



Exam DP-203: Microsoft Azure Data Engineer

Associate Crash Course

Data Engineering in Microsoft Azure

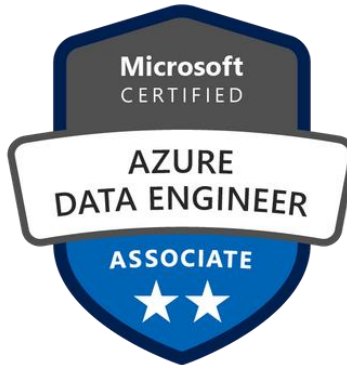


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Course Overview

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](https://twitter.com/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%)



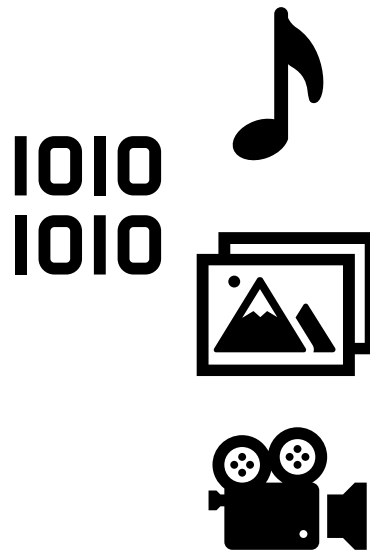
Data Types



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)

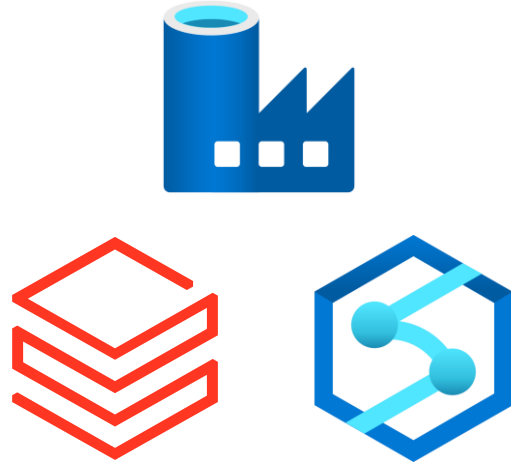
- Azure Data Lake Gen2
- Azure Stream Analytics
- Azure Synapse Analytics
- Azure Data Factory
- Azure Databricks



