Dataflow Templates

Akvelon

https://akvelon.com/

Agenda

Dataflow Templates

Use Case - Data Protection Using Tokenization

Solution Architecture & Technical Highlights

Demo

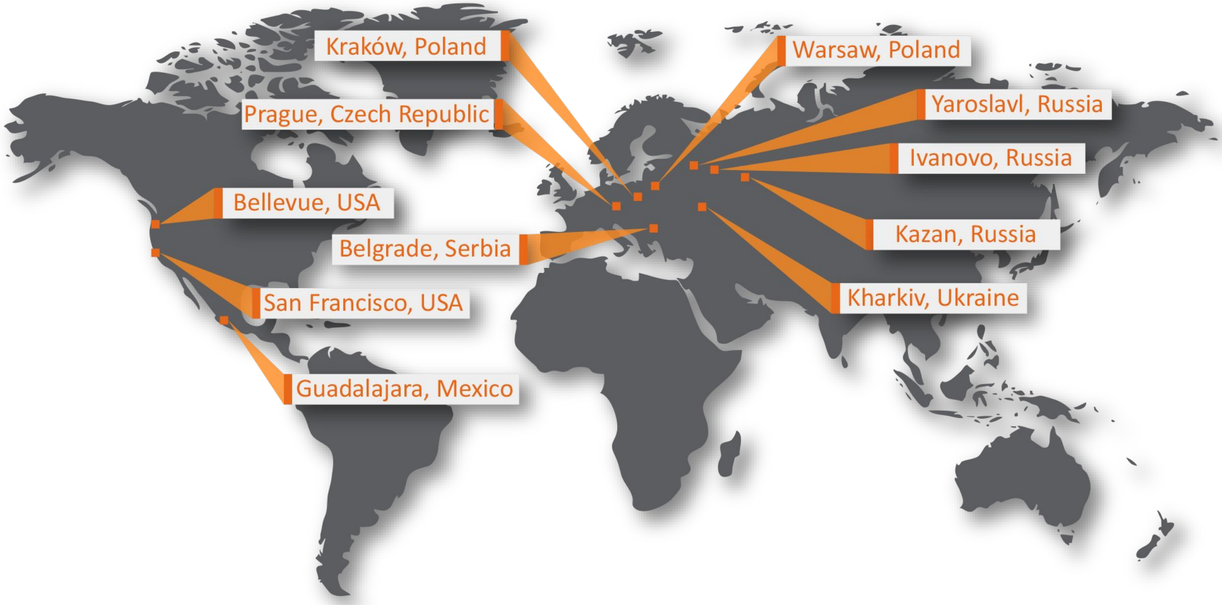
Contributing to open source DataflowTemplates

AKVELON

We make BIG software happen

Google Cloud Partner

BEAM COLLEGE



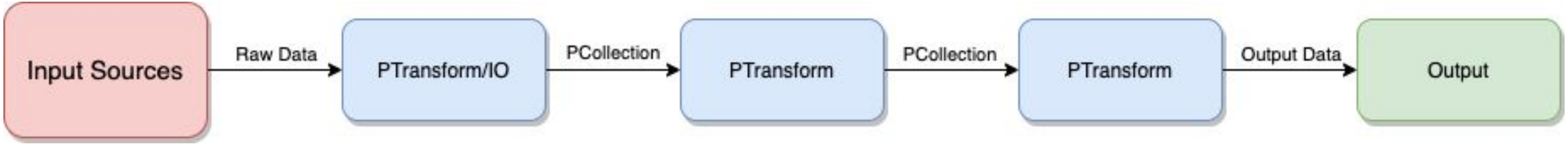
BEAM
COLLEGE

beam

AKVELON
We make BIG software happen

Google Cloud
Partner

Beam Pipeline



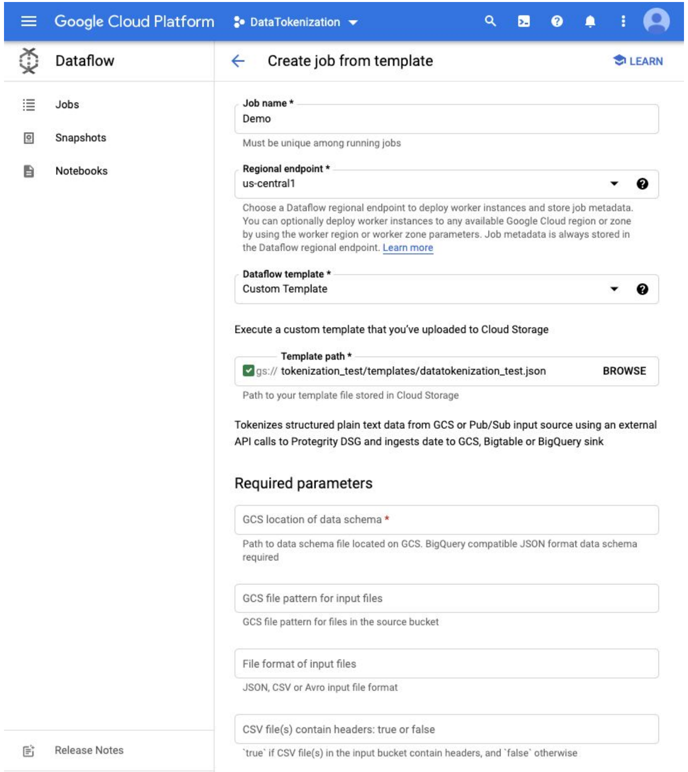
Dataflow Templates

Template - a way to package and stage pipelines

Template types: Classic and Flex

Flex template benefits

- Dynamic DAG
- Eliminated need for ValueProvider
- Expanded templates flexibility



