PUBLIC SECTOR SUMMIT ONLINE

Improve Resilience and create Business Continuity with AWS

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Agenda

- Introduction to Resilience
- Backup/Restore
- High Availability (HA), Multi-site & Multi-Region
- Disaster Recovery
  - Disaster Recovery techniques
  - CloudEndure
- Conclusions

Introduction to resilience

Introduction

Resilience is Critical

It affects the quality of service your users experience

Resilience is Complex

Like security, it is an end-to-end discipline that must be built in

Cannot be bolted on later as an after thought

Resilience is a key Cost driver

How many sites, how many data copies - drives cost in multiples (2x, 3x,…)

Resilience in the cloud need not be the same as traditional IT

Need to meet the same business objectives of availability and recovery

There are better ways to provide continuity in the cloud – Use them!

Introduction (cont.)

Data is the lifeblood of your applications

- Protect it!

Storage Hierarchy – not all data is the same

- Different data types have differing criticality and access needs
- Select the right storage type/class based on these needs
- Select the right backup and recovery mechanism to ensure data availability
- Be cost conscious at all times

What are we planning for?

- Server event
- Rack level outage
- Building level outage – water, fire,…
- Carrier/connection problems – fiber cuts, DOS,…
- Major regional disaster – power, weather,…
- Accidental data deletion/modification

Backup and recovery

Initial questions to answer

How important are the applications to your business?

What is the associated recovery point and time for these applications?

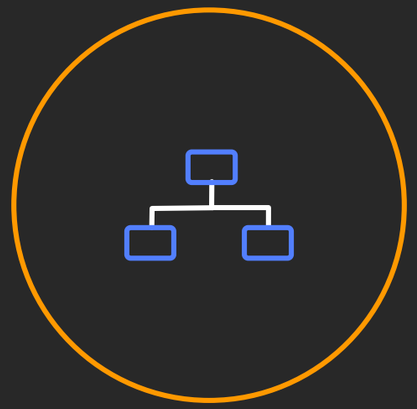
How are you storing the data?

Where are you storing the data?

How are you restoring the application?

How and why do we backup the data?

Modernizing backup architecture with Immediate cloud backup benefits



Leverage existing investments in infrastructure

…cloud as a backup target integrates with existing backup frameworks

Cost effective offsite storage alternatives

…with pay as you go pricing and no upfront capital investments

Elimination of physical tape backups and administration

…for a low-cost, highly scalable virtual alternative with nominal disruptions to existing systems

Unlocking insights from your data

…by applying analytics, artificial intelligence, and machine learning capabilities

AWS Storage and Backup Building Blocks

Block storage

General Purpose SSD
Provisioned IOPS SSD
Throughput-Optimized HDD
Cold HDD
Elastic Volumes

File storage

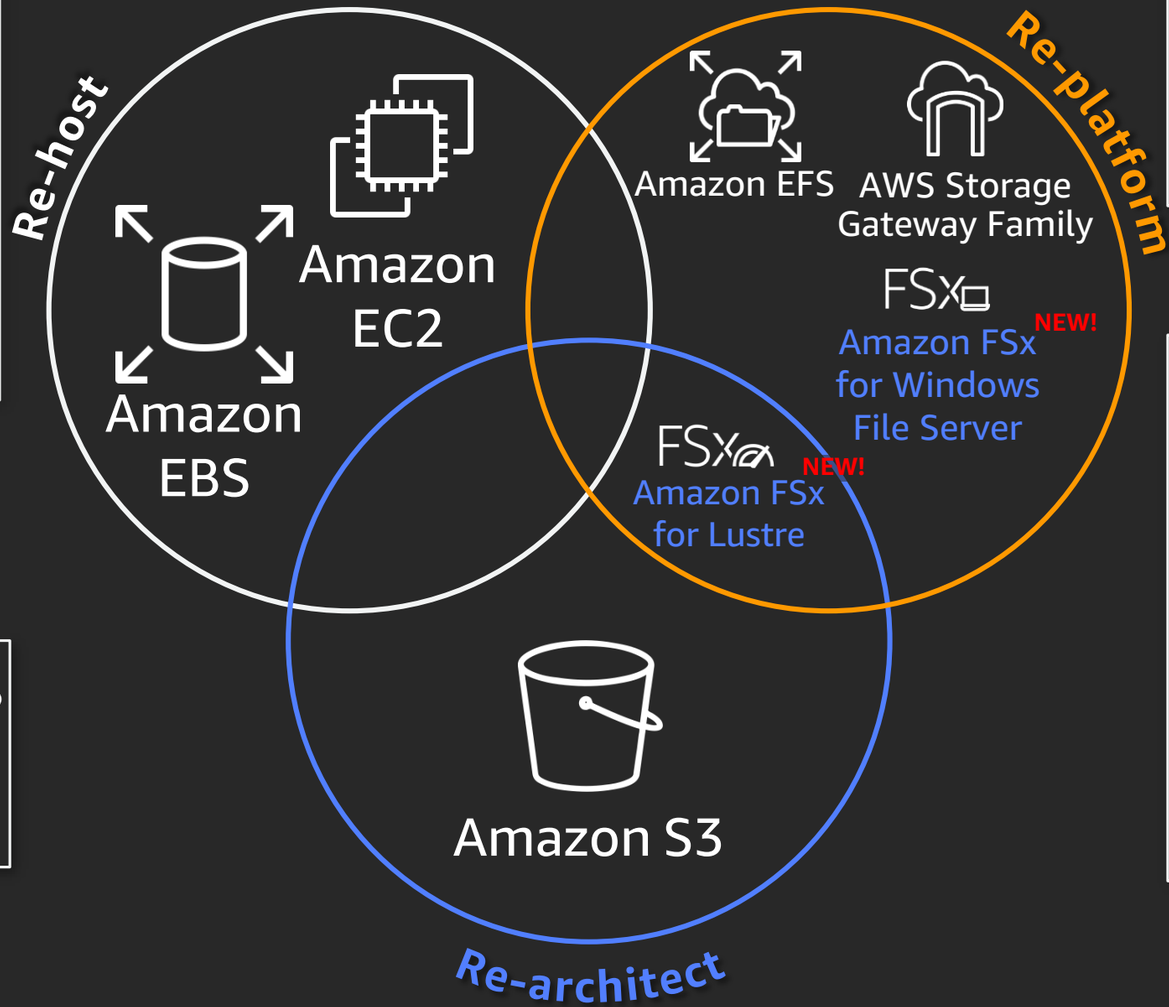
EFS Standard
EFS Infrequent Access NEW!

Object storage

S3 Standard
S3 Standard-IA
S3 One Zone-IA
S3 Glacier
S3 Intelligent-Tiering
S3 Glacier Deep Archive NEW!

Backup & Restore

AWS Backup NEW!