Data Processing Types



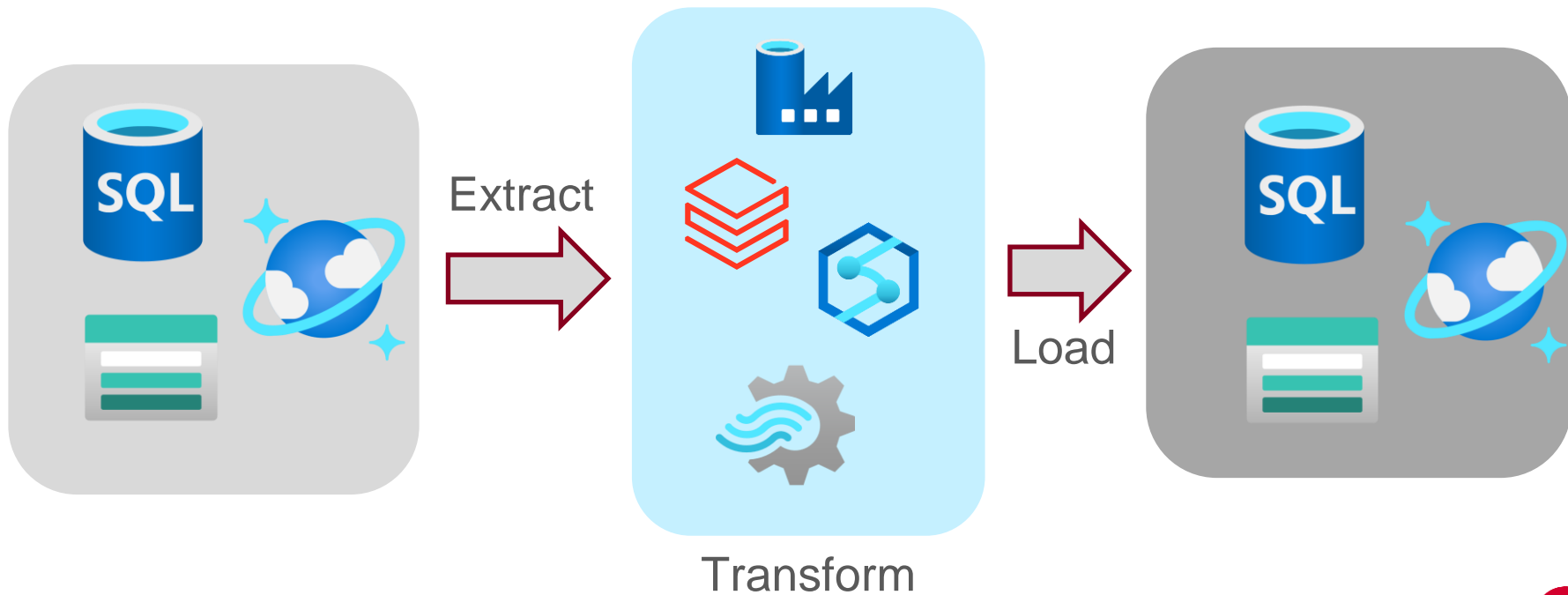
Stream data



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.

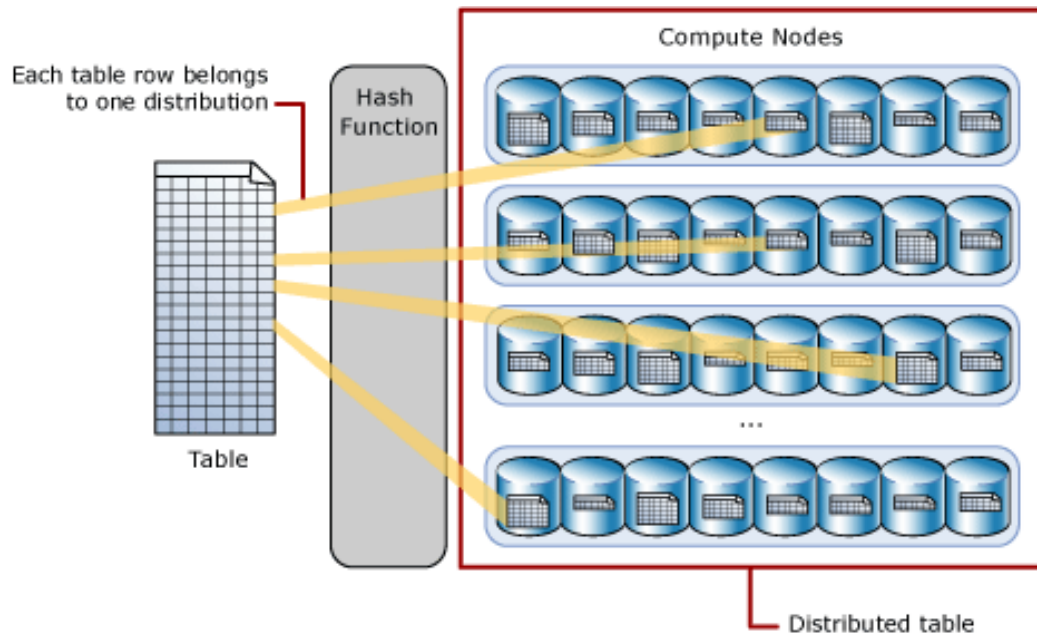


Azure Synapse Analytics Shard

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



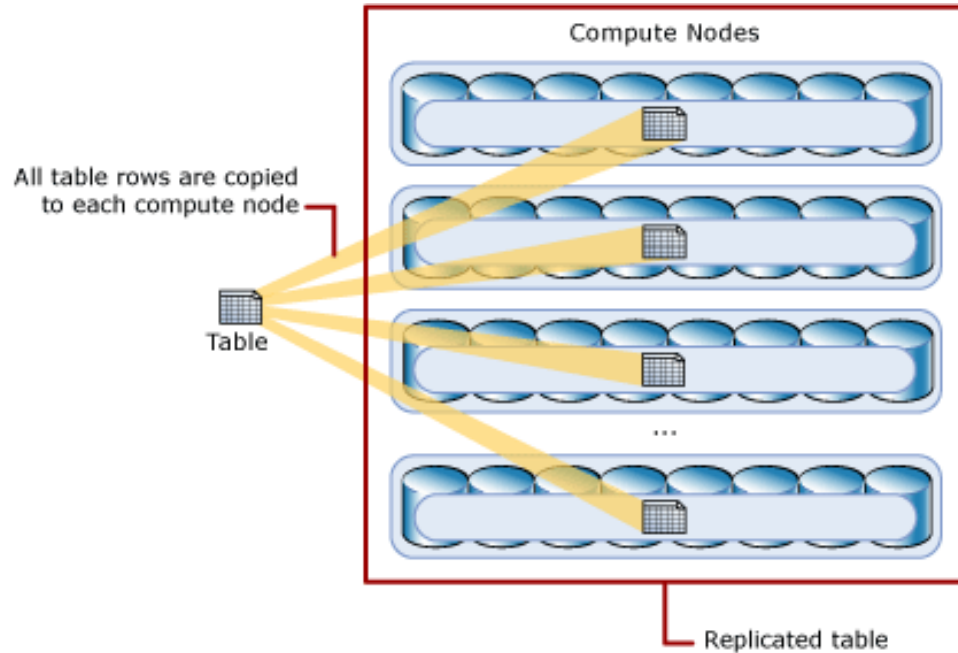
Azure Synapse Distributed Tables (Hash)



