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***VIRTUALIZATION & CLOUD COMPUTING***

**ASSIGNMENT**

Q) Database support in Microsoft Azure

**Azure Database Service :**

Azure database services are fully managed, freeing up valuable time you’d otherwise spend managing your database so you can focus on new ways to delight your users and unlock opportunities. Enterprise-grade performance with built-in high availability means you can scale quickly and reach global distribution without worrying about costly downtime. And developers can take advantage of industry-leading innovations such as built-in security with automatic monitoring and threat detection, automatic tuning for improved performance, and turnkey global distribution. On top of all of this, your investment is protected by financially backed SLAs.

**Azure SQL Database:**

Azure SQL Database is a relational database-as-a-service (DBaaS) based on the latest stable version of Microsoft SQL Server. Azure SQL Database is a fully managed Platform as a Service (PaaS) Database Engine that handles most of the database management functions such as upgrading, patching, backups, and monitoring without user involvement.

## Deployment Models:

Azure SQL Database provides the following deployment options for an Azure SQL database:

* [Single database](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-single-database):

[Single database](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-single-database) represents a fully managed, isolated database. You might use this option if you have modern cloud applications and micro services that need a single reliable data source. A single database is similar to a [contained database](https://docs.microsoft.com/sql/relational-databases/databases/contained-databases?toc=/azure/sql-database/toc.json) in [Microsoft SQL Server Database Engine](https://docs.microsoft.com/sql/sql-server/sql-server-technical-documentation?toc=/azure/sql-database/toc.json)

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* [Managed instance](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-managed-instance) :

[Managed instance](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-managed-instance) is a fully managed instance of the [Microsoft SQL Server Database Engine](https://docs.microsoft.com/sql/sql-server/sql-server-technical-documentation?toc=/azure/sql-database/toc.json). It contains a set of databases that can be used together. Use this option for easy migration of on-premises SQL Server databases to the Azure cloud, and for applications that need to use the database features that SQL Server Database Engine provides.

* [Elastic pool](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-elastic-pool) :

[Elastic pool](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-elastic-pool) is a collection of [single databases](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-single-database) with a shared set of resources, such as CPU or memory. Single databases can be moved into and out of an elastic pool.

## Azure Monitoring Capabilities:

Azure provides [built-in performance monitoring](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-performance-guidance) and [alerting](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-insights-alerts-portal) tools, combined with performance ratings, that enable you to monitor the status of thousands of databases. Using these tools, you can quickly assess the impact of scaling up or down, based on your current or projected performance needs. Additionally, SQL Database can [emit metrics and resource logs](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-metrics-diag-logging) for easier monitoring. You can configure SQL Database to store resource usage, workers and sessions, and connectivity into one of these Azure resources:

* **Azure Storage**: For archiving vast amounts of telemetry for a small price.
* **Azure Event Hubs**: For integrating SQL Database telemetry with your custom monitoring solution or hot pipelines.
* **Azure Monitor logs**: For a built-in monitoring solution with reporting, alerting, and mitigating capabilities.

**Scalable Performance :**

You can define the amount of resources assigned.

* With single databases, each database is isolated from others and is portable.  The amount of the resources assigned to the database is dedicated to that database, and isn't shared with other databases in Azure.
* With elastic pools, you can assign resources that are shared by all databases in the pool. You can create a new database, or move the existing single databases into a resource pool to maximize the use of resources and save money.
* With managed instances, each managed instance is isolated from other instances with guaranteed resources.

### Purchasing Models:

SQL Database offers the following purchasing models:

1. The [vCore-based purchasing model](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-service-tiers-vcore) lets you choose the number of vCores, the amount of memory, and the amount and speed of storage.
2. The [DTU-based purchasing model](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-service-tiers-dtu) offers a blend of compute, memory, and I/O resources in three service tiers, to support light to heavy database workloads.
3. The [server less model](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-serverless) automatically scales compute based on workload demand, and bills for the amount of compute used per second.

### Service Tiers:

### Azure SQL Database offers three service tiers that are designed for different types of applications:

1. [General Purpose/Standard](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-service-tier-general-purpose) service tier designed for common workloads. It offers budget-oriented balanced compute and storage options.
2. [Business Critical/Premium](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-service-tier-business-critical) service tier designed for OLTP applications with high transaction rate and lowest-latency I/O. It offers the highest resilience to failures by using several isolated replicas.
3. [Hyperscale](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-service-tier-hyperscale) service tier designed for very large OLTP database and the ability to autoscale storage and scale compute fluidly.

