ETL in Azure Made Easy

with Data Factory Data Flows

Paul Andrew | Principal Consultant & Solution Architect

Microsoft® Most Valuable Professional

@MrPaulAndrew

Microsoft Partner
Microsoft
Gold Cloud Platform
Gold Data Analytics
Gold Data Platform
Gold DevOps
Gold Datacenter

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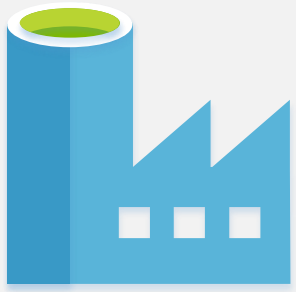
Extract Transform Load

ETL in Azure Made Easy

with Data Factory Mapping Data Flows



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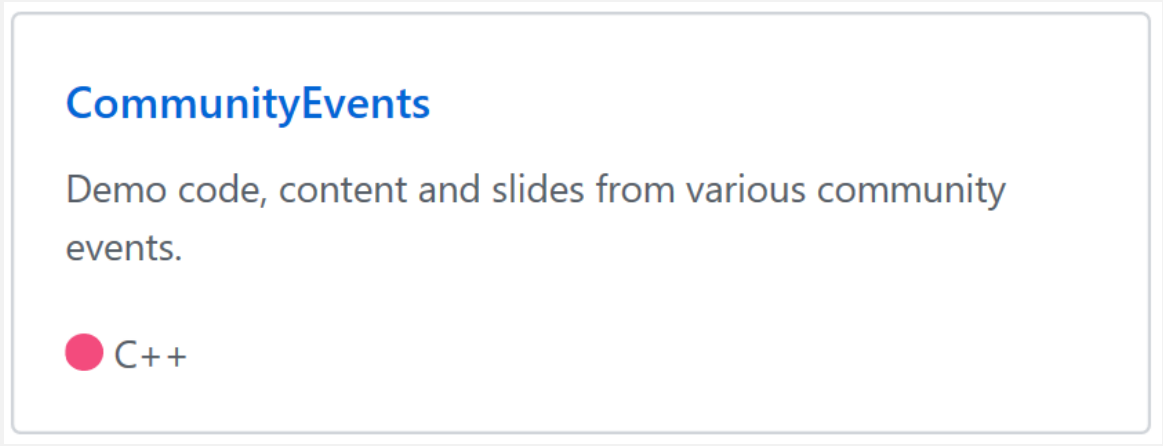
GitHub

https://github.com/mrpaulandrew



{Event/Location}-{Month}-{Year}

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Azure Data Factory

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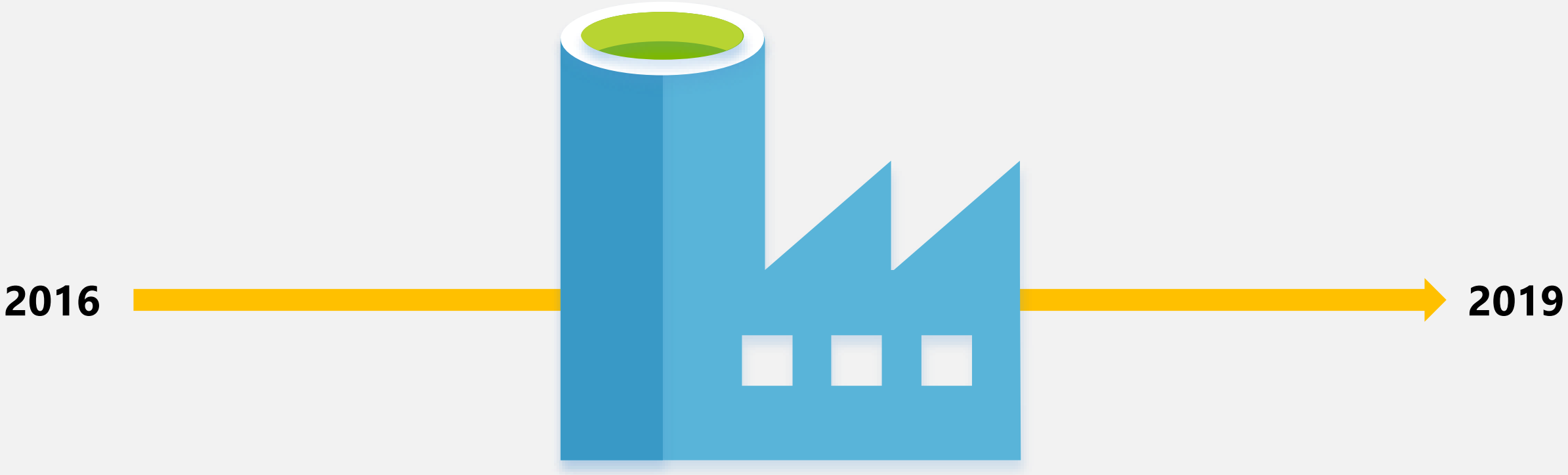
What is Azure Data Factory?



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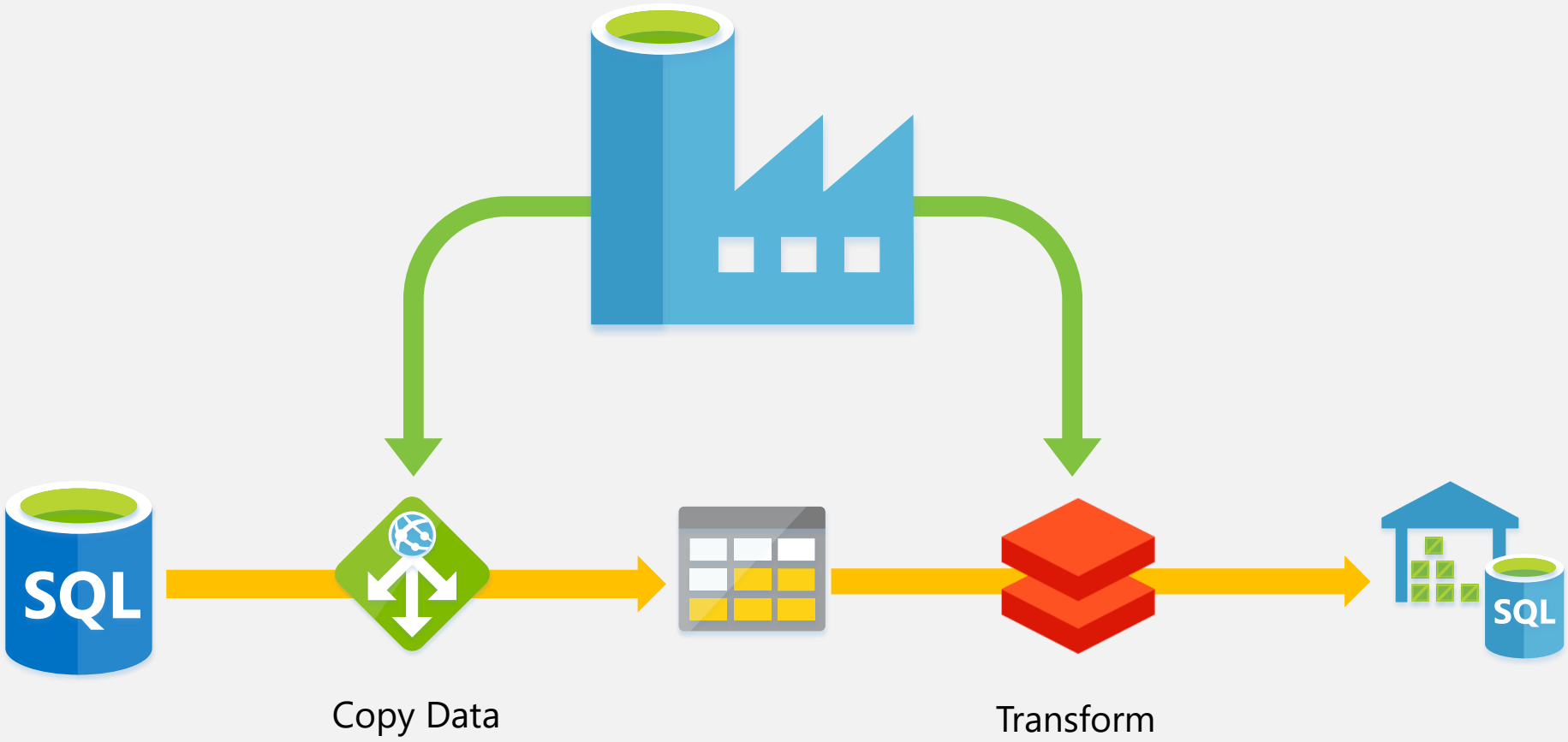

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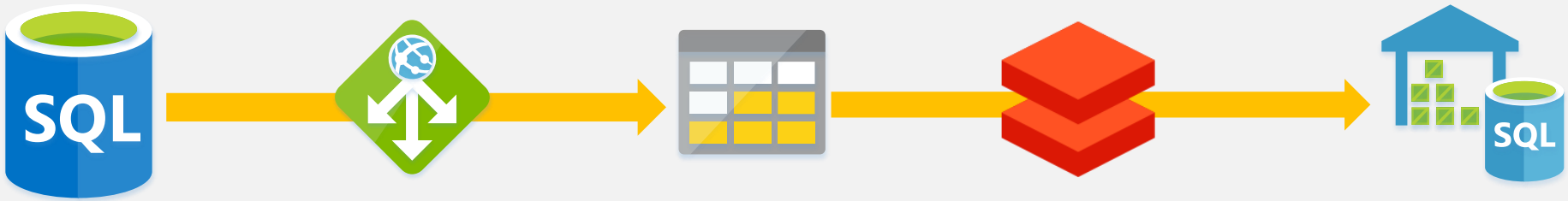

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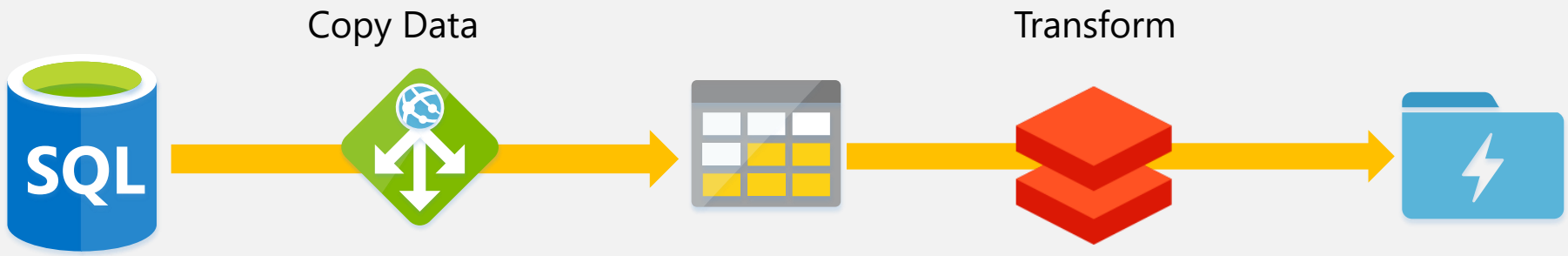
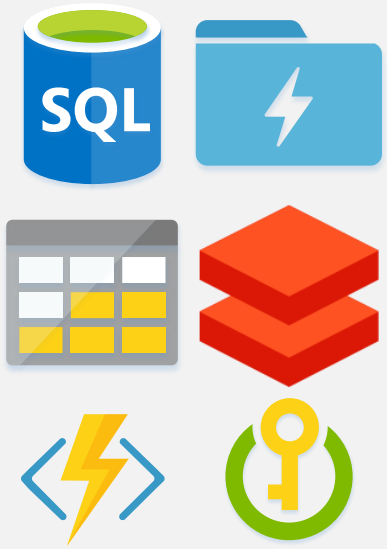
Data Factory Components



1 **Linked Services** – How do I connect? Like the SSIS connection manager.



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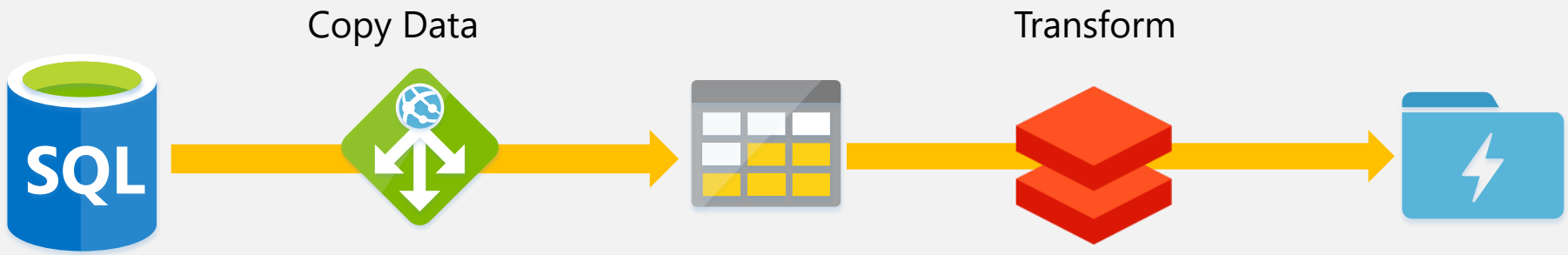
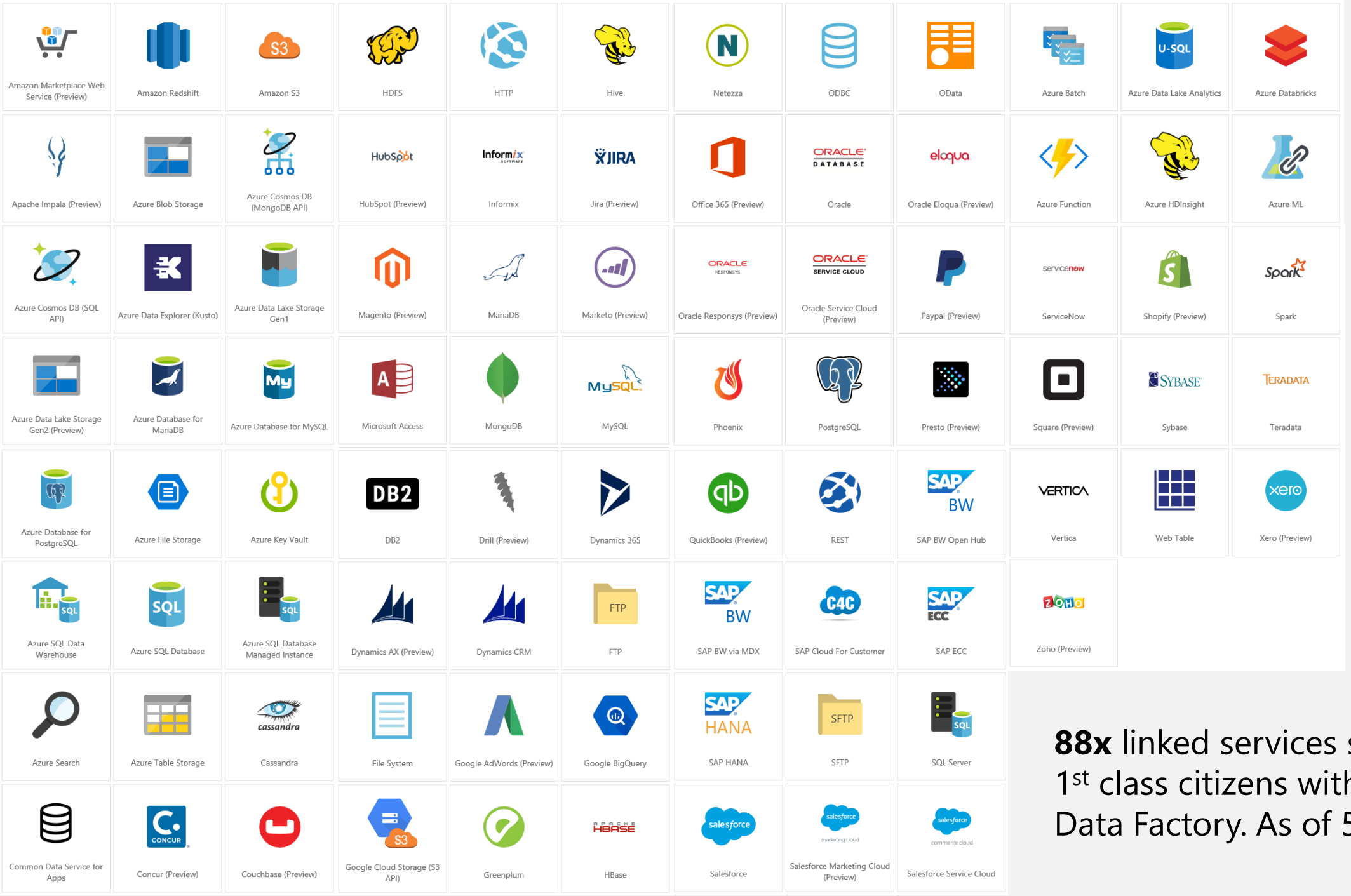
Data Factory Components

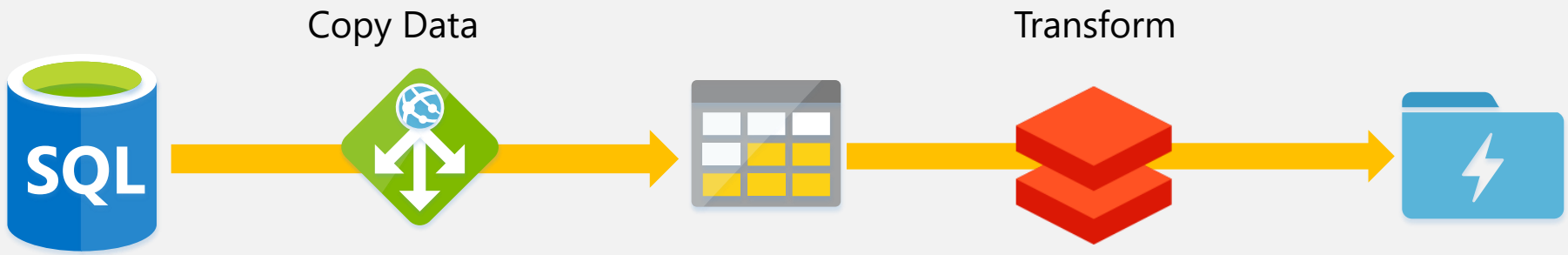


1 Linked Services



88x linked services supported as 1st class citizens within Azure Data Factory. As of 5th Feb 2019.

