Microsoft Azure v/s Amazon AWS Cloud Services: An Appropriative Study

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Abstract: *Present days, many companies are going for computerization. It may not be feasible for every startup to invest huge amount of money for procuring servers, IT infrastructure and recruiting staff who can maintain these servers and IT Infrastructure. But, better option is Cloud computing is a pay as you go model that holds the potential of eliminating the requirement of setting up high cost and complex IT infrastructure. Many options are available while choosing Cloud service provider. Amazon Web Services (AWS) and Microsoft Azure are often regarded as the leaders in cloud computing comparing with other providers. It is very difficult to decide one cloud service provider from others. In this paper, comparison of Amazon EC2 and Microsoft Azure is given, which will help in taking decision for choosing Cloud Provider.*
Index Terms*: Cloud Computing, Amazon EC2, Microsoft Azure, Selection of cloud provider*

I. Introduction

Amazon who had invested a lot in computing infrastructure, started leasing out their underutilized and unused resources with cloud computing technology, resulting in cloud computing acquire attention and popularity within the computing industry. For several reasons Cloud computing, has become an option in recent years. The investment and maintenance cost is greatly in favor of cloud computing. Customers can use their VMs (or computing power) only for required amount of time from any cloud providers to cut their prices. Cloud providers have gained the popularity among Small scale to Enterprise customers after started providing easy access and efficient storage space on effective pricing. More and more users are subscribing to these cloud services at affordable prices provided by these companies.

One of the key benefits of cloud computing is avoiding capital infrastructure expenses with low variable costs that scale with the business. With the Cloud, businesses no longer need to plan for and procure servers and other IT infrastructure weeks or months in advance. Instead, they can instantly acquire hundreds or thousands of servers in minutes and deliver results faster.Cloud Computing definition from the National Institute ofStandards and Technology (NIST) [2]: "Cloud computing is a model for enabling convenient, on demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage,applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

Cloud computing provides various key features like,
1. Reduction in capital expenditure
2. Device and location independence
3. Increase in Peak-load capacity
4. Reliability
5. Scalability
6. Security
7. Ease of Maintenance

Major Cloud Service offeringsavailable in market are,
1. Software as a Service (SaaS): Software as a service is a software distribution model in which applications are hosted by a service provider in cloud and made available to customers over a network.
2. Platform as a Service (PaaS): Platform as a Service (PaaS) is a way to rent hardware, operating systems, storage and network capacity over the Internet, for running existing applications or developing and testing new applications.

3. Infrastructure as a service (IaaS): Infrastructure as a Service is a model in which an organization outsources the equipment including storage, hardware, servers and networking components.

In all Cloud Computing offerings, service providers (like Amazon, Microsoft) owns the equipment and is responsible for installing, running and maintaining them with almost no downtime to customers. Here Customers typically pays based onthe usage basis only.

Major Cloud Computing Providers
There are many cloud computing providers available in industry. Few leading companies are listed below as perGartner'sMagic Quadrant for Cloud Infrastructure as a Service(IaaS), published in the month of August-2016.

❖ Amazon Web Services
❖ Microsoft
❖ Google
❖ Rackspace
❖ Virtustream
❖ CenturyLink
❖ VMware
❖ NTT Communication
❖ IBM(SoftLayer)
❖ Fujitsu

Figure 1. Magic Quadrant for Cloud Infrastructure as a Service, Worldwide

According to the Gartner study key players are Microsoft and Amazon for cloud computing. Remaining players are far behind than these two players. The future of other service providers is increasingly uncertain and customers must carefully manage provider-related risks. In this paper, we are studying and comparing cloud offerings provided by Amazon (AWS) and Microsoft (Azure).

Virtual machines (VMs) as a service and one of AWS's first products released in 2006. Amazon took time from 2006 to build an excellent head start over its competition. One of those competitors, Microsoft Azure was introduced in 2010. But by this time Amazon already had a strong lead in providing cloud services. Both are popular and leading Cloud Service Providers today [1]. These companies are both global titans and popular with the resources to make their respective cloud services as robust and expand them as they want. With reference to servers size, both are equipped to meet the needs of enterprises of any size. But while the question: "So which of the two is better for my business?" is a simple one, the answer may be a little more complicated [2].

