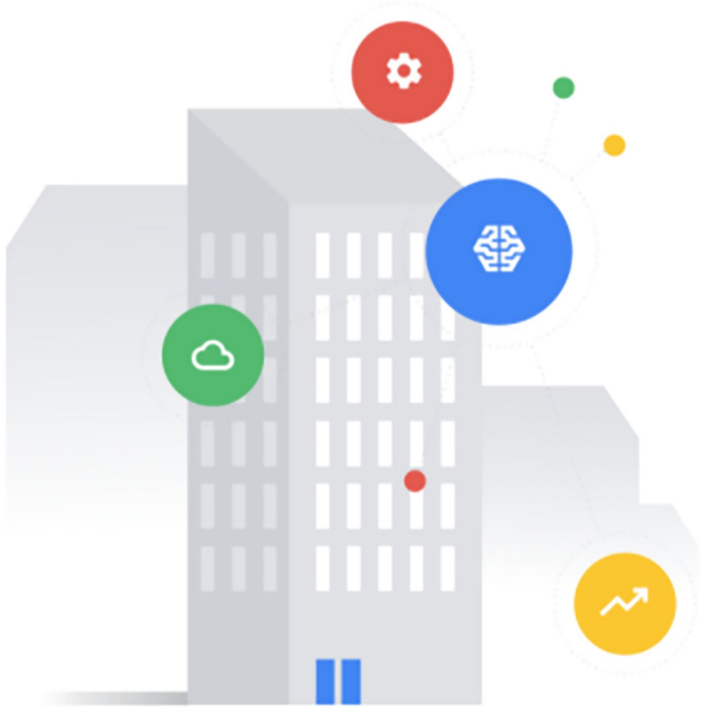
Google

Lesson 2

Cloud setup



Before you get started

This onboarding deck has interactive features and activities that enable a self-guided learning experience. To help you get started, here are two tips for viewing and navigating through the deck.

1 View this deck in presentation mode.

- To enter presentation mode, you can either:
  - Click the **Present** or **Slideshow** button in the top-right corner of this page.
  - Press **Ctrl+F5** (Windows), **Cmd+Enter** (macOS), or **Ctrl+Search+5** (Chrome OS) on your keyboard.
- To exit presentation mode, press the **Esc** key on your keyboard.

2 Navigate by clicking the buttons and links.

- Click the **Back** or **Next** buttons to go backward or forward in the deck. Moving forward, you'll find them in the bottom corners of every slide.
- Click blue text to go to another slide in this deck or open a new page in your browser.
- For the best learning experience, using your keyboard or mouse wheel to navigate is discouraged.

Ready to get started? Let's go!

Lesson 2

Cloud setup

What you'll learn about:

- Google Cloud components
- UDMI Cloud infrastructure

By the end of this lesson, you'll be able to:

- Create a Google Cloud Project.
- Create an IoT Core registry.
- Deploy the UDMI cloud functions.
- Set up Pub/Sub topics & subscriptions.
- Set up a reflector registry & device.

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Creating a Google Cloud project

To create a Google Cloud project, refer to Creating and managing projects.

Then, make sure that your billing information has been added by following the instructions found here.

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Cloud infrastructure

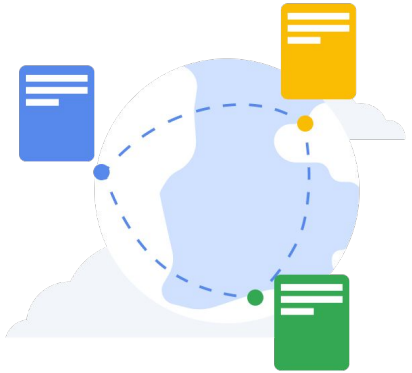
The Universal Device Management Interface (UDMI) platform includes cloud side infrastructure that processes device messages, which enables the use of tools provided by UDMI.

To learn how to deploy UDMI cloud infrastructure, refer to the instructions found here.

