CONTOSO

# Report: Moving to Azure

## STEP 0: Problem Background

Contoso is an online cloth merchandise company specializing in selling activewear. They have a rented space in a local data center. They have one system administrator who makes sure all servers are working properly 24x7. Their hardware is getting old and they must decide on whether they need to spend $22,000 for new hardware or move their business to the Azure cloud services.  The following list represents their current on-premises infrastructure:

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| Server 1: | **Purpose:** WordPress web server<br>**CPU:** 8 Cores and 60% average utilization<br>**RAM:** 16 GB and 87% average utilization<br>**HDD OS:** 500 GB capacity with 57 GB used<br>**Web URL:** Contoso.com<br>**IP # Public:** 200.200.100.50<br>**IP #:** 10.10.1.11<br>**Firewall:** Inbound TCP 2222-2224, 80, 443<br>**Usage:** This is Contoso's only web server. It runs WordPress and eCommerce services. Their on-line store is always open, and they receive orders 24x7<br>This server uses ports 80 and 443 for HTTP and HTTPS traffic |

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| Server 2 & 3: | **Purpose:** Microsoft SQL 2019<br>**CPU:** 8 Cores and 30% average utilization x2<br>**RAM:** 16 GB and 87% average utilization x2<br>**HDD OS:** 500 GB capacity with 240 GB used x2<br>**HDD Data:** 2 TB SAN (Storage Area Network drive)<br>**IP #:** 10.10.1.12 and 10.10.1.13<br>**SQL Cluster:** SQLCluster.Contoso.Com<br>**IP #:** 10.10.1.14<br>**Firewall:** Inbound TCP 2222-2224, 1433<br>**Usage:** These two servers are running Microsoft SQL cluster services. SQL Always-On service is fully configured as Active-Passive nodes. The 2 servers use an external attached SAN drive for all data storage such as product descriptions, transaction logs, and clients lists. Annual data growth is negligible.<br>These servers use the standard SQL inbound TCP port 1433 |
| Server 4: | **Purpose:** ABC Backup and Restore server<br>**CPU:** 8 Cores and 30% average utilization<br>**RAM:** 16 GB and 87% average utilization<br>**HDD OS:** 500 GB capacity with 164 GB used<br>**HDD Backup:** 40 TB<br>**IP #:** 10.10.1.15<br>**Firewall:** Inbound TCP 2222<br>**Usage:** The ABS backup software runs daily at 8pm. It stores the last 18 months of all the SQL data drive contents onto a local D: drive (HDD Backup) with 40 TB capacity. |

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| Server 5: | **Purpose:** XYZ Antivirus server<br>**CPU:** 8 Cores and 30% average utilization<br>**RAM:** 16 GB and 87% average utilization<br>**HDD:** 500 GB capacity with 43 GB used<br>**IP #:** 10.10.1.16<br>**Firewall:** Inbound TCP 2222-2224<br>This server uses ports TCP 2222-2224 for the antivirus client<br>**Usage:** The XYZ anti-virus services are essential for the security of Contoso's operations security. The server is always on and constantly running. It monitors all Contoso's servers and mitigates against viruses and hack attacks. Data grown is negligible. |

# STEP 1: Assessing the On-Premises Environment

Purpose: To identify the Azure services needed to ensure Contoso's business continuity in the cloud.

