

Synopsis: Pub/Sub → BigQuery using Cloud Functions (Gen2) – Step-by-Step Implementation

This task demonstrates a **real-time serverless data ingestion pipeline** on Google Cloud, where messages from a Pub/Sub topic are automatically processed by a Cloud Function (Gen2) and stored in BigQuery for analysis

Step 1: Create Pub/Sub Topic and Subscription

A Pub/Sub topic was created to receive event messages (for example, user activity events). A subscription was also created so that downstream services could consume messages from the topic

Step 2: Create Cloud Function (Gen2) with Pub/Sub Trigger

A **Cloud Function Gen2** was created and configured with a **Pub/Sub trigger**, so the function is invoked automatically whenever a new message is published to the topic. This eliminates the need for manual polling or server management.

Step 3: Implement the Cloud Function (main.py)

The function uses the **Functions Framework** to handle Pub/Sub events.

- The Pub/Sub message is received as a CloudEvent.
- The message data is Base64-decoded and parsed from JSON.
- Required fields (event, user) are extracted, and a timestamp is added.
- The processed record is inserted into a BigQuery table using the BigQuery client library.

This ensures that every event published to Pub/Sub is reliably stored in BigQuery.

Step 4: Define Dependencies (requirements.txt)

The required Python libraries were specified:

- functions-framework to run the Cloud Function
- google-cloud-bigquery to interact with BigQuery

These dependencies are automatically installed during deployment.

Step 5: Enable Required Google Cloud Services

Essential services were enabled using the gcloud CLI, including Pub/Sub, BigQuery, Cloud Functions, Eventarc, and Cloud Run. This allows all components to communicate seamlessly within the GCP environment.

Step 6: Create BigQuery Dataset and Table

A BigQuery dataset was created in the required region, followed by a table with a defined schema:

- event (STRING)
- user (STRING)
- ts (TIMESTAMP)

This schema matches the structure of the data processed by the Cloud Function.

Step 7: Publish a Test Message to Pub/Sub

A sample JSON message was published to the Pub/Sub topic using the gcloud command-line tool. This action triggered the Cloud Function automatically.

Step 8: Verify Execution Using Cloud Logs

After publishing the message, **Cloud Function logs** were checked in **Cloud Logging** to confirm:

- The function was triggered successfully
- The “BigQuery Insert Succeeded” message appeared
- No runtime or permission errors occurred

This step validates that the Pub/Sub trigger and function execution are working correctly.

Step 9: Verify Data in BigQuery

Finally, the BigQuery table was opened and the **Preview** option was used to confirm that the event data was successfully inserted as a new row.

Conclusion:

Using **Google Cloud Pub/Sub**, **Cloud Functions (Gen2)**, and **BigQuery**, this solution provides a scalable, serverless, and real-time event ingestion pipeline with built-in observability through Cloud Logs.

Google Cloud

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Pub/Sub / Subscriptions

Pub/Sub

- Topics
- Subscriptions
- Snapshots
- Schemas

Pub/Sub Lite

- Lite Reservations
- Lite Topics
- Lite Subscriptions

Subscriptions

Create subscriptionDeleteTags

Pub/Sub offers SMTs to simplify data transformations for streaming pipelines

Perform single message transforms such as casting, redaction, masking, complex filtering, to message attributes and/or the data directly within Pub/Sub using new JavaScript User-Defined Functions (UDFs).

Learn more

ListMetrics

FilterFilter subscriptions

	State	Subscription ID	Delivery type	Topic name	Ack deadline
<input type="checkbox"/>	✓	pavan	Pull	projects/pavanp/topics/pavanid	10 seconds
<input type="checkbox"/>	✓	pavanid-sub	Pull	projects/pavanp/topics/pavanid	10 seconds

Select a subscription

PermissionsLabels

Please select at least one resource.

DismissActivate

Free trial status: ₹13,516.32 credit and 77 days remaining. Activate your full account to get unlimited access to all of Google Cloud—use any remaining credits, then pay only for what you use.

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Pub/Sub / Topics / Topic: pavanid

Pub/Sub

- Topics
- Subscriptions
- Snapshots
- Schemas

Pub/Sub Lite

- Lite Reservations
- Lite Topics
- Lite Subscriptions

pavanid

EditTrigger Cloud Run functionImportDelete

Tags

Export to BigQuery

Export data to a BigQuery table.

