Data Processing Architecture

Google Cloud Platform Fundamentals: Big Data and Machine Learning

Version #1.1

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1. Introduction
2. Fundamentals of GCP
3. Data Analysis on the Cloud
4. Scaling Data Analysis
5. Machine Learning
6. Data Processing Architecture

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Message-oriented architectures

Serverless data pipelines

GCP Reference Architecture

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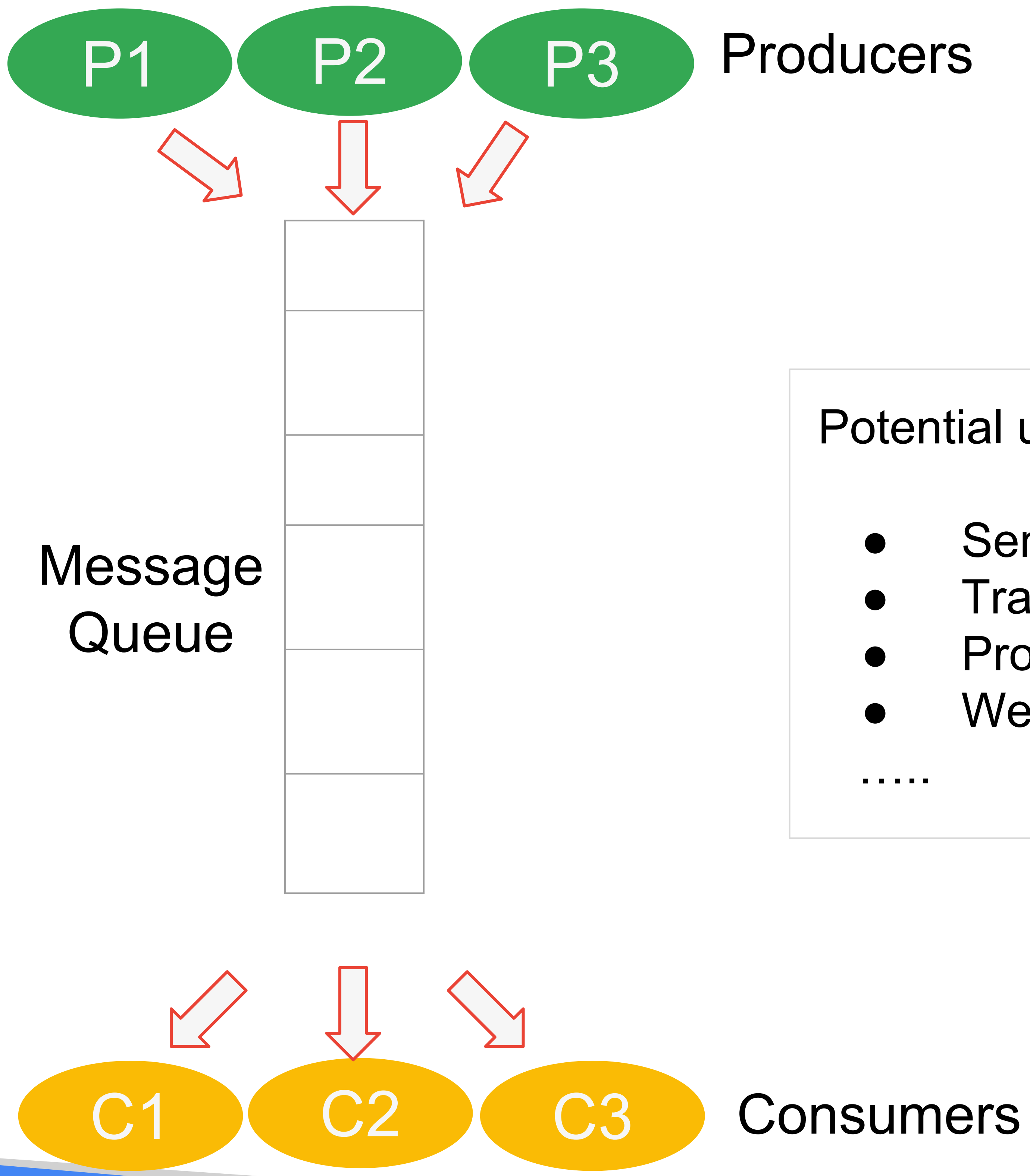
Asynchronous processing is useful for long-lived tasks or to have loose coupling between two systems



Potential use cases:

- Send an SMS
- Train ML model
- Process data from multiple sources
- Weekly reports

