THRIVE

Database Data Recovery Plan

- Database Recovery Strategy Objectives
- The different Database Recovery Strategies
- Implementation examples
- Detect (Alarms), Restore (Backups) and Failover (Triggers)
- Documentation
- Staff training
- Conclusions

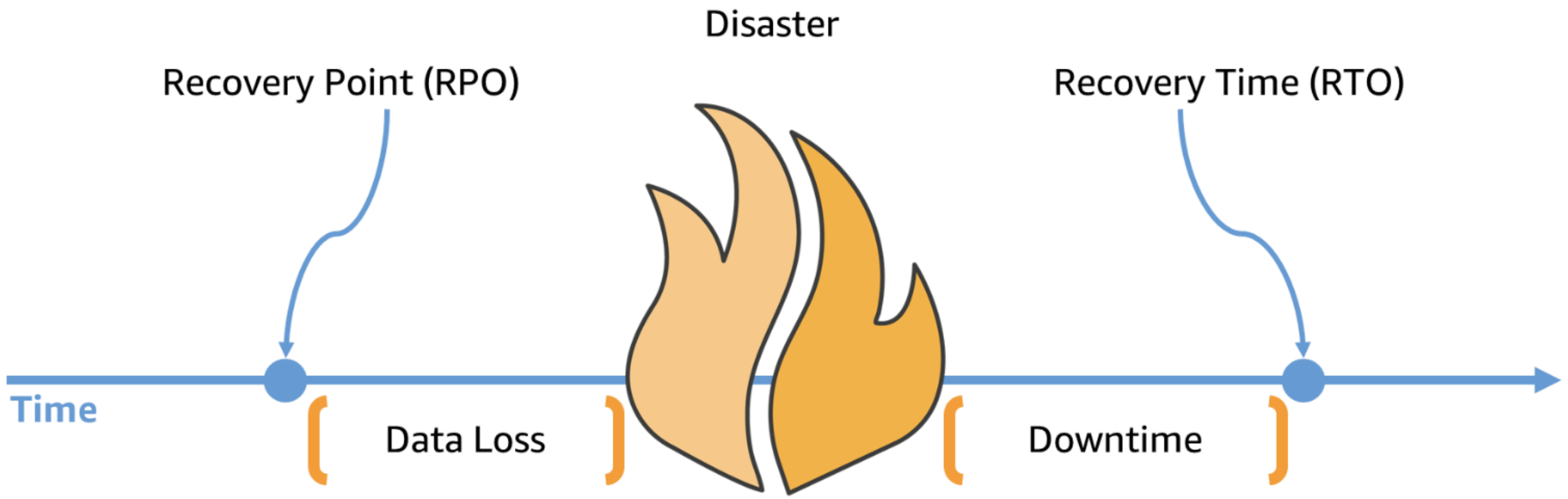
Database Recovery Strategy Objectives

Database Disaster recovery is a very important process to ensure business continuity for a company, there are many impacts when we have a database outage which can lead to severe money or reputation loss for the company.
There are two criteria that will determine the Disaster Recovery strategy that we will put in place
When a Database is faulty, the failover process is not instantaneous, the replication happens over the network and there is no guarantee that the integrity between the active and the backup database is in sync, there for, we must set RPO and RTO objectives

Database Recovery Strategy Objectives

How much data can you afford to recreate or lose?

How quickly must you recover? What is the cost of downtime?