Data Factory Components



1. **Linked Services**
2. **Data Sets** – Where is my data? What format? What file path/table do I need?

dbo.DimCustomer

/RAW/Orders/2018/01/01/Orders.csv

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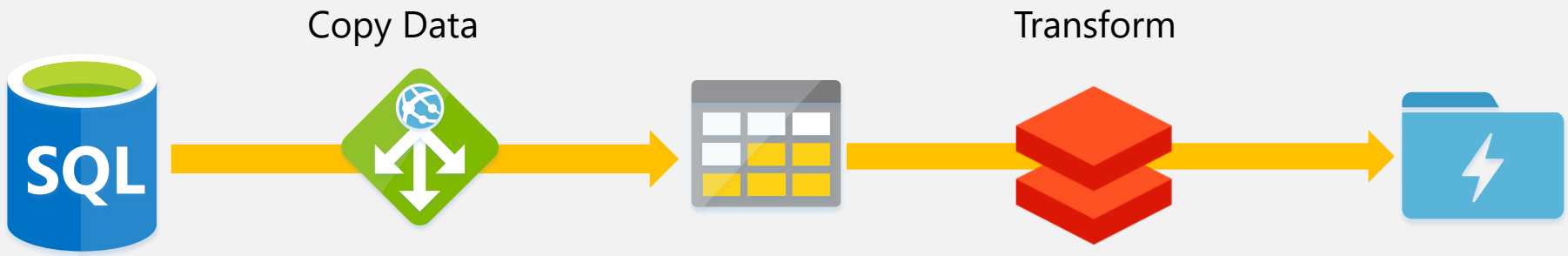
Data Factory Components



1. **Linked Services**
2. **Data Sets**
3. **Activities** – What do we want to happen? With what conditions?

Databricks Notebook Activity

notebookPath: */Playground/Playing*
baseParameters: *Testing*
libraries[jar]: dbfs:/lib1.jar
linkedServiceName: *BricksOfData01*

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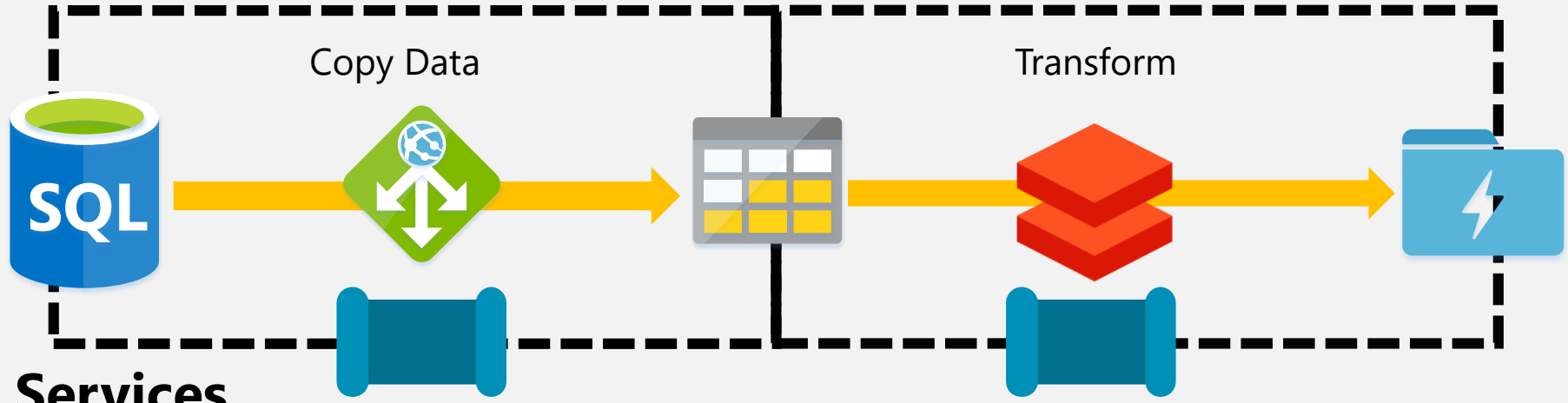
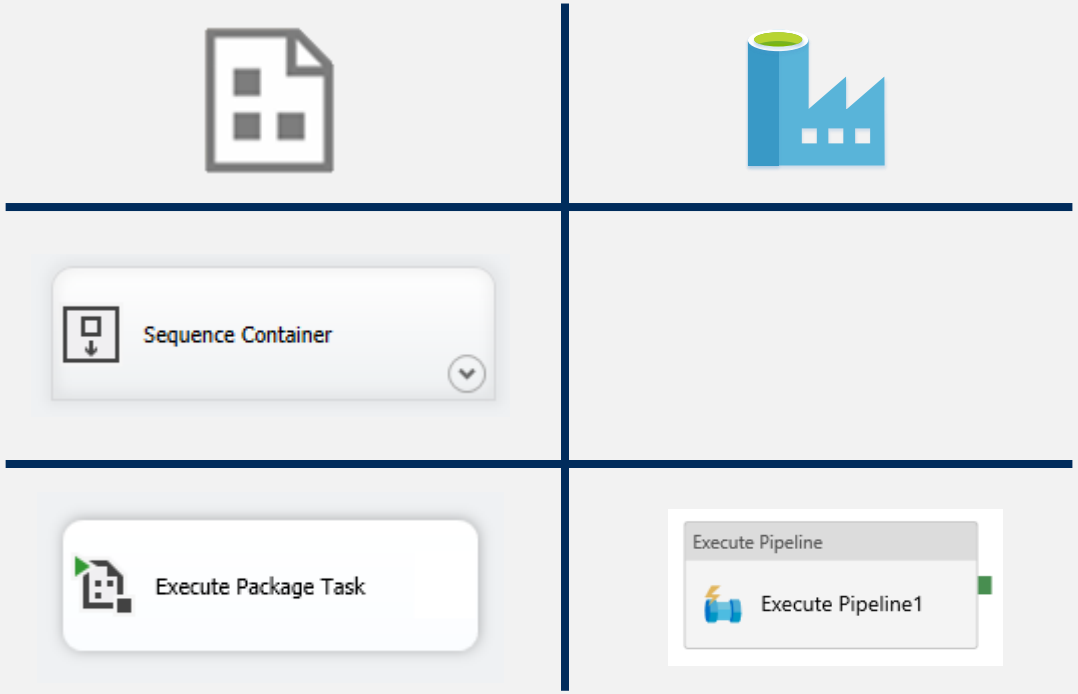
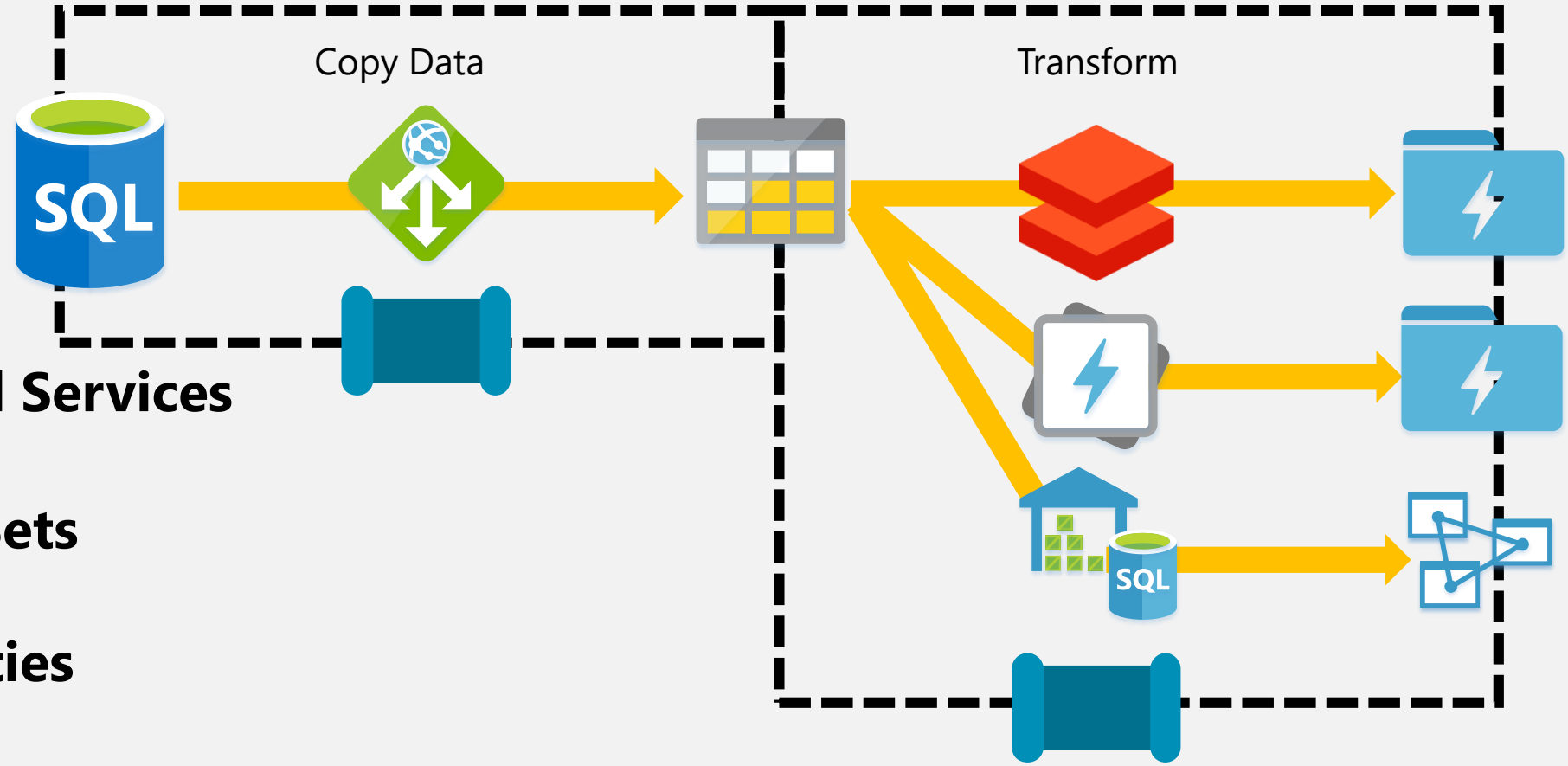
Data Factory Components



1. **Linked Services**
2. **Data Sets**
3. **Activities**
4. **Pipelines** – What groups of work do I want to do?



Data Factory Components



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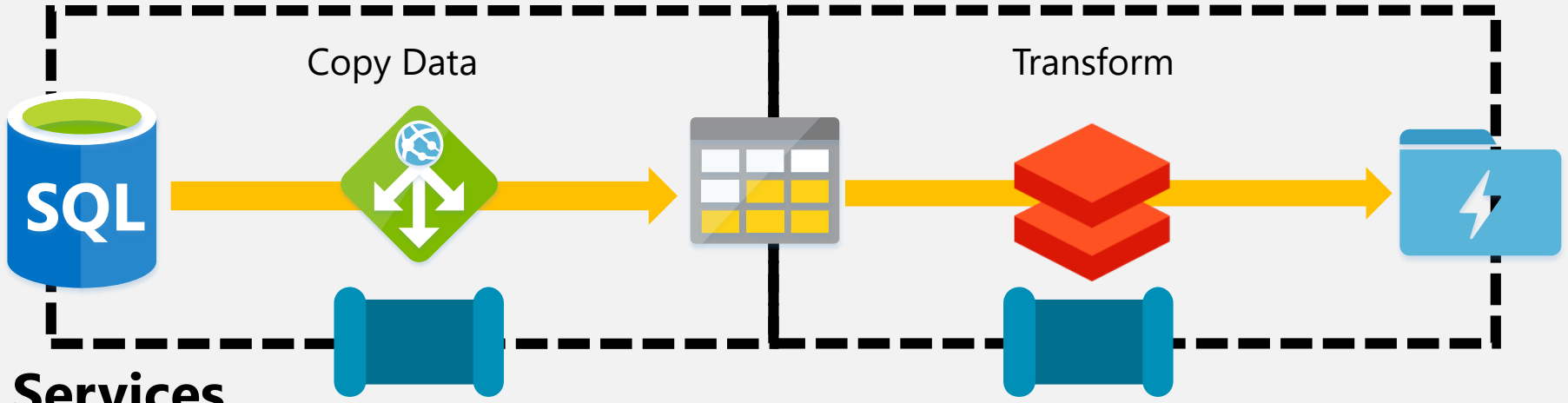

1. **Linked Services**
2. **Data Sets**
3. **Activities**
4. **Pipelines**
5. **Triggers** – How are we going to tell our pipeline(s) to execute?

- Manual via UI
- Tumbling Windows
- Scheduled
- Blob File Events
- Logic App Calls

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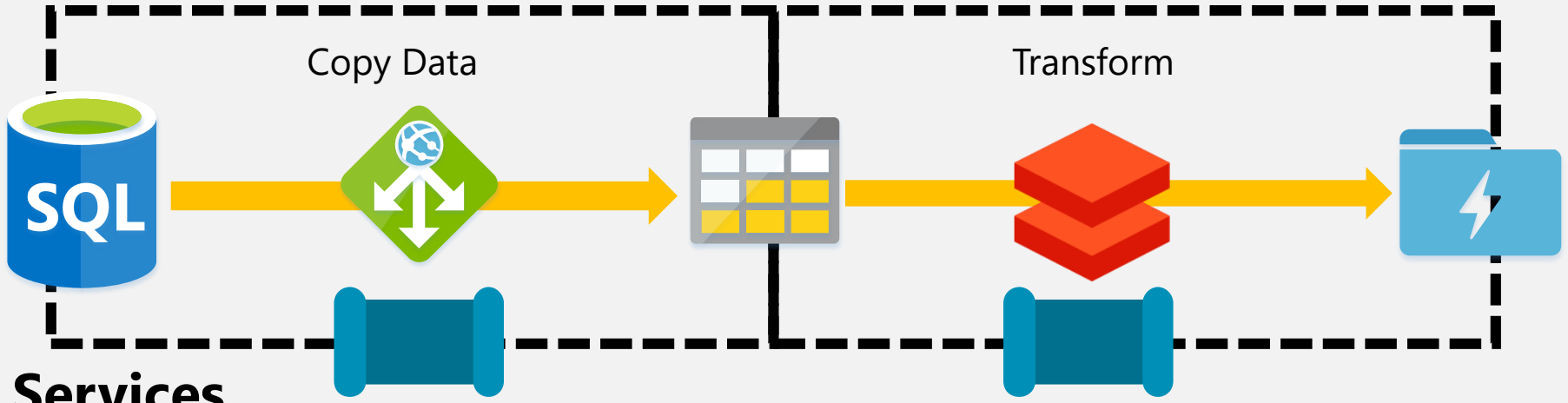
Data Factory Components



1. **Linked Services**
2. **Data Sets**
3. **Activities**
4. **Pipelines**
5. **Triggers**

- **Manual**
- Tumbling Windows
- Scheduled
- Blob File Events
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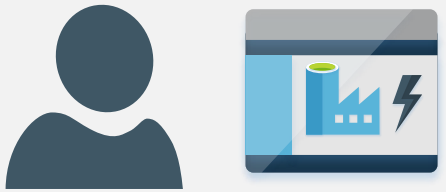

```
Invoke-AzureRmDataFactoryV2Pipeline
-DataFactoryName $dataFactoryName
-ResourceGroupName $resourceGroupName
-PipelineName $pipelineName
```

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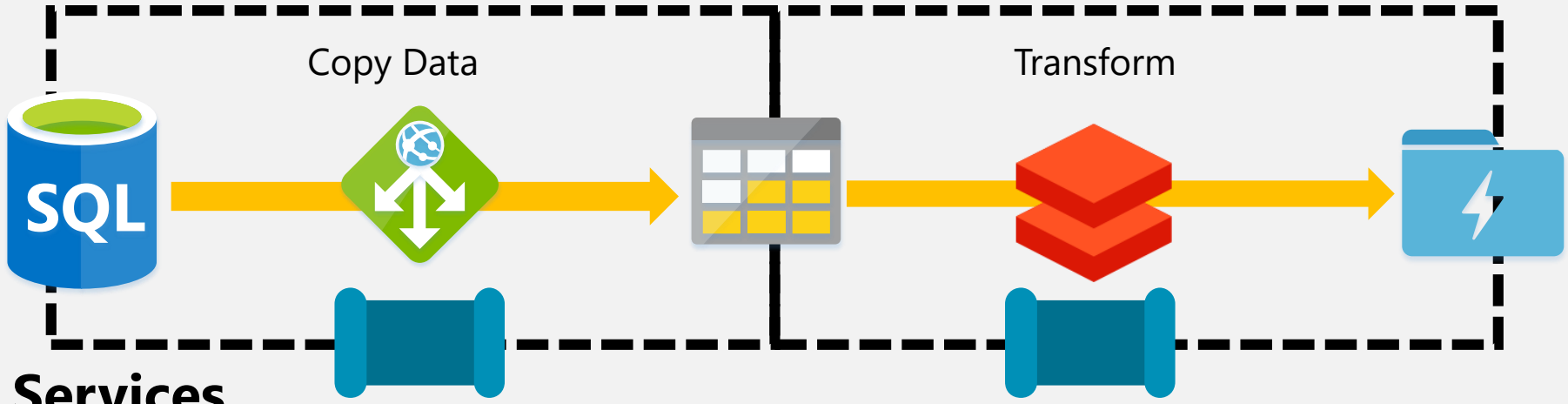
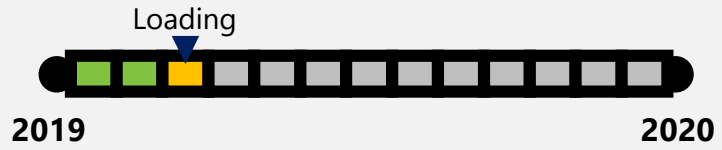
Data Factory Components



1. **Linked Services**
2. **Data Sets**
3. **Activities**
4. **Pipelines**
5. **Triggers**

- Manual via UI
- **Tumbling Windows** - AKA Time Slices
- Scheduled
- Blob File Events
- Logic App Calls



