

Cloud Computing Administration

by Robert Radu

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Cloud Computing Administration ACCA6025

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Table of Contents

Guidance for Cloud Solution for Aspire Retailers.....	2
Comparison Among Cloud Service Providers	3
1 TCO Calculations.....	5
Azure Active Directory Usage.....	15
Cloud Governance Strategy	17
Cloud Disaster Recovery Plan for Aspire Retailers	33
References	35

Guidance for Cloud Solution for Aspire Retailers

Aspire Retailer is a growing name in the section home improvement retail business, and they are currently using an on-premises data center to manage their all-business-related operations. But in recent times the company is have issues in the process of their process of computing services, after assessing the problems and going through the proper understanding of the changing dynamics of the market, the company has decided to go for cloud adoption so that they can better manage their operations. As IT administrator, it is recommended to Aspire Relaters that they can adopt the cloud solution, this can help the company to meet the criteria of their business where they are lacking behind [13]. Some of the major benefits that cloud adoption can provide to Aspire Retailer are listed here.

- **Disaster recovery:** One of the greatest advantages of cloud adoption is that it provides its users a greater advantage in the process of disaster recovery. As the cloud comes with the feature of providing unlimited space for storing their valuable data, this can help Aspire Retailers to store their data online. And if any incident related to data theft or data breach may affect the workability of the company then the data which Aspire Retailers has stored in the cloud will act as a backup.
- **Pay-as-you-go model:** Cloud providers have a habit of working ¹⁷ in a Pay-as-you-go model where the users of the cloud services will only need to pay for the resources which they are using. This will help a lot to Aspire Retailers to save their valuable money, the company will not have to make any upfront payment for expensive hardware and software resources for management of their computing services [12].
- **Data security and compliance:** Cloud services providers keep their special focus on the factors like data security and compliance. These companies made their huge investments in maintaining the security of their platforms and obtaining the relevant certifications. Aspire Retailers can take advantage of features like encryption, detection against threats, management of identity and access, and data recovery provided by cloud service providers to keep their valuable data safe [14].

Load balancing is a computer networking technique that allows the distribution of excessive incoming network traffic load from a single network to different resources. It works on the

principles of proper optimization of resources, helps to enhance performance, and promotes flexibility in cloud services [8]. Some of the main features of load balancing are mentioned here.

- **Traffic distribution:** Traffic distribution is one of the major features of load balancing, it helps to make even distribution of the incoming traffic or requests over a network to spread across multiple servers and resources. This helps to protect a single server from getting overloaded with requests and will help enhance the cloud's performance.
- **SSL termination:** Load balancers are also very useful in the process of handling encryption and decryption of the SSL/TLS protocols. Which helps to provide relief to the backend servers from getting bumped into the overhead computation. This helps the company to enhance the overall performance of its servers and will contribute to make safe communication between the client and server [15].
- **Scalability:** It is another major benefit the load balancers provide in cloud adoption. As the load balancers have the capability in them that by analyzing the incoming traffic they can optime the number of resources are being in use. They have the ability to add or remove any server, this helps to ensure the perfect use of cloud resources. This feature of load balancing will play a big role for Aspire Retailers in the process of management of sudden increases in traffic and will help the company to run its business without any hindrance.

Comparison Among Cloud Service Providers

As Aspire Retailers are planning for adoption so that they can enhance their computing services, it becomes very important for the company to make a proper assessment of the different cloud service providers which are available in the market. This section of the report is going to conduct a thorough comparison of the services and features of three major cloud services providing companies. For this the report is going to assess the features of Google Cloud Platform (GCP), Amazon Web Services (AWS), and Microsoft Azure [5].

Google Cloud Platform (GCP)

Computer Engine: In terms of computer engine, GPC permits its users to create virtual machines as per the requirement, these virtual machines are built with the specific configuration of the user, and also come with the feature of making customization in the future as per the changing needs.

This feature of GPC delivers greater flexibility to its users, this can help organizations to choose the resources as per their requirements [9].

Cloud storage: The storage solution provided by GPC is very durable and scalable. GPC provides its storage facilities in different classes of storage, which includes, the Standard class, Nearline class, Coldline class, and Archive class. Users have the freedom to choose any of these classes based on the pattern of their data access, which further contributes to better optimization of both costs as well as performance for the user.

Cloud spanner: The cloud spanner of GPC provides scalable as well as distributed relational database services to its clients. It has the ability, that it can combine the most suitable features of traditional relational databases with the fault-tolerance features of a NoSQL system and scalability [10].

27

Amazon Web Services (AWS)

Elastic Compute Cloud (EC2): The EC2 services of AWS provide its users with various of options to choose any virtual server, these virtual servers are very easy to maintain and set up so the users can easily use these servers for the efficient management of their cloud resources. AWS allows its users to choose any of the EC2 servers as per the workload of the functions for the organization. Which is flexible and scalable according to the user's needs [7].

Simple Storage Service (S3): The storage services of AWS is also known as S3 services. It allows its users to store and retrieve any amount of data. The users of AWS can store any type of data over the cloud such as backup files, static data, or even multimedia content. AWS promises its users to give high durability over the data which they have stored in the cloud.

Elastic Load Balancing (ELB): The ELB feature of AWS plays a major role in the process of distributing the incoming traffic from the application over the various EC2 instances. This helps to make improvements in the process of fault tolerance. One this is special about the load balancing feature of AWS is that it provides three types of load balancers to its users [11].

Microsoft Azure

Computing system: Azure provides more than one option to its users for solving the computing needs of its users. First, it includes Virtual machines which are very helpful in running different

types of applications, second one is Azure functions which help its users to get enabled with serverless computing systems. And the next one is Azure batch which comes with the capability to deliver high performance to its user and also provides the service of parallel computing. Users can choose any one of these as per their requirements.

Storage: Like computing, Azure also provides multiple options to its users in the storing process also. Where users can use Azure Blob Storage for storing data which is in an unstructured manner, for the purpose of storage and transfer of big files users can use the Azure file storage services, Azure Table Storage contributes to storing NoSQL data, and along with all of these there is still a long list of a storage facility which azure provide to its users [6].

Networking: Azure delivers its users a strong and secure networking solution to its users for the efficient run of applications. It allows its users to create a virtual network for their specific use of the user, it also comes with an enhanced seven-layer load-balancing feature for its users [16].

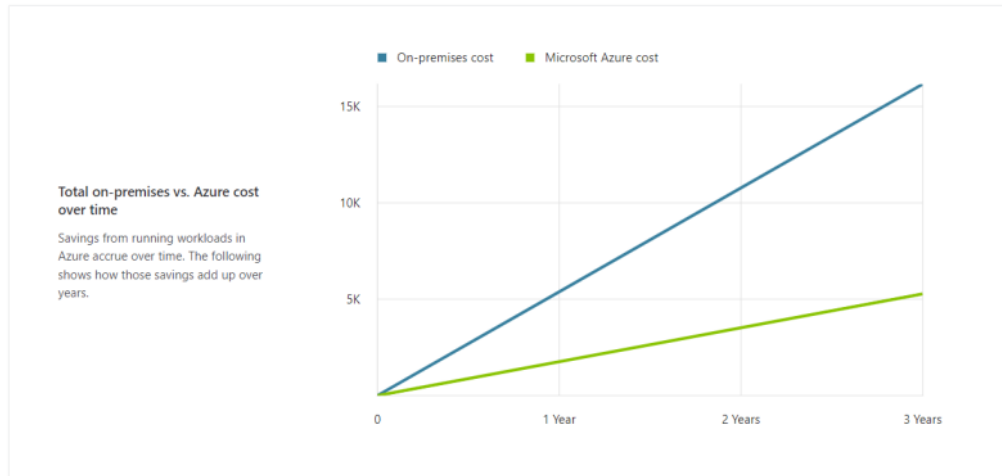
TCO Calculations

In association with the detailed analysis of the case study here, it had been determined that the Aspire Retailers had been acquainted with running 5 different VMs on their system, for which they had been required to determine proper cost management for taking care of their VMs. Since the organization had been found to attracted to use Microsoft Azure over their existing on-premises solution. For their requirement to operate both Linux as well as Windows OS, the TCO calculation for each VM had been specified below:

VM 1

The image being provided below had been foreshowing the TCO cost calculation over 3-years of time gap for the VM 1:

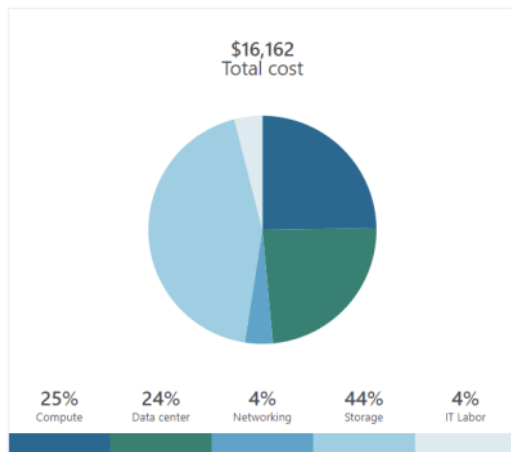
Over 3 year(s) with Microsoft Azure, your estimated cost savings could be as much as **\$10,883**



The image above had been determining that with the implementation of VM1, with 2-core CPU and 14 GB of RAM, the Aspire Retailers would easily save a sum of around \$10,883 if they go with Microsoft Azure.

