THE HENSON GROUP, INC. (THG)

Analysis & Recommendation Document

For

CLIENT X

Consultant: X

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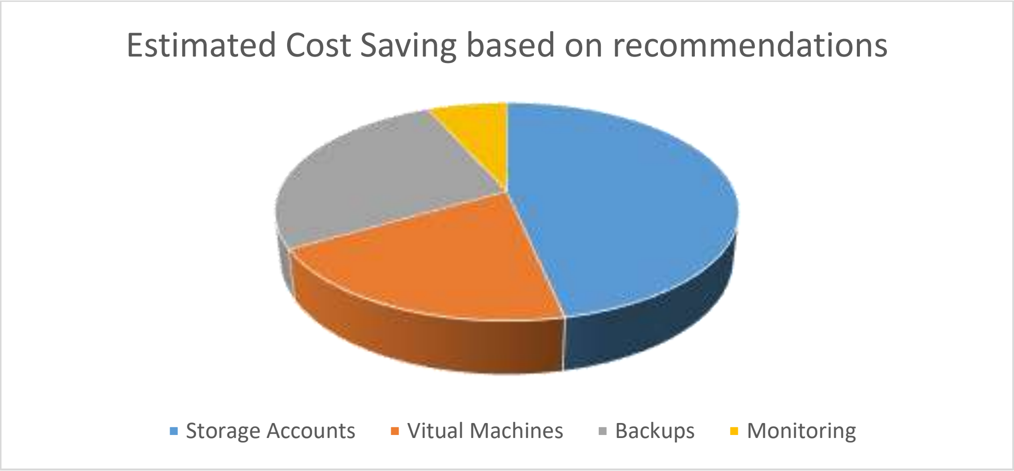
Report Overview

This report and its recommendation have been build keeping the following objectives in mind: Cost Savings, Optimum use of Azure capabilities and Security.

The below table summarizes the scope of improvements with respect to each of these objectives.

Service	Cost Savings				Optimal use				Security			
	High	Med	Low	None	High	Med	Low	None	High	Med	Low	None
Storage Accounts	🟩				🟦					🟨		
Virtual Machines		🟩			🟦					🟨		
Virtual Network				🟩		🟦			🟨			
Monitoring & Analytics			🟩			🟦			🟨			
Backup & Recovery		🟩				🟦						🟨



Since CLIENT X’s usage grew exponentially over the last few months, we recommend investing time & effort at:

- **Optimizing utilization of each resource**: since its cloud you can always allocate more resources, upscale & downscale your applications with a click, unlike forecasting resource utilization for 3-4 years and capacity planning for it. Be it a new VM, a VM being used for only few hours or running huge batch processes on weekly/monthly basis, choose a size that suits you right now and stop/delete what is not needed.
- **Proper categorization** of various types of resources like Dev, Test, UAT and PROD. Azure has specific low cost services and plans for the low priority resources and Premium options for those mission critical ones. Different servers & data have different compliance, backup & recovery needs. In a disaster situation, a PROD server needs to be back and running within minutes maybe a different location, but Dev server can wait a few hours. User data backup should be at a faraway location, maybe a different continent (if compliance allows).
- **Regular monitoring & cleanup:** we highly recommend your System Admins to check Azure diagnostics and remove/archive unwanted resources. Some resources just need to stopped like VMs and Backups while others need to be deleted or achieved like blobs, networks, gateways,

- **IaaS to PaaS movement:** everyone starts with basic services like VM and storage disks. This does reduces management effort but the true potential of cloud remains in the PaaS and SaaS services. Pre-configured and immediate auto-scaling for web apps & databases, auto-recovery in case of failure, point-in-time restore of data, threat detection and alerts etc. A good cloud roadmap and the right execution can help you with long term gains, reduced costs, higher performance and easier manageability.
- **Plan development for Cloud and not traditional IT:** Azure highly supports DevOps scenarios where your Dev team can directly publish code to their Dev site and databases from their development studio. Testing can happen at realtime and the same environment can be reset for UAT thus saving time. Deploy new code without any downtime in PROD or do A/B testing and check how your customers responded using highly integrated telemetry services for your web, mobile or IOT apps.

Storage management

We analyzed each storage account in depth and the following needs to be highlighted:

1. Azure storage accounts actually consist of multiple services. Each has its own price, limits and usage. Refer to Appendix 1 for more details on limits.
   a. Blobs – these can be files of any type.
      - Max size 195 GB. This affects few use cases eg. a SQL backup of a huge database being saved directly to Storage account as a blob but the backup file is larger than 195GB, then backup job will fail.
      - These are billed as per total size of all the blobs in a storage account.
      - All blobs need to be contained in a "Container".
      - There is not concept of nested containers, however to organize data you can use a folder structure by using a "/" in the file name at the end of each folder name.

   b. Page Blobs – these are all the VHD files used by Azure VMs
      - Max size – 1 TB
      - The billing for Standard Storage account and Premium storage account is different. Explained later.
      - If you need a disk bigger than 1 TB then utilize the "Spanned volume" option in Windows Disk manager. Please note this has disadvantages too as data recovery or moving disks to a different VM has to be done very carefully and is prone to errors.

   c. File Share – these are SMB shares
      - Max size – 5 TB
      - Maz IOPS – 1000
      - They have higher IOPS (nearly twice) than a standard VHD disk and even a P10 premium disk.
      - This is billed on the allocated size of the File Share and not on its consumption. Eg. a 5TB file share with 200GB data will be billed for the complete 5TB.

   d. Tables – these are NoSQL tables. Can be used for Big Data, logs or any other non-relational data types.
      - It is billed as per usage and doesn't need a size to be allocated.
      - Max size of a table entity – 1 MB
      - Max size of a table – 500TB

   e. Queues – these are data queues that can be used by applications to store small data packets. This is out of scope for this document.

2. Storage account replication types

LOCALLY REDUNDANT STORAGE (LRS)	ZONE REDUNDANT STORAGE (ZRS)	GEOGRAPHICALLY REDUNDANT STORAGE (GRS)	READ-ACCESS GEOGRAPHICALLY REDUNDANT STORAGE (RA-GRS)
Makes multiple synchronous copies of your data within a single datacenter	Stores three copies of data across multiple datacenters within or across regions. For block blobs only.	Same as LRS, plus multiple asynchronous copies to a second datacenter hundreds of miles away	Same as GRS, plus read access to the secondary datacenter

3. Standard storage account

a. It has all the different Storage account services mentioned above.
b. This supports all 4 types of storage account replications – LRS, ZRS (some locations), GRS and RA-GRS.
c. The VHDs are billed as per as per data consumption on them and not the size allocated. Eg. if we create 1 TB VHDs disk but it only have 200GB data on it, then you shall be billed for 200GB + few GBs extra for the partition tables but not for the complete 1 TB.
d. VHDs have a limit of 500 IOPS per disk and the storage account has a limit of 20,000 IOPS. Hence do not create more than 40 disks on a single storage account to avoid performance issues.
e. **Recommendation**, never create more than 20 disks on a single storage account.

