

Cloud Computing and Microsoft Azure

Sachin M. Vettiyattil

Department of Computer Science Mumbai Educational Trust College, Mumbai, India

ABSTRACT

The rapid rise of cloud computing has provided businesses the ability to quickly provision computing resources without the costly and laborious task of building data centers, and without the cost of running servers with unutilized capacity due to variable workloads. Azure, Microsoft's cloud computing platform launched in February 2010.

In addition to traditional cloud offerings such as virtual machines, object storage and content delivery networks, Azure offers services that leverage proprietary Microsoft technologies. Azure also offers cloud-hosted versions of common enterprise Microsoft solutions, such as Active Directory and SQL Server.

1. INTRODUCTION

Microsoft Azure, formerly also known as Windows Azure, is Microsoft's public cloud computing platform. Microsoft Azure is a cloud computing service created by Microsoft for building, testing, deploying, and managing applications and service through global network of Microsoft data centres. It provides a range of cloud services, starting from those for compute, analytics, storage and networking.

Users can pick and choose from these services to develop and scale new applications or run existing applications in the public cloud. Azure is comprehensive set of cloud services that developers and IT professionals use to build, deploy and manage applications through our global network of data centers. Microsoft Azure is considered to be both a Platform as a Service(PaaS) and Infrastructure as a service(IaaS) as well as Software as a Service(SaaS) offering.



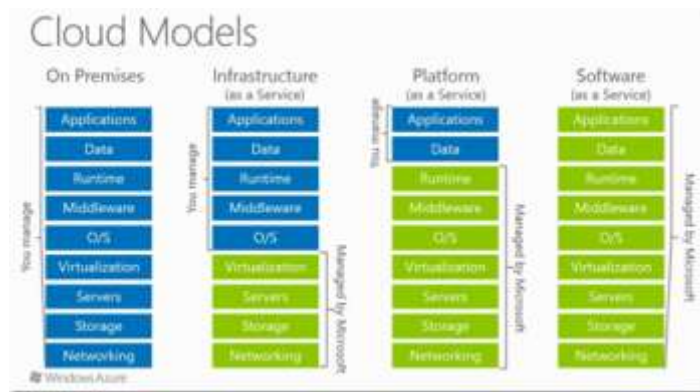
2. TYPE OF CLOUD

A public Cloud provides global services, whereas a private Cloud is a proprietary network or a Data Centre, which provides services to a limited number of people. When a service provider uses publicCloud resources to create his own private Cloud, the result is called Virtual Private Cloud. Private Cloud type describes an IT infrastructure designed for exclusive use by a single organization comprising more consumers. A Private Cloud can be compared to a conventional Data Centre – the difference being represented by the applicability of technological solutions in order to optimize available resources and expansion of these resources through small investments, which are made gradually over time. Cloud represents a model of public-owned infrastructure, administrated and operated by a specialized service provider, a commercial, academic and governmental

organization or a combination of these. Within this type of Cloud the modality to access services is via the Internet, and service provider plays an essential role in terms of effective protection of data that are employed in its systems.

Hybrid Cloud, or the model of "Broker Cloud", describes a cloud infrastructure that represents a combination of two or more distinct Cloud infrastructure (Community Cloud, private or public). They behave as unique entities but are interconnected by a standardized or proprietary technology, which enables data and application portability on demand (a usage example is balancing resource usage for spikes request). The main aspects and essential facilities for Cloud Computing are: agility that improves users' ability to quickly adapt themselves to cheaper infrastructure resources provided by forecasting technologies; low costs; independence of location and computing device; Multi-Tenancy facilities; Reliability and Scalability. Cloud applications maintenance is much easier because it does not have to be installed on each user's computer. They are easier to administrate and/or upgrade, any change being accessible to customers almost instantly.

2.1 Cloud Model



2.1.1 Infrastructure as a service (IaaS)

Infrastructure as a Service is an instant computing infrastructure provisioned and managed over internet.

