Beam Portability

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Cloud Consultant, Google Cloud

Agenda

Course Intro

Beam and Dataflow Refresher

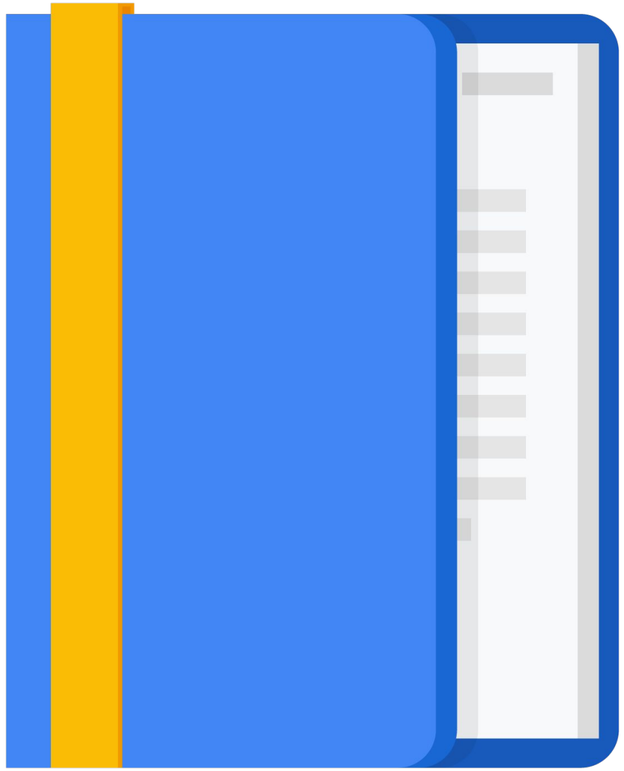
Beam Portability

Separating Compute and Storage

IAM, Quotas, and Permissions

Security

Summary



Beam portability

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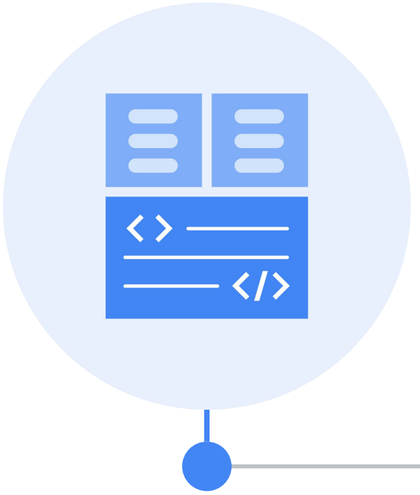


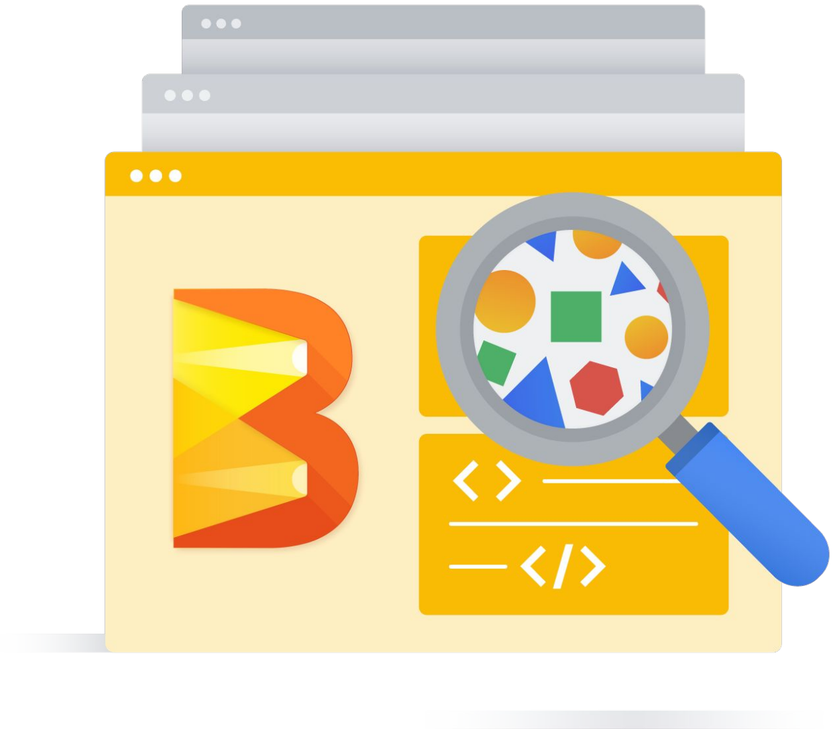
Beam portability

Runner v2

Container environments

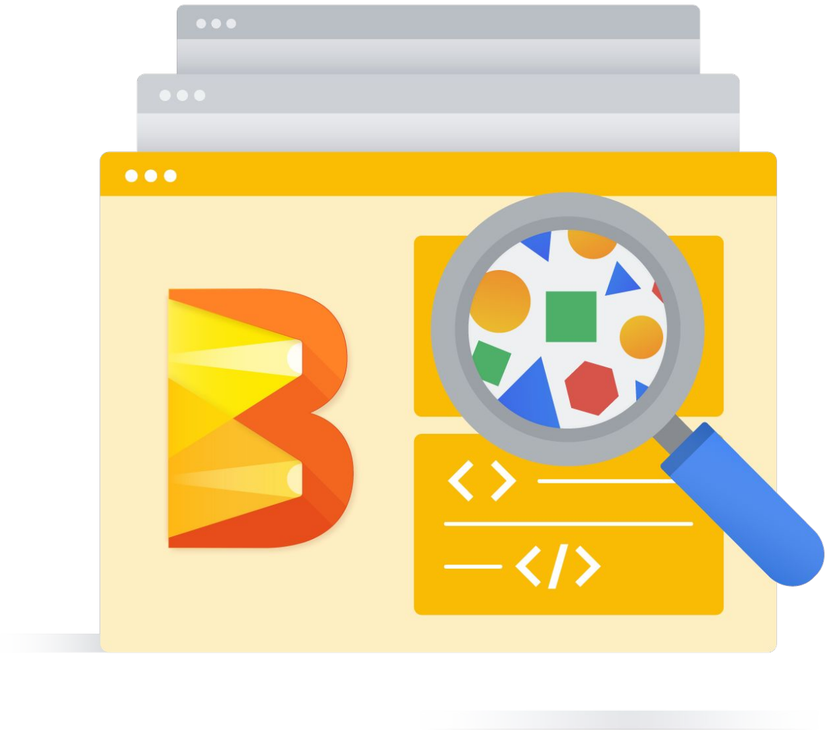
Cross-language transforms

The Beam vision



The Beam vision

Provide a **comprehensive portability framework** for data processing pipelines; one that allows you to write your pipeline once in the **programming language of choice** and run it, with minimal effort, on the **execution engine of choice**.



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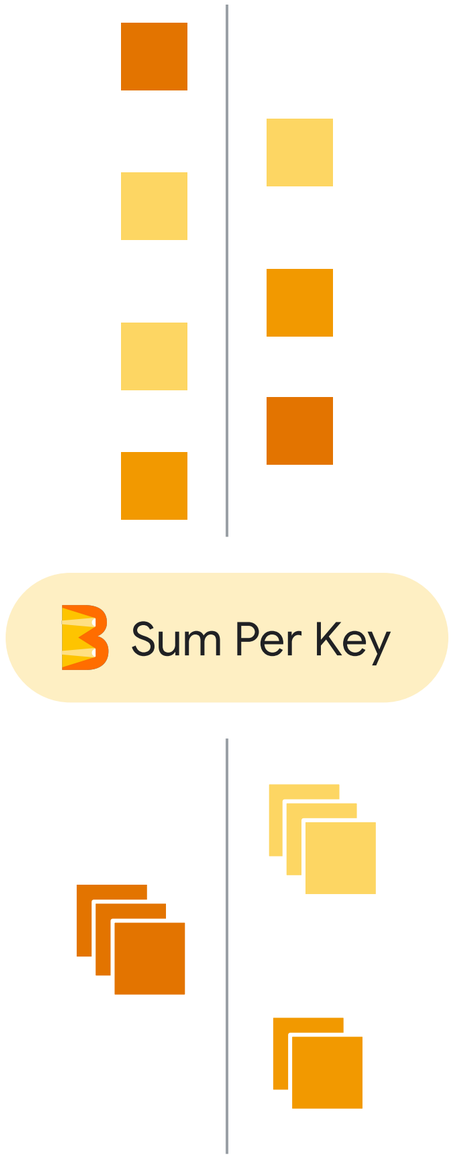


The Beam vision

Java

Input.apply
(Sum.integersPerKey())

