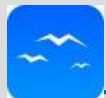Jes Schultz

Microsoft

Which Azure Database Option Should I Choose?

Jes Schultz (she/her)
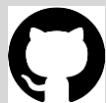
- Product Manager @ Microsoft
- Based in Louisville, KY
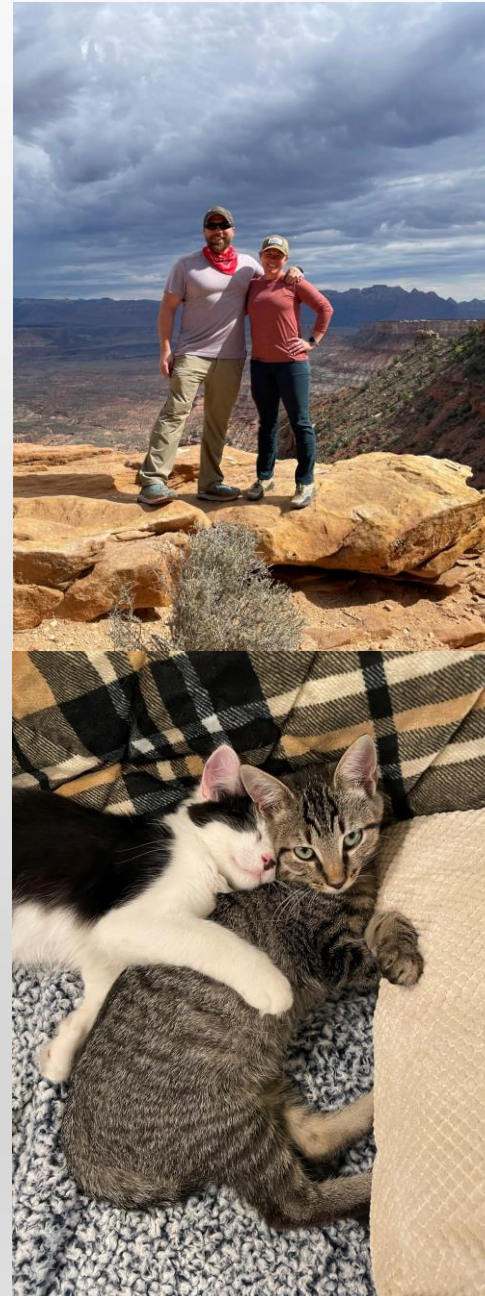- Runner
- Foodie

 /grrlgeek.bsky.social

 Jes Schultz

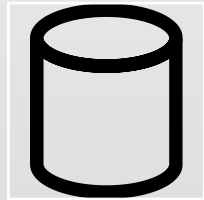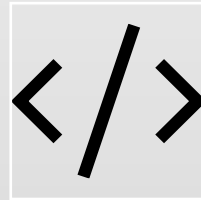 grrlgeek

What you'll learn

IaaS vs. PaaS

Azure's PaaS database offerings

What makes each unique

What's managed for you with each offering
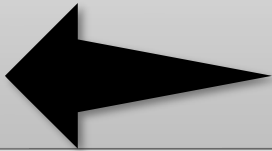
First, let's talk IaaS vs PaaS

IaaS

- Infrastructure as a Service
- You "rent" infrastructure – VMs, compute, storage, networks, OSes
- You manage the VMs, OS, and any applications on them

PaaS

- Platform as a Service
- You rent access to a ready-to-use platform (in this case database)
- The provider manages the hardware, OS, upgrades, and many administrative tasks

Let's talk about types of data stores

Highly structured data with primary/foreign key relationships and constraints	Loosely structured data stored as a document (JSON), key/value pair, or graph	Low-latency, high-throughput data storage	Store and query large amounts of data for analysis
Relational	Non-relational	In-memory	Analytics

Azure Database Options

These roughly fall into several categories

Relational	Non-relational	In-memory	*Analytics*	*Other*

• Azure **SQL**, SQL databases, SQL servers, SQL elastic pools, SQL managed instances
• Azure Database for **MySQL** servers
• Azure Database for **MariaDB** servers
• Azure Database for **PostgreSQL** servers
• Azure Cosmos DB
  • PostgreSQL (Citus)
	• Azure **Cosmos DB**
	  • NoSQL
	  • MongoDB
	  • Apache Cassandra
	  • Apache Gremlin
	  • Table
		• Azure Cache for **Redis**	• *Azure Synapse Analytics*
			• *Dedicated SQL pool*
			• *Analysis Services*
				• *Azure Database Migration Services*
				• *SQL Server stretch databases*
				• *Managed databases*
				• *Data factories*
				• *Virtual clusters*
				• *Elastic Job agents*
				• *SQL virtual machines (Iaas)*

Choose your own adventure

Why choose Azure SQL?

- Microsoft's SQL Server database engine – now evergreen, no messy version upgrades required, ever

- Enterprise features, especially security (Ledger, Always Encrypted, Auditing)

- Developers: less time managing performance
  - Automatic tuning
  - Intelligent query processing
  - SQL DB Emulator for local development

- Integrated with Azure Functions

Managed Instance
- One or more databases managed as an instance with shared resources
- Nearly 100% compatibility with SQL Server
- Best for: lift-and-shift from on-prem or IaaS

SQL Database
- One database with dedicated resources
- Provisioned and serverless options available
- Best for: cloud-native apps

Elastic Pools
- A pool of resources shared by many SQL Databases
- Manage databases that have varying, unpredictable usage
- Best for: SaaS apps, ISV apps, multi-tenant databases

Why choose Azure Database for MySQL servers?

