AWS re:Invent

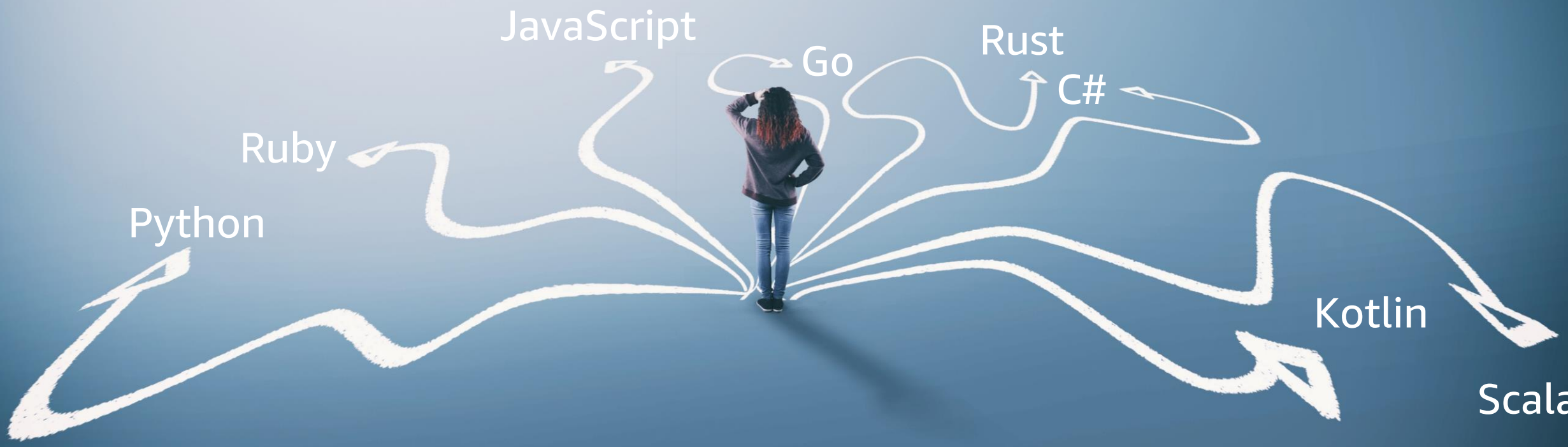
NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

ENT304-R2

Modernize Java enterprise applications with AWS services

Dennis Kieselhorst (he/him)
Sr. Solutions Architect

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JavaScript
Go
Rust
C#
Ruby
Python
Kotlin
Scala

“Java is the most popular programming language.”

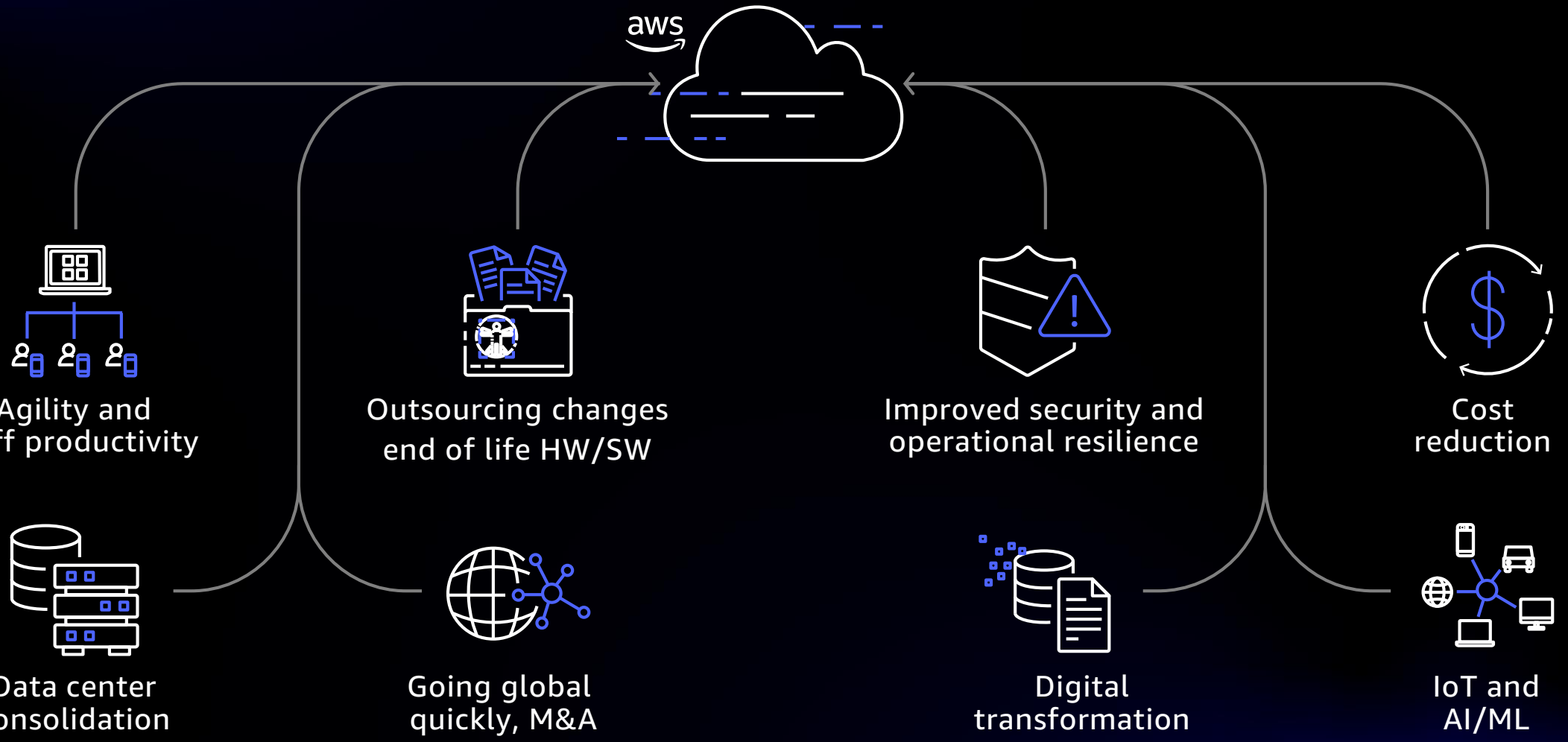
IDC PaaSView 2021 survey

June 2021



IDC, IDC Survey Illustrates the Growing Importance of Developers to the Modern Enterprise, Document #48058021, July 07, 2021.

