ETL in Azure Made Easy

With Integration Pipeline Data Flows

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Microsoft Most Valuable Professional

avanade

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MrPaulAndrew.com

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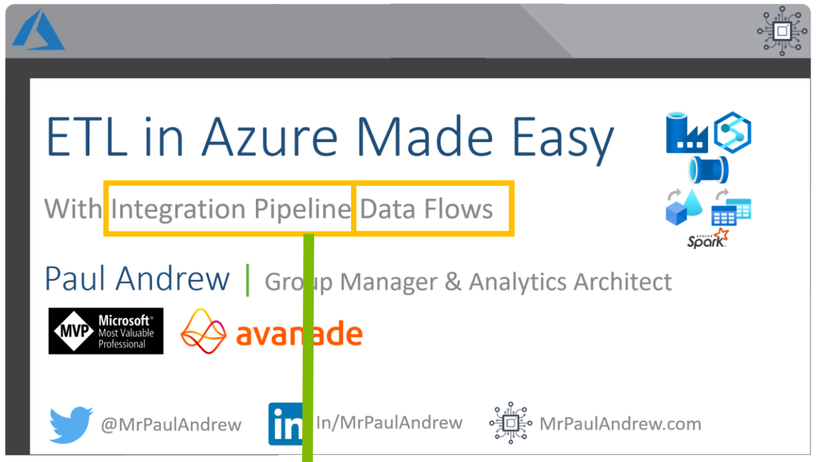
CommunityEvents

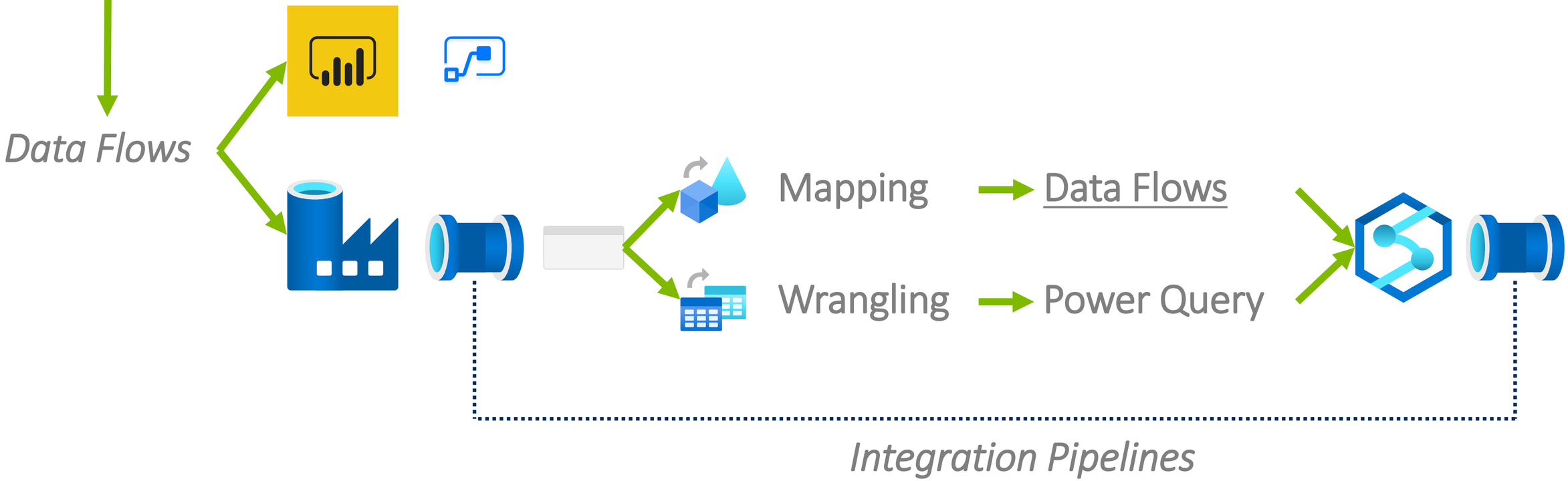
Demo code, content and slides from various community events.

C++

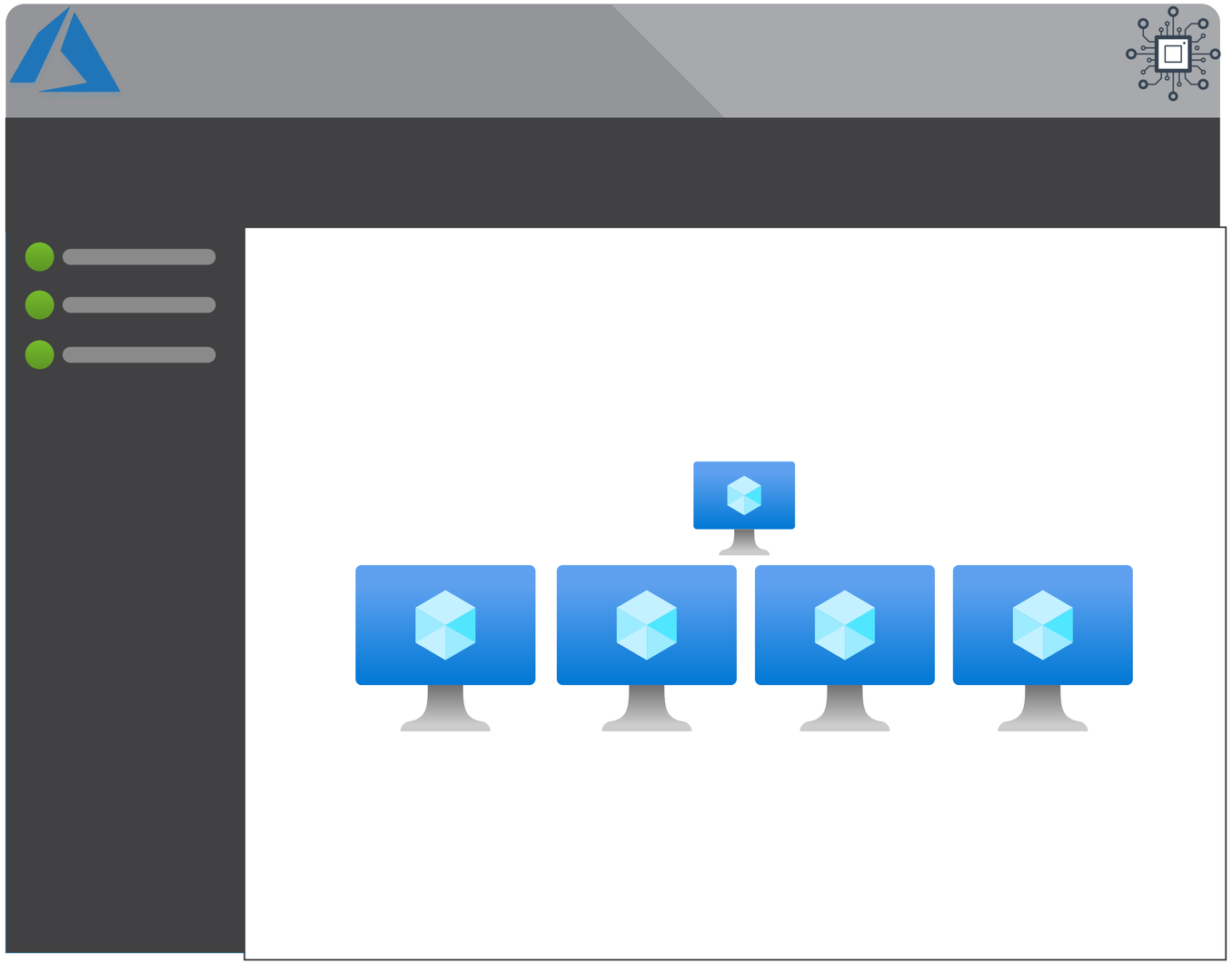
{Event/Location}-{Month}-{Year}

Terminology Clarification

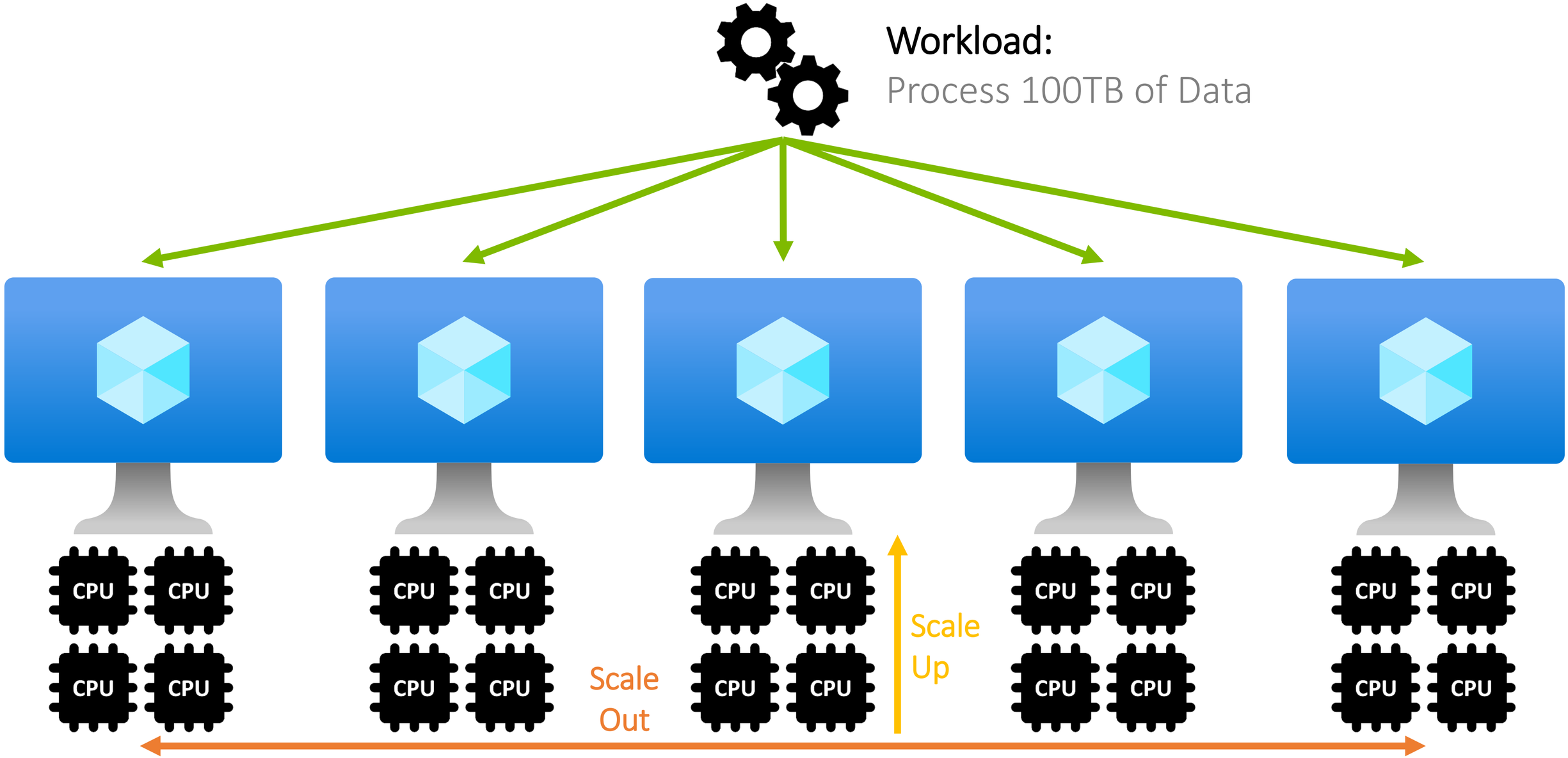




Scaling Up vs Scaling Out



Scaling Up and/or Scaling Out



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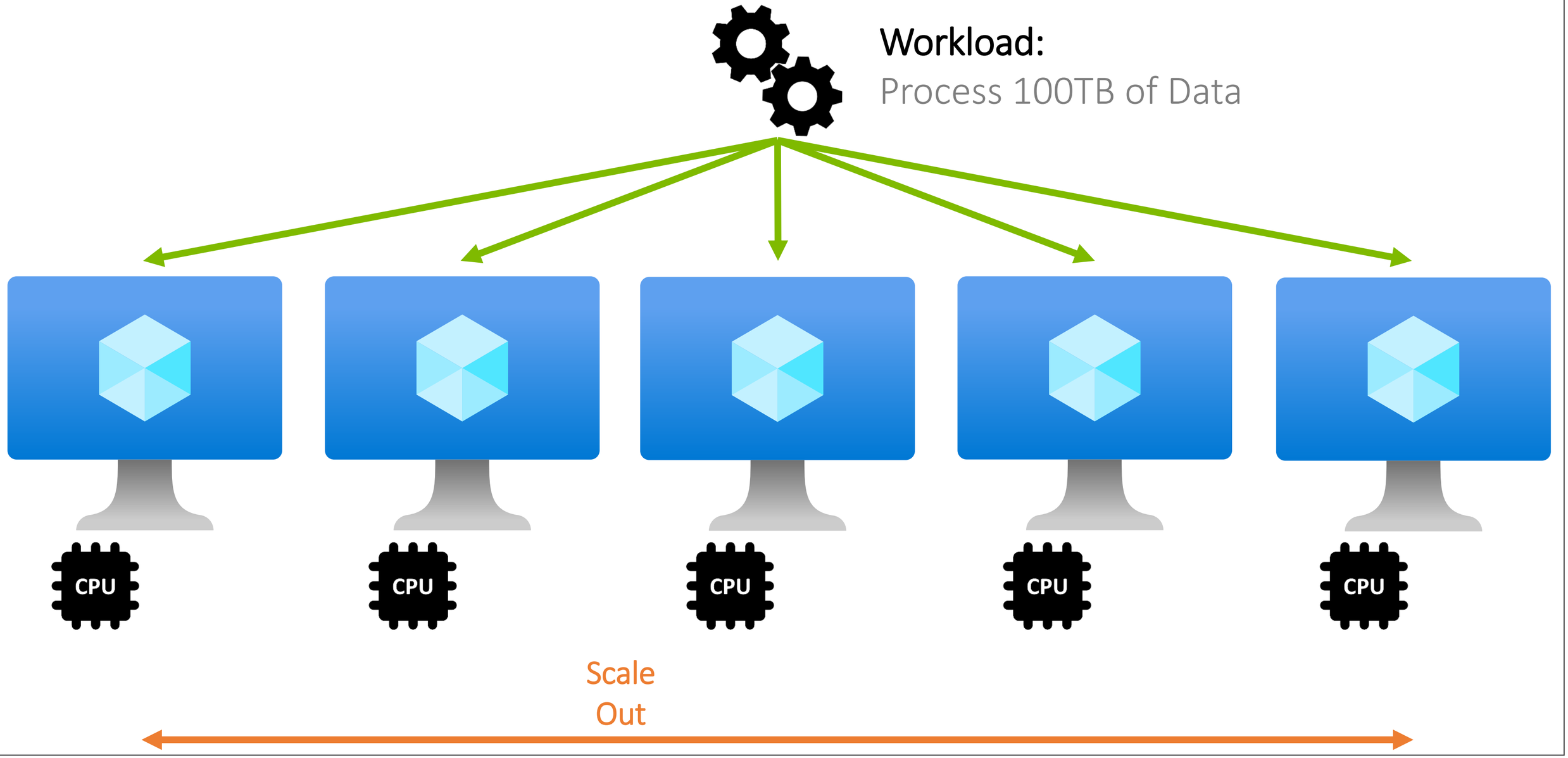

