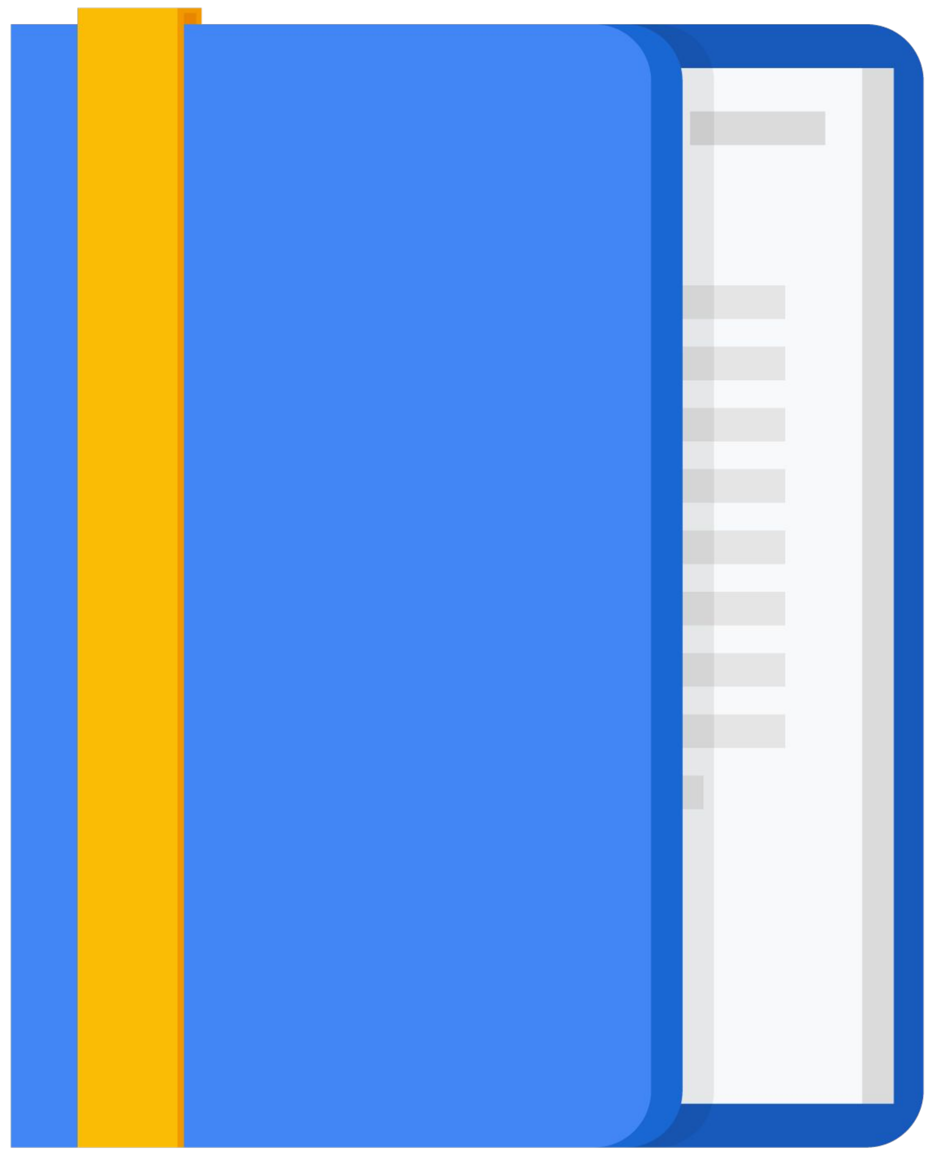
Google Cloud

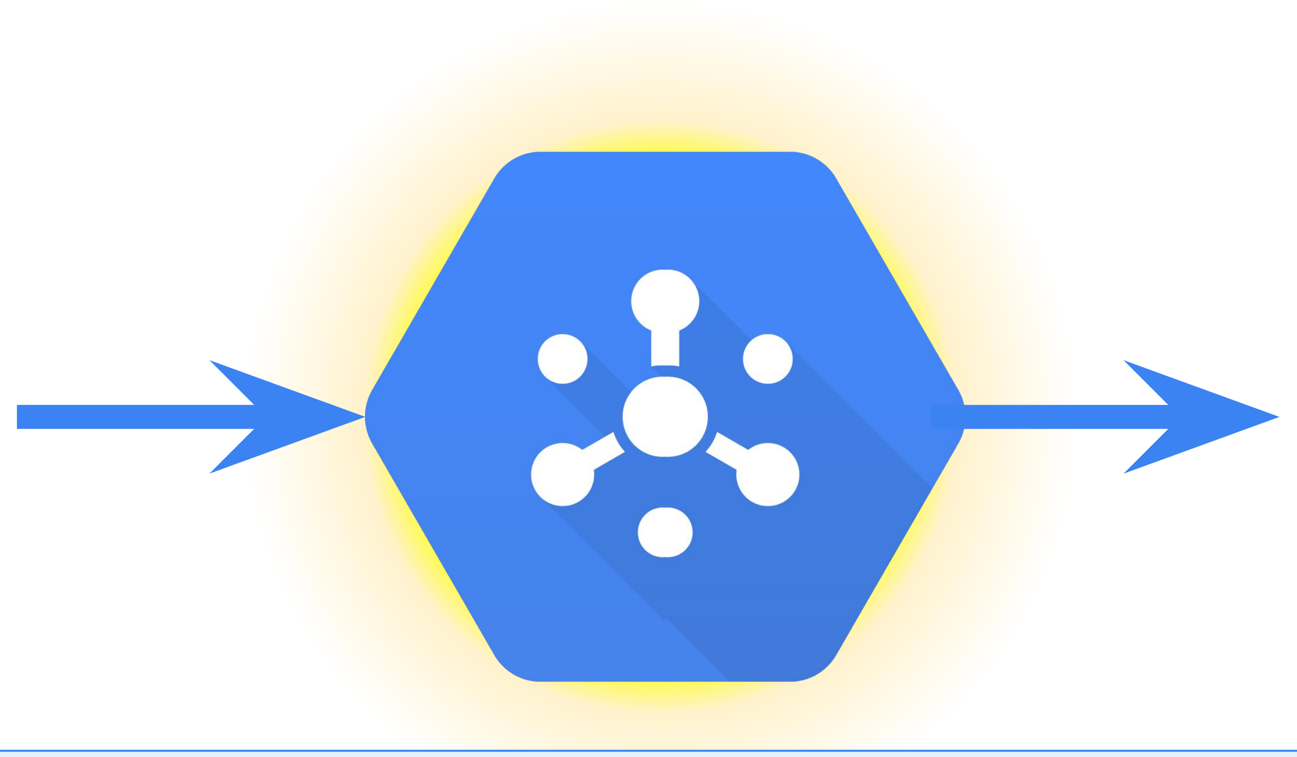
Serverless Messaging with Pub/Sub

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

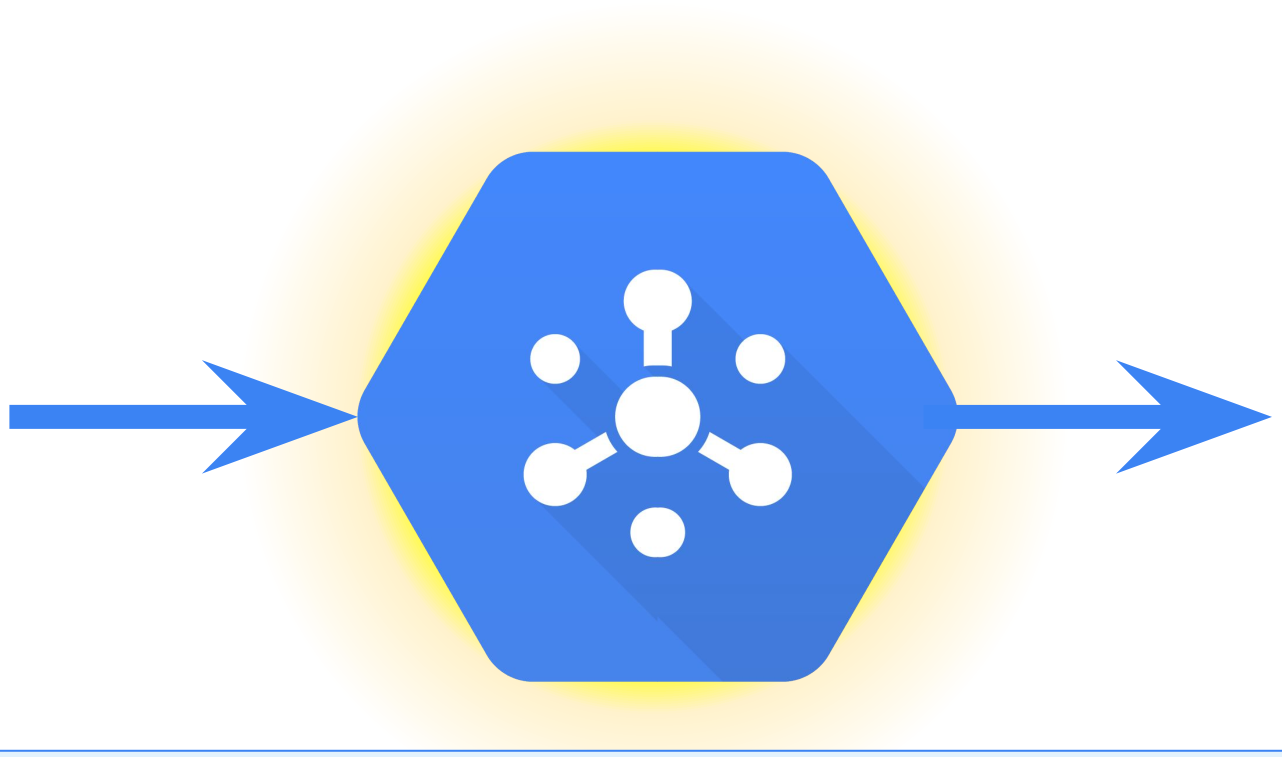
Qualities that Cloud Pub/Sub contribute to Data Engineering solutions:

- Availability
- Durability
- Scalability

100s of milliseconds

Google Cloud

Cloud Pub/Sub



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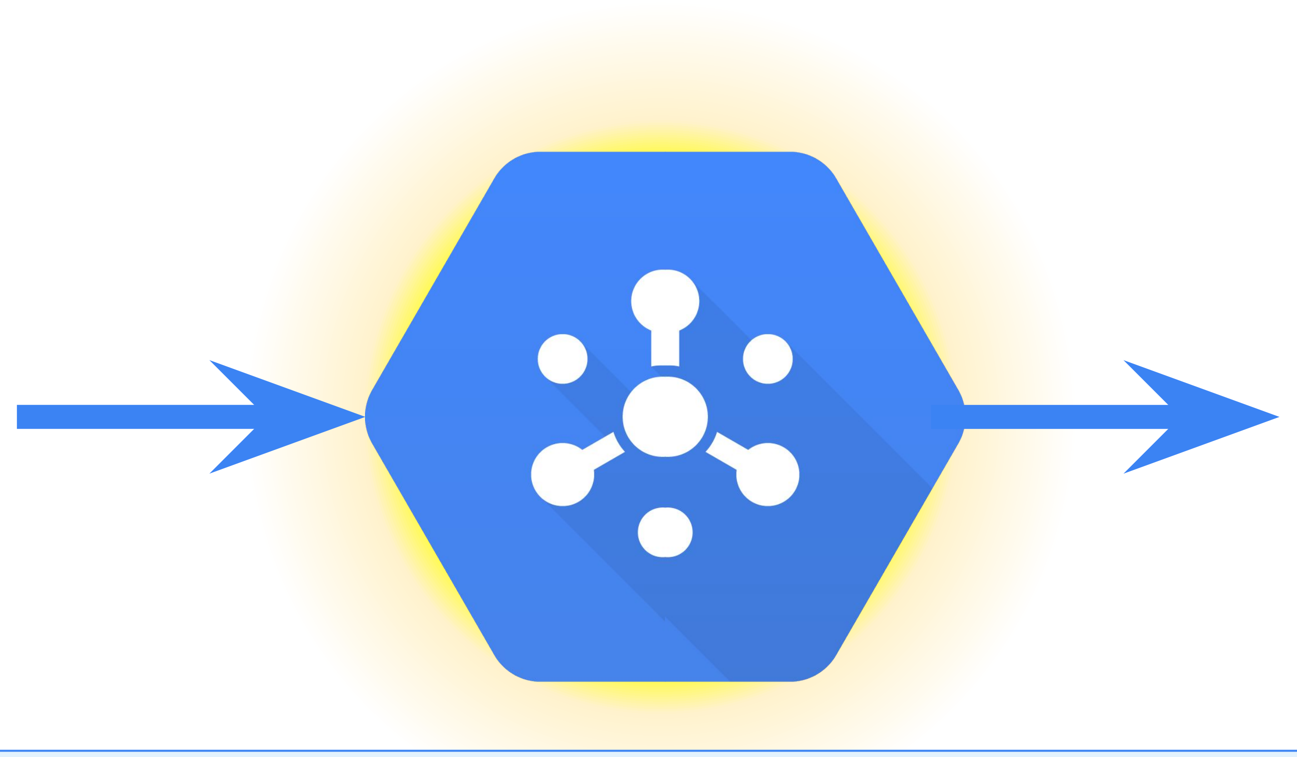
Google Cloud

