



# INNOVATE

ONLINE CONFERENCE

分会场三：计算

# 使用 AWS Step Functions 和 AWS Lambda 进行无服务器化服务编排

冯嘉升，AWS 解决方案架构师

# 日程

- Serverless 函数编排
- 深入浅出 AWS Step Functions
- 案例剖析
- Demo

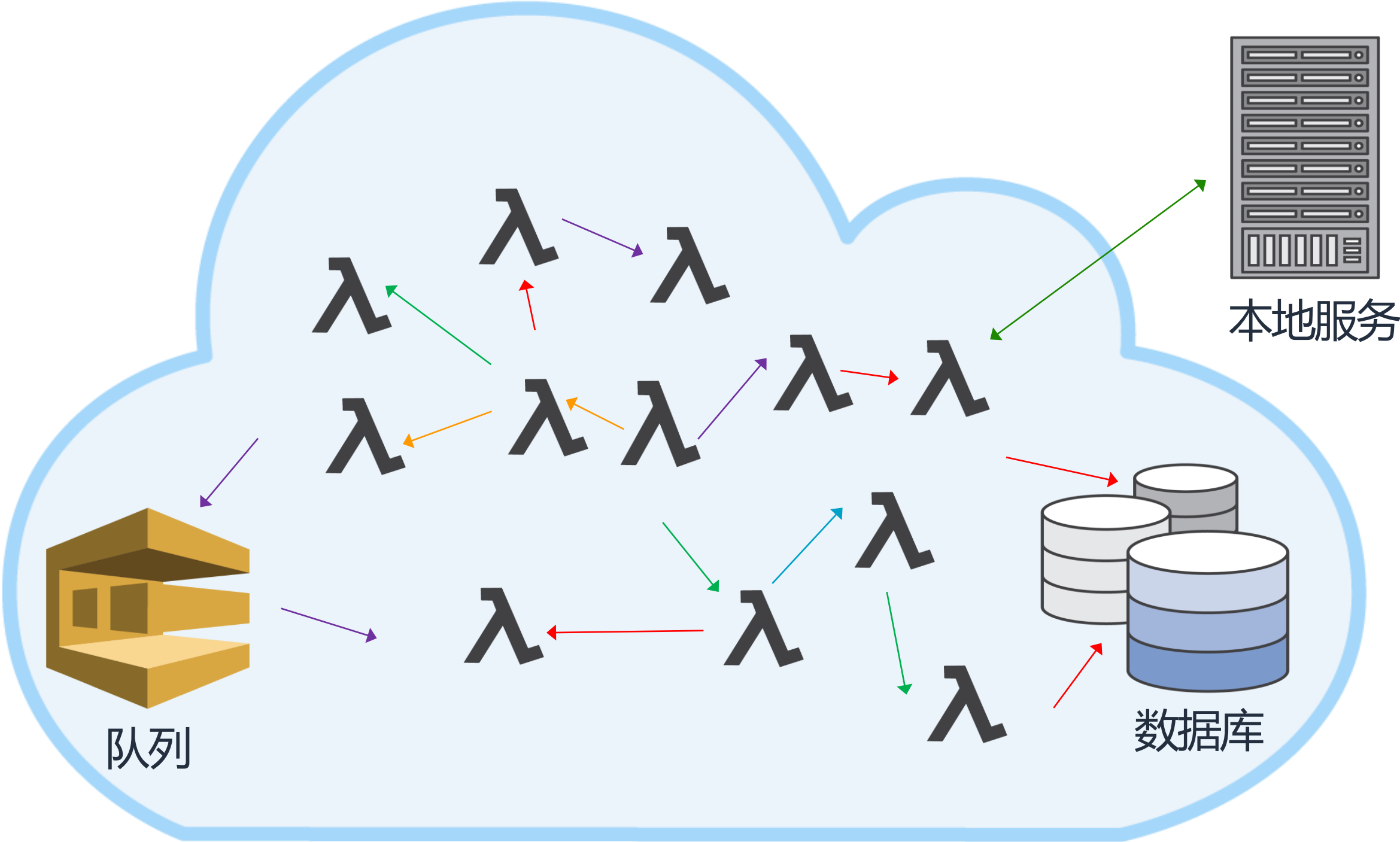
# Serverless 函数编排

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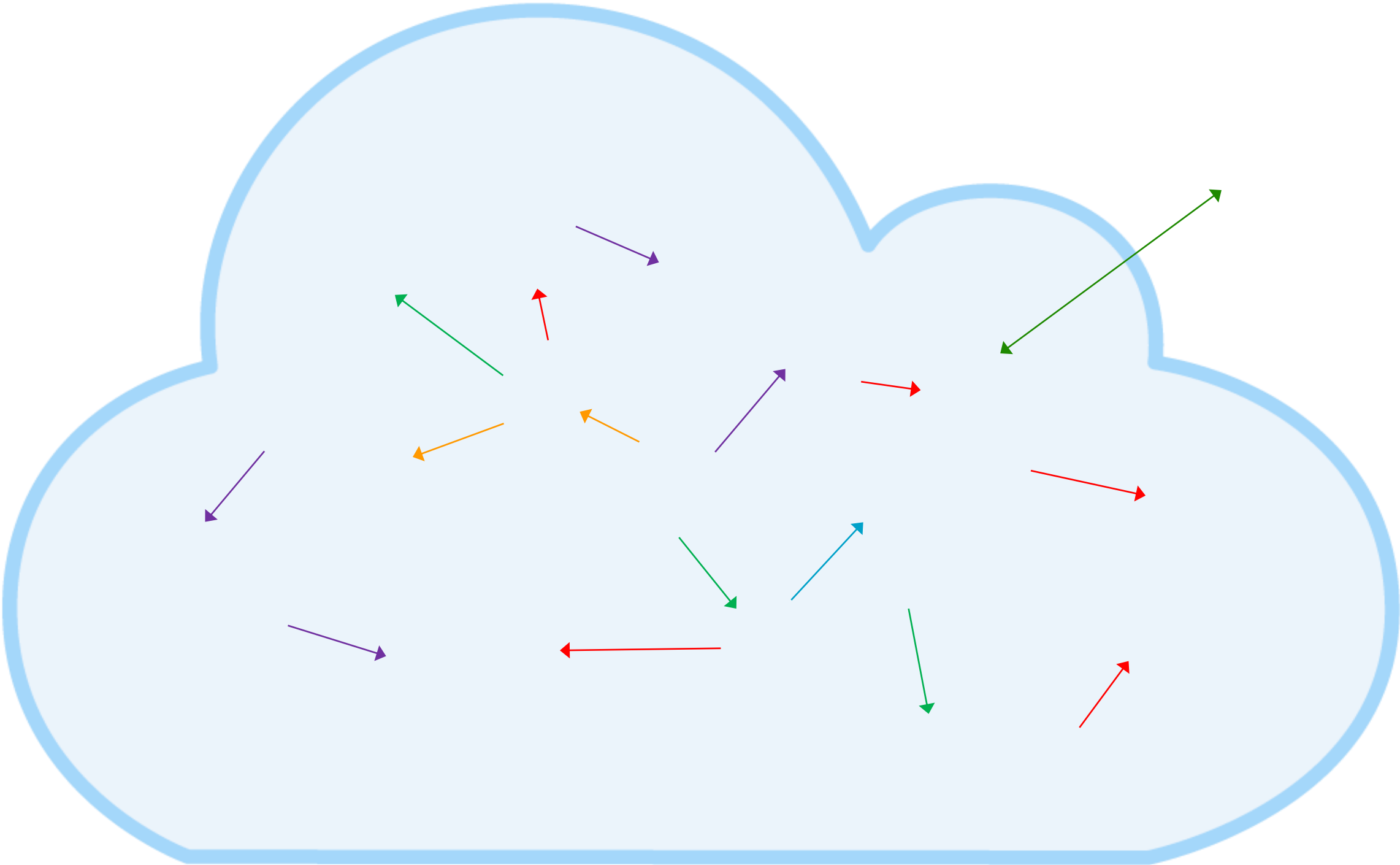
AWS 中国（宁夏）区域由西云数据运营  
AWS 中国（北京）区域由光环新网运营



# 现代应用架构



# 现代应用架构

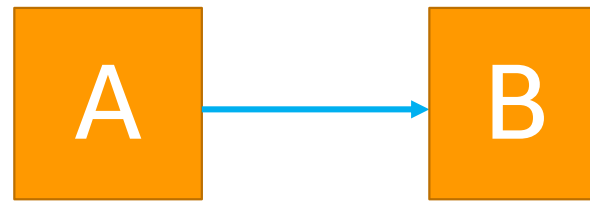


# 函数编排需求

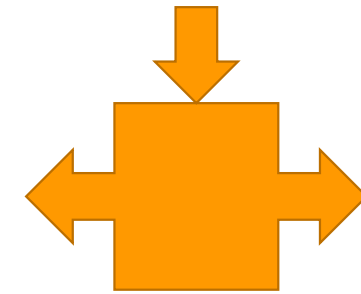
“我想要重试某些函数”



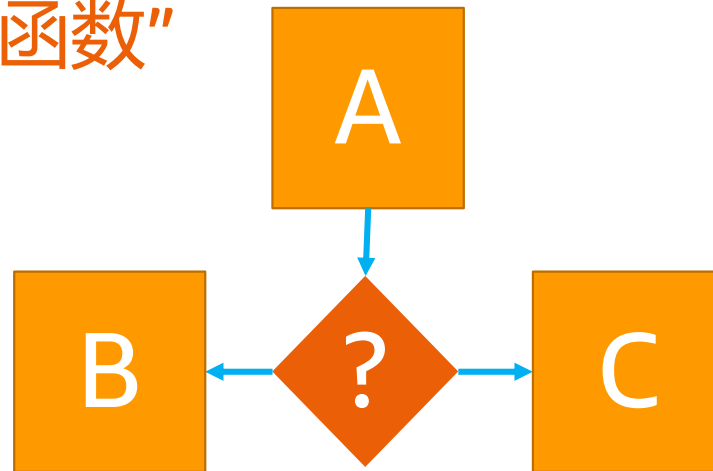
“我想要顺序地执行函数”



