MULTI-REGION RESILIENCE

RESILIENCE OVERVIEW

- Part of resiliency is the ability to respond to failures in a non-catastrophic manner.
- Another aspect is the ability to return to your ideal state as quickly as possible.
- Ideally, a highly resilient system can do both without significant disruption to the users' experience.

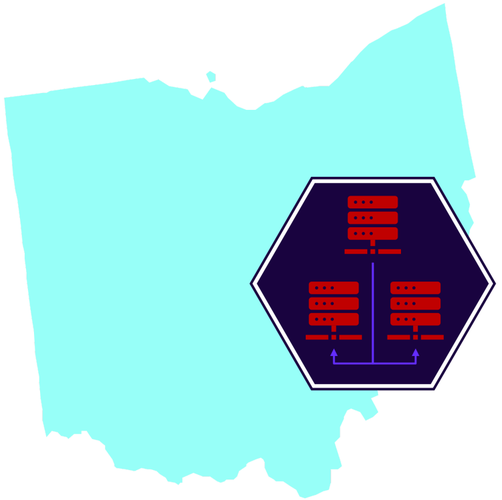
RESILIENCE IN HIGHLY DISTRIBUTED SYSTEMS

MULTI-REGION DATABASES CAN ENCOUNTER VARIOUS LEVELS OF FAILURE

PARTIAL REGION FAILURE (AVAILABILITY ZONE)

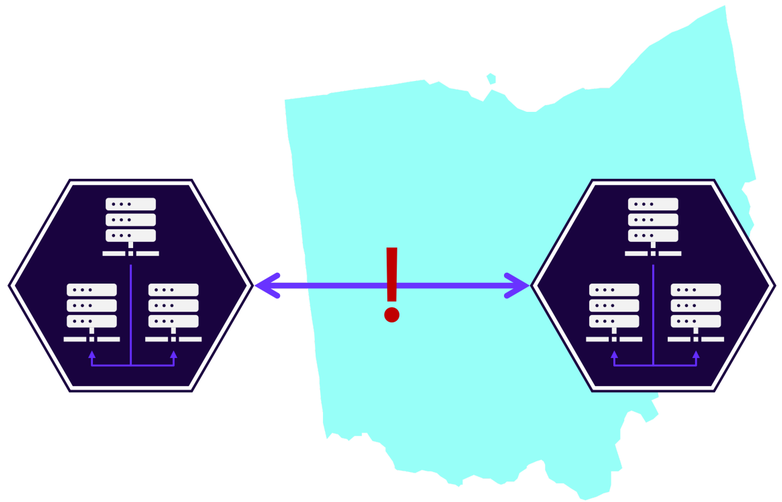
- Partial failures can happen within a region
  - For example, a bad actor takes a single datacenter offline

FULL REGION FAILURE



- Complete node failures can happen across a larger geographic region
  - For example, a natural disaster takes out all datacenters in a geographic region

FULL REGION FAILURE



- Failures can also happen between regions due to network connectivity loss
  - For example, Internet Service Provider (ISP) failure between regions

MULTI-REGION DATABASE RESILIENCE

- With a multi-region database like CockroachDB, you can build a strategy for high resilience that takes scale into account.
- CockroachDB multi-region capabilities allow architects to define behavior for their system in case of failures.

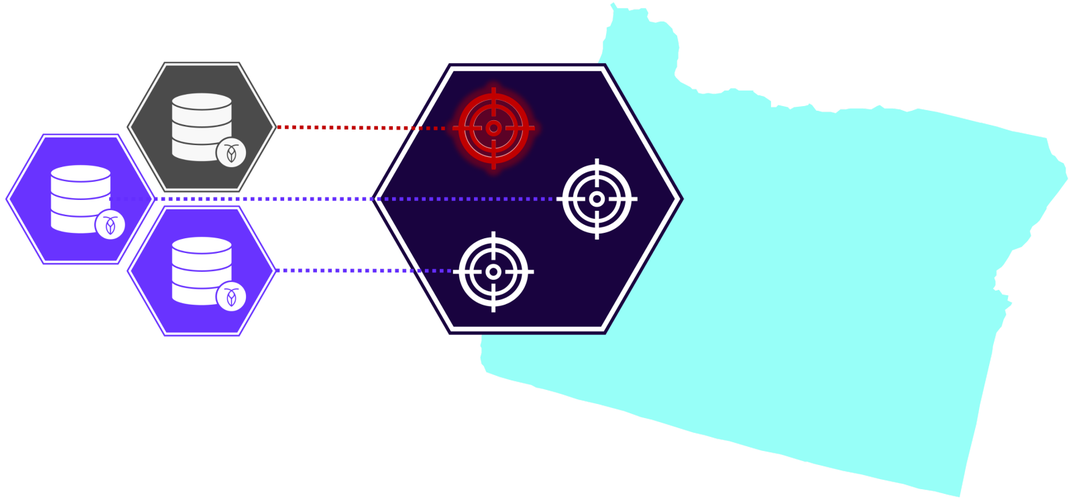
SURVIVAL GOAL OVERVIEW

- A survival goal is CockroachDB's mechanism for tuning resilience to acheive specific database behavior.
- The survival goal dictates how many simultaneous failures a multi-region database can survive.
- While every database can have its own survival goals, the tables within that database operate with the goals of the parent database.