Create job from template

Job name *
Demo
Must be unique among running jobs

Regional endpoint *
us-central1
Choose a Dataflow regional endpoint to deploy worker instances and store job metadata. You can optionally deploy worker instances to any available Google Cloud region or zone by using the worker region or worker zone parameters. Job metadata is always stored in the Dataflow regional endpoint. Learn more

Dataflow template *
Custom Template

Execute a custom template that you've uploaded to Cloud Storage

Template path *
gs:// tokenization_test/templates/datatokenization_test.json
Path to your template file stored in Cloud Storage

Tokenizes structured plain text data from GCS or Pub/Sub input source using an external API calls to Protegrity DSG and ingests date to GCS, Bigtable or BigQuery sink

Required parameters

GCS location of data schema *
Path to data schema file located on GCS. BigQuery compatible JSON format data schema required

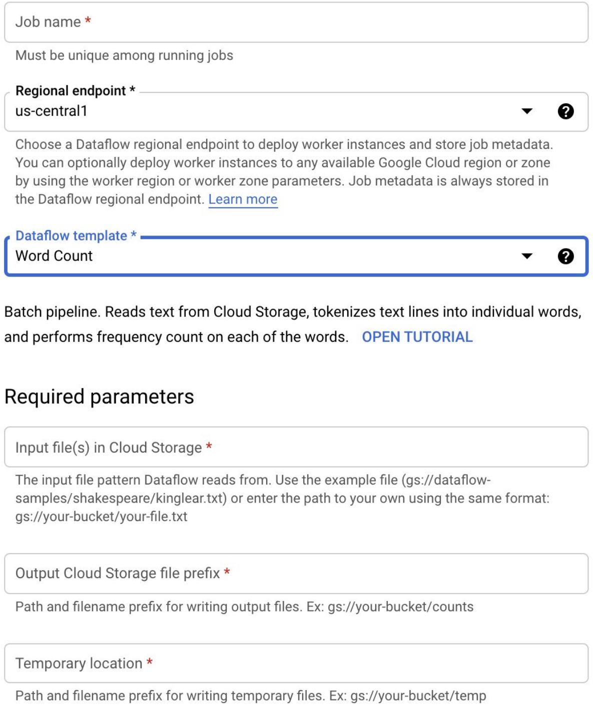
GCS file pattern for input files
GCS file pattern for files in the source bucket

File format of input files
JSON, CSV or Avro input file format

CSV file(s) contain headers: true or false
`true` if CSV file(s) in the input bucket contain headers, and `false` otherwise

Create Template

- Implement pipeline
- Create metadata
- Build template



Job name *

Must be unique among running jobs

Regional endpoint *
us-central1

Choose a Dataflow regional endpoint to deploy worker instances and store job metadata. You can optionally deploy worker instances to any available Google Cloud region or zone by using the worker region or worker zone parameters. Job metadata is always stored in the Dataflow regional endpoint. Learn more

Dataflow template *
Word Count

Batch pipeline. Reads text from Cloud Storage, tokenizes text lines into individual words, and performs frequency count on each of the words. OPEN TUTORIAL

Required parameters

Input file(s) in Cloud Storage *

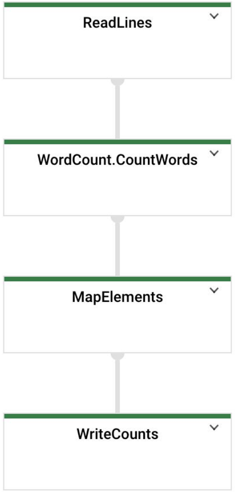
The input file pattern Dataflow reads from. Use the example file (gs://dataflow-samples/shakespeare/kinglear.txt) or enter the path to your own using the same format: gs://your-bucket/your-file.txt

Output Cloud Storage file prefix *

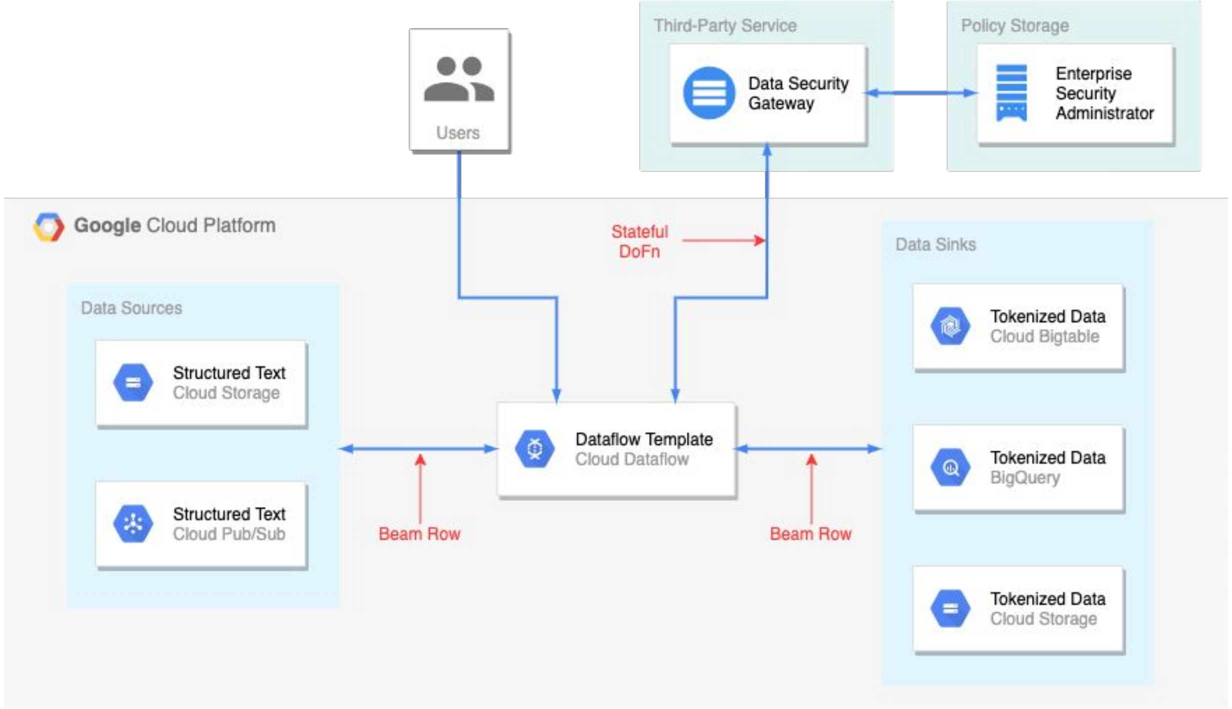
Path and filename prefix for writing output files. Ex: gs://your-bucket/counts