4. Premium Storage account

a. It only supports Blobs and Page Blobs.
b. The VHDs are billed are per their size allocated, irrespective of consumption. Eg. a 1TB VHD with 200GB data will be billed for the complete 1TB.
c. It only supports the LRS replication type.
d. The IOPS limits of disk depends on its size. Refer table below:

Premium Storage Disk Type	**P10**	**P20**	**P30**
Disk size	128 GB	512 GB	1024 GB (1 TB)
Max IOPS per disk	500	2300	5000
Max throughput per disk	100 MB per second	150 MB per second	200 MB per second
Max number of disks per storage account	280	70	35

We can categories your storage into multiple usage classes but the ones that need immediate attention are below:

- Accounts with RA-GRS replication type
  - This is a very expensive replication method, 240% of LRS and 20% more than GRS.
  - Should be used only for specific use cases where all the data on the storage account needs to be read-only at the secondary data location.
  - **Account 'finfe2stdgClient X' needs attention.**
- Accounts with huge File Shares
  - File Shares as explained earlier get billed for the allocated size.
  - There can be increased and reduced easily from the portal without any loss of data.
  - **Accounts 'iinfe2stdgClient X' and 'iinfe2stdlClient X' needs attention.**
- Accounts with many 1TB VHDs
  - As mentioned above, there is a limit to the maximum number of disk per storage account.
  - Reduce empty disks, move disks to another premium or standard storage accounts.

  - **Accounts 'iinfe2prem5Client X, iinfe2prem6Client X, iinfe2premClient X, iinfe2stdgClient X, iinfe2stdlClient X' needs attention.**
- Accounts with GRS replication type
  - This replication type is 200% more expensive than LRS.
  - Should be used only for data that needs high redundancy.

Some good practices are being followed and need more push:

0. Backup SQL databases as Blobs to a storage account instead of a drive or file share. It helps in easy and direct access to backup files.
1. Use of GRS type storage account for backups. This gives an extra level of redundancy.

Not Recommended: Saving SQL to a Local disk on GRS type storage account and also setting up File Backup of the same files on a LRS or GRS Recovery Vault. Although this increases the redundancy to 4 times but is an overkill with high cost and low benefit.

Cool & Hot Storage

This is new specialized Storage account type for Cool (data with low access needs) and Hot (data with high access needs).

- This storage account will only support blobs and not the other storage account services.
- This only supports LRS, GRS and RA-GRS replication types.
- Cool Storage – low data cost than standard blobs, higher access cost
- Hot Storage – higher data cost than standard blobs, lower access cost
- All API are compatible with this storage account type.
- It supports on Azure Resource Manager (ARM) model and doesn't exists in Classic storage accounts.

Refer https://azure.microsoft.com/en-us/pricing/details/storage/blobs/ for a detailed pricing comparison between Cool & Hot storage with each replication type.

Approx. Cost Savings: $3000 - $4500

Virtual Machines

We analyzed your VMs and based on the information available as of now, the following needs to be highlighted:

Using Premium disk with D-series VMs instead of Standard disk

1. Azure Premium Storage delivers high-performance, low-latency disk support for virtual machines running I/O-intensive workloads.
2. VM disks that use Premium Storage store data on solid state drives (SSDs).
3. You can migrate your application's VM disks to Azure Premium Storage to take advantage of the speed and performance of these disks.
4. An Azure VM supports attaching several Premium Storage disks, so that your applications can have up to 64 TB of storage per VM. With Premium Storage, your applications can achieve 80,000 IOPS (input/output operations per second) per VM and 2000 MB per second disk throughput per VM with extremely low latencies for read operations.
5. Azure Premium Storage disks can be attached to supported Azure VMs (DS, DSv2, GS, or Fs series).
6. A Premium Storage account only supports Locally Redundant Storage (LRS) as the replication option and keeps three copies of the data within a single region.

The following needs attention in your environment:

1. D-series VMs with Disk on Standard Storage account
    a. This refers to VMs that have been configured as DS-series but their disks are hosted on a Standard storage account. This is a common mistake and leads to lower performance than expected.
    b. Please refer to “Appendix: How to move VMs to Premium Disk(Storage Account)” for steps to correct this issue.
    c. VM “admin10” needs attention.

2. Multiple VMs with disks on same Standard account thus exhausting IOPS limits
    a. Bad overall performance on the VM
    b. Degraded performance multiple VMs sharing the storage account.
    c. VMs ‘bu30, bu31, bu35’ need attention.
3. Multiple VMs with disks on same Premium account thus exhausting IOPS limits –
    a. Bad overall performance on the VM
    b. Degraded performance multiple VMs sharing the storage account.
    c. VMs ‘FS30, FS31’ maybe need changes if you are facing slow performance as currently they have 16 P30 (1TB) disks. Adding more than 20 P30 disks is not recommended by us.

The following Best Practices could also be adopted:

1. Identify VMs with adhoc or scheduled usages
2. For Adhoc usage, users can be given access to specific VMs or a PowerShell script that will start the VM when needed and shutdown after usage. Eg. Test VMs.

3. For scheduled usage, Azure Automation can be used to start VMs only for a specific time period daily, weekly or monthly and shutdown after the period is over. Eg. Dev VMs start at 9am daily on weekdays and shutdown at 6pm.
4. Use Dev-Test labs for managing Dev & Test VMs, templates, easier scheduling & helps keep Production and other environments untouched on the same subscription.

Approx. Cost Savings: $1200 - $2000

Backup & BCDR

Currently backup is setup on the below VMs with different configurations:

- GRS – 110 TB across 5 VMs and 4 set of File & Folders.
- LRS – 6.8 TB across 2 VMs

Another service to be considered for future use could be the Azure Site Recovery (ASR). Although it doesn't support Azure-to-Azure failover currently but this feature is expected to be available soon.

This can help a quicker and structured failover to a new data center or secondary location in case of data center failure.

Major ASR advantages:

1. Higher frequency of backups unlike once a day with Azure Backup service
2. Ability of failover a specific pre-configured network at a secondary physical or Azure location.
3. Ability to failback to the original Azure location (yet to be released for public preview)

Above mentioned storage optimization will lead to cost savings on backup as well.

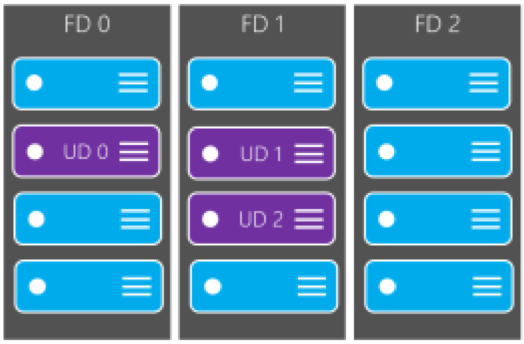
Note: implementation of ASR is a complex procedure and hence out of scope for this report. Please let us know if you are interested in using this service.

Assuming the backup data reduces to 60% of current, then approx. Cost Saving: $2000

Availability Sets

Configure multiple virtual machines in an availability set for redundancy

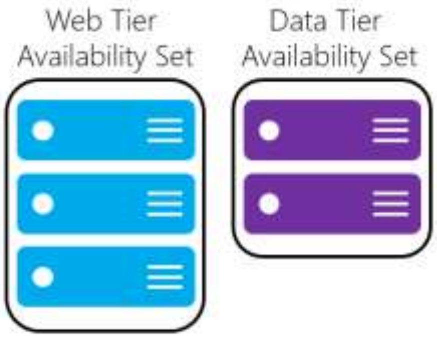
To provide redundancy to your application, we recommend that you group two or more virtual machines in an availability set. This configuration ensures that during either a planned or unplanned maintenance event, at least one virtual machine will be available and meet the 99.95% Azure SLA.



Configure each application tier into separate availability sets

If your VMs are all nearly identical and serve the same purpose for your application, we recommend that you configure an availability set for each tier of your application. By configuring at least two virtual machines in an availability set for each tier, you guarantee that at least one virtual machine in each tier will be available.

For example, you could put all the virtual machines in the front-end of your application running IIS or SQL Server cluster in a single availability set. Make sure that only front-end virtual machines are placed in the same availability set. Similarly, only data-tier virtual machines are placed in their own availability set. In your case you can use it for all File Servers too so atleast 1 of them is running even during planned Azure maintenance.



