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. | Inventory the On-Premises environment :-  Contoso’s current on-premises infrastructure consists of 5 virtual machines –   1. WordPress web server with 8 cores of CPU, 16 GB of RAM, HDD OS of 500 GB capacity and runs 24\*7. 2. Two Microsoft SQL 2019 servers, each of with 8 cores of CPU, 16 GB of RAM, HDD OS of 500GB, HDD Data of 2 TB Storage Area Network drive which runs 24\*7 and act as active-passive nodes. 3. ABC Backup and Restore server with 8 cores of CPU, 16 GB of RAM, HDD OS of 500 GB capacity and HDD Backup of 40 TB. The backup software runs daily at 8pm and stores data of last 18 months. 4. XYZ Antivirus Server with 8 cores of CPU, 16 GB of RAM, HDD of 500 GB capacity which is constantly running and monitor’s all Contoso’s servers and mitigates against viruses and hack attacks. |
| **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.  Investigate equivalent Azure solutions to the on-premises environment:-   1. WordPress Web server – One Azure Virtual Machine, B8ms has 8 cores of CPU, 32 GB of RAM used for WordPress web server that runs 24\*7. 2. One Azure Virtual Machine B8ms, each of with 8 cores of CPU and 32 GB of RAM used as Microsoft SQL servers and runs 24\*7 with MS SQL 2019 installed. 3. One AzureVirtual Machine, B8ms with 8 cores of CPU, 32 GB of RAM dedicated for backup and restore purpose. 4. One Azure virtual machine, B8ms with 8 cores of CPU, 32 GB of RAM installed with Antivirus software which serves as 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. | Inventory related services and firewall exceptions to carry to the cloud.   * Inventorying services running on on-premises devices – * It can be done through Azure Portal using Azure Migrate * Azure Portal 🡪 Azure Migrate🡪 Servers (under Migration goals)🡪Assessment Tool🡪Discover(Servers discovered from appliance or imported servers, csv file). |
| **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. | * Where any firewall exceptions can be found?   + On-premises server 🡪Control Panel🡪Windows Firewall🡪Exceptions tab. |
| **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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| **ServerName** | **CPU Cores** | **RAM** | **VM Type** | **Monthly Cost** |
| WordPress Web Server | 8 | 32 | B8ms | $169.20 |
| MS SQL Server1 | 8 | 32 | B8ms | $169.20 |
| ABC Backup and Restore Server | 8 | 32 | B8ms | $169.20 |
| XYZ Antivirus Server | 8 | 32 | B8ms | $169.20 |
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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? | Assess the possibility of High Availability/Disaster Recovery in the cloud :-   * There is no High Availability/Disaster Recovery with this 4 server setup. * High Availability can only be reached if there is no single point of failure. * There is only one server for each task in the current setup, which creates a single point of failure, if we need to update a server then the site will be down. |
| **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 to B2ms. Also, please provide a screenshot of the VM Overview settings, including VM name and size. | Whether Virtual Machine size can be changed after deployment?   * Yes, it is possible to resize virtual machines after deployment. * Goto Azure Portal🡪Virtual Machines🡪Select the Virtual Machine to resize🡪In Virtual Machine resource, select Size(under settings)🡪Select new size from available sizes🡪Create * New size of B2ms was selected and virtual machine size was updated from the old size B4ms.   D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\MovingFromOnPremToAzureCloud\screenshots\step2screenshot1.png |
| **Optional Discussion** Is Contoso better off with a SQL Managed Instance? Check Azure Pricing. |  |

# 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. | Creates a replica of Wordpress server configuration, and includes a screenshot of a template configuration process.  D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\MovingFromOnPremToAzureCloud\screenshots\step4screenshot1.png |
| **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. | List at least three benefits of using ARM templates. Think of when, why and how you can benefit from this Azure service.   * ARM templates are written in JSON and are useful they allow us to automate the deployment of resources instead of manual deployment within Azure. * The main elements within the ARM templates include – Schema, ContentVersion, Parameters, Variables, Functions, Resources, outputs. * By using ARM templates, we have-   + Consistency with deployments   + There is a reduction of errors   + Easily reusable   + Speed deployments * Imagine having to deploy 10 virtual machines with different networks, Scale Sets, NSGs, etc. temporarily for staging/testing purposes which would be deleted and added back 4-6 times every month, which is cumbersome and time intensive. * Azure Automation tools will make this process easier by using ARM templates for deployment in conjunction with Azure Blueprint to enforce business security/compliance requirements. * With ARM template, we will be able to redeploy this template over and over again with more consistent settings. Settings will be static and some settings will need to change to something different/unique for each deployment for the information that changes on each deployment. For situations, like that, you have a parameter file in which you change the information for each deployment. |
