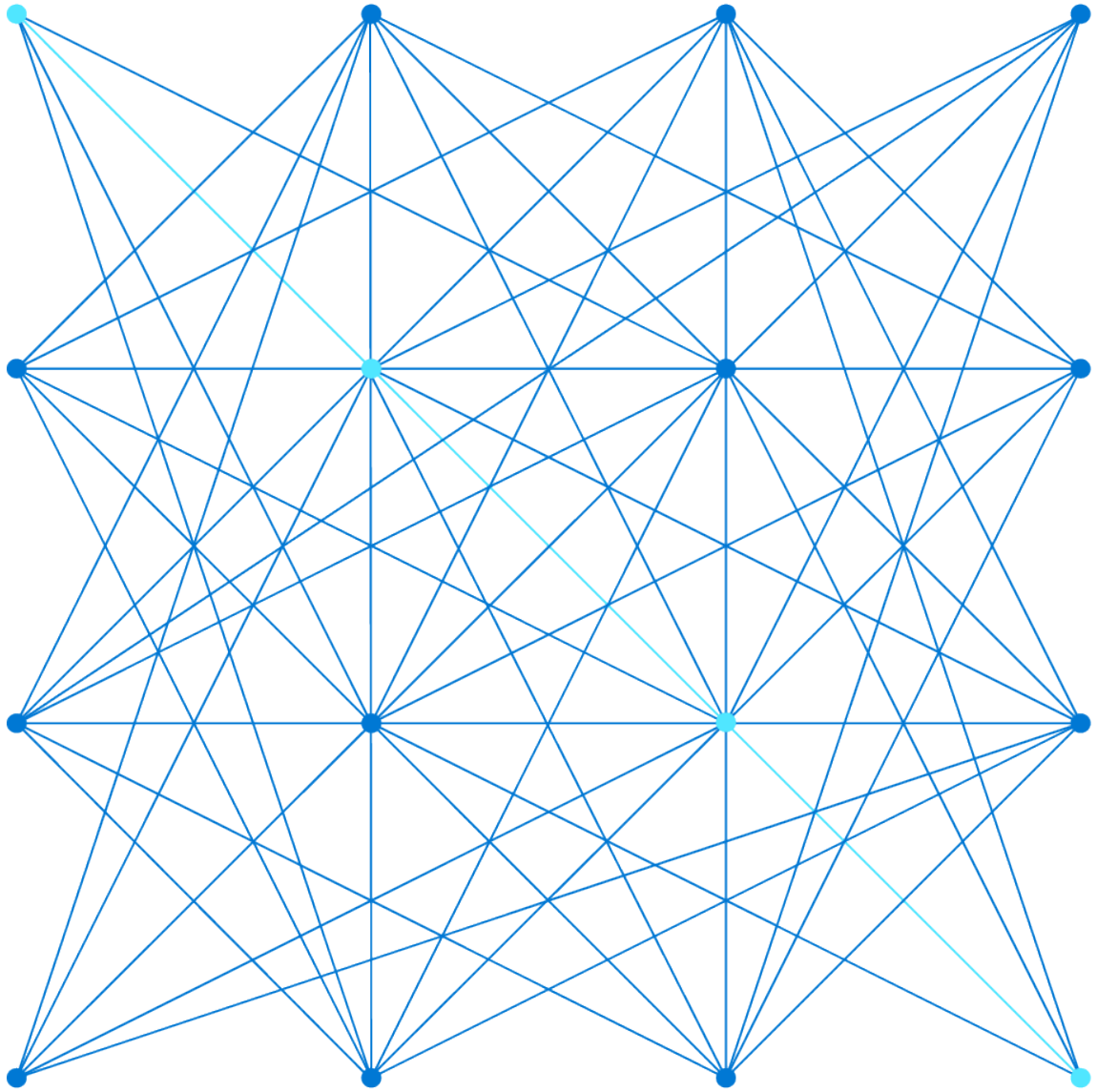
Microsoft Azure

2: Explore fundamentals of relational data in Azure



Agenda

Explore relational data concepts

Explore Azure services for relational data

1: Explore relational data concepts

Relational tables

Data is stored in tables

Tables consists of rows and columns

All rows have the same columns

Each column is assigned a datatype

Customer

ID	FirstName	MiddleName	LastName	Email	Address	City
1	Joe	David	Jones	joe@litware.com	1 Main St.	Seattle
2	Samir		Nadoy	samir@northwind.com	123 Elm Pl.	New York

Product

ID	Name	Price
123	Hammer	2.99
162	Screwdriver	3.49
201	Wrench	4.25

Order

OrderNo	OrderDate	Customer
1000	1/1/2022	1
1001	1/1/2022	2

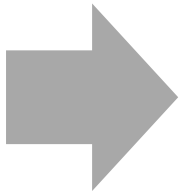
LineItem

OrderNo	ItemNo	ProductID	Quantity
1000	1	123	1
1000	2	201	2
1001	1	123	2

Normalization

Sales Data

OrderNo	OrderDate	Customer	Product	Quantity
1000	1/1/2022	Joe Jones, 1 Main St, Seattle	Hammer ($2.99)	1
1000	1/1/2022	Joe Jones- 1 Main St, Seattle	Screwdriver ($3.49)	2
1001	1/1/2022	Samir Nadoy, 123 Elm Pl, New York	Hammer ($2.99)	2
…	…	…	…	…



- Separate each *entity* into its own table
- Separate each discrete *attribute* into its own column
- Uniquely identify each entity instance (row) using a *primary key*
- Use *foreign key* columns to link related entities

Customer

ID	FirstName	LastName	Address	City
1	Joe	Jones	1 Main St.	Seattle
