

STES's

SINHGAD COLLEGE OF ENGINEERING

Vadgaon (Bk), Pune.

Department of Computer Engineering



LABORATORY MANUAL

2020-21

LABORATORY PRACTICE-IV

BE-COMPUTER ENGINEERING

SEMESTER-II

Subject Code: 410255

TEACHING SCHEME

Practical: 4 Hrs/Week

EXAMINATION SCHEME

Oral Assessment: 50 Marks

Term work: 50 Marks

CREDITS

02

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4	Case study on Microsoft azure to learn about Microsoft Azure is a cloud computing platform and infrastructure, created by Microsoft, for building, deploying and managing applications and services through a global network of Microsoft-managed data centre's. How it works, different services provided by it.
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1	Setup your own cloud for Software as a Service (SaaS) over the existing LAN in your laboratory. In this assignment you have to write your own code for cloud controller using open source technologies without HDFS . Implement the basic operations may be like to upload and download file on/from cloud in encrypted form.
	OR
2	Setup your own cloud for Software as a Service (SaaS) over the existing LAN in your laboratory. In this assignment you have to write your own code for cloud controller using open source technologies to implement with HDFS . Implement the basic operations may be like to divide the file in segments/blocks and upload/ download file on/from cloud in encrypted form.

Assignment No. 1

Aim:

Installation and configuration of own Cloud

Objectives:

1. To learn Cloud computing
2. To install and configure own Cloud

Software Requirements:

Ubuntu 16.04

PHP

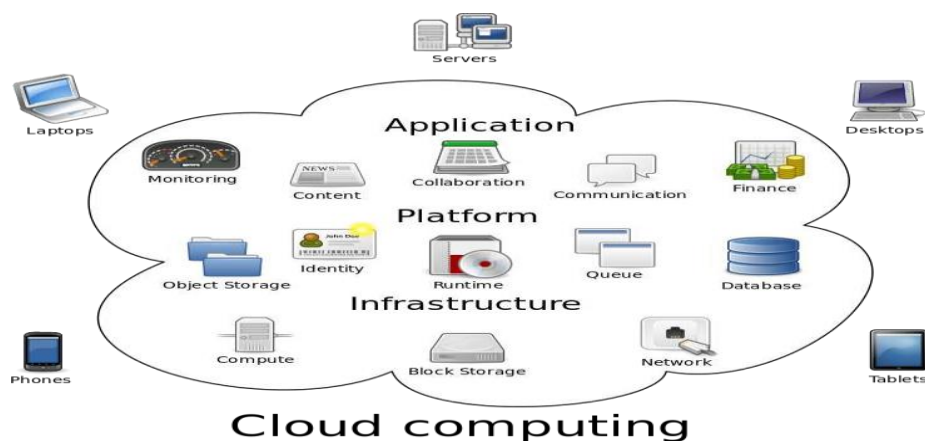
MySQL

Hardware Requirements:

Pentium IV system with latest configuration

Theory:

Cloud computing is a method for delivering information technology (IT) services in which resources are retrieved from the Internet through web-based tools and applications, as opposed to a direct connection to a server. Rather than keeping files on a proprietary hard drive or local storage device, cloud-based storage makes it possible to save them to a remote database. As long as an electronic device has access to the web, it has access to the data and the software programs to run it.



Cloud Computing – Types of Cloud

Cloud computing is usually described in one of two ways. Either based on the deployment model, or on the service that the cloud is offering.

Based on a deployment model, we can classify cloud as

- **Public**
- **Private**
- **Hybrid**
- **Community cloud**

Based on a service the cloud model is offering, we are speaking of either:

- **IaaS (Infrastructure-as-a-Service)**
- **PaaS (Platform-as-a-Service)**
- **SaaS (Software-as-a-Service)**

or,Storage, Database, Information, Process, Application, Integration, Security, Management,Testing-as-a-service

Basically, programs that are needed to run a certain application are now more popularly located on a remote machine, owned by another company. This is done in order not to lose on the quality performance due to processing power of your own computer, to save money on IT support, and yet remain advantageous on the market. These computers that run the applications, store the data, and use a server system, are basically what we call “the cloud”.

Public Cloud

When we talk about **public cloud**, we mean that the whole computing infrastructure is located on the premises of a cloud computing company that offers the cloud service. The location remains, thus, separate from the customer and he has no physical control over the infrastructure.

As public clouds use shared resources, they do excel mostly in performance, but are also most vulnerable to various attacks.

GlobalDots offers worldwide Public Cloud service in leading data centers. Our experts will assist

you in choosing the right solution for you.

Private Cloud

Private Cloud provides the same benefits of Public Cloud, but uses dedicated, private hardware. Private cloud means using a cloud infrastructure (network) solely by one customer/organization. It is not shared with others, yet it is remotely located. The companies have an option of choosing an on-premise private cloud as well, which is more expensive, but they do have a physical control over the infrastructure.

The security and control level is highest while using a private network. Yet, the cost reduction can be minimal, if the company needs to invest in an on-premise cloud infrastructure.

GlobalDots offers worldwide private cloud service in leading data centers.

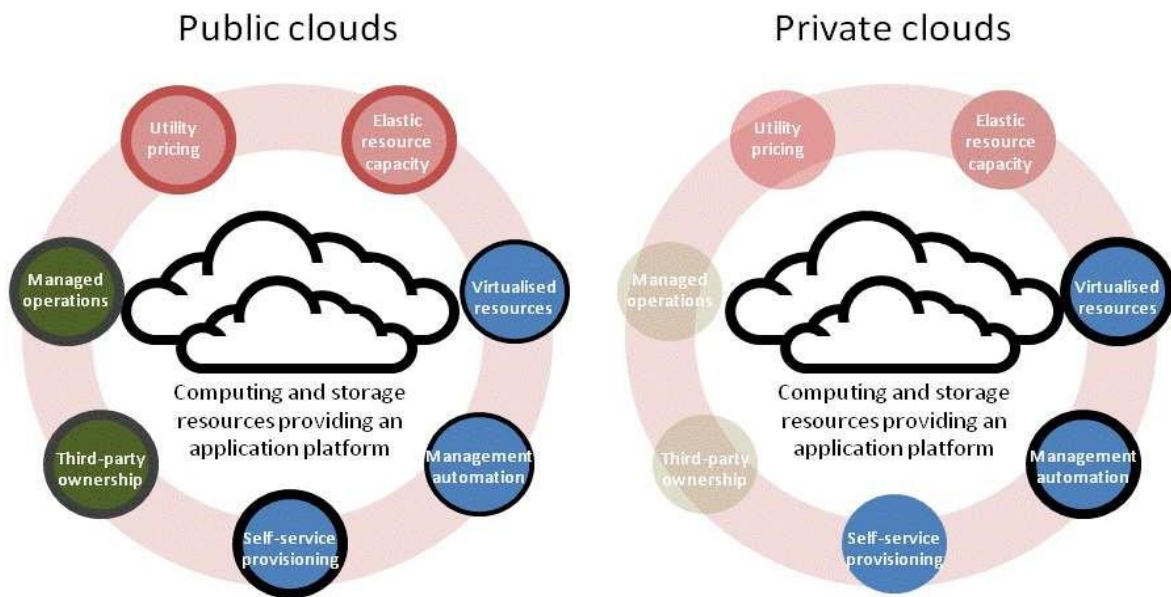
With our Private Cloud you'll get:

- ✓ Increased redundancy
- ✓ Decreased provisioning time for new servers
- ✓ Saved capital by eliminating hardware support contracts
- ✓ Quicker expendability compared to hosting your own physical servers
- ✓ Use of dedicated, private hardware

Hybrid Cloud

Hybrid cloud, of course, means, using both private and public clouds, depending on their purpose. For example, public cloud can be used to interact with customers, while keeping their data secured through a private cloud. Most people associate traditional public cloud service with elastic scalability and the ability to handle constant shifts in demand. However, performance issues can arise for certain data-intensive or high-availability workloads.