[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

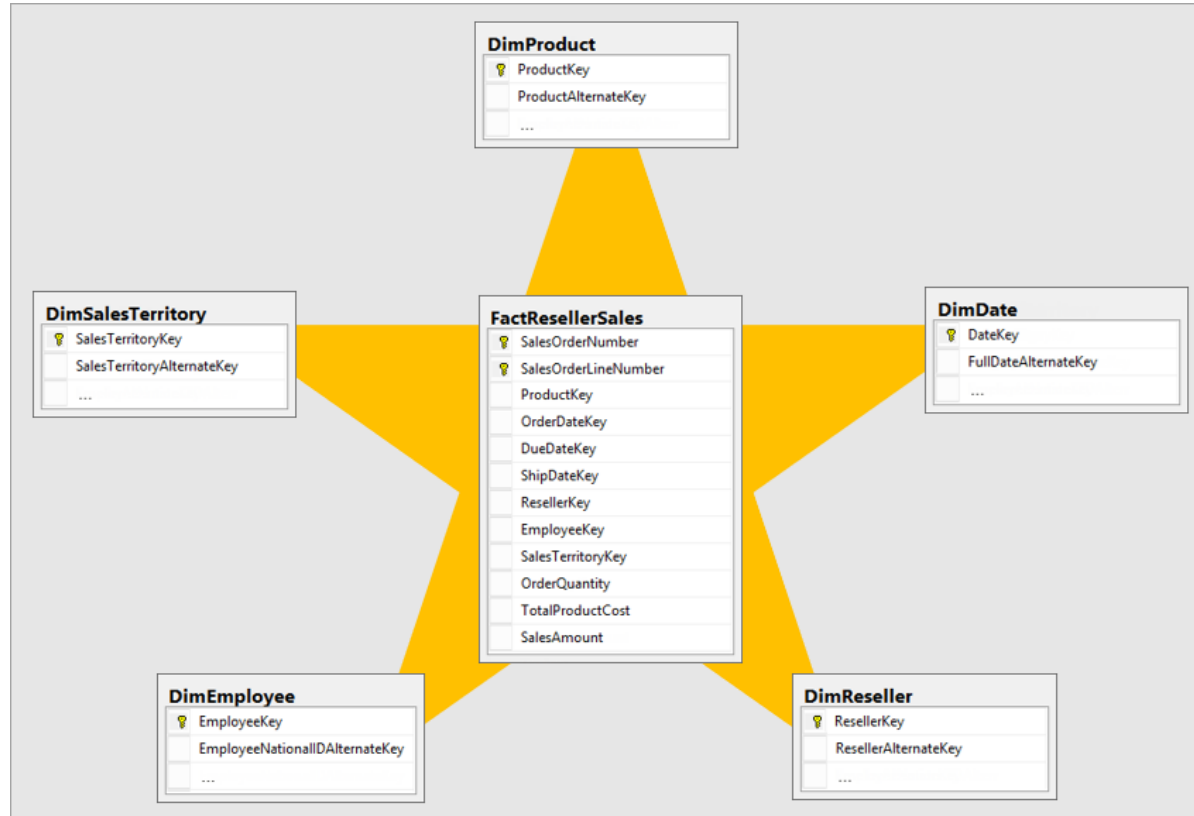


Azure Synapse Star Schema

- 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



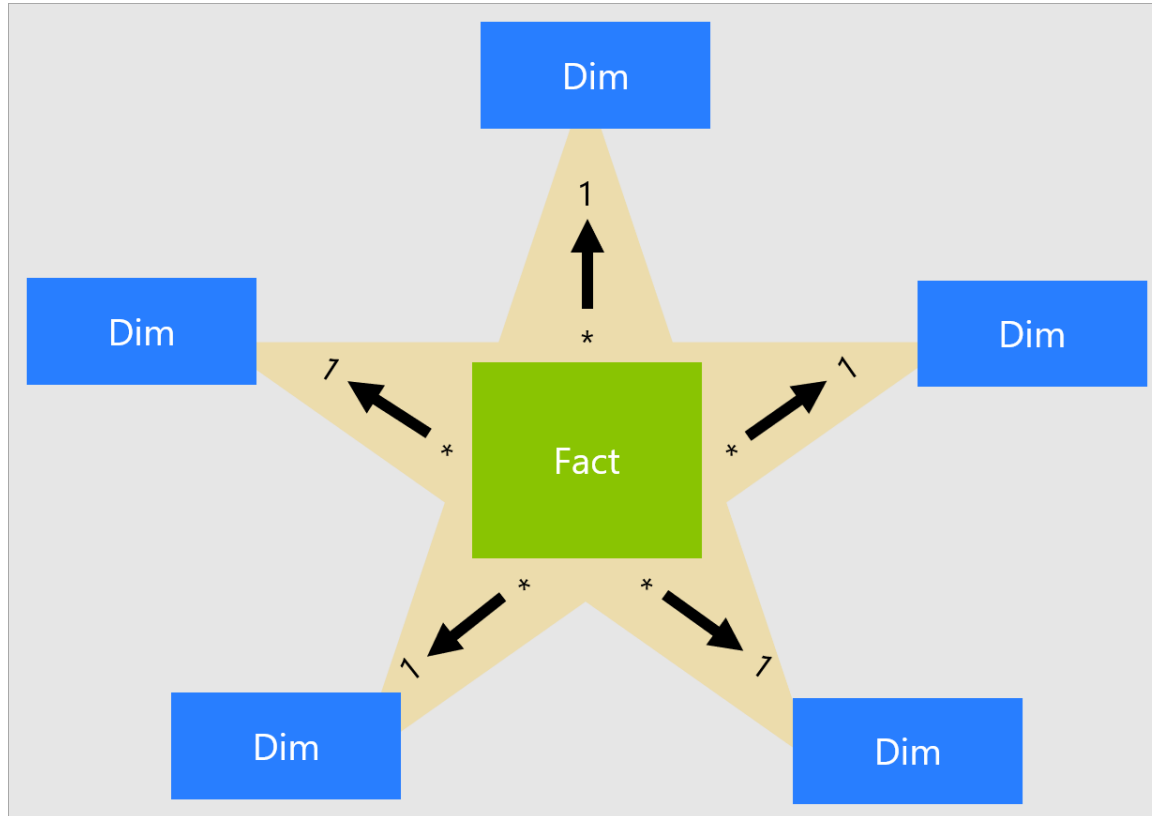
Azure Synapse Star Schema



[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



Type 1 SCD

CustomerID	FirstName	LastName	EmailAddress	CompanyName	InsertedDate	ModifiedDate
2	Keith	Harris	keith0@aw.com	Progressive Sports	2021-03-20	2021-03-20
3	Donna	Carreras	donna0@aw.com	A Bike Store	2021-03-20	2021-03-20

CustomerID	FirstName	LastName	EmailAddress	CompanyName	InsertedDate	ModifiedDate
2	Keith	Harris	keith0@aw.com	Progressive Sports	2021-03-20	2021-03-20
3	Donna	Carreras	donna0@aw.com	Bikes, Bikes, Bikes	2021-03-20	2021-03-22

<https://learn.microsoft.com/en-us/training/modules/populate-slowly-changing-dimensions-azure-synapse-analytics-pipelines/3-choose-between-dimension-types>



