ADVANCING DATABRICKS

Understanding Spark to build next-gen ETL systems

Microsoft Partner
Microsoft
Gold Data Analytics
Gold Data Platform
Silver Cloud Platform

databricks

Sponsors

Track

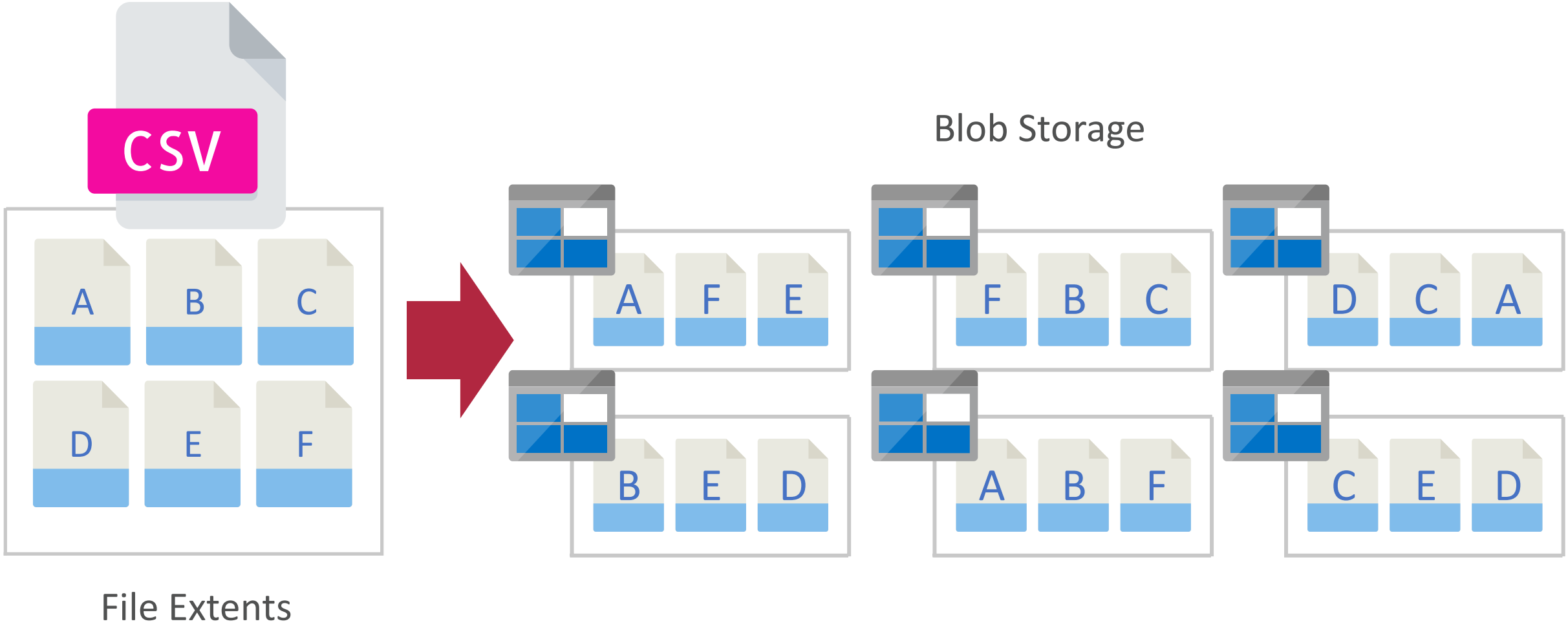
Event

HTTPS://GITHUB.COM/SIWHITELEY/DATABRICKSETL

Google File System Papers Released

2003

HDFS IN AZURE

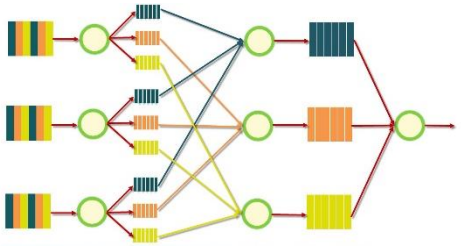


Google File System Papers Released

2003

Google MapReduce Papers

2004



ADVANCING ANALYTICS

Input

This is a large document

This might come from a log file

Or it might come from your user input

Split

This is a large document

This might come from a log file

Or it might come from your user input

Map

This, 1
is, 1
a, 1
large, 1
document, 1

This, 1
might, 1
come, 1
from, 1
a, 1
log, 1
file, 1

Or, 1
it, 1
might, 1
come, 1
from, 1
your, 1
user, 1
input, 1

Shuffle

This (1,1)

is (1)

a (1,1)

large (1)

document (1)

might (1,1)

come (1,1)

from (1,1)

log (1)

Or (1)

file (1)

it (1)

your (1)

user (1)

input (1)

Reduce

This, 2
might, 2
come, 2
from, 2
a, 2
is, 1
large, 1
document, 1
log, 1
Or, 1
file, 1
it, 1
your, 1
user, 1
input, 1

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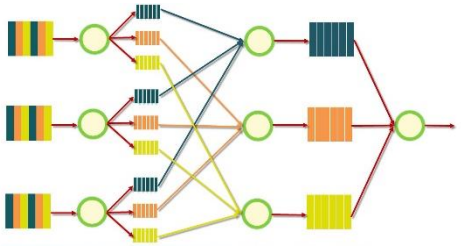