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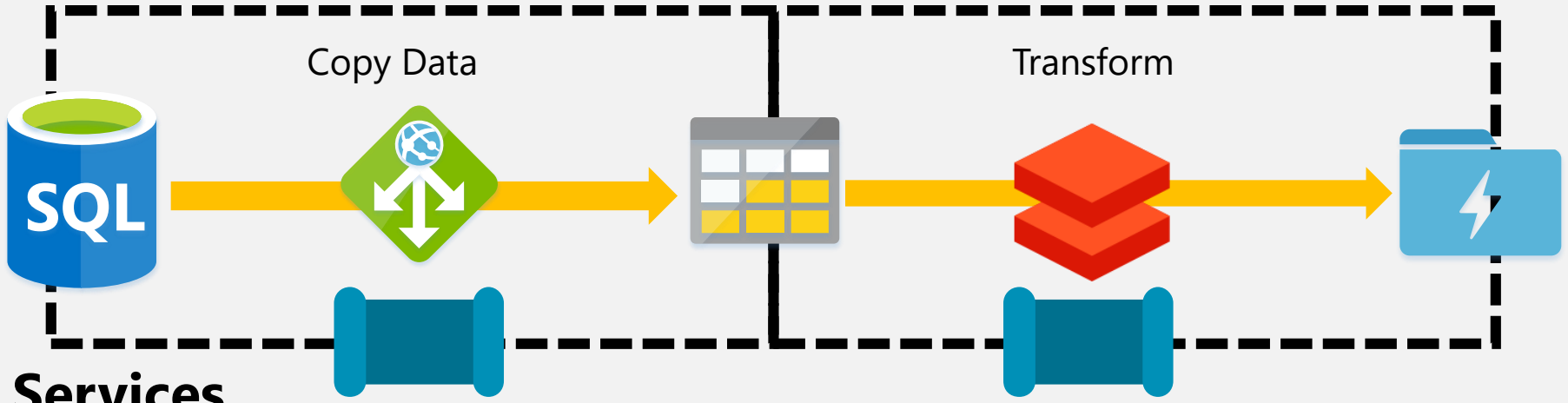
Data Factory Components



1. **Linked Services**
2. **Data Sets**
3. **Activities**
4. **Pipelines**
5. **Triggers**

- Manual via UI
- Tumbling Windows
- **Scheduled**
- Blob File Events
- Logic App Calls

- Every 1 minute.
- UTC

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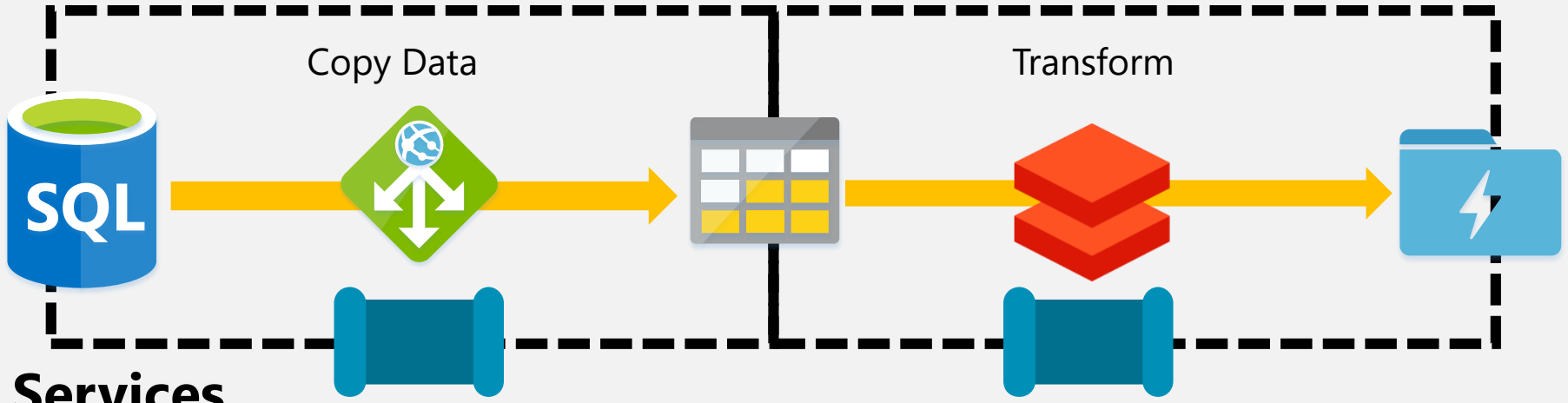
Data Factory Components



1. **Linked Services**
2. **Data Sets**
3. **Activities**
4. **Pipelines**
5. **Triggers**

- Manual via UI
- Tumbling Windows
- Scheduled
- **Blob File Events**
- Logic App Calls

CSV

- {Path} Created
- {Path} Deleted

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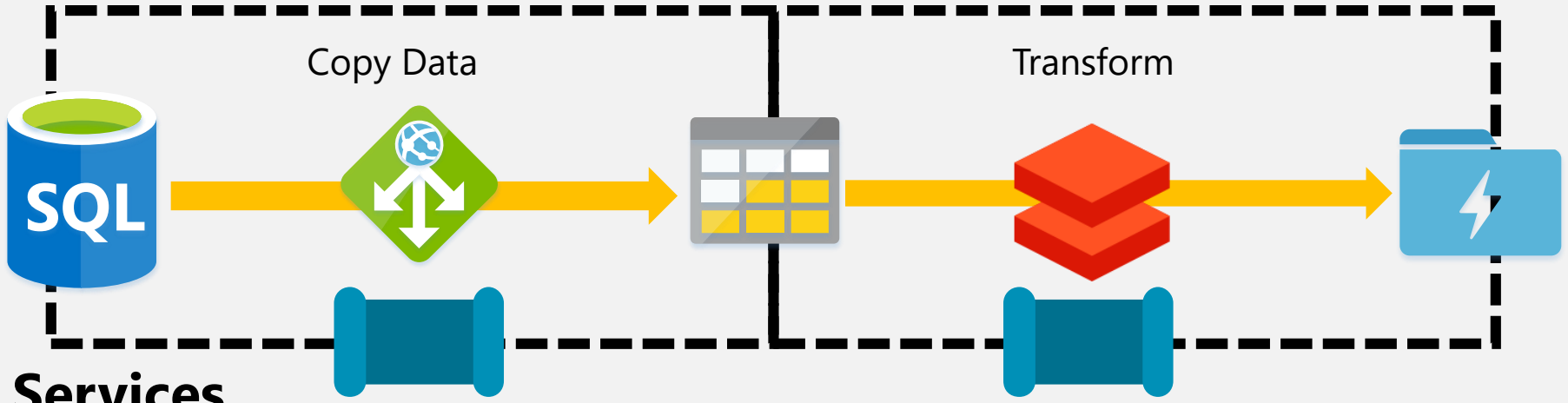
Data Factory Components



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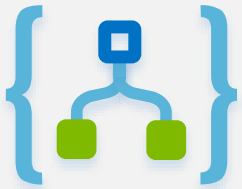
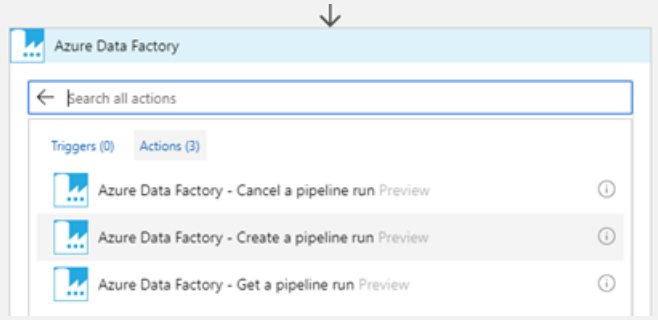
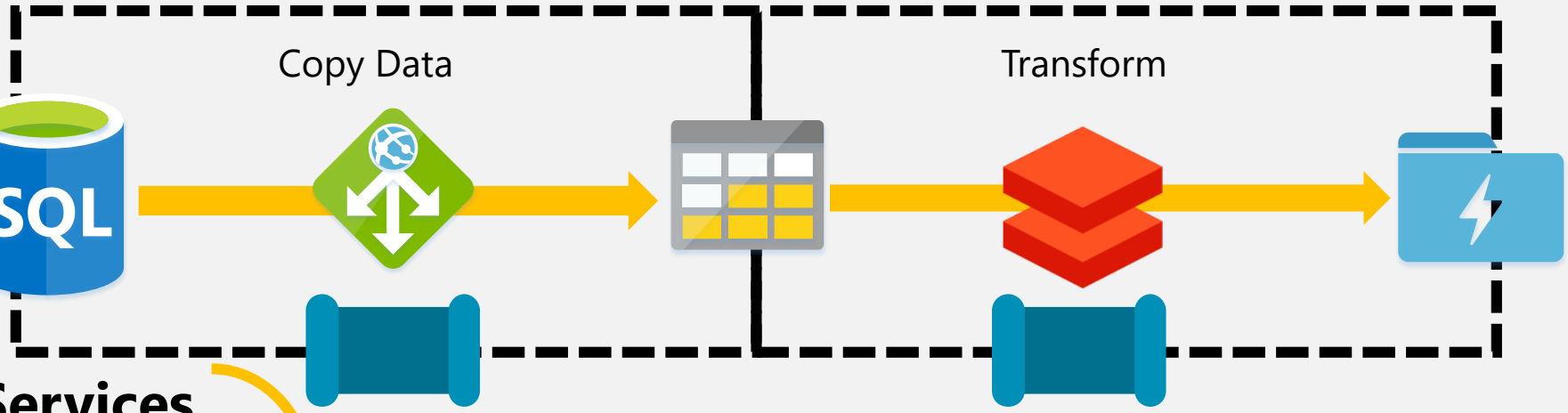




Data Factory Components



1. **Linked Services**
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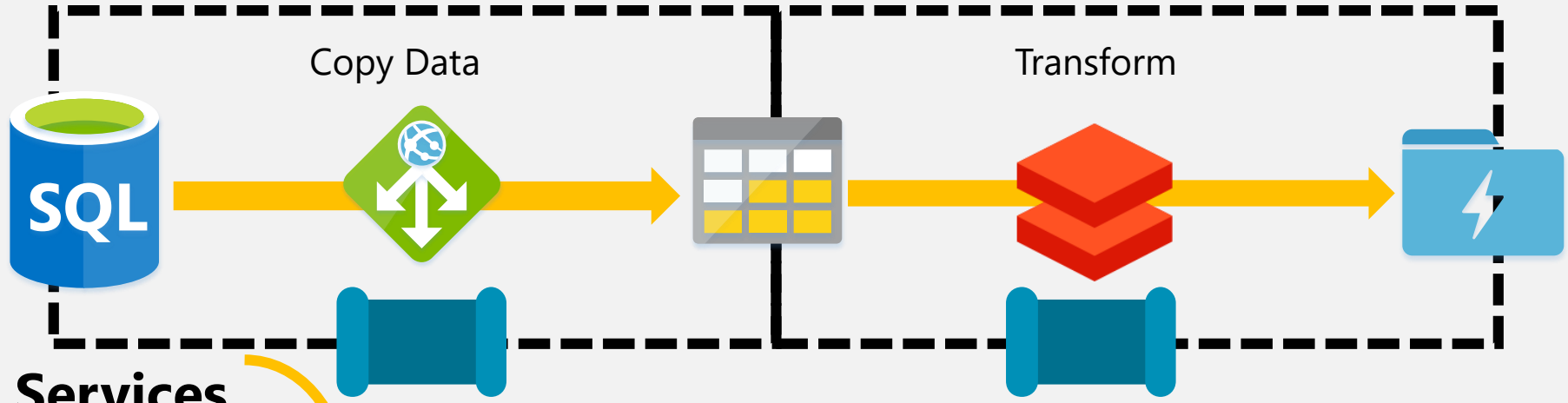
Data Factory Control Flow Components



1. Linked Services
2. Data Sets
3. Activities
4. Pipelines
5. Triggers

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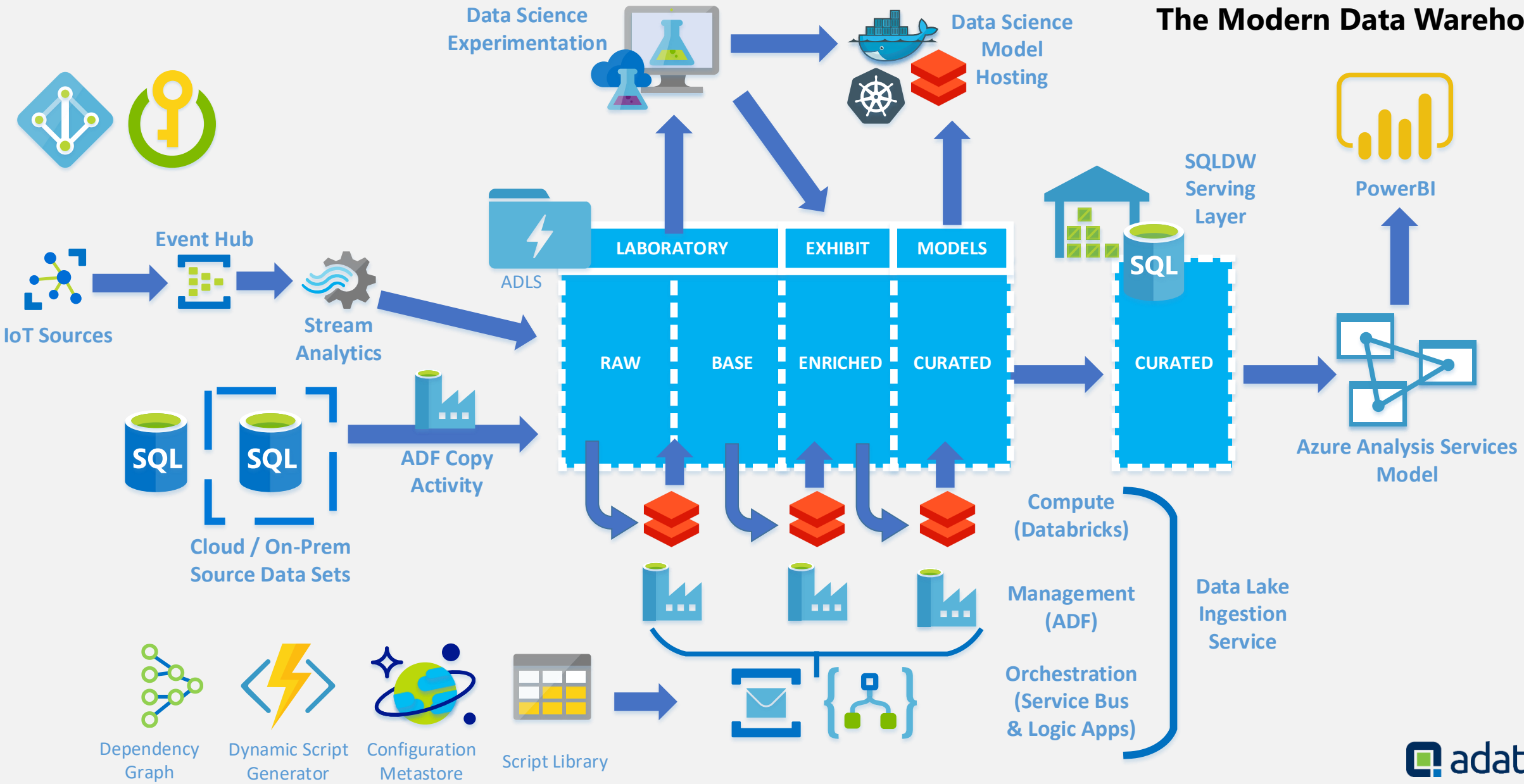
Why use Azure Data Factory?



