

# Observability using Datadog in Serverless applications

Leticia Santos

Data Engineer



**DATADOG**

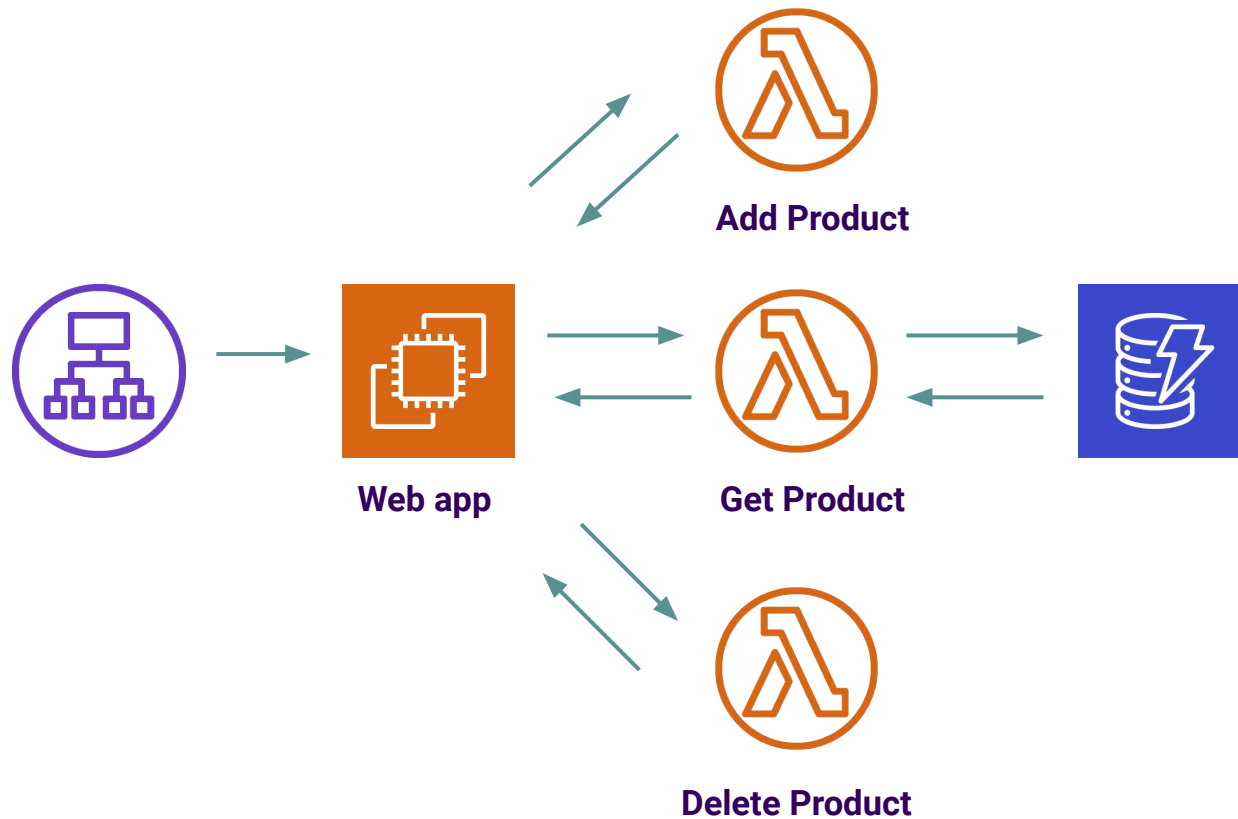
# Agenda

- What's Serverless?
- What's Observability?
- What's Datadog?
- Let's Build!

**Serverless** refers to utilising **cloud provider machines** to perform tasks **without the customer having to maintain** these machines.



