Evolving SQL Databases & Administrations

- Atul Kumar
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Introduction

- *Atul Kumar*
- Melbourne, Australia
- SQL Server DBA
- BI Developer and Data Visualization
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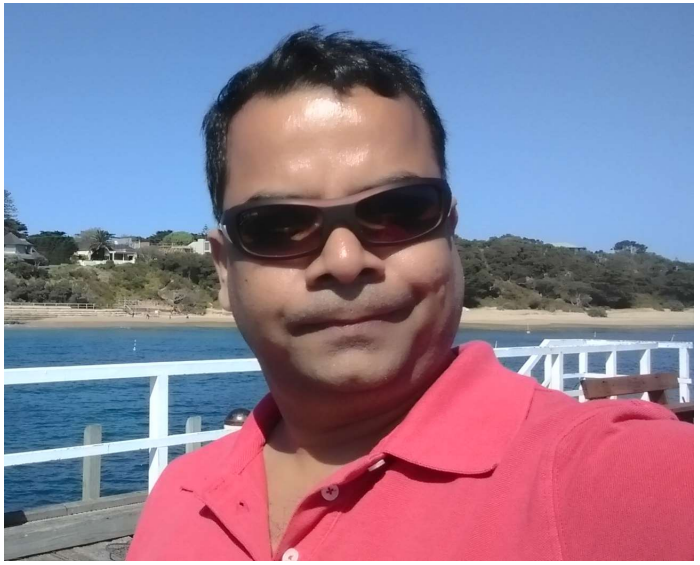
- My Blob - Tech Blogs (atuldata.blogspot.com)



Azure SQL

Azure Synapse Analytics

Azure Cosmos DB

NoSQL

Agenda

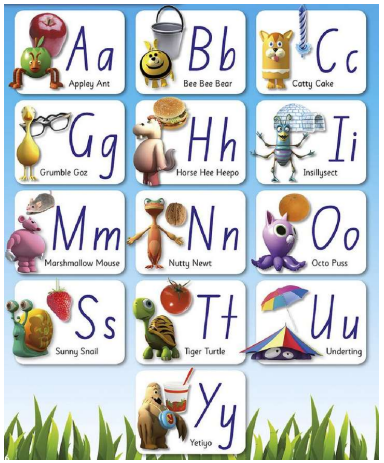
- Journey of Database
- Data Growth
- Azure SQL Database
- Demo
- Traditional DBA Tasks vs Azure DB Management Tasks
- Intro to Azure Synapse
- Intro to Cosmos DB

The Journey of **Data** and **Management** starts from early childhood

The **Alphabets** always starts from **A to Z** in any book

To bring the attention of kid, **pictures** are used

This is **Visualization** effect of Information.



Reports View

When information data grew, books are split in **Subjects**

- English
- Mathematics
- Physics
- Chemistry
- Biology
- Social

Tables

Journey of Database

The first computer database was built in the **1960**s (IBM)

Oracle brought the first commercial relational database to market in **1979** followed by DB2, SAP Sysbase ASE, and Informix.

Late **1989**, Microsoft developed a database for the OS/2 platform called SQL Server 1.0

In **1998**, Microsoft released **SQL Server V7**

Relational databases were architected around the assumption that they would be run on a single machine.

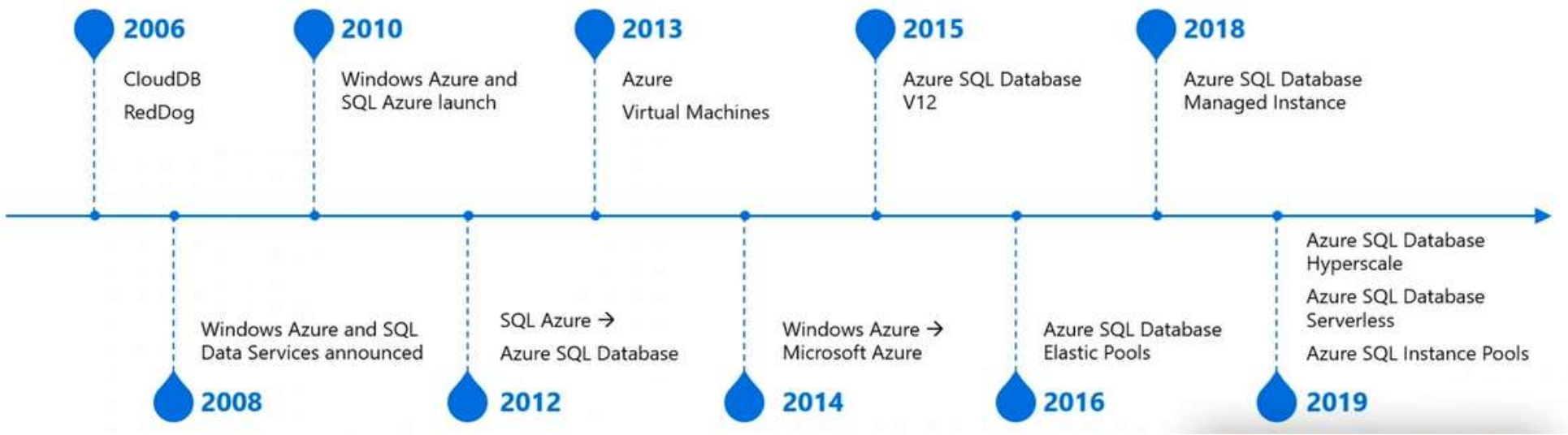
In **2010**, Microsoft introduce cloud based **SQL Azure**

