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Migrating from Heroku to AWS

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Free Migration Assessment
for all eligible attendees

Migrating from Heroku to AWS

PRESENTERS

J. Michael Bako
Solutions Architect, Startups

Prasanth Ramachandran
Director, Solutions Delivery & Architecture

Amazon Web Services (AWS) is the **world's most comprehensive and broadly adopted cloud platform**, offering over 200 fully featured services from data centers globally. Millions of customers—including the fastest-growing startups, largest enterprises, and leading government agencies—are using AWS to lower costs, become more agile, and innovate faster.

nClouds is an **AWS Premier Consulting Partner** and award-winning provider of AWS and DevOps consulting and implementation services. We are an integrated team of skilled engineers, architects, developers, project managers, and sales & marketing pros who are passionate about client success, software excellence, and innovation. We enable our clients to deliver better products faster and create awesome customer experiences.

AWS Well-Architected

aws partner network

Premier Consulting Partner

- Data & Analytics Competency
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- MSP Partner
- Migration Competency
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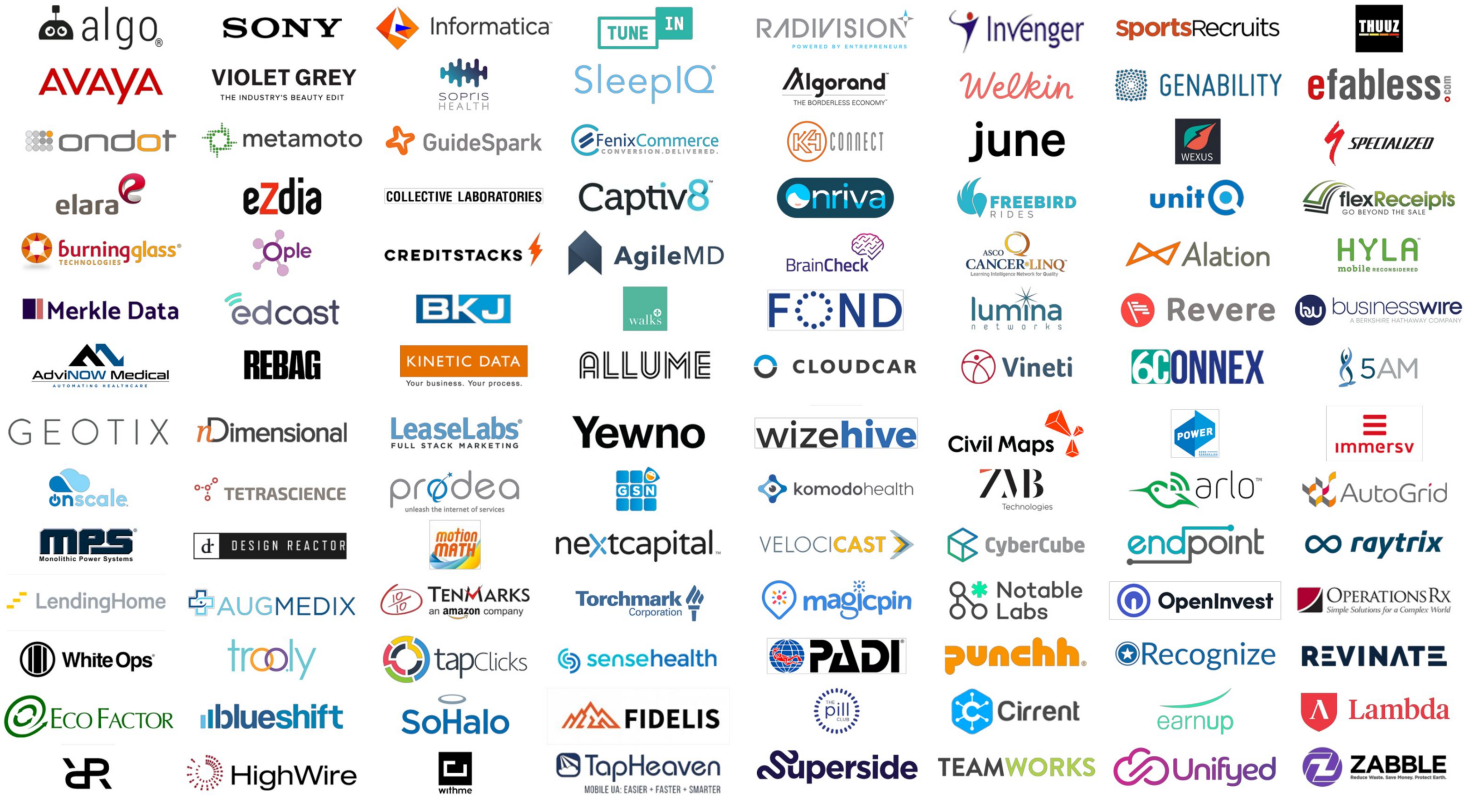

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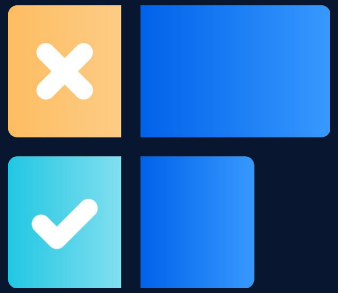
Migrating from Heroku to AWS

AGENDA

DETAILS ***(All times PST)***

- **11:00 - 11:05 am -** Intro & Session Objectives *by Randy Newell, nClouds*
- **11:05 - 11:20 am -** Migrating from Heroku to AWS *by J. Michael Bako, AWS*
- **11:20 - 11:35 am -** Nylas & LendingHome Client Success Stories *by Prasanth Ramachandran, nClouds*
- **11:35 - 11:50 am -** Strategies for Heroku to AWS Migration *by Prasanth Ramachandran, nClouds*
- **11:50 - 12:00 pm -** Q&A *by AWS and nClouds*



Poll

From Heroku to AWS

An overview of target AWS services

J. Michael (“Jay”)
Sr Startup Solutions Architect

Topics

- Brief Overview of AWS
- Relevant Services for a Heroku Migration
    - Application
    - Data
    - Build & Deploy

What is AWS?

AWS provides a highly reliable, scalable, low-cost infrastructure platform in the cloud that powers millions of businesses in over 190 countries around the world.

Benefits

- Low Cost
- Elasticity & Agility
- Open & Flexible
- Secure
- Global Reach

aws

What sets AWS apart?

