



Exam DP-203: Microsoft Azure Data Engineer

Associate Crash Course

Data Engineering on Microsoft Azure

November/2021

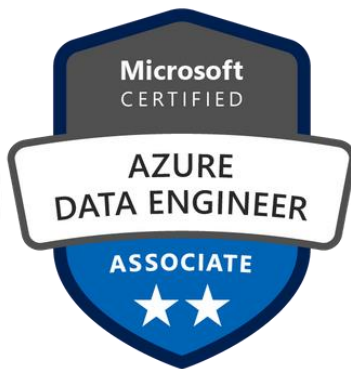


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Cloud Enthusiast



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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](#)



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:
 - Must have solid knowledge of data processing languages, such as SQL, Python, or Scala
 - And they need to understand parallel processing and data architecture patterns.



DP-203 Skills Measured

- Skills measured:
 - Design and implement data storage (40-45%)
 - Design and develop data processing (25-30%)
 - Design and implement data security (10-15%)
 - Monitor and optimize data storage and data processing (10-15%)



Design and Implement Data Storage



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 database
 - Azure Cosmos DB Core API
- Database for social media
 - Azure Cosmos DB Graph API
- Migrating from MongoDB
 - Azure Cosmos 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





Choosing the Right Data Storage

- Structured data
 - Azure SQL Database, MySQL, PostgreSQL, MariaDB
- Unstructured data
 - Azure Cosmos DB, Azure Table Storage
- Blobs / files
 - Azure Blob Storage, Data Lake Gen 2