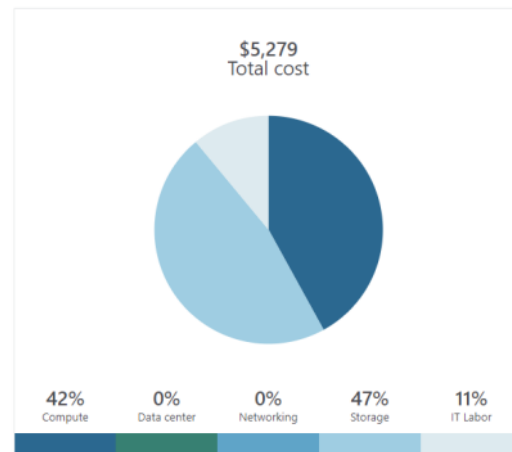
Total on-premises over 3 year(s)

TCO of on-premises environments tends to be driven by compute and data center costs.



Total Azure cost over 3 year(s)

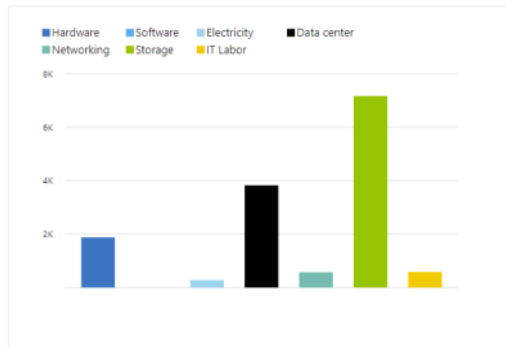
In Azure, certain cost categories decrease or go away completely.



The image obtained above had been representing a brief comparison of the total cost that the Aspire Retailers would have to face, if they choose to go with either of the solutions here for their organization.

Total on-premises cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.

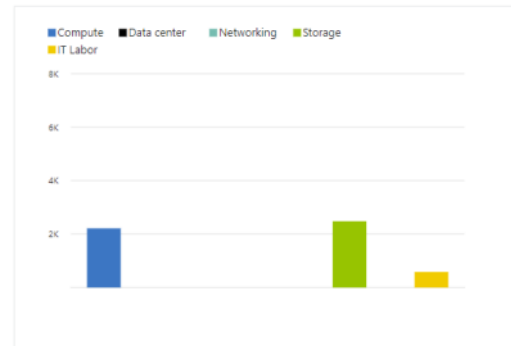


\$16,162

Cost over 3 year(s)

Total Azure cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.



\$5,279

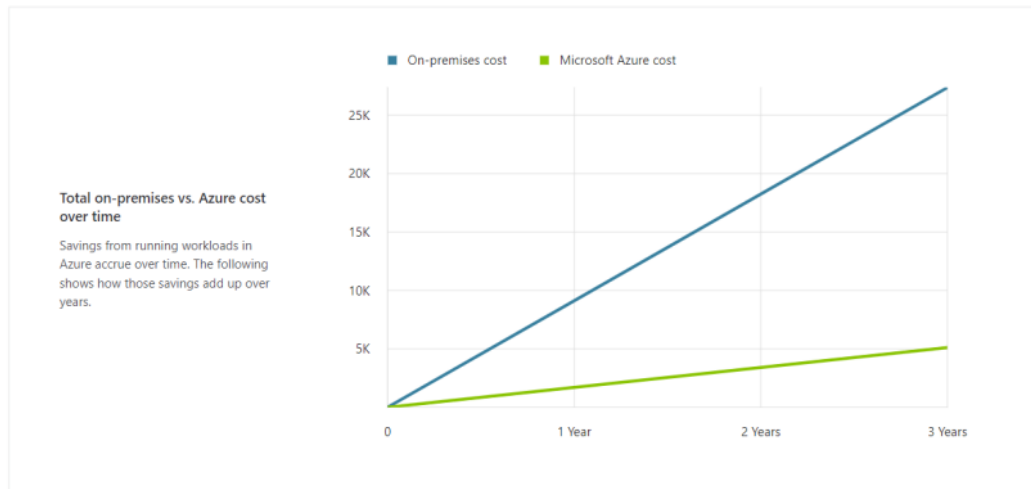
Cost over 3 year(s)

The image obtained above had been representing the total cost breakdown for both, On-premises as well as Azure solution, thus determining that how the organization would be at benefit they select Azure over their existing infrastructure.

VM 2

The image being provided below had been foreshowing the TCO cost calculation over 3-years of time gap for the VM 2:

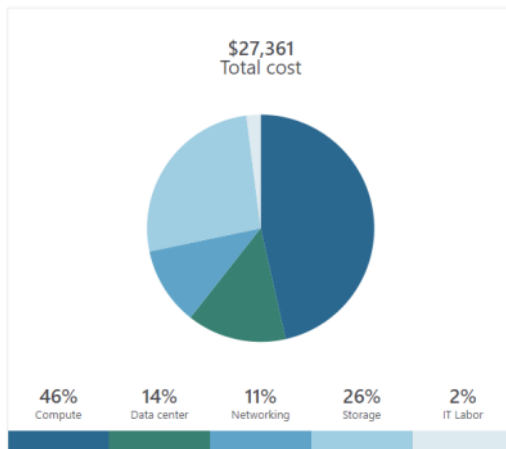
Over 3 year(s) with Microsoft Azure, your estimated cost savings could be as much as **\$22,250**



The image obtained above foreshows the total savings of \$ 22,250, that the Aspire Retailers could acquires while using VM 2 with 4-core CPU and 16 GB RAM, of they tend to choose Azure over their existing On-premises datacenter.

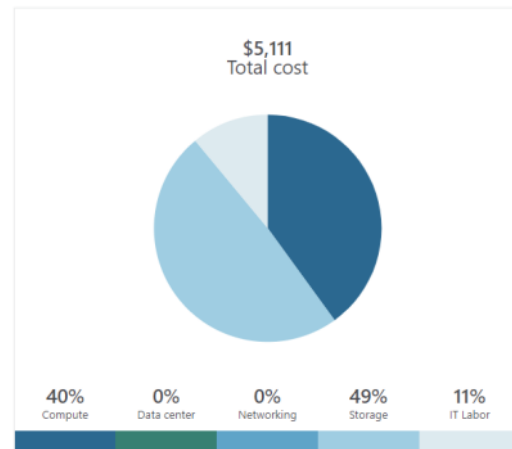
Total on-premises over 3 year(s)

TCO of on-premises environments tends to be driven by compute and data center costs.



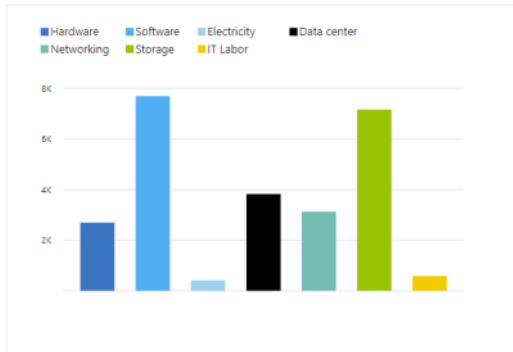
Total Azure cost over 3 year(s)

In Azure, certain cost categories decrease or go away completely.



Total on-premises cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.

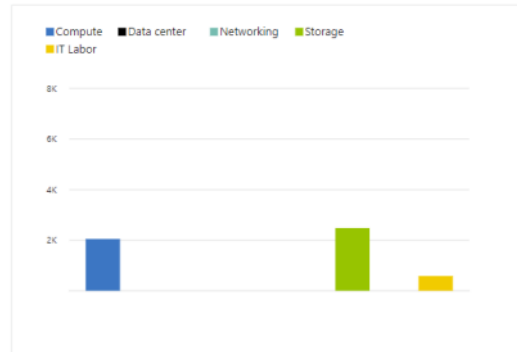


\$27,361

Cost over 3 year(s)

Total Azure cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.



\$5,111

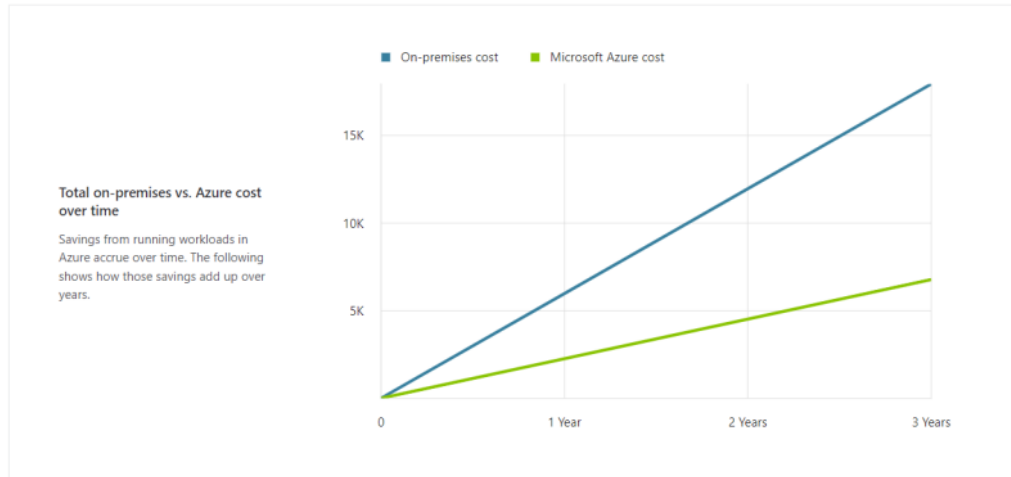
Cost over 3 year(s)

The image being obtained above had been representing a brief differentiation among the costs that would be incurred if Aspire Retailers tends to select either of the solutions here. This simply determines that the implementation of Microsoft Azure would be beneficial for Aspire Retailers rather than sticking to their existing On-premises datacenter.

