# Exam DP-203: Microsoft Azure Data Engineer Associate Crash Course

## Data Engineering in Microsoft Azure

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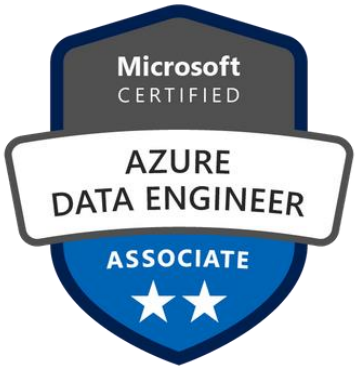
Cloud Consultant

@zaalion


# Course Overview

# DP-203


Microsoft
CERTIFICATION EXAM
DP-201


Microsoft
CERTIFICATION EXAM
DP-200


Microsoft
CERTIFICATION EXAM
DP-203

# DP-203 Skills Measured

Exam DP-203: Data Engineering on Microsoft Azure

# Questions & Resources

- Post questions in the QnA box
- Resources are in the course repository
  - https://github.com/zaalion/oreilly-dp-203

- Reach out:
  - Twitter: @zaalion

# DP-203 Candidate Profile

- Microsoft Azure data engineers
  - Integrate, transform, and consolidate data from various structured and unstructured data systems ...
  - Into structures that are suitable for building analytics solutions

# DP-203 Candidates

Azure Data Engineers integrate, transform, and consolidate data:

- Knowledge of data processing languages, such as SQL, Python, or Scala
- Understand parallel processing and data architecture patterns.

# DP-203 Skills Measured

Skills measured:

- Design and implement data storage (15-20%)
- Develop data processing (40-45%)
- Secure, monitor, and optimize data storage and data processing (30-35%)

# Data Types


Structured

```
{"widget": {
    "debug": "on",
    "window": {
        "title": "Sample Konfabulator Widget",
        "name": "main_window",
        "width": 500,
        "height": 500
    },
    "image": {
        "src": "Images/Sun.png",
        "name": "sun1",
        "hOffset": 250,
        "vOffset": 250,
        "alignment": "center"
    },
    "text": {
        "data": "Click Here",
        "size": 36,
        "style": "bold",
        "name": "text1",
        "hOffset": 250,
        "vOffset": 100,
        "alignment": "center",
        "onMouseUp": "sun1.opacity = (sun1.opacity / 100) * 90;"
    }
}}
```

Semi-structured


Unstructured

# DP-203 Main Focus (not limited to)

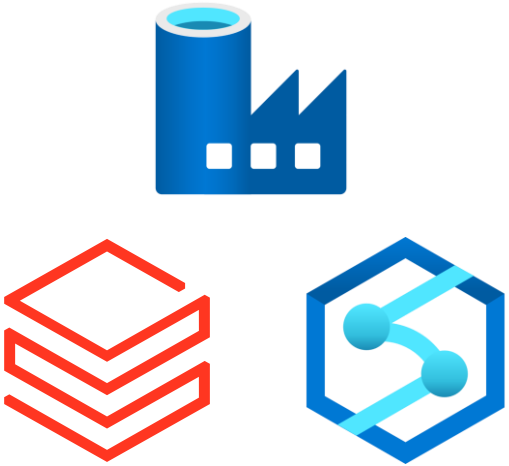
- Azure Data Lake Gen2
- Azure Stream Analytics
- Azure Synapse Analytics
- Azure Data Factory
- Azure Databricks





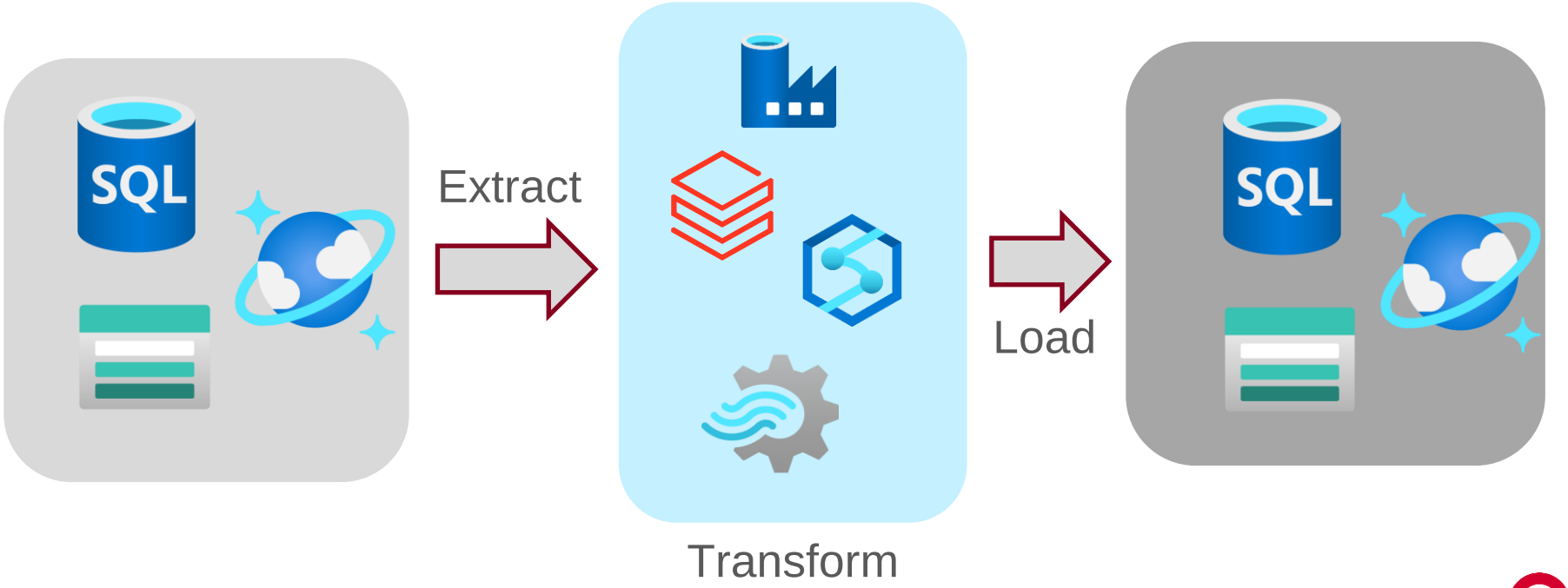
# Data Processing Types

Stream data



Batch data

# ETL/ELT



# Design and Implement Data Storage

# Sharding

- A data store hosted by a single server might be subject to the following limitations:
  - Storage space
  - Computing resources
  - Network bandwidth
  - Geography