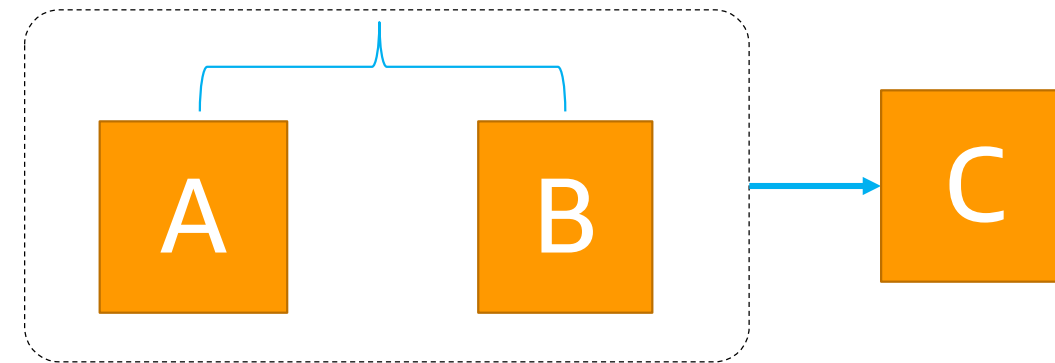
“我想要 try/catch/finally 逻辑”



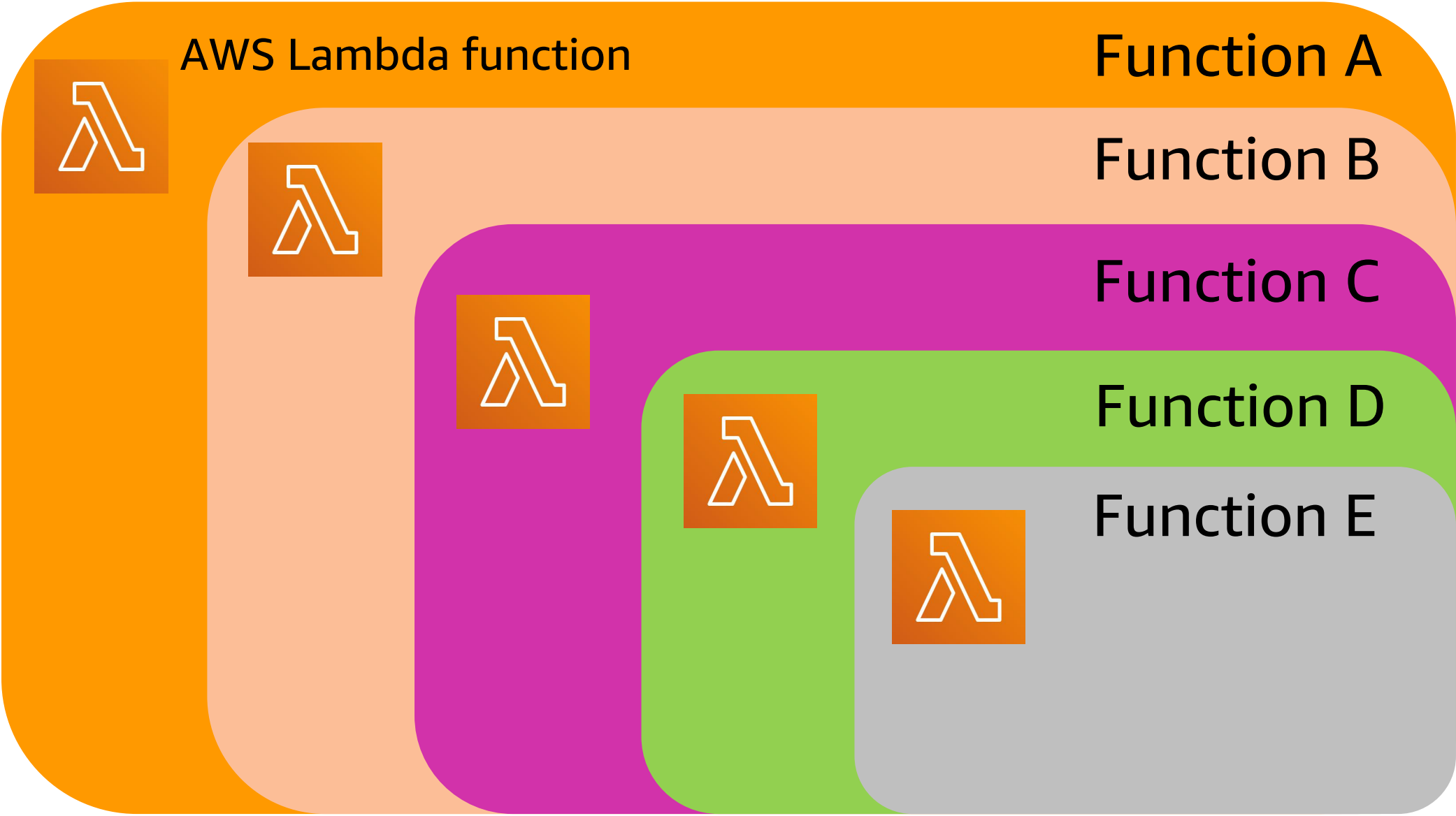
“我想要根据数据选择执行函数”



“我想要并行地运行这些函数”

