Google Cloud

Serverless Messaging with Cloud Pub/Sub

Agenda

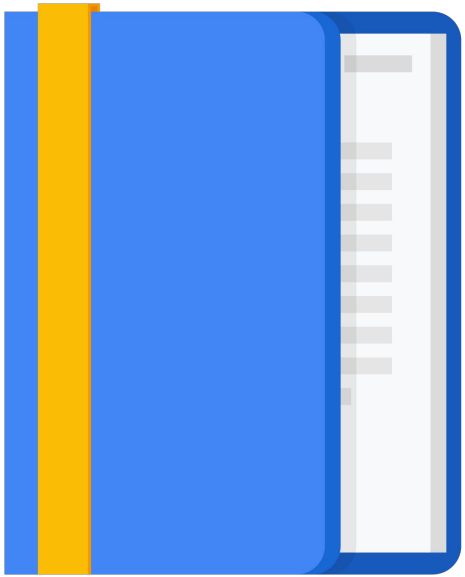
Processing Streaming Data

Cloud Pub/Sub

Cloud Dataflow Streaming Features

BigQuery and Bigtable Streaming Features

Advanced BigQuery Functionality



Cloud Pub/Sub

Cloud Pub/Sub

Qualities that Cloud Pub/Sub contribute to Data Engineering solutions:

- **Availability**
- Durability
- Scalability

100s of milliseconds

Google Cloud

Cloud Pub/Sub

Cloud Pub/Sub

Qualities that Cloud Pub/Sub contribute to Data Engineering solutions:

- Availability
- Durability
- Scalability

100s of milliseconds

Google Cloud

Cloud Pub/Sub

Cloud Pub/Sub

Qualities that Cloud Pub/Sub contribute to Data Engineering solutions:

- Availability
- Durability
- Scalability

100s of milliseconds

Google Cloud

Cloud Pub/Sub

Cloud Pub/Sub

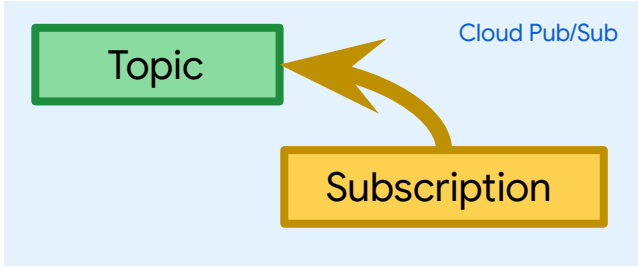
Qualities that Cloud Pub/Sub contribute to Data Engineering solutions:

- Availability
- Durability
- Scalability

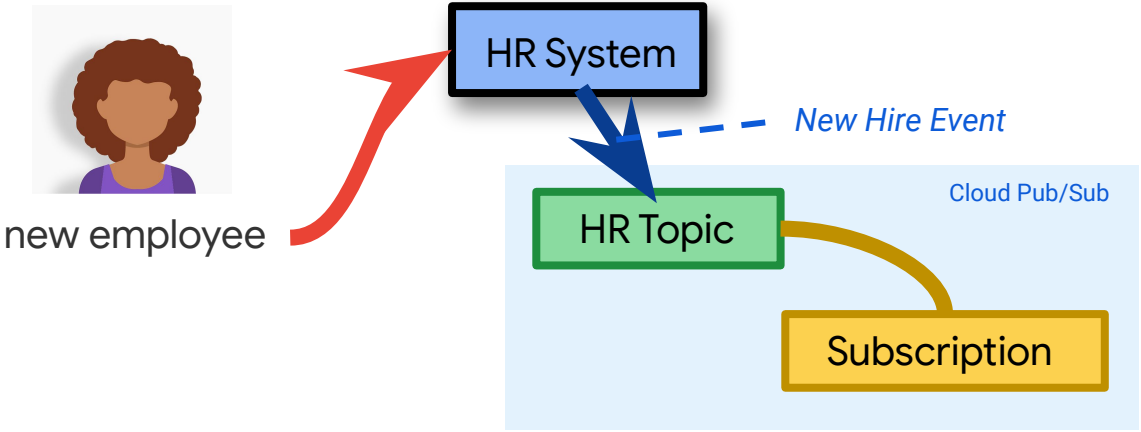
100s of milliseconds

Google Cloud

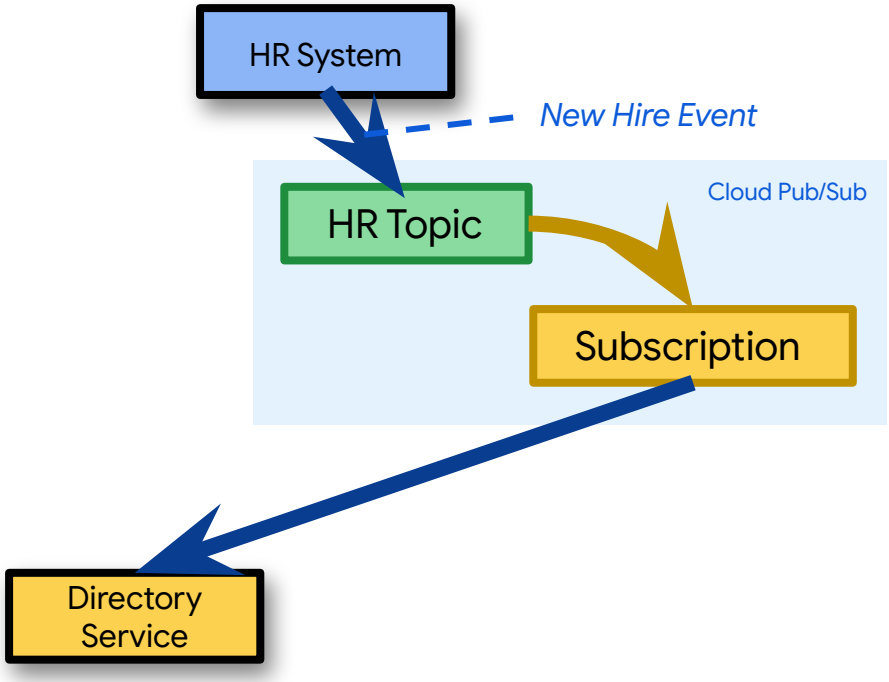
Example of a Cloud Pub/Sub application



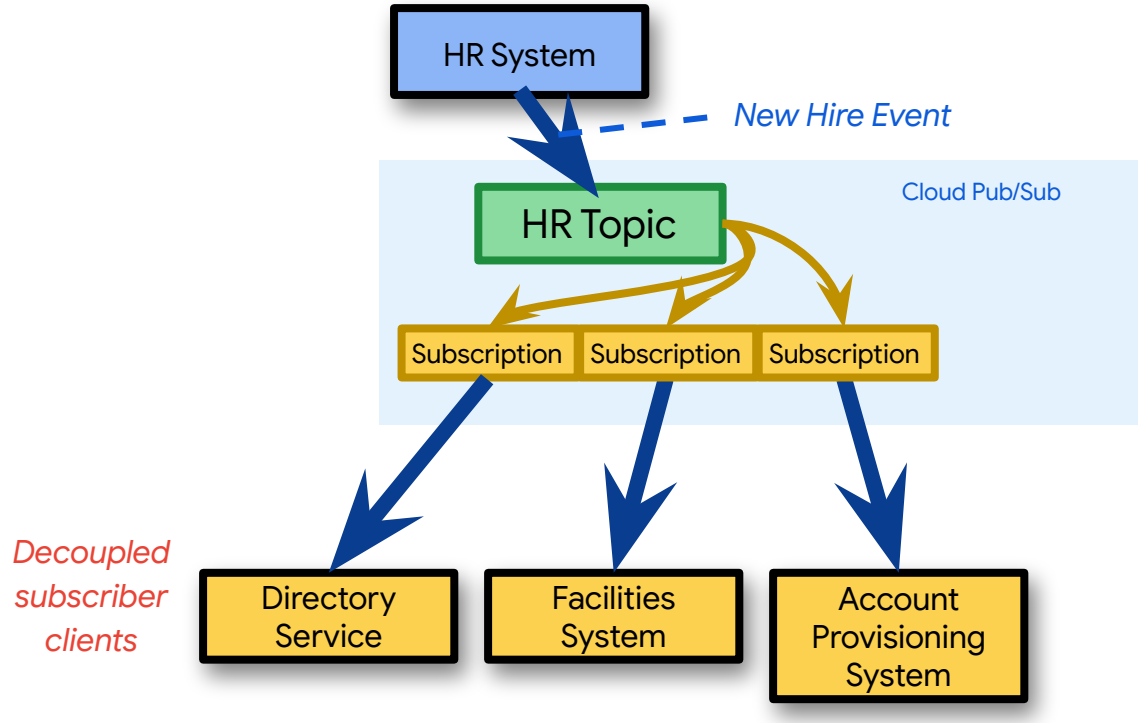
A new employees arrives causing a new hire event.



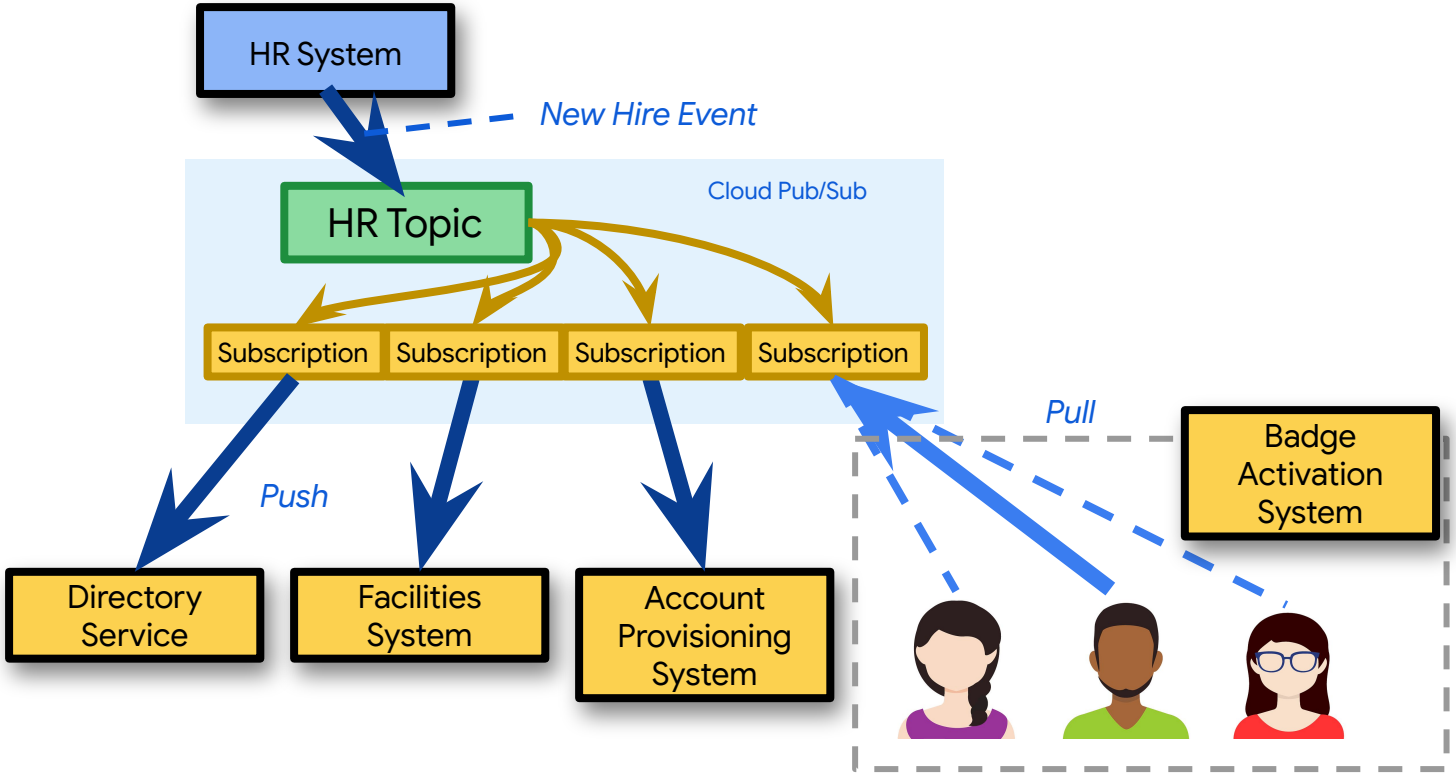
The message is sent from Topic to Subscription



