Private cloud to support Infrastructure as a Service "IaaS"

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APPROVAL

This Project/Internship titled **"Private cloud to support Infrastructure as a Service "IaaS""** submitted by "Zahirul Islam, Sudip Proshad Gosh and Md. Monir Khan" to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 19/20/22 August 2015.

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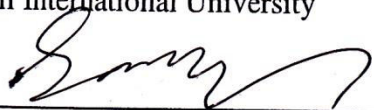Faculty of Science & Information Technology
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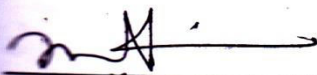Faculty of Science & Information Technology
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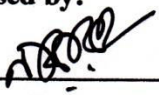**Professor and Chairman**
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We hereby declare that, this project has been done by us under the supervision of **Narayan Ranjan Chakraborty, Senior Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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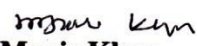Daffodil International University

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ABSTRACT

Cloud computing is basically an Internet-based network made up of large numbers of servers - mostly based on open standards, modular and inexpensive. Clouds contain vast amounts of information and provide a variety of services to large numbers of people. The term cloud computing is a recent buzzword in the IT world. Though the term Cloud Computing" is recent but the idea of centralizing computation and storage in distributed data centers maintained by third party companies is not new but it came in way back in 1990s along with distributed computing approaches like grid computing. Cloud computing is aimed at providing IT as a service to the cloud users on-demand basis with greater exibility, availability, reliability and scalability with utility computing model. The cloud we choose the Open Stack is private Cloud. The benefits of cloud computing are Reduced Data Leakage, Decrease evidence acquisition time, they eliminate or reduce service downtime, they Forensic readiness, they Decrease evidence transfer time the main factor to be discussed is security of cloud computing, which is a risk factor involved in major computing fields.

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CHAPTER 1
Introduction

1.1 Introduction

Cloud computing means that instead of all the computer hardware and software you're using sitting on your desktop, or somewhere inside your company's network, it's provided for you as a service by another company and accessed over the Internet, usually in a completely seamless way. Exactly where the hardware and software is located and how it all works doesn't matter to you, the user it's just somewhere up in the nebulous "cloud" that the Internet represents.

1.2 Objectives

Security and risk specialists objectively quantify the possible business benefits available from cloud computing measured against the security challenges. These tools provide risk governance metrics from many perspectives: internal (from within the current IT enterprise), from the cloud service provider (CSP) view, and from external legal and regulatory factors.

Management should carefully consider the monitoring mechanisms that are appropriate and necessary for the enterprise's own circumstances. Management may choose not to include all of the activities and approaches discussed in this document and, similarly, may choose activities not mentioned in this document. In either case, customization of the approaches described in this document will undoubtedly be necessary to reflect the specific circumstances of each enterprise.

- Protect information resources from supply chain threats. This includes verifying and maintaining the trustworthiness and reliability of the CP, as well as the security assurances associated with the hardware and software used.
- Prevent unauthorized access to cloud computing infrastructure resources.
- Define trust boundaries between CPs and consumers to clearly establish and promulgate boundaries of responsibility for providing security.
- Protect Internet browsers from attacks to mitigate end-user security vulnerabilities. This includes taking measures to protect Internet-connected personal computing devices by

applying security software, personal firewalls, and patches on a regular maintenance schedule.

1.3 Idea of our project

Our idea is very simple, assume there is a very important for cloud storage. Giving a set of Infrastructure as a Service.

Infrastructure as a Service (IaaS) is a form of cloud computing that provides virtualized computing resources over the internet IaaS is one of three main categories of cloud computing service, alongside Software as a Service (SaaS) and Platform as a Service (PaaS). Leading IaaS provider include Amazon Web Service (AWS), Windows Azure, and Google Computing Engine. Rackspace Open Cloud and IBBM SmartCloud Enterprise.

Cloud computing can refer to a lot of different thing, but typically talks about running different items "as a service"-software, platforms and infrastructure. OpenStack falls into the latter category and is consider infrastructure as a Service (IaaS). Providing infrastructure means that OpenStack makes it easy for users to quickly add new instance, upon which other cloud components can run. We are using OpenStack for deploying a simple IaaS.

CHAPTER 2

Cloud computing

2.1 Introduction

Cloud computing is computing in which large groups of remote servers are networked to allow centralized data storage and online access to computer services or resources [1].

Cloud computing is defined as technology that provides virtualized IT resources to users as a service by using internet. His user uses IT resources such as software, storage, server, and network at pay-per-use service, and receive flexible support depending on the usage of the service[2].

2.2 Rules of cloud computing

Use of cloud computing resources must be in compliance with all other University policies and procedures. It is the responsibility of the employee using such services to ensure that the use is consistent with those policies[3].

2.2.1 Intellectual property and copyright

Review and understand the policies on the use of intellectual property including copyrights, trademarks, and patents[3].

2.2.2 Privacy and data security

- Cloud computing may not be used for information that is classified, per the University's data classification policy, as restricted/confidential, private, personal, or sensitive, unless there is a contractual agreement between WMU and the service provider that protects the confidentiality of that information and data.

- No contractual agreement may be entered into for cloud computing services without having been approved by the product and appropriate contract review processes[3].

2.2.3 Data availability and records retention

- All records whether instructional, administrative, or research must be retained according to the records retention guide.

- Applications or services must be accessible to all appropriate people (i.e. visually impaired students).

- Materials are backed-up regularly to ensure that records are available when needed, as many providers assume no responsibility for data-recovery of content[3].

2.3 Type of cloud computing

Cloud computing is typically classified in two ways.

       a) Allocation of the cloud computing.

       b) Type of services offered.