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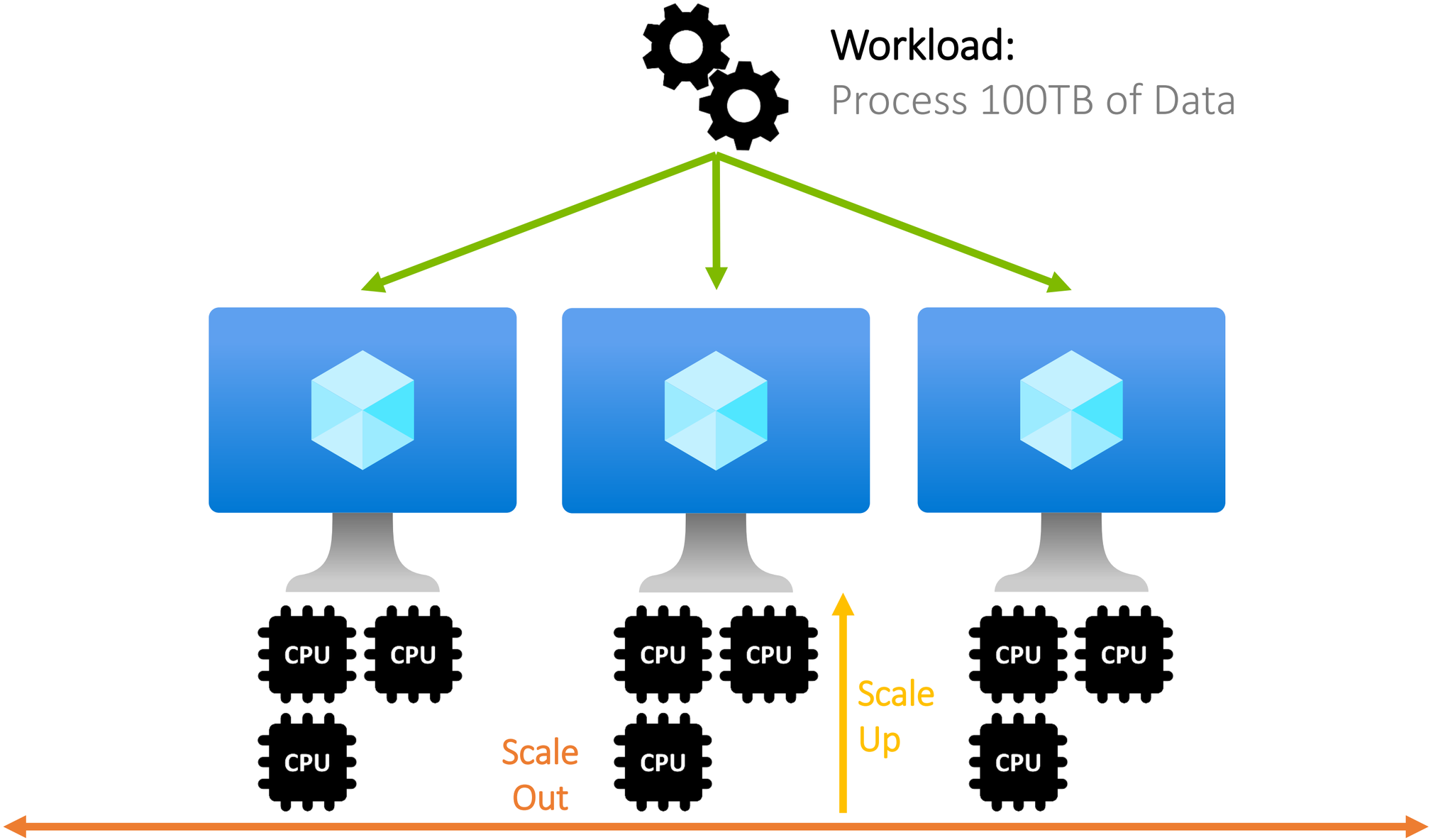
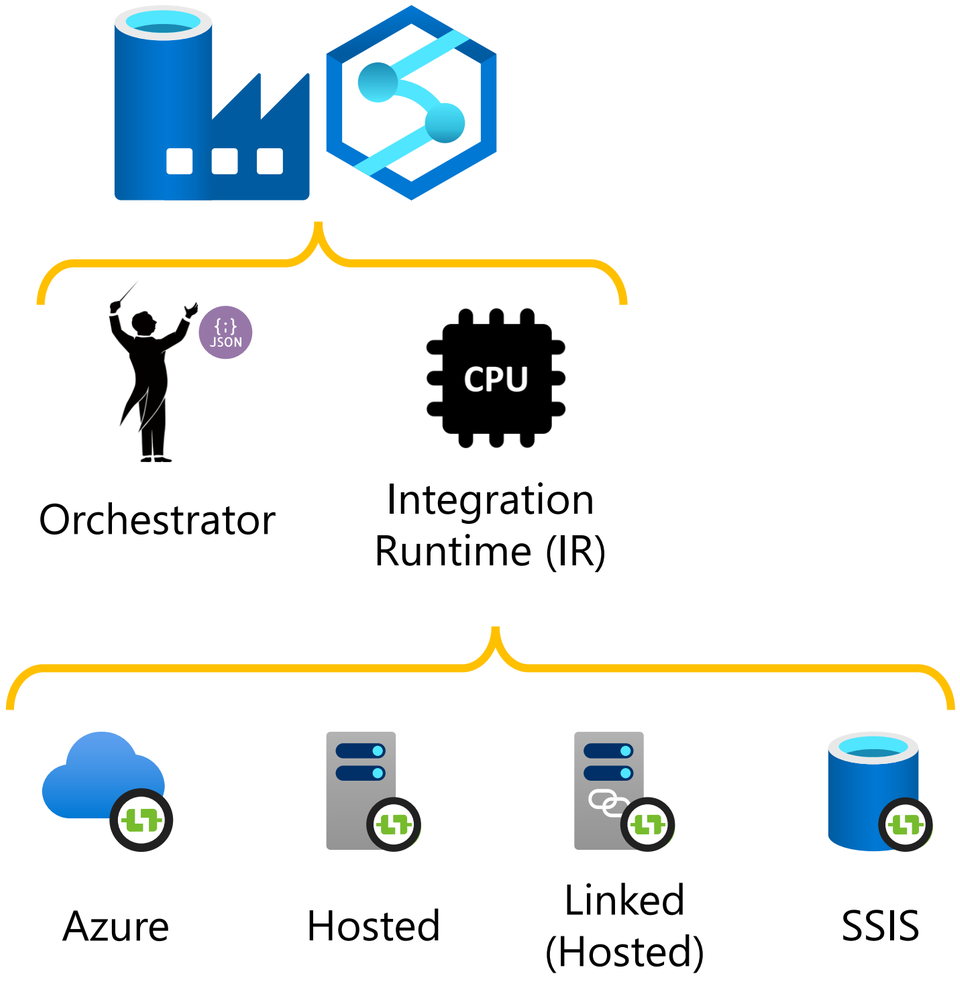
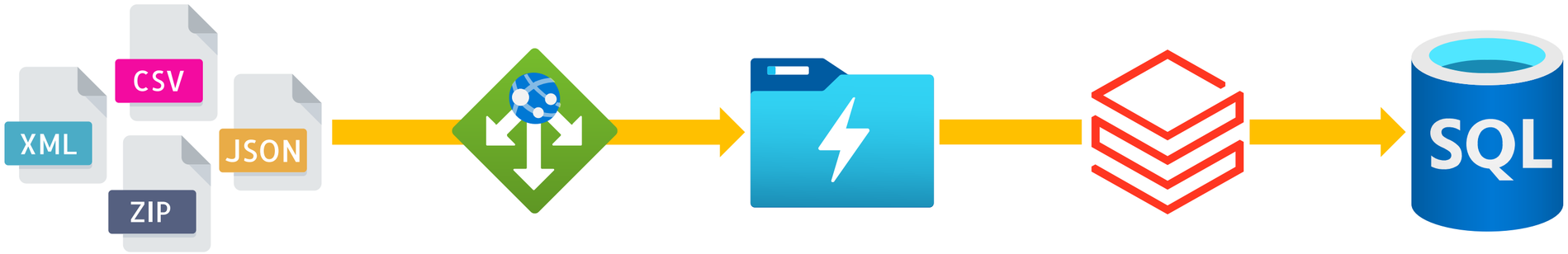


Integration Components

Integration Runtimes



Integration Components



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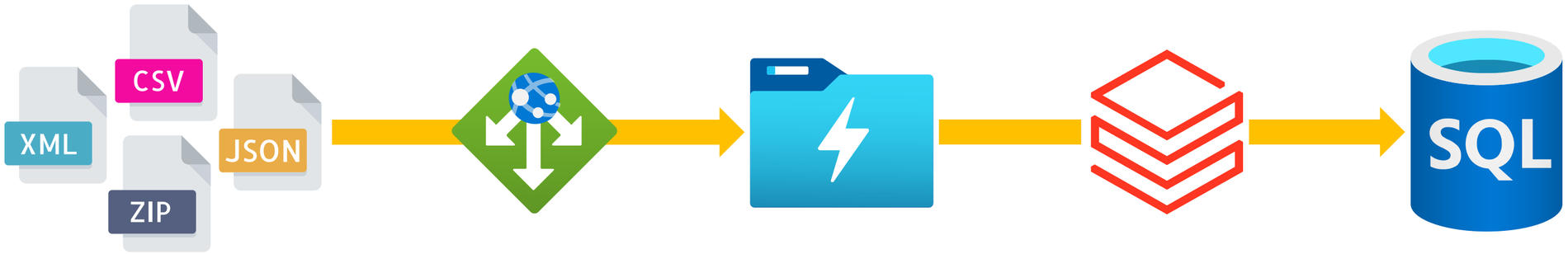
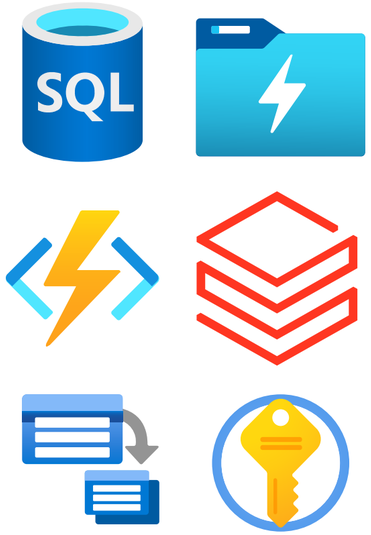


1 **Linked Services** – What to interact with and how?

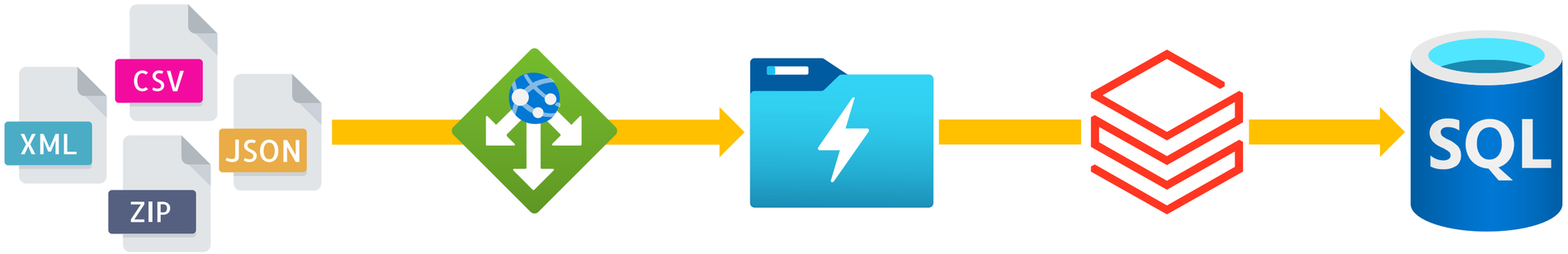


JSON

SQLDBLinkedService

ConnectionString: *Server=MyServer;Database=myDataBase*
UserName: “MrPaulAndrew”
*Password: **********

Integration Components

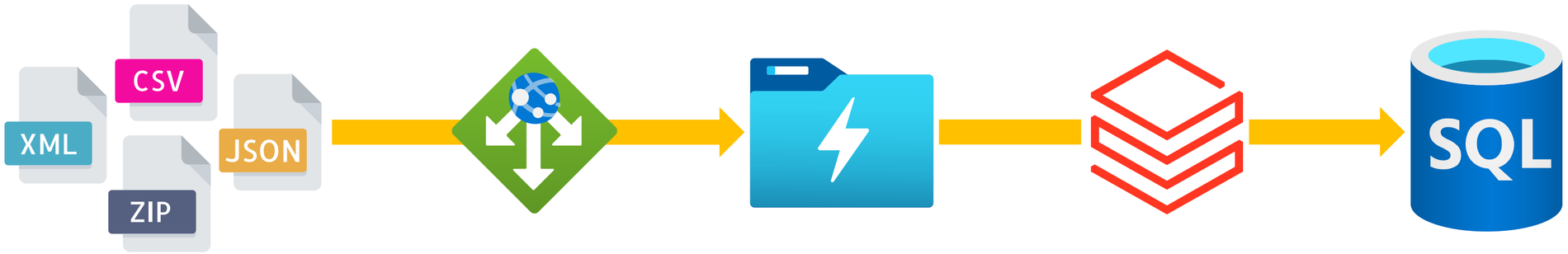


1. **Linked Services**
2. **Datasets** – Where is my data? What format? What file path/table do I need?

[dbo].[SalesOrders]

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

Integration Components



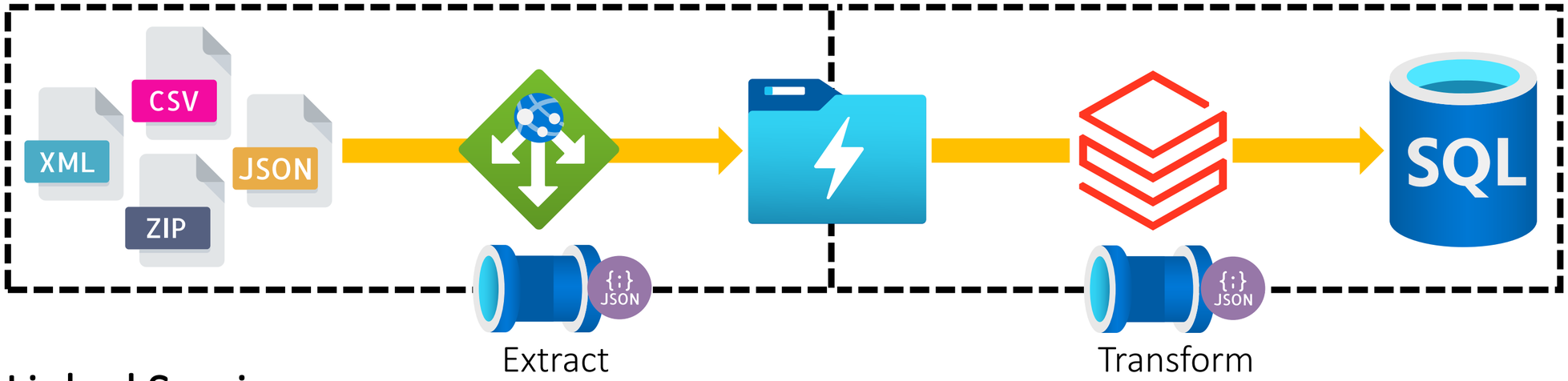
1. **Linked Services**
2. **Datasets**
3. **Activities** – What do we want to happen when we invoke a Linked Service?
   With what conditions?

JSON

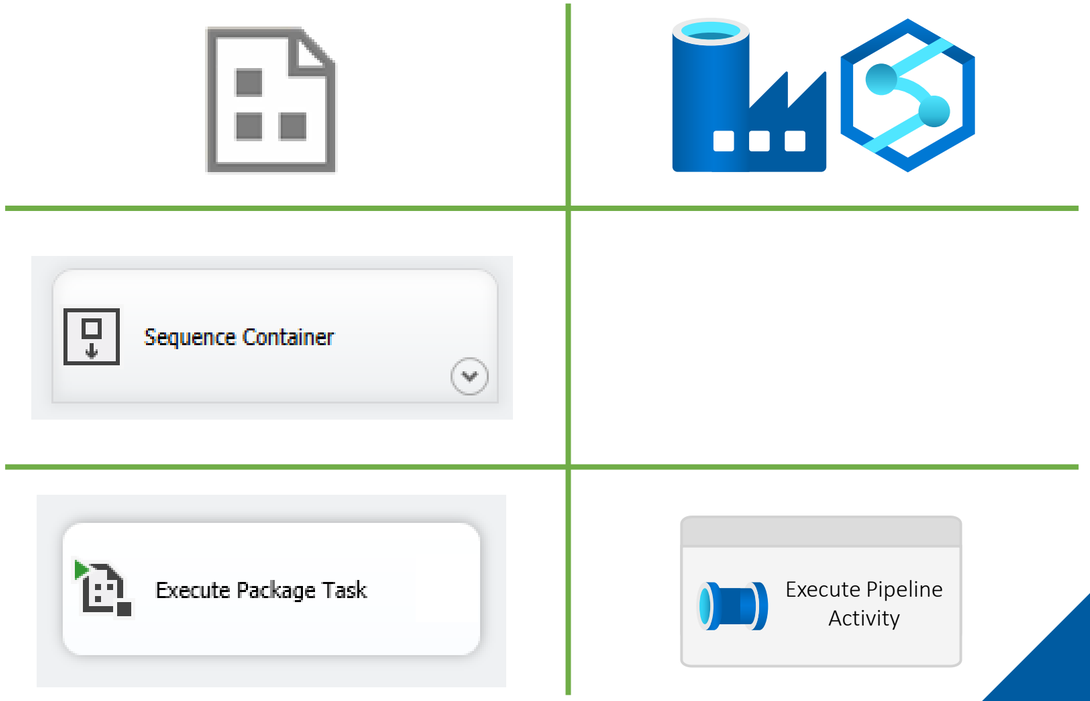
Databricks Notebook Activity

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

Integration Components



1. **Linked Services**
2. **Datasets**
3. **Activities**
4. **Pipelines** – Logical groups of work that can be executed.