Security	Fine-grained control
Service Breadth & Depth; pace of innovation	175+ services to support any cloud workload; rapid customer driven releases
Experience: 1M+ customers	Building and managing cloud since 2006
Global Footprint	77 Availability Zones within 24 geographic Regions, 1 Local Zone, 216 Points of Presence (205 Edge Locations and 11 Regional Edge Caches) in 84 cities across 42 countries.
Machine Learning	More machine learning happens on AWS than anywhere else. Machine learning in the hands of every developer and data scientis
Ecosystem	Tens of thousands of APN partners. The AWS Marketplace offers 50 categories, and more than 8,000 software listings
Enterprise leader	AWS positioned as a Leader in the Gartner Magic Quadrant for Cloud Infrastructure as a Service, Worldwide

aws

Customer obsessed

90%

of roadmap originates with customer requests and are designed to meet specific needs

heroku

"Performance, reliability, and responsiveness are fundamental to our customer experience, and T3 instances help us to deliver on that customer promise while also controlling our costs."

—Heroku

aws

What services should I use?

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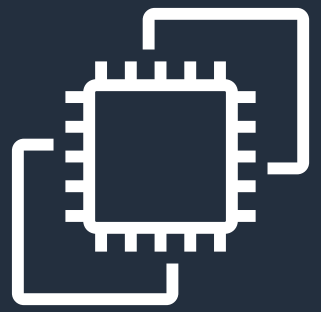
Application

Choices for Compute



Amazon EC2

Virtual server instances in the cloud

Amazon ECS, EKS, and Fargate

Container management service for running Docker on a managed cluster of EC2

AWS Lambda

Serverless compute for stateless code execution in response to triggers

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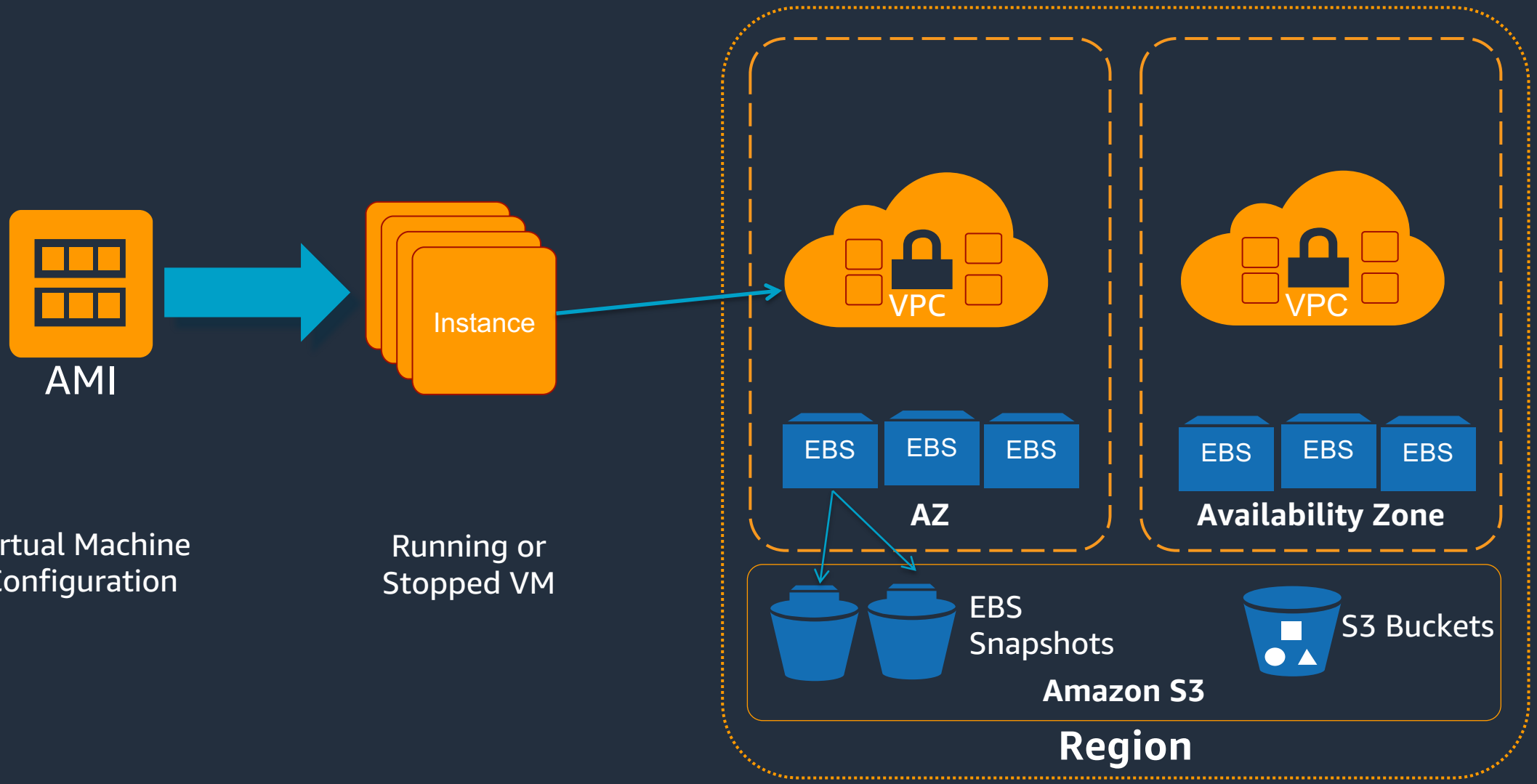
EC2 Terminology



Virtual Machine Configuration

Running or Stopped VM

Instance Types

	General Purpose		Compute Optimized		Memory Optimized				Accelerated Computing			Storage Optimized		
	Burstable performance	General Purpose	Compute Intensive	Compute +memory up to 100 Gbps	Memory Optimized	In-memory	Memory Intensive	Compute and Memory Intensive	Graphics Intensive	General Purpose GPU	FPGA	High I/O	Dense Storage	Big Data Optimized
intel	T3	M5	C5	C5n	R5	X1	X1e		G3	P3	F1		D2	H1
Local storage (NVMe SSD)		M5d	C5d		R5d			Z1d				I3		
AMD	T3a	M5a			R5a									
metal		M5m	c5m		R5m		u-12tb1	Z1dm				I3m		
others	A1	M6g	C6g		R6g					P3dn		I3en		
arm														

aws

Heroku Dynos to EC2 Instance Sizes

Dyno	CPU	RAM	EC2	vCPU	RAM
free	1x	512MB	t3.nano	2 (w/ burst)	512MB
hobby	1x	512MB	t3.nano	2 (w/ burst)	512MB
standard-1x	1x	512MB	t3.nano	2 (w/ burst)	512MB
standard-2x	2x	1GB	t3.micro	2 (w/ burst)	1GB
performance-m	3x	2.5GB	c5.large	2 (dedicated)	4GB
performance-l	12.5x	14GB	c5.2xlarge	8 (dedicated)	16GB

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AWS Graviton2 based instances

Up to 40% better price-performance for general purpose, compute intensive, and memory intensive workloads.

