
AWS
re:Invent
NOV. 28 – DEC. 2, 2022 | LAS VEGAS, NV

SVS403

Effectively using Java on serverless

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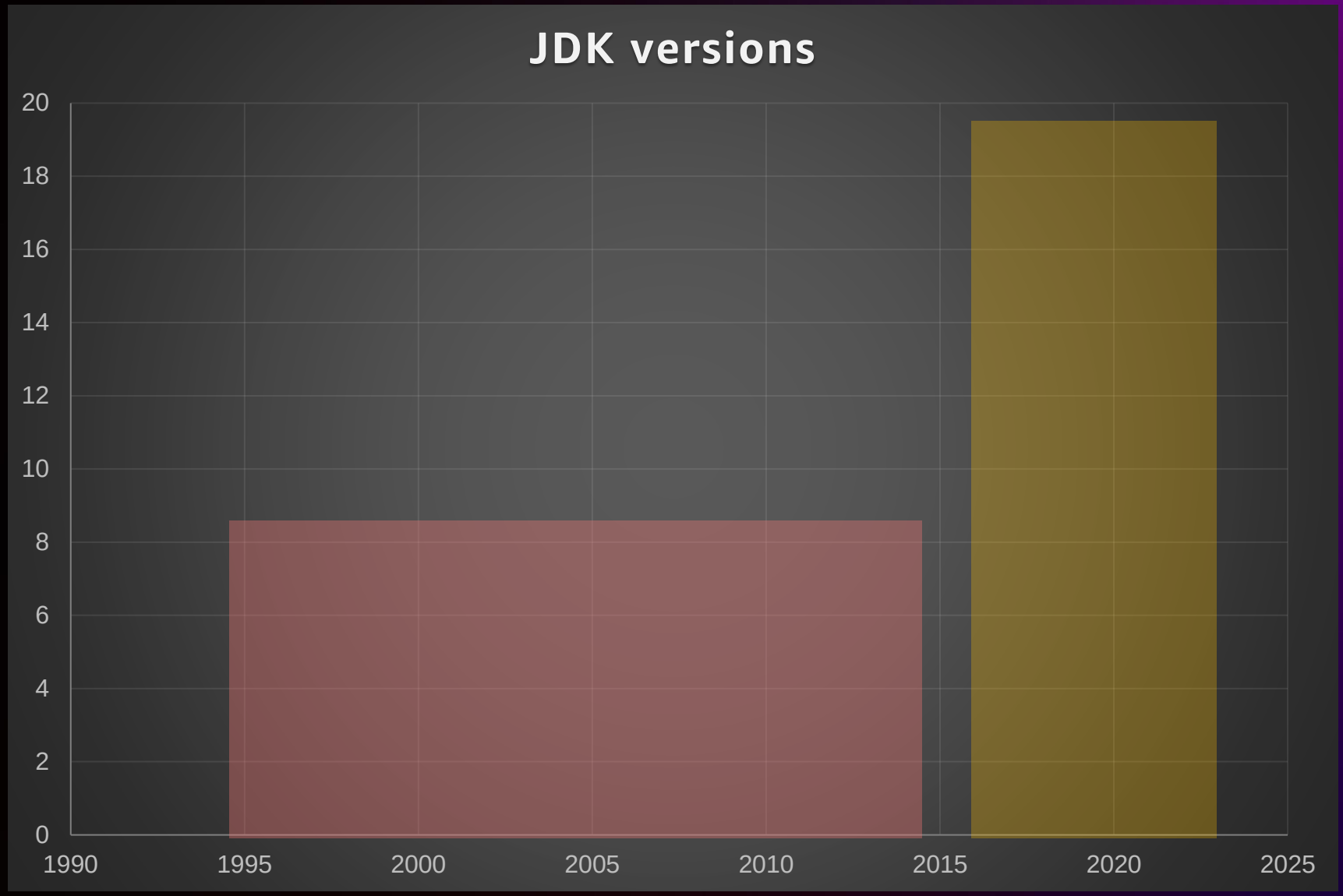
