



GCP Dataflow Architecture

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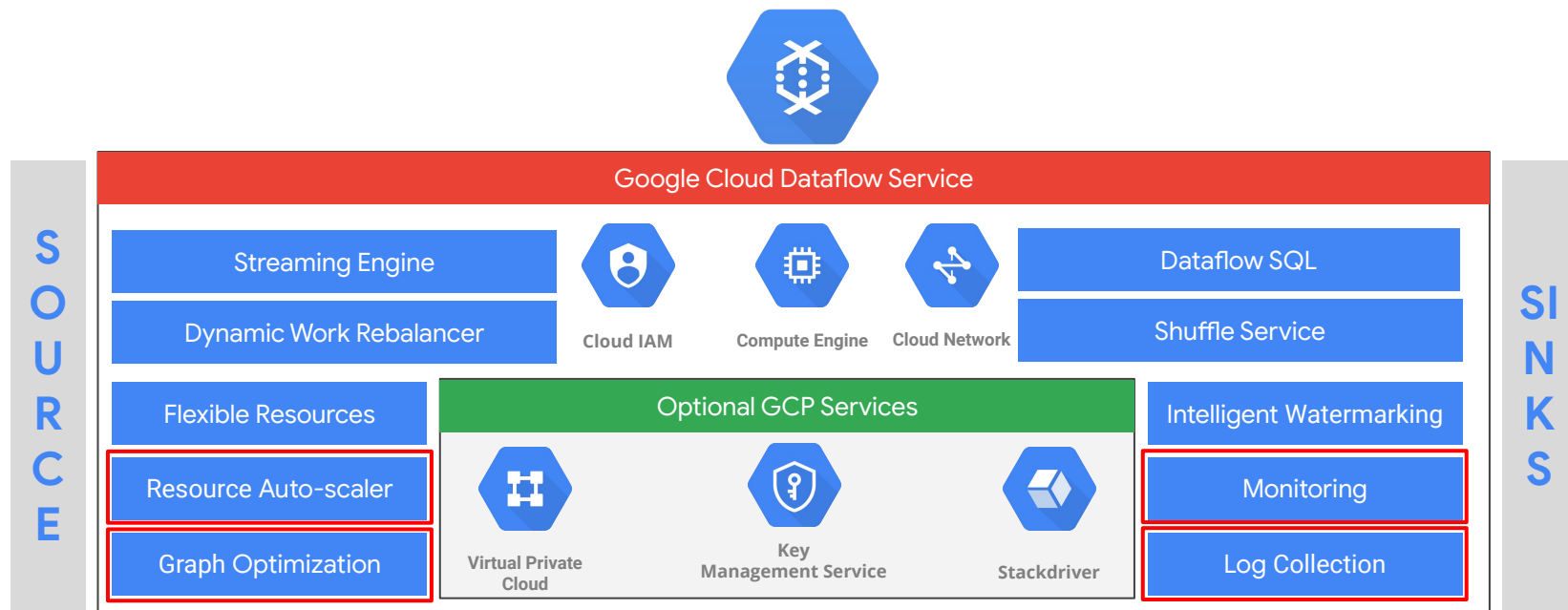
Software Engineer, Google



Goals

- Overview of Dataflow Runner architecture
- Overview of Dataflow Runner core features
- GCP Horizontal services integrations