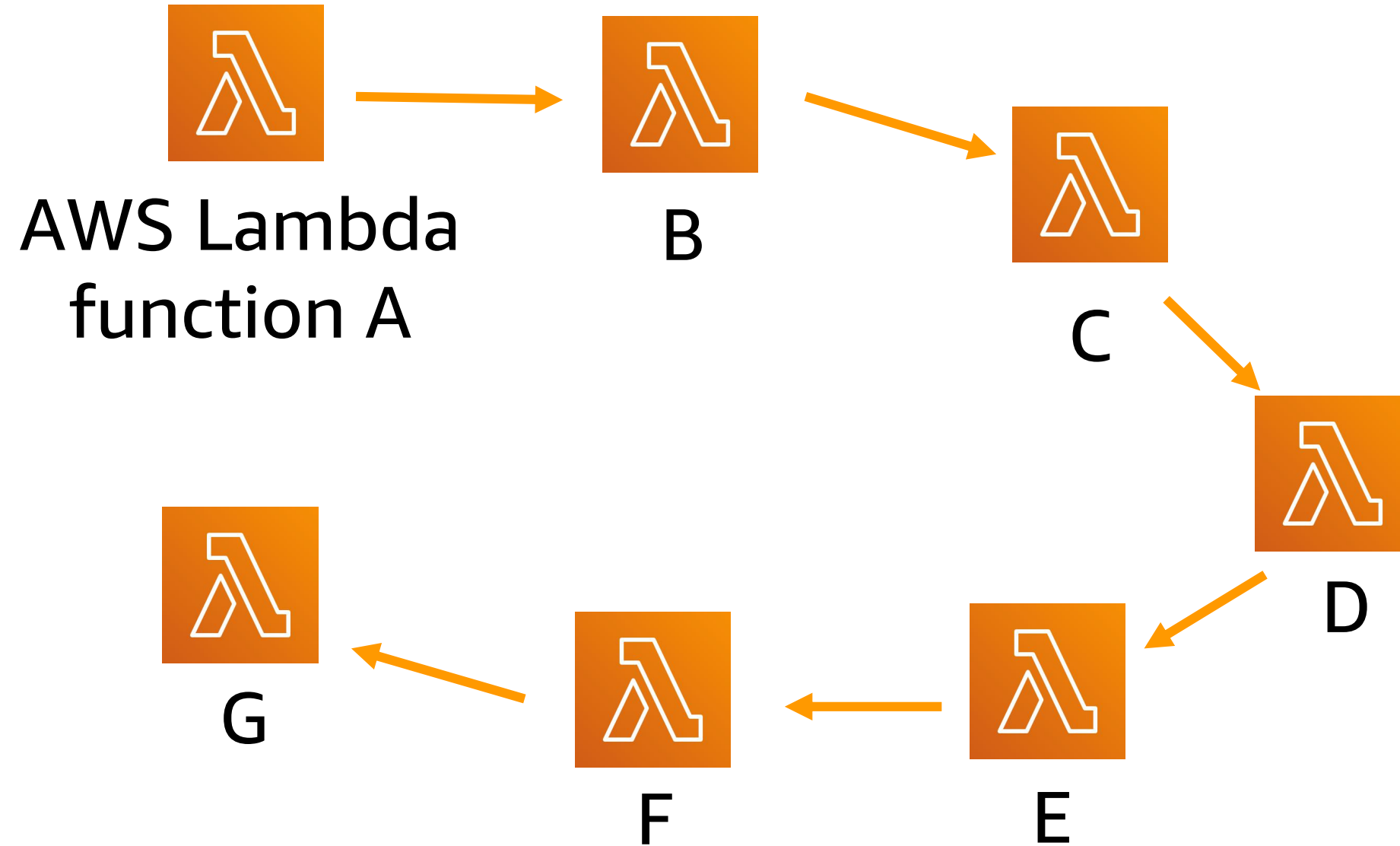


# 传统函数编排——通过方法调用协调

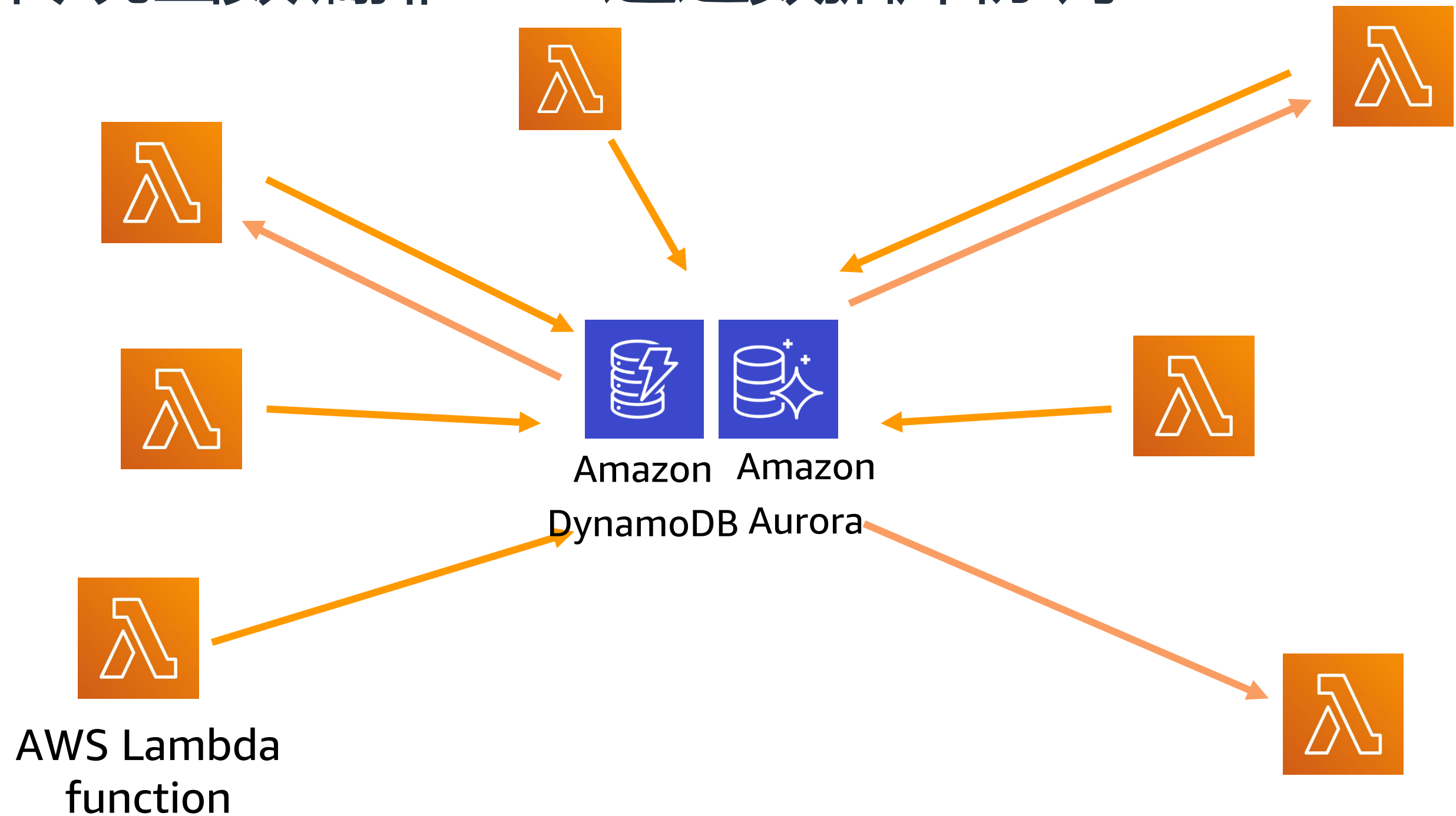




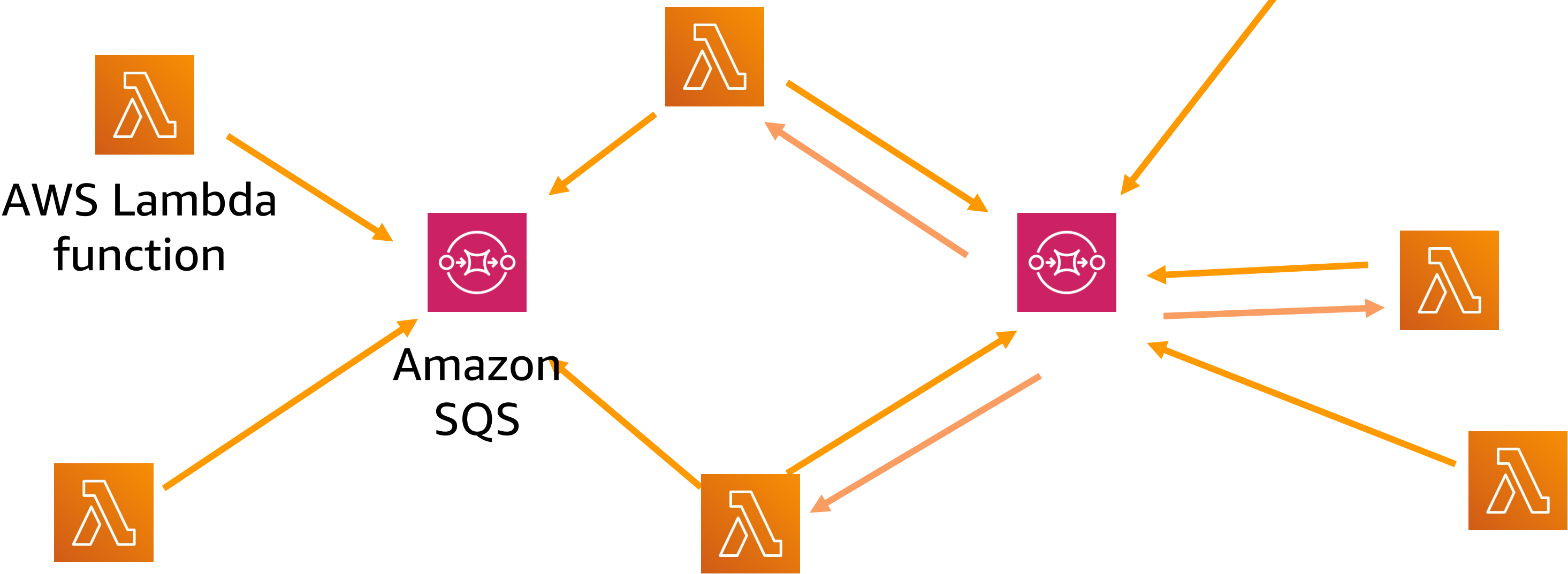
# 传统函数编排——通过方法链协调



# 传统函数编排——通过数据库协调



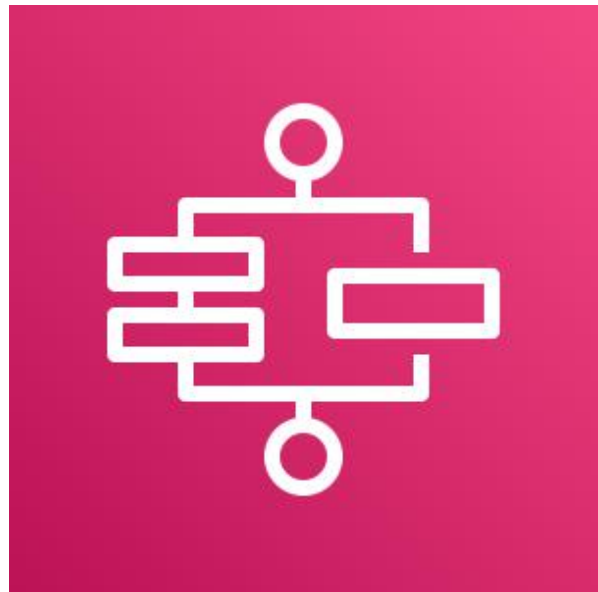
# 传统函数编排——通过队列协调





# Our Wish List

# AWS Step Functions



- AWS Step Functions 允许您构建可快速将业务需求转换为技术需求的可视化工作流。当需求变化时，您可以交换或重新组织组件而无需自定义任何代码。
- 使用 AWS Step Functions 将多个 AWS Lambda 函数组合到应用程序和微服务中，而不必为工作流逻辑、并行进程、错误处理、超时或重试编写代码。您还可以编排在 Amazon EC2 实例、容器或本地服务器上运行的数据和服务。

# 深入浅出 AWS Step Functions

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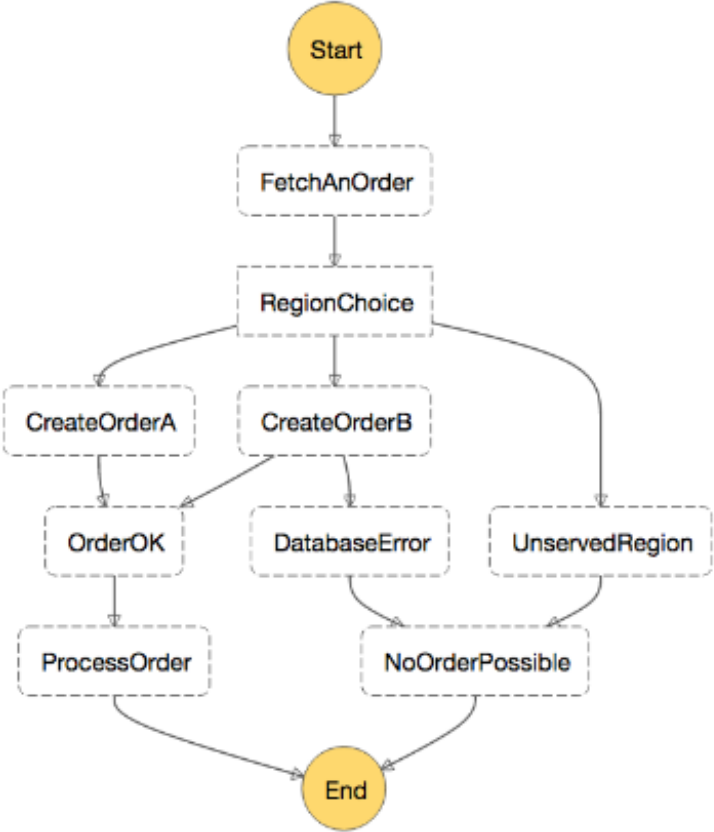
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# AWS Step Functions 构成——三部曲

设计 workflow

通过 Amazon Software License (ASL) 定义 workflow

监控执行



```
Code
1 {
2   "Comment": "An AWL example using a choice state.",
3   "StartAt": "FirstState",
4   "States": {
5     "FirstState": {
6       "Type": "Task",
7       "Resource": "arn:aws:lambda:REGION:ACCOUNT_ID:function:FUNCTION_NAME",
8       "Next": "ChoiceState"
9     },
10    "ChoiceState": {
11      "Type": "Choice",
12      "Choices": [
13        {
14          "Variable": "$?.Success",
15          "Next": "ProcessOrder"
16        },
17        {
18          "Variable": "$?.Failed",
19          "Next": "DatabaseError"
20        },
21        {
22          "Variable": "$?.NeedsRetry",
23          "Next": "UnservedRegion"
24        }
25      ]
26    }
27  }
28 }
```

Dashboard > Order > New\_Order

Execution Arn: arn:aws:states:eu-central-1:482419509455:execution:OrderNew\_Order

### New\_Order ✓

Graph Code

Success Failed Needs retry In progress

Execution Details

Info Input Output

Execution Status: **Succeeded**

State Machine Arn: arn:aws:states:eu-central-1:482419509455:stateMachine:OrderNew\_Order

