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

SVS204

What’s new in serverless

David Boyne (he/him)

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AWS Serverless

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About me

David Boyne

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Event-driven architectures and learn in public

Father of two

1st – Vegas and re:Invent



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Agenda

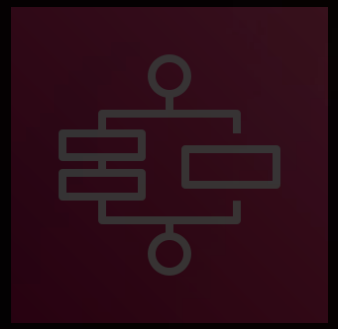
- AWS Lambda
- AWS Step Functions
- Amazon EventBridge
- AWS Serverless Application Model (AWS SAM)
- More resources

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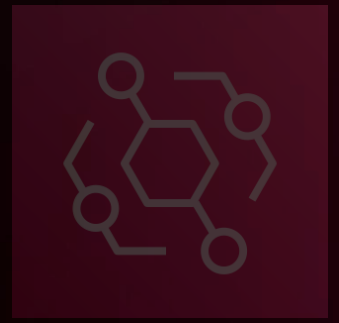
Serverless services



AWS Lambda



AWS Step Functions



Amazon EventBridge



AWS Serverless Application Model

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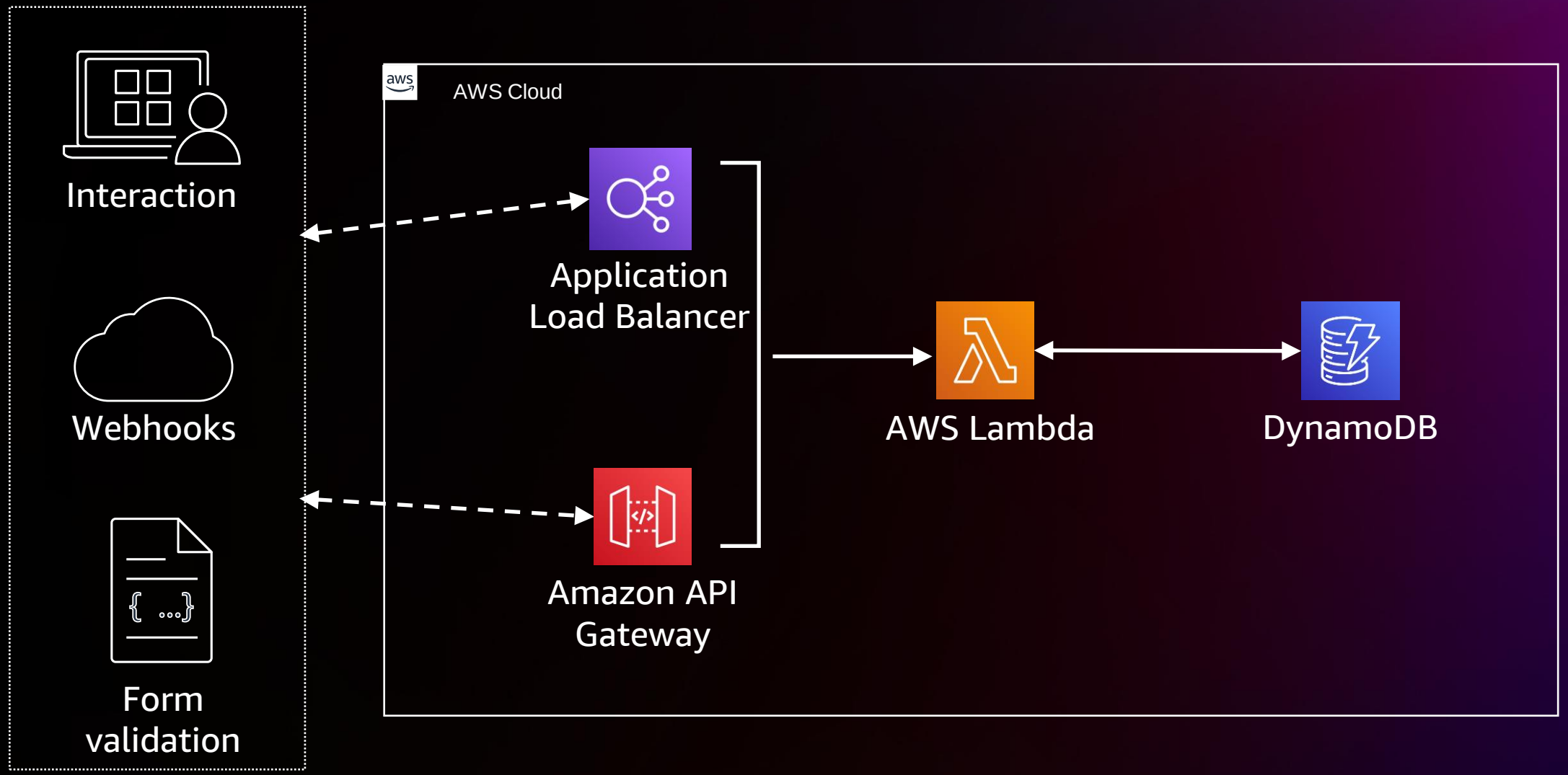
AWS Lambda function URLS

https://<url-id>.lambda-url.<region>.on.aws/

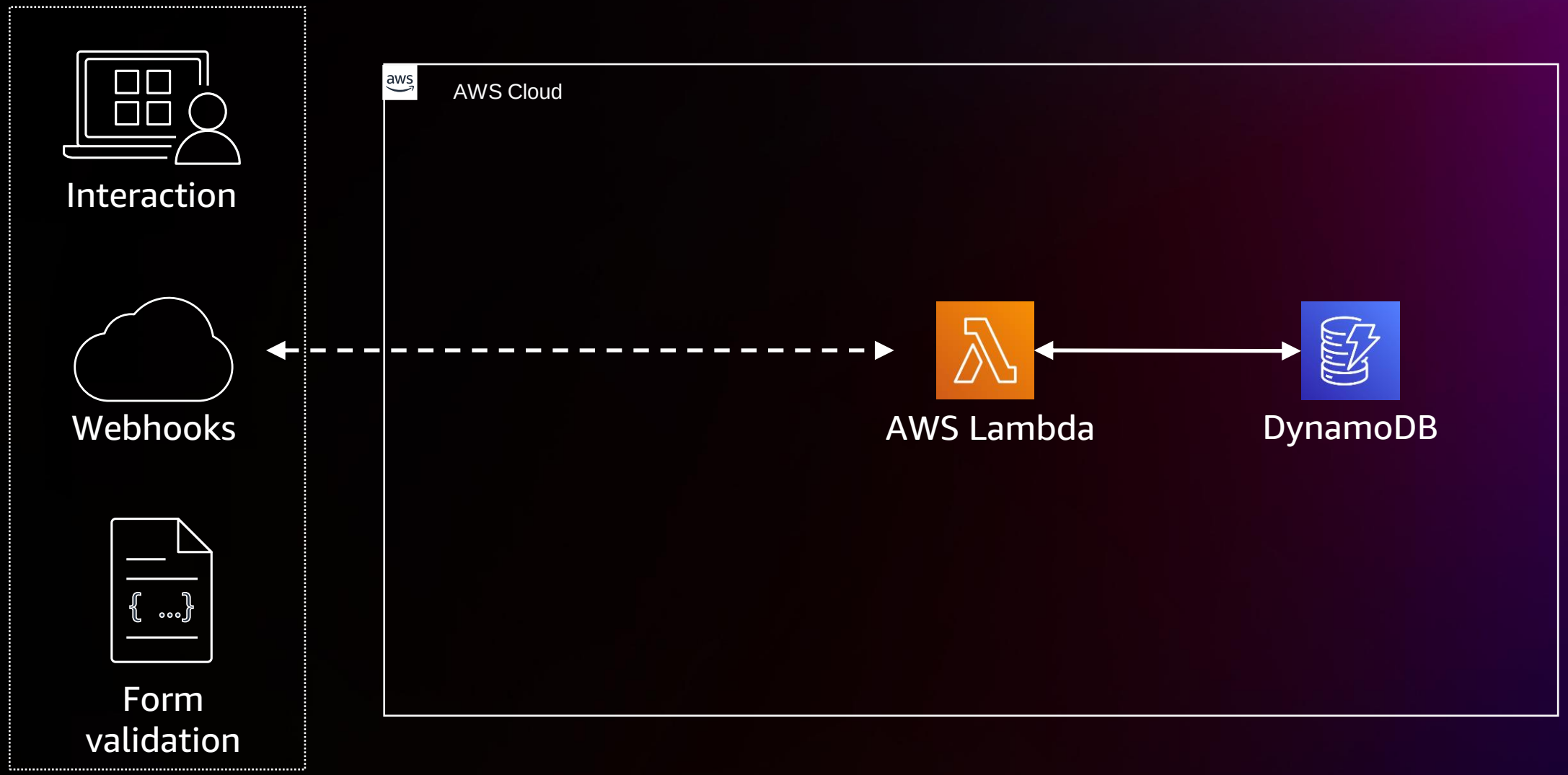
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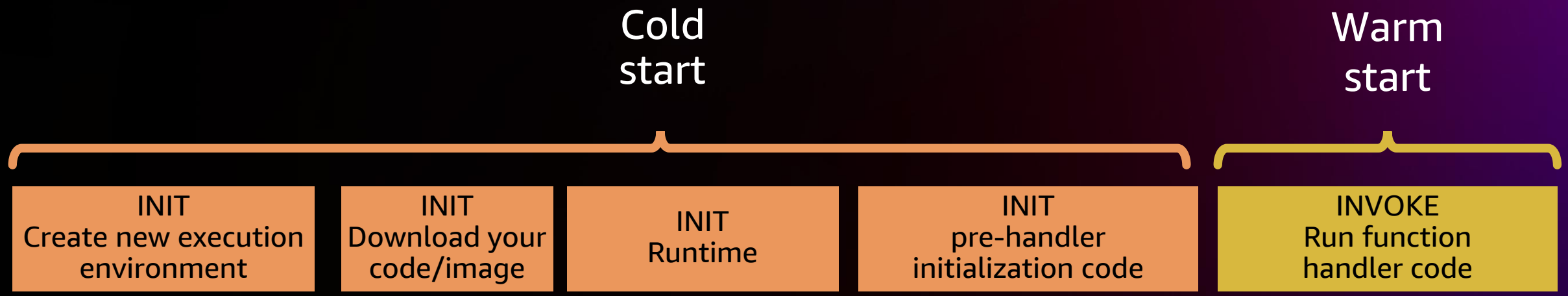


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Lambda SnapStart

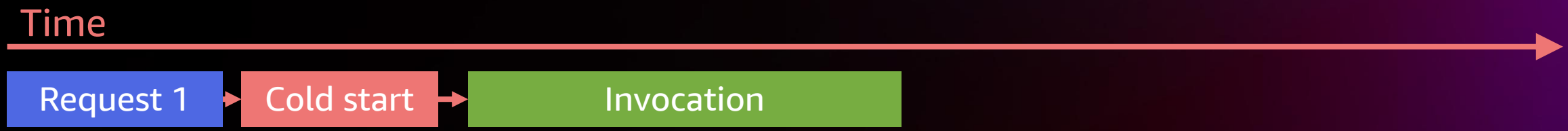
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AWS Lambda execution environment lifecycle



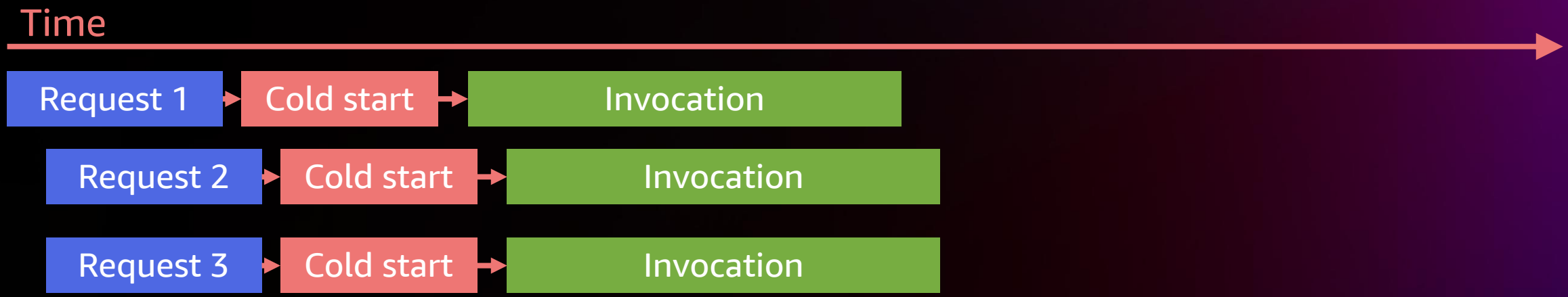
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AWS Lambda request timeline



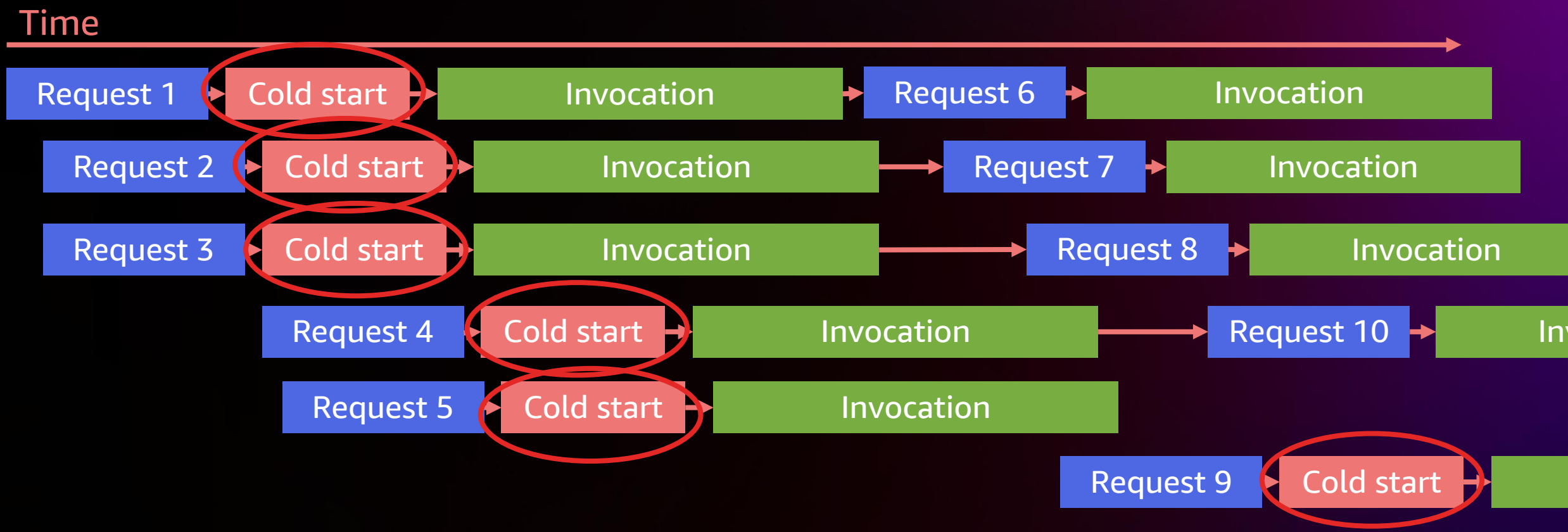
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AWS Lambda request timeline



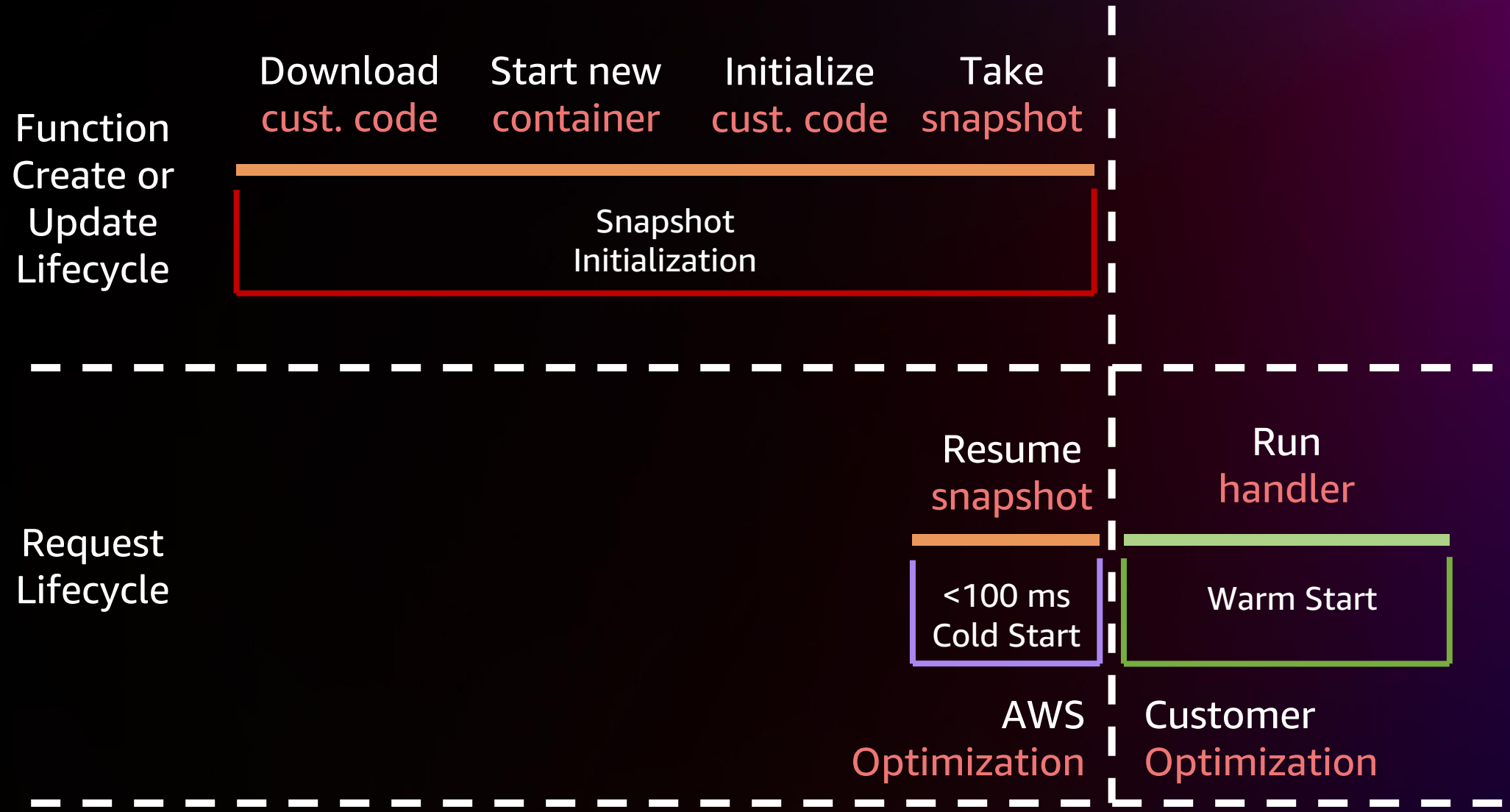
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AWS Lambda request timeline



