Amazon Route 53 Application Recovery Controller (ARC)

Introduction

Amazon Route 53 Application Recovery Controller (ARC) enhances application resilience and high availability by providing failover orchestration across Availability Zones and Regions. It enables controlled traffic routing, readiness monitoring, and automatic mitigation mechanisms to minimize downtime.

Overview

ARC has two primary capabilities:

1. **Zonal Shift & Autoshift** (Multi-AZ recovery):
    a. **Zonal Shift**: Temporarily reroute traffic away from a single AZ manually.
    b. **Zonal Autoshift**: Automatically reroutes traffic from unhealthy AZs based on AWS-internal health signals.
2. **Routing Control & Readiness Check** (Multi-Region recovery):
    a. **Routing Control**: Manually or programmatically reroute traffic between Regions.
    b. **Readiness Check**: Ensures that backup Regions are properly configured and scaled before failover.

Pre-requisites

- AWS workloads deployed across multiple AZs or Regions.
- IAM permissions for Route 53 ARC (e.g., r53-recovery-readiness:, *r53-recovery-control:*).
- Optional: Route 53, CloudWatch, EventBridge integration for automation.

Key Concepts

- **Recovery Group**: Logical grouping of cells (app replicas).
- **Cell**: An isolated unit of deployment (AZ or Region).
- **Cluster**: Logical container for routing controls.
- **Control Panel**: Dashboard interface for toggling routing controls.
- **Safety Rules**: Guardrails to prevent unintended routing control changes.

- **Resource Set**: A group of AWS resources associated with a Readiness Check.

Benefits / Use Cases / Examples

- **Disaster Recovery**: Shift traffic to a standby Region.
- **Zone Outage Mitigation**: Temporarily isolate traffic from a degraded AZ.
- **Maintenance**: Route traffic away from a cell during updates.
- **Multi-Region HA**: Active/active or active/passive deployment switching.

How-Tos

1. Multi-AZ: Zonal Shift / Autoshift

- Opt in to zonal shift for supported services (ALB, NLB, EC2)
- Use CLI:

```
Unset
aws arc-zonal-shift start-zonal-shift
--resource-identifier <arn> --away-from <az>
```

- View health metrics and AWS-initiated autoshifts from the console

2. Multi-Region: Routing Control

- Create a **cluster** and **control panel**
- Define **routing controls** (on/off switches)
- Link controls to Route 53 records (weighted or failover routing)
- Add **safety rules** (e.g., at least one control must remain ON)

3. Multi-Region: Readiness Check

- Define a **Recovery Group** with multiple **cells**
- Associate **resource sets** (e.g., ALBs, RDS) with each cell
- Create **readiness checks** to monitor infra readiness
- Monitor via CloudWatch or trigger alerts via EventBridge

Considerations

- **Zonal autoshift** is currently AWS-initiated only (no custom triggers)
- **Route 53 integration** is essential for traffic routing
- **Propagation delay** applies for DNS-level changes
- **Safety rules** are critical to avoid routing all traffic to unhealthy Regions

- **Costs** increase with multi-Region deployments and extra resources

Documentation

- Route 53 ARC Overview: https://docs.aws.amazon.com/r53recovery/latest/dg/what-is-route53-recovery.html
- Readiness Checks: https://docs.aws.amazon.com/recovery-readiness/latest/api/what-is-recovery-readiness.html
- Zonal Shift & Autoshift: https://docs.aws.amazon.com/r53recovery/latest/dg/multi-az.html
- Routing Control CLI: https://docs.aws.amazon.com/cli/latest/reference/arc-zonal-shift/index.html