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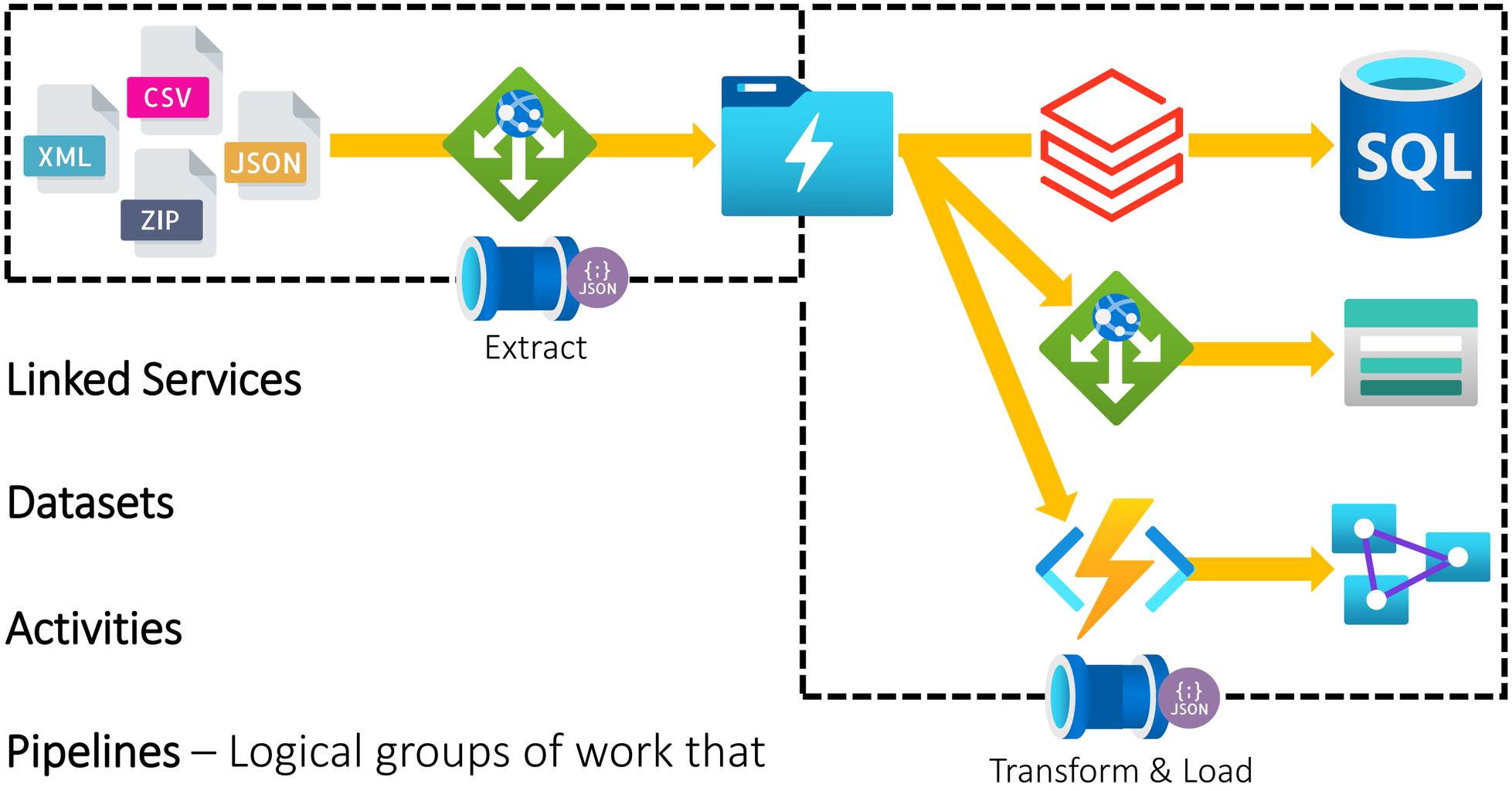
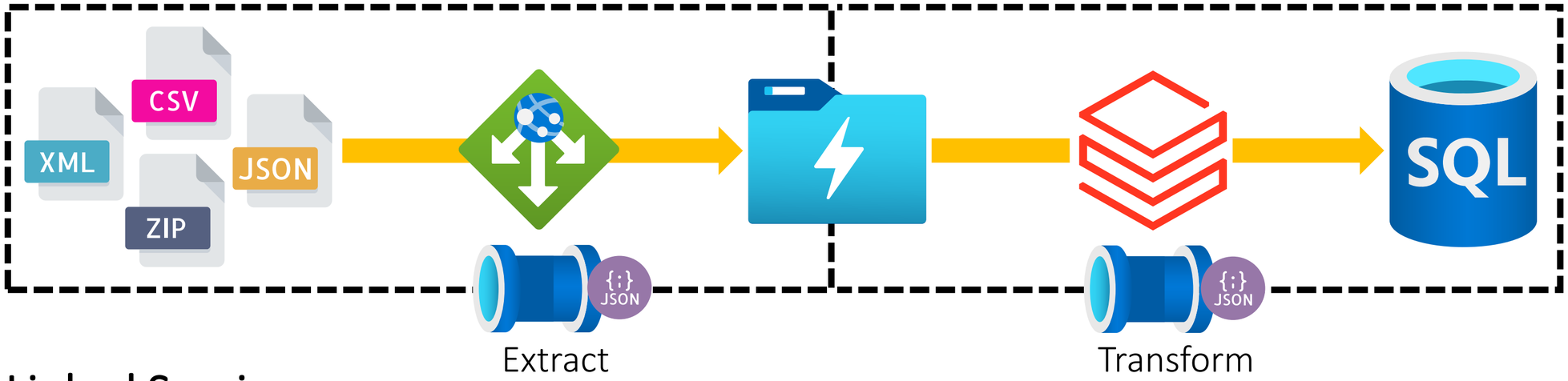
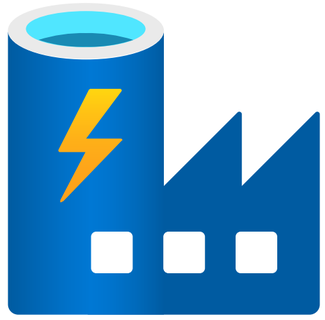


1. Linked Services
2. Datasets
3. Activities
4. **Pipelines** – Logical groups of work that can be executed.

Integration Components

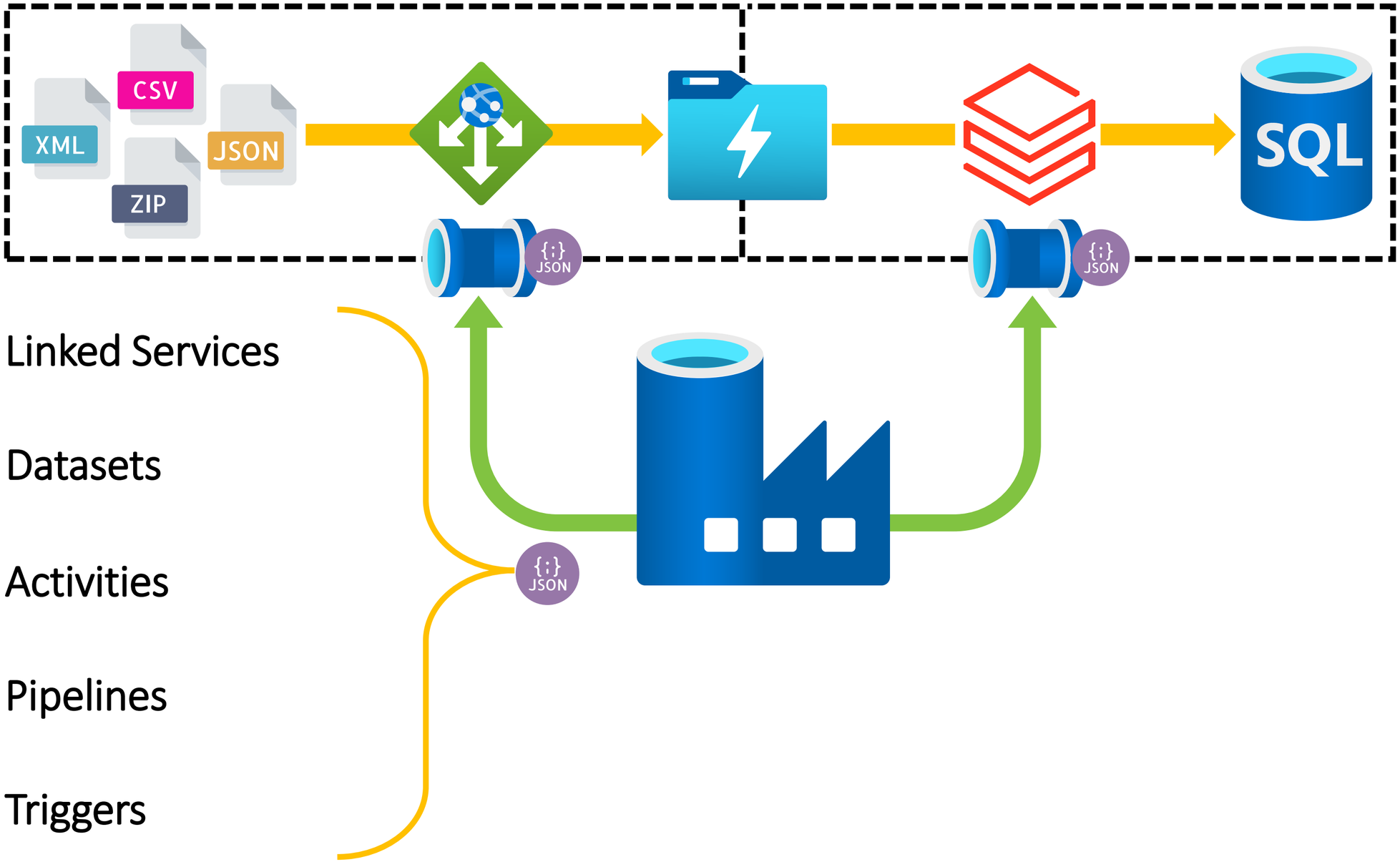


1. **Linked Services**
2. **Datasets**
3. **Activities**
4. **Pipelines**
5. **Triggers** – Tell our pipelines when to run.



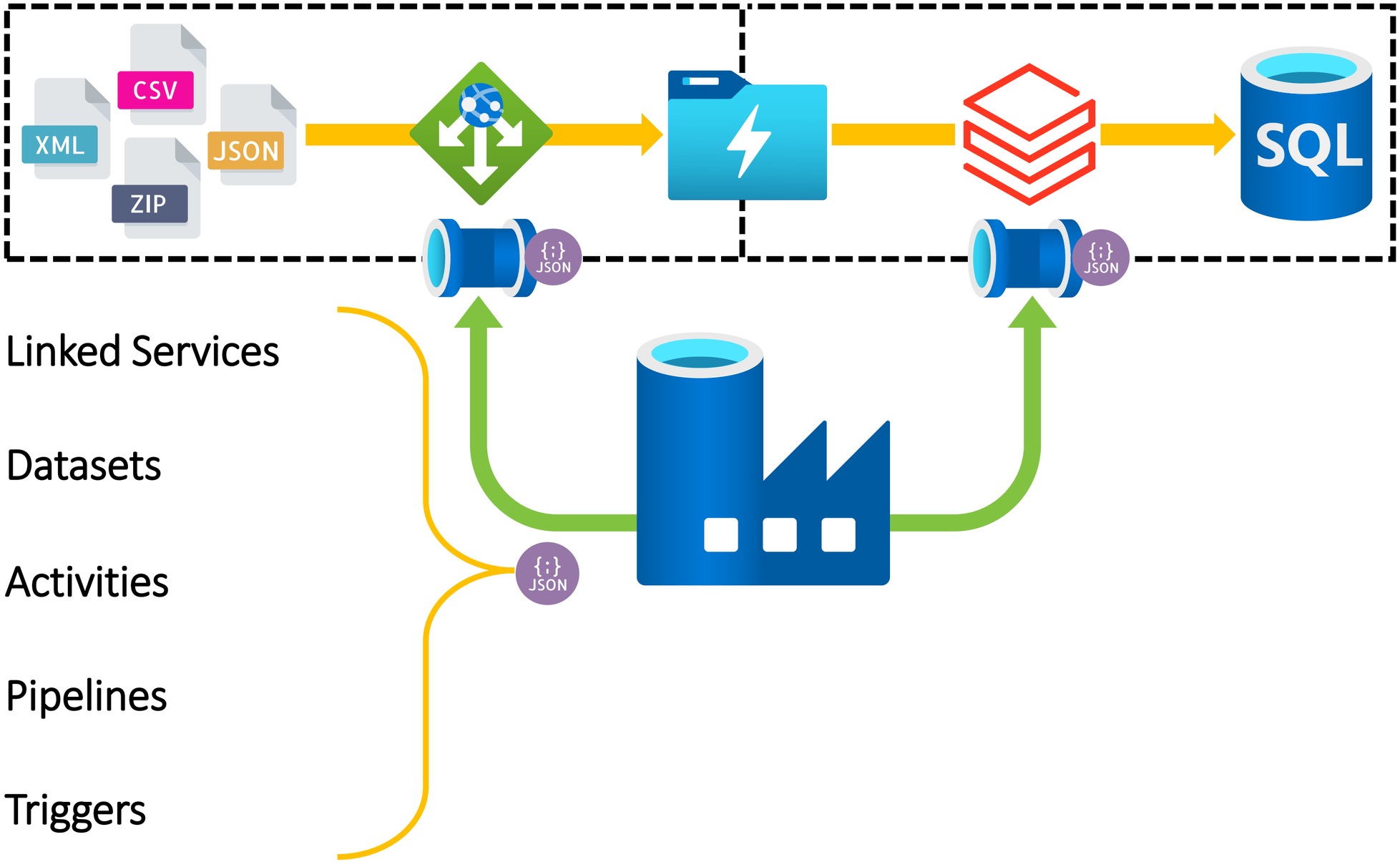
- Manually
- Programmatically
- Schedule
- Tumbling Windows
- File Event

Integration Components



1. Linked Services
2. Datasets
3. Activities
4. Pipelines
5. Triggers

Integration Control Flow Components



1. Linked Services
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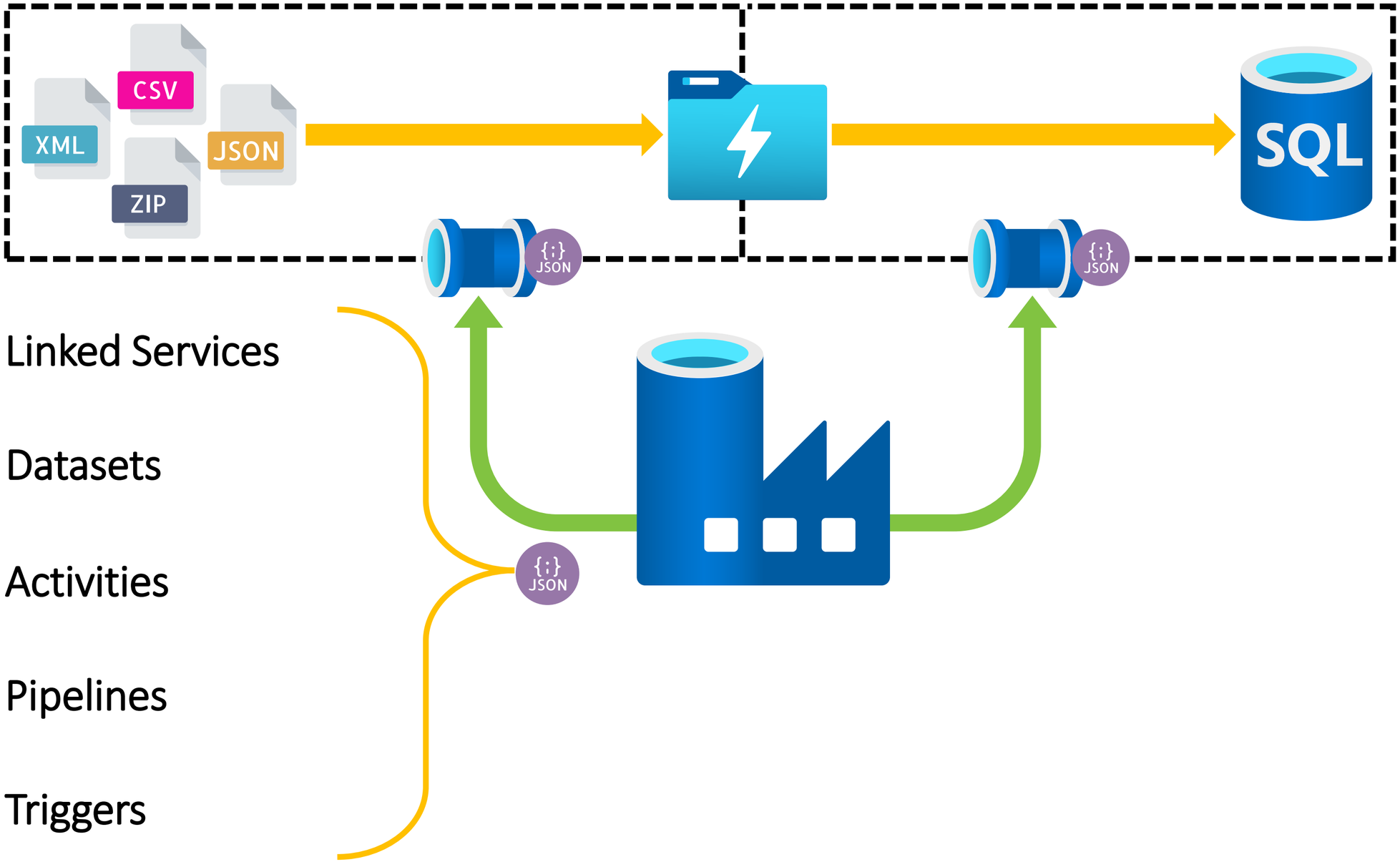
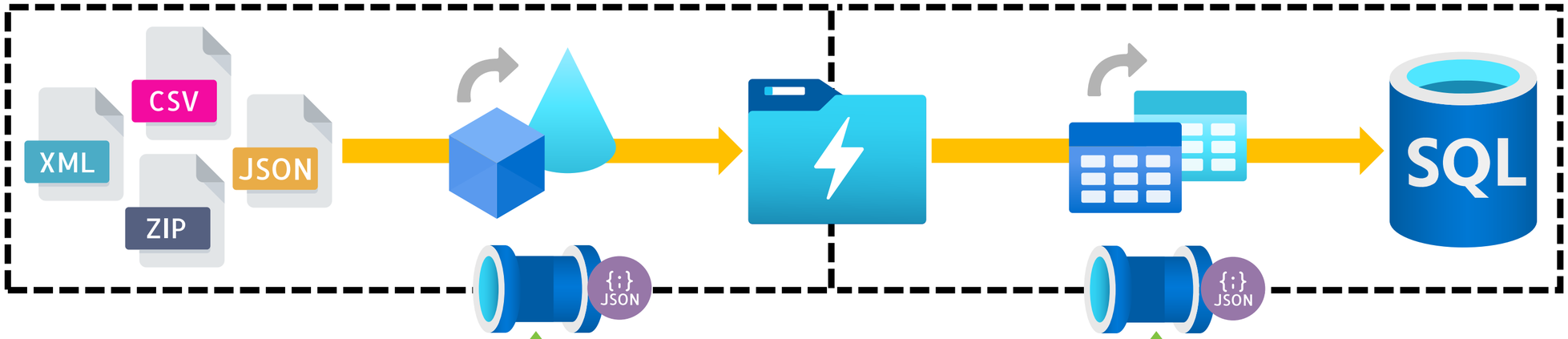