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Data Transformation in Azure

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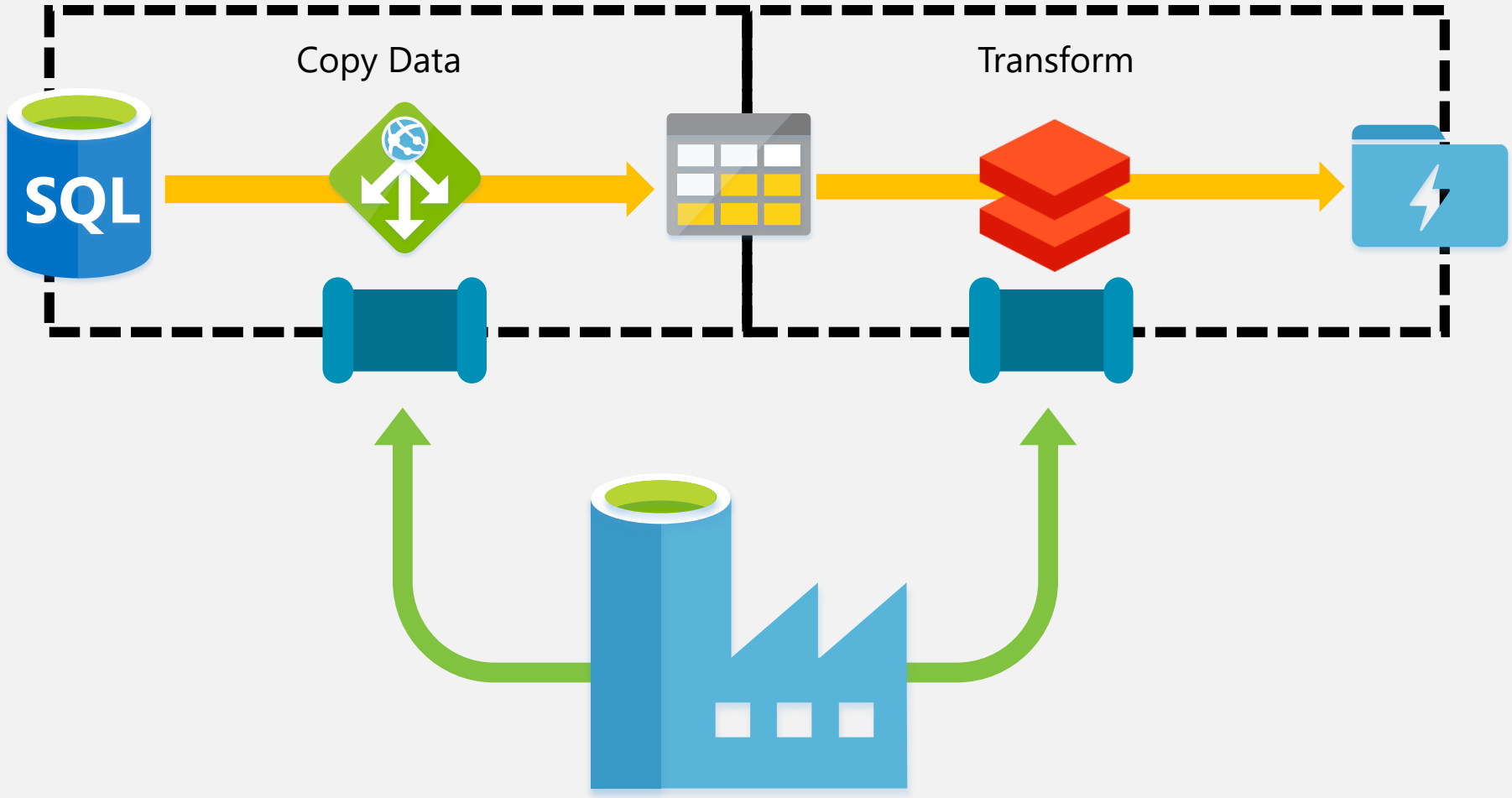
Data Factory Control Flow Components



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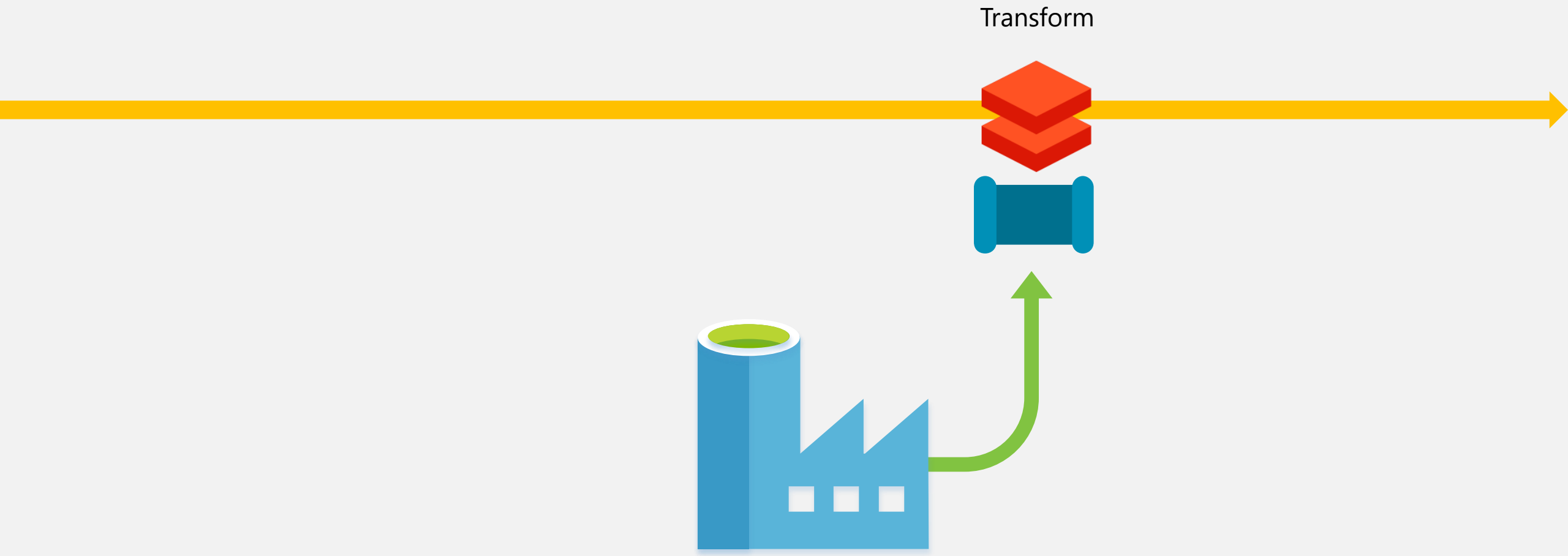

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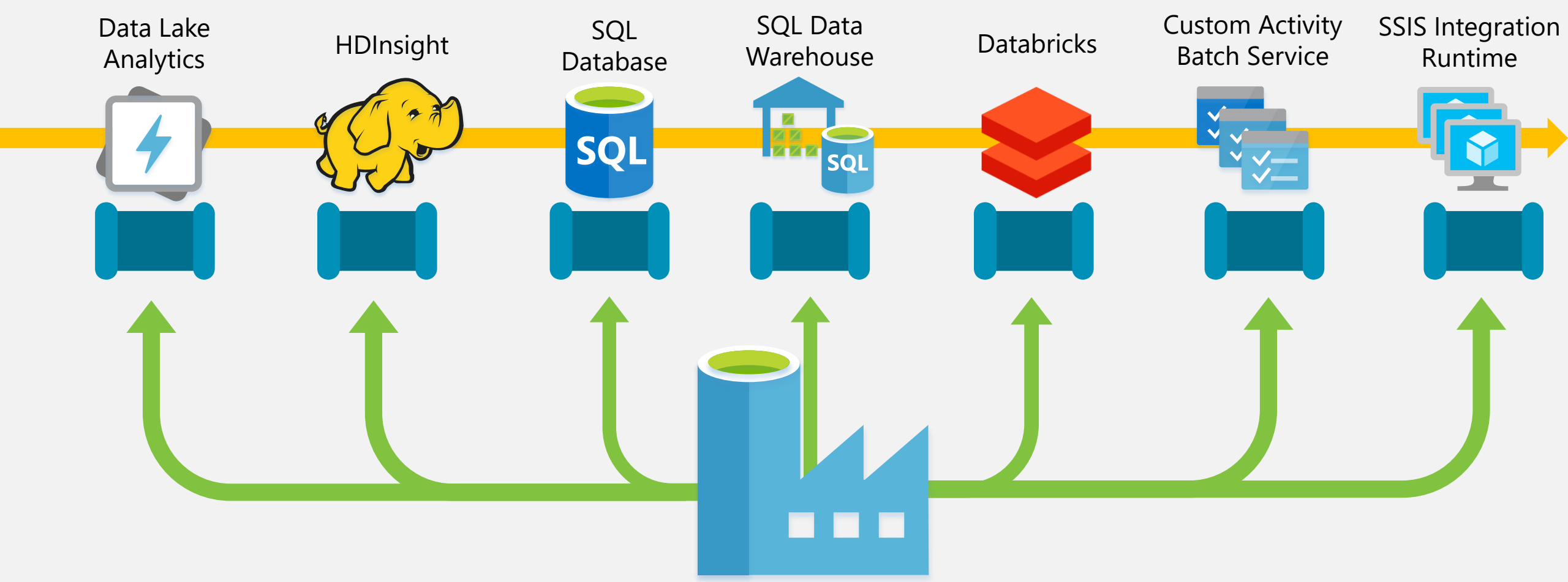

Future Uncertain

Expensive Clusters

Only Scales Up

Requires at least 1TB

Learn Spark, Python/Scala

Custom Apps on IaaS

IaaS VMs 20min start

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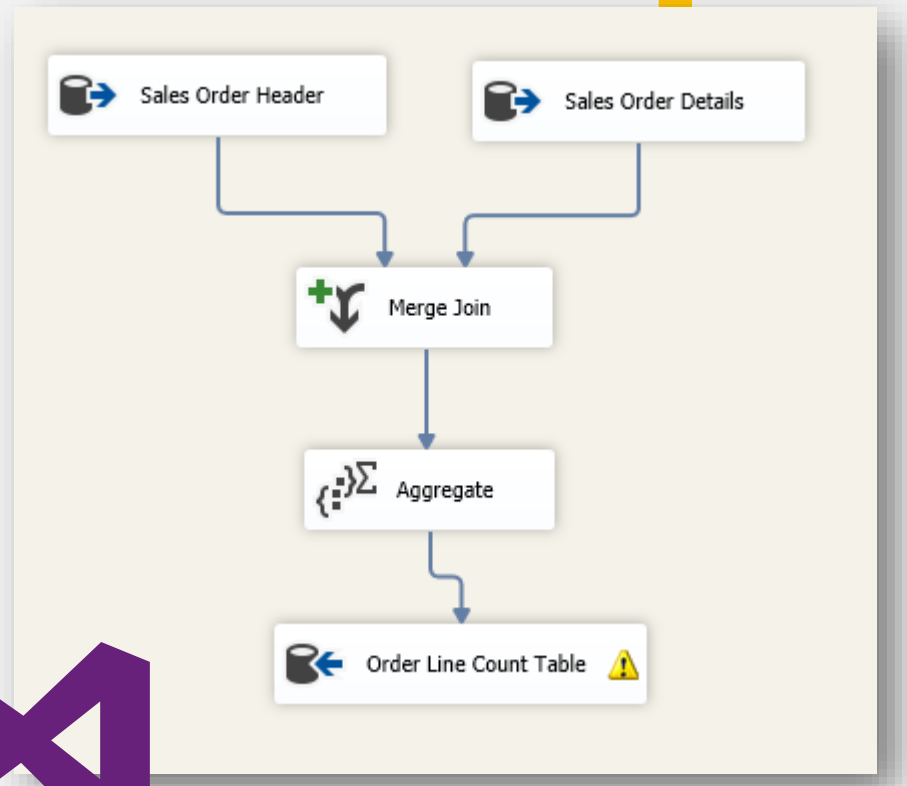
Data Transformation in Azure with SSIS

SSIS Package

8x Packages per Node

10x Nodes

SSIS Integration Runtime



Visual Studio – SQL Server Data Tools (SSDT)

Data Factory

Logical or Managed Instance

SSISDB

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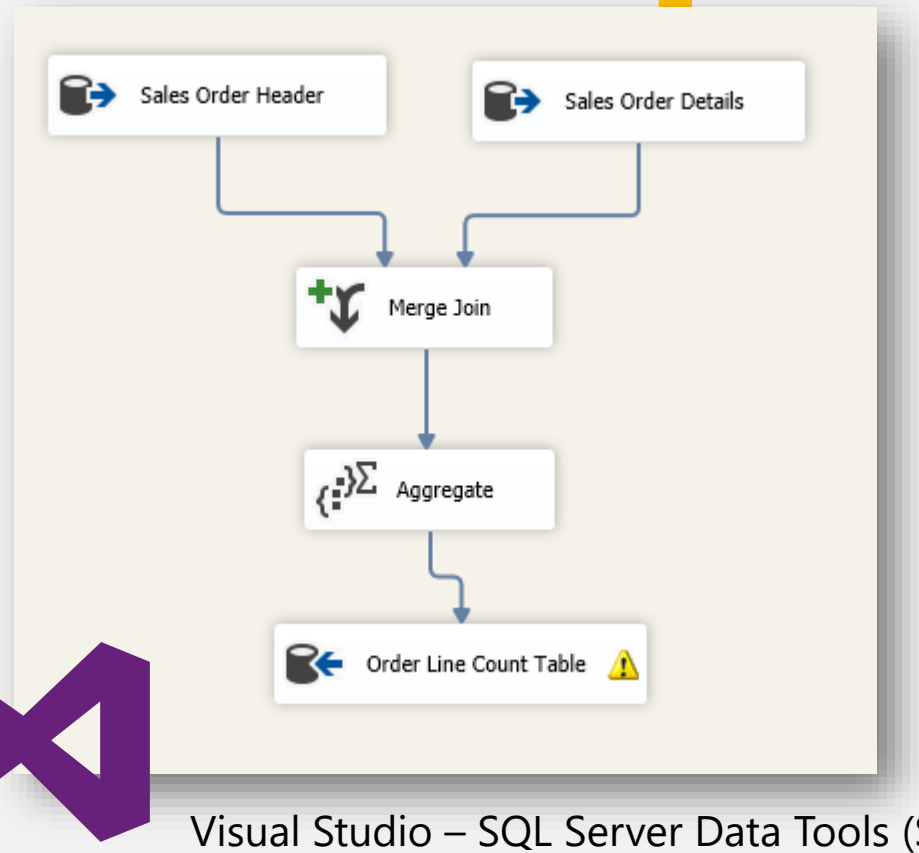
Data Transformation in Azure with SSIS

SSIS Package



Visual Studio – SQL Server Data Tools (SSDT)

8x Packages per Node

10x Nodes

SSIS Integration Runtime

Express Route

VNet

Data Factory

Logical or Managed Instance

SSISDB

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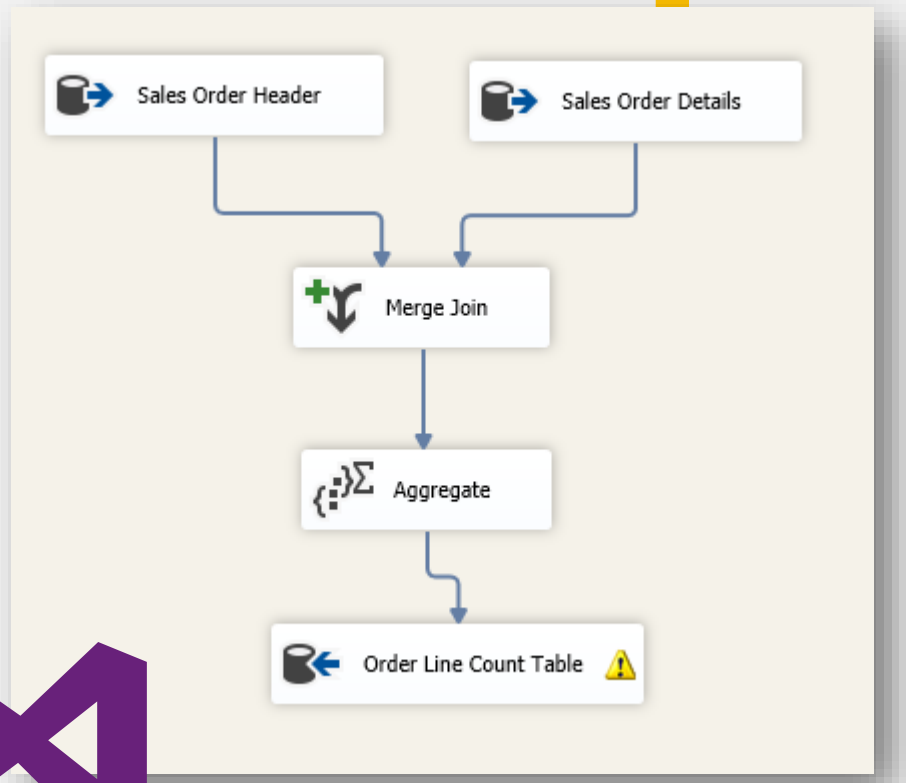
Data Transformation in Azure with SSIS

SSIS Package



Visual Studio – SQL Server Data Tools (SSDT)

1x Package per Node

D64_v3
64 Cores
256GB RAM
£1,700 a month

1x Node

SSIS Integration Runtime

Data Factory

Logical or Managed Instance

SSISDB

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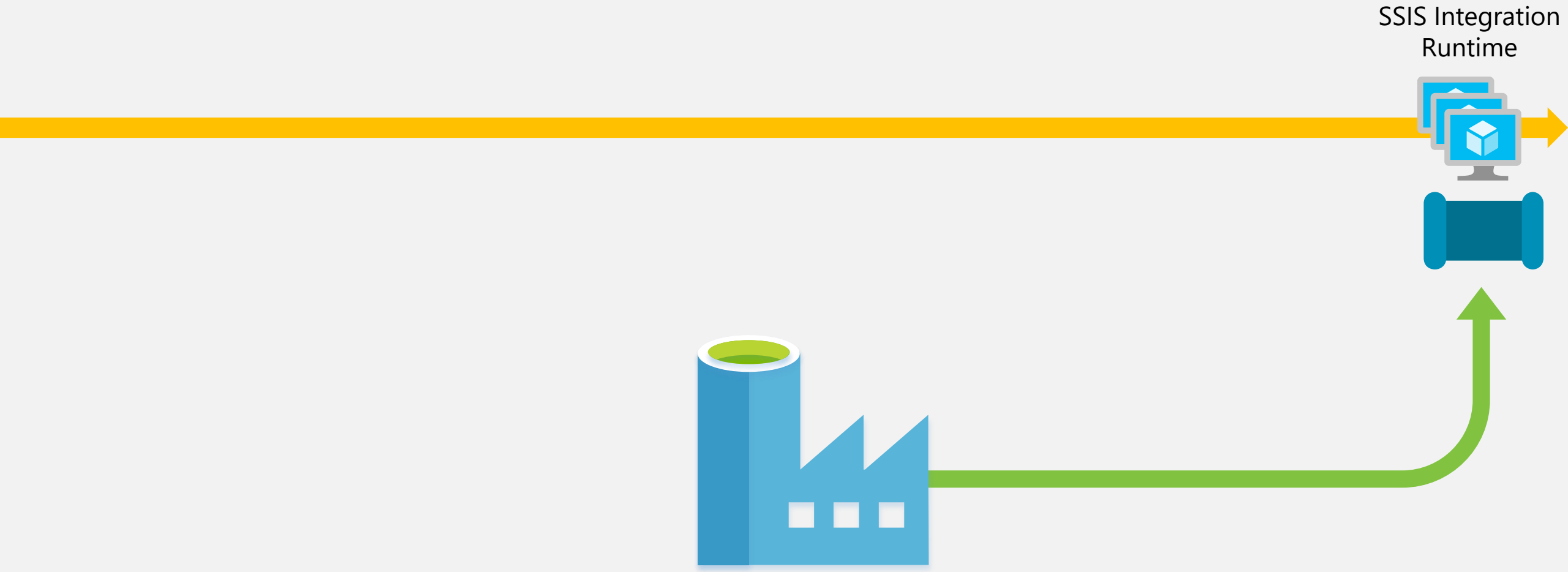
Data Transformation in Azure