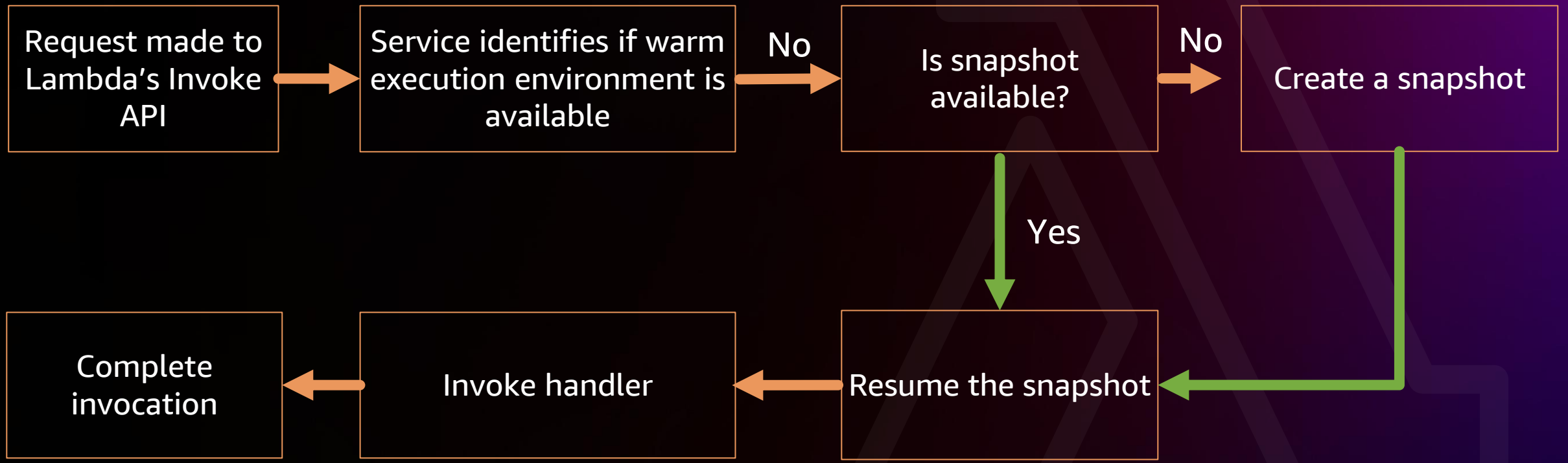
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Lambda SnapStart – How it works



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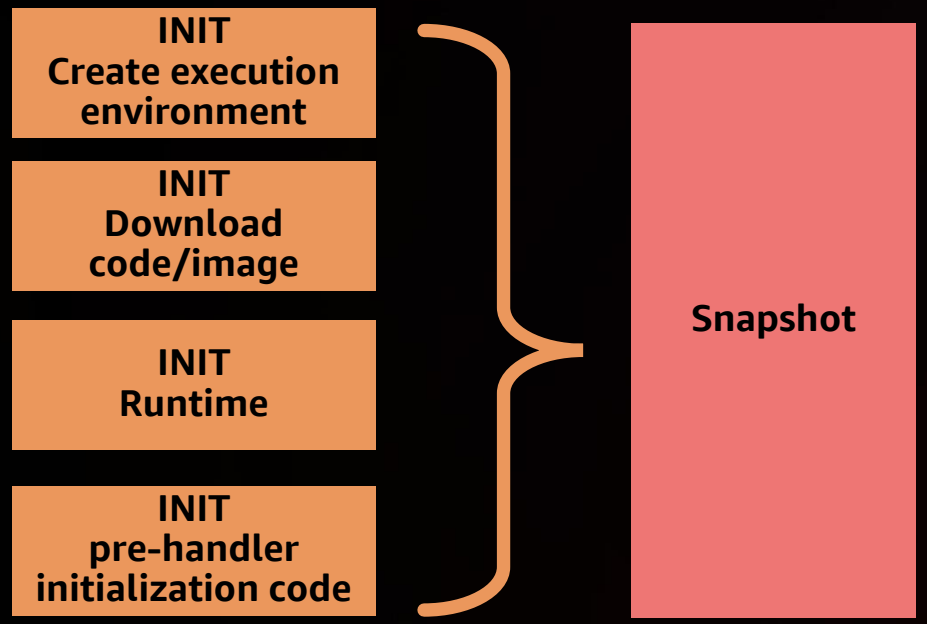
SnapStart function lifecycle



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Lambda SnapStart

OPTIMIZES AWAY THE INITIALIZATION OVERHEAD OF CREATING AN EXECUTION ENVIRONMENT



- New Lambda feature that optimizes away the initialization overhead of creating an execution environment
- Allowing functions to start running handler function code within hundreds of milliseconds
- Initially available for AWS Lambda functions running Amazon Corretto Java 8 (java8.al2) or Amazon Corretto Java 11 (java11)
- Powered by MicroVM Snapshot technology

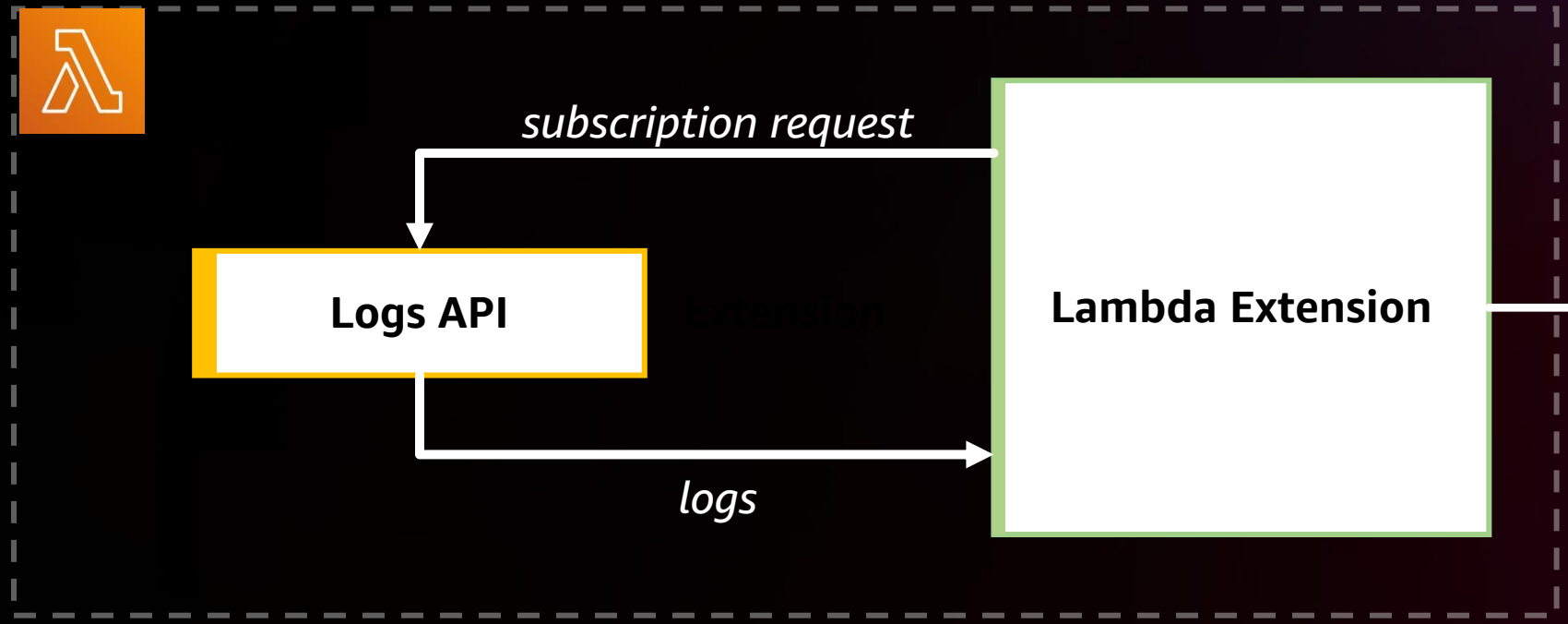
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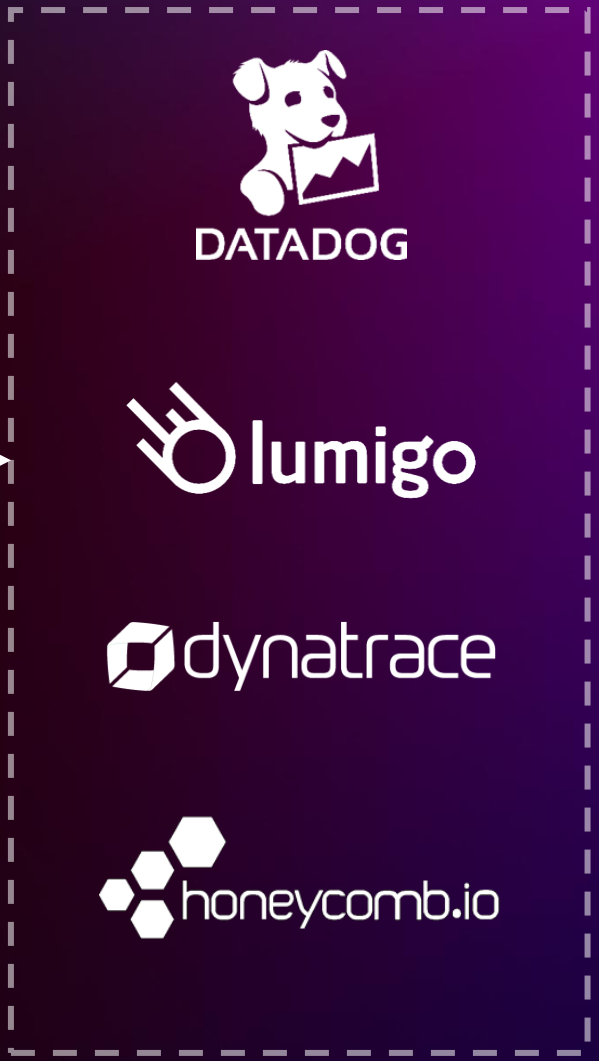
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Lambda Telemetry API

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Lambda Logs API (2021)

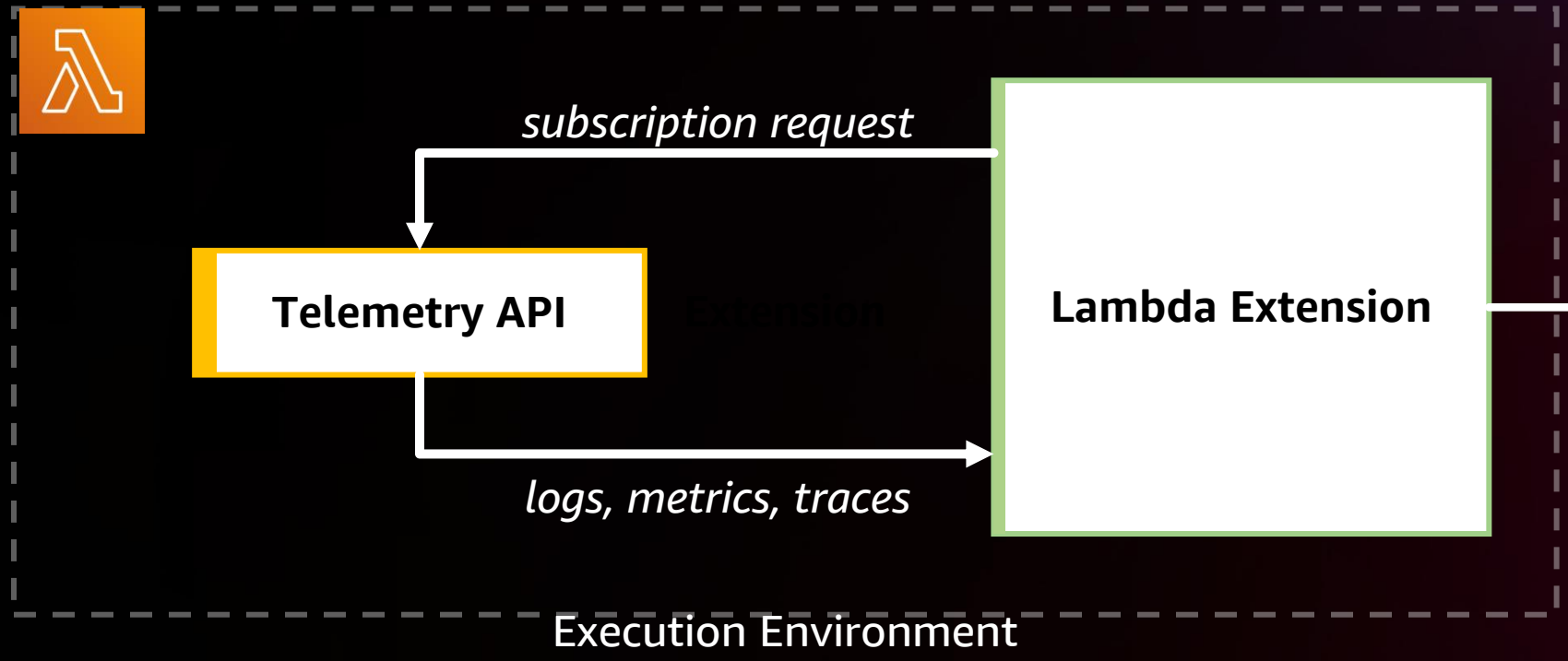




Subscribe to function logs, extension logs, and platform logs

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Telemetry API (2022)



DATADOG

lumigo

dynatrace

honeycomb.io

Extension Partners

Receive telemetry data including logs, platform traces, and new performance metrics with new Lambda API

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Telemetry API: Events and metrics

TELEMETRY API

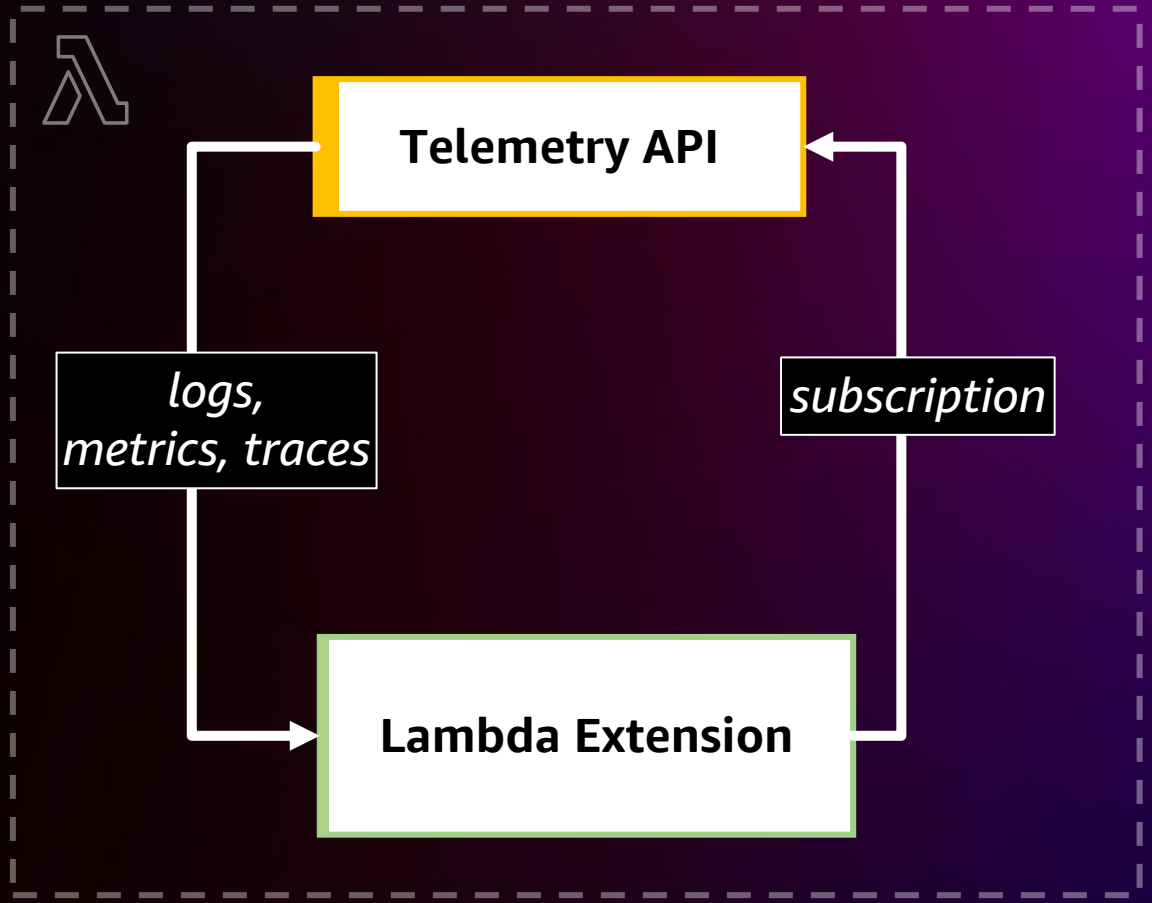
Event Type	Life cycle	Description
platform.initStart	Init	Function initialization started
platform.initRuntimeDone	Init	Function initialization completed
platform.start	Invoke	Function invocation started
platform.runtimeDone	Invoke	Runtime finished processing event with either success or failure
platform.report	Invoke	Report of function invocation
platform.logsDropped	Fault handling	Lambda dropped log entries due to…

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Lambda Telemetry API

- Receive enhanced telemetry data using preferred monitoring and observability tools
- Telemetry API enhances functionality of the Logs API
- Receive logs, metrics, and traces directly from Lambda service
- Telemetry API schema is semantically compatible with OpenTelemetry (OTEL)



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Lambda storage

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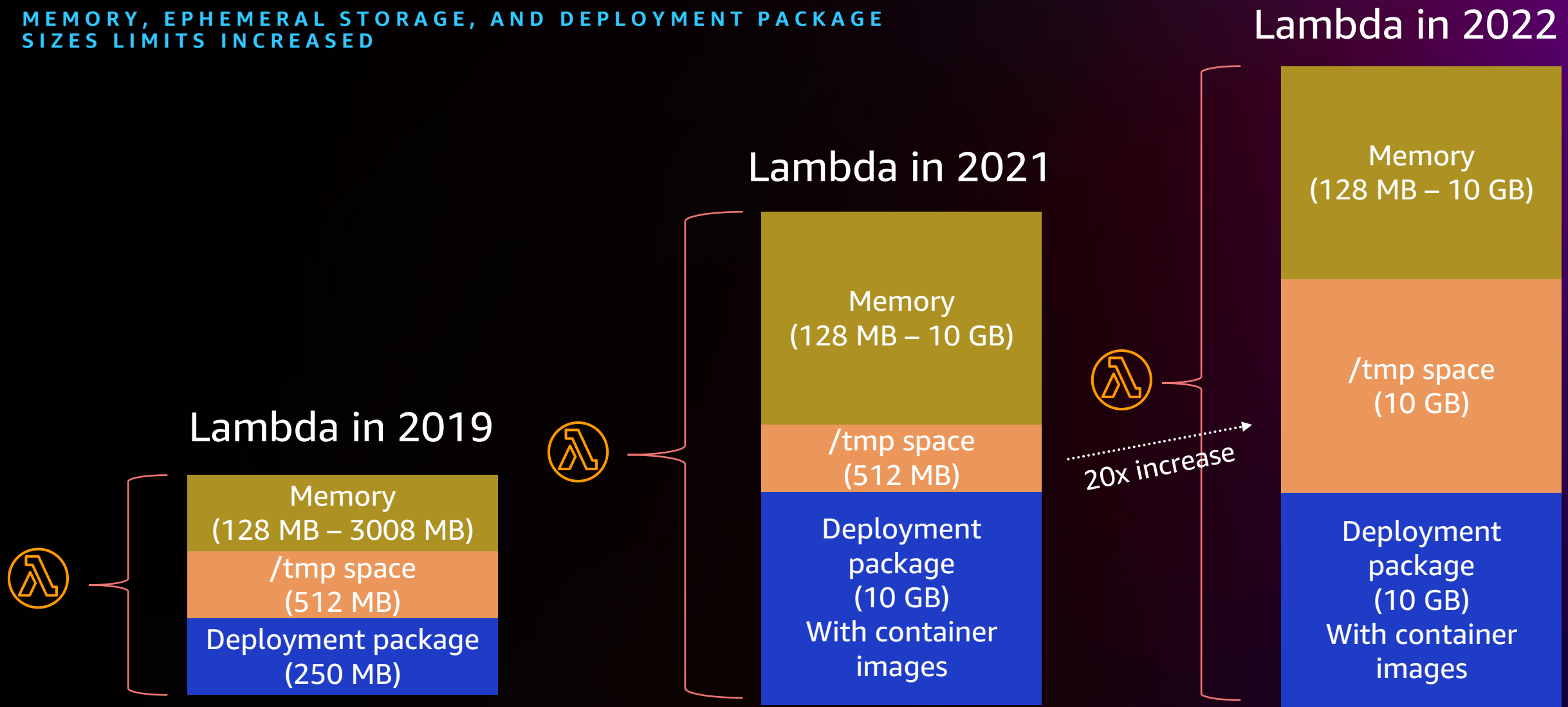
Customers have been looking for simpler ways to process big data workloads



