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Industrial Internship Report

Microsoft Certified Azure Fundamentals

submitted by

Abhijeet Chatterjee

19BCE10021

DECLARATION BY THE CANDIDATE

I hereby declare that the Industrial Internship report entitled “Microsoft Certified Azure Fundamentals " submitted by me to VIT Bhopal University, Bhopal in partial fulfilment of the requirement for the award of the degree of B.Tech in Computer Science and Engineering is a record of bonafide industrial training undertaken by me under the supervision of “Etrain Education Private Limited”. I further declare that the work reported in this report has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

ABHIJEET CHATTERJEE

Signature of the student

Name: ABHIJEET CHATTERJEE
Reg No:19BCE10021

Certificate given by the Organization:

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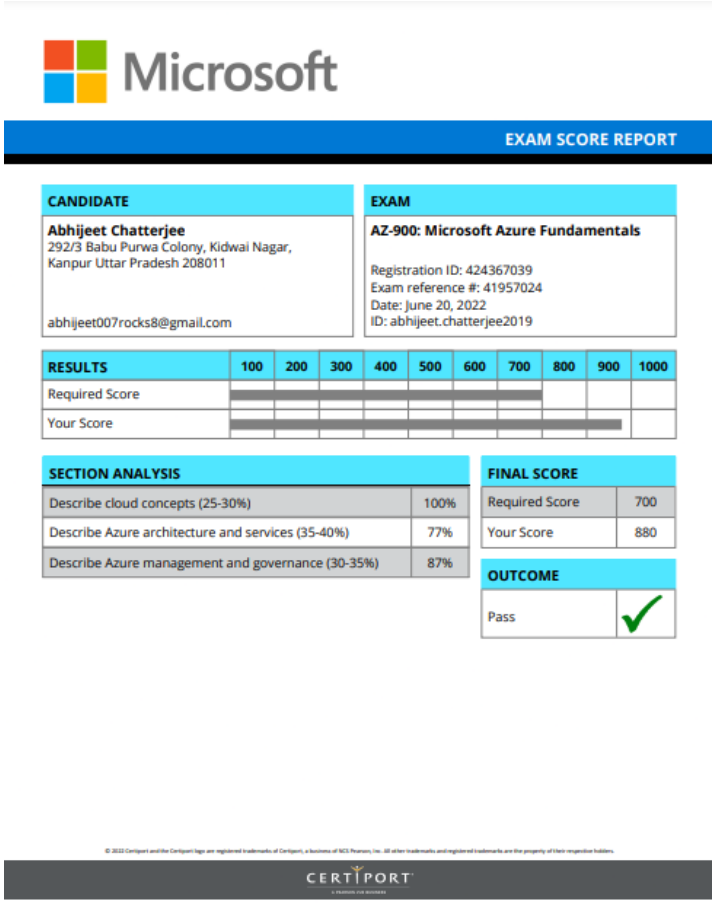
Score Card:



Microsoft

EXAM SCORE REPORT

CANDIDATE	EXAM
Abhijeet Chatterjee 292/3 Babu Purwa Colony, Kidwai Nagar, Kanpur Uttar Pradesh 208011 abhijeet007rocks8@gmail.com	**AZ-900: Microsoft Azure Fundamentals** Registration ID: 424367039 Exam reference #: 41957024 Date: June 20, 2022 ID: abhijeet.chatterjee2019

RESULTS	100	200	300	400	500	600	700	800	900	1000
Required Score										
Your Score										

SECTION ANALYSIS	
Describe cloud concepts (25-30%)	100%
Describe Azure architecture and services (35-40%)	77%
Describe Azure management and governance (30-35%)	87%

FINAL SCORE	
Required Score	700
Your Score	880

OUTCOME	
Pass	✓

CERTIPORT

ACKNOWLEDGEMENT

I would like to express my gratitude to “Dr. Chandan Kumar Behera, Professor in School of Computer Science and Engineering at VIT Bhopal University, Bhopal” and “Etrain Education Private Limited”, for giving us access to such excellent information about "Azure Technology" through this course. It provided us with excellent direction and helped us through trying times. Their support and excitement significantly aided in the program's success. I'd want to show my gratitude to all of the teachers who helped us by giving us guidance and providing the necessary equipment, as well as to my friends who helped me throughout the programme by answering my questions, correcting my mistakes, and providing the equipment I needed.

Name: Abhijeet Chatterjee

Reg No:19BCE10021

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Summary

My course “Microsoft Certified Azure Fundamentals” by Microsoft was conducted from 01 June 2022 to 30 June 2022. In particular, understanding the use case of Azure services to access its capabilities on demand is a key component of this course's exploration of Azure technologies and services-based cloud computing.

We learned about Azure services, security, privacy, compliance, and trust, as well as Azure price and support, among other things, in this course. The basics of cloud computing and Azure, how to sign up for accounts and subscriptions, the advantages of using cloud services, and knowing how to differentiate between the many categories.

We also get knowledge of the various terms, concepts, and resources as well as the various types of cloud computing.

Six separate modules made up this course, which was finished in just four weeks.

About The Organization

End-to-end solutions for educational goods from Microsoft, HPE, Adobe, and other manufacturers are offered by EtrainIndia. They serve as an online marketplace for widely accepted credentials and skill training. EtrainIndia was created and is managed by individuals with extensive industry knowledge.

They already provide students with opportunities in more than 50 Indian locations thanks to our network of more than 600 trustworthy partners throughout India. Through a range of credentials, they have assisted more than 250 000 students in empowering themselves with the aid of our efficient training techniques and qualified instructors.

Microsoft encourages digital transformation in the era of the cloud and the intelligent edge. Its objective is to increase the effectiveness of every person and organisation on the planet.

INTRODUCTION

This course covers the foundations of cloud computing, key Azure services, security, privacy, compliance, and trust, as well as Azure pricing and support.

We are introduced to Azure and all of its features and services through the six learning pathways in Azure Fundamentals. If you're interested in learning about the basic computing, network, storage, and database services provided by Azure, learning about best practices for cloud security, or exploring the cutting edge of and machine learning, Azure Fundamentals is the best introduction to Azure. We may practice utilizing Azure using the interactive exercises in Azure Fundamentals. By utilizing the many activities that provide a temporary Azure environment called the sandbox, we may study for free and at our own pace.

ABOUT AZURE

Azure is a cloud computing platform that provides an ever-expanding selection of services to help you develop solutions to meet your business goals. Azure offers a variety of services, from straightforward web hosting for your business's online presence to fully virtualized PCs that you may use to run your own special software applications.

Azure provides a wide range of cloud-based services, such as remote storage, database hosting, and centralized account management. Azure offers contemporary features like artificial intelligence and the Internet of Things (IoT).

In this course, we learned the fundamentals of Azure and all of its features.

COURSE OBJECTIVE

In this course, we learned about the following things:

1. The basics of cloud computing and Azure, including how to create accounts and subscriptions.

2. The advantages of utilizing cloud services, including how to differentiate between the many cloud computing categories and types.

3. The key services offered by Microsoft Azure. how to find the different words, materials, and ideas needed to work with Azure architecture.

4. The basic solutions, which incorporate many Microsoft Azure tools and services.

5. How you may use the many Azure services to make sure your cloud resources are dependable, safe, and have general security features.

WEEK-1

Module 1 - Cloud concepts

Cloud computing: What is it?

It involves the delivery of computing services over the internet and is sometimes referred to as the cloud. Some of these services include servers, storage, databases, networking, software, analytics, and intelligence. Benefits of cloud computing include scale economies, quicker innovation, and adaptable resources.

Why is cloud computing frequently more cost-effective?

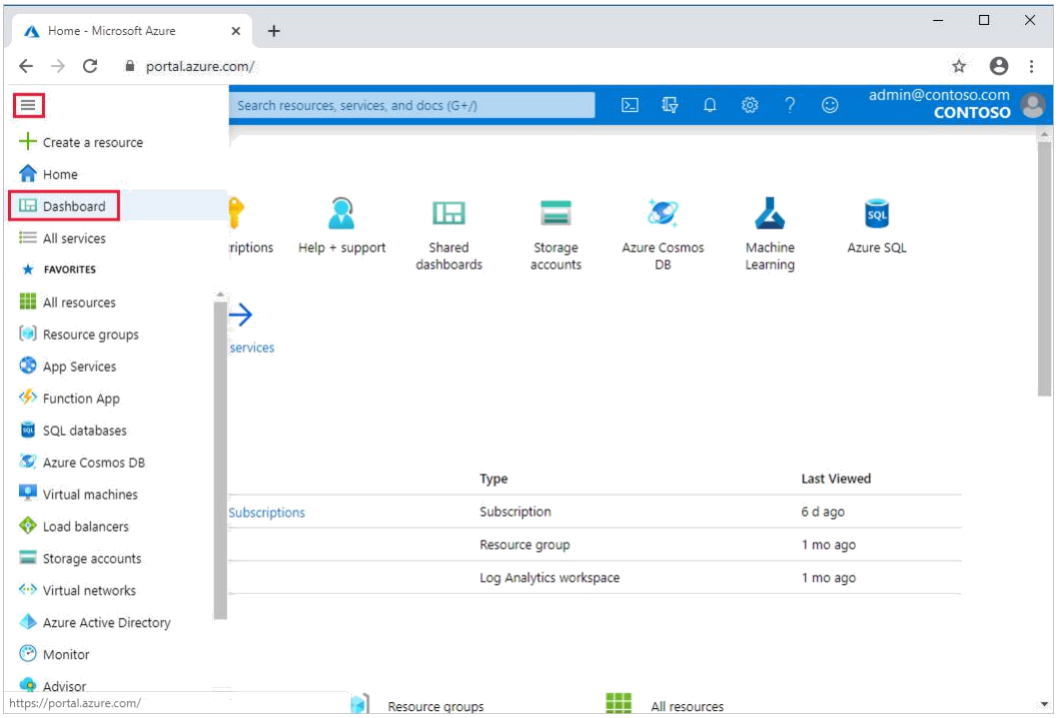
Cloud computing is the practise of distributing computing services over the internet using a pay-as-you-go pricing model. Typically, you only pay for the cloud services you actually use, which helps you by:

- Reducing your operating costs.
- Improving the way, you manage your infrastructure.
- Extend as the demands on your business evolve.

