Scenario : Want to move all of disparate data to a common database service.

1. Azure cosmos DB is globally distributed multi-model database service. Can elastically and independently scale throughput and storage across any number of Azure regions worldwide, and take advantage of fast single digit millisecond data access by using any one of several popular APIs.

Azure cosmos DB offers comprehensive SLA, which cover the guarantees for throughput, consistency, availability and latency. Servers are still running the code.

Azure cosmos DB also support schema-less data, which lets you build highly responsive and always on applications to support constantly changing data.

1. At the lower level, Azure cosmos DB stores data in atom record sequence, ARS format.
2. Azure cosmos DB is a flexible database that provides guaranteed single digit milliseconds response times and 99.999% availability backed by comprehensive SLAs.
3. Azure cosmos DB are Elastic and independent scale throughput and storage on demand,
4. Azure cosmos DB provide access to multiple data models and APIs for working with your data.
5. Azure cosmos DB has the availability to globally distributed your data and build highly responsive applications.

A diagram of a diagram of a course

Description automatically generated A person with her mouth open

Description automatically generated

What is **Azure SQL Database**…is a relational database based on the latest stable version of the Microsoft SQL Server database engine. Azure SQL Database provides you with a high performance, reliable, fully managed and secure database. You can use it to build data driven applications and websites in the programming language of your choice withou needing to manage infrastructure. Azure SQL Database Features :

1. Is a PaaS database enginee. It handles most of the database management functions, such as upgrading, patching, backups, and monitoring without user involvement.
2. SQL Database also provide 99.99 % availability.
3. You can create a highly available and high performance data storage layer for applications and solutions in Azure.
4. You don’t have to manage the underlying infrastructure.
5. Is a Fully managed services that has build in high availability, backups and other common maintenance operations.
6. PaaS capabilities that are built into SQL database enable you to focus on the domain specific database administration and optimization activities that are critical for your business.
7. Enables you to process both relational data and non-relational structures such a graphs, JSON, Spatial and XML.
8. Has another advanced features such as High performance, in-memory technologies and intelligent query procesing.

**Azure SQL Managed Instance** is a scalable cloud data service that provides the broadest SQL server database engine compatibilty with all the benefits of a fully managed platform as a service. Azure SQL Managed Instance might offer more options for your database needs. Azure SQL Managed Instance is a PaaS (same as Azure SQL database) database engine.

Azure SQL Database and Azure SQL Managed Instance offers many of the same features, however Azure SQL Managed Instance provides several option that might not be available to Azure SQL Database. Features of Azure SQL Managed Instance:

1. Azure SQL Managed Instance uses Server level collation could be specified when the instane is created. On the other hand Azure SQL database only uses the default SQL\_latin1\_General\_CP1\_CI\_AS server collation.

Noted : we can change server-level collation in Azure SQL Managed Instance, **it cannot be changed once the instance has been created.**

1. *Azure SQL Managed Instance makes it easy to migrate your on-premises data on SQL Server to the cloud using Azure Database Migration Service (DMS)* or native backup and restore.
2. **Azure Database for MySQL** is a relational database service in the cloud, and it’s based on the MySQL community edition database engine. With it you have 99.99 availability SLA powered by a global network of Microsoft managed data centers. Azure Database for MySQL Server take advantage of :
   1. **Built in security** ,
   2. **Fault tolerance,**
   3. **Data protection**,
3. Azure Database for MySQL you can use point in time restore to recover a server to an earlier state as far back as 35 days. Azure Database for MySQL delivers built in :
   1. High avavilability with no additional cost,
   2. predicatable performance,
   3. inclusive pay-as-you-go pricing,
   4. scale is needed within seconds,
   5. ability to protect sensitive data at rest and in motion,
   6. automatic backups, and
   7. enterprise-grade security and compliance.

All these capabilities require almost no administration, and all are provided at no add cost.

1. Azure Database for MySQL offers several service tiers, and each tiers provide different performance and capabilities to support lightweight to heavyweight database workloads. Dynamic scalability transparently respond to rapidly changing resource requirements.