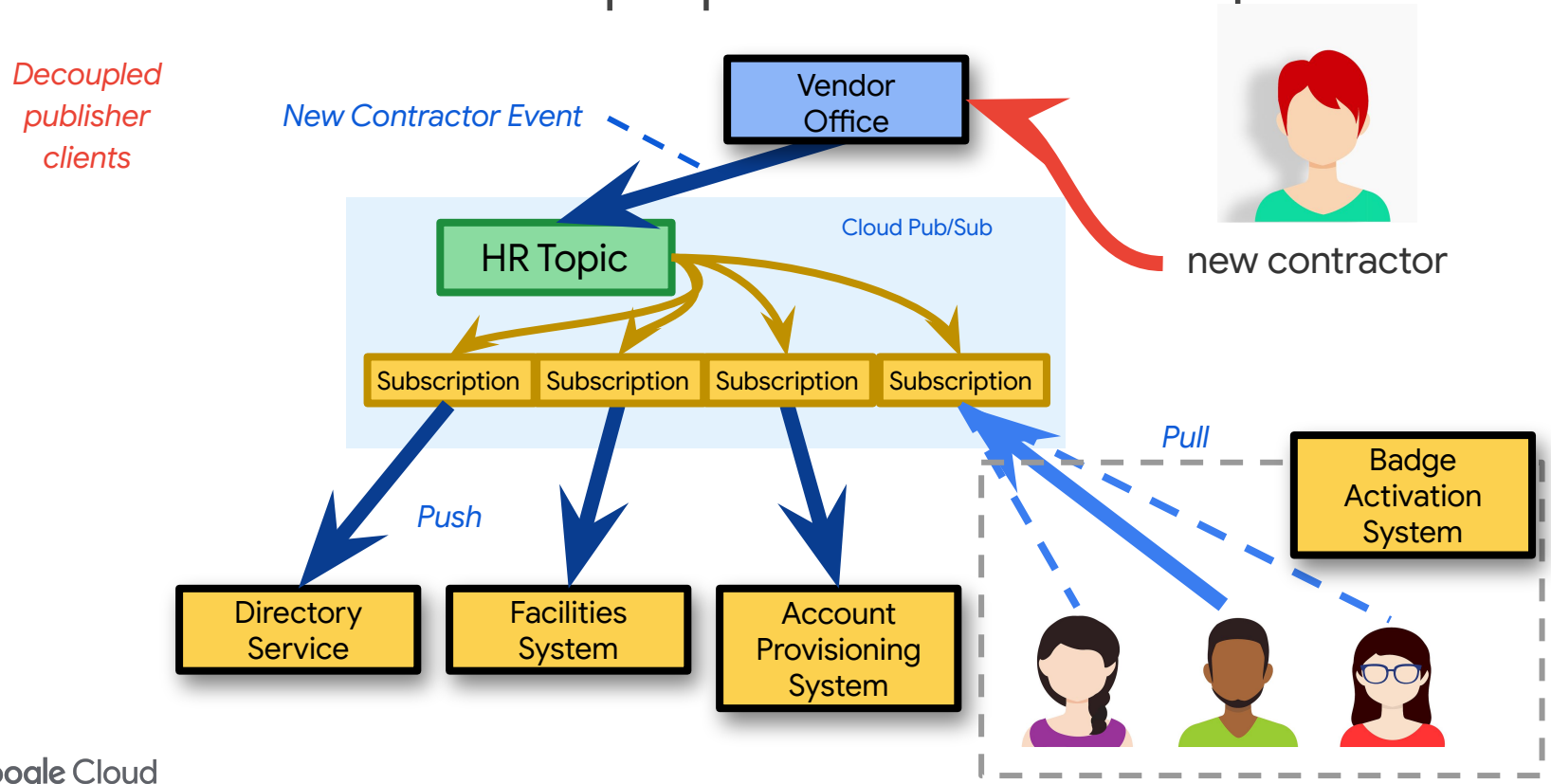
There can be multiple Subscriptions for each Topic



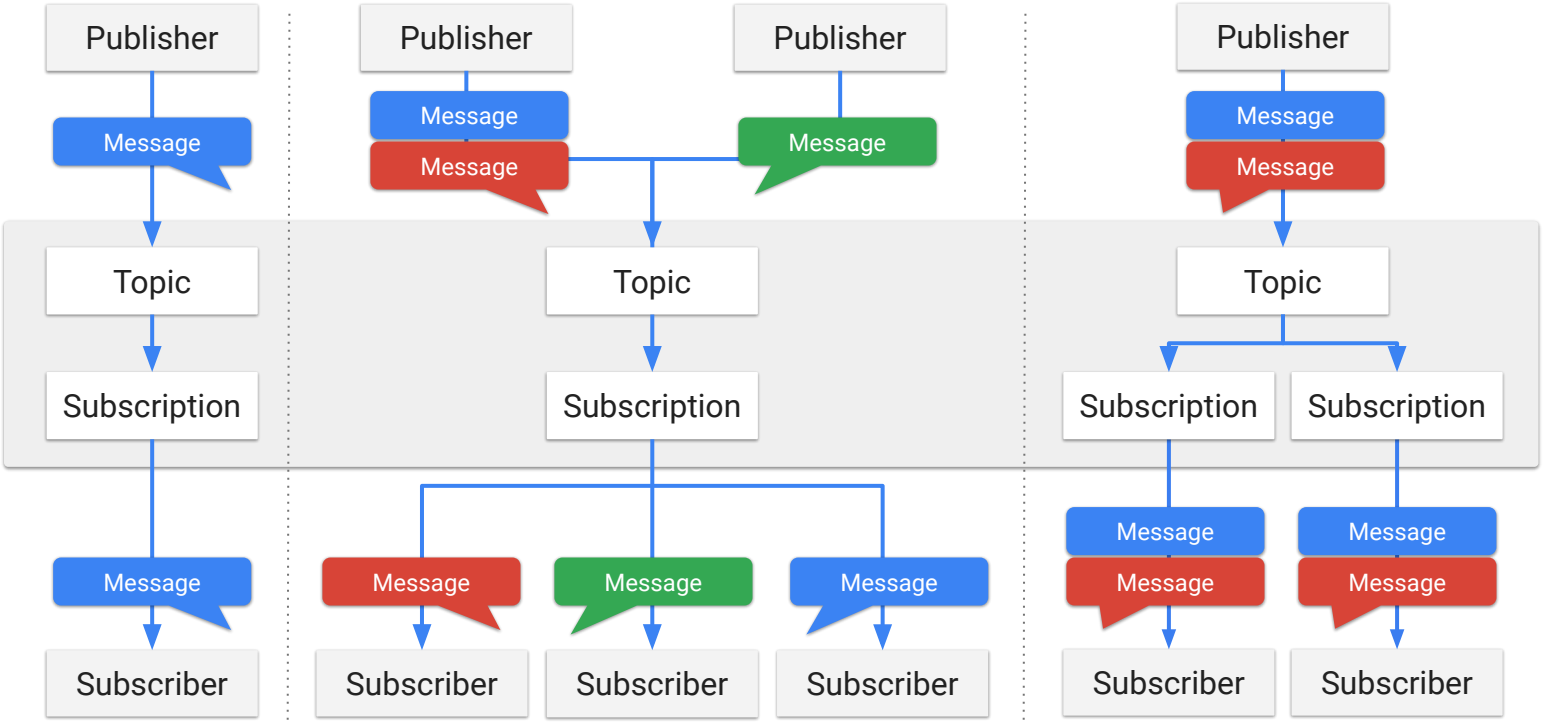
And there can be multiple subscribers per Subscription