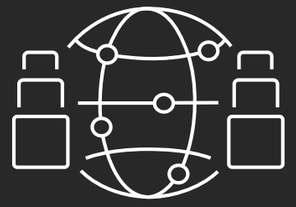
AWS storage hierarchy and lifecycle management





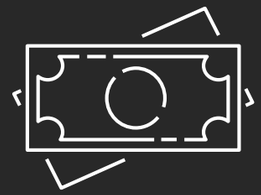

S3 Standard	S3 Intelligent-Tiering	S3 Standard-IA	S3 One Zone-IA	S3 Glacier	S3 Glacier Deep Archive
Frequent		***Access frequency***			***Archive***
• Active, frequently accessed data • Milliseconds access • ≥ 3 AZ • $0.0210/GB	• Data with changing access patterns • Milliseconds access • ≥ 3 AZ • $0.0210 to $0.0125/GB • Monitoring fee per object • Min storage duration	• Infrequently accessed data • Milliseconds access • ≥ 3 AZ • $0.0125/GB • Retrieval fee per GB • Min storage duration • Min object size	• Re-creatable, less accessed data • Milliseconds access • 1 AZ • $0.0100/GB • Retrieval fee per GB • Min storage duration • Min object size	• Archive data • Select minutes or hours • ≥ 3 AZ • $0.0040/GB • Retrieval fee per GB • Min storage duration • Min object size	• Long-term archive data • Select hours • ≥ 3 AZ • $0.00099/GB • Retrieval fee per GB • Min storage duration • Min object size

What is AWS Backup



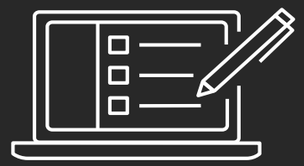
Centralized backup management service

Meet business and regulatory backup compliance requirements



Simple and cost-effective

Common way to protect application data in the AWS Cloud and on-premises



Central console and set of APIs for protecting your application data across AWS services

AWS Backup: services supported at launch

Amazon EFS

Amazon EBS

Amazon RDS

DynamoDB

AWS Storage Gateway

Automated Backup Schedules	✓	✓	✓	✓	✓
Automated Retention Management	✓	✓	✓	✓	✓
Centralized Backup Monitoring/Logging	✓	✓	✓	✓	✓
KMS Integrated backup encryption	✓	✓	✓	✓	✓
Lifecycle to Cold Storage	✓				
Independent Backup Encryption	✓				

METRO

High Availability (HA), Multi-site & Multi-region

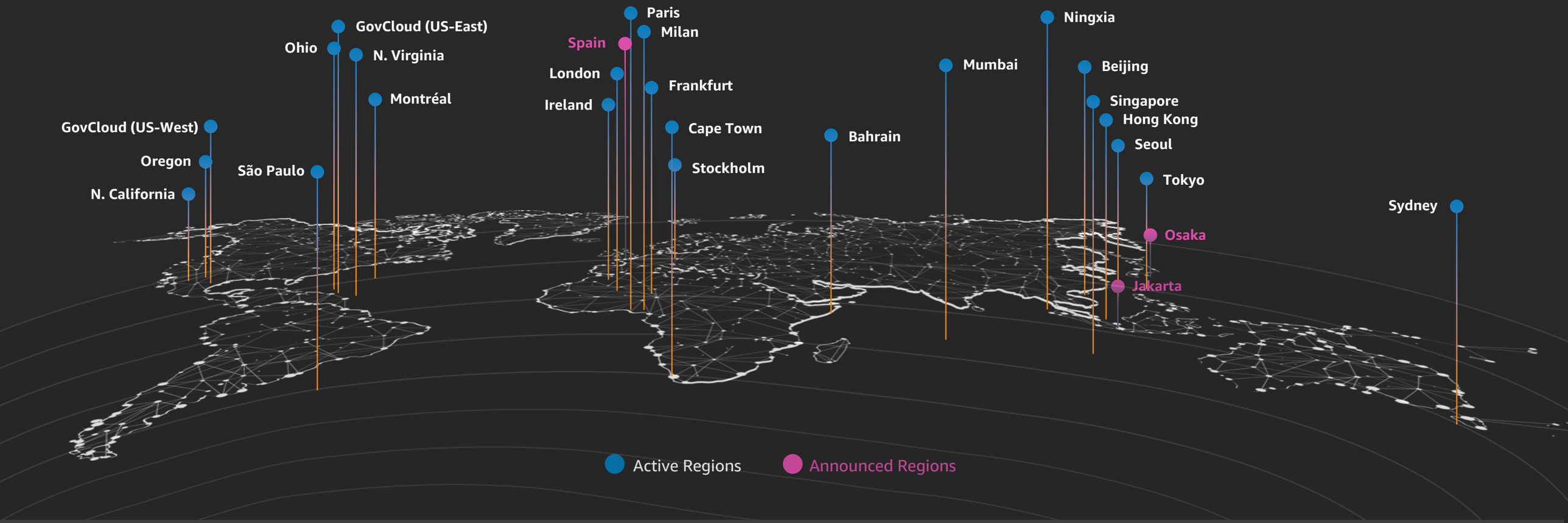
HA/DR definitions – Degrees of resilience

- **High Availability** – improving the uptime of a system by *removing single points of failure*, implementing *redundant communication paths and automating the detection and recovery* from failures.

- **Disaster Recovery** - set of policies and procedures which enable the *recovery or continuation* of vital technology infrastructure and systems *following a natural or human-induced disaster*. Typically includes out of region recovery

- **Business Continuity** - Keeping all *essential aspects of a business functioning* (personnel, offices, IT…) despite *significant disruptive events*. Disaster recovery is a subset of business continuity.

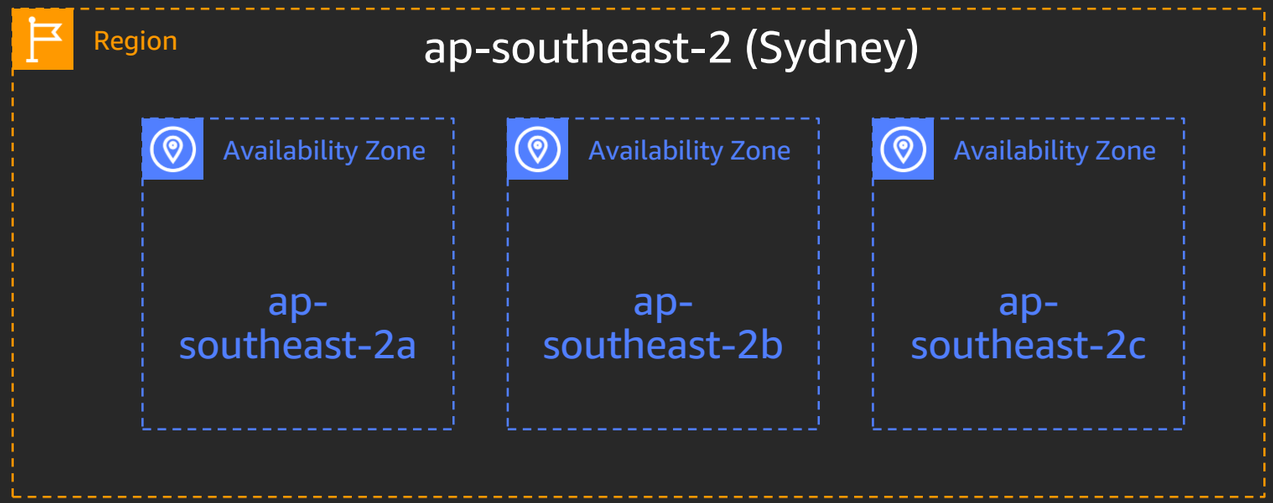
Global Regions and Availability Zones



In 2018, the next-largest cloud provider had almost **7x** more downtime hours than AWS