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Lambda storage

MEMORY, EPHEMERAL STORAGE, AND DEPLOYMENT PACKAGE SIZES LIMITS INCREASED



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10 GB /tmp space – 2022

MORE TEMPORARY SPACE IN YOUR AWS LAMBDA EXECUTION ENVIRONMENT

Features	Description
Maximum size	10,240 MB
Persistence	Ephemeral
Content	Dynamic
Storage type	File system
Operations supported	Any file system operation
Pricing model	Included in Lambda (Charged over 512 MB)
Shared across all invocations	No

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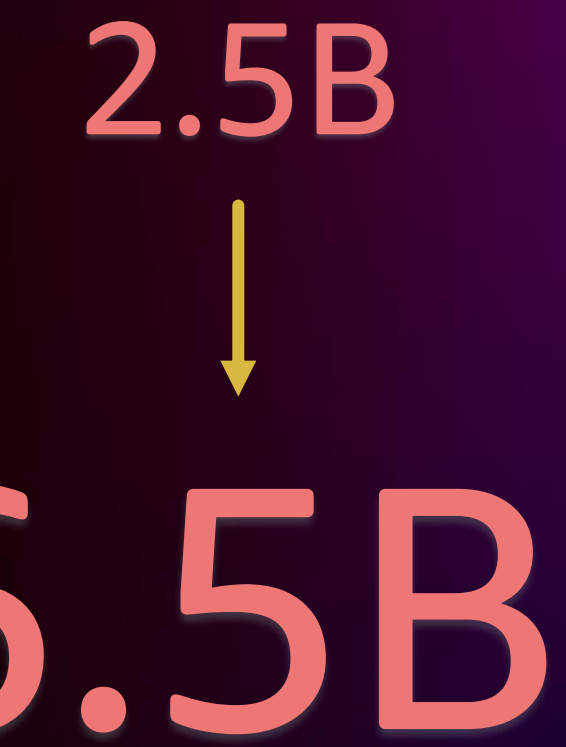
Lambda Powertools

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Lambda Powertools

A SUITE OF UTILITIES FOR AWS LAMBDA FUNCTIONS

- Open source library to help discover and incorporate serverless best practices
- Logger, Tracing, Metrics, and Utilities for Lambda
- Python 2.5B invocations in 2021, growing YOY to 6.5B in 2022
- In 2022 released support for .NET (preview) and TypeScript (GA)

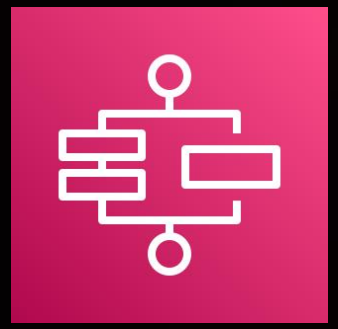


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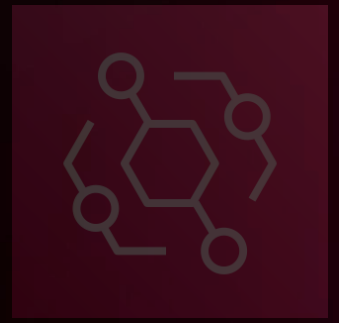
Serverless services



AWS Lambda



AWS Step Functions



Amazon EventBridge



AWS Serverless Application Model

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Write it all in (pseudo) code?

```
// Order acceptance

if (isStoreOpen) {
  if (isBaristaBusy) {
    saveOrderToDynamoDB(timeStamp)
  } else {
    rejectOrder('Barista busy')
  }
} else {
  rejectOrder('Store not open')
}
```

```
// Check for timeouts every minute

const orders = getAllOpenOrdersFromDDB
const now = currentTime

for (order in orders) {
  // Did customer time out?
  if (order.waitingForCustomer &&
     (now - order.timeStamp) > 5 mins)
  {
    rejectOrder('Customer timed out')
    updateDynamoDB
  }

  // Then check for barista time out
  ...
}
```

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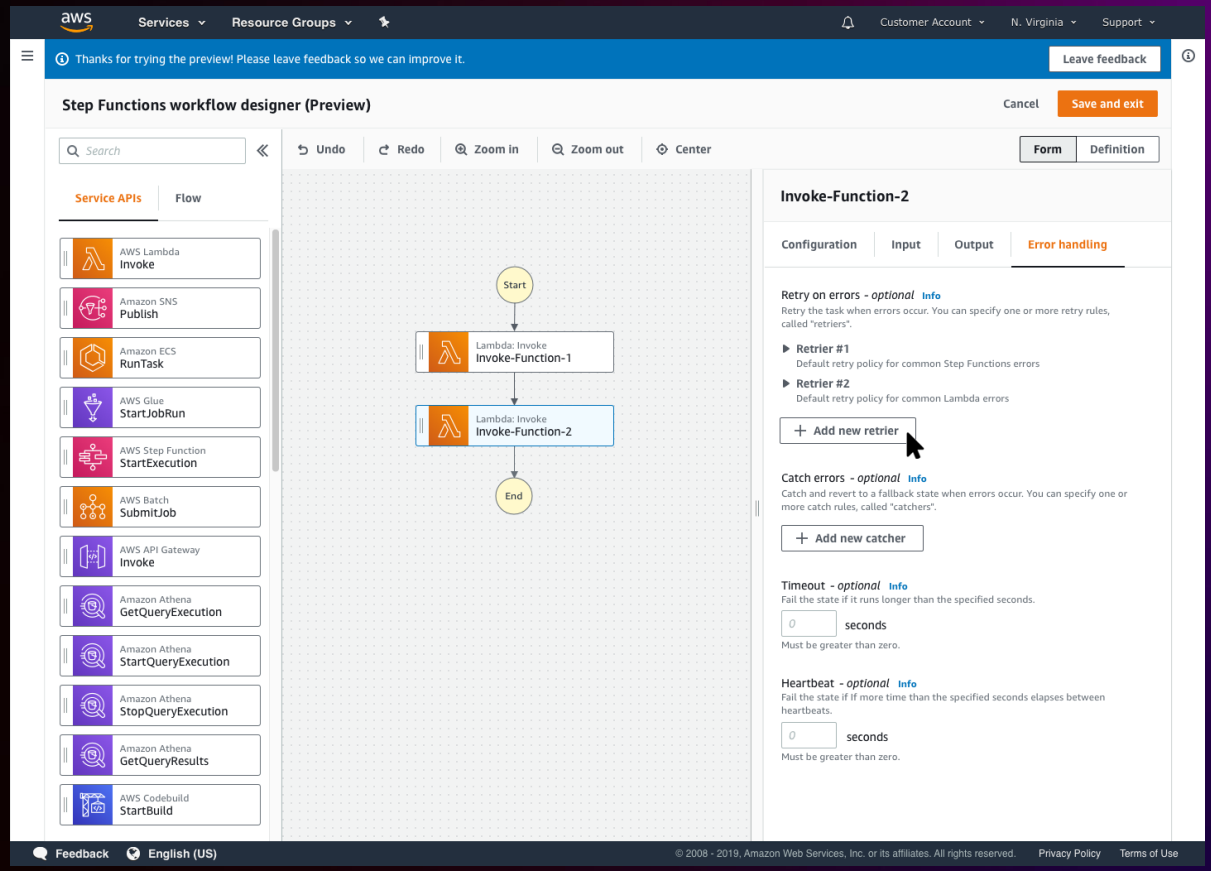
AWS Step Functions Workflow Studio

OVER 223 SERVICES AND 10,000+ APIS

The **workflows** you build with Step Functions are called **state machines**, and **each step** of your workflow is called a **state**

When you execute your state machine, **each move** from one state to the next is called a **state transition**

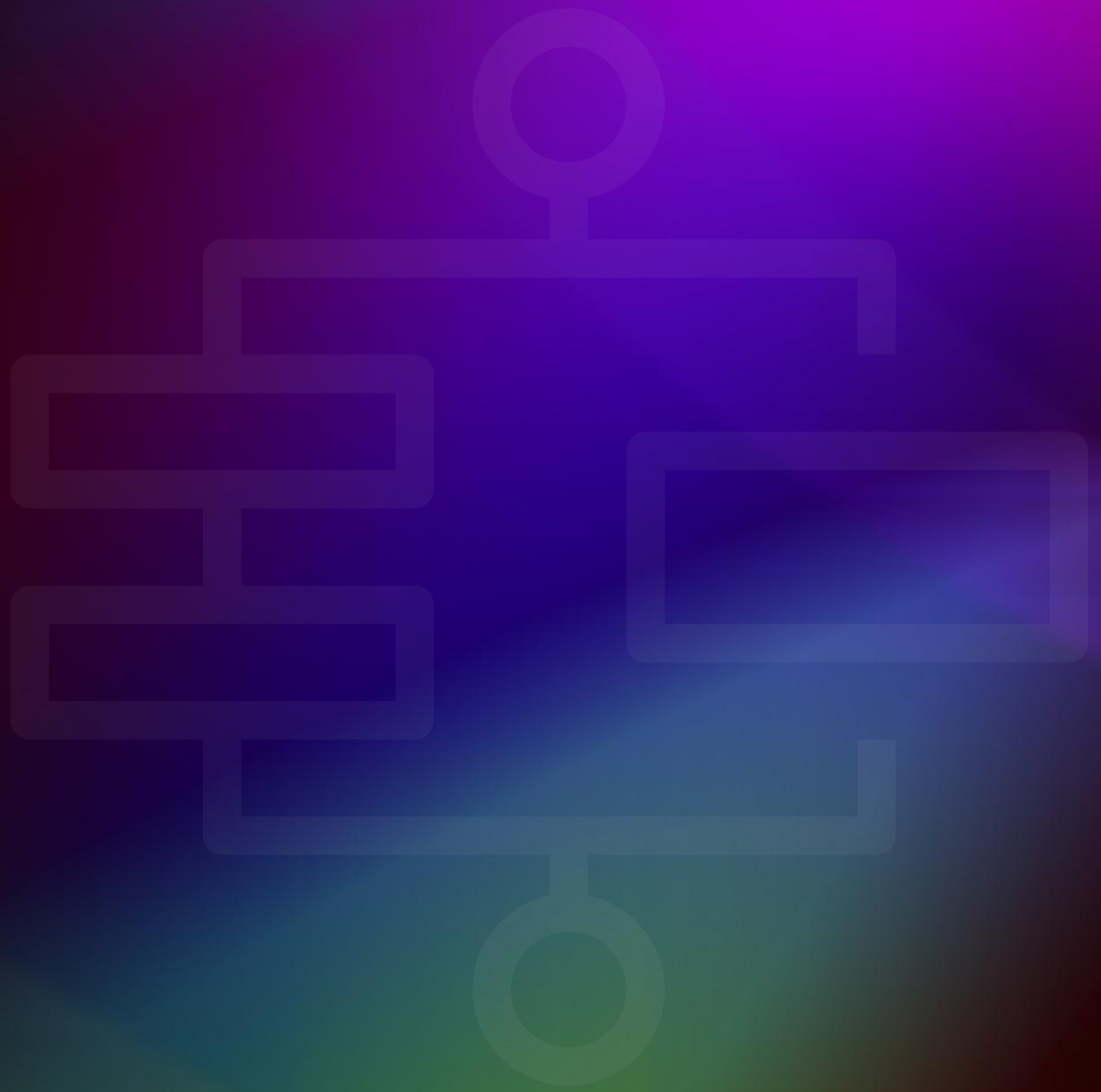
You can **reuse components**, easily edit the sequence of steps or swap out the code called by task states as your needs change



AWS Step Functions Workflow Studio

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Intrinsic functions



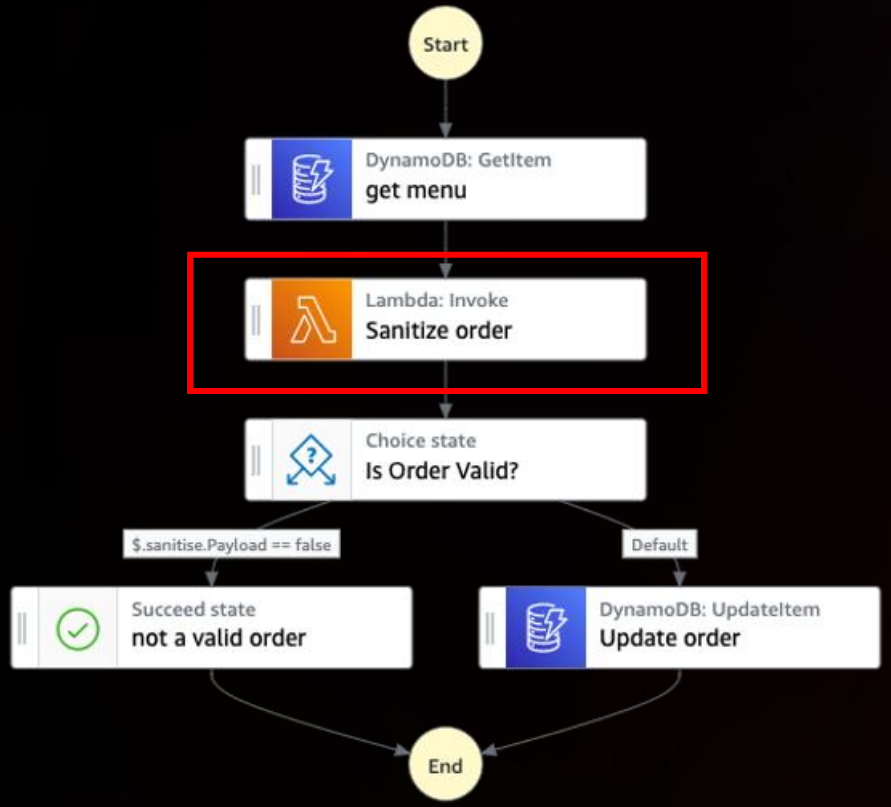
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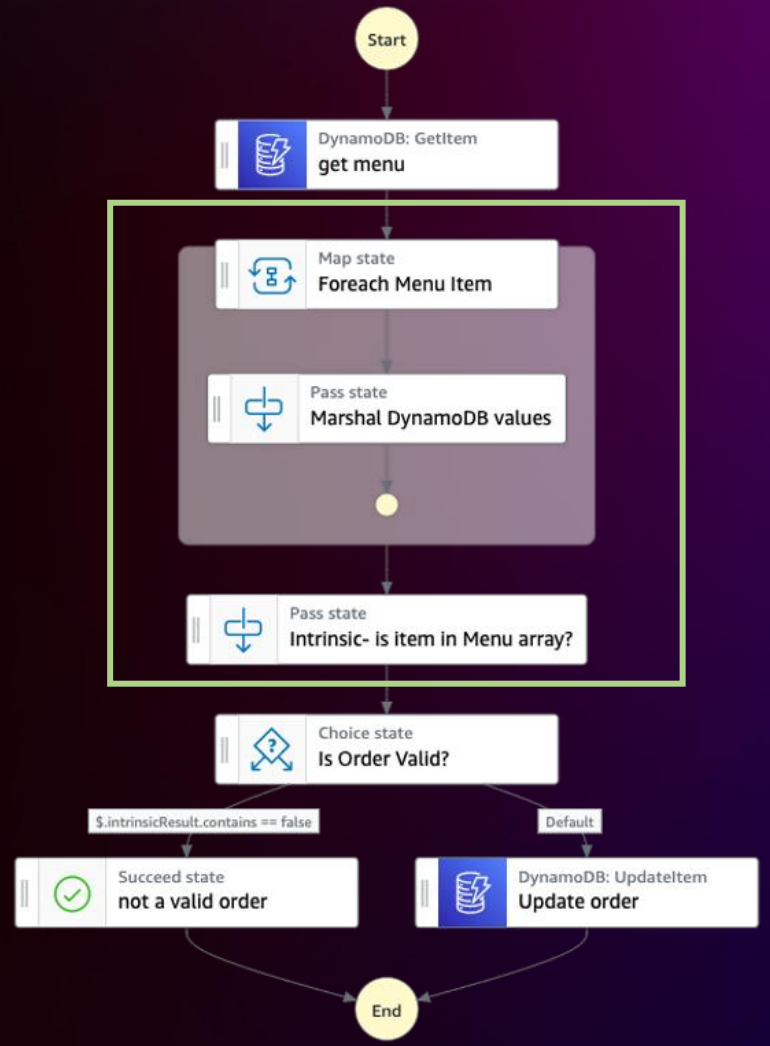
Customers have asked for additional intrinsic functions to perform more data transformation tasks with Step Functions



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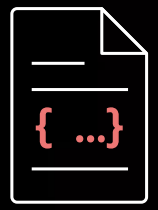
How intrinsic functions can reduce code





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AWS Step Functions intrinsic functions



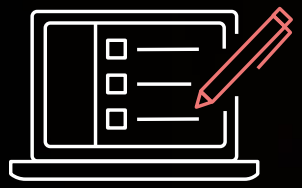
Arrays



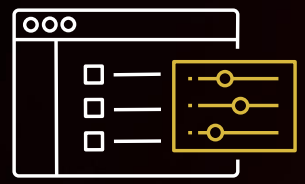
JSON data manipulation



Encoding and decoding



Math operations



String operations



Unique identifier generation

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AWS Step Functions intrinsic functions

PERFORM BASIC DATA PROCESSING OPERATIONS WITHOUT USING A TASK

Function	Description
States.Array	Create array with a given input
States.ArrayContains	Check if given array contains your match
States.UUID	Generates universally unique identifier (v4 UUID)
States.Base64Encode	Encode data based on MIME base64 encoding scheme
States.Base64Decode	Decode data based on MIME base64 decoding scheme
States.Hash	Generate hash value of given input (MD5, SHA-1, SHA-256, SHA—384, SHA 512)