| **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. | Distinguishes between the ARM template and a server image, both in what they are and when they are used.   * In Azure, **ARM templates** are used to automate the deployment of resources. It is also possible to modify ARM template and redeploy. It requires Azure Subscription, Resource Group, Template.json file, if required Parameters.json file.   + ARM templates can be thought as Infrastructure as a code service, which uses declarative syntax to define properties of resources you need to deploy.   + With ARM template resources can be rapidly deployed in various environments for your organization.   + There is no limit for the number of resources deployed parallelly. * **Server image** can be thought as a virtual machine image that includes all aspects of Azure virtual machines. It contains the metadata of the virtual machines.   + Server images can also be used to deployed resources in various environments in the organization.   + There is a certain limit for the number of resources deploying parallelly. |
| **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. | Note – Created backup service with name “ContosoBackAndRecovery” instead of “ServersBackup”.  D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\MovingFromOnPremToAzureCloud\screenshots\step5screenshot1.pngD:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\MovingFromOnPremToAzureCloud\screenshots\step5screenshot2.png |
| **Discussion Question #1** What is the difference between Azure backup and site recovery? When would you use each service and for what reason? | Discusses the difference between Azure Backup and Site Recovery, including when would you use each service and for what reason.   1. Azure Backup – you have the ability to backup resources both on-premises and also resources within Azure cloud.  * Advantages of Azure Backup, it provides full flexibility for when backups are taken(scheduled backups or manual backups) * Support for virtual machines on both Hyper-V and VMware. * Requires no special licensing. * Azure Backup Services can be used to perform a failure mode analysis, planning redundancy, utilizing resiliency strategies when applicable, making availability a consideration for designing a solution. * With Azure Backup Services you can create a plan that will protect your on-premises environment against unexpected disaster and failover offsite in the event of the existing onsite data center not being accessible.  1. Azure Site Recovery is a tool which provides the ability to replicate physical and VM workloads from on-premises environment into a secondary location.  * Azure Site Recovery is a tool which has disaster recovery as a service. You do not have to worry about the separate facility that you maintain for the purpose of having another physical site to protect against disaster occurring at your main site. * Through Azure Site Recovery, the second physical site will be at Microsoft’s datacenter but you are not responsible for day to day maintenance. * Azure Site Recovery has the capabilities to replicate physical machine from on-premises to Azure cloud, replicate virtual machine from on-premises to Azure cloud, replicate virtual machine within Azure cloud from one region to another region within Azure cloud. * It provides customizable recovery plan feature to specify the order in which your virtual machines are recovered. * With Azure Site Recovery setup, if you have a natural disaster at your primary site the system will failover to the secondary location and once you have the primary site functional again then you will have the ability to failback again over to the primary site. |
| **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? | Discusses the differences between Restore Time Objective(RTO) and Restore Point Objective(RPO).  While creating protection plan for on-premises environment, establishing recovery metrics is one of the crucial requirements, we have -   1. Restore Time Objective is the maximum acceptable time that an application can be unavailable after an disaster or incident. 2. Restore Point Objective is the maximum duration of data loss that is acceptable during a disaster. |
| **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. | Provides a screenshot of the modified NSG firewall inbound rules confirming that relevant ports/IP are open to traffic.  D:\Courses\Udacity\CloudArchitectUsingMicrosoftAzure - Bertelsmann\projects\MovingFromOnPremToAzureCloud\screenshots\step6screenshot1.png  Note- Submitting screenshot of modified nsg firewall inbound rules for one virtual machine. |
| **Discussion Question #1** Will you need to create an inbound port exception on your Windows OS? | Discuss whether they need to create an inbound port exception on Windows OS.   * Yes, inbound port exception must be set on Windows OS. * Inbound port exceptions are used to allow traffic from other networks or servers to your system. |

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