
AWS
re:Invent
DECEMBER 2 – 6, 2024 | LAS VEGAS, NV

DAT304

Amazon Aurora HA and DR design patterns for global resilience

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Resilience

Ability to:

- **Recover** from dependency disruptions
- **Acquire and release** resources
- **Mitigate** transient issues

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Availability

Disaster recovery

aws

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Availability

Proportion of time available for use **during a time period**

- For example, 99.99% per year

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Disaster recovery (DR)

Recovery time objective (RTO)

- Maximum length of **one impact**
- “Downtime”

Recovery point objective (RPO)

- **Maximum** amount of data loss (as time) after an outage

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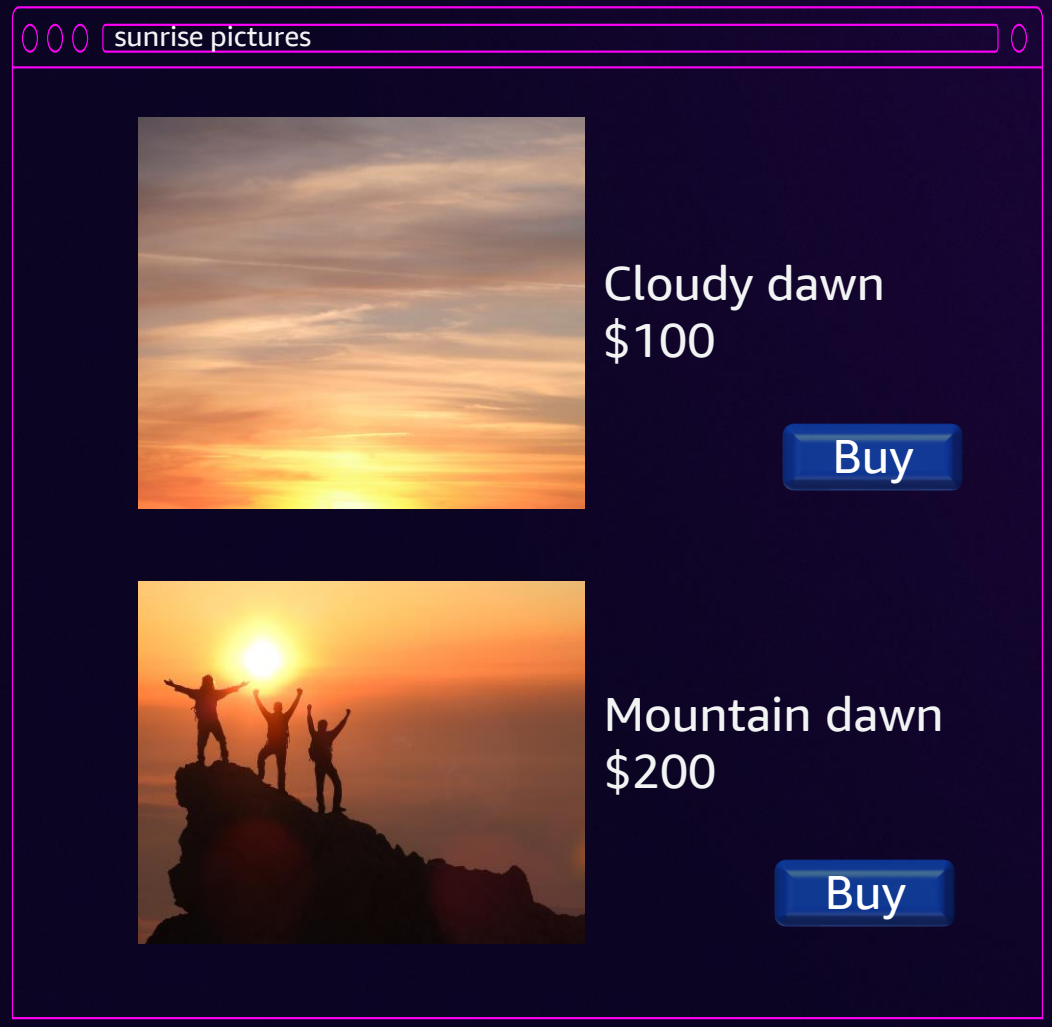
Example



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Aurora storage

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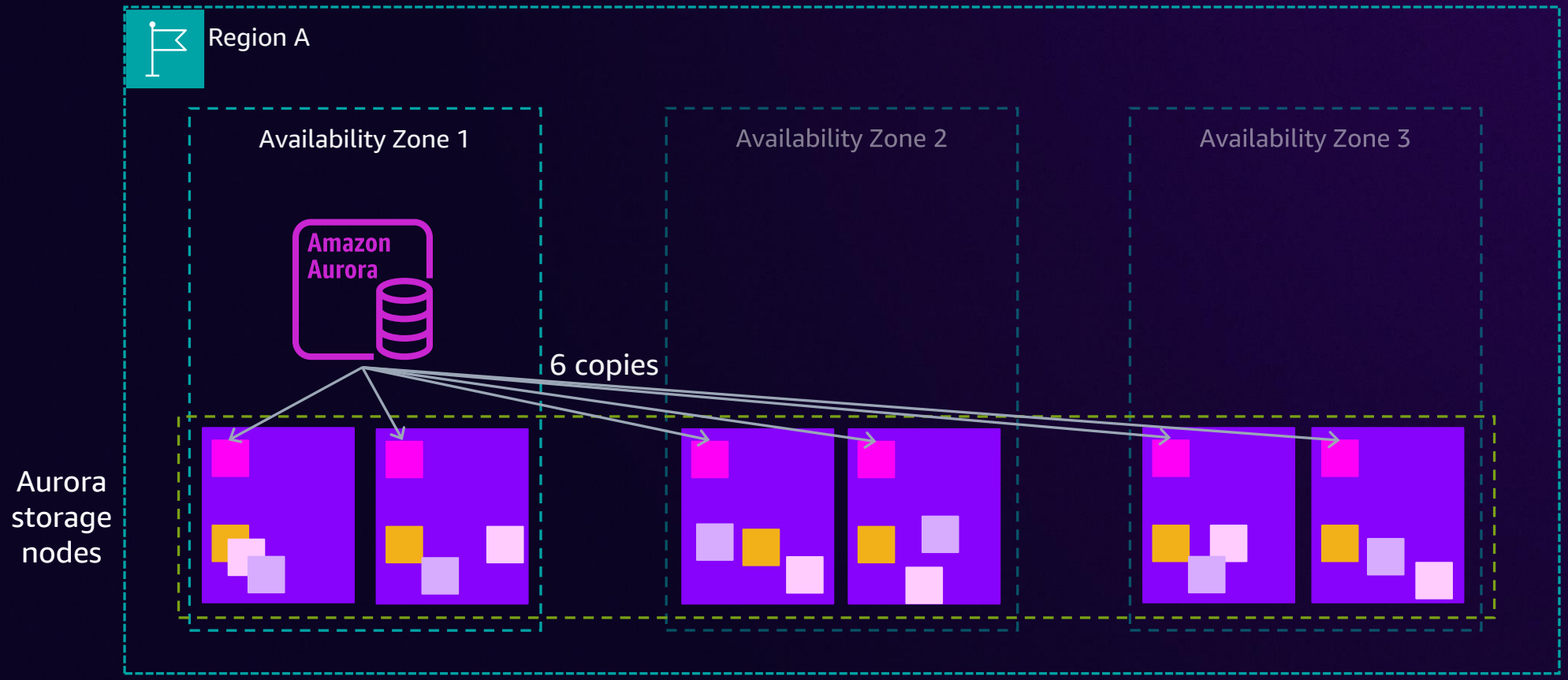

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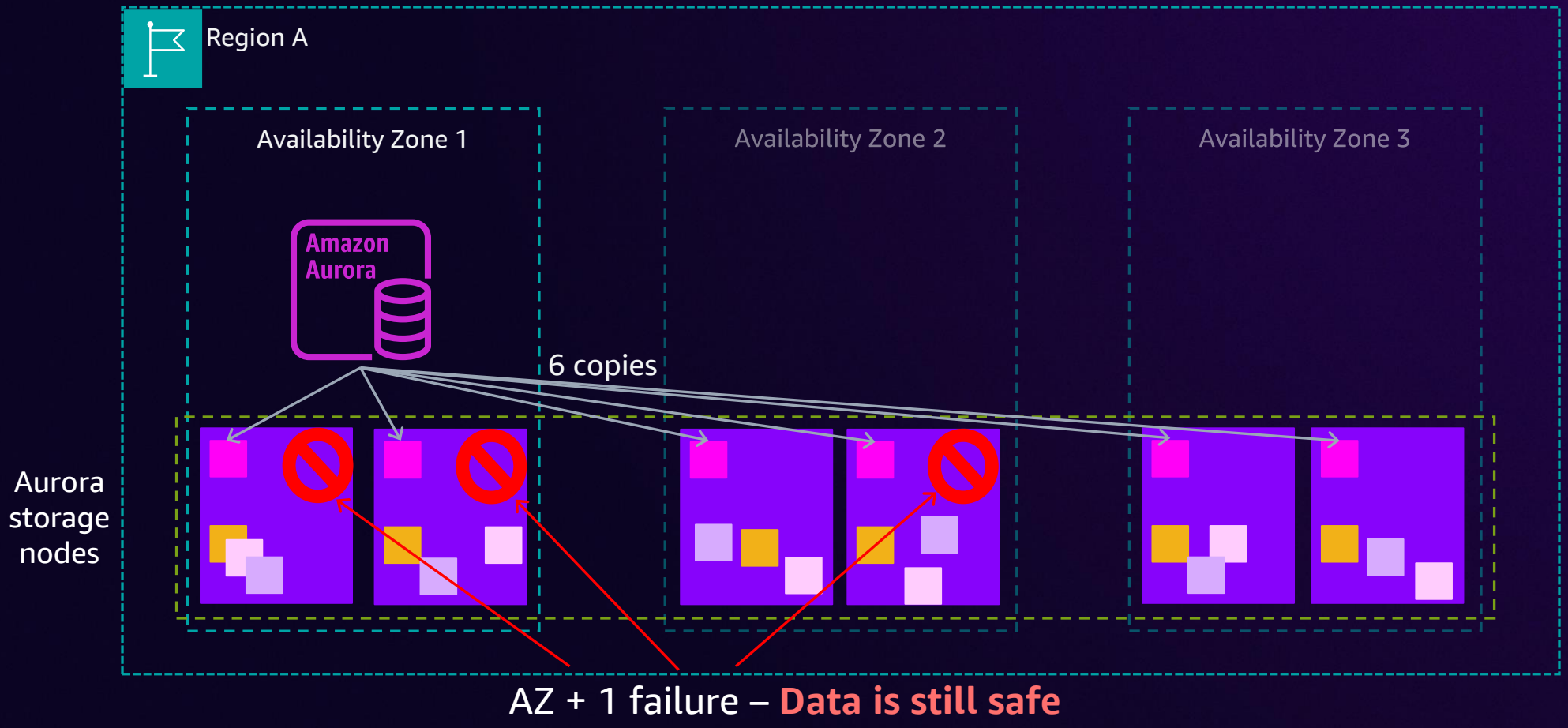
Aurora storage



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Aurora storage deep dive

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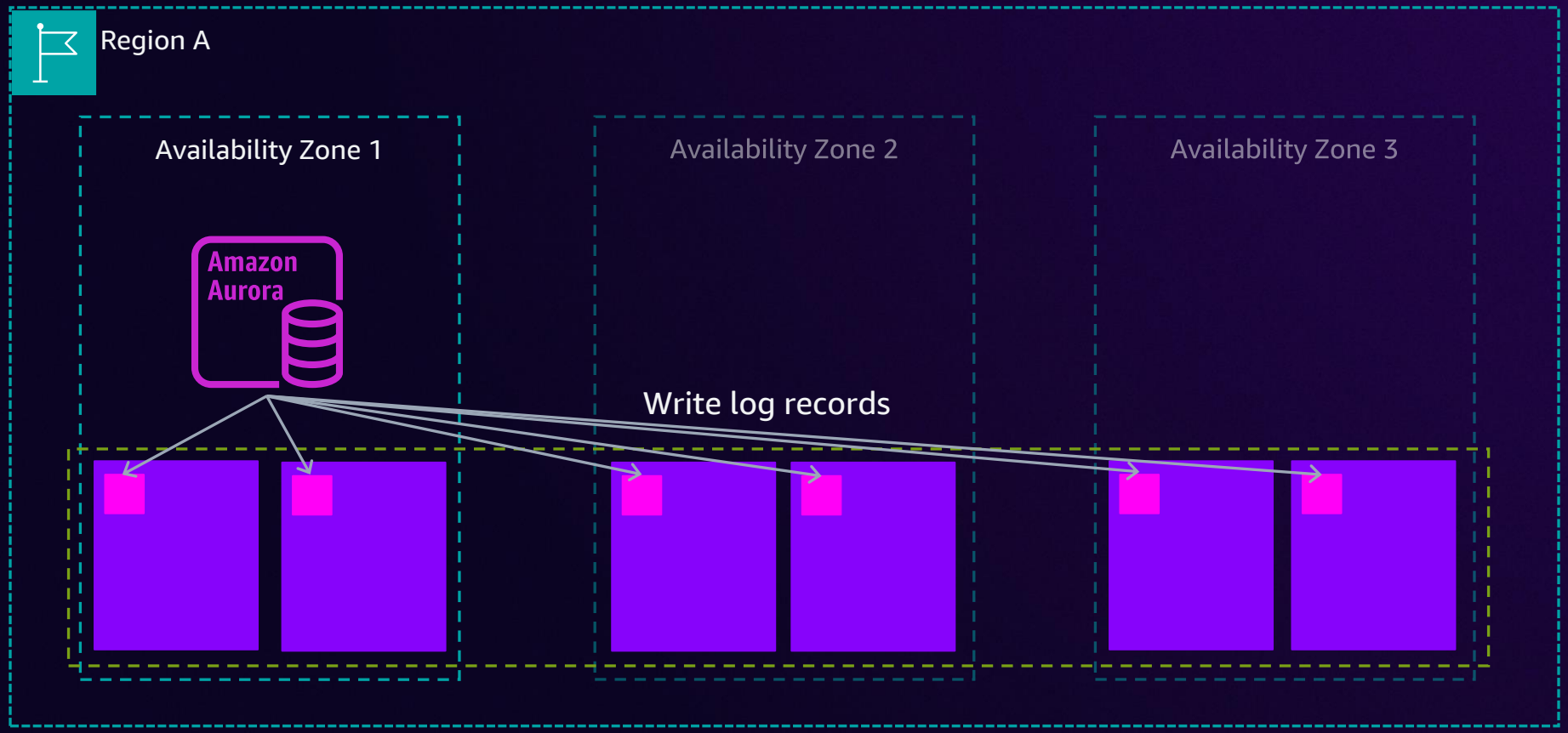
Aurora storage deep dive



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Backup and restore

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Backup and restore

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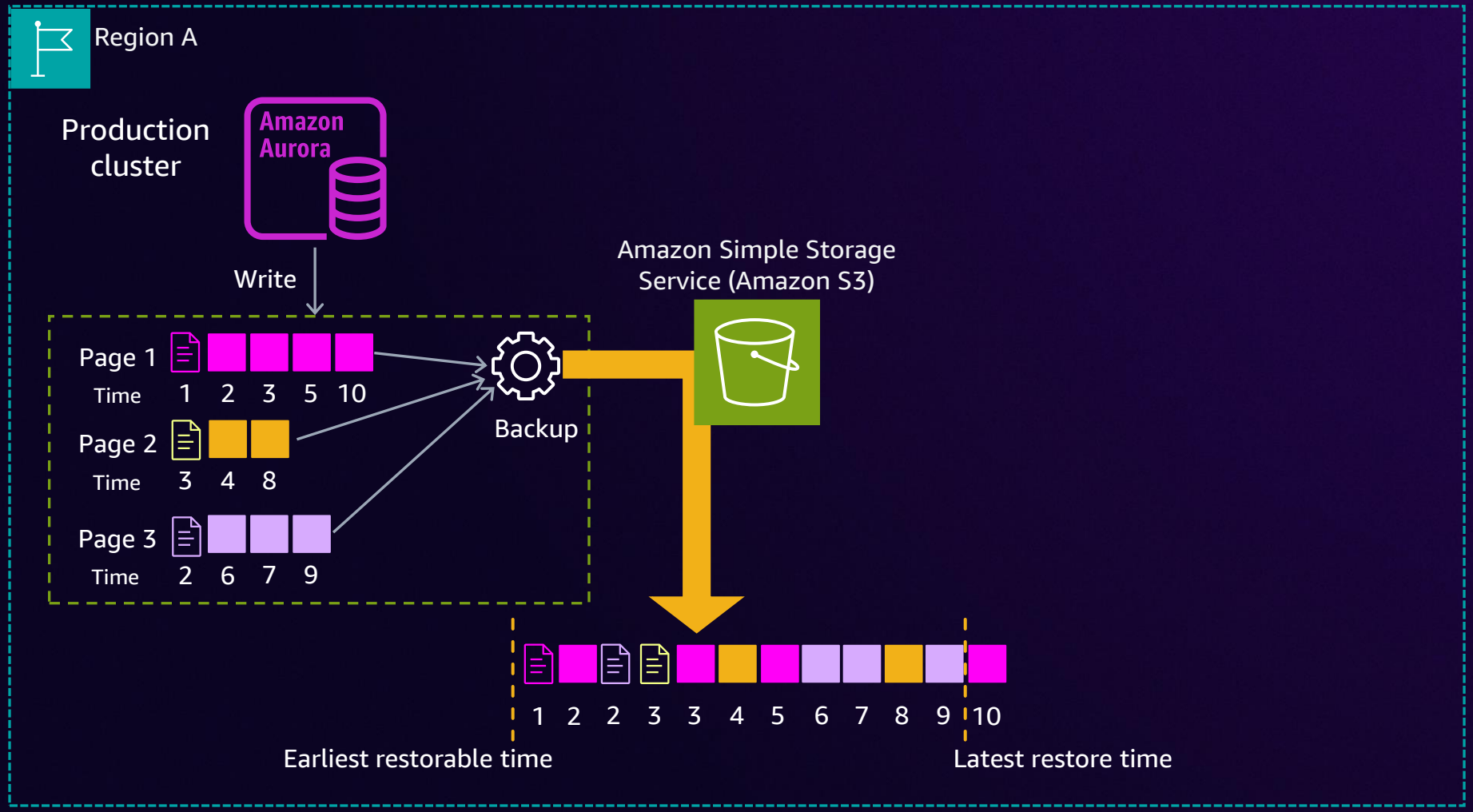
Backup and restore



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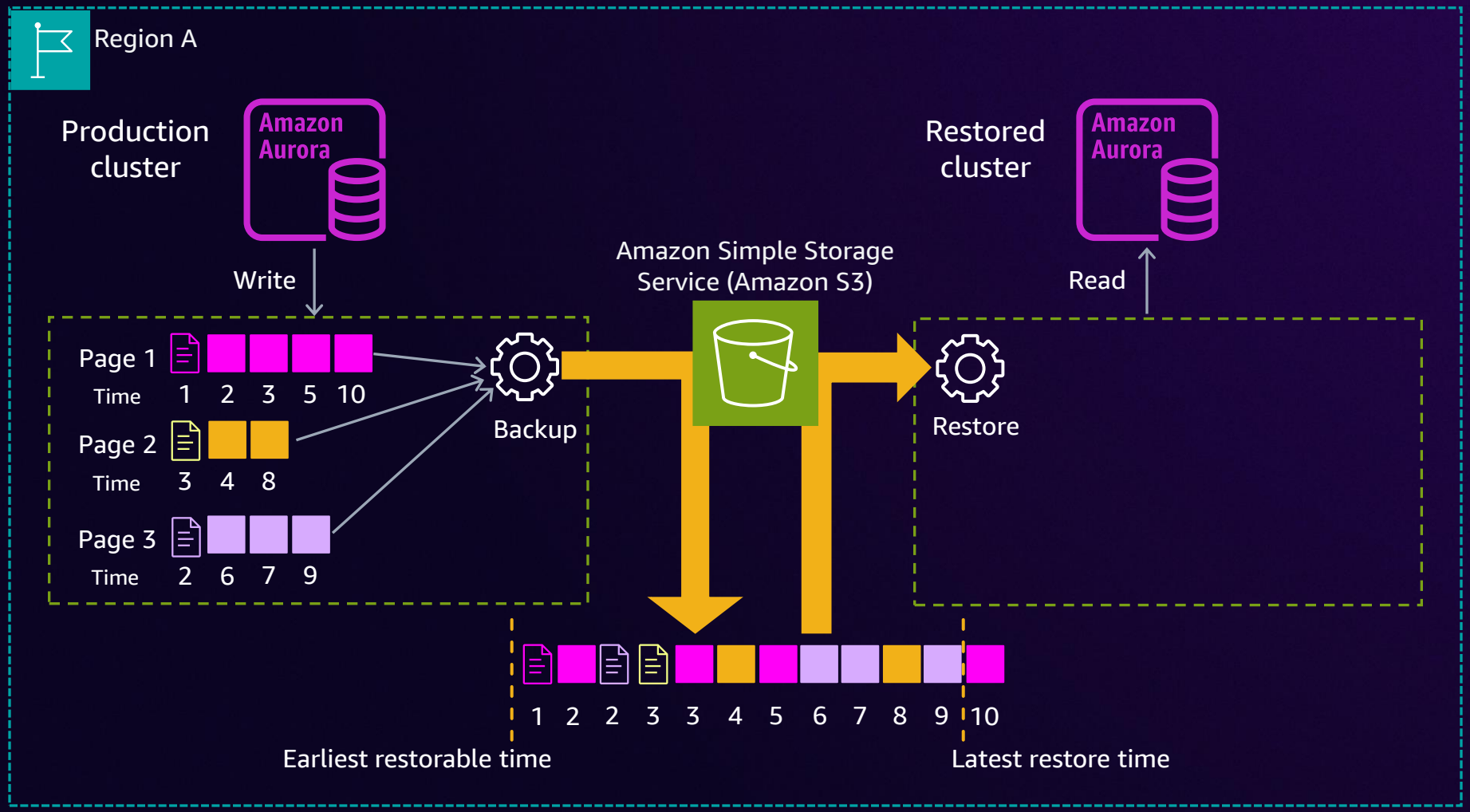
Backup and restore



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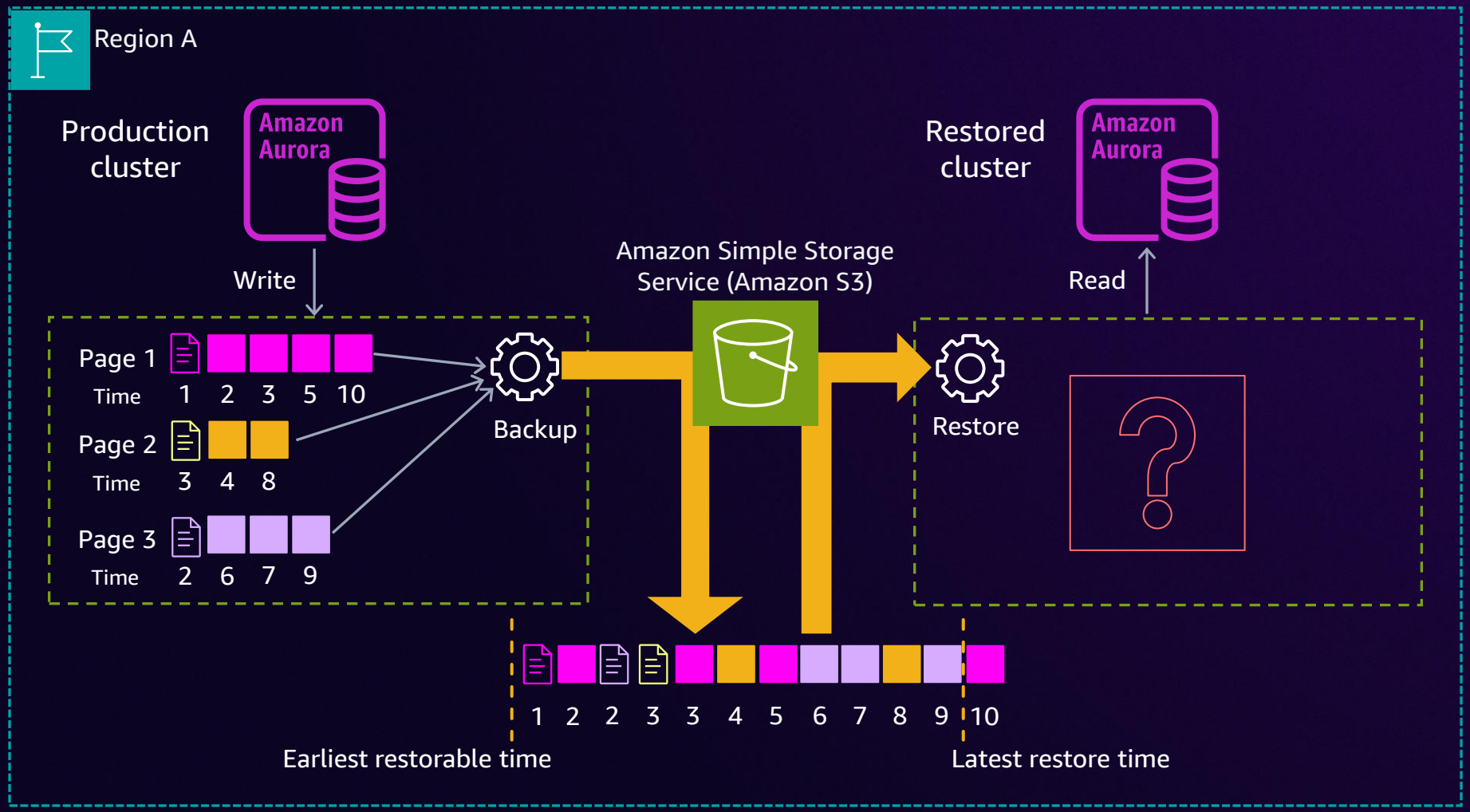

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Restore’s inner workings

Amazon RDS console

Backup

Automated backups	Earliest restorable time	Latest restore time
Enabled (7 Days)	October 09, 2024, 14:41 (UTC+10:30)	October 09, 2024, 14:47 (UTC+10:30)

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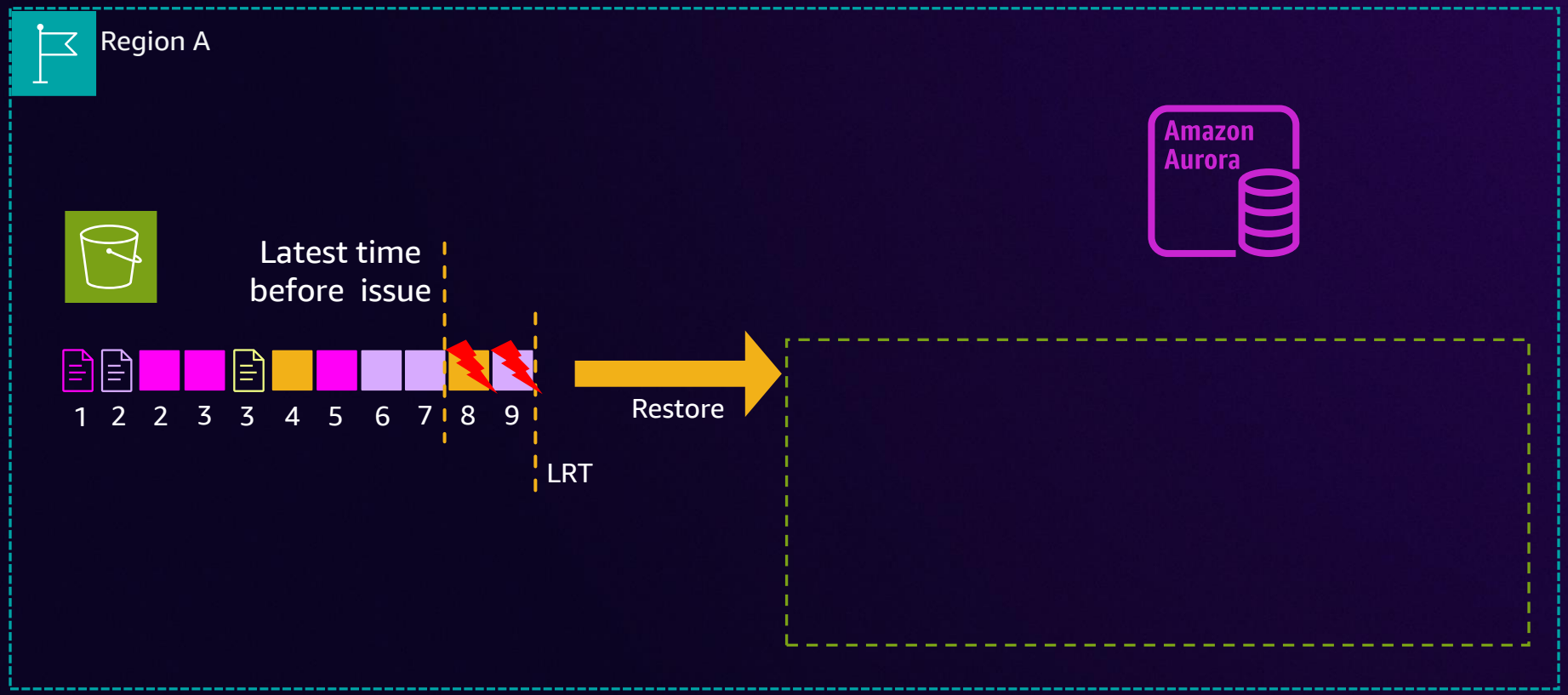

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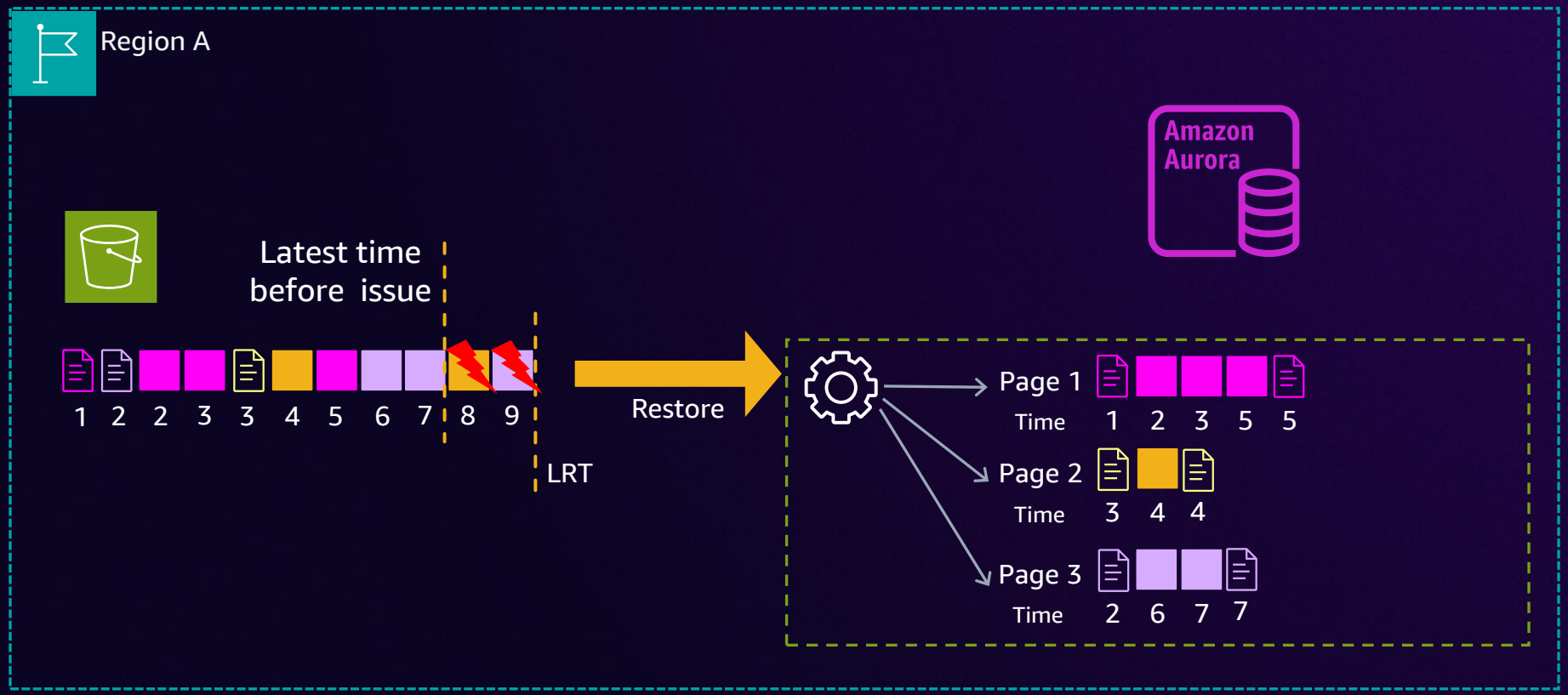

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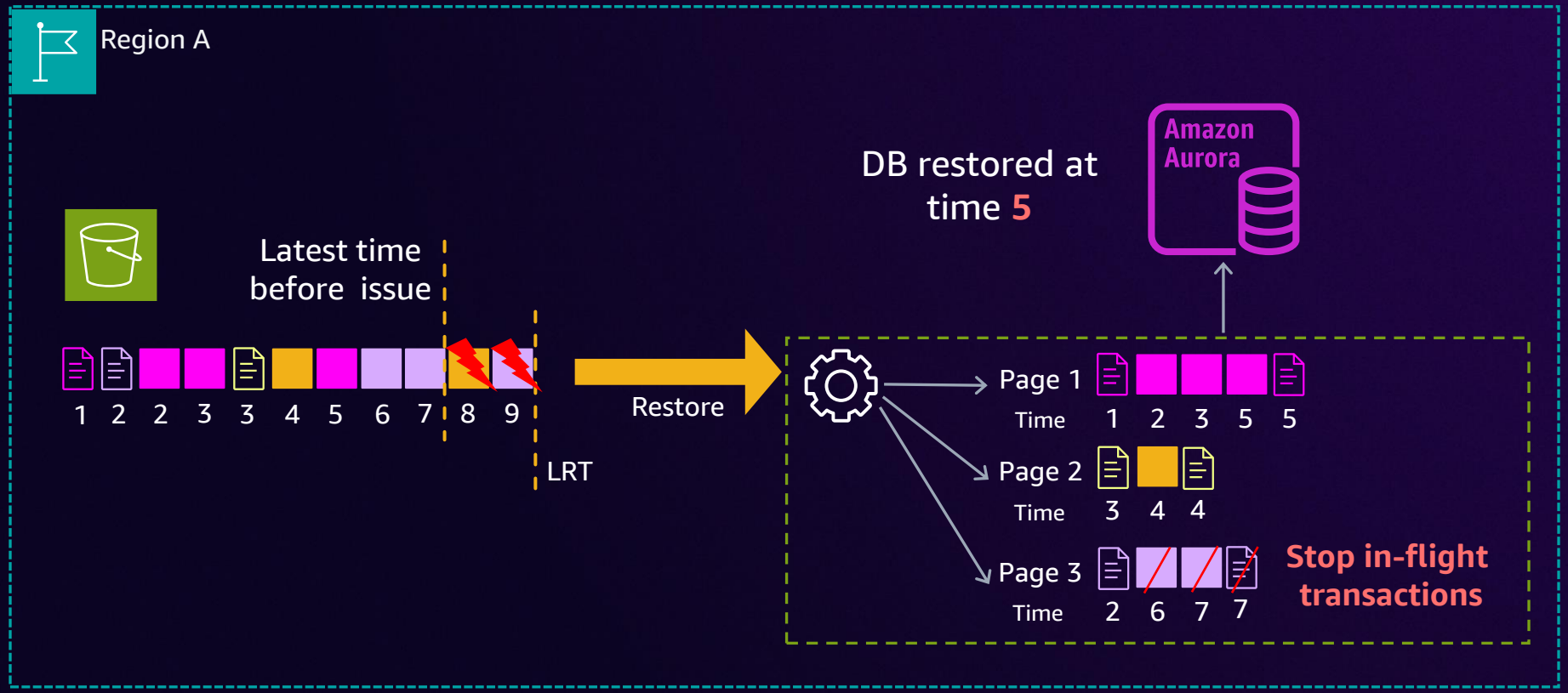
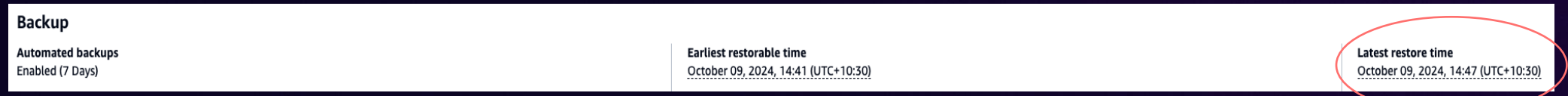


Amazon RDS console



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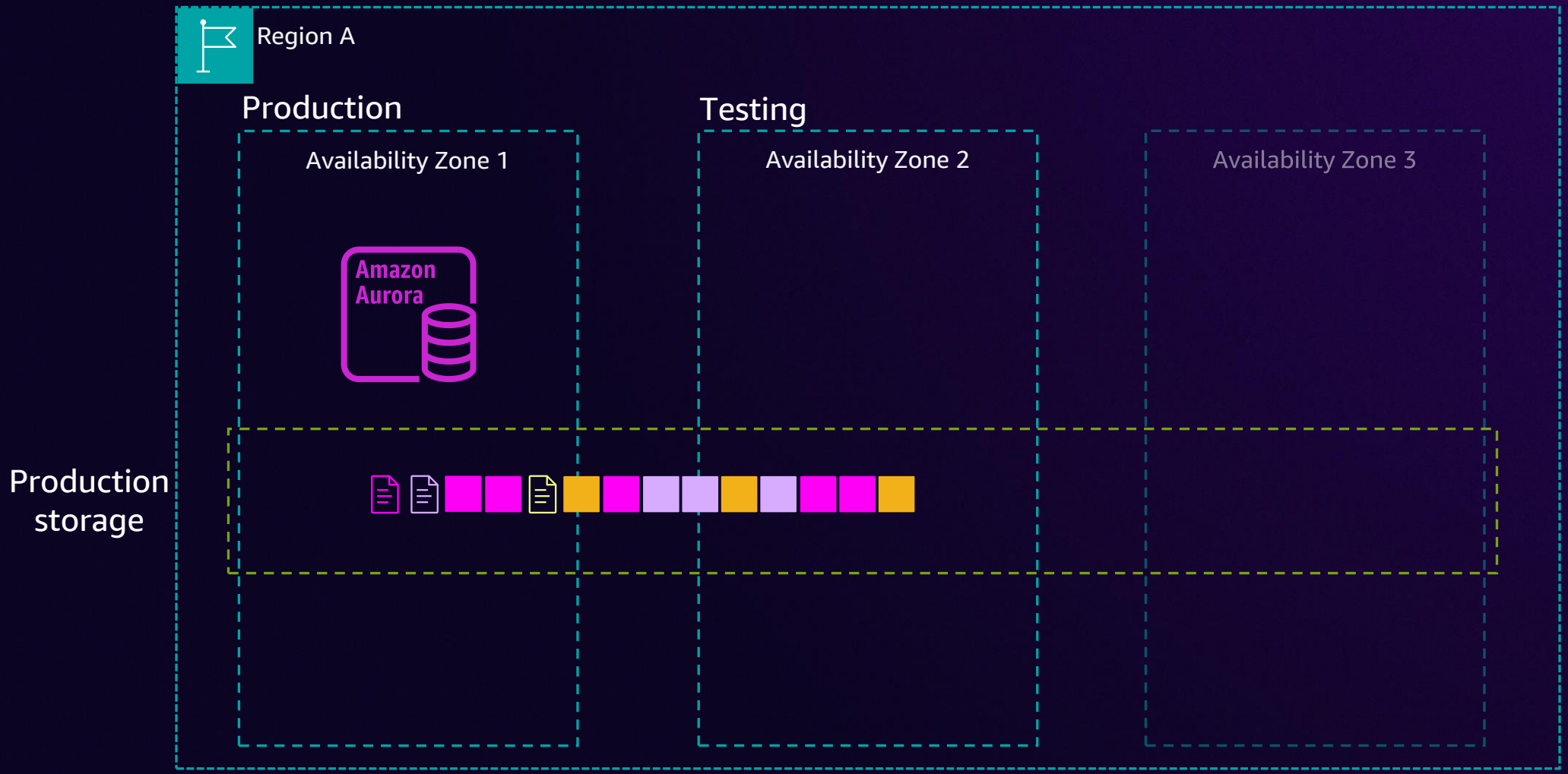

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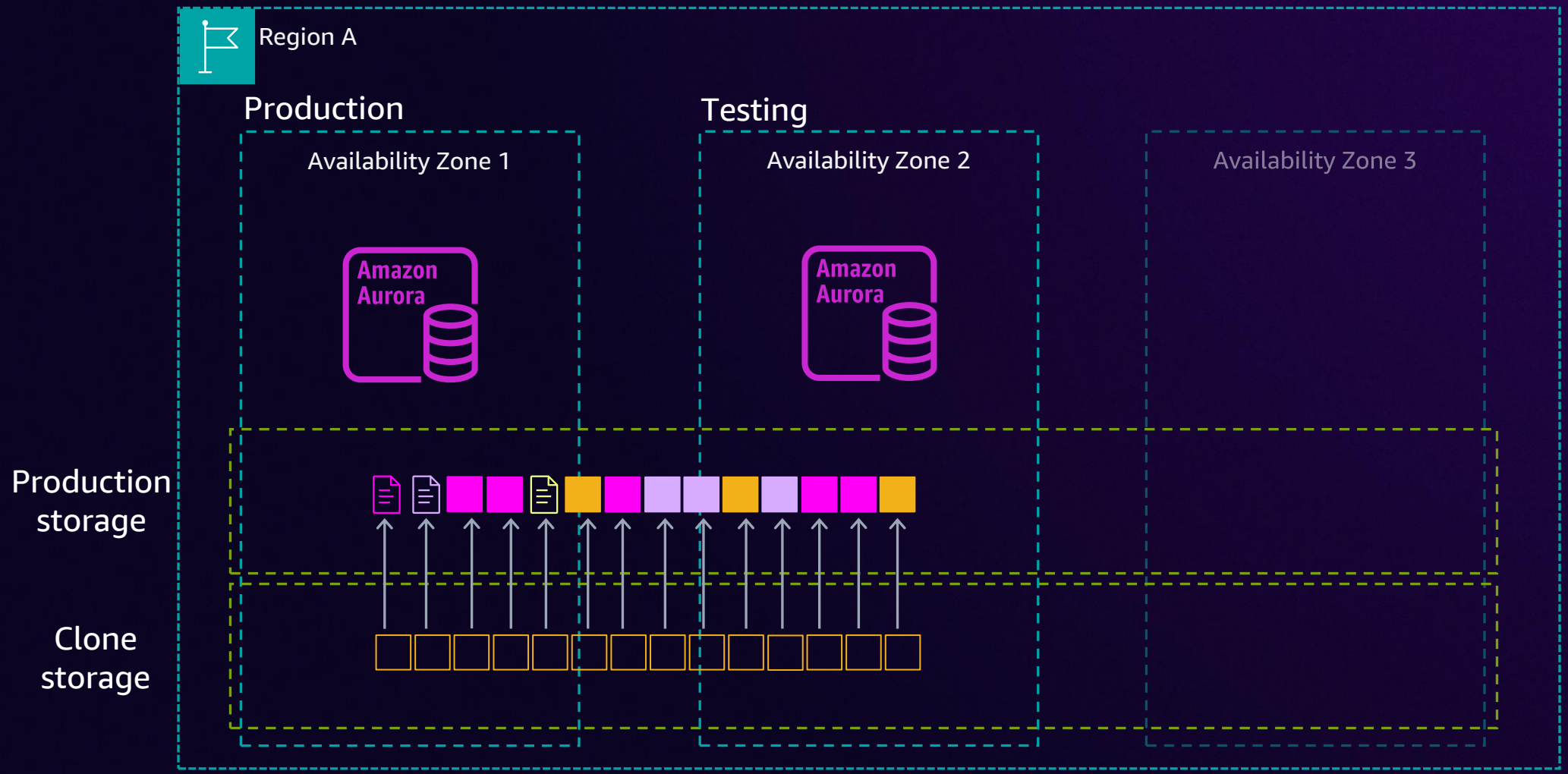

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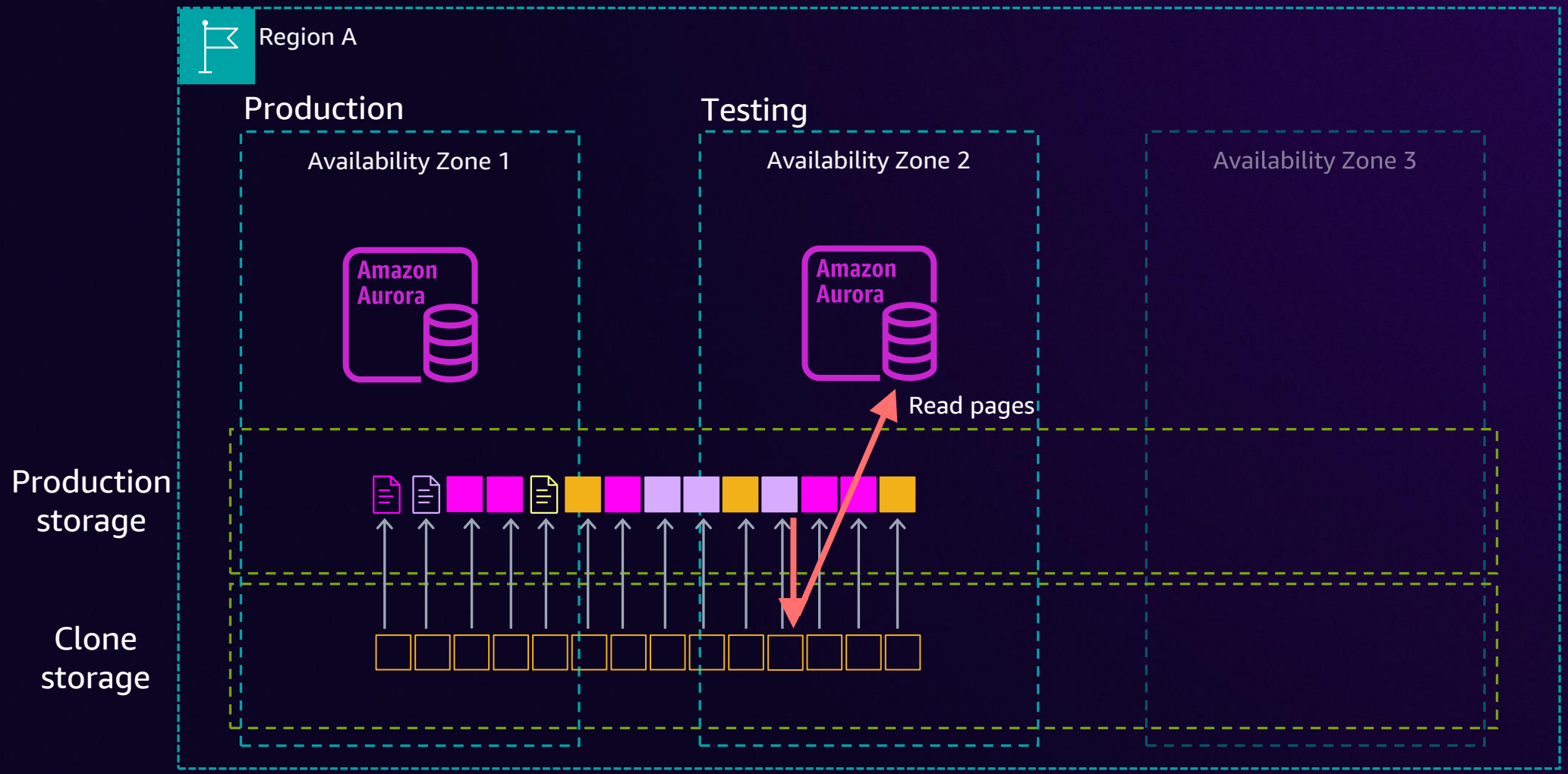

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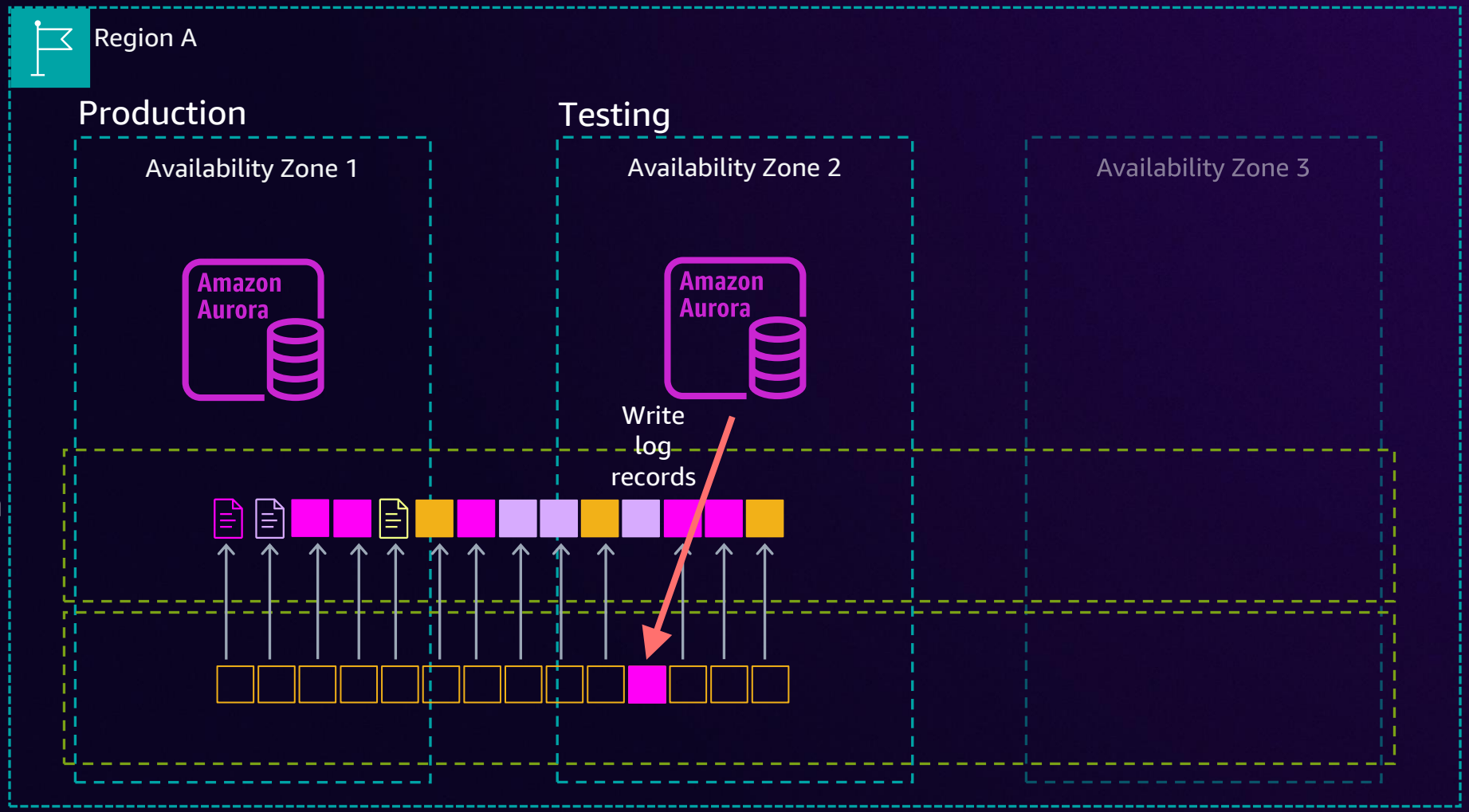

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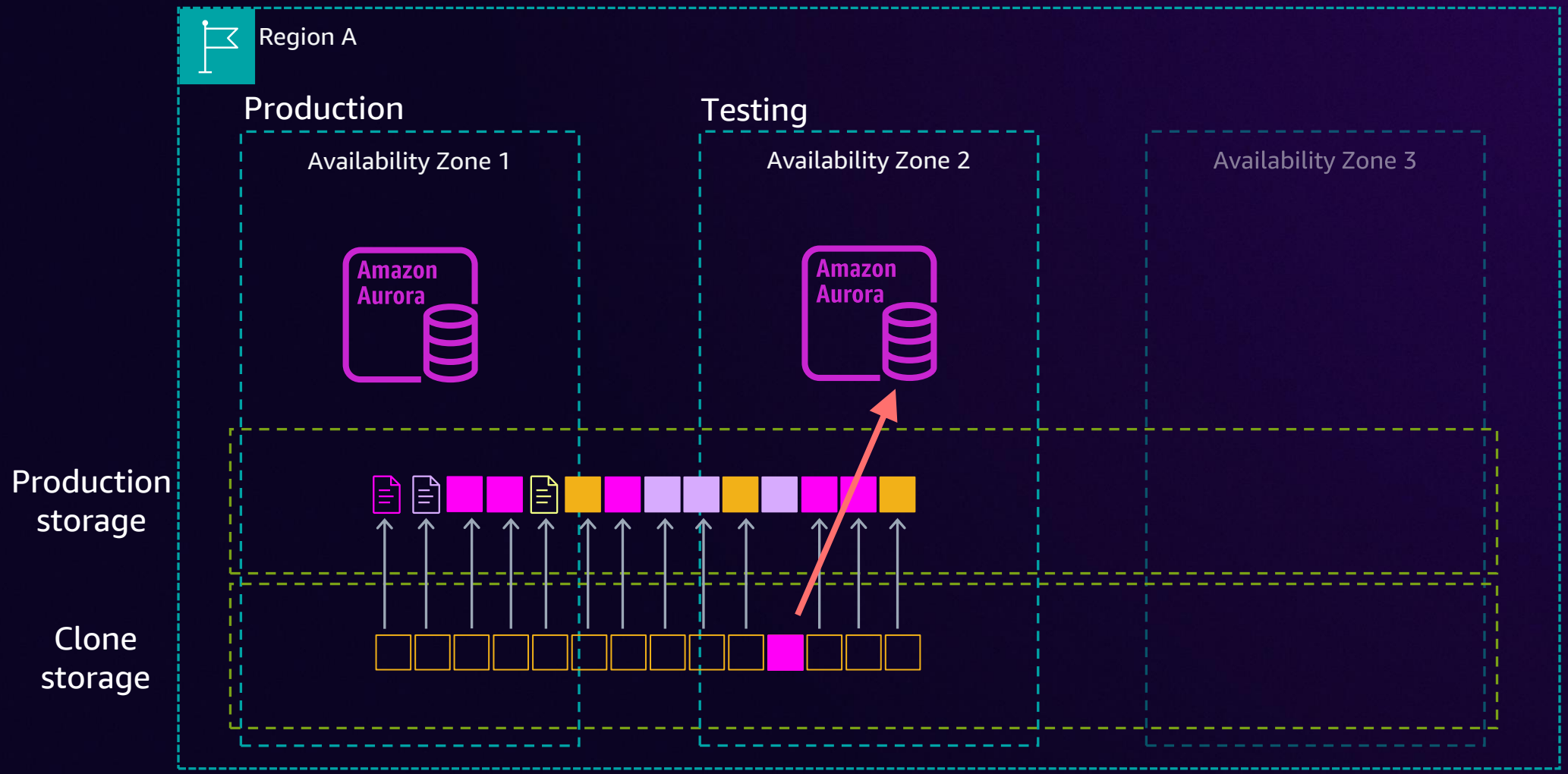

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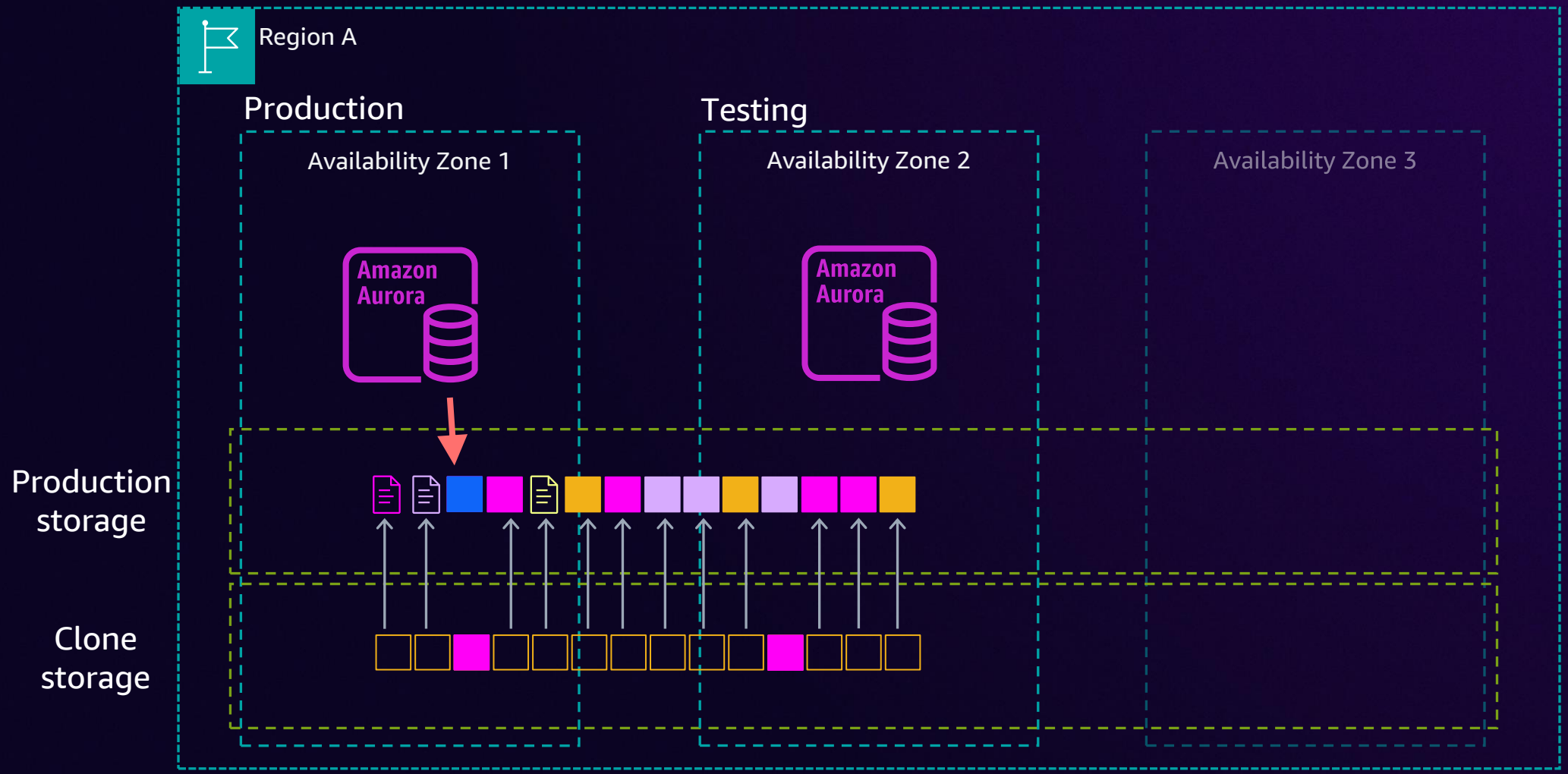

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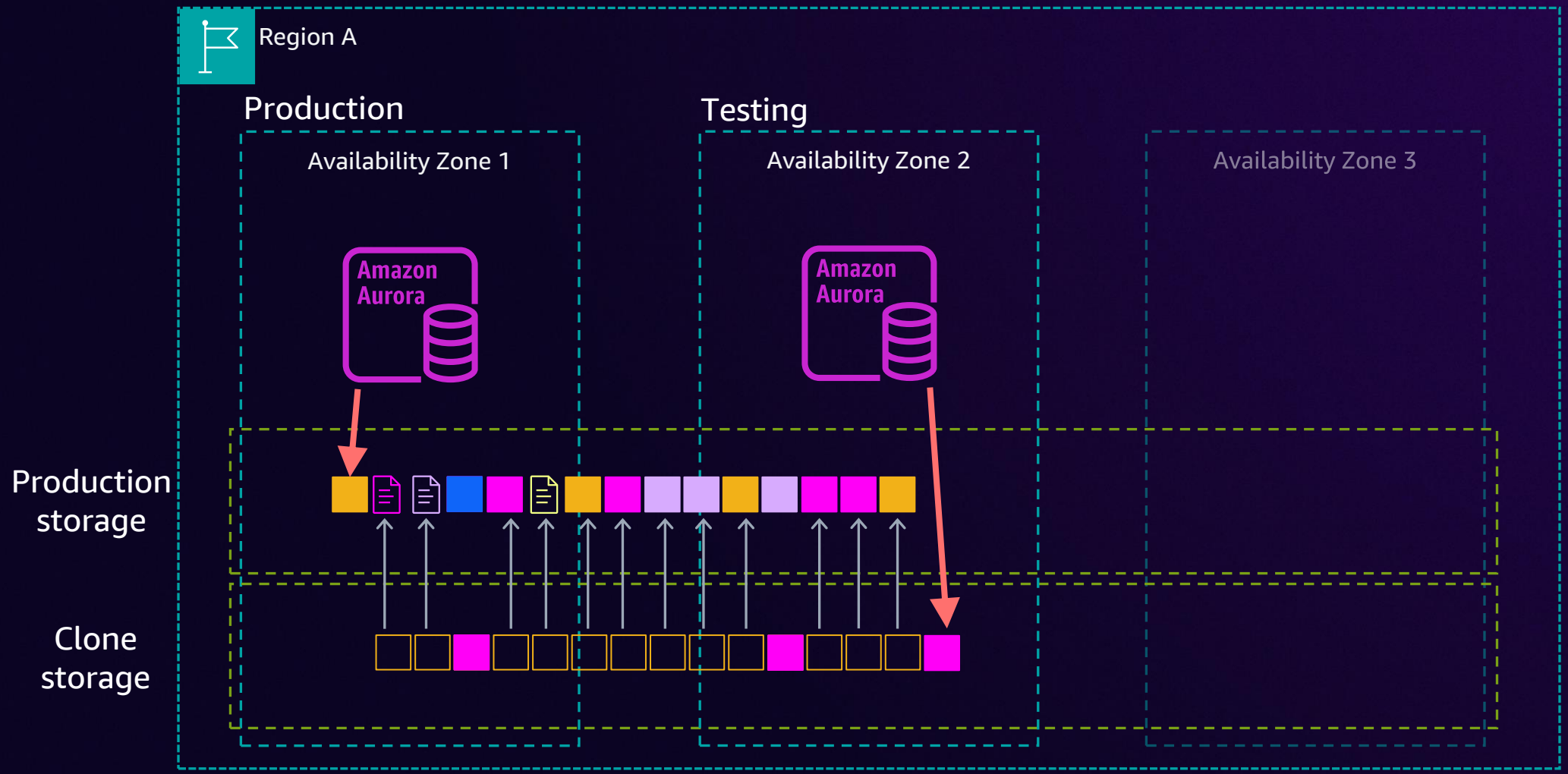

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Everything fails, all the time

Dr. Werner Vogels

VP and CTO

Amazon.com

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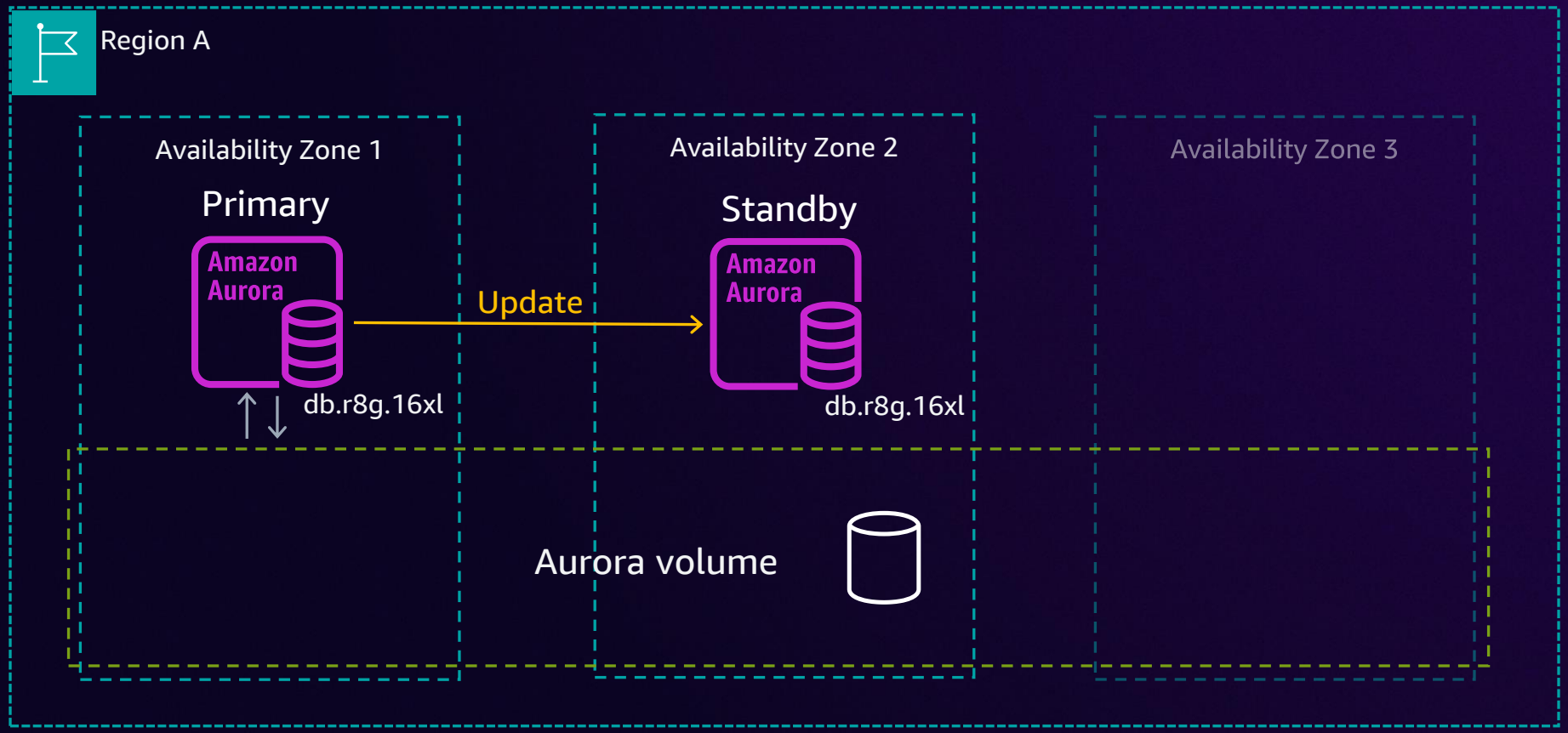
Multi-AZ



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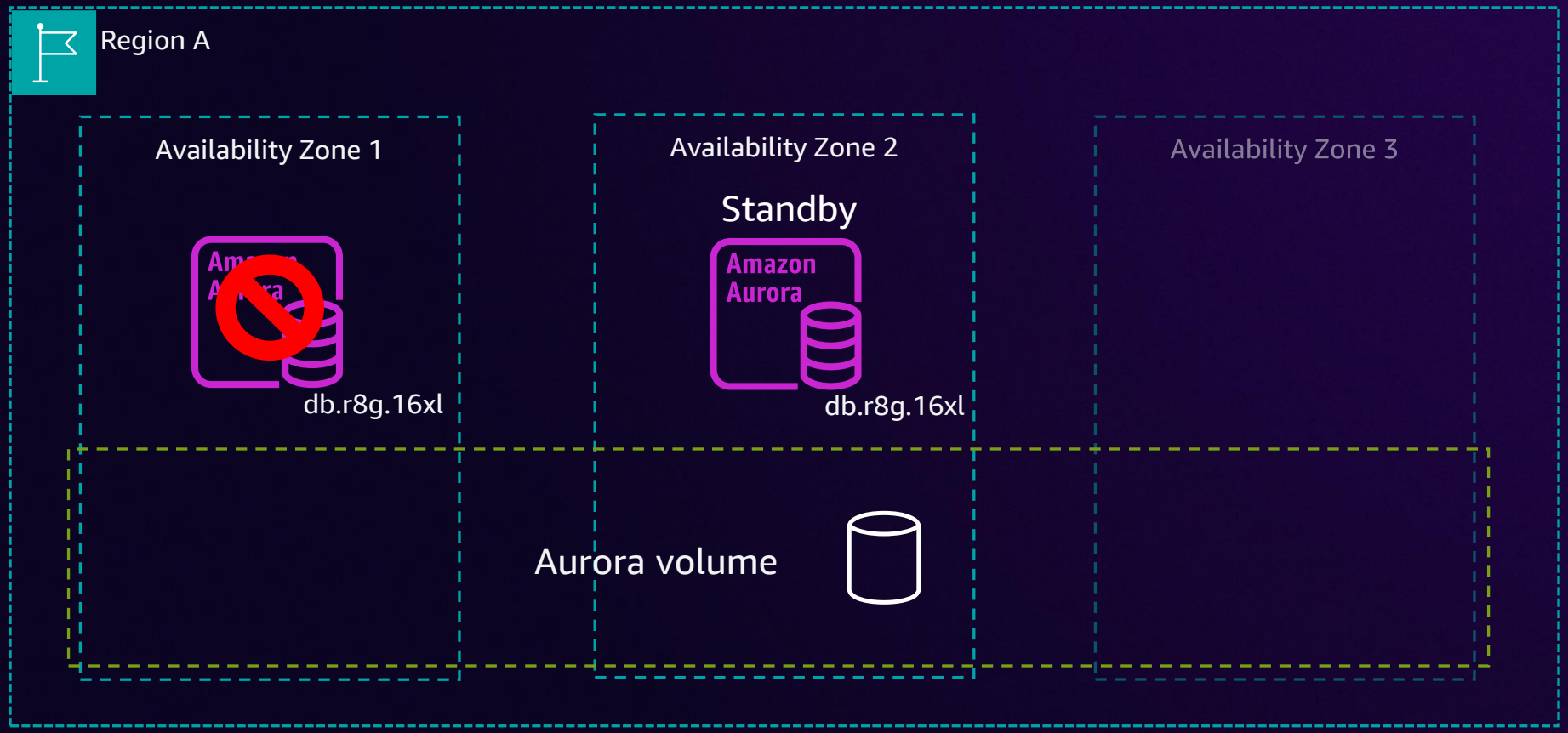