VM 3

The image being provided below had been foreshowing the TCO cost calculation over 3-years of time gap for the VM 3:

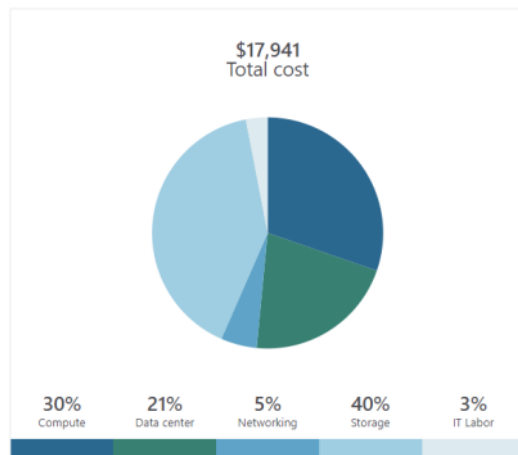
Over 3 year(s) with Microsoft Azure, your estimated cost savings could be as much as **\$11,159**



The associated image obtained above had been foreshadowing the cost saving of \$11,159, for the VM 3, with 8-Core CPU and 32 GB RAM, which Aspire Retailers tends to utilize while using Azure cloud platform, rather than their existing On-premises Datacenter.

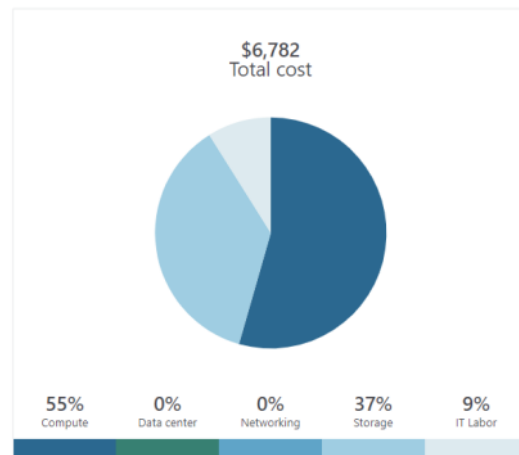
Total on-premises over 3 year(s)

TCO of on-premises environments tends to be driven by compute and data center costs.



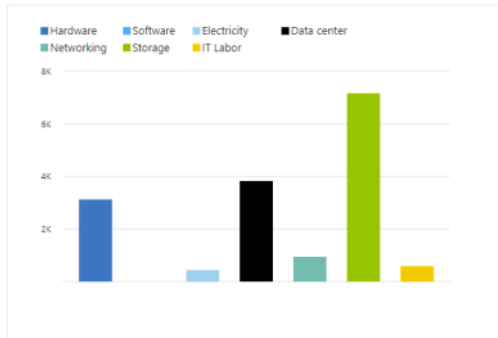
Total Azure cost over 3 year(s)

In Azure, certain cost categories decrease or go away completely.



Total on-premises cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.

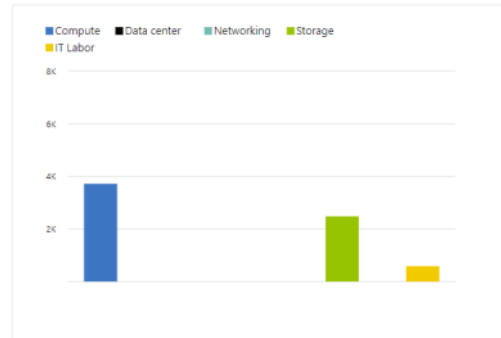


\$17,941

Cost over 3 year(s)

Total Azure cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.



\$6,782

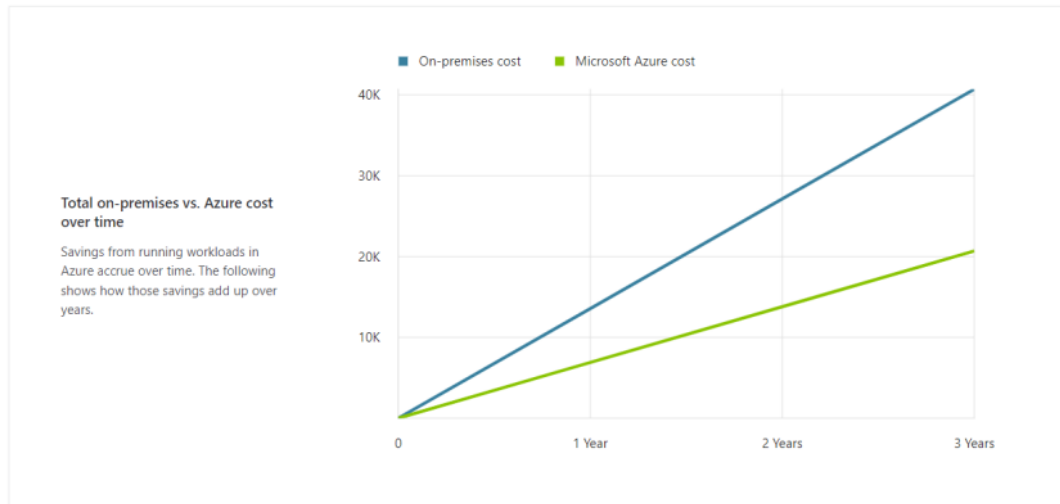
Cost over 3 year(s)

The images obtained above had been representing a brief differentiation among the costs that would be incurred if Aspire Retailers tends to select either of the solutions here.

VM 4

The image being provided below had been foreshadowing the TCO cost calculation over 3-years of time gap for the VM 4

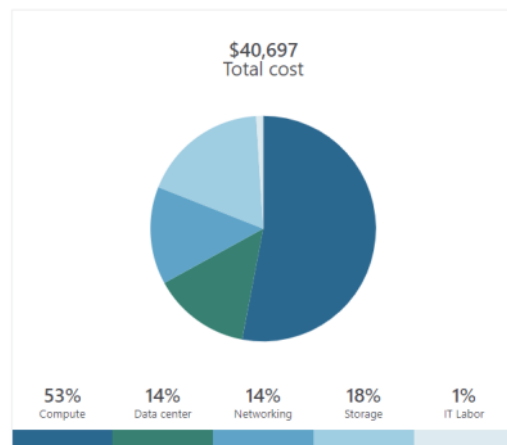
Over 3 year(s) with Microsoft Azure, your estimated cost savings could be as much as **\$20,005**



The image being obtained above had been representing the total cost saving, worth \$20,005, which Aspire Retailers would avail with their implementation of VM4, with 16-core CPU and 112 GB RAM on Microsoft Azure.

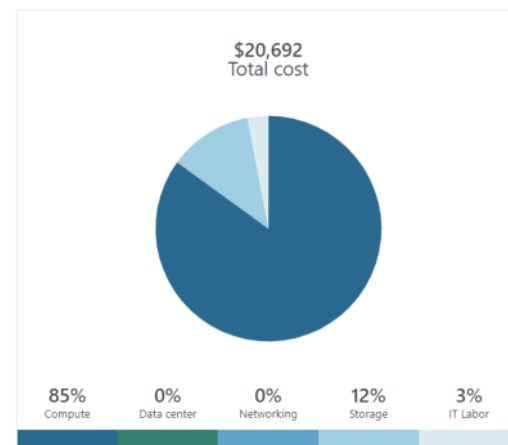
Total on-premises over 3 year(s)

TCO of on-premises environments tends to be driven by compute and data center costs.



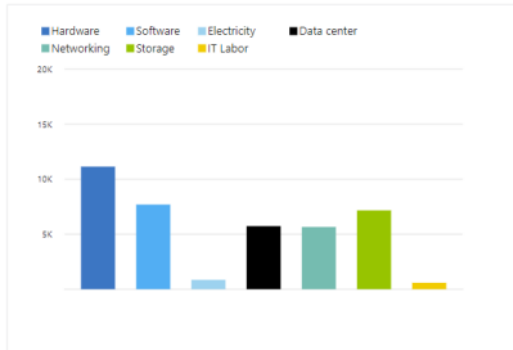
Total Azure cost over 3 year(s)

In Azure, certain cost categories decrease or go away completely.



Total on-premises cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.

