Performance

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Strategic Cloud Engineers,
Google Cloud

CD

Agenda

Course Intro

Monitoring

Logging and Error Reporting

Troubleshooting and Debugging

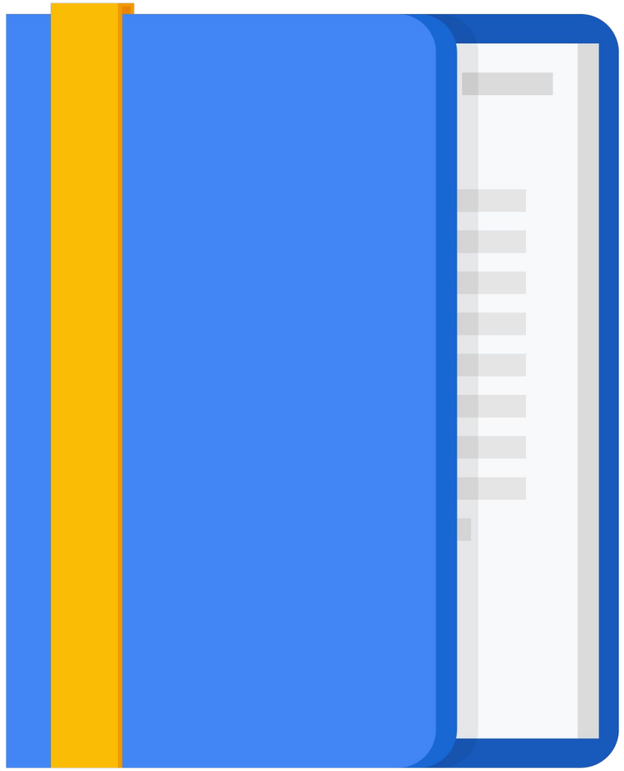
Performance

Testing and CI/CD

Reliability

Flex Templates

Course Summary



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Pipeline design

Data shape

Sources, sinks & external systems

Shuffle & Streaming Engine

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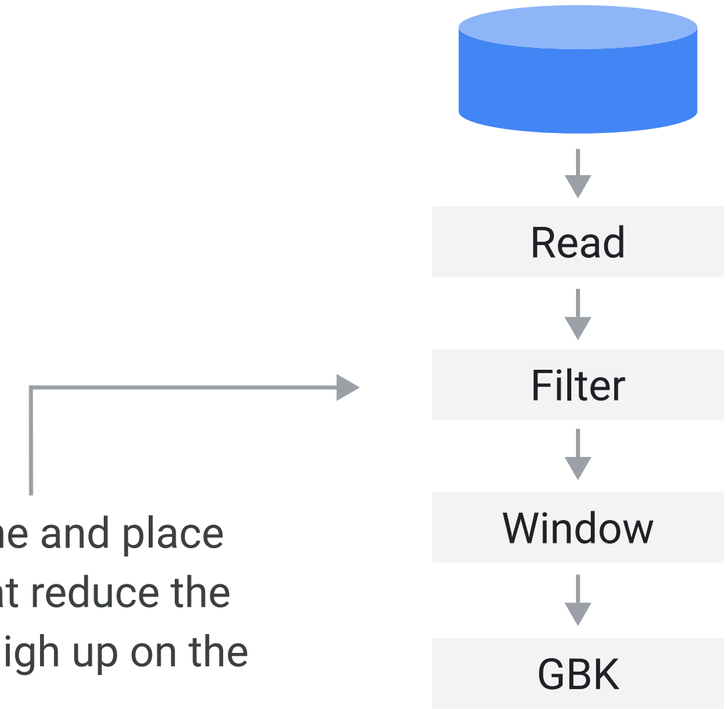
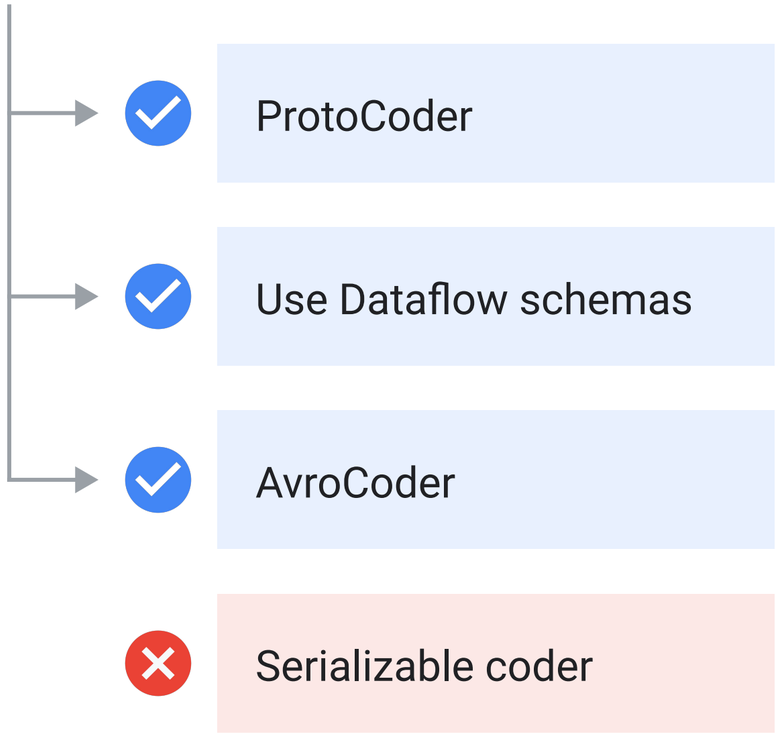
Design: Topology



Filter early in pipeline and place transformations that reduce the volume of data as high up on the graph as possible.