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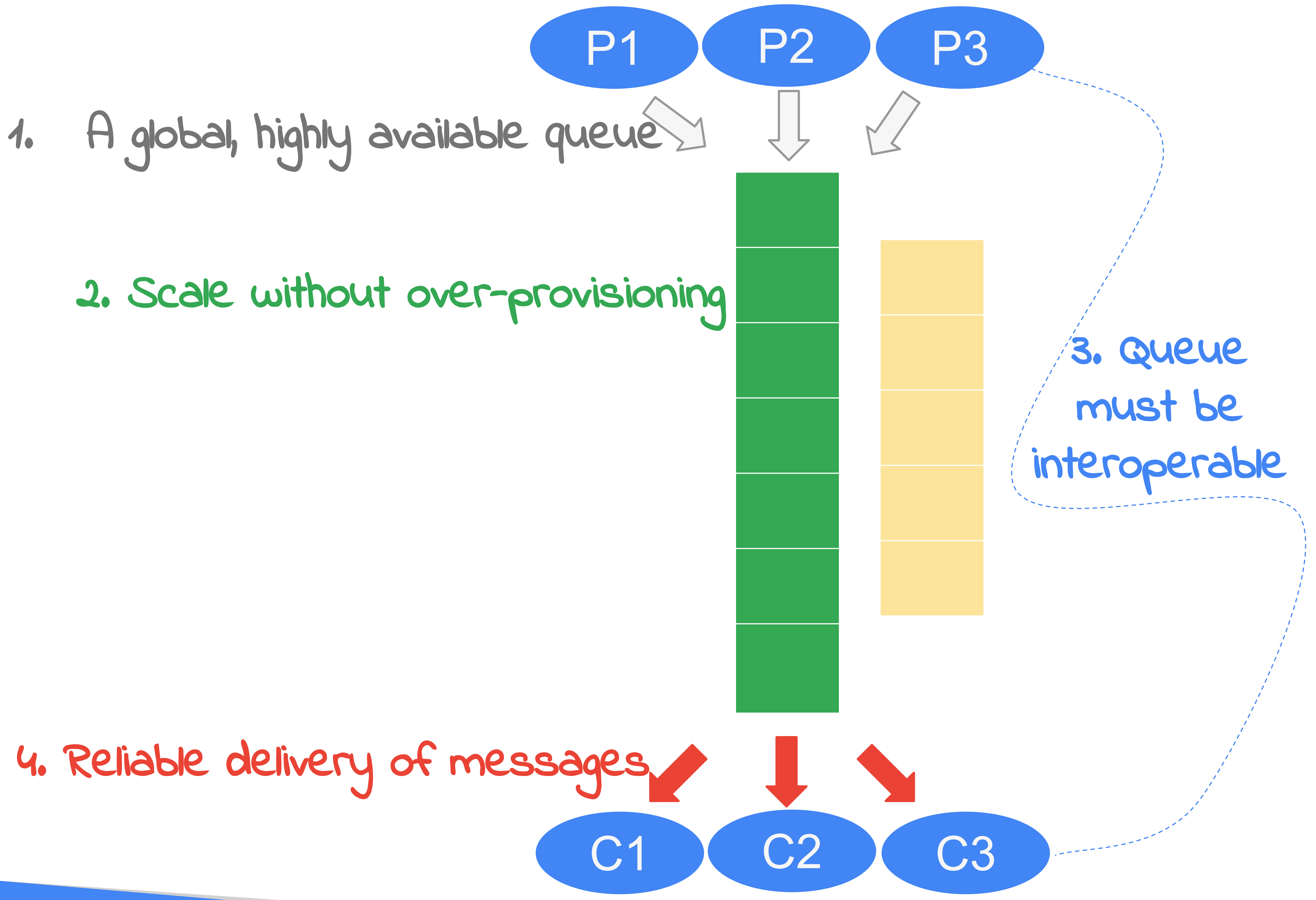
For robust asynchronous processing, you need:


P1
P2
P3
1. A global, highly available queue
2. Scale without over-provisioning
3. Queue must be interoperable
4. Reliable delivery of messages
C1
C2
C3

