CLOUD COMPUTING: WINDOWS AZURE PLATFORM

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Abstract: Cloud computing is the set of technologies and infrastructure capabilities being offered in a utility based consumption model. Windows Azure is Microsoft's Cloud Computing offering to help its customers realize the benefits of cloud computing. This paper is an introduction on Windows Azure and provides insights into different aspects of Azure based development especially for those who are interested in adopting Windows Azure within their Enterprise IT landscape. Windows® Azure™ platformAppFabric provides common building blocks required by .NET applications when extending their functionality to the cloud, and specifically, the Windows Azure platform.

INTRODUCTION

Cloud computing is the set of technologies and infrastructure capabilities being offered in a utility based consumption model. A technical definition is a computing capability that provides an abstraction between the computing resource and its underlying technical architecture (e.g., servers, storage).

Following are the key value propositions of Cloud:

a. Lower upfront capital investments
b. Improved business agility and ability to innovate with reduced entry barriers
c. Pay-per-Use model which significantly aligns IT investment to operational expenditure
d. Elastic scale which helps meet on-demand needs more dynamically

CLOUD COMPUTING CATEGORIZES

Cloud computing today can be delivered in multiple forms and which can be broadly categorized as:

Infrastructure as a Service (IaaS):

IaaS providers abstract IT infrastructure resources such as CPU, storage and memory as services. A Cloud provider manages the physical infrastructure; provisions virtualized instances of operating systems to the cloud consumer. The consumer here is given complete ownership of the virtual image which he/she can choose to configure as they think appropriate. A cloud consumer has better control and flexibility at a system level, however, on the flip side higher administration and licensing overheads will have to be borne by the customer.

IaaS Providers: Amazon, Enamoly, Rackspace

Platform as a Service (PaaS):

PaaS is the next higher level of abstraction in which not only do the technical infrastructure resources, as discussed above, but essential application infrastructure services such as computation, messaging, structured data persistence, connectivity, access control, etc, form a part of the service offering. These are also referred to as the building blocks of cloud applications. Here, cloud consumers have lesser control and flexibility in terms of defining the underlying IT configuration.

However, there is lesser administration and licensing overheads when compared to the earlier model discussed. Also, service consumers would not be responsible to upgrade systems or apply patches on the platform. This would be completely managed and automated behind the scenes by the PaaS providers.

PaaS Providers: Microsoft's Azure, Google AppEngine, Force.com

Software as a Service (SaaS):

SaaS is the highest level of abstraction on the cloud. Here, key application functionalities such CRM, SCM are abstracted and delivered over the cloud. Cloud consumers do not have any control in defining the underlying infrastructure configuration and so there is no management and operational overheads in maintaining the application. Cloud consumers do not have any control in defining the underlying infrastructure configuration and so there is no management and operational overheads in maintaining the application.

SaaS Providers: Salesforce.com and Amitive

MICROSOFT WINDOWS AZURE

Windows Azure is an operating system as a service – we can think of it as Windows in the cloud.

a. Azure is Microsoft's Cloud Computing offering for developers to build and deploy applications on a pay-per- use basis.
b. Azure is a comprehensively managed hosted platform for running applications and services.
c. The Windows Azure Platform is an internet-scale cloud services platform hosted in Microsoft data centers, which provides an operating system and a set of developer services that can be used individually or together.

Azure's flexible and interoperable platform can be used to build new applications to run from the cloud or enhance existing applications with cloud-based capabilities. Windows Azure provides a scalable infrastructure for customer to run their web services and applications.

Azure supports:

Programming language	.NET, PHP, Java, Ruby
Standards and protocols	SOAP, REST, and XML
Development tools	Visual Studio, Eclipse

Figure 1: Azure Support

MICROSOFT WINDOWS AZURE CORE

The Windows Azure Platform at the core is essentially driven by a set of software and hardware components geographically distributed across the globe, which is completely abstracted by a services layer on the top.
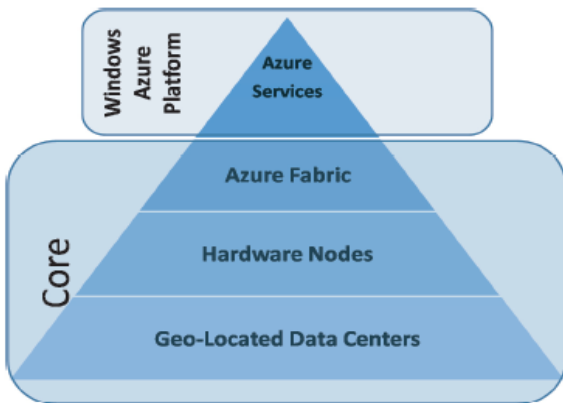

Figure 2: Windows Azure Core

Azure Data Centers:

Microsoft has and will continue to invest in building huge data centers across the globe. A lot of research and investments have also gone in making the data centers run with high efficiency to provide the access to environment friendly sustainable technologies to its customers.

Azure Hardware Nodes:

The Azure data center is a host for several technical Infrastructure components maintained in large numbers. These components include fiber optic cables, high-speed switches, routers, hardware balancers, UPS's, servers, commodity hardware systems, etc., and that too in large numbers.