Type 3 SCD

CustomerID	FirstName	LastName	CurrentEmail	OriginalEmail	CompanyName	InsertedDate	ModifiedDate
2	Keith	Harris	keith0@aw.com	keith0@aw.com	Progressive Sports	2021-03-20	2021-03-20
3	Donna	Carreras	donna0@aw.com	donna0@aw.com	A Bike Store	2021-03-20	2021-03-20

CustomerID	FirstName	LastName	CurrentEmail	OriginalEmail	CompanyName	InsertedDate	ModifiedDate
2	Keith	Harris	keith0@aw.com	keith0@aw.com	Progressive Sports	2021-03-20	2021-03-20
3	Donna	Carreras	dc3@aw.com	donna0@aw.com	A Bike Store	2021-03-20	2021-03-22

<https://learn.microsoft.com/en-us/training/modules/populate-slowly-changing-dimensions-azure-synapse-analytics-pipelines/3-choose-between-dimension-types>



Type 1 SCD

CustomerID	FirstName	LastName	EmailAddress	CompanyName	InsertedDate	ModifiedDate
2	Keith	Harris	keith0@aw.com	Progressive Sports	2021-03-20	2021-03-20
3	Donna	Carreras	donna0@aw.com	A Bike Store	2021-03-20	2021-03-20