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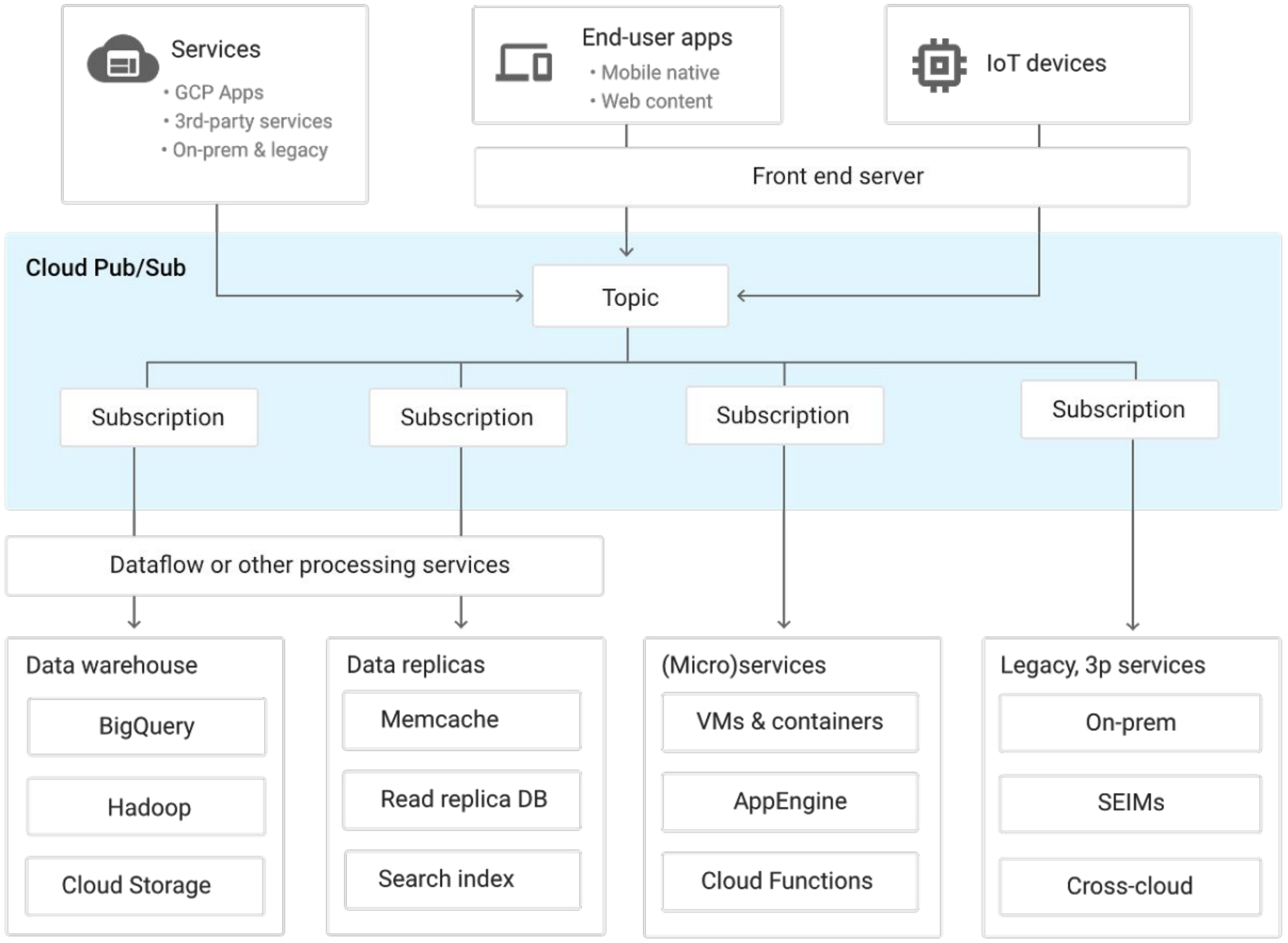
Pub/Sub provides a no-ops, serverless global message queue