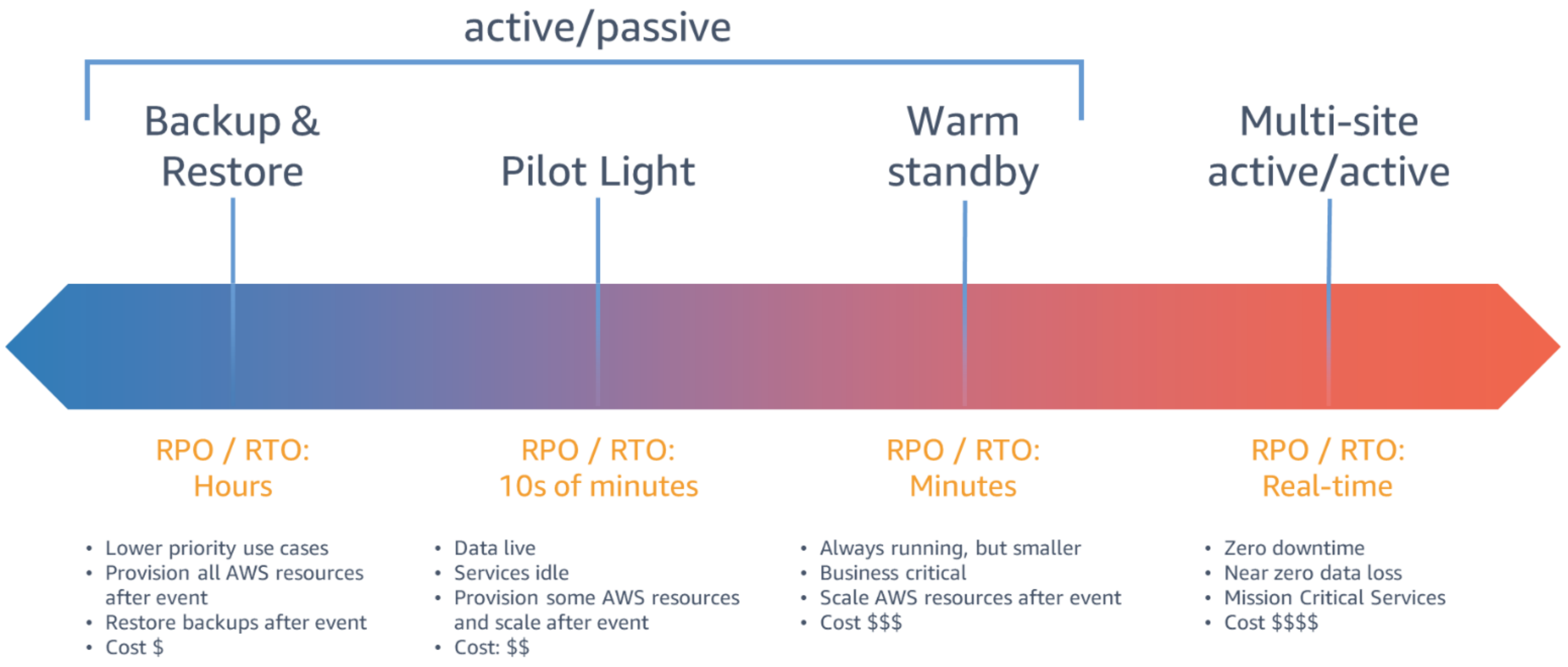
RPO (Recovery Point Objective)

The maximum acceptable amount of time since the last data recovery point. This determines what is considered an acceptable loss of data.

RTO (Recovery Time Objective)

The maximum acceptable delay between the interruption of service and restoration of service. This determines an acceptable length of time for service downtime.

The different Database Recovery Strategies



Backup & Restore (RPO / RTO: Hours)
- Lower priority use cases
- Provision all AWS resources after event
- Restore backups after event
- Cost $

Pilot Light (RPO / RTO: 10s of minutes)
- Data live
- Services idle
- Provision some AWS resources and scale after event
- Cost: $$

Warm standby (RPO / RTO: Minutes)
- Always running, but smaller
- Business critical
- Scale AWS resources after event
- Cost $$$

Multi-site active/active (RPO / RTO: Real-time)
- Zero downtime
- Near zero data loss
- Mission Critical Services
- Cost $$$$

Implementation examples

Before we talk about different architectures for Database Recovery, let's mention our constraints:

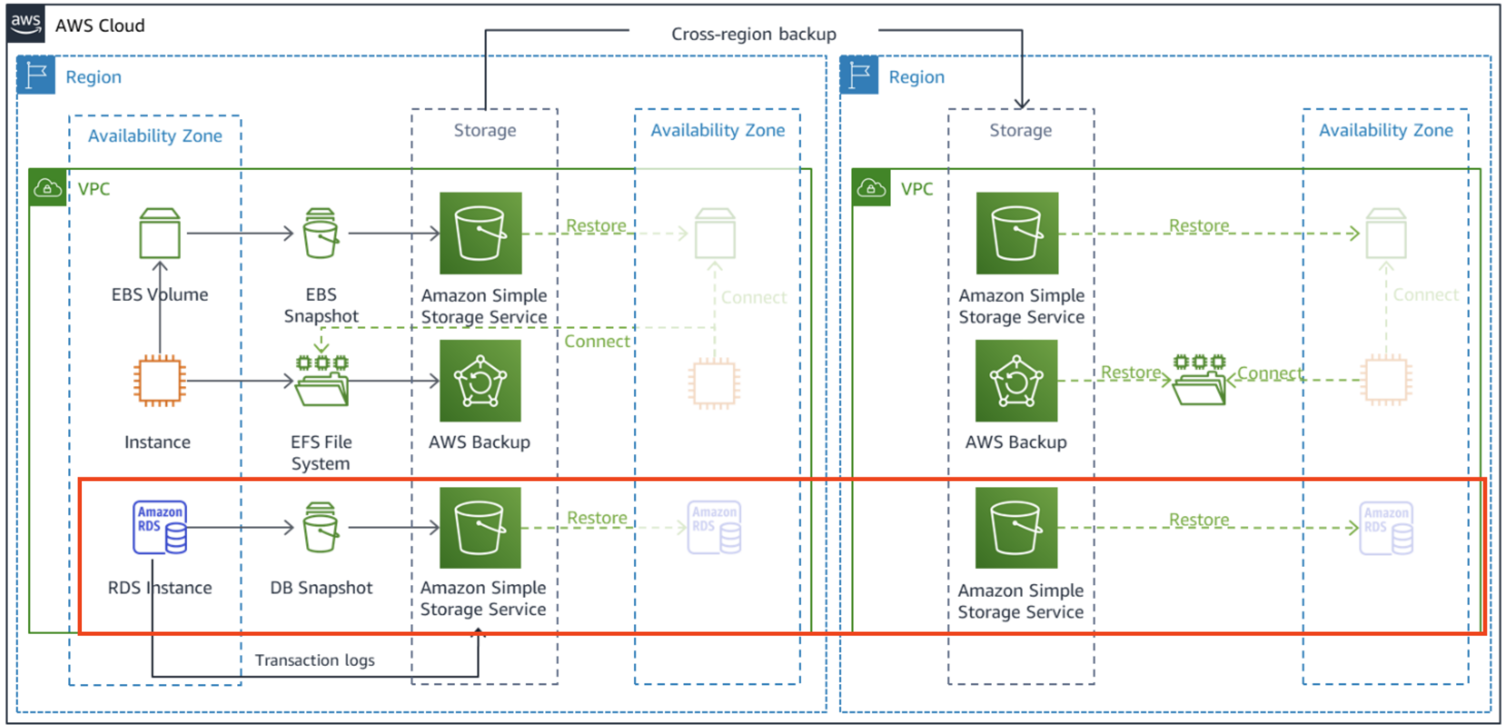
1- Data must stay within the country for legal compliance, Amazon have a data center in Canada

2- We must have a geographical redundancy, Amazon only have one data center in Canada (second one in Calgary soon), but there are multiple Availability Zones that we can use for Geographical redundancy