CustomerID	FirstName	LastName	EmailAddress	CompanyName	InsertedDate	ModifiedDate
2	Keith	Harris	keith0@aw.com	Progressive Sports	2021-03-20	2021-03-20
3	Donna	Carreras	donna0@aw.com	Bikes, Bikes, Bikes	2021-03-20	2021-03-22

<https://learn.microsoft.com/en-us/training/modules/populate-slowly-changing-dimensions-azure-synapse-analytics-pipelines/3-choose-between-dimension-types>



Type 6 SCD

SalesRepID	RepSourceId	FirstName	LastName	CurrentRegion	HistoricalRegion	StartDate	EndDate	IsCurrent
1	312	Jun	Cao	Southwest	Southwest	2021-03-20	9999-12-31	True
2	331	Susan	Eaton	Southcentral	Southcentral	2021-03-20	9999-12-31	True

SalesRepID	RepSourceId	FirstName	LastName	CurrentRegion	HistoricalRegion	StartDate	EndDate	IsCurrent
1	312	Jun	Cao	Southwest	Southwest	2021-03-20	9999-12-31	True
2	331	Susan	Eaton	Southeast	Southcentral	2021-03-20	2021-03-21	False
3	331	Susan	Eaton	Southeast	Southeast	2021-03-22	9999-12-31	True

<https://learn.microsoft.com/en-us/training/modules/populate-slowly-changing-dimensions-azure-synapse-analytics-pipelines/3-choose-between-dimension-types>