Cloud Pub/Sub



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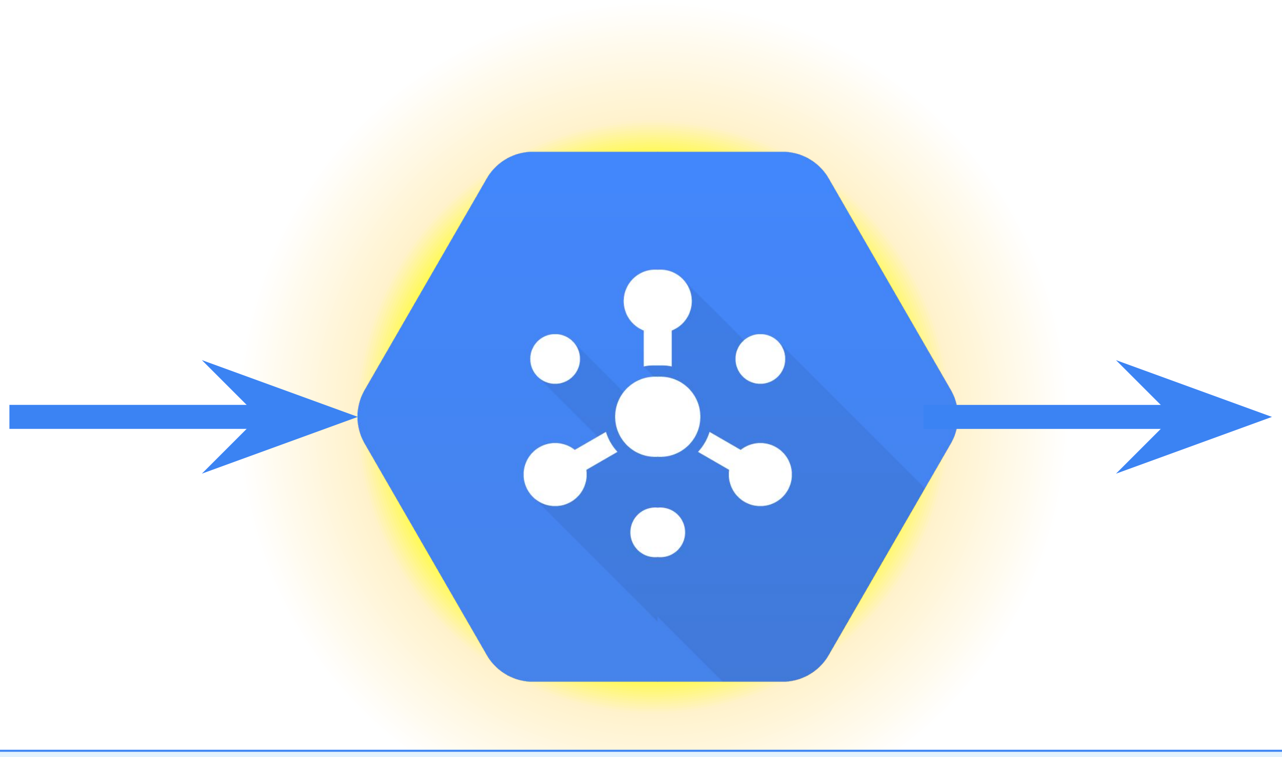

Qualities that Cloud Pub/Sub contribute to Data Engineering solutions:

Availability
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Cloud
Pub/Sub

100s of
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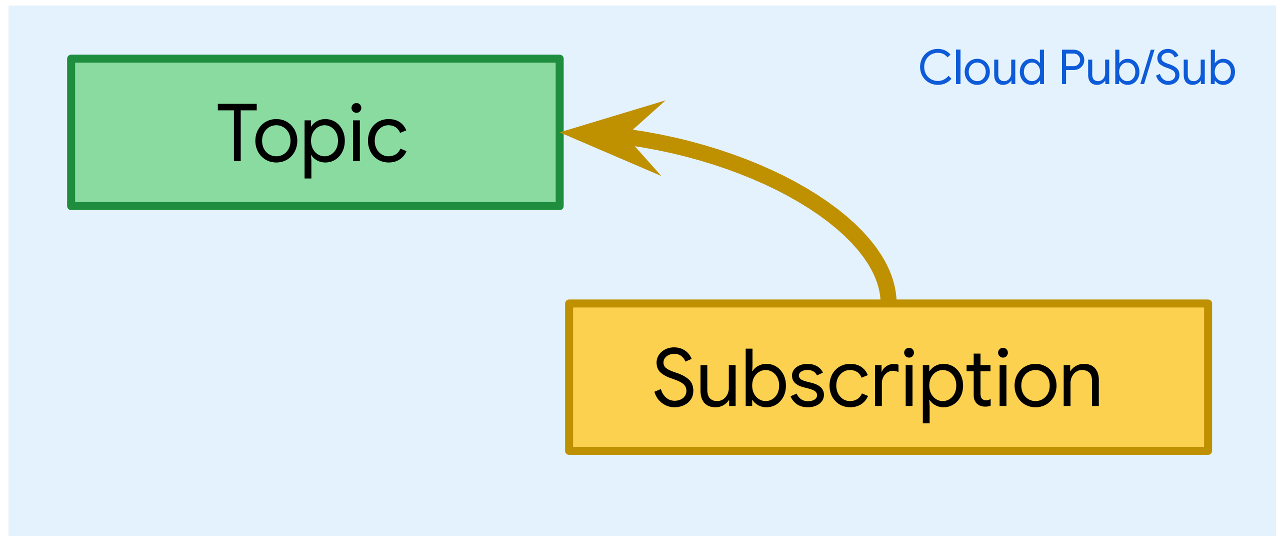
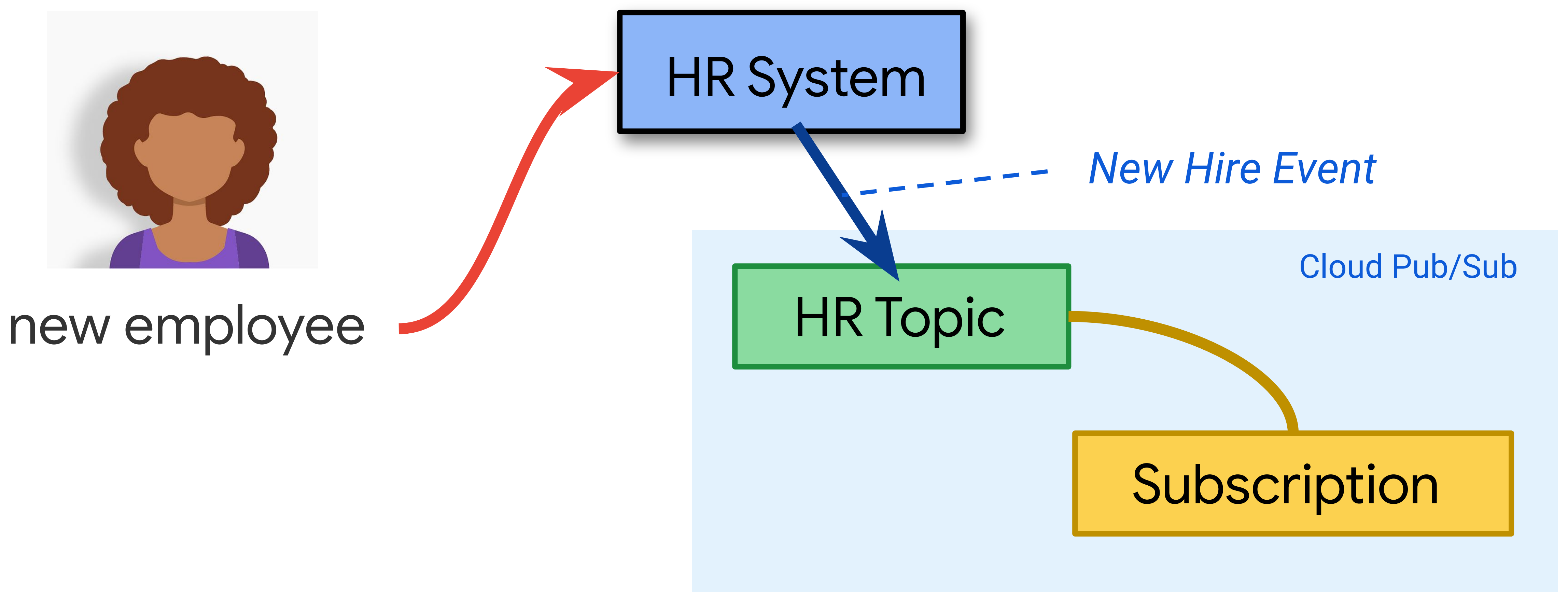
Google Cloud