Having the cloud infrastructure in place enables the use of validation tools.

The cloud functions provide several functionalities, including:

- Redirecting all state updates into the udmi_target, so that a single subscription receives both state and events.
- A reflector registry and device entry which enables the use of the sequencer tool.



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Cloud infrastructure (continued)

1. On your local machine, ensure you have cloned the UDMI Repository, installed and initialized the gcloud CLI, selecting the project you have created as the current project, and also authenticated with the gcloud application default credentials.

2. Enable the following required GCP API's:

   - IoT Core
   - Cloud Functions
   - Cloud Build

   By entering the following into your terminal window:

   ```
   gcloud services enable cloudbuild.googleapis.com cloudfunctions.googleapis.com cloudiot.googleapis.com
   ```

3. To deploy the UDMIS and cloud functions to the GCP Project, navigate to the root directory of the UDMI directory in a terminal console and enter:

   ```
   udmis/deploy_udmis_gcloud GCP_PROJECT_ID
   ```

   The cloud functions should now be deployed to the project!

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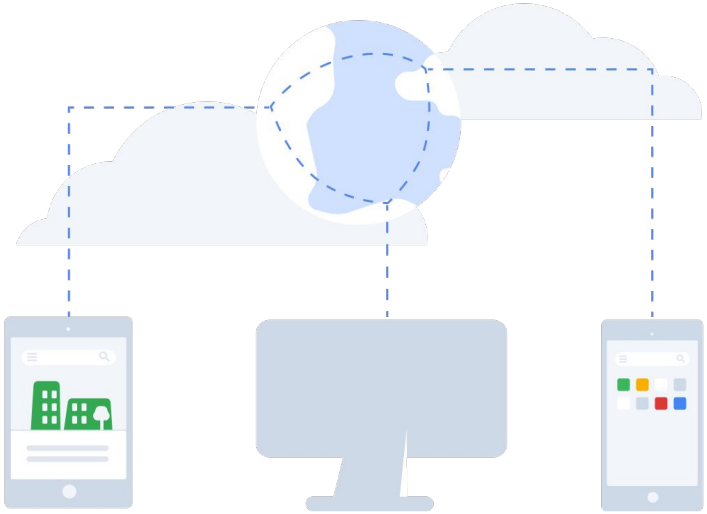
What’s an IoT Core registry?

An IoT core registry is a collection of devices.

A device is a processing unit that is capable of connecting to the internet and exchanging data with the cloud. Devices are often called "**smart devices**" or "**connected devices**."



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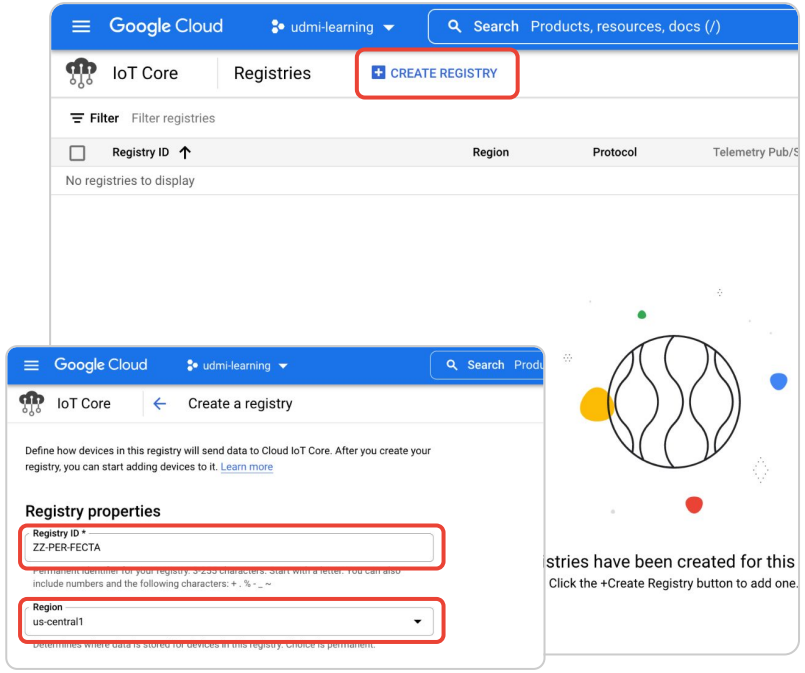
Creating an IoT Core device registry

To access Cloud IoT Core, you must create at least one device registry.

