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:

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.

Current Environment Make a list of all current on-premises servers and services.	SERVERS • Wordpress Web Server (Windows) • 2 X Microsoft SQL 2019 Servers (Windows) • ABC Backup and Restore Server (Windows) • XYZ Antivirus Server (Windows) SERVICES • E-Commerce (Public IP) • SQL Cluster (Active Passive nodes) • Backup • Anti Virus (Traffic Monitoring and defense against virus and 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. Wordpress Server can be implemented using 4 Services/ Resources 1 Virtual Machine, Public IP, Disk, DNS , NSG (Most are included while creating a Azure Vm) . 2 Microsoft SQL servers can be replaced with 1 VM configured as SQL Server a 2 TB disk can be mounted to this VM (2nd SQL Server is not necessary as azure provides 99.9% availability) Backup Server is can be replaced by Azure Virtual Machine or using Azure Backup Service. XYZ Antivirus Server can be implemented using Azure Virtual Machines (NSGs can be used to allow traffic to other vms from 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.	A • Azure Migrate • By deploying and configuring the Azure Migrate appliance on premises. • To configure the appliance, you can use the deployment method as per your environment (Vmware / Hyper-V) (if any). • After deploying the appliance, you need to register it with the Migrate project and configure it to initiate the discovery. • On premises Services can be found using Discovery and Assessment Tool in Azure Migrate. (Deployment methods for the Migrate Appliance are via Vmware / Hyper-V template and Powershell installer Script.) B • Listing Current Environment (Resources and Services) • Find Equivalent options on a Azure • Estimate Cost benefits using pricing calculator and explaining it to Stakeholders • Getting Approval from Stakeholders • Training Personnel (making them comfortable with using cloud services as their workspace). • Studying how to implement migration • Testing implementation on a small scale • Once successful, slowly start migrating, using Azure Migrate Appliance while not decommissioning resources on premises. • Monitor for improvements.

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 • For port exceptions go to : • Control Panel>System and Security>Windows Defender Firewall>Allow an app or feature through Windows Defender Firewall. • To Find Active Apps, Services: • Control Panel>Programs>Programs and Features B • Yes, these port exceptions must match the NSG firewall exceptions, as the NSG is an external firewall through which packets go through before reaching (receiver), going towards(sender) the destination. • While sending if the port used for sending is opened on the windows server but not the NSG, then it will leave the windows server through the assigned port but when it comes to the NSG firewall server to leave towards the destination since the port has not been opened the packet will be discarded at the NSG firewall. • Similarly if NSG port is on and Windows port is off then the packet will be discarded when it reaches the Windows Server.
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.

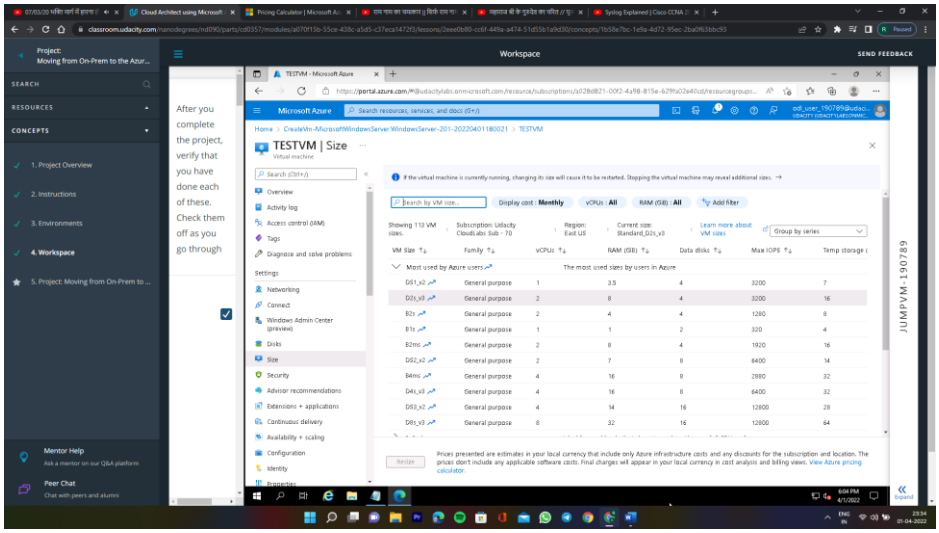
Server Name	CPU Cores	RAM/HD	VM Type	Monthly Cost
Wordpress Web Server	8	16/512	F8s v2 : 8vcpus, 16 GB ram, 64 gb temporary Storage; Compute Optimised	$133.48
SQL SERVER	8	16/512 + 2TB	F8s v2 : 8vcpus, 16 GB ram, 64 gb temporary Storage; Compute Optimised	$133.48 + $77.87
-	-	-	-	-
BACKUP SERVER	8	16/512GB + 40 TB	F8s v2 : 8vcpus, 16 GB ram, 64 gb temporary Storage; Compute Optimised	$133.48+ $563.54
XYZ ANTIVIRUS SERVER	8	16/512	F8s v2 : 8vcpus, 16 GB ram, 64 gb temporary Storage; Compute Optimised	$133.48