Location of the cloud

2.3.1 Cloud computing is typically classified in the following three ways:

Public cloud:

 In Public cloud the computing infrastructure is hosted by the cloud
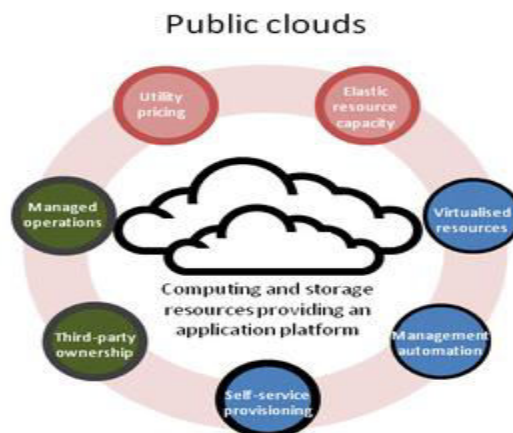

Fig: 2.1 Public Cloud [14]

Vendor at the vendor's premises. The customer has no visibility and control over where the computing infrastructure is hosted. The computing infrastructure is shared between any organizations. Figure 2.1 shows the architecture of Public cloud.

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Using public cloud as the only IT support, using expensive facilities, using cloud to as part of the IT resource, Public cloud is a service [4].

2.3.2 Private cloud

The computing infrastructure is dedicated to a particular organization and not shared with other organizations. Some experts consider that private clouds are not real examples of cloud computing. Private clouds are more expensive and more secure when compared to public clouds.
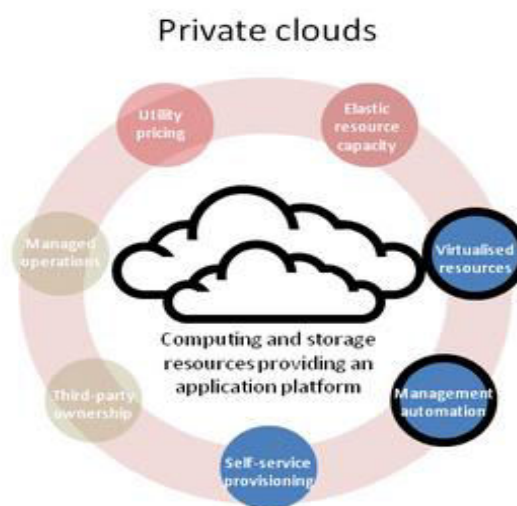

Fig: 2.2 Private Cloud [14]

Private clouds are of two types: On-premise private clouds and externally hosted private clouds. Externally hosted private clouds are also exclusively used by one Organization, but are hosted by a third party specializing in cloud infrastructure. Externally hosted private clouds are cheaper than On-premise private clouds. A single machine play different role, Easy to replace the hardware, Better use of the resource and etc. [4]. Fig 2.2 shows the architecture of private cloud.

2.3.3 Hybrid cloud

Organizations may host critical applications on private clouds and applications with relatively less security concerns on the public cloud. The usage of both private and public clouds together

is called hybrid cloud. A related term is Cloud Bursting. In Cloud bursting organization use their own computing infrastructure for normal usage, but access the cloud using services like Salesforce cloud computing for high/peak load requirements. This ensures that a sudden increase in computing requirement is handled gracefully [4].Fig 2.3 shows the architecture of Hybrid cloud.
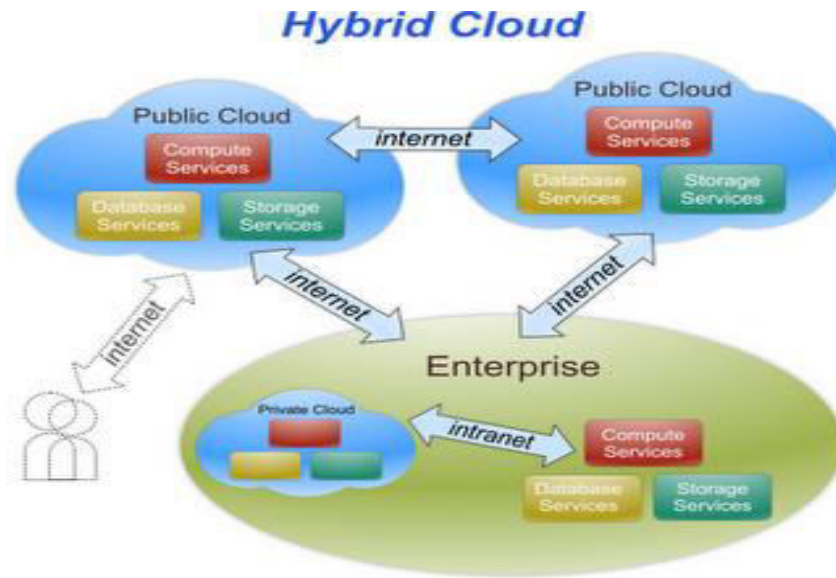

Fig: 2.3 Hybrid Cloud [15]

2.3.4 Community cloud

Involves sharing of computing infrastructure in between organizations of the same community. For example all Government organizations within the state of California may share computing infrastructure on the cloud to manage data related to citizens residing in California [4].

2.4 Classification based upon service provided

Based upon the services offered, clouds are classified in the following ways:

2.4.1 Infrastructure as a service (IaaS)

Involves offering hardware related services using the principles of cloud computing. These could include some kind of storage services (database or disk storage) or virtual servers. Leading vendors that provide Infrastructure as a service are Amazon EC2, Amazon S3, and Rackspace

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Cloud Servers and Flexi scale[4, 5].Fig 2.4 shows the architecture of IaaS (Infrastructure as a service).

Fig: 2.4 IaaS[16]

2.4.2 Platform as a Service (PaaS)

Involves offering a development platform on the cloud. Platforms provided by different vendors are typically not compatible. Typical players in PaaS are Google Application Engine, Microsoft Azure, and Salesforce. Coma force.com [4,5].Fig 2.5 shows the architecture of PaaS (Platforms as a service).

Fig: 2.5 PaaS[16]

2.4.3 Software as a service (SaaS)

Includes a complete software offering on the cloud. Users can access a software application hosted by the cloud vendor on pay-per-use basis. This is a well-established sector. The pioneer in this field has been Salesforce.com offering in the online Customer Relationship Management (CRM) space. Other examples are online email providers like Googles Gmail and Microsoft Hotmail, Google docs and Microsoft online version of office called BPOS (Business Productivity Online Standard Suite

Fig: 2.6 SaaS [16]

In practical usage, PaaS and IaaS are actually very similar with the difference that whether the image is provided by user or not. If you use the image provided, it is PaaS, otherwise, it is IaaS.