1. Go to the Google Cloud IoT Core page in Cloud Console.
2. Click **Create Registry**.
3. Give the registry a registry id and state which region it's in.
   (For more on regions, click here.)



You may use the following values which will be used throughout these lessons.

Registry ID: ZZ-PER-FECTA

Region: us-central-1

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Google

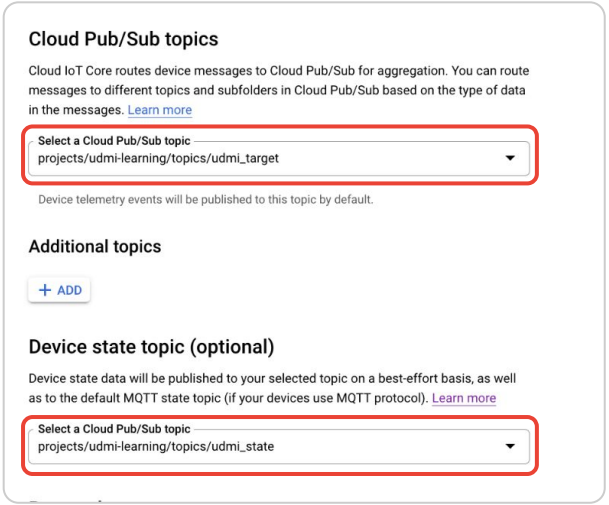
Creating an IoT Core device registry (continued)

4. Select **MQTT** as your protocol.

5. Internal to your Google Cloud project, messages received from your devices will be processed via Pub/Sub, a Google Cloud service that allows you to send messages between different applications.

But to handle messages from a device, you first have to set up your Pub/Sub topics. For the default telemetry topic, select **udmi_target** from the dropdown menu.

Note: This topic was automatically created as a part of the cloud function deployment. If no Pub/Sub default topic is selected, data being sent from the device will be lost.



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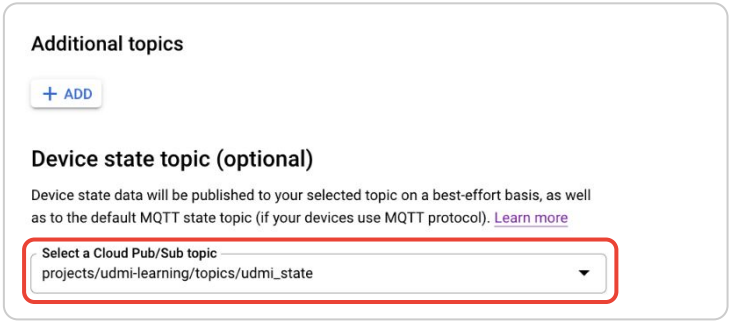
Creating an IoT Core device registry (continued)

6. Select **Advanced Options**.
7. For the device state topic, select **udmi_state** from the dropdown menu.

   Note: This topic was automatically created as a part of the cloud function deployment.

8. Click **Create**.

For more information, see Create a device registry.



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Google Pub/Sub

Pub/Sub is a Google Cloud service which follows the publisher/subscriber messaging model to exchange data between different applications or services.

To learn more about how this exchange works, refer to What is Pub/Sub?

Topics are resources to which messages are sent by publishers.
Subscriptions are resources representing the stream of messages from a single, specific topic.

