

IaaS



Section 3 - 3 hours

Considerations before beginning

A bad query is always worth tuning

You will not have the same resources – especially memory. Network may be limited. Tune, tune, tune BEFORE moving your workload into Azure.

You pay for data going OUT of Azure.

Deployment model

- **Service Management – classic (old)**
- **Resource Manager**
 - Deploy, manage, monitor all related services together
 - Consistent deployment – for example, Dev to QA and QA to Prod
 - Reference: Resource Manager Overview <https://azure.microsoft.com/en-us/documentation/articles/resource-group-overview/>
- **Reference: Understanding Resource Manager deployment and classic deployment** <https://azure.microsoft.com/en-us/documentation/articles/resource-manager-deployment-model/>



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MSFT recommends Resource Manager going forward
I recommend it too, especially for SQL Images, for extra options
It's what I'll demo today

Region

- Are the services you want available in the region you want?
- Reference: Services by region <https://azure.microsoft.com/en-us/regions/#services>



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VM size

- Understand what you need for your workload
- Minimums for SQL Server
 - Standard - DS2
 - 2 cores
 - 7 GB RAM
 - 4 disks @ 6400 max IOPS
 - Enterprise - DS3
 - 4 cores
 - 14 GB RAM
 - 8 disks @ 12,800 max IOPS
- Reference: Sizes for virtual machines: <https://azure.microsoft.com/en-us/documentation/articles/virtual-machines-size-specs/>
- Reference: Virtual Machines Pricing: <https://azure.microsoft.com/en-us/pricing/details/virtual-machines/>



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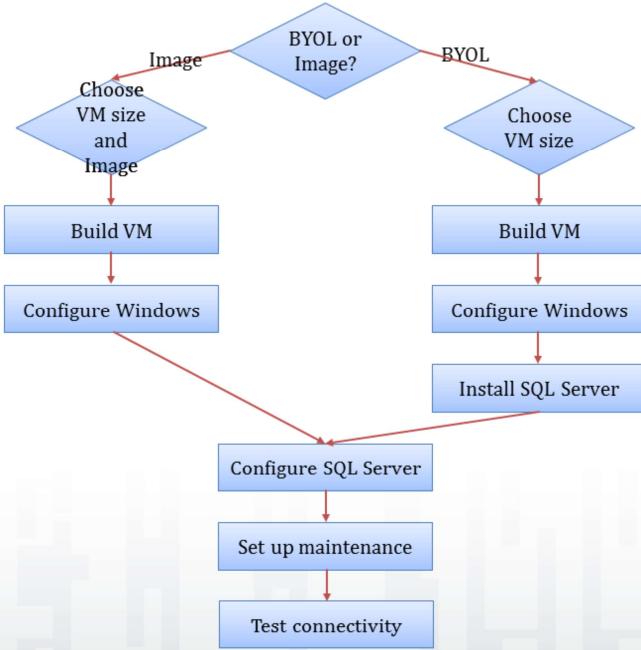
Storage

- VM size determines max number & speed of disks, regular vs premium storage
- Starts with C: and D:
 - D: is temporary and Microsoft warns to never store anything you want to keep on it!
- You can and should add more disks and stripe them – we'll talk about that later
 - When you do that, you're paying for additional storage



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Workflow



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BYOL

Bring Your Own Licensing

Build the VM

- **Reference: Performance best practices for SQL Server in Azure Virtual Machines** <https://azure.microsoft.com/en-us/documentation/articles/virtual-machines-sql-server-performance-best-practices/>
 - VM size
 - Storage
 - Disks
 - I/O
 - Back up to blob storage



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You will have to enter

- **VM Name**
- **Size**
- **Storage account**
- **Virtual Network**



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Demo – Resource Group

Steps

Log into Portal

Click +New > Mgmt > Resource Groups

Name: Azure20160408

Location: Central US

Demo – Virtual Machine

Steps

Log into Portal

Click +New > Virtual Machines > See All. Show all the stuff available!

