Universal concepts in Cloud Computing

What is cloud computing?

Cloud computing is the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet ("the cloud") to offer faster innovation, flexible resources, and economies of scale.

You typically pay only for cloud services you use, helping you lower your operating costs, run your infrastructure more efficiently, and scale as your business needs change.

On-demand delivery of compute, database, storage, application and other IT resources through a cloud service platform via internet with pay-as-you-go pricing.

Cloud services also expand the traditional IT offerings to include things like Internet of Things (IoT), machine learning (ML), and artificial intelligence (AI).

In short, the cloud is the Internet, and cloud computing is techspeak that describes software and services that run through the Internet (or an intranet) rather than on private servers and hard drives.

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How cloud computing works

The cloud is basically a decentralized place to share information through satellite networks.

Every cloud application has a host, and the hosting company is responsible for maintaining the massive data centers that provide the security, storage capacity and computing power needed to maintain all of the information users send to the cloud.

These hosting companies can sell the rights to use their clouds and store data on their networks, while also offering the end user an ecosystem that can communicate between devices and programs (for example, download a song on your laptop and it's instantly synced to the music app on your iPhone).

Cloud computing differs from traditional IT hosting services in that the consumer (whether that's a business, organization, or individual user) generally doesn't own the infrastructure needed to support the programs or applications they use.

Instead, those elements are owned and operated by a third party, and the end-user pays only for the services they use.

In other words, cloud computing is an on-demand, utility-based model of computing.

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Characteristics of cloud computing

On-demand self-service : Users can access computing services via the cloud when they need to without interaction from the service provider.

The computing services should be fully on-demand so that users have control and agility to meet their evolving needs.

Broad network access : Cloud computing services are widely available via the network through users' preferred tools (e.g., laptops, desktops, smartphones, etc.)

Resource pooling : One of the most attractive elements of cloud computing is the pooling of resources to deliver computing services at scale.

Resources, such as storage, memory, processing, and network bandwidth, are pooled and assigned to multiple consumers based on demand.

Rapid elasticity : Successful resource allocation requires elasticity.

Resources must be assigned accurately and quickly with the ability to absorb significant increases and decreases in demand without service interruption or quality degradation.

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Cloud service models

Cloud solutions come in three primary service models:

Infrastructure as a Service (IaaS),Platform as a Service (PaaS), and Software as a Service (SaaS).

IaaS : IaaS gives users access to storage, networking, servers, and other computing resources via the cloud.

While the user is still responsible for managing their applications, data, middleware, etc., IaaS provides automated and scalable environments that provide a high degree of control and flexibility for the user.

For example, many businesses use IaaS to support workload spikes during busy seasons (like holidays).

Popular IaaS providers include:

- Amazon Web Services (AWS)

- Microsoft Azure

- Google Compute Engine (GCE), the IaaS component of Google Cloud Platform (GCP)

PaaS : This service layer is primarily geared towards developers and operations professionals.

Service providers rent out cloud-based platforms for users to develop and deliver applications.

In other words, PaaS provides a framework that makes it easier and more efficient to build, customize, and deploy applications.

SaaS : Cloud application services are the most well-known of the cloud service models. The software is hosted, packaged, and delivered by a third party through the Internet (typically on a browser-based interface).

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Types of cloud computing

There are three main cloud service options: private, public, and hybrid clouds.

Each has its own advantages and disadvantages and which one you (or your business) choose will depend on your data as well as the level of security and management you need.

Public : A public cloud is probably the most commonly understood cloud computing option. This is where all the services and supporting infrastructure are managed off-site over the Internet and shared across multiple users (or tenants).\

A good example of a public cloud at the individual consumer level is a streaming service like Netflix or Hulu. Users subscribe to the service through an individual account but access the same services across the platform through the Internet.

Private : A private cloud provides IT services through the Internet or a private network to select users, rather than to the general public.

Instead of having multiple tenants, like a public cloud does, a private cloud typically has only one tenant. All the data is protected behind a firewall.

Hybrid : A hybrid cloud environment combines both private and public cloud elements to varying degrees.

Despite operating independently, the clouds in a hybrid environment communicate over an encrypted connection and allow for the portability of data and applications.

Benefits of using the cloud for your business

There are many potential advantages to adopting cloud-based solutions for your business. Depending on your business and data needs, migrating to a cloud environment can result in the following benefits:

Cost savings : Although the initial price tag for migrating to the cloud can give some businesses sticker shock, there are attractive opportunities for ROI and cost savings.

Operating on the cloud typically means adopting a pay-as-you-go model, which means you no longer have to pay for IT you're not using (whether that's storage, bandwidth, etc.).

Reliability : A managed cloud platform is generally much more reliable than an in-house IT infrastructure, with fewer instances of downtime or service interruptions.

Most providers offer 24/7 support and over 99.9% availability.

With backups for their backups, you can rest assured your data and applications will be available whenever you need them.

Mobility : The cloud brings a level of portability unheard of with traditional IT delivery.

By managing your data and software on the cloud, employees can access necessary information and communicate with each other whenever and wherever they want from their laptop, smartphone, or other Internet-connected devices.

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Overview of Azure and available services

What is Azure?

The Azure cloud platform is more than 200 products and cloud services designed to help you bring new solutions to life—to solve today's challenges and create the future.

Build, run and manage applications across multiple clouds, on-premises and at the edge, with the tools and frameworks of your choice.

Trust your cloud : Get security from the ground up, backed by a team of experts and proactive compliance trusted by enterprises, governments and startups.

Operate hybrid seamlessly : On-premises, across multiple clouds and at the edge—we will meet you where you are. Integrate and manage your environments with services designed for hybrid cloud.

Build on your terms : With a commitment to open source and support for all languages and frameworks, build how you want and deploy where you want to.

Be future-ready : Continuous innovation from Microsoft supports your development today and your product visions for tomorrow.

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How Azure can help in business?

Capital less: We don't have to worry about the capital as Azure cuts out the high cost of hardware. You simply pay as you go and enjoy a subscription-based model that's kind to your cash flow.

Also, setting up an Azure account is very easy. You simply register in Azure Portal and select your required subscription and get going.

Less Operational Cost: Azure has a low operational cost because it runs on its servers whose only job is to make the cloud functional and bug-free, it's usually a whole lot more reliable than your own, on-location server.

Cost Effective: If we set up a server on our own, we need to hire a tech support team to monitor them and make sure things are working fine.

Also, there might be a situation where the tech support team is taking too much time to solve the issue incurred in the server. So, in this regard is way too pocket-friendly.

Easy Back-Up and Recovery options: Azure keeps backups of all your valuable data. In disaster situations, you can recover all your data in a single click without your business getting affected.

Cloud-based backup and recovery solutions save time, avoid large up-front investments and roll up third-party expertise as part of the deal.

Easy to implement: It is very easy to implement your business models in Azure. With a couple of on-click activities, you are good to go.

Better Security: Azure provides more security than local servers. Be carefree about your critical data and business applications.

As it stays safe in the Azure Cloud. Even, in natural disasters, where the resources can be harmed, Azure is a rescue. The cloud is always on.

Work from anywhere:

Azure gives you the freedom to work from anywhere and everywhere. It just requires a network connection and credentials.

And with most serious Azure cloud services offering mobile apps, you're not restricted to which device you've got to hand.

Increased collaboration:

With Azure, teams can access, edit and share documents anytime, from anywhere. They can work and achieve future goals hand in hand.

Another advantage of Azure is that it preserves records of activity and data.

Timestamps are one example of Azure's record-keeping.

Timestamps improve team collaboration by establishing transparency and increasing accountability.

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Microsoft Azure Services

Compute: Includes Virtual Machines, Virtual Machine Scale Sets, Functions for serverless computing, Batch for containerized batch workloads, Service Fabric for Microservices and container orchestration, and Cloud Services for building cloud-based apps and APIs.

Networking: With Azure, you can use a variety of networking tools, like the Virtual Network, which can connect to on premise data centers; Load Balancer; Application Gateway; VPN Gateway; Azure DNS for domain hosting, Content Delivery Network, Traffic Manager, ExpressRoute dedicated private network fiber connections; and Network Watcher monitoring and diagnostics

Storage: Includes Blob, Queue, File, and Disk Storage, as well as a Data Lake Store, Backup, and Site Recovery, among others.

Web + Mobile: Creating Web + Mobile applications is very easy as it includes several services for building and deploying applications.

Containers: Azure has a property that includes Container Service, which supports Kubernetes, DC/OS or Docker Swarm, and Container Registry, as well as tools for Microservices.

Databases: Azure also included several SQL-based databases and related tools.

Data + Analytics: Azure has some big data tools like HDInsight for Hadoop Spark, R Server, HBase, and Storm clusters.

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Azure Services Customer Case Studies

Daimler embraces the cloud to innovate faster :

Daimler AG, one of the world's largest manufacturers of premium cars and trucks, is driving hard to be a key player in software.

To speed up software development and thus innovation, Daimler uses Microsoft Azure DevTest Labs.

By developing in Azure, the company can onboard developers in hours versus weeks, get new ideas underway faster, and attract top talent with a state-of-the-art development environment.

Swedish tooling solutions company upgrades decade-old architecture to Azure, analyzes data with Power BI :

Sandvik uses Azure Cosmos DB to build a reactive data platform and for features such as autopilot, change feed, and bulk uploads.

Using features like autopilot allows for adjusting the large amounts of telemetry data emitted from components without having to redesign tables.

Azure Data Factory is used as an orchestration engine for keeping track of data flows and sourcing up or triggering Azure Functions.

Sandvik Coromant uses Data Factory in a modern way that allows it to break things down into modules to make it easier to make changes to the solution.

Azure Services Customer Case Studies

Swedbank migrates big data platform to Azure Cloud for enhanced security and scalability:

Swedbank is a multinational bank with a 200-year history. Recently, the company took the bold decision to migrate its big data platform to the cloud in search of greater scalability and security.

With Azure Databricks functioning at the core of this solution, the successful migration has brought the bank a wealth of benefits.