Devices publish data to MQTT topics, which are different from Pub/Sub topics. Once data is published, Pub/Sub only exists in the cloud. MQTT only exists in devices. These devices only speak MQTT and do not recognize Pub/Sub.

The GCP IoT Core acts as a bridge and publishes all messages received to a Pub/Sub topic. To receive these messages published by devices in IoT core, a Pub/Sub subscription is required.

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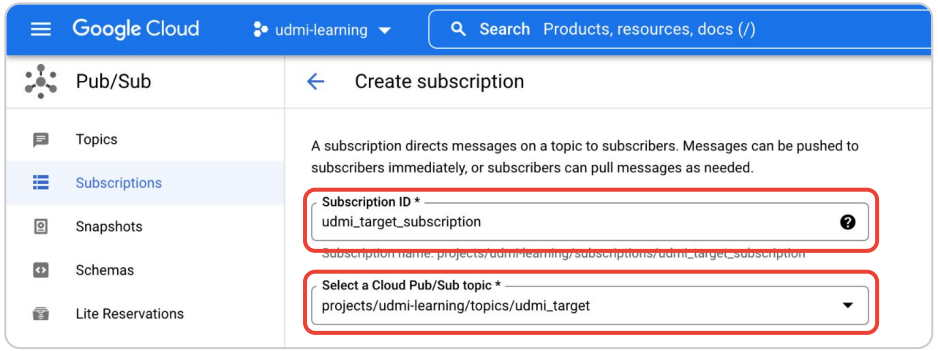
Create a Pub/Sub Subscription

Follow the instructions below to create the subscription.

For more information, refer to Create and use subscriptions.



1. Navigate to Pub/Sub on the GCP Console.
2. Select **Subscriptions**.
3. Select **Create Subscriptions**.
   - Type in a subscription ID: udmi_target_subscription.

     Note: As an MSI, you may be given a subscription name if the cloud is already set up for you. If that's the case, you should be using that name throughout these lesson's tutorials.

   - Set the target topic to udmi_target.
4. Select **Create**.

Your Pub/Sub subscription is now created! ✅

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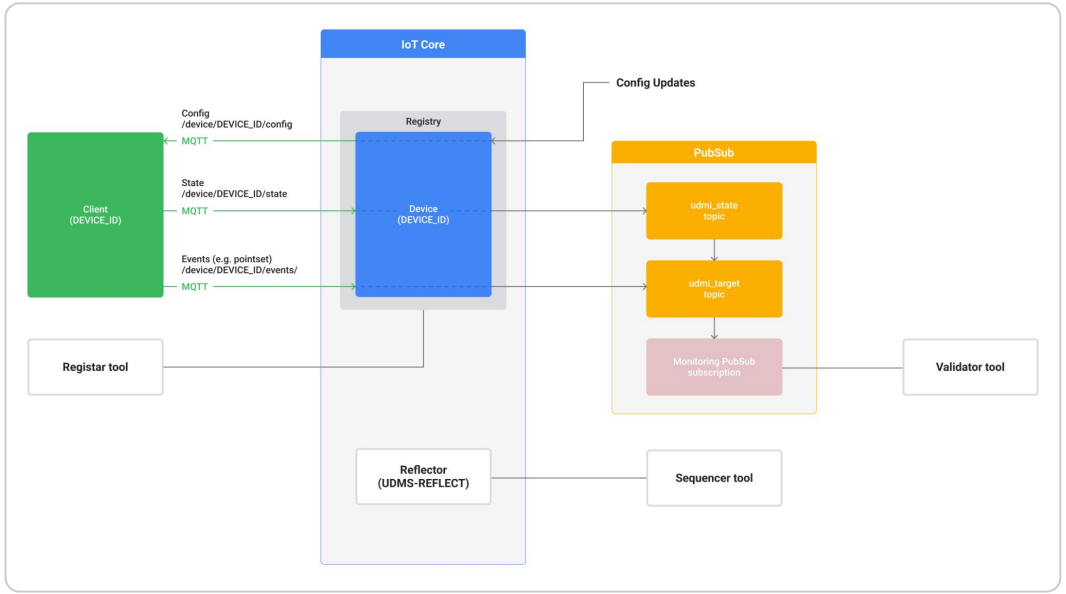
Reflector registry and device entry

A reflector registry and device entry allow greater functionality when using the UDMI tools, and enable functionality of the sequence validator you will use later.