Why migrate and modernize?



aws

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Java end of life/ license issues

End of life for certain JRE/JDK and applications server versions

- End of public updates, additional costs for extended support
- Security challenges with outdated versions

License issues

- Commercial vs. open-source licenses
- License audits/restrictions (no Cloud usage allowed)

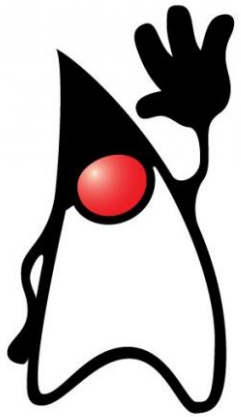


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Amazon Corretto

- Amazon supported distribution of OpenJDK
- Run internally on thousands of production services
- Multiplatform: Amazon Linux 2, Windows, macOS, Docker, Ubuntu, etc.
- No cost: distributed under open-source license—no charge for use or distribution
- No cost LTS (patches, performance improvements)
- Corretto 8, 11, 15, 16, and 17
- Open source – all patches and enhancements will be up streamed to OpenJDK: https://github.com/corretto



J2EE → JEE → Jakarta EE



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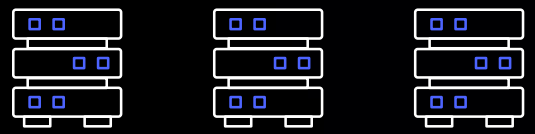
Traditional Java enterprise application architecture



Web servers

Presentation layers

JavaServer Faces (JSF)
Servlets
JavaServer Pages (JSP)
Applets



Application servers

Business logic

Enterprise JavaBeans (EJB)
Webservices (JAX-RPC, JAX-WS, JAX-RS)
Java Message Service (JMS)

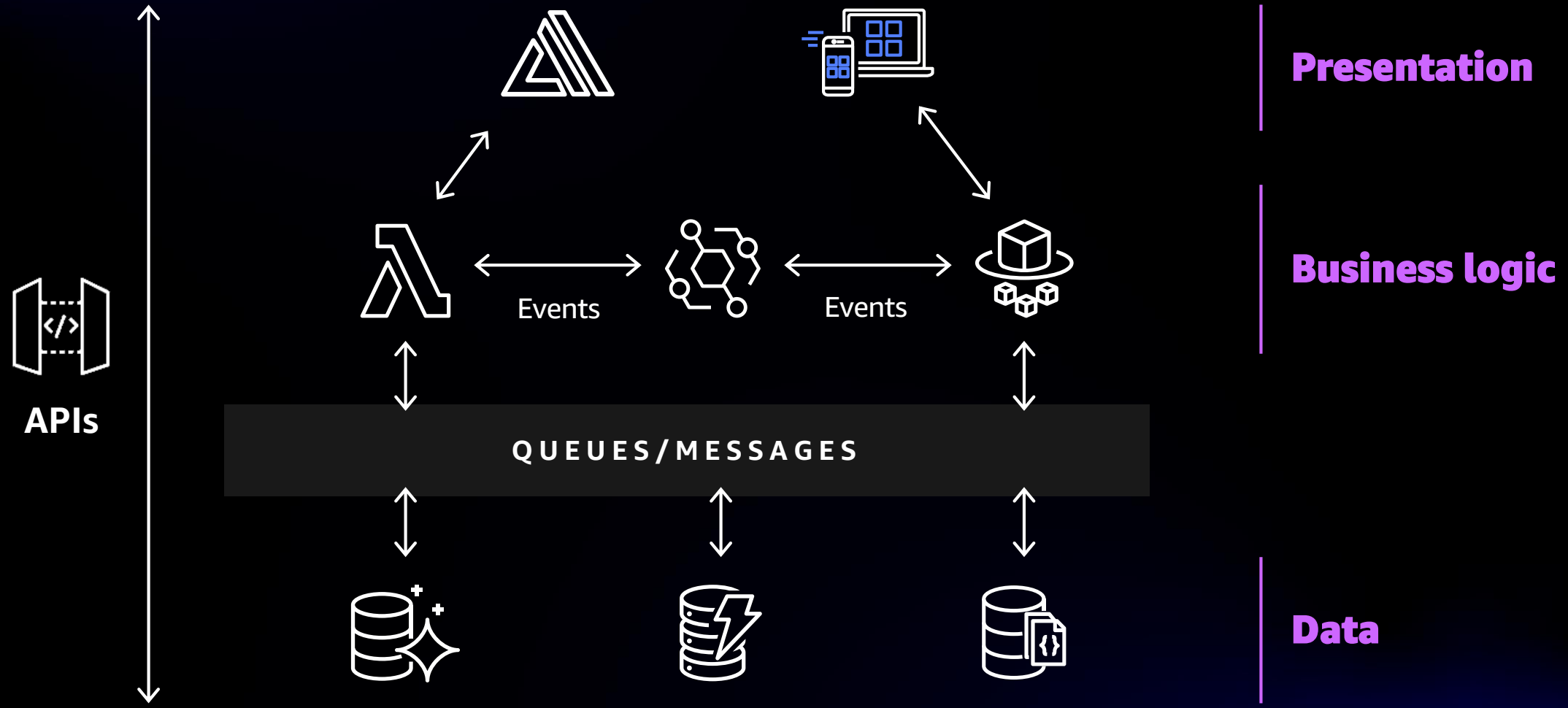


Database servers

Data layer

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A modern 3-tier application architecture



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Modernization pathways – Overview