M6g

Built for: General-purpose workloads such as application servers, mid-size data stores, and microservices.

C6g

Built for: Compute intensive applications such as HPC, video encoding, gaming, and simulation workloads.

R6g

Built for: Memory intensive workloads such as open-source databases, or in-memory caches.

Launched **in 2020**

Local NVMe-based SSD storage options also available in general purpose (M6gd), compute-optimized (C6gd), and memory-optimized (R6gd) instances

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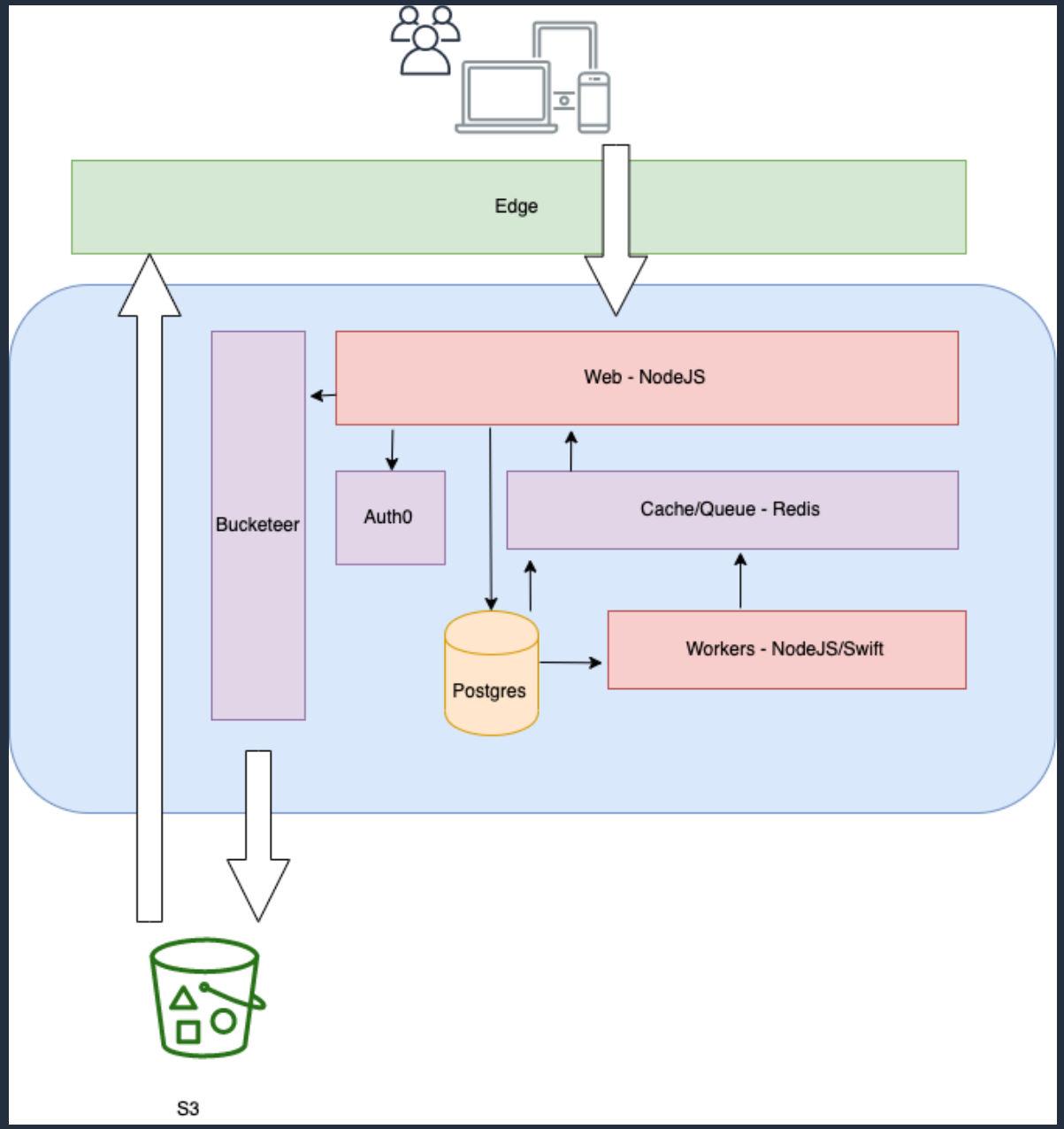
Example – Heroku Architecture