The reflector device entry serves as a reflection of the IoT registry by combining all messages into a single stream.

It can also be used as an alternative to a Pub/Sub subscription.



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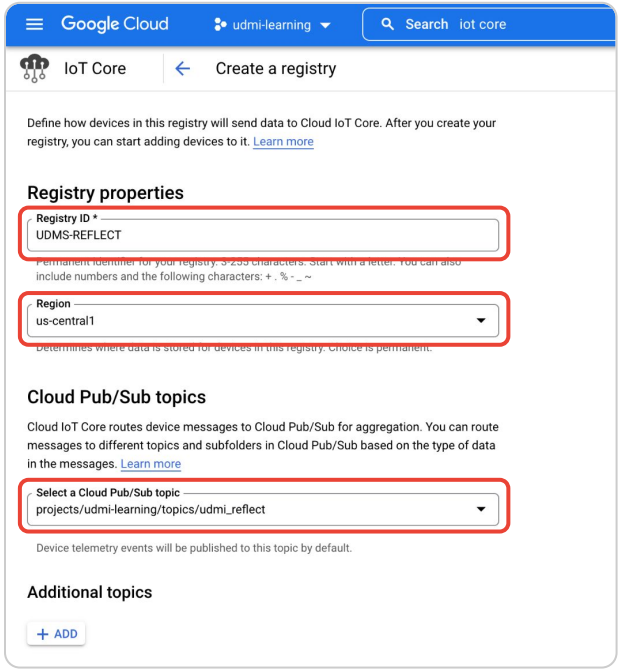
Reflector registry and device entry (continued)

To set up the reflector registry, follow the instructions below.

1. Add a new GCP IoT Core registry with a registry ID of UDMS-REFLECT. Use udmi_reflect as the default Pub/Sub topic for this registry, creating it if it does not exist.



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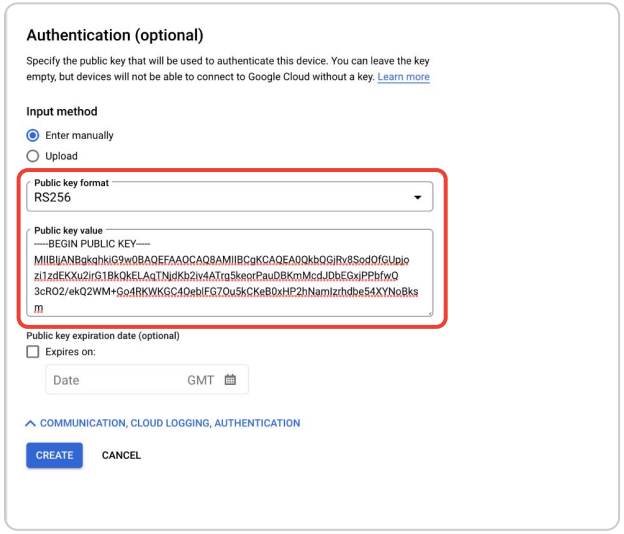
Reflector registry and device entry (continued)

2 Create reflector credentials:

- On your local machine, create a directory to store the credentials. Consider calling this `reflect_credentials` for now.

  Note: Be sure to remember where you have stored these reflector credentials, as you will need them later on!

- Run `bin/keygen RS256 path_to_directory` to create a public and private key.



