



INFORMATION TECHNOLOGY PROGRAMME
SOFT807 Cloud Applications Development

Assignment 1

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Summary

This assignment aims to demonstrate an understanding of cloud server technology in a real-life scenario. To illustrate a practical use of the main concepts of Cloud Computing, a fictional scenario was created simulating a technological company called “Tech Waves Solutions LTD.” owned by two fictional owners, Taylor and Alex. Throughout the first tasks, business models related to cloud connectivity, scalability, elasticity and storage were explored and broken apart into sections for explanation and analysis. In addition, a report of 4 key cloud concepts that are pivotal for understanding the cloud providers' responsibilities and rights.

For task 2, the development of a functional web application could include technologies such as HTML, CSS, JQuery and a database directly connected to a cloud service. The web application also should have been deployed at the cloud platform, in that way being accessible online by URL. The application should count with a sitemap and a description of its functions.

Thirdly, for task 3, a recording of the web application demonstrating its functionalities, including updating and deleting products and user authentication. Aside from that, the illustration of all the data storage is inserted, updated and deleted from the database, which is allocated to the cloud service.

Lastly, the process described in the previous lines will be demonstrated by using two distinct platforms to display their differences, functionalities, pricing and user interface.

Introduction

Taylor and Alex are the CEO of Tech Wave Solutions LTD. The company plan to achieve clients wanting to expand their business with technological solutions. They aim to use diverse types of programming languages to meet their clients' needs by developing applications using HTML, CSS, JavaScript, Jquery, which are commonly known as web languages, and also by developing applications using C#, Java, Python and for last connection with a database to store and pull requests in live time. Tech Wave Solution's goals for a future project are to expand their work field to develop mobile applications for the two most used platforms, iOS and Android. Besides that, an upcoming project for a charity book place was also developed. This project aims to achieve a functional web app where users can log in and out of the system, create an account, and store books on their online shelves. An administrator was also requested to manage users, publishers and authors. Register, updating and deleting users will be the administrator function.

Platforms

The cloud platform is an essential tool for delivering a good calibre service, and for the following procedures, the chosen platforms were Microsoft Azure and Amazon Web Services. The concept of offering cloud service is based on a marketplace where users can include services to their main account and use them as needed. For the ensuing topic, what has been taken into consideration was the following points:

- The efficiency of fault tolerance methods for prolonged hours running client-end services

- The effectiveness of scalability towards different stress and no-stressed scenarios
- The usability of portal tools to configure and deploy one or more containers
- The Price-Cost value of the services and their benefits
- The Frequent Asked Questions (FAQs) or Question and Answers page that provides tutorials or procedures for its users

Microsoft Azure

The Azure Cloud Platform proposes more than 200 products and cloud services and applications that can run on multiple platforms. Azure aims to deliver solutions for daily life tasks and professional solutions for any size company.

Azure allows users to create an account with \$200 (U.S. dollars) as credit can expire in 30 days; besides, it also offers the creation of student accounts that do not expire and have \$100 credits. All of those services can be extended and changed to a pay-as-you-go profile (Microsoft, 2024).

Azure Support

Microsoft offers an extensive support page: Trial, testing and development. Product workloads. Business-critical services. Comprehensive Microsoft technology support. The user can receive support via tickets, email and calls (Microsoft, 2024).

Amazon Web Services (AWS)

AWS has over 200 fully featured services. Startups, governments and enterprises use it. AWS has a great low-cost benefit which is attractive to many individuals and companies (Amazon Web Services, 2024).

Similar to Azure, AWS also offer trial plans. However, there are three different categories of plans. One of them is free Trials, which have a determined period of use, 12 months of free and always free, which, in that way, do not expire. All of those services can be extended and changed to a pay-as-you-go profile (Amazon Web Services, 2024).

AWS Support

AWS has an online page focused only on support. It is possible to find Support plans for Enterprise, Business and Developer. Support solutions for its services. Partner Support, Pricing Support and FAQs (Amazon Web Services, 2024).

Scenario description:

Tech Wave Solutions Ltd has started in the technology market, aiming to provide smart web solutions for its clients. For instance, using HTML, CSS, JavaScript, and React library for client-side applications and Node.js for server-side programming. In addition, the possibility of extending their services for mobile applications for iOS and Android.

What is Cloud Computing

Cloud Computing is a convenient model that allows individuals to access cutting-edge technologies and then manage them as they like. Internet connections provide access to a vast platform that permits the use of networking configurations, test environments, storage and other computing functionalities that not long ago were restricted to physical infrastructures and robust installations (Wufka & Canonico, 2023).

Cloud Computing and its Concepts

In cloud computing, concepts are also cited as business-models solutions offered to clients; these models are effective tools that encapsulate and virtualise computing services that can operate under public, hybrid and private platforms (Ogbole; Ogbole; Olagesin, 2021).

Infrastructure as a Service - IaaS

The scenario presented by Tech Wave Solutions leads to an introduction to Infrastructure as a Service (IaaS); the business model is a core concept towards cloud computing. This model allows the virtualisation of many useful resources that were available mostly only to big corporations and required advanced knowledge in different fields, such as networking configuration, security protocols and setup of test environments, making the installation process expensive and complicated.

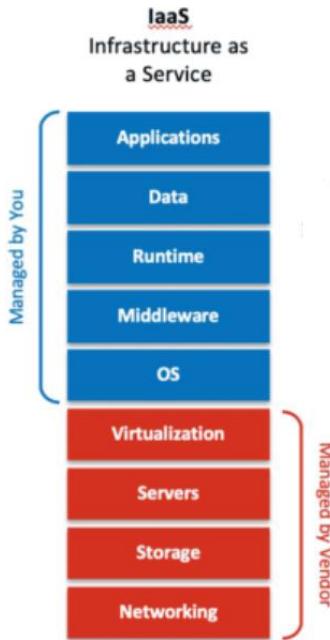
The IaaS model was chosen because it permits a high customisation per the client side, including virtualisation of services, the elasticity of computing processing power, networking configuration such as blocking and allowing public and private access and creating endpoints to access certain services. According to Godse and Mulik (2009) cited by Ogbole, Ogbole & Olagesin (2021), “is the capability provided to consumers to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications.”

The benefits of IaaS

Infrastructure as a service can drastically reduce access to the cost of high-end technology and well-structured virtual environments; it is built to bring reliability to its clients and on-demand tools. It relies upon the user's responsibility, which brings up a new benefit: IaaS offers great freedom for its users, as the services can be used as they desire. Other main points that should be taken in consideration by an IaaS model:

- Has a vast manageable resource pool. Whereas it ranges from networking security protocols to virtual machines

- Offers smart elasticity and scalability tools towards dynamic demands that may happen
- Delivers workloads that can transit throughout different operating systems, servers and virtual machines



Containers

Containers are a pivotal piece in cloud computing. It delivers standard packages with the necessary content for the environment to run its tasks. In other words, containers help platforms execute their tasks in more than one type of platform. For instance, a well-structured container can run in Windows, Linux and other operational system environments. Moreover, it virtualises standard specifications for a system to interact with different platforms. (Google Cloud, 2024).

To better understand containers, for instance, think about a physical container that transports items to build and repair a house structure; it contains nails, a hammer, a piece of timber, etc. All those items were included in the container by an engineer or architect. As soon as the final destination arrives, it will not matter what the location or items are already there. The container already has all the requirements to support a new simple house or provide repairs.

The benefits of containers

Containers are time-savers; as a package has been created, it can be deployed straightforwardly. As a result, no concerns will occur as the target instances will not struggle with extra configuration. It also has high interactivity with virtual machines because it can virtualise operational systems; similarly, it can deploy an image to numerous Virtual Machines. It extends from encapsulated code libraries and virtualises CPU, memory RAM and networking configuration at the operational system level (Google Cloud, 2024).

Shared Responsibility

The shared responsibility model is crucial in cloud services. Adopting the cloud model, the concept of sharing a physical server machine that hosts multiple virtual servers brings up the necessity of understanding the points where cloud providers have their part of the responsibility. For instance, Amazon Web Services (2024) and Microsoft Azure (2024) clarify the company's duty towards the cloud platform; some examples are below:

- Physical integrity of hosts, networking and datacentres
- Integrity of software storage, database, and computing power
- Integrity of regions, availability zones and edge locations

However, as the model implies, the user also holds responsibility for its use in the cloud. Regardless of infrastructure, platform or software, data, access management and accounts are expected to be handled by the user, such as:

- Operational system, network and firewall configuration
- Client-side data
- Networking traffic protection
- Applications

Price models

As a result of offering up-to-date technology, pricing models are essential to secure the user and the service provider for a fair trade. Like traditional subscription-based services, this model is also available for contract in Cloud Services. It offers predictable pricing and bills and works well for individuals or companies with a moderate budget. This model provides a safe approach, not letting the user exceed its quota; it does not require constant monitoring, as the subscription is “limited” to what was contracted. Moreover, the Pay-as-you-go model operates greatly with customisation and adaptability. Specifically for this model type, the user has a wide set of tools in the platform. However, for every configuration and decision, the billing cost will increase (Cloudzy.com, 2023). For example, the client needs a web server that will be hosted in a virtual machine running the operational system Linux – Debian. The break-down of the example will be:

- 1 - Virtual machine cost
 - 1a) Size (virtual CPU, Memory)
 - 1b) Operational System (In this case, Debian has a free license)
- 2- Keep the virtual machine online
 - 2a) The rates can vary from minutes, hourly and/or daily charges
 - 2b) Stability and elasticity can increase the server performance, although increase the rate with it.
- 3- Install a web server in the VM – no cost

Furthermore, pricing models are widely flexible; they can fit startups and host big companies' services. The two models presented here are the more commonly used. However, pay-as-you-go relies on the user's knowledge, giving them more freedom to scale tools.

In conclusion, cloud computing is a handy service facilitator that has many business models, each developed focusing on infrastructure solutions, including software and platform demands. It also aims to facilitate the delivery of good service to clients who use centres and servers; likewise, clients from simpler businesses are looking for simple solutions for daily tasks. Cloud service providers also engage with the user towards responsibility duties and give them options to choose a suitable plan model that better fits their necessity.

Tech Wave Solutions x Cloud Computing

The proposed scenario illustrates Taylor and Alex's company's necessity to adapt their services to achieve their target client. The solutions in this assignment are related to a cloud platform that offers workloads that can be customised or are already preset in the platform of choice. For the ensuing section, a breakdown of each service provided by the cloud service providers was done to clarify the best use for the imposed situation explicated by Tech Wave Solution.

Virtual Machines and Scale Sets

Virtual machines (VM) are virtualised machines that run into a closed system. In other words, a VM simulates a whole virtualised system, CPU, Memory, Storage Size, Operational System, and Network interface. The VM is crucial for a solution to Tech Wave because the virtualisation of machines allows one physical machine to operate one or more virtual "computers". As a result, having the same or identical operational system in a set of VMs allows building Scale Sets (Redhat, 2019).

Scale Sets

Scale Sets are workloads that work together to offer high elasticity for high-demand traffic (Microsoft, 2024). However, it can also operate in the opposite way if necessary. Virtual Machines Scale Set (VMSS) extends the virtualisation of one unique machine into a more complex system, where not only one but a set of virtual machines come together to absorb and respond to requests for its services so that the processing power, storage capability or network connections are not affected. In addition, VMSS need to have the same or identical operational system running, as their load is shared between the connected machines.

Scale Sets are highly scalable. For instance, scalability is a concept applied in more than one way.

Scalability on demand

Cloud service providers are built on an extraordinary infrastructure. Infrastructure as a Service supplies solid tools for customised and manual scalability. That is what is called scalability on demand, which allows users to create inbound and outbound rules, such as processor power, bandwidth or storage usage and scheduled scalability. Two main scale types might occur: Horizontal and Vertical, or Scale-Out / Scale-In for the former and the late Scale-Up/ Scale-Down (CloudZero, 2023).

The horizontal scale uses processing power to increase or decrease the Virtual Scale Set. For instance, if a high demand for a specific service is expected, the user can set based on

their evidence, a scale-out of resources and increase the amount of CPU and memory RAM available, the scale-in, on the other hand, will decrease the server capability, to when demands are not so high, for example, in a holiday or weekend evening. Vertical scaling works as scale-up and scale-down. Scaling-up will increase the amount of virtual servers made available, which are made very small for situations where high traffic demand is expected. For web applications and server-side web applications, concepts such as vertical scalability are compelling, where the service provider can increase the processing power of such virtual machines. On the other hand, horizontal scalability can provide a temporary number of extra virtual machines that will distribute the workload through the network (CloudZero, 2023).

Storage

Manage data that is stored in the cloud. The platform offers a reasonable storage size for data. This data can be managed, accessed, and downloaded as requested.

Microsoft Azure – Portal

Virtual Machines

Create a virtual machine in Microsoft Azure. The ensuing steps will describe the creation and configuration of virtual machines using the Azure platform:

In the search bar at the very top, type Virtual Machine. Click on Create + and Create Azure Virtual Machine. Once on the page, select the available subscription.

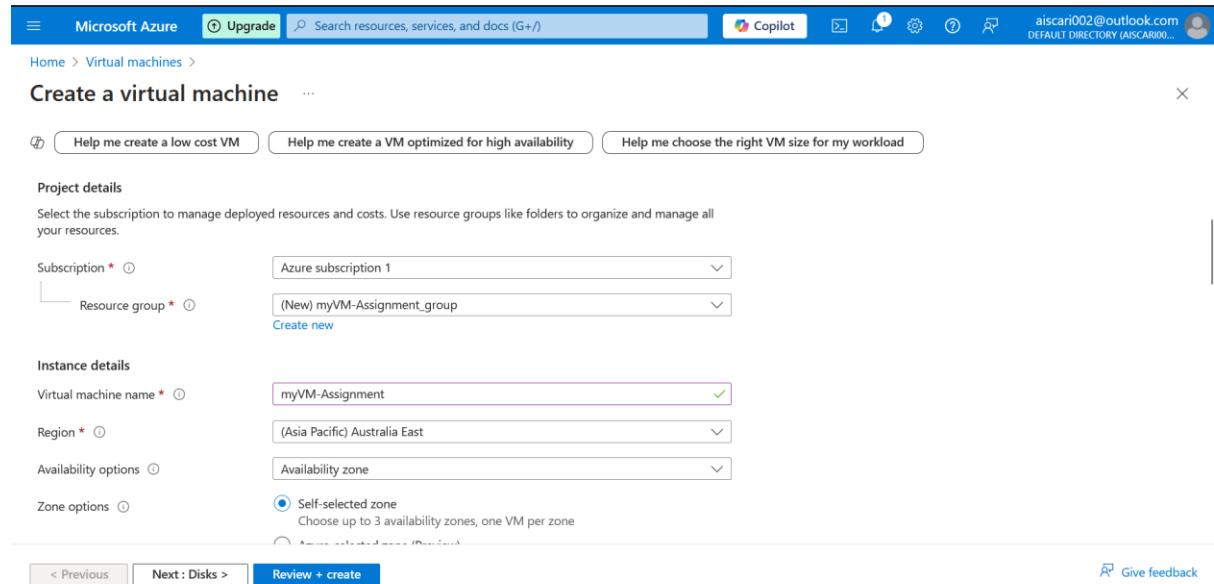


Image: Initial page for creating a virtual machine. Retrieved from <https://portal.azure.com/>
Subscription: Choose an active subscription

Resource Group: This section is a collection of assets and configurations designed to facilitate monitoring and access control (Microsoft, 2024).

In this case, a new group called myVM-Assingment_group was created

Virtual machine name: myVM-Assignment

Region: Select the closest region to the target area, reducing networking delay

Availability options: This option allows for the selection of no redundancy, physically separate resources, virtual machine scale set, or availability set.

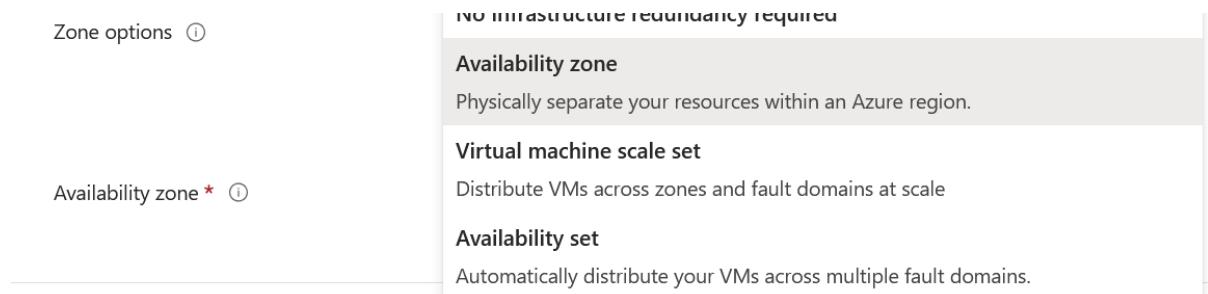


Image: Availability zone for redundancy. Retrieved from <https://portal.azure.com/>

The availability zone is initially selected as: self-selected zone. For future scale set configurations. This might change.

Zone Options: Azure – select zone. Microsoft Azure will automatically define the best zone of use.

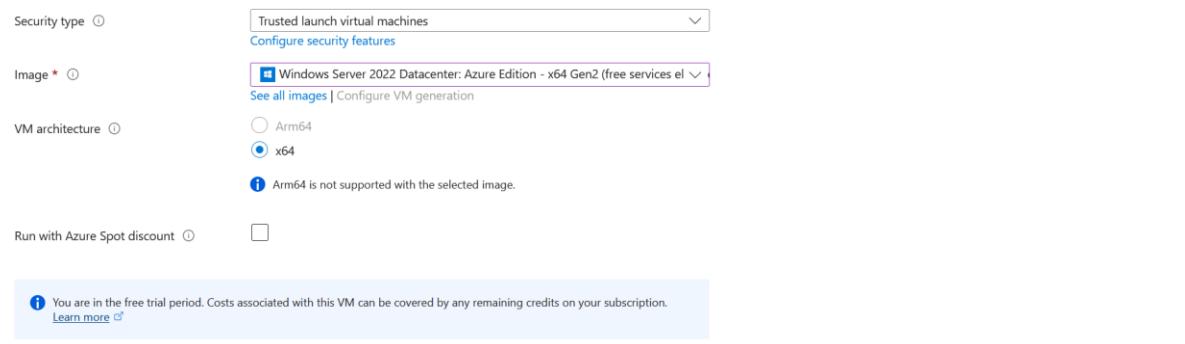


Image: Availability zone for redundancy. Retrieved from <https://portal.azure.com/>

Security type: Default option, it has protocols of defence attack using a Trust Platform Model

Image: Operational System image

VM Architecture: x64 – Operational System Architecture

Size: Selection of vCPU and RAM memory, as well as Local Storage

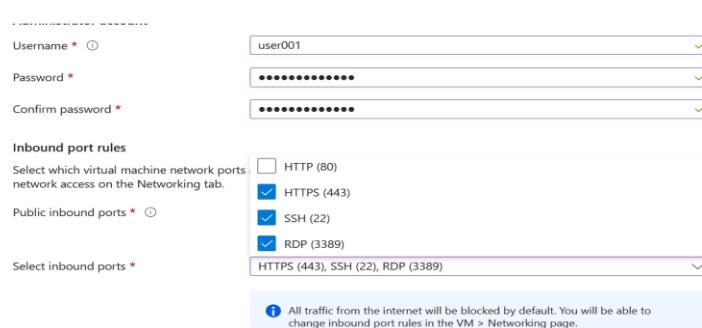


Image: Availability zone for redundancy. Retrieved from <https://portal.azure.com/>

Username: Select a username

Password: Define a password

Inbound port rule: Define which ports are available for connection

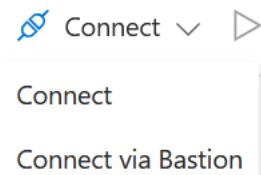
There are more configurations available. Although the steps described above are enough to create a functional virtual machine. Proceed to Review and Create, and then Create.

The screenshot shows the Azure portal interface for a deployment named 'CreateVm-MicrosoftWindowsServer.WindowsServer-202-20241008150402'. The main panel displays a green checkmark indicating 'Your deployment is complete'. Below this, it shows deployment details: Deployment name: CreateVm-MicrosoftWindowsServer.Win..., Start time: 10/8/2024, 3:15:16 PM; Subscription: Azure subscription 1, Resource group: myVM-Assignment_group. It also lists recommended next steps: Setup auto-shutdown, Monitor VM health, performance and network dependencies, and Run a script inside the virtual machine, all marked as Recommended. At the bottom of the main panel are 'Go to resource' and 'Create another VM' buttons. To the right, there are promotional cards for Cost Management, Microsoft Defender for Cloud, and Free Microsoft tutorials.

Image: The deployment of the recently created virtual machine is complete. Retrieved from <https://portal.azure.com/>

Accessing the virtual machine

To connect to the virtual machine, click on Go to Resources after the deployment is complete, and then click on Connect:



On this newly loaded page, scroll down and then download the RDP file.