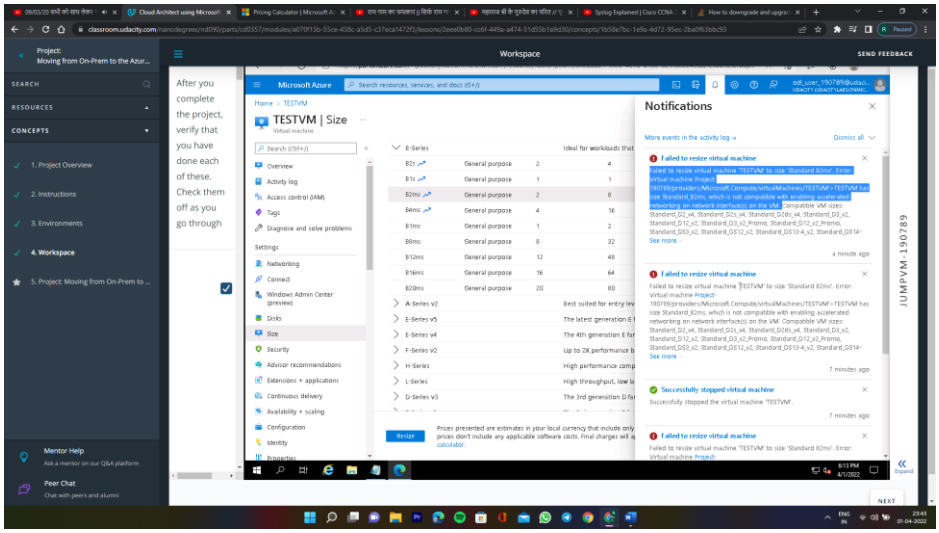
Discussion Question #1 Will these 4 Azure servers provide HA/DR for Contoso? Will their site be available 24x7, 365 days?	No these 4 Servers will not provide HA/DR for Contoso. (Azure provides 99.9% Availability) Their Site will not be available 24x7,365 days as the servers may go down for Server Maintenance(Updates/Upgrades) / Center Outage that . Azure provides 99.9% availability. That is for 0.1% annually azure may shutdown the instance for maintenance or due to an outage, (0.1 % is 8.76 hours per year) (In such case Contoso can use Availability Zones, DR to ensure 100% uptime.) Case) When the Wordpress/Any Server needs to be Updated at that time the updating/upgrading Server's Service will go down. (Contoso can be Replicated on the same Center or a different Availability Zone. The original E-commerce Web Server can be Failed over to a Availability Zone or in a Availability Set and set to Update/Upgrade meanwhile the replicated machine working as the Web Server for Clients.) Case) In case a disaster occurs the current Workload can be failed over to a different Availability Zone or a different Region and as soon as things go normal the replicated Workload can be failed back to the original Zone. Case) Single Point failure may happen in such case an anomaly can be detected and on trigger this will replicate/restore to the last working point backup. Above are common cases one may face and use the mentioned solutions to maintain HA. [Azure guarantees 95% SLA for a single Virtual Machine and 99.5% SLA for 2 or more Virtual Machine Instances in same availability set. Based on this, Wordpress Server will surely have atleast 95% uptime Sql Server (either 1) will have atleast 99.95% uptime Backup Server will have atleast 95% uptime (Incase of failing to provide above uptimes Azure will compensate for it)]