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| **Current Environment**<br><br>Make a list of all current on-premises servers and services. | Server:<br>1. WordPress web server<br>2. ABC Backup and Restore server<br>3. 2 Microsoft SQL server 2019<br>4. XYZ Antivirus server<br>Service:<br>1. ECommerce Service (Public IP)<br>2. Microsoft SQL Cluster Service (Active Passive nodes)<br>3. Backup Service<br>4. Anti-Virus Service (Traffic Monitoring and defense against viruses and attacks) |
| **Matching Azure Services**<br><br>Match the list of on-premises servers and services to the corresponding Azure ones. | Make a list of all servers and services you would create on Azure, and why you chose each. As a hint, one of the servers is likely no longer needed.<br>→ The WordPress web server could be set up using these resources:<br>1 virtual machine, public IP, Disk, DNS, NSG (Included white creating the VM)<br>→ 2 MS SQL can be replaced with 1 VM configured as a SQL server with 2TB disk that can be mounted to this VM<br>→ The ABC backup and restore server can be replaced by VM using the Azure Backup service<br>→ The XYZ antivirus server can be set up using VM and NSG. (NSG can allow traffic to other VMs from the antivirus server.) |
| **Discussion Question #1**<br><br>A - How can you verify the running programs and services on each of your on-premises servers? List the steps taken to identify the services running for each server.<br><br>B - List your migration plans. | A: Using the Azure Migrate<br>• Deploy and configure the Azure Migrate appliance to start and initial discovery on premises<br>• Configure the appliance, you can use the deployment method as per your environment (VMware or Hyper-V)<br>• After deploying, we must register it with the Migrate project and config it to initiate the discovery.<br>• On-Premises services can be found using the discovery and Assessment Tool in Azure Migrate. Deploy via VMware or Hyper-V template and PowerShell script.<br>B: Step to Migration.<br>• Access to the current on-premises environment.<br>• Find similar or the same options on Azure<br>• Using the calculator tool to provide the est cost and share it with the Stakeholders<br>• Once the stakeholders approve it, we can train the people so that they work on the new system on Azure.<br>• Study how to implement migration,<br>• Testing the implementation on a small scale.<br>• Once thriving, we can use the Azure Migration applicate to start migrating<br>• Monitor change. |

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| **Discussion Question #2**<br><br>On your on-premises servers:<br>A - How can you find the listing of all windows firewall port exceptions?<br><br>B - Do these firewall port exceptions have to match the NSG firewall exceptions? Please explain. | A: For port exceptions go to<br>→ Control Panel -> System and Security -> Windows Defender Firewall -> Allow an app or feature through Windows Defender Firewall.<br><br>To find the active apps, service:<br>→ Control Panel ->Programs ->Programs and Features<br><br>B: Yes, the port exceptions must match the NSG firewall exceptions as it is an external firewall through which packets go through before reaching<br>If the sending is open on the windows server but not open on NSG firewall, the packet will be discarded at the NSG firewall.<br>If the NSG port is on but Windows port is off then packet will be discared when it reaches the windows server. |
| **Optional Discussion**<br><br>Looking at the new Azure server farm, what will you change and why? | |

# STEP 2: Cost Estimates

Purpose: To provide the CIO with a monthly cost estimate after the migration to Azure.

Use Azure Pricing Calculator to provide the CIO with a monthly cost estimate, including:

- The number of VMs needed
- The RAM and CPU needed for each VM
- The amount of storage needed
- Any Azure services such as anti-virus, back-up, database, etc.
- Build a list/table that includes VM type (you may use the template below or create your own)

Build / fill out the table providing your current server farm and its corresponding Azure farm. List the potential Azure replacement for each of the on-premises servers, the VM type and monthly cost. Assume your company has Hybrid benefits and are willing to commit to 3-year agreements. Use the East US Azure zone. Show the cost of all servers with a three year commitment after applying Azure Reservations cost reduction. Compare the VMs prices with and without Azure Reservations.

| Server Name | CPU Cores | RAM/HD | VM Type | Monthly Cost |
|---|---|---|---|---|
| WordPress Web Server | 8 | 16/512 | F8s v2 : 8vcpus, 16 GB ram, 64 gb temporary Storage; Compute Optimised | $112.29 |
| SQL Server | 8 | 16/512 + 2TB | F8s v2: 8vcpus, 16 GB ram, 64 GB temporary Storage; Compute Optimised | $112.29 + $77.82 |
| - | - | - | - | - |
| ABC Backup & Restore Server | 8 | 16/512 + 40TB | F8s v2 : 8vcpus, 16 GB ram, 64 gb temporary Storage; Compute Optimised | $112.29 + $614.4 |
| XYZ Antivirus Server | 8 | 16/512 | F8s v2 : 8vcpus, 16 GB ram, 64 gb temporary Storage; Compute Optimised | $112.29 |