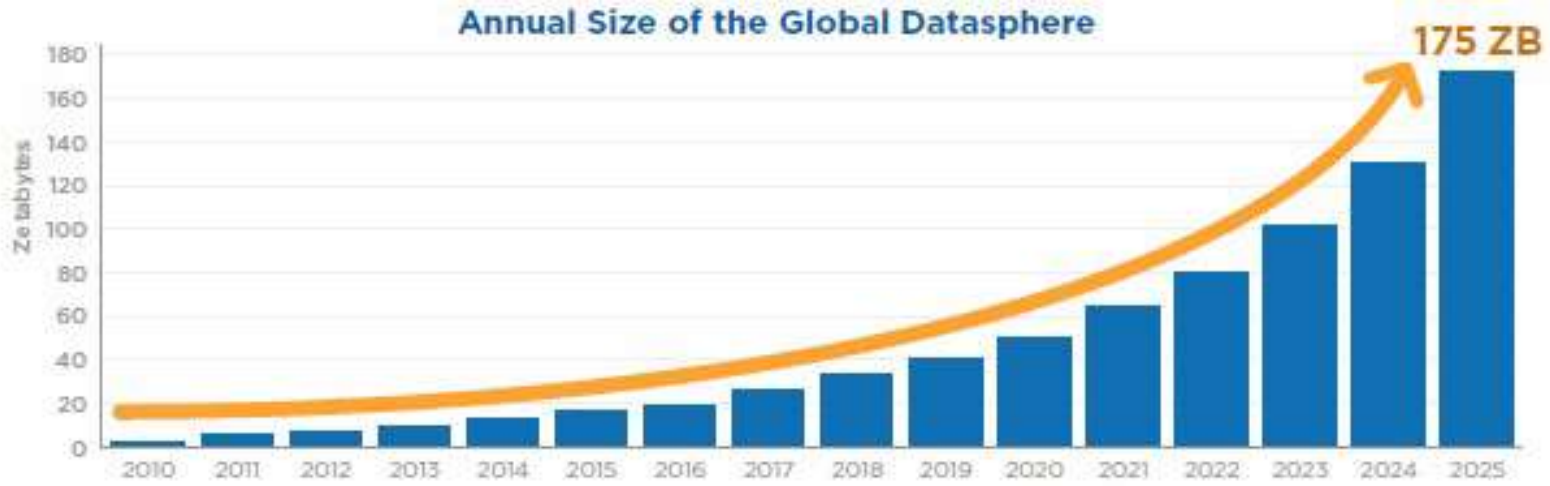
SQL Server Journey

1989		2006		2012	2014	2016	2017	2019
SQL Server 1.0		SQL Server 2005		SQL Server 2012	SQL Server 2014	SQL Server 2016	SQL Server 2017	**SQL Server 2019**