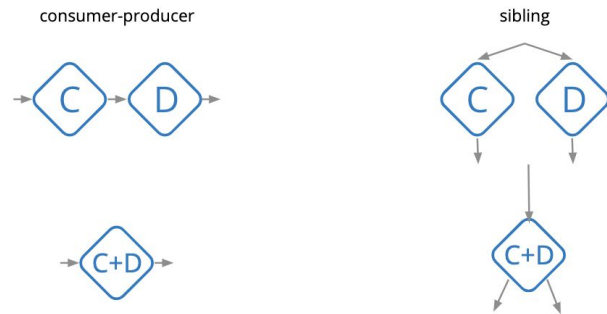
Google Cloud Dataflow Service



Dataflow features

Graph optimization

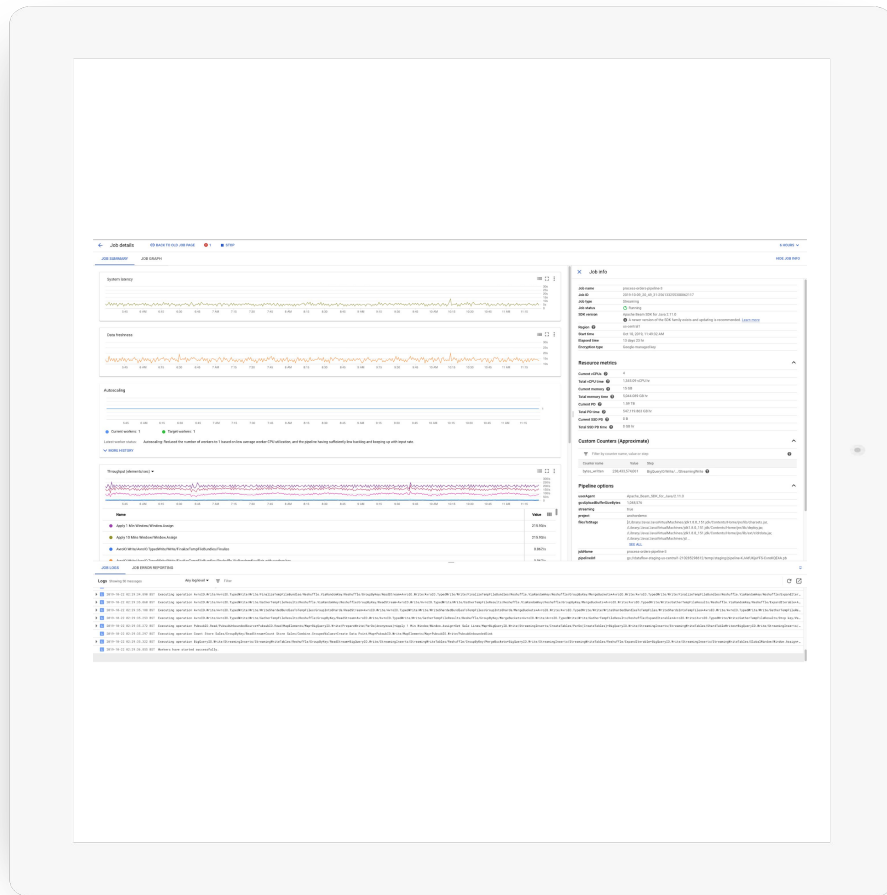
- Producer - Consumer Fusion
- Sibling Fusion
- Others...



Dataflow features

Monitoring

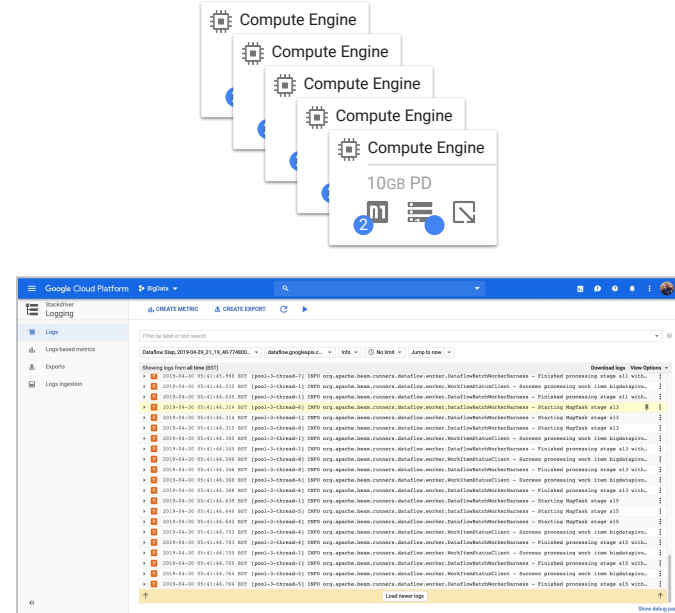
- Dataflow job page
 - Enhanced observability features



