MICROSOFT AZURE:
CLOUD COMPUTING
PLATFORM AND SERVICES

A Seminar Report

Submitted by

MOHAMMAD ILYAS MALIK

Inpartial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE

AT

SSM college Of Engineering & Technology

Department of CSE

Parihaspora Pattan,Baramulla

MARCH 2016

CERTIFICATE

This is to certify that the seminar report entitled

MICROSOFT AZURE: CLOUD COMPUTING PLATFORM

Is a bonafide record of the work done by MOHAMMAD ILYAS MALIK, Enroll No. 3777 under our supervision, in partial fulfillment of the requirements for the award of Degree of Bachelor of Engineering in Computer Science Engineering from SSM College of Engineering & Technology for the year 2016.

Mr. Suhail Ashraf   **Ms. Hafsa**

Asst. Prof.,Dept.of CSE   Asst.Prof.Dept. of CSE

Seminar Co-ordinator   Seminar Guide

Mrs. Yasmeen

Head of Department

Computer Science Engineering

(Department Seal)

Table of Contents

ABSTRACT

Software industry is heading towards centralized computing. Due to this trend data and programs are being taken away from traditional desktop PCs and placed in Compute clouds instead. Compute clouds are enormous server farms packed with computing power and storage space accessible through the Internet.

Instead of having to manage one's own infrastructure to run applications, server time and storage space can be bought from an external service provider. From the customers point of view the benefit behind this idea is to be able to dynamically adjust computing power up or down to meet the demand for that power at a particular moment. This kind of flexibility not only ensures that no costs are incurred by excess processing capacity, but also enables hardware infrastructure to scale up with business growth. Because of growing interest in taking advantage of cloud computing a number of service providers are working on providing cloud services. Amazon, Salerforce.com and Google are examples of firms that already have working solutions on the market. Recently also Microsoft released a preview version of its cloud platform called the Azure. Early adopters can test the platform and development tools free of charge.

The main purpose of this paper is to shed light on the internals of Microsoft's Azure platform. In addition to examining how Azure platform works.

The benefits of Azure platform are explored. The most important benefit in Microsoft's solution is that it resembles existing Windows environment a lot. Developers can use the same application programming interfaces (APIs) and development tools they are already used to. The second benefit is that migrating applications to cloud is easy. This partially stems from the fact that Azure's services can be exploited by an application whether it is run locally or in the cloud.

Acknowledgement

Alhamdulillah (Praise be to Allah), who bestowed upon me the courage, strength and ability to undertake this work. Without His will just nothing can be done.

I would like to express my immense and profound to the scholarly concerned and monitorial soul of **Mrs. Mehak** for valuable guidance, inspiration and help without which it would have been difficult to achieve anything worthwhile.

I also wish to express my sincere thanks to **Mrs . Yasmeen, HOD** Computer Science Engineering for extending all facilities and all words of encouragement while working on this seminar report.

It is an honour for me to express the greatest of all the love, honour, respect and appreciations to my family, whose inspiration and vision brought me where I am today.

Lastly my special gratefulness to all those who helped and guided me directly or indirectly in the completion of this seminar report.

Mohammad Ilyas Malik

Enroll No 3777

 BE 7th Semester

Computer Engineering Department SSM

College of Engineering & Technology

Table of Figures

Figure No.	Figure Name	Page No.
1.	**Overview of cloud computing**	1
2.	**Types of Cloud**	2
3.	**Services of Cloud Computing**	5
4.	**Sign in to Microsoft Azure**	10
5.	**Services and application of Microsoft Azure**	11
6.	**Services of Microsoft Azure**	12
7.	**Datacenters of Microsoft Azure**	19

1. CLOUD COMPUTING – OVERVIEW

The popular trend in today's technology driven world is 'Cloud Computing'. Cloud computing can be referred to as the storing and accessing of data over the internet rather than your computer's hard drive. This means you don't access the data from either your computer's hard drive or over a dedicated computer network (home or office network). Cloud computing means data is stored at a remote place and is synchronized with other web information.