Relocate/rehost

MIGRATE TO THE CLOUD

Apps/DBs run on VMs

No code changes



VMware Cloud on AWS



Amazon EC2



Database on Amazon EC2

Customer operates everything above the infrastructure

Re-platform

CONTAINERIZE APPLICATIONS

Develop and deploy faster

Application portability

No code changes



Amazon ECS



AWS Fargate



Amazon EKS

MOVE TO MANAGED

Managed provisioning, backups, patching, monitoring, and scaling

No code changes



Amazon RDS

Refactor/rewrite

MOVE TO OPEN-SOURCE

License freedom/savings

Performance improvement

Cross-platform support

MOVE TO SERVERLESS FUNCTIONS

Move from idea to market, faster

Lower costs



AWS Lambda

PURPOSE-BUILT DATABASES

High performance and scalability

Licensing savings



Amazon Aurora



Amazon DynamoDB



Amazon Neptune



Amazon Redshift

...

Applications

Databases

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Modernization pathways – Application focus

Java enterprise applications

Relocate/rehost

MIGRATE TO THE CLOUD

Apps/DBs run on VMs

No code changes



VMware Cloud on AWS



Amazon EC2

Re-platform

CONTAINERIZE APPLICATIONS

Develop and deploy faster

Application portability

No code changes



Amazon ECS



AWS Fargate



Amazon EKS

Refactor/rewrite

MOVE TO OPEN-SOURCE

License freedom/savings

Performance improvement

Cross-platform support

MOVE TO SERVERLESS FUNCTIONS

Move from idea to market, faster

Lower costs



AWS Lambda

On-prem → Cloud

VMs → Containers

Examples:

Oracle WebLogic
IBM WebSphere
Pivotal Cloud Foundry



Apache Tomcat
Apache TomEE
WildFly

Monolith → Microservices

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AWS App2Container



Discover and analyze

Create application inventory and analyze runtime dependencies

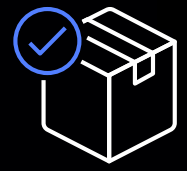
1



Extract and containerize

Extract application with dependencies and create container image

2



Create deployment artifacts

Generate the ECS tasks or Kubernetes pod definitions and create CI/CD pipelines

3



Deploy to AWS and launch

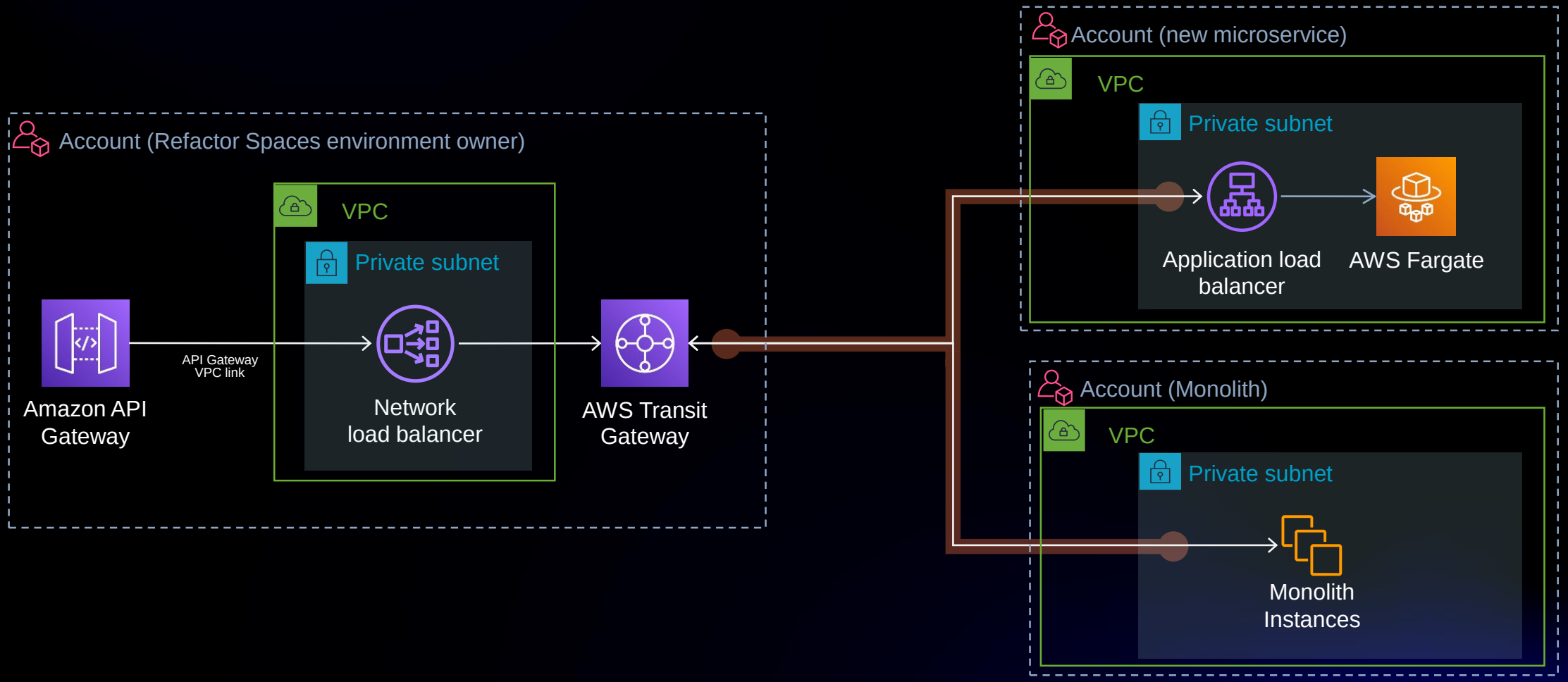
Store image in Amazon ECR and deploy to Amazon ECS or Amazon EKS

4

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AWS Migration Hub Refactor Spaces

Create environment → Add accounts → Create application → Create Services w/VPC or Lambda → Add routes