Design: Coders

Utilize efficient coders



Annotating a custom data type [Java]

```
@DefaultCoder(AvroCoder.class)
public class MyCustomDataType {
  ...
 }
```

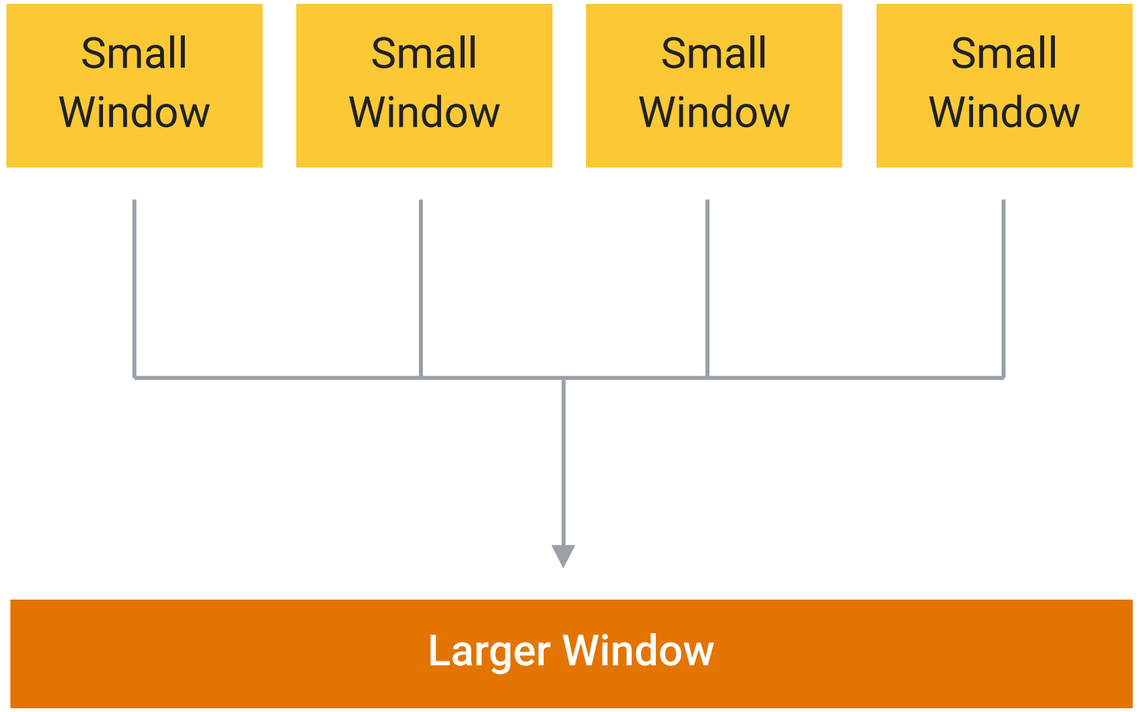
Set a default coder [Java]

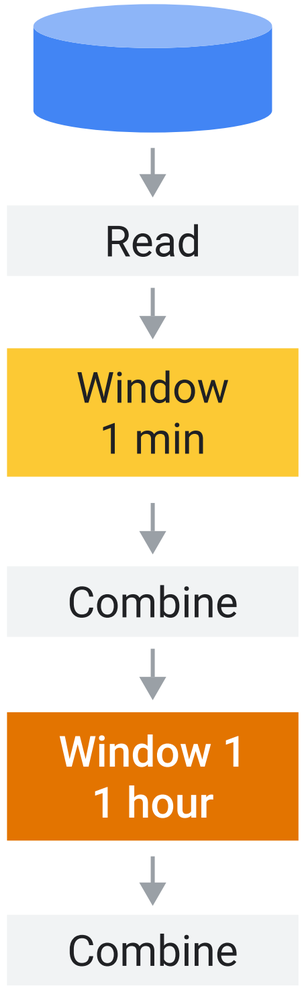
```
PipelineOptions options =
PipelineOptionsFactory.create();
Pipeline p = Pipeline.create(options);


CoderRegistry cr = p.getCoderRegistry();
cr.registerCoder(Integer.class,
BigEndianIntegerCoder.class);
```

Set a default coder [Python]

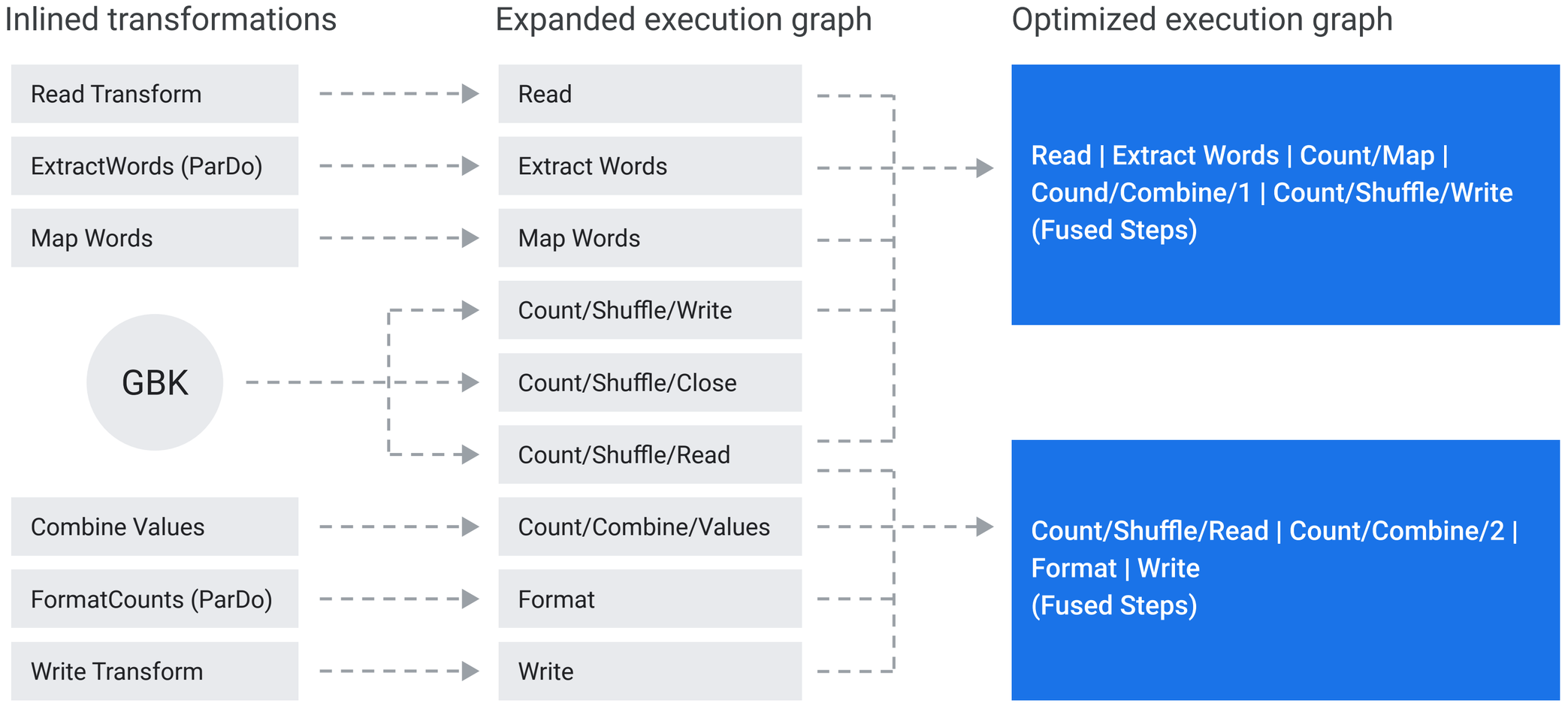
```
apache_beam.coders.registry.register_coder(i
nt, BigEndianIntegerCoder)
```