Python

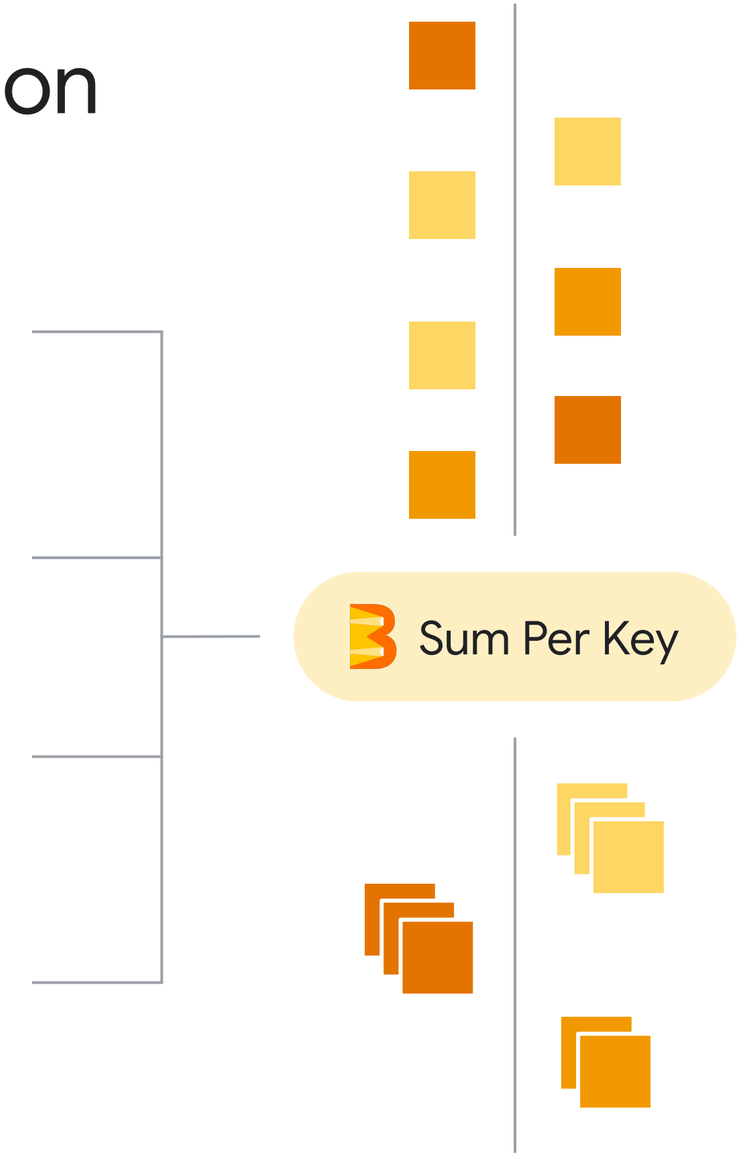
input | Sum.PerKey()

Go

stats.Sum(s, input)

SQL

SELECT key, SUM(value)
FROM input GROUP BY key



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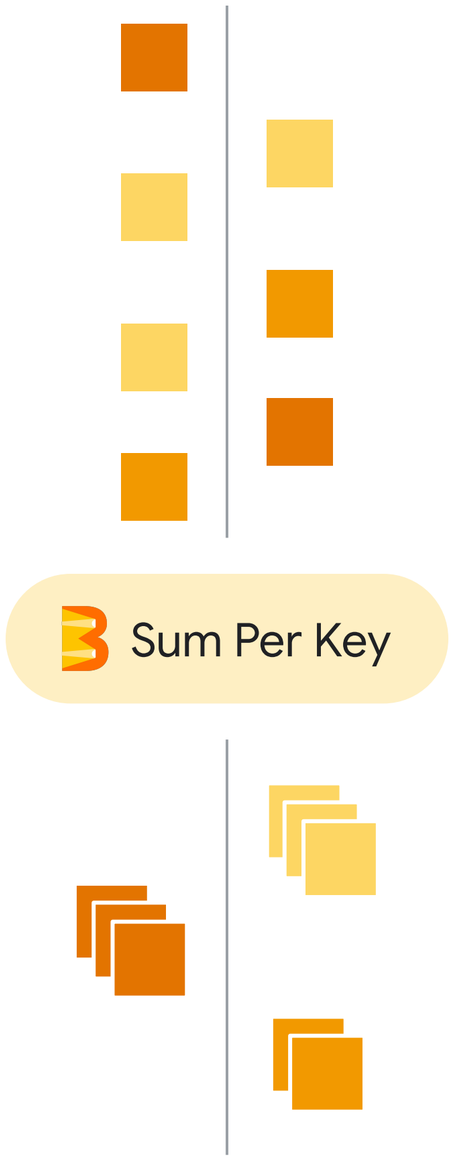
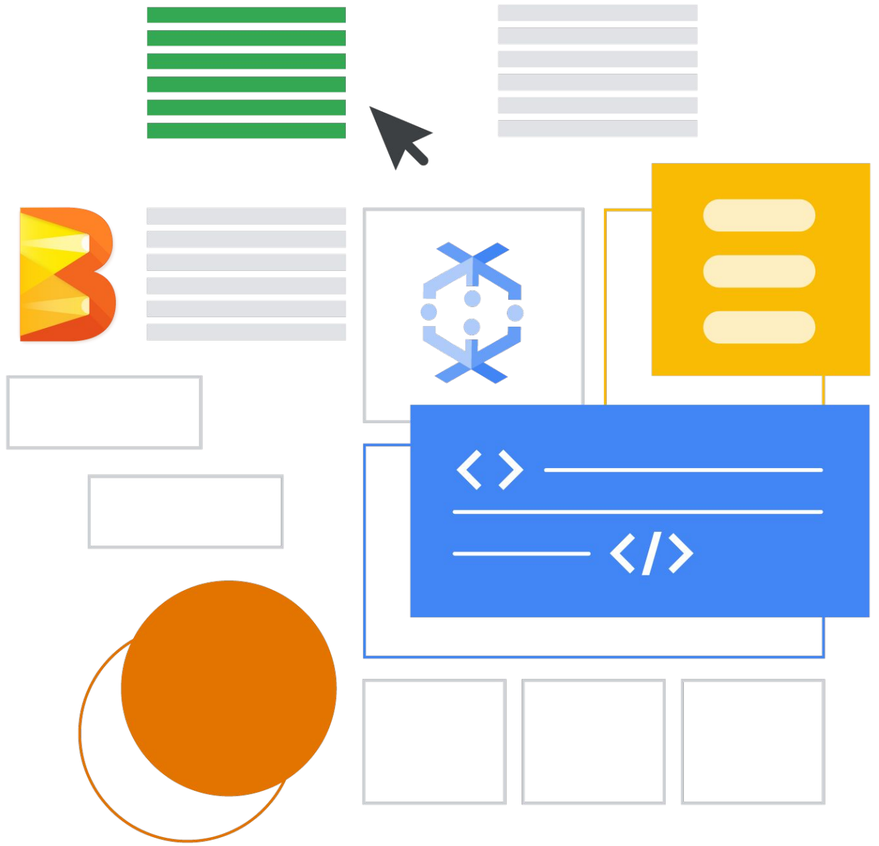


- Dataflow
- Apache Flink
- Apache Spark
- Apache Apex
- Gearpump
- IBM Streams
- Apache Samza
- Apache Nemo (Incubating)

Portability framework

- **Language-agnostic** for representation and **protocol** for execution



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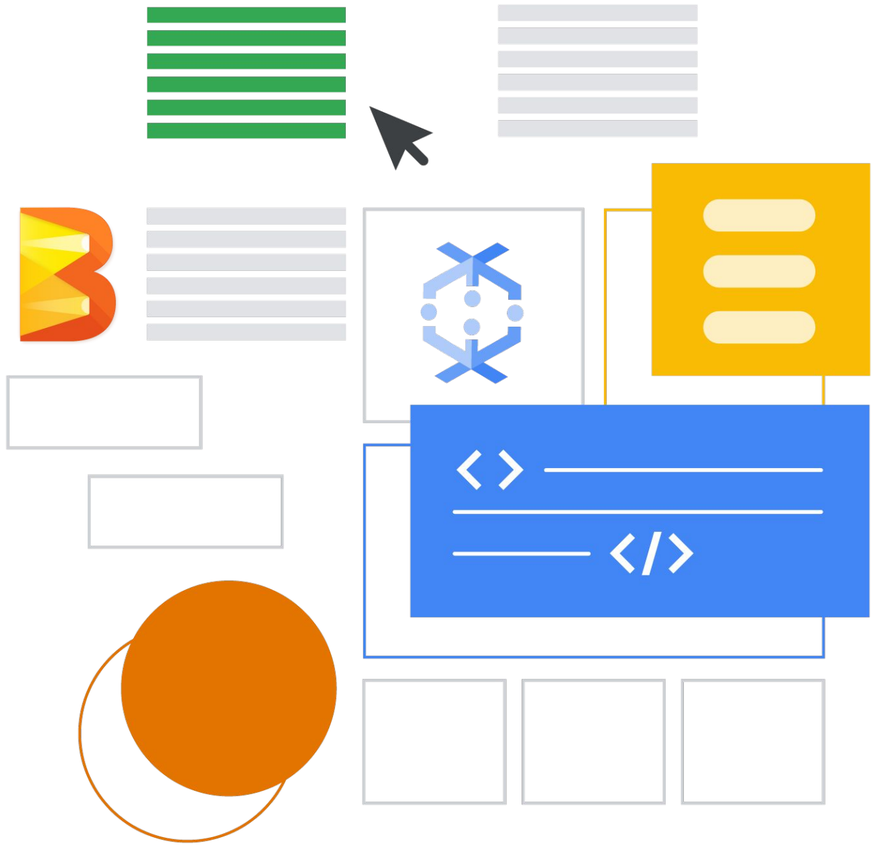
- **Language-agnostic** for representation and **protocol** for execution
- Interoperability layer = **Portability API**



