

JAVAMS11 Working with Cloud Spanner

2 hoursFree

Rate Lab

Overview

In this series of labs, you take a demo microservices Java application built with the Spring framework and modify it to use an external database server. You adopt some of the best practices for tracing, configuration management, and integration with other services using integration patterns.

In a previous lab, you modified the application to use Cloud SQL for database services. Cloud SQL provides a managed database service for applications that require robust relational database services. But when higher performance and transactions are critical to your application, you can use Cloud Spanner to provide high-performance, relational database services. Cloud Spanner is an enterprise-grade, globally distributed, strongly consistent database service built for the cloud specifically to combine the benefits of relational database structure with non-relational horizontal scale. This combination delivers high-performance transactions and strong consistency across rows, regions, and continents with enterprise-grade security.

In this lab, you update your application to use the Spring Cloud GCP starter for Cloud Spanner, test the changes locally in Cloud Shell, and then redeploy the backend service to App Engine.

Objectives

In this lab, you learn how to perform the following tasks:

- Create a Cloud Spanner instance and database
- Use the data definition language (DDL) to create a Cloud Spanner table
- Use Spring to add support for Cloud Spanner to an application
- Modify a Java application to use Cloud Spanner instead of Cloud SQL

Task 0. Lab Preparation

Access Qwiklabs

How to start your lab and sign in to the Console

1. Click the **Start Lab** button. If you need to pay for the lab, a pop-up opens for you to select your payment method. On the left is a panel populated with the temporary credentials that you must use for this lab.

Open Google Console

Caution: When you are in the console, do not deviate from the lab instructions. Doing so may cause your account to be blocked. [Learn more.](#)

Username
google2727032_student@qwiklabs.n

Password
k68CZXsxMZ

GCP Project ID
qwiklabs-gcp-4fbfecac8667e457

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2. Copy the username, and then click **Open Google Console**. The lab spins up resources, and then opens another tab that shows the **Choose an account** page.

Tip: Open the tabs in separate windows, side-by-side.

3. On the Choose an account page, click **Use Another Account**.

Google

Choose an account

Your.Email@gmail.com

google1381214_student@qwiklabs.net
Signed out

Use another account

4. The Sign in page opens. Paste the username that you copied from the Connection Details panel. Then copy and paste the password.

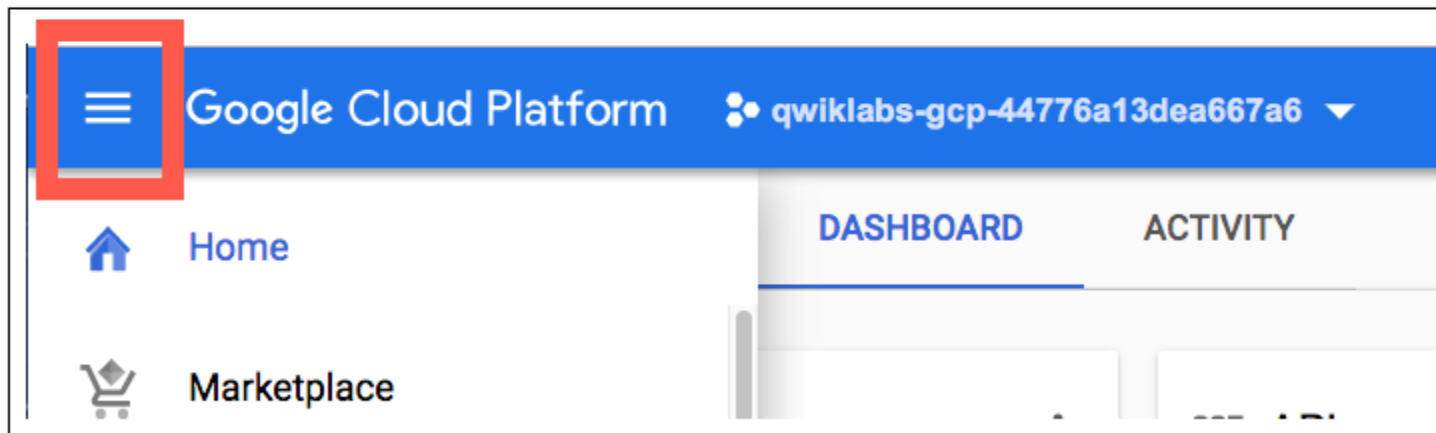
Important: You must use the credentials from the Connection Details panel. Do not use your Qwiklabs credentials. If you have your own GCP account, do not use it for this lab (avoids incurring charges).

