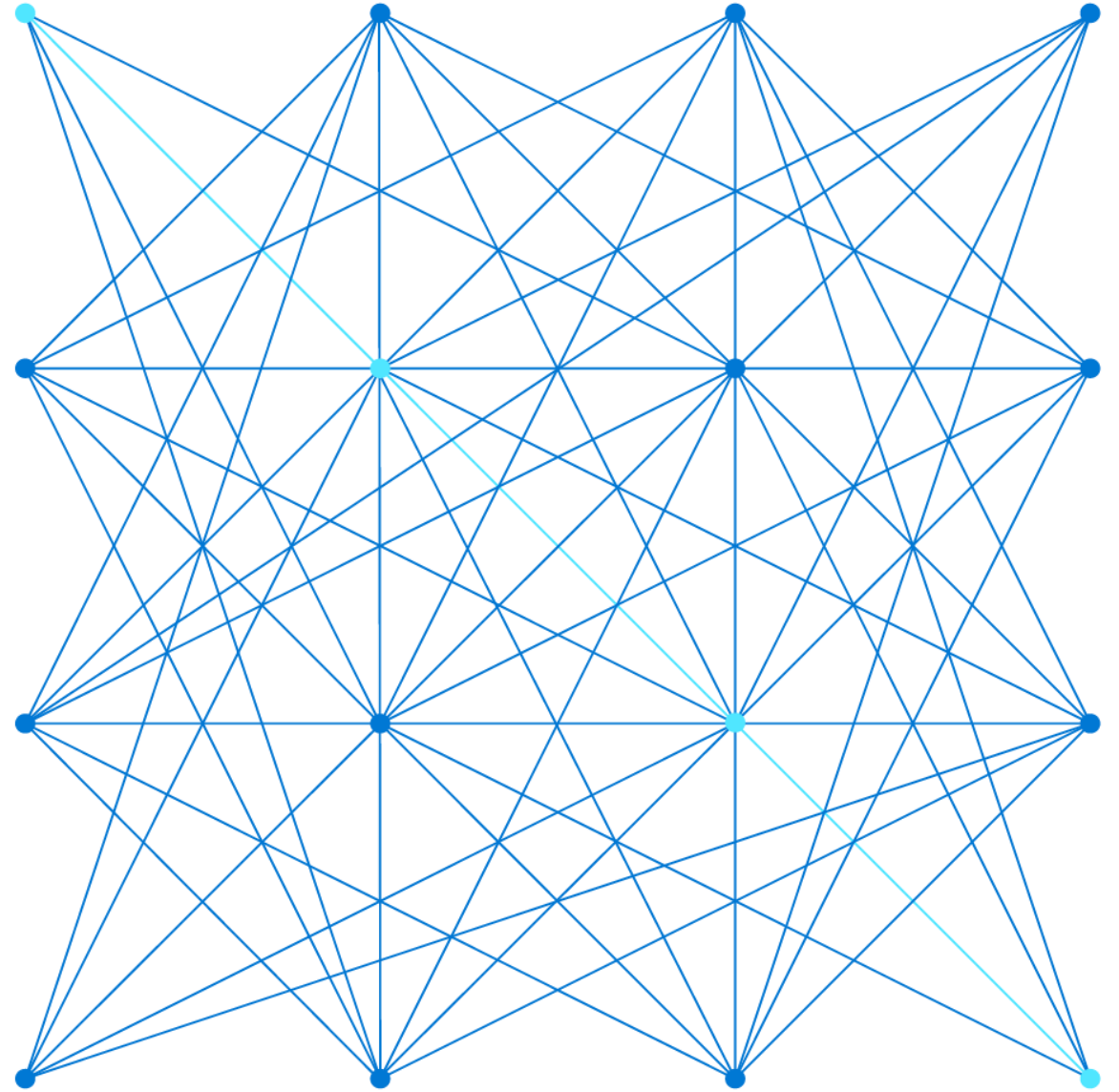


Microsoft Azure Data Fundamentals



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Microsoft Certified Trainer (MCT)

Microsoft Certified Solutions Associate (MCSA) - Web Application Development

Microsoft Certified Azure Fundamentals

About this course



Course format:

One-day instructor-led with hands-on exercises

Supplemented by online training at <https://docs.microsoft.com/learn/>



Course objectives:

Describe core data concepts in Azure

Explain concepts of relational data in Azure

Explain concepts of non-relational data in Azure

Identify components of a modern data warehouse in Azure

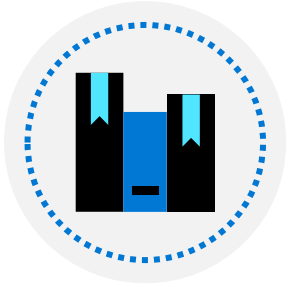
Course agenda

Module	Lessons
Module 1: Explore core data concepts	<ul style="list-style-type: none">• Explore core data concepts• Explore roles and responsibilities in the world of data• Describe concepts of relational data• Explore concepts of non-relational data• Explore concepts of data analytics
Module 2: Explore relational data in Azure	<ul style="list-style-type: none">• Explore relational data offerings in Azure• Explore provisioning and deploying relational database offerings in Azure• Query relational data in Azure
Module 3: Explore non-relational data in Azure	<ul style="list-style-type: none">• Explore non-relational data offerings in Azure• Explore provisioning and deploying non-relational data services in Azure• Manage non-relational data stores in Azure
Module 4: Explore modern data warehouse analytics	<ul style="list-style-type: none">• Examine components of a modern data warehouse• Explore data ingestion in Azure• Explore data storage and processing in Azure• Get started building with Power BI

Azure Learning Path

Level	Category	Code	Course	Role
Beginner (Fundamentals)	-	AZ-900	Microsoft Azure Fundamentals	IT Professional and Non-IT Professional (All)
	Data	DP-900	Microsoft Azure Data Fundamentals	Data Engineer, Database Administrator
	AI	AI-900	Microsoft Azure AI Fundamentals	AI Engineer, Data Scientist, Developer, Solutions Architect
Intermediate (Associate)	DevOps	AZ-104	Microsoft Azure Administrator	Administrator, DevOps Engineer
		AZ-204	Developing solutions for Microsoft Azure	Developer, DevOps Engineer
	Security	AZ-500	Microsoft Azure Security Technologies	Security Engineer
	Data	DP-300	Administering Relational Databases on Microsoft Azure	Database Administrator
		DP-200	Implementing an Azure Data Solution	Data Engineer
		DP-201	Designing an Azure Data Solution	
		DP-100	Designing and Implementing a Data Science Solution on Azure	Data Scientist
	AI	AI-100	Designing and Implementing an Azure AI Solution	AI Engineer
Advance (Expert)	DevOps	AZ-400	Designing and Implementing Microsoft DevOps solutions	DevOps Engineer
	Solutions Architect	AZ-303	Microsoft Azure Architect Technologies	Solutions Architect
		AZ-304	Microsoft Azure Architect Design	
Specialty	Data	DA-100	Analyzing Data with Power BI	Data Analyst
	-	AZ-220	Microsoft Azure IoT Developer	Developer

Lab environment



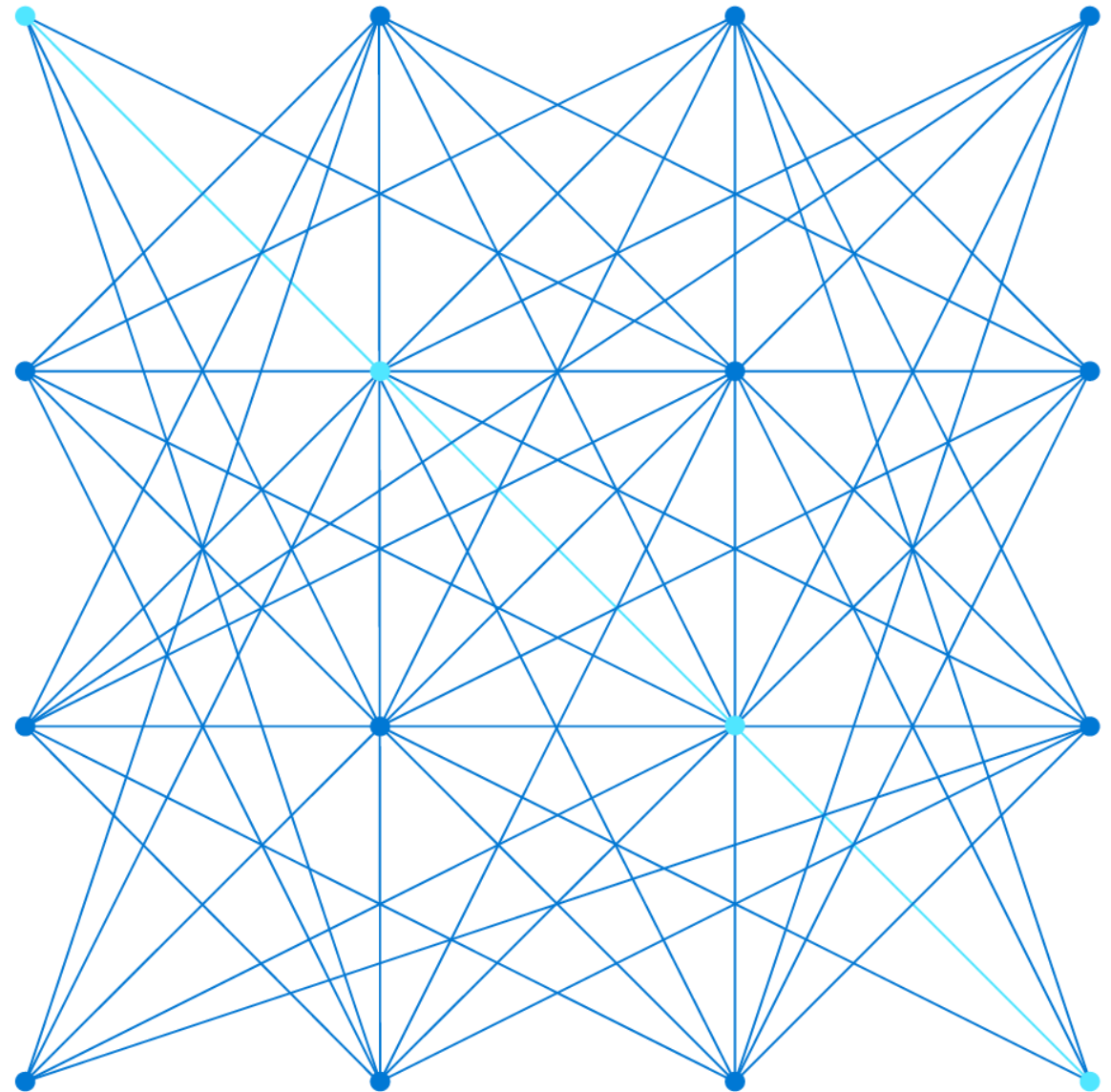
The materials in this workbook are designed to be used alongside online modules in [Microsoft Learn](#). Throughout the course, you'll find references to specific Learn modules containing labs that you should use to gain hands-on experience



Module 1: Explore core data concepts

Author name

Date



Agenda



Explore core data concepts



Explore roles and responsibilities in the world of data



Describe concepts of relational data

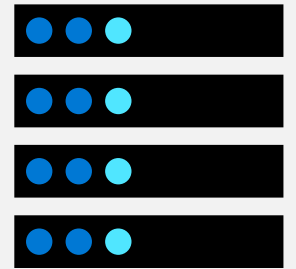


Explore concepts of non-relational data

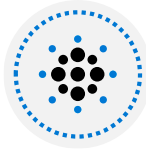


Explore concepts of data analytics

Lesson 1: Explore core data concepts



Lesson 1 objectives



Identify how data is defined and stored



Identify characteristics of relational and non-relational data



Describe and differentiate data workloads



Describe and differentiate batch and streaming data

What is data?

Collection of facts, numbers, descriptions, objects , stored in a structured, semi-structured, unstructured way


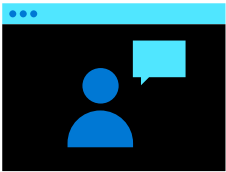
Structured



Table

Semi-structured

```
## Document 1 ## {
"customerID": "103248",
"name": { "first": "AAA",
"last": "BBB" }, "address": {
"street": "Main Street",
"number": "101", "city":
"Acity", "state": "NY" },
"ccOnFile": "yes",
"firstOrder": "02/28/2003" }
## Document 2 ## {
"customerID": "103249",
"name": { "title": "Mr",
"forename": "AAA",
"lastname": "BBB" },
"address": { "street":
"Another Street", "number":
"202", "city": "Bcity",
"county": "Gloucestershire",
"country-region": "UK" },
"ccOnFile": "yes" }
```

Unstructured





Transactional vs analytical data stores

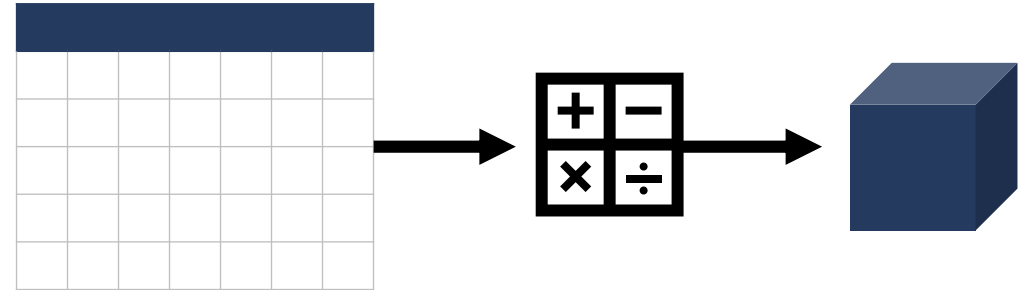
Online Transactional Processing (OLTP)

Customer		
CustomerID	CustomerName	CustomerPhone

Orders		
OrderID	CustomerID	OrderDate

Data is stored one transaction at a time

Online Analytical Processing (OLAP)



Data is periodically loaded, aggregated and stored in a cube

Transactional workloads

Customer		
CustomerID	CustomerName	CustomerPhone

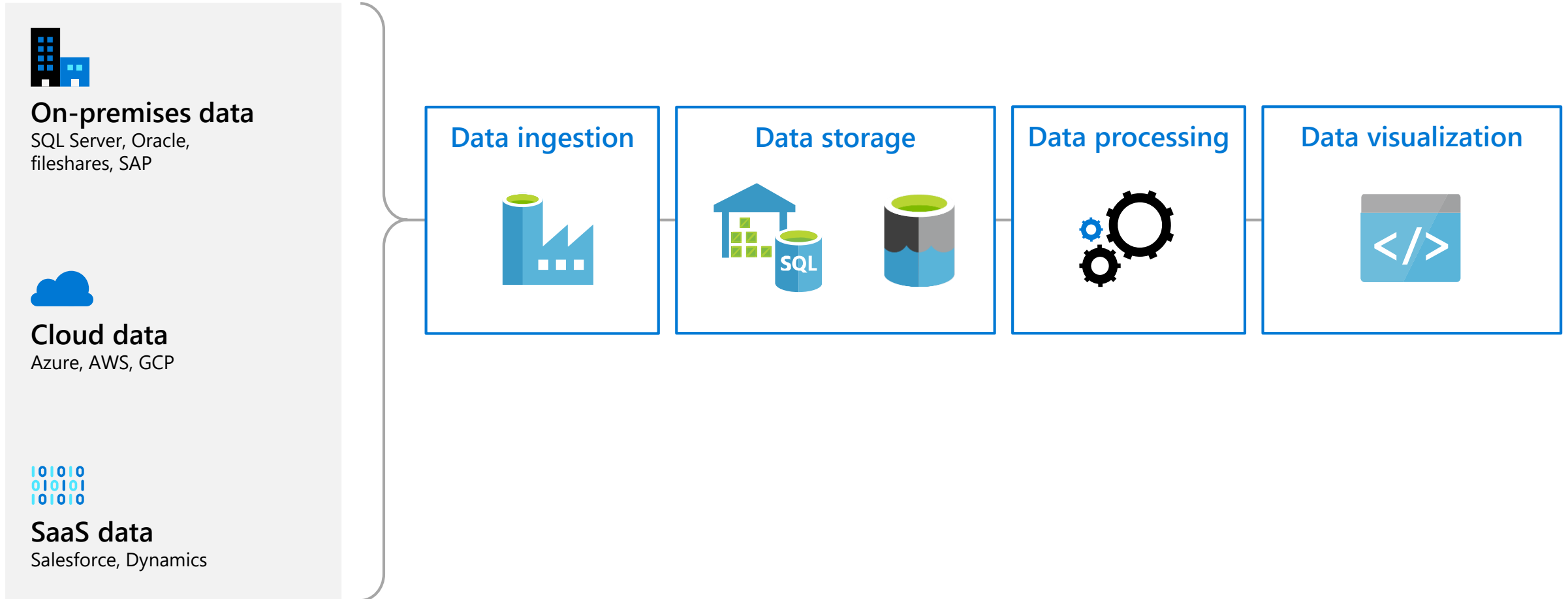
Orders		
OrderID	CustomerID	OrderDate

Account	
CustomerID	Balance
5558	1000
6023	1500

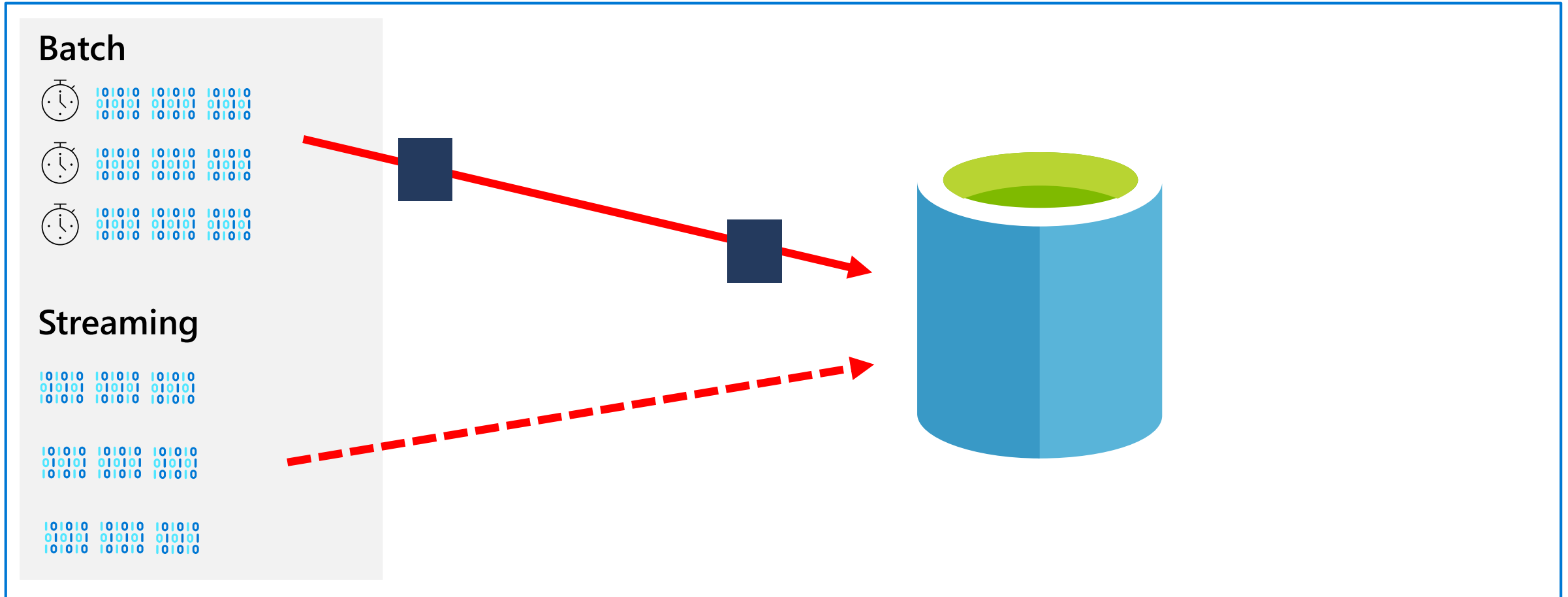
Transfers					
TransactionID	FromAccount	ToAccount	Transaction Amount	OrderDate	TransactionDescription
982801	6023	5558	500	DD/MM/YY	Transfer 500 from account 6023 to account

```
BEGIN TRANSACTION
UPDATE Account
SET Balance = Balance -500
WHERE CustomerID=6023;
UPDATE Account
SET Balance = Balance +500
WHERE CustomerID=5558;
INSERT INTO Transfers (Fromaccount, ToAccount, TransactionAmount,TransactionDescription)
VALUES (6023,5558,500,'Transfer 500 from account 6023 to account 5558)
COMMIT TRANSACTIONTransaction
```

Analytical system



Batch data/streaming data



Lesson 1: Knowledge check



How is data in a relational table organized?

- ☒ Rows and Columns
 - ☐ Header and Footer
 - ☐ Pages and Paragraphs
-



Which of the following is an example of unstructured data?

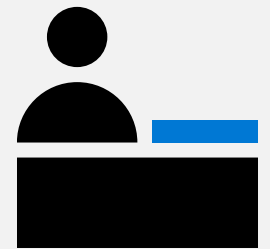
- ☐ An Employee table with columns Employee ID, Employee Name, and Employee Designation
 - ☒ Audio and Video files
 - ☐ A table within SQL Server database
-



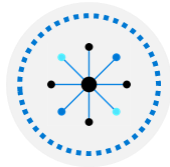
What of the following is an example of a streaming dataset?