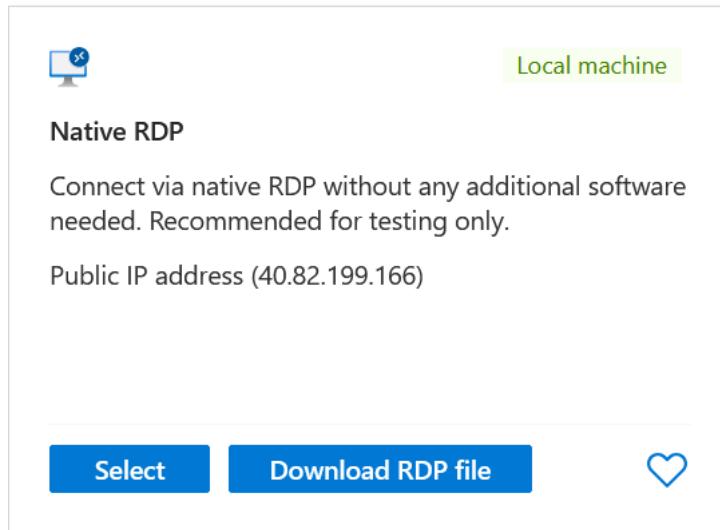


Image: RDP installer. Retrieved from <https://portal.azure.com/>

A file will be downloaded from the computer, open the program, and the credentials created on the first steps will be requested:

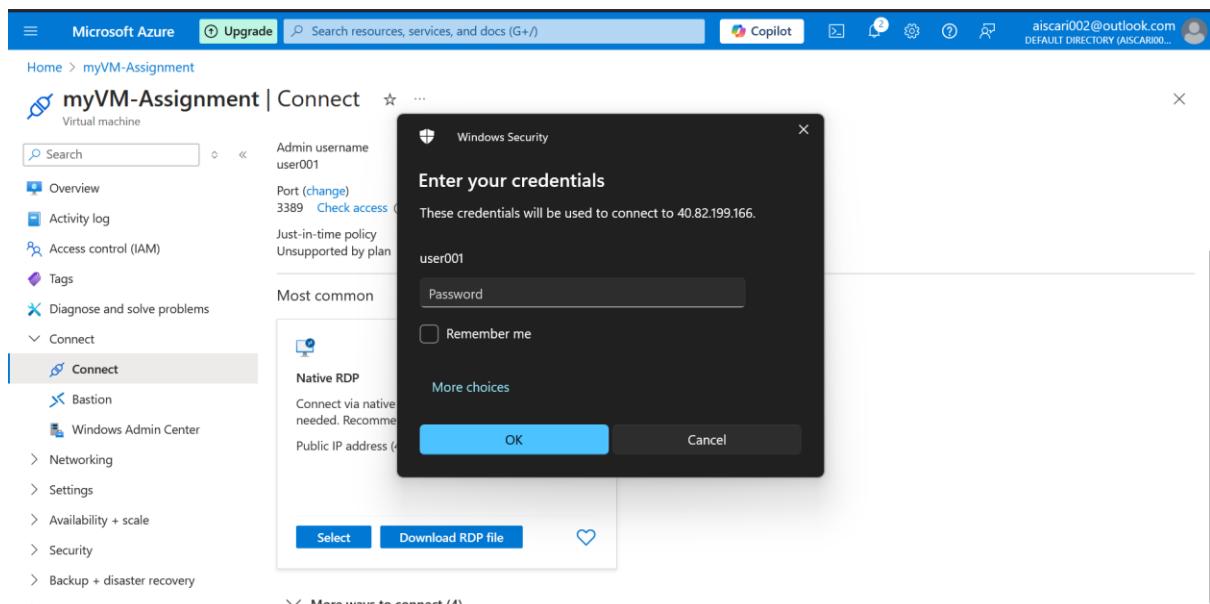


Image: Password request for the virtual machine. Retrieved from <https://portal.azure.com/>

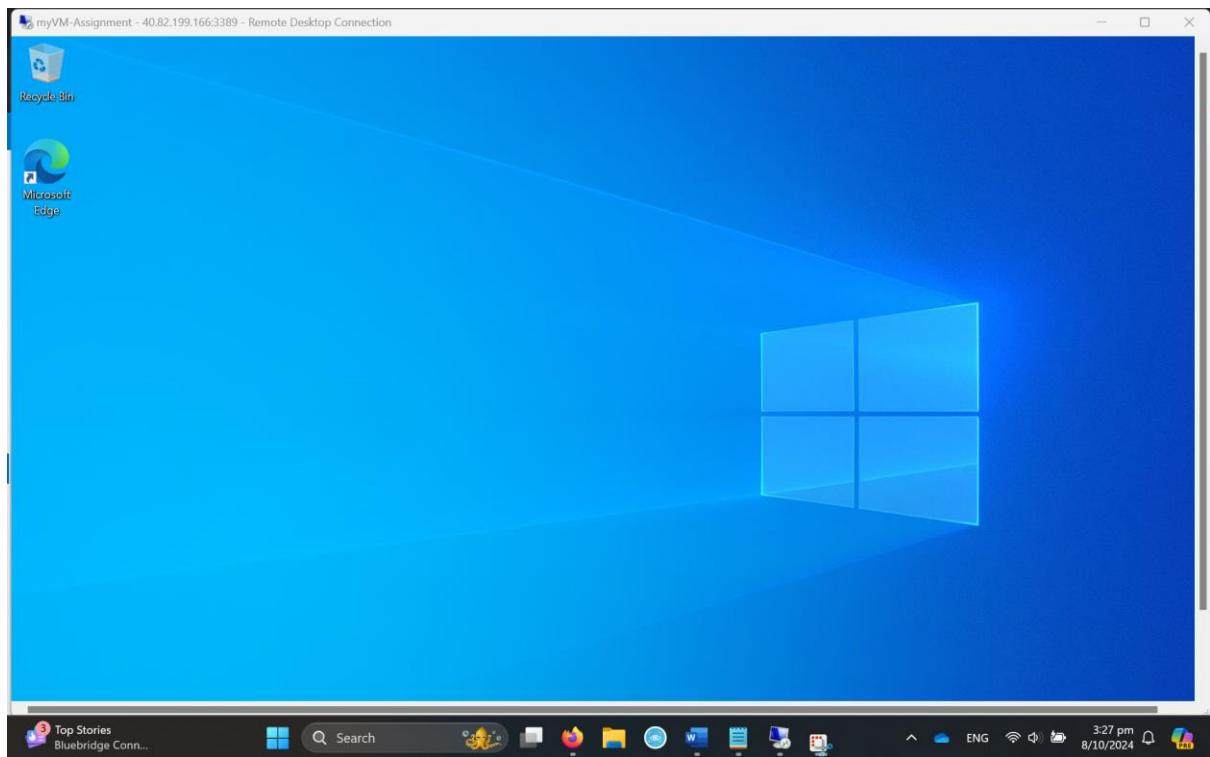


Image: Virtual machine running. Retrieved from <https://portal.azure.com/>

Result: Virtual Machine Online

In conclusion, deploying a new virtual machine on Azure is straightforward and clear. Microsoft explains every step of the process. It is possible to foresee what is going to be the cost per hour once the review is finalised:

Pricing

Basics Disks Networking Management Monitoring Advanced Tags [Review + create](#)

Price

1 X Standard B1s by Microsoft [Subscription credits apply](#) ⓘ [0.0172 USD/hr](#) [Pricing for other VM sizes](#)

[Terms of use](#) | [Privacy policy](#)

Image: Overview of the cost price per hour. Retrieved from <https://portal.azure.com/>

Virtual Machine Scale Set (VMSS)

Scale set is a useful tool for a collection of virtual machines running the same Operational System image. This is a pivotal procedure to performance scale in and out towards the high traffic demands.

Start by typing in the search box Virtual Machine Scale Set. Once selected, click on Create +

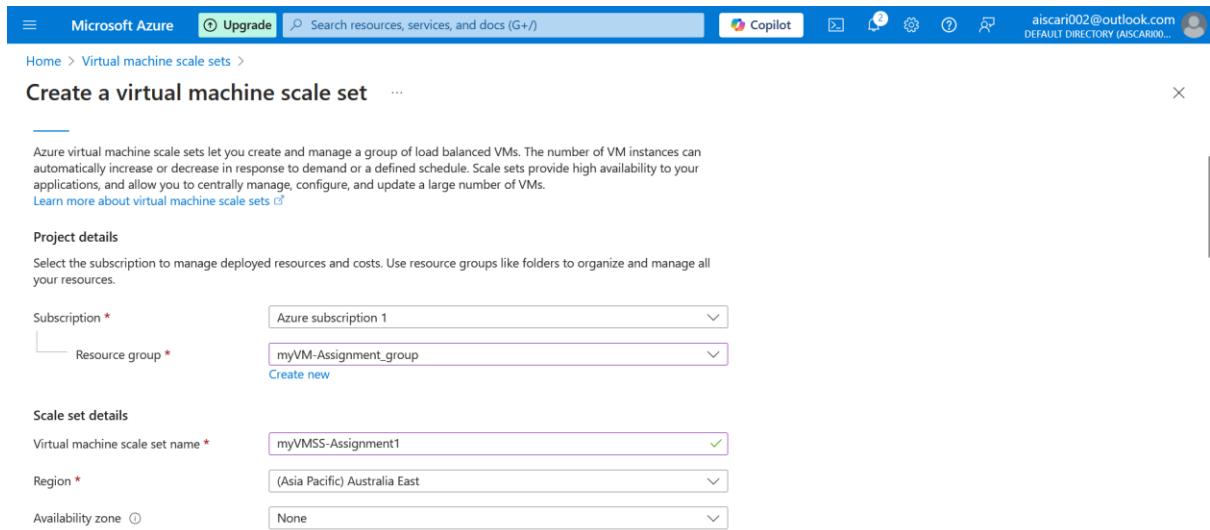


Image: Initial page to set up scale set. Retrieved from <https://portal.azure.com/>

Subscription: Choose an active subscription

Resource group: Choose a resource group that contains the pre-set configurations that match your necessity

VMSS name: Scale Set name

Region: Select the closest region to the target area, reducing networking delay

The screenshot shows the scaling mode options in the Azure portal. It includes a 'Scaling' section with a 'Scaling mode' dropdown. The 'Scaling mode' dropdown has three options: 'Manually update the capacity' (selected), 'Autoscaling', and 'No scaling profile'. Below the dropdown is a checked checkbox for 'Improve your availability by selecting multiple zones'. At the bottom, there's an 'Instance count' dropdown set to '5' and a 'Configure scaling options' link.

Image: Scaling mode option. Retrieved from <https://portal.azure.com/>

Orchestration: Select flexible, virtual machines with the same scale type will work together to achieve high scalability

Security Type: Trust launch virtual machines

Scaling: Manually update the capacity. This option lets the user decide when to scale up the vCPU and RAM capacity. Automatically scaling can also be selected. However, it relies on metrics that should be analysed with data based on previous experience.

Instance details

Image * ⓘ [See all images](#) | [Configure VM generation](#)

VM architecture ⓘ Arm64 x64
Info Arm64 is not supported with the selected image.

Size * ⓘ [See all sizes](#)

Enable Hibernation ⓘ
Info Hibernate is not supported by the size that you have selected. Choose a size that is compatible with Hibernate to enable this feature. [Learn more](#)

Image: Operational system and size set up. Retrieved from <https://portal.azure.com/>

Image: Operational System the VMs will run

Size: VMs processing, storage and memory capability

Administrator account

Username * ⓘ

Password * ⓘ

Confirm password * ⓘ

Image: Defining the username and password. Retrieved from <https://portal.azure.com/#home>

Username: Choose an admin username

Password: Define a password

Move to the Networking Section

The networking interface setup has been created. Keep the default configuration and move to the Load Balance section.

Create a virtual machine scale set

Virtual network configuration

Azure Virtual Network (VNet) enables many types of Azure resources to securely communicate with each other, the internet, and on-premises networks. [Learn more about VNets](#)

Virtual network * [Create virtual network](#)

Network interface

A network interface enables an Azure virtual machine to communicate with internet, Azure, and on-premises resources. A VM can have one or more network interfaces.

+ Create new nic [Delete](#)

NAME	CREATE PUBL...	SUBNET	NETWORK SECURIT...	ACCELERATED N...
myVM-Assignment_gr...	Yes	default (10.1.0.0/20)	Basic	Off Edit

Image: NIC – Networking Interface, which will allow the Azure virtual machine scale set to connect and communicate with other Azure machines and access the internet. Retrieved from <https://portal.azure.com/>

Select Azure load balancer in the load balance section and then click Create a load balancer.

Create a load balancer

Details such as subscription and resource group will be inherited from the virtual machine that you're creating. A default IP, backend pool, and load balancer rule will be created on your behalf, though certain configurations can be changed if desired.

Load balancer name *

Type * **Public**
Provides outbound connections for virtual machines inside your virtual network using public load balancers.

Internal
Used to load balance traffic inside a virtual network. A load balancer frontend can be accessed from an on-premises network in a hybrid scenario.

Protocol * TCP
 UDP

Rules Load balancer rule Inbound NAT rule

Load balancer rule
A load balancing rule distributes incoming traffic that is sent to a selected IP address and port combination across a group of backend pool instances. Only backend instances that the health probe considers healthy receive new traffic.

Port *
Backend port *

Inbound NAT rule
An inbound NAT rule forwards incoming traffic sent to a selected IP address and port combination to a specific virtual machine.

Frontend port range start *
Backend port *

Create **Cancel**

Image: Creating a load balancer. Retrieved from <https://portal.azure.com/>

Type: Public, allow IP addresses which have public origin to have access to the balance network

Protocol: TCP – Transport Protocol

The load balancer rule will distribute the incoming traffic by IP. The ports shown in the screenshots are commonly used by default. Backend ports that are considered healthy will receive the incoming traffic. In addition, the Networking Address Translation Protocol (NAT) will distribute the incoming traffic to available virtual machines.

Once the fields are complete, click on Review + Create

Deployment name : CreateVmss-MicrosoftWindows... Start time : 10/8/2024, 6:13:56 PM
Subscription : Azure subscription 1 Correlation ID : 7251d97a-a2f7-4ce9-9264-4f32...
Resource group : myVM-Assignment_group

Image: Deployment of the Virtual Machine Scale Set. Retrieved from

<https://portal.azure.com/>

Automatic Scale Set Scalability

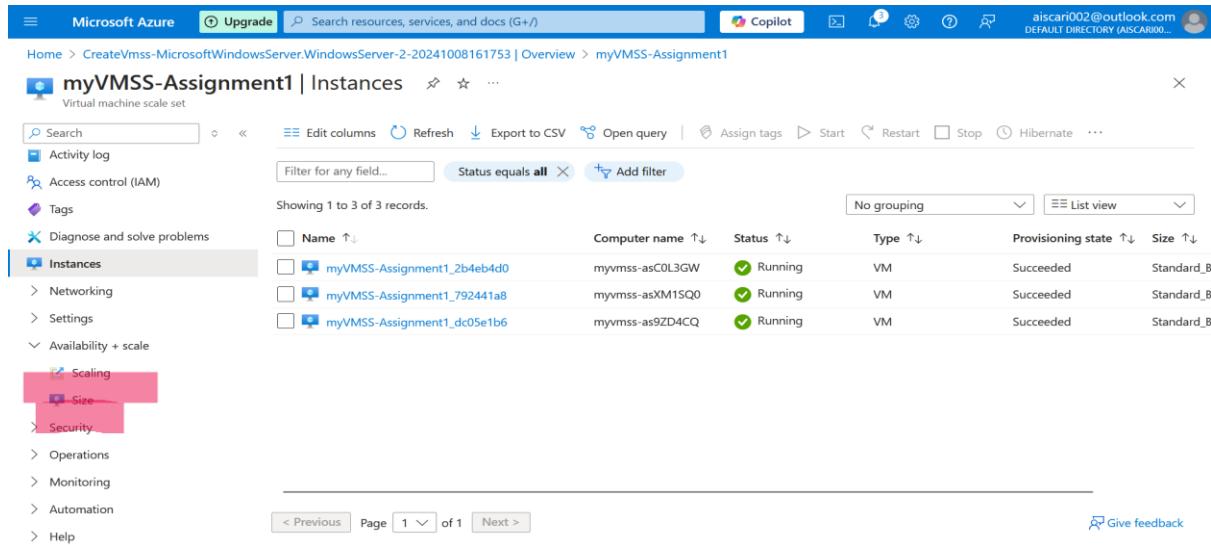
Changing from manual to automatic is possible after setting up a new scale set condition. This tool is crucial to prevent outages for high peak demands. Let us consider the Tech Wave Solution case: On a week evening, a client from a tech company creates an astonishing deal. To get a promotional link, users must sign in to the website and click on a button requesting a link that will be sent to their email. Hundreds to thousands of requests are made in a matter of minutes, forcing the servers to their limits. Resulting in delays and the loss of interest in some clients. However, the service already had a pre-defined scale set for these conditions, which did not work. Taylor and Alex then decide to use an automatic scale set based on evidence and data provided by their clients so, for future astonishing deals, the system will take care of the demand and scaling out and for periods where the access to services is low, it will scale in.

Creating an automatic Scale Set – Scale-In and Scale-Out / Horizontal Scale

Scale-Out

Configuring a scale-out setup, this procedure focuses on creating a rule for high-traffic demands that require a scaling up or horizontal scale of the virtual machine processing.

Type in the search bar Resource group, then select the one with the Virtual Machine Scale Set.

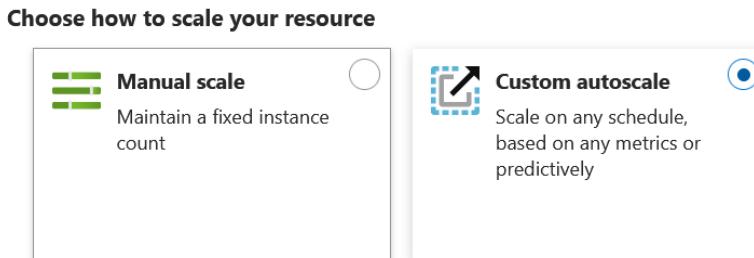


The screenshot shows the Microsoft Azure portal interface. The top navigation bar includes 'Microsoft Azure', 'Upgrade', 'Search resources, services, and docs (G+)', 'Copilot', and user information. Below the navigation is the URL 'Home > CreateVmss-MicrosoftWindowsServer.WindowsServer-2-20241008161753 | Overview > myVMSS-Assignment1'. The main content area is titled 'myVMSS-Assignment1 | Instances' and shows a list of three virtual machines. The 'Scaling' option in the left sidebar is highlighted with a red box. The table below lists the VM details:

Name	Computer name	Status	Type	Provisioning state	Size
myVMSS-Assignment1_2b4eb4d0	myvmss-asCOL3GW	Running	VM	Succeeded	Standard_B
myVMSS-Assignment1_792441a8	myvmss-asXM1SQ0	Running	VM	Succeeded	Standard_B
myVMSS-Assignment1_dc05e1b6	myvmss-as9ZD4CQ	Running	VM	Succeeded	Standard_B

Image: All the instances assigned to the scale set. Retrieved from <https://portal.azure.com/>
Following to the next page, click on Availability + Scale and then click on Scaling

For the next step, select Custom autoscale.



The screenshot shows a dialog box titled 'Choose how to scale your resource'. It contains two options: 'Manual scale' and 'Custom autoscale'. The 'Custom autoscale' option is selected and highlighted with a red box. The 'Manual scale' option is described as 'Maintain a fixed instance count'.

Image: Custom autoscale. Retrieved from <https://portal.azure.com/>

Click on scale based on a metric so the link to add a rule gets enabled.

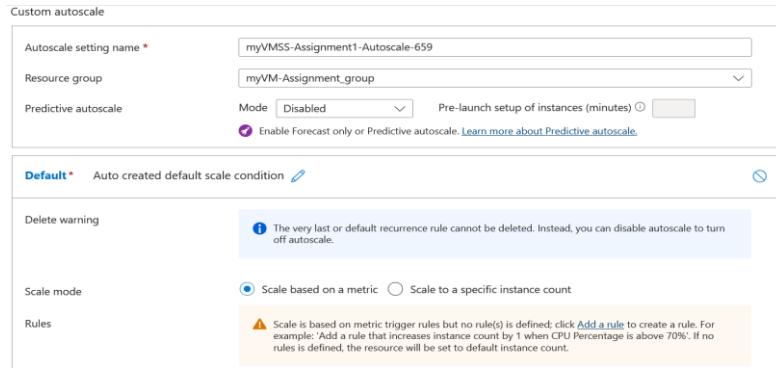


Image: Creating an inbound or outbound rule. Retrieved from <https://portal.azure.com/>
Setting the scale rules

The scale rule page will move on the screen. The first fields are resource type, metric namespace, and metric and dimension name. It also follows with a chart showing the use of the vCPU by day and time. Scroll down for more settings.

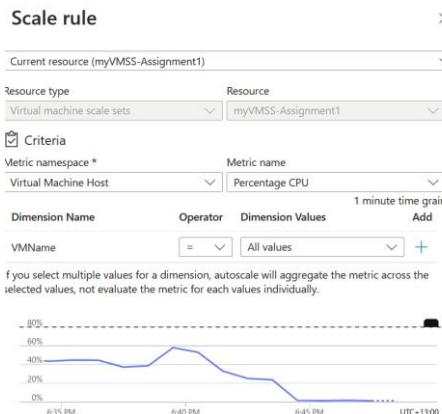


Image: Scale rules. Retrieved from <https://portal.azure.com/>

The ensuing fields are metrics that the scale set will use to define when the scale-out rule should be applied:

Percentage CPU (Average)	34.87 %
<input type="checkbox"/> Enable metric divide by instance count	
Operator *	Metric threshold to trigger scale action * ⓘ
Greater than	80 %
Duration (minutes) *	Time grain (minutes) *
15	1
Time grain statistic *	Time aggregation *
Average	Average
Action	
Operation *	Cool down (minutes) *
Increase percent by	5
Percentage *	20

Image: Scale out rules set. Retrieved from <https://portal.azure.com/>

Operator: Choose the logical operator, for example, greater than, less than or equal to
Metric threshold to trigger scale action: The percentage metric which will trigger the action.
The scaling rule will be applied if the operator exceeds 80% once the traffic exceeds the percentage.

Duration: the expected duration in minutes that the scaling will last

Operation: Choose what action will proceed during the cool down. Increase percent by, decrease percent by or increase/decrease by count

Percentage: the percentage of increase or decrease

Cool down: The amount of time the scale set will cool before getting triggered again

Click on Add after the rule is defined

Back to the main page, define what are the instance limits, minimum, maximum and the default:

The screenshot shows the 'Scale out' section of the Azure portal. It includes a warning message about deleting the last rule, a 'Scale mode' selector (set to 'Scale based on a metric'), a 'Rules' section with a note to add at least one rule, and a detailed 'Scale out' rule configuration. The rule triggers when the average CPU usage for 'myVMSS-Assignment1' exceeds 80%, increasing the instance count by 20%. Below this, there are sections for 'Instance limits' (minimum, maximum, and default all set to 3) and 'Schedule'.

Image: Rules of scaleout and instance limits. Retrieved from <https://portal.azure.com/>

To finish the procedure, click Save at the top of the page.

Creating an automatic scale in set.

