PYTHON PIPELINE PRIMER

ADDING A LITTLE SPARK TO YOUR WAREHOUSE PROCESS

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https://github.com/SiWhiteley/DatabricksETL

PYTHON PIPELINE PRIMER

Agenda

What is Databricks?

Patterns & Implementation

Orchestration

Data Factory Dataflows

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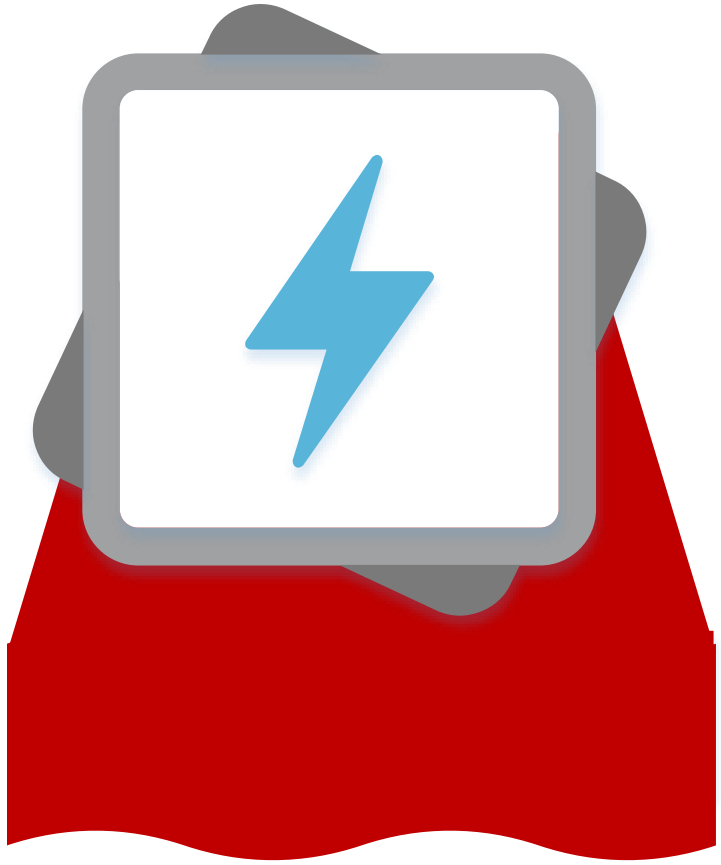

DATA LAKE ANALYTICS

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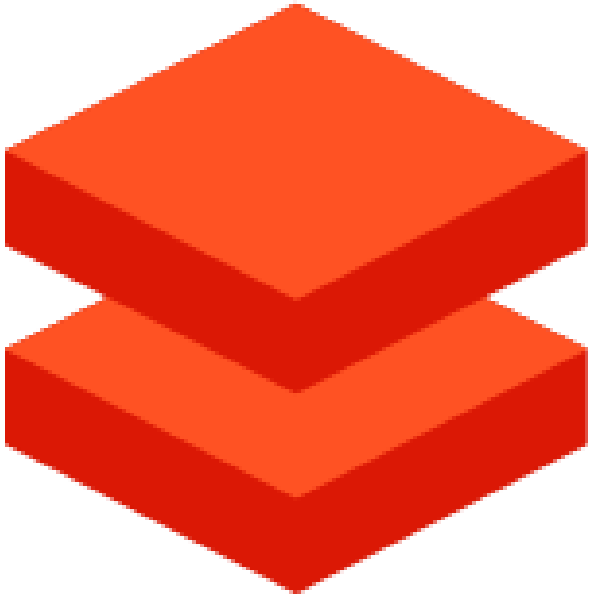

Azure Databricks

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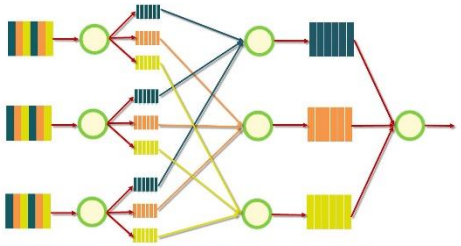
Google File System Papers Released

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

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amazon web services

2016

Microsoft Azure

2018

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

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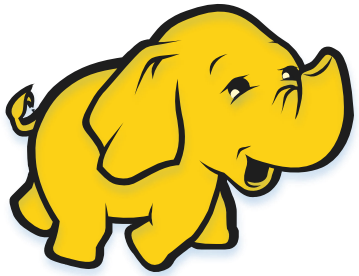


Open Source

20 min provisioning

Integrates Well

Secure

Hadoop, Spark, Kafka, Hbase, HIVE, Storm...

Slow Release Cycle

Open Source

5 min provisioning

Integrates Well

Secure

Spark (Python/Scala/R)

Fast Release Cycle

Proprietary

1 min provisioning

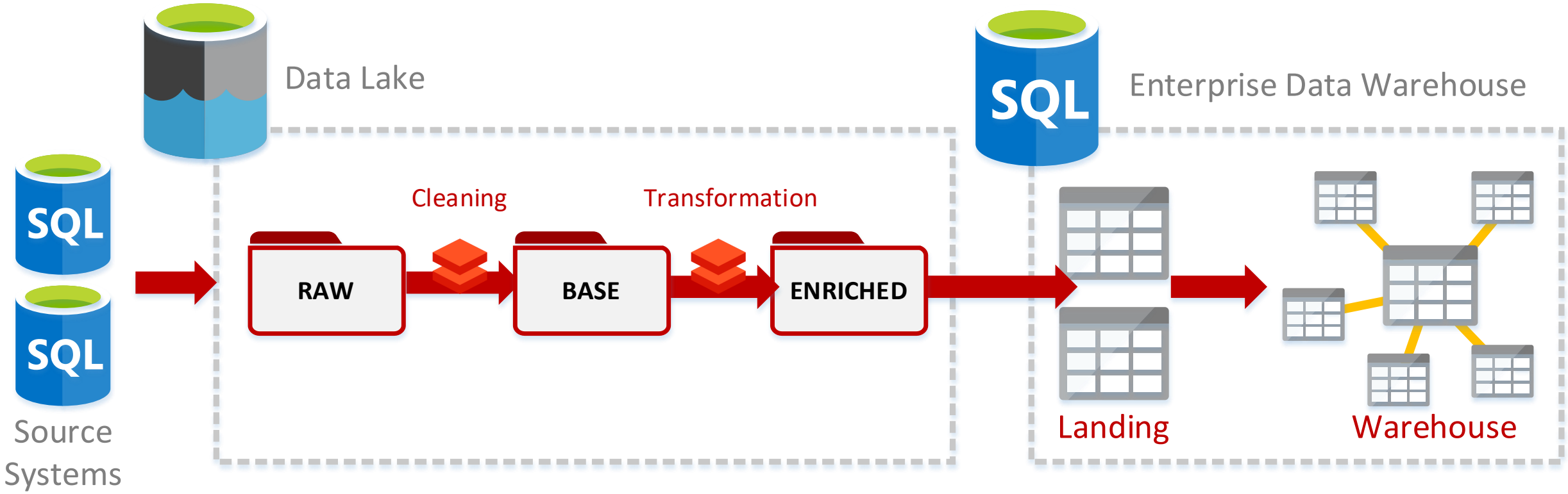
Integrates Poorly

Secure

U-SQL

Slow Release Cycle

PYTHON PIPELINE PROFILER



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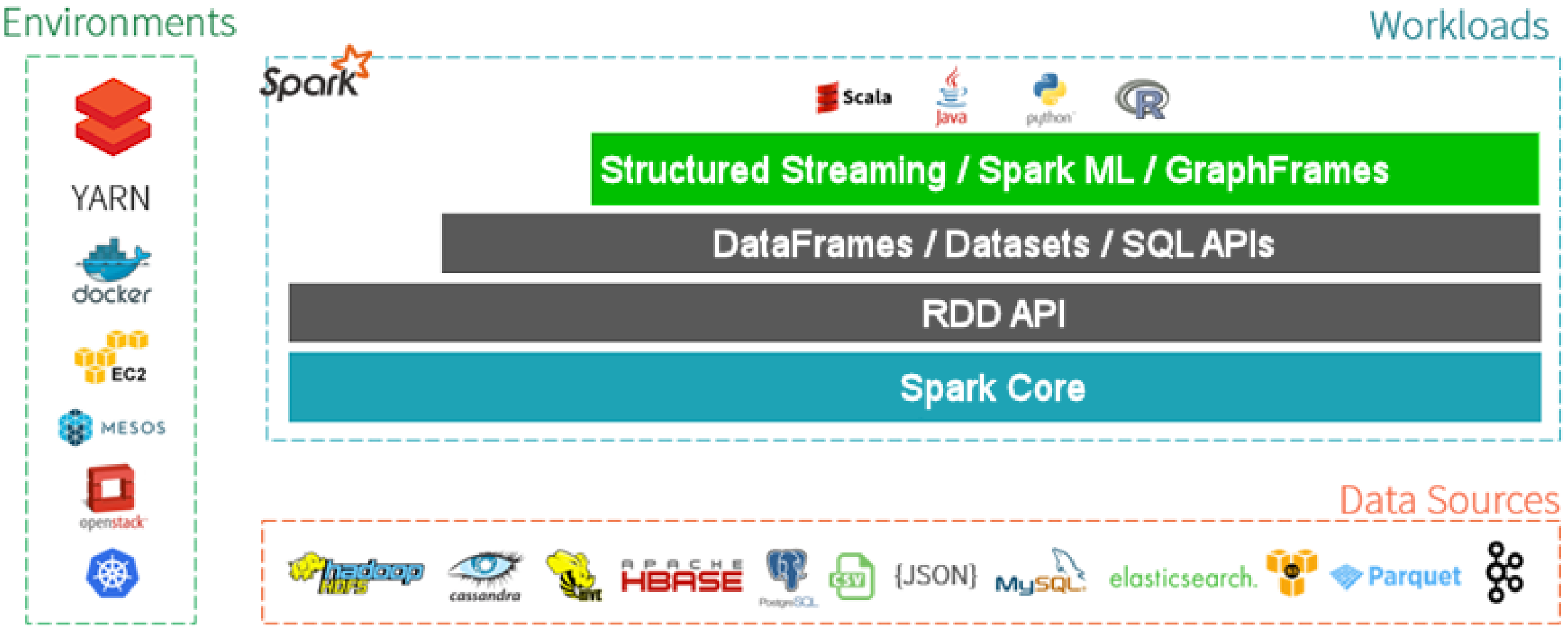
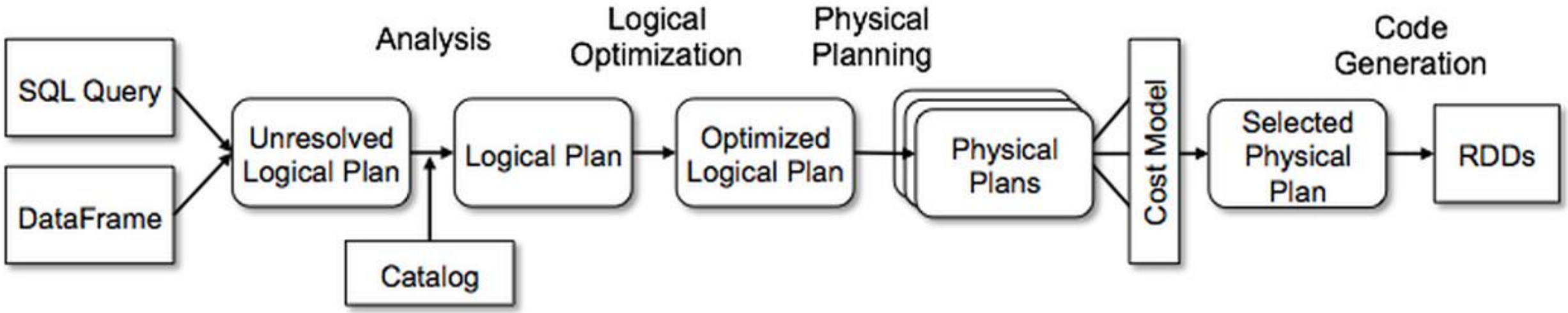
DATABRICKS BASICS