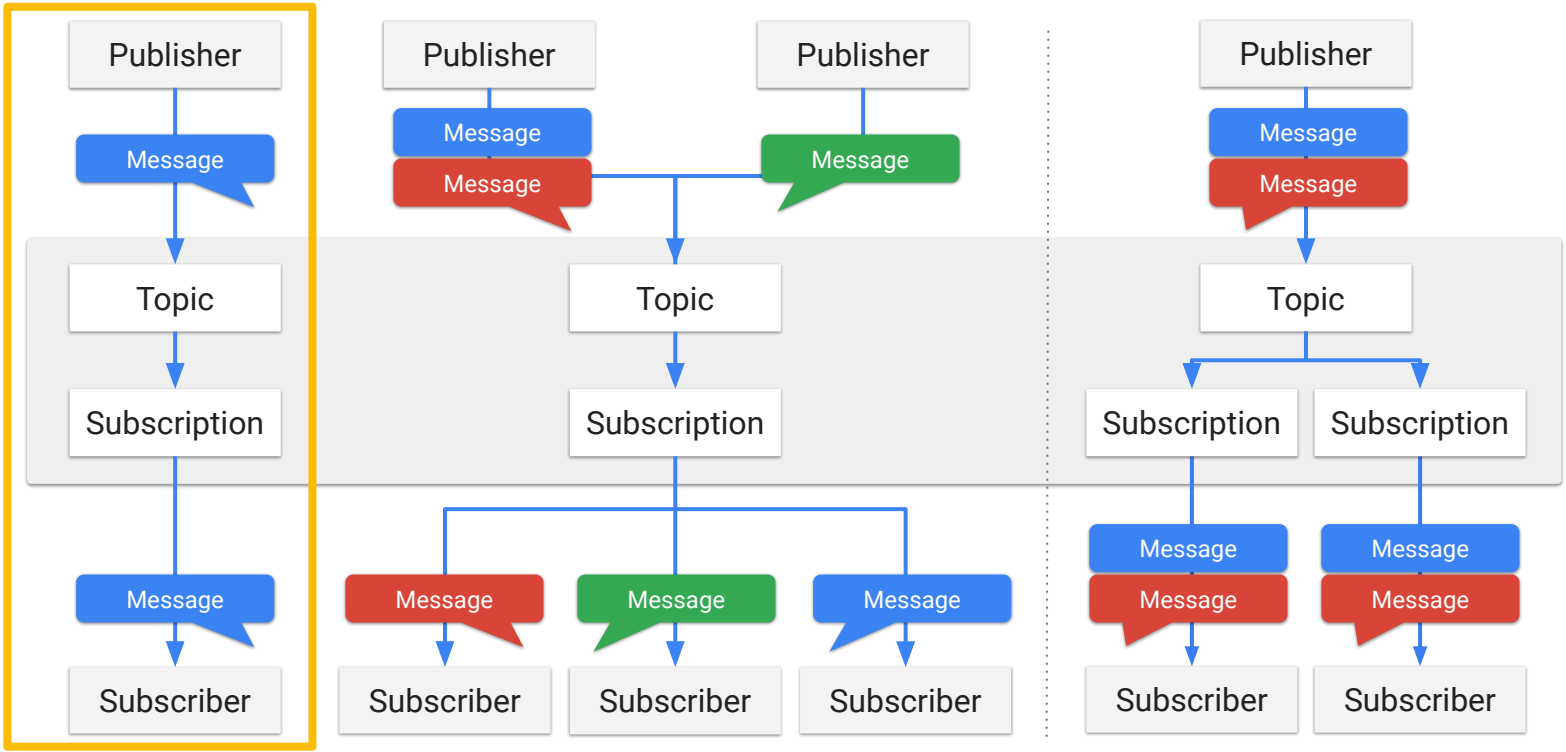
And there can be multiple publishers to the Topic