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AWS Elastic Beanstalk

A fully managed service for hosting web applications

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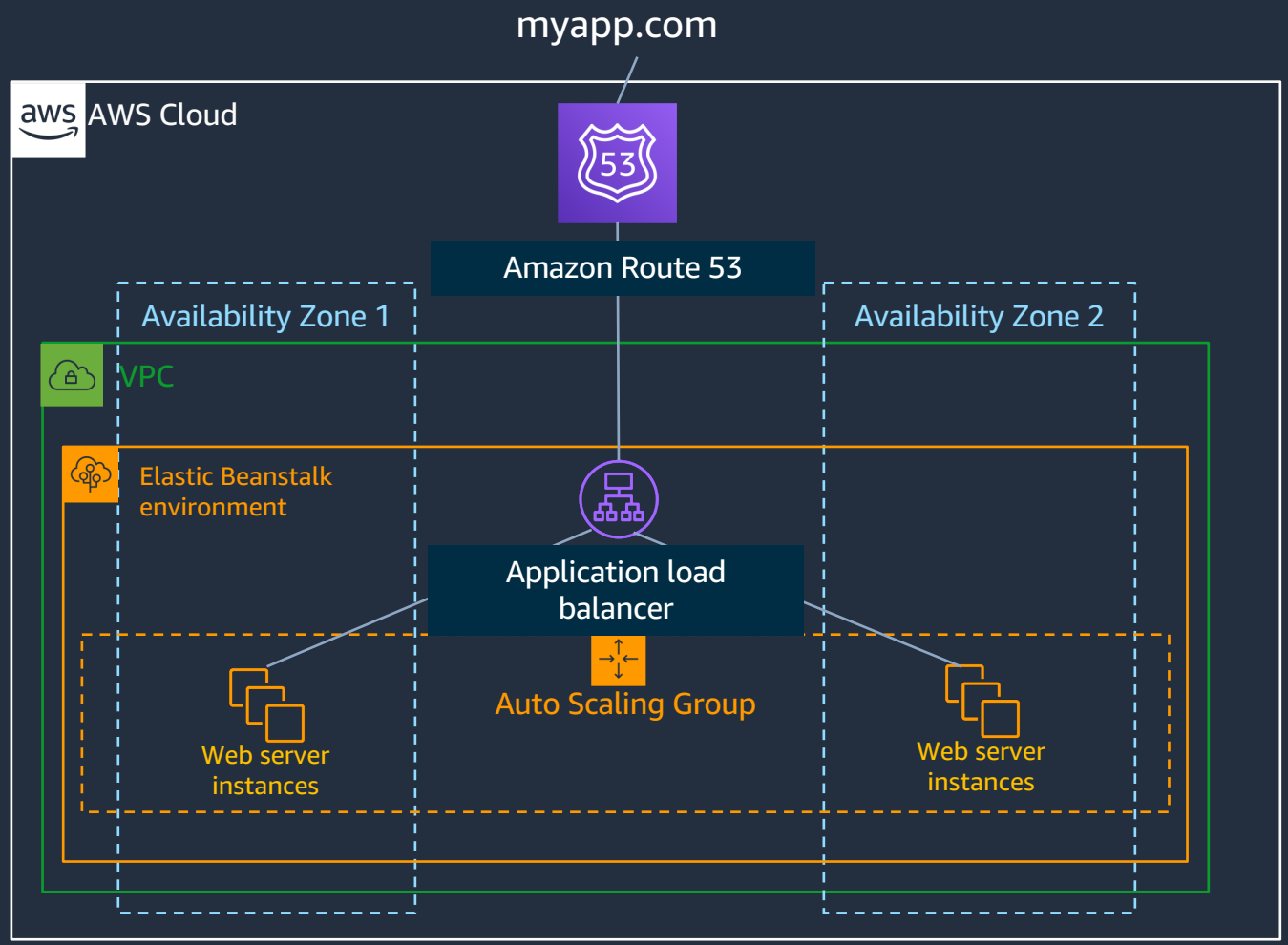
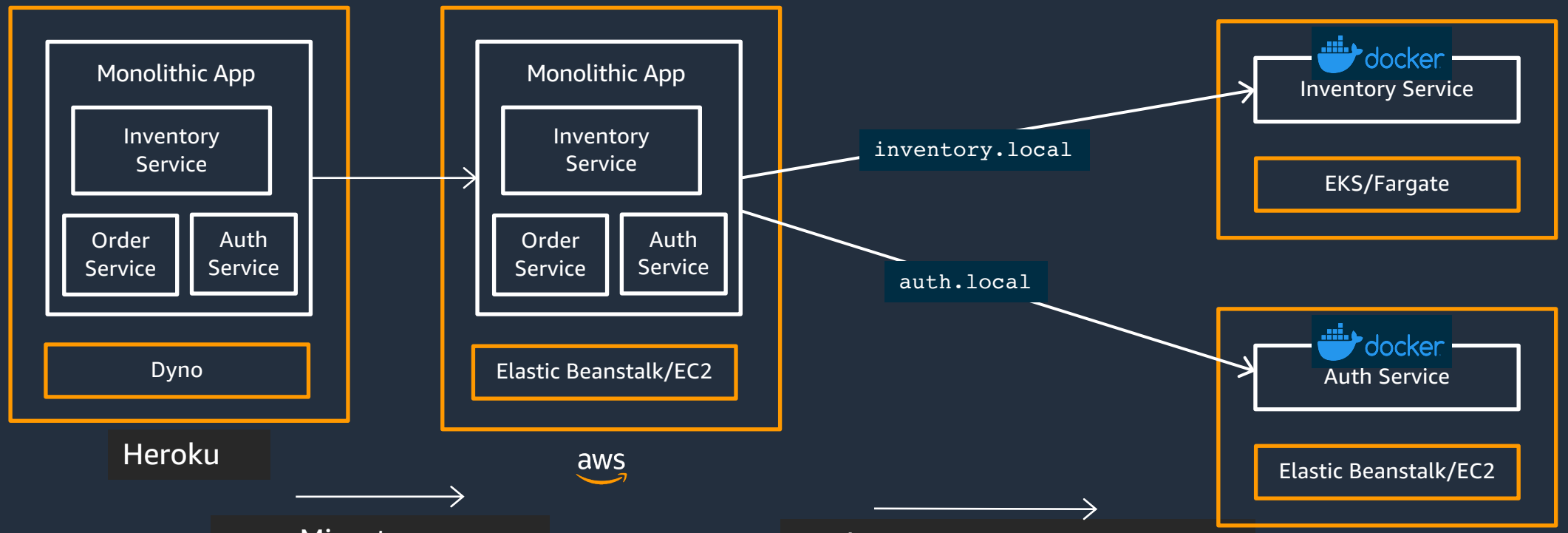
Elastic Beanstalk Architecture

