Windows Azure

Windows Azure for G Cloud

G-Cloud Service Definition Document in response to G-Cloud ITT tender –

RM1557iii G-Cloud RFx

G-Cloud
Accredited
IL2

Microsoft

Contents

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1. G-Cloud Service Definition for Microsoft Azure

This G-Cloud Service Definition document is to be read in conjunction with Microsoft's standard Service Description documentation for Dynamics CRM Online found at :

www.windowsazure.com.

If there is a conflict between this G-Cloud Service Definition document and the Microsoft Standard Service Description documentation for Windows Azure, the Standard Service Description document shall take precedence.

The Windows Azure service enables customers optionally to access and use a variety of additional resources, applications, or services provided by Microsoft or third party providers (for convenience, "add-ons"), as described in services documentation and/or in the portal through which customer organizations manage and configure their Dynamics CRM Online service. Customers must determine for themselves whether use of these add-ons is appropriate in their individual circumstances.

Specifically Only the Windows Azure services identified in the planned scope of G-cloud Security Accreditation are being offered by Microsoft subject to the Framework Agreement. These include at present:

•   *Cloud Services (includes Web and Worker roles, formerly under Compute)*

•   *Virtual Machines (persistent VM role for Infrastructure-as-a-Service)*

•   *Storage (includes Tables, Blobs, and Queues)*

•   *Networking (includes Traffic Manager, Windows Azure Connect, and Virtual Network)*

•   *Windows Azure Active Directory (excluding Access control)*

Other features of Windows Azure, including but not limited to SQL Database (formerly SQL Azure), Service Bus, Caching, Windows Azure Active Directory – Access Control, Marketplace / Store, are not currently offered subject to the G-Cloud Framework Agreement.

Similarly, any services provided by third parties, data that customer elects to provide to the Microsoft technical support organization, if any, or data provided by or on behalf of customer to Microsoft's billing or commerce systems in connection with purchasing/ordering Windows Azure services is not subject to the currently planned accreditation scope for Windows Azure.

The tender of Windows Azure services to the G-cloud iii Framework does not constitute a tender of services other than those defined in the Windows Azure accreditation scope.

Add-ons, including but not limited to additional resources, applications, or services that are (i) provided by third parties, or (ii) are provided by Microsoft subject to their own terms of use or privacy policies, are not offered subject to the Framework Agreement.

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1.1 Pricing and Ordering

Customers have two licensing programs in which to purchase the Windows Azure platform. They can purchase via the direct model - the Microsoft Online Subscription Program (MOSP). Alternatively, customers can purchase the Windows Azure platform through our Enterprise Agreement (EA) program.

Microsoft Online Subscription Program (MOSP)

Windows Azure can be purchased directly by selecting one of our offers in the MOSP program, the offers are either Pay as you go or can be commitment based. With the pay as you go options you can sign up for monthly billing using the following two methods.

- o Monthly using a credit card.
- o Monthly using an invoice : You can see all the details for setting an invoice billing here : http://www.microsoft.com/windowsazure/invoicing/

Further details of purchase options please see http://www.windowsazure.com/en-us/pricing/purchase-options/

Attachment to an Enterprise Agreement (EA)

Customers are able to purchase Windows Azure services through the EA program either by attaching Windows Azure terms and conditions to an existing EA or through a stand-alone enrolment for Windows Azure. Customers in the EA program can make an upfront annual monetary commitment and receive our discounted commitment rates against any usage until this upfront monetary commitment is exhausted. Any usage in excess of this will be charged at their consumption rates.

The customer can flexibly use their commitment across months and for different resources enabling customers to commit more upfront with much less worry that they will lose their investment if their forecast is incorrect.

Each calendar month their usage is applied against their monetary commitment balance at the discounted commitment rates. Once the balance is exhausted, overage is calculated on the excess usage at the consumption rates. We invoice the customer for their overage on their enrolment's quarterly anniversary dates.

Key Benefits
Some of the key benefits of purchasing in EA include:

- An additional discount for all Azure services
- Standardise the procurement process to match your other Microsoft software and services
- A consolidated reporting interface for all Azure projects helps internal cross-charging

Customers will also be able to aggregate and have visibility of all their usage across all of their MOSP accounts and subscriptions. This includes a single annual bill for commitment and quarterly bills for

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overage. This compares to the MOSP program where the customer receives separate monthly bills for each individual subscription. Customers will also be able to sign up to receive periodic notifications of their unbilled balance at whatever frequency they desire (daily, weekly or monthly). Customers can also download usage data that spans their entire organization.

Who's Eligible to Purchase in EA?

Customers wishing to purchase Windows Azure services through the EA program are required to make a minimum annual of **£7636.80** in a one year subscription.

Once this has been done, customers can access the Windows Azure Enterprise Portal to manage their accounts.

Usage Reporting

Using the Microsoft Online Services Customer Portal you can view past and current bills and usage. The bills include:

- **Recurring Charges** : the flat monthly charges for your base units if you purchased a commitment offer. These recurring charges are billed in advance for your next month's service.
- **Usage Charges** : Monthly charges for the usage that surpasses the amount included with your offer. You are billed in arrears for your past month's usage.

The usage charges are broken down at the following level:

- Name of Service
- Type – variant of service e.g. database size variant.
- Region - Indicates which region the usage applies and primarily relates to data transfers, since these rates can vary by region
- Resource - Identifies the unit of measure for the resource being consumed, resources include:
  - Compute Hours, Access Control Transactions (in 100,000s), Cache Memory (MB/month), Data Transfer GB (except for CDN), Data Transfer (CDN), Database (db/month), Service Bus Connections (cxns/month), Storage (GB/month) and Storage Transactions (in 10,000s)
- Consumed - Contains the amount of the resource that has been consumed during the billing period.
- Included - Identifies the amount that is included each month with your offer
- Billable - If the Consumed amount exceeds the Included amount, this column displays the difference
- Rate - the rate you are charged per billable unit.
- Amount the result of multiplying the Billable column by the Rate column

Depending on your usage, there can be thousands of rows of daily usage data. If you want to analyse this data, you can export the data to a comma-separated variable file (CSV), which can then be viewed in Microsoft Office Excel and other programs.

Free Trials

Information on free trials can be found at: http://www.microsoft.com/windowsazure/free-trial/

If the customer has a **MSDN** subscription, see http://www.microsoft.com/windowsazure/msdn-benefits/.

Windows Azure Pricing

Pricing for VL and MOSP are indicated below:

	Windows Azure		*Enterprise Licensing*	*MOSP*
Lot	**G-Cloud Ref#**	**Short Description**	**Price**	**Pricing**
Lot 1	G2.179.019	Virtual Machines	From £0.085*2 See Table 3.	Latest Pricing at http://www.windowsazure.com/en-us/pricing/details/
Lot 1	G2.179.021	Storage	From £0.53 See Table 4.	
Lot 2	G2.179.023	Virtual Network	£2.15 See Table 5.	
Lot 2	G2.179.024	Connect & Traffic Manager	£0.00*1	
Lot 2	G2.179.025	Cloud Services	From £0.085 See Table 2.	
Lot 2	tba	Active Directory	£0.00*1	

Table 1.

*1 Currently in Preview offered at no charge.
*2 Currently in Preview and offered at the same prices as Cloud Services.

Please speak to your Microsoft Account Manager and ask for the Microsoft Azure G-Cloud Order Form before ordering.

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Windows Azure – Cloud Services			Volume Licensing
Windows Azure Component	Microsoft Part Number	Unit	Unit Price
Extra Small instance	N7H-00013 / 6	Per 10 Hour	£0.085
Small instance	N7H-00013	Per 10 Hour	£0.51
Medium instance	N7H-00013 x2	Per 10 Hour	£1.02
Large instance	N7H-00013 x3	Per 10 Hour	£2.04
Extra-large instance	N7H-00013 x 4	Per 10 Hour	£4.08

Table 2.

Windows Azure – Virtual Machines (CTP)			Volume Licensing
Windows Azure Component	Microsoft Part Number	Unit	Unit Price
Extra Small instance	N7H-00013 / 6	Per 10 Hour	£0.085
Small instance	N7H-00013	Per 10 Hour	£0.51
Medium instance	N7H-00013 x2	Per 10 Hour	£1.02
Large instance	N7H-00013 x3	Per 10 Hour	£2.04
Extra-large instance	N7H-00013 x 4	Per 10 Hour	£4.08

Table 3.

Compute Instance Size	CPU Cores	Memory
Extra Small	Shared	768 MB
Small	1	1.75 GB
Medium	2	3.5 GB
Large	4	7 GB
Extra Large	8	14 GB

Windows Azure – Storage			Volume Licensing
Windows Azure Component	**Microsoft Part Number**	**Unit**	**Unit Price**
Storage – Geo replicated	N9H-00005	Per 10 GB Per Month (geo-replicated)	£ 0.53
Storage – Non Geo replicated	N9H-00006	Per 10 GB Per Month (non geo-replicated)	£ 0.40
Transactions	N9H-00008	Per 10 Million	£ 0.43

Table 4.

Windows Azure – Virtual Network			Volume Licensing
Windows Azure Component	**Microsoft Part Number**	**Unit**	**Unit Price**
Connection	N7H-00018	Per 100 hours	£ 2.15

Table 5.

N.B. Data Transfers

If required data transfer rates are determined by the region in which your solution is deployed. Data transfers between Azure Services located within the same sub region are not subject to charge. Data transfers between sub regions are charged at normal rates on both sides of the transfer. A sub region is the lowest level geo-location that you may select to deploy your applications and associated data. Below is a list of our regions and sub regions:

Windows Azure – Data Transfers			Volume Licensing
Windows Azure Component	**Microsoft Part Number**	**Unit**	**Unit Price**
Zone 1 per GB out	Q5H-00010	Per 10GB Per Month	£ 0.51
Zone 2 per GB out	Q5H-00009	Per 10GB Per Month	£ 0.81

Table 6.