| **Discussion Question #1**<br><br>Will these 4 Azure servers provide HA/DR for Contoso? Will their site be available 24x7, 365 days? | - No, although azure provides 99.9% availability, these 4 Servers will not provide HA/DR for Contoso<br>- Their Site will not be available 24x7,365 days as the servers may go<br>down for Server Maintenance (Updates/Upgrades) / Center Outage that<br>- Still, 100% availability can be achieved with the help of DR and availability zones<br><br>Azure guarantees 95% SLA for a single Virtual Machine and 99.5% SLA for 2 or more Virtual Machine Instances in the same availability set<br>Based on this:<br>- The WordPress server will have at least 95% uptime.<br>- The SQL server will have at least 99.95% uptime<br>- The Backup server will have at least 95% uptime |
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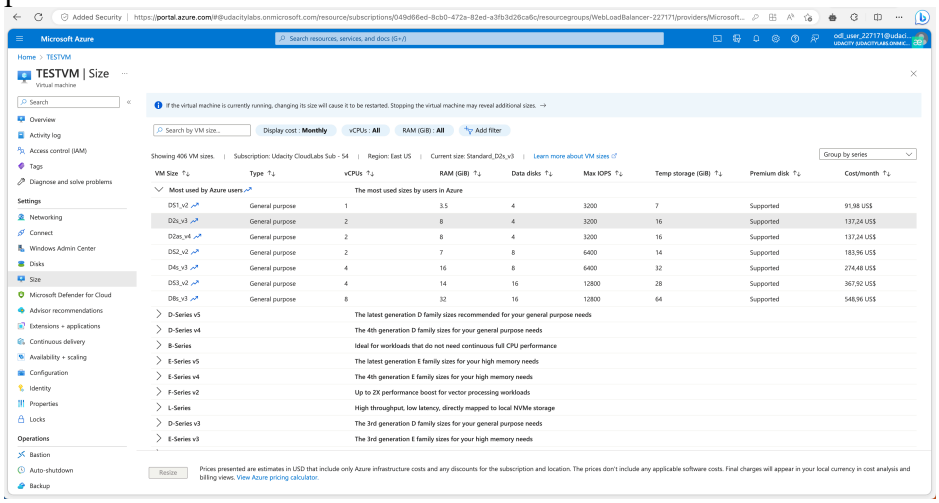
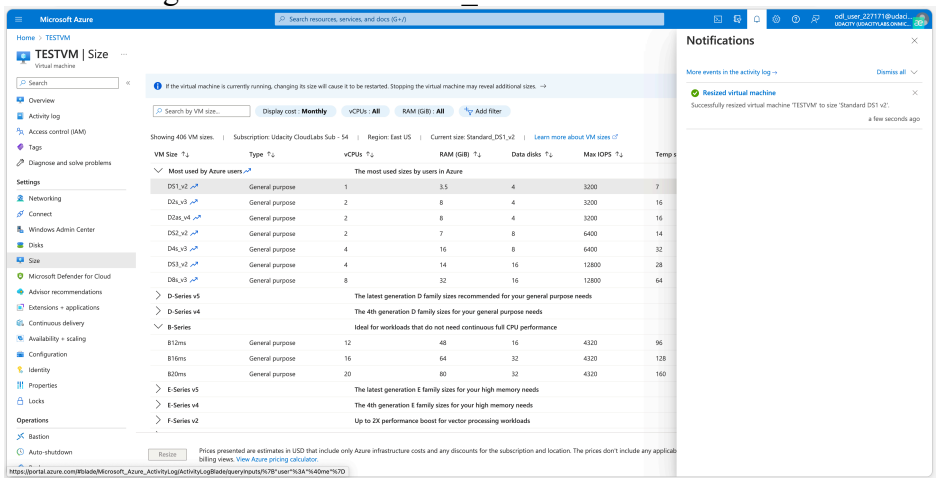
| **Discussion Question #2**<br><br>Can you change the VM type (upgrade or downgrade the configurations based on needs)? Try to downgrade one of the Azure VMs. Also, please provide a screenshot of the VM Overview settings, including VM name and size. | Yes, VM sizes can be Up/Down scaled based on depending on the needs but the functionalities, the previous one was providing must also be provided with the new one<br>  <br>I have downgraded this VM to DS1_v2<br>  |
| **Optional Discussion**<br><br>Is Contoso better off with a SQL Managed Instance? Check Azure Pricing. | Managed instance cost $864.78<br>SQL server on VM cost $190.11<br><br>Contoso is better off with a SQL Server on VM (cost wise) |

**Note:** *If you are using Udacity Cloud Labs, you will be allowed to create a few VM sizes only. Visit [this] link to see all the possible VM sizes and go through the classroom instructions for more details.*

# STEP 3 (OPTIONAL): Creating a VPN

Purpose: Build and set up a point-to-point (site to site) VPN connection between Contoso's on-premises and Contoso's Azure environments.

