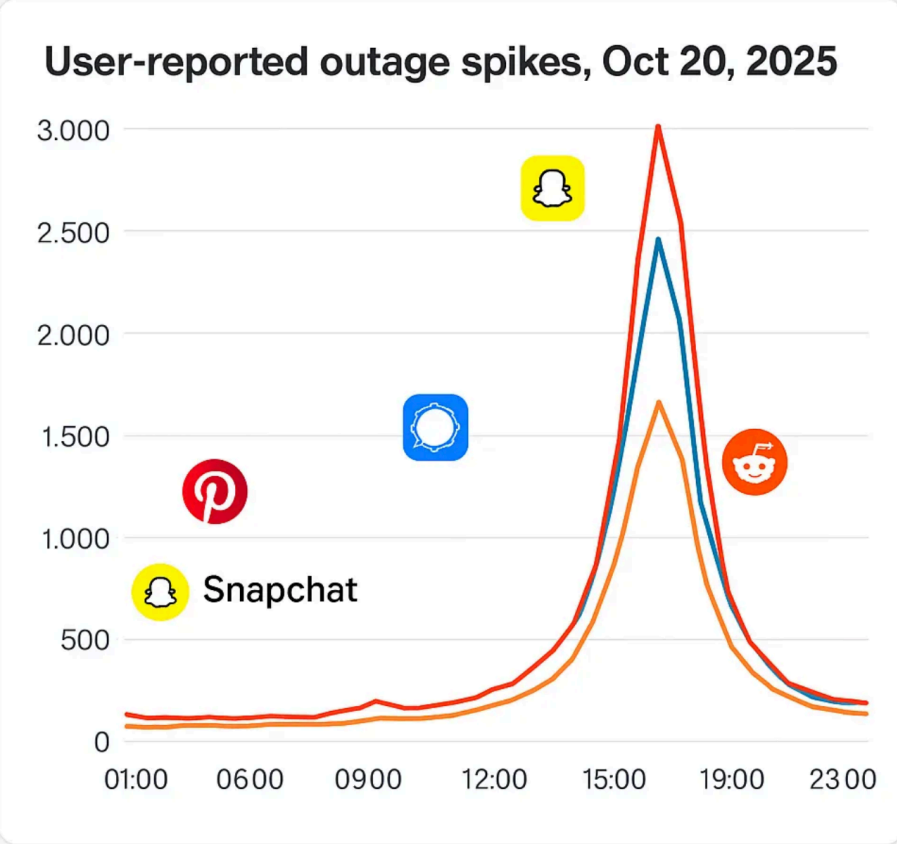
Multi-Region EKS with Global Accelerator

High Availability Kubernetes on AWS

Why Multi-Region ?

AWS US-EAST-1 Outage (October 20–21, 2025)



Who survives or is less affected?