Execution ID: arn:aws:states:eu-central-1:482419509455:execution:OrderNew\_Order

Started: Nov 20, 2016 8:55:28 AM

Closed: Nov 20, 2016 8:55:32 AM

Step Details

ID	Type	Timestamp
1	ExecutionStarted	Nov 20, 2016 8:55:28 AM
2	TaskStateEntered	Nov 20, 2016 8:55:28 AM
3	LambdaFunctionScheduled	Nov 20, 2016 8:55:28 AM

# AWS Step Functions 构成——状态机

Task	在状态机中执行一些特定的工作
Choice	在执行分支之间进行选择
Parallel	并行地执行分支
Wait	提供一定时间的延迟，直至指定的时间或日期
Fail	停止执行，返回失败
Succeed	停止执行，返回成功
Pass	直接将输入传递到输出，或者设定一些固定值



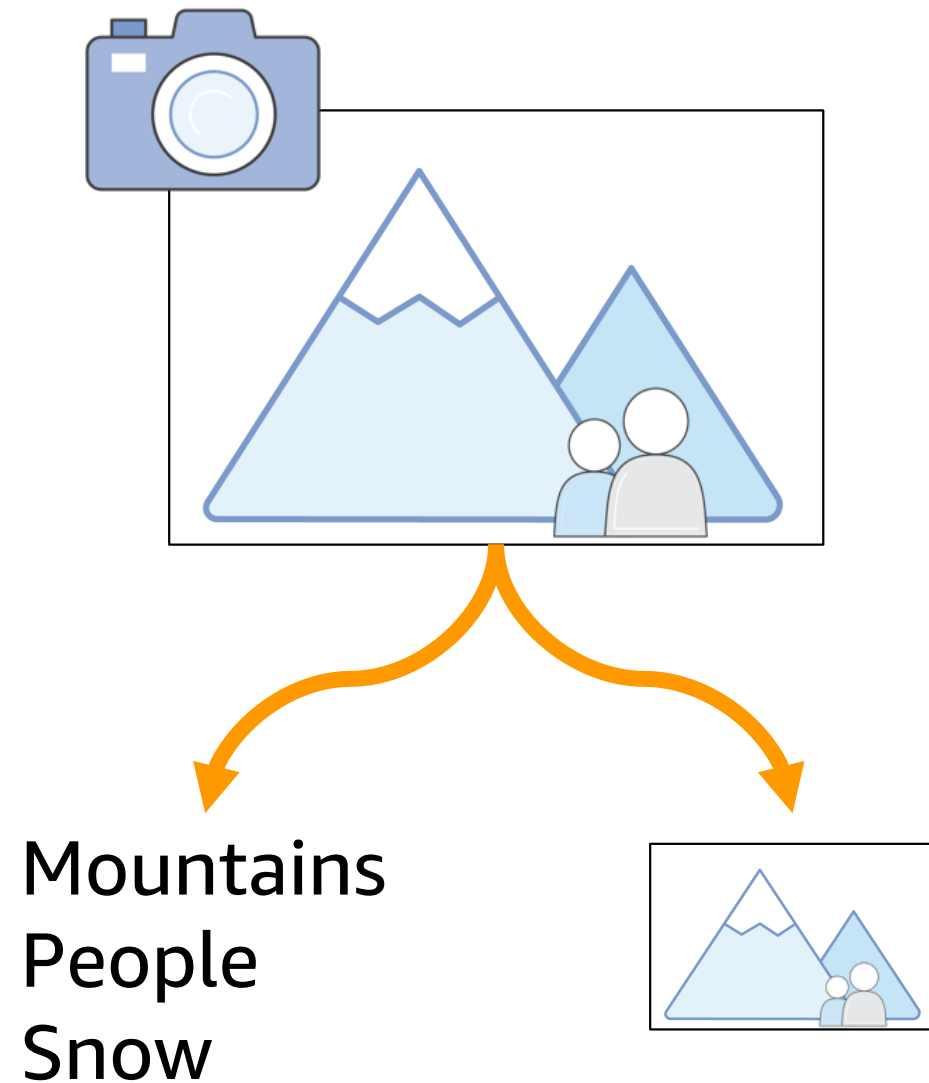
# AWS Step Functions 构成——Amazon State Language



## AWS Step Functions workflow

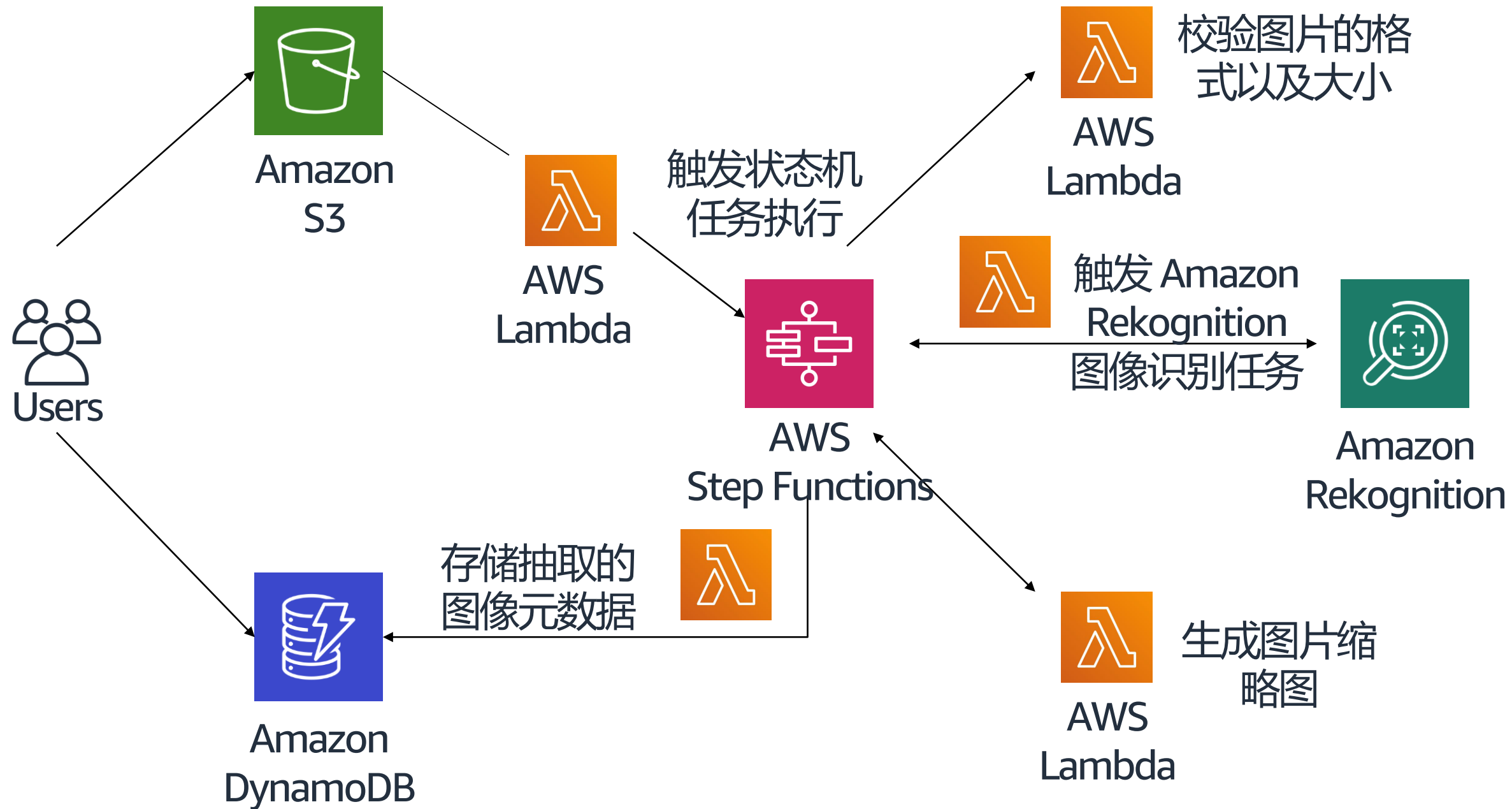
```
{  
  "Comment": "Image Processing workflow",  
  "StartAt": "ExtractImageMetadata",  
  "States": {  
    "ExtractImageMetadata": {  
      "Type": "Task",  
      "Resource": "arn:aws:lambda::function:photo-ExtractImageMetadata-...",  
      "Next": "ImageTypeCheck",  
      "Catch": [ {  
        "ErrorEquals": [ "ImageIdentifyError"],  
        "Next": "NotSupportedImageType"  
      } ],  
      "Retry": [ {  
        "ErrorEquals": [ "States.ALL"],  
        "IntervalSeconds": 1,  
        "MaxAttempts": 2}, ...  
      ]  
    }  
  }  
}
```