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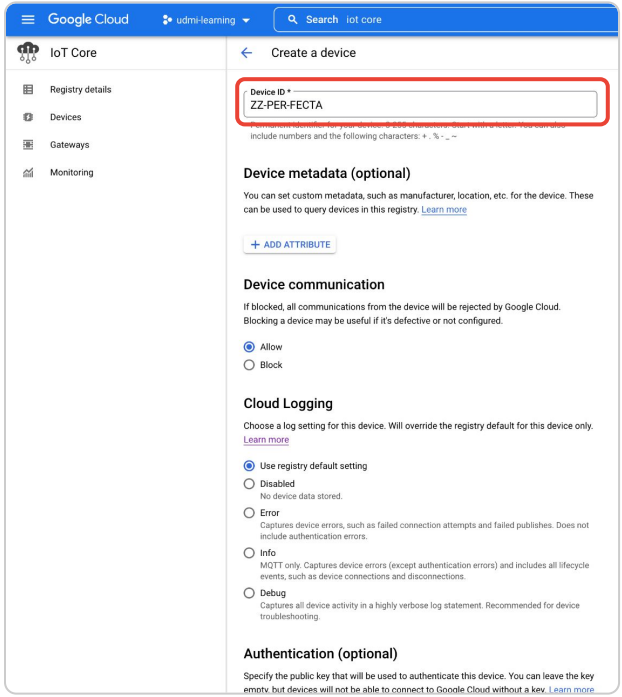
Reflector registry and device entry (continued)

3. Add a new device entry to the UDMS-REFLECT by registering with the following configuration:
   - Select the UDMS-REFLECT registry.
   - Select **Devices**.
   - Select **Create a Device**.
4. Enter the following information:
   - **device_id**: Use the Registry ID of the IoT Core registry you have created, (e.g., ZZ-PER-FECTA).
   - **Authentication - Public Key Value**: Use the public key you just created from validator/rsa_public.pem by copying the contents of the file into this field or uploading the file directly.
5. Select **Create**.



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Lesson 2

Knowledge check

Let’s take a moment to reflect on what you’ve learned so far.

- The next slides will have questions about the concepts and actions that were introduced in this lesson.
- Review each question and select the correct response.

You won’t be able to move forward until the correct answer is selected.

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*Click **Next** when you’re ready to begin.*

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Knowledge check 1

Resources representing the stream of messages from a single, specific topic.

Which Pub/Sub term is being described?

Select the best answer from the options listed below.

- Pub/Sub topic
- Pub/Sub message
- Pub/Sub subscription

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Knowledge check 1

Resources representing the stream of messages from a single, specific topic.

Which Pub/Sub term is being described?

Select the best answer from the options listed below.

Pub/Sub topic

Pub/Sub message

Pub/Sub subscription

Close... but not quite right! 🤔

Pub/Sub topics are resources to which messages are sent by publishers.

Try again

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Knowledge check 1

Resources representing the stream of messages from a single, specific topic.

Which Pub/Sub term is being described?

Select the best answer from the options listed below.

Pub/Sub topic

Pub/Sub message

Pub/Sub subscription

Close... but not quite right! 🤔

A Pub/Sub message is the combination of data and attributes that a publisher sends to a topic and is eventually delivered to subscribers.

Try again

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Knowledge check 1

Resources representing the stream of messages from a single, specific topic.

Which Pub/Sub term is being described?

Select the best answer from the options listed below.

Pub/Sub topic

Pub/Sub message

Pub/Sub subscription

That's right! 🎉

A Pub/Sub subscription is a named resource representing the stream of messages from a single, specific topic, to be delivered to the subscribing application. A subscription is required to receive all messages published by devices in IoT core.

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Knowledge check 2

Which of the following options is NOT a step in setting up a reflector device entry?

Select the best answer from the options listed below.

- Add a new GCP IoT Core registry with a registry ID of UDMS-REFLECT.
- Add a new device entry to the UDMS-REFLECT by registering with the provided configuration.
- Install the Google Cloud SDK.
- Create the reflector credentials.