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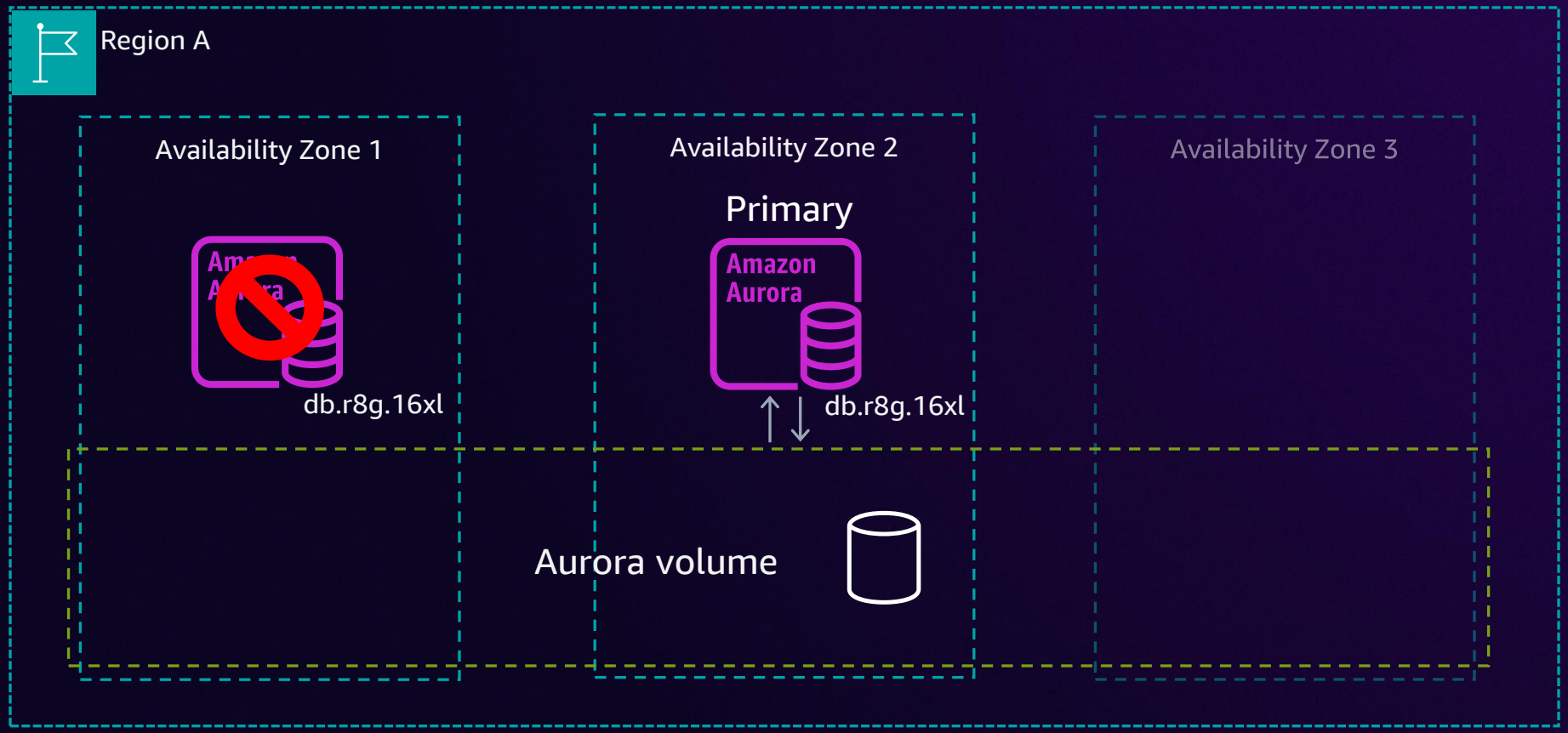

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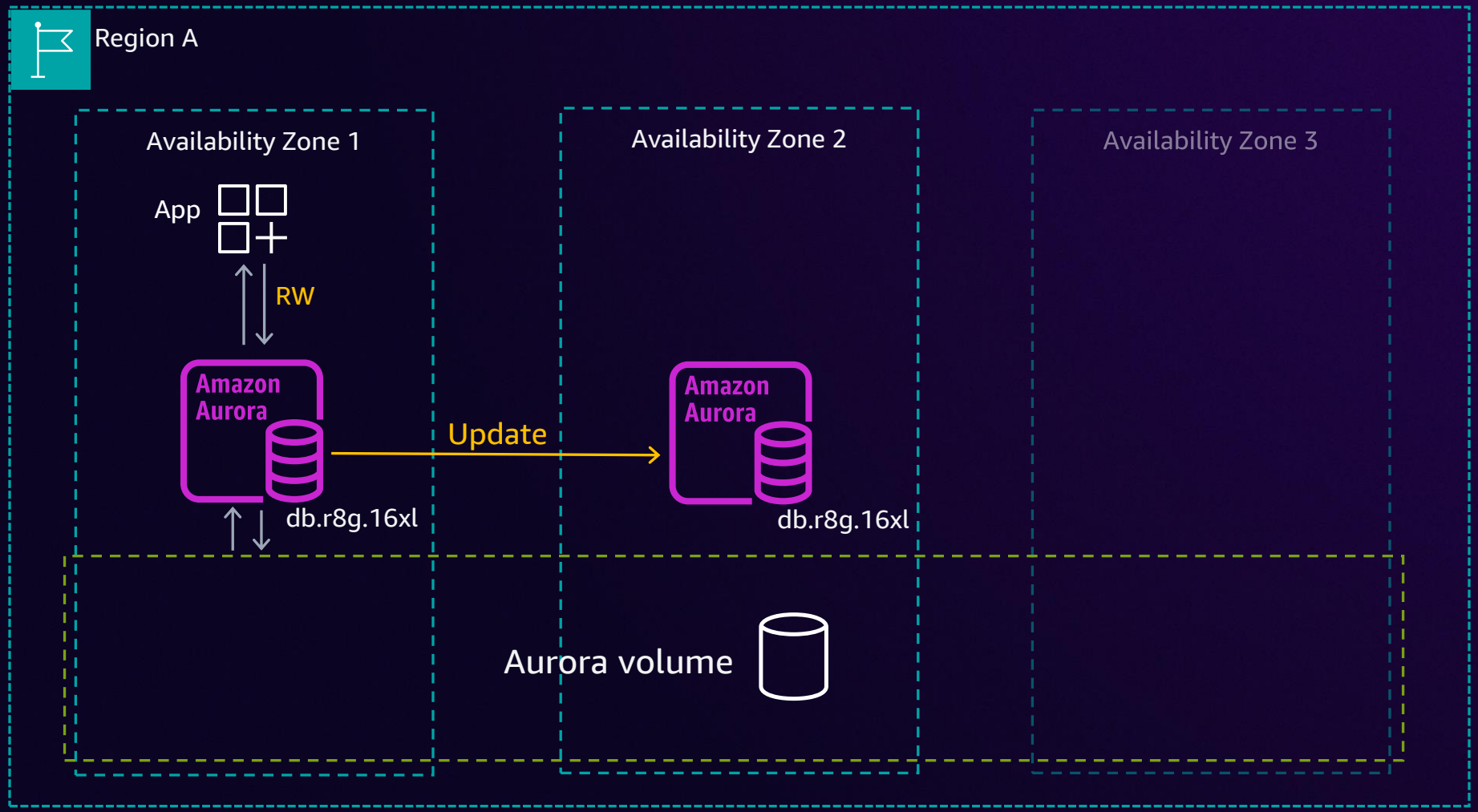
Read replica



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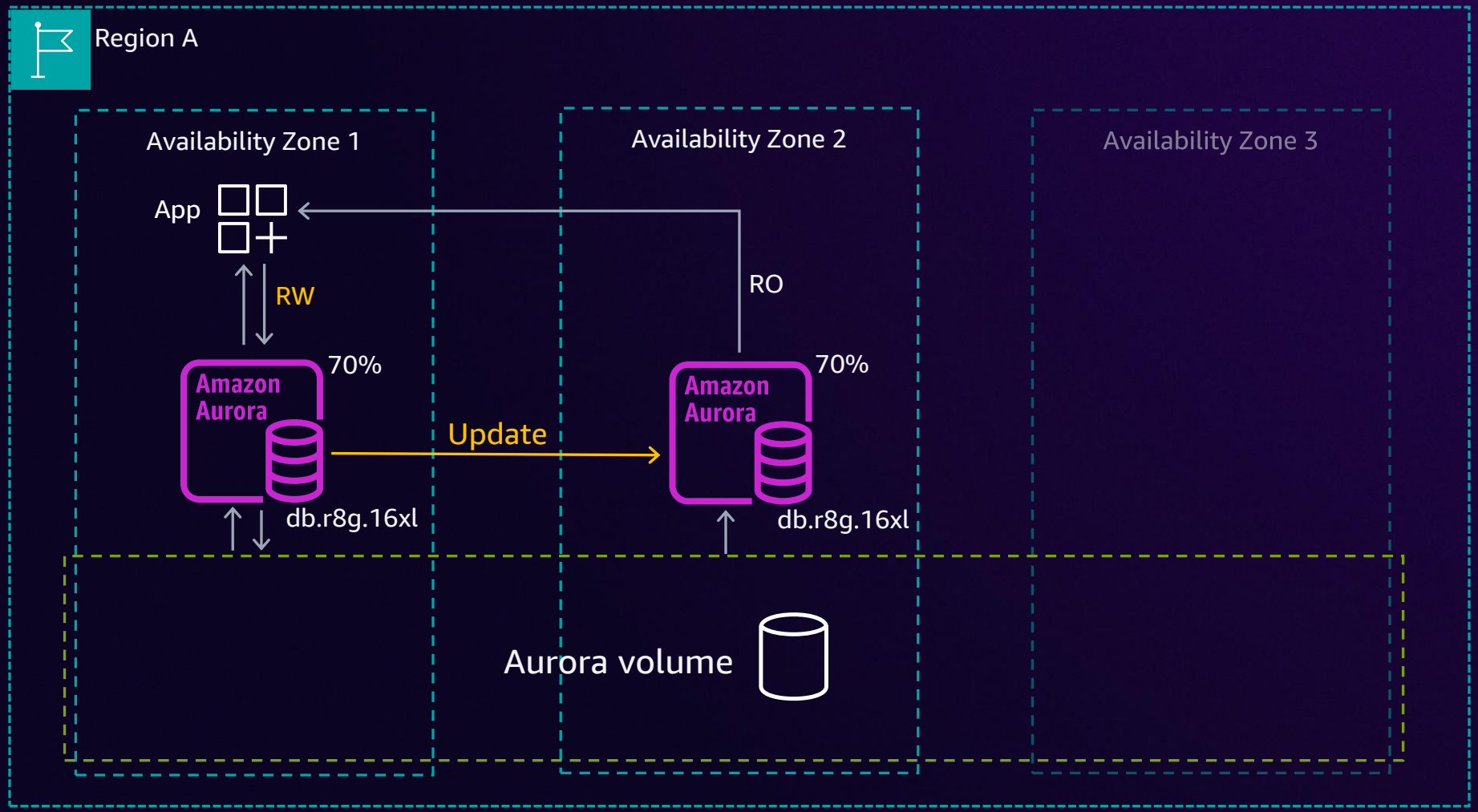

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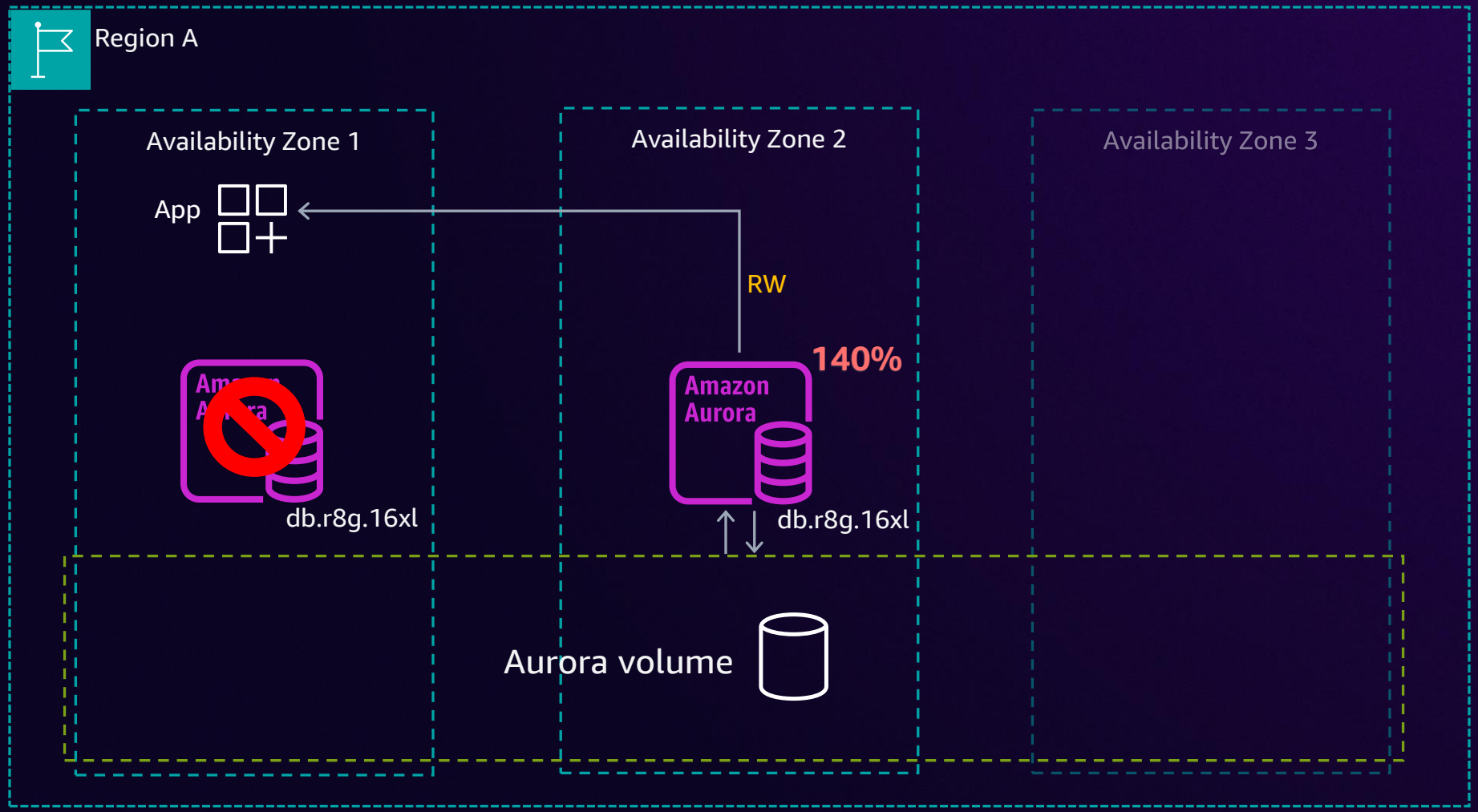

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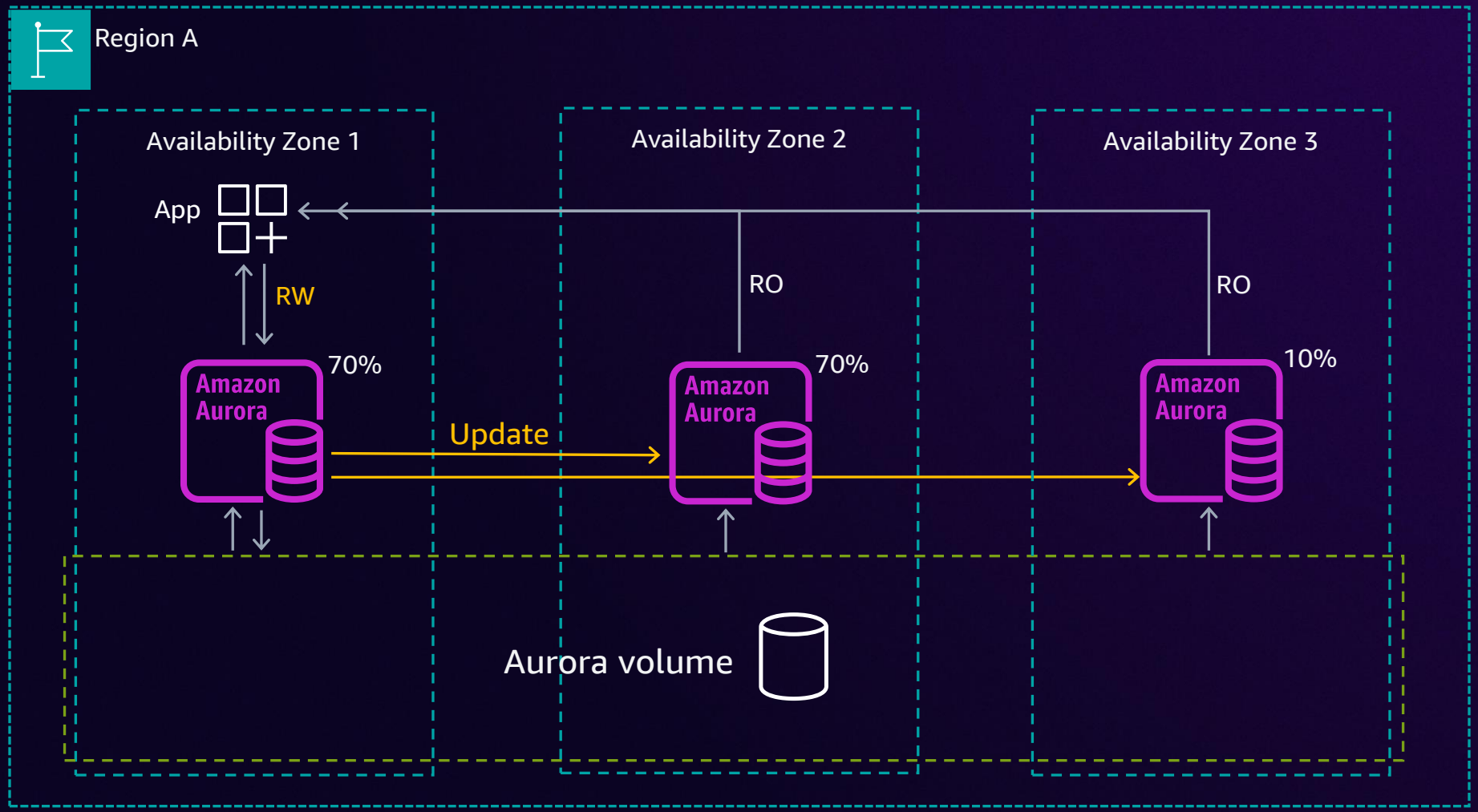
A large cluster



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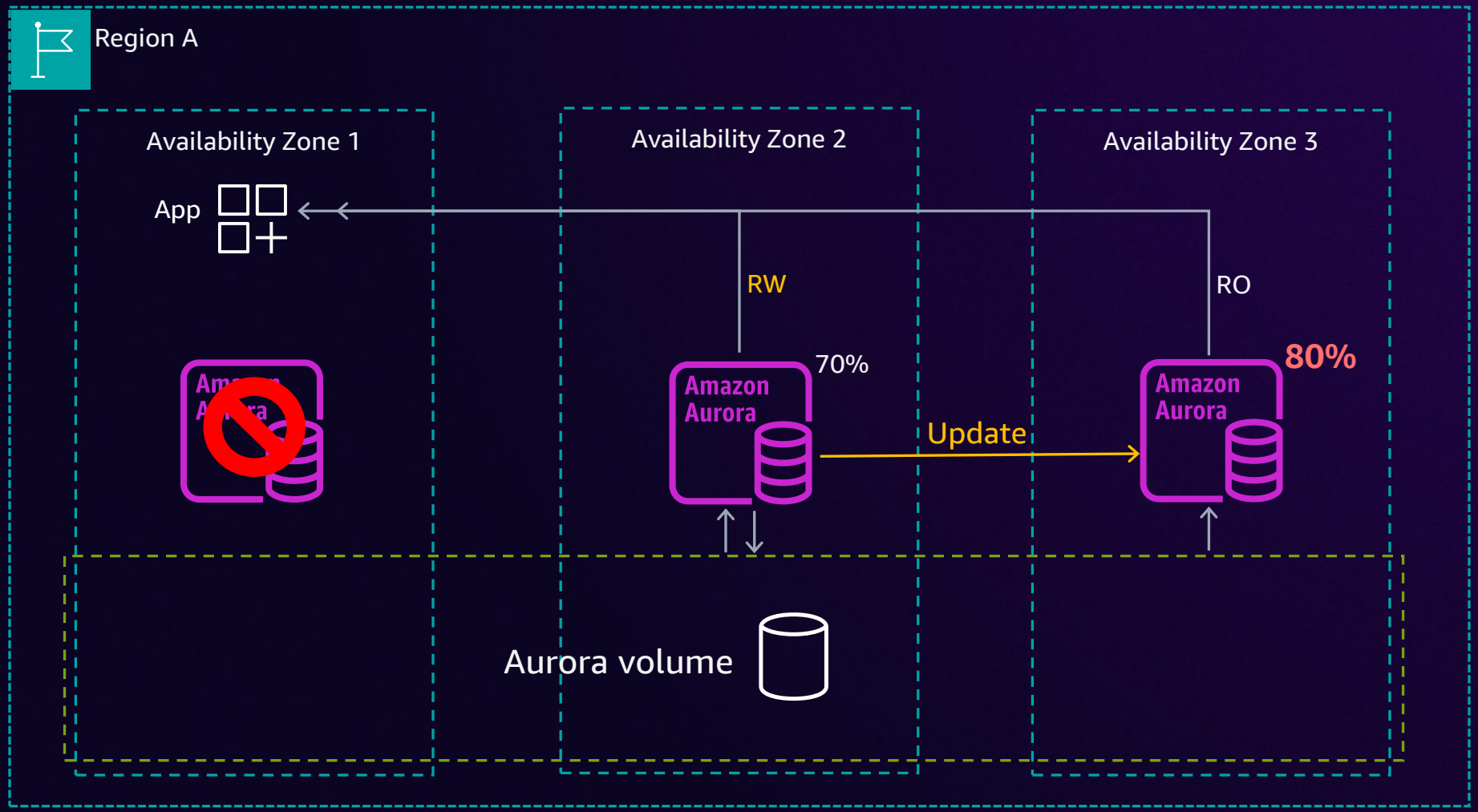

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A mixed cluster

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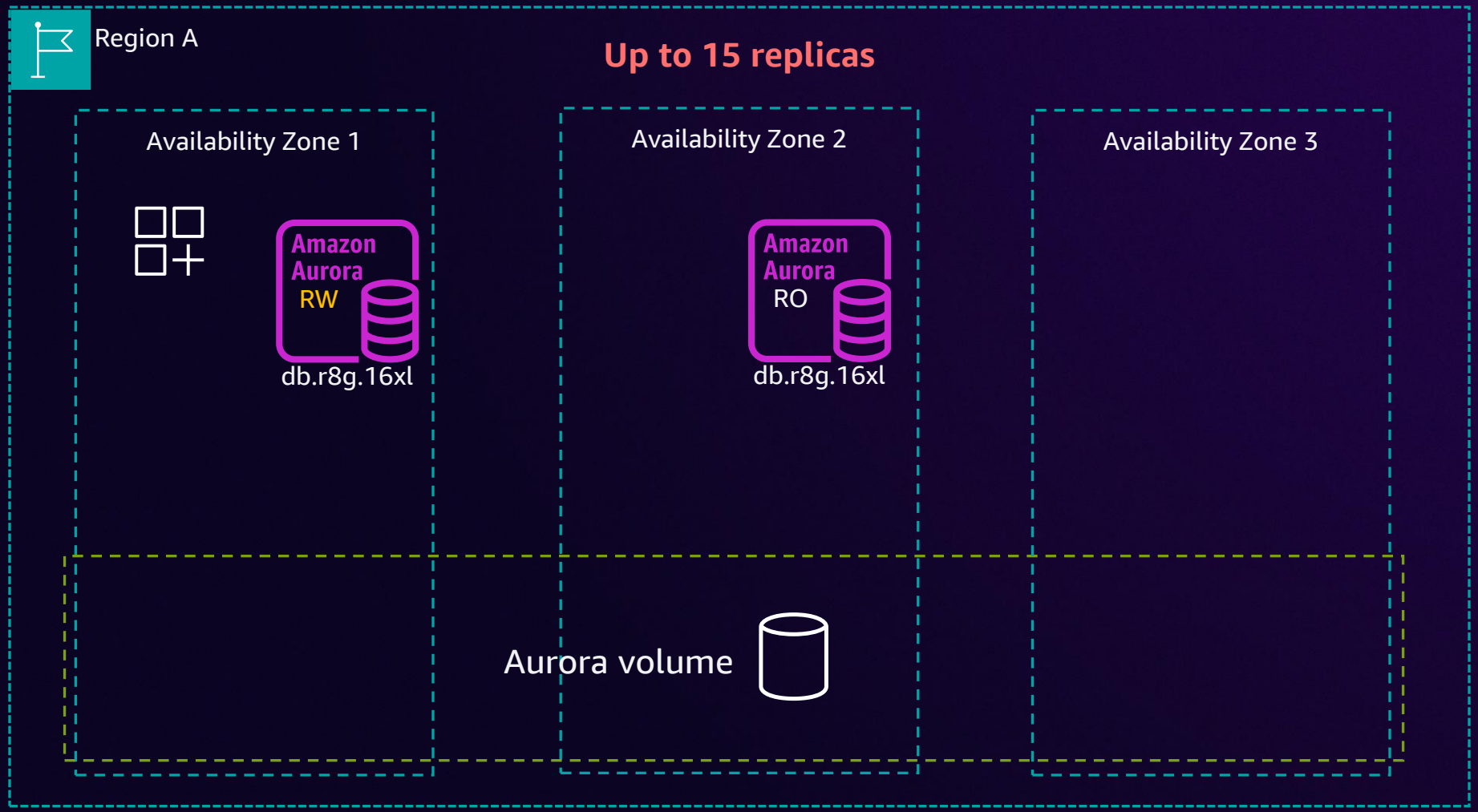
A mixed cluster



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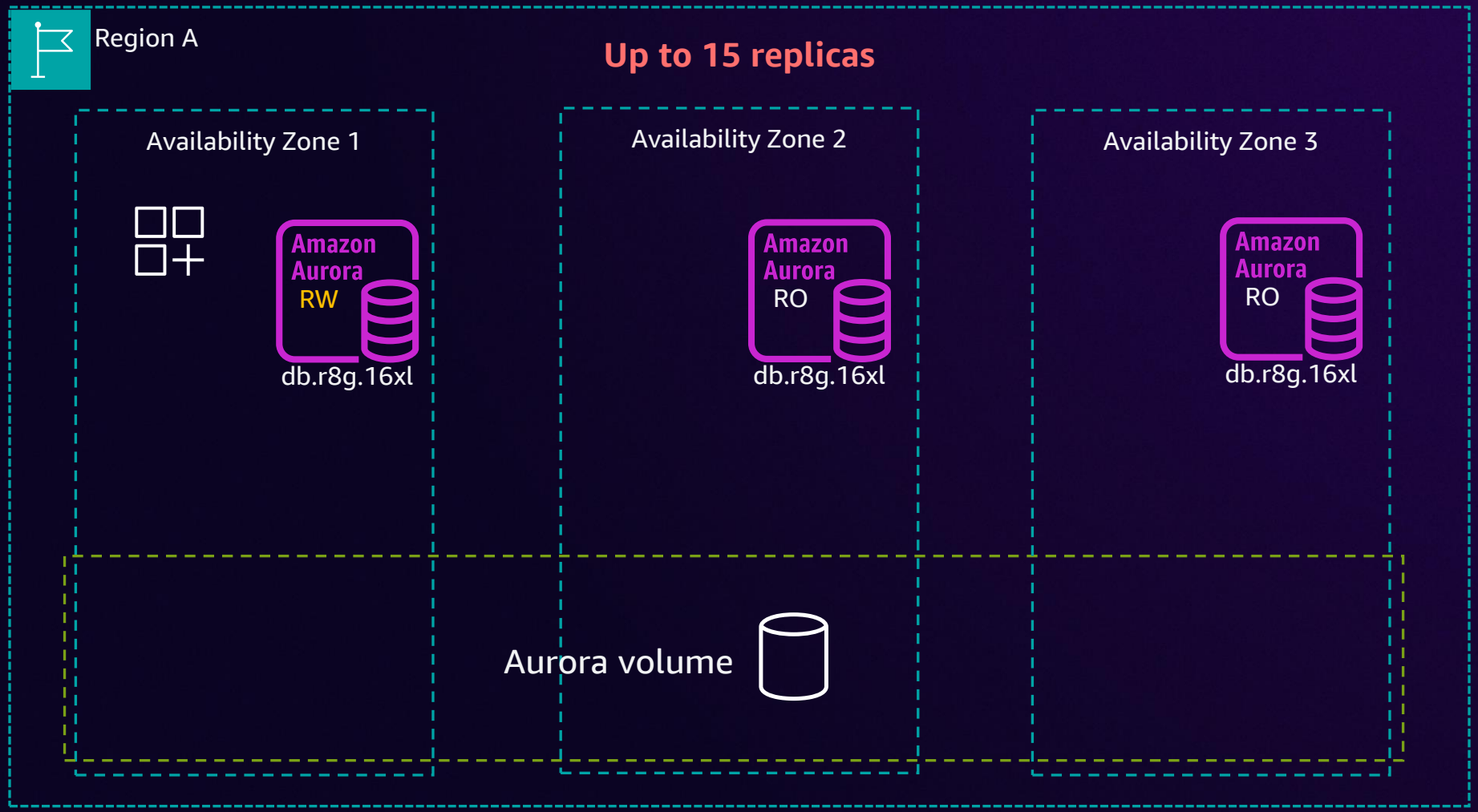

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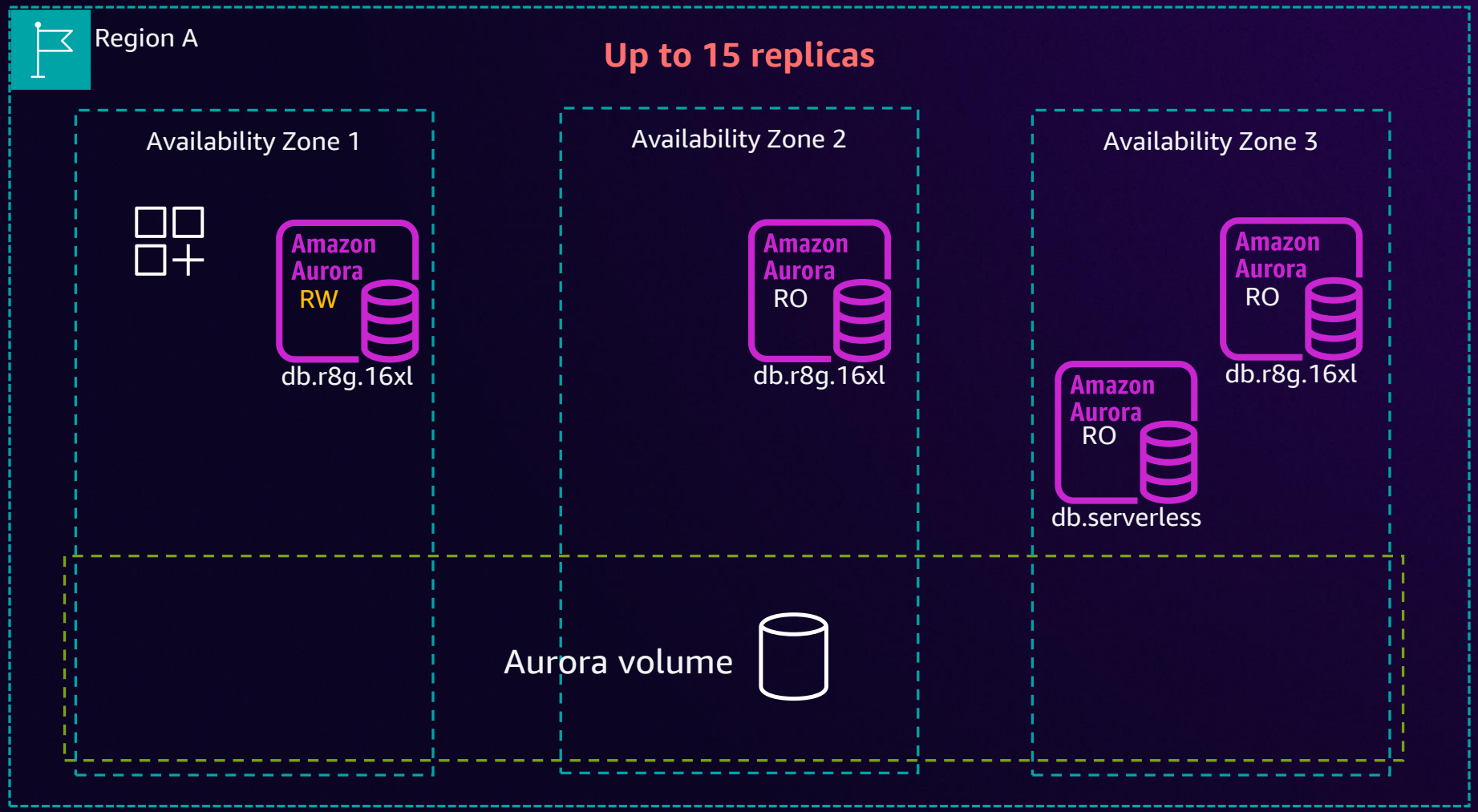

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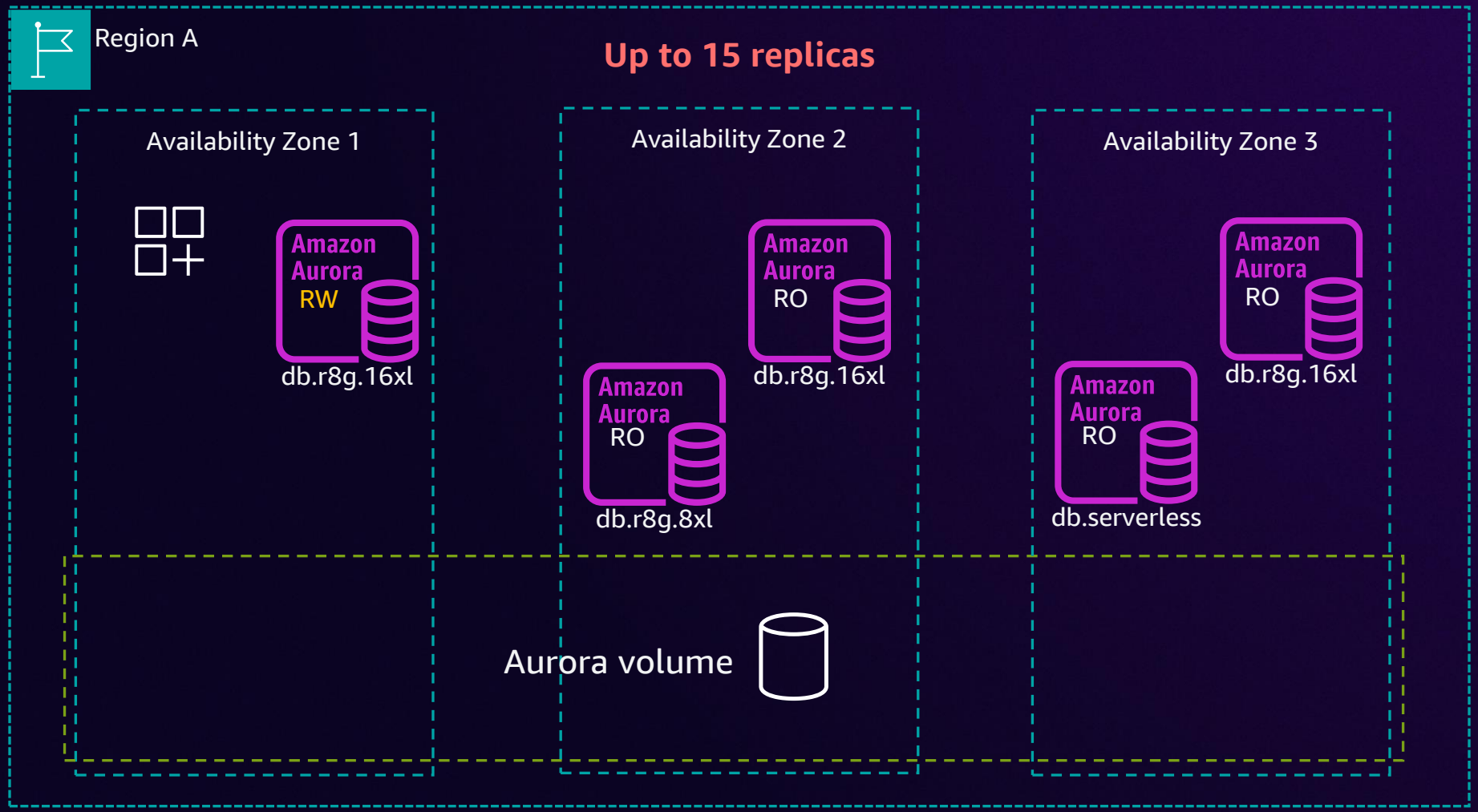

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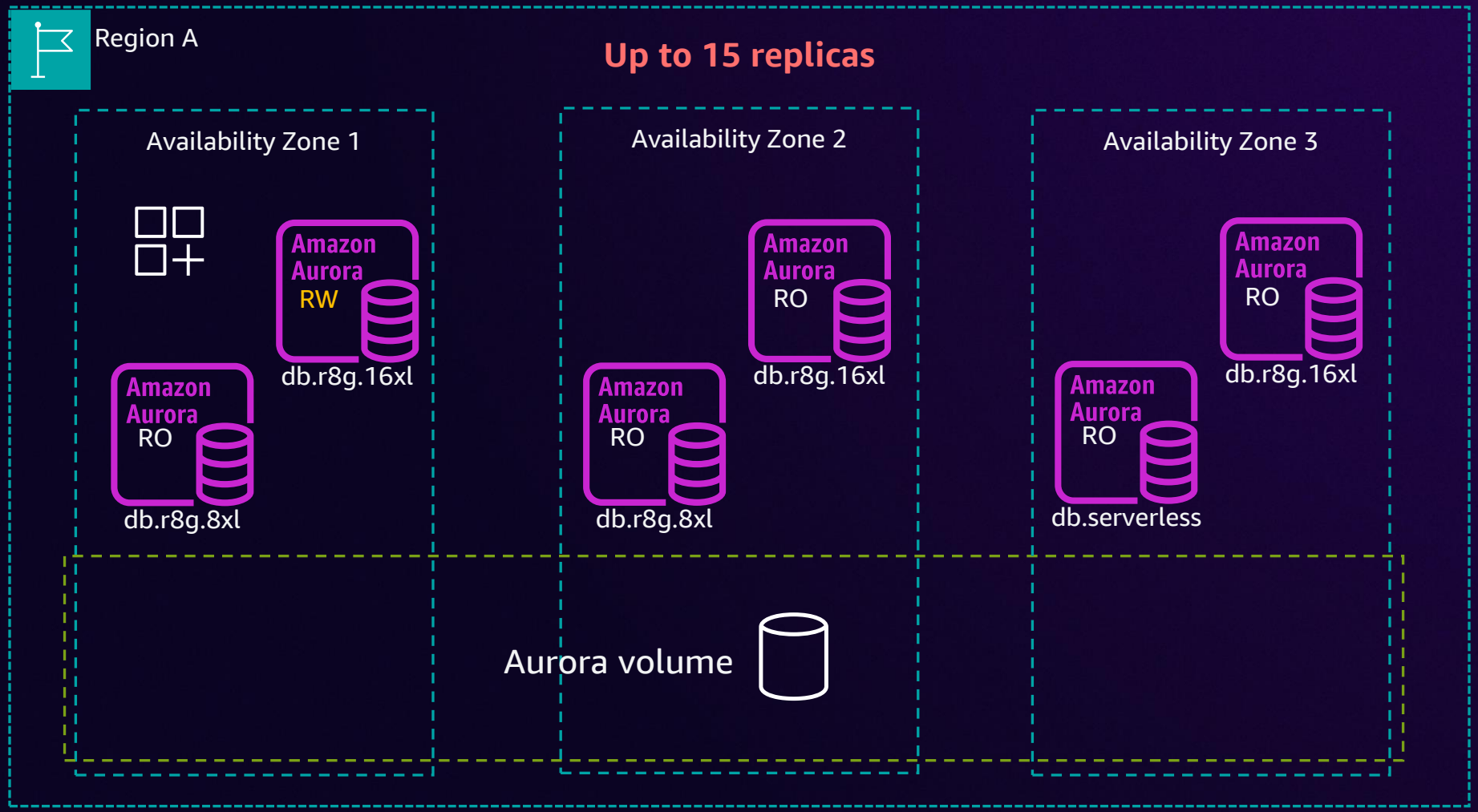

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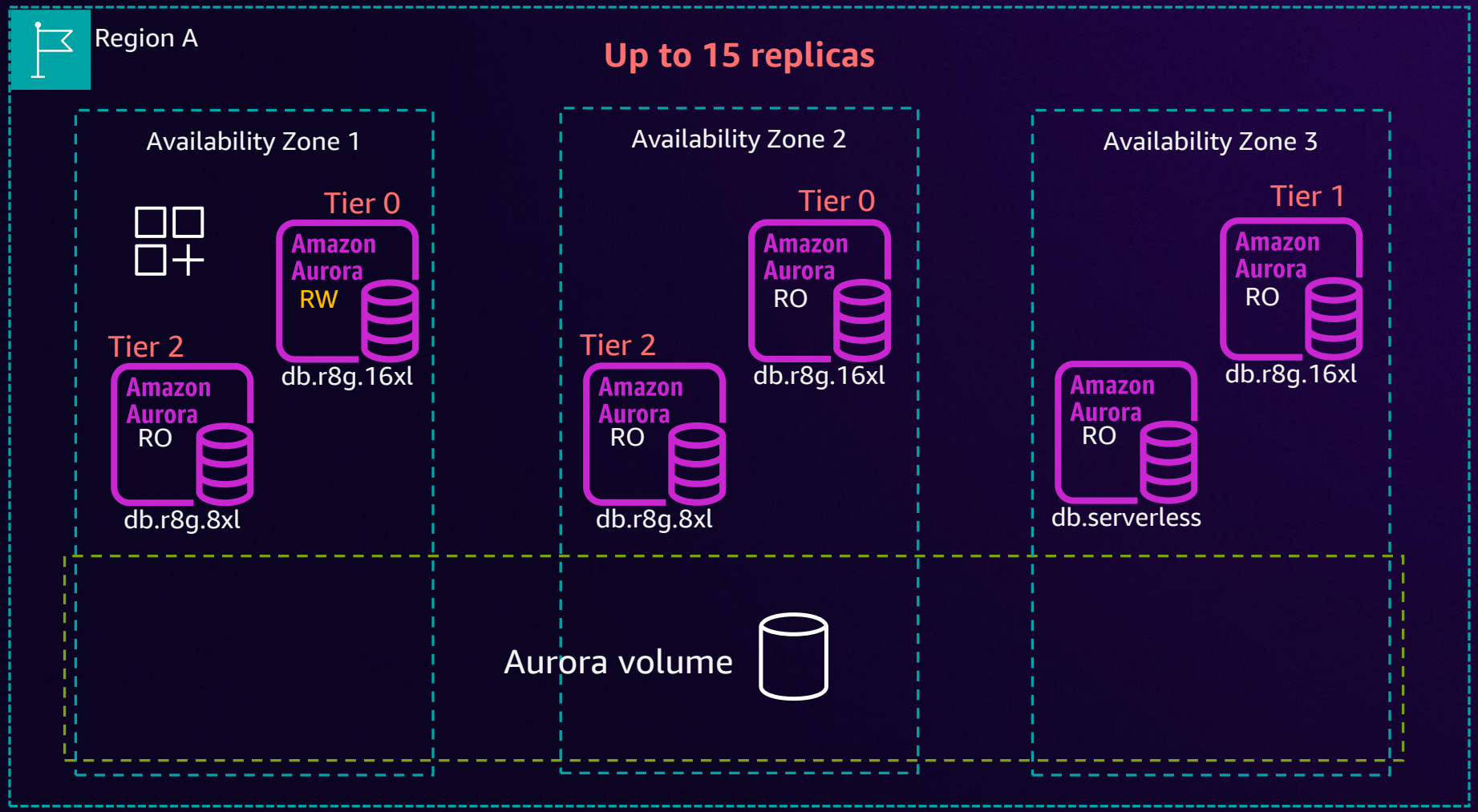

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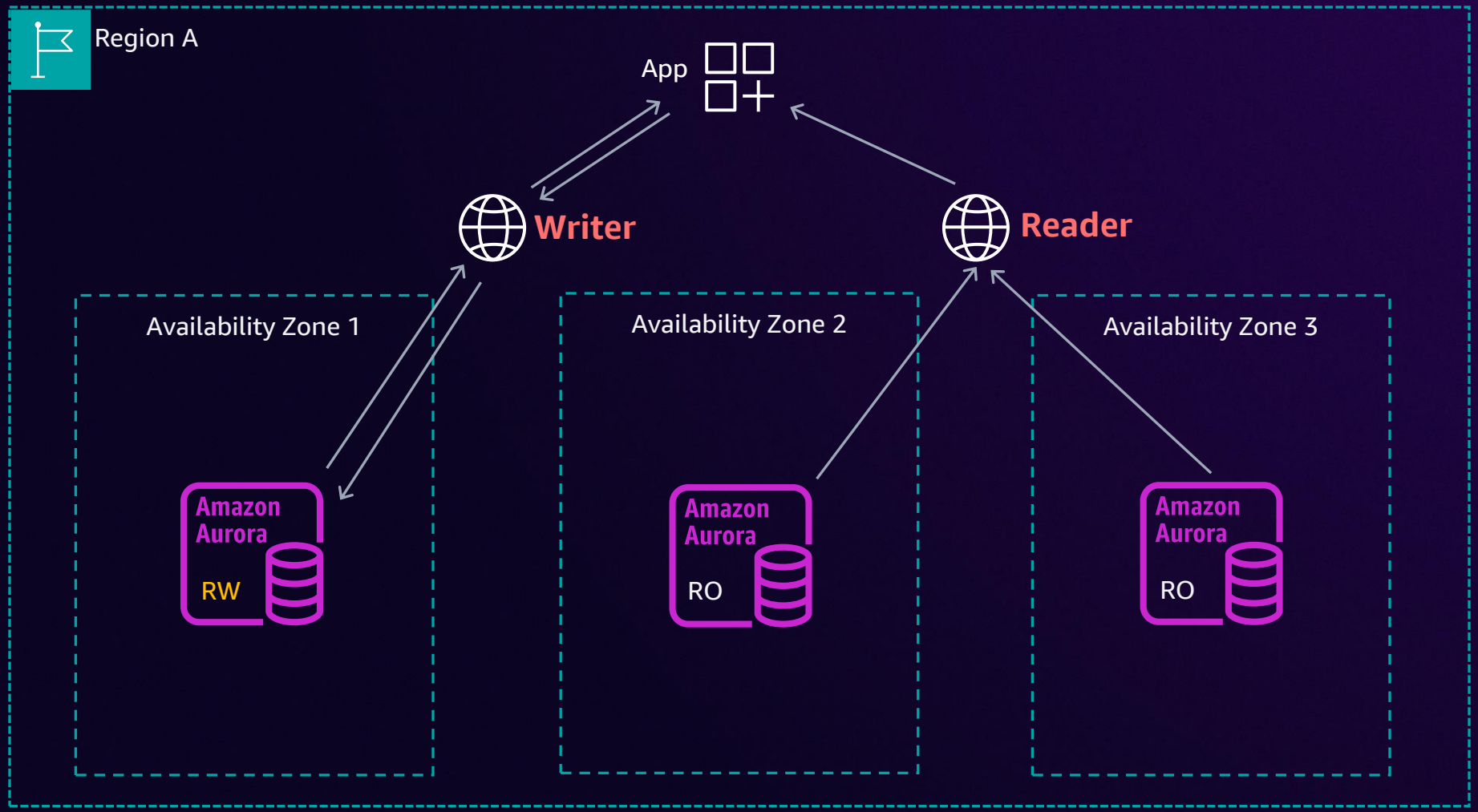

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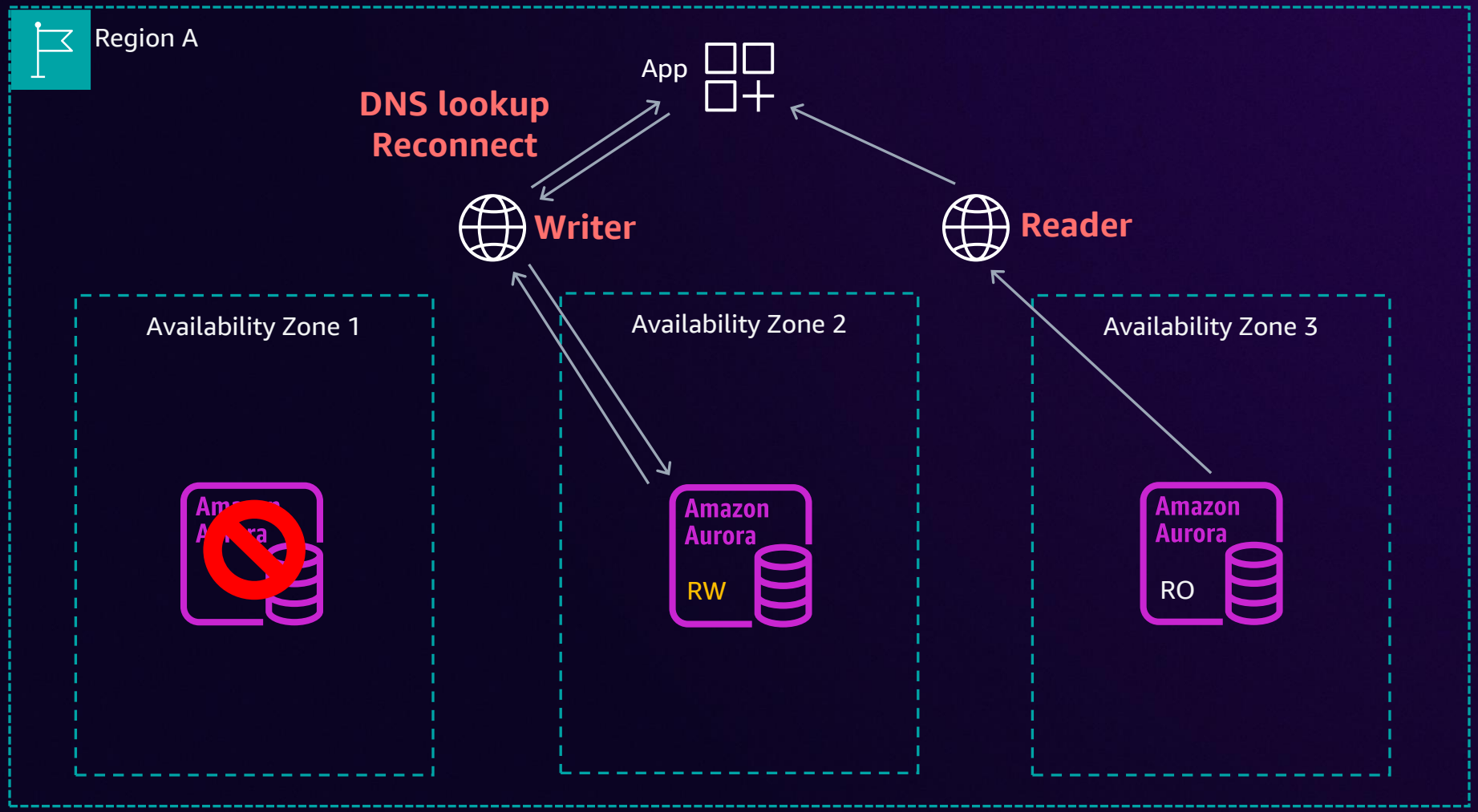

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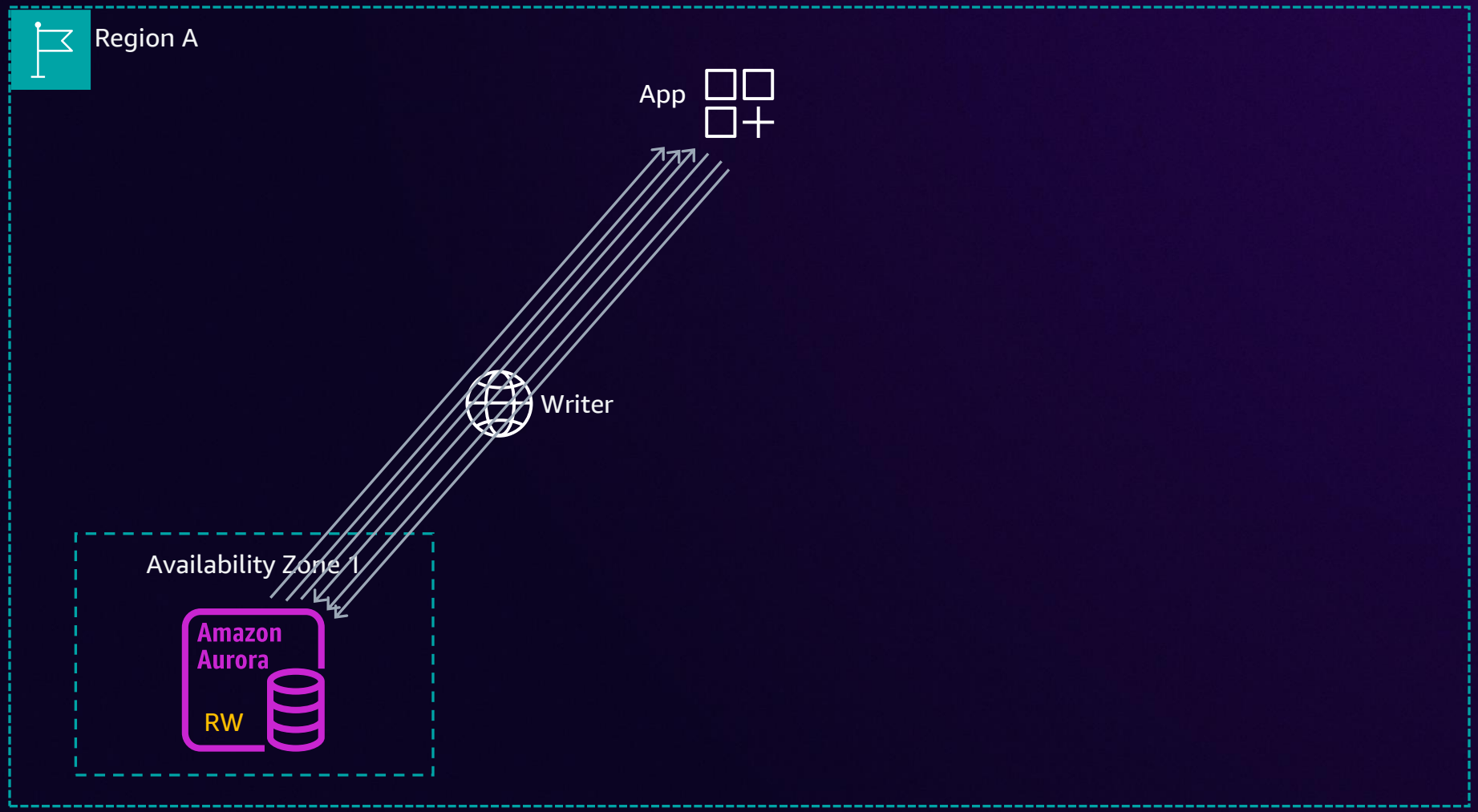
Connection management



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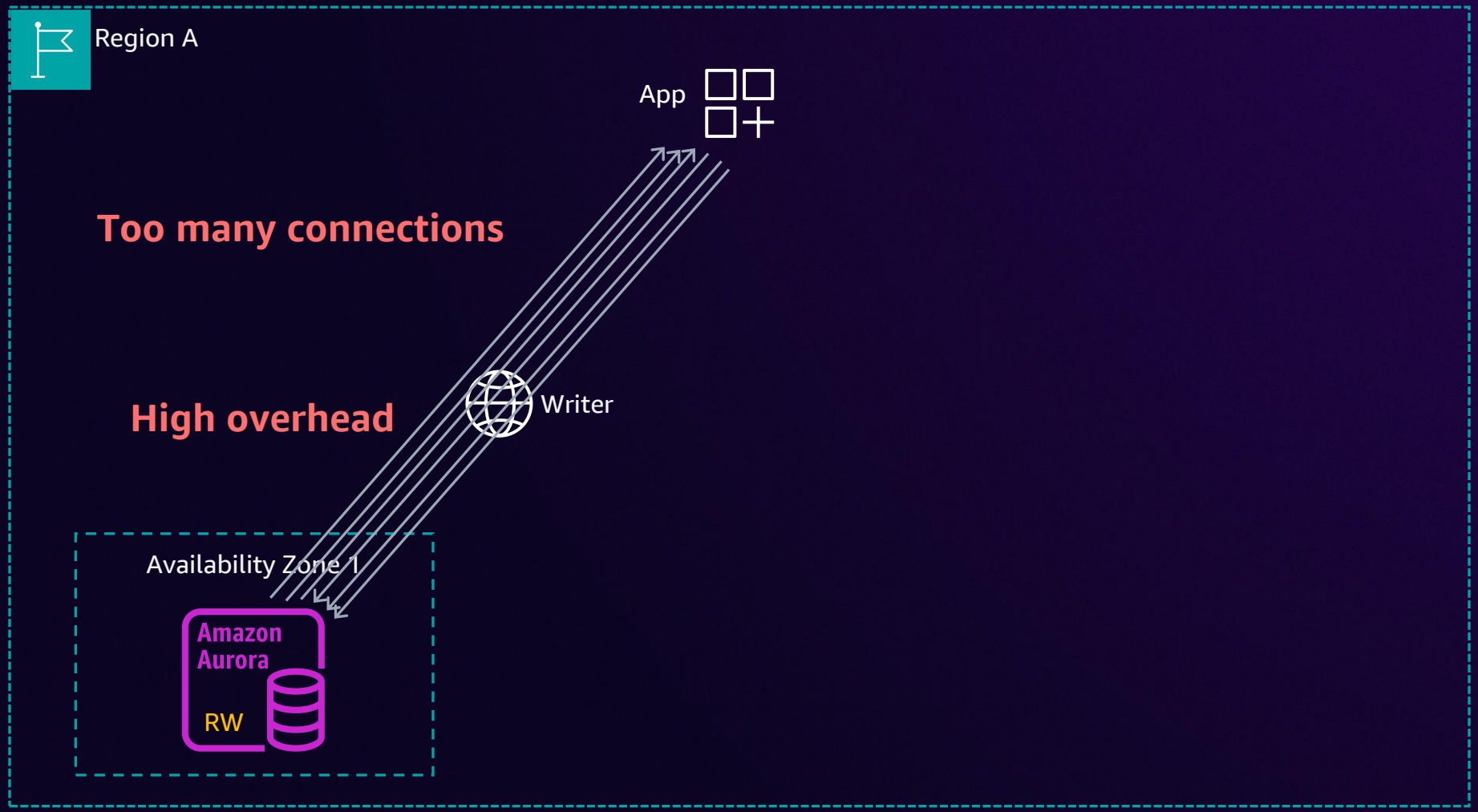

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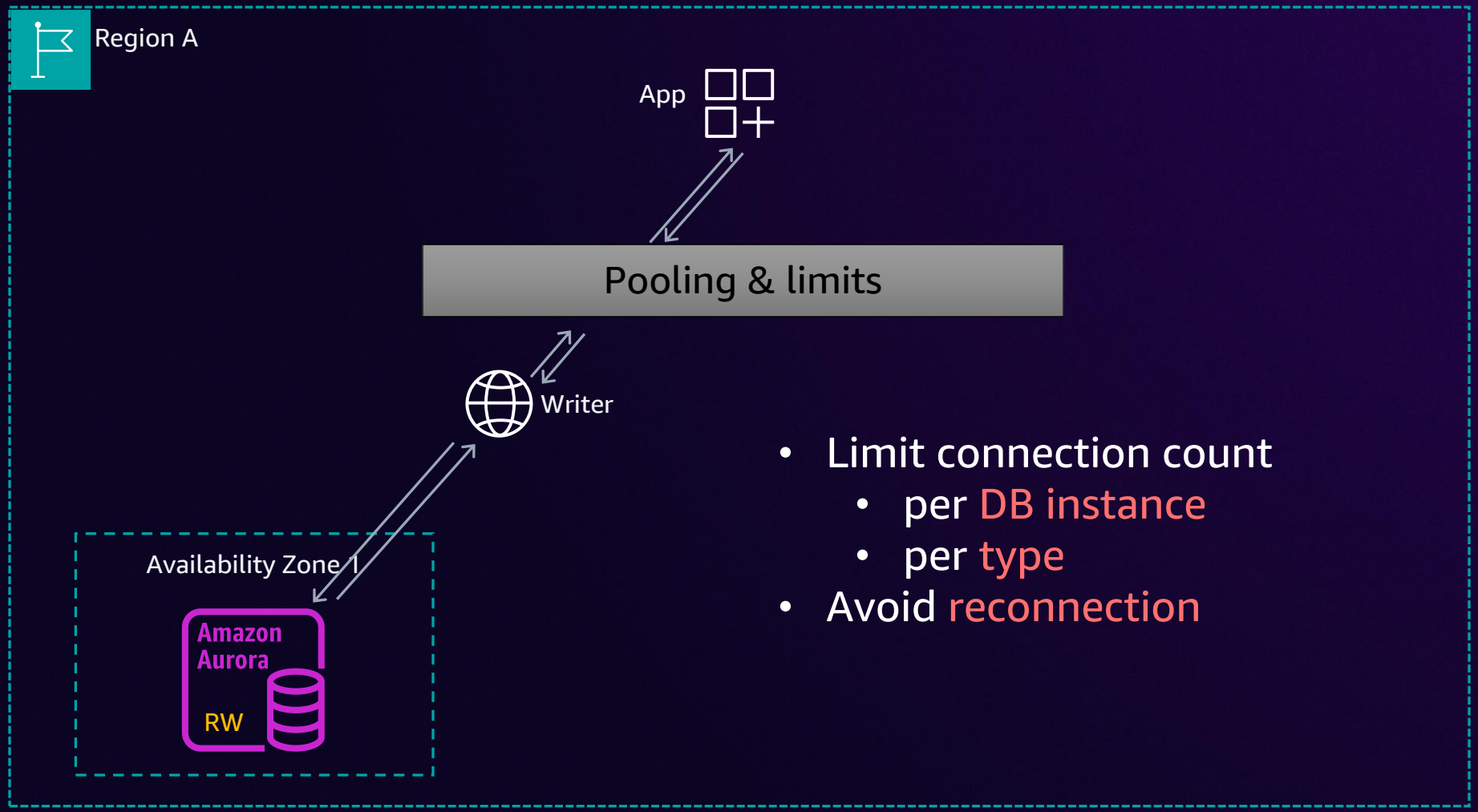

- Limit connection count
  - per DB instance
  - per type
- Avoid reconnection

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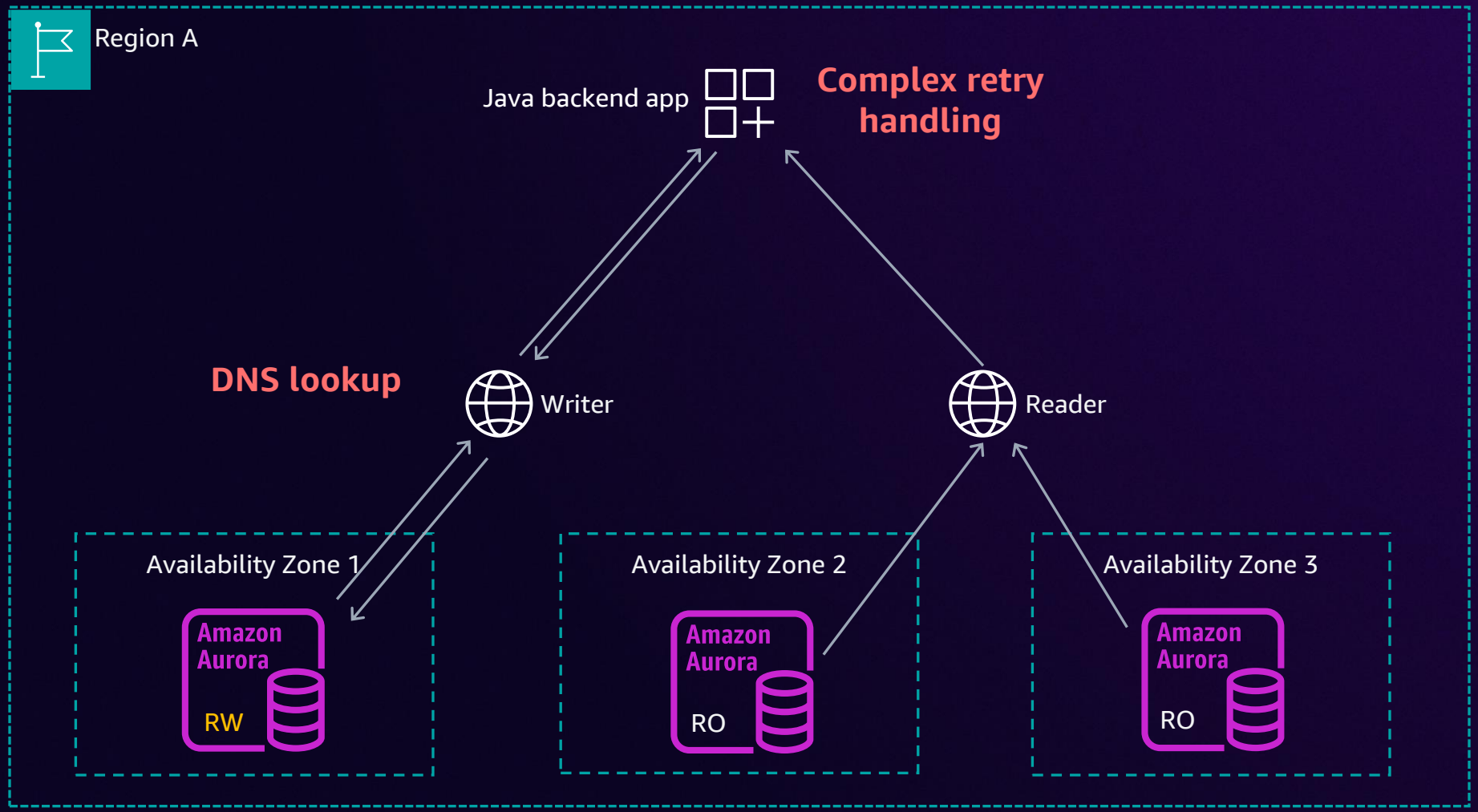
AWS advanced JDBC wrapper



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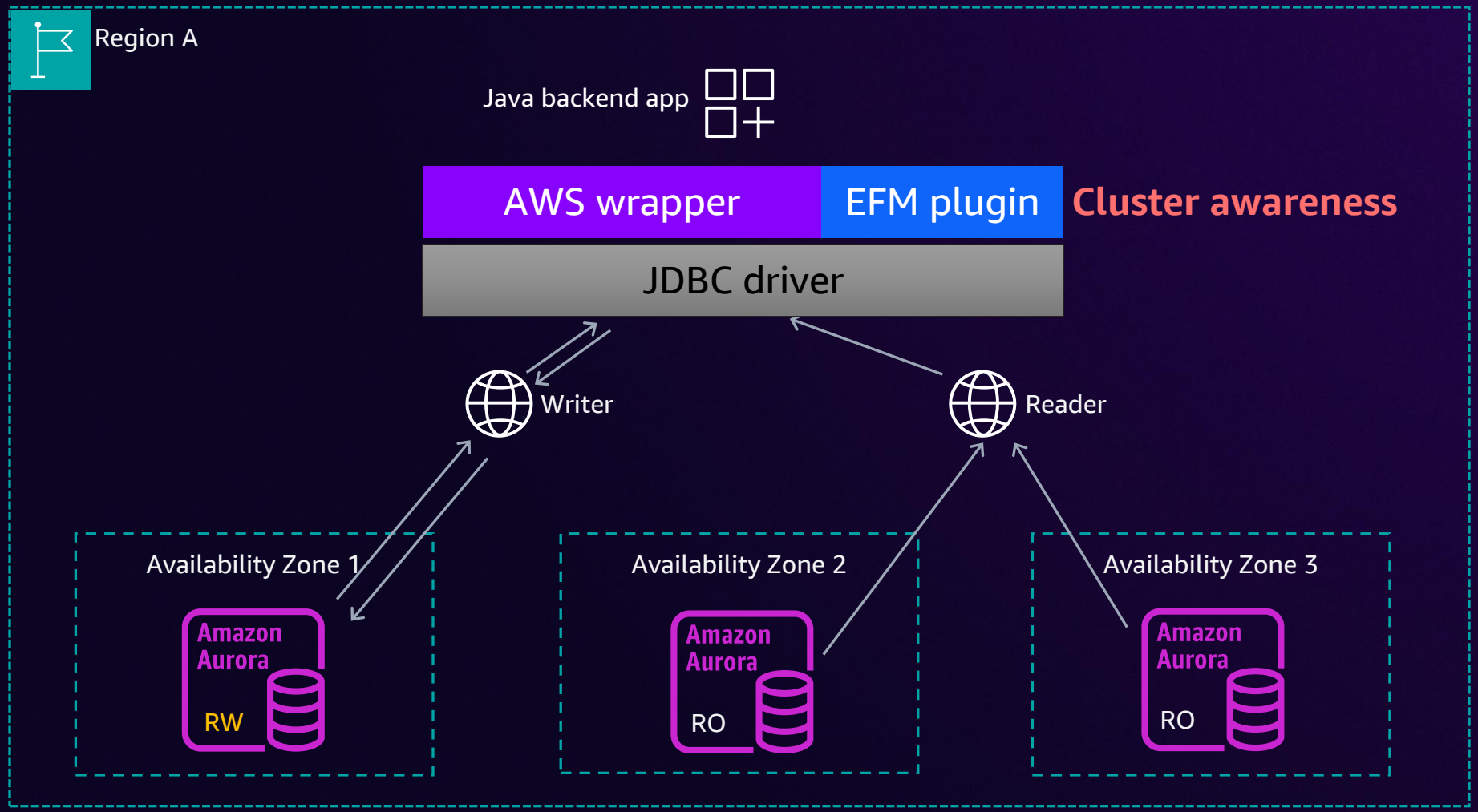