UNDER THE HOOD





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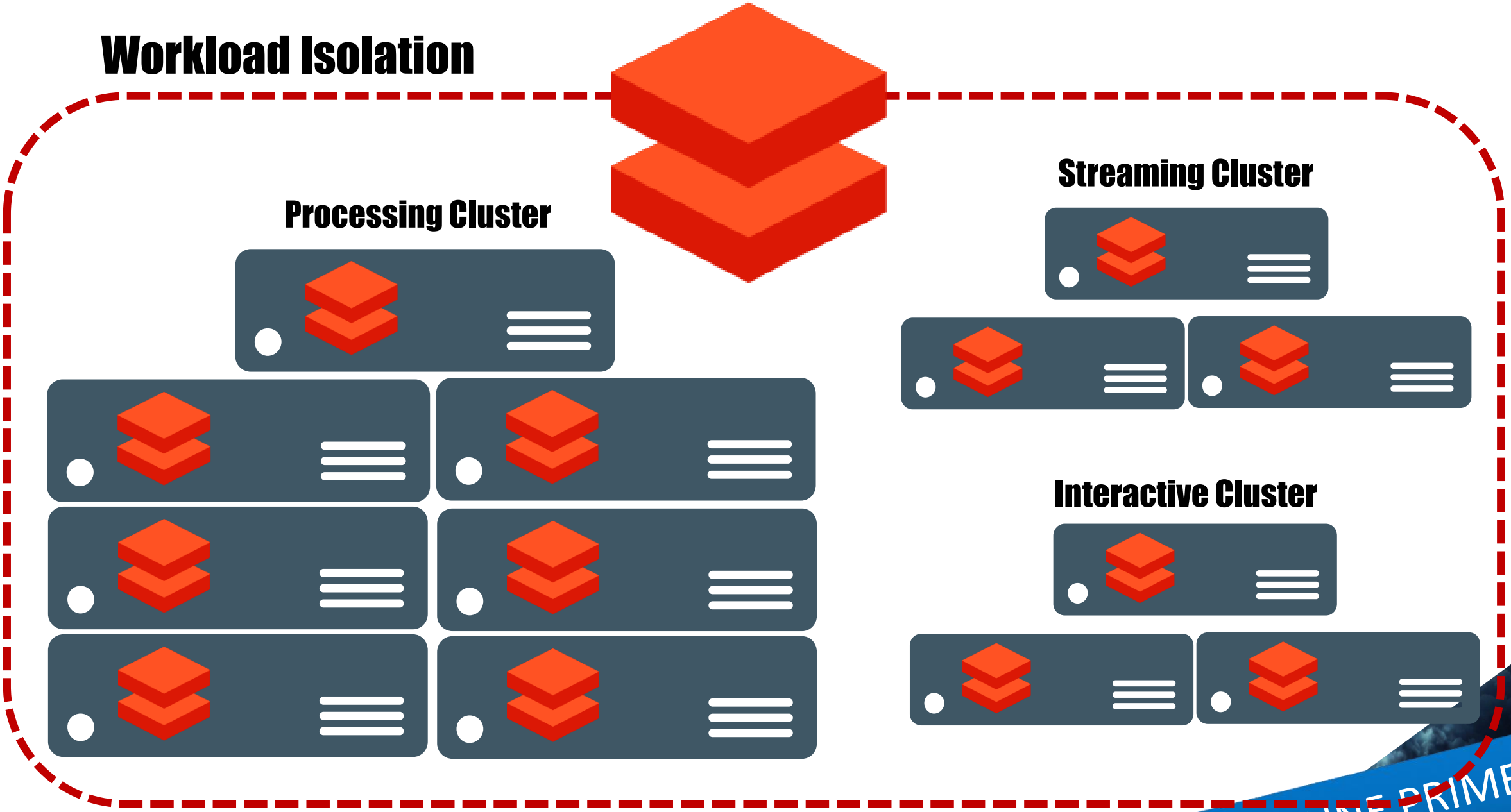
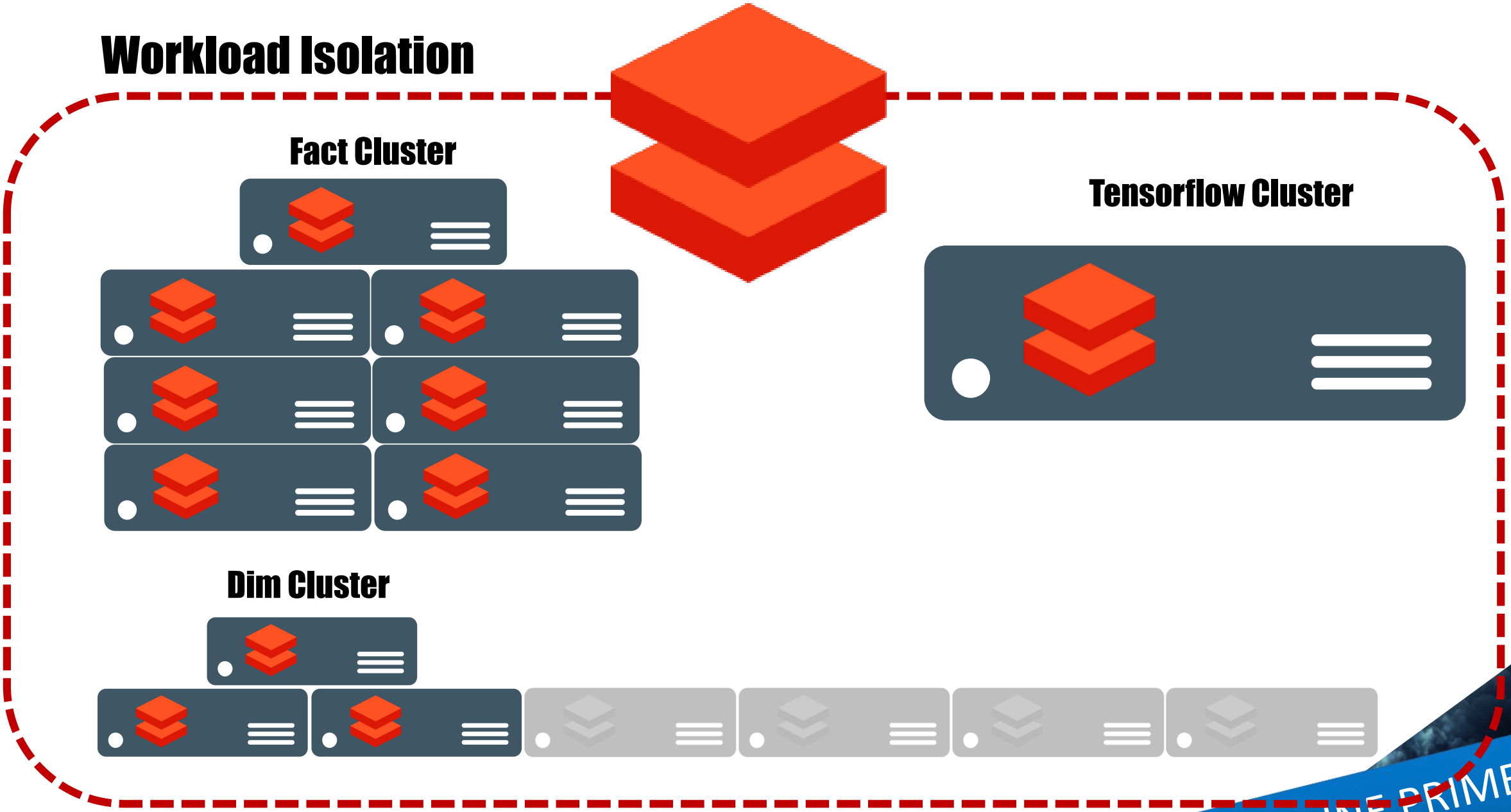
PATTERNS & IMPLEMENTATION

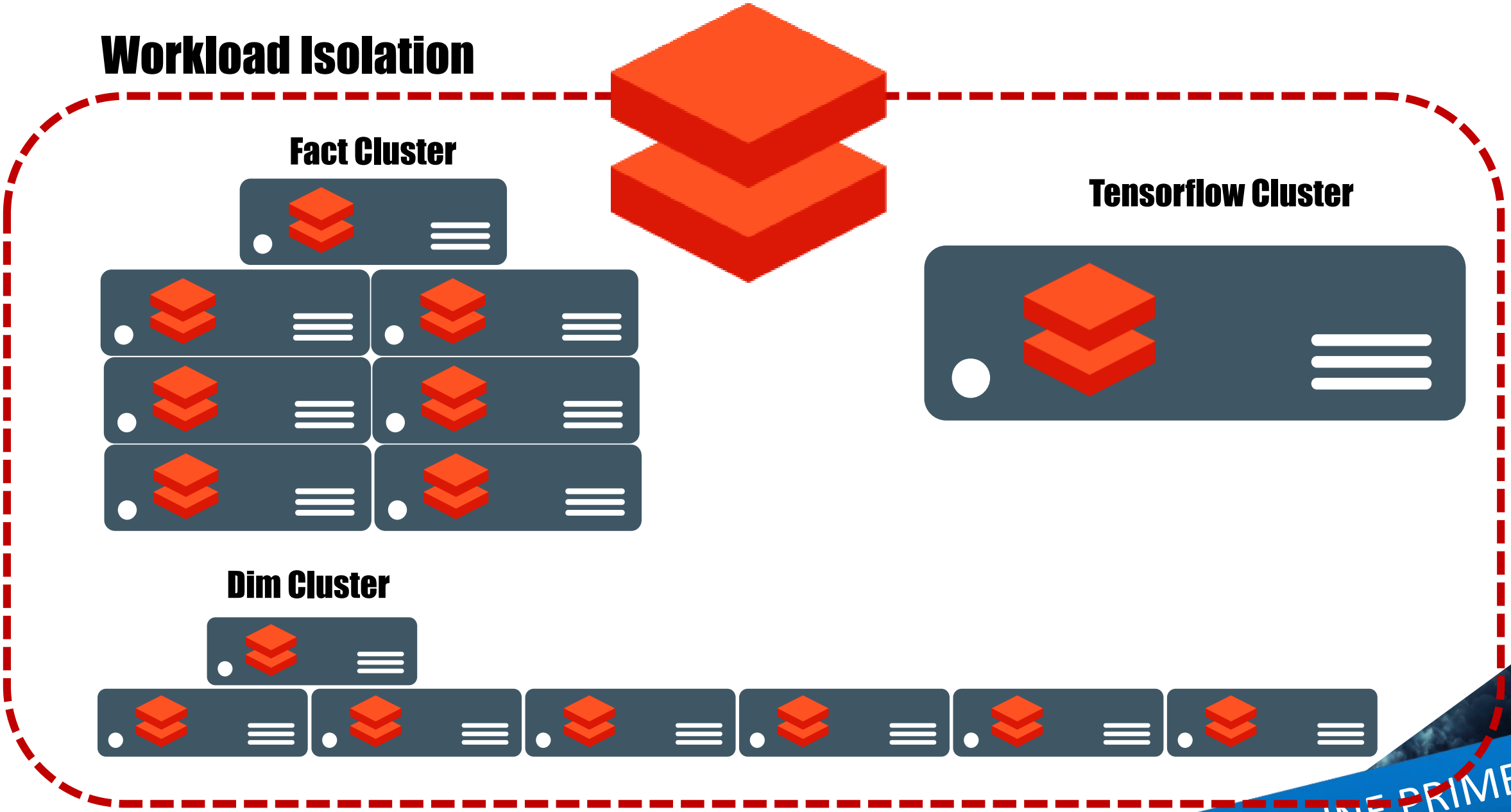
Workload Isolation



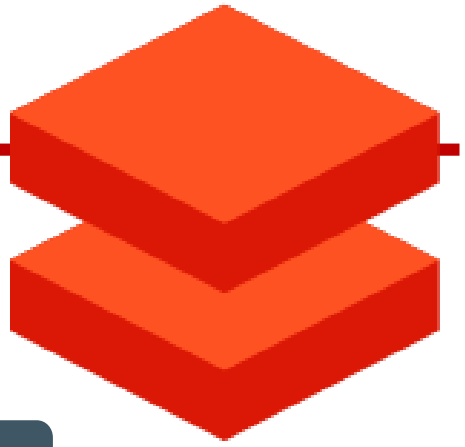
Workload Isolation



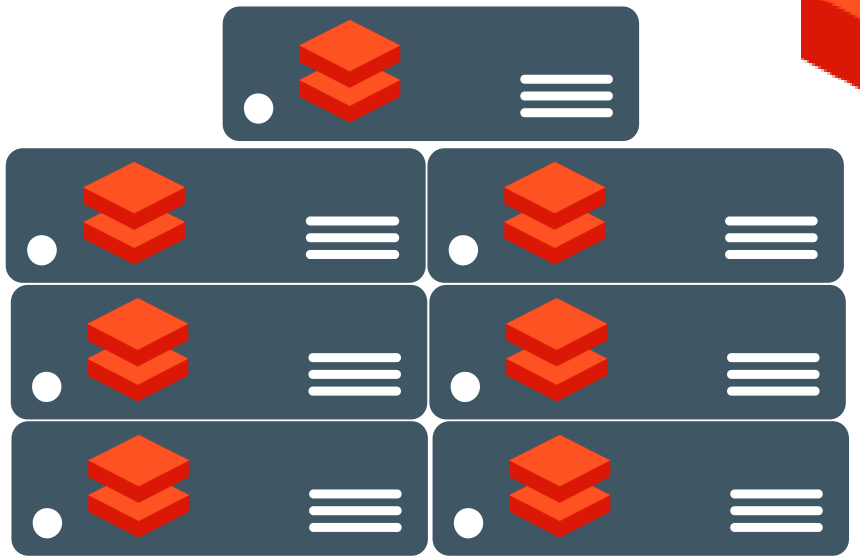
Workload Isolation



Workload Isolation



Fact Cluster



Tensorflow Cluster

Dim Cluster

(High Concurrency)

SO.... WHAT SIZE?