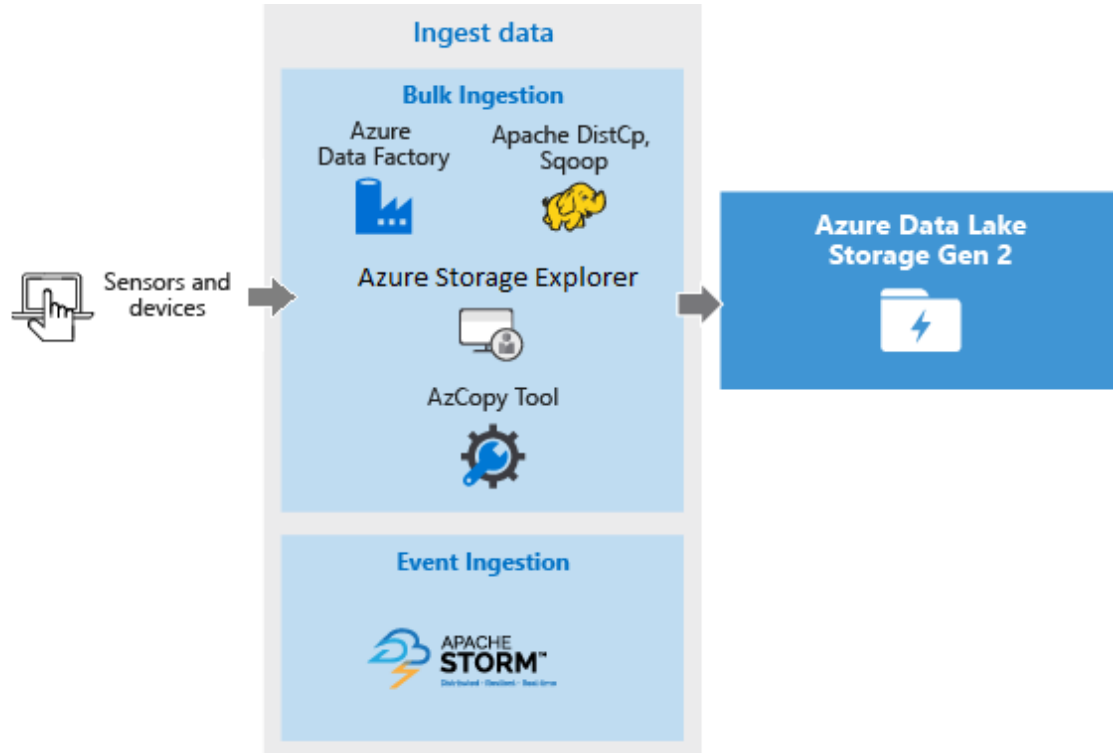


Azure Data Lake Gen2

- 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



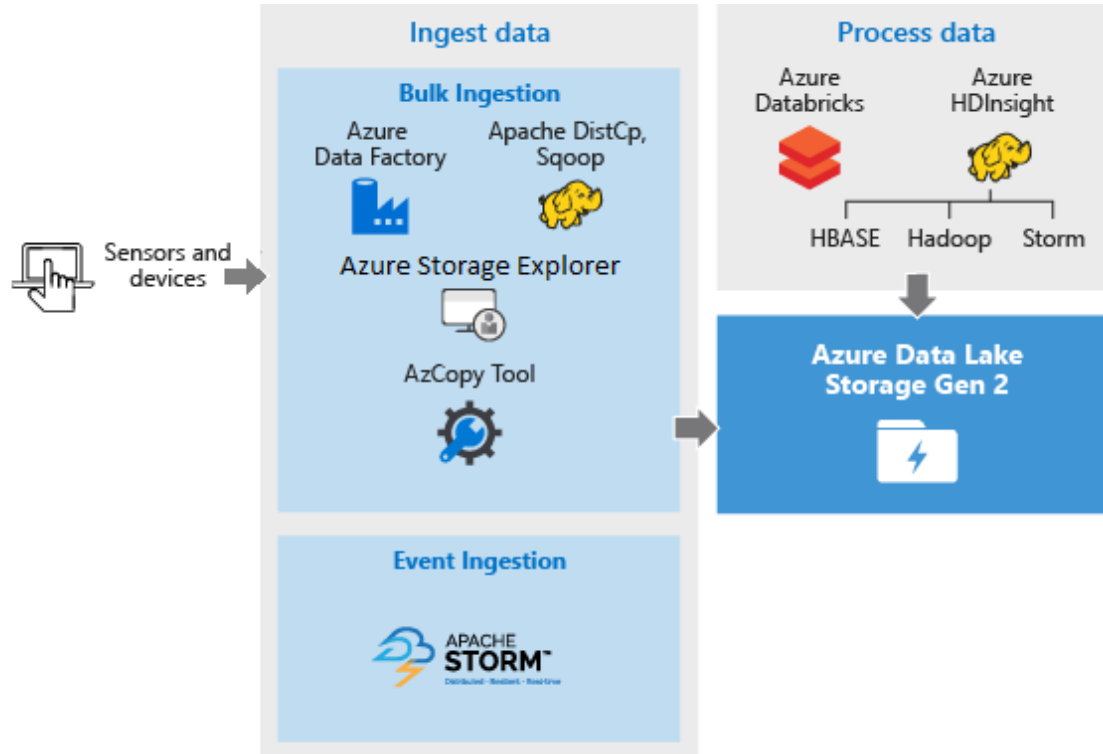
Data Lake Storage Gen2 for big data requirements



[See reference](#)