What is Azure?

Azure is a continually expanding set of cloud services that can help your business address both current and foreseeable business challenges. Azure gives you the freedom to design, manage, and deploy apps across a huge global network using the tools and frameworks of your choice.

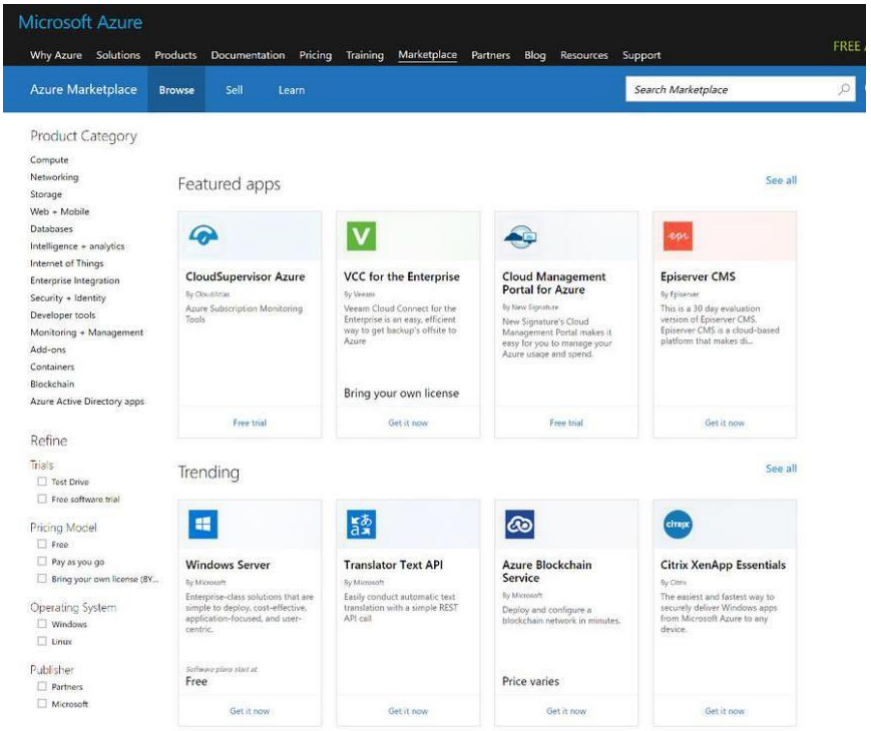
Azure Portal The web-based, unified console known as the Azure portal serves as an alternative to command-line tools. Through the graphical user interface of the Azure portal, you may manage your Azure membership. You are able to: Create, manage, and keep an eye on everything, from simple online applications to complex cloud deployments. For the optimal user experience, arrange resources using personalized dashboards and configure accessibility features.



Azure portal

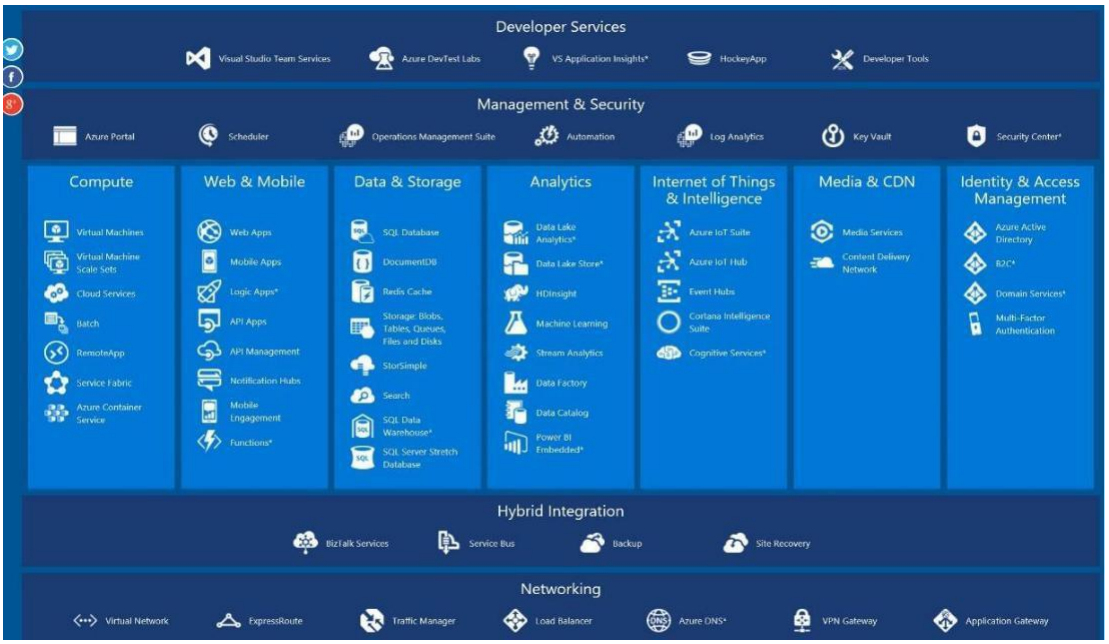
Microsoft Marketplace

Azure Marketplace makes it simpler to connect customers with Microsoft partners, independent software developers, and start-ups that are offering their solutions and services that are intended to run on Azure. Customers may browse, test, purchase, and supply applications and services from hundreds of leading service providers through the Azure Marketplace. The use of all goods and services on Azure has been authorized.



Azure Marketplace

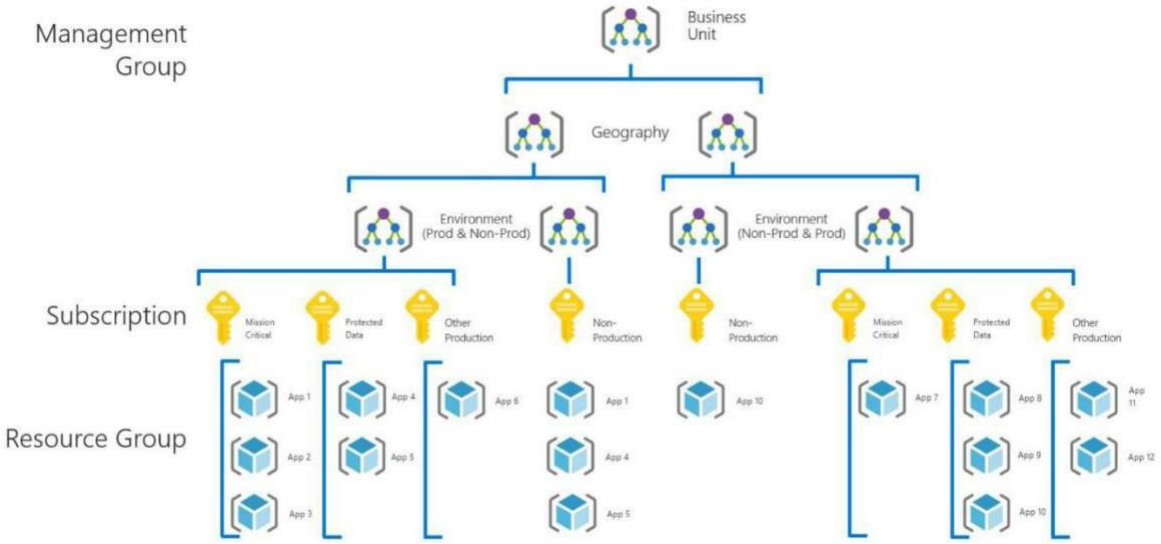
Azure services:



Big picture view of available azure services

Create an Azure account to get started:

You need an Azure membership in order to build and use Azure services. The majority of the time when you finish a Learn module, a temporary subscription is generated for you and it operates in a space called the Learn sandbox. You are free to generate additional subscriptions once you have established an Azure account.



Azure Subscription Structure

Cloud models

Public, private, and hybrid clouds are the three primary deployment models used in cloud computing.

When using the cloud, you should consider the unique qualities of each deployment method.

Public cloud

The general internet provides access to services for anyone looking to buy them. Cloud resources, such as servers and storage, are owned and managed by a third-party cloud service provider and then made available online.

Private cloud

A private cloud is made up of computing resources that are solely used by users from a single business or organisation. A private cloud may be physically located in your company's on-site (on-premises) datacenter or it may be hosted by a third-party service provider.

Hybrid Cloud

When data and applications can be shared between a public cloud and a private cloud, it creates a computing environment known as a hybrid cloud.

Some cloud computing advantages

• High availability: Depending on the service-level agreement (SLA) you choose, your cloud-based apps may provide a continuous user experience with no discernible downtime, even when things go wrong.

