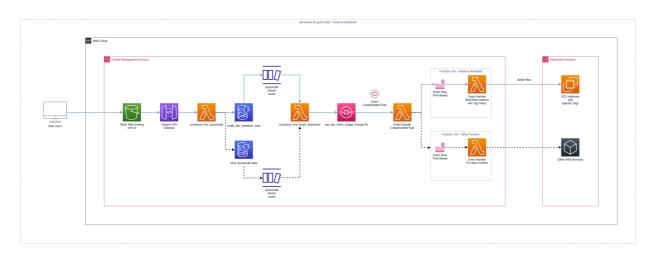
# Overview / 项目概述

项目采用无服务器架构实现了Amazon Instance Scheduler题目要求的功能

#### **Online Demo**

Amazon Instance Scheduler

# Architecture / 架构图



# **Components**

#### **Frontend**

Ouroboros Frontend is built with VUE3 + Nuxt3 + Element-Plus and deployed with AWS S3 Static Web Hosting.

项目前端使用了VUE3 + Nuxt3 + Element-Plus 开发, 使用AWS S3静态网站发布功能进行部署

#### **Backend - Lambda Function**

#### ouroboros ims dynamodb

Handle requests from API gateway, query schedule rules and logs in dynamodb and response

应用后端使用API Gateway + Lambda 开发, 负责处理来自前端的REST API请求, 查询 DynamodDB中的数据并返回响应结果, 对于非只读类的接口采用API KEY 进行认证

#### **Database - DynamoDB**

#### cmdbdevschedule\_rules

Table to store schedule rules.

DynamoDB表, 用于存储自定义计划任务

#### cmdbdevschedule\_logs

Table to store event logs.

DynamoDB表,用于存储EC2操作事件日志

#### **Streaming Service - DynamoDB Stream**

#### cmdbdevschedule\_rules/stream

Event stream capture both INSERT and REMOVE operations in *cmdbdevschedule\_rules* and trigger event handler *ouroborosimsevent\_dispatcher* 

使用了DynamoDB的Stream功能,自动捕获数据库中计划任务对象的变化,触发后端的事件分发函数

# **Event Dispatcher**

#### ouroborosimsevent\_dispatcher

Receive streaming events from DynamoDB stream, dispatch event to corresponding queues.

以DynamoDB Stream作为事件源,将数据库变更事件转化为资源操作事件,并将事件分发到对应的消息队列中等待处理

#### **Queue Service**

#### sqsdevec2statechange

Queue for integration with ec2 handler to avoid messages loss

用于和EC2资源操作函数进行集成,避免直接调用失败导致的事件丢失

#### sqs devevent bridge change. fifo

Queue for integration with event bridge handler to avoid messages loss

用于和Event Bridge资源操作函数进行集成, 避免直接调用失败导致的事件丢失

#### **Event Handlers**

#### ouroborosimsservice ec2

Handle messages in *sqsdevec2statechange*, describe instances with given filters and start/stop corresponding instances

处理EC2事件变化队列中的事件,对目标账号中的机器进行开关机操作

#### ouroborosimsservice\_eventbridge

Handle messages in *sqsdeveventbridgechange.fifo*, create event bridge rule according to input params and link to specific event handler

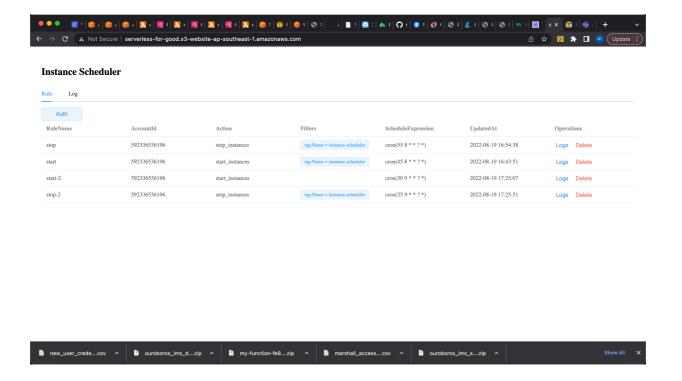
处理Event Bridge事件变化队列中的事件, 创建或删除对应的Event Bridge Time-Based Rule