# Serverless Application



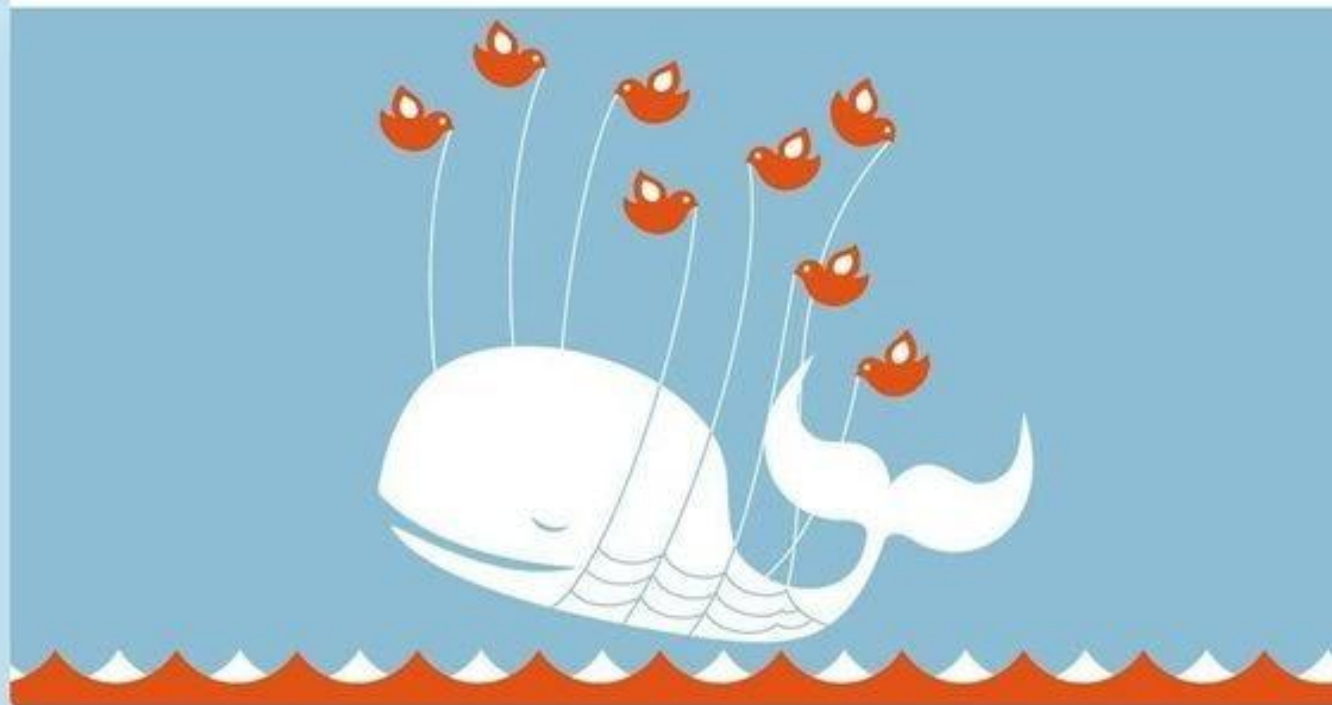
**Each function  
has a specific  
responsibility**

# Observability

**A measure of how well internal states of a system can be inferred from knowledge of its external outputs**

## Twitter is over capacity.

Too many tweets! Please wait a moment and try again.



# Serverless is special

- No access to the underlying OS
- Runtimes may be a blackbox
- Charge by exec time / mem allocated



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**Datadog is a monitoring and analytics platform that helps companies improve observability of their infrastructure and applications**





\$aws\_account ▾ \$region ▾ \$function ▾



This dashboard is powered by real-time [enhanced AWS Lambda metrics](#). You need to set up these enhanced metrics before data will appear here.

To dig deeper into your user-facing AWS Lambda execution time, enable percentiles on the `aws.lambda.enhanced.duration` metric. Browse to [Metrics > Distribution Metrics](#) and click **Calculate Percentiles**.

See [AWS Lambda integration documentation](#).

Invocations

29K

Errors

1K

Cold Starts

637

Estimated Monthly Cost 1mo

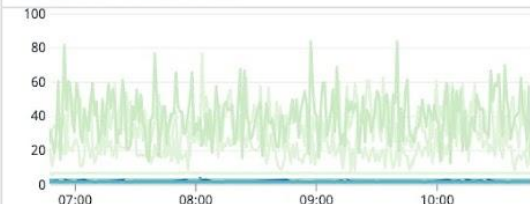
161.22\$

## Invocations

## Top invoked functions

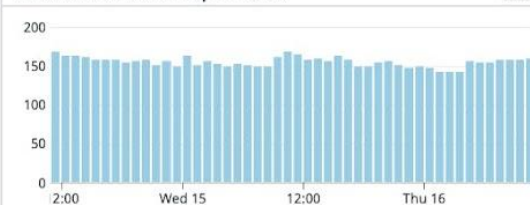
9.46K	post-coupon-us-ake-prod
8.62K	post-coupon-prod-us
5.02K	ddbfunction101
1.43K	lambda-laa-test-dev-functions-dev-step-four
478.00	lambda-laver-step-functions-dev-step-five
477.00	lambda-laver-step-functions-dev-step-two
477.00	lambda-laver-step-functions-dev-step-one
477.00	lambda-laver-step-functions-dev-step-three
263.00	swf-hello-test
240.00	tian-test-dd-tracer
240.00	hello-doo-dev-hello36