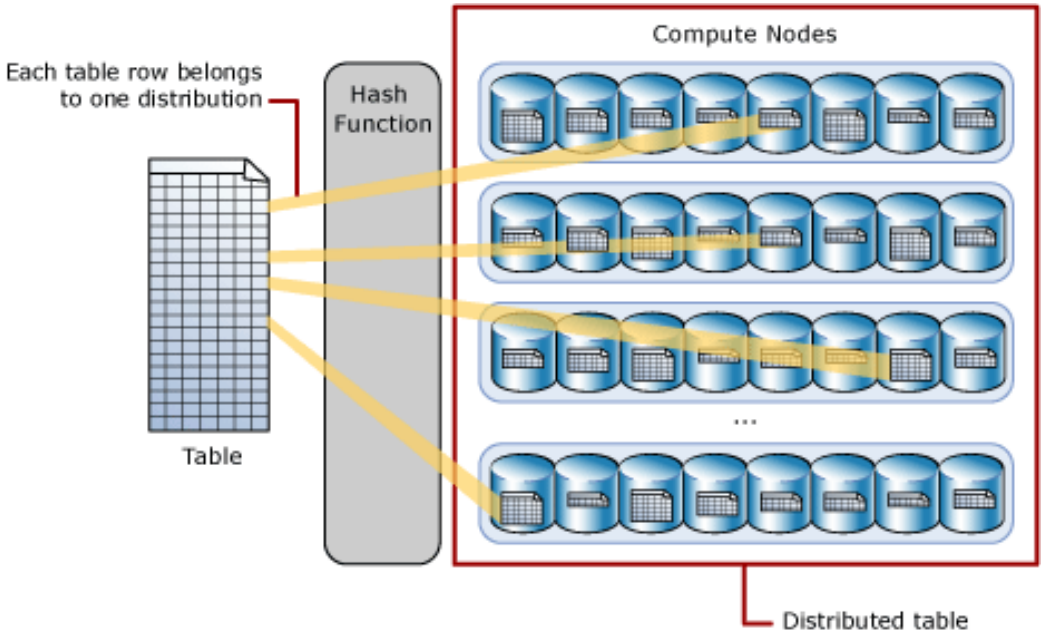
# Sharding

- Solution
  - Divide the data store into horizontal partitions or shards.
  - Each shard has the same schema but holds its own distinct subset of the data.

# Azure Synapse Analytics Shard

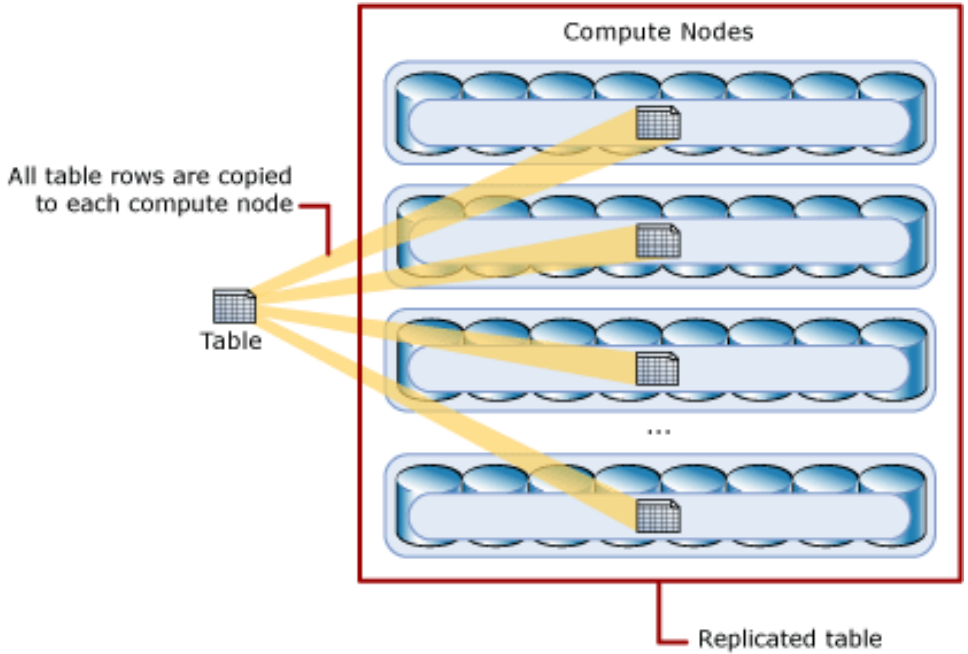
- Azure Synapse Analytics Storage sharding options:
  - Hash-distributed tables
  - Round-robin distributed tables
  - Replicated Tables

# Azure Synapse Distributed Tables (Hash)




See reference

# Azure Synapse Distributed Tables (Replicated)




See reference

# Azure Synapse Distributed Tables (Round Robin)

- The simplest table to create
- Delivers fast performance when used as a staging table for loads
- Distributes data evenly across the table

*See reference*

# Azure Synapse External Tables

- External Tables
  - An external table points to data located in Hadoop, Azure Storage blob, or Azure Data Lake Storage.
  - External tables are used to read data from files or write data to files in Azure Storage.
  - With Synapse SQL, you can use external tables to read external data using dedicated SQL pool or serverless SQL pool.

# Why Partition Your Data?

- Data partitioning
  - Improve scalability
  - Improve performance
  - Improve security
  - Provide operational flexibility
  - Match the data store to the pattern of use
  - Improve availability