Combine a load balancer with availability sets

Combine the Azure Load Balancer with an availability set to get the most application resiliency. The Azure Load Balancer distributes traffic between multiple virtual machines.

If the load balancer is not configured to balance traffic across multiple virtual machines, then any planned maintenance event will affect the only traffic-serving virtual machine, causing an outage to your application tier. Placing multiple virtual machines of the same tier under the same load balancer and availability set enables traffic to be continuously served by at least one instance.

Auto-Scaling Azure VMs

In every environment we can find VMs that are subjected to conditions where scale-up or scale-out for short period is needed. This can be either done manually by changing the VM size for Scale-up or create multiple copied manually to scale-out.

For web applications, Azure Website provided an easy scale-up and scale-out service but for VMs its not currently possible. However, an auto-scaling out of Azure VMs can be configured for similar VMs using the below method without any pre-provision on VMs.

Create a Windows Virtual Machine Scale Set using Azure PowerShell

Virtual machine scale sets are an Azure Compute resource you can use to deploy and manage a set of identical VMs. With all VMs configured the same, VM scale sets are designed to support true autoscale – no pre-provisioning of VMs is required – and as such makes it easier to build large-scale services targeting big compute, big data, and containerized workloads.

Please see “Appendix: Create a Windows Virtual Machine Scale Set using Azure PowerShell” for a step-by-step walkthrough of the process.

Note: there is also another method to achieve auto-scaling but that needs pre-provisioned VMs. We don’t recommend that method due extra storage needs, high maintenance of VM images (any change on the Primary VM needs to be manually done to each pre-provisioned copy) and unreliable Windows updates & patch management.

Billing Alerts

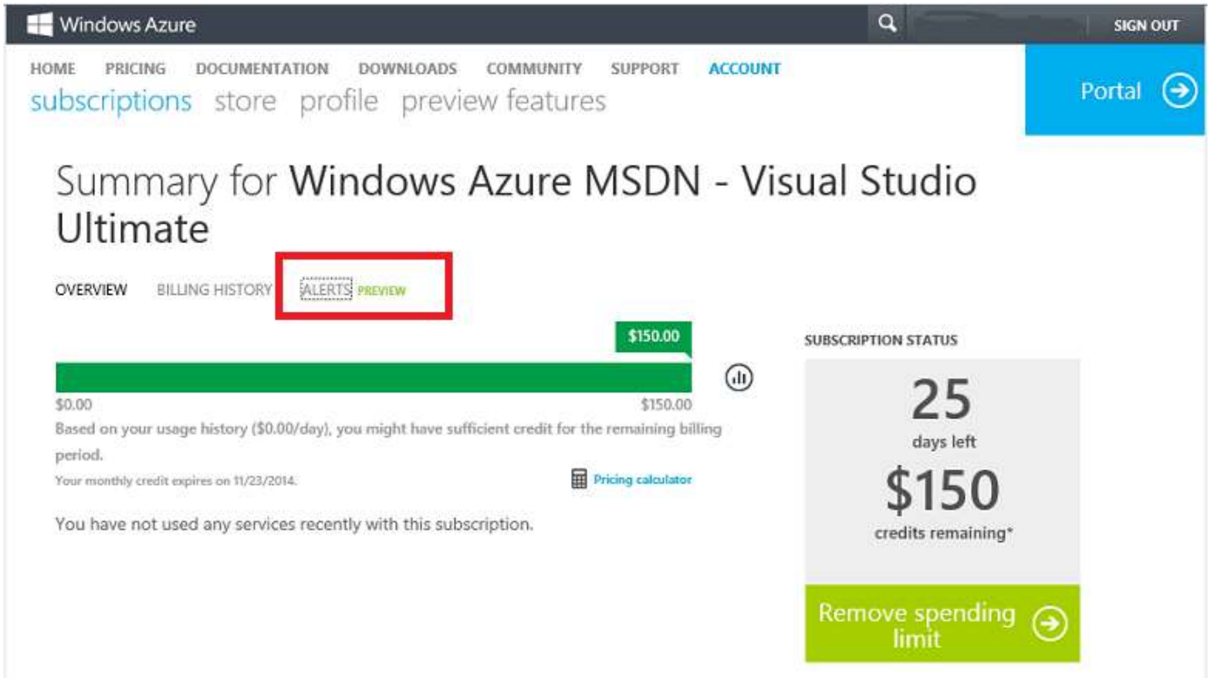
Set up billing alerts for your Microsoft Azure subscriptions

If you're the account administrator for an Azure subscription, you can use the Azure Billing Alert Service to create customized billing alerts that help you monitor and manage billing activity for your Azure accounts.

This service is a preview service, so the first thing you have to do is sign up for it. Visit the Preview Features page in the Azure account management portal to do enable this feature.

Set the alert threshold and email recipients

After you receive the email confirmation that the billing service is turned on for your subscription, visit the Subscriptions page in the account portal. Click the subscription you want to monitor, and then click Alerts.



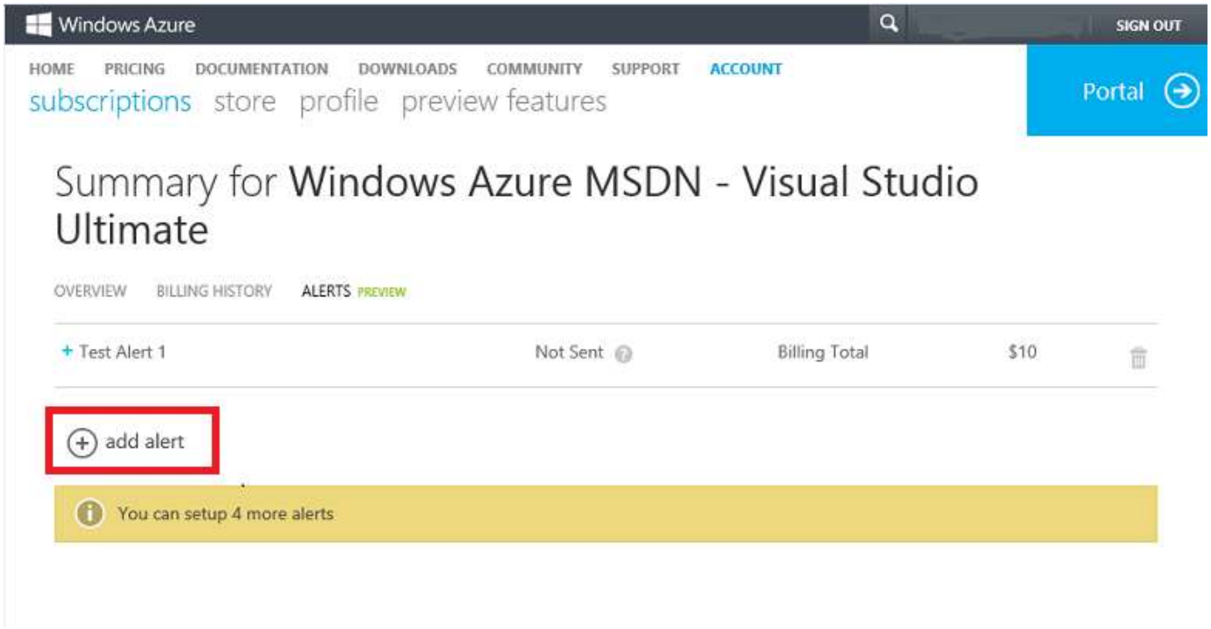
Summary for Windows Azure MSDN - Visual Studio Ultimate

Based on your usage history ($0.00/day), you might have sufficient credit for the remaining billing period.

Your monthly credit expires on 11/23/2014.

You have not used any services recently with this subscription.