## Function invocations



## Invoked functions per hour

2d



## Most expensive functions (last month)

1mo

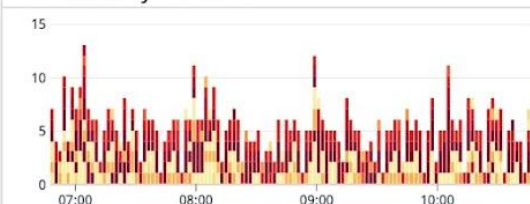
76.54	post-coupon-us-ake-prod
53.15	post-coupon-prod-us
9.01	ddbfunction101
2.91	hello-doo-node-dev-hello10x
1.62	lambda-laa-test-dev-node-timeout-12
1.36	xrav-step-functions-dev-acuoci-xrav-step-four
1.25	xrav-step-functions-dev-acuoci-xrav-step-one
1.25	xrav-step-functions-dev-acuoci-xrav-step-two
1.25	xrav-step-functions-dev-acuoci-xrav-step-three
1.25	xrav-step-functions-dev-acuoci-xrav-step-five
1.25	gen-ad-preferences-dev-ad-server-model-combine

## Cold Starts &amp; Provisioned Concurrency

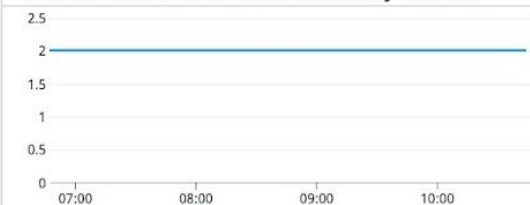
## Top cold-starting functions

144.00	lambda-laa-test-dev-ao-timeout
144.00	lambda-laa-test-dev-ao-outofmemory
67.00	lambda-laa-test-dev-ao-raiseserror
66.00	lambda-laa-test-dev-ava-outofmemory
64.00	lambda-laa-test-dev-ava-timeout
56.00	post-coupon-us-ake-prod
46.00	post-coupon-prod-us
6.00	swf-hello-test
6.00	ddbfunction101
3.00	lambda-laa-test-dev-ao-normalloas
3.00	lambda-laver-step-functions-dev-step-two
3.00	lambda-laver-step-functions-dev-step-three

## Cold starts by function



## Provisioned concurrent executions by function



## Provisioned concurrency utilization by function

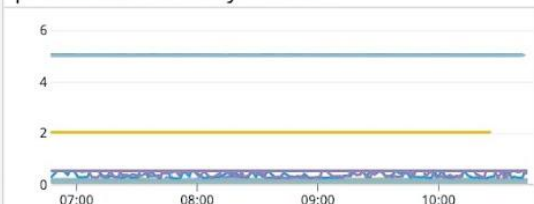


## Execution Time

## Slowest functions

30.02	lambda-laa-test-dev-node-timeout
30.02	lambda-laa-test-dev-ia-ia-timeout
30.02	lambda-laa-test-dev-node-timeout-12
30.02	lambda-laa-test-dev-ao-timeout
30.02	lambda-laa-test-dev-ruby-timeout
21.95	lambda-laa-test-dev-node-outofmem-12
18.93	lambda-laa-test-dev-node-outofmem
5.01	xrav-step-functions-dev-acuoci-xrav-step-one
5.01	gen-ad-preferences-dev-ad-server-model-create-dat...
5.01	xrav-step-functions-dev-acuoci-xrav-step-five
5.01	xrav-step-functions-dev-acuoci-xrav-step-two
5.01	xrav-step-functions-dev-acuoci-xrav-step-three

## p95 execution time by function



## Max execution time / timeout

1.00	lambda-laa-test-dev-python-timeout-27
1.00	lanqerflowlogdemo
1.00	lambda-laa-test-dev-node-timeout-12
1.00	lambda-laa-test-dev-ia-ia-timeout
1.00	lambda-laa-test-dev-node-timeout
1.00	lambda-laa-test-dev-python-timeout
1.00	lambda-laa-test-dev-ruby-timeout
1.00	lambda-laa-test-dev-node-outofmem-12
1.00	lambda-laa-test-dev-node-outofmem
1.00	lambda-laa-test-dev-qo-timeout

