Azure Machine Learning Analytics

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Agenda

- Azure ML Services
- Azure Databricks
- Azure Data Factory

Azure ML Services

Azure Machine Learning service

Democratize AI

Enable Domain Experts & Developers to get rapidly build AI solutions

Accelerate AI

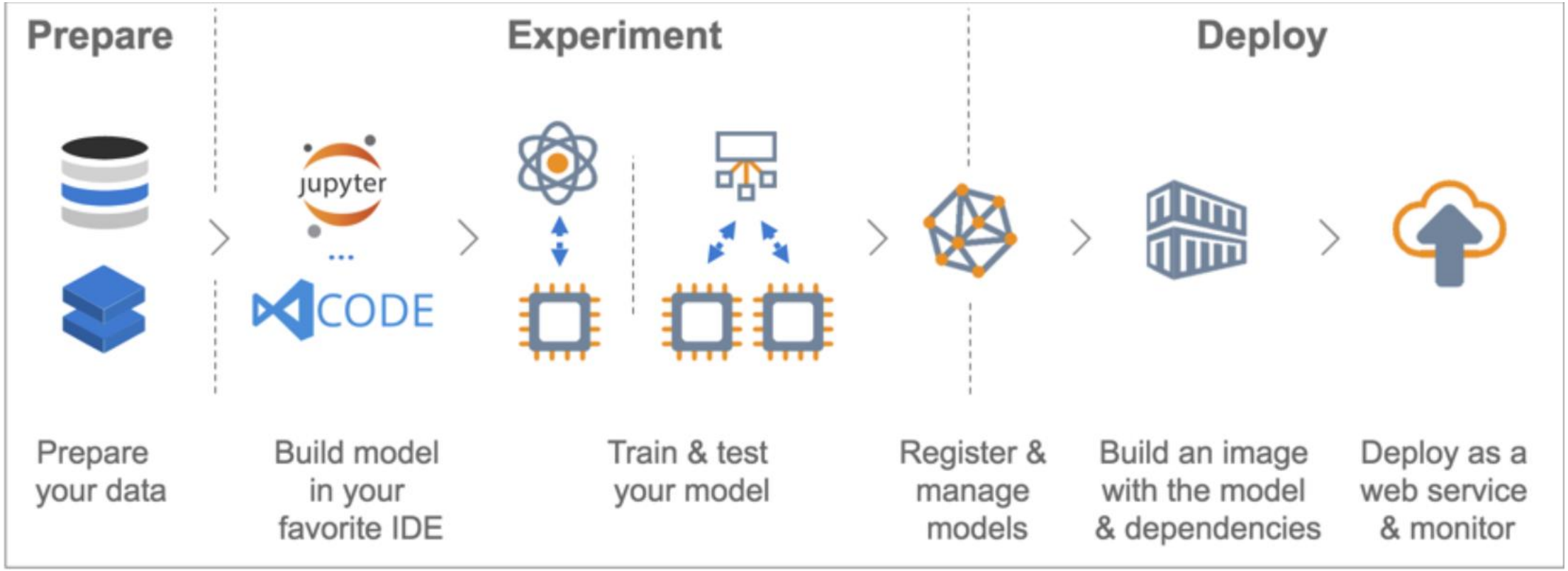
Improve productivity for Data scientists

Scale AI

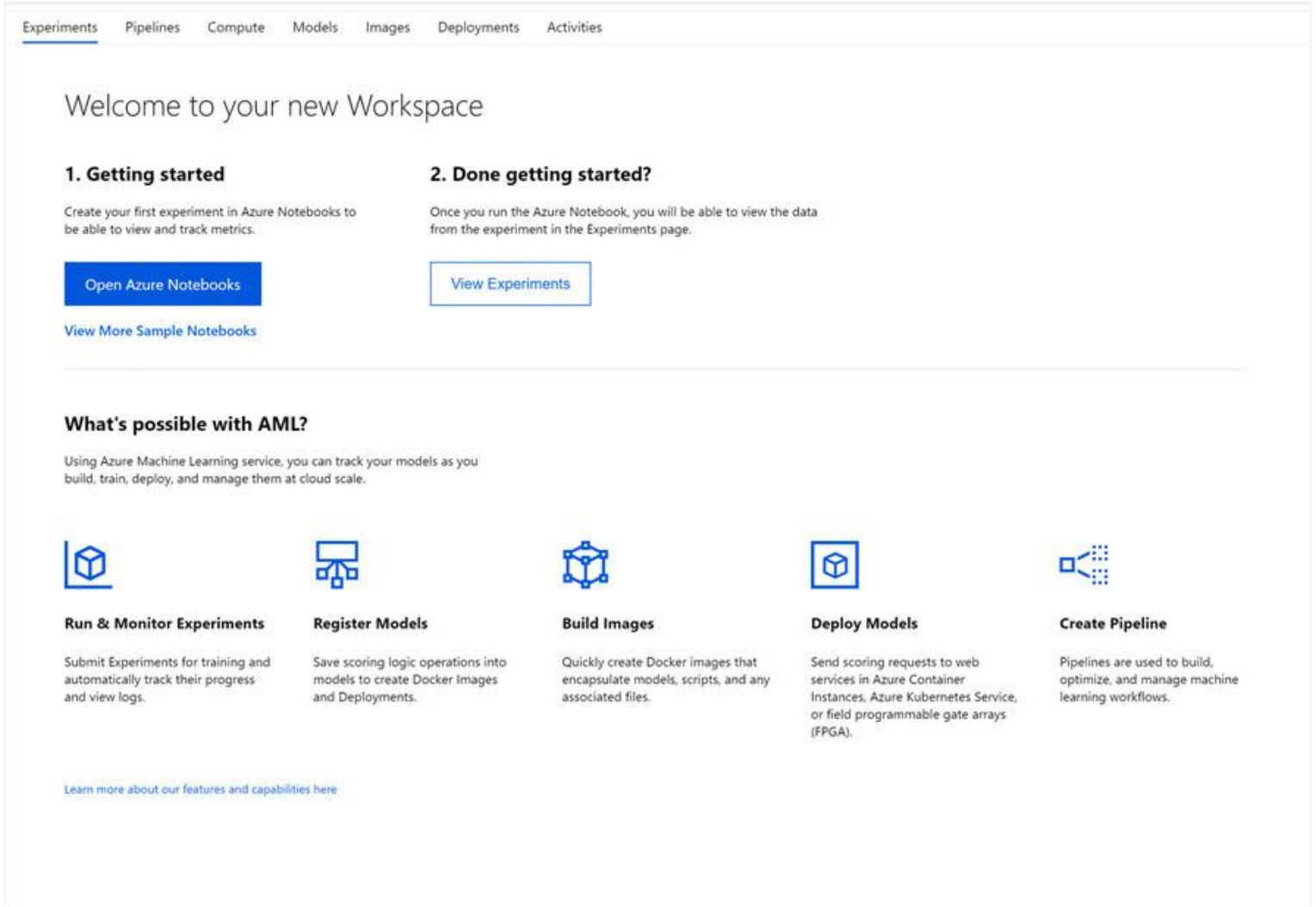
Build AI solutions at scale in an automated fashion

What is Azure Machine Learning service?

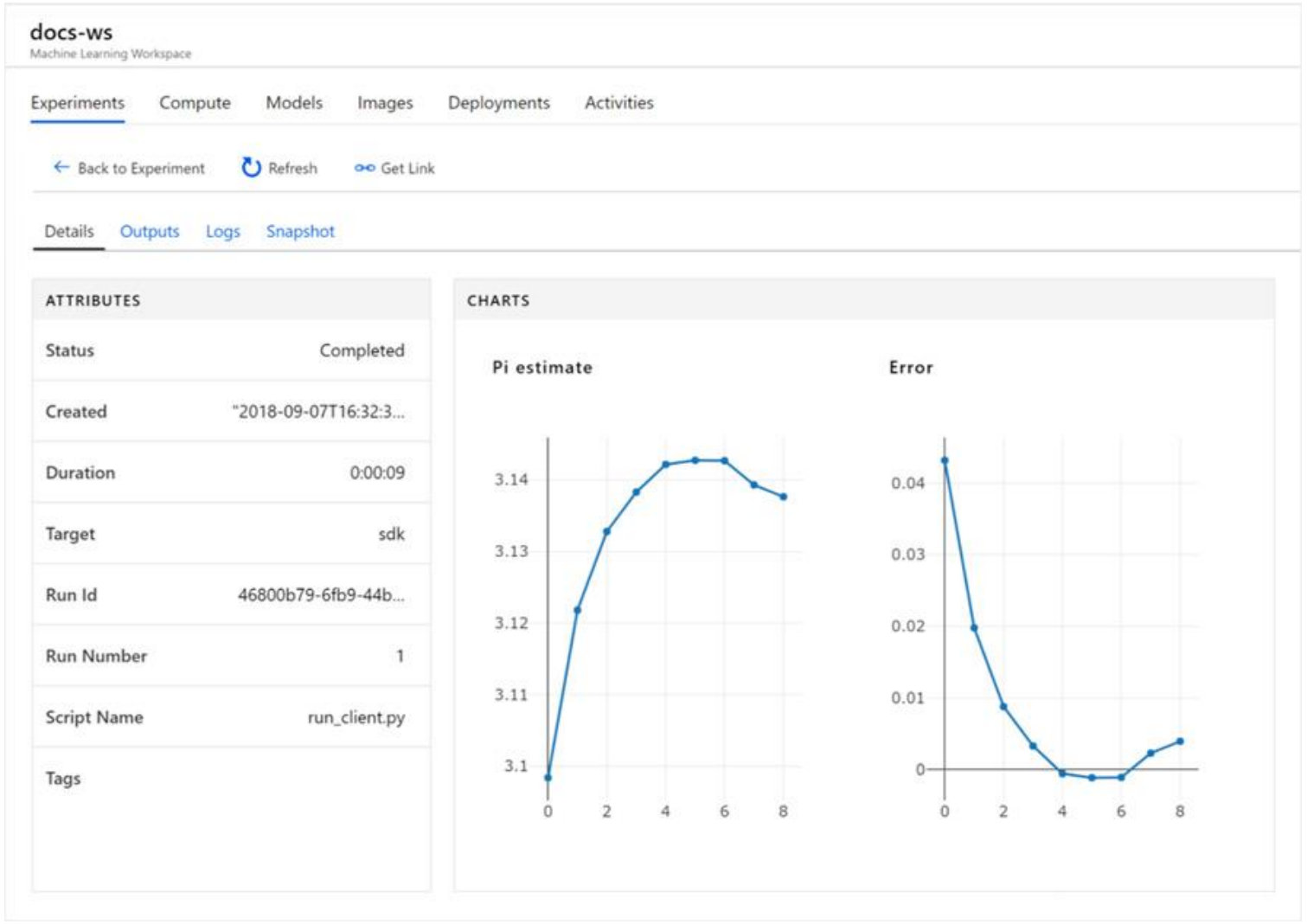
Cloud-based environment you can use to prep data, train, test, deploy, manage, and track machine learning models