Implementation examples

Backup & Restore

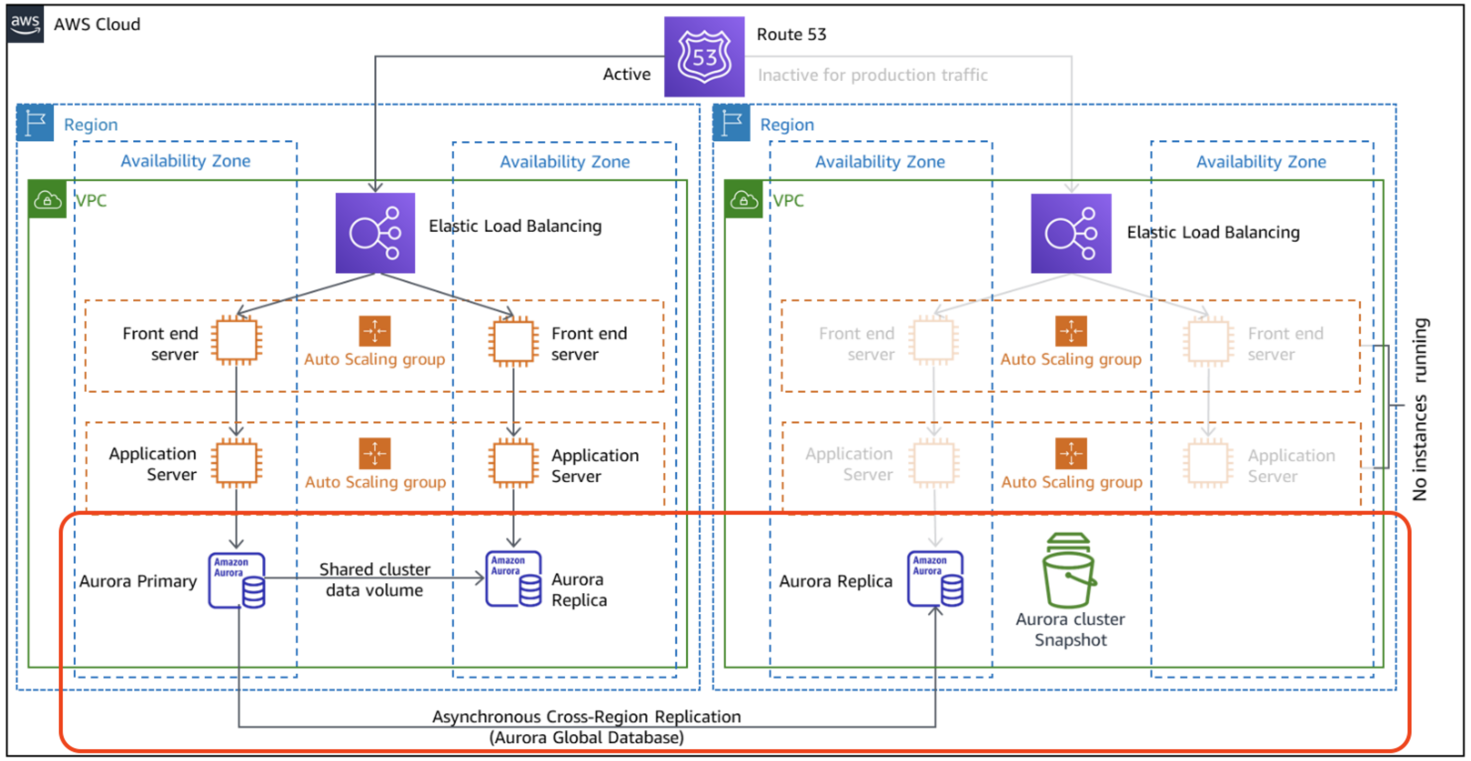
Note: we do not use another region, we use AZ