## Total execution time (seconds)

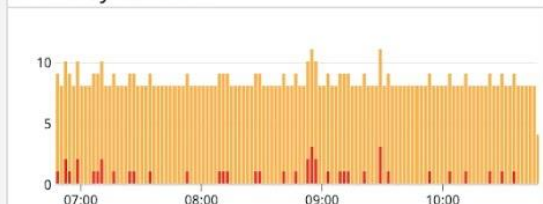
4.32K	lambda-laa-test-dev-node-timeout-12
4.11K	lambda-laa-test-dev-ao-timeout
3.10K	lambda-laa-test-dev-node-outofmem-12
2.19K	lambda-laa-test-dev-pvthon-timeout
2.13K	lambda-laa-test-dev-node-timeout
1.98K	lambda-laa-test-dev-pvthon-timeout-27
1.77K	lambda-laa-test-dev-ia-ia-timeout
1.47K	lambda-laa-test-dev-ruby-timeout
1.44K	lambda-laa-test-dev-node-outofmem
1.20K	xrav-step-functions-dev-acuoci-xrav-step-one
1.20K	gen-ad-preferences-dev-ad-server-model-create-dat...

## Errors

## Functions with most errors

956.00	lambda-layer-step-functions...
44.00	swf-hello-test

## Errors by function



## Error logs by function



## Throttled invocations by function

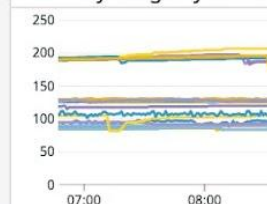


## Memory

## Functions using most m

196.90	lambda-laver-step-fun
191.61	lambda-laver-step-fun
189.72	lambda-laver-step-fun
188.60	lambda-laver-step-fun
188.53	lambda-laver-step-fun
128.49	lambda-laa-test-dev-n
128.35	lambda-laa-test-dev-n
126.17	post-coupon-us-ake-u
126.14	post-coupon-prod-us
124.58	lambda-laa-test-dev-n
123.75	lambda-laa-test-dev-n

## Memory usage by functi



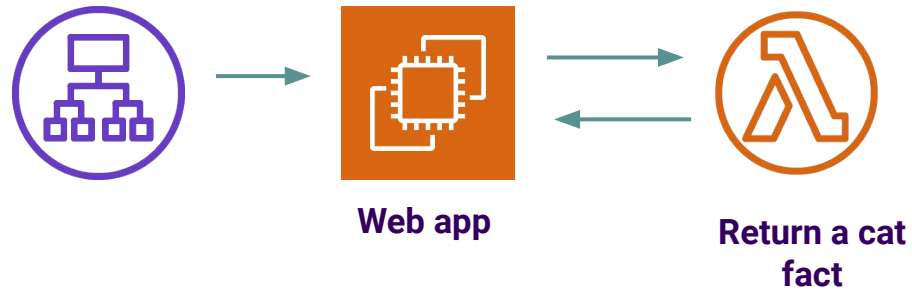
## Change in memory usag

191.57	lambda-laver-ste...
188.53	lambda-laver-ste...
126.13	post-coupon-pro...
128.47	lambda-laa-test-...
124.58	lambda-laa-test-...
128.35	lambda-laa-test-...
126.18	post-coupon-us-...
196.9	lambda-laver-ste...
189.68	lambda-laver-ste...
188.58	lambda-laver-ste...

The background is a solid purple gradient. Overlaid on this are several thin, teal-colored lines that form a series of interconnected geometric shapes, primarily triangles and quadrilaterals, creating a sense of depth and structure. These lines are positioned mostly on the right side of the image, with some extending towards the center.

**Let's Build!**

# Serverless Application



```
1qgbe5a78l.execute-api.us-east-1.amazonaws.com

{"fact": "The name \"jaguar\" comes from a Native American word meaning \"he who kills with one leap\".", "length": 89}
```



catfact.ninja

Swagger

Supported by SMARTBEAR

https://catfact.ninja/docs

Explore

Cat Fact API

1.0.0

OAS3

https://catfact.ninja/docs/api-docs.json

An API for facts about cats

Contact the developer

Facts

Cat Facts

GET

/fact

Get Random Fact

GET

/facts

Get a list of facts

Breeds

Breeds


GET

/breeds

Get a list of breeds

catfact.ninja/fact

```
{"fact": "Cats can judge within 3 inches the precise location of a sound being made 1 yard away.", "length": 86}
```

 DATADOG



serverless

```
serverless.yml
1  service: aws-python-http-api-leticia-santos
2  frameworkVersion: '3'
3
4  plugins:
5    - serverless-python-requirements
6
7  custom:
8    pythonRequirements:
9      dockerizePip: non-linux
10
11 provider:
12   name: aws
13   runtime: python3.8
14   profile: sandbox-leticia-santos # Add your profile name
15   region: us-east-1
16   tags:
17     datadog: true # Optional. Can be used for AWS Lambda resource exclusion
18     owner: Leticia Santos # Add your name
19   environment:
20     DD_ENV: test
21     DD_SERVICE: simple_http_api_leticia_santos
22     DD_VERSION: '1.0'
```

```
# Using Automatic Instrumentation
def get_request_1():
    response = requests.get('https://catfact.ninja/fact')
    return response
```

```
def hello(event, context):
    cat_facts = get_request_1()
    cat_facts_json = cat_facts.json()

    response = {"statusCode": 200, "body": json.dumps(cat_facts_json)}

    return response
```

```
25  functions:
26    | hello:
27    |   handler: handler.hello
28    |   events:
29    |     - httpApi:
30    |       | path: /
31    |       | method: get
32
```