Regions	Sub Regions
Zone 1	North Europe
	Western Europe
	North Central US
	South Central US
Zone 2	East Asia
	Southeast Asia

1.2   An overview of the Windows Azure Service

Windows Azure is an Internet-scale computing and services platform hosted in Microsoft datacentres. It includes a number of features with corresponding developer services which can be used individually or together.

Windows Azure provides both Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) as defined by the NIST definition. You can use the Windows Azure platform in many different ways. For instance, you can use Windows Azure to :

- Build a web application that runs and stores data in Microsoft datacentres.
- Just store data, with the applications that use this data running on-premises (that is, outside the public cloud).
- Create virtual machines to host Windows Server and Linux applications.
- Build massively scalable applications with lots and lots of users.

Because the platform offers a wide range of services, all of these things-and more-are possible. Windows Azure is only accessible through the public Internet and is not connected to any other government networks.

Take a look at our case studies at http://www.windowsazure.com/en-us/home/case-studies/ and http://www.microsoft.com/casestudies/

The following illustration shows the products and components that are part of the Windows Azure platform (not all of which are included in the planned Windows Azure accreditation scope).

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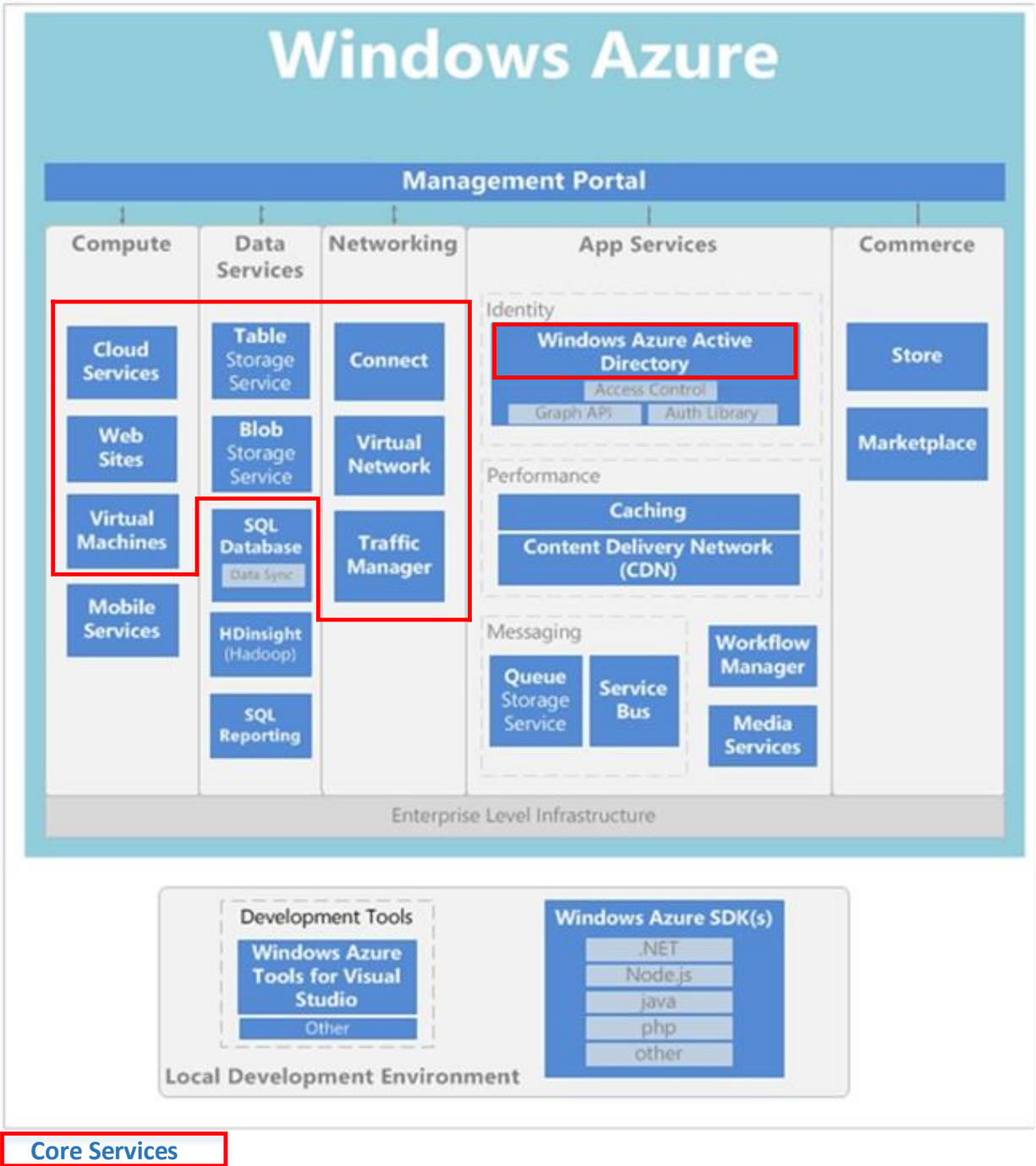
Figure 1 Windows Azure Platform

1.3   Windows Azure - Virtual Machines

Note: Windows Azure Virtual Machines are currently in Preview release.

The ability to create a virtual machine (VM) on demand, whether from a standard image or from one you supply, can be very useful. Add the ability to pay for this VM by the hour, and it's even more useful. This approach, commonly known as Infrastructure as a Service (IaaS), is what Windows Azure Virtual Machines provides.

To create a VM, you specify which Virtual Hard Drive (VHD) to use and the VM's size. You then pay for each hour the VM is running. As Figure 2 shows, Windows Azure Virtual Machines offers a gallery of standard VHDs. These include Microsoft-provided options, such as Windows Server 2008 R2, Windows Server 2012, and Windows Server 2008 R2 with SQL Server, along with Linux images provided by Microsoft partners including Ubuntu, Centos and SUSE. You're free to upload and create VMs from your own VHDs as well.

Wherever the image comes from, you can persistently store any changes made while a VM is running. The next time you create a VM from that VHD, things pick up where you left off. It's also possible to copy the changed VHD out of Windows Azure, then run it locally within your own datacentre.

Windows Azure VMs can be used in many different ways. You might use them to create an inexpensive development and test platform that you can shut down when you've finished using it. You might also create and run applications that use whatever languages and libraries you like. Those applications can use any of the data management options that Windows Azure provides, and you can also choose to use SQL Server or another DBMS running in one or more virtual machines. Another option is to use Windows Azure VMs as an extension of your on-premises datacentre, running SharePoint or other applications. This quite general approach to cloud computing can be used to address many different problems. What you do is up to you.

Benefits of using virtual machines in Windows Azure

- Runway to the cloud for existing applications – A virtual machine in Windows Azure stores operating system data. You can also attach a data disk to a virtual machine for storing application data. These features enable you to easily migrate your applications to Windows Azure as-is, without requiring any changes to the existing code.
- Storage of operating system data – Changes that you make to the configuration of the operating system are preserved in Windows Azure Storage for high durability of data.
- Single instance availability – In Windows Azure, operating system data for a virtual machine is stored for you, which means that customization of the virtual machine only applies to one running instance.
- Full control of the operating system – As an administrator, you can remotely access the virtual machine to perform maintenance and troubleshooting tasks.

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Persistence Model

The Windows Azure Virtual Machines provides a **Persistent** model for Compute as defined by the g-cloud Framework Agreement.   The persistence of the OS and data disks is a crucial aspect of the Virtual Machines offering. Because we wanted the experience to be completely seamless, we do all disk management directly from the hypervisor. Thus, the disks are exposed as SATA (OS disk) and SCSI (data disks) 'hardware' to the Virtual Machine, when actually the 'disks' are VHDs sitting in a storage account. Because the VHDs are stored in Windows Azure Storage accounts, you have direct access to your files (stored as page blobs) and get the highly durable triplicate copies implemented by Windows Azure storage for all its data.

Hypervisor

The Virtual Machines hypervisor is compatible with Microsoft Hyper-V and VHDs can be used interchangeably.

Pricing and Metering for Virtual Machines

Customers can choose between a Windows and Non-Windows Virtual Machine (VM). The Windows VM includes Windows Server licensing costs. The Non-Windows VM allows you to separately license and deploy a non-Windows host operating system.

Pricing is based on usage per hour based on an instance size (as per table below), see Pricing for rates.

Compute Instance Size	CPU Cores	Memory
Extra Small	Shared	768 MB
Small	1	1.75 GB
Medium	2	3.5 GB
Large	4	7 GB
Extra Large	8	14 GB

All Virtual Machine compute hours are converted into small instance hours in the same manner and ratios as described in the Cloud Services section. Compute hours are charged whenever the Virtual Machine is deployed, irrespective of whether it is running or not. Compute hours do not include any Windows Azure Storage costs associated with the image running in Windows Azure Virtual Machines. These costs are billed separately. For a full description of how compute hours are calculated, please refer to the Cloud Services section.

When you upload your on-premises Windows Server images to Windows Azure, Microsoft provides the Windows Server license keys for any running instances. Your on-premises Windows Server license does

not transfer with the uploaded image. If you then download the uploaded image to run back on-premises, you will then be required to supply a license to this image. The license provided in Windows Azure is non-transferrable to on-premises.

Microsoft License Mobility through Software Assurance on Windows Azure

With License Mobility through Software Assurance, you can:

- Deploy certain server application licenses purchased under your Volume Licensing agreement in Windows Azure datacentres.
- Extend the value of your server application licenses by deploying them on-premises or in the cloud.
- Take advantage of the low cost computing infrastructure for changing business priorities.

More program benefit details and information can be found here.

1.4   Windows Azure - Virtual Network

Note: Windows Azure Virtual Network is currently in Preview release.

One useful way to use a public cloud is to treat it as an extension of your own datacentre. Because you can create VMs on demand, then remove them (and stop paying) when they're no longer needed, you can have computing power only when you want it. And since Windows Azure Virtual Machines lets you create VMs running SharePoint, SQL Server, and other familiar on-premises software, this approach can work with the applications you already have.