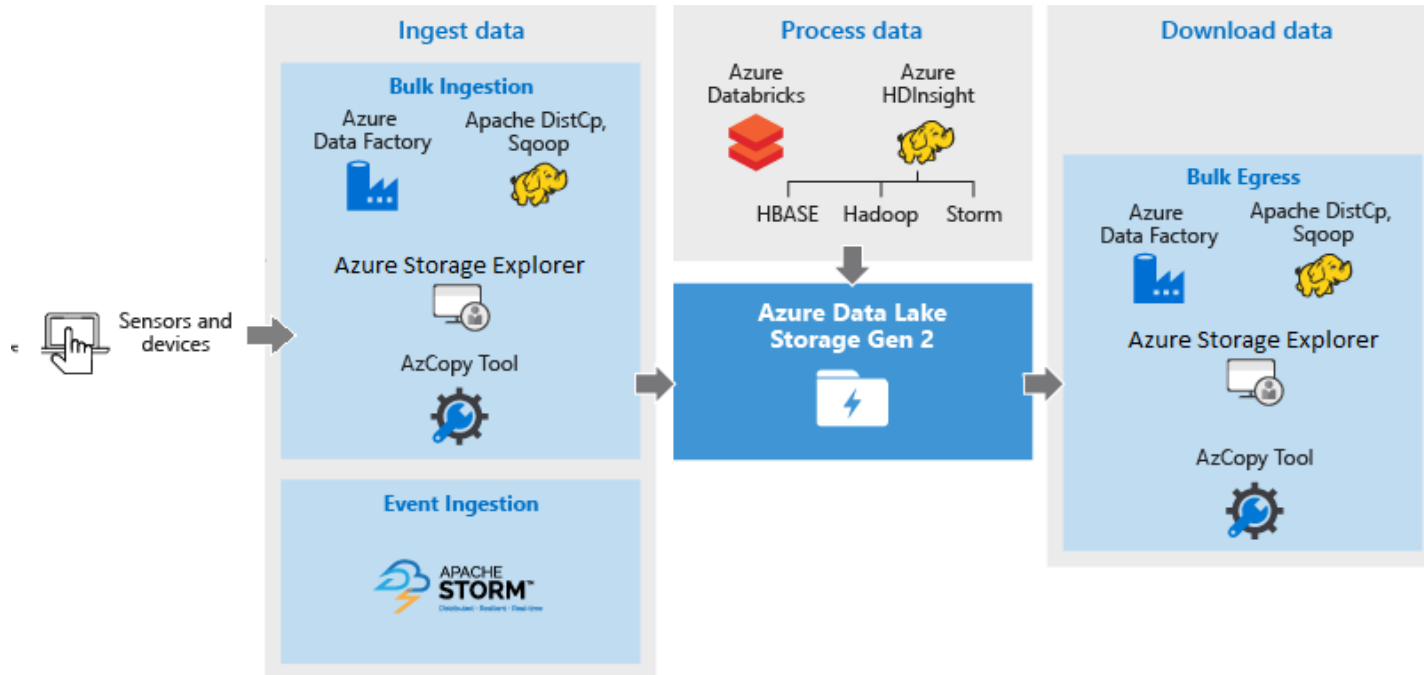
Data Lake Storage Gen2 for big data requirements



[See 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 Hive data.



Data Lake Access Control Model

- Data Lake Storage Gen2 supports the following authorization mechanisms:
 - Shared Key authorization
 - Shared access signature (SAS) authorization
 - Role-based access control (Azure RBAC)
 - 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.





Design Non-relational Cloud Data Stores

- Design a solution that uses Cosmos DB, Data Lake Storage Gen2, or Blob storage
- Select the appropriate Cosmos DB API
- Design data distribution and partitions
- Design for scale (including multi-region, latency, and throughput)
- Design a disaster recovery strategy
- Design for high availability



Design a Solution That Uses Cosmos DB

- <https://docs.microsoft.com/en-us/azure/architecture/browse/#databases>





Design a Solution That Uses Data Lake Storage Gen2 & Blobs

- <https://docs.microsoft.com/en-us/azure/architecture/browse/#storage>



Select the Appropriate Cosmos DB API

- Cosmos DB APIs
 - Azure Cosmos DB SQL API
 - Azure Cosmos DB's API for MongoDB
 - Azure Cosmos DB Cassandra API
 - Azure Cosmos DB Gremlin API
 - Azure Cosmos DB Table API
 - vs. Azure Table Storage





Cosmos DB Data Distribution

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



Design Relational Cloud Data Stores

- Design data distribution and partitions
- Design for scale (including latency, and throughput)
- Design a solution that uses Azure Synapse Analytics
- Design a disaster recovery strategy
- Design for high availability