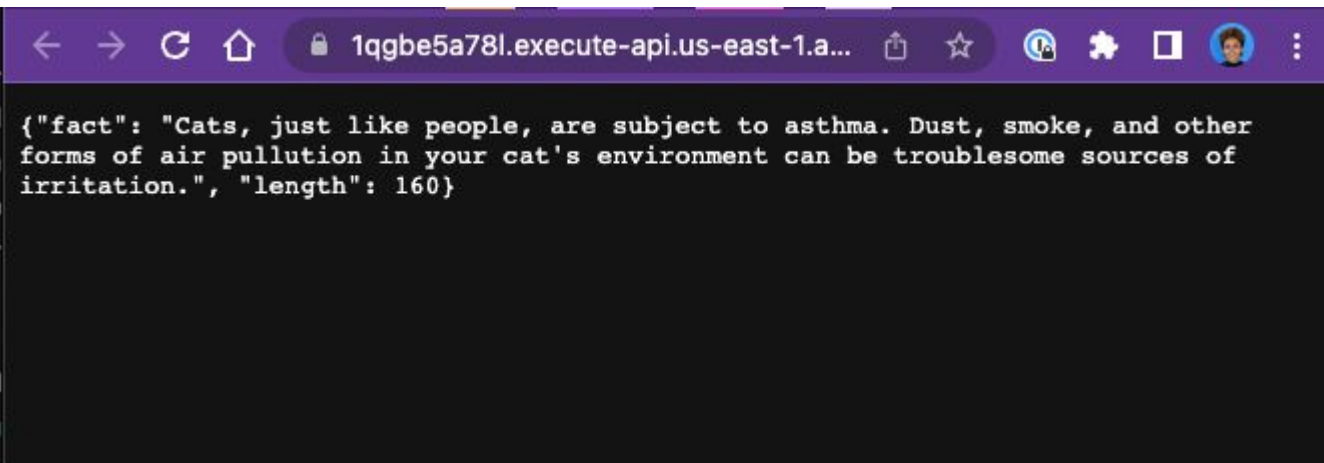
```
leticia.santos@ ~/dd/sandbox/serverless/lambda-extension/aws-python-http-api [main] $ serverless deploy
Running "serverless" from node_modules

Deploying aws-python-http-api-leticia-santos to stage dev (us-east-1)

✓ Service deployed to stack aws-python-http-api-leticia-santos-dev (133s)

endpoint: GET - https://1qgbe5a78l.execute-api.us-east-1.amazonaws.com/
functions:
  hello: aws-python-http-api-leticia-santos-dev-hello (33 MB)

Improve API performance – monitor it with the Serverless Dashboard: run "serverless"
leticia.santos@ ~/dd/sandbox/serverless/lambda-extension/aws-python-http-api [main] $
```




A screenshot of a web browser window. The address bar shows the URL `1qgbe5a78l.execute-api.us-east-1.a...`. The main content area displays a JSON response: `{"fact": "Cats, just like people, are subject to asthma. Dust, smoke, and other forms of air pollution in your cat's environment can be troublesome sources of irritation.", "length": 160}`.





# Integração com Datadog



DATADOG

Go to...

Watchdog

Events

Dashboards

Infrastructure

Monitors

Metrics

Integrations

APM

CI

Notebooks

Logs

Security

UX Monitoring

Integrations

Marketplace


Agent

Reference Tables

BETA


All

Available




.NET CLR

+ Available




.NET Runtime Metrics

+ Available




Active Directory

+ Available




ActiveMQ

+ Available




ActiveMQ XML

+ Available




Aerospike

+ Available




Airbrake

+ Available




Airflow

+ Available




Akamai DataStream

+ Available




Akamai DataStream 2

+ Available




Akamai mPulse

+ Available




AlertNow

+ Available




Algorithmia

+ Available



Alibaba Cloud

+ Available



Altostra

+ Available

# Datadog Integration



## ddtrace

Datadog's Python APM client

[Installation + Quickstart](#)

[Configuration](#)

[Integrations](#)

[Basic Usage](#)

[Advanced Usage](#)

[Benchmarks](#)

[Contributing](#)

[Troubleshooting](#)

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[Upgrading](#)

[API](#)

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## Datadog Python APM Client

**ddtrace** is Datadog's Python APM client. It is used to profile code and trace requests as they flow across web servers, databases and microservices. This enables developers to have greater visibility into bottlenecks and troublesome requests in their application.