Scale In

Scale-in the set of virtual machines creates a setup for low demands on the server, is useful for situations where the requests are low, and helps with the billing cost.

On the same page where the scale-out rule is set, click on a new rule.

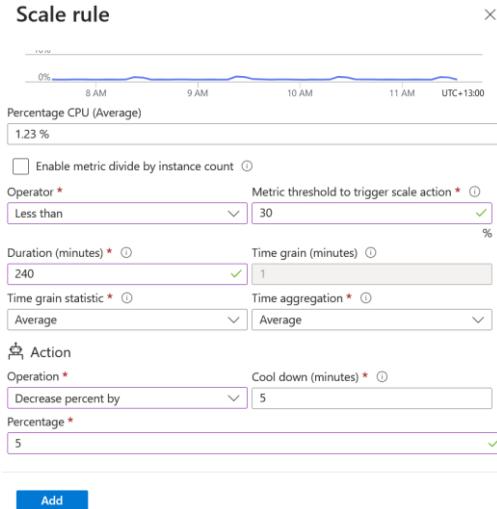


Image: Creating scale-in rules. Retrieved from <https://portal.azure.com/>

Operator: Change to less than

Metric threshold to trigger scale action: Select based on pieces of evidence what is the percentage that the scale-in should be activated based on processing requests

Duration: The desired duration of the scale-in

Operation: Decrease percent by

Percentage: Add the percentage that the processing power will be decreased by

Click on Add to include the new scale-in rule

Once the rules are set, click save at the page's top.

Scheduled Scales

On the other hand, Azure also allows scheduling scales in and out

Schedule	<input checked="" type="radio"/> Specify start/end dates	<input type="radio"/> Repeat specific days
Timezone	(UTC+00:00) Coordinated Universal Time	
Start date	10/10/2024	12:00:00 AM
End date	10/10/2024	11:59:00 PM

Image: Specification for a scheduled scale set. Retrieved from <https://portal.azure.com/>

In this example, it is possible to define the scaling set's time zone and start and end dates.

Vertical scaling – Scale Up/Down

To scale up and down settings, go to the top bar and search for Azure Data Explorer.

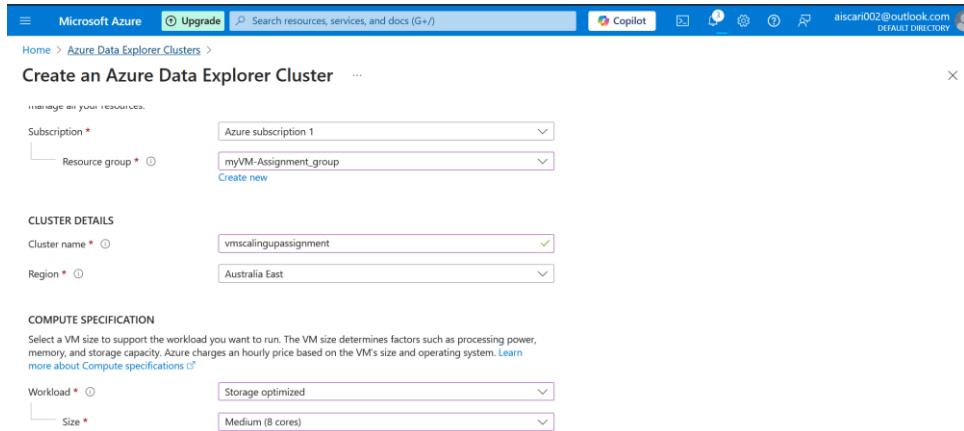


Image: Initial page of scaling up/down. Retrieved from <https://portal.azure.com/>

Resource group: Choose the resource group that includes the instances where the scale-up will take a role

Cluster name: Select a name

Region: Select the closest region

Workload: Choose in between Storage, Compute or Dev/Test optimisation

Size: Choose the workload according to necessity.

Next, move to the Scale page and select optimised autoscale:

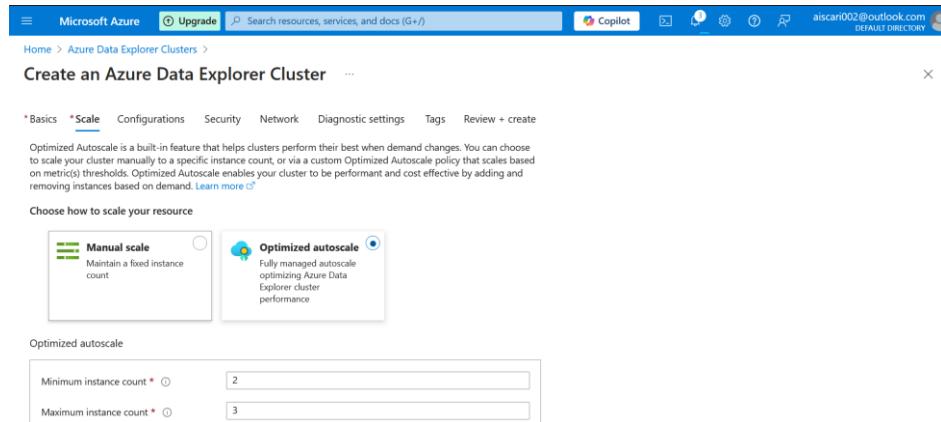


Image: Scale page. Retrieved from <https://portal.azure.com/>

The minimum and maximum instance count will vary according to the instance count in the resource group. Choose the desired number and then click on Review + Create

As the deployment finishes, click on Go to Resources, and then click on settings, scale up:

Image: Find the right optimisation for the vertical scaling. Retrieved from <https://portal.azure.com/>

This page has recommended SKUs (Stock Keep Units) to select. Azure allows scaling up or down based on Storage, Compute or for Development and Test purposes. Based on the evidence, click on Apply to confirm.

It is also possible to configure a scale-out within the resource group selected previously during the creation of the scale-up

Image: Deployment of the vertical scale. Retrieved from <https://portal.azure.com/>

Once the setup is complete, click on Save.

Storage

To create a storage account, type on the search bar storage accounts and click on the first option; a new page will load; then, click on the + Create Botton at the top of the panel on the left. The page below will be displayed:

The screenshot shows the 'Create a storage account' wizard in the Microsoft Azure portal. The 'Basics' tab is selected. The 'Project details' section shows a subscription dropdown set to 'Azure subscription 1' and a resource group dropdown set to 'assignment1'. The 'Instance details' section shows a 'Storage account name' input field containing 'clientnameandid'. The 'Region' dropdown is set to '(Asia Pacific) Australia East'. The 'Primary service' dropdown is set to 'Azure Blob Storage or Azure Data Lake Storage Gen 2'. The 'Primary workload' dropdown is set to 'Backup and archive', with a note about it being best for secure, durable, and cost-effective retention of backups and archives. The 'Performance' dropdown is set to 'Standard', with notes about it being recommended for most scenarios and being suitable for low latency. The 'Redundancy' dropdown is set to 'Geo-redundant storage (GRS)', with notes about it making read access available in the event of regional unavailability and being recommended for backup and archive workloads.

Image: Creating a storage account. Retrieved from <https://portal.azure.com/>

Click on Review + Create, the deployment will occur, and a new page will load. On this new page, scroll down to the left menu and click on Static Website.

After the deployment is completed, click on Go to Resources and scroll through the menu on the left.

This page setup allows you to enable the Static website. Once done, define the index document and an error document.

The screenshot shows the Azure portal interface for a storage account named 'clientenameandid'. The 'Static website' section is open, with the 'Enabled' button highlighted. The 'Index document name' field is set to 'index.html' and the 'Error document path' field is set to 'error.html'. A note at the top right says, 'An Azure Storage container has been created to host your static website.' A tooltip for '\$web' indicates it's a placeholder for a blob container. On the left sidebar, 'Static website' is selected under 'Data management'.

Image: Creating scale-in rules. Retrieved from <https://portal.azure.com/>

Go to Data Management, select Static Website and then click on Enabled.

Primary endpoint: Storage URL

Index document name: If hosting a website, index a document that contains the reference index.html

Error document path: Include a page with the error message

Moving to the next step, click on Containers. Two are created by default \$logs and \$web. The files will be uploaded in the \$web container in this example.

The screenshot shows the 'Containers' blade in the Azure portal. It lists three containers: '\$logs', '\$web', and 'website-curriculum'. The '\$web' container is highlighted. The '\$logs' container is marked as Private and Available. The 'website-curriculum' container is marked as Blob and Available. The left sidebar shows other storage-related options like 'File shares', 'Queues', and 'Tables'.

Image: Create and change the access level to a container. Retrieved from <https://portal.azure.com/>

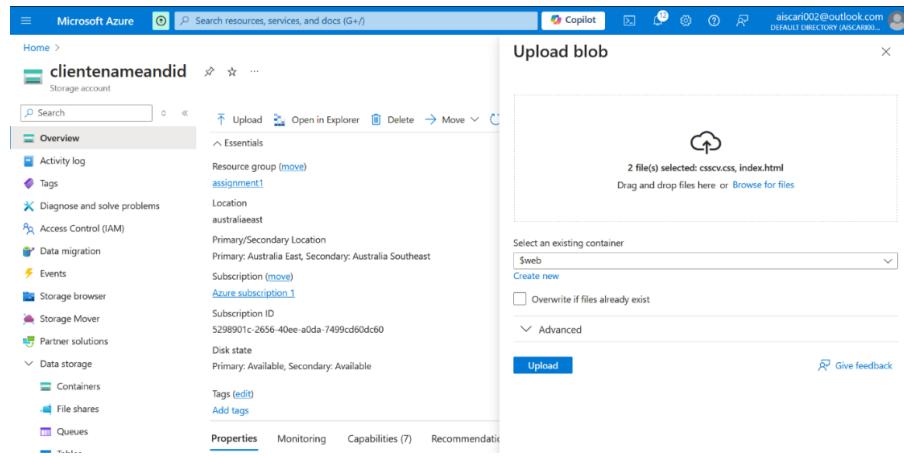


Image: Creating scale-in rules. Retrieved from <https://portal.azure.com/>

After uploading, go back to the main storage page.

Back to the container main page, to make the file content for public access, it is necessary to change the access level to Blob (anonymous read access for blobs only)

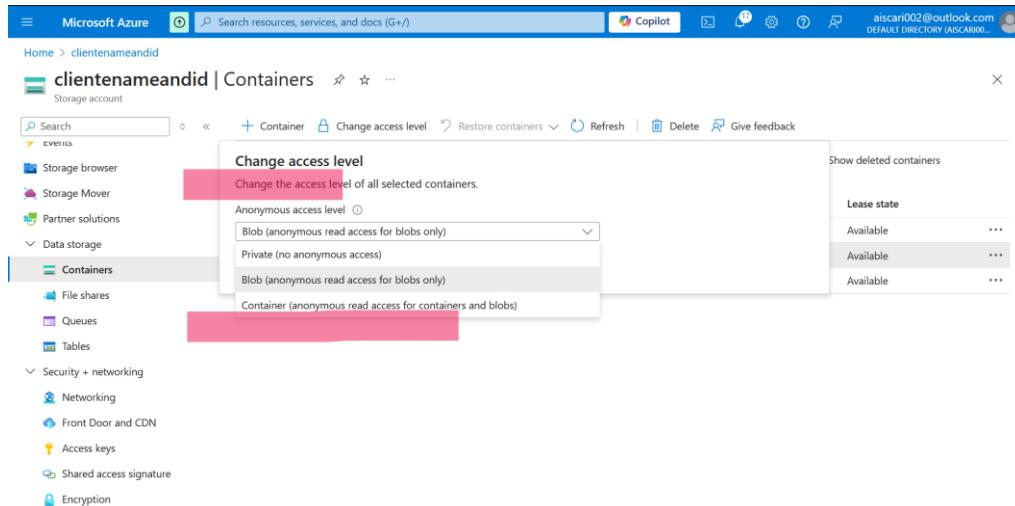
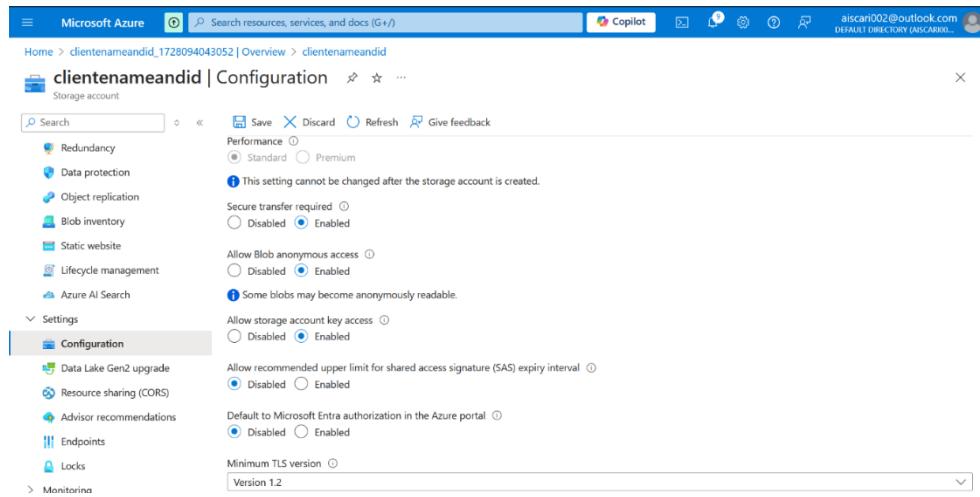


Image: Changing the access level for anonymous access. Retrieved from <https://portal.azure.com/>

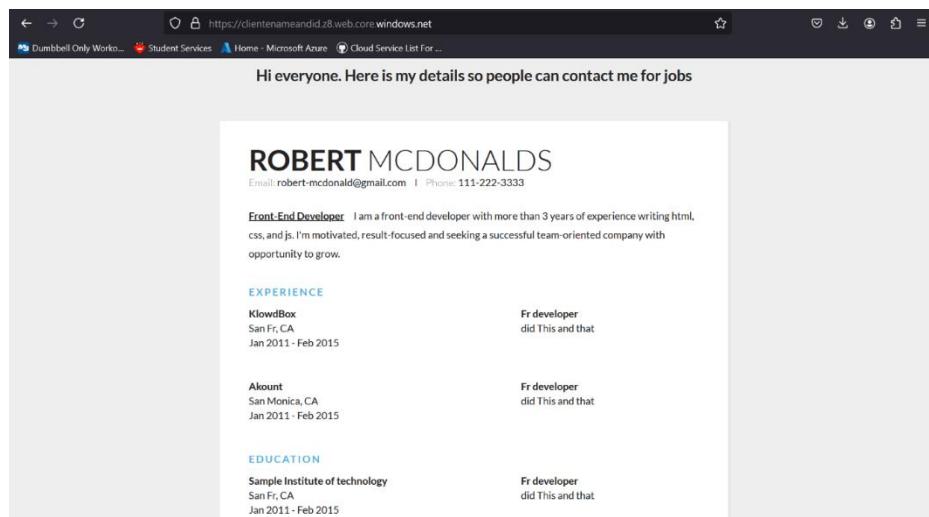
In case the access level is not enabled. On settings > Configuration, enable Blob anonymous access and save it, then try the previous step again.



The screenshot shows the Microsoft Azure Storage account configuration page for a storage account named 'clientenameandid'. The 'Configuration' tab is selected under the 'Settings' section. In the main pane, the 'Allow Blob anonymous access' setting is highlighted with a blue circle, indicating it is set to 'Enabled'. Other settings like 'Performance' (Standard), 'Secure transfer required' (Disabled), and 'Allow storage account key access' (Enabled) are also visible.

Image: Configure anonymous access to the storage file. Retrieved from
<https://portal.azure.com/>

Since all the previous steps have been executed successfully. As a result, the webpage is online, and it has its own web address: <https://clientenameandid.z8.web.core.windows.net/>



The screenshot shows a web browser displaying a resume-like page for 'ROBERT MCDONALDS'. The page includes a header with contact information (Email: robert-mcdonald@gmail.com, Phone: 111-222-3333). Below the header, there is a brief bio: 'Front-End Developer I am a front-end developer with more than 3 years of experience writing html, css, and js. I'm motivated, result-focused and seeking a successful team-oriented company with opportunity to grow.' The page is divided into sections: 'EXPERIENCE', 'EDUCATION', and 'PROJECTS'. Under 'EXPERIENCE', there are two entries: 'KloudBox' (San Fr, CA, Jan 2011 - Feb 2015) and 'Akount' (San Monica, CA, Jan 2011 - Feb 2015). Under 'PROJECTS', there are two entries: 'Fr developer' (did This and that) and 'Fr developer' (did This and that).

Image: Client content online. Retrieved from
<https://clientenameandid.z8.web.core.windows.net/>

Curriculum content retrieved from Devsnap.me (2015)

Network

Azure allows the creation of accessing online storage contents

Create rules to block public IPs or select private IPs to access files, databases and host content on the internet.

Create a new Storage Account. It is essential to select the resource group which contains the containers where the services will be stored.

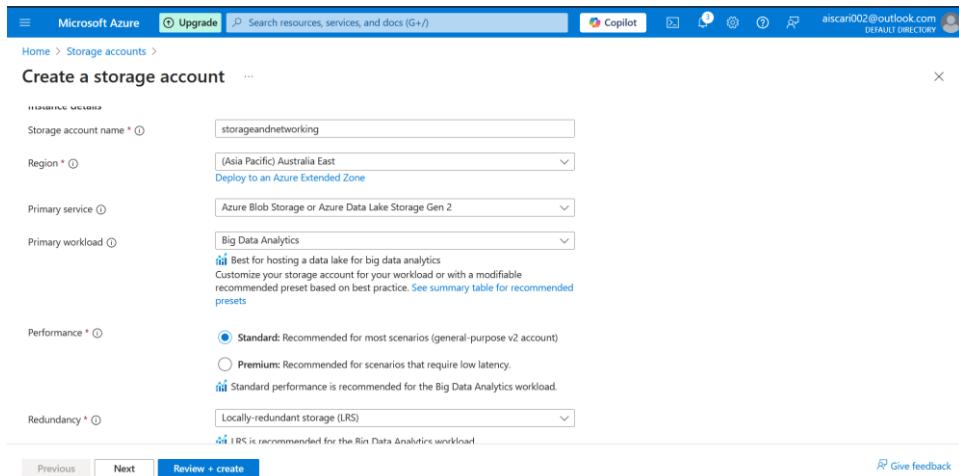


Image: Initial page for creating the storage account. Retrieved from <https://portal.azure.com/>

Primary service: Azure Blob by Microsoft. This feature was created to support massive data storage. Although, it is possible to select a less robust service, such as Azure files

Primary workload: Backup and archive

Performance: Standard

Redundance: Select in-between options; in this case, local redundancy was selected.

Go then to the advanced page

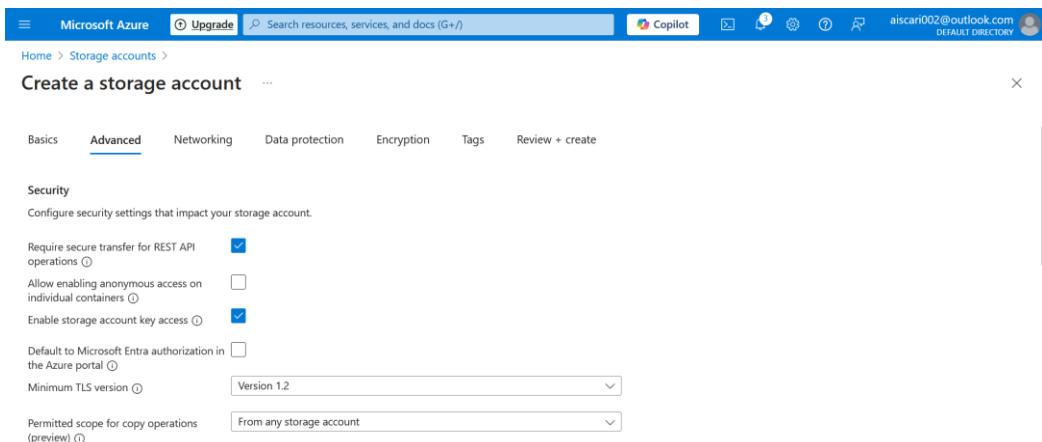


Image: Advanced storage configuration. Retrieved from <https://portal.azure.com/>

Require secure transfer for REST API: Select this option to secure the incoming requests are made only via HTTPS

Allow enabling anonymous access on individual containers: Keep this option unselected to block all anonymous access.

Enable storage account key access: If selected, it will request for a shared key to access the content (recommended keep selected)

Default to Microsoft Entra authorisation in the Azure Portal: Allows authentication with Microsoft Entra account

Keep the other settings as default and advance to the networking page

There are three Network Access options:

Enable public access from all networks

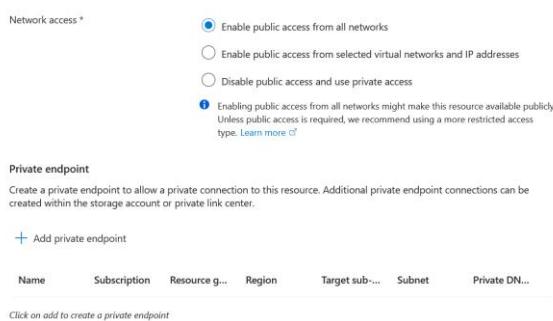


Image: Access to the storage. Retrieved from <https://portal.azure.com/>

This option will enable public access to the network. However, it is possible to add private endpoints to allow private connection to this resource

Enable public access from selected virtual networks and IP addresses.

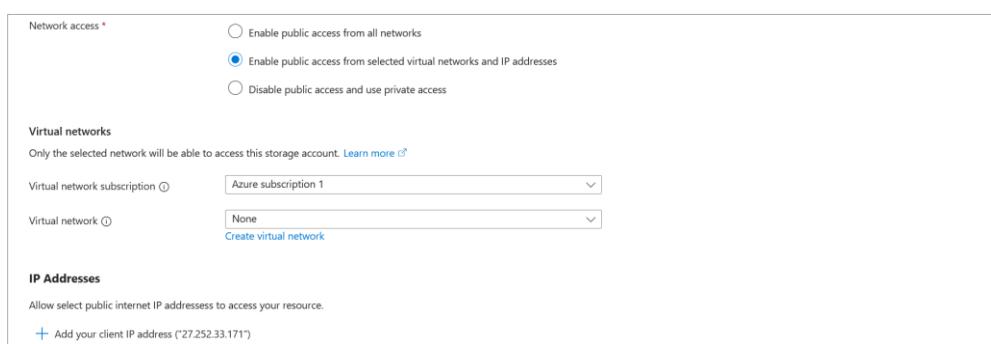


Image: Adding a public endpoint to access the resources. Retrieved from <https://portal.azure.com/>

This option will allow the inclusion of a range of public IP addresses to access the network, as well as private endpoints and virtual networks created in Azure.