Discussion Question #2

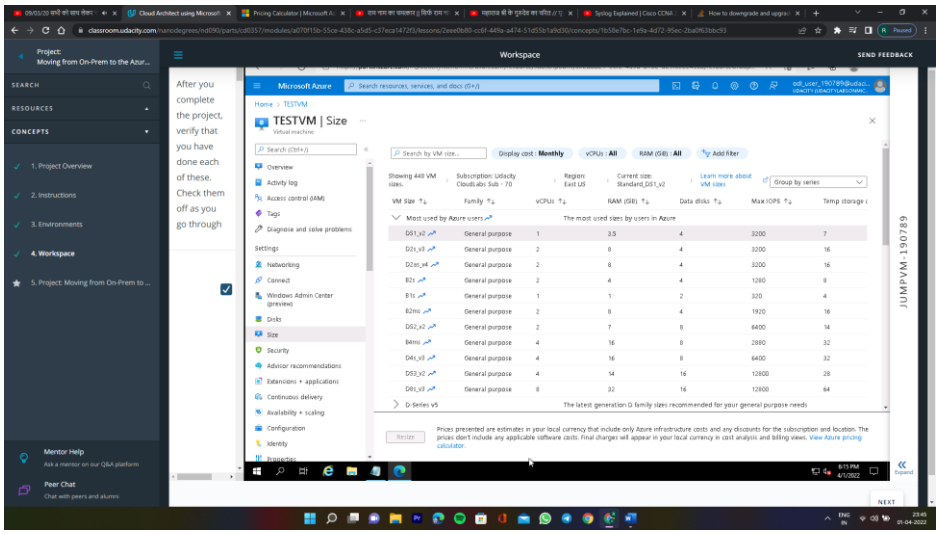
Can you change the VM type (upgrade or downgrade the configurations based on needs)? Try to downgrade one of the Azure VMs to B2ms. Also, please provide a screenshot of the VM Overview settings, including VM name and size.

Yes VM sizes can be Up/Down Scaled based on needs but the functionalities the previous size was offering must also be offered by the smaller size

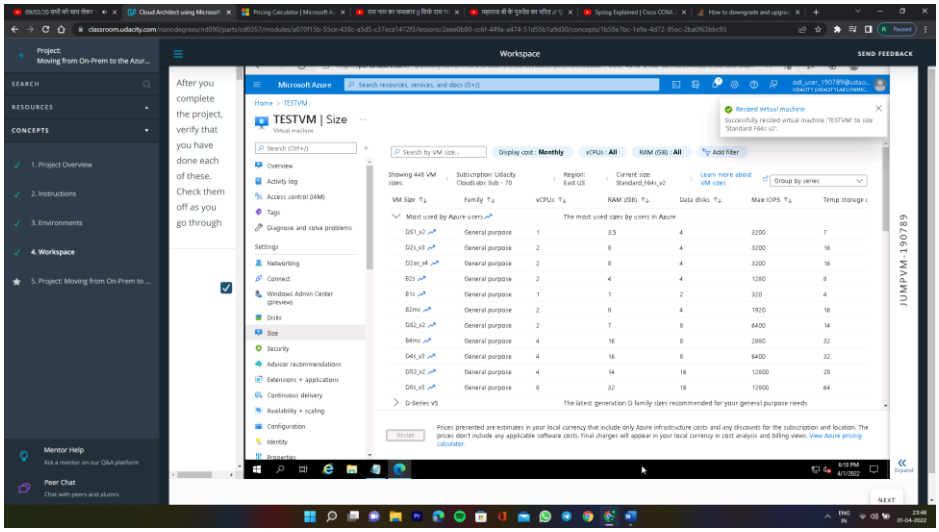




Since B2ms doesn't support accelerated networking thus Vm size could not be downgraded but below I have downgraded it to DS1_v2



Now I will upgrade it to F64s_v2



Optional Discussion

Is Contoso better off with a SQL Managed Instance? Check Azure Pricing.