**Note:** *This step is entirely optional, and may take a considerable amount of time to implement. Therefore, it is suggested that you only attempt this step on your own after having satisfactorily completed all other project steps. You may find this site helpful in completing this optional step.*

## STEP 4: An Additional Server

Purpose: Use Azure Resource Manager (ARM) to deploy one additional WordPress web server. This additional web server should provide web services redundancy and improve the web site's response time.

**Create a replica of the WordPress server configuration.**

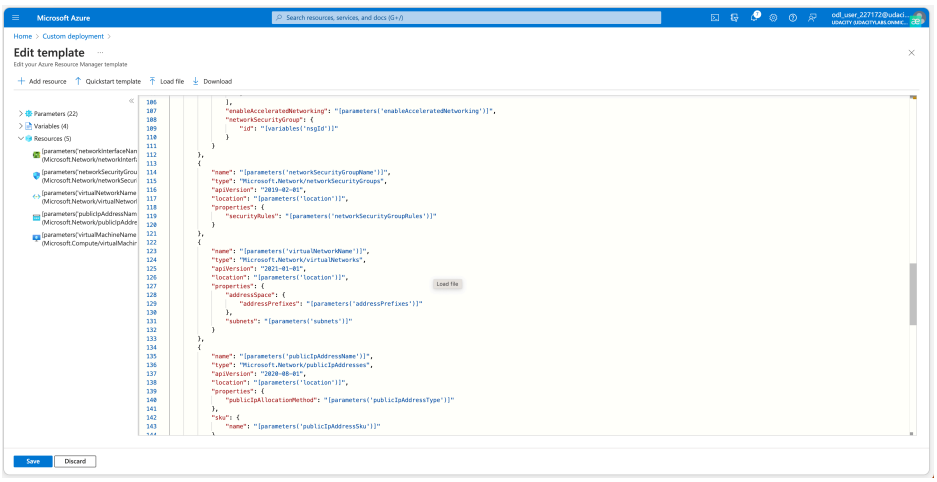
The process is summarized as:

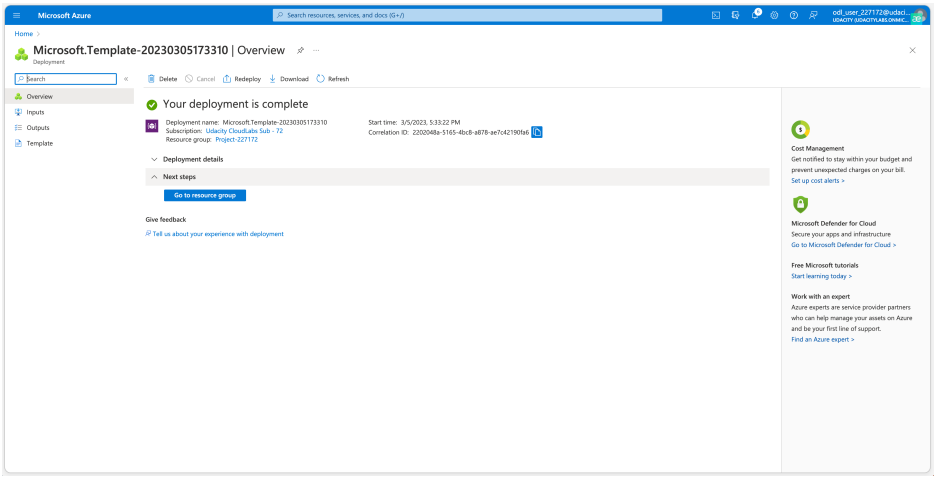
- The current WP server settings were saved as a template during the creation process. If not, you will need to add it to your Template store.
- Deploy a new VM from a template. In the Azure portal search for TEMPLATES and run that service.
- The WP server template should be listed there.  Select it.
- Make sure you load and edit the parameters file and change the values for the new VM as needed. Values such as Name, Password, etc. should be unique. Use the Azure Template Services.

Make sure you already have a resource group to place the VM in. You may need to create a Servers-RG resource group if one does not exist.

## Configuration Process

Provide a screenshot of the template configuration process.




## Discussion Question #1

List the benefits (at least three) of using ARM templates. Think of when, why and how you can benefit from this Azure service.