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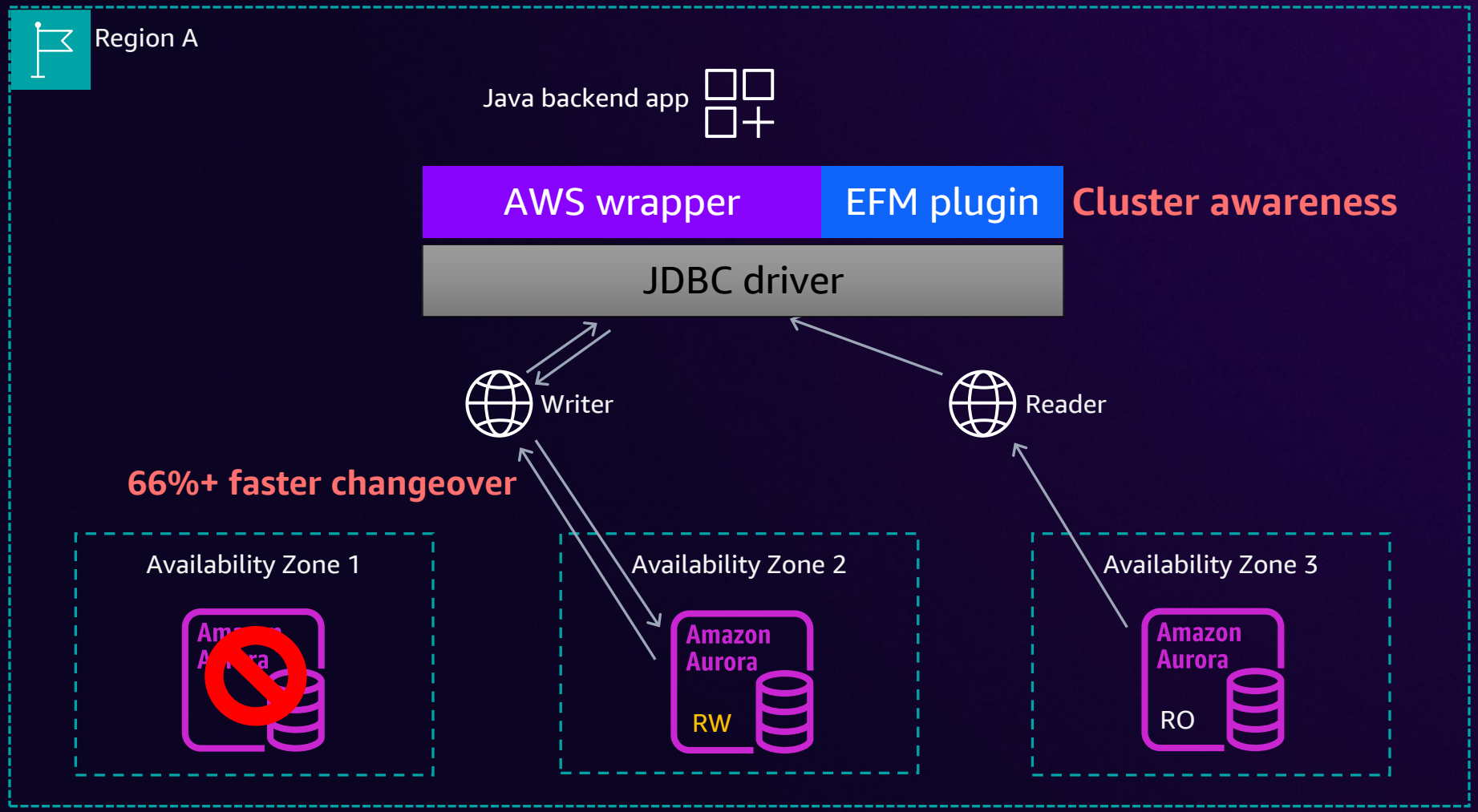

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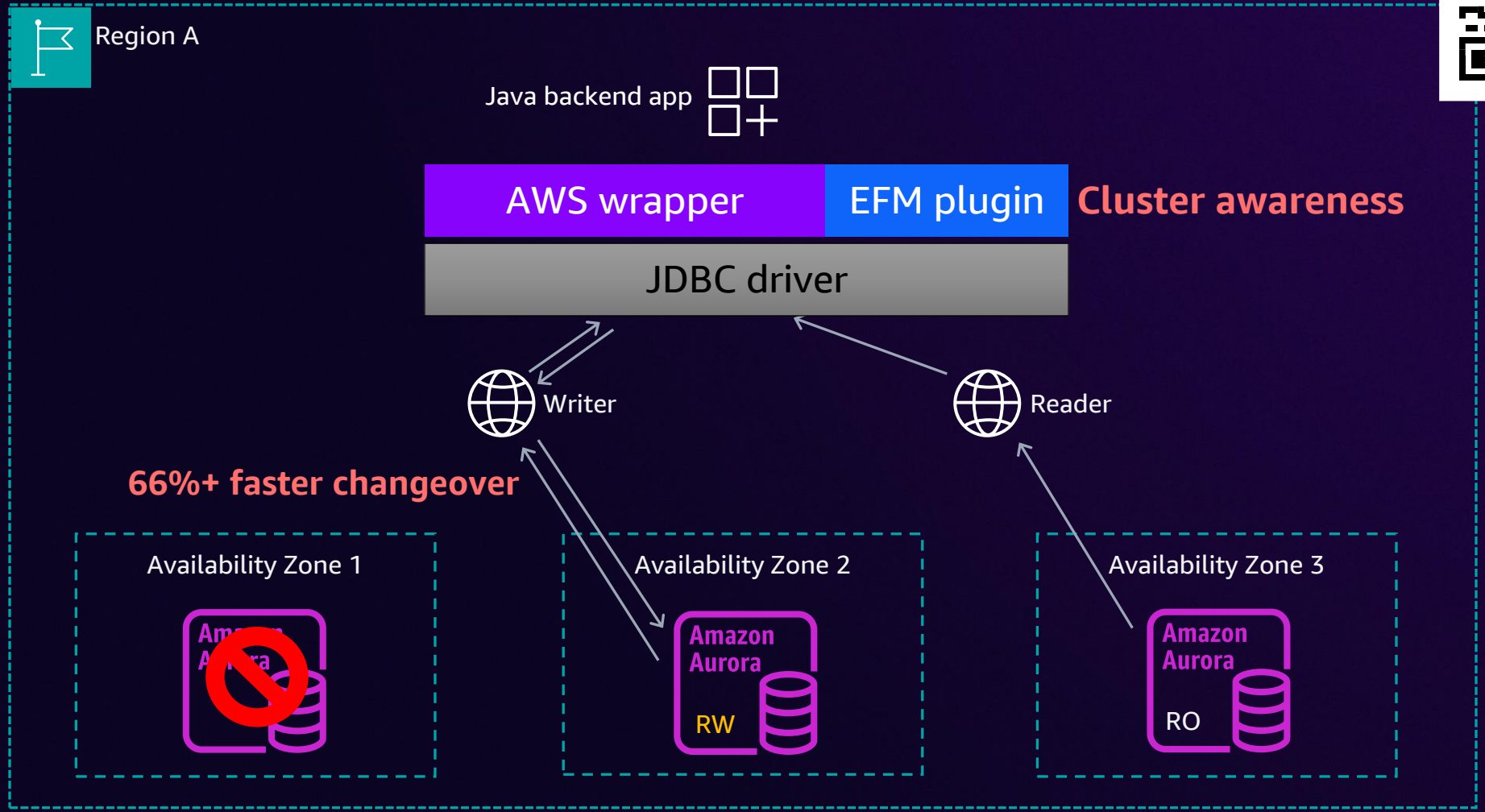

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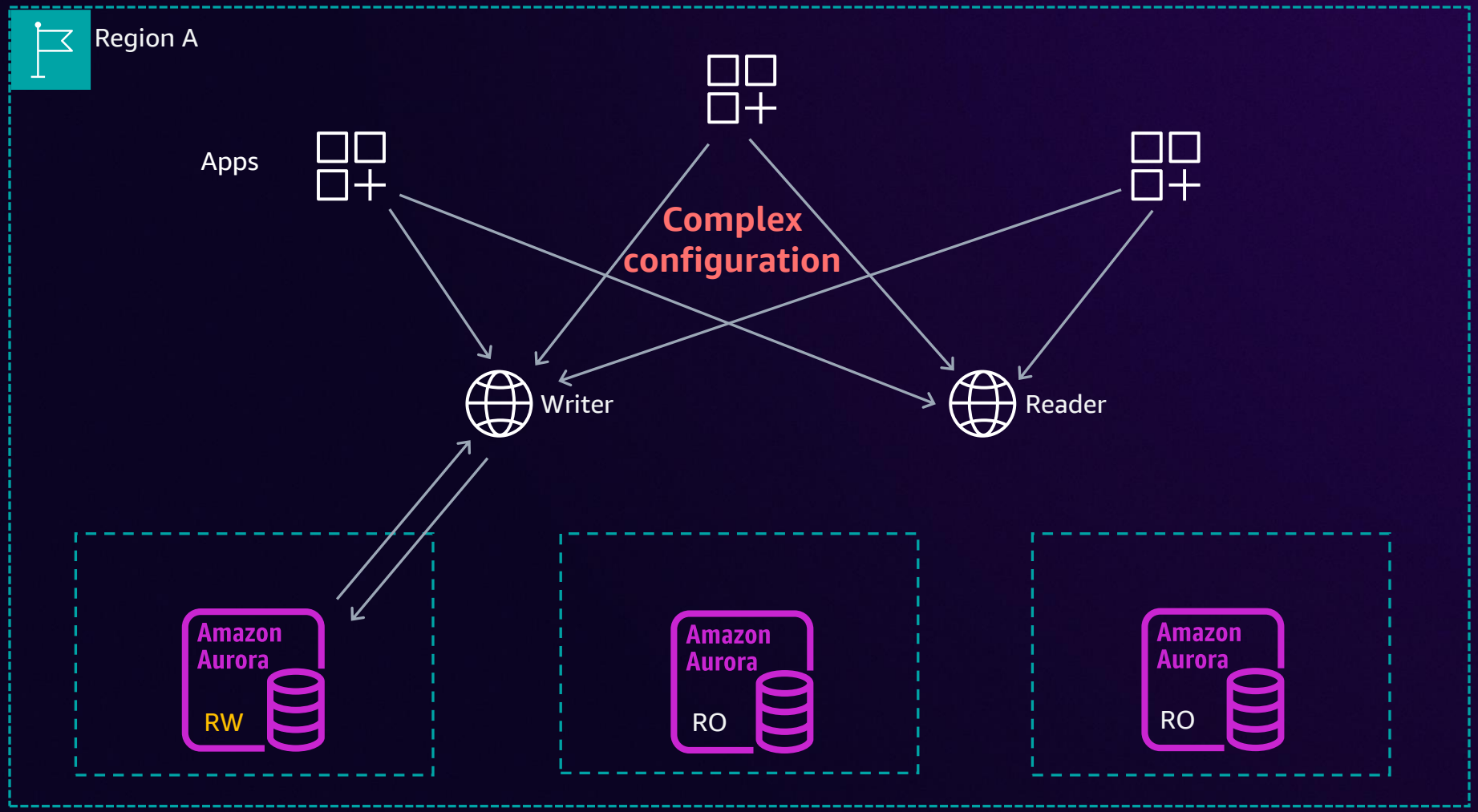
Amazon RDS proxy



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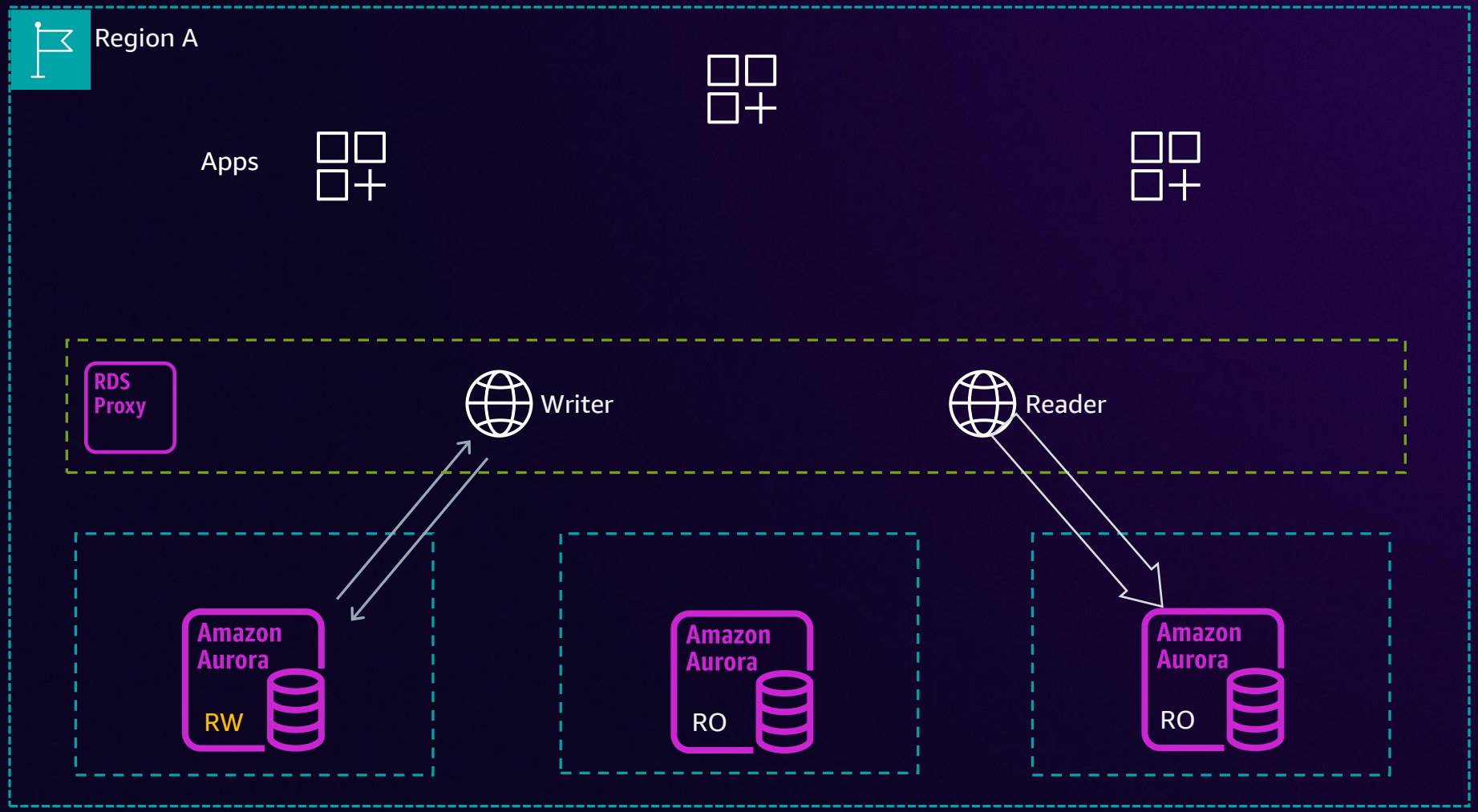

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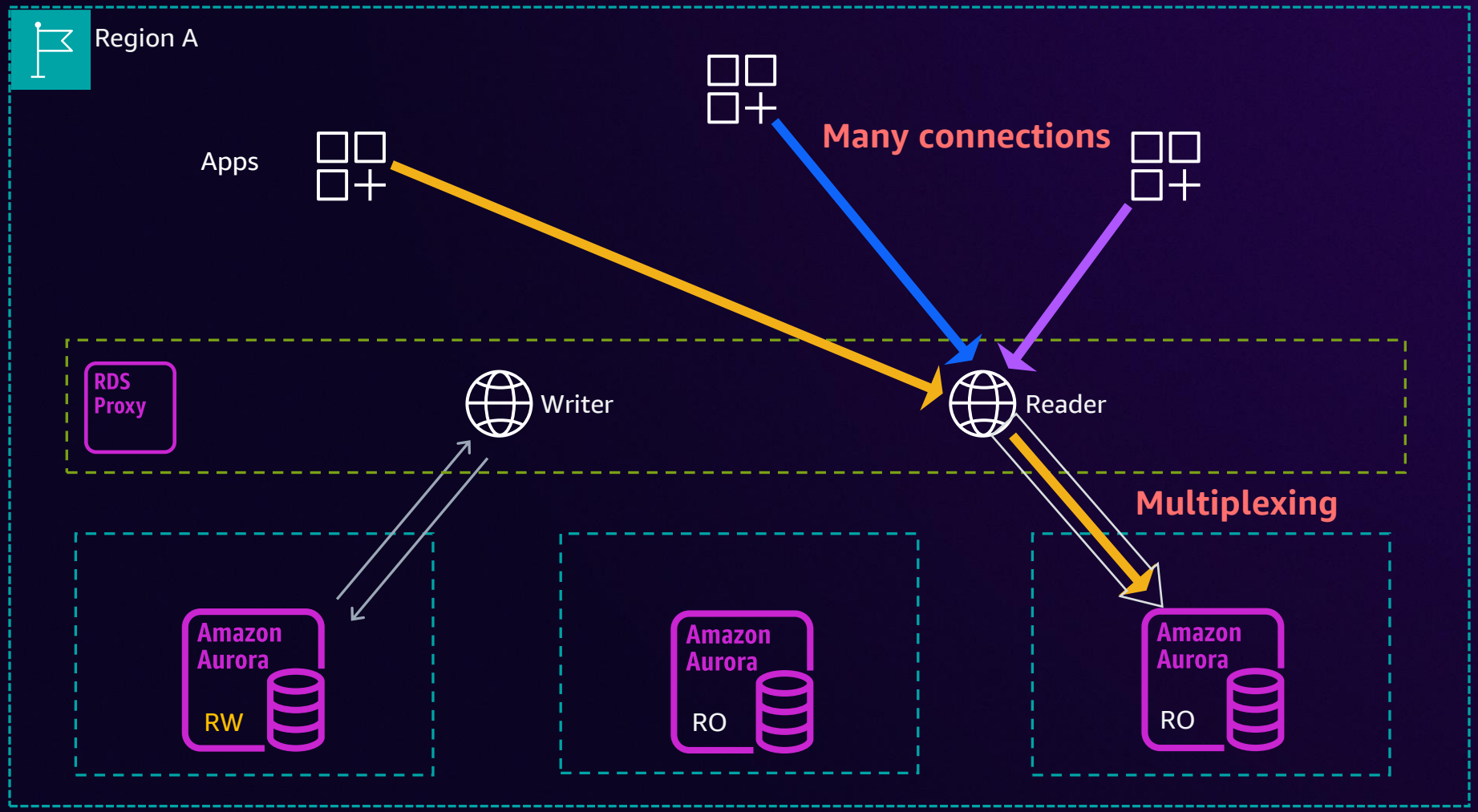

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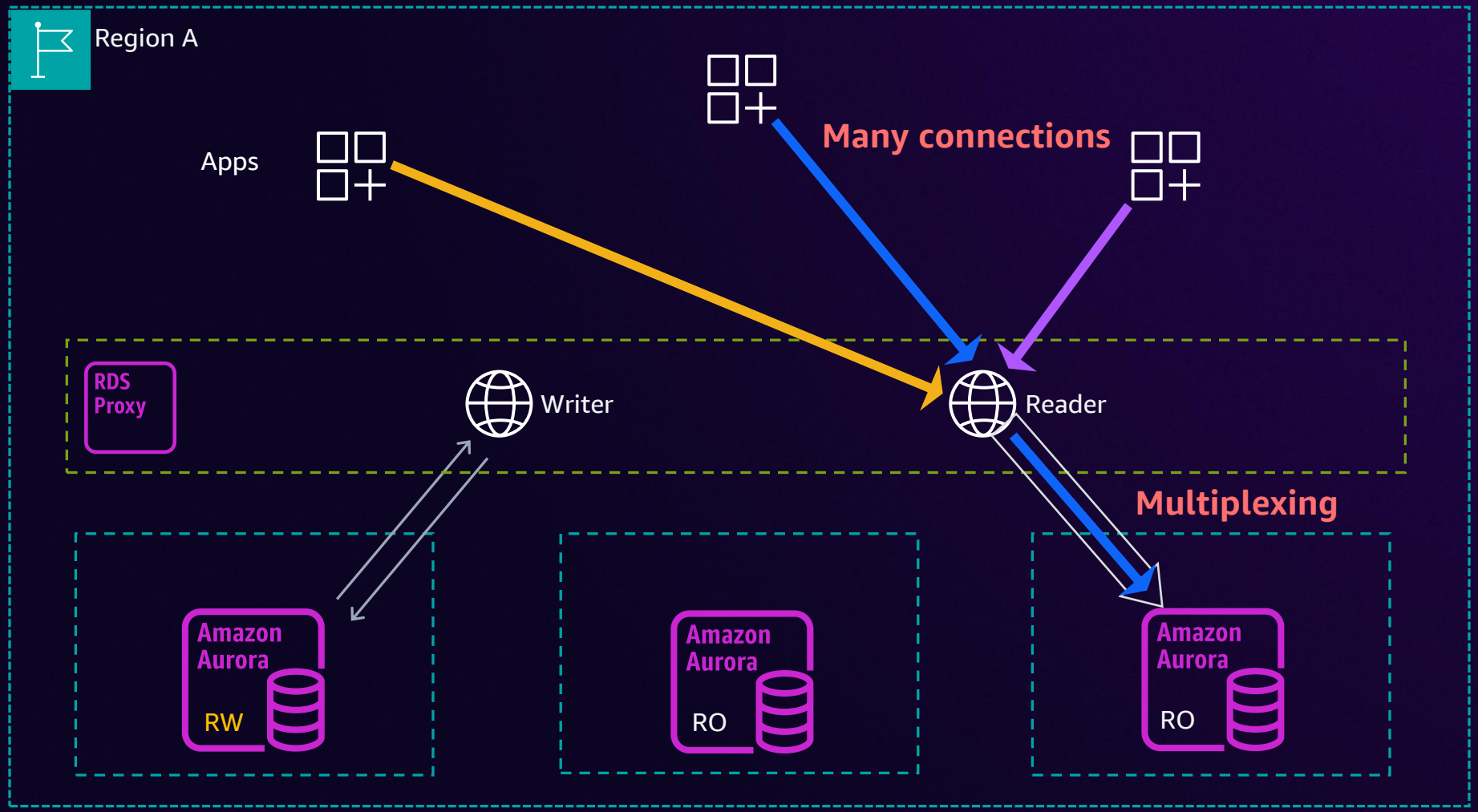

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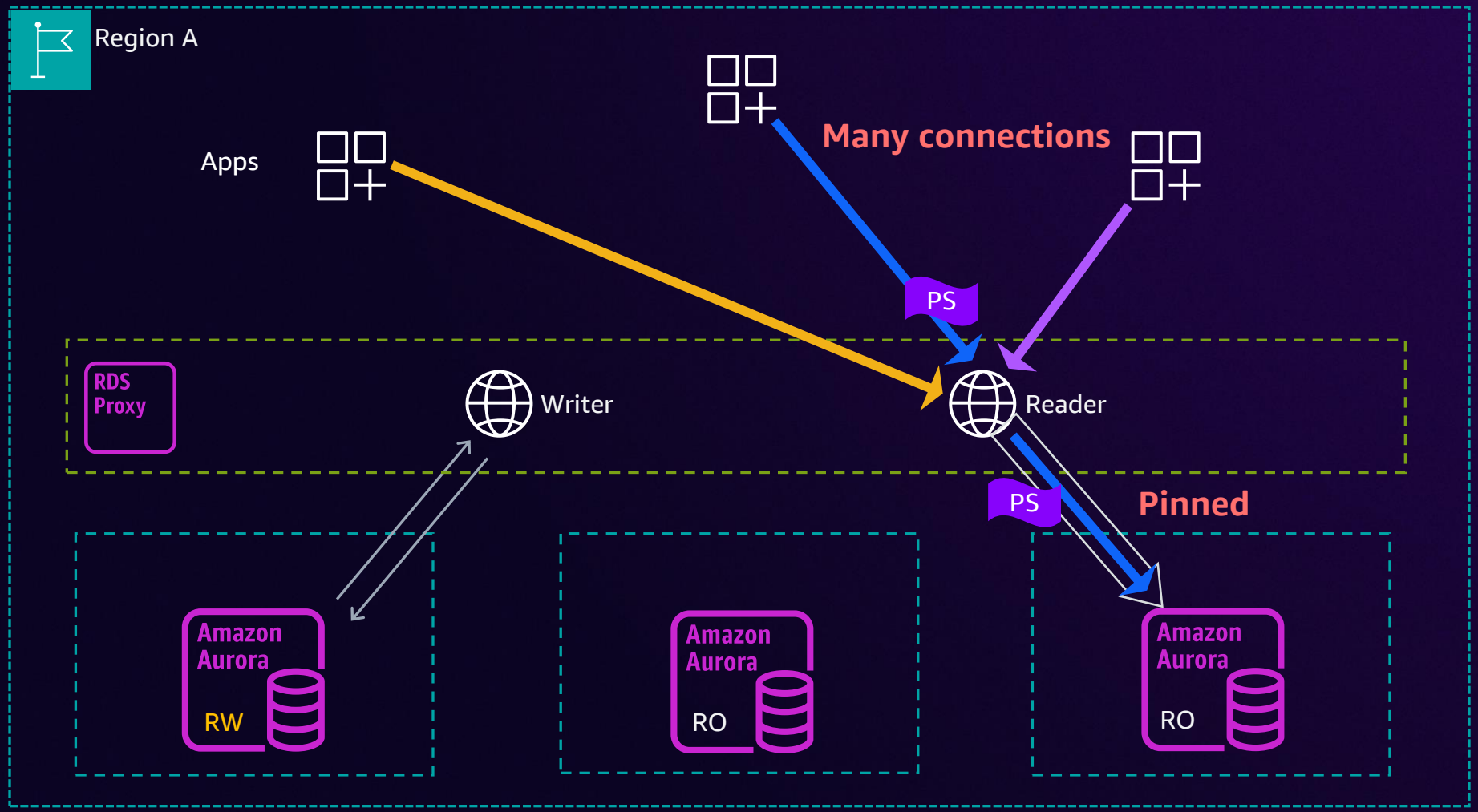
Amazon RDS proxy

AWS CloudWatch: DatabaseConnectionsCurrentlySessionPinned



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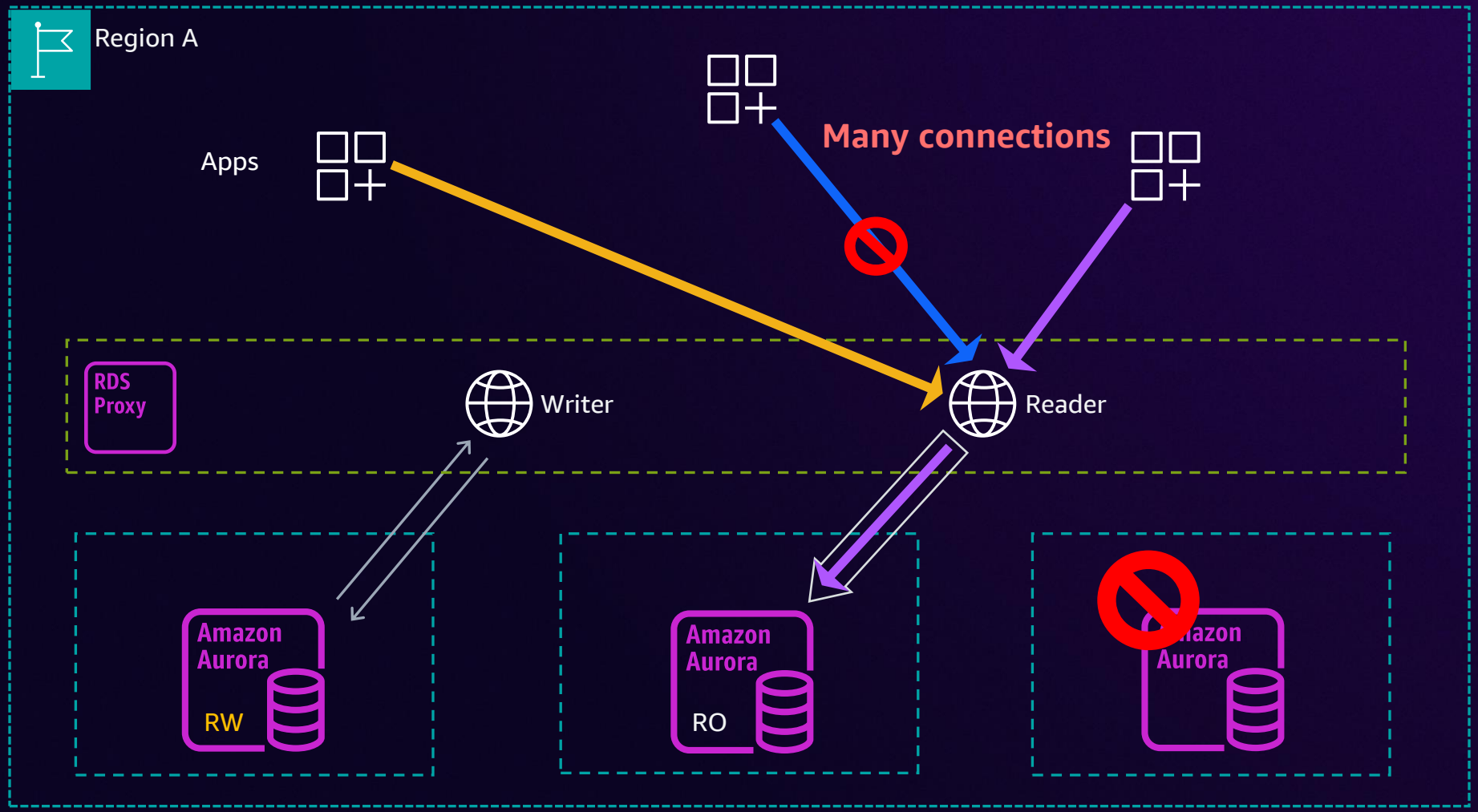
Amazon RDS proxy

AWS CloudWatch: DatabaseConnectionsCurrentlySessionPinned



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Global resilience

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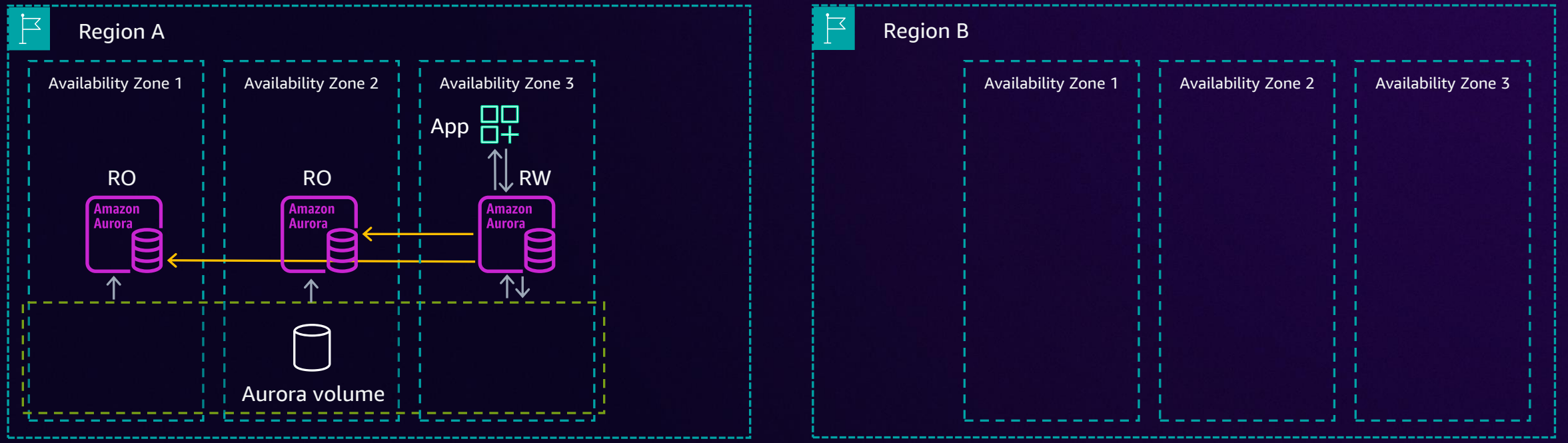
Cross-Region backups



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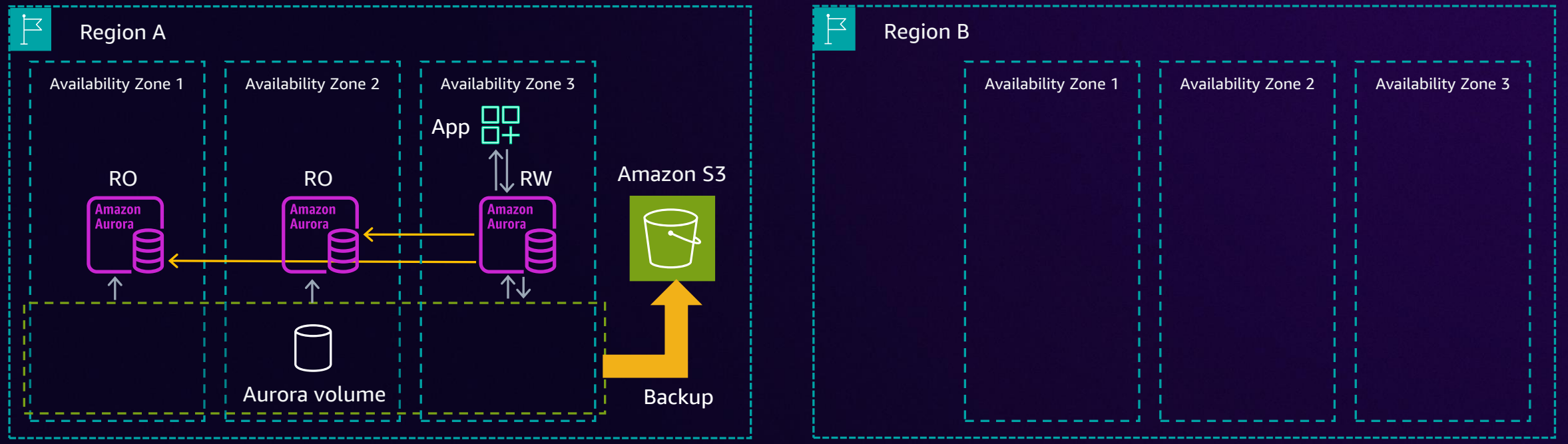
Cross-Region backups



create-db-cluster-snapshot (hourly)

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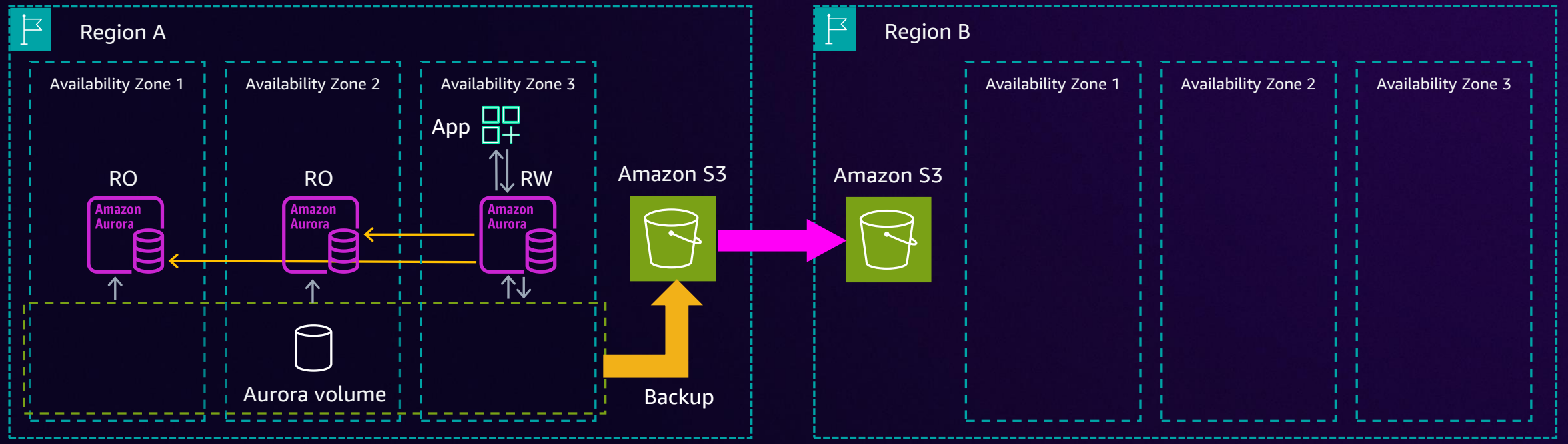
Cross-Region backups



create-db-cluster-snapshot (hourly)

copy-db-cluster-snapshot

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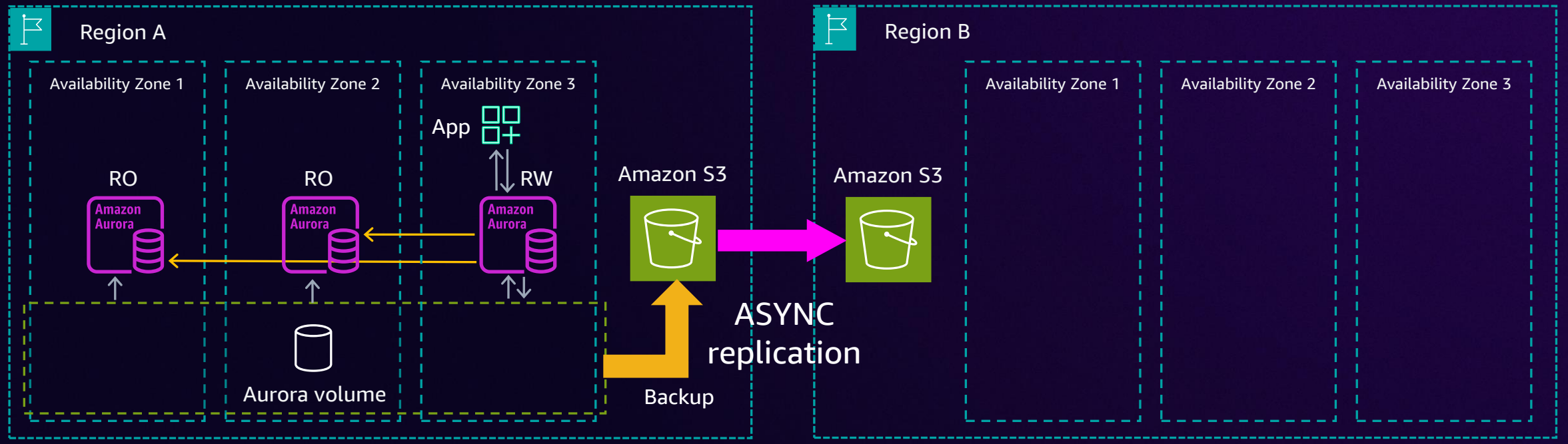
Cross-Region backups



create-db-cluster-snapshot (hourly)

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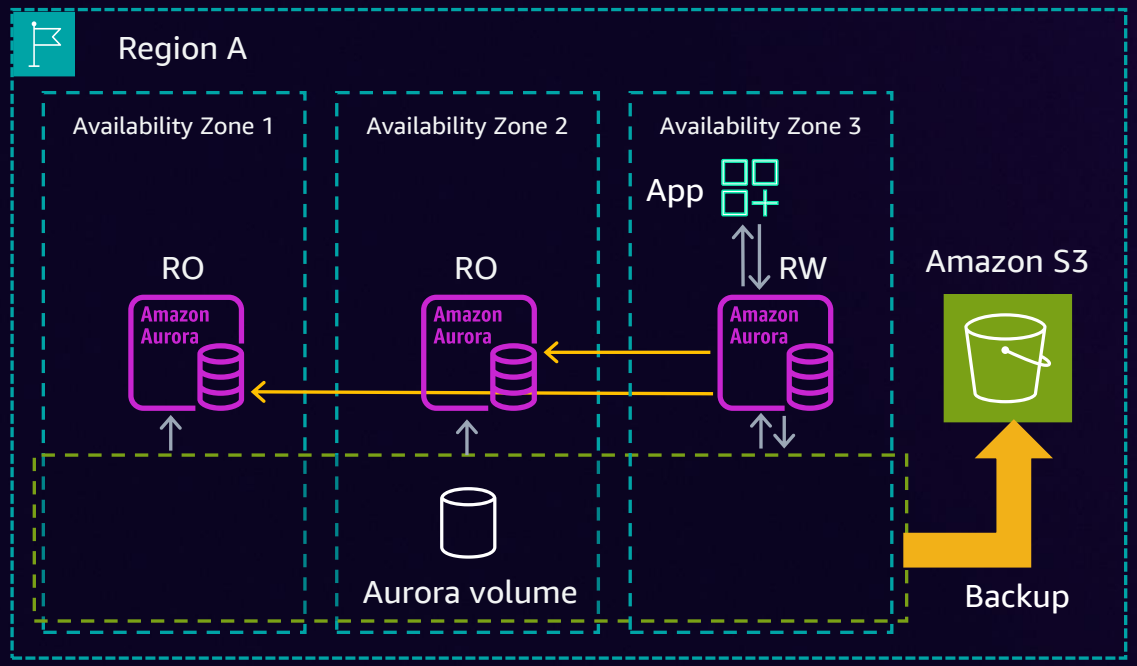
Cross-Region backups



create-db-cluster-snapshot (hourly)

copy-db-cluster-snapshot

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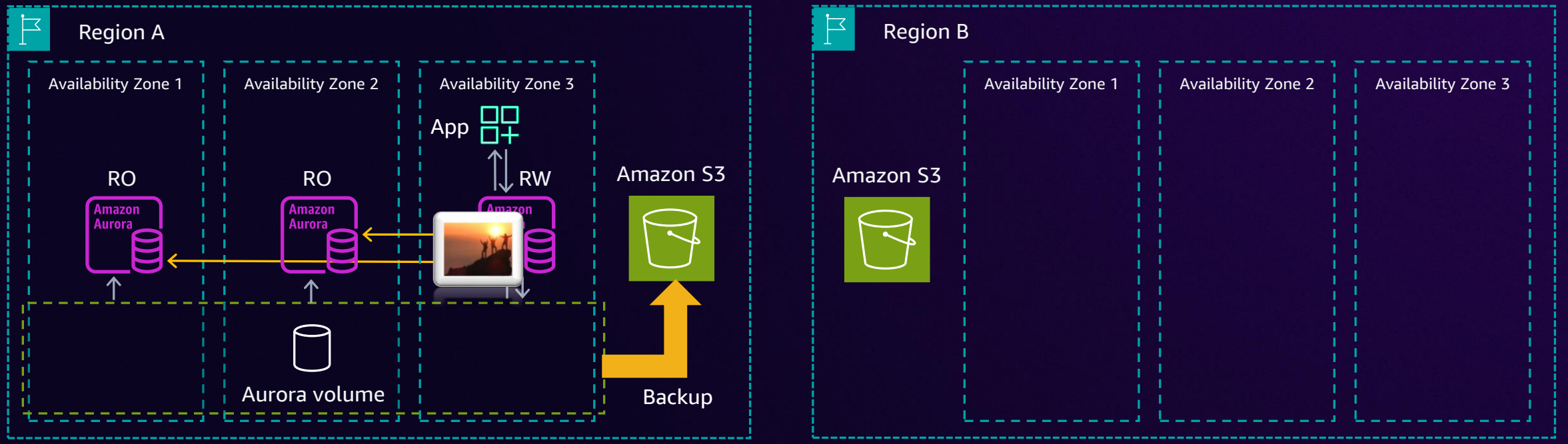
Cross-Region backups



create-db-cluster-snapshot (hourly)

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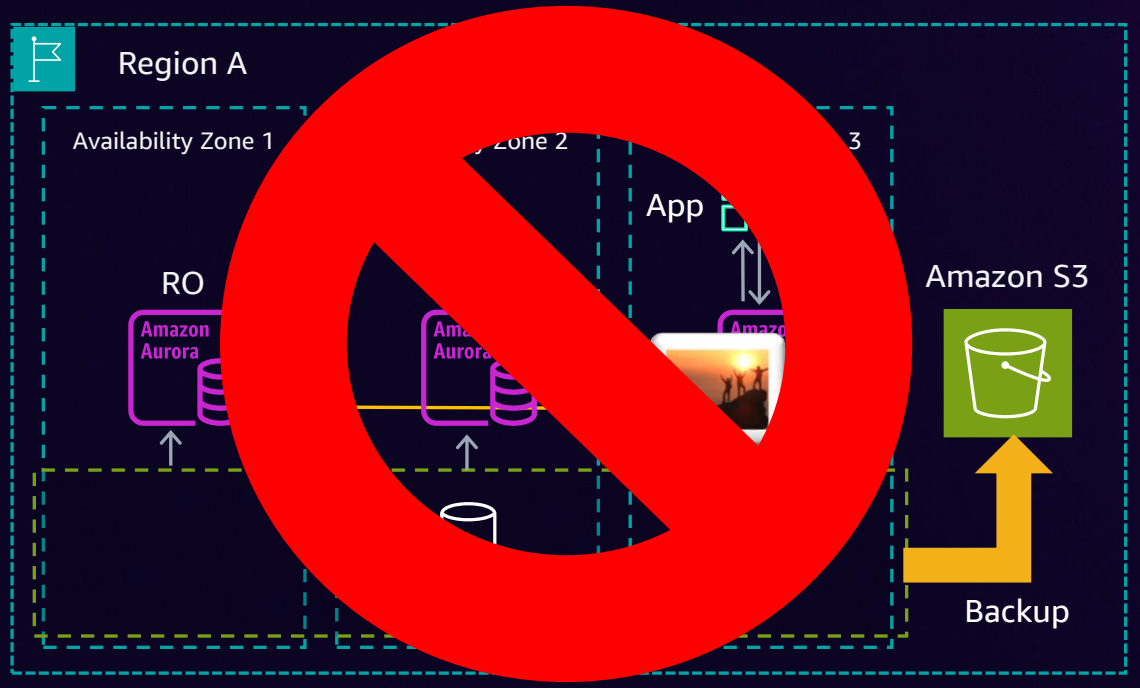
Cross-Region backups



create-db-cluster-snapshot (hourly)

copy-db-cluster-snapshot

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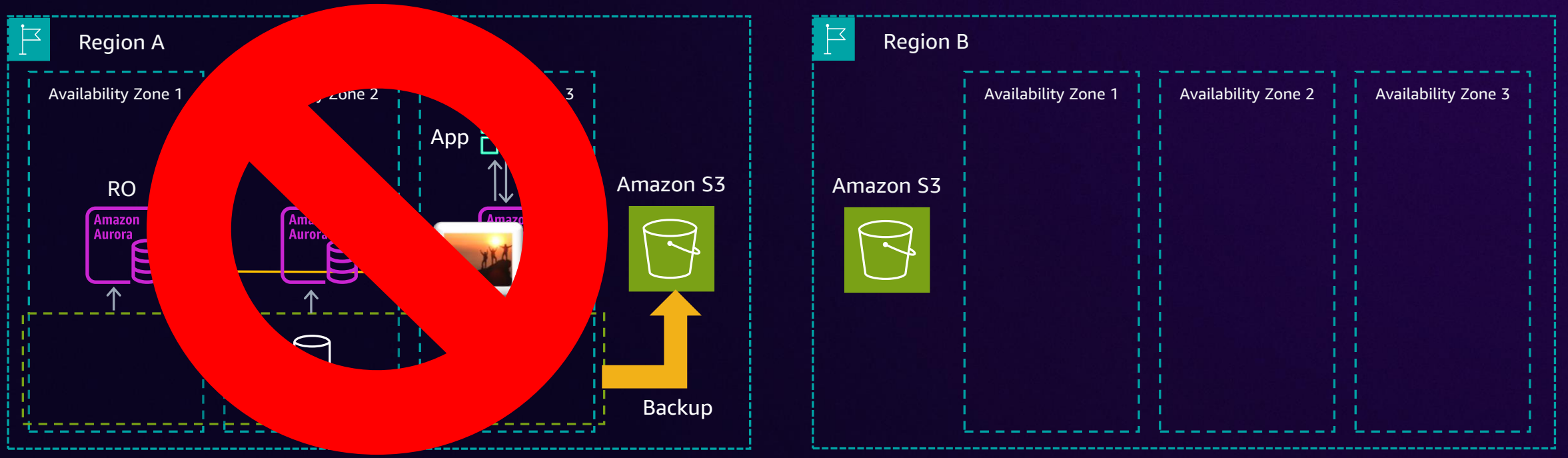
Cross-Region backups



create-db-cluster-snapshot (hourly)

copy-db-cluster-snapshot

RPO ≈ 10–70 minutes for replication lag

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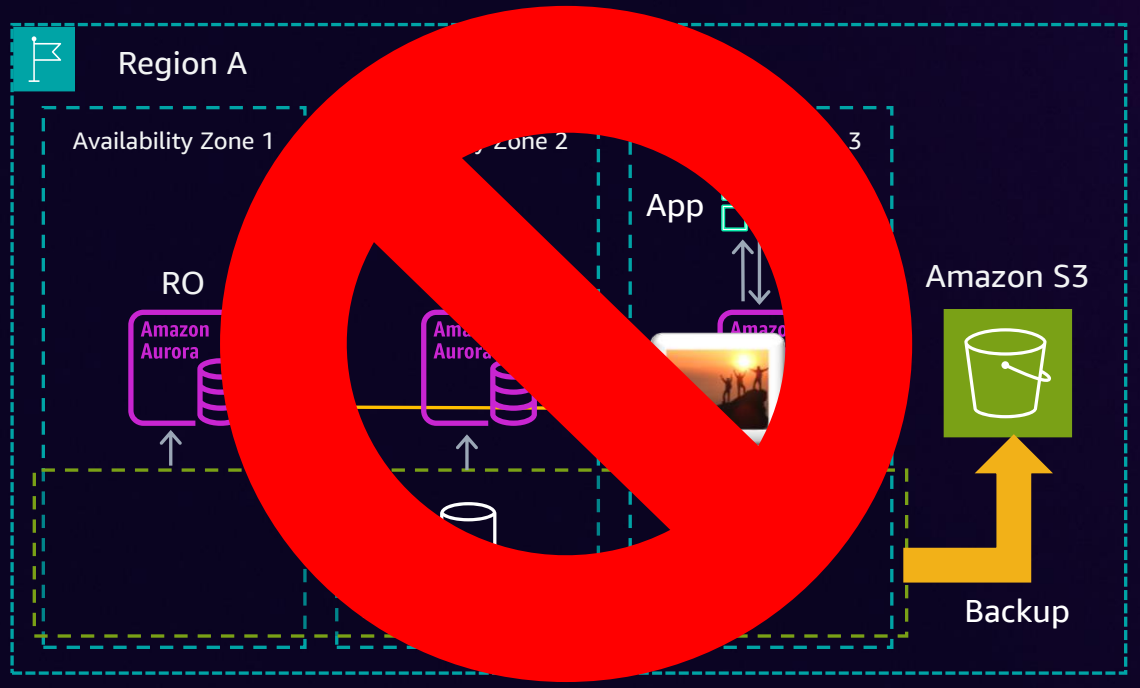
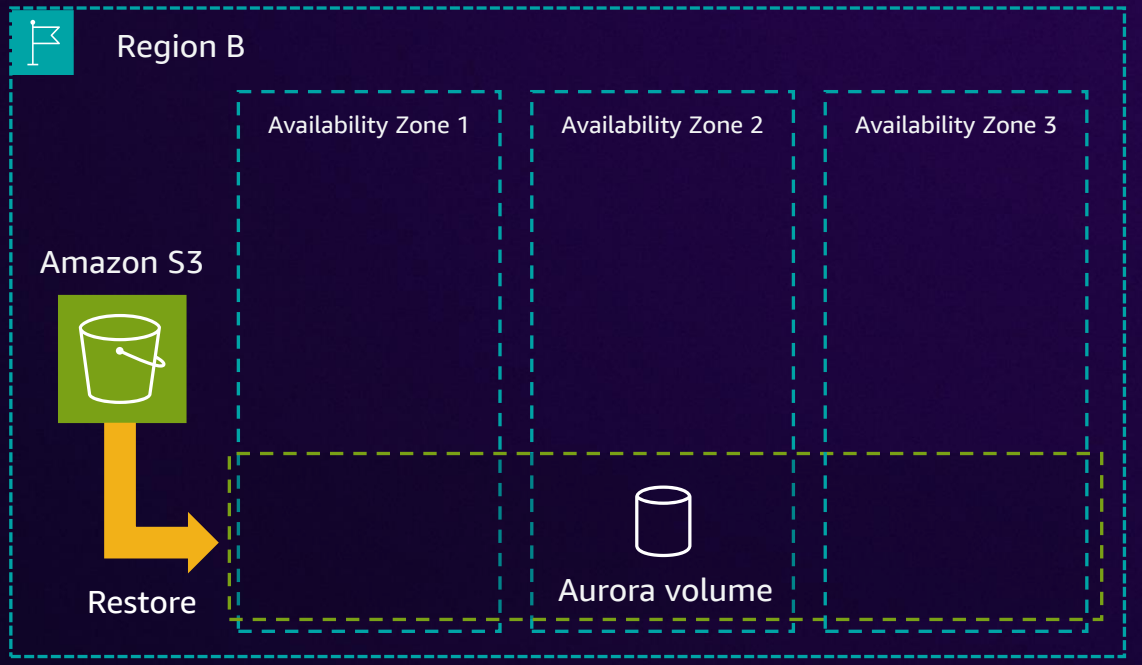
Cross-Region backups



create-db-cluster-snapshot
(hourly)



copy-db-cluster-snapshot
restore-db-cluster-from-snapshot

RPO ≈ 10–70 minutes for replication lag

aws
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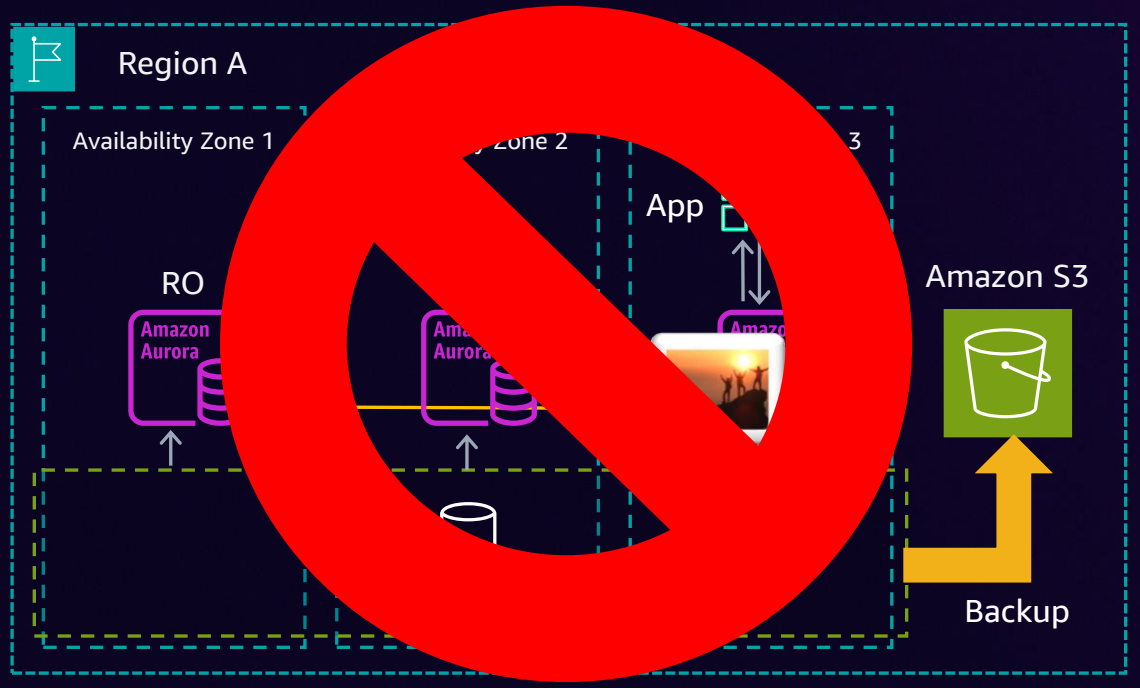
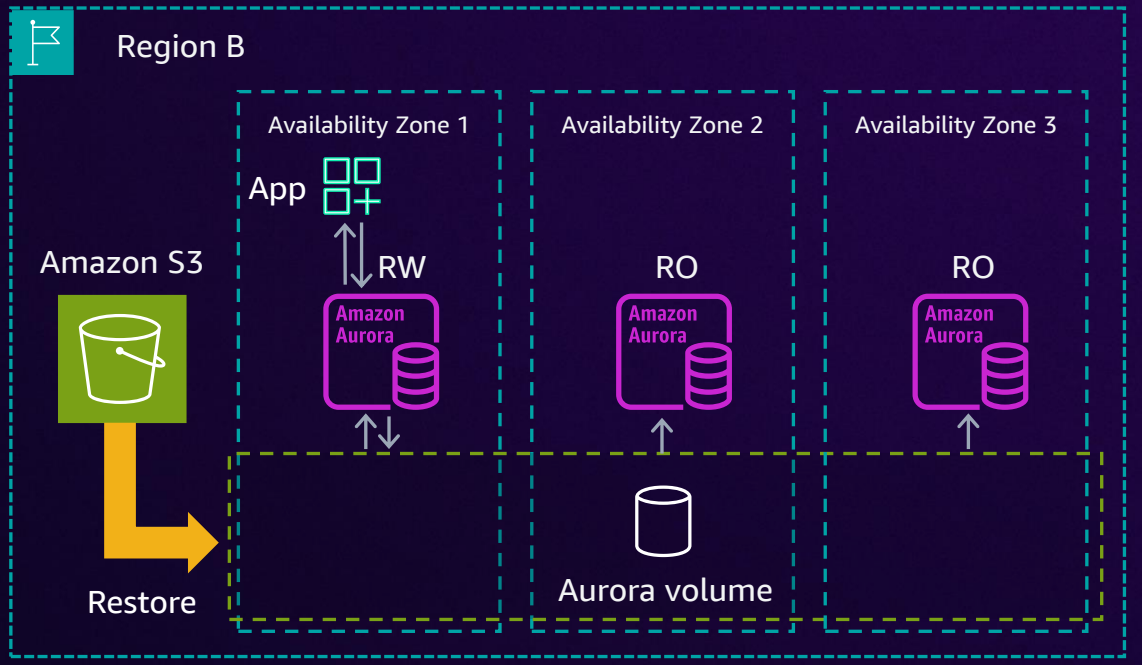
Cross-Region backups



create-db-cluster-snapshot
(hourly)



copy-db-cluster-snapshot
restore-db-cluster-from-snapshot
create-db-instance

RPO ≈ 10–70 minutes for replication lag

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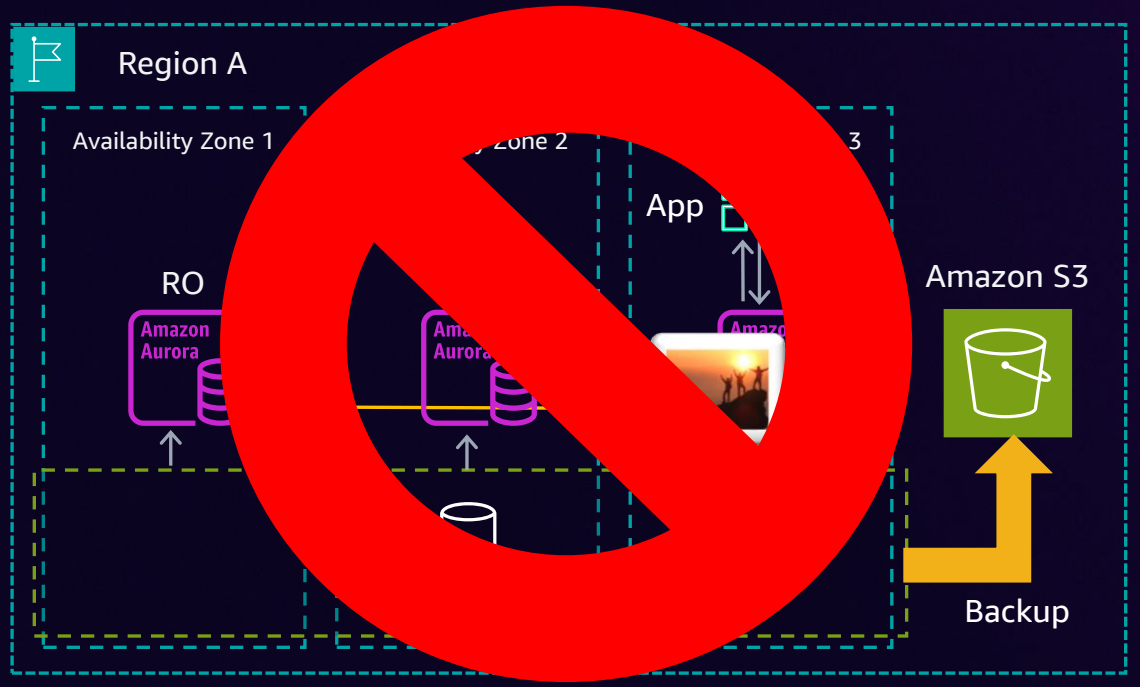
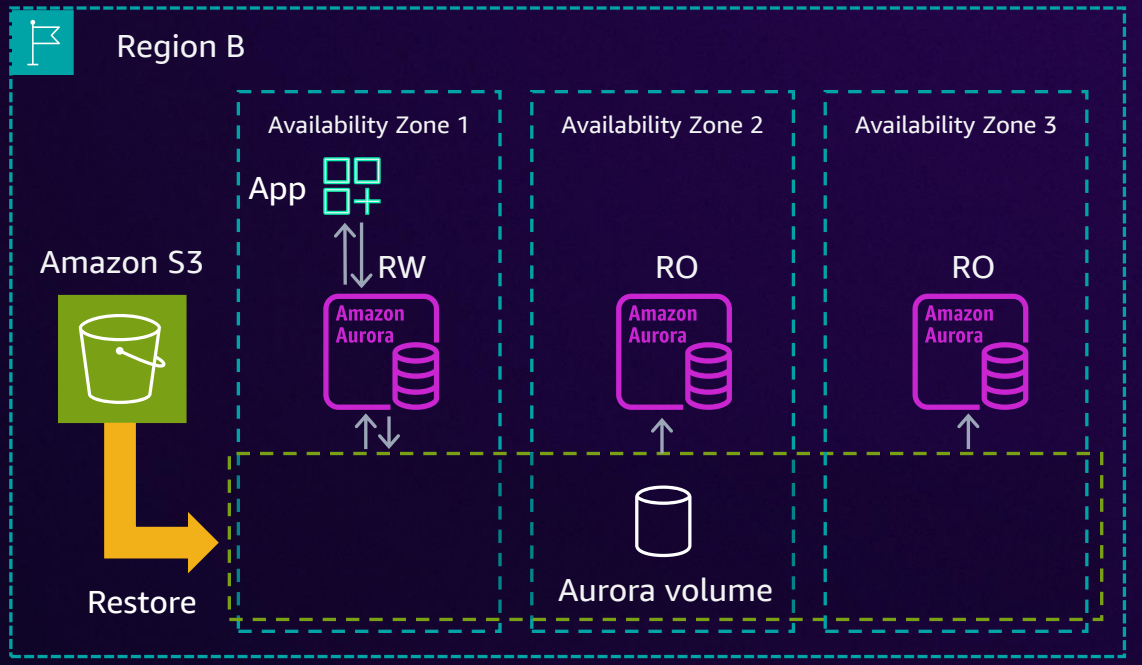
Cross-Region backups



create-db-cluster-snapshot
(hourly)

RTO ≈ 60+ minutes
RPO ≈ 10–70 minutes for replication lag



copy-db-cluster-snapshot
restore-db-cluster-from-snapshot
create-db-instance

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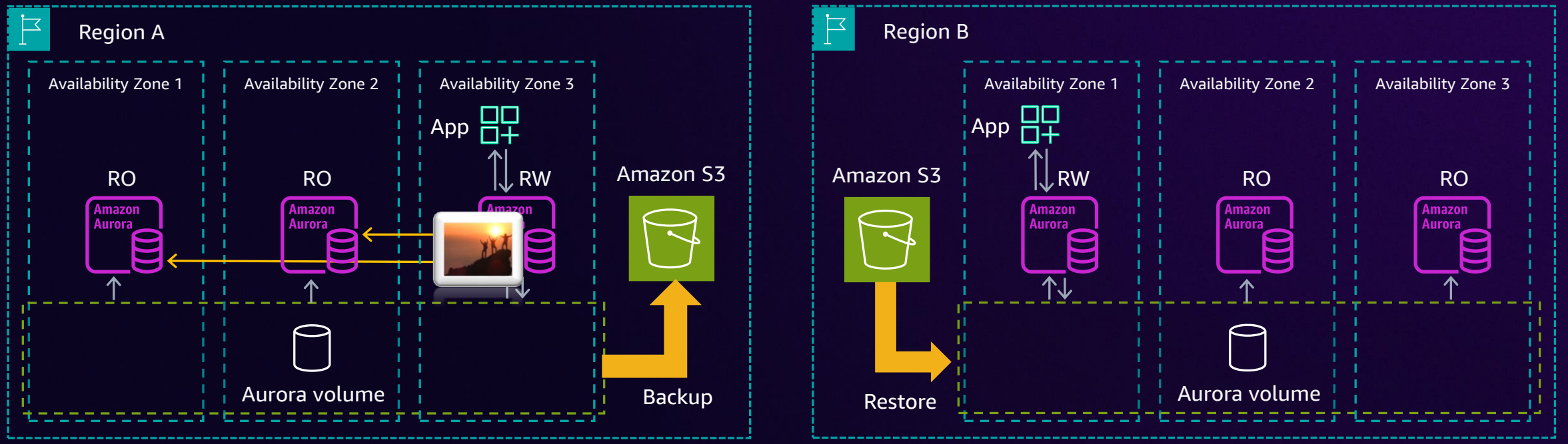
Cross-Region backups



create-db-cluster-snapshot
(hourly)

RTO ≈ 60+ minutes
RPO ≈ 10–70 minutes for replication lag

copy-db-cluster-snapshot
restore-db-cluster-from-snapshot
create-db-instance

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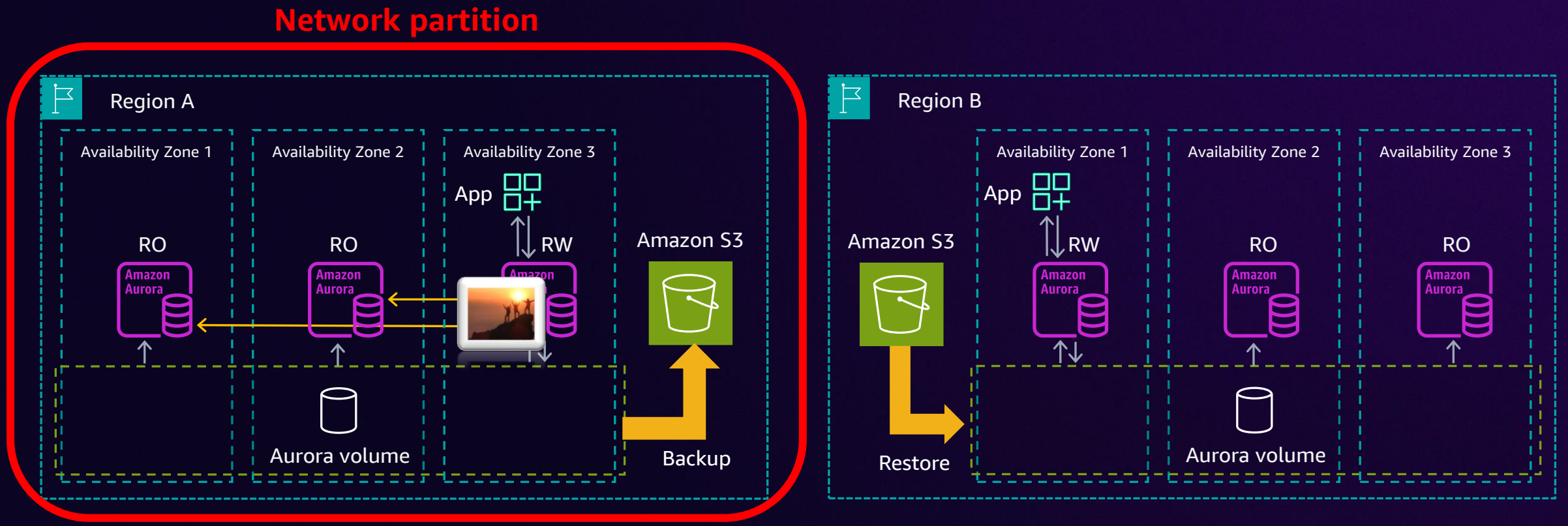
Cross-Region backups



create-db-cluster-snapshot
(hourly)