***Each version has 10 years of Support life**

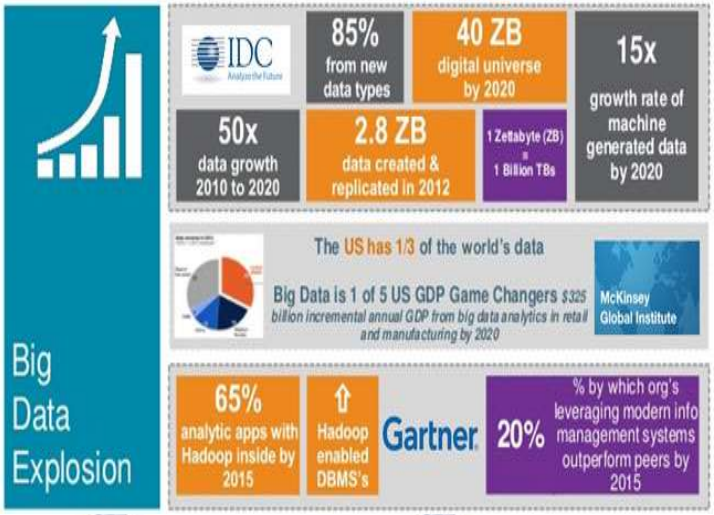
Azure SQL Journey

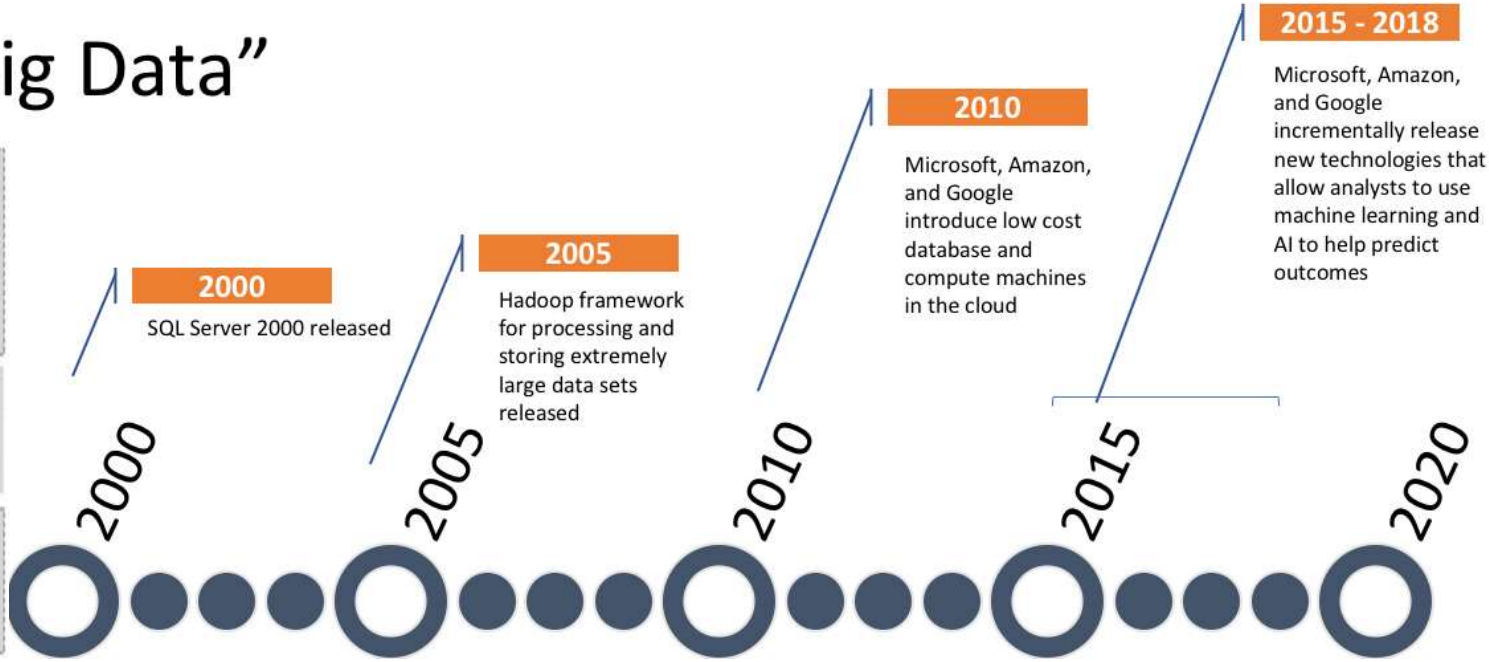




Megabyte (Mb)	1,000 kilobytes
Gigabyte (Gb)	1,000 megabytes
Terabyte (Tb)	1,000 gigabytes
Petabyte (Pb)	1,000 terabytes
Exabyte (Eb)	1,000 petabytes
Zettabyte (Zb)	1,000 exabytes

The Evolution of "Big Data"





Did you know ?

- Google gets over **3.5 billion** searches daily
- WhatsApp users exchange up to **65 billion** messages daily
- In 2020, every person generated **1.7 megabytes** per second
- 80-90% of the data we generate today is unstructured
- Data interactions went up by **5000%** between 2010 and 2020
- The number of IoT devices could rise to **41.6 billion** by 2025

Internet Live Stats - Internet Usage & Social Media Statistics

5,057,493,493	1,892,634,329	255,022,011,444
Internet Users in the world	Total number of Websites	Emails sent today
7,642,299,176	7,394,815	772,314,372
Google searches today	Blog posts written today	Tweets sent today
7,332,187,884	88,154,589	156,607,779
Videos viewed today on YouTube	Photos uploaded today on Instagram	Tumblr posts today

This massive data inflow has given rise to Cloud adaptation. It created new opportunities and new capabilities to be introduced to Cloud Database services.

There are several configurations in which to deploy Azure SQL Database:

- Single Database
- Elastic Pool
- Hyperscale
- Serverless

Priced in three tiers

- Basic
- Standard
- Premium

- vCore Model
- DTU Model

vCore Model

Provisioned Compute:

- You can provision up to 80 vCore
- 5.1 GB RAM per vCore
- Max 408 GB RAM

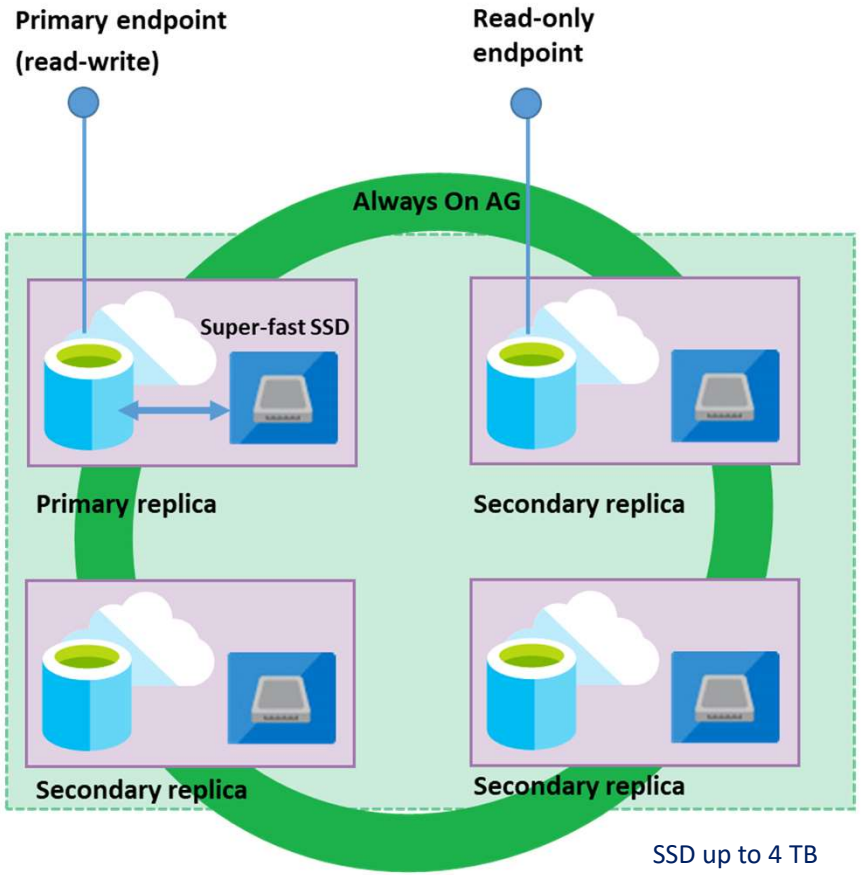
Serverless Compute:

- Auto-scale up to 40 vCore
- Auto-scale RAM up to 24 GB per vCore
- Max up to 12 GB