5. Click through the subsequent pages:

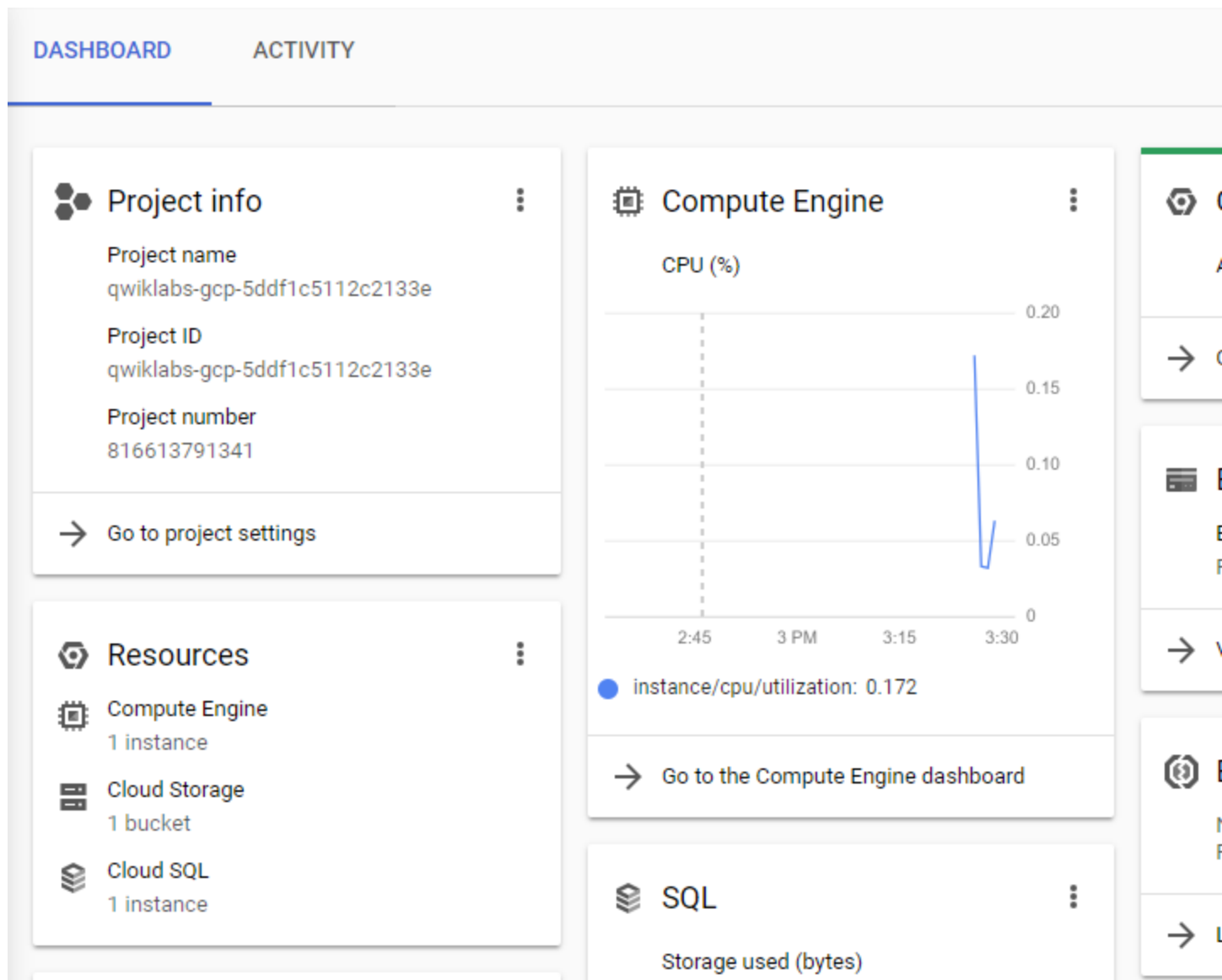
- Accept the terms and conditions.
- Do not add recovery options or two-factor authentication (because this is a temporary account).
- Do not sign up for free trials.

After a few moments, the GCP console opens in this tab.

Note: You can view the menu with a list of GCP Products and Services by clicking the **Navigation menu** at the top-left, next to “Google Cloud Platform”.



After you complete the initial sign-in steps, the project dashboard appears.