1. Linked Services
2. Datasets
3. Activities
4. Pipelines
5. Triggers

Integration Data Flow (Transformation) Activities



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2. Datasets
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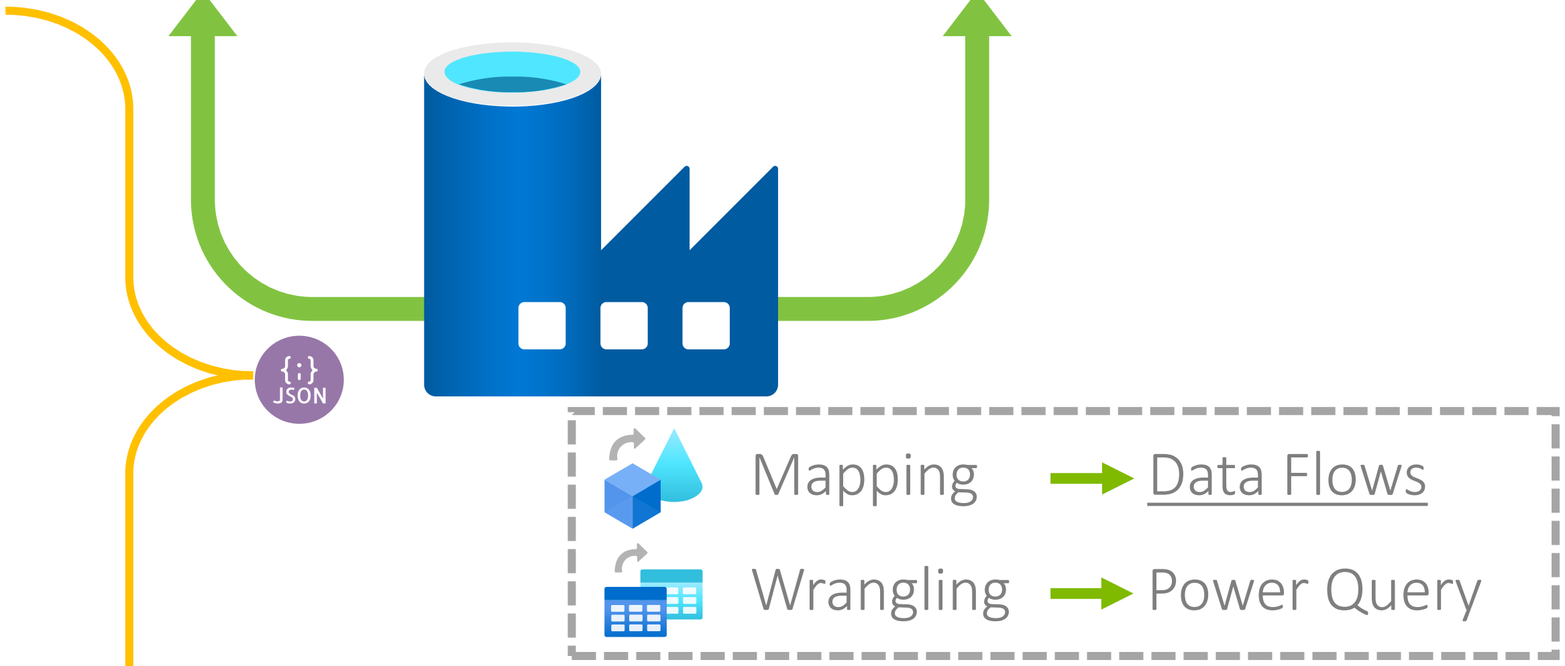
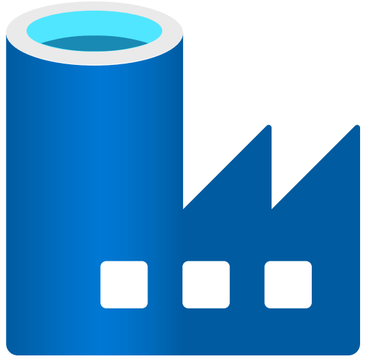
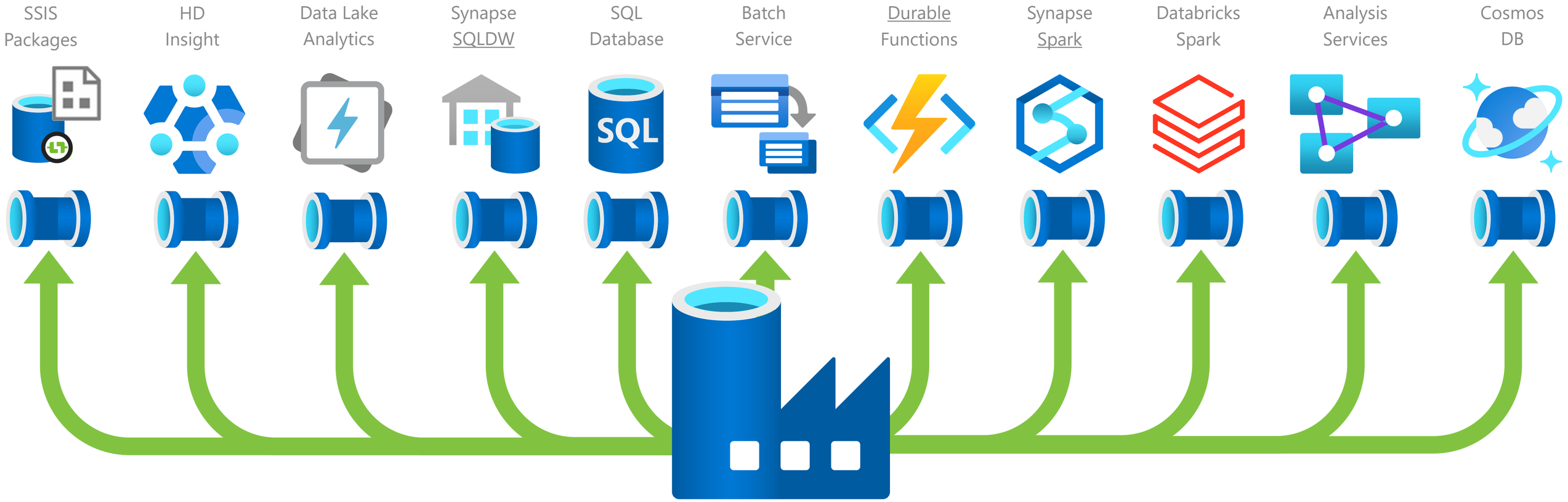
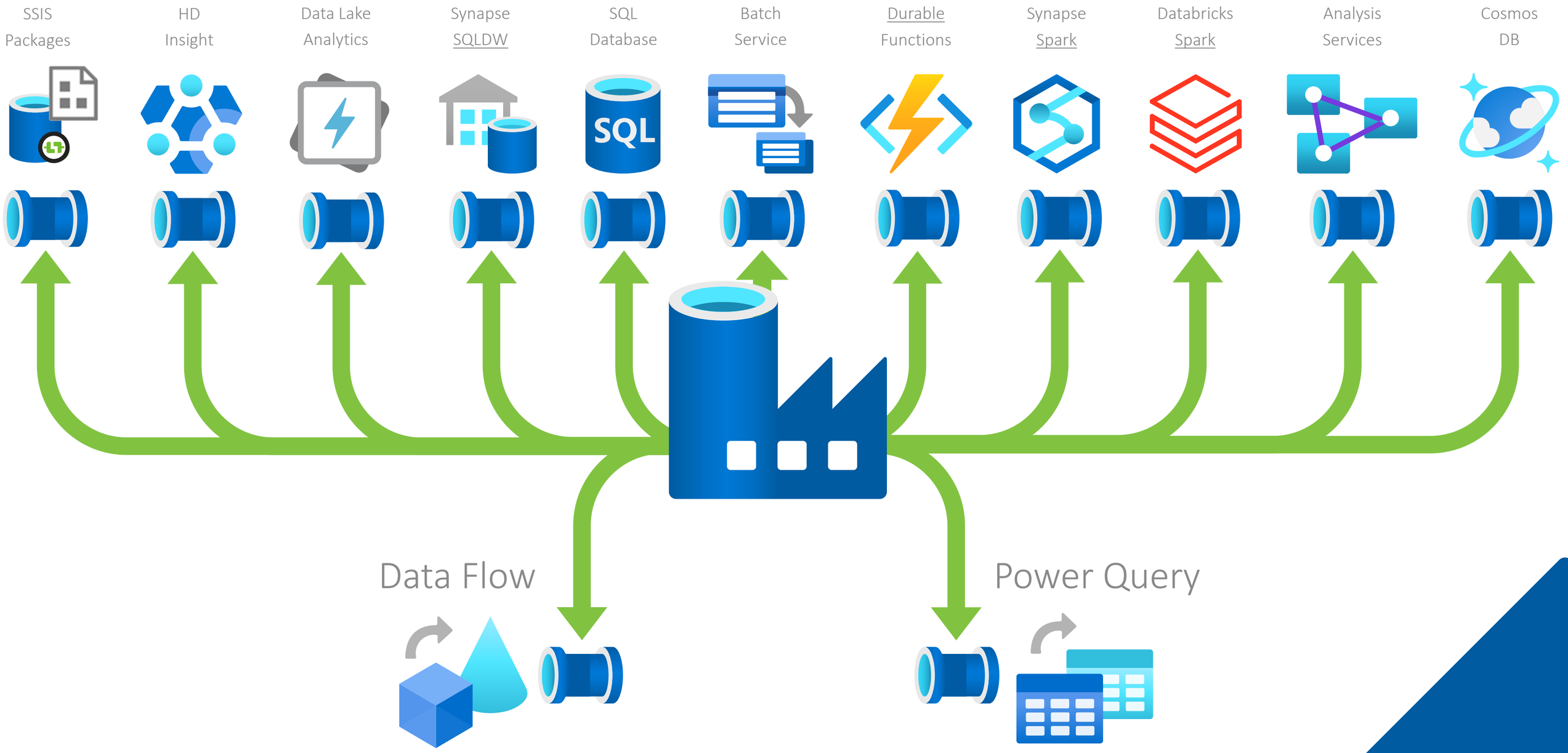




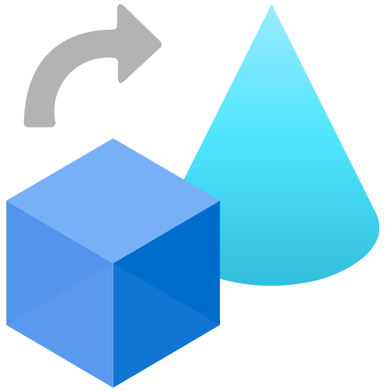
Other Data Transformation Services in Azure



When Should We Use These Integration Pipeline Transformation Activities?



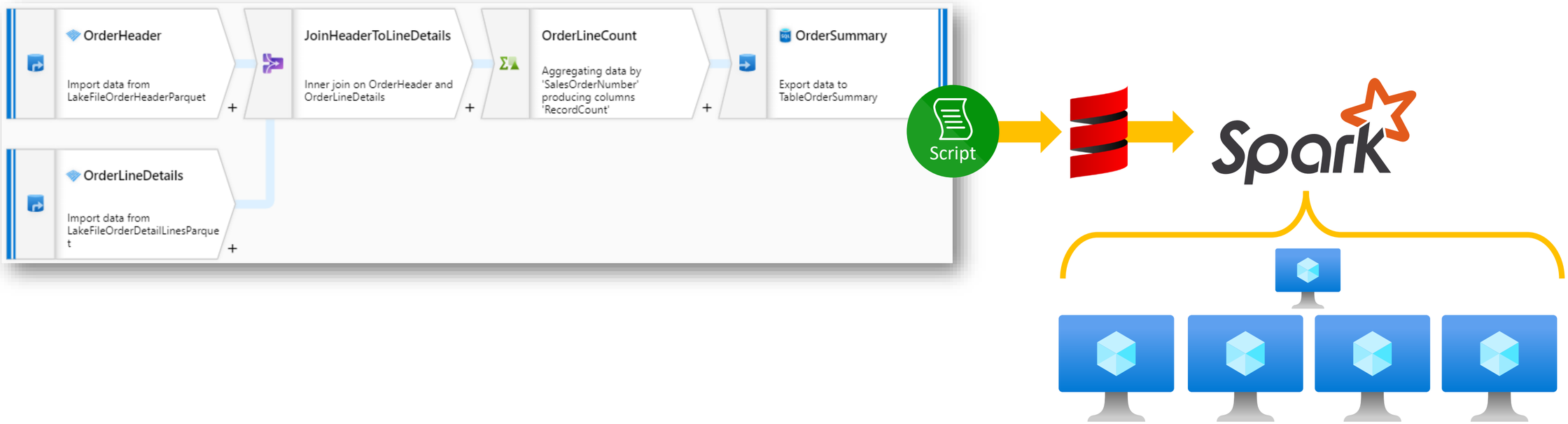
Data Flows



What is a ~~Mapping~~ Data Flow?

Control Flow

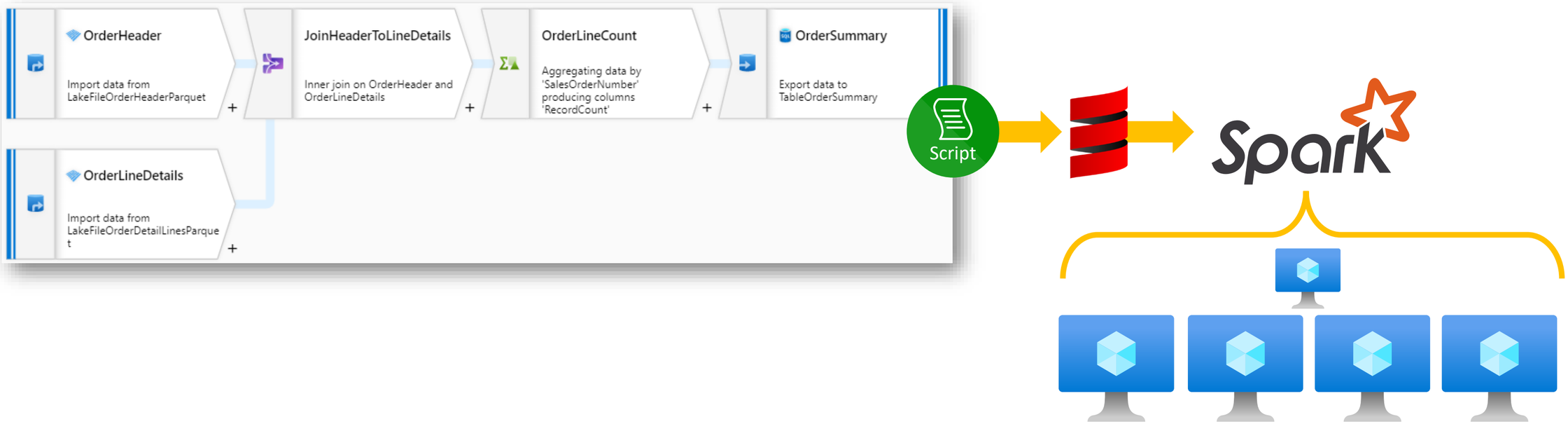
Data Flow



Q: What is a ~~Mapping~~ Data Flow?

Control Flow

Data Flow



A: Graphic no low/low code data transformation tool that sits on top of Apache Spark.