From reduced time-to-market and cost savings to significant improvements in its ability to detect fraud – it has set the bank and its 7.7 million customers on course for a more secure future.

Data is ingested from various different sources and flows into the Azure Data Lake, where the data is cleansed and modeled. The Data Lake is also the primary service for hosting of all data.

It's then processed via Databricks, which is the core of all computation.

Swedbank is already enjoying real-world benefits thanks to the migration. The goal of the migration was to decrease time to market while increasing scalability, resilience and availability.

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Data storage in Azure

Introduction to Azure Storage

- The Azure Storage platform is Microsoft's cloud storage solution for modern data storage scenarios.

- Azure Storage offers highly available, massively scalable, durable, and secure storage for a variety of data objects in the cloud.

- Azure Storage data objects are accessible from anywhere in the world over HTTP or HTTPS via a REST API.

- Azure Storage also offers client libraries for developers building applications or services with .NET, Java, Python, JavaScript, C++, and Go.

- Developers and IT professionals can use Azure PowerShell and Azure CLI to write scripts for data management or configuration tasks.

- The Azure Storage platform is Microsoft's cloud storage solution for modern data storage scenarios.

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Benefits of Azure Storage

Azure Storage services offer the following benefits for application :

- **Durable and highly available :** Redundancy ensures that your data is safe in the event of transient hardware failures.

- **Secure :** All data written to an Azure storage account is encrypted by the service. Azure Storage provides you with fine-grained control over who has access to your data.

- **Scalable :** Azure Storage is designed to be massively scalable to meet the data storage and performance needs of today's applications.

- **Managed :** Azure handles hardware maintenance, updates, and critical issues for you.

- **Accessible :** Data in Azure Storage is accessible from anywhere in the world over HTTP or HTTPS.

Example scenarios for Azure Storage services

Azure Files :

- You want to "lift and shift" an application to the cloud that already uses the native file system APIs to share data between it and other applications running in Azure.

- You want to replace or supplement on-premises file servers or NAS devices.

- You want to store development and debugging tools that need to be accessed from many virtual machines.

Azure Blobs:

- You want your application to support streaming and random access scenarios.

- You want to be able to access application data from anywhere.

- You want to build an enterprise data lake on Azure and perform big data analytics.

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Azure Files and Azure File Sync customer case studies

Azure Files AI model training use case : To interpret and contextualize seafloor health, a team of marine environmental scientists and analysts stored an extensive collection of images in Azure Files to use for building and training a crucial AI model.

Azure Files NFS for SAP use case : A global insurance company runs one of the largest SAP deployments in Europe, which it historically managed on its own private cloud. As the company continued to grow, its on-premises hardware resources became increasingly scarce.

To improve scalability and performance, the company moved its SAP environment to Azure, using Azure Virtual Machines and Azure Disk Storage.

Azure File Sync collaboration use case : A sportswear brand was looking for ways to elevate the speed and ease of collaboration across different locations.

The company used Azure File Sync along with Azure Virtual WAN to get the best of both worlds: an on-premises performance cache for local users, plus cloud scale and worldwide syncing.

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Azure Data Storage Labs

How to create an SMB Azure file share and connect it to a Windows VM using the Azure portal :

https://learn.microsoft.com/en-us/azure/storage/files/storage-files-quick-create-use-windows

Create an NFS Azure file share and mount it on a Linux VM using the Azure portal :

https://learn.microsoft.com/en-us/azure/storage/files/storage-files-quick-create-use-linux

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Azure Blob Storage

What is Azure Blob Storage?

Azure Blob Storage is Microsoft's object storage solution for the cloud. Blob Storage is optimized for storing massive amounts of unstructured data.

Unstructured data is data that doesn't adhere to a particular data model or definition, such as text or binary data.

Blob Storage is designed for:

- Serving images or documents directly to a browser.

- Storing files for distributed access.

- Streaming video and audio.

- Writing to log files.

- Storing data for backup and restore, disaster recovery, and archiving.

- Storing data for analysis by an on-premises or Azure-hosted service.

Users or client applications can access objects in Blob Storage via HTTP/HTTPS, from anywhere in the world. Objects in Blob Storage are accessible via the Azure Storage REST API, Azure PowerShell, Azure CLI, or an Azure Storage client library.
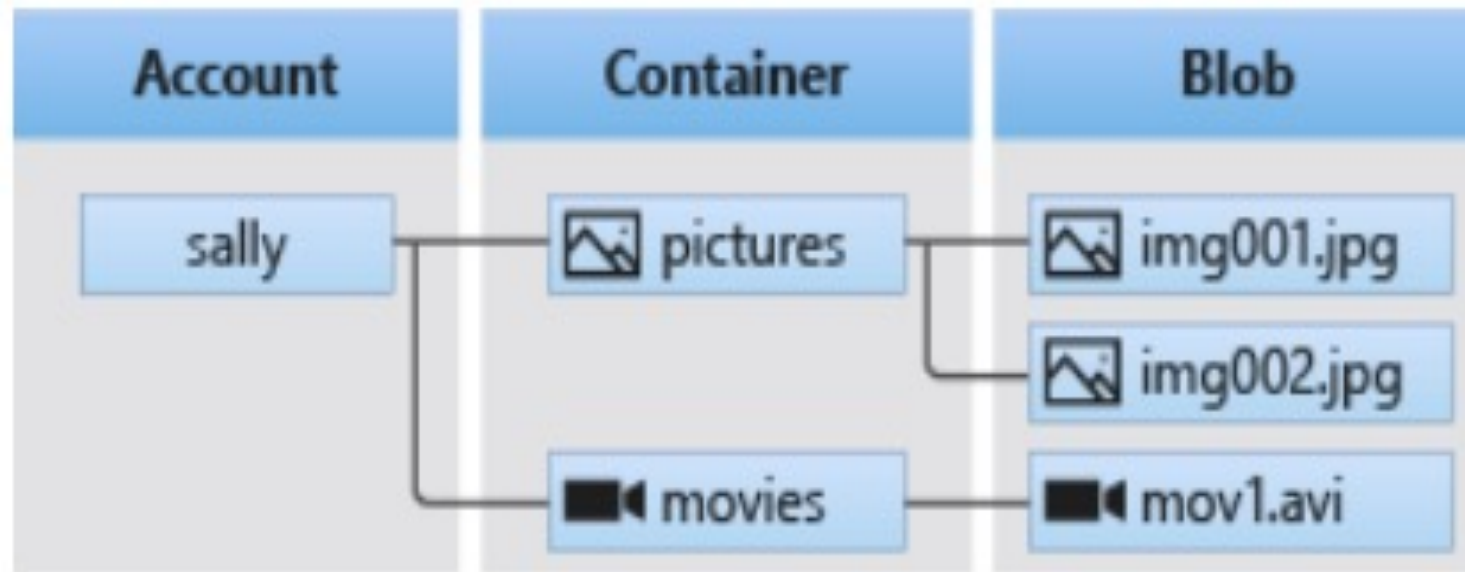
Client libraries are available for different languages, including: .NET, Java, Node.js, Python, Go.

Blob Storage resources

Blob Storage offers three types of resources:

- The **storage account**

- A **container** in the storage account

- A **blob** in a container

The following diagram shows the relationship between these resources :

Azure Blobs

Azure Storage supports three types of blobs:

- **Block blobs** store text and binary data. Block blobs are made up of blocks of data that can be managed individually. Block blobs can store up to about 190.7 TiB.

- **Append blobs** are made up of blocks like block blobs, but are optimized for append operations. Append blobs are ideal for scenarios such as logging data from virtual machines.

- **Page blobs** store random access files up to 8 TiB in size. Page blobs store virtual hard drive (VHD) files and serve as disks for Azure virtual machines.

Azure Blob Customer Case Studies

Elekta : Radiotherapy innovator Elekta harnesses AI technologies to help further its mission to bring hope to more cancer patients in more places throughout the world.

Radiotherapy innovator Elekta harnesses AI technologies to help further its mission to bring hope to more cancer patients in more places throughout the world.

Elekta AI specialists use the agility and power of on-demand infrastructure and services from Microsoft Azure to develop solutions that help empower clinicians to provide the next generation of personalized cancer treatments with the potential to improve patient treatment.

Resulting increases in efficiency and effectiveness will help drive down the disparity between the many who are in need and the relatively few who have access to first-rate radiotherapy treatment.

A pervasive problem at the root of many roadblocks to accessing cancer care is time. For the patient, this means time they need to spend away from their work and families to undergo their course of therapy, which often involves daily treatments over several weeks.

For hospitals and clinics, this means time spent by scarce experts who are required to assess patients, identify radiotherapy targets and at-risk organs (known as contouring), and plan a course of treatment.

Each visit involves more tests, scans, and assessments to confirm progress and ensure that vital contouring remains accurate as treatment progresses.

Azure Blob Storage Lab

Create a Storage Account:

https://learn.microsoft.com/en-us/azure/storage/common/storage-account-create?tabs=azure-portal

Upload, download, and list blobs with the Azure portal:

https://learn.microsoft.com/en-us/azure/storage/blobs/storage-quickstart-blobs-portal

Azure SQL Server

What is SQL Server?

The original SQL Server code was developed in the 1980s by the former Sybase Inc., which is now owned by SAP. In 1988 Microsoft created SQL Server for OS/2 as a joint effort between Sybase, Microsoft, and Ashton- Tate.

The partnership ended in 1990, and Microsoft retained the name SQL Server.

Today it is available on 64-bit Windows, Linux and the Azure Cloud platform. SQL Server is an RDBMS. Microsoft and Sybase released version 1.0 in 1989.

Database management systems have become crucial in the IT world to store data and extract information that will help in solving different problems that exist.

SQL Server is an RDBMS, created largely to compete with MySQL and Oracle databases which is used in the corporate IT ecosystem to provide a variety of business analytics and transaction processing.

SQL Server is built on both, SQL as well as on T-SQL, a standardized programming language that Database Administrators and other IT professionals use to manage databases.

Built around a tuple-based table structure that connects related data elements in different tables to one another.

DBMS And RDBMS

DBMS & RDBMS are the ways of storing the data and then managing it.