2006

Apache Hadoop project created

Matei Zaharia starts Spark project

2009

Project donated to Apache Foundation

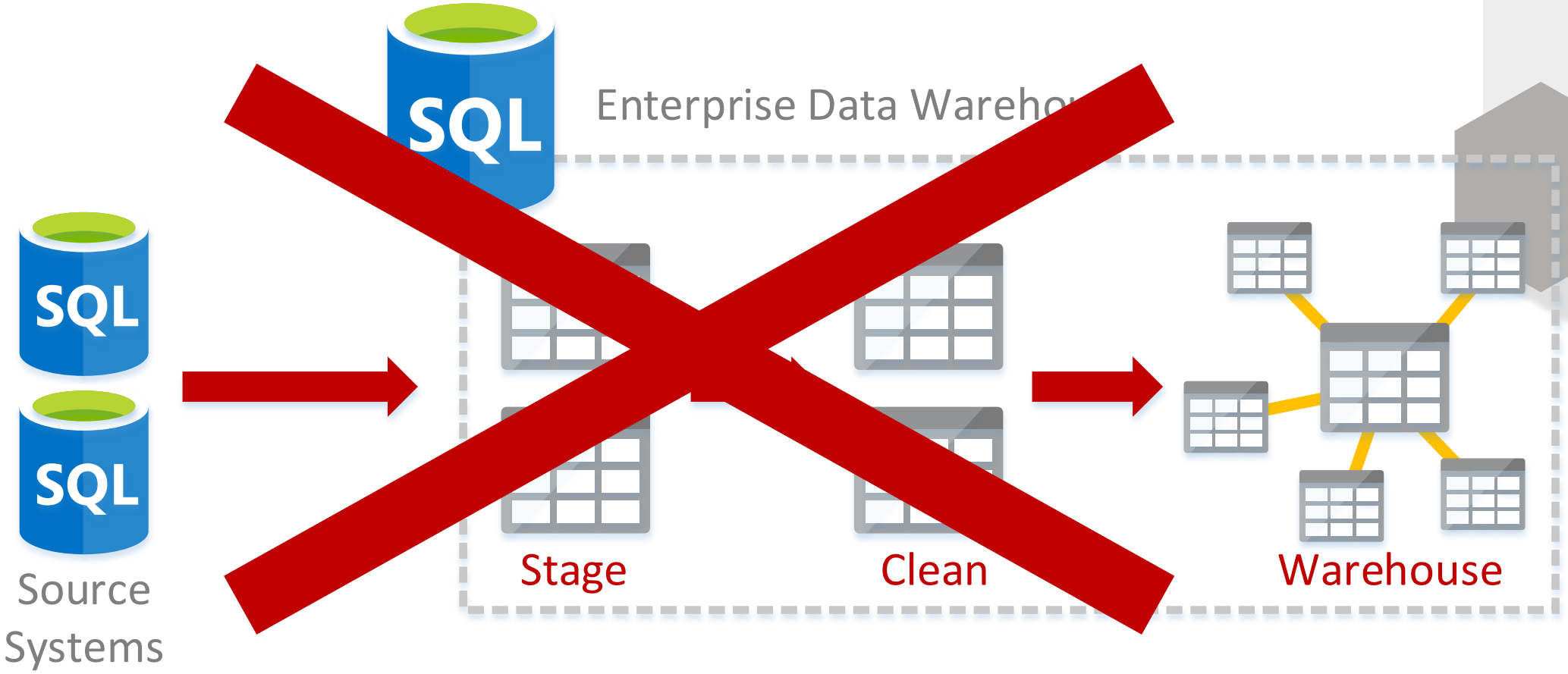
2013

Databricks founded by Matei & UC Berkley Colleagues

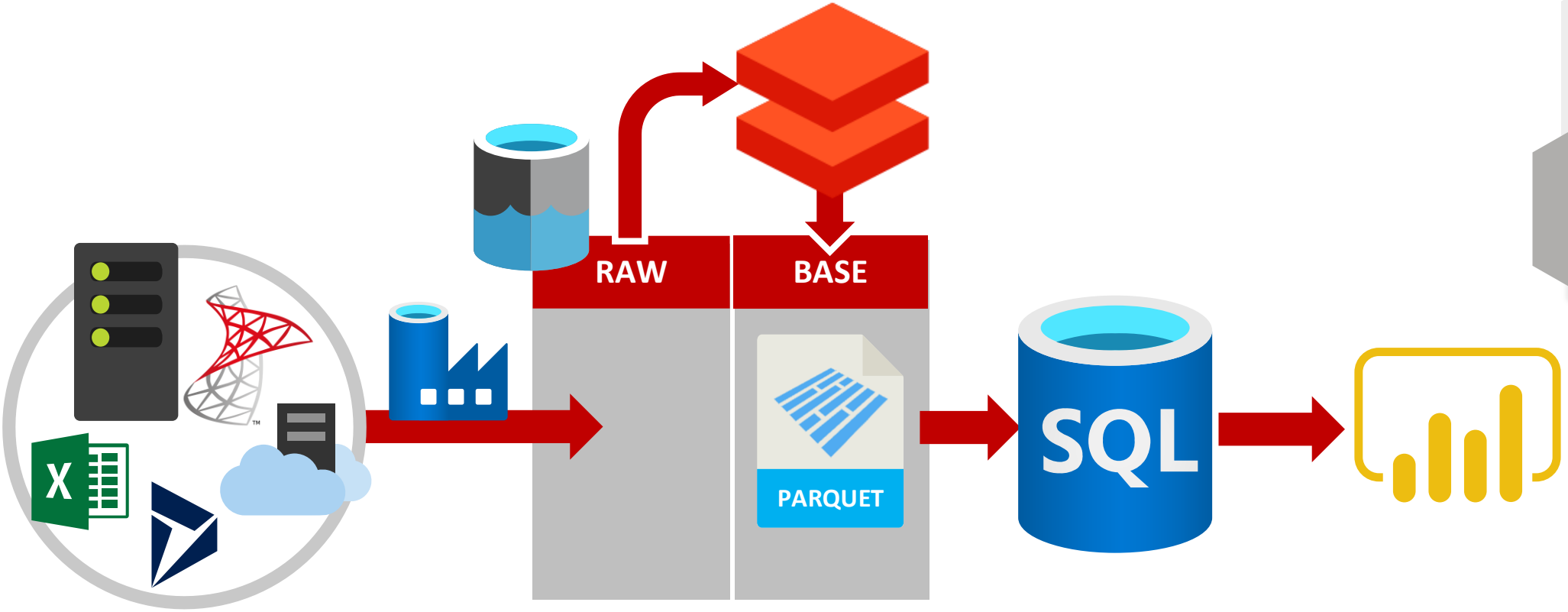
2013


JSON
jupyter
Language Flexibility
SQL
R
SQL
SQL
Integrations

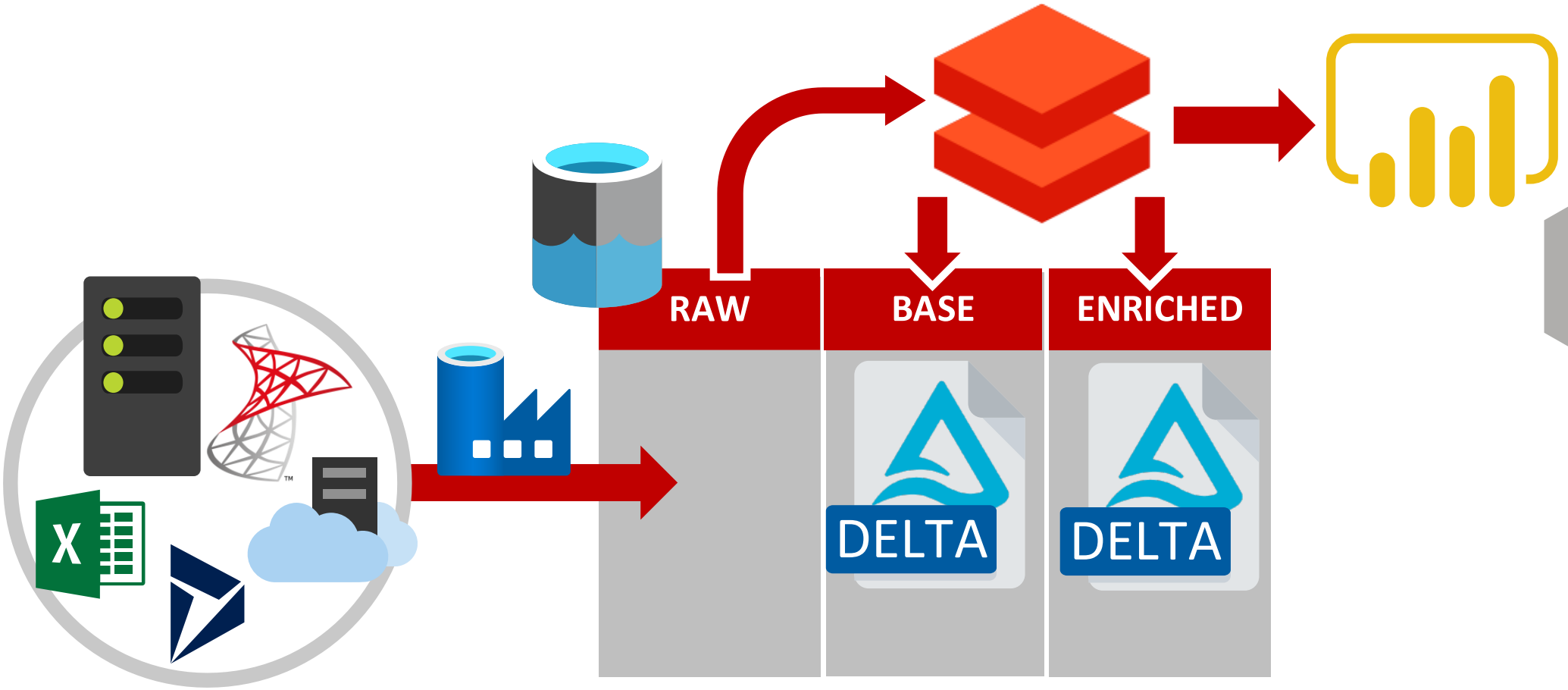
BUT MOST OF ALL…



MODERN DATA WAREHOUSE

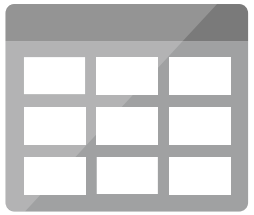


DATA LAKEHOUSE



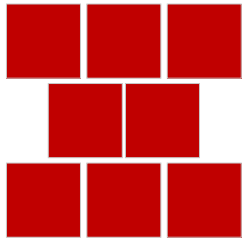
SPARK INTERNALS

UNDER THE HOOD



DataFrame API

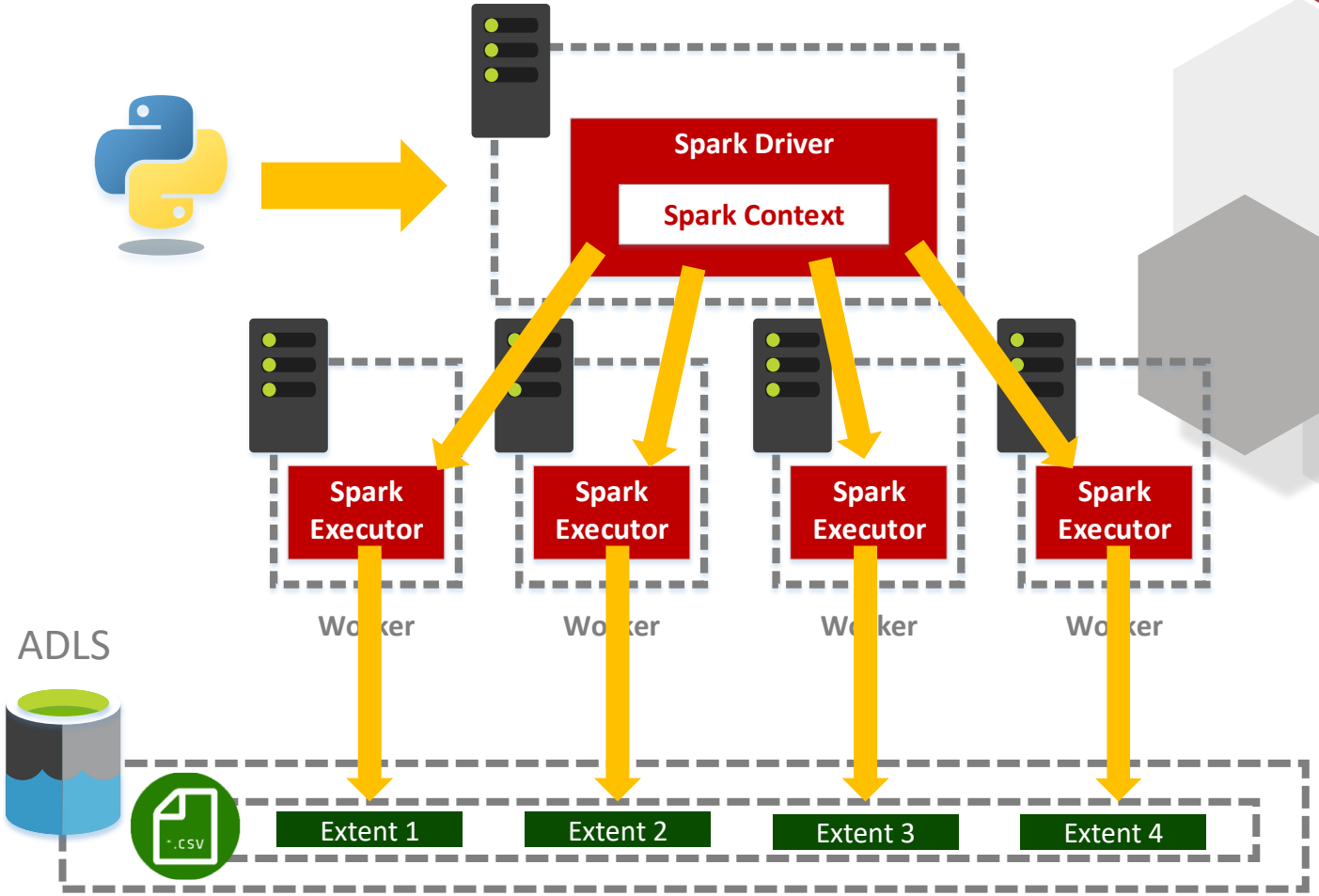
SQL API



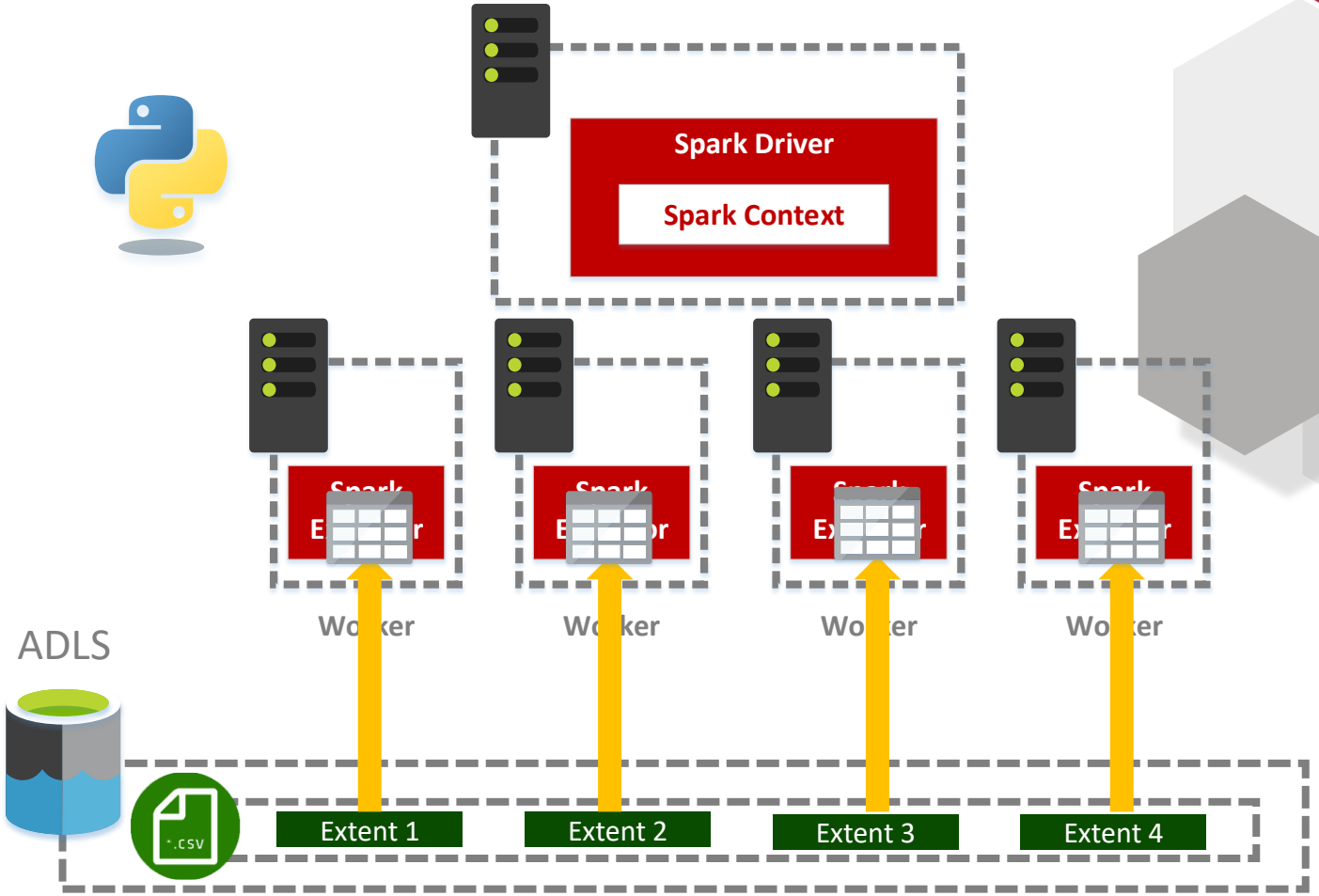
Resilient Distributed Datasets – In-Memory Data Blocks

