



# Azure Introduction and Training

## Part Three

[Current to September 2017]



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# SQL VMs in Azure

# SQL VMS in Azure

- It is much **easier** to create a SQL VM using Images **from the Gallery**. This assumes you want to pay for SQL licensing through the portal. This is the **pay-as-you-go licensing model**.
- **NOTE: You will have to change the DISK setup for gallery VMs.**
- Pay-as-you-go gives you options for **scale up and scale down as required**
- SQL VMs from the Gallery have most of the advanced configuration scripted as part of the install.
- SQL 2014 and especially **SQL 2016** are integrated with Azure Resource Manager. More on this later.

# SQL VMS in Azure – Storage

- SQL can be **very sensitive to storage latency** (read and write). If the storage does not meet requirements SQL will crawl.
- SQL with **Premium Storage** is the ONLY way to do **production SQL servers**. For smaller configuration databases you might get away with Standard Storage. Not advisable though.
- Disk types should have different cache settings:
  - OS Disk – As configured
  - Data Disk/Temp DB – Read Cache
  - Logs – No cache

# SQL VMS in Azure – Gallery Images

- When you create a new VM from the **Gallery it looks after a lot of the configuration steps** for you...this is a good and a bad thing.
- For larger SQL servers you **WILL have to make changes.**

Setting	Value
Stripe size	256 KB (Data warehousing); 64 KB (Transactional)
Disk sizes	1 TB each
Cache	Read
Allocation size	64 KB NTFS allocation unit size
Instant file initialization	Enabled
Lock pages in memory	Enabled
Recovery	Simple recovery (no resiliency)
Number of columns	Number of data disks <sup>1</sup>
TempDB location	Stored on data disks <sup>2</sup>

<sup>1</sup> After the storage pool is created, you cannot alter the number of columns in the storage pool.

<sup>2</sup> This setting only applies to the first drive you create using the storage configuration feature.



# SQL VMS – Changing Disk configuration

- Sometimes the VM you get from the Gallery does not have the optimum disk configuration e.g. 1 x P30 for database and transaction log.
- Delete the disk and start again e.g. 1 x P30 for Data/Temp, 1 x P30 for Transaction.
- Use a separate Windows Storage Space for each ... allows you to add more disks and increase the virtual disk size at a later date without reconfiguring SQL.

# SQL VMS – What you need to know

Important you know the background to the wizard driven Gallery Images.

- <https://docs.microsoft.com/en-us/azure/virtual-machines/windows/sql/virtual-machines-windows-sql-performance>
- <https://docs.microsoft.com/en-us/azure/virtual-machines/windows/sql/virtual-machines-windows-sql-server-storage-configuration>

## **Demo:**

Create SQL VM from Gallery and change  
the disk configuration





# Backup and Recovery

Meeting RTO and RPO Requirements



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# Backup and Recovery Scenarios

