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  **CPU:** 8 Cores and 60% average utilization  **RAM:** 16 GB and 87% average utilization  **HDD OS:** 500 GB capacity with 57 GB used  **Web URL:** Contoso.com  **IP # Public:** 200.200.100.50  **IP #:** 10.10.1.11  **Firewall:** Inbound TCP 2222-2224, 80, 443  **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  This server uses ports 80 and 443 for HTTP and HTTPS traffic |
| Server 2 & 3: | **Purpose:** Microsoft SQL 2019  **CPU:** 8 Cores and 30% average utilization x2  **RAM:** 16 GB and 87% average utilization x2  **HDD OS:** 500 GB capacity with 240 GB used x2  **HDD Data:** 2 TB SAN (Storage Area Network drive)  **IP #:** 10.10.1.12 and 10.10.1.13  **SQL Cluster:** SQLCluster.Contoso.Com  **IP #:** 10.10.1.14  **Firewall:** Inbound TCP 2222-2224, 1433  **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.  These servers use the standard SQL inbound TCP port 1433 |
| Server 4: | **Purpose:** ABC Backup and Restore server  **CPU:** 8 Cores and 30% average utilization  **RAM:** 16 GB and 87% average utilization  **HDD OS:** 500 GB capacity with 164 GB used  **HDD Backup:** 40 TB  **IP #:** 10.10.1.15  **Firewall:** Inbound TCP 2222  **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. |
| Server 5: | **Purpose:** XYZ Antivirus server  **CPU:** 8 Cores and 30% average utilization  **RAM:** 16 GB and 87% average utilization  **HDD:** 500 GB capacity with 43 GB used  **IP #:** 10.10.1.16  **Firewall:** Inbound TCP 2222-2224  This server uses ports TCP 2222-2224 for the antivirus client  **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**  Make a list of all current on-premises servers and services. | Server 1: WordPress web server - Running 24x7  Server 2 & 3: Microsoft SQL 2019  Server 4: ABC Backup and Restore server  Server 5: XYZ Antivirus server - Running 24x7 |
| **Matching Azure Services** Match the list of on-premises servers and services to the corresponding Azure ones. | Use Azure App Service: matches with server 1  Create SQL Databases: matches server 2 & 3  Create Recovery Service vaults: matches with server 4  Azure Security Center: matches with server 5 |
| **Discussion Question #1** 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.  B - List your migration plans. | A - Verify the running programs and services  By analyzing the metrics, you can identify the services running on the Azure VM and monitor their resource utilization. Additionally, you can use Azure Log Analytics to collect and analyze logs from the VMs, which can provide more detailed information about the running services.  B – Migration plans  Step 1) Assessment and Planning: Assess the resource requirements, dependencies, and configurations of each on-premises server.  Step 2) Create an Azure Account and Subscription: Sign up for an Azure account and create an appropriate subscription.  Step 3) Azure Resource Creation: Create the necessary Azure resources to host the WordPress site, including Azure App Service, Azure SQL Database, and Azure Backup Vault.  Step 4) Data Migration: Migrate the WordPress website's content and database to Azure App Service and Azure SQL Database, respectively. You can use tools like Azure Database Migration Service or other database migration tools.  Step 5) Configure Security Center: Enable and configure Azure Security Center to monitor and protect your Azure resources, including the WordPress site.  Step 6) Implement Backup and Restore: Set up Azure Backup for automatic backups of the Azure SQL Database and other critical data.  Step 7) DNS and Network Configuration: Update DNS settings to point to the new WordPress site hosted on Azure App Service. |
| **Discussion Question #2** On your on-premises servers:  A - How can you find the listing of all windows firewall port exceptions?  B - Do these firewall port exceptions have to match the NSG firewall exceptions? Please explain. | A)By reviewing the "Inbound port rules" section, you can identify all the Windows Firewall port exceptions configured for the Azure VM  B)  Yes, the firewall port exceptions configured in the Windows Firewall on your Azure VM should ideally match the Network Security Group (NSG) firewall exceptions.  When traffic reaches an Azure VM, it first encounters the NSG rules, which act as a network-level filter. If the traffic is allowed by the NSG rules, it then reaches the Windows Firewall on the VM. |
| **Optional Discussion** 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.