Hyperscale

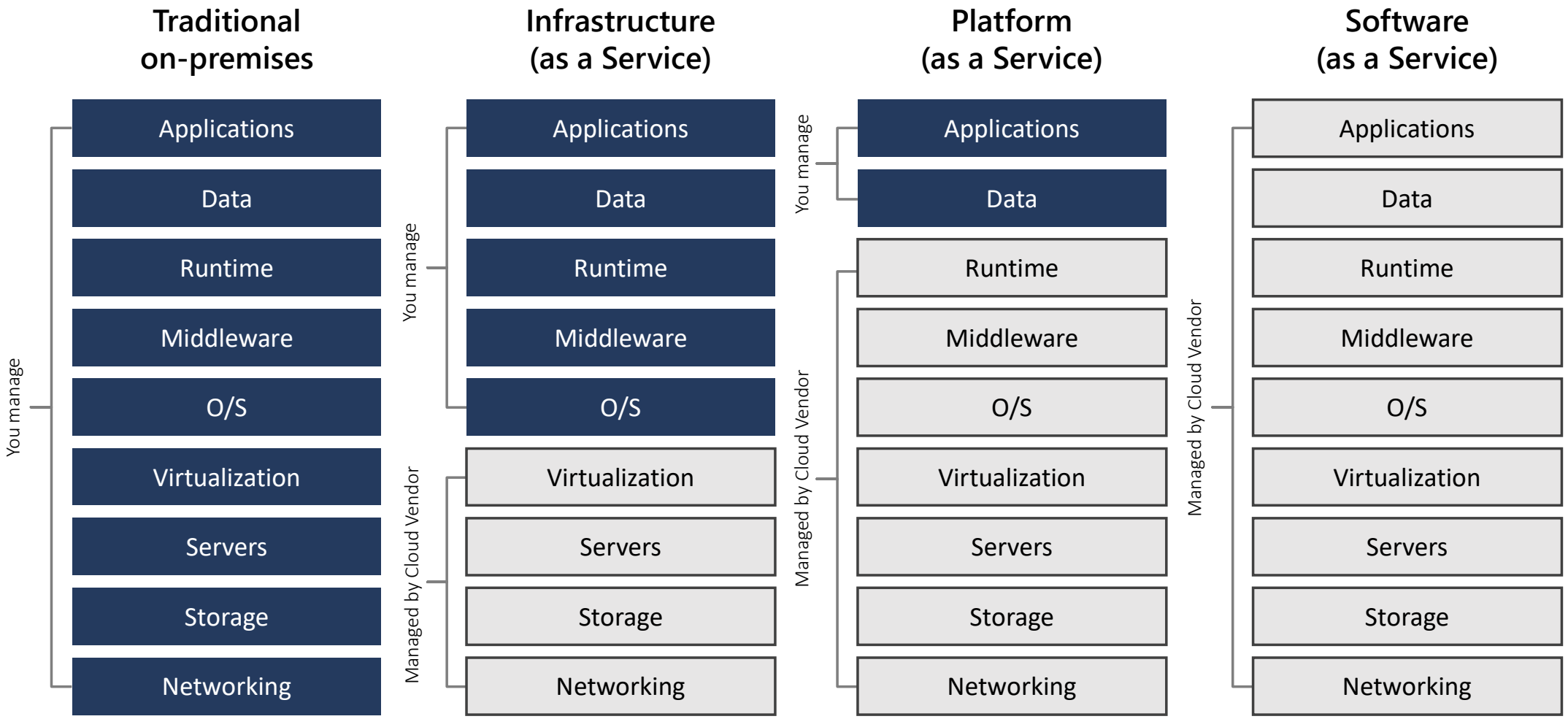
- Storage up to 100 TB
- Up to 4 read-scale Replicas

Business Critical



SSD up to 4 TB

Understanding Azure services



Azure SQL

SQL virtual machines

Best for migrations and applications requiring OS-level access

SQL virtual machine

- SQL Server and OS server access
- Expansive SQL And OS version support
- Automated manageability features for SQL Server

Managed instances

Best for most lift-and-shift migrations to the cloud

Single instance

- SQL Server surface area (vast majority)
- Native virtual network support
- Fully managed service

Instance pool

- Pre-provision compute resources for migration
- Enables cost-efficient migration.
- Ability to host smaller instances (2Vcore)
- Currently in public preview