• Scalability: Cloud-based programmes may expand both horizontally and vertically. A horizontal scale would add instances of resources, such as VMs, to the configuration, whereas a vertical scale would add RAM or CPUs to a virtual machine.

• Elasticity: Cloud-based apps can be configured to employ autoscaling, guaranteeing they always have the resources they need.

• Agility: Quickly deploy and configure cloud-based resources as your app's needs change.

Your customers will always receive the best service if you distribute apps and data to local datacentres throughout the globe.

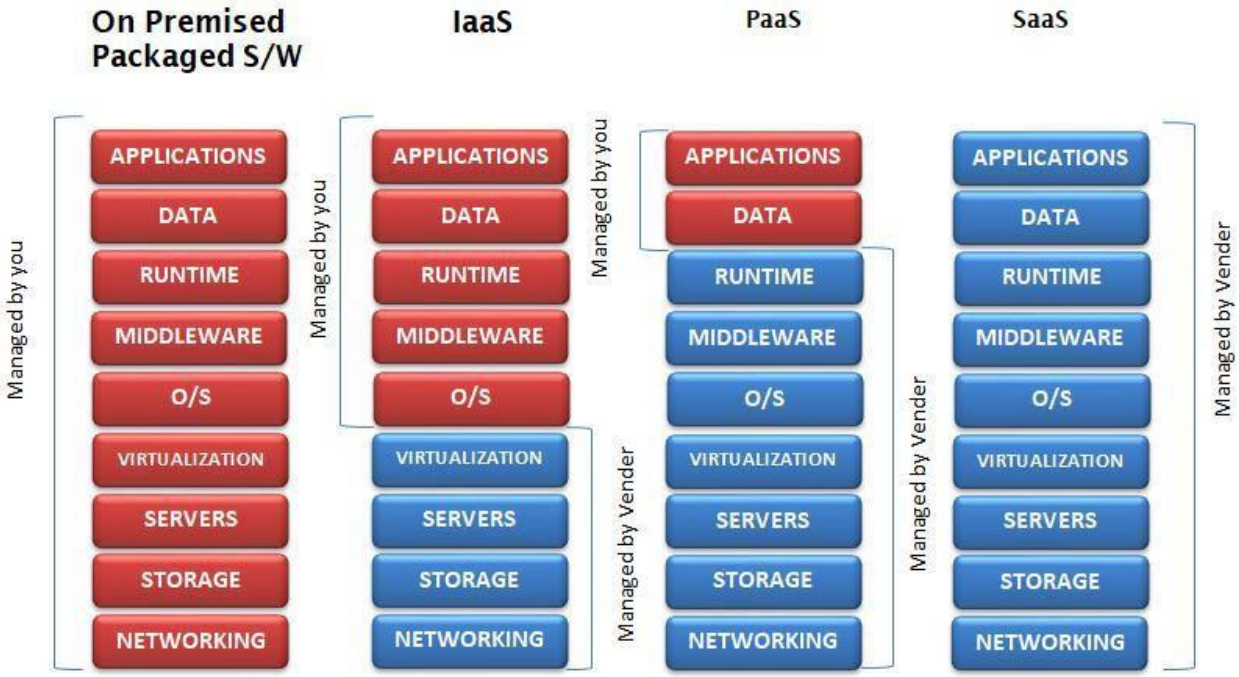
Operating costs versus capital expenses

There are two distinct categories of expenses to take into account:

Capital Expenditure (CapEx) is the initial outlay of funds for physical infrastructure, followed by ongoing maintenance progressively subtracting that initial expenditure. the value of the initial CapEx expense is reduced with time.

Operational Expenditure (OpEx) is the cost of purchasing current services or goods and being invoiced now for them. This expense qualifies for a tax deduction in the year it is incurred. As there is no upfront fee. As you utilise a service or good, you pay for it.

Cloud service model:



Service model comparison

WEEK-2

Core Azure architectural components

Azure regions, availability zones, and region pairs

Azure regions

A region is an area of the world that has one or more datacenters that are close to one another and linked by a low-latency network. To ensure that workloads are evenly dispersed, Azure controls and intelligently distributes resources across each region. One typical requirement for resources utilised in Azure is choosing the location where you want your resource to be deployed.

Azure availability zones

Availability zones are physically separate datacenters that are part of an Azure region. Each availability zone consists of one or more datacenters with independent power, cooling, and networking. An availability zone is set up as an isolation border. Even if one zone malfunctions, the other continues to function. Private, fast fiber-optic networks connect availability zones.

Azure region pairs

Each Azure region is linked with a neighbouring region that is at least 300 miles apart and located in the same geographic area (such as the US, Europe, or Asia). This method enables the replication of resources (such VM storage) across a geography, which lowers the possibility of interruptions brought on by

occurrences like natural disasters, armed conflict, power outages, or physical network outages that simultaneously affect both locations.

Azure resources, resource groups, and Azure Resource Manager

Azure resources

A thing that Azure can manage and makes available. Virtual machines (VMs), storage accounts, web applications, databases, and virtual networks are a few examples of resources.

Azure resource groups

A container for an Azure solution that contains relevant resources. Resources that you want to manage together are included in the resource group. According to what makes the most sense for your organisation, you select the resources that should be included in a resource group.

Azure Resource Manager

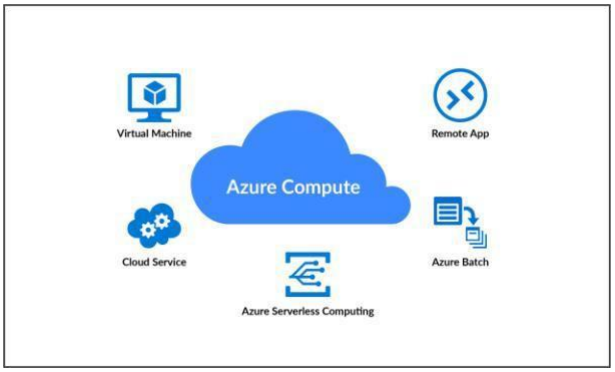
Azure Resource Manager is the name of Azure's deployment and management service. Using the management layer it provides, you can add, change, and remove resources in your Azure account. After deployment, you use management tools like locks, tags, and access control to organise and safeguard your resources.

Azure workload products

Azure compute services

Applications built for the cloud are run using an on-demand computing platform called Azure Compute. It provides computing resources like as networking, operating systems, discs, CPUs, and memory. The resources are often on demand and can be made available in a matter of minutes or even seconds. Only the resources you actually use and the time you actually utilise them are charged to you.

When it comes to running apps, growing your datacenter, and creating and testing new ones, Azure offers a number of computing alternatives. The service offers help for Linux, Windows Server, SQL Server, Oracle, IBM, and SAP. On Azure, there are also many virtual machine services available (VMs).

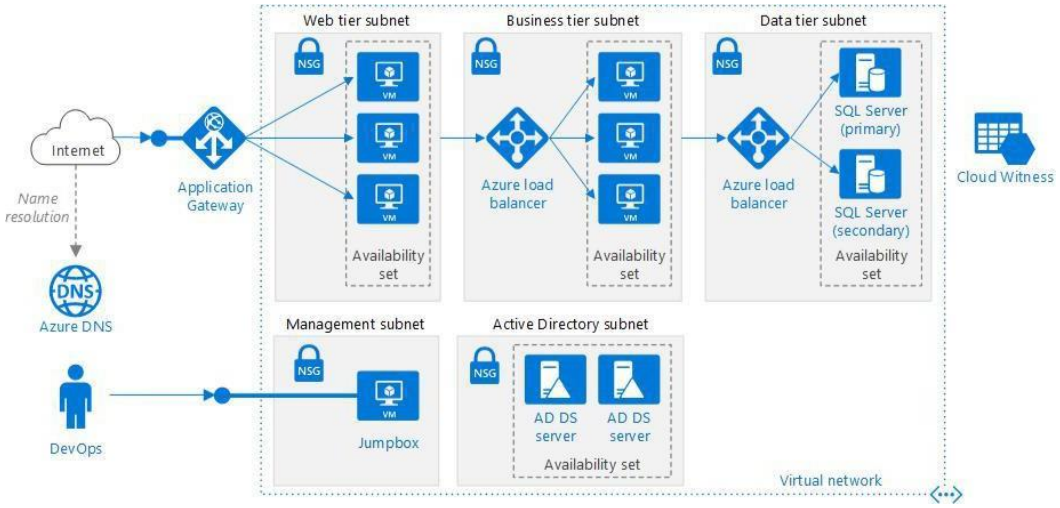


Azure compute services

Azure networking services

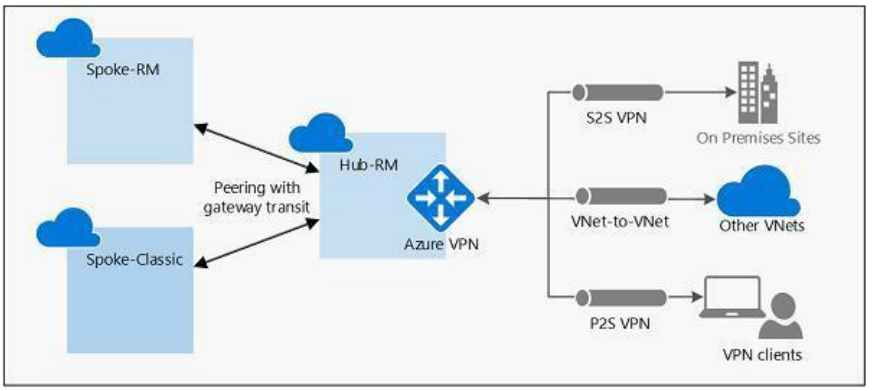
Azure Virtual Networking

Azure resources, including VMs, web apps, and databases, may connect with one other, with users online, and with your on-premises client devices thanks to Azure virtual networks. An Azure network is a collection of resources that connects other Azure resources.