Fetch the application source files

The lab setup includes automated deployment of the services that you configured yourself in previous labs. When the setup is complete, copies of the demo application (configured so that they are ready for this lab session) are put into a Cloud Storage bucket named using the project ID for this lab.

Before you proceed with the tasks for this lab, you must first copy the demo application into Cloud Shell so you can continue to work on it.

1. In the upper-right corner of the screen, click **Activate Cloud**



Shell () to open Cloud Shell.

2. Click **Start Cloud Shell**.

Boost mode is not needed for this lab.

3. In the Cloud Shell command line, enter the following command to create an environment variable that contains the project ID for this lab:

```
export PROJECT_ID=$(gcloud config list --format 'value(core.project)')
```

4. Verify that the demo application files were created.

```
gsutil ls gs://$PROJECT_ID
```

Repeat the last step if the command reports an error or if it does not list the two folders for the `guestbook-frontend` application and the `guestbook-service` backend application.

Note

A Cloud Storage bucket that is named using the project ID for this lab is automatically created for you by the lab setup. The source code for your applications is copied into this bucket once the Cloud SQL server is ready and both application microservices components have been deployed to App Engine. You might have to wait up to 10 minutes for the deployment tasks to complete.

5. Copy the application folders to Cloud Shell.

```
gsutil -m cp -r gs://$PROJECT_ID/* ~/
```

6. Make the Maven wrapper scripts executable.

```
chmod +x ~/guestbook-frontend/mvnw
chmod +x ~/guestbook-service/mvnw
```

7. Check that the frontend application is running.

8. Find the URL of the frontend application that should now be running on App Engine

```
gcloud app browse
```

This command reports a URL that links to your application's frontend.

```
Did not detect your browser. Go to this link to view your app:
https://....appspot.com
```

9. Click the link to open a browser tab to the frontend URL.

Guestbook

https://qwiklabs-gcp-79b600d0ad63b36f.appspot.com

Guestbook

Your name:

Message:

File:

Choose File No file chosen

Post

Ray Hello Cloud SQL

Task 1. Enable Cloud Spanner API

In this task, you enable Cloud Spanner API so that you can create a Cloud Spanner database for your application.

1. Switch back to the Cloud Shell and enable the Cloud Spanner API.

```
gcloud services enable spanner.googleapis.com
```

Task 2. Create and provision a Cloud Spanner instance

In this task, you create a Cloud Spanner instance, a database and a database table.

Create a Cloud Spanner instance

You create a Cloud Spanner instance and then create a database on that instance for the demo application.

1. Create a Cloud Spanner instance.

```
gcloud spanner instances create guestbook --config=regional-us-central1 \
--nodes=1 --description="Guestbook messages"
```

2. Create a `messages` database in the Cloud Spanner instance.

```
gcloud spanner databases create messages --instance=guestbook
```

3. Confirm that the database exists by listing the databases of the Cloud Spanner instance.

```
gcloud spanner databases list --instance=guestbook
```

The output indicates that the database is ready:

NAME	STATE
messages	READY

Create a table in the Cloud Spanner database

You create a table in the `messages` database by creating a file that contains a DDL statement and then running the command.

1. In the `guestbook-service` folder, create the `db` folder.

```
cd ~/guestbook-service
mkdir db
```

2. In the Cloud Shell code editor, select **File > Refresh**.

3. In the Cloud Shell code editor, create a file named `spanner.ddl` in the `~/guestbook-service/db/` directory.

4. Add the following commands to the `spanner.ddl` file:

```
CREATE TABLE guestbook_message (
  id STRING(36) NOT NULL,
  name STRING(255) NOT NULL,
  image_uri STRING(255),
  message STRING(255)
) PRIMARY KEY (id);
```

5. In the Cloud Shell use `gcloud` to run the DDL command to create the table.


```
gcloud spanner databases ddl update messages \
--instance=guestbook --ddl="$(<db/spanner.ddl) "
```

6. Open the GCP Console tab for your lab session.
7. In the Navigation Menu open **Storage** >__ **Spanner**.__
8. Click the name of the **Guestbook messages** instance to open it.
9. Click the name of the __**messages** __database to open it.

You should see the **guestbook_message** table if the `spanner.ddl` file was processed successfully.

10. Click the **guestbook_message** table to open it.

The database opens showing the schema details tab. The schema should match the schema you created in the `spanner.ddl` file.

11. Click the **Data** tab.

There is no data in the table yet.

