Disaster Recovery Strategies on AWS
DISASTER RECOVERY STRATEGIES ON AWS

AWS Regions and Availability Zones (AZs)

AWS REGIONS ARE PHYSICAL LOCATIONS AROUND THE WORLD WHERE WE CLUSTER DATA CENTERS

32 AWS Regions worldwide

Each AWS Region has multiple AZs

Each AZ includes one or more discrete data centers

A Region is a physical location in the world

AWS Regions

Announced Regions

Data centers, each with redundant power, networking, and connectivity, housed in separate facilities.
High availability
High Availability (HA)

About application availability

Smaller scale, more frequent events:
- Component failures
- Network issues
- Load spikes

Measures mean over time:
- “The 9’s” (99.99% available)
Multi-AZ for high availability (HA)

- Availability Zone A:
  - VPC
  - NAT gateway
  - Elastic Load Balancing
  - Auto Scaling group
  - Compute Instance
  - EBS Volume
  - Amazon Relational Database Service (Amazon RDS) (primary)

- Availability Zone B:
  - NAT gateway
  - Auto Scaling group
  - Compute Instance
  - EBS Volume
  - Amazon RDS (standby)

- Availability Zone C:
  - NAT gateway
  - Auto Scaling group
  - Compute Instance
  - EBS Volume
  - Amazon RDS read replica

- Amazon Simple Storage Service (S3)
- Amazon DynamoDB
Disaster recovery
Disaster recovery (DR)

- About business continuity
- Larger scale, less frequent, events:
  - Natural disasters
  - Technical failures
  - Human actions
- Measures a one-time event:
  - Recovery Time
  - Recovery Point
Multi-AZ for Disaster Recovery (DR)

Each AWS Region has multiple AZs

Each AZ includes one or more discrete data centers

A Region is a physical location in the world

Data centers, each with redundant power, networking, and connectivity, housed in separate facilities

Availability Zone A
- Amazon RDS (primary)
- Compute instance
- Elastic Load Balancing
- NAT gateway

Availability Zone B
- Amazon RDS (standby)
- Compute instance
- Auto Scaling group
- NAT gateway

Availability Zone C
- Amazon RDS (read replica)
- Compute instance
- NAT gateway

Amazon EBS
- Amazon EBS
- EBS Snapshot
Each AWS Region has multiple AZs

A Region is a physical location in the world

Multi-Region for Disaster Recovery (DR)
Data Protection

- Accidental deletions
- Regional impairments
- Malicious intent
Disaster Recovery - Understanding the Impact of Failures

Risk assessment
Which risks? How likely?

Business impact analysis
What is the cost of disruption?

Align DR to Business Continuity Plan
How will you operate?

- **$1.25B to $2.5B**
  - Annual Fortune 1,000 application downtime costs (IDC)

- **$474K**
  - Average cost/hour of downtime (Ponemon Institute)

- **$500K to $1M**
  - Cost/hour of a critical application failure (IDC)

- **$100K**
  - Average cost/hour of an infrastructure failure (IDC)
Recovery Point and Recovery Time Objective (RPO/RTO)

How much data can you afford to recreate or lose?

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

Disaster Recovery Point (RPO)

Disaster Recovery Time (RTO)

Time

Data loss
Down time
Strategies for Disaster Recovery

- **Backup & Restore**: RPO / RTO: Hours
  - Data backed up
  - No services deployed
  - Cost $

- **Pilot Light**: RPO / RTO: 10s of minutes
  - Data live
  - Services idle
  - Cost: $$

- **Warm standby**: RPO / RTO: Minutes
  - Data live
  - Services run reduced capacity
  - Cost $$$

- **Multi-site active/active**: RPO / RTO: Near real-time
  - Data live
  - Live services
  - Cost $$$$$
AWS as Disaster Recovery site

WITH AWS ELASTIC DISASTER RECOVERY – A PILOT LIGHT STRATEGY

AWS Elastic Disaster Recovery
Quickly and reliably recover your on-premises or cloud-based applications

Set up
Define settings and initiate continuous data replication

Test
Launch instances for non-disruptive tests

Operate
Maintain readiness with monitoring and periodic drills

Failover
Launch recovery instances on AWS within minutes

Failback
Initiate replication and return to primary site

RPO: Sub-Seconds
RTO: Minutes
Game Days
SIMULATE FAILURE OR EVENT TO TEST SYSTEMS RESILIENCY, PROCESSES, AND TEAM RESPONSES

People
Cross-disciplinary team
Processes

Briefing
Overview
Roles

Planning
Preparation
Hypothesis

Execution
Run experiment

Analysis
Verify
Improve
An untested DR strategy
...is no DR strategy
Resources

Whitepaper, “Disaster Recovery of Workloads on AWS: Recovery in the Cloud”

Well-Architected hands-on DR labs

AWS Architecture blog: Disaster Recovery series
Workshops
Disaster Recovery Workshops (Take your pick(s) !)