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

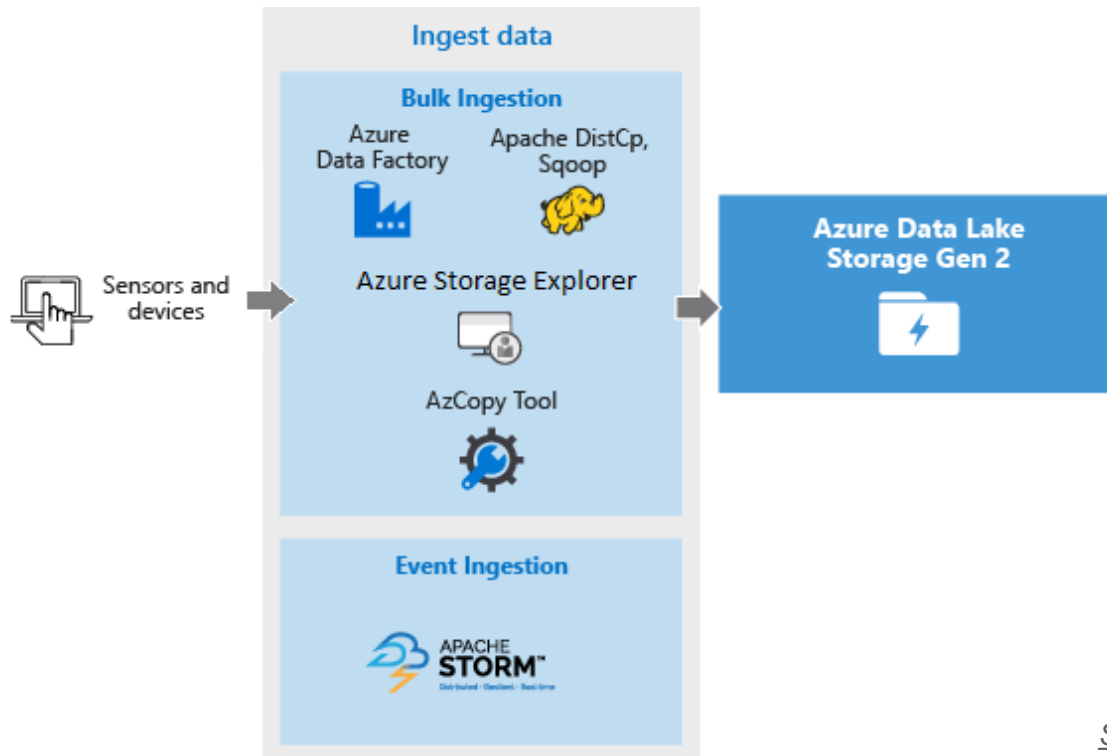


Azure Data Lake Gen2

- 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