Managed instance cost $855.26
SQL server on VM cost $266

Contoso is better off with a SQL Server on VM (cost wise)

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.

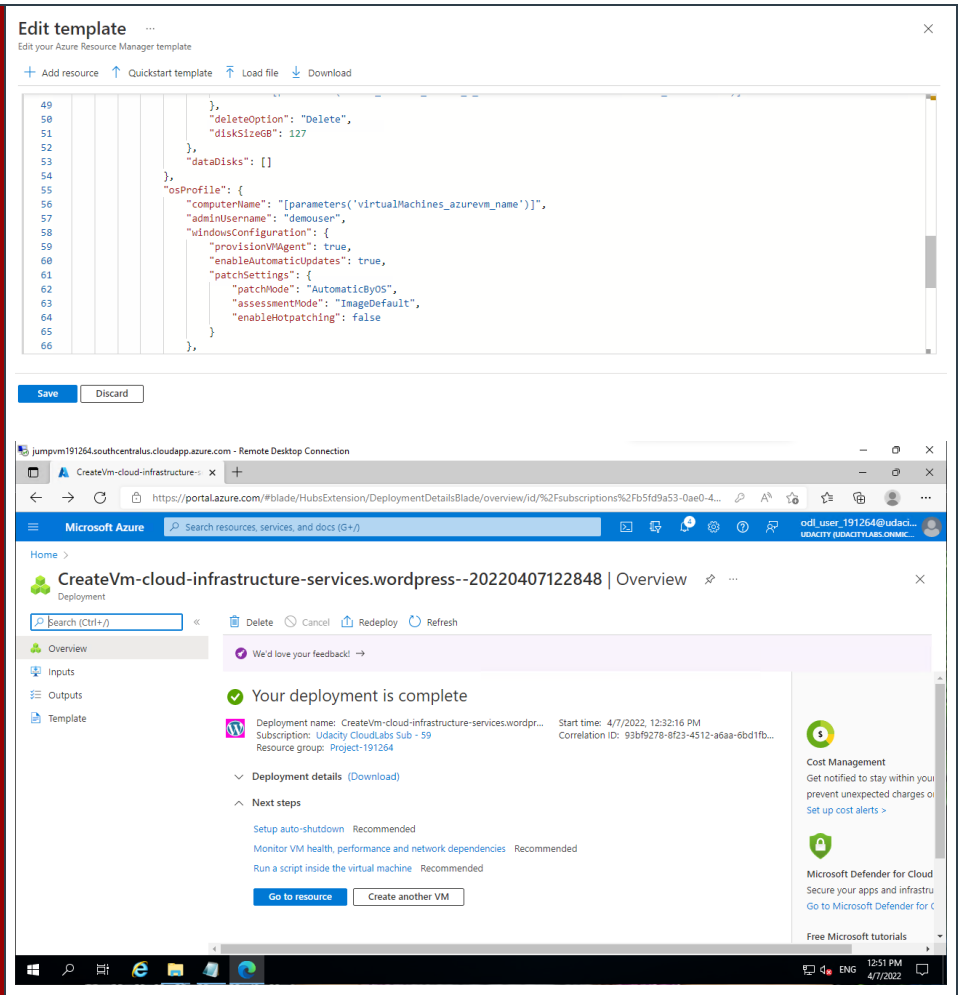
The process is summarized as:

- 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.

Results that are repeatable (Automation): Deploying infrastructure repeatedly throughout, development lifecycle and we can be confident that our resources are deployed consistently. Idempotent templates are those that can be deployed multiple times and produce the same resource types in the same state.

You can divide down your templates into smaller, reusable components and can link them together at deployment time with modular files. It is also possible to stack one template inside another template.

Create any Azure resource : New Azure services and features can be used in templates. We can use templates to deploy new resources as soon as they are introduced by a resource provider.

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.