2	Samir	Nadoy	123 Elm Pl.	New York

Product

ID	Name	Price
123	Hammer	2.99
162	Screwdriver	3.49
201	Wrench	4.25

Order

OrderNo	OrderDate	Customer
1000	1/1/2022	1
1001	1/1/2022	2

LineItem

OrderNo	ItemNo	ProductID	Quantity
1000	1	123	1
1000	2	201	2
1001	1	123	2

Structured Query Language (SQL)

SQL is a standard language for use with relational databases

Standards are maintained by ANSI and ISO

Most RDBMS systems support proprietary extensions of standard SQL

Data Definition Language (DDL)	Data Control Language (DCL)	Data Manipulation Language (DML)
CREATE, ALTER, DROP, RENAME	*GRANT, DENY, REVOKE*	*INSERT, UPDATE, DELETE, SELECT*

```
CREATE TABLE Product
(
  ProductID INT PRIMARY KEY,
  Name VARCHAR(20) NOT NULL,
  Price DECIMAL NULL
);
```

Product

ID	Name	Price

```
GRANT SELECT, INSERT, UPDATE
ON Product
TO user1;
```

Product

ID	Name	Price
123	Hammer	2.99
162	Screwdriv	3.49
201	Wrench	4.25

```
SELECT Name, Price
FROM Product
WHERE Price > 2.50
ORDER BY Price;
```

Results

Name	Price
Hammer	2.99
Screwdriver	3.49
Wrench	4.25

Other common database objects

Views

Pre-defined SQL queries that behave as virtual tables

```
CREATE VIEW Deliveries
AS
SELECT o.OrderNo, o.OrderDate,
       c.Address, c.City
FROM Order AS o JOIN Customer AS c
ON o.Customer = c.ID;
```

Deliveries

OrderNo	OrderDate	Address	City
1000	1/1/2022	1 Main St.	Seattle
1001	1/1/2022	123 Elm Pl.	New York