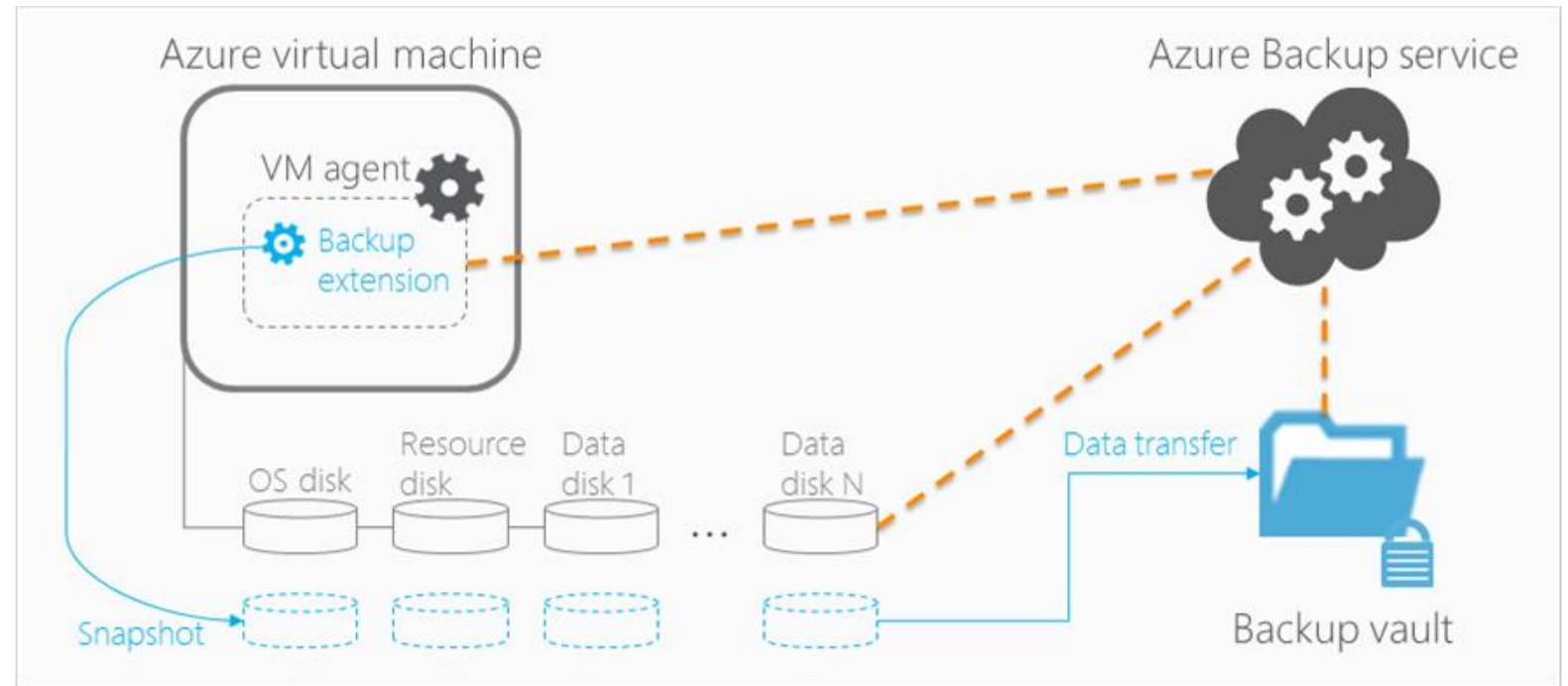
It is important to understand how the various backup and restore options work in Azure.

When going through the scenarios consider the following:

- What failure scenarios are you trying to protect against? OS failure, file loss/corruption, application issues?
- The likelihood of failure is different in Hyperscale cloud environments. The impact is the same though. Map out the risk/impact.
- Strongly recommend ALWAYS replicating Recovery Service Vaults to another region.

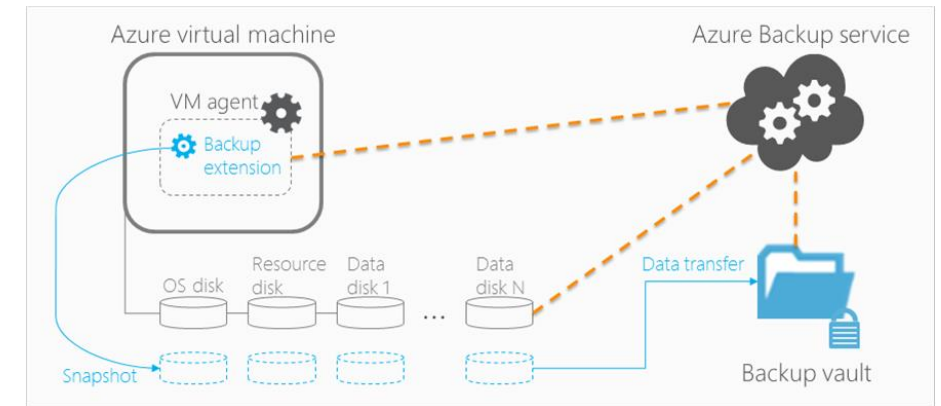
# Backup – VM Backup process

- VM Backup is a VSS snapshot of ALL disks
- Application-consistent backup (Windows/Linux)
- Understand the difference between crash, file and application consistent backups.