Portability framework

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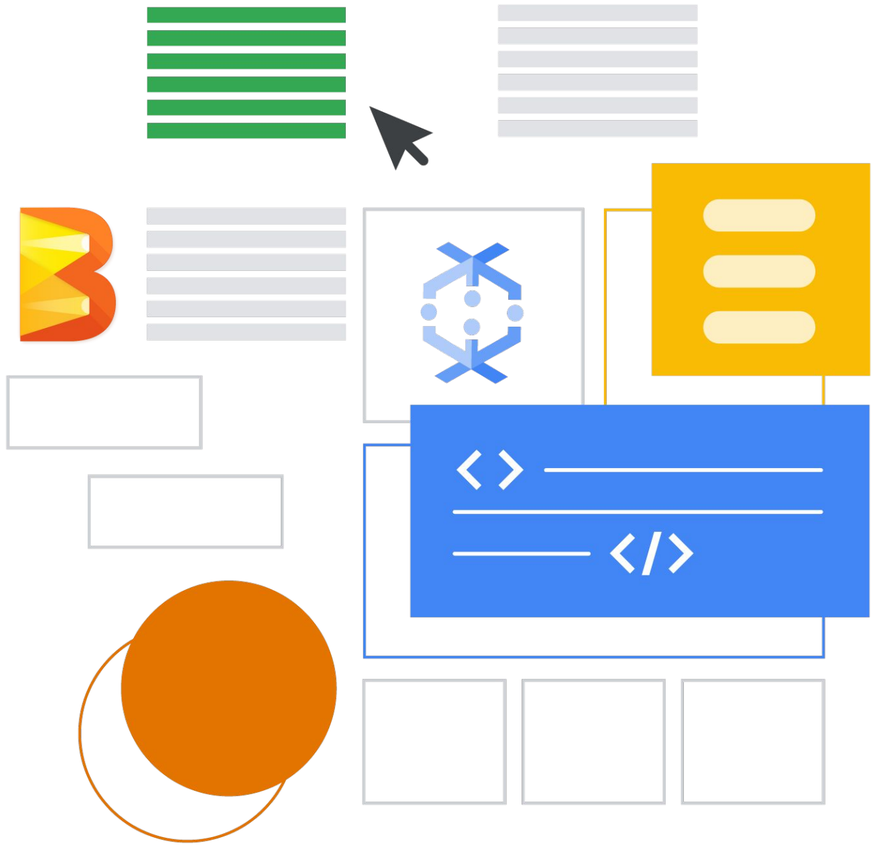
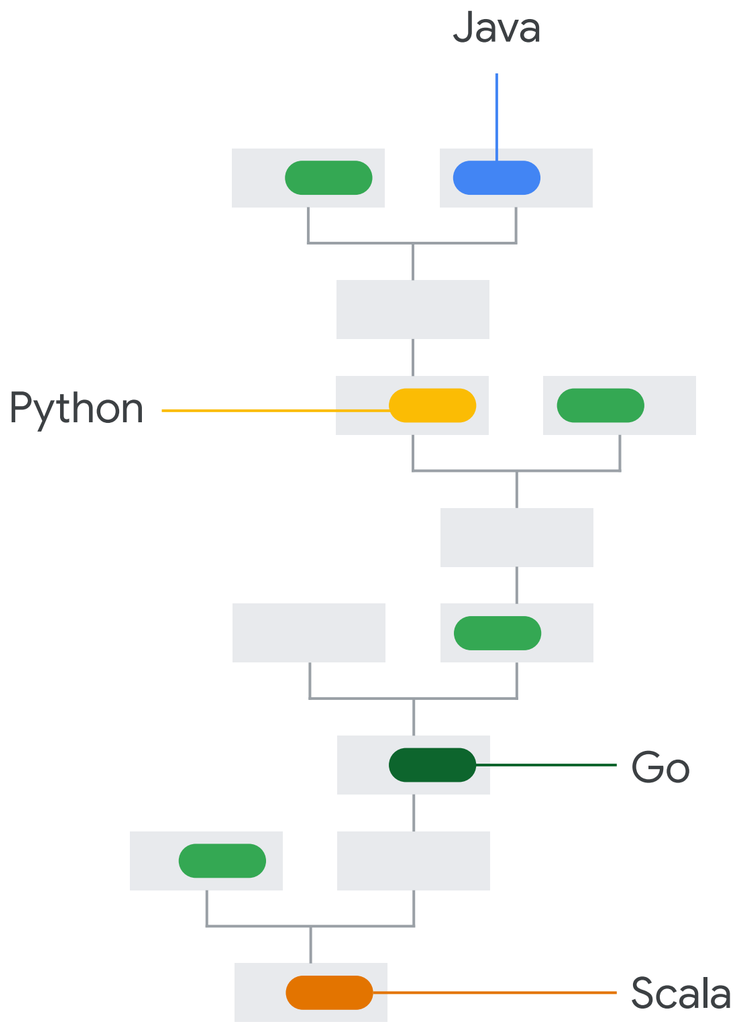
- Interoperability layer = **Portability API**
- **Docker containerization** to customize your execution environment