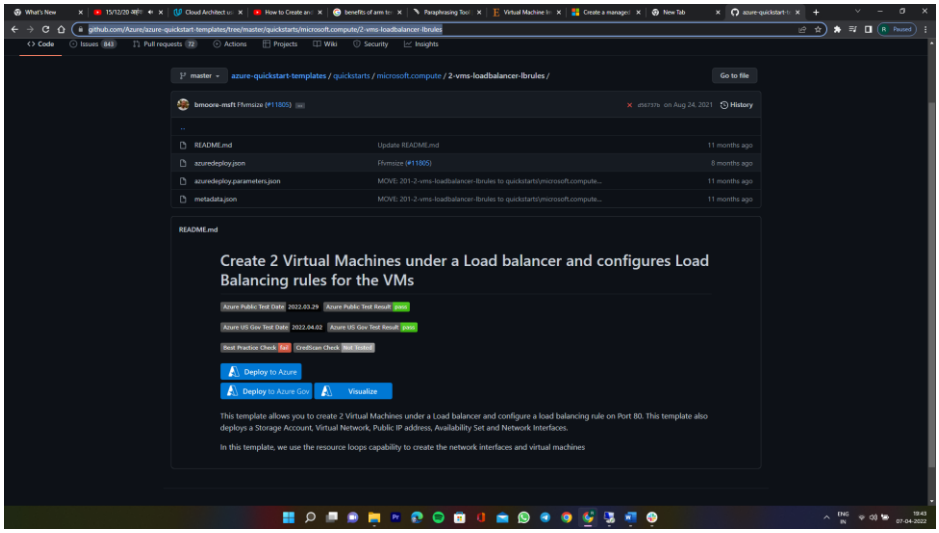
Arm templates come under (IAAC) Infrastructure as a Code, basically one can create configured or bare minimum configured Infrastructure i.e Virtual Machines, Networking services, disks etc via code.

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	ARM Template
A VM image is an executable image file from a virtual machine that is stored in a specific format. By uploading the image file to the actual machine, we can establish a new virtual machine. Typically, some software, such as MySQL or Microsoft Office, is installed on these new VMs before to its use.	ARM Template is a JSON file that outlines your project's infrastructure and configuration. Declarative syntax is used in the template, which allows you to state what you want to deploy without having to write the programming commands to do so. You specify the resources to deploy as well as their characteristics in the template.
It is IAAS (Infrastructure as a Service)	It is Infrastructure as a code (IAAC)
This file's size is huge as it is an executable image file.	ARM template is just code so its size is negligible as compared to a Server Image. (template size limit is 4 MB)
User chooses one according to his requirement.	User can design or choose one as per his requirement.

A Server Image Is used when a General Service is needed and other changes are to be done manually, also it supports upto 20 simultaneous deployments whereas Arm template is used when a specific Service or a Set of Services are needed for which an image is not available for such case the required services can be installed via ARM Template and it supports upto 800 Resource Group Creation, basically it is used for Large and/or specific Infrastructure Creation Automation. Server Images may be used inside an Arm Template for Automation Purpose.

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.	https://github.com/Azure/azure-quickstart-templates/tree/master/quickstarts/microsoft.compute/2-vms-loadbalancer-lbrules 

STEP 5: Backup and Recovery

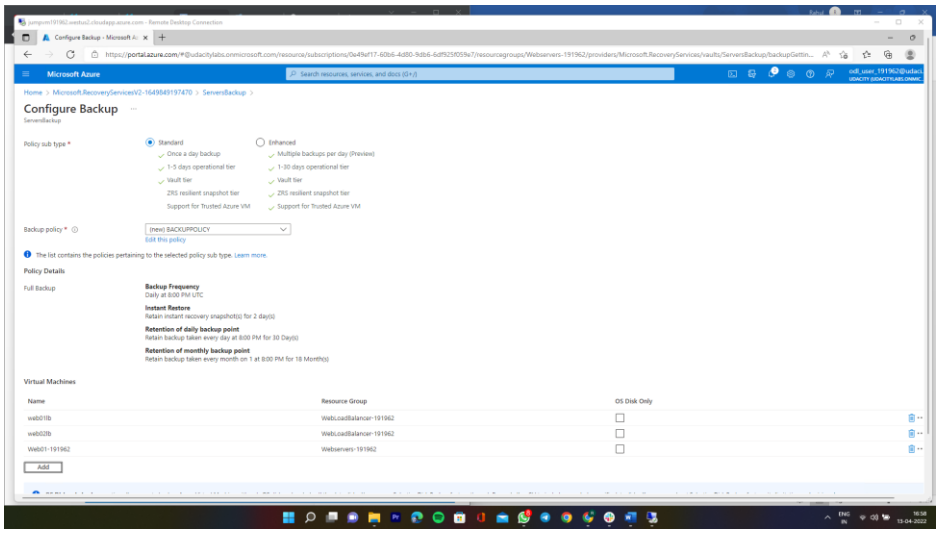
Purpose: Use the Azure backup services to setup recurring full daily backup jobs of your products and client's data. Test the backup process. No back is fully verified until you perform a successful restore.