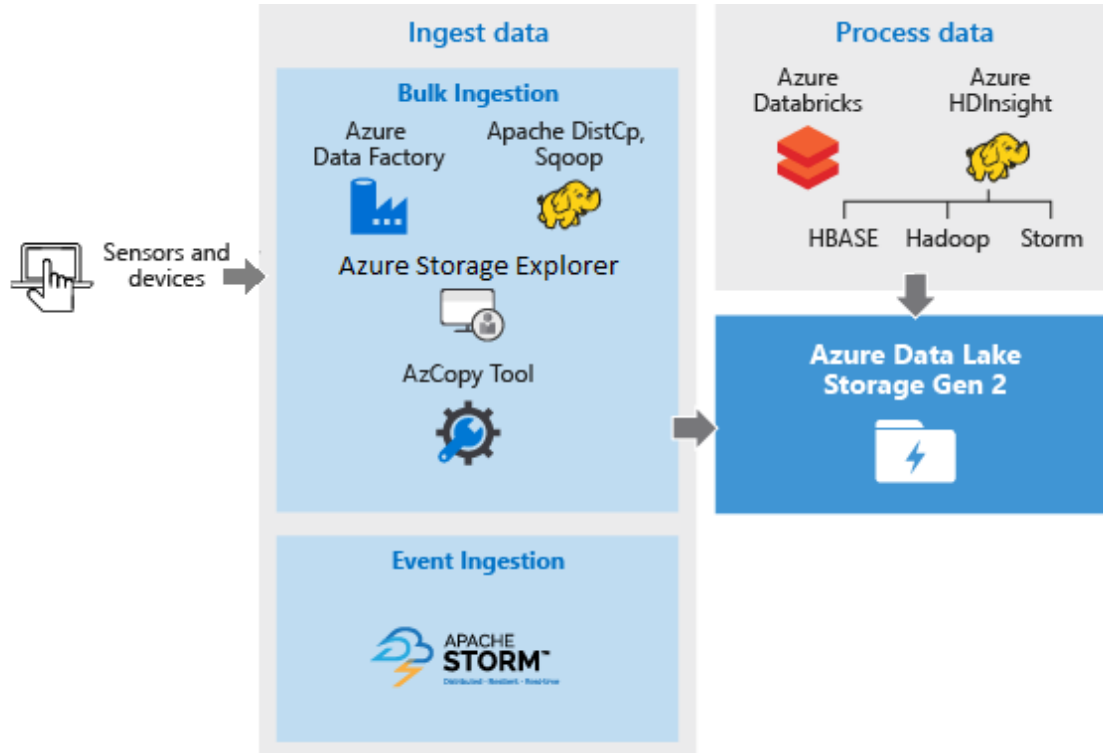
Data Lake Storage Gen2 for big data requirements



[See reference](#)



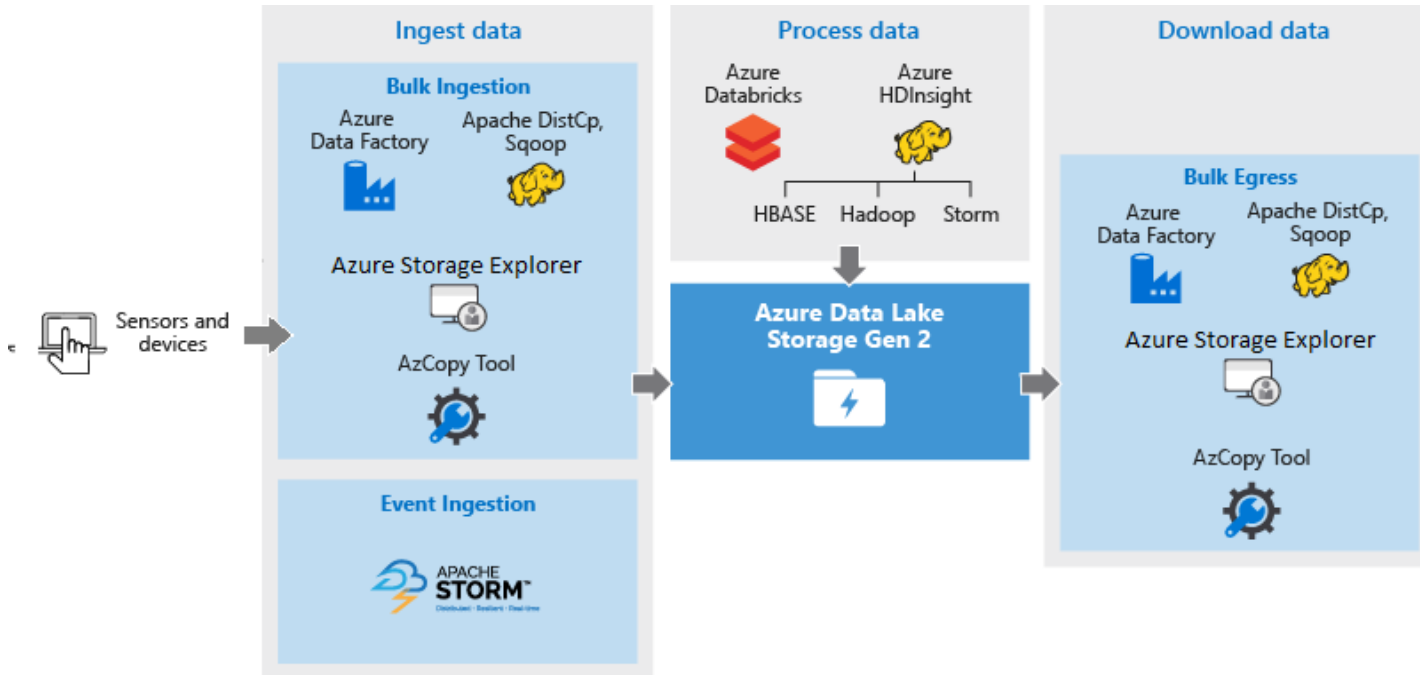
Data Lake Storage Gen2 for big data requirements