Data Flows – Inputs & Outputs

Source & Sink

Linked Services

Source Types

Dataset

Inline

Data Flows – Transformations

https://sqlplayer.net/2018/12/azure-data-factory-v2-and-its-available-components-in-data-flows/

- New Branch
- Join
- Conditional Split
- Exists
- Union
- Lookup
- Derived Column
- Select
- Aggregate
- Surrogate Key
- Pivot
- Unpivot
- Window
- Rank
- Flatten
- Parse
- Filter
- Sort
- Alter Row

Key

Input & Output Modifiers

Schema Modifiers

Formatters

Row Modifiers

Data Flows – Transformations

https://sqlplayer.net/2018/12/azure-data-factory-v2-and-its-available-components-in-data-flows/

New Branch

Join

Conditional Split

Exists

Union

Lookup

Filter

Sort

Alter Row

& Output Modifiers

na Modifiers

atters

Modifiers

Components

Operation / Activity	Description	SSIS equivalent	SQL Server equivalent
New branch	Create a new flow branch with the same data	Multicast (+icon)	`SELECT INTO` `SELECT OUTPUT`
Join	Join data from two streams based on a condition	Merge join	`INNER/LEFT/RIGHT JOIN,` `CROSS/FULL OUTER JOIN`

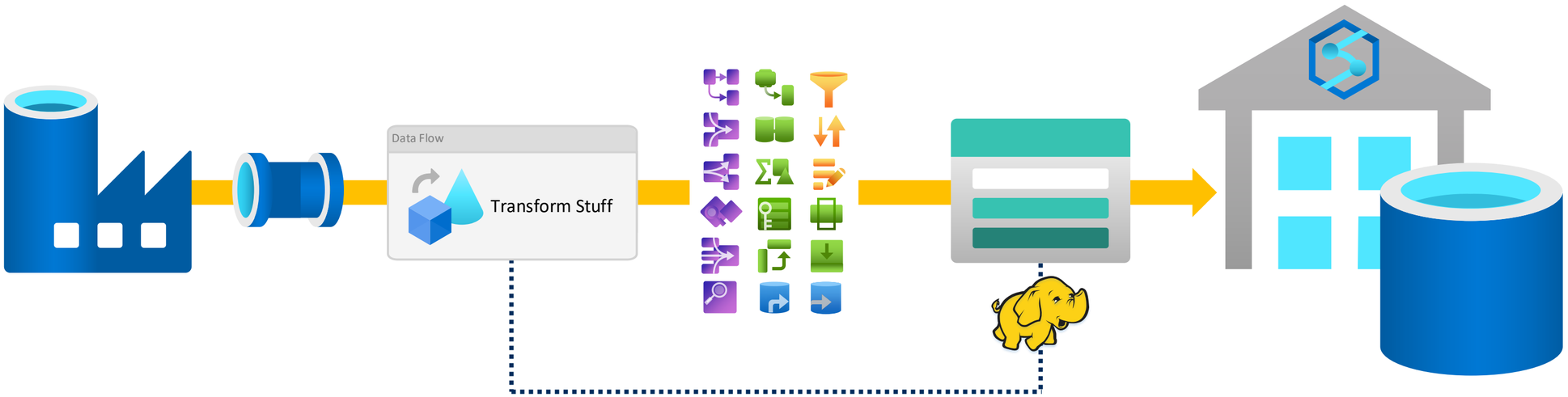
Conditional Split	Route data into different streams based on conditions	Conditional Split	`SELECT INTO WHERE condition1`
			`SELECT INTO WHERE condition2`
			`CASE ... WHEN`

Union	Collect data from multiple streams	Union All	`SELECT col1a UNION (ALL)` `SELECT col1b`
Lookup	Lookup additional data from another stream	Lookup	*Subselect, function,* `LEFT/RIGHT JOIN`
Derived Column	Compute new columns based on the existing once	Derived Column	`SELECT Column1 * 1.09 as NewColumn`

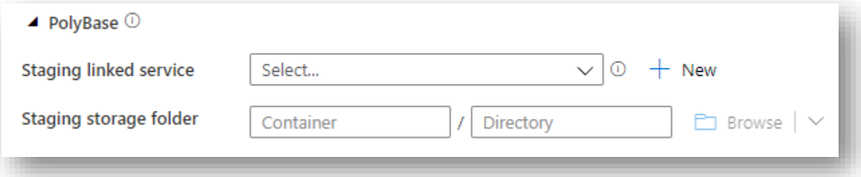
Aggregate	Calculate aggregation on the stream	Aggregate	`SELECT Year(DateOfBirth) as YearOnly,`
			`MIN(), MAX(), AVG()`
			`GROUP BY Year(DateOfBirth)`

Surrogate Key	Add a surrogate key column to output stream from a specific value	Script Component	`SELECT ROW_NUMBER()`
			`OVER(ORDER BY name ASC) AS Row#,`
			`name`
			`FROM sys.databases`

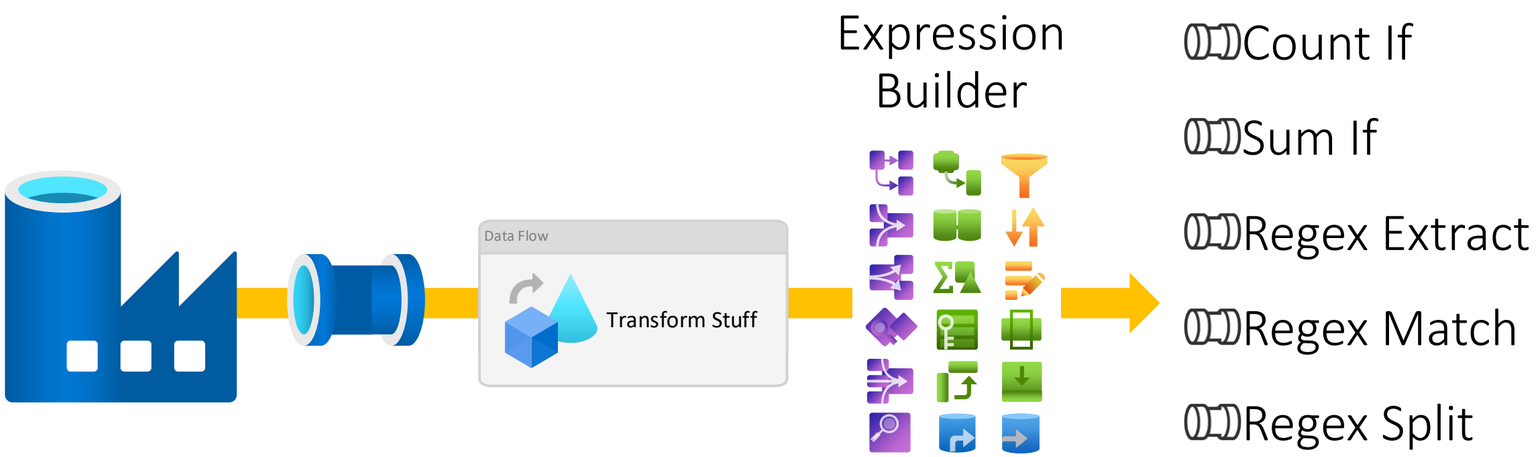
Data Flows – Data Warehouse Loading (PolyBase)



Staging



Data Flows – Expression Builder

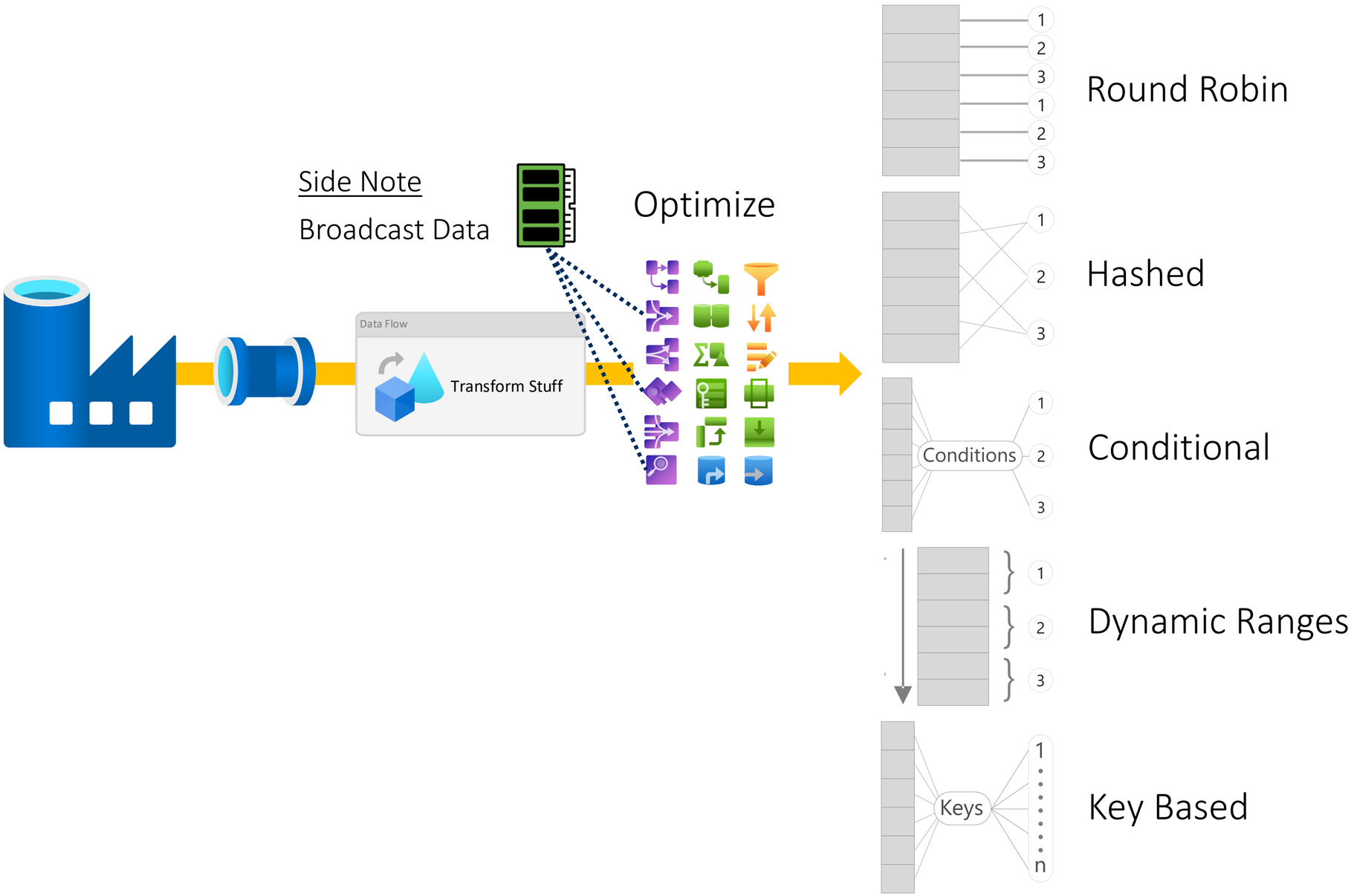


Expression Builder

- Count If
- Sum If
- Regex Extract
- Regex Match
- Regex Split
- R-Like

https://docs.microsoft.com/en-gb/azure/data-factory/data-flow-expression-functions