Disable public access and use private access

The screenshot shows the 'Network connectivity' section of the Azure portal. It includes a note about connecting via public IP addresses or service endpoints, and a 'Network access' field where the 'Disable public access and use private access' option is selected. Below this is a 'Private endpoint' section with a note about creating a private endpoint for connections, and a 'Add private endpoint' button.

Image: Disabling public access. Retrieved from <https://portal.azure.com/>

This option will disable public access. However, the inclusion of a private endpoint is compulsory.

The second option was chosen in this situation, and a public IP address was added. After selecting, move to the next page, Data Protection.

This page will allow a setup backup option. Keep the default option selected. However, increasing the number of days the backup is kept on the servers is possible.

The screenshot shows the 'Create a storage account' page in the Azure portal. It displays several configuration options under the 'Delete' section:

- Enable point-in-time restore for containers: A note explains that this allows restoring one or more containers to an earlier state if point-in-time restore is enabled.
- Enable soft delete for blobs: A note explains that soft delete allows recovering blobs previously marked for deletion. A 'Days to retain deleted blobs' input field is set to 7.
- Enable soft delete for containers: A note explains that soft delete allows recovering containers previously marked for deletion. A 'Days to retain deleted containers' input field is set to 7.
- Enable soft delete for file shares: A note explains that soft delete allows recovering file shares previously marked for deletion. A 'Days to retain deleted file shares' input field is set to 7.

Image: Configuring delete configurations. Retrieved from <https://portal.azure.com/>

Click on Review + Create and wait for the deployment to be done successfully.

Accessing the storage Account:

Type in the search bar Storage Accounts and select the first option

The screenshot shows the Microsoft Azure portal interface. In the top navigation bar, 'Storage accounts' is selected under 'Default Directory'. The main area displays the 'storageandnetworking' storage account details. On the left, there's a sidebar with various management links like 'Create', 'Restore', and 'Diagnose and solve problems'. The central 'Overview' section shows the account's properties: Resource group (assignment1), Location (australiaeast), Subscription (Azure subscription 1), and Account kind (StorageV2 (general purpose v2)). It also lists the subscription ID, disk state, and creation date. Below the properties, there are tabs for 'Properties', 'Monitoring', 'Capabilities (7)', 'Recommendations (0)', and 'Tutorials'. At the bottom, there are links for 'Tools + SDKs' and 'JSON View'.

Image: Storage overview page. Retrieved from <https://portal.azure.com/>

To upload a file, click on Upload.

The screenshot shows the 'Upload blob' dialog box. It features a central area for selecting files, with a message indicating '1 file(s) selected: SOFT807-T3-2024-Course Outline Final.docx' and a 'Browse for files' button. Below this, there's a dropdown menu for selecting an existing container, with 'mycontainer' selected. There's also a 'Create new' button. A checkbox for 'Overwrite if files already exist' is present. At the bottom, there are 'Upload' and 'Give feedback' buttons.

Image: Upload a file page. Retrieved from <https://portal.azure.com/>

A new page will load. Select the document by clicking Browse for files, create a container, then click Upload, and keep the advanced tab with the default selection.

Once the message is successfully uploaded, click back on Overview and Open Explorer.

Azure allows access to the Storage Explorer By Browse or Download on the computer.

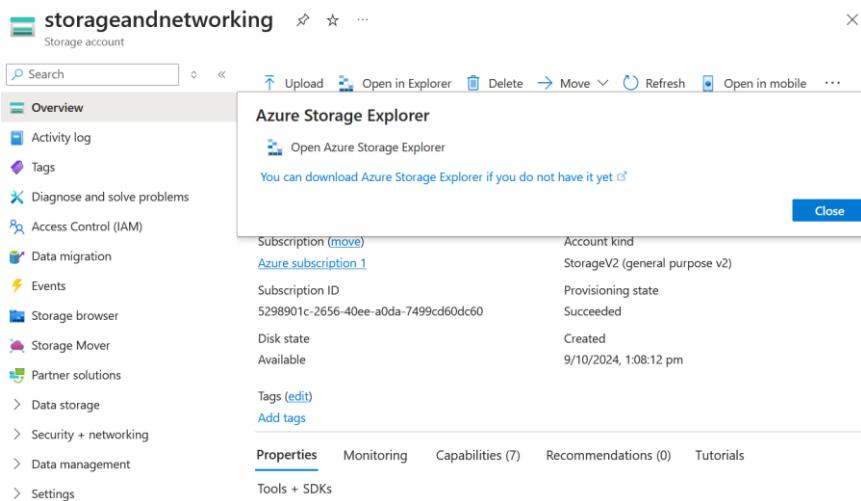


Image: Access Azure Storage. Retrieved from <https://portal.azure.com/>

After accessing the new panel and login to the same account where the files were storages, navigate through the folders which are already created

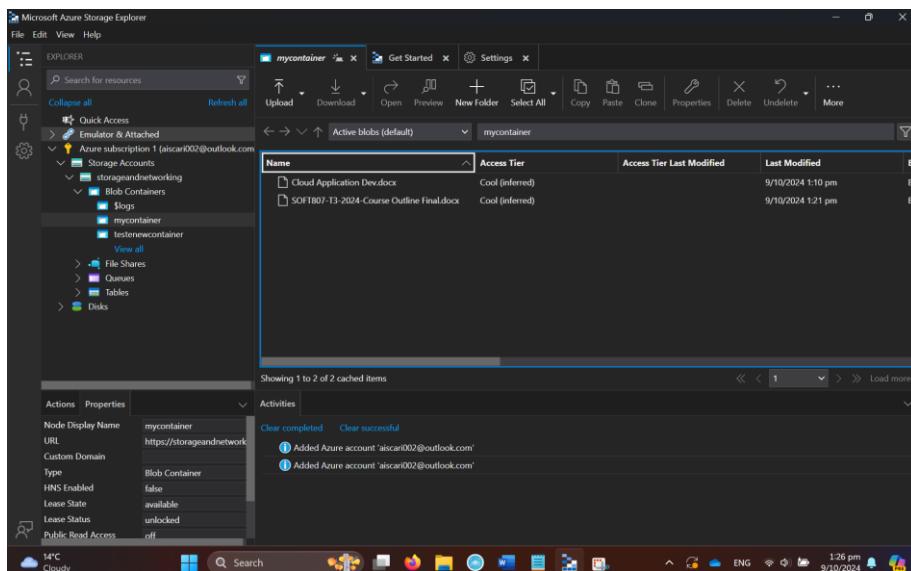


Image: Azure Storage Explorer for desktop. Retrieved from <https://portal.azure.com/>

In the image above, it is possible to see the documents uploaded by the Azure Portal. This access only happened because the public IP was added as an exception. However, it is possible to deny entries by blocking public IPs or a range of specific IPs.

Amazon Web Services – Portal

Instances – AWS Virtual Machine

Create a virtual machine in AWS. The ensuing steps will describe the creation and configuration of virtual machines using the Amazon Web Services platform:

After login to the AWS portal, type on the search bar for EC2 and select EC2 – Virtual Servers in the Cloud

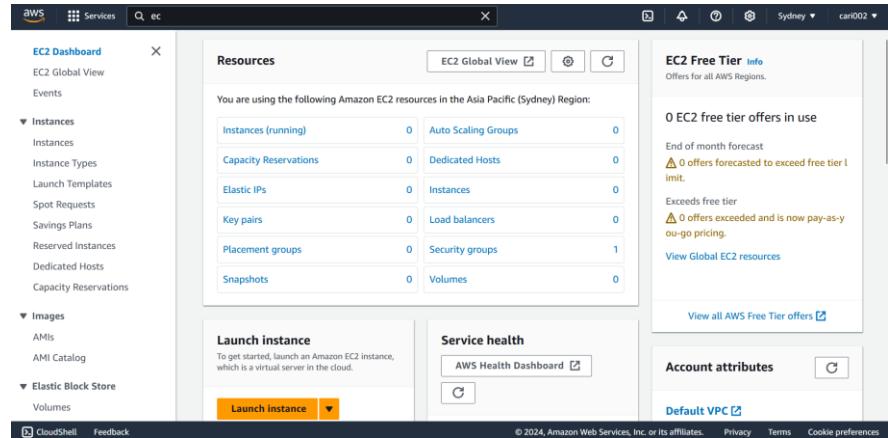


Image: Creating a new virtual machine instance. Retrieved from <https://go.aws/3Nqcvmu>

Click on Launch Instances to create a new Virtual Machine.

A new page will be loaded; fill in the fields as required:

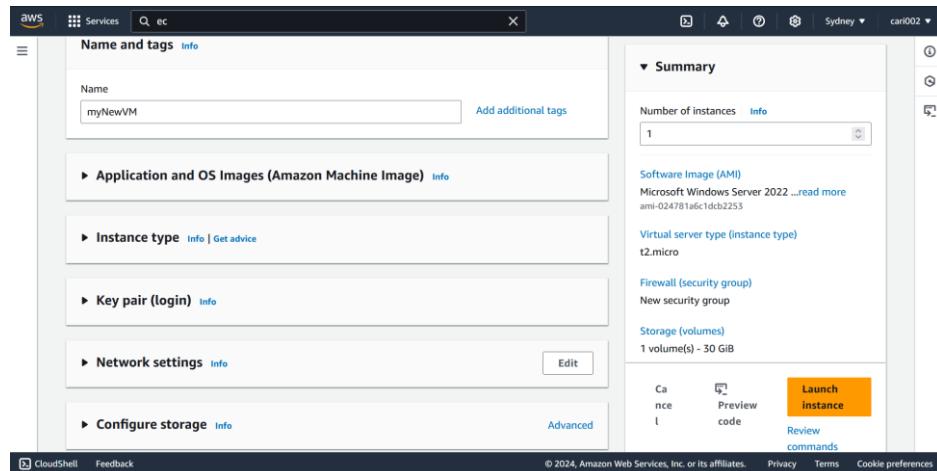


Image: Creating a new virtual machine instance. Retrieved from <https://go.aws/3Nqcvmu>

Name: Virtual machine name

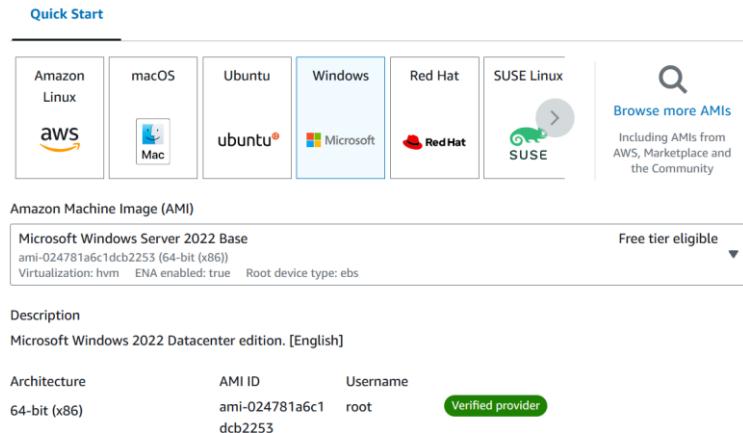


Image: Select an operational system for the instance. Retrieved from <https://go.aws/3Nqcvmu>
 Application and OS: Choose the operation system image

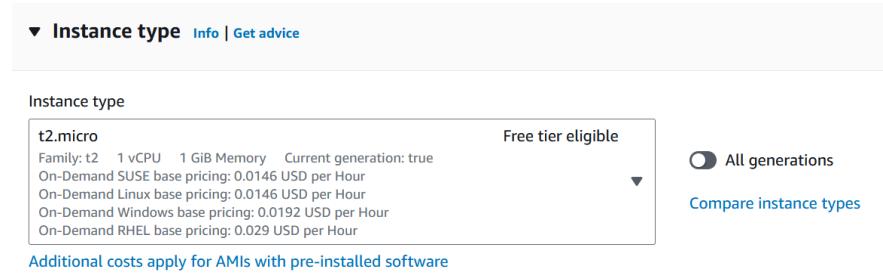


Image: Instance models. Retrieved from <https://go.aws/3Nqcvmu>
 Instance types: Select an instance that meets your computing, memory, networking, or storage needs. It is also possible to check for each instance demand price.

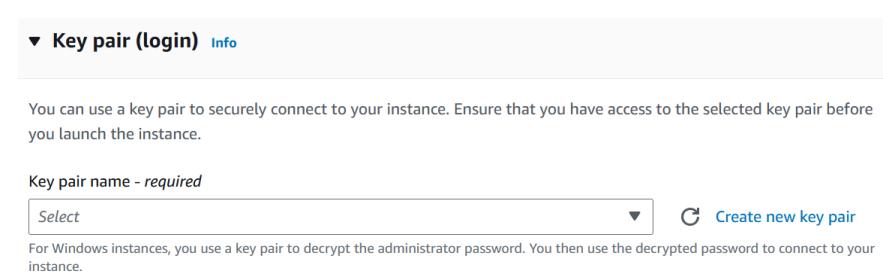


Image: Select the type of key pair for login proposes. Retrieved from
<https://go.aws/3Nqcvmu>

For AWS instances, a key pair login is necessary for Windows access. However, it is possible to create a key pair login for other operational systems as well.

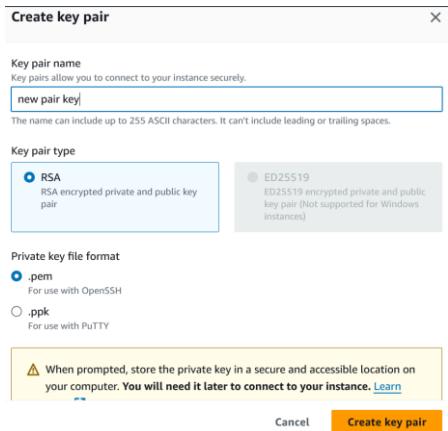


Image: Naming the RSA key. Retrieved from <https://go.aws/3Nqcvmu>

Key pair: Login credentials.

Chose a name for the key pair

Click on Create key pair, a file will be downloaded to the computer, save it as the same file will be needed for the future steps

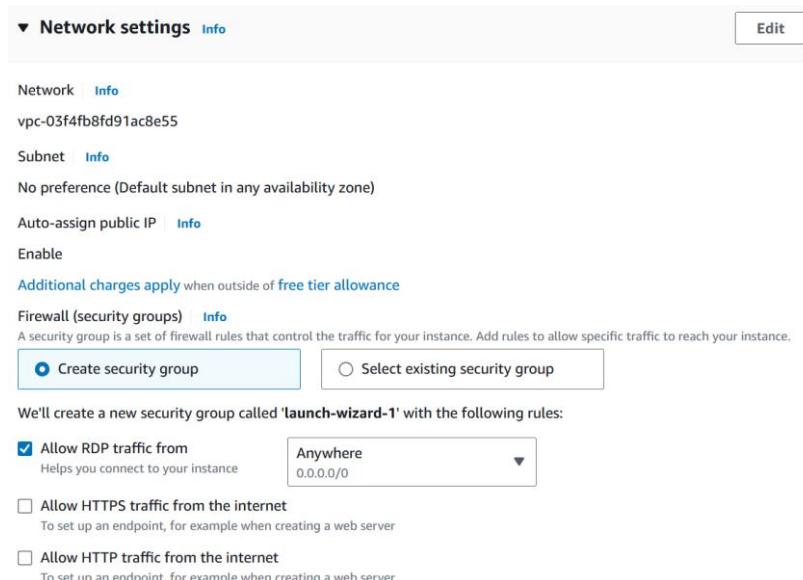


Image: Network settings. Retrieved from <https://go.aws/3Nqcvmu>

Network setting: Define in this section permissions to allow Ips that can access the instance, HTTPS traffic and security group

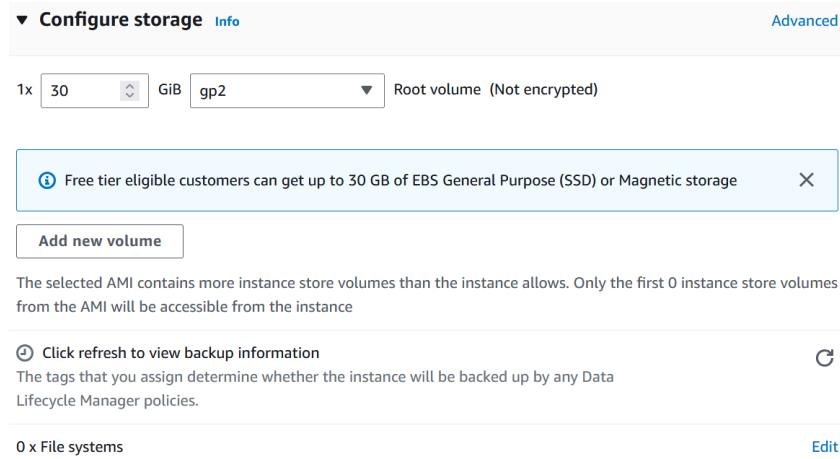


Image: Increase or decrease the volume of the instance. Retrieved from <https://go.aws/3Nqcvmu>

Storage: Define what will be the VM storage capability

Click then on Launch Instance and wait for the confirmation.



Image: Instance successfully created. Retrieved from <https://go.aws/3Nqcvmu>

Accessing the Instance

After the deployment is complete, click on the instance code.

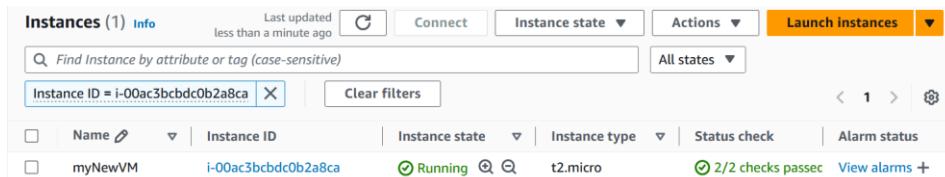


Image: Viewing instances. Retrieved from <https://go.aws/3Nqcvmu>

Click on the instance ID

The next page will load all the information about the recently created virtual machine

Instance summary for i-00ac3bcbdc0b2a8ca (myNewVM) Info		
Copy	Connect	Instance state ▼
Updated less than a minute ago		
Instance ID Copy i-00ac3bcbdc0b2a8ca (myNewVM)	Public IPv4 address Copy 3.25.221.216 open address	Private IPv4 addresses Copy 172.31.11.142
IPv6 address -	Instance state Copy Running	Public IPv4 DNS Copy ec2-3-25-221-216.ap-southeast-2.compute.amazonaws.com open address
Hostname type IP name: ip-172-31-11-142.ap-southeast-2.compute.internal	Private IP DNS name (IPv4 only) Copy ip-172-31-11-142.ap-southeast-2.compute.internal	Elastic IP addresses -
Answer private resource DNS name IPv4 (A)	Instance type t2.micro	AWS Compute Optimizer finding Opt-in to AWS Compute Optimizer for reco
Auto-assigned IP address Copy 3.25.221.216 [Public IP]	VPC ID Copy vpc-03f4fb8fd91ac8e55	

Image: Instance overview. Retrieved from <https://go.aws/3Nqcvmu>

Click on Connect

Image: Connecting to an instance Retrieved from <https://go.aws/3Nqcvmu>

For the next step, select RDP Client, download the remote desktop file, scroll down the page and click on Get Password

Image: Get a password. Retrieved from <https://go.aws/3Nqcvmu>

Windows instances on AWS request the creation of an RSA key file. Click on Upload the private key file and locate it in the system the correct file.

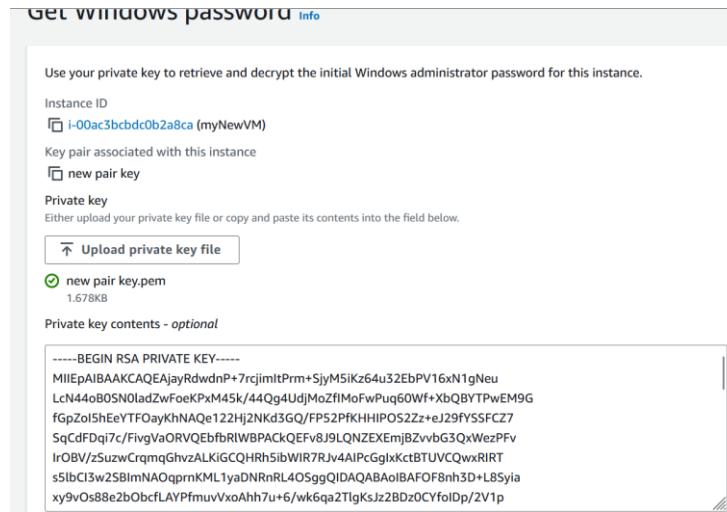


Image: Uploading the RSA pair key. Retrieved from <https://go.aws/3Nqcvmu>

Once the key is decrypted, use the remote desktop file to access the VM

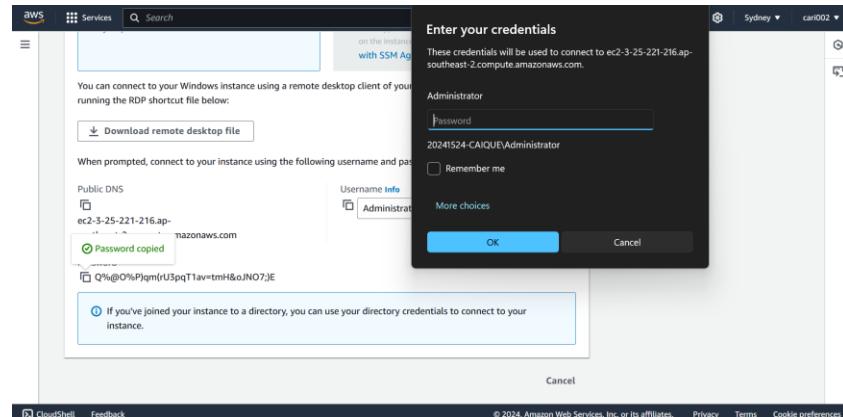


Image: Accessing the virtual instance. Retrieved from <https://go.aws/3Nqcvmu>

As a result, the connection to the AWS instance succeeded.