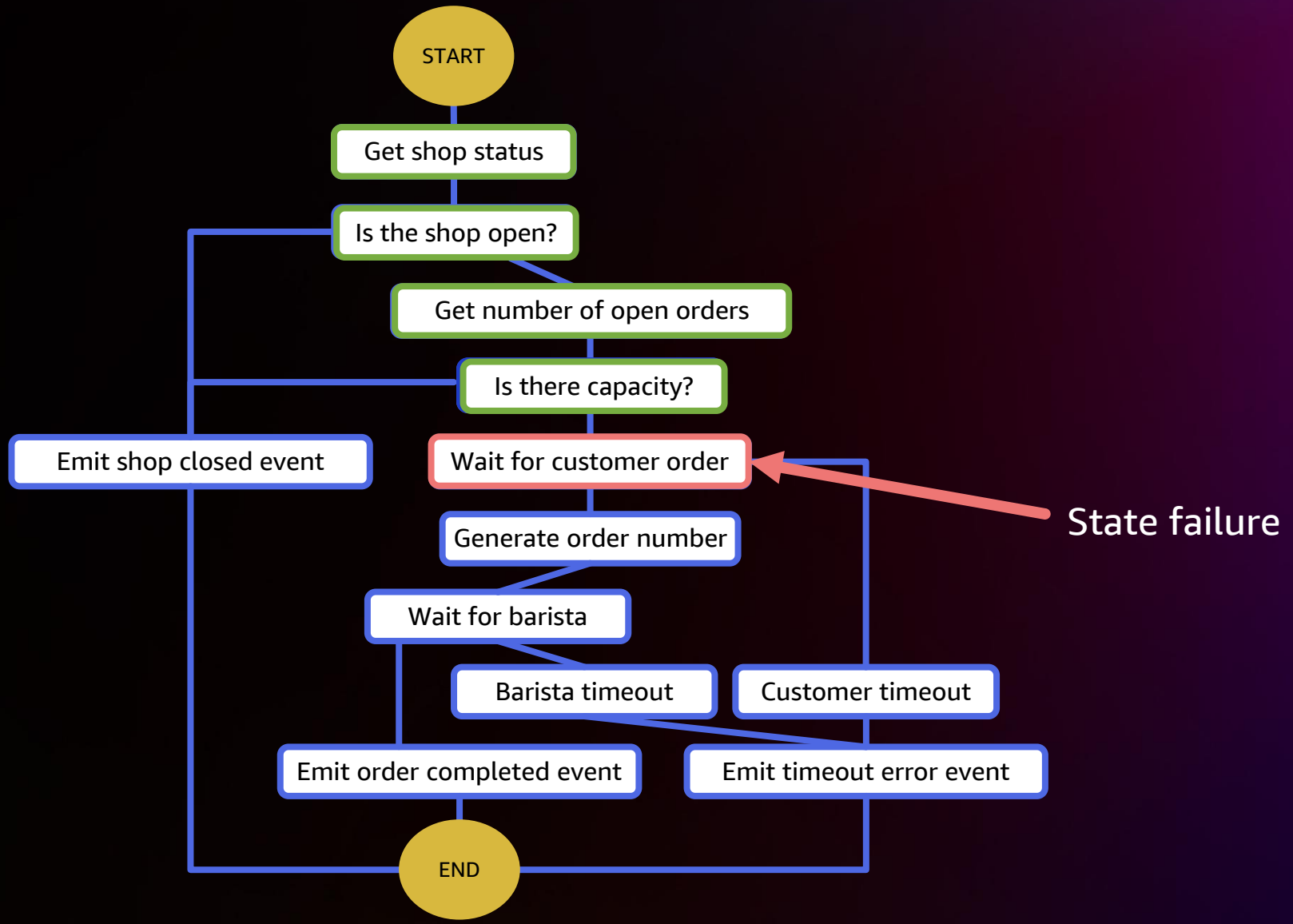
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New workflow observability features for AWS Step Functions

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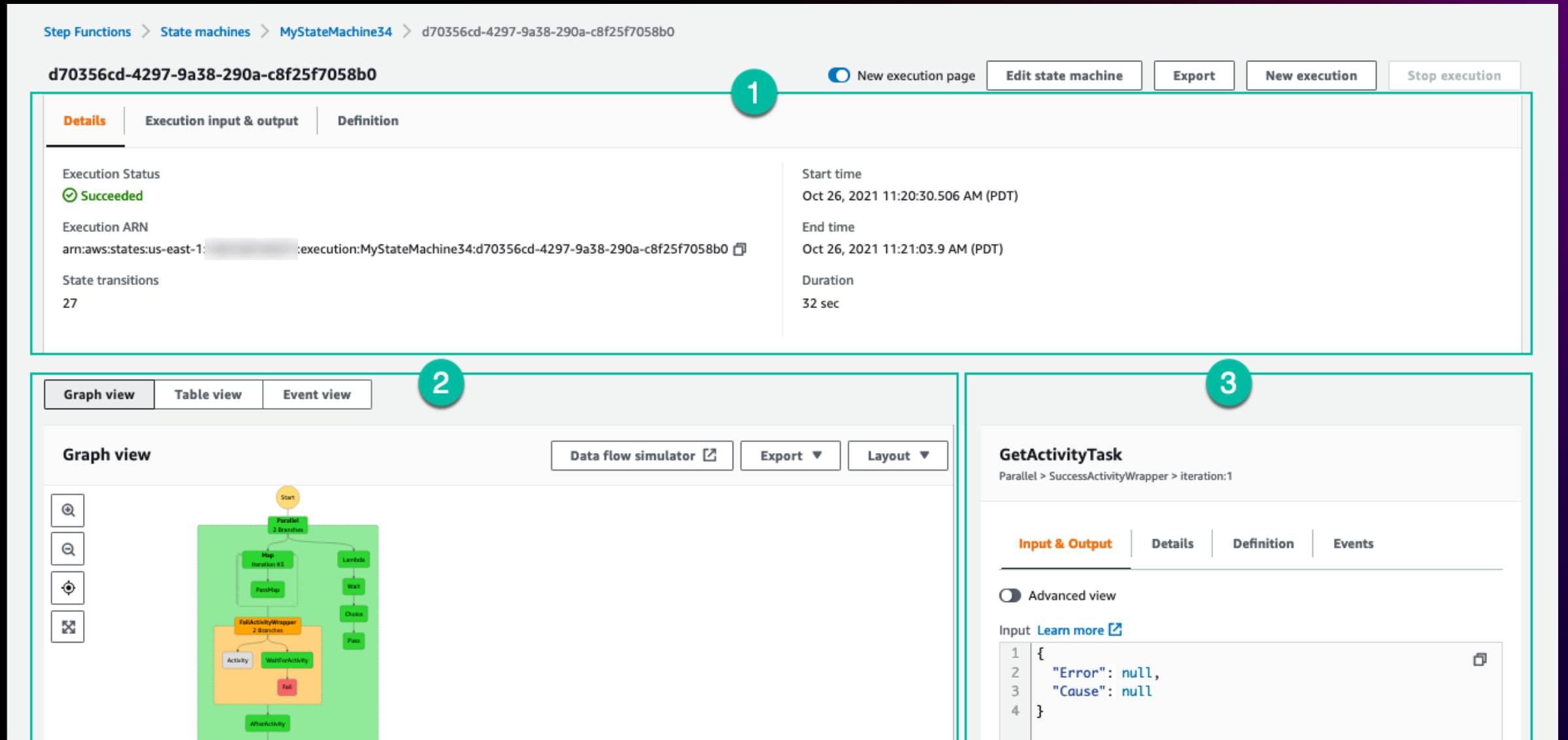
Step Functions workflow



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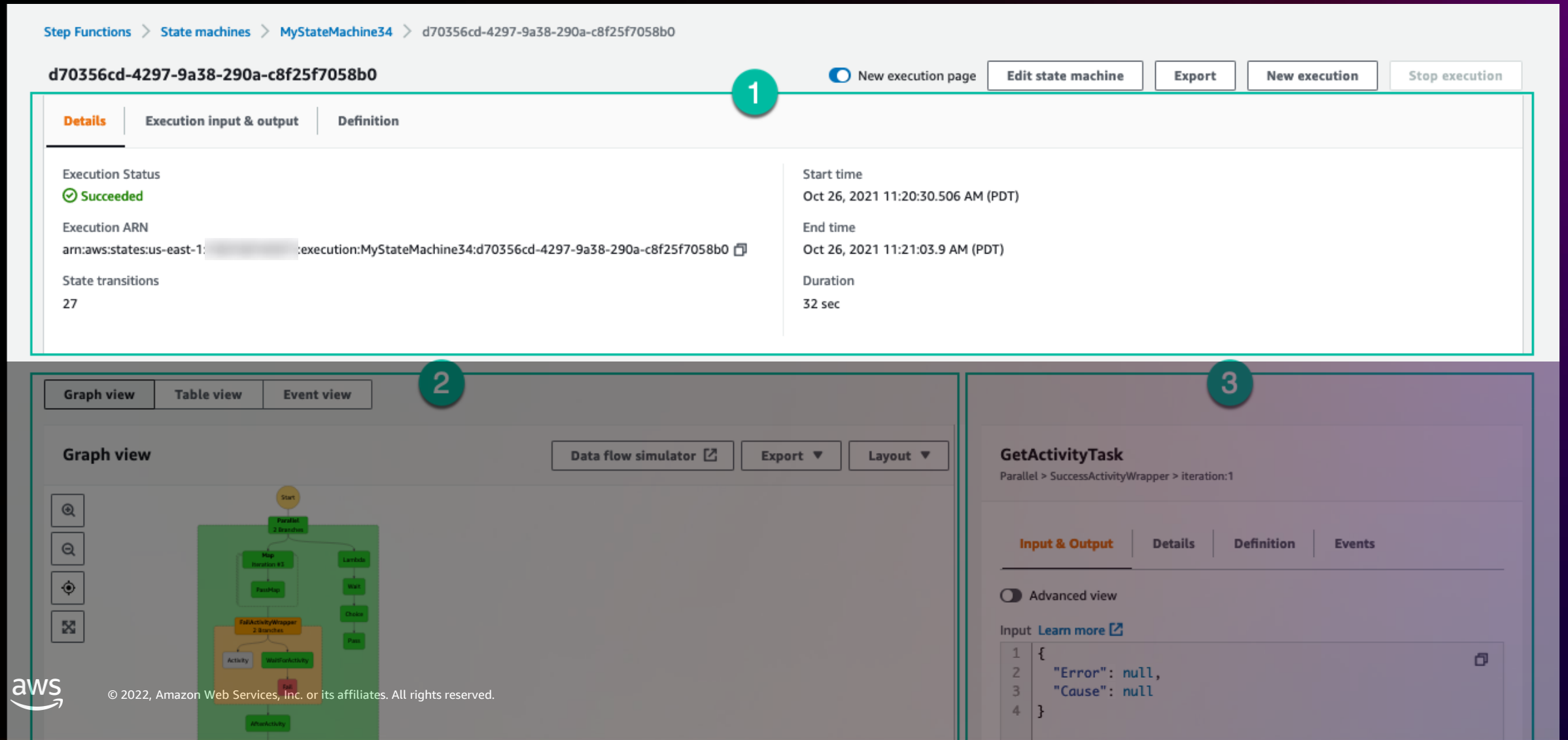
Step Functions: New console experience

DEBUGGING STEP FUNCTIONS WITH THE NEW EXECUTION PAGE



Step Functions: Execution summary

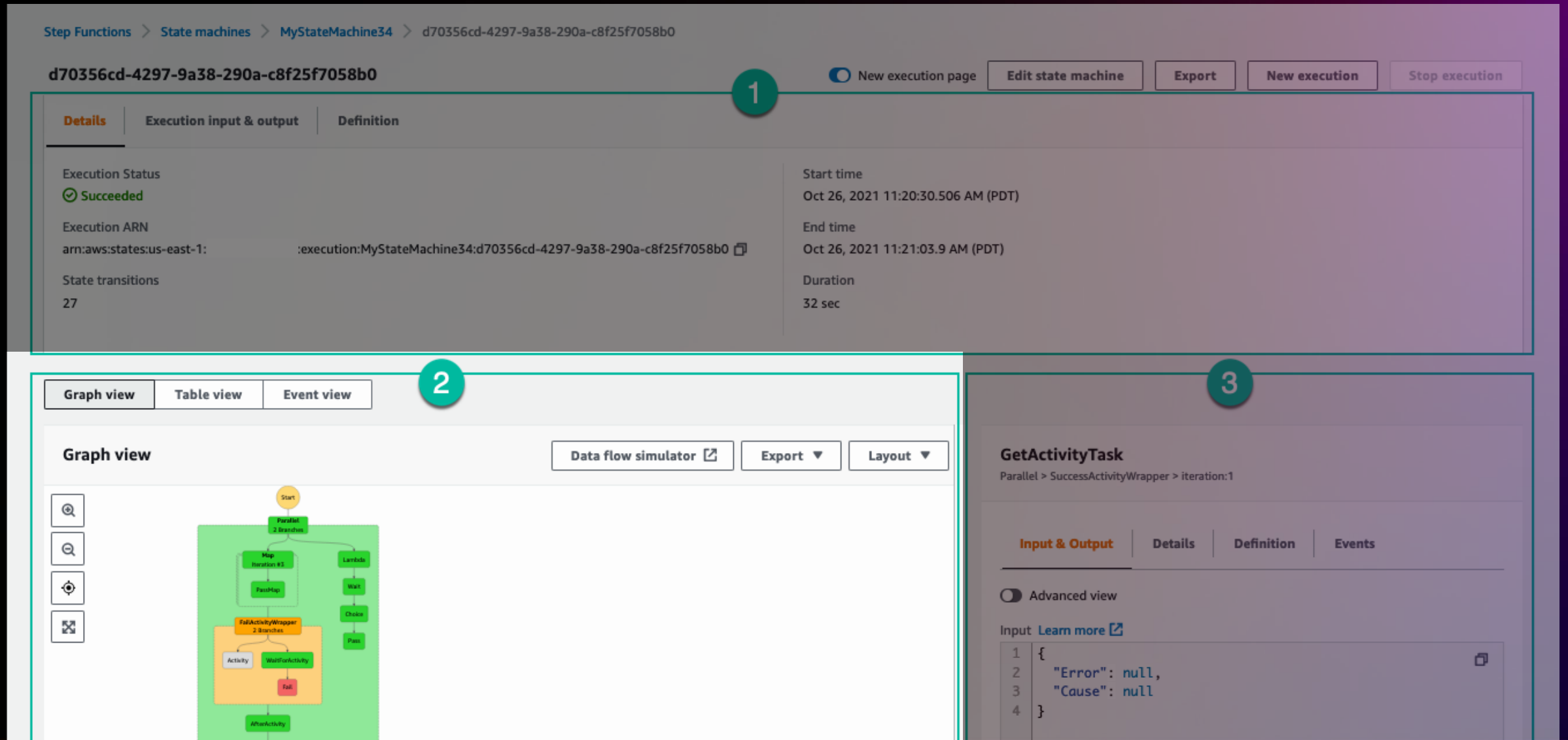
DEBUGGING STEP FUNCTIONS WITH THE NEW EXECUTION PAGE



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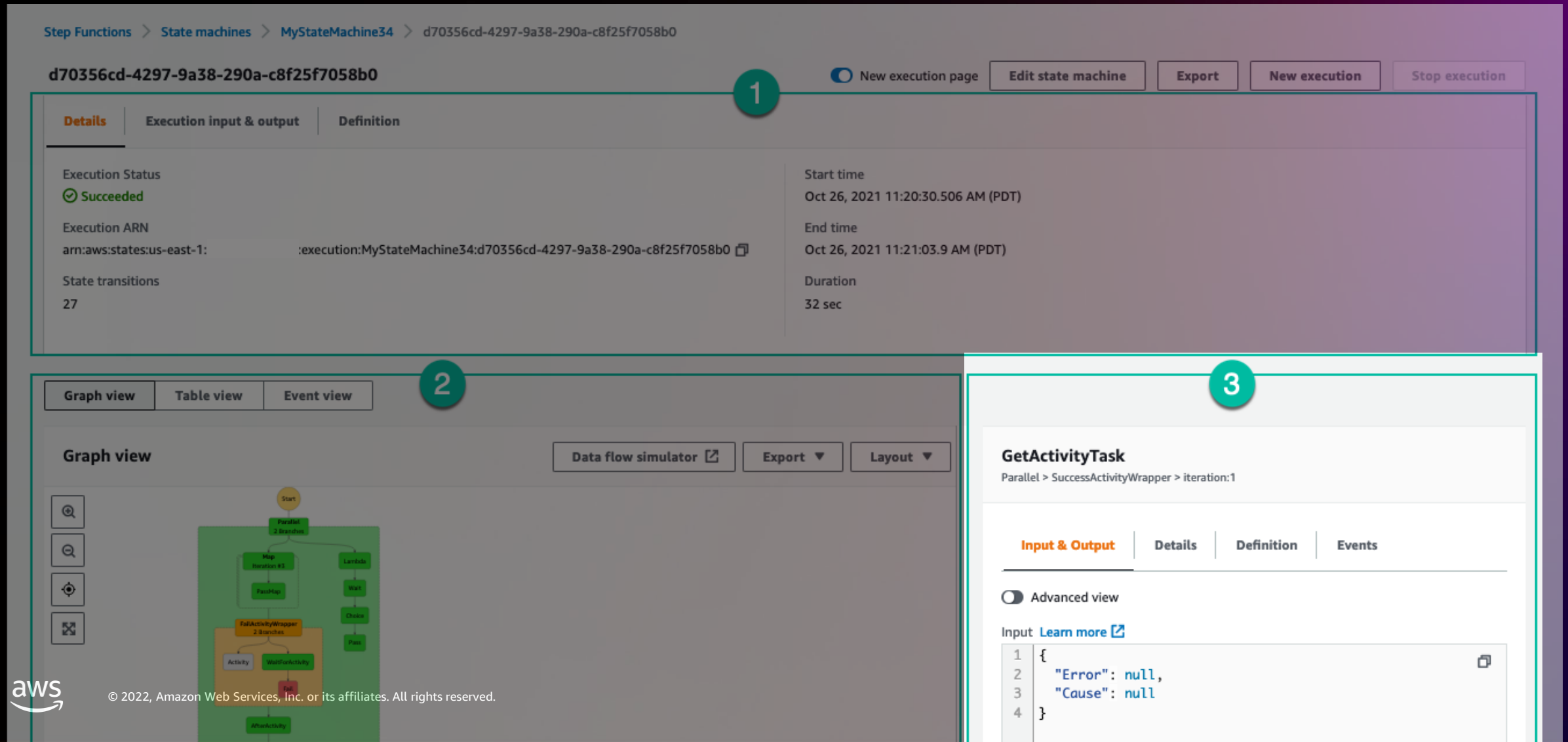
Step Functions: View mode

DEBUGGING STEP FUNCTIONS WITH THE NEW EXECUTION PAGE



Step Functions: Details for selected state

DEBUGGING STEP FUNCTIONS WITH THE NEW EXECUTION PAGE

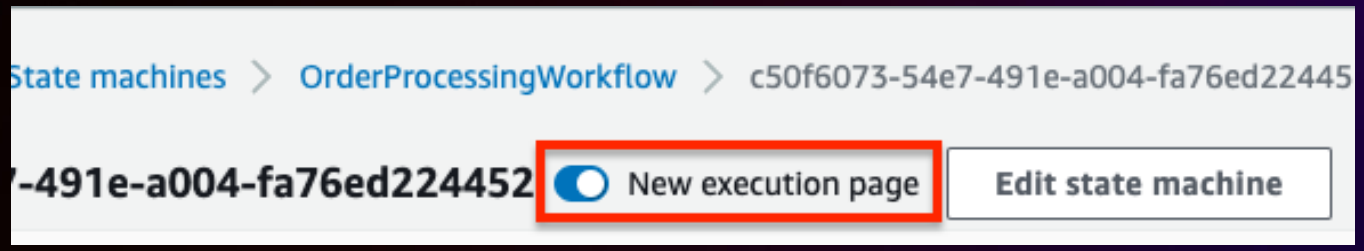


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Step Functions: New console experience

DEBUGGING STEP FUNCTIONS WITH THE NEW EXECUTION PAGE

- New experience to help you analyze, debug, and optimize Step Functions Standard Workflows
- Events tab that displays all the events for the selected state, with their corresponding timestamp
- Input & Output tab allows you to debug state input to output with transformations in between with Parameters
- Turn on “New execution page” to get started



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Step Functions distributed map state