However, Database Management System is software that identifies, manages or arranges, and creates data in a database.

• Data in DBMS is usually stored in a file format.

• It helps in the retrieval of data from the database.

• Examples of DBMS are MySQL, ORACLE, etc.

The advanced version of DBMS is the Relational Database Management System (RDBMS), where the data is stored in a form of tabular format.

• An example of RDBMS is Microsoft SQL Server.

• RDBMS allows easy access as the data stored in it is huge.

• The data duplicity reduces in this database.

• Secure enough to handle layers of data.

• RDBMS is a collection of tuples that are connected and make some relation between them.

What are SQL and T-SQL?

Both SQL and T-SQL are the factors for the generation of SQL Server.

Structured Query Language is a language by which we interact with the system by writing queries. Helps in data storing, retrieving, and manipulating.

It has five main types of commands, which helps the users with different tasks, like:

• Data Definition Language for creating, dropping, altering, and truncating.

• Data Manipulation Language is used in insertion, update, and deletion.

• Data Query Language is used to extract particular data from a database with the help of the Select command.

• Data Control Language is used for granting permissions and revoking them.

• Transaction Control Language is used to commit changes, rollbacking, and save the changes at a particular point.

What are SQL and T-SQL?
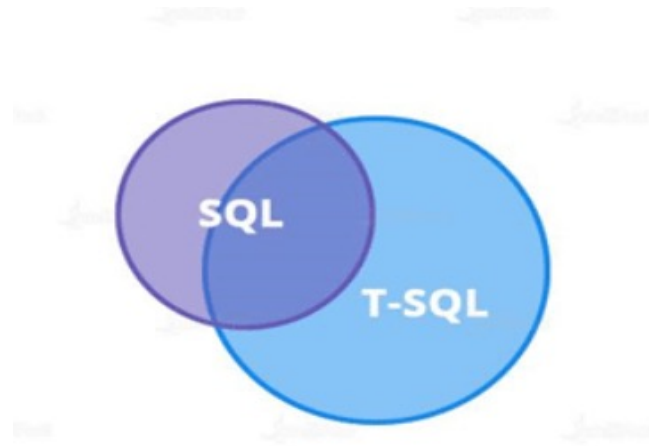
However, when it comes to including procedural programming, local variables, string processing, and data processing in SQL, it led to an extension called T-SQL, which stands for Transact-SQL.

- It is created by Microsoft, which further lead to the creation of SQL Server, again a product of Microsoft.

- The whole interaction done with SQL Server is because of T-SQL only.

- Each variable, row, and column in SQL is the data type in SQL Server.

SQL Server Architecture

The constantly improving nature of SQL Server makes it one of the most popular database management systems in the data world.

This relational model brings integrity and data accuracy.

The table-based format of the data makes it easy to make interconnections between related tables.

ACID Property is the way of maintaining the integrity, redundancy, and accuracy of the data. Terms and attribute that makes it an ACID property are:

Atomicity: The entire process that takes place should be completed once or should not happen at all.

Consistency: The database should maintain consistency before and after any transaction happened.

Isolation: One transaction that is happening in the database should not affect other transactions by any means.

Durability: Somehow, if the system is corrupted and fails to work, the successful transaction should reflect in the data.

Security is usually attained with the help of the above property. However, SQL Server Database Engine also provides data storage and data processing, which includes a relational engine that processes commands and queries.

- A relational Engine also has a storage engine that manages database files, tables, pages, and transactions.

- A network interface layer uses Microsoft's tabular data stream protocol to grant requests and response interactions with database servers.
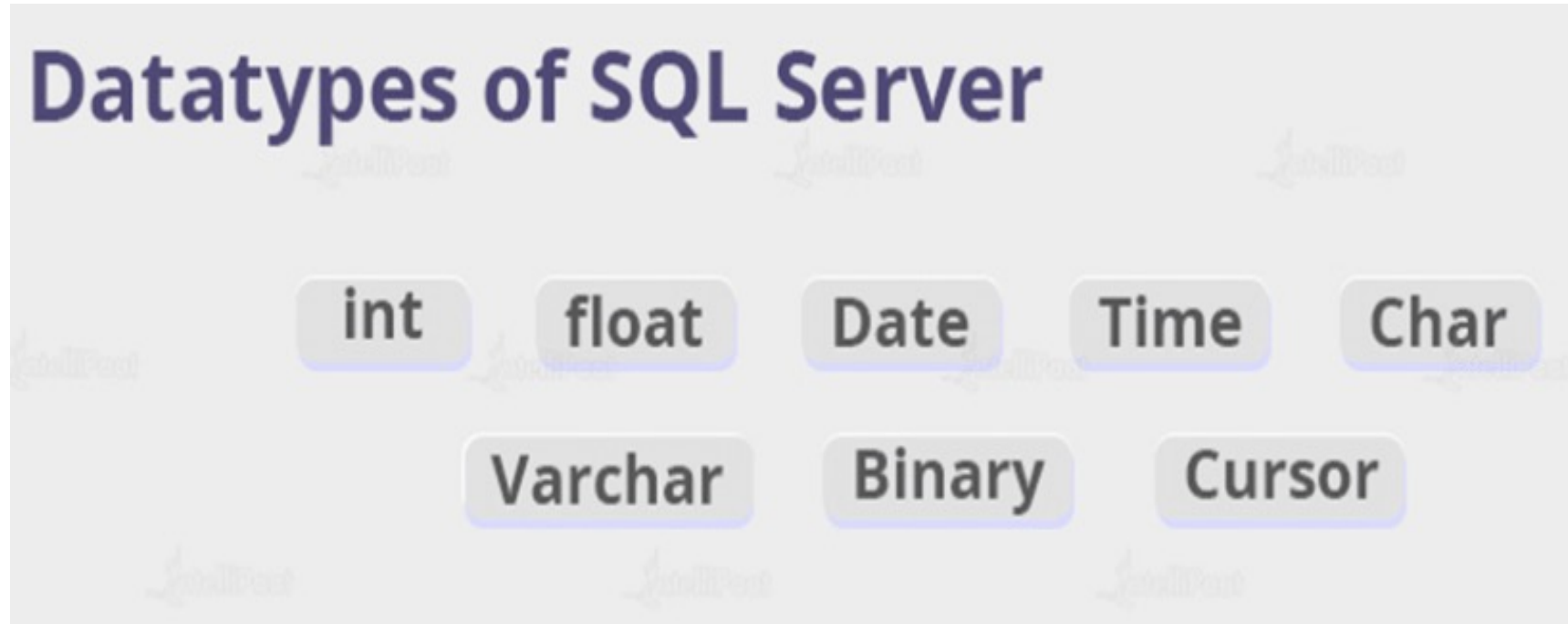
SQL Server Datatypes

The attribute known as "datatype" simply describes the kind of data that an object can store.

Say, for example, there is an integer type, character type, binary type, and so on.

SQL Server provides a similar type of data that defines all the Types of Data that it can hold.\

There is one benefit of Transact-SQL that it gives the ability the users to define their own type of data with the help of CREATE TYPE syntax.

These user-defined data types usually obtain their behavior from the methods or functions that are defined in the classes using a language that is supported by .NET Framework.

Data Type in SQL Server

Datatypes of SQL Server

int   float   Date   Time   Char

Varchar   Binary   Cursor

• **int:** Used to store integers in the range from -2147483648 to 2147483647. Further, in int type, we have bigint, smallint, and tinyint, which have different ranges.

• **float:** Used to store n numbers of bits in decimal value.

SQL Server Datatypes

- **Date:** Used to store date in a database in the format of YYYY-MM-DD.

- **Time**: Used to store time in a database in a format of hh: mm: ss.

- **Char:** A fixed-size string data is stored in a char datatype, known as a character.

- **Varchar:** A mixture of variables and characters is varchar. For example " 12ENG " is a varchar datatype.

- **Binary:** It is a string or zeros and ones, no other values can be written in binary datatype. For example, 000011110011 is a binary datatype.

- **Cursor:** It is a datatype that can reference variables and parameters that contain a reference to a cursor.

These datatypes mentioned above are majorly used ones. However, SQL Server datatype does have wide ranges and categories.

Features & Uses of SQL Server

SQL Server was created in 1995 and the latest version was released in 2019. It has covered a long journey because of its consistent updating strategy.

Data Processing:

It enables us to work with data storage to process them and provide the necessary results. SQL Server could be used to compute the data.

High Storage:

The SQL Server has the capacity to store a lot of data. It is seen as the greatest option for data storage in companies due to its enormous storage capacity.

Integration with the front end of the sites:

To provide a method for dynamic data updating, it might potentially be integrated with the front-end application. It is utilized in the integration of online applications.

Enhanced Performance:

SQL Server delivers improved performance because it has transparent data compression and encryption technologies that are built in. It provides efficient permission tools with access control designed to help users secure sensitive data.

Features & Uses of SQL Server

Highly Secure:

The usage of Highly sophisticated encryption algorithms makes the security layer so thick that one cannot breach it in any manner.

Effective Tools:

The effective tools built for data mining and data management of SQL Server helps to maintain the crucial data.

Brings out the capacity in the storage to keep highly confidential data.

These mentioned features outcast SQL Server from its competitors and lead it to have high in the technological world where an enormous amount of data is present.

SQL Server Customer Case Studies

Longtime innovator SKF unveils the factory of the future on Azure hybrid cloud :

On the factory floor, machine and sensor data are rapidly collected and streamed into Azure SQL Edge, a database and streaming engine optimized for Industrial IoT (IIoT) and edge deployments.

Data is then routed to Azure Arc-enabled SQL Managed Instance, an Azure database service that runs on-premises at SKF factories.

It works with or without a connection to Azure—a key benefit in securing uninterrupted operations at SKF factories even where connectivity is spotty.

SKF started the Future Factory initiative two years ago and tasked it with putting into practice the vision of a reliable, lean, and digital value chain to accelerate world-class manufacturing.

The team of cloud specialists set out to redefine the infrastructure layer at factories with the adoption of Azure Stack HCI.