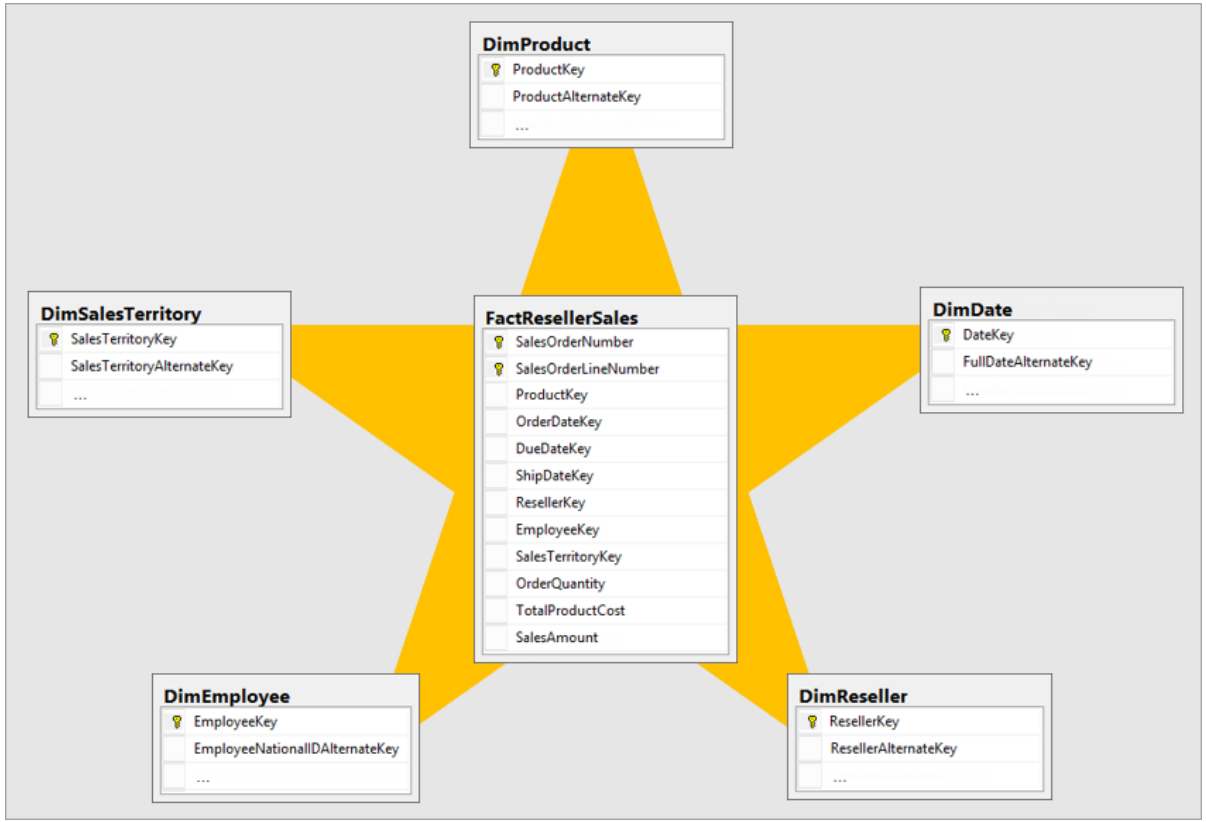
# Choose the Partition Distribution Type

- Data partitioning types
  - Horizontal
  - Vertical
  - Functional

# Azure Synapse Star Schema

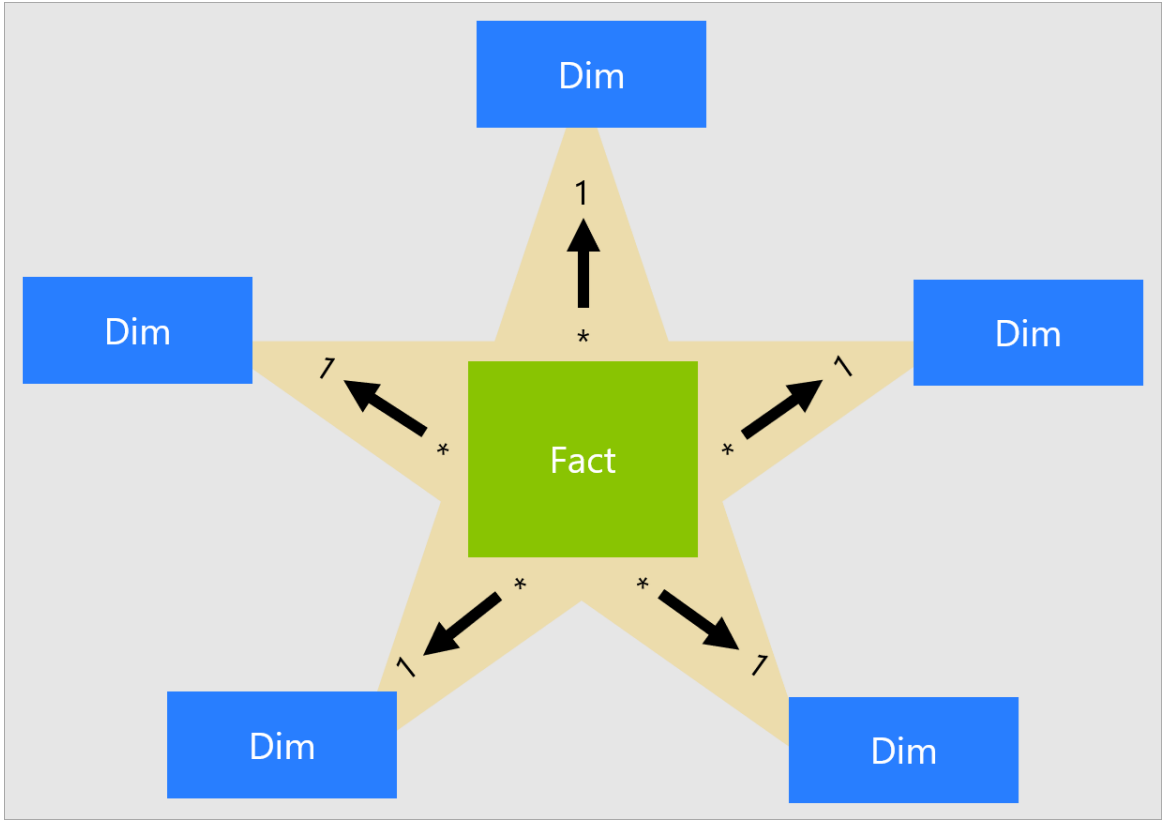
- Star schema
  - A mature modeling approach widely adopted by relational data warehouses. It requires modelers to classify their model tables as either dimension or fact.
    - Dimension tables
    - Fact tables

# Azure Synapse Star Schema




*See reference*

# Azure Synapse Star Schema




See reference

# Slowly Changing Dimensions

- Slowly changing dimension
  - Dimensions in data management and data warehousing contain relatively static data about such entities as geographical locations, customers, or products.
  - Data captured by Slowly Changing Dimensions (SCDs) change slowly but unpredictably, rather than according to a regular schedule.
  - See tutorial

# Slowly Changing Dimensions

- Slowly changing dimension types:
  - Type 1 SCD
  - Type 2 SCD
  - Type 3 SCD
  - Type 6 SCD (1+2+3)

# Temporal Data

- Temporal Data
  - A temporal database stores data relating to time instances. It offers temporal data types and stores information relating to past, present and future time.
  - Azure SQL Database

# Database Normalization

- The process of structuring a database in order to reduce data redundancy and improve data integrity.
  - UNF: Unnormalized form
  - 1NF: First normal form
  - 2NF: Second normal form
  - 3NF: Third normal form