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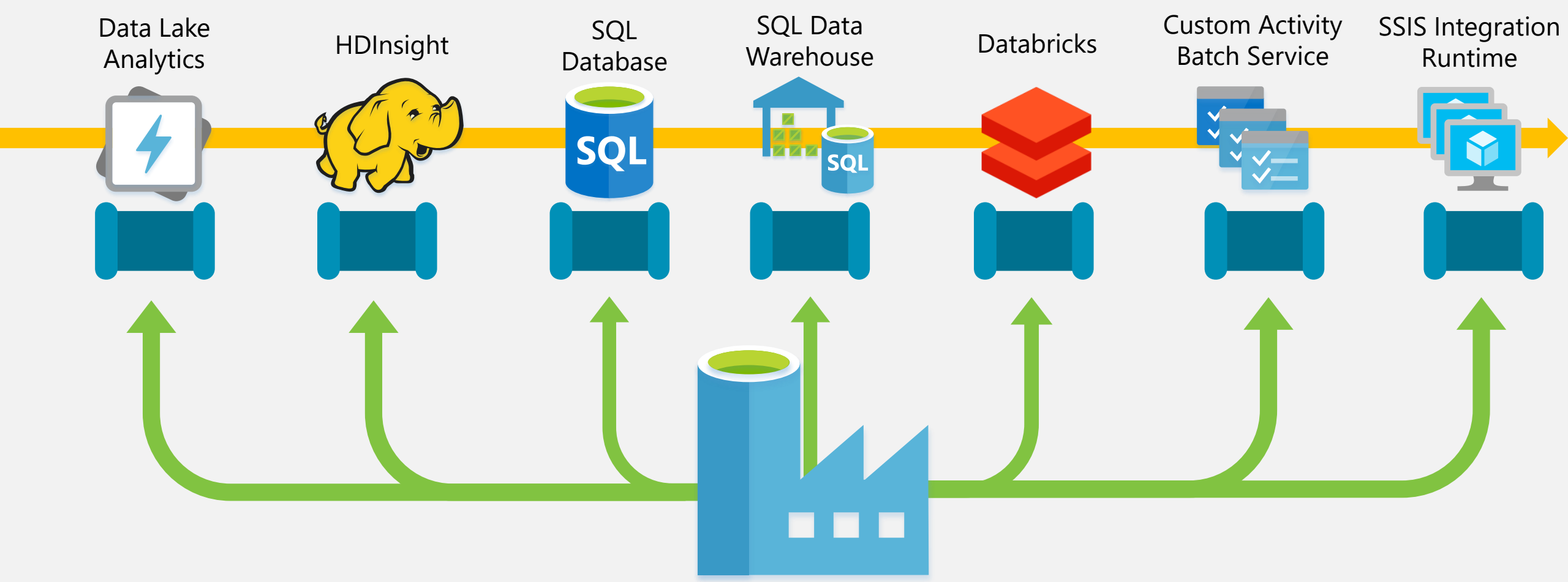
Data Transformation in Azure



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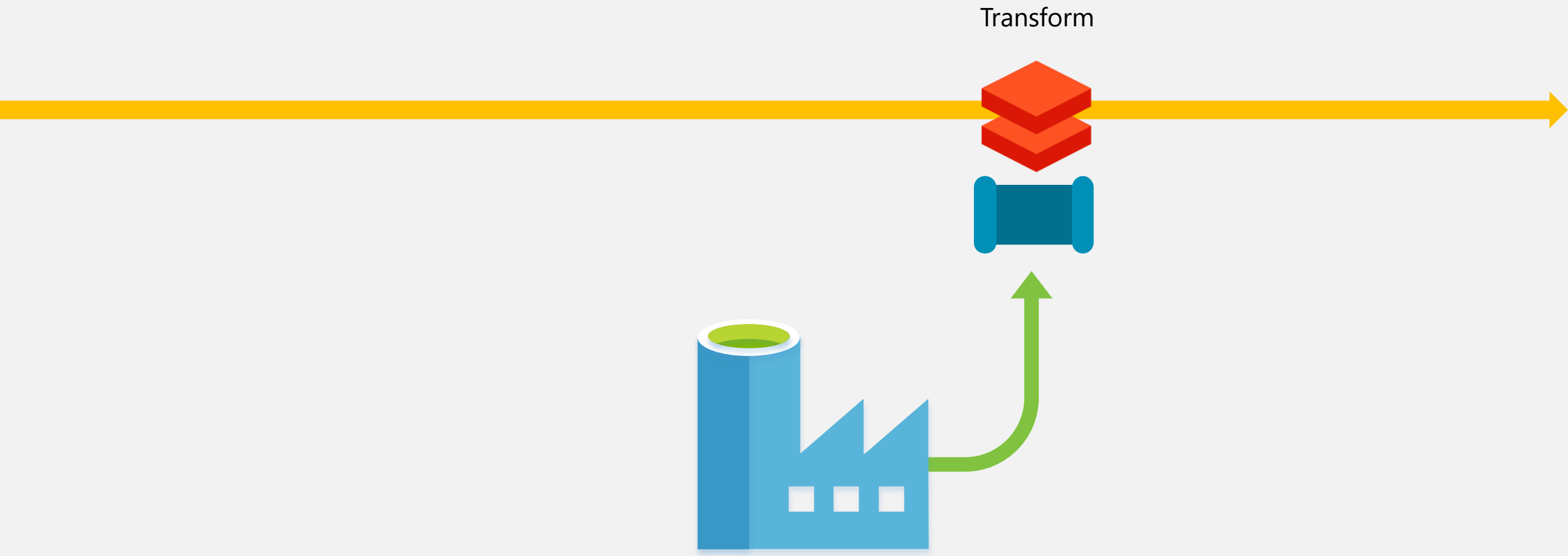

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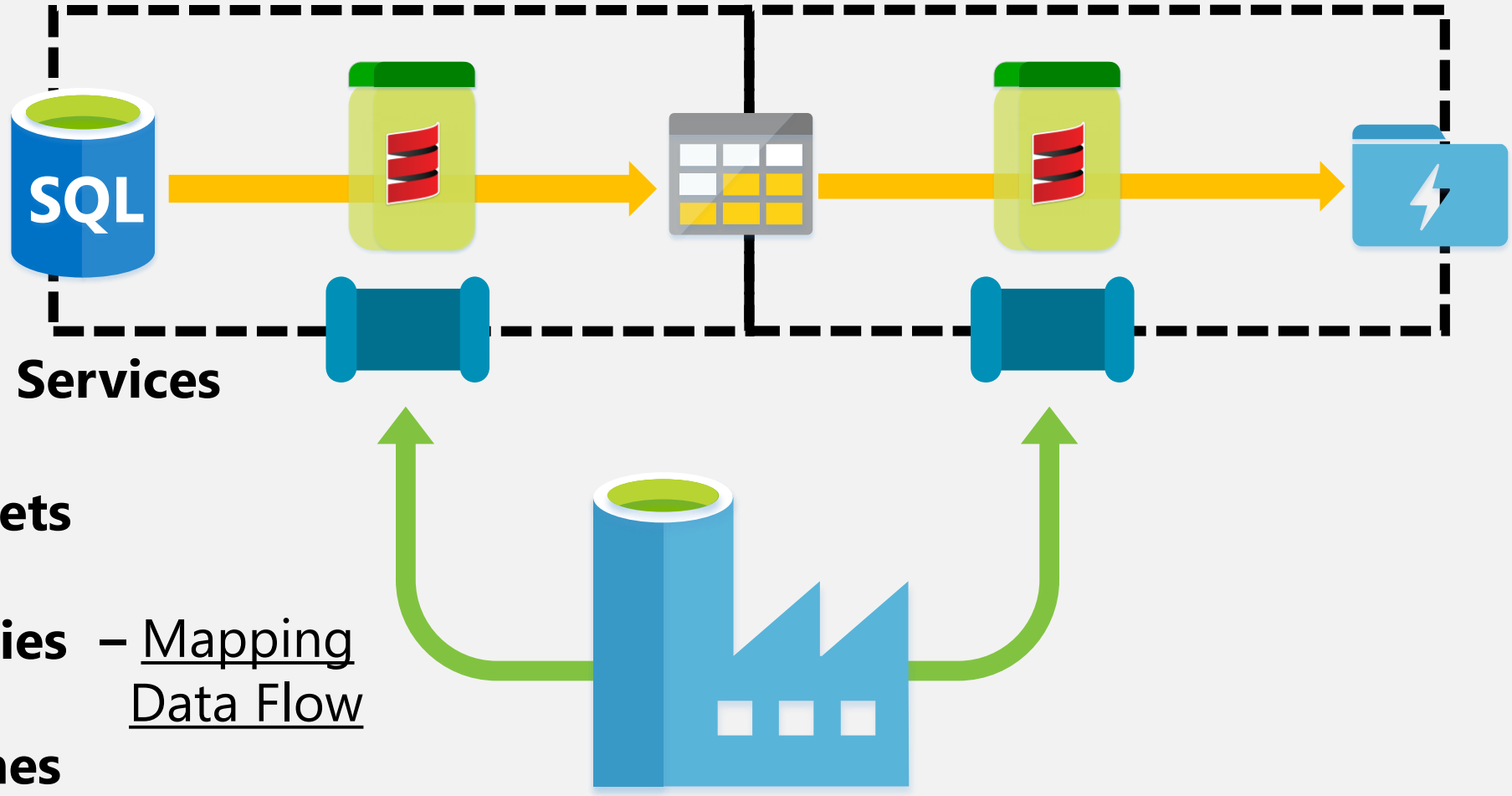
Data Factory Control Flow Components



1. **Linked Services**
2. **Data Sets**
3. **Activities** – Mapping Data Flow
4. **Pipelines**
5. **Triggers**

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Mapping Data Flows

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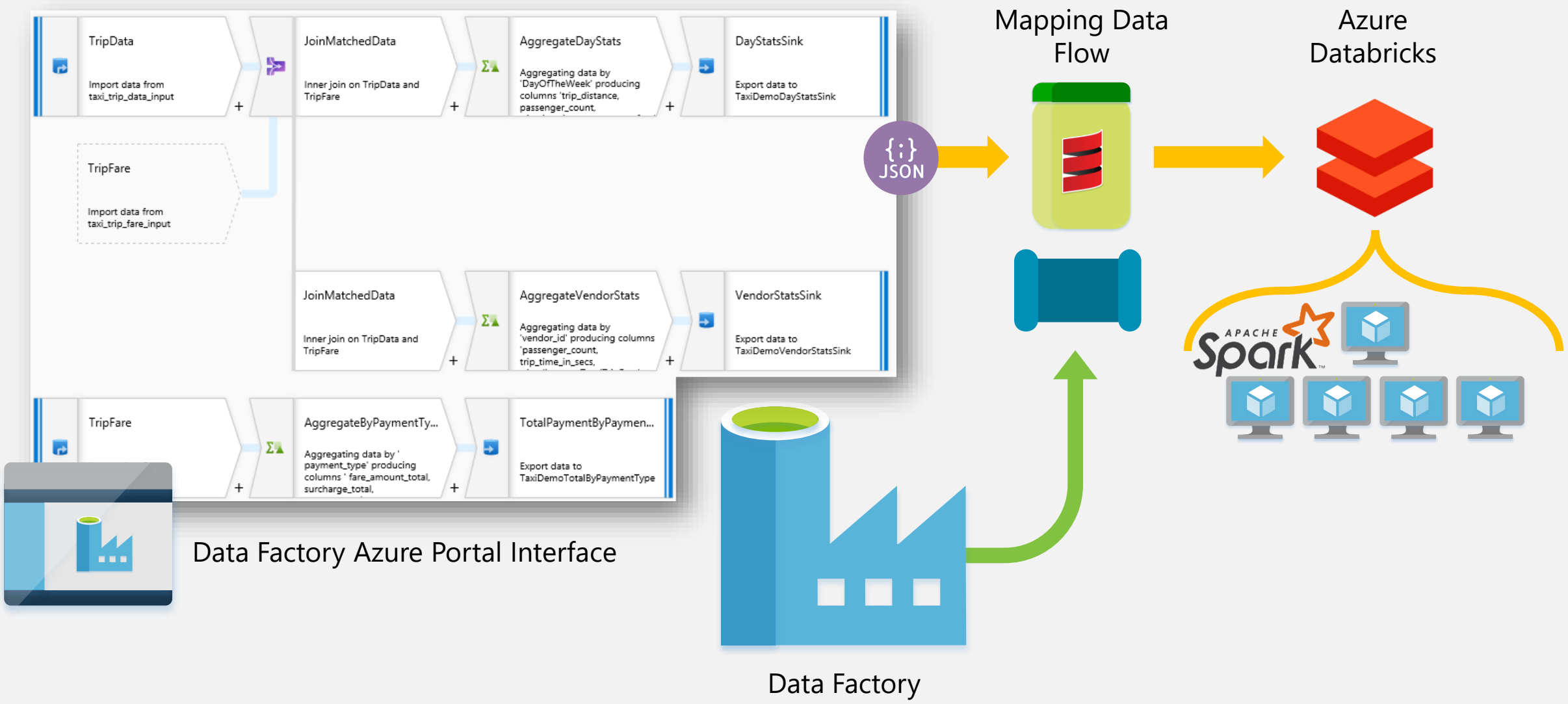
What is a Mapping Data Flow?



https://mrpaulandrew.com/2018/10/22/what-is-azure-data-factory-data-flow/

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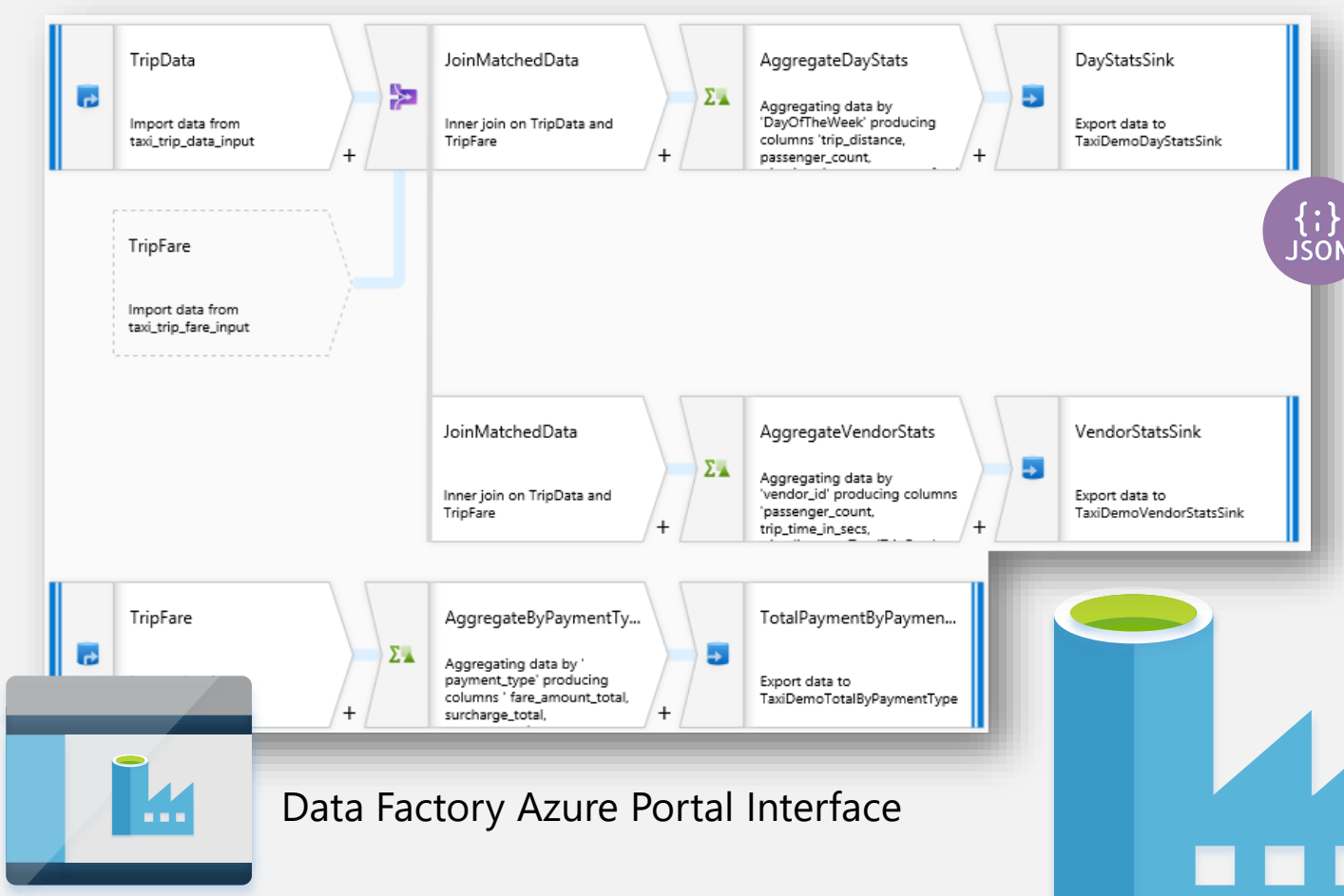
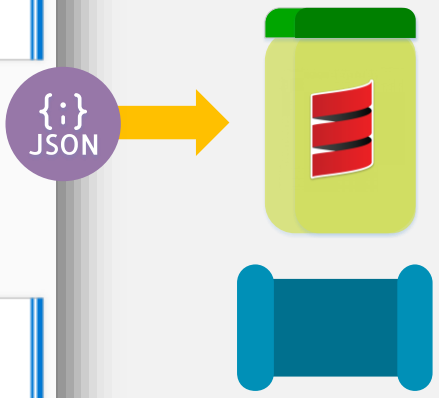