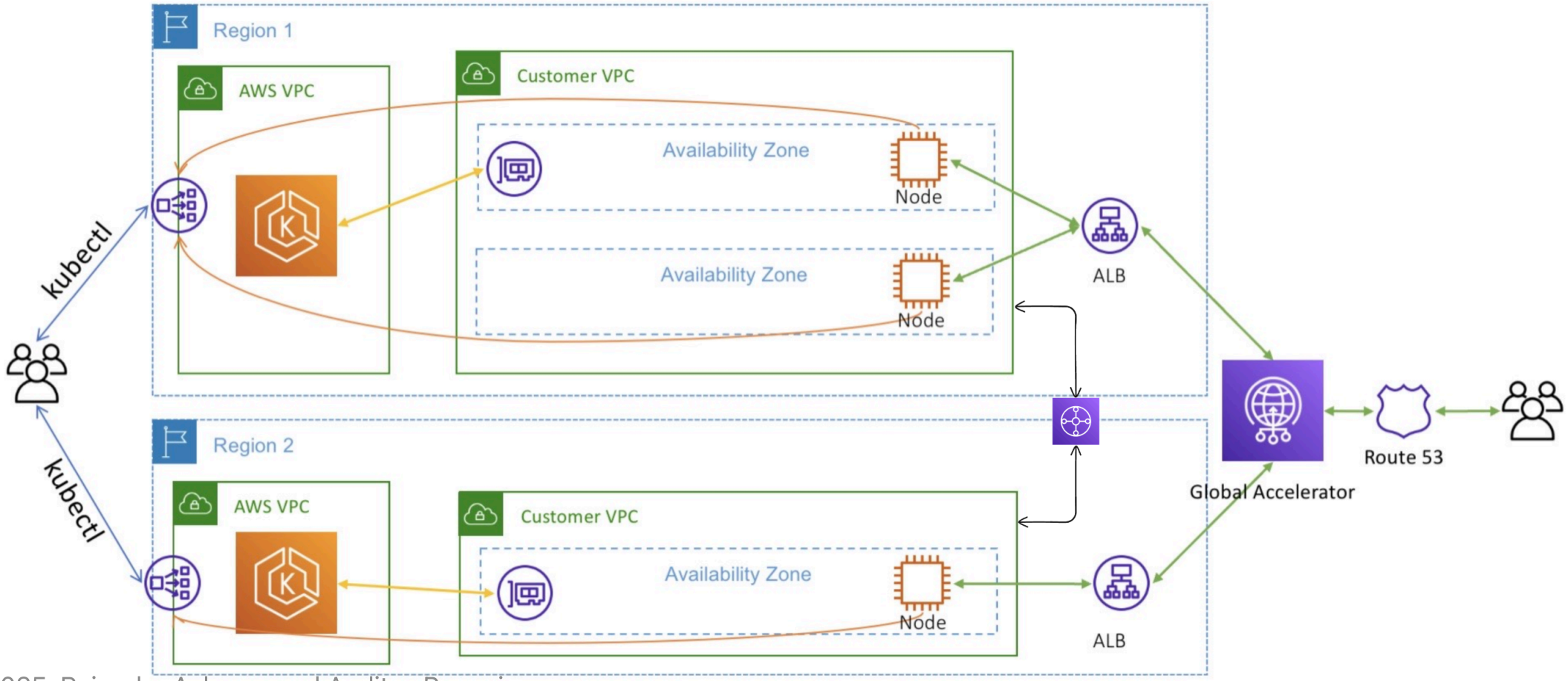
Architecture Overview

Multi-region stateless applications using Amazon EKS

Key Components:

- **EKS Clusters**: Primary (us-east-1) and Secondary (us-west-2)
- **Global Accelerator**: Static anycast IPs with automatic failover
- **Route53**: DNS management with alias records
- **Network Load Balancers**: Regional endpoints
- **Transit Gateway**: Cross-region connectivity

Deployment Architecture



Network Architecture & Traffic Flow

Regional Setup:

- **Primary (us-east-1)**: VPC `10.0.0.0/16`, 3 AZs, EKS v1.31
- **Secondary (us-west-2)**: VPC `10.1.0.0/16`, 3 AZs, EKS v1.31
- **Worker Nodes**: t3.medium (Min: 1, Max: 6, Desired: 3)
- **Application**: Nginx (3 replicas/region)

Traffic Flow:

1. Client → Global Accelerator (anycast IPs)
2. Global Accelerator → Regional NLB (primary: 100%)
3. NLB → EKS Service LoadBalancer
4. Service → Application Pods

Global Accelerator & Failover

Static IPs:

- `52.223.29.64` / `166.117.186.20`

Configuration:

- **Protocol**: TCP Port 80
- **Affinity**: SOURCE_IP
- **Primary**: 100% (active)
- **Secondary**: 0% (standby)

Failover Mechanism:

- **Health Checks**: Global Accelerator monitors NLB health
- **Automatic Failover**: Traffic shifts to secondary region on failure
- **Traffic Dial**: Gradual traffic shifting (0-100%)

Transit Gateway: Cross-Region Connectivity

Purpose:

- **Private VPC peering** between regions (10.0.0.0/16 <--> 10.1.0.0/16)
- **Pod-to-pod communication** across EKS clusters
- **Shared services** access (databases, caching, monitoring)

Use Cases:

- Stateful applications requiring cross-region sync
- Centralized logging/monitoring infrastructure
- Multi-region microservices communication

Demo

```
resource "aws_globalaccelerator_endpoint_group" "secondary" {
  listener_arn = aws_globalaccelerator_listener.main.id

  endpoint_group_region   = local.regions.secondary
  traffic_dial_percentage = 0

  endpoint_configuration {
    endpoint_id = "arn:aws:elasticloadbalancing:ap-northeast-1:488309743291:loadbalancer/net/a4d0
    weight      = 100
  }
}
```

```
# Run: ./get-nlb-arns.sh
resource "aws_globalaccelerator_endpoint_group" "primary" {
  listener_arn = aws_globalaccelerator_listener.main.id

  endpoint_group_region   = local.regions.primary
  traffic_dial_percentage = 100
```