This hyperconverged infrastructure (HCI) operating system is delivered as an Azure service and provides an on-ramp to cloud services.

SQL Server Lab

Migrate SQL Server to an Azure SQL Managed Instance offline using DMS :

[Tutorial: Migrate SQL Server to SQL Managed Instance - Azure Database Migration Service | Microsoft Learn](#)

Add SQL Managed Instance to a failover group :

[Tutorial: Add SQL Managed Instance to a failover group - Azure SQL Managed Instance | Microsoft Learn](#)

Azure Cosmos DB

What is Azure Cosmos DB ?

Azure Cosmos DB is a fully managed NoSQL and relational database for modern app development.

Azure Cosmos DB offers single-digit millisecond response times, automatic and instant scalability, along with guaranteed speed at any scale.

App development is faster and more productive thanks to:

- Turnkey multi region data distribution anywhere in the world

- Open source APIs

- SDKs for popular languages.

As a fully managed service, Azure Cosmos DB takes database administration off your hands with automatic management, updates and patching.

It also handles capacity management with cost-effective serverless and automatic scaling options that respond to application needs to match capacity with demand.

Key Benefits

Guaranteed speed at any scale :

- Real-time access with fast read and write latencies globally, and throughput and consistency all backed by SLAs

- Multi-region writes and data distribution to any Azure region with just a button.

- Independently and elastically scale storage and throughput across any Azure region – even during unpredictable traffic bursts – for unlimited scale worldwide.

Simplified application development :

- Deeply integrated with key Azure services used in modern (cloud-native) app development including Azure Functions, IoT Hub, AKS (Azure Kubernetes Service), App Service, and more.

Choose from multiple database APIs including the native API for NoSQL, MongoDB, PostgreSQL, Apache Cassandra, Apache Gremlin, and Table.

Build apps on API for NoSQL using the languages of your choice with SDKs for .NET, Java, Node.js and Python.

|
Or your choice of drivers for any of the other database APIs.

Change feed makes it easy to track and manage changes to database containers and create triggered events with Azure Functions.

Azure Cosmos DB's schema-less service automatically indexes all your data, regardless of the data model, to deliver blazing fast queries.

Mission-critical ready :

Guarantee business continuity, 99.999% availability, and enterprise-level security for every application.

Easily distribute data to any Azure region with automatic data replication. Enjoy zero downtime with multi-region writes or RPO 0 when using Strong consistency.

Enjoy enterprise-grade encryption-at-rest with self-managed keys.

Azure role-based access control keeps your data safe and offers fine-tuned control.

Fully managed and cost-effective :

End-to-end database management, with serverless and automatic scaling matching your application and TCO needs

Fully managed database service. Automatic, no touch, maintenance, patching, and updates, saving developers time and money.

Cost-effective options for unpredictable or sporadic workloads of any size or scale, enabling developers to get started easily without having to plan or manage capacity.

Serverless model offers spiky workloads automatic and responsive service to manage traffic bursts on demand.

Auto scale provisioned throughput automatically and instantly scales capacity for unpredictable workloads, while maintaining SLAs.

Azure Synapse Link for Azure Cosmos DB

Azure Synapse Link for Azure Cosmos DB is a cloud-native hybrid transactional and analytical processing (HTAP) capability that enables near real time analytics over operational data in Azure Cosmos DB.

Azure Synapse Link creates a tight seamless integration between Azure Cosmos DB and Azure Synapse Analytics.

Reduced analytics complexity with No ETL jobs to manage.

Near real-time insights into your operational data.

No effect on operational workloads.

Optimized for large-scale analytics workloads.

Cost effective

Solutions that benefit from Azure Cosmos DB

Web, mobile, gaming, and IoT application that handle massive amounts of data, reads, and writes at a global scale with near-real response times for various data will benefit from Azure Cosmos DB.

Azure Cosmos DB's guaranteed high availability, high throughput, low latency, and tunable consistency are huge advantages when building these types of applications.

Scale instantly and elastically to handle IoT and telemetry use cases in real time without sacrificing ingestion or query performance.

Ingest, process, and analyze streaming data at scale from any number of devices, anywhere in the world.

Deliver scalable, high-performance retail use cases, including real-time product catalog, personalized recommendations, order processing, and checkout services.

Support business-critical digital customer experiences by providing quick, efficient service to customers around the world.

Cosmos DB Customer Case Studies

FastTrack prepares Hive Streaming for global co-sell accessibility :

Azure is now Hive Streaming's sweet solution when it comes to iterating and deploying quickly.

It streamlines product and feature conception using Microsoft managed offerings. Joining the FastTrack for Azure ISVs and startups program lowered the time to market for the Azure interoperation.

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It streamlines product and feature conception using Microsoft managed offerings.

Joining the FastTrack for Azure ISVs and startups program lowered the time to market for the Azure interoperation.

And the Azure engineering team helped Hive understand the Microsoft software as a service (SaaS) model along with the technical details and requirements needed to interoperate with Microsoft SaaS APIs.

Cosmos DB Lab

Azure Cosmos DB for NoSQL client library for .NET :

[Quickstart - Azure Cosmos DB for NoSQL client library for .NET | Microsoft Learn](#)

Azure Cosmos DB for MongoDB for .NET with the MongoDB driver :

[Quickstart - Azure Cosmos DB for MongoDB for .NET with MongoDB driver | Microsoft Learn](#)

Hosting web applications in Azure

App Service

Quickly and easily create enterprise-ready web and mobile apps for any platform or device, and deploy them on a scalable and reliable cloud infrastructure.

Work with .NET, .NET Core, Node.js, Java, Python, or PHP in containers, or running on Windows or Linux.

Fully managed service with built-in infrastructure maintenance, security patching, and scaling.

Built-in continuous integration and continuous delivery (CI/CD) and zero-downtime deployments.

Support for virtual networks, and ability to run in an isolated and dedicated App Service Environment.

Rigorous security and compliance standards, including SOC and PCI, for seamless deployments in the cloud, in Azure Government, and on premises

Quickly build web apps and APIs in the cloud :

Bring your code or container using the framework language of your choice.

Run on Kubernetes, anywhere across Azure, on-premises, and any CNCF-conformant Kubernetes cluster through Azure Arc.

Increase developer productivity with tight integration of Visual Studio Code and Visual Studio.

Streamline CI/CD with Git, GitHub, GitHub Actions, Atlassian Bitbucket, Azure DevOps, Docker Hub, and Azure Container Registry.

Reduce downtime and minimize risk for app updates by using deployment slots.
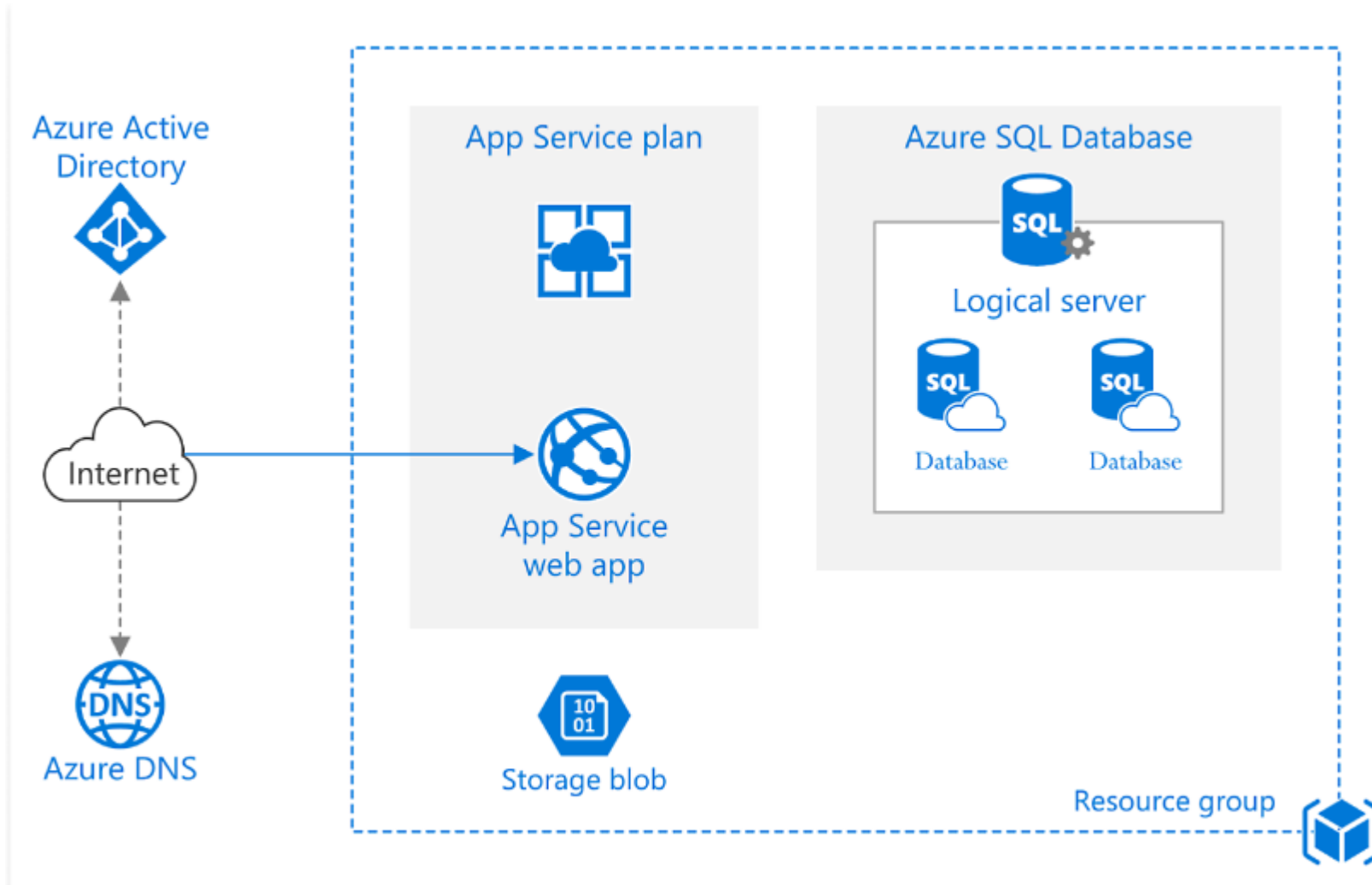
Scale web apps on an enterprise-grade service :

Get high availability with a service-level agreement (SLA)-backed uptime of 99.95 percent.