GlobalDots offer combines hybrid cloud with bare-metal and virtualized clouds into a unified environment allowing your business to optimize for scale performance and cost simultaneousl



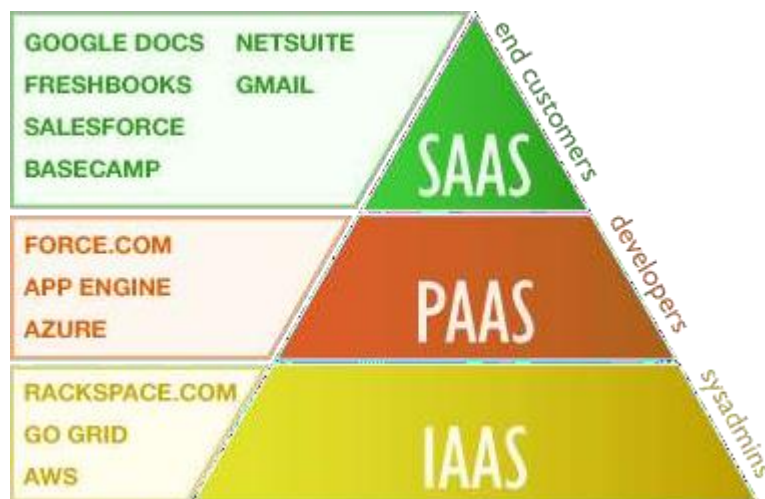
Community cloud

It implies an infrastructure that is shared between organizations, usually with the shared data and data management concerns. For example, a community cloud can belong to a government of a single country. Community clouds can be located both on and off the premises.

The most popular services of the cloud are that of either **infrastructure**, **platform**, **software**, or **storage**.

As explained before, the most common cloud service is that one offering data storage disks and virtual servers, i.e. infrastructure. Examples of Infrastructure-as-a-Service (IaaS) companies are Amazon, Rackspace, Flexiscale.

If the cloud offers a development platform, and this includes operating system, programming language execution environment, database, and web server, the model is known as Platform-as-a-Service (PaaS), examples of which are Google App Engine, Microsoft Azure, Salesforce. Operating system can be frequently upgraded and developed with PaaS, services can be obtained from diverse sources, and programming can be worked in teams (geographically distributed). Software-as-a-Service (SaaS), finally, means that users can access various software applications on a pay-per-use basis. As opposed to buying licensed programs, often very expensive. Examples of such services include widely used GMail, or Google Docs.



Advantages of Cloud Computing:

1. Less Costs

The services are free from capital expenditure. There are no huge costs of hardware in cloud computing. You just have to pay as you operate it and enjoy the model based on your subscription plan.

2. 24 X 7 Availability

Most of the cloud providers are truly reliable in offering their services, with most of them maintaining an uptime of 99.9%. The workers can get onto the applications needed basically from anywhere. Some of the applications even function off-line.

3. Flexibility in Capacity

It offers flexible facility which could be turned off, up or down as per the circumstances of the user. For instance, a promotion of sales is very popular, capacity can be immediately and quickly added to it for the avoidance of losing sales and crashing servers. When those sales are done, the capacity can also be shrunk for the reduction of costs.

4. All over Functioning

Cloud computing offers yet another advantage of working from anywhere across the globe, as long as you have an internet connection. Even while using the critical cloud services that offer mobile apps, there is no limitation of the device used.

5. Automated Updates on Software

In cloud computing, the server suppliers regularly update your software including the updates on security, so that you do not need to agonize on wasting your crucial time on maintaining the system. You find extra time to focus on the important things like „How to grow your businesses.

6. Security

Cloud computing offers great security when any sensitive data has been lost. As the data is stored in the system, it can be easily accessed even if something happens to your computer. You can even remotely wipe out data from the lost machines for avoiding it getting in the wrong hands.

7. Carbon Footprint

Cloud computing is helping out organizations to reduce their carbon footprint. Organizations utilize only the amount of resources they need, which helps them to avoid any over-provisioning. Hence, no waste of resources and thus energy.

8. Enhanced Collaboration

Cloud applications enhance collaboration by authorizing diverse groups of people virtually meet and exchange information with the help of shared storage. Such capability helps in improving the customer service and product development and also reducing the marketing time.

9. Control on the Documents

Before cloud came into being, workers needed to send files in and out as the email attachments for being worked on by a single user at one time ultimately ending up with a mess of contrary titles, formats, and file content. Moving to cloud computing has facilitated central file storage.

10. Easily Manageable

Cloud computing offers simplified and enhanced IT maintenance and management capacities by agreements backed by SLA, central resource administration and managed infrastructure. You get to enjoy a basic user interface without any requirement for installation. Plus you are assured guaranteed and timely management, maintenance, and delivery of the IT services.

Applications of Cloud Computing

1. Online File storage
2. Photo editing software
3. Digital video software
4. Twitter-related applications
5. Creating image-album
6. Web application for antivirus
7. Word processing application
8. Spreadsheets
9. Presentation software
10. Finding a way on the map
11. E-commerce software
12. Miscellaneous applications.

Steps: <https://www.linode.com/docs/applications/cloud-storage/install-and-configure-owncloud-on-ubuntu-16-04/#create-an-administrator-account>

Open Terminal and type:-

1. `sudo apt update && sudo apt upgrade`
2. `sudo wget -nv https://download.owncloud.org/download/repositories/9.1/Ubuntu_16.04/Release.key -O Release.key`
3. `sudo apt-key add - < Release.key`
4. `sudo sh -c "echo 'deb http://download.owncloud.org/download/repositories/9.1/Ubuntu_16.04/' > /etc/apt/sources.list.d/owncloud.list"`
5. `sudo apt update`
6. `sudo apt install owncloud`

Open another terminal

`mysql -u root -p`

password: root

ENTER COMMAND:

1. `CREATE DATABASE ownCloud;`
2. `CREATE USER ownCloud@localhost;`
3. `SET PASSWORD FOR 'ownCloud'@'localhost' = PASSWORD('root');`

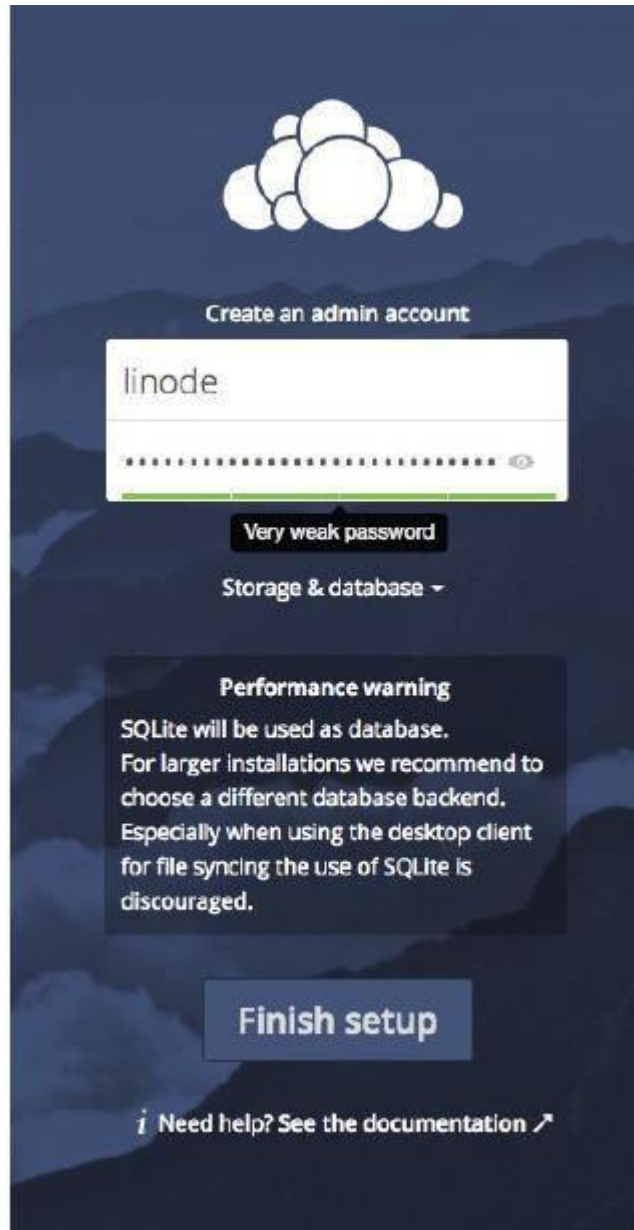
```
GRANT ALL PRIVILEGES ON ownCloud.* to ownCloud@localhost; FLUSH PRIVILEGES;  
exit
```

```
mysql -u ownCloud -p  
enter password : root  
SELECT current_user();
```