Design: Window considerations



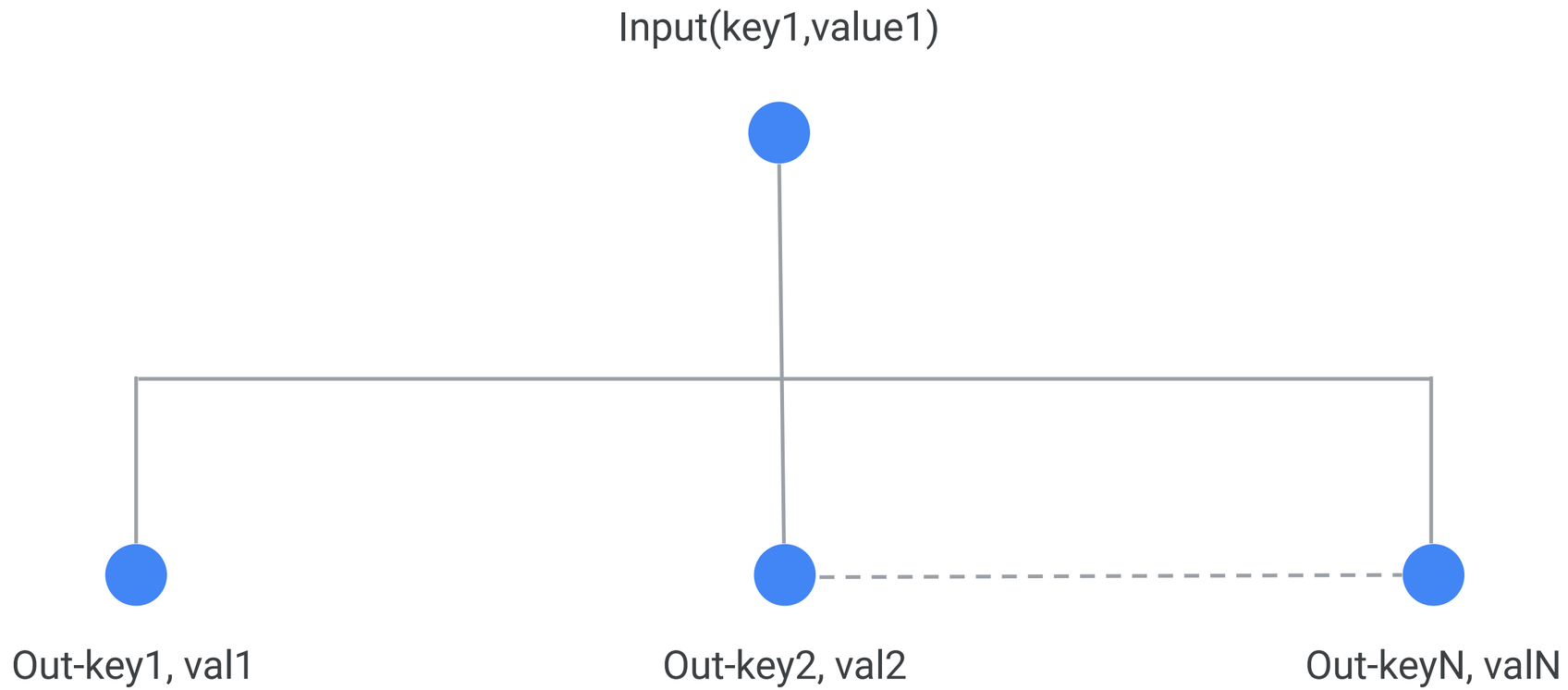


Design: Graph optimization



Design: Graph optimization

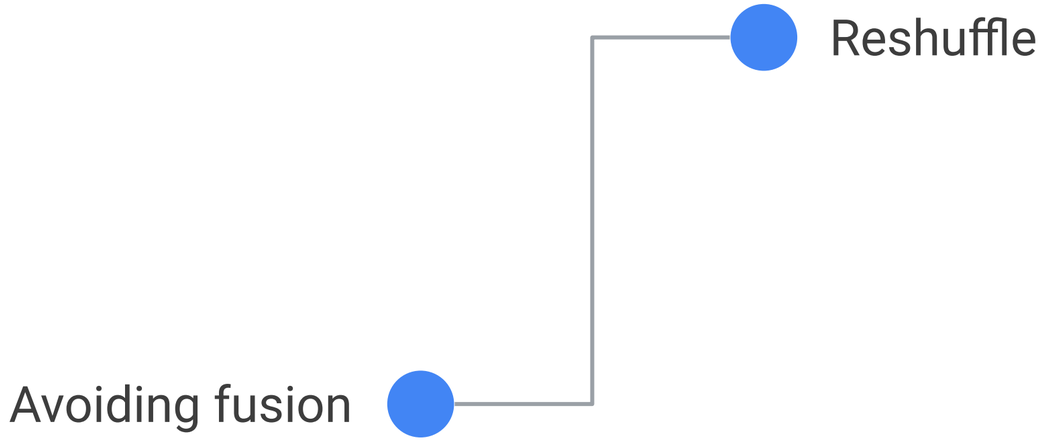
Fanout transformation



Design: Graph optimization

Avoiding fusion

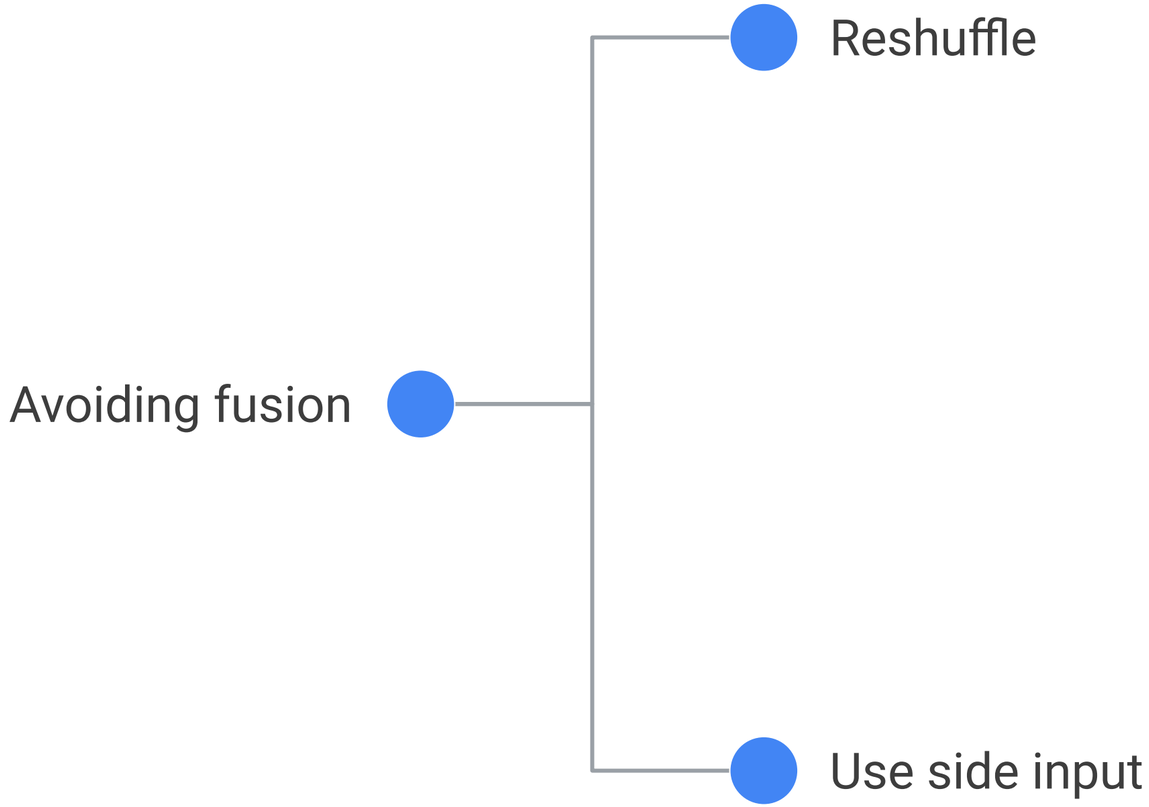
Design: Graph optimization




```
output_collection = output_collection |
'Reshuffle' >> beam.Reshuffle()
```

```
input.apply("Reshuffle",Reshuffle.viaRandomKey())
```

Design: Graph optimization

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```
messages.apply(ParDo.of(new DoFn<PubsubMessage,
TableRow>() {
@ProcessElement
public void processElement(ProcessContext c) {
TableRow sideInputData =
c.sideInput(mapData).get(key);
// Do something with side input
).withSideInputs(mapData));
```