Azure VPN Gateway

VPNs operate inside another network over an encrypted tunnel. They are generally used to establish connections between two or more trusted private networks over unreliable networks (typically the public internet). To guard against eavesdropping and other threats, traffic across the untrusted network is encrypted.



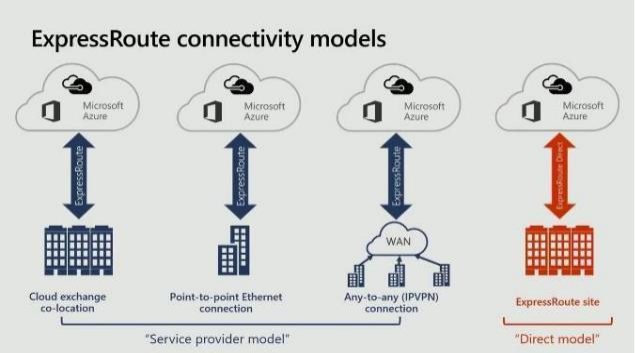
Deploying VPN Gateway

ExpressRoute

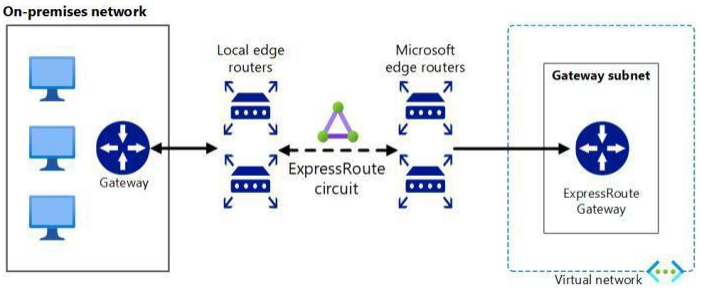
With the aid of a connectivity provider and ExpressRoute, you may expand your onpremises networks into the Microsoft cloud via a secure connection. You can

connect to Microsoft cloud services like Microsoft Azure and Microsoft 365 using ExpressRoute.

A point-to-point Ethernet network, an any-to-any (IP VPN) network, or a virtual cross-connection through a connectivity provider in a colocation facility are all options for connectivity. No connections to ExpressRoute use the open Internet. As a result, compared to standard Internet connections, ExpressRoute connections can provide superior levels of security, consistency, and reliability.



Express Route connectivity models

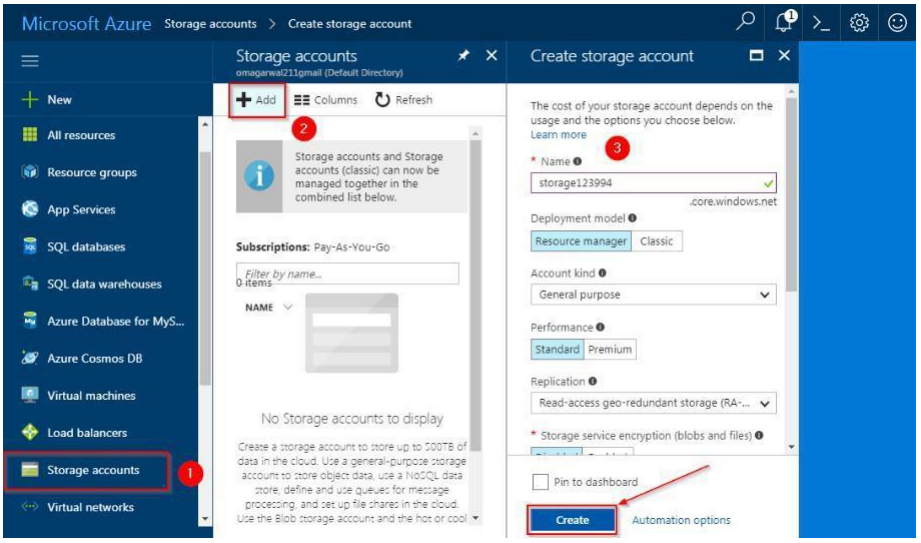


Express Route architecture

Azure storage services

Azure Storage can offer your business a range of alternatives for data storage. For instance, you discovered that setting up a storage account is the first thing you should do when using Azure Storage. Following that, Azure offers you a number of alternatives for storing your data, including:

- **Azure Blob Storage**
  An object storage option for the cloud is Azure Blob Storage. It can hold enormous volumes of textual or binary data. Because Azure Blob Storage is unstructured, there are no limitations on the types of data that can be stored there. Blob Storage is accessible from any location with an internet connection and has the capacity to handle thousands of simultaneous uploads, enormous volumes of video footage, and continuously expanding log files.
- **Azure Files Storage**
  Azure Files offers fully managed file shares in the cloud and is reachable via the popular Server Message Block and Network File System (preview) protocols. On-premises or cloud-based installations of Windows, Linux, and macOS can all concurrently mount Azure file shares. Applications running in Azure virtual machines or cloud services can mount a file storage share to access file data similarly to how a desktop programme would mount a typical SMB share.
- **Azure Disk Storage**
  Thanks to disc storage, discs are accessible to Azure virtual machines. Applications and other services can access and utilise these discs as necessary, just like in on-premises environments. Data from a linked virtual hard disc can be persistently stored and accessed with the help of disc storage.

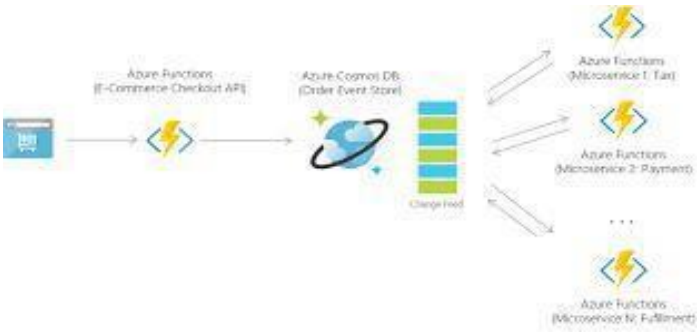


Creating Azure storage account

Azure database services

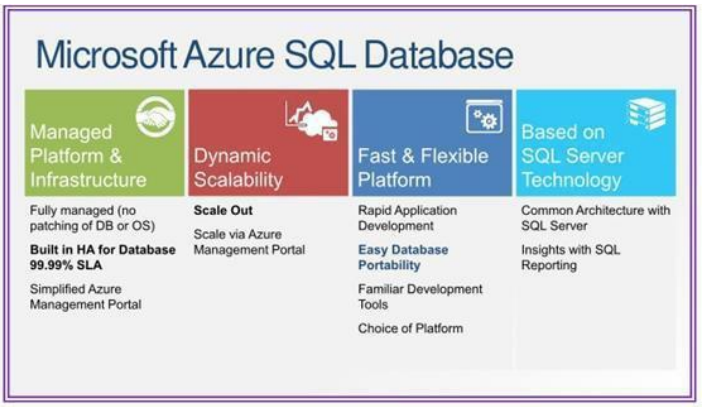
Azure Cosmos DB

A globally distributed, multi-model database service is called Azure Cosmos DB. Throughput and storage can be scaled independently and elastically across any number of Azure regions across the world. Use any of the numerous well-liked APIs to gain access to data quickly—in single-digit milliseconds. Comprehensive service level agreements for throughput, latency, availability, and consistency are provided by Azure Cosmos DB.



Azure SQL Database

Based on the most recent stable version of the Microsoft SQL Server database engine, Azure SQL Database is a relational database. A safe, high-performance, fully managed, and dependable database is SQL Database. It allows you to create websites and applications that are data-driven in the programming language of your choice without having to deal with infrastructure management.



Types of data stored on SQL Database

WEEK-3

Core solutions and management tools

Azure IoT services

Devices with these kinds of sensors and internet connectivity could communicate sensor readings to a particular endpoint in Azure via a message by utilising Azure IoT services. Data from the message is then gathered, collated, and turned into reports and alerts. Alternatively, by delivering software updates from Azure IoT services to each device, all devices might be updated with new firmware to repair bugs or provide new functionality.

Azure IoT Hub

The managed service Azure IoT Hub1 serves as a central messaging hub for two-way communication between your IoT application and the devices it manages. It is hosted in the cloud. Building IoT solutions with dependable and secure connections between millions of IoT devices and a cloud-hosted solution back end is possible with Azure IoT Hub. Almost any device can be connected to your IoT hub.