One prominent example of cloud computing is Office 365 which allows users to store, access, edit their MS Office documents online without installing the actual program on their device.
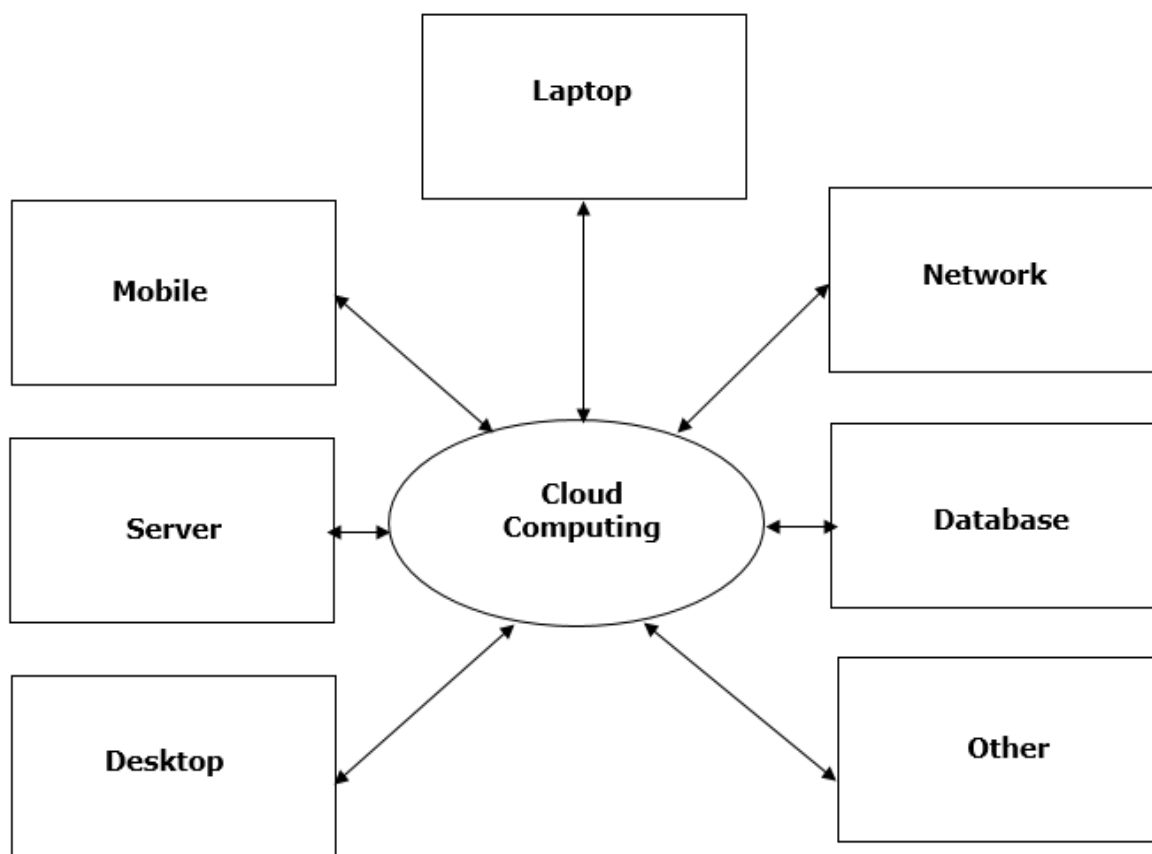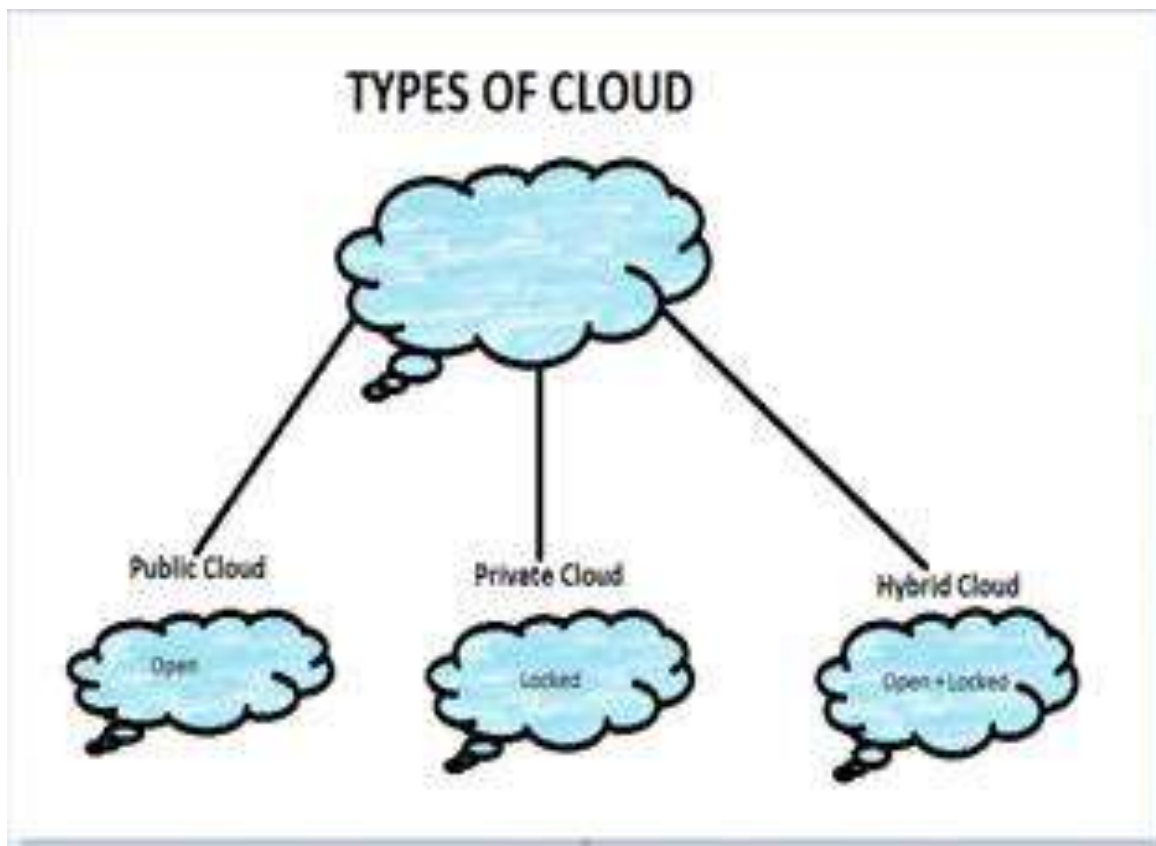

Figure 1: Overview of cloud computing

1.1 TYPES OF CLOUD

The storage options on cloud is in 3 forms:

1. Public.

2. Private.

3. Hybrid.

Figure2: Types of Cloud

1. **Public Cloud:** A service provider makes the clouds available to the general public which is termed as a public cloud. These clouds are accessed through internet by users. These are open to public and their infrastructure is owned and operated by service providers as in case of Google and Microsoft.

2. **Private Cloud**: These clouds are dedicated to a particular organization. That particular organization can use the cloud for storing the company's data, hosting business application, etc. The data stored on public cloud can't be shared with other organizations. The cloud is managed either by the organization itself or by the third party.