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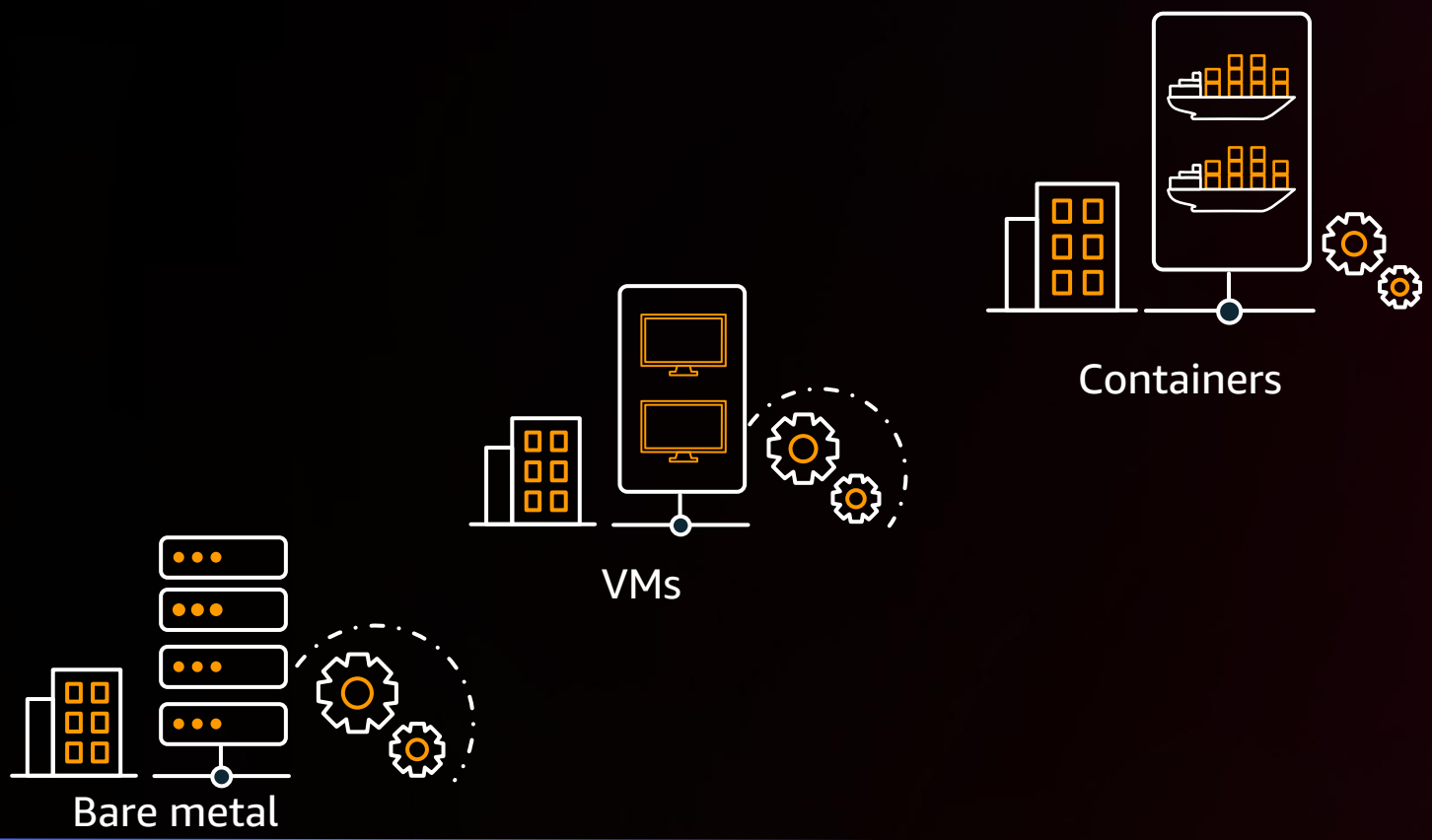
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Java release cadence