Cloud usually provides many images with pre-set-up environment like SQL server and PHP. Users treat it as online-shopping and buying the IT service [4, 5].Fig 2.6 shows the architecture of SaaS (Software as a service).

2.5 Summary

We have shown the different type of cloud computing Public cloud, Private cloud, Hybride Cloud and community cloud. The rules of cloud computing. We also define the different type of cloud layer Infrastructure as a Service, Platform as a Service and Software as a Service.

CHAPTER 3

Using cloud layer and manage

3.1 Introduction

Cloud computing provide different type of layer. We have used the layer of IaaS. Use our private cloud and also manage this. Cloud computing uses process and also manage it. Cloud computing use the virtualization process.

3.2 Using Cloud Layer

Usually, a cloud provide user with virtual machines. A virtual machine can be independent to others, just same as the servers inside the server room. But how can a cloud be elastic and fit to users business[6].

There are two main approaches, but both of them do it by adjusting the number of virtual machines running but with two totally different mechanisms.

The first approach is giving the different virtual machine with different roles. The typical example is Microsoft Azure. Let take a large scale web application similar to YouTube as an example. The duty of the application are allowing user to upload the data and software.

Azure is actually a cloud layer running on a number of windows sever. It contains many technologies like crash handling, and workload distributed system. If a machine crash, the application can still run on other server and the database won't lose.

Azure requires programmers set up one or more roles (type of virtual machines) under some framework in the cloud application. Each role processes different types of job. For example:

      a) Web Role process the website query, e.g. Display videos

      b) Worker role process the background job, e.g. convert the videos to different format.

      c) VM role are used by administrators to manage the application.

Such configuration even allows the role can run some large scale process in more than a virtual machine parallel.

3.3 Our private cloud

We built our first private cloud with 3 new machines, the hardware equipment are shown in previous discussion. The most important requirement is having some CPU.

After building a cloud, we built many software to test the actually performance of the cloud. Software and database requires three file: kernel, ram disk, and hard disk software. Each of these file has an ID.

Instance ID	This represent the ID of the virtual machine running, it is random generate by default.
Private IP	Public IP Use this IP to connect this virtual machine. This IP is bind to the cloud controller. The network traffic is first going to the cloud controller and then the host (node), so the bandwidth is bounded by the bandwidth of cloud controller.
Subnet IP	The virtual machine within the same cloud can communicate within this IP. This is a virtual IP bind to the host. So it is only bounded by the host.
Status	It shows three status: a) Pending: preparing the instance. b) Running: The boot signal is sent to kvm. c) Terminated: the instance is killed.

The IP of host using this IP to get the display of the instance.

Type of instance	it refer to the configuration of the instance, e.g. No of virtual CPUs.

The instance is similar to the virtual machine in virtual and VMware. It can get the internet service like real machine. But instance only know his subnet IP but no idea of the public IP.

We can view the display of an instance by making a connection to the host with VNC viewer [6].

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3.4 Power of Cloud

Private cloud powerful because of it is easy to manage and maintain too privately. And use most securely. Most of private cloud are maintain their private network that's why it's powerful. Resource pool is large Public cloud gives users surprise with its elastic property and giant resource pool with thousands of machines. With a few line of commands, user can use these machines to do anything they wanted to do.

3.5 Easy to manage

Private cloud gives users surprise with its easiness of managing resource and better use of resource. Private cloud users can send request similar to the public cloud users. Apart from that, they can almost get what they want immediately. All these actions are handled by cloud system and administrators need not to set up any new machines.

3.6 Virtualization allows physical machine divide resource and plays many roles

Cloud clients directly use IT infrastructures which may include computing, storage, network elements, and other essential computing resources available in the IaaS cloud. Virtualization plays a vital role in IaaS cloud in order to assimilate or divide physical resources to meet rapidly changing resource demand from Cloud consumers. Each virtual machine obtain environment with different amount of resource, like Size of RAM, Storage and number of virtual CPU cores. The resource allocated can be very small and extremely large[7].

3.7 Summary

Private cloud is a way to manage the system, private cloud is a business term rather than technical term. Cloud has feature of elastic and virtualization. The most important benefit of cloud is reduce cost. It's easy to change the physical resource. So our private cloud computing layer used for our Infrastructure as a Service (IaaS).

CHAPTER4

Working process

4.1 Introduction

Private cloud computing working process show and explain part to part. We are also show the how does it work and used in the platform. This process is show the how to login and show the virtualization. IaaS structure create image and instance and provide virtual machine as like a new pc by used the total system in the cloud storage.

4.2 Home Page

This is the login page of private cloud computing.Its design a simple. So it's very user friendly. Here only two input items, User Id and Password. User input their user id and password to login the private cloud computing.
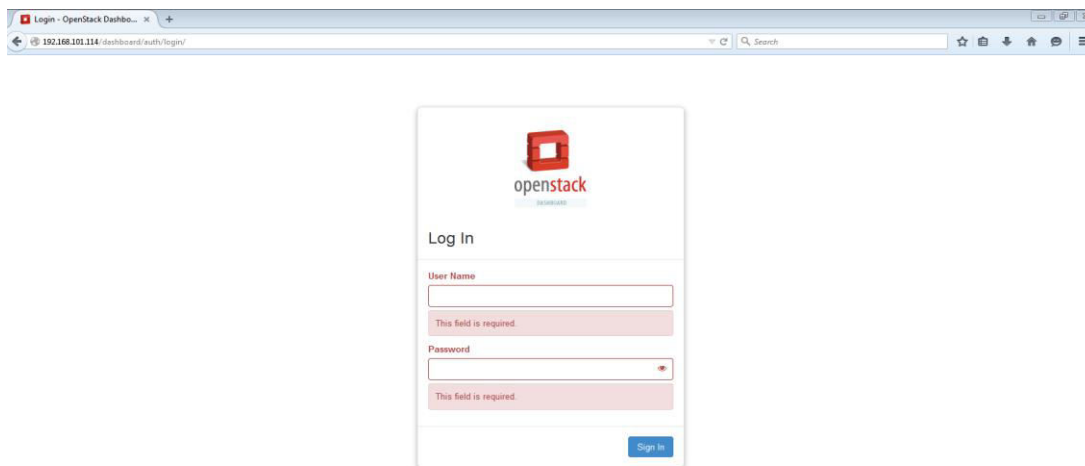