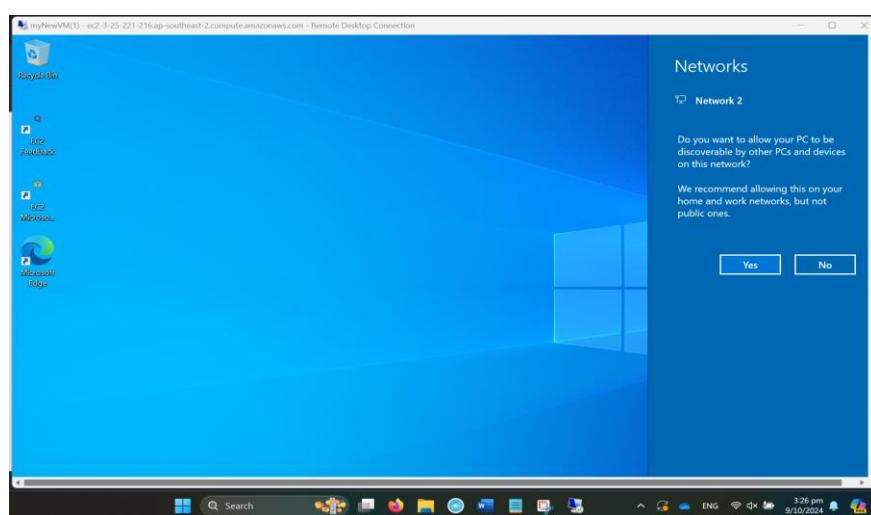


Image: The new instance is online. Retrieved from <https://go.aws/3Nqcvmu>

Instance Horizontal Scale Set

To set a Scale Set on AWS, firstly, there are a few steps to be followed:

- Create a Launch Template
- Security Group
- Create an Auto Scaling Group
- Create a Load Balancer

Create a Launch Template

Type in the search box EC2, go to Instances and Launch Templates and then click on Create Launch Template

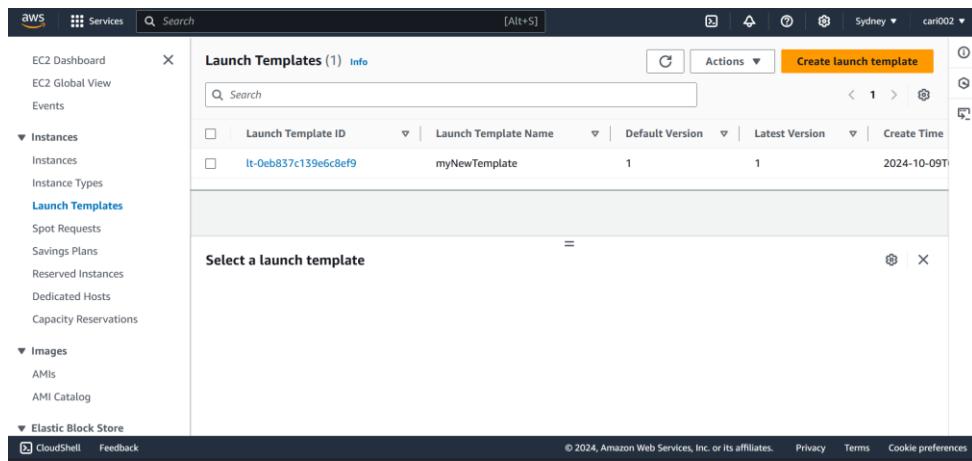


Image: Accessing the virtual instance. Retrieved from <https://go.aws/3Nqcvmu>

In this new loaded page, edit the details for the Launch Template

A screenshot of the 'Create launch template' wizard. The left panel shows the 'Launch template name and description' section with fields for 'Launch template name - required' (containing 'myNewTemplateScaleSet') and 'Template version description' (containing 'Scale Set'). The right panel shows sections for 'Software Image (AMI)', 'Virtual server type (instance type)', 'Firewall (security group)', and 'Storage (volumes)'. A callout box highlights a 'Free tier' offer for the first year. At the bottom are 'Cancel' and 'Create launch template' buttons.

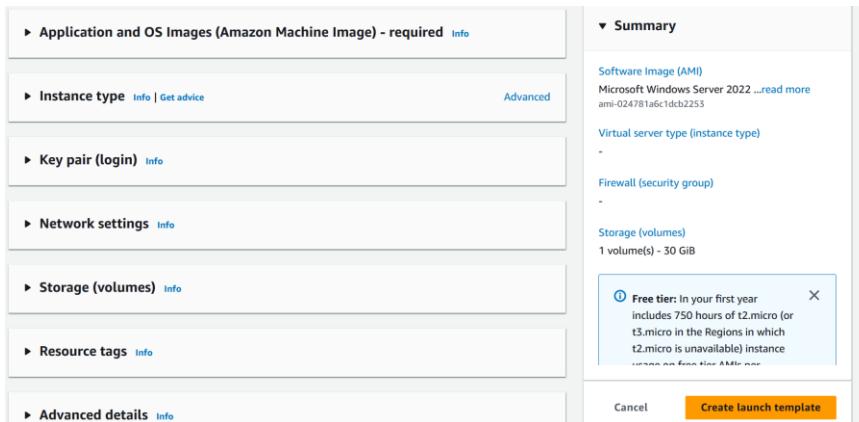


Image: Accessing the virtual instance. Retrieved from <https://go.aws/3Nqcvmu>

A summary of the selected options will be displayed on the right side of the screen

Application and OS Image: The selected OS image for the example was Windows Server 2022

Instance type: t1.micro – 1 vCPU, 1GiB, architecture x86 and x64

Key pair: Do not include in Launch Template. However, it is possible to use an existing key

Network settings: Subnet: Don't include in the template. Security group: Default.

Storage: Not included in the Launch Template

Once finished, click on Create Launch Template

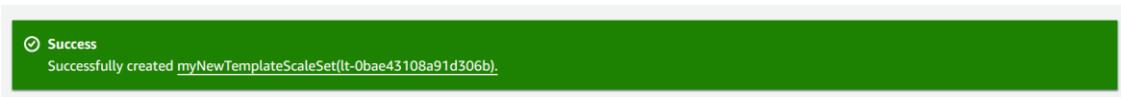


Image: Deployment is successfully done. Retrieved from <https://go.aws/3Nqcvmu>

Security Group

Type on the search box EC2 and select Security Group

A default group has been created already. However, to create a new one, click on Create Security Group

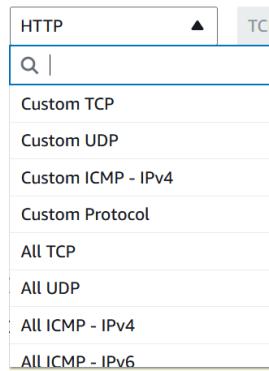
Security Groups (3) Info			C	Actions ▾	Export security groups to CSV	Create security group
<input type="checkbox"/>	Name	Security group ID		Security group name	VPC ID	
<input type="checkbox"/>	–	sg-0910a1da024203151		launch-wizard-1	vpc-03f4fb8fd91ac8ef	
<input type="checkbox"/>	–	sg-0f32350d0b36adad1		myNewSecurityGroupVMSS	vpc-03f4fb8fd91ac8ef	

Image: Security group main page. Retrieved from <https://go.aws/3Nqcvmu>

On the Create a Security Group page. Create a group name and its description.

The screenshot shows the 'Inbound rules' and 'Outbound rules' sections of a security group configuration. In the Inbound rules section, there is one rule: Type: Custom TCP, Protocol: TCP, Port range: 0, Source: 0.0.0.0/0, Description: optional. In the Outbound rules section, there is one rule: Type: All traffic, Protocol: All, Port range: All, Destination: Cus..., Description: optional.

Image: Inbound and outbound setup rules page. Retrieved from <https://go.aws/3Nqcvmu>



On the page above, the inclusion of it is possible to add inbound and outbound rules. Select the type of port that will be used to create the rule.

If any IP needs to be added for exception or blocking, select the type of ID, the port range, the source and the address, and add any comments if necessary. Then scroll down and click on Create Security Group.

Back to the EC2 main page, click on Auto Scaling Groups and Create an Auto Scale Group.

Scaling Set Groups

▼ Auto Scaling
Auto Scaling Groups

Image: Inbound and outbound setup rules page. Retrieved from <https://go.aws/3Nqcvmu>

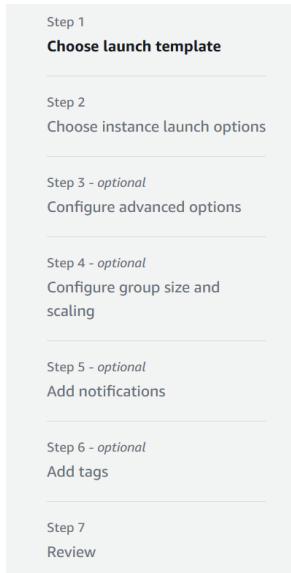


Image: Steps for finishing the scale set creation. Retrieved from <https://go.aws/3Nqcvmu>
It is necessary to go through 7 steps in order to create the scale group successfully:

Step 1: Define a name and Template

Auto Scale Group Name - myAssignmentAutoScalingGroup

Launch Template: myNewTemplateScaleSet

Step 2: Choose instance launch pool

By default, a launch template will be selected; however, it is possible to override this option and choose a new setting. For the example, the default template will be kept.

Instance type requirements <small>Info</small>		Override launch template
You can keep the same instance attributes or instance type from your launch template, or you can choose to override the launch template by specifying different instance attributes or manually adding instance types.		
Launch template	Version	Description
myNewTemplateScaleSet <small>edit</small>	Default	Scale Set
lt-0bae43108a91d306b		
Instance type		
t2.micro		

Image: Launch template display page. Retrieved from <https://go.aws/3Nqcvmu>

Moving on to the Network section

Network Info

For most applications, you can use multiple Availability Zones and let EC2 Auto Scaling balance your instances across the zones. The default VPC and default subnets are suitable for getting started quickly.

VPC
Choose the VPC that defines the virtual network for your Auto Scaling group.

vpc-03f4fb8fd91ac8e55
172.31.0.0/16 Default

Create a VPC

Availability Zones and subnets
Define which Availability Zones and subnets your Auto Scaling group can use in the chosen VPC.

Select Availability Zones and subnets

Create a subnet

Image: Network setup configuration. Retrieved from <https://go.aws/3Nqcvmu>

Network: VPC (Virtual Private Cloud) – Provides networking functionality to virtual machines. Keep the default option selected

- ap-southeast-2a | subnet-0bd8f23fe94fc9509
172.31.0.0/20 Default
- ap-southeast-2b | subnet-0d15648441109968a
172.31.32.0/20 Default
- ap-southeast-2c | subnet-0cf80a49c299174c9
172.31.16.0/20 Default

Image: Redundancy areas, one to three areas can be selected. Retrieved from <https://go.aws/3Nqcvmu>

Availability Zones: Each zone comes with its own subnet. Choose the desired amount of redundancy zones and click on Next.

Configure advanced options:

Load Balancing:

Select Attach to an existing load balancer and then select the previously created one. Creating a new load balancer and using the preset configurations or new ones is also possible.

Load balancing Info

Use the options below to attach your Auto Scaling group to an existing load balancer, or to a new load balancer that you define.

No load balancer
Traffic to your Auto Scaling group will not be fronted by a load balancer.

Attach to an existing load balancer
Choose from your existing load balancers.

Attach to a new load balancer
Quickly create a basic load balancer to attach to your Auto Scaling group.

Image: Load balancer selection page. Retrieved from <https://go.aws/3Nqcvmu>

After selecting a load balancer, move to the next step

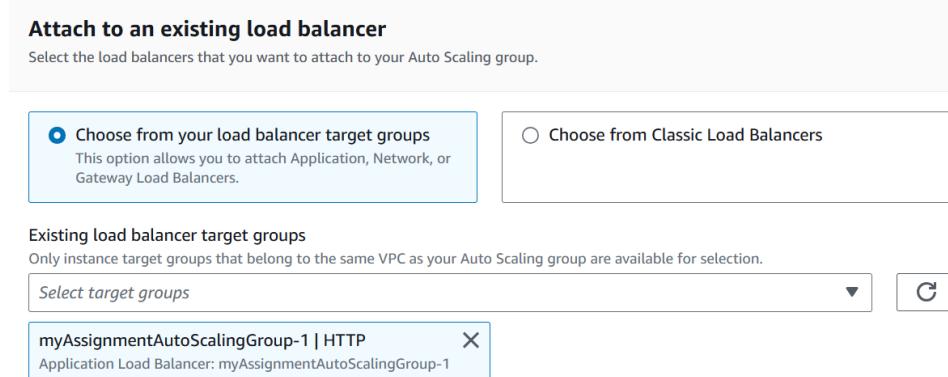


Image: Load balancers help to balance the incoming traffic demand. Retrieved from <https://go.aws/3Nqcvmu>

VPC Lattice Service:

No VPC Lattice Service

Health check:

Turn it on (recommended) – health checkers will check if the instance is healthy enough to receive new requests that are sent by auto-scaling.

Step 4: Configure group size and scaling:

Desired group size: 1 – This option represents the initial group size. 1 instance means one virtual machine, so it will know how many it should keep running when the auto scale starts.

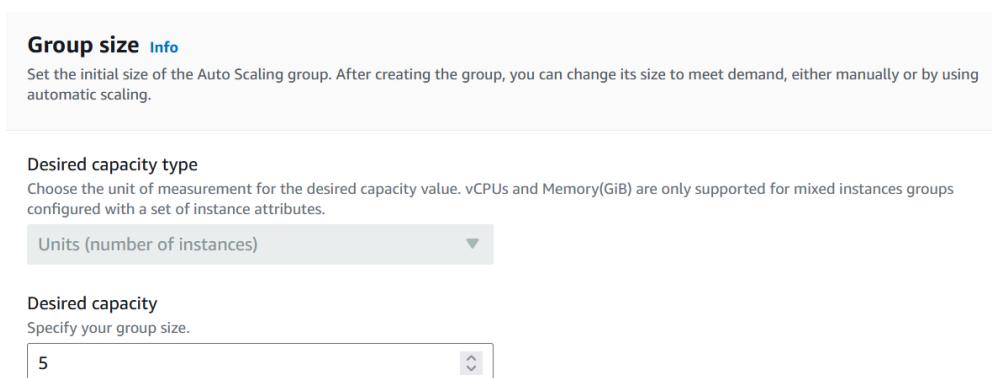


Image: Group size. Retrieved from <https://go.aws/3Nqcvmu>

Scaling: Set the min and max count to increase or decrease the capacity of the scale set

Min: 1

Max: 5

Scaling Info

You can resize your Auto Scaling group manually or automatically to meet changes in demand.

Scaling limits
Set limits on how much your desired capacity can be increased or decreased.

Min desired capacity	Max desired capacity
1	5

Equal or less than desired capacity Equal or greater than desired capacity

Automatic scaling - optional

Choose whether to use a target tracking policy Info

You can set up other metric-based scaling policies and scheduled scaling after creating your Auto Scaling group.

No scaling policies
Your Auto Scaling group will remain at its initial size and will not dynamically resize to meet demand.

Target tracking scaling policy
Choose a CloudWatch metric and target value and let the scaling policy adjust the desired capacity in proportion to the metric's value.

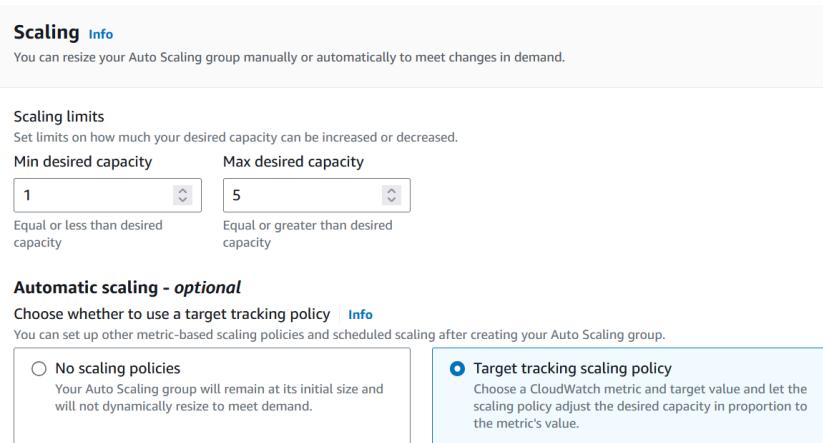


Image: Group size. Retrieved from <https://go.aws/3Nqcvmu>

Scaling policy name

Metric type Info
Monitored metric that determines if resource utilization is too low or high. If using EC2 metrics, consider enabling detailed monitoring for better scaling performance.

Average CPU utilization

Target value

Instance warmup Info
300 seconds

Disable scale in to create only a scale-out policy

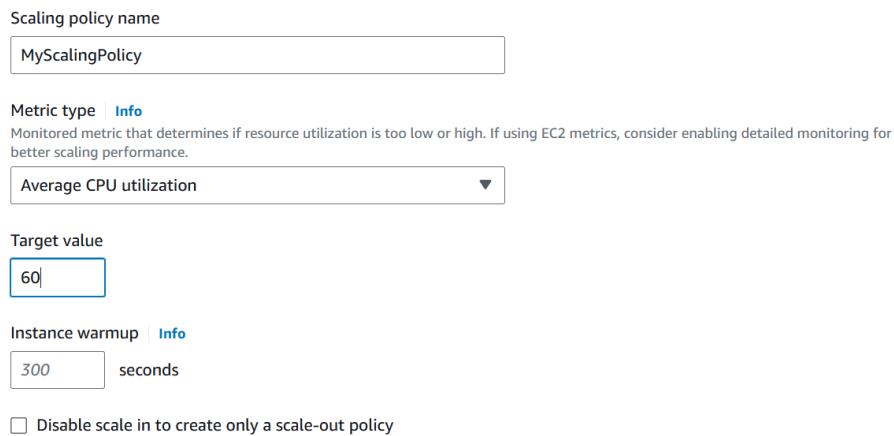


Image: Group size. Retrieved from <https://go.aws/3Nqcvmu>

Target tracking scaling policy – Select this option to have access to metrics towards the scaling policy.

Metric type: Average vCPU utilisation

Target value: 60%

Instance warmup: 300 seconds – This option will add a cool-down count until the next scale set is reactivated

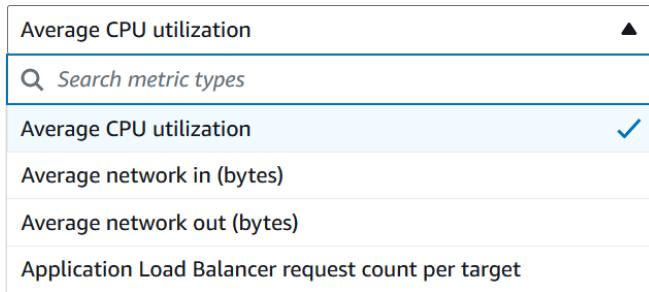


Image: Available metrics for scale-out and scale-in. Retrieved from <https://go.aws/3Nqcvmu>

Instance maintenance policy: No policy.

Complete steps 5 and 6 with personal information and advance to step 7.

Click on Next and then proceed to the deployment page.

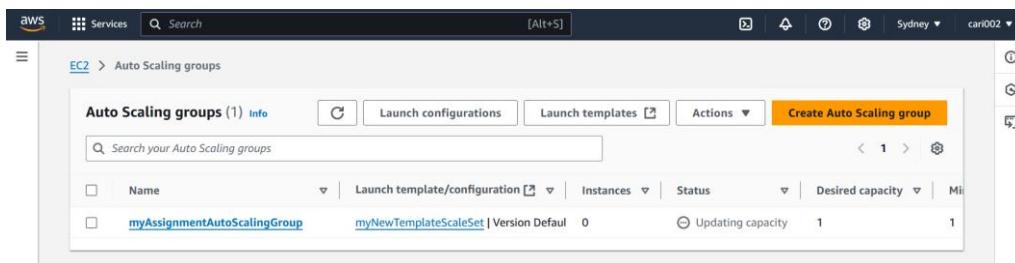


Image: Auto Scaling group successfully created. Retrieved from <https://go.aws/3Nqcvmu>

Vertical Scaling

Amazon Web Service recommends using the EC2 tools for automatic scaling as the AWS platform allows for resizing instance sizes. However, the process includes shutting down the service, resizing it, and applying the changes. The EC2 auto-scale provides tools for elasticity requests, simulating vertical scale up/down.

Storage

For the ensuing example on AWS, type on the search bar for S3. Secondly, creating a bucket is mandatory for creating virtual storage that hosts or stores files on the cloud. AWS makes the creation of a bucket compulsory.

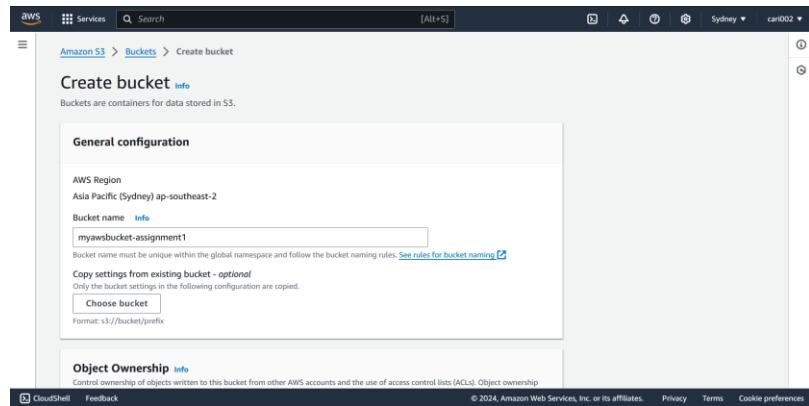


Image: Create a bucket page. Retrieved from <https://go.aws/3Nqcvmu>

On Amazon Web Services, the terminology “bucket” is used as a synonym for containers. Creating a bucket differs from creating a container to be deployed on the platform. Object Ownership and Block Public Access settings: As the HTML object's purpose is to be seen publicly, enabling the ACLs and allowing all public access is necessary. However, if the purpose of the files is to be private, the ACLs must be disabled, and the same applies for Block all public access. After confirming the information, proceed to Create Bucket.