A screenshot of a computer

Description automatically generated A diagram of a cloud computing system

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**Azure Database for PostgreSQL** is a relational database service in the cloud. The server’s software is based on the community version of the open-source PostgreSQL database engine. Key benefits of Azure Database for PostgreSQL :

1. Built-in high availability compared to on-premises resources. No additional configuration, replication, or cost required to make sure your apps are always available.
2. Simple and flexible pricing
3. Scale up/down within seconds, you can scale ,compute, or storage independently as needed to make sure you adapt your service too much usage.
4. Adjustable automatic backups, point in time restore for up to 35 days.
5. Enterprise-grade-security and compliance to protect sensitive data at rest and in motion. Security covers data encryption on disk, and SSL encryption between client and server communication.

Azure Database for PostgreSQL is available in 2 deployment options :

1. **Single Server**, delivers predictable performance and inclusive pay as you go pricing. Vertical scale is needed within seconds. Enterprise grade security and compliance , monitoring and alerting to assess your server, ability to protect sensitive data at rest and in motion, automatic backup and point in time restore for up to 35 days.

**All provided at no additional cost.**

Single servers option offers 3 pricing tiers :

* 1. **Basic**,
  2. **General-purpose**,
  3. **Memory-optimized**,

1. **Hyperscale (Citus)** , horizontally scales across multiple machines by using sharding. Its query engine parallelizes incoming SQL queries across these servers for faster responses on large datasets. It serves applications that require greater scale and performance. Support multi tenant applications, realtime operational analytics and high throughput transactional workloads.
2. **Azure Synapse Analytics,** formerly Azure SQL Data Warehouse, a limitless analytics service that brings together enterprise data warehousing and big data analytics. You have unified experience to ingest, prepare, manage and serve data for immediate via ML needs. Azure Synapse Analytics is the logical choice for analyzing large volumes of data.
3. **Azure HD insight,** a fully managed open-source analytics service for enterprises. It’s a cloud service that make it easier, faster, and more cost-effective to process massive amounts of data. You can run open source frameworks such as Apache Spark, Hadoop, Apache Kafka, Apache HBase, Apache Storm. Also support a broad range of scenarios such as extraction, transformation and loading ETL, data warehousing, ML and IoT.
4. **Azure Databrick,** helps you unlock insights from all your data and build AI solutions. You can set up your Apache spark environment in minutes, and then autoscale and collaborate on shared projects in an interactive workspace. Azure Databricks supports Python, R, Java and SQL as well as data science frameworks and libraries including Tensorflow, Pytorch, and scikit-learn.
5. **Azure Data Lake Analytics,** is an on-demand analytics job service that simplifies big data. Instead of deploying, configuring and tuning hardware, you write queries to transform your data and extract valuable insights. Pay only for your job when it’s running, making it more cost-effective.
6. **Azure SQL Database** is a platform as a service (PaaS) database engine. It handles most of the database management functions, such as upgrading, patching, backups, and monitoring, without user involvement.
7. **Azure SQL Managed Instance** is a scalable cloud data service that provides the broadest SQL Server database engine compatibility with all the benefits of a fully managed platform as a service.
8. **Azure Cosmos DB** supports SQL, MongoDB, Cassandra, Tables, and Gremlin APIs.
9. **Azure Cosmos DB** supports schema-less data, which lets you build highly responsive and Always On applications to support constantly changing data. You can use this feature to store data that is updated and maintained by users around the world. Cosmos DB level of flexibility means that as you migrate your company's databases to Azure Cosmos DB, your developers can stick with the API where they're most comfortable. Azure Cosmos DB supports open-source APIs and SDKs.

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Reading :

1. <https://learn.microsoft.com/en-us/azure/azure-sql/database/features-comparison?view=azuresql>
2. <https://azure.microsoft.com/en-us/products/category/analytics/>
3. <https://learn.microsoft.com/en-us/azure/cosmos-db/>
4. <https://learn.microsoft.com/en-us/azure/azure-sql/?view=azuresql>
5. <https://learn.microsoft.com/en-us/azure/azure-sql/managed-instance/?view=azuresql>
6. <https://learn.microsoft.com/en-us/azure/mysql/>
7. <https://learn.microsoft.com/en-us/azure/postgresql/>

* **Azure Virtual Machines,** can create and use VM in the cloud. VM provide infrastructure as a service (IaaS). When you need total control over an OS and environment, VM are an ideal choice. Just like PC, you can customize all the software running on the VM.