Availability Zones

- A Region is comprised of multiple Availability Zones (AZs) each with redundant power, networking, and connectivity, housed in separate facilities
- Isolation from other AZs (power, network, flood plains)
- A single AZ can include multiple data centers
- Low latency (<10ms) direct connect between AZs – enables active-active (not DR)
- Operate production applications and databases that are **more highly available, fault tolerant, and scalable**



Eliminating single points of failure

1. **Recreate on failure**
   Auto Scaling Groups (ASG) and other deployment automation

2. **Server clustering**
   Elastic Load Balancer (ELB)

3. **Database clustering**
   Types of replicas and failover supported vary by platform

4. **Network connectivity**
   Direct Connect (DX) with VPN backup, multiple DX/VPNs

5. **AWS managed services**
   Offer many benefits in this area as the redundancy and failover is often managed for you transparently

Multi-region DR design considerations

1. **RPO/RTO** – this is the number one consideration

2. **Network architecture**
    - How do regions talk to each other publically and privately?
    - How much bandwidth is required? What latency and data consistency is tolerable?
    - Network services - Domain Name Services (DNS), Content Delivery Networks (CDN), Caching and Load Balancing.

3. **Data Replication and Synchronization** - asynchronous versus synchronous replication demands, etc.

Multi-region DR Design Considerations (cont.)

4. Monitoring – How do you detect degradation and failure and control failover when necessary?

5. Cross region replication and drift control – how do you keep images and configurations consistent across regions?

6. Other Considerations – distributed security management across regions, encryption and decryption with associated key management,…

Disaster Recovery (DR)

“**Everything fails all the time.**”

–Werner Vogels

Chief Technology Officer & VP, Amazon

Objectives and impacts

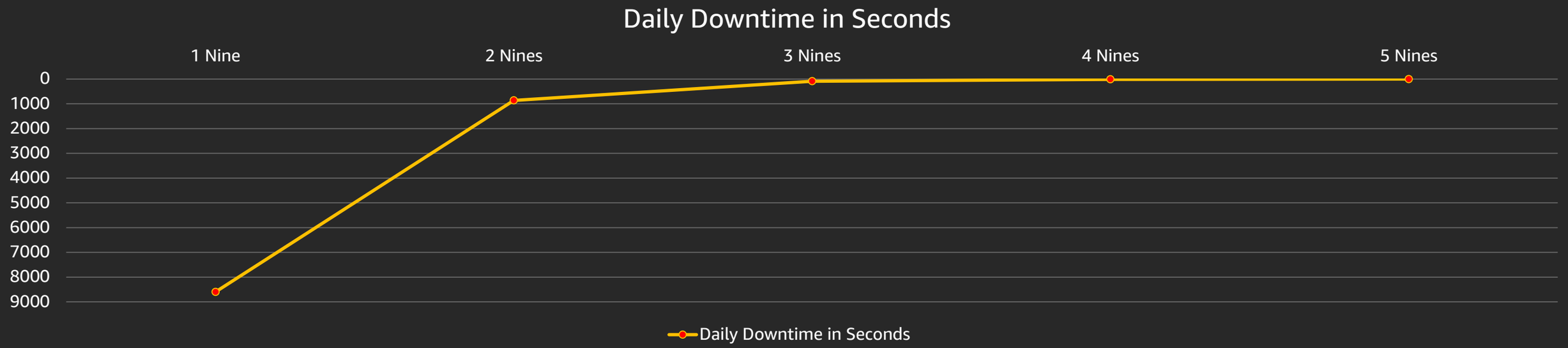
How much data can you afford to recreate or lose?

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

It's *not* about the data, it's about the *mission*

Availability by the numbers

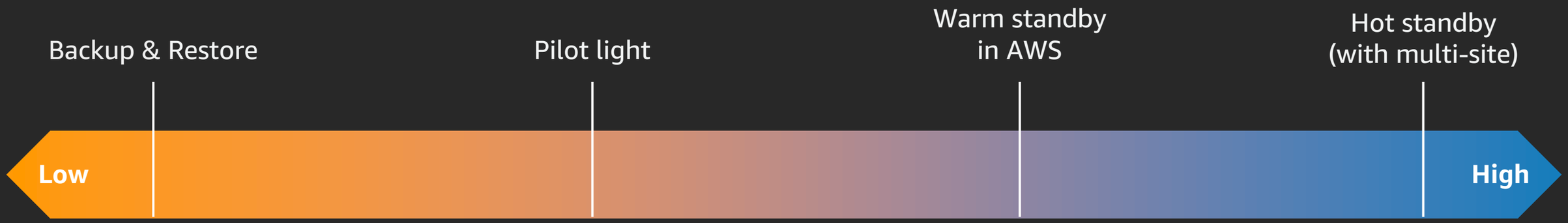
Level of availability	Percent uptime	Downtime per year	Downtime per day
1 Nine	90%	36.5 Days	2.4 Hours
2 Nines	99%	3.65 Days	14 Minutes
3 Nines	99.9%	8.76 Hours	86 Seconds
4 Nines	99.99%	52.6 Minutes	8.6 Seconds
5 Nines	99.999%	5.26 Minutes	0.86 Seconds



Disaster Recovery techniques

DR spectrum and options

AWS offers four levels of backup and DR support across a spectrum of complexity and time



RPO/RTO: Hours

- Lower priority use cases
- Solutions: Amazon S3, AWS Storage Gateway
- Cost: $

RPO/RTO: 10s of Minutes

- Meeting lower RTO & RPO requirements
- Core services
- Scale AWS resources in response to a DR event
- Cost: $$

RPO/RTO: Minutes

- Solutions that require RTO & RPO in minutes
- Business critical services
- Cost: $$$