Search for Windows Server 2012 R2. Choose Datacenter.

Deployment model – Resource Manager. Click Create.

Name – BYOLdemo

User name BYOL

Password

Resource Group Azure20160408

Location Central US

Size – click View All, show options. Choose DS3.

Disk type Premium.

Storage account – click to create new. Name azure20160408

Type - show options.

Virtual network click to Create new.

Name azure20160408. Address space 10.2.0.0/16. Subnet name default. Subnet address range 10.2.0.0/24.

Public IP Address – new. Name BYOLdemo

Network Security Group choose None.

Monitoring Enabled.

Diag storage account use default

Avail set None

Click OK

While it's creating, show PowerShell script.

When it's created, save RDP to desktop and connect.

Try to connect with domain creds.

PowerShell

- Open New-AzureRmVM.ps1
- Resource: Create and configure a Windows Virtual Machine with Resource Manager and Azure PowerShell
<https://azure.microsoft.com/en-us/documentation/articles/virtual-machines-ps-create-preconfigure-windows-resource-manager-vms/>



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Note: -AzureRm in commands indicates it's designed for the Resource Manager model

Prep Windows

- Check power setting
- Enable Perform volume maintenance tasks, Lock pages in memory (maybe!)
- Join to domain



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Create and attach storage

- **Attach from Portal or PowerShell**
- **Stripe or pool in File & Storage Systems**
- **Add in Disk Management**



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Portal > Go to Disks > Add new.

Add two.

Go to VM. Open Disk Mgmt. Show...nothing.

Go to File & Storage Systems. May have to refresh, but show disks.

Create Pool. Parity is RAID 5, Mirror is RAID 1.

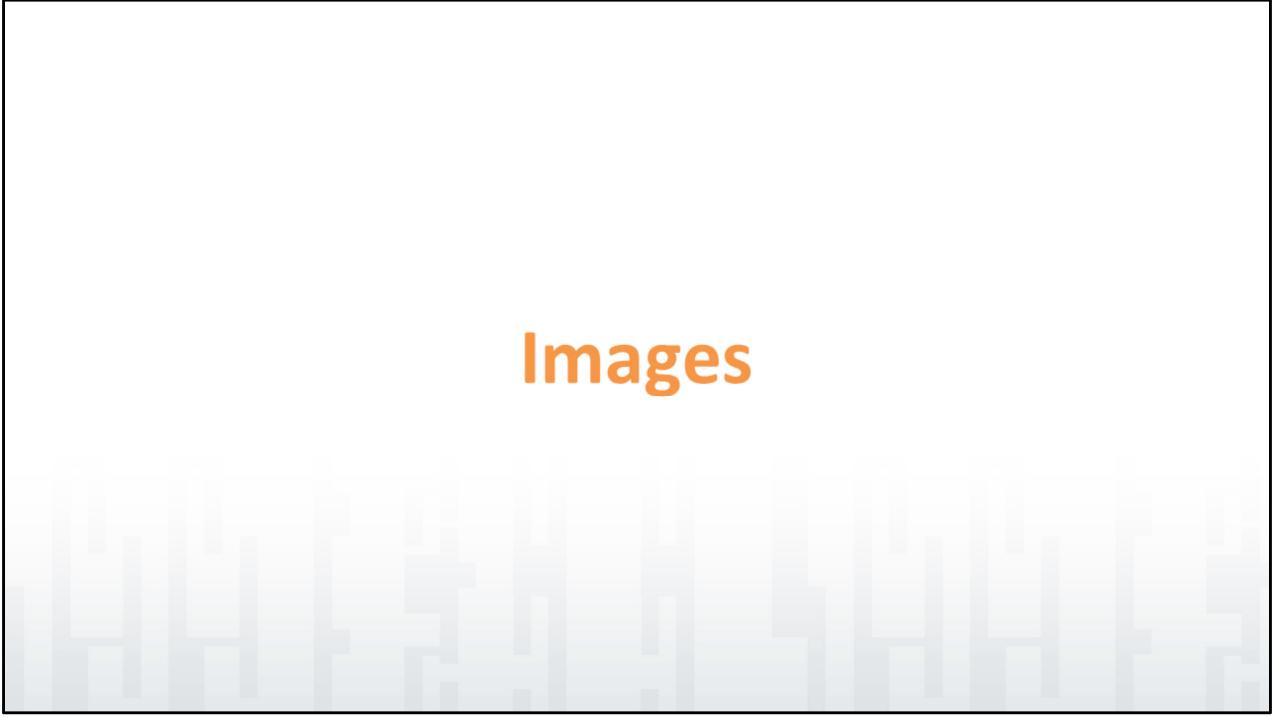
Create logical drive G for Data from this.