To make this really useful, though, your users ought to be able to treat these applications as if they were running in your own datacentre. This is exactly what Windows Azure Virtual Network allows. Using a VPN gateway device, an administrator can set up a virtual private network (VPN) between your local network and a defined group of VMs running in Windows Azure. Because you assign your own IP v4 addresses to the cloud VMs, they appear to be on your own network. Users in your organization can access the applications those VMs contain as if they were running locally.

Pricing and Metering for Virtual Network

When you create a hardware VPN connection for your virtual network with a VPN gateway, you will be charged for each VPN connection hour that the connection is provisioned and available. When you terminate your VPN connection, the charges for that connection will cease. Partial VPN connection-hours are billed as full hours. All data transferred over the VPN connection is charged at Windows Azure's standard data transfer rates. All resources consumed within the provisioned private network(s) are charged at regular Azure prices for the resource (e.g. compute, storage etc.).

1.5   Windows Azure - Cloud Services

Windows Azure Cloud Services provides developers a platform to host and manage applications in Microsoft's datacentres across the globe. A Windows Azure application is built from one or more components called 'roles.' Roles come in two different types: Web role and Worker role.

- A **Web role** handles HTTP request via a specialized version of IIS. This is how Windows as your services interact with end users, devices, and Web services. A Windows Azure application can have multiple distinct Web roles, for example when handling admin requests and one handling user requests, as well as multiple distinct worker roles. A web role is supported by Internet Information Services (IIS) 7 and ASP.NET. A load balancer is built into the Windows Azure fabric to appropriately split incoming TCP requests across Web roles as needed.

- A **Worker role** is useful for generalized development, and is commonly used to perform background processing for a web role. The Worker role does not typically interact with end users or devices.

A hosted service may be comprised of any combination of role types, and may include multiple roles of each type.

Developers are free to use the .NET framework or other software that runs on Windows with the Worker role or Web role.

Benefits of Windows Azure Cloud Services

A great application hosting environment

Since the Windows Azure Web role is pre-configured with IIS7, it's easy to create applications using ASP.NET, Windows Communication Foundation (WCF) or other web technologies. Developers can also create applications using languages such as PHP and Java.

Focus on the application, not the operational constraints

The automated service management provided by Windows Azure offers customers the benefits of:

- Administration: Windows Azure automatically takes care of things such as load balancing and failover thereby reducing the effort and cost of administering the application environment.

- Availability: Windows Azure is designed to let developers build applications that are continuously available, even in the face of software upgrades and hardware failures.

- Scalability: Windows Azure enables developers to build scalable applications that run in Microsoft's global data centres. It also allows developers to scale down applications when necessary, letting them use just the resources they need.

Flexible instances sizes to meet your application needs

The table below summarizes the resources provided by each instance size. Each Windows Azure cloud service instance represents a virtual server. Although many resources are dedicated to a particular instance, some resources associated to I/O performance are shared among the compute instances on the same physical host. During periods when a shared resource is not fully utilized, you are able to utilize a higher share of that resource. The different instance types will provide minimum performance from the shared resources depending on their size. Compute instance sizes with a high I/O performance indicator as noted in the table will have a larger allocation of the shared resources. Having a larger allocation of the shared resource will also result in more consistent I/O performance.

Compute Instance Size	CPU Cores	Memory	IO Performance
Extra Small	Shared	768 MB	Low
Small	1	1.75 GB	Moderate
Medium	2	3.5 GB	High
Large	4	7 GB	High
Extra Large	8	14 GB	High

Details on the virtual machine sizes can be found here

A role may interact with the runtime environment by using the Windows Azure Managed API.

Pricing and Metering for Azure Cloud Service

Windows Azure Web and Worker roles are charged only when your application is deployed. When developing and testing your application, remove the Cloud Services instances that are not being used to minimize billing. Partial Cloud Services hours are billed as full hours.

- To learn about using role types: http://msdn.microsoft.com/en-us/library/windowsazure/gg432976.aspx

- To learn about managing applications: http://msdn.microsoft.com/en-us/library/windowsazure/gg433038.aspx

- Further Pricing and Metering Details https://www.windowsazure.com/en-us/pricing/details/#header-2

Local Development Environment

The tools included in the Windows Azure SDK enable you to run, test, debug, and fine-tune your application before you deploy it as a hosted service to Windows Azure.

Windows Azure Tools for Microsoft Visual Studio extend Visual Studio to enable the creation, building, debugging, running and packaging of scalable web applications and services on Windows Azure.

- To learn about the Windows Azure SDK Tools: http://msdn.microsoft.com/en-us/library/windowsazure/gg433055.aspx
- To learn about the Windows Azure Tools for Visual Studio: http://msdn.microsoft.com/en-us/library/windowsazure/ee405484.aspx

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1.6   Windows Azure - Storage

Windows Azure gives you four core storage services that are secure, scalable and easy to access. They provide persistent and durable storage in the cloud. Blobs, Tables, and Queues are all available as part of the Windows Azure Storage account. Unlike local storage, Blobs, Tables, and Queues are accessible by multiple applications or application instances simultaneously, and represent dedicated storage instead of temporary. The capabilities provided by the Windows Azure Storage Service include:

- **Binary Large Object (BLOB) Service**, the simplest way to store text or binary data with Windows Azure.

- **Table Service** is better for large amounts of data that need additional structure, which works exceptionally well with applications that need to work with data in a very detailed manner via queries.

- **Queue Service** for reliable, persistent messaging between Web and Worker role instances.

- **Windows Azure Drive** allows Windows Azure applications to mount a Page Blob, which is a single volume NTFS VHD. This allows applications to upload/download VHDs via blob.

All your content stored on Windows Azure is replicated at least three times. No matter which storage service you use, your data will be replicated on different fault domains (guaranteed different storage racks) thereby making it much more fault tolerant.

In addition, Windows Azure Geo-replication can replicate Windows Azure Blob and Table data between two locations hundreds of miles apart within the same region (i.e., between North and South US, between North and West Europe, and between East and Southeast Asia). Geo-replication is provided for additional data durability in case of a major data centre disaster. The location where your data is geo-replicated is referred to as the secondary location. The secondary location is automatically determined based on the location of the primary, e.g. Western Europe is the secondary location for the Northern Europe data centre. If you do not want your data geo-replicated you can disable geo-replication for your account.

The storage services are all accessible through a REST API enabling their content to be accessed from a wide variety of platforms and devices.

Blobs

Blobs provide a way to store large amounts of unstructured, binary data, such as video, audio, images, etc. In fact, one of the features of blobs is streaming content such as video or audio. There are two types of blob storage available, each provides specific functionality:

Block Blob

- Optimized for streaming (upload and download)

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- Composed of blocks up to 4MB (largest block that can be submitted in one operation)

- Allows blocks to be uploaded before being committed

- Maximum size of 200GB (50,000 blocks)

Page Blob

- Optimized for random access

- Composed of pages that are referenced by offsets from the beginning of the blob

- Maximum size of 1TB, which can be composed of multiple pages, or a single 1TB page

Blob storage provides options for storing metadata for each blob and for taking snapshots of blobs for backups.

Blobs can also leverage the Content Delivery Network (CDN,) which can be used to cache blobs at a data centre located near your customers to ensure fast access to the data stored in the blob.

Queues

Queues provide storage for passing messages between applications. Messages stored to the queue are limited to a maximum of 8KB in size, and are generally stored and retrieved on a first in, first out (FIFO,) basis; however FIFO is not guaranteed.

Processing messages from a queue is a two stage process, which involves getting the message, and then deleting the message after it has been processed. This pattern allows you to implement guaranteed message delivery by leaving the message in the queue until it has been fully processed. If the application processing the message fails before it has completed processing, the message is left in the queue and can be processed by another application. To prevent the message from being processed by multiple applications simultaneously, getting the message causes it to be marked as invisible when it is first read and remains invisible until it is either deleted or a specified time interval has passed.

Tables

Table storage is a collection of row like entities, each of which can contain up to 255 properties; however unlike tables in a database, there is no schema that enforces a certain set of values on all the rows within a table. And while a table stores structured data, it does not provide any way to represent relationships between data. Windows Azure Storage tables are more like rows within a spreadsheet application such as Excel than rows within a database such as SQL Azure, in that each row can contain a different number of columns, and of different data types, than the other rows in the same table.

While table storage does support basic operations such as insert, update, delete, and select, it does not support joins, foreign keys, stored procedures, triggers, or any processing on the storage engine side, such as SQL Database does. Queries returning a large number of results, or queries that time out, return partial results along with a continuation token that allows the query to be resumed.

Pricing and Metering for Windows Azure Storage

Storage capacity is billed in units of the average daily amount of data stored (in GB) over a monthly period for Blob, Table, Queue, and Windows Azure Drive storage. For example, if you consistently utilized 10 GB of storage for the first half of the month and none for the second half of the month, you would be billed for your average usage of 5 GB of storage.

Windows Azure storage provides two levels of redundancy:

- Locally Redundant Storage (LRS) - provides highly durable and available storage within a single sub region.
- Geo Redundant Storage (GRS) - provides our highest level of durability by additionally storing your data in a second sub region within the same region.

Storage accounts by default are set up to be geographically redundant. Customers that do not require this additional level of durability can turn off their storage accounts' default settings for Geo Redundancy.

Storage costs are calculated on a graduated scale based on size and the level of redundancy chosen. A storage transaction cost is also applied, see Pricing for details.

For Windows Azure Drive storage, you will be billed only for the storage space used by the page blob and the read/write transactions to the page blob. You will not be charged for read transactions that utilize the local drive cache. Windows Azure Drive usage is billed at the same rates as standard Windows Azure Storage and is included in these totals on your bill. There will not be a separate line item for Windows Azure Drive on your bill.

- To learn about storing and accessing data: http://msdn.microsoft.com/en-us/library/windowsazure/gg433040.aspx

- To learn about the data storage offerings: http://social.technet.microsoft.com/wiki/contents/articles/data-storage-offerings-on-the-windows-azure-platform.aspx

1.7   Windows Azure - Traffic Manager and Connect

Note: Windows Azure Connect and Traffic Manager are currently in Preview release.