Fig 4.1: Login Page
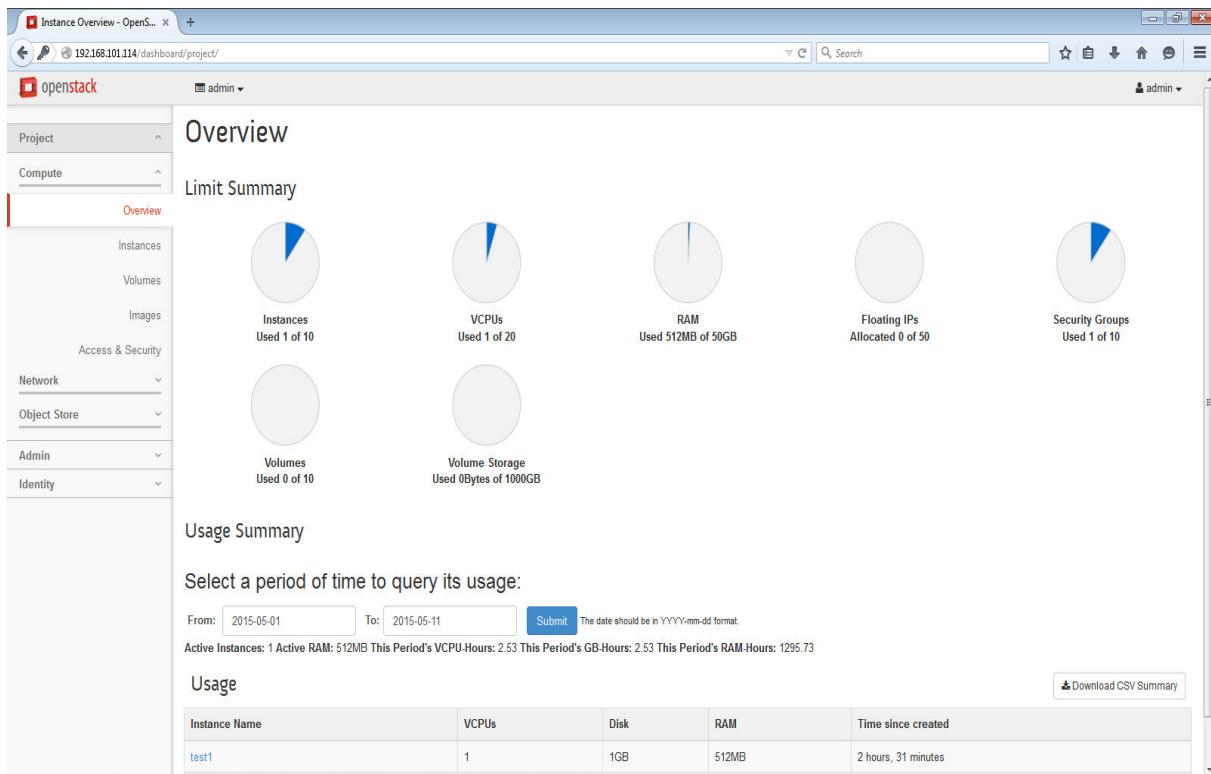
This is my home of private cloud computing.

Fig 4.2: Basic Home Page

- **Overview:** This page show the overview of home page.

- **Instance:**After configure the Compute services, we can launch an instance. An instance is a virtual machine that OpenStack provisions on a Computer servers[8].

- **VCPU:**Virtualization Driver Guest CPU / Memory PlacementScope. This feature aims to give users and administrators the ability to control the vCPU topology exposed to guests. This enables them to avoid hitting limitations on vCPU topologies that OS vendors place on the product[9].

- **Floating IPs:**This section describes how to configure floating IP addresses with nova-network.

- **Security Group:** Key pair and API used this section. Key pair used Public and Private key for internal and VM user.

- **Volumes:**Manages volumes and snapshots for use with the Block Storage API, also known as cinder services.

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Fig 4.1 and 4.2 shows the architecture of Basic home page of cloud computing IaaS.

4.3 Instances

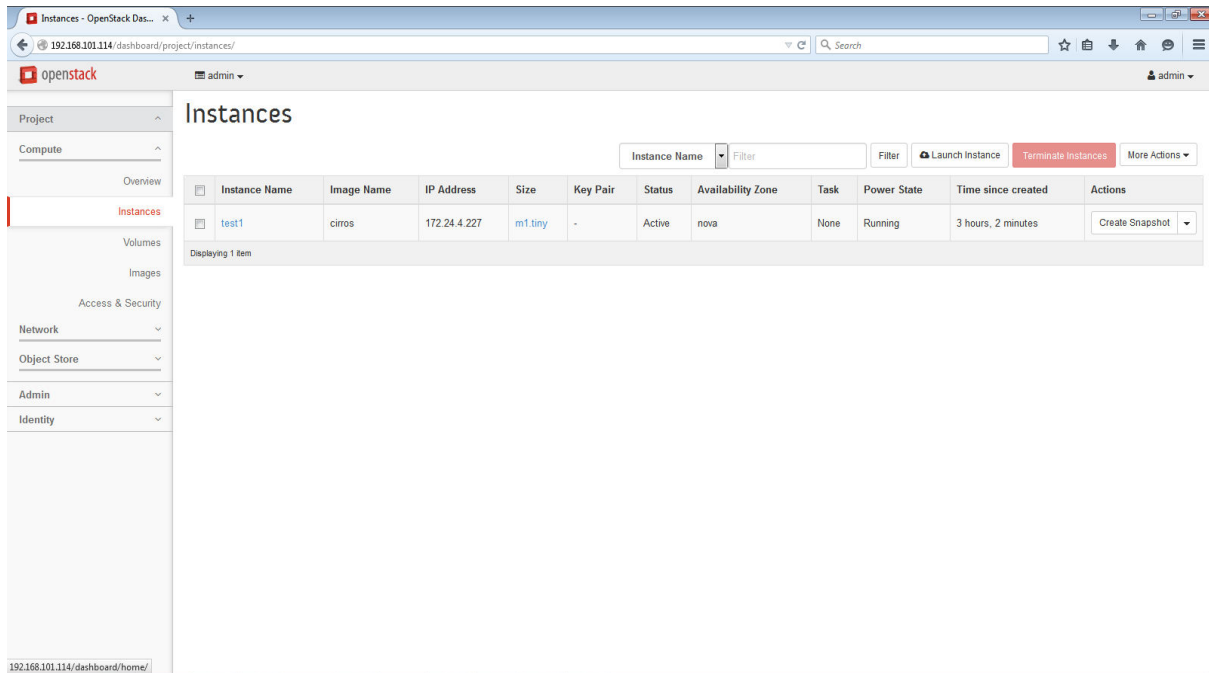After configure the Compute services, we can launch an instance.