Install SQL Server

- **Mount media, follow your normal checklist**
 - You have a setup checklist, right?!
- **You choose what features and services are installed**
- **You control service accounts**
- **You can specify data directories**



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Images

Build the VM

- Follow the same best practices



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You will have to select

- **Name**
- **Size**
- **Storage Account**
- **Virtual Network**
- **Connectivity**
- **Port**
- **Authentication mode**
- **Auto patching**
- **Auto backups**



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Demo

Portal > New > compute > see all > search for sql server. Choose SQL Server 2014 Standard.

Name: Imagedemo

User name: Image

Resource group: Azure20160408

Location: Central US

Size: DS3

Storage: Premium

Storage account: Azure20160408

Vnet: azure20160408

Subnet: default

Public IP: ImageDemo

NSG: none

Avail set: none

SQL Connectivity: Private

Port: 1433

SQL Auth: disable

Storage config: move the sliders to show how many data disks will be added. Choose

General for optimization.

Automated patching: Fri 20:00 duration 60

Automated backup: enable (but can't for 2016 dammit)

Key vault: disabled because I can't tell you what it does.
This takes a long time, so use the existing ImageDemo to show the rest.

PowerShell

- Same script, different image



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Windows and SQL Server are installed

- **SQL Server features installed**
 - ALL of the features
- **Service account used**
 - Change this, restart service
- **Data directories**
 - What if you wanted something different?



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Open configuration manager
Services – everything
Service account – NT Service\MSSQLSERVER, etc
Open Windows Explorer to show disks created
Open SSMS to show default file locations

Prep Windows

- Check power setting
- Enable Perform volume maintenance tasks, Lock pages in memory (maybe!)
- Join to domain



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Both

Build servers frequently?

- **Configure Azure Resource Manager Templates**
 - Use JSON



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Configure SQL Server

- **Use your checklist!**
- **Mine includes:**
 - Configure tempdb & model
 - Set MAXDOP & cost threshold for parallelism
 - Configure max & min memory
 - Add startup trace flags
 - Configure Database Mail
 - Set up Alerts for important errors
 - Set up and schedule maintenance



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Yes, you still need to do maintenance!

- **Backups**
 - BYOL
 - Recommend backup to Azure blob storage
 - SQL Server Images does allow you to set auto-backups
 - Uses SQL Server Managed Backup in the background
 - Backs up to Azure blob storage
- **CHECKDB**
- **Indexes/Statistics**



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Tools for maintenance

- Maintenance Plans
- T-SQL scripts
- 3rd party tools



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Same as an on-prem version!

Connectivity

- **Connect applications to the new server**
 - In the same vnet? Specify server name and integrated security in the connection string.
 - Over the internet?
 - Open TCP ports in Windows Firewall
 - Configure SQL Server to listen on TCP
 - Configure mixed mode authentication
 - Configure a Network Security Group inbound rule for port 1433
 - Configure DNS name
 - Verify connectivity
- **Resource: Connect to a SQL Server Virtual Machine on Azure (Resource Manager)**
<https://azure.microsoft.com/en-us/documentation/articles/virtual-machines-sql-server-connectivity-resource-manager/>



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How can I demo this?

