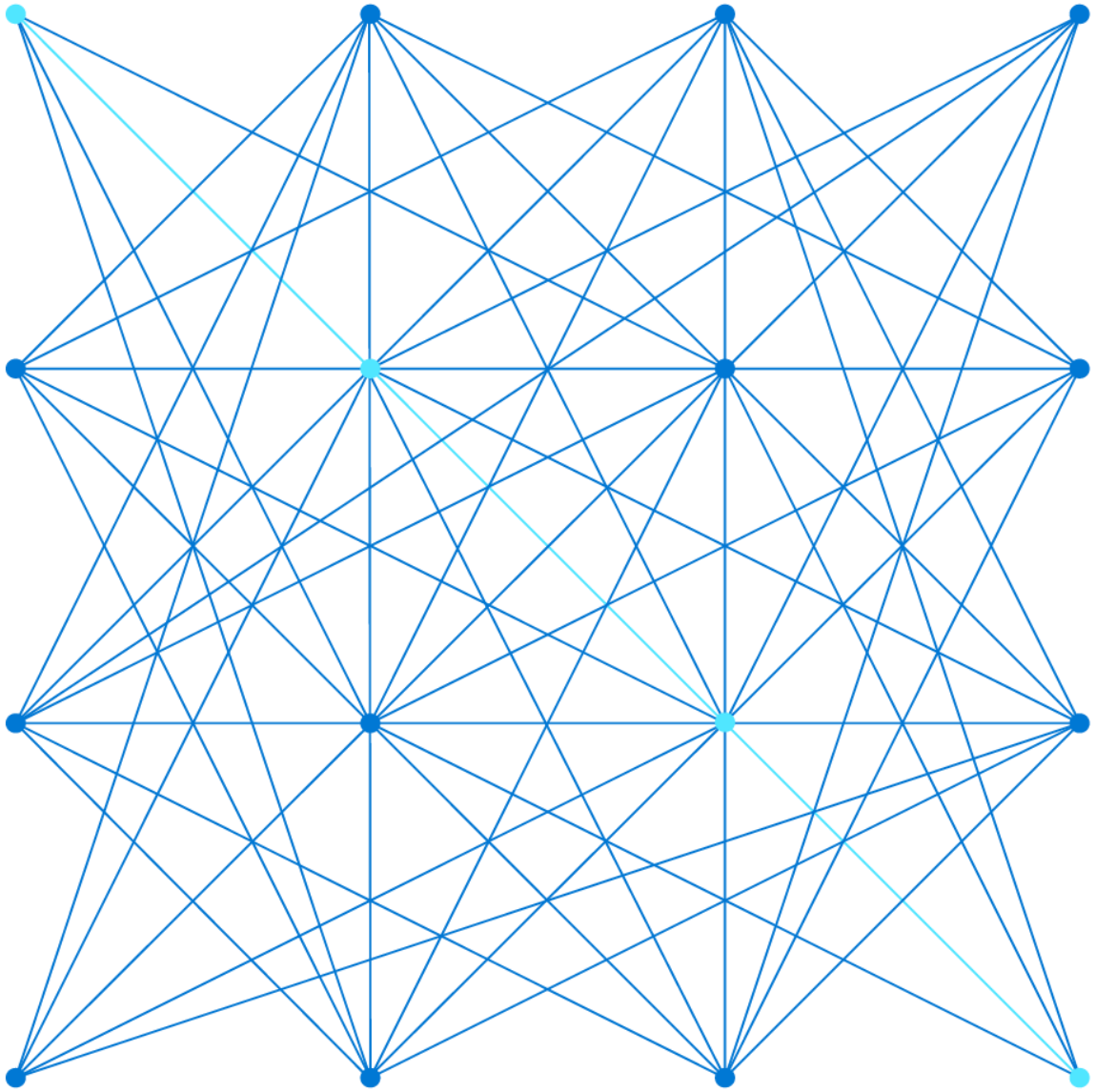
Microsoft Azure

Module 2: Explore relational data in Azure

Mohammed Arif
10/03/2022



© Copyright Microsoft Corporation. All rights reserved.

Agenda

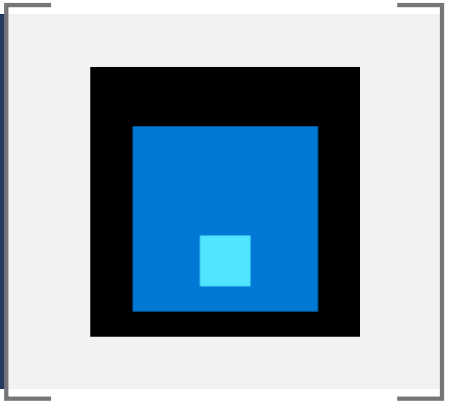
Explore relational data services in Azure

Explore provisioning and deploying relational database services in Azure

Query relational data in Azure

© Copyright Microsoft Corporation. All rights reserved.

Lesson 1: Explore relational data services in Azure



© Copyright Microsoft Corporation. All rights reserved.

Lesson 1 objectives

What are Azure Data Services?