Fig 4.3: Instance

An instance is a virtual machine that OpenStack provisions on Compute servers. Show the new instance name, image, IP address, size key pair, status, Availability Zone, task power state and time since created. Fig 4.3 and 4.4 shows the architecture of how to create instance and lunch.
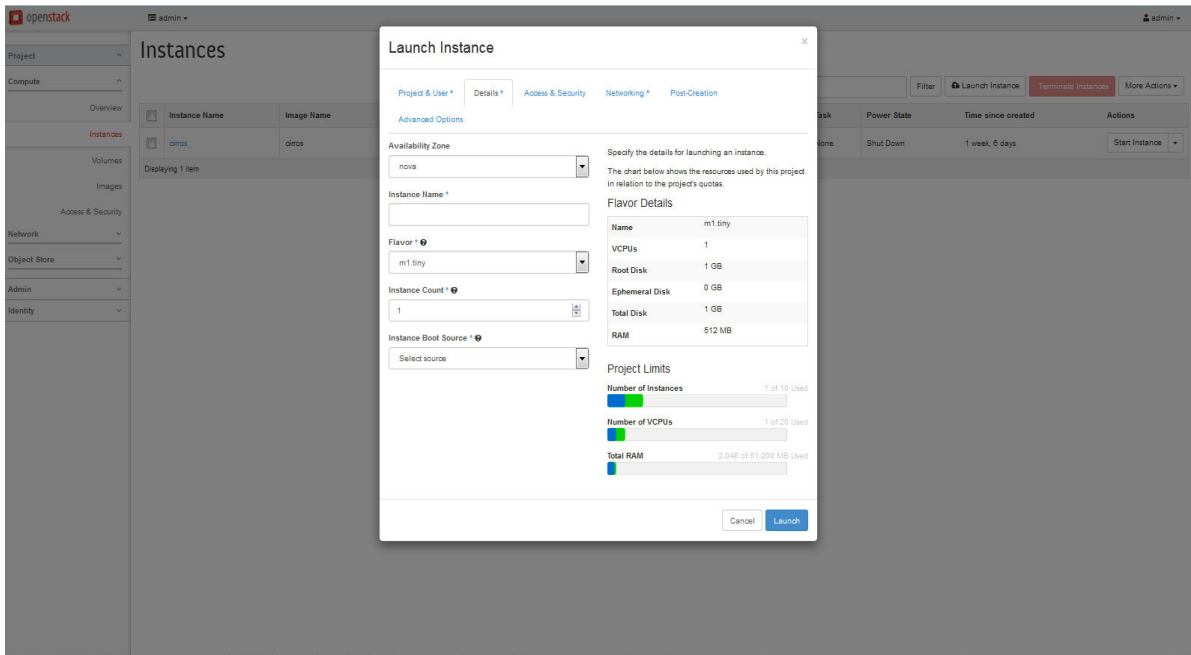
Fig: 4.4 Instance Create

4.4 Instance Load

Load a image for working progress. It is use for the vm and create the user process. Fig 4.5 shows the architecture of Instance load.
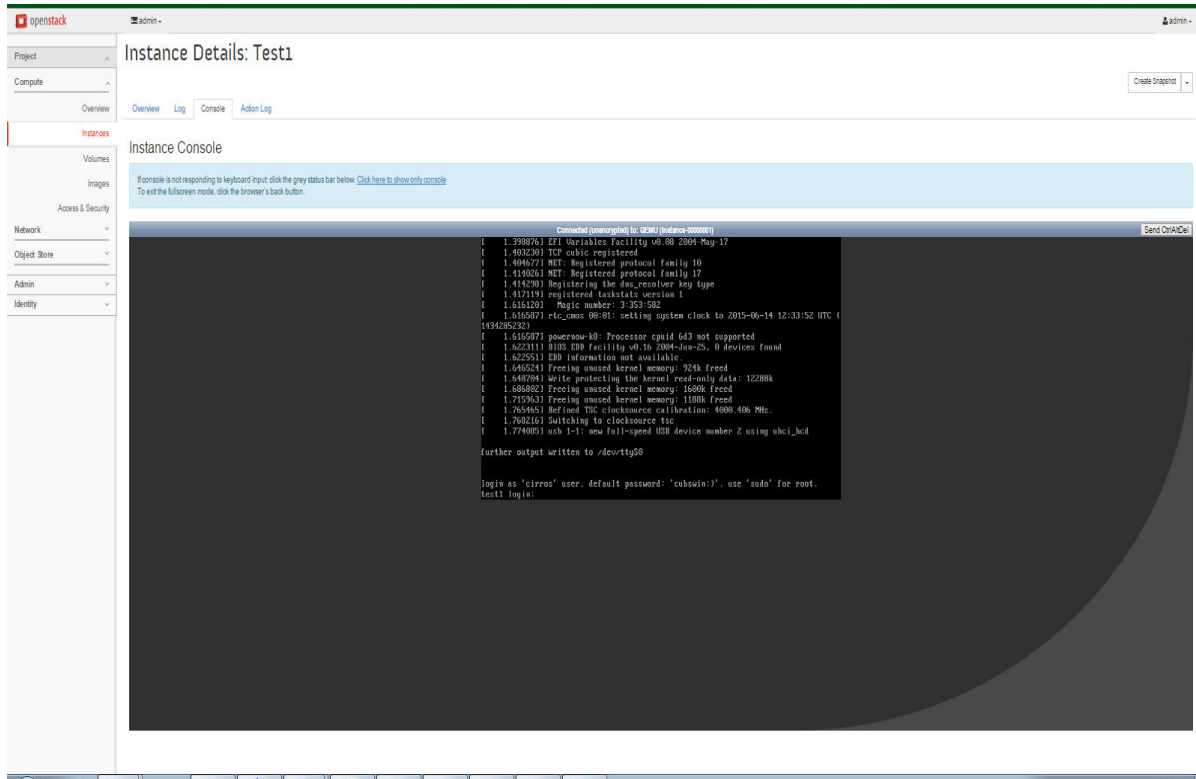