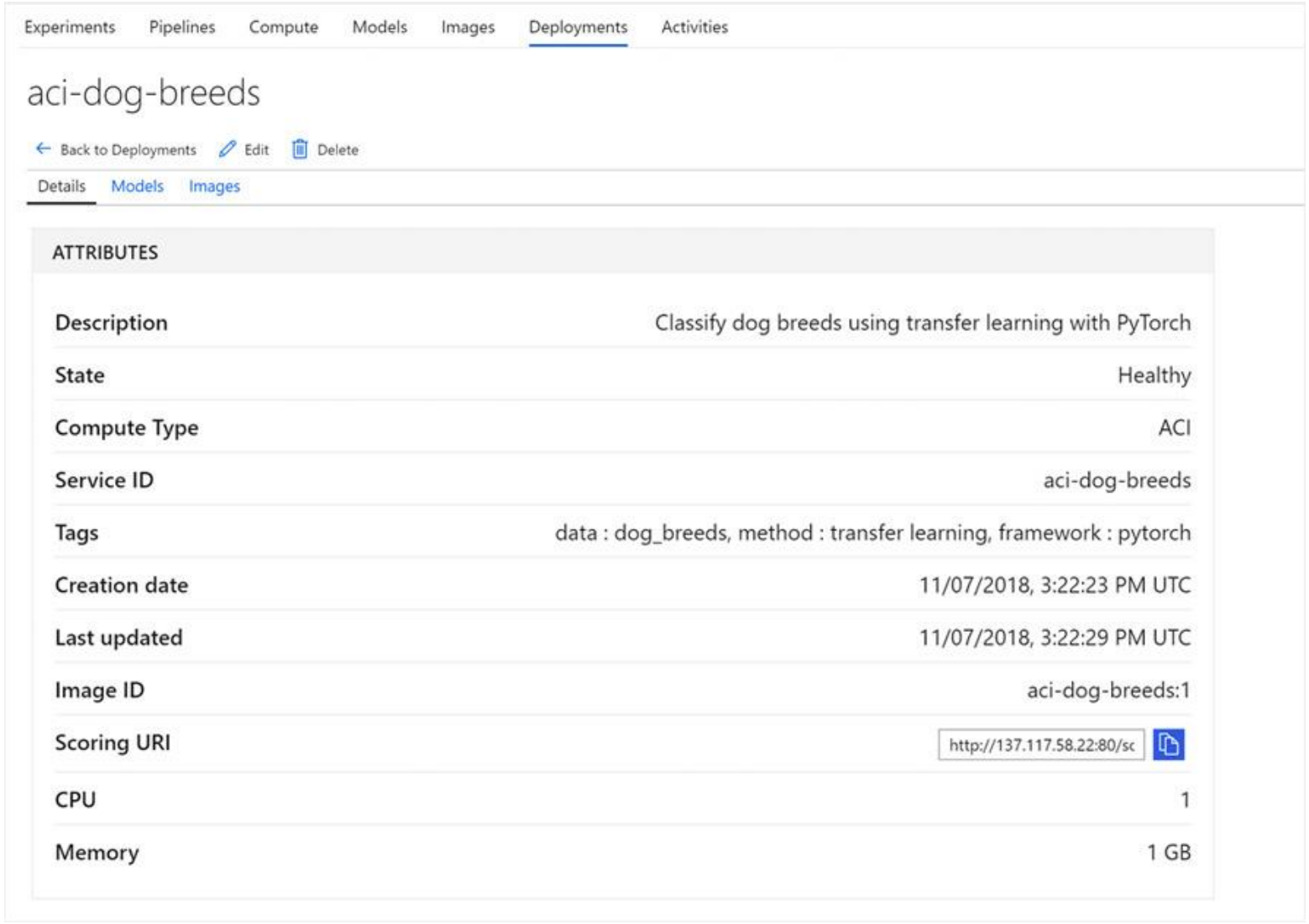
How to use Azure Machine Learning service
Create a workspace



How to use Azure Machine Learning service
Build and train



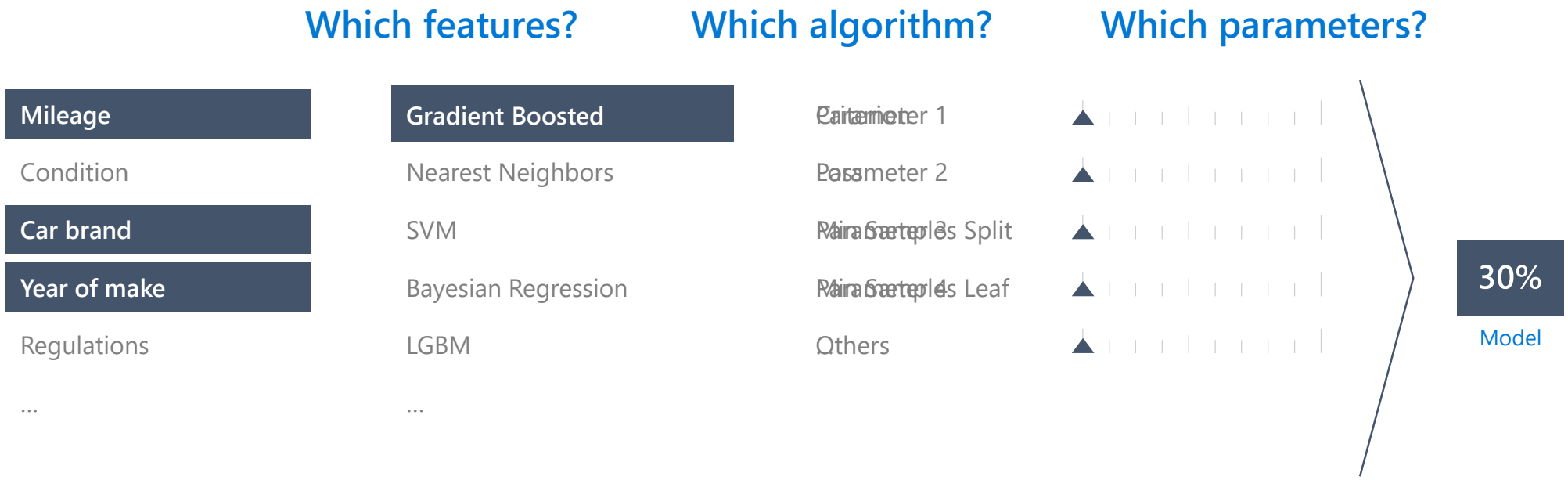
How to use Azure Machine Learning service
Deploy and manage



What is automated machine learning?

- Automated machine learning (automated ML) picks an algorithm and hyperparameters for you and generates a model ready for deployment
- The model can be downloaded to be further customized as well
- Automated ML Capabilities
  - Based on Microsoft Research
  - Brain trained with several million experiments
  - Collaborative filtering and Bayesian optimization
  - Privacy preserving: No need to “see” the data

Model Creation Is Typically Time-Consuming



Model Creation Is Typically Time-Consuming

Which features?

- Mileage
- Condition
- Car brand
- Year of make
- Regulations
- …

Which algorithm?

- Gradient Boosted
- Nearest Neighbors
- SVM
- Bayesian Regression
- LGBM
- …

Which parameters?

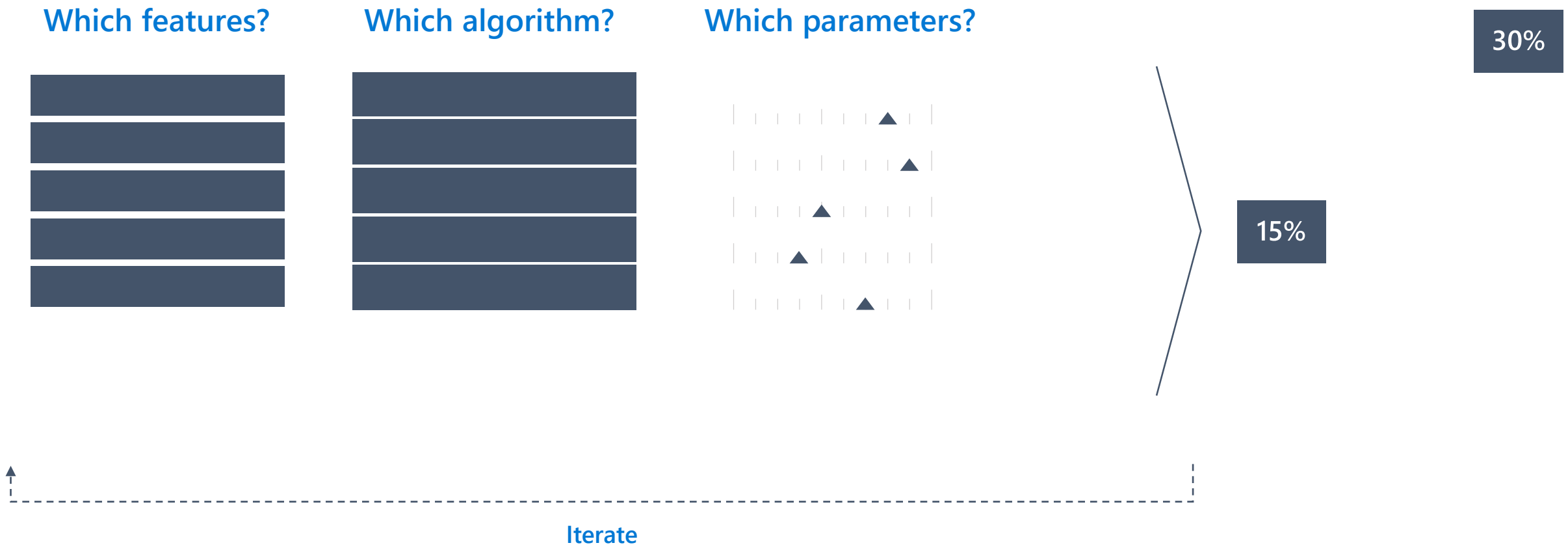
- Number of Neighbors
- Weights
- Min Samples Split
- Min Samples Leaf
- Others