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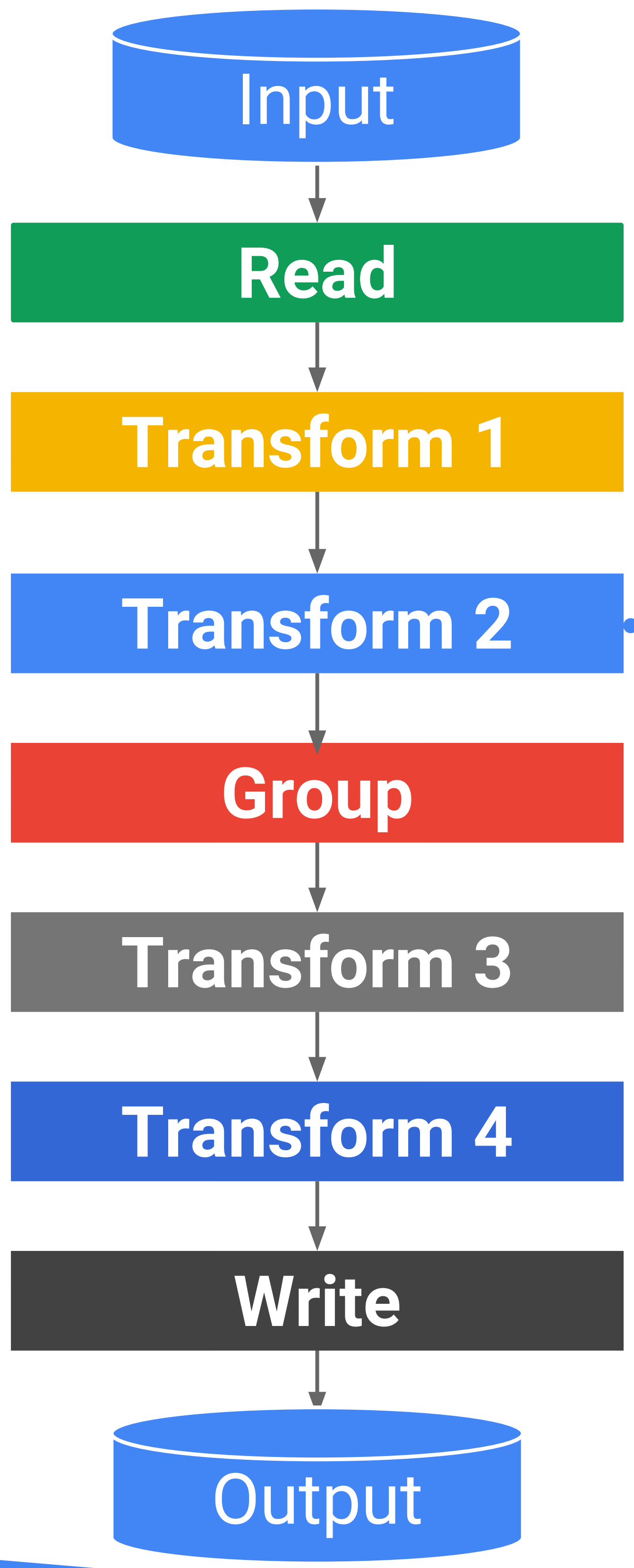
Dataflow offers NoOps data pipelines in Java and Python



```
p = beam.Pipeline(options=options)

  lines = p | beam.io.ReadFromText('gs://...')

  traffic = lines | beam.Map(parse_data).with_output_types(unicode)

                  | beam.Map(get_speedbysensor) # (sensor, speed)

                  | beam.GroupByKey() # (sensor, [speed])

                  | beam.Map(avg_speed) # (sensor, avgspeed)

                  | beam.Map(lambda tup: '%s: %d' % tup))

   output = traffic | beam.io.WriteToText('gs://...]')

p.run();
```

Open-source API (Apache Beam) can be executed on Flink, Spark, etc. also

Map

Group-By

Reduce

Each of these steps is run in parallel and autoscaled by execution framework

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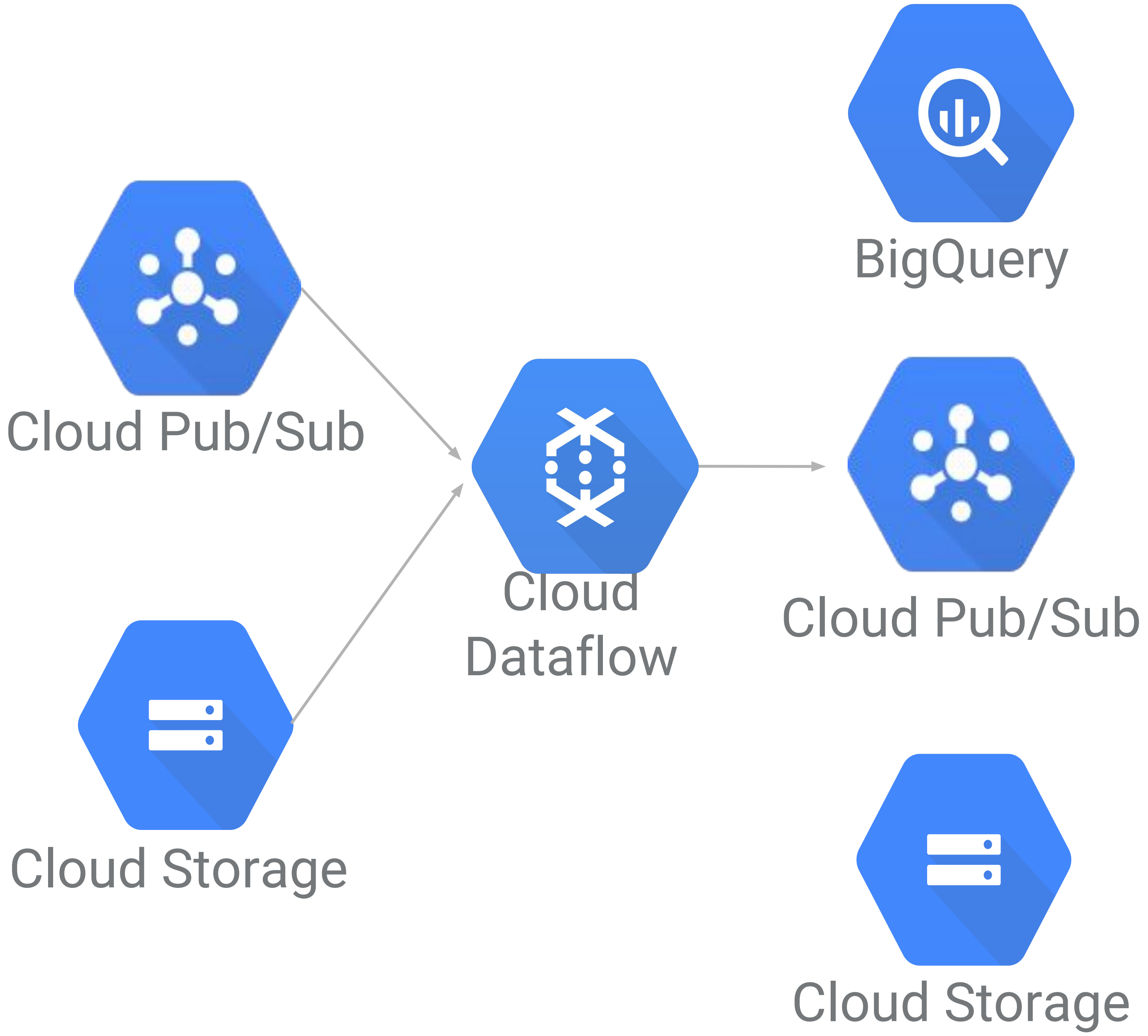
Same code does real-time and batch



```
options = PipelineOptions(pipeline_args)
options.view_as(StandardOptions).streaming = True
p = beam.Pipeline(options=options)
   lines = p | beam.io.ReadStringsFromPubSub(input_topic)
   traffic = (lines
      | beam.Map(parse_data).with_output_types(unicode)
      | beam.Map(get_speedbysensor) # (sensor, speed)
      | beam.WindowInto(window.FixedWindows(15, 0))
      | beam.GroupByKey() # (sensor, [speed])
      | beam.Map(avg_speed) # (sensor, avgspeed)
      | beam.Map(lambda tup: '%s: %d' % tup))
   traffic | beam.io.WriteStringsToPubSub(output_topic)

p.run()
```