IaaS vs PaaS

SQL Server on Azure virtual machines

Azure SQL DB

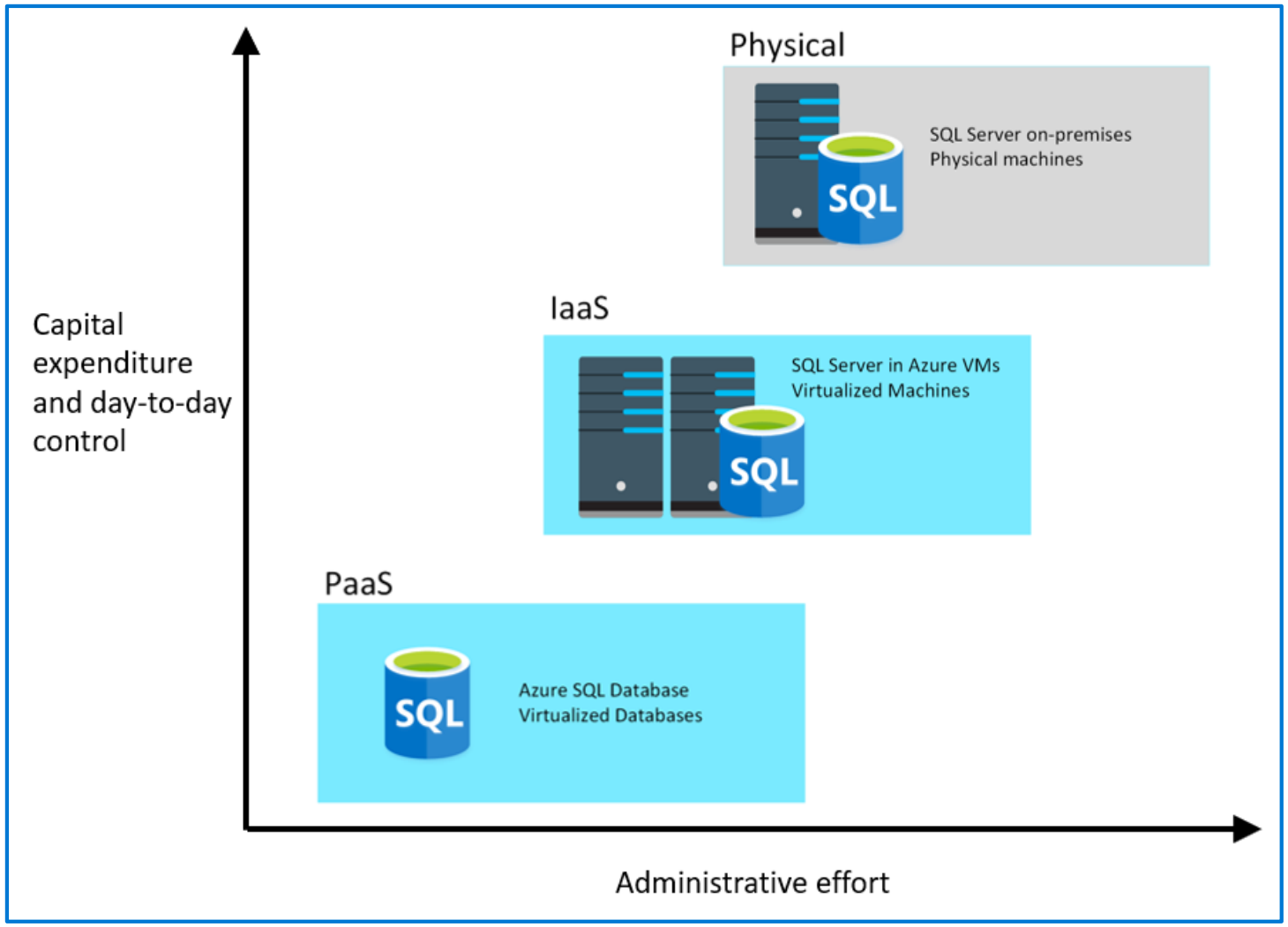
PostgreSQL, MySQL, MariaDB

© Copyright Microsoft Corporation. All rights reserved.

What are Azure Data Services?

© Copyright Microsoft Corporation. All rights reserved.

IaaS vs PaaS



© Copyright Microsoft Corporation. All rights reserved.

SQL Server on Azure

SQL Server on Azure Virtual Machines

Azure SQL Managed Instance

Azure SQL Database

Infrastructure as a Service

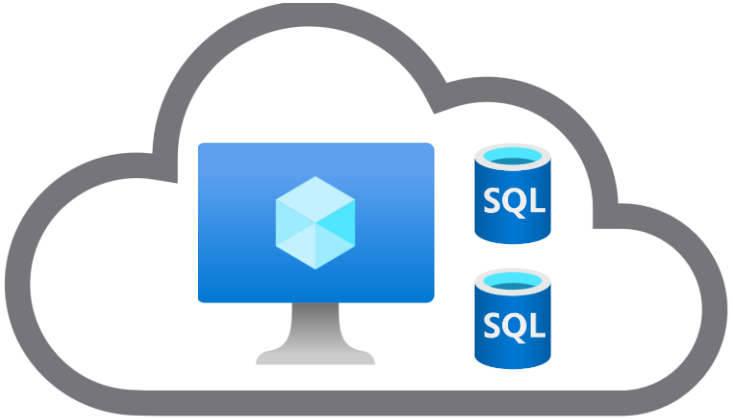
Platform as a Service

© Copyright Microsoft Corporation. All rights reserved.

SQL Server on Azure Virtual Machines

SQL Server on Virtual Machines is an IaaS solution that enables users to use full versions of SQL Server in the Cloud without having to manage any on-premises hardware.

- Guaranteed compatibility to SQL Server on premises
- Customer manages everything – OS upgrades, software upgrades, backups, replication
- Pay for the server and licensing, not per database



© Copyright Microsoft Corporation. All rights reserved.

Azure SQL Database

Azure SQL Database is a PaaS offering where users create a managed database server in the cloud, and then deploy the databases on the server.

- Low-cost option with minimal administration
- Best for new cloud projects with flexible application design
- Supports systems with variable loads – scale up and down quickly without restarting

Single Database

Create and run a database server in the cloud and access the database through the server.

Elastic Pool

Multiple databases share the same resources, such as memory, storage, and processing power.

© Copyright Microsoft Corporation. All rights reserved.

Azure SQL Managed Instance

Azure SQL Managed Instance allows you to pre-provision compute resources and deploy several individual managed instances up to your pre-provisioned compute level.

- Automatic backups, software patching, database monitoring, and other administrative tasks
- Near 100% compatibility with on-premises SQL Server
- Supported by other Azure services

Single Instance

One SQL Server instance, multiple databases.

Instance Pool

Multiple instances share the same resources.

© Copyright Microsoft Corporation. All rights reserved.

Azure SQL Managed Instance or Azure SQL Database

Azure SQL Managed Instance

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

Azure SQL Database

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

© Copyright Microsoft Corporation. All rights reserved.