3. **Hybrid Cloud:** When two or more clouds are bound together to offer the advantage of both public and private clouds, they are termed as Hybrid Cloud. Organizations can use private clouds for sensitive application, while public clouds for non-sensitive applications. The hybrid clouds provide flexible, scalable and cost-effective solutions to the organizations.

3.2 BENEFITS OF CLOUD

There are many benefits of clouds. Some of them are listed below.

➢ Cloud service offers scalability. Allocation and de-allocation of resources is dynamically as per demand.

➢ It saves on cost by reducing capital infrastructure.

➢ It allows the user to access the application independent of their location and hardware configuration.

➢ It simplifies the network and lets the client access the application without buying license for individual machine.

➢ Storing data on clouds is more reliable as it is not lost easily.

1.4 SPI

Next comes how cloud services are categorized. S stand for Software, P stands for Platform and I for Infrastructure in SPI. SAAS is Software as a service; PAAS is Platform as a service and IAAS is Infrastructure as a Service.

➤ All these allow user to run application and store data online.

➤ Each offers a different level of user flexibility and control.
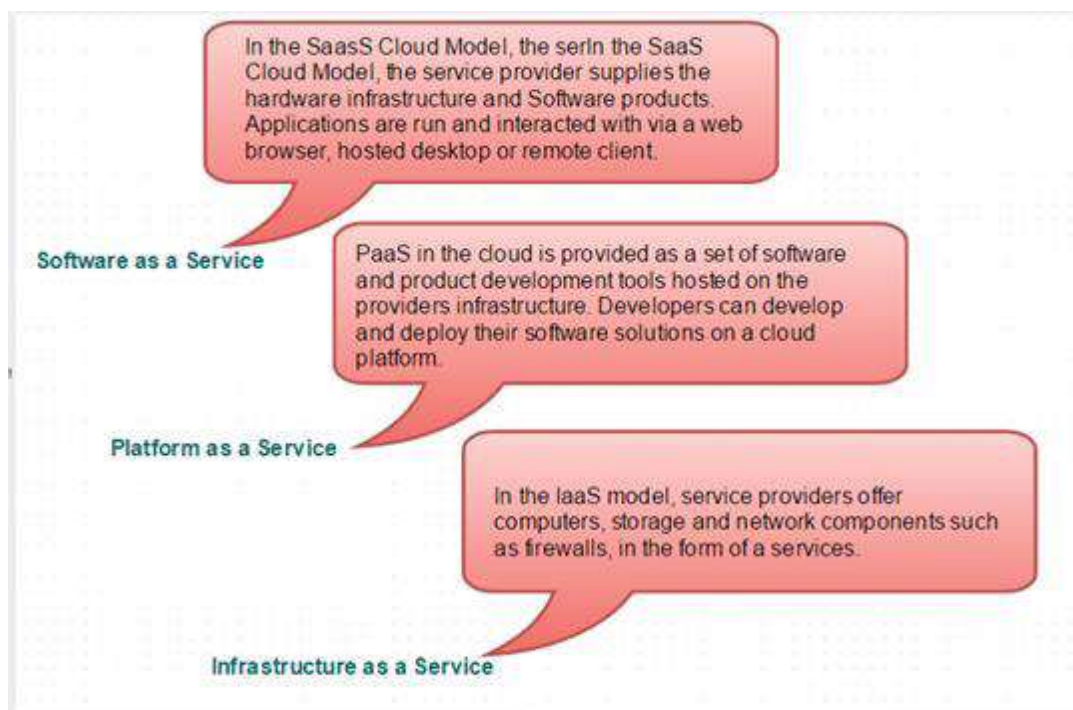
Figure3: Services of Cloud Computing

Following are the live examples of these models.

> **SAAS Model:** E-mail (Gmail, Yahoo, etc.)

> **PAAS Model:** Microsoft Azure

> **IAAS Model:** Amazon S3

2. MICROSOFT AZURE

2.1 INTRODUCTION

Azure was announced in October 2008 and released on 1 February 2010 as **Windows Azure**, before being renamed to Microsoft Azure on 25 March 2014. Along with Amazon Web Services Azure is considered a leader in the IAAS field.

Microsoft Azure is an open and flexible cloud platform that enables you to quickly build, deploy, and manage applications across a global network of Microsoft-managed datacenters. You can build applications using any language, tool, or framework. And you can integrate your public cloud applications with your existing IT environment.

This definition tells us that Microsoft Azure is a cloud platform, which means you can use it for running your business applications, services, and workloads in the cloud. But it also includes some key words that tell us even more:

Open Microsoft Azure provides a set of cloud services that allow you to build and deploy cloud-based applications using almost any programming language, framework, or tool.

Flexible Microsoft Azure provides a wide range of cloud services that can let you do everything from hosting your company's website to running big SQL databases in the cloud. It also includes different features that can help deliver high performance and low latency for cloud-based applications.

Microsoft-managed Microsoft Azure services are currently hosted in several datacenters spread across the United States, Europe, and Asia. These datacenters are managed by Microsoft and provide expert global support on a 24x7x365 basis.

Compatible Cloud applications running on Microsoft Azure can easily be integrated with on-premises IT environments that utilize the Microsoft Windows Server platform.

It provides both PAAS and IAAS services and supports many different programming languages, tools and frameworks, including both Microsoft-specific and third-party software and systems.

2.2   AZURE AS PAAS (PLATFORM AS A SERVICE)

As the name suggests, a platform is provided to clients to develop and deploy software. The clients can focus on the application development rather than having to worry about hardware and infrastructure. It also takes care of most of the operating systems, servers and networking issues.

Pros

➢ The overall cost is low as the resources are allocated on demand and servers are automatically updated.

➢ It is less vulnerable as servers are automatically updated and being checked for all known security issues. The whole process is not visible to developer and thus does not pose a risk of data breach.