2.1.2 Platform as a service (PaaS)

Platform as a Service is a complete development & deployment environment in the cloud, with resources that enable you to deliver cloud-based apps & cloud-enabled enterprise application.

2.1.3 Software as a Service (SaaS)

Software as a Service allows users to connect to and use cloud-based apps over the internet.

3. BENEFITS IN WINDOWS AZURE

Using Windows Azure applications can be developed applications in almost any language and can integrate public applications from Cloud into existing IT environment. Windows Azure includes the following features that enable customers to control access to their data and applications:

Organizations can synchronize identification data at headquarters with Active Directory from Windows Azure and allows single authentication to simplify user access to their cloud-based applications. At any time can be achieved security reports to monitor data access and contribute to risk management. Authentication can be done by several methods, which helps to prevent unauthorized access, also providing a mechanism for authentication in addition to password. Customers can implement authorization schemes to control users access to resources on the tasks of the role, the level of authorization and permissions approved. If you want to keep a number of local applications on your local servers and move others on cloud then when using "hybrid" approach we can have the necessary flexibility to run your applications and data will be stored locally on the cloud or in a mix of both versions.

Microsoft offers solutions such as Office 365, Microsoft Azure and Windows Server. For example, if you intend to host your applications in cloud, Office 365 provides access from anywhere by traditional use, on the desktop and on mobile devices. Moreover, Microsoft Azure offers a fully managed cloud infrastructure to host our business applications and has the ability to quickly install new applications or move them from local servers on cloud, anytime we want. If we do not plan to invest in servers to run applications locally, then we can choose to use a server with built in virtualization capability such as Windows Server 2012 R2, thus having the ability to run multiple applications on the same server. This solution eliminates the extra costs associated to buying a new hardware, IT maintenanceservices and current bills. Virtualization can also simplify the upgrade process. Even if in the past you used to purchase servers, software or services, "making charges" was the only option [26]. You had to pay directly, in advance, for what you thought you needed, whether it was a larger storage space or a new application by email. Now, cloud technologies offer a better model of payment: a payment on the go [24], see Fig 1.

D11 Standard	D12 Standard	D13 Standard
2 vCores	4 vCores	8 vCores
14 GB	28 GB	56 GB
4 Data disks 4x500 MB 12GB	8 Data disks 8x500 MB 12GB	16 Data disks 16x500 MB 12GB
100 GB 100 GB	200 GB 200 GB	400 GB 400 GB
Load balancing	Load balancing	Load balancing
Auto scale	Auto scale	Auto scale

Figure 1. Choice of resources(<https://azure.microsoft.com/en-us/>)

The main types of services brought by Windows Azure are classified as follows:

3.1 For computer

Azure Virtual Machines that allows you install Windows Server or Linux images in Cloud. You can select images from a gallery or you can bring your own customized images of operating system. Azure Cloud Services for which you do not have to manage the infrastructure any longer. With Web and Worker roles, you can switch immediately to the development, deployment and management of modern applications.

Azure Web Sites helps you quickly install Web applications on a scalable and reliable Cloud structure. You can immediately scale resources or number of nodes; or set up automatic scaling as load application requirements. Azure Mobile Services Provides a backend in Cloud for Windows Store mobile applications, Windows Phone, Apple iOS, Android or HTML/JavaScript.

3.2 Data Services

Azure Storage provides storage space for non -relational data structures such as objects or binary files, simple tables, queues or virtual disks. Azure SQL Database is a relational database service that allows you to quickly create applications, to expand or scale them in Cloud. Azure Backup manages backup copies kept in Cloud with familiar tools in Windows Server 2012, Windows Server 2012 Essentials or System enters 2012 Data Protection Manager.