30%

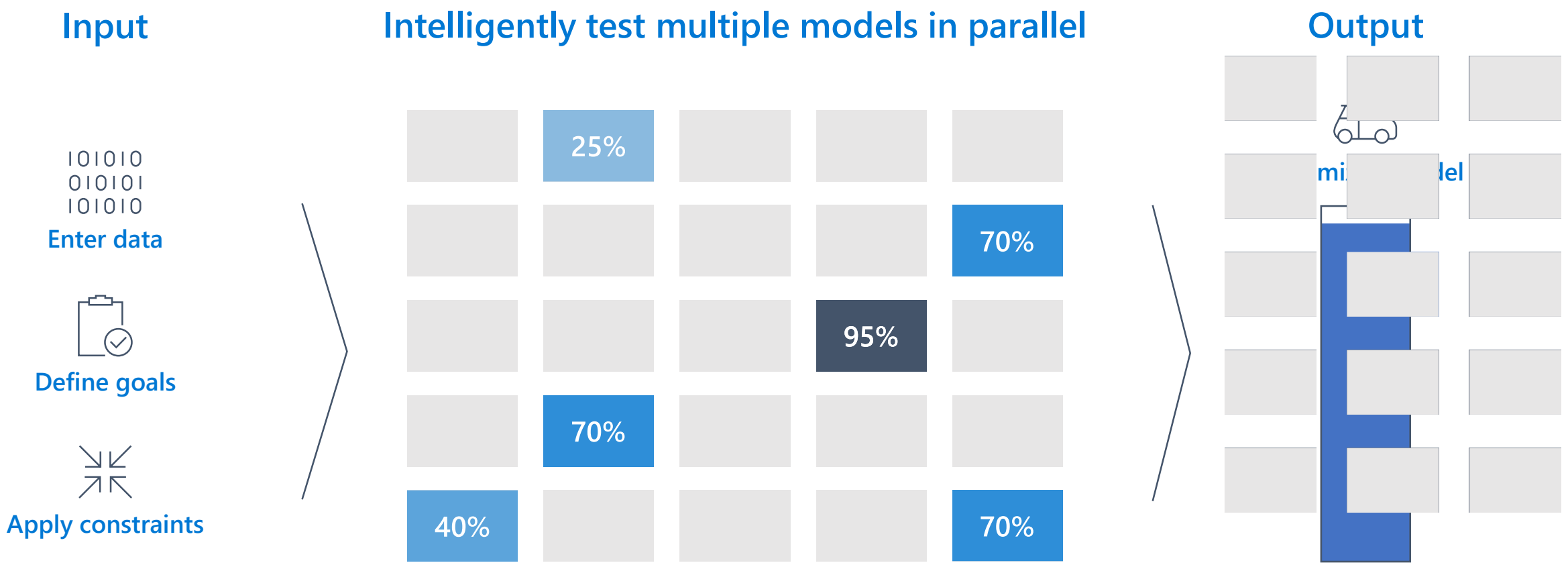
Model

Iterate

Model Creation Is Typically Time-Consuming



Automated ML Accelerates Model Development



Automated ML

Data

☑

Data cleaning support

Automated ML currently supports automated data cleaning

Feature

☑

Feature engineering

Most time consuming part when done manually can now be done within minutes.

Algorithm

☑

Pick and play

Testing many different algorithms at once.

Tuning

☑

What to leave out

Hyperparameter tuning: what to include what to leave out

Ranking

☑

Ranking

Having an overview of the best performing models based on accuracy & speed.

Explaining

☑

Justification

Being able to explain what created an outcome and what features had the most significant impact

Why Use Azure ML Services?

Broadly useful

Is a part of Azure Cloud

Integration with data platforms, ex: PowerBI, SQL, CosmosDB

Efficient

Automated ML accelerates model development

Faster model training using multiple cores and parallel experiments

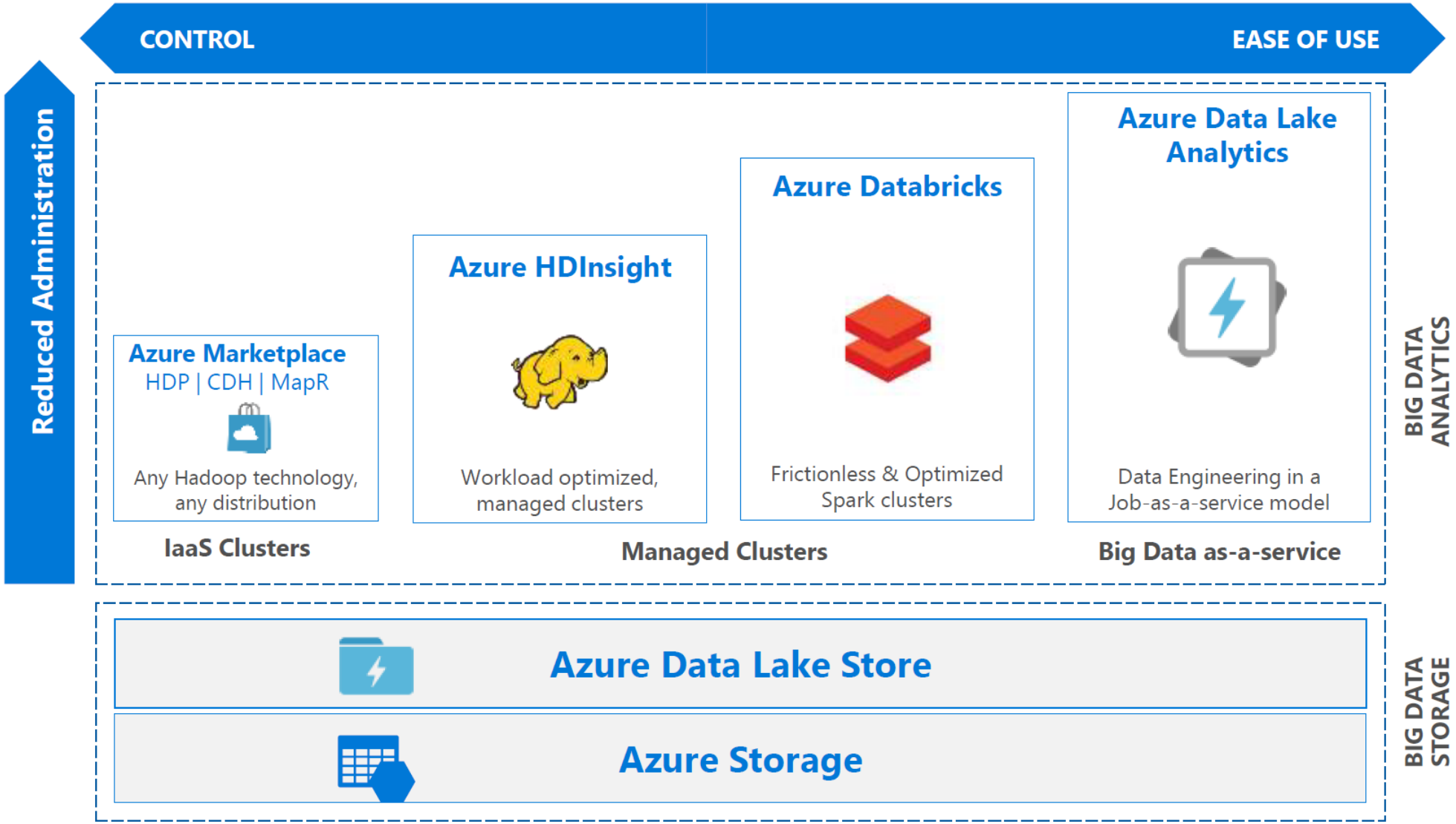
Integration

Azure Notebooks, Jupyter Notebooks

Python SDK for deployment and hosting for inference

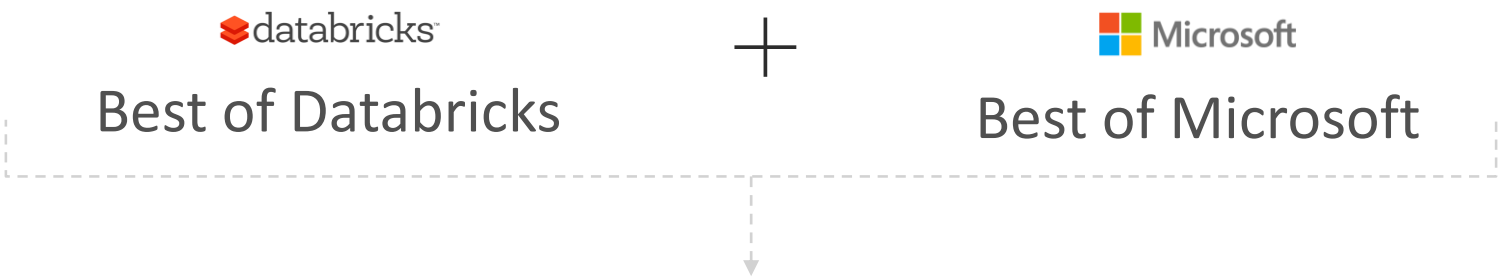
Azure Databricks

Knowing the various big data solutions



What is Azure Databricks ?

A fast, easy and collaborative Apache® Spark™ based analytics platform optimized for Azure



- Designed in collaboration with the founders of Apache Spark
- One-click set up; streamlined workflows
- Interactive workspace that enables collaboration between data scientists, data engineers, and business analysts.
- Native integration with Azure services (Power BI, SQL DW, Cosmos DB, Blob Storage, ADF, SQL DB, AAD)
- Enterprise-grade Azure security (Active Directory integration, compliance, enterprise-grade SLAs – 99.95%)

What is Apache Spark

Apache Spark emerged to provide a parallel processing framework that supports in-memory processing to boost the performance of big-data analytical applications on massive volumes of data.

Interactive Data Analysis
Used by business analysts or data engineers to analyze and prepare data.

Streaming Analytics
Ingest data from technologies such as Kafka and Flume to ingest data in real-time.

Machine Learning
Contains a number of libraries that enables a Data Scientist to perform Machine Learning.