Core Spark Engine – 80% Scala Code Libraries

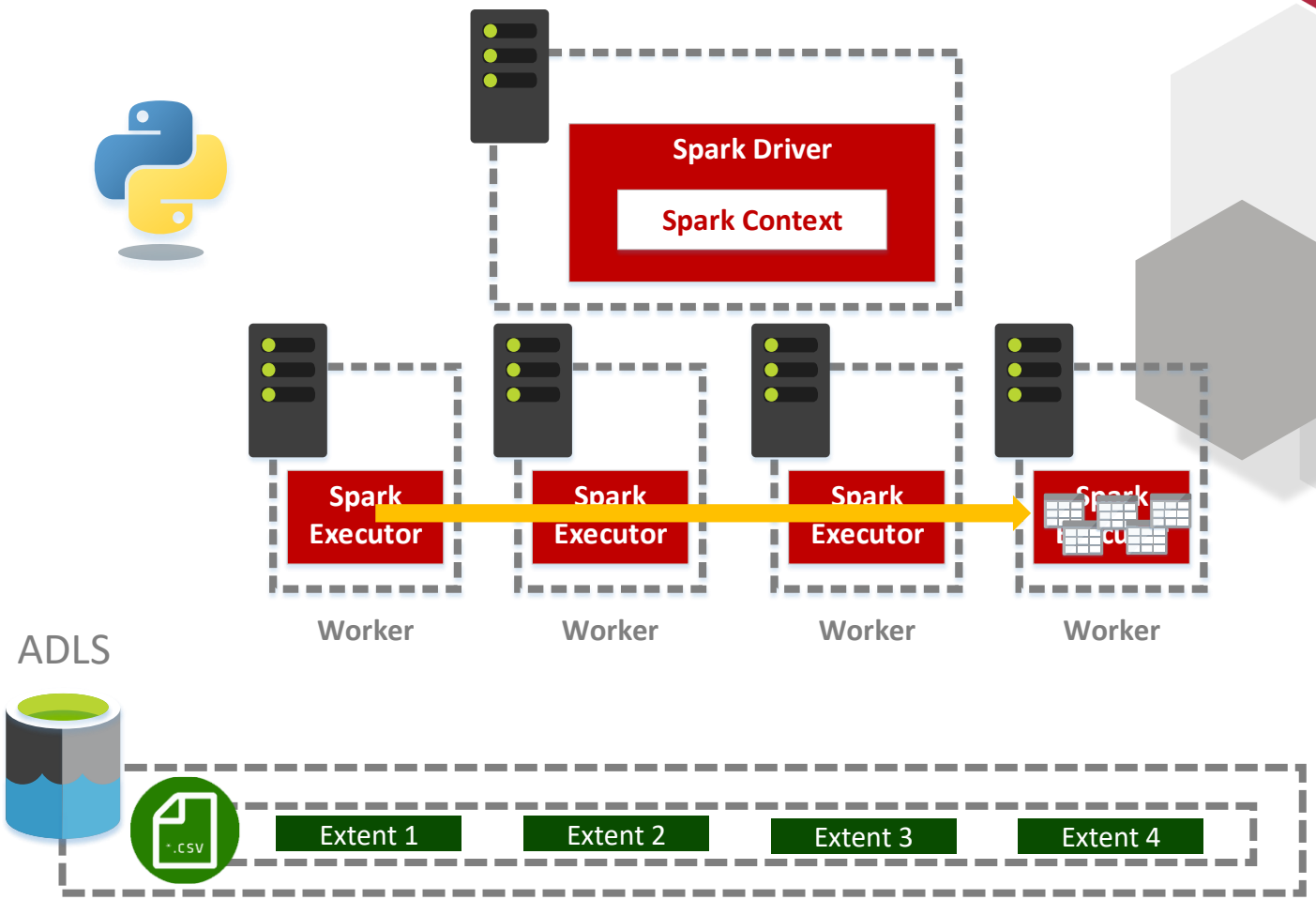
DISTRIBUTED COMPUTE



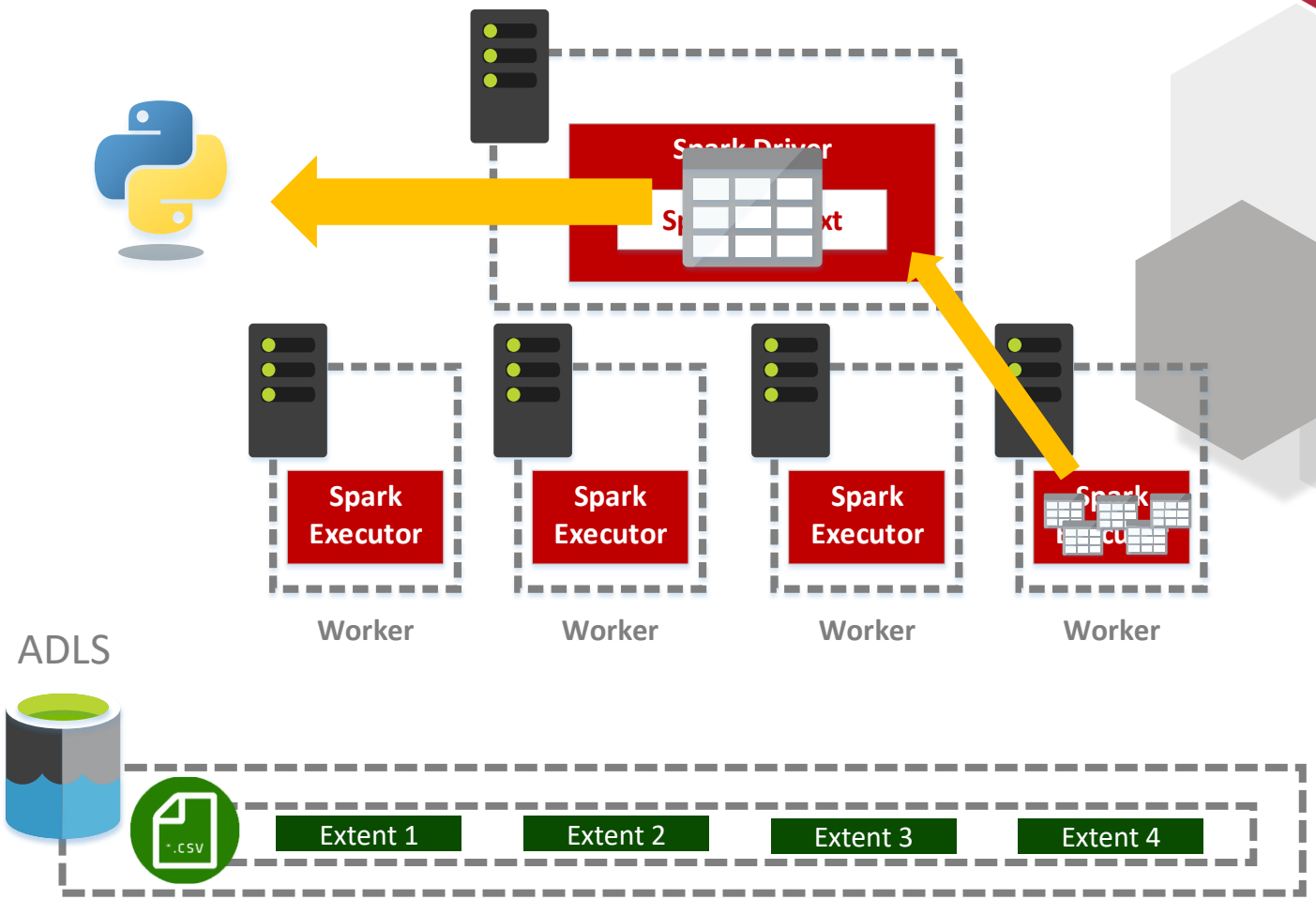
DISTRIBUTED COMPUTE



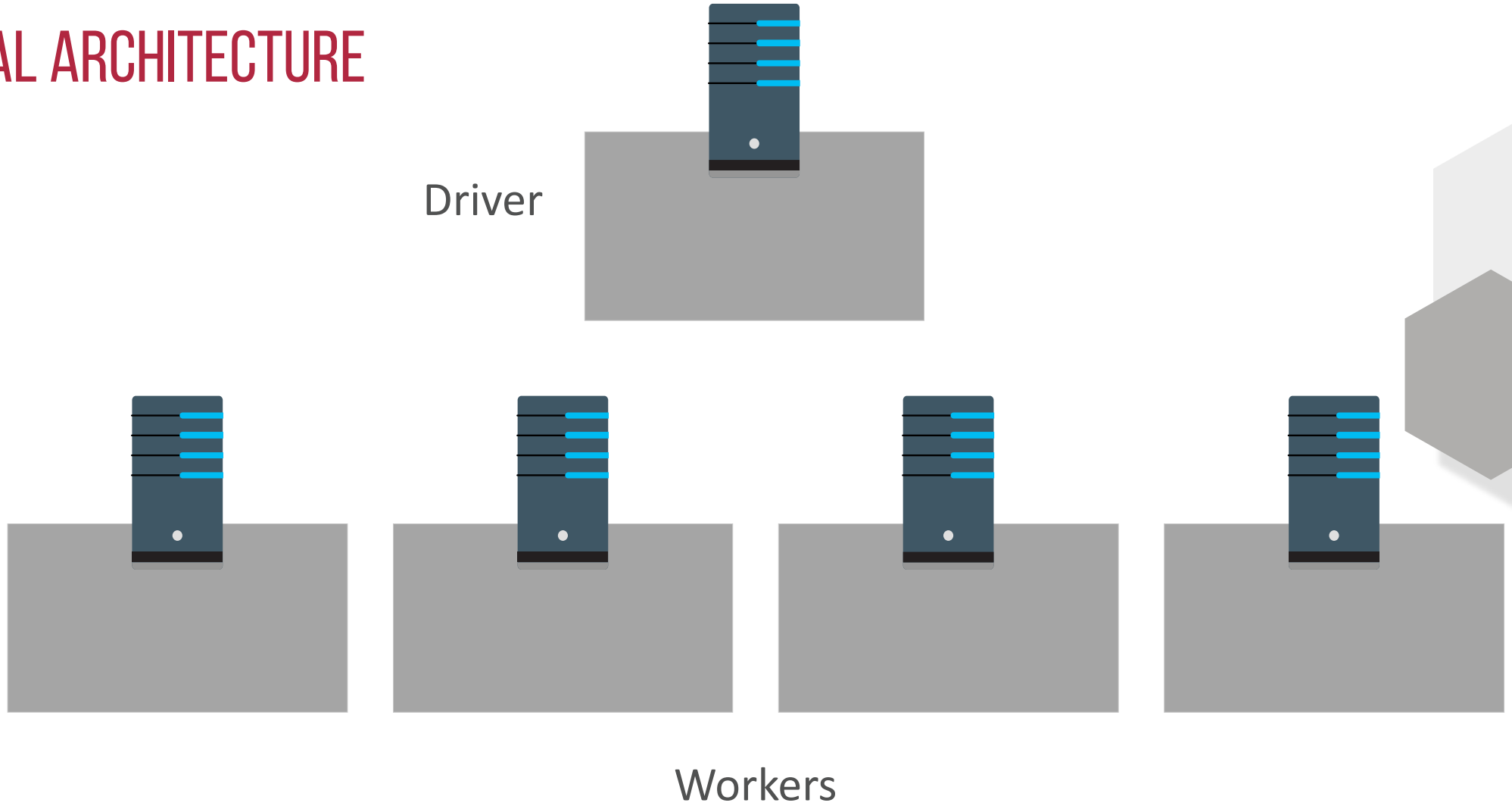
DISTRIBUTED COMPUTE



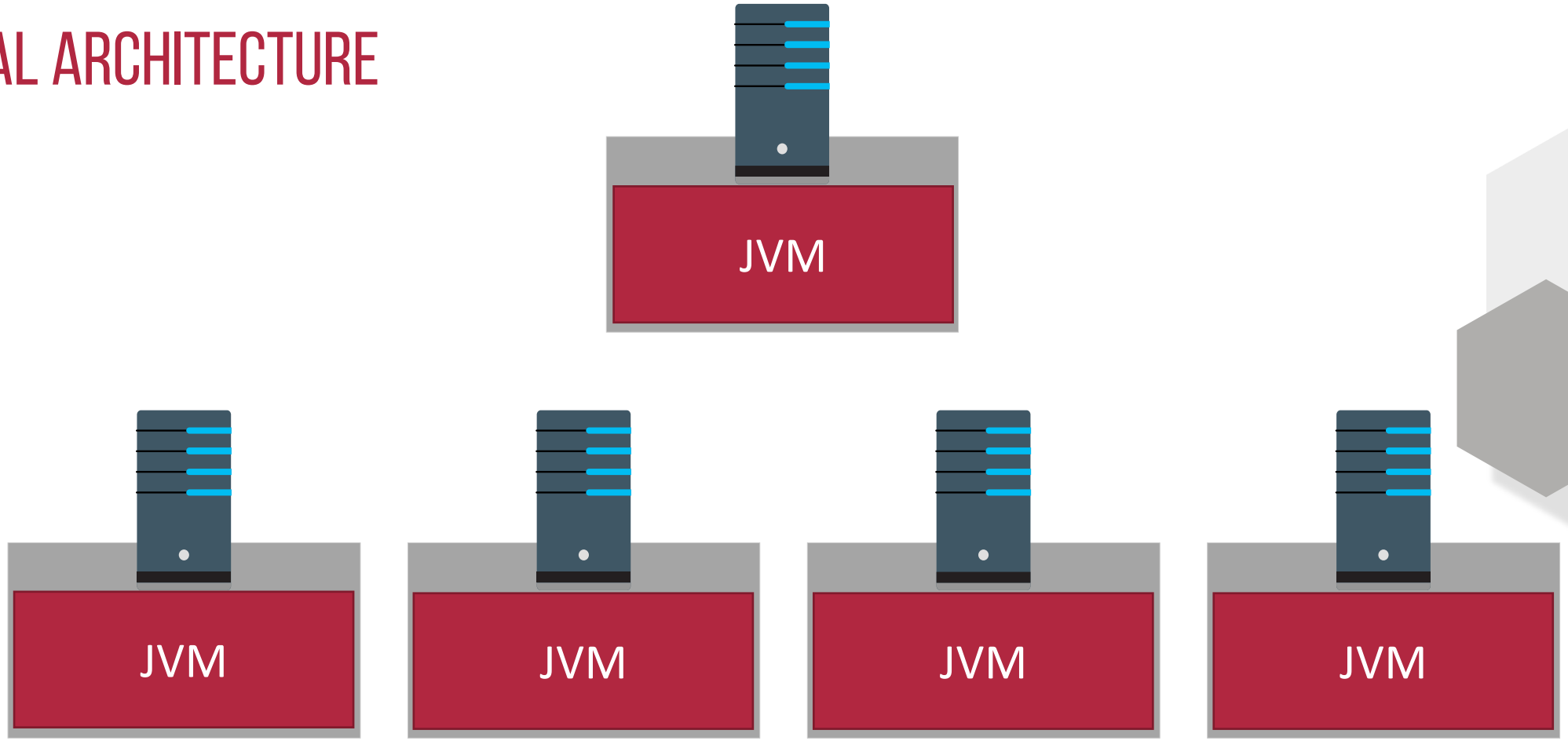