Size of Driver

What is the largest dataset that we will perform need to return to the user? What actions do we need to perform outside of the spark engine? How performance / memory intensive is it? How many concurrent workers does my driver need to handle?

Size of Worker

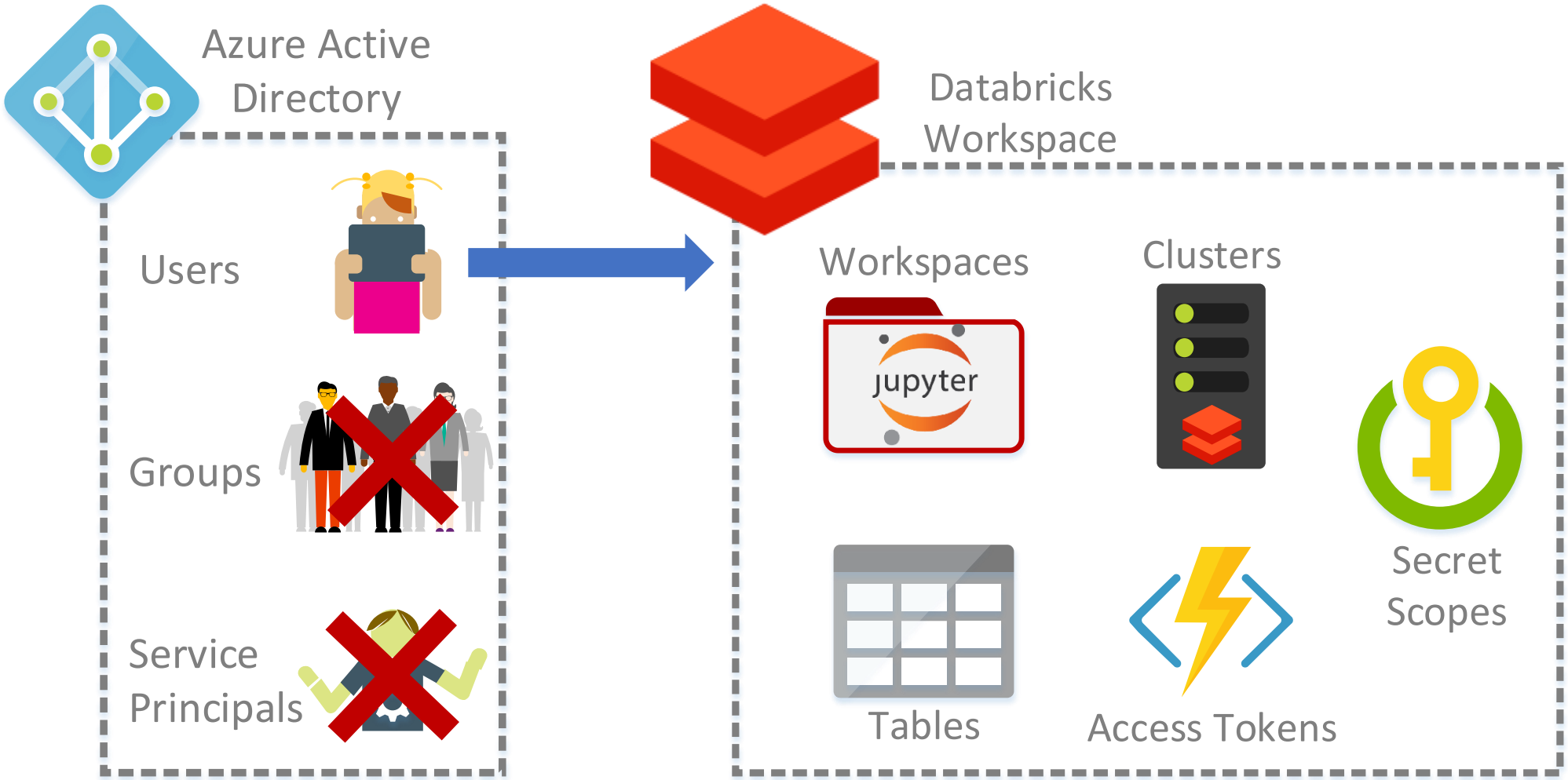
What is the largest data set/single partition that needs to fit on a single executor?
How much memory should be left over for performing calculations?
How fast should each executor finish their job?

Number of Workers

What is the total amount of data that needs to be held in memory (both for in transformation queries, and cached tables)
How much concurrency do I need?

SECRETS

USER MANAGEMENT



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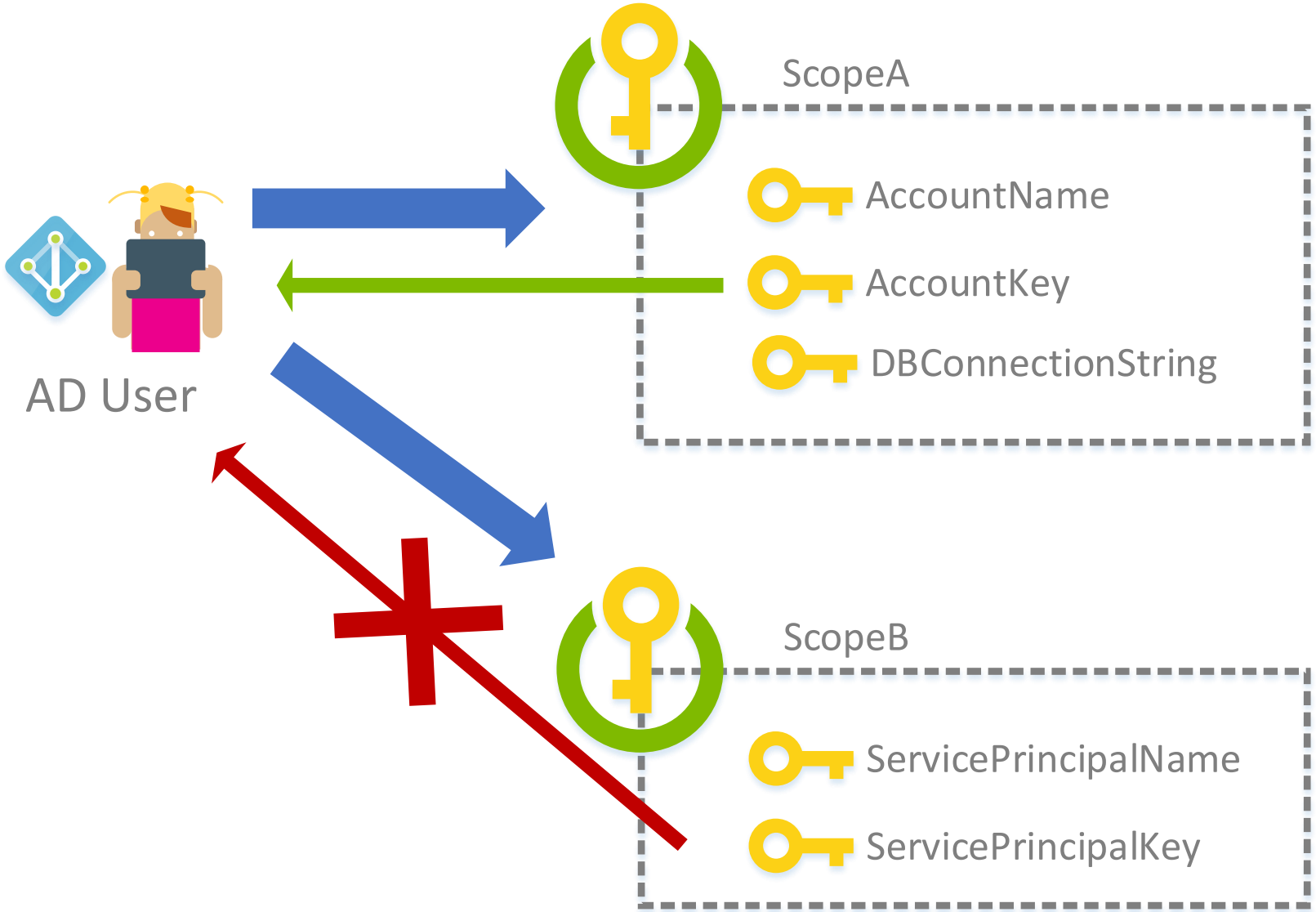
DATABRICKS SECRETS

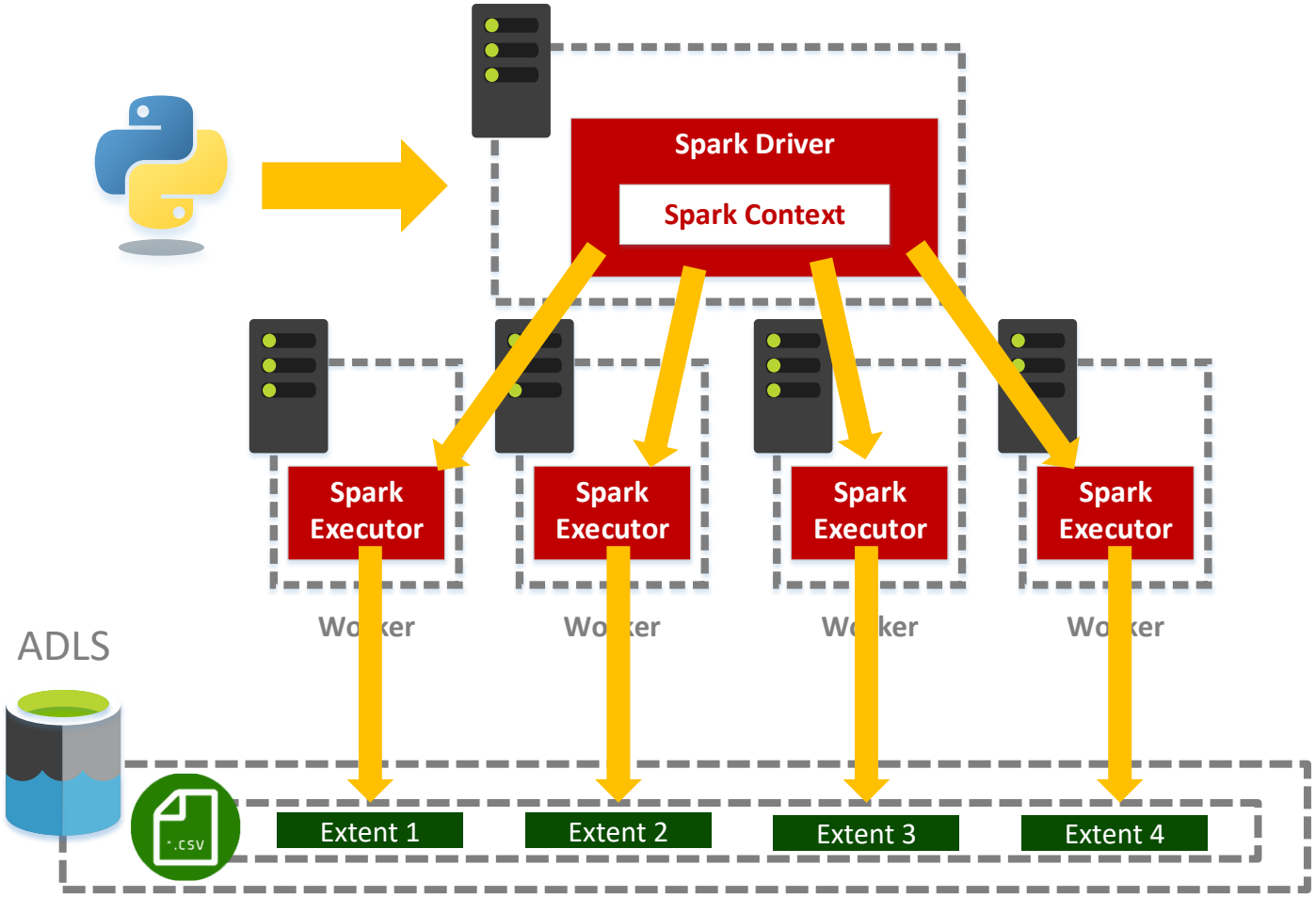


Secrets are never displayed in databricks notebooks, even if you have access!

Any attempt to display the value will return **[REDACTED]**!