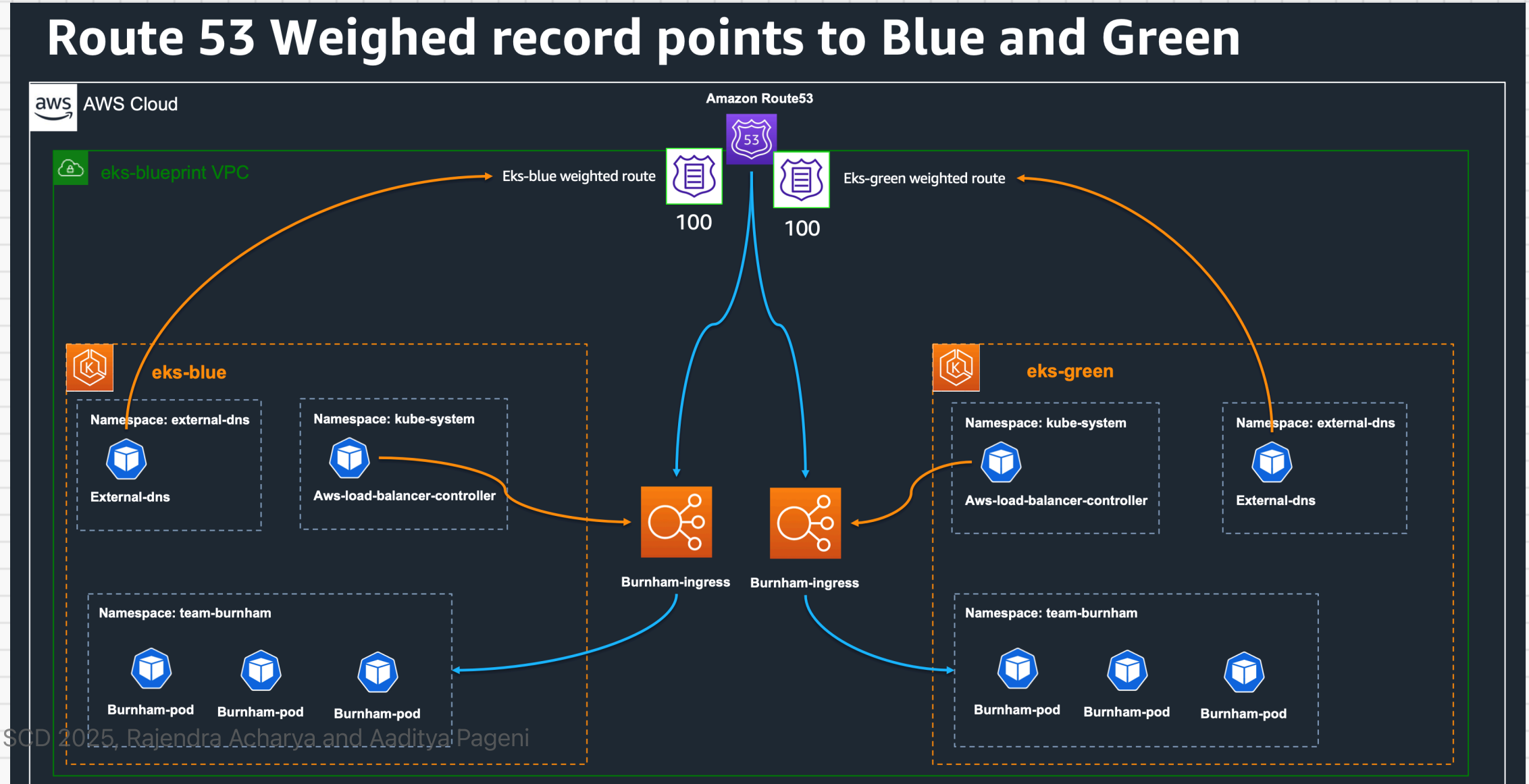
```
resource "aws_globalaccelerator_endpoint_group" "primary" {
  listener_arn = aws_globalaccelerator_listener.main.id

  endpoint_group_region   = local.regions.primary
  traffic_dial_percentage = 50

  endpoint_configuration {
    endpoint_id = "arn:aws:elasticloadbalancing:ap-south-1:4883097432
    weight      = 100
  }
}

resource "aws_globalaccelerator_endpoint_group" "secondary" {
  listener_arn = aws_globalaccelerator_listener.main.id

  endpoint_group_region   = local.regions.secondary
  traffic_dial_percentage = 50

  endpoint_configuration {
    endpoint_id = "arn:aws:elasticloadbalancing:ap-northeast-1:488309
    weight      = 100
  } 16h rajendr… multi-region failover test
}
```