Temporary location *

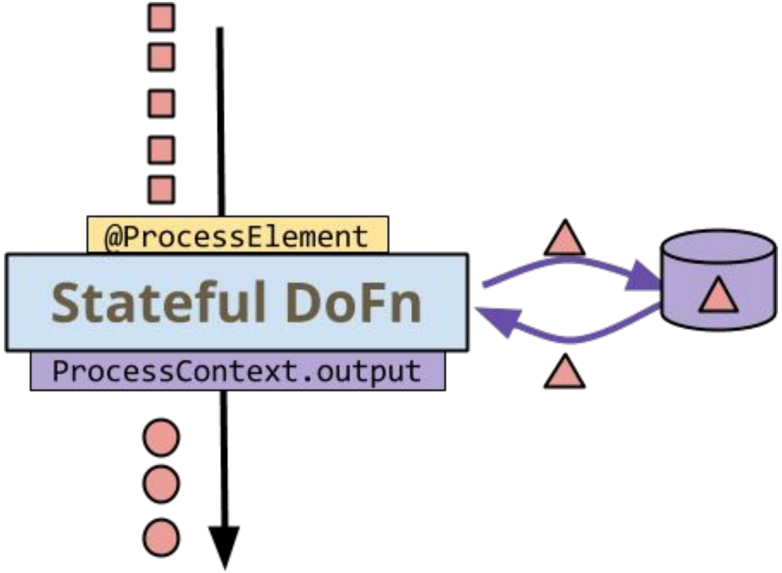
Path and filename prefix for writing temporary files. Ex: gs://your-bucket/temp



Data Protection Using Tokenization

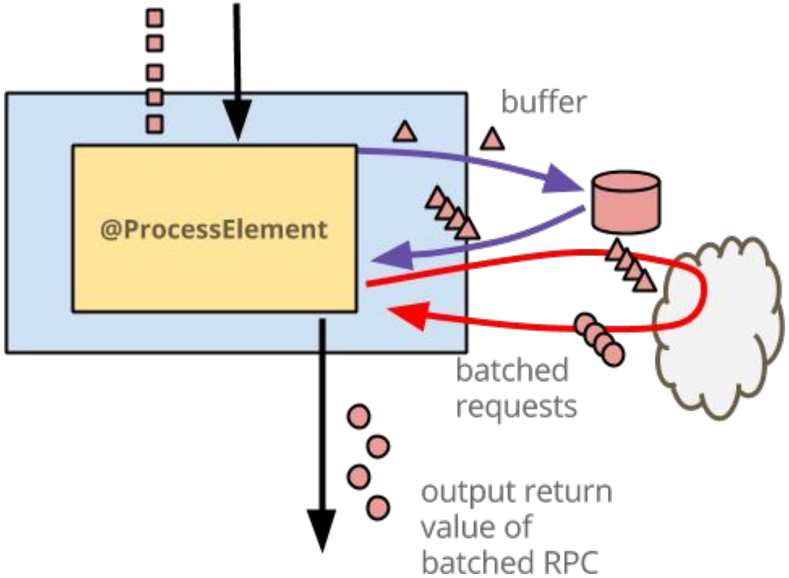

Users
Third-Party Service
Data Security Gateway
Policy Storage
Enterprise Security Administrator
Google Cloud Platform
Stateful DoFn
Data Sources
Structured Text Cloud Storage
Structured Text Cloud Pub/Sub
Beam Row
Dataflow Template Cloud Dataflow
Beam Row
Data Sinks
Tokenized Data Cloud Bigtable
Tokenized Data BigQuery
Tokenized Data Cloud Storage