- Module 1: Backup and Restore
- Module 2: Pilot Light
- Module 3: Warm Standby
- Module 4: Hot Standby

https://wellarchitectedlabs.com/reliability/disaster-recovery/
Module 1: Backup and Restore Workshop Architecture
Module 1: Backup and Restore Workshop Architecture

**us-east-1 - Primary Passive**
- Amazon VPC
- Instance
- Amazon RDS instance
- AMI
- AWS Backup
- DB snapshot

**us-west-1 - Recovery Active**
- Amazon VPC
- Connect
- Launch
- Instance
- AMI
- Restore
- Amazon S3 Website
- AWS Backup
- Cross-Region replication

**Cross-Region backup**
- Amazon S3 Website
- AWS Backup
- Cross-Region replication

**Cross-Region replication**
- Amazon S3 Website
- AWS Backup
- Cross-Region replication
Module 2: Pilot Light Workshop Architecture

Disaster Recovery Strategies on AWS

AWS Cloud

**us-east-1 - Primary Active**
- Availability Zone
- Amazon VPC
- Instance
- AMI
- Aurora Primary Writer
- Amazon S3
- Website
- Asynchronous Cross Region Replication
- Aurora Global Database

**us-west-1 - Recovery Passive**
- Availability Zone
- Amazon VPC
- Amazon S3
- Website
- Aurora Read Replica
Module 2: Pilot Light Workshop Architecture

Disaster Recovery Strategies on AWS

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Module 3: Warm Standby Workshop Architecture
Module 4: Hot Standby Workshop Architecture

- **us-east-1 - Primary Active**
  - Amazon VPC
  - Availability Zone
  - Instance
  - Aurora Primary Writer
  - Amazon S3 Website
  - Amazon API Gateway
  - AWS Lambda
  - Amazon DynamoDB
  - Asynchronous Cross Region Replication DynamoDB Global Tables

- **us-west-1 - Recovery Passive**
  - Amazon VPC
  - Availability Zone
  - Instance
  - Aurora Read Replica
  - Amazon S3 Website
  - Amazon API Gateway
  - AWS Lambda
  - Amazon DynamoDB
  - Asynchronous Cross Region Replication Aurora Global Database
Module 4: Hot Standby Workshop Architecture
Getting Started With Event Engine

• As a participant, you will have access to an AWS account with any optional pre-provisioned infrastructure and IAM policies needed to complete this workshop.

• The AWS account will only be available for the duration of this workshop. You will lose access to the account thereafter.

• Be sure to review the terms and conditions of the event. Do not upload any personal or confidential information to the account.
Getting Started With Event Engine

Before we continue, please verify the following

1. You are logged out of any business or personal AWS accounts
2. That you disconnect from your VPN (if possible)
3. You have an email address that you can easily access right now
Start labs

1. Login to your Event Engine account
   • https://dashboard.eventengine.run
   • Replace with hash code

Copy this code into a notepad or text editor
Access the AWS Account Console
Access the AWS Account Console

AWS Console Login

Remember to only use "us-west-2" as your region, unless otherwise directed by the event operator.

Login Link

[Open AWS Console]
[Copy Login Link]

Credentials / CLI Snippets

Mac / Linux

Mac or Linux

export AWS_DEFAULT_REGION=us-west-2
export AWS_ACCESS_KEY_ID=ASIAAWS2EFQCRMDMII
export AWS_SECRET_ACCESS_KEY=3l1Y04CpOJOKMyqI7MfB6KNYk9z194JyU8Q+hwto
export AWS_SESSION_TOKEN=2IOQ3J3Jp221uxVjE6gakCVY2LAW/nc3QUM3JHEFC1QXi15u1DS2j3fYzSwQnP92GwT2XboCg944QRQ/2gJlu

How do I use the AWS CLI?

Checkout the AWS CLI documentation here: https://docs.aws.amazon.com/cli/latest/userguide/cli-chap-welcome.html

[OK]
Lab Instructions


MAKE SURE TO ALWAYS FOLLOW THE INSTRUCTIONS FOR IN-PERSON WORKSHOP

Account setup

Using an account provided by instructor at virtual or in-person workshop

- If you are running this workshop as part of an instructor-led workshop, please log into the console using this link and enter the hash provided to you as part of the workshop.
- All resources for this workshop have been pre-provisioned.

Using your own AWS account

- If you are running this workshop in your own account, click Next Step.
Thank you!

[speaker name]
[speaker role]
[speaker team]

linkedin.com/in/{speaker handler}

Please complete the survey