# AWS Step Functions 案例开发三部曲

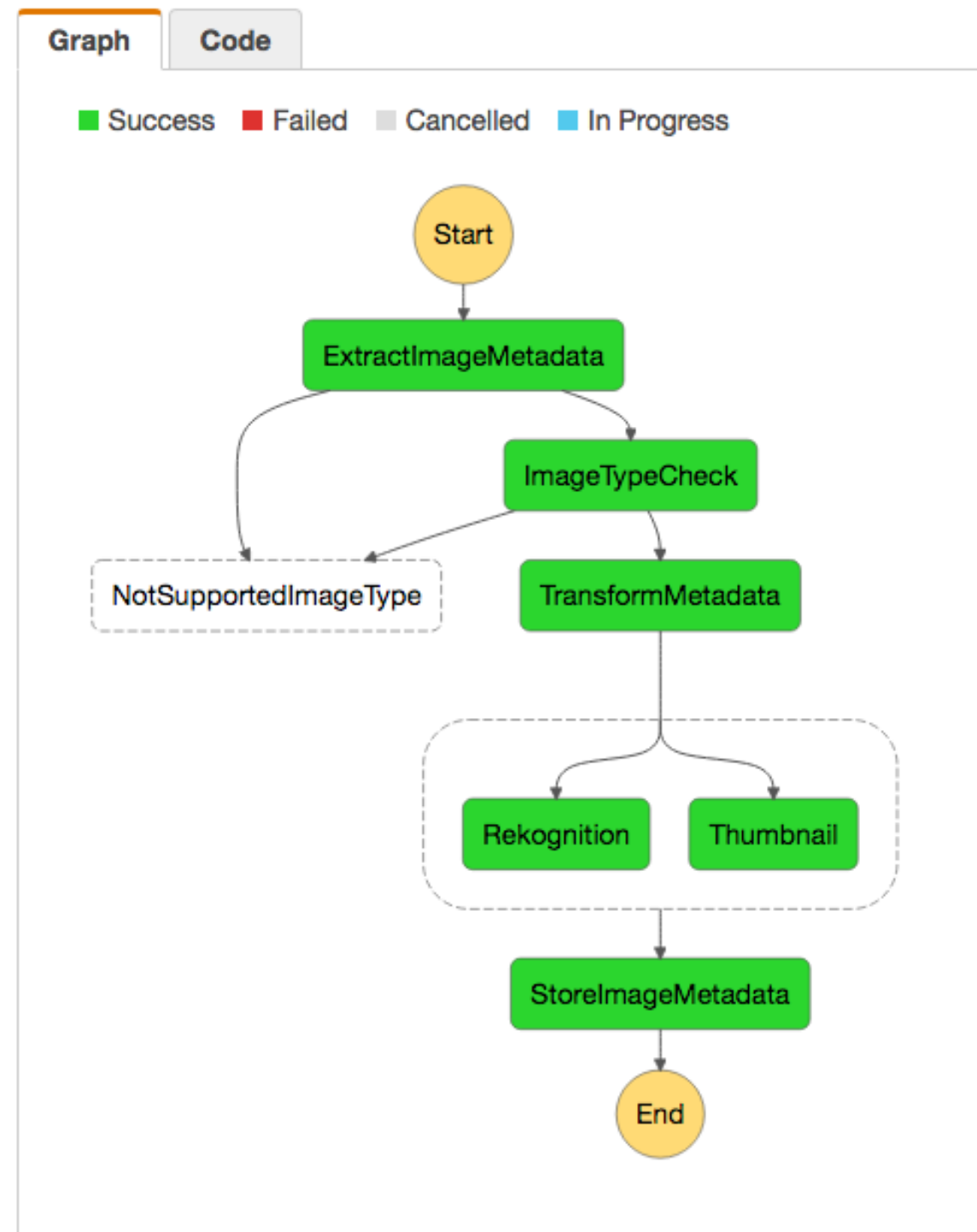


- 提取图片元数据信息
- 然后使用 Amazon Rekognition 对图像中的物体进行识别并打标签
- 同时使用 AWS Lambda 函数生成缩略图

# Serverless 图片处理与 AI 识别案例分析



# #1 设计可视化 workflows

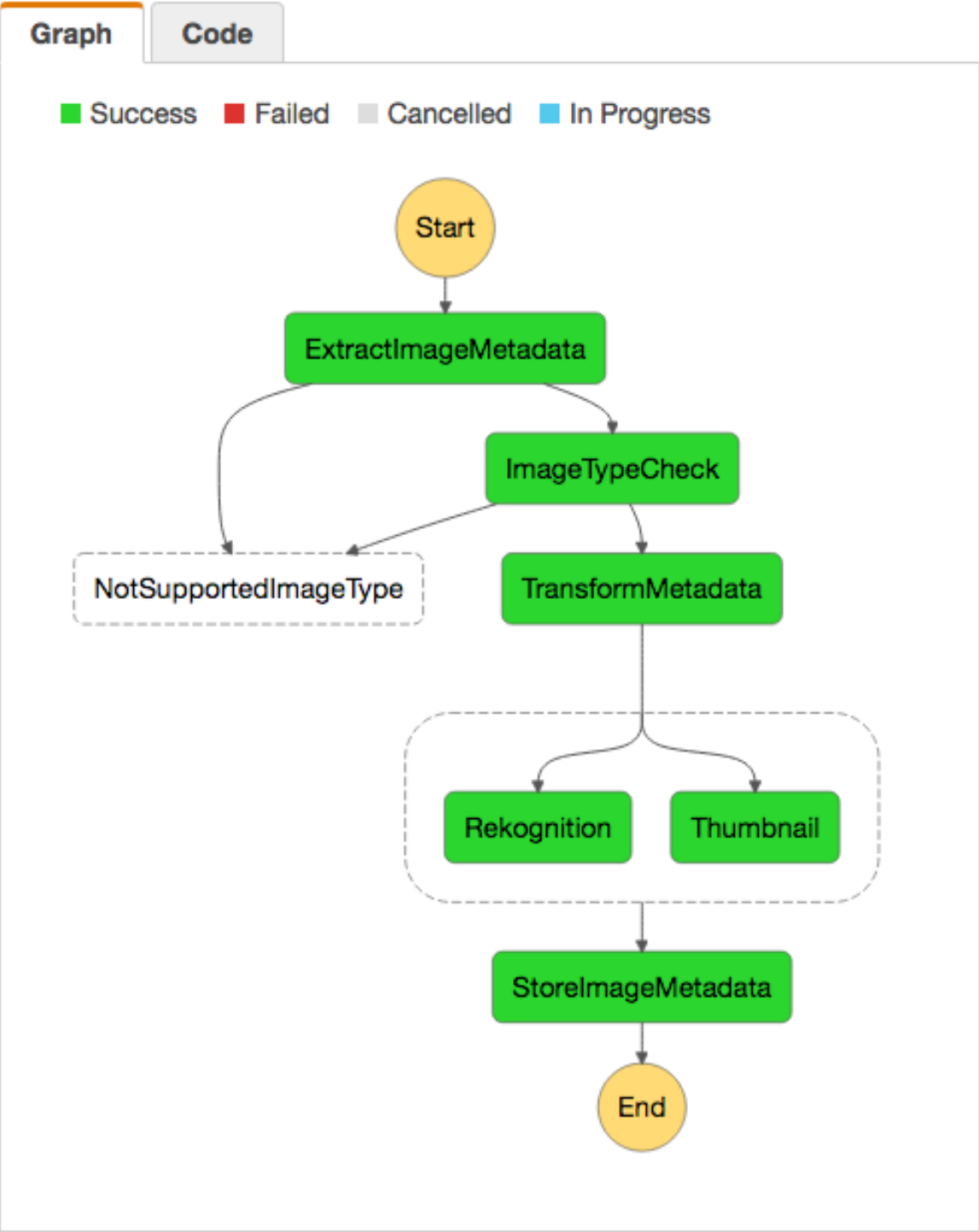


# #2 通过 ASL 定义 workflows

```

"ParallelProcessing": {
  "Type": "Parallel",
  "Branches": [
    {
      "StartAt": "Rekognition",
      "States": {
        "Rekognition": {
          "Type": "Task",
          "Resource": "${RekognitionLambdaArn}",
          "End": true
        }
      }
    },
    {
      "StartAt": "Thumbnail",
      "States": {
        "Thumbnail": {
          "Type": "Task",
          "Resource": "${GenerateThumbnailLambdaArn}",
          "End": true
        }
      }
    }
  ],
  "ResultPath": "$.parallelResults",
  "Next": "StoreImageMetadata"
}

```



Visual Workflow

Code

■ Success ■ Failed ■ Cancelled ■ In Progress

Start

ExtractImageMetadata

ImageTypeCheck

NotSupportedImageType

TransformMetadata

Rekognition

Thumbnail

StoreImageMetadata

End

Execution Details

Info

Input

Output

Execution Status

Succeeded

State Machine Arn

arn:aws:states:us-west-2:407004707705:state-machine:image-photo-sharing-backend-TransformMetadataFunction-9POWGFODCB18

