CSCI 5902 - Fall 23 - Azure Tutorial

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Recap

- Azure Compute - Hosting Models
- Services in Azure Compute
- Virtual Machines - Use cases, reference architecture, availability options, configuration options, VM series
- App Service - Features, App service plan, configuration options, reference architecture
- Compute selection decision tree

T5 - Azure Database Services

Databases on Azure

Key Features

- Azure offers choice of relational and non-relational databases.
- Built-in intelligence helps to automate management tasks like high availability, scaling, query performance tuning.
- Provided upto 5 9’s availability

Types of databases in Azure

- MS SQL Server
- Oracle
- PostgreSQL
- MariaDB
- MySQL
- MongoDB
- Apache Cassandra
- Redis ✗

- Azure Confidential ledger ✗

Azure SQL

Azure SQL is a family of managed, secure, and intelligent products that use the SQL Server database engine in the Azure cloud.

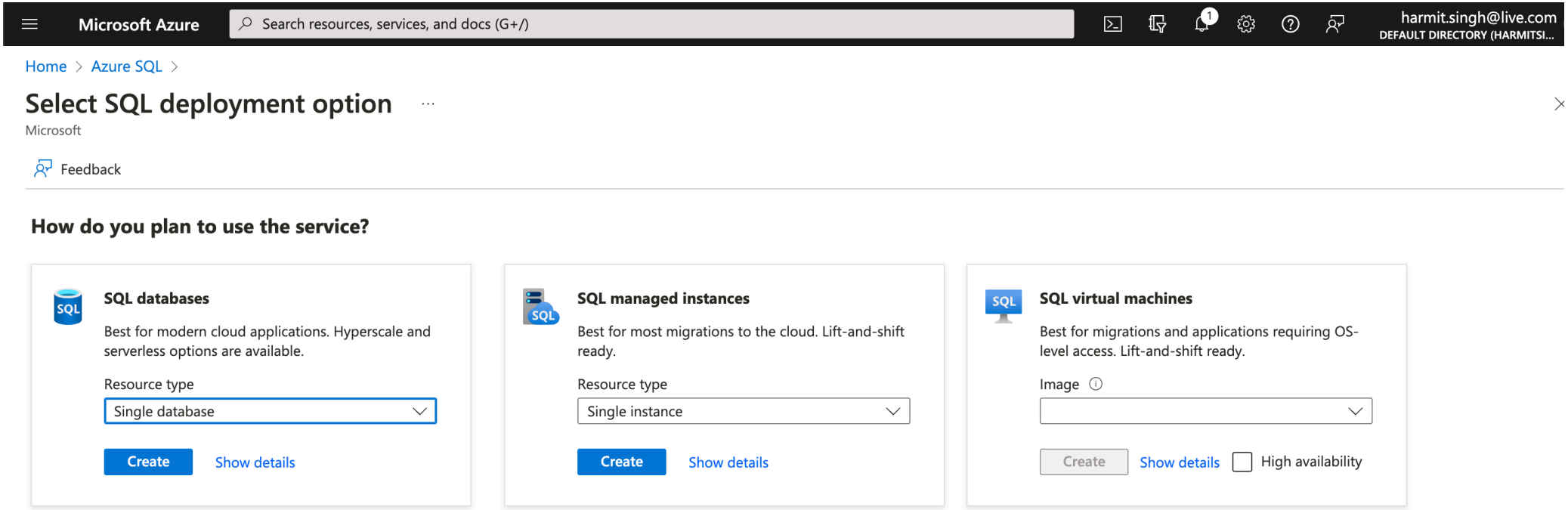
Azure SQL database
Azure SQL Managed database
SQL Server on Azure VM
Azure SQL Edge

Azure SQL(Contd.)