- Policy as Code: this code (ARM template) allows you to automate governance. When you install Azure policies through templates, policy remediation is performed on non-compliant resources.
- Modular files: The template can be spread to smaller, reusable component and link them together at deployment time.
- Validation: It is only deploy when passing the validation.

## Discussion Question #2

What is the difference between an ARM template and a server image? When will you use each and for what purpose? Make sure you consider each of the two.

| ARM Template | Server image |
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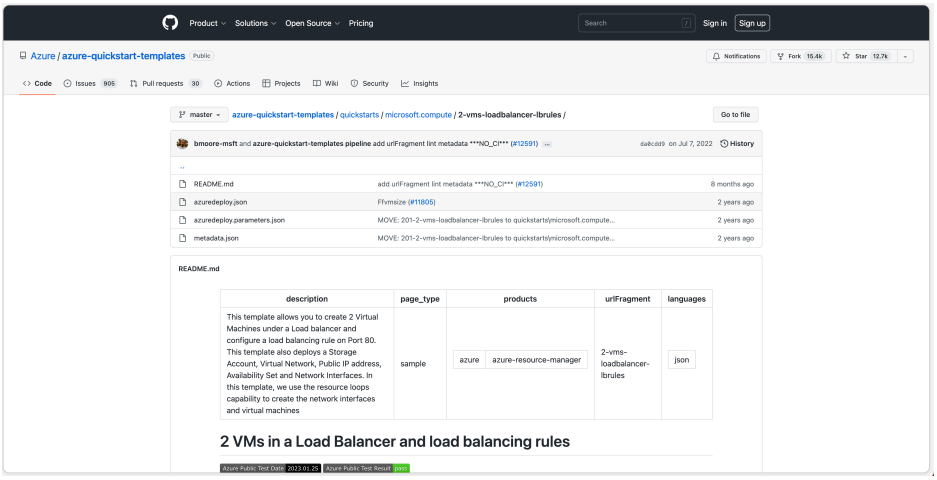
| This is a json file that outline your project infra and configuration. | This is an executable image file of a virtual machine. |
| It is Infrastructure as a code (IAAC) | It is IAAS (Infrastructure as a Service) |
| ARM template is just code so its size is negligible as compared to a Server Image. (template size limit is 4 MB) | This file's size is huge as it is an executable image file. |

## Optional Discussion

Visit GitHub (https://github.com/azure/azure-quickstart-templates) and look at all available templates. Can you find a template that deploys 2 web servers, a load balancer, and a Resource Group? Send the link to the template or a screenshot clearly highlighting the one you will select.




# STEP 5: Backup and Recovery

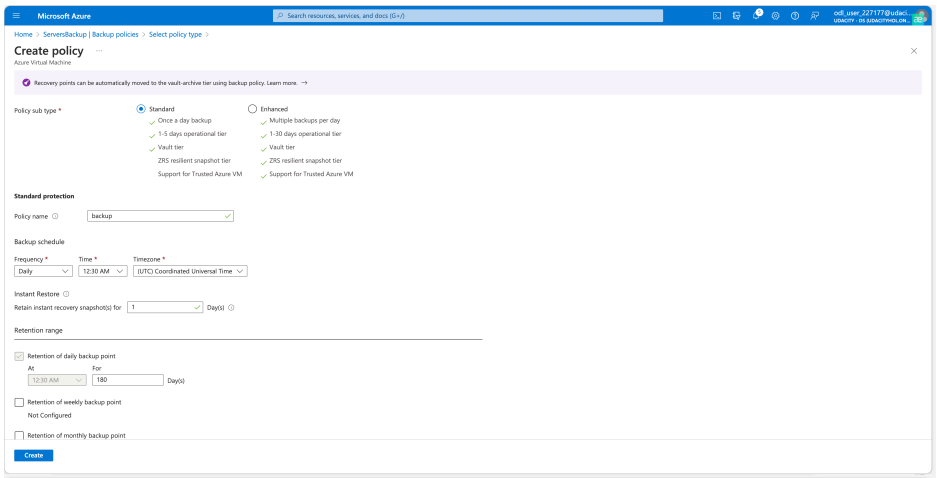
Purpose: Use the Azure backup services to setup recurring full daily backup jobs of your products and client's data. Test the backup process. No back is fully verified until you perform a successful restore.