RTO ≈ 60+ minutes
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copy-db-cluster-snapshot
restore-db-cluster-from-snapshot
create-db-instance

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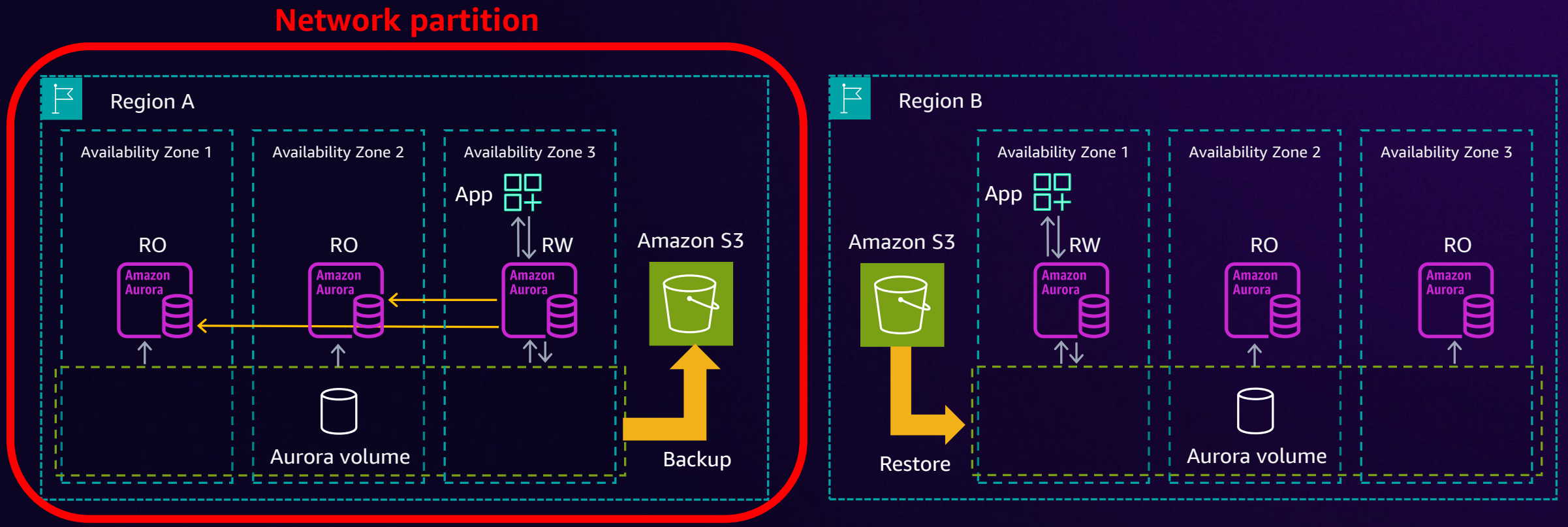
Cross-Region backups



create-db-cluster-snapshot
(hourly)

RTO ≈ 60+ minutes

copy-db-cluster-snapshot
restore-db-cluster-from-snapshot
create-db-instance

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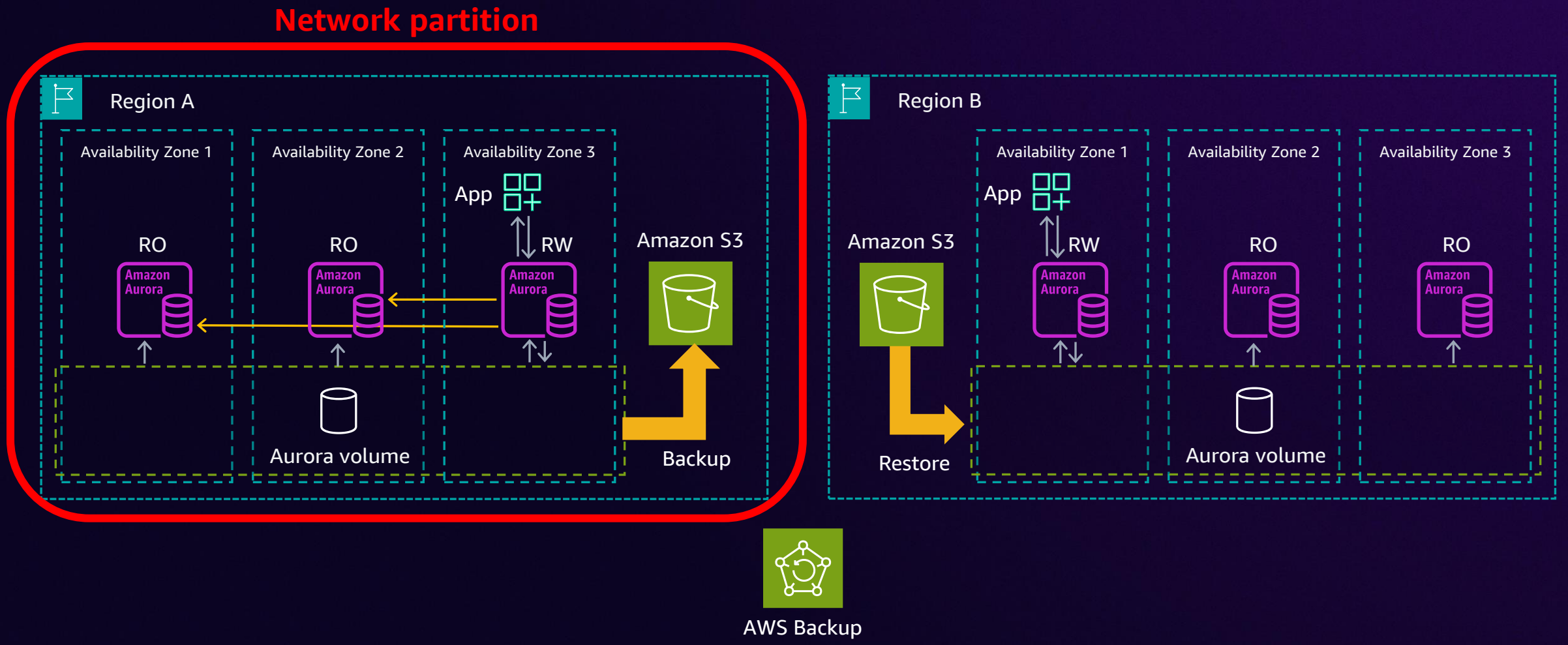
Cross-Region backups



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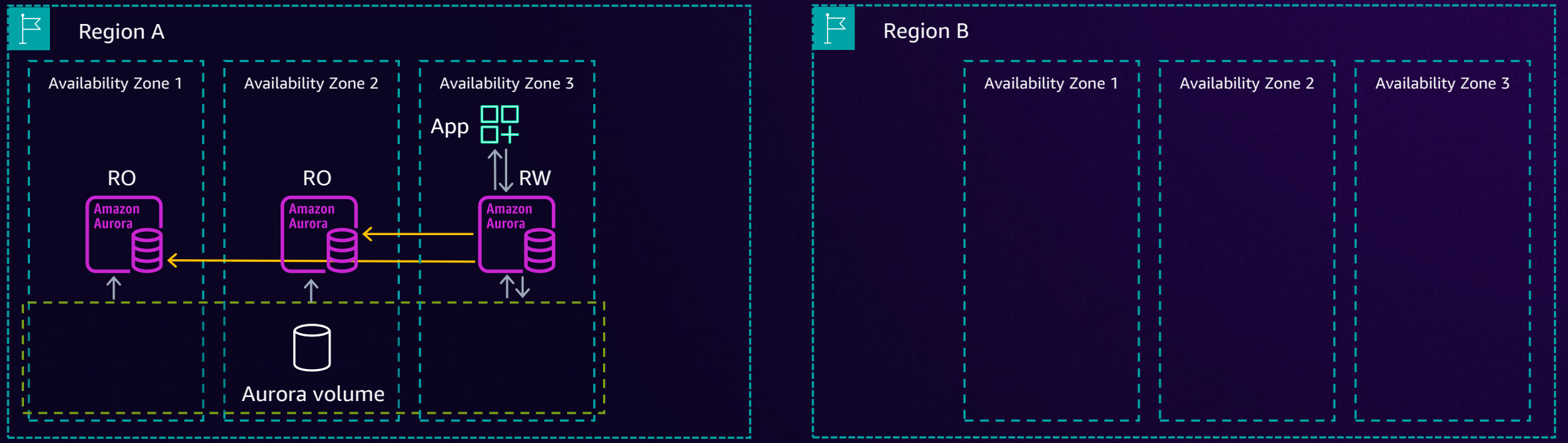
Aurora global database – Storage only



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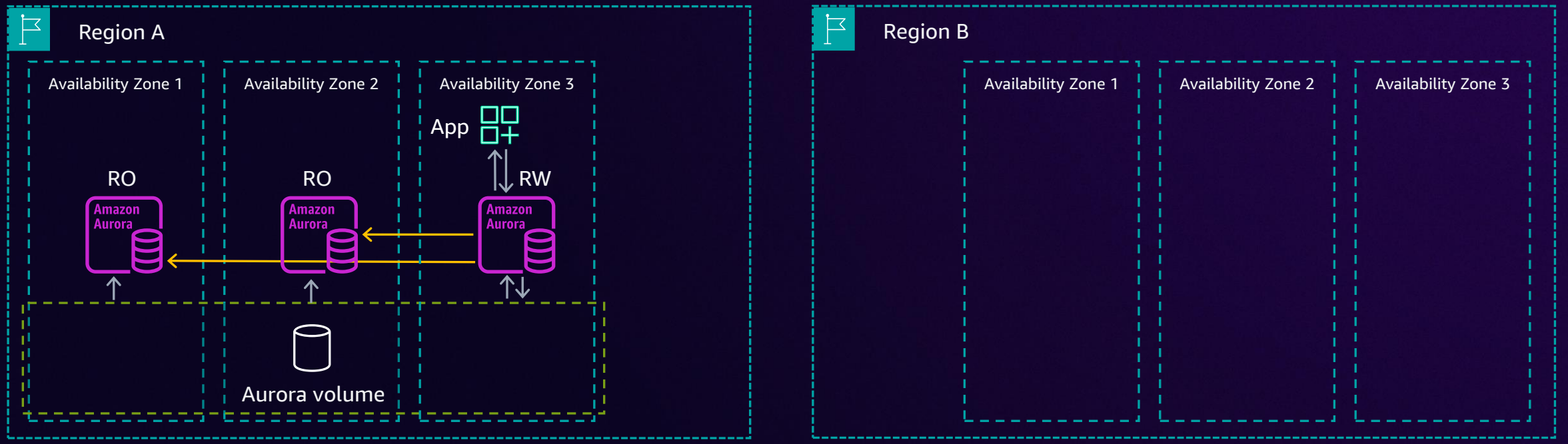
Aurora global database – Storage only



create-global-cluster

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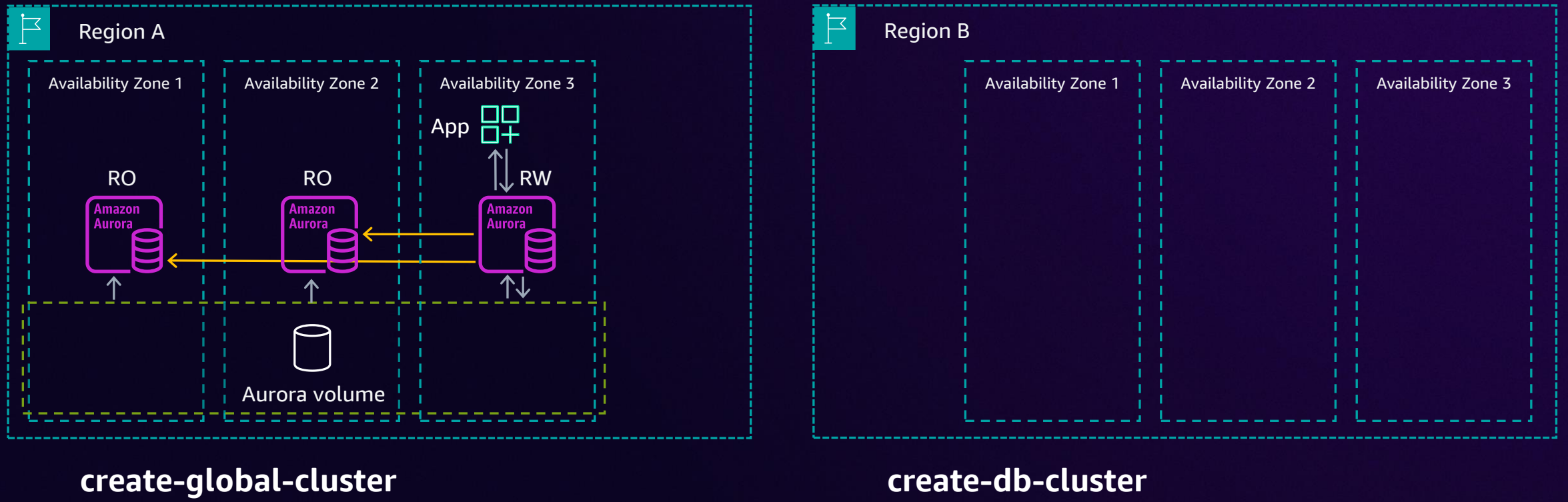
Aurora global database – Storage only



create-global-cluster

create-db-cluster

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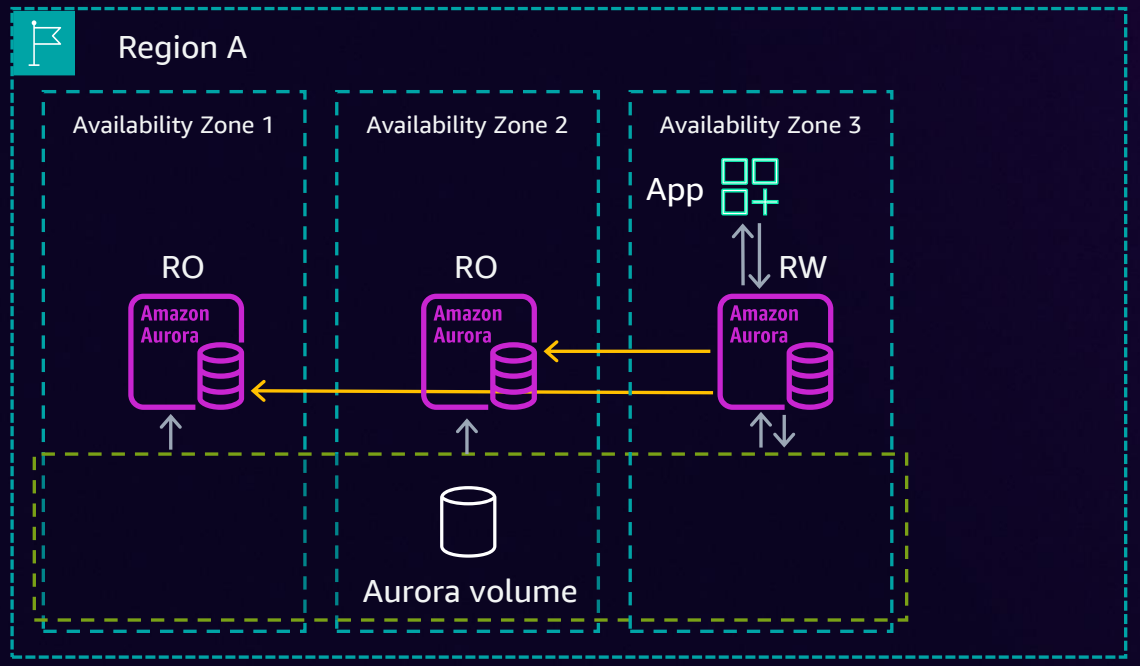
Aurora global database – Storage only



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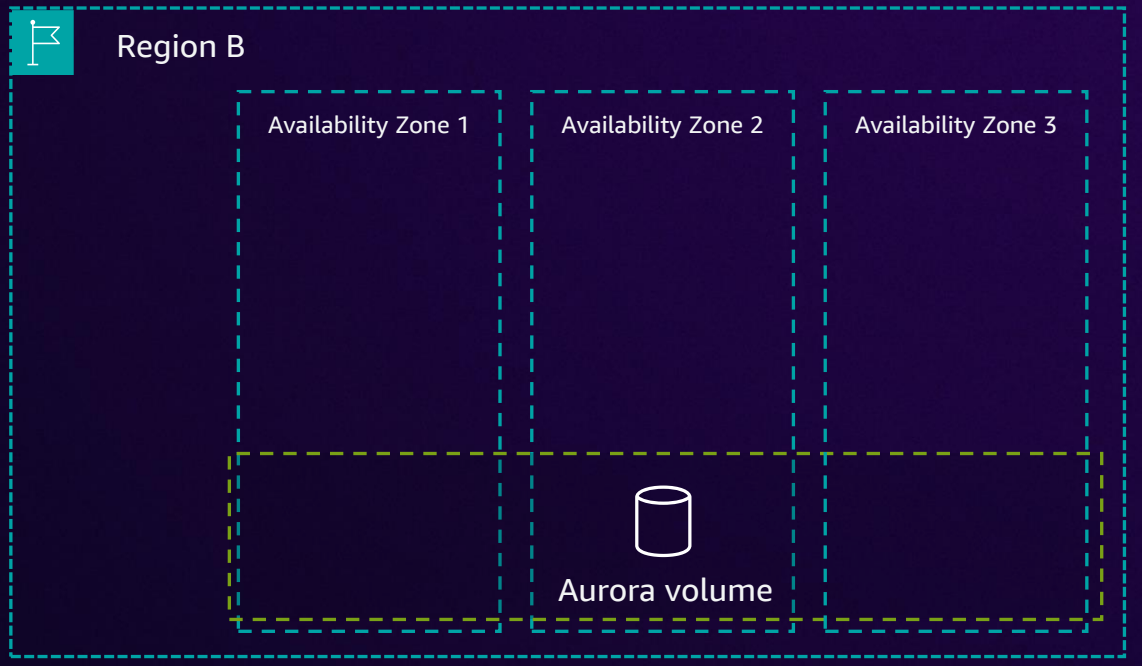

create-db-cluster

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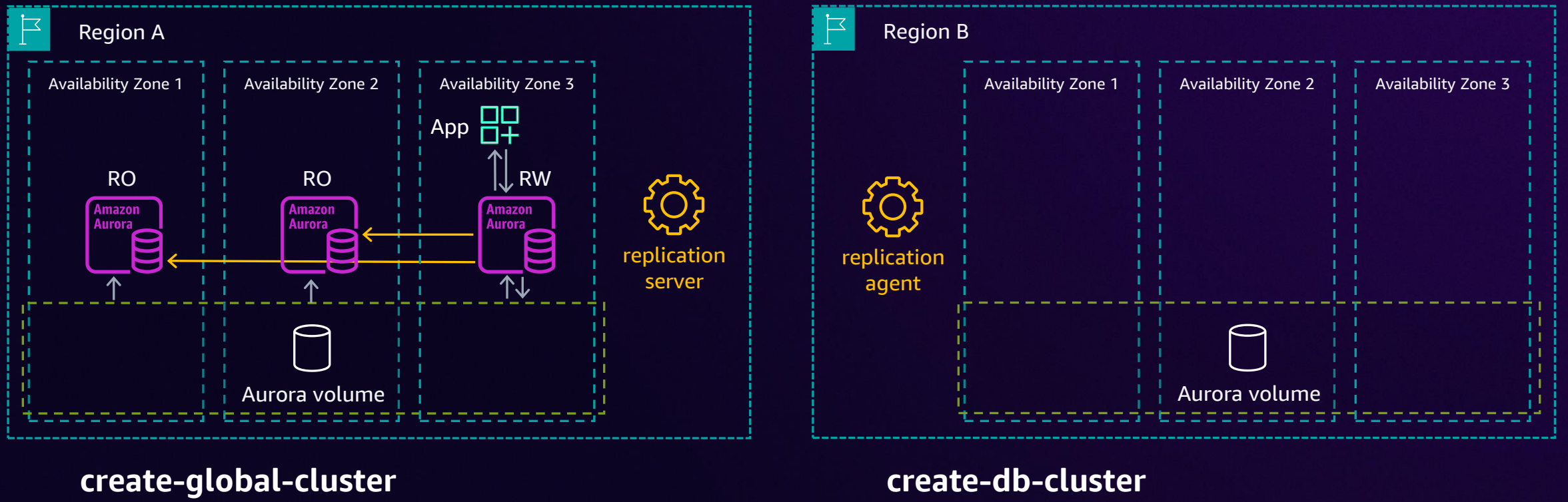
Aurora global database – Storage only



create-global-cluster

create-db-cluster

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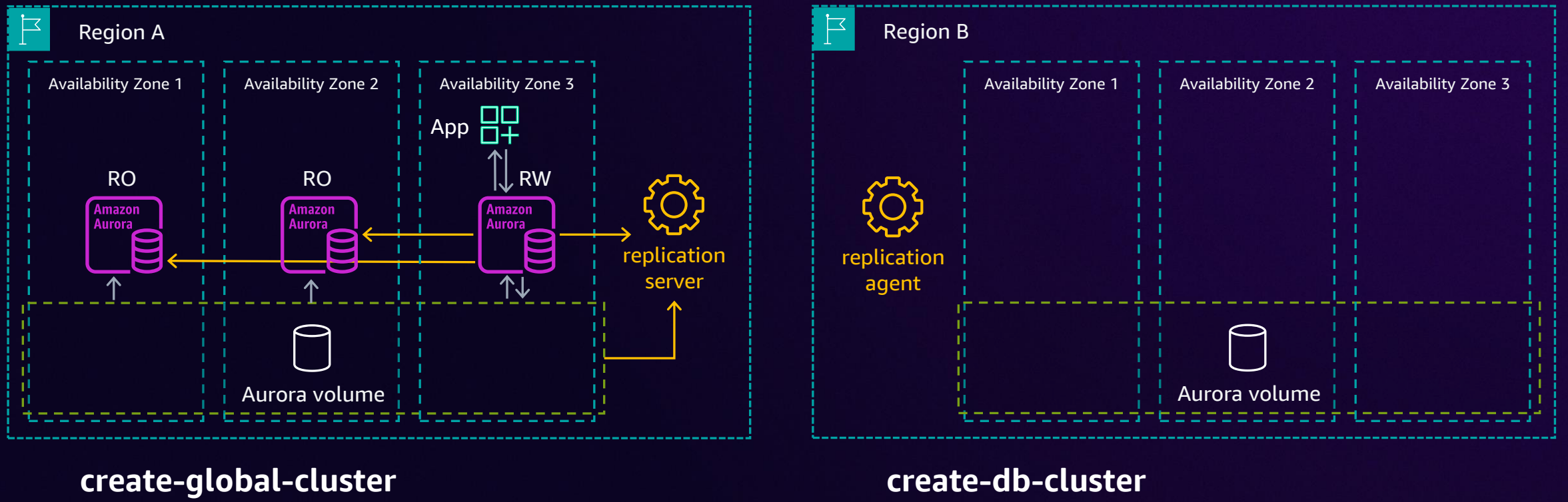

create-global-cluster

create-db-cluster

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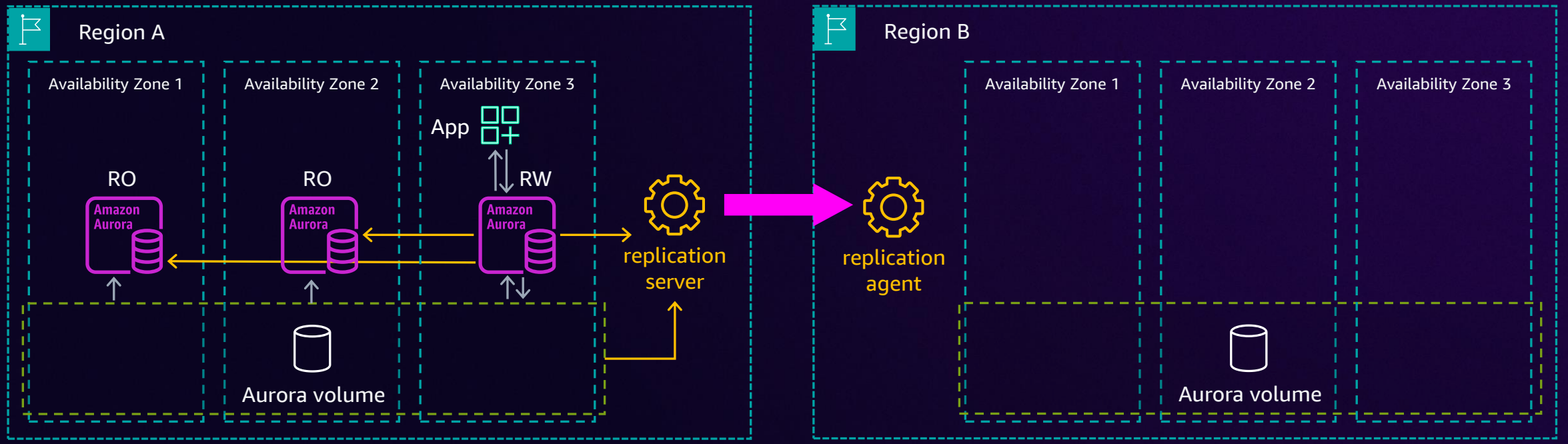
Aurora global database – Storage only



create-global-cluster

create-db-cluster

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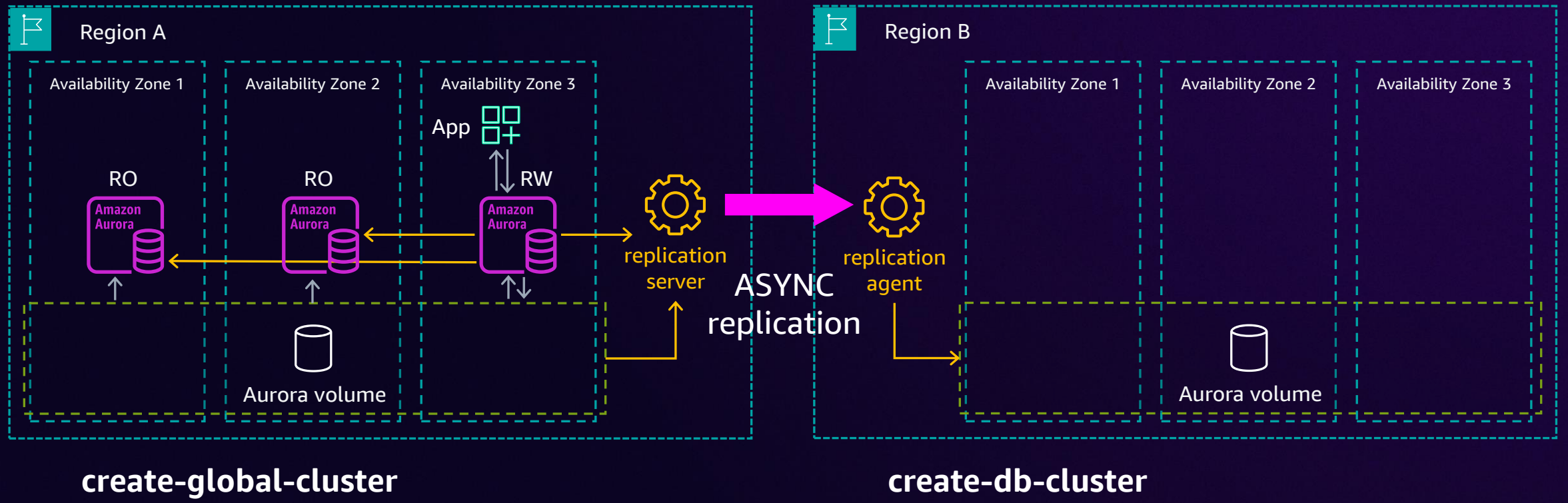
Aurora global database – Storage only



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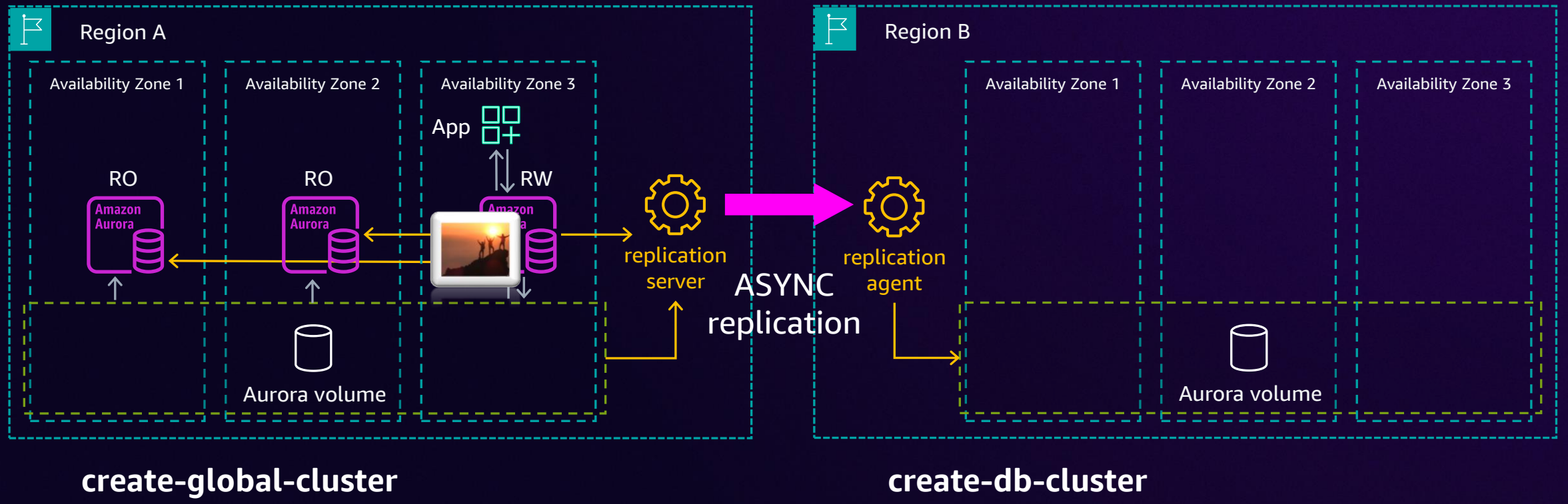
Aurora global database – Storage only



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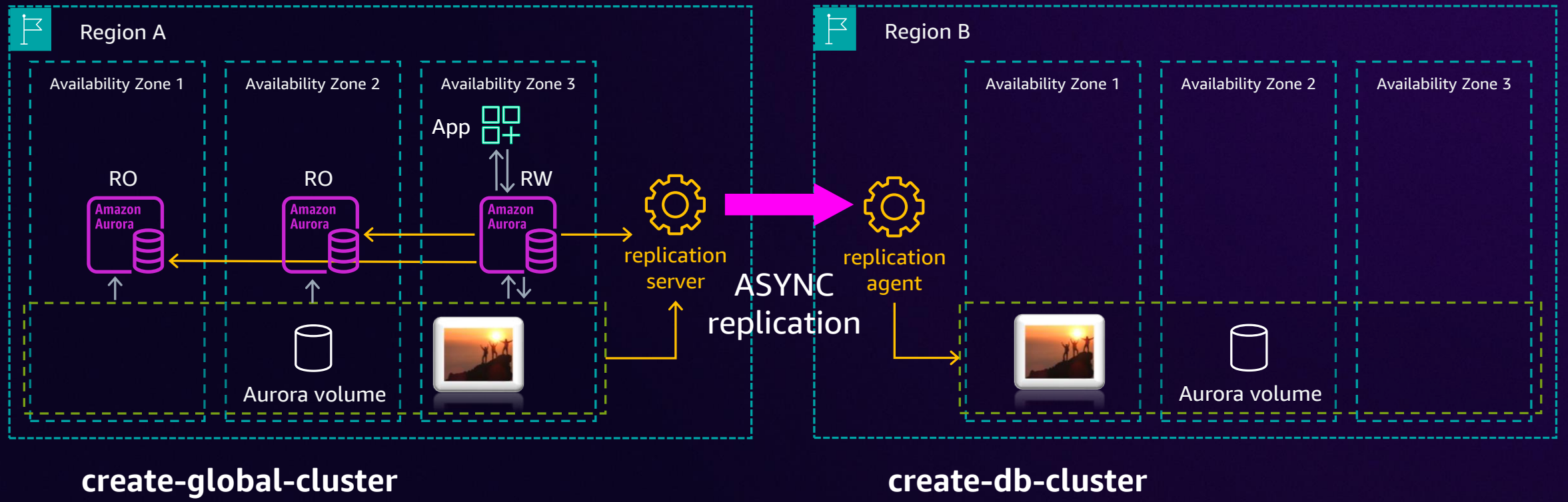
Aurora global database – Storage only



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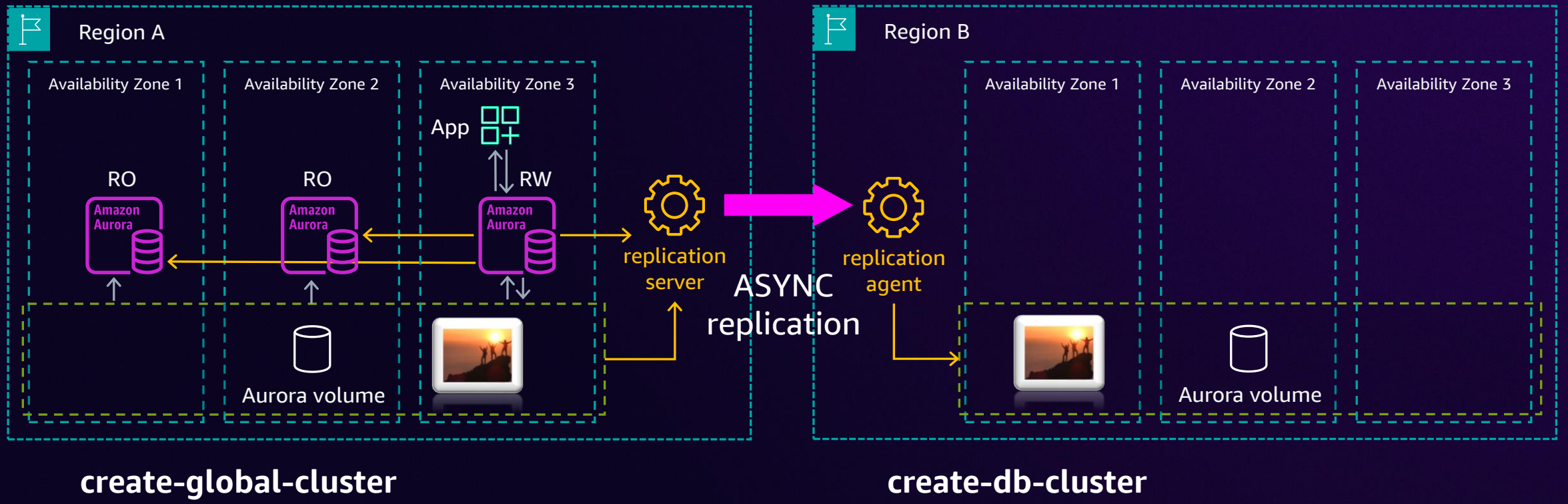
Aurora global database – Storage only



RPO ≈ sub 1 second for replication lag + network partition time

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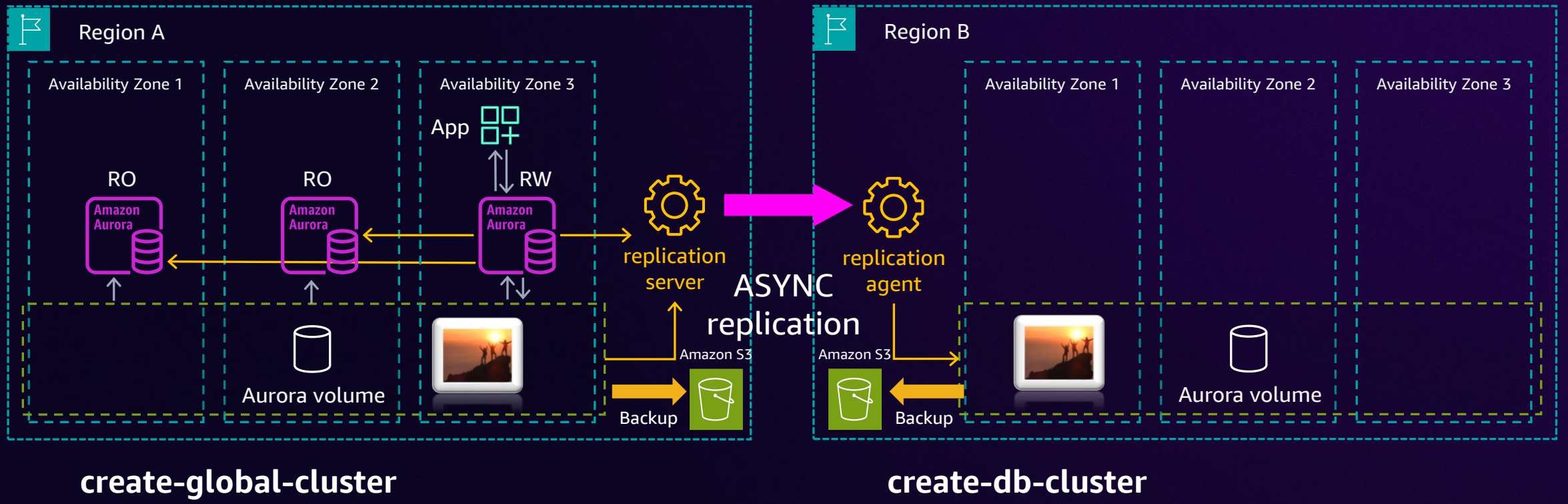
Aurora global database – Storage only



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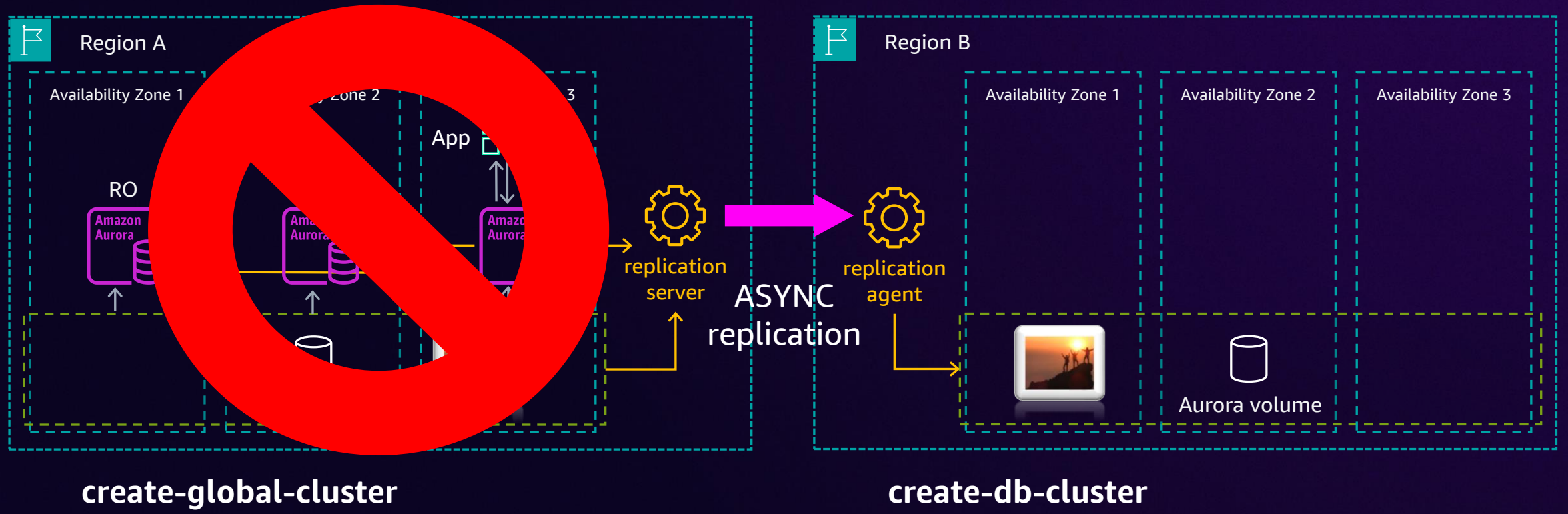

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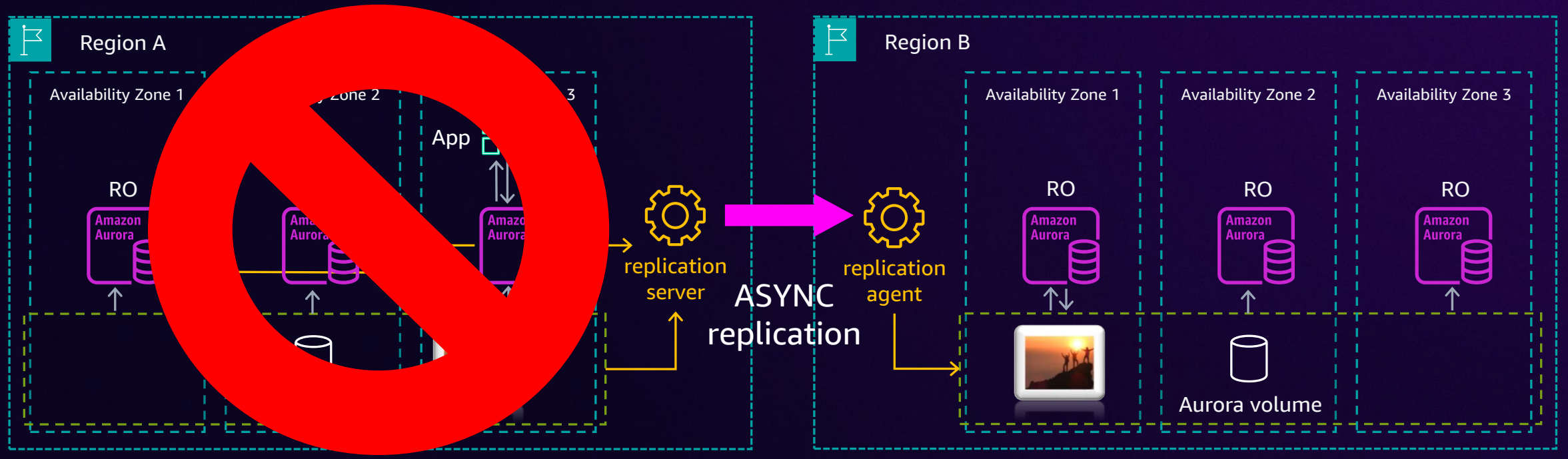

create-global-cluster

create-db-cluster
create-db-instance

RPO ≈ sub 1 second for replication lag + network partition time

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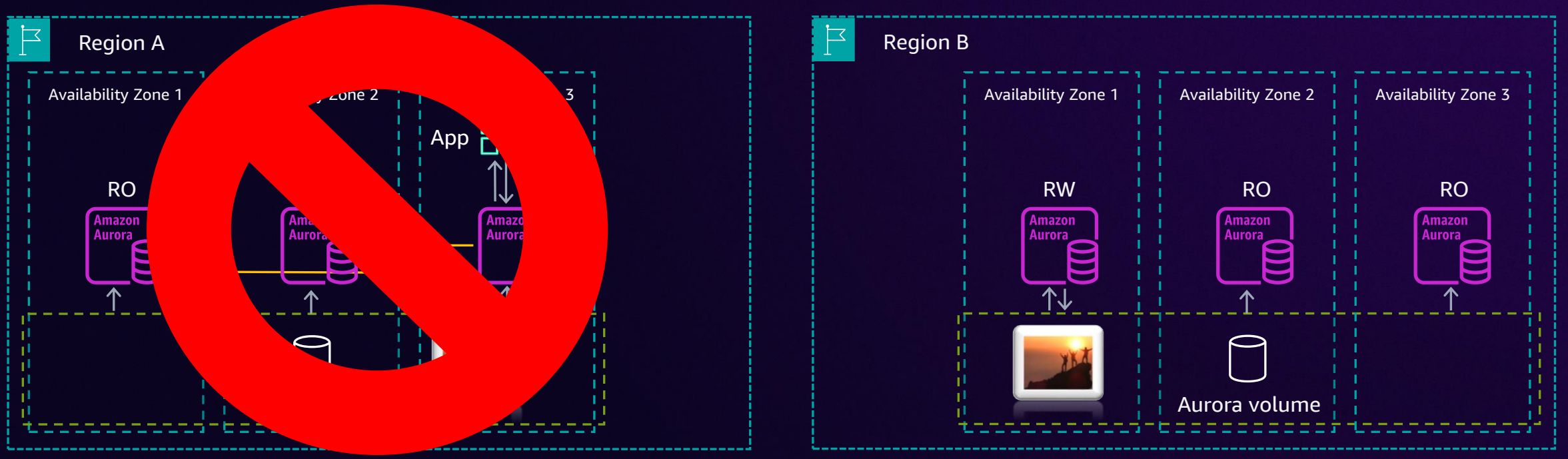
Aurora global database – Storage only



create-global-cluster

create-db-cluster
create-db-instance
failover-global-cluster --allow-data-loss

RPO ≈ sub 1 second for replication lag + network partition time

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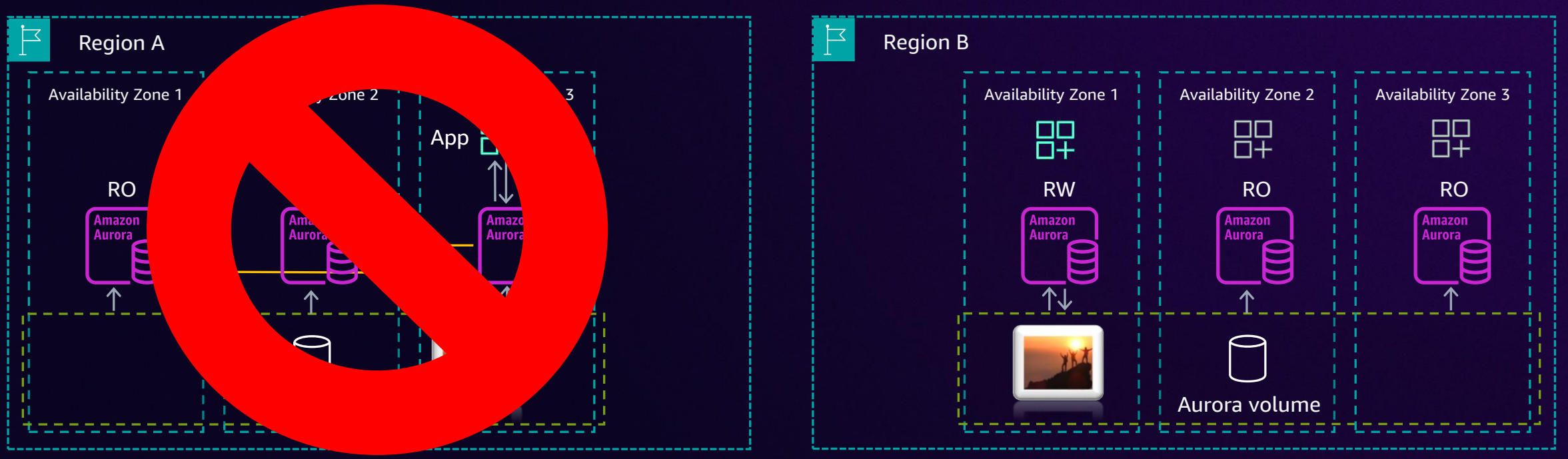
Aurora global database – Storage only



create-global-cluster

create-db-cluster
create-db-instance
failover-global-cluster --allow-data-loss

RPO ≈ sub 1 second for replication lag + network partition time

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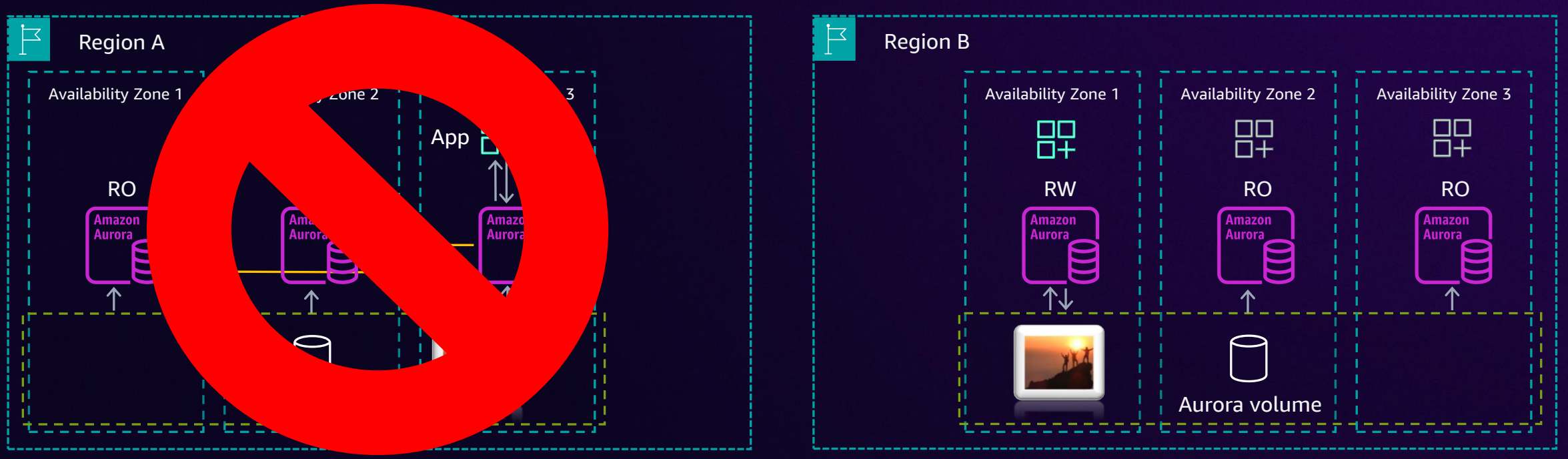
Aurora global database – Storage only



create-global-cluster

create-db-cluster
create-db-instance
failover-global-cluster --allow-data-loss

RTO ≈ 15+ minutes

RPO ≈ sub 1 second for replication lag + network partition time

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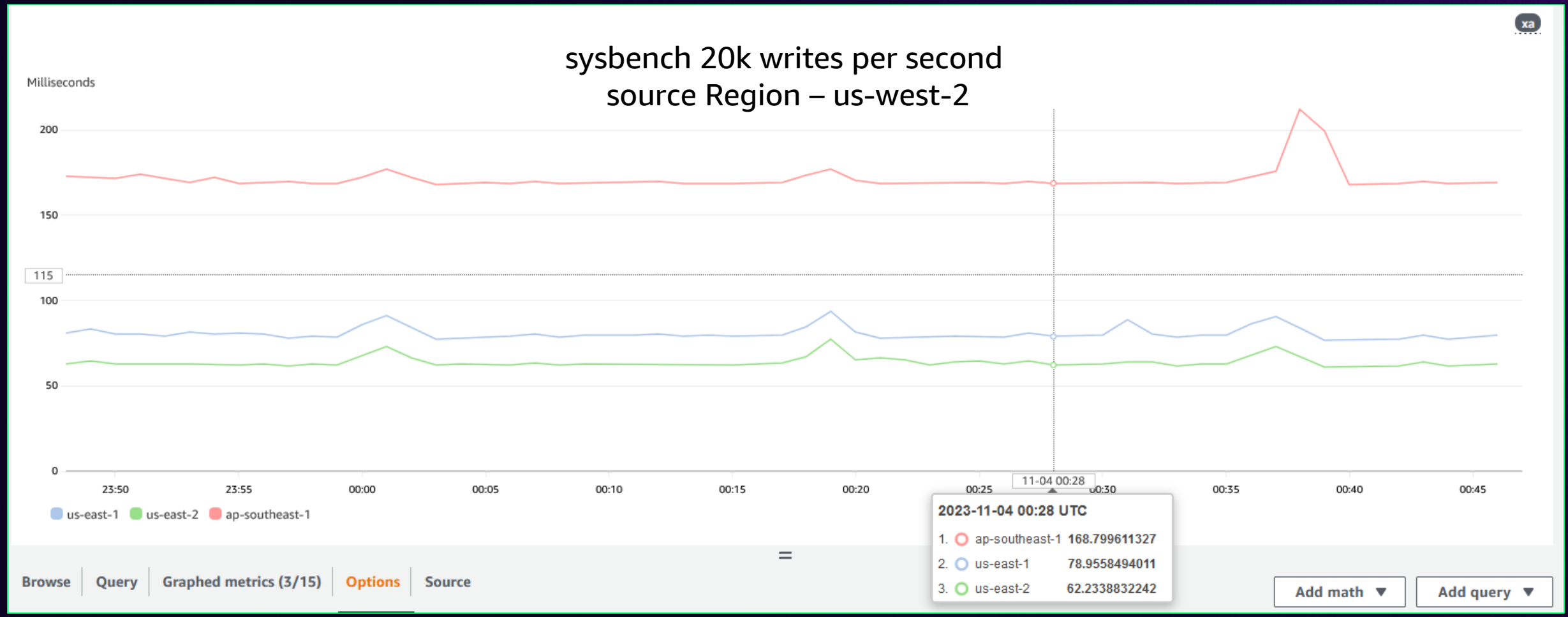
Aurora global database – Replication lag



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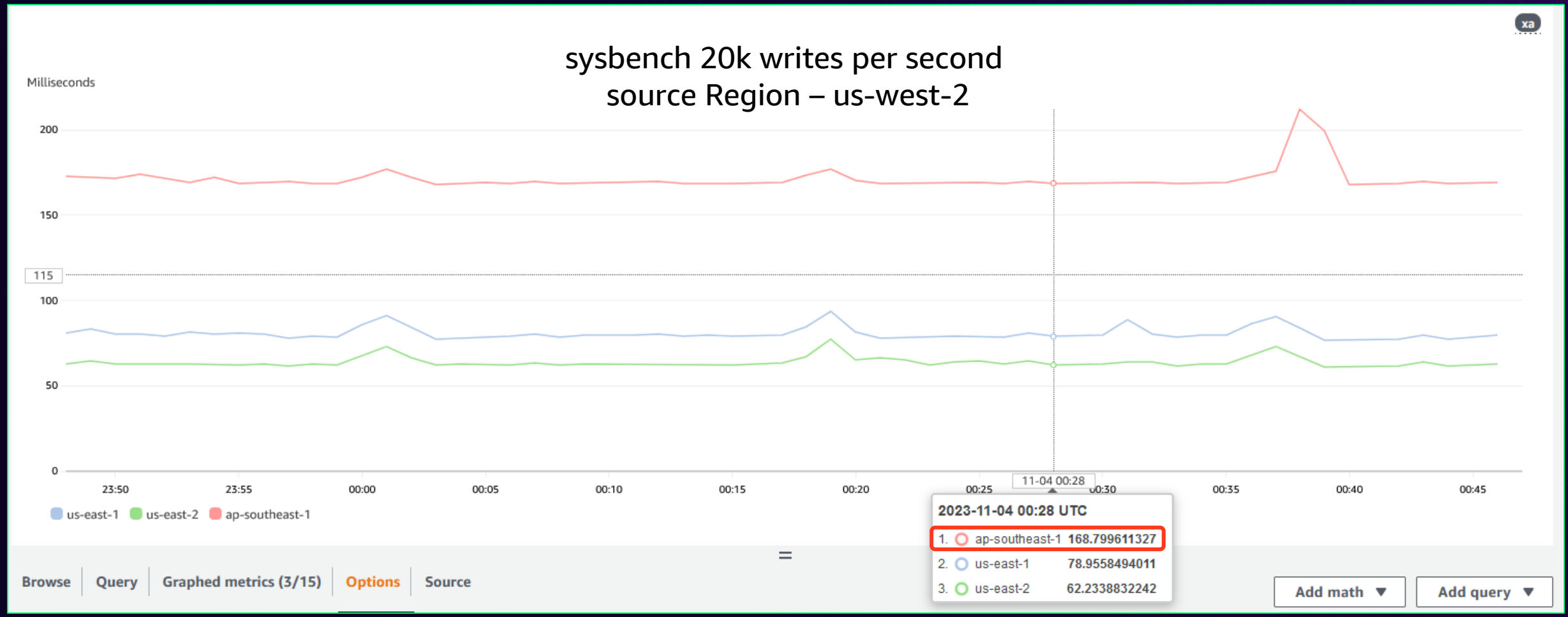
Aurora global database – Replication lag



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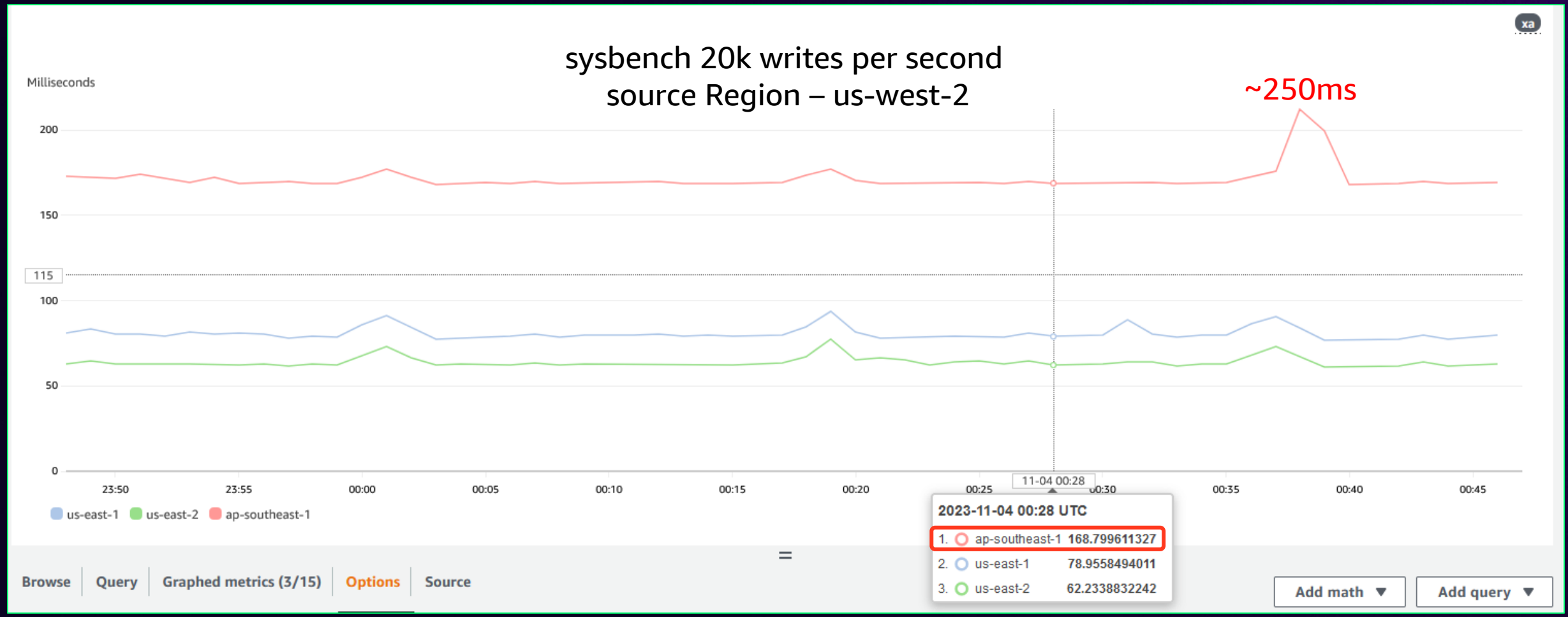
Aurora global database – Replication lag



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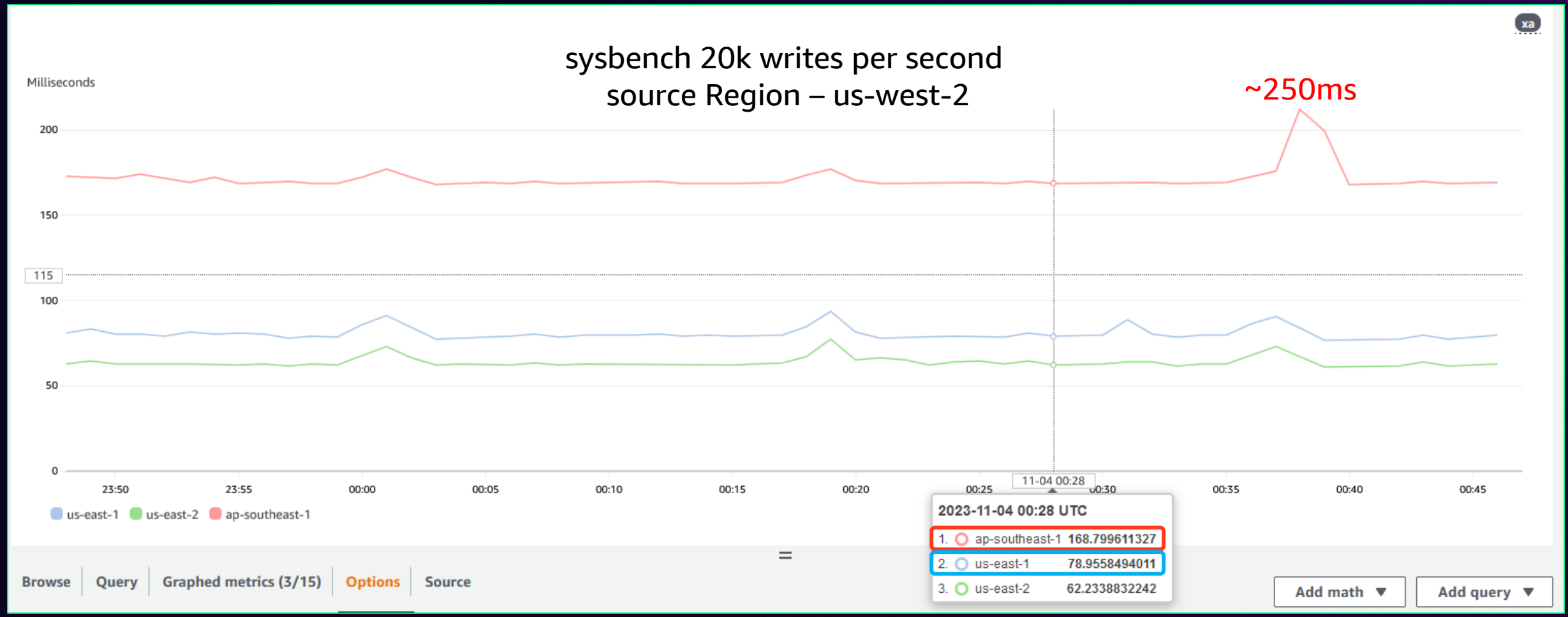
Aurora global database – Replication lag



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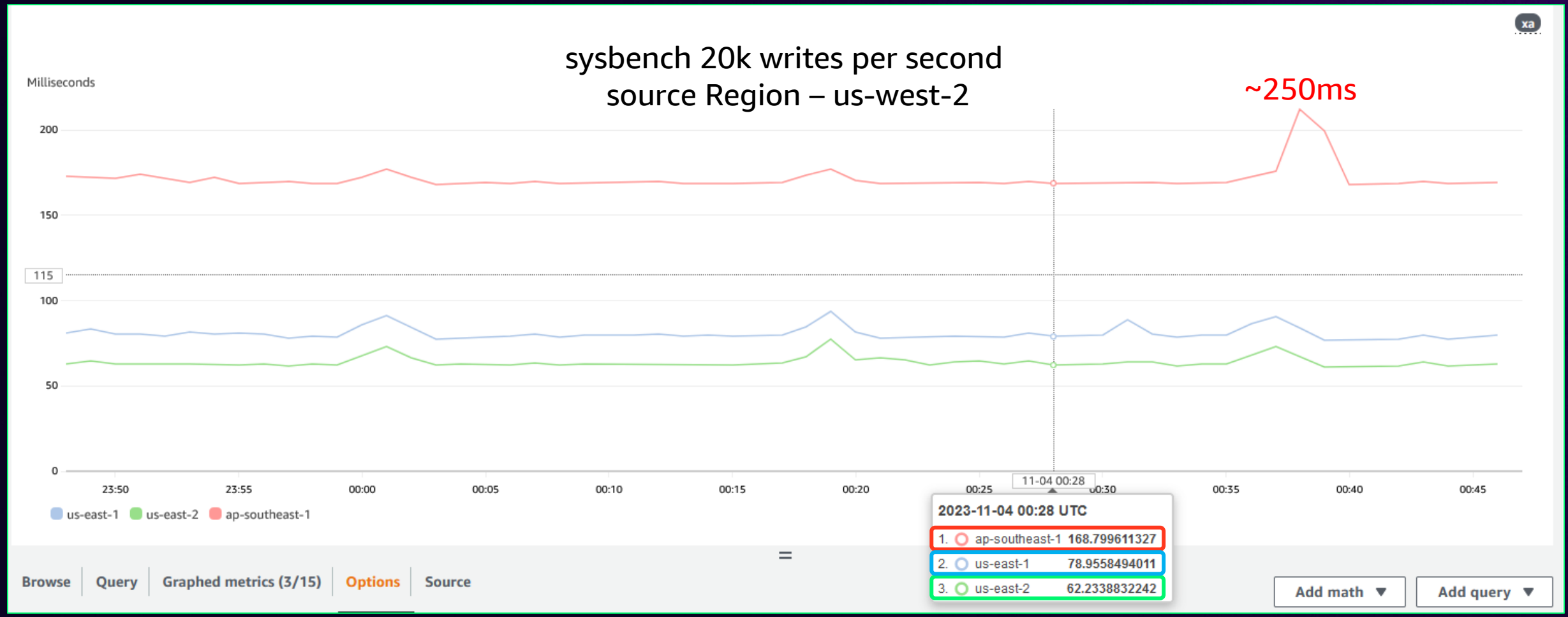
Aurora global database – Replication lag



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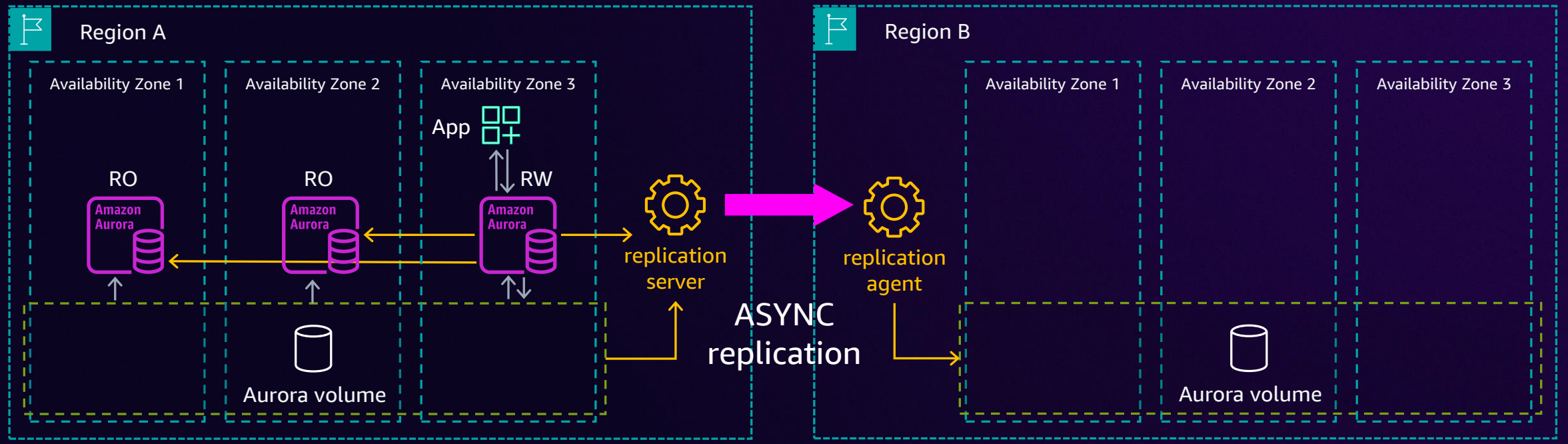
Aurora global database – Symmetric configuration



RPO ≈ sub 1 second for replication lag + network partition time

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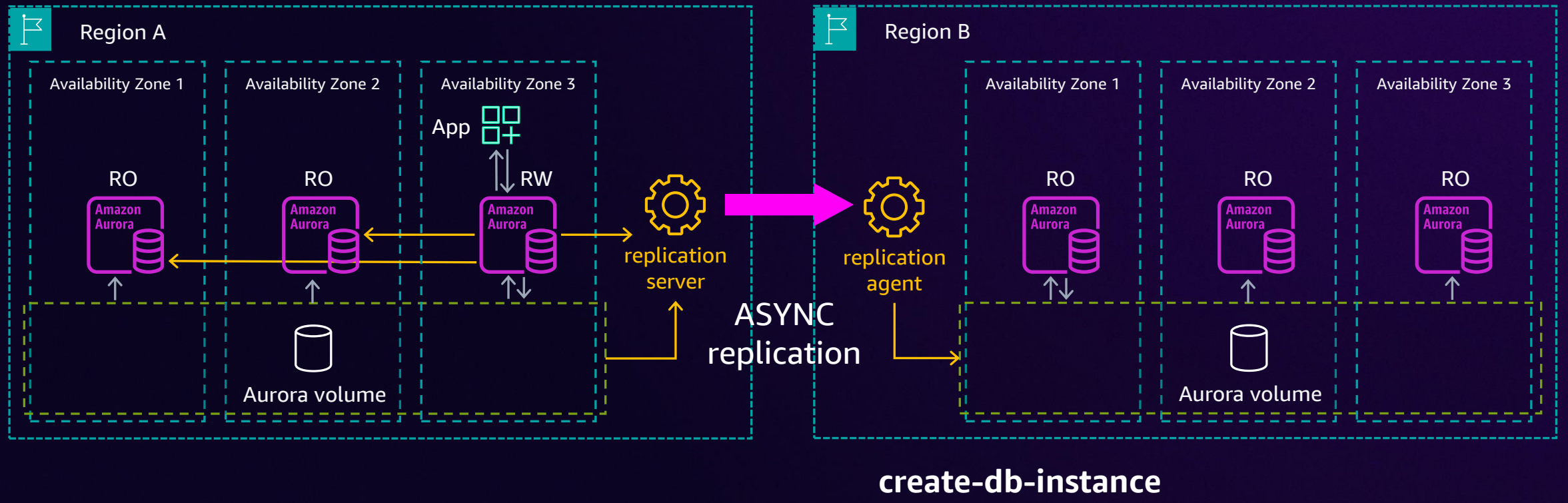
Aurora global database – Symmetric configuration