Windows Azure Traffic Manager

Windows Azure Traffic Manager enables you to manage and distribute incoming traffic to your Windows Azure hosted services whether they are deployed in the same datacentre or in different datacentres across the world. Traffic Manager is a load balancing solution that enables the distribution of incoming traffic among different hosted services in your Windows Azure subscription, regardless of their physical location. Traffic routing occurs as the result of policies that you define and that are based on one of the following criteria:

- Performance – traffic is forwarded to the closest hosted service in terms of network latency

- Round Robin – traffic is distributed equally across all hosted services

- Failover – traffic is sent to a primary service and, if this service goes offline, to the next available service in a list

Traffic Manager will monitor each collection of hosted service on any http or https port. If it detects the service is offline Traffic Manager will send traffic to the next best available service. By using this new feature businesses will see increased reliability, availability and performance in their applications.

Windows Azure Connect

Windows Azure Connect provides a simple and easy-to-manage mechanism to setup IP-based network connectivity between on-premises and Windows Azure resources. This capability makes it easier for an organization to migrate their existing applications to the cloud by enabling direct IP-based network connectivity with their existing on-premises infrastructure.

Developers can setup direct connectivity to their cloud-hosted virtual machines, enabling remote administration and troubleshooting using the same tools that they use for on-premises applications.

With Windows Azure Connect, you can use a simple user interface to configure IPsec protected connections between computers or virtual machines (VMs) in your organization's network, and roles running in Windows Azure. After you configure these connections, role instances in Windows Azure use IP addressing like that of your other networked resources, rather than having to use some form of external virtual IP addressing. Windows Azure Connect makes it easier to do tasks such as the following:

You can configure and use a distributed application that uses roles in Windows Azure (for example, a Web role) together with servers in your organization's network (for example, a SQL Server and associated network infrastructure). The distributed application could be one that you are reworking to include not only resources in your network, but also one or more Windows Azure roles, such as a Web role.

Many combinations are possible between Windows Azure roles (Web roles, Worker roles, or VM roles) and your networked resources (including servers or VMs for file, print, email, database access, Web communication, collaboration, and so on).

You can join Windows Azure role instances to your domain, so that you can use your existing methods for domain authentication, name resolution, or other domain-wide maintenance actions. For diagrams that help describe this configuration, first see the basic diagram in Elements of a configuration in Windows Azure Connect, later in this topic, and then see Overview of Windows Azure Connect When Roles Are Joined to a Domain.

For more information see http://msdn.microsoft.com/en-us/library/windowsazure/gg433122.aspx

1.8   Windows Azure – Active Directory

Note: Windows Azure Active Directory is currently in Preview release. Also the Access Control element of Active Directory is not in scope for the G-Cloud Framework.

Windows Azure Active Directory (Windows Azure AD) is a modern, REST-based service that provides identity management and access control capabilities for your cloud applications. Now you have one identity service across Windows Azure, Microsoft Office 365, Dynamics CRM Online, Windows Intune and other 3rd party cloud services. Windows Azure Active Directory provides a cloud-based identity provider that easily integrates with your on-premises AD deployments and full support of third party identity providers.

Windows Azure AD provides software developers with a user centric cloud service for storing and managing user identities, coupled with a world class, secure & standards based authorization and authentication system. With support for .Net, Java, & PHP it can be used on all the major devices and platforms software developers use today.

Use Windows Azure AD to:

- •   **Integrate with your on-premises active directory** - Quickly extend your existing on-premises Windows Azure AD to apply policy and control and authenticate users with their existing corporate credentials to Windows Azure and other cloud services.
- •   **Offer access control for you applications** Easily manage access to your applications based on centralized policy and rules. Ensure consistent and appropriate access to your organizations applications is maintained to meet critical internal security and compliance needs.
- •   **Provide single sign-on across your cloud applications** - Provide your users with a seamless, single sign-on experience across Microsoft Online Services, third party cloud services and applications built on Windows Azure with popular web identity providers like Microsoft Account, Google, Yahoo!, and Facebook.

Windows Azure Active Directory Graph

Windows Azure AD Graph provides programmatic access to Windows Azure Active Directory (AD) through REST API endpoints. Using Windows Azure AD Graph developers can execute create, read, update, and delete (CRUD) operations on Windows Azure AD objects such as users and groups. In the on-premise world, you would usually programmatically access Windows Server Active Directory by using ADSI or ADO.NET libraries. In the cloud, you programmatically access Windows Azure AD using Windows Azure AD Graph.

Role-Based Authorization. Client access permissions are managed using Role-Based Access Control (RBAC). Client applications can be assigned different administrator roles that enable privileges such as read and write. Roles are managed using Office 365 Windows PowerShell cmdlets and scripts.

Microsoft

To Get Started and for further information

- Sign up for a new Windows Azure AD tenant.
  https://activedirectory.windowsazure.com/Signup/QuickSignup.aspx?ru=https://activedirectory.windowsazure.com&ali=1
- Integrate with Windows Azure Active Directory
  https://activedirectory.windowsazure.com/Develop/Default.aspx
- Windows Azure Active Directory Graph http://msdn.microsoft.com/en-us/library/hh974476.aspx

1.9   Additional Windows Azure Features

Windows Azure includes a number of additional features that are not currently in the planned scope for G-Cloud Security Accreditation and thus are not currently offered subject to the Framework Agreement. More information on these features can be found at www.windowsazure.com.   These services may be procured through other procurement mechanisms.

Microsoft is working to expand the scope of services in our ISO 27001 certification and thus eligible for inclusion in the accreditation scope. For current information, please visit the Windows Azure Trust Center compliance page.

1.10   Windows Azure Resource Model

As defined by the resource definition in the G-Cloud Framework agreement, the Windows Azure Compute resources are **Elastic** as additional resources must be requested by a user through the Service Management Portal or programmatically through the Windows Azure Service Management API. The control of resources remains within the control of the subscriber of the service.

Burst style capabilities can be incorporated for example through the Autoscaling Application Block from the Microsoft Patterns and Practices group http://msdn.microsoft.com/en-us/library/hh680892(v=PandP.50).aspx This code block reduces the amount of manual work involved in dynamically scaling an application. It can do this in two different ways: either pre-emptively by adjusting the number of role instances based on a timetable, or reactively by adjusting the number of role instances in response to some counter or measurement that you can collect from your application or from the Windows Azure environment.

1.11   Guaranteed Resources

The Windows Azure platform generally provides a **Non-Guaranteed** resource model as per the definition in the G-Cloud Framework agreement.

For customers who purchase Azure through an Attachment to an Enterprise Agreement (see Ordering and Invoicing Process), by making a commitment to Compute resources Microsoft in return provides a guarantee commitment for the Windows Azure Compute of the greater of 50 concurrent small compute instances per month, or 125% of customer's Estimated Usage.

 If Microsoft fails to meet the compute resource commitment the customer will receive a credit equal to 25% of the monetary value of the unavailable Windows Azure Computer Service at the Commitment rate.

1.12   Managed Application Platform

Microsoft believes the Windows Azure Platform provides both a managed server components and a Managed application deployment platform as defined by the G-Cloud Framework Agreement. Components can be deployed individually or grouped at an Application Platform level, i.e. an Azure Hosted Service could include a number of different web roles, worker roles and VM Role components forming the application, which is deployed and managed as a single entity.

Windows Azure API
The Windows Azure SDK provides several APIs for programming in the Windows Azure environment:

Microsoft

- The **Windows Azure Managed Library** is a .NET library that contains classes for interacting with the Windows Azure compute or runtime environment; for managing Windows Azure Diagnostics; and for accessing the Windows Azure storage services, which include the Blob, Queue, and Table services.

- The **Windows Azure Native Library** is a native code library for interacting with the Windows Azure runtime environment.

- The **Windows Azure Storage Services API** is a REST API for accessing the Windows Azure storage services.

- The **Windows Azure Service Management API** is a REST API for managing your service deployments and storage accounts.

The libraries are all fully documented and supported, for further details see: API References for Windows Azure http://msdn.microsoft.com/en-us/library/windowsazure/ff800682.aspx

1.13 Windows Azure Platform: An Open and Interoperable Approach

As an open platform, the Windows Azure platform allows developers to use multiples languages and development tools to build applications. With its standards-based and interoperable approach, the Windows Azure platform supports multiple Internet protocols including HTTP, XML, SOAP and REST.

Cloud platforms should support commonly used industry standards so as to facilitate interoperability with other software and services that support the same standards. New standards may be developed where existing standards are insufficient for emerging cloud platform scenarios. Microsoft is engaged with the many Standards Organizations related to Cloud Computing including International Organization for Standardization, World Wide Web Consortium and OpenID Foundation, a full list can be found here: http://cloudinteropelements.cloudapp.net/Microsoft-Engagement-With-Standards-Organizations.aspx

Standards and Developer Choice

Cloud Platforms should support commonly accepted standards and may lead to the creation of new standards. Windows Azure platform provides a standards-based environment in that any of the Windows Azure platform services can be called from other platforms and programming languages:

1. Service Access by providing these Open Standards: REST, SOAP and XML

2. Service Authentication by providing these Federated Identity Standards: SAML and OAuth

3. Data Portability by supporting web protocols and open specifications like: OData and TDS

4. Programming Languages and Runtimes: .NET, Java, PHP, Python and Ruby

5. Developer tools : Visual Studio, Eclipse and command-line tools for PHP

6. Windows Azure platform SDKs for multiple languages:

a. NET languages including C#, F#, Visual Basic .NET, and Managed C++.

b. Other languages including PHP, Java, Python, and Ruby

REST-Based APIs

Windows Azure platform supports REST-Based APIs, thus facilitating broad access.

Windows Azure Storage Services may be accessed from within a service running in Windows Azure, or directly over the Internet from any application that can send an HTTP/HTTPS request and receive an HTTP/HTTPS response.

The REST APIs for Windows Azure Storage Services exposes Storage Account, Blob Service, Queue Service, and Table Service.