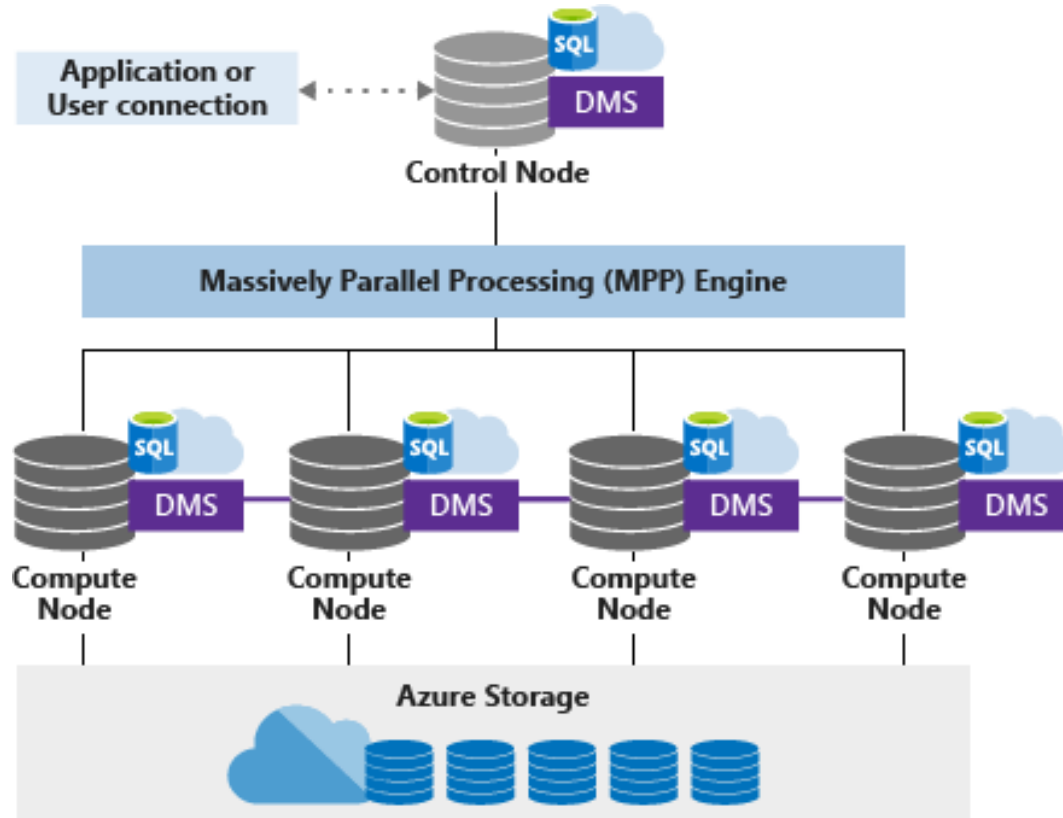


Azure Synapse Analytics

- 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



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.