# Types of Keys in Data Warehouse

- Primary Key
- Surrogate Key vs. Natural Key (Business key)
- Alternate key (e.g., UNIQUE constraint)
- Foreign Key

# Develop data processing

# Choosing the Right Data Storage

- Choose the correct data storage solution to meet the technical and business requirements
- Choose the partition distribution type

# Choosing the Right Data Storage

- Relational databases
- Document databases
- Key/Value databases
- Graph databases
- Column family databases
- Object storage
- File share
- Data analytics databases
- Search Engine databases
- Time Series databases





# Choosing the Right Data Storage

- Store logs / Azure Cognitive Services output
  - **Azure Blob Storage**
- Low latency document /NoSQL database
  - **Azure Cosmos DB NoSQL API**
- Database to model graphs (e.g., social media )
  - **Azure Cosmos DB Graph API**
- Migrating from MongoDB
  - **Azure Cosmos DB for MongoDB API**

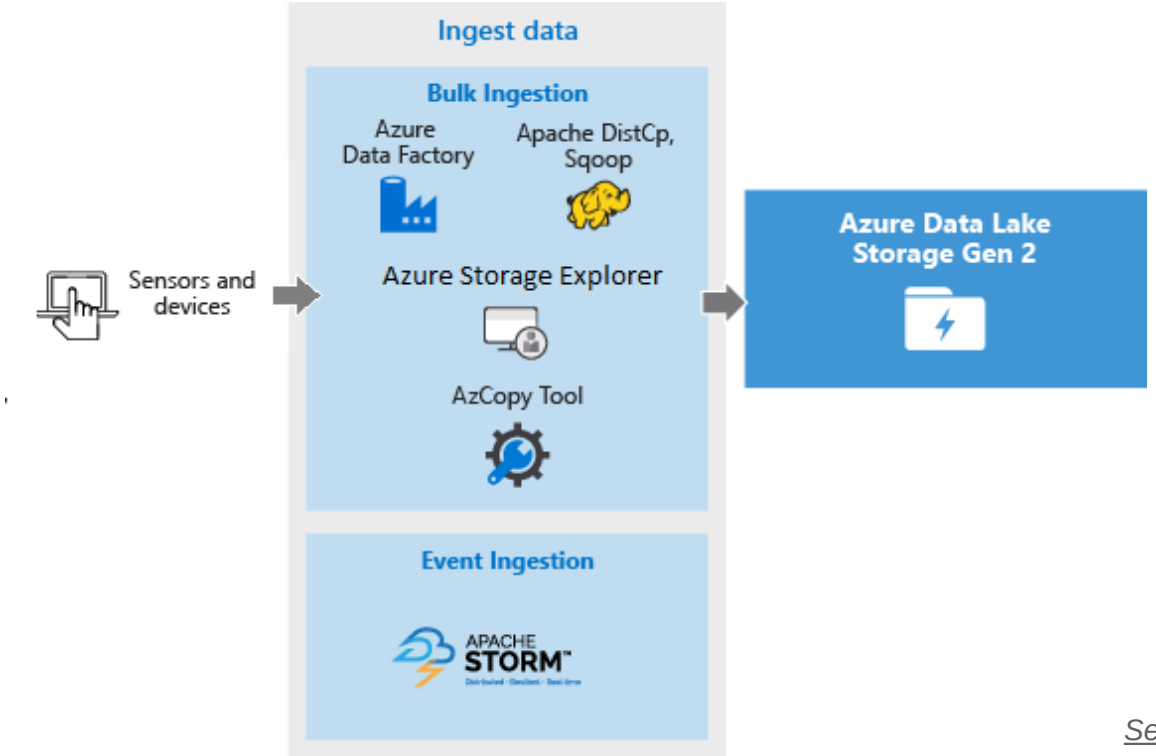
# Choosing the Right Data Storage

- Building search around your existing data
  - **Azure Cognitive Search**
- Fast cache store
  - **Azure Cache for Redis (Azure Redis)**
- Highly relational data
  - **Azure SQL Database**
- Cheap column database
  - **Azure Table Storage**

# Azure Data Lake Gen2

- Azure Data Lake Storage Gen2 is a set of capabilities dedicated to big data analytics, built on Azure Blob storage.
  - Hadoop compatible access
  - A superset of POSIX permissions
  - Cost effective
  - Optimized driver

# Data Lake Storage Gen2 for big data requirements

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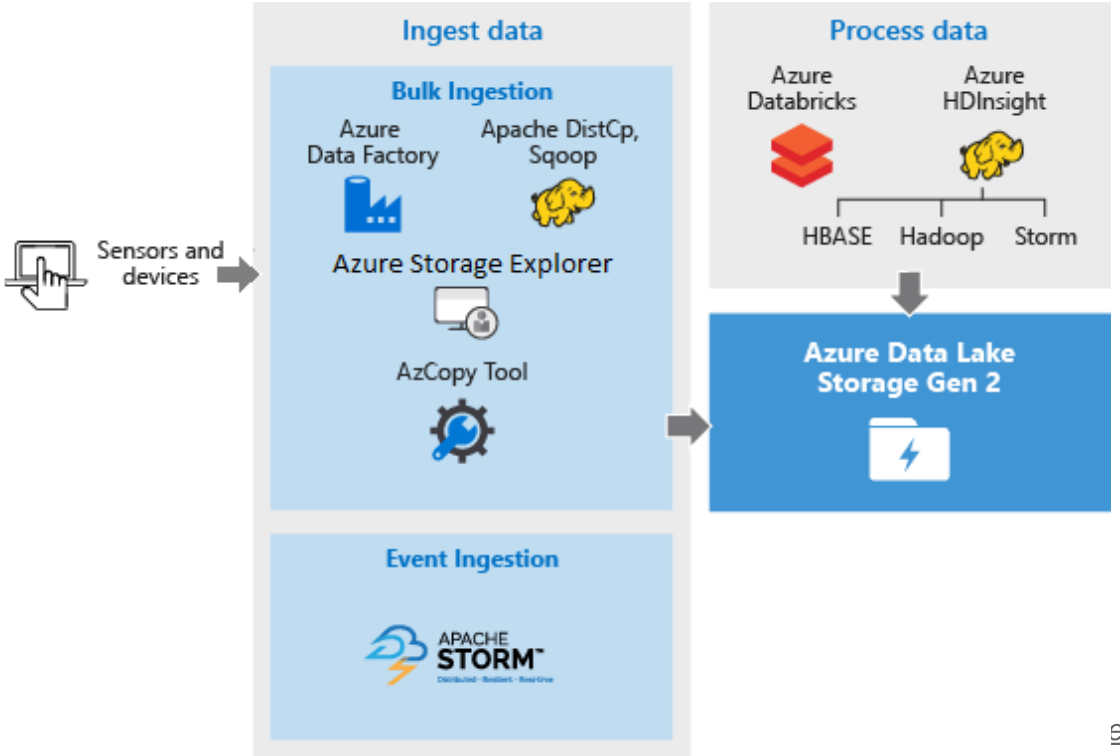
# Data Lake Storage Gen2 for big data requirements