Open Data Protocol OData

The Open Data Protocol (OData) is a web protocol for querying and updating data over the Web. OData is a REST-based protocol whose core focus is to maximize the interoperability between data services and clients that wish to access that data. It is thus being used to expose data from a variety of sources, from relational databases and file systems to content management systems and traditional websites.

OData targets Web applications, regardless of implementation technology. OData is supported by many Microsoft products, including Windows Azure Storage, SQL Server 2008 R2, Excel 2010, SharePoint 2010, and WCF Data Services.

For example, Open Data Protocol (OData) client libraries are available for:

* .NET, Silverlight,
* AJAX,
* PHP (via OData SDK for PHP)
* Java (via Restlet Extension for OData)

On May 24th 2012, Citrix Systems Inc., IBM Corp., Microsoft Corp., Progress Software, SAP AG and WSO2 submitted a proposal to Organization for the Advancement of Structured Information Standards (OASIS) to begin the formal standardization process for OData.

Execute Native Code

Windows Azure platform computing paradigm is based on the exchange and execution of arbitrary code written using non-Microsoft programming languages with Full-Trust. In a full-trust environment, any code the developer compiles is allowed to run on the local computer.

Windows Azure platform supports running the code in your Web roles under Full-Trust. This capability unlocks a number of compelling scenarios such as use native code via spawning processes or Platform

Invoke (P/Invoke), use .NET Libraries that require Full Trust, provide Inter-process Communication via Named Pipes.

FastCGI

The FastCGI protocol support in Windows Azure hosting environment enables developers to run web applications that are written using dynamic programming languages (e.g., PHP, Ruby).

For more information, see Interoperability Elements of a Cloud Platform
http://www.microsoft.com/cloud/interop/

VHD Image Format Specification
Microsoft offers the Virtual Hard Disk (VHD) Image Format Specification, used by the Windows Azure Virtual Machines service, freely under the terms of the Open Specification Promise to make it easier for partners to develop VHD-based solutions and continue to enhance the capabilities and extensibility of the VHD format.

1.14 Windows Azure Platform: Open Source Usage

Microsoft has supported a number of open source initiatives to extend and enhance the core platform. For example, Microsoft has partnered with Soyatec on the creation of Windows Azure tools for Eclipse (see http://www.windowsazure4e.org). The Windows Azure tools for Eclipse extension builds upon the PHP Development Toolkit (PDT) and integrates Web Tools Platform (WTP) to provide a complete toolkit for Windows Azure web application development. Open source extensions to the Windows Azure Platform available from third parties include:

- Linux distribution images from Microsoft partners for use within the Virtual Machines service including Suse Linux Enterprise Server 11 SP2, OpenSuse 12.01, CentOS 6.2 and Canonical Ubuntu 12.04.

- Windows Azure Plug-in for Eclipse 8 with Java- http://java.interoperabilitybridges.com/articles/deploying-a-java-application-to-windows-azure-with-eclipse

- Windows Azure Plug-in for Eclipse with PHP - http://azurephp.interoperabilitybridges.com/downloads/windows-azure-tools-for-eclipse

- Windows Azure Starter Kit for Java http://wastarterkit4java.codeplex.com/

- Windows Azure Mobile Services http://www.windowsazure.com/en-us/develop/mobile/

- Windows Azure Toolkit for Android https://github.com/WindowsAzure-Toolkits/wa-toolkit-android

- Windows Azure Toolkit for iOS https://github.com/WindowsAzure-Toolkits/wa-toolkit-ios

- Windows Azure Command-Line Tools for PHP Developers
  http://azurephp.interoperabilitybridges.com/articles/deploying-your-first-php-application-with-the-windows-azure-command-line-tools-for-php

The Windows Azure SDK is available for many languages including open source and is available for Windows, Linux and Mac.

- Windows Azure SDK for Java The Source code for the Windows Azure client libraries for Java is available on GitHub and released under an open source license.

- Windows Azure SDK for PHP Source code for the Windows Azure SDK for PHP is available on CodePlex and released under an open source license.

- Windows Azure SDK for Node.js Source code for the Windows Azure Node.js client libraries is available on GitHub and released under an open source license.

- Windows Azure SDK for Python   Source code for the Windows Python client libraries is available on GitHub and released under an open source license.

1.15 Information Assurance

Windows Azure has IL2 for Confidentiality and Integrity accreditation for core features as part of the UK Government's G-Cloud Pan Government Accreditation process. The Service scope defined for IL2 accreditation will take precedence over details contained within this Service Definition.

ISO/IEC 27001:2005 Audit and Certification

On November 29, 2011, Windows Azure obtained ISO/IEC 27001:2005 certification for its core features following a successful audit by the British Standards Institution (BSI). You can view details of the ISO certificate here, which lists the scope as: "The Information Security Management System for Microsoft Windows Azure including development, operations and support for the compute, storage (XStore), virtual network and virtual machine services, in accordance with Windows Azure ISMS statement of applicability dated September 28, 2011. The ISMS meets the criteria of ISO/IEC 27001:2005 ISMS requirements Standard."

The ISO certification covers the policies, controls, and processes applicable to the following Windows Azure core features:

- Cloud Services (includes Web and Worker roles, formerly under Compute)
- Storage (includes Blobs, Queues, and Tables)
- Networking (includes Traffic Manager, Windows Azure Connect, and Virtual Network)
- Virtual Machines

Included in the above are Windows Azure service management features and the Windows Azure Management Portal, as well as the information management systems used to monitor, operate, and update these services.

In our next phase, we will pursue certification for the remaining features of Windows Azure, including SQL Database, Web Sites, Service Bus, Windows Azure Active Directory, and Caching. Microsoft's Global Foundation Services division has a separate ISO/IEC 27001:2005 certification for the datacentres in which Windows Azure is hosted.

SSAE 16/ISAE 3402 Attestation

A detailed Service Control Organizations 1 (SOC 1) Type 2 report is available to customers under a non-disclosure agreement. Please contact Windows Azure customer support or your local Microsoft representative to get a copy of the report.

The audit was conducted in accordance with the Statement on Standards for Attestation Engagements (SSAE) No. 16 put forth by the Auditing Standards Board (ASB) of the American Institute of Certified Public Accountants (AICPA) and International Standard on Assurance Engagements (ISAE) 3402 put forth by the International Auditing and Assurance Standards Board (IAASB), a standard-setting board within the

International Federation of Accountants (IFAC). The examination was conducted in 2012, and it covers the following Windows Azure core features:

- Cloud Services (includes Web and Worker roles, formerly under Compute)
- Storage (includes Blobs, Queues, and Tables)
- Networking (includes Traffic Manager and Windows Azure Connect)

The following additional features were launched after the examination review period but are subject to the same controls and processes that were tested in the audit:

- Virtual Network
- Virtual Machines

Safe Harbour Framework

Microsoft abides by the Safe Harbour framework as set forth by the U.S. Department of Commerce regarding the collection, use, and retention of data from the European Union, the European Economic Area, and Switzerland. See http://www.microsoft.com/online/legal/en-us/Azure_privacy_statement.htm

Microsoft also offers additional contractual commitments to its volume licensing customers:

- A Data Processing Agreement that details our compliance with the E.U. Data Protection Directive and related security requirements for Windows Azure core features within ISO/IEC 27001:2005 scope.
- E.U. Model Contractual Clauses that provide additional contractual guarantees around transfers of personal data for Windows Azure core features within ISO/IEC 27001:2005 scope.

1.16 Data Centre Locations

The Windows Azure Platform (compute and storage) is presently hosted within the following Microsoft datacentres:

Europe

- North Europe - Dublin, Ireland
- West Europe - Amsterdam, Netherlands

North America

- North-central US - Chicago, IL
- South-central US - San Antonio, TX
- West US - Santa Clara, CA
- East US - Ashburn, VA

Asia

- East Asia - Hong Kong, China
- South East Asia - Singapore

When creating a hosted service in Azure, an attribute of this service is the user selected region which determines the location of the deployed service. The location of the deployed service applies to both compute and storage.

1.17 Windows Azure Trust Centre

For current information on our security, privacy, and compliance practices, please visit the Windows Azure Trust Centre: http://www.windowsazure.com/en-us/support/trust-center/.

1.18 Environmental Focus

Microsoft helped develop the EU Code of Conduct for Data Centres, a voluntary commitment to implement energy efficiency best practices and use energy-efficient equipment. Microsoft's data centres adhere to this Code of Conduct. By using cutting- edge sensor and monitoring equipment, new high-efficiency container-based datacentre designs and air cooling systems that reduce the need for mechanical chillers, Microsoft's new datacentres consume 50 per cent less energy for the same level of output than datacentres built just three years ago.

Microsoft's recent datacentre designs in Dublin, Ireland build upon these innovations. They eliminate the chillers and refrigeration systems by using airside economization. The Dublin facility maintains an average 1.25 in Power Use Effectiveness (PUE), an industry metric of datacentre energy efficiency where 1 represents optimal energy use. (The datacentre industry average for PUE is 2; Microsoft datacentres as a

whole currently average 1.53.) It is also improving energy efficiency by approximately 50 percent and using only 1 per cent of the annual water consumption of a traditional industry datacentre. Our datacentre in Dublin is officially recognized by the European Commission's Sustainable Energy Europe Campaign as a best practice for energy efficiency. See http://www.microsoft.com/presspass/features/2011/apr11/04-19GreenDatacenters.mspx

Microsoft's new, fully modular datacentre in Quincy takes the best practices gained from research and development further and maintains a PUE of 1.15-1.2, while reducing the typical datacentre construction time of two years by half. Both facilities rely on 100 percent renewable power sources (hydropower in Quincy and wind power in Dublin) to decrease its carbon footprint as well.