➢ Since new versions of development tools are tested by the Azure team, it becomes easy for developers to move on to new tools. This also helps the developers to meet the customer's demand by quickly adapting to new versions.

Cons

➢ There are portability issues with using PAAS. There can be a different environment at Azure, thus the application might have to be adapted accordingly.

2.3 Azure as IAAS (Infrastructure as a Service)

It is a managed compute service that gives complete control of the operating systems and the application platform stack to the application developers. It lets the user to access, manage and monitor the data centers by themselves.

Pros

➢ This is ideal for the application where complete control is required. The virtual machine can be completely adapted to the requirements of the organization or business.

➢ IAAS facilitates very efficient design time portability. This means application can be migrated to Windows Azure without rework. All the application dependencies such as database can also be migrated to Azure.

➢ IAAS allows quick transition of services to clouds, which helps the vendors to offer services to their clients easily. This also helps the vendors to expand their business by selling the existing software or services in new markets.

Cons

➢ Since users are given complete control they are tempted to stick to a particular version for the dependencies of applications. It might become difficult for them to migrate the application to future versions.

➢ There are many factors which increases the cost of its operation. For example, higher server maintenance for patching and upgrading software.

➢ There are lots of security risks from unpatched servers. Some companies have well-defined processes for testing and updating on-premise servers for security vulnerabilities. These processes need to be extended to the cloud-hosted IAAS VMs to mitigate hacking risks.

➢ The unpatched servers pose a great security risk. Unlike PAAS, there is no provision of automatic server patching in IAAS. An unpatched server with sensitive information can be very vulnerable affecting the entire business of an organization.

➢ It is difficult to maintain legacy apps in IAAS. It can be stuck with the older version of the operating systems and application stacks. Thus, resulting in applications that are difficult to maintain and add new functionality over the period of time.

It becomes necessary to understand the pros and cons of both services in order to choose the right one according your requirements. In conclusion it can be said that, PAAS has definite economic advantages for operations over IAAS for commodity applications. In PAAS, the cost of operations breaks the business model. Whereas, IAAS gives complete control of the OS and application platform stack.

2.4 AZURE MANAGEMENT PORTAL

Azure Management Portal is an interface to manage the services and infrastructure launched in 2012. All the services and applications are displayed in it and it lets the user manage them.

Getting started

A free trial account can be created on Azure management portal by visiting the following link - manage.windowsazure.com

The screen that pops up is as shown in the following image. The account can be created using our existing Gmail, Hotmail or Yahoo account.
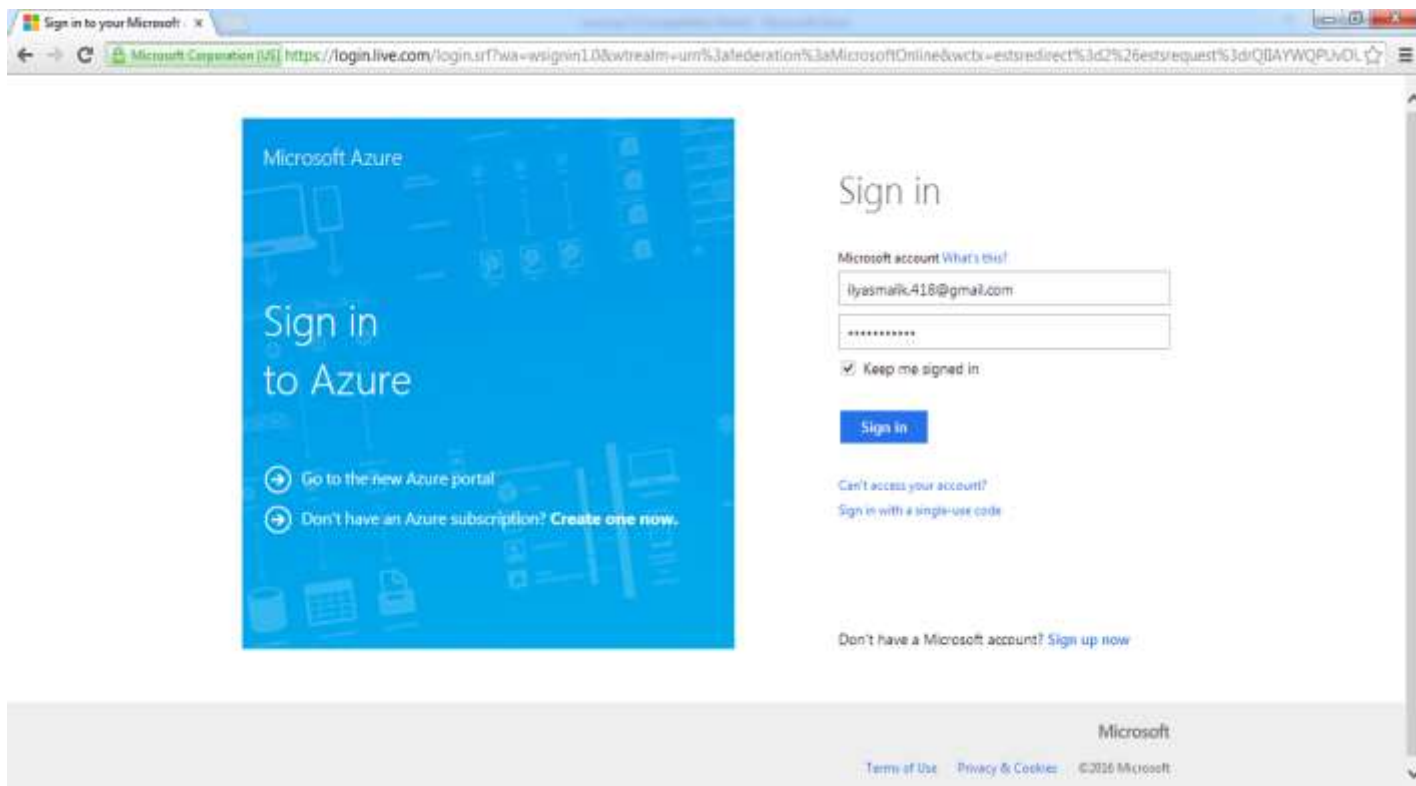
Figure4: Sign in to Microsoft Azure