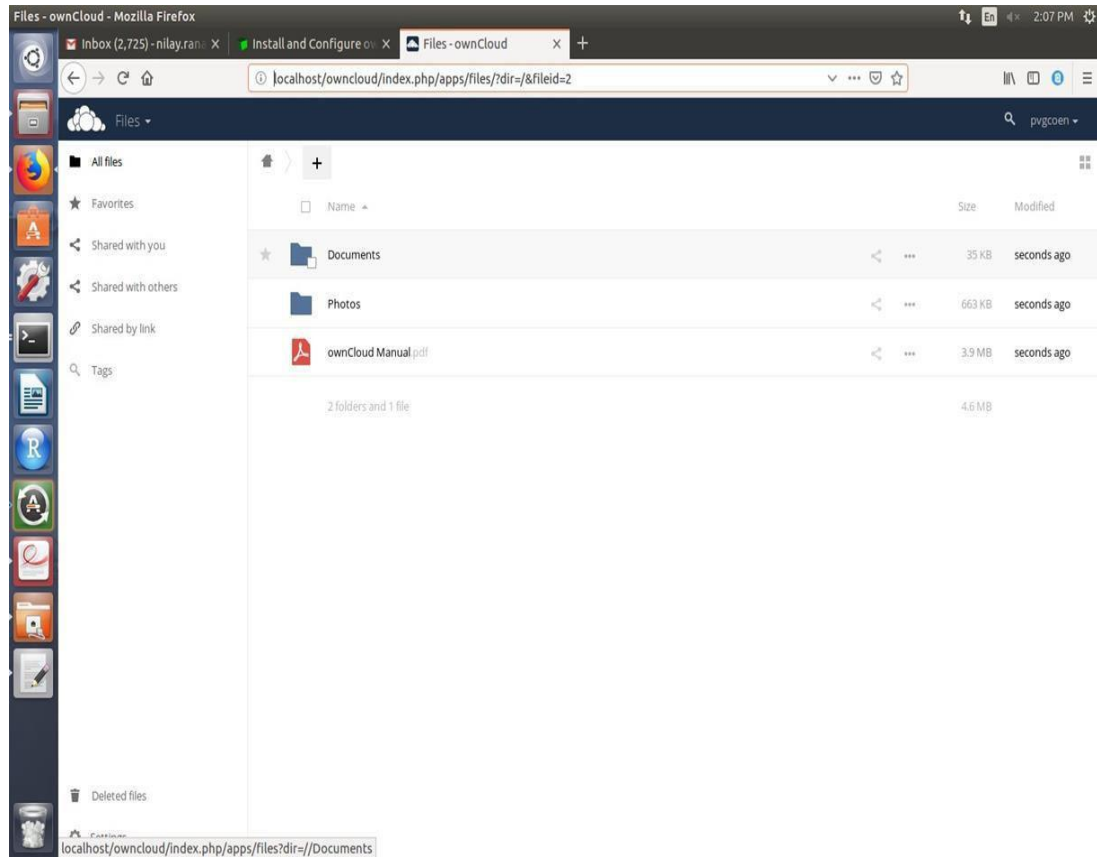
NOW OPEN YOUR BROWSER AND TYPE:-

localhost/owncloud

Create an Administrator Account



1. ENTER USERNAME
2. ENTER PASSWORD
3. FINISH SETUP!



Conclusion

Thus, we have successfully configured own cloud.

Assignment No. 2

Aim:

Implementation of Virtualization in Cloud Computing to Learn Virtualization Basics, Benefits of Virtualization in Cloud using Open-Source Operating System.

Objectives:

1. To learn Virtualization basics.
2. To implement basic OS virtualization using VMware.

Software Requirements:

Ubuntu 16.04

PHP

MySQL

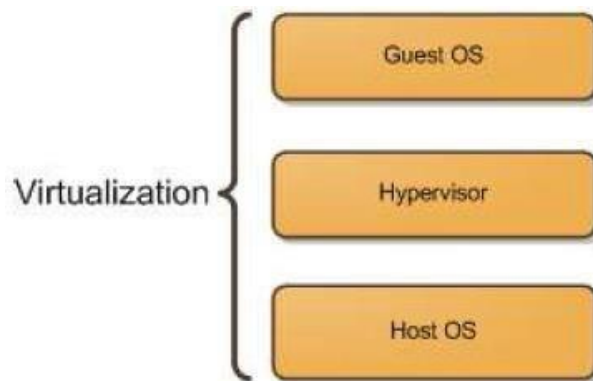
Vmware station

Hardware Requirements:

Pentium IV system with latest configuration

Theory:

Virtualization is not a new concept, but its complexity has been growing, and a number of new paradigms are rising. I will try to demystify some of the concepts behind virtualization, briefly explain some of its basics, and finally look at some of the products and solutions out there.



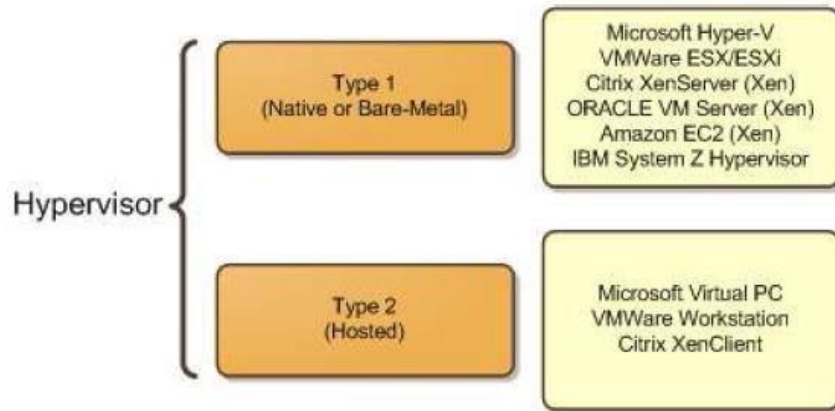
To begin, let me introduce three very simple concepts regarding virtualization: the host operating system, the hypervisor, and the guest operating system. The host operating system provides a host to one or more virtual machines (or partitions) and shares physical resources with them. It's where the virtualization product or the partitioning product is installed.

The guest operating system is the operating system installed inside a virtual machine (or a partition). In a virtualization solution the guest OS can be completely different from the host OS. In a partitioning solution the guest OS must be identical to the host OS.

A hypervisor, also called a virtual machine manager (VMM), is a program that allows multiple operating systems to share a single hardware host. Each operating system appears to have the host's processor, memory, and other resources all to itself. The task of this hypervisor is to handle resource and memory allocation for the virtual machines, ensuring they cannot disrupt each other, in addition to providing interfaces for higher level administration and monitoring tools.

The Hypervisor

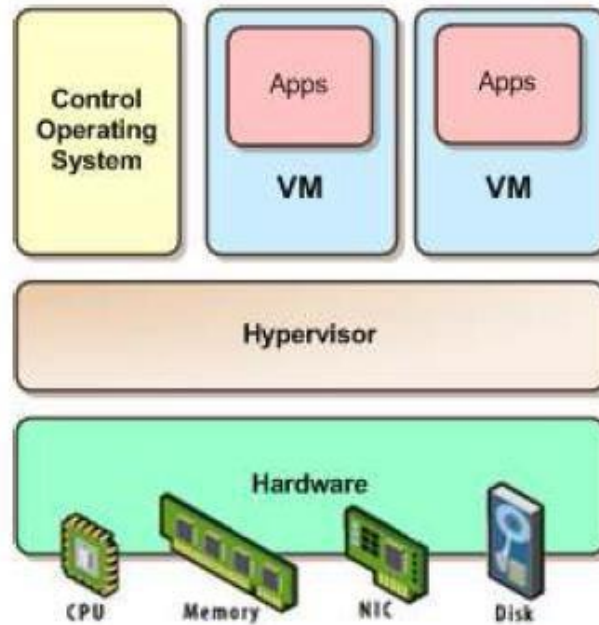
There are two types of hypervisors as depicted below:



Note: Xen is an open-source virtualization software used by several companies to implement their virtualization solution; companies like, ORACLE, Citrix, Sun, and Virtual Iron, to name a few.