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Knowledge check 2

Which of the following options is NOT a step in setting up a reflector device entry?

Select the best answer from the options listed below.

Add a new GCP IoT Core registry with a registry ID of UDMS-REFLECT.

Add a new device entry to the UDMS-REFLECT by registering with the provided configuration.

Install the Google Cloud SDK.

Create the reflector credentials.

Close... but not quite right! 🤔

This is actually the **first** step in setting up a reflector device entry! You should use udmi_reflect as the default Pub/Sub topic for this registry, creating it if it does not exist.

Try again

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Knowledge check 2

Which of the following options is NOT a step in setting up a reflector device entry?

Select the best answer from the options listed below.

Add a new GCP IoT Core registry with a registry ID of UDMS-REFLECT.

Add a new device entry to the UDMS-REFLECT by registering with the provided configuration.

Install the Google Cloud SDK.

Create the reflector credentials.

Close... but not quite right! 🤔

This is actually the **third** step in setting up the reflector device entry! You should enter the details provided in the previous instructions to register the device entry.

Try again

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Knowledge check 2

Which of the following options is NOT a step in setting up a reflector device entry?

Select the best answer from the options listed below.

Add a new GCP IoT Core registry with a registry ID of UDMS-REFLECT.

Add a new device entry to the UDMS-REFLECT by registering with the provided configuration.

Install the Google Cloud SDK.

Create the reflector credentials.

That's right! 🎉

Installing the Google Cloud SDK is **not** a step in setting up a reflector device entry. This step should be taken to create a Google Cloud project, and is necessary before installing UDMI tools.

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Knowledge check 2

Which of the following options is NOT a step in setting up a reflector device entry?

Select the best answer from the options listed below.

Add a new GCP IoT Core registry with a registry ID of UDMS-REFLECT.

Add a new device entry to the UDMS-REFLECT by registering with the provided configuration.

Install the Google Cloud SDK.

Create the reflector credentials.

Close... but not quite right! 🤔

This is actually the **second** step in setting up a reflector device entry! You must create a directory to store the credentials. It's important to remember where you've stored these reflector credentials, as you'll need them later on.

Try again

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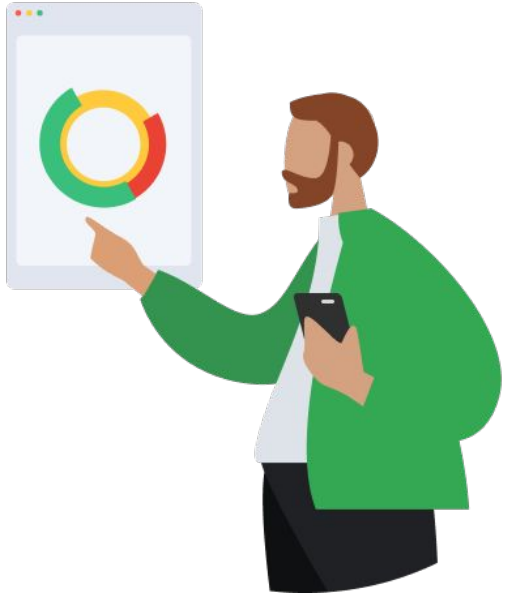
Lesson 2 summary

Let's review what you learned about:

- Google Cloud components
- UDMI Cloud Infrastructure

Now you should be able to:

- Create a Google Cloud Project.
- Create an IoT Core registry.
- Deploy cloud functions.
- Set up Pub/Sub topics & subscriptions.
- Set up Reflector registry & device.



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You completed Lesson 2!

Now's a great time to take a quick break before starting Lesson 3.

Ready for Lesson 3?

Let's go!

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*Press the **Esc** key on your keyboard to exit presentation mode.*

Google

Helpful resources

Bookmark these resources for future reference..

- UDMI Project GitHub
  Contains specification for management and operation of IoT systems.
- Git Documentation
  Contains various sources of information about Git contributed by Git community.