DISTRIBUTED COMPUTE



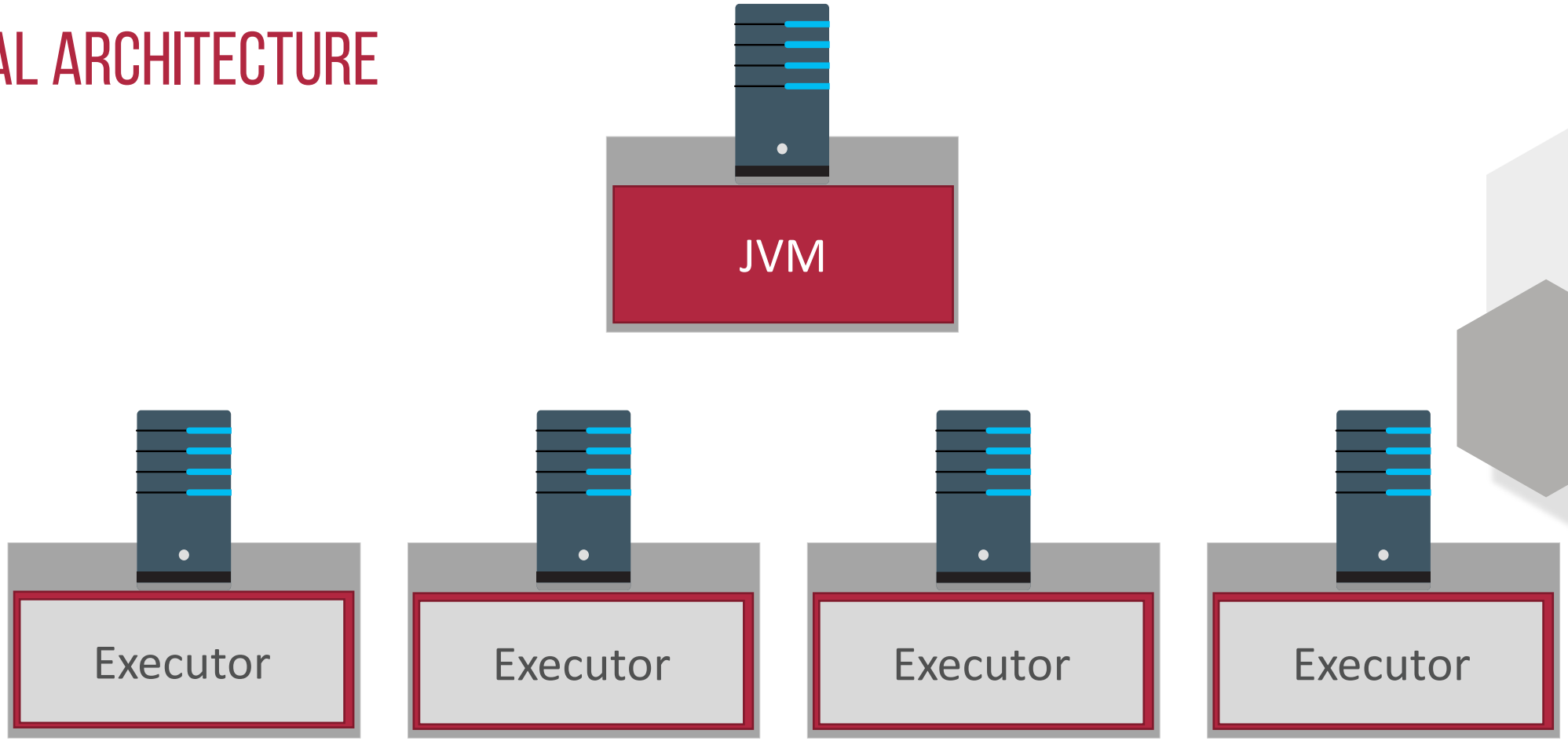
PHYSICAL ARCHITECTURE



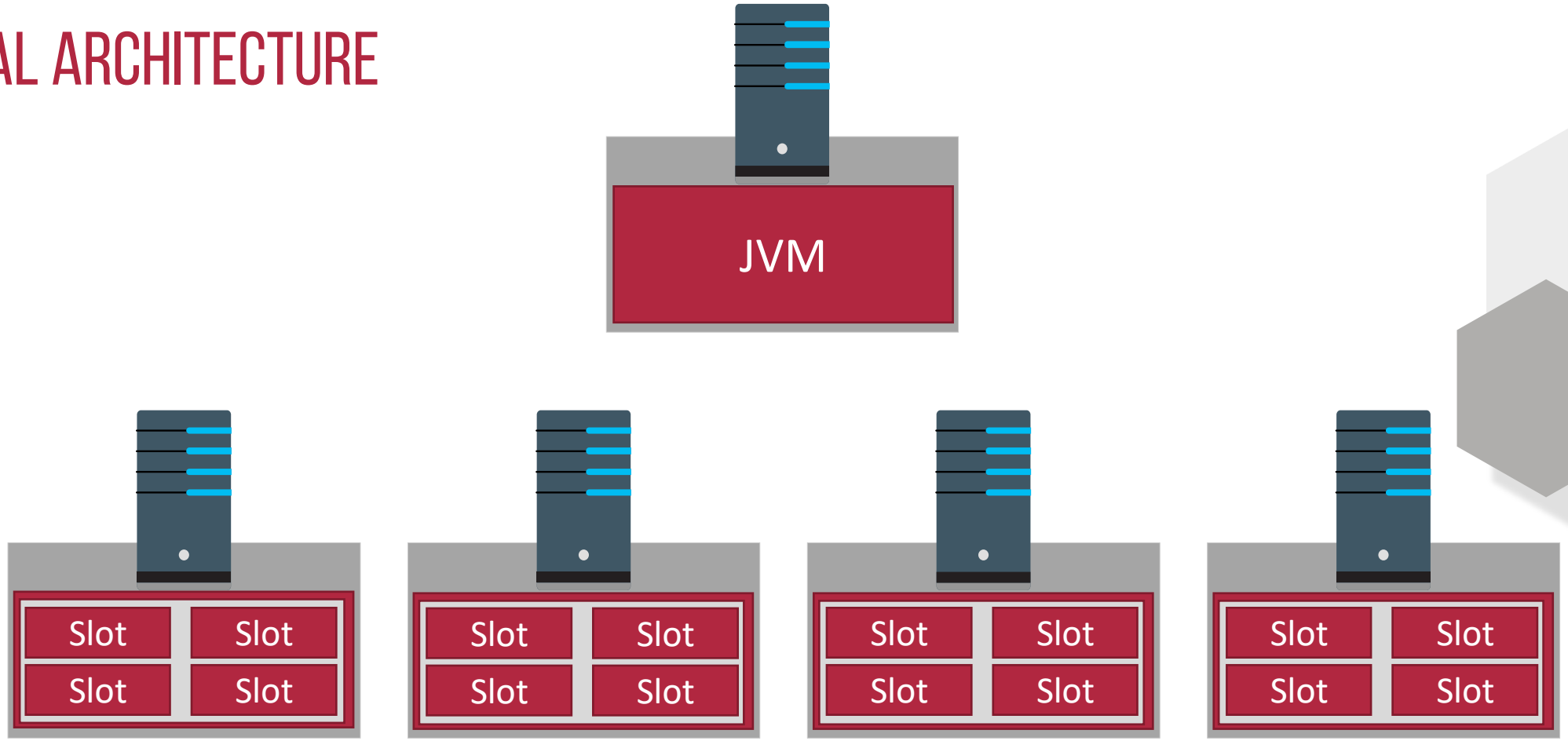
PHYSICAL ARCHITECTURE



PHYSICAL ARCHITECTURE



PHYSICAL ARCHITECTURE



EXECUTION HIERARCHY

```
df = spark.read…
     .filter(…)
     .join(…)
     .write…
```