Databases

Single database

- Hyperscale storage (up to 100TB)
- Serverless compute
- Fully managed service

Elastic pool

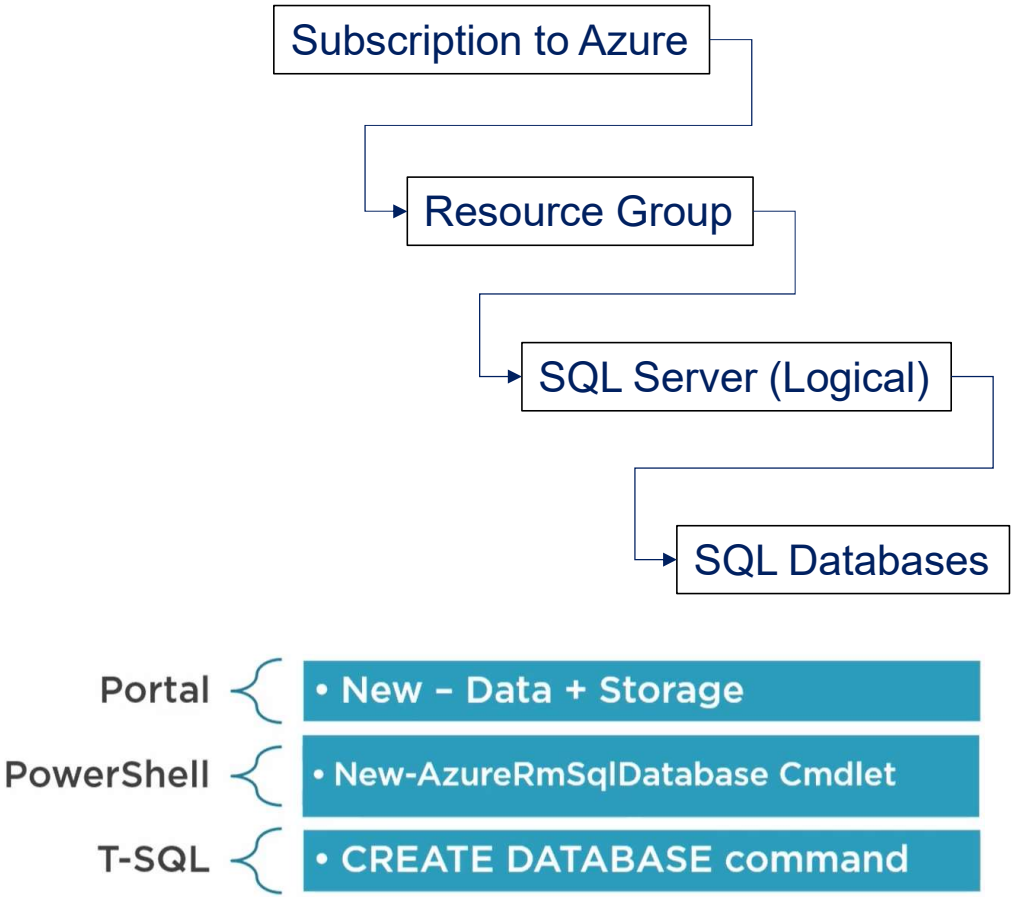
- Resource sharing between multiple databases to price optimize
- Simplified performance management for multiple databases
- Fully managed service

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.

Demo

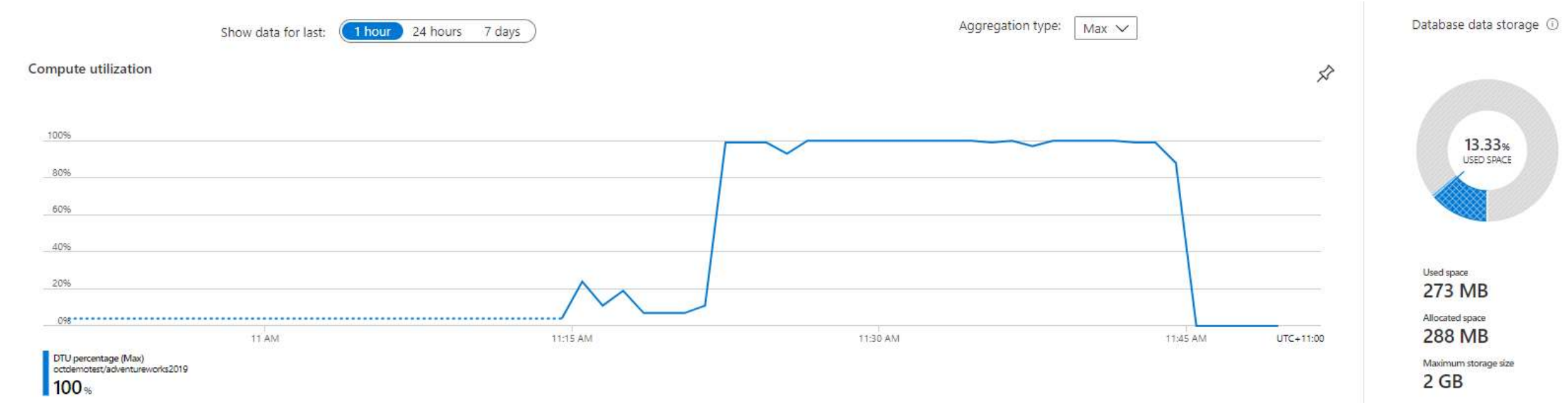
- Build SQL Server
- Create Database
- Migrate Database

Flow Steps https://portal.azure.com



Demo

Performance Analysis



Notifications (2) Database features (6)

All Alerts (1) Recommendations (1) Info (0)