- ☒ Data from sensor feeds
- ☐ Sales data for the past month
- ☐ List of employees working for a company

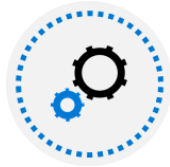
Lesson 2: Explore roles and responsibilities in the world of data



Lesson 2 objectives



Explore data job roles



Explore common tasks and tools for data job roles

Roles in data

Database Administrator

- Database Management
- Implements Data Security
- Backups
- User Access
- Monitors performance



Data Engineer

- Data Pipelines and processes
- Data Ingestion storage
- Prepare data for Analytics
- Prepare data for analytical processing



Data Analyst

- Provides insights into the data
- Visual Reporting
- Modeling Data for Analysis
- Combines data for visualization and analysis



Common tools – Database administrator

Azure Data Studio

Graphical interface for managing on-premises and cloud-based data services

Runs on Windows, macOS, Linux

SQL Server Management Studio

Graphical interface for managing on-premises and cloud-based data services

Runs on Windows

Comprehensive Database Administration tool

Azure Portal/CLI

Tools for management and provisioning of Azure Data Services

Manual and automation of scripts using Azure Resource Manager or Command Line Interface scripting

Common tools – Data engineering

Azure Synapse Studio

Azure Portal integrated to manage Azure Synapse

Data Ingestion (Azure Data Factory)

Management of Azure Synapse assets (SQL Pools/Spark Pool)

SQL Server Management Studio

Graphical interface for managing on-premises and cloud-based data services

Runs on Windows

Comprehensive Database Administration tool

Azure Portal/CLI

Tools for management and provisioning of Azure resources

Manual and automation of scripts using Azure Resource Manager or Command Line Interface scripting

Common tools – Data analyst

Power BI Desktop

Data Visualization tool
Model and Visualize Data
Management of Azure Synapse
assets (SQL Pools/Spark Pool)

Power BI Portal/ Power BI Service

Authoring and management of
Power BI reports
Authoring of Power BI dashboards
Share Reports/Datasets

Power BI Report Builder

Data Visualization tool for
paginated reports
Model and Visualize paginated
reports

Lesson 2: Knowledge check



Which one of the following tasks is a role of a database administrator?

- ☒ Backing up and restoring databases
 - ☐ Creating dashboards and reports
 - ☐ Identifying data quality issues
-



Which of the following tools is a visualization and reporting tool?

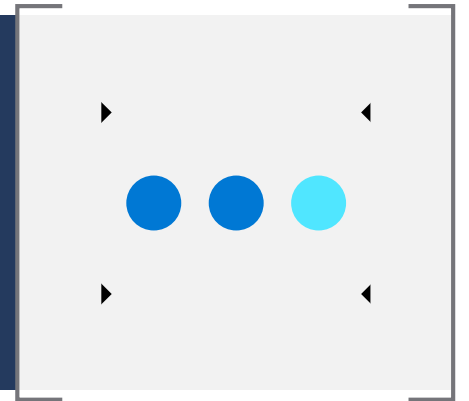
- ☐ SQL Server Management Studio
 - ☒ Power BI
 - ☐ SQL
-



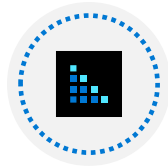
Which one of the following roles is not a data job role?

- ☒ Systems Administrator
- ☐ Data Analyst
- ☐ Database Administrator

Lesson 3: Describe concepts of relational data



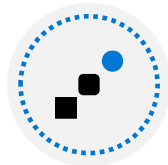
Lesson 3 objectives



Explore the characteristics of relational data

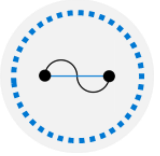


Define tables, indexes, and views



Explore relational data workload services in Azure

Identify relational database use cases



IoT:

Although typically considered for non-relational, the data from IoT devices could be structured and consistent



Online transaction processing:

For example order systems that perform many small transactional updates



Data warehousing:

Large amounts of data can be imported from multiple sources and structured to enable high-performance queries

Tables

Customers		
CustomerID	CustomerName	CustomerPhone
100	Muisto Linna	XXX-XXX-XXXX
101	Noam Maoz	XXX-XXX-XXXX
102	Vanja Matkovic	XXX-XXX-XXXX
103	Qamar Mounir	XXX-XXX-XXXX
104	Zhenis Omar	XXX-XXX-XXXX
105	Claude Paulet	XXX-XXX-XXXX
106	Alex Pettersen	XXX-XXX-XXXX
107	Francis Ribeiro	XXX-XXX-XXXX

Data is stored in a table

Table consists of rows and columns

All rows have same # of columns

Each column is defined by a datatype

Entities

Customers		
CustomerID	CustomerName	CustomerPhone
100	Muisto Linna	XXX-XXX-XXXX
101	Noam Maoz	XXX-XXX-XXXX
102	Vanja Matkovic	XXX-XXX-XXXX
103	Qamar Mounir	XXX-XXX-XXXX
104	Zhenis Omar	XXX-XXX-XXXX
105	Claude Paulet	XXX-XXX-XXXX
106	Alex Pettersen	XXX-XXX-XXXX

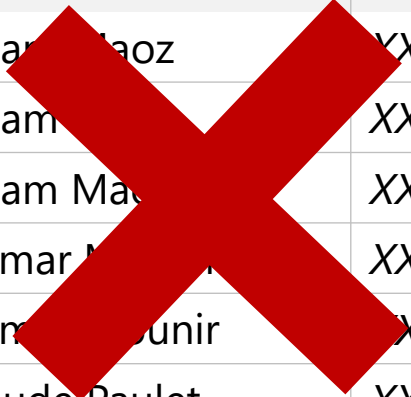
An entity is a representation of an item which can be physical (such as a customer or a product), or virtual (such as an order).

Entities are connected by relations enabling interaction. For example, a customer can place an order for a product

Normalization

Customers		
CustomerID	CustomerName	CustomerPhone
100	Muisto Linna	XXX-XXX-XXXX
101	Noam Maoz	XXX-XXX-XXXX
102	Vanja Matkovic	XXX-XXX-XXXX
103	Qamar Mounir	XXX-XXX-XXXX
104	Zhenis Omar	XXX-XXX-XXXX
105	Claude Paulet	XXX-XXX-XXXX
106	Alex Pettersen	XXX-XXX-XXXX

Orders		
OrderID	CustomerName	CustomerPhone
AD100	Noam Maoz	XXX-XXX-XXXX
AD101	Noam Maoz	XXX-XXX-XXXX
AD102	Noam Maoz	XXX-XXX-XXXX
AX103	Qamar Mounir	XXX-XXX-XXXX
AS104	Qamar Mounir	XXX-XXX-XXXX
AR105	Claude Paulet	XXX-XXX-XXXX
MK106	Muisto Linna	XXX-XXX-XXXX



Data is normalized to:

Reduce storage

Avoid data duplication

Improve data quality

Relations

Customers			Orders		
CustomerID	CustomerName	CustomerPhone	OrderID	CustomerID	SalesPersonID
100	Muisto Linna	XXX-XXX-XXXX	AD100	101	200
101	Noam Maoz	XXX-XXX-XXXX	AD101	101	200
102	Vanja Matkovic	XXX-XXX-XXXX	AD102	101	200
103	Qamar Mounir	XXX-XXX-XXXX	AX103	103	201
104	Zhenis Omar	XXX-XXX-XXXX	AS104	103	201
105	Claude Paulet	XXX-XXX-XXXX	AR105	105	200
106	Alex Pettersen	XXX-XXX-XXXX	MK106	105	201

In a normalized database schema:

Primary Keys and Foreign keys are used to define relationships

No data duplication exists (other than key values in 3rd Normal Form (3NF))

Data is retrieved by joining tables together in a query

Indexes

Customers		
CustomerID	CustomerName	CustomerPhone
100	Muisto Linna	XXX-XXX-XXXX
101	Noam Maoz	XXX-XXX-XXXX
102	Vanja Matkovic	XXX-XXX-XXXX
103	Qamar Mounir	XXX-XXX-XXXX
104	Zhenis Omar	XXX-XXX-XXXX
105	Claude Paulet	XXX-XXX-XXXX
106	Alex Pettersen	XXX-XXX-XXXX

IDX-CustomerRegion	
CustomerID	Region
100	France
101	Brazil
102	Croatia
103	Jordan
104	Spain
105	France
106	USA

An index:

Optimizes search queries for faster data retrieval

Reduces the amount of data pages that need to be read to retrieve the data in a SQL Statement

Data is retrieved by joining tables together in a query

View

Customers		
CustomerID	CustomerName	CustomerPhone
100	Muisto Linna	XXX-XXX-XXXX
101	Noam Maoz	XXX-XXX-XXXX
102	Vanja Matkovic	XXX-XXX-XXXX
103	Qamar Mounir	XXX-XXX-XXXX
104	Zhenis Omar	XXX-XXX-XXXX
105	Claude Paulet	XXX-XXX-XXXX
106	Alex Pettersen	XXX-XXX-XXXX

Orders		
OrderID	CustomerID	SalesPersonID
AD100	101	200
AD101	101	200
AD102	101	200
AX103	103	201
AS104	103	201
AR105	105	200
MK106	105	201
DB205	100	205

Create the definition of a view:

```
CREATE VIEW
vw_customerorders AS
SELECT Customers.CustomerID,
Customers.CustomerName,
Orders.OrderID FROM
Customers JOIN Orders on
Customers.CustomerID =
Orders.CustomerID
```

Retrieve the orders placed by customer 102 using the view:

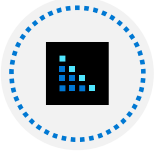
```
SELECT CustomerName, OrderID
from vw_customerorders WHERE
CustomerID=102
```

A view is a virtual table based on the result set of query:

Views are created to simplify the query

Combine relational data into a single pane view

Lesson 3: Knowledge check



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

- ☐ All data must be stored as character strings
 - ☒ A row in a table represents a single entity
 - ☐ Different rows in the same table can contain different columns
-



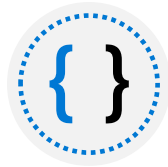
What is an index?

- ☒ A structure that enables you to locate rows in a table quickly, using an indexed value
- ☐ A virtual table based on the result set of a query
- ☐ A structure comprising rows and columns that you use for storing data

Lesson 4: Explore concepts of non-relational data



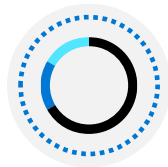
Lesson 4 objectives



Explore the characteristics of non-relational data



Define types of non-relational data



Describe NoSQL, and the types of non-relational databases

Explore characteristics of non-relational data

Entities

```
## Customer 1 ID: 1
Name: Mark Hanson
Telephone: [ Home: 1-999-9999999, Business: 1-888-8888888, Cell: 1-777- 7777777 ]
Address: [ Home: 121 Main Street, Some City, NY, 10110,
           Business: 87 Big Building, Some City, NY, 10111 ]
## Customer 2 ID: 2
Title: Mr
Name: Jeff Hay
Telephone: [ Home: 0044-1999-333333, Mobile: 0044-17545-444444 ]
Address: [ UK: 86 High Street, Some Town, A County, GL8888, UK,
           US: 777 7th Street, Another City, CA, 90111 ]
```

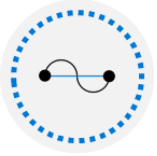
Non-relational collections can have:

Multiple entities in the same collection or container with different fields

Have a different, non-tabular schema

Are often defined by labeling each field with the name it represents

Identify non-relational database use cases



IoT and Telematics:

Often require to ingest large amounts of data in frequent burst of activity, data is either semi structured or structured, often requires real time processing



Retail and Marketing:

Common scenarios for globally distributed data, document storage



Gaming:

In-game stats, social media integration, leaderboards, low-latency applications



Web and Mobile:

Commonly used with web click analytics, modern applications including bots

Types of non-relational data

What is semi-structured data?

Data structure is defined within the actual data by fields. Format/file types include:



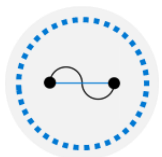
JSON

AVRO

ORC

Parquet

What is unstructured data?

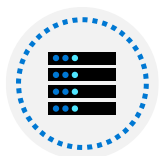


Does not naturally contain fields:

Examples: video, audio, media streams, documents



Often used to extract data organization and categorize or identify “structures”



Frequently used in combination with Machine Learning or Cognitive Services capabilities to “extract data” by using:

Text Analytics

Sentiment Analysis with Cognitive APIs

Vision API

What is NoSQL?

Loose term, to describe non-relational



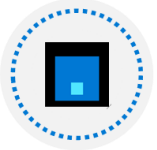
Key-value
stores

Document
based

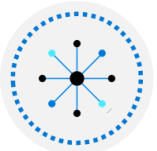
Column
family
databases

Graph
Databases

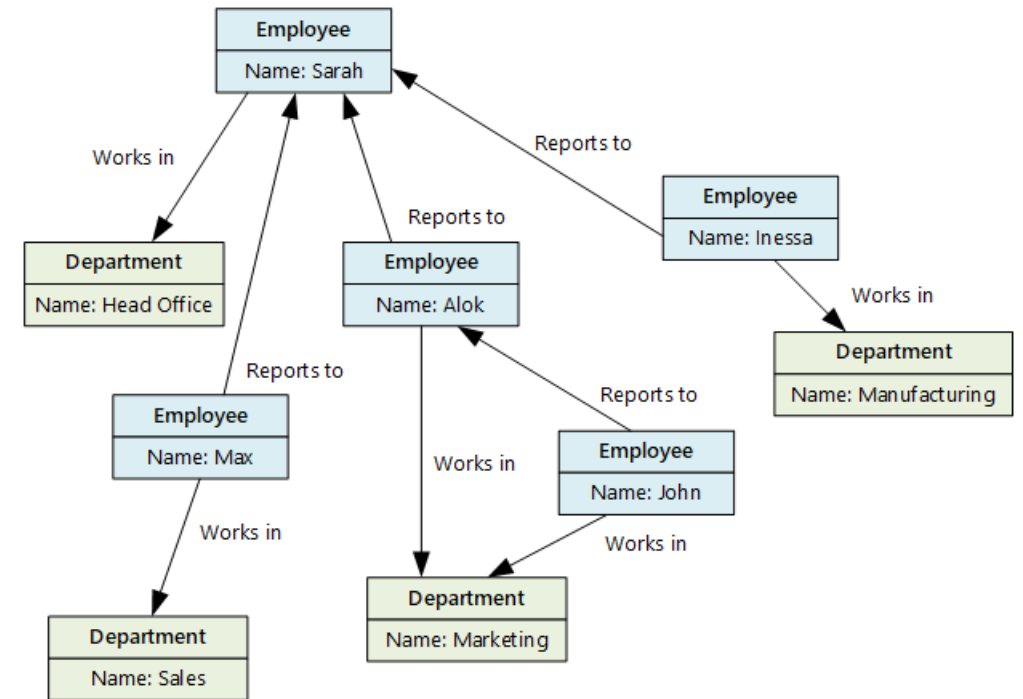
What is a graph database?



Stores entities centric around relationships



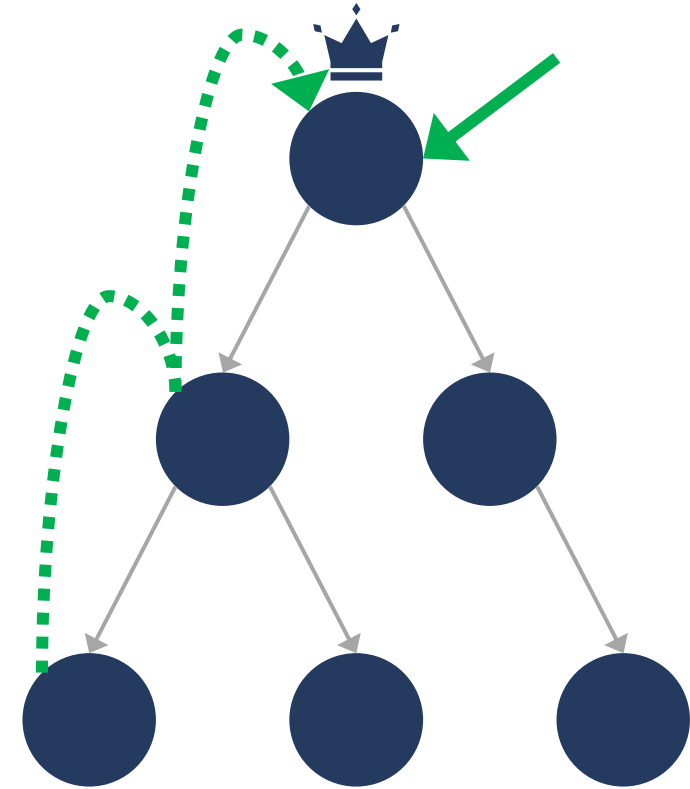
Enables applications to perform queries traversing a network of nodes and edges



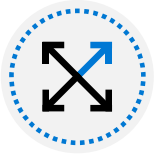
What applications require a graph database?

Business requirements:

- OLTP apps with highly **correlated data**
- Easy **updates** to single or many objects
- Flexible data **modelling**
- Data requirements that **evolve**
- **Hierarchical** data structures



Lesson 4: Knowledge check



Which of the following services should you use to implement a non-relational database?

- ☒ Azure Cosmos DB
 - ☐ Azure SQL Database
 - ☐ The Gremlin API
-



Which of the following is a characteristic of non-relational databases?

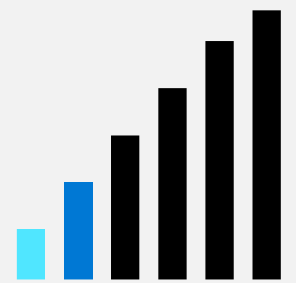
- ☐ Non-relational databases contain tables with flat fixed-column records
 - ☐ Non-relational databases require you to use data normalization techniques to reduce data duplication
 - ☒ Non-relational databases are either schema free or have relaxed schemas
-



You are building a system that monitors the temperature throughout a set of office blocks, and sets the air conditioning in each room in each block to maintain a pleasant ambient temperature. Your system has to manage the air conditioning in several thousand buildings spread across the country or region, and each building typically contains at least 100 air-conditioned rooms. What type of NoSQL data store is most appropriate for capturing the temperature data to enable it to be processed quickly?

- ☒ A key-value store
- ☐ A column family database
- ☐ Write the temperatures to a blob in Azure Blob storage