Transformations

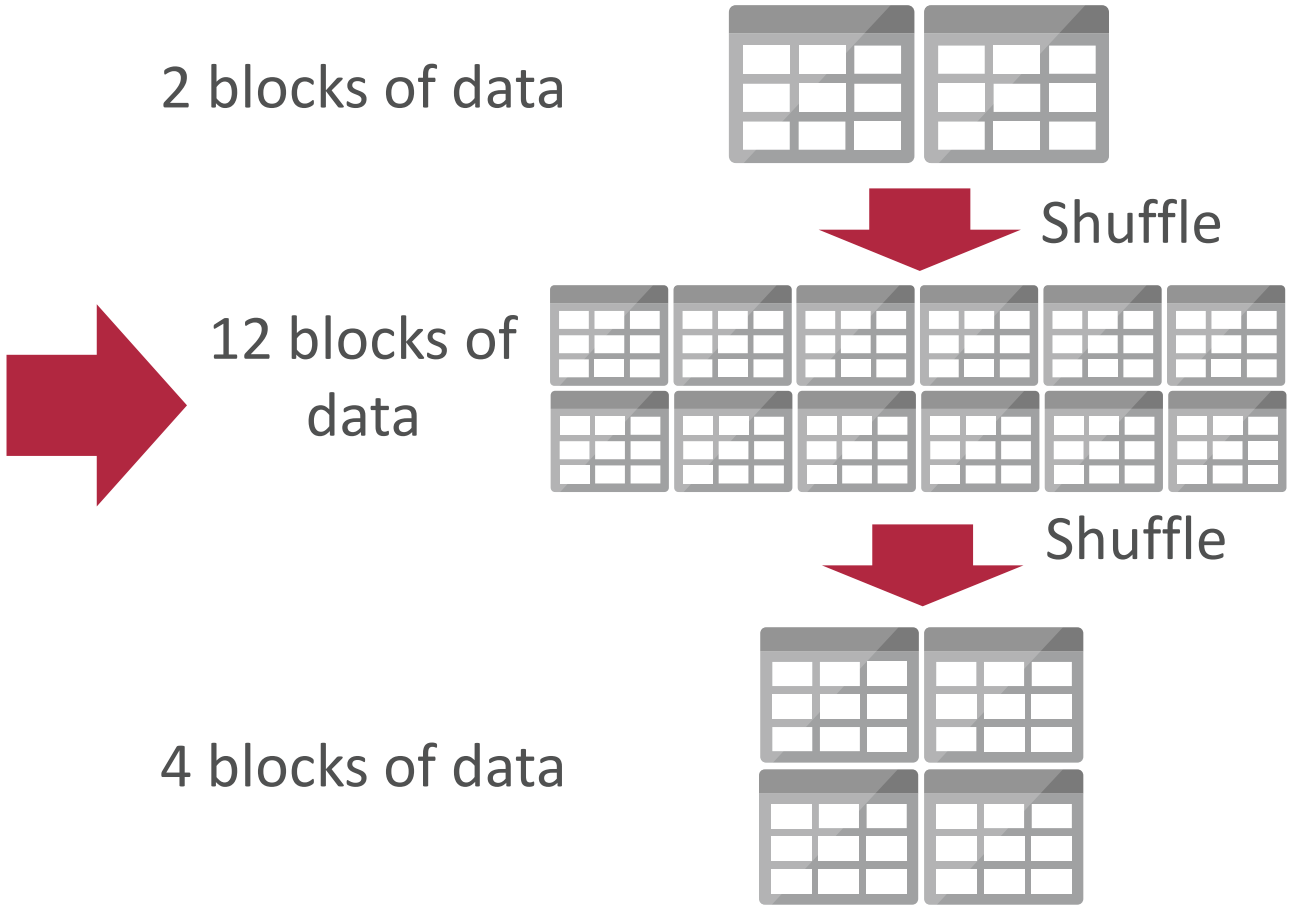
Narrow

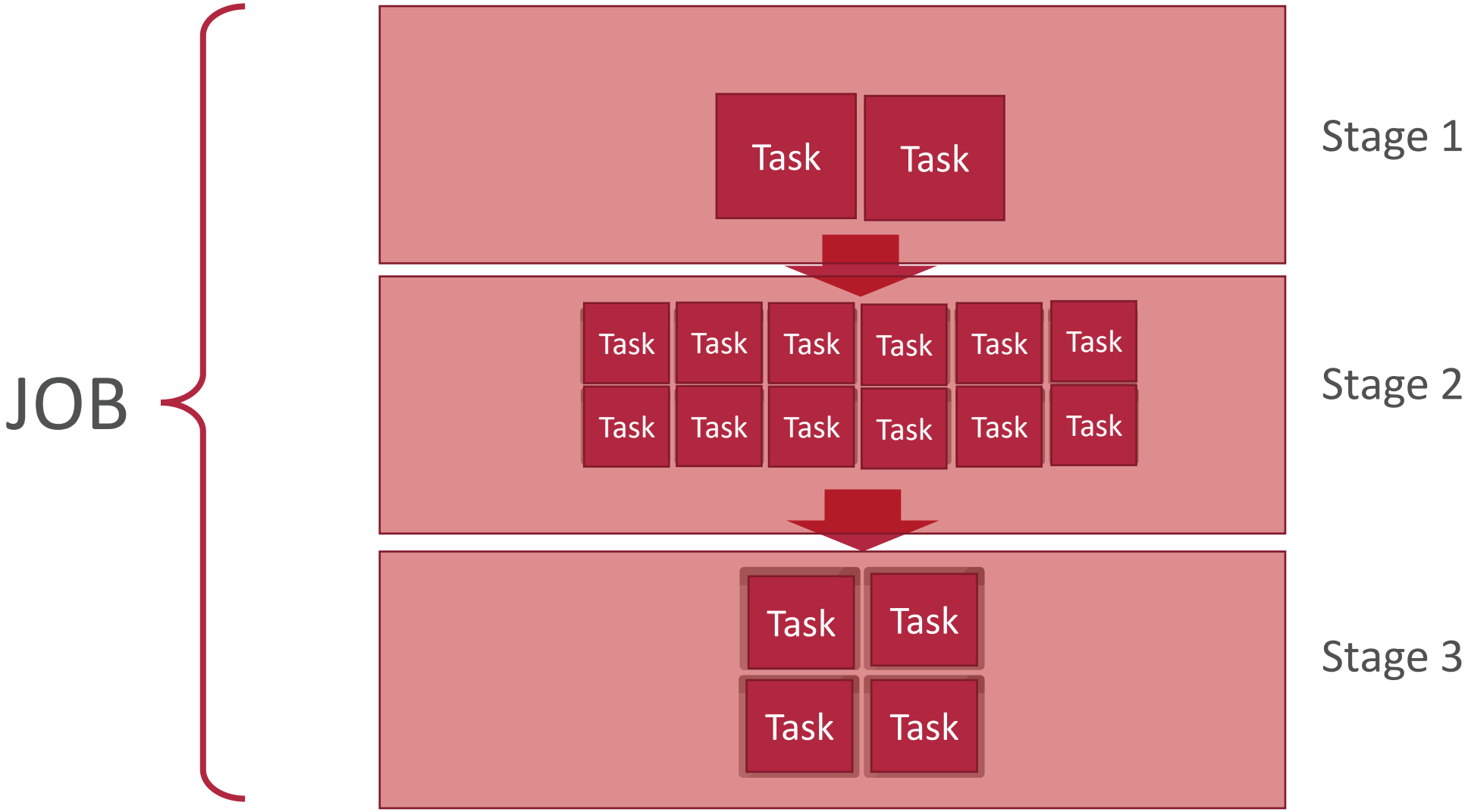
Wide

Actions

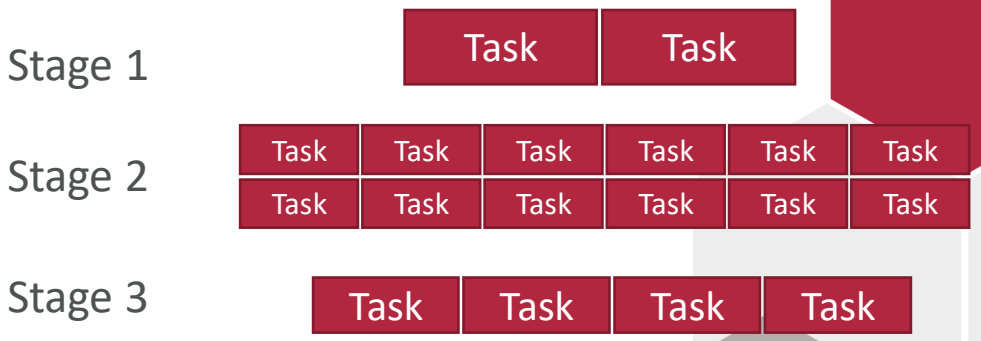
EXECUTION HIERARCHY

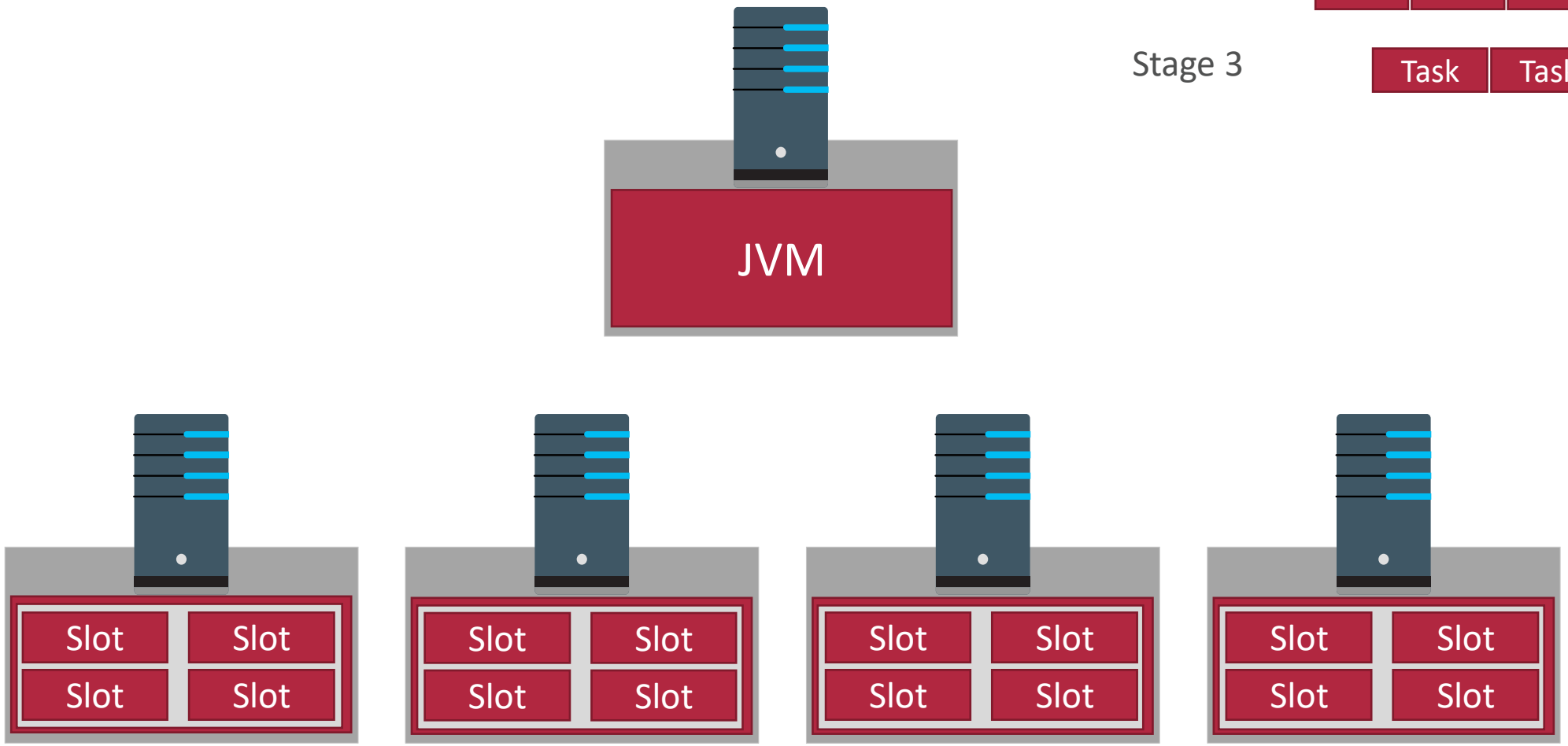
```
df = spark.read…
.filter(…)
.join(…)
.write…
```




JOB
Task
Task
Stage 1
Task
Task
Task
Task
Task
Task
Task
Task
Task
Task
Task
Task
Stage 2
Task
Task
Task
Task
Stage 3