EXECUTIONS

DISTRIBUTED COMPUTE



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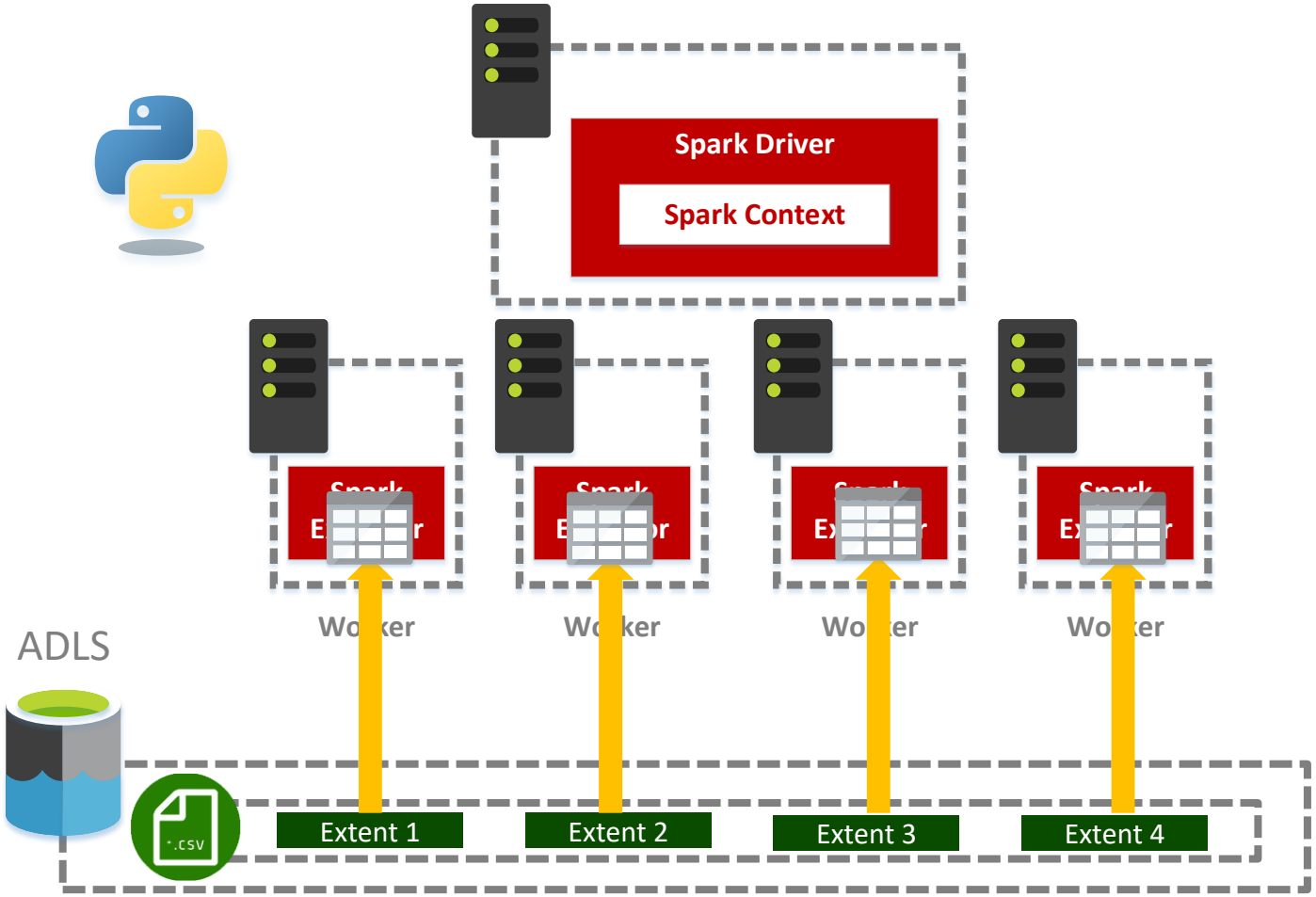
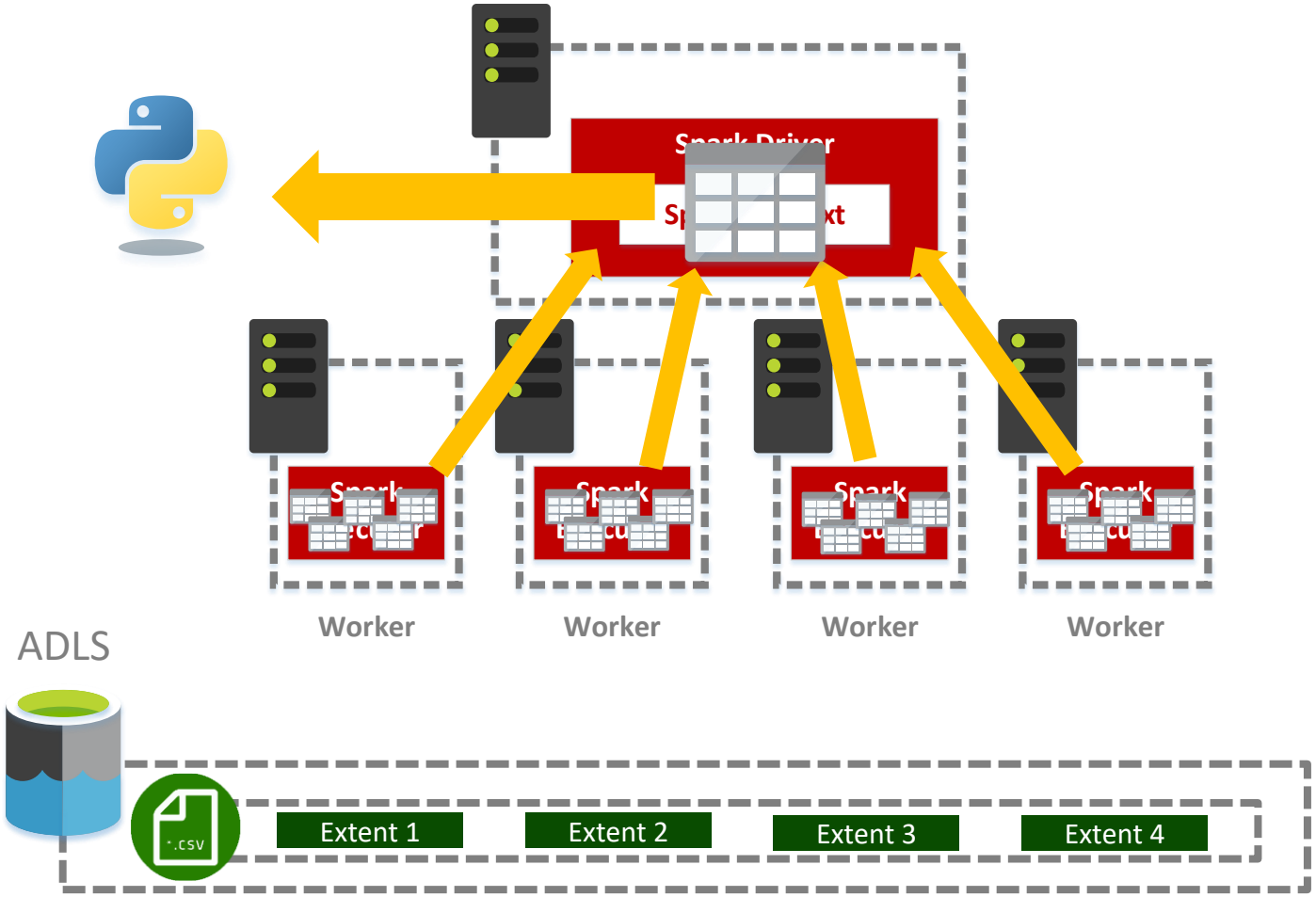
DISTRIBUTED COMPUTE



PYTHON PIPELINE PRIMER

DISTRIBUTED COMPUTE



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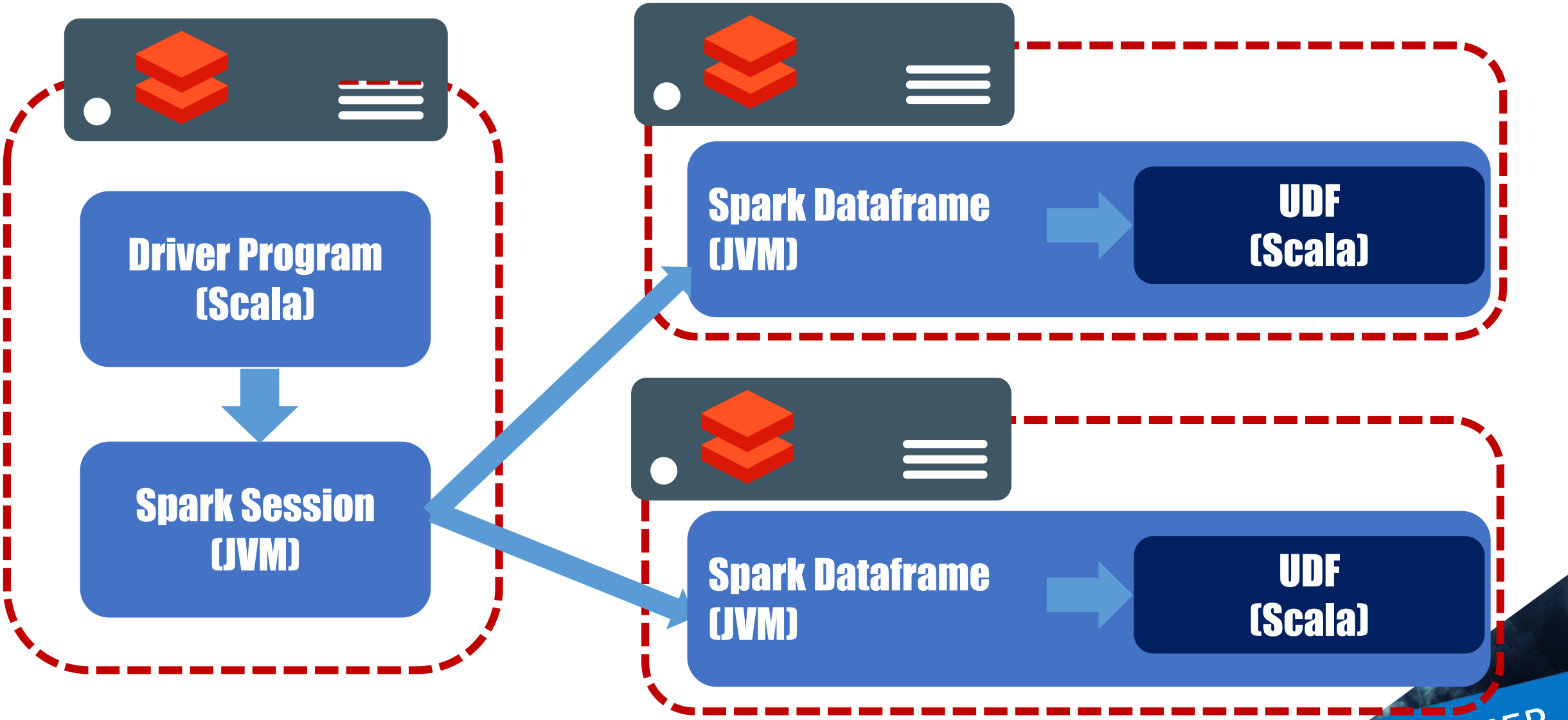
ALL LANGUAGES PERFORM THE SAME

...EXCEPT...

UDFS



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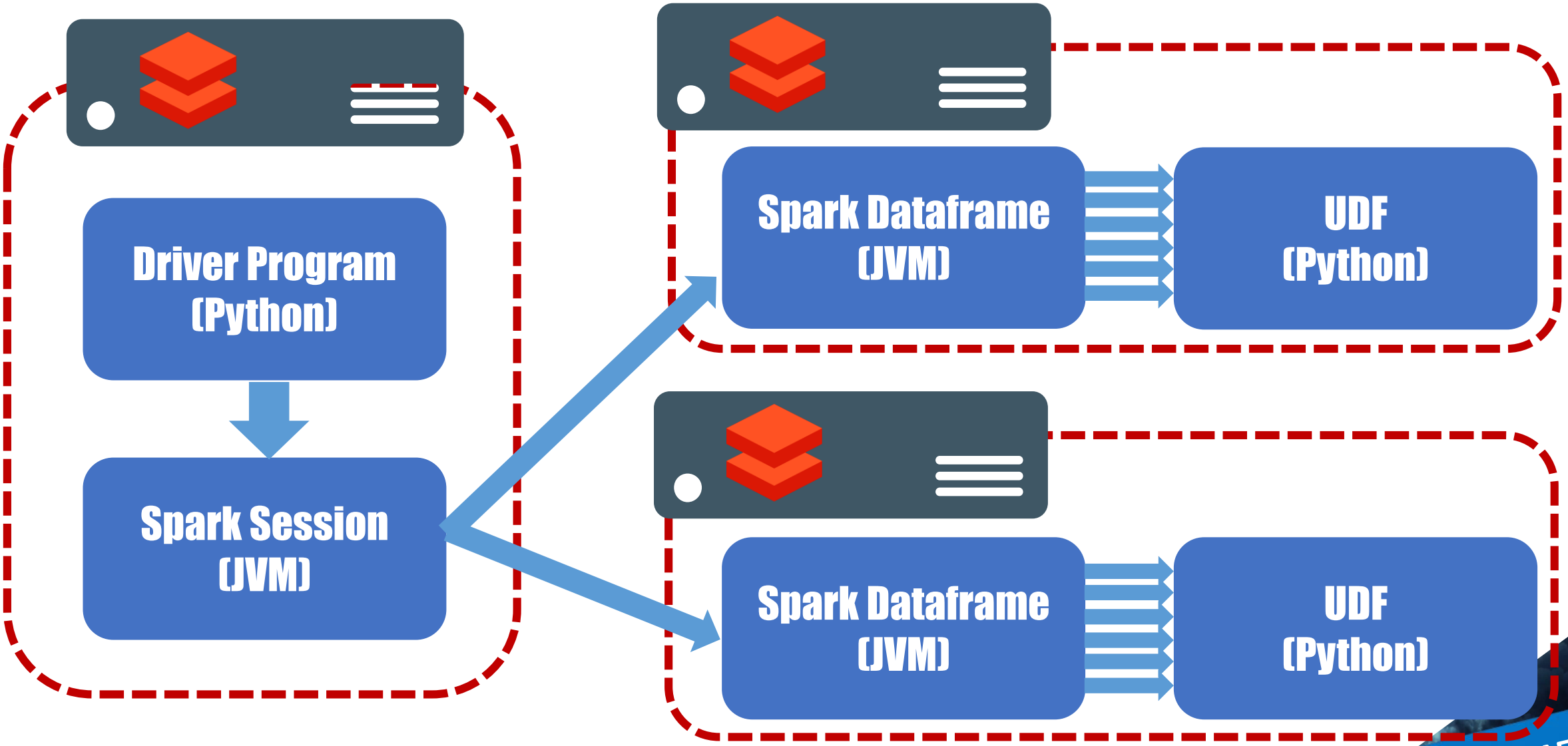