**Virtual Machines provides infrastructure as a service (IaaS)** in the form of a virtualized server, and can be used in different ways. If you want to provision Linux and Windows virtual machines with the configurations of your choice, you could so in seconds using Azure Virtual Machines services.Just like physical computer, we can customized all the Software running on the VM.

* **VM Scale Sets,**
* **Azure Kubernetes Service,** dad
* **Windows Virtual Desktop,** dsda
* **Azure Compute,** is on demand computing service for running Cloud based applications. It provides computing resources such as disks, processors, memory, networking, and OS. The resources are available on demand and can typically be made available in minute or even seconds. Pay only for the resources you use and only as long as you are using them.Each service provides different options depending on your requirements.Some of main services include :
  1. **Azure App Service,** including Virtual Machines Scale Set.

**VM Scale sets**, Azure compute resource that you can use to deploy and manage a set of identical VM. They lets you create and manage a group of identical load balanced VM. They (Scale set) allow you to centrally manage, configure and update a large number of VM in minutes to provide highly available applications.The number of VM instances can automatically increase or decrease in response to demand or defined schedule. Azure scale set kets you create and manage a group of identical load balanced VM.

*As demands goes up ,more VM instances can be added.*

*As demands goes down, VM instances can be removed.* The process can be manual, automated or both.

* 1. **Azure Container Instances,** including **Azure Kubernetes Services (AKS).**

Container instances and Azure Kubernetes Servie (AKS) are azure compute resources that you can use to deploy and manage containers. Containers are lightweight virtualized application environments. You can run multiple instances of a containerized application on a single host machine. One of the most popular Container Engines is Docker, which is supported by Azure.

With containers ,you can quickly restart in case of crash or hardware interruption.

* 1. **Azure App Service,** on the other hand is a platform as a service (PaaS) not IaaS like VM. With Azure service, you can quickly build, deploy, and scale enterprise grade web, mobile and API apps running on any platform.
  2. **Azure Functions or serverless computing**.

What are Virtual Machines (VMs).  **Virtual Machines VM** are software emulations of physical computers. They include a virtual processor, memory, storage and networking resources. VM host an operating system and you can install and run software just like a physical computer. When using a remote desktop client, you can use and control the VM as if you were sitting in front of it. Azure VM gives you the flexibility of virtualization without having to buy and maintain the physical hardware that runs the VM. We still need to configure, update and maintain the Software that runs on the VM. Selecting **an image** is the one of the most important decisions you will make when you create VM**. An image** is a template used to create a VM. These templates already include an OS and software development tools or web hosting environments. When to use VM, for example :

1. During testing and development, easy way to create different OS and application configuration.
2. Running apps in the cloud, might need to handle fluctuations in demand.
3. When extending datacenter to the cloud. Apps like sharepoint can run on an Azure Vm instead of running locally.
4. During disaster recovery,
5. Move a physical server to the cloud, known as lift and shift. Just like a pyhsical on premises server, you must maintain the VM and also update the installed OS on the software it runs.

**Azure Batch** enables large scale parallel and high performance computing (HPC) , batchjobs with the ability to scale to tens hundreds or thousands of VM. When you are ready to run a job, batch does the following.

Start a pool to compute VM for you, installs applications and staging data, run jobs with as many tasks is you have, identifies failures, request work, scale down the pool as work completes.

A diagram of a diagram of a company

Description automatically generated with medium confidence

**VM best fit if we want to total control over an OS and environment, while VM are excellent ways to reduce costs VS the investments that are necessary for physical hardware. If we want to run multiple instances of an applications on a single host machine, Containers are an excellent choice.**

Containers are a virtualization environment, much like running multiple VM on a single physical host, we can run multiple containers on a single physical or virtual host. Unlike VM, you don’t manage the OS for container. VM to be an instance of an OS that you can connect to and manage, but containers are lightweight and designed to be created, scale out and stopped dynamically.