PHYSICAL ARCHITECTURE





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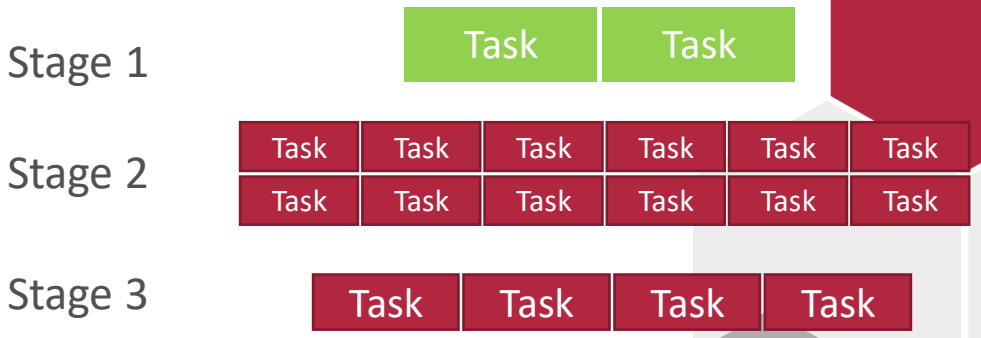
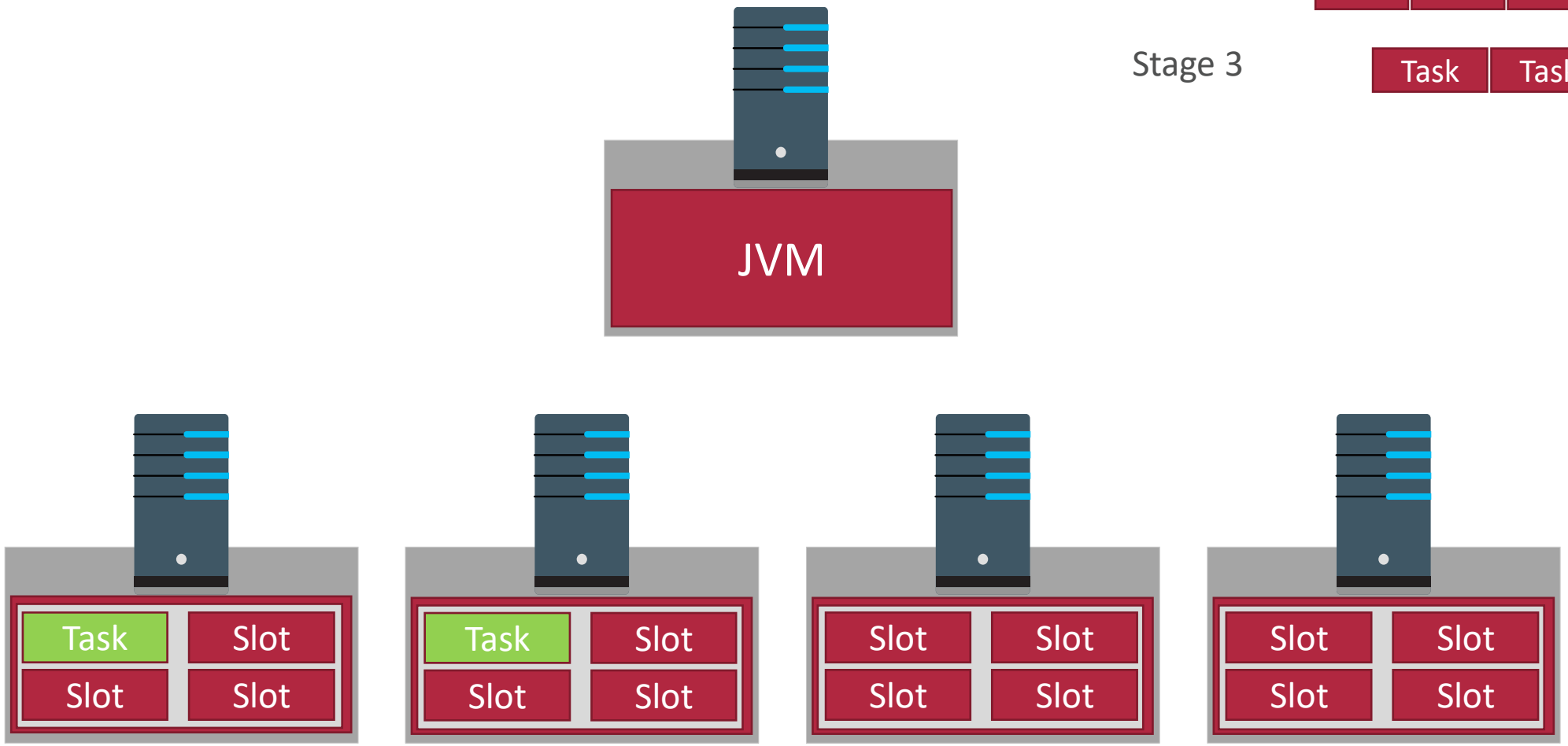
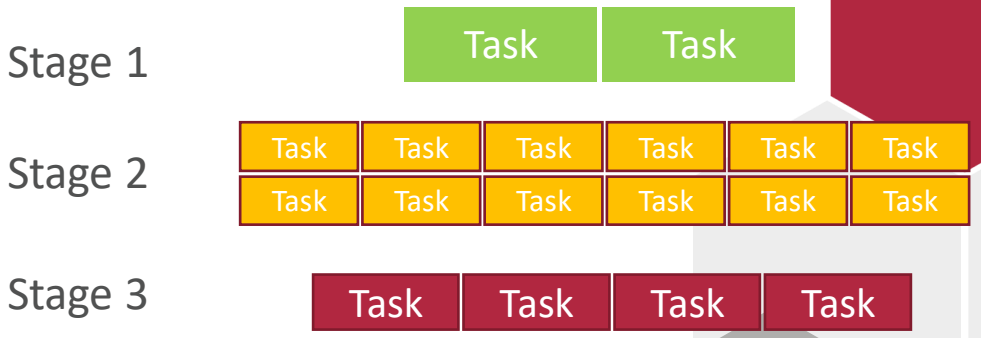
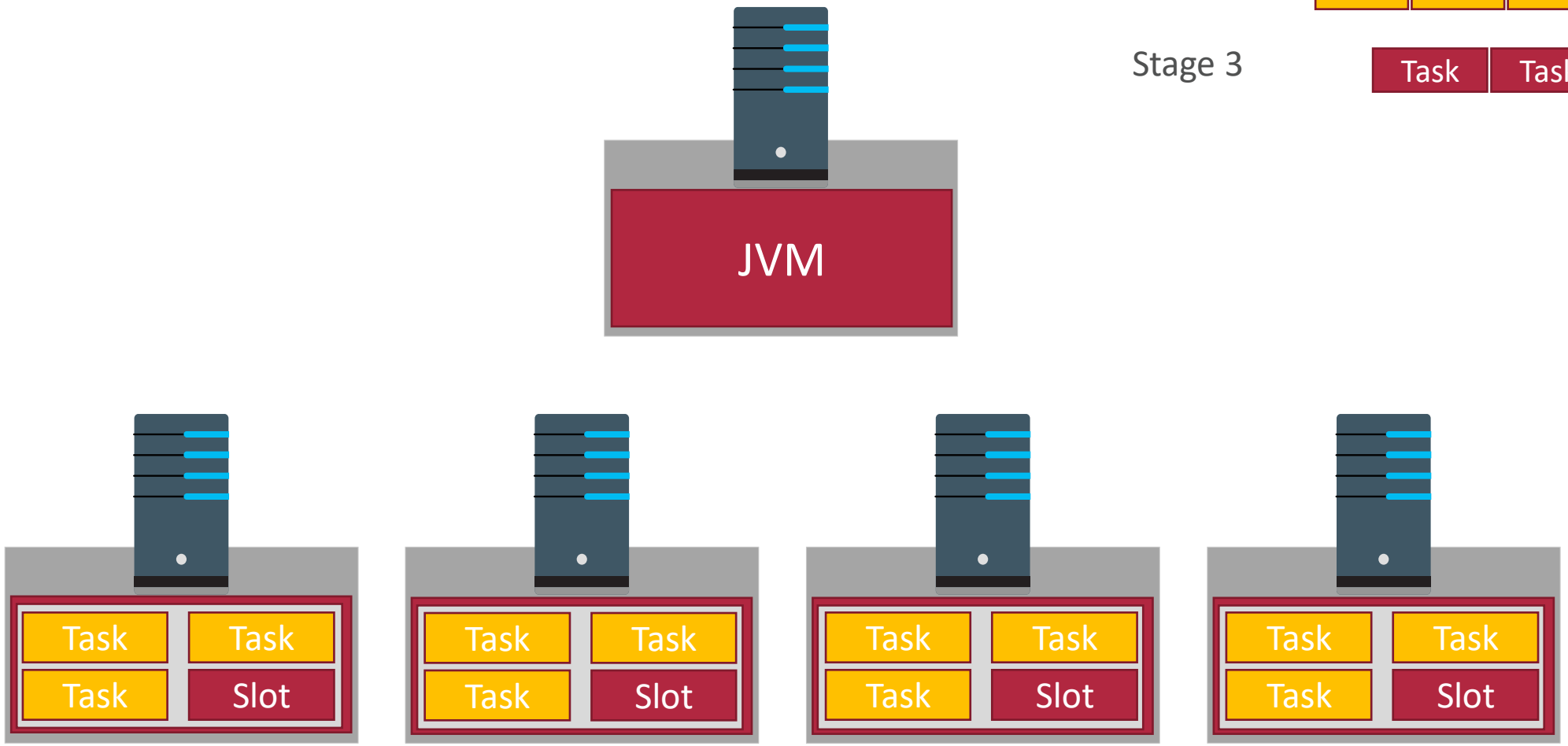