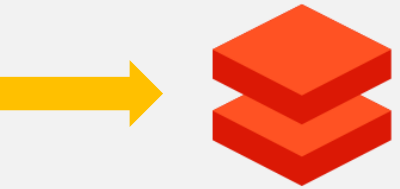
Data Factory Azure Portal Interface

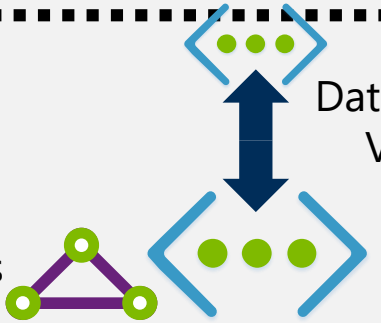
Data Factory

Mapping Data Flow



Azure Databricks





Databricks VNet

Express Route

Production VNet

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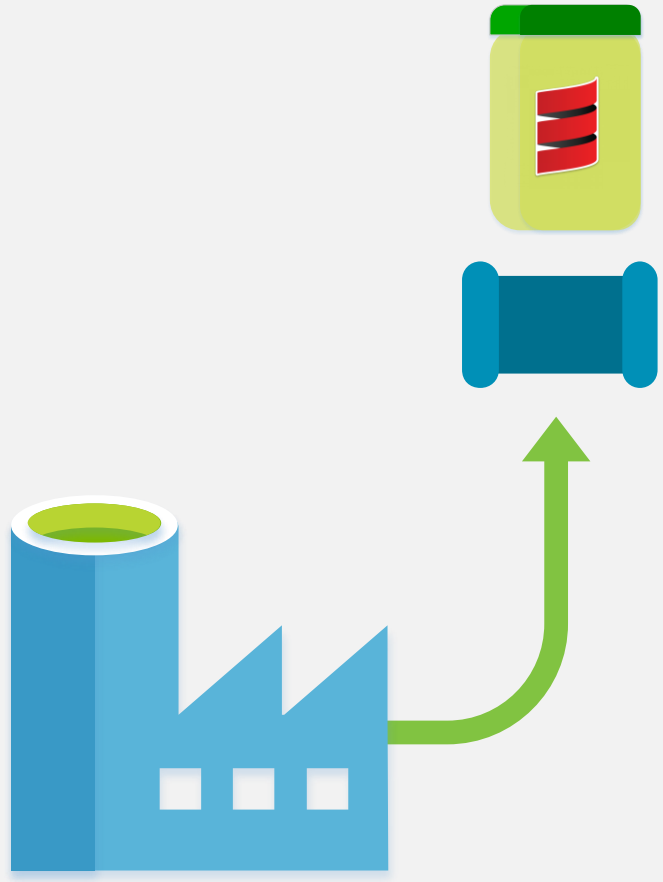
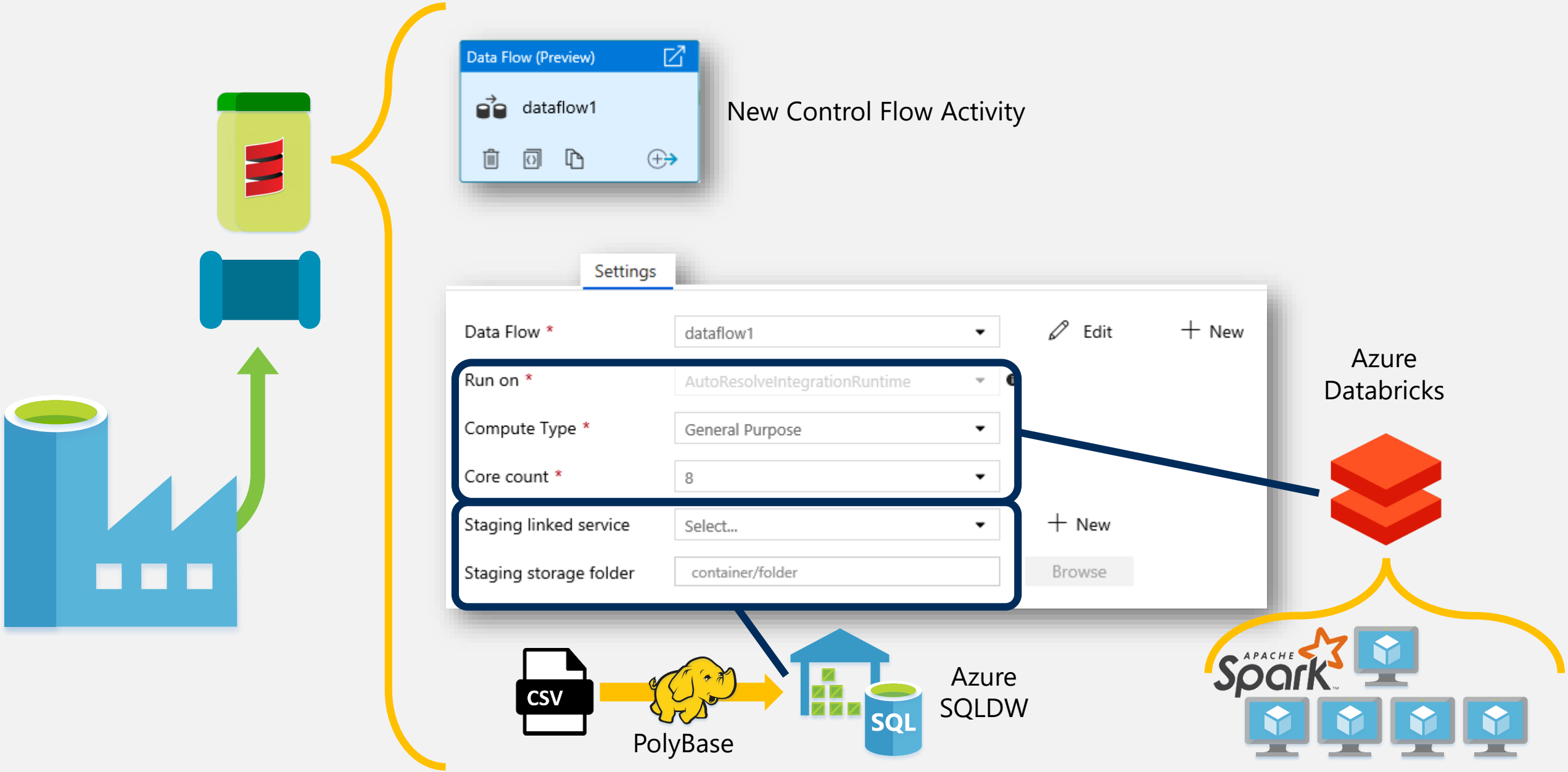
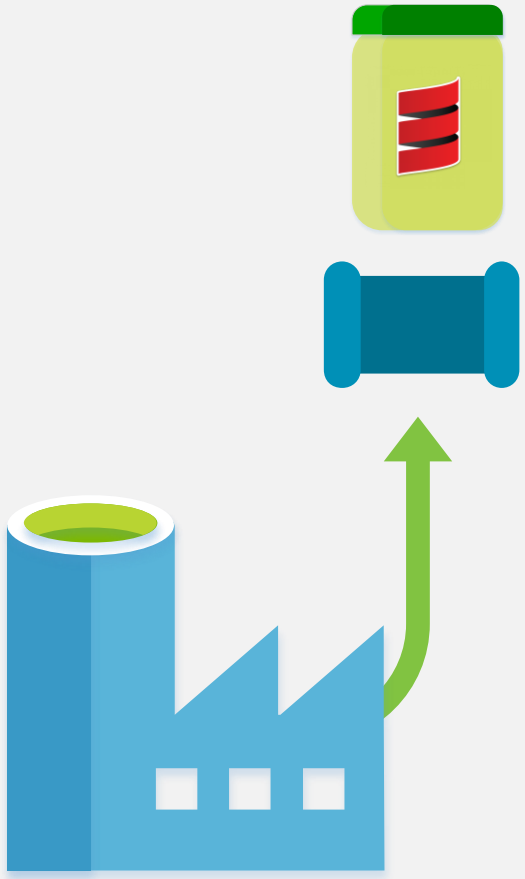
Mapping Data Flows



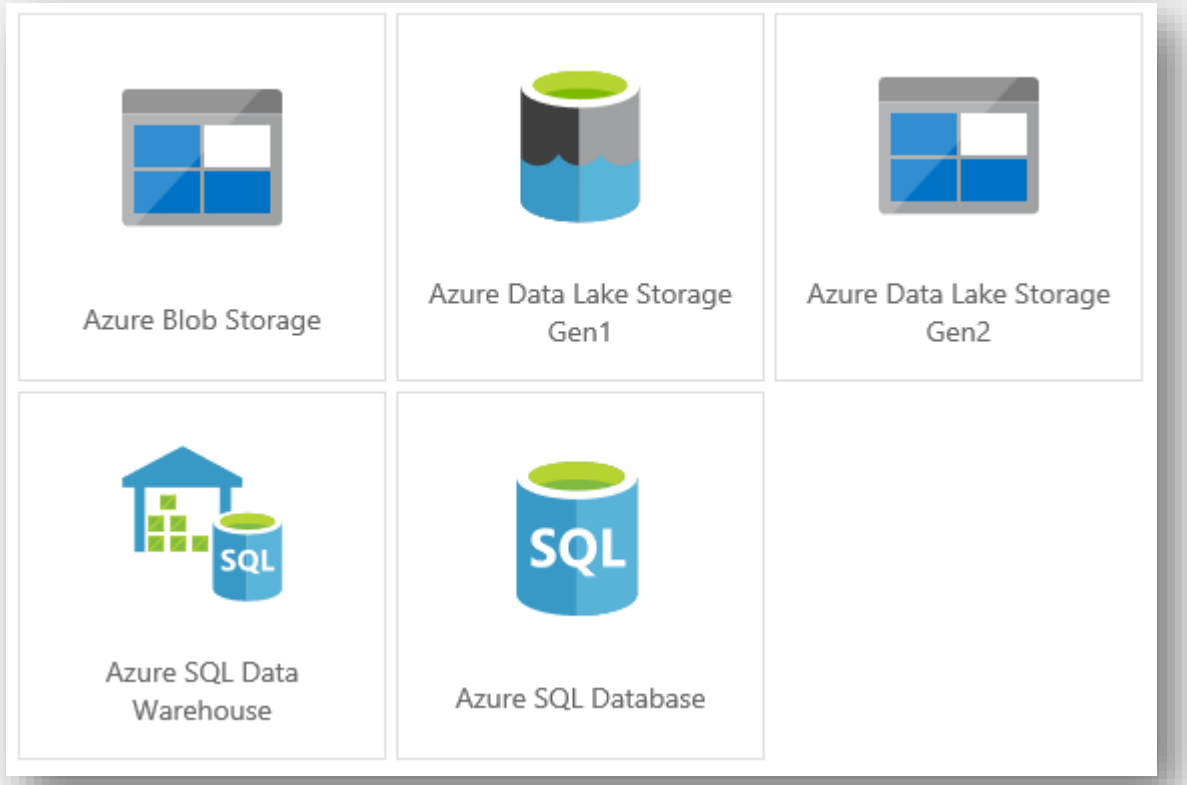
Mapping Data Flows – Settings & Concepts



Mapping Data Flows – Settings & Concepts



Currently Available:



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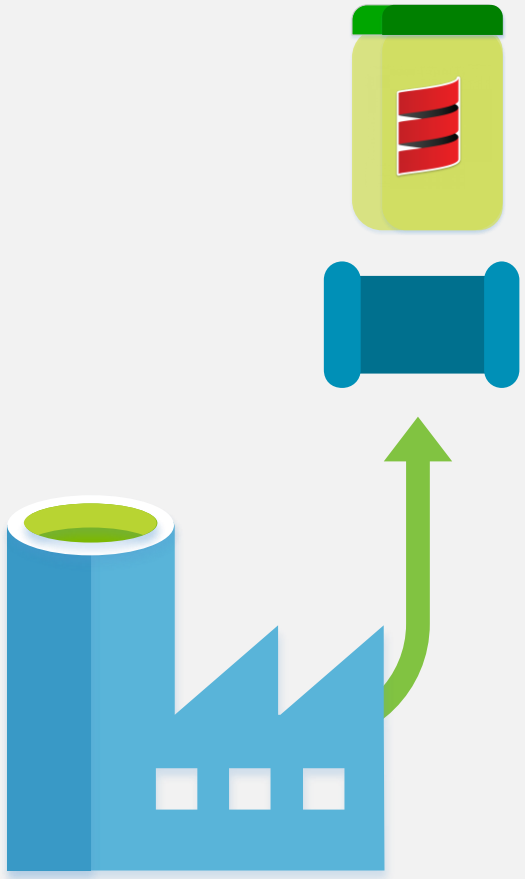
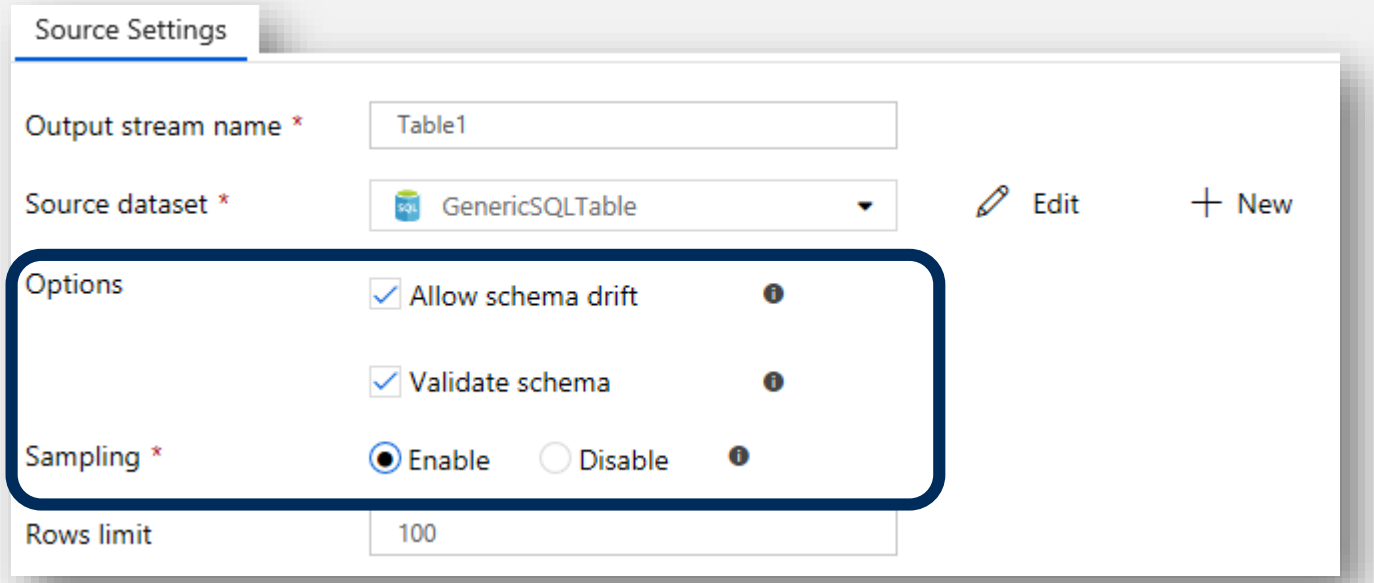
Mapping Data Flows – Settings & Concepts





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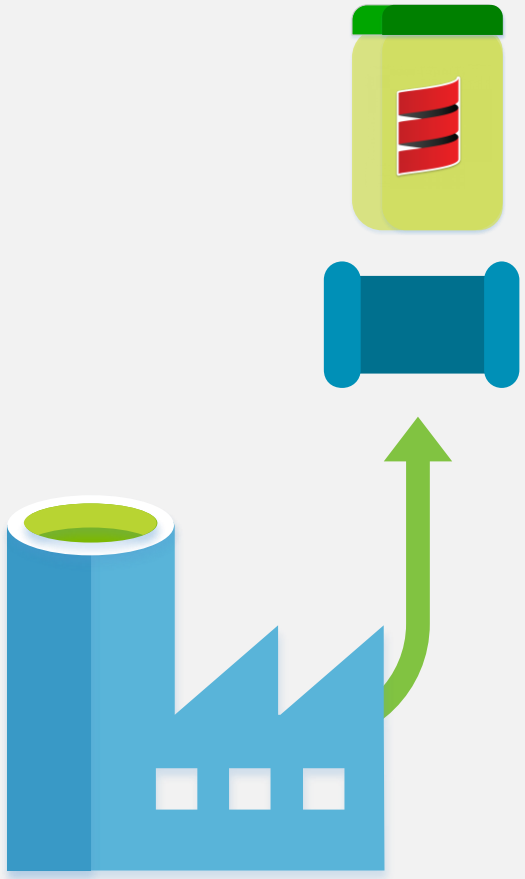
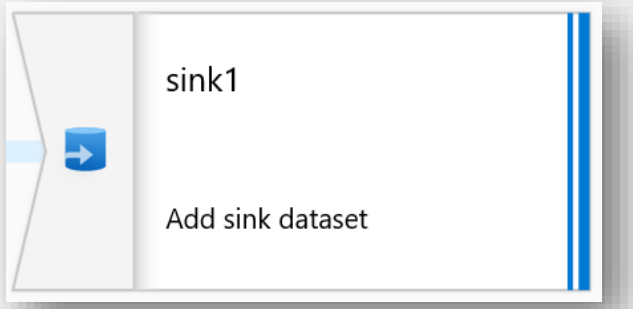
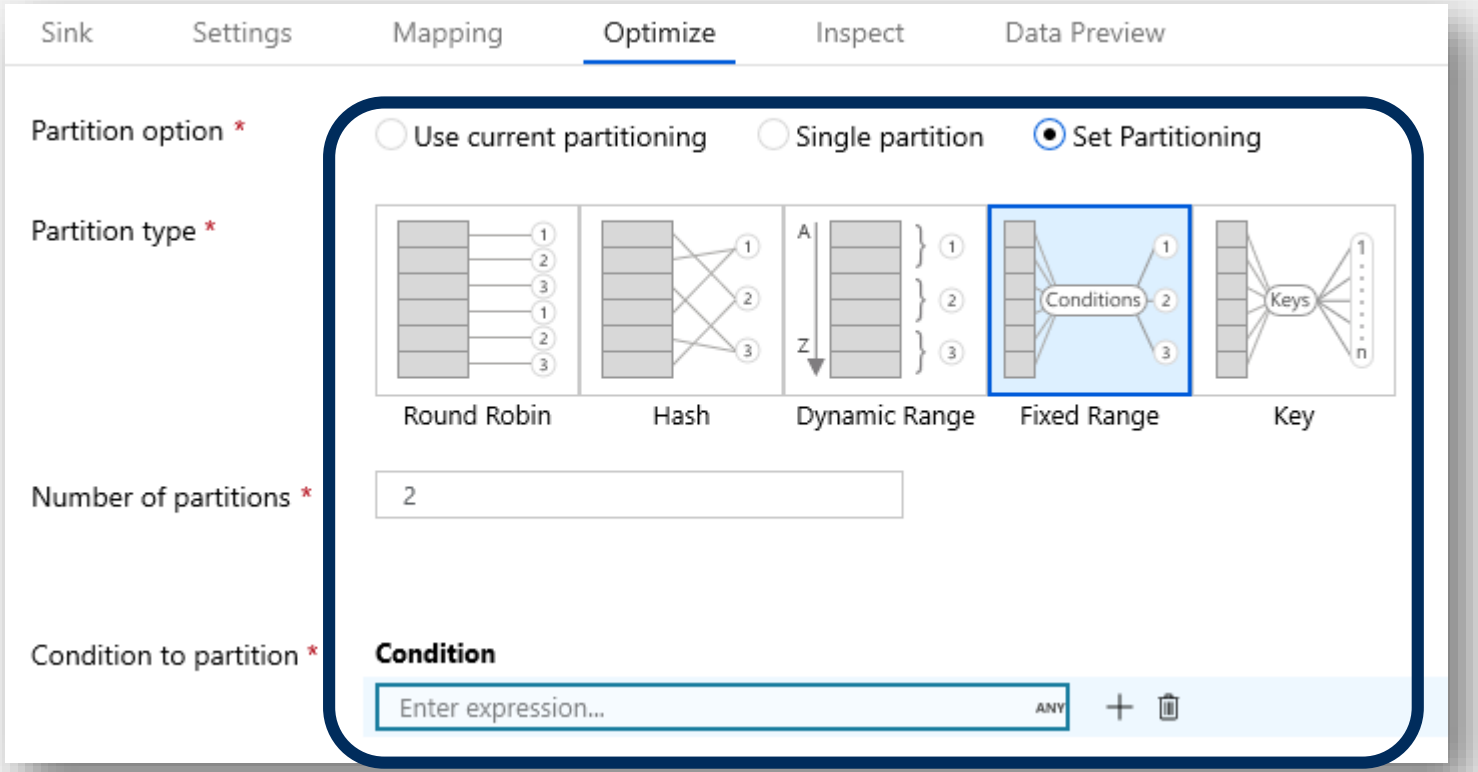
Mapping Data Flows – Settings & Concepts