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Modern Java frameworks run well on AWS

Popular ones with specific AWS docs/submodules:

- Quarkus
- Spring Boot/Spring Native
- Micronaut

Performance tuning

- Native compilation using GraalVM
- Tiered compilation stop at level 1
- Analyze garbage collection

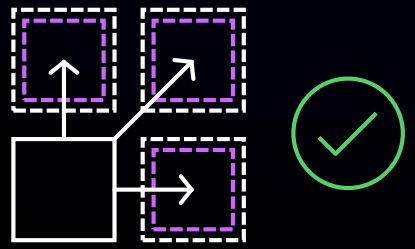
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Appendix

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Key pillars of modernization



Technology & architecture

Independent business functions



People, process, & culture

Organized for value



Ops & governance at scale

Automate, enable, & self-service

Modernization is the refactoring of legacy technology by combining modern infrastructure, architecture, and organization patterns together to maximize resiliency, engineering efficiency, and business agility

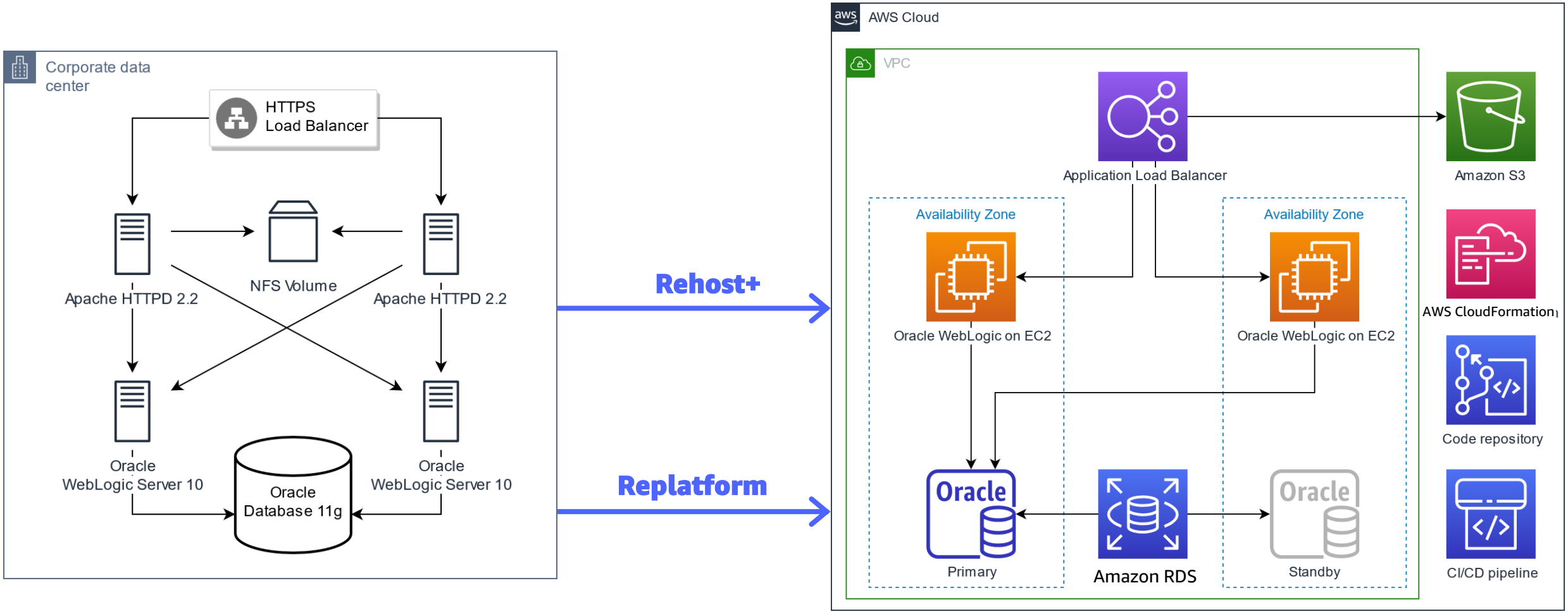
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Example for an iterative migration and modernization

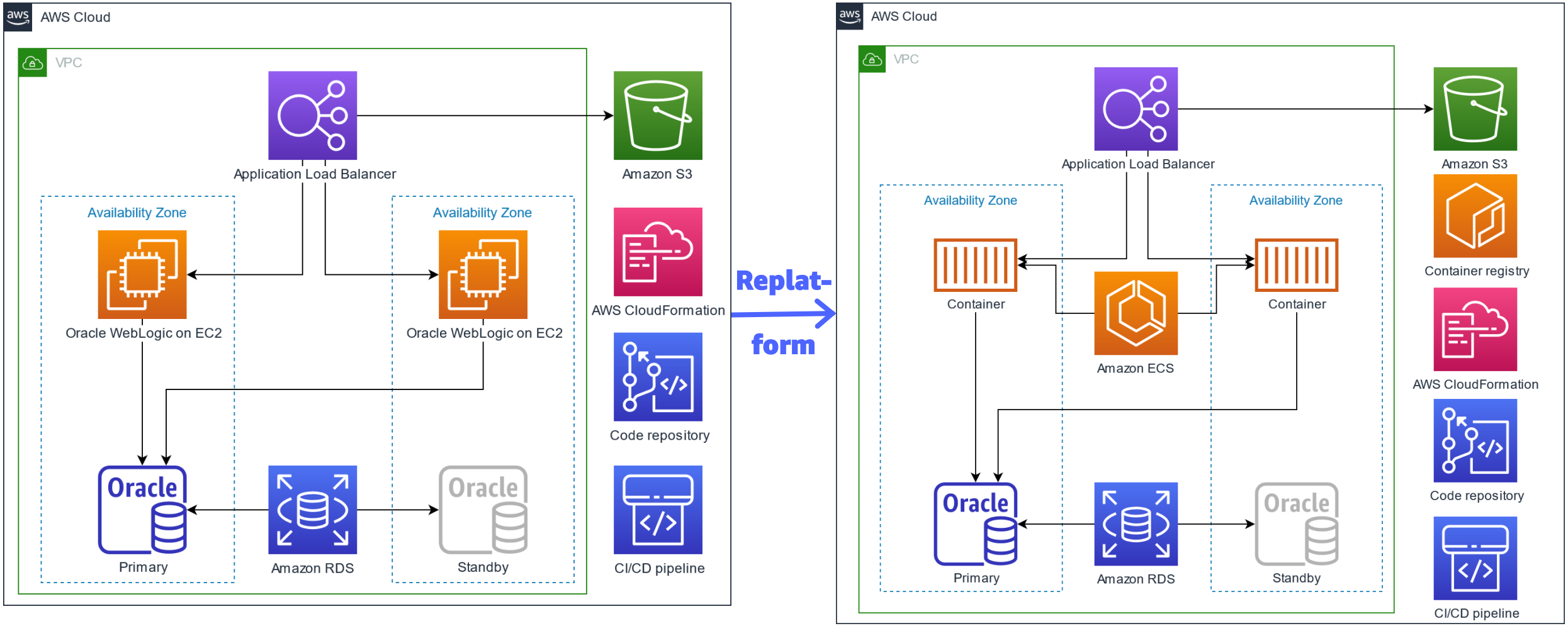
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Migration with first modernization steps