Lesson 5: Explore concepts of data analytics



Lesson 5 objectives



Learn about data ingestion and processing

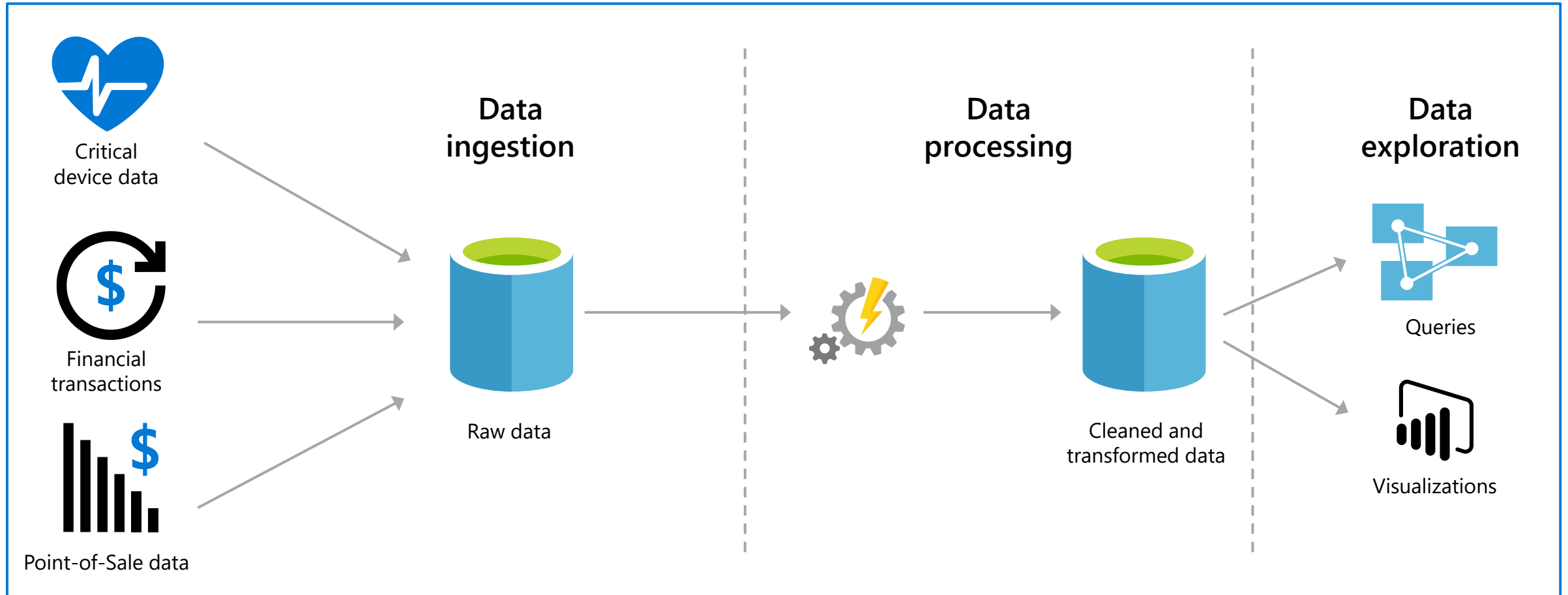


Explore data visualization

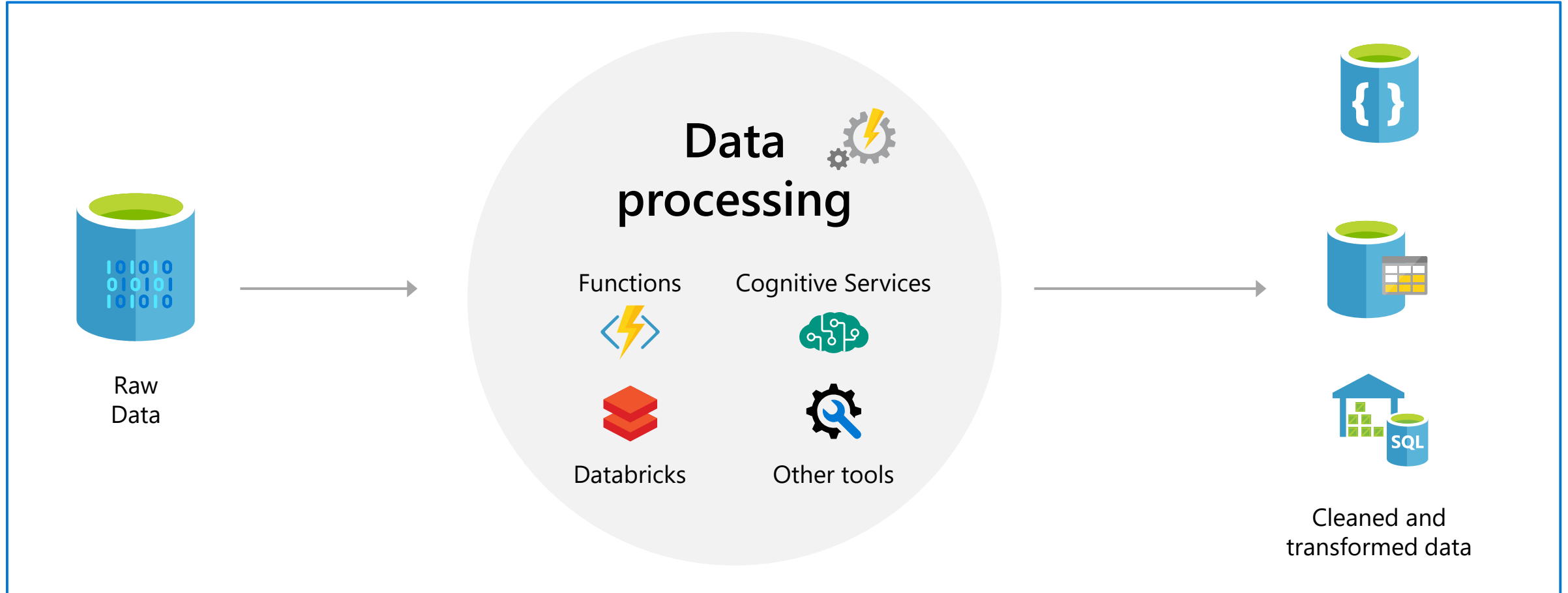


Explore data analytics

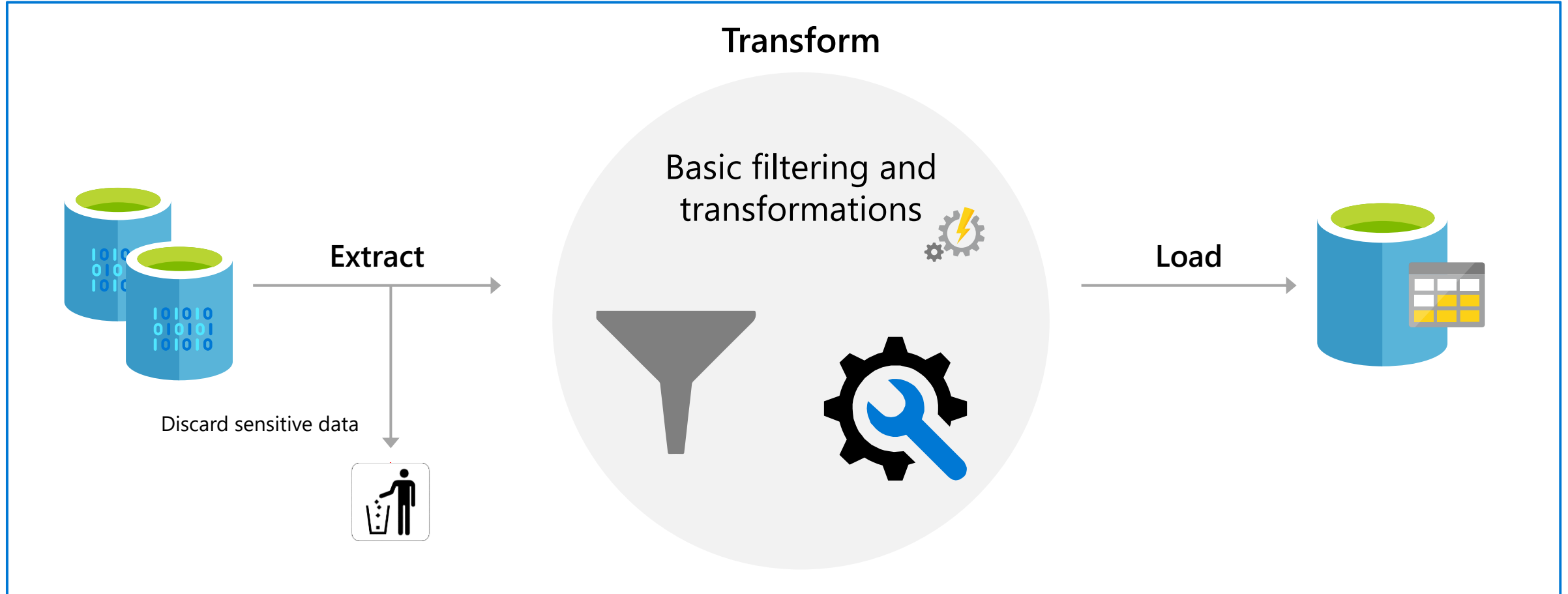
What is data ingestion?



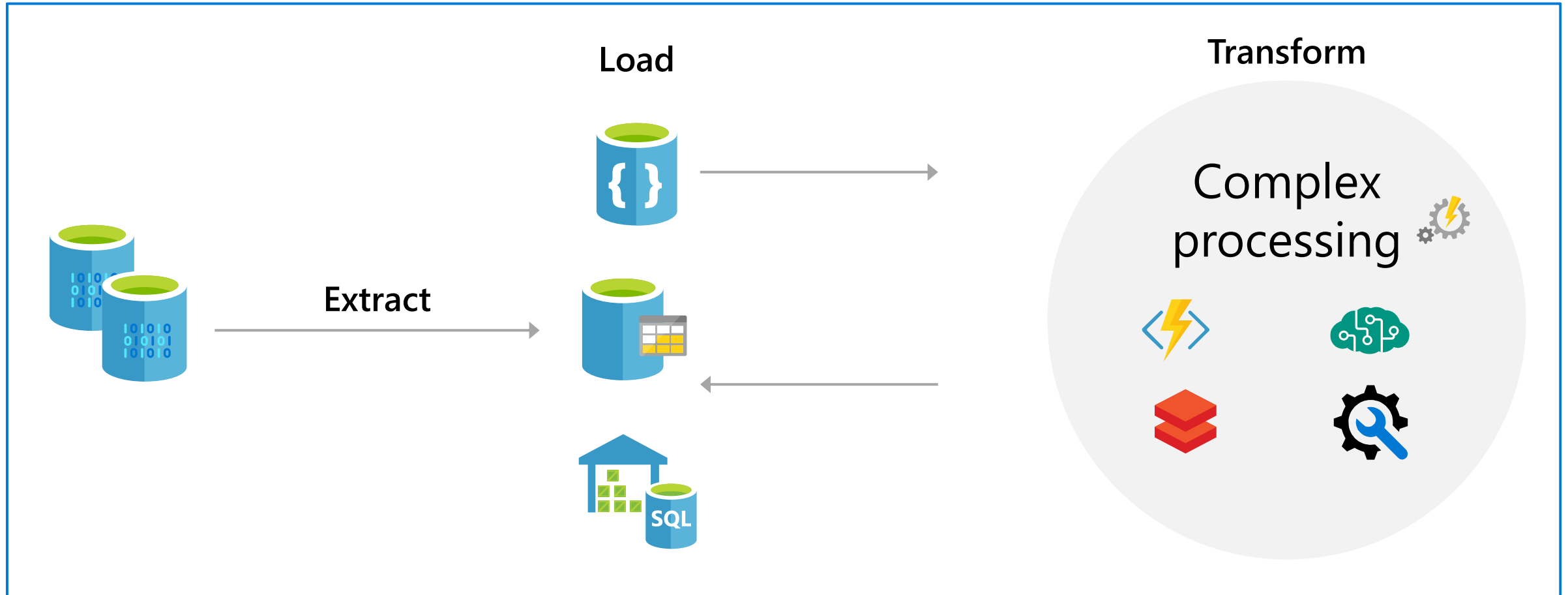
What is data processing?



What is ETL?

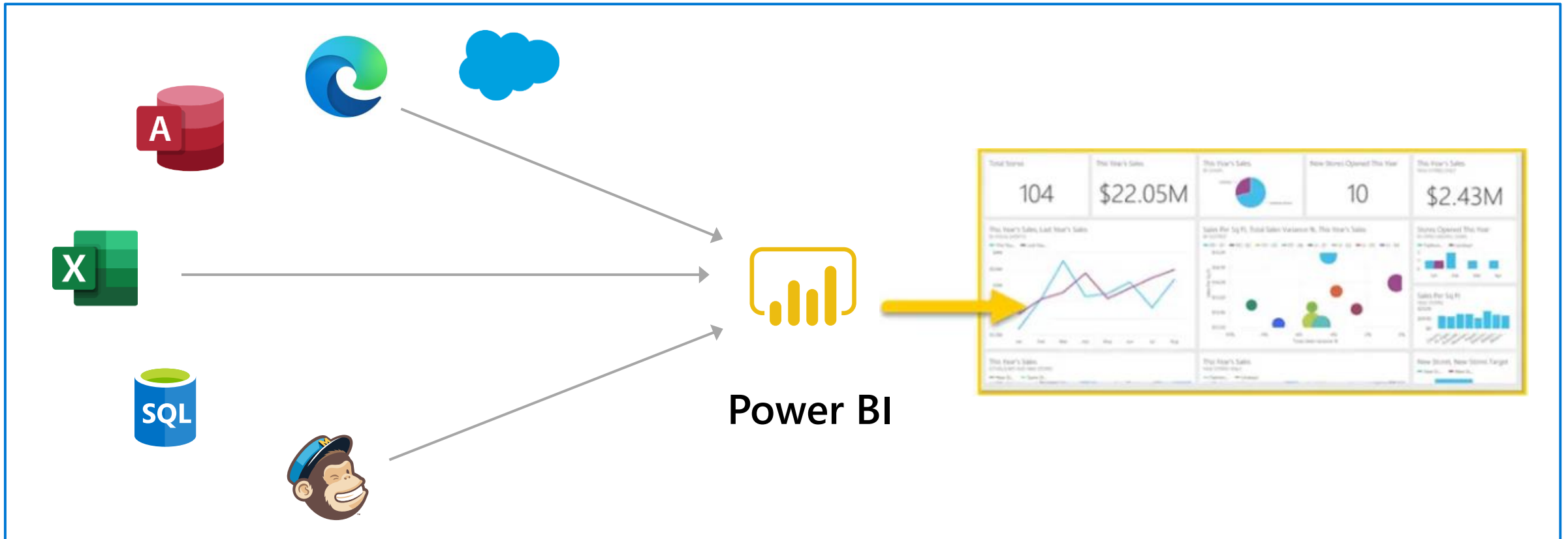


What is ELT?



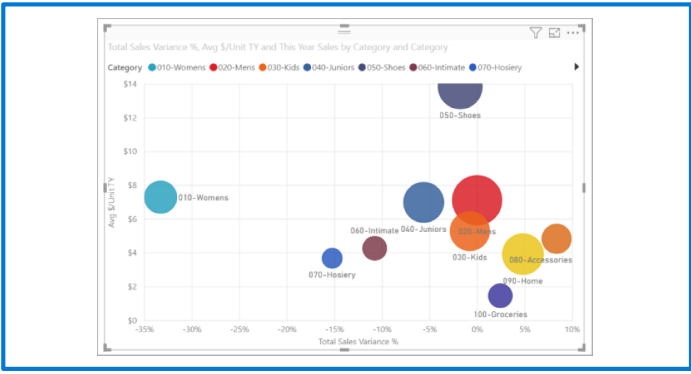
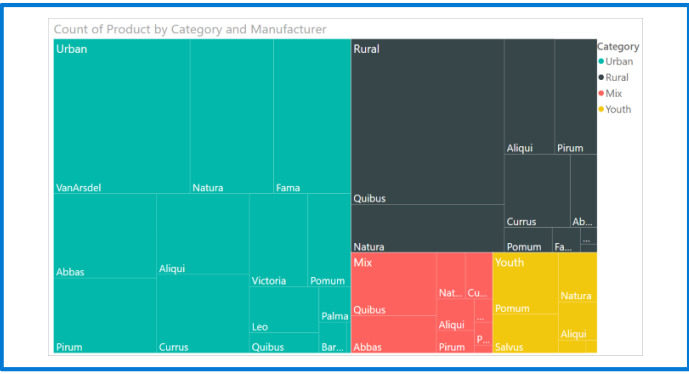
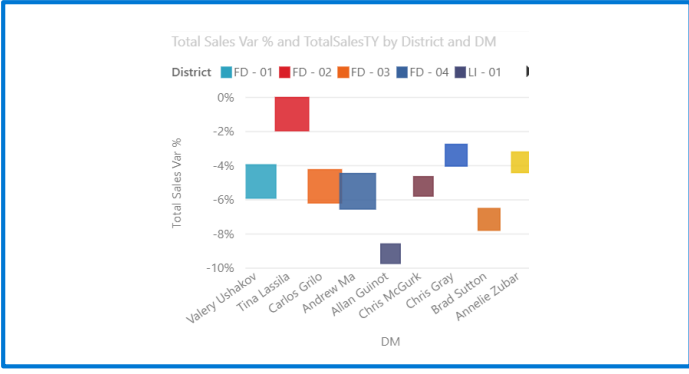
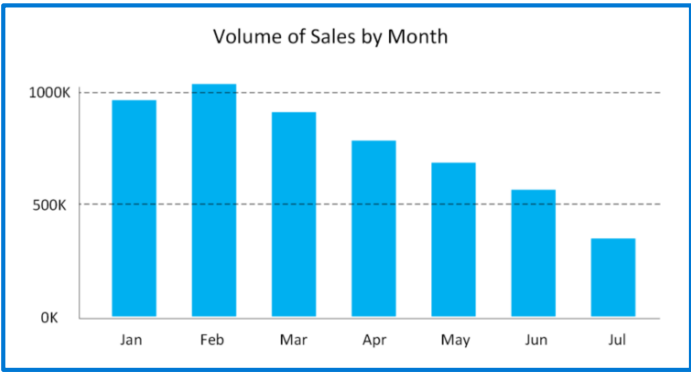
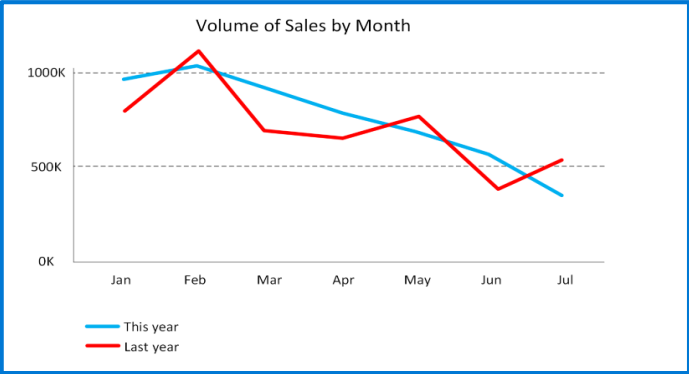
Explore data visualization

Power BI: A collection of software, services, apps, and connectors



Power BI

Visualizations

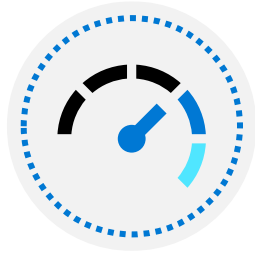


Quarter Year	Q1		Q2	
	Revenue	YTD Revenue	Revenue	YTD Revenue
2015	\$45,186	\$45,186	\$70,609	\$115,795
2016	\$52,154	\$52,154	\$73,542	\$125,696
2017	\$51,388	\$51,388	\$68,149	\$118,537
2018	\$48,281	\$48,281	\$66,853	\$115,134
2019	\$53,145	\$53,145	\$49,135	\$102,280

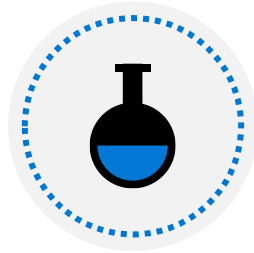
Explore data analytics



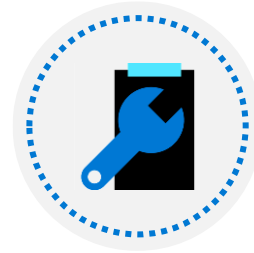
Descriptive



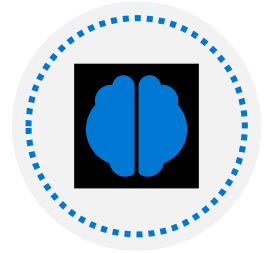
Diagnostic



Predictive



Prescriptive



Cognitive

Lesson 5: Knowledge check



What is data ingestion?

- ☐ The process of transforming raw data into models containing meaningful information
 - ☐ Analyzing data for anomalies
 - ☒ Capturing raw data streaming from various sources and storing it
-



Which one of the following visuals displays the major contributors to a selected result or value?

- ☒ Key influencers
 - ☐ Column and bar chart
 - ☐ Matrix chart
-

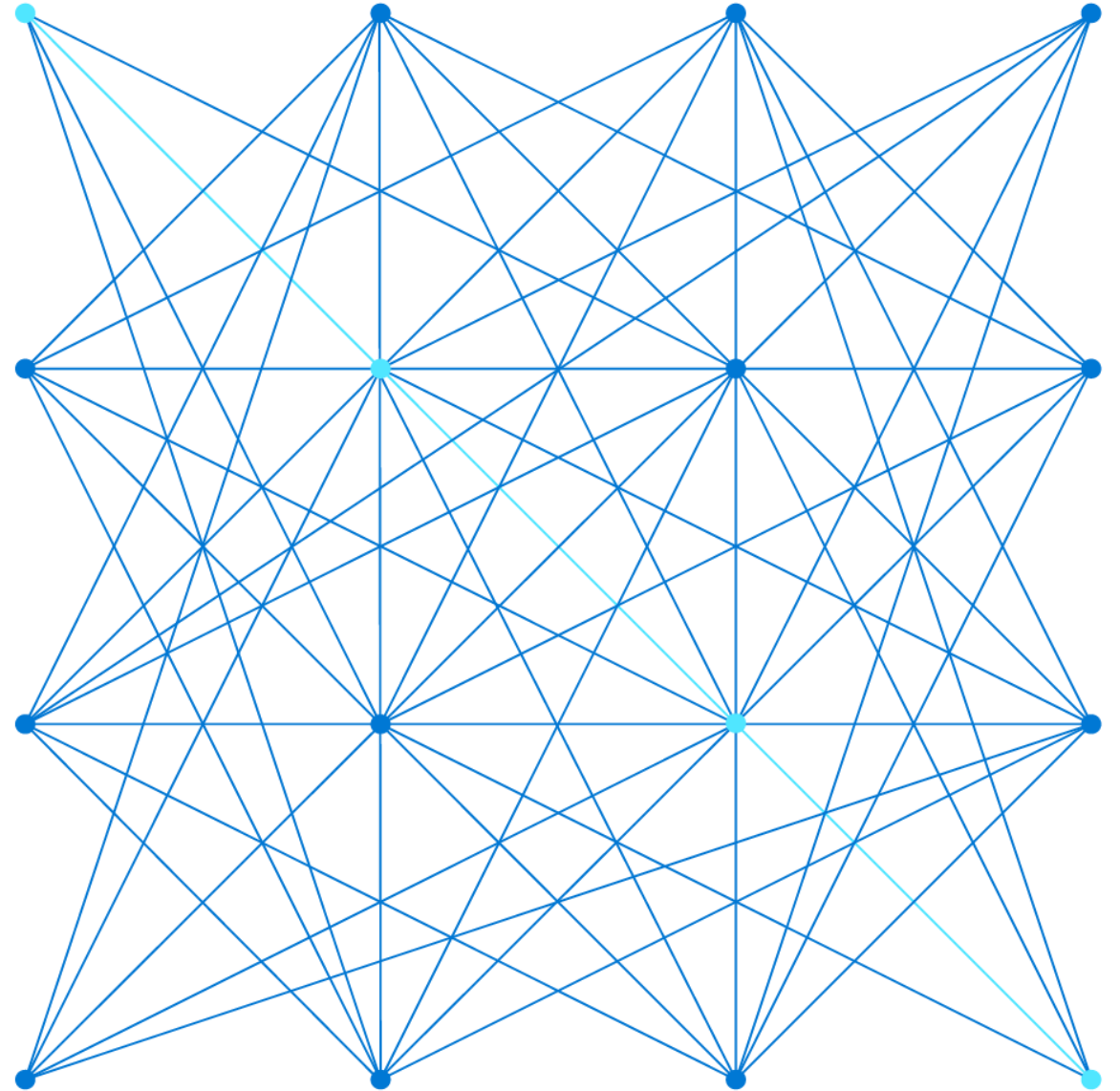


Which type of analytics helps answer questions about what has happened in the past?