They both share common elements of a public cloud such as self-service and instant provisioning, auto scaling, security and some management services. Both companies are also investing to meet needs for new cloud services. This has resulted in more mature analytics offerings. For example, support for Hadoop clusters and added machine learning tools and several features targeted, while customers can choose either cloud to variously buildan app or even create high performance computing environment according to their needs. Meanwhile the recent surveys proved, with both providers supporting Docker services. Microsoft has also been creating its own Hyper-V container technology that it will run in on premise data centers as part of its Windows Server 2016 release [3].

II. Understanding amazon ec2 cloud

Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed for web computing easier for developers and allows simple web service interface to obtain and configure capacity with minimal resistance. It provides complete control of computing resources and proven computing environment. Amazon EC2 reduces the time required to obtain and boot new server instances and allowing quickly to scale capacity, both up and down, as per computing requirements change. Amazon EC2 provides developers the tools to build failure resilient applications and isolate themselves from common failure scenarios [3].

AWS offers Xen-virtualized multitenant and single-tenant compute (Elastic Compute Cloud [EC2]), with multitenant storage, along with extensive additional IaaS and PaaS capabilities, a Docker container service (EC2 Container Service [ECS]), event-driven "serverless computing" (Lambda), and an PaaS-like developer experience (Elastic Beanstalk). It is willing to negotiate large-scale single-tenant and on-premises deals (such as the U.S. intelligence community cloud deal). The AWS marketplace has an extensive selection of third-party software and services.

AWS groups its data centers into regions, each of which contains at least two availability zones (data centers). It has regions on the East and West Coasts of the U.S., and in Germany, Ireland, Australia, India, Japan, Singapore, South Korea, Brazil and (in preview) China. It also has one region dedicated to the U.S. federal government. It has a global sales presence. The portal and documentation are provided in English, Dutch, French, German, Italian, Japanese, Korean, Mandarin, Portuguese and Spanish. The primary languages for support are English, Japanese and Mandarin, but AWS will contractually commit to providing support in many other languages.

AWS has a diverse customer base and the broadest range of use cases, including enterprise and mission-critical applications.This has enabled it to attract an ecosystem of open-source tools, along with more than a thousand technology partners that have licensed and packaged their software to run on AWS, have integrated their software with AWS capabilities, or deliver add-on services.

It has the richest array of IaaS and PaaS capabilities. It provides the deepest capabilities for governing many users and resources. It continues to rapidly expand its service offerings and to offer higher-level solutions. It retains a multiyear competitive advantage over all its competitors, and thus is the common reference point for competitive benchmarking.

Components of Amazon EC2:

Figure 2 : Components of Amazon EC2

❖ *Elastic Compute Units:*The Elastic Compute Unit (ECU) was introduced by Amazon EC2 as an abstraction of computer resources.

❖ *Amazon EC2 Instances Types:* Amazon EC2 instances types are grouped into six families [4]:

Standard

Micro

High-Memory

High CPU

Cluster Compute

Cluster GPU

❖ *EC2 Storage Types*

▪ Elastic Block Storage (EBS): This is persistent,network-based storage called Elastic Block Store(EBS), which can be attached to running instances or also used as a persistent boot medium.

• Instance Storage: This is local storage, which is non-persistent and data will be lost after an instance terminates [4].

❖ *Elastic IP Addresses:* Amazon's Elastic IP Address feature is like static IP address in traditional data centers. A user can programmatically map an Elastic IP Address to any virtual machine instance without a network administrator's help and without having to wait for DNS to propagate the new binding. In this sense an Elastic IP Address belongs to the account and not to a virtual machine instance. It exists until it is explicitly removed. It remains associated with the account, even while it is associated with no instance.

❖ *Amazon CloudWatch:* Amazon CloudWatch is a web service that provides monitoring for AWS cloud resources and applications, starting with Amazon EC2. It provides with visibility into resource utilization, operational performance, and overall demand patterns—including metrics such as CPU utilization, disk reads and writes, and network traffic. It provides statistics, view graphs, and set alarms for all metric data. Amazon CloudWatch will begin aggregating and storing monitoring data that can be accessed using web service APIs or Command Line Tools [5].