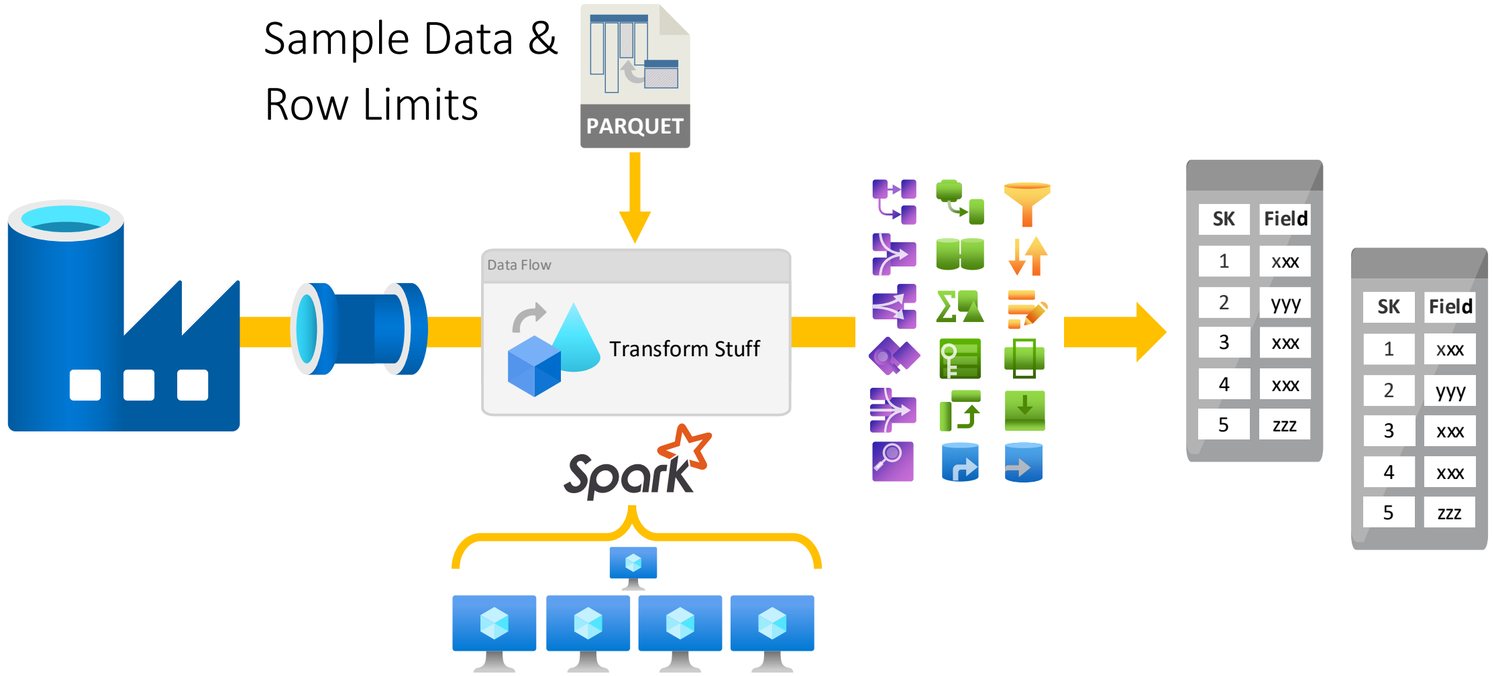
Data Flows – Partition Handling



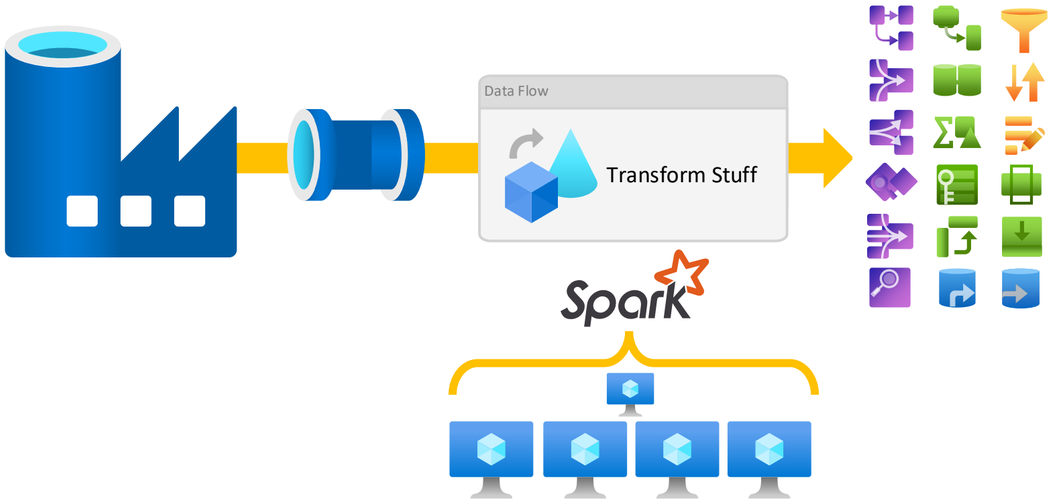
Data Flows – Debugging

Enable Data Flow Debug Mode

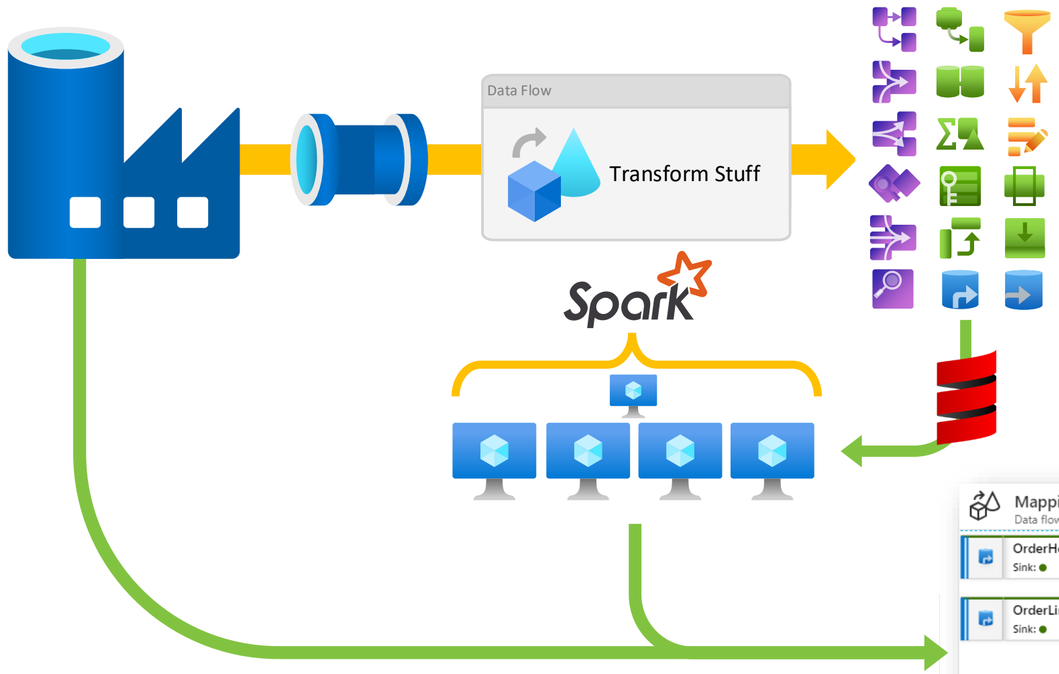
Data Preview

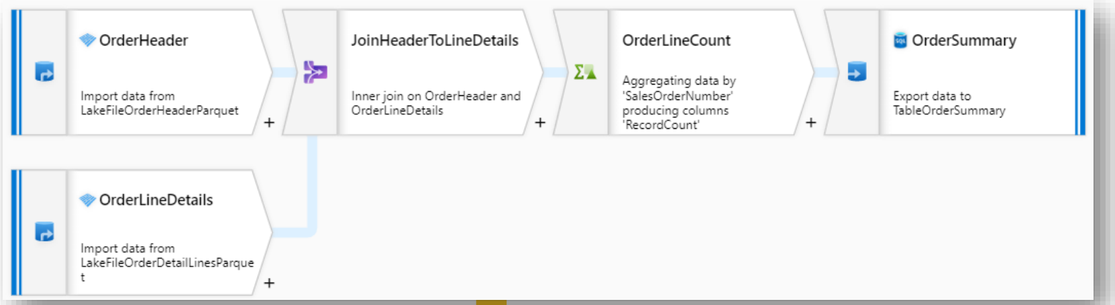


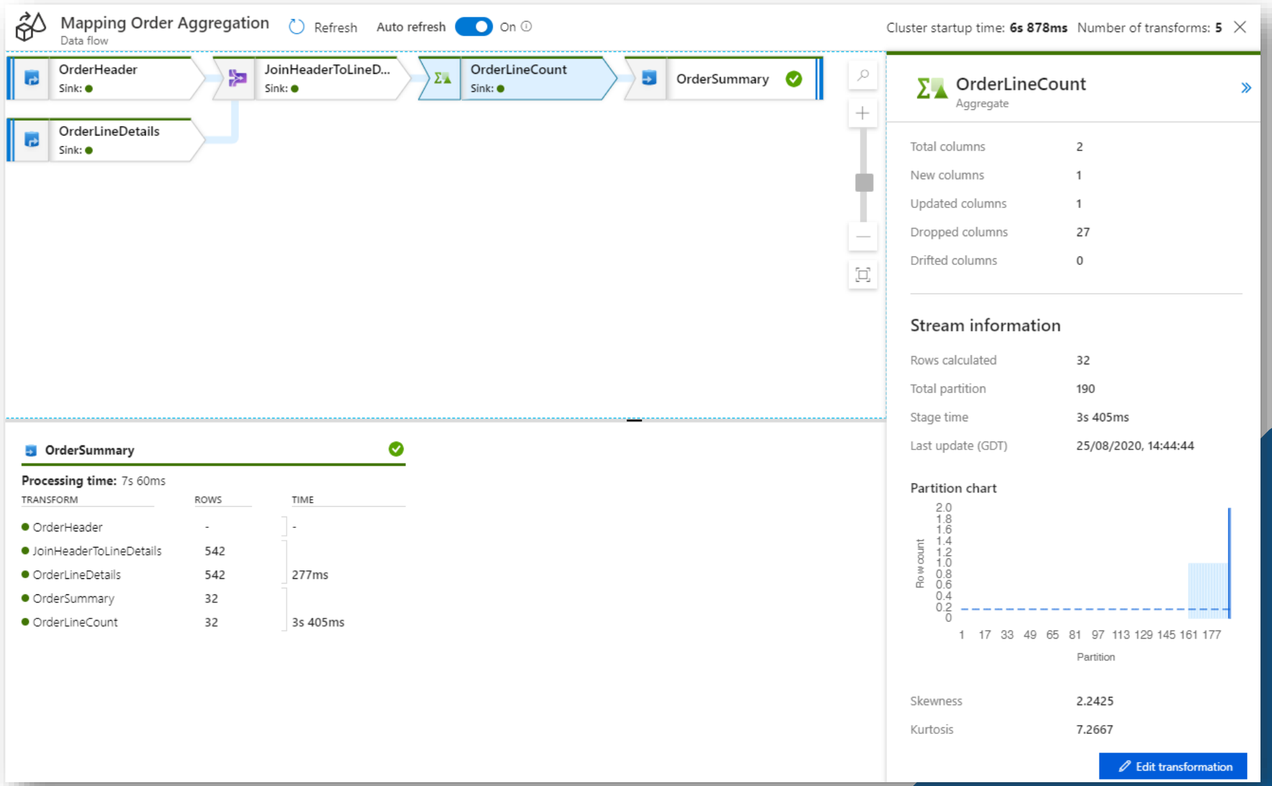
Data Flows – Monitoring

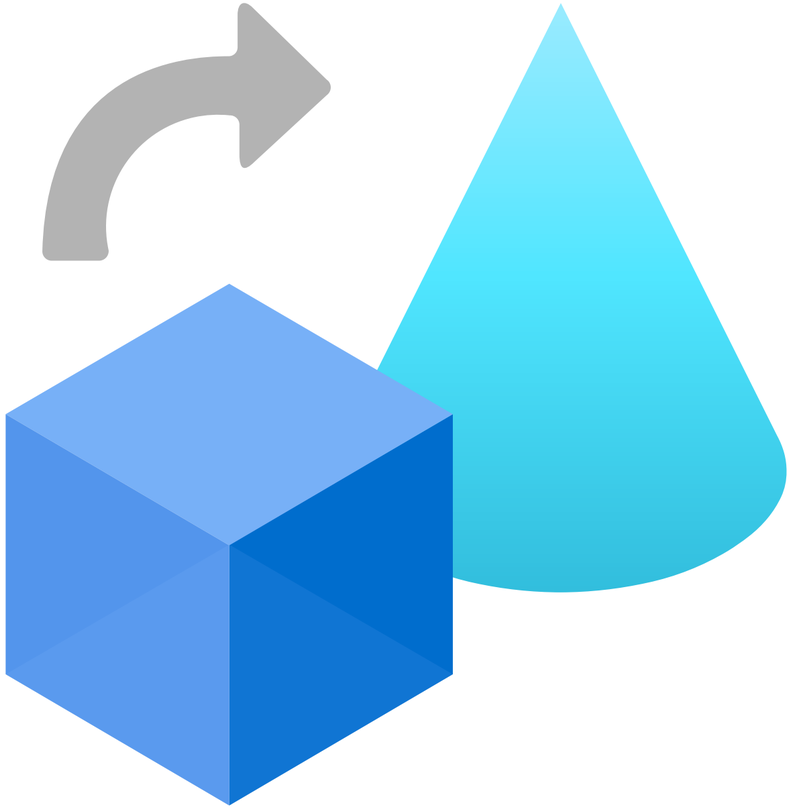


Data Flows – Monitoring









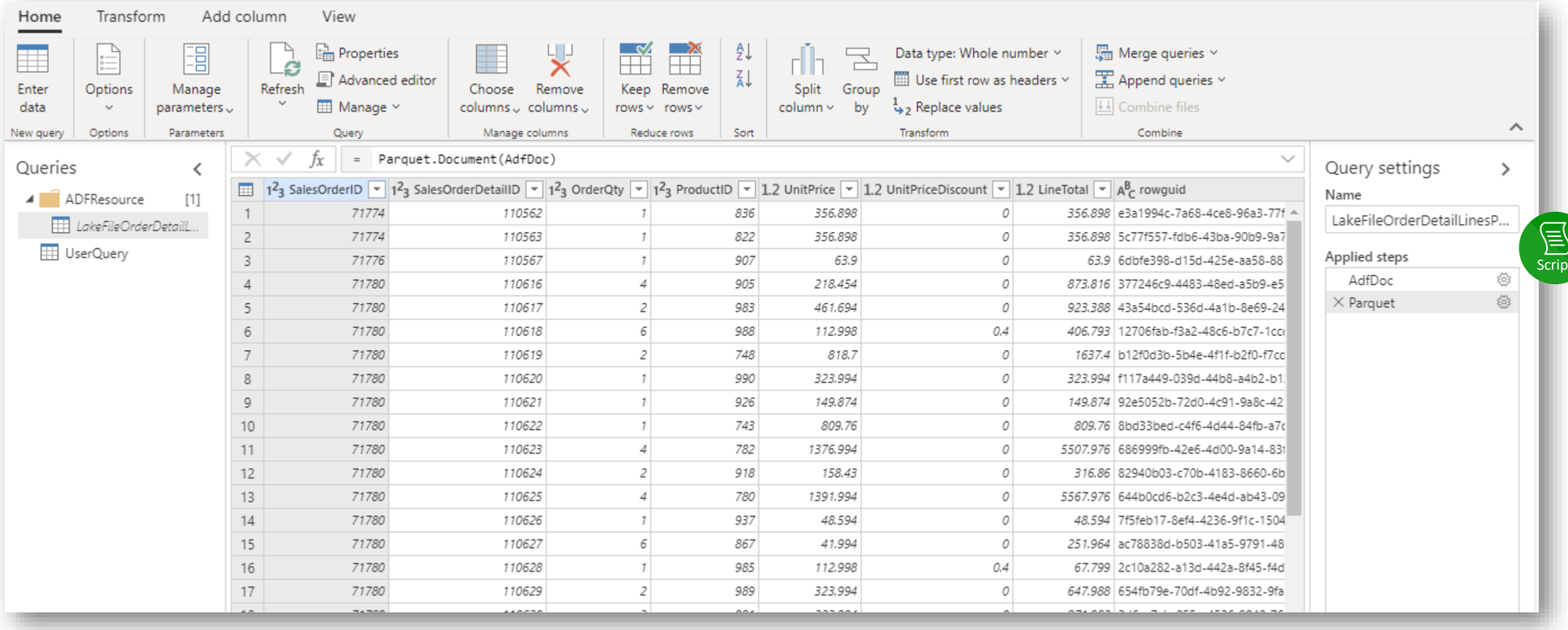
Data Flows

Power Query
(Preview)

What is a Power Query Activity?

Control Flow

Data Flow



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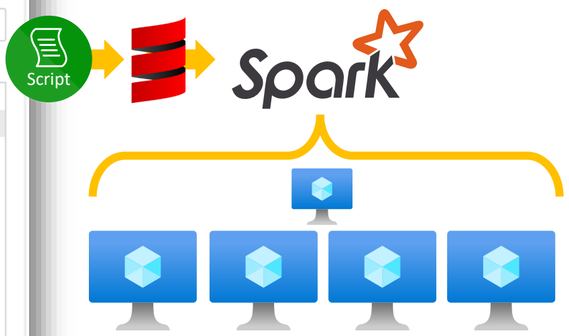
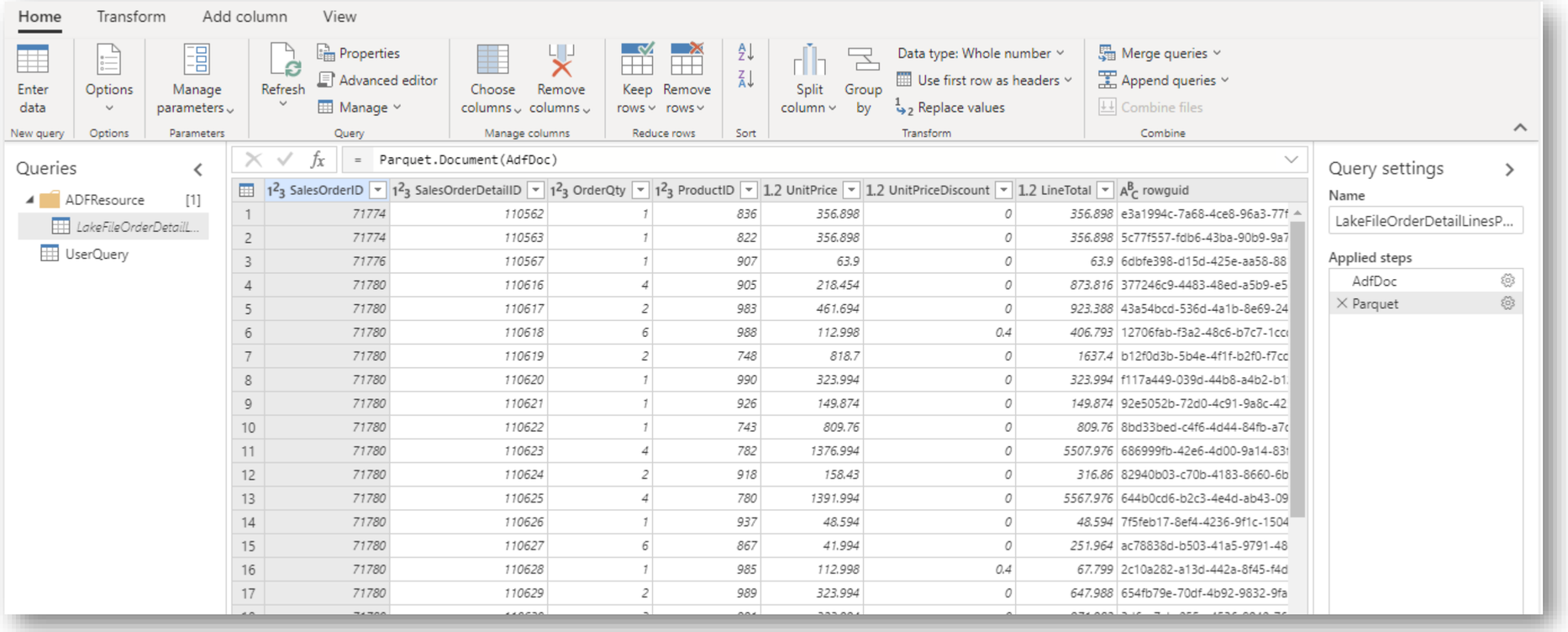
1	71774	110562	1	836	356.898	0	356.898	e3a1994c-7a68-4ce8-96a3-77f
2	71774	110563	1	822	356.898	0	356.898	5c77f557-fdb6-43ba-90b9-9a7
3	71776	110567	1	907	63.9	0	63.9	6dbfe398-d15d-425e-aa58-88
4	71780	110616	4	905	218.454	0	873.816	377246c9-4483-48ed-a5b9-e5
5	71780	110617	2	983	461.694	0	923.388	43a54bcd-536d-4a1b-8e69-24
6	71780	110618	6	988	112.998	0.4	406.793	12706fab-f3a2-48c6-b7c7-1cc
7	71780	110619	2	748	818.7	0	1637.4	b12f0d3b-5b4e-4f1f-b2f0-f7cc
8	71780	110620	1	990	323.994	0	323.994	f117a449-039d-44b8-a4b2-b1.
9	71780	110621	1	926	149.874	0	149.874	92e5052b-72d0-4c91-9a8c-42
10	71780	110622	1	743	809.76	0	809.76	8bd33bed-c4f6-4d44-84fb-a7c
11	71780	110623	4	782	1376.994	0	5507.976	686999fb-42e6-4d00-9a14-83
12	71780	110624	2	918	158.43	0	316.86	82940b03-c70b-4183-8660-6b
13	71780	110625	4	780	1391.994	0	5567.976	644b0cd6-b2c3-4e4d-ab43-09
14	71780	110626	1	937	48.594	0	48.594	7f5feb17-8ef4-4236-9f1c-1504
15	71780	110627	6	867	41.994	0	251.964	ac78838d-b503-41a5-9791-48
16	71780	110628	1	985	112.998	0.4	67.799	2c10a282-a13d-442a-8f45-f4d
17	71780	110629	2	989	323.994	0	647.988	654fb79e-70df-4b92-9832-9fa



What can a Power Query Activity do?