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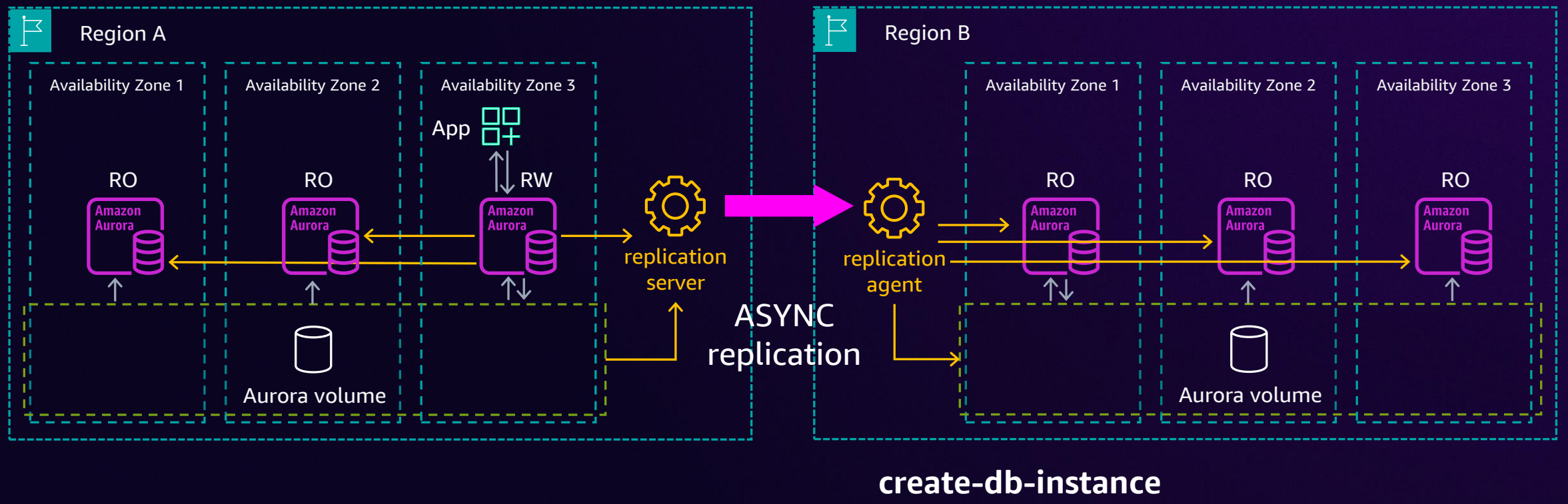
Aurora global database – Symmetric configuration



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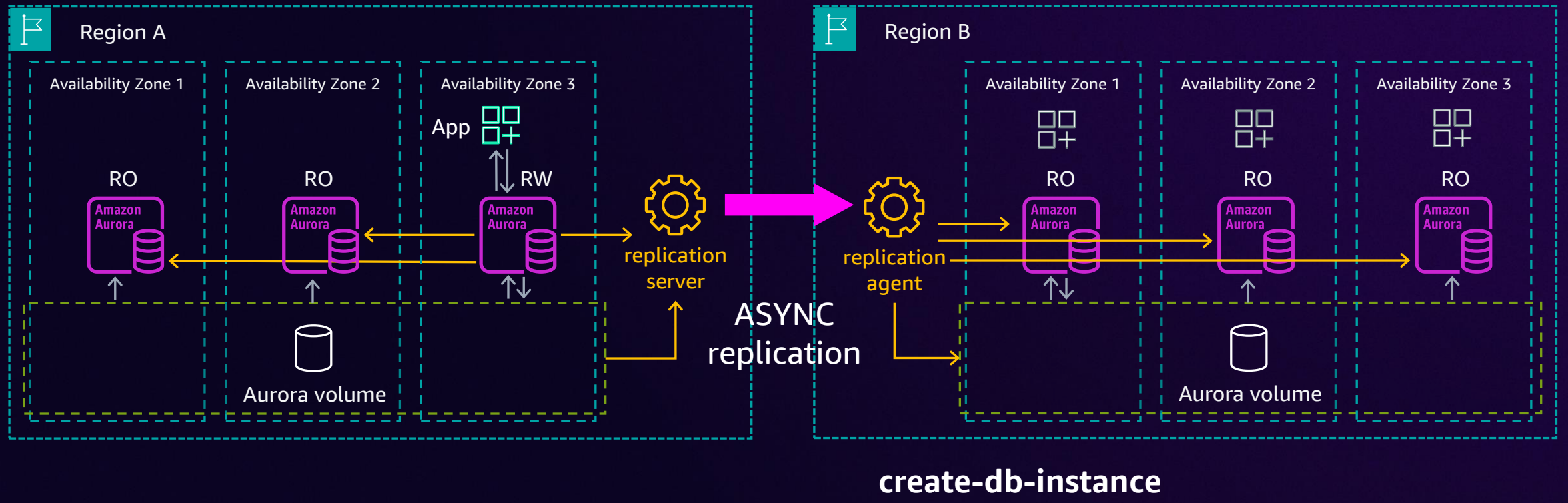
Aurora global database – Symmetric configuration



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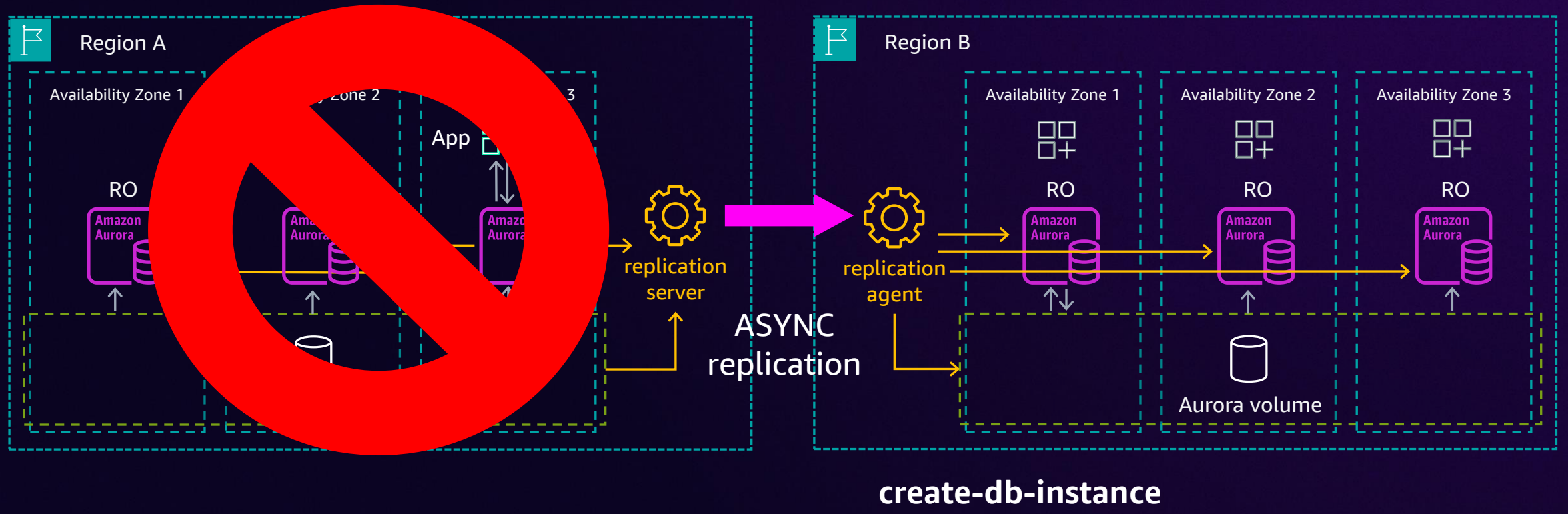

RPO ≈ sub 1 second for replication lag + network partition time

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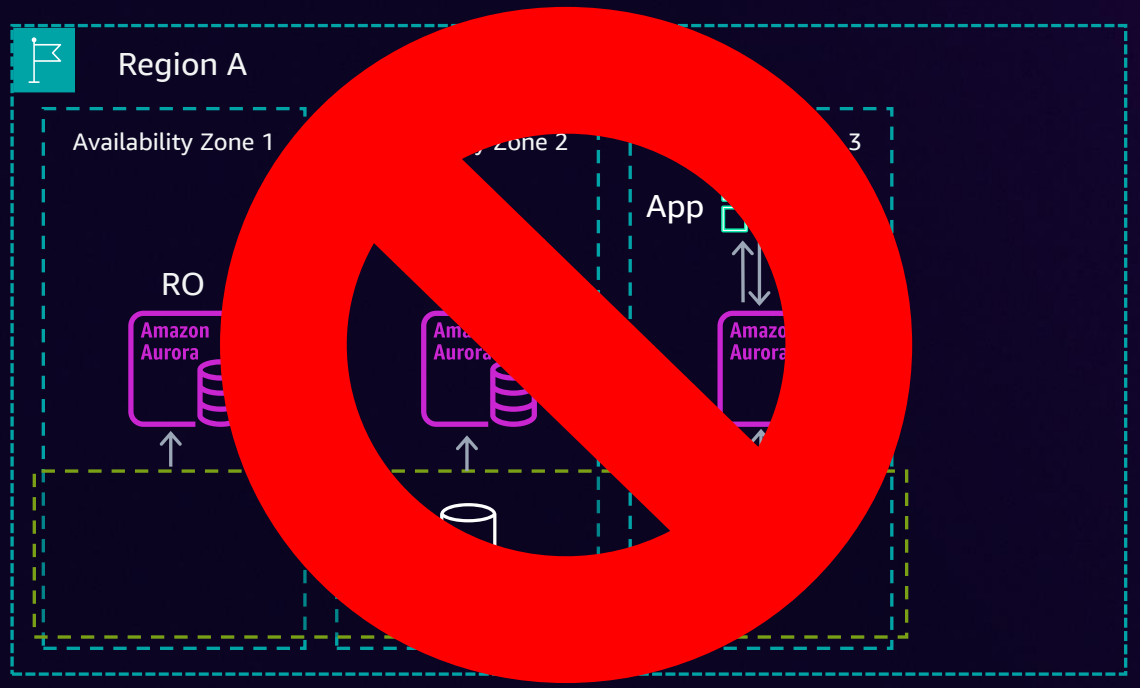
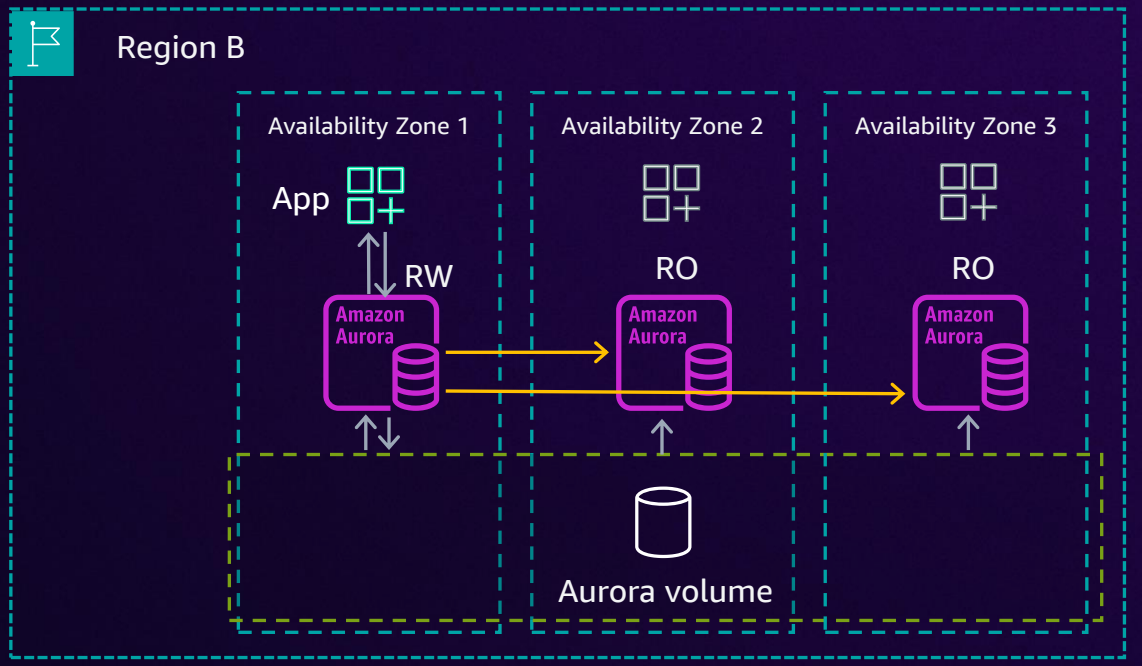
Aurora global database – Symmetric configuration





create-db-instance
failover-global-cluster --allow-data-loss

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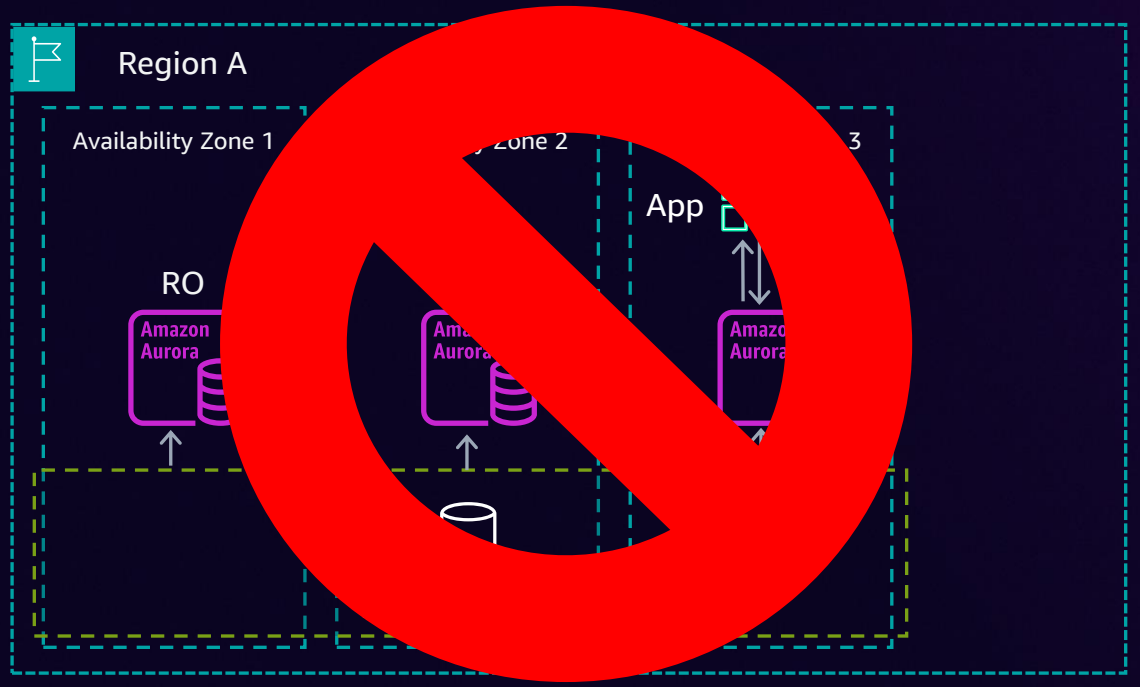
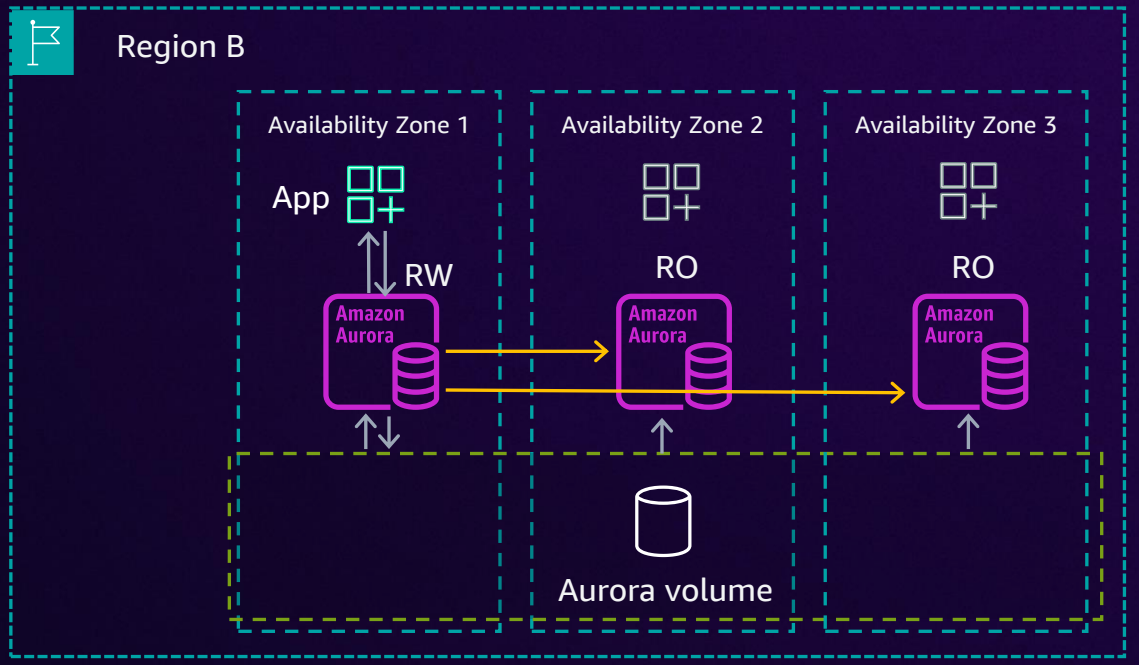
Aurora global database – Symmetric configuration





create-db-instance
failover-global-cluster --allow-data-loss

RTO ≈ 2+ minutes
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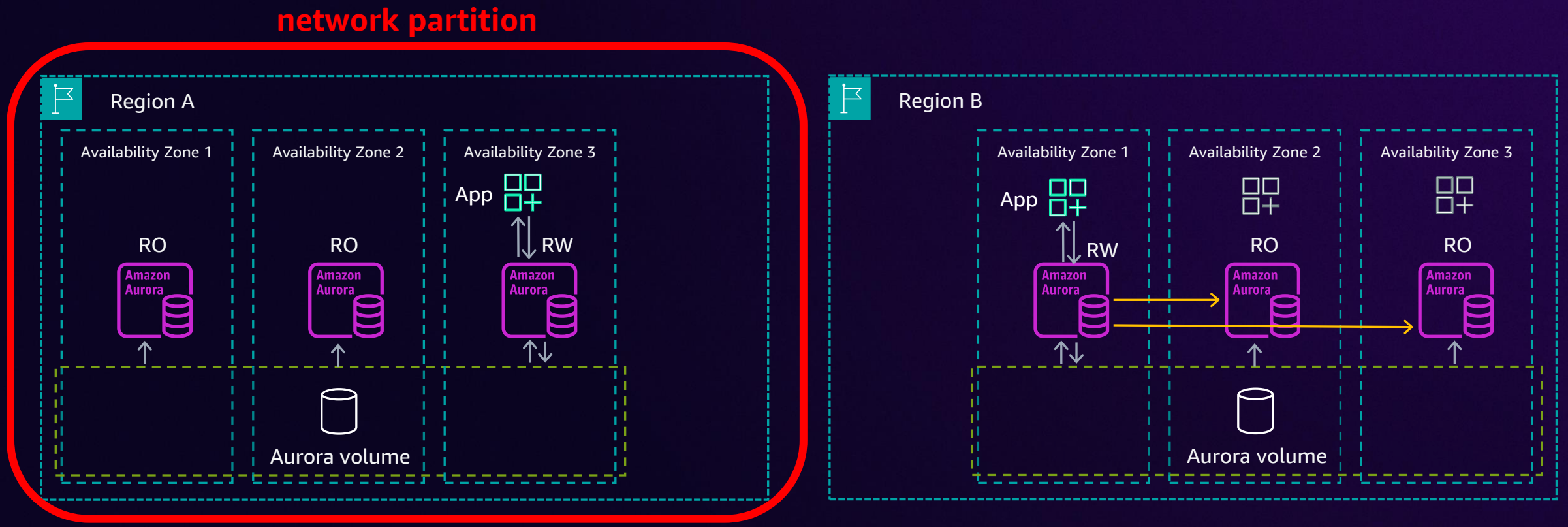

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aws
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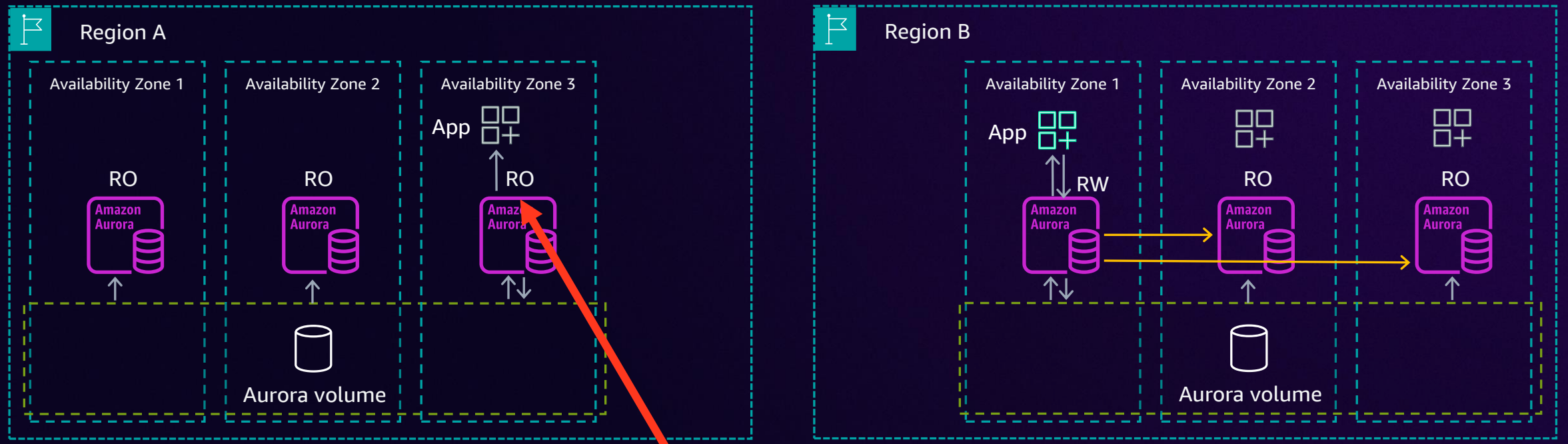

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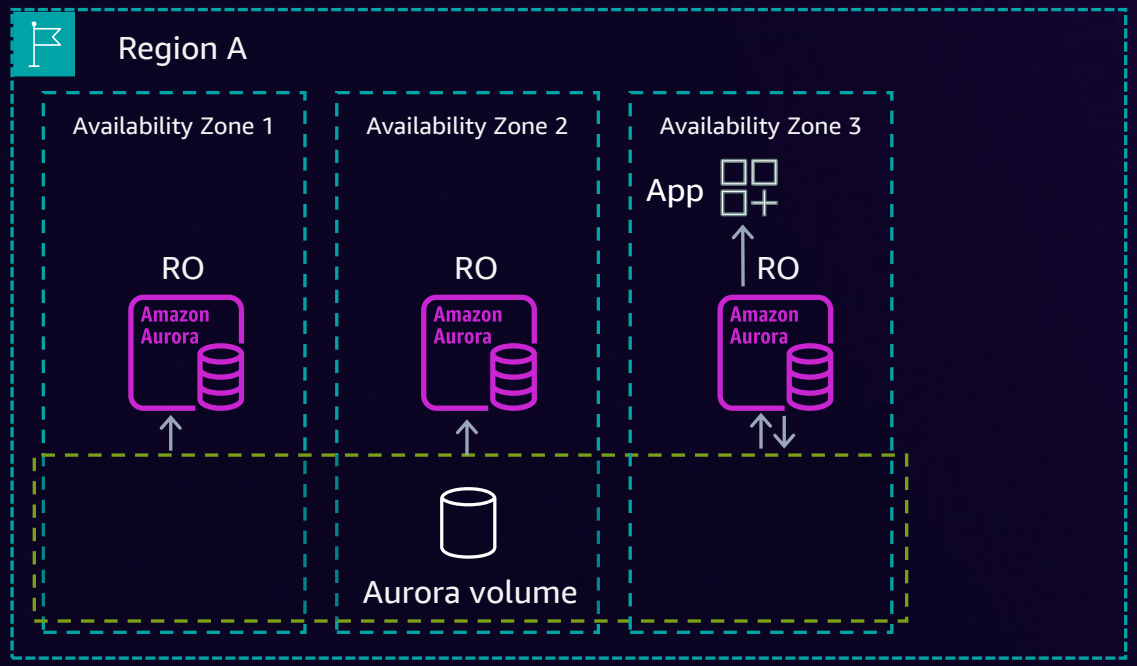

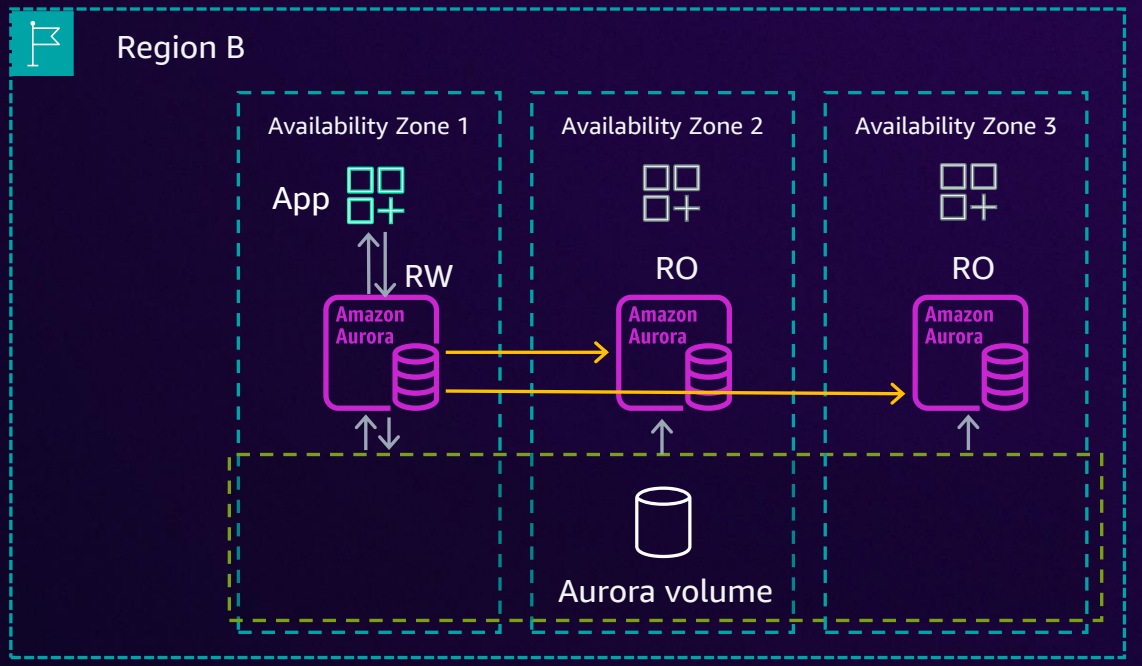

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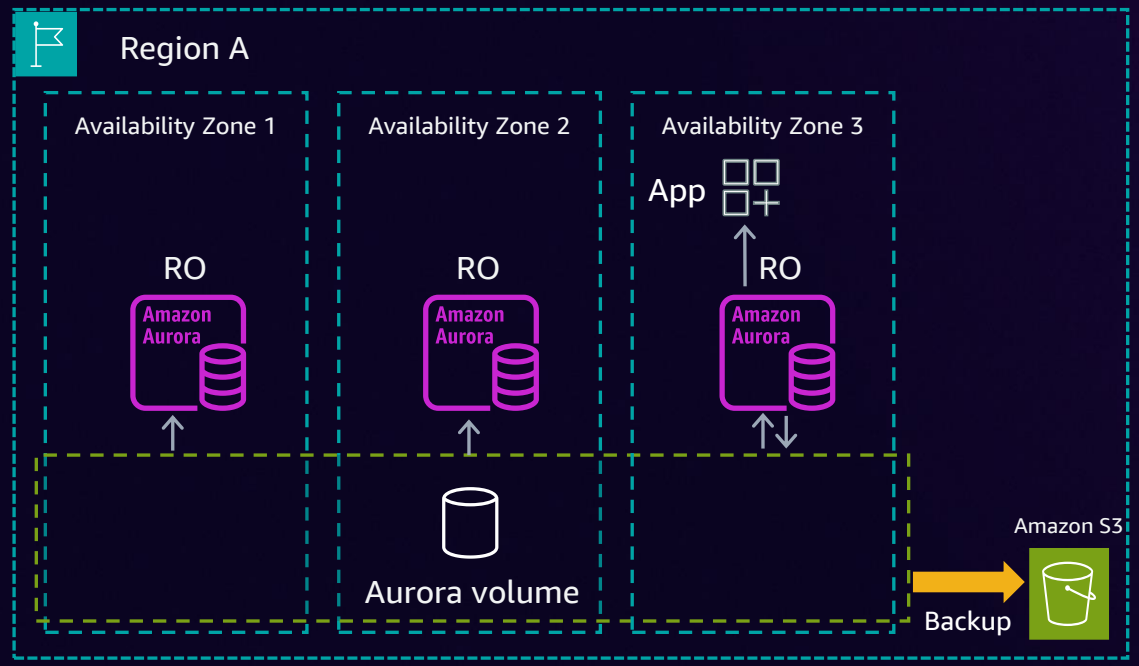

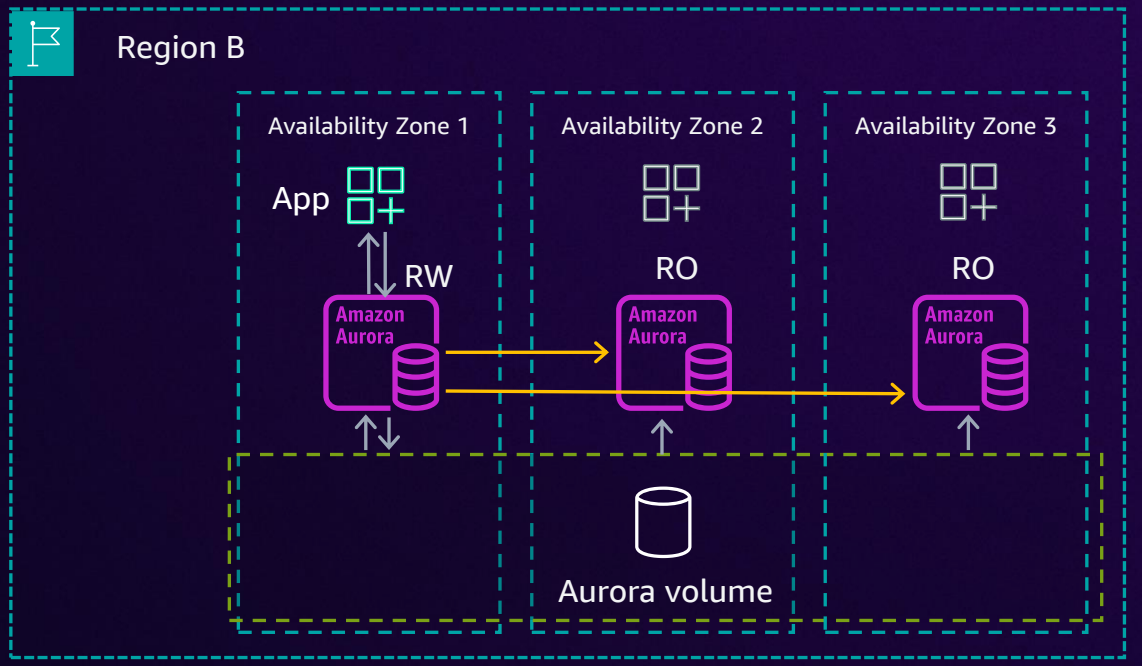

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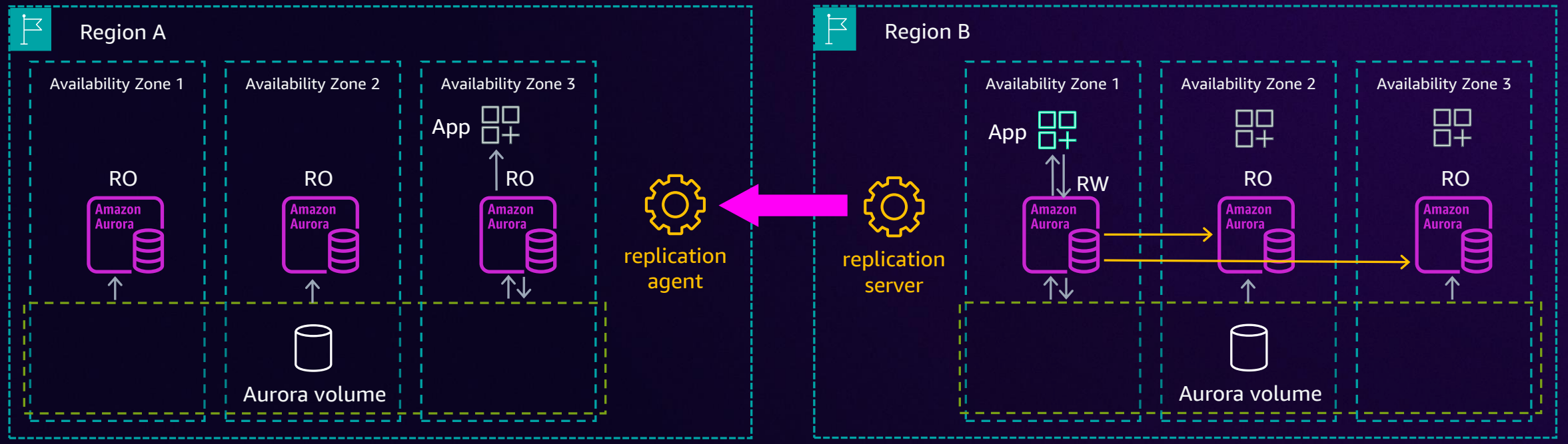

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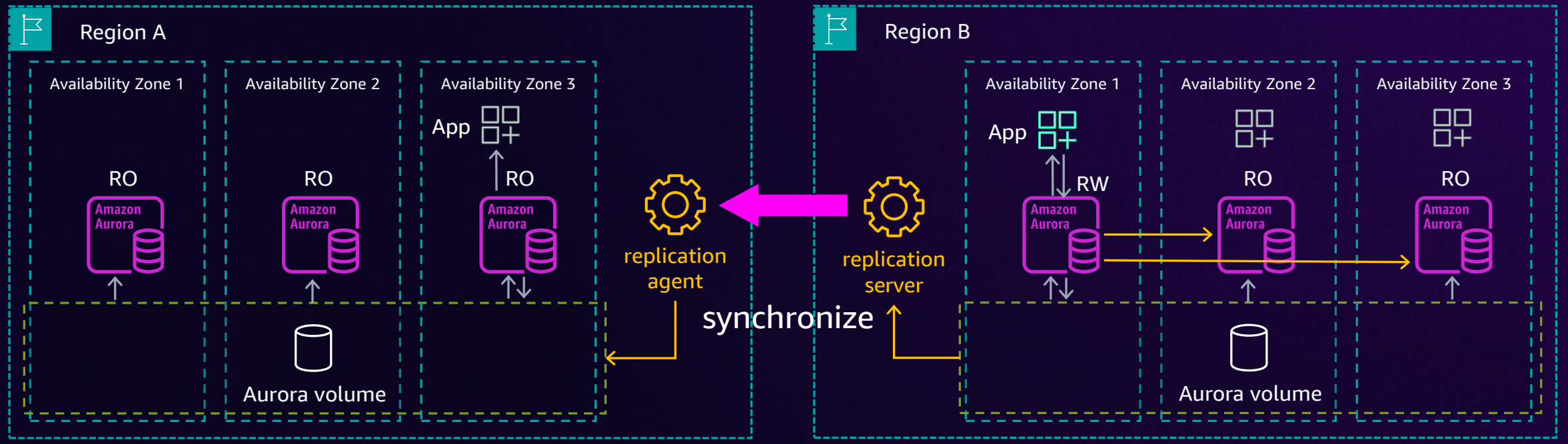

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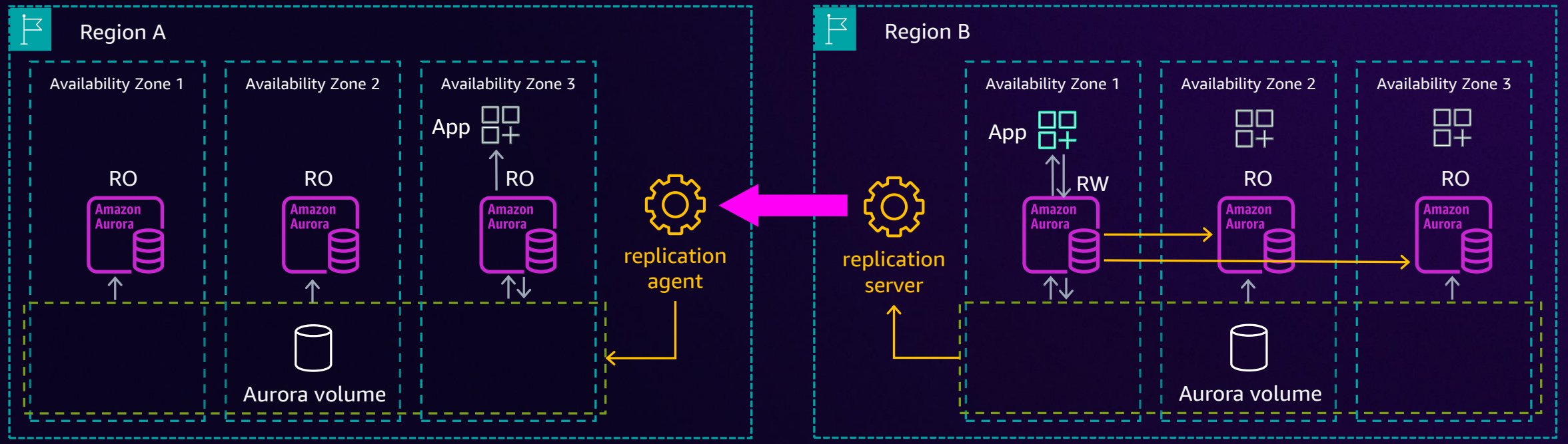

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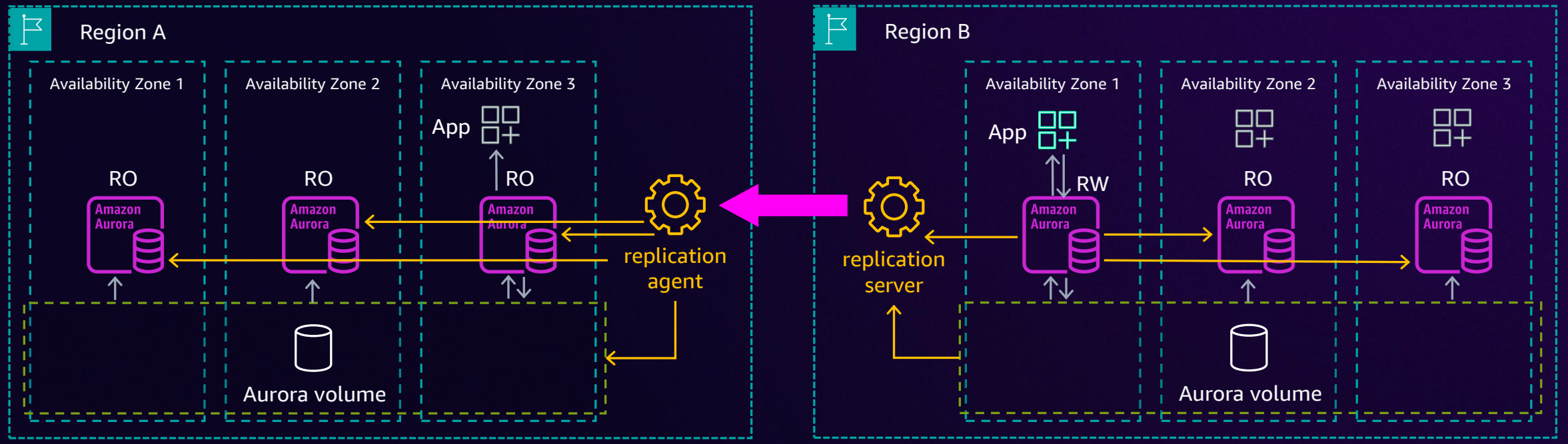

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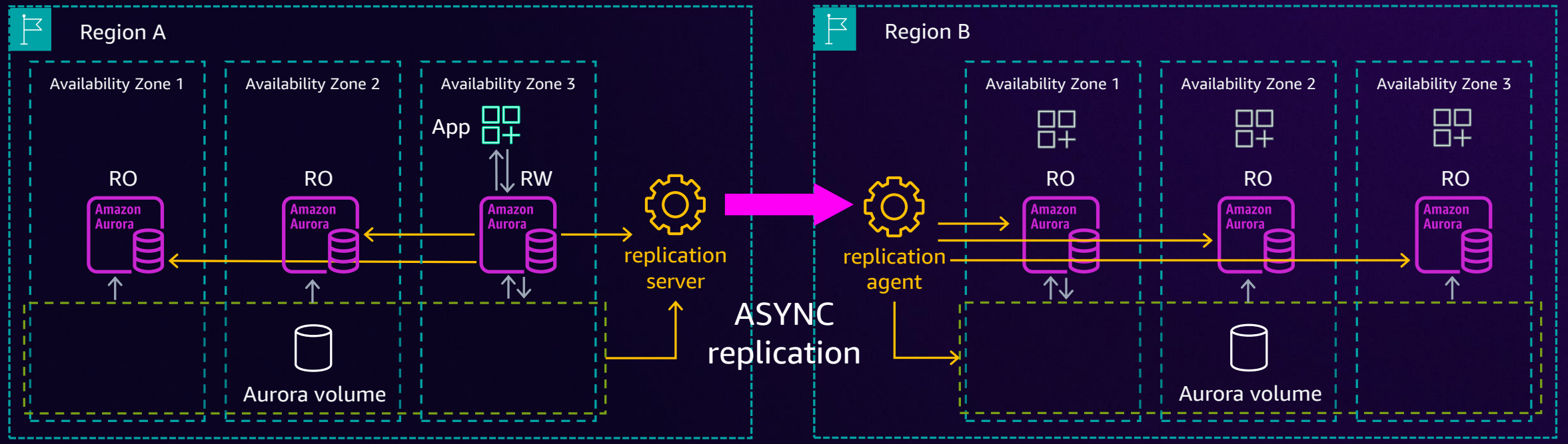
Aurora global database – Switchover



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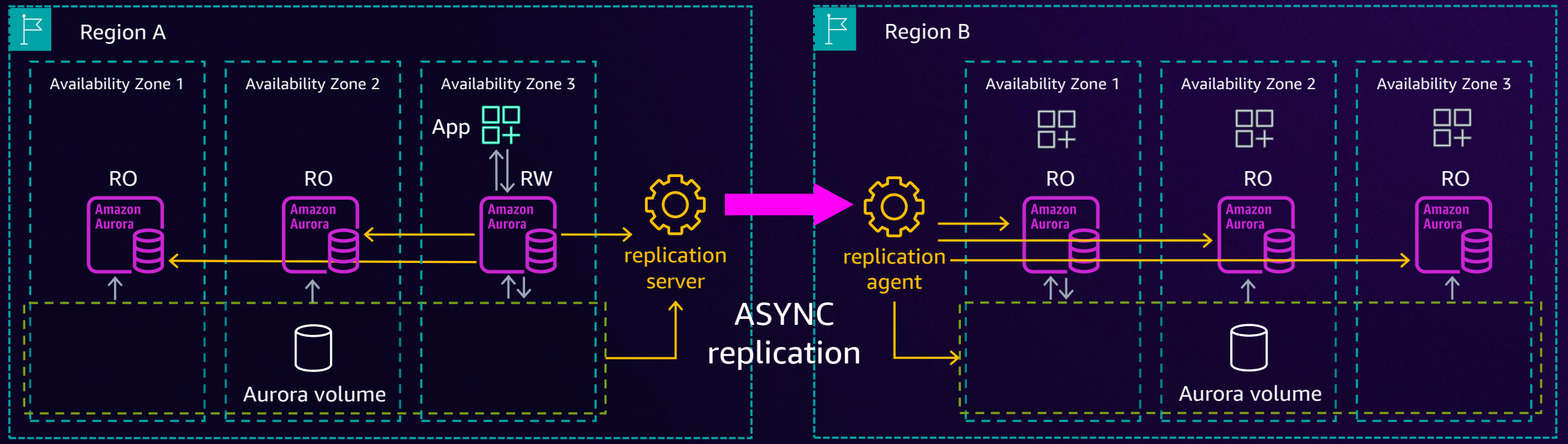
Aurora global database – Switchover



switchover-global-cluster

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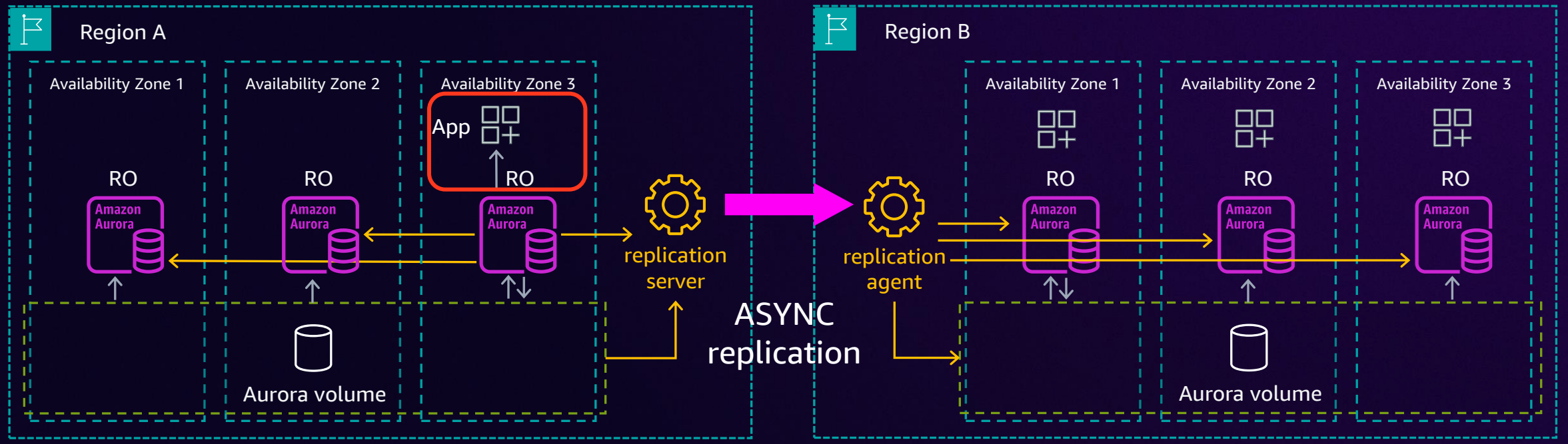
Aurora global database – Switchover



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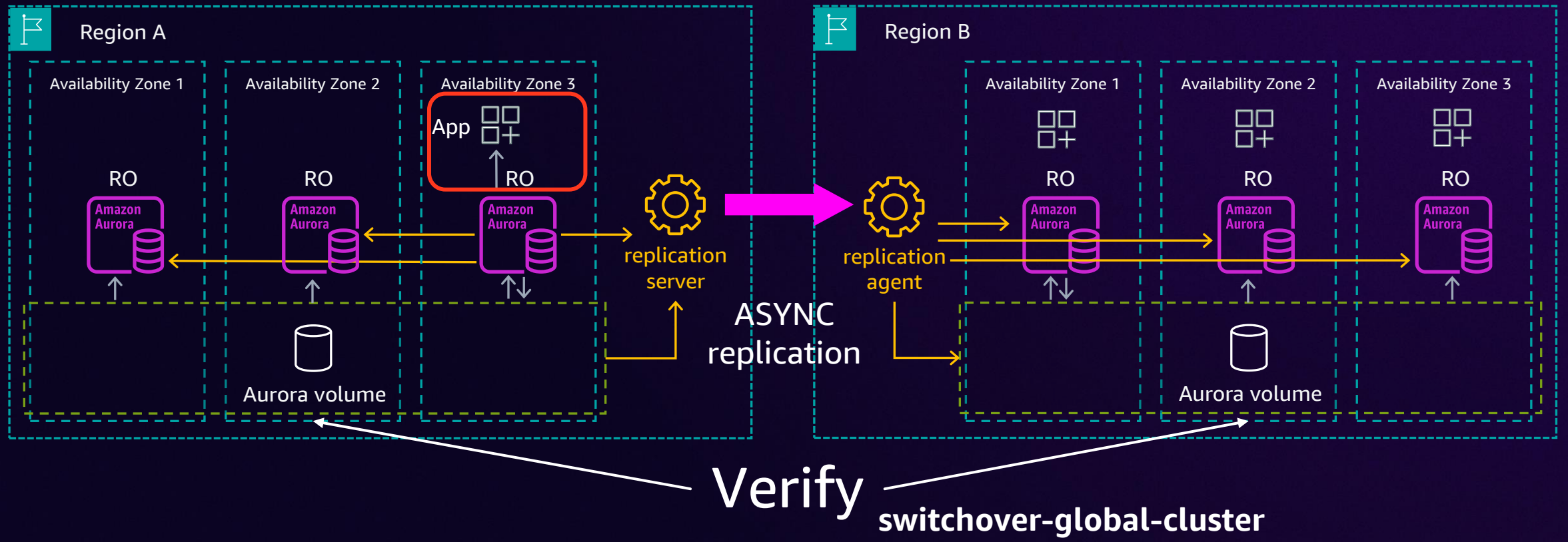
Aurora global database – Switchover



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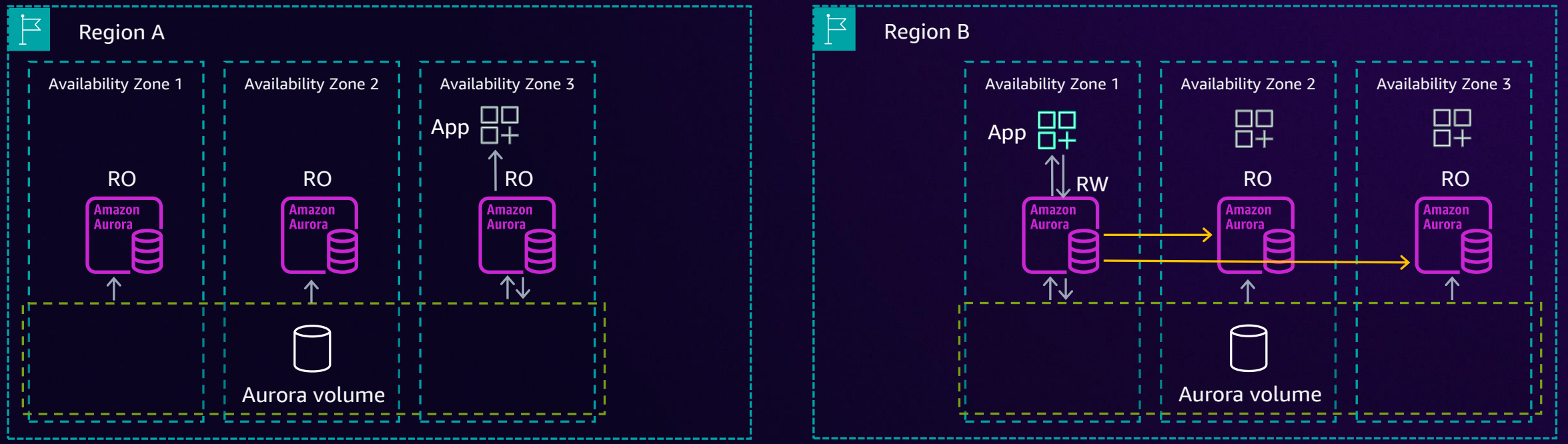
Aurora global database – Switchover



switchover-global-cluster

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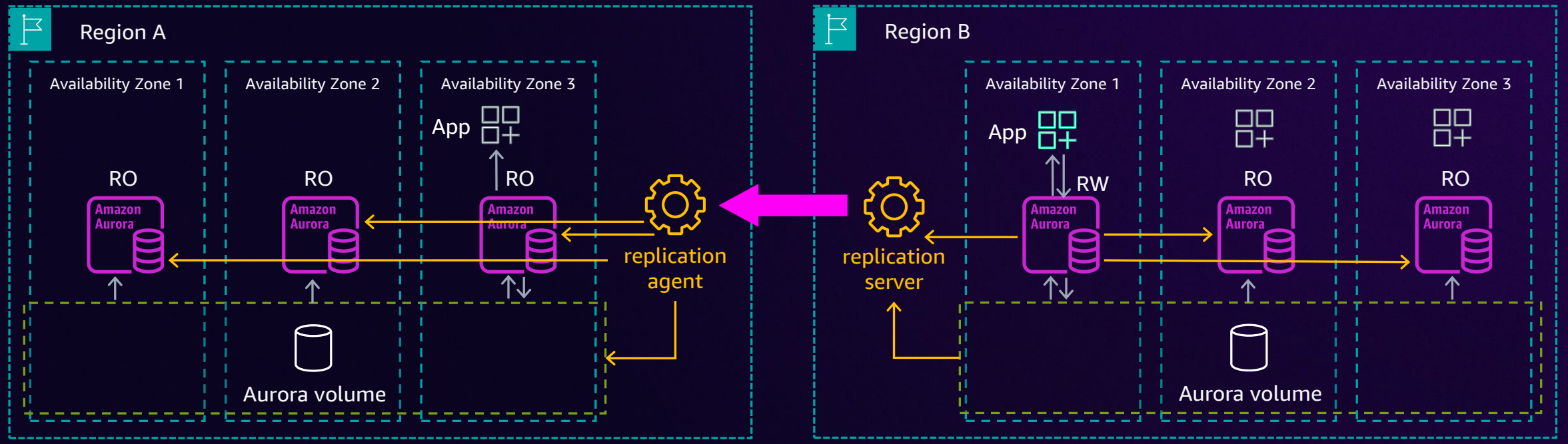
Aurora global database – Switchover



switchover-global-cluster

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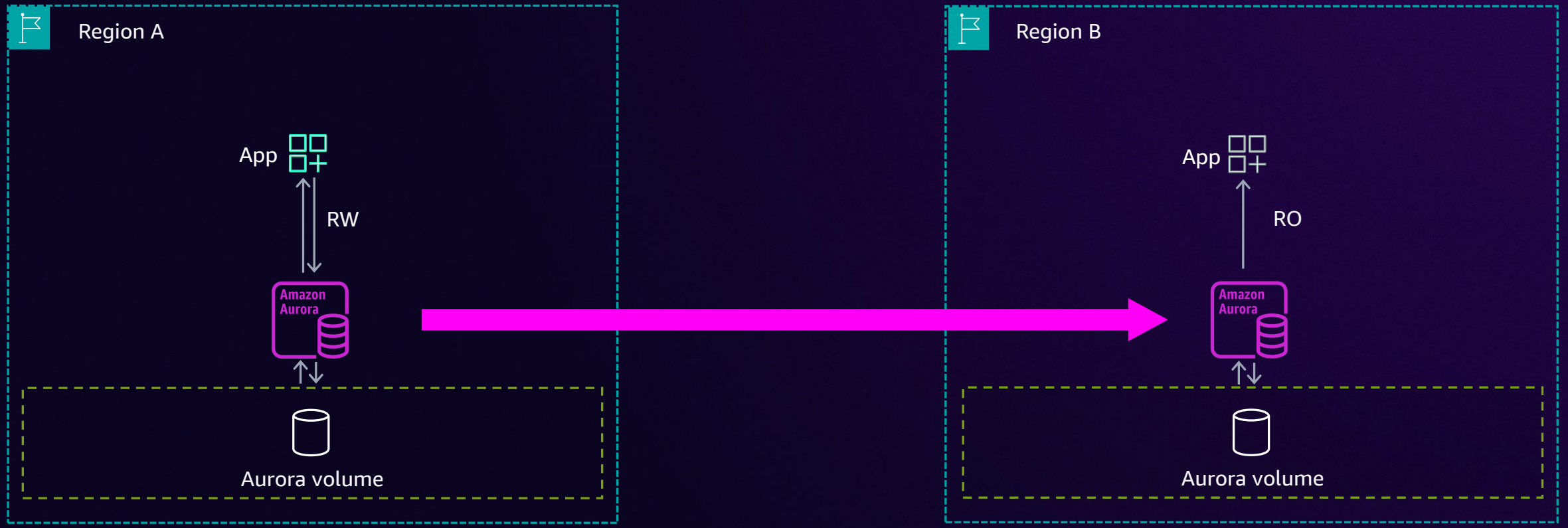
Aurora global database – global endpoint



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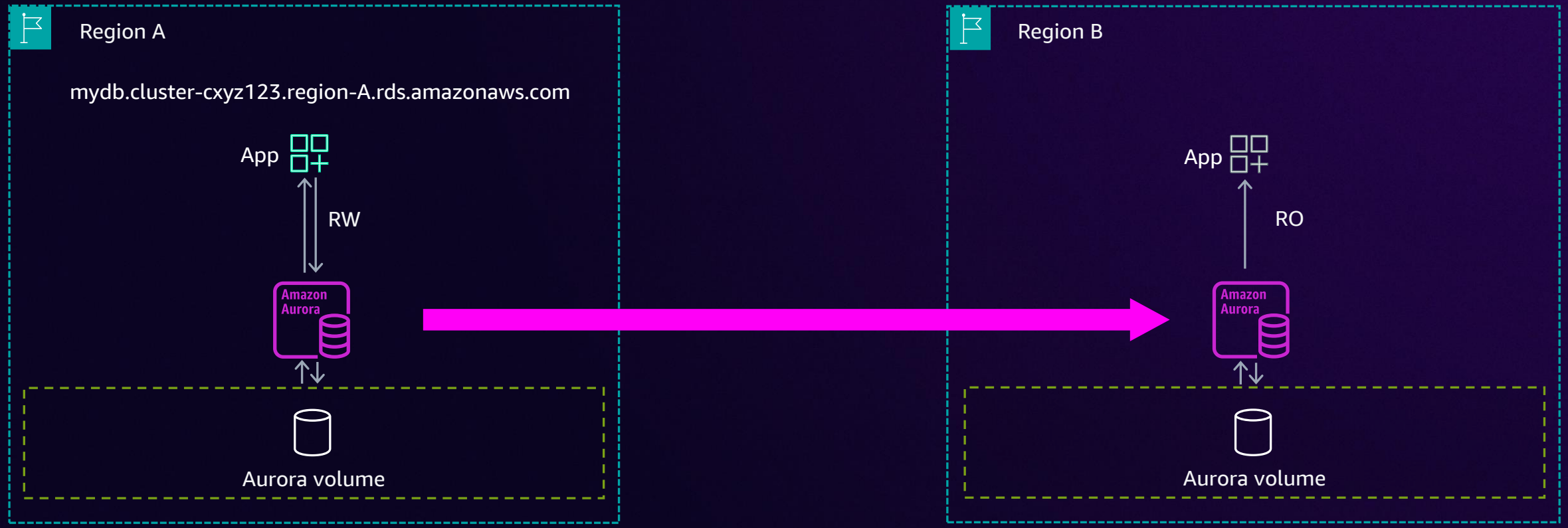
Aurora global database – global endpoint



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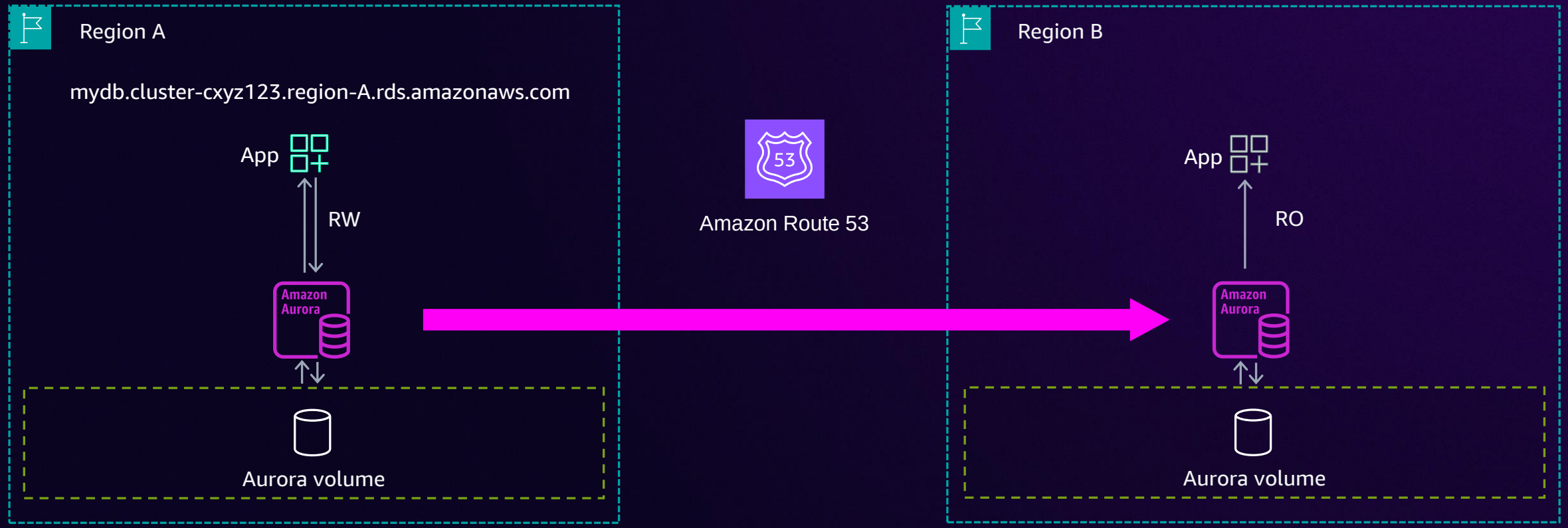
Aurora global database – global endpoint



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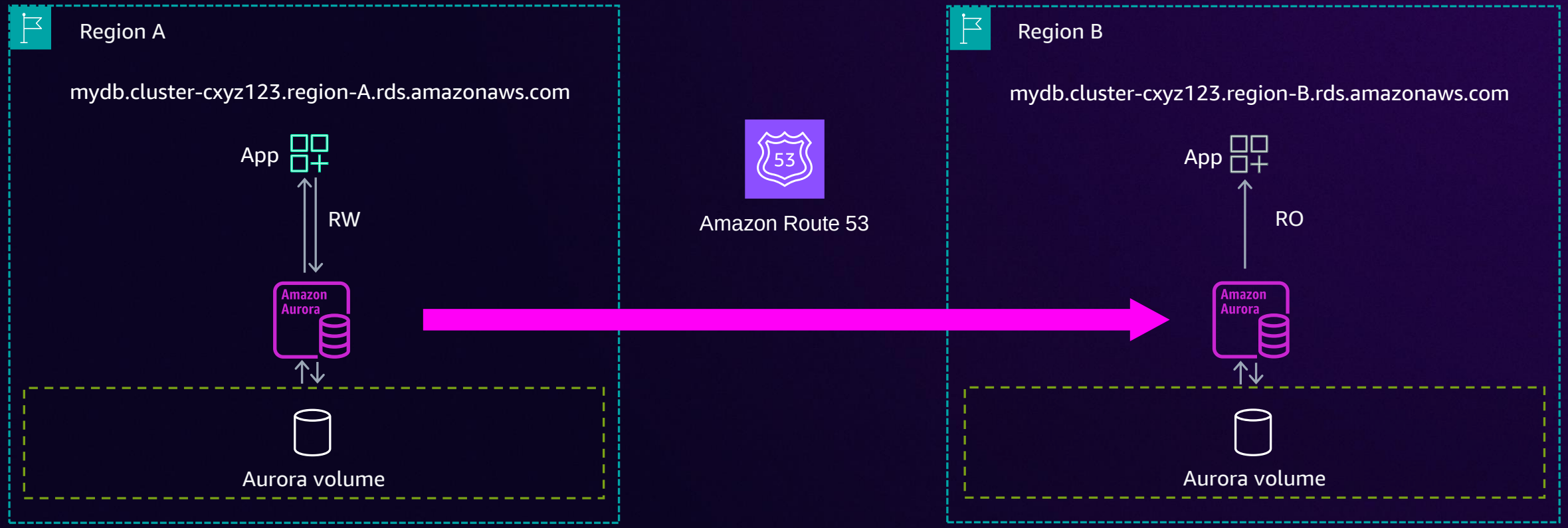
Aurora global database – global endpoint



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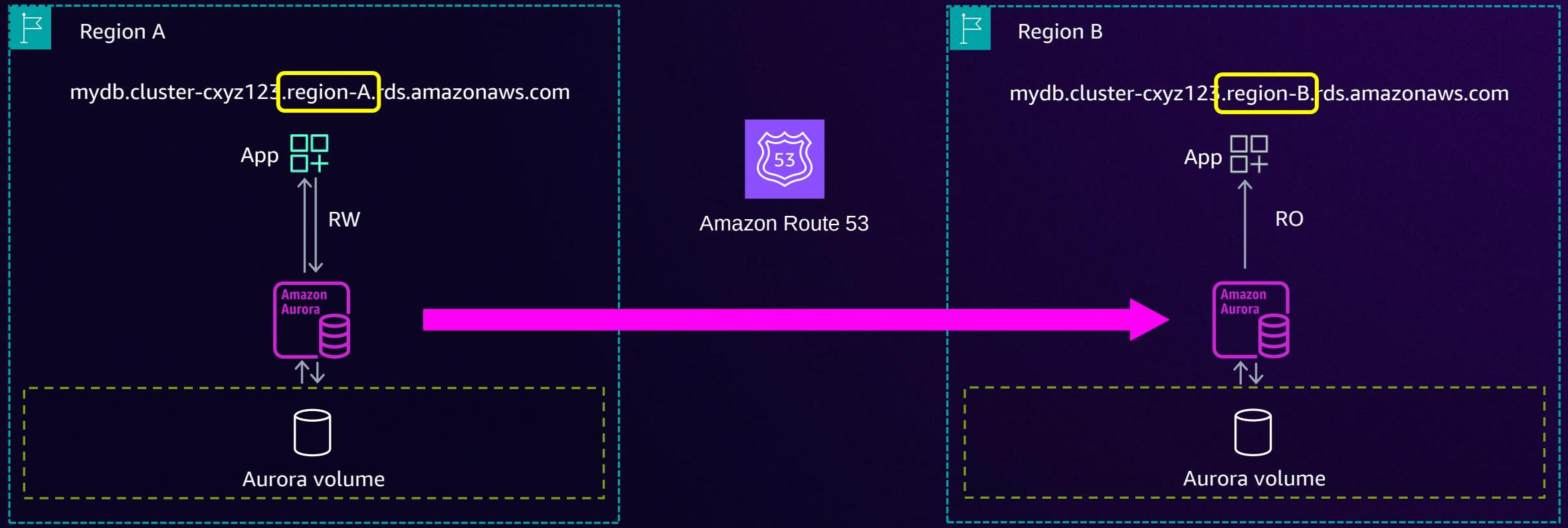
Aurora global database – global endpoint