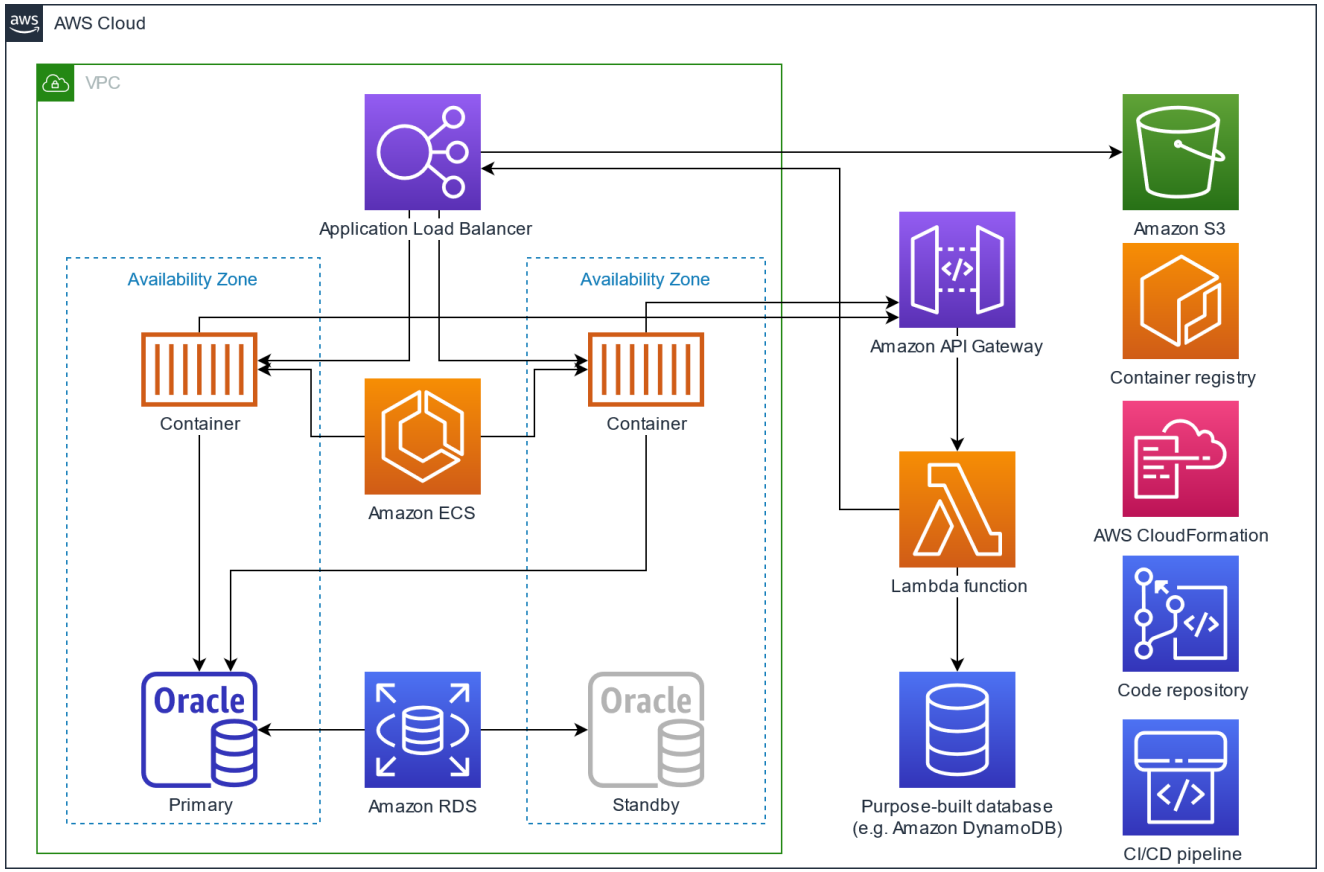
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Modernization with containers