Control Flow

Data Flow



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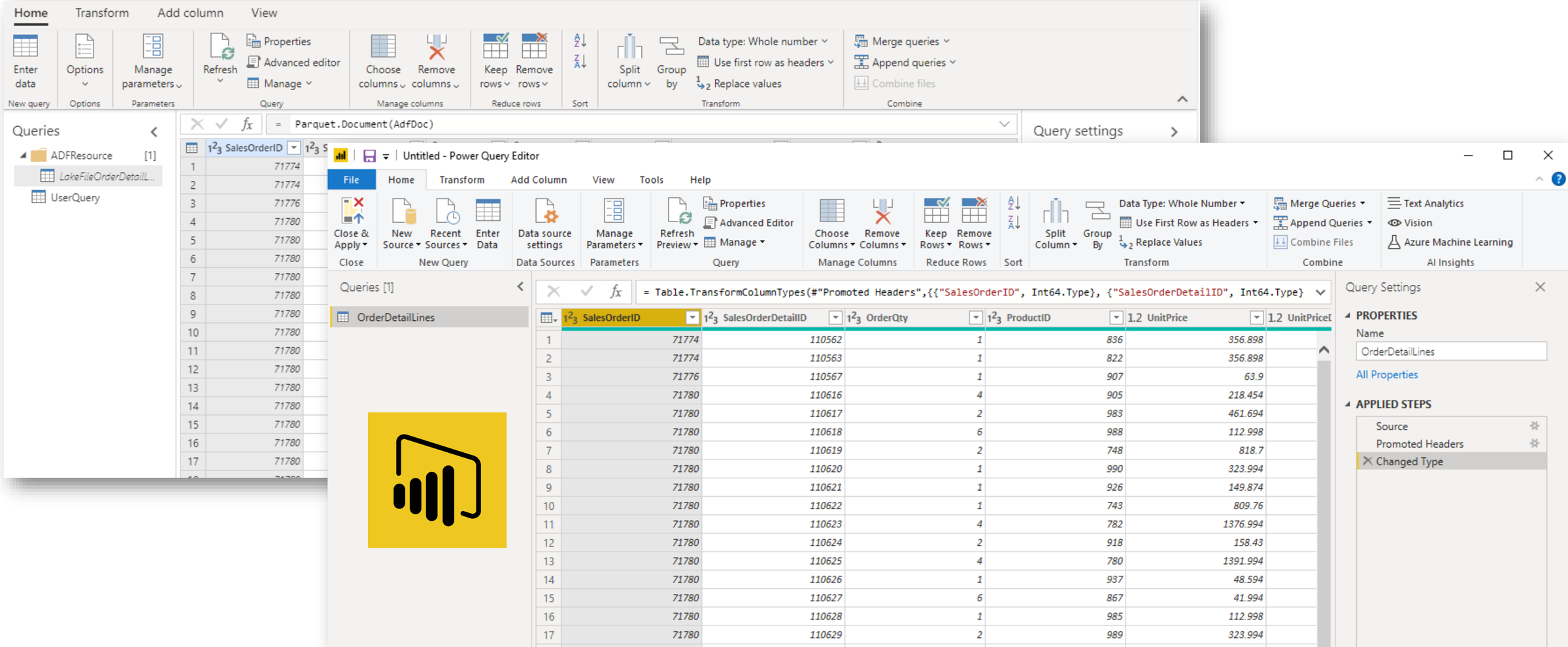
3	71776	110567	1	907	63.9	0	63.9	6dbfe398-d15d-425e-aa58-88
4	71780	110616	4	905	218.454	0	873.816	377246c9-4483-48ed-a5b9-e5
5	71780	110617	2	983	461.694	0	923.388	43a54bcd-536d-4a1b-8e69-24
6	71780	110618	6	988	112.998	0.4	406.793	12706fab-f3a2-48c6-b7c7-1cc
7	71780	110619	2	748	818.7	0	1637.4	b12f0d3b-5b4e-4f1f-b2f0-f7cc
8	71780	110620	1	990	323.994	0	323.994	f117a449-039d-44b8-a4b2-b1.
9	71780	110621	1	926	149.874	0	149.874	92e5052b-72d0-4c91-9a8c-42
10	71780	110622	1	743	809.76	0	809.76	8bd33bed-c4f6-4d44-84fb-a7c
11	71780	110623	4	782	1376.994	0	5507.976	686999fb-42e6-4d00-9a14-83
12	71780	110624	2	918	158.43	0	316.86	82940b03-c70b-4183-8660-6b
13	71780	110625	4	780	1391.994	0	5567.976	644b0cd6-b2c3-4e4d-ab43-09
14	71780	110626	1	937	48.594	0	48.594	7f5feb17-8ef4-4236-9f1c-1504
15	71780	110627	6	867	41.994	0	251.964	ac78838d-b503-41a5-9791-48
16	71780	110628	1	985	112.998	0.4	67.799	2c10a282-a13d-442a-8f45-f4d
17	71780	110629	2	989	323.994	0	647.988	654fb79e-70df-4b92-9832-9fa

Power Query – Home

Control Flow

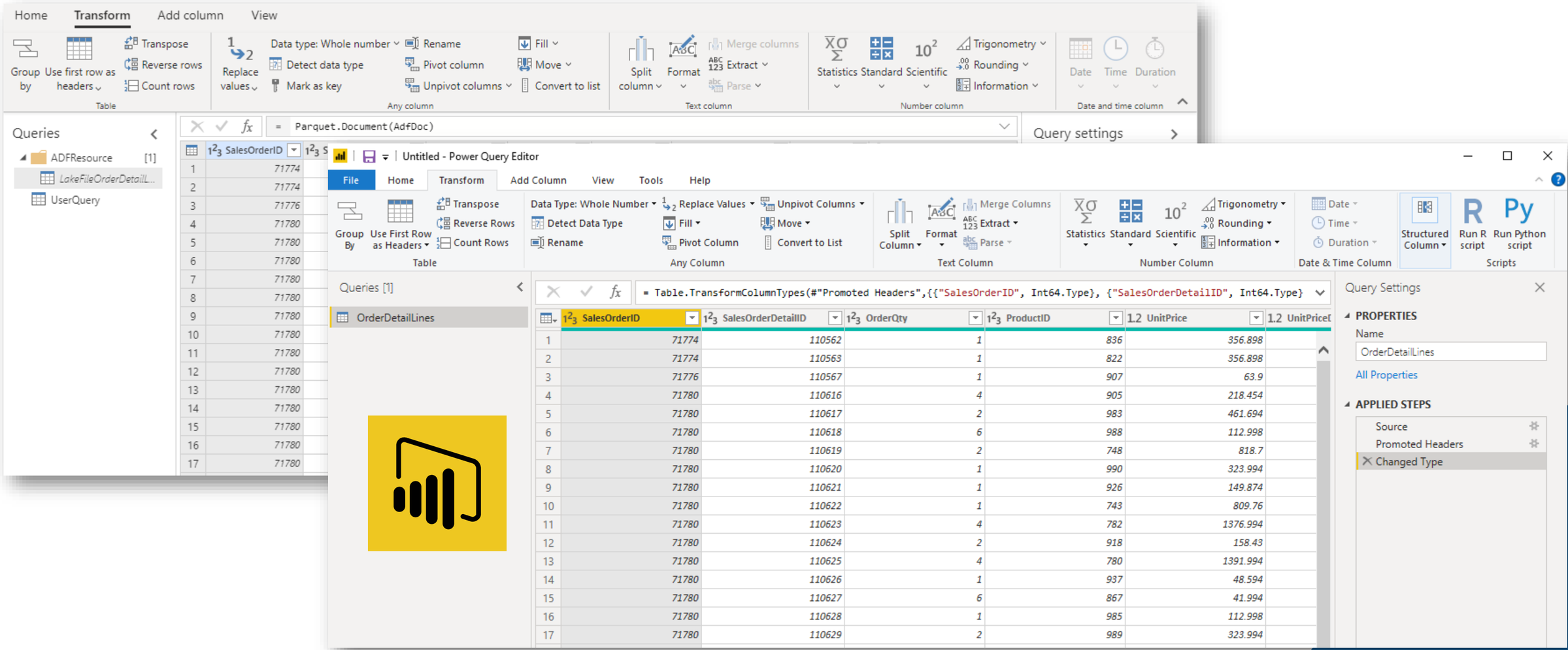
Data Flow



Power Query – Transform

Control Flow

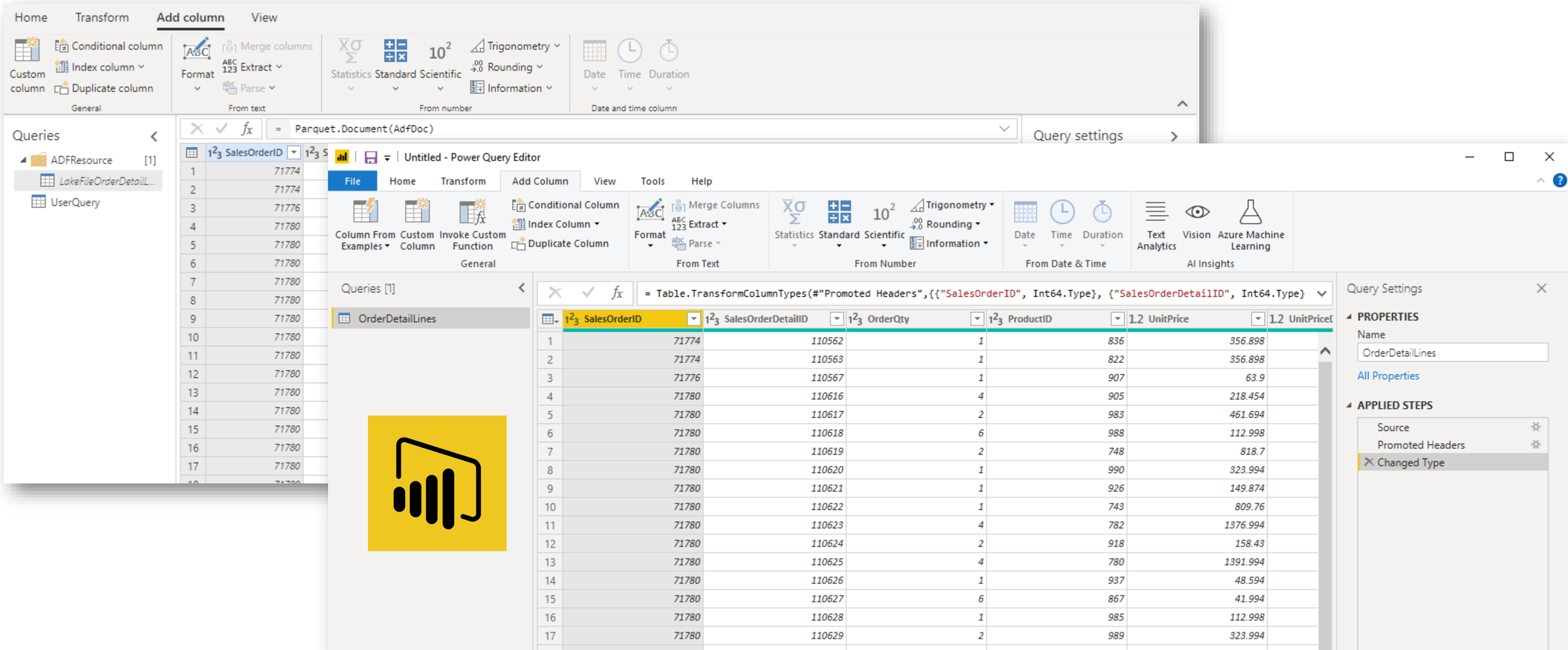
Data Flow



Power Query – Add Column

Control Flow

Data Flow

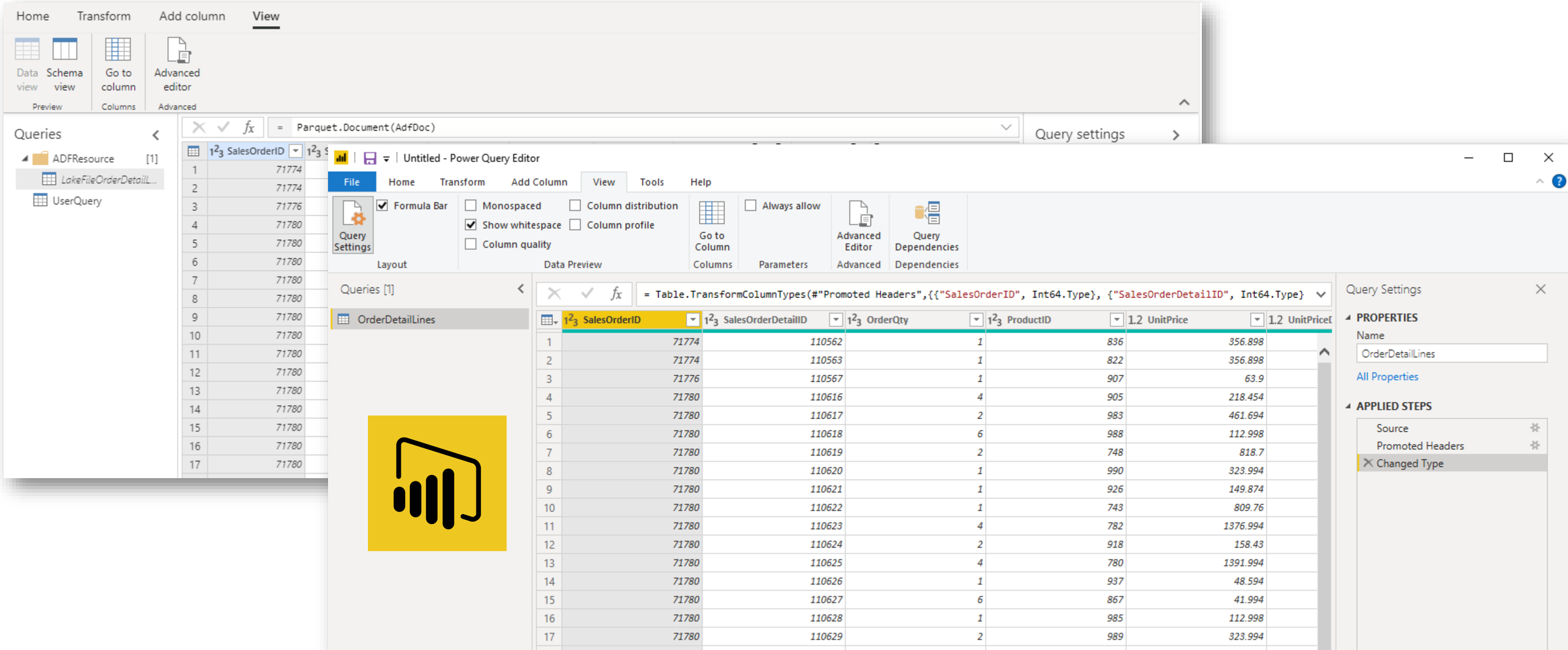


	SalesOrderID	SalesOrderDetailID	OrderQty	ProductID	UnitPrice	UnitPriceE
1	71774	110562	1	836	356.898	
2	71774	110563	1	822	356.898	
3	71776	110567	1	907	63.9	
4	71780	110616	4	905	218.454	
5	71780	110617	2	983	461.694	
6	71780	110618	6	988	112.998	
7	71780	110619	2	748	818.7	
8	71780	110620	1	990	323.994	
9	71780	110621	1	926	149.874	
10	71780	110622	1	743	809.76	
11	71780	110623	4	782	1376.994	
12	71780	110624	2	918	158.43	
13	71780	110625	4	780	1391.994	
14	71780	110626	1	937	48.594	
15	71780	110627	6	867	41.994	
16	71780	110628	1	985	112.998	
17	71780	110629	2	989	323.994	

Power Query – View

Control Flow

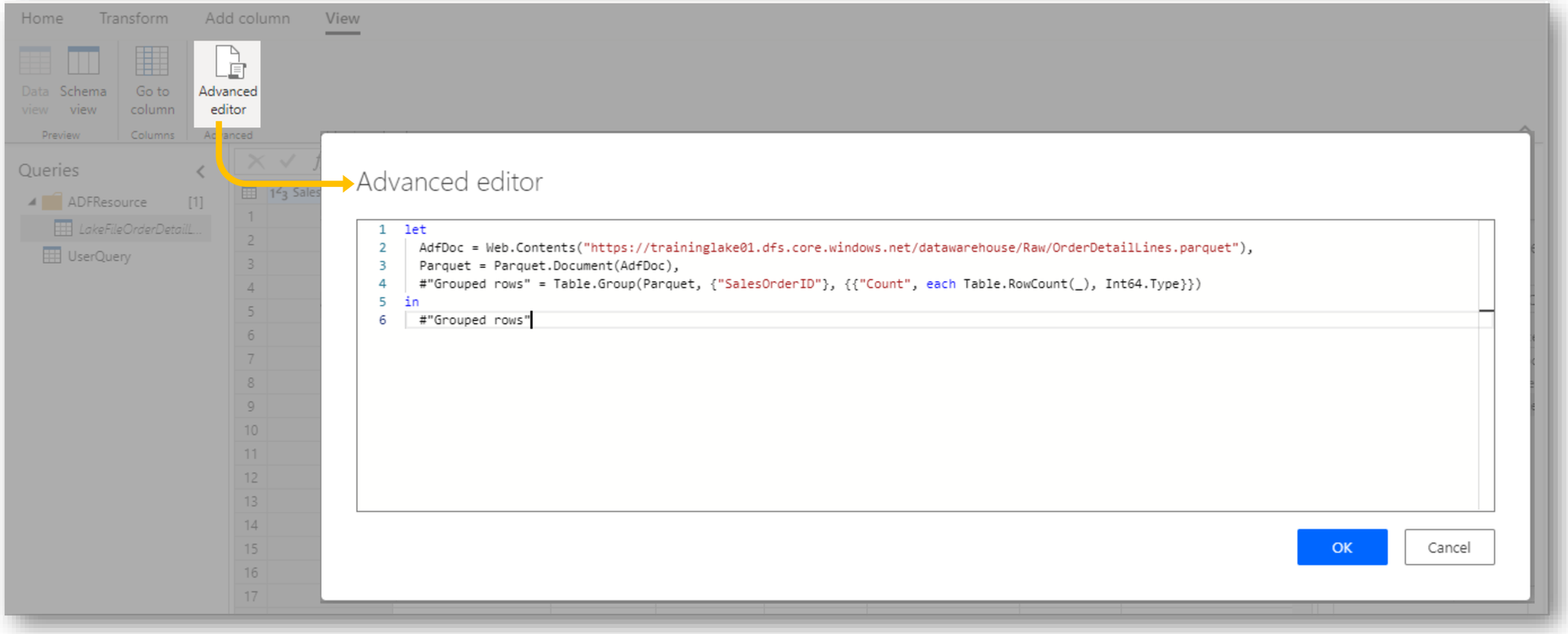
Data Flow



Power Query – View (Advanced Editor)