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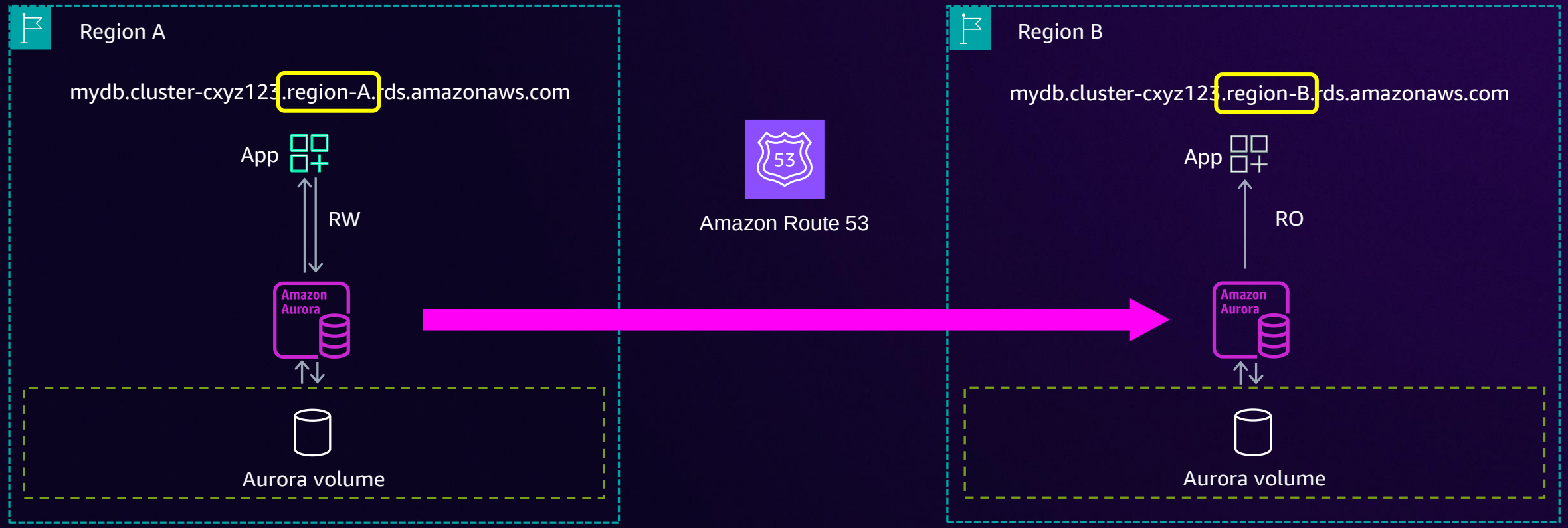
Aurora global database – global endpoint



describe-global-cluster

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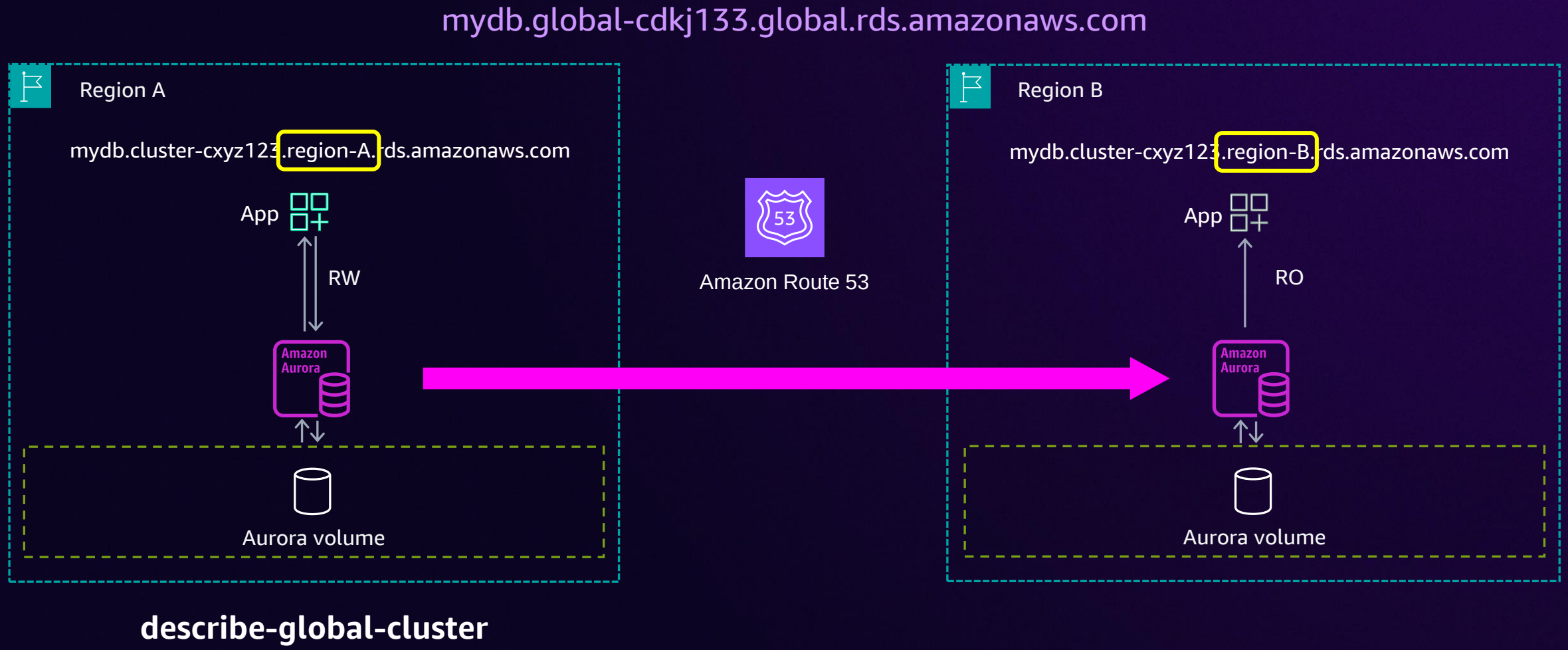
Aurora global database – global endpoint



describe-global-cluster

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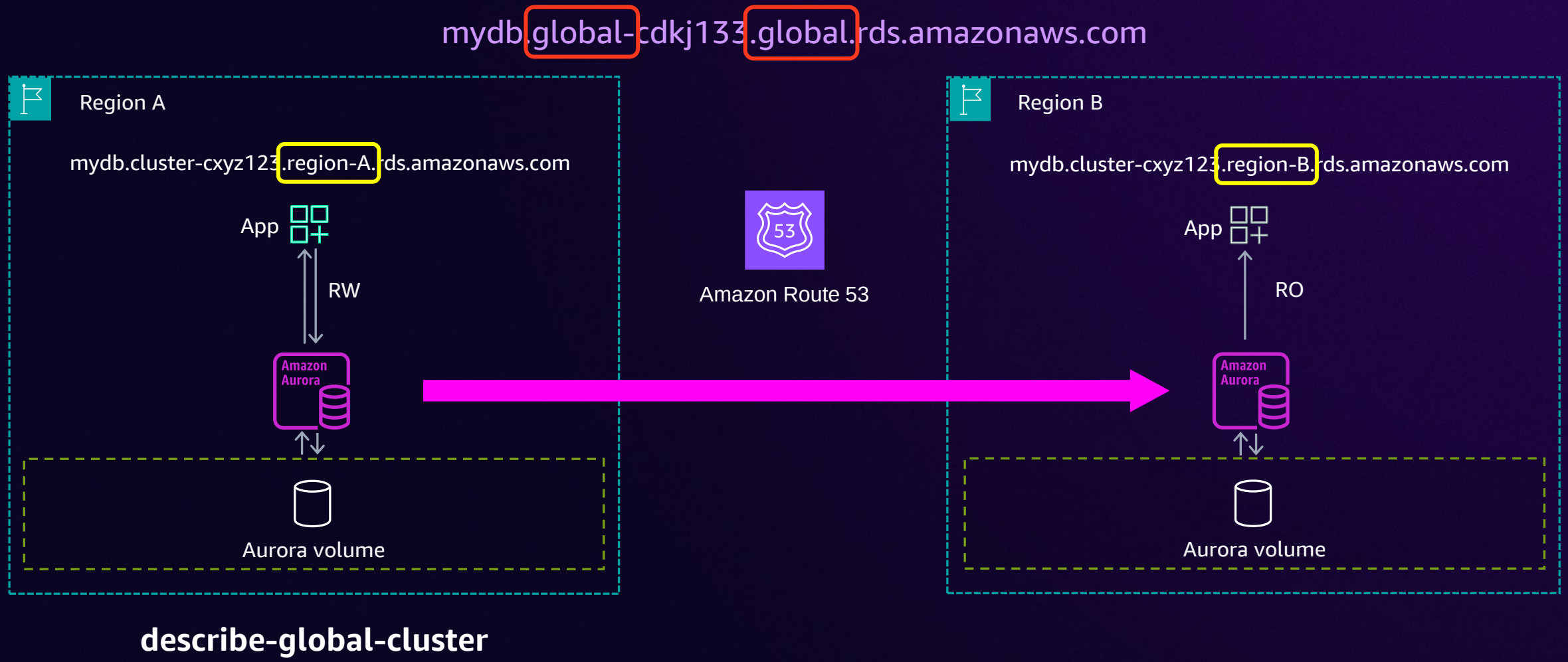
Aurora global database – global endpoint



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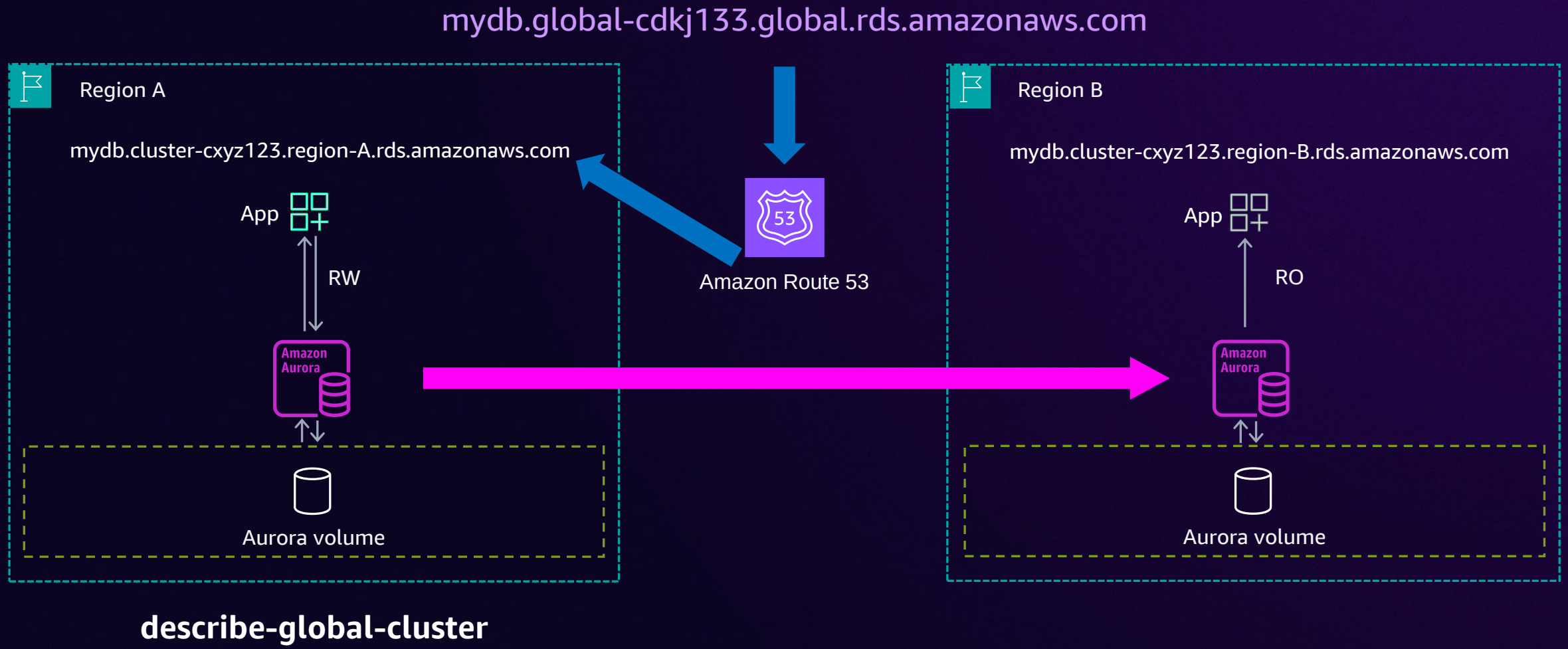

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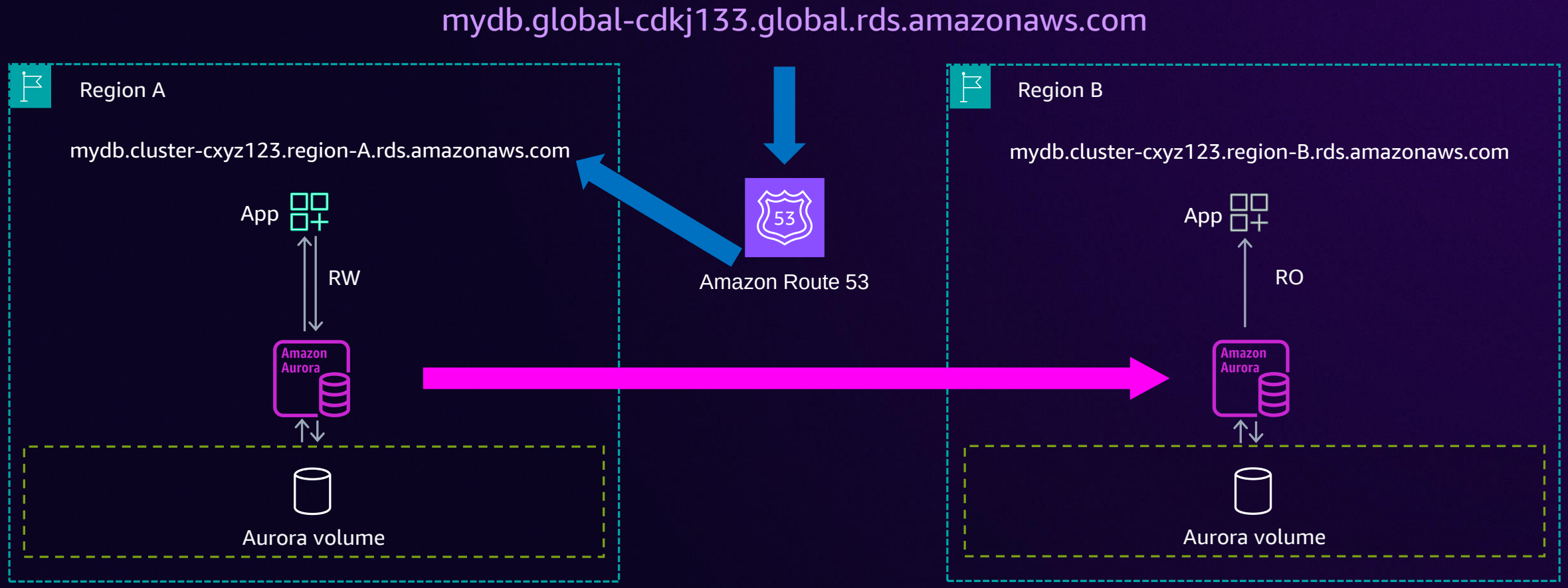

describe-global-cluster

switchover-global-cluster
or
failover-global-cluster

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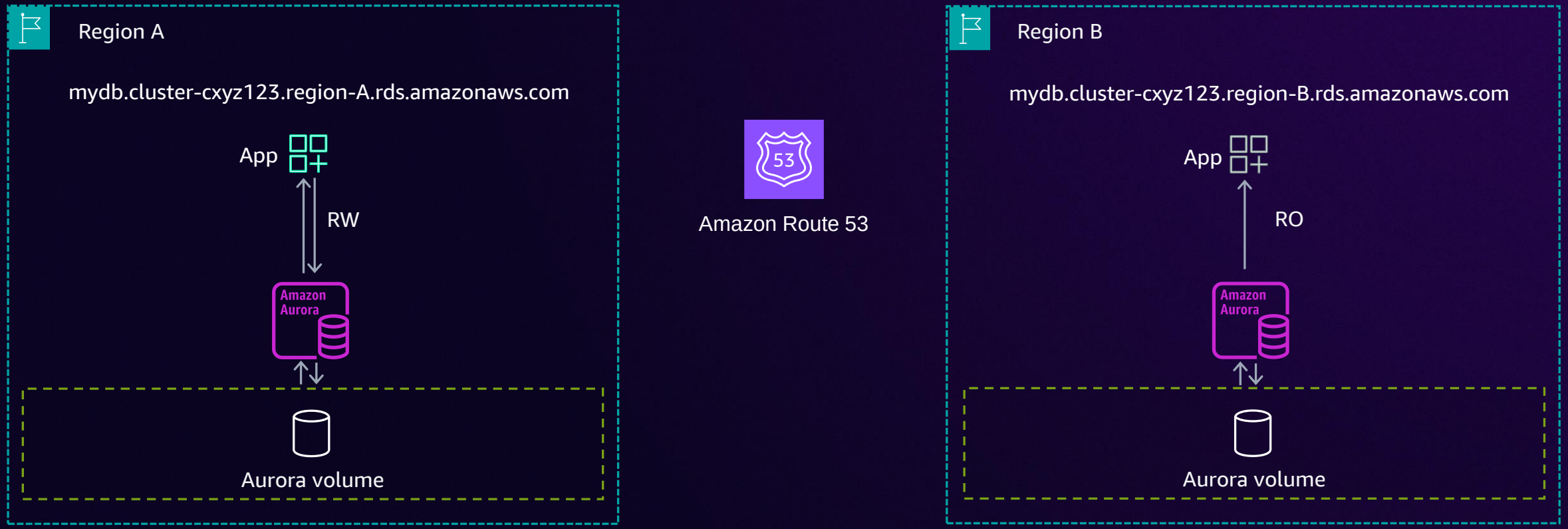
Aurora global database – global endpoint

mydb.global-cdkj133.global.rds.amazonaws.com



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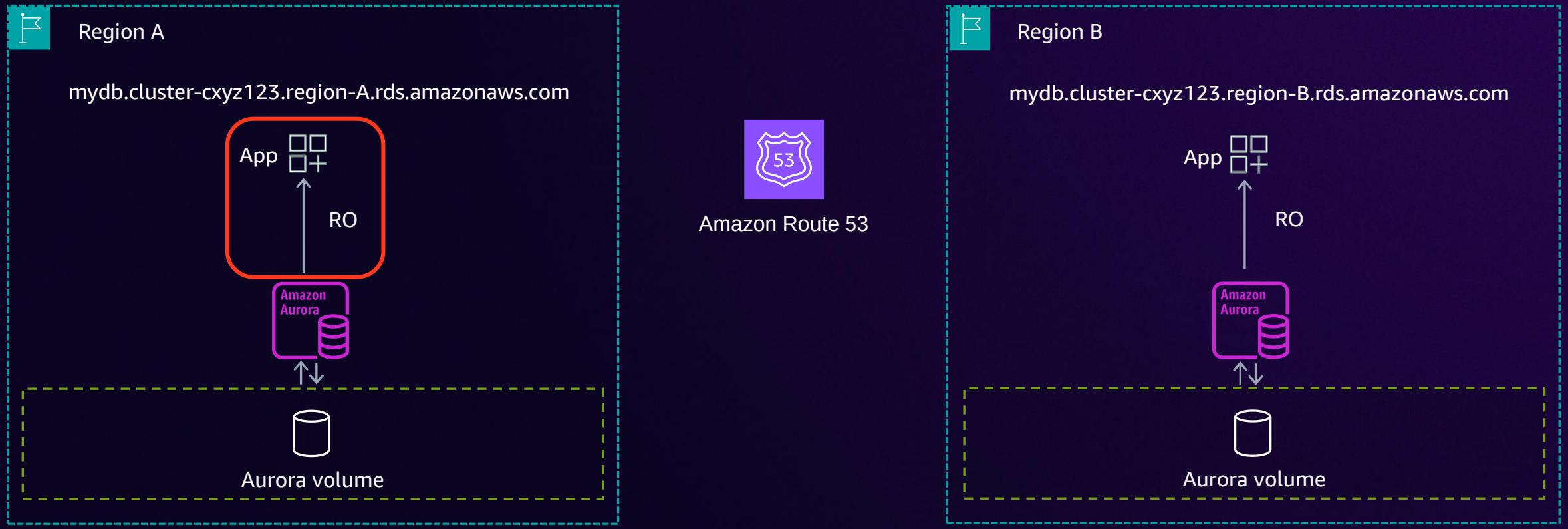

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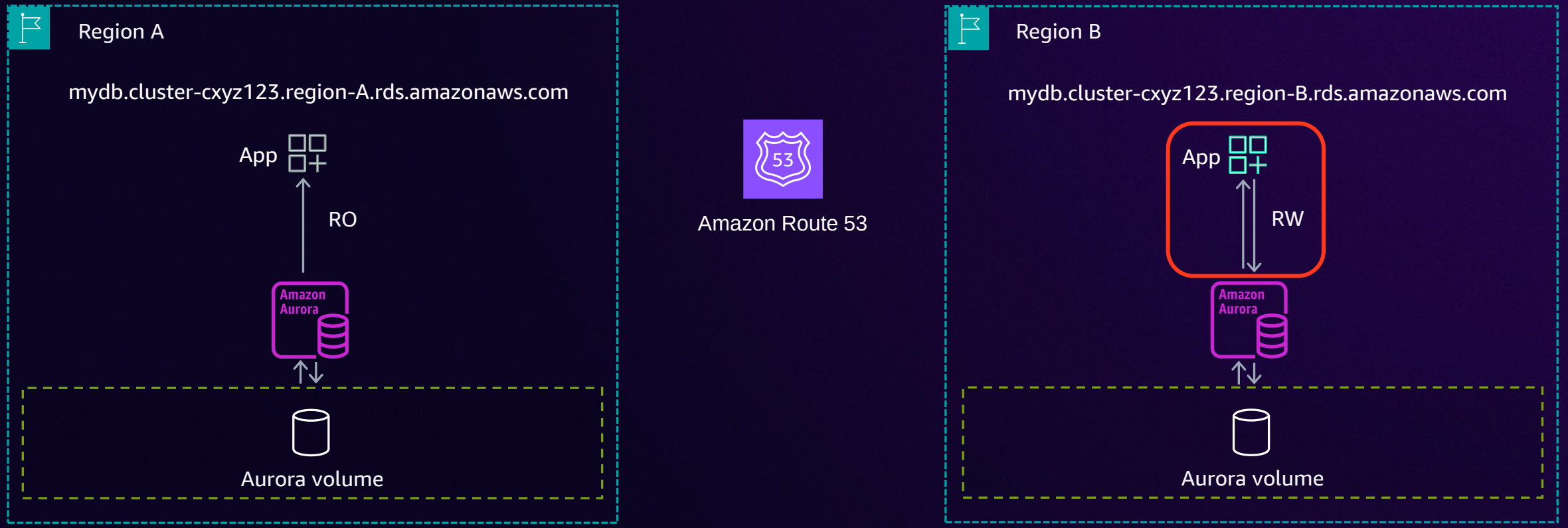

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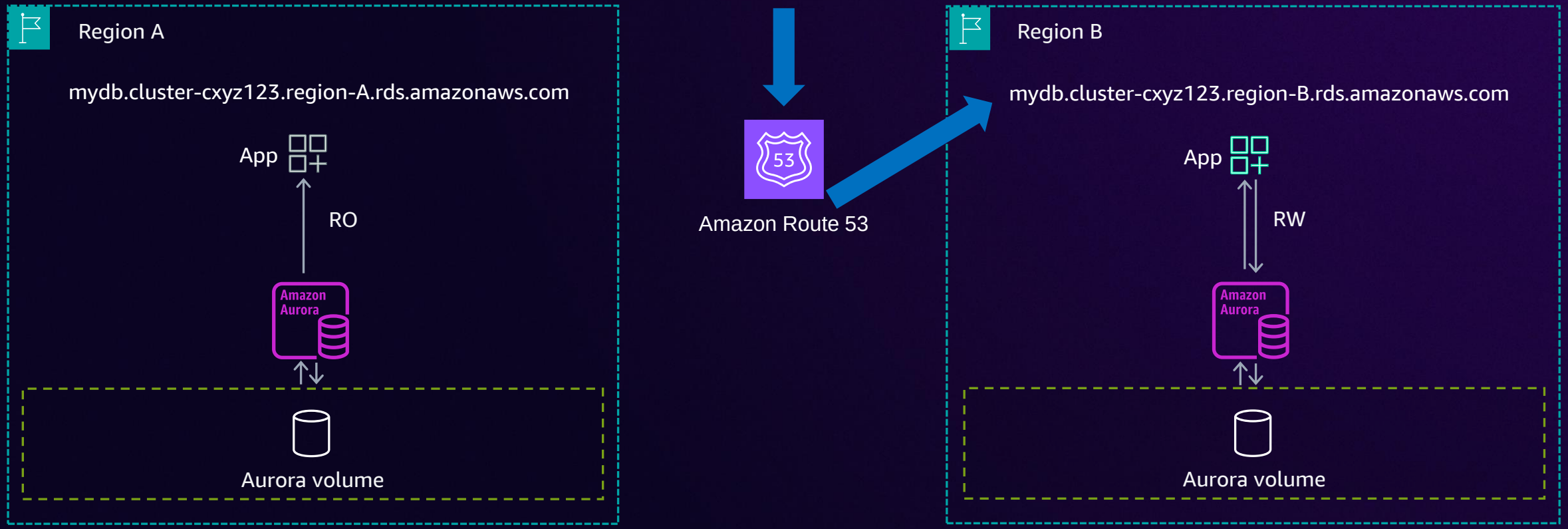

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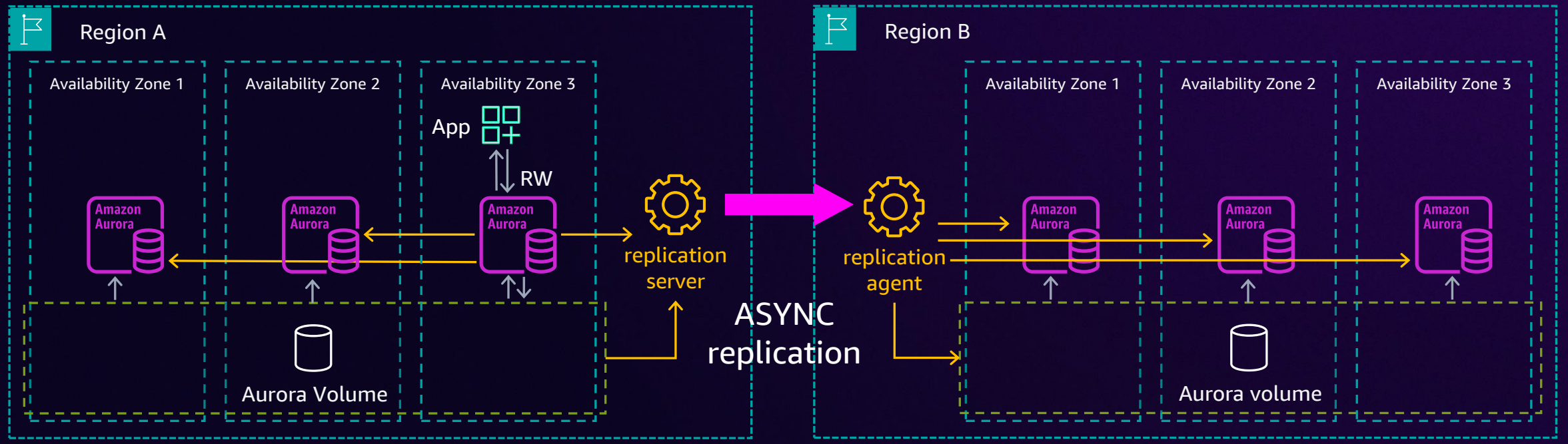
Aurora global database – Read resiliency



RTO ≈ 2+ minutes

RPO ≈ sub 1 second for replication lag + network partition time

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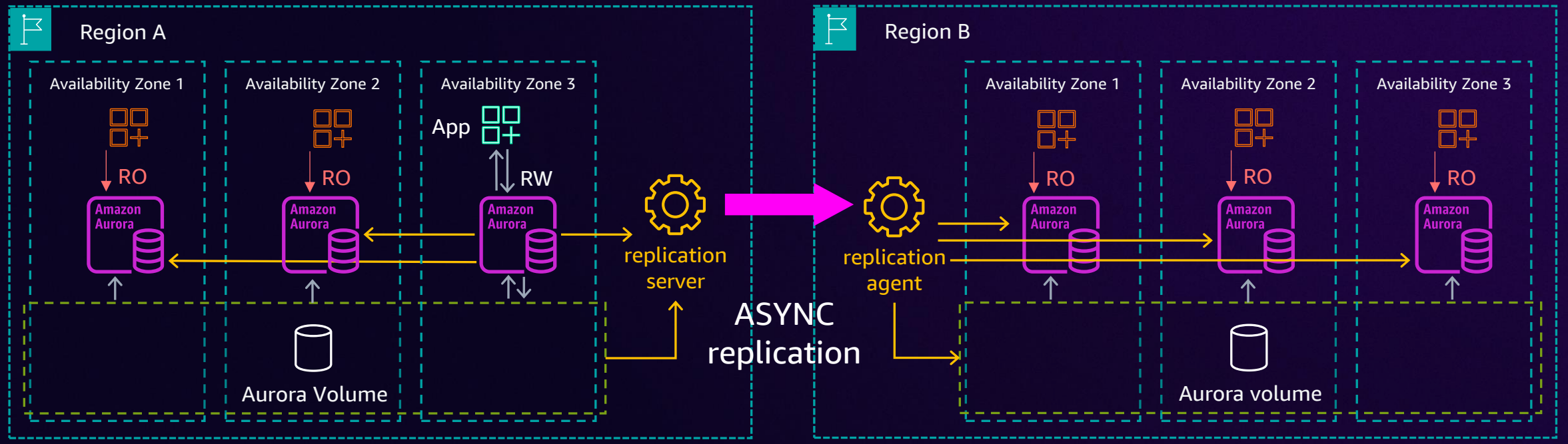
Aurora global database – Read resiliency



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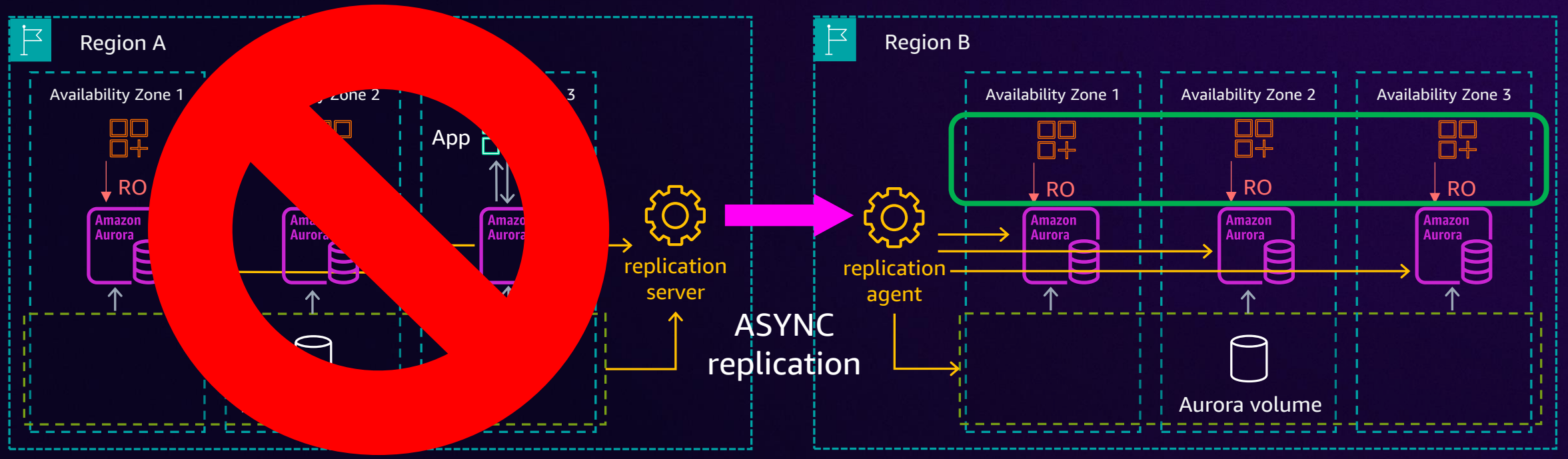

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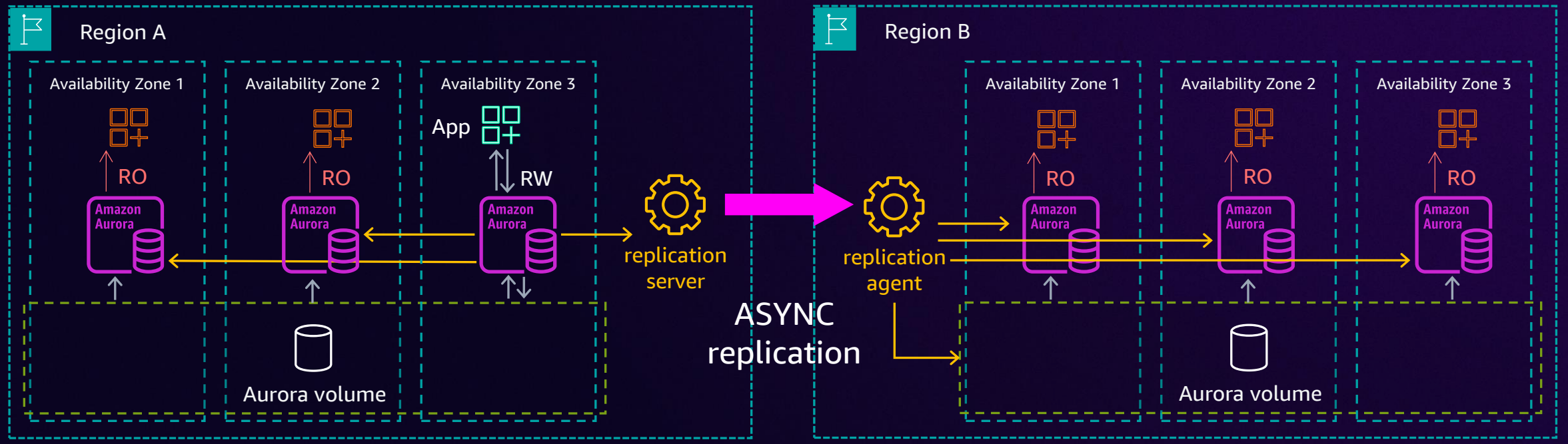
Aurora global database – Write forwarding



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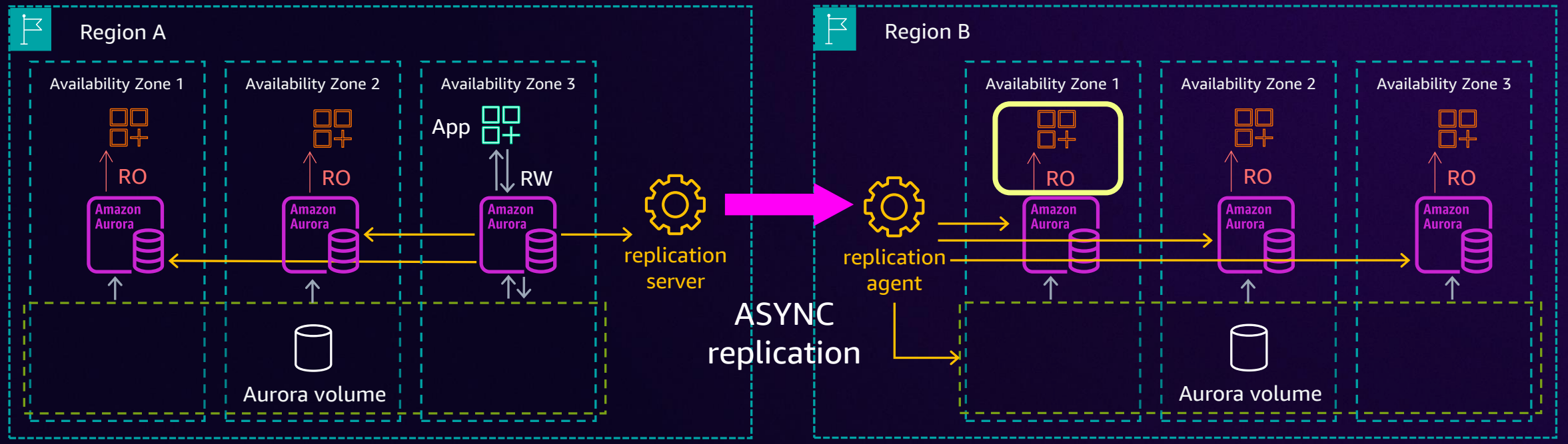
Aurora global database – Write forwarding



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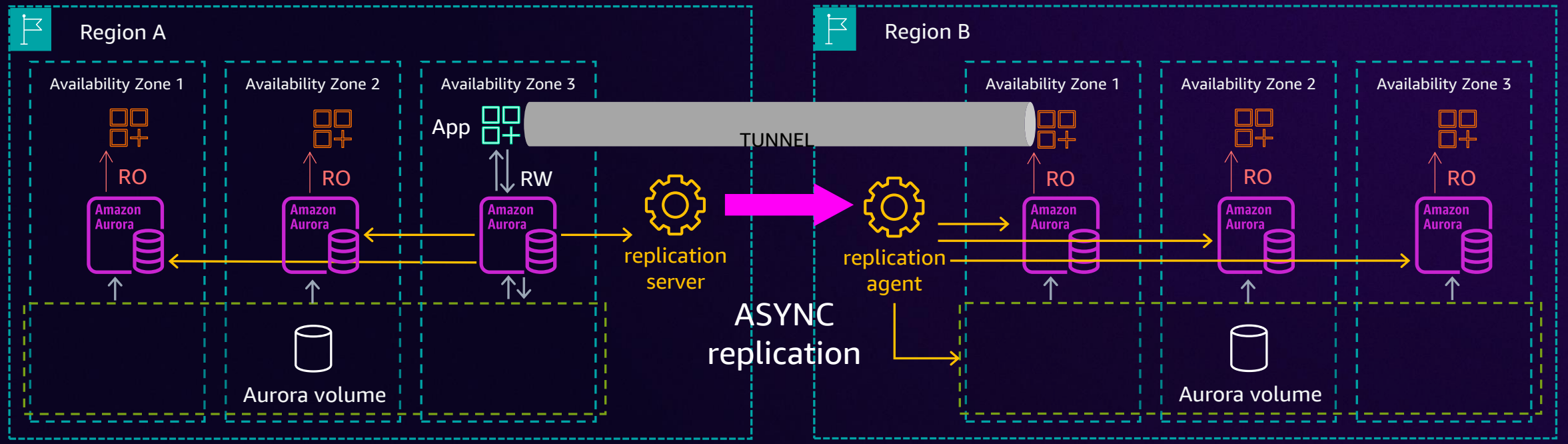

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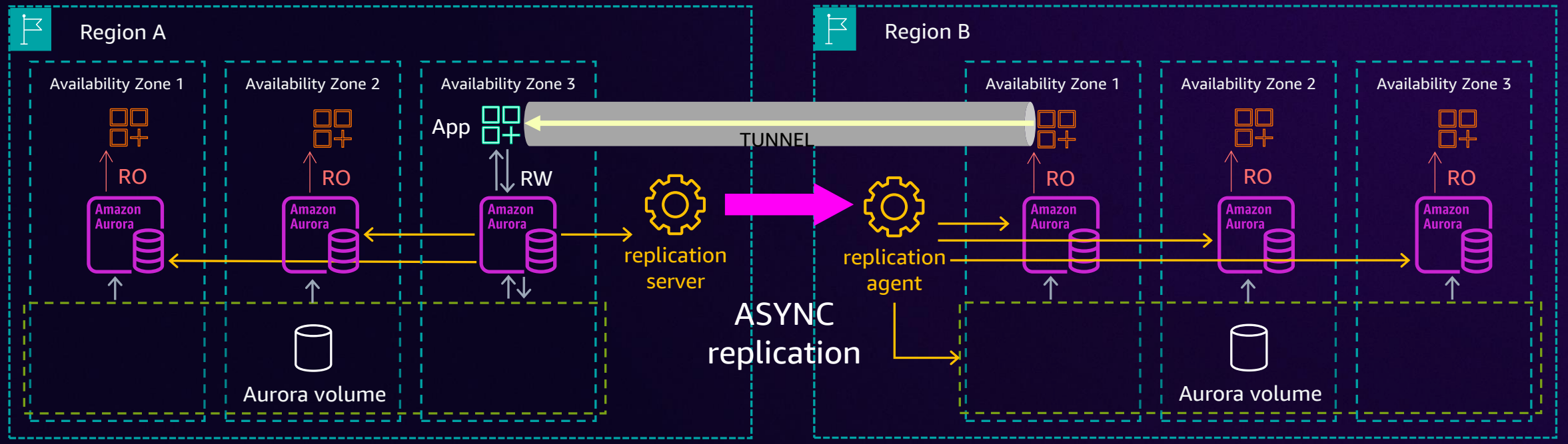

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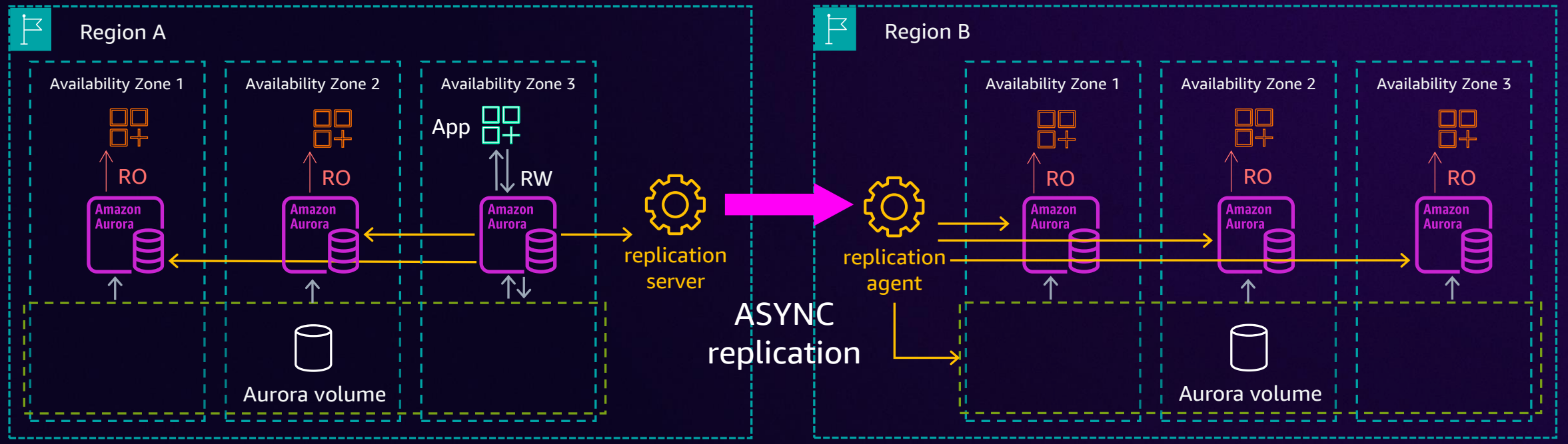

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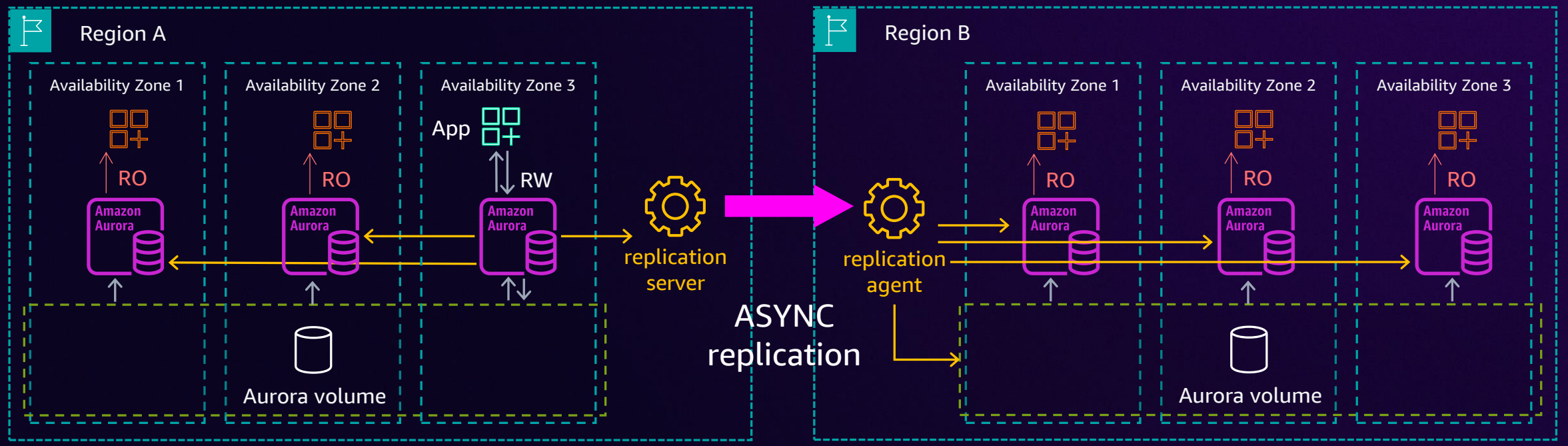

--enable-global-write-forwarding

RTO ≈ 2+ minutes

RPO ≈ sub 1 second for replication lag + network partition time

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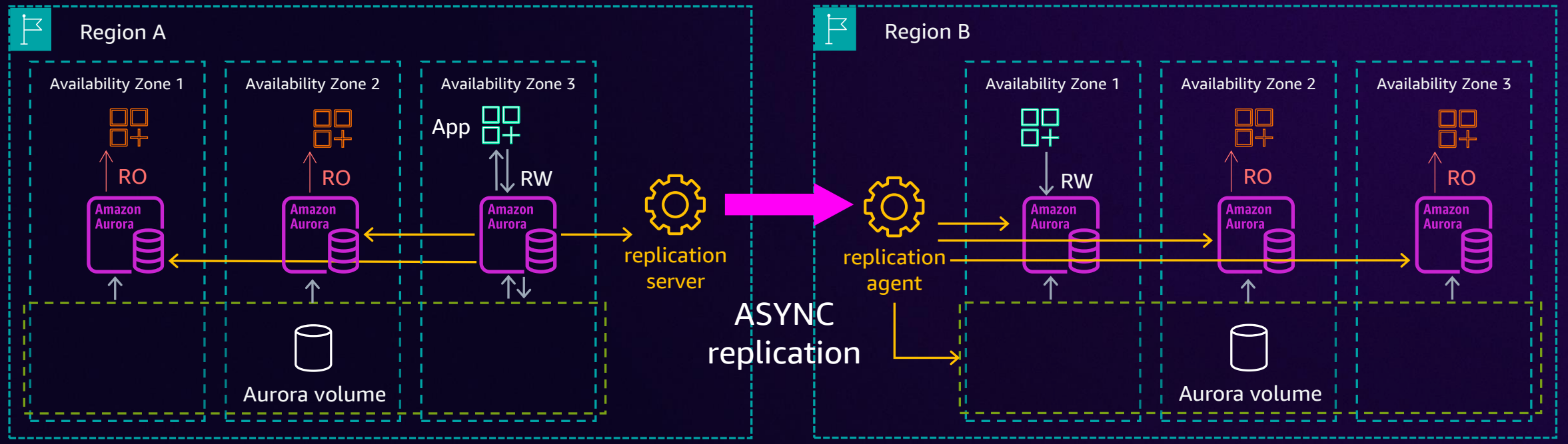
Aurora global database – Write forwarding



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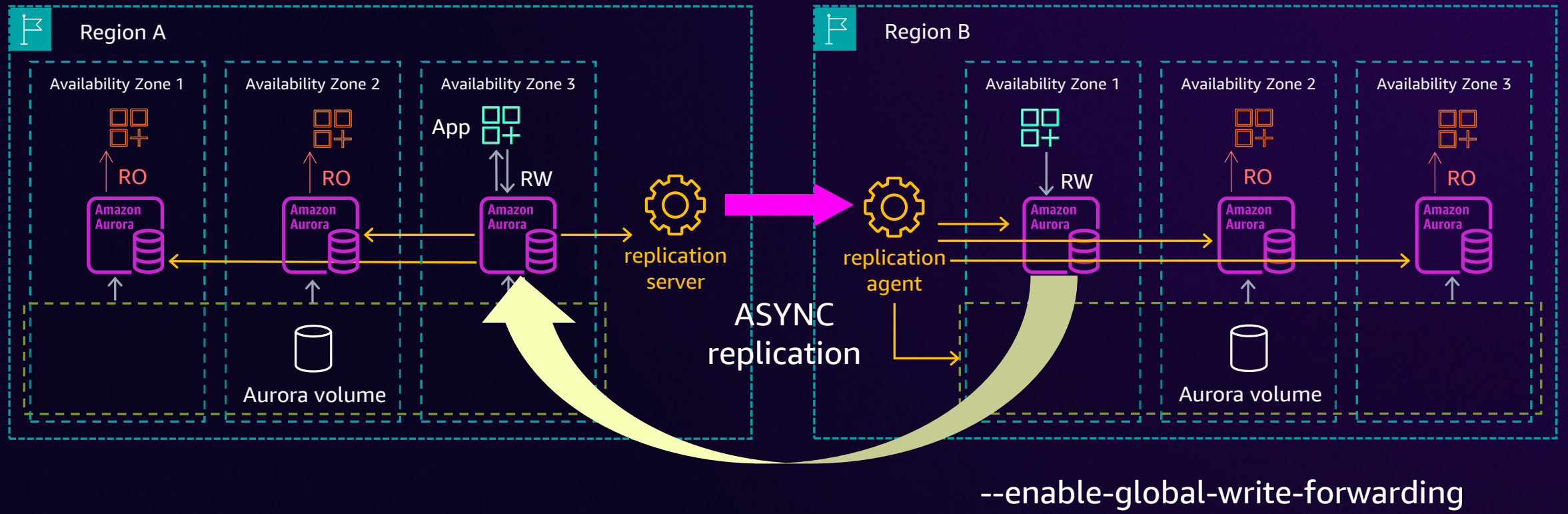

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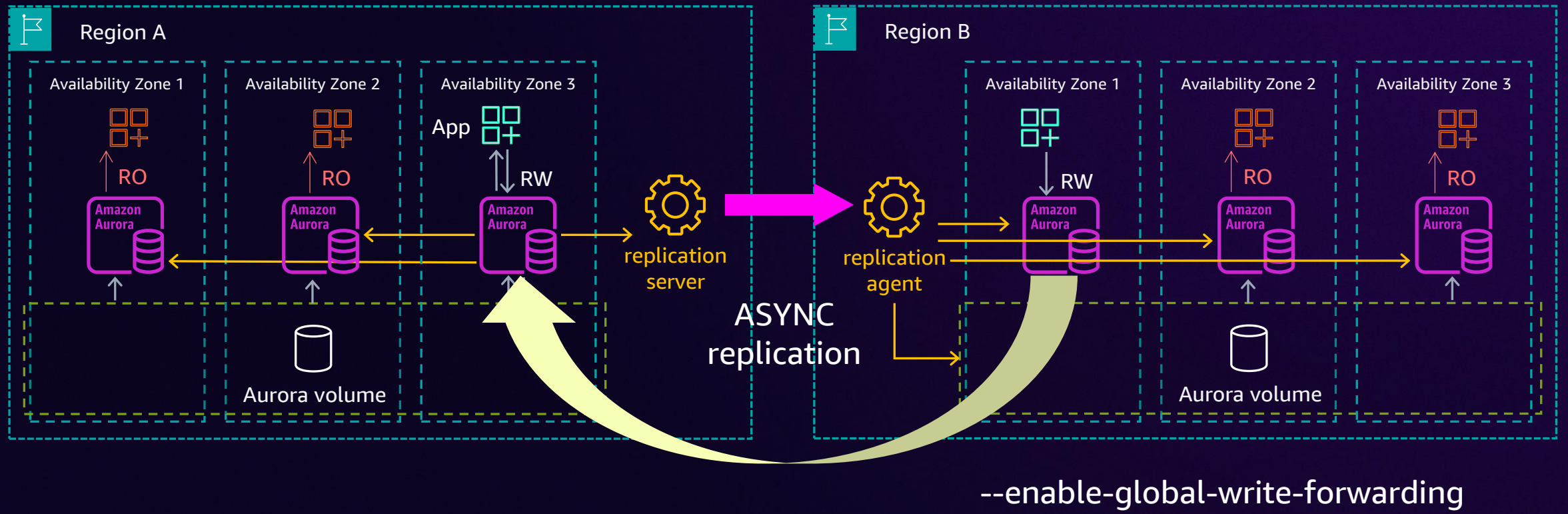
Aurora global database – Write forwarding



RTO ≈ 2+ minutes

RPO ≈ sub 1 second for replication lag + network partition time

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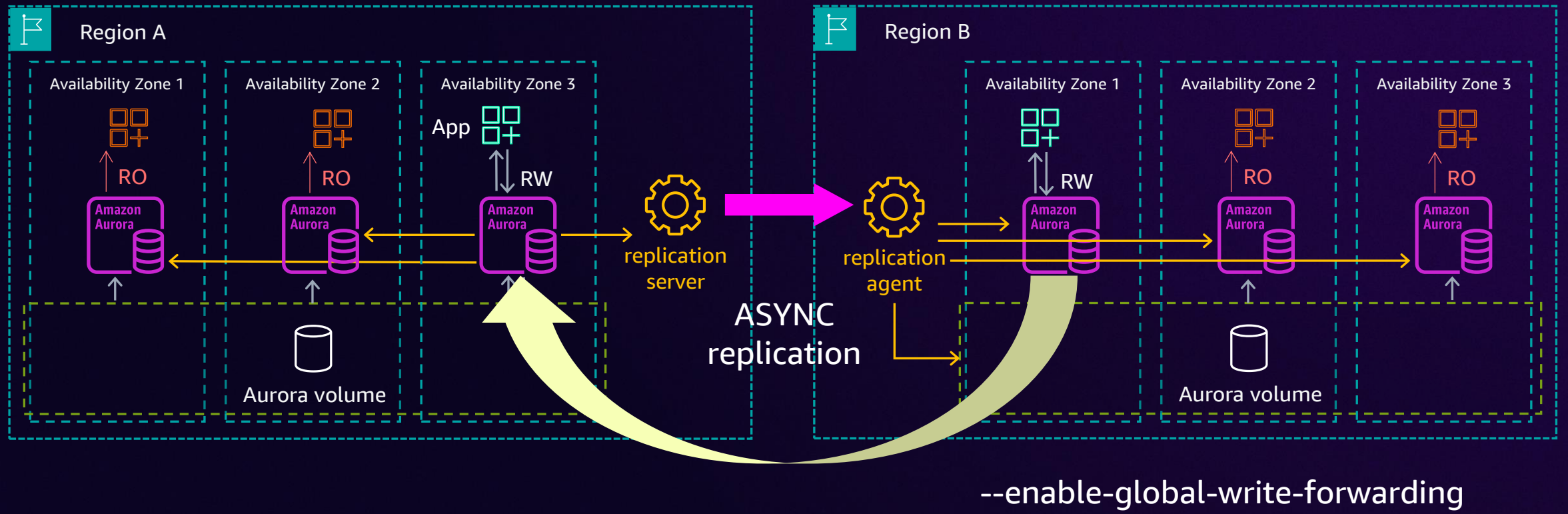
Aurora global database – Write forwarding



RTO ≈ 2+ minutes

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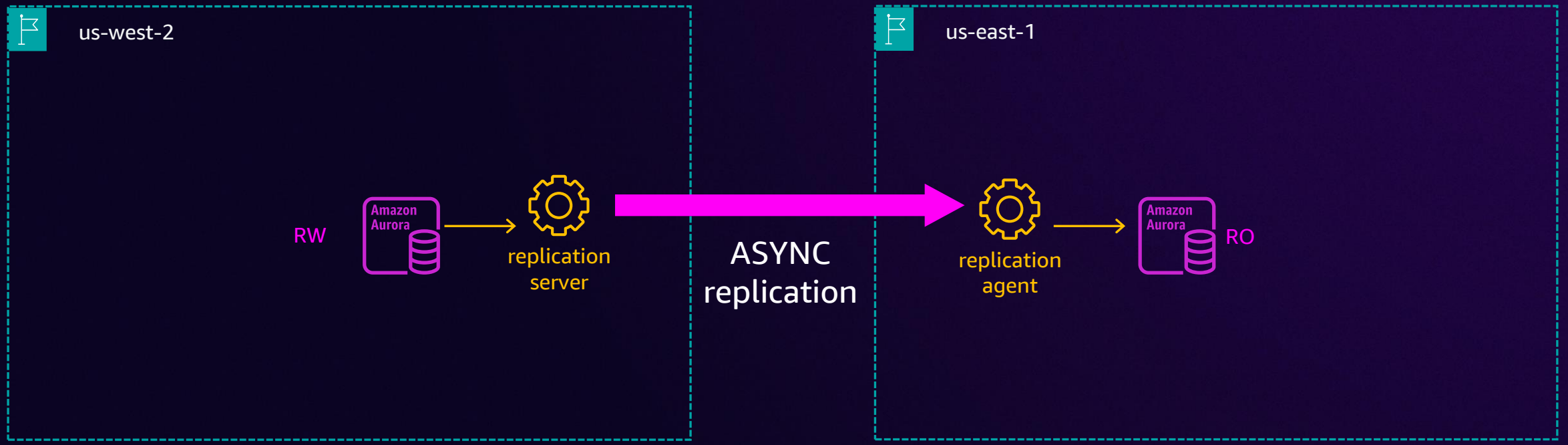
Aurora global database – Session read visibility



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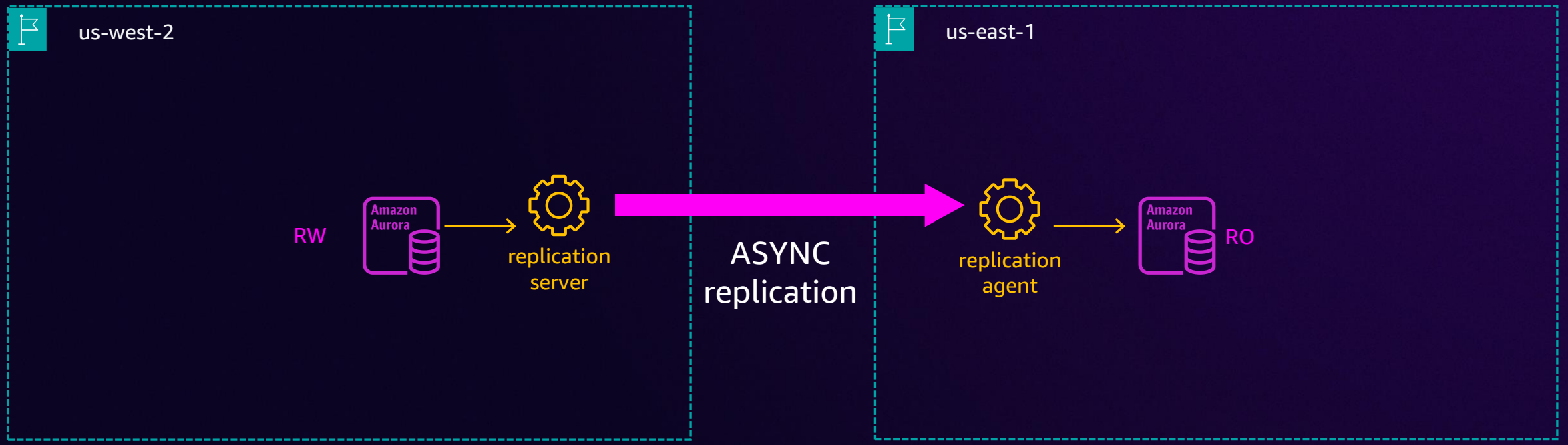

apg_write_forward.consistency_mode=session

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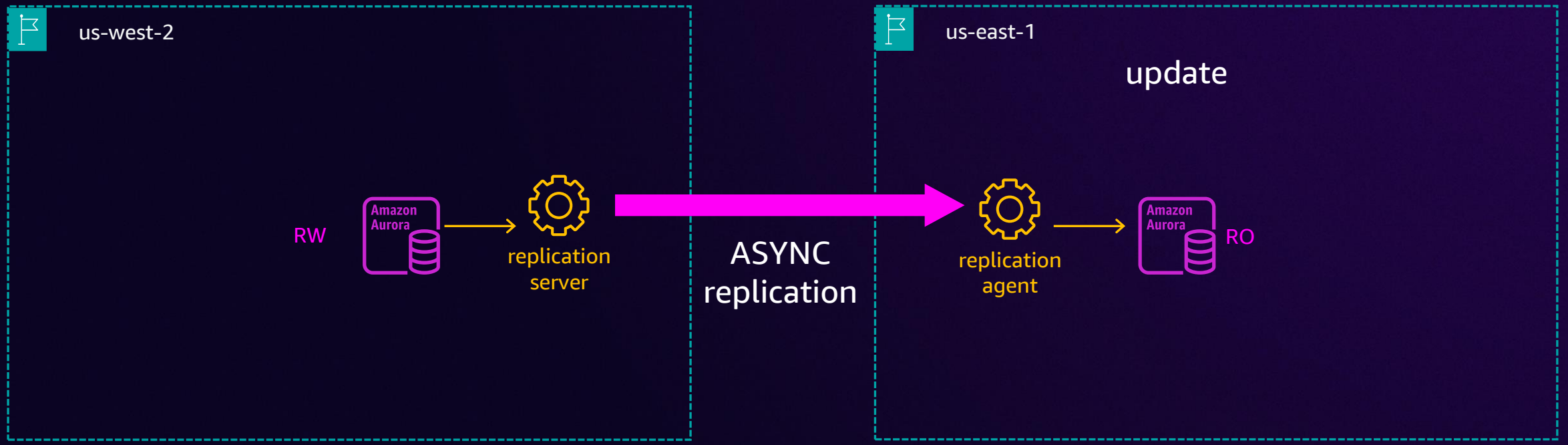

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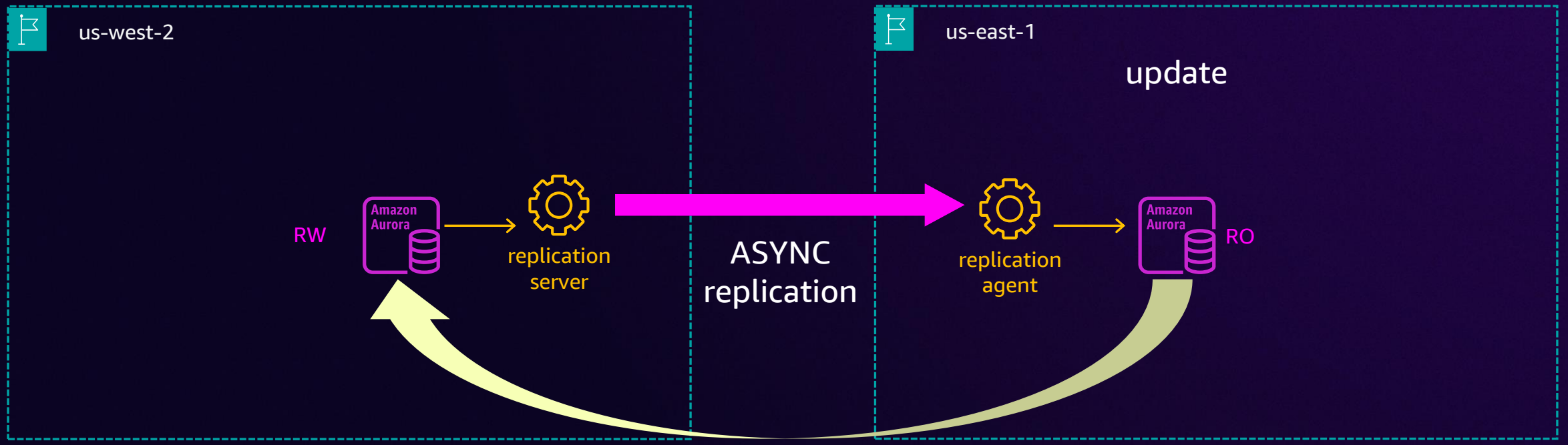

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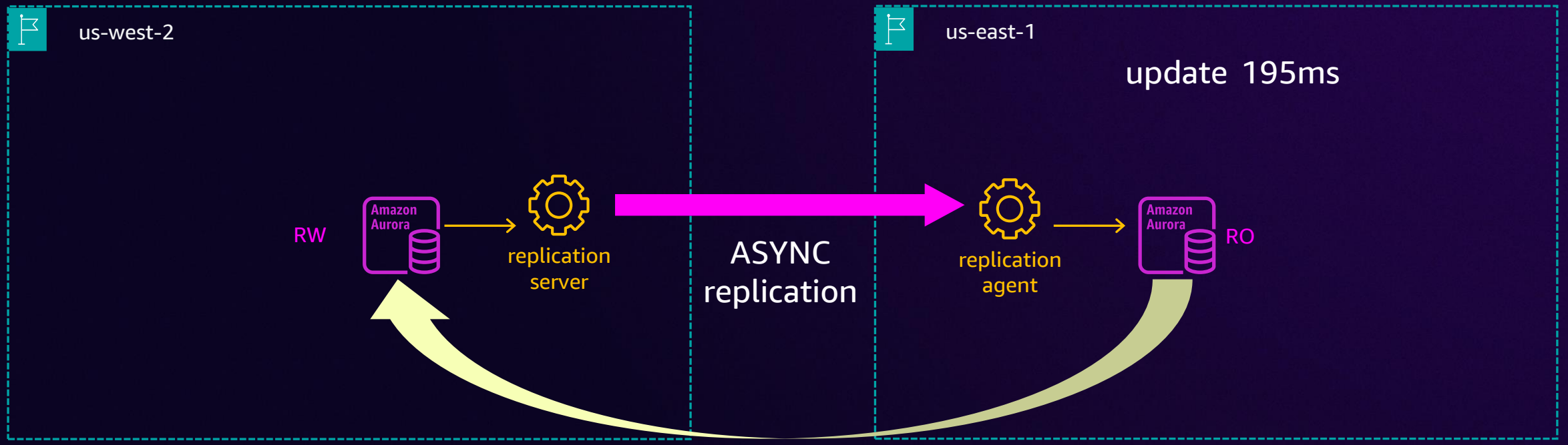

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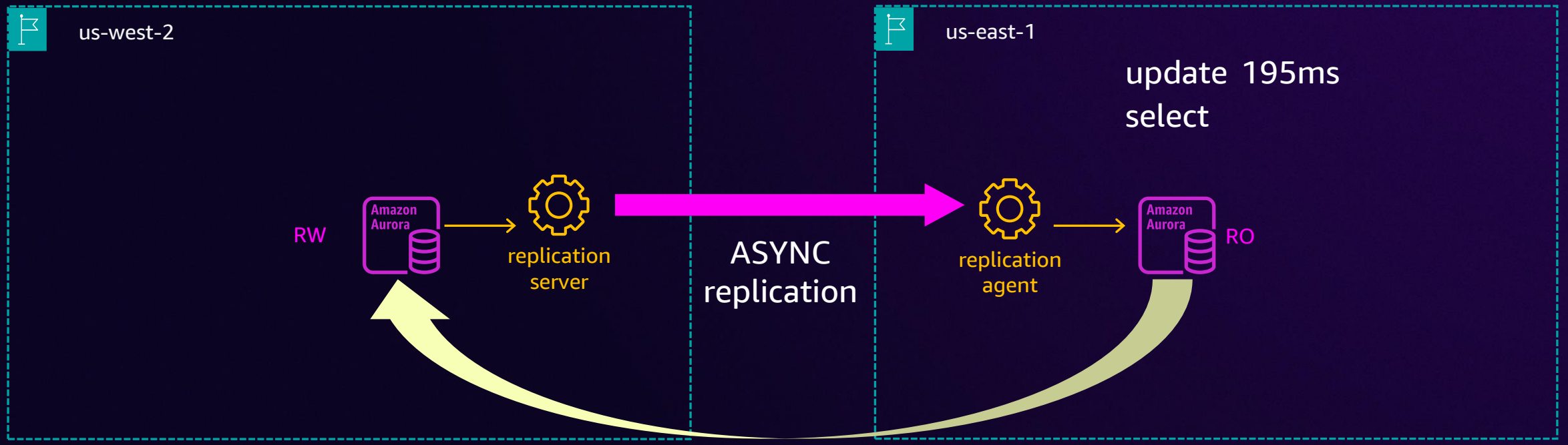

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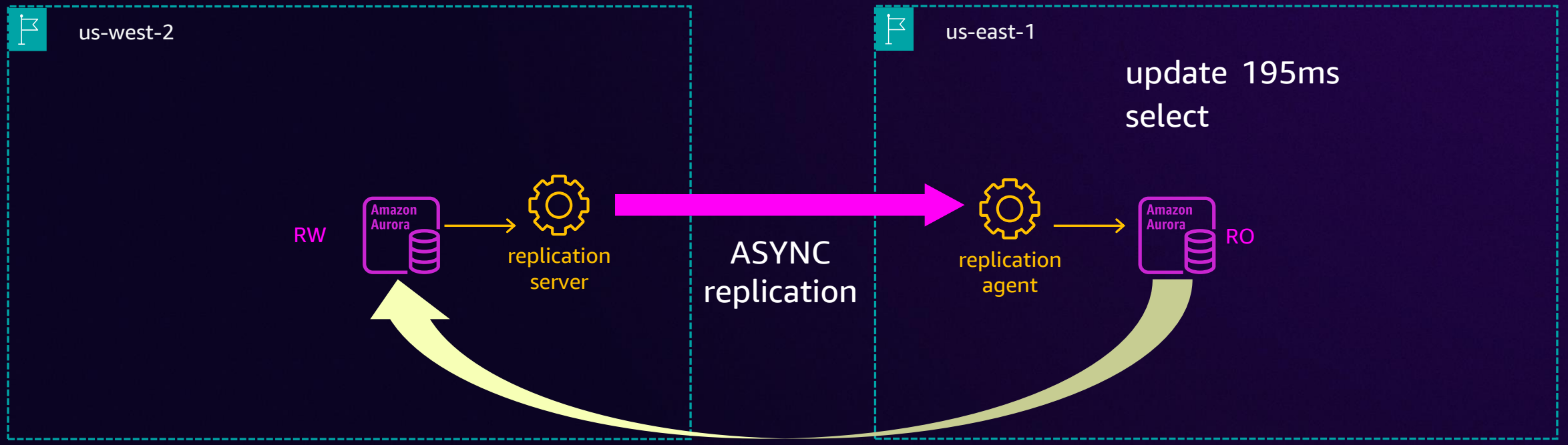