Why use Azure Databricks

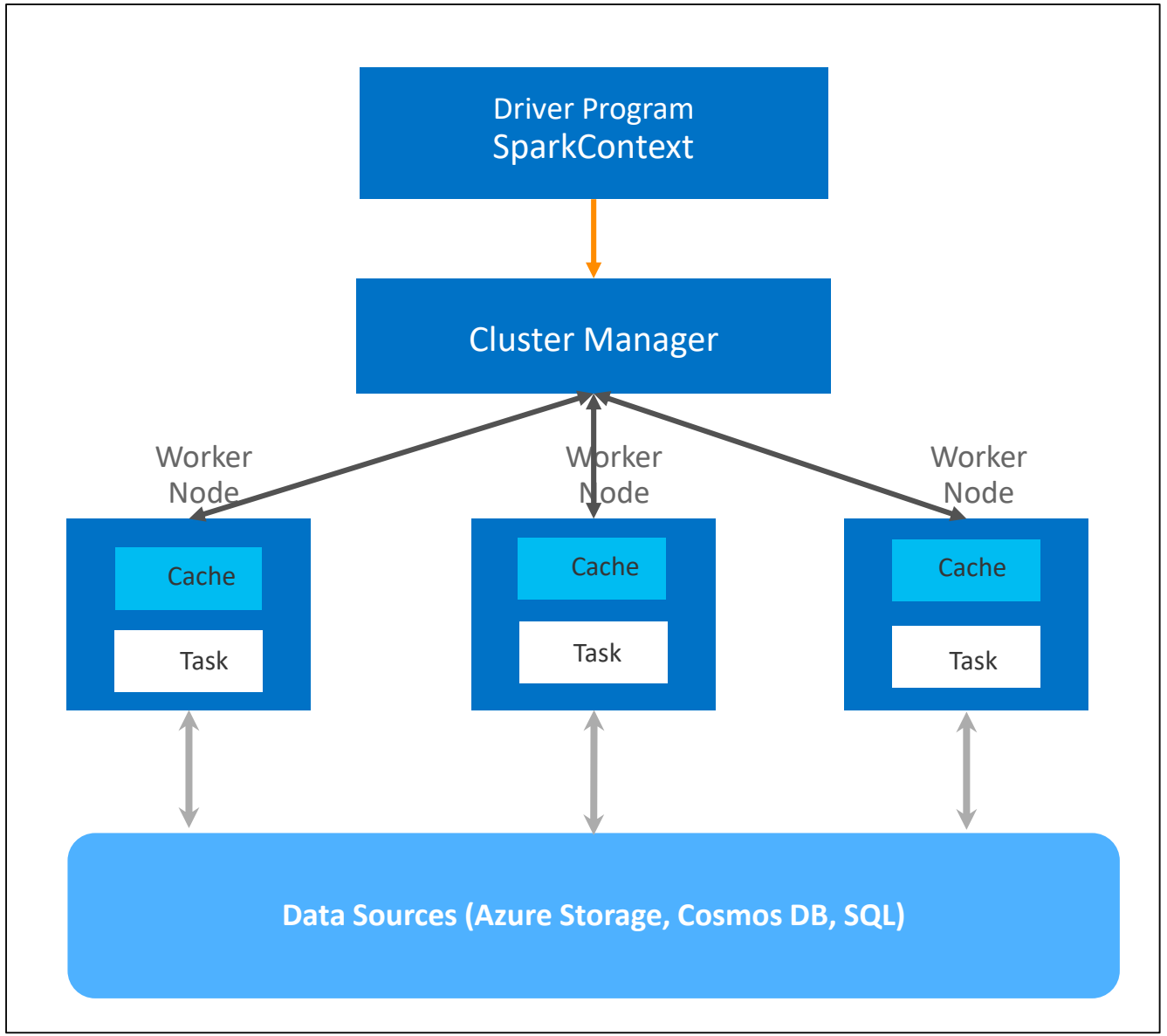
Azure Databricks is a wrapper around Apache Spark that simplifies the provisioning and configuration of a Spark cluster in a GUI interface
.

Azure Databricks components.

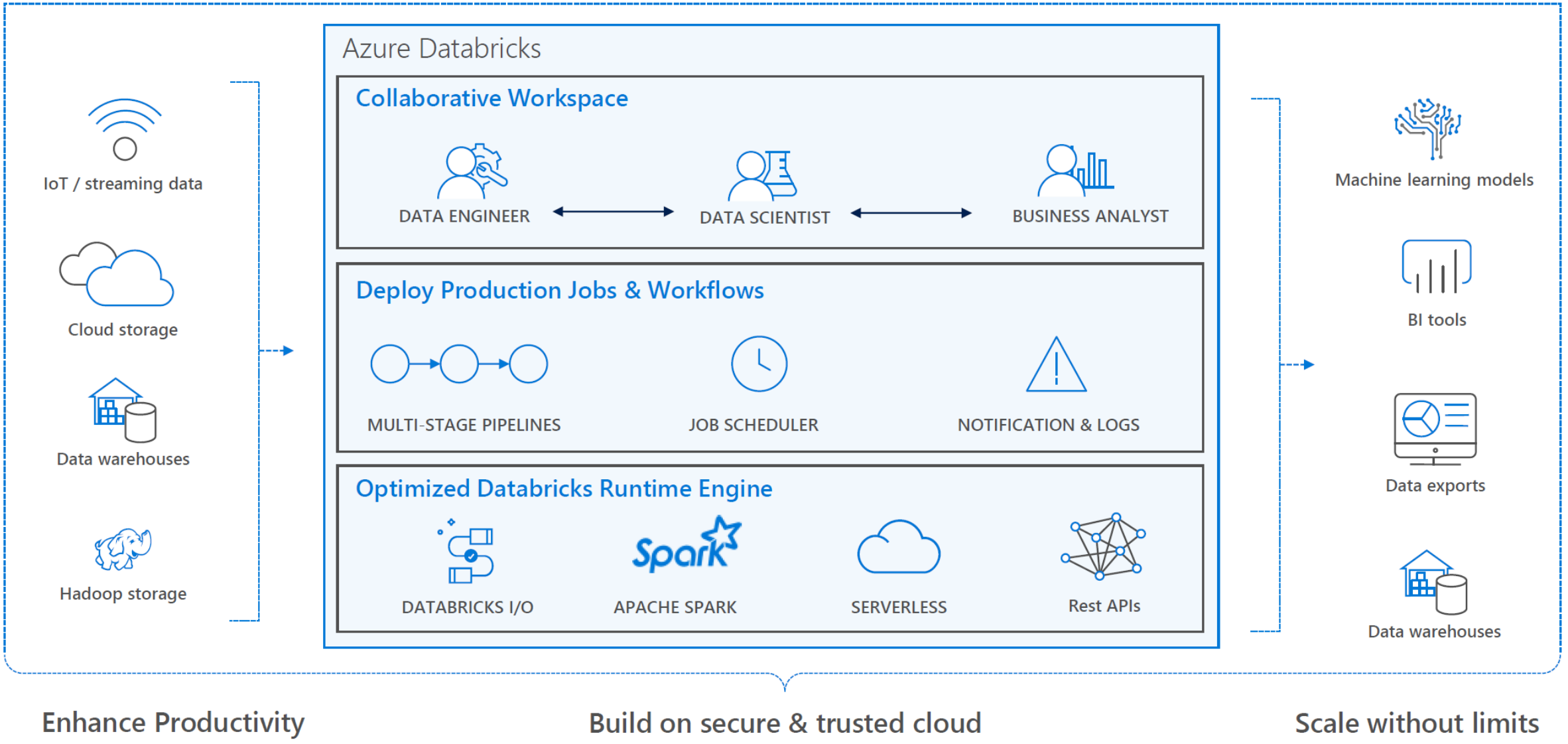
- Spark SQL and DataFrames
- Streaming
- Mlib
- GraphX
- Spark Core API

Spark Architecture & Dataframes

- 'Driver' runs the user's 'main' function and executes the various parallel operations on the worker nodes
- To take advantage of Spark – you use Dataframes as the data structure
- Once your Data is in the DataFrame – Spark can parallelize operations
- The Dataframes support both batch and streaming data
- The results of the operations are collected by the driver



Azure Databricks



Enhance Productivity

Build on secure & trusted cloud

Scale without limits

Performing ETL to populate a data model

The goal of transformation in Extract Transform Load (ETL) is to transform raw data to populate a data model.

Extraction	Data Validation	Transformation	Corrupt Record Handling	Loading Data
Connect to many data stores: • Postgres • SQL Server • Cassandra • Cosmos DB • CSV, Parquet • Many more..	Validate that the data is what you expect.	Applying structure and schema to your data to transform it into the desired format.	Built-in functions of Databricks allow you to handle corrupt data such as missing and incomplete information.	Highly effective design pattern involves loading structured data back to DBFS as a parquet file.

Why Use Azure Databricks ?

Enhance productivity

Get started quickly by launching your new Spark environment with one click

Share your insights in powerful ways through rich integration with Power BI

Build on the most compliant cloud

Simplify security and identity control with built-in integration with Active Directory

Regulate access with fine-grained user permissions to Azure Databricks' notebooks, clusters, jobs and data