Azure Cache is a scalable distributed solution, in memory, allowing you to build responsive applications of high availability and scalability, providing fast access to data. Azure HD Insight is a service bringing Apache Hadoop solution in Cloud. Earn Big Data full value with a Cloud-based platform that manages data of any type and size. Hyper-V Recovery Manager helps protect important services; coordinates replication or recovery of virtual machines with a Cloud-based System Centre 2012 in a secondary location. Azure Media Services provide Cloud solutions for many existing technologies for collection, encoding, format conversion, content protection and streaming live or on-demand. Azure Active Directory provides management capabilities of identities and access control for Cloud applications. Azure Multi-Factor Authentication helps prevent unauthorized access to Cloud applications or on-premises: adds another level of authentication. Azure Service Bus is a messaging infrastructure that is put between applications, enabling them to exchange messages for a better scalability and resilience.

Notification Hubs is a cross-platform infrastructure of high scalability for sending notifications. Azure Scheduler allows you to run actions that make HTTP/S calls or send messages in a queue on a settled schedule. Azure Automation allows you to automatize creation, deployments, monitoring and maintenance of resources using a scalable and reliable engine for execution of workflows. Azure Content Delivery Network deliver broadband content to worldwide customers, with low latency and high availability through a robust global network of data centres. Azure API Management lets you publish Pastor Developers, partners or employees, in secure and scalable way.

3.3 Network

Azure Express Route allows you to create private connections between Azure data centres and infrastructure, which is located on premises or in collocation environment. Azure Virtual Network helps us to create VPNs -Virtual Private Networks in Azure and tie safely these VPNs with IT infrastructure. Azure Traffic Manager makes load balancing forth traffic coming towards more services hosted on Azure.

4. VIRTUALIZATION IN WINDOWS AZURE

Virtualization is the most important sector in the field of IT technologies. The current trend in virtualization domain is to install more virtual machines on a physical machine for maximum exploitation of the resources of processor and memory on the life duration of the physical machine. Among virtualization solutions we can include: virtualization at the hardware level (VMware Virtual Centre and ESX, Microsoft Hyper-V and Virtual Server), virtualization at operating level system (Open

Source Open VZ, Sun Solaris Containers, HP Secure Resource Partitions), virtualization at the application level (VMware Thin stall, Microsoft Soft Grid, Symantec -Altars SVS, App Stream, Endeavours), Network virtualization and storage virtualization. Windows Azure enables creating Virtual Machines, offering Iasi (Infrastructure as a Service) so that IT professionals can create and use virtual machines in cloud.

Virtual Machine developed for Windows Azure offers to users the possibility of using a R2 image in Windows Server 2012 system as well as the possibility of running Linux through a virtual machine, as shown in Fig. 2



Figure 2. Contained operating systems

These servers, either Windows or Linux can be accessed via Remote Desktop. System Center 2012 R2 provides unified management and system administration for Cloud and Microsoft Azure platforms, having also the following capabilities provision of infrastructure; providing infrastructure; monitoring infrastructure; on-demand service and automation; performance monitoring; service management. System Center 2012 works with Windows Server 2012 to manage a large number of physical machines [28-31]. The virtual machine has a private IP and access to this can only be done through an intermediate machine (Load Balancer), which provides **public** IP (VIP) see Fig 3. At any time is known and monitored the occupancy and load degree of virtual machine used, as can be seen in Fig 4.



Figure 3. Identifying the IP of virtual machine

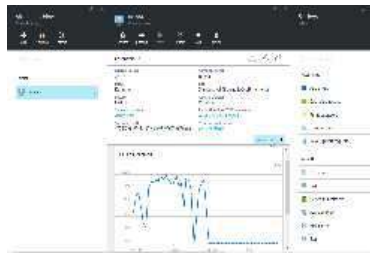


Figure 4. Virtual machine properties

Connecting to virtual created machine is performed based on authentication according to Fig 5. It is very important that the Azure virtual servers to be accessible from anywhere. Windows Azure contains a "preview feature" called VHD Role and allows us to realise virtual machines as in the Amazon or any other hosting virtual machines, either from a predefined template, or with a WHD custom, which then is loaded into cloud [32-34].