RPO/RTO: Real-time

- Auto-failover of your environment in AWS
- Cost: $$$$

Start with requirements

Identify applications to protect

Business impact analysis

Define RPO and RTO requirements

Compliance considerations

Availability concepts

High availability

Keep your applications running 24x7

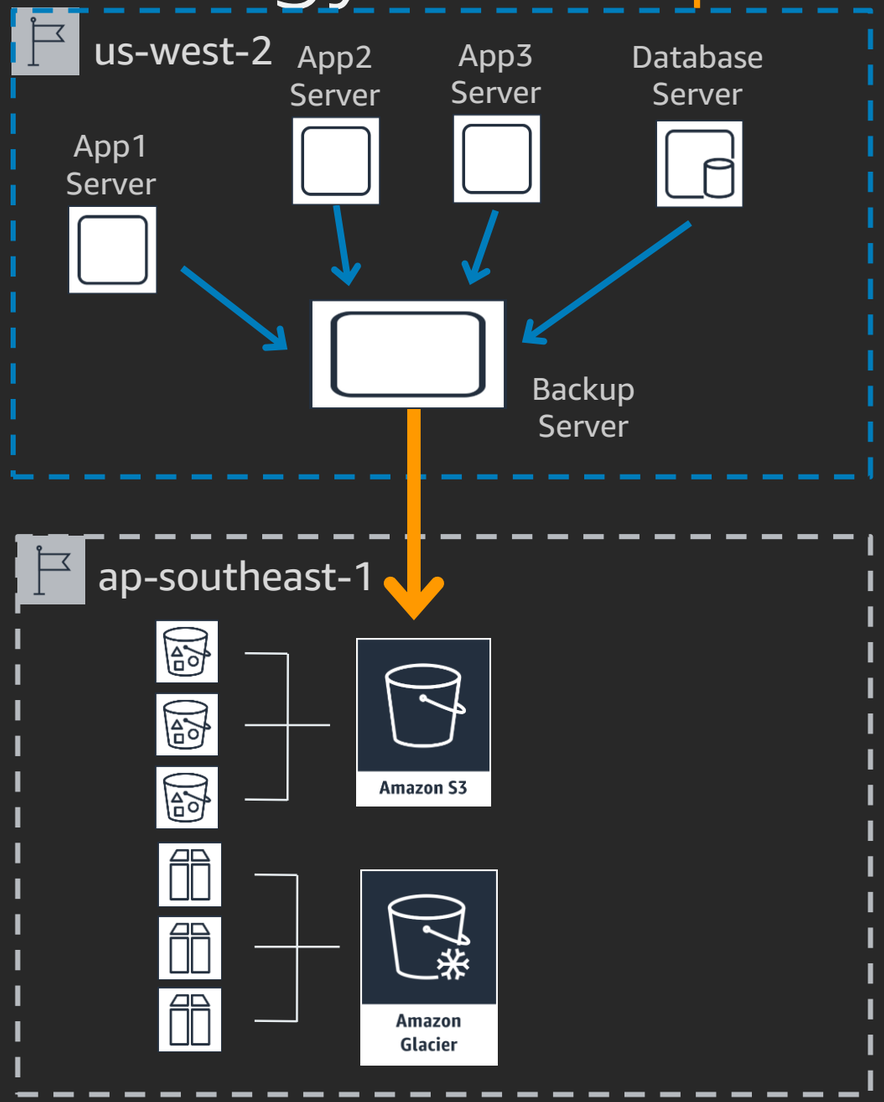
Backup

Make sure your data is safe

Disaster recovery

Get your applications and data back after a major disaster

Strategy: Backup & restore (multi-region)

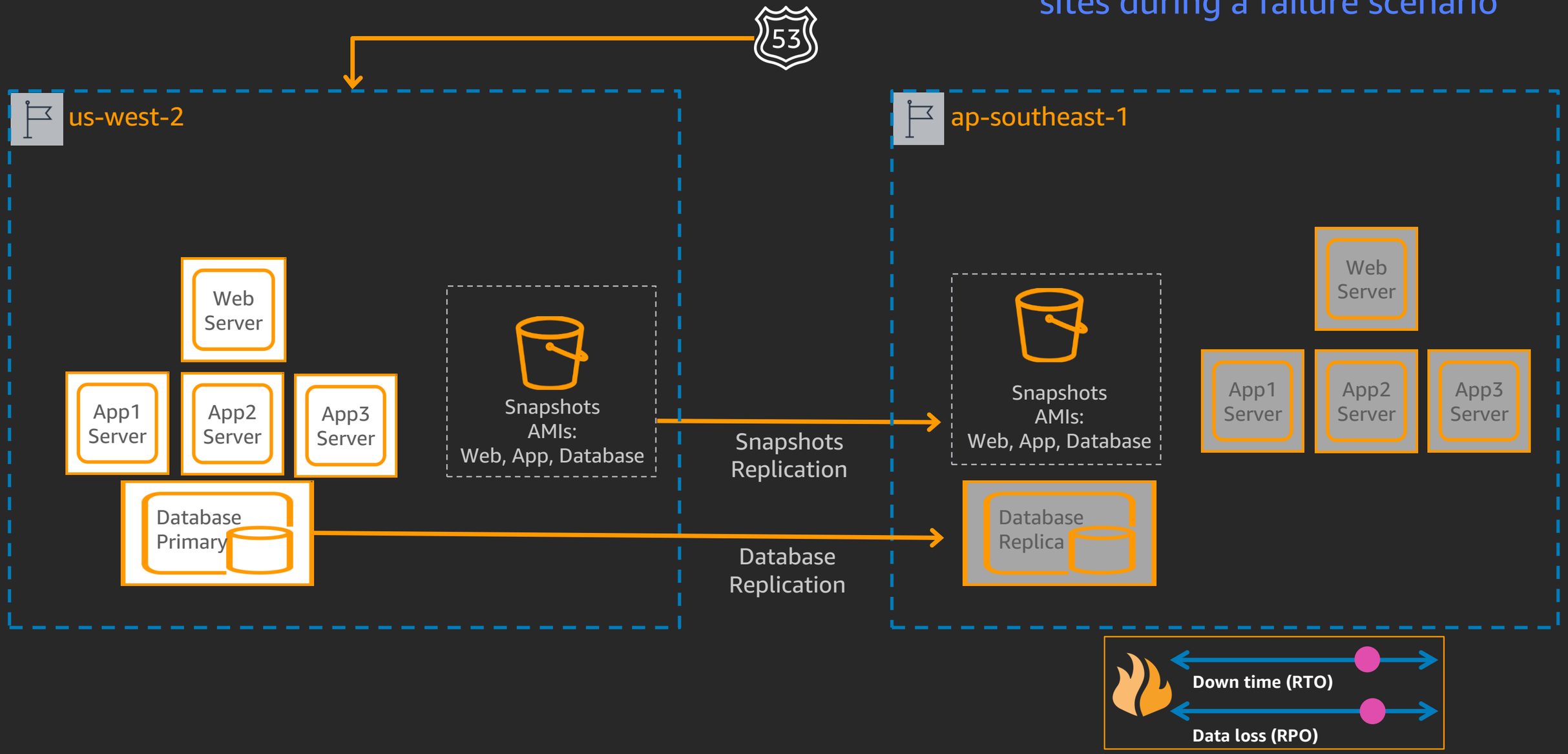


Back up to another Region

- Use managed database services with Amazon S3 (Amazon S3) or Amazon S3 Glacier
- Data stored with high durability in multiple locations

Strategy: Pilot light (multi-region)