Scale without limits

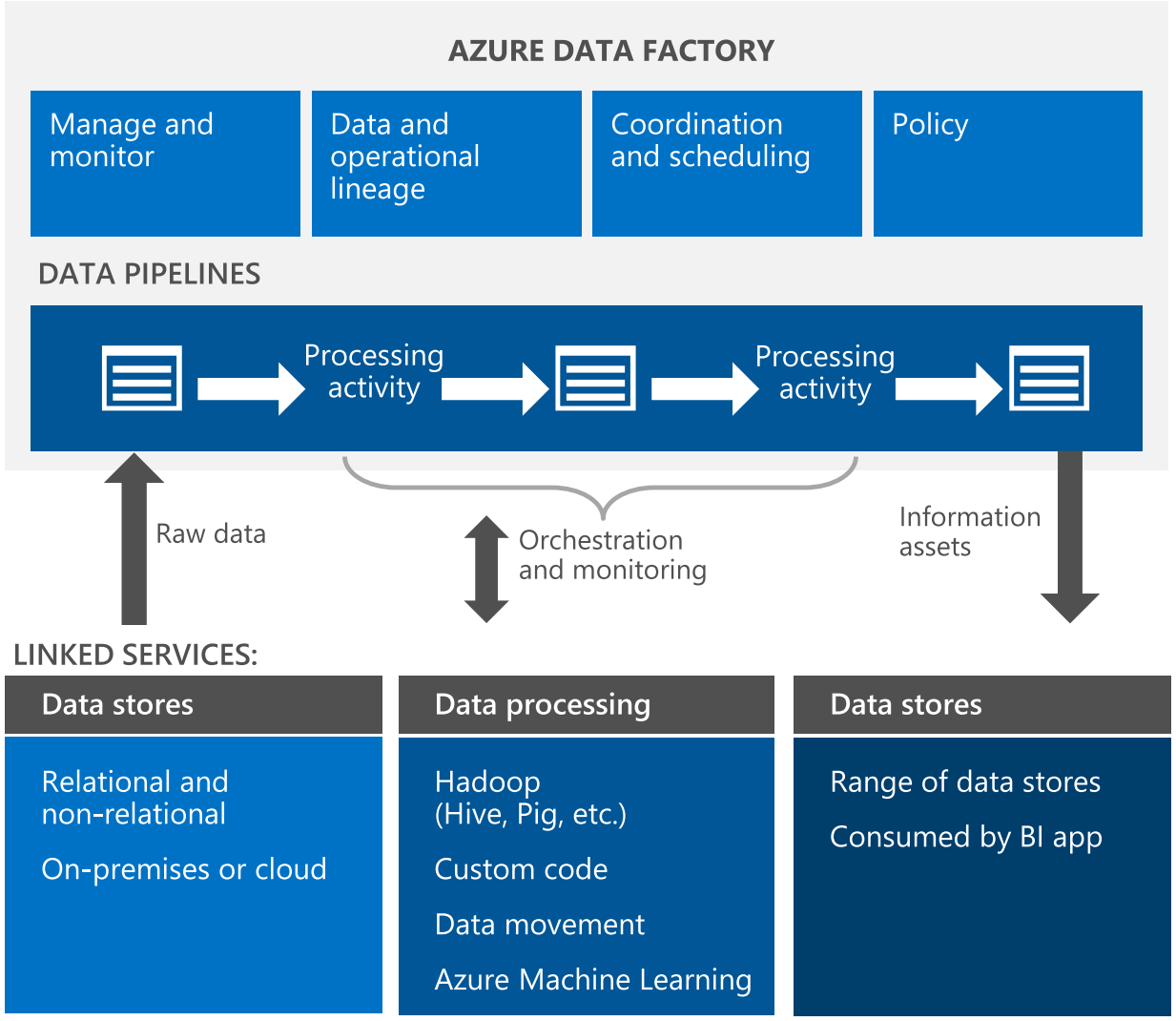
Operate at massive scale without limits globally

Accelerate data processing with the fastest Spark engine

Azure Data Factory

Azure Data Factory

Compose services to transform data into actionable intelligence



Activities

- Actions you perform on your data
- Inputs turned into outputs

Pipelines

- Logical grouping of activities for group operations

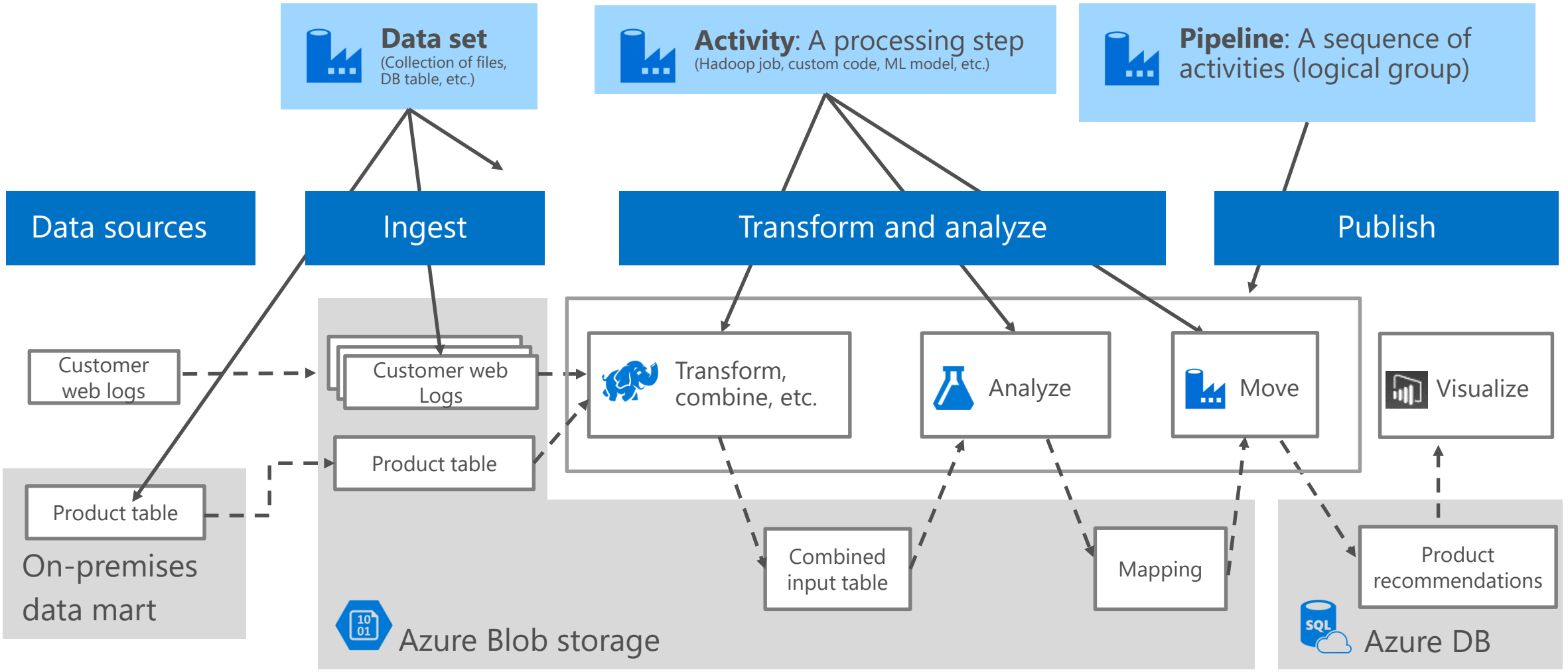
Data sets

- A named reference/pointer to data you want to use as an input or output of an activity

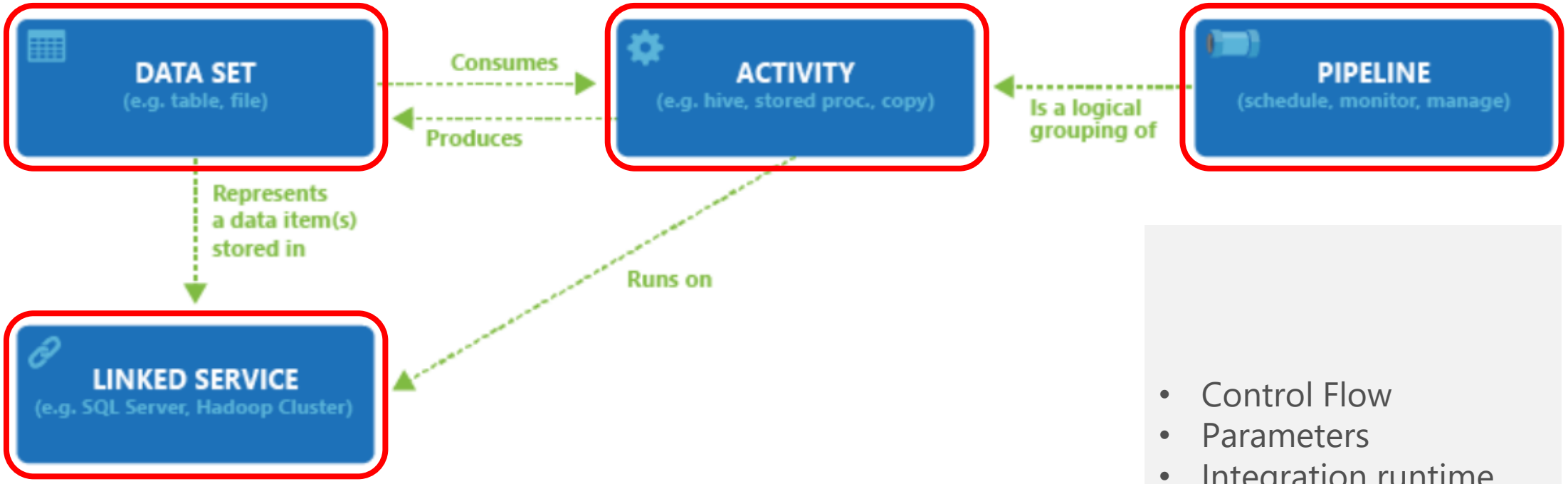
Linked services

- Connection of data factories to the resources and services you want to use
- Connection of data stores like Azure storage and on-premises SQL Server
- Connection of compute services like Azure Machine Learning, Azure HDInsight, and Azure Batch