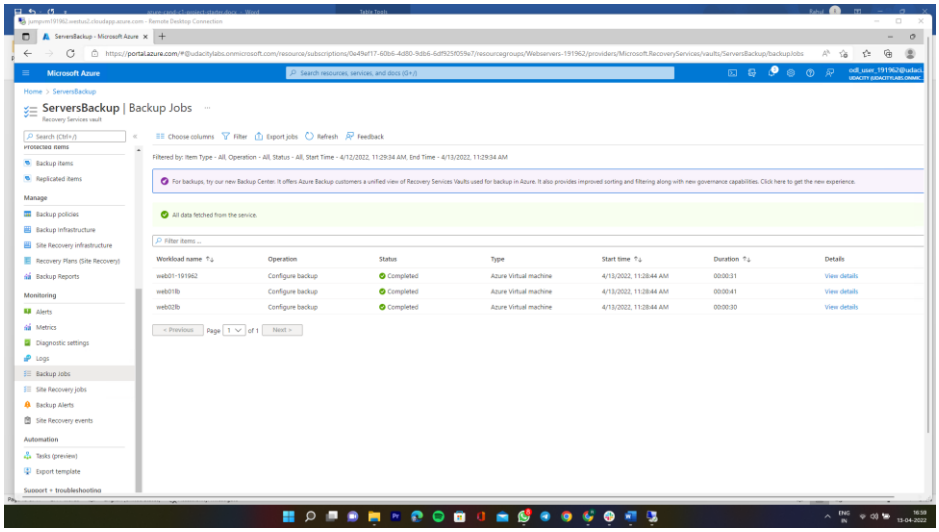
You want to ensure your VMs are all backed up. You want to ensure a working replica of each of them is saved somewhere safe. The steps are:

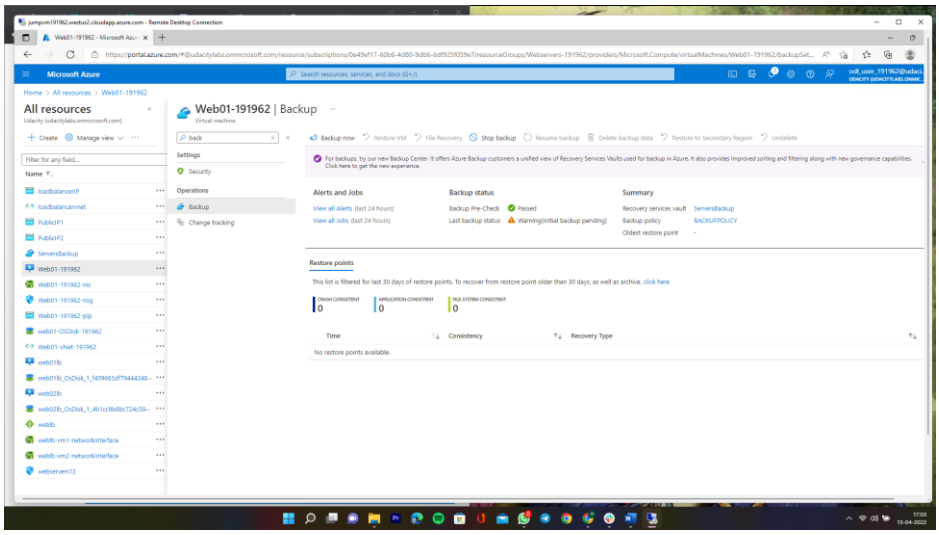
1. Create a backup vault. Call it "ServersBackup".azure
2. Install Azure Backup Extension on the target VM.
3. Create a backup policy in the vault. Set retention policy and daily backup points.
4. Now it is time to link the target VM to the backup policy. Click on the target VM, select Backup from the 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?	Basic difference between Azure Backup and Site Recovery is that, backup will ensure data is safe and recoverable and Site Recovery will keep the data and Workload available when an outage occurs. Basically the Workload will be shifted to an availability zone by fail over and once the datacenter is back up then the Workload will be again failed over to the original datacenter. Azure Backup is used to save time based checkpoints of data or machine states which will/may eventually be used for recovery/restoration. Azure Site Recovery is used during an Outage/Disaster in a Datacenter/On Prem for Availability(Uptime of Services of Client). (Takes more time to execute as the entire Infrastructure needs to be replicated along with configurations and the data and services, a carbon copy of the Vm which is down is to created, HDD's may further slow down the process.)

