Python Pipeline Primer

ETL in Azure

Simon Whiteley | Adatis

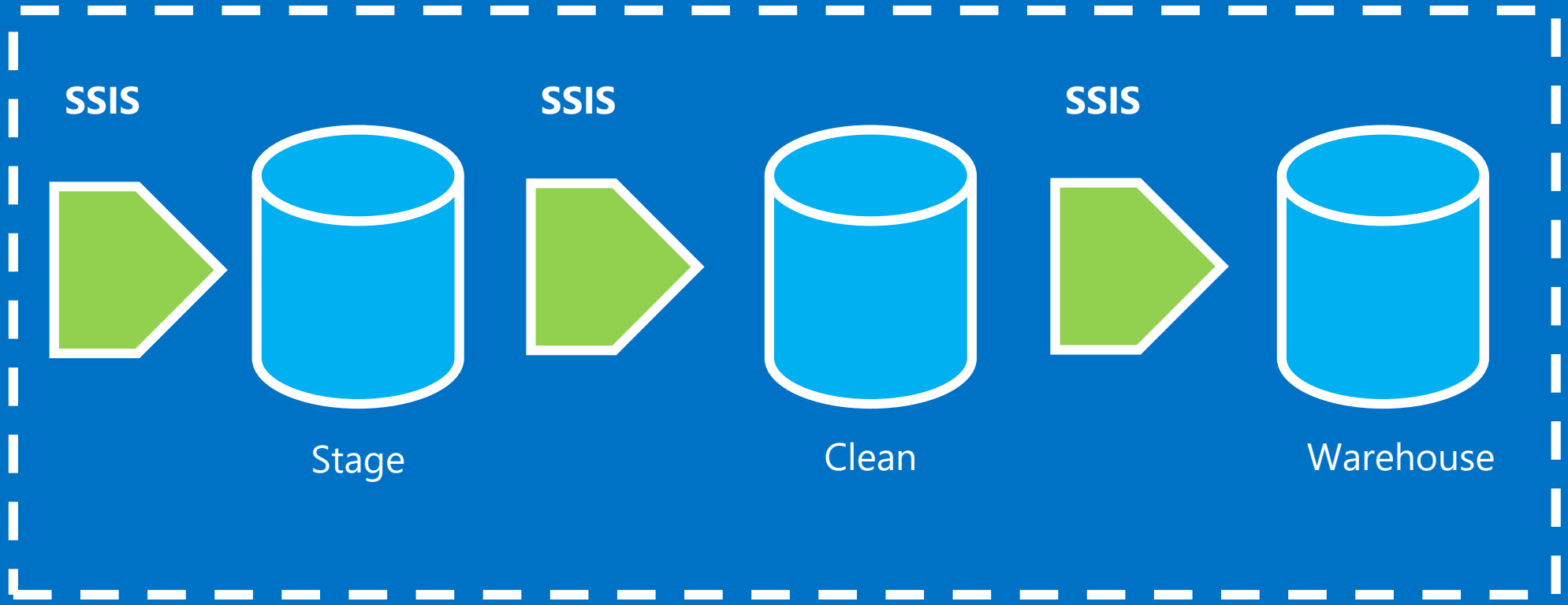
10/10/2018

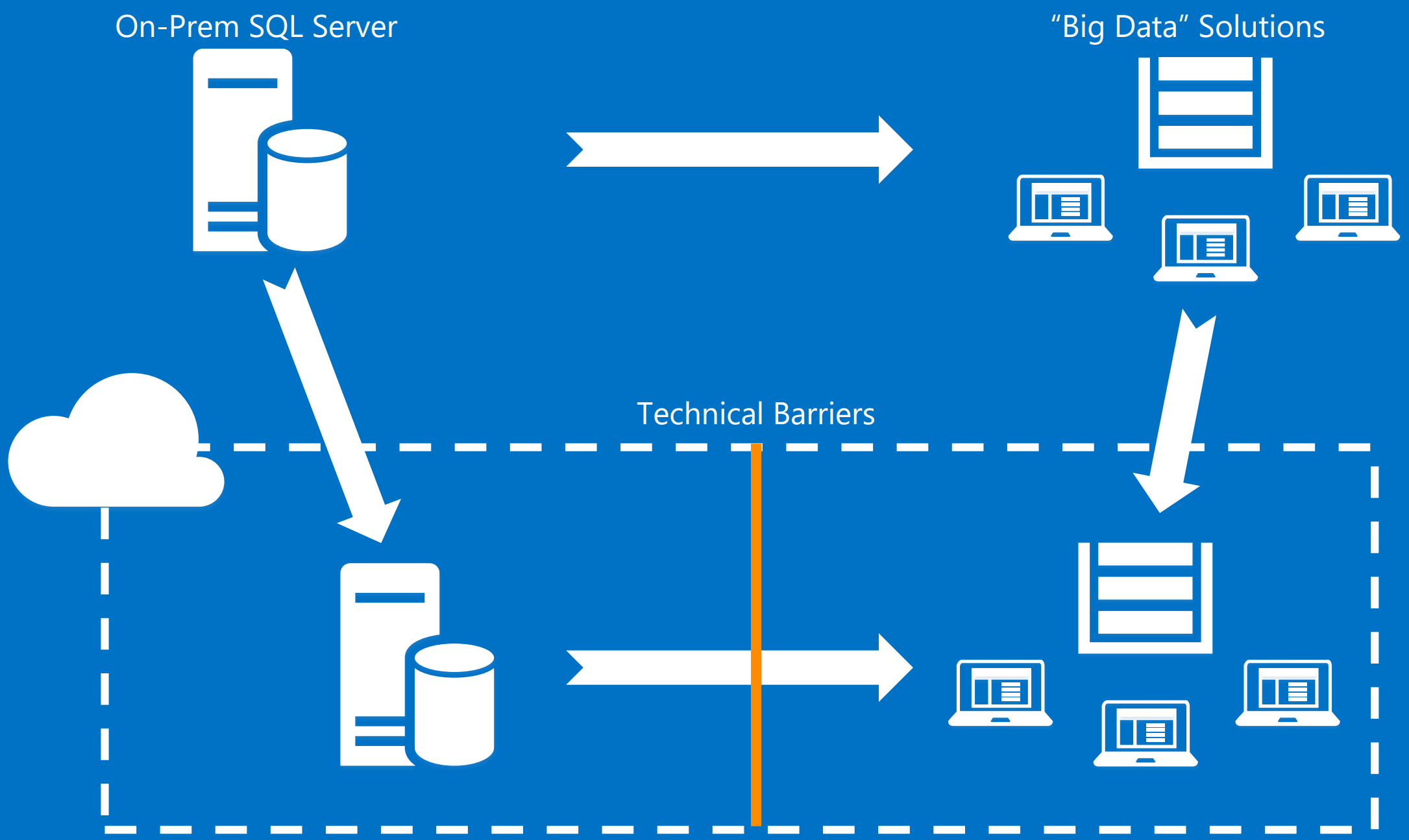
Agenda

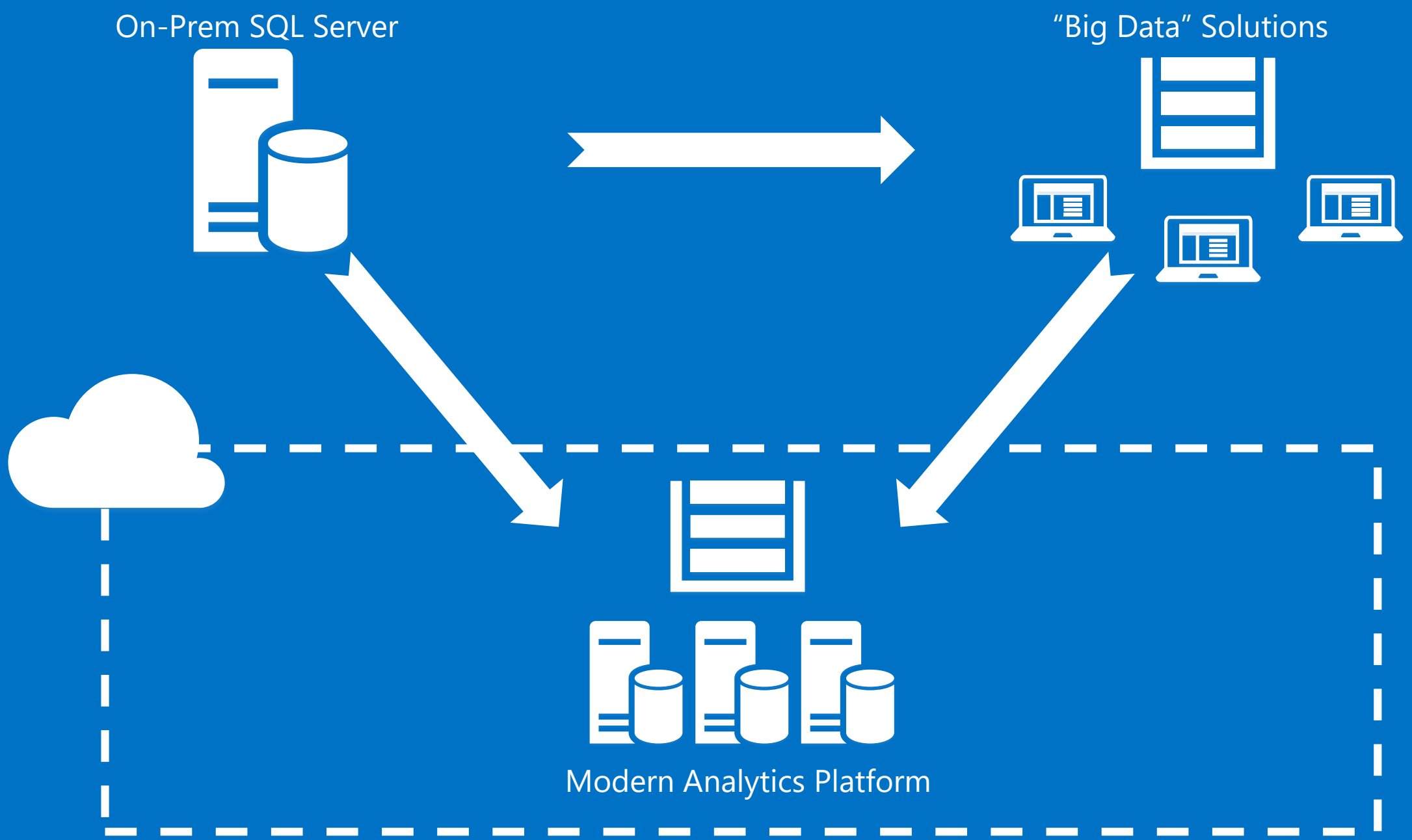
- Why Big Data processing is needed in the cloud
- What is Databricks?
- Patterns & Implementation
- Orchestration
- Data Factory Dataflows