Data Factory concepts



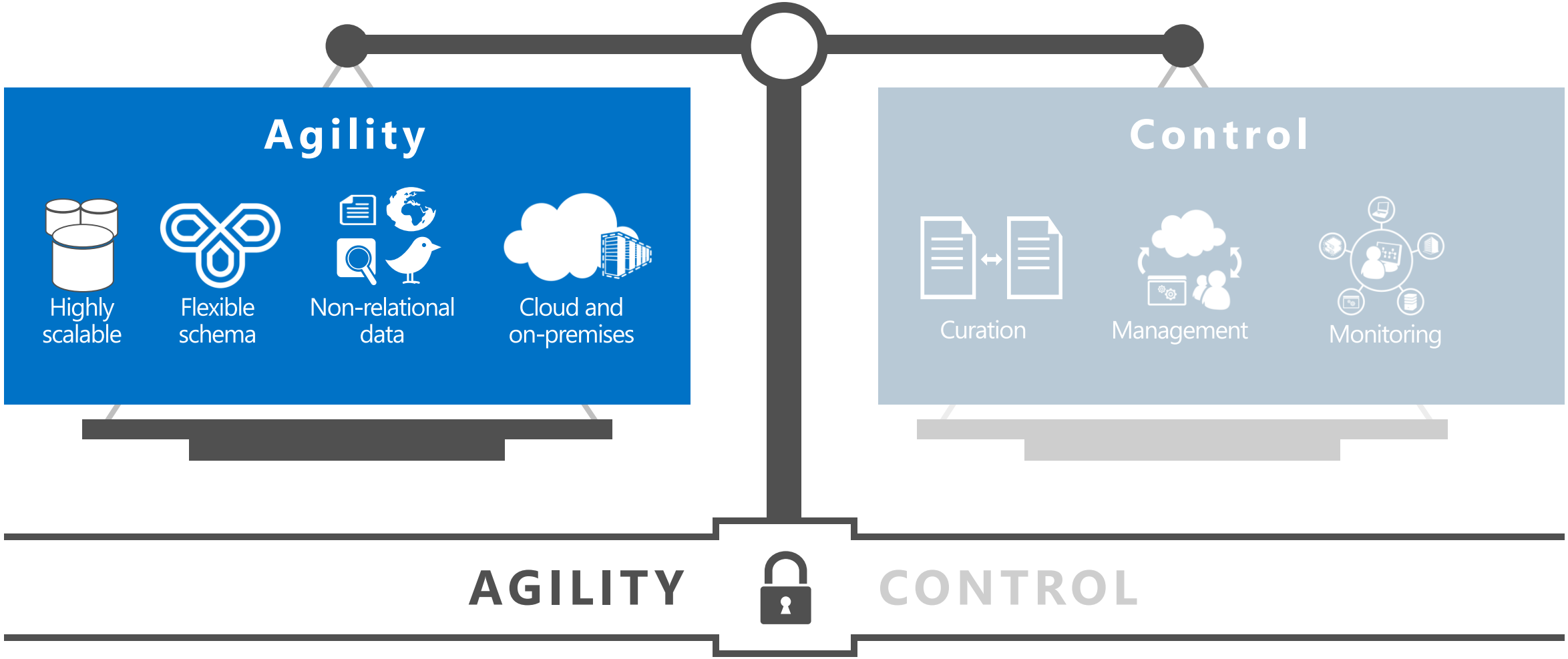
Azure Data Factory Components

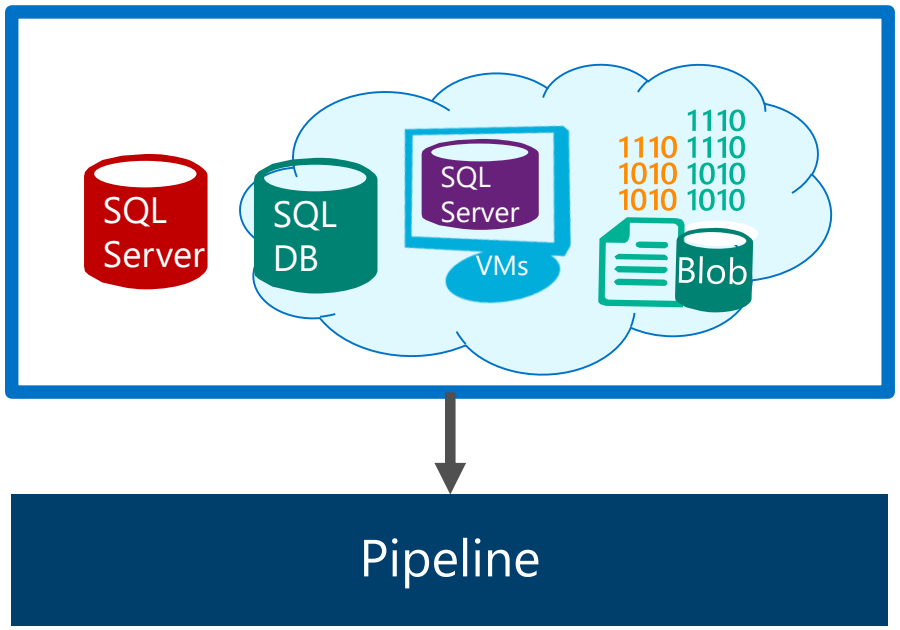


- Control Flow
- Parameters
- Integration runtime

Azure Data Factory

Produce trusted information from raw data





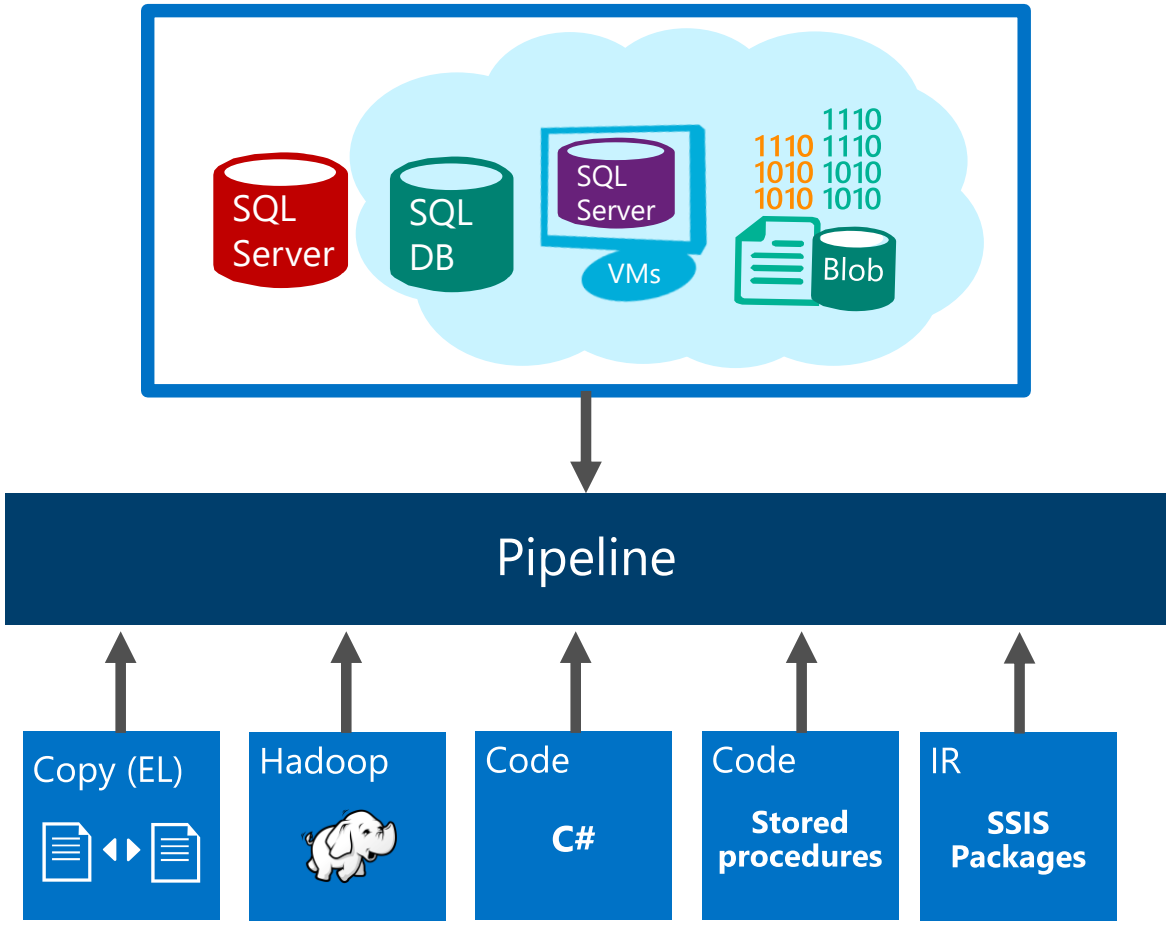
Produce trusted information from raw data

Connect to your data

- SQL Server on-premises
- SQL Server VMs, SQL Database, Azure blobs, tables
- Data movement (v2)

Gain agility on shapes and location

- Leverage highly scalable data stores with flexible schemas (Hadoop)
- Connect on-premises and cloud data
- Leverage relational and non-relational data



Compose processing to curate data

Processing on data

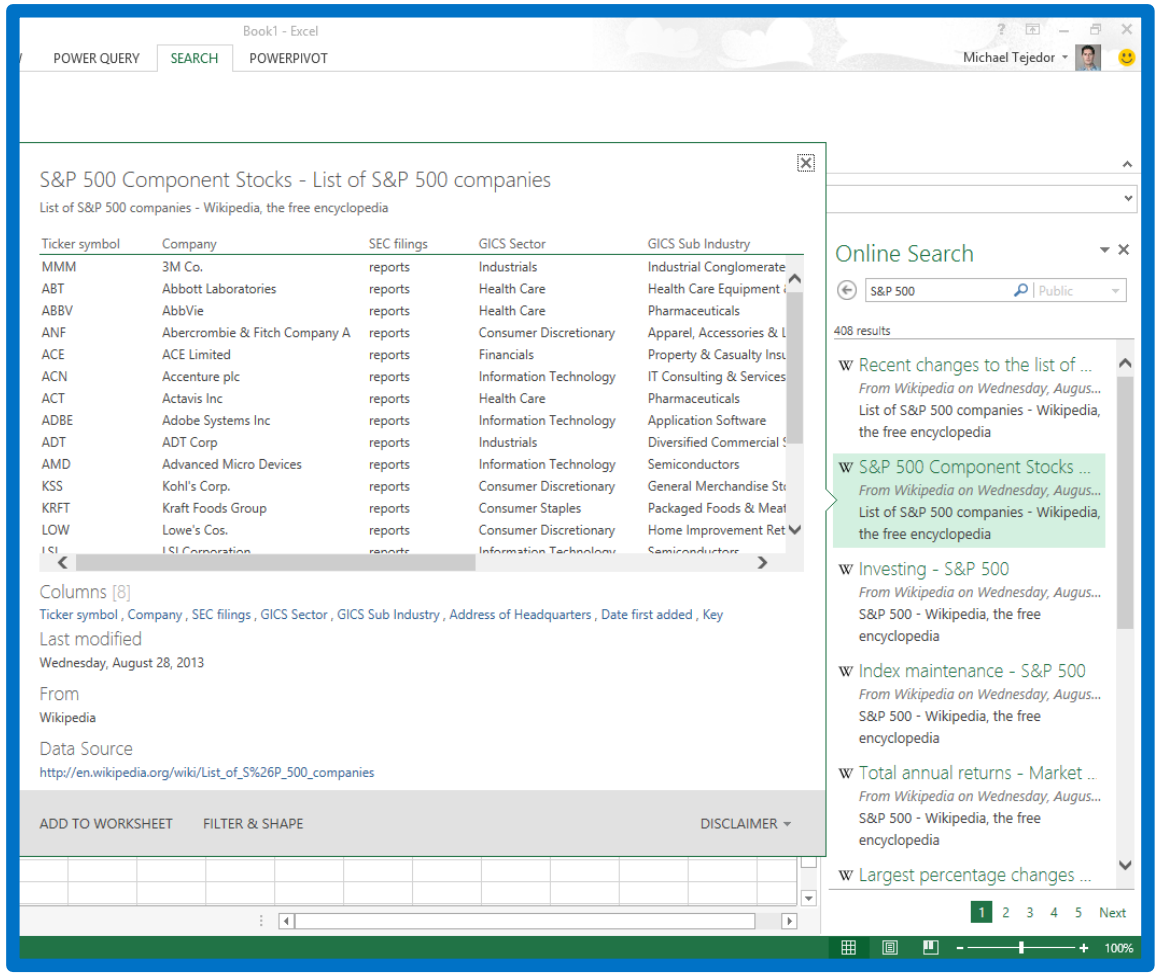
- Hadoop (Map/Reduce, Hive, Pig)
- C#
- Stored procedures
- Copy
- Activity dispatch