Azure Sphere

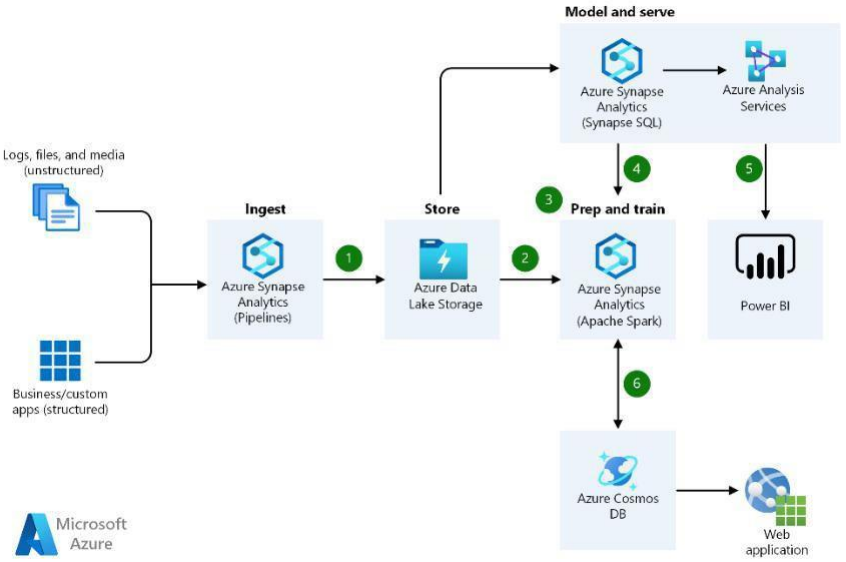
Customers can purchase an IoT solution from Azure Sphere3 that is endto-end, extremely secure, and includes everything from the hardware and operating system on the device to the safe way to send messages from the device to the messaging hub. For devices that are linked to the internet, Azure Sphere includes built-in security and communication functions.

Azure sphere MCU

Big data and analytics

There are many different forms and formats for data. Large amounts of data are what we mean when we talk about big data. This Tailwind Traders scenario involves the collection of data from the GPS sensors, including location data, data from weather systems, and data from numerous other sources that produce significant volumes of data. Making sense of and using this volume of data to inform decisions gets more and more difficult. Traditional methods of processing and analysis are no longer appropriate due to the volumes' size.

Over time, open-source cluster solutions have been created in an effort to handle these enormous datasets. In order to deliver big data and analytical solutions, Microsoft Azure provides a wide array of technologies and services, such as Azure Synapse Analytics, Azure HDInsight, Azure Databricks, etc.



Azure Synapse Analytics

It is an unrestricted analytics service that combines big data analytics and enterprise data warehousing. You can ask employing either serverless or provided, data on your terms scaled-down resources You have a single experience to take in, prepare for, and manage and serve data for machine learning and BI right now.

Azure HDInsight

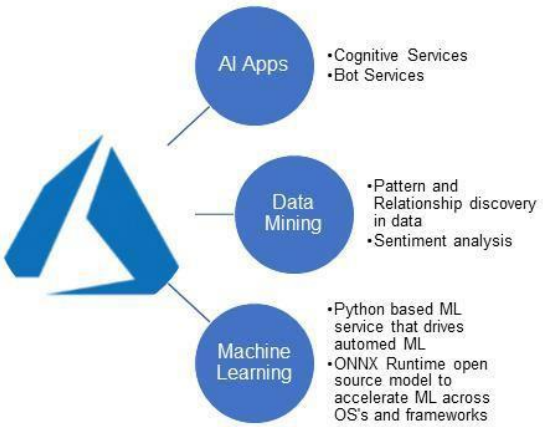
It is an open-source analytics service for businesses that is completely managed. It's a cloud service that enables processing enormous volumes of data simpler, faster, and more affordable. Popular open-source frameworks can be used, and cluster types like Apache Spark can be created.

Azure Data Lake Analytics

It is a business that provides on-demand analytics jobs for big data. To transform your data and extract insightful information, you write queries rather than deploying, configuring, and tweaking hardware. By adjusting the power dial to the appropriate level, the analytics service can rapidly tackle tasks of any size. This makes it more cost-effective because you only pay for your job while it is active.

AI service

AI is a broad category of computing that enables a software system to understand its surroundings and take actions that increase the likelihood that it will succeed in reaching its objectives. The development of software with self-adaptive or self-learning capabilities is one of the objectives of artificial intelligence (AI).



Azure Machine Learning

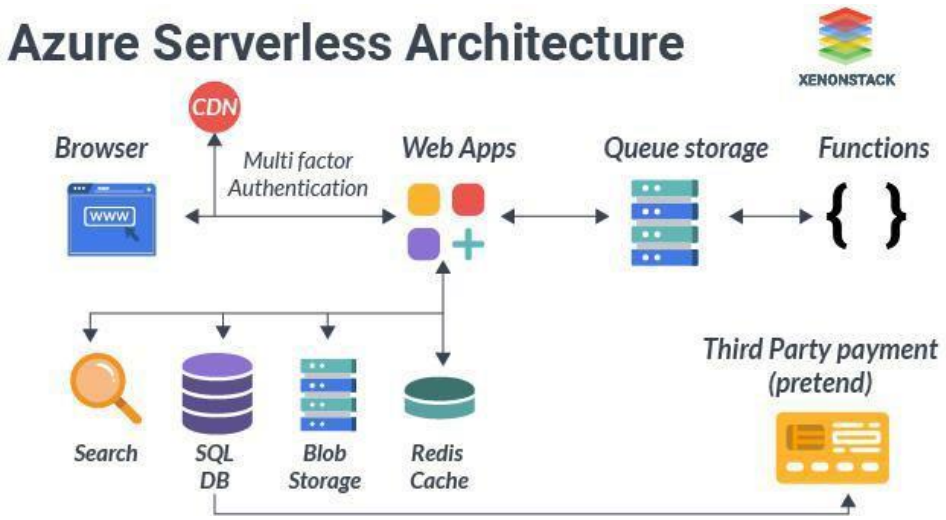
A platform for making predictions is Azure Machine Learning4. It contains of tools and services that let you connect to data to train and test models in search of the best accurate one that can forecast an outcome. You can deploy and use the model in real-time via a web API endpoint after you've conducted experiments to test it.

Azure Bot Service

The platforms Azure Bot Service and Bot Framework enable the development of virtual agents that comprehend inquiries and provide responses much like humans. In that it has a particular use case, Azure Bot Service is a little different from Azure Machine Learning and Azure Cognitive Services. In particular, it develops a virtual agent capable of intelligent human-to-human communication. The bot you create makes use of other Azure services, such as Azure Cognitive Services, in the background to comprehend the requests made by their human counterparts.

Azure serverless technology

A managed and setup execution environment is what is referred to as "serverless computing." By writing code or connecting and configuring components in a visual editor, you simply explain what you want to happen. You then specify the actions that activate your functionality, such as a timer or an HTTP request. The best part is that you never have to worry about an outage, your code can scale quickly to match demand, and you only pay for what is actually used.



Azure Functions

You can host a single method or function written in a well-known programming language in the cloud using the Azure Functions8 service, which executes in response to an event. An HTTP request, a fresh message in a queue, or a message on a timer are examples of events. Azure Functions' atomic nature allows for a wide range of uses in the design of applications.

Many popular programming languages, including C#, Python, JavaScript, Typescript, and PowerShell, can be used to create functions.

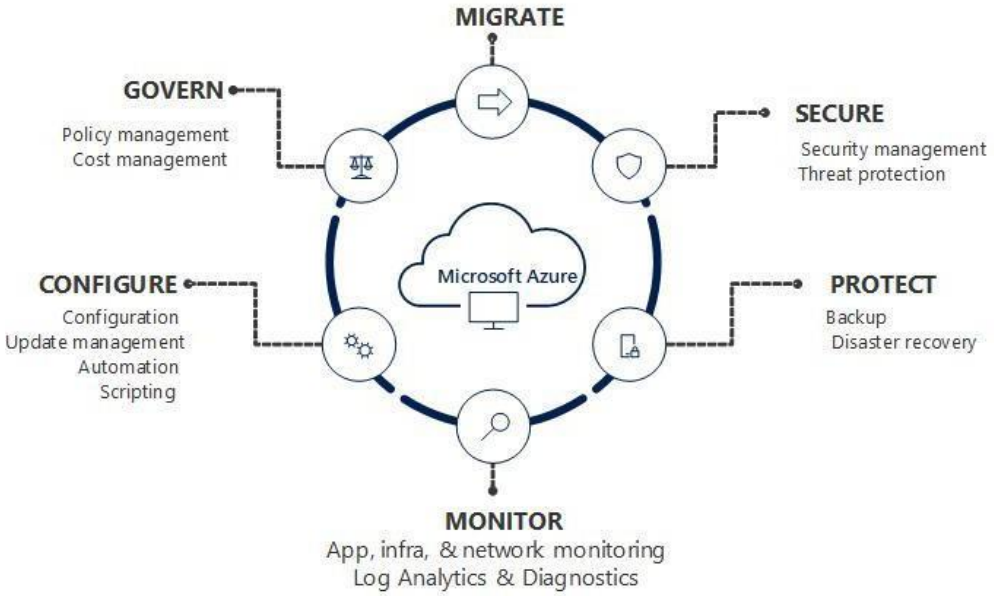
Azure Logic Apps

A low-code/no-code development platform offered as a cloud service is Logic Apps. When integrating apps, data, systems, and services across companies or organisations, the service aids you in automating and orchestrating tasks, business processes, and workflows. Whether you're building scalable solutions on-premises, in the cloud, or both, Logic Apps makes the process simpler. This solution addresses enterprise application integration (EAI), app integration, data integration, system integration, and business-to-business (B2B) integration.