### Getting Started

For a basic product overview: check out the [setup documentation](#).

For details about developing and contributing: refer to the [development guide](#).

For descriptions of the terminology of Datadog APM: take a look at the [official documentation](#).

### Supported Libraries

```
handler.py > ...  
1  import json  
2  import requests  
3  from ddtrace import tracer  
4  import time  
5
```

# Datadog Integration

```
# Using Automatic Instrumentation
def get_request_1():
    response = requests.get('https://catfact.ninja/fact')
    return response
```


```
# Using Decorator
@tracer.wrap(service="cat_service_2", resource="cat_facts_2")
def get_request_2():
    response = requests.get('https://catfact.ninja/fact')
    return response
```

```
# Using Context Manager
def get_request_3():
    with tracer.trace("cat_operation_3", service="cat_service_3", resource="cat_facts_3"):
        response = requests.get('https://catfact.ninja/fact')
    return response
```

```
# Using Manual
def get_request_4():
    span = tracer.trace("cat_operation_4", service="cat_service_4", resource="cat_facts_4")
    time.sleep(.2)
    response = requests.get('https://catfact.ninja/fact')
    span.set_tag("custom_key", "custom_value") # Adding a custom span tag
    span.finish()
    return response
```

# Datadog Integration

```
plugins:  
  - serverless-python-requirements  
  - serverless-plugin-datadog  
  
custom:  
  pythonRequirements:  
    dockerizePip: non-linux  
  datadog:  
    addExtension: true  
    apiKey: <YOUR_DD_API_KEY> # Add your Datadog API key
```



**DATADOG**

Go to...

Watchdog

Events

Dashboards

Infrastructure

Monitors

Metrics

Organization Settings ▾

Organization: Leticia Santos Sandbox | [Log Out](#)

ACCOUNTS

- Users
- Service Accounts

GROUPS

- Roles
- SAML Group Mappings

ACCESS

- API Keys**
- Application Keys
- Client Tokens

## API Keys

[+ New Key](#)

Your API Keys are unique to your organization. An API key is required by the Datadog Agent to submit metrics and events to Datadog.

Filter by name, id, or creator

Showing 1-2 of 2 API Keys

NAME	KEY ID	KEY	CREATED ON
API Key created by leticia.santos@datadog.com o...	4f27ff70-e764-...	.....4fb8	Oct 20, 2022, 4:35 ...
AWS-Integration	06eb7f6f-3cbc-...	.....654a	Oct 20, 2022, 5:06 ...

Results per page: 50 ▾



# Datadog Integration

```
leticia.santos@ ~/dd/sandbox/serverless/lambda-extension/aws-python-http-api [main] $ serverless deploy
Running "serverless" from node_modules

Deploying aws-python-http-api-leticia-santos to stage dev (us-east-1)
Auto instrumenting functions with Datadog
Adding Lambda Library Layers to functions
Adding Datadog Lambda Extension Layer to functions
Adding Plugin Version 4.1.0 tag
Adding service and environment tags
Adding Plugin Version 4.1.0 tag
Adding service and environment tags
Datadog Monitoring
functions
  hello: https://app.datadoghq.com/functions/aws-python-http-api-leticia-santos-dev-hello:us-east-1:601427279990:aws?source=sls-plugin
View Serverless Monitors
  https://app.datadoghq.com/monitors/manage?q=tag%3A%28%22env%3Adev%22AND%22service%3Aaws-python-http-api-leticia-santos%22%29

✓ Service deployed to stack aws-python-http-api-leticia-santos-dev (166s)

endpoint: GET - https://1qgbe5a78l.execute-api.us-east-1.amazonaws.com/
functions:
  hello: aws-python-http-api-leticia-santos-dev-hello (40 MB)

Improve API performance – monitor it with the Serverless Dashboard: run "serverless"
leticia.santos@ ~/dd/sandbox/serverless/lambda-extension/aws-python-http-api [main] $
```

# Datadog can collect from your functions:

- **Logs**
- **Traces**
- **Execution data**

The background features a solid purple field with several thin, teal-colored lines. These lines are arranged in a series of parallel, slightly angled paths that create a sense of depth and movement, resembling a stylized architectural or geometric pattern.