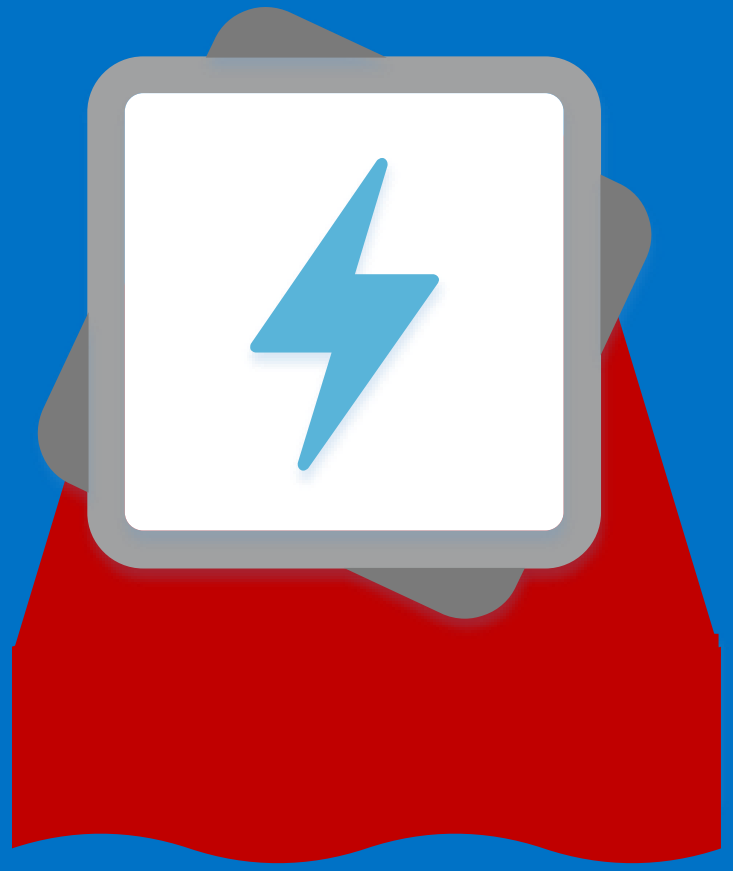
WBDPINITC

One-Box SQL BI Architecture

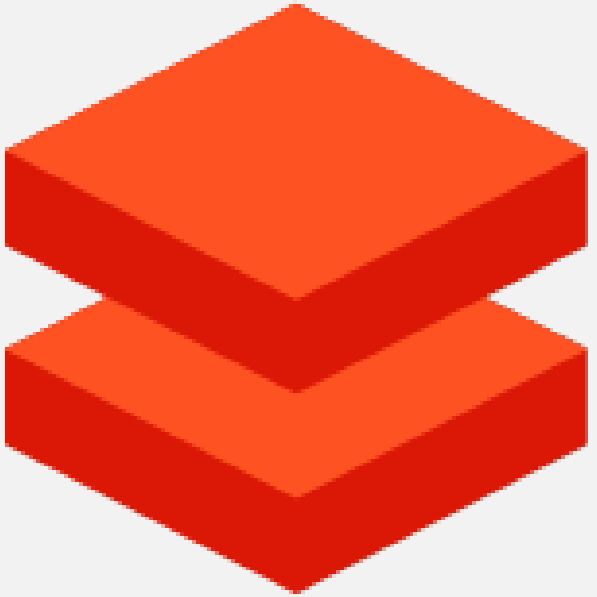



On-Prem SQL Server
"Big Data" Solutions
Technical Barriers


On-Prem SQL Server
"Big Data" Solutions
Modern Analytics Platform



DATA LAKE ANALYTICS



Azure
Databricks

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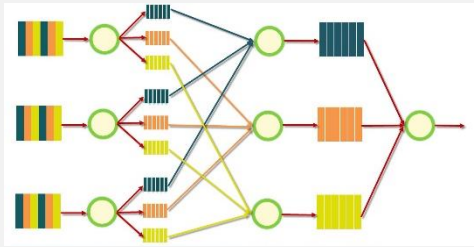
Databricks?

Google File System Papers Released

2003

Google MapReduce Papers

2004



2006

Apache Hadoop project created

Matei Zaharia starts Spark project

2012

Project donated to Apache Foundation

2013

Databricks founded by Matei

2013

2016

It’s new to Azure, not to everyone else!

Microsoft Azure

2018

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So What?

- Most up to date Spark optimisations
- Doesn’t need specialist hardware
- Quicker than traditional MapReduce
- Cluster Management, Notebooks, Jobs…

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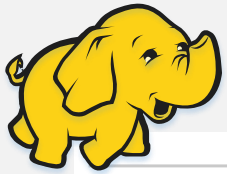

HDInsight

INSTANCE	CPU	RAM	OS	HDINSIGHT PRICE	TOTAL PRICE++
D3 v2	4	14 GB	£0.171/hour	£0.05/hour	£0.22/hour

Databricks

INSTANCE	vCPU	RAM	DBU COUNT	LINUX VM PRICE	DBU PRICE	PAY AS YOU GO TOTAL PRICE
D3 v2	4	14.00 GiB	0.75	£0.203/hour	£0.308/hour	£0.511/hour

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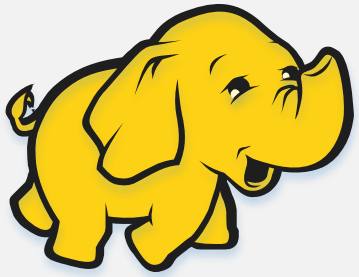

Open Source	Open Source	Proprietary
20 min provisioning	5 min provisioning	1 min provisioning
Integrates Well	Integrates Well	Integrates Poorly
Secure	Secure	Secure
Hadoop, Spark, Kafka, Hbase, HIVE, Storm…	Spark (Python/Scala/R)	U-SQL
Slow Release Cycle	Fast Release Cycle	Slow Release Cycle

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Data Scientists

Data Engineers

Data Analysts

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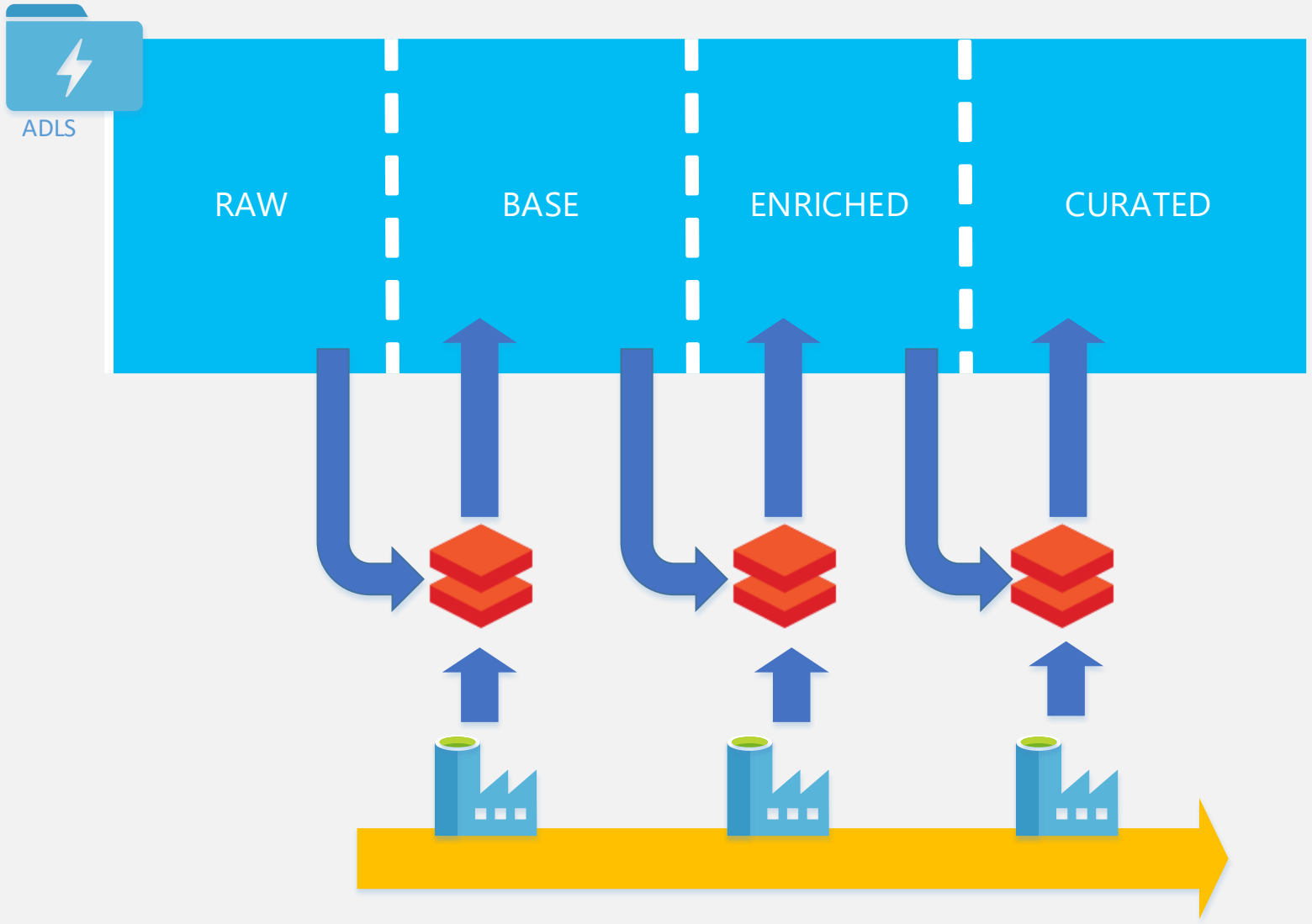

