

Evaluate requirements and functional benefits/impact for the deployment

So, we saw in the previous part that we were able to have an Azure SQL database, but we're also able to have SQL managed instances and SQL virtual machines.

So, what's the difference between them?

So now it's probably a good stage to have a look at these and compare them. While looking at the similarities

Azure SQL database, Azure SQL managed instances, they are both PaaS, platform as a service, as opposed to SQL server, which is IaaS,

So, the Infrastructure as a service. The infrastructure is the Azure virtual machine and SQL server sits on top of that, just like a normal program.

Whereas for these two,

SQL database and SQL managed instance, Azure manages the database, an SQL server on a virtual machine

Azure SQL Database	Azure SQL Managed Instance	SQL Server on Azure VM
PaaS	PaaS	IaaS
Azure manages the database.		You need to manage your VM, and gives you control of the database.
Resources always running unless dropped (apart from serverless, when paused).	Resources always running unless dropped.	You can shut down resources when not in use.
	Best for most migrations to the cloud. May need some changes.	Lift-and-shift. As easy as moving from one on-prem server to another.
		Higher cost than PaaS.
Best for modern cloud applications, and fast time-to-market for new solutions are needed.	Best for new applications or existing on-prem applications for use in the cloud.	Best when you don't want any database changes, or when you require OS-level access.
Can use Azure Hybrid Benefit (Windows Server for VMs only, and SQL Server licenses with Software Assurance) and reserved capacity to reduce cost.		
Hybrid Benefit does not apply to serverless.		

Azure SQL Database	Azure SQL Managed Instance	SQL Server on Azure VM
<u>Most commonly used SQL Server features</u>	<u>High compatibility with SQL Server</u>	All on-premises capabilities.
Trace flags not supported.	Only a limited number of (global) trace flags are supported.	Trace flags supported.
Built-in backups, patching and recovery.		You manage backup and patches
Databases up to 100 Tb	Up to currently available instance size, subject to number of vCores	Instances up to 256 Tb. (Databases of up to instance size)
Supports serverless compute [the alternative is "provisioned"]		Lift-and-shift.
CLR not supported.	CLR supported.	
Based on latest stable Enterprise Edition.	Based on latest stable Enterprise Edition.	Choose which version of SQL Server (from 2008R2 updates), edition (Developer, Express, Web, Standard, Enterprise) and OS you use.
Can use Elastic Job Agent service.	Can use SQL Agent jobs.	Can use SQL Agent jobs.

Scalability of the possible database offerings:

Azure SQL Database	Azure SQL Managed Instance	SQL Server on Azure VM
Databases up to 100 Tb (hyperscale)	General Purpose: Up to 16Tb Business Critical: 4-16 Tb. Up to 100 databases (up to 500 for Next-gen General Purpose)	Instances up to 256 Tb. Up to 50 instances per server. <u>Databases of up to instance size</u>
Size of single database or elastic pool can be changed as needed.	Size can be changed as needed.	Size of VM can be changed as needed.
You can also add more compute power (vertical scaling) or shard your data into multiple database nodes (horizontal scaling).	Can add more compute power (vertical scaling), but not easily sharding (though you can do it more manually).	Compute power of VM can be changed as needed
You can also change service tier from Standard/General Purpose (Premium disks) to Premium/Business Critical (SSDs).	You can change between Premium and Business Critical only.	
For more, see topic 9 and 13.	For more, see topic 10.	

Security aspects of the possible database offerings

Azure SQL Database	Azure SQL Managed Instance	SQL Server on Azure VM
Auditing works at the database level.	Auditing works at the server level.	Auditing works at the server level.
.xel log files are stored in Azure Blob storage.	.xel log files are stored in Azure Blob storage.	Events are stored in the file system or Windows event logs.
Can use Azure Defender for SQL, which includes : Vulnerability assessment and Threat detection (costs around \$0.02/instance/hour)		
Data encryption, using Transport Layer Security (TLS), Transparent Data Encryption (TDS) and Always Encrypted. Firewalls.		
SQL authentication or Azure Active Directory authentication		Windows or SQL Server authentication.

HA/DR – High Availability/Disaster Recovery – possible database offerings

Azure SQL Database	Azure SQL Managed Instance	SQL Server on Azure VM
Up to 99.995% availability. Minimum SLA is 99.99% availability, except for Hyperscale, which is 99.9%-99.95%.	99.99% availability	Up to 99.99% availability. However, this requires a second VM, and using Always On availability group. Minimum SLA is 95% for the VM.
At the Basic, Standard and General Purpose level, can use Locally redundant availability. At the Premium and Business Critical level or elastic pools, can use a three-to four-node cluster with Locally or Zone Redundant Availability. You can also add read-only replicas (the "Read Scale-out" feature).		Can configure availability replicas, using a domain controller VM.
At the General Purpose level using Gen5 compute hardware in certain regions, can use Zone redundant configuration (preview).		

Azure SQL Database	Azure SQL Managed Instance	SQL Server on Azure VM
Automatic backups , including full, differential and transaction log, for 7-35 days.		Can configure backups.
Can configure full database backups to Azure Storage for long-term backup retention (LTR).	Can perform copy-only backups for long-term backup retention (preview).	Can configure backups.
Point-in-time restores		With appropriate backups, can do point-in-time restores.
Can configure Active geo-replication (up to 4 readable secondary databases)	No.	Can configure geo-replication storage (asynchronously). Data file and log file needs to be on the same disk.
Can configure auto-failover groups (not Hyperscale)	Can configure auto-failover groups	Can configure Azure failover cluster instances using shared storage.