Fig4.5: Instance Load

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4.5 Images

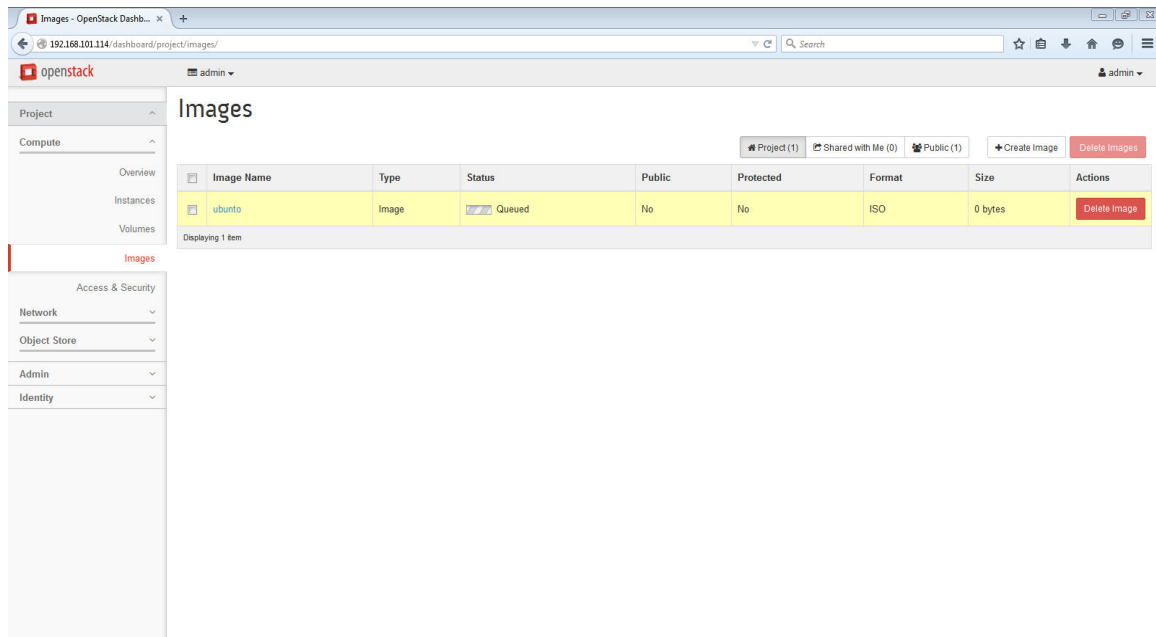We are create a new image file and show this.

Fig 4.6: Images

OpenStack images can often be thought of as "virtual machine templates." Images can also be standard installation media such as ISO images. Essentially, it contains bootable file systems that are used to launch instances. It has more option for create images, delete, and show publicly or not. Fig 4.6 and 4.7 shows the architecture of image view and how to create image.
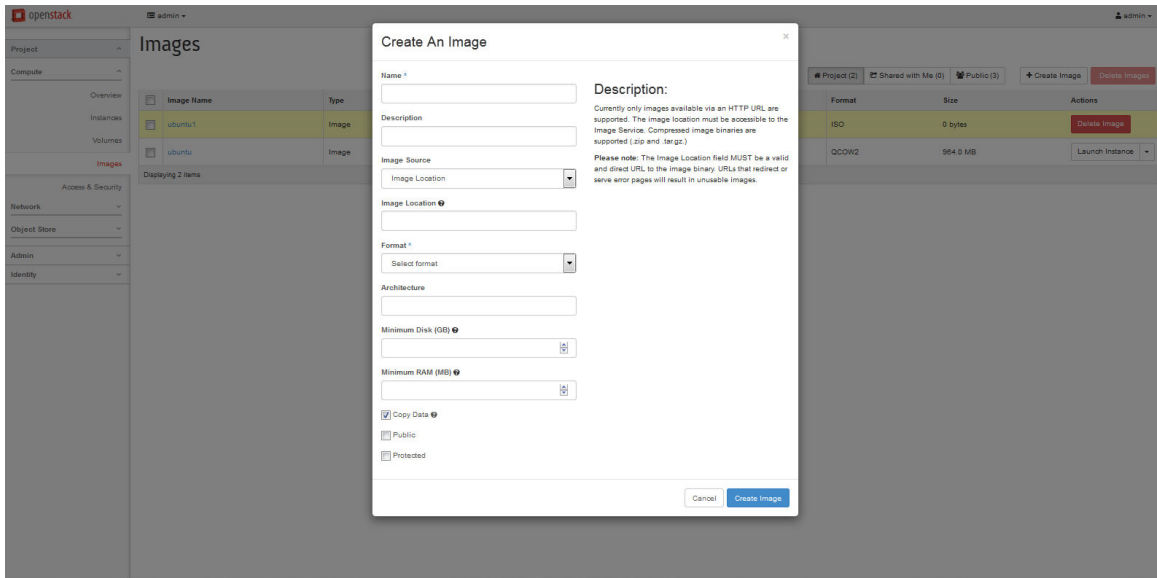
Fig 4.7: Image create