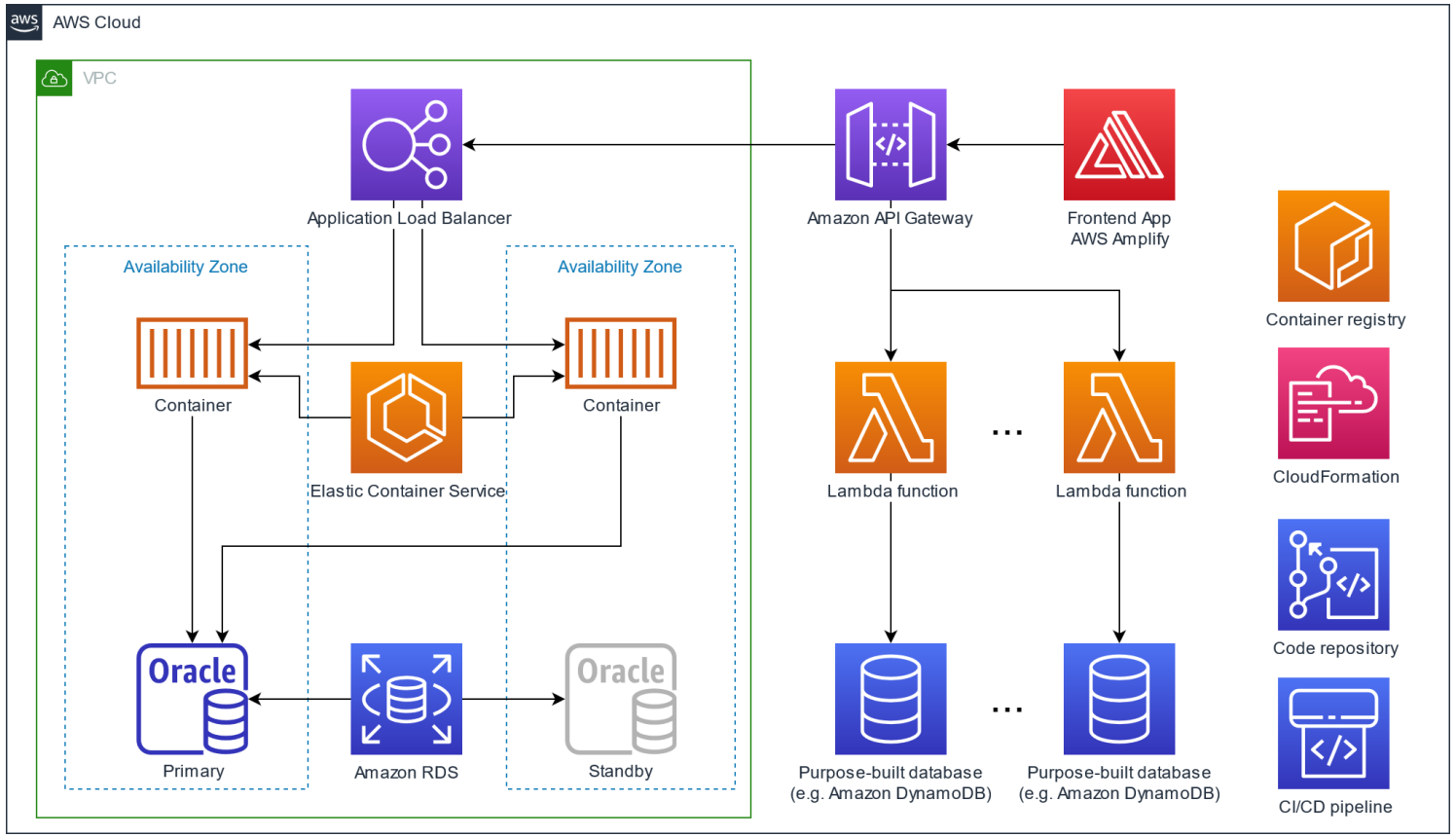
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Rearchitecting/refactoring to use serverless functions



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Rearchitecting/refactoring, including front-end



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Other helpful AWS services

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Storage

Object



Amazon S3

Block



Amazon EBS

File



Amazon EFS



Amazon FSx for Windows File Server



Amazon FSx for Lustre



Amazon FSx for NetApp ONTAP

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Databases

	Relational	Key value	Document	In memory	Graph	Time series	Ledger	Wide column
	Referential integrity, ACID transactions, schema-on-write	High-throughput, low-latency reads and writes; endless scale	Store documents and quickly access querying on any attribute	Query by key with microsecond latency	Quickly and easily create and navigate relationships between data	Collect, store, and process data sequenced by time	Complete, immutable, and verifiable history of all changes to application data	Scalable, highly available, and managed Apache Cassandra-compatible service
AWS SERVICE(S)	 Amazon RDS  Amazon Aurora  Amazon Redshift	 Amazon DynamoDB	 Amazon DocumentDB	 Amazon ElastiCache	 Amazon Neptune	 Amazon Timestream	 Amazon QLDB	 Amazon Keyspaces for Apache Cassandra
COMMON USE CASES	Lift-and-shift, ERP, CRM, finance	Real-time bidding, shopping cart, social, product catalog, customer preferences	Content management, personalization, mobile	Leaderboards, real-time analytics, caching	Fraud detection, social networking, recommendation engine	IoT applications, event tracking	Systems of record, supply chain, health care, registrations, financial	Build low-latency applications, leverage open source, migrate Cassandra to the cloud