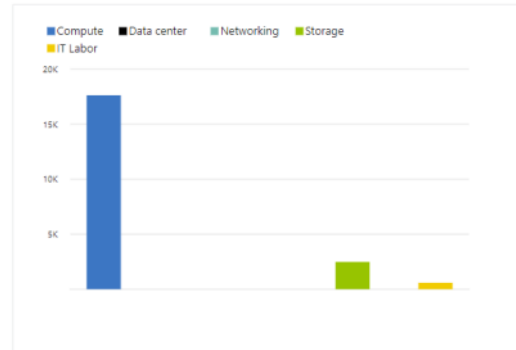


\$40,697

Cost over 3 year(s)

Total Azure cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.



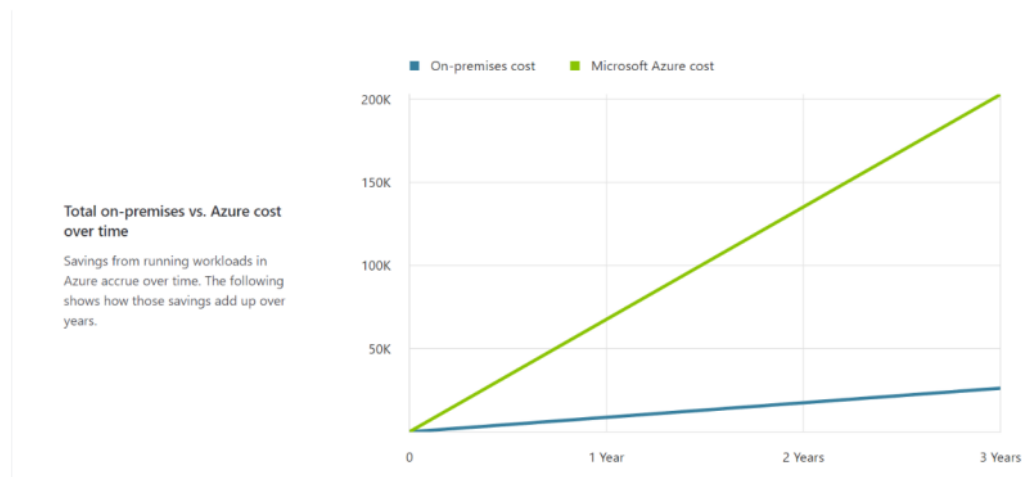
\$20,692

Cost over 3 year(s)

The image that had been obtained above had been representing the detailed analysis in between the difference of total cost that would incur for Aspire Retailers if they tend to go with either of the solution for managing their data.

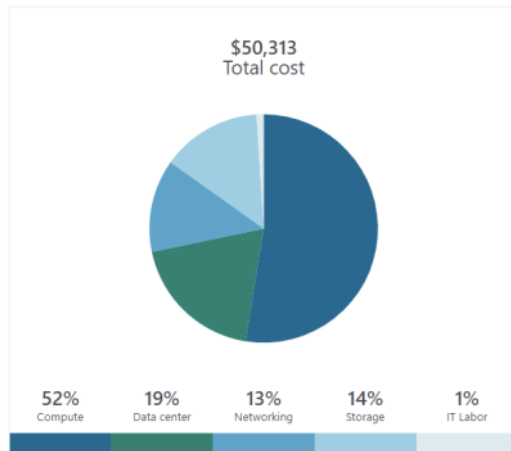
VM 5

The image being provided below had been foreshowing the TCO cost calculation over 3-years of time gap for the VM 5:



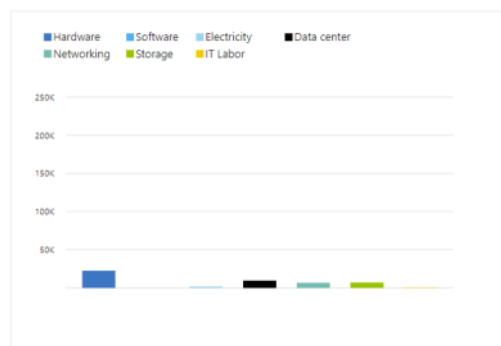
Total on-premises over 3 year(s)

TCO of on-premises environments tends to be driven by compute and data center costs.



Total on-premises cost breakdown

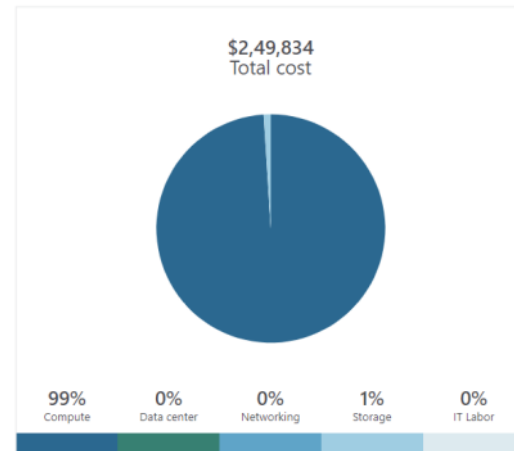
In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.



\$50,313
Cost over 3 year(s)

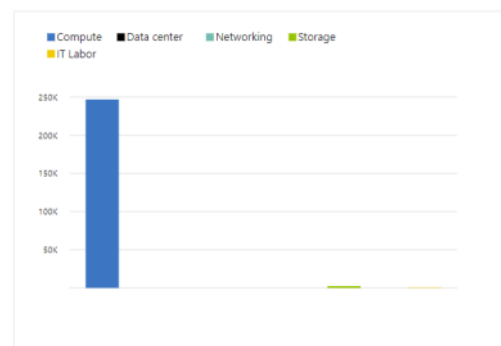
Total Azure cost over 3 year(s)

In Azure, certain cost categories decrease or go away completely.



Total Azure cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.



\$2,49,834
Cost over 3 year(s)

Since the TCO Calculator here had been limited to only 448 GB of RAM, thus no exact cost could be determined here that would incur over Aspire Retailers while implementing VM 5 with 32-cores CPU and 512 GB RAM. Thus, it could only be concluded that the total estimated cost for implementing VM 5 at Aspire Retailers would cost them about \$2,49,834 over 3 years. For further summarization, a detailed computing plan for each VM had been provided below:

s	Cost for 3-years
²³ VM 1	\$ 5,279
VM 2	\$ 5,111
VM 3	\$ 6,782
VM 4	\$ 20,629
VM 5	\$ 2,49,834
Total Overall Cost	\$ 2,87,635

¹ In association with the detailed analysis being conducted at the ¹ table obtained above, it can be seen that the Aspire Retailers would be required to invest a total of \$ **2,87,635** over 3-years for their configuring their cloud computing with 5 VMs, apart from which they would be saving a huge sum of money regarding the implementation of external hardware, software and electricity, since they had been required here to pay for their computational costs only.

Azure Active Directory Usage

Azure Active Directory (Azure AD) is a commonly used solution that helps in generating identity and access management solutions provided by Microsoft Azure [17]. It enables organizations to operate over accounts, access controls, and security policies centrally. Retailers can use Azure for enhancing the security level within the cloud environment.

Configuration of User Account

With the help of Azure AD, multiple accounts of various user can be created and managed at the same time. By following the below-mentioned steps the user accounts can be configured:

- **Create User Accounts:** by the usage of PowerShell commands, administrators can create user accounts within Azure AD. These accounts can be associated with the organization domain or created as a guest accounts for external users.
- **Assigning User Priorities:** properties of the user such as name, contract, and job title can be set for each of the user accounts. Such kind of information can help in managing the user account properly.
- **Configuring Authentication Method:** There is a large variety while considering authentication in AD as it provides to choose multiple varieties to choose between, such as multi-factor authentication and password-based authentication and also it has integration with several authentication providers [18]. The administrator can choose from the vast authentications available and can select one as per the requirement.
- **Define User Roles and Permissions:** Azure AD also provides user-based access control for user permissions. By assigning different roles to different users the administrator can build a strong security concern that can ensure no disruption to the resources within the organization. Setting roles such some to be Global Administrator and User Administrator [20].

Setting roles to Global users and Normal users

Normally in terms of Azure AD Global users are the seniors of the organization who are responsible is decision-making and overseeing the total workflow inside the organization, they have more power and they can directly access the resources of the organization whereas while speaking about the normal users they have less power as compared to the Global users and they cannot even access the resources of the organization, therefore the normal users are basically the workers or the members of the organization [19].

Implementations of the below-discussed points are necessary for setting the global and normal users in Azure AD, including:

- **Assigning Global Administrator Role:** The Global Administrator role is full of responsibilities and it also enables the individuals to access to all the administrative features and controls in Azure AD [28]. Moving forward Aspire Retailers can assigning individuals

to relatable tasks and by assigning individuals for managing and performing administrative task of the organization.

- **Defining Custom Roles:** In Azure AD custom roles can also be assigned with specific powers and limitations to take care of specific organizational requirements. In circumstances such as retailers can define a custom role through which users can perform specific tasks and can access to some of the organizational resources for successful completion of the task.
- **Assigning User Administrator Role:** The User Administrator performs the role of granting permissions for accessing to the user accounts and passwords and other important details and also other jobs related to user [23]. In such cases, Aspire Retailers can take the help of IT professionals, who can assist them in user management.
- **Group-Based Access Control:** Usage of Group-Based Access Control Technique in Azure AD enhances the process of assigning users to predefined or custom groups. Administrators can manage the user right at a group level by assigning roles to these groups at the same point of time with streamless access management.