- Highly available
- Scalable
- Provisioned automatically



Easy to get started

Adopt a service-oriented architecture

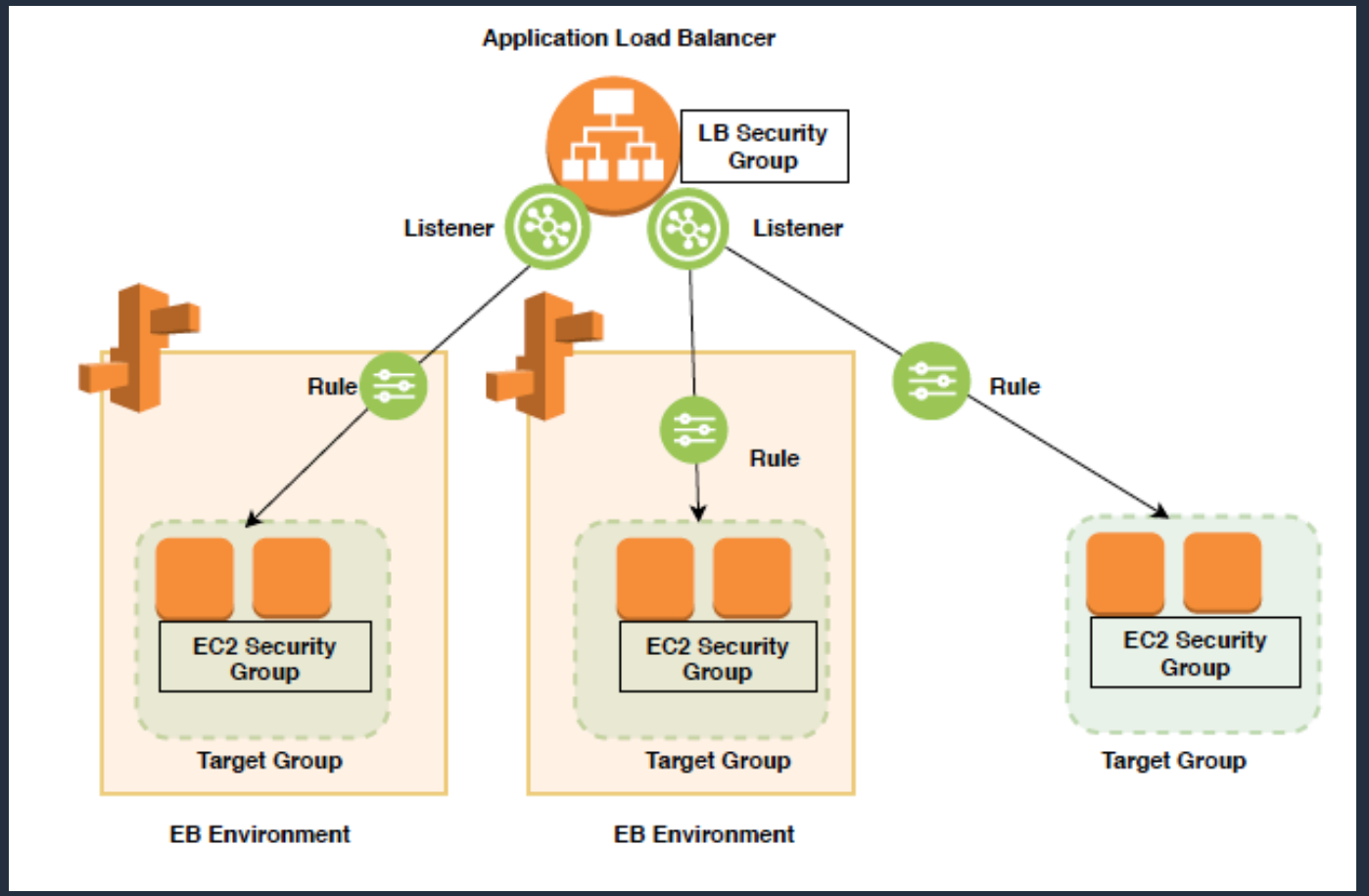


Gateway to modernization

- ✓ Unblocks teams from monolithic pipelines
- ✓ Decoupled components can scale independently

Shared Application Load Balancer capability

- Share an ALB among EB environments
- Reduce ALB costs while modernizing your app
- Use Host-based and Path-based rules to serve traffic to multiple environments or services hosted on Beanstalk or ECS



Gateway to modernization

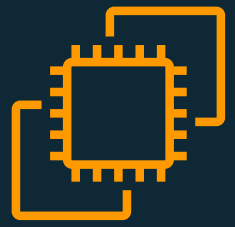
AWS Container Services

Management
Deployment, Scheduling, Scaling & Management of containerized applications

Amazon Elastic Container Service

Amazon Elastic Kubernetes Service

Hosting
Where the containers run



Amazon EC2

AWS Fargate

Image Registry
Container Image Repository

Amazon Elastic Container Registry

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Data

Amazon Relational Database Service (RDS) - PostgreSQL

Low Administrative Burden

Automated patching, backups, replication, failover, and best practice guidance

Network Isolation

Private routing and DNS protected with firewalls and fine-grained IAM-based access controls

Fast & Secure

SSD-backed with standard or provisioned IOPS. Automated encryption support for both at-rest and in-transit.

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Amazon Aurora w/ PostgreSQL Compatibility

Faster at higher scale

3x higher throughput than stock PostgreSQL, including distributed system enhancements.

Low-latency replicas

Replicas share the same storage as the source and support auto-scaling based on metrics you specify.

Highly efficient IOPS

Optimized use of buffer cache for reads, and transaction logs only for modified data pages get applied at storage node for writes.

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Other Heroku Data Services

Amazon Elasticache

Amazon Managed Streaming for Kafka (MSK)

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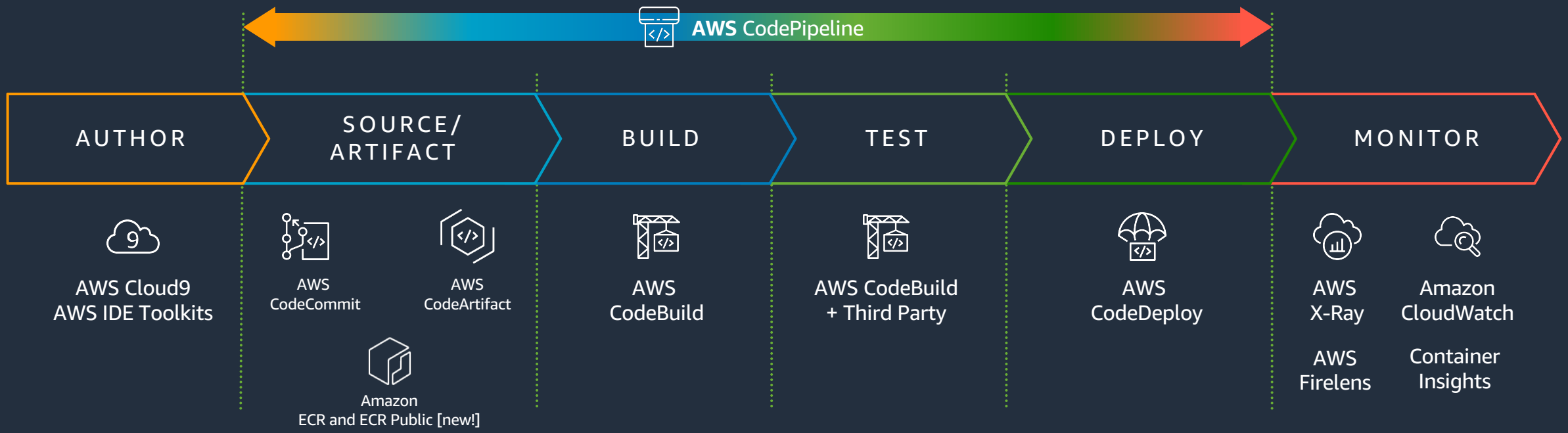
Build & Deploy

Automate deployment with AWS developer tools



MODEL **AWS** CloudFormation **AWS** Cloud Development Kit (CDK, CDK8s, CDK-terraform) **AWS** Amplify **AWS** Copilot **Docker Compose**

Summary

- Dynos → Elastic Beanstalk or ECS/EKS+Fargate
- Heroku Postgres → RDS Postgres or Aurora Postgres
- Heroku Redis → Elasticache for Redis
- Heroku Kafka → Amazon MKS
- Build & Deploy → Code* services

… and don’t forget to check out Graviton2!