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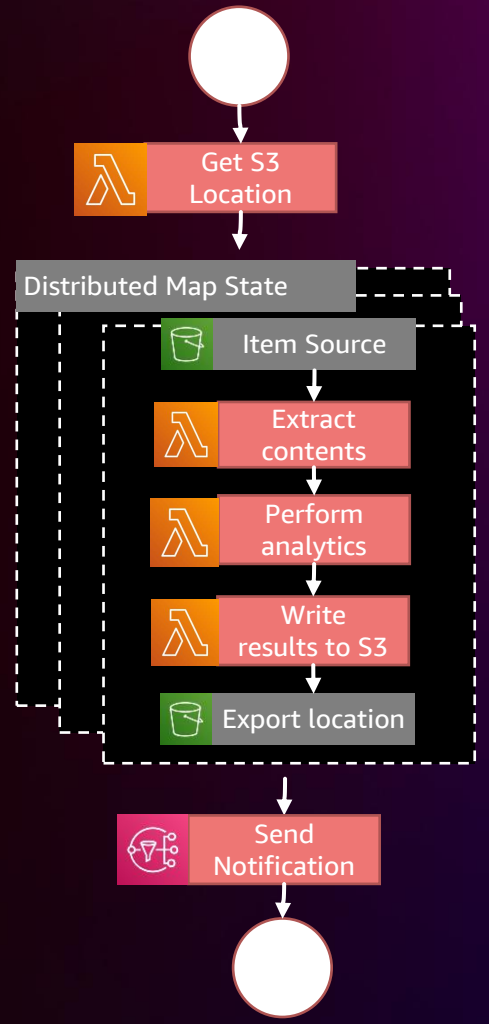
Customers have been asking for more simpler ways to dynamically process large arrays of data without building custom solutions



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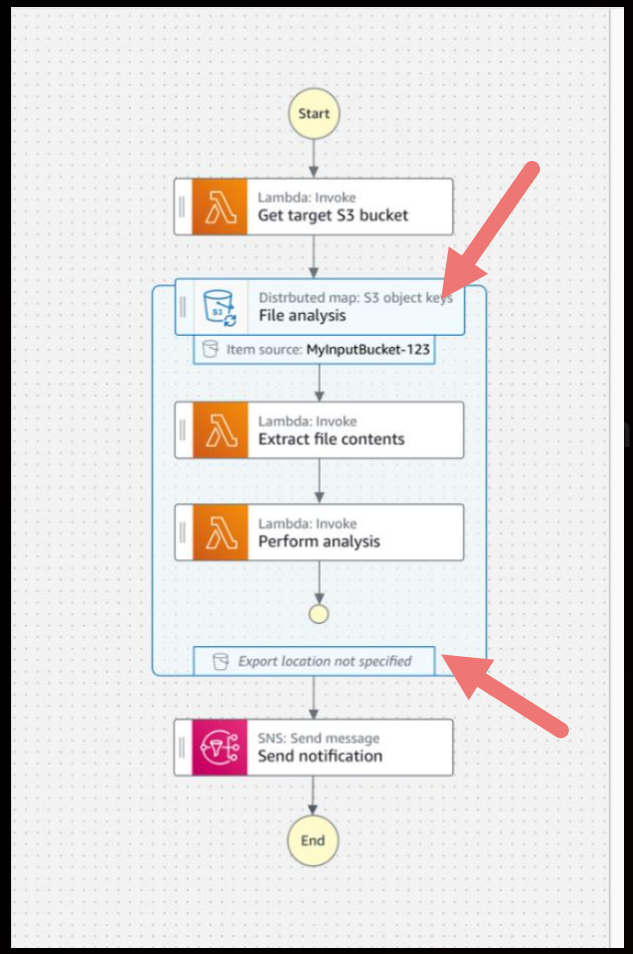
Step Functions distributed map state

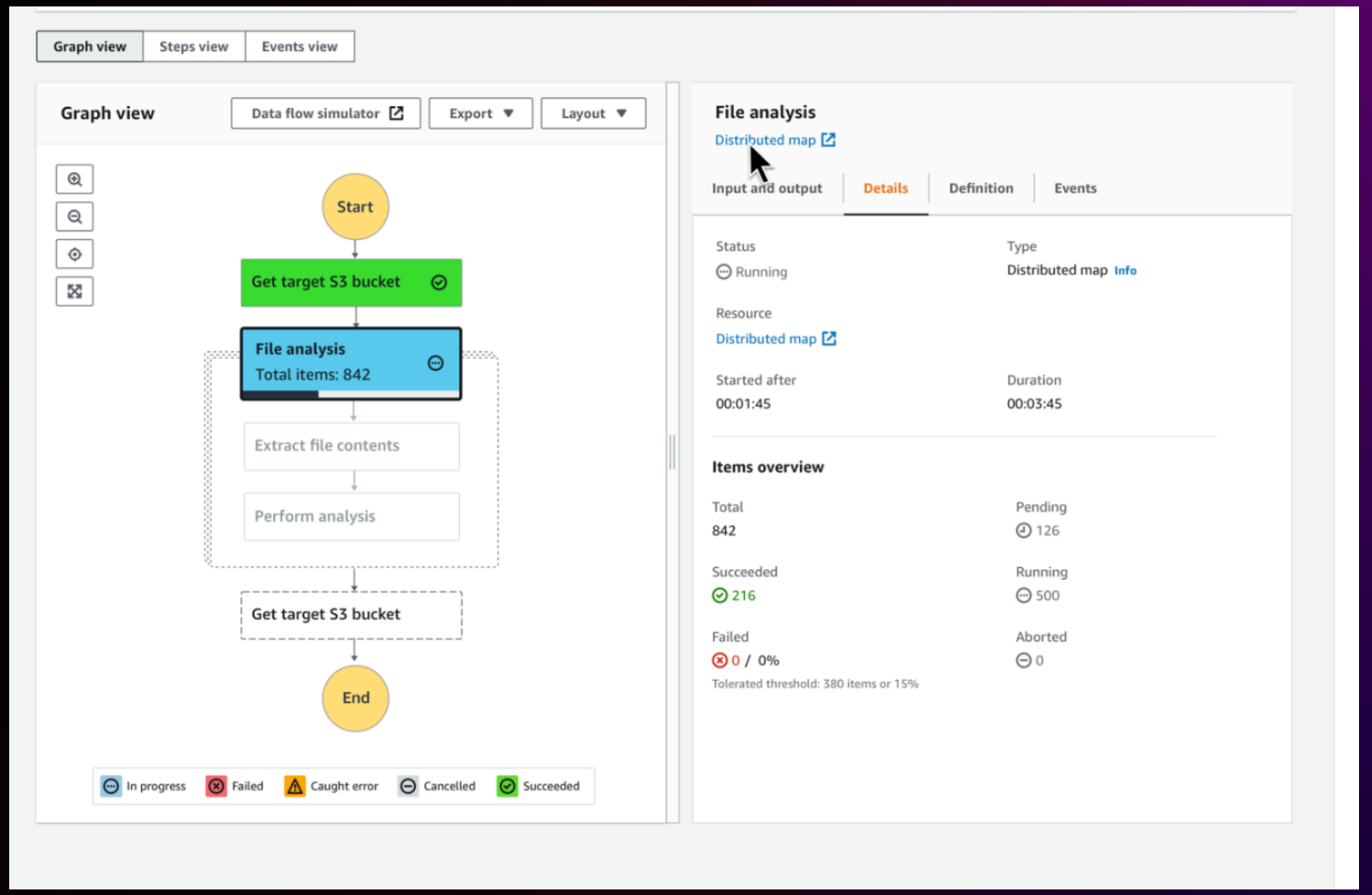
- Coordinate large-scale parallel workloads in Step Functions
- Iterate over millions of S3 objects such as JSON or CSV files
- Up to 10,000 parallel executions
- Invoke Lambda or Amazon ECS/AWS Fargate for large scale on demand serverless compute
- Choose express or standard workflow



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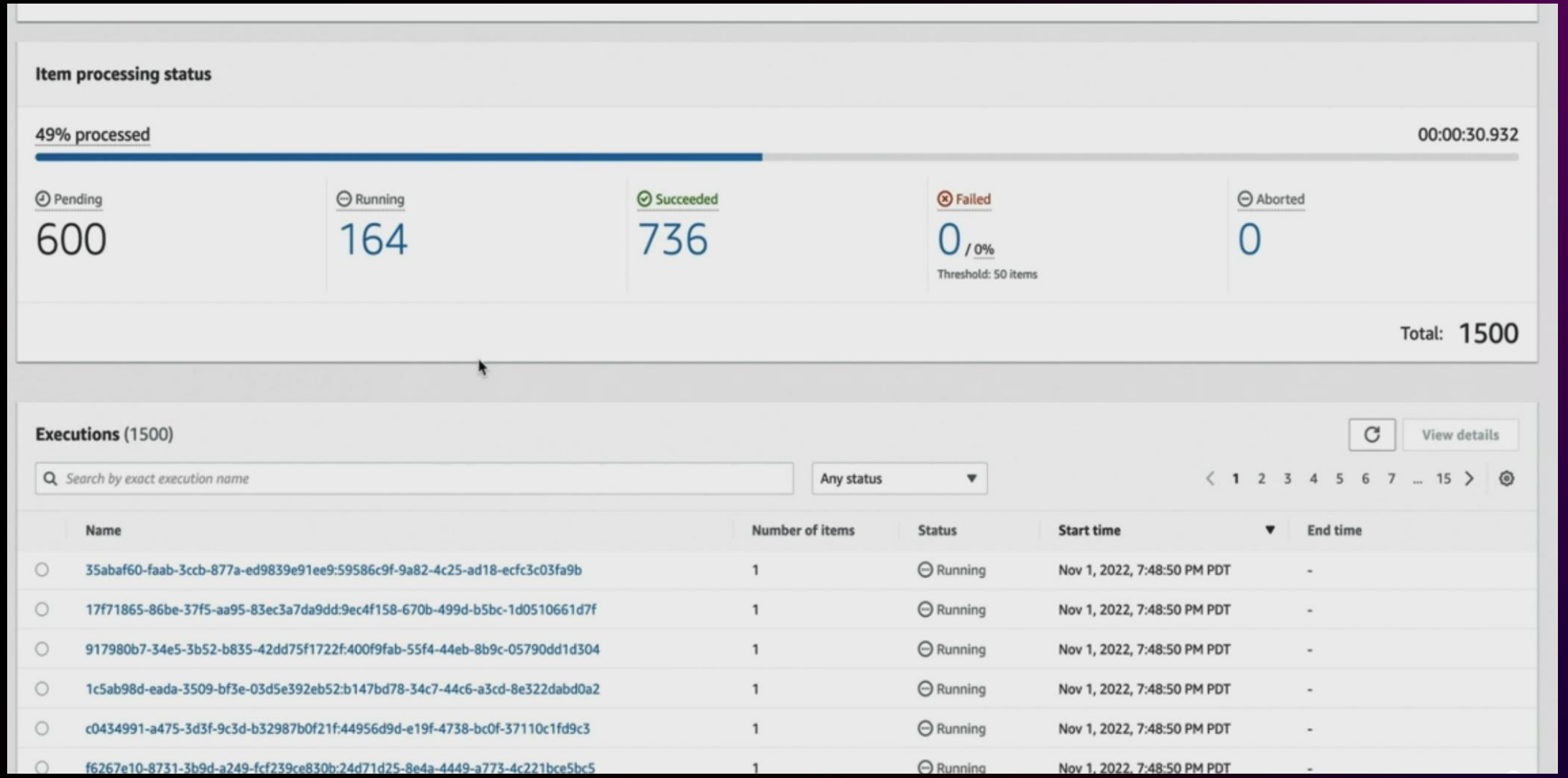
Use case: Removing sensitive content





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Use case: Removing sensitive content

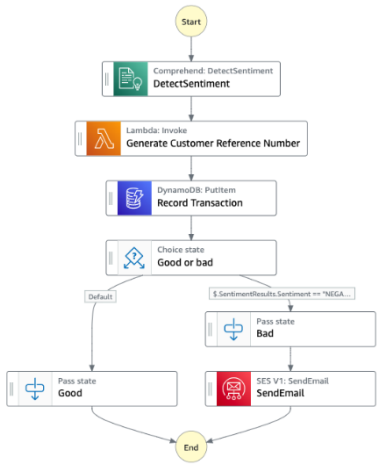


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Step Functions workflow collection and workshops

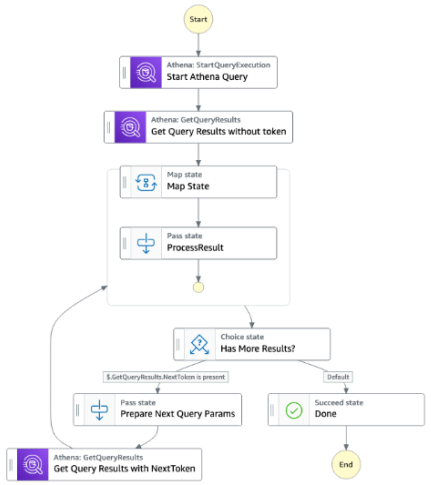
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The Step Functions workflow collection



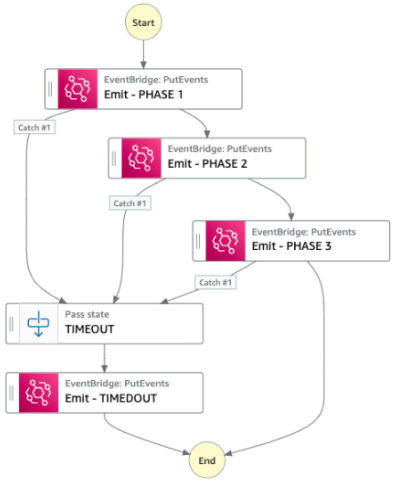
Web contact form processor

Standard 3 - Application SAM View



Query Athena S3 data

Standard 3 - Application SAM View



Emit and wait workflow

Standard 2 - Pattern SAM View

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Step Functions Workflow Collection

New Blogs Videos Learn Patterns **Workflows** Snippets Office Hours Search Search

Serverless Workflows Collection

Submit a workflow

New to AWS Step Functions? Try the new interactive Step Functions workshop.

Filters (31 workflows) Reset

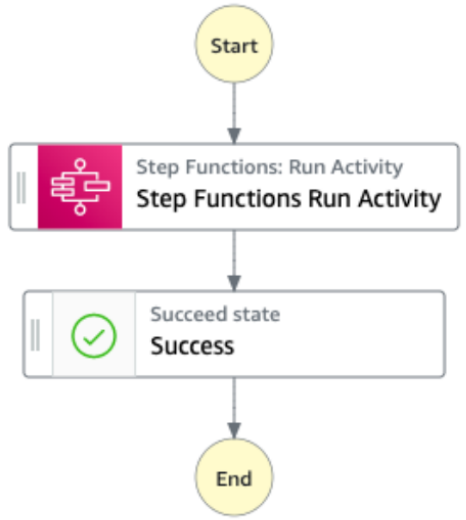
Workflow Type

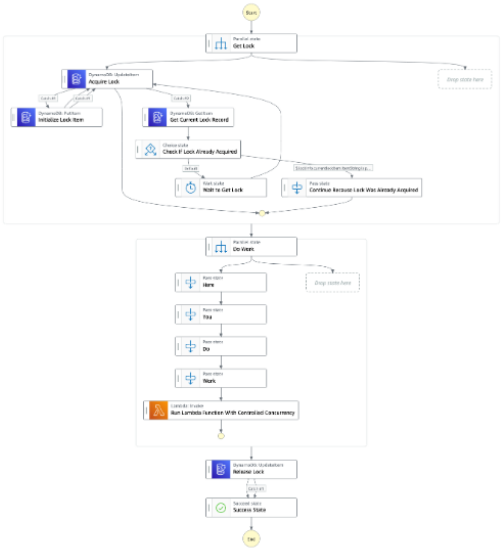
- [ ] Express
- [ ] Standard

Use case

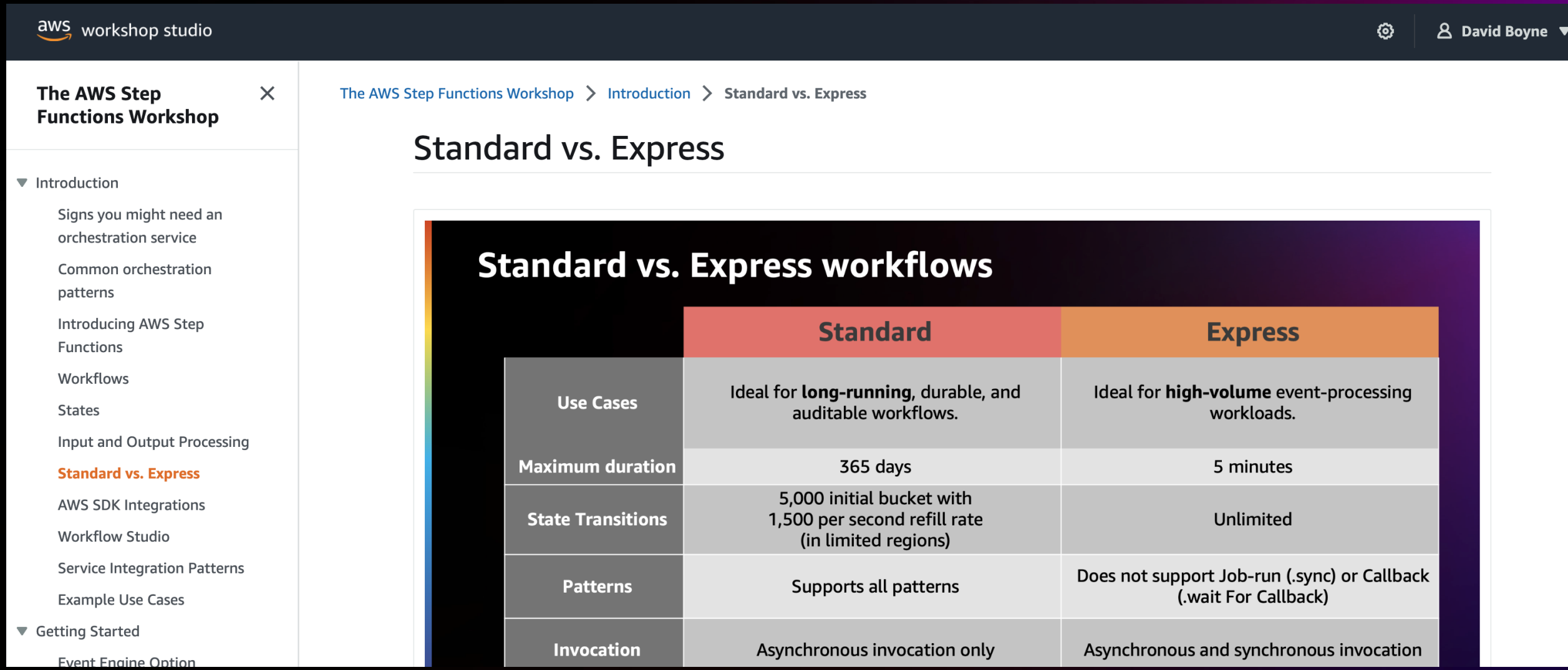
- [ ] Content Moderation
- [ ] Data Processing

Use Step Functions workflows to quickly build applications using AWS SAM and CDK templates. Filter by use-case and copy the template or workflow definition directly into your application.