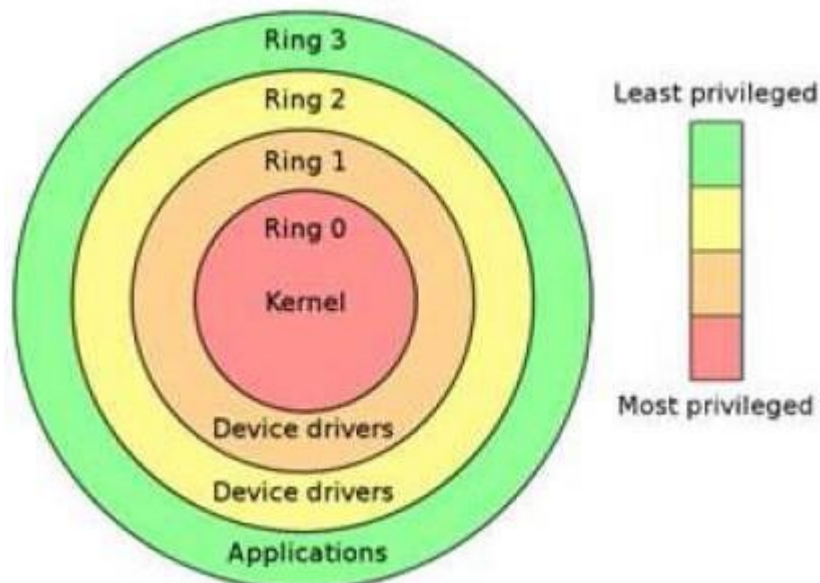
Type 1 hypervisors, also known as bare-metal, are software systems that run directly on the host's hardware as a hardware control and guest operating system monitor. Bare-metal virtualization is the current enterprise data center leader. VMware ESX is easily the market leader in enterprise virtualization at the moment, and it utilizes bare-metal virtualization architecture. What is immediately apparent about this architecture, is the lack of an existing OS; the hypervisor sits directly on top of the hardware, hence the term "bare-metal virtualization". The reason so many data centers implement bare-metal products, such as ESX, Xen, and Hyper-V, is because of the speed it provides due to the decreased overhead from the OS that hosted virtualization uses.

Type 2 hypervisors, also known as hosted, are software applications running within a conventional operating system environment. This type of hypervisor is typically used in client side virtualization solutions such as Microsoft's Virtual PC, and VMware's Workstation.



The Protection Rings

Another important concept is the protection rings. x86 CPUs provide a range of protection levels, also known as rings, in which code can execute. Ring 0 has the highest level privilege and is where the operating system kernel normally runs. Code executing in Ring 0 is said to be running in system space, kernel mode or supervisor mode. All other code, such as applications running on the operating system, operate in less privileged rings, typically Ring 3.



The hypervisor runs directly on the hardware of the host system in ring 0. Clearly, with the hypervisor occupying ring 0 of the CPU, the kernels for any guest operating systems running on

the system must run in less privileged CPU rings. Unfortunately, most operating system kernels are written explicitly to run in ring 0, for the simple reason that they need to perform tasks that are only available in that ring, such as the ability to execute privileged CPU instructions and directly manipulate memory.

The AMD-V and Intel-VT CPUs use a new privilege level called Ring -1 for the VMM to reside, allowing for better performance as the VMM no longer needs to fool the Guest OS that it is running in Ring 0. Solutions like VMWare ESX, Xen (Citrix, ORACLE, IBM, etc.), and Microsoft Hyper-V take advantage of the hardware virtualization capabilities inherent to the new Intel and AMD CPUs.

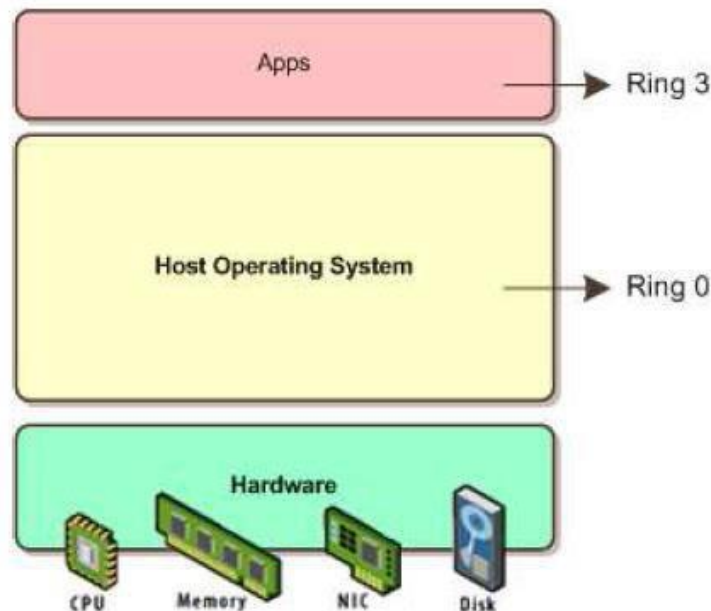
Virtualization Landscape

After this brief introduction, let's now take a look at the global virtualization landscape available out there. The following diagram shows how virtualization architectures are organized, as well as some of the solutions that implement them.

The following sections will briefly introduce some of the most important types of virtualization.

Traditional

This is not a virtualization scenario; it's here solely for comparison purposes. Here we see that the OS sits directly above the hardware executing in the ring 0.

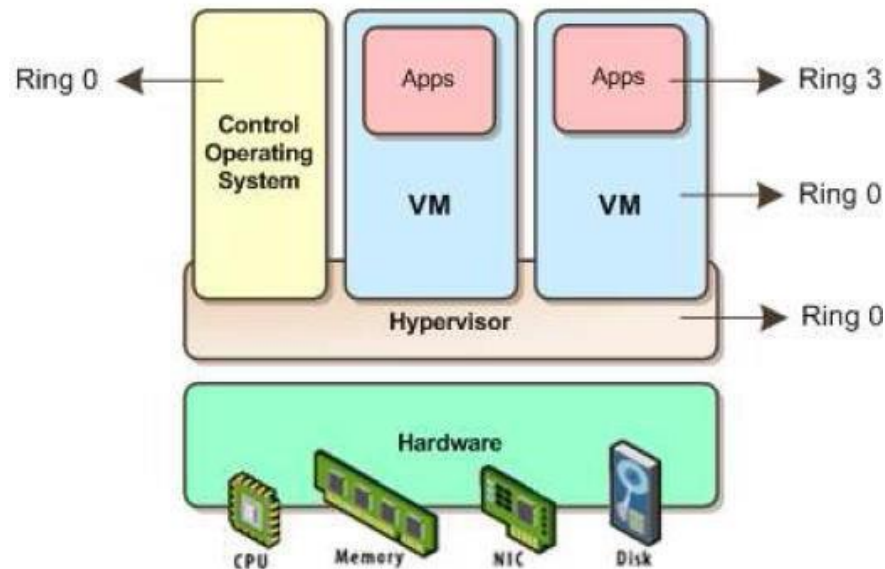


Paravirtualization

Under paravirtualization, the kernel of the guest operating system is modified specifically to run on the hypervisor. This typically involves replacing any privileged operations that will only run in ring 0 of the CPU with calls to the hypervisor (known as hypercalls). The hypervisor in turn performs the task on behalf of the guest kernel.

This typically limits support to open source operating systems, such as Linux, which may be freely

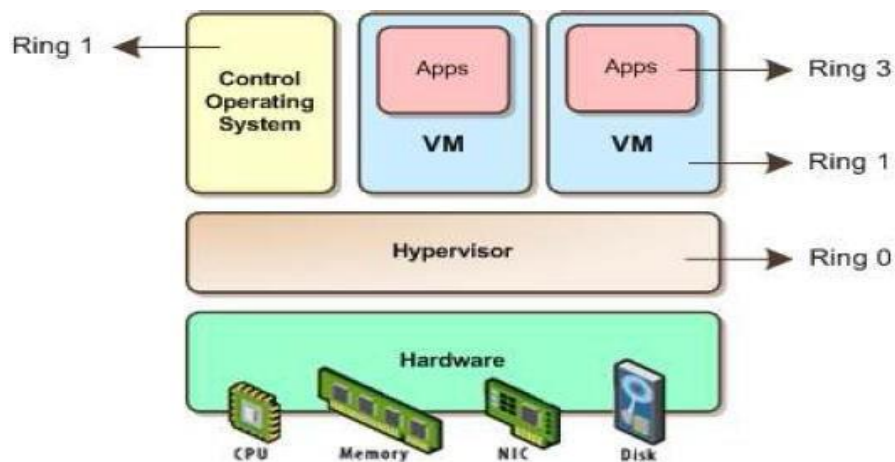
altered, and proprietary operating systems where the owners have agreed to make the necessary code modifications to target a specific hypervisor. This results in the ability of the guest kernel to communicate directly with the hypervisor, resulting in greater performance levels than other virtualization approaches.



Full Virtualization without Hardware Assist

Full virtualization provides support for unmodified guest operating systems. The term unmodified refers to operating system kernels which have not been altered to run on a hypervisor and, therefore, still execute privileged operations as though running in ring 0 of the CPU.