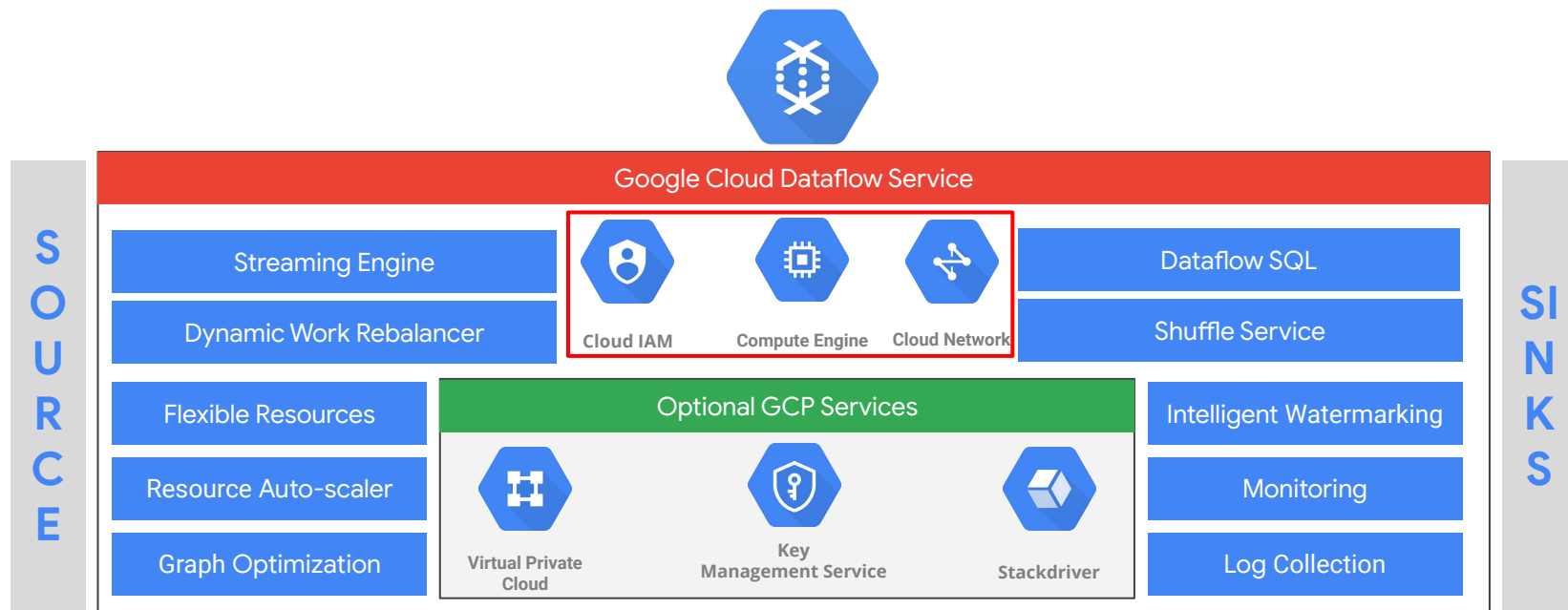
Dataflow features

Centralized Logging

- Single searchable logging via stackdriver

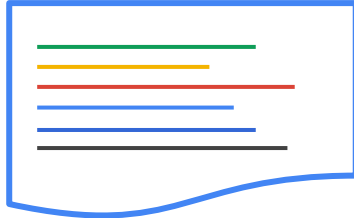


Google Cloud Dataflow Service



At a very high level: a user submits a processing pipeline to our managed service, which optimizes it and runs a pool of virtual machines (sometimes called workers) to do the work.