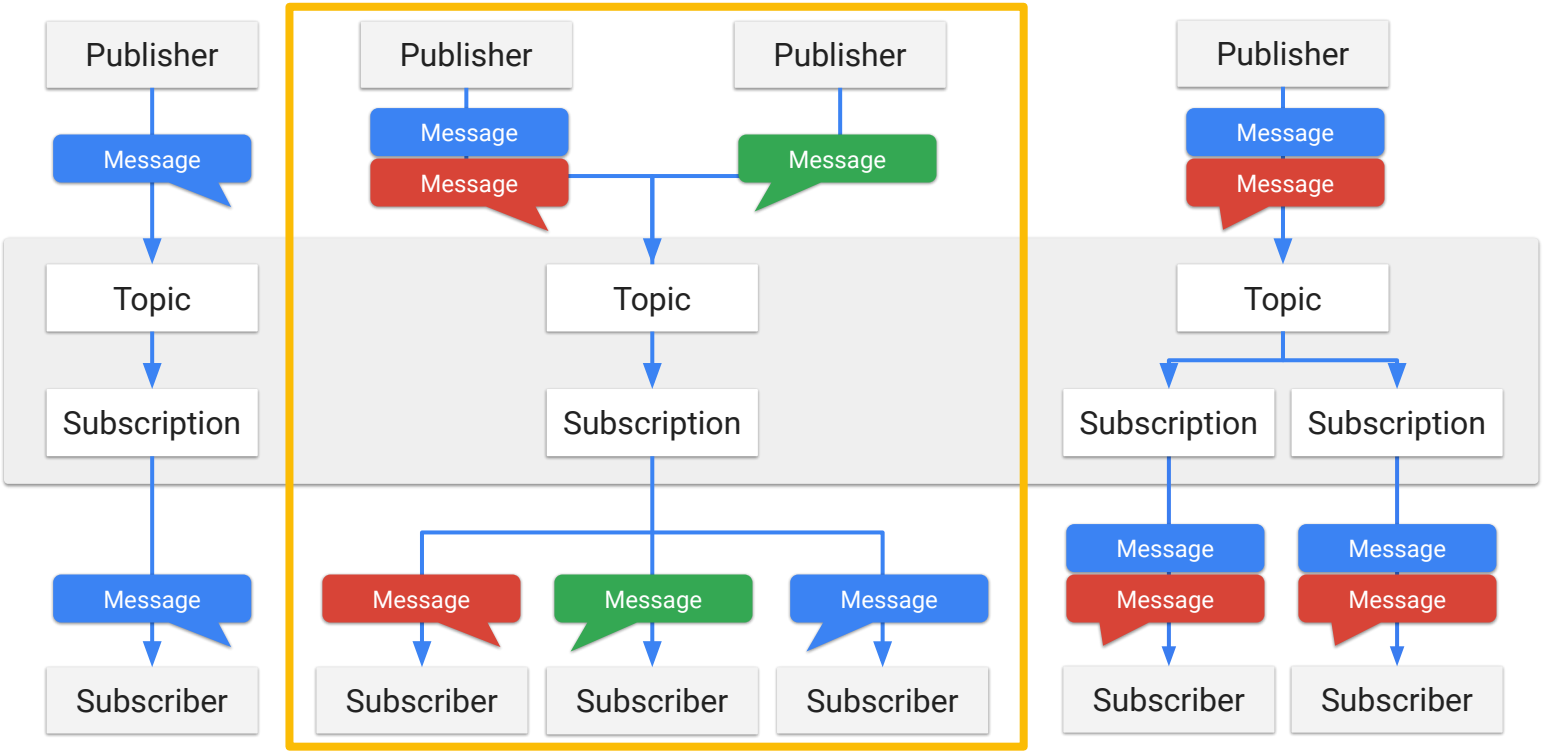
Publish/Subscribe patterns



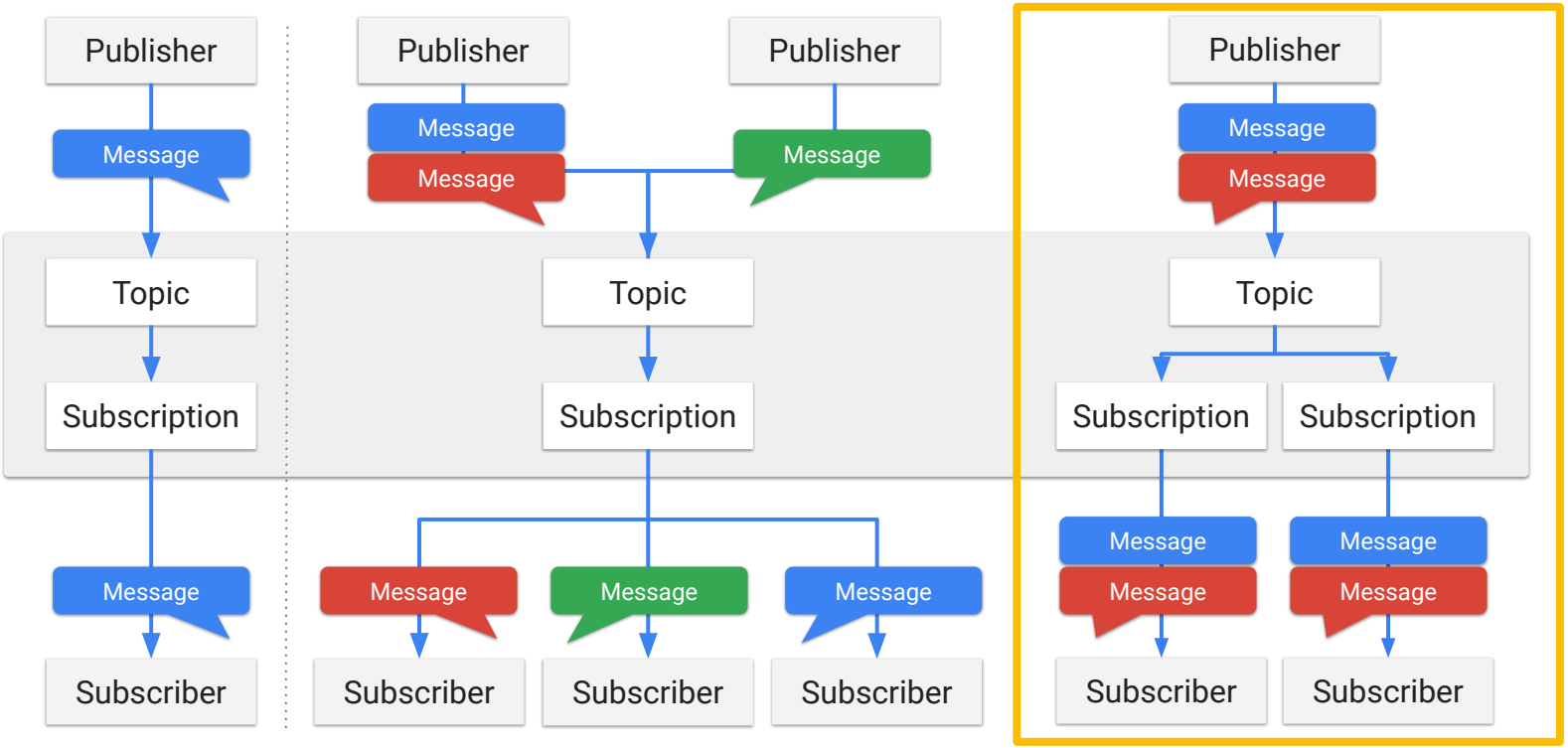
Publish/Subscribe patterns



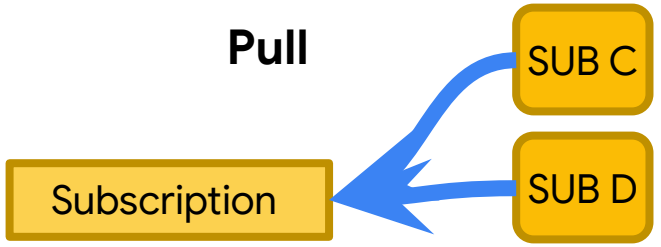
Publish/Subscribe patterns

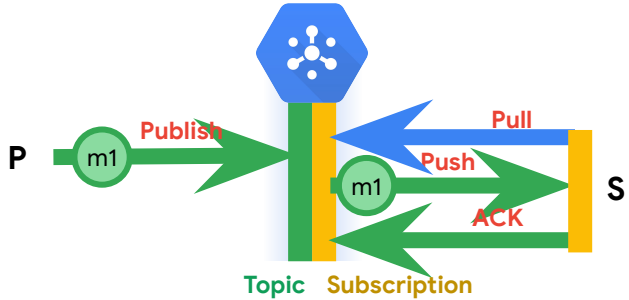


Publish/Subscribe patterns



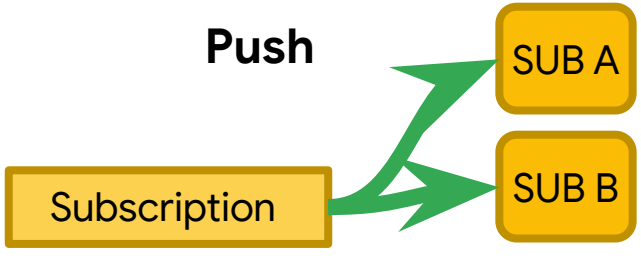
Cloud Pub/Sub provides both Push and Pull delivery

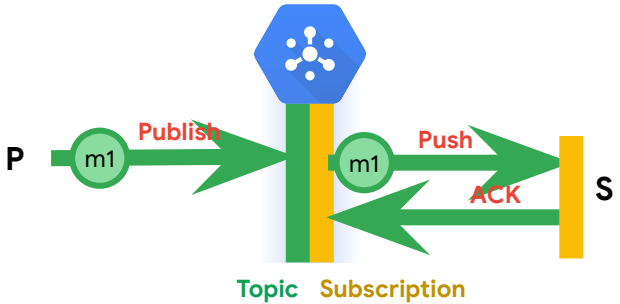




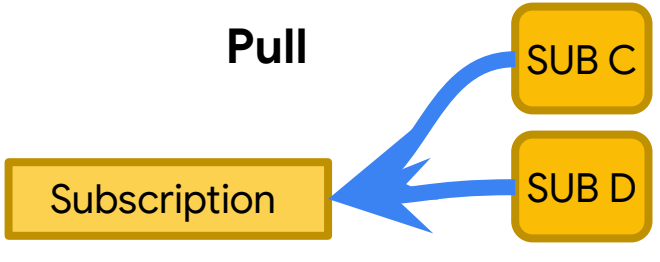
Messages are stored up to
7 days

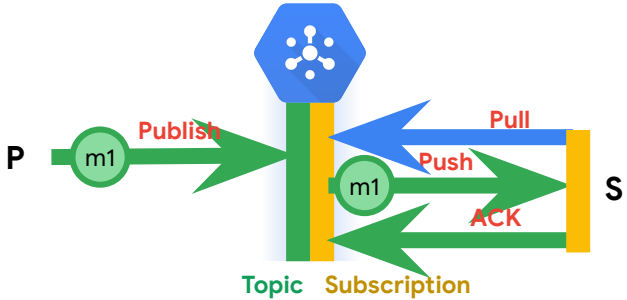
Cloud Pub/Sub provides both Push and Pull delivery