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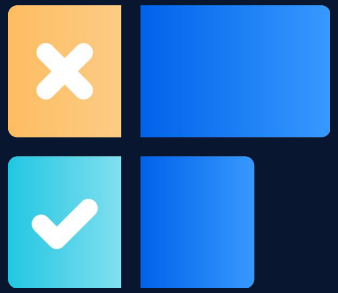

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Client Success Stories

Prasanth Ramachandran

Director, Solutions Delivery & Architecture

Nylas
BACKGROUND

- Nylas, founded in 2013, provides an API platform that enables developers to build apps that deep integration with email, calendar, and contacts.
- Need better ability to scale on-demand.
- Cost optimization had room for improvement.
- Need to adopt advanced deployment strategies with new generation CI/CD.

Nylas
PRE-MIGRATION ARCHITECTURE

- Dynos (Web, API Layer)
- Data on Heroku Postgres
- Circle CI

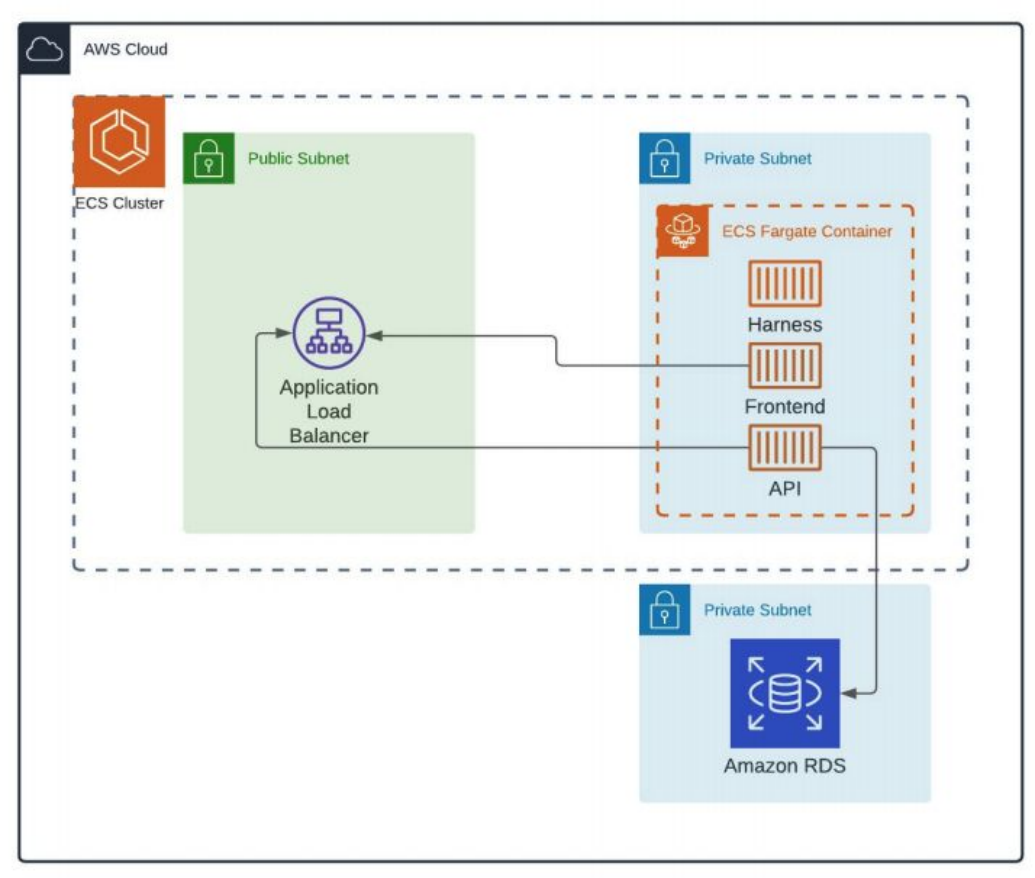
Nylas
MIGRATION APPROACH

- Created ECS Cluster and Network Infrastructure with Terraform.
- Deployed new CI/CD (Harness) within ECS.
- Containerized the applications, performed local tests.
- Secrets moved to AWS Parameter Store.
- Deployed ECS tasks via CI/CD.

Nylas
MIGRATION APPROACH (CONT.)

- Heroku Dynos were shut down, DB Snapshot created.
- DB restored in RDS.
- ECS tasks restarted.
- DNS entries changed.

Nylas
POST-MIGRATION ARCHITECTURE



Nylas
MIGRATION RESULTS

- Ability to quickly react to demand spikes with autoscaling.
- Improved cost-to-performance ratio.
- Faster deployment.

Read the full case study here.

LendingHome
BACKGROUND

- LendingHome provides an end-to-end mortgage platform that offers a seamless, transparent, and reliable online process for homebuyers, real estate professionals, and investors.
- Running into scalability issues.
- Difficult to trace and solve errors hidden behind platform.
- Finer control needed for compliance and security.
- Need to expand to more regions.

Lending Home
PRE-MIGRATION ARCHITECTURE

- Dynos (Web, Worker Modules - total count in 100s).
- Data on Heroku Postgres.
- No Cache Layer or additional monitoring.
- Single region.
- Different “variants” of same stack deployed per tenant.