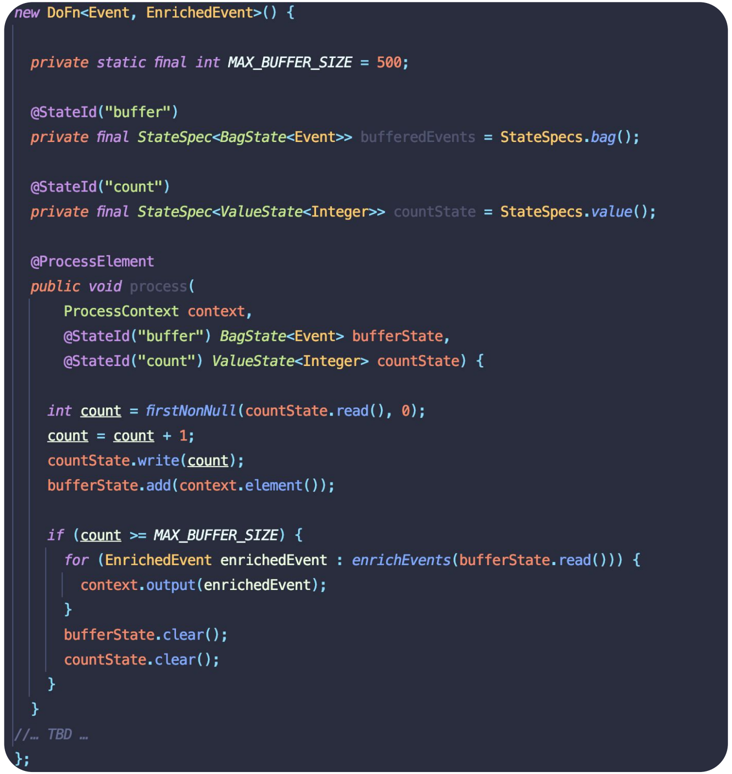
Stateful Processing



More info https://beam.apache.org/blog/stateful-processing/

Stateful DoFn

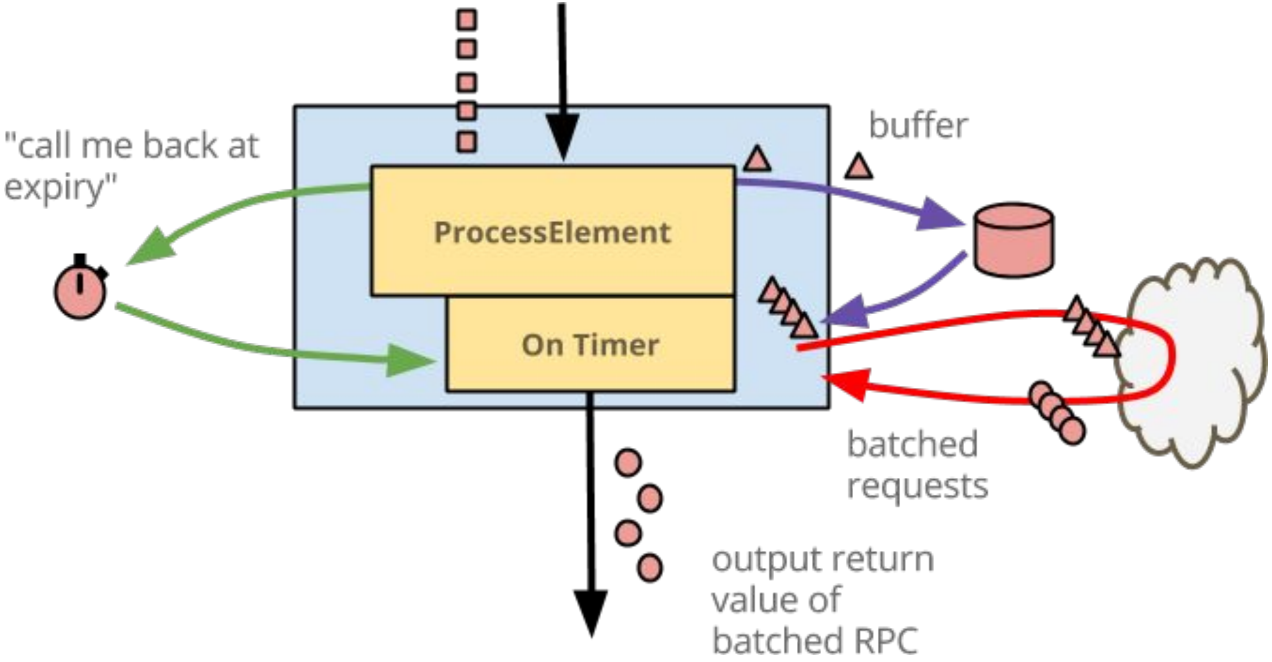




```java
new DoFn<Event, EnrichedEvent>() {

  private static final int MAX_BUFFER_SIZE = 500;

  @StateId("buffer")
  private final StateSpec<BagState<Event>> bufferedEvents = StateSpecs.bag();

  @StateId("count")
  private final StateSpec<ValueState<Integer>> countState = StateSpecs.value();

  @ProcessElement
  public void process(
      ProcessContext context,
      @StateId("buffer") BagState<Event> bufferState,
      @StateId("count") ValueState<Integer> countState) {

    int count = firstNonNull(countState.read(), 0);
    count = count + 1;
    countState.write(count);
    bufferState.add(context.element());

    if (count >= MAX_BUFFER_SIZE) {
      for (EnrichedEvent enrichedEvent : enrichEvents(bufferState.read())) {
        context.output(enrichedEvent);
      }
      bufferState.clear();
      countState.clear();
    }
  }
//… TBD …
};
```

