release the node, charged according to usage. The IaaS is shared by the public, thus has higher efficiency of resource use. PaaS: provide the operation of the user application environment. PaaS itself is responsible for the resources of the dynamic extension and fault-tolerance management, user applications need not too much to consider cooperation between the nodes. But at the same time, the user's autonomy, must use a certain programming environment and follow specific programming model, applies only to resolve the calculation problem of certain. SaaS: targeted stronger, it will be some specific application software functions encapsulated into service. It only provides some specialized service supply with calls.

## **2.2 The Components of AWS**

AWS is an open source cloud computing project management platform, composed of several main components to complete the specific work. Through a variety of complementary services provide the infrastructure as a service (IaaS) solution, each service provides the API for integration. It the latest version of the Grizzly suites with a total of seven different function, respectively is operational suite Nova, object storage, Cinder block storage suite, suite Swift netcom suite Quantum, and identity identification suite Keystone, image file management suite Glance dashboard suite Horizon. The main components of AWS is shown in Fig. 1. Nova: It create an abstraction layer, let the CPU, memory, network adapter and server virtualization resources goods such as hard disk drives, and have the ability to improve the efficiency and automation. Neutron/Quantum: Known as Quantum before Neutron, it provides the ability to manage local area network (LAN), have applied to virtual local area network (VLAN), dynamic host configuration Protocol and Internet Protocol version 6 features. User can define network, subnet, and routers to configure its internal topology, then assigned to the network IP address and VLAN. Floating IP address allows the user to the VM allocation fixed external IP address. Keystone: It Management user directory, and users can access it service catalogue. It

exposed a central authentication mechanisms. Keystone itself does not provide Authentication, it can integrate various other Directory service, such as Pluggable Authentication Module, Lightweight Directory Access Protocol (LDAP) or request.

Swift: it is the ideal redundant Storage systems. It ensures that all equipment in the pool of data replication and distribution, let users can take advantage of the commercial hard disk and the server, rather than the more expensive the equipment. If a component fails, the contents of a system from other activities, so it can be added to the new cluster member. The architecture also supports the horizontal extension, because it is easy to use other server according to need to extend the storage cluster.

Swift is a distributed storage system, mainly for the static data, such as the VM image, backup and archive. The software to write documents and other objects into the possible distribution in one or more multiple servers within the data centre of a set of disk drives, to ensure the data replication and integrity within the entire cluster.

Cinder: Cooperate with Cinder storage is the most common used Linux server storage. The system provides the additional piece of equipment used to create a piece of equipment, to the server and separation from the server block device interface. In addition, Cinder volumes can be used to backup system. Glance: It supports the VM images, Glance mirror can serve as a template, quickly and consistently to deploy a new server, users can use it to list and get assigned to a set of extensible back-end Storage of the virtual disk image.

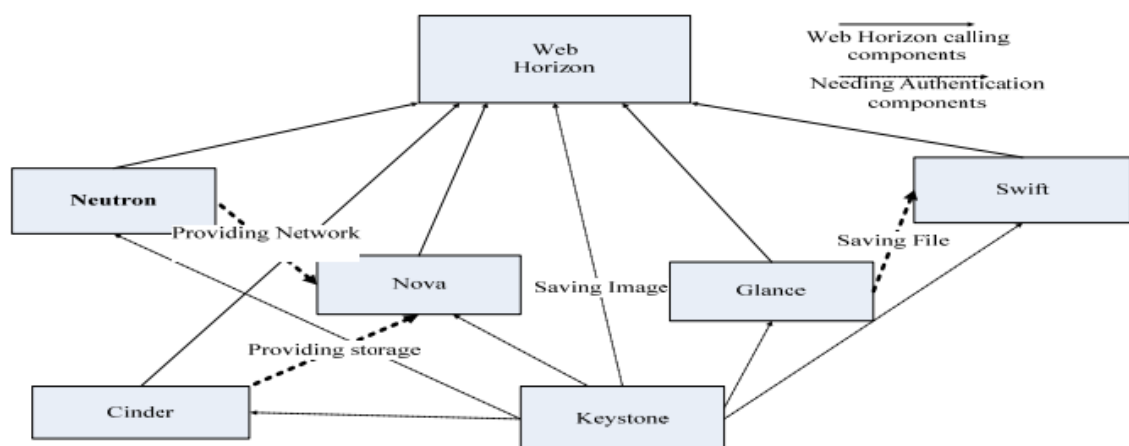


Fig. 1. the Main Components Of AWS



### 3. The Design of Private Cloud Platform For Colleges And Universities Education Resources

Private Cloud Platform for Colleges and Universities Education Resources includes two parts of hardware and software. The hardware part mainly use AWS to build Iaas, All hardware in school will be connected together as a whole through the network and AWS. Software part is based on the IAAs platform, it realized remote login authentication, after the user authentication succeeded, and user can access to the corresponding resources and has corresponding operating rights.

#### 3.1 Users the Overall Architecture

User's login system by PC or mobile or iPad, after the user passed the system certification, System according to the user's role, let the user to enter different private cloud. The overall architecture is shown in figure 2.