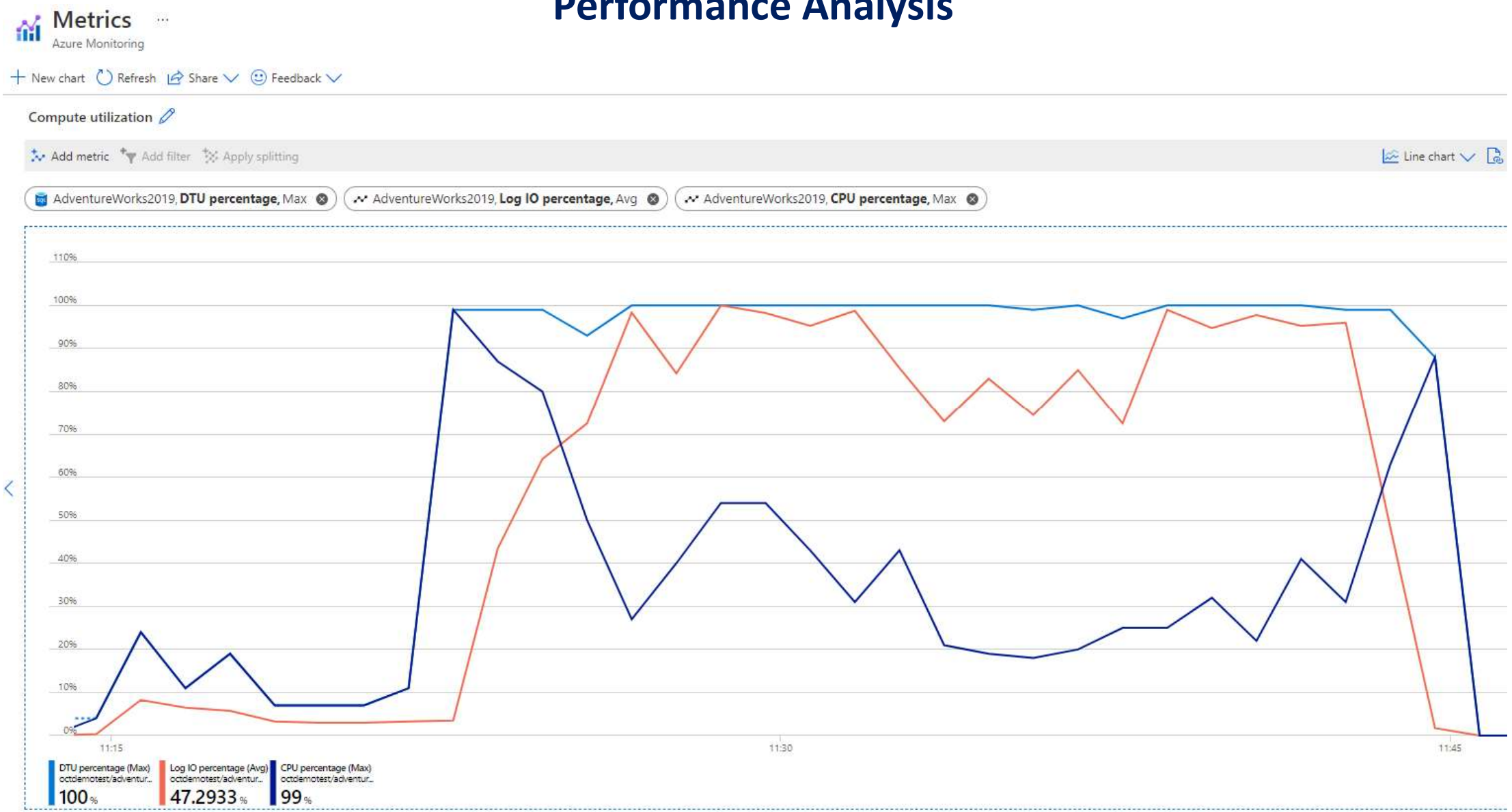
Database DTU consumption is high.

Click here to review top queries.

High resources usage

The database is currently using Basic service tier and hit the resource limit in Log IO. Consider upgrading database in case of performance issues.

Performance Analysis



Demo

- Performance Monitor
- Scaling Up
- Alert Configuration
- Cost Management View

Traditional DBA Activities	Azure SQL DBA Activities
Database Backup and Recovery	Secure Databases
Secure and Manage Databases	Monitor Database health and performance
Monitor system health and performance	Monitor DTU usage and Alerts
Ensure High Availability	Custom Tasks defined in Azure Automation
Manage SQL Agent Jobs/Tasks	Manage ROI and Results visible in very short time
SQL Server Upgrade	Seamless transition to different Service Tier
SQL Server Patch Management	Acting on Performance Recommendations
Disk Space/Storage Management	

Database Backup and Restore

Database Backup to **Cloud Storage**

Traditional Command:

```
BACKUP DATABASE [AdventureWorks2019]
TO DISK = 'D:\SQL_Backup\AdventureWorks2019_20210925.BAK'
```

Cloud Storage Backup Command:

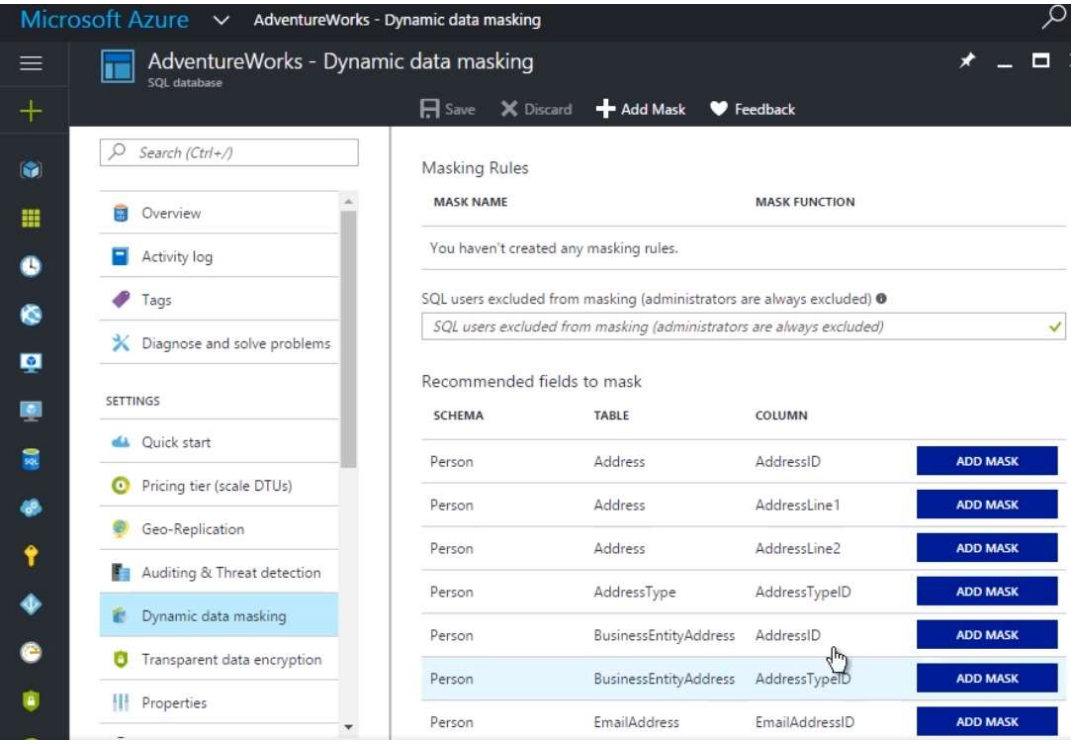
```
BACKUP DATABASE [AdventureWorks2019]
TO URL = 'https://<storageaccountname>.blob.core.windows.net/SQLBackup/AdventureWorks2019_20210925.BAK'
```