PostgreSQL, MySQL, MariaDB

Azure Database for PostgreSQL is a relational database service in the Microsoft cloud based on the PostgreSQL Community Edition database engine.

Azure Database for MySQL is a PaaS implementation of MySQL in the Azure cloud, based on the MySQL Community Edition.

Azure Database for MariaDB is an implementation of the MariaDB database management system adapted to run in Azure. It's based on the MariaDB Community Edition.

© Copyright Microsoft Corporation. All rights reserved.

Benefits of Azure Database for PostgreSQL, MySQL, MariaDB

Fully managed community database:
Take advantage of a fully managed service while still using the tools and languages you're familiar with

Built-in high availability for lowest TCO:
Ensure your data is always available without the need for additional costs

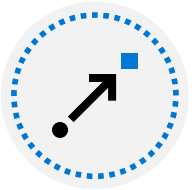
Intelligent performance and scale:
Improve performance with built-in intelligence and up to 16TB storage and 20K IOPs

Industry-leading security and compliance:
Protect your data with enhanced security features including Advanced Threat Protection

Integration with the Azure ecosystem:
Build apps faster with Azure services and safeguard your innovation with Azure IP Advantage

© Copyright Microsoft Corporation. All rights reserved.

Lesson 1: Knowledge check (continued on next slide)



Which deployment requires the fewest changes when migrating an existing SQL Server on-premises solution?

- ❑ Azure SQL Database Managed Instance
- ☑ SQL Server running on a virtual machine
- ❑ Azure SQL Database Single Database

Which of the following statements is true about SQL Server running on a virtual machine?

- ❑ You must install and maintain the software for the database management system yourself, but backups are automated
- ❑ Software installation and maintenance are automated, but you must do your own backups
- ☑ You're responsible for all software installation and maintenance, and performing back ups

Which of the following statement is true about Azure SQL Database?

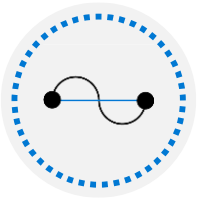
- ❑ Scaling up doesn't take effect until you restart the database
- ❑ Scaling out doesn't take effect until you restart the database
- ☑ Scaling up or out will take effect without restarting the SQL database

© Copyright Microsoft Corporation. All rights reserved.

Lesson 1: Knowledge check (continued)

When using an Azure SQL Database managed instance, what is the simplest way to implement backups?

- ❑ Manual Configuration of the SQL server
- ❑ Create a scheduled task to back up
- ☑ Backups are automatically handled

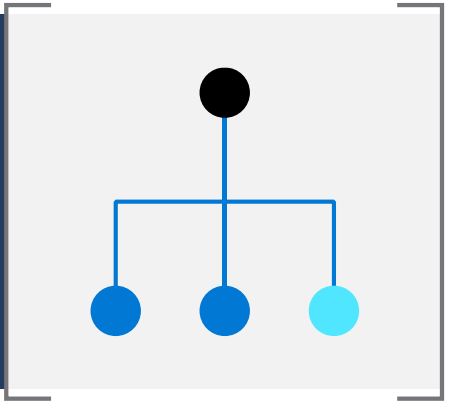


What is the best way to transfer the data in a PostgreSQL database running on-premises into a database running Azure Database for PostgreSQL service?

- ❑ Export the data from the on-premises database and import it manually into the database running in Azure
- ❑ Upload a PostgreSQL database backup file to the database running in Azure
- ☑ Use the Azure Database Migration Services

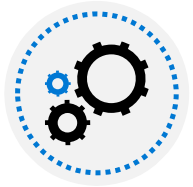
© Copyright Microsoft Corporation. All rights reserved.

Lesson 2: Explore provisioning and deploying relational database services in Azure



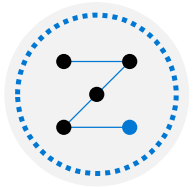
© Copyright Microsoft Corporation. All rights reserved.

Lesson 2 objectives



Provision relational data services

Configure relational data services



Explore basic connectivity issues

Explore data security

© Copyright Microsoft Corporation. All rights reserved.

Demo: What is provisioning?

This video summarizes the process that Azure performs when you provision a service

© Copyright Microsoft Corporation. All rights reserved.

Configure relational data services

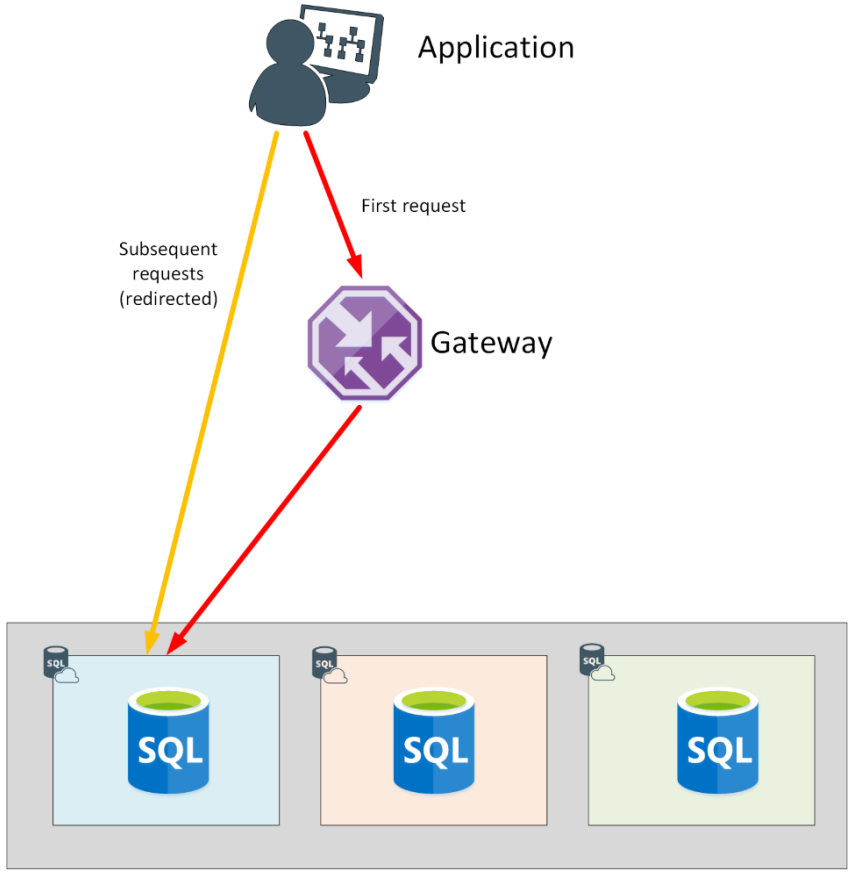
Basics	Network connectivity	Additional settings	Tags (DB)	Review & create
Subscription	Public vs Private access	Data source (DB)		Terms and Privacy
Resource group	VNet/Firewall rules	Server Collation (MI)		
Managed Instance/ Server name	Connection type (MI)	Database Collation (DB)		
Database Name (DB)		Time zone (MI)		
Admin Login		Opt-in for Advanced data security (DB)		
Password				
Region				
Opt-in for pools (DB)				
Compute + storage				