- ☒ Descriptive analytics
- ☐ Prescriptive analytics
- ☐ Predictive analytics



Module 2: Explore relational data in Azure



Agenda



Explore relational data services in Azure



Explore provisioning and deploying relational database services in Azure



Query relational data in Azure

Lesson 1: Explore relational data services in Azure



Lesson 1 objectives



What are Azure Data Services?



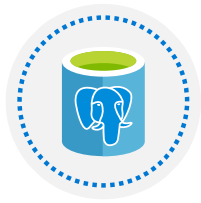
IaaS vs PaaS



SQL Server on Azure virtual machines



Azure SQL DB



PostgreSQL, MySQL, MariaDB

What are Azure Data Services?



SQL Server on Azure Virtual Machines

Best for re-hosting and apps requiring OS-level access and control

Automated manageability features and OS-level access



Azure SQL Managed Instance

Best for modernizing existing apps

Offers high compatibility with SQL Server and native VNET support



Azure SQL Database

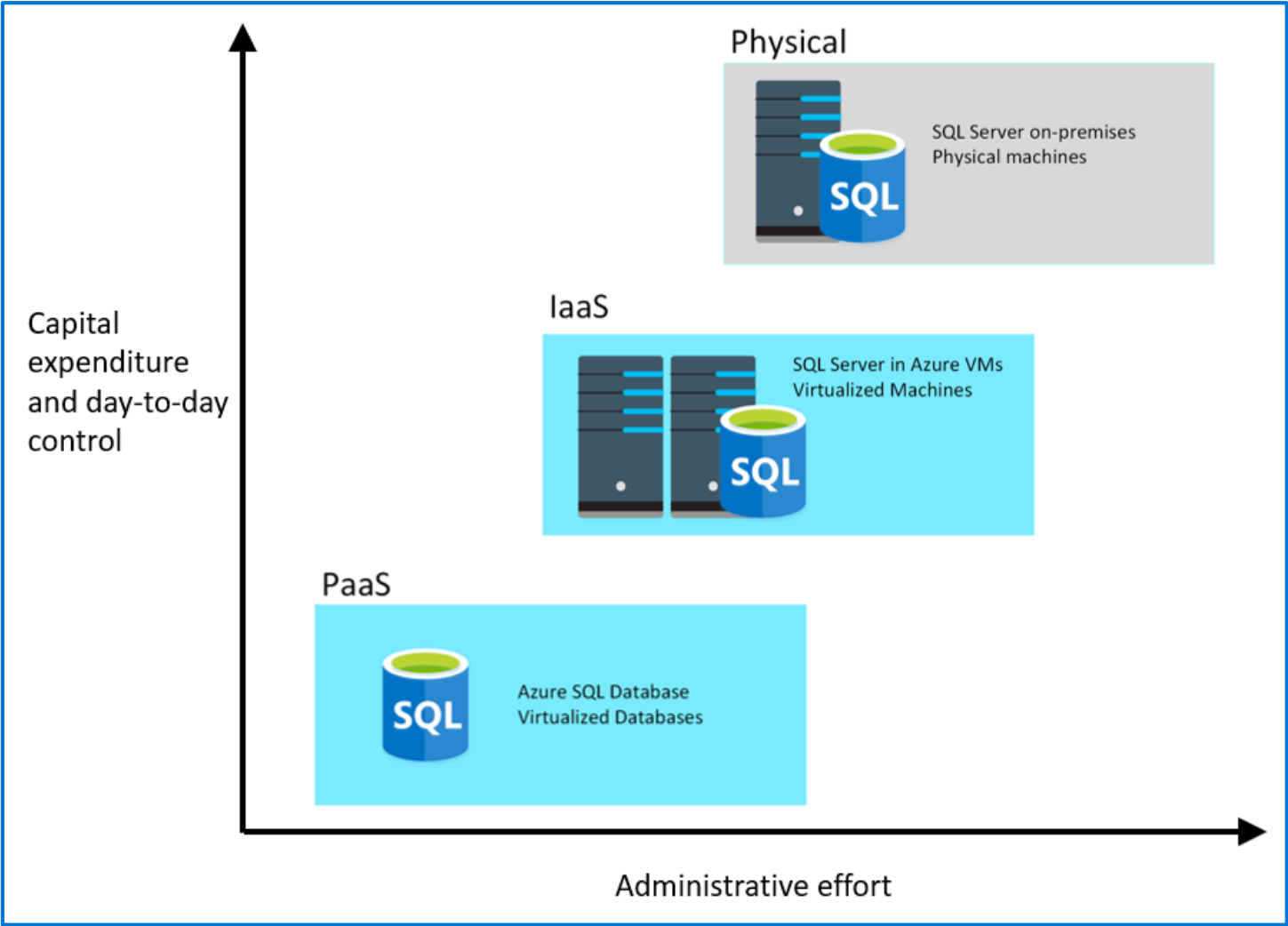
Best for building new apps in the cloud

Pre-provisioned or serverless compute and Hyperscale storage to meet demanding workload requirements

Infrastructure as a Service

Platform as a Service

IaaS vs PaaS



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

PostgreSQL, MySQL, MariaDB



PostgreSQL is the most popular and wanted database for modern apps

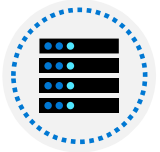


MySQL is a leading open source relational database for LAMP stack apps



MariaDB is a community-developed fork of MySQL with strong focus on the user community

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



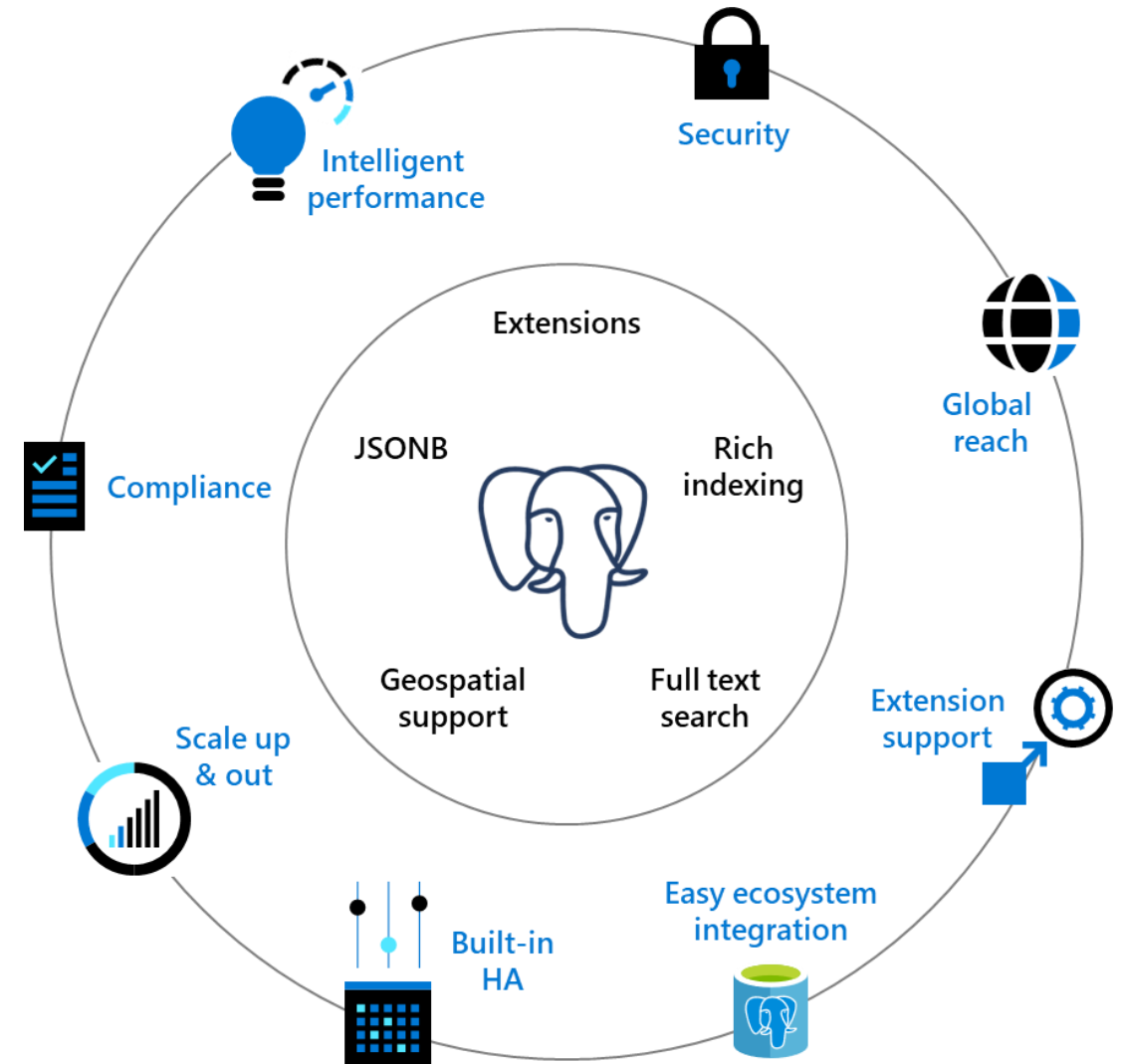
Integration with the Azure ecosystem:

Build apps faster with Azure services and safeguard your innovation with Azure IP Advantage

Azure Database for PostgreSQL

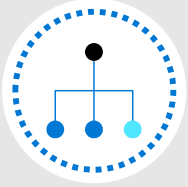
Azure builds upon the core benefits of PostgreSQL and Open Source

Azure Database for PostgreSQL is fully-managed, community PostgreSQL



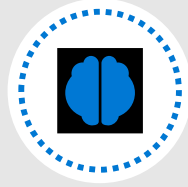
The benefits of Azure Database for PostgreSQL

Build or migrate your workloads with confidence and optimized for value



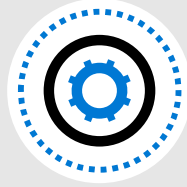
Fully managed and secure

Focus on your apps while Azure manages resource-intensive tasks, supports a large variety of Postgres versions and provides best-in industry indemnification coverage



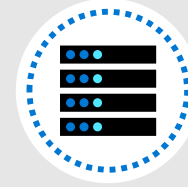
Intelligent performance optimization

Improve performance and reduce cost with customized recommendations



Flexible and open

Stay productive with your favorite Postgres extensions and leverage Microsoft's contributions to the Postgres community



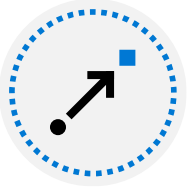
High performance scale-out with Hyperscale

Break free from the limits of single-node Postgres and scale out across 100s of nodes

Single Server

Hyperscale

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?

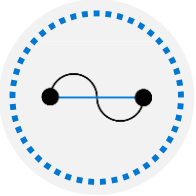
- ☐ Scaling up doesn't take effect until you restart the database
- ☐ Scaling out doesn't take effect until you restart the database
- ☒ Scaling up or out will take effect without restarting the SQL database

Lesson 1: Knowledge check (continued)



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

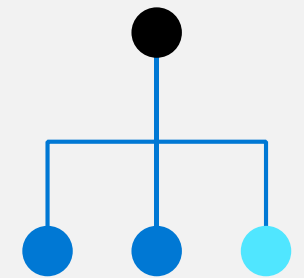
- ☐ Manual Configuration of the SQL server
- ☐ Create a scheduled task to back up
- ☒ Backups are automatically handled



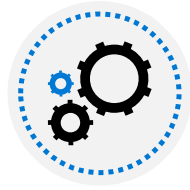
What is the best way to transfer the data in a PostgreSQL database running on-premises into a database running Azure Database for PostgreSQL service?

- ☐ 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

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



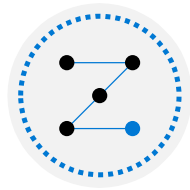
Lesson 2 objectives



Provision relational data services



Configure relational data services



Explore basic connectivity issues



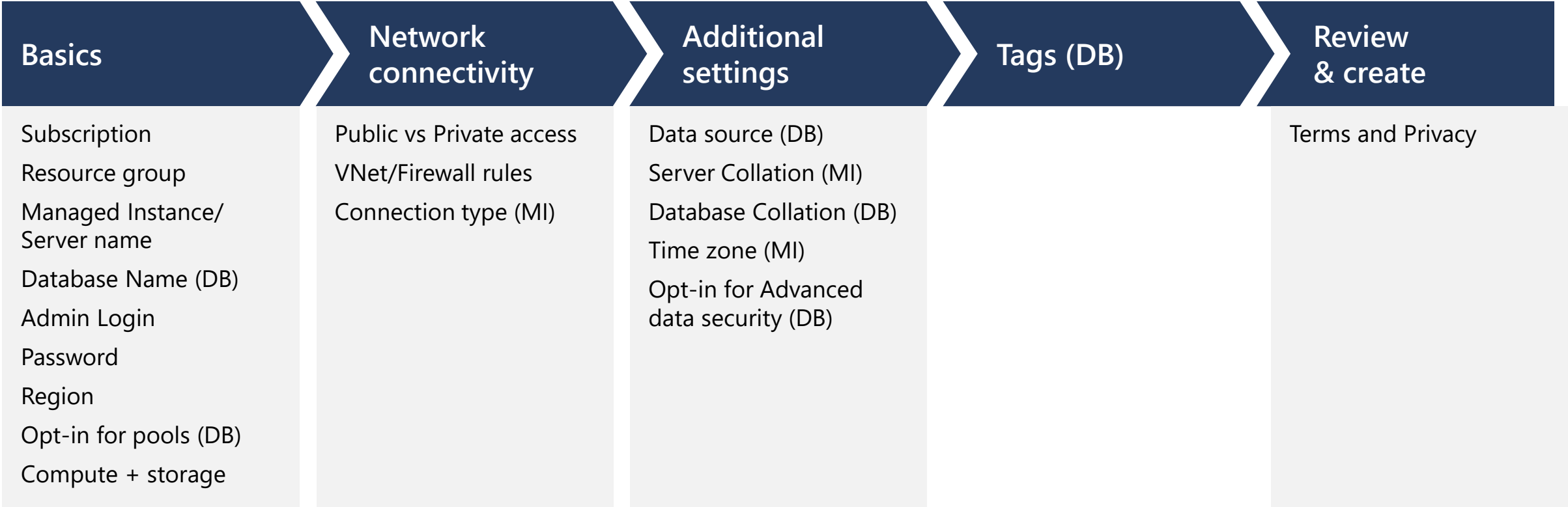
Explore data security

Demo: What is provisioning?

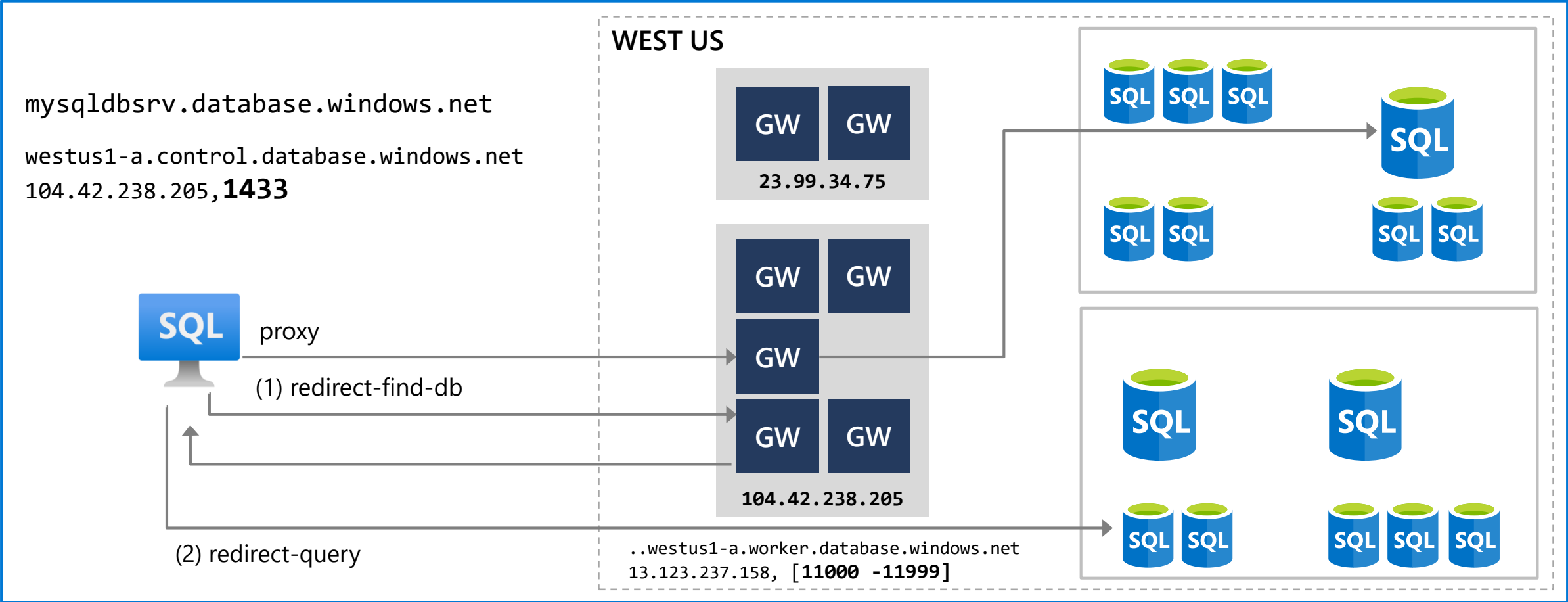
This video summarizes the process that Azure performs when you provision a service



Configure relational data services



Connectivity and Firewalls



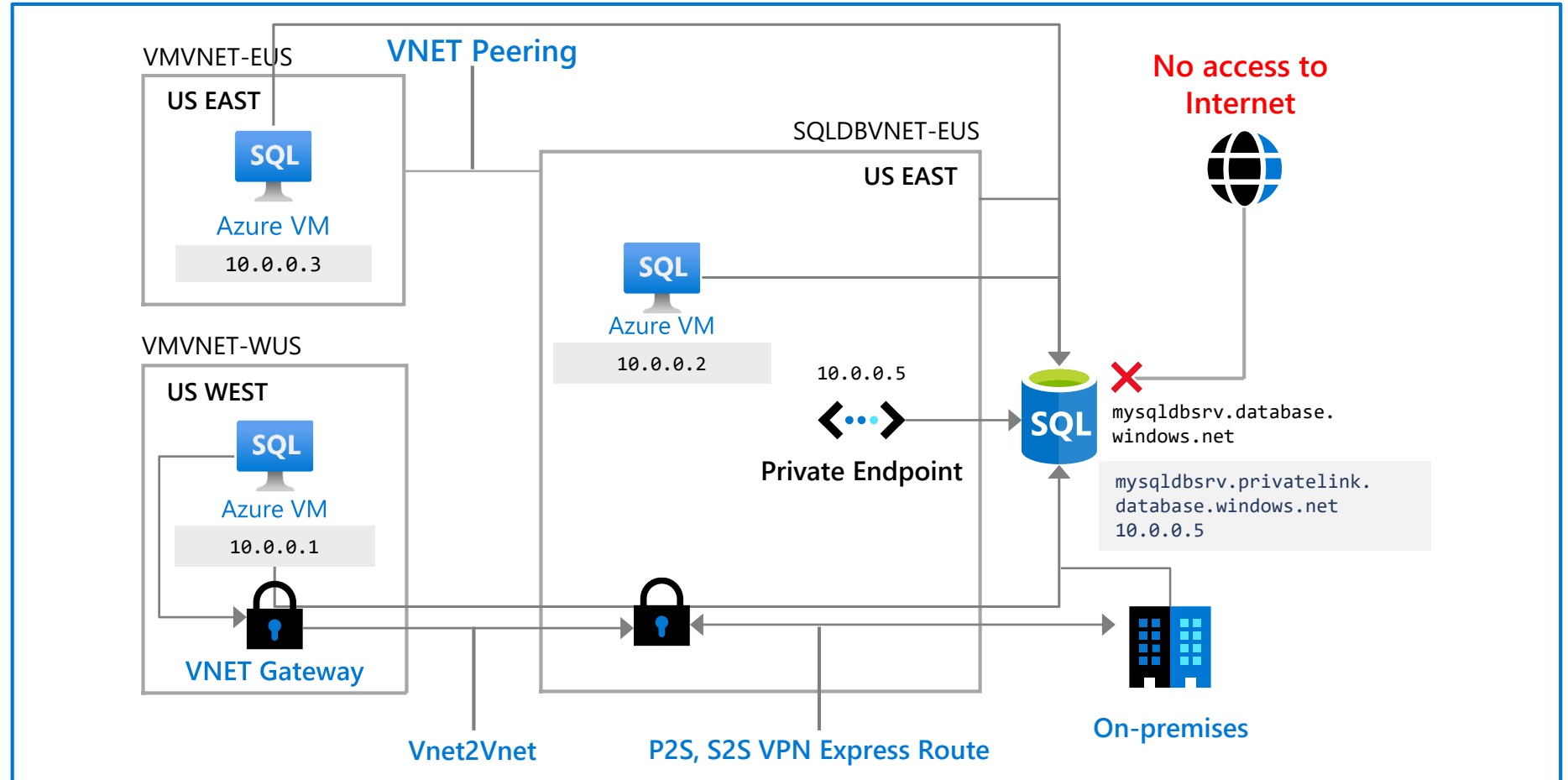
Network Security – SQL Database

Allow access to
Azure services

Firewall Rules

Virtual
Network Rules

Private Link



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)