Azure management tools

The Azure portal

Almost all of Azure's features may be accessed through the Azure portal, a web-based user interface. To view all the services you're using, add new services, customize your services, and check reports, you can use the user-friendly, graphical interface of the Azure site. Most users get their first taste of Azure through the Azure portal. But, as your use of Azure increases, you'll probably decide to manage it using a more repeatable code-centric strategy.



Azure mobile app

When you're not at your computer, the Azure mobile app gives iOS and Android users access to your Azure resources. You can use it to:

- Keep an eye on the wellbeing and status of your Azure resources.
- Examine for signals, swiftly identify and resolve problems, and restart a web application or virtual machine (VM).
- To manage your Azure resources, use the Azure CLI or Azure PowerShell commands.

Azure PowerShell

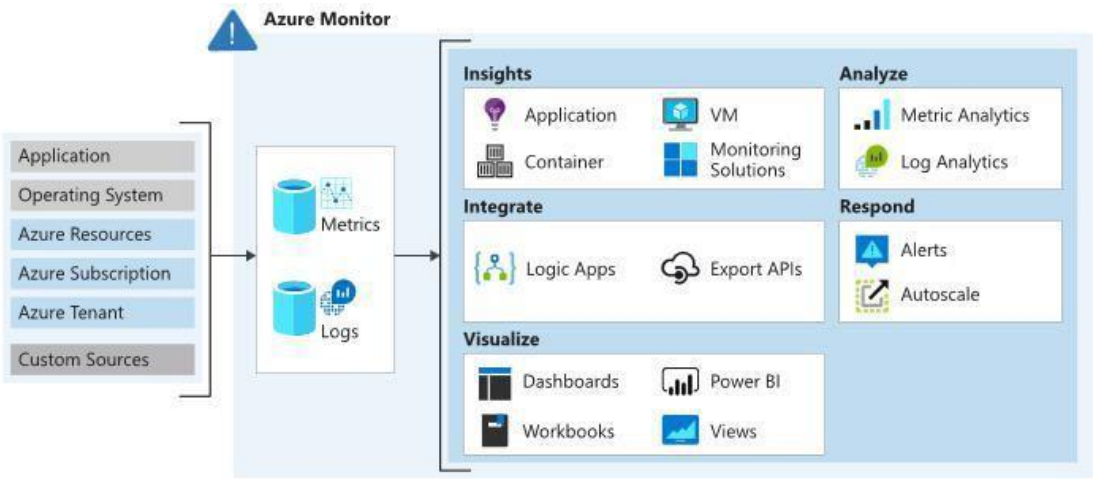
Developers, DevOps, and IT professionals can run commands called cmdlets with the Azure PowerShell shell. These instructions use the Azure Rest API to carry out every administration function conceivable in Azure. To orchestrate: The routine setup, teardown,

and maintenance of a single resource or many connected resources. The deployment of an entire infrastructure, which may contain dozens or hundreds of resources, from imperative code. The combination of Cmdlets into a script file and execution of that file**.**

The Azure CLI

An executable software called the Azure CLI command-line interface
allows a developer, DevOps expert, or IT professional to run Bash commands. To carry out any administrative function conceivable in Azure, the instructions make use of the Azure Rest API. For the routine setup, teardown, and maintenance of a single resource or a complete environment, you can run the commands individually or combine them into a script and execute them all at once.

Azure monitoring service



Azure monitor

Azure Advisor

Azure Advisor assesses your Azure resources and provides recommendations to help raise operational excellence, increase performance, reliability, and security, and cut costs. You can cut down on time spent on cloud optimization with the aid of advisor. You can immediately take, defer, or reject the recommended activities that are part of the recommendation service.

Azure Monitor

The platform Azure Monitor allows you to gather, examine, visualise, and maybe take action on metric and logging data from your complete on-premises and Azure environment.

Azure Service Health

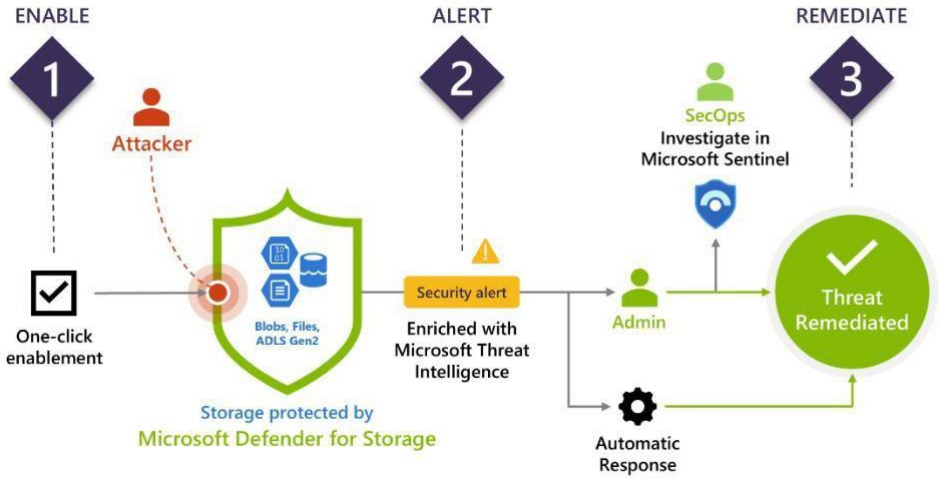
A personalised picture of the wellbeing of the Azure services, regions, and resources you use is offered by Azure Service Health. The complete picture is not given by the status.azure.com website, which only shows significant difficulties that broadly impact Azure customers. However, Azure Service Health shows both significant and smaller, more specific problems that you have. Although service problems are uncommon, it's always wise to be ready for anything. Alerts that aid in triaging outages and scheduled maintenance can be set up. Root cause analyses (RCAs), which Service Health produces as official incident reports following an outage, can be shared with stakeholders.

General security and network security features

A simple word for a big notion, security. There are a lot of things to take into account when protecting your data and apps. How can Azure help you defend the workloads you run in your on-premises data centre and the cloud.

Microsoft Defender for Cloud

A monitoring solution called Microsoft Defender for Cloud gives you visibility into the security status of all of your services, whether they are hosted on Azure or on-site. Security policies, controls, and your capacity to foresee, thwart, and respond to security threats are all referred to by the term "security posture."



Secure score

Security controls, or collections of connected security suggestions, provide the basis of the secure score. The percentage of security controls that you meet determines how well you perform. The higher the score, the more security controls you satisfy. When you

implement all of the suggestions for a particular resource within a control, your score goes up.

Respond to security alerts

Azure Logic Apps and Defender for Cloud connectors are used for workflow automation. A threat detection warning or a Defender for Cloud recommendation that has been filtered by name or severity can start the logic app. The logic app can then be set up to do an action, such sending an email or publishing a message on a Microsoft Teams channel.

Microsoft Sentinel

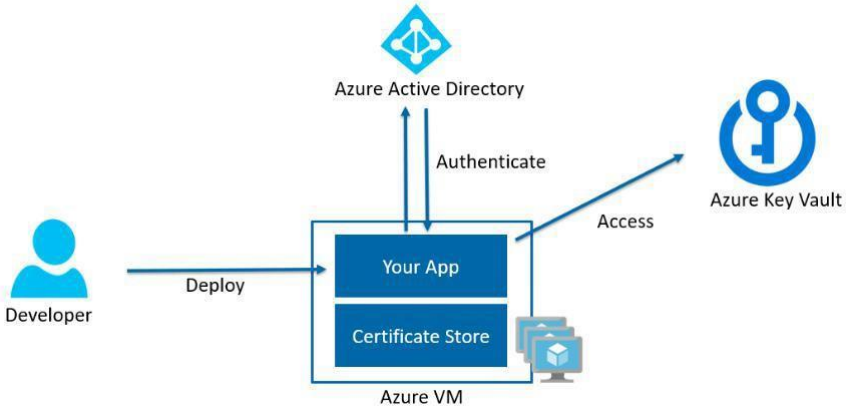
A dedicated security information and event management (SIEM) system can be useful for large-scale security management. If the sources of the security data can support an open-standard logging format, a SIEM system can combine security data from numerous sources. Additionally, it has danger detection and reaction capabilities.

The cloud-based SIEM system from Microsoft is called Sentinel. Threat analysis and intelligent security analytics are used.

Azure Key Vault

Passwords, encryption keys, and certificates, among other private data. An application needs to have access to this information in order to work, yet doing so could give someone else access to application data.

A centralised cloud solution called Azure Key Vault is used to keep all of an application's secrets in one place. By offering access control and logging features, it gives secure access to critical information.



Secure network connectivity

Defence in depth

Protection of information and preventing its theft by individuals without authorization are the goals of defence in depth.
A defence-in-depth approach employs a number of techniques to impede the progress of an attack that seeks to gain unauthorised access to data.
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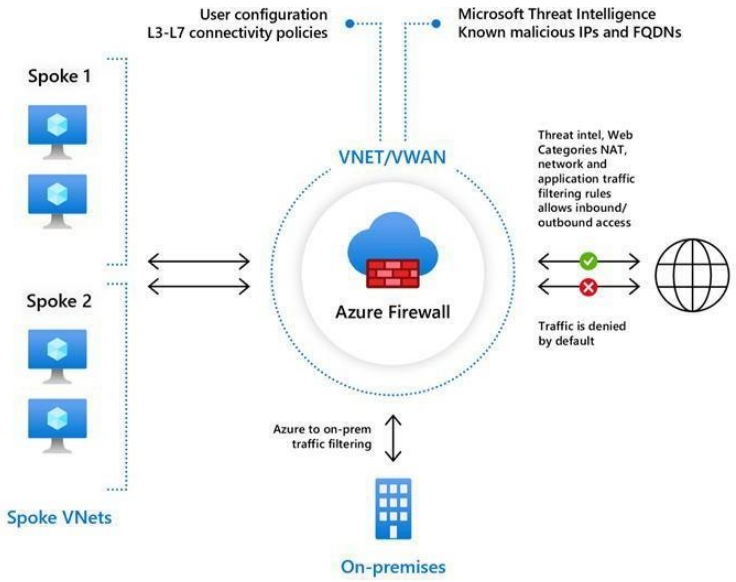
Network Security Groups

You can filter network traffic to and from Azure resources inside an Azure virtual network by using a network security group. NSGs can be compared to an internal firewall. You can filter traffic to and from resources by source and destination IP address, port, and protocol using an NSG's various incoming and outbound security rules.