Azure SQL Database

DBA is not responsible for Database Backups
One can only Export the database, if require
You can use the Restore option to restore the database from available backup
Database Backups are available as below:
- Basic Service Tier : 7 Days
- Standard and Premium Service Tier : Up to 35 Days

One can retail the database backup for up to 10 years under Long Term Retention plan

You can not overwrite existing database. So restore always work as new database




```
ALTER TABLE Data.Membership ALTER COLUMN FirstName
ADD MASKED WITH (FUNCTION = 'partial(1, "xxxxx", 1)')

ALTER TABLE Data.Membership ALTER COLUMN Email
ADD MASKED WITH (FUNCTION = 'email()')

ALTER TABLE Data.Membership ALTER COLUMN DiscountCode
ADD MASKED WITH (FUNCTION = 'random(1, 100)’)

GRANT UNMASK to DataOfficers
```

Data Masking in Easy with Built-in Functions

Normal End Users

	FirstName	LastName	Email	DiscountCode
1	Rxxxxxo	Tamburello	RXXX@XXXX.com	42
2	Jxxxxxe	Galvin	JXXX@XXXX.com	36
3	Sxxxxxi	Menon	SXXX@XXXX.com	91
4	Zxxxxxg	Mu	ZXXX@XXXX.com	33

Role DataOfficers

	FirstName	LastName	Email	DiscountCode
1	Roberto	Tamburello	RTamburello@contoso.com	10
2	Janice	Galvin	JGalvin@contoso.com.co	5
3	Shakti	Menon	SMenon@contoso.net	50
4	Zheng	Mu	ZMu@contoso.net	40

Missing in Azure SQL

SQL Server Agent services
SP_Configure option
DBCC FREEPROCCACHE
Database Mail
Event Notification
SQL Server Trace / Profiler

SQL Server Reporting Services
SQL Server Integration Services
SQL Server Analysis Services

Log Shipping
Database Mirroring
Availability Groups

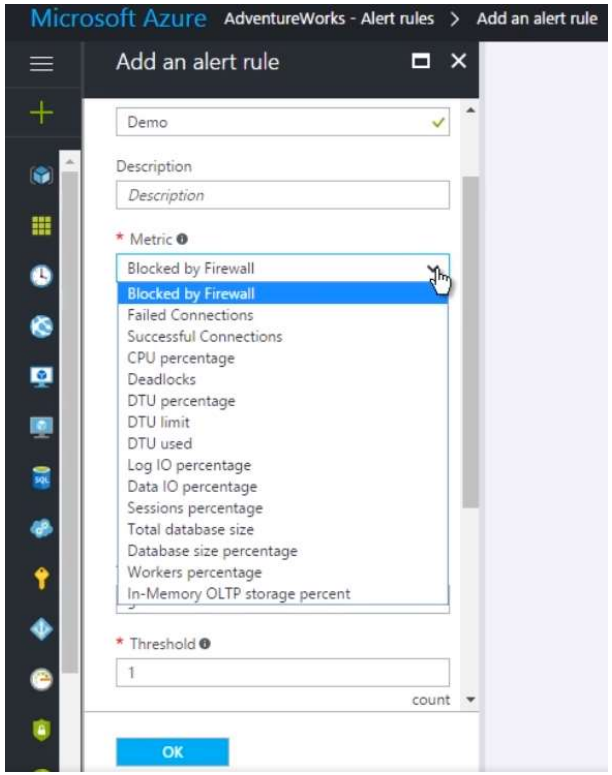
```
RECONFIGURE
GO
EXEC sp_configure 'cost threshold for parallelism', 25 ;
GO
RECONFIGURE
------------------------*/
Msg 40510, Level 16, State 1, Line 13
Statement 'CONFIG' is not supported in this version of SQL Server.
Msg 2812, Level 16, State 62, Line 15
Could not find stored procedure 'sp_configure'.
Msg 40510, Level 16, State 1, Line 17
Statement 'CONFIG' is not supported in this version of SQL Server.
```

Microsoft handles all Infrastructure related configurations and settings

Options in Azure SQL

On Premises SQL Agent
Elastic Database Job Module
Alert Rules for Databases
Power BI for Reporting
Azure Synapse for Analytic services
Extended Events