Next, click Add Alert to create your first one - you can set up a total of five billing alerts per subscription, with a different threshold and up to two email recipients for each alert.

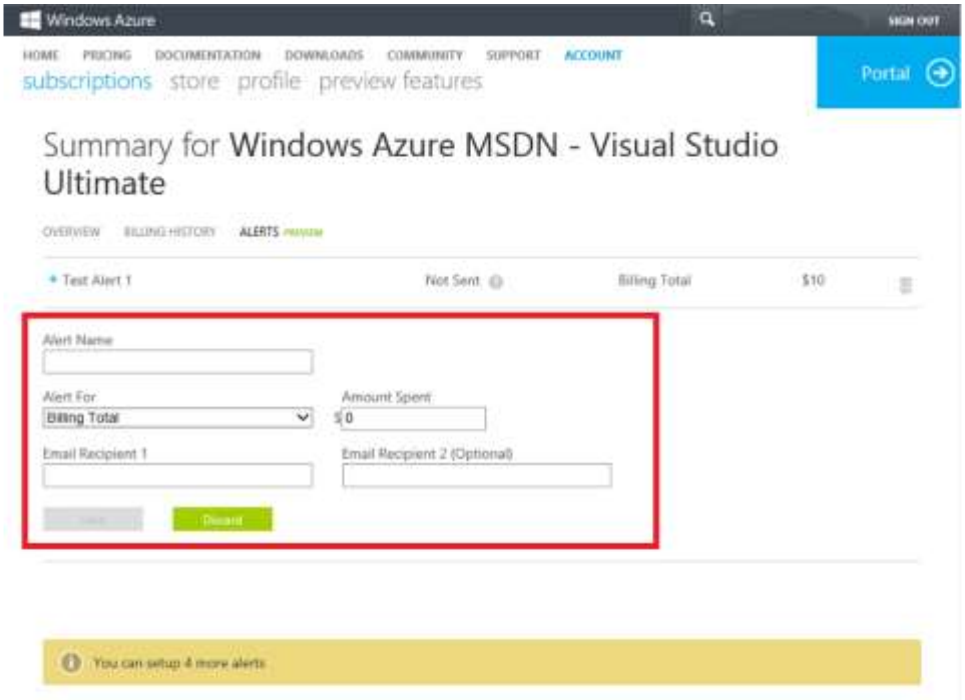

Windows Azure
SIGN OUT
HOME PRICING DOCUMENTATION DOWNLOADS COMMUNITY SUPPORT ACCOUNT
subscriptions store profile preview features
Portal
OVERVIEW BILLING HISTORY ALERTS PREVIEW
add alert

Summary for Windows Azure MSDN - Visual Studio Ultimate

+ Test Alert 1	Not Sent	Billing Total	$10

You can setup 4 more alerts

When you add an alert, you give it a unique name, choose a spending threshold, and choose the email addresses where alerts will be sent. When setting up the threshold, you can choose either a Billing Total or a Monetary Credit from the Alert For list. For a billing total, an alert is sent when subscription spending exceeds the threshold. For a monetary credit, an alert is sent when monetary credits drop below the limit. Monetary credits usually apply to free trials and subscriptions associated with MSDN accounts.


Windows Azure
SIGN OUT
HOME PRICING DOCUMENTATION DOWNLOADS COMMUNITY SUPPORT ACCOUNT
subscriptions store profile preview features
Portal
OVERVIEW BILLING HISTORY ALERTS PREVIEW
Save
Discard

Summary for Windows Azure MSDN - Visual Studio Ultimate

+ Test Alert 1	Not Sent	Billing Total	$10

Alert Name

Alert For: Billing Total

Amount Spent: $ 0

Email Recipient 1

Email Recipient 2 (Optional)

You can setup 4 more alerts

Azure supports any email address but doesn't verify that the email address works, so double-check for typos.

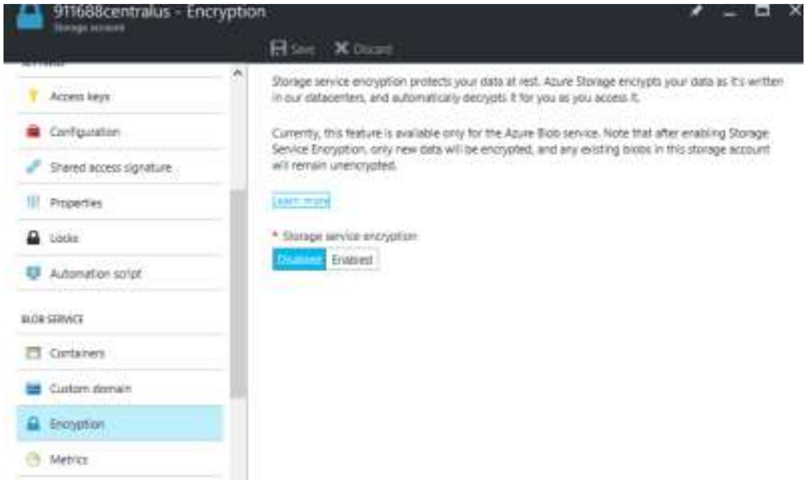
Check on your alerts

After you set up alerts, the Account Center lists them and shows how many more you can set up. For each alert, you see the date and time it was sent, whether it's an alert for Billing Total or Monetary Credit, and the limit you set up. The date and time format is 24-hour Universal Time Coordinate (UTC) and the date is yyyy-mm-dd format. Click the plus sign for an alert in the list to edit it, or click the trash-can to delete it.

Security

We observed that there are security best practices lagging in the environment and the following needs to be done:

1. Use Network Security Group (NSG) with each NIC
2. Configure NSG for specific ports
3. Configure NSG rules for specific IP addressed that need access, do not leave it open to all.
4. Do not add a Public IP for backend servers unless there is a specific requirement.
5. Access backend servers using a secure Point-to-site, Site-to-site VPN or ExpressRoute.
6. Use static Private IPs
7. Use Static Public IPs for all web and front end servers especially those bound to a public domain name. Dynamic IPs change every time the server is restarted manually or during maintenance.
8. Enable Virtual Network monitoring using OMS (solution pack is in Public Preview) to detect any threats and configure alerts for suspicious activities reaching your network.
9. Enable Azure Storage Service Encryption (SSE) for Data at rest. This service is for only Blobs and only new data being added to the storage, so currently it can be used to encrypt your new SQL database backups but old ones will remain unencrypted. This feature is not available for Table, Queues and File shares as of now.
   Simply go to Storage Account settings and Encryption.

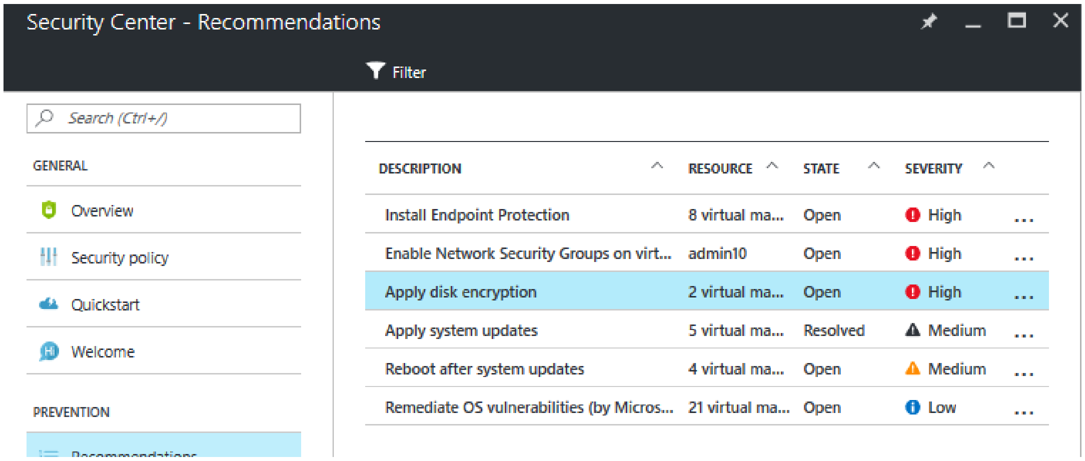


Storage service encryption protects your data at rest. Azure Storage encrypts your data as it's written in our datacenters, and automatically decrypts it for you as you access it.