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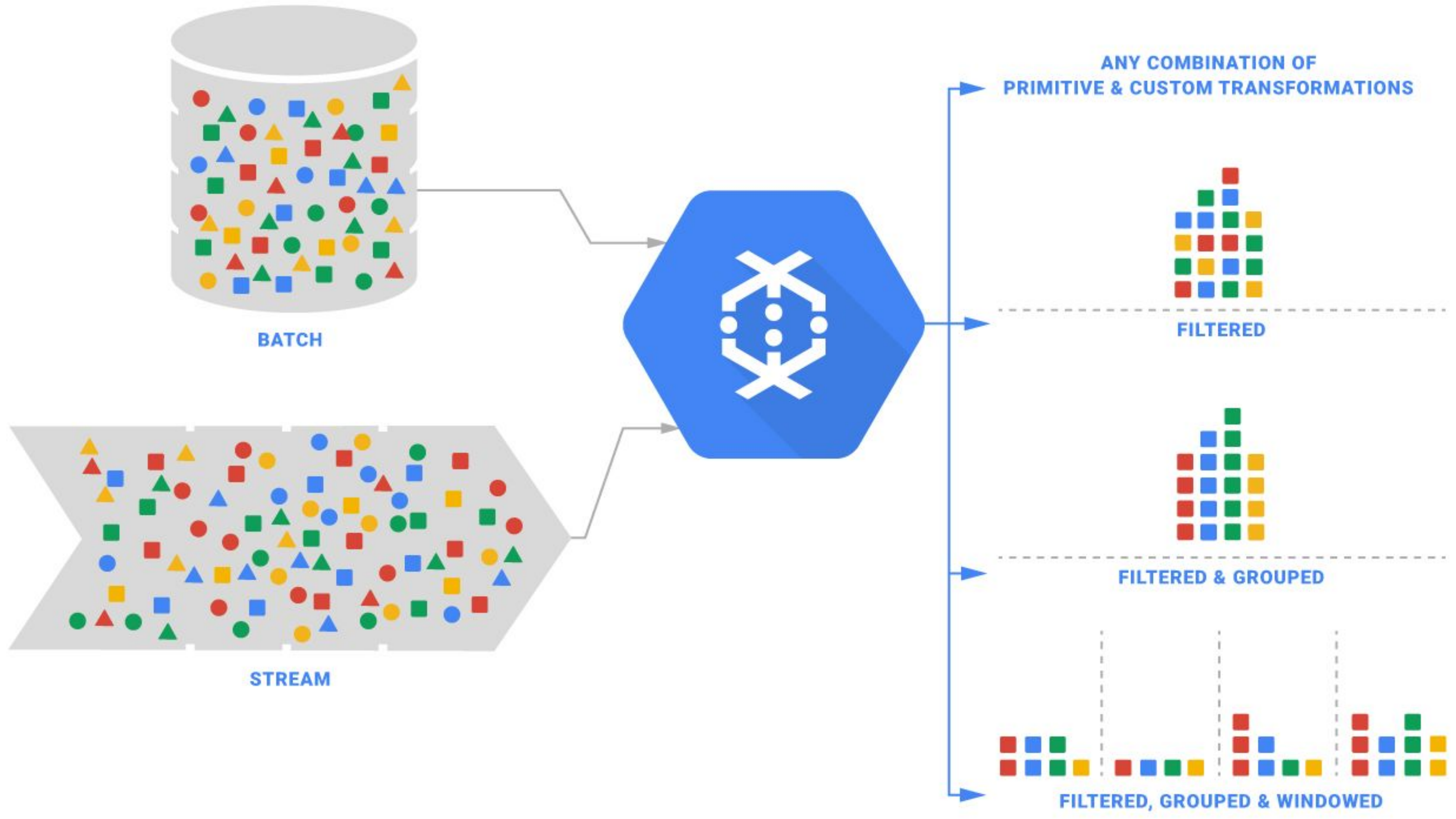
Dataflow does ingest, transform, and load; consider using it instead of Spark