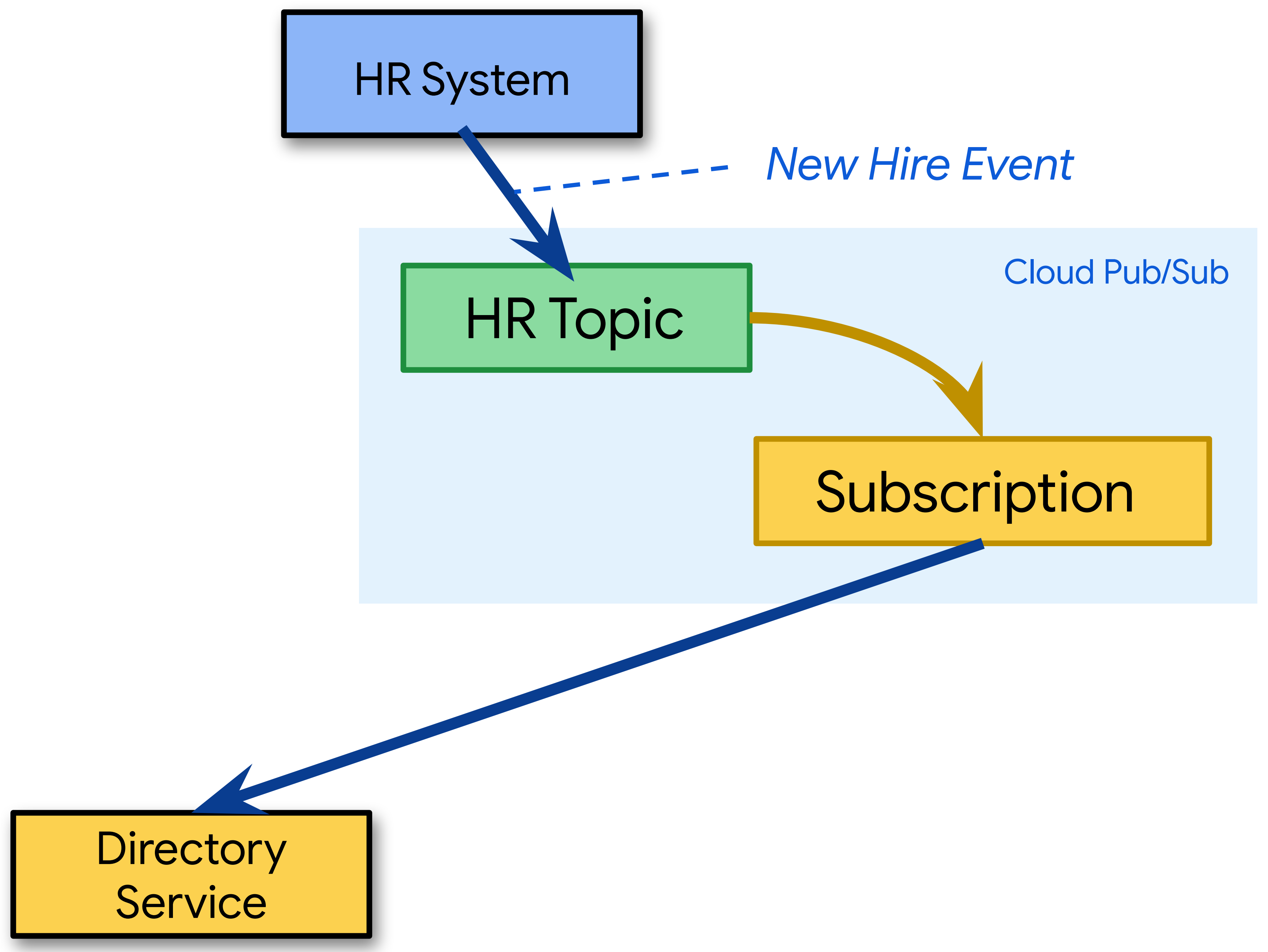
Example of a Cloud Pub/Sub application



A new employees arrives causing a new hire event.



The message is sent from Topic to Subscription



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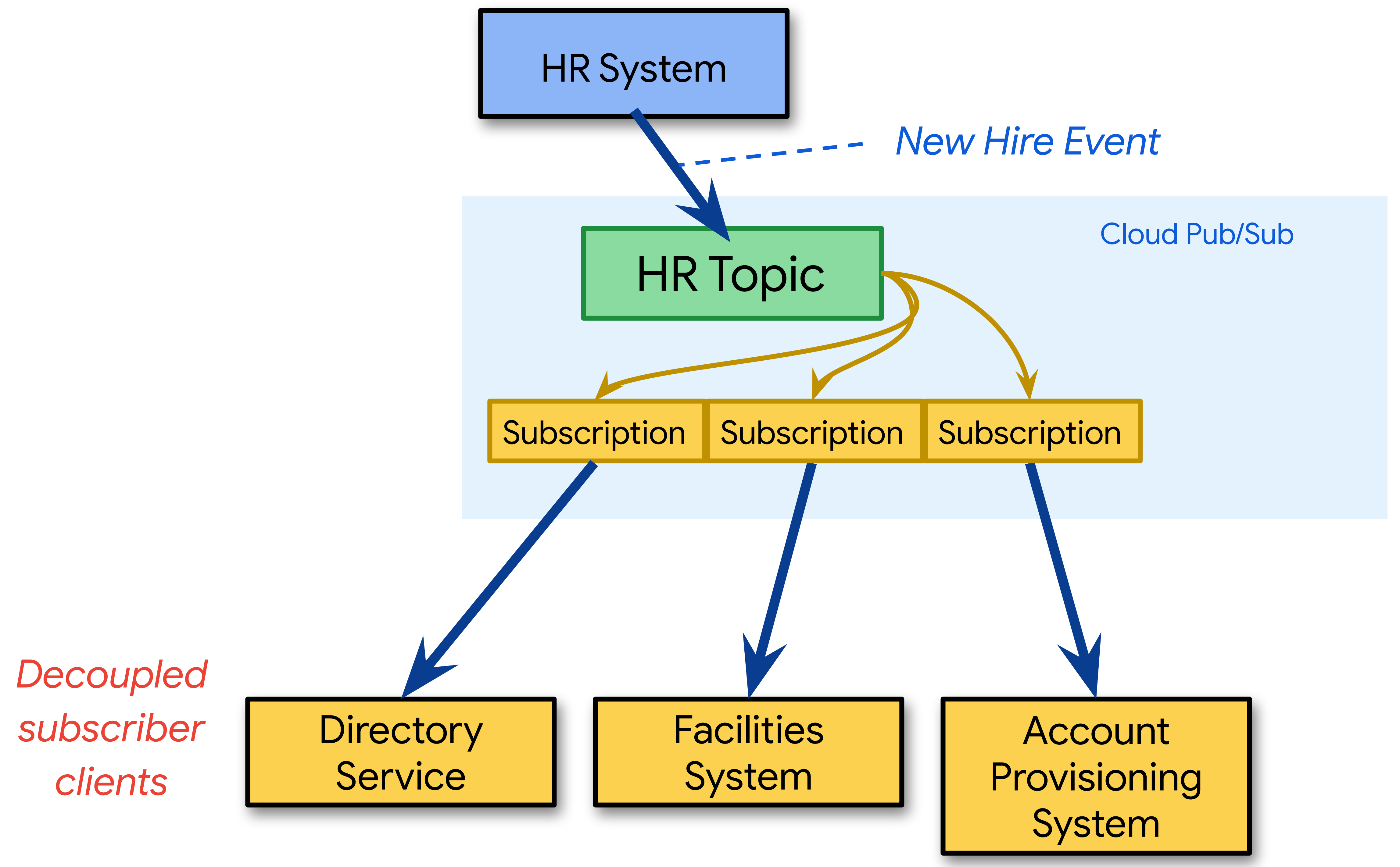
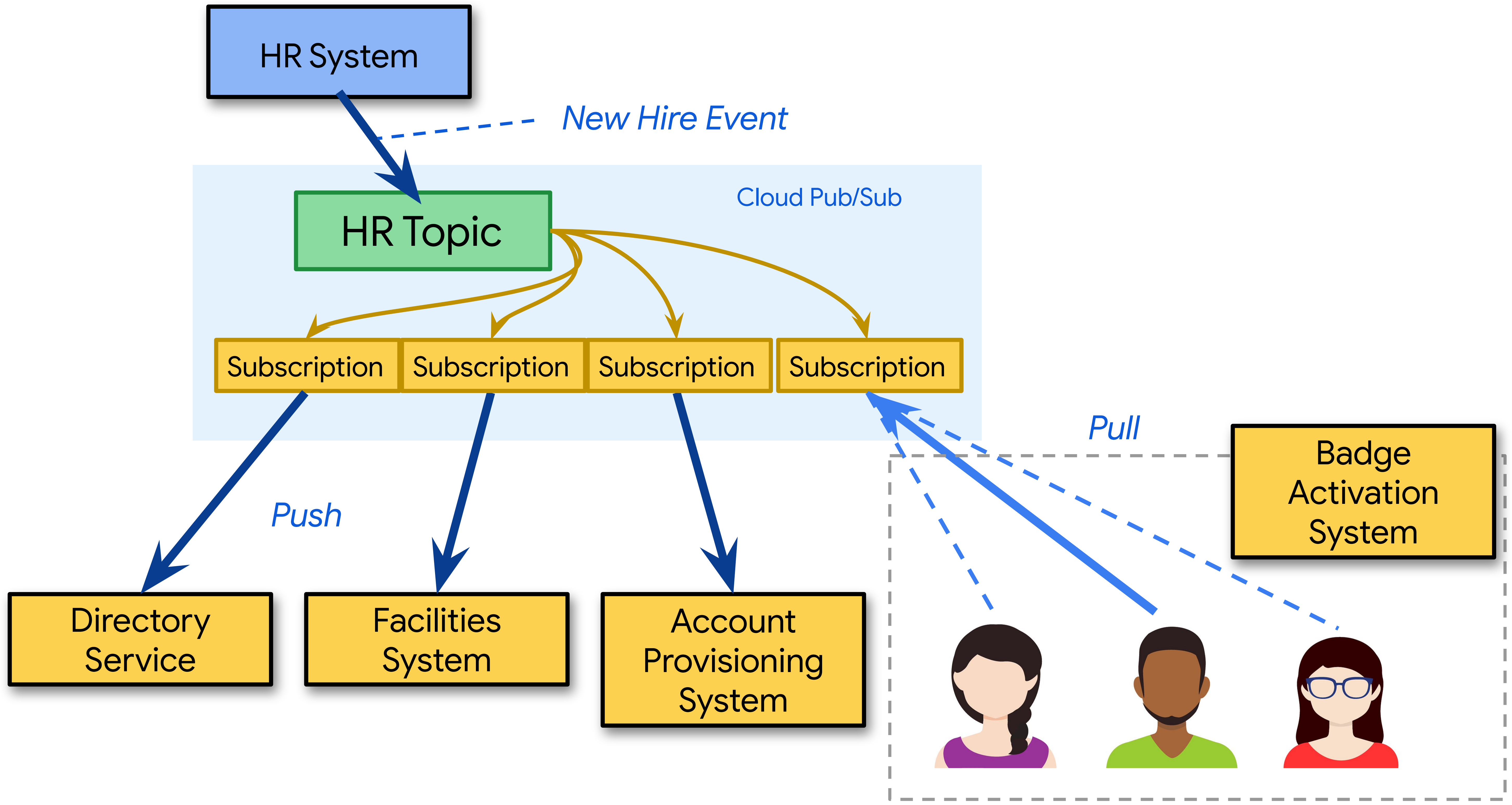
There can be multiple Subscriptions for each Topic