Simplify operations with automatic platform maintenance and security patching.

Help protect your applications with Azure Web Application Firewall, and connect through virtual network integration.

Deploy isolated web app instances with a single-tenancy model. Use App Service Environment v3 to enforce network access external to your applications.

Use Azure Active Directory and other popular identity providers to authenticate and authorize app access.

Scale globally across all Azure regions.
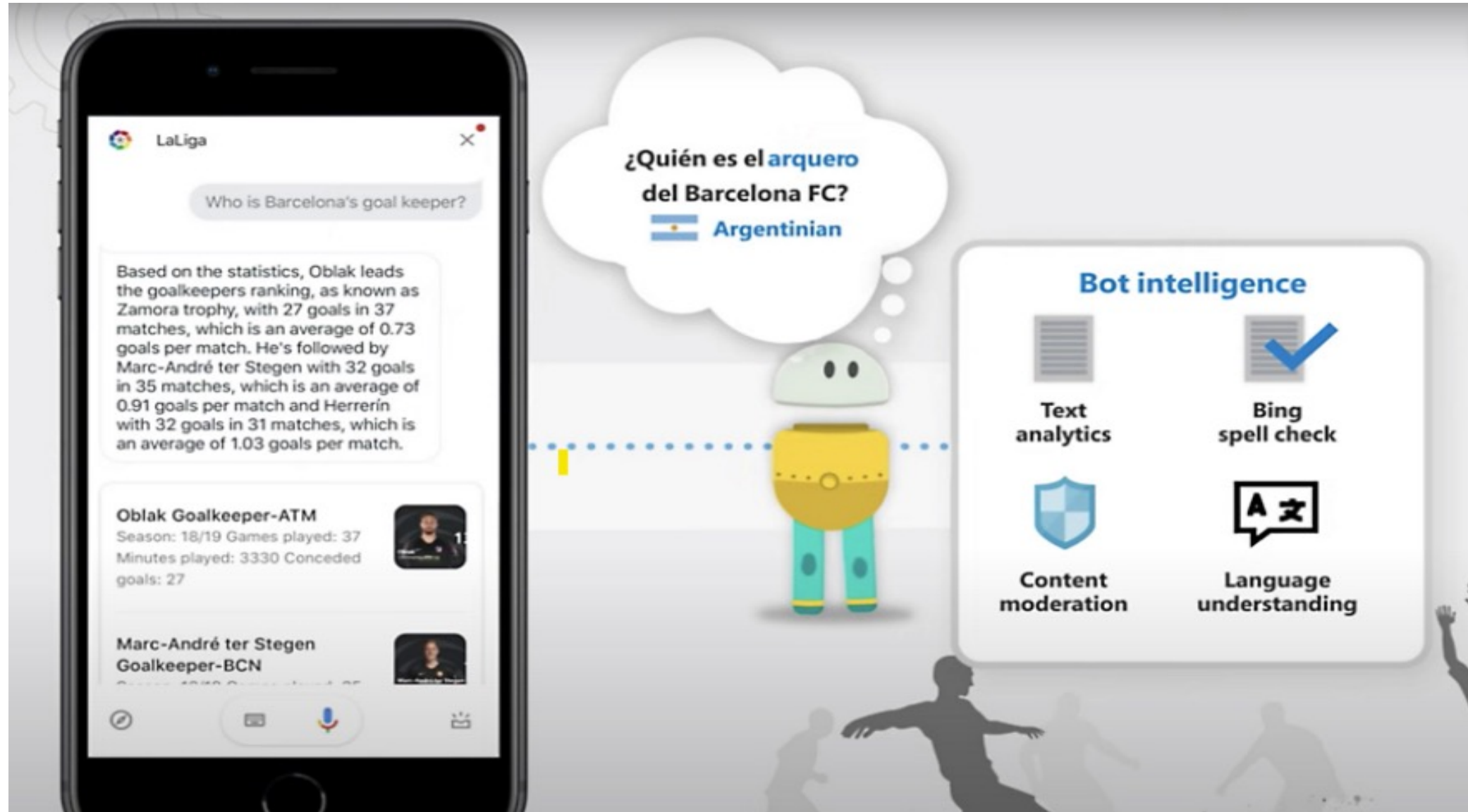
Quickly build web apps and APIs in the cloud :

Use App Service to bring the best of Azure to your web app.

Improve accessibility with Azure AI Services for embedded text reading and speech translation.

Create easily searchable content with AI-powered cloud search services.
Boost usability with Personalizer.

Innovate faster by managing all your APIs in one place.

Simplify operations with built-in monitoring :

Perform intelligent and interactive, live troubleshooting with App Service diagnostics.

View application performance and health using Azure Monitor and Application Insights to make decisions faster.

Build real-time views of application resource usage with Azure Monitor and configure alerts to notify you of unexpected conditions.

Gain deeper insights into your app's throughput, response time, downstream dependencies, and error trends using Application Insights.

App Service Customer Case Studies

Edument Training

Nordic insurer guarantees DevOps quality with cloud-based monitoring and governance :

The company's DevOps groups have found that Azure Monitor offers many features to make their jobs easier.

One example is the Application Map, included with Application Insights application performance management, which helps developers quickly troubleshoot performance bottlenecks or component failures across a distributed application.

When the system raises an alert, developers can drill down to determine which service caused the exception, and if necessary, developers can drill even deeper down into stack traces and custom logging.

Developers use Azure Monitor Logs to dig into specific problems and see all of the data related to an issue.

While If is using Azure services to improve its DevOps processes, the company is seeing valuable business benefits as well.

App Service Lab

Deploy an ASP.NET web app :

[Quickstart: Deploy an ASP.NET web app - Azure App Service | Microsoft Learn](#)

Deploy an ASP.NET app to Azure with Azure SQL Database :

[Tutorial: ASP.NET app with Azure SQL Database - Azure App Service | Microsoft Learn](#)

Azure Container Instances

Container Instances

Develop apps fast without managing virtual machines or having to learn new tools—it's just your application, in a container, running in the cloud.

Run containers without managing servers :

By running your workloads in Azure Container Instances (ACI), you can focus on designing and building your applications instead of managing the infrastructure that runs them.

Increase agility with containers on demand :

Deploy containers to the cloud with unprecedented simplicity and speed—with a single command. Use ACI to provision additional compute for demanding workloads whenever you need.

For example, with the Virtual Kubelet, use ACI to elastically burst from your Azure Kubernetes Service (AKS) cluster when traffic comes in spikes.

A pervasive problem at the root of many roadblocks to accessing cancer care is time. For the patient, this means time they need to spend away from their work and families to undergo their course of therapy, which often involves daily treatments over several weeks.

For hospitals and clinics, this means time spent by scarce experts who are required to assess patients, identify radiotherapy targets and at-risk organs (known as contouring), and plan a course of treatment.

Each visit involves more tests, scans, and assessments to confirm progress and ensure that vital contouring remains accurate as treatment progresses.

Container Instances
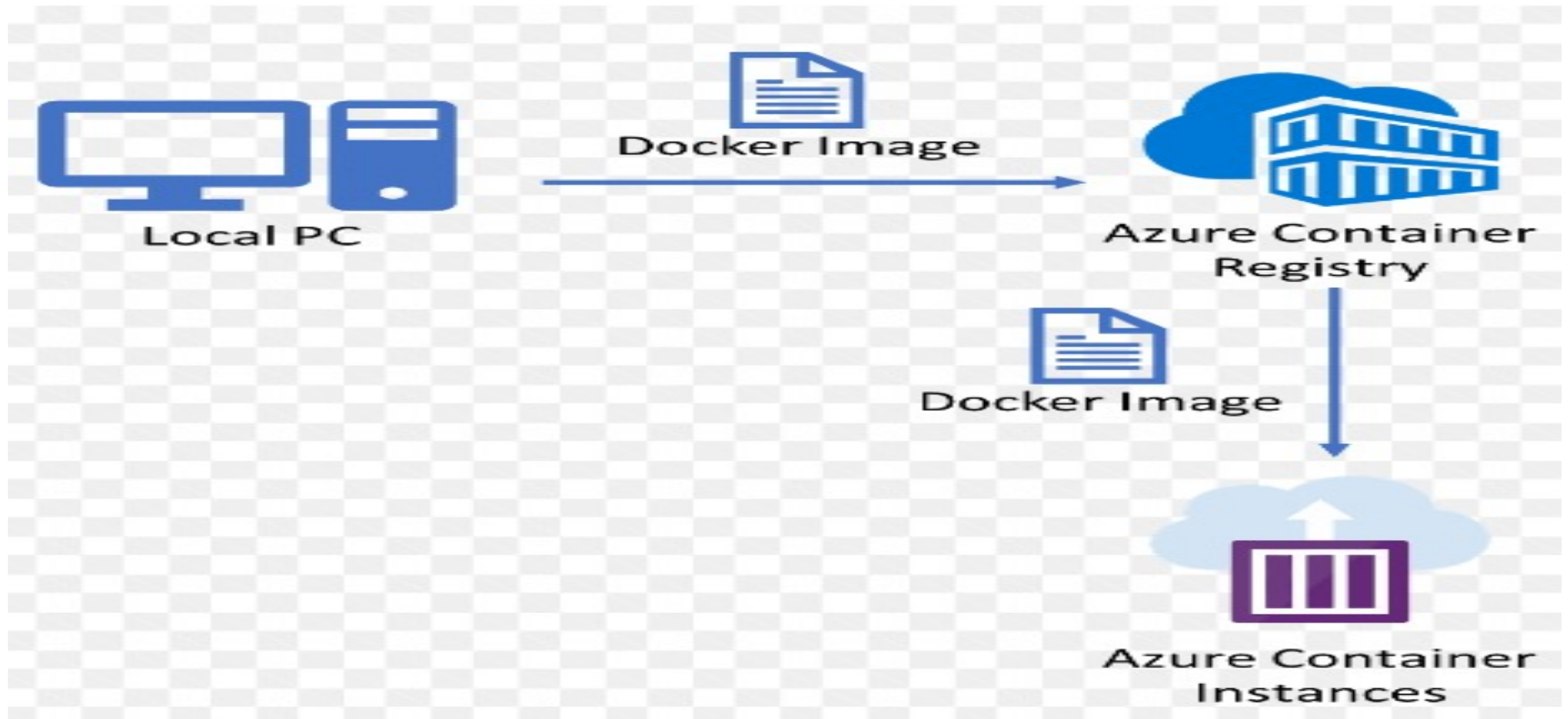
What can you build with Azure Container Instances?