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Data Science VM Pool

Exploration & Development

Published Models

Complexity & Sophistication

Azure ML Studio

Azure ML Services

Docker

HPC

Model Hosting & APIs

Cognitive APIs

Model Services

Microsoft CNTK

Batch Scoring & Collaborative Experimentation

Data Processing & Interactive Querying

Published Data Sets

ADLS

DataBricks

LABORATORY | EXHIBIT | MODELS

Ad-Hoc Data Collection &Transformation

RAW | BASE | ENRICHED | CURATED

DataLake Data Science EcoSystem

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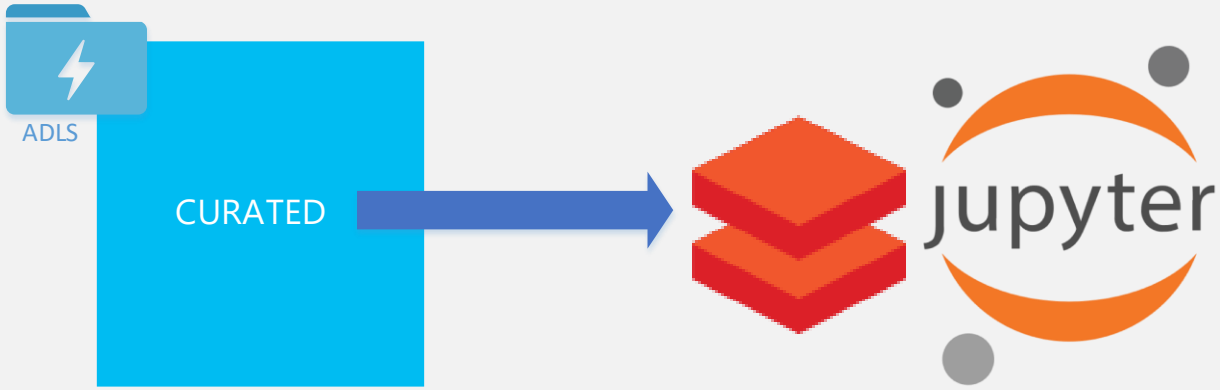
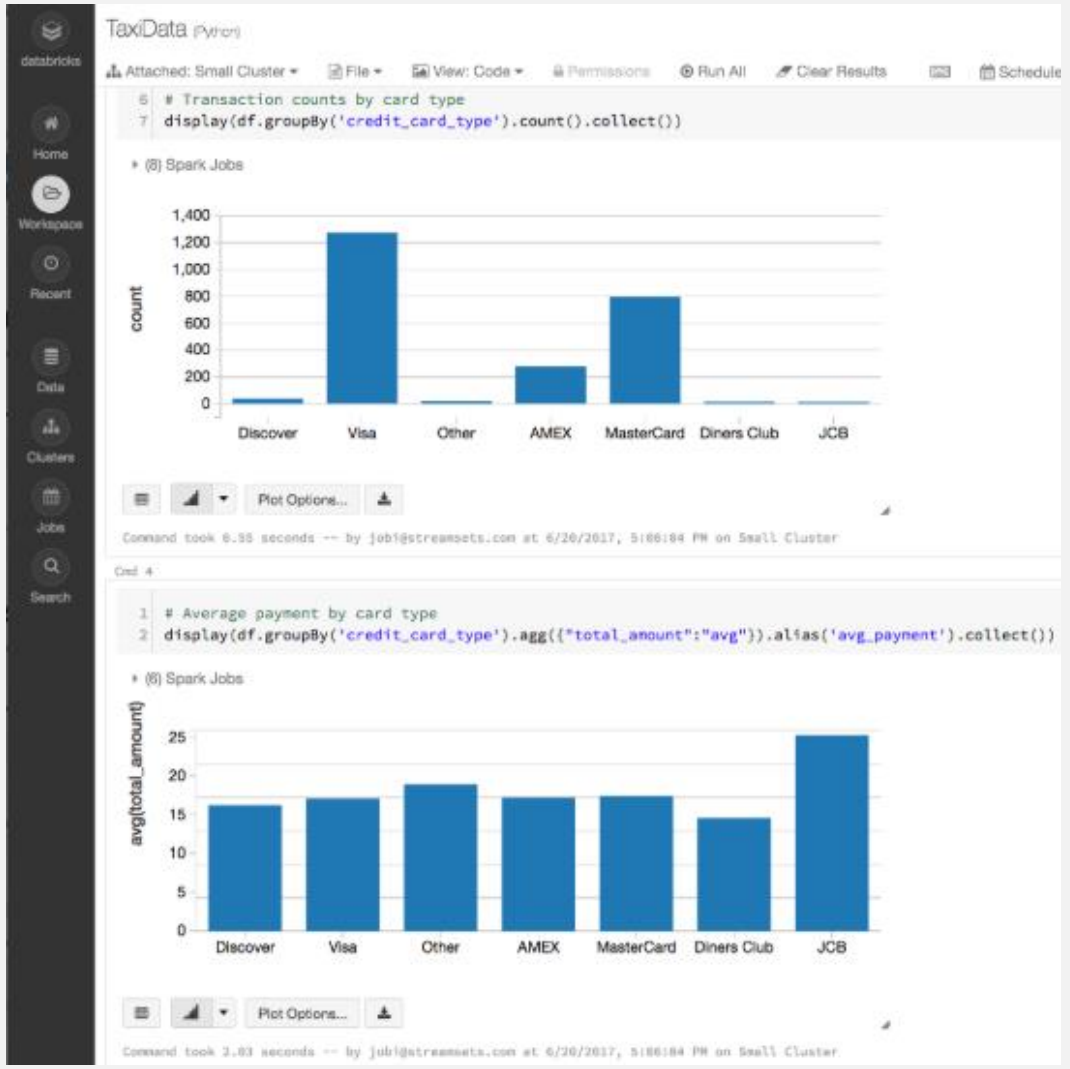

ADLS
CURATED
jupyter


databricks
Home
Workspace
Recent
Data
Clusters
Jobs
Search
TaxiData (Python)
Attached: Small Cluster
File
View: Code
Permissions
Run All
Clear Results
Schedule
# Transaction counts by card type
display(df.groupBy('credit_card_type').count().collect())
(8) Spark Jobs
count
1,400
1,200
1,000
800
600
400
200
0
Discover
Visa
Other
AMEX
MasterCard
Diners Club
JCB
Plot Options...
# Average payment by card type
display(df.groupBy('credit_card_type').agg({"total_amount":"avg"}).alias('avg_payment').collect())
(8) Spark Jobs
avg(total_amount)
25
20
15
10
5
0
Discover
Visa
Other
AMEX
MasterCard
Diners Club
JCB
Plot Options...

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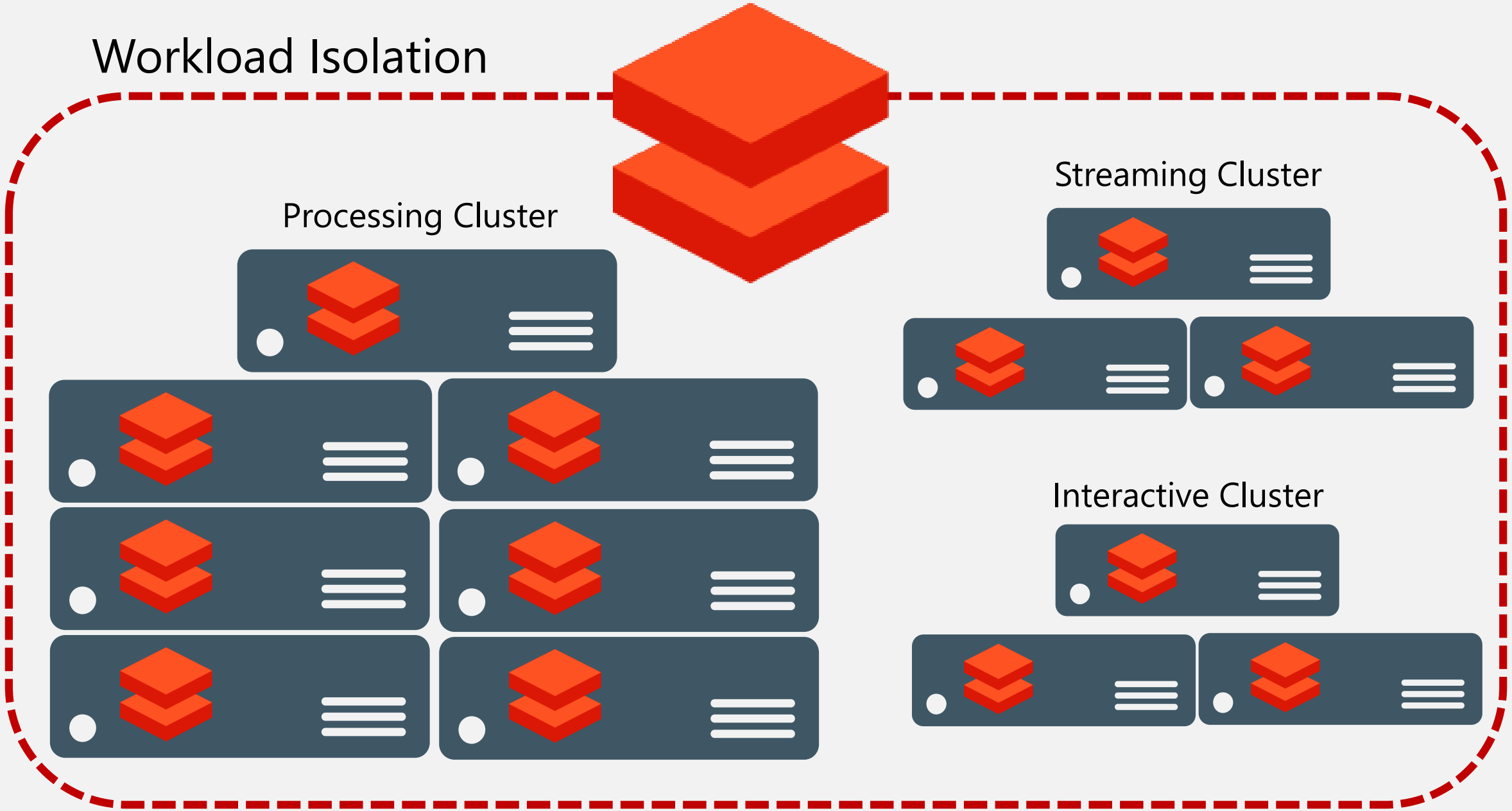
Databricks Basics

Patterns & Implementation

Workload Isolation



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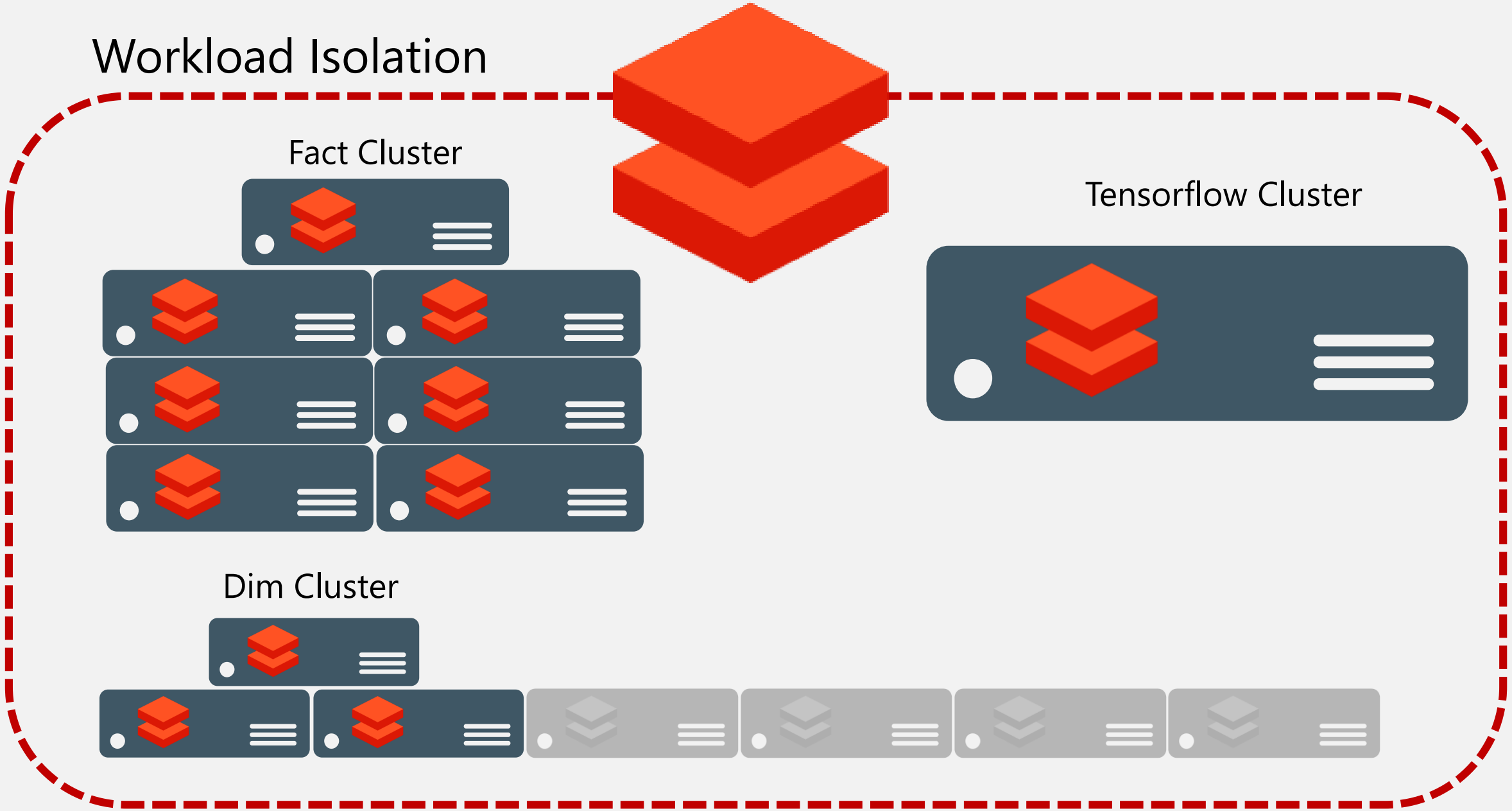
Workload Isolation