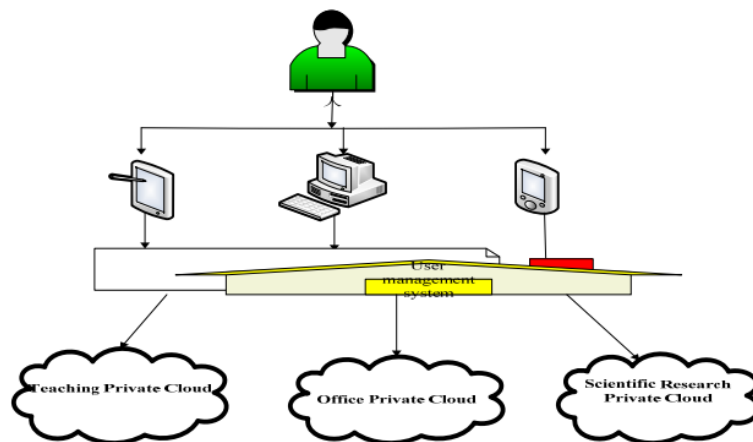


Fig. 2. The Overall Architecture of Private Cloud Platform

#### 3.2 Private Cloud Deployment

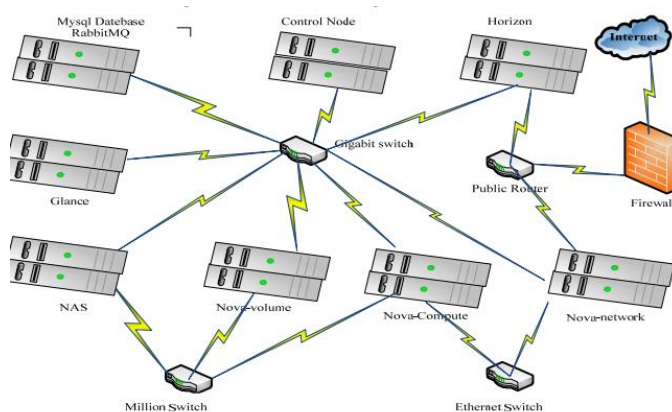


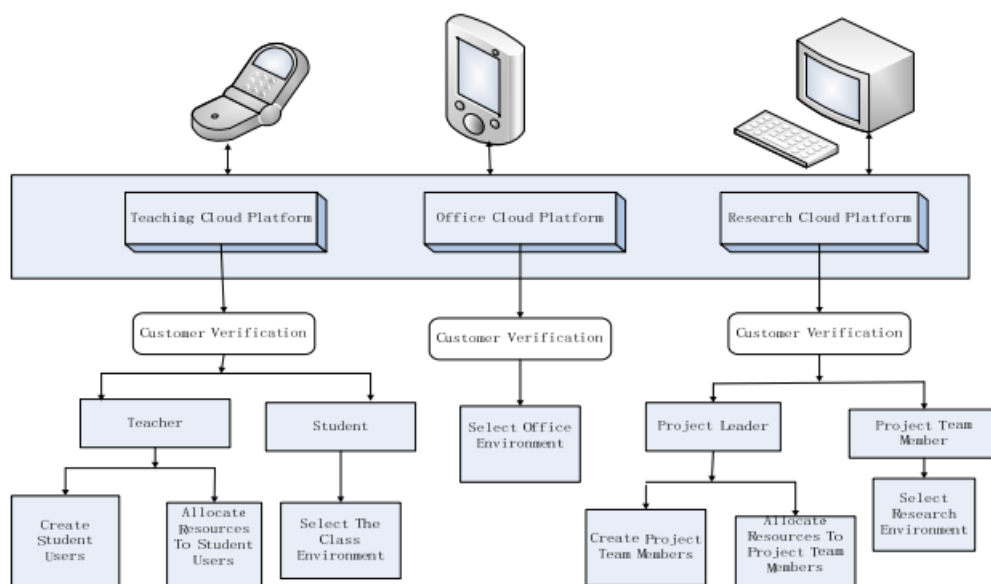
Fig. 3. Private Cloud Deployment

According to the component of AWS, PC servers install one of the AWS components, then all the servers can work together. Each node in Figure 3 will have a lot of servers.

According to the deployment of Figure 3, the control nodes make the network nodes, computing nodes, storage nodes, mirror nodes work together. User application work with monitoring management platform, to realize the allocation and use of resources.

### 3.3 The Design of User Management System

User management platform can be accessed by different clients, When the user access platform, users need to access to different platforms according to the needs of user. There are three major categories according to the teacher's professional classification, so the platform is divided into, teaching platform, office platform, and scientific research platform. Each type of platform requires user authentication, after user passed the verification, they can further visit the system. The system has different functions according to different users' roles. Details see Figure 4.



*Fig. 4. Private Cloud User Management Platform*

In this system, teaching cloud platform and research cloud platform has a super user roles, super users can allocate resources to other users. This user management platform needs to be closely linked with the horizon of Private

cloud deployment, and need to rely on horizon to access and call the private cloud resources.

## **4 . Summary**

According to the components and functions of AWS, this paper designs the overall architecture of user access to private cloud. According to the design of the whole architecture, the private cloud platform is deployed. According to the characteristics of AWS private cloud platform, user's management platform is designed. User management platform through the user access to private cloud platform.

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