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| **Server Name** | **CPU Cores** | **RAM/HD** | **VM Type** | **Monthly Cost** |
| Server 1 WordPress web server | 8 | 16 | The Standard A8 v2 | 145.25 |
| Server 2 Microsoft SQL 2019 | 8 | 16 | The Standard A8 v2 | 203.285 |
| Server 3 Microsoft SQL 2019 | 8 | 16 | The Standard A8 v2 | 203.285 |
| Server 4 ABC Backup and Restore server | 8 | 16 | The Standard A8 v2 | 145.25 |
| Server 5 XYZ Antivirus server | 8 | 16 | The Standard A8 v2 | 145.25 |

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| **Discussion Question #1** Will these 4 Azure servers provide HA/DR for Contoso? Will their site be available 24x7, 365 days? | No, there is no HA setup on the current system, the provided servers represent a single point of failure. As the information above, server number 1-4-5 is a single node, if the upgrade or patching happens, the system need downtime for these action. |
| **Discussion Question #2** 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, in Azure, you can easily change the VM type (upgrade or downgrade) to adjust the configurations based on your needs. This flexibility is one of the advantages of using cloud services like Azure Virtual Machines.      Result: |
| **Optional Discussion** Is Contoso better off with a SQL Managed Instance? Check Azure Pricing. |  |

**Note:** *If you are using Udacity Cloud Labs, you will be allowed to create a few VM sizes only. Visit*[this](https://portal.azure.com/#create/Microsoft.VirtualMachine) *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*](https://docs.microsoft.com/en-us/azure/vpn-gateway/vpn-gateway-howto-site-to-site-classic-portal) *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.

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| **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. | 1. ARM templates enable defining Azure infrastructure as code using JSON files, offering version control for tracking changes, enabling automated deployment through tools like Azure DevOps, and facilitating collaborative work. 2. ARM templates ensure consistent deployments across environments, reduce errors, and support customization. 3. ARM templates simplify resource management by unifying configuration, tracking changes, and handling dependencies efficiently. |
| **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 Purpose:Defines Azure resources and configurations as code for consistent, automated deployment.  - ARM Template Usage: Ideal for creating and managing Azure resources across environments, ensuring version control and predictability.  - Server Image Purpose: Snapshot of an OS and software setup for creating uniform virtual machine instances.  - Server Image Usage: Used to rapidly deploy VMs with the same software stack, ensuring standardized environments and reducing setup time. |
| **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.

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| **Backups**  Provide screenshots of 1) the backup vault and 2) the backup policy. | 1)    2) |
| **Discussion Question #1** What is the difference between Azure backup and site recovery? When would you use each service and for what reason? | 1. Azure Backup: Azure Backup is primarily focused on protecting and restoring data. It provides a simple and reliable way to back up and restore files, folders, and system state of virtual machines (VMs) running in Azure or on-premises. 2. Azure Site Recovery: Azure Site Recovery (ASR) focuses on disaster recovery and business continuity. It provides replication and orchestration capabilities to help you recover and failover your applications and workloads in case of a disaster. |
| **Discussion Question #2** Restore Time Objective (RTO) and  Restore Point Objective (RPO) have  similarities and differences.  A - How are they different? Make sure you consider each of the two.  B - Which backup strategy consumes more disc space? | A - Differences:  - RTO: Focuses on downtime, defines maximum acceptable time to restore systems.  - RPO: Focuses on data loss, sets maximum acceptable time between last backup and disruption.  B - Disk Space:  - Backup strategies with smaller RPO consume more disk space due to frequent backups. Larger RPO strategies use less space with fewer backups. |
| **Optional Discussion** 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**  Provide a screenshot of the modified nsg firewall inbound rules. |  |
| **Discussion Question #1** Will you need to create an inbound port exception on your Windows OS? | Yes, it is necessary to allow incoming network traffic to reach specific applications or services running on your machine. By default, Windows blocks incoming connections for security reasons. However, there are scenarios where you might want to allow certain applications or services to receive incoming traffic. This can be done through the Windows Firewall with Advanced Security tool. For example, we open port 80 for HTTP or port 443 for HTTPS. This allows external users to access your web server and view your website. |

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