Blue Green Deployment ?

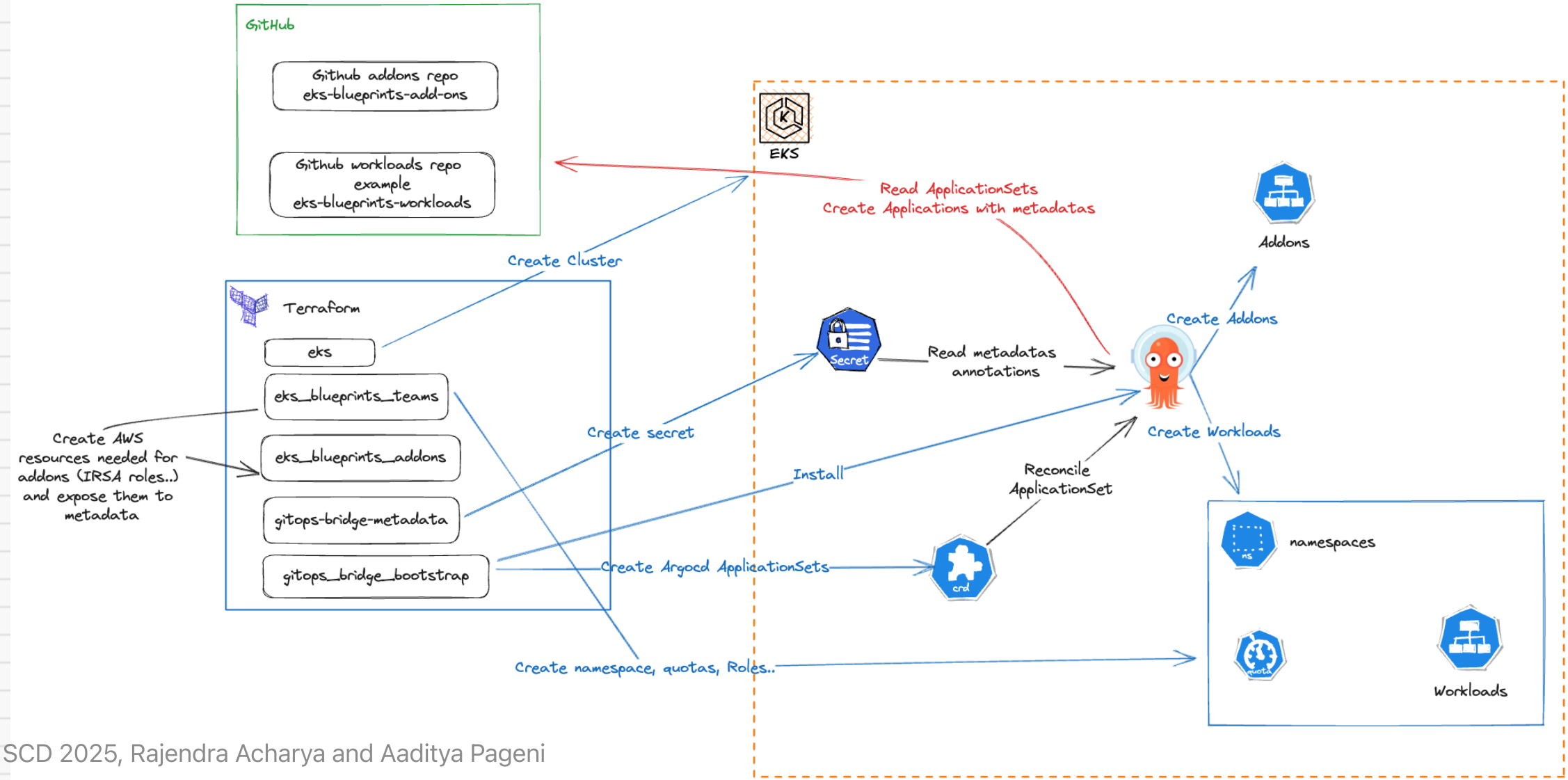
Why Blue-Green

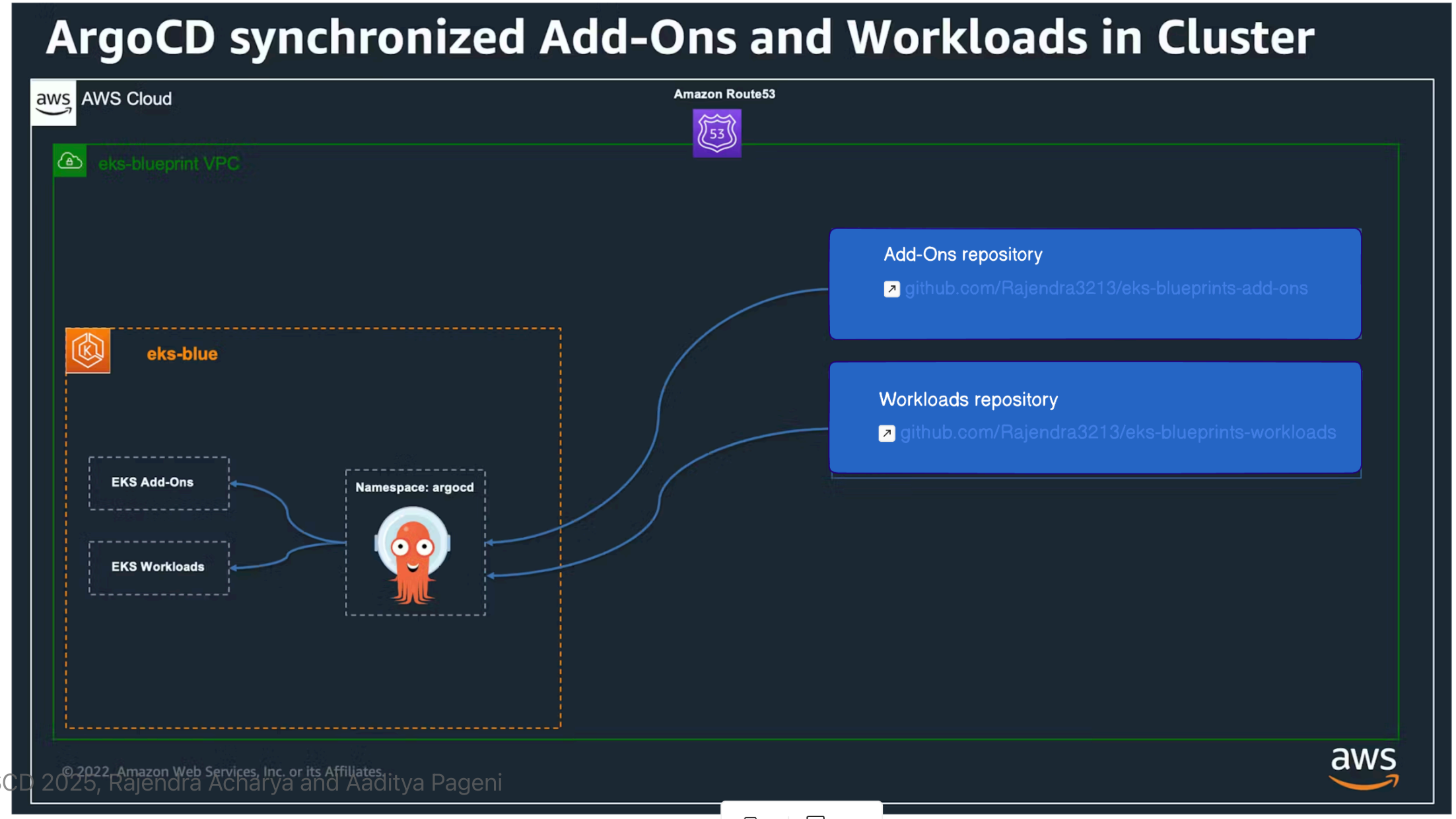
- Minimize downtime during upgrades
- Easy rollback to previous version
- Safer testing in production: Green can be fully tested before live traffic hits it.