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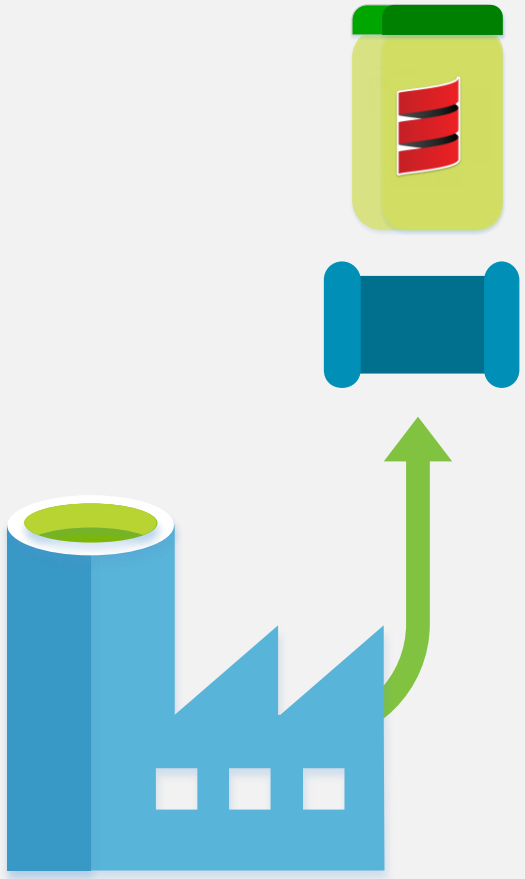
Mapping Data Flows – Transformations



Multiple inputs/outputs

- New Branch — Multicast
- Join — Merge Join
- Conditional Split
- Union
- Lookup

Schema modifier

- Derived Column
- Aggregate
- Surrogate Key
- Pivot
- Unpivot
- Window

https://docs.microsoft.com/en-gb/azure/data-factory/data-flow-surrogate-key

Row modifier

- Exists
- Select
- Filter
- Sort

Custom

- Extend — Script Component

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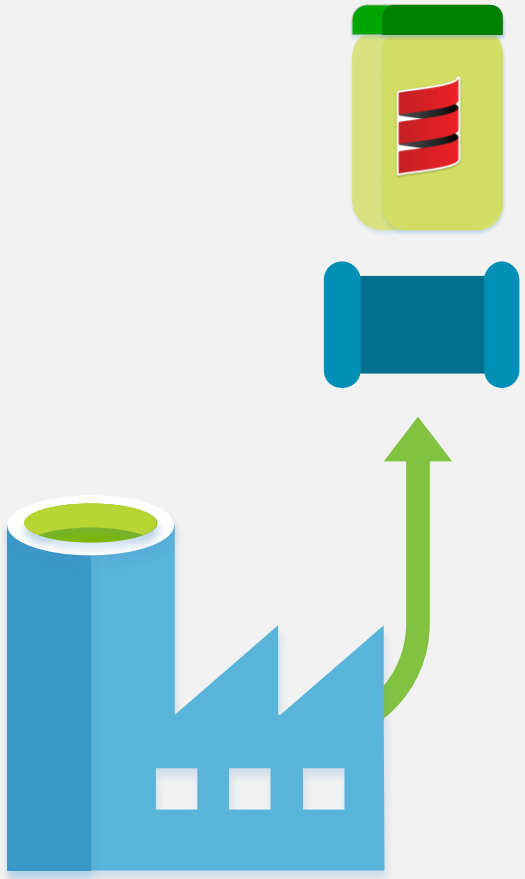
Mapping Data Flows – Expression Builder



Visual Expression Builder

Currently working on: year

Filter...

All | String | Math | Date | Logical | Input

- abc md5(ANY expression)
- 123 nextSequence()
- abc regexExtract(abc string, abc regex to find, ANY match group 1-based index)
- regexMatch(abc string, abc regex to match)
- abc right(abc string to subset, ANY number of characters)

```
toInteger(trim(right(title, 6), '()'))
```

Extract a matching substring for a given regex pattern. The last parameter identifies the match group and is defaulted to 1 if omitted. Use `<regex>`(back quote) to match a string without escaping

Examples
1. regexExtract('Cost is between 600 and 800 dollars', '(\\d+) and (\\d+)', 2) -> '800'
2. regexExtract('Cost is between 600 and 800 dollars', `(\d+) and (\d+)`, 2) -> '800'

+ - * / ||

Data preview

Please turn on the debug mode and wait until cluster is ready to preview data...

Output: year 123	title abc
-	-

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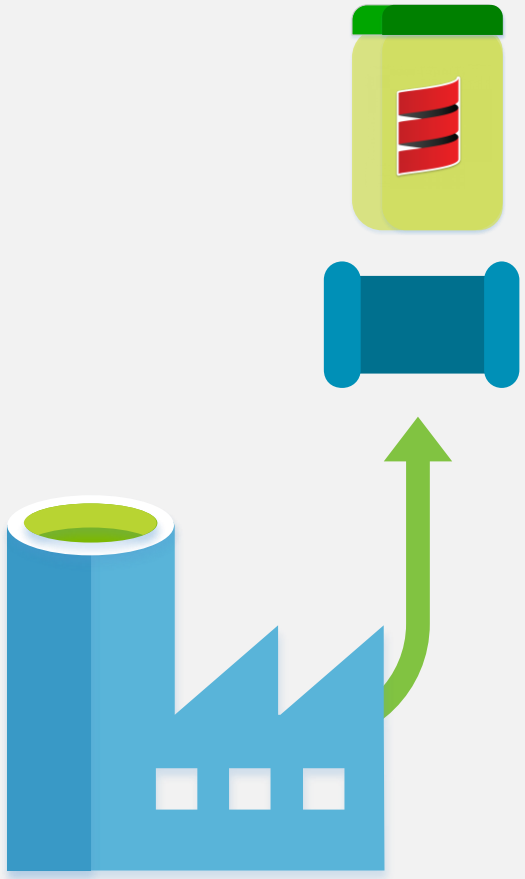
Mapping Data Flows – Debug Mode



ADWAnalysis | ADWAnalysisB...

Debug | Saved | Validate | Source Settings | Cluster ● ForDataFlow

OrderHeader
Columns:
22 total

Join1
Inner join on OrderHeader and OrderDetails

Aggregate1
Aggregating data by 'SalesOrderNumber' producing columns 'OrderLineCount'

sink1
Export data to ADWOrderLineCountTable

OrderDetails
Import data from ADWSalesOrderDetail

Add Source

Source Settings | Define schema | Optimize | Inspect | Data Preview

	Updated*	New*	Unchanged	Total
Number of rows	N/A	N/A	N/A	32

SalesOrderID 123	RevisionNumber abc	OrderDate	DueDate	ShipDate
71774	2	06/01/2008 00:06:00	06/13/2008 00:06:00	06/08/2008
71776	2	06/01/2008 00:06:00	06/13/2008 00:06:00	06/08/2008

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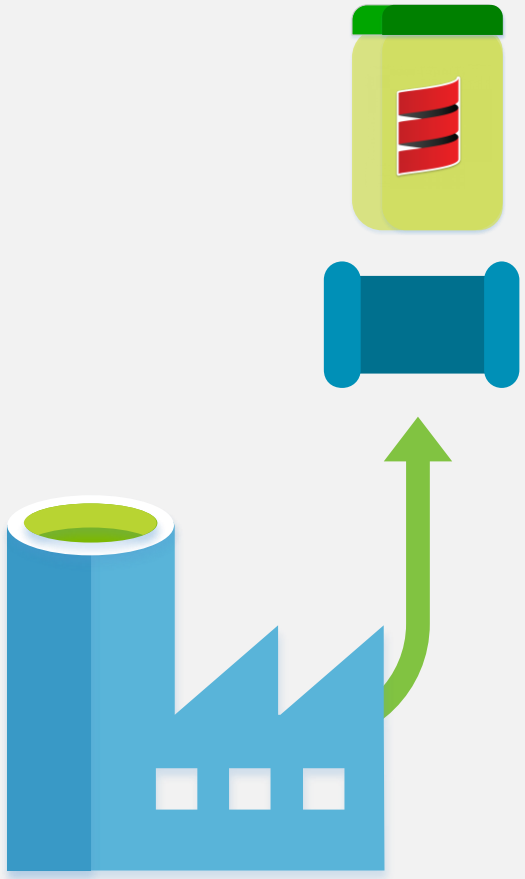
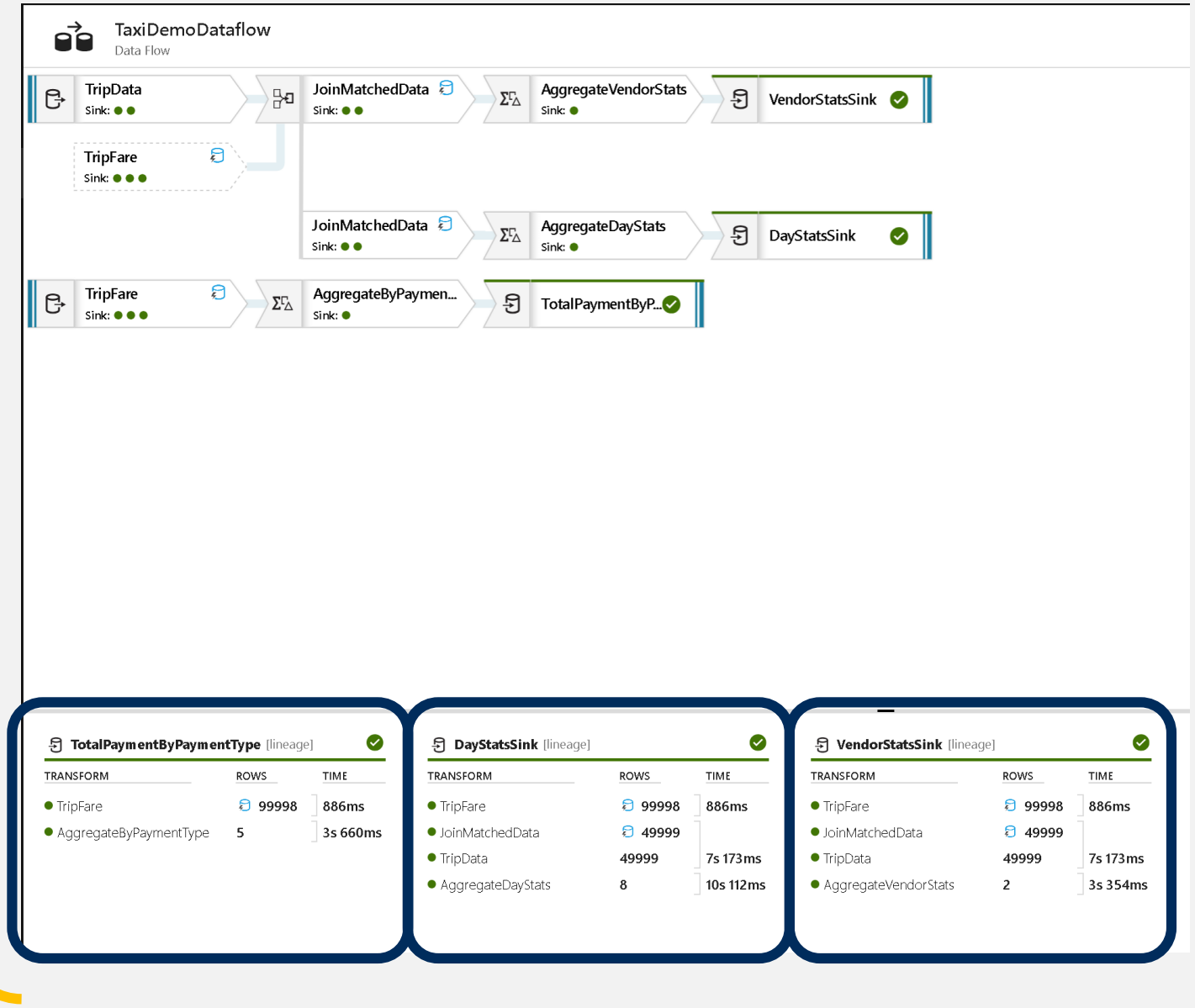
Mapping Data Flows – Monitoring





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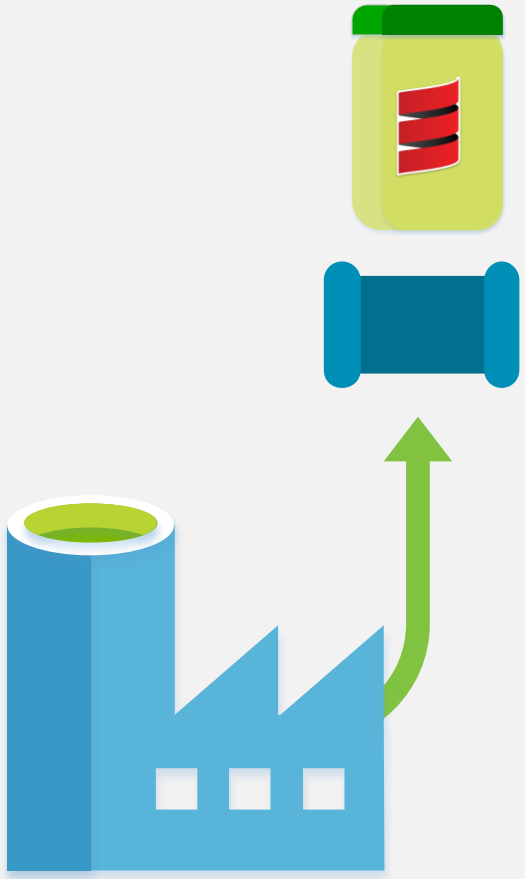
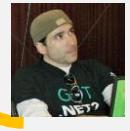
Mapping Data Flows



1. **Activity**
   https://docs.microsoft.com/en-gb/azure/data-factory/concepts-data-flow-overview
2. **Source & Sink**
   https://docs.microsoft.com/en-gb/azure/data-factory/concepts-data-flow-schema-drift
3. **Transformations**
   https://docs.microsoft.com/en-gb/azure/data-factory/data-flow-aggregate
4. **Expression Builder**
   https://docs.microsoft.com/en-gb/azure/data-factory/data-flow-expression-functions
5. **Debug Mode**
   https://docs.microsoft.com/en-gb/azure/data-factory/concepts-data-flow-debug-mode
6. **Monitoring**
   https://docs.microsoft.com/en-gb/azure/data-factory/concepts-data-flow-monitoring



https://github.com/kromerm/adfdataflowdocs/tree/master/videos

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Demo

Note to self; start clusters!

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Demo Summary

Transformation Method	Graphical Development	Scales Out	Scales Up	Cloud Native Tech
T-SQL (SQLDB)	✗	✗	✓	✗
SSIS	✓	✗	✓	✗
Scala (Databricks)	✗	✓	✓	✓
Mapping Data Flow	✓	✓	✓	✓

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Design Patterns

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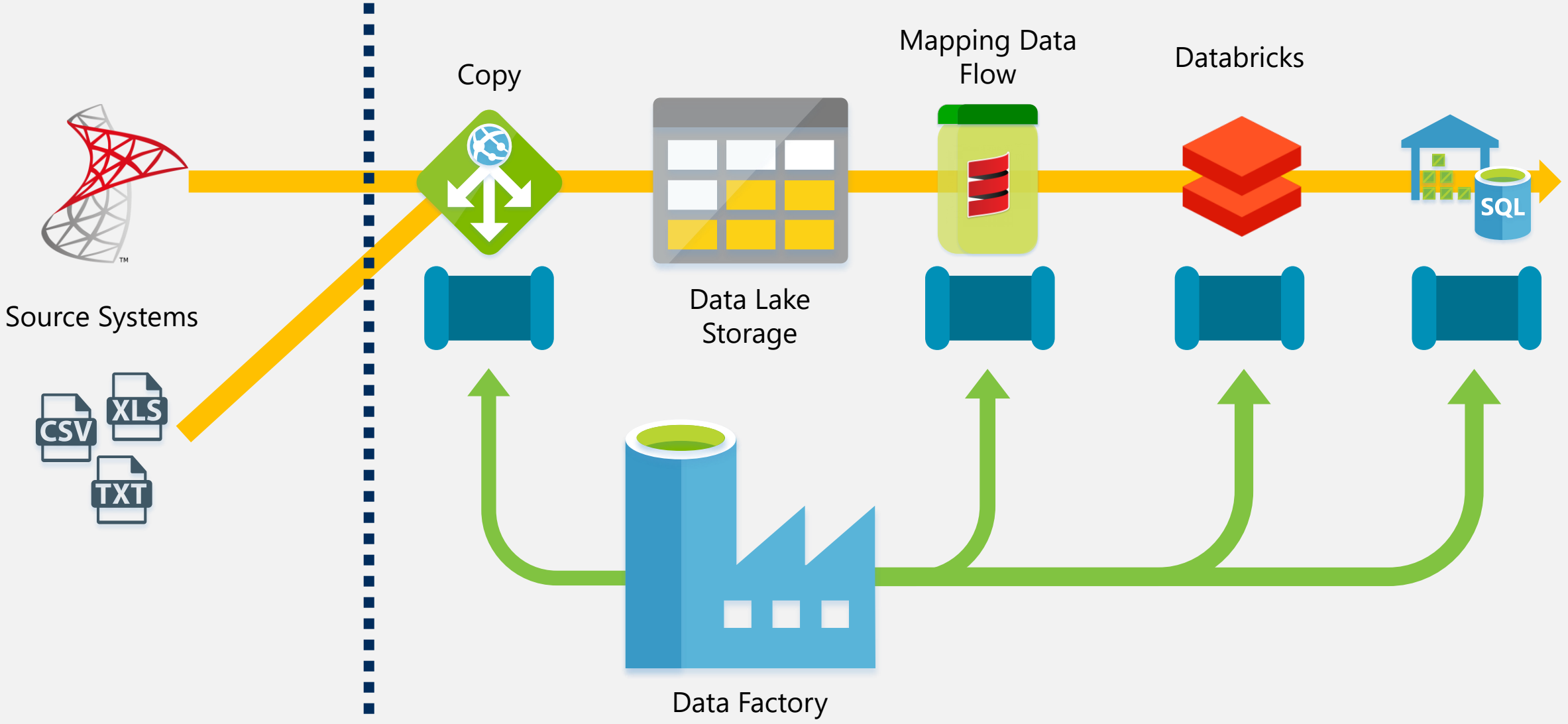
Mapping Data Flow Future Design Patterns ???