Task 3. Add the Spring Cloud GCP Cloud Spanner starter

In this task, you update the backend guestbook service application's `pom.xml` file with a newer version of the Spring Cloud GCP and the Cloud Spanner starter dependency.

1. Switch back to the tab running the Cloud Shell code editor.
2. Cloud Shell code editor, open `~/guestbook-service/pom.xml`.
3. Add the following code at the end of the `<dependencies>` section, immediately before the closing `</dependencies>` tag:

```
<dependency>
  <groupId>org.springframework.cloud</groupId>
  <artifactId>spring-cloud-gcp-starter-data-spanner</artifactId>
</dependency>
```

Task 4. Configure the cloud profile to use Cloud Spanner

In this task, you add the Cloud Spanner instance and database configuration properties to `application-cloud.properties` for the guestbook backend service application and you delete the Cloud SQL configuration properties.

1. In the Cloud Shell code editor, open `~/guestbook-service/src/main/resources/application-cloud.properties`.
2. Remove the Spring properties for Cloud SQL:

```
spring.cloud.gcp.sql.enabled=true
spring.cloud.gcp.sql.database-name=messages
spring.cloud.gcp.sql.instance-connection-name=...
```

3. Add the Spring properties for Cloud Spanner:

```
spring.cloud.gcp.spanner.instance-id=guestbook
spring.cloud.gcp.spanner.database=messages
```

Task 5. Update the backend service to use Cloud Spanner

You can use the `@Table` annotation to map a Java class to a Cloud Spanner table. And you can use the `@Column` annotation to map properties to table columns. You use the `@Table` annotation to map to the `guestbook_message` table that was created when you ran the DDL statement with `gcloud`.

The `id` property is specified as the primary key. In the class constructor, the `id` property is auto-populated with a random UUID. The UUIDv4 format is recommended over a monotonically increasing ID. This format helps Cloud Spanner avoid creating hotspots when it automatically shards the data.

The other class properties included match the table's schema in the DDL statement, except for `imageUri`, which uses the `@Column` annotation to map the table column name `image_uri` to the property name `imageUri`.

In this task, you modify `GuestbookMessage.java` to use the Cloud Spanner annotations.

1. In the Cloud Shell code editor, open
`~/guestbook-`
`service/src/main/java/com/example/guestbook/GuestbookMessage.java`.
2. Replace the entire contents of this file with the following code:

```
package com.example.guestbook;

import lombok.*;
import org.springframework.cloud.gcp.data.spanner.core.mapping.*;
import org.springframework.data.annotation.Id;

@Data
@Table(name = "guestbook_message")
public class GuestbookMessage {
    @PrimaryKey
    @Id
    private String id;

    private String name;

    private String message;

    @Column(name = "image_uri")
    private String imageUrl;

    public GuestbookMessage() {
        this.id = java.util.UUID.randomUUID().toString();
    }
}
```

Task 6. Add a method to find messages by name

Spring Data Spanner implements many commonly used Spring Data patterns, such as creating simple methods that can be automatically translated to corresponding SQL queries.

One example is a simple method signature: `List<GuestbookMessage> findByName(String name);`. The Spring framework enables querying the Cloud Spanner table with the SQL query `SELECT * FROM guestbook_message WHERE name = ?`.

In this task, you update the `GuestbookMessageRepository.java` file to use `String` as the ID type.

1. In the Cloud Shell code editor, open `~/guestbook-service/src/main/java/com/example/guestbook/GuestbookMessageRepository.java`.

2. Insert the following `import` directive below the existing `import` directives:

```
import java.util.List;
```

3. Change the datatype for the `PagingAndSortingRepository GuestbookMessage` parameter from `Long` to `String`.

```
public interface GuestbookMessageRepository extends
    PagingAndSortingRepository<GuestbookMessage, String> {
}
```

4. Insert the following code into the definition for the `GuestbookMessageRepository` public interface, immediately before the closing brace:

```
List<GuestbookMessage> findByName(String name);
```

The `GuestbookMessageRepository.java` file should now look like the screenshot:

```
1 package com.example.guestbook;
2
3 import org.springframework.data.repository.PagingAndSortingRepository;
4 import org.springframework.data.rest.core.annotation.RepositoryRestResource;
5 import java.util.List;
6
7 @RepositoryRestResource
8 public interface GuestbookMessageRepository extends
9     PagingAndSortingRepository<GuestbookMessage, String> {
10     List<GuestbookMessage> findByName(String name);
11 }
12
```

Task 7. Test the backend service application locally in Cloud Shell

In this task, you run the updated guestbook backend service application in Cloud Shell in order to test that the application has been correctly configured to use Cloud Spanner for database services.