Implementation examples

Pilot Light

Note: we do not use another region, we use AZ



Implementation examples

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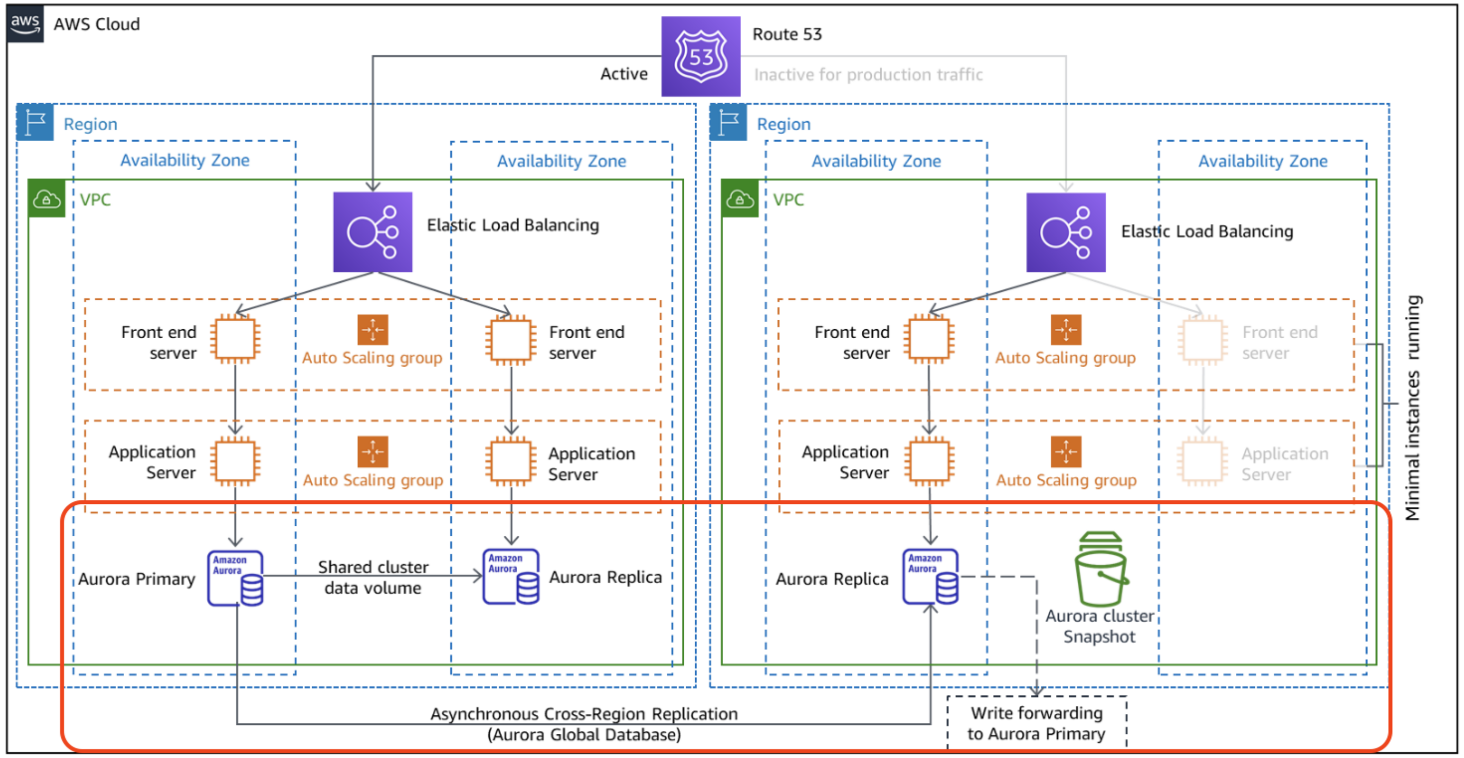
Warm StandBy

Note: we do not use another region, we use AZ


AWS Cloud
Route 53
Active
Inactive for production traffic
Region
Availability Zone
VPC
Elastic Load Balancing
Front end server
Auto Scaling group
Application Server
Aurora Primary
Shared cluster data volume
Aurora Replica
Aurora cluster Snapshot
Minimal instances running
Asynchronous Cross-Region Replication (Aurora Global Database)
Write forwarding to Aurora Primary

Implementation examples

Active/Active

This is the same as Warm StandBy but all application servers are active. Both main setup and backup setup can support production traffic