Execution Details

Step Details

Info

Exception

Input

Output

Status

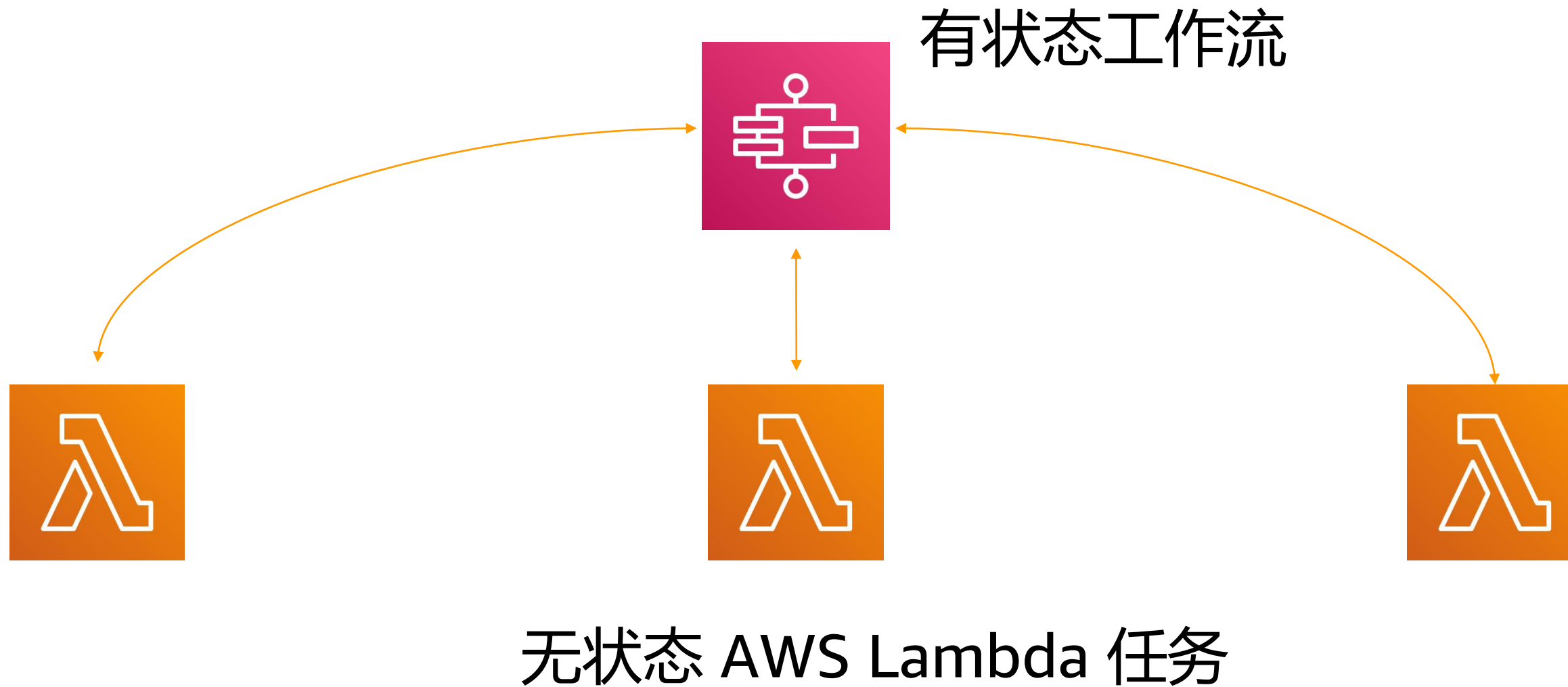
Succeeded

Resource

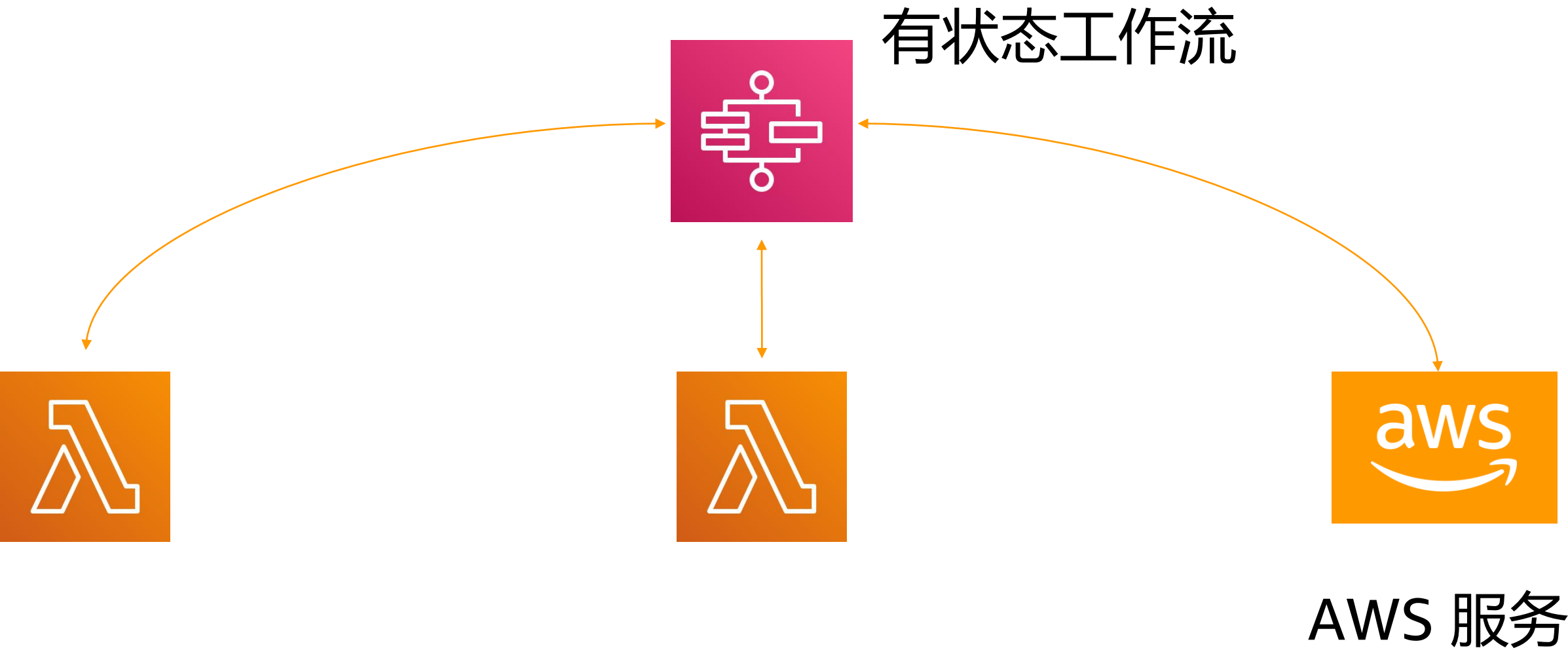
arn:aws:lambda:us-west-2:407004707705:function:photo-sharing-backend-TransformMetadataFunction-9POWGFODCB18 (CloudWatch logs)

	Resource	Elapsed Time (ms)	Timestamp		
	---	0	Sep 25, 2017 04:44:26.573 PM		
adata	---	35	Sep 25, 2017 04:44:26.608 PM		
adata	Lambda   CloudWatch logs	35	Sep 25, 2017 04:44:26.608 PM		
▶ 4	LambdaFunctionStarted	ExtractImageMetadata	Lambda   CloudWatch logs	162	Sep 25, 2017 04:44:26.735 PM
▶ 5	LambdaFunctionSucceeded	ExtractImageMetadata	Lambda   CloudWatch logs	3355	Sep 25, 2017 04:44:29.928 PM
▶ 6	TaskStateExited	ExtractImageMetadata	---	3355	Sep 25, 2017 04:44:29.928 PM
▶ 7	ChoiceStateEntered	ImageTypeCheck	---	3380	Sep 25, 2017 04:44:29.953 PM
▶ 8	ChoiceStateExited	ImageTypeCheck	---	3380	Sep 25, 2017 04:44:29.953 PM