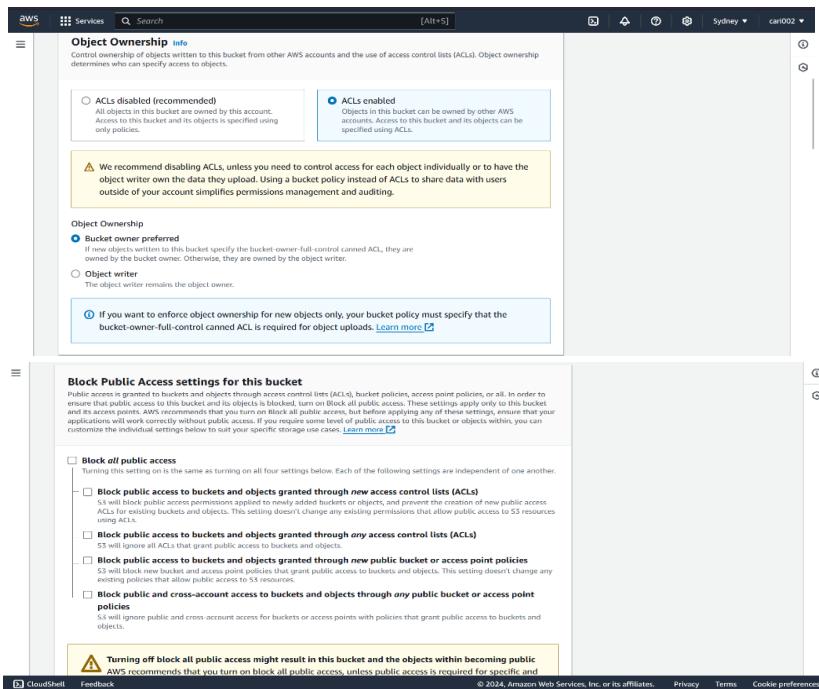


Image: Bucket Ownership. Retrieved from <https://go.aws/3Nqcvmu>

Once the deployment is complete, click on the bucket name, the example name: myawsbucket-assignment1, and on the bucket page, click on Properties in the last section, Static website hosting, click on Edit and then enable.

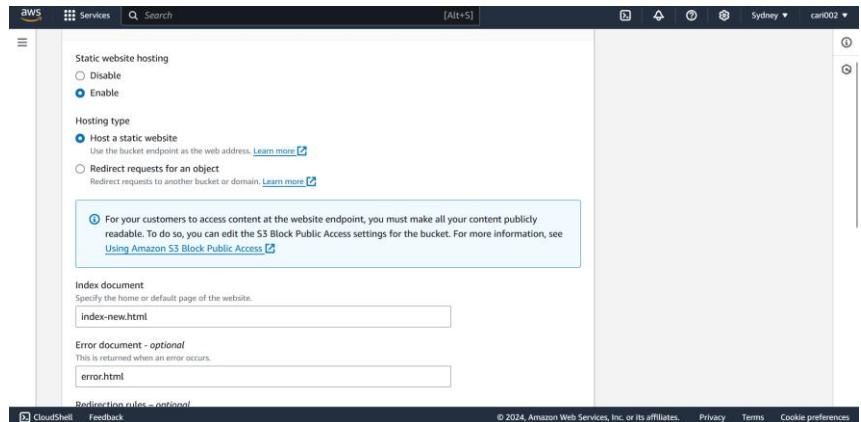


Image: Configuring the static website. Retrieved from <https://go.aws/3Nqcvmu>

Creating an index.html document for the main page exhibition is also necessary. Once done, save the changes.

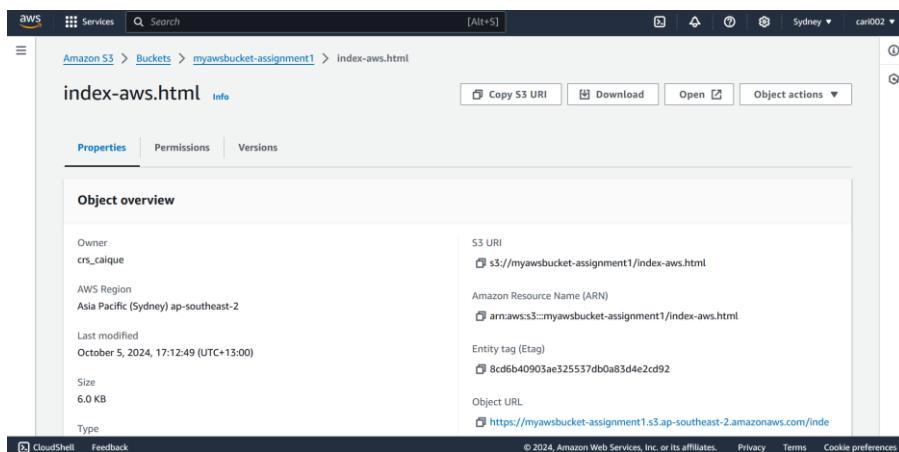


Image: Index page and Object URL. Retrieved from <https://go.aws/3Nqcvmu>

For the next step, to find the URL for the web page, browse through buckets, click on the file that will be the index page, and copy the Object URL link at the bottom of the page.

The object now has its own web page: <https://myawsbucket-assignment1.s3.ap-southeast-2.amazonaws.com/index-aws.html>

Hi everyone. Here is my details so people can contact me for jobs

GIOVANNA MACHADO

Email: gio-machado@gmail.com | Phone: 111-222-3333

Front-End Developer I am a front-end developer with more than 3 years of experience writing html, css, and js. I'm motivated, result-focused and seeking a successful team-oriented company with opportunity to grow.

EXPERIENCE	
KlowBox	Fr developer
San Fr, CA	did This and that
Jan 2011 - Feb 2015	
Akount	Fr developer
San Monica, CA	did This and that
Jan 2011 - Feb 2015	
EDUCATION	
Sample Institute of technology	Fr developer
San Fr, CA	did This and that
Jan 2011 - Feb 2015	

Image: Static page online. Retrieved from <https://go.aws/3Nqcvmu>

Curriculum content retrieved from Devsnap.me (2015)

In addition, AWS S3 allows the uploading of private files. Create a new bucket and select the following options:

The screenshot shows the 'General configuration' section of the AWS S3 console. The 'Bucket name' field contains 'myprivatebucket'. Below it, there's a note about bucket naming rules and a 'Choose bucket' button. Under 'Object Ownership', the 'ACLs disabled (recommended)' option is selected, while 'ACLs enabled' is available but not selected. A note explains that objects in this bucket are owned by the account.

Image: Static page online. Retrieved from <https://go.aws/3Nqcvmu>

Object Ownership: ACLs (Access Control Lists) disabled

The screenshot shows the 'Block Public Access settings for this bucket' page. The 'Block all public access' checkbox is checked. Below it, four sub-options are listed, each with a checkbox: 'Block public access to buckets and objects granted through new access control lists (ACLs)', 'Block public access to buckets and objects granted through any access control lists (ACLs)', 'Block public access to buckets and objects granted through new public bucket or access point policies', and 'Block public and cross-account access to buckets and objects through any public bucket or access point policies'. Each sub-option has a brief description below it.

Image: Managing permission to public access. Retrieved from <https://go.aws/3Nqcvmu>

Keep the Public Access setting blocked for the bucket

The settings above will turn the URL private and only allow the bucket owner to have access

Network

AWS has a dedicated page for Network and Security, which can be found by typing on the search bar for EC2. Scroll down and on the left menu look for Network & Security

It is possible to create Security Groups, Elastic IPs, Placement Groups, Key Pairs and networking interfaces.

▼ Network & Security

Security Groups

Elastic IPs

Placement Groups

Key Pairs

Network Interfaces

For networking purposes, the use of security groups and network interfaces is of pivotal importance. Security Groups work as a firewall rule, for incoming and outgoing traffic. Those rules can be setup to be triggered by adding a custom TCP, HTTPS, or email server (IMAP)

The screenshot shows two sections of the AWS Management Console for setting security group rules. The top section, 'Inbound rules', has a 'Type' dropdown set to 'Custom TCP', a 'Protocol' dropdown set to 'TCP', and a 'Port range' input field containing '0'. The bottom section, 'Outbound rules', has a 'Type' dropdown set to 'All TCP', a 'Protocol' dropdown set to 'TCP', and a 'Port range' input field containing '0 - 65535'. Both sections include fields for 'Source' and 'Description - optional'.

Image: Setting inbound and outbound rules. Retrieved from <https://go.aws/3Nqcvmu>

For inbound rules, it is possible to define the source from where the IP is coming from and the port range, whereas for outbound rules, the destination of the IP and the port range as well.

Network interface

Create a Virtual Network Interface; this will virtualise the network of the cloud system

The screenshot shows the 'Details' tab of a network interface creation form. It includes fields for 'Description - optional' (with a placeholder 'Description of your network interface'), 'Subnet' (with a 'Select subnet' dropdown), 'Private IPv4 address' (with options for 'Auto-assign' and 'Custom' selected, and an input field for 'IPv4 address'), and 'Elastic Fabric Adapter' (with an 'Enable' checkbox). There is also a 'Advanced settings' link at the bottom.

Image: Create a virtual IPv4 address. Retrieved from <https://go.aws/3Nqcvmu>

Platforms Overview

Cloud platforms have been popularised over the last few years. They offer tech solutions to many clients, from small companies to other big techs. However, even though the services and products seem to be similar, there are many distinctions between the providers and procedures, like nomenclature, interface, pricing and usability. To start with:

Interface

Microsoft Azure offers a clear interface with a menu of recently accessed services. However, with a quick click on the left top bar, a menu with all the main services slides on the screen for rapid access. The search tool also responds according to what was typed, and the top panel holds link functions for A.I. tools, portal settings, support menu and profile settings. For each service that is offered, the interface remains the same, following the same pattern. For instance, the first page has basic info, the second page has networking, the third page has security and so on. This makes the process of creating new instances predictable and easy to associate.

On the other hand, AWS might look a bit simpler than Azure and not so dynamic. In contrast, after a few minutes of use and after accessing a few services, the portal shows itself as being versatile, where it is possible to grab and drag items to the initial page, mark them as favourites, and/or add widgets to the main page as desired by the user. The initial page contains a menu with the most recent search bar at the top, a link to check for notifications, a support page, region, configuration and profile page and a left menu containing a link to all services. However, the creation and configuration page might give an overwhelming feeling to the user as there are many options to be completed as the configuration moves forward.

Usability

Microsoft Azure and AWS are dynamic towards the usability of the portal. They both have live information about the service deployment progress and interactive tips all over the creation or configuration process, which helps the user understand what some options or fields are made for. Equally important, both platforms offer a link to QuickStart configuration and usability tips, useful tools for quick learning about the services and what is offered. The two companies have done a great job of delivering an effective and useful cloud service provider portal.

FAQ's and Support

The two platforms generally offer a vast range of FAQs and support tools for their user. However, Microsoft Azure presents a better way to deliver tutorials about its services on their forum. The Azure step-by-step gives the impression of being more consistent and loyal to what is on the cloud platform; with only a few modifications, it is possible to follow the tutorial and achieve the same result as is explicit in the screenshots. AWS, on the other hand, did not pass consistency over some of the tutorials. Another point to be highlighted is that AWS has a huge base of how-to procedures and configurations for content that users create, which are extremely useful. Microsoft also has an incredible amount of user content online, but it is not necessarily as different from what can be found on their own forums.

Support-wise, Azure and AWS have an internal support system that covers different topics, from billing to technical issues. The support SLA takes around 24 hours to receive a first contact and can be done by email and call. Artificial Intelligence is also present for both platforms. Microsoft has a co-pilot, whereas Amazon uses Amazon Q, a generative AI that helps with doubts about the service.

Pricing

Cost-wise, AWS is a few steps ahead. The company has 3 different kinds of free cloud service trials, one of those lasting 12 months and a free tier service (AWS, 2023). Moving to the service cost price, Azure and AWS operate similarly, pay-as-you-go or account credits. Services like virtual machines/instances, databases and storage can have a distinctive difference, as Amazon has a mix of free services and Azure does not. In addition, AWS also offer a Linux-based operational system for databases and virtual machines that are totally free and customised for use.

Regarding the billing home page, it is very descriptive; separating the billing by services, period, location, or subscription is possible. They also offer tools for analysing and understanding what is being charged and a report update. Azure has a useful prediction tool that foresees the cost of the service in days, weeks, and months from the current date.

Cloud Platform Conclusion

In conclusion, Azure and AWS are complex cloud platforms that englobe many business models and concepts to provide their clients with many possibilities and solutions. Users unfamiliar with cloud services may initially struggle with the concept, but it will not take long to understand the idea of deployment and workloads. However, the spotlight of the services goes to users who have the knowledge and now the opportunity to apply either on Software, Platform or Infrastructure as a Service to their business end. Although the tools presented by both companies have similarities, they follow very distinctive processes. On one side, Microsoft benefits from having licences for many of the services offered; it also presents tools that work as shortcuts for its system. Visual Studio is a great example. It integrates perfectly with the platform; the Storage Explorer is also an excellent tool for creating user access layers. On the other hand, Amazon does a great job in dividing its procedures into sections and, as a result, categorises all specifications needed to deploy a service on a well-planned layout. Therefore, in my opinion, AWS is great for cost-benefit use, as it has over 200 services Amazon (2024); aside from that, a reasonable explanation for all its services is that Azure provides a good and dynamic interface and an extremely large database for support to its user with a well-designed question and answers page.

Task 2

Development of a web and deployment of this same application in the Microsoft Azure and Amazon Web Services platform

Application Introduction

Web Application: Online Library

Title: Online Library

Application programming language: HTML, BootStrap, JQuery, JavaScript and C#

Database: SQL Commands

Scenario:

The company Tech Wave Solutions has requested a functional website that can register users and products and has a database connection. The website will demonstrate the reliability of the company's services, illustrating that they are able to develop and set up applications that can run 24/7 and operate with significant stability even through high access demands.

The product: An Online Library Web was developed with the aim to aggregate users to register in the system and have access to books on their shelf. As well as an administrator that can login and manage books, publishers and other users.

Application Functions

Users Type:

- Administrator.
- Common user.

Administrator functions:

- Author Management
- Publisher Management
- Book Inventory
- Book Issuing
- Member Management

User Function:

- Check in books
- Check out books

Site Map

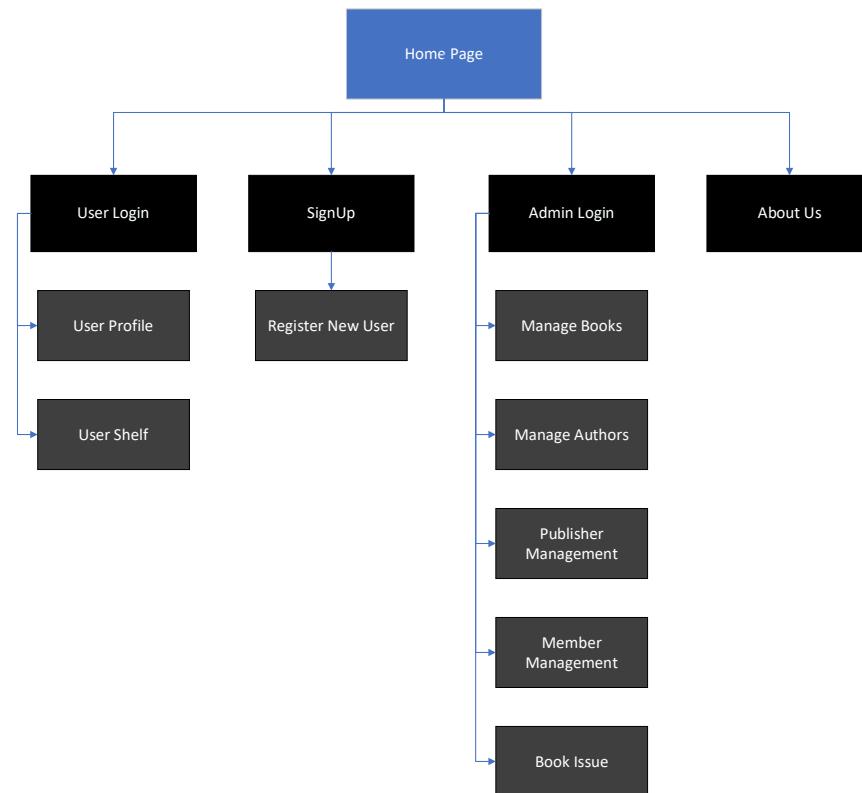


Image: Site Map of the application. Retrieved from Microsoft Visio

Tech Wave Solution Online Library

A web app has been developed for Tech Wave Solution. The application counts with customer and administrator functions and also with a log-in and log-out system.

Sign Up

The Sign Up page features a header with 'Online Library' and links for 'Home' and 'About us'. On the right, there are links for 'View Books', 'User Login', and 'Sign Up'. The main form is titled 'Join the community' and includes the following fields:

- First name: Caique
- Last name: Silva
- Date of Birth: 24/05/1993
- Email Address: caique.nota10@gmail.com
- Contact Number (Numbers Only): 33334444
- User Address: Address here
- Member ID: caique
- Password: (redacted)
- Pin Code: c1

Image: Sign-up page for customers. Retrieved from Online Library Web App

	member_id	first_name	dob	contact_no	email	pincode	full_address	password	account_status	last_name
1	caique	Caique	1993-05-24	33334444	caique.nota10@gmail.com	c1	Address here	123	pending	Silva

Image: member registered in the database. Retrieved from SQL Server Management Studio

The screenshot shows the user login page of the Online Library Web App. At the top, there is a header with the logo 'Online Library', 'Home', and 'About us' on the left, and 'View Books', 'User Login', and 'Sign Up' on the right. Below the header is a large rectangular form with a circular user icon at the top. The form is titled 'User Login'. It contains two input fields: 'Username' with the value 'caique' and 'Passkey' with the value '****'. Below these fields is a blue 'Login' button. At the bottom of the form, there is a link 'Not a member yet? Click here to sign-up' and a link 'Main Page'.

Image: User login page. Retrieved from Online Library Web App

View Books Logout Hello Caique

Image: User logged in

Admin Access

The screenshot shows the administrator login page of the Online Library Web App. At the top, there is a header with the logo 'Online Library', 'Home', and 'About us' on the left, and 'View Books', 'Logout', and 'Hello Caique' on the right. Below the header is a large rectangular form with a circular user icon at the top. The form is titled 'Admin Access'. It contains two input fields: 'Username' with the value 'admin' and 'Password' with the value '*****'. Below these fields is a blue 'Login' button. At the bottom of the form, there is a link 'Admin Login - AIS - Student'.

Image: Administrator login page. Retrieved from Online Library Web App

	username	password	full_name
1	1	123	Caique Silva
2	admin	12345	Caique Silva

Image: Administrator registered in the database. Retrieved from SQL Server Management Studio

Administrator Details

Member ID	First Name	Last Name	Contact Number	Email	pincode	Address	Acc Status
caique	Caique	Silva	33334444	caique.nota10@gmail.com	c1	Address here	pending

Image: Administrator Manager Page. Retrieved from Online Library Web App

Functions: Administrator can change user status or delete account

User Profile

member_id	member_name	book_id	book_name	issue_date	due_date
alexg	Alex	b2	Soul	2024-10-20	2024-10-27
JP1	Joel	b1	A Million to one	2024-10-19	2024-10-26

Image: User profile and the books on his shelf. Retrieved from Online Library Web App

Book Check-in / Check-out

Virtual Check-In / Check-Out

Member ID's	Member Name
caique	Caique

Book ID's	Book Name
b3	Woodlands

Start Date	End Date
dd/mm/yyyy	dd/mm/yyyy

Book Issue List					
member_id	member_name	book_id	book_name	issue_date	due_date
alexg	Alex	b2	Soul	2024-10-20	2024-10-27
IP1	Ioel	b1	A Million to one	2024-10-19	2024-10-26

Image: Admin Check-In/Check-Out. Retrieved from Online Library Web App

Bookshelf

Book Shelf

Book ID	Book Name	Genre	Author	Publisher	Current in Stock
b1	A Million to one	Thriller	New Author Name	Arrow Publisher	100
b2	Soul	Drama	New Author Name	Arrow Publisher	99
b3	Woodlands	Drama	New Author Name	Arrow Publisher	100

[<<< Main Page](#)

Admin Login - [Admin Logout](#)

Image: Books registered. Retrieved from Online Library Web App

Book Inventory

Book Details

Book cover	Book ID
<input type="file"/>	<input type="text"/>

Author's Name	Book Name	Publisher Name
New Author Name	<input type="text"/>	<input type="text"/>

Genre	Publisher Name
Choose the book genre Thriller	<input type="text"/>

Number of books registered	Current Stock	Number of Books Issued
<input type="text"/>	<input type="text"/>	<input type="text"/>

[Add](#) [Update](#) [Delete](#)

Book Inventory List

book_id	book_name	genre	author_name	publisher_name	publisher_date	book_description	actual_stock	current_stock	book_img_link
b1	A Million to one	Thriller	New Author Name	Arrow Publisher	A Million to One Name	100	100	-/book_inventory	
b2	Soul	Drama	New Author Name	Arrow Publisher	A Million to One	100	99	-/book_inventory	
b3	Woodlands	Drama	New Author Name	Arrow Publisher	Woodland Name	100	100	-/book_inventory	

[<<< Main Page](#)

Image: Books registered. Retrieved from Online Library Web App

	book_id	book_name	genre	author_name	publisher_name	publisher_date	book_description	actual_stock	current_stock	book_img_link
1	b1	A Millian to one	Thriller	New Author Name	Arrow Publisher	NULL	A Million to One	100	100	~/book_inventory/
2	b2	Soul	Drama	New Author Name	Arrow Publisher	NULL	A Million to One	100	99	~/book_inventory/
3	b3	Woodlands	Drama	New Author Name	Arrow Publisher	NULL	Woodland	100	100	~/book_inventory/

Image: Book Database. Retrieved from SQL Server Management Studio

Author's Management

Writer's Page
Add, Edit or Delete Books by its Author

Writer's ID	Writer's Name	
<input type="button" value="Add"/>	<input type="button" value="Update"/>	<input type="button" value="Delete"/>

Author's List

author_id	author_name
1	New Author Name
3	Robert Peterson

[<<< Main Page](#)

Image: Author's Page. Image: Books registered. Retrieved from Online Library Web App

The admin can add, update and delete the author.