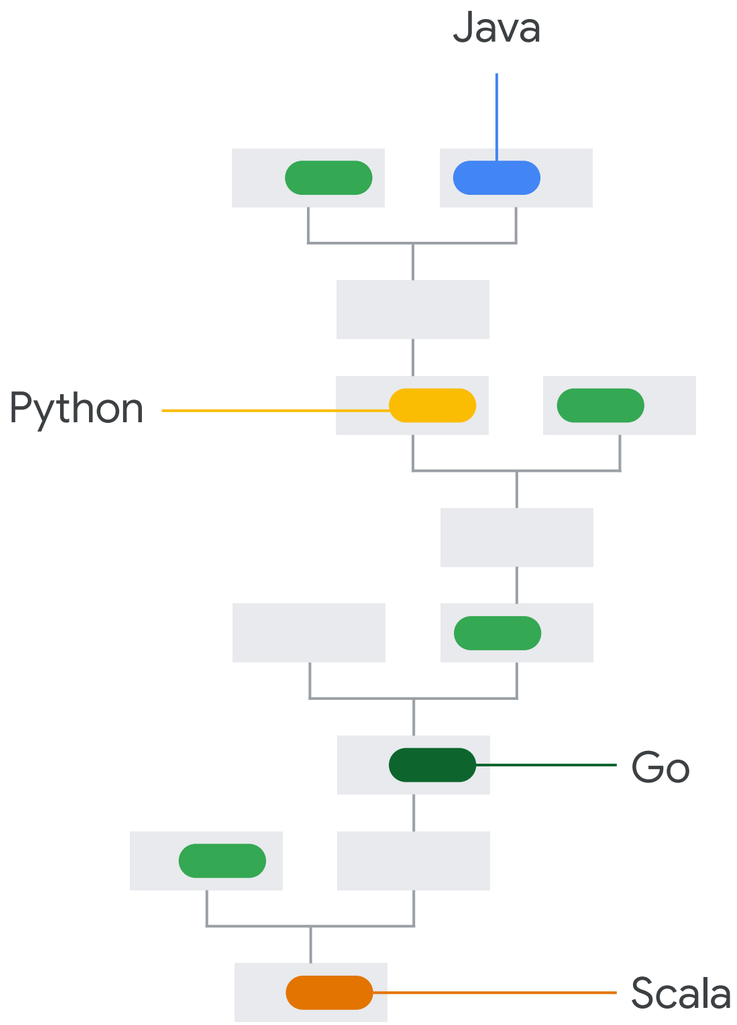


Benefits of portability



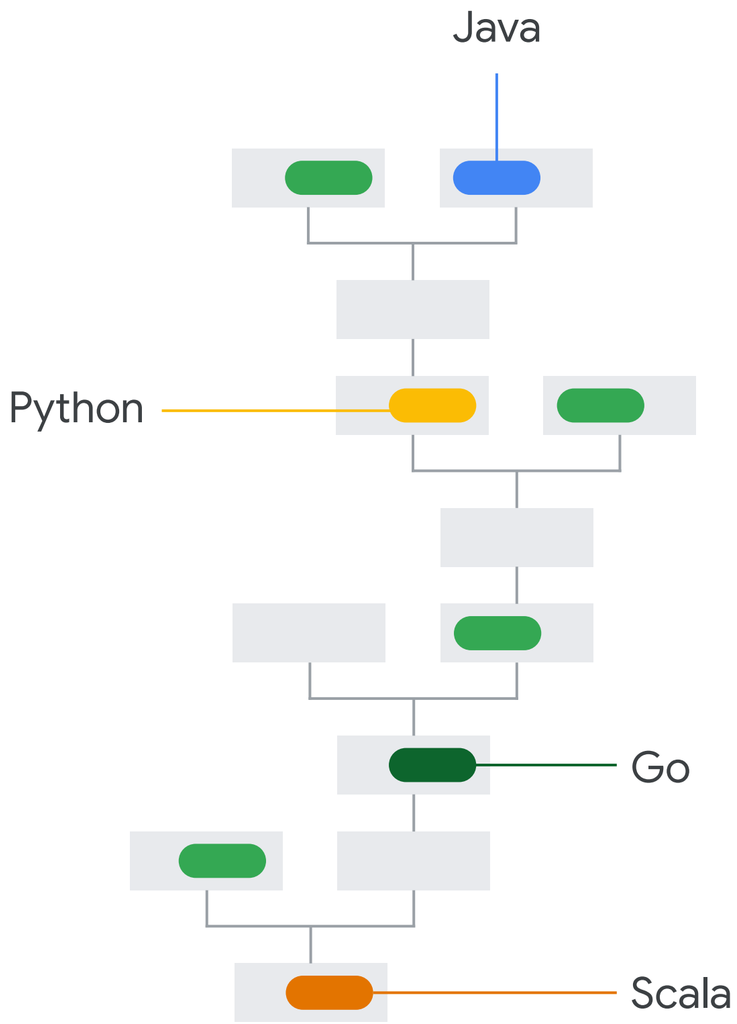
Benefits of portability

- **Every runner** works with **every language**.



Benefits of portability

- **Every runner** works with **every language**
- Configurable, hermetic **worker environment**



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- **Every runner** works with **every language**
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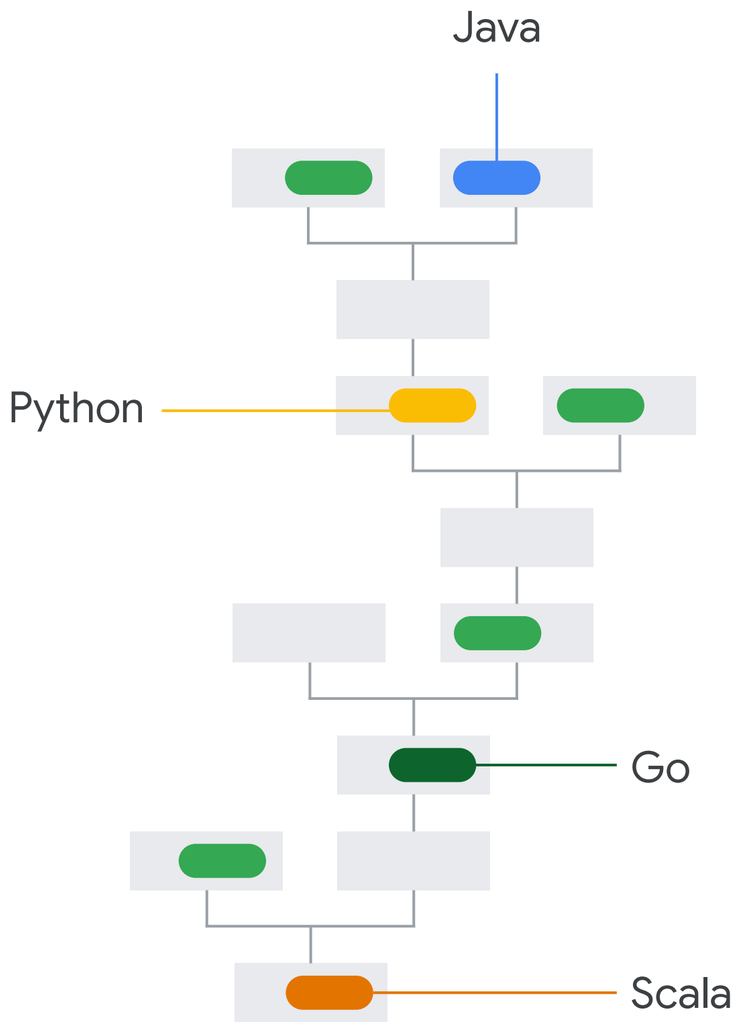
- **Multi-language** pipelines



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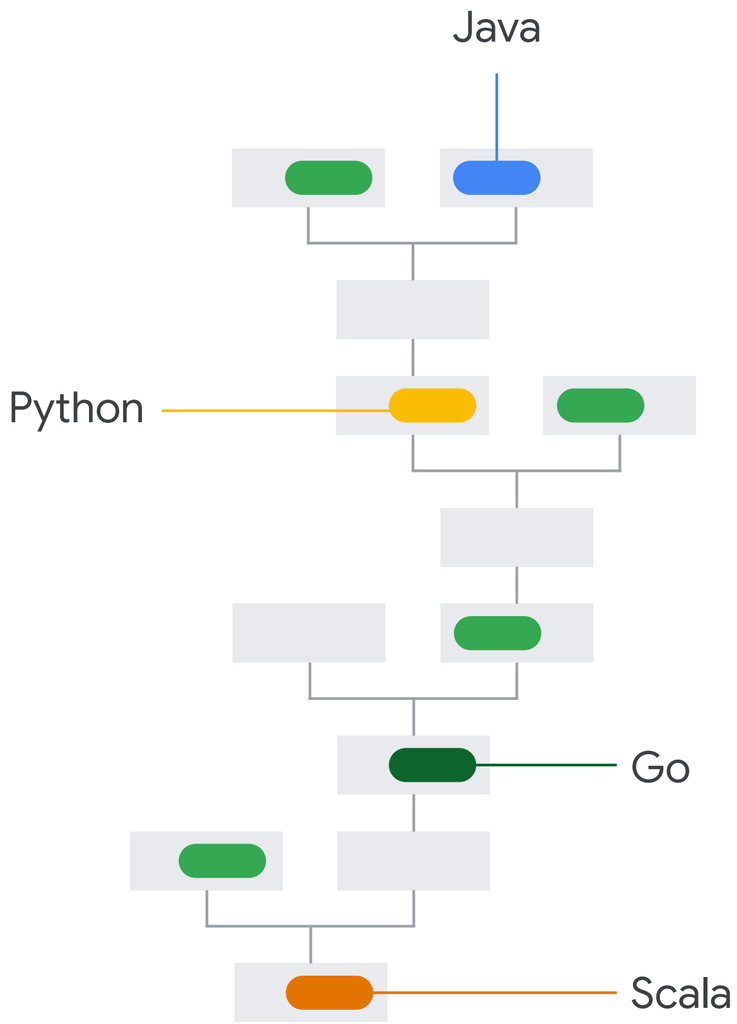
- **Multi-language** pipelines
- **Cross-language** transforms



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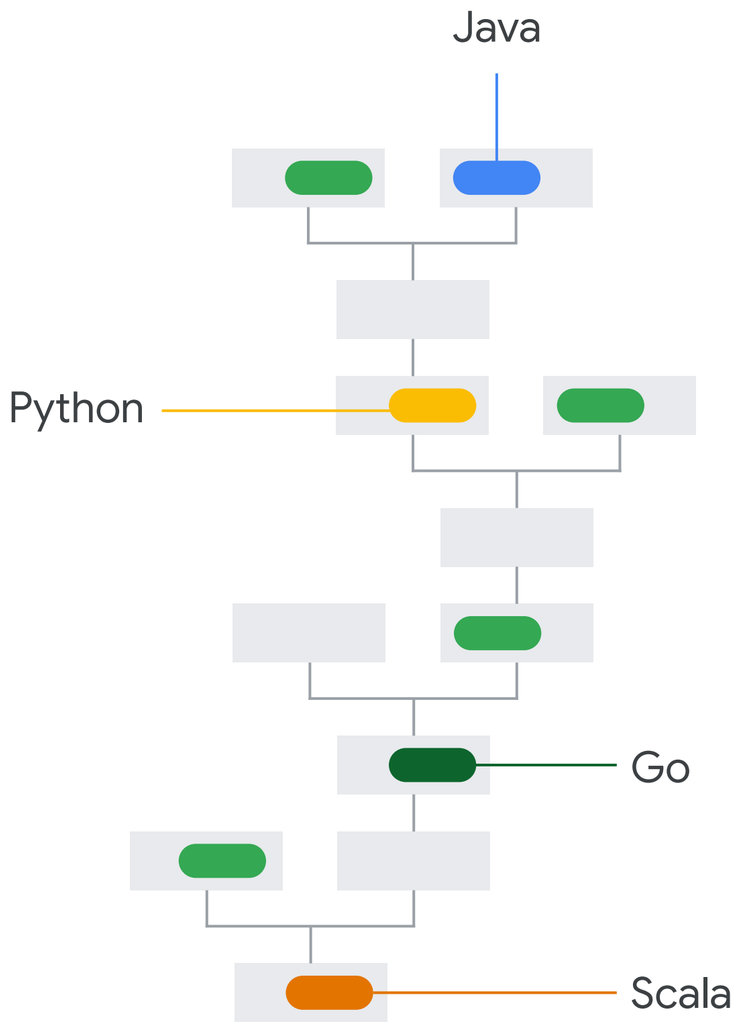
- **Multi-language** pipelines
- **Cross-language** transforms
- Faster delivery of **new features**