# AWS Lambda 任务集成



# AWS 服务集成





# AWS Step Functions 新增服务集成



Amazon  
DynamoDB

中国区

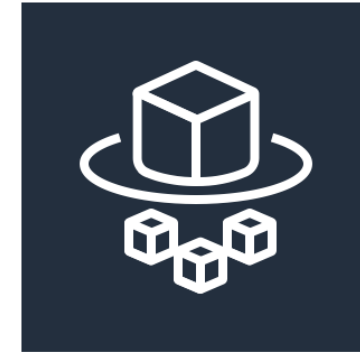


AWS Batch



Amazon ECS

中国区



AWS Fargate



Amazon SNS

中国区



Amazon SQS

中国区



AWS Glue



Amazon  
SageMaker

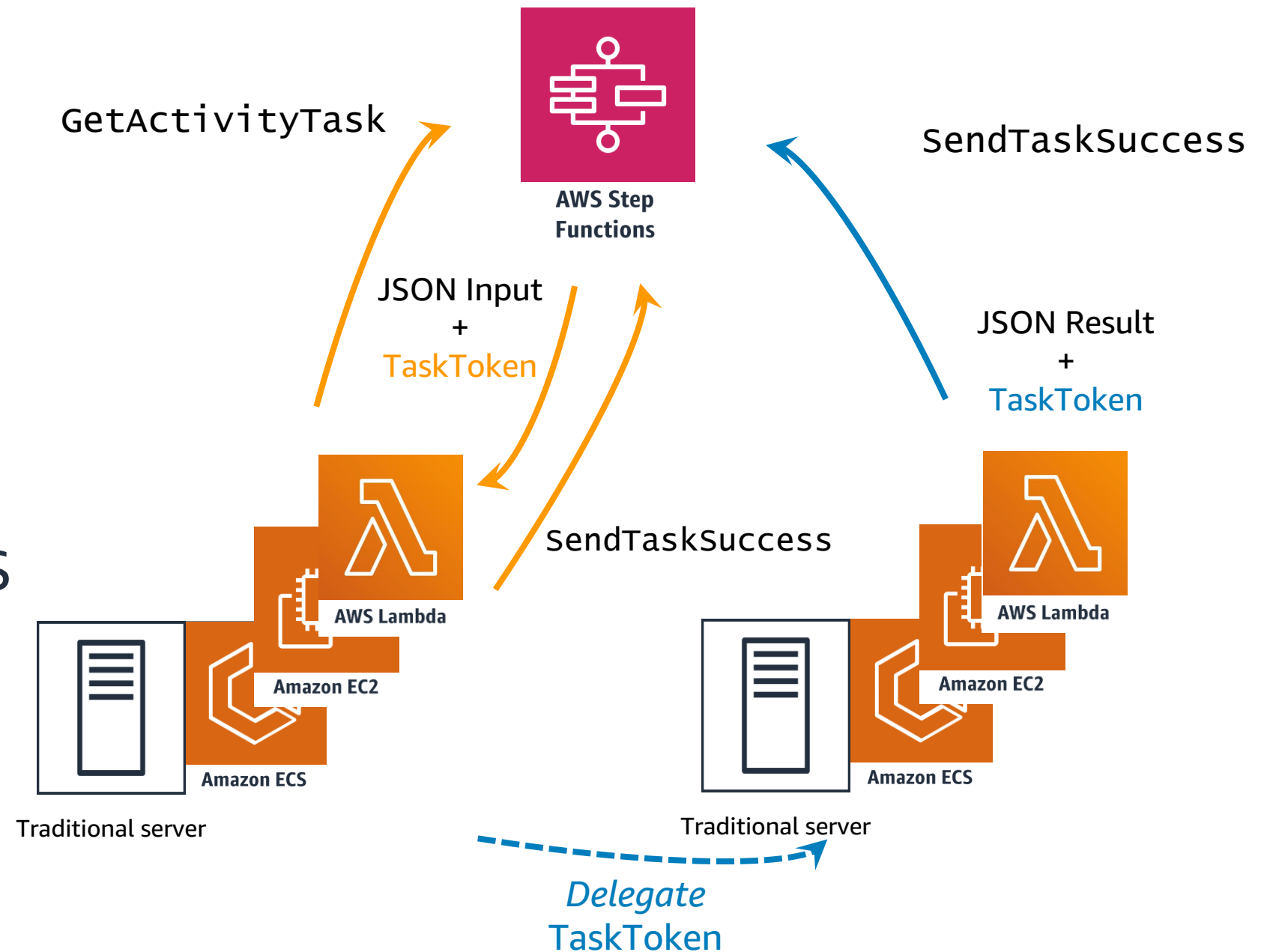
# AWS Step Functions Activity 任务

## Call-work-respond:

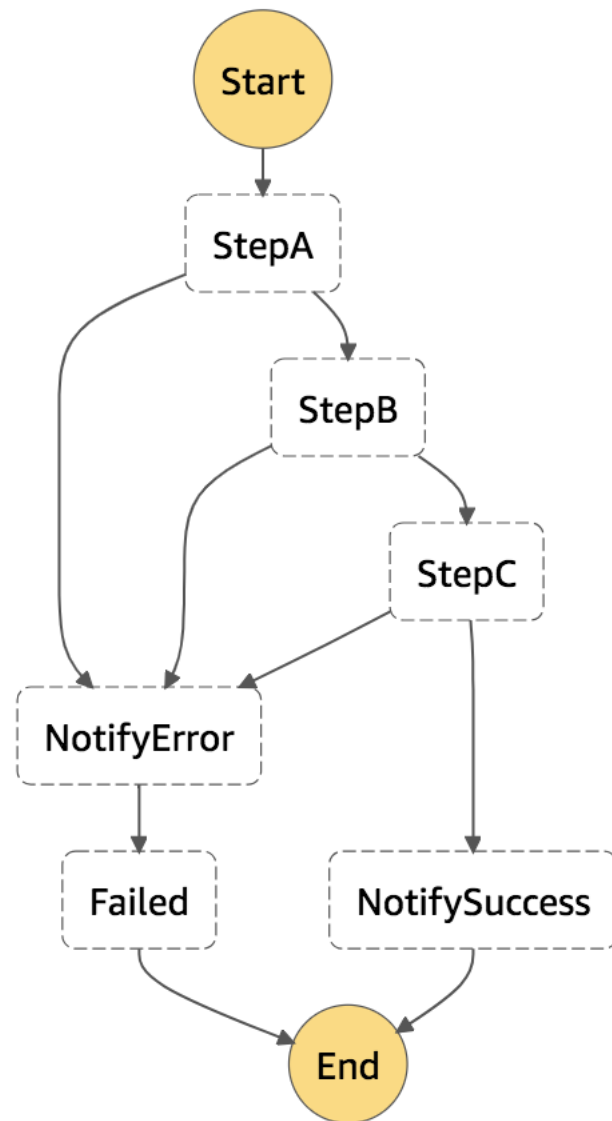
活动工作线程获取令牌，执行任务并更新活动，活动完成后返回成功或失败信号

## Call-work-delegate...respond:

活动工作线程获取令牌，然后将更新活动的责任委派给下游 AWS 服务



# 错误重试机制



## 错误处理

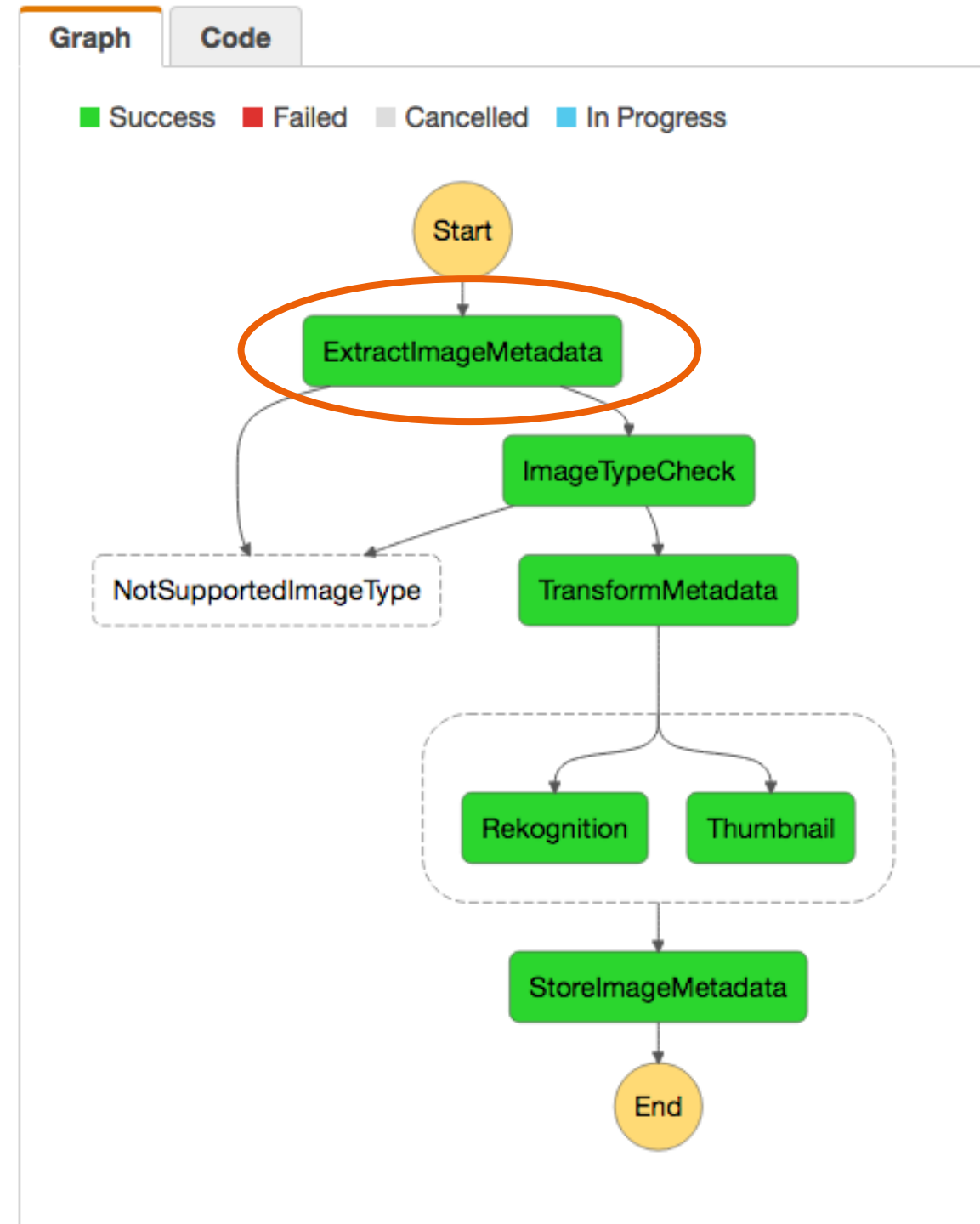
- 状态机定义问题（例如，Choice 状态中没有匹配规则）。
- 任务失败（例如，AWS Lambda 函数中的异常）。
- 临时性问题（例如，网络分区事件）。

## 重试机制

- 匹配捕捉错误后实现重试策略（ErrorEquals）
- 设置等待时间和每个重试之间的时间增长倍数（IntervalSeconds / BackoffRate）
- 错误重复发生超过指定次数停止重试（MaxAttempts）

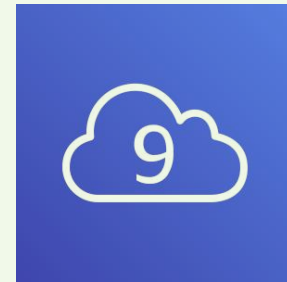
# 错误重试机制

```
"ExtractImageMetadata": {
  "Type": "Task",
  "Resource": "${ExtractImageMetadataLambdaArn}",
  "InputPath": "$",
  "ResultPath": "$.extractedMetadata",
  "Next": "ImageTypeCheck",
  "Catch": [{
    "ErrorEquals": ["ImageIdentifyError"],
    "Next": "NotSupportedImageType"
  }],
  "Retry": [{
    "ErrorEquals": ["ImageIdentifyError"],
    "MaxAttempts": 0
  },
  {
    "ErrorEquals": ["States.ALL"],
    "IntervalSeconds": 1,
    "MaxAttempts": 2,
    "BackoffRate": 1.5
  }]
}
```