EKS-Blue-Green deployment setup



Argo Rollout setup




ArgoCD synchronized Add-Ons and Workloads in Cluster
AWS Cloud
Amazon Route53
eks-blueprint VPC
Add-Ons repository
github.com/Rajendra3213/eks-blueprints-add-ons
eks-blue
Workloads repository
github.com/Rajendra3213/eks-blueprints-workloads
EKS Add-Ons
Namespace: argocd
EKS Workloads
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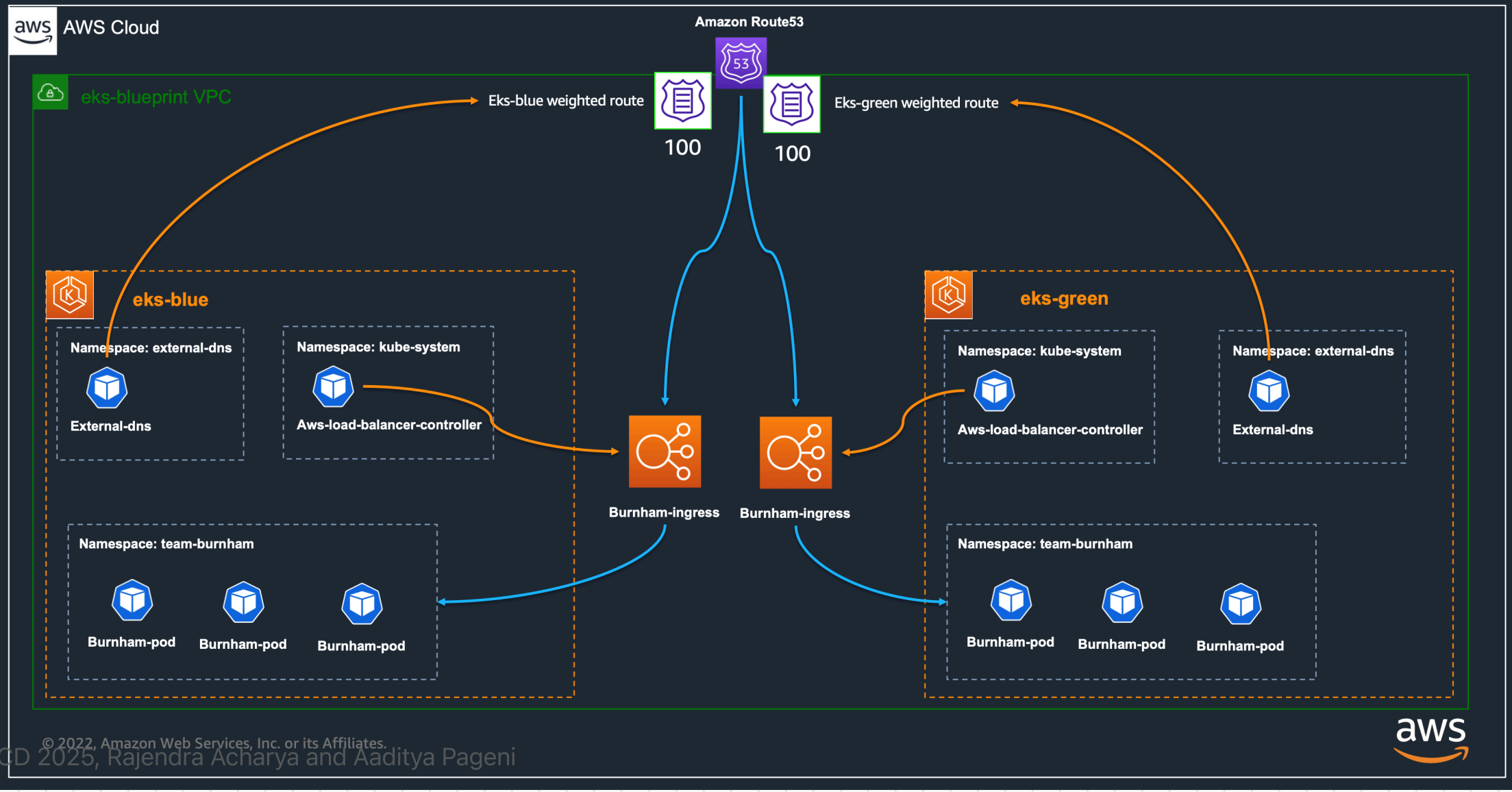
Tips

