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:

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, 443p
	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.

Current Environment	- Server 1 : WordPress web
Make a list of all current on-premises servers and services.	- Server 2 & 3 : Microsoft SQL 2019 - Server 4 : ABC Backup and Restore - Server 5 : XYZ Antivirus
Matching Azure Services Match the list of on-premises servers and services to the corresponding Azure ones.	- Azure Virtual Machine running a web server with WordPress - Azure Virtual Machine running a SQL server - Azure Virtual Machine running ABC Backup - Azure Virtual Machine running XYZ Antivirus
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 - To verify the running programs and services on each of your on-premises servers, you can follow these steps: 1. Log in to each on-premises server using appropriate administrative credentials. 2. Open the Task Manager by pressing Ctrl+Shift+Esc or by right-clicking on the taskbar and selecting "Task Manager". 3. In the Task Manager, go to the "Processes" or "Details" tab to view the list of running processes and services. 4 Identify the relevant services by looking for their names or associated processes. You can also check the "Services" tab in the Task Manager for a more detailed view of the services running on the server. 5. Make note of the services running on each server, including any backups or antivirus software. B - Server 1 & 5 : Replace with Azure VM Server 2 & 3 : Migrate with Azure VM via Migration Assistant Server 4 : Replace with Azure Backup server
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 - To find the listing of all Windows firewall port exceptions on your on-premises servers, you can follow these steps: 1. Open the Windows Firewall with Advanced Security management console. You can access it by typing "wf.msc" in the Run dialog box or by searching for "Windows Firewall with Advanced Security" in the Start menu. 2. In the management console, navigate to "Inbound Rules" or "Outbound Rules" depending on the direction of the traffic you want to inspect. 3. Here, you will find a list of all the firewall rules that are currently configured on your server. These rules specify which ports and protocols are allowed or blocked for inbound or outbound traffic.

	B - Firewall port exceptions on your on-premises servers don't have to match NSG firewall exceptions in Azure. Windows firewall controls local network traffic on your servers. NSGs in Azure control traffic to and from Azure resources. While consistency is good, it's not mandatory to have matching rules. Review and update firewall rules during migration to ensure proper communication.
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.

Server Name	CPU Cores	RAM/HD	VM Type	Monthly Cos
Server 1 – WP web	4	16GB/128GB	D4s_v3	$ 274.48
Server 2 – SQL	4	16GB/256GB(+ex2TB)	D4s_v3	$ 274.48
Server 3 – SQL	4	16GB/256GB(+ex2TB)	D4s_v3	$ 274.48

Server 4 – Backup	4	16GB/256GB	D4s_v3	$ 274.48
Server 5 – Antivirus	4	16GB/128GB	D4s_v3	$ 274.48
Total				$ Backup1,372.4

| Discussion Question #1

Will these 4 Azure servers provide HA/DR for Contoso? Will their site be available 24x7, 365 days?	No. The availability and high availability/disaster recovery (HA/DR) capabilities of the Azure servers will depend on the specific configurations and settings implemented by Contoso. Azure provides various features and services, such as load balancers, virtual machine scale sets, and availability sets, that can be utilized to achieve high availability and ensure continuous operation of the site. By implementing appropriate redundancy and failover mechanisms, Contoso can ensure that their site remains available 24x7, 365 days a year. It is important for Contoso to carefully plan and configure their Azure infrastructure to meet their specific availability requirements.
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, we can change the VM type and upgrade or downgrade the configurations based on your needs in Azure. To downgrade an Azure VM, you need to follow these steps:

1.Go to the Azure portal and navigate to the Virtual Machines tab.
2.Select the target VM that you want to downgrade.
3.Make sure the VM is turned off and deallocated.
4.On the left navigation, select "Size".
5.A new window will open up displaying various VM size options.
6.Choose a smaller VM size that meets your requirements.
7.Click the "Resize" button to initiate the downgrade process. |
| 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 *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.	Using ARM templates in Azure offers several benefits: 1. **Infrastructure as Code**: ARM templates allow you to define your infrastructure as code, which means you can describe your Azure resources, their configurations, and dependencies in a declarative manner. This enables consistent and repeatable deployments, reducing the risk of manual errors and ensuring that your infrastructure is always in the desired state. 2. **Automation and Scalability**: ARM templates enable automation of resource provisioning and management. You can easily deploy and scale resources by simply deploying the template, which saves time and effort. This is particularly useful in scenarios where you need to deploy multiple instances of the same resource or when you need to scale your infrastructure based on demand. 3. **Version Control and Collaboration**: ARM templates can be version controlled using tools like Git, allowing you to track changes, roll back to previous versions, and collaborate with team members. This promotes collaboration, facilitates code reviews, and ensures that infrastructure changes are properly documented and auditable.
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 templates are used for provisioning and managing infrastructure resources, while server images are used for provisioning and deploying virtual machines. ARM templates define the infrastructure and configuration, while server images capture the state of a VM. You would use an ARM template when you want to define and deploy a specific set of resources, and you would use a server image when you want to quickly deploy multiple instances of a VM with the same configuration.
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	-

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?	Azure Backup is used for data protection, backup, and recovery of specific resources or workloads, while Azure Site Recovery is used for disaster recovery and business continuity, ensuring failover and failback of entire environments or sites. You would use Azure Backup when you need to protect and recover specific data, and you would use Azure Site Recovery when you need to ensure business continuity and recover entire environments 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 - The main difference between RTO and RPO is that RTO focuses on the time it takes to restore a system or service, while RPO focuses on the point in time to which data needs to be recovered. B - The backup strategy that consumes more disk space depends on the specific implementation and requirements of the backup solution. Generally, a backup strategy that includes frequent backups or backups with shorter retention periods may consume more disk space compared to a strategy with less frequent backups or longer retention periods. Additionally, the size of the data being backed up also plays a role in determining the disk space consumption. It is important to strike a balance between the desired RTO, RPO, and the available disk space to ensure efficient and cost-effective backup storage.
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.

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, in certain scenarios, we may need to create an inbound port exception on your Windows OS to allow specific network traffic.

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