Azure Role Based Access Control (RBAC)

All Azure operations for Azure SQL are controlled through RBAC

Think of this as security rights outside the Managed Instance or Database

Security principal and role-based system

Scope includes subscription, resource group, and resource

Decoupled from SQL Security (today)

Applies to operations in Azure portal and CLI

Allows for separation of duties for deployment, management, and usage

Azure locks help protect resources from delete or read-only

Built-in Azure SQL roles available to reduce need for owner

SQL DB
Contributor

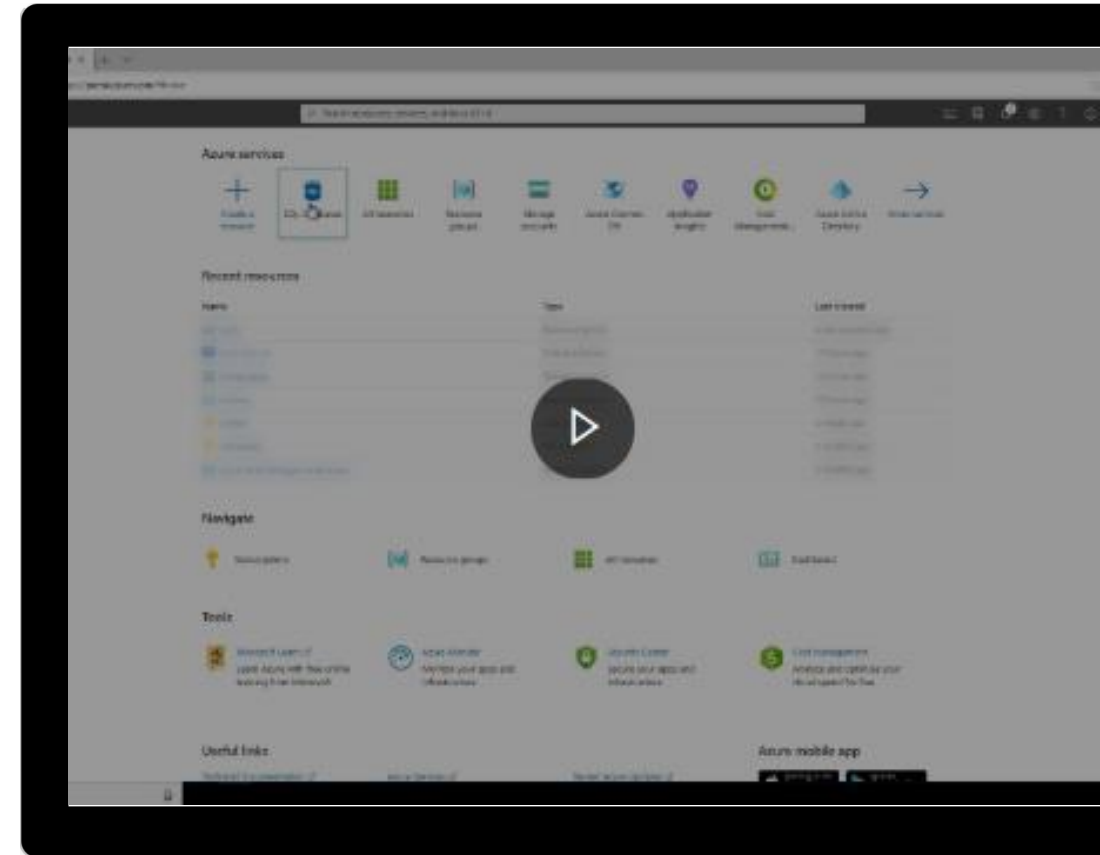
SQL Managed
Instance Contributor

SQL Security Manager

SQL Server Contributor

Demo: Provision an Azure SQL Database instance

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



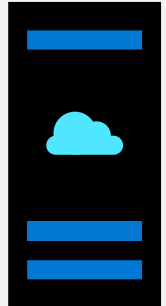
Lab: Provision Azure relational database service



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

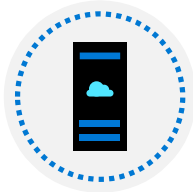
Lesson 3: Query relational data in Azure



Lesson 3 objectives



Query relational data



Describe query techniques for data using the SQL language

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

SQL Statement types

DML

Data Manipulation
Language

Used to query and
manipulate data

SELECT, INSERT, UPDATE,
DELETE

DDL

Data Definition Language

Used to define database
objects

CREATE, ALTER, DROP,
RENAME

DCL

Data Control Language

Used to manage security
permissions

GRANT, REVOKE, DENY

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

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>

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;
```

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);
```

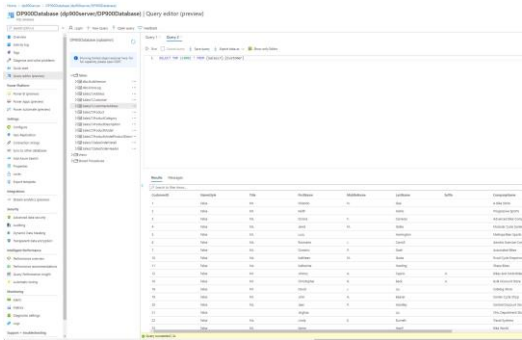
Use DDL statements

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.

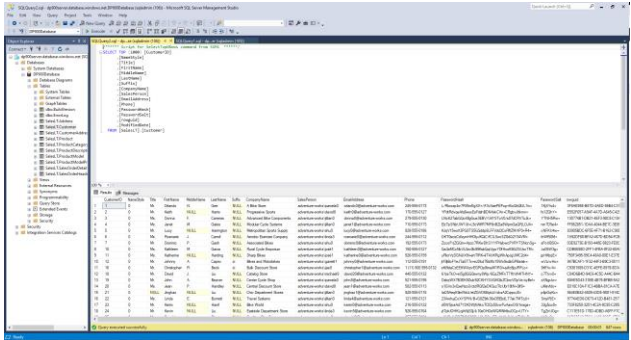
Example of CREATE statement

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

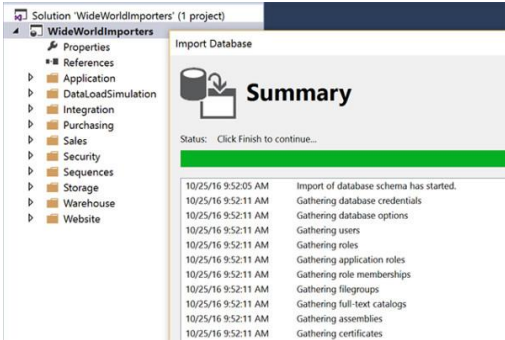

Query tools



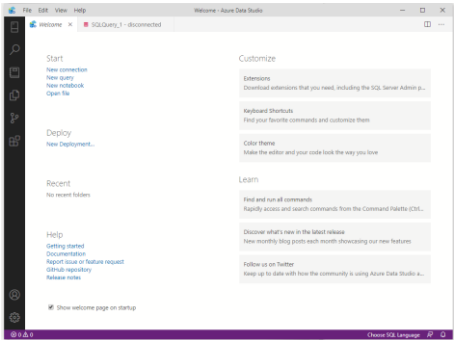
Azure portal



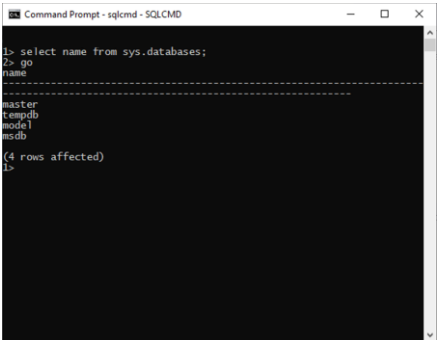
SQL Management Studio



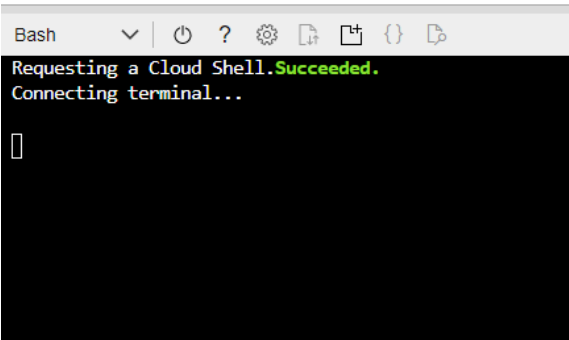
SQL Server Data Tools



Azure Data Studio



SQLCMD



Azure CLI/Cloud Shell

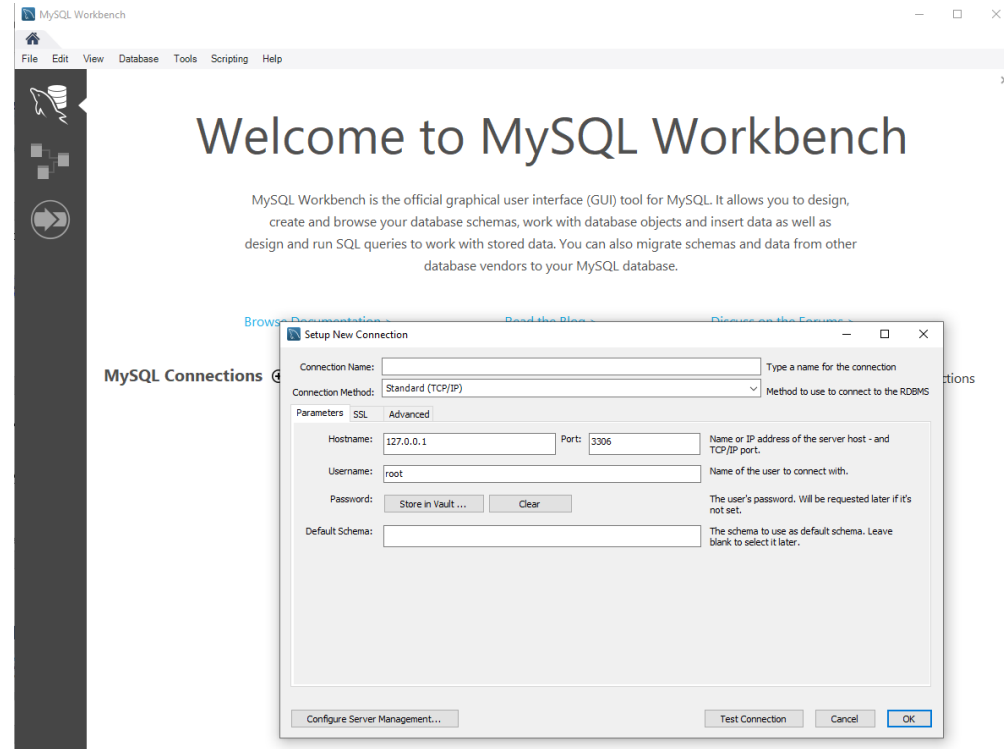
Query relational data in Azure SQL Database for PostgreSQL

Use PSQL to query a database

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

Query relational data in Azure SQL Database for MySQL

Use MySQL Workbench to query a database



Lab: Use SQL to query Azure SQL Database



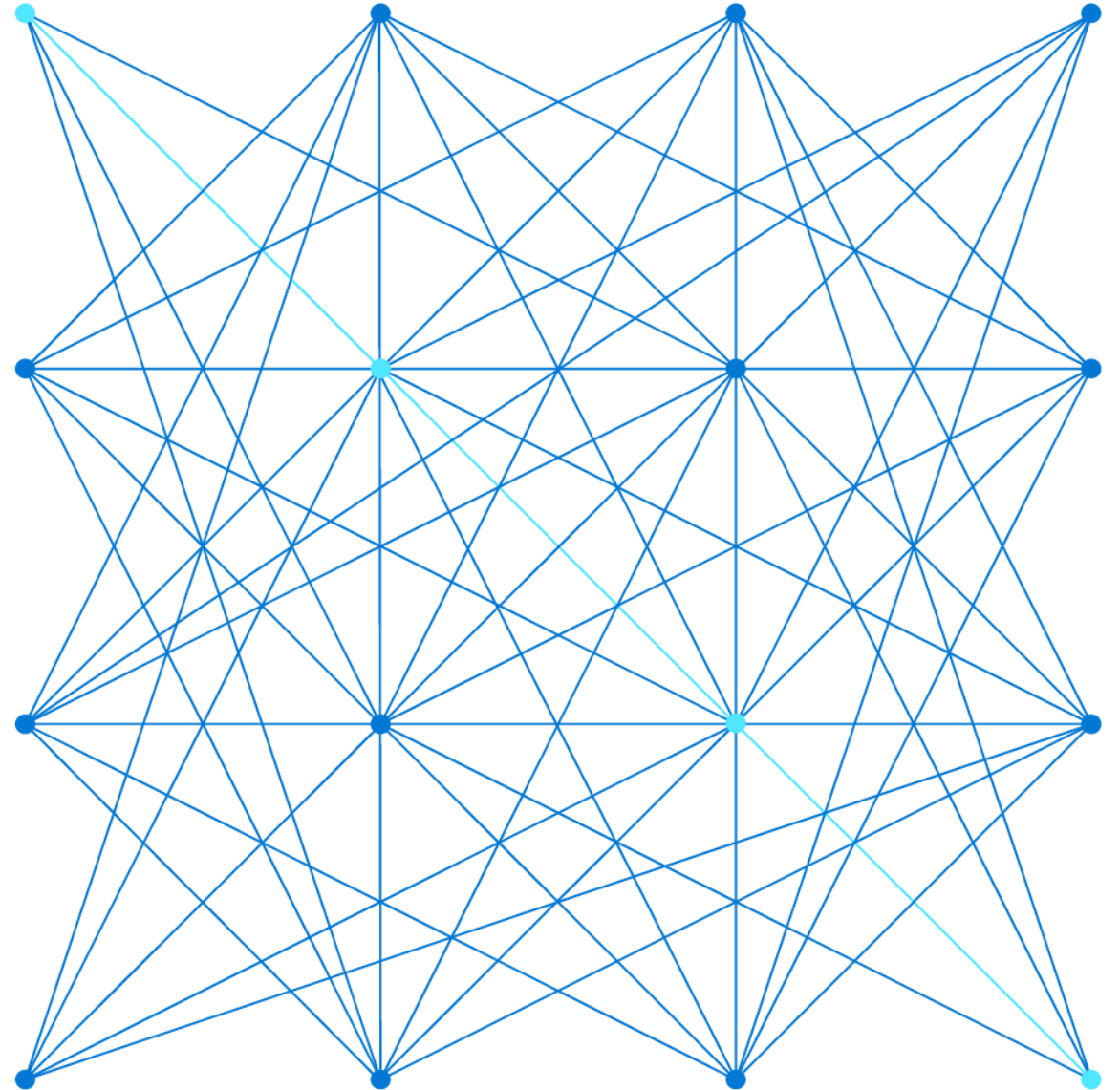
Contoso has provisioned the SQL database and has imported all the inventory data into the data store.

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



Module 3: Explore non-relational data in Azure



Agenda



Explore non-relational data services in Azure



Explore provisioning and deploying non-relational data services in Azure



Manage non-relational data stores in Azure

Lesson 1: Explore non-relational data services in Azure



Lesson 1 objectives



Explore use-cases and management benefits of using Azure Table storage



Explore use-cases and management benefits of using Azure Blob storage



Explore use-cases and management benefits of using Azure File storage



Explore use-cases and management benefits of using Azure Cosmos DB

Explore Azure Table storage

Key (Customer ID)	Value (Customer Data)					
C1	AAAAA	BBB	101 Block Street		YY	999 888
C2	MM	NN	21 A Street		5 B Avenue	
C3	DDD	EEE	FFF	111	222	66 C Road

Explore Azure Blob storage

Block blobs

Has a maximum size of 4.7TB

Best for storing large, discrete, binary objects that changes infrequently

Each individual block can store up to 100MB of data

A block blob can contain up to 50000 blocks

Page blobs

Can hold up to 8TB of data

Is organized as a collection of fixed sized-512 byte pages

Used to implement virtual disk storage for virtual machines

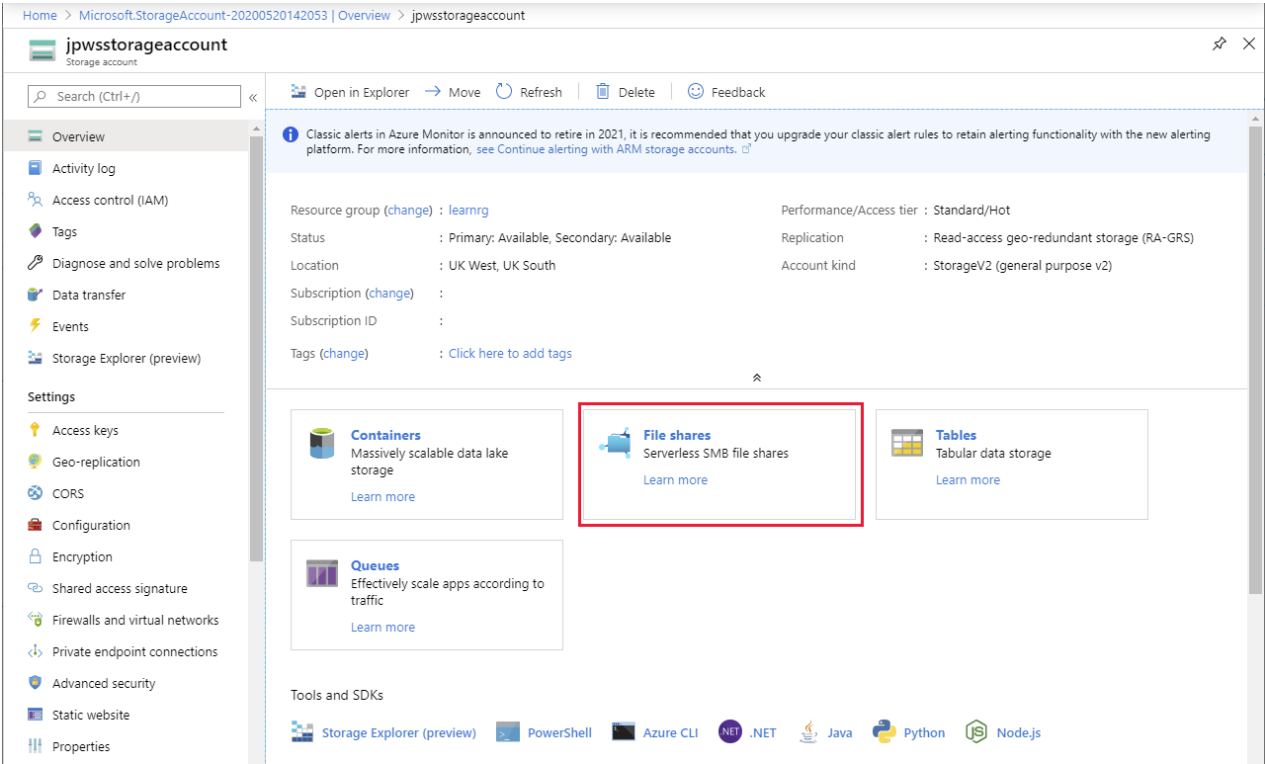
Append blobs

The maximum size is just over 195GB

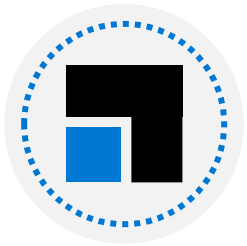
Is a block blob that is used to optimize append operations

Each individual block can store up to 4MB of data

Explore Azure File storage



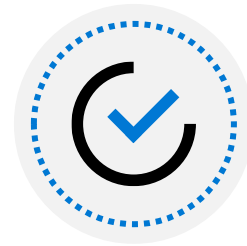
Explore Azure Cosmos DB



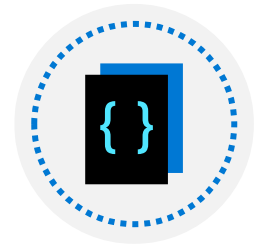
Scalability



Performance



Availability



**Programming
model**

Use cases for Azure Cosmos DB

Web and retail

Using Azure Cosmos DB's multi-master replication model along with Microsoft's performance commitments, Data Engineers can implement a data architecture to support web and mobile applications that achieve less than a 10-ms response time anywhere in the world

Gaming

The database tier is a crucial component of gaming applications. Modern games perform graphical processing on mobile/console clients but rely on the cloud to deliver customized and personalized content like in-game stats, social media integration, and high-score leader boards

IoT scenarios

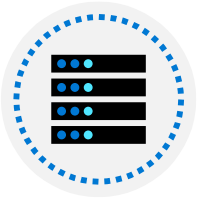
Hundreds of thousands of devices have been designed and sold to generate sensor data known as Internet of Things (IoT) devices. Using technologies like Azure IoT Hub, Data Engineers can easily design a data solution architecture that captures real-time data. Cosmos DB can accept and store this information very quickly

Lesson 1: Knowledge check (continued on next slide)



What are the elements of an Azure Table storage key?

- ☐ Table name and column name
 - ☒ Partition key and row key
 - ☐ Row number
-



When should you use a block blob, and when should you use a page blob?

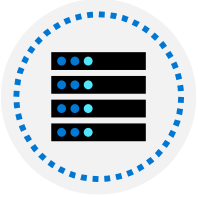
- ☐ Use a block blob for unstructured data that requires random access to perform reads and writes. Use a page blob for discrete objects that rarely change.
 - ☐ Use a block blob for active data stored using the Hot data access tier, and a page blob for data stored using the Cool or Archive data access tiers
 - ☒ Use a page block for blobs that require random read and write access. Use a block blob for discrete objects that change infrequently
-



Why might you use Azure File storage?