Currently, this feature is available only for the Azure Blob service. Note that after enabling Storage Service Encryption, only new data will be encrypted, and any existing blobs in this storage account will remain unencrypted.

* Storage service encryption: Disabled

10. Take action on Azure Security Center's recommendation and check for them once in 15days. These recommendations are based on data gathered by Microsoft and follows the latest best practices.
    You currently have a few recommendations pending, you can dismiss the irrelevant ones.



DESCRIPTION	RESOURCE	STATE	SEVERITY	
Install Endpoint Protection	8 virtual ma...	Open	High	...
Enable Network Security Groups on virt...	admin10	Open	High	...
Apply disk encryption	2 virtual ma...	Open	High	...
Apply system updates	5 virtual ma...	Resolved	Medium	...
Reboot after system updates	4 virtual ma...	Open	Medium	...
Remediate OS vulnerabilities (by Micros...	21 virtual ma...	Open	Low	...

Below are a few steps to help setup some of the above recommendations.

ACL in Azure firewall

An endpoint Access Control List (ACL) is a security enhancement available for your Azure deployment. An ACL provides the ability to selectively permit or deny traffic for a virtual machine endpoint. This packet filtering capability provides an additional layer of security. You can specify network ACLs for endpoints only. You can't specify an ACL for a virtual network or a specific subnet contained in a virtual network.

Using Network ACLs, you can do the following:

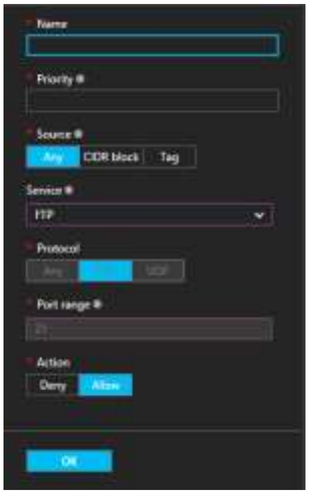
- Selectively permit or deny incoming traffic based on remote subnet IPv4 address range to a virtual machine input endpoint.
- Blacklist IP addresses
- Create multiple rules per virtual machine endpoint
- Specify up to 50 ACL rules per virtual machine endpoint
- Use rule ordering to ensure the correct set of rules are applied on a given virtual machine endpoint (lowest to highest)
- Specify an ACL for a specific remote subnet IPv4 address.

Please check “Appendix: How to add IPs to ACL in Azure firewall“

Adding ports to Azure Firewall

When you create a Window’s virtual machine in the Azure portal, common endpoints like those for Remote Desktop and Windows PowerShell Remoting are typically created for you automatically in Network Security Group. You can configure additional endpoints while creating the virtual machine or later on as needed.

1. To change or to add port, follow the same procedure to go to Inbound security rules. And click on Add.
2. In new portal, you can select the port from list of services that you need. You can add custom too.
3. After giving Name and Priority click on OK. Port will be added to your Azure Firewall.



Name

Priority

Source: Any | CIDR block | Tag

Service: FTP

Protocol: Any | UDP

Port range: 21

Action: Deny | Allow

Other recommendations

1. Enable diagnostics of all VMs and resources for auditing and analysis purpose. We have currently implemented the same for all your existing VMs but this needs to be followed as a regular
2. If possible, use only 1-2 Standard storage accounts for all collecting & storing diagnostics data from all VMs and resources in a data center. It will be easier to configure them with a monitoring/log analytics solution like Splunk or OMS.

Services that don’t need any specific recommendation

The following services have been checked but are not being discussed in this report in detail:

1. VM extensions –AntiMalware extension to be enabled on all VMs. Already enabled for most VMs.
2. VPN – not configured nor any specific requirement mentioned.
3. ExpressRoute – already configured with help from a service provider
4. Classic Resources – no classic resources were found.
5. OMS/Log analytics – currently Splunk is being used for monitoring purpose. It’s a 3rd party tool and hence out of scope for this analysis. OMS has various solution packs for specialized monitoring of SQL Servers, Networks, Active Directory, Windows & Linux servers etc.

Appendix

Storage Service limits

Resource	**Default Limit**
Number of storage accounts per subscription	200[1]
TB per storage account	500 TB
Max number of blob containers, blobs, file shares, tables, queues, entities, or messages per storage account	Only limit is the 500 TB storage account capacity
Max size of a single blob container, table, or queue	500 TB
Max number of blocks in a block blob or append blob	50,000
Max size of a block in a block blob or append blob	4 MB
Max size of a block blob or append blob	50,000 X 4 MB (approx. 195 GB)
Max size of a page blob	1 TB
Max size of a table entity	1 MB
Max number of properties in a table entity	252
Max size of a message in a queue	64 KB
Max size of a file share	5 TB
Max size of a file in a file share	1 TB
Max number of files in a file share	Only limit is the 5 TB total capacity of the file share

Resource	Default Limit
Max 8 KB IOPS per share	1000
Max number of files in a file share	Only limit is the 5 TB total capacity of the file share
Max number of blob containers, blobs, file shares, tables, queues, entities, or messages per storage account	Only limit is the 500 TB storage account capacity
Max number of stored access policies per container, file share, table, or queue	5
Total Request Rate (assuming 1KB object size) per storage account	Up to 20,000 IOPS, entities per second, or messages per second
Target throughput for single blob	Up to 60 MB per second, or up to 500 requests per second
Target throughput for single queue (1 KB messages)	Up to 2000 messages per second
Target throughput for single table partition (1 KB entities)	Up to 2000 entities per second
Target throughput for single file share	Up to 60 MB per second
Max ingress[2] per storage account (US Regions)	10 Gbps if GRS/ZRS[3] enabled, 20 Gbps for LRS
Max egress[2] per storage account (US Regions)	20 Gbps if RA-GRS/GRS/ZRS[3]enabled, 30 Gbps for LRS
Max ingress[2] per storage account (European and Asian Regions)	5 Gbps if GRS/ZRS[3] enabled, 10 Gbps for LRS

Resource	Default Limit
Max egress[2] per storage account (European and Asian Regions)	10 Gbps if RA-GRS/GRS/ZRS[3]enabled, 15 Gbps for LRS

How to move VMs to Premium Disk (Storage Account)

If you currently have an Azure VM that uses Standard Storage disks, follow the process below for migrating that to Premium Storage. At a high-level, the migration involves two stages: - Migrating the disks from Standard Storage account to a Premium Storage account - Converting the VM size from A/D/G to DS, DSv2 or GS needed for using Premium Storage disks.