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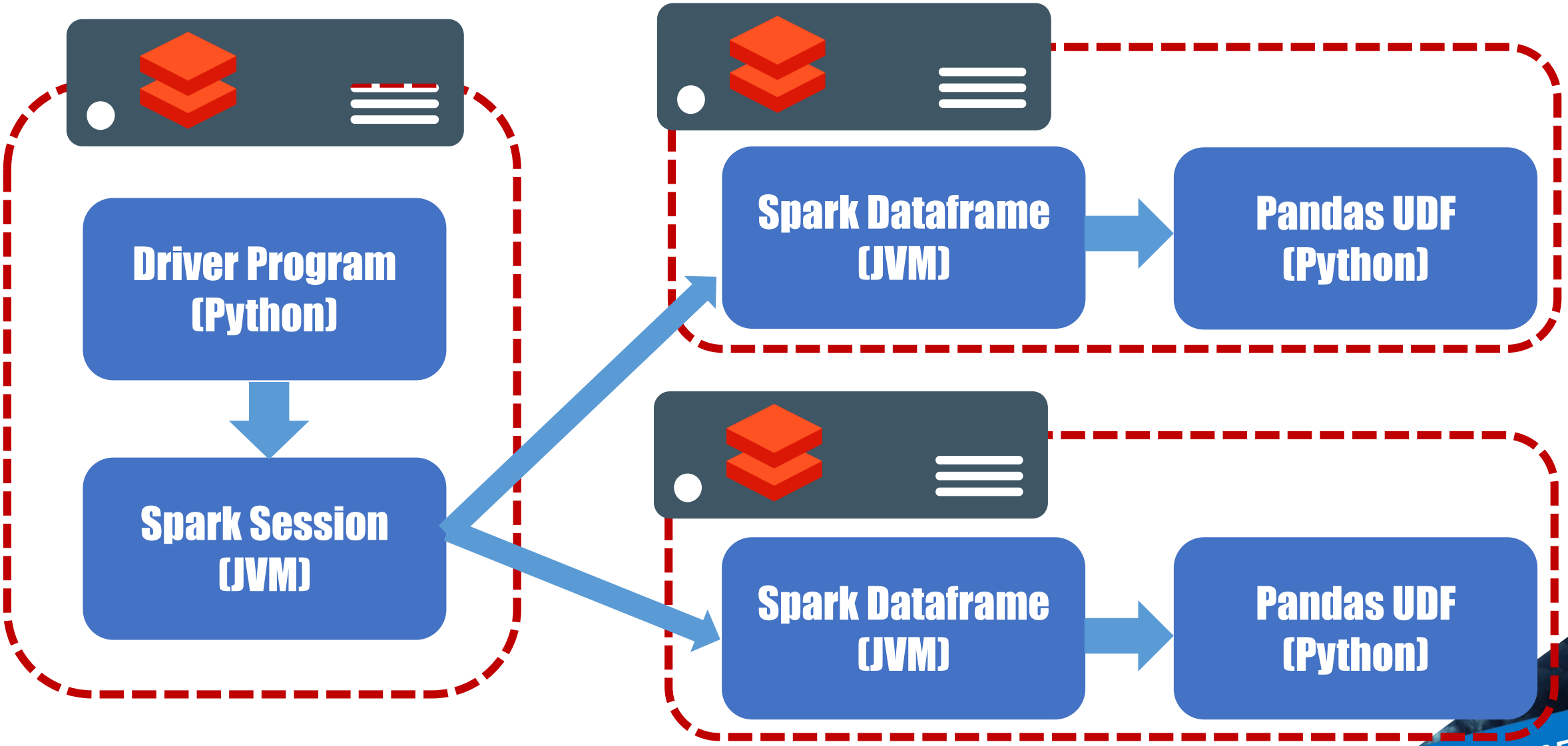

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Performance comparison of different UDF methods in Databricks

https://bit.ly/2CAXkVI

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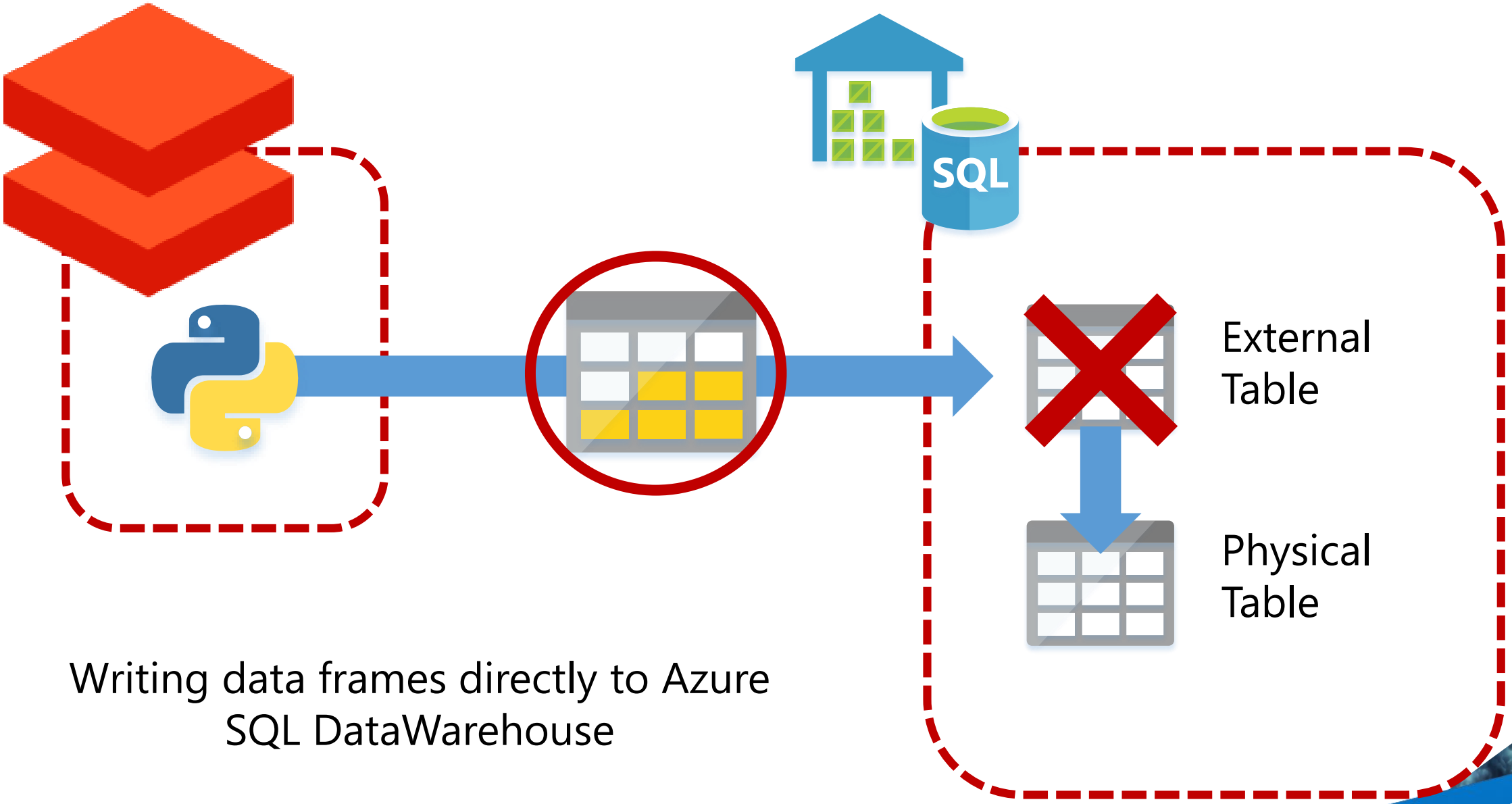

Writing data frames directly to Azure SQL DataWarehouse

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SCHEMA ON READ – INFER SCHEMA

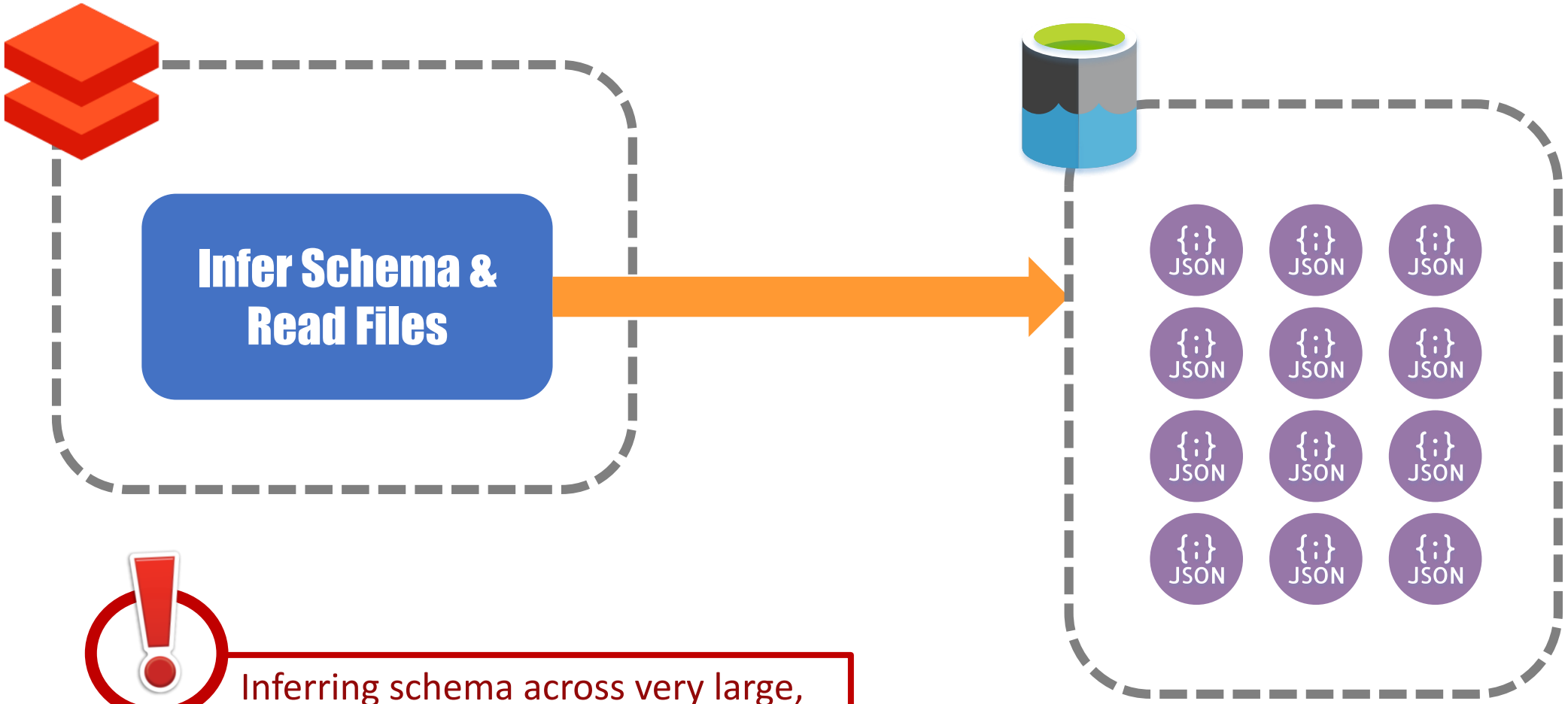
Cmd 3

```
df = sqlContext.read.format("csv") \
  .option("header", "true") \
  .option("inferSchema", "true") \
  .load("abfss://root@dblake.dfs.core.windows.net/RAW/Public/Taxi/v1/SmallSlice.csv")
```

```
df: pyspark.sql.dataframe.DataFrame
    Dispatching_base_num: string
    Pickup_DateTime: timestamp
    DropOff_datetime: string
    PUlocationID: integer
    DOlocationID: string
```