```
result = ( main_input | 'ApplyCrossJoin' >>
beam.FlatMap(cross_join,rights=beam.pvalue.AsIter
(side_input)))
```

Design: Logging

1 Logging considerations

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2	Use a dead letter pattern	• Use a dead letter pattern followed by a count per window (ex: 5 mins) for reporting data errors.

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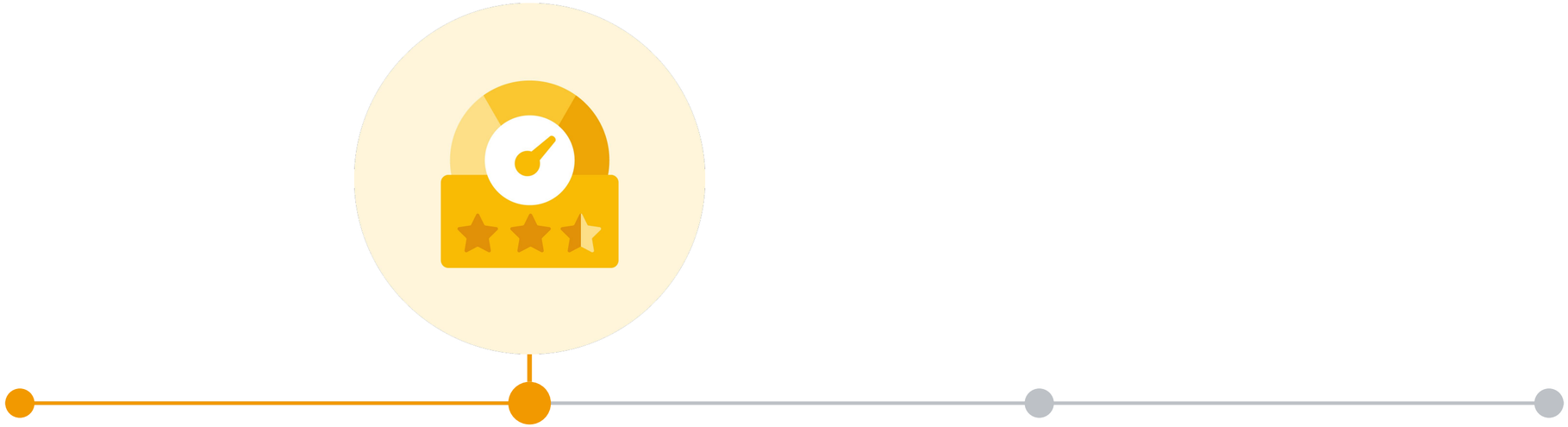


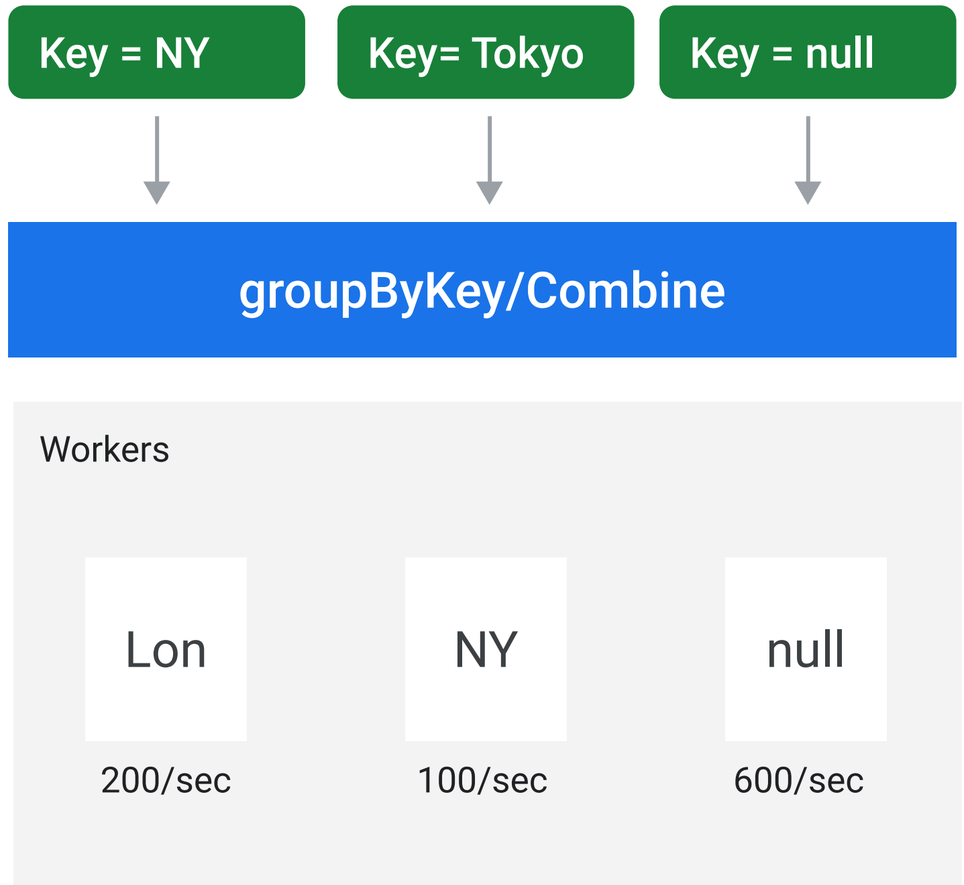