Azure-SSIS Integration Runtime (IR)

Data curation

- Join, aggregate, cleanse, enrich

Output trusted insights

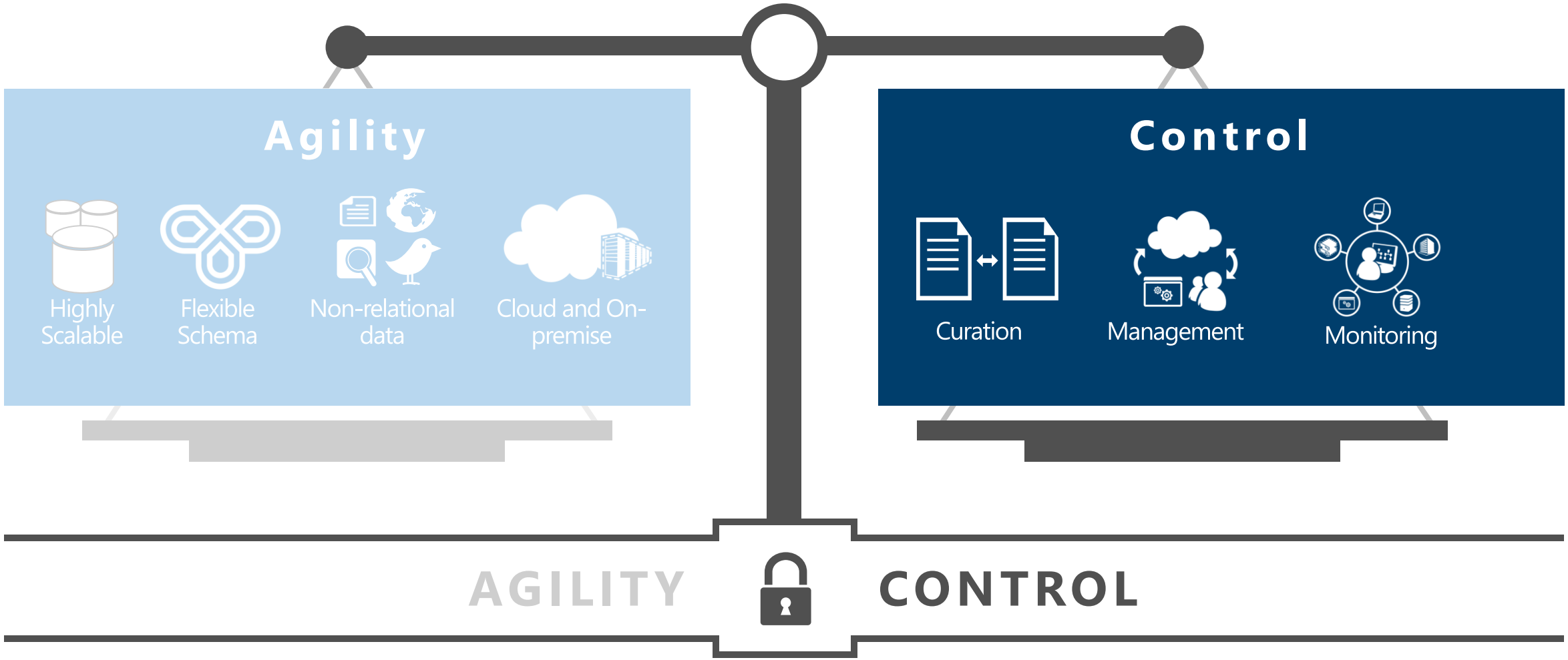


Consume data assets by BI tool or application

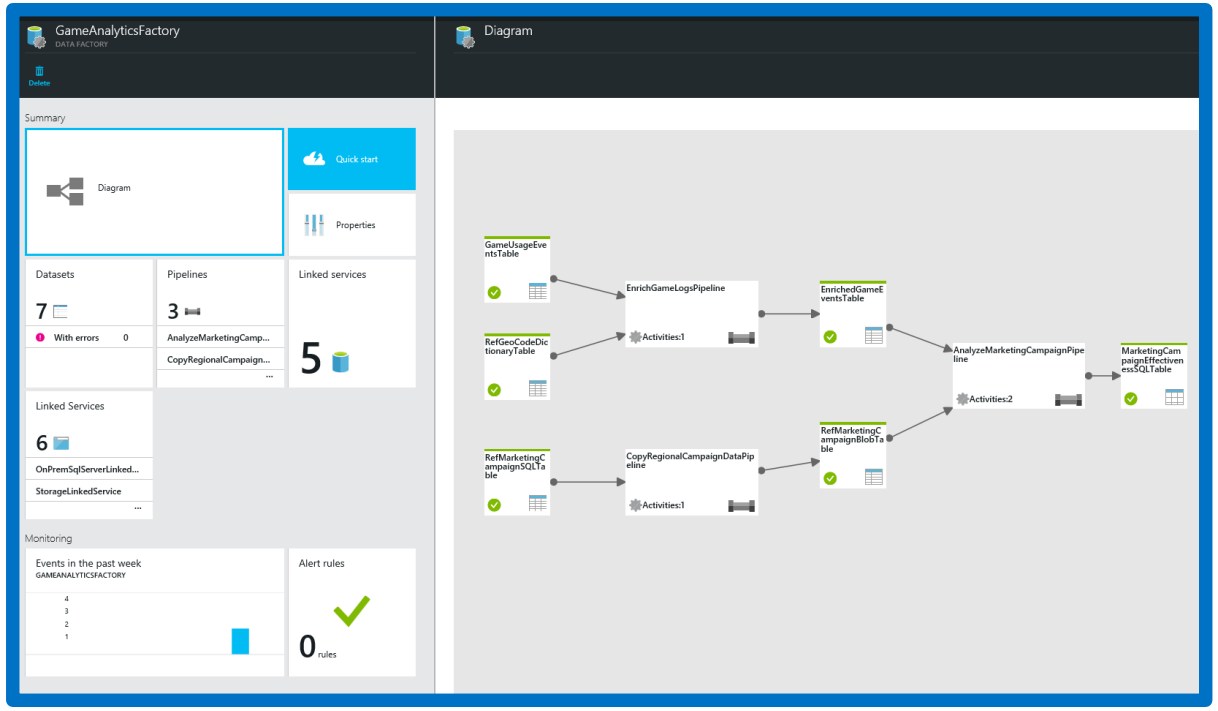
REST APIs for easy application integration

