

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 pub Subscriptions

Subscriptions

Pub/Sub offers SMTs to simplify data transformations for streaming pipelines [New](#)

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](#)

List Metrics

Filter Filter subscriptions

State	Subscription ID	Delivery type	Topic name	Ack deadline
Green	pavan	Pull	projects/pavangtopics/pavanid	10 seconds
Green	pavanid-sub	Pull	projects/pavangtopics/pavanid	10 seconds

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.

Select a subscription

Permissions Labels

Please select at least one resource.

Activate

Google Cloud pavang pub Subscriptions

Topics

Tags

Export to BigQuery Export to Cloud Storage

Export data

Subscriptions Snapshots Metrics Details Messages

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 subscription Export

Filter Filter subscriptions

Subscription ID	Subscription name	Project
pavanid-sub	projects/pavangsubscriptions/pavanid-sub	pavang

Release Notes

Subscriptions

Permissions Labels Storage policy

Add principal Show inherited roles in table

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 Severity Default Filter Search all fields and values

Logs Severity Timestamp Summary Explain this log entry Open in Logs Explorer

```
Severity: 2025-12-24 10:26:52.776 IST Severity: 2025-12-24 10:26:52.776 IST
Timestamp: Bigquery Insert Succeeded {'event': 'USER_LOGIN', 'user': 'pavan', 'ts': '2025-12-24T04:56:52.189854'}
Summary: insertId: "694b7294000bd9192365a431"
labels: {}
logName: "projects/pavanp1/logs/run.googleapis.com%2Fstdout"
payload: "textPayload"
```

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 Severity Default Filter Search all fields and values

Logs Severity Timestamp Summary Explain this log entry Open in Logs Explorer

```
Severity: 2025-12-24 10:26:42.201 IST Severity: 2025-12-24 10:26:52.181 IST Severity: 2025-12-24 10:26:52.776 IST Severity: 2025-12-24 10:27:13.753 IST Severity: 2025-12-24 10:27:13.812 IST
Timestamp: Cloud Run ReplaceService pavanp1 (@type: type.googleapis.com/google.cloud.audit.AuditLog, methodName: /Services.. API-Call-Type: Google-Cloud-Run ReplaceService)
Summary: POST 200 130 B 594 ms APIs=Google; (https://pavanp1-403485263242.asia-south2.run.app/?_GCP_CloudRun=1&_GCP_CloudRunMethod=ReplaceService&_GCP_CloudRunVersion=1&_GCP_CloudRunRegion=asia-south2&_GCP_CloudRunService=pavanp1&_GCP_CloudRunType=CloudRun")
Bigquery Insert Succeeded {'event': 'USER_LOGIN', 'user': 'pavan', 'ts': '2025-12-24T04:56:52.189854'}
POST 200 130 B 58 ms APIs=Google; (https://pavanp1-403485263242.asia-south2.run.app/?_GCP_CloudRun=1&_GCP_CloudRunMethod=ReplaceService&_GCP_CloudRunVersion=1&_GCP_CloudRunRegion=asia-south2&_GCP_CloudRunService=pavanp1&_GCP_CloudRunType=CloudRun")
Bigquery Insert Succeeded {'event': 'USER_LOGIN', 'user': 'pavan', 'ts': '2025-12-24T04:57:13.758248'}
No newer entries found matching current filter.
```

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 Severity Default Filter Search all fields and values

Logs Severity Timestamp Summary Explain this log entry Open in Logs Explorer

```
Severity: 2025-12-24 10:26:42.201 IST Severity: 2025-12-24 10:26:52.181 IST Severity: 2025-12-24 10:26:52.776 IST Severity: 2025-12-24 10:27:13.753 IST Severity: 2025-12-24 10:27:13.812 IST
Timestamp: Cloud Run ReplaceService pavanp1 (@type: type.googleapis.com/google.cloud.audit.AuditLog, methodName: /Services.. API-Call-Type: Google-Cloud-Run ReplaceService)
Summary: POST 200 130 B 594 ms APIs=Google; (https://pavanp1-403485263242.asia-south2.run.app/?_GCP_CloudRun=1&_GCP_CloudRunMethod=ReplaceService&_GCP_CloudRunVersion=1&_GCP_CloudRunRegion=asia-south2&_GCP_CloudRunService=pavanp1&_GCP_CloudRunType=CloudRun")
Bigquery Insert Succeeded {'event': 'USER_LOGIN', 'user': 'pavan', 'ts': '2025-12-24T04:56:52.189854'}
POST 200 130 B 58 ms APIs=Google; (https://pavanp1-403485263242.asia-south2.run.app/?_GCP_CloudRun=1&_GCP_CloudRunMethod=ReplaceService&_GCP_CloudRunVersion=1&_GCP_CloudRunRegion=asia-south2&_GCP_CloudRunService=pavanp1&_GCP_CloudRunType=CloudRun")
Bigquery Insert Succeeded {'event': 'USER_LOGIN', 'user': 'pavan', 'ts': '2025-12-24T04:57:13.758248'}
No newer entries found matching current filter.
```

BigQuery Search (/) for resources, docs, products, and more Search

pavanp1 / Datasets / pavan_events_ds / Tables / 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

