Cloud SQL Study

What

Fully managed relational database service.

Database Replication

Cloud SQL supports the following types of replicas:

- [Read replicas](#)

You use a read replica to offload work from a Cloud SQL instance. The read replica is an exact copy of the primary instance. Data and other changes on the primary instance are updated in almost real time on the read replica. Read replicas are read-only; you cannot write to them.

- ➔ Additional read capacity
- ➔ Analytics target

- [Cross-region read replicas](#)

Cross-region replication lets you create a read replica in a different region from the primary instance.

- ➔ Additional read capacity
- ➔ Analytics target
- ➔ Additional disaster recovery capability
- ➔ Improve read performance
- ➔ Migrate data between regions

- [External read replicas](#)

External read replicas are external MySQL instances that replicate from a Cloud SQL primary instance.

- ➔ Reduced latency for external connections
- ➔ Analytics target
- ➔ Migration path to other platforms

- Cloud SQL replicas, when replicating from an external server

Disaster Recovery

In Google Cloud, database disaster recovery (DR) is about providing continuity of processing, specifically when a region fails or becomes unavailable. Cloud SQL is a regional service. Therefore, if the Google Cloud region that hosts a Cloud SQL database becomes unavailable, then the Cloud SQL database also becomes unavailable.

To continue processing, you must make the database available in a secondary region as soon as possible. The DR plan for both Cloud SQL for MySQL and Cloud SQL for PostgreSQL requires you to configure a cross-region read replica in Cloud SQL.

The following diagram shows the minimal architecture that supports database DR:
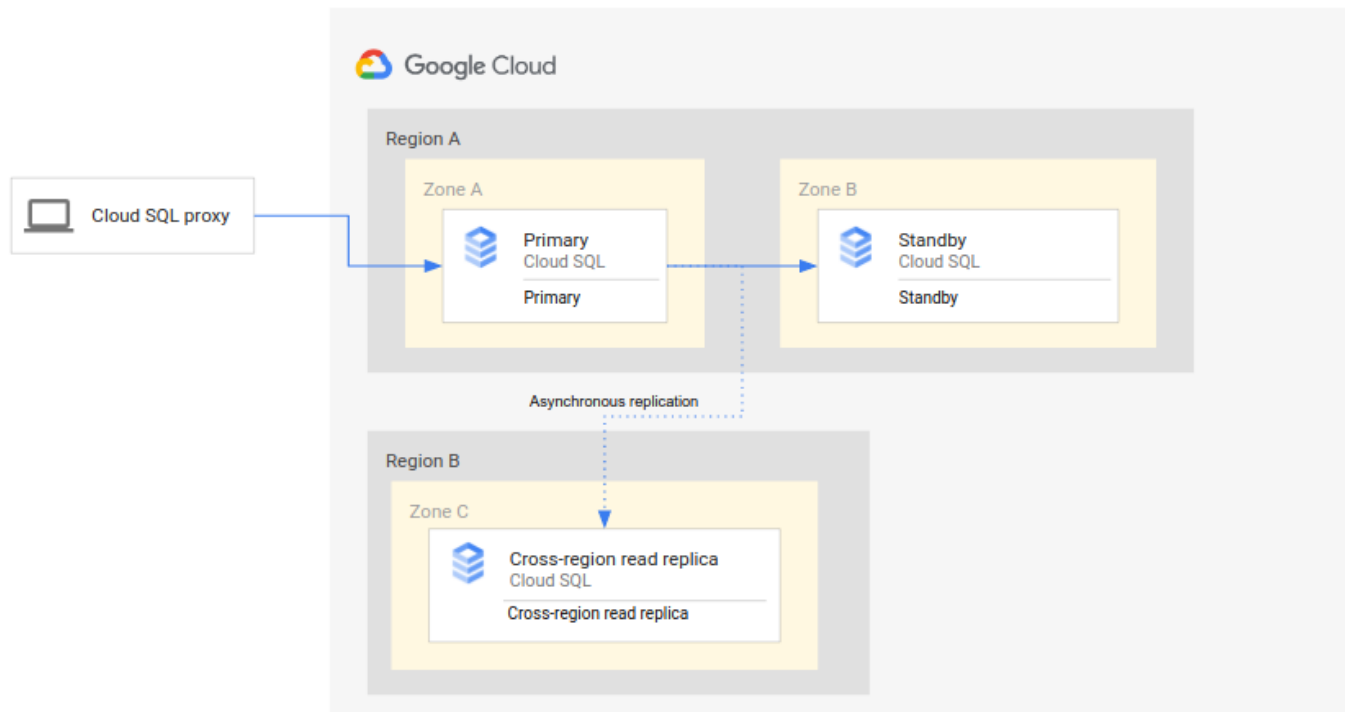

The architecture works as follows:

- Two instances of Cloud SQL (a primary instance and a standby instance) are located in two separate zones within a single region (the primary region). The instances are synchronized by using regional persistent disks.
- One instance of Cloud SQL (the cross-region read replica) is located in a second region (the secondary region). For DR, the cross-region read replica is set up to synchronize (by using asynchronous replication) with the primary instance

The primary and standby instances share the same regional disk, and so their states are identical.

Because this setup uses asynchronous replication, it's possible that the cross-region read replica lags behind the primary instance.