Microsoft and the industry aren't just stopping at measuring and driving greater power efficiencies. Under development are two new metrics called Carbon Usage Effectiveness (CUE), which looks at carbon emissions relative to IT power consumption, and Water Usage Effectiveness (WUE), which looks at water consumption relative to IT power consumption

For Further Information see: http://www.globalfoundationservices.com/microsoft-sustainability-strategy.aspx

1.19   Disaster Recovery

Disaster recovery capabilities for Azure Storage (blobs, tables, queues) are provided through Windows Azure Geo-replication. With Geo replication after the initial commit of the transaction, the primary location asynchronously replicates the recently committed transaction to the secondary location. That transaction is then made durable by fully replicating it across three different storage nodes in different fault and upgrade domains at the secondary location.

Our goal is to keep the data durable at both the primary and secondary location. This means we keep enough replicas in both locations to ensure that each location can recover by itself from common failures (e.g., disk, node, rack, TOR switch failing, etc), without having to talk to the other location. The two locations only have to talk to each other to geo-replicate the recent updates to storage accounts. They do not have to talk to each other to recover data due to common failures. This is important, because it means that if we had to failover a storage account from the primary to the secondary, then all the data that had been committed to the secondary location via geo-replication will already be durable there.

With this first release of geo-replication, we do not provide an SLA for how long it will take to asynchronously geo-replicate the data, though transactions are typically geo-replicated within a few minutes after they have been committed in the primary location.

In the event of a major disaster that affects the primary location, we will first try to restore the primary location. Dependent upon the nature of the disaster and its impacts, in some rare occasions, we may not be able to restore the primary location, and we would need to perform a geo-failover. When this happens, affected customers will be notified via their subscription contact information (we are investigating more programmatic ways to perform this notification). As part of the failover, the customer's "account.service.core.windows.net" DNS entry would be updated to point from the primary location to the

secondary location. Once this DNS change is propagated, the existing Blob and Table URIs will work. This means that you do not need to change your application's URIs – all existing URIs will work the same before and after a geo-failover.

After the failover occurs, the location (what use to be the secondary) that is accepting traffic is considered the new primary location for the storage account. This location will remain the primary location unless another geo-failover was to occur. For further information on Geo-replication see http://blogs.msdn.com/b/windowsazurestorage/archive/2011/09/15/introducing-geo-replication-for-windows-azure-storage.aspx

1.20   On-boarding and Off-boarding Processes

There are two variations in the on-board processes depending how you purchase Azure, either through the Microsoft Online Subscription Program (MOSP) or for customers who purchase Azure through an attachment to an Enterprise Agreement there is an enhanced on-boarding process.

Microsoft Online Subscription Program (MOSP)

The Azure MOSP portal handles all Windows Azure account management and billing. Through the portal, you can sign up for Windows Azure services, add additional services such as SQL Database and create new instances of existing services (referred to as subscriptions).

Subscriptions are really the "billing boundary" for Windows Azure services. You'll want to maintain separate subscriptions for each application (or collection of applications) that require a different billing structure. For example, you can create separate subscriptions with individual billing details if you have different departments all hosting applications on Windows Azure, but requiring separate billing.

You'll need to identify an "account owner" account and a "service administrator" account for each subscription. Each of these accounts is associated with a Windows Live ID. The account owner is responsible for managing the subscription and billing through the portal. The account admin has to manage the technical aspects of the subscription, including the creation of hosted services, through the Windows Azure Management Portal.

Once you've created a subscription, your account administrators can manage hosted services through the Windows Azure Management Portal. They can access this using the service administrator account credentials. See Deploying Hosted Services (Applications) below.

To create a subscription go to https://account.windowsazure.com/Subscriptions

Enterprise Enrolment On-boarding

Customers who purchase Azure through the Attachment to an Enterprise Agreement (see Ordering and Invoicing Process) have access to an additional enterprise portal through which accounts and subscriptions can all be managed through a central point with the ability to have billing information aggregated across accounts.

To administer your Windows Azure services under an Enterprise Enrollment, there are three distinct administrative roles:

Microsoft

- **Enterprise Administrator** The Enterprise Administrator has the ability to add or associate MOSP Accounts to the Enrollment, add or delete Enterprise Administrators and can view usage data across all MOSP Accounts associated to the Enrollment.

- **Account Owner** The Account Owner can add Subscriptions for their Account, update the Service Administrator for an individual subscription and view usage data for their Account.

- **Service Administrator** The Service Administrator has the ability to access and manage subscriptions and development projects within the windows Azure platform development portal. The Service Administrator does not have access to the Enterprise Portal.
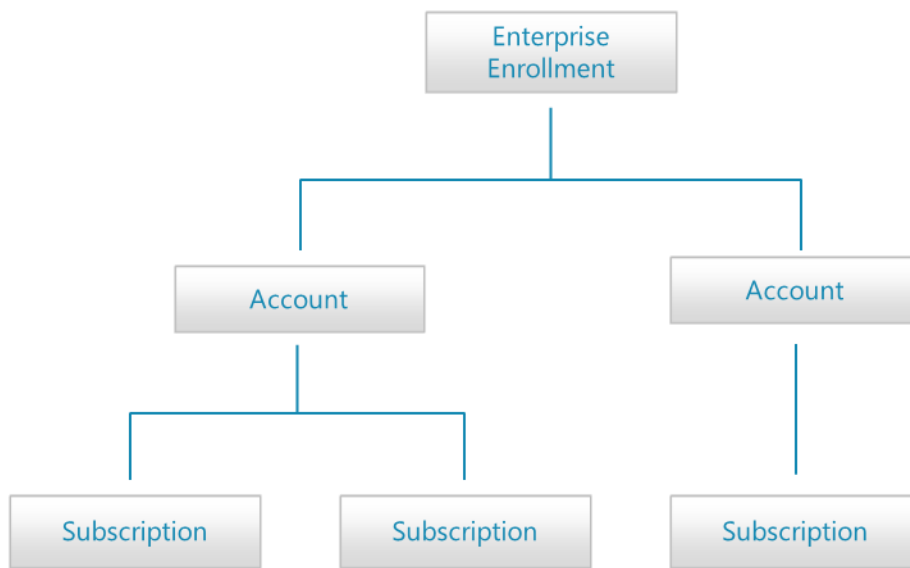
Choosing the right account set up methodology for your organization is an important first step in setting up your MOSP Accounts. How you set up your MOSP Accounts and MOSP Subscriptions will impact how they are administered and how they are reflected on your invoices and reports. Examples of typical set up methodologies include structuring by Functional, Departments or Geography.

You may create a new Account or associate an existing MOSP Account to your Enrolment as long as it has not yet been associated to another Enrolment. Creating a new Account or associating an existing MOSP Account requires confirmation of account ownership. Therefore the owner of the WLID provided in the above step will receive a notification that they have been invited to associate their existing MOSP Account with the Enrolment. To finish associating the account and begin receiving discounted rates, the owner of the WLID must confirm ownership of the MOSP Account by signing into the Enterprise Portal.

Subscriptions can be used to provide access to development projects and environments to different teams within your organization. Creating different Subscriptions for each environment for your application

and assigning a different Service Administrator WLID for each subscription is
a good way to help secure each environment.

A subscription may have any combination of services associated to it. The Account Owner has the ability
to create Subscriptions within their Account.

1.21   Deploying Virtual Machines

It's easy to create a virtual machine that is running the Windows Server or a Linux operating system when
you use the Image Gallery in the Windows Azure Management Portal. A virtual machine in Windows Azure
is a server in the cloud that you can control and manage. After you create a virtual machine in Windows
Azure, you can delete and re-create it whenever you need to, and you can access the virtual machine just
like any other server. You use virtual hard disk (VHD) files to create a virtual machine. You can use the
following types of VHDs to create a virtual machine:

- •   Image - An image is a VHD that you use as a template to create a new virtual machine. An
image is a template because it doesn't have specific settings like a running virtual machine,
such as the computer name and user account settings. If you create a virtual machine using
an image, an operating system disk is automatically created for the new virtual machine.
- •   Disk - A disk is a VHD that you can boot and mount as a running version of an operating
system. A disk is a version of an image that you can run. Any VHD that is attached to
virtualized hardware and that is running as part of a service is a disk. After an image is
provisioned, it becomes a disk. A disk is always created when you use an image to create a
virtual machine.

 You can use the following options to create a virtual machine from an image:

- •   Create a virtual machine by using an image from the Image Gallery of the Windows Azure
Management Portal.
- •   Create and upload a VHD file that contains an image to Windows Azure, and then create a
virtual machine using the image.

For further information on deploying Virtual Machines see http://msdn.microsoft.com/en-
us/library/windowsazure/jj156003

In addition to the portal you can also programmatically use the Windows Azure cmdlets to provision
virtual machines, set up virtual networks and cross-premises networks, and manage the cloud services
that host your workloads. For more information see http://msdn.microsoft.com/en-
us/library/windowsazure/jj152841.aspx

Microsoft

1.22 Deploying Cloud Services (Applications)

For developers, building a Windows Azure application looks much like building a traditional Windows or Web based application. The obvious difference is that the Windows Azure applications are deployed to the Microsoft data centres and will be managed automatically by the Windows Azure fabric controller. Applications deployed to Windows Azure are known as Hosted Services and the Azure platform formalises how these services are defined, configured and how the code (binaries) is packaged.

Whether an application runs in the cloud or in your data centre, it can almost certainly be divided into logical parts. Windows Azure formalizes these divisions into roles. A role includes a specific set of code, such as a .NET assembly or Java JAR file, and it defines the environment in which that code runs. The roles supported today are Web, Worker and VM Role as introduced in the overview. The definition of how the overall service (or application) is assembled from individual roles is specified by a service definition. This is an XML file that defines the roles that comprise a service, options for these roles (virtual machine size, whether native code execution is supported), end points, optional local storage resources, configuration settings, and certificates for SSL endpoints. The service definition is specified when building the service and cannot be changed dynamically when the application is running. Supporting the service definition is a service configuration which is used to define configuration attributes that can be changed when the service is running, for example the number of instances of a particular role, diagnostic settings, and general configuration settings.