Centralized user management along with accurate security and at the same time streamlined access control within the cloud environment can be achieved by the Aspire Retailers by adhering to appropriate roles in Azure AD and by configuring user accounts

Cloud Governance Strategy

According to the current digital space, including Bring Your Own Device (BYOD), mobile application, and cloud-based solution, the main focus has been shifted from traditional methods to modern identity-based measures. It is important to have an idea of who is accessing the system from time to time and what safety measures are important to be ensured by them relating to the safety of the user's data [24]. A robust governance strategy is important for successfully achieving organizational objectives and goals, which is a combined package of maintaining cost along with maintaining the organizational structure.

For managing cloud-based assets efficiently a set of policies or measures has been introduced which has to be implemented and this set of policies is commonly termed as cloud governance. Proper and accurate cloud governance will help in maintaining data integrity and enhance the security of data, optimize resource utilization etc.

Being one of the giants of the business industry of cloud platforms, Microsoft Azure has a variety of services for supporting governance along with enhancing access security. Listed below are some of the aspects in which Azure can assist Aspire Retailers in a relatable context:

- **Identity Access Management (IAM)**

Proper user identification, access restriction and authentication procedures can be set and overlooked and these facilities are enabled through the efficient Identity Access Management (IAM) of Azure AD. Adding upon AD can even be used by Aspire Retailers for building multi-factor authentication with a motive to establish proper user access control over the cloud resources [26]. It is the role of the administrator to make sure that correct access is provided to users based on their roles and responsibility and for ensuring this the implementation of role-based access control (RBAC) and granting appropriate permissions are necessary.

- **Conditional access policies**

Azure holds the capability to define the terms and policies that enables an organization for enforcing access requirements based on specific needs that connects with the factors like user's current location, device health along with the risk involved [25]. Aspire Retailers can add on an extra layer of security towards the preservation of available resources by approving limited access policies for devices that are operating from unauthorized locations and can safeguard the cloud environment.

- **Azure security center**

An impressive threat protection policy and security management is provided by Azure at Azure security center. The procedure involves continuous detection of unidentified activities along with the continuous recommendation of steps to be implemented for overcoming any unauthorized or unsafe circumstances, which play a vital role in improving the security posture of the cloud resources [22]. Through the help of such policy Aspire Retailers can gain a proper idea of any vulnerability's ability and characteristics, and implementing best possible security measures for countering such vulnerabilities.

- **Compliance and regulatory support**

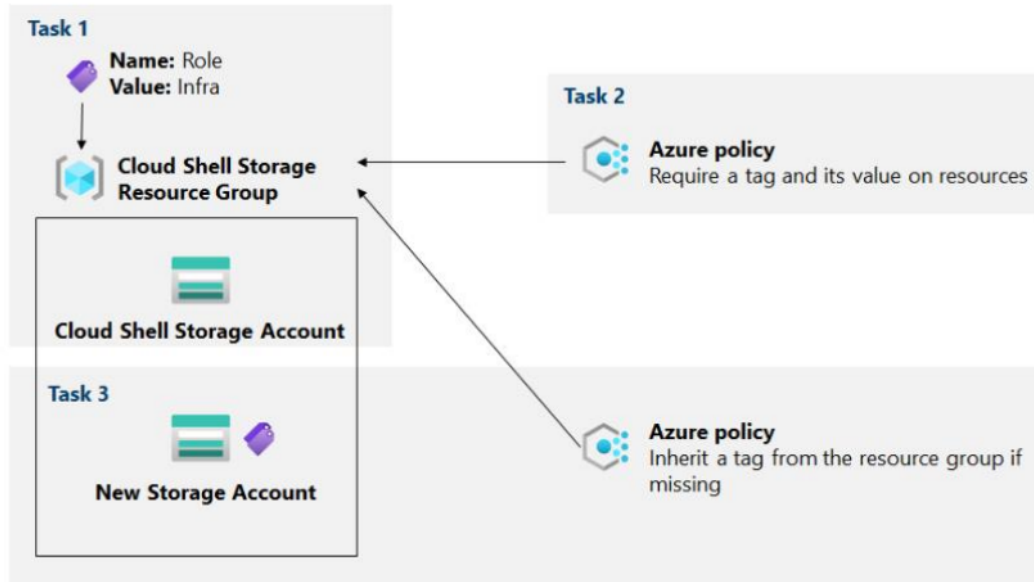
Along with aligning with the industry's norms and policies, Azure also provides a variety in terms of compliance certification [27]. Adapting Azure will enable the Aspire Retailers to address the regulatory requirements as per their cloud deployments like HIPAA and ISO 27001.

Suggested Policy: Regular access policy should be implemented by Aspire Retailers. This ensures the reviewing of access controls on a periodical basis and accounts of the employees who has left the organization or their respective and post and position in the organization has changed their accounts have to be deactivated or deleted at times. This will also reduce the chances of unauthorized access within the organization strengthening the security posture and the record will be available [21].

Aspire Retailers can make sure that users have secure access to cloud resources by implementing Azure's cloud governance policy. A well-regulated and secure cloud environment is made possible by Azure's identity and access management, conditional access controls, security monitoring, and compliance assistance.

In order to demonstrate how cloud governance strategy worked, policy lab will be performed from Skillable Azure. Here, by using the Azure policy, cloud governance will be managed.

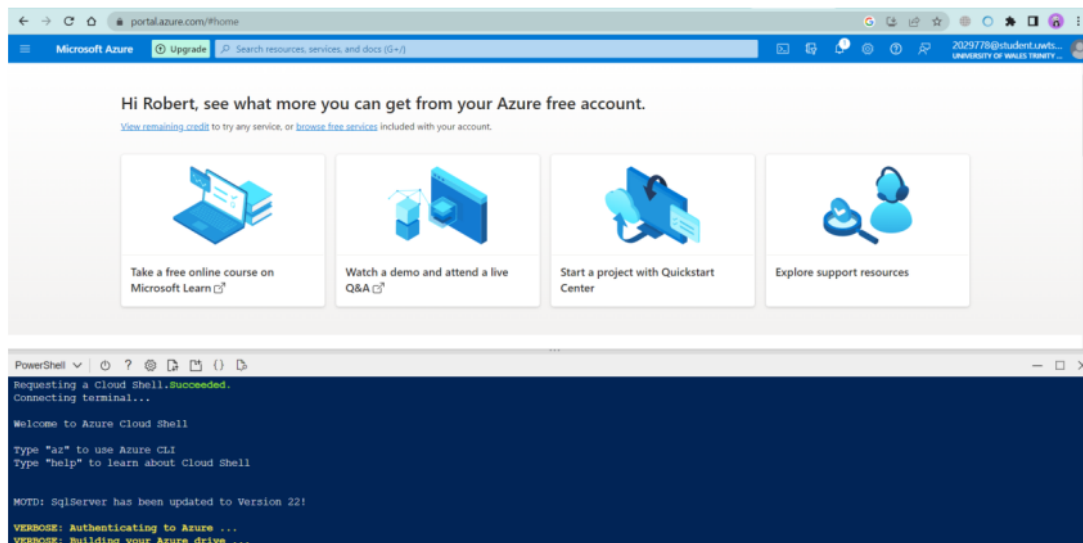
The architecture of the lab is provided below:



The lab comprises three parts which are shown below:

Task 1: Creation and assigning of tags in Azure portal

Starting the PowerShell within the Cloud Shell



Checking the storage account name

The screenshot shows the Microsoft Azure portal home page with a welcome message: "Hi Robert, see what more you can get from your Azure free account." Below this are four cards: "Take a free online course on Microsoft Learn", "Watch a demo and attend a live Q&A", "Start a project with Quickstart Center", and "Explore support resources". Below the cards is a PowerShell terminal window showing the output of the `df` command.

```

VERBODEN: Building your Azure drive ...
PS /home/robert> df
filesystem                                1K-blocks    Used Available Use% Mounted on
overlay                                50620216 24303708  26300124   49% /
tmpfs                                  65536         0    65536      0% /dev
tmpfs                                  2013272      0   2013272      0% /sys/fs/cgroup
/dev/sda1                             50620216 24303708  26300124   49% /home
shm                                    65536         0    65536      0% /dev/shm
//@cg100320012c0a854a.file.core.windows.net/cs-2029778-student-uwtsd-ac-uk-100320012c0a854a 6291456 5242880 1048576   84% /usr/causer/cloudrive
tmpfs                                  2013272      0   2013272      0% /proc/acpi
tmpfs                                  2013272      0   2013272      0% /proc/scsi
tmpfs                                  2013272      0   2013272      0% /sys/firmware
/dev/loop0                             5074592     520  4795544    1% /home/robert
PS /home/robert>

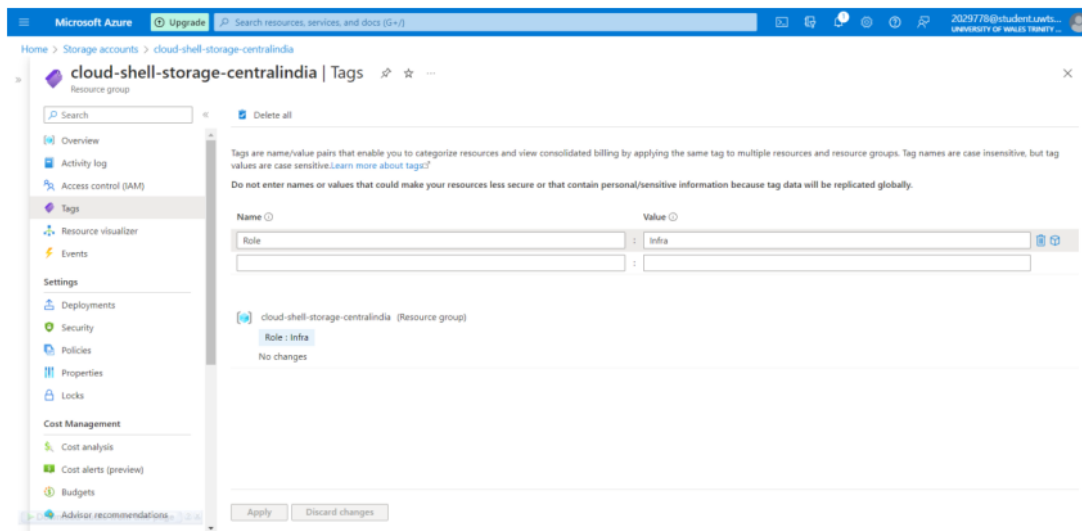
```