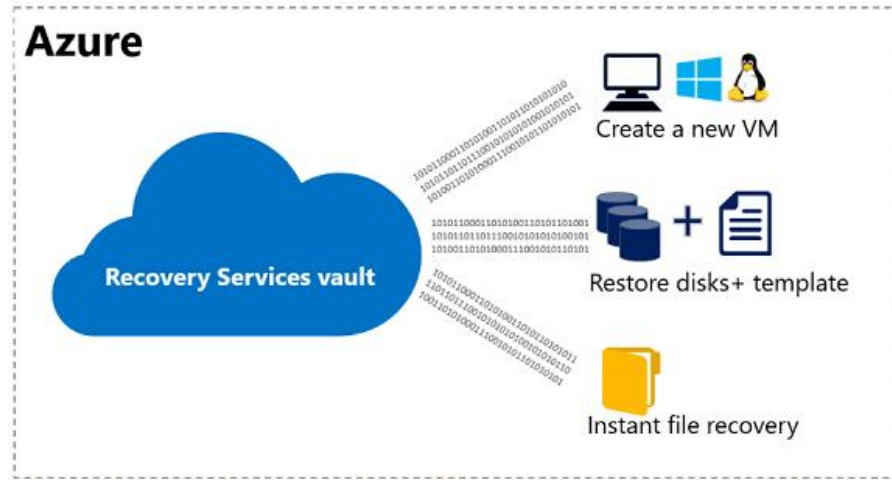
# Backup – VM Backup process

- Storage performance limits are in play when backing up the VMs. First backup is slower than incremental.
- First stage of backup is snapshot of disks. Second stage is the copy to the vault.
- It's a Shared Service used by multiple customers. There are queues. Feasible to see long backup times due to delay in copying/committing to vault. The VM impact/load (i.e. taking the backup) is completed quite quickly.
- Spread the backups between different Recovery Service Vaults. No fixed rules on how to do this. Consider how VMs are spread across storage accounts.



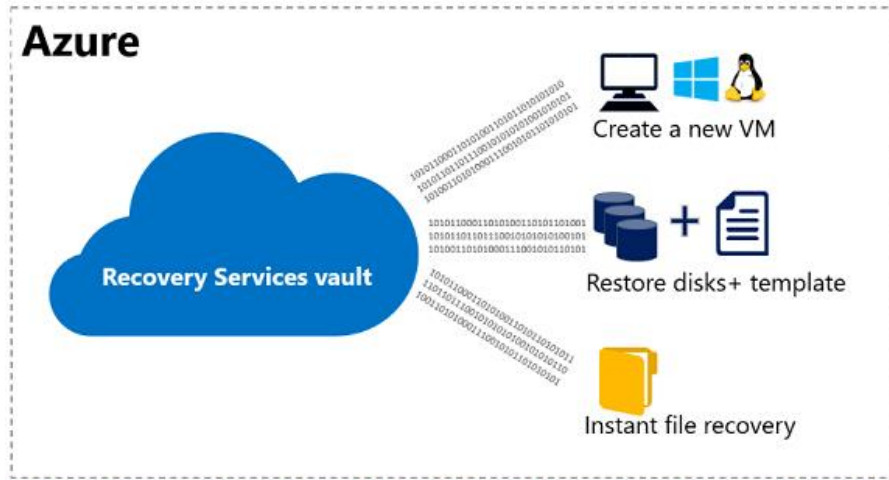
Still reviewing Managed Disks and backup/recovery.