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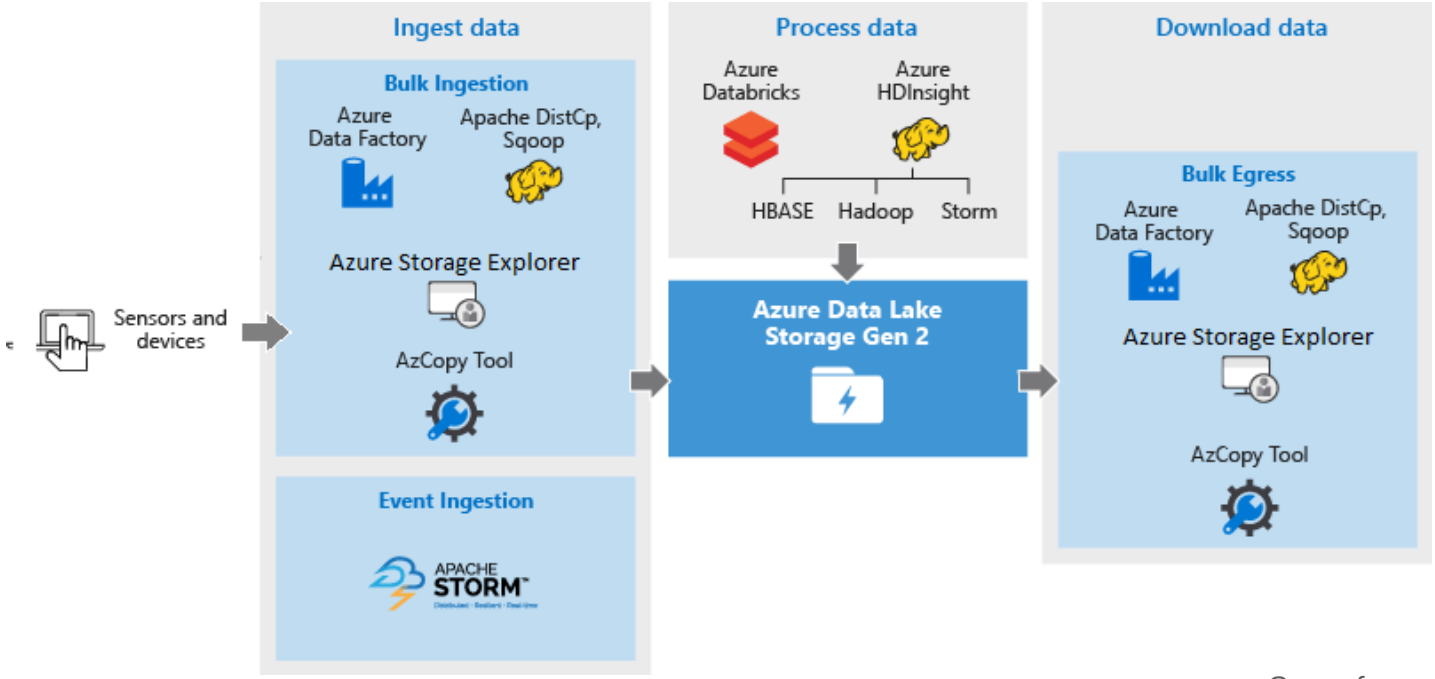
# Data Lake Storage Gen2 for big data requirements




*See reference*

# File Types for Storage (Data Lake)

- Avro format
- Binary format
- Delimited text format
- Excel format
- JSON format
- ORC format
- Parquet format
- XML format

# File Types for Storage (Data Lake)

- AVRO is a row-based storage format whereas PARQUET is a columnar based storage format.
- The Optimized Row Columnar (ORC) file format provides a highly efficient way to store Apache Hive data.

# Data Lake Access Control Model

- Data Lake Storage Gen2 supports the following authorization mechanisms:
  - **Shared Key authorization**
  - **Shared access signature (SAS) authorization**
  - **AAD, Role-based access control (Azure RBAC)**
  - **AAD, Access control lists (ACL)**

# Data Lake Archiving

- Access tiers for Azure Blob Storage
  - **Hot** - Optimized for storing data that is accessed frequently.
  - **Cool** - Optimized for storing data that is infrequently accessed and stored for at least 30 days.
  - **Archive** - Optimized for storing data that is rarely accessed and stored for at least 180 days with flexible latency requirements, on the order of hours.

# Cosmos DB

- Browse Azure Architectures for Cosmos DB

# Data Lake Storage Gen2 & Blobs

- Browse Azure Architectures for Azure Storage

# Select the Appropriate Cosmos DB API

- Cosmos DB APIs
  - API for NoSQL
  - API for MongoDB
  - API for PostgreSQL
  - API for Apache Cassandra
  - API for Apache Gremlin
  - API for Table
    - vs. Azure Table Storage

# Cosmos DB Data Distribution

- Cosmos DB Data Distribution
  - Azure Cosmos DB multi-homing APIs
  - Consistency levels in Azure Cosmos DB