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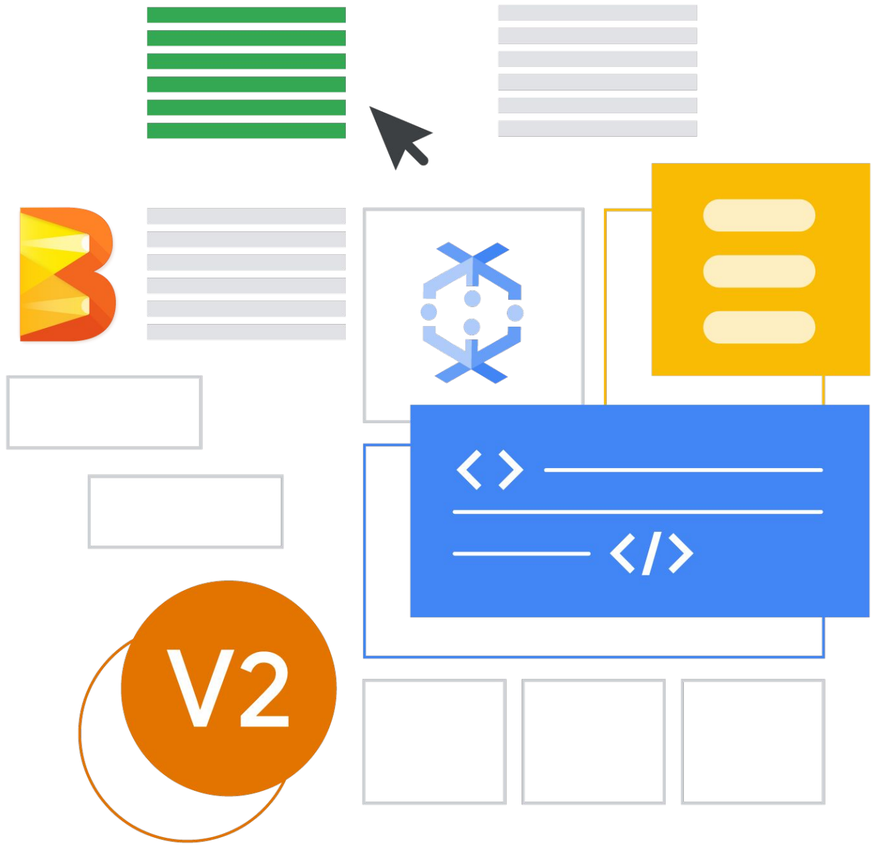
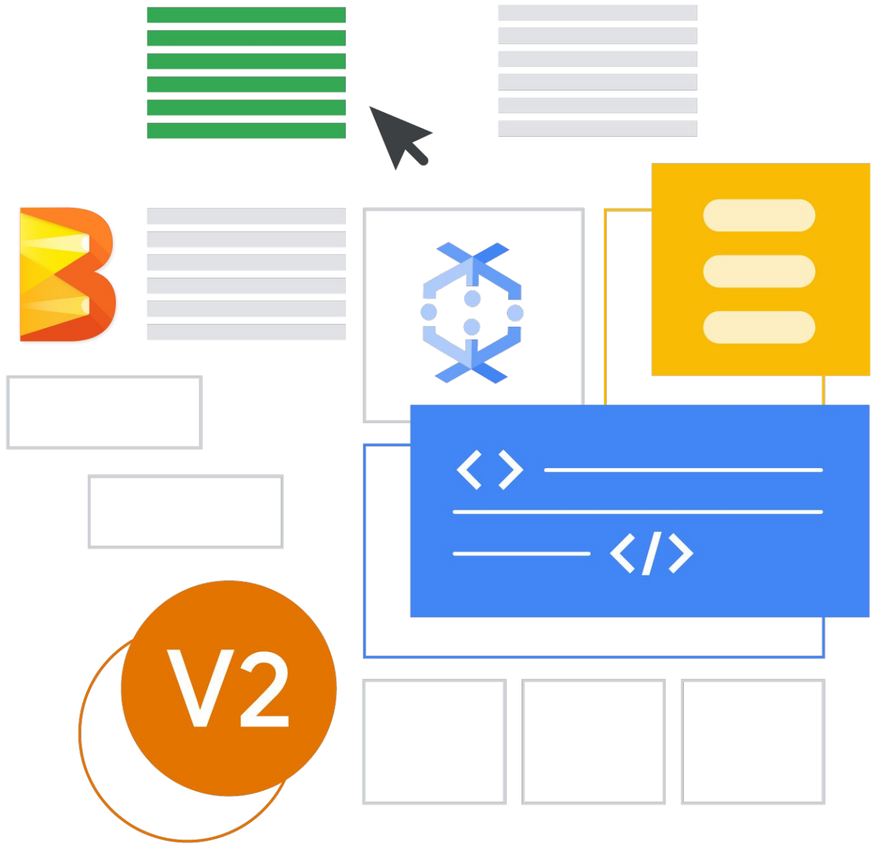
Dataflow Runner v2

- More efficient and portable worker architecture
- Based on Apache Beam portability framework



Dataflow Runner v2

- More efficient and portable worker architecture
- Based on Apache Beam portability framework
- Support for multi-language pipelines and custom containers

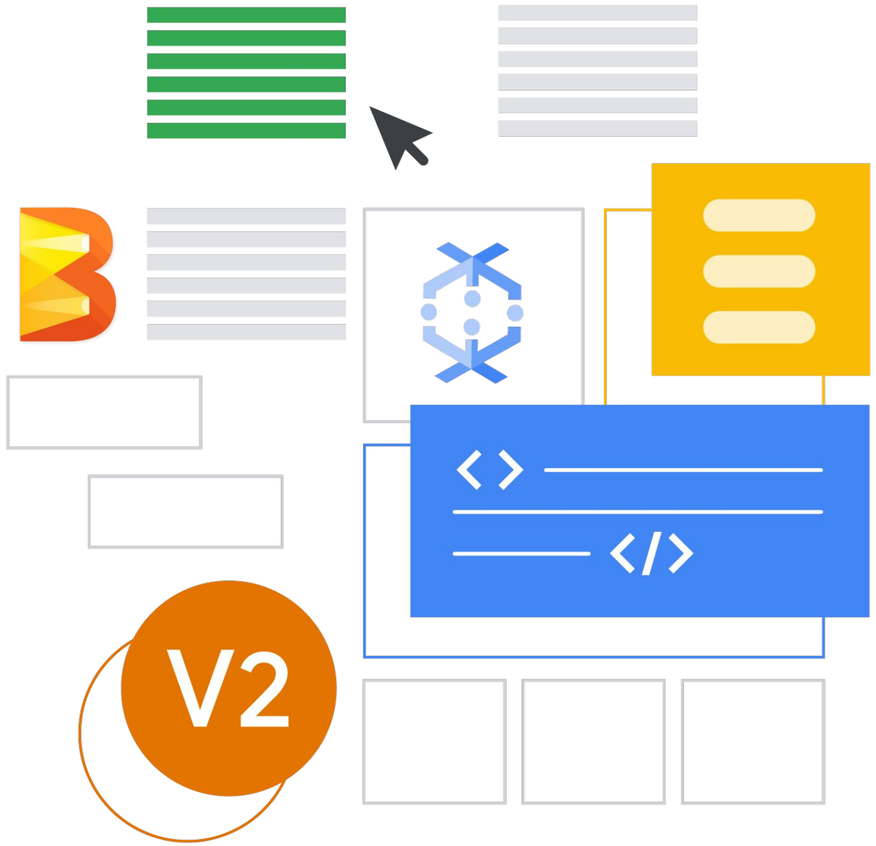


Dataflow Runner v2

- More efficient and portable worker architecture
- Based on Apache Beam portability framework
- Support for multi-language pipelines and custom containers