- Open source - based on MySQL **Community** edition
- Configurable server parameters
- Data-in and data-out replication supported from/to on-prem servers, Azure VMs, other Azure MySQL DBs, other cloud MySQL DBs
- Up to 10 read replicas for scale-out
- Storage engines available:
  - InnoDB (most similar to SQL Server's engine)
  - MEMORY

Why choose Azure Database for MariaDB servers?

- Open source – based on MariaDB **community** edition (which is a fork of MySQL)

- Configurable server parameters

- Data-in replication supported from on-prem servers, Azure VMs, other Azure MariaDBs, other cloud MariaDBs

- Up to 5 read replicas for scale-out

- Storage engines available:
  - InnoDB
  - MEMORY

Why choose Azure Database for PostgreSQL servers?

- Open source - based on PostgreSQL **community** edition
  - Microsoft has a team of committers and contributors who work full time on the open-source Postgres project
  - Versions 11, 12, 13, 14, 15
- Configurable server parameters
- Lots of supported extensions (vary by engine version)
  - Version 14 includes, but is not limited to, timescaledb, postgis, pgaudit, and pg_cron
- Built-in PgBouncer for connection pooling – public or private access
- Up to 5 read replicas for scale-out
- Query Store for performance troubleshooting
  - Runtime stats – how many times was a query run, average execution time, longest-running queries
  - Wait stats – what queries are waiting on what resource, what resource is a long-running query waiting on

Why choose Azure Cosmos DB?

- Globally distributed*
  - Read anywhere, write anywhere
- Flexible consistency levels*

Strong	Bounded Staleness	Session	Consistent Prefix	Eventual
Stronger Consistency				**Weaker Consistency**

Higher availability, lower latency, higher throughput

- Integrated with Azure Functions, IoT Hub, AKS, App Service

* PostgreSQL (Citus) has slightly different options

Cosmos DB APIs

NoSQL

- Document storage (JSON)
- Use SQL to query
- [Automatic indexing](#)
- Offline emulator
- **Great for IoT, retail, gaming**

MongoDB

- Document storage (BSON)
- Compatible with MongoDB wire protocol
- [Single and compound indexes](#)
- Use familiar tools to query (Mongo Shell, etc)

Apache Cassandra

- Wide-column data store
- Compatible with existing Cassandra SDKs and tools
- **Great for apps where writes exceed reads** – logging, package tracking, IoT

Table

- Key/value storage
- Azure Table Storage on steroids
- **Great for app caching, gaming scores, shopping carts**

Apache Gremlin

- Graph data storage - think vertices and edges
- [Automatic indexing](#)
- **Great for relationships – recommendation engines, social networks, logistics**

PostgreSQL

- Community Postgres engine with the Citus extension
- Most recent engine versions (14, 15)
- Distributed data – coordinator and worker nodes
- **Great for high-throughput transactional apps and SaaS**

Why choose Azure Cache for Redis?
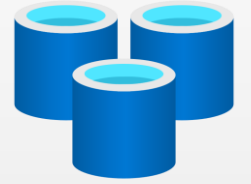
- Open-source Redis
  - Basic, Standard, Premium tiers
- Or Redis Enterprise
  - Enterprise, Enterprise Flash tiers
  - Modules supported
    - RediSearch, RedisBloom, RedisTimeSeries, RedisJSON
- Data or content caching, session store, job or messaging queue
- Redis persistence supported (available in Premium, in preview for Enterprise)
  - RDB (Redis database) – snapshots saved in Azure Storage account
  - AOF (Append only file) – write log stored in Azure Storage account
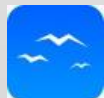
What's "managed" for these databases?

	Backups	Restores	High Availability (same region)	Disaster Recovery (different region)	Version upgrades
Azure SQL	Automatic	Point-in-time, geo-restore	Automatic	Geo-replicated backups, Geo-replication	Evergreen engine – no concept of versions. Incremental updates are automatic.
MySQL	Automatic	Point-in-time, geo-restore	Available	Geo-replicated backups, Read replicas	Patch updates – automatic. Major versions – dump and create new or perform manually through portal.
MariaDB	Automatic	Point-in-time, geo-restore	Automatic	Geo-replicated backups, Read replicas	Patch updates – automatic. Minor versions - dump and create new. Major versions - dump and create new.
PostgreSQL	Automatic	Point-in-time, geo-restore	Available	Geo-replicated backups, Read replicas	Patch and minor versions – automatic. Major versions – dump and create new.
Cosmos DB	Automatic	Point-in-time	Automatic	Scale out	Evergreen engine – no concept of versions. Incremental updates are automatic.
Redis	Set up data persistence	Load saved data	Available	Zone redundancy	Manual through portal, Azure CLI, or PowerShell.

Cool, how do I build my app using one of these PaaS databases?

- Sign up for a free trial!
  - [Create Your Azure Free Account Today | Microsoft Azure](#)
    - $200 credit for 30 days (Pro tip: provision serverless or burstable to get the most out of that)
    - After that, move to pay-as-you-go and get this every month for 12 months:
      - [Azure SQL Database](#) 10 DTUs, 250 GB storage
      - [Azure Database for MySQL](#) – 750 hours of burstable compute/32 GB storage
      - [Azure Database for PostgreSQL](#) – 750 hours of burstable compute/32 GB storage
      - [Azure Cosmos DB](#) 1,000 RUs, 25 GB storage
    - Cosmos DB has its own totally-free, no-credit-card-involved 30-day trial - [Try Azure Cosmos DB free | Microsoft Learn](#)

- Find sample code @ [github.com/azure-samples](#)

- Check documentation of each service for Quick Starts, Templates, and Samples
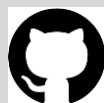
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