- SQL Server on Azure VMs - Lift-and-shift your SQL Server workloads with ease and maintain 100% SQL Server compatibility and operating system-level access.
- Azure SQL managed instance - Modernize your existing SQL Server applications at scale with an intelligent fully managed instance as a service, with almost 100% feature parity with the SQL Server database engine. Best for most migrations to the cloud.
- Azure SQL database - DBaaS solution, best suited for modern cloud applications. Has built-in high availability, intelligence and management. Uses latest stable version of SQL Server(EE) and provides serverless compute option.
- Azure SQL Edge - A robust IoT database for edge computing.

Azure SQL Database vs Managed Instance

- Azure SQL database offers 2 deployment options:
  - Single database - own set of resources managed via a logical server.
  - Elastic pool - a collection of databases with shared set of resources managed via a logical server. Provides cost effective solution for apps with variable usage patterns.
- Azure SQL managed instance -
  - Supports database migration from on-premises with minimal to no database changes.
  - Provides all of the PaaS benefits of Azure SQL Database but adds additional capabilities, such as native virtual network.
  - SQL Managed Instance provides full SQL Server access and feature compatibility to migrate your SQL Server instances to Azure.


Microsoft Azure
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Select SQL deployment option
Microsoft
Feedback
How do you plan to use the service?
SQL databases
Best for modern cloud applications. Hyperscale and serverless options are available.
Resource type
Single database
Create
Show details
SQL managed instances
Best for most migrations to the cloud. Lift-and-shift ready.
Resource type
Single instance
Create
Show details
SQL virtual machines
Best for migrations and applications requiring OS-level access. Lift-and-shift ready.
Image
Create
Show details
High availability

What is the difference between migration and modernization of database?