Azure Firewall

A firewall is a type of network security device that keeps track of incoming and outgoing network traffic and makes decisions about which traffic to allow or deny in accordance with a set of security rules. Ranges of IP addresses can be specified in firewall rules. The destination server can only be accessed by clients who have been given IP addresses that fall within certain ranges. Additionally, particular network protocol and port details can be included in firewall rules.



Basic azure firewall implementation

Azure Distributed Denial of Service (DDoS) protection

Your Azure resources are protected from DDoS attacks with the aid of Azure DDoS Protection14 (Standard).
You can help give protection against DDoS attacks by integrating DDoS Protection with advised application design standards. Every Azure region now has access to DDoS mitigation capabilities thanks to DDoS Protection, which leverages the size and elasticity of Microsoft's global network. In order to prevent DDoS traffic from impairing the availability of your service, the DDoS Protection service analyses and filters it at the Azure network edge. This helps to safeguard your Azure applications.

WEEK-4

Identity, governance, privacy, and compliance features

Authentication and Authorization

The process of confirming a person's or service's identity who wants to access a resource is known as authentication. It entails asking a person to prove that they have the proper credentials, and it serves as the cornerstone for developing an identity and access control security concept. It determines if the user is who they claim to be.

The process of determining what level of access an authenticated person or service has is called authorisation. Authentication establishes the user's identity. It details the data they can access and the actions they can take with it.

Authentication v/s Authorization

Azure Active Directory

Active Directory on Windows Server offers an identity and access management service for on-premises systems that is controlled by your own business. Microsoft's identity and access management service is based in the cloud and called Azure AD. You have control over the identity accounts using Azure AD, but Microsoft makes sure the service is accessible worldwide. You will be accustomed to using Azure AD if you have experience with Active Directory.

Microsoft does not track sign-in attempts when using Active Directory to secure identities on-premises. Microsoft can defend you by free of charge identifying suspicious sign-in attempts when you integrate Active Directory with Azure AD. Azure AD, for instance, may identify sign-in attempts coming from strange places or devices.

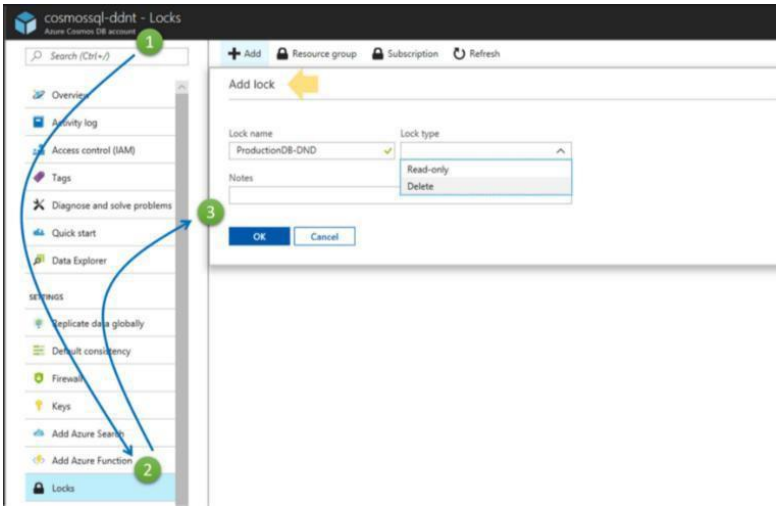
Azure Governance Methodologies

Azure RBAC

Giving users access to only the resources that are necessary for them to do their jobs is a solid security practise. Azure allows you to manage access with role-based access control3 rather than specifying the specific access requirements for each user and then updating access requirements whenever new resources are generated (Azure RBAC). Built-in roles in Azure specify standard access policies for cloud resources. You can establish your own responsibilities as well. There are certain access rights for each role that are related to that role. All of the accompanying access permissions are granted to the people or groups you assign to one or more roles.

Resource locks

An asset lock stops resources from being unintentionally altered or removed. There is still a chance that someone with the appropriate level of access could destroy crucial cloud resources even with Azure role-based access control (Azure RBAC) regulations in place. A resource lock serves as a system to alert you that a resource shouldn't be deleted or modified.



Managing resource locks

Tags

Including relevant resources in separate subscriptions is one approach to arrange them. Resource groupings can be used to organise related resources. Another method of organising resources is through resource tags. Tags offer additional metadata, or information, about your resources.

Azure Policy

You may create, assign, and administer policies that regulate or audit your resources using the Azure Policy service. Your resource configurations are subject to a variety of rules and effects enforced by these policies, ensuring that they continue to adhere to company standards.

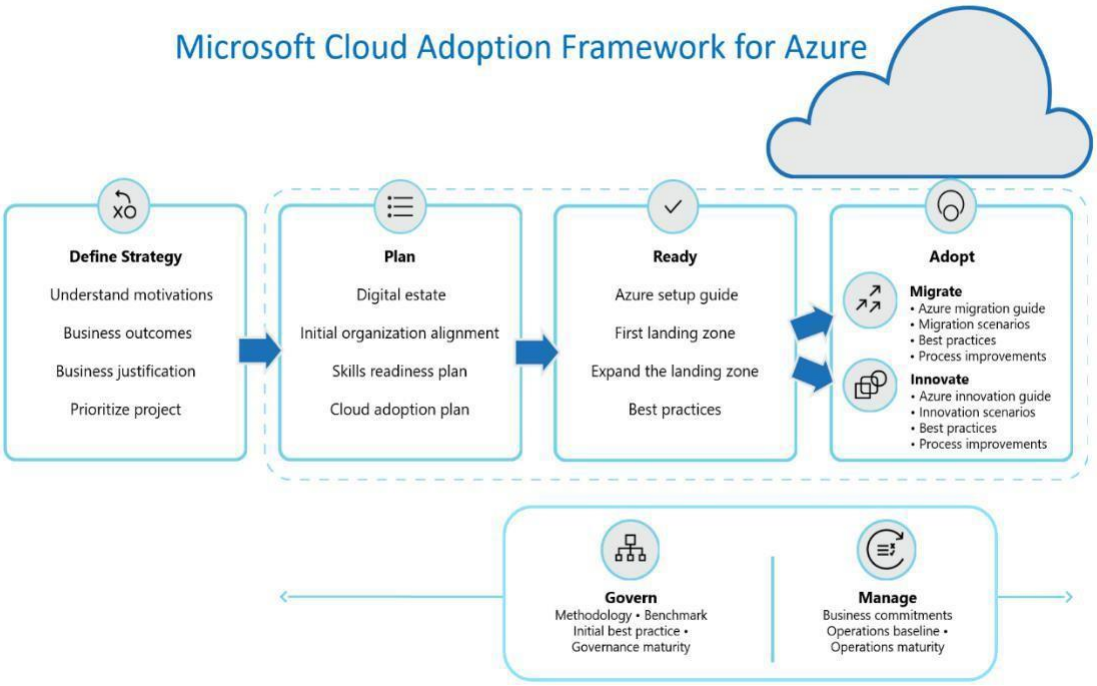
Cloud Adoption Framework for Azure

You may get tested advice for your cloud adoption journey from the Cloud Adoption Framework for Azure. The Cloud Adoption Framework assists you in developing and putting into practise the business and technological strategies required for cloud success.

Stages of Cloud adoption framework

1. Define your strategy.
2. Make a plan.
3. Ready your organization.
4. Adopt the cloud.
5. Govern and manage your cloud environments

6.



Microsoft Cloud Adoption Framework

Create a subscription governance strategy

Billing

Per subscription, one billing report may be created. Organizing subscriptions by department or project is one option if you need to "chargeback" cloud fees across various departments. Resource tags are also beneficial. Later in this

module, you'll learn about tags. Consider your internal billing needs when deciding how many subscriptions you need and what to call them.

Access control

A deployment limit for Azure resources is a subscription. Each subscription has a tenant in Azure Active Directory attached to it. Using Azure role-based access control, each tenancy offers administrators the opportunity to specify granular access through specific roles.

The deployment boundary factor should be taken into account while designing your subscription architecture. Do you, for instance, require different subscriptions for development and production environments? You can isolate their resources from one another and regulate access to each independently using different subscriptions.

Subscription limits

Additionally, subscriptions have some resource restrictions. For instance, each subscription can have a maximum of 10 network Azure ExpressRoute circuits.

Those constraints ought to be taken into account when you design. You might need to add more subscriptions if you need to go over those restrictions. There is no room for expansion after you reach the hard limit maximum.

