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# Configuring external replicas

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## MySQL | PostgreSQL

(<https://cloud.google.com/sql/docs/postgres/replication/configure-external-replica>) | [SQL Server](#)

This page describes how to configure a Cloud SQL instance that replicates to one or more replicas external to Cloud SQL, and how to demote the master instance in an external replica configuration to reverse the configuration.

For more information about the external replica configuration, see [Requirements and Tips for Configuring Replication](https://cloud.google.com/sql/docs/mysql/replication/tips#external-replica) (<https://cloud.google.com/sql/docs/mysql/replication/tips#external-replica>).

## Setting up the external replica configuration

### Before you begin

Before you start this task, you should have a Cloud SQL instance and an external MySQL instance that meet the [requirements for external replicas](https://cloud.google.com/sql/docs/mysql/replication/tips#external-replica)

(<https://cloud.google.com/sql/docs/mysql/replication/tips#external-replica>).

### Configuring the master instance

1. Go to the Cloud SQL Instances page in the Google Cloud Console.

**[GO TO THE CLOUD SQL INSTANCES PAGE \(HTTPS://CONSOLE.CLOUD.GOOGLE.COM/SQL/INSTANCES\)](https://console.cloud.google.com/sql/instances)**


2. Enable access on the master instance for the IP address of the external replica.

For information about enabling IP access, see [Configuring access for IP connections](https://cloud.google.com/sql/docs/mysql/connect-external-app#appaccessip)

(<https://cloud.google.com/sql/docs/mysql/connect-external-app#appaccessip>).

3. Record the IP address of the master instance for later use.

You can find the IP address on the instance's **Overview** page.

4. Click the Cloud Shell icon () in the upper right corner.

5. At the Cloud Shell prompt, use the built-in `mysql` client to connect to your master instance:

```
gcloud sql connect [MASTER_INSTANCE_NAME] --user=root
```

6. Enter your root password.

You should see the `mysql` prompt.

7. Create a special user for replication:

```
CREATE USER '[REPLICATION_USER]'@'%' IDENTIFIED BY '[REPLICATION_PASSWORD]';
```

8. Grant replication privileges to the replication user:

```
GRANT REPLICATION SLAVE ON *.* TO '[REPLICATION_USER]'@'%' ;
```

9. Export the database from the master instance to a Cloud Storage bucket.

Follow the external replication instructions in [Creating a SQL dump file](https://cloud.google.com/sql/docs/mysql/import-export/creating-sqldump-csv#ext) (<https://cloud.google.com/sql/docs/mysql/import-export/creating-sqldump-csv#ext>).

10. Download the export file from the bucket to the replica by clicking the file in the Cloud Storage console from the machine hosting the replica.

## Configuring the external replica

**Warning:** This procedure overwrites any data hosted in a MySQL database on the replica, including users and passwords, with the settings and data from the master instance.

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1. On the machine hosting the replica, seed your new external MySQL instance with the export file you created from the master instance.

For example, the following command loads the export file called `mysqldump.sql`:

```
mysql --user=root --password < mysqldump.sql
```

2. Determine the server ID for this replica-master pair.

The server ID is a numeric value (for example, "3") that must be unique across the external replica configuration (each replica must have a unique server ID).

3. Add the following options to the replica's `my.cnf` option file:

```
[mysqld]
server-id=[SERVER_ID]
gtid_mode=ON
enforce_gtid_consistency=ON
log_slave_updates=ON
replicate-ignore-db=mysql
binlog-format=ROW
log_bin=mysql-bin
expire_logs_days=1
read_only=ON
```

For more information about MySQL replication options, see [Replication and Binary Logging Options](https://dev.mysql.com/doc/refman/5.7/en/replication-options.html) (<https://dev.mysql.com/doc/refman/5.7/en/replication-options.html>)

4. Restart the `mysqld` process to cause the configuration file to be read.

5. In a `mysql` client on the replica, enter the following command:

```
CHANGE MASTER TO MASTER_HOST=' [MASTER_IP_ADDRESS]', MASTER_USER=' [REPLICATION_USER]',
MASTER_PASSWORD=' [REPLICATION_PASSWORD]', MASTER_AUTO_POSITION=1;
```

6. Start replication on the replica:

```
START SLAVE;
```

7. Confirm replication status:

```
SHOW SLAVE STATUS\G;
```

If you see "Waiting for master to send event", replication is working.

## Demoting the master of an external replica

When you have a Cloud SQL instance with an external replica, you can reverse the configuration, which causes these changes to happen:

- The external replica becomes the new master instance.

- The Cloud SQL instance becomes a read replica, replicating from the server that was previously the external replica (now called the source database server).