VM provide an abstraction layer for CPU, memory and storage ,that can be changed without having to invest in new hardware. With VM you are in control, to decide the OS, install tools and packages and your apps run either in isolation or with the other apps you install into the VM. VM can only run 1 OS at a time, so if you have multiple server apps that all require different runtime environments, they may also require multiple VM to execute properly. And because the VM is emulating a full computer, tassk like staring one up or taking a snapshot are pretty slow, often taking several minutes. But there is a solutin that solves some of these issues : **CONTAINTERS.**

A container bundles a single app and its dependencies, referred to as containeringing the app, then deploy it is as a unit to a container host. The container hosts provides a standardized runtime environment, which abstracts away the OS and infrastructure requirement, allowing the containerized application to run side-by-side with other containerized apps.

Easy way to differentiate between VMs and container is :

* VM virtualize the hardware : full control the environment
* Containers virtulaize the OS : portability, performance and management capabilities.

OS level virtualization of containers is one reason why the container approach is more efficient than a full VM. It allows you to run multiple containers on a single host without sacrificing the isolation that the VM originally offered.

A computer screen with a box and a box on it

Description automatically generated with medium confidenceA white line drawing of a box and a container

Description automatically generated with medium confidence

A diagram of a virtual machine

Description automatically generatedA diagram of containers with icons

Description automatically generated with medium confidence

Azure support several container variations, the most popular being **DOCKER**. Easily deploy and manage multiple containerized applications. Containers are managed through a container orchestrator, which can start, stop and scale out application instances as needed. There are 2 ways to manage both Docker and Microsoft based containers in Azure. ACI and AKS.

Your company wants to be able to manage both Docker and Microsoft-based containers.  What Azure compute services will you be able to use for this purpose?

* **Azure Container Instances (ACI)** offers the fastest and simplest way to run a container in Azure without having to manage any virtual machines or adopt any additional services. It's a platform as a service (PaaS) offering that allows you to upload your containers which it runs for you.
* **Azure Kubernetes Service (AKS)** is a complete orchestration service for containers with distributed architectures and large volumes of containers. *Orchestration is the task of automating and managing a large number of containers and how they interact.*

What is Kubernetes?? SaaS service. Using containers to host applications and other process has gone mainstream. As more and more workload is moved into containers, management systems are neded to handle the demand of containerized applications at scale.One of the most popular options for managing containers based workload is **KUBERNETES**. It combines container management automation with an extensible API to create cloud native application management powerhouse. Kubernetes manages the placement of pods, which can consists of one or more containers on a Kubernetes cluster node.

* If one of the pods crashes, Kubernetes can create a new instance of it.
* If a cluster node is removed, kubernetes can move any affected workload to a different node in the cluster. Kubernetes pods can be scaled to provide more or less throughput to meet scale demands, and these scale operations can be triggered manually or automatically using Kubernetes horizontal pod auto-scaling.
* If an application needs to be updated, kubernetes can stagger the update deployment to minimize downtime.
* If the update is problematic, kubernetes can rollback to a previous version.
* Kubernetes also can manage container storage and networking. Kubernetes persisten volumes can be used to present data storage to one or more containers. This configuration allows containers to read and write application data and persist this data across many pod instances.
* Common for an application running in Kubernetes to use cloud based storage and data systems ie. Azure Storage or Azure Cosmos DB for data storage and retrieval.
* In networking, Kubernetes network plugin provide capabilites such as exploring pods to the internet, load balancing traffic across multiple replicas of a pod, netrowk isolation and policy driven network security. These networking plugins also manage communication and name resolution between pods in the Kubernetes cluster.
* Additional capabilites can be created using a variety of methods for extending the Kubernetes API. With this flexibility operators can be created to perform custom actions such as producing cloud events on pod creation, providing custom pod scheduling logic, and on demand provisioning of managed cloud services just to name a few.

Containers are often used to create solutions by using a micro service architectures. a micro service architectures consists of a collection of small autonomous services. Each service is self contained and should implement a single business capability. Micro services architecture is where you break solutions into smaller independent pieces. For example you might split a website into container hosting your front end, another hosting your back end and a third for storage. This split allows you to separate portions of your app into logical sections that could be maintained scaled or updated independently.

IMAGINE your website back end has reached capacity , but the front end and storage aren’t being stressed.

1. Could scale back end separately to improve performance,
2. Decide to use a different storage service,
3. Replace the storage container withoud affecting the rest of the application.