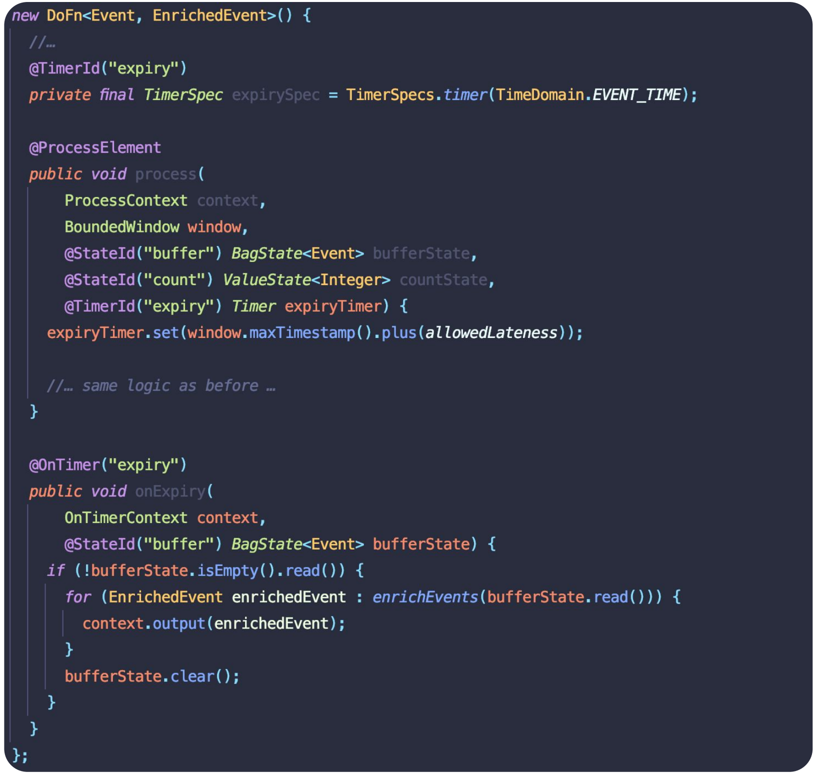
More info https://beam.apache.org/blog/timely-processing/

Timely Stateful Processing



More info https://beam.apache.org/blog/timely-processing/

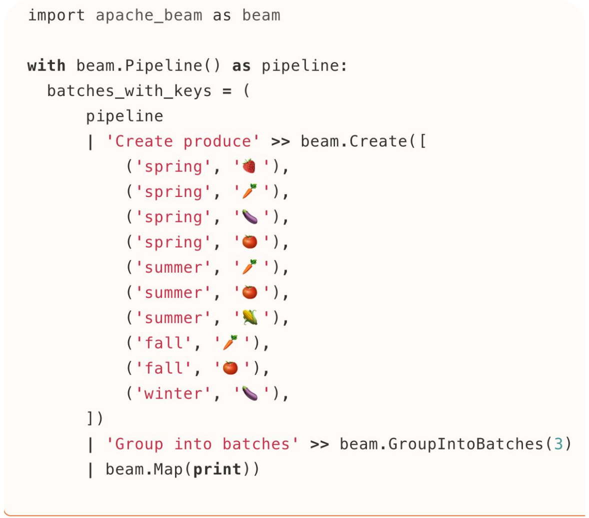
Stateful DoFn with Timer - Implementation



```java
new DoFn<Event, EnrichedEvent>() {
 //…
 @TimerId("expiry")
 private final TimerSpec expirySpec = TimerSpecs.timer(TimeDomain.EVENT_TIME);

 @ProcessElement
 public void process(
   ProcessContext context,
   BoundedWindow window,
   @StateId("buffer") BagState<Event> bufferState,
   @StateId("count") ValueState<Integer> countState,
   @TimerId("expiry") Timer expiryTimer) {
  expiryTimer.set(window.maxTimestamp().plus(allowedLateness));

  //… same logic as before …
 }

 @OnTimer("expiry")
 public void onExpiry(
   OnTimerContext context,
   @StateId("buffer") BagState<Event> bufferState) {
  if (!bufferState.isEmpty().read()) {
   for (EnrichedEvent enrichedEvent : enrichEvents(bufferState.read())) {
    context.output(enrichedEvent);
   }
   bufferState.clear();
  }
 }
};
```

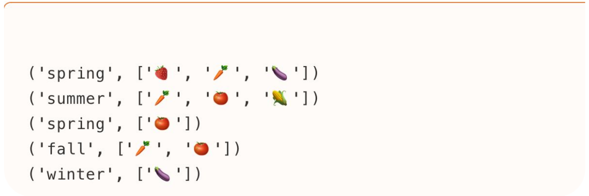
GroupIntoBatches

- Groups your data into batches
- Implemented using Stateful DoFn
- Has several optimizations
    - Prefetches data
    - Autosharding in Dataflow



```
import apache_beam as beam

with beam.Pipeline() as pipeline:
  batches_with_keys = (
      pipeline
      | 'Create produce' >> beam.Create([
          ('spring', '🍓'),
          ('spring', '🥕'),
          ('spring', '🍆'),
          ('spring', '🍅'),
          ('summer', '🥕'),
          ('summer', '🍅'),
          ('summer', '🌽'),
          ('fall', '🥕'),
          ('fall', '🍅'),
          ('winter', '🍆'),
      ])
      | 'Group into batches' >> beam.GroupIntoBatches(3)
      | beam.Map(print))
```