Elastic bursting with AKS : ACI provides fast, isolated compute to meet traffic that comes in spikes, without the need to manage servers.

For example, Azure Kubernetes Service (AKS) can use the Virtual Kubelet to provision pods inside ACI that start in seconds.

This enables AKS to run with just enough capacity for your average workload.

As you run out of capacity in your AKS cluster, scale out additional pods in ACI without any additional servers to manage.

Event-driven applications with Azure Logic Apps : Combine ACI with the ACI Logic Apps connector, Azure queues, and Azure Functions to build robust infrastructure that can elastically scale out containers on demand.

With Azure Container Instances, you can run complex tasks that are capable of responding to events.

Data processing jobs : Use Azure Container Instances for data processing where source data is ingested, processed, and placed in a durable store such as Azure Blob storage.

Edument Training

Containers Instances Customer Case Studies

Live Tech Games massively scales its gaming platform with Microsoft Azure during the FIFA World Cup :

The first match of the World Cup was coming up in November, and Live Tech Games needed support to develop the game in time for the first match and scale its gaming platform for massive amounts of concurrent users (CCUs).

Having previously struggled to scale past 10,000 CCUs, it now needed to support more than 500,000 CCUs.

To meet these challenges, Live Tech Games turned to Azure.

Over the last few years, Live Tech Games has launched several enormously successful games using the Azure platform, but it faced a unique challenge when preparing for this larger audience.

With help from the Azure team, Live Tech Games was able to use Azure Kubernetes Service (AKS), Microsoft Orleans, and Azure SignalR Service to scale to meet high influxes of demand during the 2022 World Cup.

To further enhance scalability, Live Tech Games integrated AKS into its infrastructure. AKS provided a managed Kubernetes environment that simplified the deployment, scaling, and management of containerized applications.

Edument Training

Containers Instances Customer Case Studies

Top security for every work step: IT security solution based on Microsoft 365 detects and reports threats at VAF in five minutes flat.

To produce special systems and machines for the automotive industry, medium-sized company VAF relies on connectivity and digital processes.

A wide range of interfaces are needed to ensure that everything runs smoothly.

With cybercrime on the rise, these need to be protected. In the past, the family-owned company from Bopfingen, Germany employed numerous third-party tools for this purpose.

This led to a high degree of fragmentation instead of a uniform platform—rather than enabling a proactive overview of the level of security, it required maximum administrative effort.

Today, VAF—together with its partner abtis—has taken a big step forward in cybersecurity with Modern Secure Workplace, a managed service based on Microsoft 365 E5.

In the past, VAF relied mostly on third-party tools for software distribution, VPN, firewall, and virus protection to safeguard its own IT infrastructure.

Edument Training

Containers Instances Lab

Deploy a container instance in Azure using the Azure CLI :

[Quickstart - Deploy Docker container to container instance - Azure CLI - Azure Container Instances | Microsoft Learn](#)

Deploy a multi-container group using a YAML file :

[Tutorial - Deploy multi-container group - YAML - Azure Container Instances | Microsoft Learn](#)

Azure Functions

What is Azure Functions ?

Accelerate and simplify serverless application development :

Azure Functions is an event-driven, serverless compute platform that helps you develop more efficiently using the programming language of your choice.

You ca focus on core business logic with the highest level of hardware abstraction.

Simplify complex orchestration challenges, build and debug locally, deploy at scale in the cloud, and connect functions to Azure services using triggers and bindings.

Integrated programming model with a variety of programming languages.

Built-in serverless elasticity to build secure, reliable apps at scale.

Flexible hosting options with a pay-per-use model for improved operational efficiency.

Built-in Azure DevOps tools for an end-to-end development experience.

Develop your way :

Choose from popular programming languages you already know. With the integrated programming model, respond to events and seamlessly connect to other Azure services with a rich set of triggers and bindings.

Use the optimized inner loop for local development and testing.
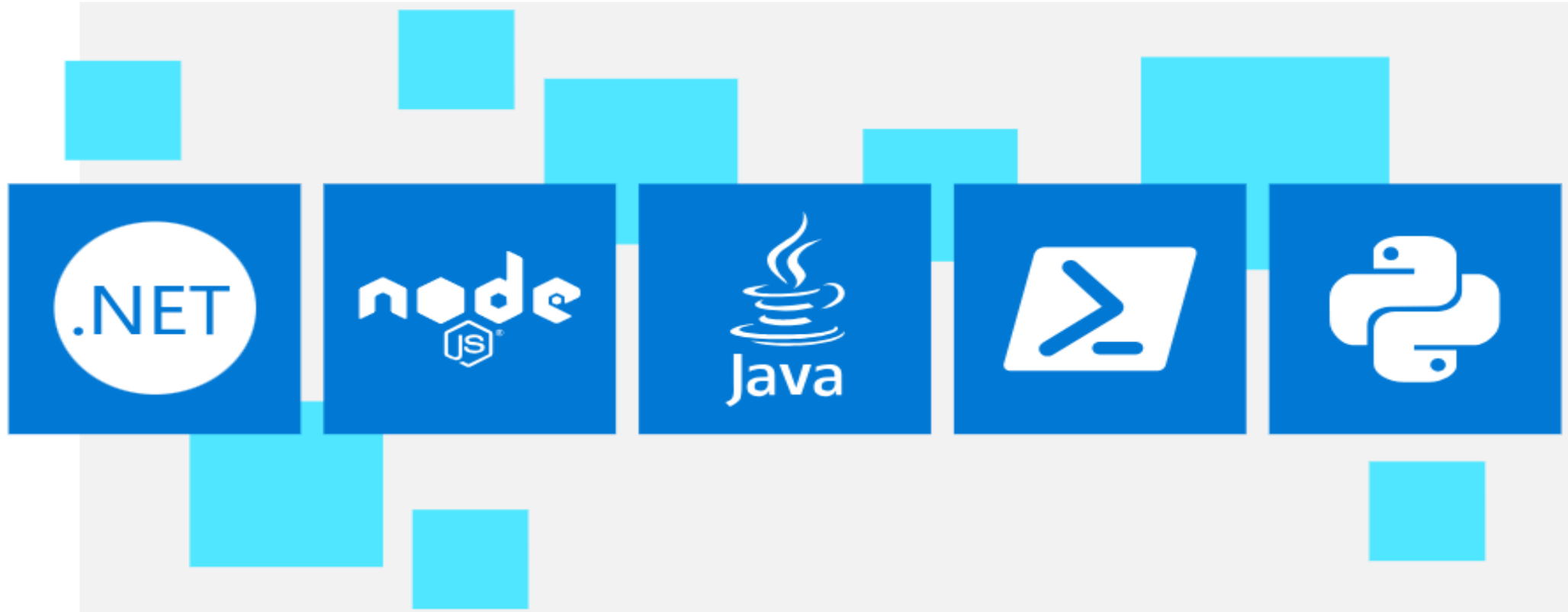
Use event-driven architecture with open-source components :

Build your app with a wide variety of data and event sources.

Simplify complex orchestration challenges with the Durable Functions extension and write stateful workflows in a serverless compute environment.

Integrate multiple app types in a microservices design. Safeguard your app with Azure Key Vault, network isolation, and built-in secure triggers and bindings.

Enforce regulatory compliance controls using Azure Policy with built-in guardrails and cloud security benchmarks.
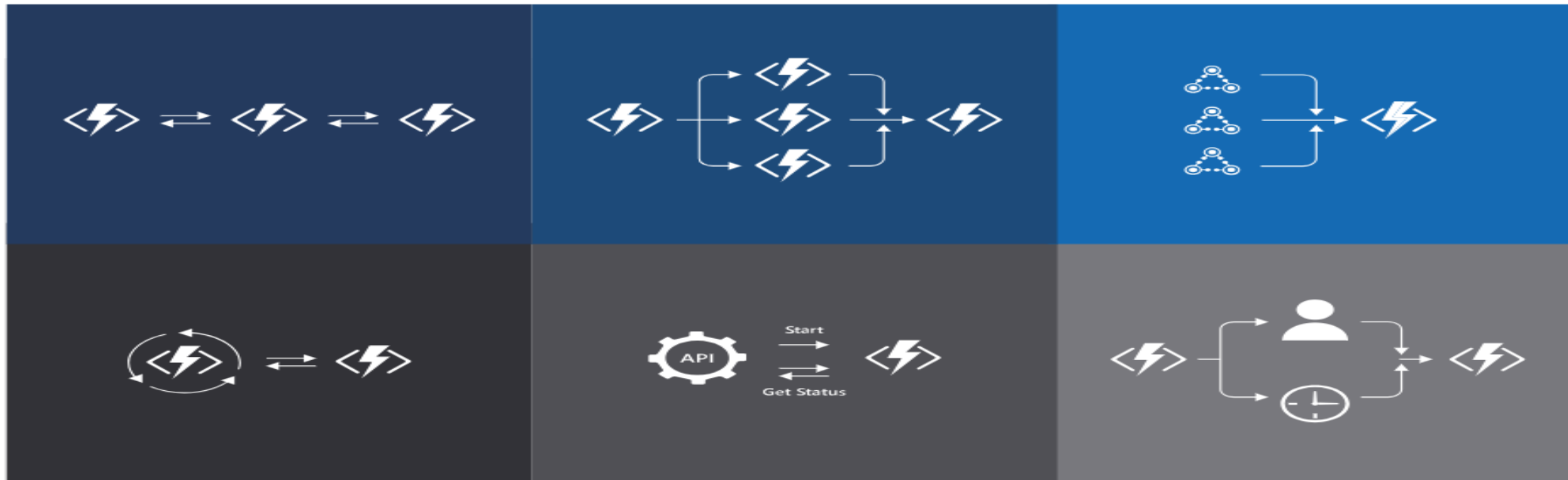
Build cost optimized portable serverless apps :

Choose your target compute with flexible hosting options including pay per use.