- ☐ To share files that are stored on-premises with users located at other sites
- ☒ To enable users at different sites to share files
- ☐ To store large binary data files containing images or other unstructured data

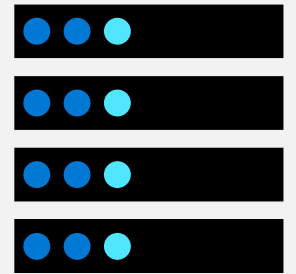
Lesson 1: Knowledge check (continued)



You are building a system that monitors the temperature throughout a set of office blocks, and sets the air conditioning in each room in each block to maintain a pleasant ambient temperature. Your system has to manage the air conditioning in several thousand buildings spread across the country/region, and each building typically contains at least 100 air-conditioned rooms. What type of NoSQL data store is most appropriate for capturing the temperature data to enable it to be processed quickly?

- ☒ Send the data to an Azure Cosmos DB database and use Azure Functions to process the data
- ☐ Store the data in a file stored in a share created using Azure File Storage
- ☐ Write the temperatures to a blob in Azure Blob storage

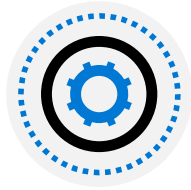
Lesson 2: Explore provisioning and deploying non-relational data services in Azure



Lesson 2 objectives



Provision non-relational data services



Configure non-relational data services



Explore basic connectivity issues



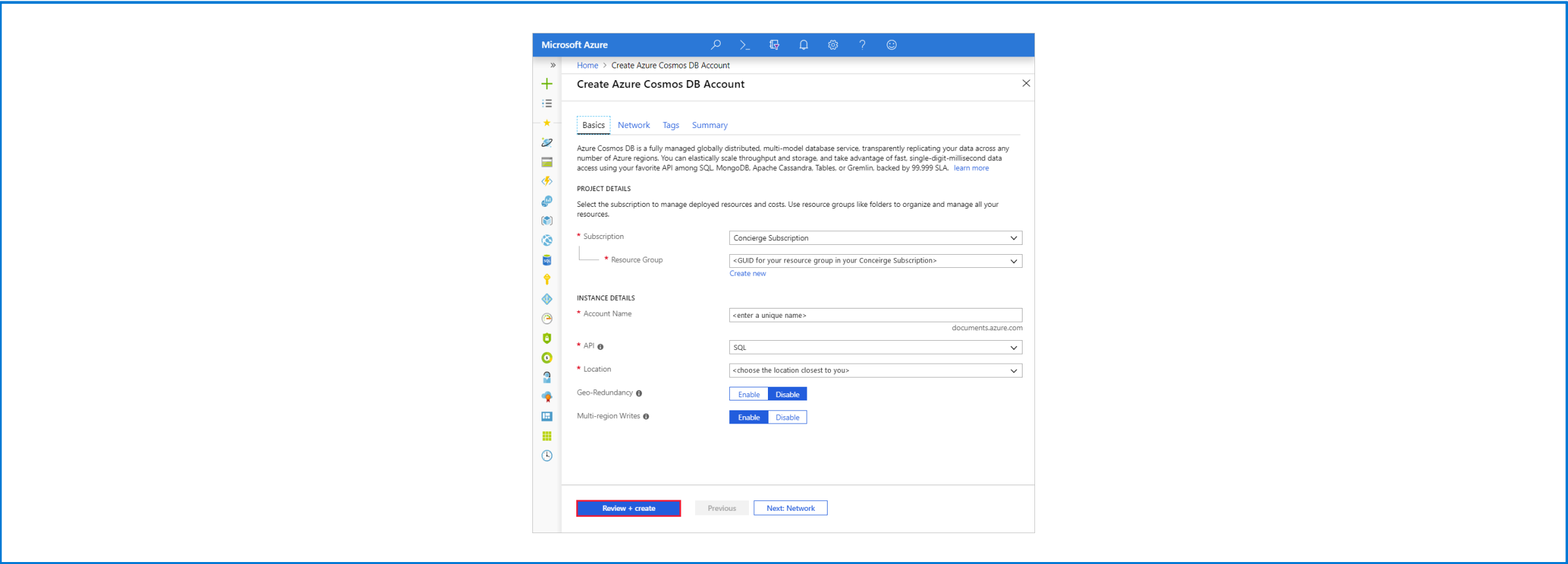
Explore data security components

Demo: What is provisioning?

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

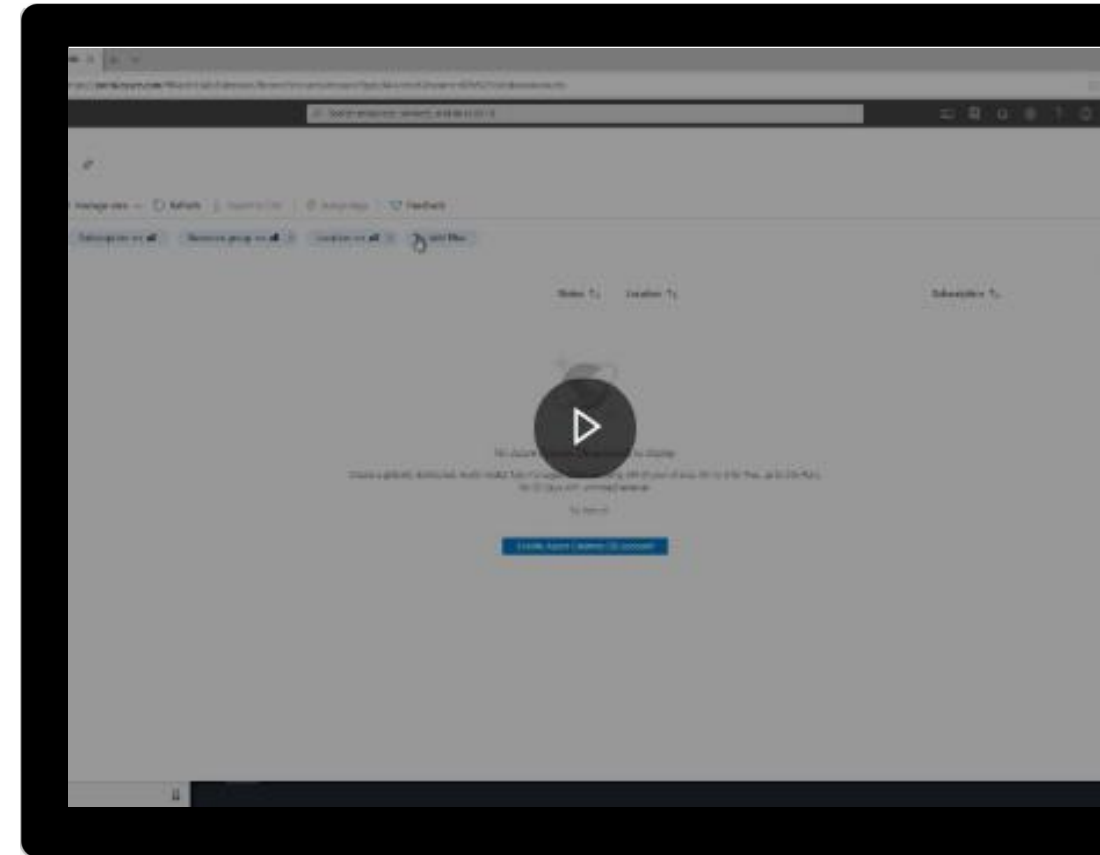


Provisioning Cosmos DB



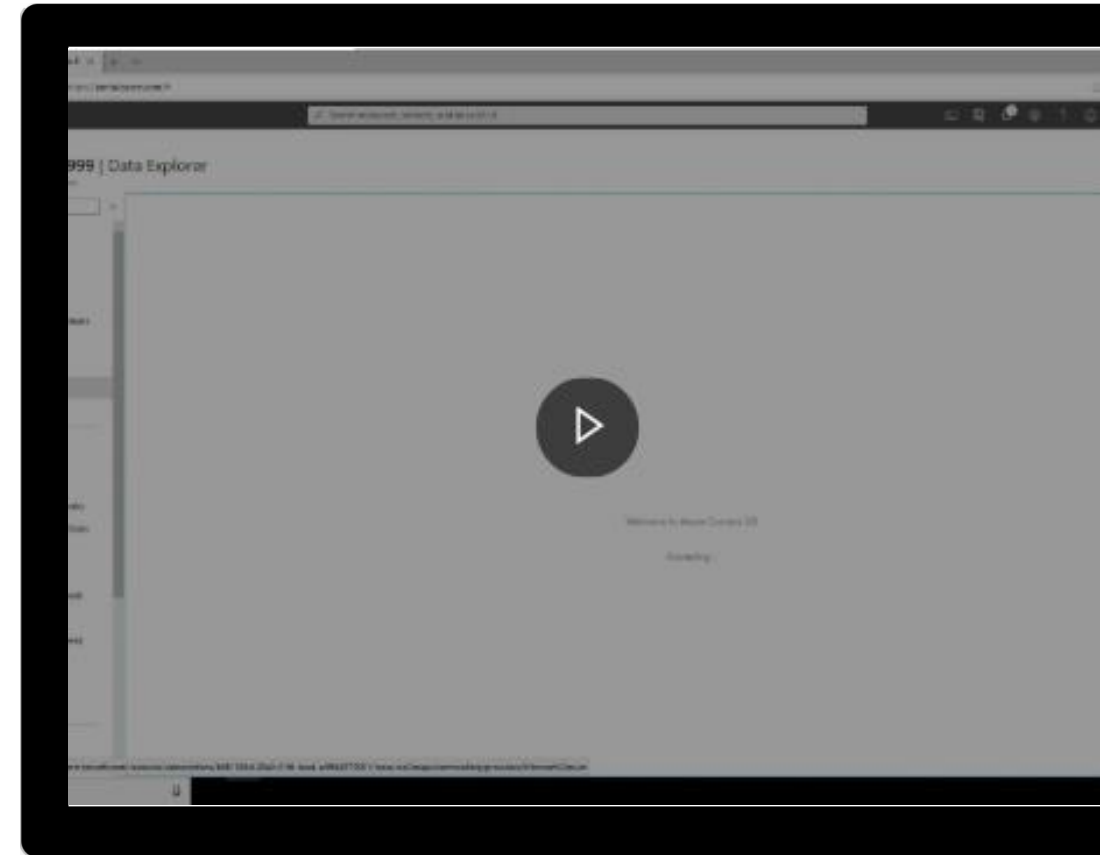
Demo: How to provision a Cosmos DB account

You can provision a Cosmos DB account interactively using the Azure portal, or you can perform this task programmatically through the Azure CLI, Azure PowerShell, or an Azure Resource Manager template. This video describes how to use the Azure portal



Demo

Use the Azure portal to create a database and container



Provisioning Data Lake storage

Create storage account

Basics

Advanced

Tags

Review + create

Azure Storage is a Microsoft-managed service providing cloud storage that is highly available, secure, durable, scalable, and redundant. Azure Storage includes Azure Blobs (objects), Azure Data Lake Storage Gen2, Azure Files, Azure Queues, and Azure Tables. The cost of your storage account depends on the usage and the options you choose below. [Learn more](#)

PROJECT DETAILS

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

* Subscription

* Resource group [Create new](#)

INSTANCE DETAILS

The default deployment model is Resource Manager, which supports the latest Azure features. You may choose to deploy using the classic deployment model instead. [Choose classic deployment model](#)

* Storage account name

* Location

Performance ☒ Standard ☐ Premium

Account kind

Replication

Access tier (default) ☐ Cool ☒ Hot

Home > New > Create storage account

Create storage account

Basics

Advanced

Tags

Review + create

SECURITY

Secure transfer required ☐ Disabled ☒ Enabled

VIRTUAL NETWORKS

Allow access from ☒ All networks ☐ Selected network

☒ All networks will be able to access this storage account. [Learn more](#)

DATA LAKE STORAGE GEN2 (PREVIEW)

Hierarchical namespace ☐ Disabled ☒ Enabled

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Demo: Azure authentication

Azure AD is a separate Azure service. You add users and other security principals (such as an application) to a security domain managed by Azure AD. This video describes how authentication works with Azure



Configure storage accounts

Create storage account

Basics **Advanced** Tags Review + create

Azure Storage is a Microsoft-managed service providing cloud storage that is highly available, secure, durable, scalable, and redundant. Azure Storage includes Azure Blobs (objects), Azure Data Lake Storage Gen2, Azure Files, Azure Queues, and Azure Tables. The cost of your storage account depends on the usage and the options you choose below. [Learn more](#)

PROJECT DETAILS

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

*

Subscription

Visual Studio Enterprise

*

Resource group

Select existing...

Create new

INSTANCE DETAILS

The default deployment model is Resource Manager, which supports the latest Azure features. You may choose to deploy using the classic deployment model instead. [Choose classic deployment model](#)

*

Storage account name

*

Location

East US

Performance

☒ Standard

☐ Premium

Account kind

StorageV2 (general purpose v2)

Replication

Read-access geo-redundant storage (RA-GRS)

Access tier (default)

☐ Cool

☒ Hot

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Lesson 2: Knowledge check



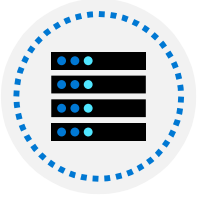
What is provisioning?

- ☒ The act of running series of tasks that a service provider performs to create and configure a service
 - ☐ Providing other users access to an existing service
 - ☐ Tuning a service to improve performance
-



What is a security principal?

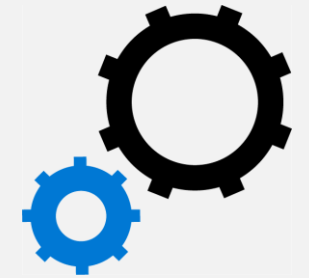
- ☐ A named collection of permissions that can be granted to a service, such as the ability to use the service to read, write, and delete data. In Azure, examples include **Owner** and **Contributor**.
 - ☐ A set of resources managed by a service to which you can grant access
 - ☒ An object that represents a user, group, service, or managed identity that is requesting access to Azure resources
-



Which of the following is an advantage of using multi-region replication with Cosmos DB?

- ☐ Data will always be consistent in every region
- ☒ Availability is increased
- ☐ Increased security for your data

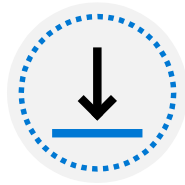
Lesson 3: Manage non-relational data stores in Azure



Lesson 3 objectives



Upload data to a Cosmos DB database, and learn how to query this data



Upload and download data in an Azure Storage account

Cosmos DB APIs

SQL API

- Supports SQL-like query language

Table API

- Compatible with Azure Table Storage

MongoDB API

- Compatible with MongoDB

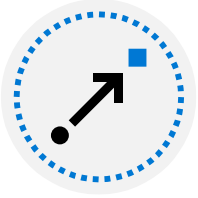
Cassandra API

- Compatible with Cassandra

Gremlin API

- A graph database

Load data using the Cosmos DB Migration tool



You can use the Data Migration tool to import data to Azure Cosmos DB from a variety of sources, including:

JSON files

MongoDB

SQL Server

CSV files

Azure Table storage

Amazon DynamoDB

HBase

Azure Cosmos containers

Demo: Configure consistency

Within a single region, Cosmos DB uses a cluster of servers. This approach helps to improve scalability and availability. A copy of all data is held in each server in the cluster. This video explains how this works, and the effects it can have on consistency



Query Azure Cosmos DB

Aggregation Function Basics

`COUNT(<fields_to_count>)`

`SUM(<numeric_fields>)`

`AVG(<numeric_fields>)`

`MAX(<numeric_fields>)`

`MIN(<numeric_fields>)`

SQL API examples

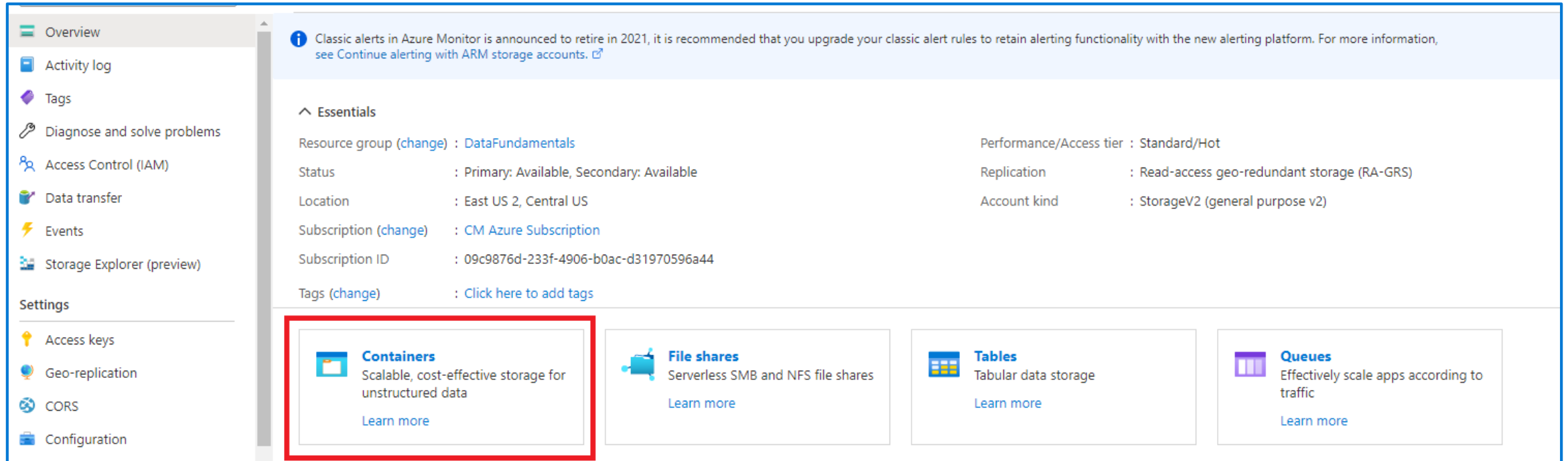
```
SELECT COUNT(*) FROM Products p
```

```
SELECT SUM(p.quantity) FROM Products p  
WHERE p.expired = 0
```

```
SELECT AVG(p.price) AS 'Average Price'  
FROM Products p
```

```
SELECT p1.ID, p.Name, p1.Description,  
p1.Price FROM Products p1  
WHERE p1.Price = (SELECT MIN(p2.Price) FROM  
Product p2)
```


Manage Azure Blob storage



The screenshot displays the Azure portal interface for managing a storage account. On the left, a navigation pane lists various services under 'Overview' and 'Settings'. The main content area shows the 'Essentials' section with account details and a row of storage service options. The 'Containers' option is highlighted with a red rectangular box.

Overview

- Activity log
- Tags
- Diagnose and solve problems
- Access Control (IAM)
- Data transfer
- Events
- Storage Explorer (preview)

Settings

- Access keys
- Geo-replication
- CORS
- Configuration

Essentials

Resource group (change) : [DataFundamentals](#)

Status : Primary: Available, Secondary: Available

Location : East US 2, Central US

Subscription (change) : [CM Azure Subscription](#)

Subscription ID : 09c9876d-233f-4906-b0ac-d31970596a44

Tags (change) : [Click here to add tags](#)

Performance/Access tier : Standard/Hot

Replication : Read-access geo-redundant storage (RA-GRS)

Account kind : StorageV2 (general purpose v2)

Containers
Scalable, cost-effective storage for unstructured data
[Learn more](#)

File shares
Serverless SMB and NFS file shares
[Learn more](#)

Tables
Tabular data storage
[Learn more](#)

Queues
Effectively scale apps according to traffic
[Learn more](#)

Manage Azure File storage

Home > Microsoft.StorageAccount-20201119151058 > filesharedatafund >

contosodata

File share

Search (Ctrl+/)

«

Connect

Upload

Add directory

Refresh

Delete share

Change tier

Edit quota

Overview

Access Control (IAM)

Settings

Properties

Operations

Snapshots

Backup

Search files by prefix

Name	Type
February	Directory
January	Directory
March	Directory

Connect

contosodata

'Secure transfer required' is enabled on the storage account. SMB clients must support 3.0 encryption to connect. Click here to learn more about connecting Azure files.