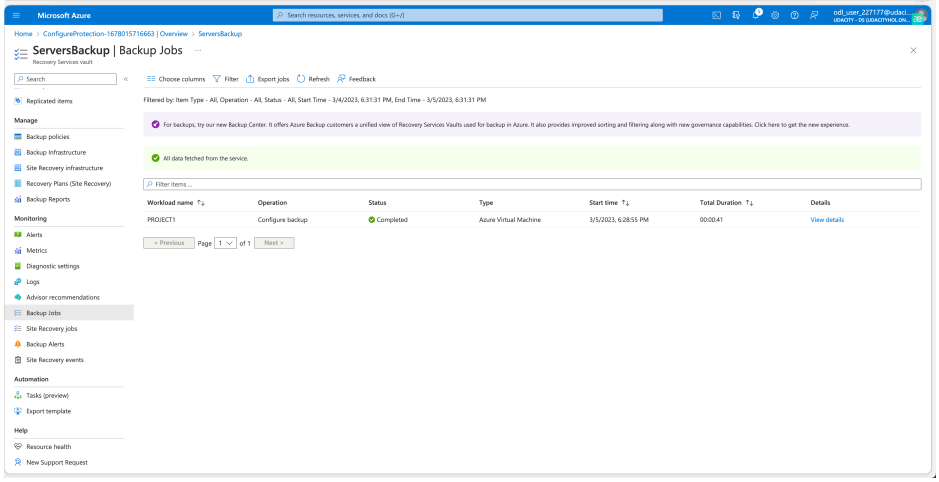
**You want to ensure your VMs are all backed up. You want to ensure a working replica of each of them is saved somewhere safe.** The steps are:

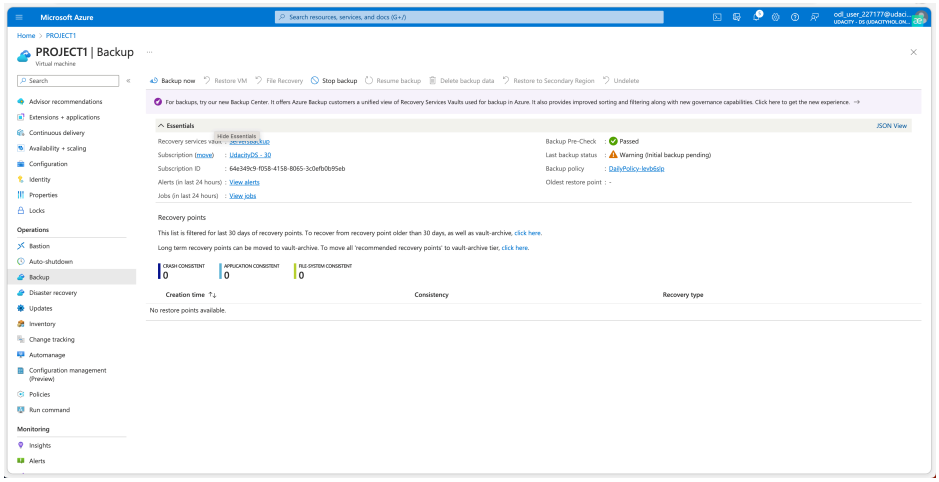
1. Create a backup vault. Call it "ServersBackup".
2. Install Azure Backup Extension on the target VM.
3. Create a backup policy in the vault. Set retention policy and daily backup points.
4. Now it is time to link the target VM to the backup policy. Click on the target VM, select Backup from the Operations tab. Then select the newly created backup policy.
5. Alternatively, you can select Recovery Services Vault from the left navigation bar. Select all the VMs you want to add to the backup.

## Backups

Provide screenshots of 1) the backup vault and 2) the backup policy.




## Discussion Question #1

What is the difference between Azure backup and site recovery? When would you use each service and for what reason?

The basic difference between azure backup and site recovery is that backup will ensure data is safe and recoverable but site recovery will keep data and workload available.
Site Recovery is used during an outage or a disaster in a data center for high availability.
Azure Backup is used to save time-based checkpoints of data or machine states which will/may eventually be used for recovery/restoration.