Deploy and scale apps faster with reduced operations.

Leverage a centralized environment for consistent and secure network isolation, observability, and scaling.

Get built-in application lifecycle management :

Get a complete serverless application development experience—from building and debugging locally to deploying and monitoring in the cloud.

Deploy, monitor, and govern your applications with Azure DevOps, GitHub Actions, and more Azure services.

Build extensible deployment pipelines for your needs.
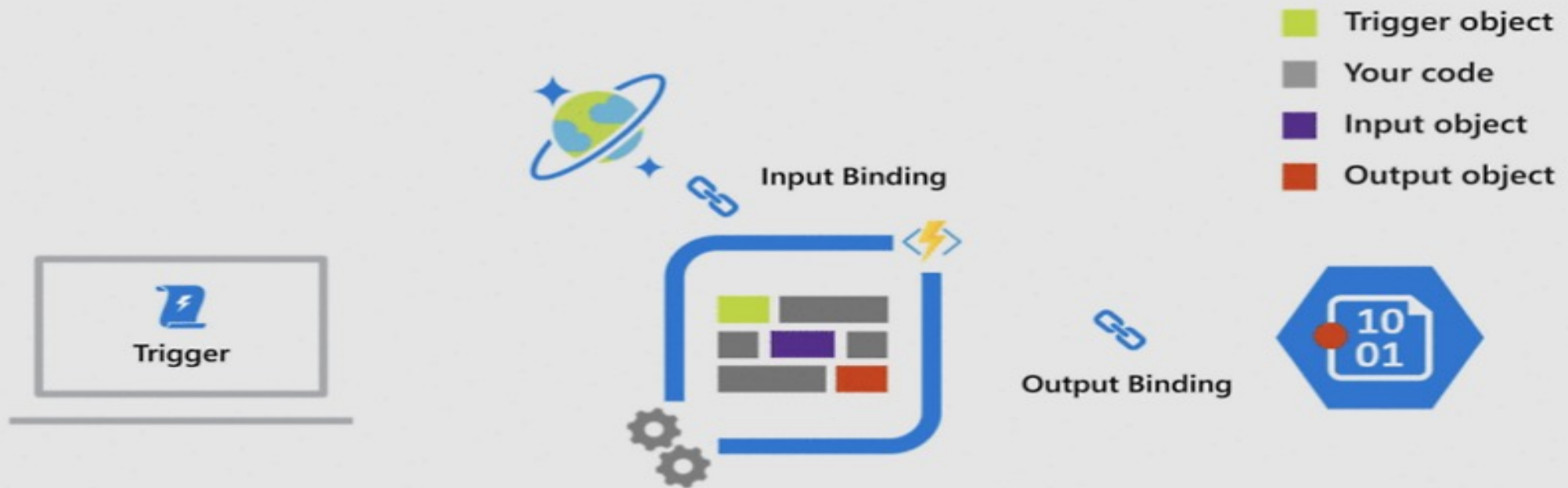
Azure Functions Customer Case Studies

Scandinavian Airlines speeds app development, lowers costs with Azure Database for PostgreSQL :

Every year, millions of travelers book flights using the Scandinavian Airlines (SAS) app, just one of many customer-friendly innovations that the company has pioneered in its 75-year history.

As a digital leader in an industry still recovering from the 2020 travel bans, SAS relies on Azure to lower infrastructure costs and gain agility for its development teams.

One missing component of its Azure migration, however, was a high-availability replacement for PostgreSQL, the popular open-source database that supports high concurrency apps.

The company solved the problem—and accelerated application development—with a move to the high availability (HA) and resilience of a managed cloud database service.

Now the booking app runs in Azure Kubernetes Service (AKS) backed by Azure Database for PostgreSQL - Flexible Server, freeing the app team from managing infrastructure so it can focus on innovation.

Azure Functions Lab

Create a function to integrate with Azure Logic Apps :

[Create a function that integrates with Azure Logic Apps | Microsoft Learn](#)

Create a function in Azure with Python using Visual Studio Code :

[Create a Python function using Visual Studio Code - Azure Functions | Microsoft Learn](#)

Create serverless APIs in Visual Studio using Azure Functions and API Management integration :

[Create serverless APIs in Visual Studio using Azure Functions and API Management | Microsoft Learn](#)

Access and Authorization in Azure

Azure Active Directory (Azure AD)

Secure your environment with multicloud identity and access management. Azure Active Directory (Azure AD), part of Microsoft Entra, is an enterprise identity service that provides single sign-on, multifactor authentication, and conditional access to guard against 99.9 percent of cybersecurity attacks.

Single sign-on simplifies access to your apps from anywhere.

Conditional access and multifactor authentication help secure data.

A single identity control plane grants full visibility and control of your environment.

Governance ensures the right people have access to the right resources, and only when they need it.

Get secured, adaptive access : Help protect access to resources and data using strong authentication and risk-based adaptive access policies without compromising the user experience.

Offer seamless user experiences : Provide a quick and easy sign-in experience to keep your users productive, reduce time managing passwords, and minimize friction.

Unify identity management : Centrally manage all your identities and access to your applications, whether they're in the cloud or on premises, to improve visibility and control.

Simplify identity governance : Help ensure that only authorized users have access to apps and data for users and admins with efficient automated identity governance.

Unify your identity infrastructure management : Simplify the experience of managing and securing your entire identity infrastructure—including Azure AD—with the Microsoft Entra admin center.

Authorization with Azure AD

Authorization is a process that grants or denies access to a system by verifying whether the accessor has the permissions to perform the requested action.

The accessor in this context is the workload (cloud application) or the user of the workload. The action might be operational or related to resource management.

There are two main approaches to authorization: role-based and resource-based. Both can be configured with Azure AD.

Use a mix of role-based and resource-based authorization. Start with the principle of least privilege and add more actions based on your needs.

Define clear lines of responsibility and separation of duties for application roles and the resources it can manage.

Consider the access levels of each operational function, such as permissions needed to publish production release, access customer data, manipulate database records.

Do not provide permanent access for any critical accounts.

Elevate access permissions that are based on approval and is time bound using Azure AD Privileged Identity Management (Azure AD PIM).

Role-based authorization

When assigning a role to a user consider what actions the role can perform and what is the scope of those operations.

Here are some considerations for role assignment:

- Use built-in roles before creating custom roles to grant the appropriate permissions to VMs and other objects.

- You can assign built-in roles to users, groups, service principals, and managed identities.

- If you need to create custom roles, grant roles with the appropriate action. Actions are categorized into operational and data actions.

- Start with actions that have least privilege and add more based your operational or data access needs.

- If you have a segmentation strategy, assign permissions with a scope.

- For example, if you use management group to support your strategy, set the scope to the group rather than the individual subscriptions. This will drive consistency and ensure application to future subscriptions.

- When assigning permissions for a segment, consider consistency while allowing flexibility to accommodate several organizational models.

- These models can range from a single centralized IT group to mostly independent IT and DevOps teams.

- Instead of granting permissions to specific users, assign access to Azure AD groups. In addition, build a comprehensive delegation model that includes management groups, subscription, or resource groups RBAC.

Resource-based authorization

- With role-based authorization, a user gets the same level of control on a resource based on the user's role.

- However, there might be situations where you need to define access rights per resource.

- For example, in a resource group, you want to allow some users to delete the resource; other users cannot. In such situations, use resource-based authorization that authorizes an action based on a particular resource.

- Every resource has an Owner. Owner can delete the resource. Contributors can read and update but can't delete it.

- You'll need to implement custom logic for resource-based authorization.

- That logic might be a mapping of resources, Azure AD object (like role, group, user), and permissions.

Authorization for critical accounts

There might be cases when you need to do activities that require access to important resources. Those resources might already be accessible to critical accounts such as an administrator account.

Or, you might need to elevate the access permissions until the activities are complete. Both approaches can pose significant risks.

Critical accounts are those which can produce a business-critical outcome, whether cloud administrators or workload-specific privileged users.

Compromise or misuse of such an account can have a detrimental-to-material effect on the business and its information systems.

It's important to identify those accounts and adopt processes including close monitoring, and lifecycle management, including retirement.

Do not provide permanent access for any critical accounts and lower permissions when access is no longer required. Some strategies include:

- Just-in-time privileged access to Azure AD and Azure resources.
- Time-bound access.
- Approval-based access.
- Break glass for emergency access process to gain access.

Limit write access to production systems to service principals. No user accounts should have regular write-access.

Ensure there's a process for disabling or deleting administrative accounts that are unused.

Authorization Customer Case Studies

Aurobay rebuilds its entire IT environment in less than two years with Azure :

To maintain business continuity, the company requires some workloads and applications, including those that steer robots on the factory floor, to be hosted on-premises.

This made Microsoft Entra ID (formerly Azure Active Directory) and Azure Arc ideal solutions. Azure Arc serves as a bridge, extending the Azure platform so that customers can build applications and services with the flexibility to run across datacenters, at the edge, and in multicloud environments.

The company set out to migrate 550 on-premises applications to Azure as is, making some entirely Azure native and transforming the rest along the way using RISE with SAP on Azure, which connects to the Aurobay Azure environment via Azure ExpressRoute.

Its integration platform resides on Azure and Teamcenter, a Siemens solution for product lifecycle management, hosted on Azure.