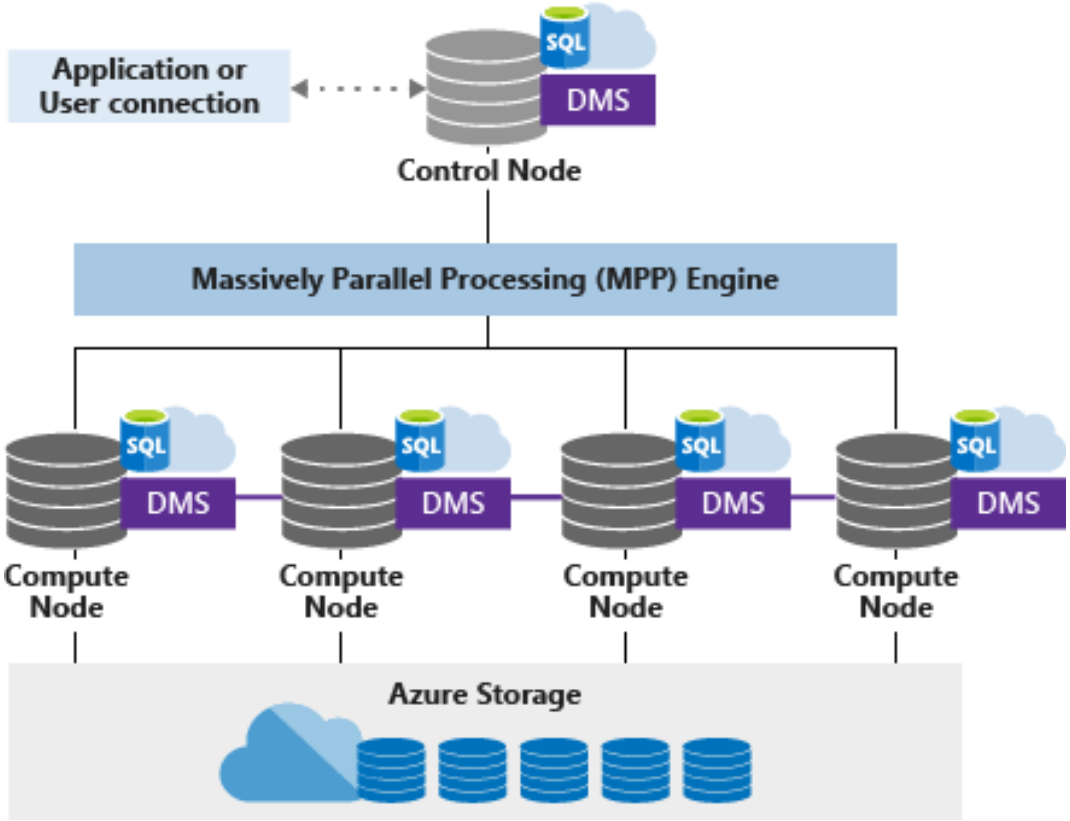
# Azure Synapse

- Browse Azure Architectures for Azure Synapse

# Azure Synapse Analytics

- Components:
  - Synapse SQL: Complete T-SQL based analytics – Generally Available
    - Dedicated SQL pool (pay per DWU provisioned)
    - Serverless SQL pool (pay per TB processed)
  - Spark: Deeply integrated Apache Spark
  - Synapse Pipelines: Hybrid data integration
  - Studio: Unified user experience

# Azure Synapse Analytics



# Batch Processing Solutions

- Design batch processing solutions that use Data Factory and Azure Databricks
- Identify the optimal data ingestion method for a batch processing solution
- Identify where processing should take place, such as at the source, at the destination, or in transit

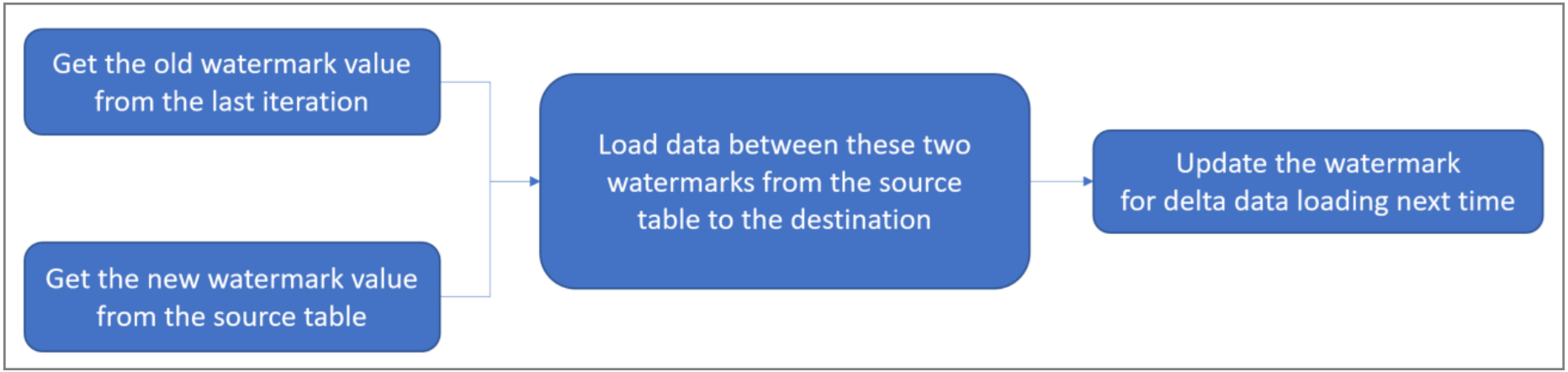
# Backup and Restore in Azure Synapse

- Data warehouse snapshot
  - Creates a restore point you can leverage to recover or copy your data warehouse to a previous state
  - Snapshots are a built-in feature that creates restore points

# Incrementally Load Data

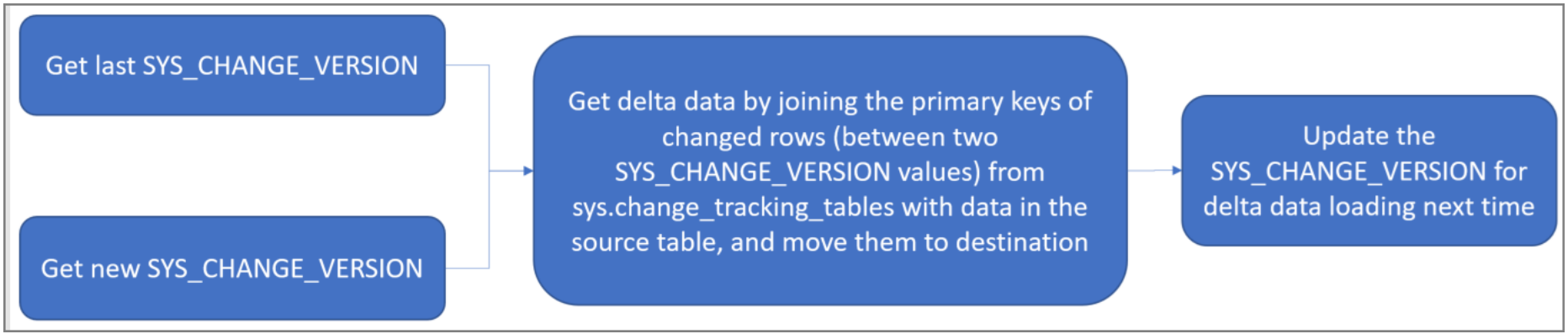
- Methods
  - Delta data loading from database by using a watermark
  - Delta data loading from SQL DB by using the Change Tracking technology
  - Loading new and changed files only by using *LastModifiedDate*
  - Loading new files only by using time partitioned folder or file name

# Using a watermark




See reference

# Using Change Tracking




*See reference*

# Azure Data Factory

- Browse Azure Architectures for Data Factory

# Azure Data Factory

- Pipelines
- Activities

# Transform Data using Azure Data Factory

- Azure SQL Database
- Spark activity

# Source control in Azure Data Factory

- To provide a better authoring experience, Azure Data Factory allows you to configure a Git repository with either Azure Repos or GitHub.