The AWS Step Functions Workshop



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Serverlesspresso workshop

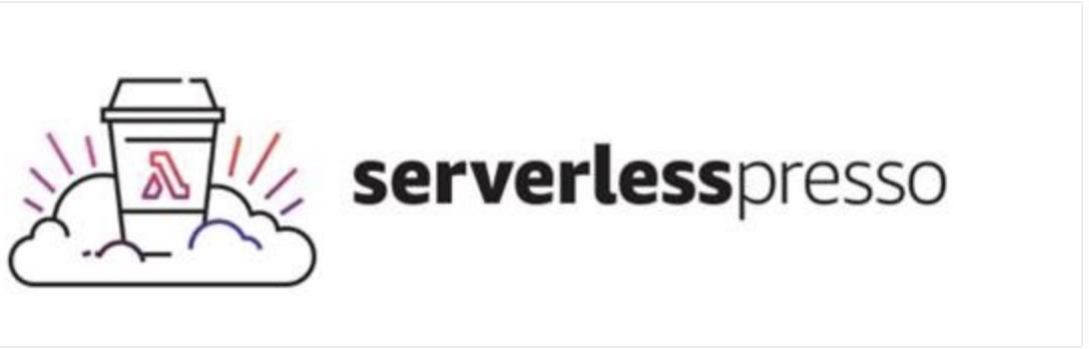
aws workshop studio

Welcome to the Serverlesspresso workshop!

- Introduction
- Setup
- Building the workflow - Part 1
- Building the workflow - Part 2
- Routing events
- Configuring the frontends
- Summary
- Clean up

Welcome to the Serverlesspresso workshop!

Welcome to the Serverlesspresso workshop!



In this workshop, you will deploy a serverless backend that supports a pop-up coffee shop. You will then test your application using 3 front-end applications that are provided.

At this event, your instructor will provide an overview of the steps involved. There are AWS employees available to help with any of your questions - don't be afraid to ask if you get stuck!

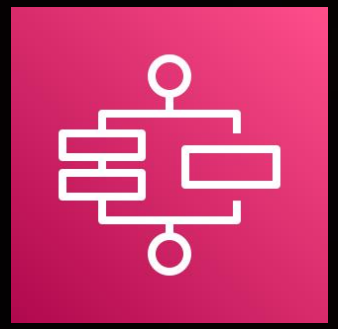
To get started, follow the module headings on the left, starting with Introduction.

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Serverless services



AWS Lambda



AWS Step Functions



Amazon EventBridge



AWS Serverless Application Model

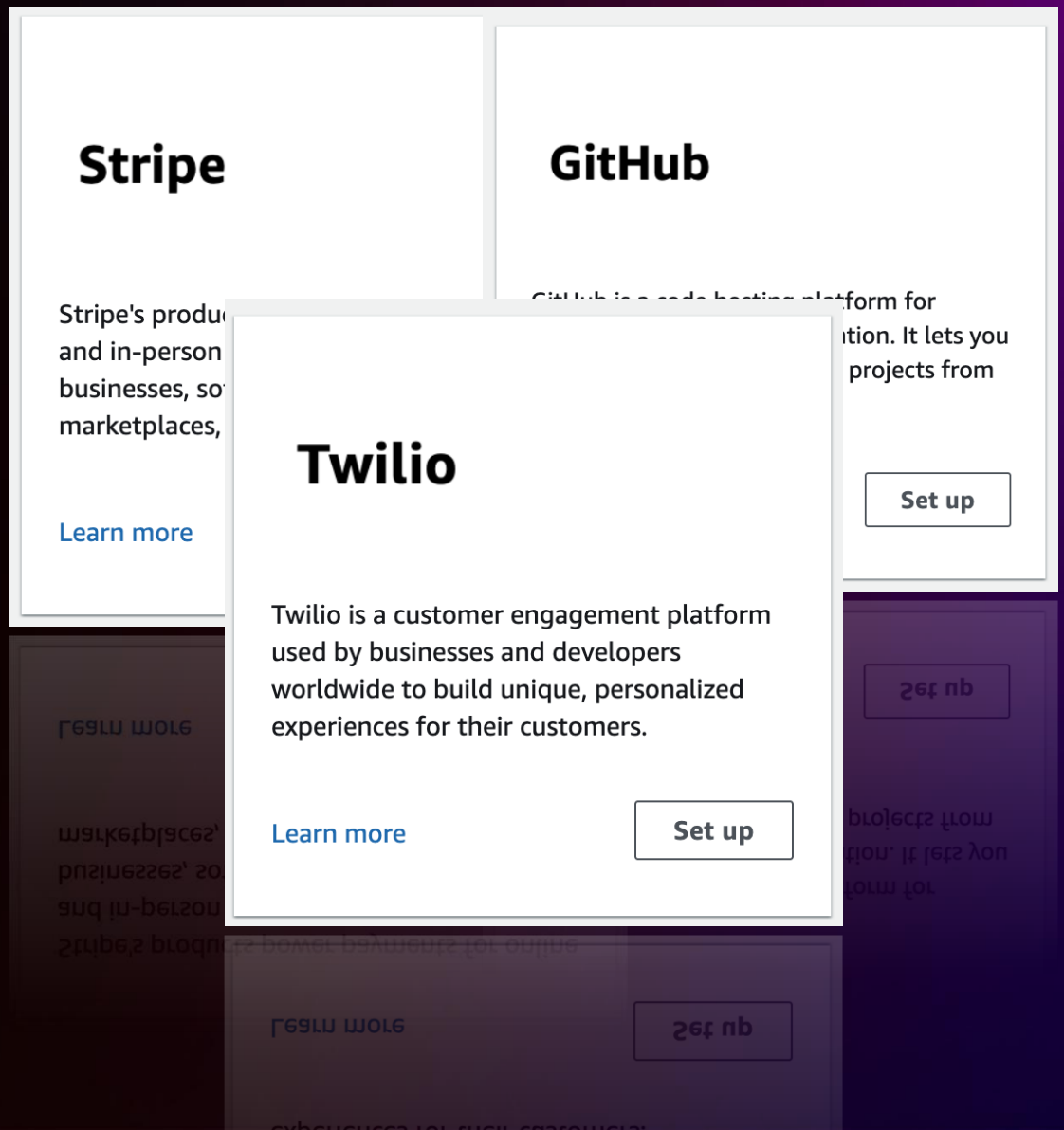
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EventBridge inbound webhooks with Lambda function URLs

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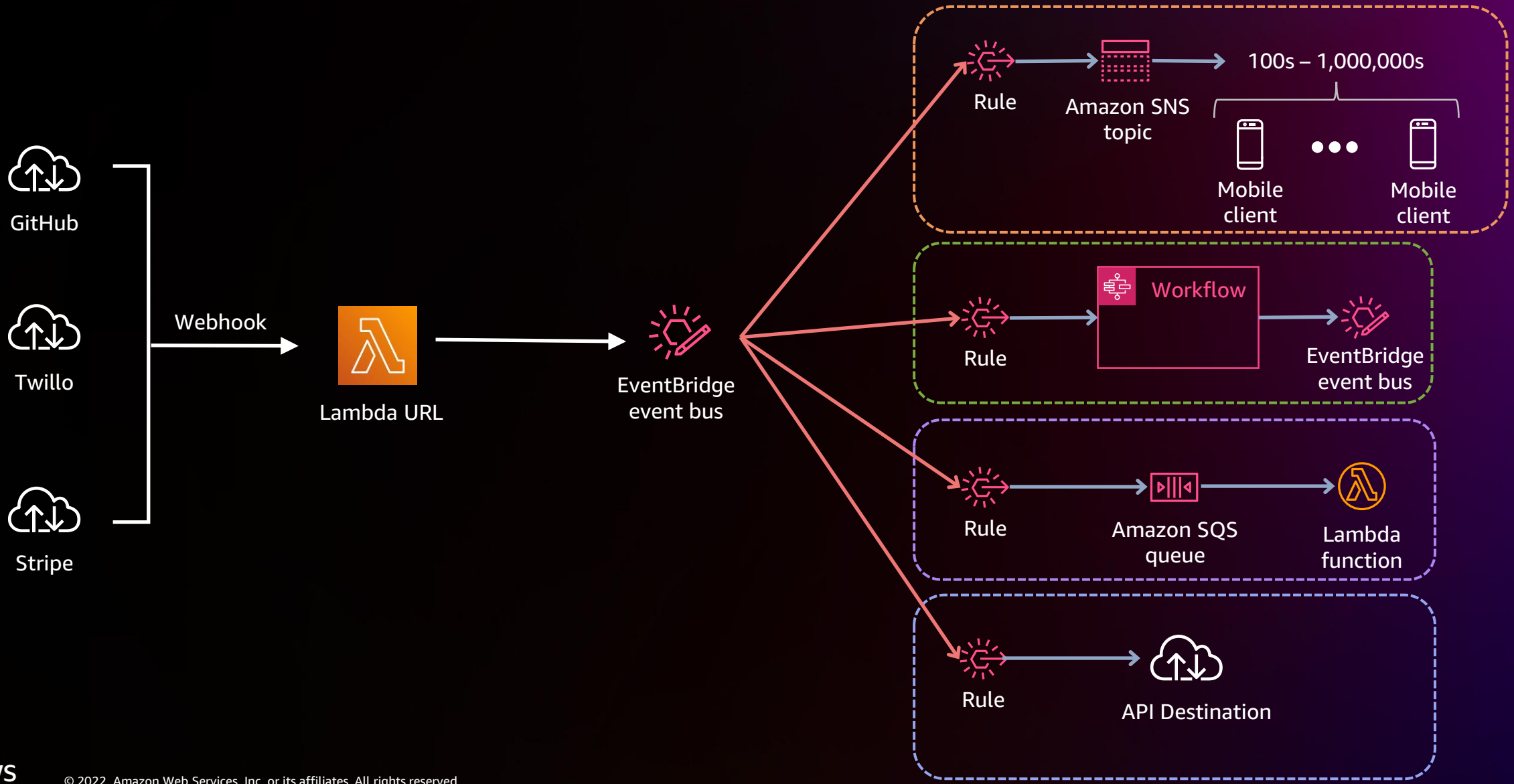
EventBridge inbound webhooks

- Save time integrating with GitHub, Stripe, and Twilio
- Forward events from GitHub, Twilio, and Stripe into EventBridge
- Provisions CloudFormation stack with Lambda function URL



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Inbound webhooks with EventBridge



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Salesforce integration with Amazon EventBridge

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“We spend too much time writing integration code.”

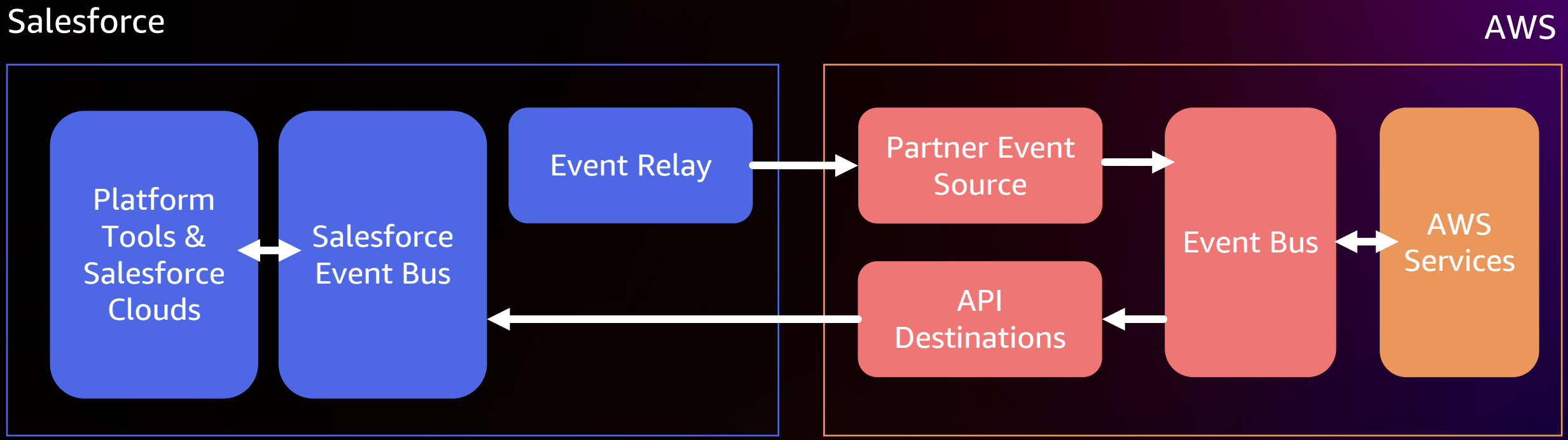
David Boyne

Just now

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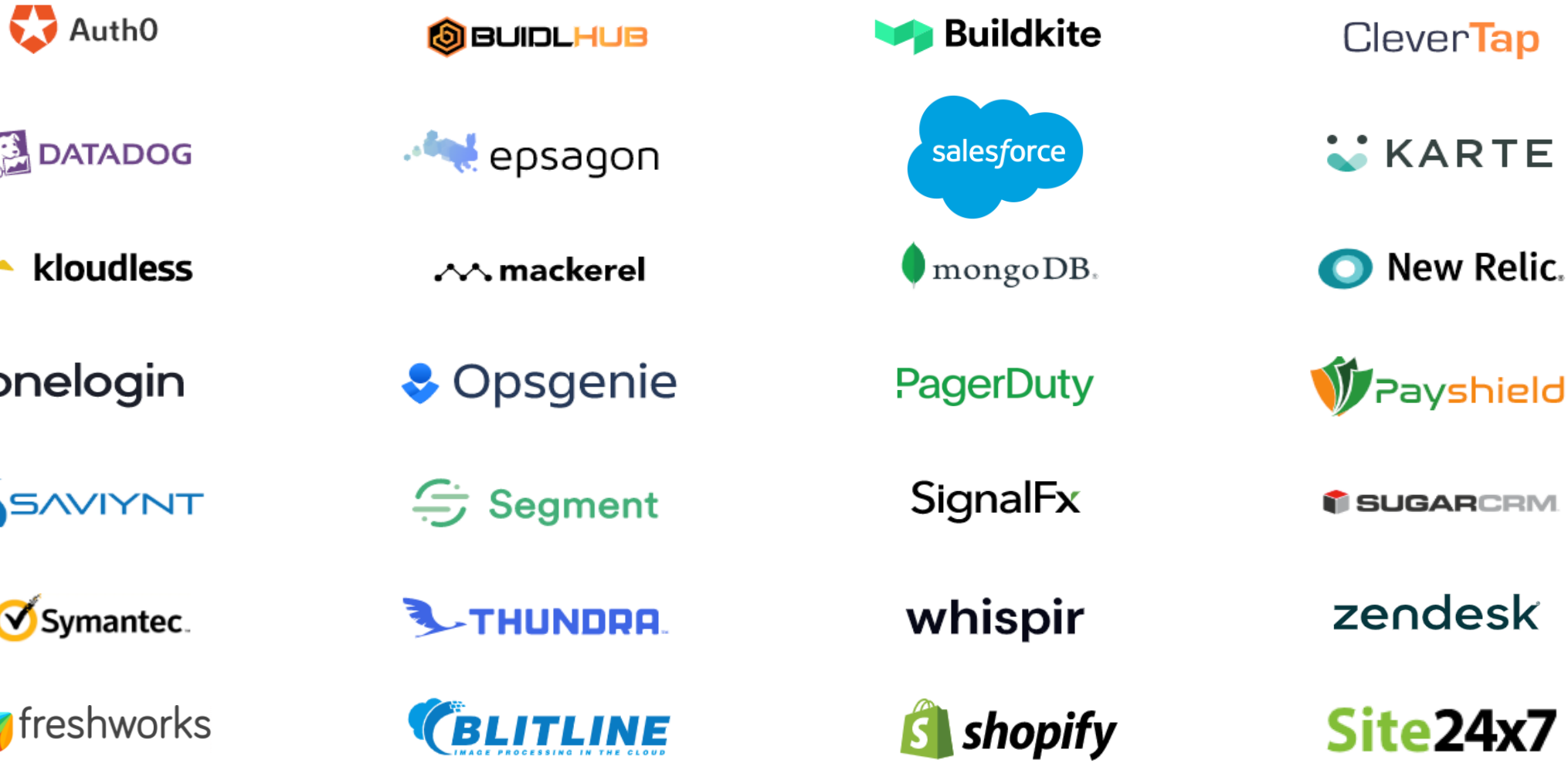
Salesforce integration with EventBridge

- Integrate Salesforce with AWS without any code
- Designed for event driven architecture and real-time applications



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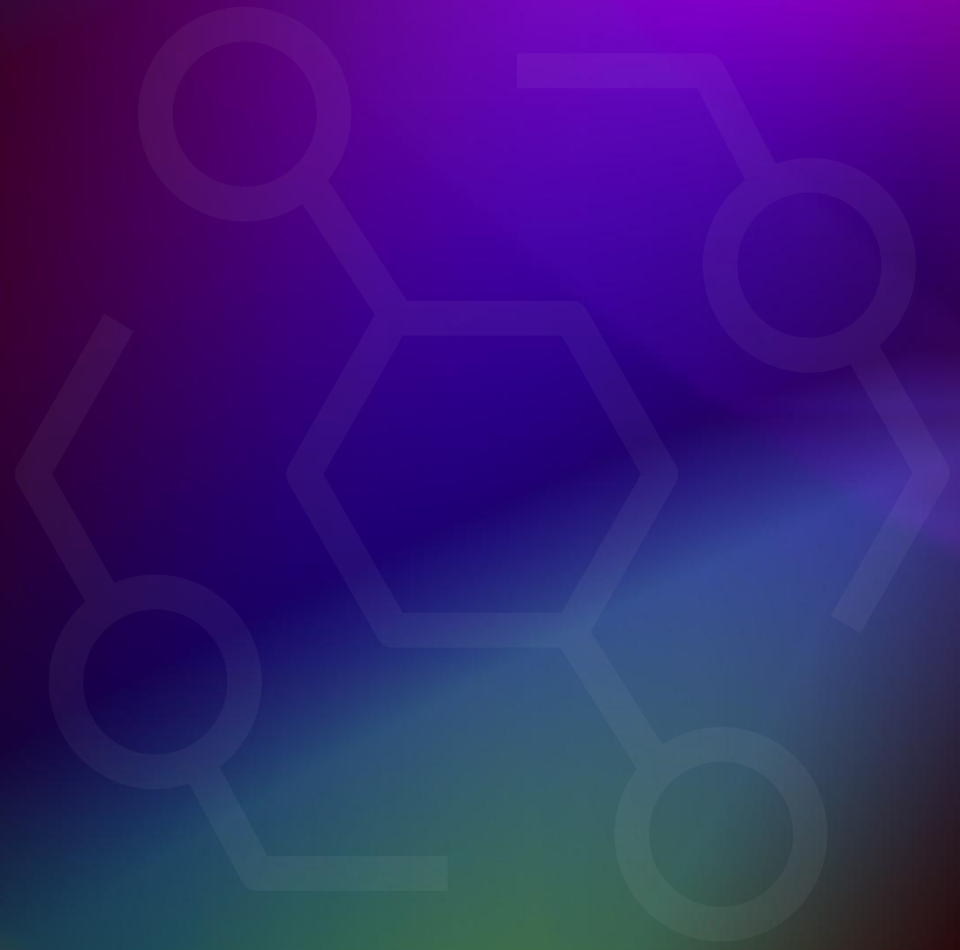
Over 42 Amazon EventBridge SaaS integrations