# Restore – Basic Virtual Machine



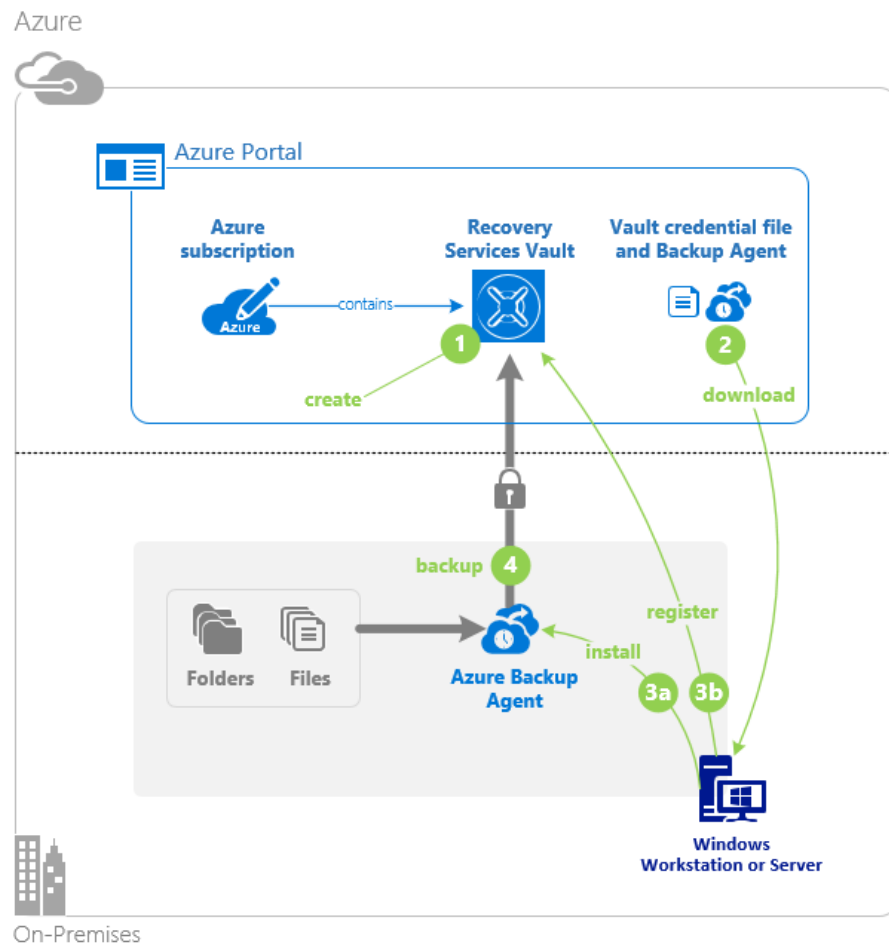
1. Consider restoring to a different Storage Account. Why? Performance.
2. In a big outage (non-Azure), you need to be able to kick off multiple restores at the same time. This recovery process should be considered during the design phase.
3. Restores are a sequential copy of data from the vault to a target Storage Account/Virtual Machine. It's a longer process than the backup (which uses VSS). Restore is a pure data copy process. IOPS and throughput intense.

# Restore – Basic Virtual Machine cont.



1. If a VM or service is difficult to recovery at VM level and/or it's a very complex application service restore ... recommend you deploy TWO or more VMs e.g. Active Directory
2. You can only run a VM backup once per day.

# File/Data backup and recovery



1. Agent based backup and recovery from within EACH virtual machine
2. File based backup agent has a small footprint. It is NOT application aware at all
3. Generally you have a longer retention on file/data backup than on a Virtual Machine backup

Step by step for backup:

<https://docs.microsoft.com/en-us/azure/backup/backup-configure-vault>

Step by step for restore (including instant file recovery)

<https://docs.microsoft.com/en-us/azure/backup/backup-azure-restore-windows-server>



# Backup and Recovery Scenarios

Lets walk through some of the common scenarios/workloads:

1. Active Directory
  - Single DC
  - Multiple DC's
2. VMs in an Availability Set
3. SQL Server

**Demo:**

Enable Backup on a VM

## **LAB Work:**

Create a Recovery Vault and backup a single VM. Restore the VM.