Pipeline design

Data shape

Sources, sinks & external systems

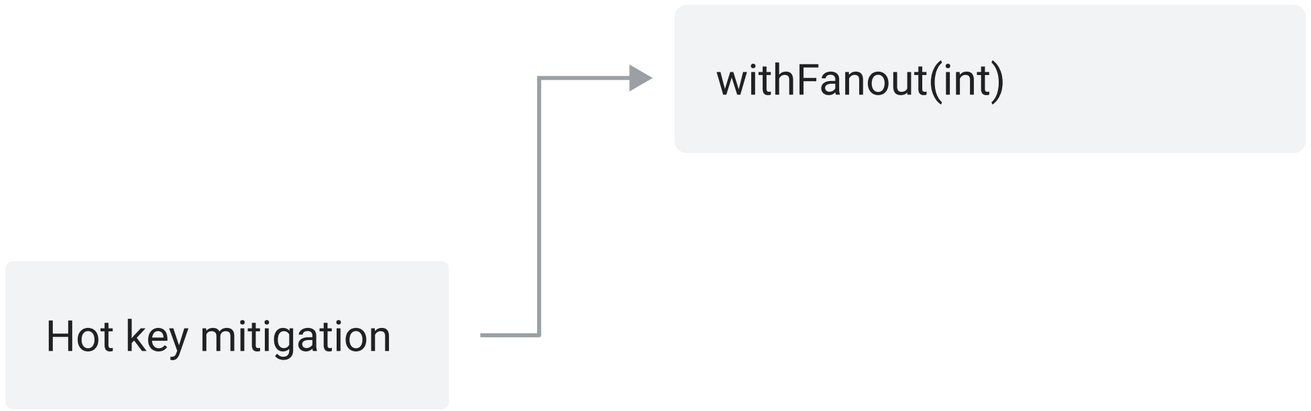
Shuffle & Streaming Engine

Design: Data skew



Design: Data skew

Log hotkeys by setting hotKeyLoggingEnabled to true



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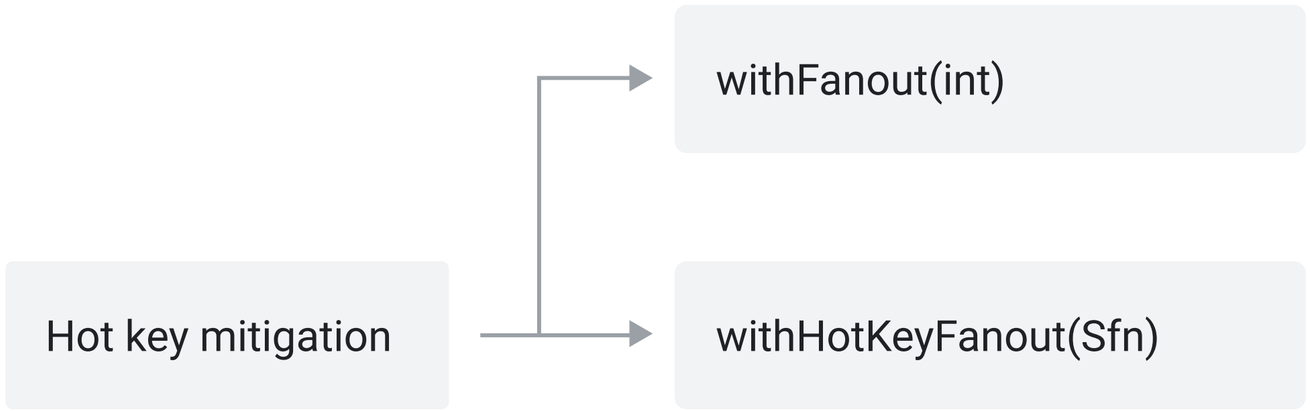

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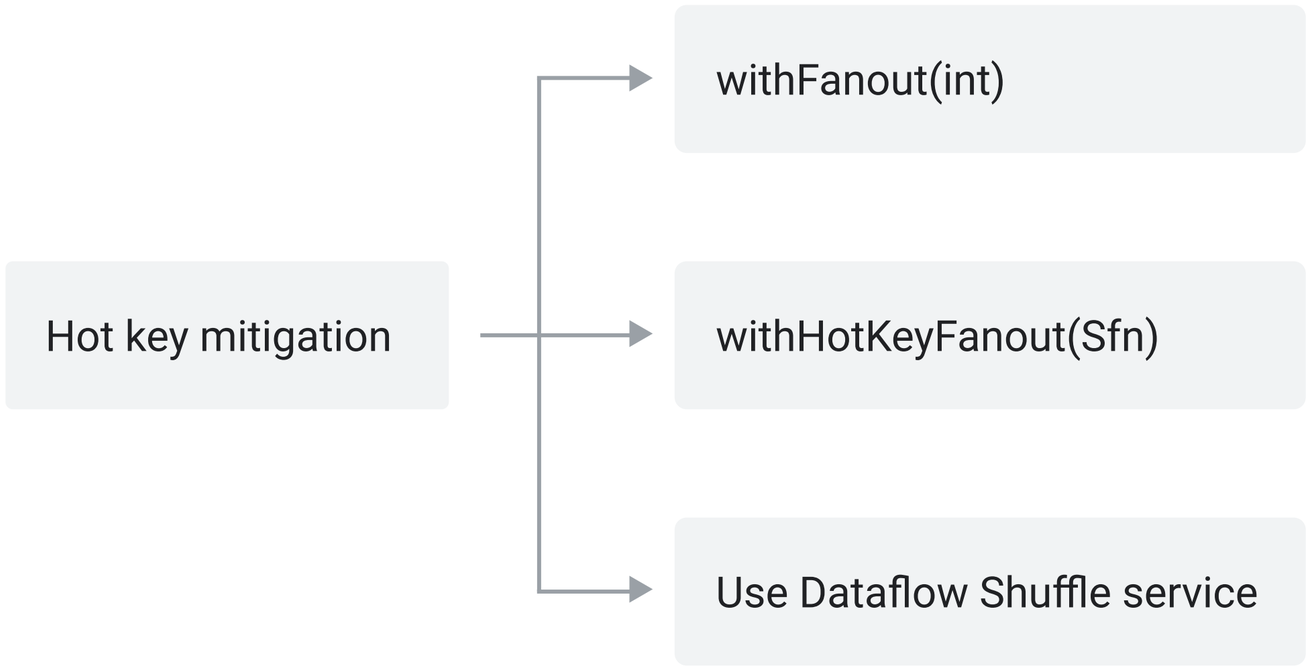

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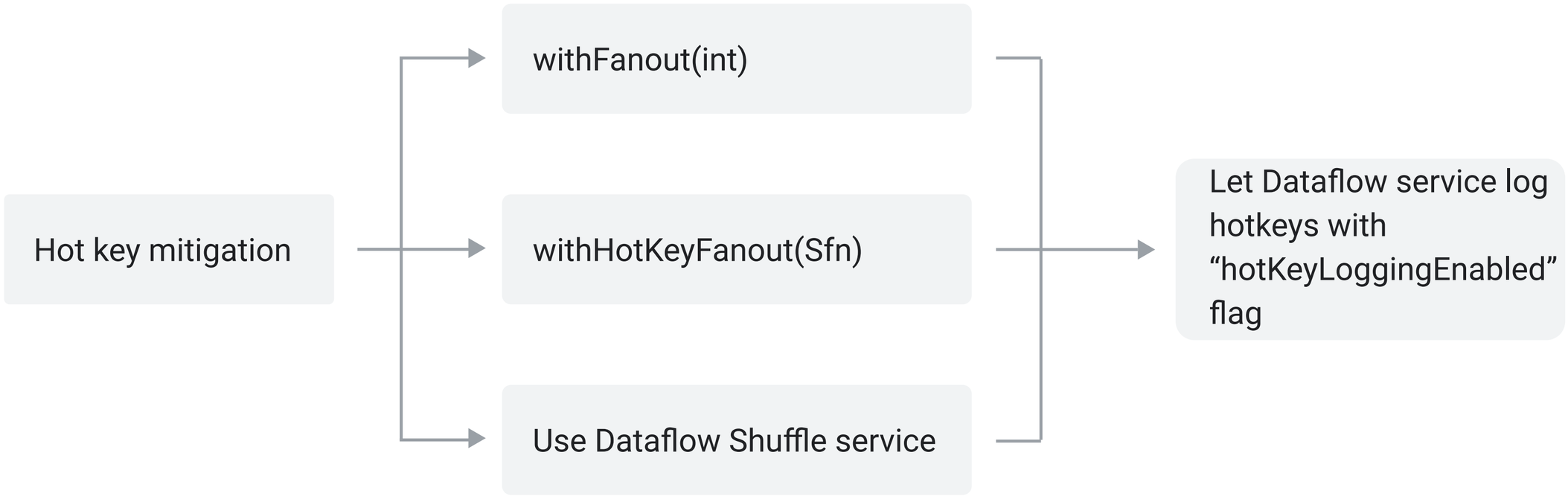