To enable Runner v2, refer to Dataflow official documentation:

https://cloud.google.com/dataflow/docs



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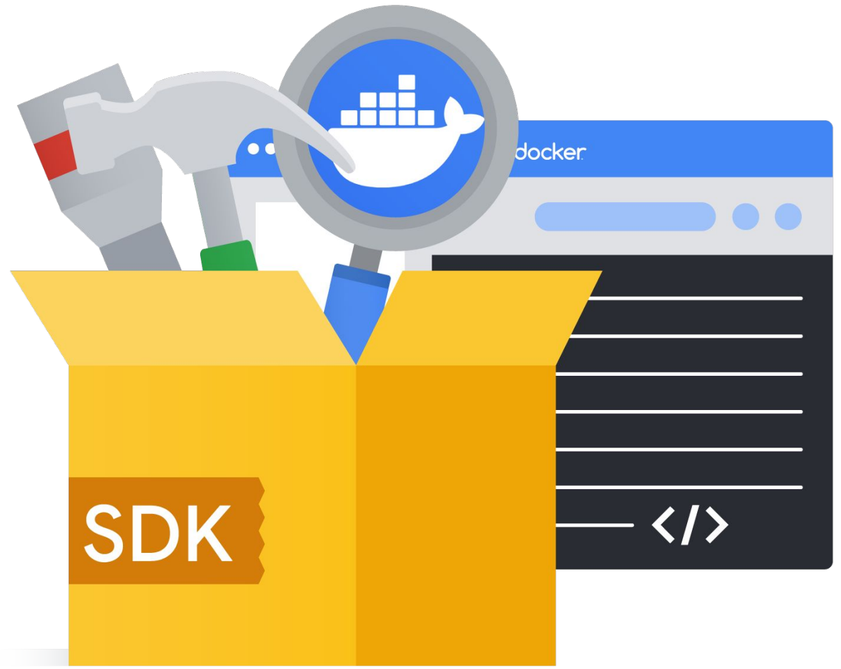

Container environments

- Containerized with Docker
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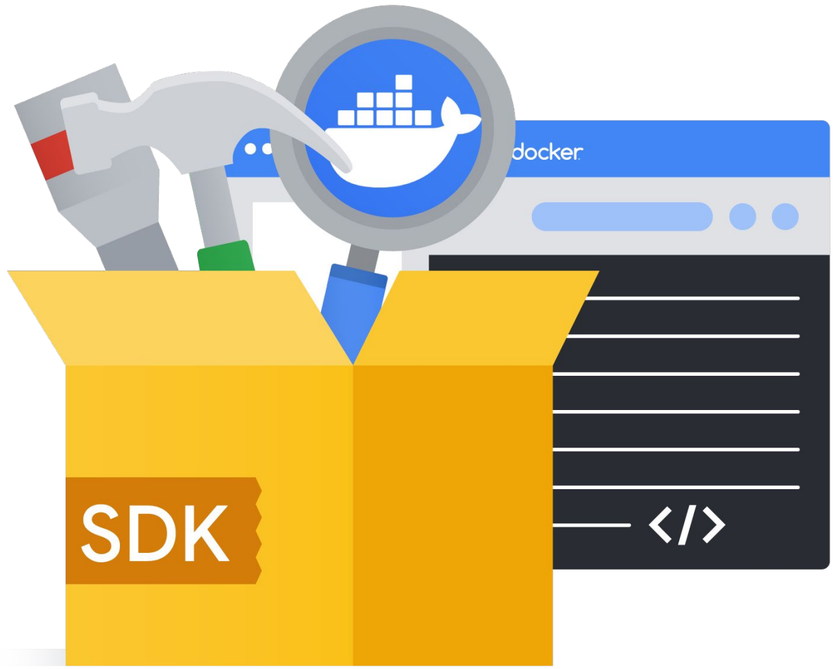

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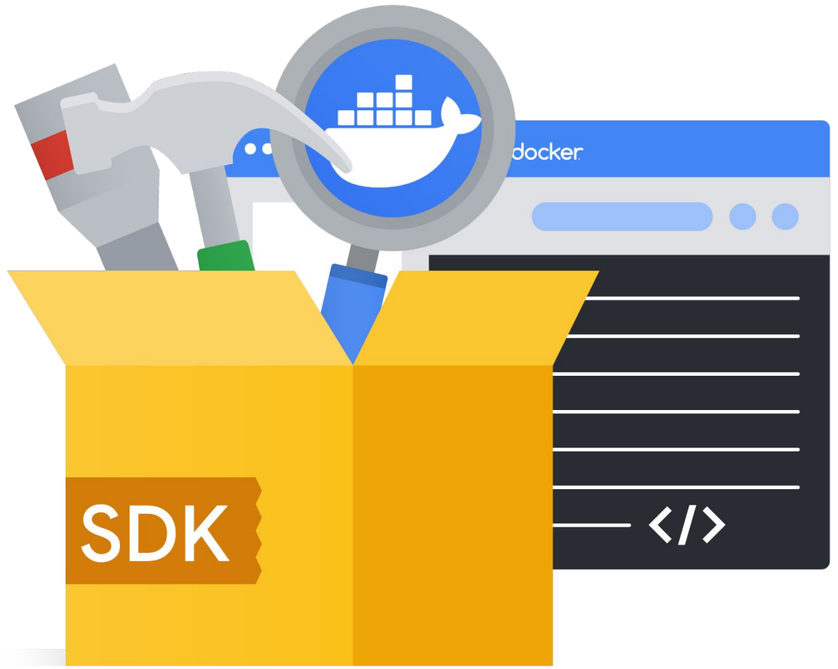

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- Containerized with Docker
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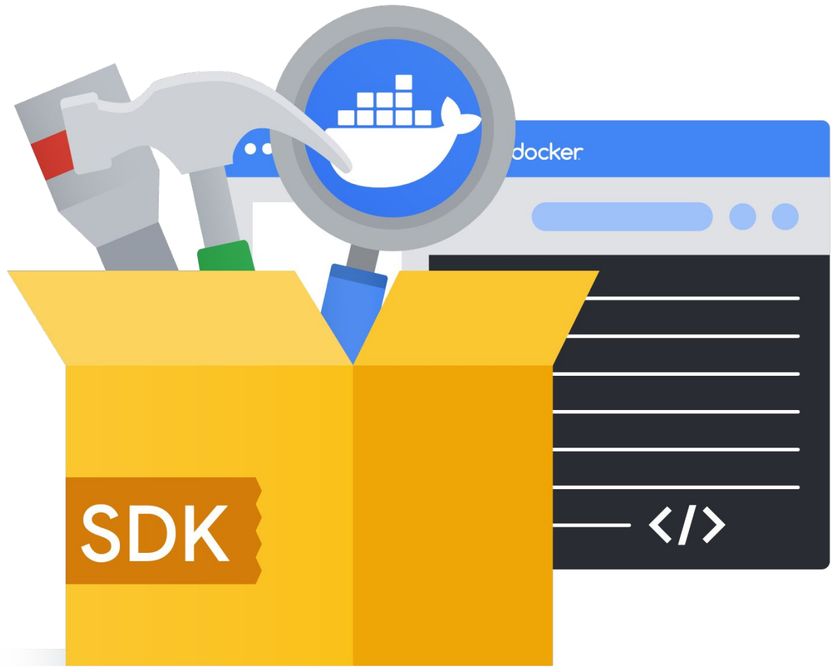
- Default environment per SDK
- Ahead-of-time installation



Container environments

- Containerized with Docker
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- Default environment per SDK
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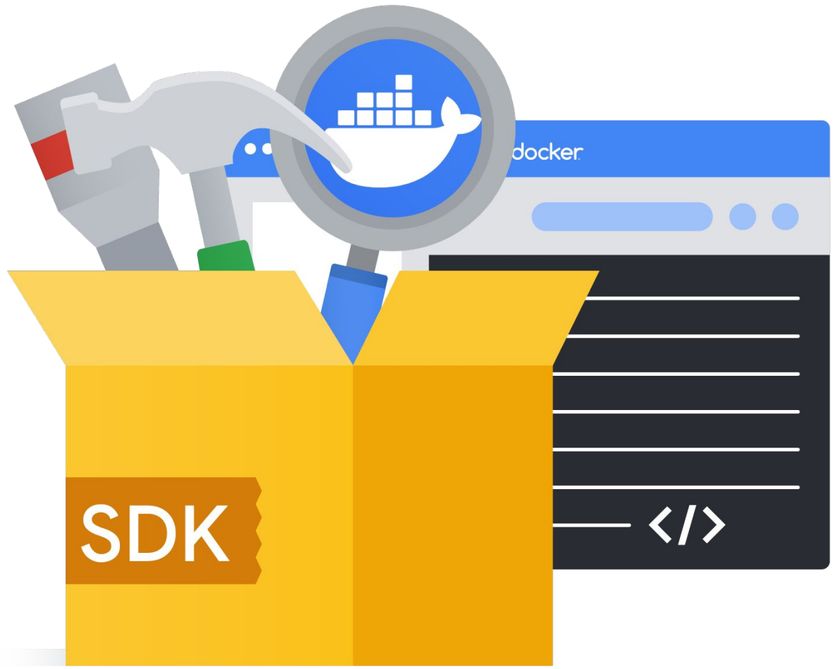
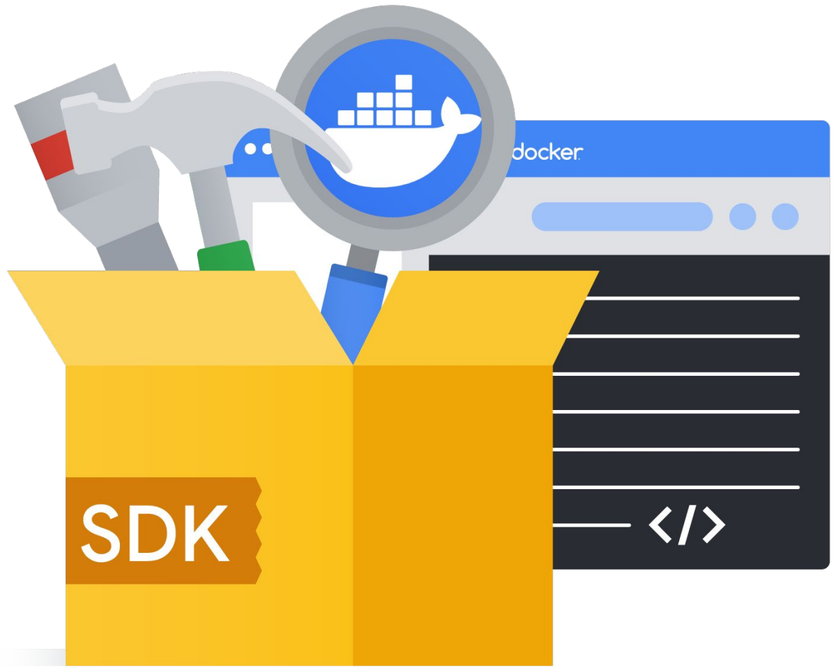
- Arbitrary dependencies