# Logs

# Logs

```
import logging

# Set logger
logger = logging.getLogger()
logger.setLevel(logging.INFO)

# Using Automatic Instrumentation
def get_request_1():
    logger.info("Requesting cat ninja API")
    response = requests.get('https://catfact.ninja/fact')
    return response
```



Search for

Filter your logs

</>

📄

+ Add ...

Group into

Fields

Patterns

Transactions

Visualize as

List

Timeseries

Top List

Table

Tree Map

Pie Chart



Search facets

Showing 22 of 22

+ Add

CORE

> Index

> Source

> Host

> Service

☒ simple\_http\_api\_leticia\_... 9

> Status

☒ Error 0

☒ Warn 0

☒ Info 9

> Watchdog Insights

DATE	HOST	SERVICE	CONTENT
Oct 22 11:27:33.276	arn:aws:lambda:us-east-1:601427279990:f...	simple_http_api_leticia_santos	REPORT <a href="#">RequestId: 4903d545-0d71-4ac4-bbb2-6fd57d...</a>
Oct 22 11:27:33.276	arn:aws:lambda:us-east-1:601427279990:f...	simple_http_api_leticia_santos	END <a href="#">RequestId: 4903d545-0d71-4ac4-bbb2-6fd57dc41...</a>
Oct 22 11:27:32.755	arn:aws:lambda:us-east-1:601427279990:f...	simple_http_api_leticia_santos	START <a href="#">RequestId: 4903d545-0d71-4ac4-bbb2-6fd57dc...</a>
Oct 22 11:26:11.846	arn:aws:lambda:us-east-1:601427279990:f...	simple_http_api_leticia_santos	REPORT <a href="#">RequestId: ec4e93de-bd74-4be5-8d1b-c90177...</a>
Oct 22 11:26:11.846	arn:aws:lambda:us-east-1:601427279990:f...	simple_http_api_leticia_santos	END <a href="#">RequestId: ec4e93de-bd74-4be5-8d1b-c90177de1...</a>
Oct 22 11:26:11.377	arn:aws:lambda:us-east-1:601427279990:f...	simple_http_api_leticia_santos	START <a href="#">RequestId: ec4e93de-bd74-4be5-8d1b-c90177d...</a>
Oct 22 11:26:07.586	arn:aws:lambda:us-east-1:601427279990:f...	simple_http_api_leticia_santos	REPORT <a href="#">RequestId: 2e0c4274-1118-472c-8d97-078bbe...</a>
Oct 22 11:26:07.586	arn:aws:lambda:us-east-1:601427279990:f...	simple_http_api_leticia_santos	END <a href="#">RequestId: 2e0c4274-1118-472c-8d97-078bbe1d9...</a>
Oct 22 11:26:06.998	arn:aws:lambda:us-east-1:601427279990:f...	simple_http_api_leticia_santos	START <a href="#">RequestId: 2e0c4274-1118-472c-8d97-078bbe1...</a>

# System metrics



aws-python-http-api-leticia-santos-dev-hello

1h

Oct 22, 10:33 am – Oct 22, 11:33 am



## SERVICE

simple\_http\_api\_leticia\_santos

## REGION

us-east-1

## AWS ACCOUNT

601427279990

## RUNTIME

python3.8



Show Latest Deployment Events



Invocations (Enhanced)



Errors (Enhanced)



Runtime Duration



Invocations

Error Tracking

Logs

Metrics

Deployments

Configuration

3 invocations with **traces** found

Filters (1)

DATE	DURATION	TRIGGER	ERROR	TRACE	LOGS	INSIGHTS
Oct 22 11:27:32.754	521 ms	GET /	—	Open Trace →	3	—
Oct 22 11:26:11.377	469 ms	GET /	—	Open Trace →	3	—
Oct 22 11:26:06.997	588 ms + 965 ms init	GET /	—	Open Trace →	2	COLD START



DATADOG

**Trace**

The background of the slide is a solid purple color. Overlaid on this background is a series of thin, light blue lines that intersect to form a series of triangles and other geometric shapes. The lines are arranged in a way that creates a sense of depth and movement, with some lines appearing to recede into the distance. The overall effect is a modern, abstract design.