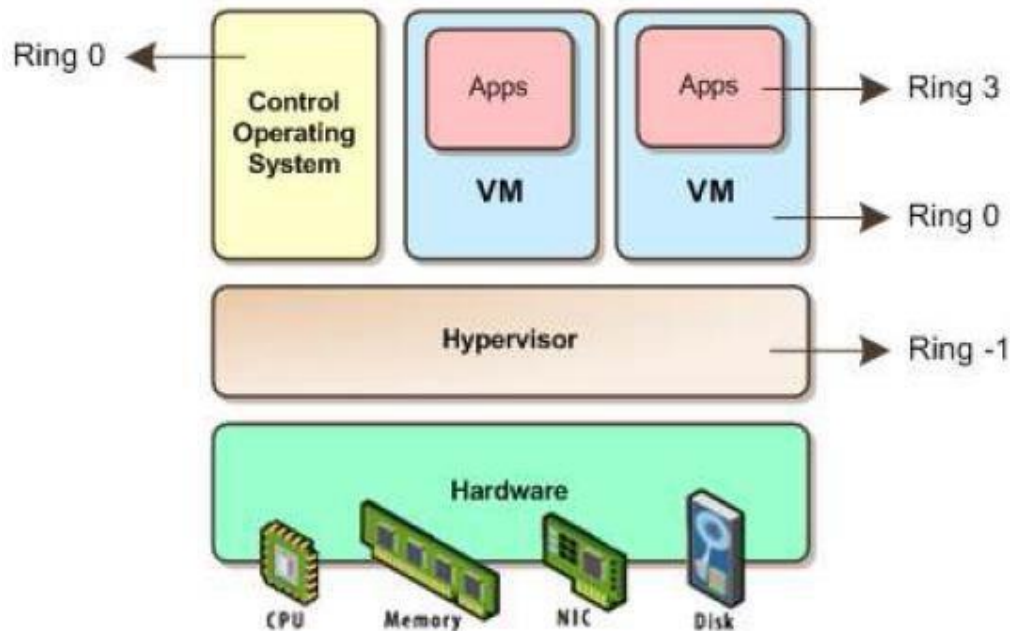
In this scenario, the hypervisor provides CPU emulation to handle and modify privileged and protected CPU operations made by unmodified guest operating system kernels. Unfortunately, this emulation process requires both time and system resources to operate, resulting in inferior performance levels when compared to those provided by paravirtualization.



Full Virtualization with Hardware Assist

Hardware virtualization leverages virtualization features built into the latest generations of CPUs from both Intel and AMD. These technologies, known as Intel VT and AMD-V, respectively, provide extensions necessary to run unmodified guest virtual machines without the overheads inherent in full virtualization CPU emulation.

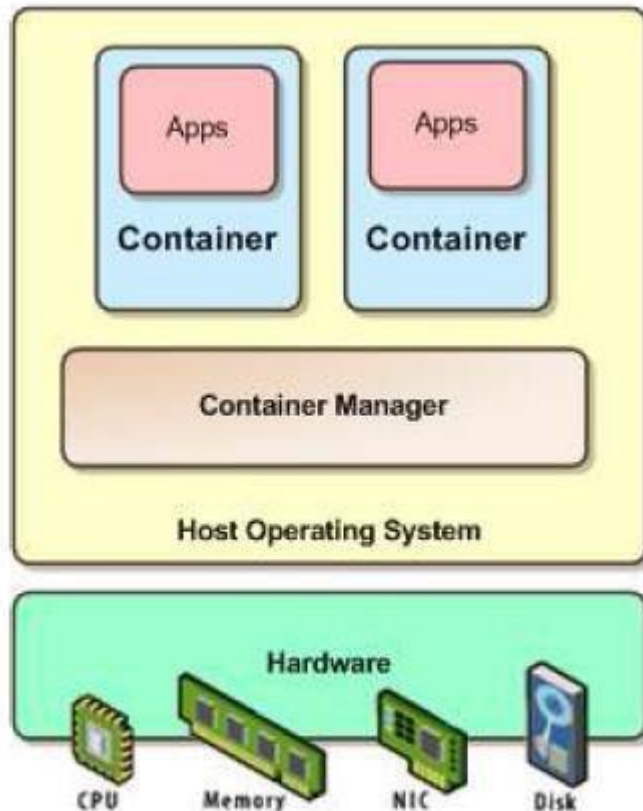
In very simplistic terms, these new processors provide an additional privilege mode below ring 0 in which the hypervisor can operate essentially, leaving ring 0 available for unmodified guest operating systems.



OS virtualization

Compared with hypervisor-based virtualization, container-based virtualization offers a completely different approach to virtualization. Instead of virtualizing with a system in which there is a complete operating system installation, container-based virtualization isolates containers work from within a single OS. In cases where only one operating system is needed, the main benefits of container-based virtualization are that it doesn't duplicate functionality and improves performance. OS virtualization has been making waves lately because Microsoft is rumored to be in the market for an OS virtualization technology. The most well-known products that use OS virtualization are Parallels Virtuozzo and Solaris Containers. This virtualization architecture has many benefits, speedy performance being the foremost. Another benefit is reduced disk space requirements. Many containers can use the same files, resulting in lowered disk space requirements.

The big caveat with OS virtualization is the OS requirement. Container OSs must be the same OS as the host OS. This means that if you are utilizing Solaris containers then all containers must run Solaris. If you are implementing Virtuozzo containers on Windows 2003 Standard Edition, then all its containers must also be running Windows 2003 Standard Edition.



Hosted virtualization

This is the type of virtualization with which most users are familiar with. All of the desktop virtualization products, such as VMware Workstation, VMware Fusion, and Parallels Desktop for the Mac, and Microsoft Virtual PC implement hosted virtualization architecture. There are many benefits to this type of virtualization. Users can install a virtualization product onto their desktop just as any other application, and continue to use their desktop OS. Hosted virtualization products also take advantage of the host OS's device drivers, resulting in the virtualization product supporting whatever hardware the host does.

Conclusion

We learnt Virtualization and implementation using different applications and tools called as hypervisors, basic OS virtualization using VMware.

Assignment No. 03

Aim:

Case study on Amazon EC2 to learn about Amazon EC2, Amazon Elastic Compute Cloud is a central part of Amazon.com's cloud computing platform, Amazon Web Services. How EC2 allows users to rent virtual computers on which to run their own computer applications.

Objectives:

1. To learn Amazon Web Services.
2. To case study the Amazon EC2.

Software Requirements:

Ubuntu 16.04

PHP

MySQL

Hardware Requirements:

Pentium IV system with latest configuration

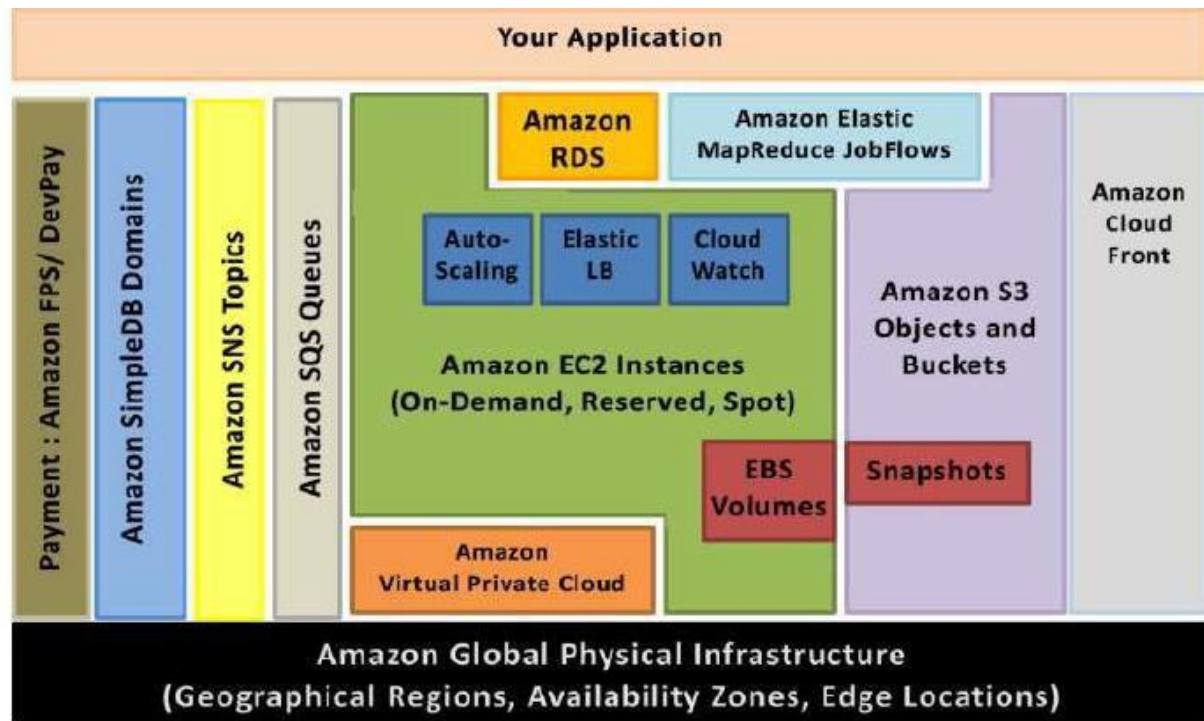
Theory:

Amazon Elastic Compute Cloud (EC2)

Elastic IP addresses allow you to allocate a static IP address and programmatically assign it to an instance. You can enable monitoring on an Amazon EC2 instance using Amazon CloudWatch² in order to gain visibility into resource utilization, operational performance and overall demand patterns (including metrics such as CPU utilization, disk reads and writes, and network traffic). You can create Auto-Scaling Group using the Auto-Scaling feature to automatically scale your capacity on certain conditions based on metric that Amazon CloudWatch collects. You can also distribute incoming traffic by creating an elastic load balancer using the Elastic Load Balancing⁴ service. Amazon Elastic Block Storage (EBS) volumes provide network network-attached persistent storage to Amazon EC2 instances.

Point-in-time consistent snapshots of EBS volumes can be created and stored on Amazon Simple Storage Service (Amazon S3). Amazon S3 is highly durable and distributed data store. With a simple web services interface, you can store and retrieve large amounts of data as objects in buckets (containers) at any time, from anywhere on the web using standard HTTP verbs. Copies of objects can be distributed and cached at 14 edge locations around the world by creating a distribution using Amazon CloudFront service a web service for content delivery (static or streaming content). Amazon SimpleDB is a web service that provides the core functionality of a database- real-time lookup and

simple querying of structured data-without the operational complexity. You can organize the dataset into domains and can run queries across all of the data stored in a particular domain. Domains are collections of items that are described by attribute- value pairs.



Amazon Relational Database Service (Amazon RDS) provides an easy way to setup, operate and scale a relational database in the cloud. You can launch a DB Instance and get access to a full-featured MySQL database and not worry about common database administration tasks like backups, patch management etc.

Amazon Simple Queue Service (Amazon SQS) is a reliable, highly scalable, hosted distributed queue for storing messages as they travel between computers and application components.

Amazon Simple Notifications Service (Amazon SNS) provides a simple way to notify applications or people from the cloud by creating Topics and using a publish-subscribe protocol.

Amazon Elastic MapReduce provides a hosted Hadoop framework running on the webscale infrastructure of Amazon Elastic Compute Cloud (Amazon EC2) and Amazon Simple Storage Service (Amazon S3) and allows you to create customized JobFlows. JobFlow is a sequence of MapReduce steps.

Amazon Virtual Private Cloud (Amazon VPC) allows you to extend your corporate network into a private cloud contained within AWS. Amazon VPC uses IPsec tunnel mode that enables you to create a secure connection between a gateway in your data center and a gateway in AWS.

Amazon Route53 is a highly scalable DNS service that allows you manage your DNS records by creating a HostedZone for every domain you would like to manage.

AWS Identity and Access Management (IAM) enable you to create multiple Users with unique security credentials and manage the permissions for each of these Users within your AWS Account. IAM is natively integrated into AWS Services. No service APIs have changed to support IAM, and exiting applications and tools built on top of the AWS service

APIs will continue to work when using IAM.

AWS also offers various payment and billing services that leverages Amazon's payment infrastructure. All AWS infrastructure services offer utility-style pricing that require no long term commitments or contracts. For example, you pay by the hour for Amazon EC2 instance usage and pay by the gigabyte for storage and data transfer in the case of Amazon S3. More information about each of these services and their pay-as-you-go pricing is available on the AWS Website.

Note that using the AWS cloud doesn't require sacrificing the flexibility and control you've grown accustomed to:

You are free to use the programming model, language, or operating system (Windows, OpenSolaris or any flavor of Linux) of your choice.

You are free to pick and choose the AWS products that best satisfy your requirements—you can use any of the services individually or in any combination.

Because AWS provides resizable (storage, bandwidth and computing) resources, you are free to consume as much or as little and only pay for what you consume.

You are free to use the system management tools you've used in the past and extend your datacenter into the cloud.

Conclusion

Performed case study of Amazon web services: Amazon EC2.

Assignment No. 04

Aim:

Case study on Microsoft azure to learn about Microsoft Azure is a cloud computing platform and infrastructure, created by Microsoft, for building, deploying and managing applications and services through a global network of Microsoft-managed datacenters. How it work, differentservices provided by it.

Objectives:

1. To learn Microsoft Azure Cloud computing platform.
2. To case study the Microsoft Azure cloud services.

Software Requirements:

Ubuntu 16.04

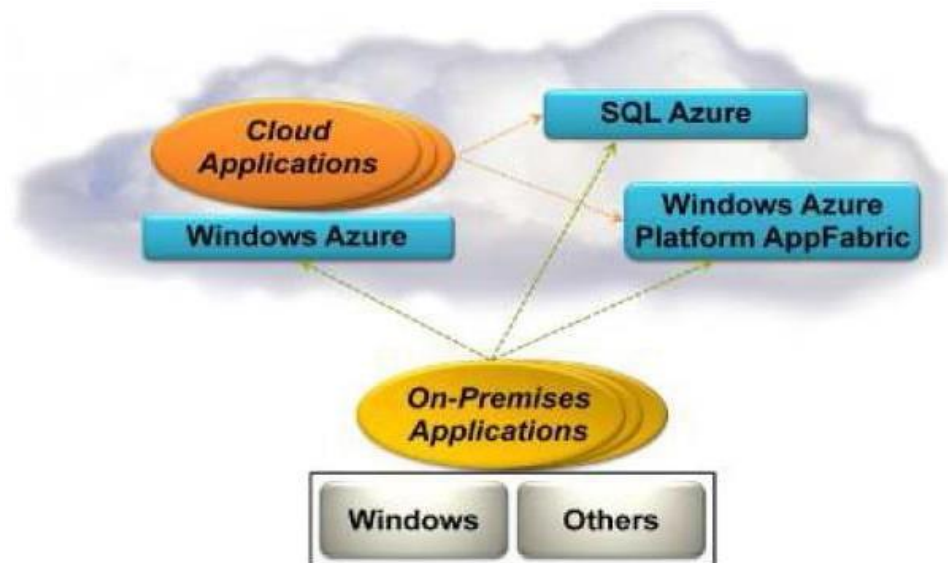
PHP

MySQL

Hardware Requirements:

Pentium IV system with latest configuration

Theory:



Execution Environment

The Windows Azure execution environment consists of a platform for applications and services hosted within one or more roles. The types of roles you can implement in Windows Azure are:

- **Azure Compute (Web and Worker Roles)**

A Windows Azure application consists of one or more hosted roles running within the Azure data centers. Typically there will be at least one Web role that is exposed for access by users of the application. The application may contain additional roles, including Worker roles that are typically used to perform background processing and support tasks for Web roles. For more detailed information see “Overview of Creating a Hosted Service for Windows Azure” at <http://technet.microsoft.com/en-au/library/gg432976.aspx> and “Building an Application that Runs in a Hosted Service” at <http://technet.microsoft.com/en-au/library/hh180152.aspx>.

- **Virtual Machine (VM role)**

This role allows you to host your own custom instance of the Windows Server 2008 R2 Enterprise or Windows Server 2008 R2 Standard operating system within a Windows Azure data center. For more detailed information see “Creating Applications by Using a VM Role in Windows Azure” at <http://technet.microsoft.com/enau/library/gg465398.aspx>.

Data Management

Windows Azure, SQL Azure, and the associated services provide opportunities for storing and managing data in a range of ways. The following data management services and features are available:

- **Azure Storage**

This provides four core services for persistent and durable data storage in the cloud. The services support a REST interface that can be accessed from within Azure hosted or on-premises (remote) applications. For information about the REST API, see Windows Azure Storage Services REST API Reference at

<http://msdn.microsoft.com/enus/library/dd179355.aspx>.