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Evolution of serverless



AWS Lambda

SERVERLESS

Continuous scaling

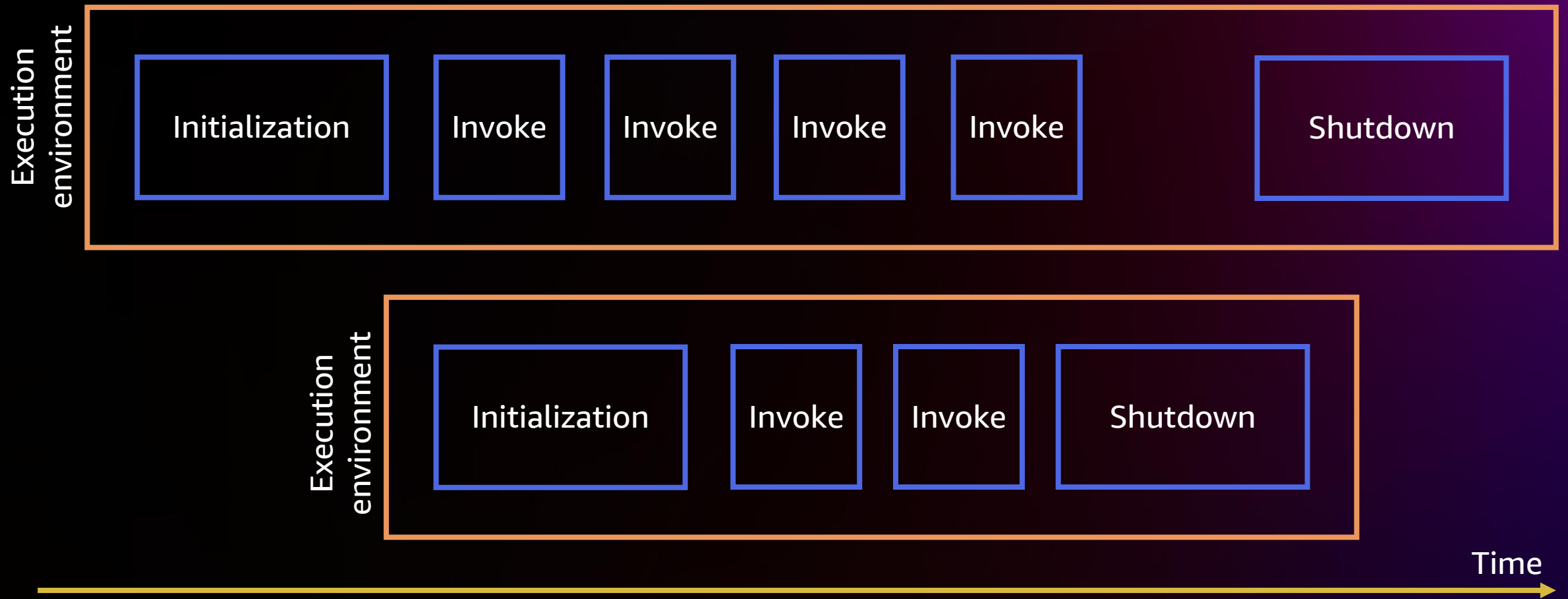
Fault tolerance built in

Pay for value

Zero maintenance

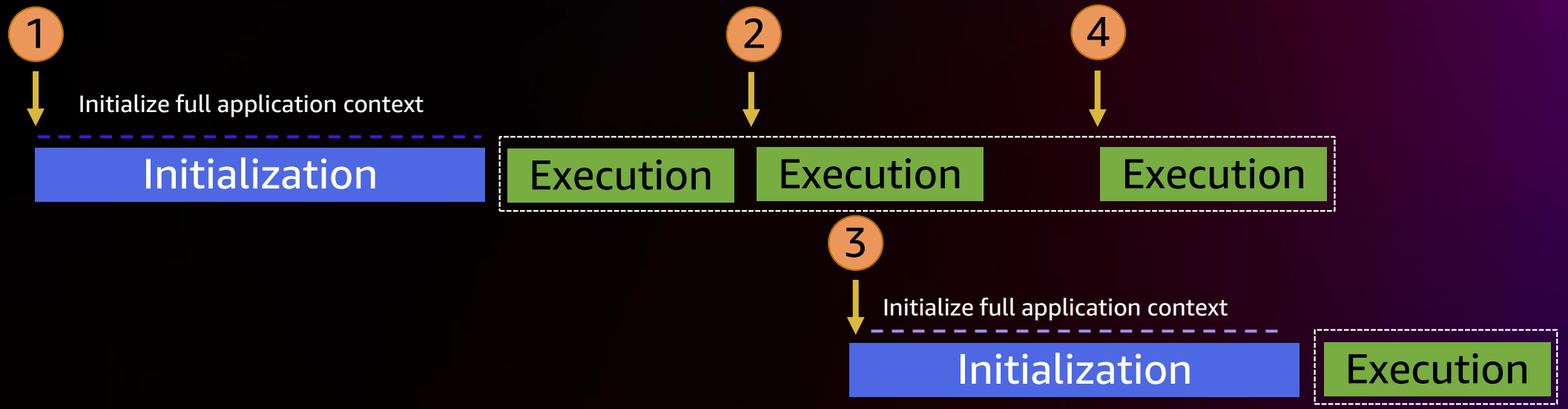
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Understanding AWS Lambda execution environment



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Challenges with Java on serverless



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Java optimizations

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Java optimizations

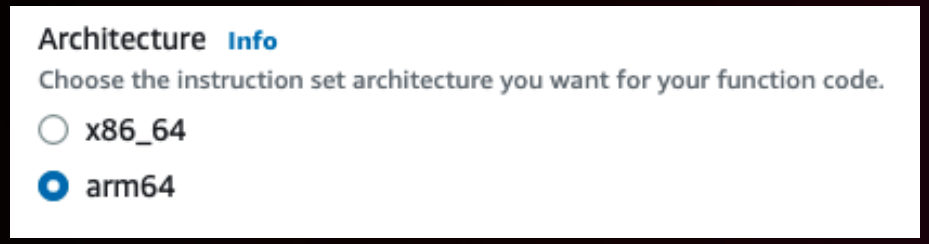
- Tiered Compilation

  JAVA_TOOL_OPTIONS to “**-XX:+TieredCompilation -XX:TieredStopAtLevel=1**”

- AWS CRT HTTP client

```
<dependency>
    <groupId>software.amazon.awssdk</groupId>
    <artifactId>aws-crt-client</artifactId>
    <version>2.17.290-PREVIEW</version>
</dependency>
```

- AWS Graviton



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GraalVM Native Image

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GraalVM Native Image

JVM

- Compiled just in time (JIT)
- Deployment with managed runtime
- Dynamic language features (runtime proxies, reflection)
- Slower startup

Native Image

- Compiled ahead of time (AOT)
- Deployment with custom runtime
- Closed-world model, no dynamic features
- Faster startup