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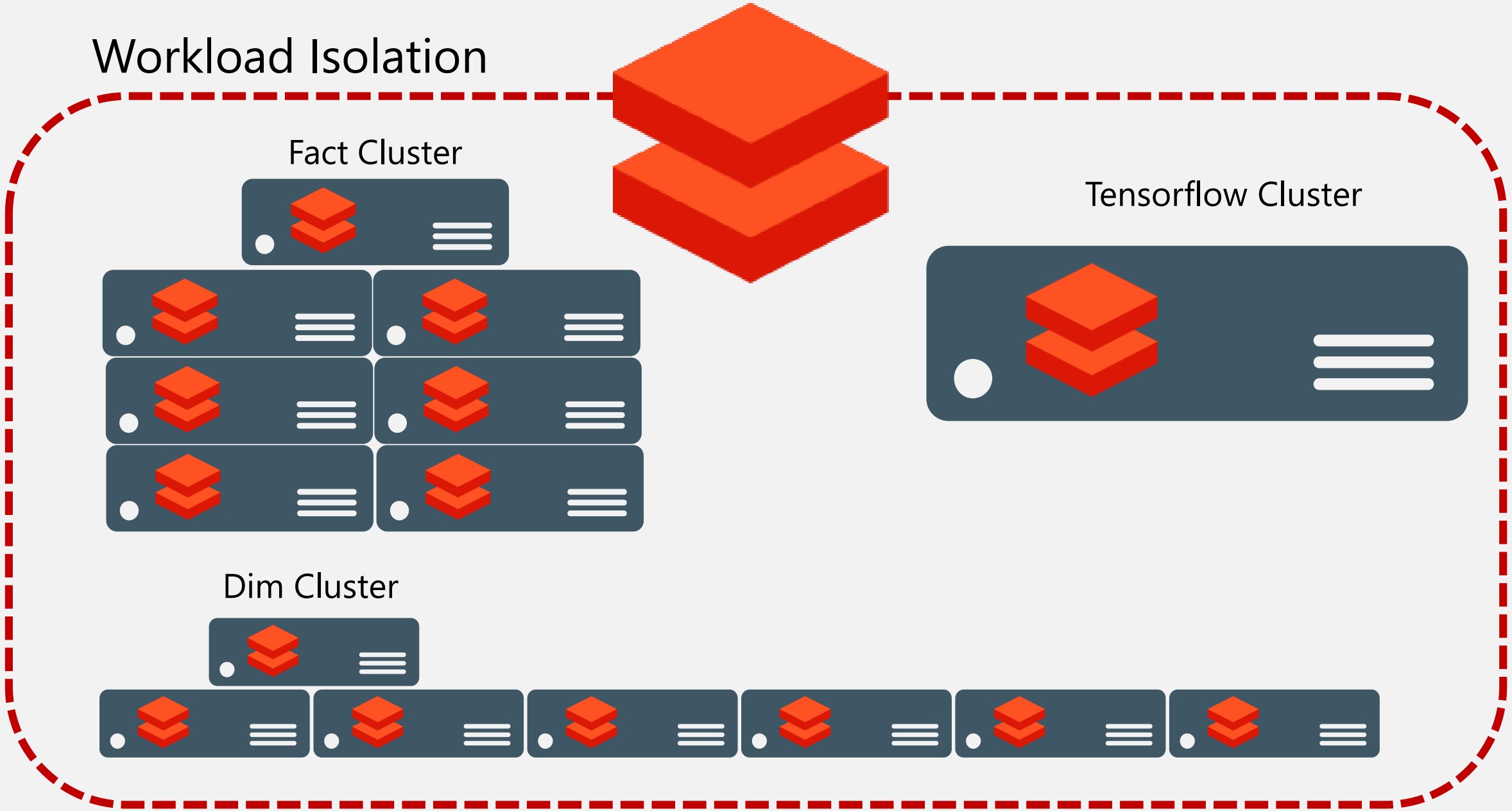
Workload Isolation



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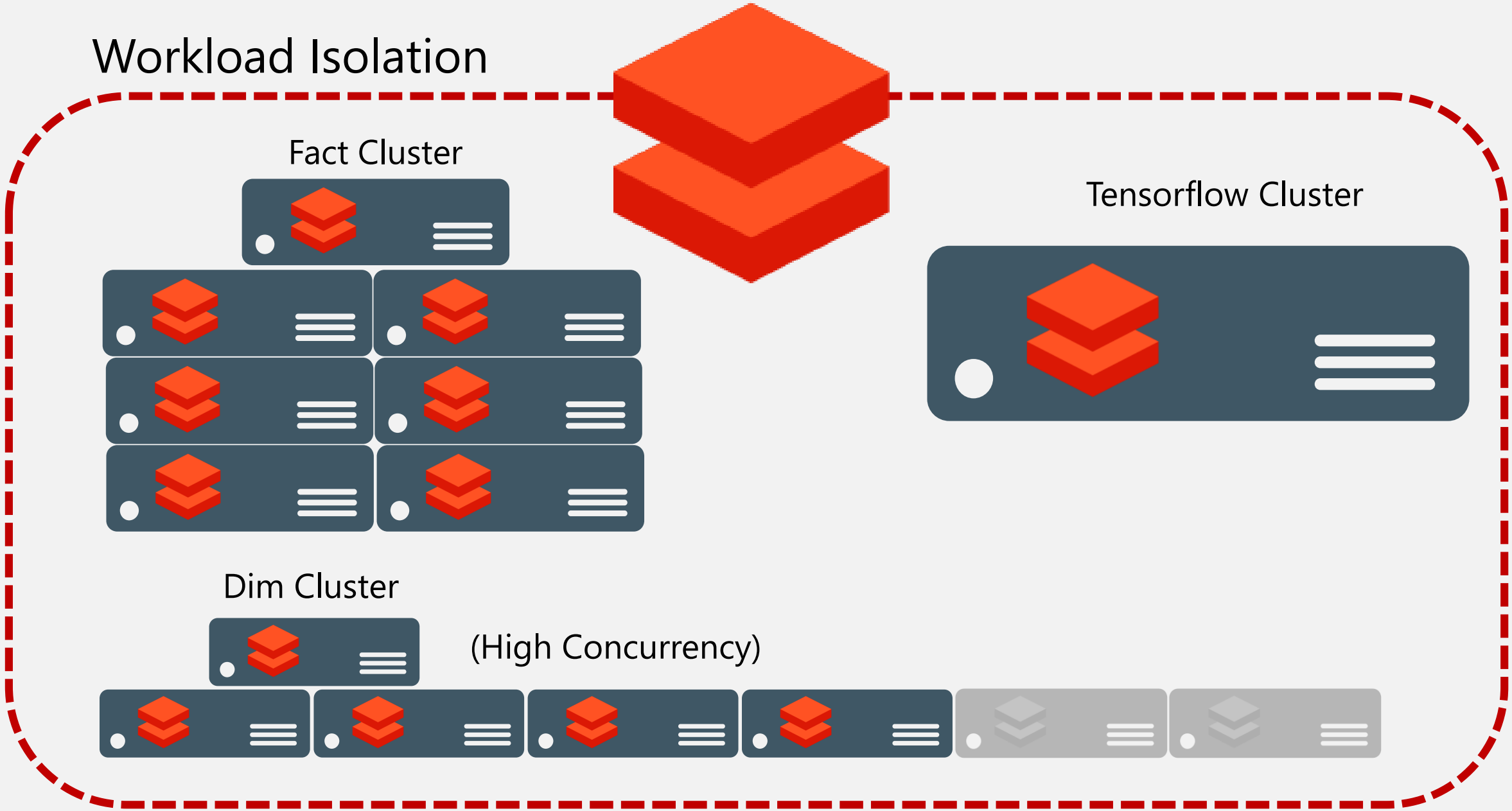
Workload Isolation



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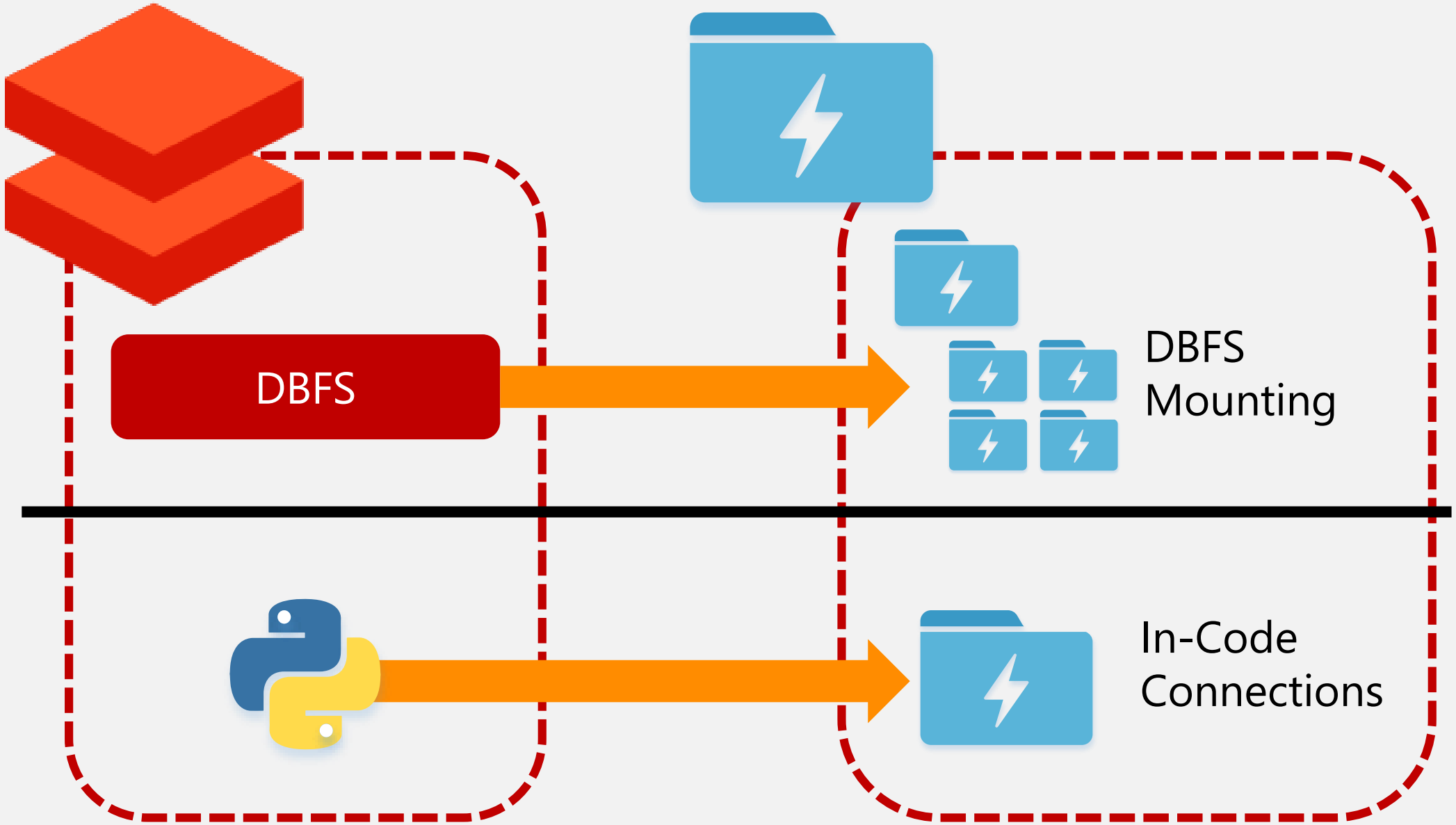