© Copyright Microsoft Corporation. All rights reserved.

Connectivity from within Azure

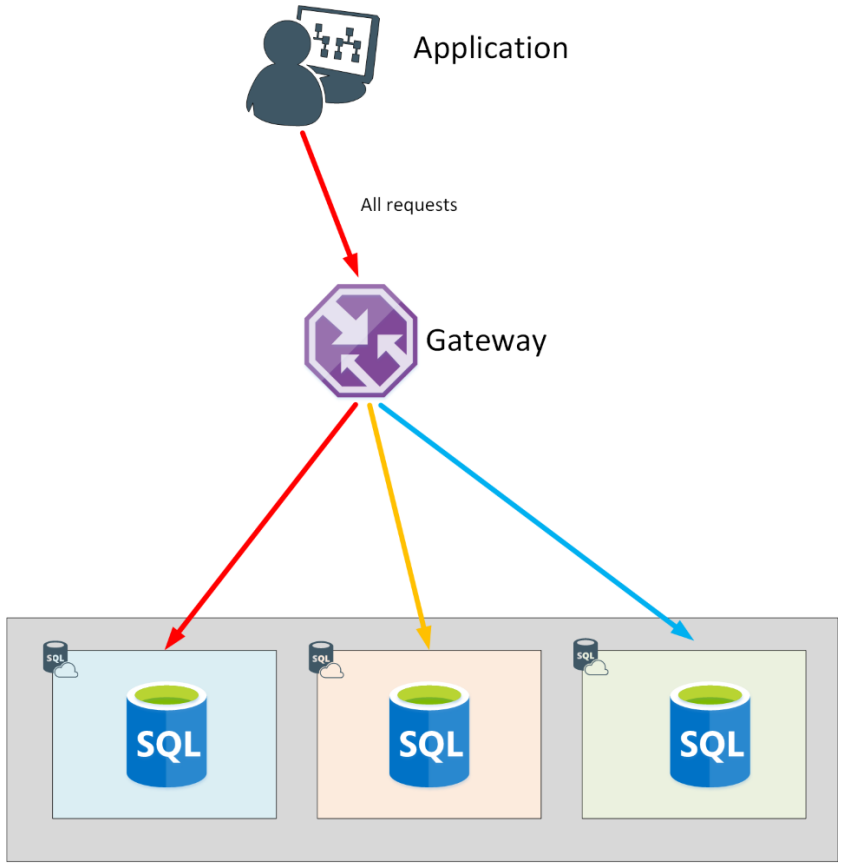
Policy of Redirect

1. An application establishes a connection to the Azure SQL database through the gateway
2. All requests after the first, will go directly to the database
3. If connectivity to the database fails, the application will have to reconnect through the gateway.
4. The application may be directed to a different copy of the database running on another server in the cluster.



© Copyright Microsoft Corporation. All rights reserved.

Connectivity from outside of Azure



Policy of Proxy

1. An application establishes a connection to the Azure SQL database via the gateway
2. All requests will go through the gateway
3. The application may be directed to a different copy of the database running on another server in the cluster.

© Copyright Microsoft Corporation. All rights reserved.

Authentication and Access Control

“Mixed Mode” authentication forced
SQL Auth for deployment: server admin:
Server-level principal for logical server for DB
Member of sysadmin server role for MI

Need Windows Auth? Use Azure AD Authentication Azure Managed Instance:
Azure AD Server Admin
SQL or Azure AD Logins
Database Users
SQL Server Contained Database supported

Azure SQL Database:
Azure AD Server Admin
SQL logins
loginmanager and dbmanager roles for limited server admins
Database Users
Contained Database Users including Azure AD (recommended)

© Copyright Microsoft Corporation. All rights reserved.

Azure Role Based Access Control (RBAC)