4.6 Access and security

When you launch a virtual machine, you can inject a key pair, which provides SSH access to your instance. For this to work, the image must contain the cloud-initpac
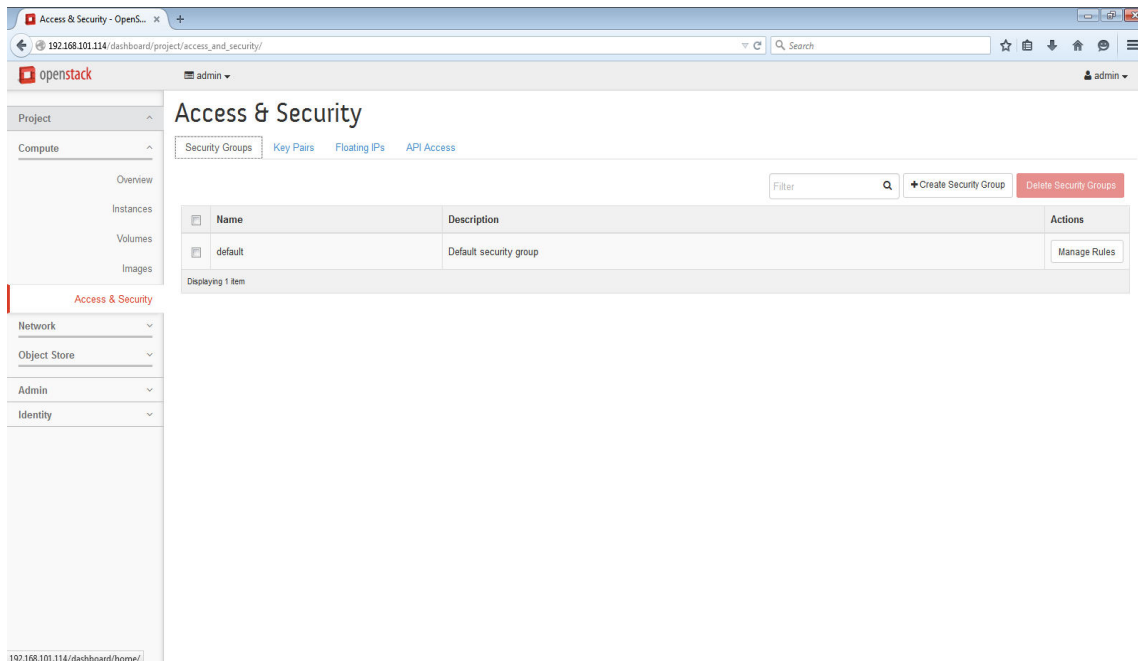

Fig 4.8: Access and security

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Key pair, floating IPs and API used this section [10].Fig 4.8 shows the architecture of Access and Security of IaaS.

4.7 Key Pair

Creating a Key Pair is the first step in launching an instance for the first time.
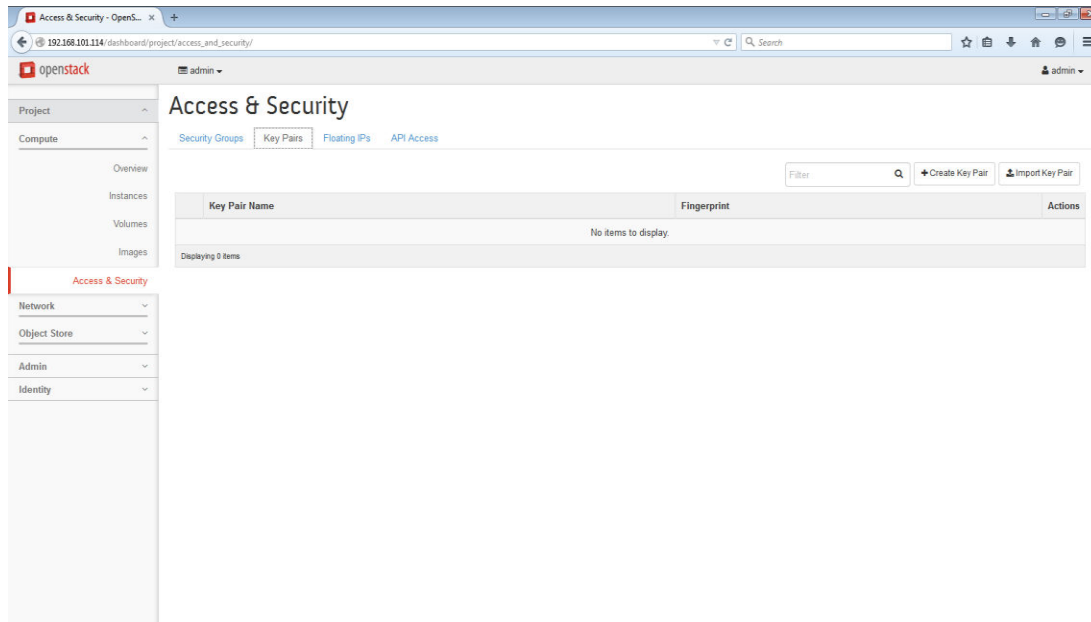

Fig 4.9: Key pair

Fig 4.9 shows the architecture of key pair.