Publisher's Management

Publisher's Page
Add, Edit or Delete Books by its Publisher

Publisher's ID	Publisher's Name	
<input type="button" value="Add"/>	<input type="button" value="Update"/>	<input type="button" value="Delete"/>

Author Management - Publisher Management - Book Inventory - Book Issuing - Member Management

publisher_id	publisher_name
1	Arrow Publisher

[<<< Main Page](#)

Image: Publisher Page. Image: Books registered. Retrieved from Online Library Web App

The admin can add, update and delete the publishers.

Database

In order to create a dynamic web, the creation of a database is made necessary. The following steps will lead to the creation of a functional database to store the data from the web application.

Microsoft Azure

To create a database on Azure, type in the search bar: SQL Database and select in the Market SQL Database

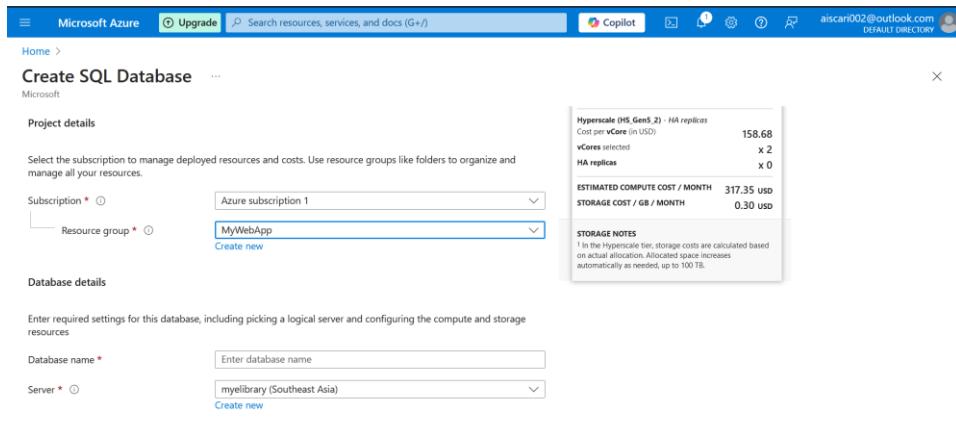


Image: Create a SQL Database page. Retrieved from <https://portal.azure.com/>

Select the subscription that will hold the database

Resource Group: Preferable a group related to the scaling setting that will be applied in the future. If no resource group has been created, click on Create New

Image: Basic information tabs for SQL Database. Retrieved from <https://portal.azure.com/>

Create a name for the database

Server: Select the closest server to reduce the latency

Want to use SQL elastic pool: No

Workload environment: Select Development

Computer + Storage: Click on Configure database

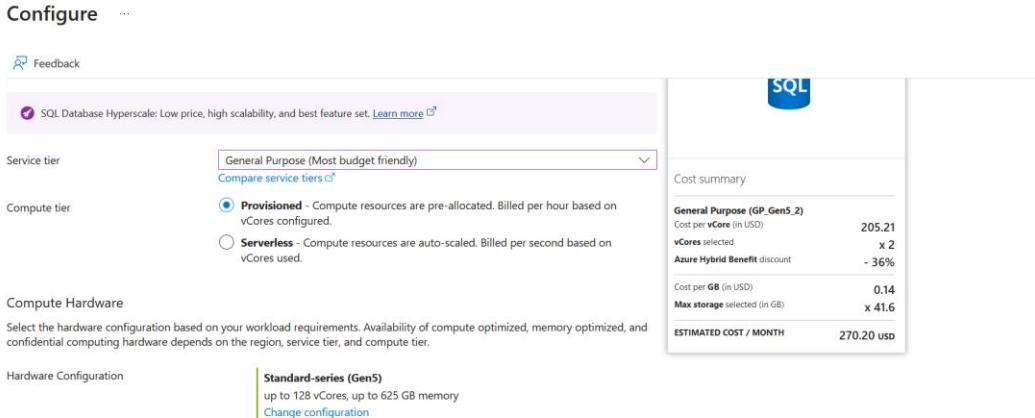


Image: Computer Hardware. Retrieved from <https://portal.azure.com/>

In this new loaded page, select the desired Service tier

Compute tier: provisioned

Hardware Configuration:

SQL hardware configuration					
Available hardware configurations					
Configuration	Description	Max vCores	Max memory	Max storage	Compute cost / vCore / month
DC-series	Enables confidential computing	40	180 GB	4 TB	289.08 USD
FSv2-series	Compute optimized	72	136 GB	4 TB	116.04 USD
Premium-series - memo...	Memory optimized	--	--	--	--
Premium-series	Balanced memory and compute	--	--	--	--
Standard-series (Gen5)	Balanced memory and compute	128	625 GB	4 TB	132.23 USD

Image: SQL Hardware Config. Retrieved from <https://portal.azure.com/>

Select the desired hardware

vCores [Compare vCore options](#)

2

Data max size (GB) [?](#)

32

9.6 GB LOG SPACE ALLOCATED

Would you like to make this database zone redundant? [?](#)

Image: Static page online. Retrieved from <https://portal.azure.com/>

Select the desired vCore number and data maximum size

Click on Apply and move to the Basics page once again.

Backup storage redundancy

Choose how your PITR and LTR backups are replicated. Geo restore or ability to recover from regional outage is only available when geo-redundant storage is selected.

- Backup storage redundancy ⓘ
- Locally-redundant backup storage
 - Zone-redundant backup storage
 - Geo-redundant backup storage

Image: Static page online. Retrieved from <https://portal.azure.com/>

Choose the zone redundancy area of choice and click on Networking.

In network connectivity, click on Public Endpoint.

However, changing to a private endpoint or no access is possible.

Create SQL Database ...

Microsoft

Basics Networking Security Additional settings Tags Review + create

Configure network access and connectivity for your server. The configuration selected below will apply to the selected server 'mysqlserver' and all databases it manages. [Learn more ↗](#)

Network connectivity

Choose an option for configuring connectivity to your server via public endpoint or private endpoint. Choosing no access creates with defaults and you can configure connection method after server creation. [Learn more ↗](#)

Connectivity method * ⓘ

- No access
- Public endpoint
- Private endpoint

Firewall rules

Setting 'Allow Azure services and resources to access this server' to Yes allows communications from all resources inside the Azure boundary, that may or may not be part of your subscription. [Learn more ↗](#)
Setting 'Add current client IP address' to Yes will add an entry for your client IP address to the server firewall.

Allow Azure services and resources to access this server *

No Yes

Add current client IP address *

No Yes

Image: Networking Config. Retrieved from <https://portal.azure.com/>

Click on Add current IP Address.

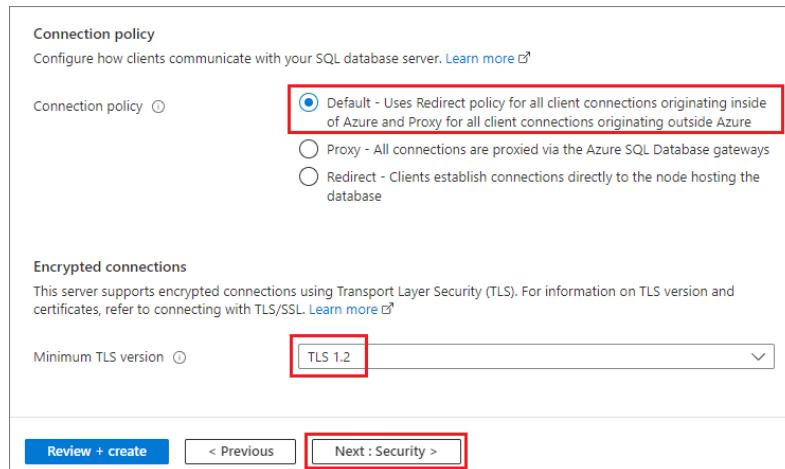


Image: Connection policy. Retrieved from <https://portal.azure.com/>

Connection Policy: Default

Minimum TLS version: TLS 1.2

Now, move to the Additional Setting page.

On this page, to use existing data, it is possible to backup previous data, start a database with sample tables or not export any information, starting with an empty database.

Customize additional configuration parameters including collation & sample data.

Data source

Start with a blank database, restore from a backup or select sample data to populate your new database.

Use existing data * None Backup Sample

Database collation

Database collation defines the rules that sort and compare data, and cannot be changed after database creation. The default database collation is SQL_Latin1_General_CI_AS. [Learn more](#)

Collation * SQL_Latin1_General_CI_AS [Find a collation](#)

Image: Backup Options. Retrieved from <https://portal.azure.com/>

After that, click on Review + Create

Connection String

To connect the dataset to the web app, it is necessary to copy the connection string command line. Go to the search bar, type Database and select SQL Database.

In the example below, the connection string used will be the SQL authentication.

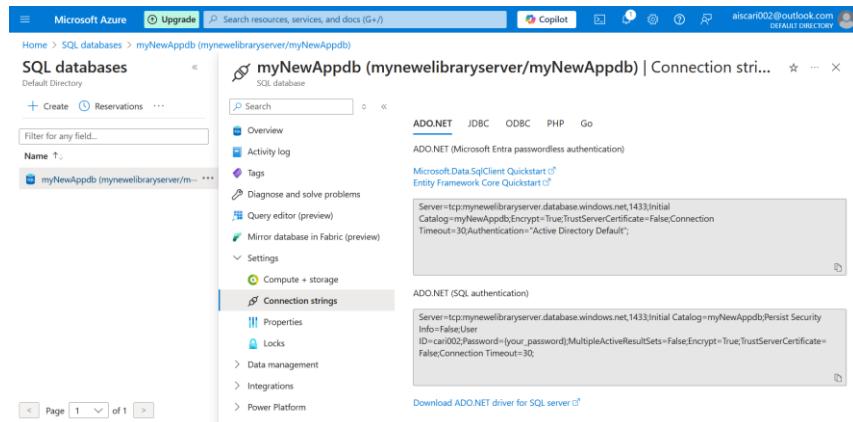


Image: Connection String for Azure. Retrieved from <https://portal.azure.com/>

Query Editor

Azure provides a query editor for inserting, deleting, updating and other query functions.

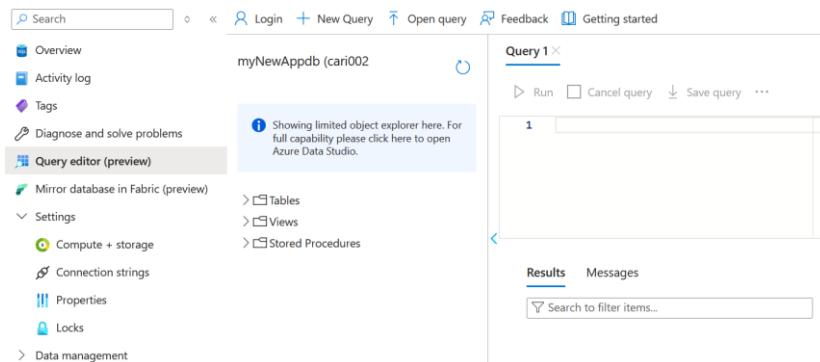


Image: Query Editor. Retrieved from <https://portal.azure.com/>

AWS

Deploy a database on Amazon Web Services

After logging into the AWS panel, go to the top bar and, type for RDS, click on the first displayed link.

For the following step, click on Create Database and choose the Standard Creation. For this specific example, our database will run Microsoft SQL Server. Choose then the engine version and template. Dev/Test or Free Tier.

Type the database name and the username for the admin access. To create a new password, select self-managed and enter a master password.

Moving on to the next step, select the instance configuration followed by the storage capability. This tab will allow the configuration of an autoscaling setup.

The Connectivity step allows choosing the Virtual Private Cloud containing the availability zones. There are three in total, right below connectivity, change the selected box to Public Access: Yes. So the instance can receive access from Public IP.

Scroll down and click on Create Database.

Endpoint & port	Networking	Security
Endpoint database-2.cb6kkwo601g.ap-southeast-2.rds.amazonaws.com	Availability Zone ap-southeast-2c	VPC security groups default (sg-01f3c1d80b6024c0c) <input checked="" type="radio"/> Active
Port 1433	VPC vpc-03f4fb8fd91ac8e55	Publicly accessible Yes
	Subnet group default-	Certificate authority Info rds-ca-rsa2048-g1
	vpc-03f4fb8fd91ac8e55	Certificate authority date May 25, 2061, 09:42 (UTC+12:00)
	Subnets subnet-0cf80a49c299174c9 subnet-0d1564844110996 8a subnet-0bd8f23fe94fc9509	DB instance certificate expiration date October 17, 2027, 16:07 (UTC+13:00)
	Network type IPv4	

Image: Database overview. Retrieved from <https://go.aws/3Nqcvmu>

Connecting to the AWS database

AWS databases only support the online Query Editor when using the Aurora Serveless Database. A database query editor is necessary for accessing and querying the other types. In this case, the software in use will be SQL Server Manager Studio.

To access the database, go to RDS and then click on the desired database that needs to be accessed, select and copy the Endpoint & Port. Go to the Query Editor, click on connect and past in the Server Name the endpoint and add a comma with the access port. For instance: database-2.cb6kkwo6021g.ap-southeast-2.rds.amazonaws.com,143

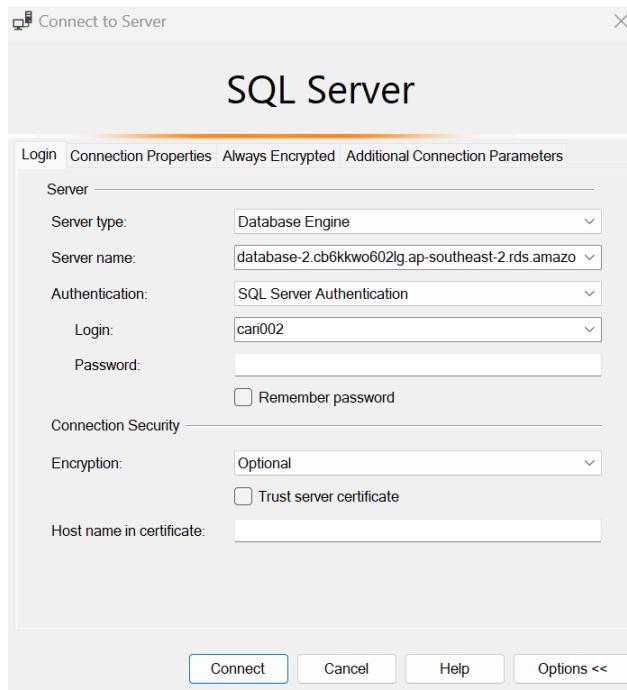


Image: Login to the database on AWS. Retrieved from SQL Server Management Studio

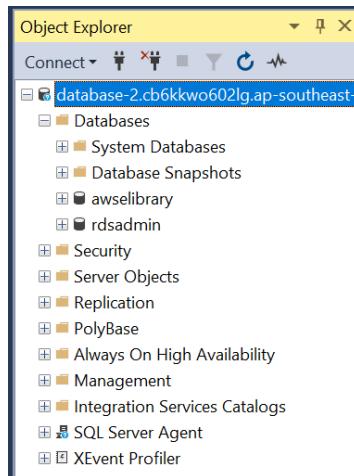


Image: Logged into the database. Retrieved from SQL Server Management Studio

Application Deployment

For the ensuing steps, the procedure to deploy the web application to the cloud service and, consequently, the app will be online for public access.

Firstly, it is assumed that the database and tables are already created. Secondly, the deployment will be done using Visual Studio Professional 2022 software.

About Visual Studio

Visual Studio Professional 2022 (VS 2022) is an environment developer software with many features for creating and deploying applications to various platforms. VS 2022 supports external tools and extensions that facilitate the development of applications either on the web or locally; it also includes extensions for database connections. The software supports different programming languages and is widely known among developers (Microsoft, 2022).

ASP.NET

Within Visual Studio, projects from different sources are available; in this case, ASP.NET is used. ASP.NET is a web framework created by Microsoft. It runs on multiple platforms. It allows the setup and configuration of Frontend and Backend coding and access to libraries and includes extensions to facilitate the developer routine (Microsoft, n.d.).

Microsoft Azure

To deploy a web project into Azure Web App centre using Visual Studio, first, open Visual Studio 2022 and click on Open (it is assumed that the project already has been developed).

Select the project that contains the code and click on Open.

Then, CTRL + ALT + L or navigate to View > Solution Explorer

A window will be open on the right side of the program.

For the next step, click with the mouse's right button on the top of the project name (Assignment 1). Click then on Publish

Click then on New Profile, and select the deployment target.

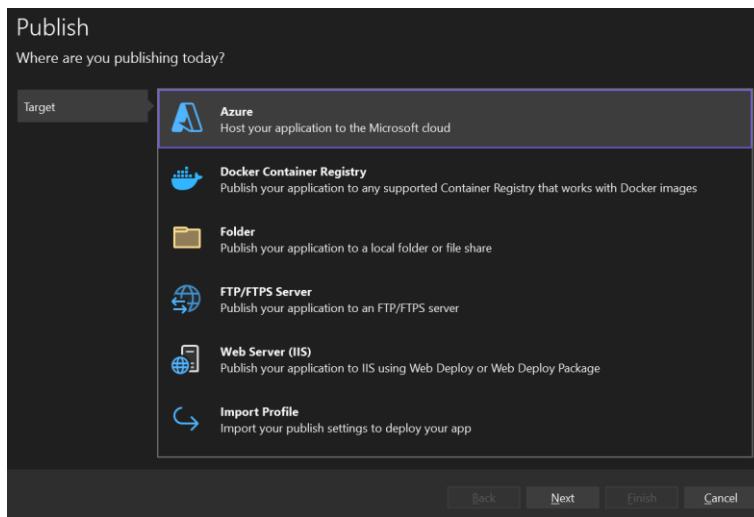


Image: Azure deploys page. Retrieved from: Microsoft Visual Studio Professional 2022

Select Azure and click on Next.

Select Azure App Service (Windows) and click on Next.

On this newly opened page, add the Azure account information.:

Click on next, and a new window will open. This page permits you to create a new folder or use one already created.

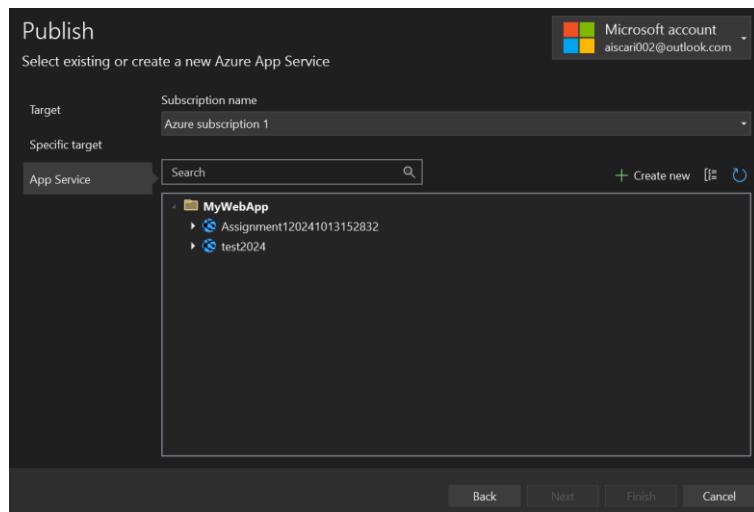


Image: Query Editor. Retrieved from: Microsoft Visual Studio Professional 2022

Click on + Create New

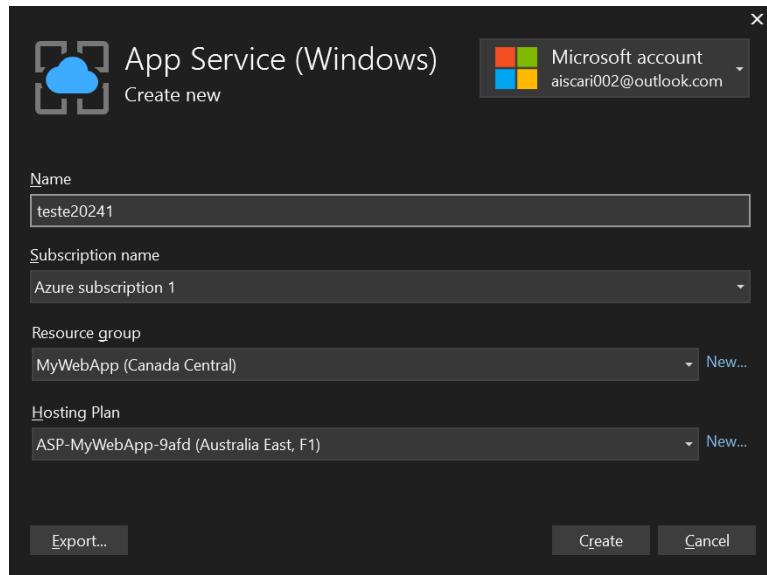


Image: Query Editor. Retrieved from: Microsoft Visual Studio 2022

Name: Project folder name

Subscription name: Select the subscription

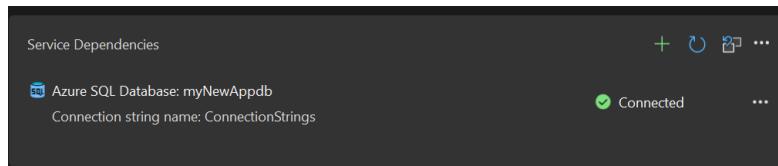
Resource Group: Select the group which contains the desired configuration

Hosting Plan: Location of the web application.