Container environments

- Containerized with Docker
- Per-operation execution environment
- Default environment per SDK
- Ahead-of-time installation
- Arbitrary dependencies
- Arbitrary customization



Custom container

Running your pipeline

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- Apache Beam SDK version 2.25.0 or later is required.

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Custom container

Running your pipeline

- Apache Beam SDK version 2.25.0 or later is required.
- Docker is required if you want to test your pipeline locally.
- You start by creating a Dockerfile:

```
# Specifying the base image with FROM instruction
FROM apache/beam_python3.8_sdk:2.25.0
# Adding an environment variable with ENV instruction
ENV MY_FILE_NAME=my_file.txt
# Copying files to add to the custom image with COPY instruction
COPY path/to/myfile/$MY_FILE_NAME ./
```

Custom container

Building your image

Custom container

Building your image

```
export PROJECT=my-project-id
export REPO=my-repository
export TAG=my-image-tag
export REGISTRY_HOST=gcr.io
export IMAGE_URI=$REGISTRY_HOST/$PROJECT/$REPO:$TAG
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```
gcloud builds submit --tag $IMAGE_URI
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→ Cloud Build

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```
gcloud builds submit --tag $IMAGE_URI
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→ Cloud Build

```
docker build -f Dockerfile -t $IMAGE_URI ./
docker push $IMAGE_URI
```

→ Docker

Custom container

Launching your job

```
python my-pipeline.py \
  --input=INPUT_FILE \
  --output=OUTPUT_FILE \
  --project=PROJECT_ID \
  --region=REGION \
  --temp_location=TEMP_LOCATION \
  --runner=DataflowRunner \
  --worker_harness_container_image=$IMAGE_URI
```

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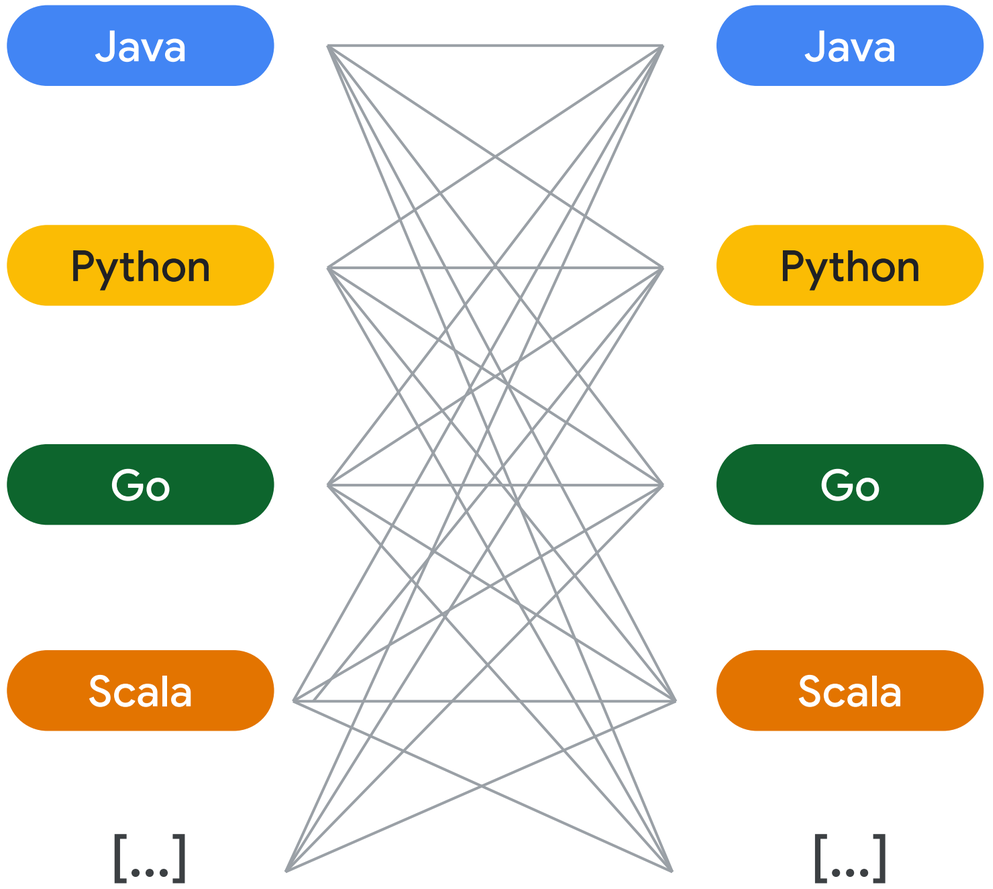
Cross-language transforms

Cross-language transforms

- Transforms can be **shared** among SDKs.



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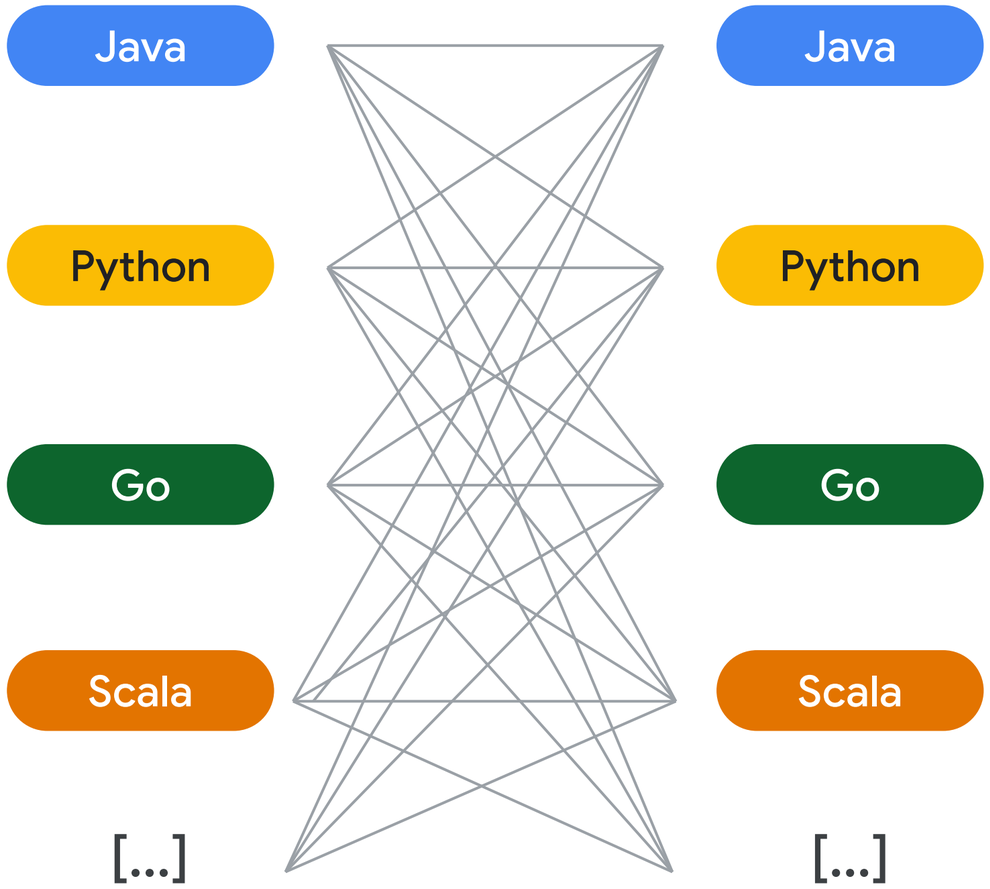
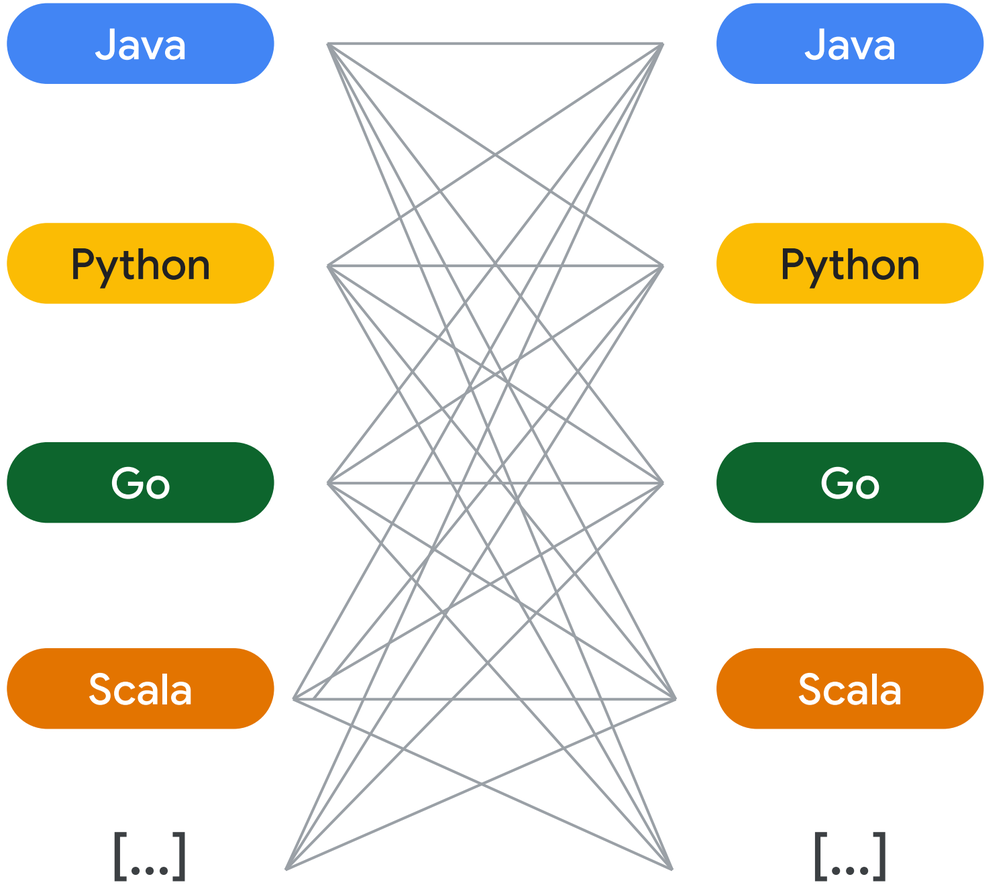
- A **rich set of IOs** from Java is available everywhere.



Cross-language transforms

- Transforms can be **shared** among SDKs.
- A **rich set of IOs** from Java is available everywhere.
- More libraries are available in the **language of your choice**.

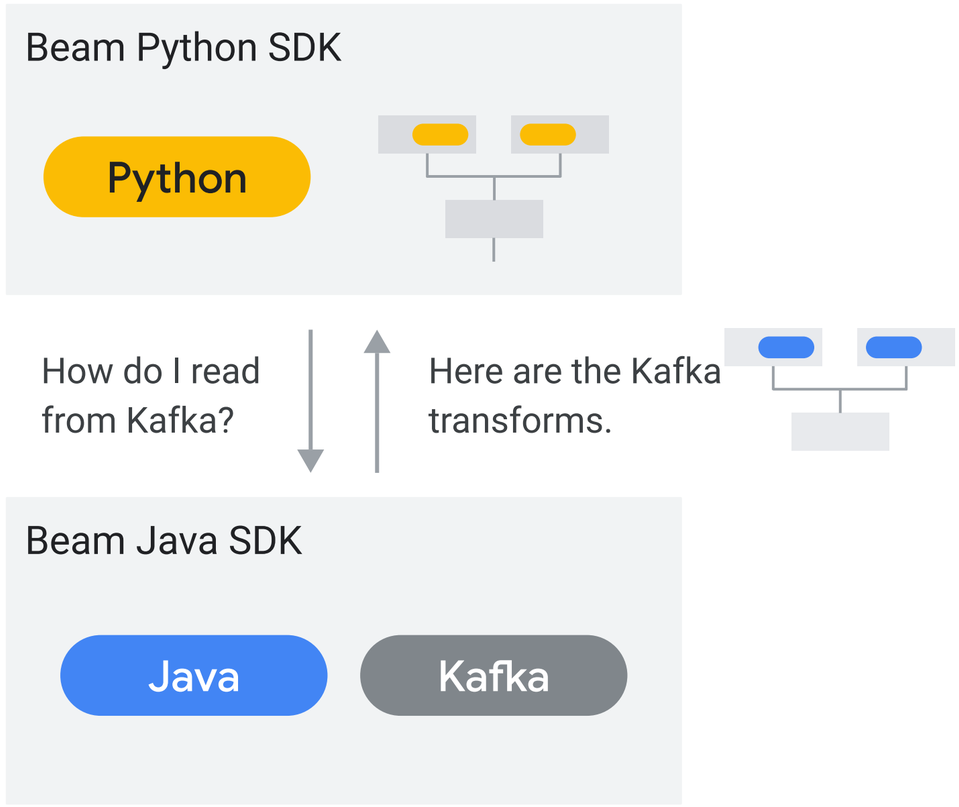


Example of cross-language transform