4.8 Floating IP

A floating IP address is a service provided by Neutron. It's not using any DHCP service nor being set statically within the guest. Fig 4.10 shows the architecture of how to use floating IP.
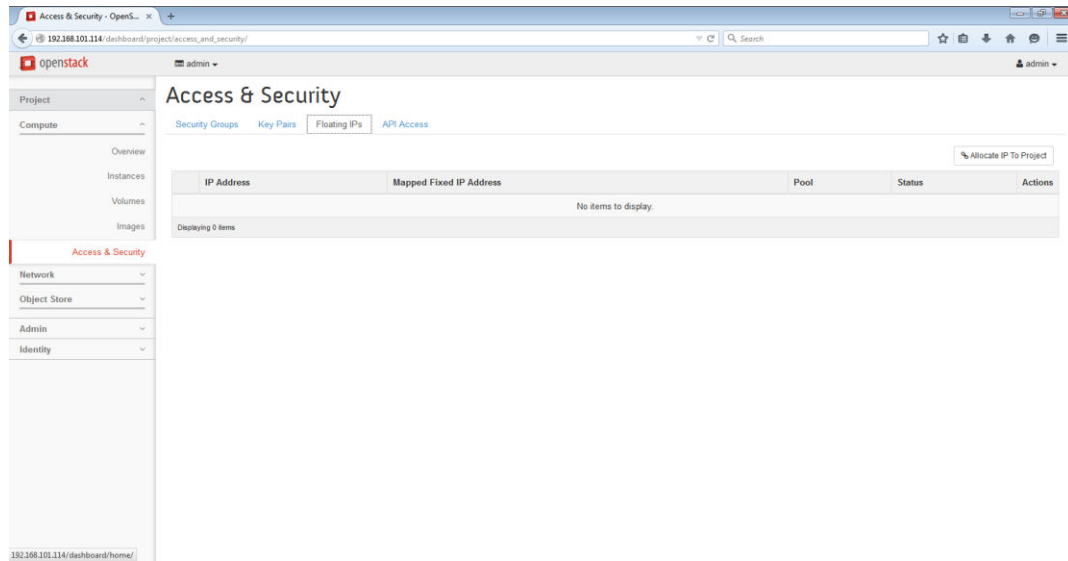

Fig 4.10: Floating IP

4.9 API Access

Use the OpenStack APIs and extensions to launch server instances, create images, assign metadata to instances and images, create containers and objects, and complete other actions in your OpenStack cloud[11]. Fig 4.11 shows the architecture of API Access and security option.
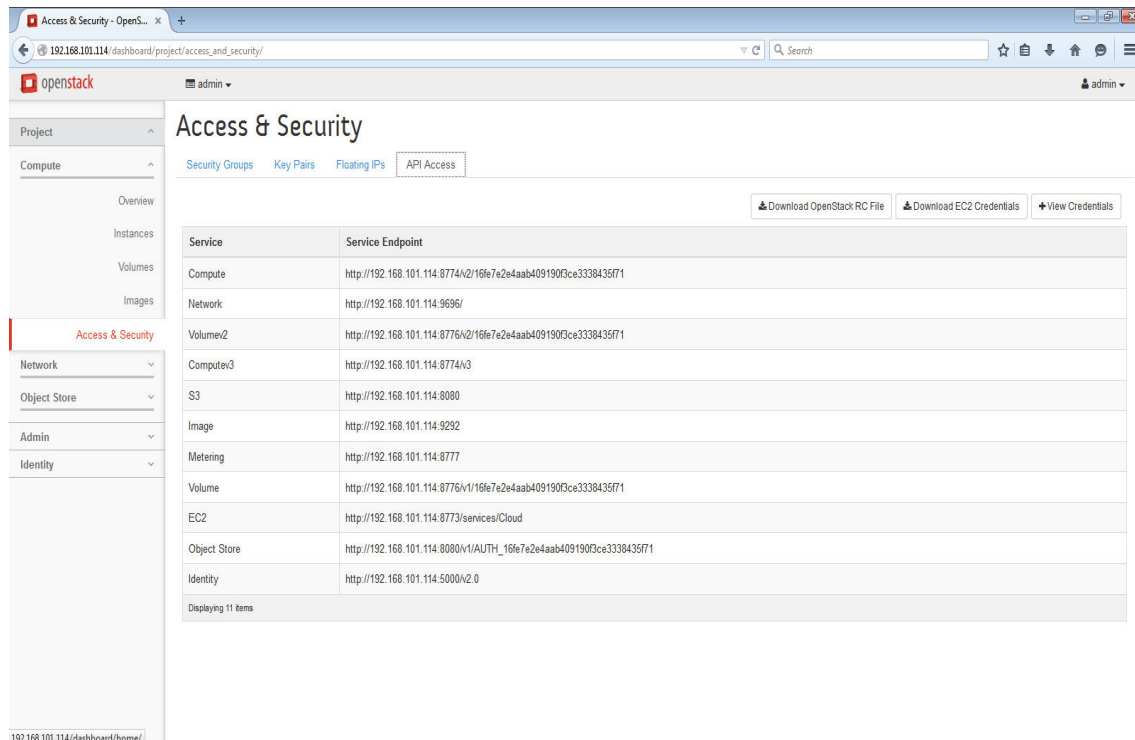
Fig 4.11: API Access

4.10 Summary

How to use our cloud we are shown it. We are explain important overviews. How to create image and create instance and upload a virtual image in the OpenStack. We have used the OpenStack for IaaS and create the virtual machine. Finally show the instance load.

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CHAPTER 5

Conclusion

5.1 Conclusion

We have explain the cloud computing and architecture. The different type of cloud computing and different type of part of cloud computing. Cloud computing day by day increasing. We are build a private cloud computing and show the how to use this and how to provide the user for their working requirements. We are used IaaS platform virtualization. So finally we are show our system and process.

5.2: Limitation

After implementation our IaaS project find the limitation. Don't use more two or three instance for VM. After that anyone can't access in this system. This IaaS has limit security and access. It not more secure. After login more than 30 min access without any use after that auto log off and user must be enter user id and password it a one of problem.

5.3 Future

Future of cloud computing is very wide, it provides a cost effective reliable scalable service for the users and it can be changed on user demand. It has ability to meet future business requirements. Application support is one of the noteworthy advantage of cloud computing.

Here are the future uses of cloud computing:

We are using Compute as a service provides compute capacity that includes servers, operating system, firewalls, routers and load balancing on demand. This cloud computing layer involves the delivery of virtual or physical resources as a services.

We are using the hardware, Software, network connection for data centers, advanced system architecture and manage infrastructure for web site and hosting service.

Storage as a Service is often used to solve offsite backup challenges. Storage is one of those necessities that only grows over time. It can be a constant struggle to maintain enough storage capacity and manage it effectively.

Desktop as a Service (DaaS) is a cloud service in which the back-end of a virtual desktop infrastructure (VDI) is hosted by a cloud service provider. Essentially it is pay-as-you-go computing that allows enterprises to quickly provision, access, run and deactivate virtual desktop machines as needed.

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