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Containers



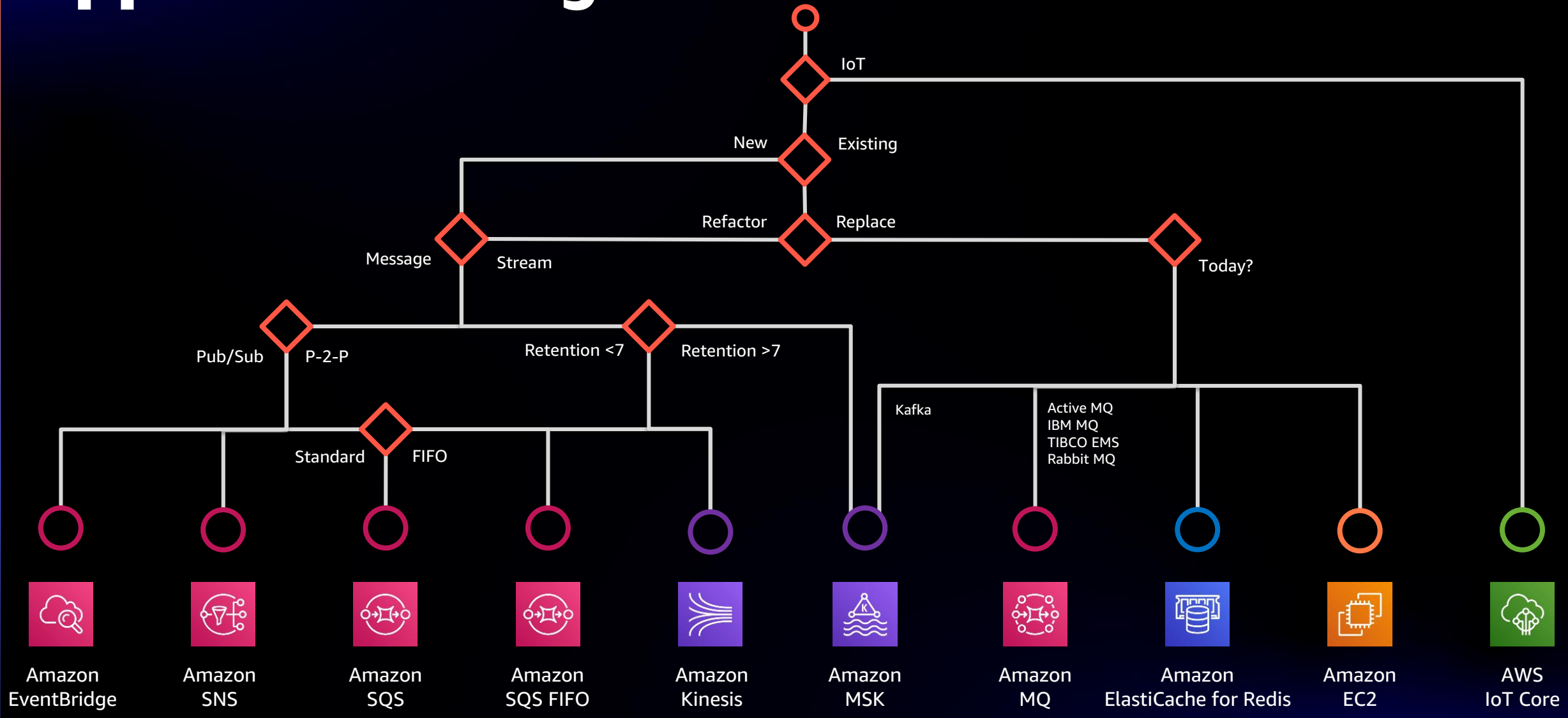
Amazon ECS

Amazon EKS

AWS App Runner

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Application integration services



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AWS observability portfolio

Observability

AWS native monitoring service

Amazon CloudWatch ServiceLens

Container insights

Lambda insights

Synthetics

Contributor insights



Amazon CloudWatch Logs



CloudWatch metrics



AWS X-Ray

Open-source managed services

Amazon Managed Grafana

Grafana

Do it yourself (DIY)



Amazon Managed Service for Prometheus



Amazon OpenSearch Service



Jaeger & Zipkin – Tracing

Insights & ML



CloudWatch agent



X-Ray agent

Instrumentation



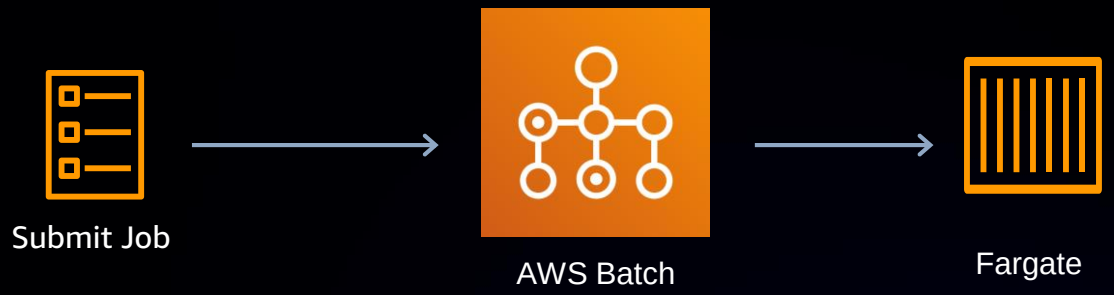
AWS Distro for OpenTelemetry (ADOT)

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AWS Batch jobs for Fargate

- Fully serverless batch computing with AWS-owned compute resources; no need to specify instance type or manage machine images
- AWS Batch provides you with a managed batch queue, complete with the ability to specify priority, dependencies, and retries



- Use Fargate Spot for savings of up to 70%
- Batch handles queueing, submission, and lifecycle management