Azure Data Factory

Produce trusted information from raw data



Manage and monitor



Manage from single pane of glass

- No custom monitoring code required

Operations Management Suite

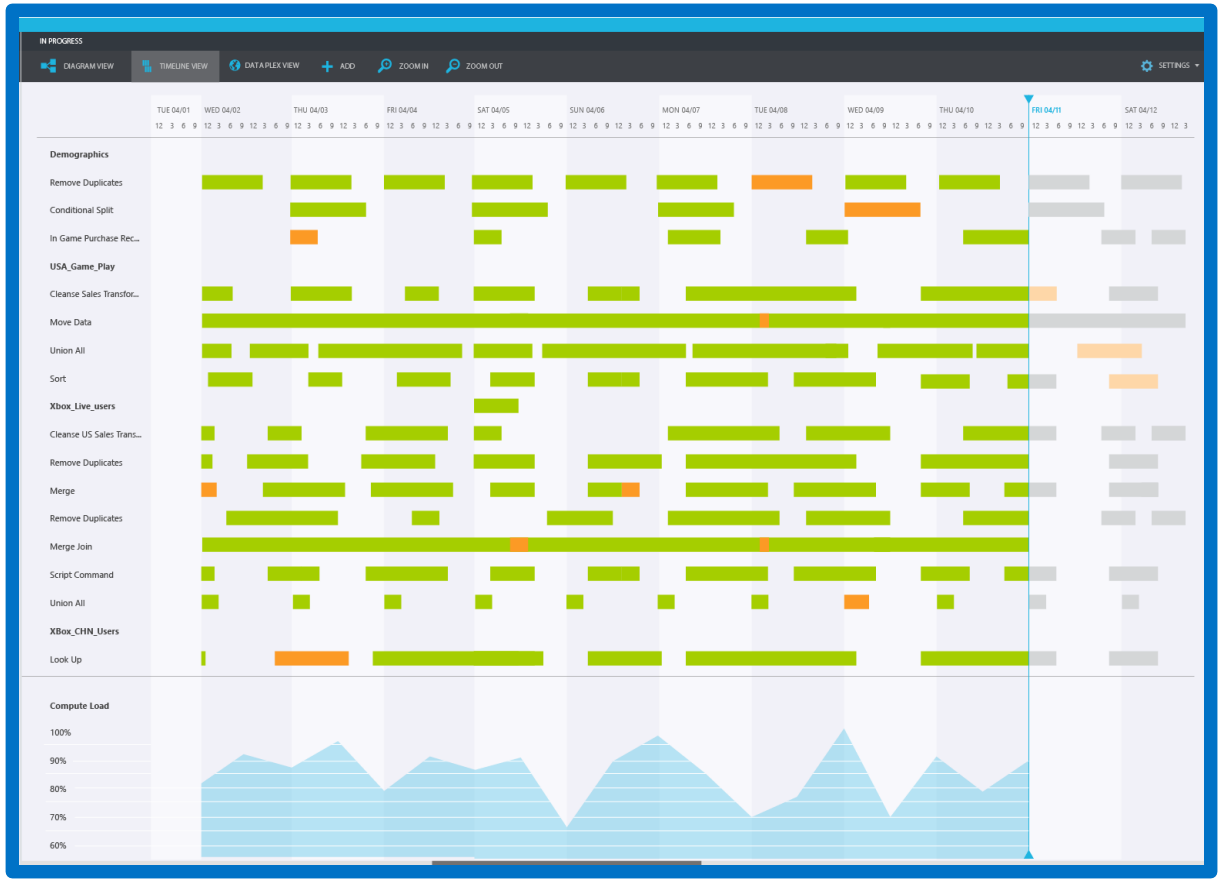
Set data production policy

- Retry, concurrency, late data handling

Identify and debug errors

- Automatic data set health alerts
- Troubleshooting of complex pipelines

Fully scriptable



Rich scheduling

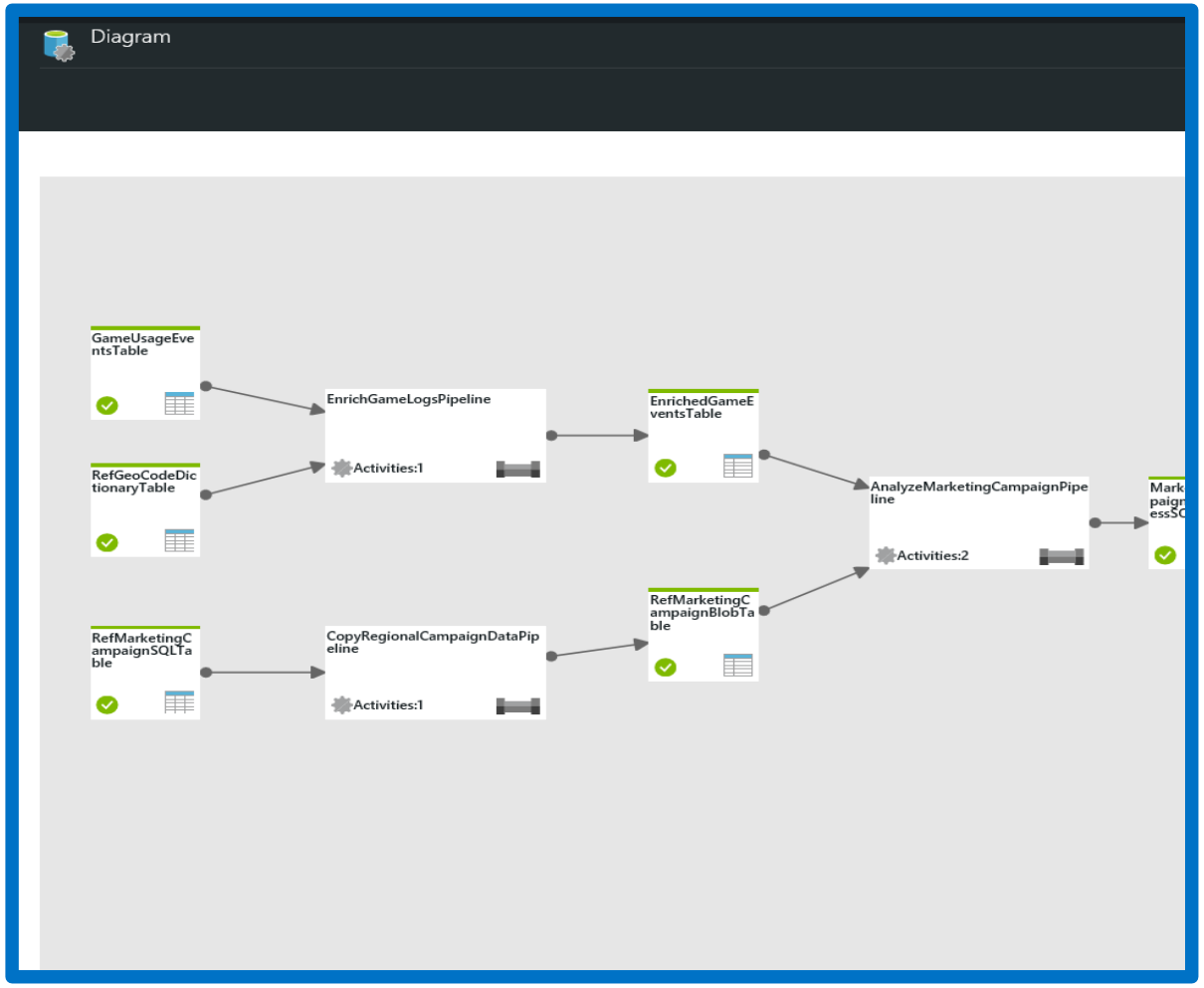
Rich scheduling controls

- Frequency: Minutes, hours, days, etc.
- Execute if precondition passes
- Easily chain pipelines running on differing schedules

Triggers

Easily restate previously produced data sets

- Rerun a single activity invocation
- Scheduled restatement with concurrency control (recalculate all data sets at once, etc.)



Lineage

Ability to trace data origins

- Understand who is consuming my data
- Determine how a field in my report was derived

Impact analysis

- Understand impact of changing data or processing

Why use Azure Data Factory?

Key tool to have a hybrid solution

Developers can use Data Factory to transform semi-structured, unstructured and structured data from on-premises and cloud sources into trusted information

Globally deployed data movement

Data Factory can access data stores and compute services in all Azure regions to move data between data stores or process data using compute services

Compatibility with SSIS

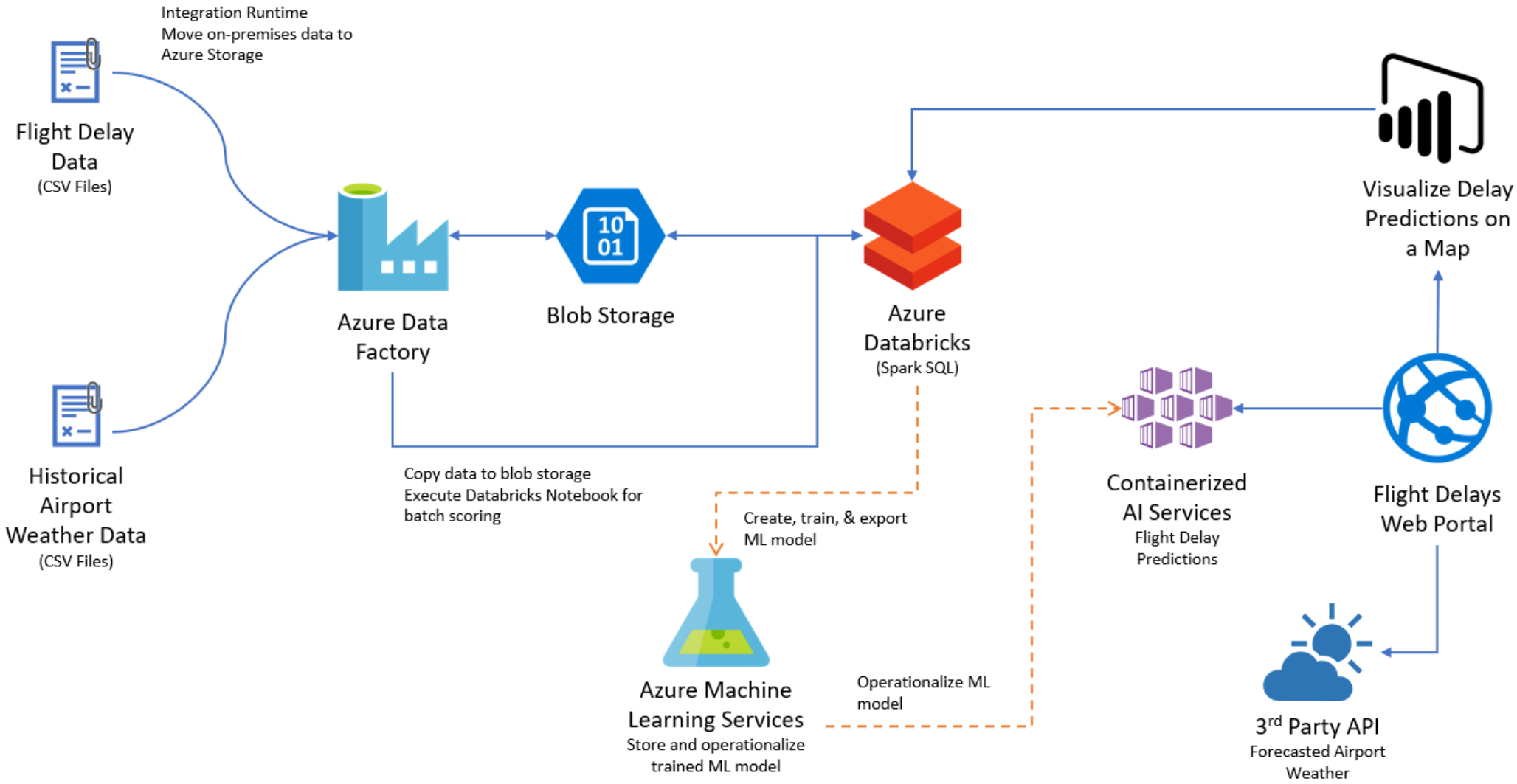
Three Integration Runtime types:

- Azure: Public Azure (PaaS)
- Self-hosted: On-premises machine or Azure VM (IaaS)
- Azure-SSIS: Can be provisioned in both public Azure network or private Azure VNet network

Lab Predictive modeling

- In this workshop, you will deploy a web app using Machine Learning Services to predict travel delays given flight delay data and weather conditions
- At the end of this workshop, you will be better able to build a complete machine learning model in Azure Databricks for predicting if an upcoming flight will experience delays
- In addition, you will learn to store the trained model in Azure Machine Learning Model Management, then deploy to Docker containers for scalable on-demand predictions, use Azure Data Factory (ADF) for data movement and operationalizing ML scoring, summarize data with Azure Databricks and Spark SQL, and visualize batch predictions on a map using Power BI

Solution architecture



Lab Predictive modeling

- Set up your environment
- Load Sample Data and Databricks Notebooks
- Setup Azure Data Factory
- Develop a data factory pipeline for data movement
- Operationalize ML scoring with Azure Databricks and Data Factory
- Summarize data using Azure Databricks

Questions

- Machine Learning practitioner
- Over 25 years of professional experience
- Artificial Intelligence MVP & MCT
- Microsoft Certified Solutions Expert
  - Data Management and Analytics
  - Cloud Platform and Infrastructure
  - Business Intelligence
- Microsoft Certified Solutions Developer
  - Azure Solution Architect