**MICRO SERVICES ARCHITECTURE**

A diagram of a service

Description automatically generated A person's hand holding a screen with hexagons

Description automatically generated

What is micro service? Is a webservice that is a small, well defined scope and is loosely couled from any other web service.

* Usually don’t build just one microservice, rather adopts a microservice architecture that consists of collection of microservices.
* Each one self contained and implementing a single business capability. Each service has a separate codebase, which can be managed by a small development team.
* In fact, microservices don’t event need to share the same technology stack, libraries or frameworks which allows eact team to choose the right tools for the job.
* This means a single development team can build, test and deploy a service. Plus they can easily roll back or roll forward and updated if something goes wrong.
* EACH micro service is responsible for persisting its own data or external state and not rely on some common repository layer.
* Even some micro services insist that each micro services should even have its own separate database.
* Fault isolation means if a service goes down, it won’t take out the entire application.
* Each microservice is an island unto itself.
* Microervice can communicate with each other by using well defined APIs. Internal implementation detail of each services are encapsulated behind their interface.
* Microservices are good when you have a large application that requires a high release velocity, have a complex application that need to be highly scalable, and have a applications with rich domains or many sub domains.
* Micro services can benefit from the management and hosting capabilites of several Azure services.
* **Microservices is a way to simplify an application architecture by focusing on creating smaller, more manageable, autonomous and independently deployed web service that address a single business domain or capability.**

**Azure Apps Service(AAS) - PaaS,**  is fully managed web hosting service for building web apps, mobile backends and RESful APIs. AAS also provide pricing and performance options that cater for every need, from small websites to globally scaled web applications. AAZ in other word enables you to build and host web apps, background jobs, mobile backends and RESTful APIs in the programming language of your choice without managing infrastructure. It offers automatic scaling and high availability. AAS support windows and Linux, and enables automated deployment from GitHub, and Azure Devops. AAS allow you to focus on the website an API logic, while Azure handles the infrastructure to run and scale your web applications.

* With AAS, could host most common App service styles like web apps, API apps, WebJobs, and mobile apps.
* AAS handles most of the infrastructure decision you deal with in hosting web accessible apps.
* Deployment and management are integrated into the platform. End point can be secured
* Sites can be scaled quickly to handle high traffic load.
* The built in load balancing and traffic manager provide high availability.
* AAS is ideal choice to host web oriented applications.
* App service include full support for hosting web apps, by using ASP.NET, Java, Ruby, PHP, Python.
* AAS much like hosting a website, can build REST based web APIs by using your choice of language and framework.
* Can use WebJobs feature to run a program .exe, Java, PHP, Python or Node.js or script.cmd or Bash in the same context as a web app, API app and mobile App.

Can ue the mobil apps feature of App service (AAS) to :

1. To quickly build a backend for iOS nad Android apps.
2. Can store mobila app data in a cloud based SQL database.
3. Authenticate customers against common social providers such as MSA, Google, Twitter and Facebook.
4. Send push notification,
5. Execute custom backend logic in C# or Node.js
6. Support for native iOS and Android, Xamarin and React Native apps.

**Azure Functions** is serverless computing service hosted on the Microsoft Azure public cloud. Azur functions and serverless computing in general is designed to accelerate and simplify application development.

**Serverless computing** is the abstraction of servers, infrastructure and OS. With serverless computing, azure take care of managing the server infrastructure and the allocation and deallocation of resources based on demand . Infrastructure is not your responsibility. Scaling and performance are handled automatically. You build only for exact resources you use. There is no need to even reserve capacity. Serverless computing includes the abstraction of servers and event-driven scale and micro billing.

* Serverless computing abstracts the servers you run on. You never explicitly reserved server instances. The platform manages that for you. Each function execution can run on a different Compute instance. You deploy your code which then runs with high availability.
* Serverless computing is an excellent fit for workload that respond to incoming events **(Event drive scale)**. Event include triggers by timers, ie. to run everyday at 10.00 AM CEST. Http for example, API and web hooks scenatios,
* Instead of writing an entire application, the developer offers a function which contain both code and metadata about its triggers and bindings. The platform automatically schedules the function to run and scale the number of compute instances based on the rate of incoming events. Triggers define how a function is invoked. Bindings provide a declarative way to connect to ervices from within the code.
* Traditional computing bills for a block of time, like paying a monthly or annual rate for website hosting. This method of billing is convenient but is not always cost effective. With serverless computing, they pay only for the time their code runs. If no active function executions occure ,they are not charged. Ie if the code runs once a day for 2 minutes, than they were charged for one execution and two minutes of computing time.