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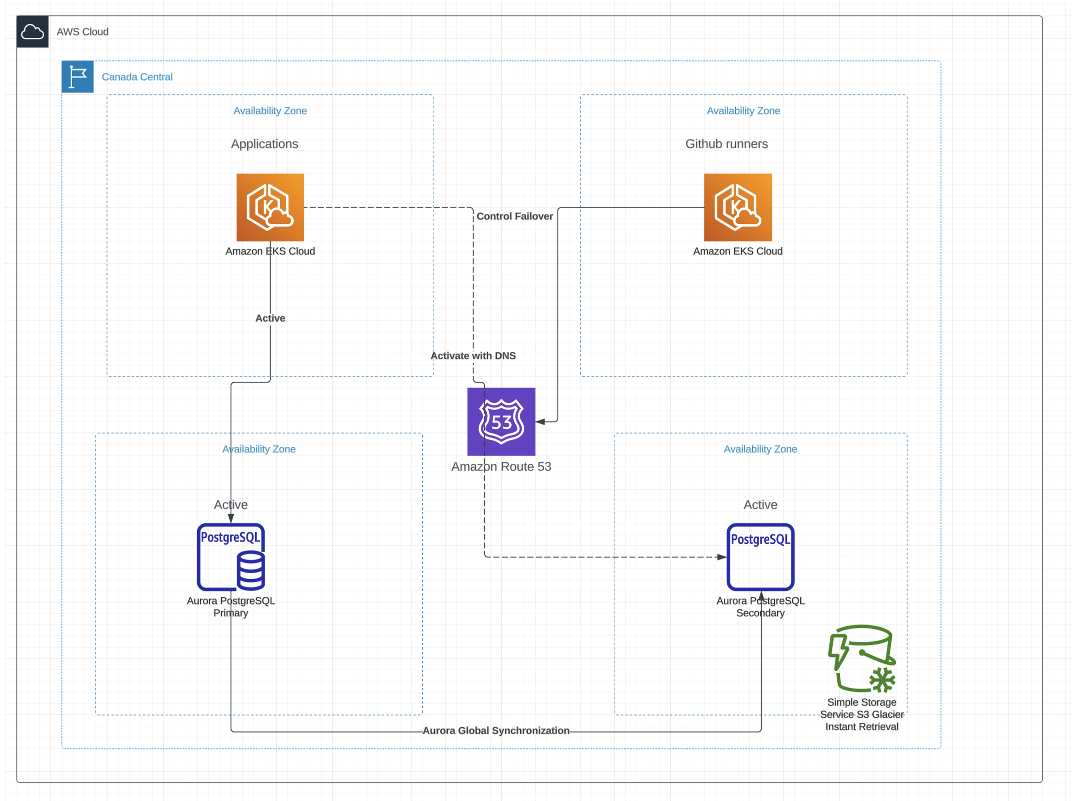
Implementation



Detect

We must put in place monitoring and alarms to detect when a Database is at fault so we can switch the backup database, there are multiple ways to detect a failure:

- Amazon CloudWatch
- Service API health checks, error rates and latency
- Collect service data using Amazon CloudWatch Synthetics
- Workload Key performance indicators i.e. number of active sessions

Restore

We have to automate the snapshot creation using AWS CLI or Terraform, we can set snapshots to be taken daily, hourly or any other interval that would allow us to have a shorter RPO.

Failover

Failover will redirect the traffic from main database instance to the backup database instance, we can use a manual trigger (GitHub Action) in order to do the failover.
The process involve mostly two actions:
1- Trigger the failover using the AWS CLI
2- Restart all containers that were connected to main database to reset TCP connections, we have seen in many cases where we have timeout errors but the socket remain active even if the database is not responding.

Documentation

We must maintain a thorough documentation about the disaster recovery process

A Run Book should be created when we setup the DRP

The Run Book must be verified and maintained by the platform team

Any changes to the architecture must validate the DRP

Staff training

All engineers on-call must be trained to do a failover and use the DRP
Chaos Engineering simulation is a good practice to get every engineer on call used to the DRP, where to find it, how to use it and how to make sure that things are verified and working as expected
In case of data loss (according to the RPO), we should define mitigation plans for the future
In case of service being not available (RTO), we should notify users and stake holders about the interruption and when the system is back online.

Conclusions

In order to come up with a good Database Disaster Recovery plan, we need to set our RPO and RTO objectives that align best with the company goals and SLA.

Many architectures can achieve a disaster recovery, the choice must align with the PRO and RTO that we have set, the less data we want to lose and the least time we want to be back online will cost more. This is an important aspect of the choice we have to make.

We can control the failover using Github Actions with runners that execute the AWS CLI commands necessary

It's very important to document and practice the disaster recovery exercise, teams should be able to do at any point in time when an emergency arise

Monitoring and alerting are a very important piece to detect a malfunctioning Database so we can trigger the failover

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References

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