A complete DR process looks like:
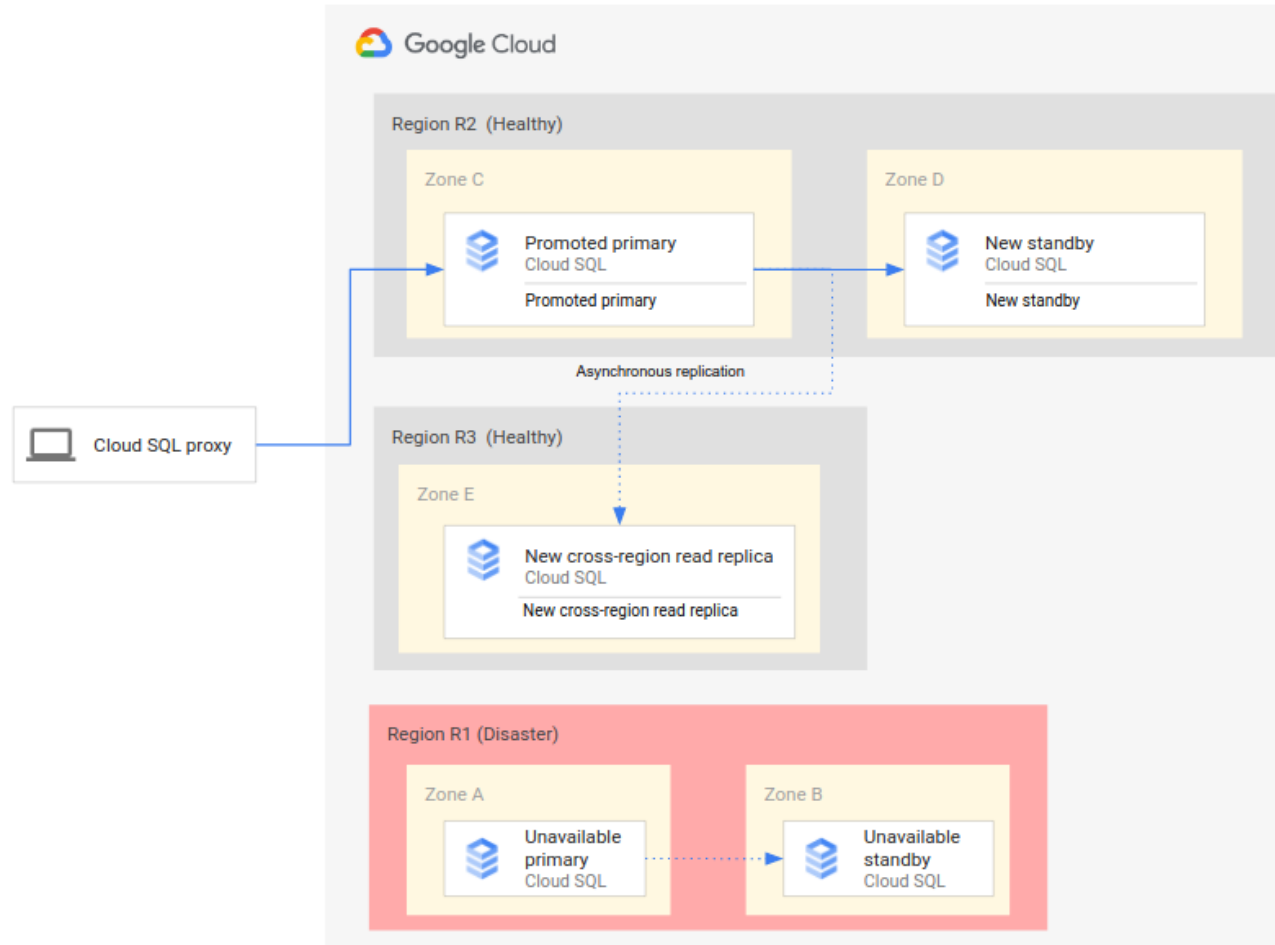
The complete database DR process consists of the following steps:

1. The primary region (R1), which is running the primary database, becomes unavailable.
2. The operations team recognizes and formally acknowledges the disaster and decides whether a failover is required.
3. If a failover is required, the cross-region read replica in the secondary region (R2) is made the new primary instance.
4. Client connections are reconfigured to access and process on the new primary instance (R2).

5. A new standby instance is created and started in R2 and added to the primary instance. The standby instance is in a different zone from the primary instance. The primary instance is now highly available because a standby instance was created for it.
6. In a third region (R3), a new cross-region read replica is created and attached to the primary instance. At this point, a complete disaster recovery architecture is recreated and operational.

To avoid a split-brain situation, you must ensure that clients can no longer access the original primary instance after R1 becomes available. Ideally, you should make the original primary inaccessible before clients start using the new primary instance, then delete the original primary right after you make it inaccessible.

Terms

- Compute Engine
Secure and customizable compute service that lets you create and run virtual machines on Google's infrastructure.

- Region vs. Zone
Compute Engine resources are hosted in multiple locations worldwide. These locations are composed of regions and zones. A region is a specific geographical location where you can host your resources. Regions have three or more zones. For example, the us-west1 region denotes a region on the west coast of the United States that has three zones: us-west1-a, us-west1-b, and us-west1-c.

- Persistent disks
Persistent disks are durable network storage devices that your instances can access like physical disks in a desktop or a server. The data on each persistent disk is distributed across several physical disks. Compute Engine manages the physical disks and the data distribution for you to ensure redundancy and optimal performance.
Persistent disks are located independently from your virtual machine (VM) instances, so you can detach or move persistent disks to keep your data even after you delete your instances.

References*

https://cloud.google.com/sql/docs/mysql/replication
https://cloud.google.com/solutions/cloud-sql-mysql-disaster-recovery-complete-failover-fallback?hl=en
https://cloud.google.com/compute/docs/regions-zones
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