Design: Key space and parallelism

Low parallelism (too few keys)

1. Increase number of keys
   Example: If windows are distinct, use composite (window + key) keys.
2. If reading from files, prefer reading from splittable compression formats like Avro

parallelism = no. of keys

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Too-high parallelism (too many keys)

1. If key space is very large, consider using hashes separating keys out internally.
2. "Re-use" processing keys from the past that are not active

parallelism = no. of keys

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Source, Sinks & External Systems

TextIO + Compressed file

Source, sinks, and external systems

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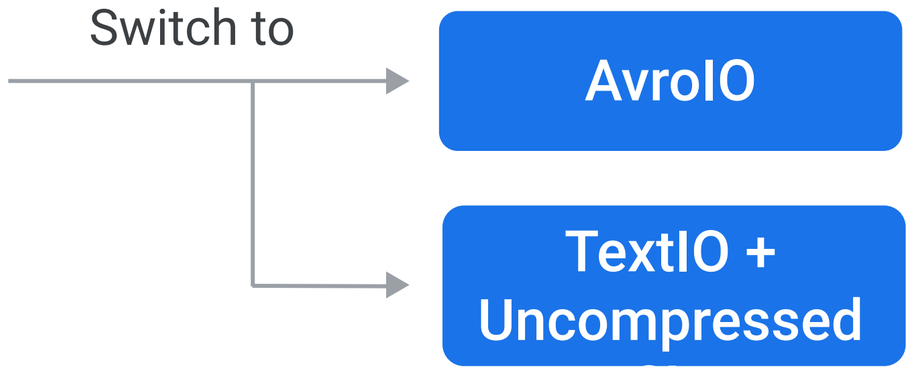

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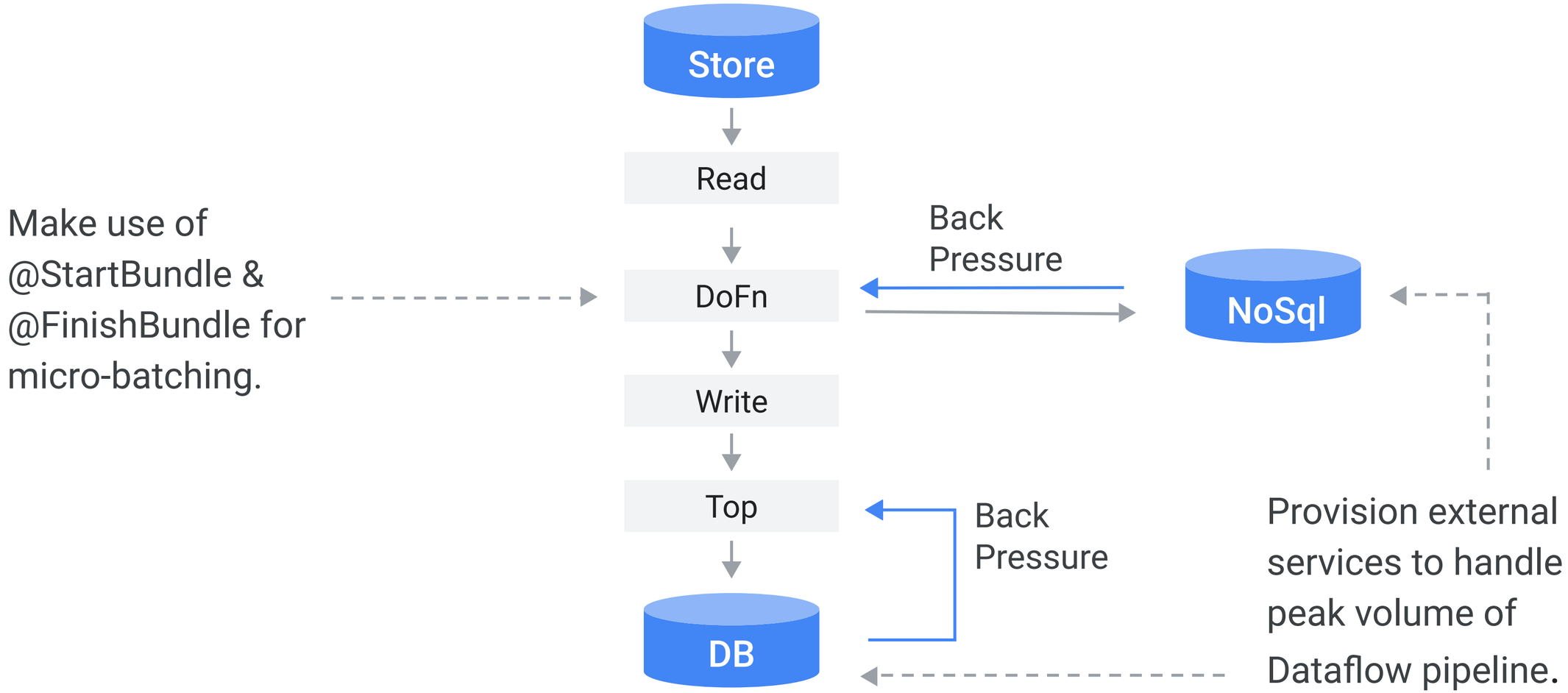
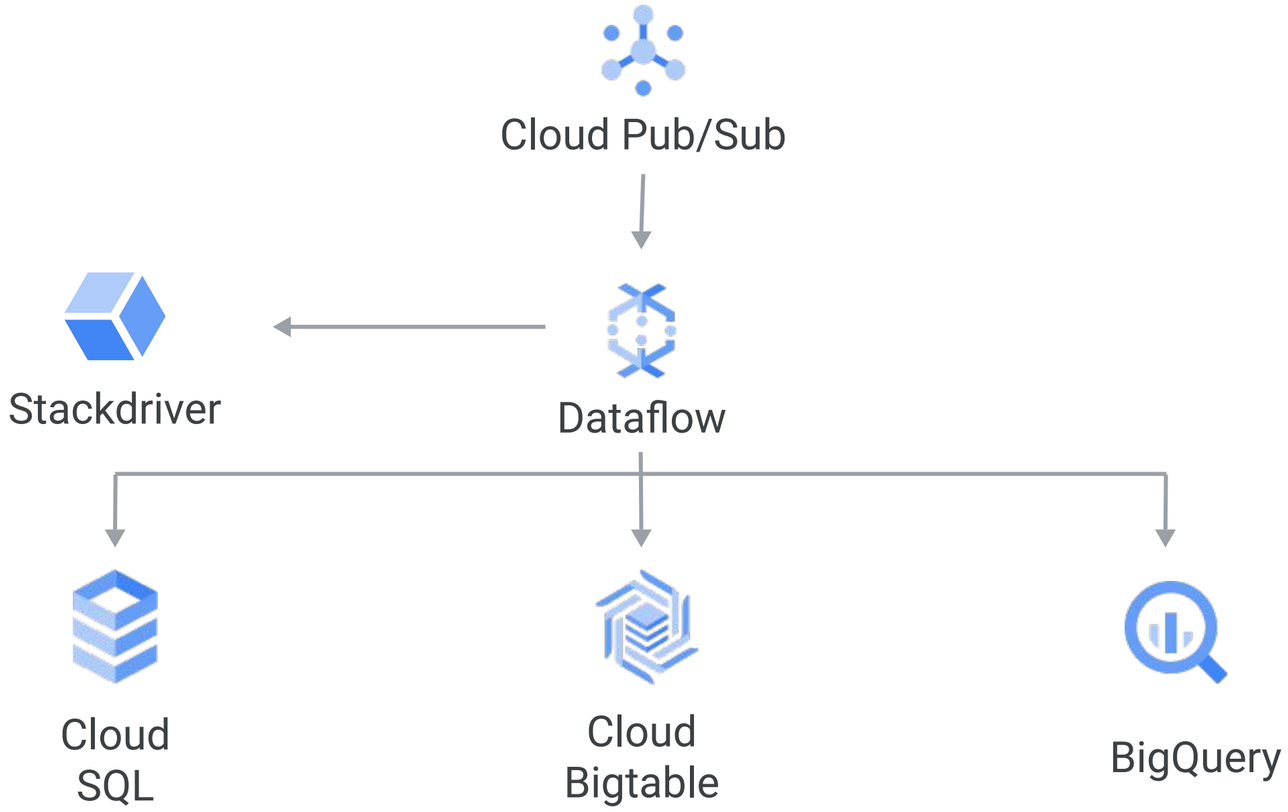