# Features / 功能介绍

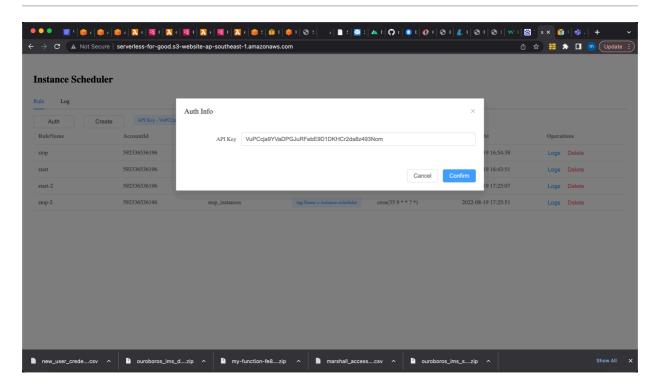
- WebUI to create schedule rule and activity logs 支持通过UI创建自定义计划和事件日志 查询
- Support filter instances with filters: *instance-id*, *tag:key*, *private-ip-address*, *vpc-id* 支持 多种筛选条件, 例如*instance-id*, *tag:key*, *private-ip-address*, *vpc-id*等
- Cross account support (remote configuration is required) 支持跨账号对资源进行操作,
   需要账号中配置好IAM Role及信任关系
- Central managed lambda functions and event bridge rules 集中化管理的Lambda代码 以及事件驱动规则
- Support throttling and quota per API Key 支持通过API Key进行限流调节和配额管理
- Full stack deployment with AWS SAM 支持使用SAM进行部署

# User Guide / 使用说明

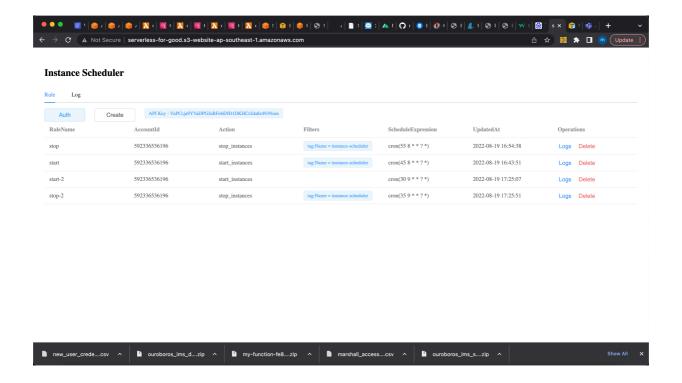
# Readonly view for user without API Key



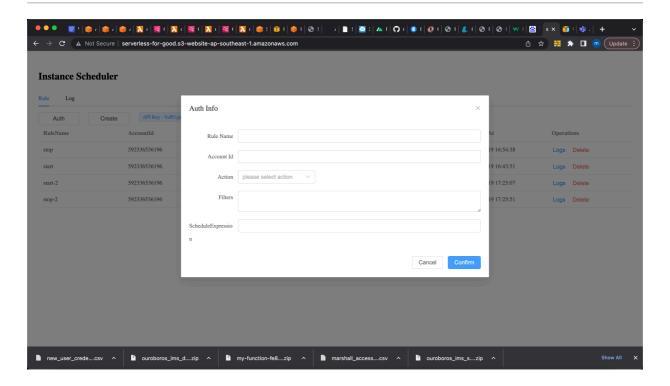
# **Configure API Key**



# Admin view after API Key configured



# **Create Schedule Rule**



# Sample Input

Rule Name

Unique name to identify specific schedule rule

Account Id

Account Id of the owner of targeted instances

Action

Select action for targeted instances

**Filters** 

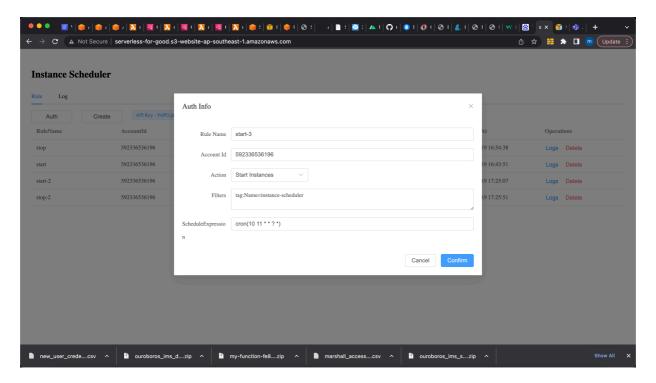
Filter string to filter specific instances