Allows the scaling of redundant sites during a failure scenario



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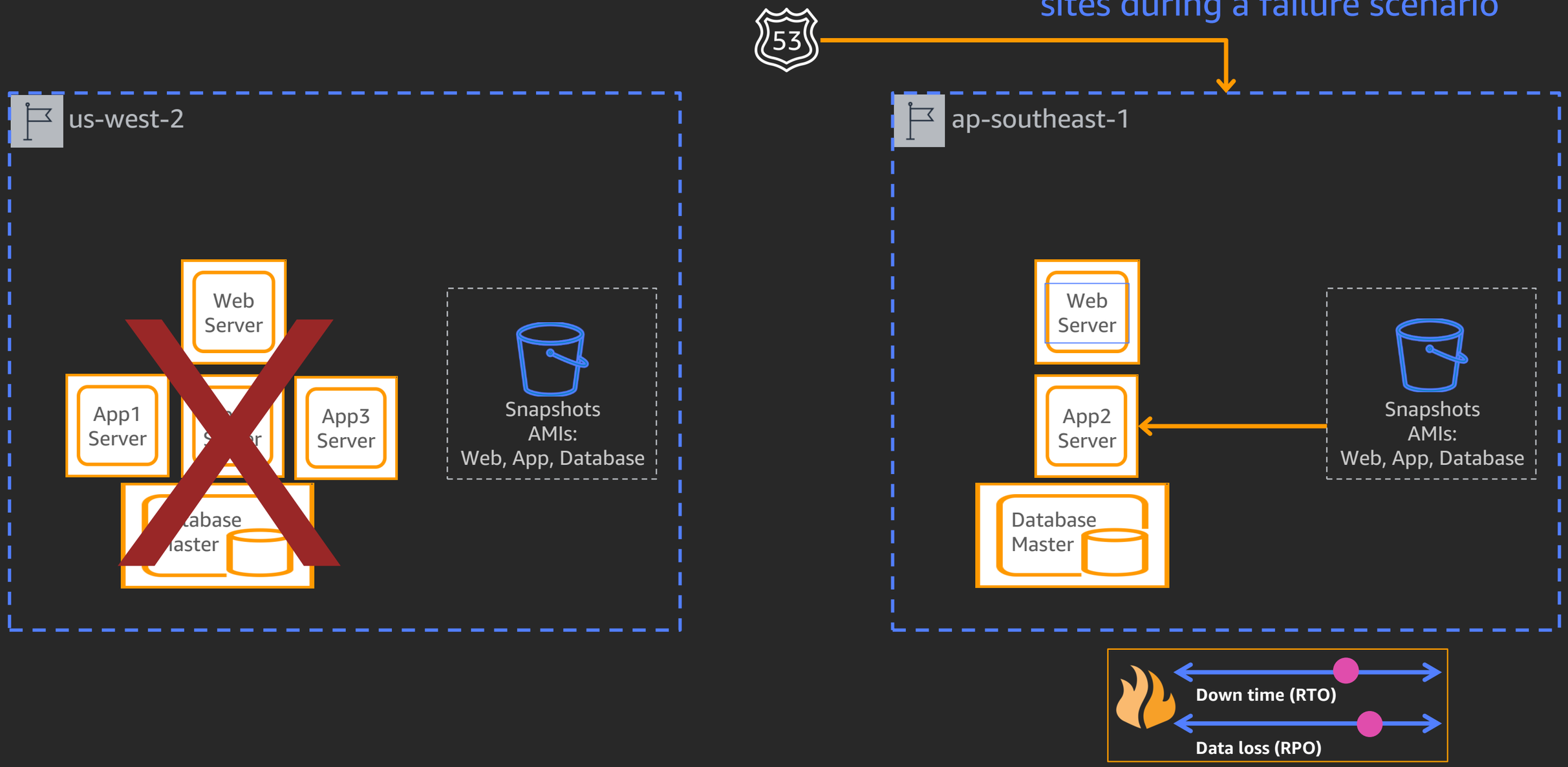
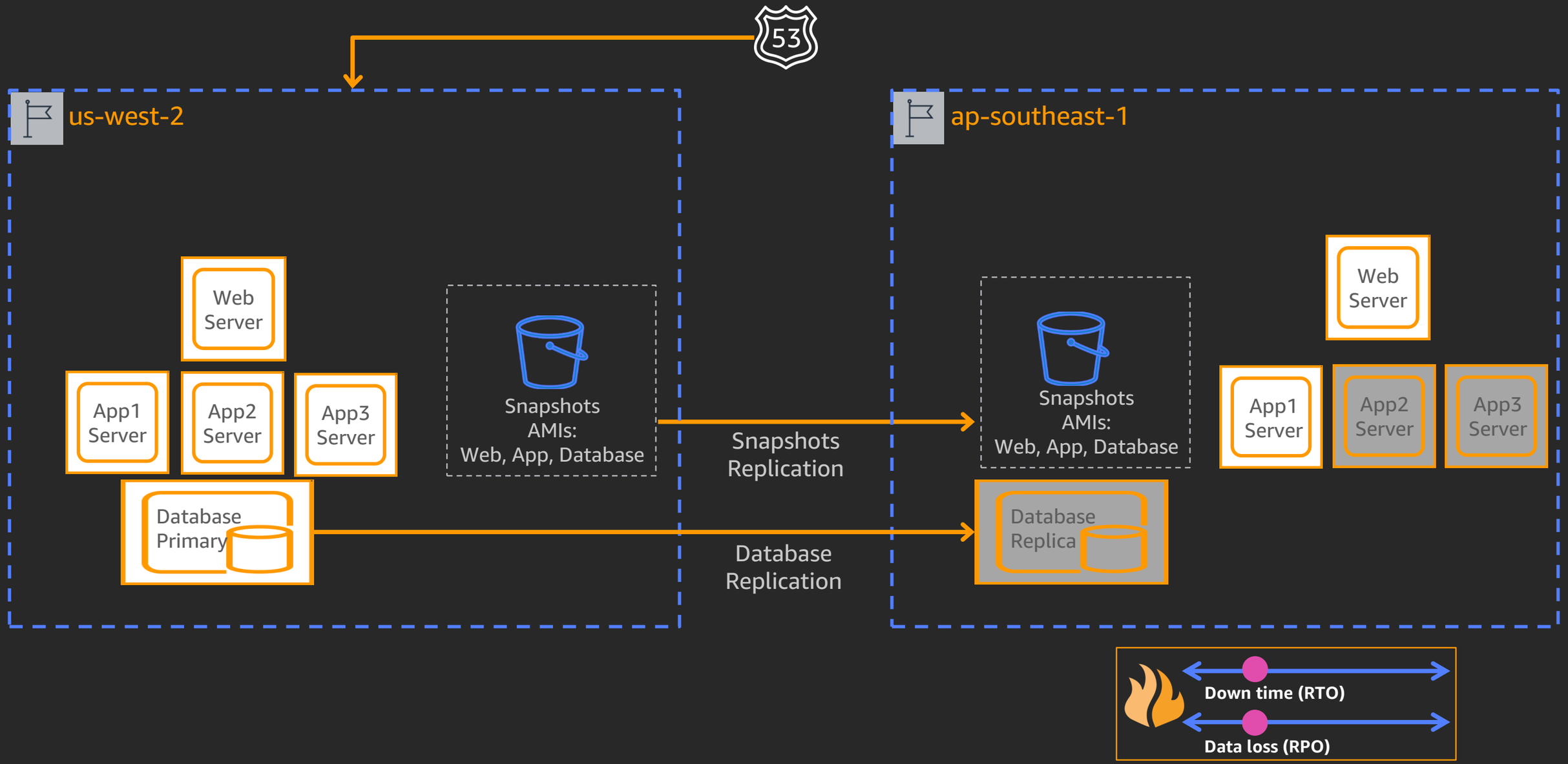
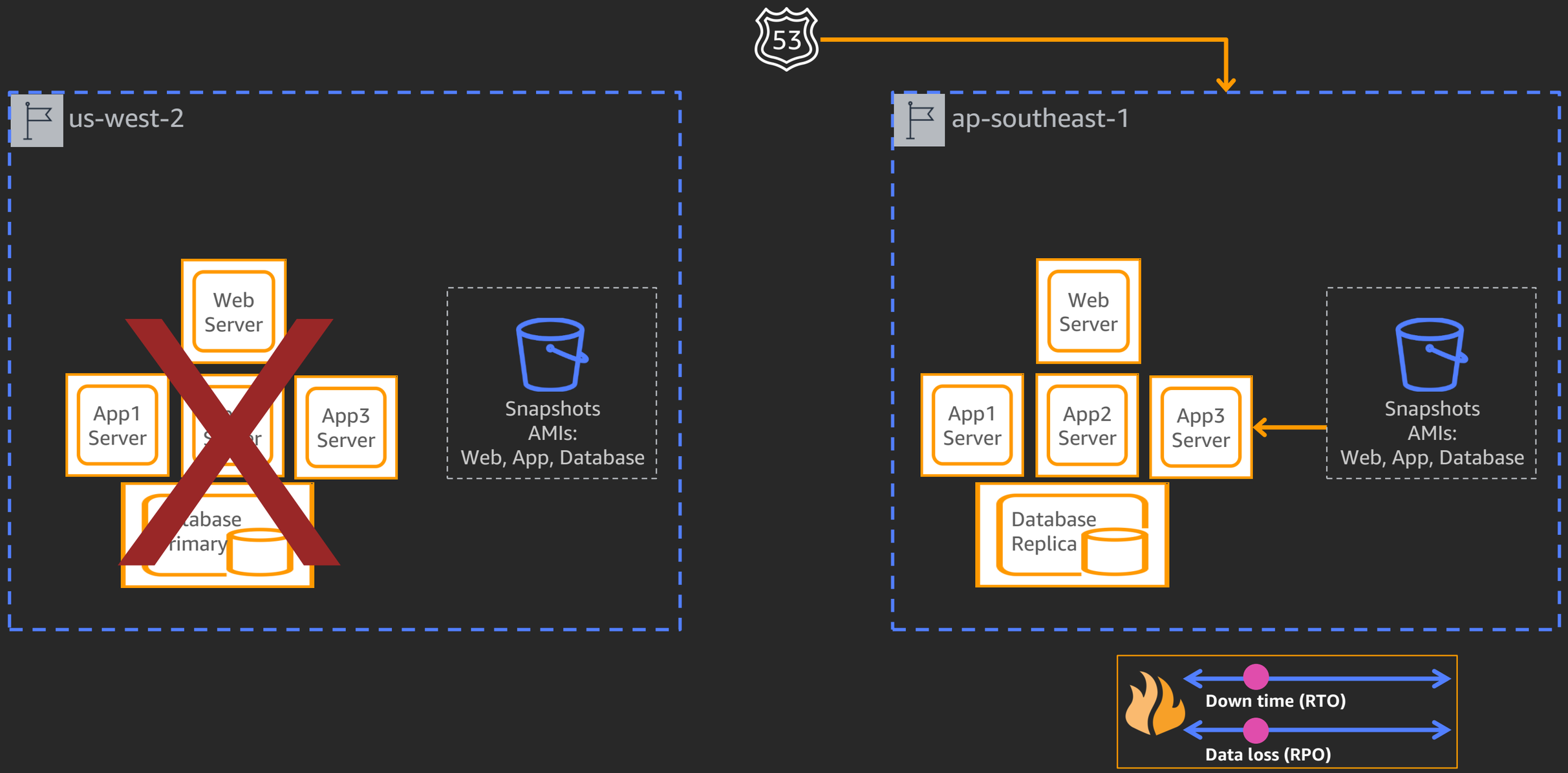