A computer screen shot of a computer

Description automatically generated

Tailwind Traders want to accelerate app development using an event-driven, serverless architecture. Which of the following services should be used?  **Azure Functions** is used when you need to perform work in response to an event (often via a REST request), timer, or message from another Azure service, and when that work can be completed quickly, within seconds or less.

Goal of Serverless computing is to help you focus your effort on getting you application to your customers. Serverless computing is a bit of misleading name, because there are in fact servers being used. It’s an abstraction of servers so that you can take your mind of your infrastructure concerns and focus them on developer concerns. 3 Big benefits of using Serverless computing approach :

* **No infrastructure management**, you don’t have to focus on administrative tasks like install OS, update system. You simply deploy your code and it automatically runs with high availability.
* **Scalability**, grows in popularity, continue working under any workload. Serverless computes can scale from nothing to tens of thousands of requests without any configuration.
* **Only pay for what you use**, is event-driven, resources are only allocated from a direct action.

Azure has 2 implementations of serverless computer.

* 1. Functions can execute code in almost any modern language.
     1. Why use Azure function.

When you are concerned only about the code running your service and not the underlying platform or infrastructure using Azure Functions is ideal. Functions are commonly used when you need to perform work in response to an event, often via a REST request, timer or message from another Azure service.

* + 1. Using a VM baed approach you would incur costs even when the VM is idle , with Functions azure runs your code when it’s triggered and automatically deallocates resources when the function is finished.
    2. Function can be either stateless or stateful. Default is stateless, behave restarted everytome they respond to an event. When they are stateful called durable functions a context is passed through the function to track prior activity.
    3. Functions are a key component of serverless computing. A general compute platform to running any type of code. Flexibility allowy you to manage scaling, run on Virtual networks, and even completely isolate the functions.
    4. Serverless apps runs only when it’s triggered by an event. Charged only when compute time used by that execution rather than a flat monthly fee for maintaining a physical or virtual server.
  1. Logic apps are designed in a web based designer and can execute logic triggred by Azure services without writing any code.
     1. Simlar to functions, both enables you to trigger logic based on an event. Function execute code, logic app execute workflows that are designed to automate business scenarios and are built from predefined logic blocks.
     2. Every Azure logic apps workflow start with a trigger which fires when a specific event happens or when newly available data meets specific criteria. Each time the triggers fires, the logic apps engine creates a logic app instance that runs the actions in the workflow. These actions can also include data conversions and flow controls such as conditional statements, switch statement, loops and branching.
     3. Create Logic App workflows by using a visual Designer on the azure portal or in visual studio. Workflows are persisted as a JSON file with a known workflow schema.
     4. Azure provides more than 200 different connectors and processing blocks to interact with different services.

**Functions versus Logic Apps**

Functions and Logic Apps can both create complex orchestrations. An orchestration is a collection of functions or steps that are executed to accomplish a complex task.

* With Functions, you write code to complete each step.
* With Logic Apps, you use a GUI to define the actions and how they relate to one another.

You can mix and match services when you build an orchestration, calling functions from logic apps and calling logic apps from functions.

Here are some common differences between the two.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | **Functions** | **Logic Apps** | | --- | --- | --- | | State | Normally stateless, but Durable Functions provide state. | Stateful. | | Development | Code-first (imperative). | Designer-first (declarative). | | Connectivity | About a dozen built-in binding types. Write code for custom buildings. | Large collection of connectors. Enterprise Integration Pack for B2B scenarios. Build custom connectors. | | Actions | Each activity is an Azure function. Write code for activity functions. | Large collection of ready-made actions. | | Monitoring | Azure Application insights. | Azure portal, Log Analytics. | | Management | REST API, Visual Studio. | Azure portal, REST API, PowerShell, Visual Studio. | | Execution Context | Can run locally or in the cloud. | Runs only in the cloud. | |

**Windows Virtual Desktop** on Azure is a desktop and applications virtualization service, that run on the Cloud. It enables your users to use a client hosted version of Windows from any location. Windows Virtual Desktopworks across devices like Windows, Mac, iOS, Android and Linux. It works that you can use to access remote dekstops and apps. Why should you use Windows Virtual Desktop?