Execution steps

1. Stop the VM. As explained above, the VM needs to be fully down in order to migrate a clean state. There will be a downtime until the migration completes.
2. Once the VM has stopped, copy each of the VHDs of that VM to your new Premium Storage account. You have to copy the OS disk VHD blob as well as all the data disk VHD blobs. For migrating we recommend use of AzCopy. Using AzCopy you can easily upload the VHD over the Internet. Depending on the size of the VHDs, this may take time.
   a. Download and install AzCopy from here: Latest version of AzCopy
   b. Open Azure PowerShell and go to the folder where AzCopy is installed.
   c. Use the following command to copy the VHD file from "Source" to "Destination".

```
AzCopy /Source: <source> /SourceKey: <source-account-key> /Dest: <destination> /DestKey:
<dest-account-key> /BlobType:page /Pattern: <file-name>

Example:
AzCopy.exe" /Source:"https://petrimigstd.blob.core.windows.net/vhds"
/Dest:"https://petrimigpre.blob.core.windows.net/vhds" /SourceKey:<SecretKey1> /DestKey:
<SecretKey2>  /Pattern:PetriMigData.vhd
```

3. Verify if the copying is complete. Wait until all the disks are copied. Once all the disks are copied over, you are ready to proceed to the next steps, for creating the new VM.

4. The following PowerShell script will create a new ARM virtual machine from an existing OS disk and data disk. Change the names and URI’s to suit your requirements.

```
## Environment - same region and resource group as old VM
$LocationName = "northeurope"
$ResourceGroupName = "PetriMig"

## VM - reusing the old VM details
$ComputerName = "PetriMig"
$VMName = "PetriMig"
```

```
## OS Disk - using the old disk
$OSDiskName = "PetriMig"
$OSDiskUri = "https://petrimigstd.blob.core.windows.net/vhds/PetriMig2016325104259.vhd"
$VMSize = "Standard_DS1"

## DataDisk - using the new disk
$DataDiskUri = "https://petrimigpre.blob.core.windows.net/vhds/PetriMigData.vhd"

## Networking - reuse the old machine's network connection
$NICObjectName = "PetriMig513"
$NIC = Get-AzureRmNetworkInterface -ResourceGroupName PetriMig -Name $NICObjectName

## Build up the VM configuration using the existing disks
$VirtualMachine = New-AzureRmVMConfig -VMName $VMName -VMSize $VMSize
$VirtualMachine = Add-AzureRmVMNetworkInterface -VM $VirtualMachine -Id $NIC.Id
$VirtualMachine = Set-AzureRmVMOSDisk -VM $VirtualMachine -VhdUri $OSDiskUri -name
$OSDiskName -CreateOption attach -Windows -Caching "ReadWrite"
$VirtualMachine = Add-AzureRmVMDataDisk -VM $VirtualMachine -Name "PetriMigData" -VhdUri
$DataDiskUri -Lun 0 -CreateOption attach -DiskSizeInGB $null -Caching "ReadOnly"

## Deploy the new VM from the configuration
# You can comment out the next line to test the above without creating a machine, saving
loads of time.
New-AzureRmVM -ResourceGroupName $ResourceGroupName -Location $LocationName -VM
$VirtualMachine -Verbose
```

Create a Windows Virtual Machine Scale Set using Azure PowerShell

Step 1: Install Azure PowerShell

See How to install and configure Azure PowerShell for information about how to install the latest version of Azure PowerShell, select the subscription that you want to use, and sign in to your Azure account.

Step 2: Create resources

Create the resources that are needed for your new virtual machine scale set.

Resource group

A virtual machine scale set must be contained in a resource group.

1. Get a list of available locations and the services that are supported:
   ```
   Get-AzureLocation | Sort Name | Select Name, AvailableServicesGet-
   AzureLocation | Sort Name | Select Name, AvailableServices
   ```

2. Pick a location that works best for you, replace the value of $locName with that location name, and then create the variable:
   ```
   $locName = "location name from the list, such as Central US"
   ```

3. Replace the value of $rgName with the name that you want to use for the new resource group and then create the variable:

```
$rgName = "resource group name"
```

4. Create the resource group:
   ```
   New-AzureRmResourceGroup -Name $rgName -Location $locName
   ```

Storage account

A storage account is used by a virtual machine to store the operating system disk and diagnostic data used for scaling. When possible, it is best practice to have a storage account for each virtual machine created in a scale set. If not possible, plan for no more than 20 VMs per storage account. The example in this article shows 3 storage accounts being created for 3 virtual machines in a scale set.

1. Replace the value of saName with the name that you want to use for the storage account and then create the variable:
   ```
   $saName = "storage account name"
   ```

2. Test whether the name that you selected is unique:
   ```
   Test-AzureName -Storage $saName
   ```
   If the answer is False, your proposed name is unique.

3. Replace the value of $saType with the type of the storage account and then create the variable:
   ```
   $saType = "storage account type"
   ```
   Possible values are: Standard_LRS, Standard_GRS, Standard_RAGRS, or Premium_LRS.

4. Create the account:
   ```
   New-AzureRmStorageAccount -Name $saName -ResourceGroupName $rgName –Type
   $saType -Location $locName
   ```

5. Repeat steps 1 through 4 to create 3 storage accounts, for example myst1, myst2, and myst3.

Virtual network

A virtual network is required for the virtual machines in the scale set.

1. Replace the value of $subName with the name that you want to use for the subnet in the virtual network and then create the variable:
   ```
   $subName = "subnet name"
   ```

2. Create the subnet configuration:
   ```
   $subnet = New-AzureRmVirtualNetworkSubnetConfig -Name $subName -
   AddressPrefix 10.0.0.0/24
   ```

3. Replace the value of $netName with the name that you want to use for the virtual network and then create the variable:
   ```
   $netName = "virtual network name"
   ```

4. Create the virtual network:
   ```
   $vnet = New-AzureRmVirtualNetwork -Name $netName -ResourceGroupName $rgName
   -Location $locName -AddressPrefix 10.0.0.0/16 -Subnet $subnet
   ```

Public IP address

Before a network interface can be created, you need to create a public IP address.

1. Replace the value of $domName with the domain name label that you want to use with your public IP address and then create the variable:
   ```
   $domName = "domain name label"
   ```
   The label can contain only letters, numbers, and hyphens, and the last character must be a letter or number.

2. Test whether the name is unique:
   ```
   Test-AzureRmDnsAvailability -DomainQualifiedName $domName -Location
   $locName
   ```
   If the answer is True, your proposed name is unique.

3. Replace the value of $pipName with the name that you want to use for the public IP address and then create the variable.
   ```
   $pipName = "public ip address name"
   ```

4. Create the public IP address:
   ```
   $pip = New-AzureRmPublicIpAddress -Name $pipName -ResourceGroupName $rgName
   -Location $locName -AllocationMethod Dynamic -DomainNameLabel $domName
   ```

Network interface

Now that you have the public IP address, you can create the network interface.

1. Replace the value of $nicName with the name that you want to use for the network interface and then create the variable:
   ```
   $nicName = "network interface name"
   ```

2. Create the network interface:
   ```
   $nic = New-AzureRmNetworkInterface -Name $nicName -ResourceGroupName
   $rgName -Location $locName -SubnetId $vnet.Subnets[0].Id -PublicIpAddressId
   $pip.Id
   ```

Configuration of the scale set

You have all the resources that you need for the scale set configuration, so let's create it.