BATCH
STREAM
ANY COMBINATION OF PRIMITIVE & CUSTOM TRANSFORMATIONS
FILTERED
FILTERED & GROUPED
FILTERED, GROUPED & WINDOWED

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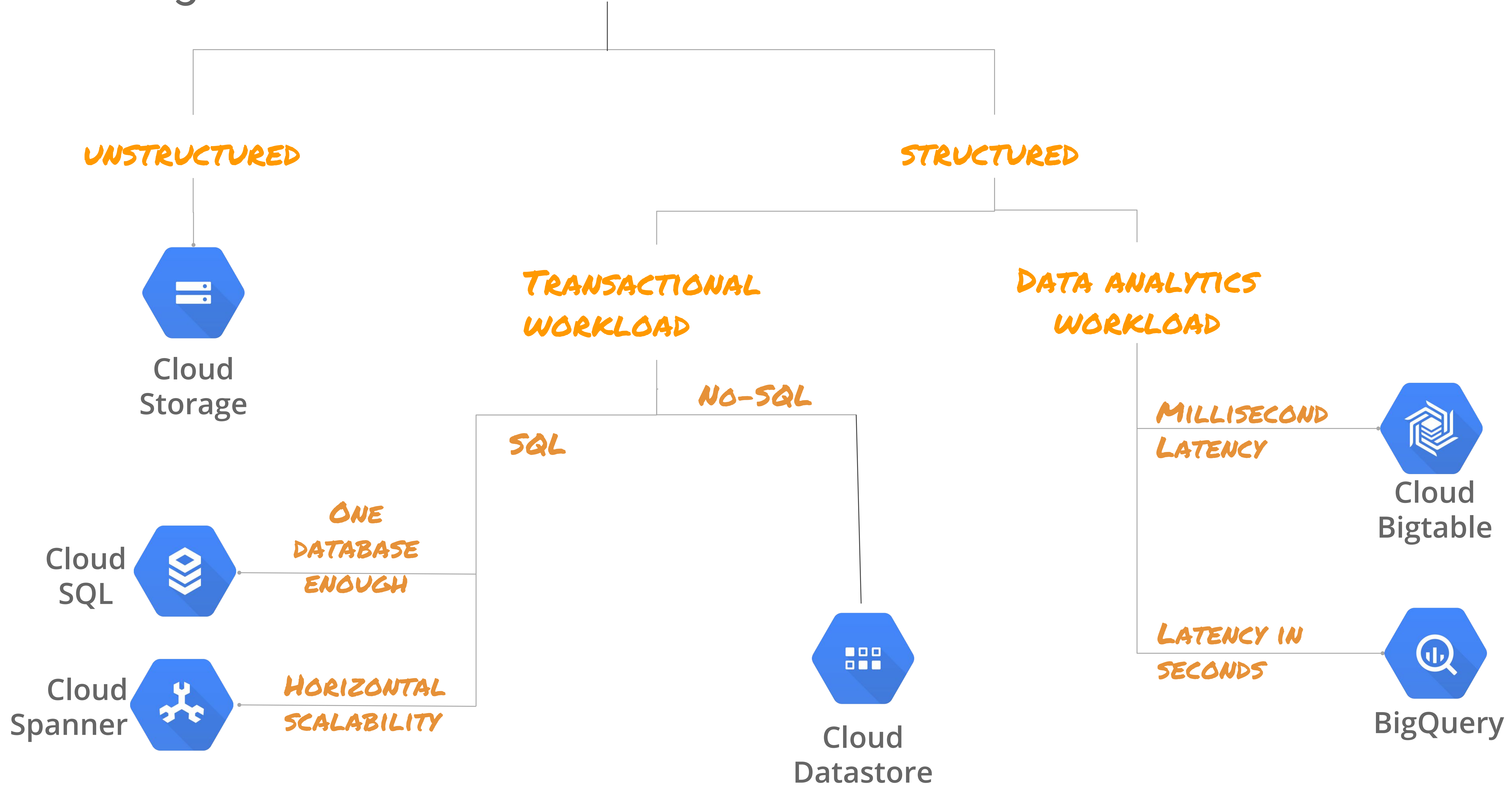
Choosing where to store data on GCP