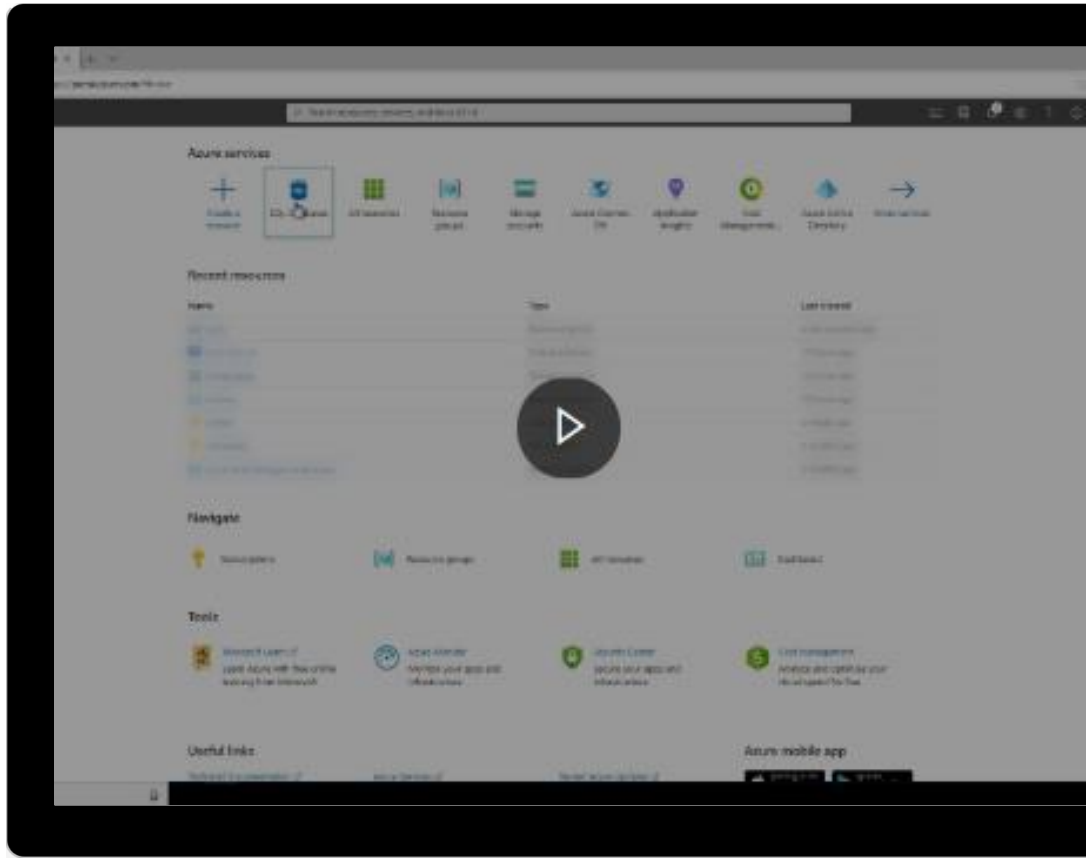
Azure Role Based Access Control (RBAC) helps you manage who has access to Azure resources, and what they can do with those resources.
You control access to resources using role assignments. A role assignment consists of three elements:

- **Security principal:** an object that represents a user or service that is requesting access to Azure resource
- **Role:** a collection of permissions
- **Scope:** A lists the set of resources that the access applies to

© Copyright Microsoft Corporation. All rights reserved.

Demo: Provision an Azure SQL Database instance

This video demonstrates how to provision an Azure SQL Database instance, to create a database and server



© Copyright Microsoft Corporation. All rights reserved.

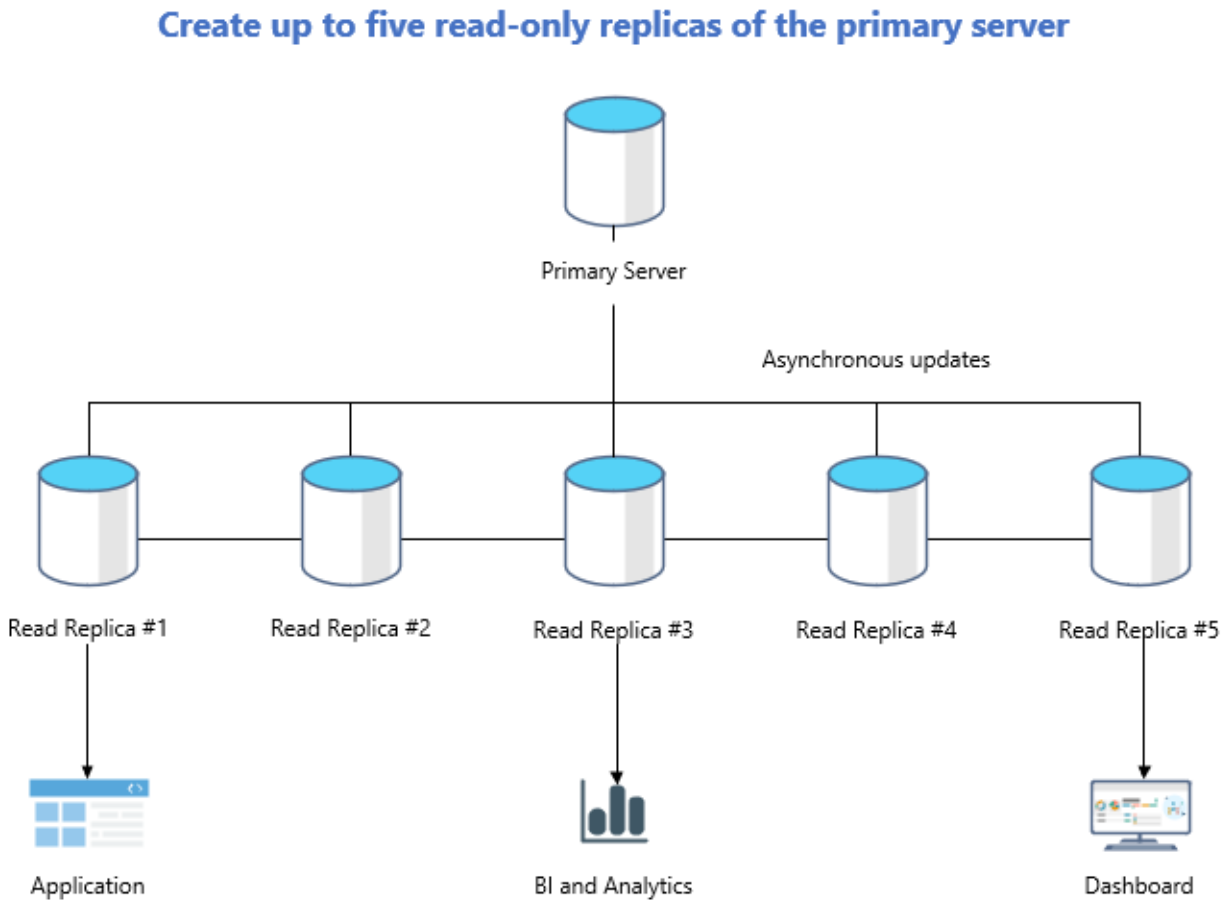
Azure DB – Read replicas

Read replicas help improve performance and scale of read-intensive workloads such as BI and analytics

Consider the read replica features in scenarios when delays in synching data between the primary and replicas are acceptable

Create a replica in a different Azure region from the primary for a disaster recovery plan, where a replica replaces the primary in cases of regional disasters

Data storage on replica servers grows automatically without impacting workloads



© Copyright Microsoft Corporation. All rights reserved.