1. In the Cloud Shell change to the `guestbook-service` directory.

```
cd ~/guestbook-service
```

2. Launch the guestbook backend service application locally using the `cloud` profile to enable the use of GCP services, including the new configuration changes for Cloud Spanner.

```
./mvnw spring-boot:run -Dserver.port=8081 -Dspring.profiles.active=cloud
```

3. In a new Cloud Shell tab, use `curl` to post a message.

```
curl -XPOST -H "content-type: application/json" \
-d '{"name": "Ray", "message": "Hello Cloud Spanner"}' \
http://localhost:8081/guestbookMessages
```

4. List all the messages.

```
curl http://localhost:8081/guestbookMessages
```

5. List specific messages using the custom `findByName()` search you added above.

```
curl http://localhost:8081/guestbookMessages/search/findByName?name=Ray
```

6. Use the `gcloud spanner databases execute-sql` command with a SQL query to validate that messages exist.

```
gcloud spanner databases execute-sql messages --instance=guestbook \
--sql="SELECT * FROM guestbook message WHERE name = 'Ray'"
```

7. Switch back to the the Google Cloud Platform console and navigate to **Spanner > Guestbook messages > messages > guestbook_message > data** to see the new entry.

guestbook_message

Schema

Indexes

Data

Insert

Edit

Delete



Filter by primary key

☐

id 

☐

5b26f86c-909e-4a73-935e-c62b2b4a5b9b

- Click **Query** and then click **Run query**, with the default `SELECT` query.

Query database: messages

```
1 SELECT * FROM guestbook_message LIMIT 100
```

Run query



Clear query

[SQL query help](#)

Schema

Results table

Explanation

Query complete (2.71ms elapsed)

id

name

image_

5b26f86c-909e-4a73-935e-c62b2b4a5b9b

Ray

Task 8. Redeploy the backend service application to App Engine

In this task, you redeploy the updated guestbook backend service application to App Engine.

1. Switch back to the Cloud Shell tab where the guestbook backend service application is running.
2. Press CTRL+C to stop the application.
3. Make sure you are in the `guestbook-service` directory.

```
cd ~/guestbook-service
```

4. Use Apache Maven to rebuild the backend service application and redeploy it to App Engine.

```
./mvnw clean appengine:deploy -DskipTests
```

When the deployment completes, the output from Maven provides the URL of the updated backend service application.

```
...
[INFO] GCLLOUD: Deployed service [guestbook-service] to [https://guestbook-
service-dot-PROJECT_ID.appspot.com]
[INFO] GCLLOUD:
[INFO] GCLLOUD: You can stream logs from the command line by running:
[INFO] GCLLOUD:   $ gcloud app logs tail -s guestbook-service
[INFO] GCLLOUD:
[INFO] GCLLOUD: To view your application in the web browser run:
[INFO] GCLLOUD:   $ gcloud app browse -s guestbook-service
...
```

5. Use the following command to list the URL for the updated backend service application.

```
gcloud app browse -s guestbook-service
```

A clickable URL link to your new backend service appears.

```
Did not detect your browser. Go to this link to view your app:
https://guestbook-service-dot-....appspot.com
```

6. Click the URL link to open the backend guestbook service. The response lists all the messages in the Cloud Spanner database.

7. Switch back to the browser tab for the frontend application.

Note

If you have closed that tab use the following command to list the URL for the guestbook frontend application that is running on App Engine.

```
gcloud app browse -s default
```

Then click the link to browse to the guestbook frontend application.

8. Enter a message to test that the application is working.

You should now see an updated message list that includes the initial test message you sent from the Cloud Shell and the new message you just posted confirming that the updated backend service application is using the new Cloud Spanner database.

End your lab

When you have completed your lab, click **End Lab**. Qwiklabs removes the resources you've used and cleans the account for you.

You'll be given an opportunity to rate the lab experience. Select the applicable number of stars, type a comment, and then click **Submit**.

The number of stars indicates your rating:

- 1 star = Very dissatisfied
- 2 stars = Dissatisfied
- 3 stars = Neutral
- 4 stars = Satisfied
- 5 stars = Very satisfied

You can close the dialog box if you don't want to provide feedback.

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