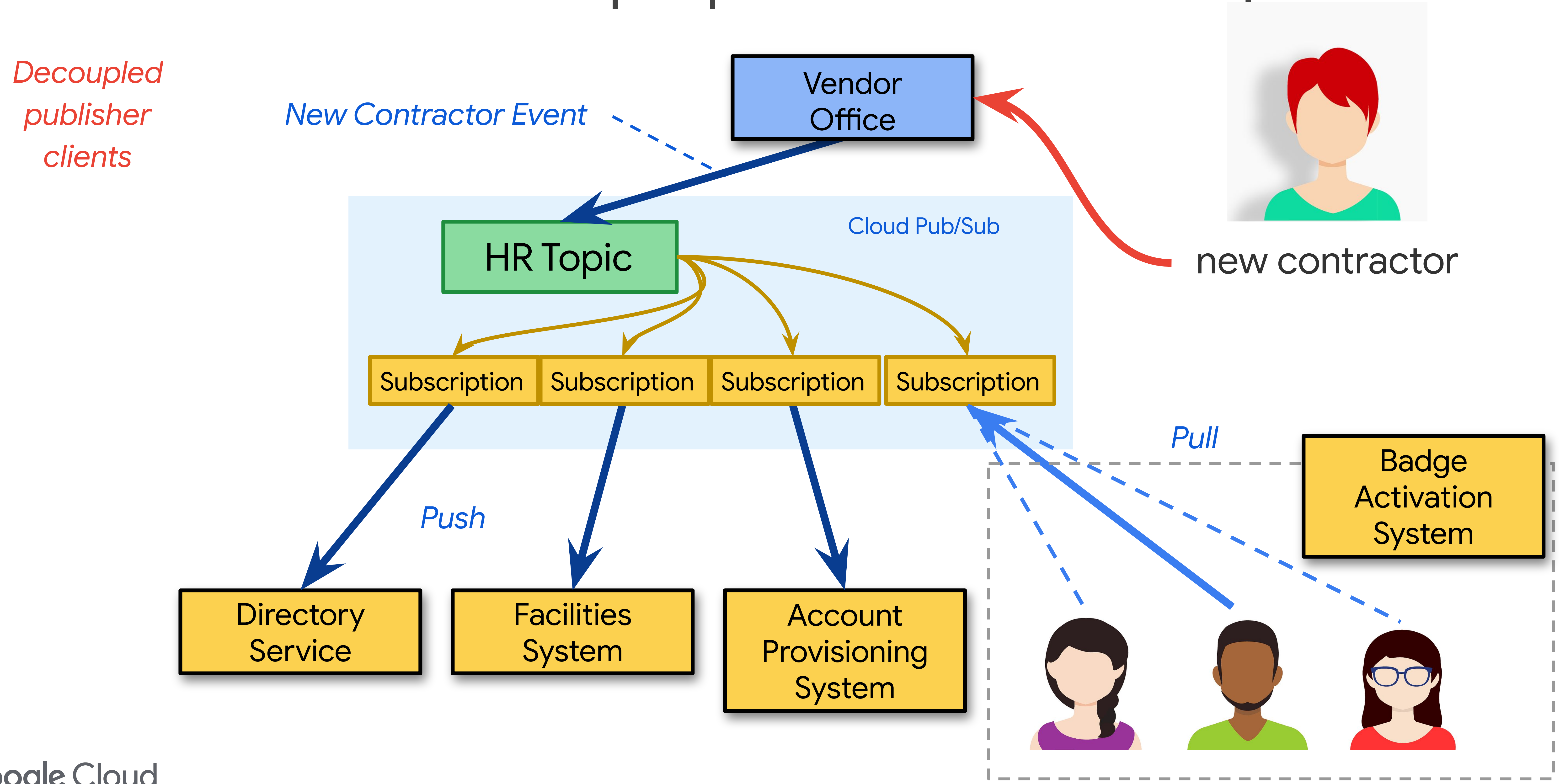


And there can be multiple subscribers per Subscription



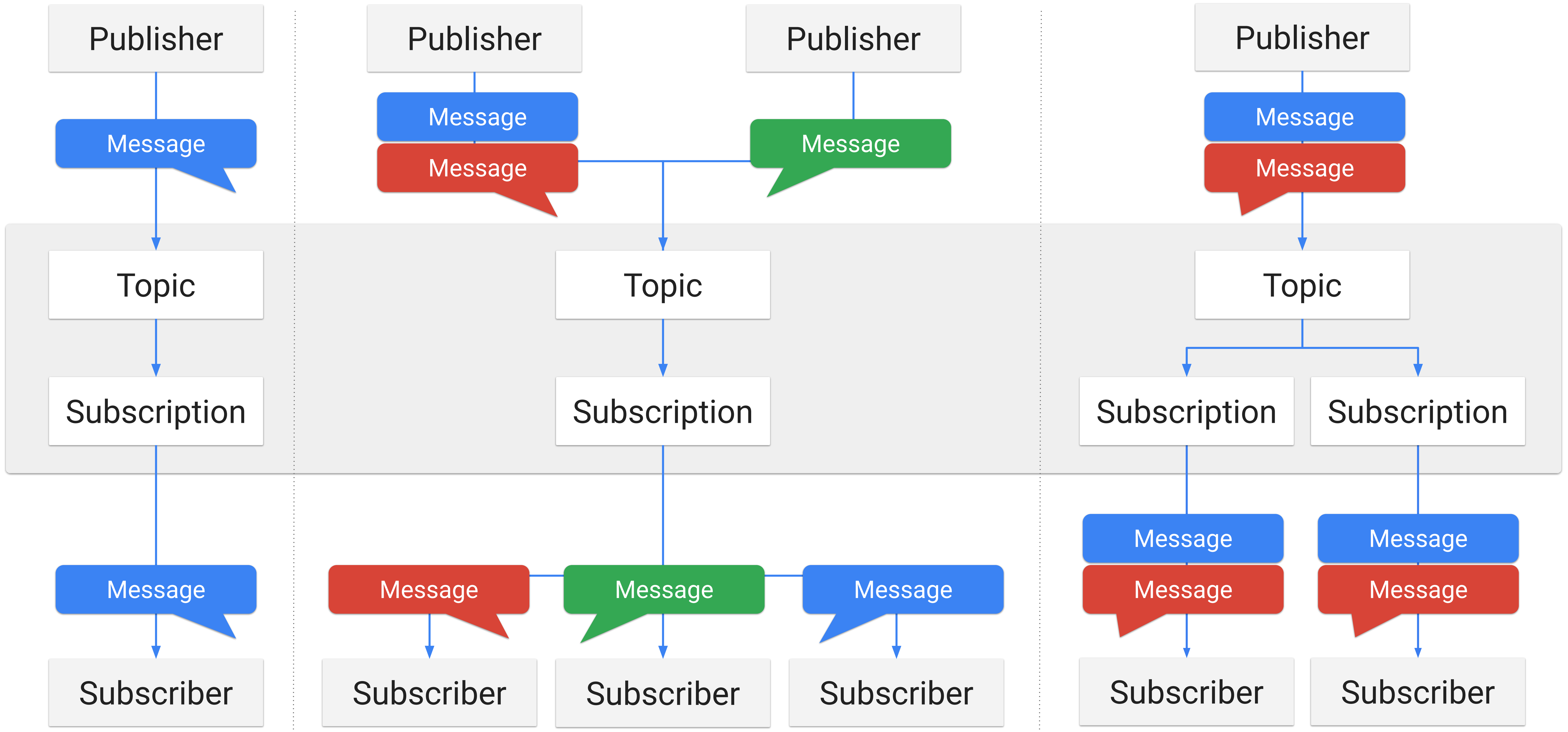
Google Cloud

And there can be multiple publishers to the Topic



Google Cloud

Publish/Subscribe patterns



Google Cloud

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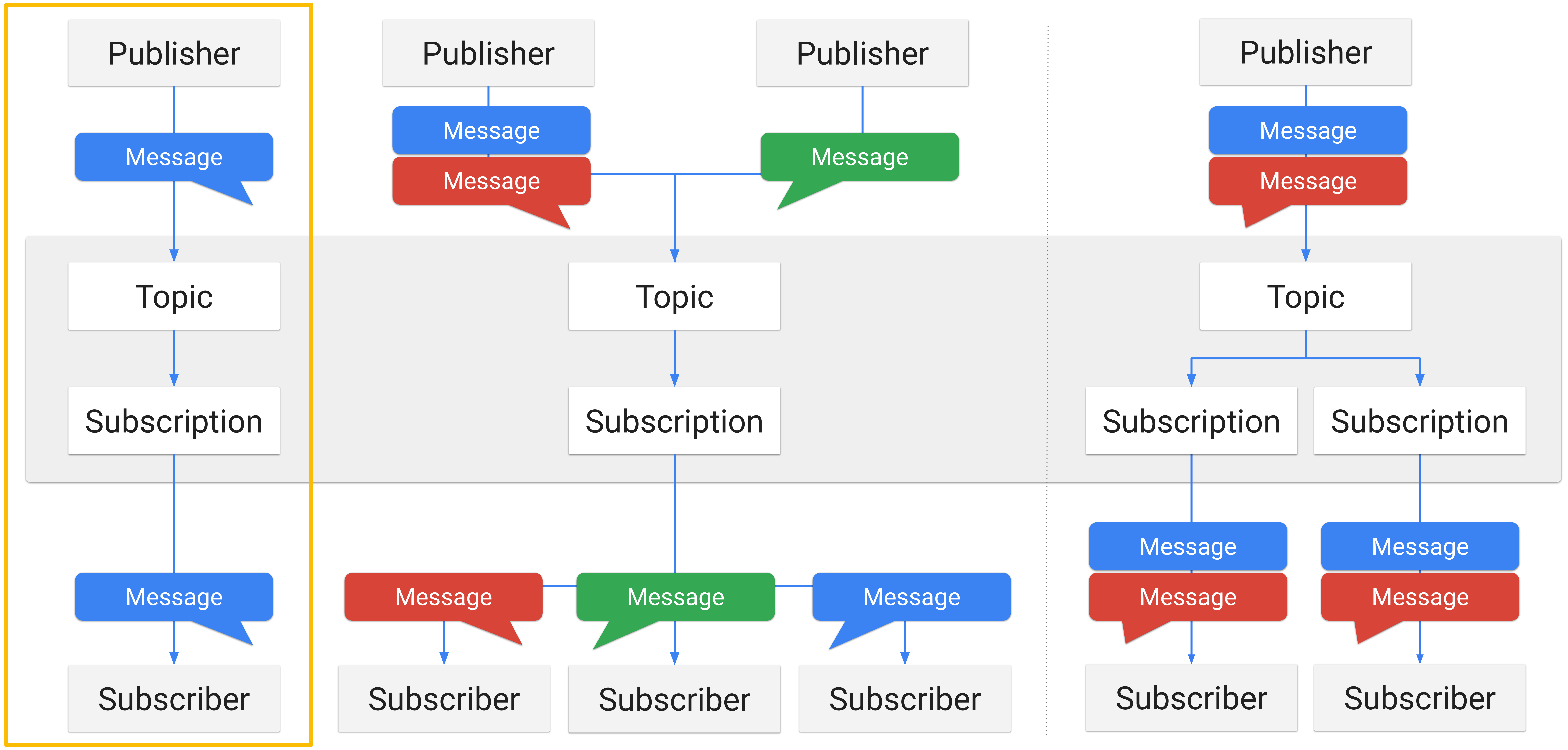

Google Cloud

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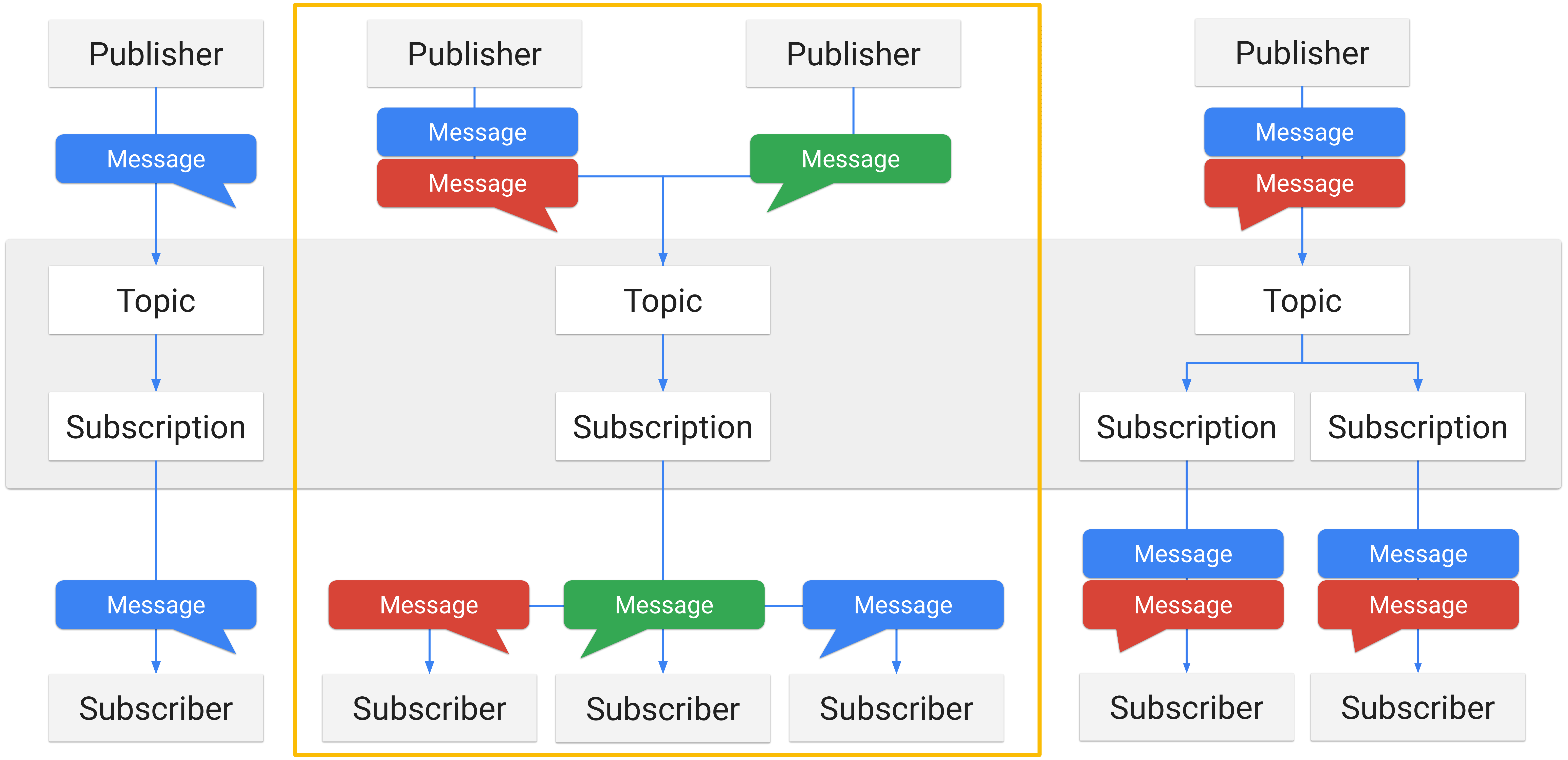