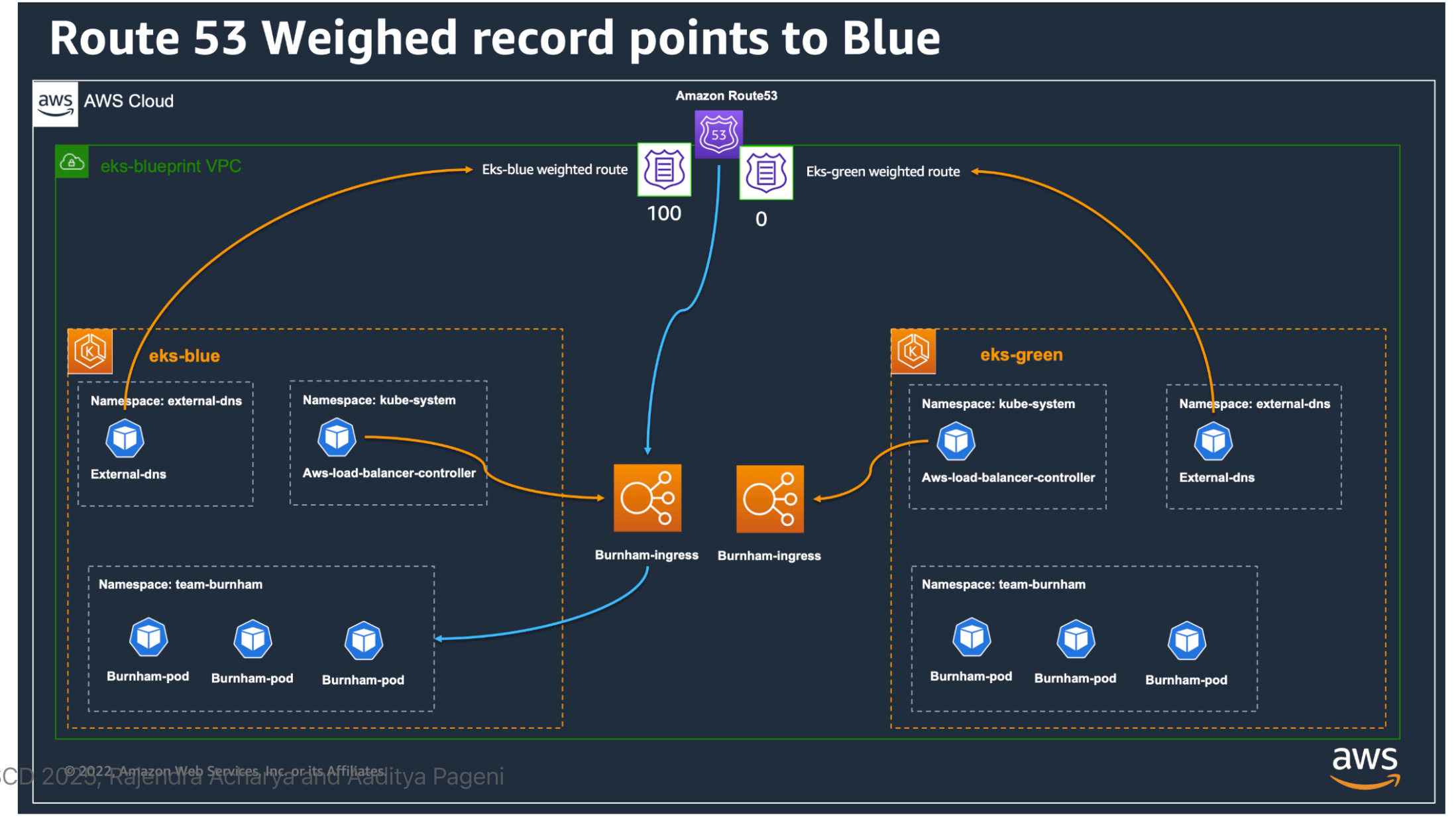
- Build and Deploy GREEN
- Run Health Checks + alarms
- Shift 10% traffic to GREEN
- Monitor logs + metrices
- Gradually increases traffic (50 % --> 100%)

Demo

Route 53 Weighed record points to Blue and Green



Which correspond to :



Thanks

Questions?