The four storage services are:

- The Azure Table Service provides a table-structured storage mechanism based on the familiar rows and columns format, and supports queries for managing the data. It is primarily aimed at scenarios where large volumes of data must be stored, while being easy to access and update. For more detailed information see “Table Service Concepts” at <http://msdn.microsoft.com/en-us/library/dd179463.aspx> and “Table Service API” at <http://msdn.microsoft.com/en-us/library/dd179423.aspx>.
- The Binary Large Object (BLOB) Service provides a series of containers aimed at storing text or binary data. It provides both Block BLOB containers for streaming data, and Page BLOB containers for random read/write operations. For more detailed information see “Understanding Block Blobs and Page Blobs” at <http://msdn.microsoft.com/en-us/library/ee691964.aspx> and “Blob Service API” at <http://msdn.microsoft.com/en-us/library/dd135733.aspx>.

- The Queue Service provides a mechanism for reliable, persistent messaging between role instances, such as between a Web role and a Worker role. For more detailed information see “Queue Service Concepts” at <http://msdn.microsoft.com/enus/library/dd179353.aspx> and “Queue Service API” at <http://msdn.microsoft.com/enus/library/dd179363.aspx>.
- Windows Azure Drives provide a mechanism for applications to mount a single volume NTFS VHD as a Page BLOB, and upload and download VHDs via the BLOB. For more detailed information see “Windows Azure Drive” (PDF) at <http://go.microsoft.com/?linkid=9710117>.
- **SQL Azure Database**
This is a highly available and scalable cloud database service built on SQL Server technologies, and supports the familiar T-SQL based relational database model. It can be used with applications hosted in Windows Azure, and with other applications running on-premises or hosted elsewhere. For more detailed information see “SQL Azure Database” at <http://msdn.microsoft.com/en-us/library/ee336279.aspx>.
- **Data Synchronization**
SQL Azure Data Sync is a cloud-based data synchronization service built on Microsoft Sync Framework technologies. It provides bi-directional data synchronization and data management capabilities allowing data to be easily shared between multiple SQL Azure databases and between on-premises and SQL Azure databases. For more detailed information see “Microsoft Sync Framework Developer Center” at <http://msdn.microsoft.com/en-us/sync>.
- **Caching**
This service provides a distributed, in-memory, low latency and high throughput application cache service that requires no installation or management, and dynamically increases and decreases the cache size automatically as required. It can be used to cache application data, ASP.NET session state information, and for ASP.NET page output caching. For more detailed information see “Caching Service (Windows Azure AppFabric)” at <http://msdn.microsoft.com/en-us/library/gg278356.aspx>.

Networking Services

Windows Azure provides several networking services that you can take advantage of to maximize performance, implement authentication, and improve manageability of your hosted applications. These services include the following:

- **Content Delivery Network (CDN)**
The CDN allows you to cache publicly available static data for applications at strategic locations that are closer (in network delivery terms) to end users. The CDN uses a number of data centers at many locations around the world, which store the data in BLOB storage that has anonymous access. These do not need to be locations where the application is actually running. For more detailed information see “Delivering High-Bandwidth Content with the Windows Azure CDN” at <http://msdn.microsoft.com/enus/library/ee795176.aspx>.

- **Virtual Network Connect.**

This service allows you to configure roles of an application running in Windows Azure and computers on your on-premises network so that they appear to be on the same network. It uses a software agent running on the on-premises computer to establish an IPsec-protected connection to the Windows Azure roles in the cloud, and provides the capability to administer, manage, monitor, and debug the roles directly. For more detailed information see “Connecting Local Computers to Windows Azure Roles” at <http://msdn.microsoft.com/en-us/library/gg433122.aspx>.

- **Virtual Network Traffic Manager**

This is a service that allows you to set up request redirection and load balancing based on three different methods. Typically you will use Traffic Manager to maximize performance by redirecting requests from users to the instance in the closest data center using the Performance method. Alternative load balancing methods available are Failover and Round Robin. For more detailed information see “Windows Azure Traffic Manager” at http://msdn.microsoft.com/enus/WAZPlatformTrainingCourse_WindowsAzureTrafficManager.

- **Access Control**

This is a standards-based service for identity and access control that makes use of a range of identity providers (IdPs) that can authenticate users. ACS acts as a Security Token Service (STS), or token issuer, and makes it easier to take advantage of federation authentication techniques where user identity is validated in a realm or domain other than that in which the application resides. An example is controlling user access based on an identity verified by an identity provider such as Windows Live ID or Google. For more detailed information see “Access Control Service 2.0” at <http://msdn.microsoft.com/enus/library/gg429786.aspx> and “Claims Based Identity & Access Control Guide” at <http://claimsid.codeplex.com/>.

- **Service Bus**

This provides a secure messaging and data flow capability for distributed and hybrid applications, such as communication between Windows Azure hosted applications and on-premises applications and services, without requiring complex firewall and security infrastructures. It can use a range of communication and messaging protocols and patterns to provide delivery assurance, reliable messaging; can scale to accommodate varying loads; and can be integrated with on-premises BizTalk Server artifacts. For more detailed information see “AppFabric Service Bus” at <http://msdn.microsoft.com/en-us/library/ee732537.aspx>

Conclusion

Performed case study of Microsoft Azure Cloud computing platform and services.

Assignment No. 5

Aim:

Write a Program to Create, Manage and groups User accounts in ownCloud by Installing Administrative Features.

Objectives:

1. To learn Cloud computing administration
2. To install and configure ownCloud administrative features

Software Requirements:

Ubuntu 16.04

PHP

MySQL

Hardware Requirements:

Pentium IV system with latest configuration

Theory:

On the User management page of your ownCloud Web UI you can:

- Create new users
- View all of your users in a single scrolling window
- Filter users by group
- See what groups they belong to
- Edit their full names and passwords
- See their data storage locations
- View and set quotas
- Create and edit their email addresses
- Send an automatic email notification to new users
- Delete them with a single click

The default view displays basic information about your users.

Username

Password

Groups

Create


Search users

	Username	Full Name	Password	Groups	Group Admin for	Quota
	admin	admin	••••••••	admin	no group	Default
	layla	layla	••••••~•	users, artists	artists	10 GB
	molly	molly	••••••~•	users	no group	Default
	ritasue	ritasue	••••••~•	artists	users	10 GB
	stashcat	stashcat	••••••~•	users, admin	no group	5 GB

The Group filters on the left sidebar lets you quickly filter users by their group memberships, and create new groups.

+ Add Group	
Everyone	5
Admins	2
users	3
artists	2

Click the gear icon on the lower left sidebar to set a default storage quota, and to display additional fields: **Show storage location**, **Show last log in**, **Show user backend**, **Send email to new users**, and **Show email address**.



Default Quota
25 GB

☐ Show storage location

☐ Show last log in

☐ Show user backend

☐ Send email to new user

☐ Show email address

User accounts have the following properties:

Login Name (Username)

The unique ID of an ownCloud user, and it cannot be changed.

Full Name

The user's display name that appears on file shares, the ownCloud Web interface, and emails.

Admins and users may change the Full Name anytime. If the Full Name is not set it defaults to the login name.

Password

The admin sets the new user's first password. Both the user and the admin can change the user's password at anytime.

Groups

You may create groups, and assign group memberships to users. By default new users are not assigned to any groups.

Group Admin

Group admins are granted administrative privileges on specific groups, and can add and remove users from their groups.

Quota

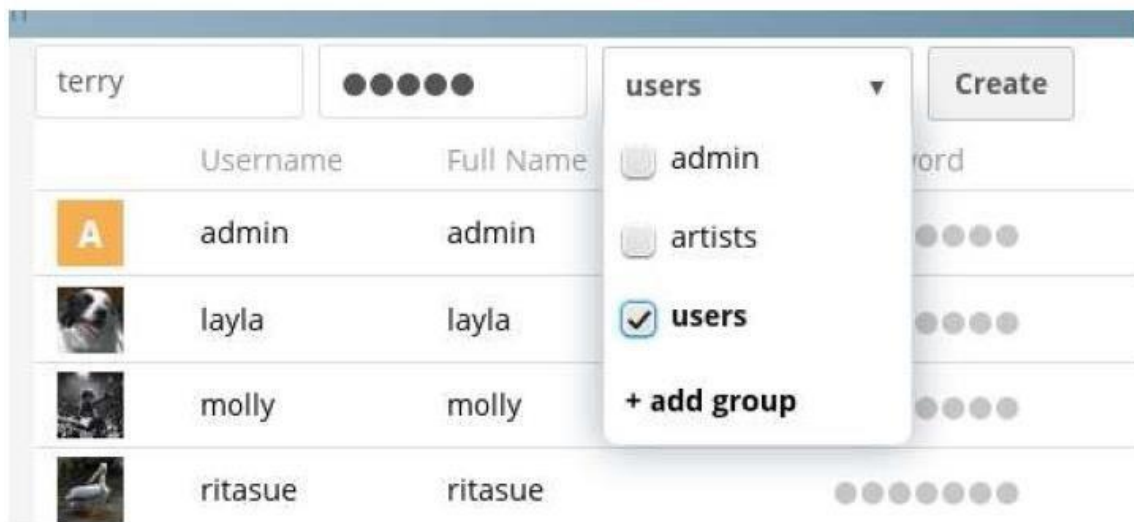
The maximum disk space assigned to each user. Any user that exceeds the quota cannot upload or sync data. You have the option to include external storage in user quotas.