Source, Sinks & External Systems

Colocation (i.e same region/zone) helps in performance



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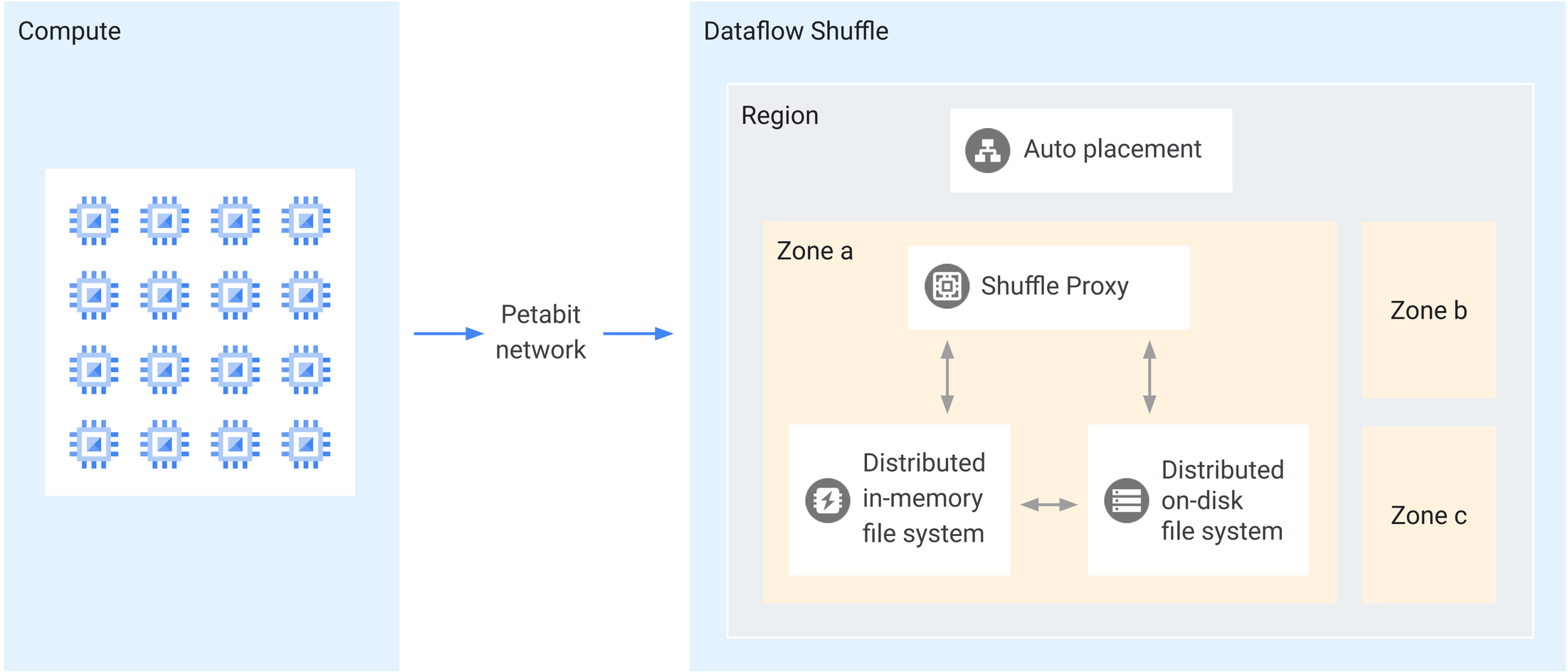
Dataflow Shuffle service



Benefits of Cloud Dataflow Shuffle

- Faster execution time of batch pipelines.

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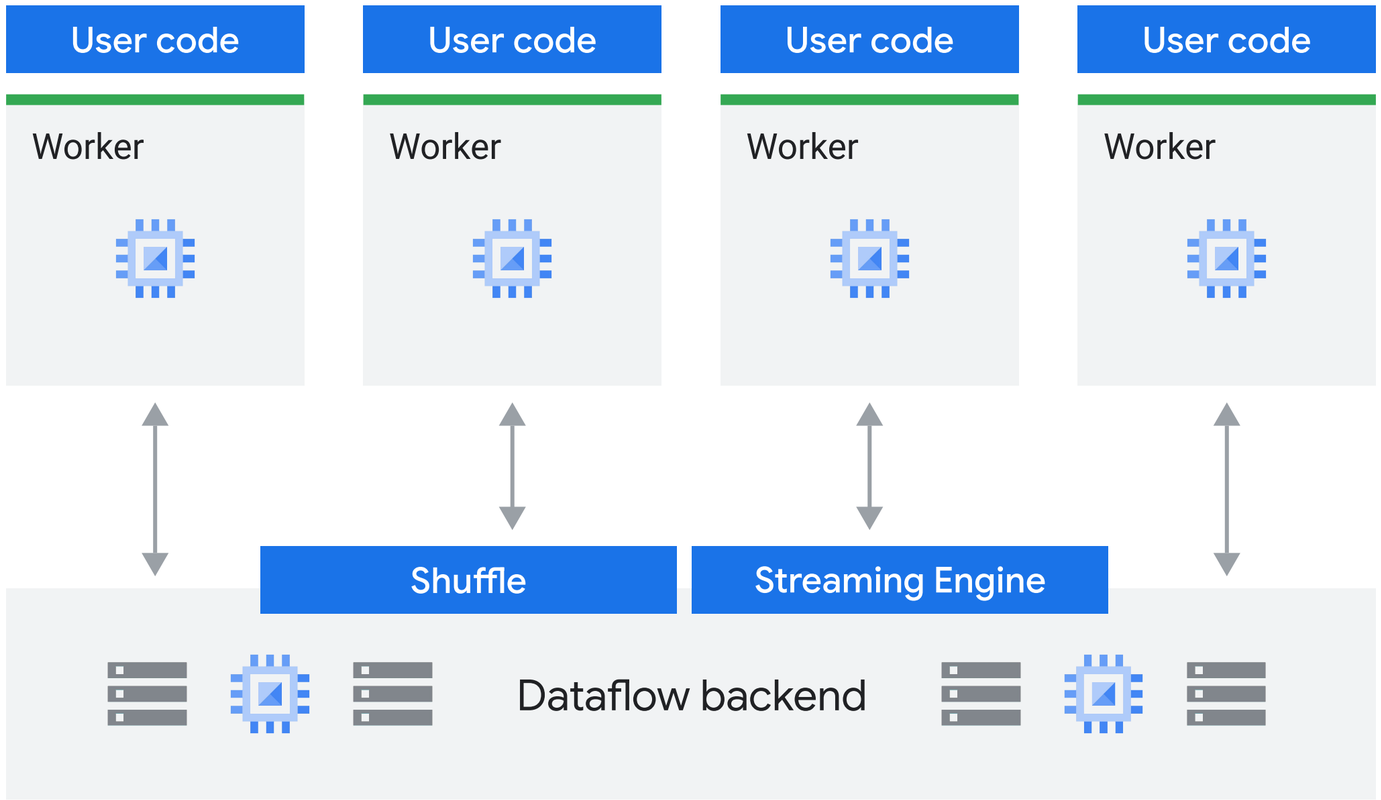
- Better autoscaling.
- Better fault tolerance.

Dataflow shuffle and streaming service



Summary