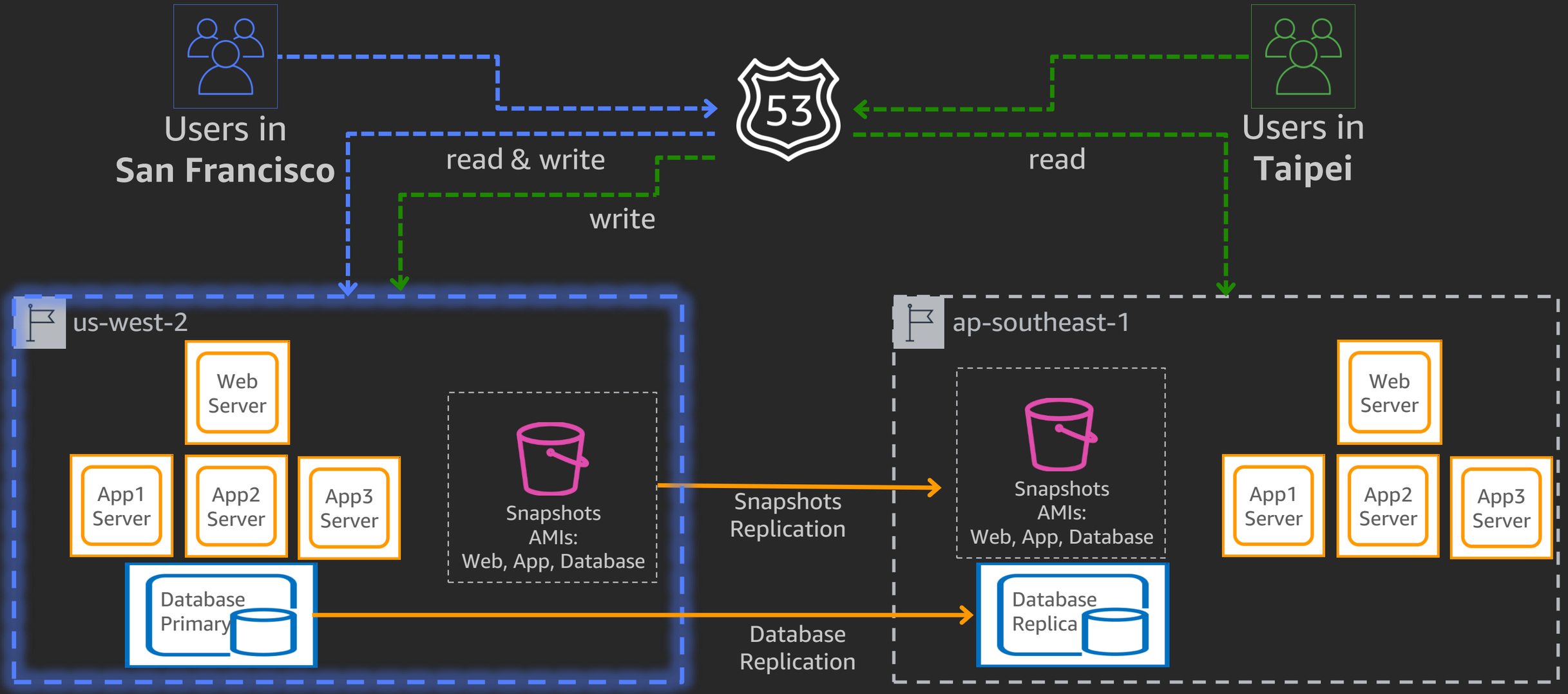
Strategy: Warm standby (multi-region)