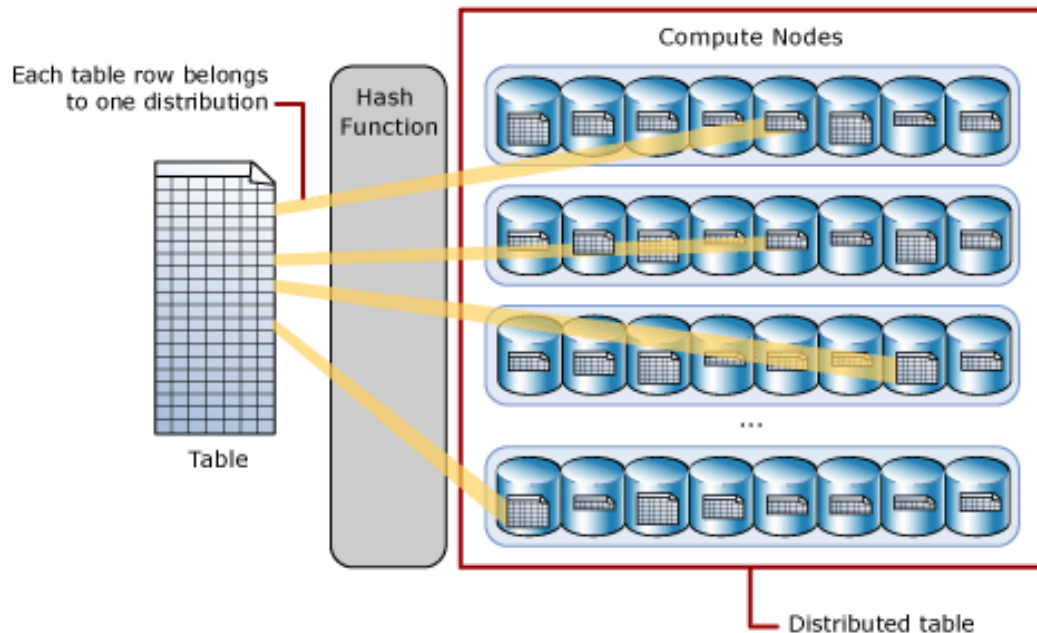


Azure Synapse Analytics Shard

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



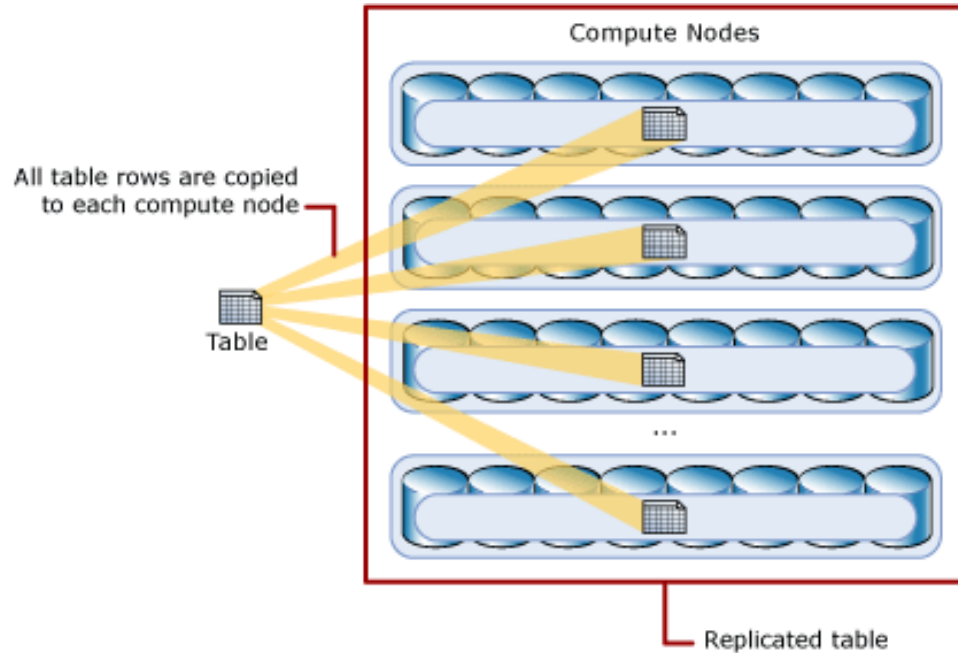
Azure Synapse Distributed Tables (Hash)



[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.



