To develop and test your application locally, you can use the Pub/Sub emulator, which provides local emulation (/sdk/gcloud/reference/beta/emulators/) of the production Pub/Sub environment. You run the Pub/Sub emulator using the `gcloud` command-line tool.

To run your application against the emulator, you first need to start the emulator and set environment variables so that your application communicates with the emulator instead of the production Pub/Sub.

You can use unencrypted endpoints (that is, `http`) in the emulator, as in the examples below. In production, secure ints (`https`) are recommended.

You must have the following to use the Pub/Sub emulator:

- Properly set up python development environment. Refer to this guide (/python/setup) for details.
- Java JRE (version 7 or higher) installed.
- Google Cloud SDK (/sdk/docs/) installed. Cloud SDK contains the `gcloud` command-line tool.
- An application that is built using the Google Cloud Client Libraries (/pubsub/libraries#gcloud-libraries).

Install the emulator from a command prompt:

Start the emulator by invoking `pubsub start` from a command prompt. Before running the command, replace ***PUBSUB_PROJECT_ID*** with a Google Cloud project ID (/resource-manager/docs/creating-managing-projects#identifying_projects). In this case, the project ID can be any valid string; it does not need to represent a real Google Cloud project because the Pub/Sub emulator runs locally.

See `gcloud beta emulators pubsub start` (/sdk/gcloud/reference/beta/emulators/pubsub/start) for a complete list of options.

After you start the emulator, you should see a message that resembles the following:

This indicates that the Pub/Sub server runs at the emulator endpoint on your local machine instead of the Google Cloud endpoint. All operations happen locally, including:

- Creating a topic or subscription
- Publishing
- Subscribing

After you start the emulator, you need to set environment variables so that your application connects to the emulator instead of Pub/Sub. Set these environment variables on the same machine that you use to run your application.

You need to set the environment variables each time you start the emulator. The environment variables depend on dynamically assigned port numbers that could change when you restart the emulator.

If your application and the emulator run on the same machine, you can set the environment variables automatically:

Your application will now connect to the Pub/Sub emulator.

If your application and the emulator run on different machines, set the environment variables manually:

1. Run the `env-init` command:

2. On the machine that runs your application, set the `PUBSUB_EMULATOR_HOST` environment variable and value as directed by the output of the `env-init` command. You can optionally set the `PUBSUB_PROJECT_ID` environment variable for the project you want to use for the emulator, but

you only need to set `PUBSUB_EMULATOR_HOST` for your application to connect to the emulator. For example:

Your application will now connect to the Pub/Sub emulator.

**Note:** If you are using the Python App Engine Standard local development server, you must pass environment variables on the command line as follows:

To use the emulator, you must have an application built using the Google Cloud Client Libraries (/pubsub/libraries#gcloud-libraries). The emulator does not support Cloud Console or `gcloud pubsub` (/sdk/gcloud/reference/pubsub/) commands.

The following example demonstrates how to create a topic, publish messages, and read messages using the emulator and an application that uses the Python Google Cloud Client Library (/pubsub/docs/reference/libraries#client-libraries-install-python).

Complete the following steps on the machine where you set the emulator environment variables (/pubsub/docs/emulator#env):

1. Get the Pub/Sub Python samples from GitHub by cloning the full Python repository (https://github.com/GoogleCloudPlatform/python-docs-samples). The Pub/Sub samples are in the `pubsub` directory.

2. In your cloned repository, navigate to the `pubsub/cloud-client` directory. You'll complete the rest of these steps in this directory.

3. From within the `pubsub/cloud-client` directory, install the dependencies needed to run the example:

4. Create a topic:

5. (Optional) If you do not have a local push endpoint for testing push subscriptions in the emulator, complete the following steps to create one on`http://localhost:3000/messages`.

    a. Install JSON Server (https://www.npmjs.com/package/json-server).

    b. Start JSON Server.

    where `db.json` contains the following starter code:

c. Note down `http://localhost:3000/messages` for ***PUSH_ENDPOINT*** in the next step.

6. Create a subscription to the topic:

   - Create a pull subscription:

   - Create a push subscription:

7. Publish messages to the topic:

8. Read the messages published to the topic:

   - Retrieve messages from your pull subscription:

   - Observe the messages delivered to your local push endpoint. For example, messages look like the following:

In all languages except for Java and C#, if you have set `PUBSUB_EMULATOR_HOST` as described in Setting environment variables (/pubsub/docs/emulator#env), the Pub/Sub client libraries automatically call the API running in the local instance rather than Pub/Sub.

However, C# and Java client libraries require you to modify your code to use the emulator:

To stop the emulator, press Control+C.

After you stop the emulator, run the following command to remove the `PUBSUB_EMULATOR_HOST` environment variable so your application will connect to Pub/Sub:

For details on command-line arguments for the Pub/Sub emulator, see `gcloud beta emulators pubsub` (/sdk/gcloud/reference/beta/emulators/pubsub/).

- UpdateTopic and UpdateSnapshot RPCs are not currently supported.
- IAM operations are not currently supported.
- Configurable message retention is not supported; all messages are retained indefinitely.
- Subscription expiration is not supported. Subscriptions do not expire.

To file issues, visit the Pub/Sub forum (https://googlecloudplatform.uservoice.com/forums/302631-cloud-pub-sub/filters/top).