Strategy: Warm standby (multi-region)



Strategy: Active-Active (multi-region)



CloudEndure

CloudEndure

Better, faster, more affordable disaster recovery

Flexible

Replicate from any **source**

Wide range of OS, **application**, and database support

Failback to cloud/on-prem

Reliable

Robust, predictable, non-disruptive **continuous** replication

RPO: **subsecond**
RTO: minutes

Protection against ransomware, corruptions, and human errors

Highly automated

Minimal **skill set** required to operate

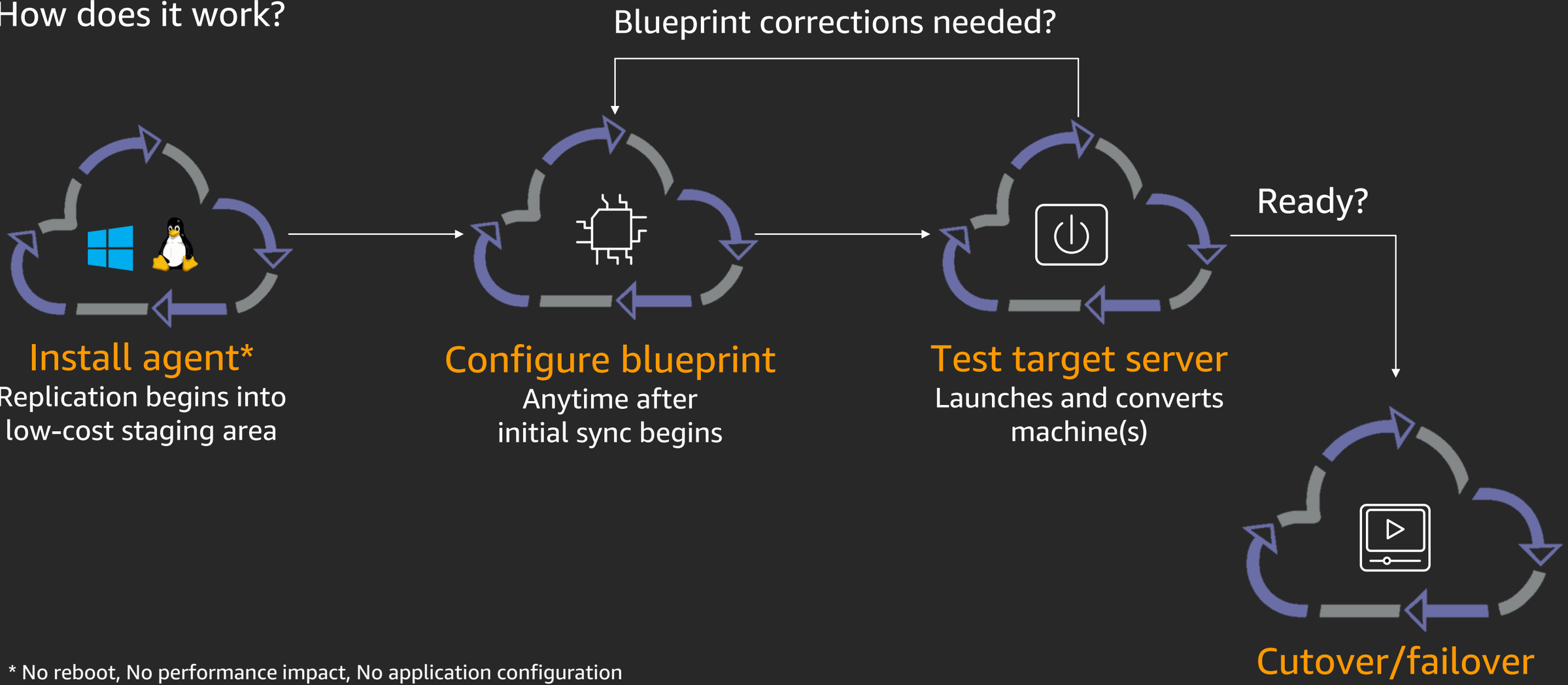
Easy, non-disruptive DR tests

Automated lightweight staging area reduces TCO

- Improve recovery objectives & reduce TCO
- Simple setup lets you start in minutes
- Same highly automated process for all workloads
- Minimizes complexity and reduces risk
- Easy failover and failback

CloudEndure

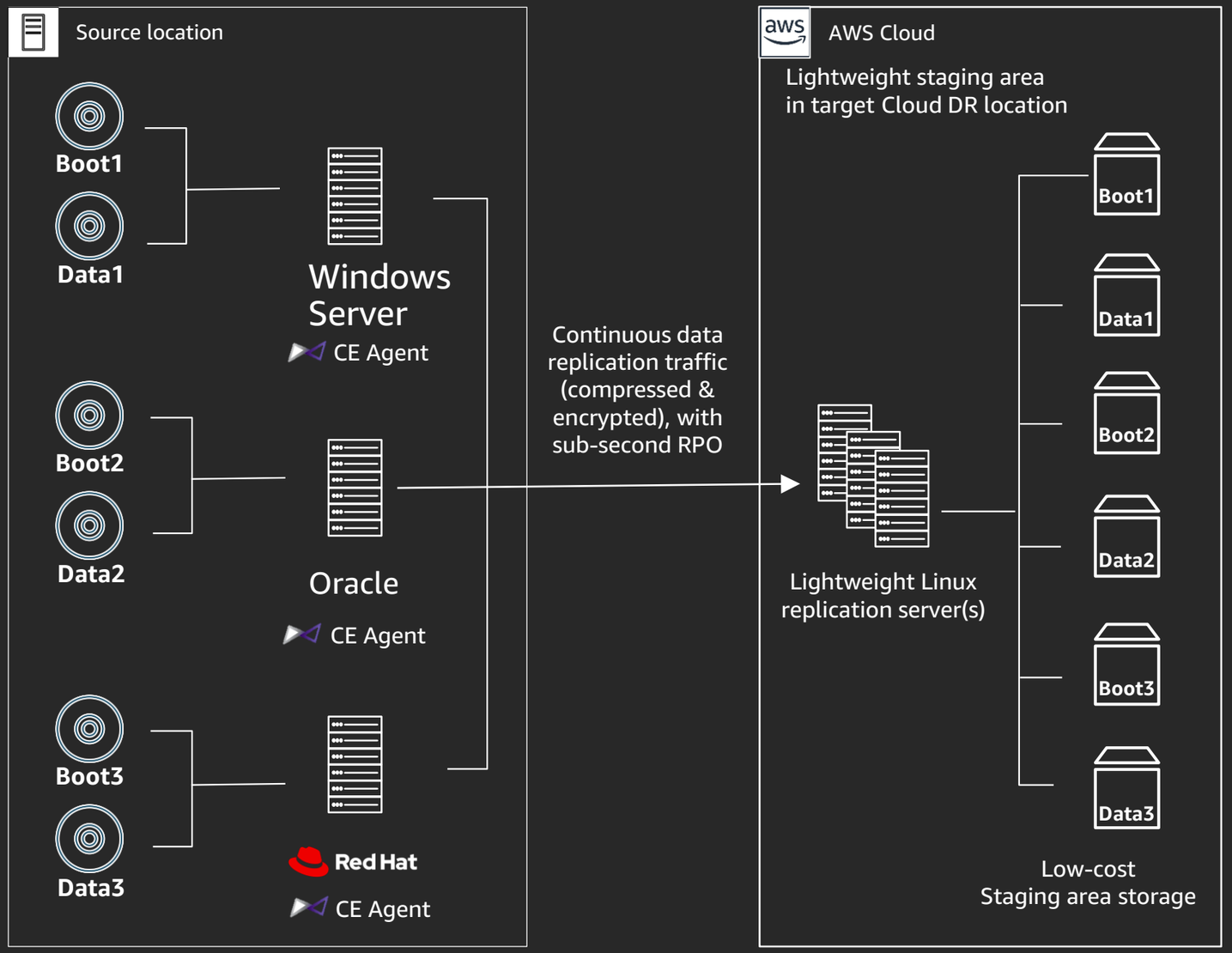
How does it work?