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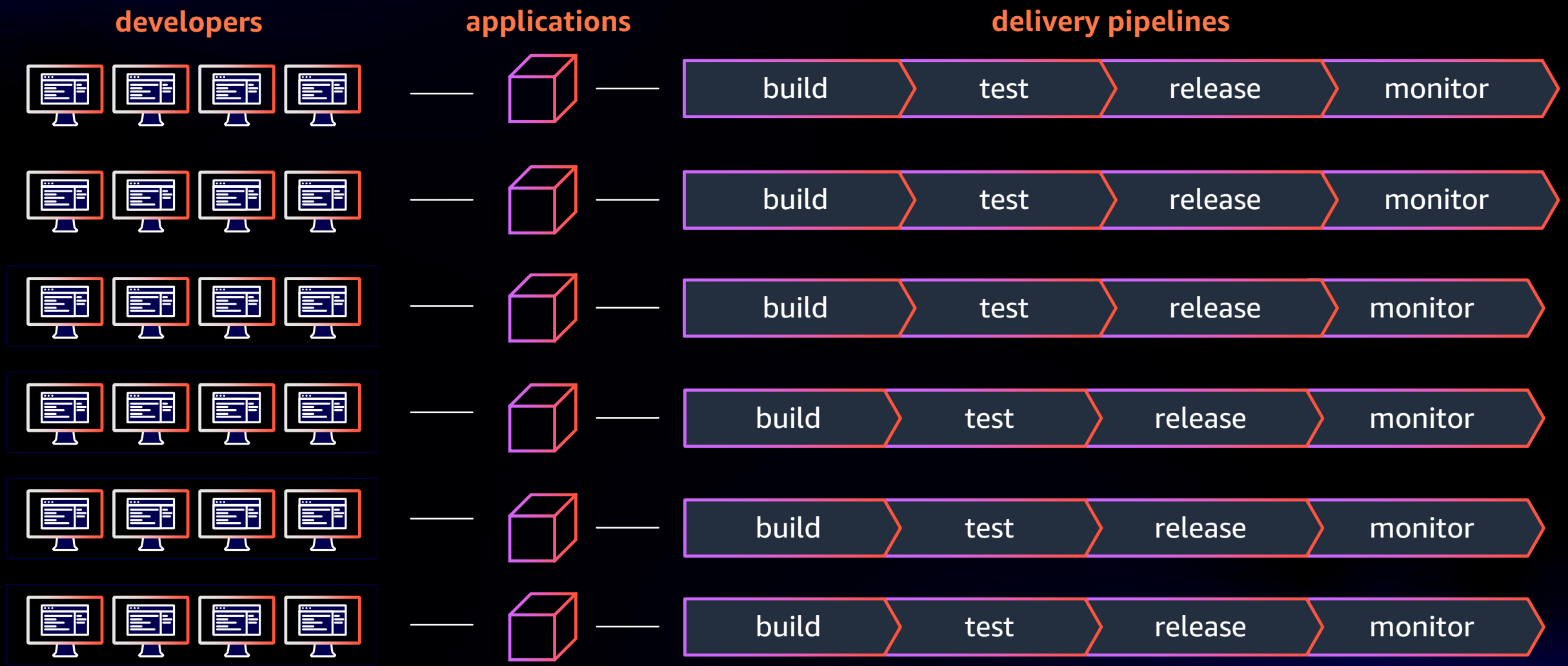
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Session state

- Enable session stickiness in Elastic Load Balancing
- The JGroups communication protocol is common for synchronizing session state between application server nodes
- Multicast is not supported inside Amazon VPC
- Examples how to implement it:
  - Amazon ElastiCache for Redis in combination with Tomcat and the Redisson library: https://github.com/redisson/redisson/tree/master/redisson-tomcat
  - Amazon Route 53 in combination with Infinispan configuration: https://aws.amazon.com/blogs/compute/migrate-wildfly-cluster-to-ecs-using-service-discovery/

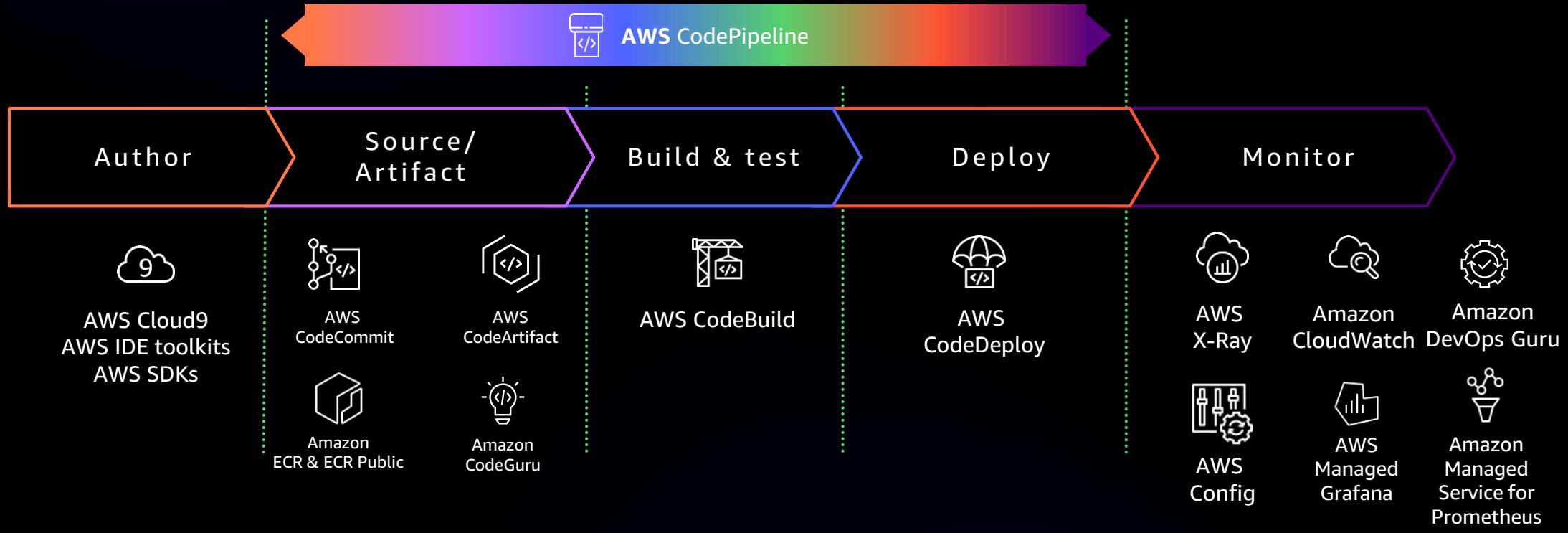
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Development lifecycle



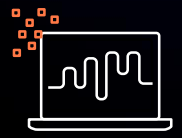
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AWS developer tools



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Guardrails instead of central control



Monitoring

CPU Utilization

Database throughput

Business processes



Provisioning

Access permissions

Resource availability

Configuration



Deployment

Time window

Toolsets available

Size or timing of test releases



Cost management

Resource costs

Resource utilization

Spend run rates



Security & compliance

Account setup/access

Standards compliance

Certificate maintenance

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AWS Proton

Increase control over your cloud infrastructure, accelerating the **pace of innovation** for your development teams



Infrastructure operators

Create application infrastructure templates



AWS Proton

Monitor and update deployments



Development teams

Find and deploy application infrastructure

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Thank you!

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dkieselh@amazon.de

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