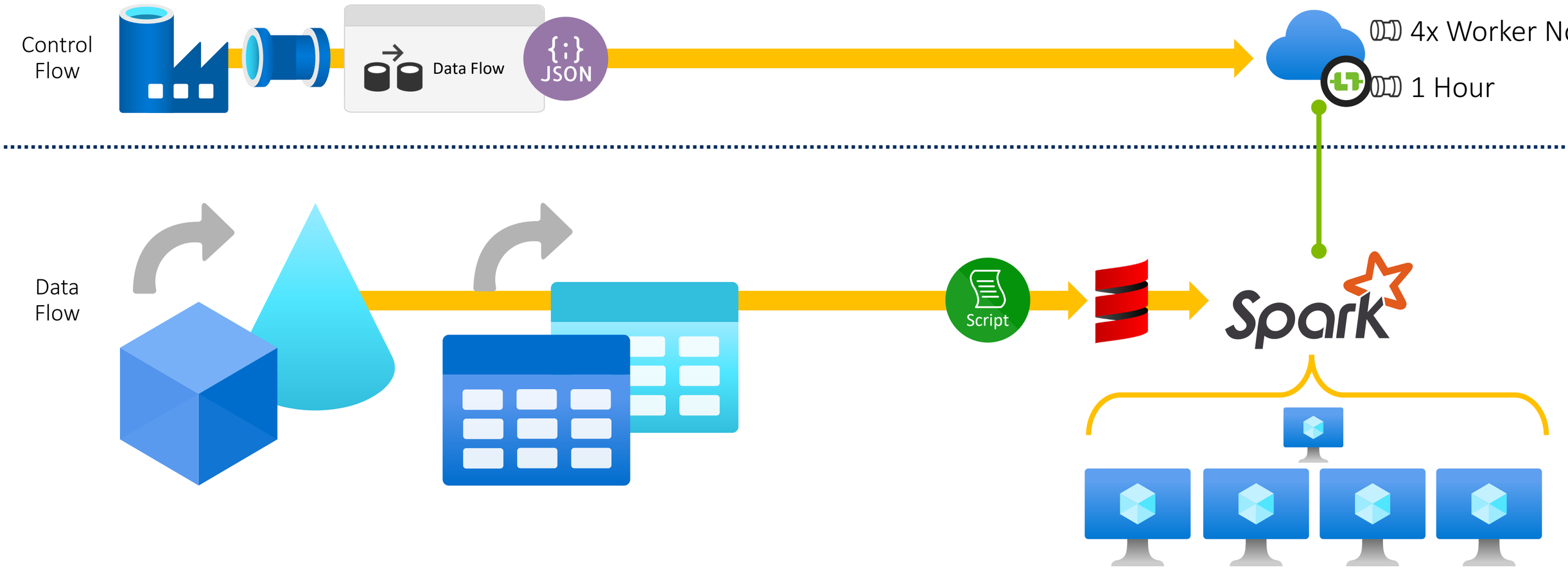
Control Flow

Data Flow



Configuration

Data Flow Cluster Configuration

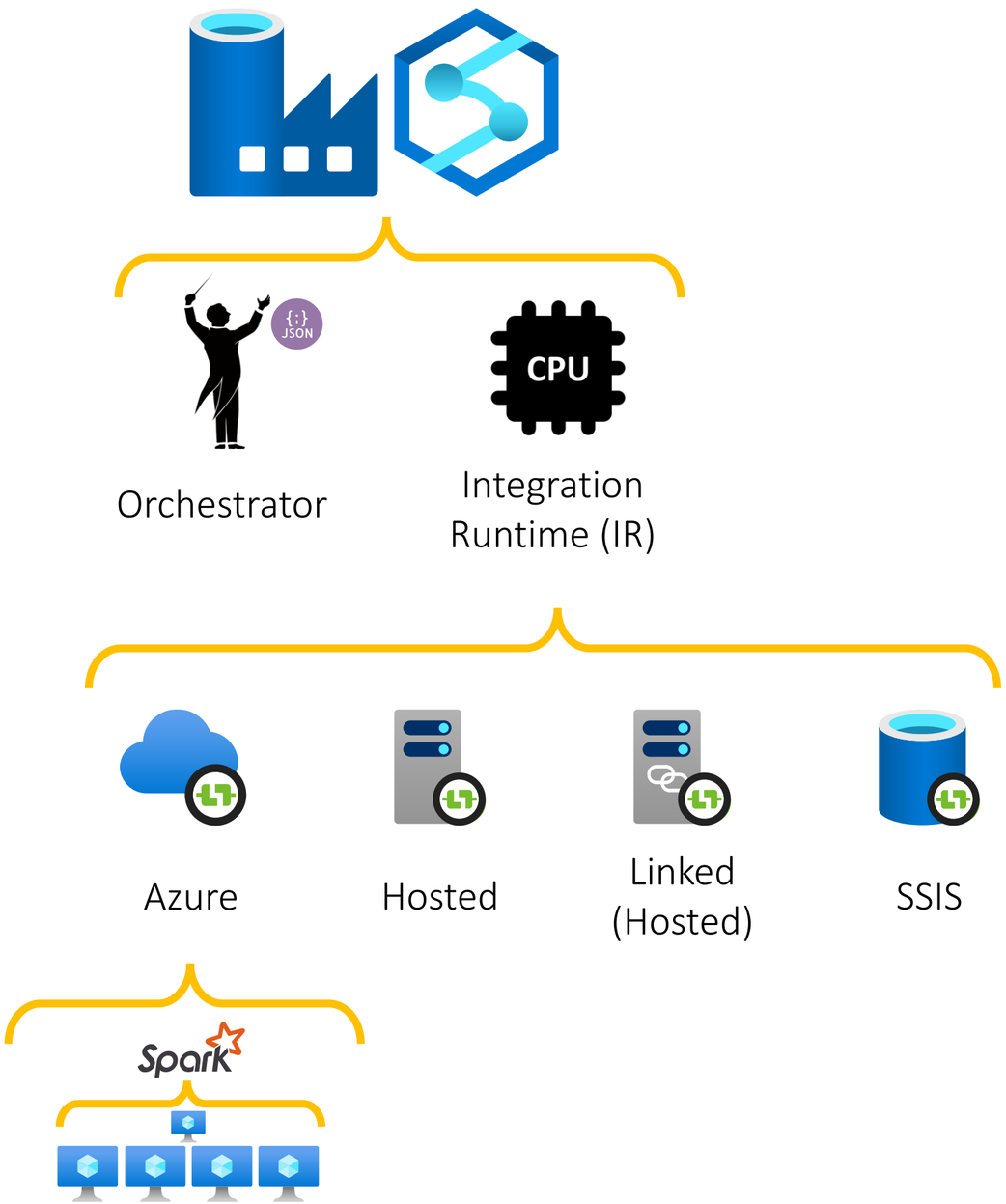


Default Azure IR

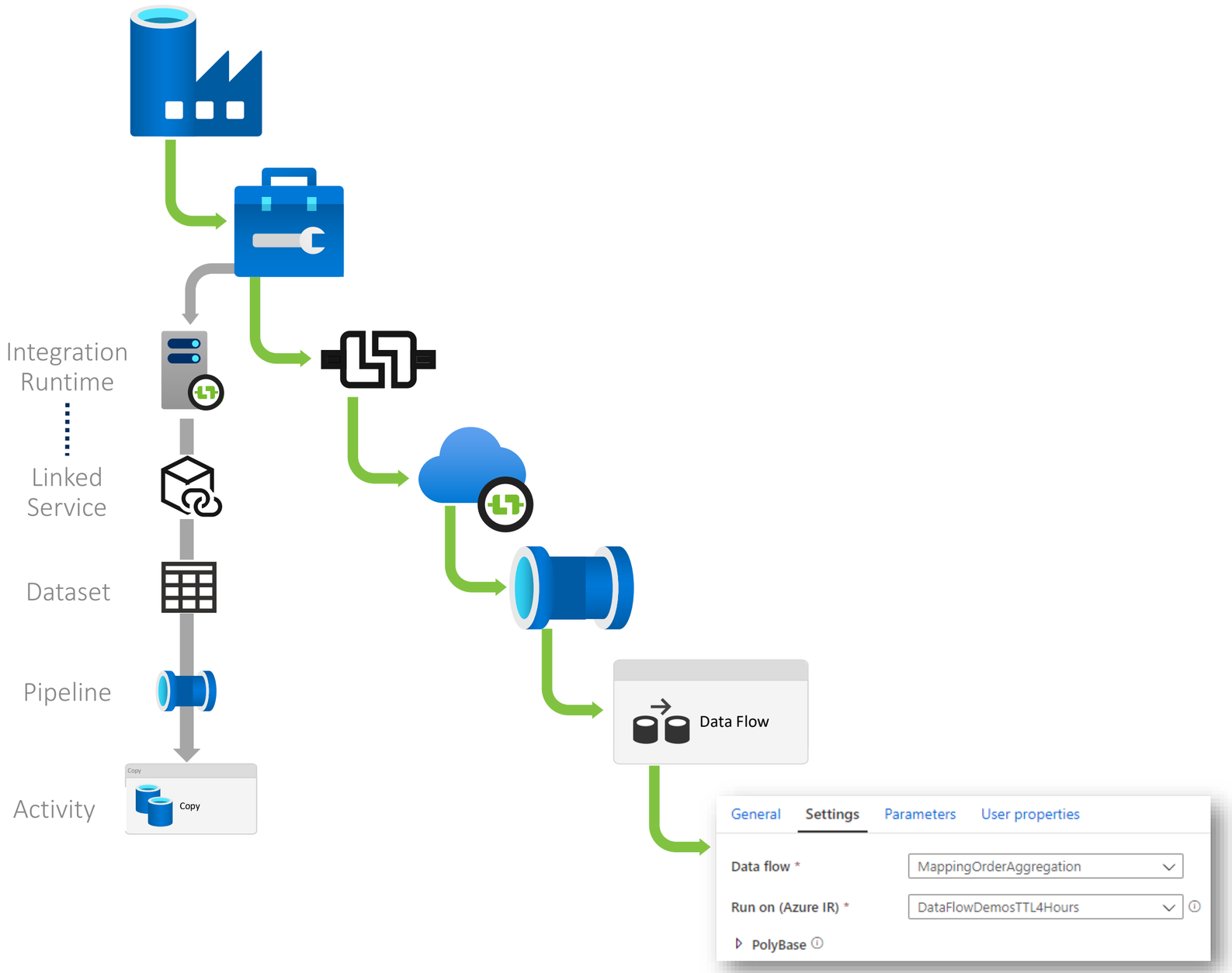
- General Purpose
- 4x Worker Nodes
- 1 Hour

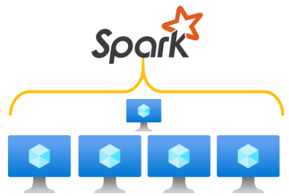
- Compute Type
- Number of Worker Nodes
- Cluster Time to Live

Integration Runtimes



Setting the Data Flow Cluster (IR Configuration)





Data Factory

Manage

Integration Runtimes

Azure IR

Pipeline

Data Flow Activity

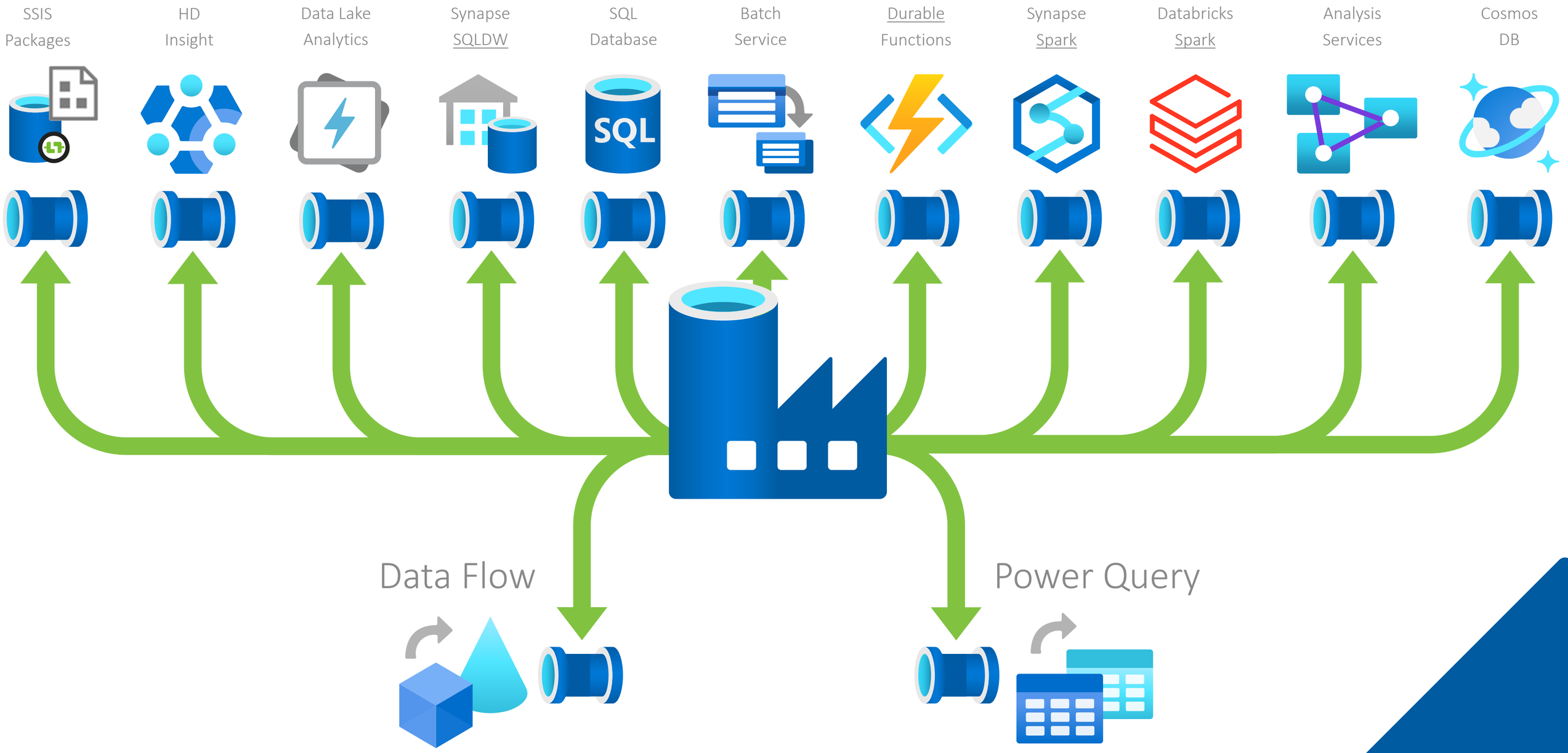
Settings

Use Cases & Conclusions

Data Transformation Services in Azure Comparison

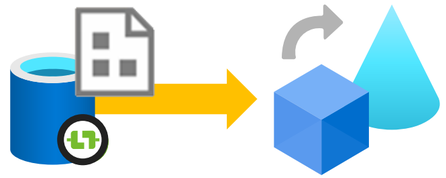
Transformation Tools	Graphical UI (Low/No Code)	Scales Out	Scales Up	Cloud Native Tech
T-SQL with SQLDB	✗	✗	✓	✗
SSIS Packages	✓	✗	✓	✗
Scala/Python/SQL with Databricks	✗	✓	✓	✓
Data Flows & Power Query	✓	✓	✓	✓

When Should We Use These Integration Pipeline Transformation Activities?

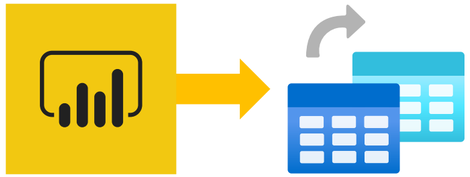


Use Cases

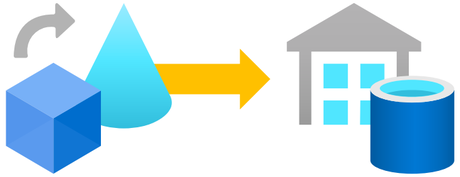
SSIS developers who are transferring existing skills to cloud native technologies have a very low barrier to entry and don't need to worry about distributed compute to get started.



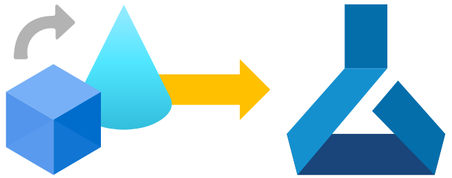
Data engineering made easy for the power users who has grown out of Power BI following a series of Data Lake exploration sessions.



Data insight teams needing to do rapid prototyping and data warehouse loading within a single Azure Resource making deployments simple and release cycles short.



Simpler and quicker data wrangling for data scientists that want to quickly prepare multiple raw datasets ready for model training and testing, also with the ability to use large amounts of compute.



Data Flows used to deliver all data transformation workloads as part of a end to end cloud based data analytics/warehouse solution.

Data Flows script dynamically generated from external metadata and injected into like we once did with BIML for SSIS packages.

Thank you for listening…

Paul Andrew

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