Opening the resource group associated with Storage account

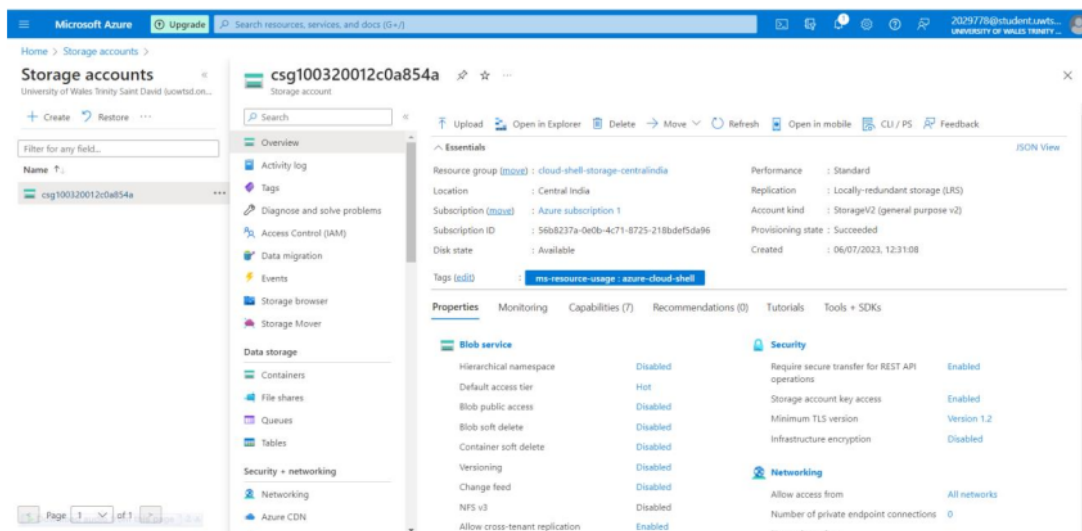
The screenshot shows the Microsoft Azure portal interface for the resource group 'cloud-shell-storage-centralindia'. The left sidebar contains navigation options like Overview, Activity log, Access control (IAM), Tags, Resource visualizer, Events, Settings, Deployments, Security, Policies, Properties, Locks, Cost Management, Cost analysis, Cost alerts (preview), Budgets, and Advisor recommendations. The main area shows the 'Resources' tab with a table of resources. The table has columns for Name, Type, and Location. One resource is listed: 'csg100320012c0a854a' of type 'Storage account' located in 'Central India'.

Name	Type	Location
csg100320012c0a854a	Storage account	Central India

New tag creation



Checking the new tag is storage account



The above figure illustrates that the newly created has not been automatically assigned within the storage account.

Task 2: Tagging enforcement through Azure policy

Setting policy in Azure

The screenshot shows the Microsoft Azure Policy Overview page. The left sidebar contains navigation links: Overview, Getting started, Compliance, Remediation, Events, Authoring (Definitions, Assignments, Exemptions). The main content area displays the scope as 'Azure subscription 1'. A message states: 'Compliance state change events are now available at the management group level. Use event-based architecture to react to notifications with an Azure Function, Logic App, or any other supported event handler. Learn more https://aka.ms/policyhubeventgrid'. Below this, there are four summary cards: Overall resource compliance (100%), Resources by compliance state (0 Compliant, 0 Non-compliant), Non-compliant initiatives (0 out of 0), and Non-compliant policies (0 out of 0). A 'LEARN MORE' link is provided. At the bottom, there is a table header for 'ASSIGNMENTS BY COMPLIANCE (LAST 7 DAYS)'.

Checking all built-in policy associated with Tags

The screenshot shows the Microsoft Azure Policy Definitions page. The left sidebar is the same as the previous screenshot. The main content area has filters for Scope (Azure subscription 1), Definition type (All definition types), and Category (1 categories). A message states: 'The export to GitHub experience has been deprecated due to scalability issues. We are looking to introduce a similar experience using SDK in our documentation.' Below this is a table of built-in policies:

Name	Definition location	Policies	Type	Definition type	Category
Require a tag and its value on resources			Builtin	Policy	Tags
Append a tag and its value to resources			Builtin	Policy	Tags
Requires resources to not have a specific tag			Builtin	Policy	Tags
Inherit a tag from the subscription if missing			Builtin	Policy	Tags
Append a tag and its value to resource group			Builtin	Policy	Tags
Add a tag to resources			Builtin	Policy	Tags
Add or replace a tag on resources			Builtin	Policy	Tags
Add or replace a tag on subscriptions			Builtin	Policy	Tags
Add a tag to resource groups			Builtin	Policy	Tags
Require a tag on resources			Builtin	Policy	Tags
Require a tag and its value on resource group			Builtin	Policy	Tags

Opening a policy named “Require a tag and its value on resources”

The screenshot shows the Azure portal interface for a policy definition. The breadcrumb navigation is 'Home > Policy | Definitions > Require a tag and its value on resources'. The page title is 'Require a tag and its value on resources'. Below the title are links for 'Assign', 'Edit definition', 'Duplicate definition', and 'Delete definition'. The 'Essentials' section displays the following details:

- Name:** Require a tag and its value on resources
- Description:** Enforces a required tag and its value. Does not apply to resource groups.
- Available Effects:** Deny
- Category:** Tags
- Definition location:** --
- Definition ID:** /providers/Microsoft.Authorization/policyDefinitions/1e30110a-5ceb-460c-a204-c1c3969c6d62
- Type:** Built-in
- Mode:** Indexed

The 'Definition' tab is selected, showing a JSON definition:

```

1 {
2   "properties": {
3     "displayName": "Require a tag and its value on resources",
4     "policyType": "BuiltIn",
5     "mode": "Indexed",
6     "description": "Enforces a required tag and its value. Does not apply to resource groups.",
7     "metadata": {
8       "version": "1.0.1",
9       "category": "Tags"
10    },
11   },
12   "parameters": {
13     "tagName": {
14       "type": "String",
15       "metadata": {
16         "displayName": "Tag Name",
17         "description": "Name of the tag, such as 'environment'"
18       }
19     },
20     "tagValue": {
21       "type": "String"
22     }
23   }
24 }

```

Assigning the policy

The screenshot shows the 'Assign policy' page in the Azure portal. The breadcrumb navigation is 'Home > Policy | Definitions > Require a tag and its value on resources'. The page title is 'Require a tag and its value on resources'. Below the title are links for 'Assign policy', 'Review + create', 'Previous', and 'Next'. The 'Basics' tab is selected, showing the following configuration:

- Scope:** Azure subscription 1/cloud-shell-storage-centralindia
- Exclusions:** Optionally select resources to exclude from the policy assignment.
- Policy definition:** Require a tag and its value on resources
- Assignment name:** Require Role tag with Infra value
- Description:** Require Role tag with Infra value for all resources in the Cloud Shell resource group

At the bottom, there are buttons for 'Review + create', 'Cancel', 'Previous', and 'Next'.

Microsoft Azure Upgrade Search resources, services, and docs (5+)

Home > Policy | Definitions > Require a tag and its value on resources >

Require a tag and its value on resources

Assign policy

Basics Advanced **Parameters** Remediation Non-compliance messages Review + create

Search by parameter name ☒ Only show parameters that need input or review

Tag Name * ✓

Tag Value * ✓

Review + create Cancel Previous Next

Microsoft Azure Upgrade Search resources, services, and docs (5+)

Home > Policy | Definitions > Require a tag and its value on resources >

Require a tag and its value on resources

Assign policy

Basics Advanced Parameters Remediation Non-compliance messages **Review + create**

Basics

Scope	Azure subscription 1/cloud-shell-storage-centralindia
Exclusions	--
Policy definition	Require a tag and its value on resources
Assignment name	Require Role tag with Infra value
Description	Require Role tag with Infra value for all resources in the Cloud Shell resour...
Policy enforcement	Enabled
Assigned by	Robert Radu

Advanced

Resource selectors

No selectors associated with this assignment.