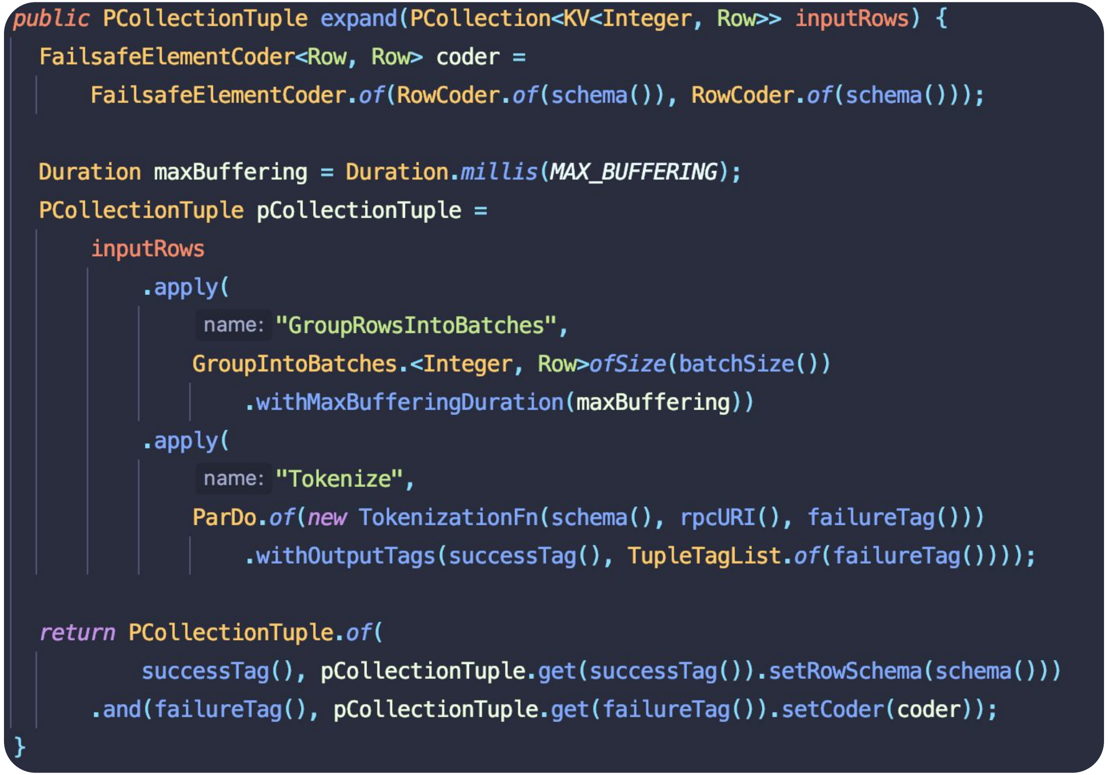
Output:



```
('spring', ['🍓', '🥕', '🍆'])
('summer', ['🥕', '🍅', '🌽'])
('spring', ['🍅'])
('fall', ['🥕', '🍅'])
('winter', ['🍆'])
```

More info
https://beam.apache.org/documentation/transforms/python/aggregation/groupintobatches

Processing with GroupIntoBatches



```
public PCollectionTuple expand(PCollection<KV<Integer, Row>> inputRows) {
  FailsafeElementCoder<Row, Row> coder =
      FailsafeElementCoder.of(RowCoder.of(schema()), RowCoder.of(schema()));

  Duration maxBuffering = Duration.millis(MAX_BUFFERING);
  PCollectionTuple pCollectionTuple =
      inputRows
          .apply(
              name: "GroupRowsIntoBatches",
              GroupIntoBatches.<Integer, Row>ofSize(batchSize())
                  .withMaxBufferingDuration(maxBuffering))
          .apply(
              name: "Tokenize",
              ParDo.of(new TokenizationFn(schema(), rpcURI(), failureTag()))
                  .withOutputTags(successTag(), TupleTagList.of(failureTag())));

  return PCollectionTuple.of(
          successTag(), pCollectionTuple.get(successTag()).setRowSchema(schema()))
      .and(failureTag(), pCollectionTuple.get(failureTag()).setCoder(coder));
}
```

Use Case Recommendations

Stateful DoFn

Customization of stateful processing

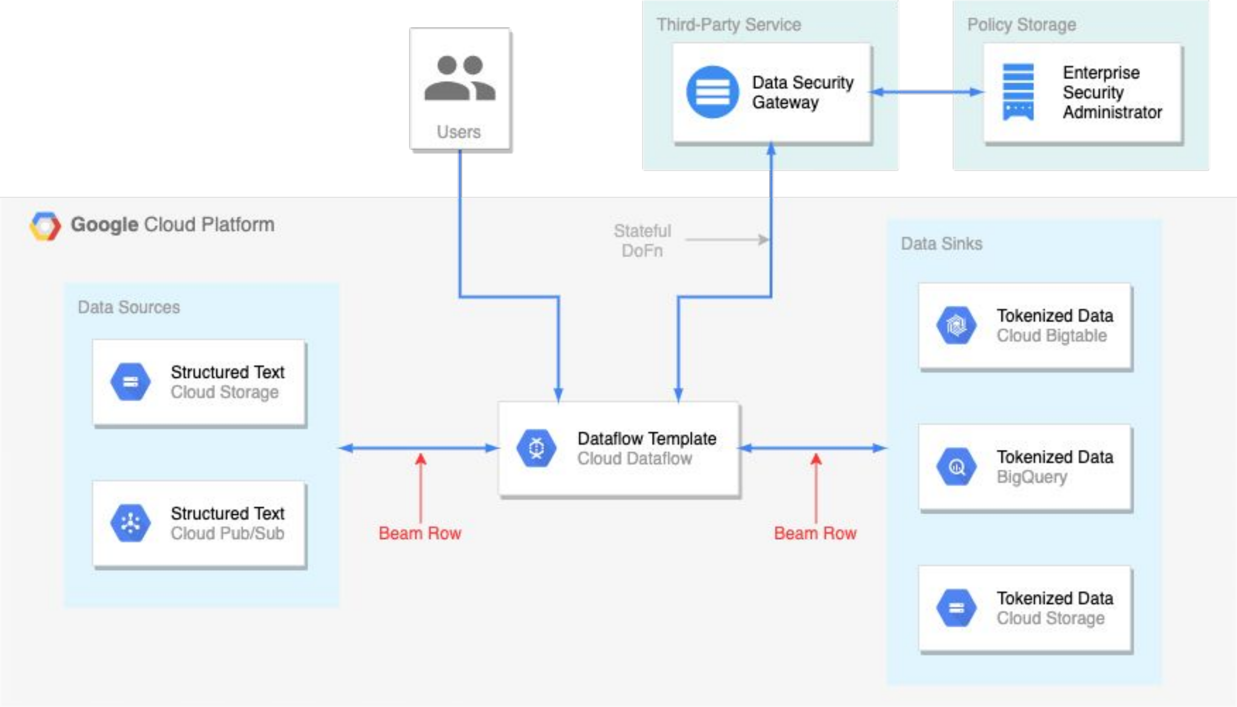
- Deduplication
- Arbitrary-but-consistent indexing