WindowsLinuxmacOS

To connect to this Azure file share from Windows, choose from the following authentication methods and run the PowerShell commands from a normal (not elevated) PowerShell terminal:

Drive letter

Z

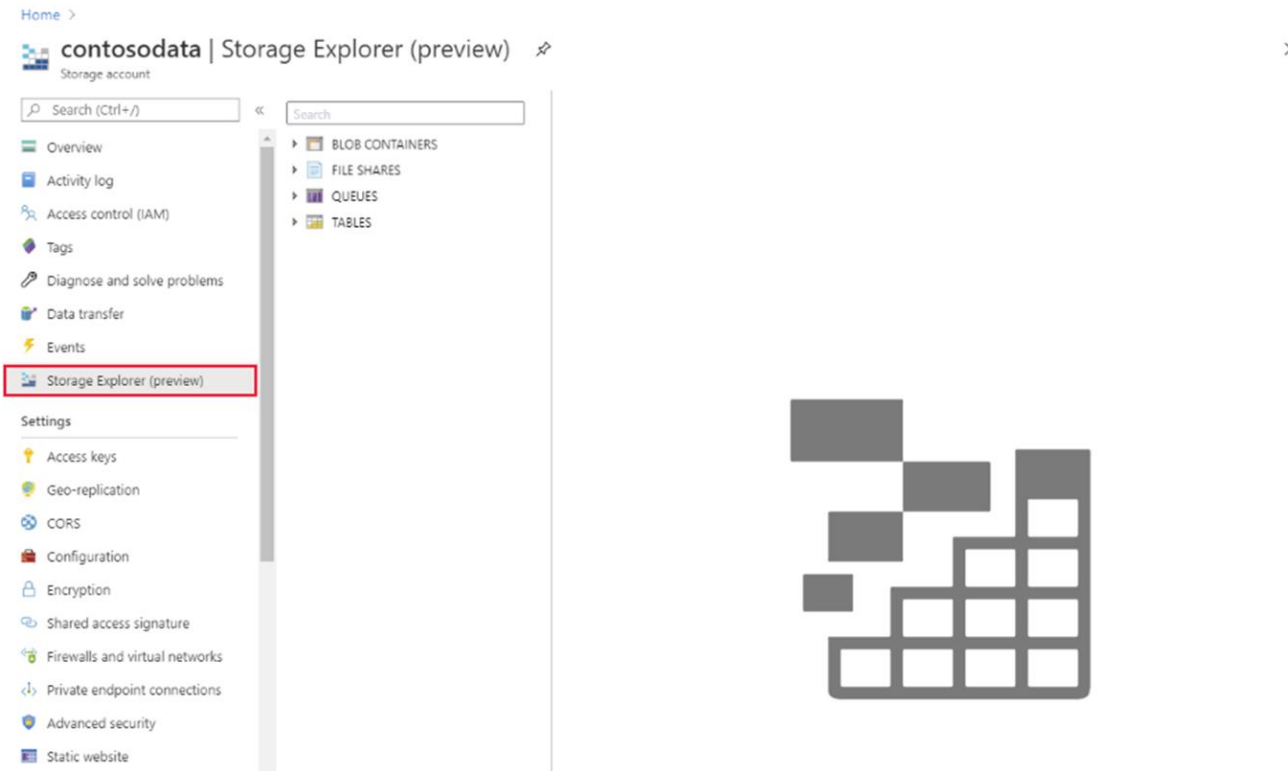
```
$connectTestResult = Test-NetConnection -ComputerName
filesharedatafund.file.core.windows.net -Port 445
if ($connectTestResult.TcpTestSucceeded) {
    # Save the password so the drive will persist on reboot
    cmd.exe /C "cmdkey /add:"filesharedatafund.file.core.windows.net"
    /user:"Azure\filesharedatafund"
    /pass:"YKgMe3JXyyloS6VQQ7M4TVm6Vv0p6DMj3ZVfaF4Dp/E4DwMbSwd9abawmM"
```

This script will check to see if this storage account is accessible via TCP port 445, which is the port SMB uses. If port 445 is available, your Azure file share will be persistently mounted. Your organization or internet service provider (ISP) may block port 445, however you may use Azure [Point-to-Site \(P2S\) VPN](#), Azure [Site-to-Site \(S2S\) VPN](#), or [ExpressRoute](#) to tunnel SMB traffic to your Azure file share over a different port.

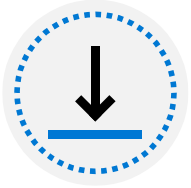
[Learn how to circumvent the port 445 problem \(VPN\)](#)

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Copying to Azure storage



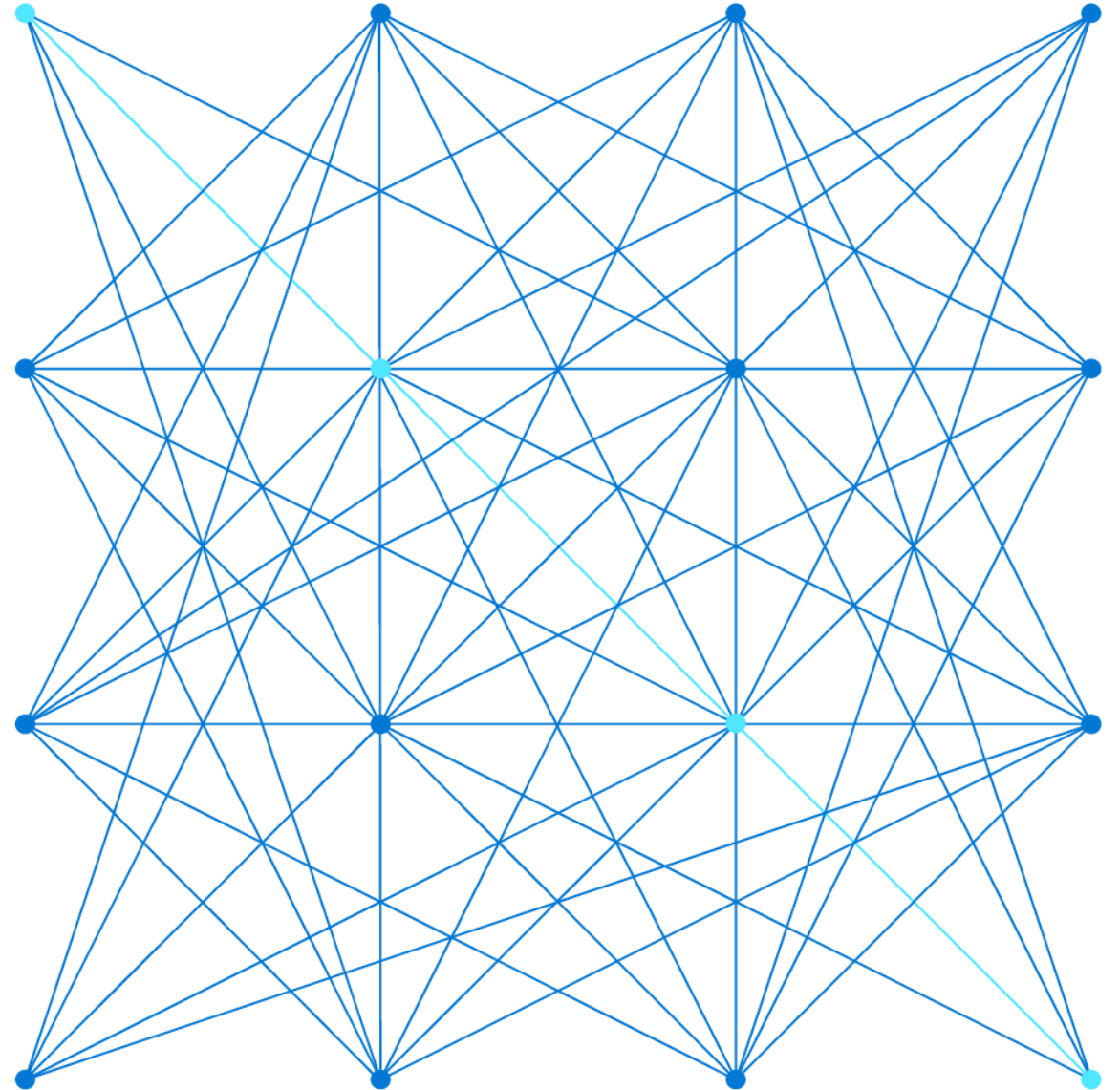
Lab: Upload, download, and query data in a non-relational data store



Go to the exercise **Upload, download, and query data in a non-relational data store** module on Microsoft Learn, and follow the instructions in the module



Module 4: Explore modern data warehouse analytics



Agenda



Examine components of a modern data warehouse



Explore data ingestion in Azure



Explore data storage and processing in Azure



Get started building with Power BI

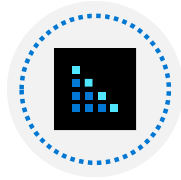
Lesson 1: Examine components of a modern data warehouse



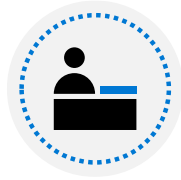
Lesson 1 objectives



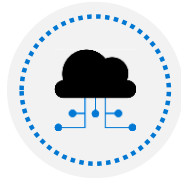
Explore data warehousing concepts



Explore Azure data services for modern data warehousing



Explore modern data warehousing architecture and workload



Explore Azure data services in the Azure portal

Demo: Modern data warehouse components

This video describes the components commonly used to create a data warehouse, and how data might flow through them. This video shows one particular approach



What is modern data warehousing?

Ingest & Prep



Azure Data Factory

Code-free data transformation and ingestion from 90+ data integration connectors



Azure Databricks (Data prep)

Up to 10x faster than vanilla Spark

Model & Serve



Azure Synapse Analytics (Data Warehouse)

Up to 14x faster and costs 94% less than other cloud providers

Visualize



Power BI

Leader in the Magic Quadrant for Business Intelligence and Analytics Platforms*

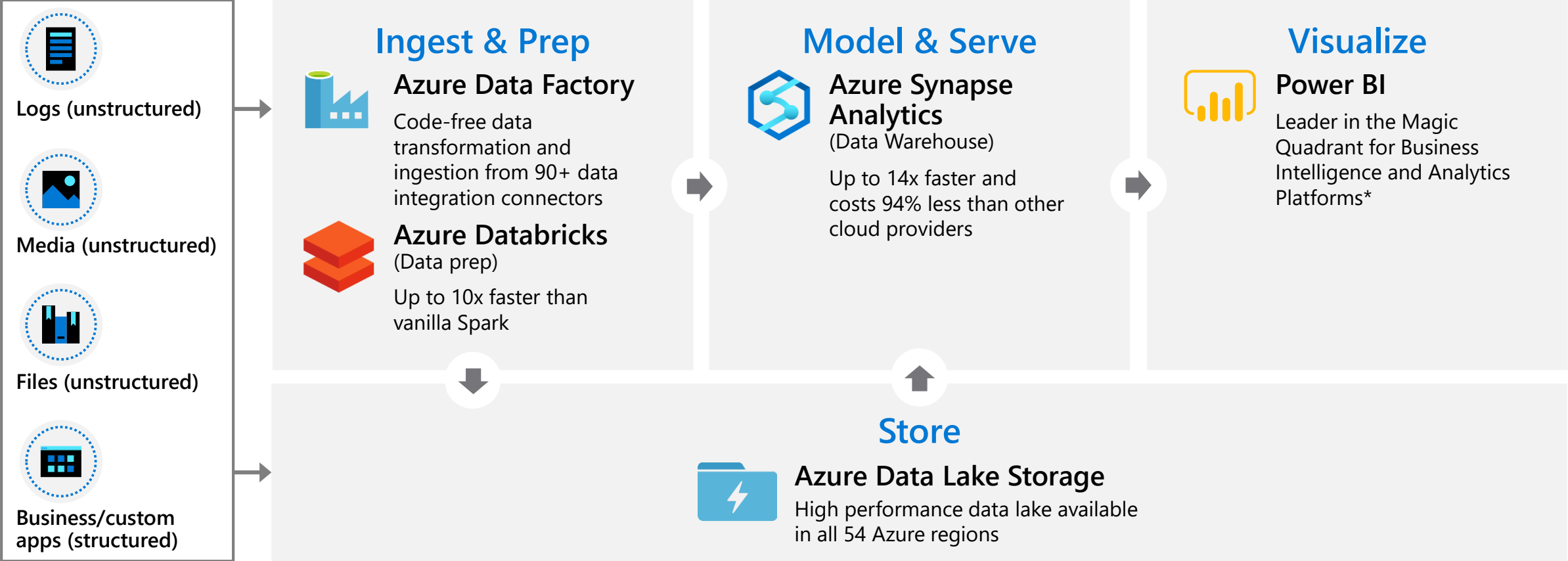
Store



Azure Data Lake Storage

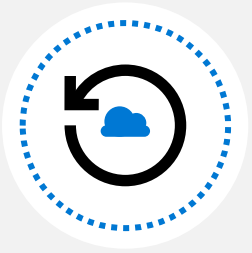
High performance data lake available in all 54 Azure regions

Combine batch and stream processing



Explore Azure data services for modern data warehousing

What is Azure Data Factory



A cloud-based data integration service that allows you to orchestrate and automate data movement and data transformation

What is Azure Data Lake storage?

A repository of data for your Modern Data Warehouse

Organises data into directories for improved file access

Supports POSIX and RBAC permissions

It is compatible with Hadoop Distributed File System

Store



Azure Data Lake Storage

High performance data lake available in all 54 Azure regions

What is Azure Databricks?



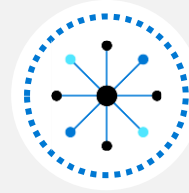
Apache Spark-based platform:

Simplifies the provisioning and collaboration of Apache Spark-based analytical solutions



Enterprise Security:

Utilizes the security capabilities of Azure



Integration with Azure services:

Can integrate with a variety of Azure data platform services and Power BI

What is Azure Synapse Analytics?



Synapse Pipelines



Synapse Link



Synapse Studio



Synapse SQL

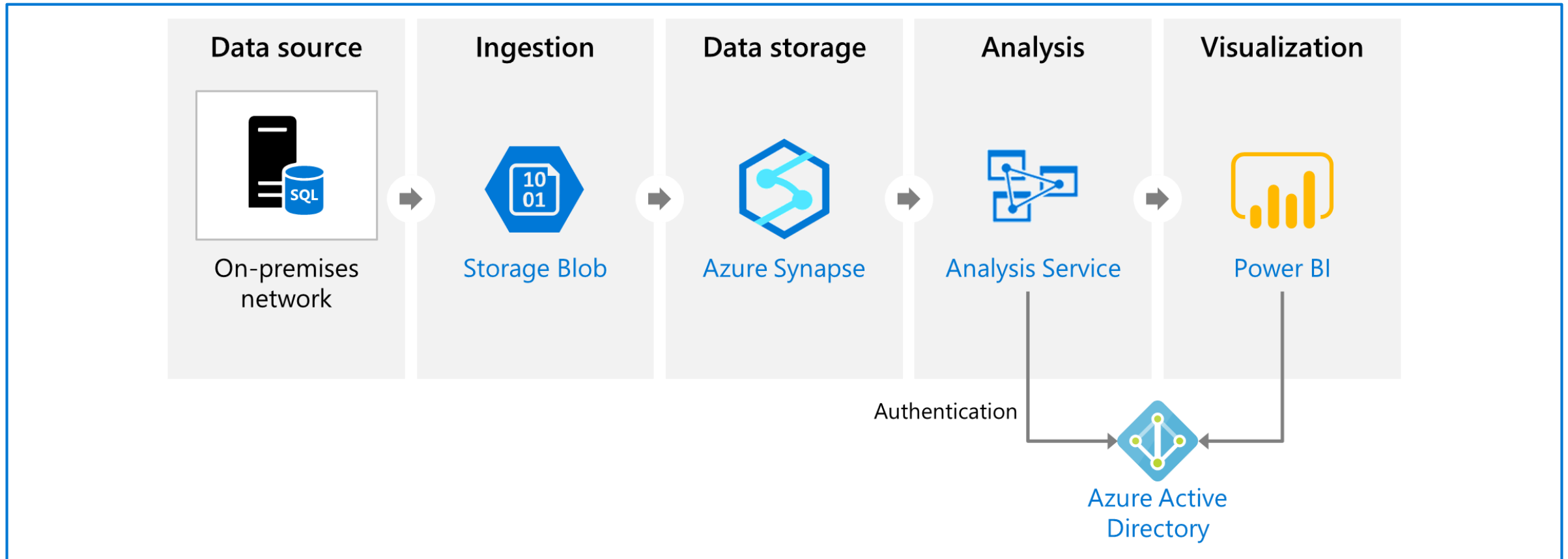


Azure Synapse
Analytics

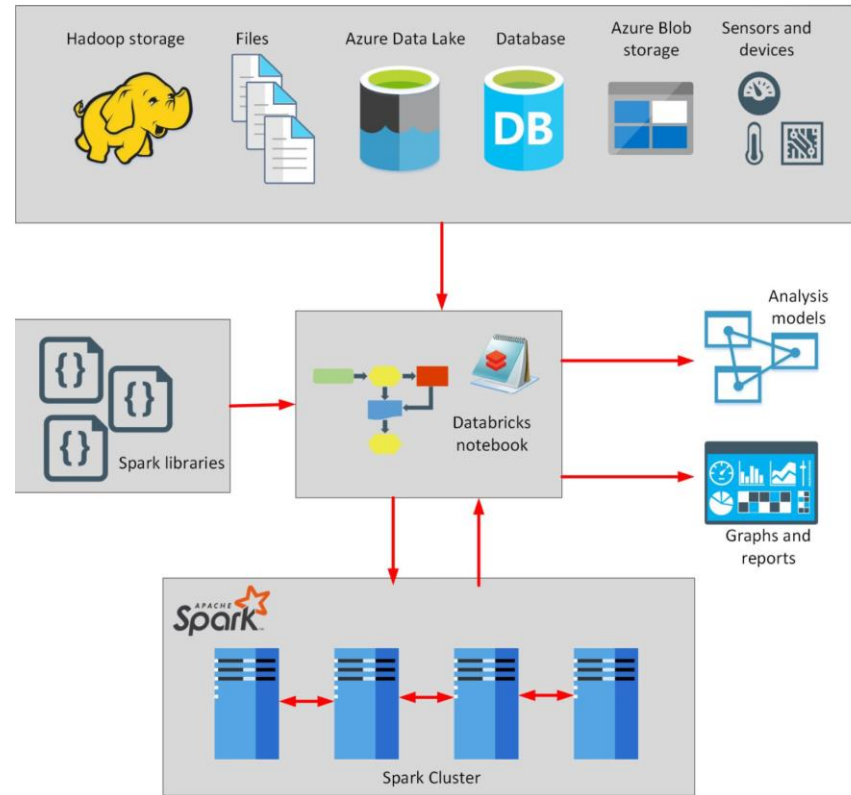


Synapse Spark

What is Azure Analysis Services?



What is Azure HDInsight?



Lesson 1: Knowledge check



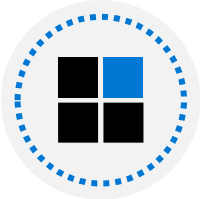
When should you use Azure Synapse Analytics?

- ☒ To perform very complex queries and aggregations
 - ☐ To create dashboards from tabular data
 - ☐ To enable large number of users to query analytics data
-



What is the purpose of data ingestion?

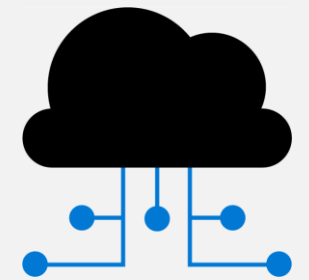
- ☐ To perform complex data transformations over data received from external sources
 - ☒ To capture data flowing into a data warehouse system as quickly as possible
 - ☐ To visualize the results of data analysis
-



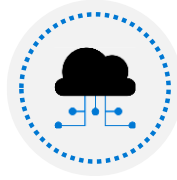
What is the primary difference between a data lake and a data warehouse?