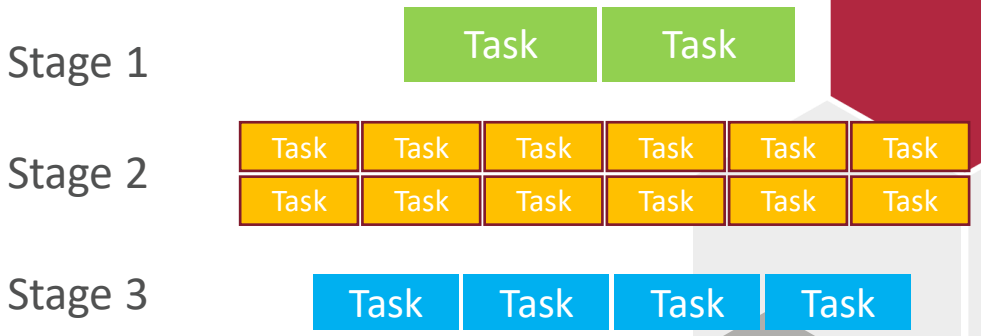


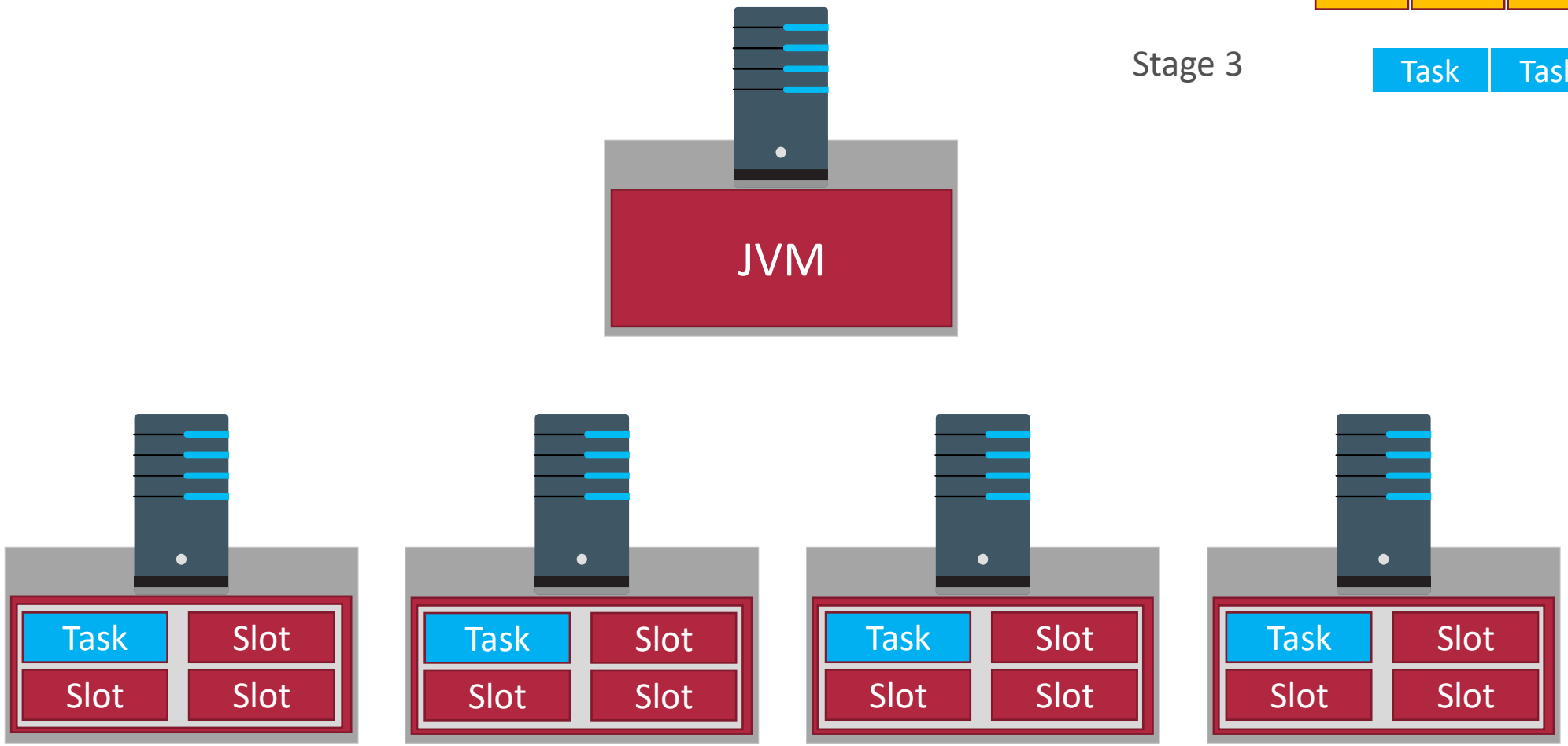
PHYSICAL ARCHITECTURE





PHYSICAL ARCHITECTURE





ETL IN DATABRICKS

SCHEMA ON READ – INFER SCHEMA

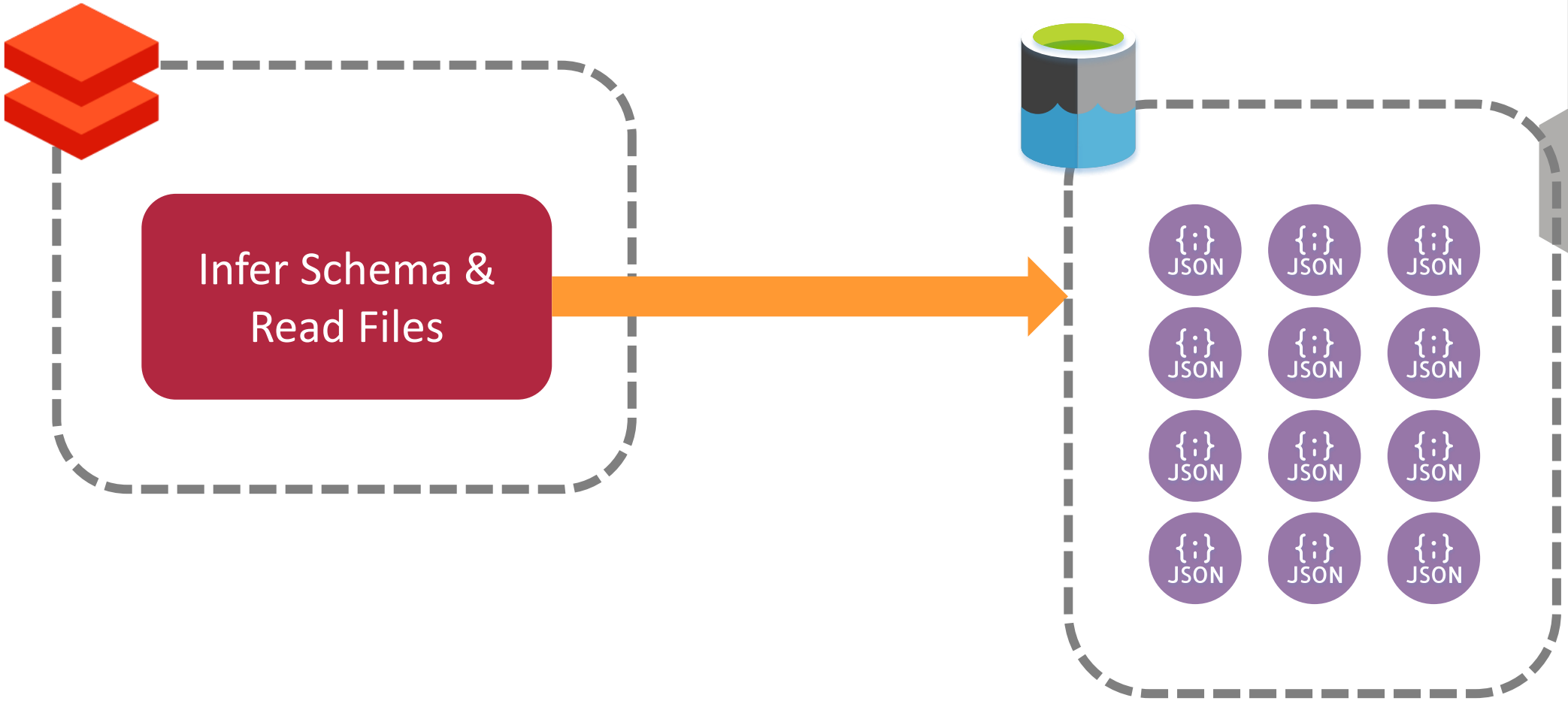
Cmd 3

```
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")
```

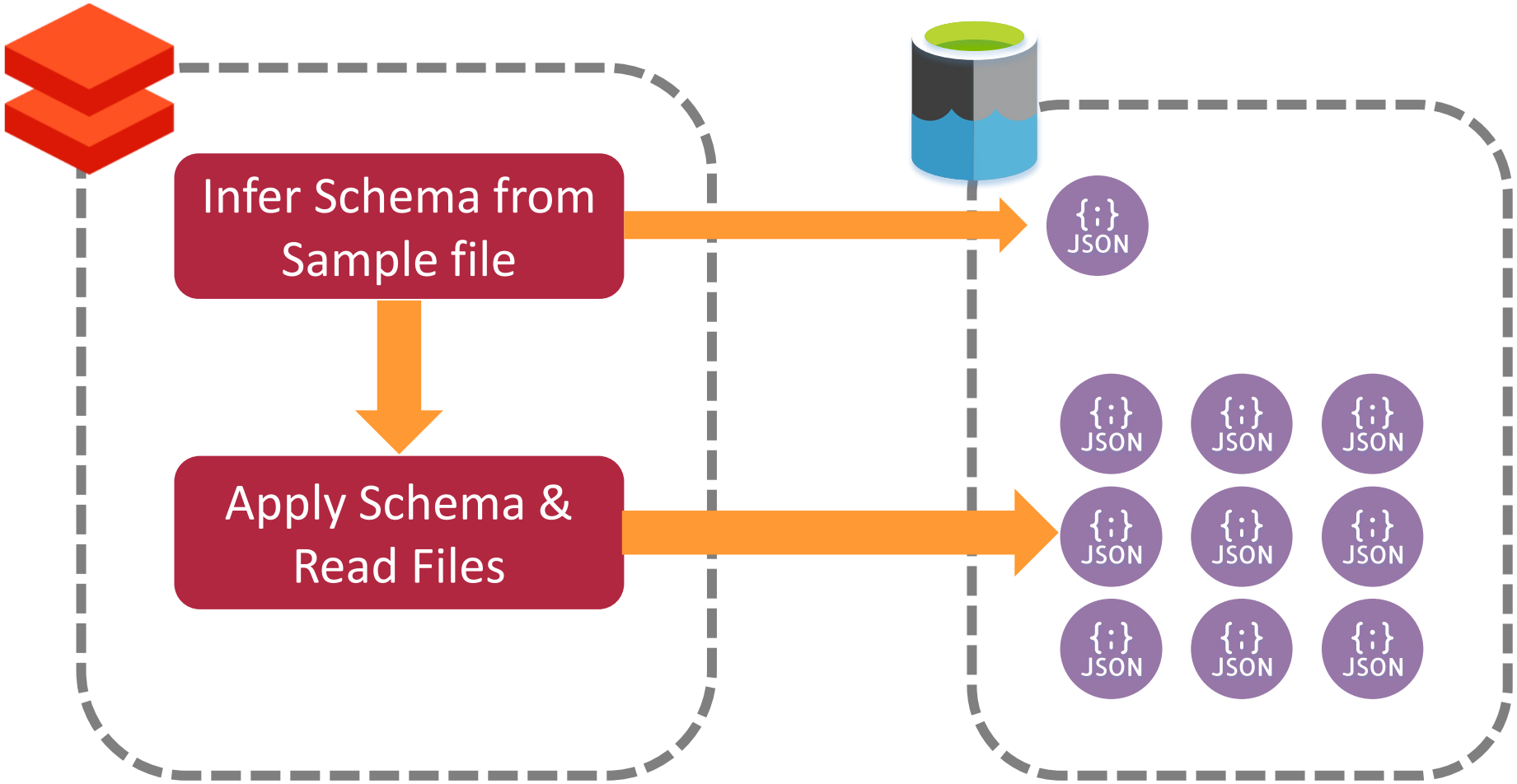
df: pyspark.sql.dataframe.DataFrame

```
Dispatching_base_num: string
Pickup_DateTime: timestamp
DropOff_datetime: string
PUlocationID: integer
DOlocationID: string
```