cat\_service\_3

env:test operation:cat\_operation\_3 version:\*

Related Dashboards Service Info

No Monitors or Synthetic Tests

Watchdog Insights

## Service Summary

### DEPLOYMENTS

Active: 1.0 2m ago

### ERROR TRACKING

NO ISSUES Error Rate: 0%

### SLOs

+ Create new

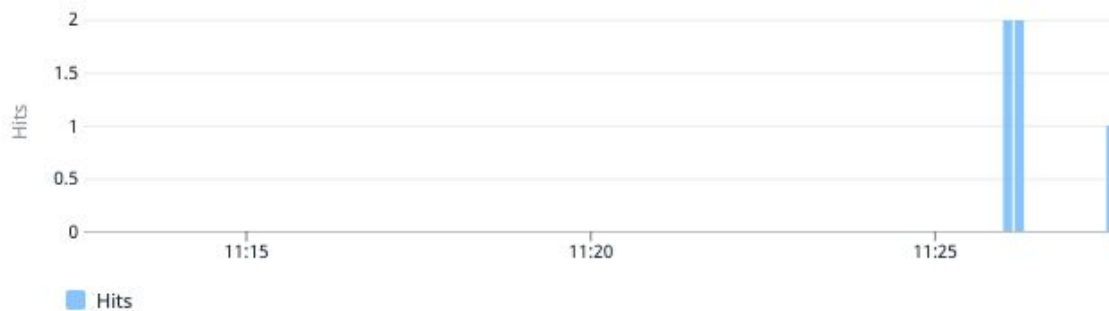
NONE Get started

### INCIDENTS

+ Declare new

NO REPORTED INCIDENTS

Requests and Errors 5 total (< 0.1 req/s)



Latency

Log scale





🌐 **qgbe5a78l.execute-api.us-east-1.amazonaws.com** > GET /

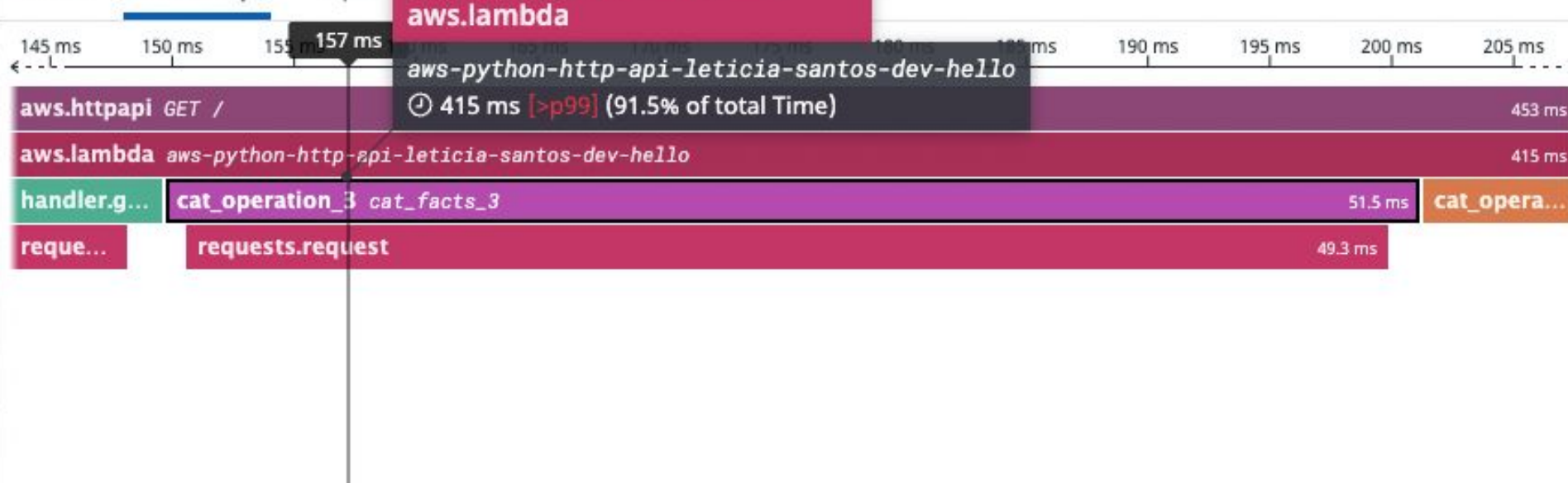
[Open Full Page](#) | ✕

🕒 453 ms total duration GET 1qgbe5a78l.execute-api.us-east-1.amazonaws.com/ 200 OK

on Oct 22 11:27:32.718 (1m ago)

Trace: Flame Graph Span

[Hide Legend](#) >



Service	% Exec Time	
simple_http_api...	45.7%	<div></div>
cat_service_4	44.8%	<div></div>
qgbe5a78l.exec...	8.53%	<div></div>
cat_service_2	0.59%	<div></div>
cat_service_3	0.47%	<div></div>

# Learn more!

<https://learn.datadoghq.com/>

**Learn Datadog through a free  
course series!**





# DATADOG

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**`leticia.santos@datadoghq.com`**

**<https://www.linkedin.com/in/tixas2/>**