Google Cloud

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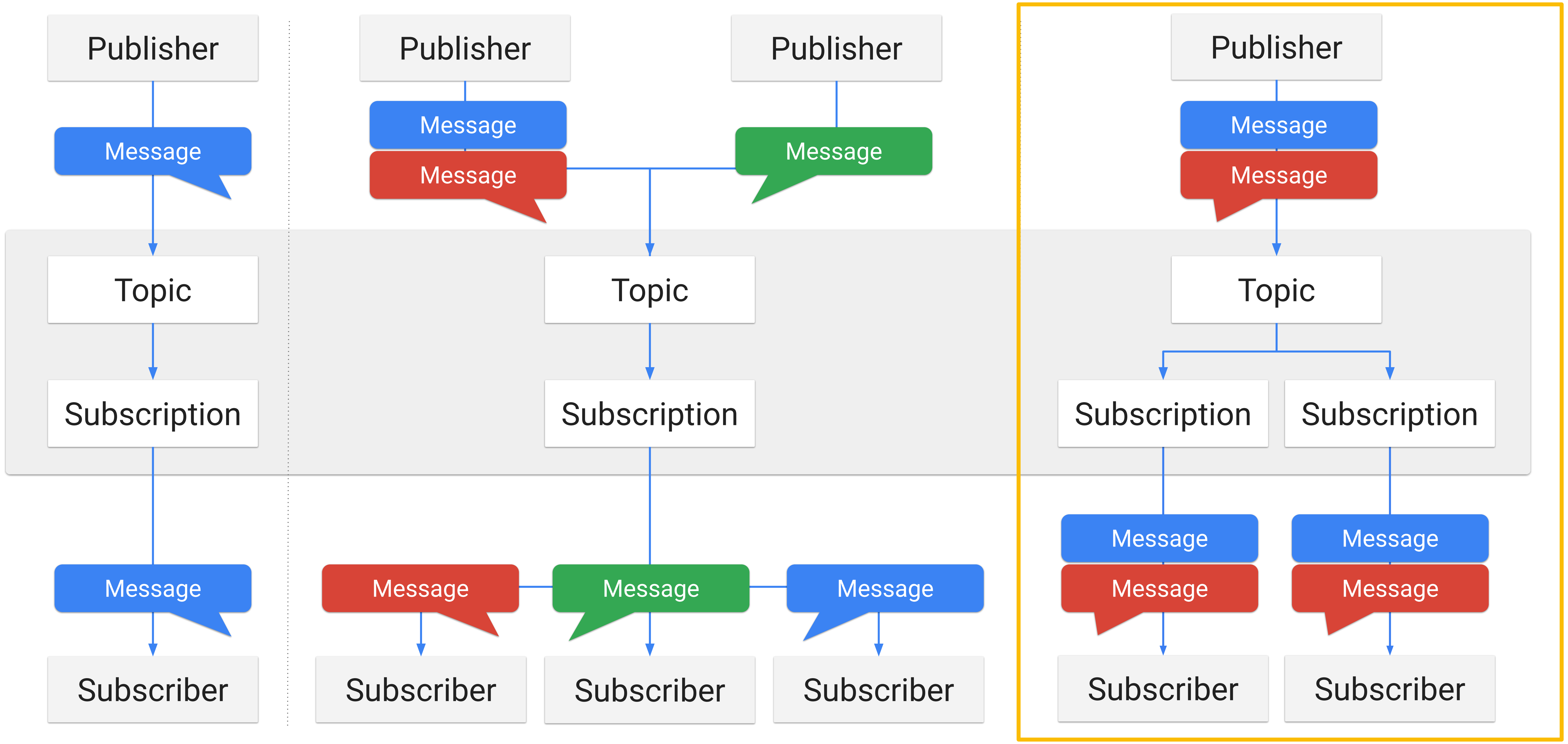
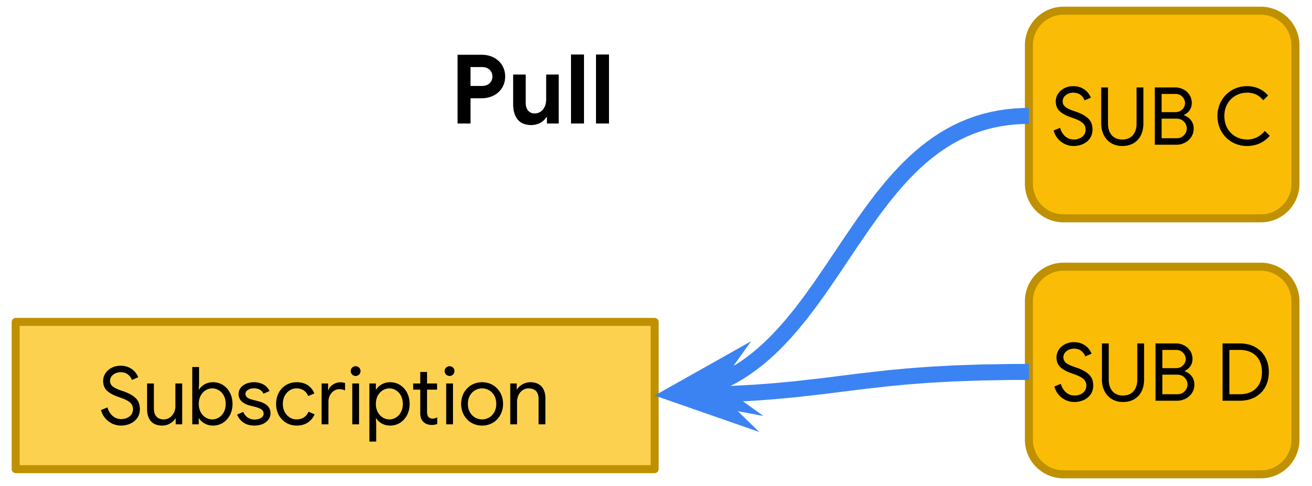
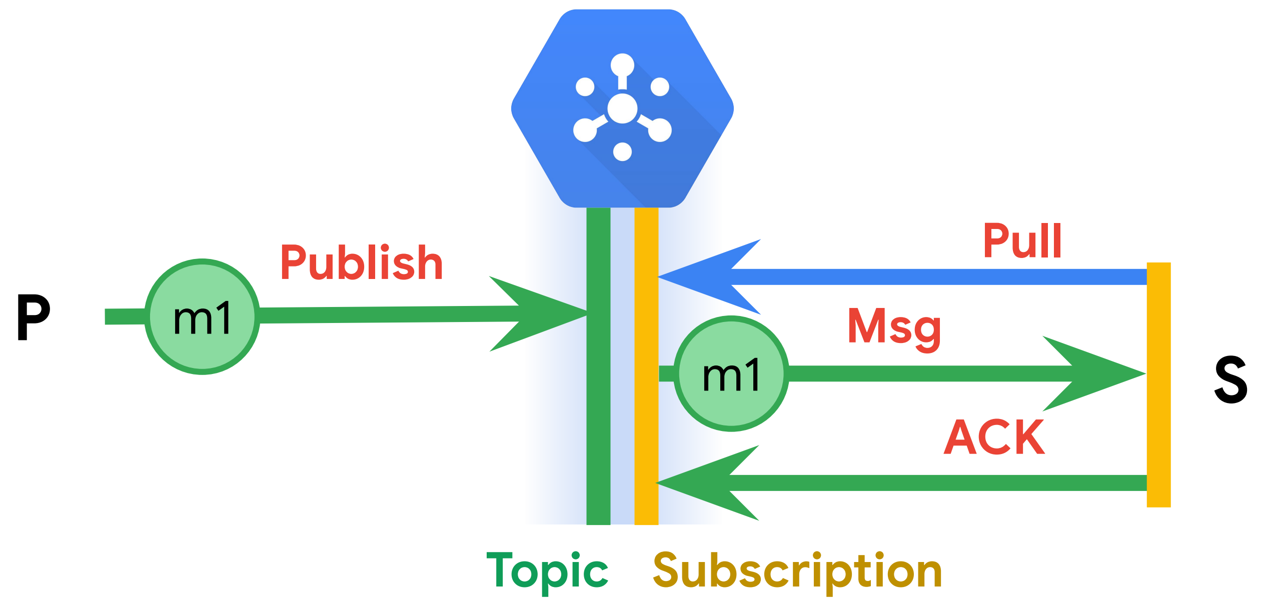


Google Cloud

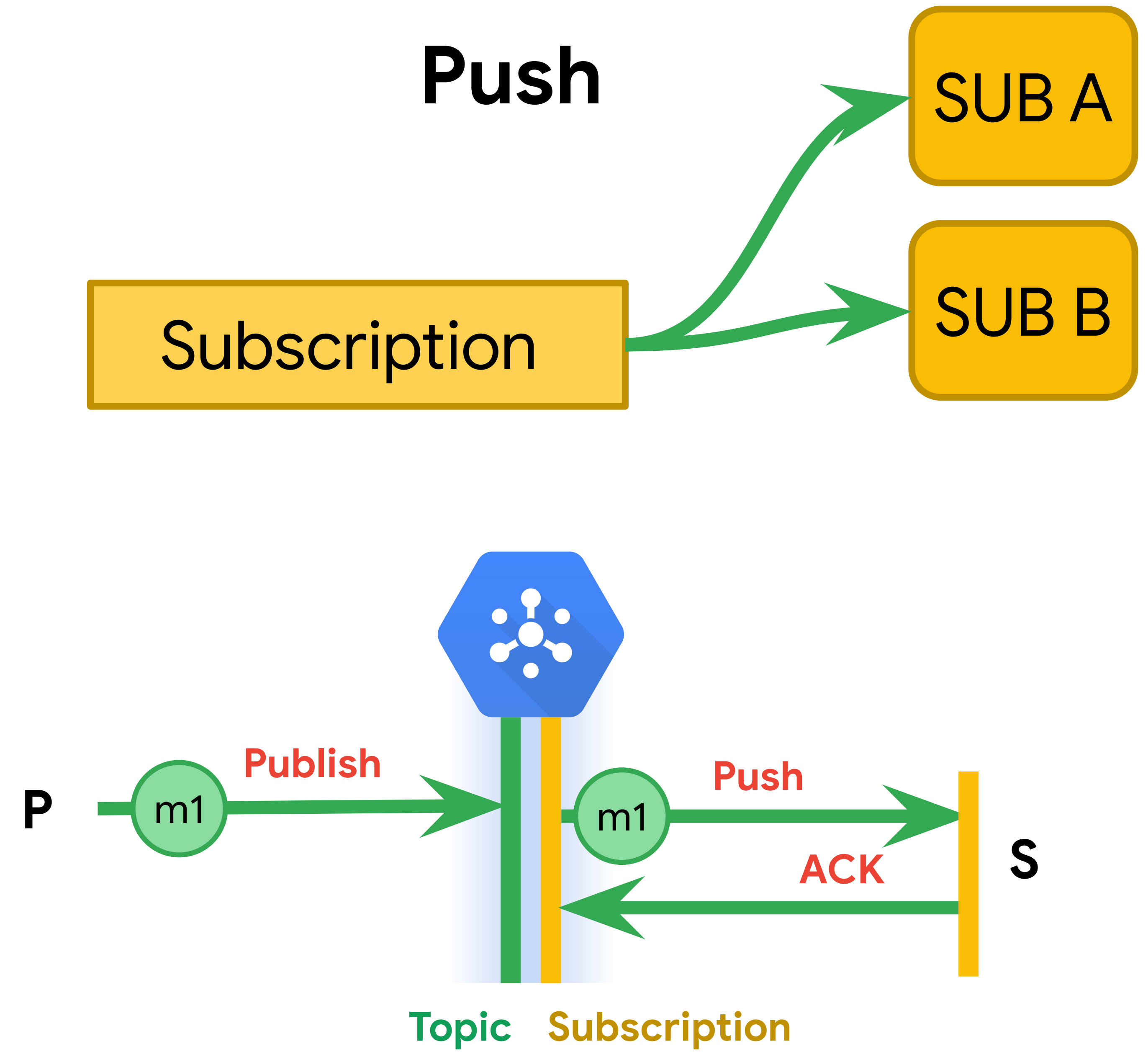
Cloud Pub/Sub provides both Push and Pull delivery