# Azure Data Factory Error Handling

- Handle SQL truncation error
- Troubleshoot Azure Data Factory UX Issues
- Monitor and Alert Data Factory by using Azure Monitor

# Real-time Processing Solutions

- Design for real-time processing by using Stream Analytics and Azure Databricks
- Design and provision compute resources

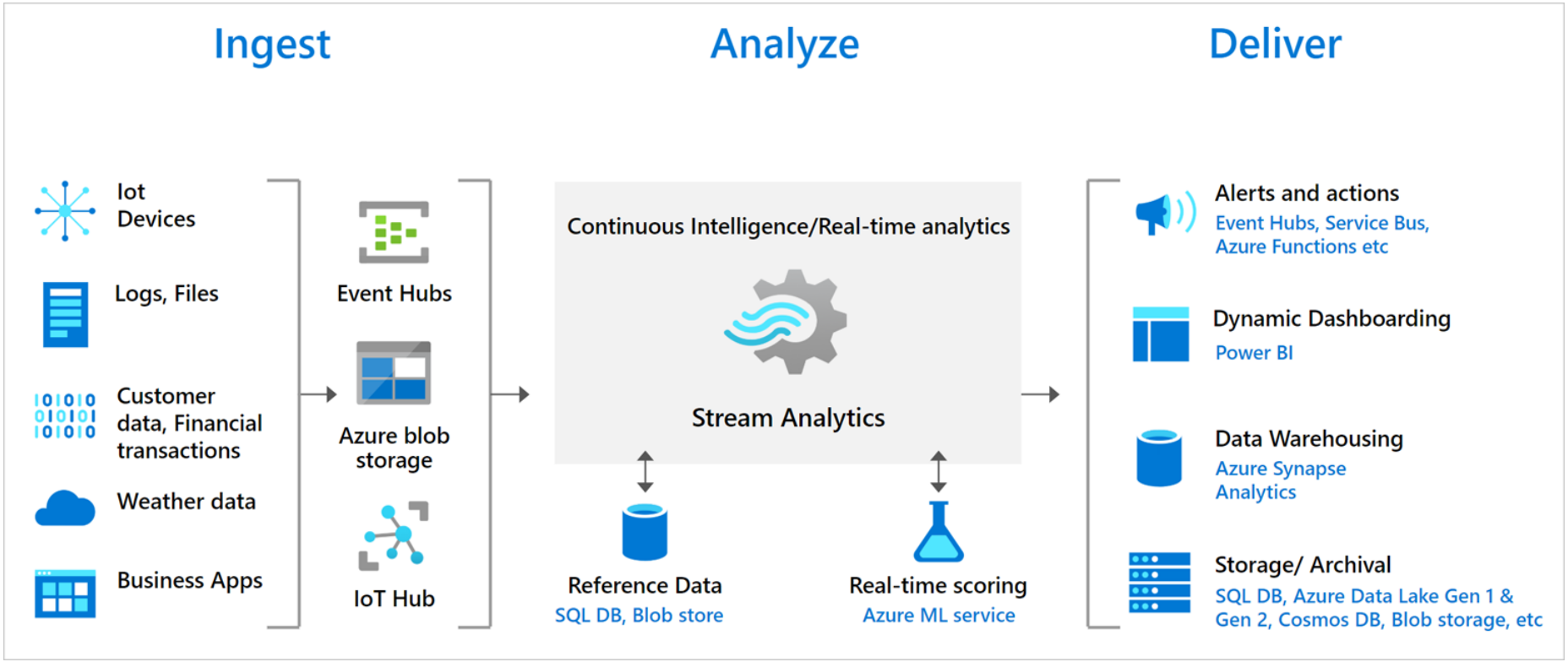
# Azure Stream Analytics

- Browse Azure Architectures for Azure Stream Analytics

# Develop Streaming Solutions

- Azure Stream Analytics
  - Ingest and process real-time data
    - Ingest from *IoT Hub*, *Event Hubs* and *Blob Storage*
    - Process using a SQL-like language
    - Output to several services such as *Event Hubs*, *Power BI*, *Logic Apps*, etc.

# Azure Stream Analytics



# Stream Analytics Windowing Functions

- Window types
  - Tumbling
  - Hopping
  - Sliding
  - Session
  - Snapshot

# Stream Analytics Input Types

- Stream input
- Reference input

# Time Handling in Azure Stream Analytics

- Time handling, late arriving data
- Event ordering policies
- Out of order and late-arriving events

# Azure Databricks

- Browse Azure Architectures for Azure Databricks

# Azure Databricks Clusters

- An Azure Databricks cluster is a set of computation resources and configurations on which you run data engineering, data science, and data analytics workloads, such as production ETL pipelines, streaming analytics, ad-hoc analytics, and machine learning.

# Azure Databricks ETL Data

- Using Scala
  - Scala

# Secure, monitor, and optimize data storage and data processing

# Data Security

- Plan for secure endpoints (private/public)
- Choose the appropriate authentication mechanism, such as access keys, shared access, signatures (SAS), and Azure Active Directory (Azure AD)

# Plan for Secure Endpoints

- Secure endpoints:
  - Azure Cosmos DB
  - Azure Storage Account
  - Azure Synapse Analytics
  - Azure Data Factory
  - Azure Databricks

# Data Policies and Standards

- Design data encryption for data at rest and in transit
- Design for data auditing and data masking
- Design for data privacy and data classification
- Design a data retention policy
- Plan an archiving strategy
- Plan to purge data based on business requirements

# Data Encryption for Data at Rest and in Transit

- Data encryption:
  - Azure Cosmos DB
  - Azure Storage Account
  - Azure Synapse Analytics

# Azure compliance documentation

- Azure compliance

# Monitor Data storage and data processing

- Implement logging used by Azure Monitor
- Measure performance of data movement
- Monitor data pipeline performance
- Query Performance Insight for Azure SQL Database
- Monitor cluster performance in Azure HDInsight
- Use Azure Monitor with your Azure Synapse Analytics workspace
- Monitoring Azure Databricks

# Monitor Data storage and data processing

- Collect custom logs with Log Analytics agent in Azure Monitor
- Azure Monitor Metrics overview
- Data spill, data breach
- GDPR Breach Notification
- Azure and Dynamics 365 breach notification under the GDPR

# Monitor Data storage and data processing

- Skewness
- Choose a distribution column with data that distributes evenly
- Determine if the table has data skew
- Troubleshoot performance bottlenecks in Azure Databricks
- Automatic tuning in Azure SQL Database and Azure SQL Managed Instance
- Automatic tuning
- Performance tuning with result set caching
- Known issues for Apache Spark cluster on HDInsight
- Troubleshoot Azure Data Factory

# The Exam

# Questions in DP-203

- 40-60 questions in beta (watch the time!)
- Questions
  - Multiple choice
  - Drag and drop
  - Scenario based
- There is no hands-on lab (might change)
- No negative marking

# DP-203

- Exam DP-203: Data Engineering on Microsoft Azure
- Skills measured

# DP-203 Main Focus (not limited to)

- Azure Data Lake Gen2
- Azure Stream Analytics
- Azure Synapse Analytics
- Azure Data Factory
- Azure Databricks





processing languages, such as SQL, Python, or Scala, and they need to understand parallel processing and data architecture patterns.

