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. | 1 WordPress web server in Server 1  2 Microsoft SQL 2019 in Server 2 & 3  1 ABC Backup and Restore server in Server 4  1 XYZ Antivirus server in Server 5 |
| **Matching Azure Services** 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.  1 Virtual machines for the web server  1 Virtual machines for SQL databases? Yes, we only need one SQL DB server, not the second one.  1 Virtual machines for the ABC Backup and Restore server.  1 Virtual machines for XYZ Antivirus server. |
| **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. | 1. In search bar menu input “Task manager”, Click open Task Manager, The Task Manager will open on the left side under the System section.      1. To gather information from the on-premises environment, I can utilize Azure Migrate to discover the machines and generate reports. Then, we conduct assessments to determine the readiness for migrating from on-premises to Azure. |
| **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. | 1. You can locate the list of all Windows Firewall port exceptions in the Advanced Settings within the Windows Firewall menu of the Control Panel. 2. No need. One potential issue when starting out is not making the proper adjustments to the NSG. Administrators typically set restrictions within the Windows Firewall. However, the rules in the NSG take precedence over those in the Windows Firewall. Additional problems arise from creating rules in both the Windows Firewall and the NSG. This results in duplicate rules, requiring modifications in two places in the event of organizational changes. |
| **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** |
| Web server(Azure App Service) | 4 vCPUs | 14 GB RAM/ 500 GB HDD | D3 | 3-year agreements :  Hybrid Benefit: $175.44  Pay as you go: $430.56 |
| SQL Database Server(Azure SQL Database) | 4 vCPUs | 32 GB RAM/ 500 GB HDD | L4s | 3-year agreements :  Hybrid Benefit: $171.64  Pay as you go: $1480.44 |
| Antivirus server | 8 vCPUs | 16 GB RAM/ 500 GB HDD | F8 | 3-year agreements:  Hybrid Benefit: $220.34  Pay as you go: $580.94 |
| ABC Backup and Restore server( Azure Backup) | 4 vCPUs | 14 GB RAM/ 500 GB HDD | D3 | 3-year agreements:  Hybrid Benefit: $175.44  Pay as you go: $430.56 |

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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? | High availability is achieved when there are no single points of failure in the system. However, in our current setup, each task relies on a single server, creating potential points of failure. For instance, if we need to update the WordPress server, the entire site will be down, highlighting the lack of high availability with only 4 Azure servers.  To ensure high availability in the future, we need to eliminate single points of failure in all VMs. This can be achieved through various tools and strategies, including:   1. Availability Zones: Instead of having virtual machines on different physical machines within the same datacenter, they are logically organized across multiple physical devices, spanning multiple data centers. 2. VM Scale Sets: Automatically scales the number of VMs based on demand, ensuring high availability by distributing workload across multiple instances. 3. Availability Sets: Provides fault tolerance and update domains. By default, there are two fault domains and five update domains.  * Fault domain: Allows Azure to automatically failover virtual machines to different physical hosts in case of hardware failures. * Update domain: Manages instances where there is scheduled or unscheduled maintenance.  1. Load Balancer: Distributes incoming traffic across multiple VM instances to ensure high availability. Resources can be placed in different regions to mitigate potential disasters in an entire region.   If servers need to be updated or upgraded, they will fail over to other VMs available in different fault domains, ensuring uninterrupted service. |
| **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. |
| **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. | Consistency across deployments.  Simplified complex deployments.  Reduced errors.  Easily reusable.  Improved speed. |
| **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. | Server image: An image is a backup copy of your server, allowing you to restore or clone it. With a backup plan, images can be created automatically at scheduled intervals.  ARM: ARM (Azure Resource Manager) is used for deployments, allowing for automated resource deployment within Azure using JSON templates. |
| **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. |  |
| **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 provides a cost-effective and secure backup solution with one-click simplicity. It's scalable to fit your backup storage requirements. The centralized management interface makes it easy to define backup policies and protect various enterprise workloads, including Azure Virtual Machines, SQL and SAP databases, and Azure file shares.  * In short, Azure Backup is used for creating backups.  1. Site Recovery is a native disaster recovery as a service (DRaaS), and Microsoft has been recognized as a leader in DRaaS by Gartner in the 2019 Magic Quadrant for Disaster Recovery as a Service, based on completeness of vision and ability to execute.  * It enables the replication of physical machines from on-premise environments to the Azure Cloud, as well as the replication of virtual machines from on-premise to the Azure Cloud. |
| **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. RTO (Recovery Time Objective) is the targeted duration between the event of failure and the resumption of operations.  RPO (Recovery Point Objective) is the maximum acceptable time period from which data can be restored, indicating the potential data loss. It represents the age of the files or data in backup storage needed to restore normal operations after a system or network failure.   * RPO is the time elapsed from the last data backup to the occurrence of an incident that may have led to data loss, while RTO is the time set to recover the lost data.   B. Full snapshot copies require more disk space. |
| **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, inbound ports must be configured on the Windows OS. The inbound port rules are just the basic ones. In Windows OS, we can configure more advanced features. |

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