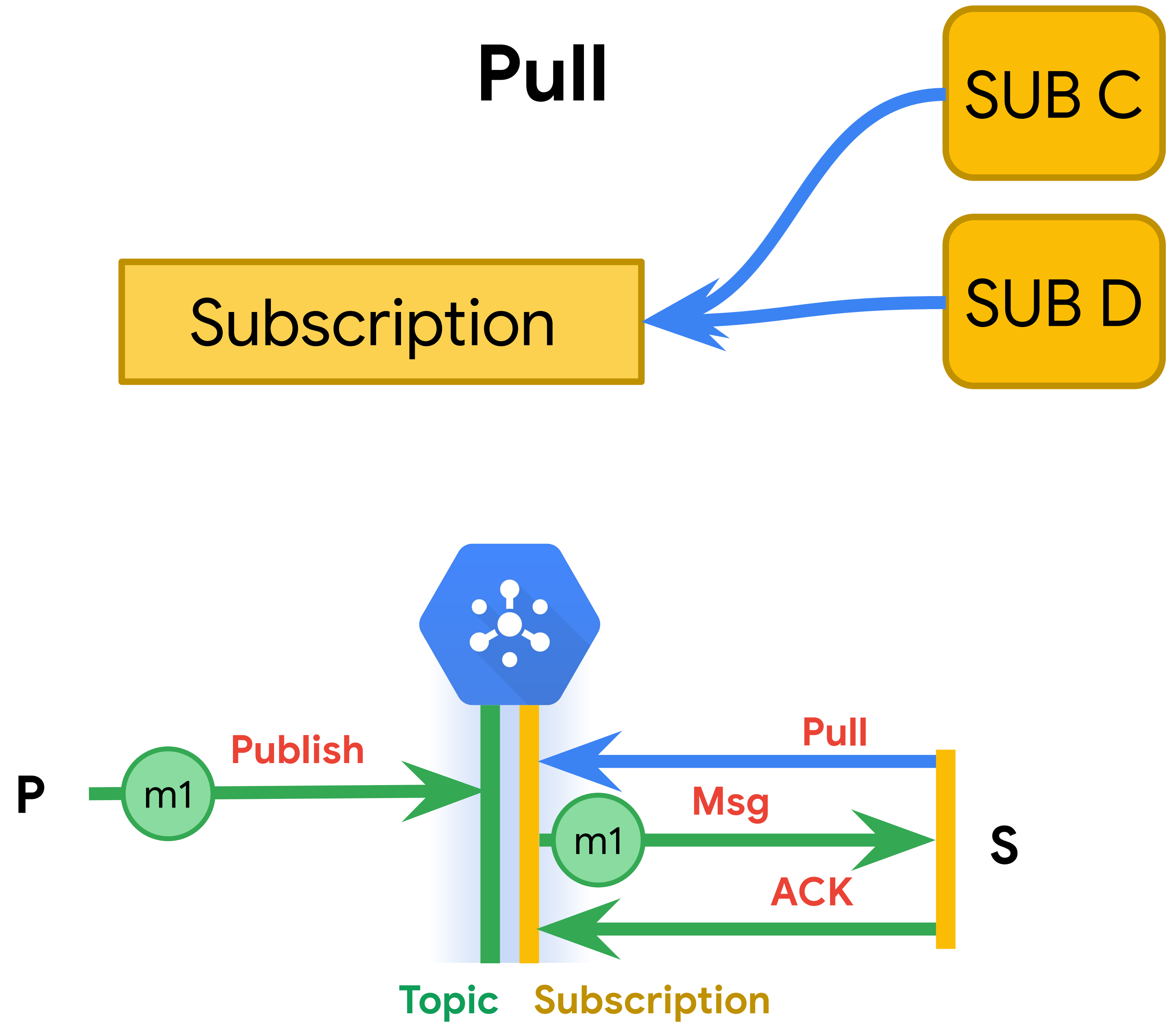


Messages are stored up to 7 days

Cloud Pub/Sub provides both Push and Pull delivery



Acknowledgement used for dynamic rate control

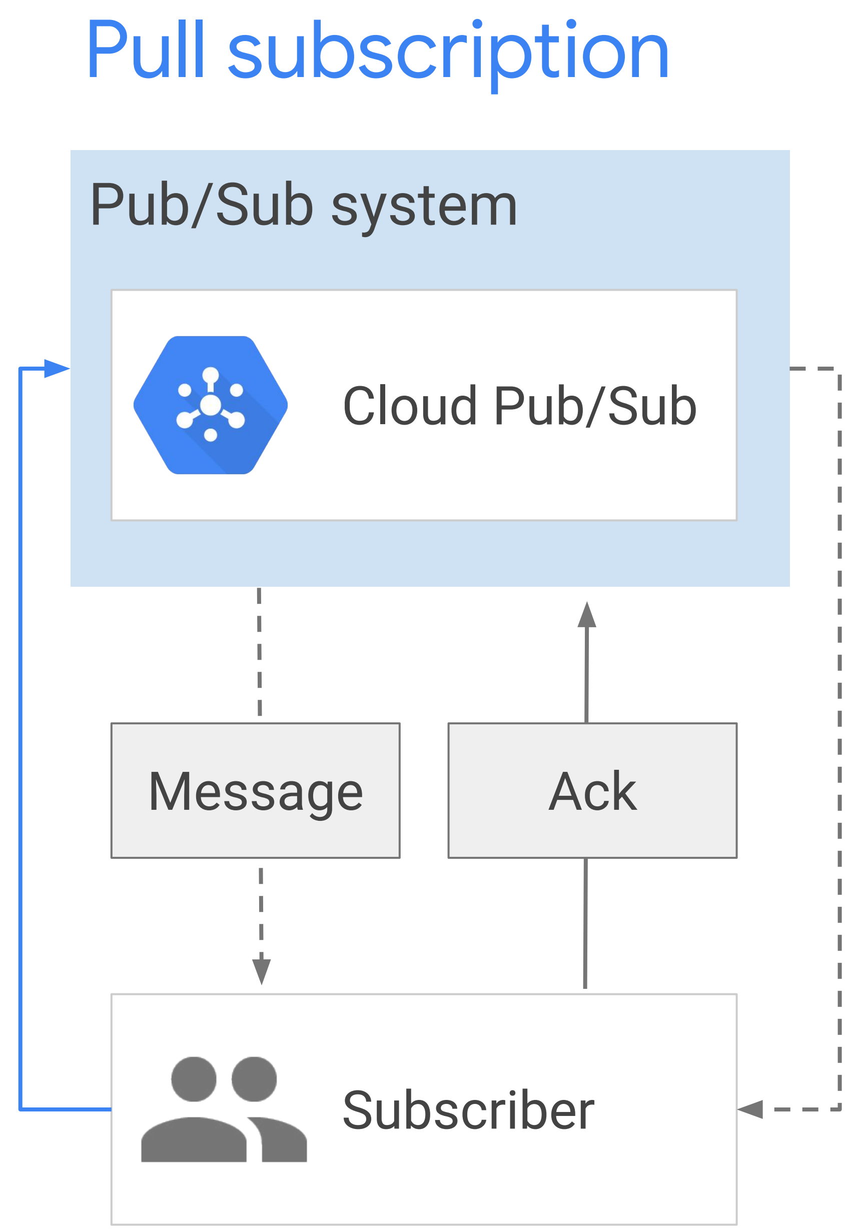


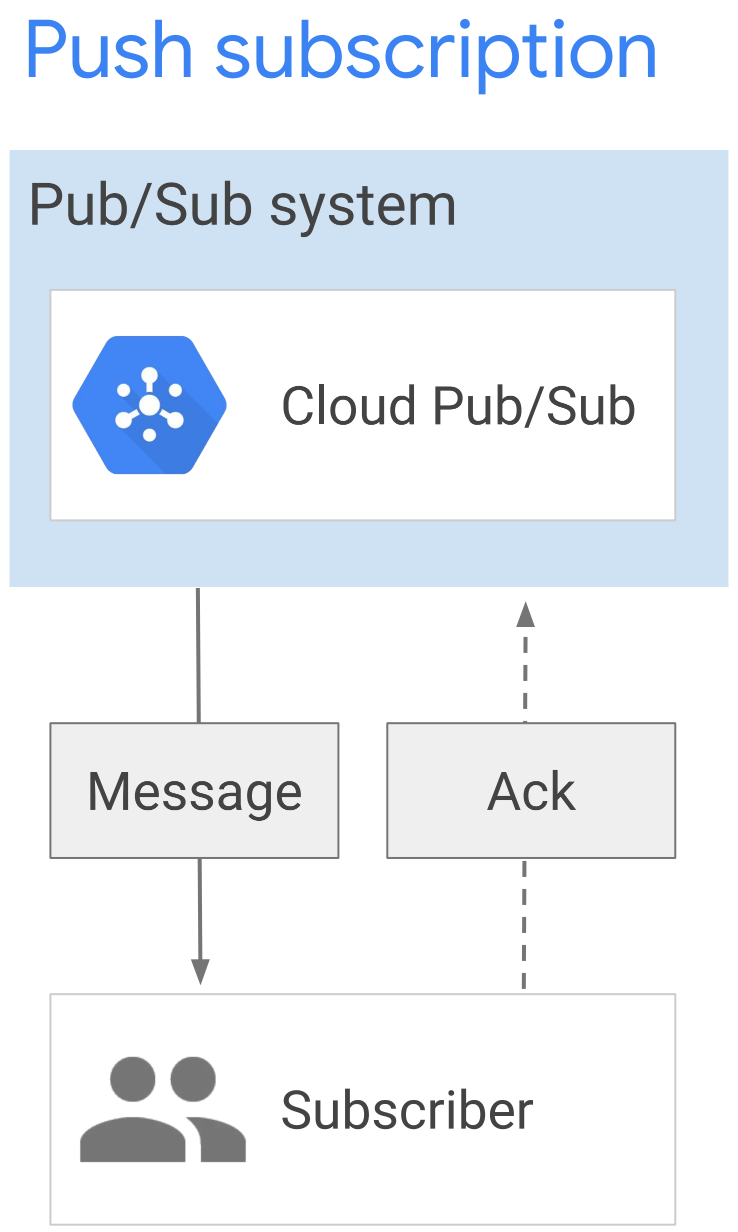
Messages are stored up to 7 days

Google Cloud

At least once delivery guarantee

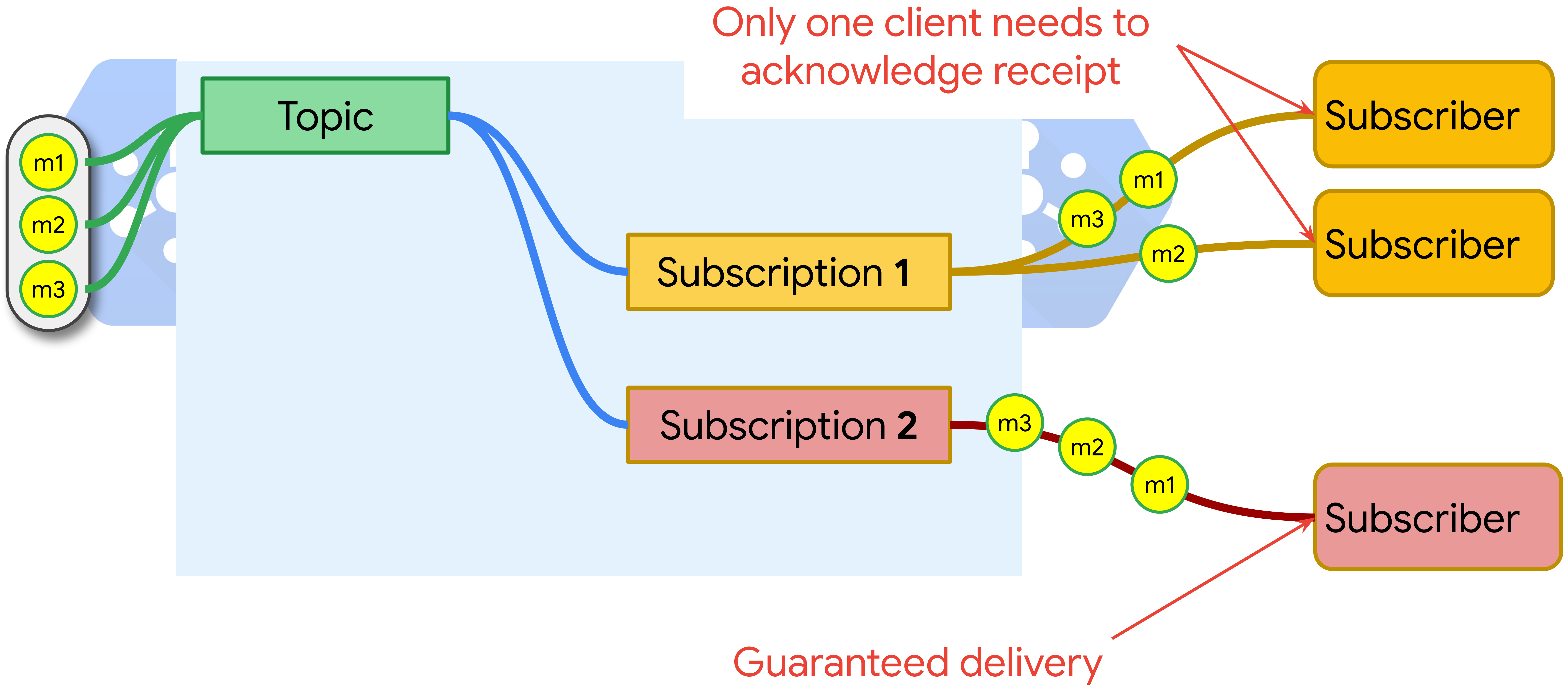
- A subscriber ACKs each message for every subscription
- A message is resent if subscriber takes more than `ackDeadline` to respond
- Messages are stored for up to 7 days
- A subscriber can extend the deadline per message





Google Cloud

Subscribers can work as a team or separately



Google Cloud

Publishing with Cloud Pub/Sub

```
gcloud pubsub topics create sandiego
```

Create topic

Publishing with Cloud Pub/Sub

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Create topic

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

Publish to topic

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Publish to topic

Python

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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

Google Cloud

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Google Cloud

Subscribing with Cloud Pub/Sub using async pull

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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

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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 synchronous pull

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

Create subscription

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

Pull subscription

Set subscription name

Create a client

```
import time

from google.cloud import pubsub_v1

subscriber = pubsub_v1.SubscriberClient()

subscription_path = subscriber.subscription_path(project_id, subscription_name)
```