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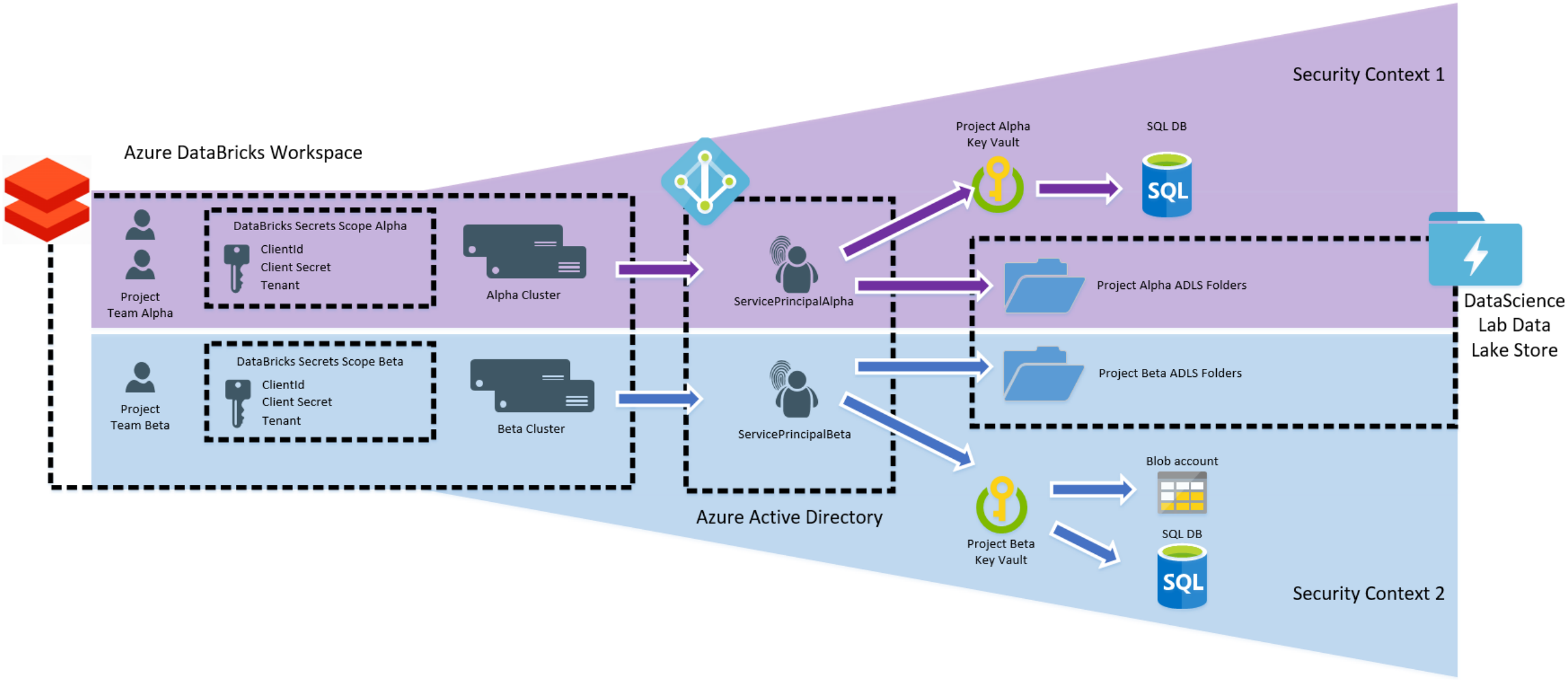
Secrets


Azure DataBricks Workspace
Project
Team Alpha
DataBricks Secrets Scope Alpha
ClientId
Client Secret
Tenant
Alpha Cluster
Project
Team Beta
DataBricks Secrets Scope Beta
ClientId
Client Secret
Tenant
Beta Cluster
Azure Active Directory
ServicePrincipalAlpha
ServicePrincipalBeta
Security Context 1
Project Alpha
Key Vault
SQL DB
SQL
Project Alpha ADLS Folders
Project Beta ADLS Folders
DataScience
Lab Data
Lake Store
Blob account
Project Beta
Key Vault
SQL DB
SQL
Security Context 2

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Standard Clusters Vs Serverless pools

Serverless pools / High Concurrency

- Use SQL, Python, or R
- Want Azure Databricks to manage worker selection

Standard cluster

- Use Scala
- Require a specific Spark version or want to configure Spark
- Want to control some advanced parameters

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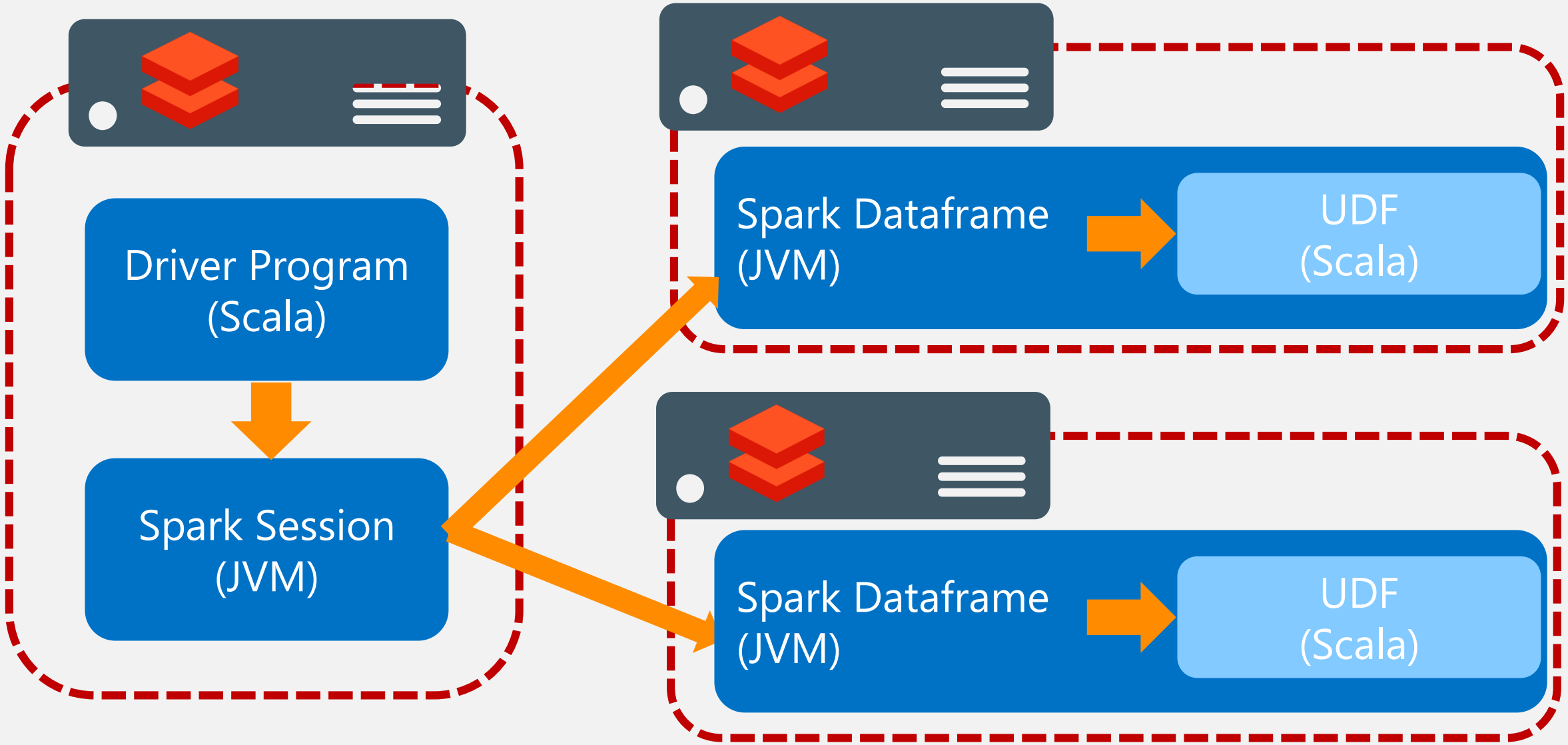
UDFs


Driver Program
(Scala)
Spark Session
(JVM)
Spark Dataframe
(JVM)
UDF
(Scala)
Spark Dataframe
(JVM)
UDF
(Scala)

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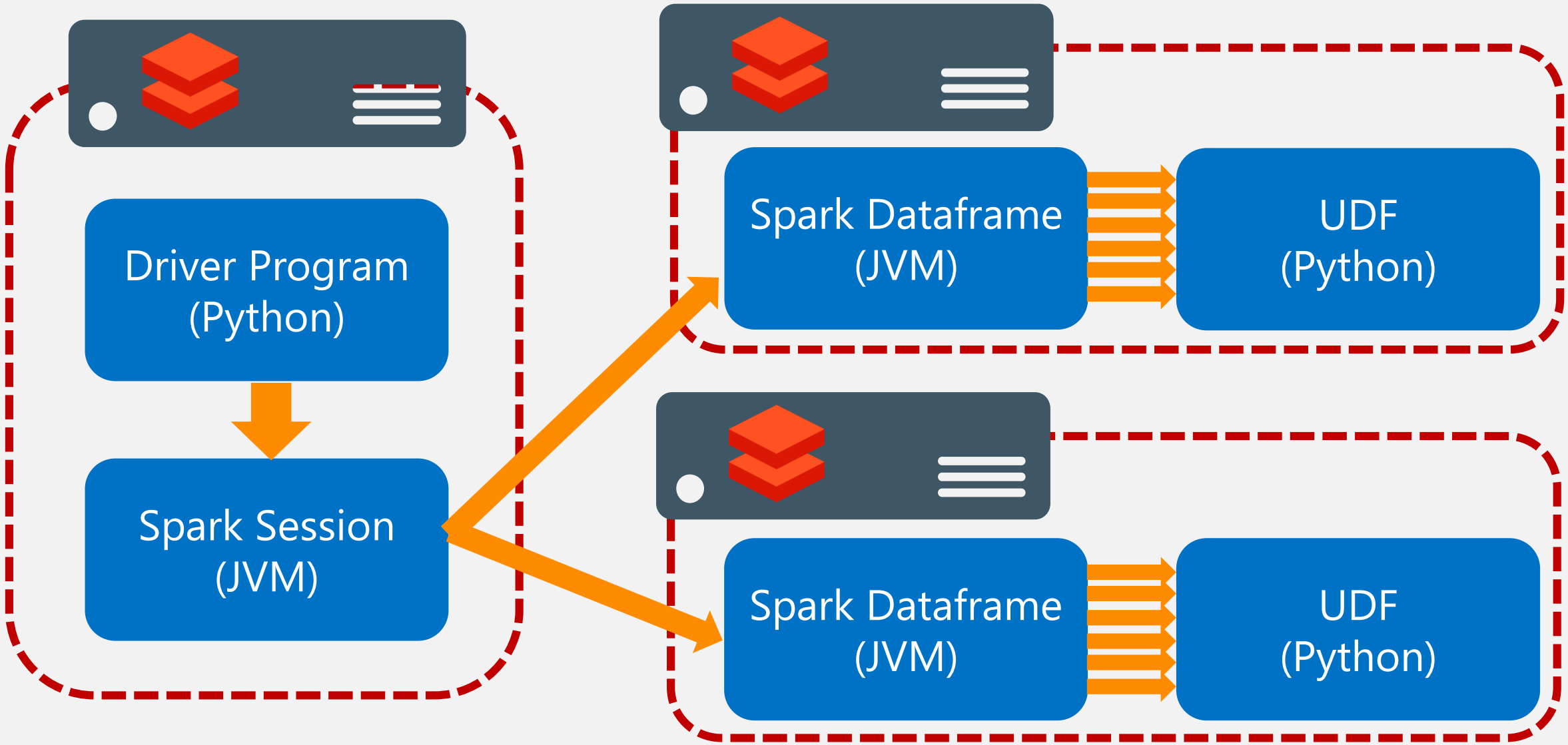
Driver Program
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Spark Session
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Spark Dataframe
(JVM)
UDF
(Python)
Spark Dataframe
(JVM)
UDF
(Python)