Stored Procedures

Pre-defined SQL statements that can include parameters

```
CREATE PROCEDURE RenameProduct
          @ProductID INT,
          @NewName VARCHAR(20)
AS
UPDATE Product
SET Name = @NewName
WHERE ID = @ProductID;
...
EXEC RenameProduct 201, 'Spanner';
```

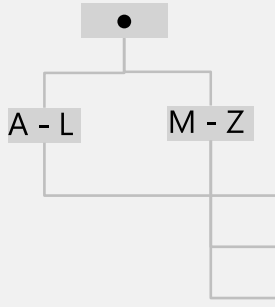
Product

ID	Name	Price
201	~~Wrench~~ **Spanner**	4.25

Indexes

Tree-based structures that improve query performance

```
CREATE INDEX idx_ProductName
ON Product(Name);
```



Product

ID	Name	Price
123	Hammer	2.99
162	Screwdriver	3.49
201	Spanner	4.25

1: Knowledge check

Which one of the following statements is a characteristic of a relational database?

- ❑ All columns in a table must be of the same data type
- ☑ A row in a table represents a single instance of an entity
- ❑ Rows in the same table can contain different columns

Which SQL statement is used to query tables and return data?

- ❑ QUERY
- ❑ READ
- ☑ SELECT

What is an index?

- ☑ A structure that enables queries to locate rows in a table quickly
- ❑ A virtual table based on the results of a query
- ❑ A pre-defined SQL statement that modifies data

2: Explore Azure services for relational data

Azure SQL

Family of SQL Server based cloud database services

SQL Server on Azure VMs

- Guaranteed compatibility to SQL Server on premises
- Customer manages everything – OS upgrades, software upgrades, backups, replication
- Pay for the server VM running costs and software licensing, not per database
- Great for hybrid cloud or migrating complex on-premises database configurations

Azure SQL Managed Instance

- Near 100% compatibility with SQL Server on-premises
- Automatic backups, software patching, database monitoring, and other maintenance tasks
- Use a single instance with multiple databases, or multiple instances in a pool with shared resources
- Great for migrating most on-premises databases to the cloud

Azure SQL Database

- Core database functionality compatibility with SQL Server
- Automatic backups, software patching, database monitoring, and other maintenance tasks
- *Single database* or *elastic pool* to dynamically share resources across multiple databases
- Great for new, cloud-based applications

IaaS

PaaS

Azure Database services for open-source

Azure managed solutions for common open-source RDBMSs

Azure Database for MySQL

- PaaS implementation of MySQL in the Azure cloud, based on the MySQL Community Edition
- Commonly used in Linux, Apache, MySQL, PHP (LAMP) application architectures

Azure Database for MariaDB

- An implementation of the MariaDB Community Edition database management system adapted to run in Azure
- Compatibility with Oracle Database

Azure Database for PostgreSQL

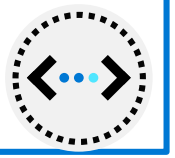
- Database service in the Microsoft cloud based on the PostgreSQL Community Edition database engine
- Hybrid relational and object storage

PaaS

Lab: Provision Azure relational database services

In this lab, you will provision, configure and query an Azure SQL Database.

1. Start the virtual machine for this lab
   or go to the exercise page at https://aka.ms/dp900-sql-lab
2. Follow the instructions to complete the exercise on Microsoft Learn
   Use the Azure subscription provided for this lab



2: Knowledge check

Which deployment option offers the best compatibility when migrating an existing SQL Server on-premises solution?

- ☐ Azure SQL Database (single database)
- ☐ Azure SQL Database (elastic pool)
- ☑ Azure SQL Managed Instance

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

- ☑ Most database maintenance tasks are automated
- ☐ You must purchase a SQL Server license
- ☐ It can only support one database

Which database service is the simplest option for migrating a LAMP application to Azure?

- ☐ Azure SQL Managed Instance
- ☑ Azure Database for MySQL
- ☐ Azure Database for PostgreSQL

Microsoft Azure