`projects/{project_id}/subscriptions/{subscription_name}`

subscription_path format

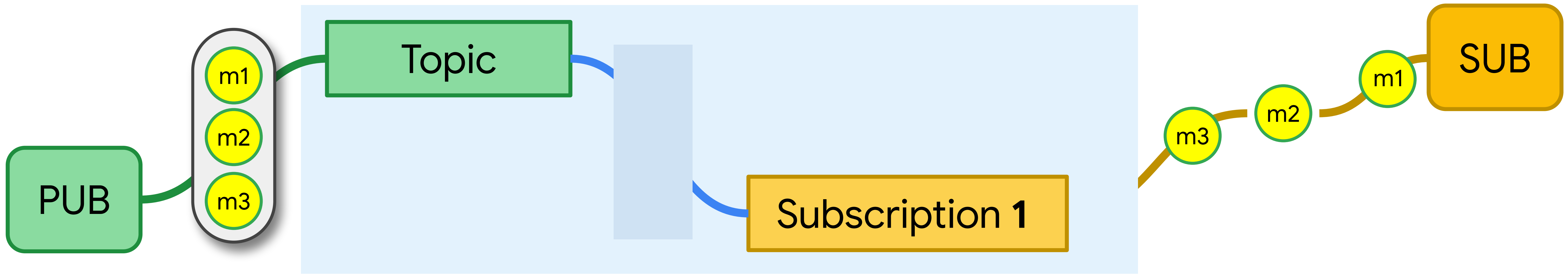
```
 NUM_MESSAGES = 2
 ACK_DEADLINE = 30
 SLEEP_TIME = 10


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

Subscriber is non-blocking

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

Google Cloud

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



Batching messages: throughput versus latency

Google Cloud

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

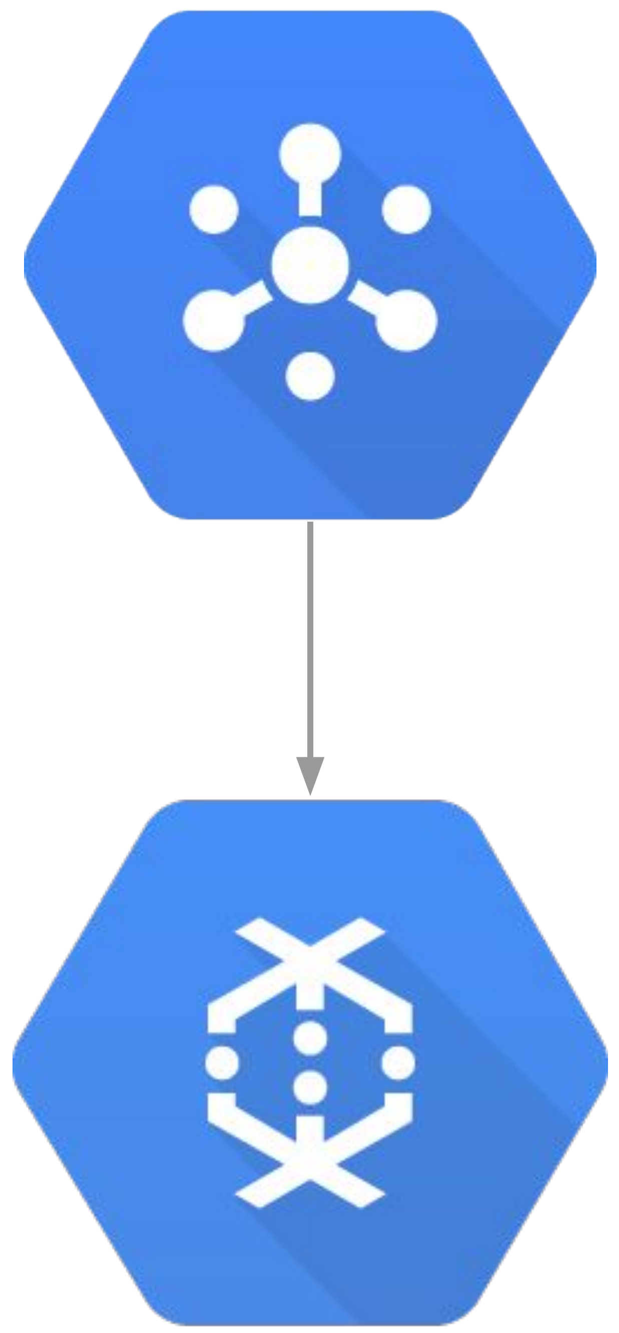
Google Cloud

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

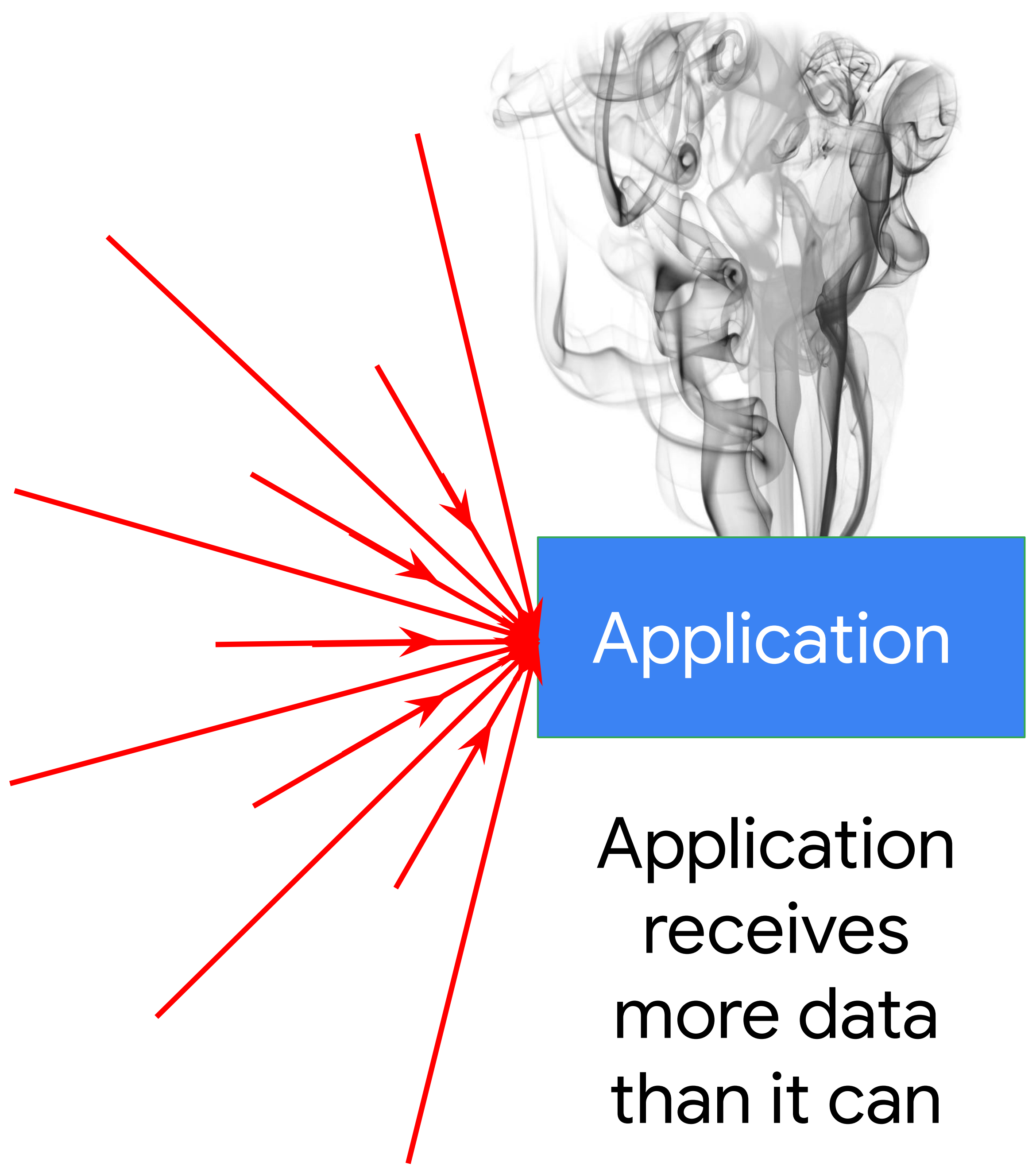
Cloud Pub/sub with Dataflow: Exactly once, ordered processing

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