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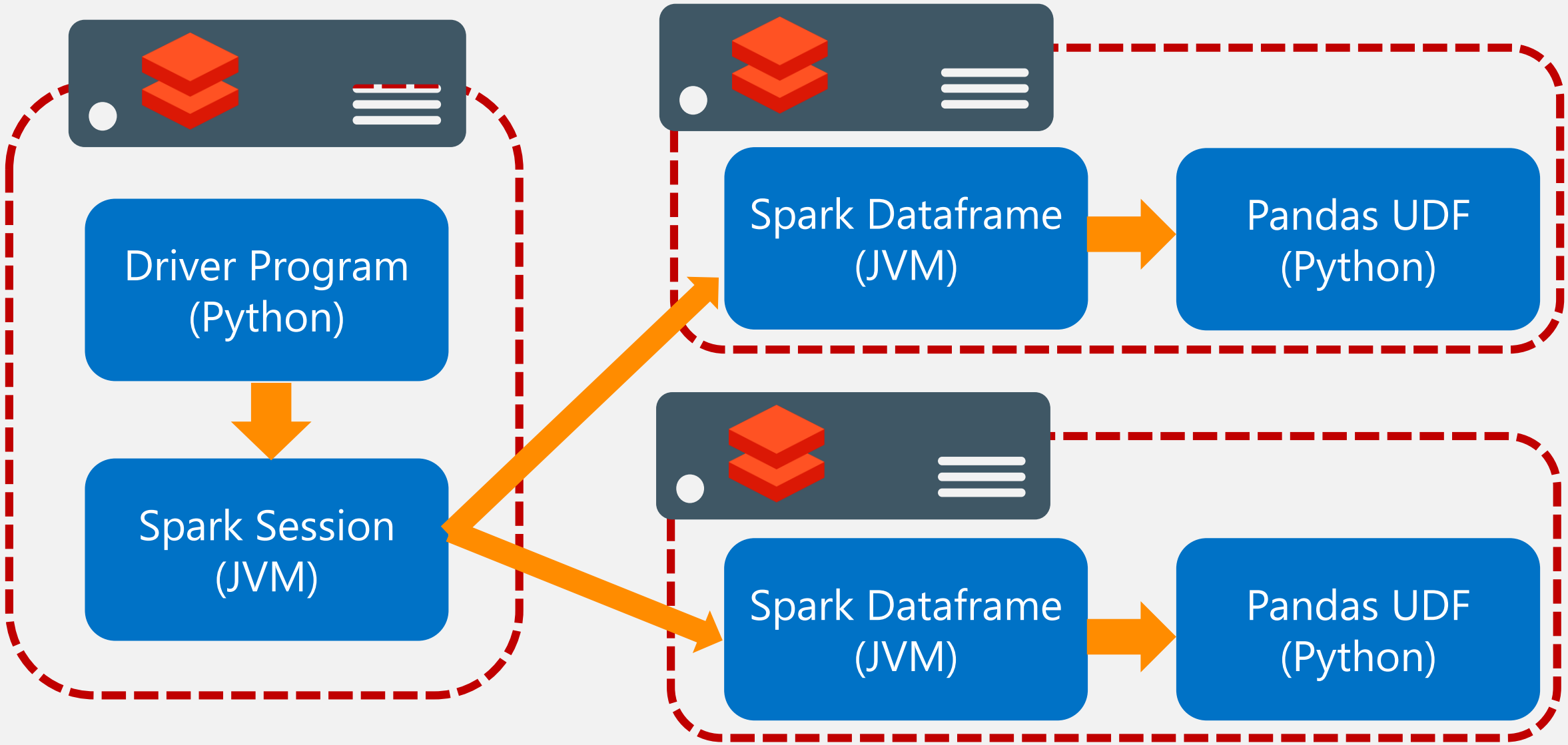
Driver Program
(Python)
Spark Session
(JVM)
Spark Dataframe
(JVM)
Pandas UDF
(Python)
Spark Dataframe
(JVM)
Pandas UDF
(Python)

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Performance comparison of different UDF methods in Databricks

https://bit.ly/2CAXkVI

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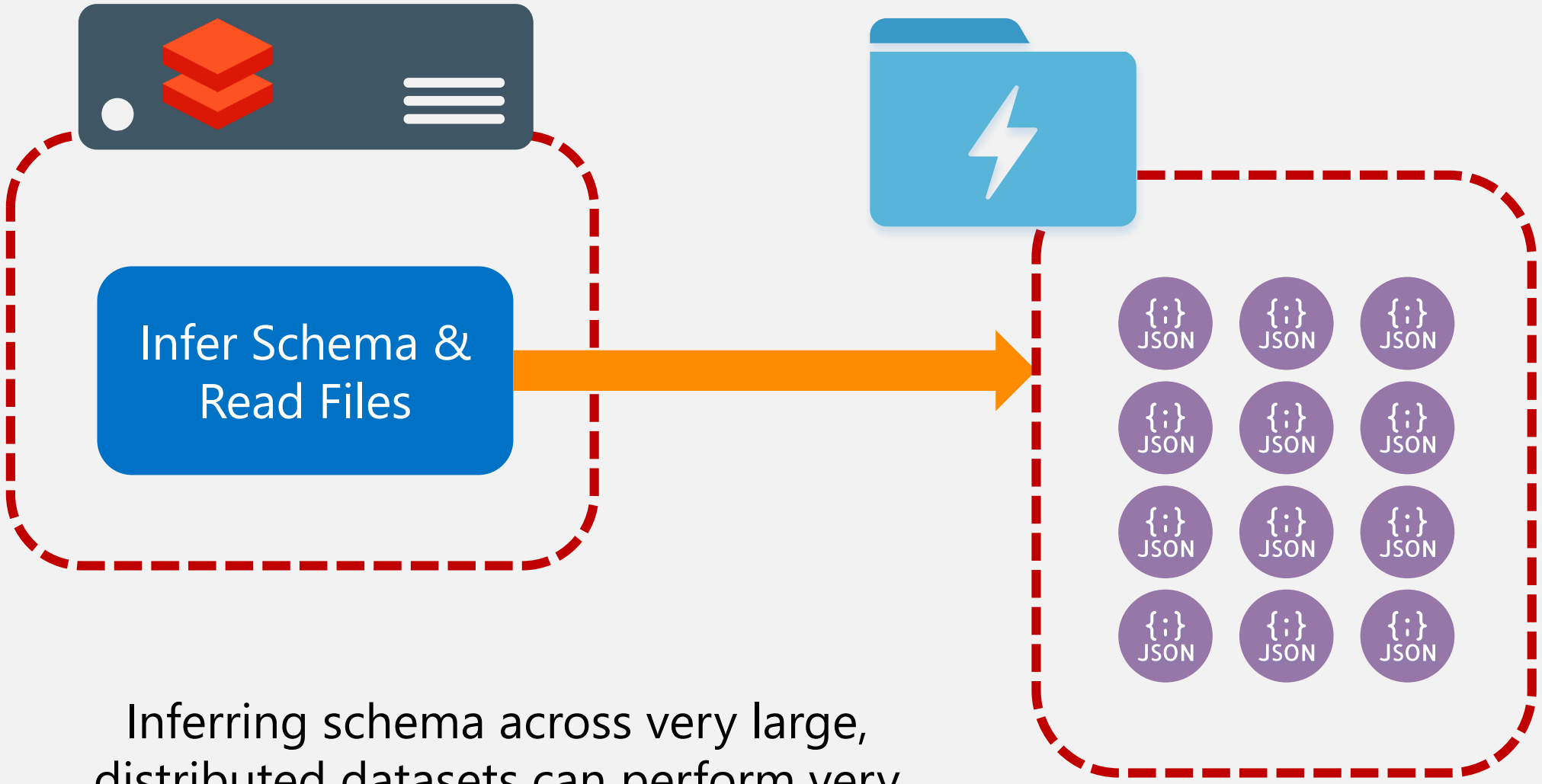

Inferring schema across very large, distributed datasets can perform very badly!