* **Works across multiple devices** like Windows, iOS, Android, Linux
* **Provide virtualization on any personal devices ,** from any internet connected location.
* **Gives you access at no additional cost ,** when youuse eligible Windows or Microsoft 365 licences.
* **Keeps your Virtual desktops secure,** by leveraging reverse connections on security solutions.

OTHER WORD, why Windows Virtual Desktop?

* **USER have the freedom to connect to Windows Virtual Desktop.** Windows Virtual Desktop provides  the best user experience. Users have the freedom to connect to  Windows Virtual Desktop with any device over the Internet.  They use a Windows Virtual Desktop client, to connect to their published Windows desktops and applications. This kind could either be a native application on the device,  or the Windows Virtual Desktop HTML5 web client.
* **Users stay productive and don't encounter long load times** , You can make sure your session host virtual machines run near apps and services, that connect to your data center or the Cloud.
* **Users sign in to Windows Virtual Desktop is fast**, because user profiles are containerized by using FSLogix.
* **The user profile is immediately available** and appears in the system exactly like a native user profile.
* **Users can have access to personal remote desktops**. You can provide individual ownership  through personal persistent desktops. For example, you might want to provide personal remote desktops for members of an engineering team, then they can add or remove programs without impacting other users on that remote desktop
* **Windows Virtual Desktop also provides enhanced security**.
* **Windows Virtual Desktop provides centralized security management**, for users desktops with Azure Active Directory, Azure AD. You can enable multi-factor authentication to secure user sign-ins. You can also secure access to data by assigning granular role-based access controls or a box to users
* With Windows Virtual Desktop, the data and apps or separated from the local hardware, Windows Virtual Desktop runs them instead on a remote server, the risk of confidential data being left on a personal device is reduced.
* User sessions are isolated in both single and multi-session environments.
* Windows Virtual Desktop also improve security by using reverse connect technology. This connection type is more secure, than the Remote Desktop Protocol, we don't open in-band ports to the session host virtual machines.
* Some of the key features of  Windows Virtual Desktop include
  + Simplified management,

Windows Virtual Desktop is an Azure service, so it will be familiar to Azure administrators. You use Azure AD and our backs to manage access to resources. With Azure, you also get tools to automate VM deployments, manage VM updates, and provide disaster recovery. As with other Azure services, Windows Virtual Desktop uses Azure Monitor for monitoring an alerts. This standardization, Let's Admins identify issues through a single interface.

* + Performance management,

Windows Virtual Desktop gives you options to load balance users on your virtual machine host pools. Host pools are collections of Virtual Machines, with the same configuration assigned to multiple users. For the best performance, you can configure low balancing to occur as user sign-in,. Breath mode. With breath mode, users are sequentially allocated across the host pool for your workload. To save costs, you can configure your virtual machines for depth mode, load balancing for users are fully allocated, on one virtual machine before moving on to the next. Windows Virtual Desktop provides tools to automatically provision additional virtual machines, when incoming demand exceeds a specified threshold.

* + Multi-session Windows 10 Deployment.

that delivers a full Windows 10 with scalability. Windows Virtual Desktop lets you use Windows 10 Enterprise multi-session, the only Windows client based operating system, that enables multiple concurrent users on a single virtual machine. Windows Virtual Desktop also provides a more consistent experience, with broader application supports compared to Windows Server based operating systems. You have investigated the features and benefits that are available using Windows Virtual Desktop.

What about costs? Costs are always something you should consider before you make a decision on using any services. How can you reduce costs with Windows Virtual Desktop? One way to reduce costs is that you can use your existing Microsoft licenses. Windows Virtual Desktop is available to you at no additional cost. If you have an eligible Microsoft 365 license, you only pay for the Azure resources used by Windows Virtual Desktop. Further examples of cost savings include, Windows 10 Enterprise, and Windows 7 Enterprise desktops and apps are available at no additional cost when you present an eligible Windows or Microsoft 365 license. Windows Server, Remote Desktop Services desktops and apps are also available at no additional cost, if you are Microsoft Remote Services Client Access License customer. Another way to reduce costs associated with Windows Virtual Desktop, is to save on Compute costs. If you buy a one-year or three-year Azure reserved Virtual Machine instances, you can save up to 72 percent, versus paying as you go pricing. You can pay for reservation upfront or monthly. Reservations provide a billing discount and don't affect the runtime state of your resources.