❖ *Automated Scaling:* Auto Scaling allows to automatically scale Amazon EC2 capacity up or down according to conditions defined by the user. With Auto Scaling, user can ensure that the number of Amazon EC2 instances they are using scales up seamlessly during demand spikes to maintain performance,and scales down automatically during demand lulls to minimize costs.Auto Scaling is particularly well suited for applications that experience hourly, daily, or weekly variability in usage. Auto Scaling is enabled by Amazon CloudWatch and available at no additional charge beyond Amazon CloudWatch fees [6].

III. Understanding windows azure

Windows Azure is Microsoft's application platform for the public cloud. The applications can use this platform in different ways. For instance, Windows Azure to build a web application that runs and stores it'sdata in Microsoft datacenters. Windows Azure only to store data, with the applications that use that data running on-premises (that is, outside the public cloud). Windows Azure to help on-premises applications connect with each other or to map between different sets ofidentity information or in other ways. Because the platformoffers a wide range of services[7]. Microsoft is a large and diversified technology vendor that is increasingly focused on delivering its software capabilities via cloud services. Azure business was initially PaaS, but Microsoft launched Azure Infrastructure Services (which include Azure Virtual Machines and Azure Virtual Network) into general availability in April 2013, thus entering the cloud IaaS market.

Microsoft Azure offers Hyper-V-virtualized multitenant compute (Virtual Machines), with multitenant storage, along with many additional IaaS and PaaS capabilities, including object storage (Blob Storage) and a CDN. The Azure Marketplace offers third-party software and services.

There are multiple Azure regions in the U.S., Canada, Australia, India and Japan, as well as regions in Ireland, the Netherlands, Hong Kong, Singapore and Brazil. There are also two regions for the U.S. federal government. (The two Azure China regions are part of a separate service operated by 21Vianet Group.) Microsoft has global sales. Azure support is provided in English, Dutch, French, German, Italian, Spanish, Japanese, Korean, Mandarin and Portuguese; support for Azure IaaS capabilities is also available in Hebrew. Technical documentation is available in those languages, as well as Russian. The portal is additionally available in Czech, Hungarian, Polish, Swedish and Turkish.

Microsoft Azure encompasses integrated IaaS and PaaS components that operate and feel like a unified whole. Microsoft has been rapidly rolling out new features and services, including differentiated capabilities and extend interoperate with on-premises Microsoft infrastructure (rooted in Hyper-V, Windows Server, Active Directory and System Center), development tools (including Visual Studio and Team Foundation Server [TFS]), middleware and applications, as well as Microsoft's SaaS offerings. Microsoft is also becoming more open and less reliant upon its Windows franchise, and Azure's support for Linux and other open-source technologies is improving quickly.

Components of Windows Azure

To understand what Windows Azure offers, it's useful togroup its services into distinct categories.

Figure 3 : Components of Windows Azure

- ❖ *Cloud Applications:* Windows Azure provides two types of roles:
- ▪ Web roles: A web role is designed for code that talks directly with web browsers or other HTTP clients i.e. it depends on IIS, Microsoft's web server. For example, ASP.NET or PHP application.
- ▪ Worker roles: A worker role is more general, designed to run a variety of different type of code. For example, application that processes lots ofdata in parallel. Each role instance is just a virtual machine (VM)running a flavor of Windows Server and each one executes in a Windows Azure datacenter [7].

Load Balancing on a Windows Azure application:Windows Azure charges by the hour for each instance, only for the needed capacity.