Additionally, management teams are accessible to help with subscription management. A management group oversees compliance, policies, and access for various Azure subscriptions.

Privacy, compliance, and data protection standards

Compliance terms and requirements

The foundation of Microsoft's online services is a shared set of compliance and regulatory controls. Consider a control as a tested, reliable benchmark that you can use to assess your solution's security. These controls adhere to current regulations and change as new requirements are implemented.

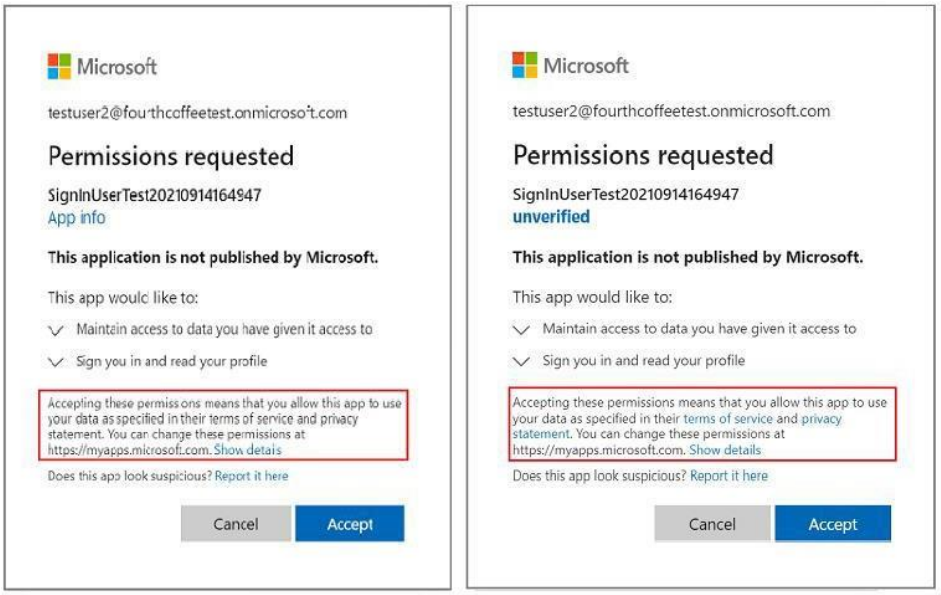
Compliance categories

Microsoft Privacy Statement, the Online Services Terms, and the Data Protection Addendum

Microsoft Privacy Statement

What personal data Microsoft collects, how it uses it, and why are all described in the Microsoft Privacy Statement. All of Microsoft's services, websites, applications, software, servers, and gadgets are covered by the privacy statement.

This list includes items like enterprise and server solutions, home-use gadgets, and educational software for students.



Privacy statement and terms of service have not been provided

Privacy statement and terms of service have been provided

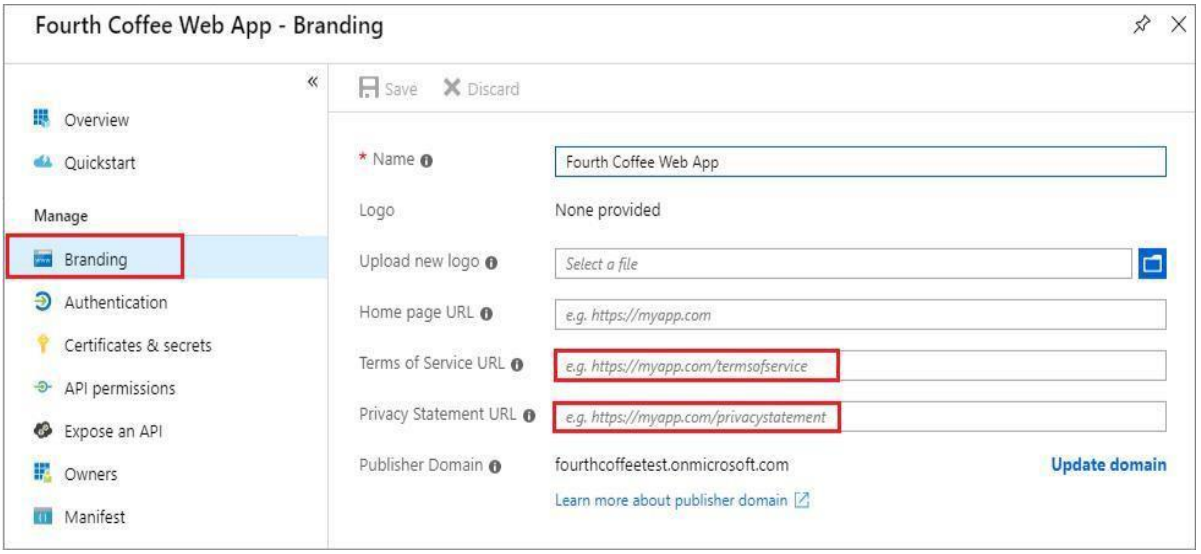
Online Services Terms

A contract between Microsoft and the consumer is known as the Online Services Terms (OST). The OST outlines each party's responsibilities for the processing and security of customer and personal data. The OST especially applies to Microsoft's subscription-based online services, such as Azure, Dynamics 365, Office 365, and Bing Maps.

Data Protection Addendum

The conditions for data processing and security for online services are further defined in the Data Protection Addendum (DPA). Among these are: Adherence to legal requirements.

- Publication of processed data.
- Data Security, which covers security procedures and guidelines, data encryption, data access, client obligations, and audits compliance.
- Transfer, storage, and erasure of data



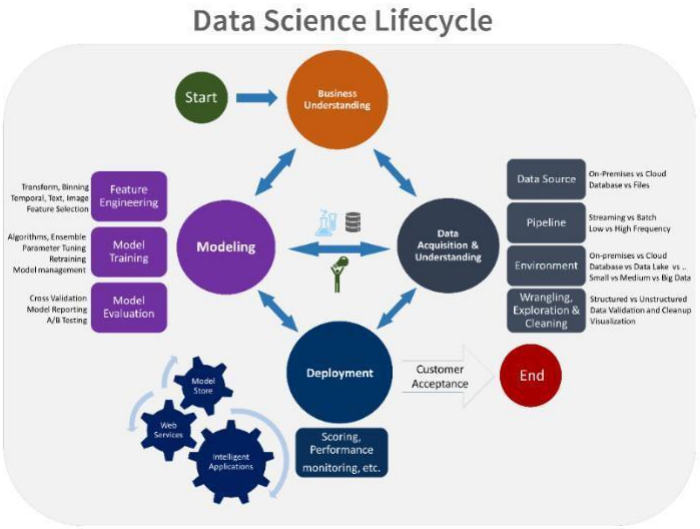
Azure pricing and lifecycle

Types of Azure subscriptions

- No-cost trial With a free trial subscription, you may take advantage of more than 25 always-free services, 12 months of well-known free services, and a 30-day credit to try any Azure service. Unless you switch to a paying subscription, your Azure services are disabled when the trial period expires or when your credit runs out for paid items.

- Pay as you go With a pay-as-you-go subscription, you can charge your credit or debit card to your account and only pay for the services you actually use. Organizations can apply for prepaid billing and volume savings.

- Member deals You may already have credits for your Azure account and discounted prices on Azure services thanks to your participation in certain Microsoft products and services. For instance, subscribers of Visual Studio can get member offers.



Factors affecting cost

Resource type

The price of Azure resources is influenced by a number of variables. They vary depending on the resource's type or degree of customization. Using a storage account as an illustration, you can provide a type (such as block blob storage or table storage), a an access tier, a performance tier (either standard or premium) (hot, cool, or archive). These choices present various expenses

Usage meters

Azure adds metres to detect resource utilisation when you provide a resource. These metres are utilised by Azure to create a record of usage that is later used to assist in determining your charge.

Usage metres might be compared to how you use water or energy in your house. Even while you may pay a flat rate each month for your energy or water service, the actual amount you pay depends on how much you used overall.

Resource usage

You are always charged for what you use in Azure. Let's see how this billing works when dealing with VM deallocation as an example.

A VM can be deleted or relocated in Azure. You can stop using a virtual machine by deleting it. Your subscription is terminated, and the virtual machine is then set up for another user.

A virtual machine (VM) that has been deallocated is no longer active. However, the corresponding hard drives and data are still stored in Azure. The fees related to compute time or the VM's IP address are not generated because the VM is not assigned to a CPU or network in Azure's datacenter. Because the resource is still available under your Azure subscription, the discs and data are still saved

Total Cost of Ownership Calculator

The TCO Calculator enables you to calculate the cost savings over time associated with running your solution on Azure as opposed to your on-premises datacenter. In finance, the phrase total cost of ownership is frequently used. Finding all the hidden costs can be challenging pertaining to running a technical capability on-site.

Hardware and software licencing are additional costs.

You insert the specifics of your on-premises workloads into the TCO Calculator. Next, you examine the suggested cost (which you can modify) for relevant operational costs based on the industry average. These prices consist of electrical power, network upkeep, and IT tasks. After that, a side-by-side report is given to you. With that you may contrast such expense with the equivalent workloads running on Azure in the report.

Azure SLAs and service lifecycles

An official contract between a service provider and the client is known as a servicelevel agreement (SLA). This Agreement establishes Microsoft's performance commitments to you, the client, for Azure. You will learn more about Azure SLAs in this section, including why SLAs are crucial, how to locate the SLA for a particular Azure service, and what to expect from a typical SLA.