Creating a New User

To create a user account:

- Enter the new user's **Login Name** and their initial **Password**
- Optionally, assign **Groups** memberships
- Click the **Create** button

Login names may contain letters (a-z, A-Z), numbers (0-9), dashes (-), underscores (_), periods (.) and at signs (@). After creating the user, you may fill in their **Full Name** if it is different than the login name, or leave it for the user to complete.



If you have checked **Send email to new user** in the control panel on the lower left sidebar, you may also enter the new user's email address, and ownCloud will automatically send them a notification with their new login information. You may edit this email using the email template editor on your Admin page.

Reset a User's Password

You cannot recover a user's password, but you can set a new one:

- Hover your cursor over the user's **Password** field
- Click on the **pencil icon**
- Enter the user's new password in the password field, and remember to provide the user with their Password

If you have encryption enabled, there are special considerations for user password resets.

Renaming a User

Each ownCloud user has two names: a unique Login Name used for authentication, and a Full Name, which is their display name. You can edit the display name of a user, but you cannot change the login name of any user.

To set or change a user's display name:

- Hover your cursor over the user's **Full Name** field
- Click on the **Pencil icon**
- Enter the user's new display name

Granting Administrator Privileges to a User

ownCloud has two types of administrators: **Super Administrators** and **Group Administrators**.

Group administrators have the rights to create, edit and delete users in their assigned groups. Group administrators cannot access system settings, or add or modify users in the groups that they are not **Group Administrators** for. Use the dropdown menus in the **Group Admin** column to assign group admin privileges



Super Administrators have full rights on your ownCloud server, and can access and modify all settings. To assign the **Super Administrators** role to a user, simply add them to the admin group.

Managing Groups

You can assign new users to groups when you create them, and create new groups when you create new users. You may also use the **Add Group** button at the top of the left pane to create new groups. New group members will immediately have access to file shares that belong to their new groups.

Setting Storage Quotas

Click the gear on the lower left pane to set a default storage quota. This is automatically applied to new users. You may assign a different quota to any user by selecting from the **Quota** dropdown, selecting either a preset value or entering a custom value. When you create custom quotas, use the normal abbreviations for your storage values such as 500 MB, 5 GB, 5 TB, and so on.

You now have a configurable option in config.php that controls whether external storage is counted against user's quotas. This is still experimental, and may not work as expected. The default is to not count external storage as part of user storage quotas. If you prefer to include it, then change the default false to true:

```
'quota_include_external_storage' => false,
```

Metadata (such as thumbnails, temporary files, and encryption keys) takes up about 10% of disk space, but is not counted against user quotas. Users can check their used and available space on their Personal pages. Only files that originate with users count against their quotas, and not files shared with them that originate from other users. For example, if you upload files to a different user's share, those files count against your quota. If you re-share a file that another user shared with you, that file does not count against your quota, but the originating user's.

Encrypted files are a little larger than unencrypted files; the unencrypted size is calculated against the user's quota. Deleted files that are still in the trash bin do not count against quotas. The trash bin is set at 50% of quota. Deleted file aging is set at 30 days. When deleted files exceed 50% of quota then the oldest files are removed until the total is below 50%. When version control is enabled, the older file versions are not counted against quotas. When a user creates a public share via URL, and

allows uploads, any uploaded files count against that user's quota.

Deleting users

Deleting a user is easy: hover your cursor over their name on the **Users** page until a trashcan icon appears at the far right. Click the trashcan, and they're gone. You'll see an undo button at the top of the page, which remains until you refresh the page. When the undo button is gone you cannot recover the deleted user.

All of the files owned by the user are deleted as well, including all files they have shared. If you need to preserve the user's files and shares, you must first download them from your ownCloud Files page, which compresses them into a zip file, or use a sync client to copy them to your local computer.

Conclusion

As a cloud service provider, we are managing user accounts and groups by using Administrative features.

Assignment No. 6

Aim:

Assignment to install and configure Google App Engine.

Objectives:

1. To learn basics of Google App Engine.
2. To install and configure Google App Engine.

Software Requirements:

Ubuntu 16.04

Python

MySQL

Hardware Requirements:

Pentium IV system with latest configuration

Theory:

Google App Engine is Google's platform as a service offering that allows developers and businesses to build and run applications using Google's advanced infrastructure. These applications are required to be written in one of a few supported languages, namely: Java, Python, PHP and Go. It also requires the use of Google query language and that the database used is Google Big Table. Applications must abide by these standards, so applications either must be developed with GAE in mind or else modified to meet the requirements. GAE is a platform, so it provides all of the required elements to run and host Web applications, be it on mobile or Web. Without this all-in feature, developers would have to source their own servers, database software and the APIs that would make all of them work properly together, not to mention the entire configuration that must be done. GAE takes this burden off the developers so they can concentrate on the app front end and functionality, driving better user experience.

Advantages of GAE include:

- Readily available servers with no configuration requirement
- Power scaling function all the way down to "free" when resource usage is minimal

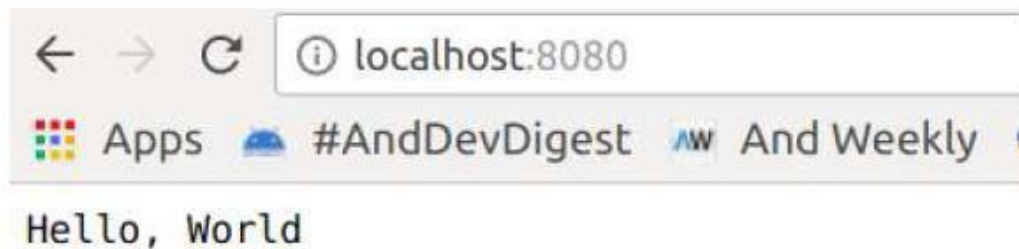
Automated cloud computing tools

1. Make sure you have python installed in your ubuntu system. run the command `"python -V"` and most probably you will get "Python 2.7.6" or above.
2. Crul `https://sdk.cloud.google.com` and use bash to run the commands by typing this command `curl https://sdk.cloud.google.com | bash`
3. Whenever you get to choose directories just hit enter, "YEAH IT WILL BE FINE".

4. Follow the instructions in the installation process.
5. Then run gcloud init
6. Follow the installation instructions as they are very straight forward.
7. Choose the account you want to use for google app engine.
8. Choose the project with numeric choice (don't use textual, you might make mistake). If you do not already have a google app engine project create a app engine project by following this link. <https://console.cloud.google.com/start>
9. Enable google api by pressing Y in the command line prompt.

Now as we have finished installing appengine, now it's time to create and upload an app. In this case we will be taking example of a "HELLO WORLD" app in python.

1. As we already have made sure that we have python installed in our system, It will be easier for us to clone existing code and deploy it rather than creating our own so we will use python-docs-sample. Run the command "git clone <https://github.com/GoogleCloudPlatform/python-docs-samples>".
2. cd to hello world sample by typing the command " cd python-docssamples/appengine/standard/hello_world".
3. Then run the command "dev_appserver.py app.yml". It will run and give you the url of default and admin. If you go to the link of default you see the text hello world like this.



This is how you run the python app in your local server. But what we have to do is hosting the app in google app engine. To do so now let's follow the following instructions.

1. Run the command *Ctrl + C*.
2. Being in the same working directory hello-world run the command *gcloud app deploy*
3. Select the project you want to deploy the app , press Y and enter to continue. after that you will get the console output "Deployed service[default] to [Your web url for appengine] "
4. If you copy and paste the url, you will see the hello world in the browser too.



Web output

Now you have successfully uploaded your web app into app engine.

Conclusion

Hence, we learnt to install and configure Google App Engine