Geo Replication for DR purpose

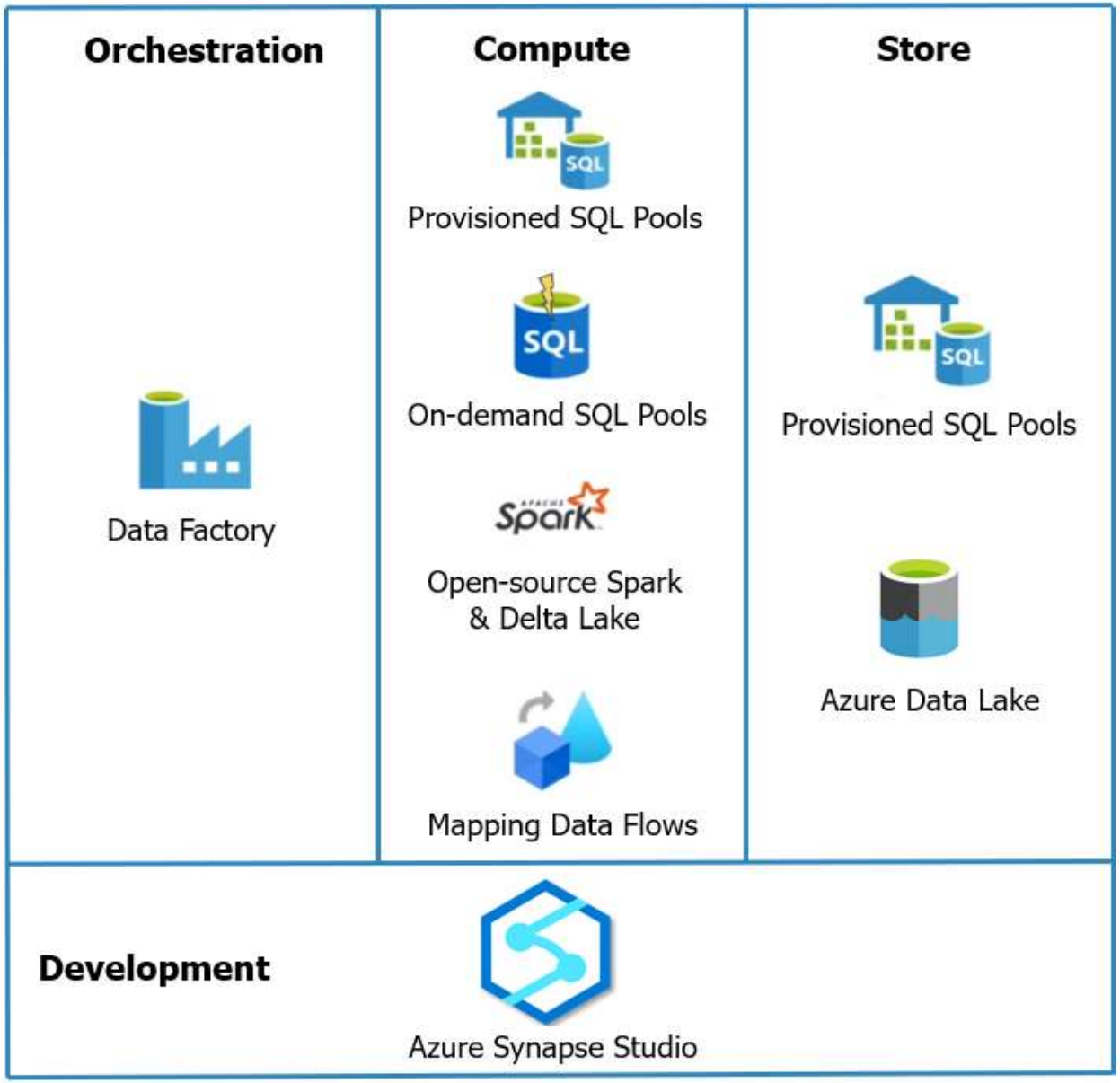



```
ALTER DATABASE SCOPED CONFIGURATION CLEAR PROCEDURE_CACHE;
```

Microsoft handles all Infrastructure related configurations and settings

Azure Synapse : DW Service

Upgrade from SQL Analysis Services (SSAS)



Azure Cosmos DB

A globally distributed, massively scalable, multi-model database service

Table API

cassandra

SQL

{LEAF} Cosmos DB's API for MongoDB

Gremlin $G = (V, E)$

Key-value

Column-family

Document

Graph

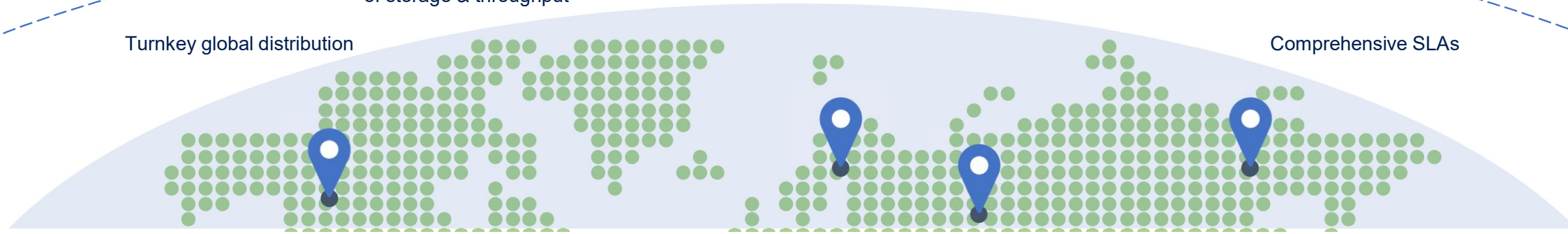
Guaranteed low latency at the 99th percentile

Elastic scale out of storage & throughput

Five well-defined consistency models

Turnkey global distribution

Comprehensive SLAs



Useful Resources

Here are some Links for further study and references

- https://docs.microsoft.com/en-us/learn/paths/azure-sql-fundamentals/
- https://docs.microsoft.com/en-us/azure/azure-sql/database/
- https://docs.microsoft.com/en-us/sql/azure-data-studio
- https://channel9.msdn.com/Series/Azure-SQL-for-Beginners
- https://www.sqlservercentral.com/articles/identifying-the-right-service-tier-for-azure-database

Certification

DP – 300 : Microsoft Certified: Azure Database Administrator Associate

thank you

Mentor - Marco Obinu

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