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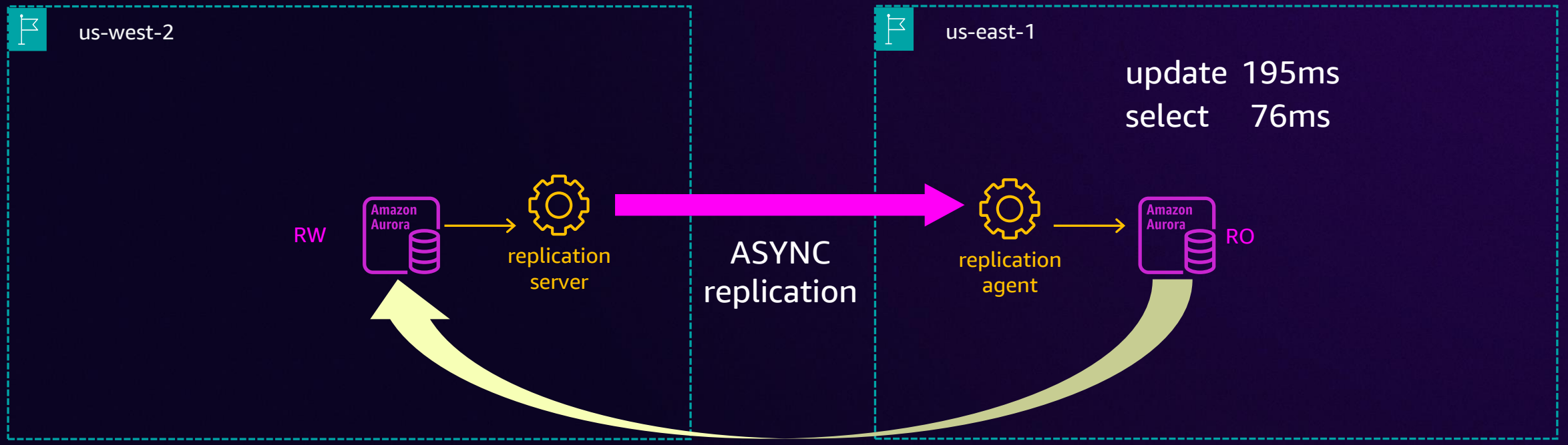

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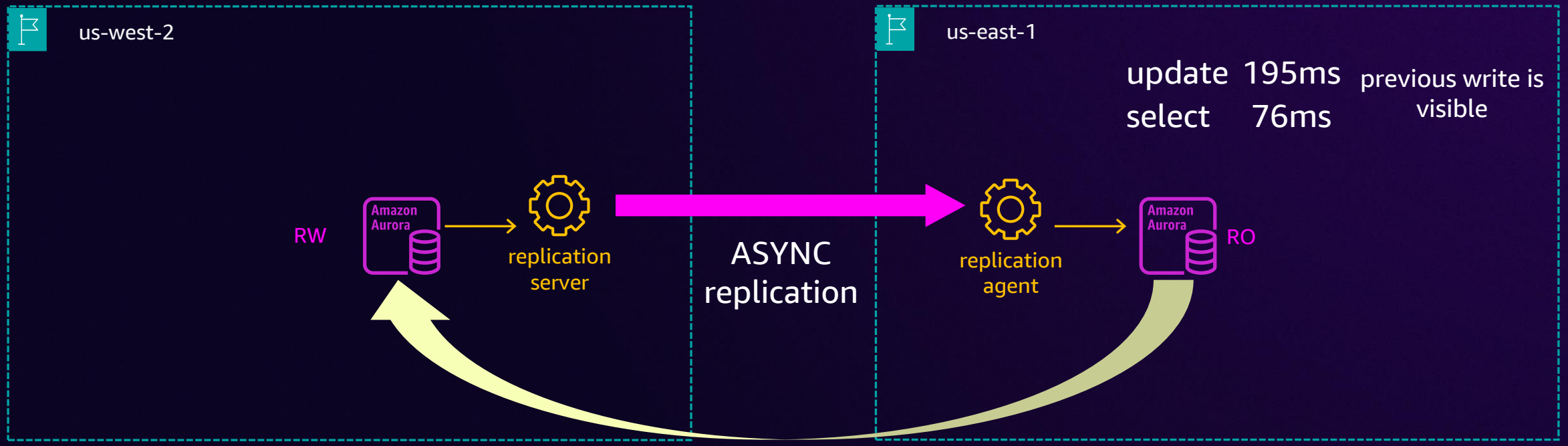

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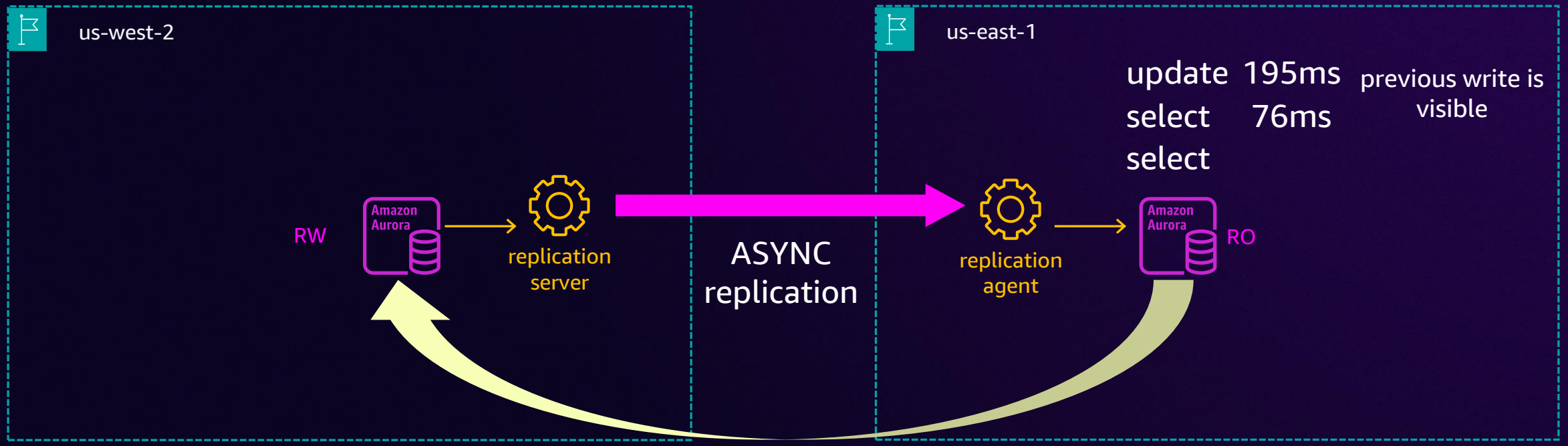

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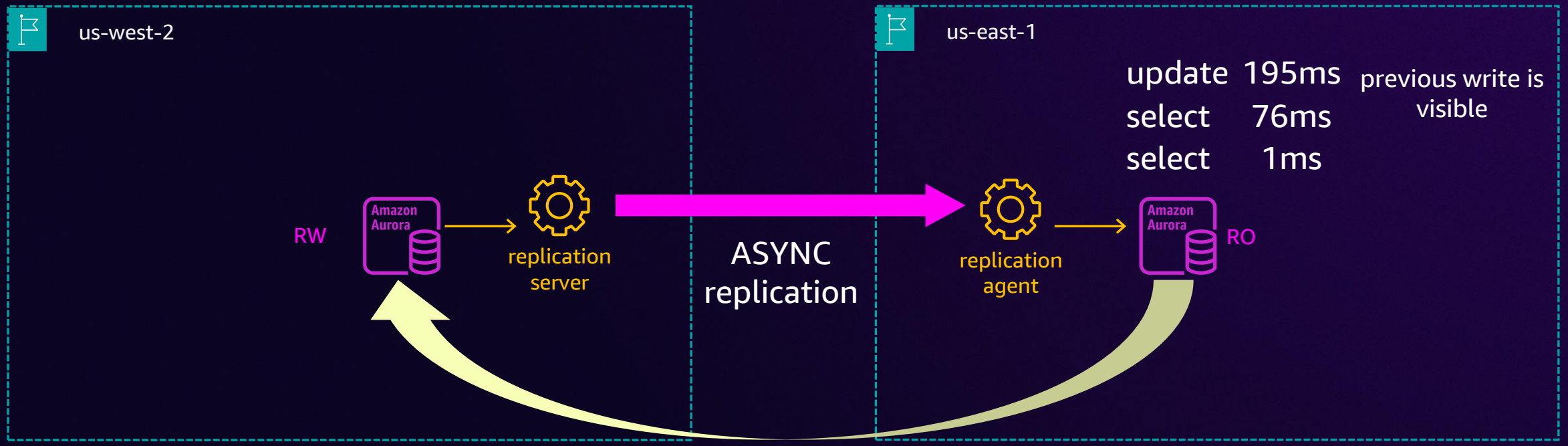

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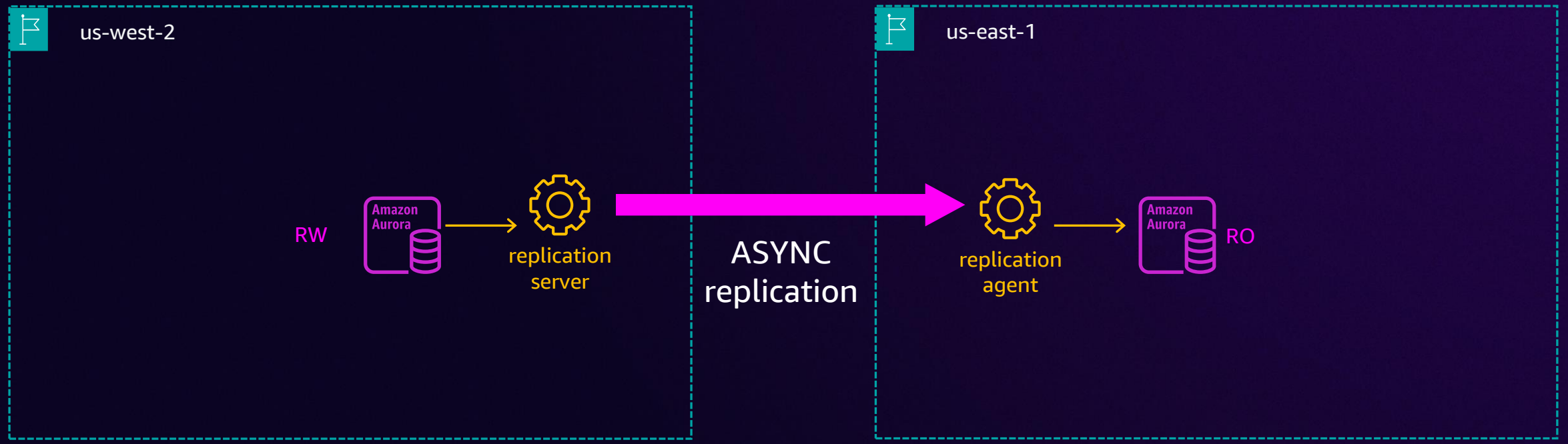
Aurora global database – Eventual read visibility



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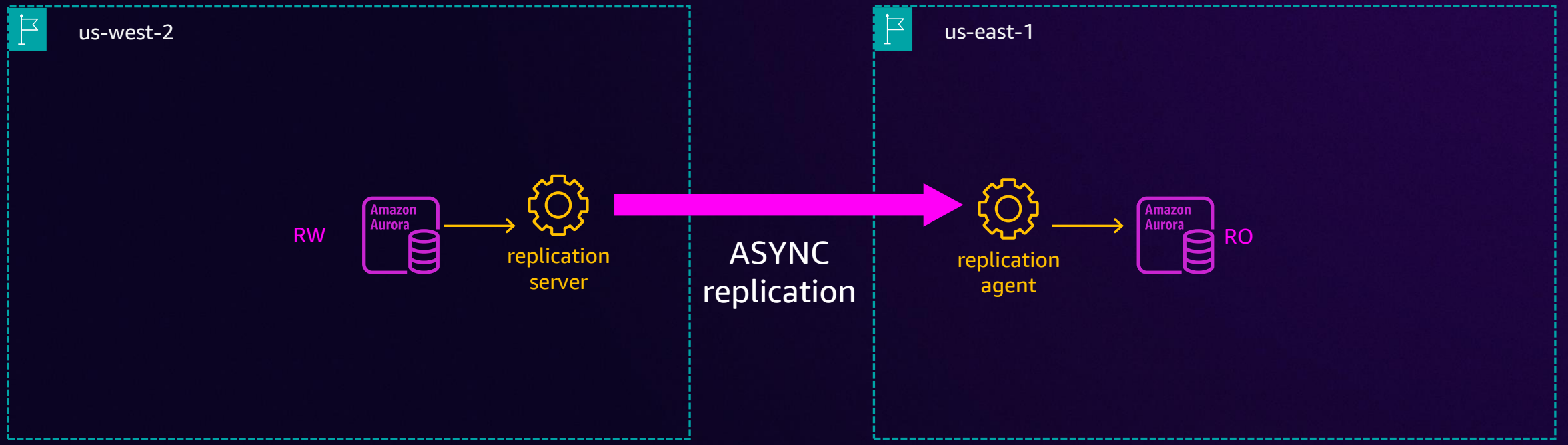

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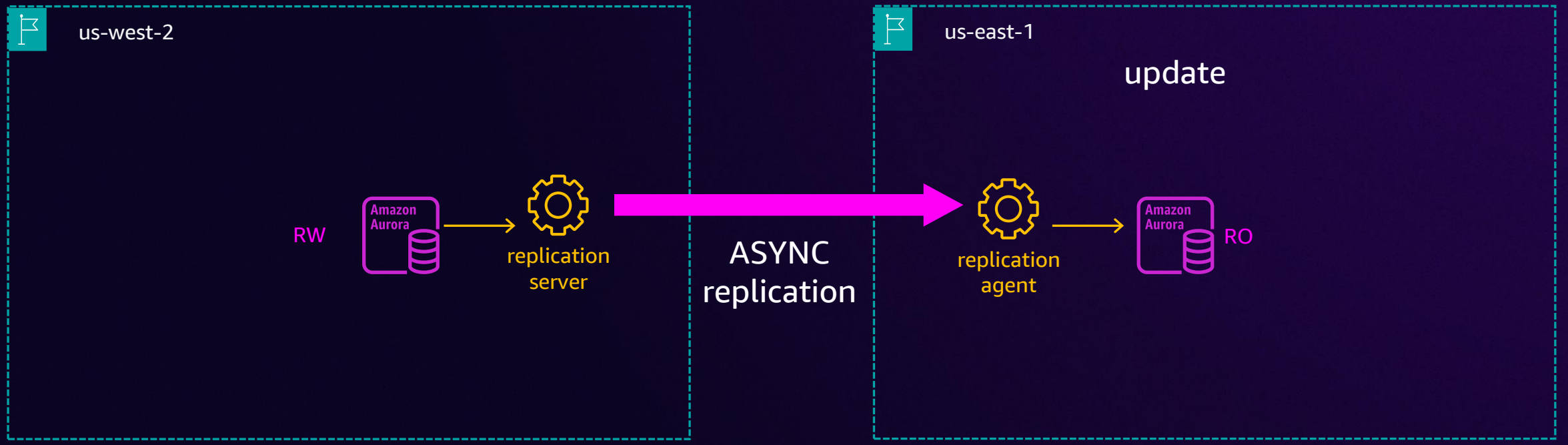

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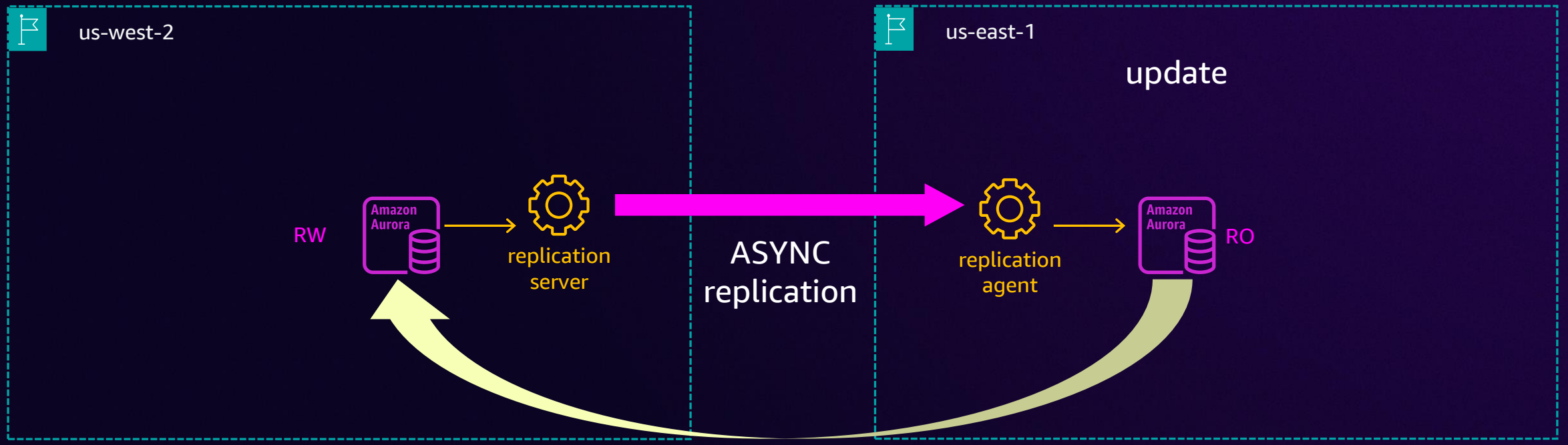

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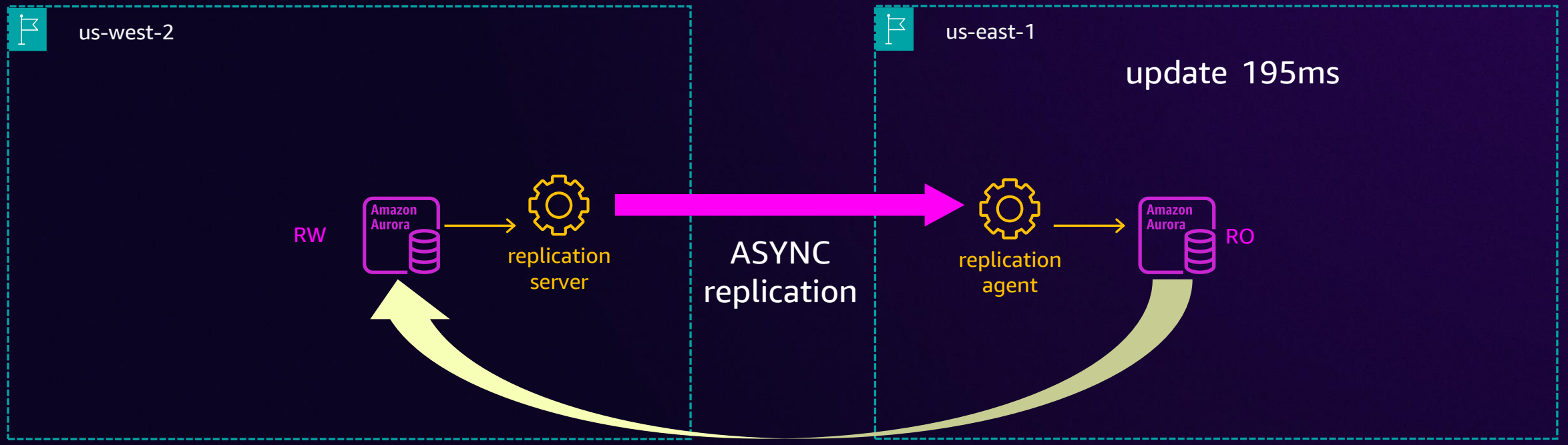

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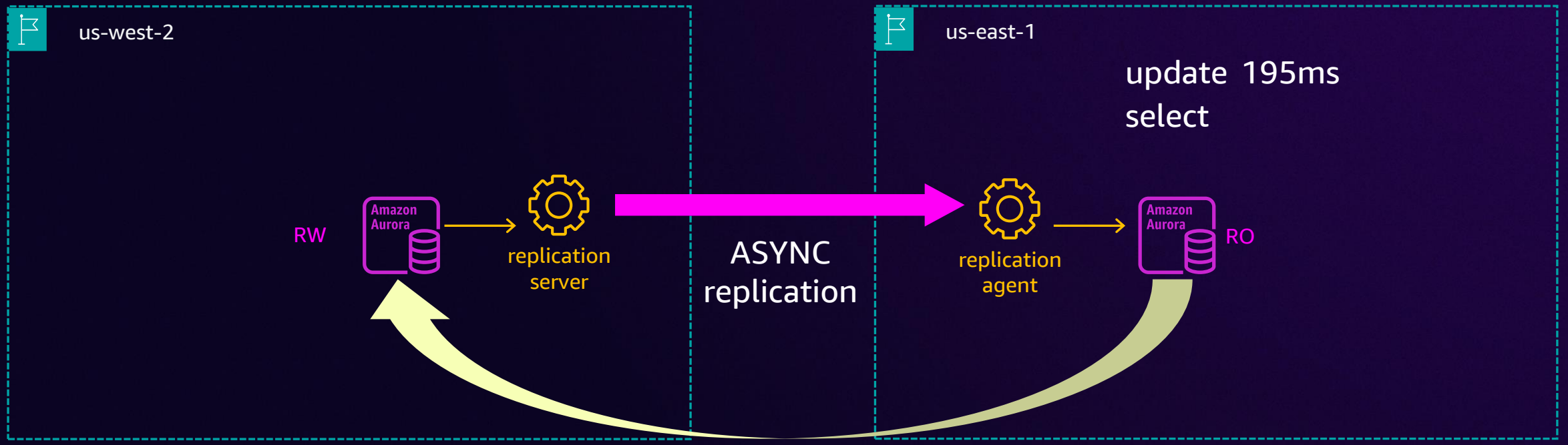

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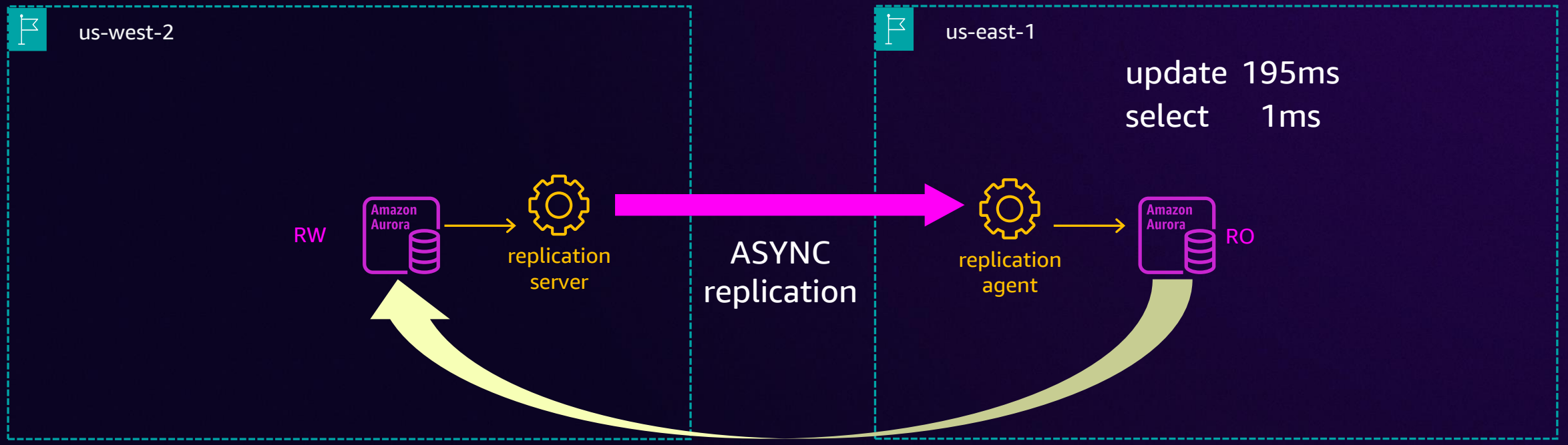

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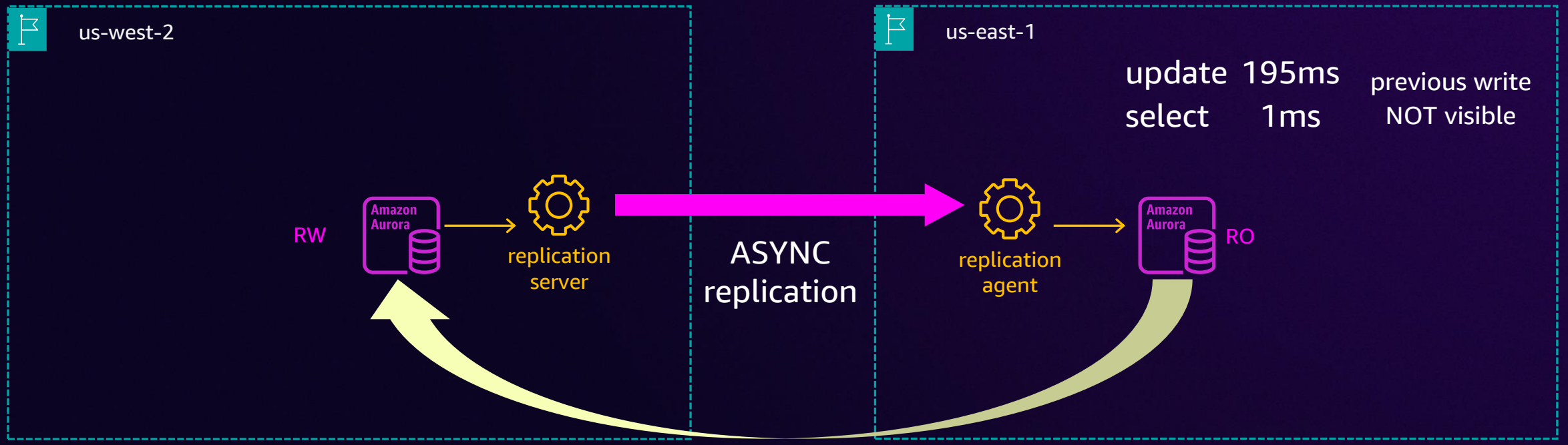

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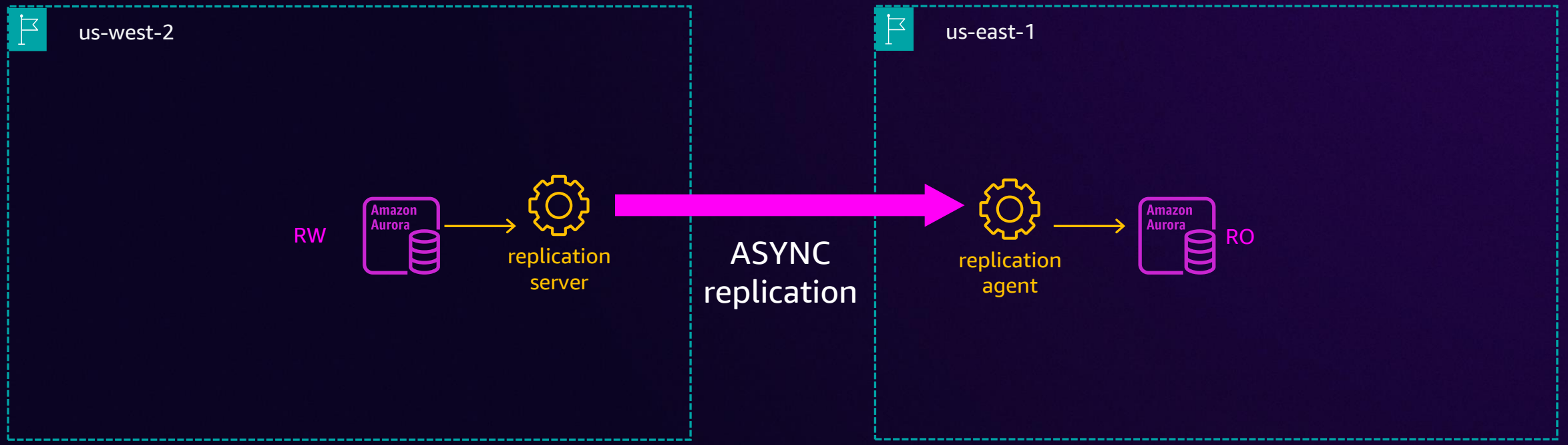
Aurora global database – Global read visibility



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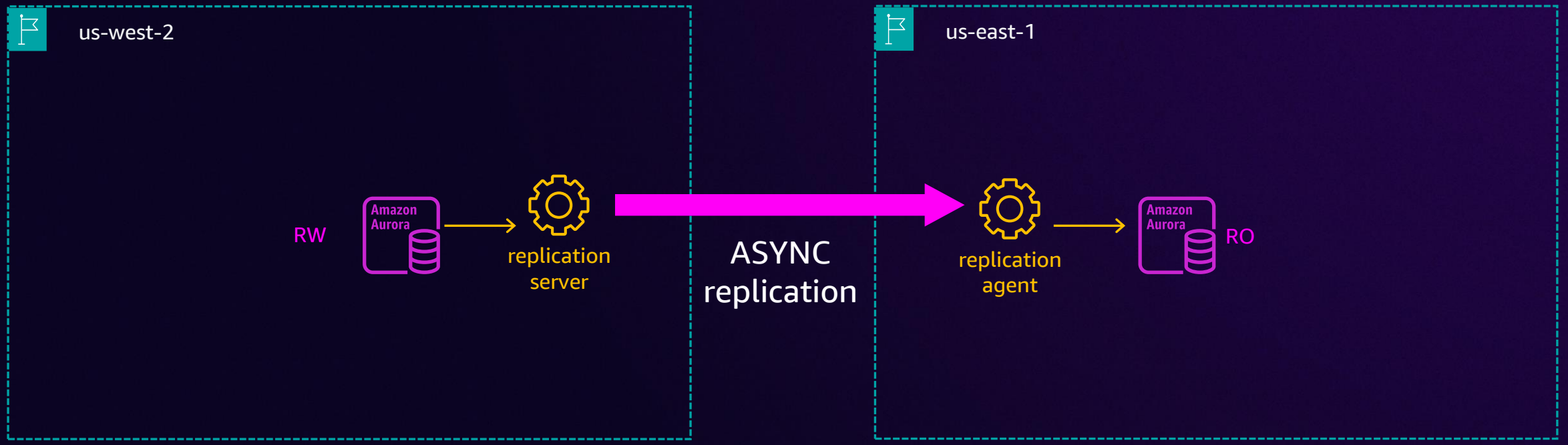

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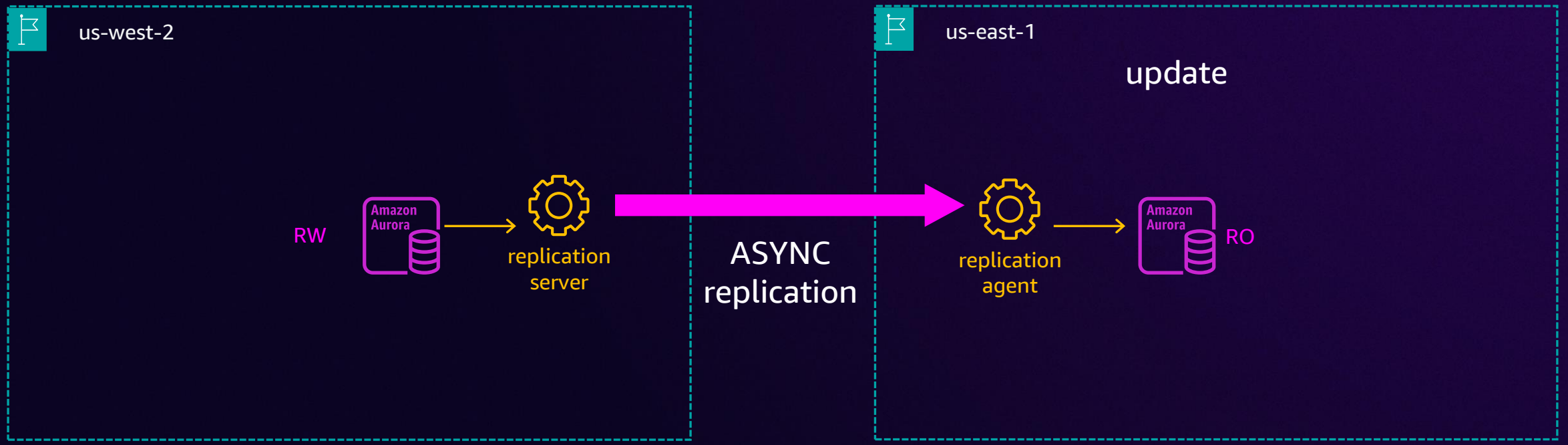

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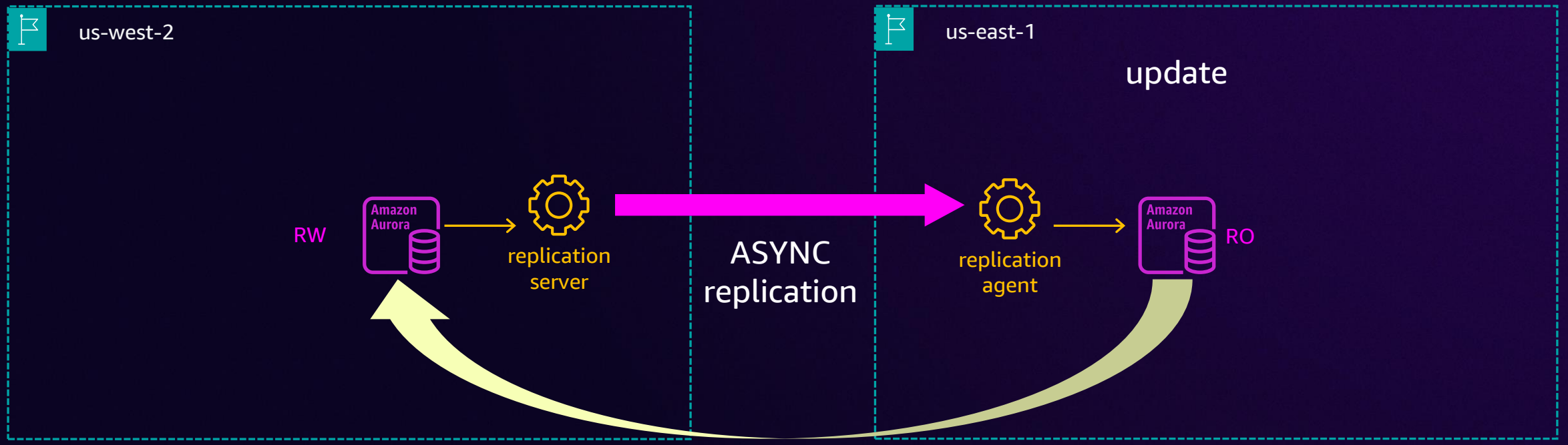

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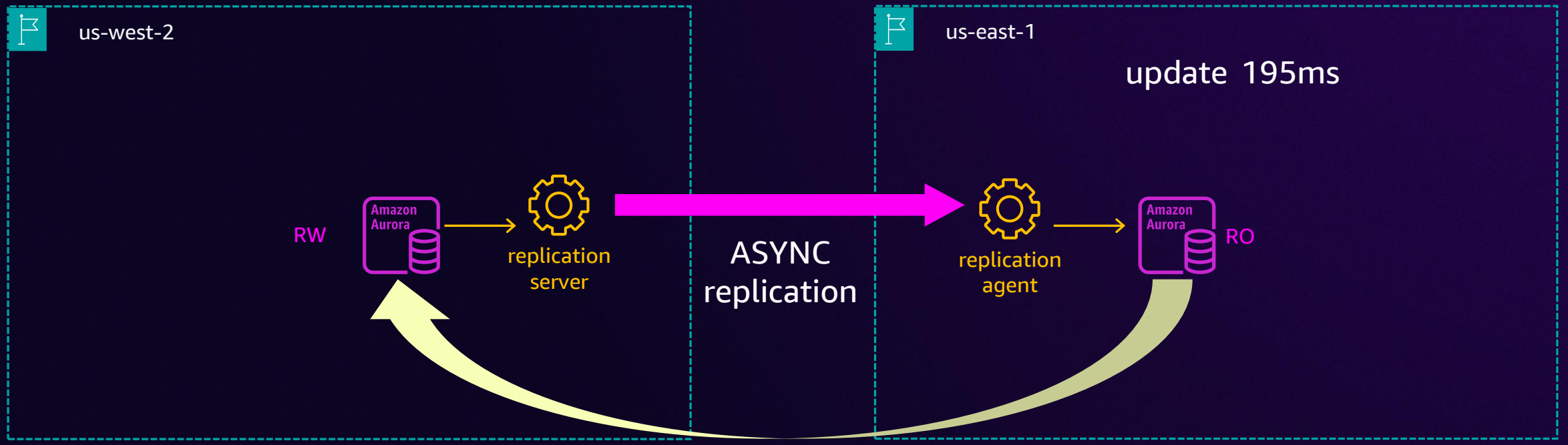

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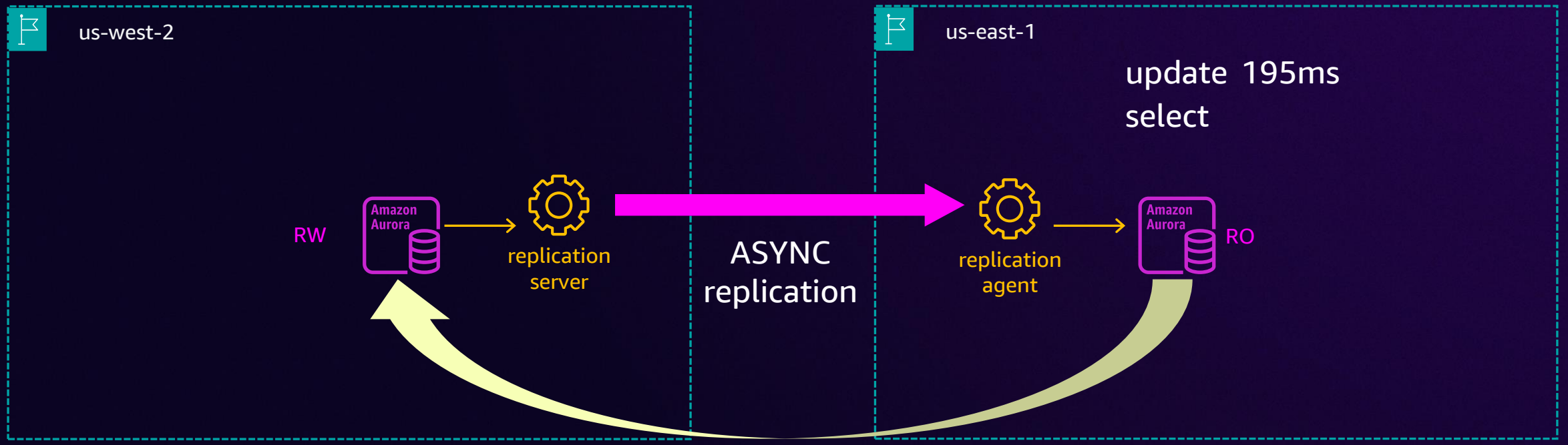

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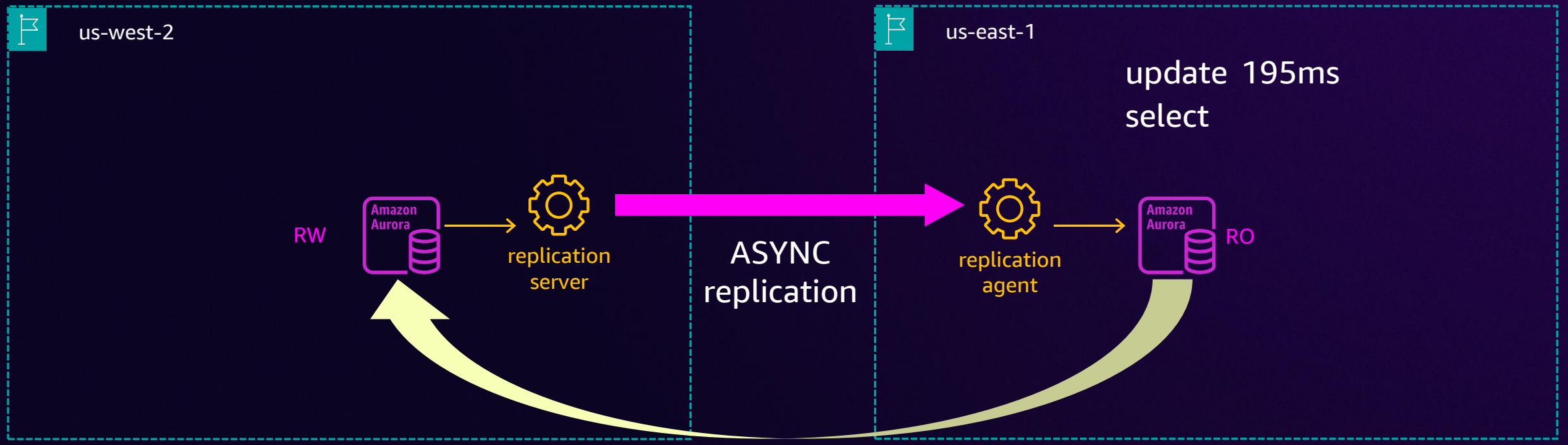

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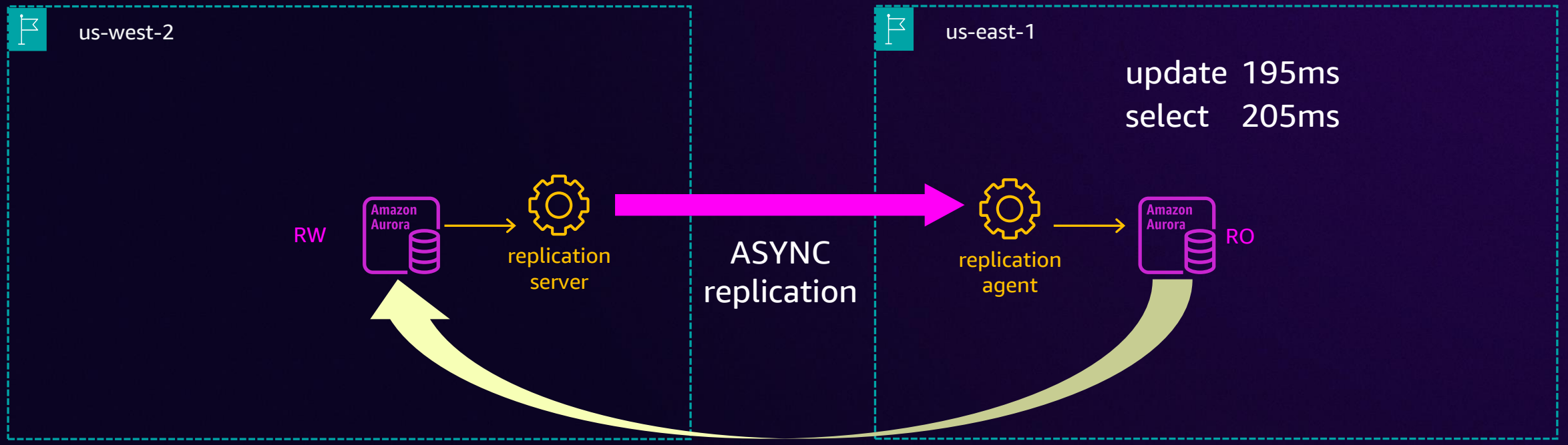

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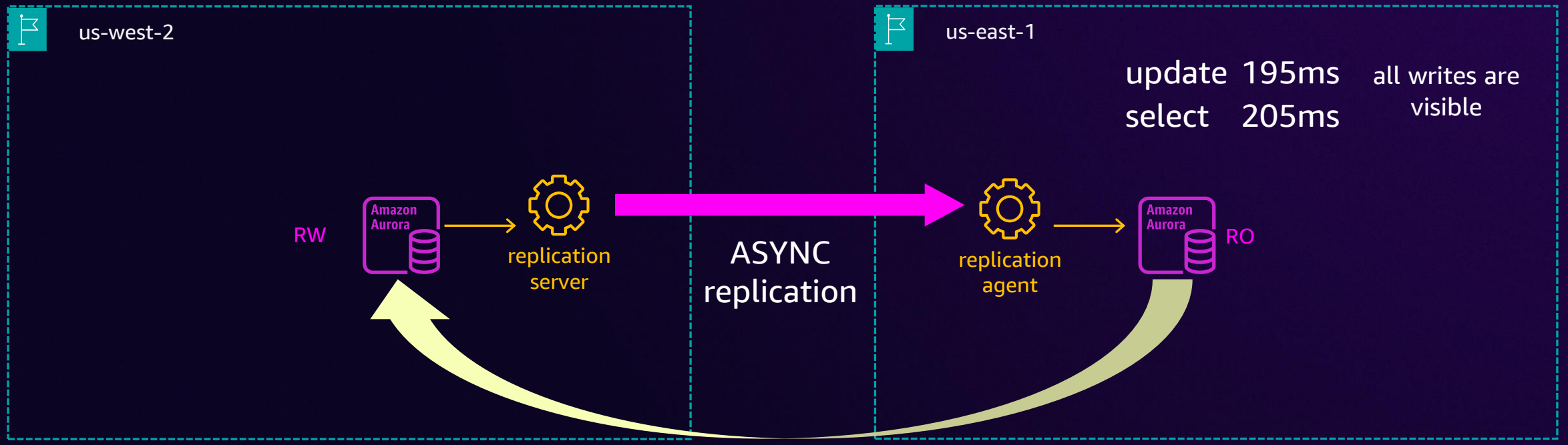
Aurora global database – Global read visibility



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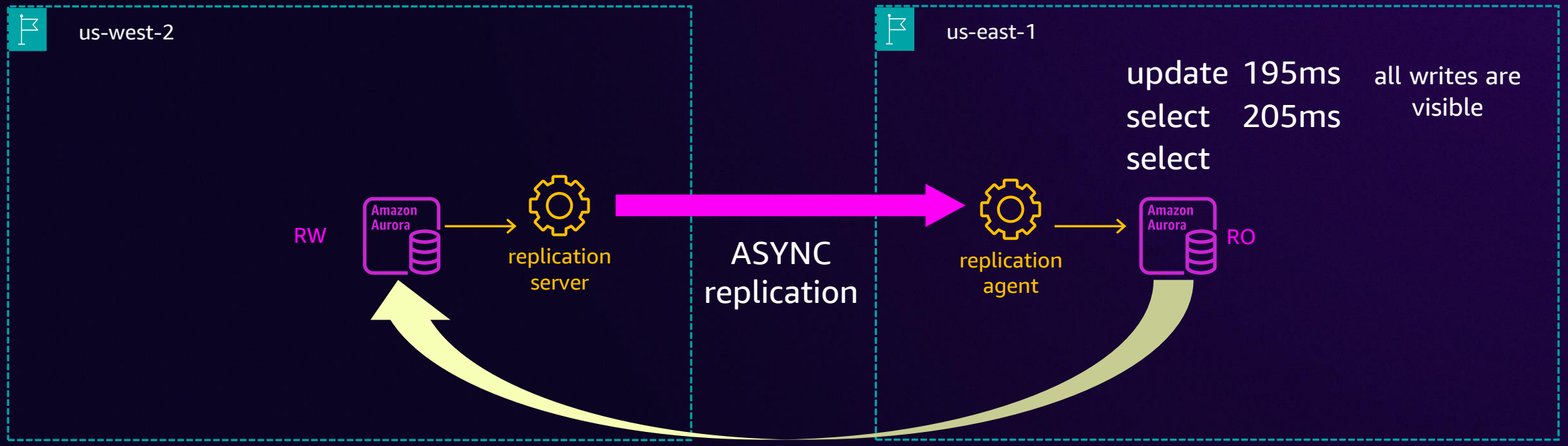

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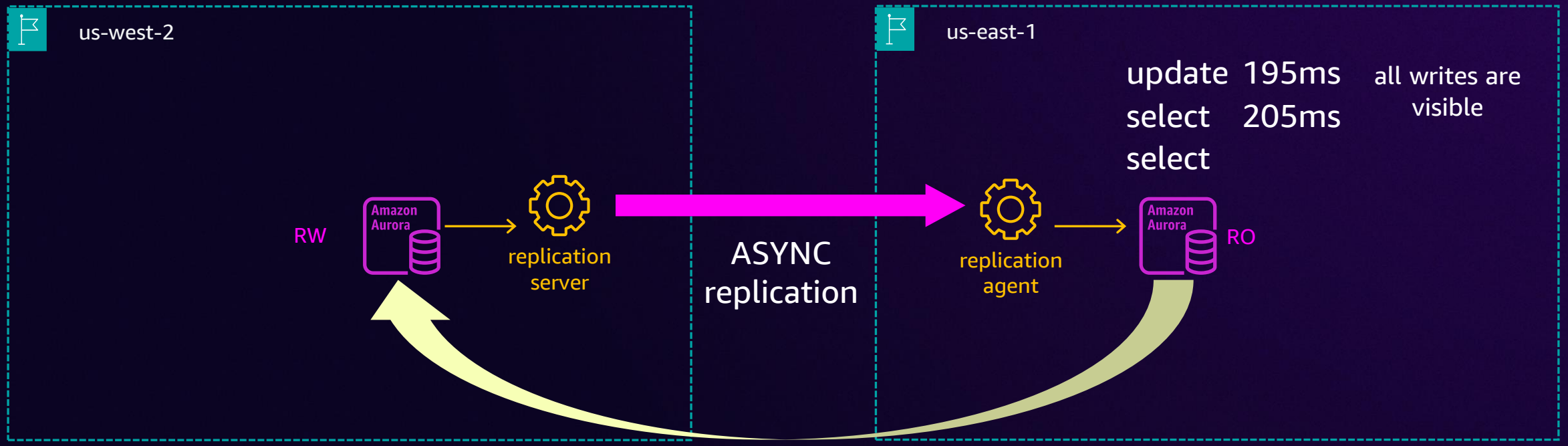

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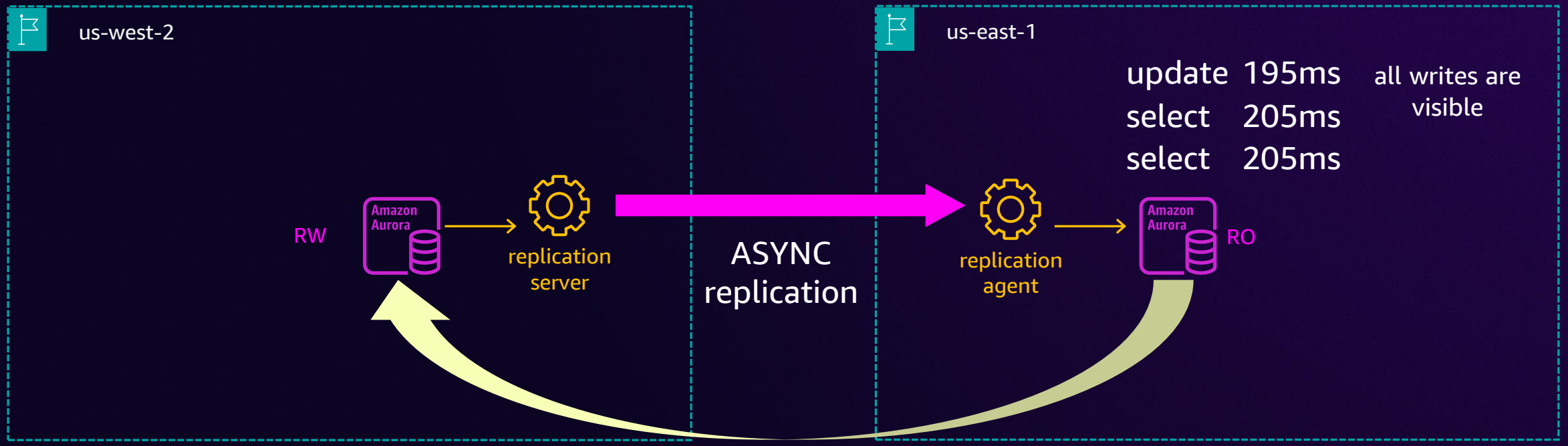

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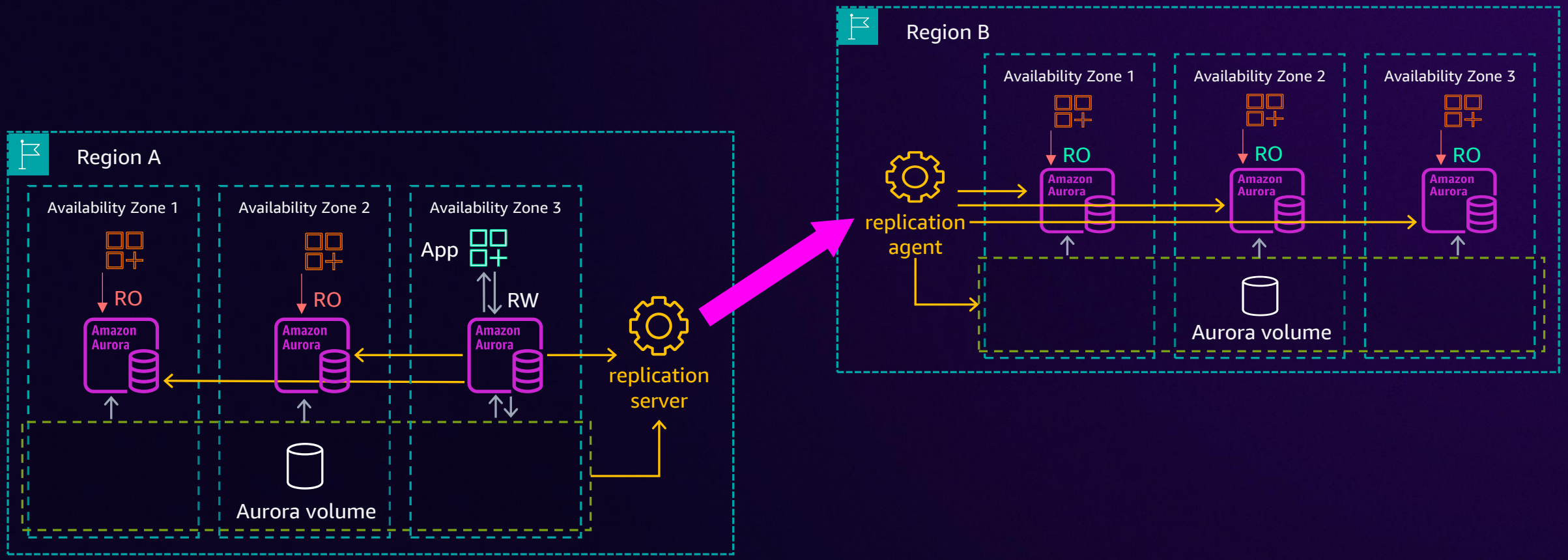
Aurora global database – Multi-Region



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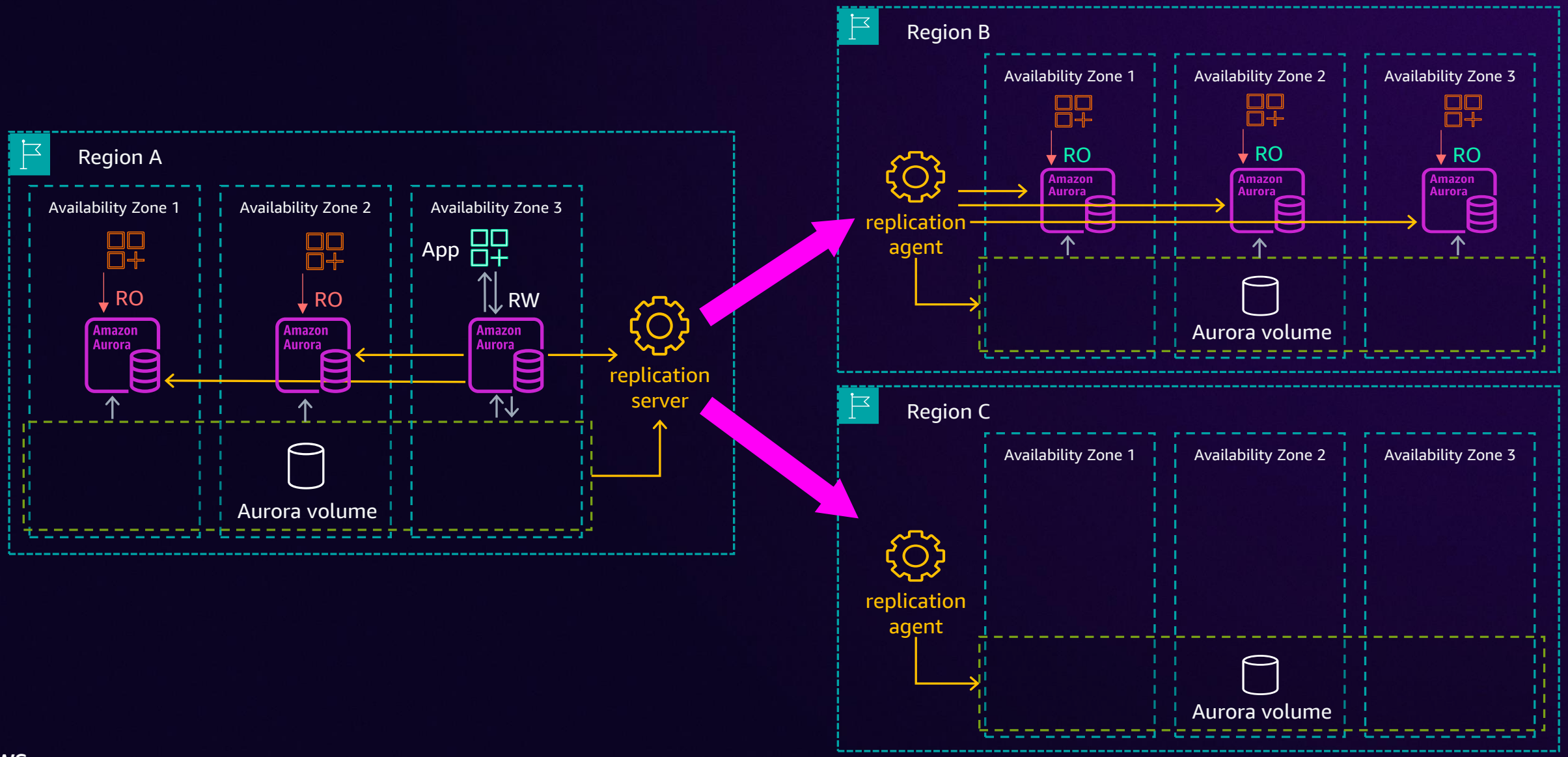
Aurora global database – Multi-Region



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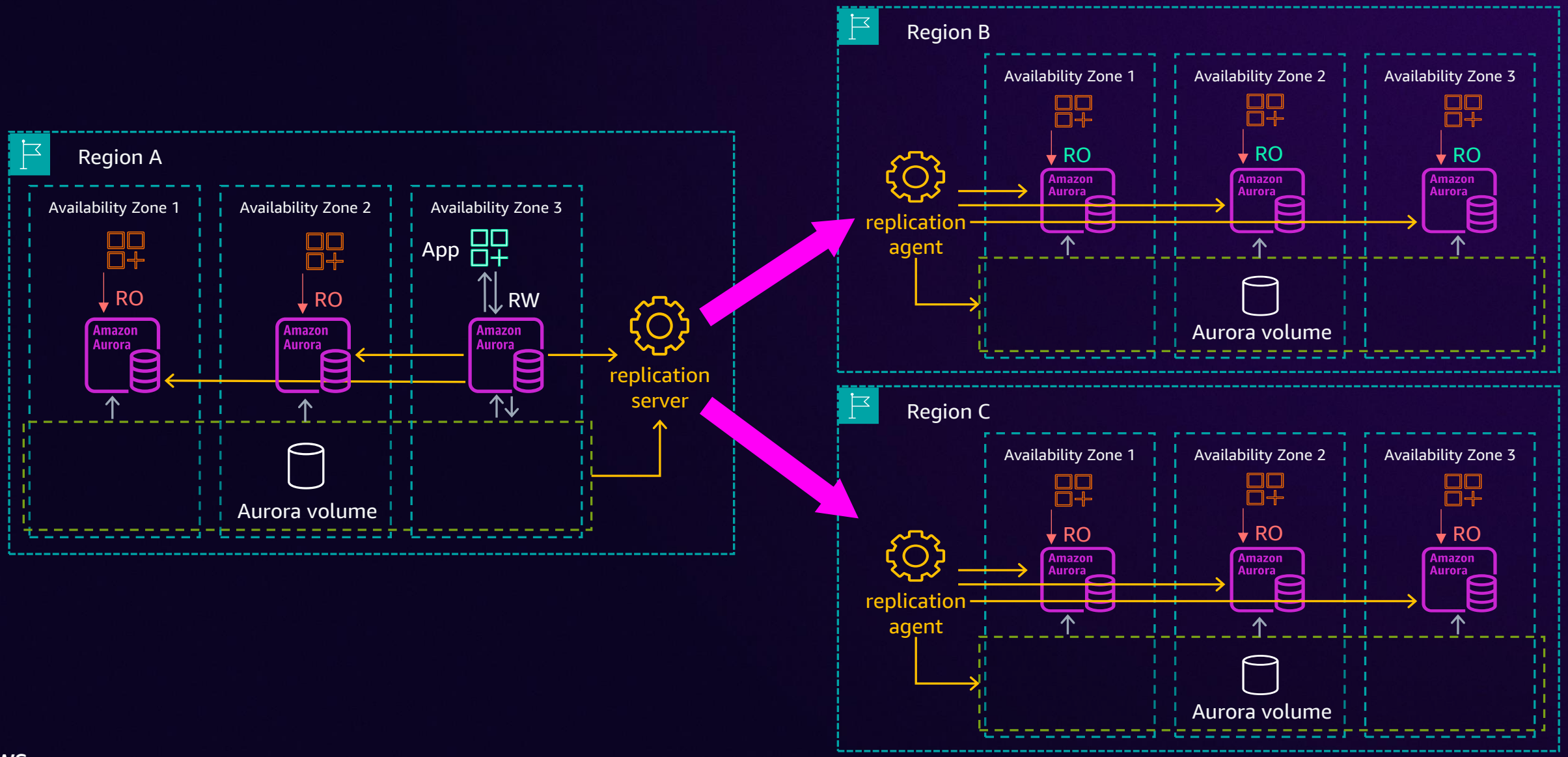

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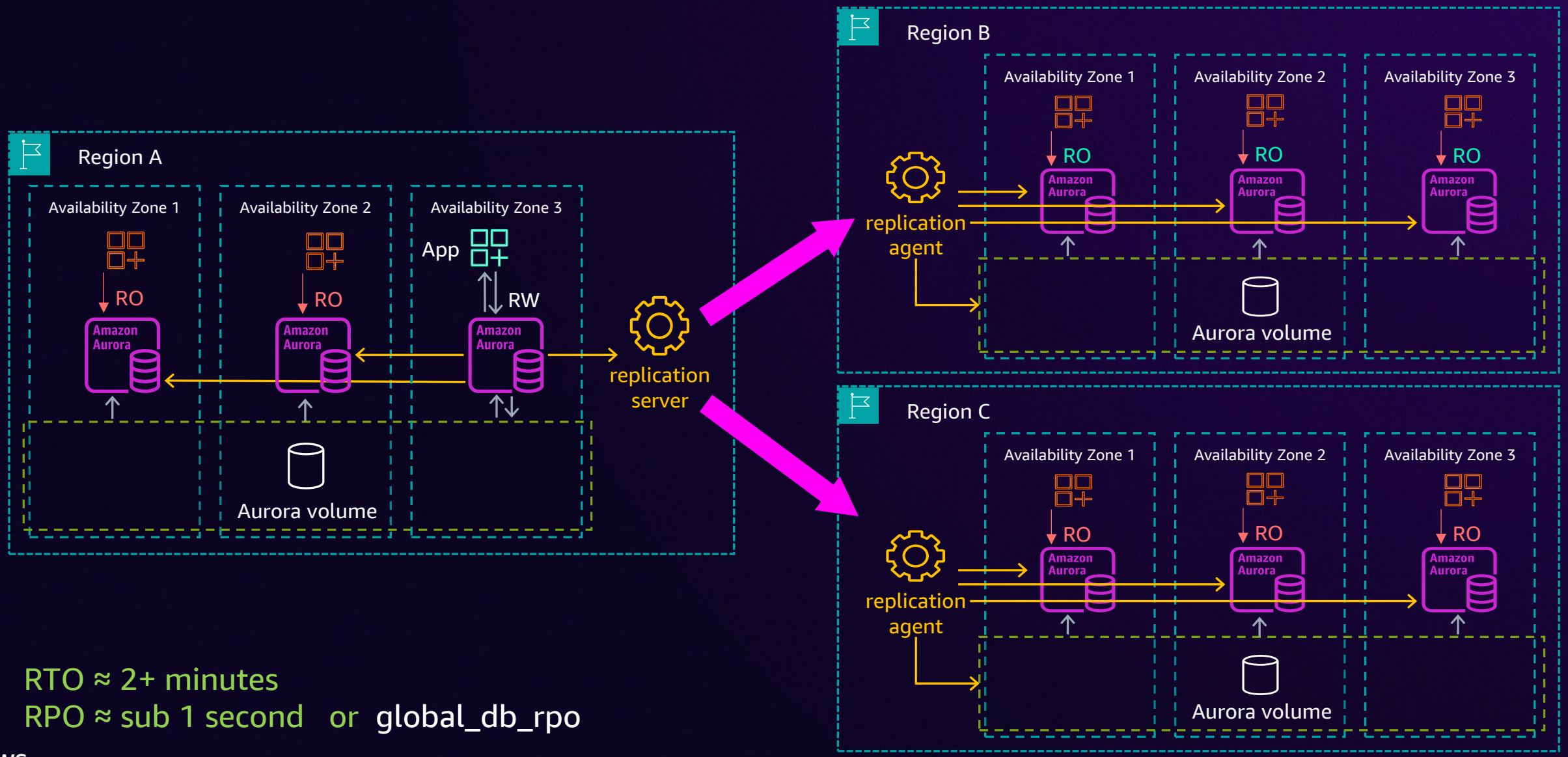
Aurora global database – Managed RPO



RTO ≈ 2+ minutes

RPO ≈ sub 1 second or global_db_rpo

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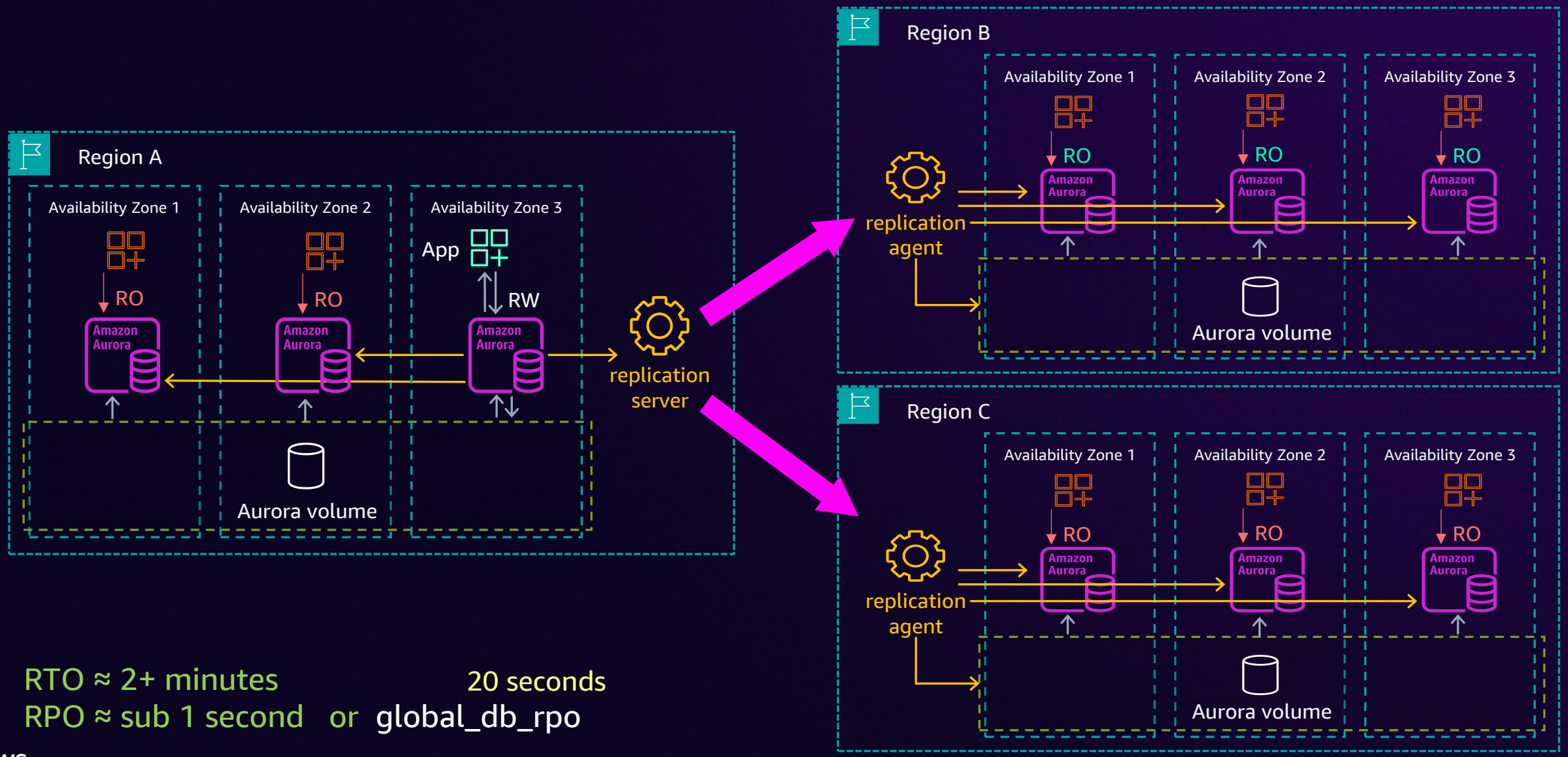
Aurora global database – Managed RPO