Acknowledgement used for dynamic rate control

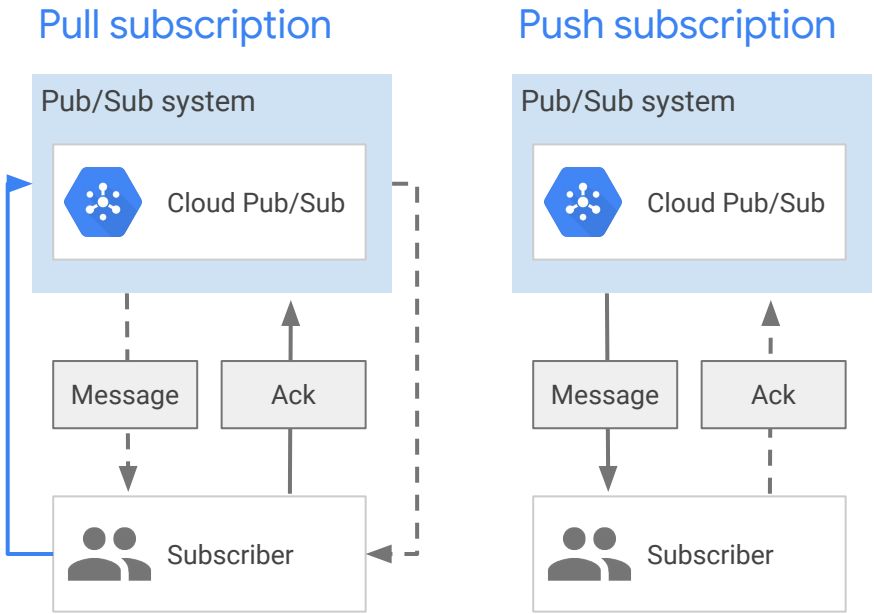




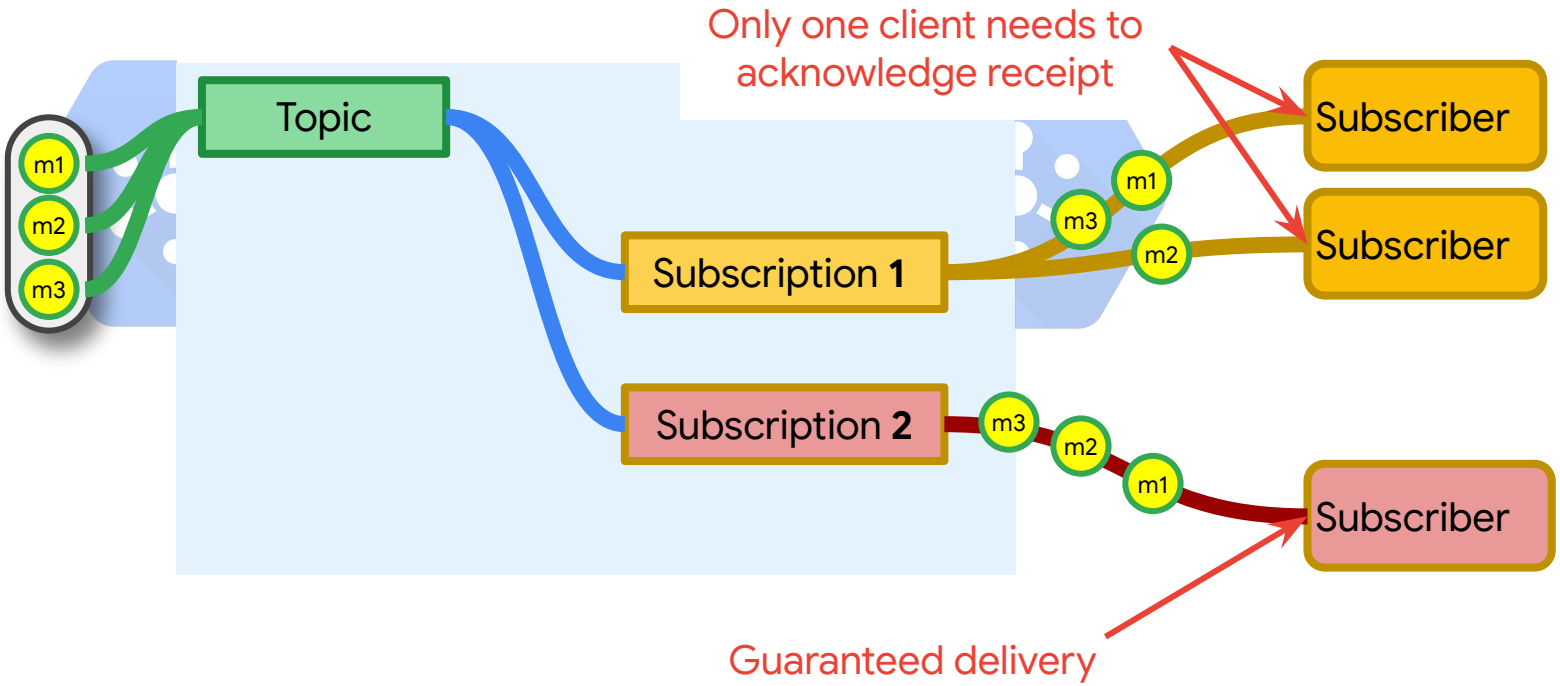
Messages are stored up to 7 days

At least once delivery guarantee

- A subscriber ACKs each message for every subscription
- A message is resent if subscriber takes more than `ackDeadline` to respond
- Messages are stored for up to 7 days
- A subscriber can extend the deadline per message



Subscribers can work as a team or separately



Publishing with Cloud Pub/Sub

```
gcloud pubsub topics create sandiego
```

Create topic

Publishing with Cloud Pub/Sub

```
gcloud pubsub topics create sandiego
```

Create topic

```
gcloud pubsub topics publish sandiego "hello"
```

Publish to topic

Publishing with Cloud Pub/Sub

```
gcloud pubsub topics create sandiego
```

Create topic

```
gcloud pubsub topics publish sandiego "hello"
```

Publish to topic

Python

```
import os
from google.cloud import pubsub_v1

publisher = pubsub_v1.PublisherClient()

topic_name = 'projects/{project_id}/topics/{topic}'.format(
    project_id=os.getenv('GOOGLE_CLOUD_PROJECT'),
    topic='MY_TOPIC_NAME',
)

publisher.create_topic(topic_name)
publisher.publish(topic_name, b'My first message!', author='dylan')
```

Create a client

Set topic name

Message

Send attribute

Publishing with Cloud Pub/Sub

```
gcloud pubsub topics create sandiego
```

Create topic

```
gcloud pubsub topics publish sandiego "hello"
```

Publish to topic

Python

```
import os
from google.cloud import pubsub_v1

publisher = pubsub_v1.PublisherClient()

topic_name = 'projects/{project_id}/topics/{topic}'.format(
    project_id=os.getenv('GOOGLE_CLOUD_PROJECT'),
    topic='MY_TOPIC_NAME',
)

publisher.create_topic(topic_name)
publisher.publish(topic_name, b'My first message!', author='dylan')
```