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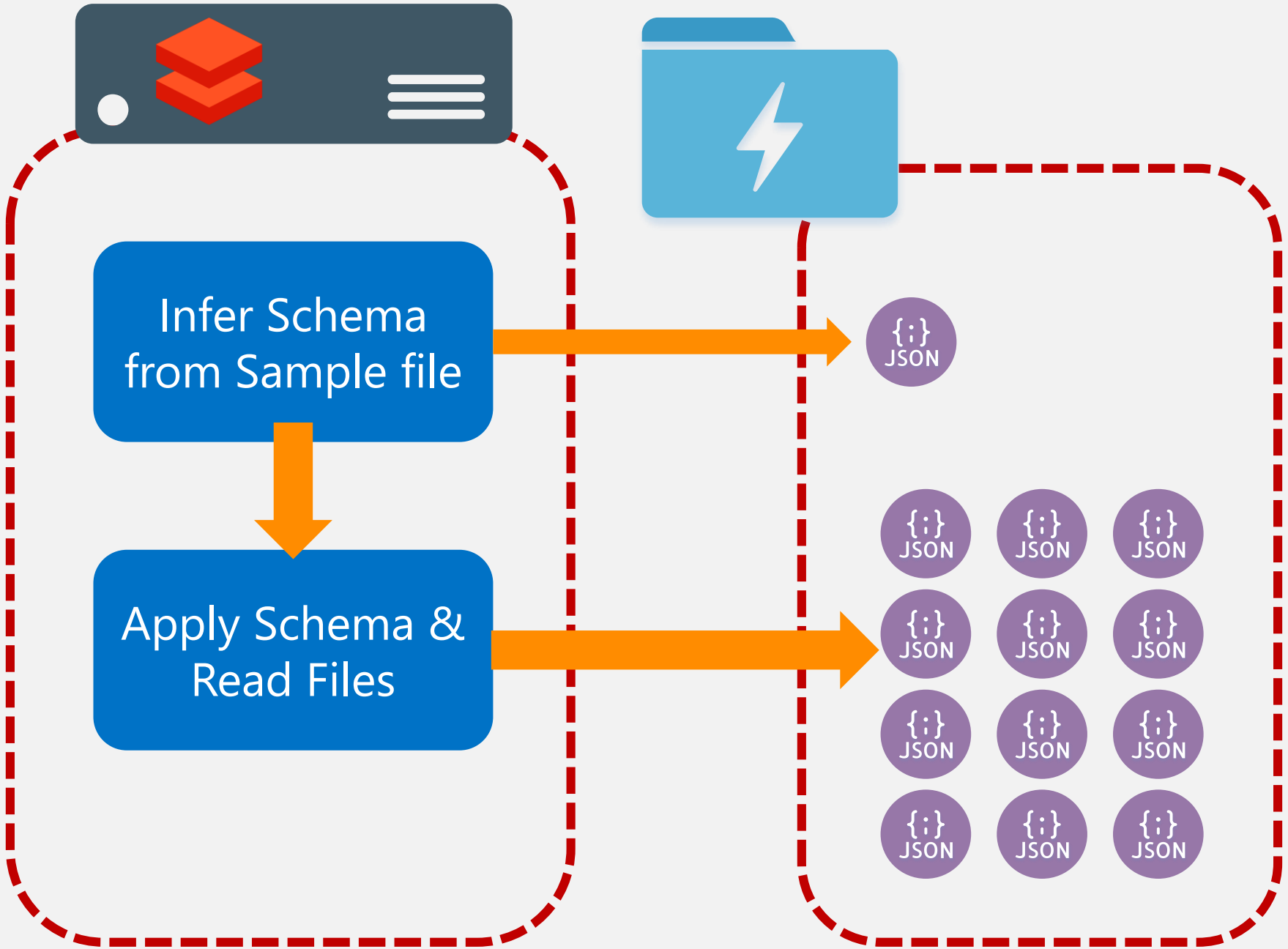

Acquire schema metadata (or infer from sample file) before reading large datasets!

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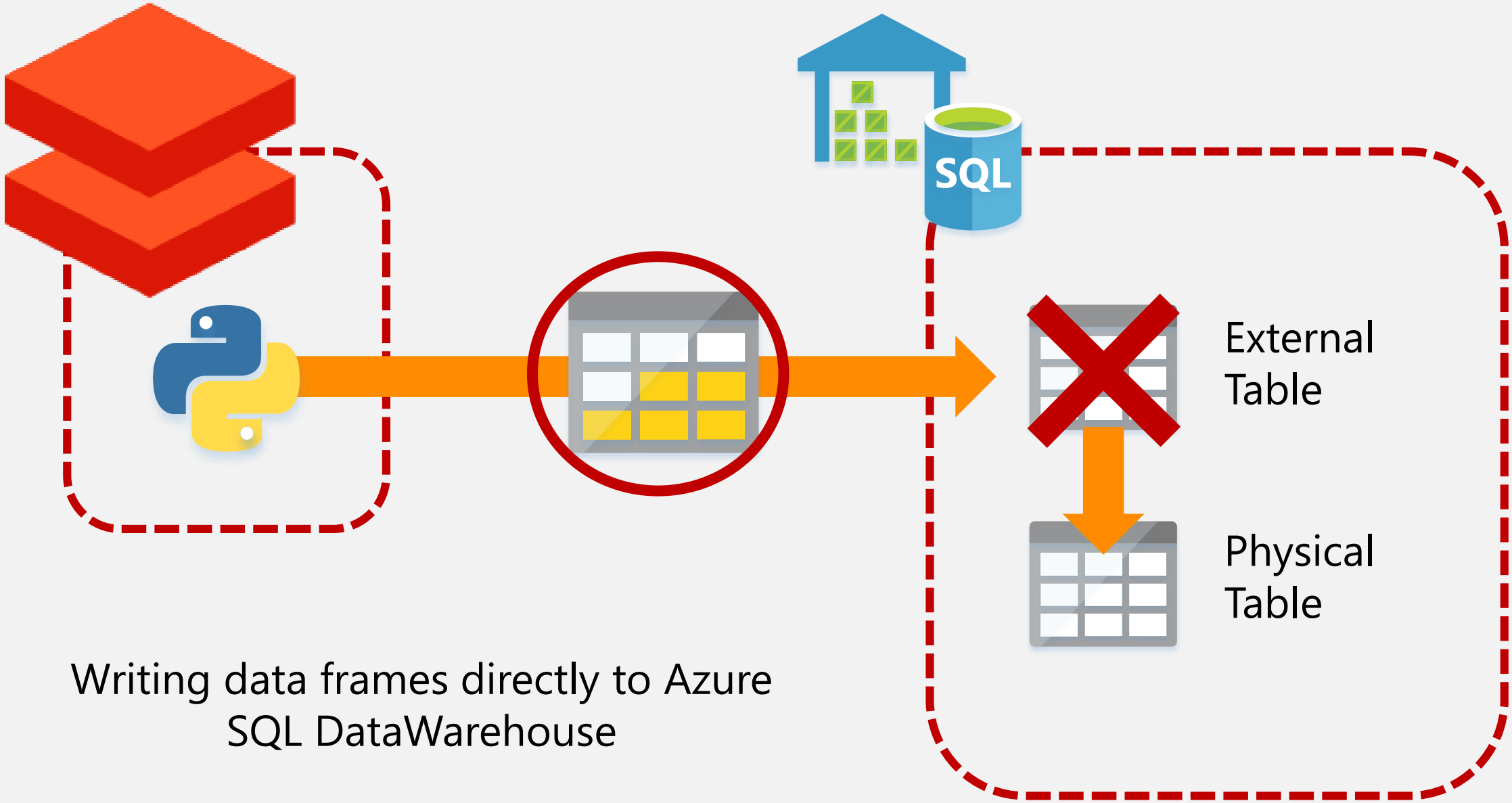

Writing data frames directly to Azure SQL DataWarehouse

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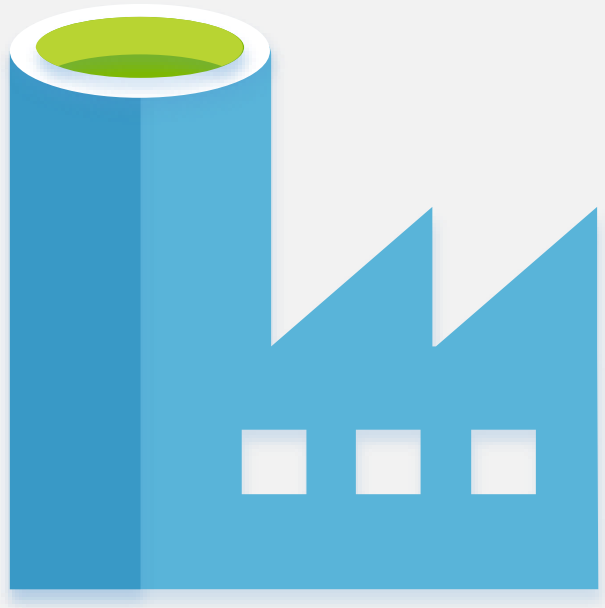
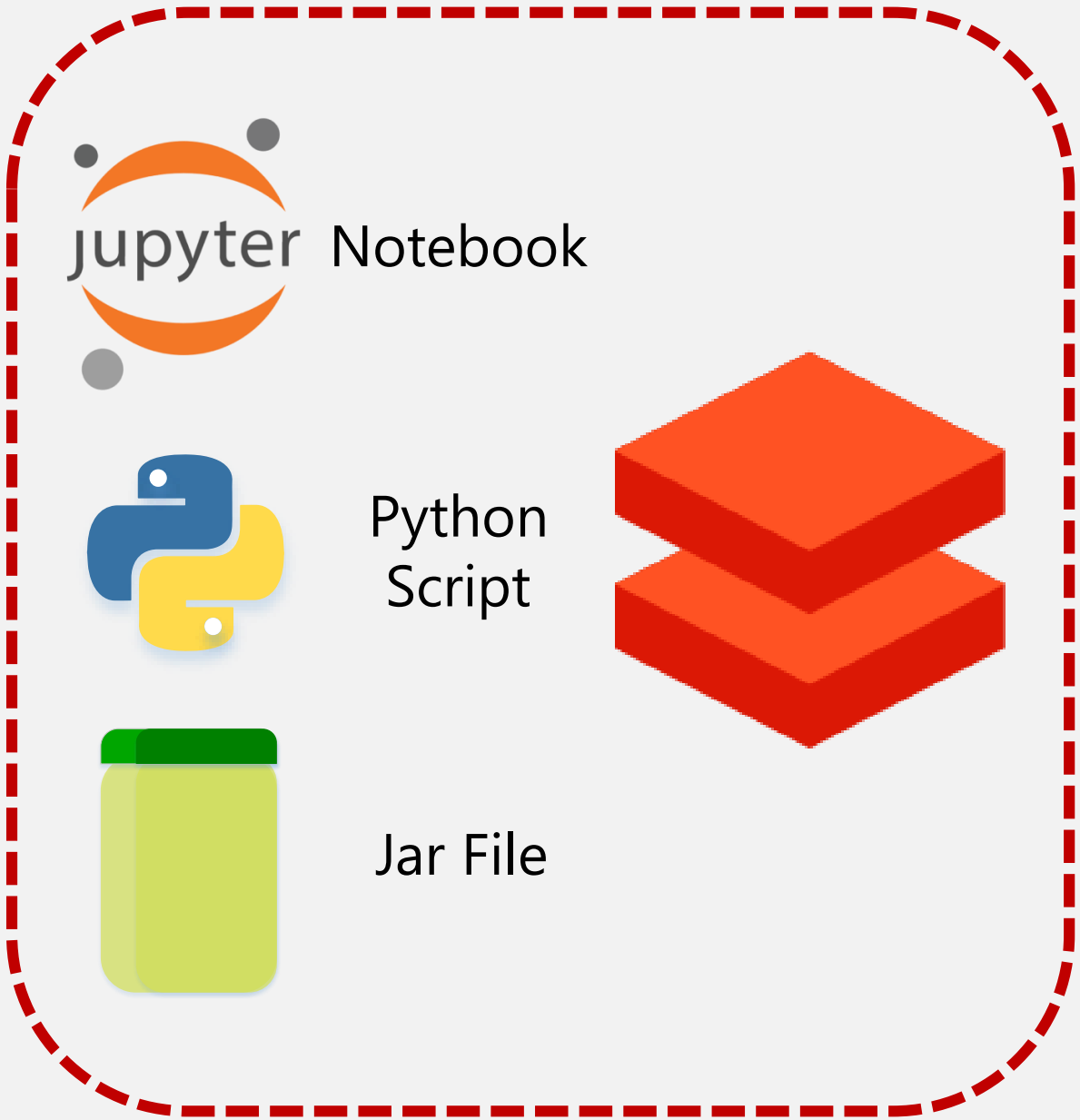
Orchestration





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Data Factory Demo

But what if I don’t want to write any code?