Example: tag:Name=instance-scheduler,vpc-id=vpc-4085e027

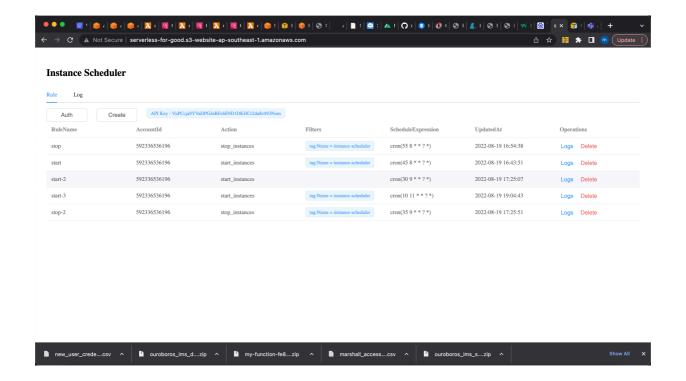
ScheduleExpression

The cron expression syntax please refer to AWS document for event bridge time-based rule

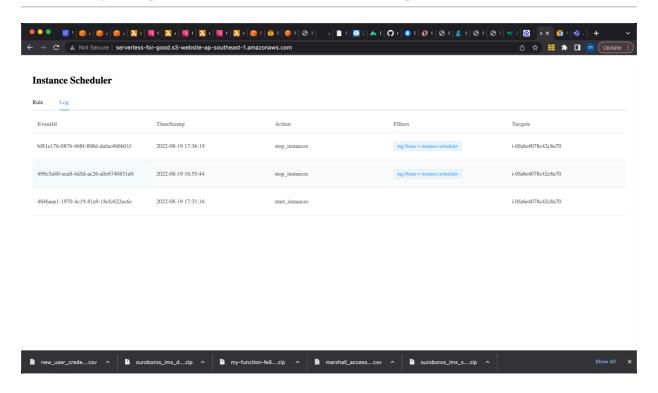
Example: cron(55 14 \* \* ? \*) # Everyday at 14:55 UTC



# Created schedule rules will be in the list



# Activity logs can be found in logs tab



# How to Deploy backend serverless with AWS SAM / 如何使用AWS SAM部署后端无服务架构

Ouroboros backend serverless app follows AWS SAM architecture. Learn more on the original AWS SAM docs

Ouroboros后端无服务架构基于AWS SAM架构实现和部署。 关于AWS SAM请参阅AWS SAM 文档

# Create or Get Dependency Service Resource / 创建或获取依赖资源

# **DynamoDB Table**

Ouroboros uses default table name is cmdb\_dev\_schedule\_rules
Ouroboros使用的默认Table名称为 cmdb\_dev\_schedule\_rules

获取DynamoDB Streams ARN: Get DynamoDB Streams ARN:

Example 示例:

arn:aws:dynamodb:ap-southeast-1:592336536196:table/cmdb*dev*schedule\_rules/stream/2022-08-17T03:05:06.359

# SQS

Ouroboros uses two default SQS queue with type:

Ouroboros 使用两个SQS队列, 默认名称和类型为:

- sqsdevec2statechange Standard
- sqsdeveventbridgechange.fifo FIFO

获取SQS Queue ARN:

Get SQS Queue ARN:

arn:aws:sqs:ap-southeast-1:592336536196:sqsdeveventbridgechange.fifo

# Configure SAM Template / 配置SAM模板

Replace DynamoDB & SQS arn in template.yaml

```
Events:

ouroborosDDBEvent:

Type: DynamoDB

Properties:

Stream: !Replace your own DDB Stream ARN here

StartingPosition: LATEST

BatchSize: 1
```

```
Events:
OuroborosFunctionSQSQueue:
Type: SQS
Properties:
Queue: !Replace your own SQS Queue ARN here
...
```

# Build / 构建

Ensure you have configured AWS credential/config in your environment. 请确保AWS SAM和cli工具已经正常安装和配置

• Run / 运行

sam build

• Example / 示例

```
sam build
Building codeuri: /Users/xp/workspace-docker/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_service_sam_ouroboros_ims_ouroboros_ims_service_sam_ouroboros_ims_ouroboros_ims_ouroboros
Running PythonPipBuilder:ResolveDependencies
Running PythonPipBuilder:CopySource
Building codeuri: /Users/xp/workspace-docker/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam/ouroboros_ims_service_sam
Running PythonPipBuilder: ResolveDependencies
Running PythonPipBuilder:CopySource
Building codeuri: /Users/xp/workspace-docker/ouroboros ims service sam/ouroboros
Running PythonPipBuilder: ResolveDependencies
Running PythonPipBuilder:CopySource
Building codeuri: /Users/xp/workspace-docker/ouroboros ims service sam/ouroboros
Running PythonPipBuilder:ResolveDependencies
Running PythonPipBuilder:CopySource
Build Succeeded
Built Artifacts : .aws-sam/build
Built Template : .aws-sam/build/template.yaml
Commands you can use next
_____
[*] Invoke Function: sam local invoke
[*] Test Function in the Cloud: sam sync --stack-name {stack-name} --wate
[*] Deploy: sam deploy --guided
```

# Test / 测试

Skipped and not shown this stage which we have covered internally.

不在本次目标之内,但我们已经在内部实施了单元测试和集成测试。请参阅AWS README

# Deploy / 部署

An initial deployment is suggested use \_-guided 首次部署强烈建议使用 \_-guided 参数

• Run / 运行

```
sam deploy --guided
```

Example / 实例

```
sam deploy --guided
Configuring SAM deploy
```

```
Looking for config file [samconfig.toml] : Found
   Reading default arguments : Success
   Setting default arguments for 'sam deploy'
   Stack Name [OuroborosAppSam]:
   AWS Region [ap-southeast-1]:
   Parameter Environment [dev]:
   #Shows you resources changes to be deployed and require a 'Y' to init
   Confirm changes before deploy [Y/n]:
   #SAM needs permission to be able to create roles to connect to the re
   Allow SAM CLI IAM role creation [Y/n]:
   #Preserves the state of previously provisioned resources when an open
   Disable rollback [Y/n]: N
   OuroborosCMDBFunction may not have authorization defined, Is this ok
   OuroborosCMDBFunction may not have authorization defined, Is this ok
   OuroborosCMDBFunction may not have authorization defined, Is this ok
   Save arguments to configuration file [Y/n]:
   SAM configuration file [samconfig.toml]:
   SAM configuration environment [default]:
   Looking for resources needed for deployment:
    Managed S3 bucket: aws-sam-cli-managed-default-samclisourcebucket-ze
    A different default S3 bucket can be set in samconfig.toml
   Saved arguments to config file
   Running 'sam deploy' for future deployments will use the parameters
   The above parameters can be changed by modifying samconfig.toml
   Learn more about samconfig.toml syntax at
   https://docs.aws.amazon.com/serverless-application-model/latest/devel
File with same data already exists at OuroborosAppSam/79a44a842d582122e4
File with same data already exists at OuroborosAppSam/8eb91e38b0e10a49al
File with same data already exists at OuroborosAppSam/fb6c4854a4d380586d
File with same data already exists at OuroborosAppSam/a6e2013103d961be51
   Deploying with following values
    _____
   Stack name
                               : OuroborosAppSam
   Region
                              : ap-southeast-1
   Confirm changeset
                              : True
   Disable rollback
                               : False
   Deployment s3 bucket
                              : aws-sam-cli-managed-default-samclisou:
                              : ["CAPABILITY IAM"]
   Capabilities
   Parameter overrides
                              : {"Environment": "dev"}
   Signing Profiles
                               : {}
```