GroupIntoBatches

Optimized out-of-the-box transform

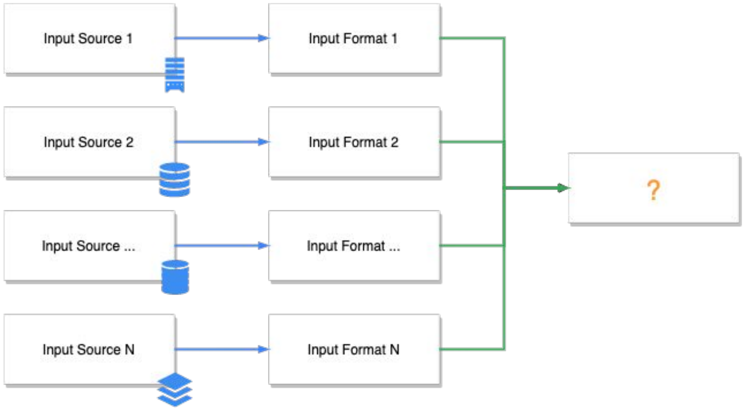
- External API call
- Data preparation for ML model

Data Protection Using Tokenization



How to Represent Data in Pipeline Code?

- Common abstractions for data representation
- Avoid writing transformation again and again
- Common interface to all IO transforms
- Easy and effective to serialize



Common Approaches

Text based formats

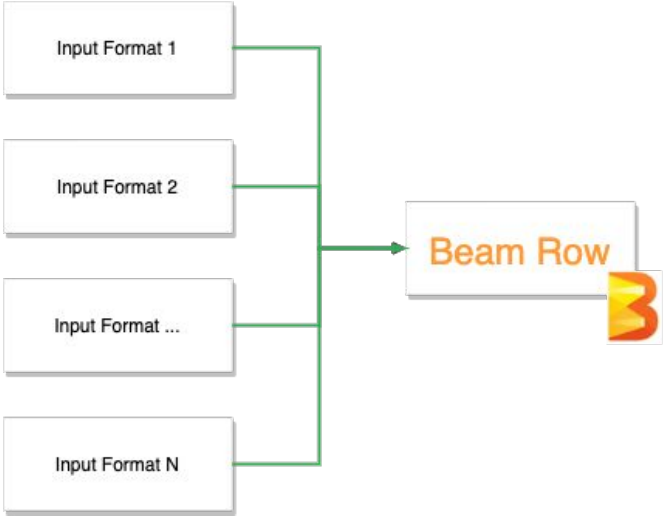
- XML
- JSON
- CSV
- YAML

Binary based formats

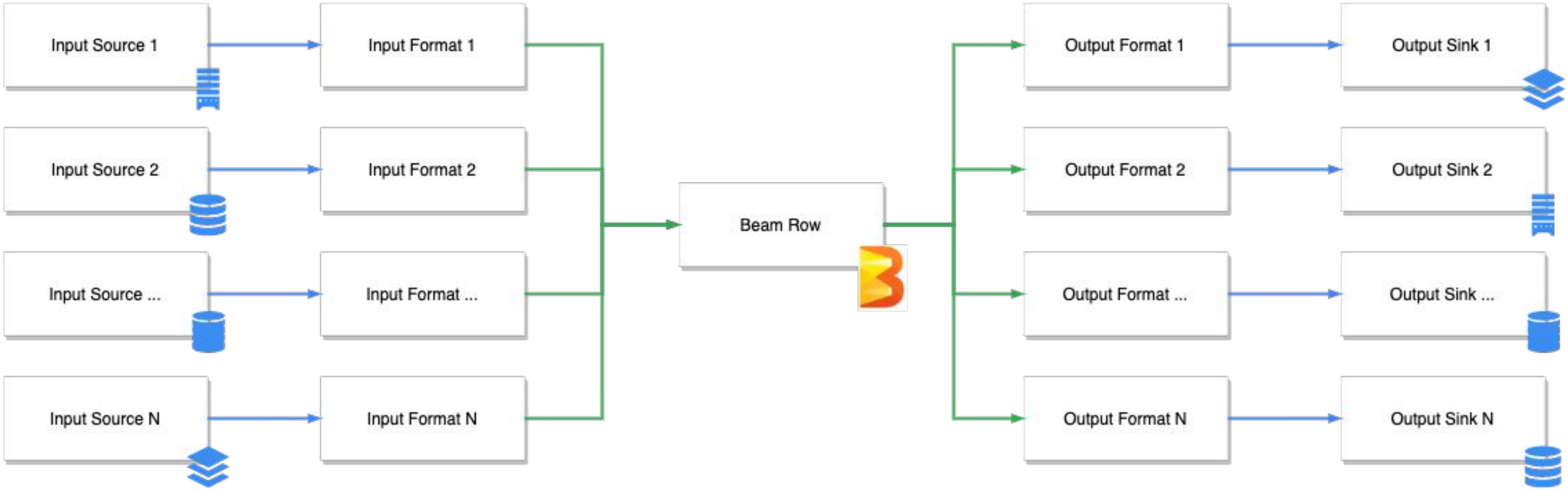
- Apache Avro
- Protobuf
- MessagePack

Beam Row!