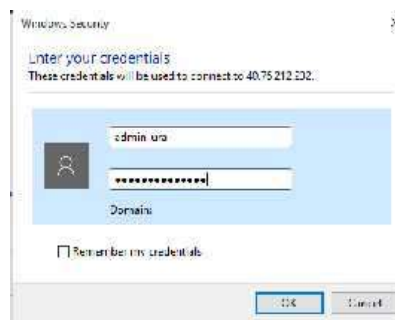


Figure 5. Connecting to virtual machine

These servers, either Windows or Linux can be accessed via Remote Desktop. Among the highest advantages that virtualization technologies offer the following are most important: the multiple applications and operating systems can run on a single physical system; servers can be centralized in virtual machines; available natural resources are treated as a common part and are controlled within the virtual machine.

5. MICROSOFT AZURE VS AWS COMPARISON

Feature	Microsoft Azure	AWS
Compute power	Microsoft Azure provides the freedom to users to choose Virtual Hard Disk (VHD), which is equivalent to a Machine Instance, to create a VM. VHD can be pre-configured by Microsoft, the user or a third party. The user must specify the number of cores and memory.	AWS EC2 allows users to configure their own VMs or choose pre-configured machine images, or customizable MIs. Clients can select size, power, memory capacity and number of VMs and choose from different regions and availability zones with which to launch from.
Storage	Azure offers Temporary Storage, Block Storage through Page Blobs for Virtual Machines. Block Blobs and Files also serve as object storage. Azure supports Relational Databases, NoSQL and Big Data through Azure Table and HD Insight. Azure also offers Site Recovery, Import, Export and Azure Back-Up for additional archiving and recovery options.	AWS has temporary storage that is allocated once an instance is started and destroyed when the instance is terminated. AWS also provide block storage (same as hard disks), that can be separate or attached to an instance. Object storage is offered with S3 and data archiving services with Glacier. Fully supports relational and NoSQL databases and Big Data.
Network	Microsoft offers Virtual Network that allows users to create isolated networks as well as subnets, route tables, private IP address ranges, and network gateways.	Amazon offers Virtual Private Cloud so users can create isolated networks within the cloud. Within a Virtual Private Cloud, a user can create subnets, route tables, private ip-address ranges and network gateways.

Integrations and Open Source	Azure Offers native integration for tools such as VBS, SQL Database, and Active Directory. Microsoft hasn't always embraced to open source model but is catching up and can now run Red Hat Enterprise Linux and Apache Hadoop clusters.	Amazon supports open source community so there are more open source integrations available including Jenkins and Github.
User-Friendliness	Azure is easier to use out of the box since it is a Windows Platform. It's simple to integrate on-premises Windows Servers with cloud instances to create a hybrid environment.	Amazon offers a lot of power, flexibility, and customization room with support for many third-party integrations.
Hybrid Cloud Capabilities	Microsoft has strong support for hybrid cloud services, with platforms like Azure StorSimple, Hybrid SQL Server and Azure Stack a new hybrid cloud platform product that allows you to bring nearly full public model it offers for its public cloud.	AWS previously held a cloud first mentality. They are backtracking and slowly responding to the customers need.

6. CONCLUSION

A successful implementation of any IT structure depends heavily on choosing and planning of architecture to meet efficiently the needs of the computer system we want to develop. Maintaining high standards of availability, security and performance in a well-developed regulatory framework will remain the major guiding lines in professional IT services. In order to achieve the desired purpose beneficiaries of cloud should be very careful in choosing a provider. Many of them often assume responsibility for managing the information, but being unable to reach a certain level of service quality may have a major impact on data confidentiality and on operations flows. Microsoft Azure allows developers and users to easily create, maintain and deploy applications. It is fully scalable, offers open access across multiple frameworks, languages and tools.

It is comprised of many different infrastructures and service modules such as big data, backup and recovery, web, mobile, development and testing, media, storage, identity and access management. With all this different service available at a single door step the only thing that is constant in Azure is Change, Rapid Change.

7. REFERENCES

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