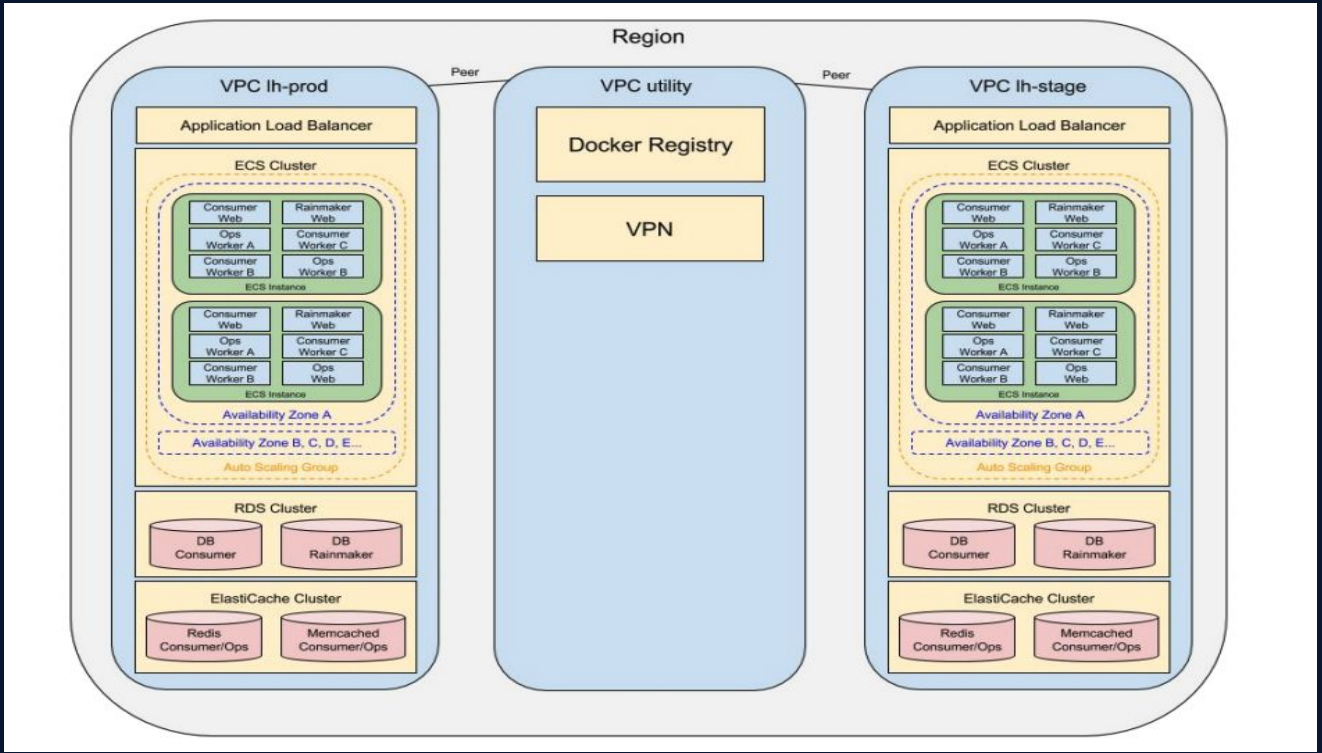
Lending Home
MIGRATION APPROACH

- Parallel infrastructure approach with tenant separation.
- Created a multi-region VPC setup.
- Separate VPC with shared-services .
- ECS cluster buildout.
- Containerized the applications.

Lending Home
MIGRATION APPROACH (CONT.)

- Full standalone environments stood up for tenants.
- Additional buildout and integrations done (ElastiCache, DataDog, Splunk).
- Snapshots taken and restored from individual tenant databases.
- Traffic diverted to AWS environment based on tenants.

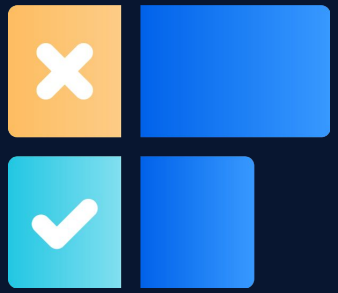
Lending Home
POST-MIGRATION ARCHITECTURE



LendingHome
RESULTS

- Improved uptime and user experience.
- Better control and visibility.
- Improved security and compliance.
- Expanded to more regions.

Read the full case study here.



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Strategies for Heroku to AWS Migration

Prasanth Ramachandran
Director, Solutions Delivery & Architecture

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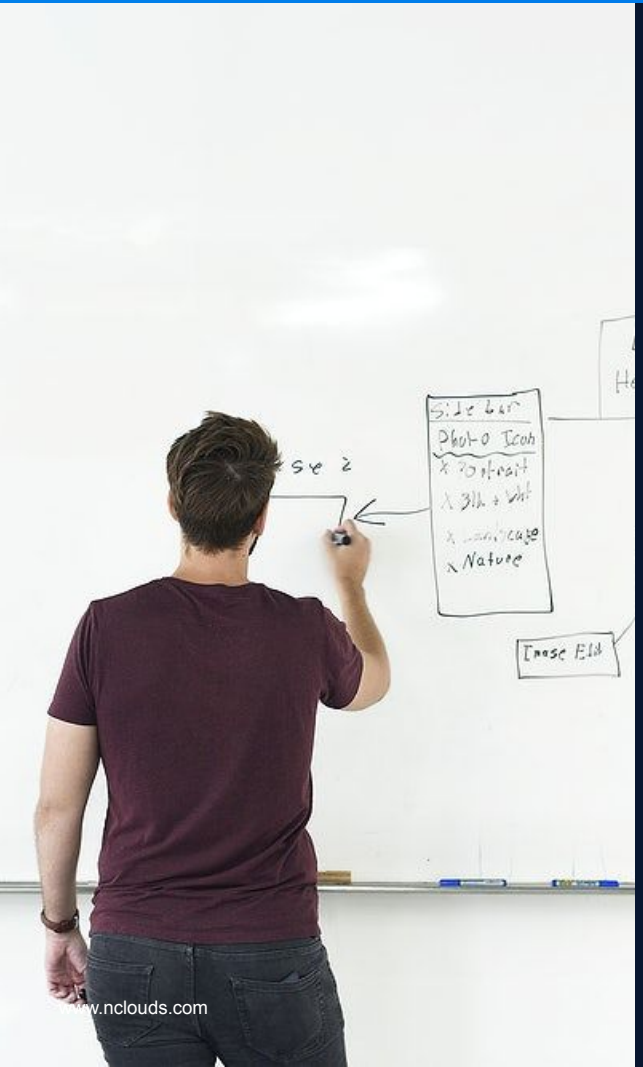
Factors that decide MIGRATION STRATEGY

- Complexity of the workload.
- Tolerance for downtime.
- Size of the database.
- Impact of tenancy on migration (multi-tenant/single-tenant).