To reverse the external replica configuration:

### 1. Create a source representation instance

(<https://cloud.google.com/sql/docs/mysql/replication/external-server#config-description>).

This instance will represent the source database server to the Cloud SQL replica after the demotion operation completes.

```
gcloud auth login
ACCESS_TOKEN="$(gcloud auth print-access-token)"
curl --header "Authorization: Bearer ${ACCESS_TOKEN}" \
  --header 'Content-Type: application/json' \
  --data '{
    "name": "[SOURCE_REPRESENTATION_NAME]",
    "region": "[REGION]",
    "databaseVersion": "[EXTERNAL_SERVER_MYSQL_VERSION]",
    "onPremisesConfiguration": {
      "hostPort": "[EXTERNAL_SERVER_IP]:[EXTERNAL_SERVER_PORT]"
    }
  }' \
  -X POST \
  https://www.googleapis.com/sql/v1beta4/projects/[PROJECT-ID]/instances
```

Use the region where you want your Cloud SQL replica to reside.

### 2. Start the demotion process.

Because this API call requires you to provide sensitive information, you should use a JSON file (<https://cloud.google.com/sql/docs/mysql/admin-api/#json-file>) to provide your data to cURL, rather than providing it on the command line.

Create the data file:

```
{
  "demoteMasterContext": {
    "replicaConfiguration": {
      "mysqlReplicaConfiguration": {
        "username": "[MYSQL_REPLICATION_USERNAME]",
        "password": "[PASSWORD]",
        "caCertificate": "[EXTERNAL_SERVER_CA]",
        "clientCertificate": "[CLIENT_CERT]",
        "clientKey": "[PRIVATE_KEY]"
      }
    }
  }
}
```

```
    }  
  },  
  "masterInstanceName": "[SOURCE_REPRESENTATION_NAME]",  
},  
}
```

Then, call the API.

```
curl --header "Authorization: Bearer ${ACCESS_TOKEN}" \  
  --header 'Content-Type: application/json' \  
  --data @[PATH_TO_DATA_FILE] \  
  https://www.googleapis.com/sql/v1beta4/projects/[PROJECT-ID]/instances/[IN
```

For more information about your options for SSL/TLS, see [SSL/TLS options](https://cloud.google.com/sql/docs/mysql/replication/external-server#ssl-options) (https://cloud.google.com/sql/docs/mysql/replication/external-server#ssl-options). For more information about the properties used by the `replicaConfiguration` object, see [Replicating from an External Server](https://cloud.google.com/sql/docs/mysql/replication/replication-from-external#setup) (https://cloud.google.com/sql/docs/mysql/replication/replication-from-external#setup).

3. Wait for the external replica to complete all pending transactions from the master instance.

When the replica is caught up, the `SHOW SLAVE STATUS` command will show `Seconds Behind Master` as 0, and the `Executed_Gtid_Set` value will be identical between the external replica and the Cloud SQL master.

4. Use the `mysql` client to stop replication on the external replica:

```
STOP SLAVE  
RESET SLAVE ALL
```

5. Wait for the Cloud SQL instance to start replicating from the external server, which is now the source database server.

Running the `SHOW SLAVE STATUS` command on the Cloud SQL instance provides replication status.

6. When the Cloud SQL instance is successfully replicating from the source database server, set the `read_only` flag on the source database server to `off` and update your applications to point to the source database server.

## What's next

- Learn how to [manage replicas](https://cloud.google.com/sql/docs/mysql/replication/manage-replicas) (https://cloud.google.com/sql/docs/mysql/replication/manage-replicas).
- Learn about [requirements and best practices for the external replica configuration](https://cloud.google.com/sql/docs/mysql/replication/tips#external-replica) (https://cloud.google.com/sql/docs/mysql/replication/tips#external-replica).
- Learn more about [MySQL replication](https://dev.mysql.com/doc/refman/5.7/en/replication.html) (https://dev.mysql.com/doc/refman/5.7/en/replication.html).
- Learn more about [replication options](https://dev.mysql.com/doc/refman/5.7/en/replication-options.html) (https://dev.mysql.com/doc/refman/5.7/en/replication-options.html).
- Learn more about [checking replication status](https://dev.mysql.com/doc/refman/5.7/en/replication-administration-status.html) (https://dev.mysql.com/doc/refman/5.7/en/replication-administration-status.html).
- Learn more about [replicating from an external server](https://cloud.google.com/sql/docs/mysql/replication/replication-from-external) (https://cloud.google.com/sql/docs/mysql/replication/replication-from-external).

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*Last updated December 5, 2019.*