**Azure Advanced Data Security:**

1. Protect your databases from malicious acts with fine-grained access controls, [Always Encrypted](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-always-encrypted-azure-key-vault) technology, and advanced threat protection capabilities.
2. Discover, track and remediate potential vulnerabilities from a single screen.
3. Azure SQL Database meets the most stringent [compliance](https://azure.microsoft.com/en-us/overview/trusted-cloud/) standards with built-in auditing and information protection technology.
4. Get continuous protection with deeper insights from Azure Security Center.
5. Multi-layered security provided by Microsoft across physical datacenters, infrastructure, and operations.

**Availability capabilities:**

Azure Availability Zones tries to protect against the outage of a single datacenter building within a single region. It helps you protect against the loss of power or network to a building. In SQL Database, you place the different replicas in different availability zones (different buildings, effectively)

In addition, SQL Database provides built-in [business continuity and global scalability](https://docs.microsoft.com/en-us/azure/sql-database/sql-database-business-continuity) features. These include:

1. SQL Database automatically performs full, differential, and transaction log backups of SQL databases to enable you to restore to any point in time. For single databases and pooled databases, you can configure SQL Database to store full database backups to Azure Storage for long-term backup retention.
2. All SQL Database deployment options support recovery to any point in time within the automatic backup retention period for any SQL database.
3. The single database and pooled databases options allow you to configure up to four readable secondary databases in either the same or globally distributed Azure datacenters.
4. All SQL Database deployment options allow you to use failover groups to enable high availability and load balancing at global scale.
5. SQL Database allows you to provision premium or business critical databases or elastic pools across multiple availability zones. Because these databases and elastic pools have multiple redundant replicas for high availability, placing these replicas into multiple availability zones provides higher resilience.

**Azure Database for PostgreSQL:**

Azure Database for PostgreSQL Hyperscale is now Azure Arc-enabled. You can run this service on premises on infrastructure of your choice with cloud benefits like automation, hyperscale, unified management, and a cloud billing model with reserved capacity pricing now available.

Azure SQL Database and Azure Database for PostgreSQL Hyperscale are available for preview on Azure Arc, with more Azure data services to come.

**Azure Database for MariaDB:**

Azure Database for MariaDB is a relational database service based on the open-source MariaDB Server engine. It's a fully managed database as a service offering that can handle mission-critical workloads with predictable performance and dynamic scalability.

Azure Database for MariaDB delivers:

* Built-in high availability with no additional cost.
* Predictable performance, using inclusive pay-as-you-go pricing.
* Scaling as needed within seconds.
* Secured protection of sensitive data at rest and in motion.
* Automatic backups and point-in-time-restore for up to 35 days.
* Enterprise-grade security and compliance.

## Monitoring and Alerting:

You can use the built-in performance monitoring and alerting features of Azure Database for MariaDB, combined with the performance ratings based on vCores. By using these tools, you can quickly assess the effect of scaling vCores up or down based on your current or projected performance needs.

## App and Business Running:

Azure's industry-leading 99.99% availability SLA is powered by a global network of Microsoft-managed datacenters. The network helps keep your app running 24/7. You benefit from the built-in security, fault tolerance, and data protection in Azure Database for MariaDB. With Azure Database for MariaDB, you can use point-in-time restore to recover a server to an earlier state, as far back as 35 days.

## Secure your data:

Azure database services have a tradition of data security that Azure Database for MariaDB upholds. Azure Database for MariaDB offers features that limit access, protect data at rest and in motion, and help you monitor activity.

**Azure Cosmos DB:**

Azure Cosmos DB is a fully managed database service with [turnkey global distribution](https://docs.microsoft.com/en-us/azure/cosmos-db/distribute-data-globally) and transparent multi-master replication. Get single-digit millisecond read and write latencies at the 99th percentile, [automatic and elastic scaling of throughput and storage](https://docs.microsoft.com/en-us/azure/cosmos-db/scaling-throughput) worldwide, 99.999-percent high availability, and [five well-defined consistency choices](https://docs.microsoft.com/en-us/azure/cosmos-db/consistency-levels)—all backed by [industry-leading comprehensive SLAs](https://azure.microsoft.com/en-us/support/legal/sla/cosmos-db/).

**Azure Cosmos DB approaches:**

Azure Cosmos DB approaches data consistency as a spectrum of choices. This approach includes more options than the two extremes of strong and eventual consistency. You can choose from five well-defined levels on the consistency spectrum. From strongest to weakest, the levels are:

* Strong
* Bounded staleness
* Session
* Consistent prefix
* Eventual

Each level provides availability and performance tradeoffs and is backed by comprehensive SLAs.

**Consistency levels and latency:**

The read latency for all consistency levels is always guaranteed to be less than 10 milliseconds at the 99th percentile. This read latency is backed by the SLA. The average read latency, at the 50th percentile, is typically 4 milliseconds or less.

**Strong consistency and multi-master:**

Cosmos accounts configured for multi-master cannot be configured for strong consistency as it is not possible for a distributed system to provide an RPO of zero and an RTO of zero.