Create a client

Set topic name

Message

Send attribute

Publishing with Cloud Pub/Sub

```
gcloud pubsub topics create sandiego
```

Create topic

```
gcloud pubsub topics publish sandiego "hello"
```

Publish to topic

Python

```
import os
from google.cloud import pubsub_v1

publisher = pubsub_v1.PublisherClient()

topic_name = 'projects/{project_id}/topics/{topic}'.format(
    project_id=os.getenv('GOOGLE_CLOUD_PROJECT'),
    topic='MY_TOPIC_NAME',
)

publisher.create_topic(topic_name)
publisher.publish(topic_name, b'My first message!', author='dylan')
```

Create a client

Set topic name

Message

Send attribute

Subscribing with Cloud Pub/Sub using async pull

Python

```
import os
from google.cloud import pubsub_v1

subscriber = pubsub_v1.SubscriberClient()
topic_name = 'projects/{project_id}/topics/{topic}'.format(
    project_id=os.getenv('GOOGLE_CLOUD_PROJECT'),
    topic='MY_TOPIC_NAME',
)
subscription_name = 'projects/{project_id}/subscriptions/{sub}'.format(
    project_id=os.getenv('GOOGLE_CLOUD_PROJECT'),
    sub='MY_SUBSCRIPTION_NAME',
)
subscriber.create_subscription(
    name=subscription_name, topic=topic_name)

def callback(message):
    print(message.data)
    message.ack()

future = subscriber.subscribe(subscription_name, callback)
```

Select topic name

Set subscription name

callback when message received

Create a client

Push method
Callback function

Google Cloud

Subscribing with Cloud Pub/Sub using async pull

Python

```
import os
from google.cloud import pubsub_v1

subscriber = pubsub_v1.SubscriberClient()
topic_name = 'projects/{project_id}/topics/{topic}'.format(
    project_id=os.getenv('GOOGLE_CLOUD_PROJECT'),
    topic='MY_TOPIC_NAME',
)
subscription_name = 'projects/{project_id}/subscriptions/{sub}'.format(
    project_id=os.getenv('GOOGLE_CLOUD_PROJECT'),
    sub='MY_SUBSCRIPTION_NAME',
)
subscriber.create_subscription(
    name=subscription_name, topic=topic_name)

def callback(message):
    print(message.data)
    message.ack()

future = subscriber.subscribe(subscription_name, callback)
```

Select topic name

Set subscription name

callback when message received

Create a client

Push method
Callback function

Subscribing with Cloud Pub/Sub using async pull

Python

```
import os
from google.cloud import pubsub_v1

subscriber = pubsub_v1.SubscriberClient()
topic_name = 'projects/{project_id}/topics/{topic}'.format(
    project_id=os.getenv('GOOGLE_CLOUD_PROJECT'),
    topic='MY_TOPIC_NAME',
)
subscription_name = 'projects/{project_id}/subscriptions/{sub}'.format(
    project_id=os.getenv('GOOGLE_CLOUD_PROJECT'),
    sub='MY_SUBSCRIPTION_NAME',
)
subscriber.create_subscription(
    name=subscription_name, topic=topic_name)

def callback(message):
    print(message.data)
    message.ack()

future = subscriber.subscribe(subscription_name, callback)
```

Create a client

Select topic name

Set subscription name

callback when message received

Push method
Callback function

Google Cloud

Subscribing with Cloud Pub/Sub using synchronous pull

```
gcloud pubsub subscriptions create --topic sandiego mySub1
```

Create subscription

```
gcloud pubsub subscriptions pull --auto-ack mySub1
```

Pull subscription

```
import time

from google.cloud import pubsub_v1

subscriber = pubsub_v1.SubscriberClient()

subscription_path = subscriber.subscription_path(project_id, subscription_name)

NUM_MESSAGES = 2
ACK_DEADLINE = 30
SLEEP_TIME = 10

# The subscriber pulls a specific number of messages.
response = subscriber.pull(subscription_path, max_messages=NUM_MESSAGES)
```

Set subscription name

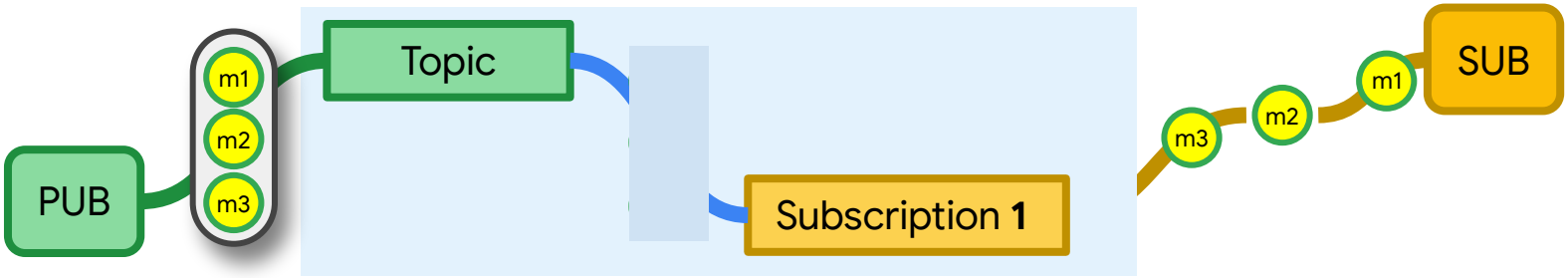
Create a client

`projects/{project_id}/subscriptions/{subscription_name}` — subscription_path format

Subscriber is non-blocking

Keep the main thread from exiting to allow it to process messages asynchronously

By default, the Publisher batches messages; turn this off if you desire lower latency



Batching messages: throughput versus latency

Changing the batch settings in Cloud Pub/Sub

Python

```
from google.cloud import pubsub
from google.cloud.pubsub import types

client = pubsub.PublisherClient(
    batch_settings=BatchSettings(max_messages=500),
)
```