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EventBridge Pipes

Connecting one event-driven system to another



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EventBridge Pipes

Event Sources


Amazon Kinesis


Amazon MQ


DynamoDB


Amazon SQS


Amazon MSK

Event targets


AWS Lambda


Amazon SNS


Step Functions

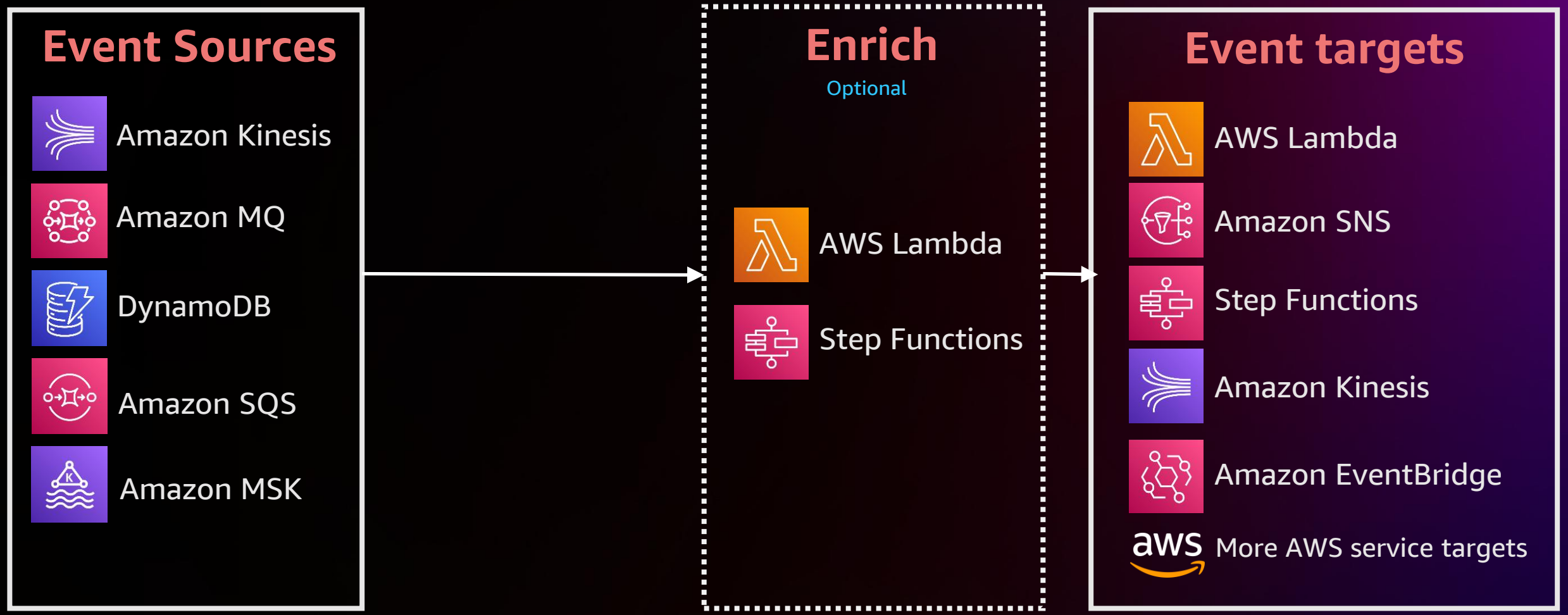

Amazon Kinesis


Amazon EventBridge


More AWS service targets

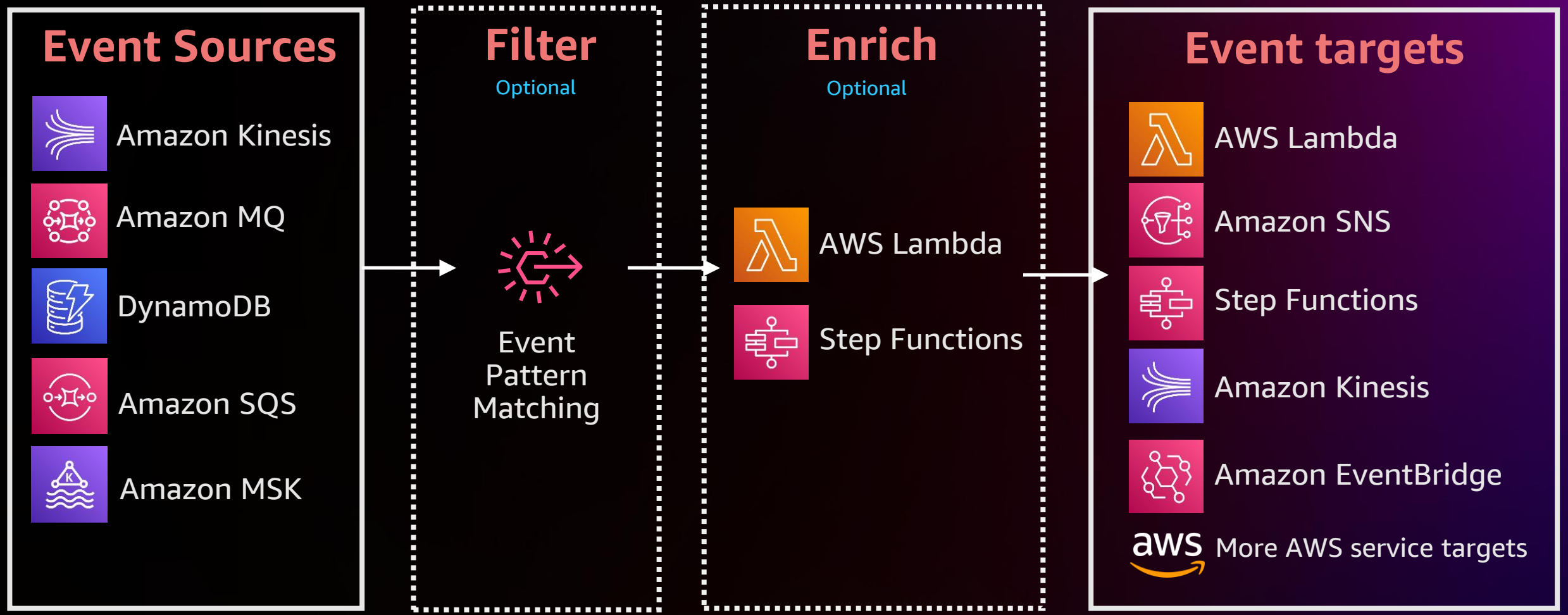
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EventBridge Pipes



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EventBridge Pipes



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EventBridge Pipes connects event-driven solutions together

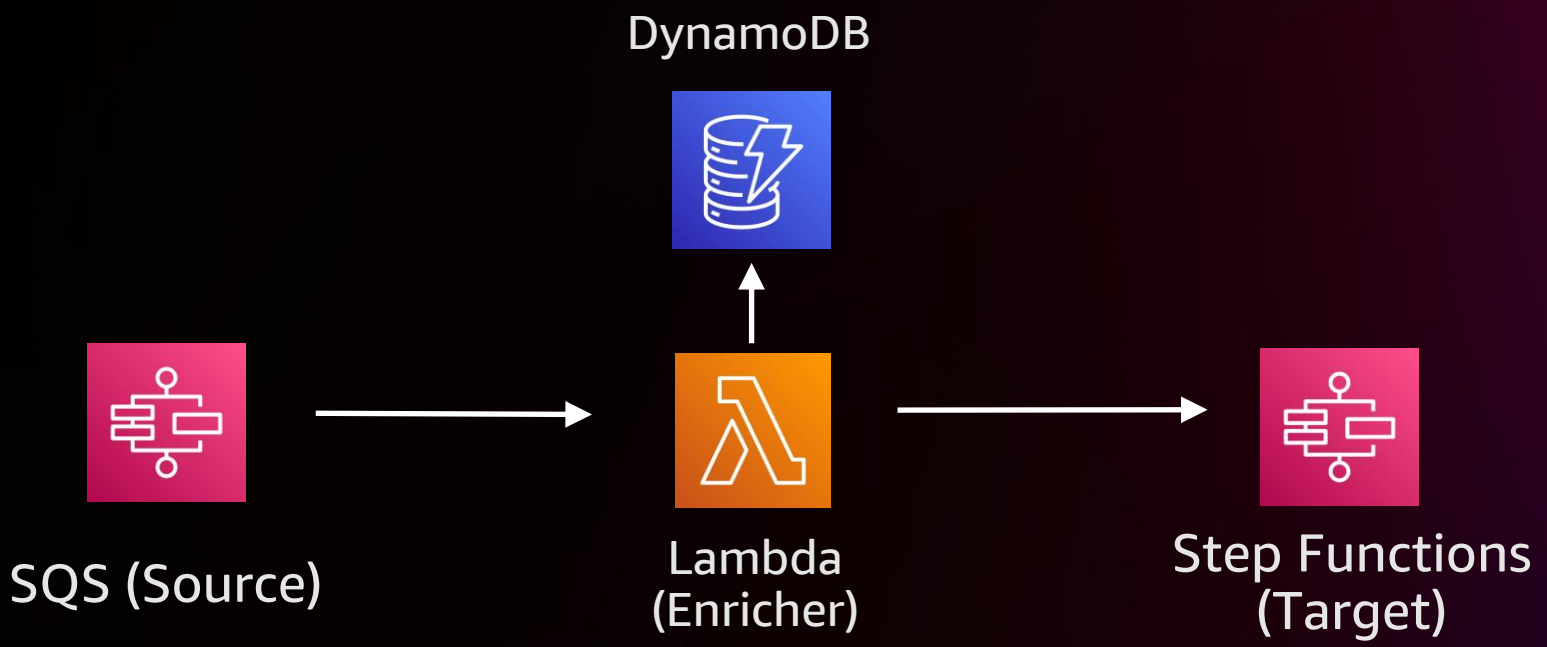
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Kinesis filter pattern



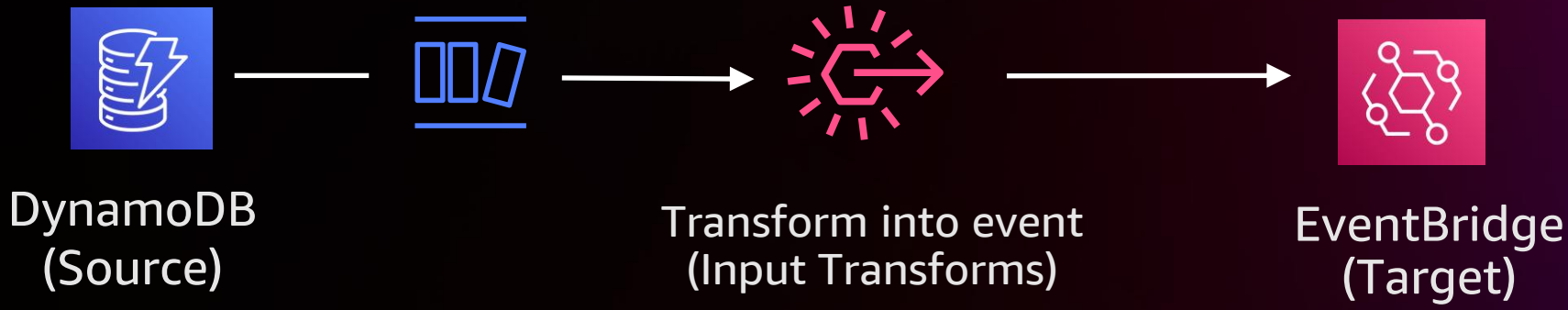
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Amazon SQS to Step Functions enrichment pattern



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Streams to events pattern



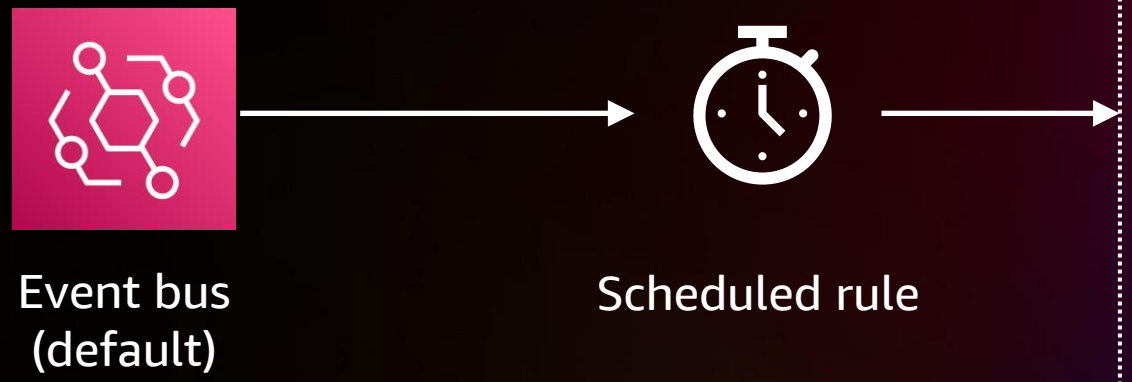
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Amazon EventBridge Scheduler

Create, execute, and manage scheduled tasks at scale

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Target 20+ AWS services and API destinations



AWS Lambda

AWS Step Functions

AWS CodePipeline

Amazon ECS

Amazon SNS

AWS CodeBuild

Amazon EC2

Amazon SQS

Amazon SageMaker

AWS Batch

Amazon API Gateway

API destinations

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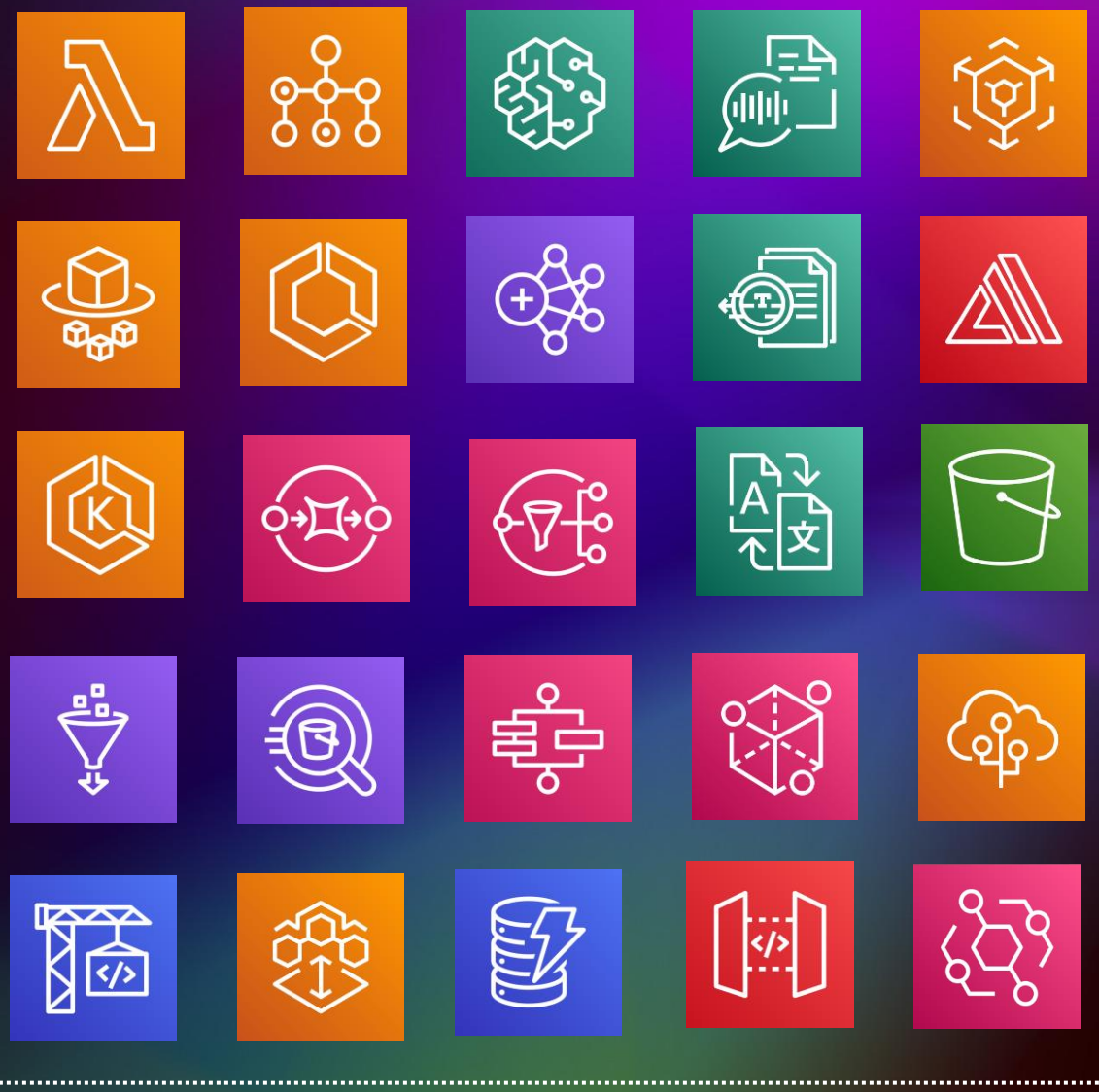
Time zone schedules

One time schedules

Millions of schedules



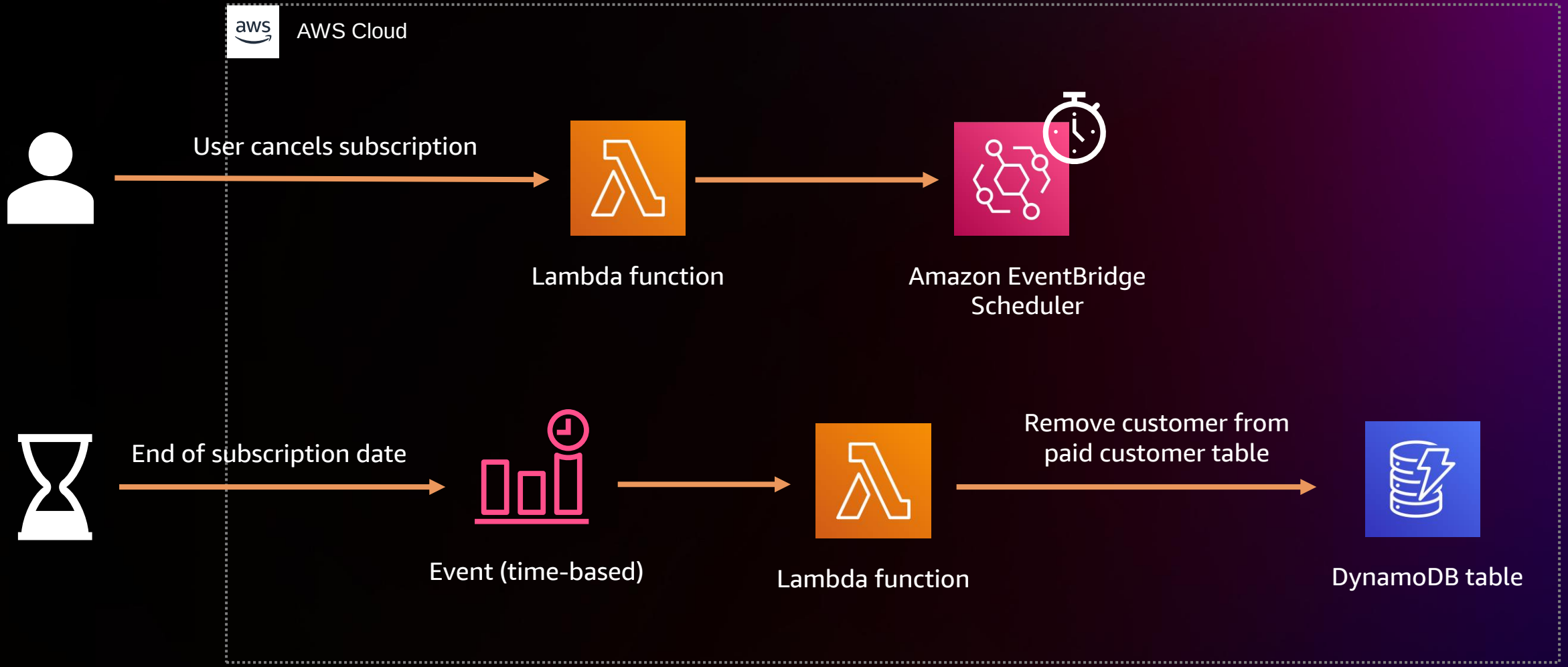
Target over 200 services and 6,000 APIs



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Amazon EventBridge Scheduler: Use case



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Amazon EventBridge Scheduler

HIGHLY SCALABLE SERVERLESS SCHEDULER

Feature	EventBridge Rules	EventBridge Scheduler
Fixed rate schedules	Yes	Yes
Cron-based schedules	Yes	Yes
One time schedules	No	Yes
Event bus support	Default bus only	No event bus used
Rule quota consumption	Yes, consumes from 300 rules per bus	No, does not consume rule quota. 1M schedules soft limit (per account)
Time zones	UTC Only	Time zone support, including daylight savings
Targets	20+ targets supported by EventBridge	Over 220 services and over 6,000 API actions with AWS SDK targets

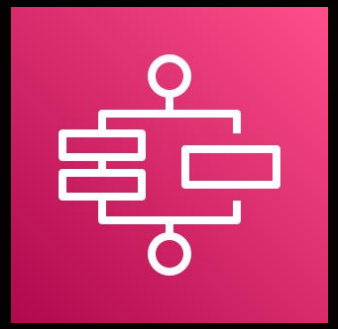
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Serverless services



AWS Lambda



AWS Step Functions



Amazon EventBridge



AWS Serverless Application Model

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Serverless Application Model

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AWS SAM has two parts

Transform templates

Shorthand syntax to express resources and event source mappings, it provides infrastructure as code (IaC) for serverless applications.