Azure Fabric:

The Fabric is the actual lifeline of the Azure Platform. All above-mentioned infrastructure components are inter-connected to form a mesh or a fabric. A fabric is a web of inter-connected nodes where high-speed switches through fiber optic channels facilitate the inter-connections and the nodes in the fabric are the commodity hardware, servers, hardware balancers and other technical infrastructure. These infrastructure pieces are glued together by the Azure Fabric controller, which governs the proper functioning of Azure.

a. The Azure Fabric controller maintains manages and provisions machines to host the applications created to be deployed on Azure.

b. It offers services outside the mesh which are responsible for managing all the nodes and other edge devices such as load balancers, servers, switches, routers etc. on the fabric.

c. Azure cloud will consist of several virtualized nodes and be regularly managed and monitored by the

fabric controller.

d. The fabric controller utilizes the configurations Defined in the role to govern the provisioning and management of nodes and additional technical infrastructure resources on the cloud.

MICROSOFT WINDOWS AZURE PLATFORM

The Windows Azure platform provides an Internet-based cloud computing environment for running applications and storing data in Microsoft data centers around the world.
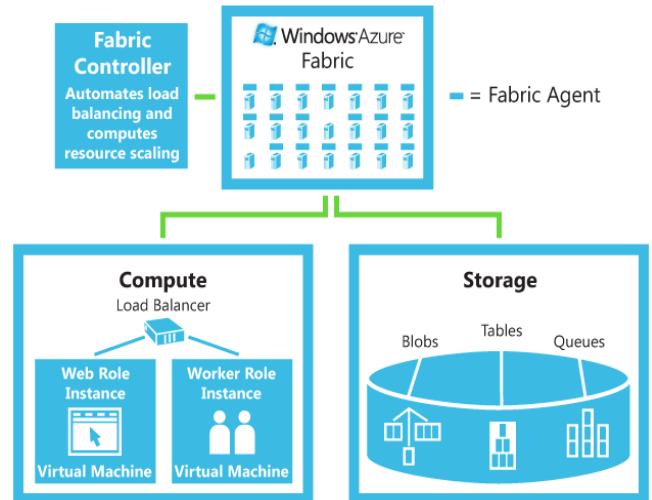

Figure 3: Azure Platform

The Windows Azure fabric provides two main areas of functionality: compute (e.g., executing an application) and storage (e.g., storing data on disk), the foundational building blocks for all cloud applications. In addition to these core services, Windows Azure also comes with Service Bus and Access Control capabilities, which make it easier to extend your .NET applications into the cloud.

Compute:

The compute service offered by Windows Azure makes it possible to "execute" your applications in the cloud. The compute service provides you with a way to run your applications on a Windows Server running in a virtual machine hosted in Microsoft data center. The value is in how Windows Azure provides these core operating system capabilities without theoretical limits.

a. From an application perspective, scale-out is simply a matter of configuration.

b. From a business perspective, Azure shields you from many of the costly IT complexities related to provisioning, configuring, and managing physical servers and the software running on them.

Storage:

It's important to note that the Windows Azure storage services are designed to be very simple and highly scalable. This service allows storing for BLOB storage, queue storage, and simple table storage we interact with these services through a simple REST API based on HTTP requests. We manipulate data in the storage services through traditional POST, PUT, and DELETE requests, and your retrieve information from the storage services using simple GET requests. This approach makes it possible for anyone

to integrate with the storage services, regardless of their platform.

a. It's also important to note that the Windows Azure storage services are not relational and you don't query them using SQL.

b. If we need the richer capabilities of a relational database, turn to SQL Azure.

Service Bus and Access Control:

The Service Bus and Access Control features make it easier to extend the reach of our .NET applications through the Windows Azure platform.

a. The primary feature of the Service Bus is to "relay" messages from clients through the Windows Azure cloud to our software running on-premises, by-passing any firewalls, NATs, or other network obstacles that might be in the way.

b. The primary feature of Access Control is to provide a claims-based access control mechanism for applications to build on in the cloud. This makes federation much easier to tackle, allowing our apps to trust identities provided by other systems

AZURE DEVELOPMENT LIFECYCLE

Azure development lifecycle will primarily follow two stages process. The two stages being

Application Development:

In the application development stage, Azure application code is constructed locally on a developer's workstation

Deployment & Release:

This stage of Azure development lifecycle is carried out on the Azure development portal. A user chooses to upload an application either in staging or production environments, along with the possibility for users to unchangeably swap the deployed code between the two environments.
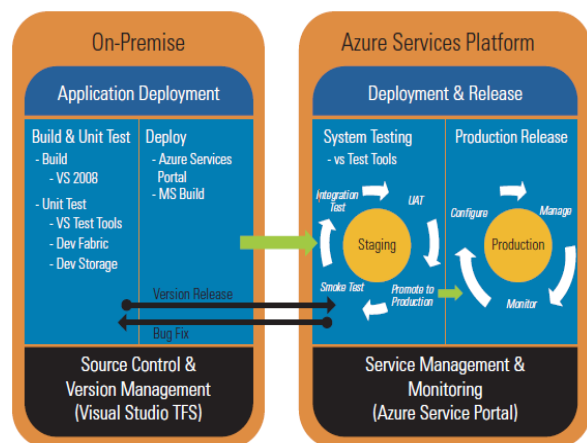

Figure 4

CONCLUSIONS

The truth is evident: Cloud computing is here. For developers, taking advantage of the cloud means using cloud platforms. With the Windows Azure platform, Microsoft presents a range of options addressing a variety of needs:

a. Windows Azure provides a computing and storage environment in the cloud.

b. SQL Azure provides a relational DBMS in the cloud, together with reporting and data synchronization.

c. Windows Azure AppFabric offers cloud-based infrastructure supporting both cloud and on-premises applications.

d. Windows Azure Marketplace is an online store for finding and purchasing datasets from content providers, together with a forthcoming store for cloud applications.

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