Overrides

No overrides associated with this assignment.

Parameters

Create Cancel Previous Next

Microsoft Azure Upgrade Search resources, services, and docs (G+J) 2027778@student.uwts... UNIVERSITY OF WALES TRAFALGAR

Home > Policy | Definitions >

Require a tag and its value on resources

Policy definition

Assign Edit definition Duplicate definition Delete definition

Essentials

Name	Require a tag and its value on resources	Definition location	--
Description	Enforces a required tag and its value. Does not apply to resource groups.	Definition ID	/providers/Microsoft.Authorization/policyDefinitions/1e30110a-5ceb-460c-a204-c1c3969c6d62
Available Effects	Deny	Type	Built-in
Category	Tags	Mode	Indexed

Definition Assignments (0) Parameters

```

1 {
2   "properties": {
3     "displayName": "Require a tag and its value on resources",
4     "policyType": "BuiltIn",
5     "mode": "Indexed",
6     "description": "Enforces a required tag and its value. Does not apply to resource groups.",
7     "metadata": {
8       "version": "1.0.1",
9       "category": "Tags"
10    },
11    "parameters": {
12      "tagName": {
13        "type": "string",
14        "metadata": {
15          "displayName": "Tag Name",
16          "description": "Name of the tag, such as 'environment'"
17        }
18      },
19      "tagValue": {
20        "type": "string"
21      }
22    }
23  }
24 }
```

Creating policy assignment 'Require Role tag with infra value' in 'Azure subscription 1/cloud-shell-storage-centralindia' was successful. Please note that the assignment takes around 5-15 minutes to take effect.

Creating a storage account for testing

portal.azure.com/#view/Microsoft_Azure_Marketplace/GalleryItemDetailsBladeNoPdlId/Microsoft.StorageAccount/selectionMode=false/resourceGroupId/resourceGro...

Microsoft Azure Upgrade Search resources, services, and docs (G+J) 2027778@student.uwts... UNIVERSITY OF WALES TRAFALGAR

Home > Resource groups > cloud-shell-storage-centralindia > Marketplace >

Storage account

Microsoft

Storage account Add to Favorites

Microsoft | Azure Service

★ 4.2 (1818 ratings)

Plan

Storage account Create

Overview Plans Usage Information + Support Ratings + Reviews

Microsoft Azure provides scalable, durable cloud storage, backup, and recovery solutions for any data, big or small. It works with the infrastructure you already have to cost-effectively enhance your existing applications and business continuity strategy, and provide the storage required by your cloud applications, including unstructured text or binary data such as video, audio, and images.

More products from Microsoft [See All](#)

Active Directory Health Check

Microsoft

Azure Service

Assess the risk and health of Active Directory environments.

AD Replication Status

Microsoft

Azure Service

Identify Active Directory replication issues in your environment.

Device Update for IoT Hub

Microsoft

Azure Service

Securely and Reliably update your devices with Device Update for IoT Hub.

Front Door and CDN profiles

Microsoft

Azure Service

Azure Front Door and CDN profiles is security led, modern cloud CDN that provides static and dynamic content acceleration, global load balancing.

Microsoft Azure

Upgrade

Search resources, services, and docs (0+)

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UNIVERSITY OF WALES TRINITY

Home > Resource groups > cloud-shell-storage-centralindia > Marketplace > Storage account >

Create a storage account

Basics Advanced Networking Data protection Encryption Tags Review

Azure Storage is a Microsoft-managed service providing cloud storage that is highly available, secure, durable, scalable, and redundant. Azure Storage includes Azure Blobs (objects), Azure Data Lake Storage Gen2, Azure Files, Azure Queues, and Azure Tables. The cost of your storage account depends on the usage and the options you choose below. [Learn more about Azure storage accounts](#)

Project details

Select the subscription in which to create the new storage account. Choose a new or existing resource group to organize and manage your storage account together with other resources.

Subscription *

Resource group * [Create new](#)

Instance details

Storage account name ⓘ *

Review

< Previous

Next : Advanced >

Give feedback

Microsoft Azure

Upgrade

Search resources, services, and docs (0+)

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Home > Resource groups > cloud-shell-storage-centralindia > Marketplace > Storage account >

Create a storage account

Basics Advanced Networking Data protection Encryption Tags Review

Validation failed. Required information is missing or not valid.

Basics

Subscription	Azure subscription 1
Resource Group	cloud-shell-storage-centralindia
Location	centralindia
Storage account name	testingstoragerobert
Deployment model	Resource manager
Performance	Standard
Replication	Read-access geo-redundant storage (RA-GRS)

Advanced

Enable hierarchical namespace	Disabled
Enable network file system v3	Disabled
Allow cross-tenant replication	Enabled
Access tier	Hot

Create

< Previous

Next >

Download a template for automation

Give feedback

portal.azure.com/#create/Microsoft.StorageAccount-ARM

Microsoft Azure Upgrade Search resources, services, and docs (5+)

Home > Resource groups > cloud-shell-storage-centralindia > Marketplace > Storage account >

Create a storage account

Basics Advanced Networking Data protection Encryption **Tags** Review

Tags are name/value pairs that enable you to categorize resources and view consolidated billing by applying the same tag to multiple resources and resource groups. [Learn more about tags](#)

Note that if you create tags and then change resource settings on other tabs, your tags will be automatically updated.

Name	Value	Resource
		All resources selected

Policy validation error. See details below.
 Policy enforcement. Value does not meet requirements on resource: newstoragerobert : Microsoft.Storage/storageAccounts
 The field 'tag name: Role' with the value 'Infra' is required:
 (Policy details)

Review < Previous Next > Review > Give feedback

Due to the created policy, new storage account is not created as that tag name and value is not matched.

Task 3: Applying tagging through Azure policy

Deleting an assignment named “Require Role tag with Infra value”

Microsoft Azure Upgrade Search resources, services, and docs (5+)

Home > Policy

Policy | Assignments

Search Assign policy Assign initiative Refresh

Scope: Azure subscription 1 Definition type: All definition types Search: Filter by name or ID...

Total Assignments: 1 Initiative Assignments: 0 Policy Assignments: 1

Assignment name	Scope	Type
Require Role tag with Infra value	Azure subscription 1/cloud-shell-storage-centralindia	Policy

The screenshot shows the Microsoft Azure Policy Assignments page. The left sidebar contains navigation links: Overview, Getting started, Compliance, Remediation, Events, Authoring, Definitions, Assignments (selected), and Exemptions. The main content area displays the 'Policy | Assignments' view for 'Azure subscription 1'. It shows a search bar, filters for 'Scope' (Azure subscription 1) and 'Definition type' (All definition types), and a search input. Below these are three summary cards: 'Total Assignments' (1), 'Initiative Assignments' (0), and 'Policy Assignments' (1). A table lists the assignments, with one entry: 'Require Role tag with Infra value' under the scope 'Azure subscription 1/cloud-shell-storage-centralindia'. A 'Delete assignment' dialog box is open, asking 'Do you want to delete the policy assignment 'Require Role tag with Infra value'?'. The dialog has 'Yes' and 'No' buttons.

Microsoft Azure Upgrade Search resources, services, and docs (0+)

Home > Policy

Policy | Assignments

Search Assign policy Assign initiative Refresh

Scope Azure subscription 1 Definition type All definition types Search Filter by name or ID...

Total Assignments 1 Initiative Assignments 0 Policy Assignments 1

Assignment name Azure subscription 1/cloud-shell-storage-centralindia Scope Policy

Delete assignment
Do you want to delete the policy assignment 'Require Role tag with Infra value'?

Yes No

portal.azure.com/#view/Microsoft_Azure_Policy/PolicyMenu blade~/Assignments

Microsoft Azure Upgrade Search resources, services, and docs (0+)

Home > Policy

Policy | Assignments

Search Assign policy Assign initiative Refresh

Scope Azure subscription 1 Definition type All definition types Search Filter by name or ID...

Total Assignments 0 Initiative Assignments 0 Policy Assignments 0

Assignment name No assignments found for this policy definition. Scope Type

Successfully deleted assignment
Successfully deleted 'Require Role tag with Infra value' from 'Azure subscription 1/cloud-shell-storage-centralindia'. Please note that the change takes around 30 minutes to take effect.