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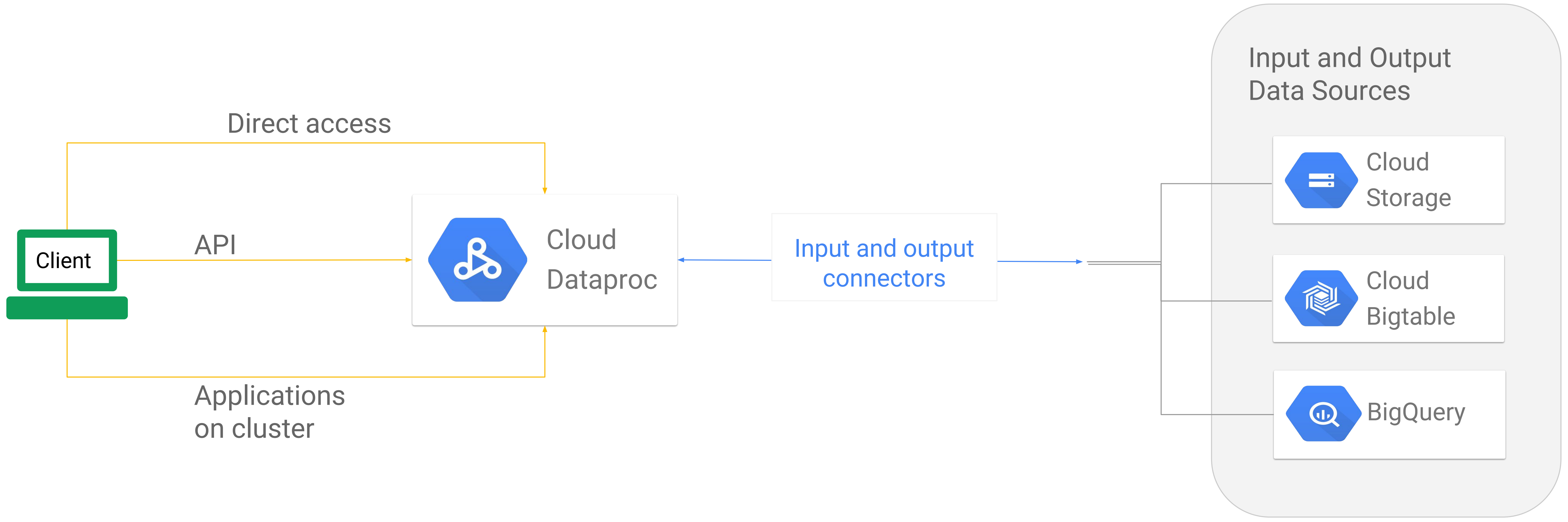
Run Spark/Hadoop jobs on Cloud Dataproc