- ❖ *Data Management*: Every Windows Azure application runs in one or more VMs. Each VM has local storage, which an application is free to use. Windows Azure provides five data management options
- ▪ SQL Azure
- ▪ Tables
- ▪ Windows Azure Blobs Storage Service
- ▪ Import / Export
- ▪ Azure File Service

- ❖ *Networking:*Azure runs today in many datacenters spread across the world. When you run an application or store data, you can select one or more of these datacenters to use. You can also connect to these datacenters in various ways using the services below.
- ▪ Virtual Network
- ▪ Traffic Manager
- ▪ Express Route

- ❖ *Identity and Access Control:*Working with identity is part of most applications. Knowing who a user is lets an application decide how it should interact with that user. Azure provides services to help track identity as well as integrate it with identity stores you may already be using.
- ▪ Active Directory
- ▪ Multi Factor Authentication

❖ *Messaging and Integration:* No matter what it's doing, code frequently needs to interact with other code. In some situations, all that's needed is basic queued messaging. In other cases, more complex interactions are required. Azure provides a few different ways to solve these problems. Figure 3 illustrates thechoices.
▪ Storage Queue
▪ Service Bus Queue
▪ Service Bus Relay
▪ Service Bus Topics
▪ Biz Talk Hybrid Connection
▪ Biz Talk Service

Today, Amazon Web Services provides a highly reliable, scalable, low-cost infrastructure platform in the cloud that powers hundreds of thousands of businesses in 190 countries around the world. With data center locations in the U.S., Europe, Brazil, Singapore, Japan, and Australia, customers across all industries are taking advantage of the following benefits:

Comparison between Microsoft Azure vs. Amazon EC2

As many companies have large amounts of information stored on computers, the need for memory is essential. Cloud computing removes the need to install dedicated software to the computer, thereby reducing the amount of memory needed. Azure and EC2 conceptually do the same thing. Both EC2 and Microsoft Azure cloud computing technologies allow the expansion of the virtual machines or VMs used for applications – both in number and power. Both services work based on the Virtual Machine model. Amazon EC2 and Azure are both marketers of applications through independent software vendors(ISV)[9].

General comparison of Amazon EC2 and MicrosoftAzure.

Feature	Amazon EC2	Microsoft Azure
Major Player	IaaS.	PaaS
Relational Database Support	SQL Server, MySQL, ProgreSQL, Oracle and MariaDB	Relational database based on SQL Server, Document DB
Virtualization Technology	XEN Virtualization Technology	Hyper V – Hypervisor based virtualization Technology
IDE Support	SDK is available for Eclipse	SDK is available for Eclipse and visual studio.
Internet of Things	AWS IoT allows building complete IoT solutions	Azure offers IoT Hub that supports AMQP, MQTT, and HTTP
Mobile Services	AWS offers Mobile Hub to allow mobile development for Android and iOS	Azure offers Mobile Apps to support backend solution.
Open Source	Recently allowing users to run Red Hat Enterprise Linux and Apache Hadoop clusters.	Never had problems with the open source community, and has been Linux-friendly from the beginning.

Table : 1

Both AWS and Azure offer almost similar services when it comes to compute, storage, networking and databases. Pricing is not a big factor to taken into account when choosing between the two as both offer competitive pricing. Most cloud services are available from Amazon, but Microsoft Azure seems to be a better choice for a hybrid approach. Amazon is a veteran player in the game and offers a nice suite of cloud computing services. But Microsoft Azure can't be completely ruled out as it continues to come up with new developments to not only match but surpass the pace of all the big players in the market, including Google.

Which cloud service to choose ? Choose amazon web serviceif require:
• efficient scalability and automation offerings
• locally and globally available
• a robust application
• the most reliable feature set

• various levels of security
• it's conceptually simple. Anyone who's ever used any
VMsoftware is going to be able to grasp what
it does immediately.

Choose microsoft azure if require:
• invested in Microsoft
• accepting scalability limitations
• using Azure PaaS or Office 365
• wanting to use just a single provider
• needing other plan for AWS
• Azure may be cheaper than EC2 in the long run.
• Azure is a zero maintenance solution.
• It's completely integrated with Visual Studio.
• Once set up, deploying changes from Visual
Studio to Windows Azure is just a couple clicks.

IV. Conclusion

The present leading Cloud Service providers are Amazon and Azure. In this paper, we listed Features, Services, Advantages, and Disadvantages etc. comparing both. This paper outlined a survey in cloud computing service providers Amazon and Azure, focusing on the list services provided by these companies. We still have more work to do; we hope this paper will be considered as a starting point identifying opportunities for future.

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