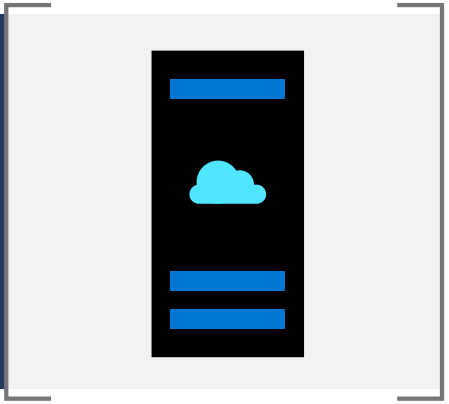
Lab: Provision Azure relational database service

As part of your role at Contoso as a data engineer, you've been asked to create and configure SQL Server, PostgreSQL, and MySQL servers for Azure

Go to the exercise **Provision non-relational Azure data services** module on Microsoft Learn, and follow the instructions in the module to create data stores

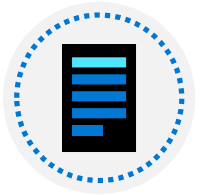
© Copyright Microsoft Corporation. All rights reserved.

Lesson 3: Query relational data in Azure



© Copyright Microsoft Corporation. All rights reserved.

Lesson 3 objectives



Query relational data

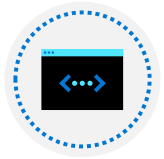
Describe query techniques for data using the SQL language

© Copyright Microsoft Corporation. All rights reserved.

Introduction to SQL

SQL is a standard language for use with relational databases

SQL standards are maintained by ANSI and ISO



Proprietary RDBMS systems have their own extensions of SQL such as T-SQL, PL/SQL, pgSQL

© Copyright Microsoft Corporation. All rights reserved.

SQL Statement types

DML	DDL	DCL
Data Manipulation Language	Data Definition Language	Data Control Language
Used to query and manipulate data	Used to define database objects	Used to manage security permissions
SELECT, INSERT, UPDATE, DELETE	CREATE, ALTER, DROP, RENAME	GRANT, REVOKE, DENY

© Copyright Microsoft Corporation. All rights reserved.

Use DML statements

Statement	Description
SELECT	Select/read from a table
INSERT	Insert new rows in a table
UPDATE	Edit/Update existing rows in a table
DELETE	Delete existing rows in a table

© Copyright Microsoft Corporation. All rights reserved.

Elements of the SELECT Statement

Clause	Expression
SELECT	<select list>
FROM	<table or view>
WHERE	<search condition>
GROUP BY	<group by list>
ORDER BY	<order by list>

© Copyright Microsoft Corporation. All rights reserved.

Example of SELECT statement

```
SELECT EmployeeId, YEAR(OrderDate) AS OrderYear
FROM Sales.Orders
WHERE CustomerId = 71
GROUP BY EmployeeId, YEAR(OrderDate)
HAVING COUNT(*) > 1
ORDER BY EmployeeId, OrderYear;
```

© Copyright Microsoft Corporation. All rights reserved.

Example of INSERT statement

The INSERT … VALUES statement inserts a new row

```
INSERT INTO Sales.OrderDetails
       (orderid, productid, unitprice, qty, discount)
VALUES (10255,39,18,2,0.05);
```

Table and row constructors add multirow capability to INSERT … VALUES

```
INSERT INTO Sales.OrderDetails
(orderid, productid, unitprice, qty, discount)

VALUES
(10256,39,18,2,0.05),
(10258,39,18,5,0.10);
```

© Copyright Microsoft Corporation. All rights reserved.

Use DDL statements

Statement	Description
CREATE	Create a new object in the database, such as a table or a view
ALTER	Modify the structure of an object. For instance, altering a table to add a new column.
DROP	Remove an object from the database.
RENAME	Rename an existing object.

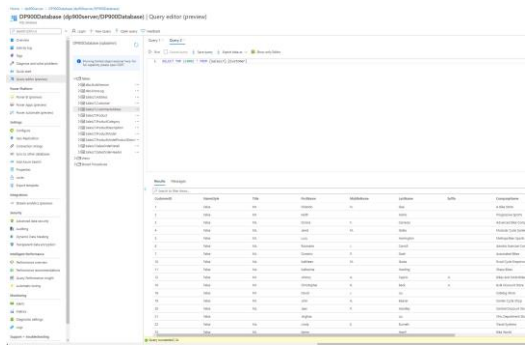
© Copyright Microsoft Corporation. All rights reserved.

Example of CREATE statement

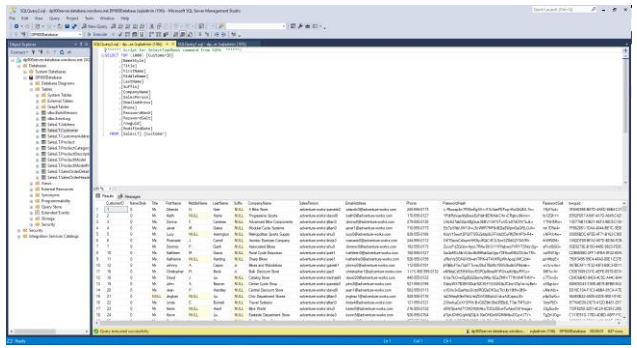
```
CREATE TABLE Mytable
(Mycolumn1 int NOT NULL PRIMARY KEY, Mycolumn2 VARCHAR(50) NOT
NULL , Mycolumn3 VARCHAR(10) NOT NULL
```

© Copyright Microsoft Corporation. All rights reserved.