RTO ≈ 2+ minutes 20 seconds
RPO ≈ sub 1 second or global_db_rpo

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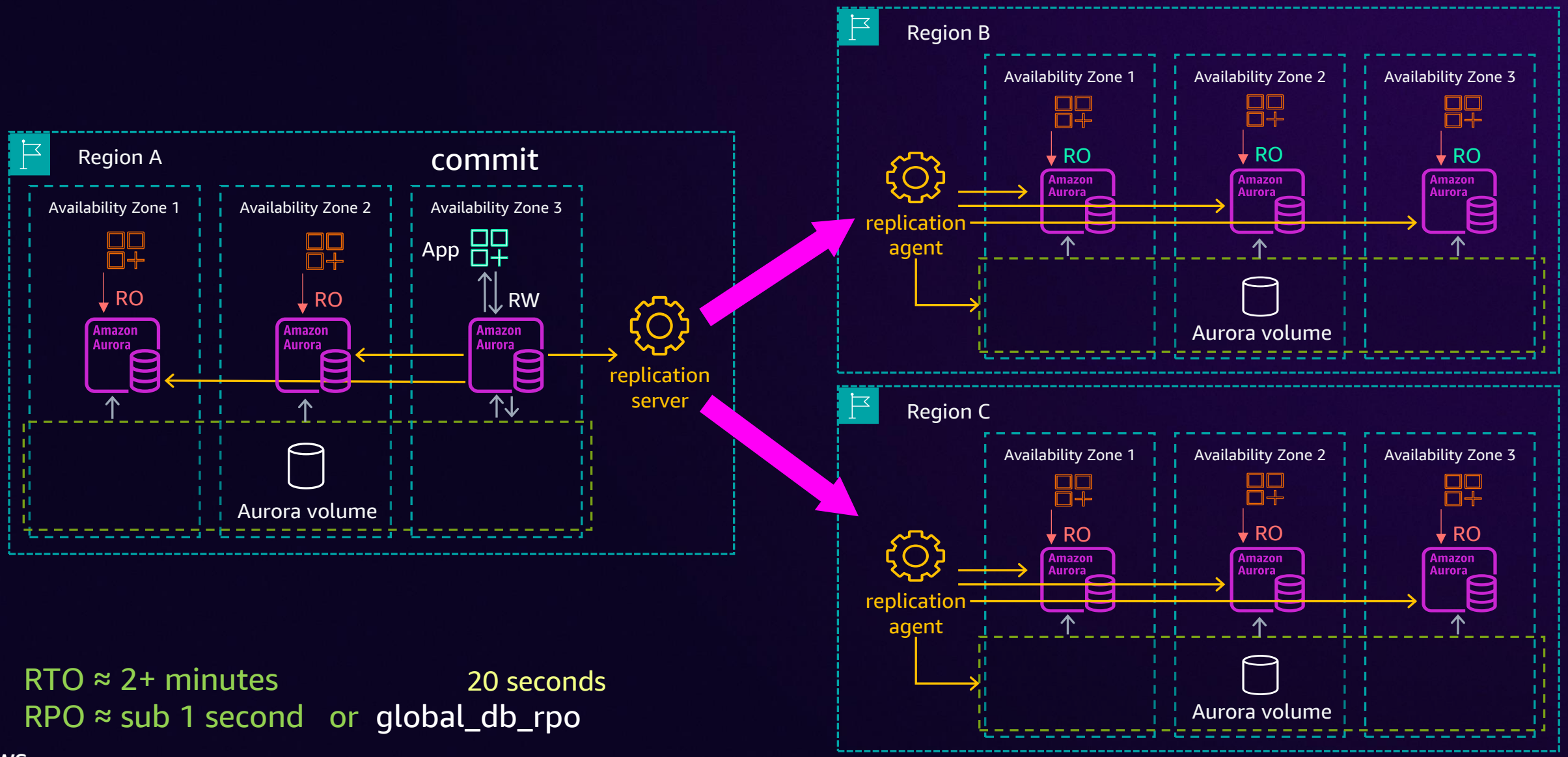
Aurora global database – Managed RPO



RTO ≈ 2+ minutes

RPO ≈ sub 1 second or global_db_rpo 20 seconds

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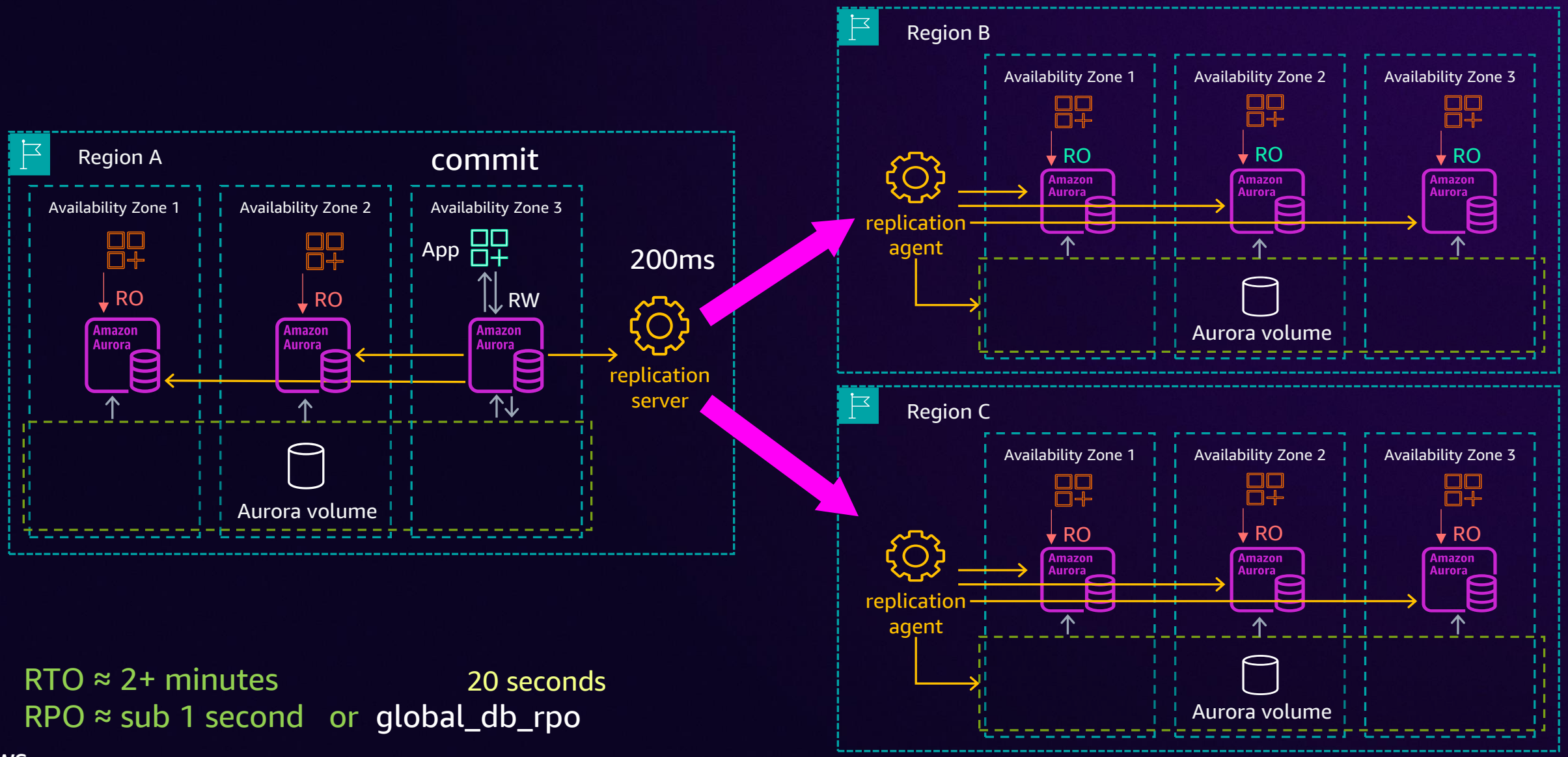

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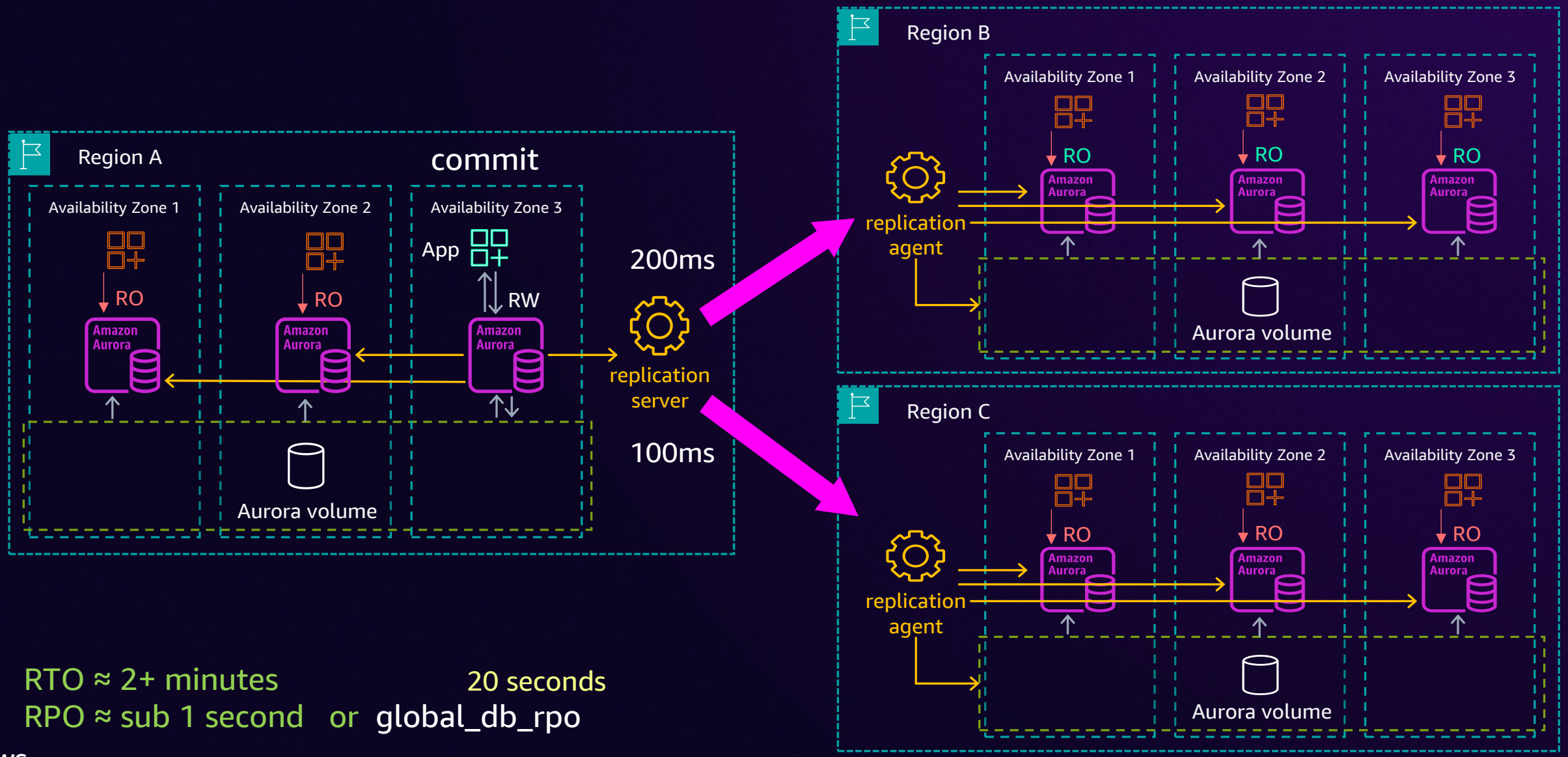

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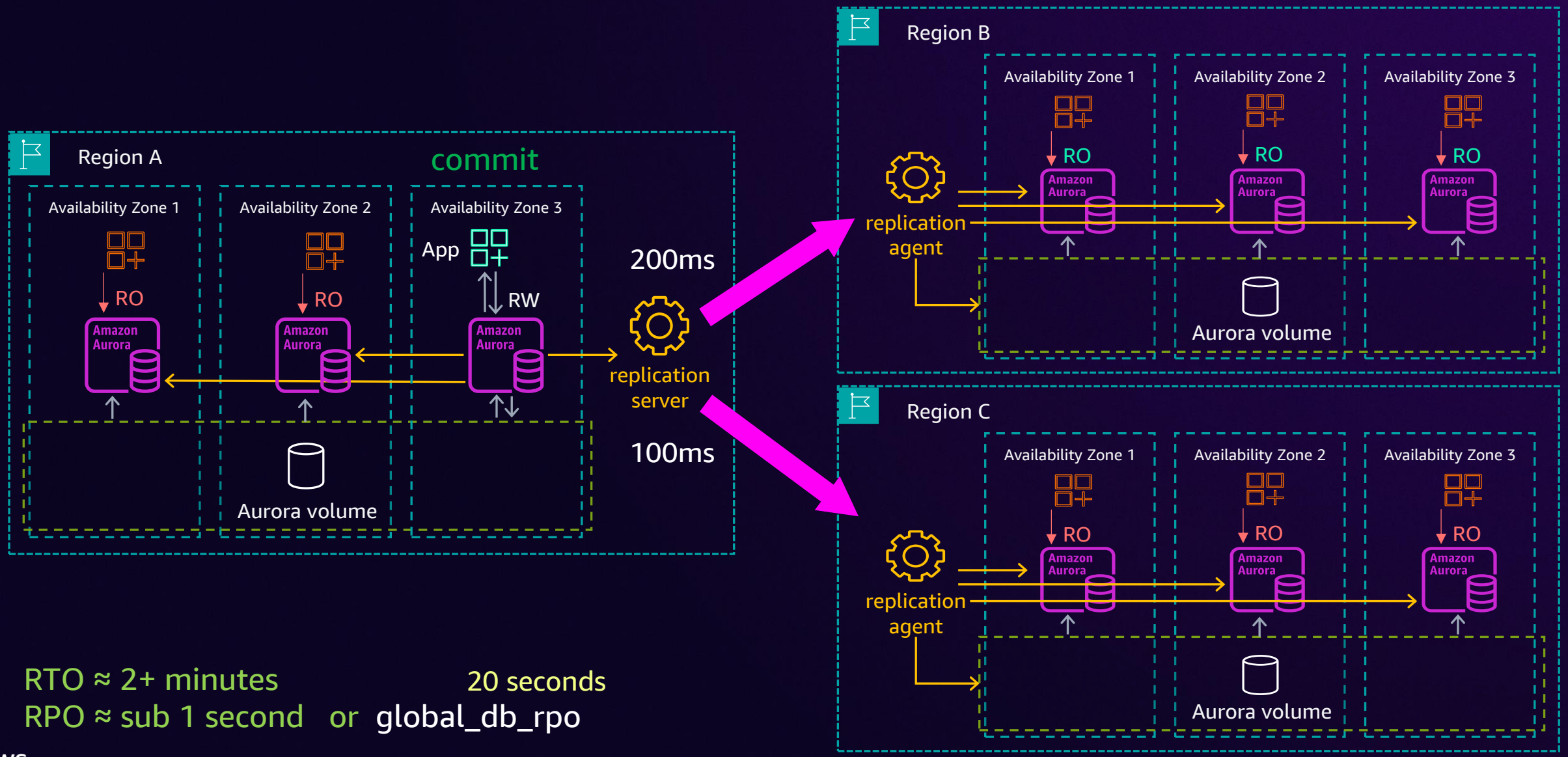

RTO ≈ 2+ minutes

RPO ≈ sub 1 second or global_db_rpo

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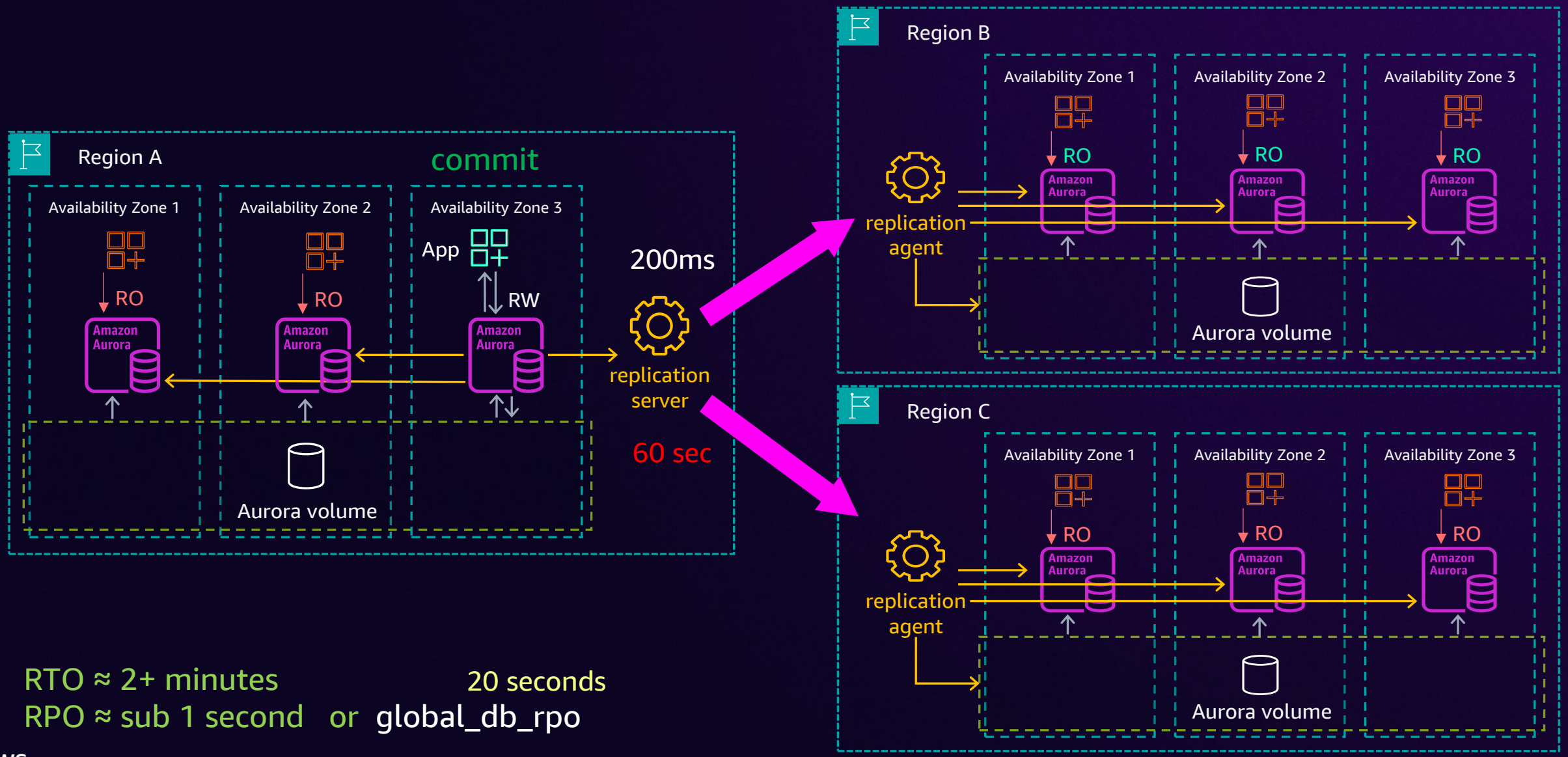

RTO ≈ 2+ minutes 20 seconds

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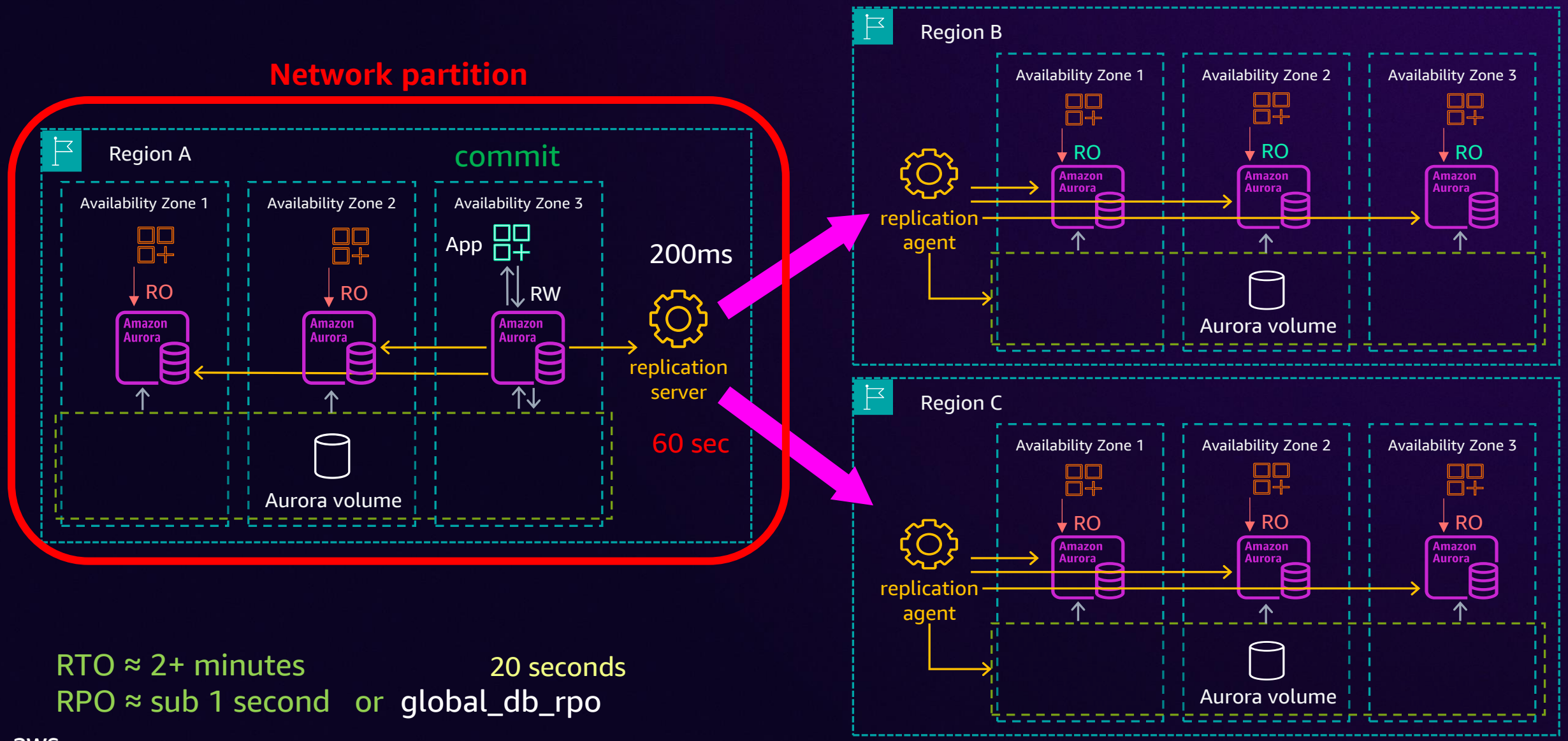

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RPO ≈ sub 1 second or global_db_rpo

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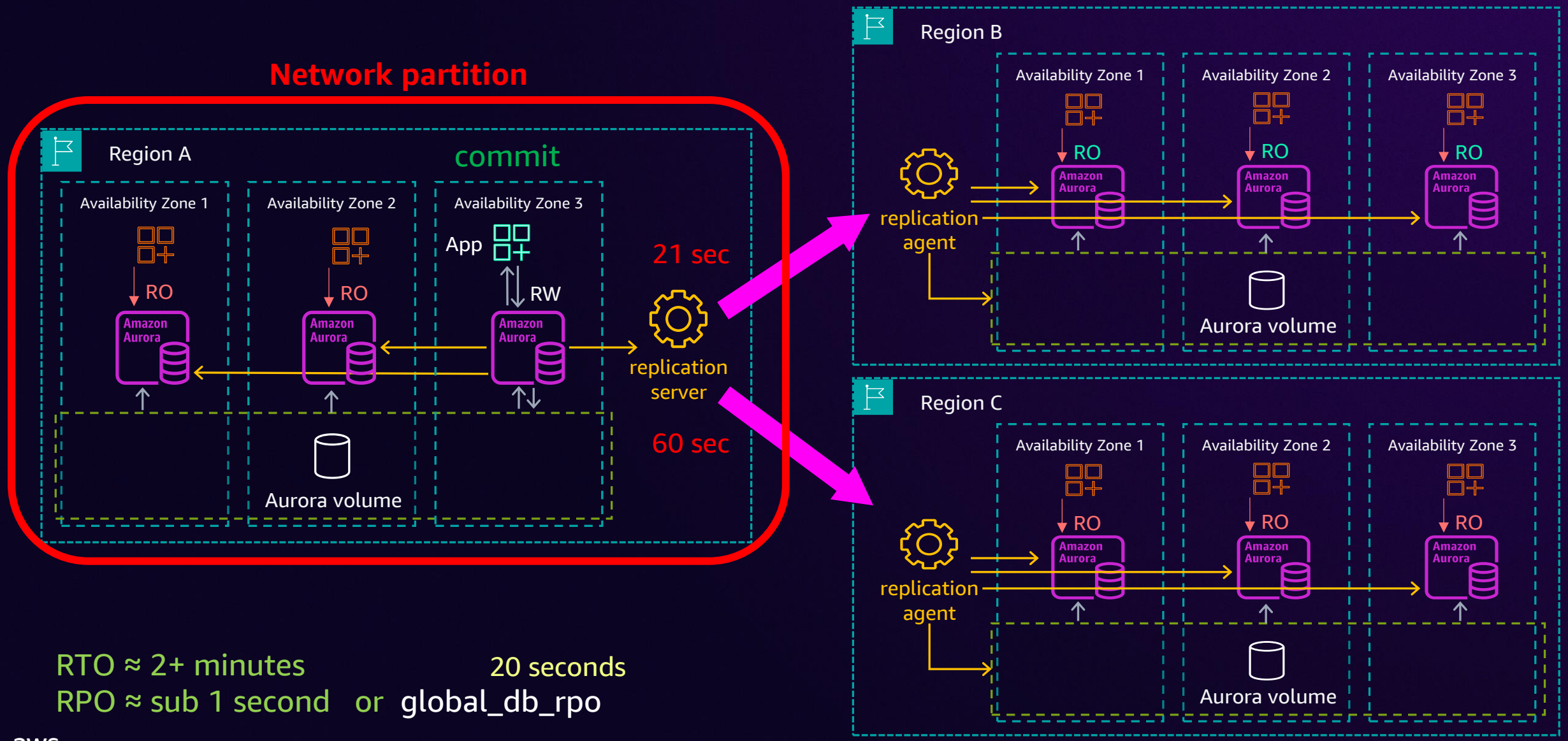

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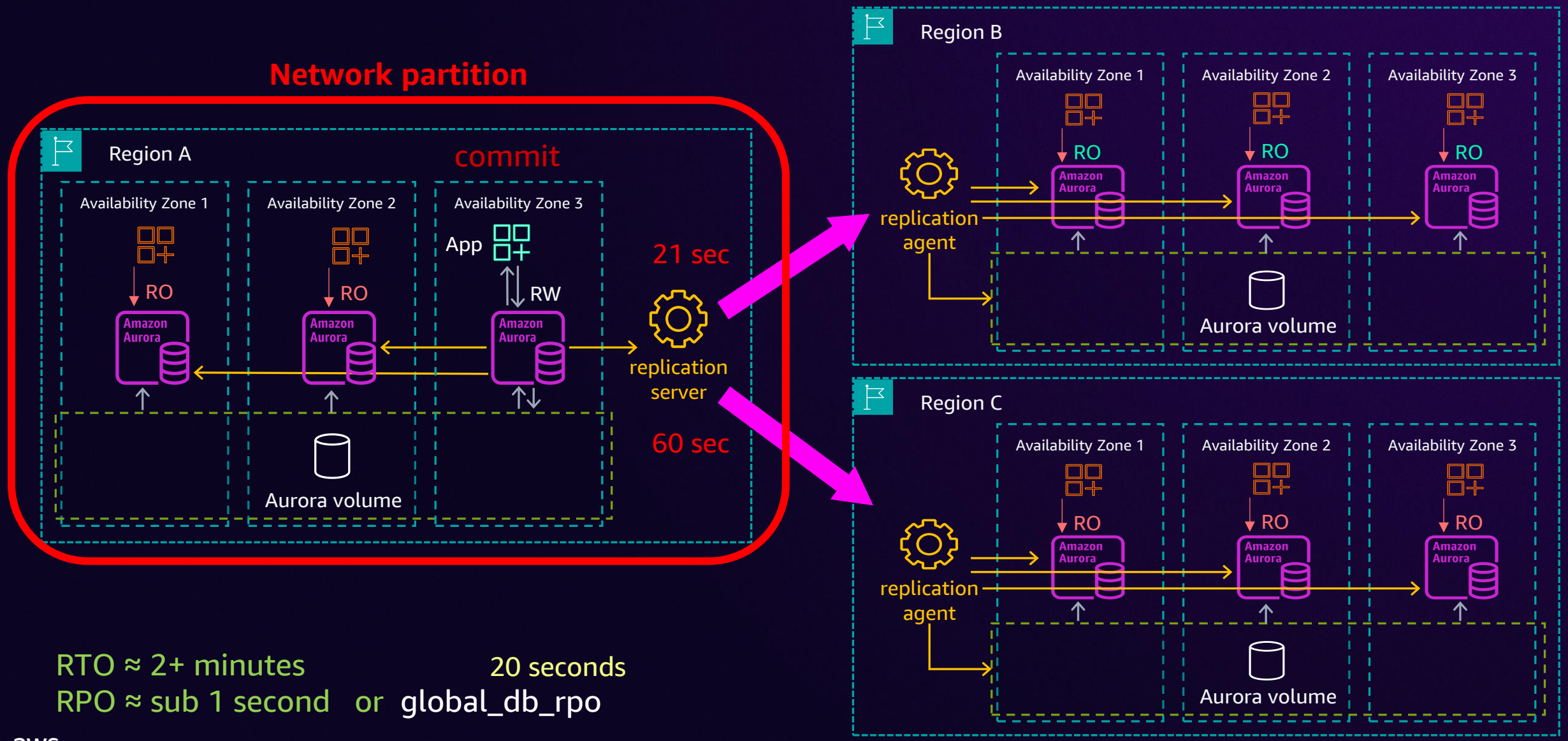

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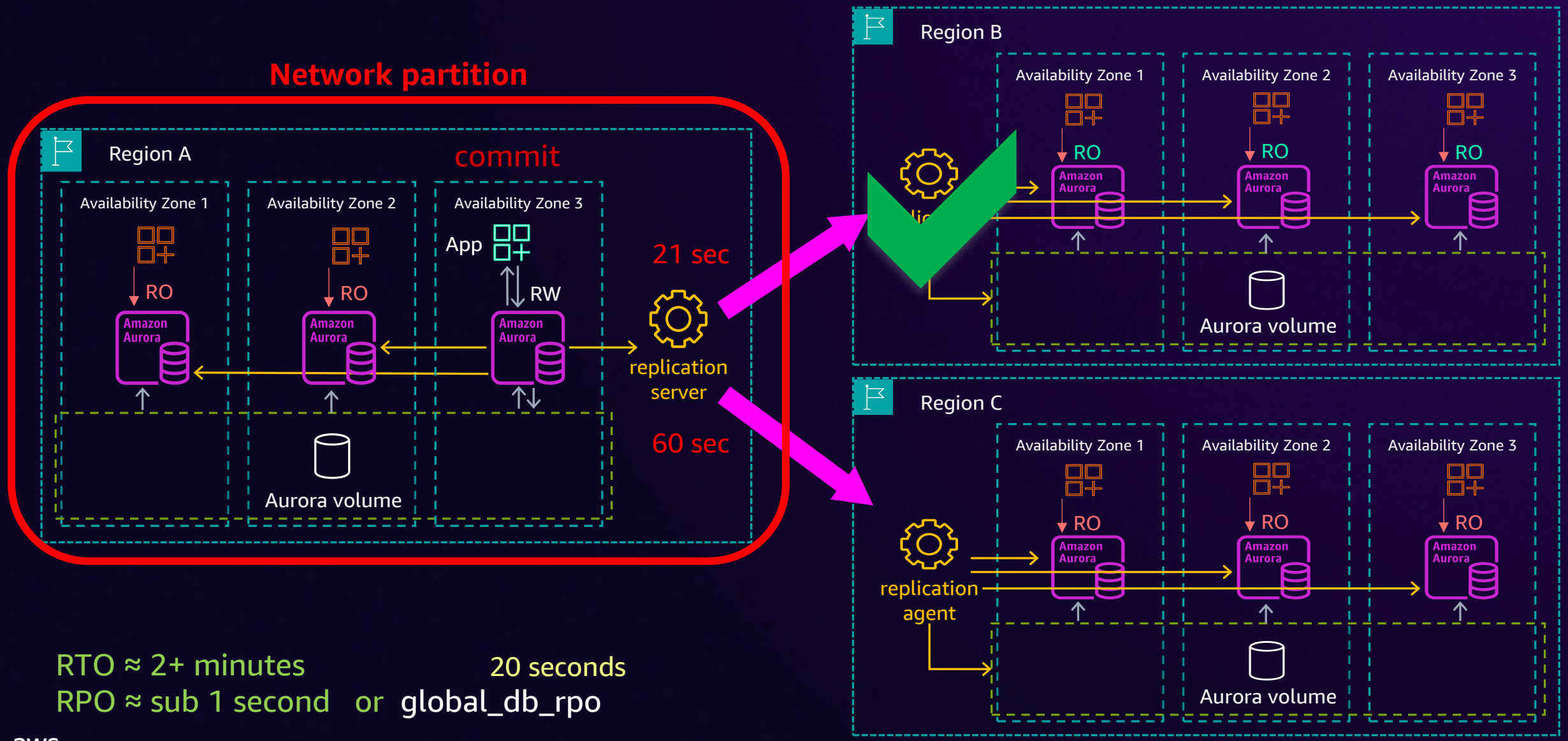
Aurora global database – Managed RPO



RTO ≈ 2+ minutes 20 seconds
RPO ≈ sub 1 second or global_db_rpo

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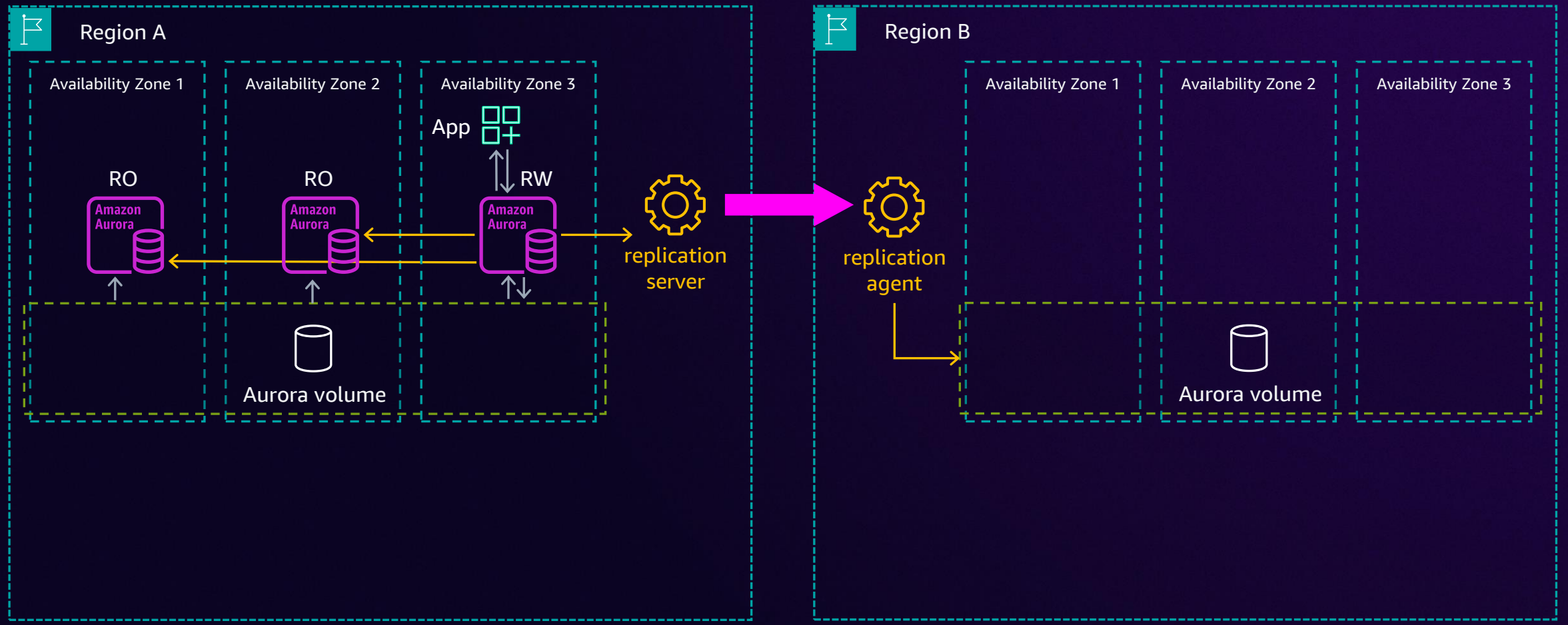
Aurora global database – Cross account



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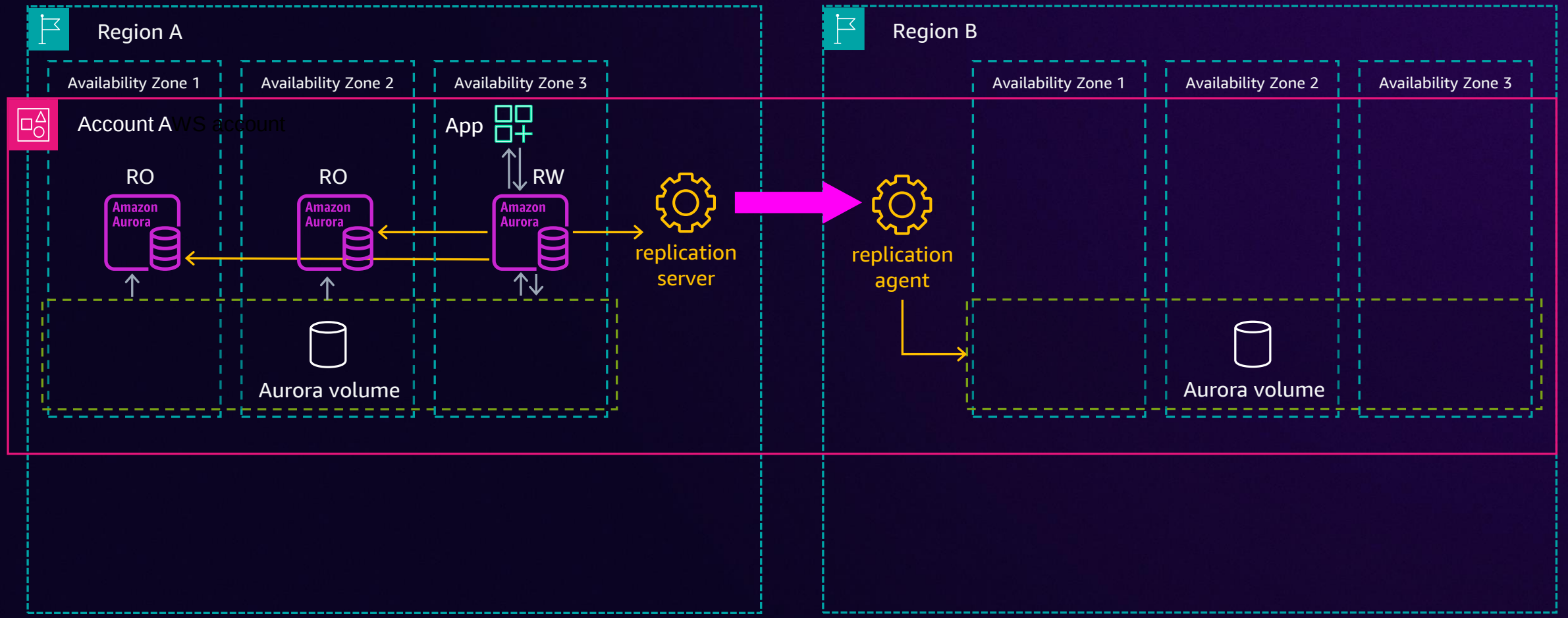
Aurora global database – Cross account



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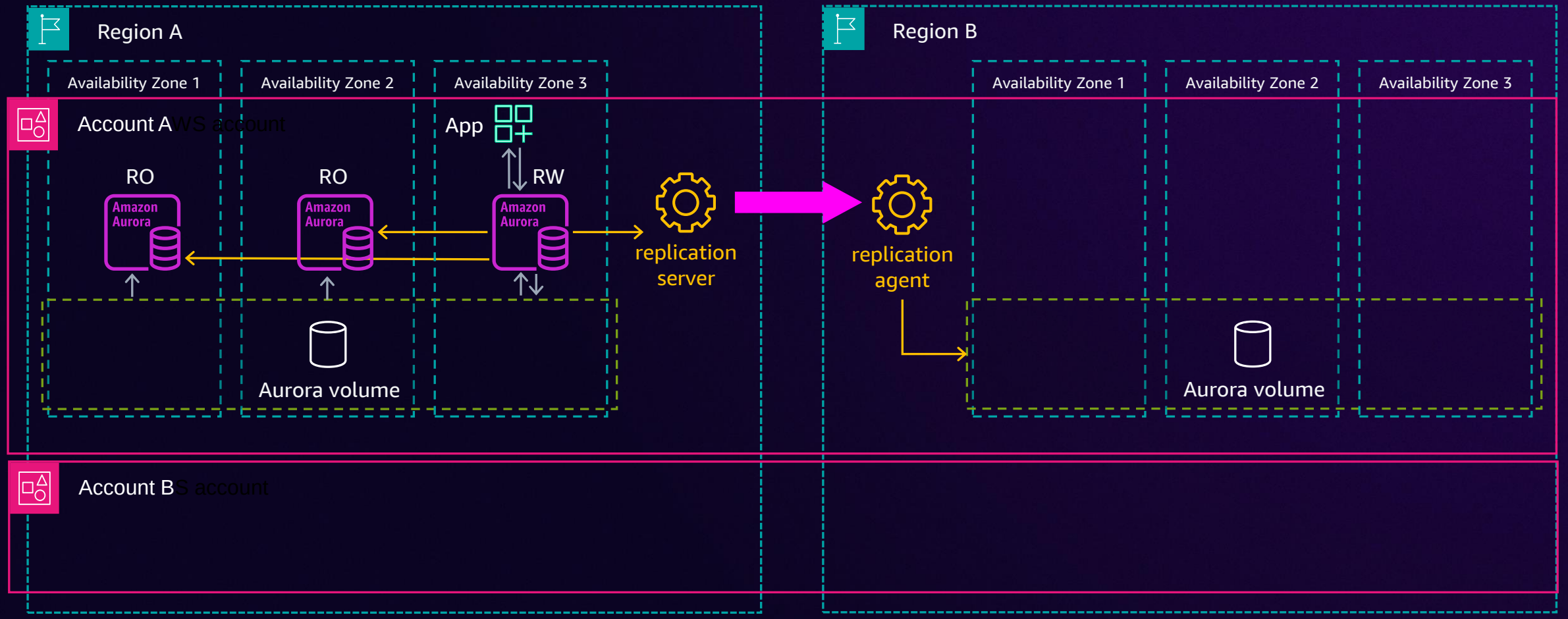
Aurora global database – Cross account



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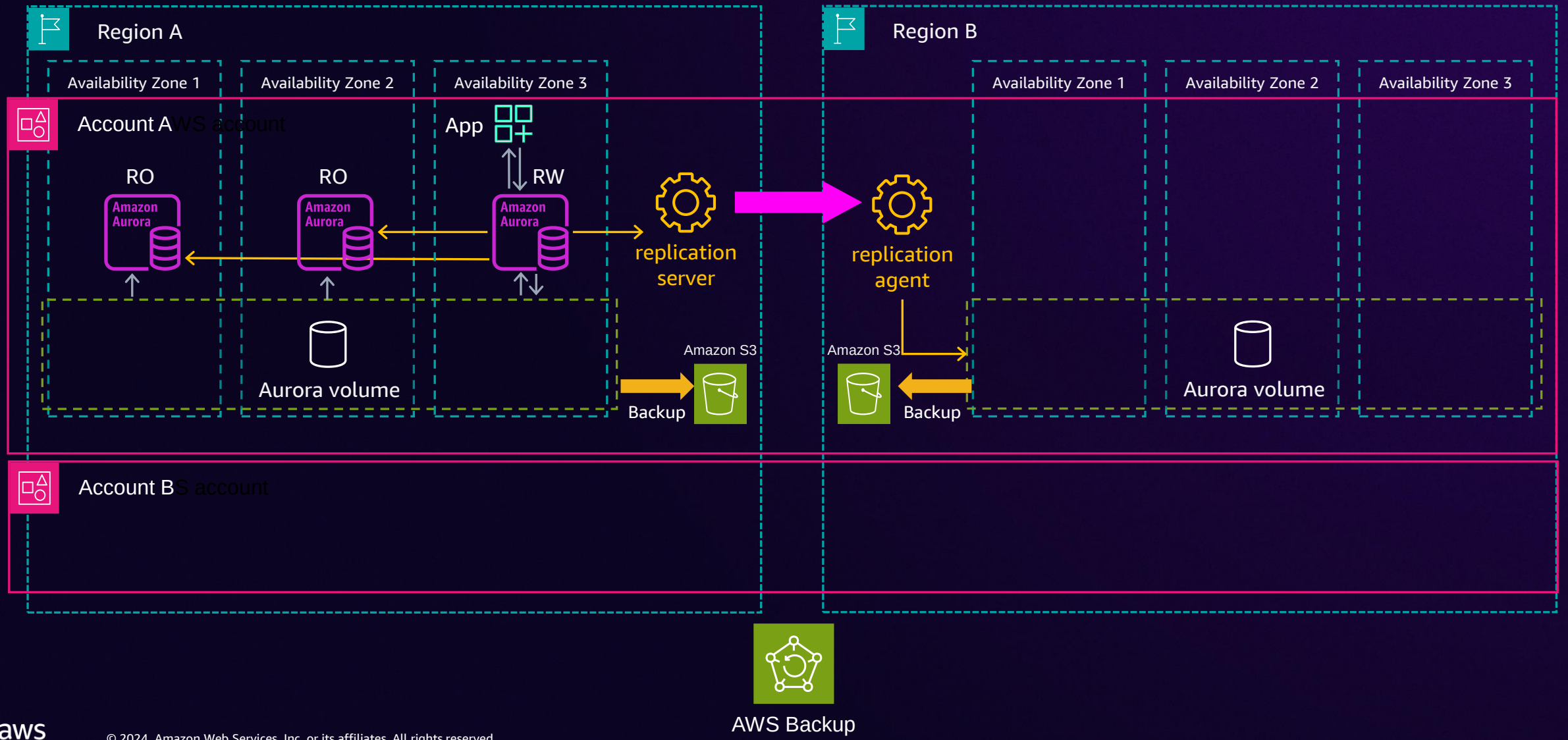
Aurora global database – Cross account



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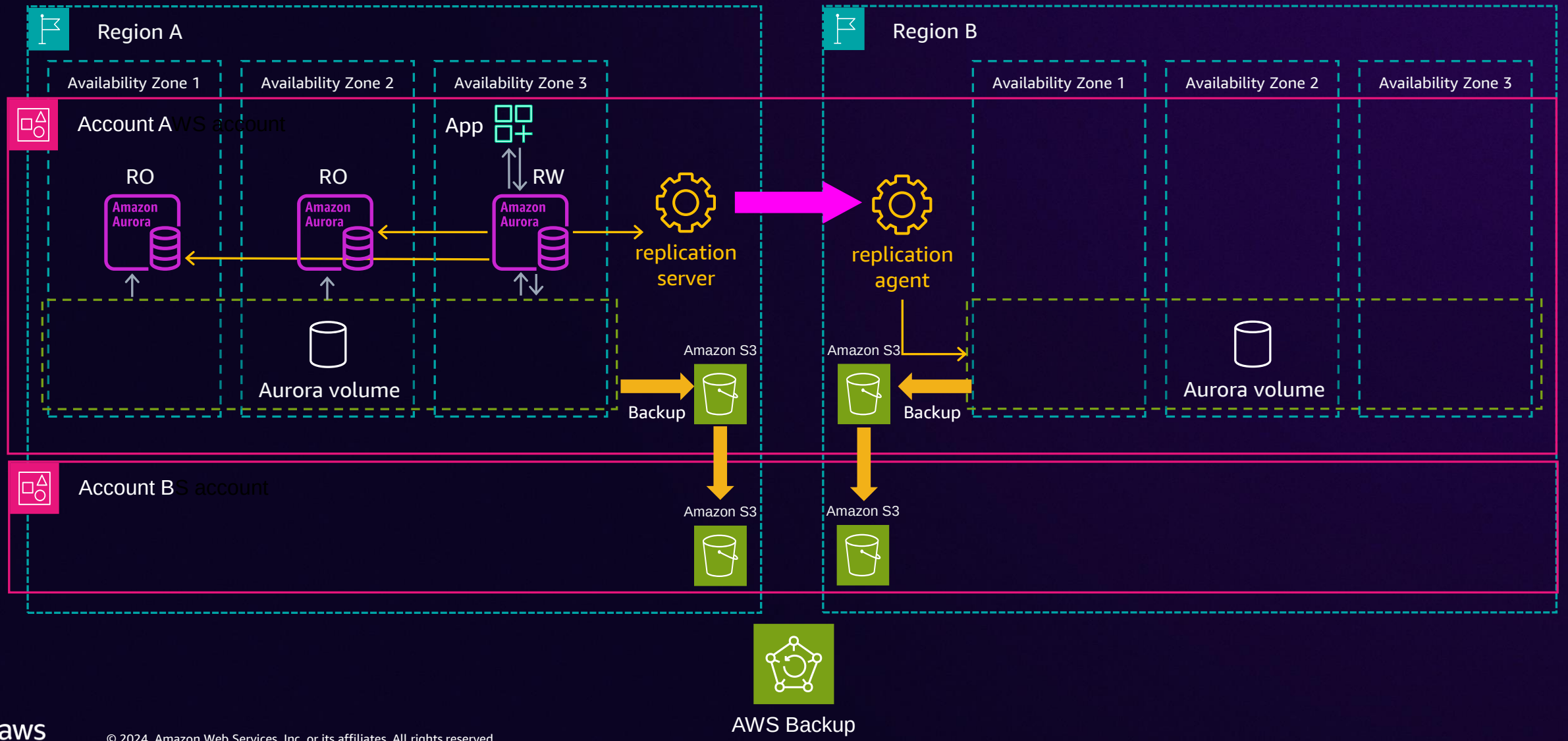
Aurora global database – Cross account



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Your journey

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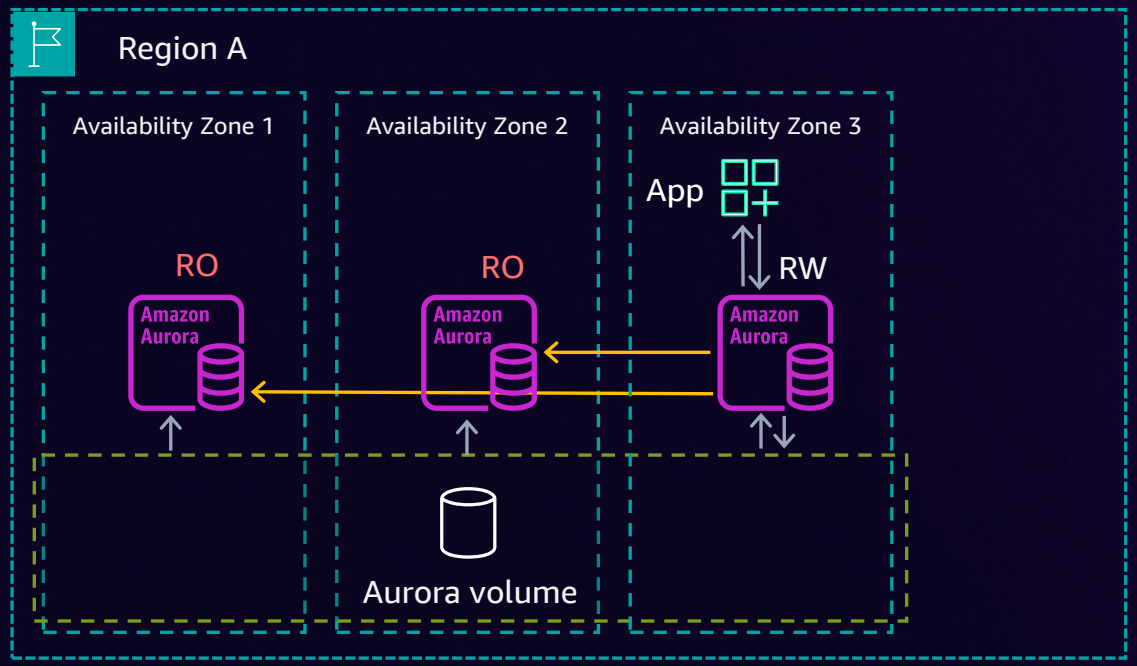
Your journey



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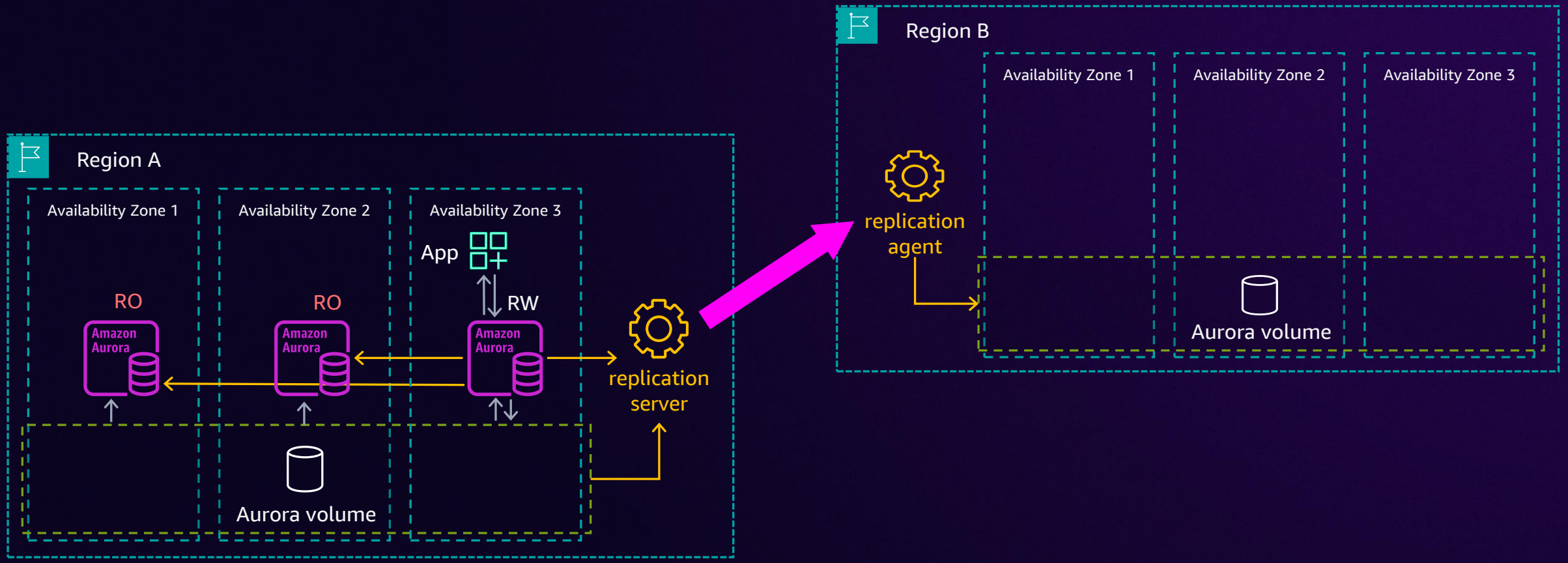
Your journey



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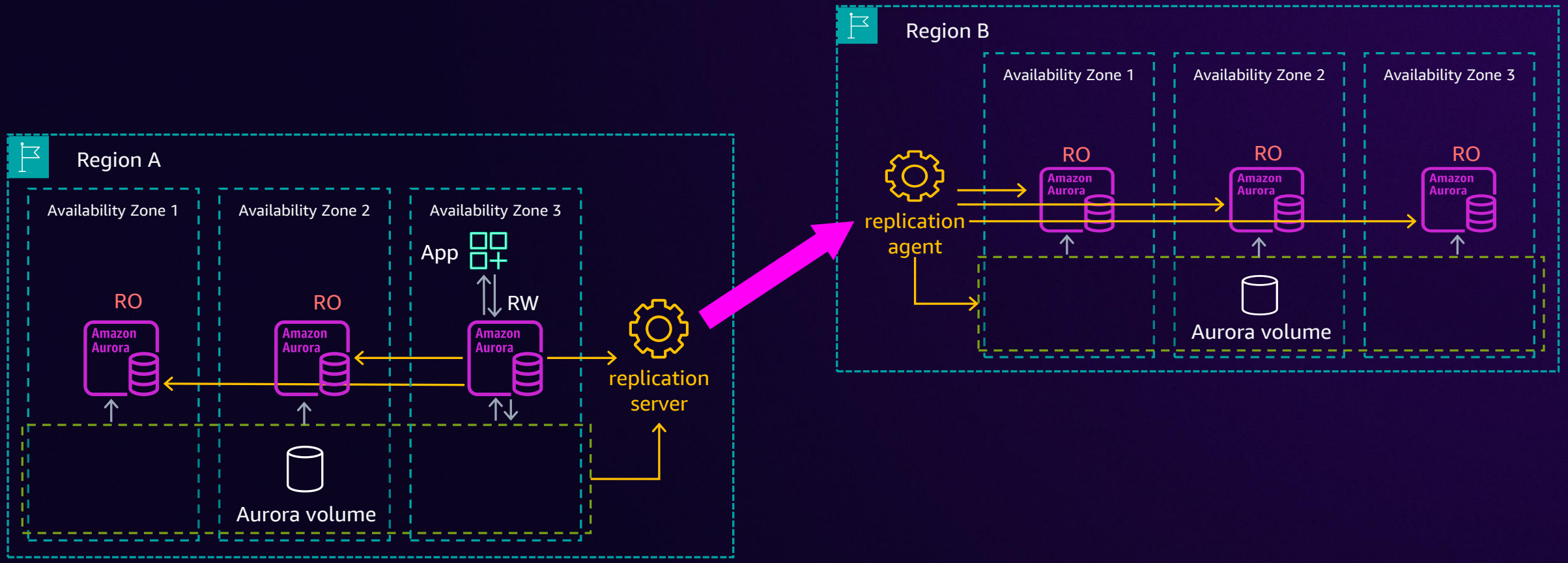
Your journey



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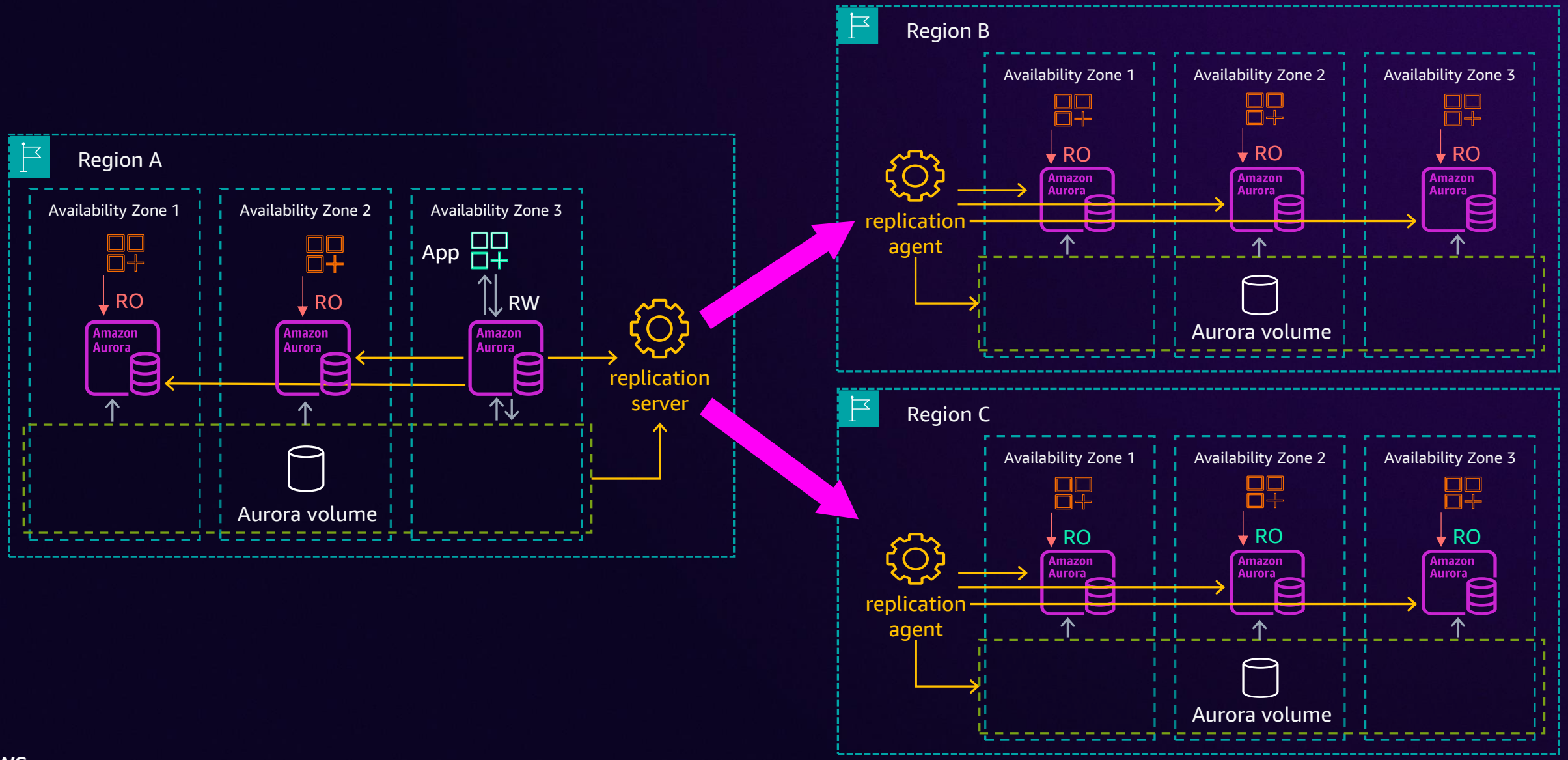
Your journey



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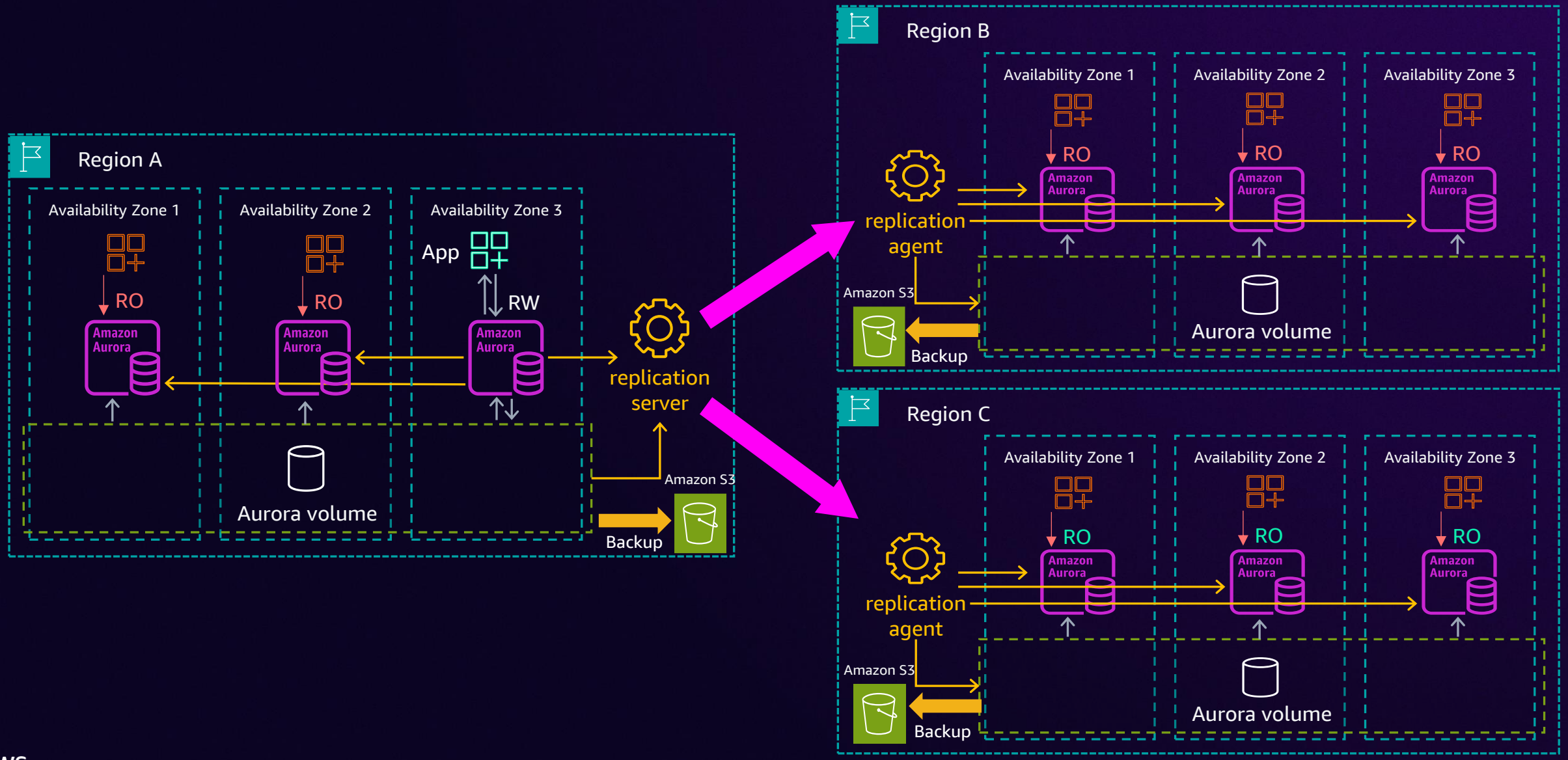
Your journey



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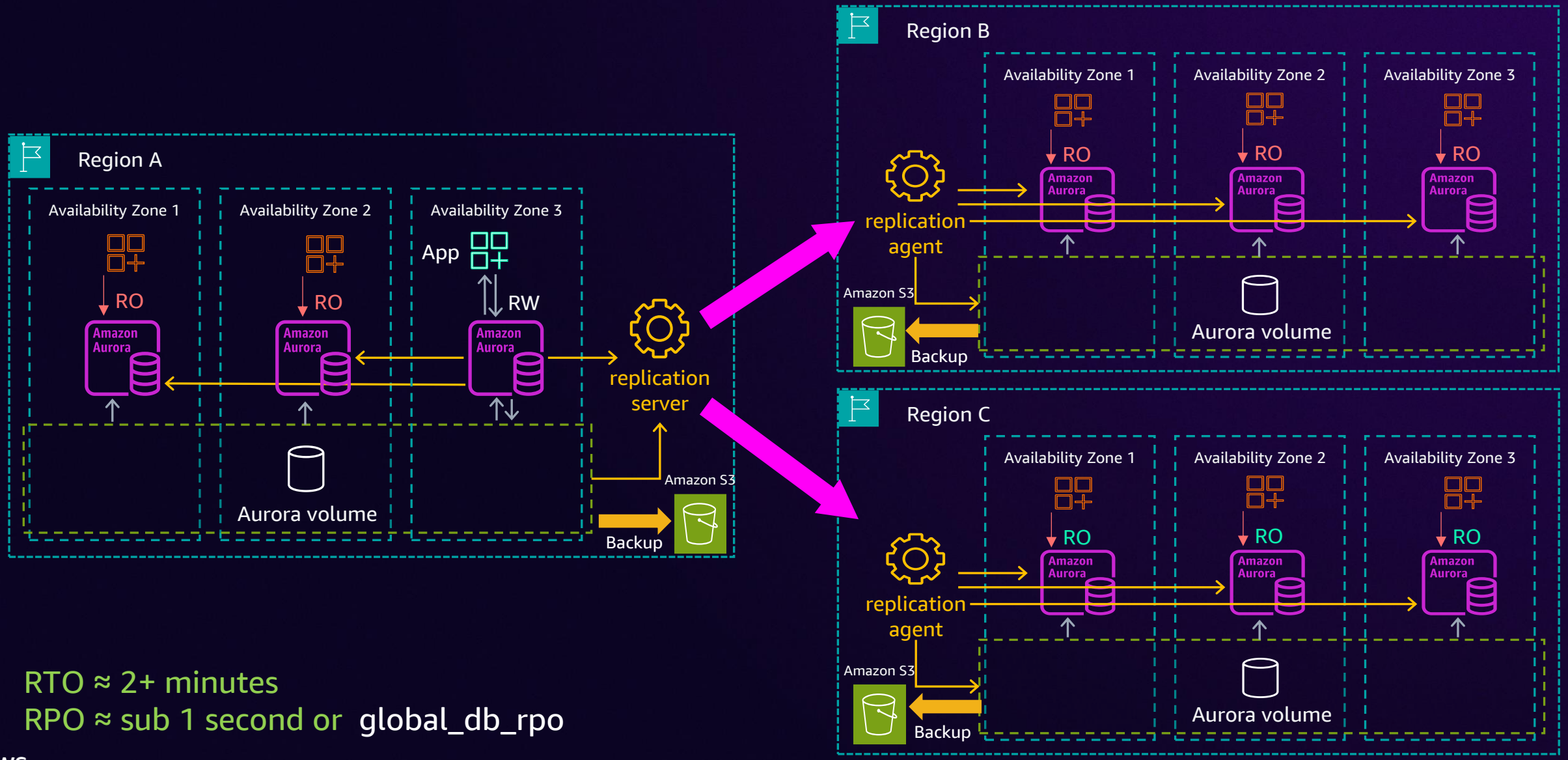
Your journey



RTO ≈ 2+ minutes

RPO ≈ sub 1 second or global_db_rpo

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Related sessions

Session	Title
DAT303-R	Making your Amazon Aurora cluster more resilient
DAT311-R	Design secure and resilient relational database architectures on AWS
DAT424	Get started with the latest Amazon Aurora innovations
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aws

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