1. Replace the value of $ipName with the name that you want to use for the IP configuration and then create the variable:
   ```
   $ipName = "IP configuration name"
   ```

2. Create the IP configuration:
   ```
   $ipConfig = New-AzureRmVmssIpConfig -Name $ipName -
   LoadBalancerBackendAddressPoolsId $null -SubnetId $vnet.Subnets[0].Id
   ```

3. Replace the value of $vmssConfig with the name that you want to use for the scale set configuration and then create the variable:
   ```
   $vmssConfig = "Scale set configuration name"
   ```

4. Create the configuration for the scale set:
   ```
   $vmss = New-AzureRmVmssConfig -Location $locName -SkuCapacity 3 -SkuName
   "Standard_A0" -UpgradePolicyMode "manual"
   ```

5. Add the network interface configuration to the scale set configuration:
   ```
   Add-AzureRmVmssNetworkInterfaceConfiguration -VirtualMachineScaleSet $vmss
   -Name $vmssConfig -Primary $true -IPConfiguration $ipConfig
   ```

Operating system profile

1. Replace the value of $computerName with the computer name prefix that you want to use and then create the variable:
   ```
   $computerName = "computer name prefix"
   ```

2. Replace the value of $adminName the name of the administrator account on the virtual machines and then create the variable:
   ```
   $adminName = "administrator account name"
   ```

3. Replace the value of $adminPassword with the account password and then create the variable:
   ```
   $adminPassword = "password for administrator accounts"
   ```

4. Create the operating system profile:
   ```
   Set-AzureRmVmssOsProfile -VirtualMachineScaleSet $vmss -ComputerNamePrefix
   $computerName -AdminUsername $adminName -AdminPassword $adminPassword
   ```

Storage profile

1. Replace the value of $storageProfile with the name that you want to use for the storage profile and then create the variable:
   ```
   $storageProfile = "storage profile name"
   ```

2. Create the variables that define the image to use:
   ```
   $imagePublisher = "MicrosoftWindowsServer"
   $imageOffer = "WindowsServer"
   $imageSku = "2012-R2-Datacenter"
   ```

3. Replace the value of $vhdContainers with a list that contains the paths where the virtual hard disks are stored, such as "https://mystorage.blob.core.windows.net/vhds", and then create the variable:

   ```
   $vhdContainers =
   @("https://myst1.blob.core.windows.net/vhds","https://myst2.blob.core.windo
   ws.net/vhds","https://myst3.blob.core.windows.net/vhds")
   ```

4. Create the storage profile:Create the storage profile:

   ```
   Set-AzureRmVmssStorageProfile -VirtualMachineScaleSet $vmss -
   ImageReferencePublisher $imagePublisher -ImageReferenceOffer $imageOffer -
   ImageReferenceSku $imageSku -ImageReferenceVersion "latest" -Name
   $storageProfile -VhdContainer $vhdContainers -OsDiskCreateOption
   "FromImage" -OsDiskCaching "None"
   ```

Virtual machine scale set

Finally, you can create the scale set.

1. Replace the value of $vmssName with the name of the virtual machine scale set and then create the variable:

   ```
   $vmssName = "scale set name"
   ```

2. Create the scale set:

   ```
   New-AzureRmVmss -ResourceGroupName $rgName -Name $vmssName -
   VirtualMachineScaleSet $vmss
   ```

Step 3: Explore resources

```
Get-AzureRmVmss -ResourceGroupName "resource group name" -VMScaleSetName "scale
set name"
```

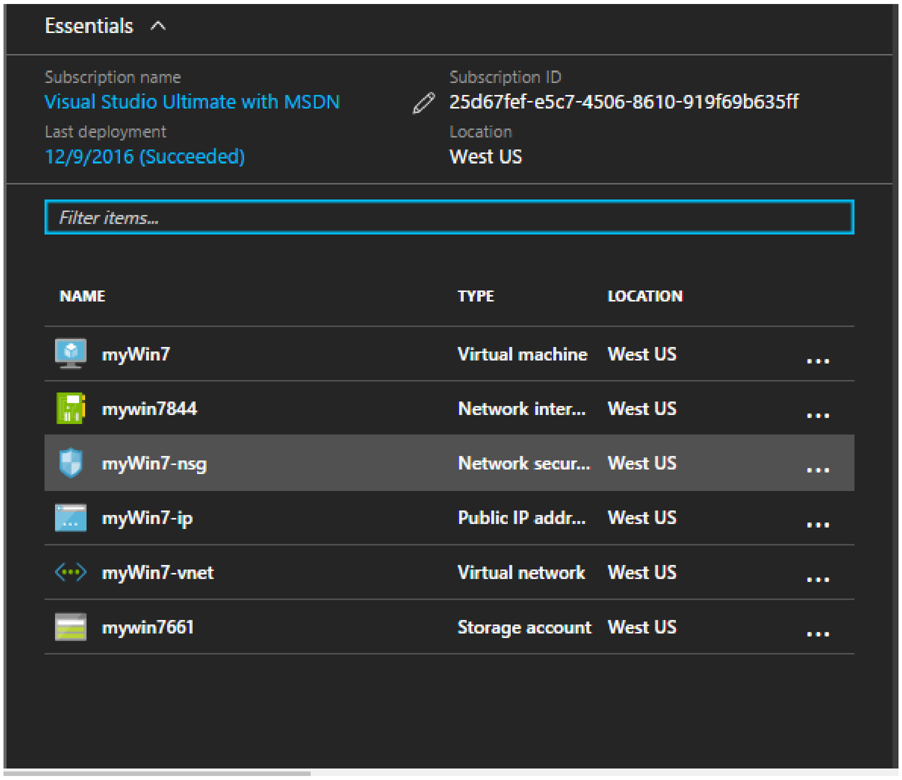
Or

```
Get-AzureRmVmssVM -ResourceGroupName "resource group name" -VMScaleSetName "scale
set name"
```

How to add IPs to ACL in Azure firewall

Use the following steps in the Azure portal to create a firewall rule that allow connections from an individual IP address (your client computer) or an entire IP address range to the VM.

1. Select the NSG(Network Security Group) of your VM.



Essentials ^

Subscription name
Visual Studio Ultimate with MSDN

Subscription ID
25d67fef-e5c7-4506-8610-919f69b635ff

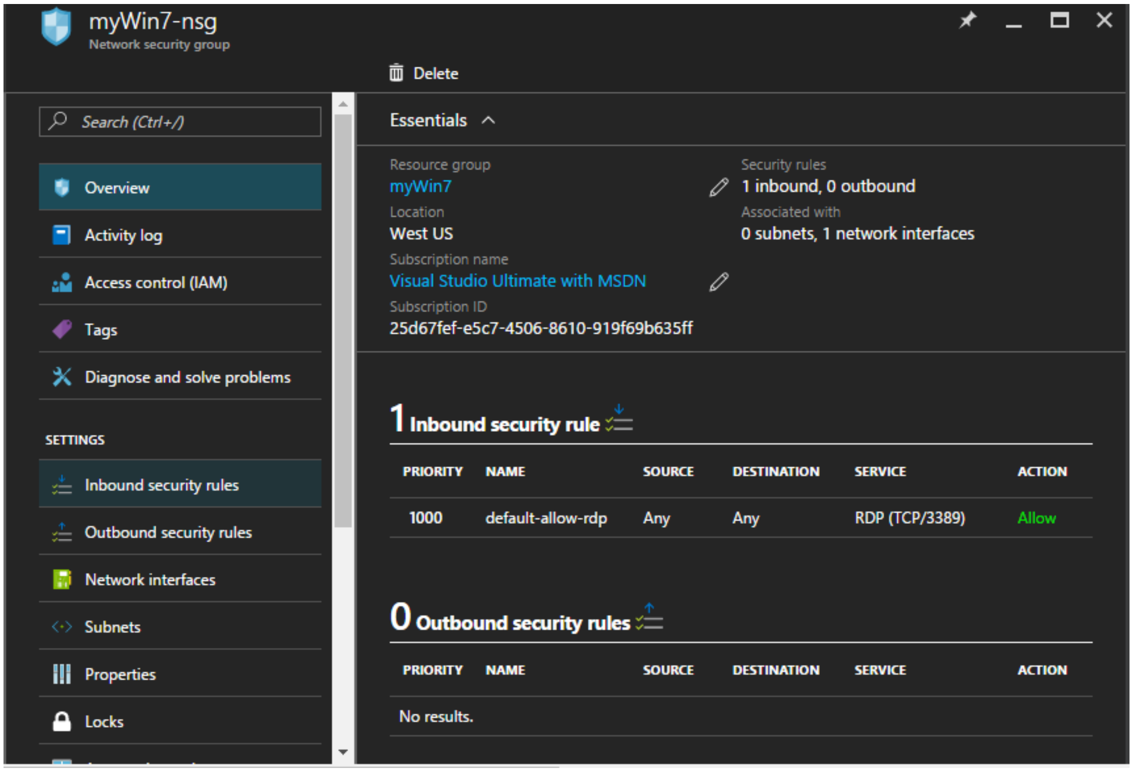
Last deployment
12/9/2016 (Succeeded)

Location
West US

Filter items...