* No reboot, No performance impact, No application configuration

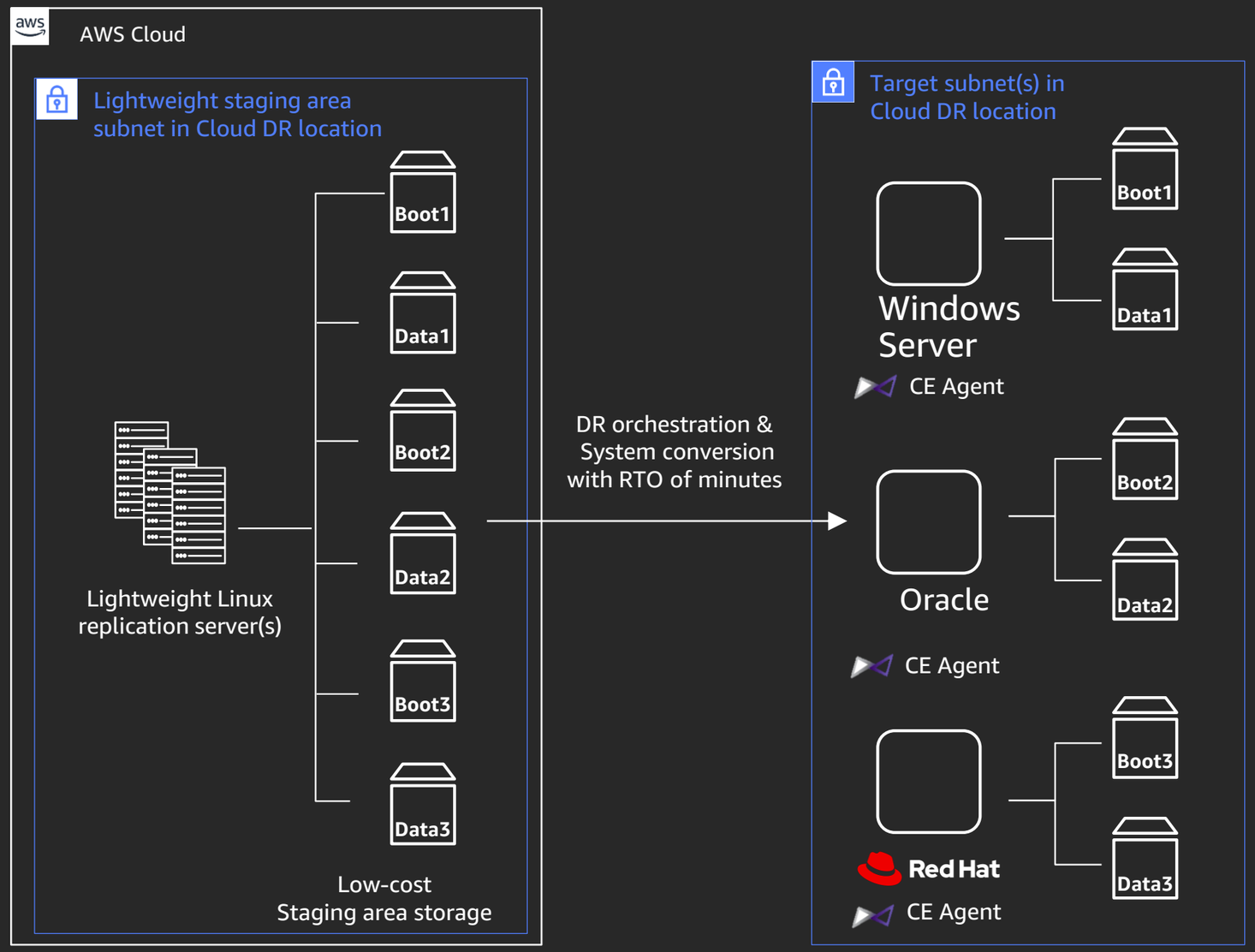
** May be modified anytime after the CloudEndure agent is installed

Lightweight Staging



- Reduce DR site compute costs by 95%+
- Reduce DR site storage costs by 70%+
- Zero DR site duplicate OS license fees!
- Zero DR site software/DB license fees!
- Zero DR site networking equipment fees!
- Continuous replication with subsecond RPO

Disaster Event or Test



- Rapid machine recovery (RTO of minutes)
- Self-service DR dashboard
- Unlimited free non-disruptive DR tests
- Built-in fail-back to any infrastructure
- Enable one-click future migration
- Enable cross-region/cross-cloud DR

Demo

Mumtalakat has more than halved its operational costs by reducing its data backup, storage and security cost in its 4 global infrastructure datacenters.

The entire migration process was handled by the organisation's internal IT team. This is the main advantage of having a capable and trained team to handle the migration activity, speeding up the migration and ensuring high-quality service. Our software is now running in Bahrain, with a lower latency and faster speed"

Mohamed Sater, Mumtalakat's Head of IT

Conclusion

Conclusion

- **Resilience matters**
  - Resilience is a QoS issue and a competitive differentiator
  - In regulated markets, it is a matter of compliance
- **Resilience and continuity are a continuum**
  - It’s not all or nothing
  - Pick the solution that matches your requirements at an application and component level
- **It must be designed in**
- **It must be tested regularly**
  - With proper monitoring and failover, daily usage and metrics are the best test

Project Resilience

https://aws.amazon.com/government-education/nonprofits/disaster-response/project-resilience/

Qualifying New customers can get up to $5,000 offset costs incurred by storing critical datasets in Amazon Simple Storage Service (Amazon S3)

Existing customers can use credits to offset costs incurred by engaging ProServe and CloudEndure to do a deeper dive on their business continuity architecture.

Resilience & Disaster Recovery Resources

AWS Well-Architected Framework

Disaster Recovery Cloud Computing Services - Amazon Web Services (AWS)
Deploying Disaster Recovery Site on AWS
BCP for Financial Institutions

https://aws.amazon.com/disaster-recovery/

http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/resources.html
Characterizes EC2 related resources by their span – e.g. Elastic IPs and SGs are region level while instance and EBS are AZ specific

https://aws.amazon.com/whitepapers/designing-fault-tolerant-applications/
Fault tolerant whitepapers and resources

Any Questions?

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Thank you!

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