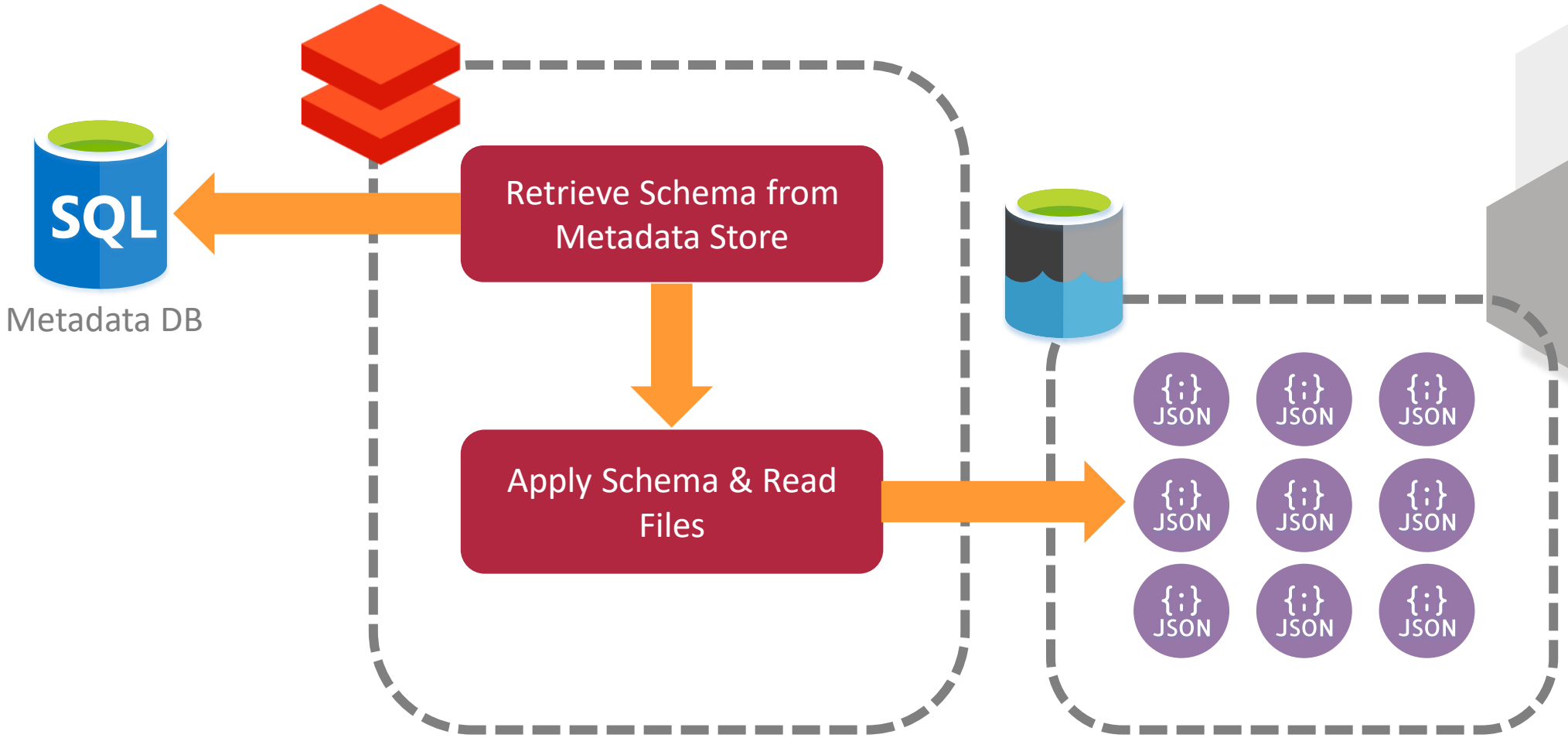
SCHEMA ON READ – INFER SCHEMA



SCHEMA ON READ – SAMPLE FILES

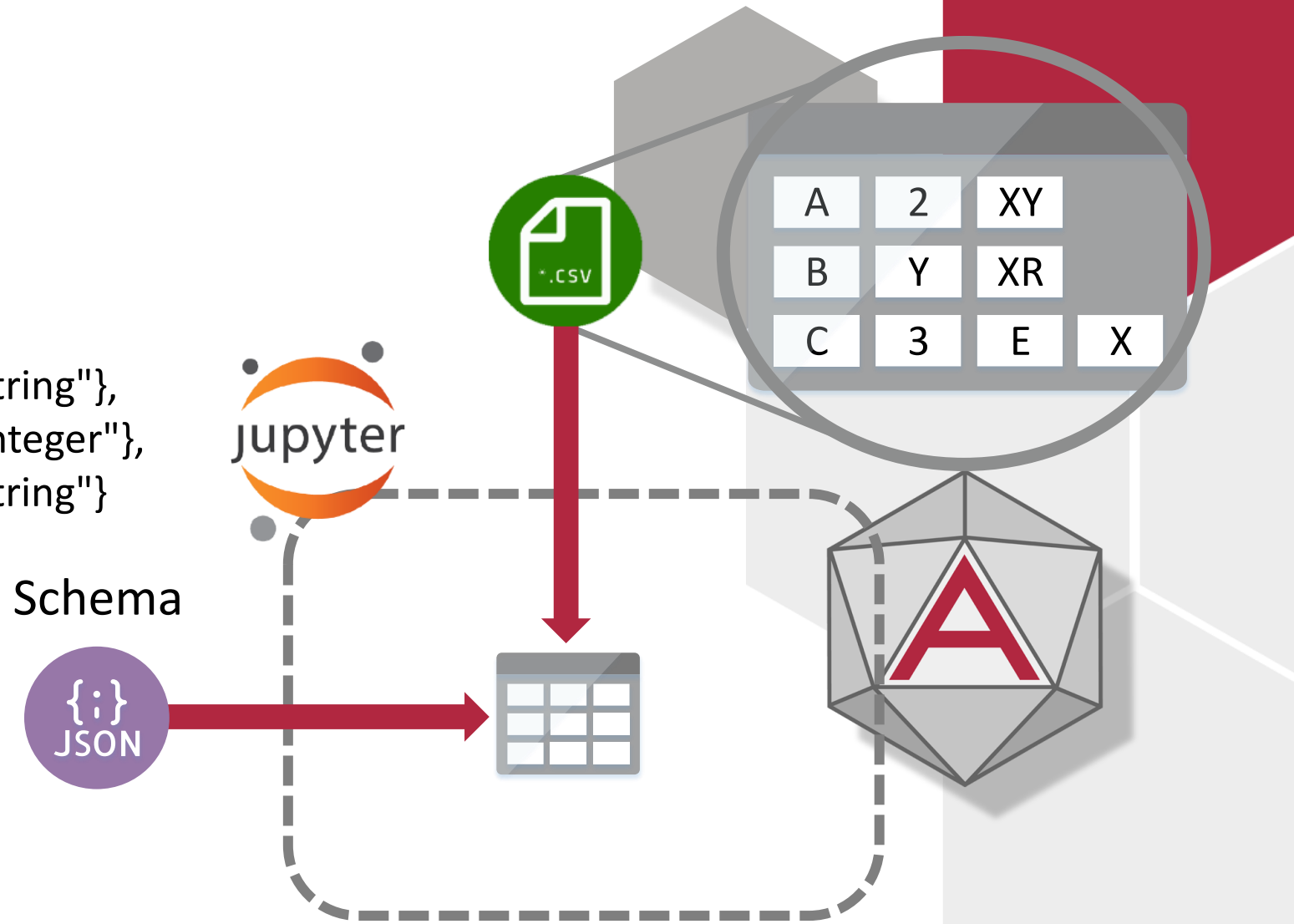


SCHEMA ON READ – METADATA STORE

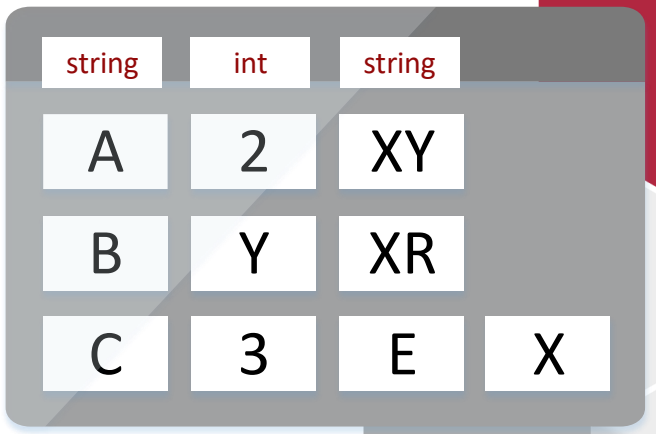


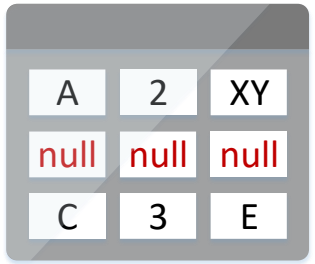
DATA VALIDATION

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



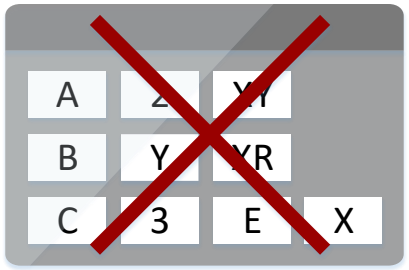
DATA VALIDATION





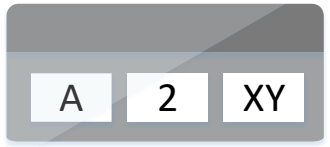
1 **PERMISSIVE**

NULL DataType Failures
Drop Extra Columns



2 **FAILFAST**

Fail on any error



3 **DROPMALFORMED**

Drop rows with DataType Failures
Drop rows with Extra Columns

DATA VALIDATION

```
#Add a system attribute to our structure
newSchema.add("_corrupt_record", StringType(), True)

#Load the data so we can inspect it
df = (spark
        .read
        .schema(newSchema)
        .option("mode", "PERMISSIVE")
        .csv(dataLocation)
      )
```


```
#Separate bad rows automatically
baddf = (spark
        .read
        .option("badRecordsPath", "/mnt/data/RAW/TaxiZones/_reject/")
        .schema(mySchema)
        .csv(location)
      )
```

DATA PROCESSING WITH SPARK

- Working with Flat Files
- Working with Dodgy Data
- Meta-Driven Systems

ORCHESTRATION

DATABRICKS WIDGETS

Cmd 3

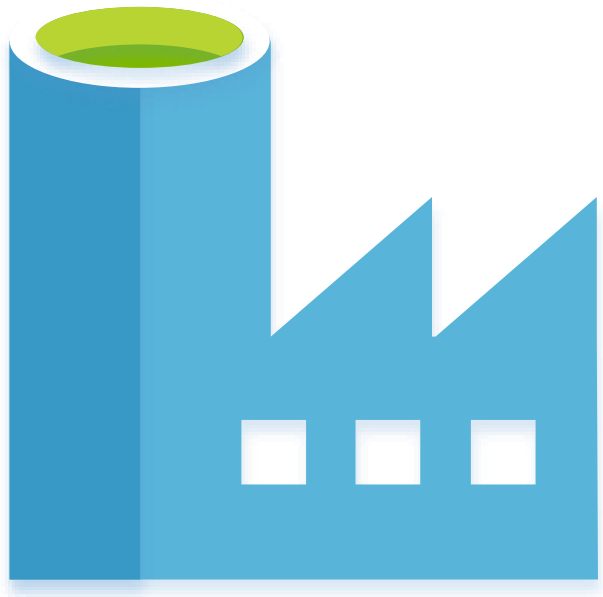
```
#dbutils.widgets.removeAll()
dbutils.widgets.text("fileName", "Product","AdventureWorks Table")
dbutils.widgets.dropdown("entity_name", "Taxi",["Taxi","TaxiZones"] ,"Entity Name")
```

AdventureWorks Table : ProductCategory

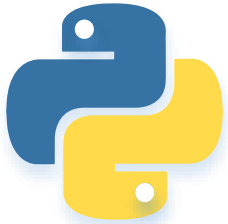
Entity Name : Taxi

Cmd 8

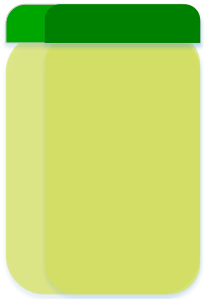
```
fileName = dbutils.widgets.get("fileName")
```



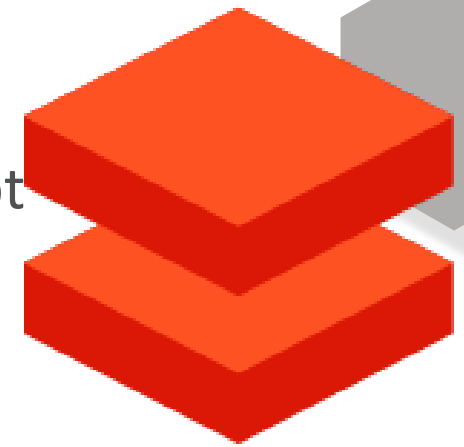
Notebook



Python Script

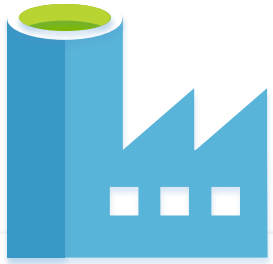


Jar File



ADVANCING ANALYTICS

AZURE DATA FACTORY



Notebook path * /Demonstrations/Dynamic Transformation/D Browse

Base Parameters

+ New | Delete

NAME	VALUE
entity_name	Taxi

Entity Name : Taxi

Cmd 1

Configure Widgets

```
#dbutils.widgets.removeAll()
dbutils.widgets.dropdown("entity_name", "Taxi",["Taxi","TaxiZones"] ,"Entity Name")
```

```
"runOutput": {
    "TransformationsApplied": 2,
    "Status": "Succeeded",
    "ProcessedRows": 66141344
},
```

Cmd 10

Return Results to Caller

```
import json
dbutils.notebook.exit(json.dumps({"processedRows":processedRows, "status":"Succeeded",
```

```
Notebook exited: {"Status": "Succeeded", "ProcessedRows": 66141344, "TransformationsApplie
```

ADVANCING ANALYTICS

DATABRICKS ORCHESTRATION

- Adding input & output parameters
- Orchestrating Databricks with ADF

THANKS!

youtube.com/c/AdvancingAnalytics

@MrSiWhiteley

www.advancinganalytics.co.uk

TEAMS MEETINGS

Azure BI - Join Microsoft Teams Meeting

Azure DB - Join Microsoft Teams Meeting

Cloud Development - Join Microsoft Teams Meeting

Data Platform - Join Microsoft Teams Meeting

Power BI - Join Microsoft Teams Meeting