- ☐ A data lake contains **structured information**, but a data warehouse holds **raw business data**
- ☒ A data lake holds **raw data**, but a data warehouse holds **structured information**
- ☐ Data stored in a data lake is dynamic, but information stored in a data warehouse is static

Lesson 2: Explore data ingestion in Azure



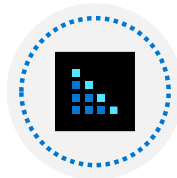
Lesson 2 objectives



Describe data ingestion in Azure



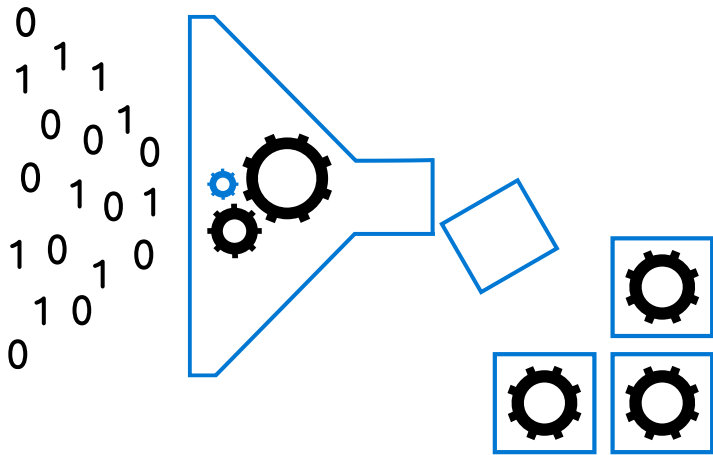
Describe components of Azure Data Factory



See how to use Azure Data Factory to load data into a data warehouse

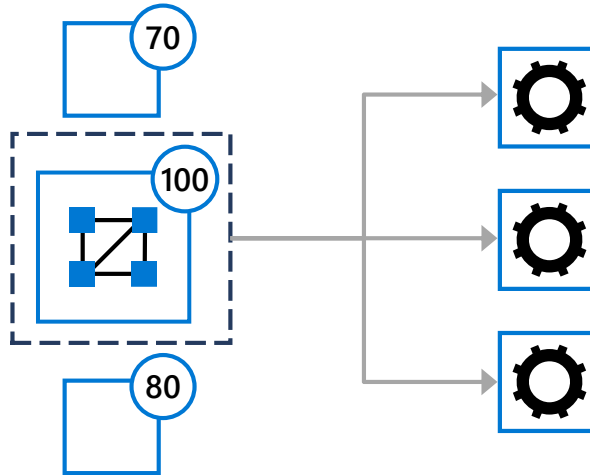
Describe data ingestion in Azure

ADF



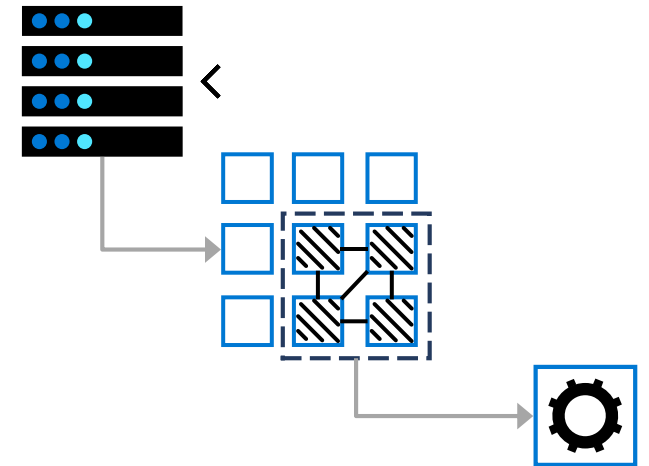
Heterogenous

PolyBase



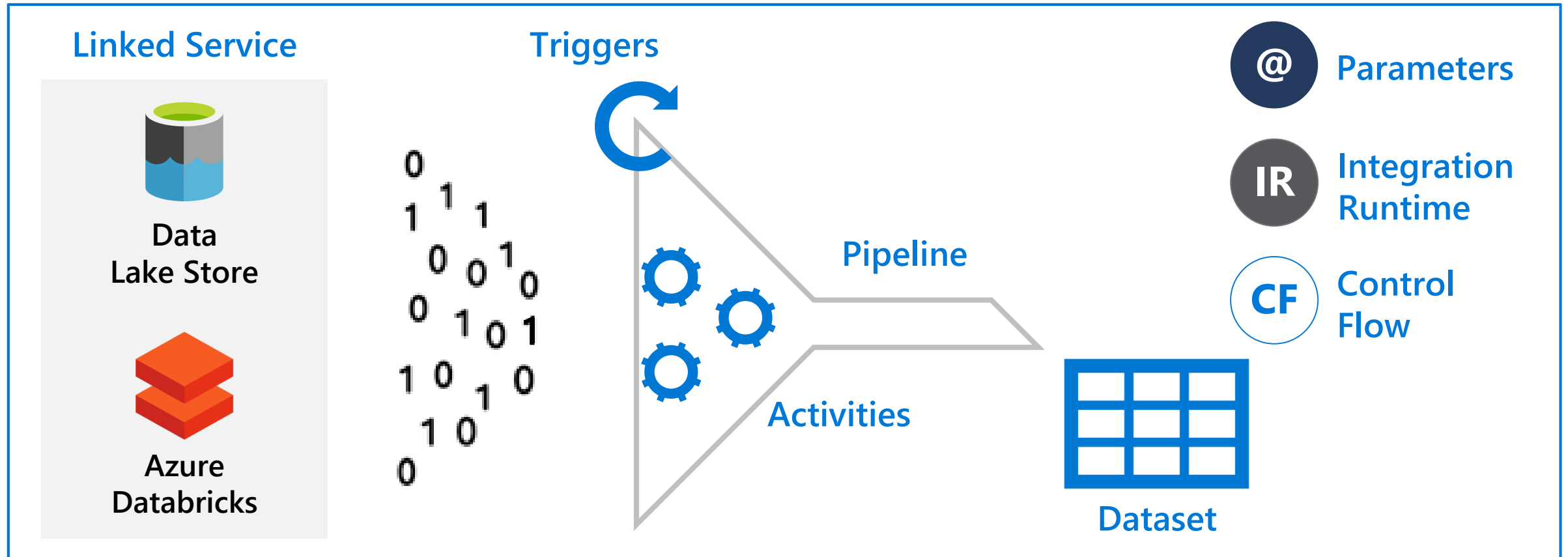
File based

SSIS



Heterogenous

Describe components of Azure Data Factory

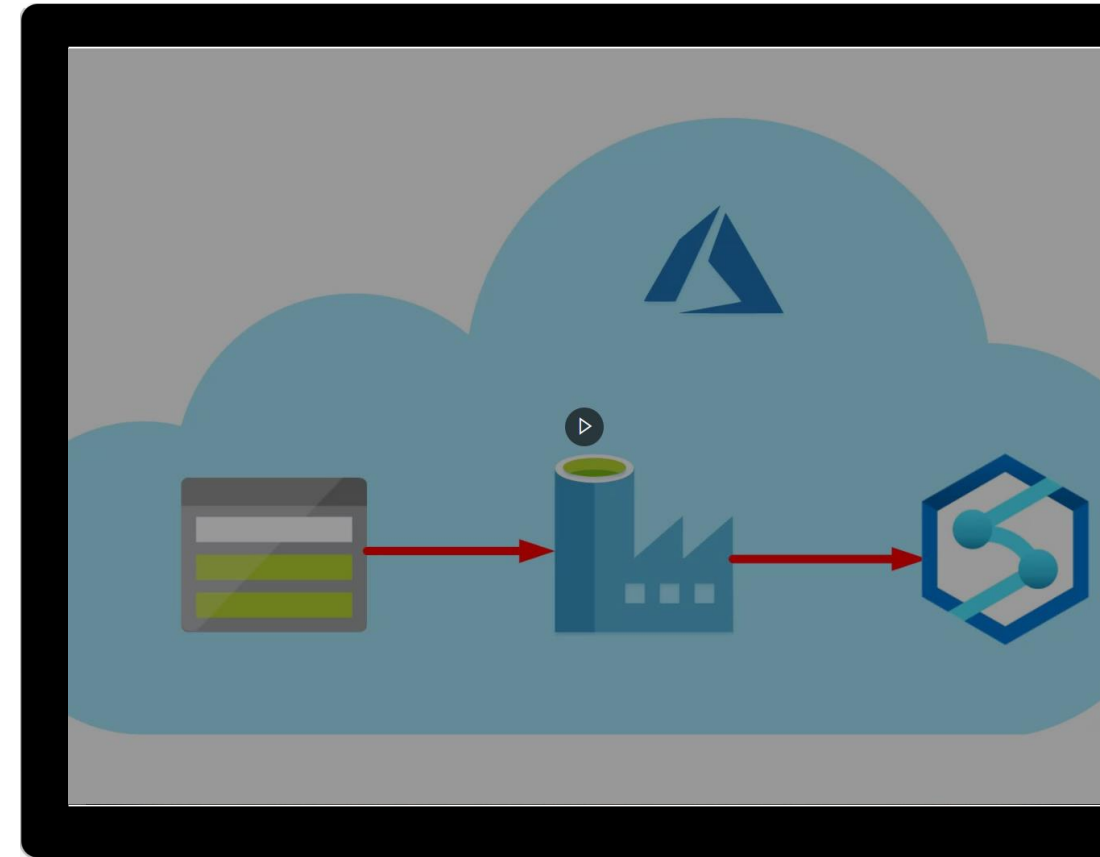


Demo: Load data into Azure Synapse Analytics

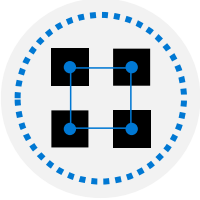
Imagine that you're part of a team that is analyzing house price data. The dataset that you receive contains house price information for several regions. Your team needs to report on how the house prices in each region have varied over the last few months. To achieve this, you need to ingest the data into Azure Synapse Analytics. You've decided to use Azure Data Factory to perform this task

In this video, you'll see how to use Azure Data Factory to ingest and process house price data for analysis

You'll store the data in Azure Synapse Analytics for later analysis

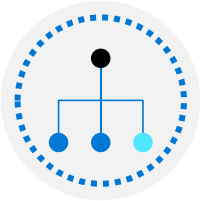


Lesson 2: Knowledge check



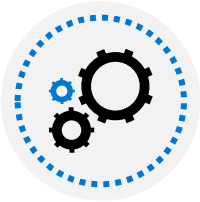
Which component of an Azure Data Factory can be triggered to run data ingestion tasks?

- ☐ CSV File
 - ☒ Pipeline
 - ☐ Linked service
-



When might you use PolyBase?

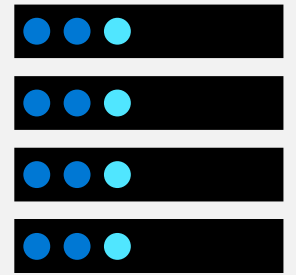
- ☒ To query data from external data sources from Azure SQL Database
 - ☐ To ingest streaming data using Azure Databricks
 - ☐ To orchestrate activities in Azure Data Factory
-



Which of these services can be used to ingest data into Azure Synapse Analytics?

- ☒ Azure Data Factory
- ☐ Power BI
- ☐ Azure Active Directory

Lesson 3: Explore data storage and processing in Azure



Lesson 3 objectives



Describe data processing options for performing analytics in Azure

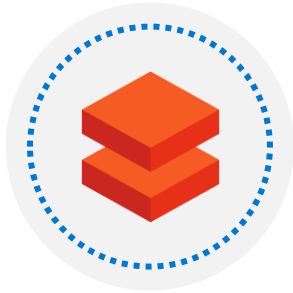


Explore Azure Synapse Analytics

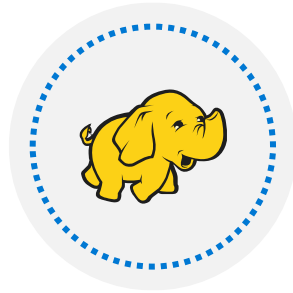
Data processing options for performing analytics in Azure



**Azure Synapse
Analytics**



**Azure
Databricks**



**Azure
HDInsight**



**Azure Data
Factory**



**Data
Lake Store**

Explore Azure Synapse Analytics



Synapse Pipelines



Synapse Link



Synapse Studio



Synapse SQL



Azure Synapse
Analytics



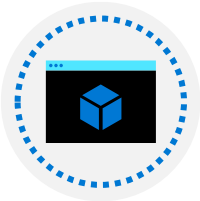
Synapse Spark

Lesson 3: Knowledge check



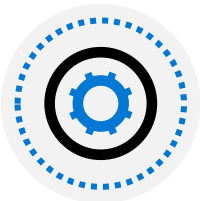
You have a large amount of data held in files in Azure Data Lake storage. You want to retrieve the data in these files and use it to populate tables held in Azure Synapse Analytics. Which processing option is most appropriate?

- ☐ Use Azure Synapse Link to connect to Azure Data Lake storage and download the data
 - ☒ Synapse SQL pool
 - ☐ Synapse Spark pool
-



Which of the components of Azure Synapse Analytics allows you to train AI models using AzureML?

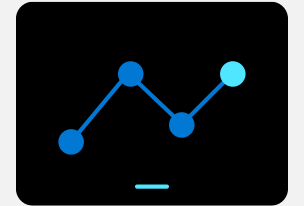
- ☐ Synapse Studio
 - ☐ Synapse Pipelines
 - ☒ Synapse Spark
-



In Azure Databricks how do you change the language a cell uses?

- ☒ The first line in the cell is %language. For example, %scala
- ☐ Change the notebook language before writing the commands
- ☐ Wrap the command in the cell with ##language##

Lesson 4: Get started building with Power BI



Lesson 4 objectives



Learn how Power BI services and applications work together

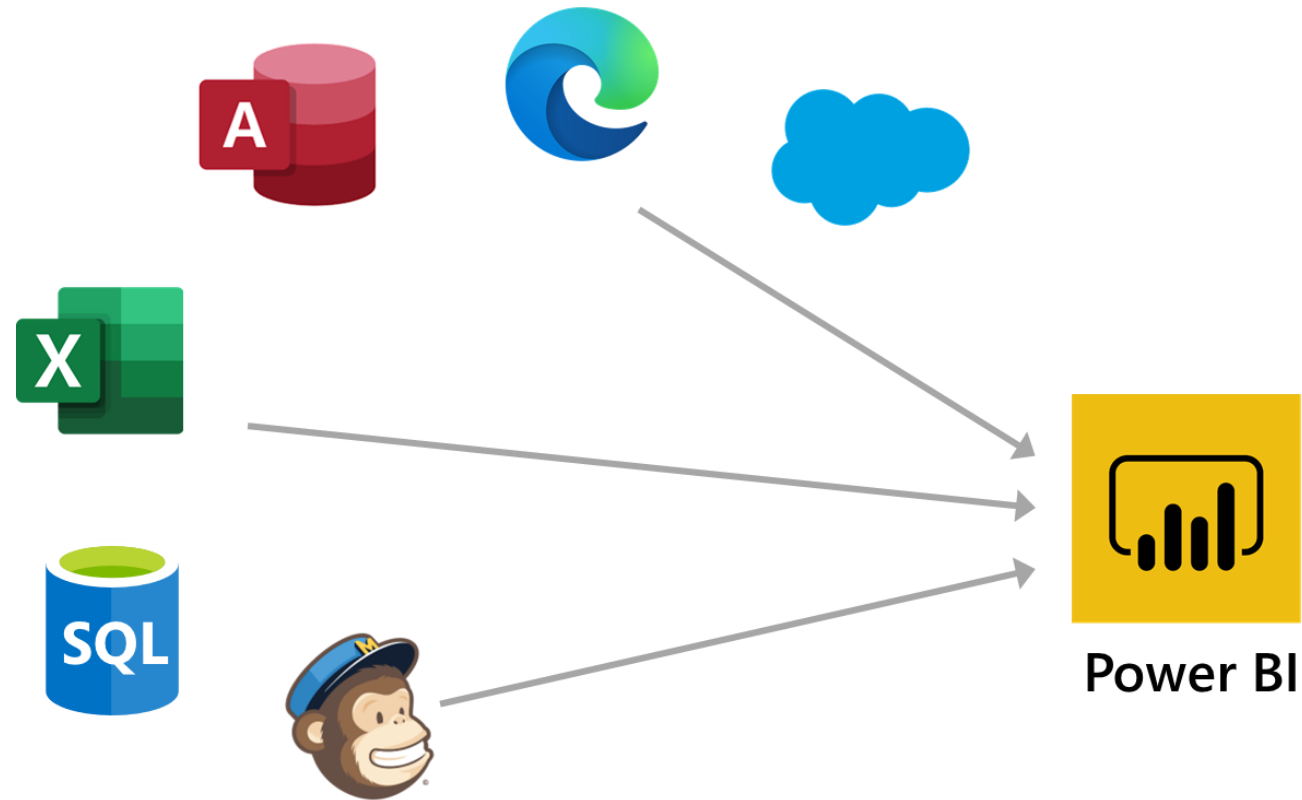


Explore how Power BI can make your business more efficient

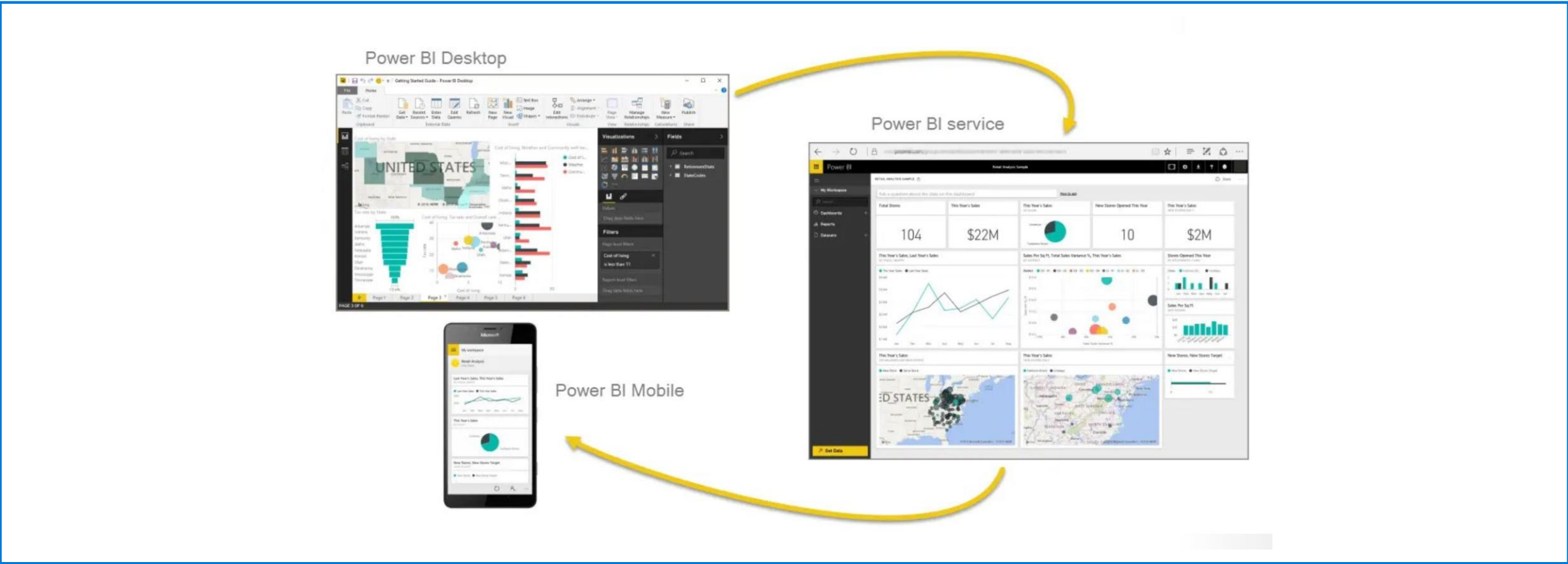


Learn how to create compelling visuals and reports

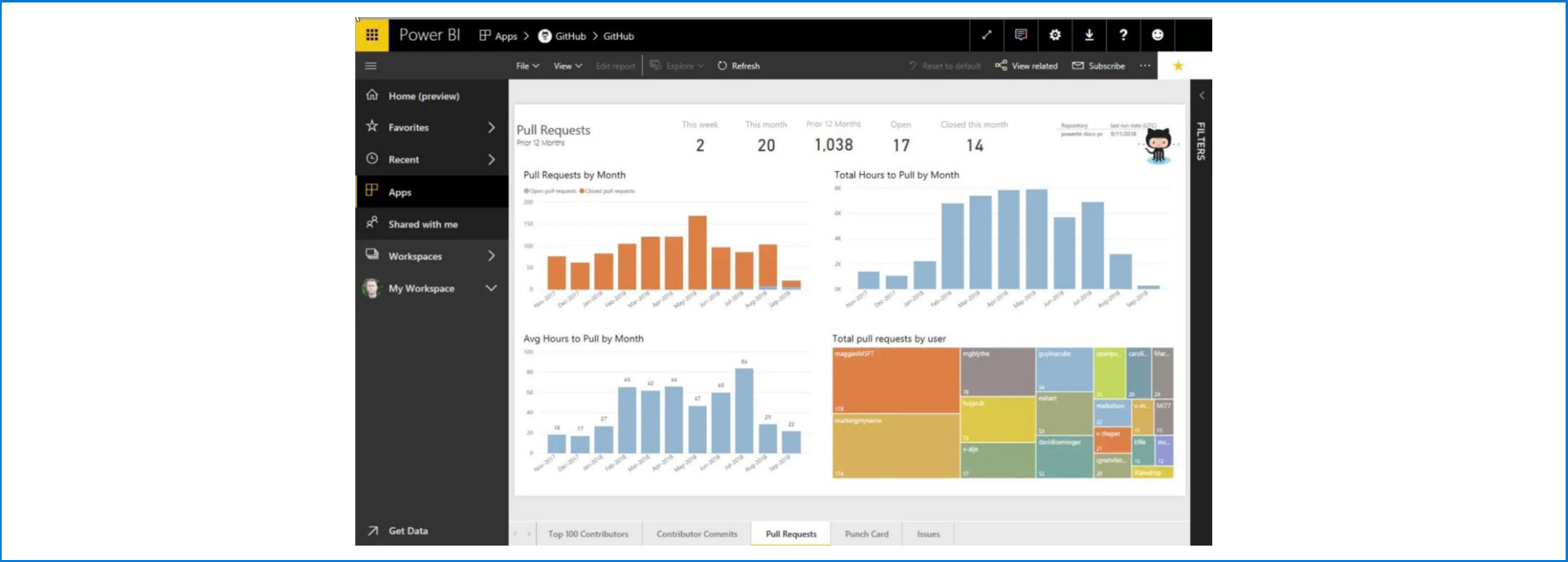
Learn how Power BI services and applications work together



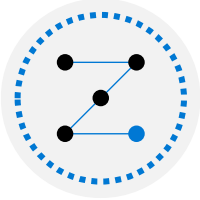
Explore how Power BI can make your business more efficient



Learn how to create compelling visuals and reports

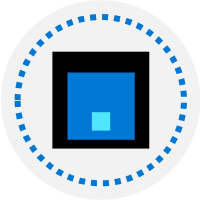


Lesson 4: Knowledge check



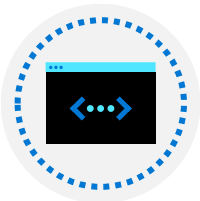
What is the common flow of activity in Power BI?

- ☐ Create a report in Power BI mobile, share it to the Power BI Desktop, view and interact in the Power BI service
 - ☐ Create a report in the Power BI service, share it to Power BI mobile, interact with it in Power BI Desktop
 - ☒ Bring data into Power BI Desktop and create a report, share it to the Power BI service, view and interact with reports and dashboards in the service and Power BI mobile
 - ☐ Bring data into Power BI mobile, create a report, then share it to Power BI Desktop
-



Which of the following are building blocks of Power BI?

- ☐ Tiles, dashboards, databases, mobile devices
 - ☒ Visualizations, datasets, reports, dashboards, tiles
 - ☐ Visual Studio, C#, and JSON files
-



A collection of ready-made visuals, pre-arranged in dashboards and reports is called what in Power BI?

- ☐ The canvas
- ☐ Scheduled refresh
- ☒ An app