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Micro JVM frameworks

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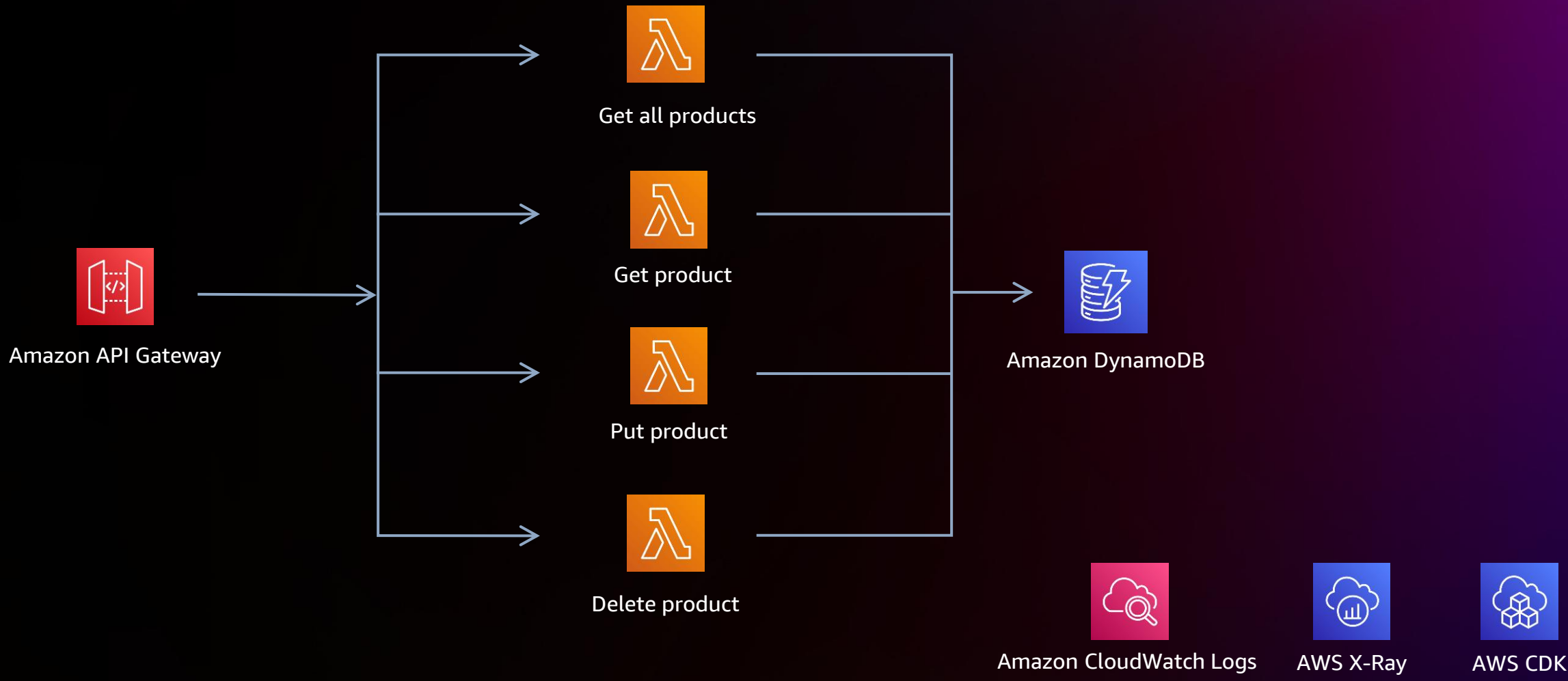
Micro JVM frameworks

- Quarkus and Micronaut support GraalVM inherently
- Easy to adopt Native Image
- OS, CPU architecture compiler plugins and packaging
- Micronaut AWS CDK support

```
dependencies {
  implementation platform("io.micronaut:micronaut-bom:3.5.3")
  implementation("io.micronaut.aws:micronaut-aws-cdk")
}
```

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Architecture



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Benchmarking results

Runtime/percentile		Cold start (ms)	Warm start (ms)
		p99	p99
Java	Managed (tiered compilation)	8,387	20
	GraalVM	577	19
Micronaut	Managed	9,685	40
	GraalVM	700	15