**Part of the requirements for:** Microsoft Certified: Azure Data Engineer Associate
**Related exams:** none
**Important:** See details
Go to Certification Dashboard

## Schedule exam

### Exam DP-203: Data Engineering on Microsoft Azure

United States

**Languages:** English
**Retirement date:** none

This exam measures your ability to accomplish the following technical tasks: design and implement data storage; design and develop data processing; design and implement data security; and monitor and optimize data storage and data processing.

**$165 USD***

Price based on the country in which the exam is proctored.

Schedule exam >

## Skills measured

# Verify exam discount eligibility

## For Microsoft employees

Microsoft employees are eligible for discounted exams. The discount will be reflected at the end of the checkout process. For MOS exams at Certiport, please request a voucher through the Microsoft Employee Voucher Portal.

To verify you are a Microsoft employee, link your Microsoft work account (alias@microsoft.com).

Link account

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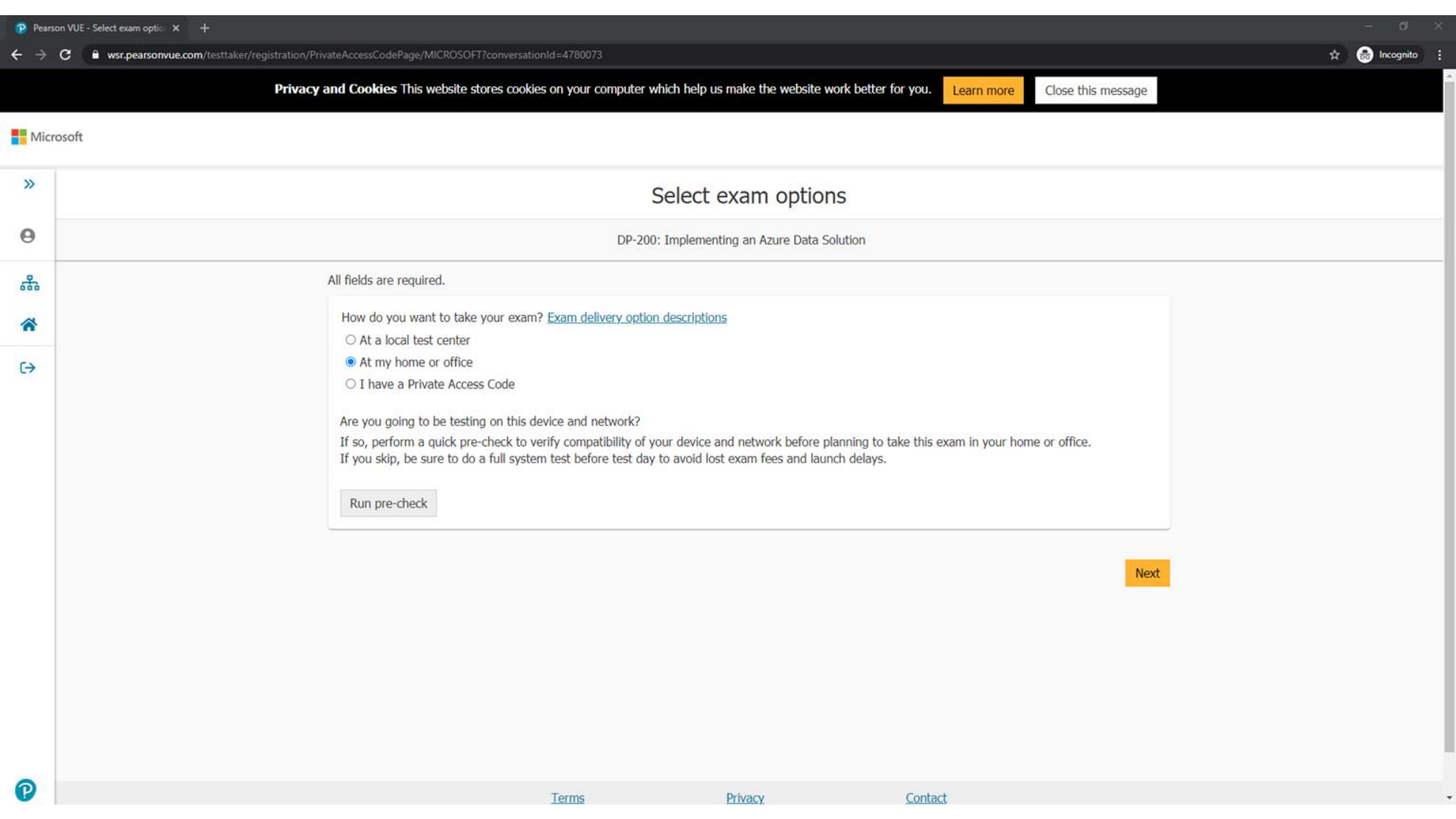
Microsoft Ignite 2019, Orlando

Verify account

## Continue scheduling exam

Proceed to the Pearson VUE website to complete the exam scheduling process.

Go to Pearson VUE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DP-200: Implementing an Azure Data Solution
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How do you want to take your exam? Exam delivery option descriptions
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Are you going to be testing on this device and network?
If so, perform a quick pre-check to verify compatibility of your device and network before planning to take this exam in your home or office.
If you skip, be sure to do a full system test before test day to avoid lost exam fees and launch delays.
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Incognito

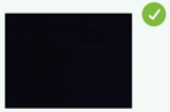
Pearson | VUE

## System check - Checking your requirements

Microphone

Default - Microphone (SI

Internet speed



Webcam

Integrated Webcam (0c4

Next

# Course Repository

https://github.com/zaalion/oreilly-dp-203

O'REILLY®

# Thank you!

**Reza Salehi**

@zaalion