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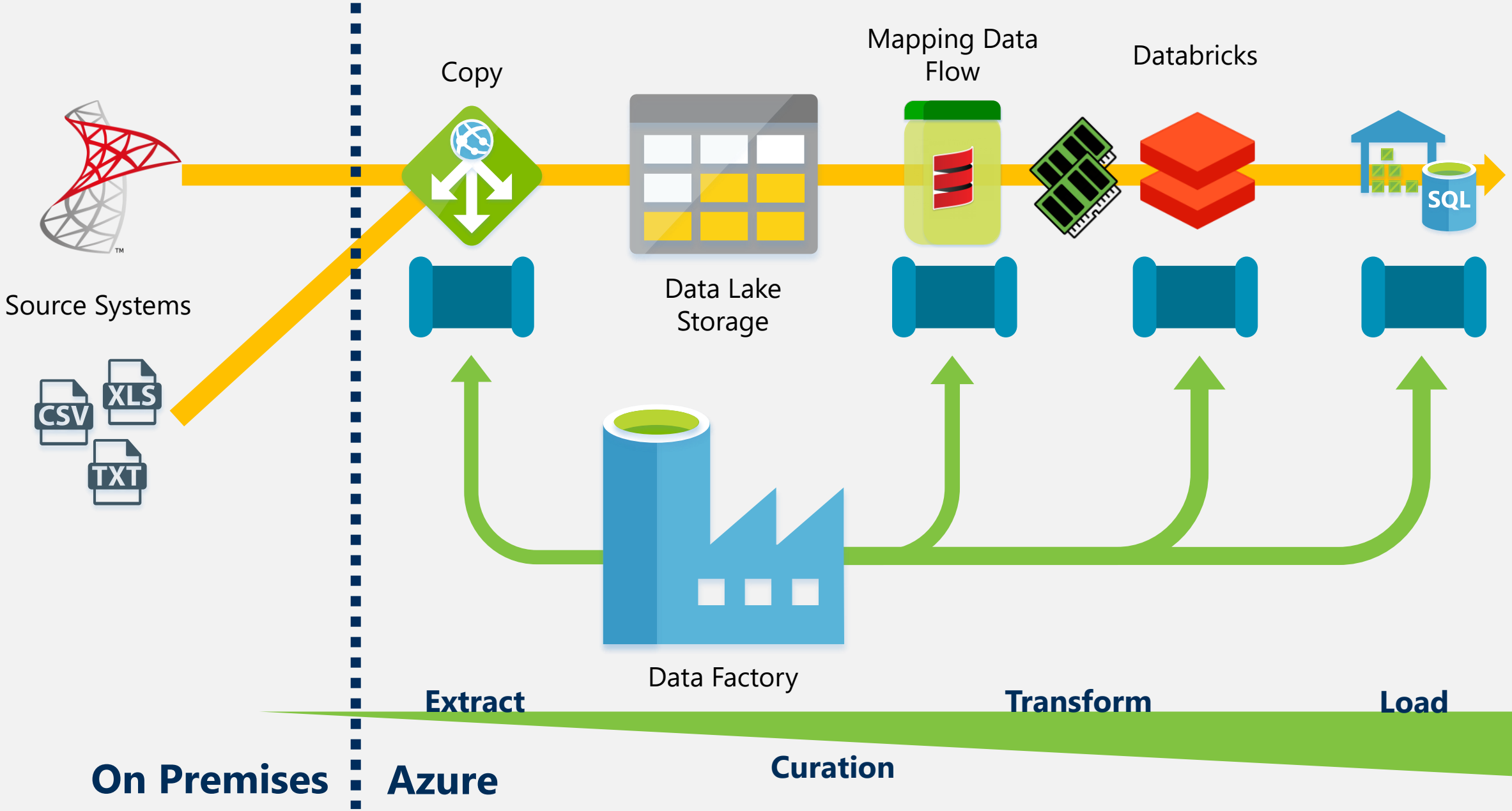
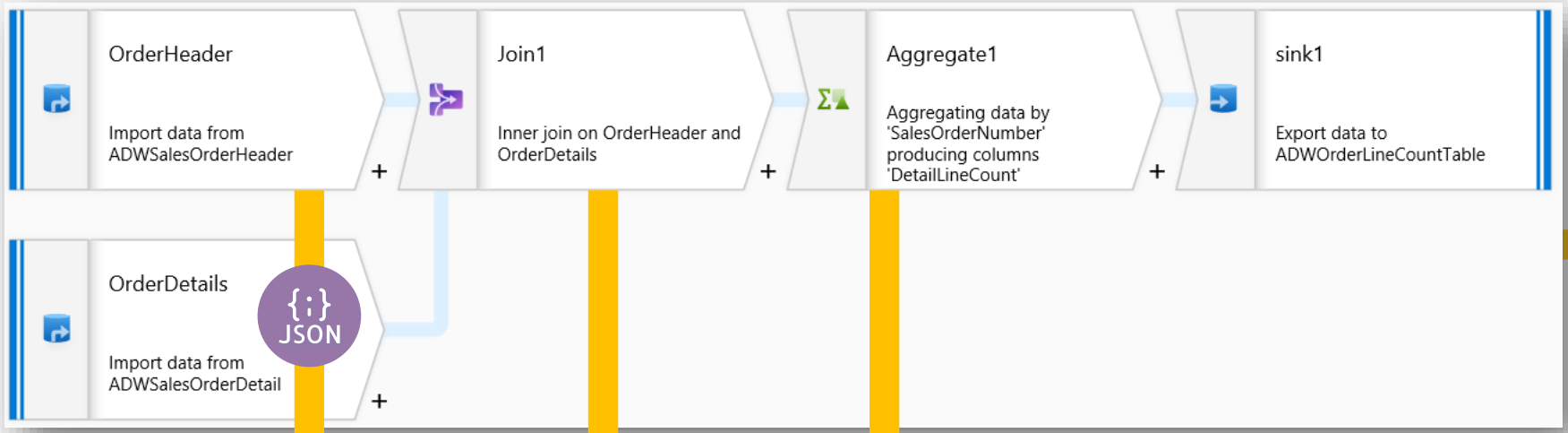
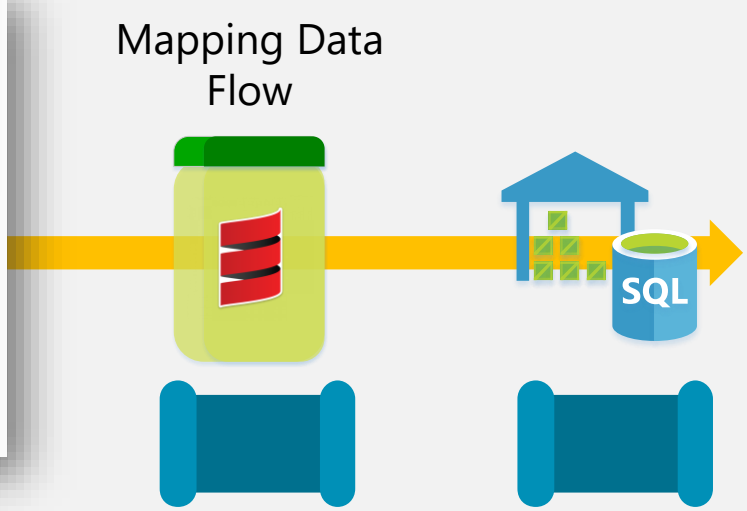
Mapping Data Flow Future Design Patterns ???

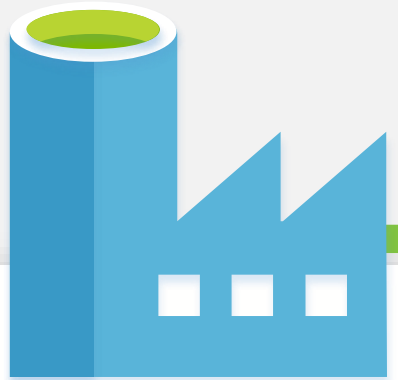


Mapping Data Flow Future Design Patterns ???






```
"fileName": {
    "value": "@dataset().FileName",
    "type": "Expression"
},
"folderPath": {
    "value": "@dataset().SourceDIR",
    "type": "Expression"
}
```



```
"transformations": [
    {
        "name": "Join1",
        "script": "OrderHeader, OrderDetail join(OrderHeader@SalesOrderID == Orde etail@SalesOrderID,\n\tjoinType:'inner',\n\tbroadcast: 'none')~> Join1"
    },
    {
        "name": "Aggregate1",
        "script": "Join1 aggregate(groupBy(SalesOrderNumber),\n\tDetailLineCount = count(SalesOrderDetailID)) ~> Aggregate1"
    }
]
```

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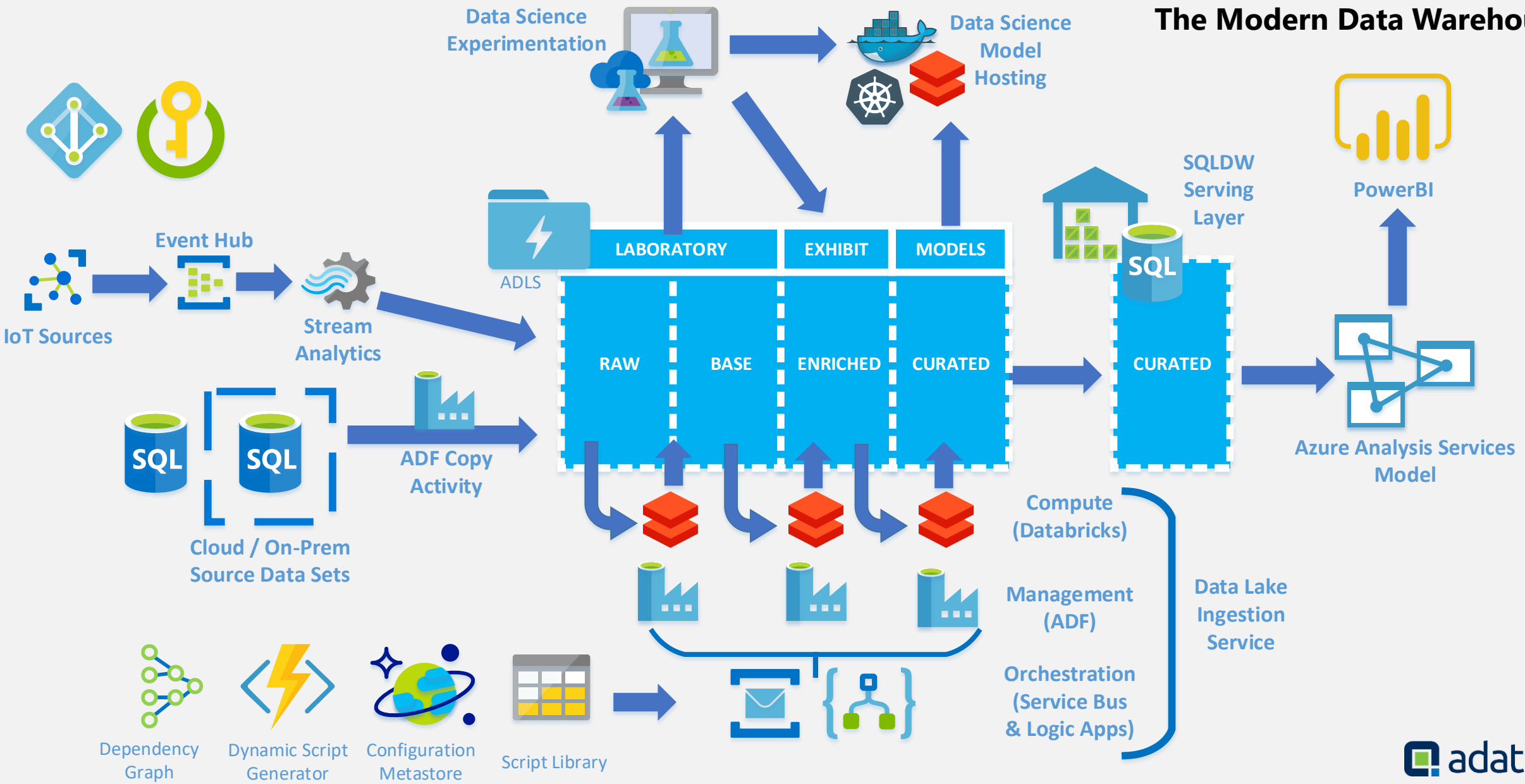
Conclusion

Why use Azure Data Factory?



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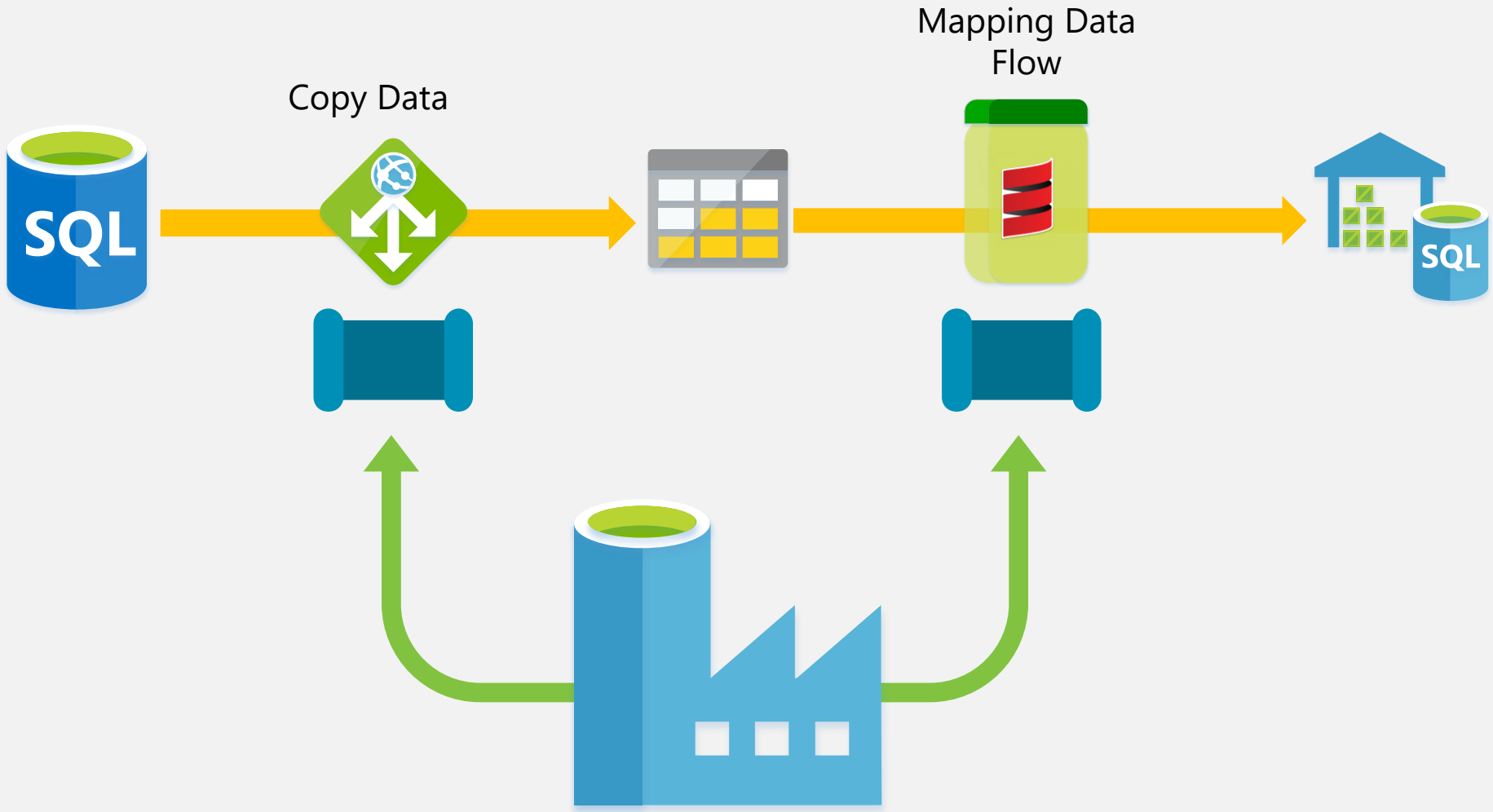
What is Azure Data Factory?



Orchestrator of our solution Control Flow operations.
Orchestrator of our solution Data Flow transformations.

... using cloud native technology in Azure and now with an easy developer interface for both.

Thanks for Listening

Paul Andrew

@MrPaulAndrew

Microsoft® Most Valuable Professional

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Email: paul@mrpaulandrew.com
Blog: mrpaulandrew.com
GitHub: github.com/mrpaulandrew

PDF Slides