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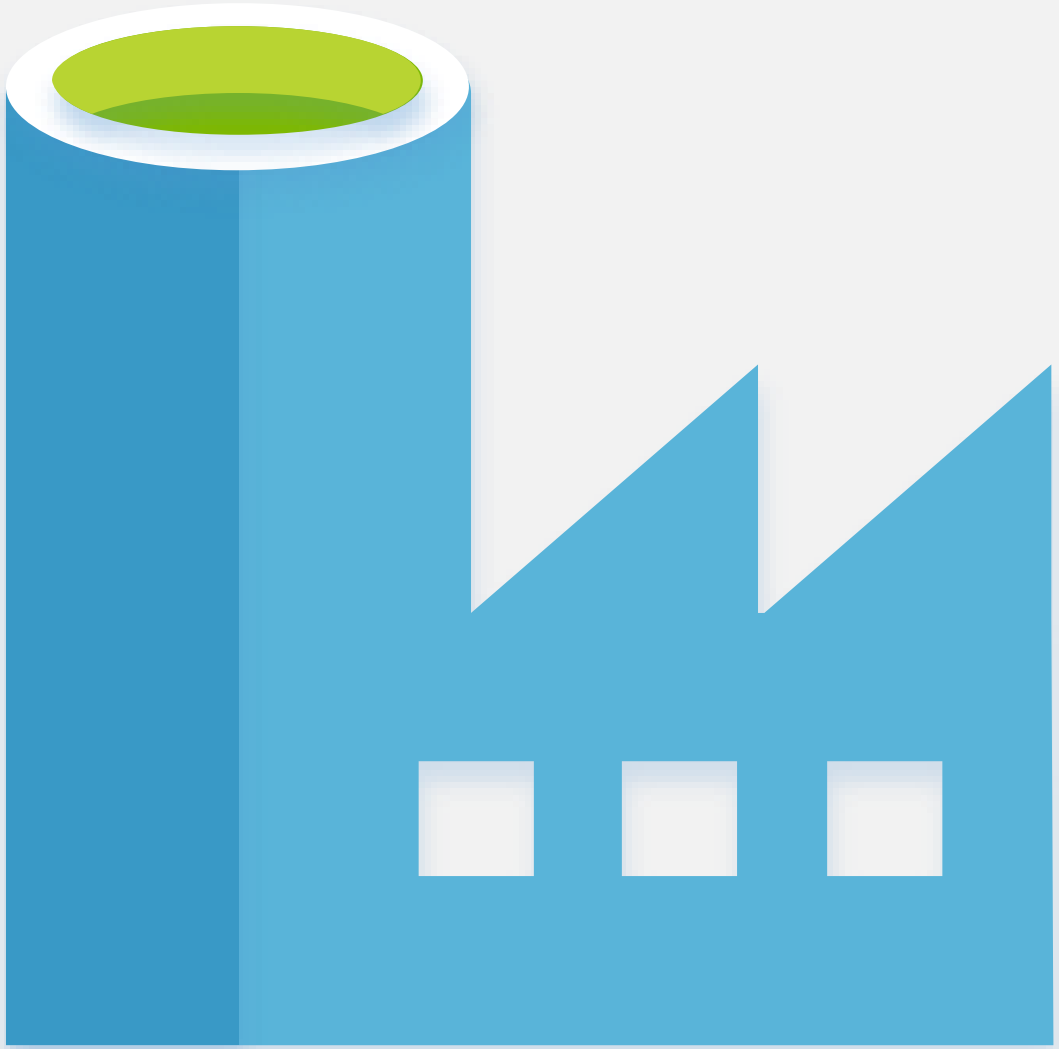

Azure Data Factory

Data Flows

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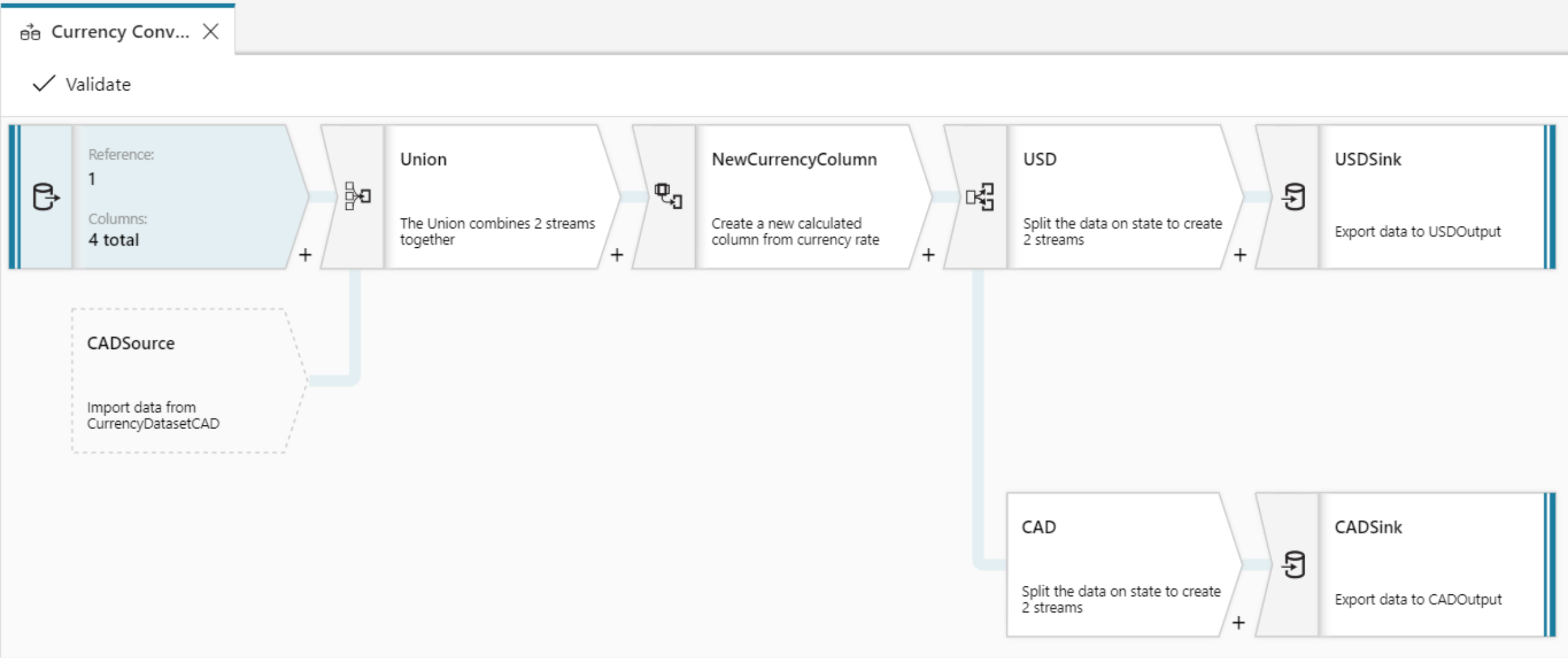
New Data Factory DataFlows can write Databricks processing packages for you!!



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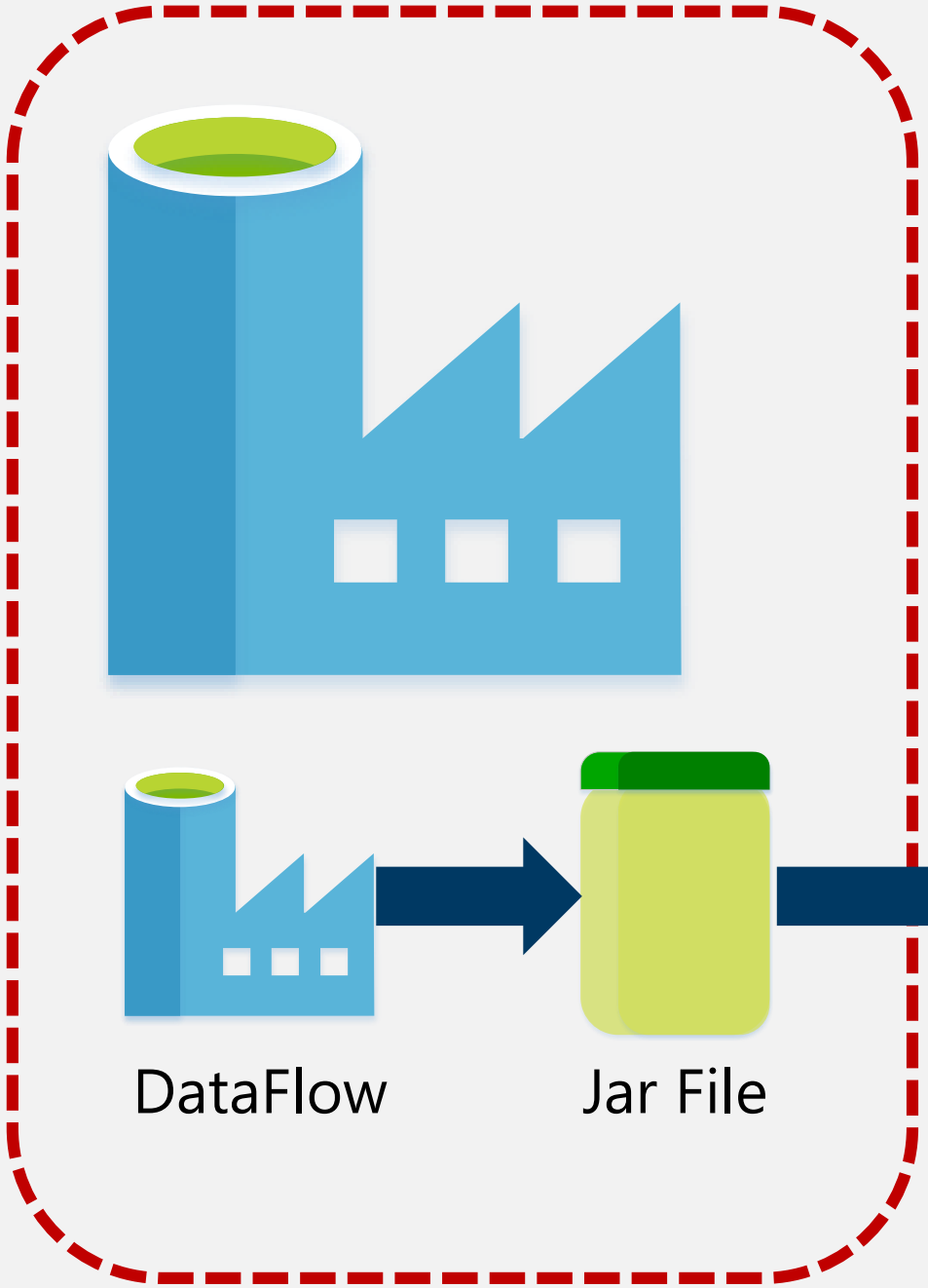
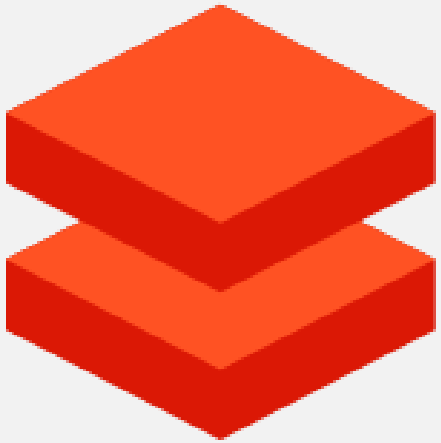


Dataflows will compile down to a JAR file which will be sent to the Databricks cluster for execution



This means it uses Scala!

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Thanks for Listening

Simon Whiteley

@MrSiWhiteley

http://blogs.adatis.co.uk