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NEW

AWS Lambda SnapStart

Up to 10x faster startup performance

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SnapStart overview

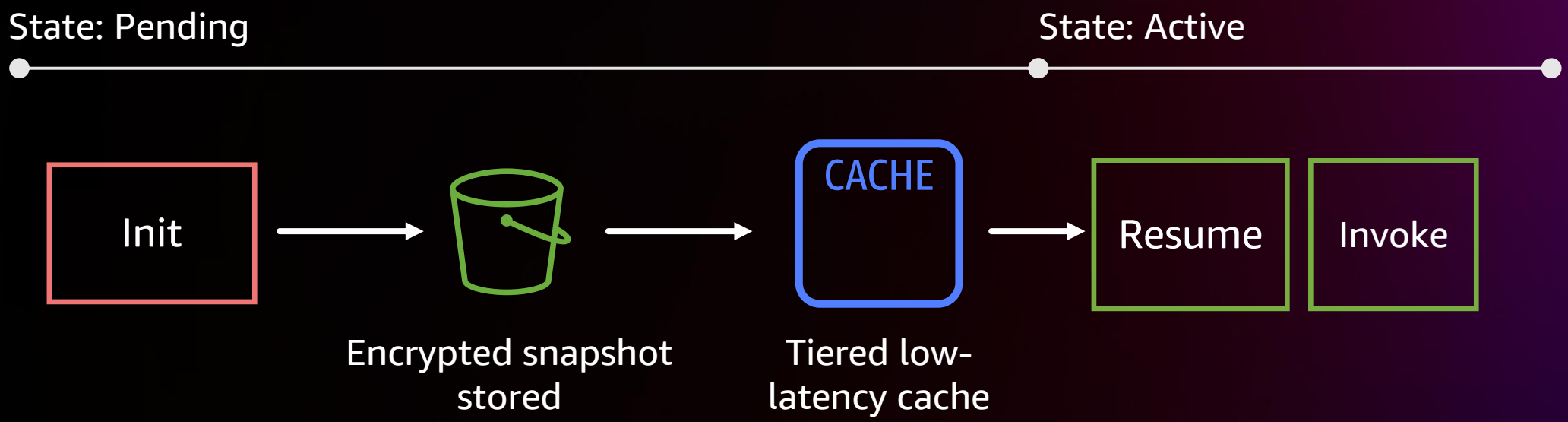
publish-version



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SnapStart overview

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AWS Cloud Development Kit (AWS CDK)

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AWS CDK



Familiar

Your language
Just classes and methods



Tool support

Compatible with testing frameworks you're already using



Abstraction

Sane defaults
Reusable classes

```java
public class Main {
  public static void main(final String[] args) {
    App app = new App();

    Environment environment = Environment.builder()
      .account(System.getenv("CDK_DEFAULT_ACCOUNT"))
      .region(System.getenv("CDK_DEFAULT_REGION"))
      .build();

    DatabaseStack dbStack = new DatabaseStack(app, "Micronaut-GraalVM-Demo-DatabaseStack", StackProps.builder()
      .env(environment)
      .build());

    new AppStack(app, "MnGraalVMDemoAppStack", AppStackProps.builder()
      .env(environment)
      .lambdaRole(dbStack.getLambdaRole())
      .rdsProxyEndpoint(dbStack.getRdsProxyEndpoint())
      .rdsSecretValue(dbStack.getRdsSecretValue())
      .lambdaSG(dbStack.getLambdaSecurityGroup())
      .vpc(dbStack.getVpc())
      .build());

    app.synth();
  }
}
```













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How CDK works



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AWS CDK with Java

- Java language for writing infrastructure
- Reusability
- Statically typed – with IDE and Java doc support
- Testable Java code for infrastructure

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Resources

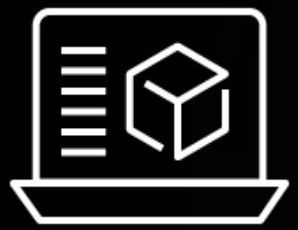
- https://github.com/aws-samples/serverless-graalvm-demo
- https://github.com/aws-samples/serverless-java-frameworks-samples
- https://go.aws/3XVS4lI
- https://s12d.com/snapstart-blog



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Thank you!

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