Once logged in, you will be redirected to the following screen, where there is a list of services and applications on the left panel.
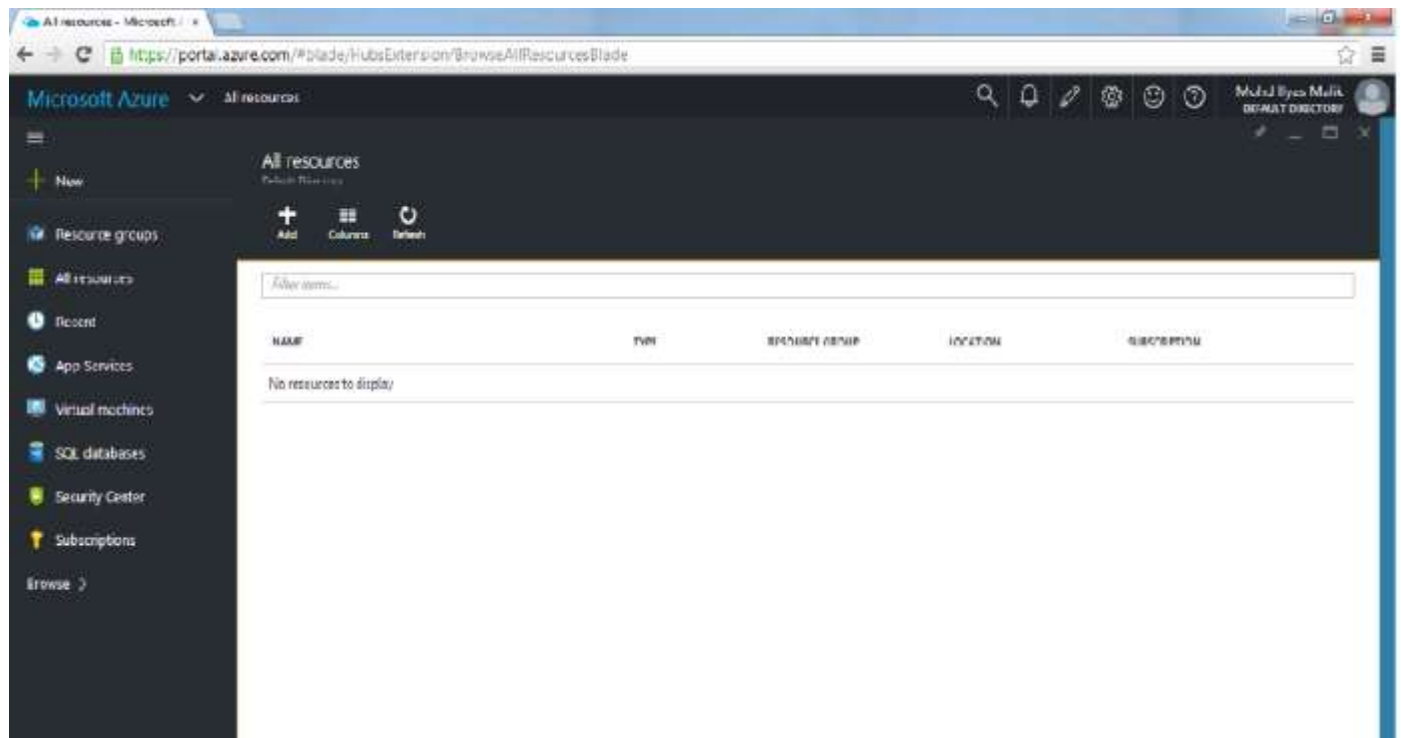
Figure5: Services and application of Microsoft Azure

When you click on a category, its details are displayed on the screen. You can see the number of applications, virtual machine, mobile services and so on by clicking on the menu item.

\

3. SERVICES OF MICROSOFT AZURE

> Windows Azure provides businesses with four basic categories of cloud-based services:

1. Compute services
2. Network services
3. Data services
4. App services
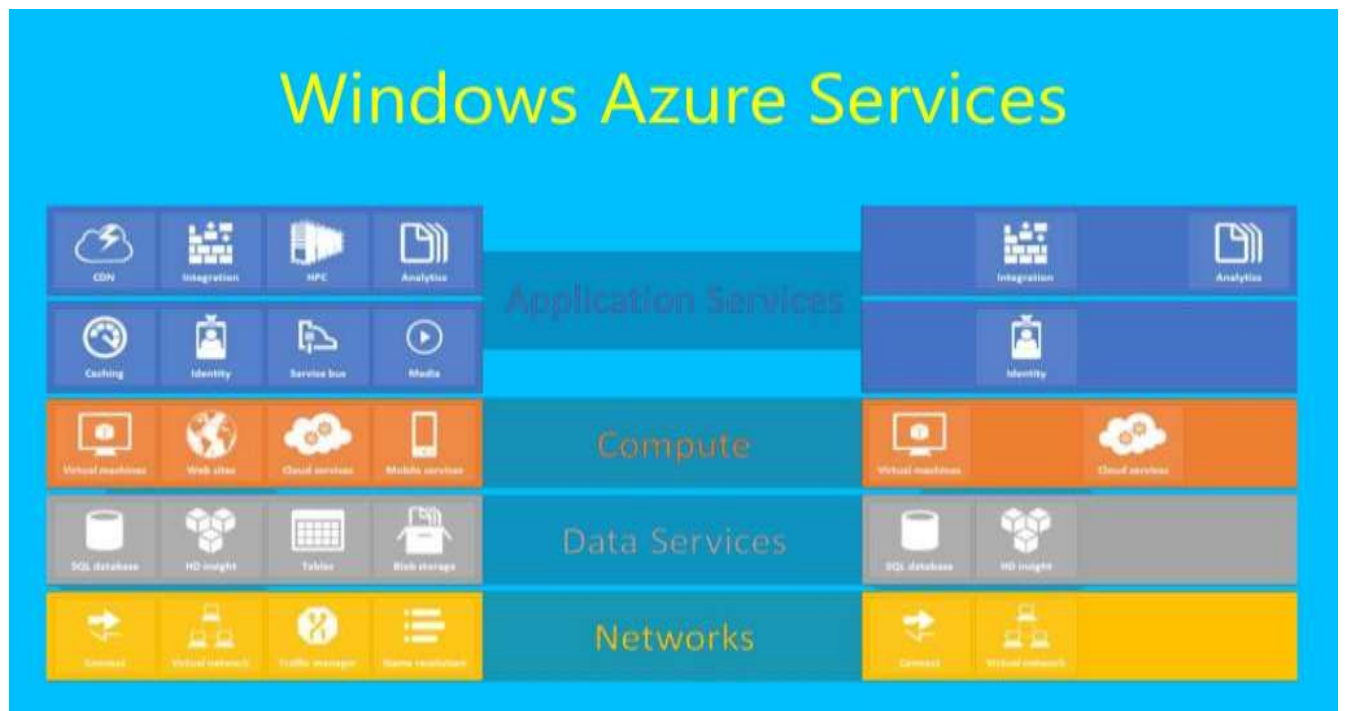
Figure6: Services of Microsoft Azure

1. **Compute services**

Windows Azure compute services provide the processing power required for cloud applications to be able to run. Windows Azure currently offers four different compute services:

➢ **Virtual Machines:** This service provides you with a general-purpose computing environment that lets you create, deploy, and manage virtual machines running in the Windows Azure cloud.

➢ **Web Sites:** This service provides you with a managed web environment you can use to create new websites or migrate your existing business website into the cloud.

➢ **Cloud Services** This service allows you to build and deploy highly available and almost infinitely scalable applications with low administration costs using almost any programming language.

➢ **Mobile Services** This service provides a turnkey solution for building and deploying apps and storing data for mobile devices.

2. Network services

Windows Azure network services provide you with different options for how Windows Azure applications can be delivered to users and datacenters. Windows Azure currently offers two different network services:

➢ **Virtual Network** This service allows you to treat the Windows Azure public cloud as if it is an extension of your on-premises datacenter.

➢ **Traffic Manager** This service allows you to route application traffic for the user who is using the application to Windows Azure datacenters in three ways: for best performance, in round robin fashion, or using an Active/Passive failover configuration.

3. **Data services**

Windows Azure data services provide you with different ways of storing, managing, safeguarding, analyzing, and reporting business data. Windows Azure currently offers five different data services:

- **Data Management** This service lets you store your business data in SQL databases, either with dedicated Microsoft SQL Server virtual machines, using Windows Azure SQL Database, using NoSQL Tables via REST, or using BLOB storage.

- **Business Analytics** This service enables ease of discovery and data enrichment using Microsoft SQL Server Reporting and Analysis Services or Microsoft SharePoint Server running in a virtual machine, Windows Azure SQL Reporting, the Windows Azure Marketplace, or HDInsight, a Hadoop implementation for Big Data.

- **HDInsight** This is Microsoft's Hadoop-based service which brings a 100 percent Apache Hadoop solution to the cloud.

- **Cache** This service provides a distributed caching solution that can help speed up your cloud-based applications and reduce database load.

- **Backup** This service helps you protect your server data offsite by using automated and manual backups to Windows Azure.

- **Recovery Manager** Windows Azure Hyper-V Recovery Manager helps you protect business critical services by coordinating the replication and recovery of System Center 2012 private clouds at a secondary location.

4. **App services**

Windows Azure app services provide you with ways of enhancing the performance, security, discoverability, and integration of your cloud apps that are running. Windows Azure currently offers seven different app services:

➢ **Media Services** This service allows you to build workflows for the creation, management, and distribution of media using the Windows Azure public cloud.

➢ **Messaging** This consists of two services (Windows Azure Service Bus and Windows Azure Queue) that allow you to keep your apps connected across your private cloud environment and the Windows Azure public cloud.

➢ **Notification Hubs** This service provides a highly scalable, cross-platform push notification infrastructure for applications running on mobile devices.

➢ **BizTalk Services** This service provides Business-to-Business (B2B) and Enterprise Application Integration (EAI) capabilities for delivering cloud and hybrid integration solutions.

➢ **Active Directory** This service provides you with identity management and access control capabilities for your cloud applications.

➢ **Multifactor Authentication** This service provides an extra layer of authentication, in addition to the user's account credentials, in order to better secure access for both on-premises and cloud applications.

9. APPLICATIONS OF MICROSOFT AZURE

Windows Azure is usually misinterpreted as just a hosting solution, but there is a lot more that can be done using Windows Azure. It provides a platform to develop applications using a range of available technologies and programming languages. It offers to create and deploy applications using .net platform, which is Microsoft's own application development technology. In addition to .net, there are many more technologies and languages supported. For example, Java, PHP, Ruby, Oracle, Linux, MySQL, Python.