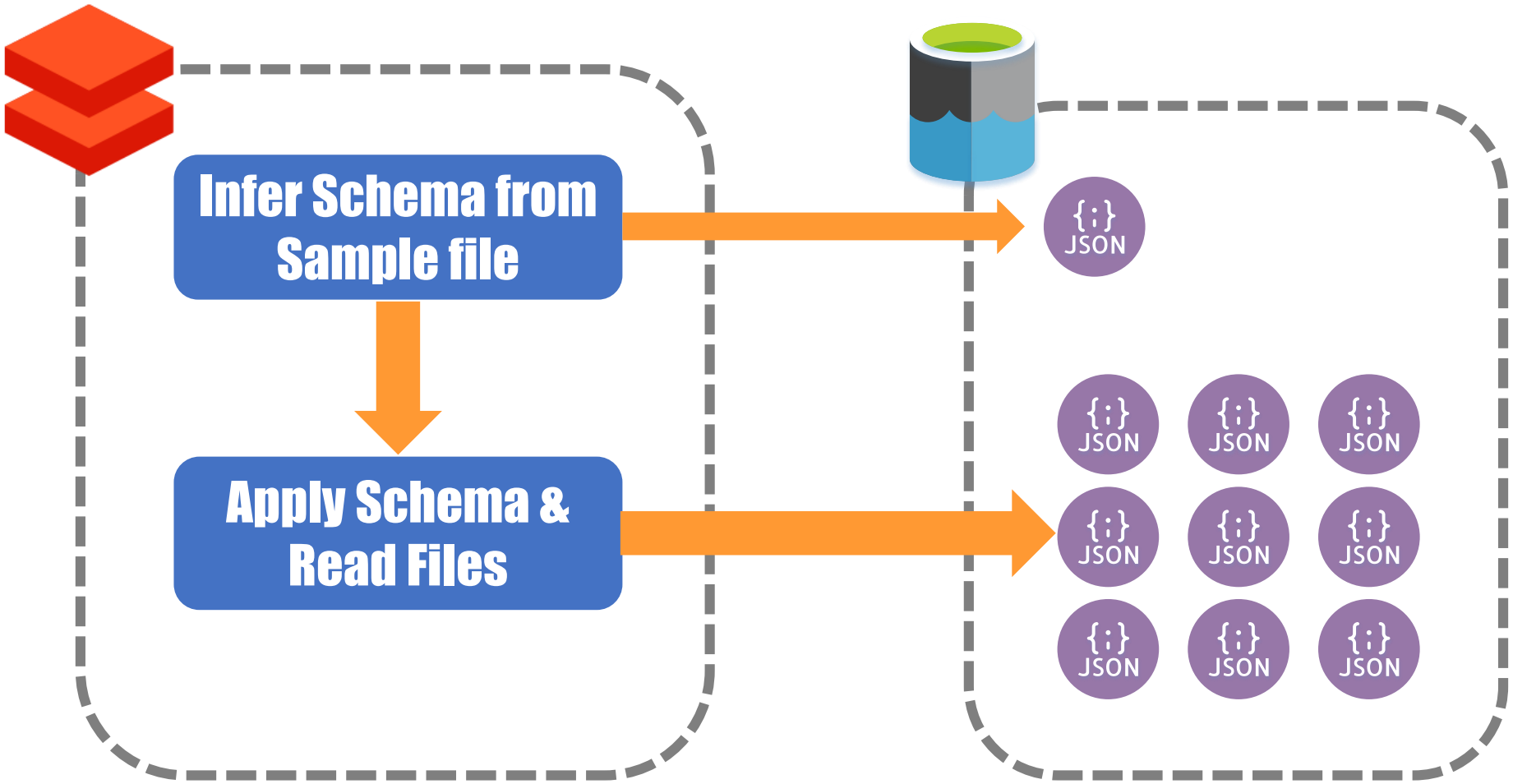
If the "inferSchema" option is used, Spark reads a sample of each file before creating a schema definition for the dataset

SCHEMA ON READ – INFER SCHEMA



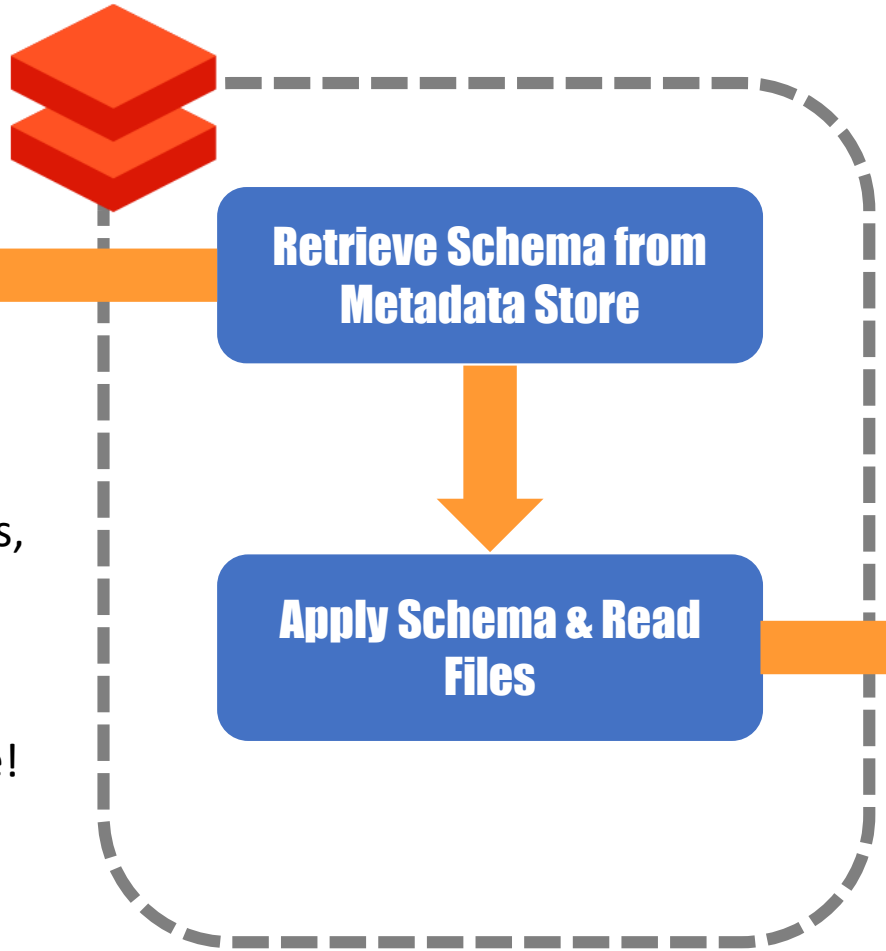
Inferring schema across very large, distributed datasets can perform very badly!

SCHEMA ON READ – SAMPLE FILES

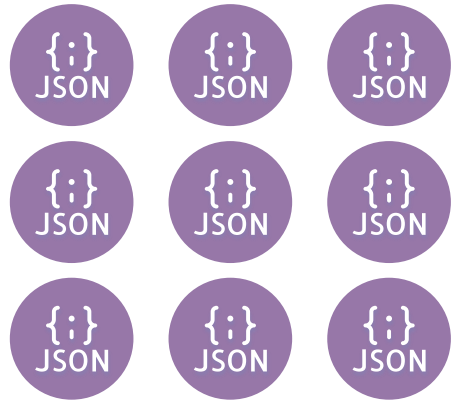


Acquire schema metadata by inferring schema from a small file sample before reading large datasets

SCHEMA ON READ – METADATA STORE



Metadata DB

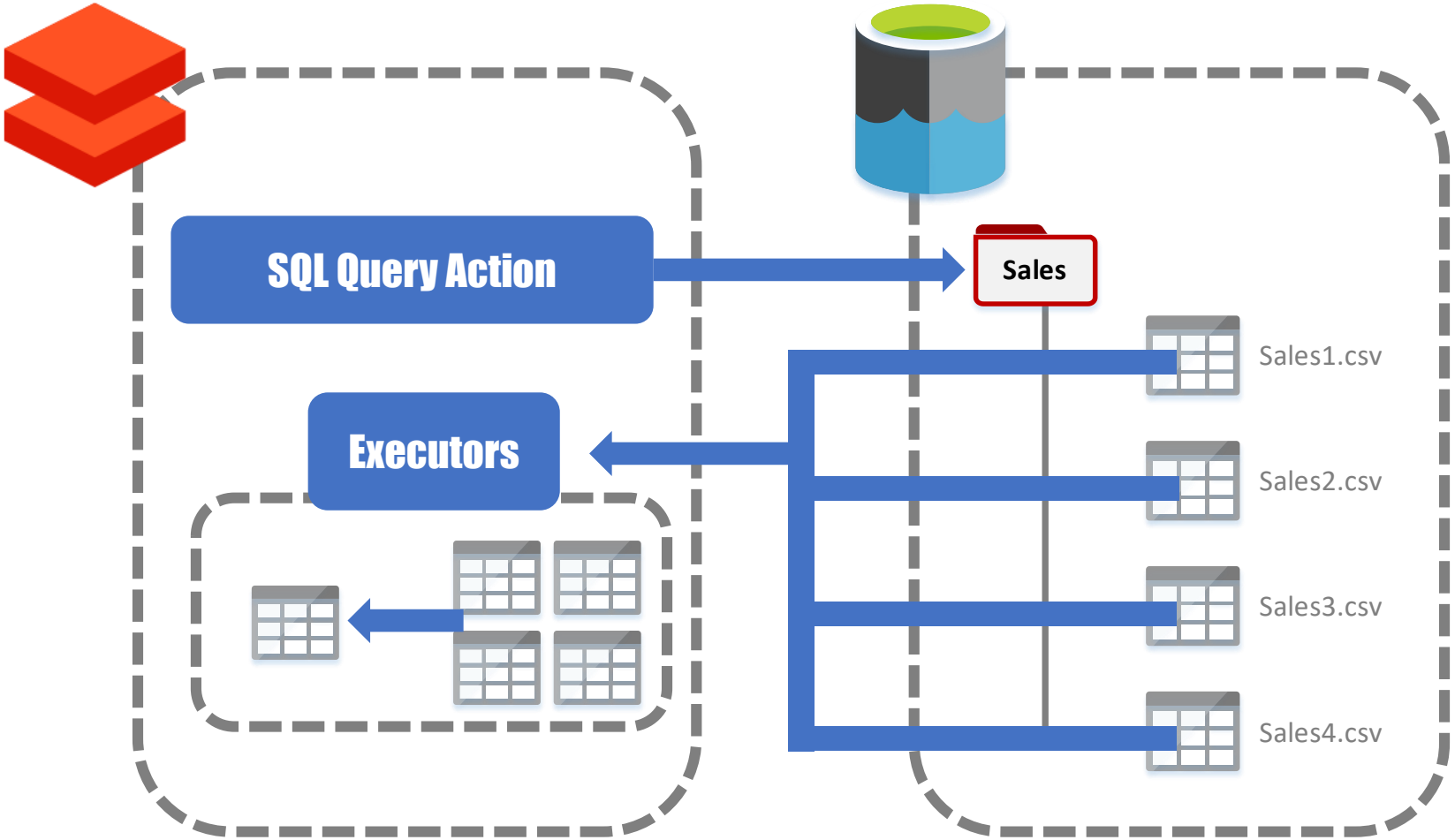


For more formal systems, implement a metadata repository holding the expected schema for entities within your lake!

Don't Forget – some file types have the schema metadata built into them! Files such as Parquet don't need a schema to be supplied!