When a developer wishes to deploy an application to Azure for the first time, a hosted service is created either through the Azure Management portal or programmatically via the Service Management API. The developer then gives Windows Azure an application to run, they provide the code for the application's roles together with the service definition and service configuration files for this application. Tools to support the definition, packaging and deployment of Azure applications are provided through Visual Studio, Windows Azure Tools for Eclipse or the Windows Azure SDK. In addition we provide a compute and storage emulator which of Windows Azure, so that you can build and test your application within a developer workstation before deploying it to Windows Azure.

Windows Azure hosted service provides production and staging environments within which you can create a service deployment. Typically a service is deployed to the staging environment to test it before deploying the service to the production environment. When it is time to promote the service in staging to the production environment, you can do so without redeploying the service. This can be done by swapping the deployments. The deployments can be swapped by calling the Swap Deployment Service Management API or by swapping the VIPs in the portal.

Microsoft does not provide any SLA for the provisioning of hosted services to the Azure platform. There are a number of variables that can impact the time taken to deploy, including application start-up time, application VHD size. Typical application deployments to the Azure platform range from 6 to 12 minutes.

For more details on deploying and managing Azure hosted services see

- Planning and Designing Applications for Windows Azure http://msdn.microsoft.com/en-us/library/windowsazure/hh674495

- Developing Applications for Windows Azure http://msdn.microsoft.com/en-us/library/windowsazure/gg433098.aspx
- Managing Hosted Services in Windows Azure http://msdn.microsoft.com/en-us/library/windowsazure/gg433038.aspx
- Migrating Applications to Windows Azure http://msdn.microsoft.com/en-us/library/windowsazure/jj156154

1.23 Off Boarding Applications

Azure Hosted services and storage accounts can be simply off boarded and deleted either through the Windows Azure Management Portal or programmatically through the Service Management API.

The major process steps for deleting an Azure hosted service are:

1. Log into the Windows Azure Platform Management Portal.
2. Select the required hosted service. Before you can delete the service, you must delete all current deployments of the service.
3. If needed, delete each service deployment for the service. To delete a service deployment:
   a. Stop the service deployment if it is running. Then wait until the service deployment's status changes to Stopped.
   b. Select the service deployment and select Delete. The deletion process might take several minutes to complete.
4. Finally delete the service

The above steps can also be completed programmatically. For further information see

- How to Delete a Hosted Service from Windows Azure   http://msdn.microsoft.com/en-us/library/windowsazure/hh531565.aspx
- Delete Storage Account http://msdn.microsoft.com/en-us/library/windowsazure/hh264517.aspx

Data extraction/removal
The Windows Azure Platform's two data storage mechanisms are Windows Azure Storage and SQL Database.

Windows Azure Storage
The 3 data services held in Windows Azure Storage Blobs, Queues and Tables are fully accessible through either the Windows Azure Managed Library or Windows Azure Storage Services REST API. A consumer of the service can therefore always access the data held within Azure storage through the public Internet. The Windows Azure storage service also provides the underlying storage for the Virtual Machines service. The extraction of data held within Azure storage is the responsibility of the consumer of the service to extract the data through these storage APIs to migrate the data to another service.

The data standards used to host the data are driven by the consumer in that the format of the data placed within the service is under their control. Data is accessed through open standards of HTTP and REST.

Microsoft does not provide any additional data extract tools outside the storage APIs.

The costs for extraction are the standard consumption costs to call the storage APIs to extract the required data, i.e the Data Transfer costs plus the storage transaction cost (cost per 100,000 storage transactions).

Media Disposal

Microsoft uses best practice procedures and a wiping solution that is NIST 800-88 compliant. For hard drives that can't be wiped we use a destruction process that destroys it (i.e. shredding) and renders the recovery of information impossible (e.g., disintegrate, shred, pulverize, or incinerate). The appropriate means of disposal is determined by the asset type. Records of the destruction are retained.

See Standard Response to Request for Information – Security and Privacy for further details
http://www.microsoft.com/en-us/download/details.aspx?id=26647

2. Windows Azure Service Management

Windows Azure services can be managed through a user interface known as the Windows Azure Platform Management Portal or programmatically through the Windows Azure REST Management API. The Service Management API provides programmatic access to much of the functionality available through the Management Portal. Using the Service Management API, you can manage your storage accounts and cloud services, your service deployments, and your affinity groups.

The Service Management API is a REST API. All API operations are performed over SSL and mutually authenticated using X.509 v3 certificates. The management service may be accessed from within a service running in Windows Azure, or directly over the Internet from any application that can send an HTTPS request and receive an HTTPS response.

For a detailed reference to the management API see the documented API reference at
http://msdn.microsoft.com/en-us/library/windowsazure/ee460799.aspx

2.1   Managing Windows Azure Subscriptions

Windows Azure subscription grants you access to Windows Azure services and to the Windows Azure Management Portal. The terms of the Windows Azure account, which is acquired through the Microsoft Online Services Customer Portal, determine the scope of activities that you can perform in the Management Portal and describe limits on available storage, network, and compute resources.

In the Management Portal, you only see virtual machines, hosted services, storage, SQL databases, and so forth that are created by using a subscription. A Windows Azure subscription has two aspects:

- The Windows Azure account, through which resource usage is reported and services are billed. Each account is identified by a Windows Live ID and is associated with at least one subscription. The account owner monitors usage and manages billings through the Microsoft Online Services Customer Portal.
- The subscription itself, which governs access to and use of the Windows Azure services that are subscribed to. The subscription holder manages services through the Windows Azure Management Portal.

The account and the subscription can be managed by the same individual or by different individuals or groups. In a corporate enrolment, an account owner might create multiple subscriptions to give members of the technical staff access to services. Because resource usage within an account billing is reported for each subscription, an organization can use subscriptions to track expenses for projects, departments, regional offices, and so forth. In this scenario, the account owner uses the Windows Live ID associated with the account to log into the Microsoft Online Services Customer Portal, but does not have access to the Windows Azure Management Portal unless they create a subscription for themselves.

Subscriptions that are created through a corporate enrolment are based on credentials that the organization provides. In this scenario, the subscription holder, who uses the services but is not responsible for billings, has access to the Management Portal but not to the Microsoft Online Services Customer Portal. By contrast, the personal account holder, who perform both duties, can log into either portal by using the Windows Live ID that is associated with the account for which you are an administrator. The billing account sets the number of compute units (virtual machines), hosted services, and storage that can be used.

For further information see http://msdn.microsoft.com/en-us/library/windowsazure/gg465713

2.2   Managing Cloud Services

A cloud service is a container for your service deployments in Windows Azure. You can create a cloud service from within the Management Portal or by calling the Create Hosted Service operation. The name that you give your cloud service must be unique across Windows Azure. This name forms part of the URI for calls that you make to the Service Management API to act on this cloud service.

Actions that you can perform using the API include listing the cloud services in your subscription; creating, updating, and deleting cloud services; returning properties for a hosted service; updating and managing deployments of your hosted service, to the staging and production environments; and upgrading your hosted service. For a complete list of the operations on hosted services available through the API see http://msdn.microsoft.com/en-us/library/windowsazure/ee460812.aspx

2.3   Managing Storage Accounts

A storage account is a unique endpoint for the Windows Azure Blob, Queue, and Table services.

You must create a storage account in the Management Portal to use the Blob, Queue, and Table services. The name you give your storage account becomes the host name within the URI that you use to address Blob, Queue, or Table resources. For example, to address a container resource in the Blob service, you use a URI like the following, where <storage-account> refers to the name of your storage account:

http://<storage-account>.blob.core.windows.net/mycontainer

Each storage account has two associated access keys, a primary access key and a secondary access key. These keys are used to authenticate requests against the storage account.

You can use the Service Management API to manage an existing storage account. The API includes operations to list the storage accounts within your subscription, to return storage account properties, to

retrieve the primary or secondary access key, and to regenerate the keys. See Operations on Storage Accounts for a complete list of API operations http://msdn.microsoft.com/en-us/library/windowsazure/ee460790.aspx

2.4   Deployments and Deployment Environments

When you deploy your service to Windows Azure, the Windows Azure fabric initiates the service lifecycle. The fabric initializes and then starts the roles that make up the service. Once deployed, your service is available via the role endpoints that you've defined in your service definition file.

A service can be deployed to one of two deployment environments: staging or production. The staging environment serves as a testing ground for your service, so that you can see it running in the fabric before moving it to production. When you are ready for your service to go live, you can move it to the production environment.

2.5   Managing Certificates

You can upload management certificates to the Windows Azure certificate store for your subscription, using the Management Portal. Certificates are now packaged and uploaded separately from the binaries for your service. This means that certificates may now be managed by someone other than the developer, such as an IT manager. The service definition file specifies a logical name for the certificate and the name and location of the local store where it may be found, and associates the certificate with a service endpoint. The service configuration file associates the logical name of the certificate with its thumbprint.

See Operations on Certificates for a complete list of API operations.

2.6   Locations and Affinity Groups

When you create a cloud service or a storage account, you must specify a geographical location for it. You can do this either by specifying a data centre location or by specifying that the service or storage account should be part of an affinity group.

An affinity group groups your services together in Windows Azure datacentres. If services in your subscription need to work together – for example, if your hosted service stores data in the Blob or Table service or relies on the Queue service for workflow – then you can organize your hosted service and storage account within an affinity group for optimal performance.

You can use the Service Management API to create, list, delete, update, and get properties of an affinity group within your subscription.

2.7 Subscription History

You can view subscription history for a specified timeframe by using the Service Management API. For example, you can list all hosted services that were created in the past month.

For a complete list of API commands available for viewing a subscription history see http://msdn.microsoft.com/en-us/library/windowsazure/gg715315.aspx

2.8 3rd Party Monitoring Access

The open Service Management API enables Azure to be monitored externally from 3rd party monitoring solutions. Including

- Cerebrata Azure Diagnostic Manager
  http://www.cerebrata.com/Products/AzureDiagnosticsManager/
- Quest Foglight on Azure http://www.quest.com/foglight-for-windows-azure-applications/

In addition an on-premise deployment of Microsoft System Center operations manager can be used to monitor an Azure Hosted Service. A Windows Azure Monitoring Management Pack is provided that enables you to monitor the availability and performance of applications that are running on Windows Azure. After configuration, the Windows Azure Monitoring Management Pack offers the following functionality:

- Discovers Windows Azure applications.
- Provides status of each role instance.
- Collects and monitors performance information.
- Collects and monitors Windows events.
- Collects and monitors the .NET Framework trace messages from each role instance.
- Grooms performance, event, and the .NET Framework trace data from Windows Azure storage account.
- Changes the number of role instances via a task.