Export data

Export to Cloud Storage

Export data to a text or Avro file in Cloud Storage.

Export data

Subscriptions

SnapshotsMetricsDetailsMessages

Only subscriptions attached to this topic are displayed. A subscription captures the stream of messages published to a given topic. You can also stream messages to BigQuery or Cloud Storage by creating a subscription from a Cloud Dataflow job. [Learn more](#)

Create subscriptionExport

FilterFilter subscriptions

Subscription ID	Subscription name	Project
pavanid-sub	projects/pavanp/subscriptions/pavanid-sub	pavanp

Release Notes

pavanid

PermissionsLabelsStorage policy

Edit or delete roles below, or select "Add principal" to grant new access.

Show inherited roles in table

Display roles inherited from the parent resources in the table below

FilterEnter property name or value

Role / Principal	Inheritance
▶	Artifact Registry Service Agent (1)
▶	Cloud Build Service Account (1)
▶	Cloud Build Service Agent (1)
▶	Cloud Functions Service Agent (1)
▶	Container Registry Service Agent (1)
▶	Editor (3)
▶	Eventarc Service Agent (1)

Cloud Run

Overview

Services

Jobs

Worker pools

Domain mappings

Service details

Edit & deploy new revision

Connect to repo

Test

Learn

Refresh

Deploying revision

Hide status

Building source (see logs)

Completed

Updating service

Completed

Creating revision

Completed

Routing traffic

Completed

pavanp1

Region: asia-south2

URL: https://pavanp1-403485263242.asia-south2.run.app

Scaling: Auto (Min: 0, Max: 3)

Observability

Revisions

Source

Triggers

Networking

Security

YAML

Metrics

Logs

SLOs

Errors

Release Notes

Severity

Default

Filter

Search all fields and values

Severity

Timestamp

Summary

2025-12-24 18:26:52.776 IST

Bigquery Insert Succeeded {'event': 'USER_LOGIN', 'user': 'pavan', 'ts': '2025-12-24T04:56:52.189854'}

Explain this log entry

Open in Logs Explorer

insertId: '694b7294808bd9192365a431'

labels: (2)

logName: 'projects/pavanp1/logs/run.googleapis.com/2Fstdout'

payload: 'textPayload'

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Default

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Search all fields and values

Severity

Timestamp

Summary

2025-12-24 18:26:42.281 IST

Cloud Run ReplaceService pavanp1 ({#type: type.googleapis.com/google.cloud.audit.AuditLog, methodName: /Services...})

2025-12-24 18:26:52.181 IST

POST 200 130 B 594 ms APIs-Google; (+https://developers.goo... https://pavanp1-inyxprrta-em.a.run.app/7_GCP_Clo...)

2025-12-24 18:26:52.776 IST

Bigquery Insert Succeeded {'event': 'USER_LOGIN', 'user': 'pavan', 'ts': '2025-12-24T04:56:52.189854'}

2025-12-24 18:27:13.753 IST

POST 200 130 B 58 ms APIs-Google; (+https://developers.goo... https://pavanp1-inyxprrta-em.a.run.app/7_GCP_Clo...)

2025-12-24 18:27:13.812 IST

Bigquery Insert Succeeded {'event': 'USER_LOGIN', 'user': 'pavan', 'ts': '2025-12-24T04:57:13.758248'}

No newer entries found matching current filter.

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Search BigQuery resources

Show starred only

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Repositories

Queries

Notebooks

Data canvases

Data preparations

Pipelines

Connections

pavan_events_ds

user_events

user_events_ds

Untitled...ery

user_events

user_events

Query

Open in

Share

Copy

Snapshot

Delete

Export

Refresh

Schema

Details

Preview

Table Explorer

Insights

Lineage

Data Profile

Data Quality

Preview may not show all data being streamed to BigQuery. If you want to check for such data, run a SELECT statement over the table.

Row

event

user

ts

1

USER_LOGIN

pavan

2025-12-24 04:56:52.189854 UTC

2

USER_LOGIN

pavan

2025-12-24 04:57:13.758248 UTC

Results per page: 50

1 - 2 of 2

Job history

Show