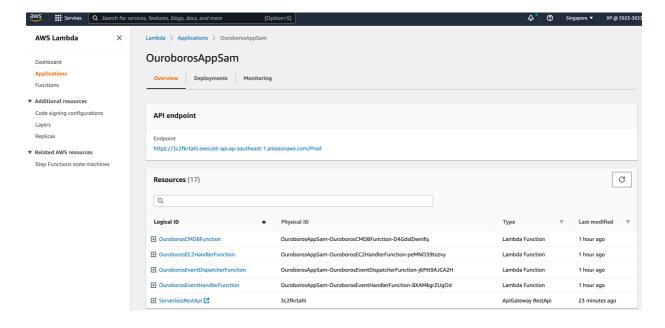
Initiating deployment Uploading to OuroborosAppSam/4c188ef728ed8434b3912d982f2ad05d.template Waiting for changeset to be created.. CloudFormation stack changeset -----Operation LogicalResourceId + Add OuroborosCMDBFunction rmissionProd OuroborosCMDBFunction + Add ssionProd + Add OuroborosCMDBFunction issionProd OuroborosCMDBFunction + Add + Add OuroborosCMDBFunction + Add OuroborosEC2HandlerFi eue + Add OuroborosEC2HandlerFi + Add OuroborosEC2HandlerFi + Add OuroborosEventDispato + Add OuroborosEventDispate + Add OuroborosEventDispato + Add OuroborosEventHandle: Oueue + Add OuroborosEventHandle + Add OuroborosEventHandle + Add ServerlessRestApiDepl + Add ServerlessRestApiPro + Add ServerlessRestApi Changeset created successfully. arn:aws:cloudformation:ap-southeast-1:59 Previewing CloudFormation changeset before deployment \_\_\_\_\_ Deploy this changeset? [y/N]: y 2022-08-19 14:03:58 - Waiting for stack create/update to complete CloudFormation events from stack operations ResourceStatus ResourceType

CREATE_IN_PROGRESS	AWS::IAM::Role
CREATE_IN_PROGRESS	AWS::IAM::Role
CREATE_IN_PROGRESS	AWS::IAM::Role
CREATE IN PROGRESS	AWS::IAM::Role
CREATE COMPLETE	AWS::IAM::Role
CREATE COMPLETE	AWS::IAM::Role
CREATE COMPLETE	AWS::IAM::Role
_	AWS::Lambda::Function
CREATE_IN_PROGRESS	AWS::Lambda::Function
CREATE_IN_PROGRESS	
CREATE_COMPLETE	AWS::IAM::Role
CREATE_IN_PROGRESS	AWS::Lambda::Function
CREATE_COMPLETE	AWS::Lambda::Function
CREATE_IN_PROGRESS	AWS::Lambda::EventSo
CREATE_COMPLETE	AWS::Lambda::Function
CREATE_COMPLETE	AWS::Lambda::Function
CREATE_IN_PROGRESS	AWS::Lambda::EventSo
CREATE_IN_PROGRESS	AWS::Lambda::EventSo
CREATE_IN_PROGRESS	AWS::ApiGateway::Res
CREATE COMPLETE	AWS::Lambda::Function
CREATE_IN_PROGRESS	AWS::Lambda::EventSo
CREATE_COMPLETE	AWS::ApiGateway::Res
CREATE_IN_PROGRESS	AWS::Lambda::EventSo
CREATE_IN_PROGRESS	AWS::ApiGateway::Res
CREATE_IN_PROGRESS	AWS::Lambda::Permiss:
CREATE_IN_PROGRESS	AWS::Lambda::Permiss:
CREATE_IN_PROGRESS	AWS::Lambda::Permiss:
CREATE_IN_PROGRESS	AWS::ApiGateway::Depl
CREATE_IN_PROGRESS	AWS::Lambda::EventSo
CREATE_COMPLETE	AWS::Lambda::EventSo
CREATE_IN_PROGRESS	AWS::Lambda::Permiss
CREATE_IN_PROGRESS	AWS::Lambda::Permiss:

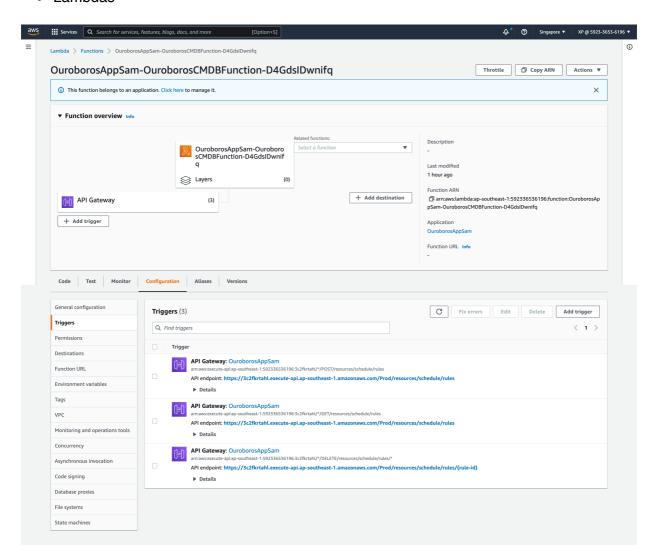
AWS::Lambda::Permiss CREATE IN PROGRESS CREATE\_IN\_PROGRESS AWS::ApiGateway::Depl CREATE COMPLETE AWS::ApiGateway::Dep CREATE IN PROGRESS AWS::ApiGateway::Sta CREATE COMPLETE AWS::ApiGateway::Stac CREATE\_IN\_PROGRESS AWS::ApiGateway::Stac CREATE\_COMPLETE AWS::Lambda::Permiss: CREATE COMPLETE AWS::Lambda::Permiss: CREATE COMPLETE AWS::Lambda::Permiss CREATE COMPLETE AWS::Lambda::EventSol CREATE COMPLETE AWS::Lambda::EventSo CREATE\_COMPLETE AWS::CloudFormation: \_\_\_\_\_\_ CloudFormation outputs from deployed stack Outputs Key OuroborosFunctionApi Description API Gateway endpoint URL for Prod stage for Hello Wo: Value https://3c2fkrtahl.execute-api.ap-southeast-1.amazona Key OuroborosCMDBFunctionIamRole Implicit IAM Role created for Hello World function Description Value arn:aws:iam::592336536196:role/OuroborosAppSam-Ourobo OuroborosCMDBFunctionFunction Key Description Hello World Lambda Function ARN Value arn:aws:lambda:ap-southeast-1:592336536196:function:( Successfully created/updated stack - OuroborosAppSam in ap-southeast-1  $\,$ 

# **AWS Console**

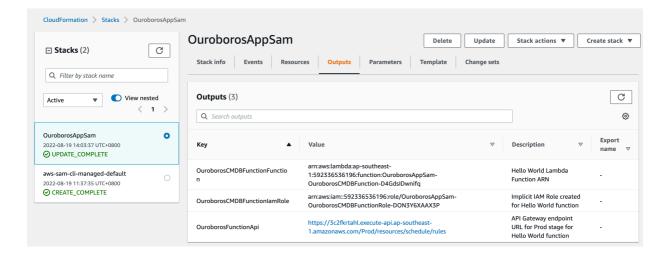
Lambda Application



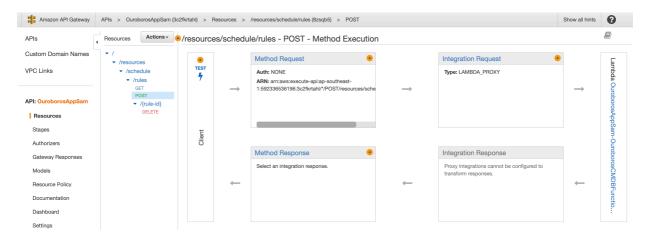
#### Lambdas



#### CloudFormation



#### API Gateway



#### DynamoDB