For further information see: http://pinpoint.microsoft.com/en-us/applications/windows-azure-application-monitoring-management-pack-release-candidate-12884907699

2.9 Service Availability to Suppliers

The Windows Azure platform is fully available to other suppliers so they can use them to provide services to government. An example of this is Love Clean Streets which mobile and cloud based service built on the Windows Azure Platform by the supplier Bbits. Using the service local authorities can allow citizens

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can report environmental crime such as graffiti, fly-tipping or potholes though their mobile phones; authorities can manage and respond through the integrated services. The service pioneered in Lewisham has been used across the country including its London branded form Love Clean London.

2.10 Service Constraints

Windows Azure does not have scheduled downtimes. Windows Azure SLA for compute is 99.95%, for storage is 99.9%. To qualify for SLA each role must have a minimum of 2 instances.

Microsoft does enforce constraints on the guest operating systems and their compatibility to Azure SDKs. To ensure that your service works as expected, you must deploy it to a release of the Windows Azure guest operating system that is compatible with the version of the Windows Azure SDK with which you developed it. A list of all the versions and also a compatibility matrix is available here : http://msdn.microsoft.com/en-us/library/windowsazure/ee924680.aspx

2.11 Service Levels

Windows Azure has different service level agreements for each of the services; these agreements are centred on availability and connectivity to the service. Microsoft does not provide any service level agreements on the performance of the underlying services.

Windows Azure Cloud Service SLA
We guarantee that when you deploy two or more role instances in different fault and upgrade domains your Internet facing roles will have external connectivity at least 99.95% of the time. Additionally, we will monitor all of your individual role instances and guarantee that 99.9% of the time we will detect when a role instance's process is not running and initiate corrective action.

Windows Azure Cloud Service SLA is available here: http://go.microsoft.com/fwlink/p/?LinkId=159704

Windows Storage SLA
For storage, we guarantee that at least 99.9% of the time we will successfully process correctly formatted requests that we receive to add, update, read and delete data. We also guarantee that your storage accounts will have connectivity to our Internet gateway.

Windows Azure Storage SLA is available here: http://go.microsoft.com/fwlink/p/?LinkId=159705

2.12 Support

Azure support is provided in three forms

- Community Support
- Self -Support
- Assisted Support

Community Support

Community support is provided in the form of a number of Azure blogs provided by the various product teams and a collection of public on-line forums dedicated to Windows Azure. Microsoft has dedicated staff responding to questions raised in the forums. There are individual forums dedicated to the following topic areas:

- Windows Azure Platform Development
- Windows Azure Platform Troubleshooting, Diagnostics & Logging
- Windows Azure Storage, CDN and Caching
- SQL Azure
- Connectivity and Messaging
- Managing Services on the Windows Azure
- Security for the Windows Azure Platform
- Windows Azure Platform Purchasing, Pricing & Billing.
- Windows Azure Media Services

See the following for further information http://social.msdn.microsoft.com/Forums/en-US/category/windowsazureplatform/

Self- Support

Microsoft provides a number of self-support services including:

- **Azure Service Dashboard** – Where you can get the current status on the health of the Windows Azure platform, subscribe to the respective RSS feeds to receive notifications for interruptions to any of the services.
- **Known Issues in Windows Azure-** Review a list of the known issues for Windows Azure.
- **Guest Operating System Updates** Subscribe to the RSS feed to receive notifications for Guest Operating System updates.
- **Windows Azure Platform Frequently Asked Questions** Provides answers to frequently asked questions across all aspects of the Windows Azure Platform, including General topics, Windows Azure Platform services and features, partnering, and commerce and billing topics.

Azure Service Dashboard

Current status on the health of the Windows Azure platform is available on an online through the Azure service dashboard. The dashboard includes both the current status and a historic status of the availability of the service. If you wish to receive notifications for interruptions to any of the services, through an RSS

feed. A detailed incident report for a service that is not running normally is provided through the dashboard.

Figure 2 Azure Service Dashboard

The Azure Service dashboard is available here:
http://www.microsoft.com/windowsazure/support/status/servicedashboard.aspx

Assisted Support

Windows Azure offers flexible support options for customers of all sizes - from developers starting their journey in the cloud to enterprises deploying business critical applications. These support options provide you with the best available expertise to increase your productivity, reduce your business costs, and accelerate your application development. For further information on the support plans available see https://www.windowsazure.com/en-us/support/plans/

Premier Support for Azure

Microsoft's paid for Premier Support Contract customers also have full coverage for Azure. Premier Support takes the support experience to the next level. With Premier Support, you will gain a seamless, managed support experience that spans both your on-premises and cloud-based solutions, enabling you to develop and deliver upon a single, cohesive support strategy. Helping to improve overall IT health and operations, Premier Support includes a complete range of services, including:

- Proactive Services. Engage in developer workshops and leverage application consulting services delivered by an Azure expert. You will optimize your technology and processes while building and enhancing the knowledge and skills of your team.
- Service Management. Benefit from an account representative who will help to alleviate any issues that may arise. Your Account Manager will facilitate your involvement in an ongoing program to effectively utilize the Azure platform, and build efficient and secure applications.
- Problem Resolution Services. Receive prioritized, 24x7 problem-resolution support with an escalation path all the way to the product development and operations teams, as well as upper management at Microsoft.

2.13 Financial recompense model

The financial recompense model for Windows Azure is through a service credit model. SLA Credits are calculated as a percentage of the bill for that service in the month the SLA was missed and then applied to the next month's bill. Details are as below:

- Compute connectivity: 10% credit if we fall below 99.95%, 25% credit if we fall below 99%.
- Compute Role Instance Monitoring: 10% credit if we fall below 99.95%, 25% credit if we fall below 99%.
- Storage: 10% credit if we fall below 99.9%, 25% credit if we fall below 99%,

Real time access to Windows Azure SLA metrics are available at the following url
http://www.microsoft.com/windowsazure/support/status/servicedashboard.aspx

2.14 Training

Microsoft provides many training vehicles to support the Azure platform including:

- Official Curriculum Training
  http://www.microsoft.com/learning/en/us/Course.aspx?ID=50466B&Locale=en-us
- Free Training Kits
- Certification Exams, *PRO: Designing and Developing Windows Azure Applications*
  http://www.microsoft.com/learning/en/us/exam.aspx?ID=70-583

- Microsoft Developer Network website contains all the documentation related with Windows Azure http://msdn.microsoft.com/en-us/library/windowsazure/dd163896.aspx
- Microsoft Press Books, e.g. "Windows Azure Step by Step"

Many 3rd party organisations also provide training for Azure including Develop Mentor, QA and Pluralsight.

Windows Azure Training Kit

The Windows Azure Platform Training Kit includes:

- Hands-on labs

- Demos

- Samples

- Presentations & Videos

This training kit covers all the services included in the Windows Azure Platform and can be found here

- http://www.microsoft.com/en-us/download/details.aspx?id=8396

2.15 Termination Terms

Your use of the Windows Azure platform services is governed by the terms and conditions of the agreement(s) under which you purchased the services. For customers who purchased online directly from Microsoft, this is the Windows Azure Agreement, which incorporates the Microsoft Online Services Use Rights. For customers who purchased through Microsoft Volume Licensing, you can obtain a copy of your agreement(s) by contacting your Microsoft account representative or volume licensing.

2.16 Data Restoration / Service migration

The Windows Azure platform provides redundant storage that help protect against hardware failure. But Windows Azure storage does not have any automated backup and restore capability and it is a consumer responsibility to provide this. The core capabilities to snapshop blobs to implement a backup and restore strategy is provided by the platform.   An example of a backup strategy is explained here: http://blogs.msdn.com/b/windowsazurestorage/archive/2010/04/30/protecting-your-blobs-against-application-errors.aspx

2.17 Consumer Responsibilities

Windows Azure Cloud Services

As a Platform as a Service (PaaS) Microsoft is responsible for managing the platform and the consumer is responsible for managing the application and data.   The Consumer also has the optional choice if Microsoft will automatically patch the underlying operating system for security patches. If this option is not selected the consumer has the responsibility for manually selecting the operating system and patch level to keep the application at the latest security patch level.

Windows Azure Virtual Machines

The Infrastructure as a Service (IaaS) the consumer will be responsible for managing the guest operating system and the software stack above it.

2.18 Technical Requirements

Windows Azure Virtual Machines

The provision of Virtual Machine requires an internet browser to access the Windows Azure Management Portal. How to access the virtual machine is dependent on the operating system.

For virtual machines running the Windows Operating System you will require a Windows Remote Desktop Client .

For a virtual machine that is running the Linux operating system, you use a Secure Shell (SSH) client to logon. You must install an SSH client on your computer that you want to use to log on to the virtual machine. There are many SSH client programs that you can choose from. The following are possible choices:

- If you are using a computer that is running a Windows operating system, you might want to use an SSH client such as PuTTY.
- If you are using a computer that is running a Linux operating system, you might want to use an SSH client such as OpenSSH.

Windows Azure Cloud Services

For the development of applications for the Windows Azure platform requires a client SDK to support the packaging of solutions for deployment to the Azure platform. There are two ways to install the Windows Azure SDK. You can download and install everything using the Microsoft Web Platform Installer or you can install the standalone version of the SDK. See http://www.windowsazure.com/en-us/downloads/

The Windows Azure Tools for Eclipse also provides the availability to develop Windows Azure Services using Eclipse. All the prerequisites are available here http://www.windowsazure4e.org/download/#Pre-requisites

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