SURVIVAL GOAL OVERVIEW

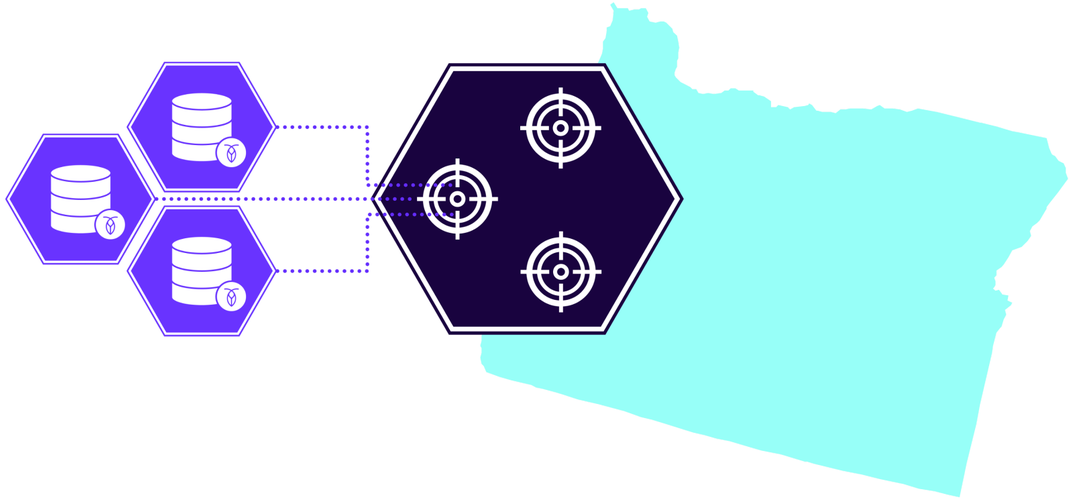
- CockroachDB offers two survival goal levels.
- The **zone level** survival goal enables your database to survive from a single node failure to the failure of an entire availability zone.
- The **region level** survival goal enables a database to survive the failure of an entire region.

ZONE LEVEL SURVIVAL GOAL



- The zone level survival goal is set by default.
- Multiple zones failing in the same region could cause the database to become unavailable.

ZONE LEVEL SURVIVAL GOAL



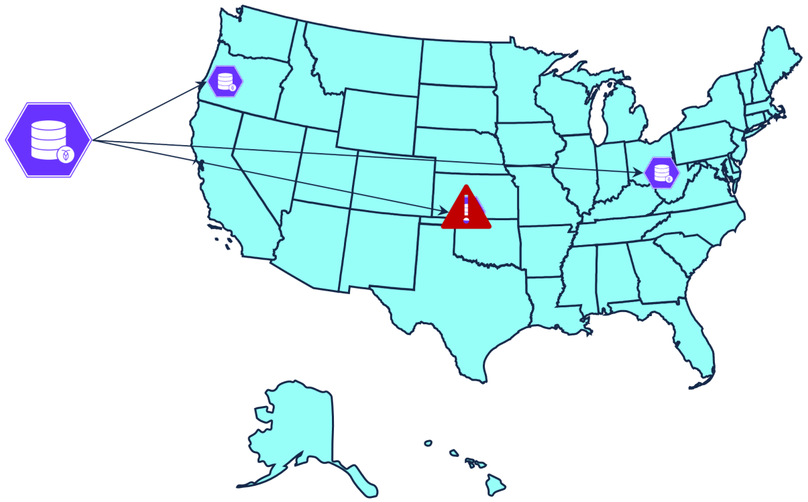
- You can have more than one node in a zone.
- You should replicate data across multiple zones for redundancy.

ZONE LEVEL SURVIVAL GOAL

- This survival goal can be configured using the `ALTER DATABASE ... SURVIVE ZONE FAILURE` statement.

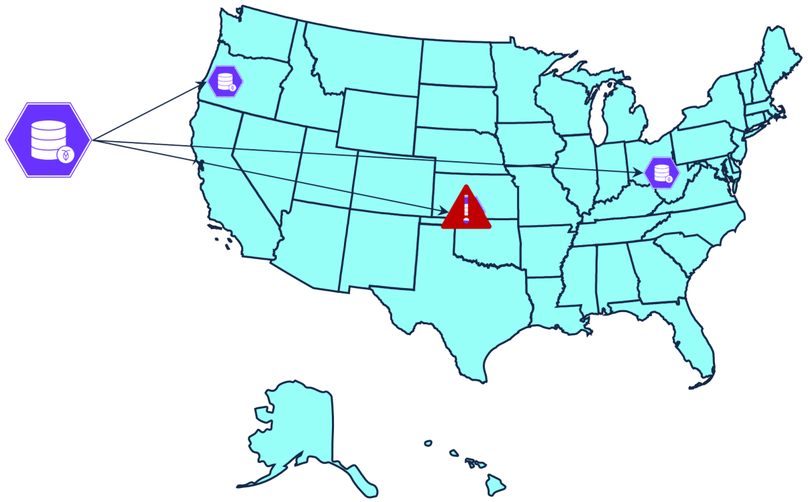
```
ALTER DATABASE movr_vehicles SURVIVE ZONE FAILURE;
```

REGION LEVEL SURVIVAL GOAL



- The database will remain fully available for reads and writes.
- There is performance cost during database writes. Reads unaffected.
- Should be considered in cases where your database must remain available even during an entire region outage.

REGION LEVEL SURVIVAL GOAL



- A minimum of 3 database regions required to survive region failure.
- Using this survival goal setting increases default replication factor to 5 from 3
- This required to maintain a local quorum in the leaseholder's region

IMPLEMENTING A REGION LEVEL SURVIVAL GOAL

- This survival goal can be configured using the `ALTER DATABASE ... SURVIVE REGION FAILURE` statement.

```
ALTER DATABASE movr_vehicles SURVIVE REGION FAILURE;
```