User pipeline code and [SDK](#)

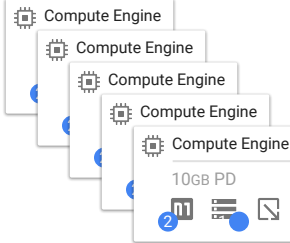


Regional Endpoint

Job Manager



Deploy and
Schedule



Cloud Platform

Dataflow & Compute Engine

Region endpoint

- Deploys and controls Dataflow workers and stores Job Metadata
- Region is **us-central1** by default, unless explicitly set using the region parameter

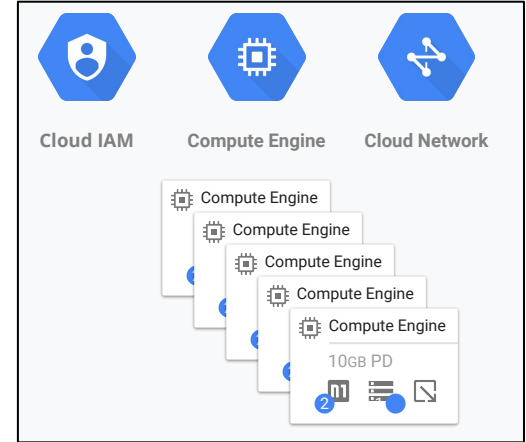
Zone

- Defines the locations of the Dataflow workers
- Defaults to a zone in the region selected based on available zone capacity. It can be overridden using the zone parameter.

The zone does not need to be in the same region as the endpoint. Reasons you may want to do this include:

- Security and Compliance
- Data locality
- Resilience and geographic separation

Caution: If you override the zone and the zone is in a different region than the regional endpoint, there may be negative impact on performance, network traffic, and network latency.



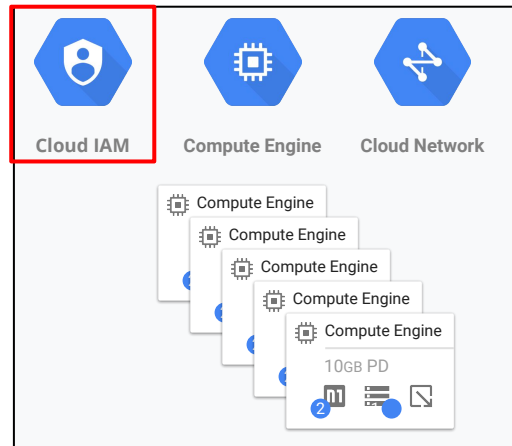
Dataflow & Compute Engine

Identity Access Management

There are a minimum of 2 service accounts used by the Dataflow service

- Dataflow Service Account
(`service-<project-number>@dataflow-service-producer-prod.iam.gserviceaccount.com`)
 - Used for worker creation, monitoring etc...
- Controller Service Account
 - `<project-number>-compute@developer.gserviceaccount.com`
 - Used by the workers to access resources needed by the pipeline, for example files on a Google Cloud Storage Bucket
 - Can be overridden using **--serviceAccount**

Third service account could be used to actually submit the pipeline to the service.



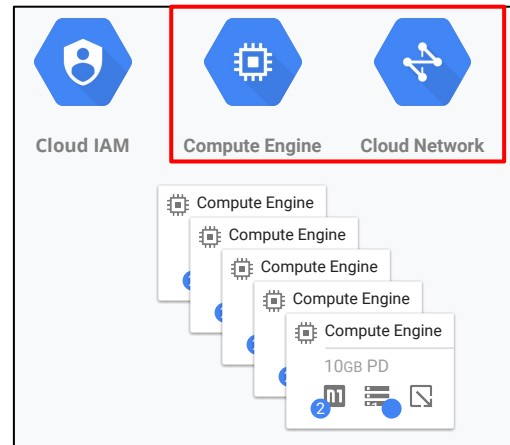
Compute Quotas - CPU / IP'S

A dataflow worker will always have the following quota requirements:

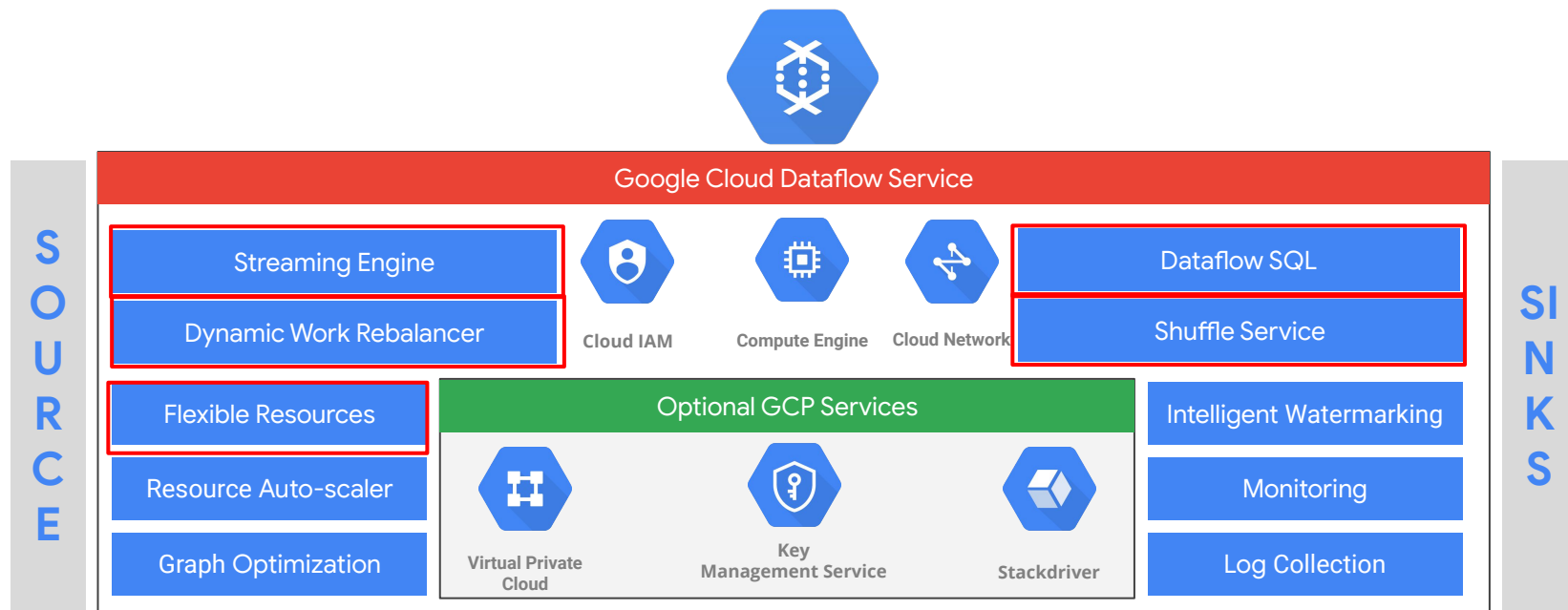
- Regional CPU quota for the type-of-instance * Maximum Workers
- Public Ip address equal to Maximum Workers, unless **usePublicIps** is set to false (default is true).

PD disk quota to cover the Max Workers * disk-per-instance

- SSD disk quota to cover the Max Workers * disk-per-instance if workerDiskType is set to SSD.