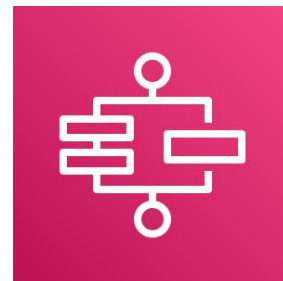


# AWS Step Functions 本地开发

本地开发工具

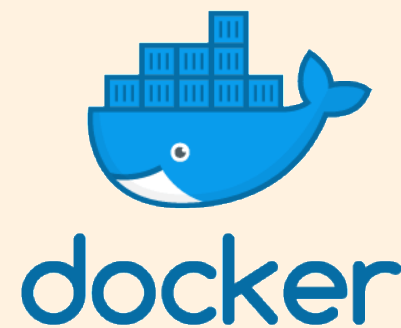


AWS Cloud9



AWS  
Step Functions

本地运行环境



`amazon/aws-stepfunctions-local`



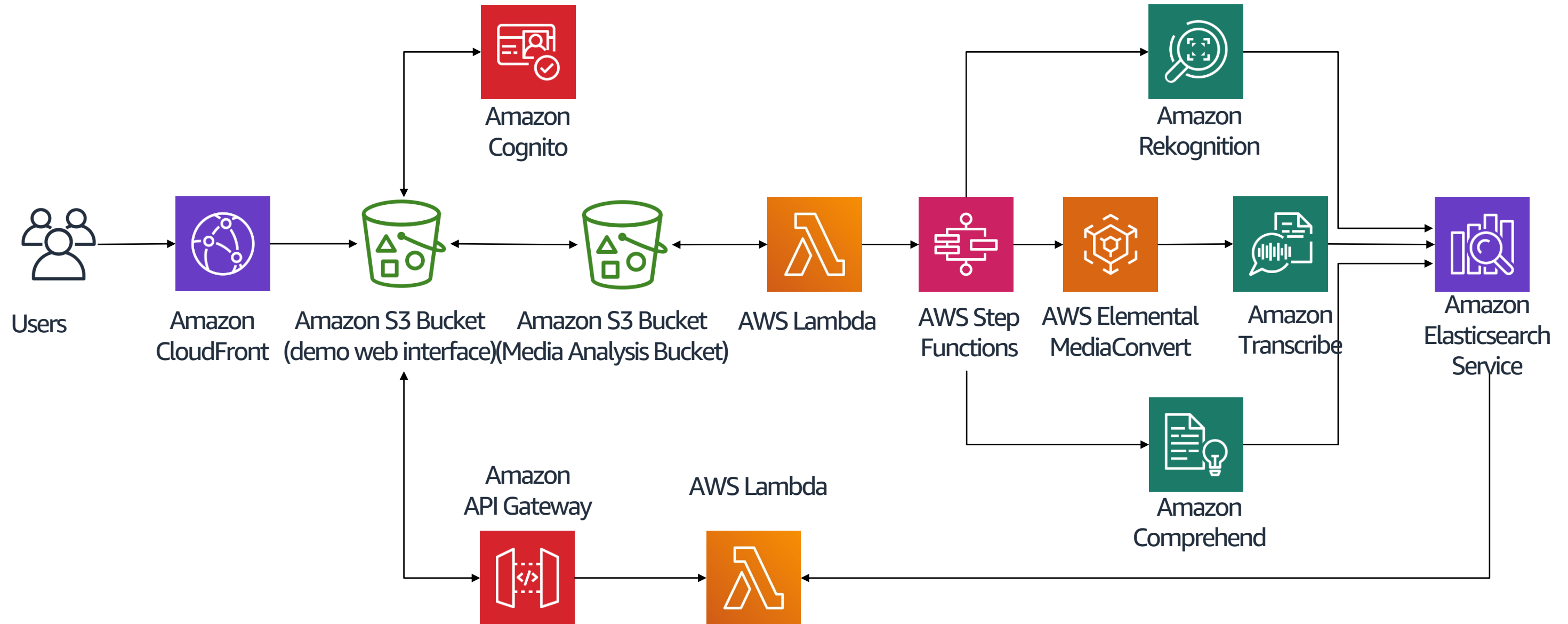
# 案例剖析

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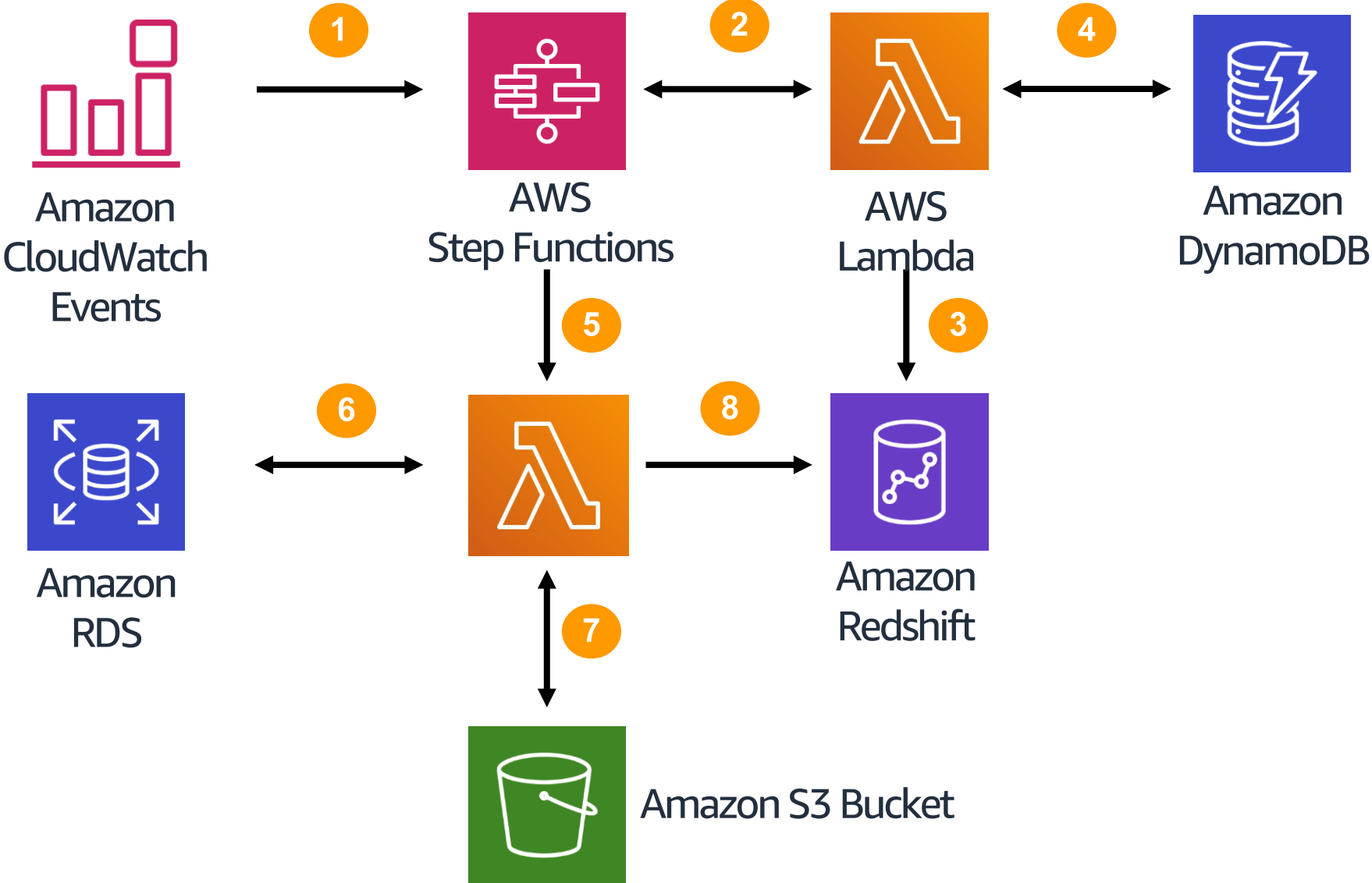
aws **INNOVATE**  
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# 多媒体文件分析



# 自动化 ETL 任务





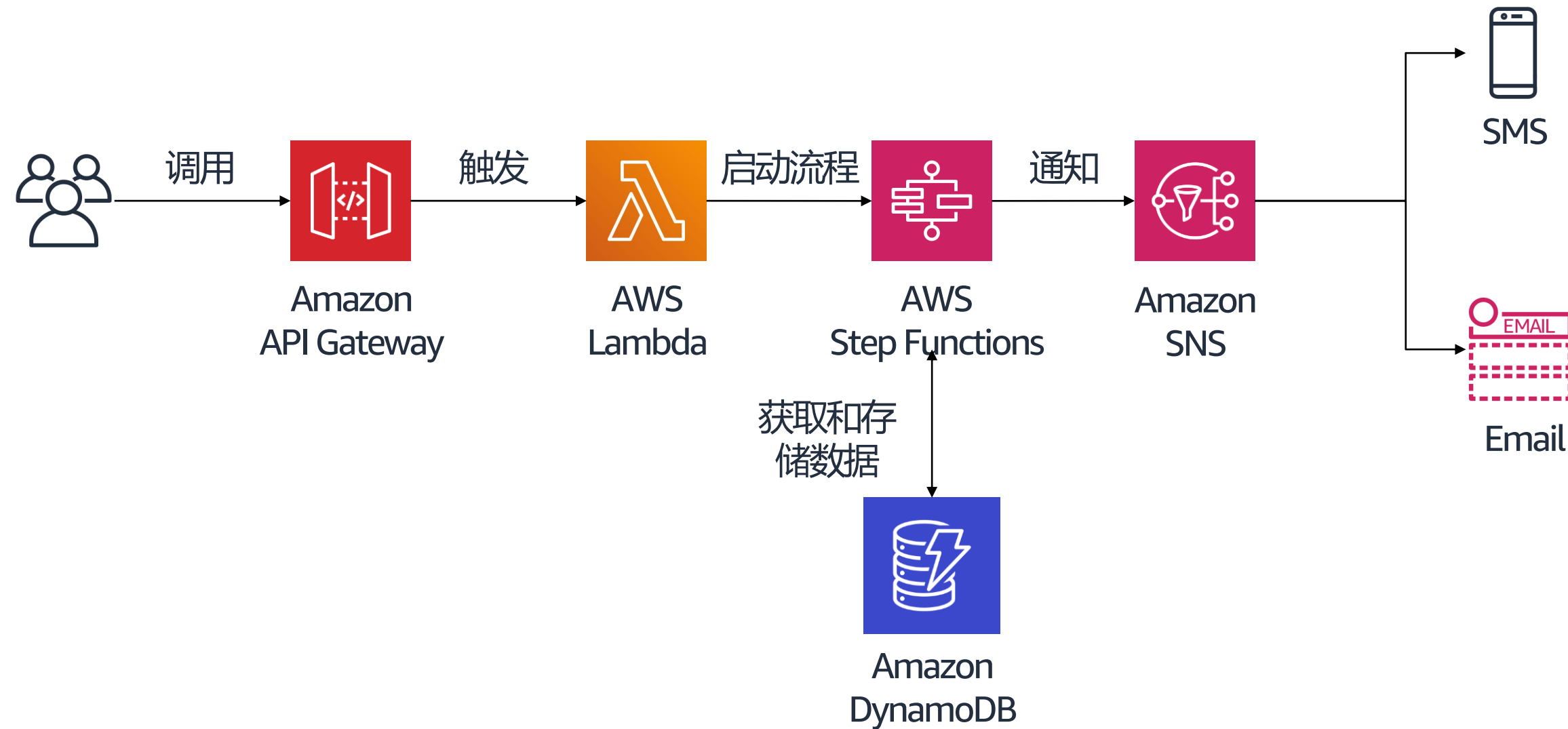
# Demo – Serverless Happy Lottery

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# Demo 架构



<https://github.com/nikosheng/aws-serverless-lottery>

QuickTime Player

File

Edit

View

Window

Help

Step Functions Management Console

Lambda Management Console

DynamoDB · AWS Console

Simple Notification Service

Inbox - niko.js.feng@gmail.com

https://ap-southeast-1.console.aws.amazon.com/states/home?region=ap-southeast-1#/homepage

Bookmarks

AWS Training

AWS

CMB

Other Bookmarks

aws

Services

Resource Groups

admin @ nikofeng

Singapore

Support

Step Functions

State machines

Activities

Application integration

# AWS Step Functions

## Build distributed applications using visual workflows.

AWS Step Functions makes it easy to coordinate the components of distributed applications as a series of steps in a visual workflow. You can quickly build and run state machines to execute the steps of your application in a reliable and scalable fashion.

Create a state machine

Choose from sample projects and templates or author a new state machine from scratch.

Get started

Pricing (US)

With AWS Step Functions, you pay only for what you use. You are charged based on the number of state transitions to complete the end-to-end workflow of your application.

4,000 state transitions per month

How it works

Visual workflow

Code

Step details (CreateOrderB)

Feedback

English (US)

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AWS 中国

AWS 中国

# 要点总结

- AWS Step Functions 是一项完全托管的函数编排服务，结合 AWS Lambda 函数能在短时间内构建一套无服务器架构的业务系统
- AWS Step Functions 目前可以和多种 AWS 服务原生集成，通过构建 Activity 活动服务与 Amazon EC2，容器服务 Amazon ECS 乃至 On-Premise 本地服务器程序结合进行程序编排
- AWS Step Functions 和 AWS Lambda 可以进行本地开发调试
- 按需支付运行资源，节省服务器开销
- 快速创新，快速试错

“Invention comes in many forms and at many scale. The most radical and transformative of inventions are often those that empower others to unleash their creativity – to pursue their dreams.”

**Jeffrey P. Bezos**  
**Founder and Chief Executive Officer**  
**Amazon.com, Inc.**



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视频中心：<http://aws.amazon.bokecc.com/>



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