Things to consider while MOVING TO AWS

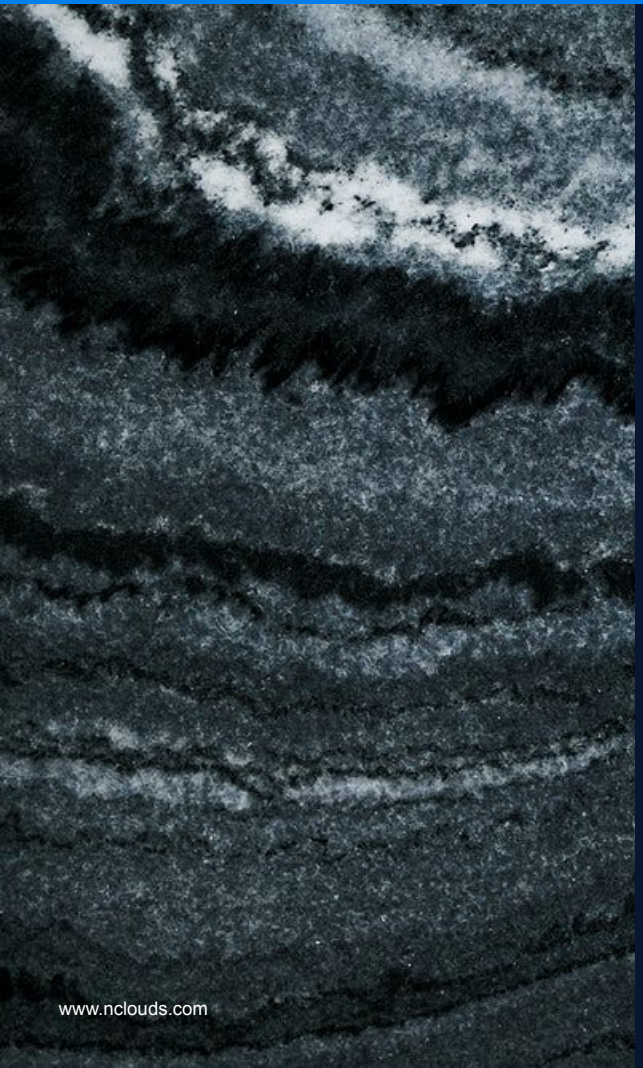
- Monitoring Operations health.
- AWS security model and best practices.
- Business continuity strategy.
- Cost and billing management.



Before Migration

BUILD THE FOUNDATION ON AWS

- Build multi-account setup.
- Setup IAM Users, Roles, and Policies.
- Setup Network Infrastructure (Private Space Peering optional).



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Different modules/layers of HEROKU MIGRATION

- **Application Layer** - Web/API/Worker modules (Heroku Dynos).
- **Data Layer** (Heroku Postgres, Heroku Redis).
- **Messaging** (Apache Kafka on Heroku).
- **Storage, Cache** and other modules (Heroku add-ons).

Strategy #1
SINGLE PHASE MIGRATION

When to adopt?

- Low complexity
- Small database
- Some downtime is tolerated

Strategy #1
SINGLE PHASE MIGRATION

- Build out the application layer as a parallel infrastructure in AWS.
- Test and validate with data restored from snapshot (non-live data).
- Shutdown the application (or make transactions read-only).
- Snapshot and restore the database in RDS.
- Redirect the web traffic (for example, via DNS change).

Strategy #2
MULTI-PHASE MIGRATION, DATA LAYER FIRST

When to adopt?

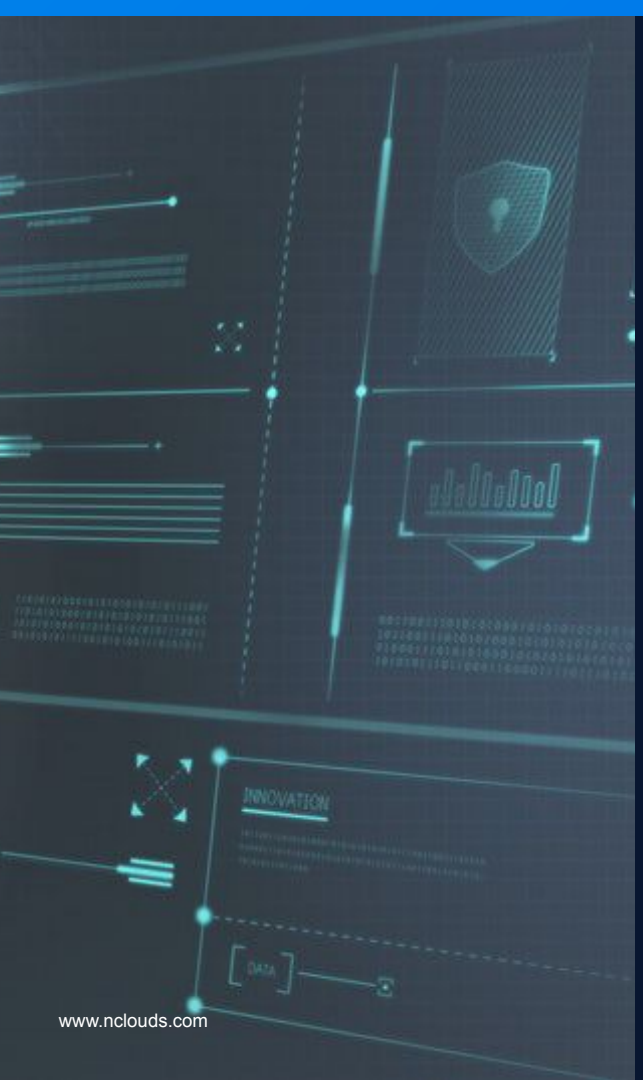
- Multiple worker modules
- Complex interdependence
- Large database
- Zero/Near-Zero downtime necessary

Strategy #2
MULTI-PHASE MIGRATION, DATA LAYER FIRST

- Build out a transitory Heroku/AWS hybrid setup.
- Replicate database to AWS and keep in-sync.
- Build out an abstraction layer for service lookup, if needed.
- Migrate worker modules one by one.
- Move Web/API modules and redirect traffic.

How to migrate?
APPLICATION LAYER

- Static Web modules can be hosted on S3 and CloudFront
- Multiple options available for Dynamic web-apps and API Layer
  - Rehost on Elastic Beanstalk
  - Containerize and run on ECS or EKS
- Options for worker modules
  - Containerize and run on ECS or EKS
  - Run as Lambda functions



How to migrate?
DATA LAYER

- Entire database has to imported into RDS Postgres or Aurora.
- AWS Database Migration Service and open-source tools utilized.
- Multiple options available for replication.
  - Binary backups and write-ahead log
  - One-time logical replication
  - Streaming logical replication

How to migrate?
OTHER MODULES

Find equivalent services in AWS and build out new infrastructure.

- Caching layer (Amazon ElastiCache)
- Kafka (Amazon MSK)
- CI/CD (AWS CodePipeline, AWS CodeBuild)

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Q&A

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