READING FILES – NO PARTITIONS

*SELECT * FROM MyFiles WHERE Year = 2019 AND Month = 3*

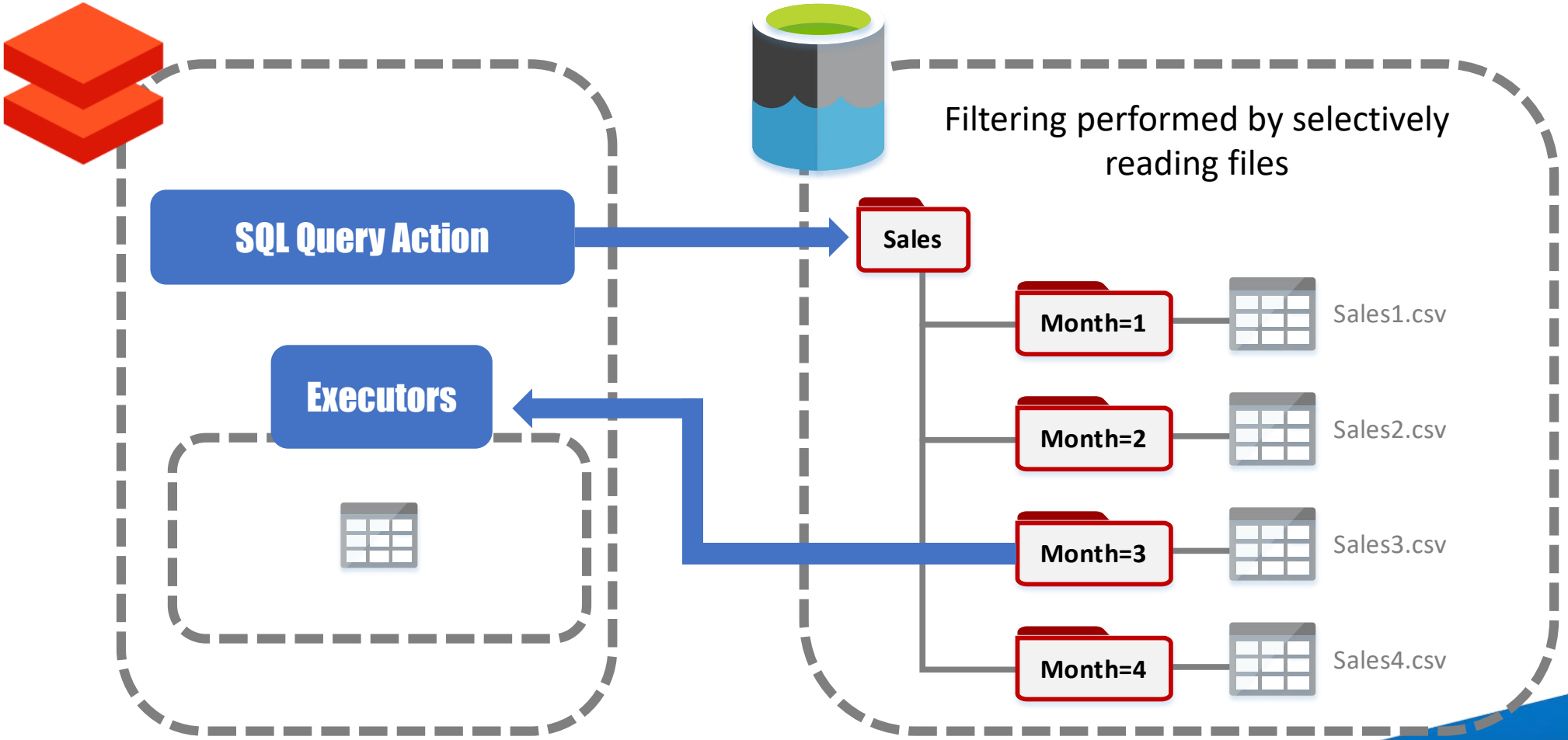


Filtering performed on executors after reading all files

Databricks has no knowledge of what each file contains, so if you try to filter on a specific column, it will read all files then filter the DataFrame in memory

READING FILES – PARTITIONED

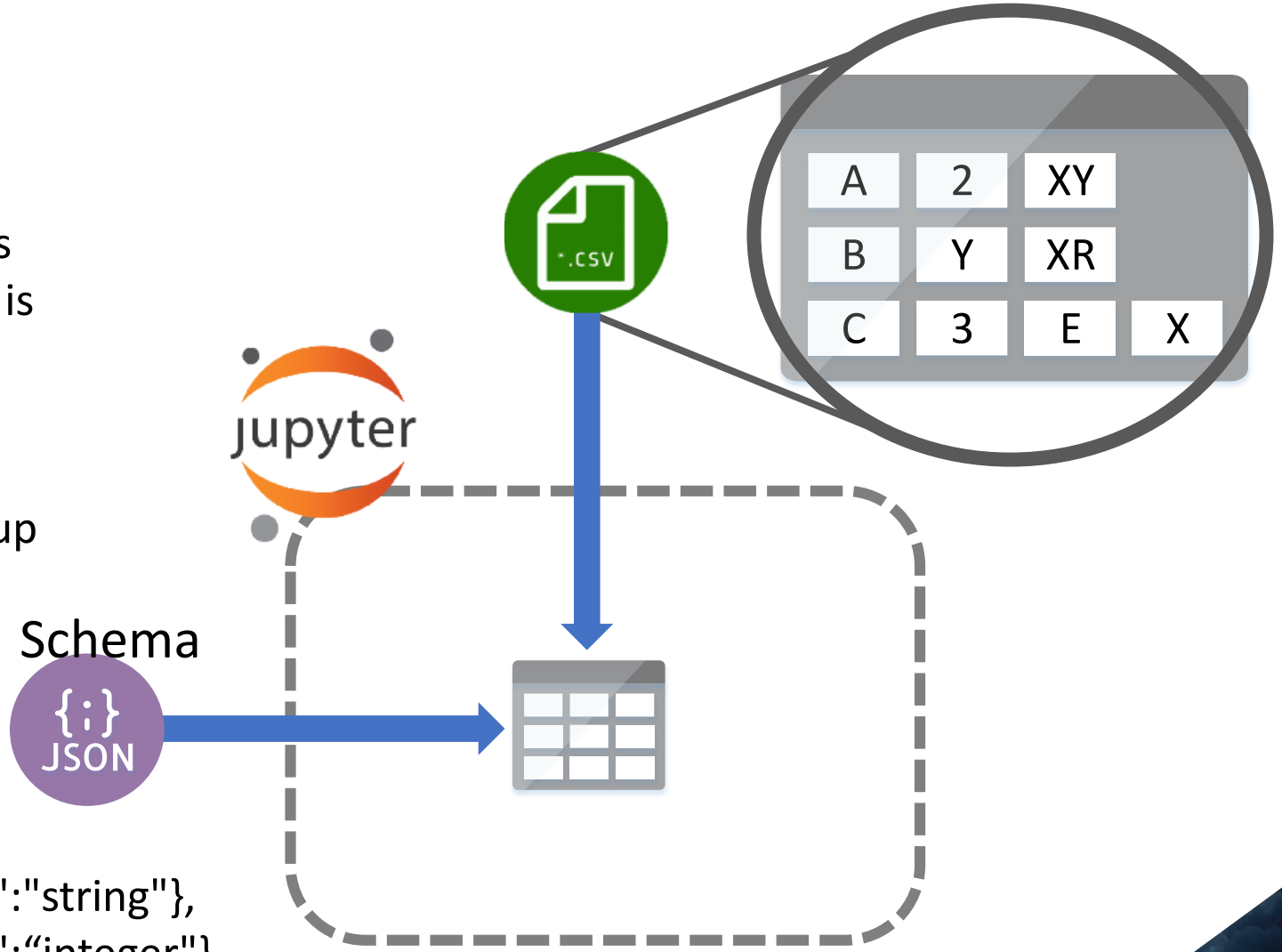
*SELECT * FROM MyFiles WHERE Year = 2019 AND Month = 3*



DATA VALIDATION

With Schema-On-Read file types such as CSV, we need to make sure that the data is in the format that we expect it to be.

Let's assume that we're specifying the schema ourselves, from an external lookup




```
{"fields":[
{"name":"Col1","nullable":true,"type":"string"},
{"name":"Col2","nullable":true,"type":"integer"},
{"name":"Col3","nullable":true,"type":"string"}
]}
```

DATA VALIDATION

We have three different methods for handling failed parsing of a DataFrame when accessing text datasets such as csv:

string	int	string	
A	2	XY	
B	Y	XR	
C	3	E	X

A	2	XY
null	null	null
C	3	E

1. **PERMISSIVE** – Extra columns are simply ignored, if any column fails to parse the entire row is nullified

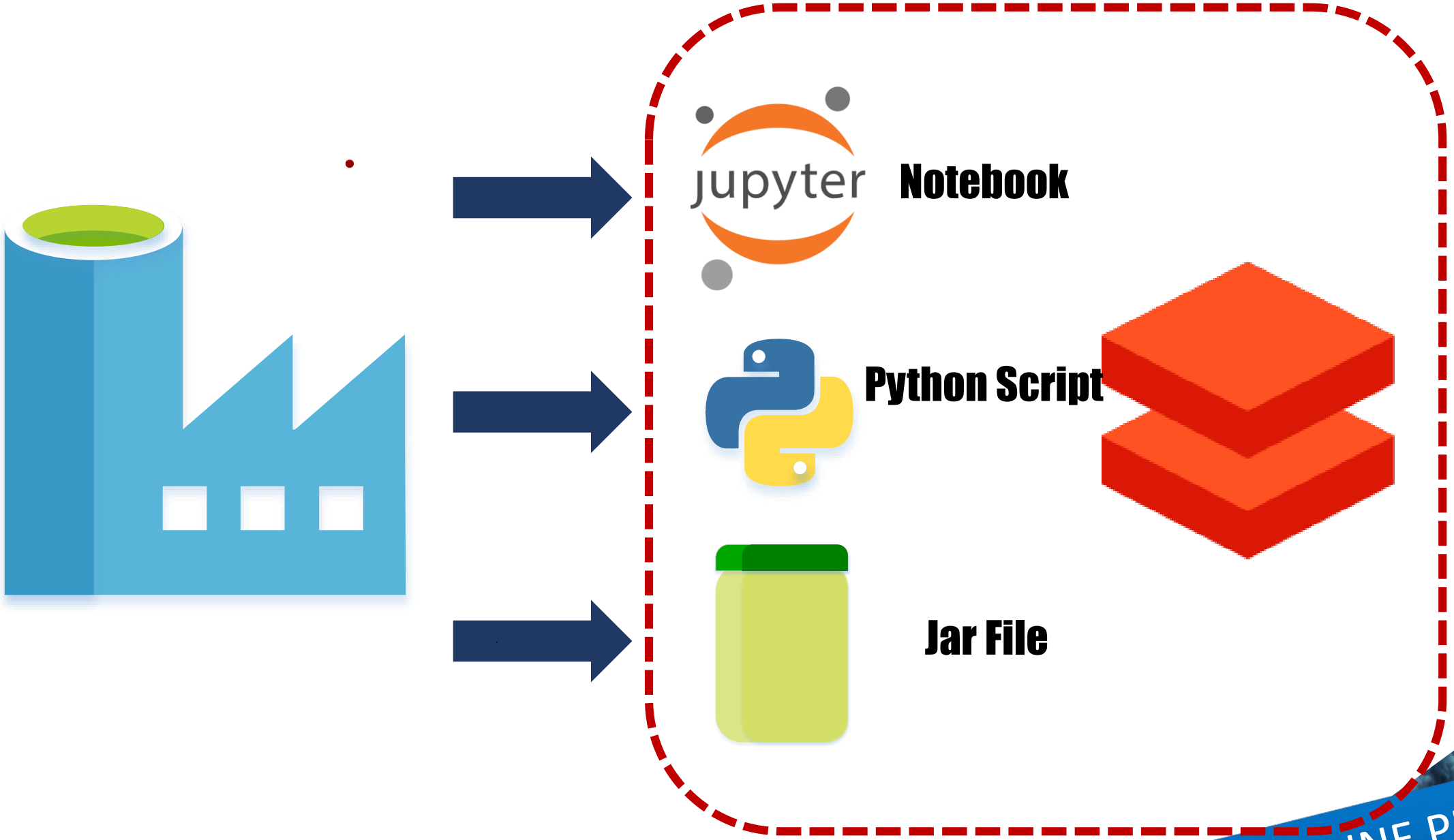
A	2	XY	
B	Y	XR	
C	3	E	X

2. **FAILFAST** – If any attributes are different to the specified schema, whether by failing to parse datatypes or attributes added/missing, the entire DataFrame will fail to load

A	2	XY

3. **DROPMALFORMED** – Any rows that differ from the schema will be silently dropped from the dataset, also known as the "Nothing to see here" approach to ETL…