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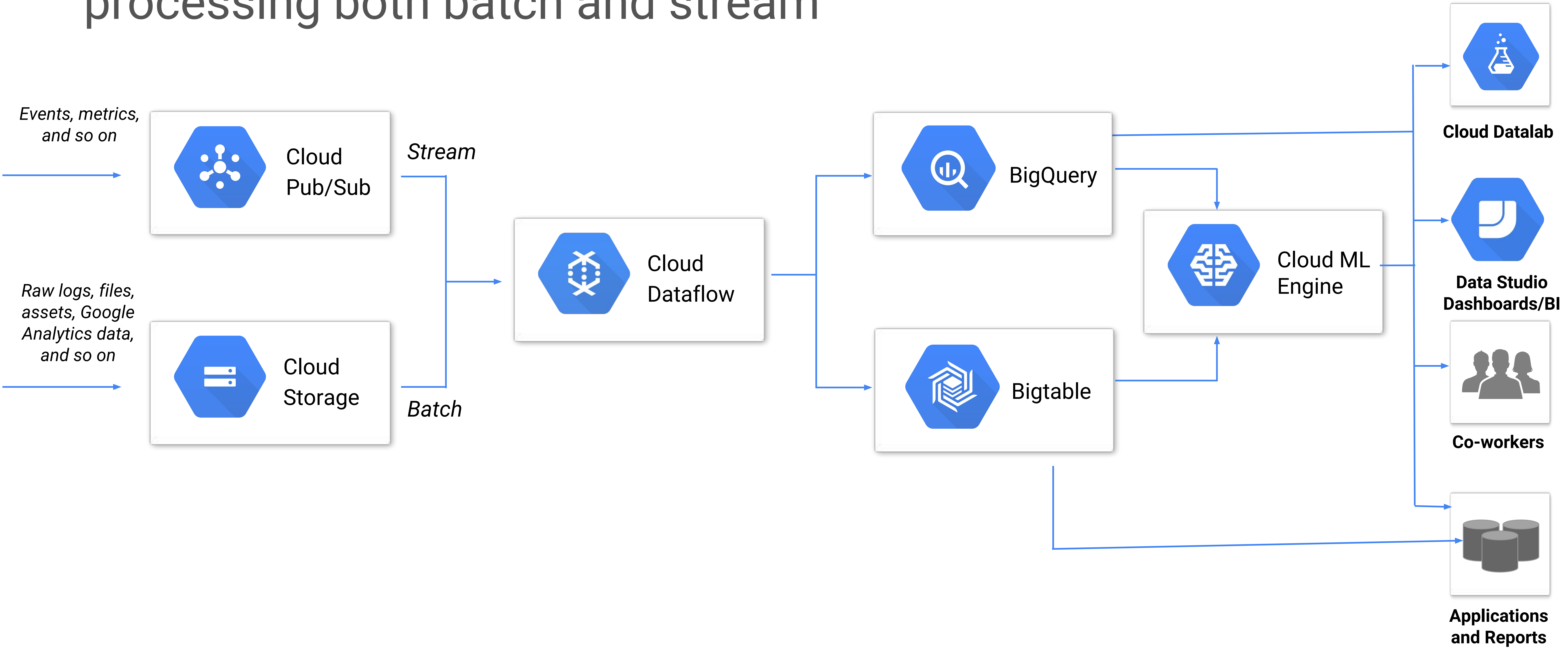
On GCP, you can have the same data processing pipeline for processing both batch and stream



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Module Review

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Module review

Match the use case on the left with the product on the right

A. Decoupling producers and consumers of data in large organizations and complex systems

B. Scalable, fault-tolerant multi-step processing of data

1. Cloud Dataflow

2. Cloud Pub/Sub

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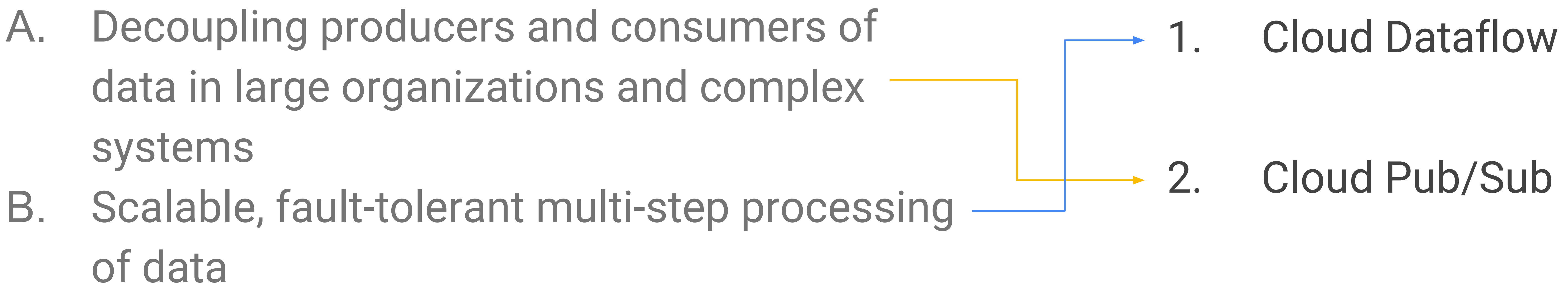
Module review answers

Match the use case on the left with the product on the right



A. Decoupling producers and consumers of data in large organizations and complex systems

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1. Cloud Dataflow

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Resources (1 of 2)

Cloud Pub/Sub	https://cloud.google.com/pubsub/
Cloud Dataflow	https://cloud.google.com/dataflow/
Processing media using Cloud Pub/Sub and Compute Engine	https://cloud.google.com/solutions/media-processing-pub-sub-compute-engine

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Resources (2 of 2)

Reverse Geocoding of Geolocation Telemetry in the Cloud Using the Maps API	https://cloud.google.com/solutions/reverse-geocoding-geolocation-telemetry-cloud-maps-ap
Using Cloud Pub/Sub for Long-running Tasks	https://cloud.google.com/solutions/using-cloud-pub-sub-long-running-tasks

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