What do you do if a VM with **Active  
Directory** fails?

What are your thoughts?

# Active Directory

Running Active Directory on a VM in Azure is no different from running a Active Directory on VMware or Hyper-V (well, kinda).

- Single Domain Controller – Good luck! Do a full VM restore following the standard virtual machine process.
- Two+ Domain Controllers – Do not restore a VM from an old recovery point. ITS NEVER OK. EVER.
  - Remove the domain controller from Active Directory Domain Services (ntstuil process)
  - Make changes to Azure Virtual Network DNS settings as appropriate.
  - Create a Domain Controller VM and promote as new Domain Controller

# Active Directory

You will read about USN roll backup and VMGeneration-ID. Scary stuff if you are not comfortable with Active Directory.

General rule: With more than ONE DC, do not restore from a backup. If you do decide to go down this route you have to use PowerShell. Not supported to restore through the portal.

**SQL Server** Recovery need VM and database processes.



# Restore a VM in an Availability Set

Scenario:

TWO VMs in an AS. One of them has died.

How to recover it and get things back online.

1. Restore the Disk(s) to storage
2. Convert the blob disk to a Managed OS Disk
3. Create a new VM
4. Add the VM into the Availability Set

# **Availability Set**

Recover a single VM

# SQL Server/Database recovery

If you have a single SQL Server it's the failure scenario that dictates the recovery process.

- Operating System failure – VM restore from vault. Backup is application consistent....but what state was the database in? VM protection is not enough.
- You need to have database backup and recovery options.
- SQL 2014 and above can backup to blob storage. Restore the VM and then restore the database from blob storage.

# SQL Server/Database recovery

- If you have aggressive RTO/RPO then you need to use SQL Server AlwaysOn to give protection against Operating System, SQL Server instance loss.
- SQL AlwaysOn does not protect against data loss/corruption/deletion.
- You still need to backup to blob storage for database recovery.

Some great options outlined here :

<https://docs.microsoft.com/en-us/azure/virtual-machines/windows/sql/virtual-machines-windows-sql-high-availability-dr>

How do you **recover from a region-wide service disruption?**

# Recovery from a region-wide service disruption

You have three options when addressing the region-wide outage:

- Manual Redeploy (slow but free 😊)
- Warm Protection (VM's might be ready for data needs updating)
- Hot Protection (Active/Active across regions ... very expensive)

Azure Site Recovery Manager will give better options when it goes GA for Azure-to-Azure scenarios

If there is a **region wide outage** ...  
do not jump into action straight away.  
**Consider the speed in which you  
can recover compared to how  
quickly Microsoft can recover**