Windows Azure applications are scaled by creating multiple instances of the application. The number of instances needed by the application is specified by the developer while hosting the applications. If traffic is increased or decreased on the website or web application it can be managed easily by logging in to Windows Azure management portal and specifying the instances. Load balancing can also be automated which would allow Azure to make the decision itself as when to assign more resources to application.

Web applications support .net, java, python, php and node.js. Tasks such as scaling and backups can be easily automated. A new feature called 'web jobs' is available, which is a kind of batch processing service. Web jobs can also be scaled and scheduled. The mobile application platforms supported are Xamarin iOS, Xamarin Android and IOS. Azure platform is developed in such a way that developers need to concentrate on only the development part and need not worry about other technical stuff outside their domain. Thus most of the administrative work is done by Azure itself.

A marketplace is also set by Azure where its customers can buy applications and services. It is a platform where customers can search applications and deploy them in an easier way. Azure marketplace is available in 88 countries at present. An application purchased from the marketplace can be easily connected to the local development environment by the application developers. The pricing is done using 5 different models, which includes usage-based and monthly fee. Some of the applications are even free of charge.
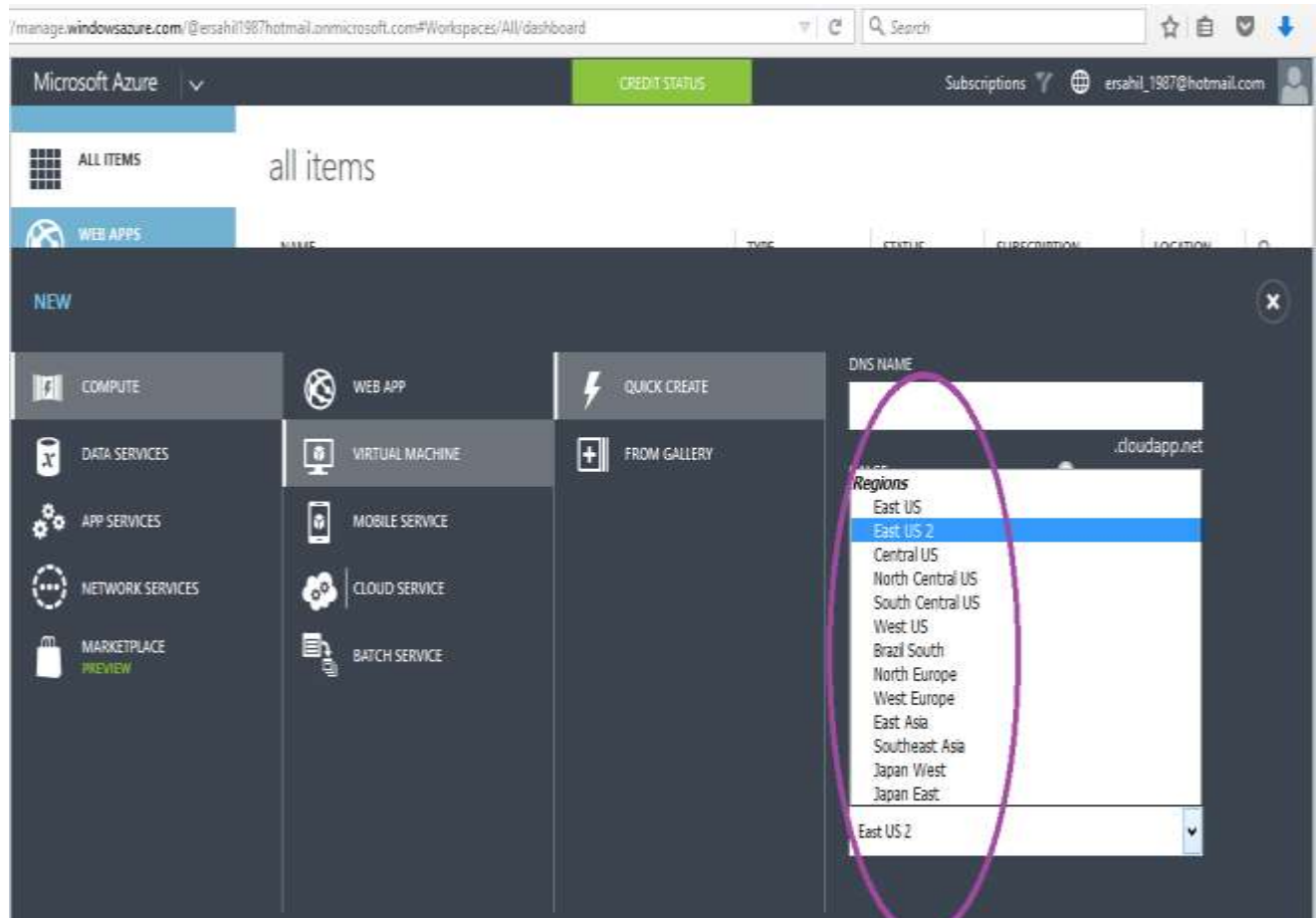
5. DATACENTERS

When we think of cloud, we imagine a place with large number of machines in big rooms. There must be a place where all the data is stored. Microsoft has datacenters all over the world from where Windows Azure services are managed. Datacenters are divided in regions. The exact location of these datacenters is not revealed by Microsoft for obvious security reasons.

Following are the 19 listed regions as can also be seen in the image.

1. Central US

2. East US

3. East US 2

4. US Gov Iowa

5. US Gov Virginia

6. North Central US

7. South Central US

8. West US

9. North Europe

10. West Europe

11. East Asia

12. Southeast Asia

13. Japan East

14. Japan West

15. Brazil South

16. Australia East

17. Australia Southeast

18. Central India

19. South India

Figure7: Datacenters of Microsoft Azure

5.1 HOW TO CHOOSE THE RIGHT DATA CENTER FOR YOUR APPLICATION

When creating Windows Azure application, whether it is mobile application, web application or database storage it asks to specify the region. Region here specifies a regional datacenter.