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| **Discussion Question #2**<br><br>Restore Time Objective (RTO) and Restore Point Objective (RPO) have similarities and differences.<br>A - How are they different? Make sure you consider each of the two.<br><br>B - Which backup strategy consumes more disc space? | A: The Restore Time Objective (RTO) and Restore Point Objective (RPO) are both important metrics used in disaster recovery planning, but they measure different aspects of the recovery process.<br><br>The RPO indicates how much data can be lost before it becomes unacceptable. This metric defines the point in time to which the data must be restored to ensure that the amount of lost data is within acceptable limits. In other words, it measures the maximum tolerable amount of data loss. For example, if the RPO for a system is 15 minutes, it means that the system must be able to recover to a point in time within the last 15 minutes to avoid unacceptable data loss.<br><br>On the other hand, the RTO measures the maximum amount of time that a system can be down before it becomes unacceptable. This metric defines the time limit for restoring the system to its operational state. It measures the maximum tolerable downtime that a system can experience before it impacts business operations. For example, if the RTO for a system is 2 hours, it means that the system must be restored within 2 hours to avoid unacceptable downtime.<br><br>Therefore, the key difference between RTO and RPO is that RTO is concerned with the time taken to recover the system, while RPO is concerned with the maximum amount of data loss that is acceptable.<br><br>B: Regarding disk space consumption, RPO can consume more disk space than RTO if the backup strategy involves taking frequent full backups. Full backups require more disk space than incremental backups because they store all the data. However, if the backup strategy involves taking incremental backups, the amount of disk space required may be less. |
| **Optional Discussion**<br><br>Create more that one backup policy for each type of data. For example, you may want to create a policy that backs up certain files and folders and not the entire VM's hard drive. Try a policy that has folder exclusion and inclusion. | |

# STEP 6: Antivirus Communication

Purpose: Enable the antivirus server to communicate with client VMs.

The XYZ antivirus server requires TCP ports 2222-2224 to communicate with the target client VMs. A firewall exception on the target VM is necessary to allow the XYZ server to scan and update the clients. Assuming Contoso will want to continue using their XYZ antivirus server, how will you alter the NSG (network security group) to allow all Contoso's Azure servers port: TCP 2222-2224 in from the antivirus server?

Each of the Azure servers you created have a unique internal (not public) IP address. Each one of these VMs has its own Network Security Group (nsg) associated with it as well. **Your task is to adjust the nsg of each server to allow for traffic coming from the antivirus server**. The steps are:

1. Make a list of each server and it's internal IP.
2. For each server's nsg, modify the settings to allow for TCP 2222-2224 from the antivirus server's IP number.
3. Test your work by trying to deploy the antivirus agent on one of the target servers.

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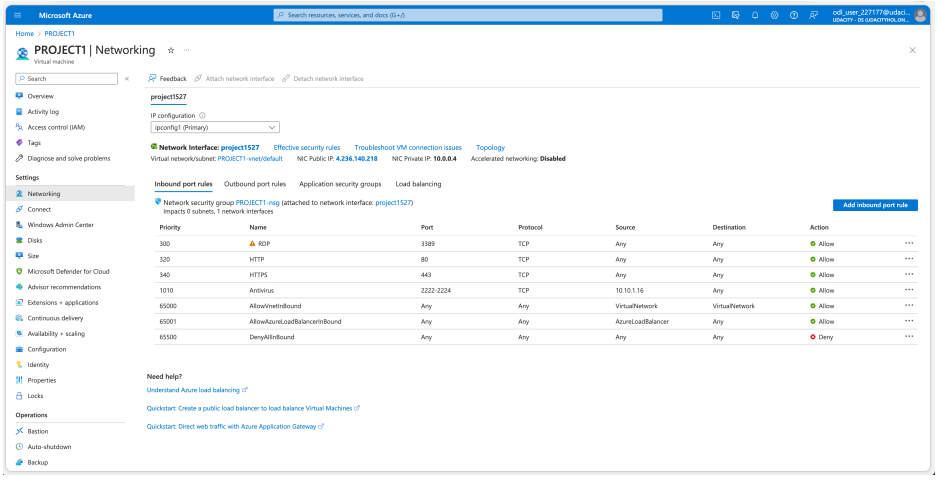
| **Inbound Rules**<br><br>Provide a screenshot of the modified nsg firewall inbound rules. |  |
| **Discussion Question #1**<br><br>Will you need to create an inbound port exception on your Windows OS? | Yes, the inbound rule should be added to the Windows OS firewall. NSG is an external firewall to a Virtual Machine hence Windows is an internal firewall, ports on both should be open for communication to take place |

**Note: Once you have completed your report, feel free to shut down your Azure resources to avoid charges!**