Set up HA/DR

- Azure options like Availability Sets protect the Windows VM and storage
- No HA or DR for your databases!



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HA/DR options

HA	Azure VMs – same region
Availability Groups	Yes
Database Mirroring	Yes
Failover Cluster Instances	Yes – with caveats

DR	Hybrid – On-prem to Azure	Azure VMs – same region	Azure VMs – span regions
Availability Groups	Yes	Yes	Yes
Database Mirroring	Yes	Yes	Yes
Backup/restore	Yes	Yes	Yes
Log shipping	Yes	Yes	Yes



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High availability and disaster recovery for SQL Server in Azure Virtual Machines
<https://azure.microsoft.com/en-us/documentation/articles/virtual-machines-sql-server-high-availability-and-disaster-recovery-solutions/>

Availability Groups

- All servers in the AG have to be in the same resource group
- You have to create a WSFC and set a static IP address
- In order to have a listener, you have to create an Internal Load Balancer to create a load-balanced endpoint
- Resource: 3 Keys to Configuring Azure Virtual Machines for Use in SQL Server Availability Groups
<http://www.concurrency.com/blog/w/3-keys-to-configuring-azure-virtual-machines-for-u>



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Database Mirroring

- Set up synchronous mirroring between two VMs in the same region
- Just like on-prem, if the VMs don't share a domain, you can set up certificate-based authentication



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Failover Cluster Instances

- Azure doesn't support shared storage
- Option 1: use SIOS DataKeeper, a 3rd party utility
 - Uses synchronous data replication between two storage volumes
- Option 2: remote iSCSI Target shared block storage via ExpressRoute



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Moving data into the database

- **Back up to and restore from URL**
- **Deploy a SQL Server Database to a Microsoft Azure VM wizard**
 - Built into SSMS
- **SQL Server Database Migration wizard**
 - CodePlex download
- **RLDB – Really Large Databases – Import/Export Service**
 - Ship a drive to a data center and have them put it in



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Deploy a SQL Server DB to Azure VM wizard - <https://azure.microsoft.com/en-us/documentation/articles/virtual-machines-windows-migrate-sql/#azure-vm-deployment-wizard-tutorial>

SQL Server DB Migration wizard - <https://azure.microsoft.com/en-us/documentation/articles/machine-learning-data-science-move-sql-server-virtual-machine/#sql-migration>

Changing VM size

FAQ

- **Can I upgrade or downgrade?**
 - Yes!
- **Is it an online operation?**
 - Yes!
- **How long does it take?**
 - It depends
- **How?**
 - Portal
 - PowerShell



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PowerShell

- Open Change Azure vm size.ps1



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Demo: C:\Users\jborland\OneDrive for Business\Documents\WindowsPowerShell\scripts\Change Azure vm size.ps1

Stopping the VM

When do you get charged?

- “If the status says “Stopped (Deallocated),” you’re not being billed. If it says “Stopped Allocated,” you’re still being billed for allocated virtual cores (not the software license itself).”
- “To ensure you’re not being billed, always stop virtual machines from the management portal. You can also stop the VM through Powershell by calling ShutdownRoleOperation with “PostShutdownAction” equal to “StoppedDeallocated”.
If you shut down a VM from inside (using Windows power options) or through PowerShell by calling ShutdownRoleOperation with “PostShutdownAction” equal to “Stopped”.”
- <https://azure.microsoft.com/en-us/pricing/details/virtual-machines/>



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That is only for compute!

- You still pay for storage**
- You still pay for network**
- If you have multiple VMs in a cluster or an AG, and you don't shut all of them down, you pay for those still running**



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BYOL or Image?

- **Which will be more cost-effective?**
 - This is a question I can't answer!
- **How much control do you want over SQL Server setup?**
 - Hint: PowerShell helps a lot!



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Demo – delete Resource Group