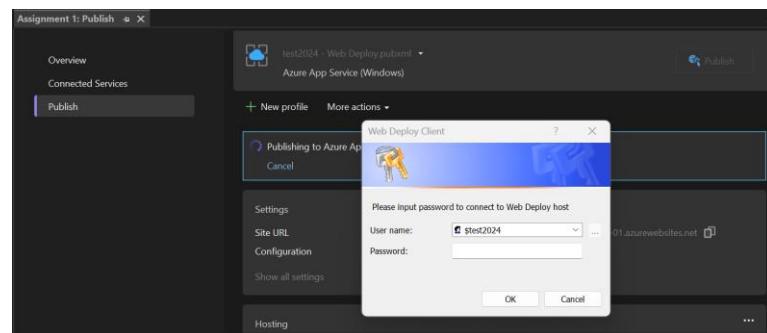
Click then on Create.

Once the account has been added, click on Finish. A new window will open

Scroll down and click. on Service Dependencies. Here it is possible to add the database to the project.



Once again, log in with the database information and select the desired database that contains the project data. Scroll back up and hit the button Publish



A new pop-up window might request authentication. Add the information and click on OK.

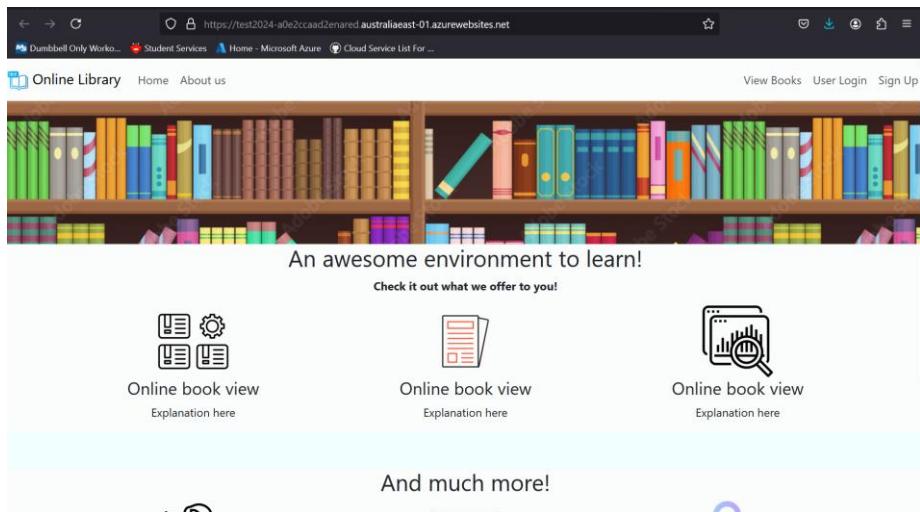


Image: Deployment complete, and object is online. Retrieved from test2024-a0e2ccaad2enared.australiaeast-01.azurewebsites.net

The web application is online. The URL is test2024-a0e2ccaad2enared.australiaeast-01.azurewebsites.net. This information can also be found in the portal.

App Service – Portal

To locate the recently created folder in the Azure portal, type the search bar for App Services.

Click on the service that has been created via Visual Studio.

	Name ↑↓	Status ↑↓	Location ↑↓	Pricing Tier ↑↓	App Service Plan ↑↓	Subscription ↑↓	App Type ↑↓	...
<input type="checkbox"/>	Assignment120241013152832	Running	Australia Southeast	Standard	Assignment120241013152832Plan	Azure subscription 1	Web App	...
<input type="checkbox"/>	test2024	Running	Australia East	Free	ASP-MyWebApp-9afdf	Azure subscription 1	Web App	...

Web Application Overview

Click on the published project folder and locate the needed information.

The screenshot shows the Azure portal's 'test2024' app service overview. The left sidebar lists sections: Backups, Custom domains, Certificates, Networking, Scale up (App Service plan), Scale out (App Service plan), WebJobs, MySQL In App, Service Connector, Properties, Locks, Performance, Load Testing, and App Service plan. The main content area shows the following details:

- Essentials**
 - Resource group ([move](#)) MyWebApp
 - Status: Running
 - Location ([move](#)) Australia East
 - Subscription ([move](#)) Azure Subscription 1
 - Subscription ID: 5298901c-2656-40ee-a0da-7499cd60dc60
 - Tags ([edit](#)) Add tags
- Properties** (selected tab)
 - Monitoring
 - Logs
 - Capabilities
 - Notifications
 - Recommendations
- Web app**
 - Name: test2024

Image: App Service overview. Retrieved from <https://portal.azure.com/>

For instance, the main page contains pieces of information like:

- Status
- Default domain
- Scale-up options
- Scale-out options
- Console

AWS

Visual Studio also permits the deployment of applications on AWS. However, it is not a native service from the software. Firstly, it is necessary to install an extension called AWS Toolkit. Go to the top bar and click on Extension and Manage Extensions. Select the tab Browse and type AWS ToolKit. Click on Install and reboot Visual Studio.

With the extension installed, click on View and then on the newly created extension AWS Explorer, which is an Amazon Version of the Solution Explorer. Once selected, log on with the desired account, and a menu on the left will appear. That is the confirmation that the account and extension have been installed successfully.

With the account synchronised and logged, click on View and Solution Explorer, move the mouse to the Solution Explorer tab, and click with the right mouse button on the top of the project title. A new option has been installed called: Publish with AWS Elastic Beanstalk

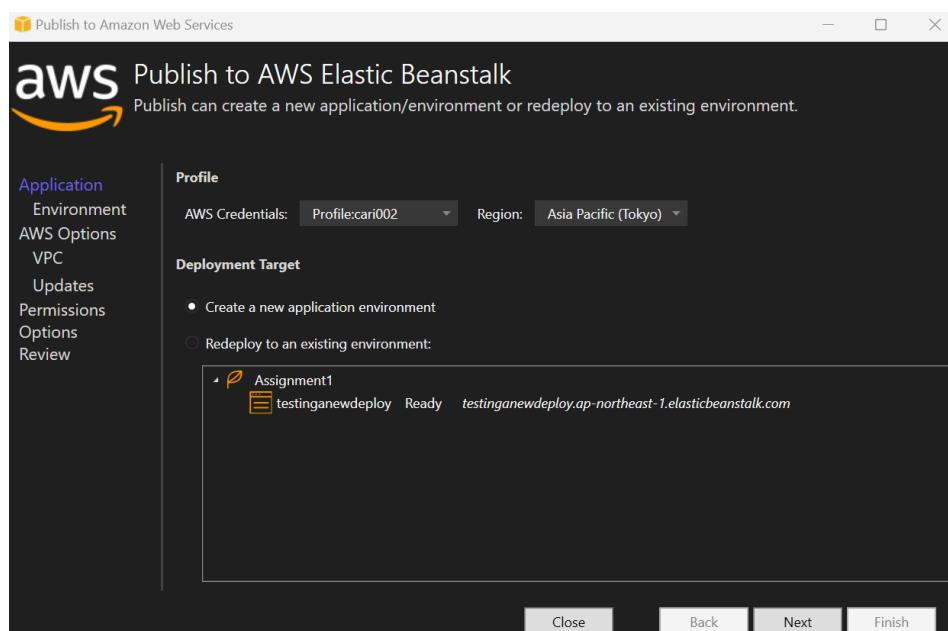


Image: Amazon Beanstalk Retrieved from: Microsoft Visual Studio 2022

Elastic Beanstalk

Creating an Application profile

After successfully downloading and configuring the AWS Extension ToolKit in Visual Studio, go to the AWS Portal, and all the pre-setup for the deployment will be done. Type on the search bar for Elastic Beanstalk.

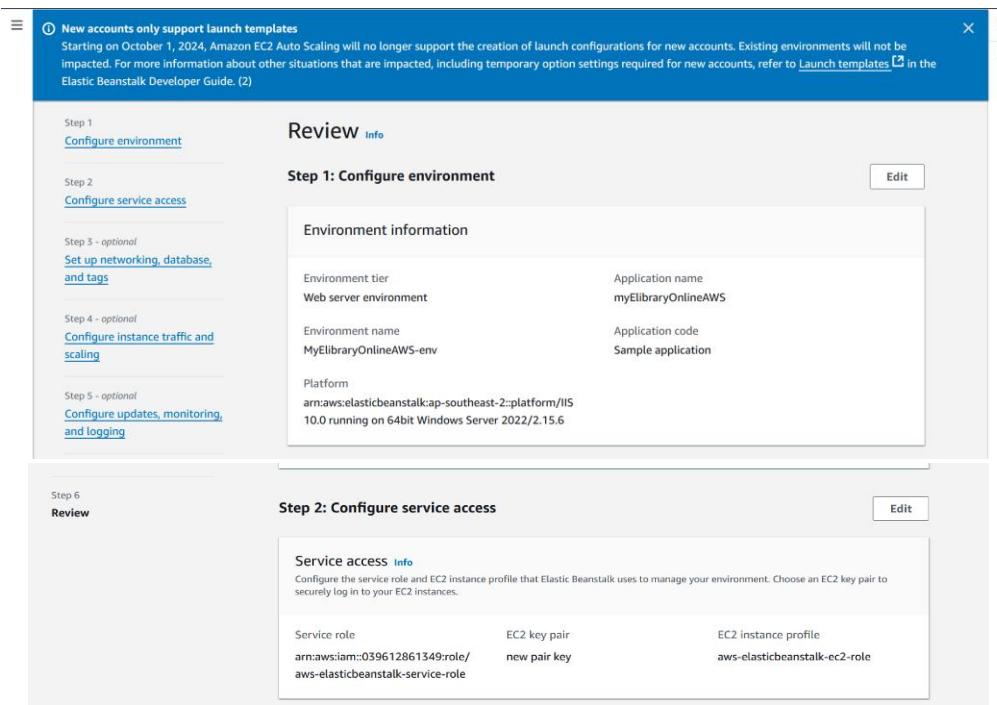
Click on Create Application. This will create the application that will host the environment setting. Here select the name of the application and description:



Image: Amazon Beanstalk Create Application Retrieved from <https://go.aws/3Nqcvmu>

Click on Create Application and proceed to create an Environment.

The environment page setup contains all configurations for the deployment. It consists of 5 steps, with the main function to define network rules and instance traffic control. For example, Step 3 permits the connection to databases previously created on AWS and the configuration of Virtual Private Connections and Subnet. In step 4, the configuration of AutoScaling based on metrics and what load balancer will be used to distribute the IP through the instances.



Step 3: Set up networking, database, and tags

Networking, database, and tags Info Configure VPC settings, and subnets for your environment's EC2 instances and load balancer. Set up an Amazon RDS database that's integrated with your environment.						
Network <table border="1"> <tr> <td>VPC vpc-03f4fb8fd91ac8e55</td> <td>Public IP address true</td> <td>Instance subnets subnet-0cf80a49c299174c9,subnet-0d15648441109968a,subnet-0bd8f23fe94fc9509</td> </tr> </table>			VPC vpc-03f4fb8fd91ac8e55	Public IP address true	Instance subnets subnet-0cf80a49c299174c9,subnet-0d15648441109968a,subnet-0bd8f23fe94fc9509	
VPC vpc-03f4fb8fd91ac8e55	Public IP address true	Instance subnets subnet-0cf80a49c299174c9,subnet-0d15648441109968a,subnet-0bd8f23fe94fc9509				
Database <table border="1"> <tr> <td>Database subnets subnet-0cf80a49c299174c9,subnet-0d15648441109968a,subnet-0bd8f23fe94fc9509</td> </tr> </table>			Database subnets subnet-0cf80a49c299174c9,subnet-0d15648441109968a,subnet-0bd8f23fe94fc9509			
Database subnets subnet-0cf80a49c299174c9,subnet-0d15648441109968a,subnet-0bd8f23fe94fc9509						
Tags <table border="1"> <thead> <tr> <th>Key</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> </tbody> </table>			Key	Value		
Key	Value					

Step 4: Configure instance traffic and scaling

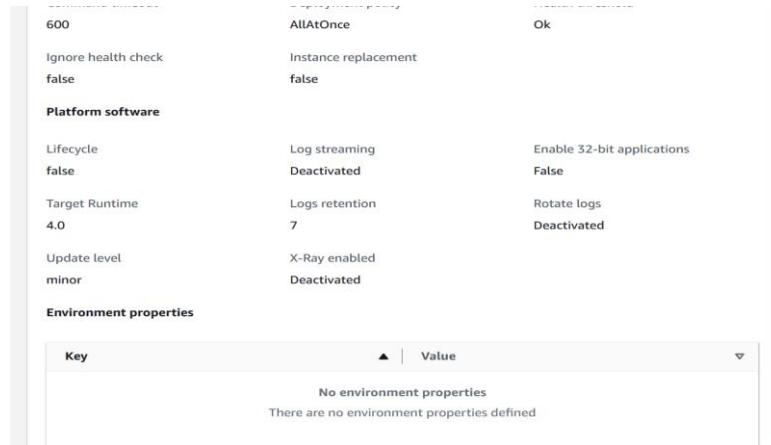
Instance traffic and scaling [Info](#)
 Customize the capacity and scaling for your environment's instances. Select security groups to control instance traffic. Configure the software that runs on your environment's instances by setting platform-specific options.

Instances <table border="1"> <tr> <td>Root volume type gp2</td> <td>IMDSv1</td> <td>Deactivated</td> </tr> </table>			Root volume type gp2	IMDSv1	Deactivated															
Root volume type gp2	IMDSv1	Deactivated																		
Capacity <table border="1"> <tr> <td>Environment type Load balanced</td> <td>Min instances 1</td> <td>Max instances 3</td> </tr> <tr> <td>Fleet composition Combine purchase options and instances</td> <td>On-demand base 0</td> <td>On-demand above base 0</td> </tr> <tr> <td>Capacity rebalancing t3.large,t3.medium</td> <td>Scaling cooldown ami-09cdf678a0070f5af</td> <td>Processor type Any</td> </tr> <tr> <td>Metric CPUUtilization</td> <td>Statistic Average</td> <td>Unit Percent</td> </tr> <tr> <td>Period 5</td> <td>Breach duration 5</td> <td>Upper threshold 6000000</td> </tr> <tr> <td>Scale up increment 1</td> <td>Lower threshold 2000000</td> <td>Scale down increment 0</td> </tr> </table>			Environment type Load balanced	Min instances 1	Max instances 3	Fleet composition Combine purchase options and instances	On-demand base 0	On-demand above base 0	Capacity rebalancing t3.large,t3.medium	Scaling cooldown ami-09cdf678a0070f5af	Processor type Any	Metric CPUUtilization	Statistic Average	Unit Percent	Period 5	Breach duration 5	Upper threshold 6000000	Scale up increment 1	Lower threshold 2000000	Scale down increment 0
Environment type Load balanced	Min instances 1	Max instances 3																		
Fleet composition Combine purchase options and instances	On-demand base 0	On-demand above base 0																		
Capacity rebalancing t3.large,t3.medium	Scaling cooldown ami-09cdf678a0070f5af	Processor type Any																		
Metric CPUUtilization	Statistic Average	Unit Percent																		
Period 5	Breach duration 5	Upper threshold 6000000																		
Scale up increment 1	Lower threshold 2000000	Scale down increment 0																		
Load balancer <table border="1"> <tr> <td>Load balancer visibility public</td> <td>Load balancer subnets subnet-0bd8f23fe94fc9509,subnet-0cf80a49c299174c9,subnet-0d15648441109968a</td> <td>Load balancer type application</td> </tr> <tr> <td>Load balancer is shared false</td> <td>Store logs</td> <td>Deactivated</td> </tr> </table>			Load balancer visibility public	Load balancer subnets subnet-0bd8f23fe94fc9509,subnet-0cf80a49c299174c9,subnet-0d15648441109968a	Load balancer type application	Load balancer is shared false	Store logs	Deactivated												
Load balancer visibility public	Load balancer subnets subnet-0bd8f23fe94fc9509,subnet-0cf80a49c299174c9,subnet-0d15648441109968a	Load balancer type application																		
Load balancer is shared false	Store logs	Deactivated																		

Step 5: Configure updates, monitoring, and logging

Updates, monitoring, and logging [Info](#)
 Define when and how Elastic Beanstalk deploys changes to your environment. Manage your application's monitoring and logging settings, instances, and other environment resources.

Monitoring <table border="1"> <tr> <td>System enhanced</td><td>Cloudwatch custom metrics - instance —</td><td>Cloudwatch custom metrics - environment —</td></tr> <tr> <td>Log streaming Deactivated</td><td>Retention 7</td><td>Lifecycle false</td></tr> </table>			System enhanced	Cloudwatch custom metrics - instance —	Cloudwatch custom metrics - environment —	Log streaming Deactivated	Retention 7	Lifecycle false
System enhanced	Cloudwatch custom metrics - instance —	Cloudwatch custom metrics - environment —						
Log streaming Deactivated	Retention 7	Lifecycle false						
Updates <table border="1"> <tr> <td>Managed updates Activated</td><td>Deployment batch size 100</td><td>Deployment batch size type Percentage</td></tr> <tr> <td>Command timeout 600</td><td>Deployment policy AllAtOnce</td><td>Health threshold Ok</td></tr> </table>			Managed updates Activated	Deployment batch size 100	Deployment batch size type Percentage	Command timeout 600	Deployment policy AllAtOnce	Health threshold Ok
Managed updates Activated	Deployment batch size 100	Deployment batch size type Percentage						
Command timeout 600	Deployment policy AllAtOnce	Health threshold Ok						



myElibraryOnlineAWS MyElibraryOnlineAWS-env October 20, 2024 12:41:... October 20, 2024 12:41:...

Image: Configuration review of a deployment. Retrieved from <https://go.aws/3Nqcvmu>

Once the configuration is finished, click Create Environment and wait for the deployment.

After the deployment, move back to Visual Studio and Publish to AWS Elastic Beanstalk. Redeploy to an existing environment, and next, select the environment created on the AWS Portal. Click on Deploy at the end of the process.

Monitoring	Event Time	Event Type	Version Label	Event Details
Resources	10/20/2024 4:48:50 PM	INFO	v20241020002009	Deploying new version to instance(s).
AWS X-Ray	10/20/2024 4:48:48 PM	INFO	v20241020002009	Environment health has transitioned from Unknown to Info.
Server	10/20/2024 4:48:32 PM	INFO		Updating environment MyElibraryOnlineAWS-env's configur
Load Balancer	10/20/2024 4:48:23 PM	INFO		Environment update is starting.
Auto Scaling	10/20/2024 2:33:00 PM	INFO	v20241020002009	Environment health has transitioned from Info to Unknown.
	10/20/2024 2:31:57 PM	INFO		Environment update completed successfully.
	10/20/2024 2:31:57 PM	INFO		Successfully deployed new configuration to environment.

Image: Deployment successfully complete. Retrieved from: Microsoft Visual Studio 2022

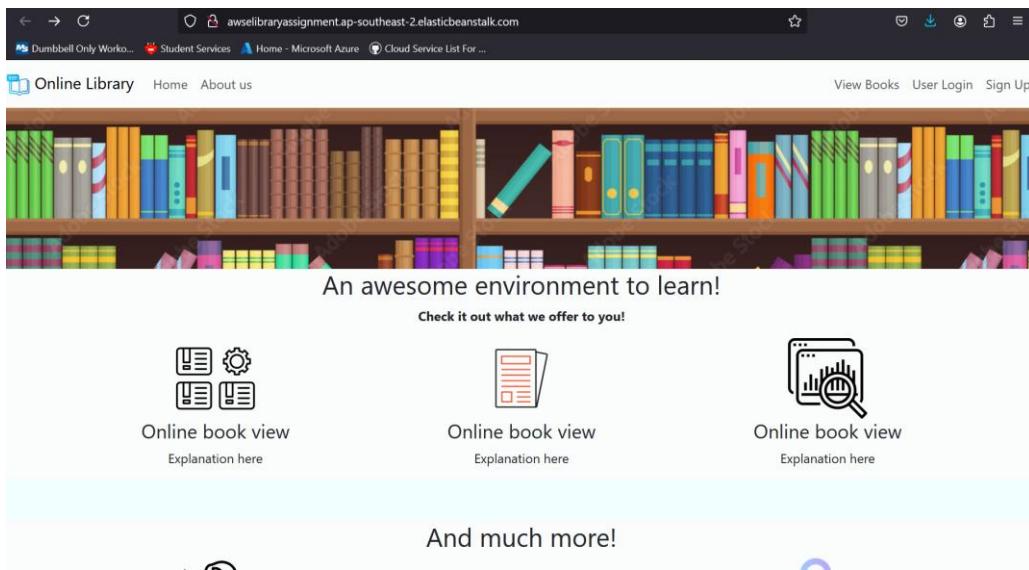


Image: Deployment successfully complete. Retrieved from <http://awselibraryassignment.ap-southeast-2.elasticbeanstalk.com/>

Cloud Computing x Online Library Web Application

The process of deploying a Web Application through a Cloud Service provider displays the practical use of different models being applied together in order to achieve a complex service. The IaaS model gives the user a range of tools for creating a diverse set of configurations that can be applied towards networking, storage, security models and the effectiveness of a service. For instance, AWS offers an incredible number of distinct configurations for instances/virtual machines. On top of that, the configuration of Private endpoints and subnets, as for Azure, the Web App Deployment system is simplified and straightforward. However, for both service providers, the infrastructure as a service is greatly developed, so the final customer does not suffer from any disturbance. Therefore, displaying the reliability that a service is expected to have.

Another valid point is using containers to virtualise settings such as IIS versions, vCPU processing for auto-scale proposes, and networking virtual settings. The collection of those configurations works well with dynamic deployment and speeds up the process for the user. Moreover, the pricing of these services can be monitored and stopped at any moment, as well as the creation of alerts or the use of free tier services. However, the pricing will increase significantly for more sophisticated processes like auto-scaling and elastic pool for databases. The reason is the availability that the providers can offer.

Conclusion

In conclusion, Azure and AWS present business models in an astonishing interface, where users run smoothly through different cloud computing concepts even though they do not know them. On the other hand, experienced users are also welcome to use the platform and find professional solutions for multi-platform projects. IaaS, Containers and Shared Responsibility are connected; they are the base for cloud service providers to offer stable service, reliability and effectiveness. Therefore, with the market of cloud computing going

through a sharp increase, the competition will ensure the pricing model also improves for fair prices for the use of well-structured services.

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