Performance: You should select the nearest datacenter to the users of your application. The performance can be affected by the relative location of the users who want to access the application. If a user is closer to the datacenter, the performance will be better.

Cost: The price of hosting the application may also increase or decrease depending upon the datacenter you choose. Price actually can vary according to the database hosting location or any other service being used by the application. You should choose the same location for all the services that are being used by your application. For example, database or any media service. If they are kept in separate datacenter there will be charges per transaction, but anything extra won't be charged if they are kept at the same datacenter.

Legal Aspect: Laws vary from country to country and restrictions could be enforced in some regions on what information can be shared and what cannot.

6. ADVANTAGE MICROSOFT AZURE

The Microsoft Azure Platform offers a range of businesses flexibility, control, and an affordable solution for running Web-scale applications. The services reduce tedious and expensive infrastructure management and planning and are built with security and reliability in mind, along with the option of a pay-as-you-go model.

➢ **Pay as you grow** – Match usage needs with the option of pay-as-you-go pricing - paying for the services you use and reducing the capital costs associated with purchasing hardware and infrastructure.

➢ **Reduce operational costs** – Azure reduces the need for up-front technology purchases and by running applications in the cloud you decrease the need for maintaining on-premise infrastructure.

➢ **Increase business efficiency and agility** – by dynamically adding and subtracting capacity in real time. Azure simplifies maintaining and operating applications by providing on-demand compute and storage to host, scale, and manage web and connected applications.

➢ Build and deploy software quickly and easily by capitalising on the same personnel, development tools and investments, and knowledge that already powers your IT organisation.

➢ **Easy developer on-ramp to the cloud** – Millions of developers worldwide already use the .NET Framework and the Visual Studio development environment. Utilize those same skills to create cloud-enabled applications that can be written, tested, and deployed all from Visual Studio. Azure will support more programming languages and development environments in the future, such as Eclipse, Ruby, PHP, and Python.

➢ **Enables Agile & Rapid Results** – Applications can be deployed to the Platform with the click of a button. Changes can be made quickly and without downtime, making it an ideal platform for affordably experimenting and trying new ideas.

➢ **Imagine and Create New User Experiences** – The Platform enables you to create web, mobile, or hybrid applications that use the cloud with on-premises applications. Combined with Live Services ability to reach over 400 million live users, new opportunities exist to interact and reach users in new ways.

- ➤ **Offers choice** –The open architecture gives developers the choice to build web applications, applications running on connected devices, PCs, servers, or hybrid solutions offering the best of online and on-premises.

- ➤ **Standards-Based Compatibility** – The services platform supports industry-standard protocols, including HTTP,REST, SOAP, RSS, and AtomPub, for consuming, exposing, and integrating with third-party services. You can easily integrate applications built on a variety of different technologies and operating systems.

7. CONCLUSION

Executing applications in the clouds offer many advantages over the traditional way of running programs. Firstly, using cloud computing allows rapid service deployment and massive
Savings upfront because not having to invest in infrastructure. Secondly, cloud computing model allows computing power and storage to scale up with business growth. In addition to this, it's also easy to dynamically adjust computing power up or down. As a customer, you end up paying for the actual usage of resources.

The advantages of using the Azure cloud platform relate to the fact that Microsoft has tried to minimize the changes involved in migrating applications to the cloud. Effort required from developers already familiar with Microsoft's technologies to utilize the Azure is minimal. In addition to this, upcoming releases of Azure are going to support applications written in languages such as Python and PHP. Another advantage in Microsoft's solution is that the services provided can be used in a very flexible fashion. Not only are Azure services available to cloud applications, but also traditional on-premises applications are free to exploit them. What's
Even better, Microsoft seems to be improving in terms of interoperability. Because all of the services are accessible via industry standard protocols, it is guaranteed exploiting them doesn't force customers to use Microsoft's operating systems on-premises. Although there are many advantages in cloud computing, there are also disadvantages that shouldn't be ignored.

The First and most obvious disadvantage is the fact that by running applications in the cloud you have to hand over your private data. Privacy and security concerns are direct consequences of this. Secondly, although cloud computing relieves customers from the burden of infrastructure management, it also takes away the possibility to be in total control of that infrastructure. In addition to losing control on hardware, using compute clouds also ties the customer very tightly to the cloud service provider. Data, for example, is usually stored in a proprietary format which makes porting applications to competitors' systems hard. As customers are locked in, they are also at the mercy of that certain service provider's future pricing strategy.

8. REFERENCES

[1] D. Chappell. Introducing the Azure Services Platform - an early look at Windows Azure, .NET services, SQL services and Live services, October 2008. http://download.

microsoft.com/download/e/4/3/e43bb484-3b52-4fa8-a9f9-ec60a32954bc/

Azure_Services_Platform.pdf.

[2] H. Erdogmus. Cloud computing: Does Nirvana hide behind the Nebula? *IEEE Software*, 26(2):4–6, 2009.

[3] M. Fitzgerald. When the forecast calls for clouds. *Inc.Boston*, 31(1):100–102, 2009.

[4] B. Hayes. Cloud computing. *Commune. ACM*, 51(7):9–11, 2008.

[5] J. N. Hoover. A stake in the cloud. *InformationWeek*, 26(1209):22–24, 2008.

[6] Microsoft Azure Services Platform documentation, October 2008. http://www.microsoft.com/Azure/default.mspx.

[7] A. Weiss. Computing in the clouds. *Net Worker*, 11(4):16–25, 2007.