# Recovery from a region-wide service disruption

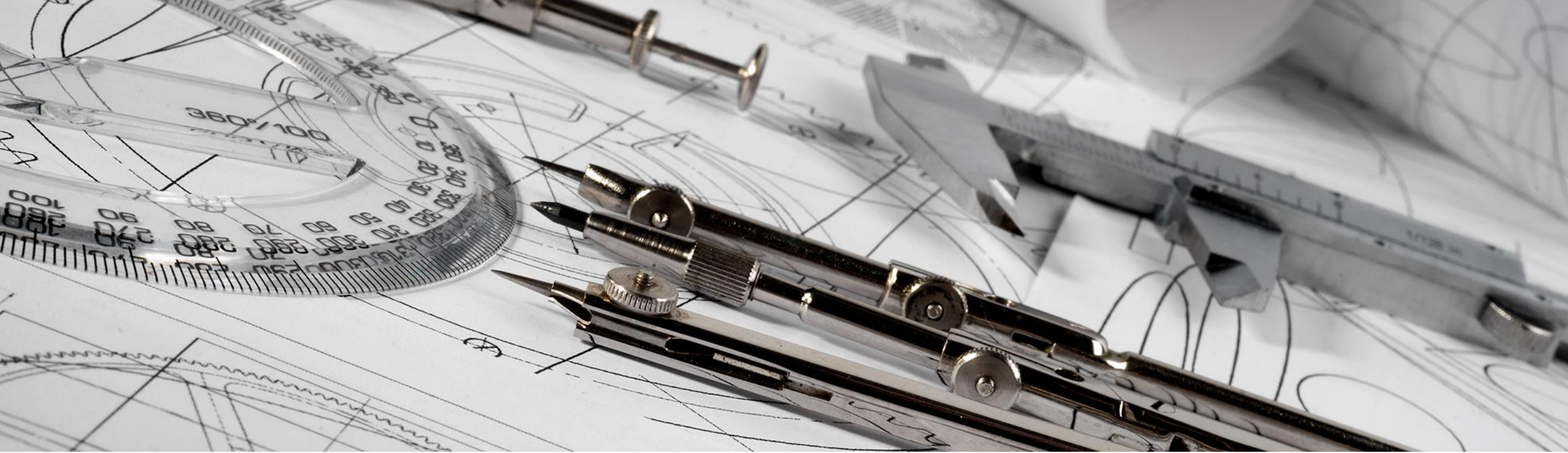
If there is a region-wide outage consider the following:

- If there is an outage Microsoft will decide when to give you access to a replicated Recovery Service Vault in the second region.
- Geo-Replication does not have an SLA and it is not Application-consistent for Virtual Machines. You cannot rely on it for recovery

# How do you now there is a region-wide outage?

If there is an outage, how can you tell? 😊

- Azure status portal : <https://azure.microsoft.com/en-us/status/>
- Social media will tell you and so will your customers 😊
- Most common major outage? Network seems to be the most common for Microsoft.



# Automating Azure

Introduction to PowerShell, JSON.



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Lets discuss **Infrastructure as Code**  
and **DevOPs**

# Infrastructure as Code/DevOps

Azure has some seriously impressive automation options. However, things are complex. The skillset required is different to normal infrastructure consulting and operational processes.

Ask yourself the following question:

**Can I justify the development effort to automate?**

# Introduction to Automation

Get the hands-on files from GitHub:

<https://github.com/gavinmcshera/training>

# JSON

Element name	Required	Description
\$schema	Yes	Location of the JSON schema file that describes the version of the template language. Use the URL shown in the preceding example.
contentVersion	Yes	Version of the template (such as 1.0.0.0). You can provide any value for this element. When deploying resources using the template, this value can be used to make sure that the right template is being used.
parameters	No	Values that are provided when deployment is executed to customize resource deployment.
variables	No	Values that are used as JSON fragments in the template to simplify template language expressions.
resources	Yes	Resource types that are deployed or updated in a resource group.
outputs	No	Values that are returned after deployment.



# Short note on JSON template

It is the Resources section of a JSON template that tells Azure Resource Manager to take action.

- The Resources section tends to get complex.
- Correction. Resources section will always be complex.
- Parameters and Variables will combine to pass the values to the Resource Section
- Some light (essential reading) : <https://docs.microsoft.com/en-us/azure/azure-resource-manager/resource-group-authoring-templates>

Lets run some **DEMO SCRIPTS** and  
**TEMPLATES.**



# Closing out the course

Make sure you are clear on **Service  
Descriptions** and **Service Level  
Agreements.**

Spend the time to **design and plan**  
**every deployment.** You have been  
given sample design templates. Feel  
free to use them.

Document and understand how to  
**backup** and **recover** your customers  
environments

When it comes to the technical stuff ...  
make sure you **RTFM.**





# Thank you