Command Line Interface (CLI)

Provides tooling for local development, debugging, build, packaging, and deployment for serverless applications



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Generally available

AWS SAM accelerate

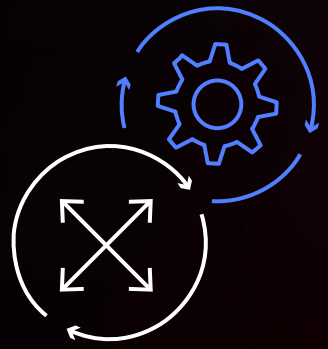
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AWS SAM accelerate



sam build

- Parallel builds
- Incremental builds
- Temporary layers



sam sync

- Update code without redeploying
- Watch for changed files

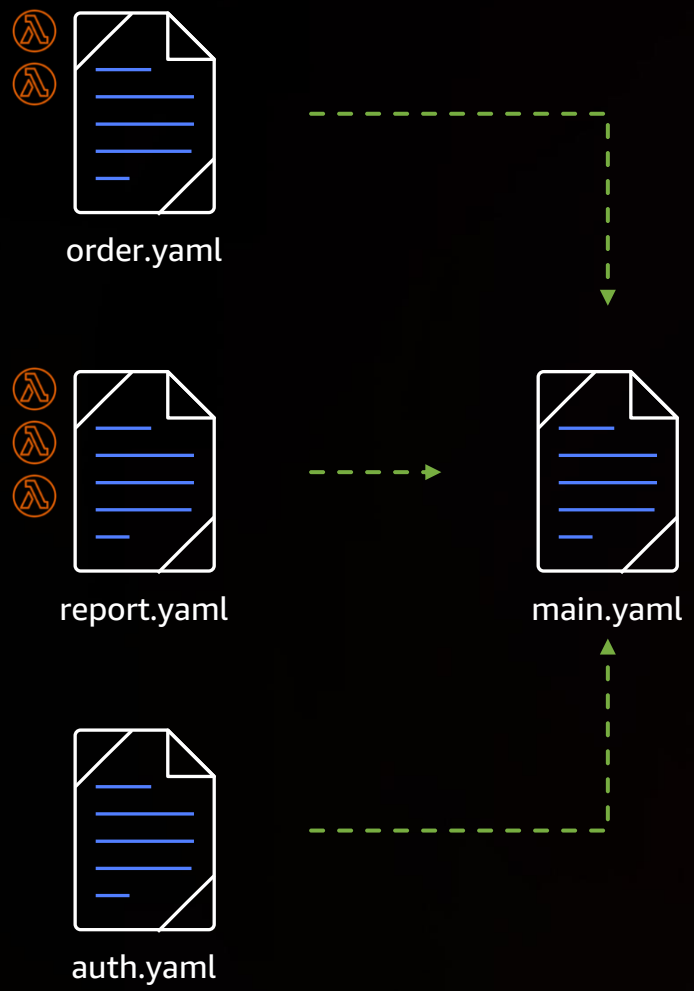


sam logs

- Get aggregated logs in your local terminal
- Filter logs
- Include traces

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Nested stack support for AWS SAM accelerate



- Use AWS SAM accelerate features with nested stacks
- Push code changes in a stack to an environment within seconds
- Use nested stacks to help manage application isolation and maintenance

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Serverless connectors

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Serverless connectors

Connectors allow the developer to describe how data and events flow between two resources and the level of permissions required



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Serverless connectors

Source 

```
HelloWorldFunction:
  Type: AWS::Serverless::Function
  Properties:
    CodeUri: hello-world/
    Handler: app.lambdaHandler
    Runtime: nodejs16.x
    Events:
      HelloWorld:
        Type: Api
        Properties:
          Path: /hello
          Method: get
```

Destination 

```
HelloWorldTable:
  Type: AWS::Serverless::SimpleTable
```

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Serverless connectors

Source 

```
HelloWorldFunction:
  Type: AWS::Serverless::Function
  Properties:
    CodeUri: hello-world/
    Handler: app.lambdaHandler
    Runtime: nodejs16.x
    Events:
      HelloWorld:
        Type: Api
        Properties:
          Path: /hello
          Method: get
```

Connector

```
MyTableConnector:
  Type: AWS::Serverless::Connector
  Properties:
    Source:
      Id: HelloWorldFunction
    Destination:
      Id: HelloWorldTable
    Permissions:
      - Write
      - Read
```

Destination 

```
HelloWorldTable:
  Type: AWS::Serverless::SimpleTable
```

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Serverless connectors

Read permissions

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Action": [
                "dynamodb:GetItem",
                "dynamodb:Query",
                "dynamodb:Scan",
                "dynamodb:BatchGetItem",
                "dynamodb:ConditionCheckItem",
                "dynamodb:PartiQLSelect"
            ],
            "Resource": [
                "arn:aws:dynamodb:us-west-2:088483494489:table/connectors-HelloWorldTable-NVNO16YXY86W",
                "arn:aws:dynamodb:us-west-2:088483494489:table/connectors-HelloWorldTable-NVNO16YXY86W/index/*"
            ],
            "Effect": "Allow”
. . .
```

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Serverless connectors

Write permissions

```
. . .
        {
            "Action": [
                "dynamodb:PutItem",
                "dynamodb:UpdateItem",
                "dynamodb:DeleteItem",
                "dynamodb:BatchWriteItem",
                "dynamodb:PartiQLDelete",
                "dynamodb:PartiQLInsert",
                "dynamodb:PartiQLUpdate"
            ],
            "Resource": [
                "arn:aws:dynamodb:us-west-2:088483494489:table/connectors-HelloWorldTable-NVNO16YXY86W",
                "arn:aws:dynamodb:us-west-2:088483494489:table/connectors-HelloWorldTable-NVNO16YXY86W/index/*"
            ],
            "Effect": "Allow"
        }
    ]
}
```

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40+ supported sources and destinations

SERVERLESS CONNECTORS

Source type	Destination type	Permissions
AWS::Lambda::Function	AWS::Serverless::SimpleTable	Read, Write
AWS::ApiGatewayV2::Api	AWS::Serverless::Function	Write
AWS::S3::Bucket	AWS::Serverless::Function	Write
AWS::Serverless::StateMachine	AWS::DynamoDB::Table	Read, Write
AWS::SNS::Topic	AWS::SQS::Queue	Write
AWS::Serverless::Api	AWSS::Lambda::Function	Write

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Use managed policies when possible

AWS SAM connectors

```
MyTableConnector:
  Type: AWS::Serverless::Connector
  Properties:
    Source:
      Id: HelloWorldFunction
    Destination:
      Id: HelloWorldTable
    Permissions:
      - Write
      - Read
```

AWS SAM policy templates

Policy template table

The following is a table of the available policy templates.

Policy Template	Description
AcmGetCertificatePolicy	Gives a permission to read a certificate from AWS Certificate Manager.
AMIDescribePolicy	Gives permission to describe Amazon Machine Images (AMIs).
AthenaQueryPolicy	Gives permissions to execute Athena queries.
AWSSecretsManagerGetSecretValuePolicy	Gives permission to get the secret value for the specified AWS Secrets Manager secret.
AWSSecretsManagerRotationPolicy	Gives permission to rotate a secret in AWS Secrets Manager.
CloudFormationDescribeStacksPolicy	Gives permission to describe AWS CloudFormation stacks.
CloudWatchDashboardPolicy	Gives permissions to put metrics to operate on CloudWatch dashboards.
CloudWatchDescribeAlarmHistoryPolicy	Gives permission to describe CloudWatch alarm history.
CloudWatchPutMetricPolicy	Gives permission to send metrics to CloudWatch.
CodeCommitCrudPolicy	Gives permissions to create/read/update/delete objects within a specific CodeCommit repository.
CodeCommitReadPolicy	Gives permissions to read objects within a specific CodeCommit repository.
CodePipelineLambdaExecutionPolicy	Gives permission for a Lambda function invoked by CodePipeline to report the status of the job.
CodePipelineReadOnlyPolicy	Gives read permission to get details about a CodePipeline pipeline.

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esbuild support with AWS SAM



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AWS SAM with esbuild

USING ESBUILD BUNDLER WITH LAMBDA

```yaml
Resources:
  HelloWorldFunction:
    Type: AWS::Serverless::Function
    Properties:
      CodeUri: hello-world/
      Handler: app.handler
      Runtime: nodejs14.x
      Architectures:
        - x86_64
      Events:
        HelloWorld:
          Type: Api
          Properties:
            Path: /hello
            Method: get
      Environment:
        Variables:
          NODE_OPTIONS: --enable-source-maps
  Metadata:
    BuildMethod: esbuild
    BuildProperties:
      Minify: false
      Target: "es2020"
      Sourcemap: true
      EntryPoints:
        - app.ts
```

Setup esbuild

- Build and package AWS Lambda functions with esbuild
- Supports Lambda functions written in TypeScript
- Reduce package size with tree shaking and minification
- Target different ECMAScript versions (default es2020)

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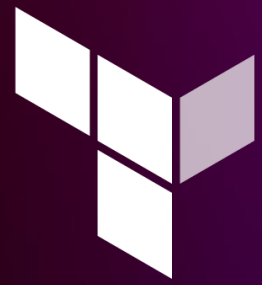
AWS SAM local support for HashiCorp Terraform

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AWS SAM local support for HashiCorp Terraform

New preview

```
resource "aws_lambda_function" "test_lambda" {
  filename = "lambda_function_payload.zip”
  function_name = "lambda_function_name”
  role = aws_iam_role.iam_for_lambda.arn
  handler = "index.test”
  source_code_hash = filebase64sha256("payload.zip")
  runtime = "nodejs16.x”
  environment {
    variables = { foo = "bar" }
  }
}
```



HashiCorp Terraform

Commands
sam local invoke
sam local start-lambda

aws

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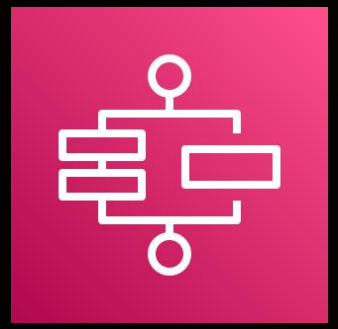
Summary

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What we covered



AWS Lambda



AWS Step Functions



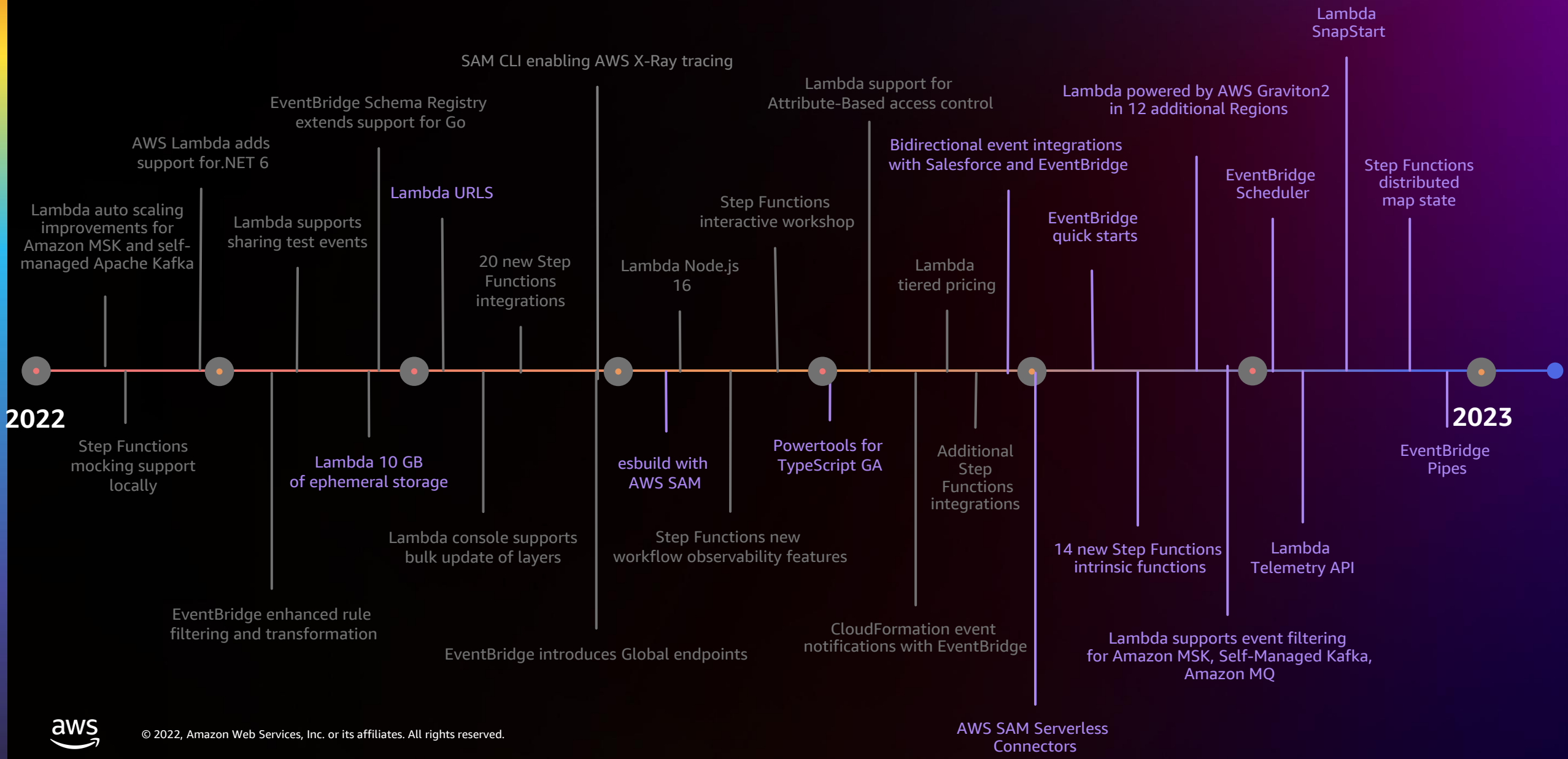
Amazon EventBridge



AWS Serverless Application Model

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What's new in Serverless 2022



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Exploring serverless

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serverlesspresso

An event driven coffee ordering app
built with serverless architecture

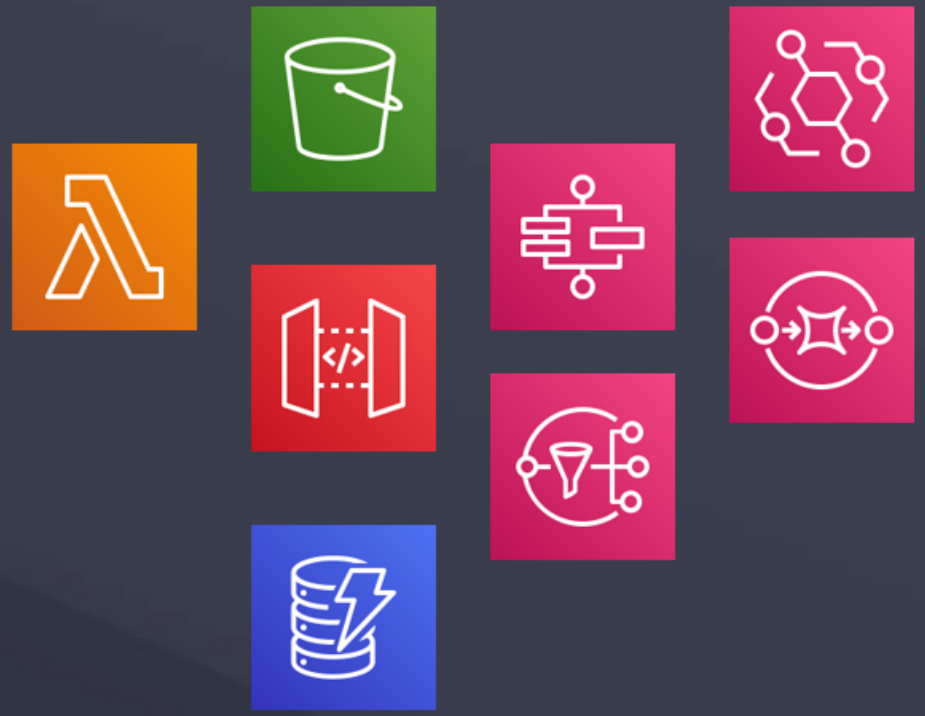
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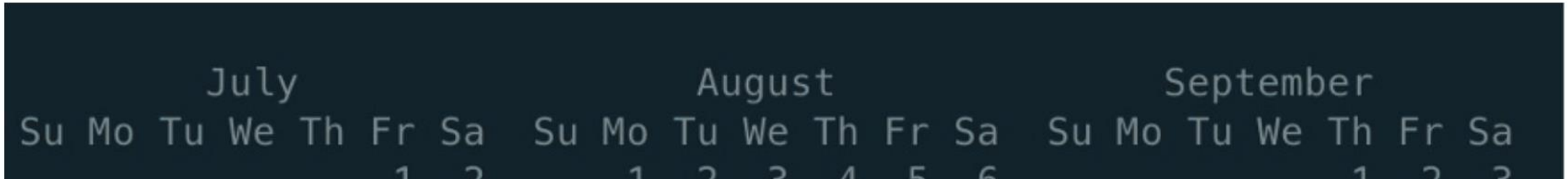
Blog Home Category Edition

AWS Compute Blog

ICYMI: Serverless Q3 2022

by David Boyne | on 03 OCT 2022 | in Amazon DynamoDB, Amazon EventBridge, Amazon Simple Notification Service (SNS), AWS Step Functions, Serverless | Permalink | Comments | Share

Welcome to the 19th edition of the AWS Serverless ICYMI (in case you missed it) quarterly recap. Every quarter, we share all the most recent product launches, feature enhancements, blog posts, webinars, Twitch live streams, and other interesting things that you might have missed!



Serverless office hours

Serverless Office Hours ▶ Play all

Join the AWS Serverless Developer Advocate team for a weekly live office hours to learn about building serverless applications. We cover a separate topic each week including what's new with...



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Alex de Brie: DynamoDB Misconceptions | Serverles...

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Serverless Apache Cassandra with Amazon...

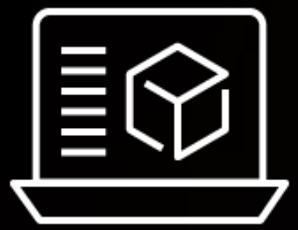
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What’s new in Serverless resources



https://s12d.com/svs204-22

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Thank you!

David Boyne
@boyney123



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