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) RPO:- The RPO indicates how recent the data will be when it is recovered. In practice, the RPO refers to the amount of data (updated or created) that will be lost or reentered following an outage. It is the metric for the amount of acceptable data loss if a recovery needs to be done. RTO:- The amount of downtime a company can endure is known as the recovery time objective (RTO). In a high-frequency transaction environment, a few seconds of downtime might cost thousands of dollars in lost revenue, but for other systems (HR databases or some other database with less priority) can go down for hours without causing a problem, so the question of "How long can services be down?" is answered by the RTO metric. This is the metric which defines the amount of time it takes to complete a recovery. B) Recovery Point Objective(RPO) Consumes more Disk Space as this strategy saves all the backups saved over time and decides by the policy condition which backup is to be used for recovery. RTO is a metric which defines a time the organization can endure, in workload recovery the os and data disks will be replicated so will other infrastructure.
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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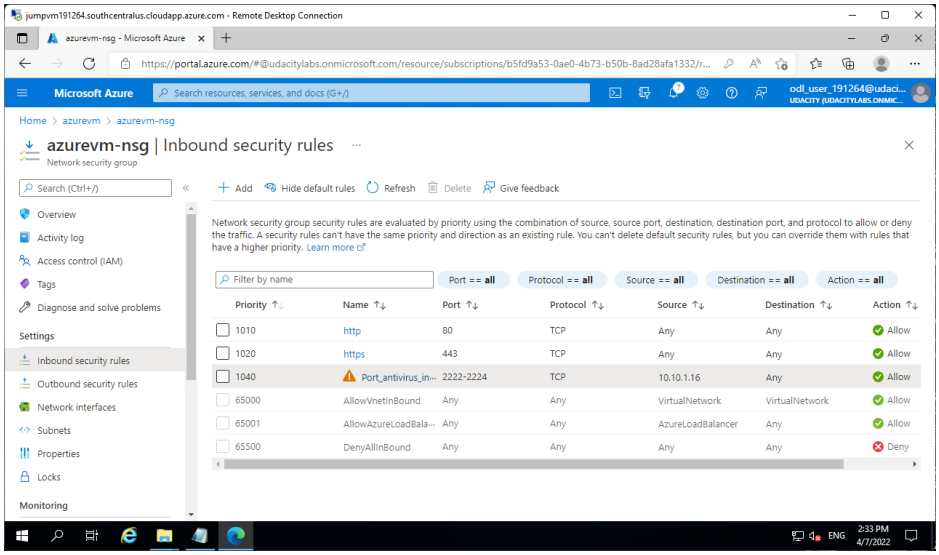
Inbound Rules Provide a screenshot of the modified nsg firewall inbound rules.	
Discussion Question #1 Will you need to create an inbound port exception on your Windows OS?	Yes an inbound rule should be added on the Windows OS Firewall. NSG is an external firewall to a VM, windows Os is an internal firewall, 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!