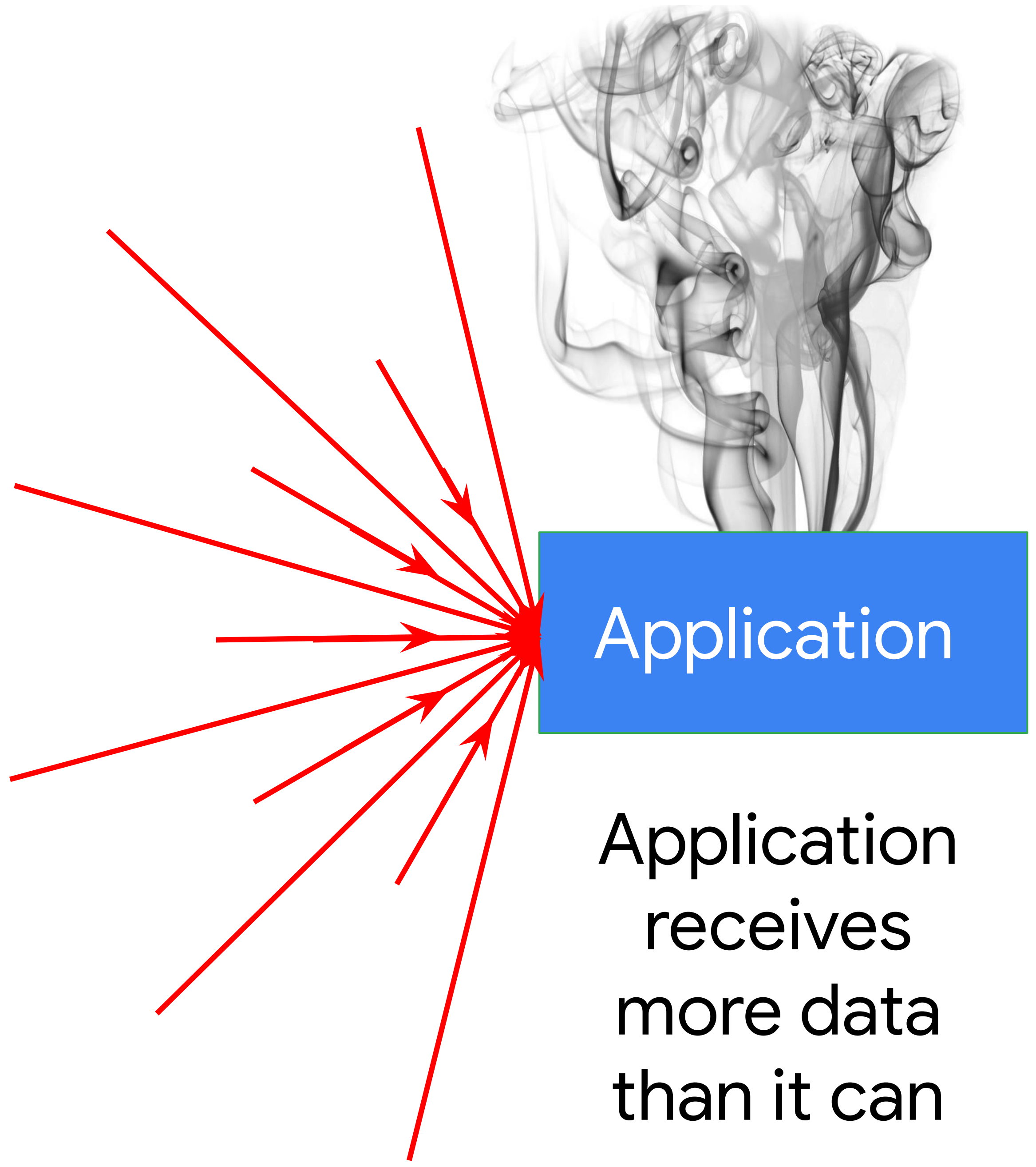
Google Cloud

Use Cloud Pub/Sub for streaming resilience



Application receives more data than it can process

Use Cloud Pub/Sub for streaming resilience



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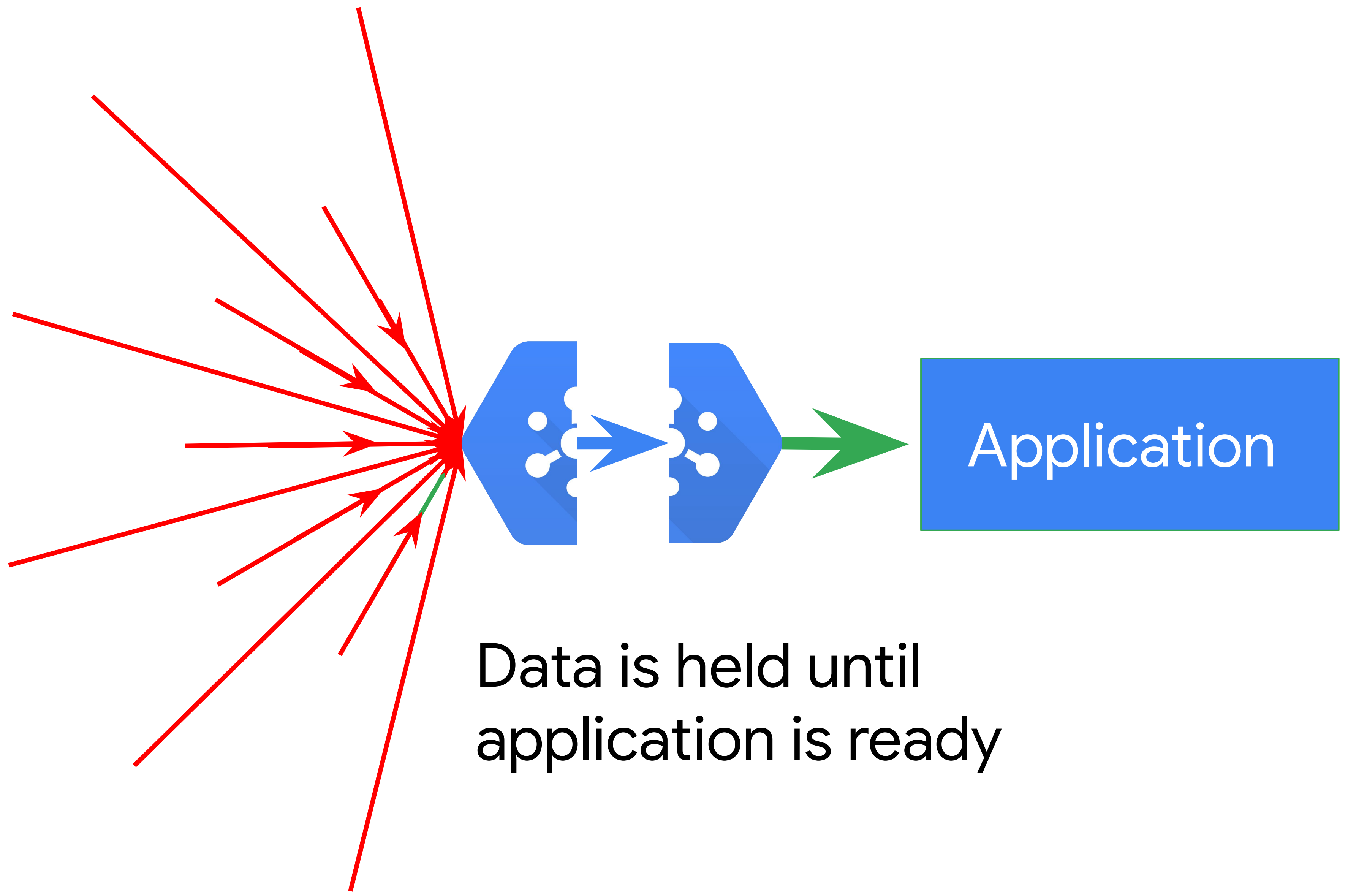
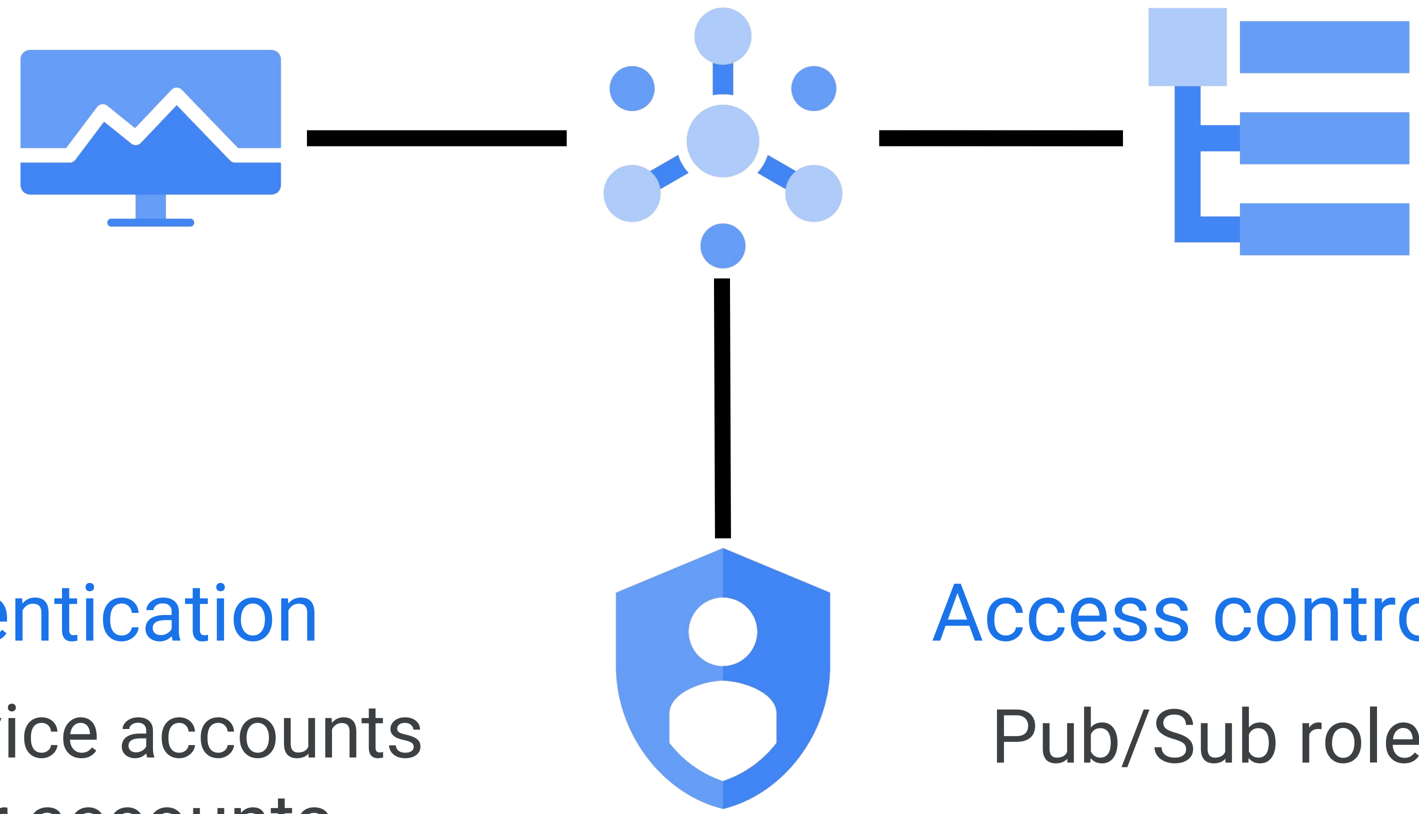


Data is held until application is ready

Security, monitoring, and logging for Pub/Sub



Cloud Logging metrics

pubsub_topic
pubsub_subscription

Cloud Audit Logs

Admin = on
Data Access = off

Authentication

Service accounts
User accounts

Access control

Pub/Sub roles per topic

Lab

Publish Streaming Data into Pub/Sub

Lab Objectives

Create a Pub/Sub topic and subscription

Simulate your traffic sensor data into Pub/Sub