Scania empowers workforce, accelerates shift to digital collaboration and improved productivity with Microsoft 365 :

Scania turned to Enterprise Mobility + Security, a component of Microsoft 365, to help protect its intellectual property and to enable mobile work environments.

The company uses the multifactor authentication and conditional access capabilities within Microsoft Azure Active Directory Premium P1 and Microsoft Intune to help secure sensitive information.

Today, the company requires employees who want to access corporate apps on personal computers outside the firewall to use multifactor authentication through a text message or the Microsoft Authenticator app, a free app that employees use to sign into their Microsoft account without requiring a password. Instead, they can use a fingerprint, face recognition, or a PIN. This feature means employees can stay productive on a device of their choosing—and Scania IT can worry less about data security.

Access and Authorization Lab

Create a new tenant in Azure Active Directory :

[Quickstart - Access & create new tenant - Microsoft Entra | Microsoft Learn](#)

Add your custom domain name using the Azure portal :

[Add your custom domain - Microsoft Entra | Microsoft Learn](#)

Create or update Azure custom roles using the Azure portal :

[Create or update Azure custom roles using the Azure portal - Azure RBAC | Microsoft Learn](#)

Introduction to Azure security

Overview

We know that security is job one in the cloud and how important it is that you find accurate and timely information about Azure security.

One of the best reasons to use Azure for your applications and services is to take advantage of its wide array of security tools and capabilities.

These tools and capabilities help make it possible to create secure solutions on the secure Azure platform. Microsoft Azure provides confidentiality, integrity, and availability of customer data, while also enabling transparent accountability.

Azure platform

Azure is a public cloud service platform that supports a broad selection of operating systems, programming languages, frameworks, tools, databases, and devices.

It can run Linux containers with Docker integration; build apps with JavaScript, Python, .NET, PHP, Java, and Node.js; build back-ends for iOS, Android, and Windows devices.

Operations

Microsoft Sentinel

Microsoft Sentinel is a scalable, cloud-native, security information and event management (SIEM) and security orchestration, automation, and response (SOAR) solution.

Microsoft Sentinel delivers intelligent security analytics and threat intelligence across the enterprise, providing a single solution for attack detection, threat visibility, proactive hunting, and threat response.

Microsoft Defender for Cloud

Microsoft Defender for Cloud helps you prevent, detect, and respond to threats with increased visibility into and control over the security of your Azure resources.

It provides integrated security monitoring and policy management across your Azure subscriptions, helps detect threats that might otherwise go unnoticed, and works with a broad ecosystem of security solutions.

Azure Resource Manager

Azure Resource Manager enables you to work with the resources in your solution as a group. You can deploy, update, or delete all the resources for your solution in a single, coordinated operation.

You use an Azure Resource Manager template for deployment and that template can work for different environments such as testing, staging, and production. Resource Manager provides security, auditing, and tagging features to help you manage your resources after deployment.

Application Insights

Application Insights is an extensible Application Performance Management (APM) service for web developers. With Application Insights, you can monitor your live web applications and automatically detect performance anomalies.

It includes powerful analytics tools to help you diagnose issues and to understand what users actually do with your apps. It monitors your application all the time it's running, both during testing and after you've published or deployed it.

Azure Monitor logs

Azure Monitor logs – Provides an IT management solution for both on-premises and third-party cloud-based infrastructure (such as AWS) in addition to Azure resources.

Data from Azure Monitor can be routed directly to Azure Monitor logs so you can see metrics and logs for your entire environment in one place.

Azure Advisor

Azure Advisor is a personalized cloud consultant that helps you to optimize your Azure deployments. It analyzes your resource configuration and usage telemetry.

It then recommends solutions to help improve the performance, security, and reliability of your resources while looking for opportunities to reduce your overall Azure spend.

Azure Advisor provides security recommendations, which can significantly improve your overall security posture for solutions you deploy in Azure. These recommendations are drawn from security analysis performed by Microsoft Defender for Cloud.

Applications

Penetration Testing

We don't perform penetration testing of your application for you, but we do understand that you want and need to perform testing on your own applications.

That's a good thing, because when you enhance the security of your applications you help make the entire Azure ecosystem more secure.

While notifying Microsoft of pen testing activities is no longer required customers must still comply with the Microsoft Cloud Penetration Testing Rules of Engagement.

Web Application firewall

The web application firewall (WAF) in Azure Application Gateway helps protect web applications from common web-based attacks like SQL injection, cross-site scripting attacks, and session hijacking.

It comes preconfigured with protection from threats identified by the Open Web Application Security Project (OWASP) as the top 10 common vulnerabilities.

Authentication and authorization in Azure App Service

App Service Authentication / Authorization is a feature that provides a way for your application to sign in users so that you don't have to change code on the app backend. It provides an easy way to protect your application and work with per-user data.

Azure Security Customer Case Studies

European power company Vattenfall energizes its security and governance with cloud monitoring tools :

As part of its security and governance efforts, Vattenfall has chosen to use Azure Security Center for all its Azure subscriptions.

In order to gain a full overview of its cloud environment, the company uses Azure Policy and Azure management groups to enforce access control at the tenant level.

It has a well-defined data classification system to help manage what information is allowed to be in the cloud for reasons of security or General Data Protection Regulation (GDPR) requirements.

Nordic insurer guarantees DevOps quality with cloud-based monitoring and governance :

If Insurance is a leading Northern European property and casualty policy provider with nearly three dozen DevOps teams.

The company found that its centralized monitoring group was struggling to keep up with the needs of all its development groups, so If started delivering Monitoring as a Service with Microsoft Azure Monitor.

Combined with other tools like Azure Security Center, If now has a robust, developer-friendly solution for monitoring and governing its cloud and on-premises systems.

About Azure Key Vault

Azure Key Vault is one of several key management solutions in Azure, and helps solve the following problems:

Secrets Management - Azure Key Vault can be used to Securely store and tightly control access to tokens, passwords, certificates, API keys, and other secrets.

Key Management - Azure Key Vault can be used as a Key Management solution. Azure Key Vault makes it easy to create and control the encryption keys used to encrypt your data.

Certificate Management - Azure Key Vault lets you easily provision, manage, and deploy public and private Transport Layer Security/Secure Sockets Layer (TLS/SSL) certificates for use with Azure and your internal connected resources.

Azure Key Vault has two service tiers: Standard, which encrypts with a software key, and a Premium tier, which includes hardware security module(HSM)-protected keys.

Why use Azure Key Vault?

Centralize application secrets :

Centralizing storage of application secrets in Azure Key Vault allows you to control their distribution.

Key Vault greatly reduces the chances that secrets may be accidentally leaked. When application developers use Key Vault, they no longer need to store security information in their application.

Not having to store security information in applications eliminates the need to make this information part of the code.

For example, an application may need to connect to a database.

Instead of storing the connection string in the app's code, you can store it securely in Key Vault.

Why use Azure Key Vault?

Securely store secrets and keys :

Access to a key vault requires proper authentication and authorization before a caller (user or application) can get access.

Authentication establishes the identity of the caller, while authorization determines the operations that they're allowed to perform.

Authentication is done via Azure Active Directory.

Authorization may be done via Azure role-based access control (Azure RBAC) or Key Vault access policy.

Azure RBAC can be used for both management of the vaults and access data stored in a vault, while key vault access policy can only be used when attempting to access data stored in a vault.

Monitor access and use : Once you've created a couple of Key Vaults, you'll want to monitor how and when your keys and secrets are being accessed. You can monitor activity by enabling logging for your vaults.

You can configure Azure Key Vault to:

- Archive to a storage account.
- Stream to an event hub.
- Send the logs to Azure Monitor logs.

You have control over your logs and you may secure them by restricting access and you may also delete logs that you no longer need.

Why use Azure Key Vault?

Simplified administration of application secrets

When storing valuable data, you must take several steps.

Security information must be secured, it must follow a life cycle, and it must be highly available.

Azure Key Vault simplifies the process of meeting these requirements by:

- Removing the need for in-house knowledge of Hardware Security Modules.

- Scaling up on short notice to meet your organization's usage spikes.

- Replicating the contents of your Key Vault within a region and to a secondary region.

- Data replication ensures high availability and takes away the need of any action from the administrator to trigger the failover.

- Providing standard Azure administration options via the portal, Azure CLI and PowerShell.

- Automating certain tasks on certificates that you purchase from Public CAs, such as enrollment and renewal.

- In addition, Azure Key Vaults allow you to segregate application secrets.

- Applications may access only the vault that they're allowed to access, and they can be limited to only perform specific operations.

- You can create an Azure Key Vault per application and restrict the secrets stored in a Key Vault to a specific application and team of developers.

Integrate with other Azure services : As a secure store in Azure, Key Vault has been used to simplify scenarios like:

- Azure Disk Encryption

- The always encrypted and Transparent Data Encryption functionality in SQL server and Azure SQL Database.

- Azure App Service.

Key Vault itself can integrate with storage accounts, event hubs, and log analytics.

Azure Key Vault Customer Case Studies

Gjensidige builds on GitHub and Azure to put security front-and-center in new application platform :

Gjensidige, the largest insurance company in Norway, must do all that it can to keep customer data secure.

To achieve this, the company built on the combined capabilities of GitHub Enterprise and Microsoft Azure to deliver a modern 'DevSecOps' environment that puts security front-and-center at all times.

Developer-first security tooling integrates seamlessly into existing development workflows, helping developers to write more secure code, embrace security best practices, and respond quickly to software supply chain vulnerabilities.

Jotun modernizes key business apps to run on Azure :

The Jotun Group is a global supplier of decorative paints and marine, protective, and powder coatings.

As part of its strategy to migrate on-premises applications to the cloud, the company recently modernized nine key business apps to run in a platform as a service environment on Microsoft Azure.

Azure Key Vault Lab

Set and retrieve a secret from Azure Key Vault using the Azure portal :

[Azure Quickstart - Set and retrieve a secret from Key Vault using Azure portal | Microsoft Learn](#)

Creating and configuring a key vault for Azure Disk Encryption :

[Creating and configuring a key vault for Azure Disk Encryption - Azure Virtual Machines | Microsoft Learn](#)