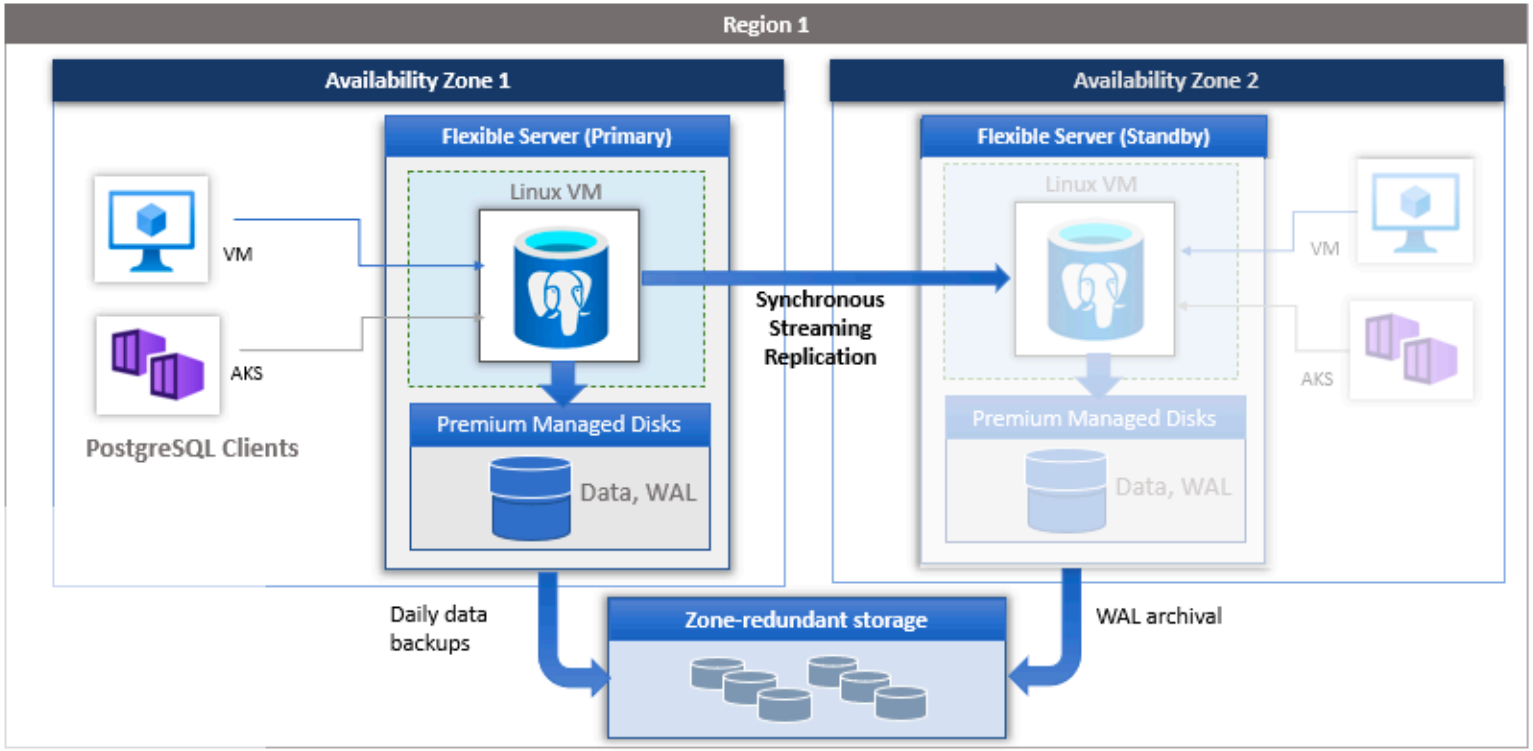
Azure Oracle

- Oracle supports running its Database 12.1 and higher Standard and Enterprise editions in Azure on VM images based on Oracle Linux.
- You can run Oracle databases on Azure infrastructure using Oracle Database on Oracle Linux images available in the Azure Marketplace.
- When using Oracle solutions in Azure, you're responsible for implementing a high availability and disaster recovery solution to avoid any downtime.
- The images are bring-your-own-license. You're charged only for the costs of compute, storage, and networking incurred running a VM.

Azure Database for PostgreSQL

- Fully managed PaaS offering.
- Supports 2 deployment models:
  - Single server - best suited for cloud native applications designed to handle automated patching without the need for granular control on the patching schedule and custom PostgreSQL configuration settings.
  - Flexible server - provides more granular control and flexibility over database management functions and configuration settings.
- Flexible server provides better cost optimization with flexibility to start/stop server and burstable compute options.

Architecture and HA for PostgreSQL



Source [1]

Azure Database for MySQL

- Further reading - https://learn.microsoft.com/en-us/azure/mysql/flexible-server/overview
- Azure DB for MariaDB is on retirement path and Microsoft recommends to migrate to Azure DB for MySQL.