```
from apache_beam.io.kafka import ReadFromKafka

with beam.Pipeline(options=<Your Beam PipelineOptions object>) as p:
      p
      | ReadFromKafka(
          consumer_config={'bootstrap.servers': ‘<Kafka bootstrap servers list>’},
            topics=[<List of Kafka topics>])
```

Cross-language transforms



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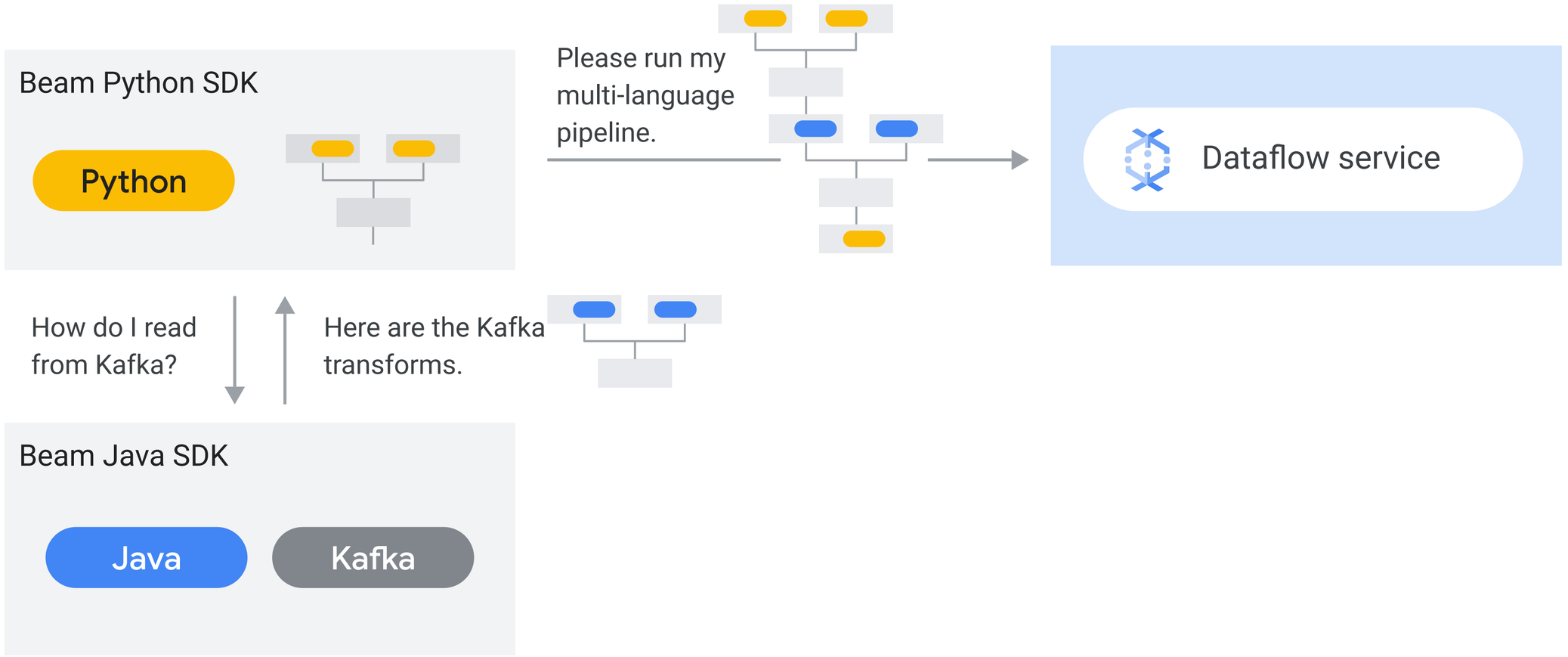

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