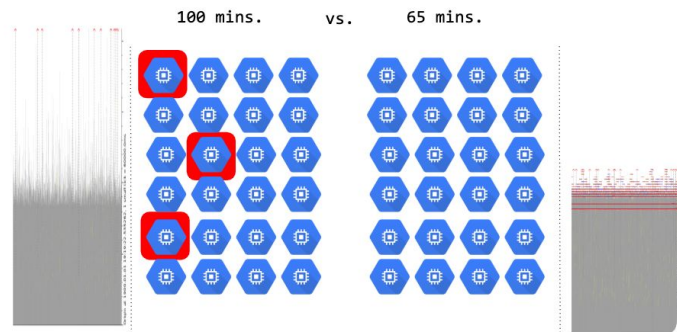
Google Cloud Dataflow Service



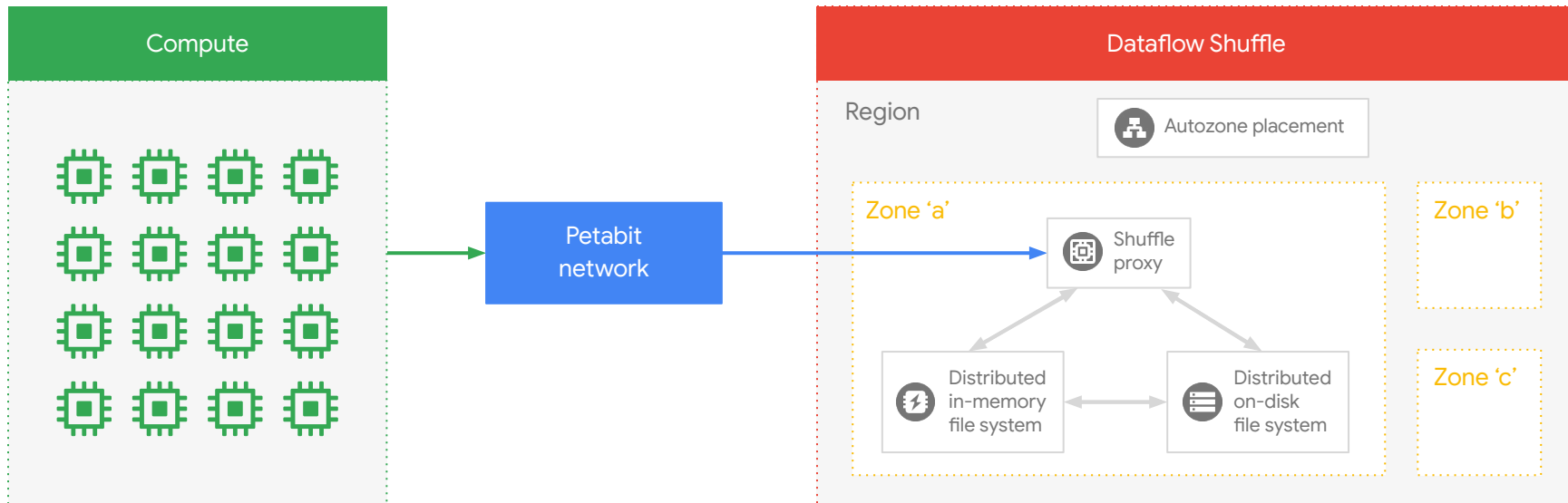
Dataflow features

Batch Dynamic Work Redistribution

- Redistribute hot keys for more even workload distribution.
- Fully automated



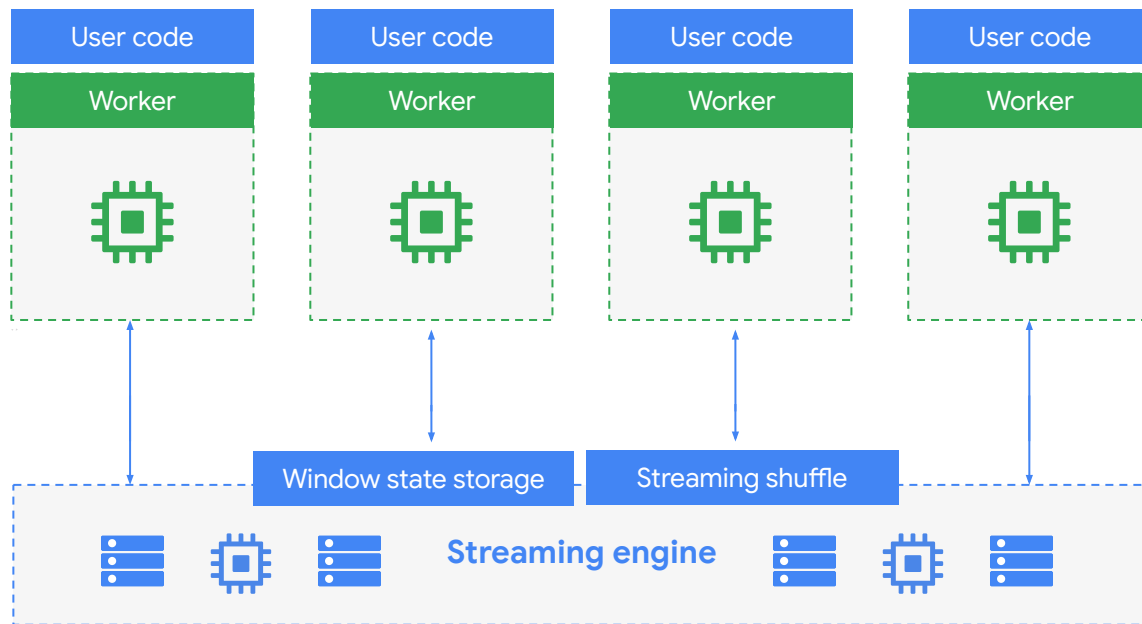
Dataflow Shuffle - Batch



Dataflow Streaming Engine

Benefits

- ✓ Smoother autoscaling
- ✓ Better supportability
- ✓ Less worker resources



Dataflow SQL UI

No coding required

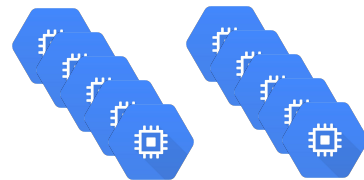
- Write SQL in BigQuery UI
- Use Schemas from Data Catalog
- Submit Dataflow jobs

```
SELECT payload.userId,  
       payload.productId  
FROM pubsub.topic.project.transactions  
WHERE  
  payload.location.latitude < 40.72  
AND  
  payload.location.latitude > 40.699  
AND  
  payload.location.longitude < -73.969  
AND  
  payload.location.longitude > -74.747
```

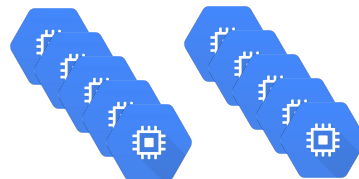

Dataflow features

Flexible Resource Scheduling

- FlexRS reduces batch processing costs by using advanced [scheduling techniques](#), the [Cloud Dataflow Shuffle](#) service, and a combination of [preemptible virtual machine \(VM\) instances](#) and regular VMs.
- Jobs with FlexRS use service-based [Cloud Dataflow Shuffle](#) for joining and grouping.



Standard VM



Preemptible
VM

Dataflow Templates

No coding required

- Select one of 20+ Google-provided templates or use your own
- Popular ETL sources and sinks
- Streaming and Batch modes
- Launch from GCS or Pub/Sub browsers

The screenshot shows the 'Create job from template' page in the Google Cloud Dataflow console. The page is titled 'Dataflow' and 'Create job from template'. It guides the user through creating a Dataflow job to export data from Cloud Pub/Sub to GCS Text File.