Assigning a policy

Microsoft Azure Upgrade Search resources, services, and docs (0+)

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Home > Policy | Assignments >

Assign policy

Basics Advanced Parameters Remediation Non-compliance messages Review + create

Scope
Scope [Learn more about setting the scope *](#)
Azure subscription 1/cloud-shell-storage-centralindia ✓

Exclusions
Optionally select resources to exclude from the policy assignment. -

Basics
Policy definition *
Inherit a tag from the resource group if missing ✓

Assignment name * ⓘ
Inherit the Role tag and its Infra value from the Cloud Shell resource group if missing ✓

Description
Inherit the Role tag and its Infra value from the Cloud Shell resource group if missing

Review + create Cancel Previous Next

Microsoft Azure Upgrade Search resources, services, and docs (0+)

2021/7/28@student (az... UNIVERSITY OF WALES TRIDENT)

Home > Policy | Assignments >

Assign policy

Basics Advanced **Parameters** Remediation Non-compliance messages Review + create

Search by parameter name ☒ Only show parameters that need input or review

Tag Name * ⓘ
Role ✓

Review + create Cancel Previous Next

portal.azure.com/View/Microsoft_Azure_Policy/PolicyMenu/~/Assignments

Microsoft Azure Upgrade Search resources, services, and docs (0+)

Home > Policy

Policy | Assignments

Assign policy Assign initiative Refresh

Scope: Azure subscription 1 Definition type: All definition types Search: Filter by name or ID...

Total Assignments: 1 Initiative Assignments: 0 Policy Assignments: 1

Assignment name: Inherit the Role tag and its Infra value from the Cloud Shell resource group if missing

Scope: Azure

Notifications

- More events in the activity log → Dismiss all
- Role Assignments creation succeeded: All role assignments were created successfully. a few seconds ago
- Creating policy assignment succeeded: Creating policy assignment 'Inherit the Role tag and its Infra value from the Cloud Shell resource group if missing' in 'Azure subscription 1/cloud-shell-storage-centralindia' was successful. Please note that the assignment takes around 5-15 minutes to take effect. a few seconds ago
- Successfully deleted assignment: Successfully deleted 'Require Role tag with Infra value' from 'Azure subscription 1/cloud-shell-storage-centralindia'. Please note that the change takes around 30 minutes to take effect. 9 minutes ago

Creating a new storage account

Microsoft Azure Upgrade Search resources, services, and docs (0+)

Home > cloud-shell-storage-centralindia > Marketplace >

Storage account

Microsoft | Azure Service

★ 4.2 (1818 ratings)

Plan: Storage account Create

Overview Plans Usage Information + Support Ratings + Reviews

Microsoft Azure provides scalable, durable cloud storage, backup, and recovery solutions for any data, big or small. It works with the infrastructure you already have to cost-effectively enhance your existing applications and business continuity strategy, and provide the storage required by your cloud applications, including unstructured text or binary data such as video, audio, and images.

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- Active Directory Health Check**
Microsoft
Azure Service
Assess the risk and health of Active Directory environments.
- AD Replication Status**
Microsoft
Azure Service
Identify Active Directory replication issues in your environment.
- Device Update for IoT Hub**
Microsoft
Azure Service
Securely and Reliably update your devices with Device Update for IoT Hub.
- Front Door and CDN profiles**
Microsoft
Azure Service
Azure Front Door and CDN profiles is security-led, modern cloud CDN that provides static and dynamic content acceleration, global load balancing.

Microsoft Azure Upgrade Search resources, services, and docs (0+1)

Home > cloud-shell-storage-centralindia > Marketplace > Storage account >

Create a storage account

Basics Advanced Networking Data protection Encryption Tags Review

Azure Storage is a Microsoft-managed service providing cloud storage that is highly available, secure, durable, scalable, and redundant. Azure Storage includes Azure Blobs (objects), Azure Data Lake Storage Gen2, Azure Files, Azure Queues, and Azure Tables. The cost of your storage account depends on the usage and the options you choose below. [Learn more about Azure storage accounts](#)

Project details

Select the subscription in which to create the new storage account. Choose a new or existing resource group to organize and manage your storage account together with other resources.

Subscription * Azure subscription 1

Resource group * cloud-shell-storage-centralindia [Create new](#)

Instance details

Storage account name * storagerobertradu

[Review](#) < Previous Next: Advanced > [Give feedback](#)

portal.azure.com/View/HubExtension/DeploymentDetailsBlade~/overview/id/%2Fsubscriptions%2F56b237a-9e0b-4c71-8725-218bde5da96%2FresourceGroups...

Microsoft Azure Upgrade Search resources, services, and docs (0+1)

Home >

storagerobertradu_1688630241945 | Overview

Deployment

Search Delete Cancel Redeploy Download Refresh

Overview Inputs Outputs Template

Your deployment is complete

Deployment name: storagerobertradu_1688630241945
Subscription: Azure subscription 1
Resource group: cloud-shell-storage-centralindia

Start time: 7/6/2023, 1:27:24 PM
Correlation ID: d790bca1-7dd6-40bf-8e29-f4162ed0f154

Deployment details
Next steps
[Go to resource](#)

Give feedback
[Tell us about your experience with deployment](#)

Deployment succeeded
Deployment 'storagerobertradu_1688630241945' to resource group 'cloud-shell-storage-centralindia' was successful.
[Go to resource](#) [Pin to dashboard](#)

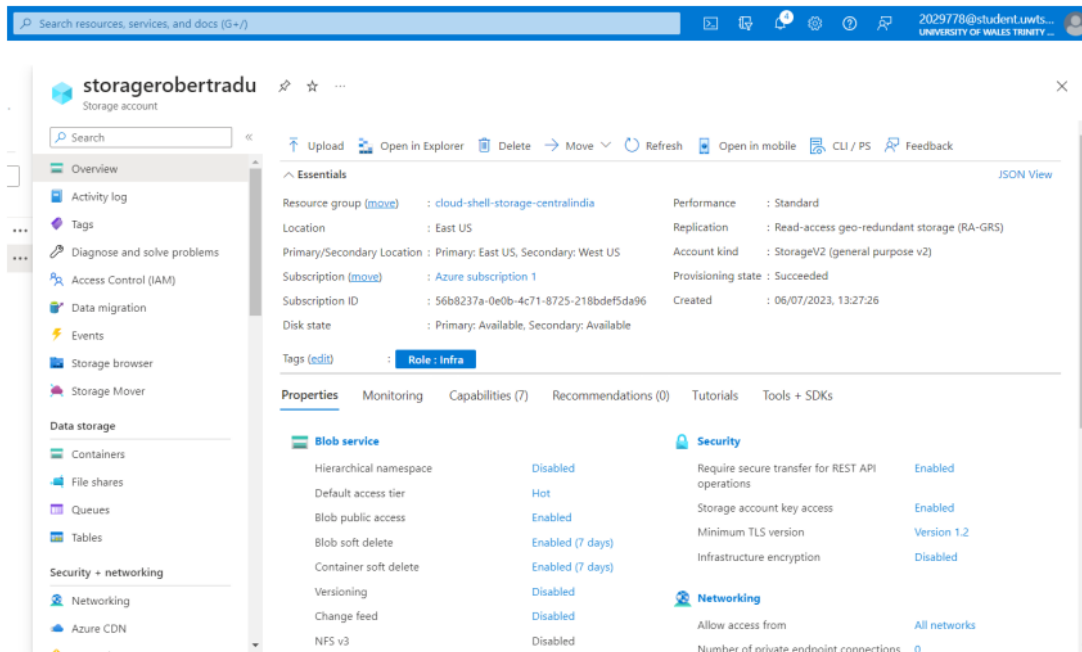
Cost Management
Get notified to stay within your budget and prevent unexpected charges on your bill.
[Set up cost alerts >](#)

Microsoft Defender for Cloud
Secure your apps and infrastructure
[Go to Microsoft Defender for Cloud >](#)

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Work with an expert
Azure experts are service provider partners who can help manage your assets on Azure and be your first line of support.
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This time the deployment was succeeded the created policy inherited that the tag name and its value from the cloud shell resource group.



The above figure illustrates that the Role:Infra tag has been ¹ automatically assigned to the newly created storage account.

Cloud Disaster Recovery Plan for Aspire Retailers

For providing with a detailed support over the data as well as each application available or being used by Aspire Retailers on the cloud, a brief and robust Disaster Recovery Plan, which seems to be crucial here for providing with data integrity and security, while maintaining data availability, the following ideas that had been required to be considered here:

- **Critical Workloads and Recovery object identification:** - The Azure Cloud Disaster Recovery plan here had been determined to be beneficial for successively identifying all kinds of critical workloads, which would be utilized for prioritizing the major works that needed to be addressed for preventing any issues during data breach [2].
- **Regular Testing and Monitoring:** - Apart from identifying and marking the critical workloads, it also had been determined beneficial here for conducting a frequent testing of the Azure Cloud platform, so as to detect any malicious activities. This would include monitoring the status of every VM replications that had been made here at the organization, while tracking their data backup health [4].

- **Azure Site Recovery**: - The Cloud Disaster recovery plan here should also be equipped with a feature called Azure Site Recovery, responsible for providing a sufficient amount of server replications, so as to execute their work on both physical as well as virtual environment with more efficiency.
- **Azure Traffic Manager**: - The Cloud Disaster Recovery Plan here should also be implementing a feature of Azure Traffic Manager, responsible for distributing the entire network traffic all across the replicas of servers at Aspire Retailers. This would further be beneficial for maintaining a proper record of what kind of network data had been utilized here by the organization [3].
- **Azure Backups**: - Last, but not least, the Cloud Disaster Recovery plan here for Aspire Retailers should also include Azure Backups, which would be responsible for providing with an additional level of protection and storage for allowing Aspire Retailers to keep their data safe, which could be utilized during any data breach [1].

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