Design a Solution That Uses Azure Synapse

- <https://docs.microsoft.com/en-us/azure/architecture/browse/#databases>



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

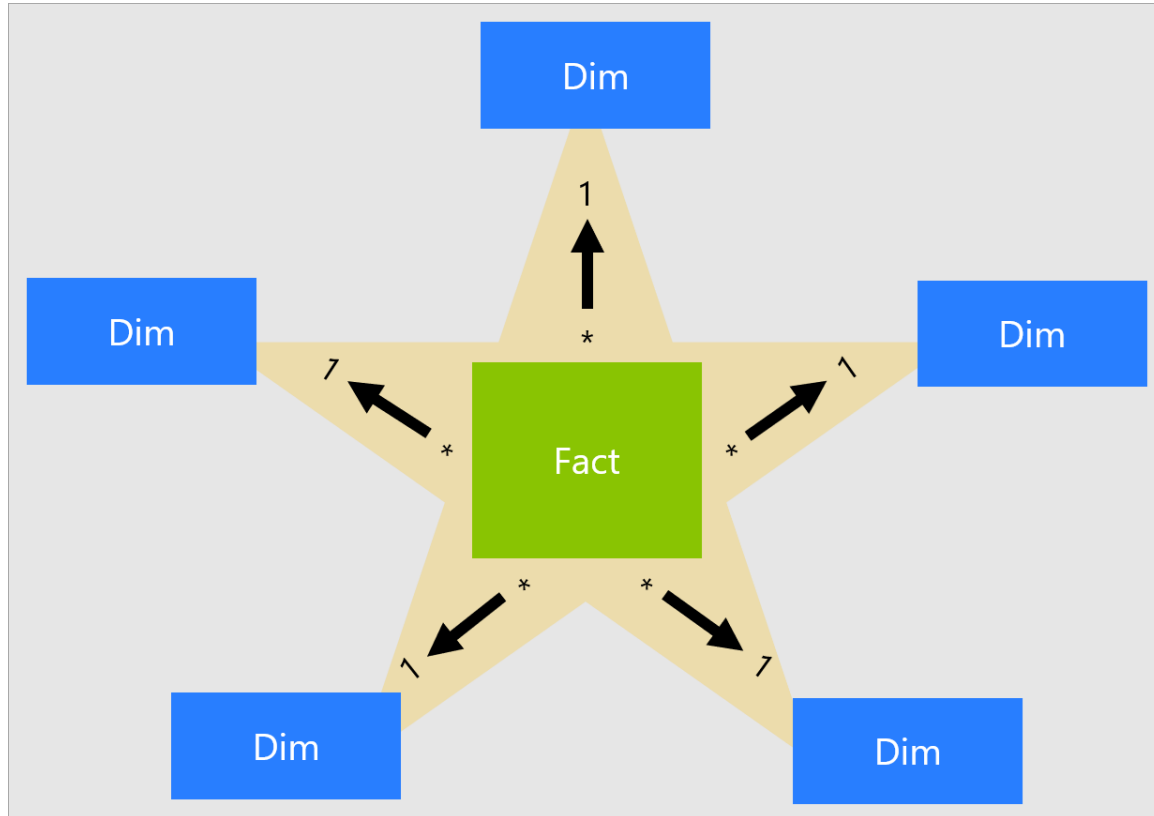


Azure Synapse Star Schema

- 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



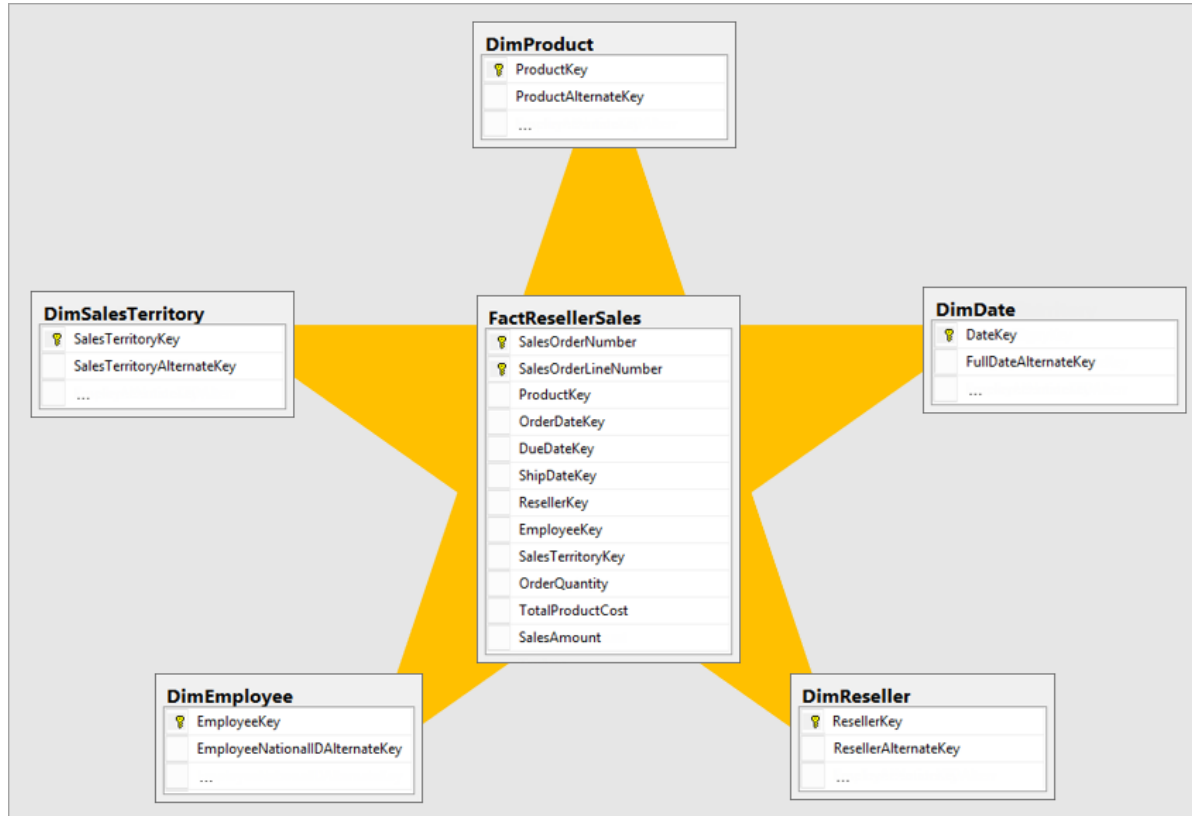
Azure Synapse Star Schema



[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





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



Design and Develop Data Processing

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

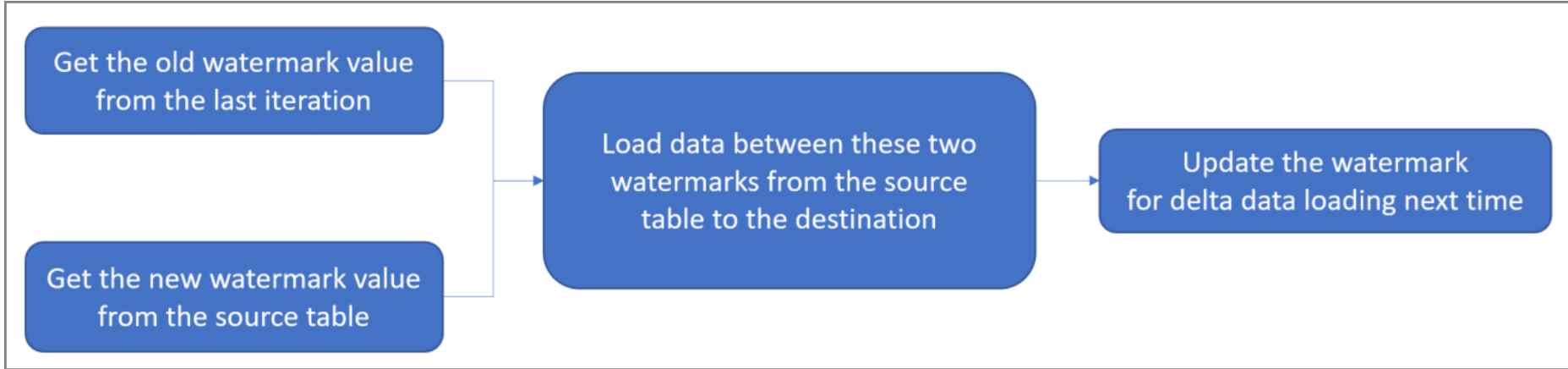


Incrementally Load Data

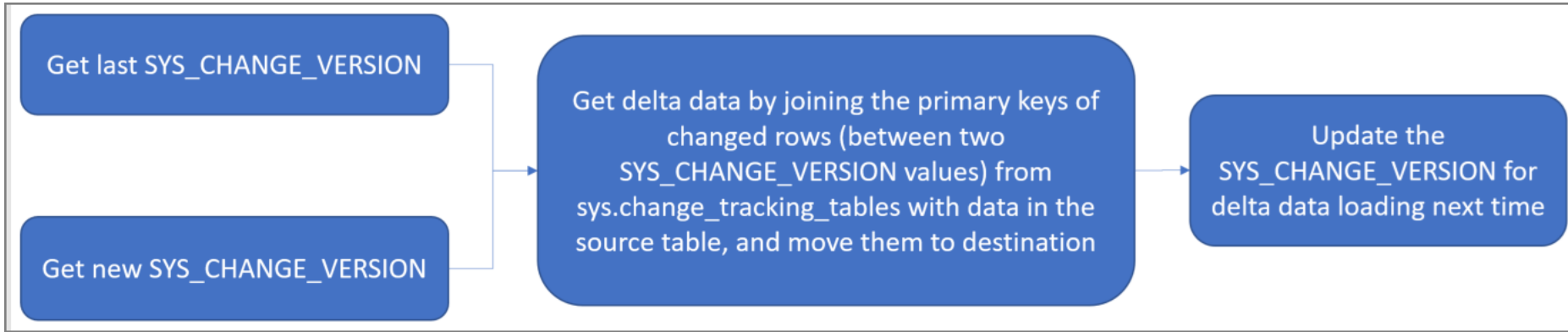
- Methods
 - Delta data loading from database by using a watermark
 - Delta data loading from SQL DB by using the Change Tracking technology
 - Loading new and changed files only by using *LastModifiedDate*
 - Loading new files only by using time partitioned folder or file name