Create a Dataflow job to export data from Cloud Pub/Sub to GCS Text File

Job name
Must be unique among running jobs. Use lowercase letters, numbers, and hyphens (-).

Cloud Dataflow template
A pipeline that reads from a Pub/Sub topic and writes messages text files stored in GCS. Note that this pipeline assumes no newlines in the body of the Pub/Sub message and thus each message becomes a single line in the output file.

Required Parameters

Regional endpoint
Choose where to deploy Cloud Dataflow workers and store metadata for the job.

Input Cloud Pub/Sub topic
Cloud Pub/Sub topic to read the input from. The topic name should be in the format of projects/<project-id>/topics/<topic-name>.

Output Cloud Storage directory
Path and filename prefix for writing output files (ex: gs://bucket-name/path/). This value must end in a slash.

Output file prefix
The prefix to place on each windowed file (ex: output-).

Temporary location
Path and filename prefix for writing temporary files. ex: gs://MyBucket/tmp

Optional parameters

Diagram: A vertical flow diagram showing the pipeline steps: 'Read PubSub Events' (with a Pub/Sub icon) connects to '5m Window', which connects to 'Write File(s)'.

Notes:

- Once you run this job, you can view its status on the next screen to confirm that no errors occurred and all data exported successfully. You can also stop it at any time.
- This streaming pipeline will cost you between \$0.40 and \$1.20 per hour in the us-central1 region...

[More](#)

Summary

1. Architecture
 2. DAG optimization
 3. Shuffle Service
 4. Streaming Engine
 5. Monitoring / Logging
 6. Flexible Resource Scheduling
 7. Out of the box Templates
 8. SQL UI
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Thank you!

Questions?