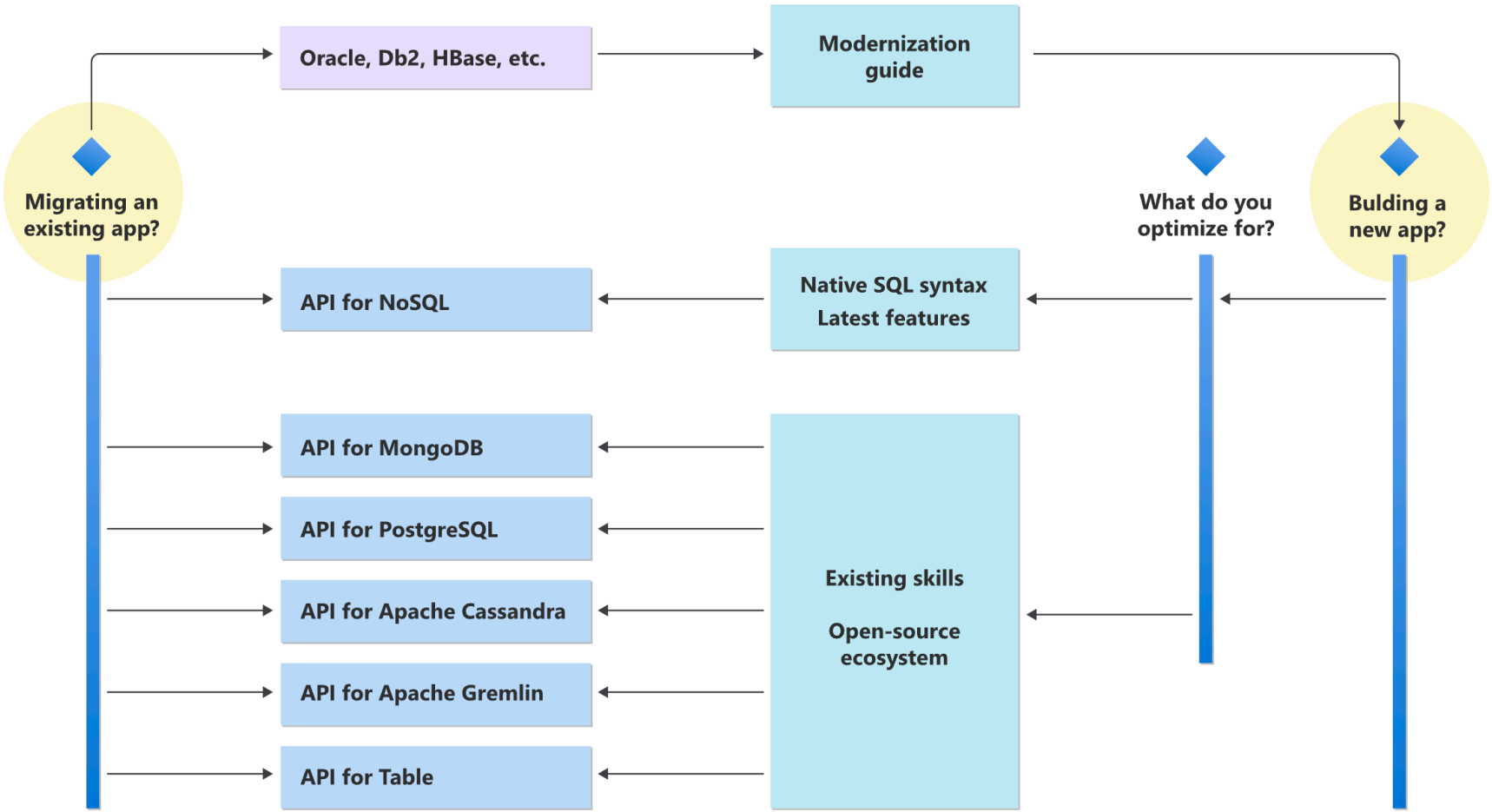
Azure Cosmos DB

Introduction to Cosmos DB

- Azure Cosmos DB is a fully managed NoSQL and relational database for modern app development.
- Azure Cosmos DB offers single-digit millisecond response times, automatic and instant scalability, along with guaranteed speed at any scale.
- Offers multiple database APIs:
    - NoSQL
    - MongoDB
    - PostgreSQL
    - Cassandra
    - Gremlin
    - Table
- Guaranteed 99.999% availability. Ability to have zero RPO with multi-region write/strong consistency.

How to decide the API?

- If you have existing MongoDB, PostgreSQL Cassandra, or Gremlin applications
- If you don't want to rewrite your entire data access layer
- If you want to use the open-source developer ecosystem, client-drivers, expertise, and resources for your database
- If you want to use the Azure Cosmos DB core features such as:
    - Global distribution
    - Elastic scaling of storage and throughput
    - High performance at scale
    - Low latency
    - Ability to run transactional and analytical workloads
    - Fully managed platform
- If you're developing modernized apps on a multicloud environment


Oracle, Db2, HBase, etc.
Modernization guide
Migrating an existing app?
What do you optimize for?
Bulding a new app?
API for NoSQL
Native SQL syntax
Latest features
API for MongoDB
API for PostgreSQL
API for Apache Cassandra
API for Apache Gremlin
API for Table
Existing skills
Open-source ecosystem

Source: [2]

What is another table database available in Azure?