Using a watermark



Using a watermark



[See reference](#)



Transform Data using Azure Data Factory

- Azure SQL Database
- Spark activity



Azure Data Factory

- Pipelines
- Activities



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



Design a Solution That Uses Azure Data Factory

- <https://docs.microsoft.com/en-us/azure/architecture/browse/#analytics>



Real-time Processing Solutions

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



Design a Solution That Uses Azure Databricks

- <https://docs.microsoft.com/en-us/azure/architecture/browse/#analytics>
 - <https://docs.microsoft.com/en-us/azure/architecture/reference-architectures/data/stream-processing-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



Azure Stream Analytics

- <https://docs.microsoft.com/en-us/azure/architecture/browse/#analytics>
 - <https://docs.microsoft.com/en-us/azure/architecture/reference-architectures/data/stream-processing-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 Batch

- Use Azure Batch to run large-scale parallel and high-performance computing (HPC) batch jobs efficiently in Azure.
 - Azure Batch creates and manages a pool of compute nodes (virtual machines), installs the applications you want to run, and schedules jobs to run on the nodes.



Design and Implement Data Security

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 and Optimize Data Storage and Data Processing

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



Monitor Data storage and data processing

- [Known issues for Apache Spark cluster on HDInsight](#)
- [Troubleshoot Azure Data Factory](#)




The Exam

Questions in DP-203

- 65 questions (watch the time!)
- Questions
 - Multiple choice
 - Drag and drop
 - Scenario based
- There is no hands-on lab (might change)





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

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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 