ee reference



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](#)

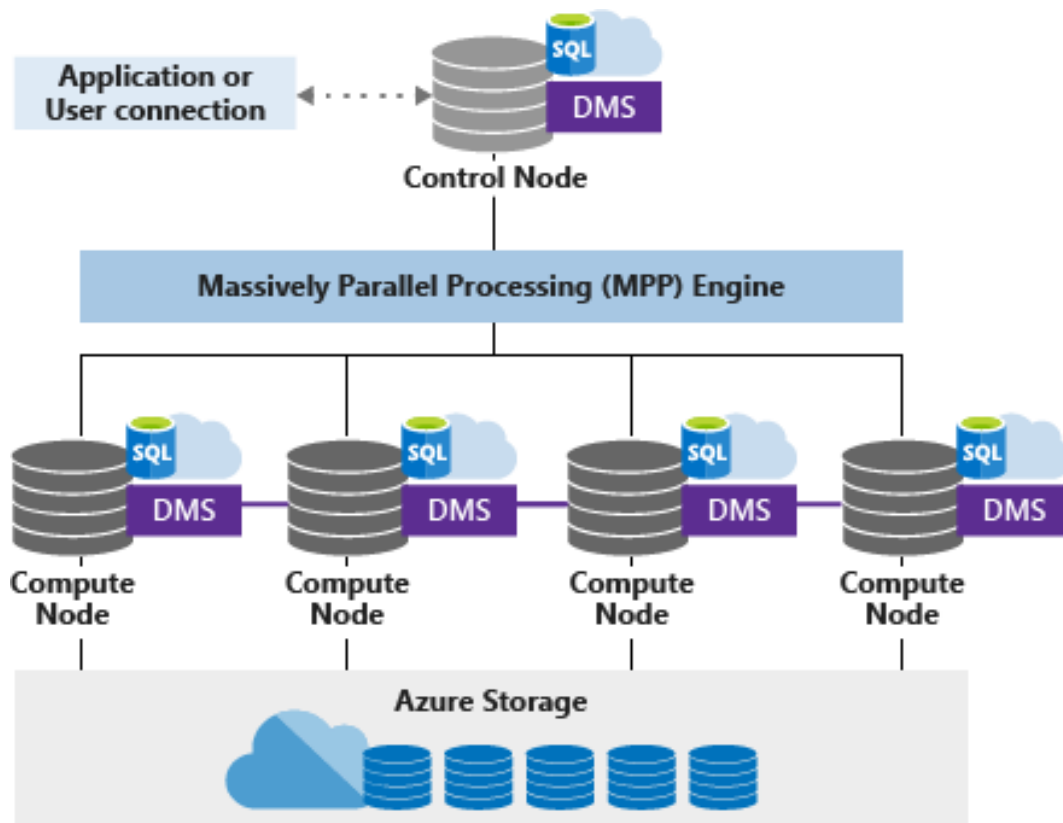


Azure Synapse Analytics

- 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

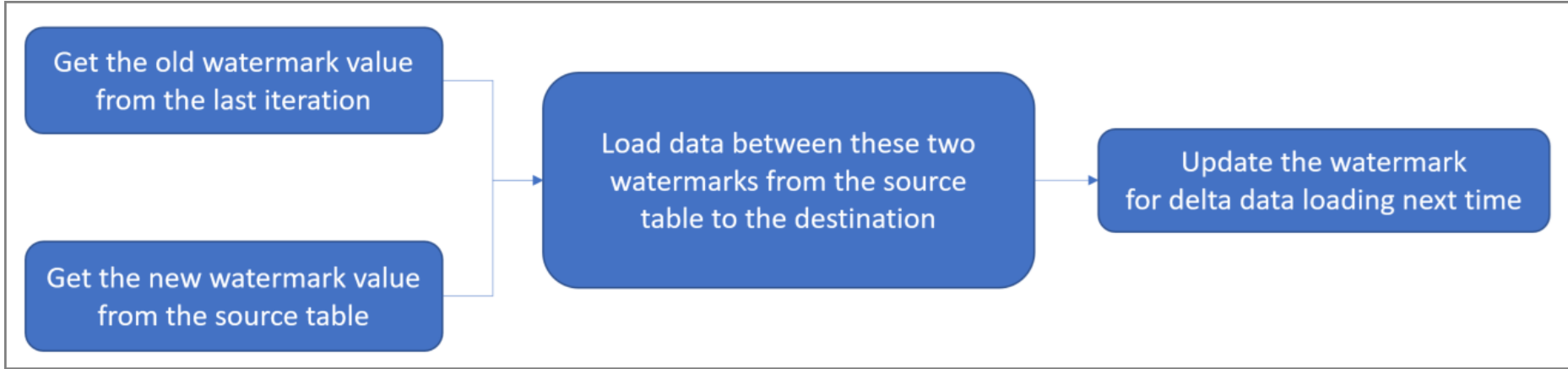


Incrementally Load Data

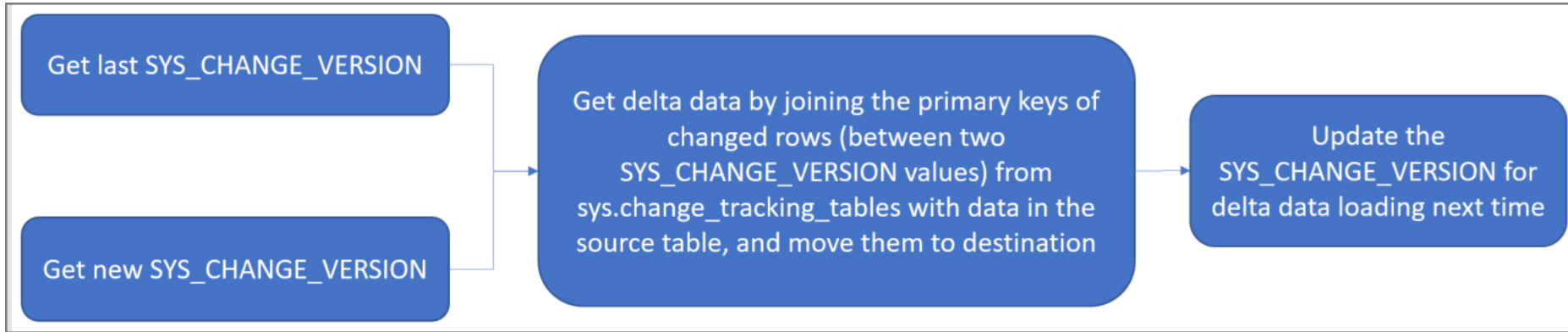
- Methods
 - Delta data loading from database by using a watermark
 - Delta data loading from SQL DB by using the Change Tracking technology
 - Loading new and changed files only by using *LastModifiedDate*
 - Loading new files only by using time partitioned folder or file name



Using a watermark



Using Change Tracking



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

Ingest

-  IoT Devices
-  Logs, Files
-  Customer data, Financial transactions
-  Weather data
-  Business Apps



Event Hubs



Azure blob storage



IoT Hub

Analyze

Continuous Intelligence/Real-time analytics



Stream Analytics



Reference Data
SQL DB, Blob store



Real-time scoring
Azure ML service

Deliver



Alerts and actions

Event Hubs, Service Bus,
Azure Functions etc



Dynamic Dashboarding

Power BI



Data Warehousing

Azure Synapse
Analytics



Storage/ Archival

SQL DB, Azure Data Lake Gen 1 &
Gen 2, Cosmos DB, Blob storage, etc

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




Congratulations, you passed!

You've renewed your Microsoft Certified: Azure Cosmos DB Developer Specialty and have extended it by **one year**.



[See your results](#)





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.

Schedule exam >

\$165 USD*

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

Skills measured

My Profile

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Select exam options

DP-200: Implementing an Azure Data Solution

All fields are required.

How do you want to take your exam? [Exam delivery option descriptions](#)

- ☐ At a local test center
- ☒ At my home or office
- ☐ I have a Private Access Code

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.

Run pre-check

Next





System check - Checking your requirements



Microphone

Default - Microphone (SI)



Internet speed



Webcam

Integrated Webcam (0c

Next



Course Repository

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



O'REILLY®

Thank you!

Reza Salehi

@zaalion 