NAME	TYPE	LOCATION	
myWin7	Virtual machine	West US	...
mywin7844	Network inter...	West US	...
myWin7-nsg	Network secur...	West US	...
myWin7-ip	Public IP addr...	West US	...
myWin7-vnet	Virtual network	West US	...
mywin7661	Storage account	West US	...

2. Select Inbound security rules.



Resource group
myWin7

Location
West US

Subscription name
Visual Studio Ultimate with MSDN

Subscription ID
25d67fef-e5c7-4506-8610-919f69b635ff

Security rules
1 inbound, 0 outbound

Associated with
0 subnets, 1 network interfaces

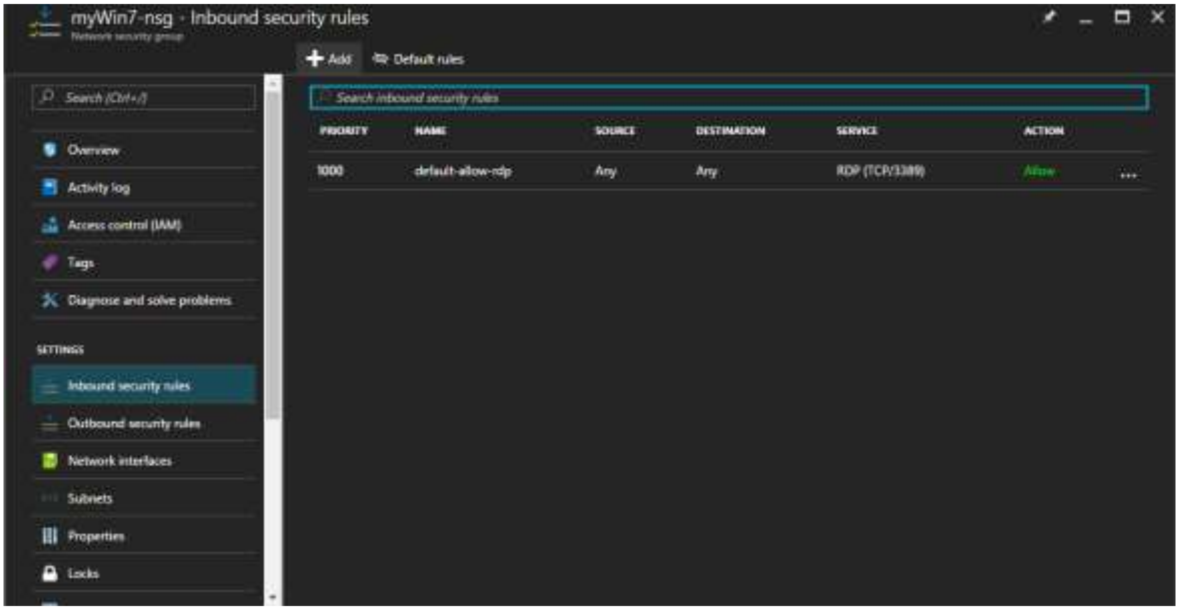
1 Inbound security rule

PRIORITY	NAME	SOURCE	DESTINATION	SERVICE	ACTION
1000	default-allow-rdp	Any	Any	RDP (TCP/3389)	Allow

0 Outbound security rules

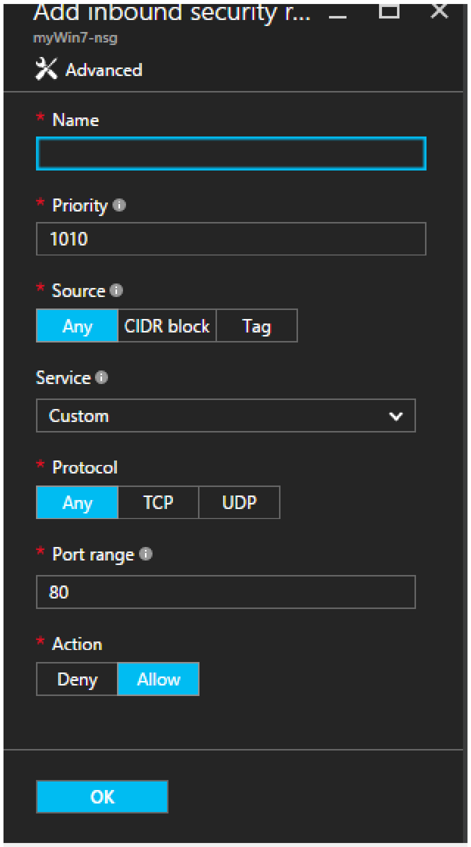
PRIORITY	NAME	SOURCE	DESTINATION	SERVICE	ACTION
No results.					

3. Already defined rules will be appear on window and to add new rules click on Add button.



PRIORITY	NAME	SOURCE	DESTINATION	SERVICE	ACTION
1000	default-allow-rdp	Any	Any	RDP (TCP/3389)	Allow

4. In this box, you define custom rules to your Azure Firewall or you can choose predefined rules.



Add inbound security r...

myWin7-nsg

Advanced

* Name

* Priority: 1010

* Source: Any | CIDR block | Tag (Any selected)

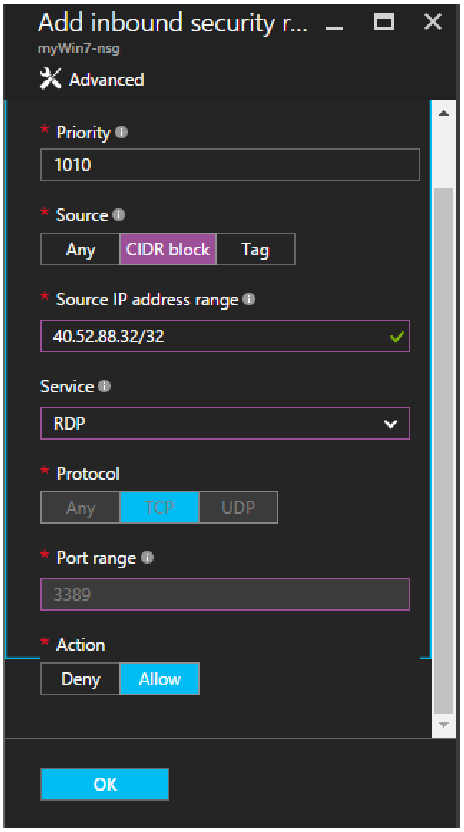
Service: Custom

* Protocol: Any | TCP | UDP (Any selected)

* Port range: 80

* Action: Deny | Allow (Allow selected)

5. You can click on CIDR button to allow only one IP to access VM using RDP.


Add inbound security r...

myWin7-nsg

Advanced

* Priority: 1010

* Source: Any | [✓ CIDR block] | Tag

* Source IP address range: 40.52.88.32/32 ✓

Service: RDP

* Protocol: Any | [✓ TCP] | UDP

* Port range: 3389

* Action: Deny | [✓ Allow]

Here above, we added 40.52.88.32/32 IP address to access VM using RDP. /32 defines that only one IP will be able to access the VM. If you want block/allow certain IP range, you can do that.

** End of Report **