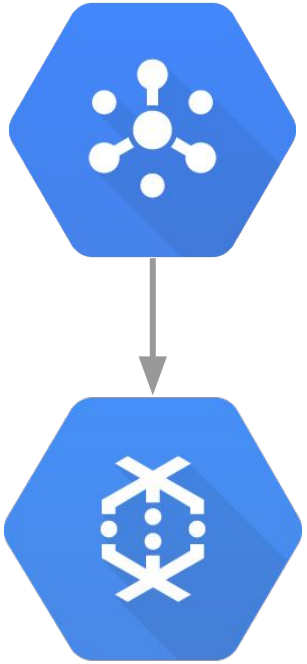
Change batch setting

Pub/Sub: latency, out-of-order, duplication will happen

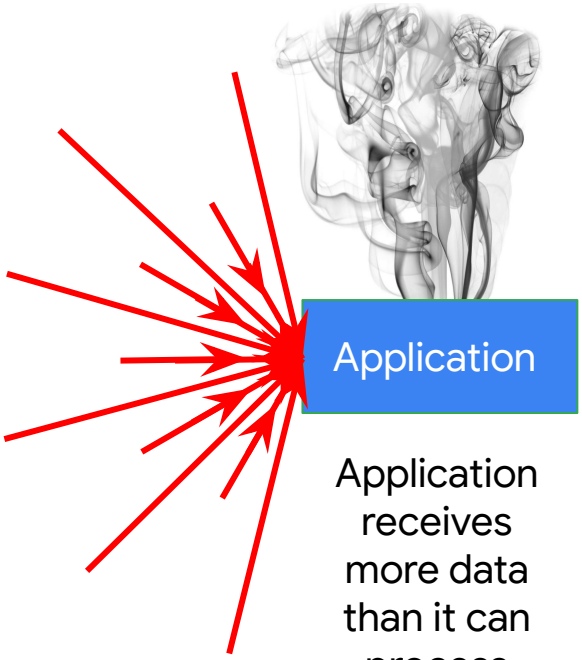
- Latency -- no guarantees
- Messages can be delivered in any order, especially with large backlog
- Duplication may happen

Cloud Pub/sub with Dataflow: Exactly once, ordered processing

- Cloud Pub/Sub delivers at least once
- Cloud Dataflow: Deduplicate, order, and window
- Separation of concerns → scale

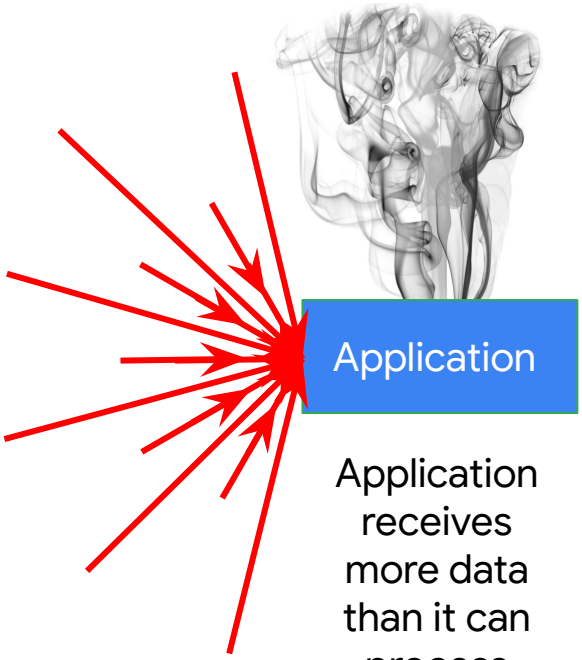


Use Cloud Pub/Sub for streaming resilience

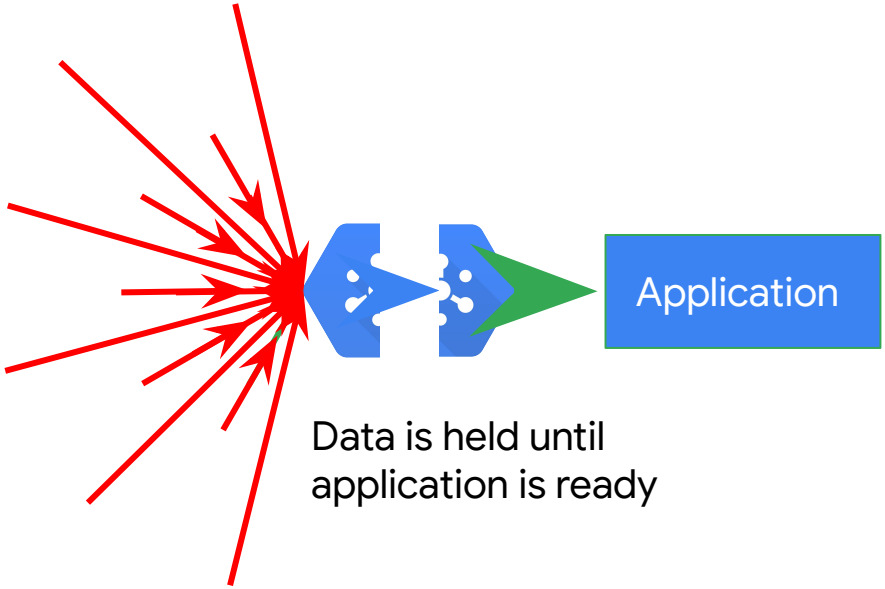


Application receives more data than it can process

Use Cloud Pub/Sub for streaming resilience

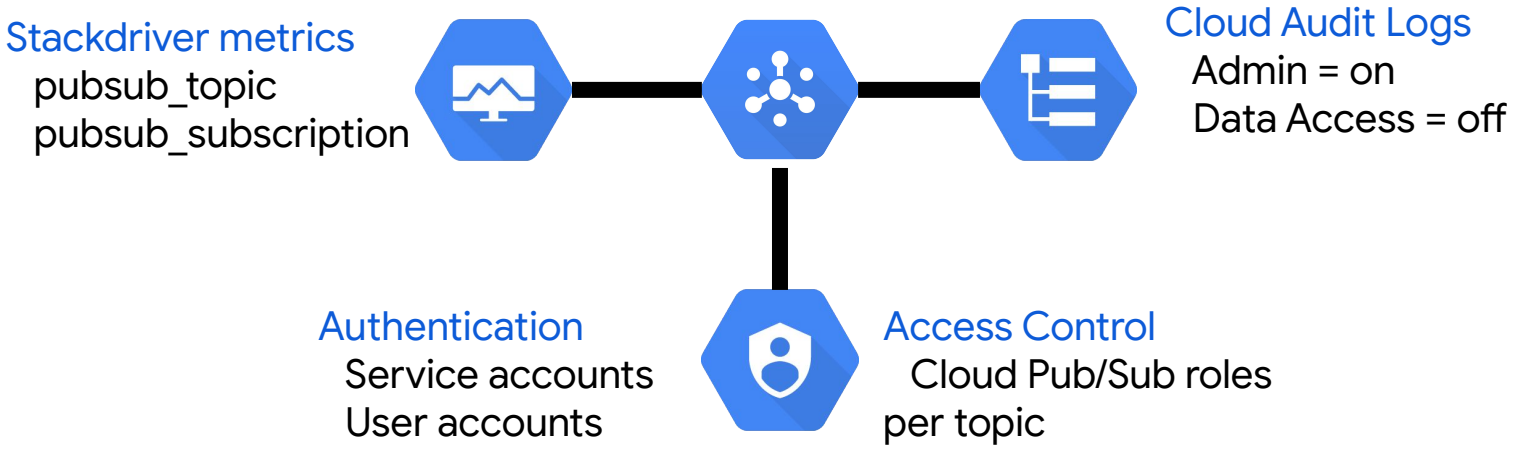


Application receives more data than it can process



Data is held until application is ready

Security, monitoring, and logging for Cloud Pub/Sub



Lab

Publish Streaming Data into Pub/Sub

Lab Objectives

Create a Pub/Sub topic and subscription

Simulate your traffic sensor data into Pub/Sub