- A schema which supports primitives
- Ordering same with schema
- Quite effective serialization using RowCoder
- Generic for json specified schema
- Available for Beam SQL



How We Use Beam Row?



Demo

- Template overview
- Add a new input source Parquet IO
- Implement Transform Parquet to Row
- Build and Run template

Demo

Template Overview

- ☑ Java Template structure
- ☑ Metadata file
- ☑ Schemas
- ☑ IO transforms

Add a New Input Source Parquet IO

- ☑ Read .parquet files

Implement Transform Parquet to Row

- ☑ Transform from Parquet to Beam Row
- ☑ Work with schemas

Build and Run Template

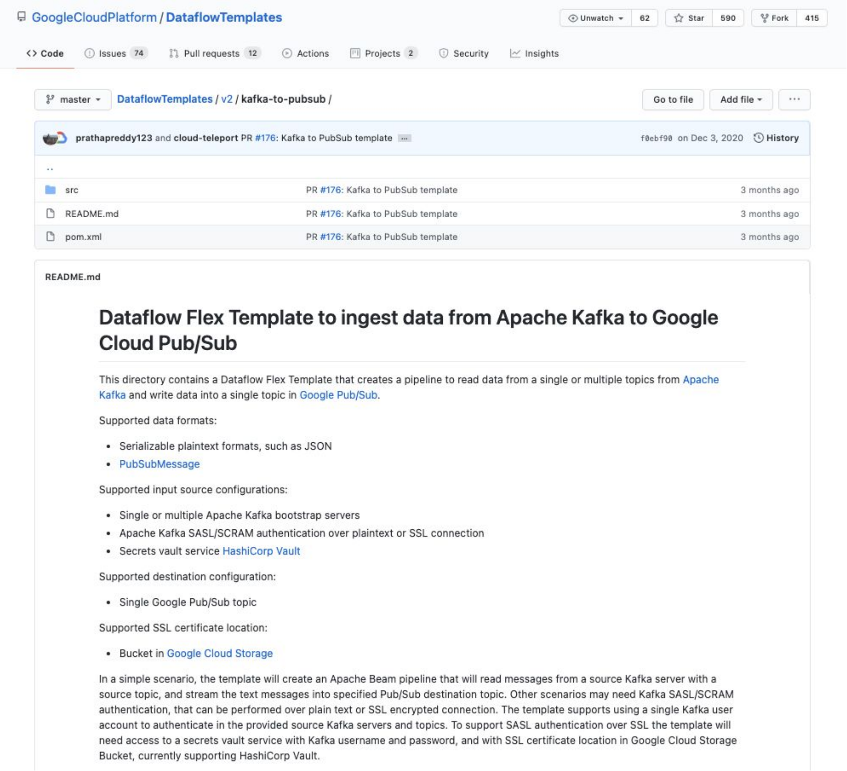
- ☑ Template building
- ☑ Ways to run template

Visit codelab at https://github.com/akvelon/codelabs

Contributing to Dataflow Templates

https://github.com/GoogleCloudPlatform/DataflowTemplates

1. Fork the repository to develop your template
2. Follow style guides and best practices
3. Sign CLA
4. Create a PR
5. LGTM code review!



prathapreddy123 and cloud-teleport PR #176: Kafka to PubSub template … f0ebf90 on Dec 3, 2020

..		
src	PR #176: Kafka to PubSub template	3 months ago
README.md	PR #176: Kafka to PubSub template	3 months ago
pom.xml	PR #176: Kafka to PubSub template	3 months ago

README.md

Dataflow Flex Template to ingest data from Apache Kafka to Google Cloud Pub/Sub

This directory contains a Dataflow Flex Template that creates a pipeline to read data from a single or multiple topics from Apache Kafka and write data into a single topic in Google Pub/Sub.

Supported data formats:

- Serializable plaintext formats, such as JSON
- PubSubMessage

Supported input source configurations:

- Single or multiple Apache Kafka bootstrap servers
- Apache Kafka SASL/SCRAM authentication over plaintext or SSL connection
- Secrets vault service HashiCorp Vault

Supported destination configuration:

- Single Google Pub/Sub topic

Supported SSL certificate location:

- Bucket in Google Cloud Storage

In a simple scenario, the template will create an Apache Beam pipeline that will read messages from a source Kafka server with a source topic, and stream the text messages into specified Pub/Sub destination topic. Other scenarios may need Kafka SASL/SCRAM authentication, that can be performed over plain text or SSL encrypted connection. The template supports using a single Kafka user account to authenticate in the provided source Kafka servers and topics. To support SASL authentication over SSL the template will need access to a secrets vault service with Kafka username and password, and with SSL certificate location in Google Cloud Storage Bucket, currently supporting HashiCorp Vault.

Summary

- Dataflow Flex templates package pipelines into containers
- Stateful processing in Apache Beam
- BeamRow provides flexible abstraction for data representation
- [DataflowTemplates]() repository - Google and community contributed templates and utilities

Thank You!

https://akvelon.com/

@AkvelonInc