Azure Table Storage

Azure table has limitations in latency, scaling, throughput, global distribution, index management, low query performance.

CAP Theorem

Distributed DB with Cosmos

- Cosmos offers API in both NoSQL and relational variants.
- Azure Cosmos DB will automatically and dynamically distribute your data across local instances or globally
- Azure Cosmos DB can also provide ACID guarantees and scale throughput to map to your application's requirements.
- With the API for PostgreSQL, there's no need to plan a complex distribution project in advance or plan a project to migrate your data from a single-node to a distributed database down the road.

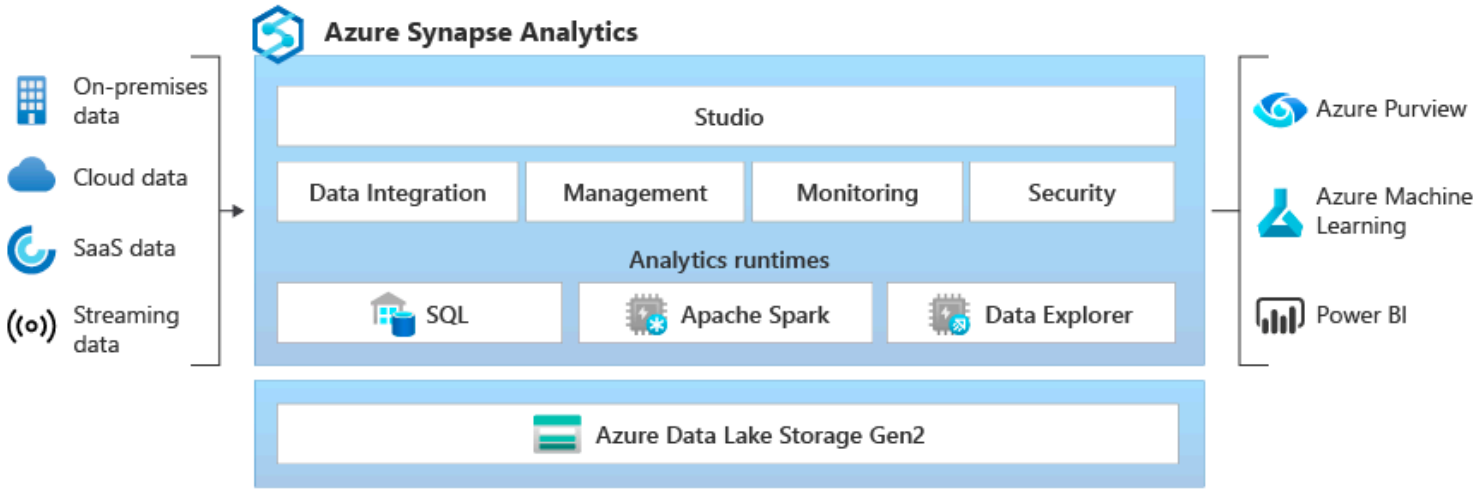
Azure Database Migration Service

Further reading:
https://learn.microsoft.com/en-us/azure/dms/

Azure Synapse Analytics

Azure Synapse

- Azure Synapse Analytics is an analytics service that brings together enterprise data warehousing and Big Data analytics.
- Azure Synapse brings together the best of **SQL** technologies used in enterprise data warehousing, **Spark** technologies used for big data, **Data Explorer** for log and time series analytics, **Pipelines** for data integration and ETL/ELT, and deep integration with other Azure services such as **Power BI**, **CosmosDB**, and **AzureML**.



Source: [3]

It’s a wrap

References

[1] https://learn.microsoft.com/en-us/azure/postgresql/flexible-server/overview

[2] https://learn.microsoft.com/en-us/azure/cosmos-db/choose-api

[3] https://learn.microsoft.com/en-us/azure/synapse-analytics/overview-what-is