ORCHESTRATION



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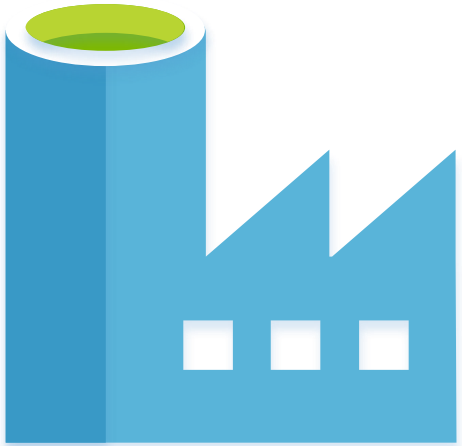
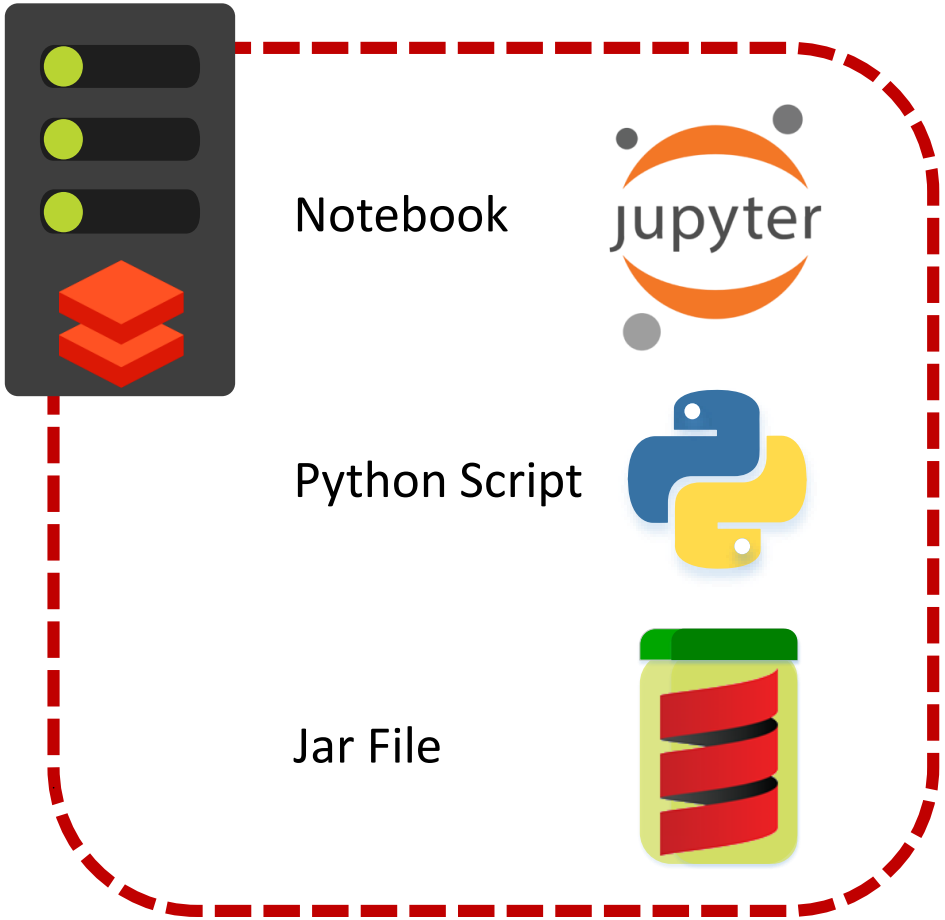
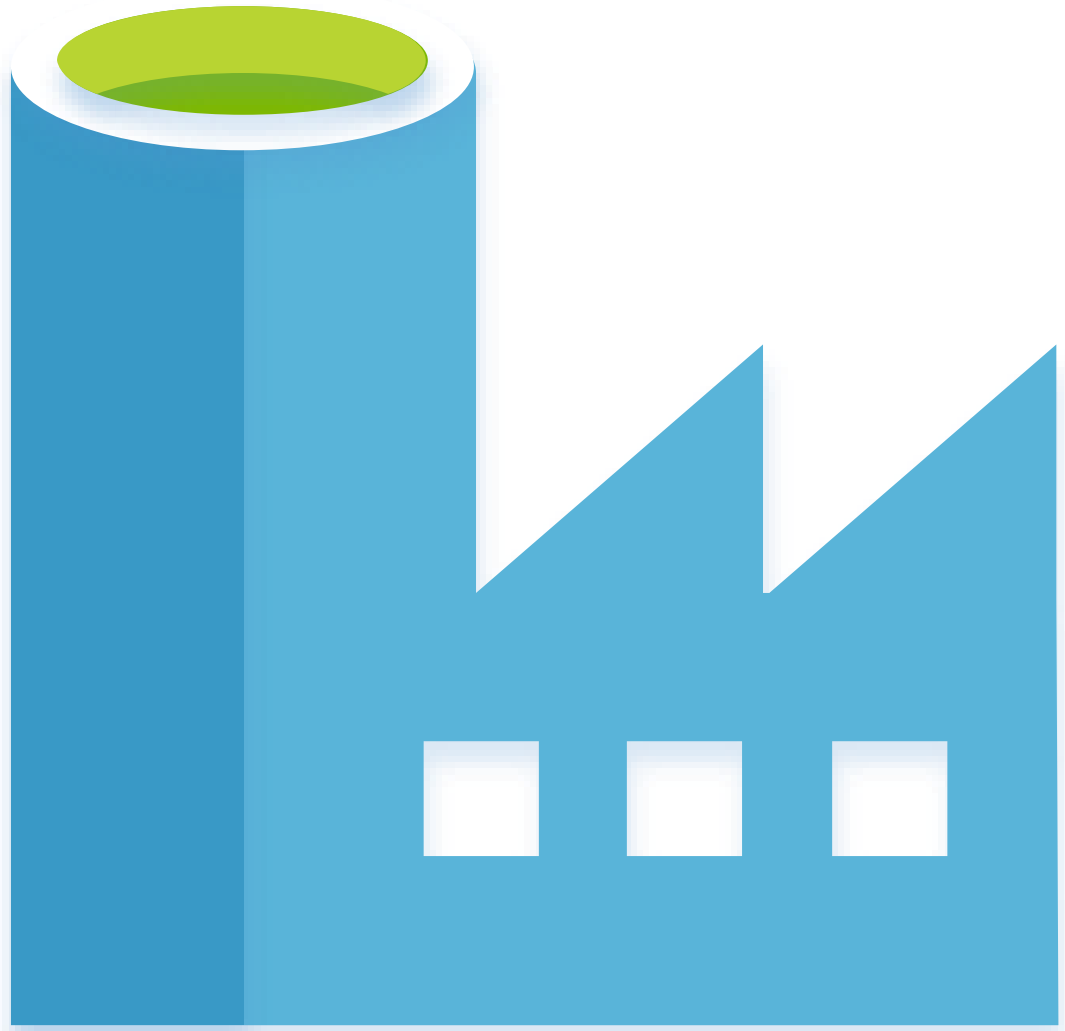
AZURE DATA FACTORY





ADF uses Databricks Jobs behind the scenes, but takes away some of the work, and means you can orchestrate your notebooks with other tasks!

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



Azure Data Factory

Mapping Data Flows

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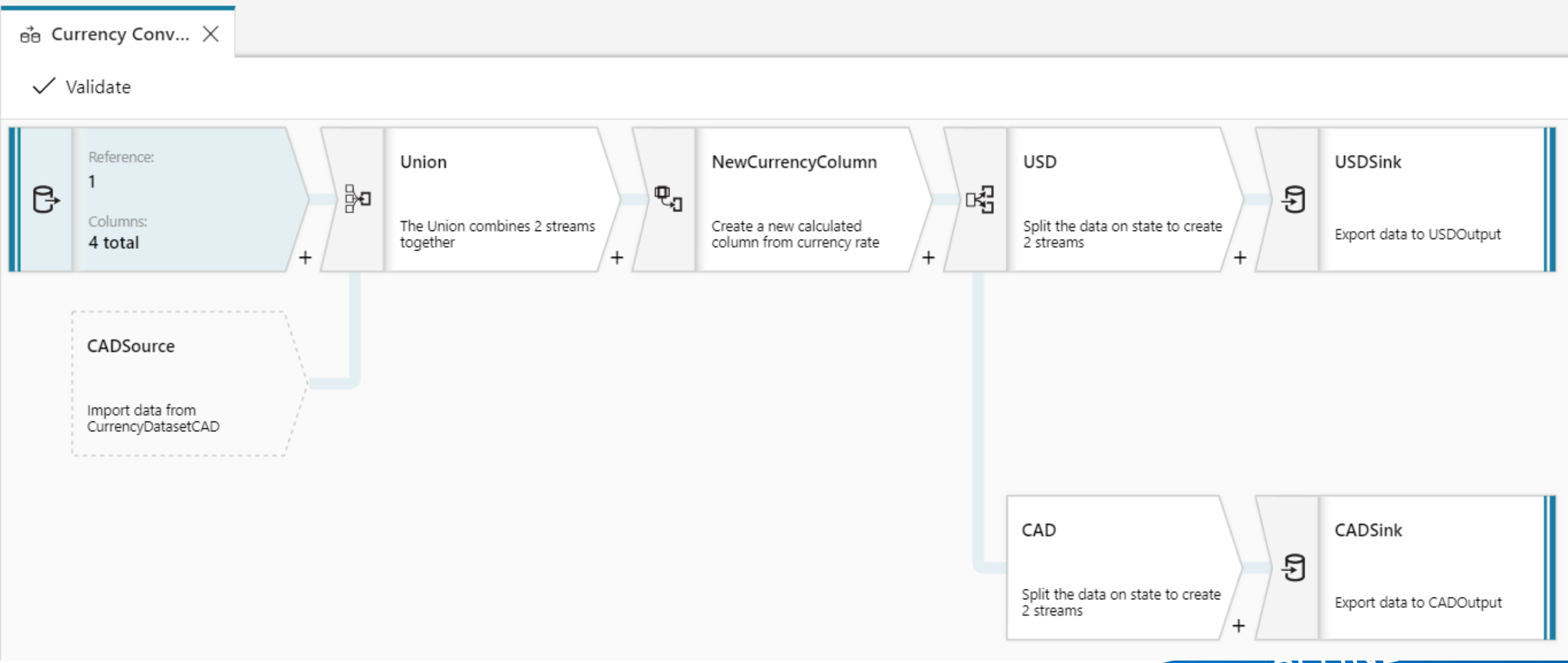
New Data Factory DataFlows can write Databricks processing packages for you!!



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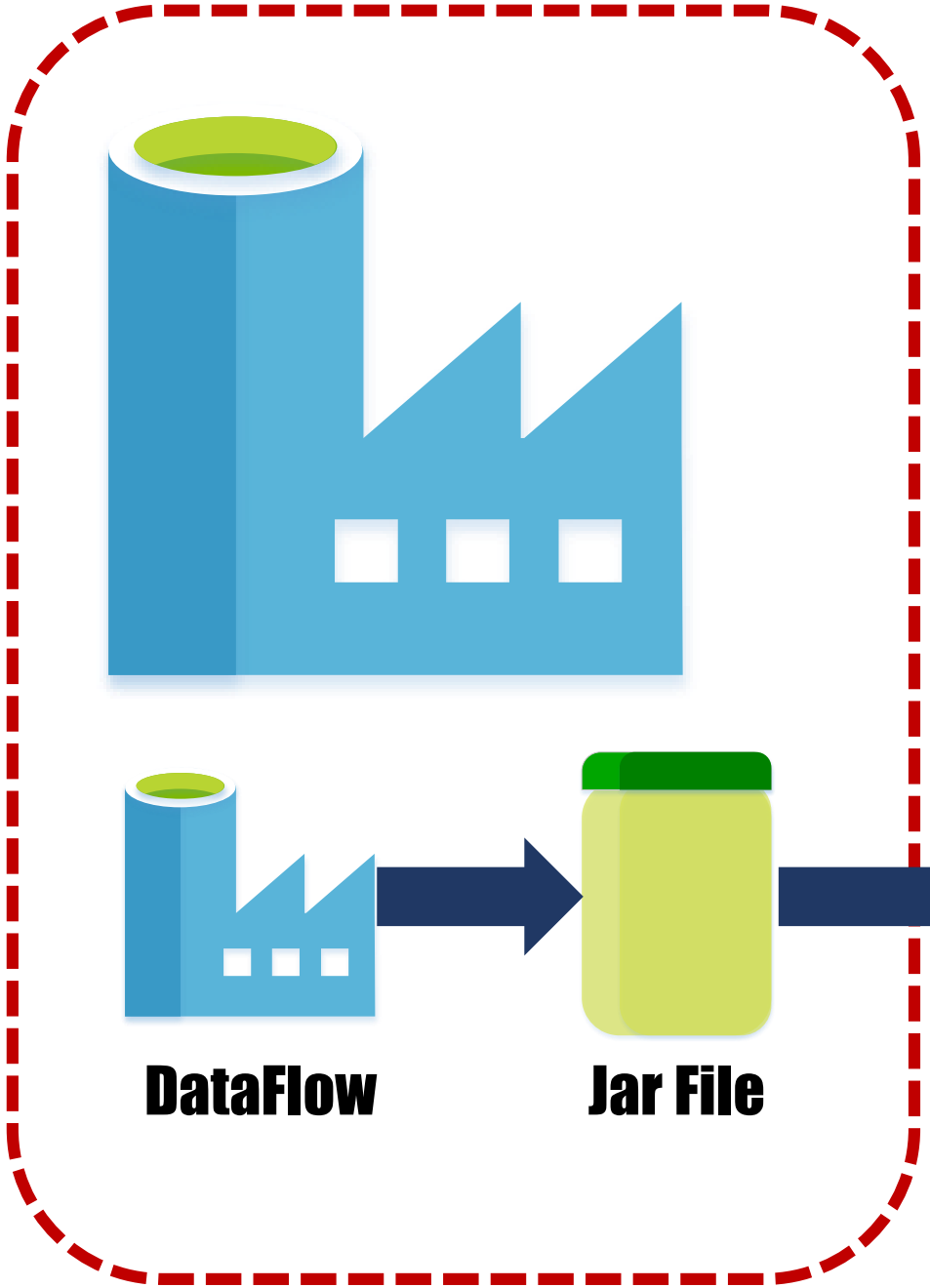
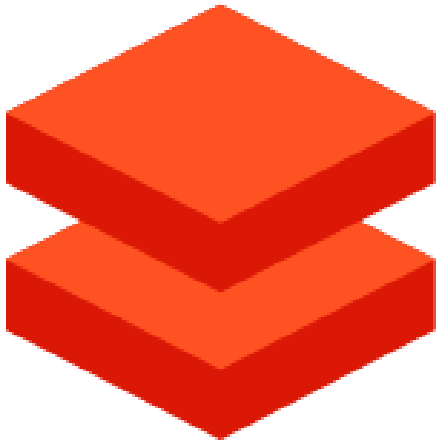


Dataflows will compile down to a JAR file which will be sent to the Databricks cluster for execution



This means it uses Scala!

ANY QUESTIONS?

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