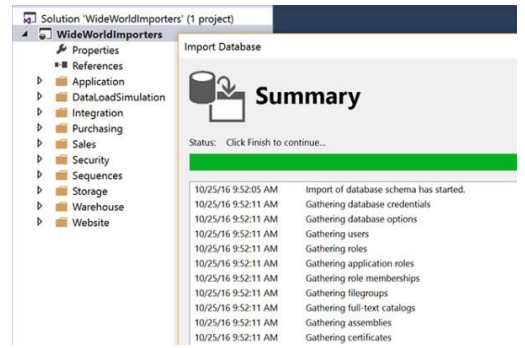
Query tools



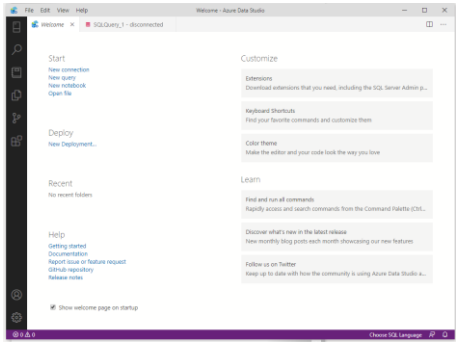
Azure portal



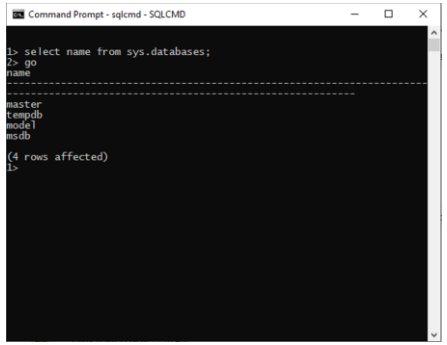
SQL Management Studio



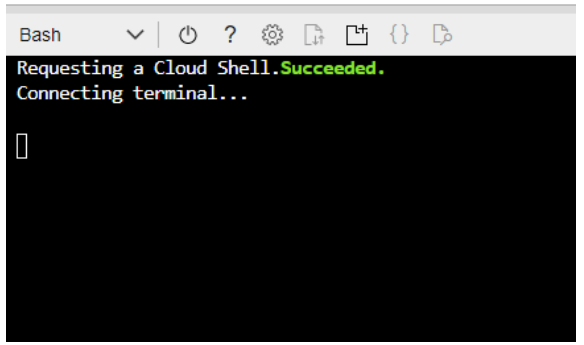
SQL Server Data Tools



Azure Data Studio



SQLCMD



Azure CLI/Cloud Shell

© Copyright Microsoft Corporation. All rights reserved.

Query relational data in Azure Database for PostgreSQL

Use PSQL to query a database

Azure Cloud Shell

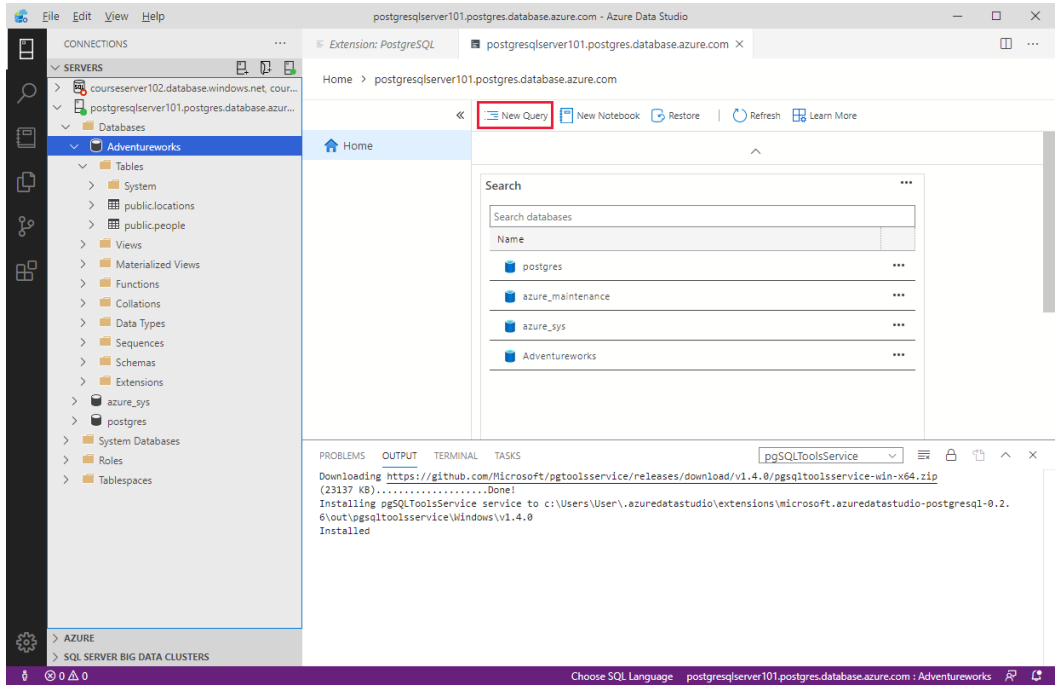
```
psql --host=<server-name>.postgres.database.azure.com
--username=<admin-user>@<server-name> --
dbname=postgres
```

```
CREATE DATABASE "Adventureworks";
```

```
CREATE TABLE PEOPLE(NAME TEXT NOT NULL, AGE INT NOT NULL);
INSERT INTO PEOPLE(NAME, AGE) VALUES ('Bob', 35);
INSERT INTO PEOPLE(NAME, AGE) VALUES ('Sarah', 28);
CREATE TABLE LOCATIONS(CITY TEXT NOT NULL, STATE TEXT NOT NULL);
INSERT INTO LOCATIONS(CITY, STATE) VALUES ('New York', 'NY');
INSERT INTO LOCATIONS(CITY, STATE) VALUES ('Flint', 'MI');
```

```
SELECT * FROM PEOPLE;
SELECT * FROM LOCATIONS;
```