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1. Virtual machine scale sets are an Azure compute resource that you can use to deploy and manage a set of identical VMs. With all VMs configured the same, virtual machine scale sets are designed to support true autoscale.
2. An Azure VM gives you the flexibility of virtualization without having to buy and maintain the physical hardware that runs the VM. However, the cloud tenant still needs to configure, update, and maintain the software that runs on the VM.
3. Azure Batch enables large-scale parallel and high-performance computing (HPC) batch jobs with the ability to scale to tens, hundreds, or thousands of VMs.
4. Azure Container Instances offers the fastest and simplest way to run a container in Azure without having to manage any virtual machines or adopt any additional service.
5. **IAAS -** This cloud service model is the closest to managing physical servers. A cloud provider will keep the hardware up to date, but operating system maintenance and network configuration is left to the cloud tenant. For example, Azure Virtual Machines are fully operational virtual compute.
6. **SAAS -** In this cloud service model, the cloud provider manages all aspects of the application environment; virtual machines, networking resources, data storage, applications, and so on. The cloud tenant only needs to provide their data to the application managed by the cloud provider.
7. **PAAS -** Azure Container Instances offers the fastest and simplest way to run a container in Azure without having to manage any virtual machines or adopt any additional services. It is a PaaS offering that allows you to upload your containers, which it will run for you.
8. With App Services, you can quickly build, deploy, and scale enterprise-grade web, mobile, and API apps running on any platform.
9. Azure Container Instances and Azure Kubernetes Service (AKS) are Azure compute resources that you can use to deploy and manage containers. These are lightweight, virtualized application environments that are designed to be quickly created, scaled out, and stopped dynamically. You can run multiple instances of a containerized application on a single host machine.
10. The task of automating, managing, and interacting with a large number of containers is known as orchestration. Azure Kubernetes Service (AKS) is a complete orchestration service.
11. Azure Cosmos DB supports schema-less data, which lets you build highly responsive and Always-On applications to support constantly changing data. You can use this feature to store data that is updated and maintained by users around the world and supports multiple APIs.
12. Azure database for PostgreSQL supports Automatic backups and point-in-time-restore for up to 35 days.
13. Azure Database for MySQL delivers built-in high availability with no additional cost of 99.99% SLA.
14. App Services provides a managed hosting environment where developers can upload their web applications without having to worry about dealing with the physical hardware and software requirements.
15. Azure Database for PostgreSQL is a relational database service in Microsoft cloud. The server software is based on the community version of the open-source PostgreSQL database engine. Azure Database for PostgreSQL is available in two deployment options; Single Server and Hyperscale (Citus).

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* [Azure compute](https://azure.microsoft.com/product-categories/compute) https://azure.microsoft.com/en-us/products/category/compute/
* [Windows virtual machines in Azure](https://docs.microsoft.com/en-us/azure/virtual-machines/windows/) https://learn.microsoft.com/en-us/azure/virtual-machines/
* [Linux virtual machines in Azure](https://docs.microsoft.com/en-us/azure/virtual-machines/linux/) https://learn.microsoft.com/en-us/azure/virtual-machines/
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1. Migrate database workloads to Azure, Azure SQL database (MySQL & PostgreSQL) migrate to existing SQL Server,
2. Azure Cosmos DB works with a variety of pupular APIs, including SQL, MongoDB, Cassandra, tables and Grammar. You can migrate your data to cloud
3. Big data analysis services like Azure synapse Analytics, Azure HDInsight, Azure Data breaks, and Azure Data Lake Analytics to analyze large volumes of data.
4. Challanges application demand using Azure Virtualization services like Azure Virtual Machines(AVM) , Azure Container Instances (ACI) and Azure Kubernetes Service (AKS)
5. Azure App service to create your website front-ends, Azure functions to create event-driven application logic that only runs when you need us.
6. Windows Virtual Desktop to quickly provide a customized operating system and software environment for your remote workers.