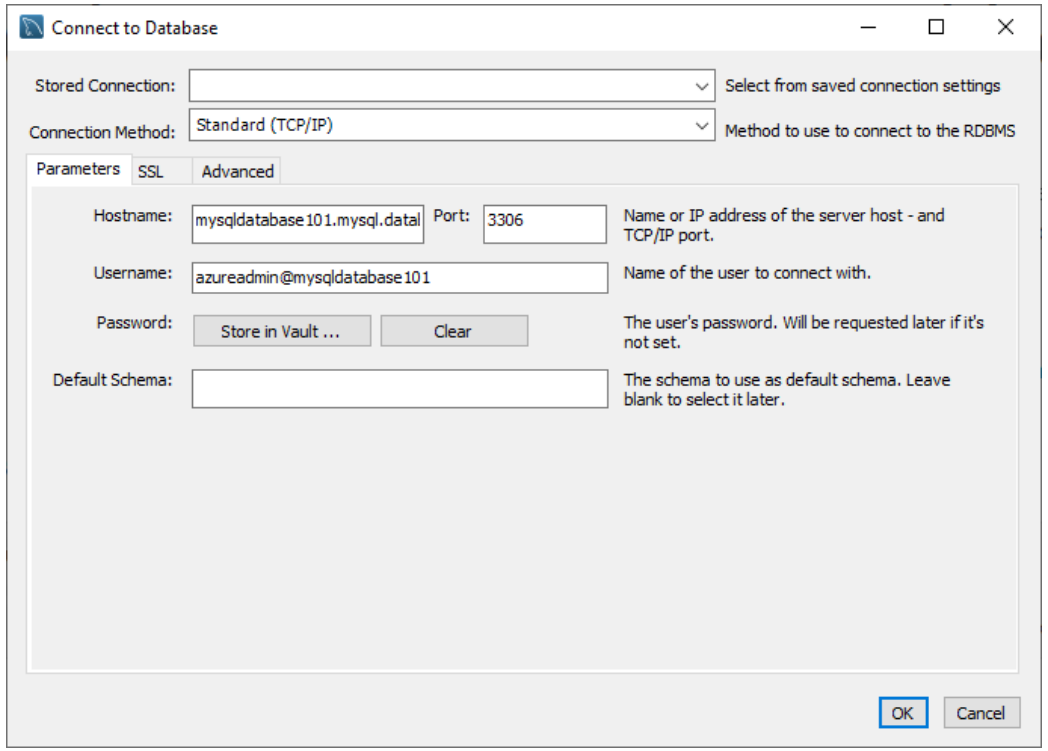
Azure Data Studio

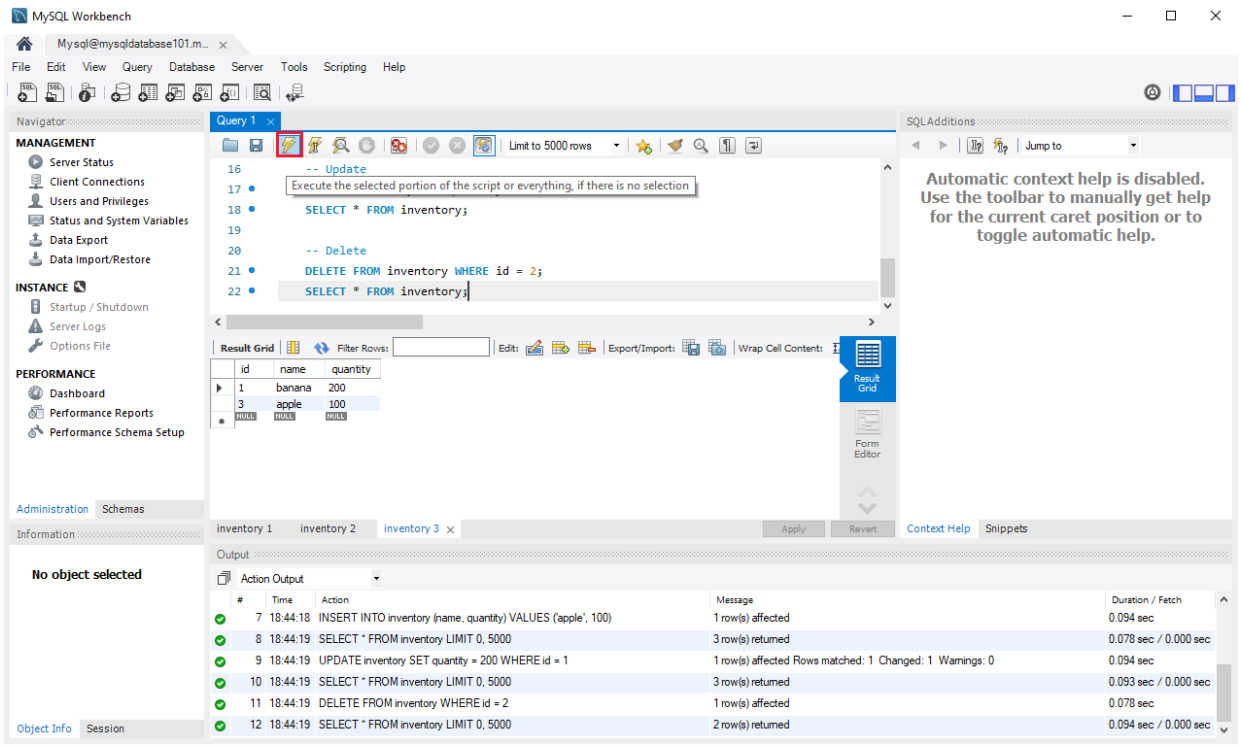


© Copyright Microsoft Corporation. All rights reserved.

Query relational data in Azure Database for MySQL

Use MySQL Workbench to query a database





© Copyright Microsoft Corporation. All rights reserved.

Lab: Use SQL to query Azure SQL Database

Contoso has provisioned the SQL database and has imported all the inventory data into the data store.
As lead developer, you've been asked to run some queries over the data

Go to the exercise **Use SQL to query Azure SQL Database** module on Microsoft Learn, and follow the instructions to query the database to find how many products are in the database, and the number of items in stock for a particular product

© Copyright Microsoft Corporation. All rights reserved.

Microsoft Azure

© Copyright Microsoft Corporation. All rights reserved.