AWS re:Invent

NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

SVS304-R2

Understanding and implementing observability for serverless apps

Julian Wood
Senior Developer Advocate, Serverless
AWS

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About me



Julian Wood

- Senior Developer Advocate – AWS Serverless
  - Twitter: @julian_wood
  - Email: jrwood@amazon.com
- Recovering server“more” infrastructure engineer
  - Enterprises + startups
- You can’t scare me, I have twin girls!
- From Cape Town via London

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What are we covering today?

My ideas

- What is observability?
- Chalking and talking
- Tooling

Your ideas

- ???????

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What is observability?

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Monitoring needs to evolve



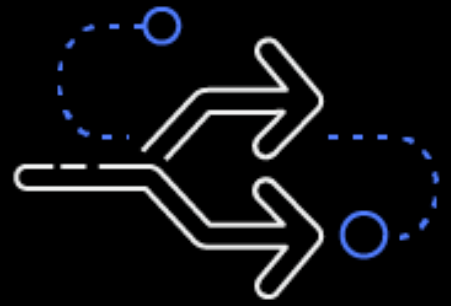
User experience



Short-lived resources



More devices, services, data



Faster release velocity

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Observability then and now



Traditional server



AWS Lambda function



AWS Lambda function



AWS Lambda function



AWS Lambda function

Centralized code

Distributed code

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Observability theory

Rudolf E. Kálmán – 1961

“On the General Theory of Control Systems”

“Observability is a measure of how well internal states of a system can be inferred by knowledge of its external outputs.”

https://en.wikipedia.org/wiki/Control_theory
https://en.wikipedia.org/wiki/Observability

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Chalking and talking!

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Monitoring !=
Observability

Investing in observability culture

Humans matter most

- Building alerts
- Creating dashboards
- Building workflows and tools

Observability is practiced

- Building and testing hypotheses about your systems
- Using observability before and after a problem
- Data-driven decisions



What?

We're doing what?



How?

The specific actions



When?

Timelines and communication

aws

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Chalking and talking!

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Amazon CloudWatch

1 quadrillion+
(1,000,000,000,000,000+)
metric observations each month

Monitors entire infrastructure of AWS and Amazon.com

3.9 trillion
events each month

100 PB
logs ingested each month

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AWS Partner, AWS Lambda Ready Partner

SERVERLESS MONITORING AND OBSERVABILITY TOOLS

























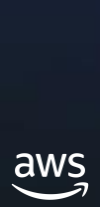


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Chalking and talking!

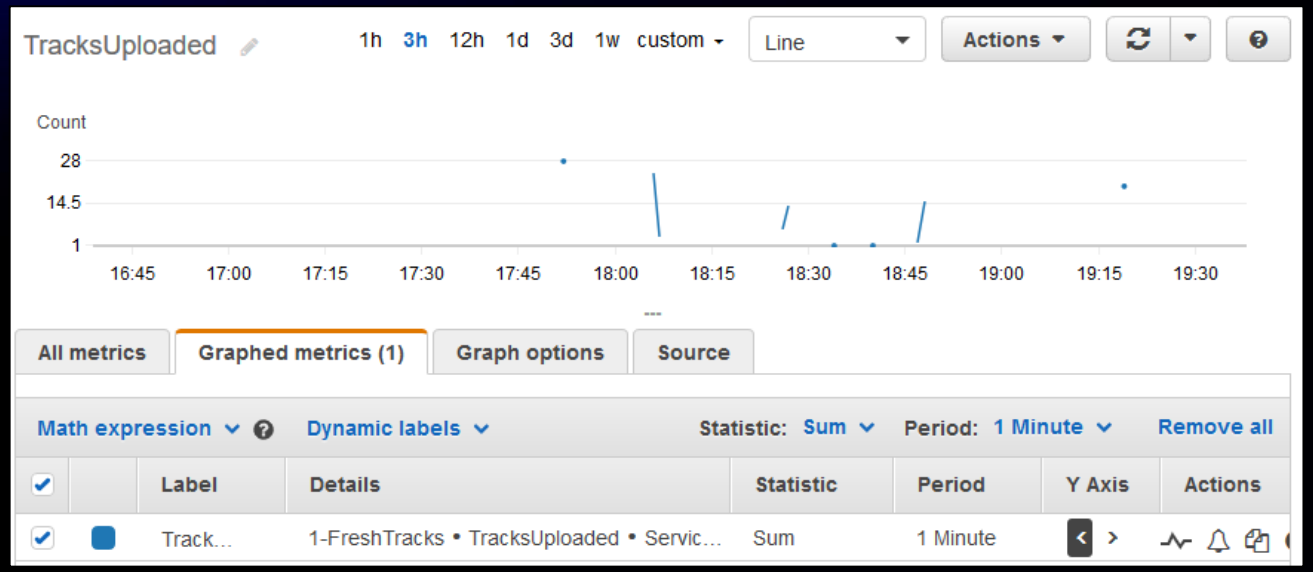
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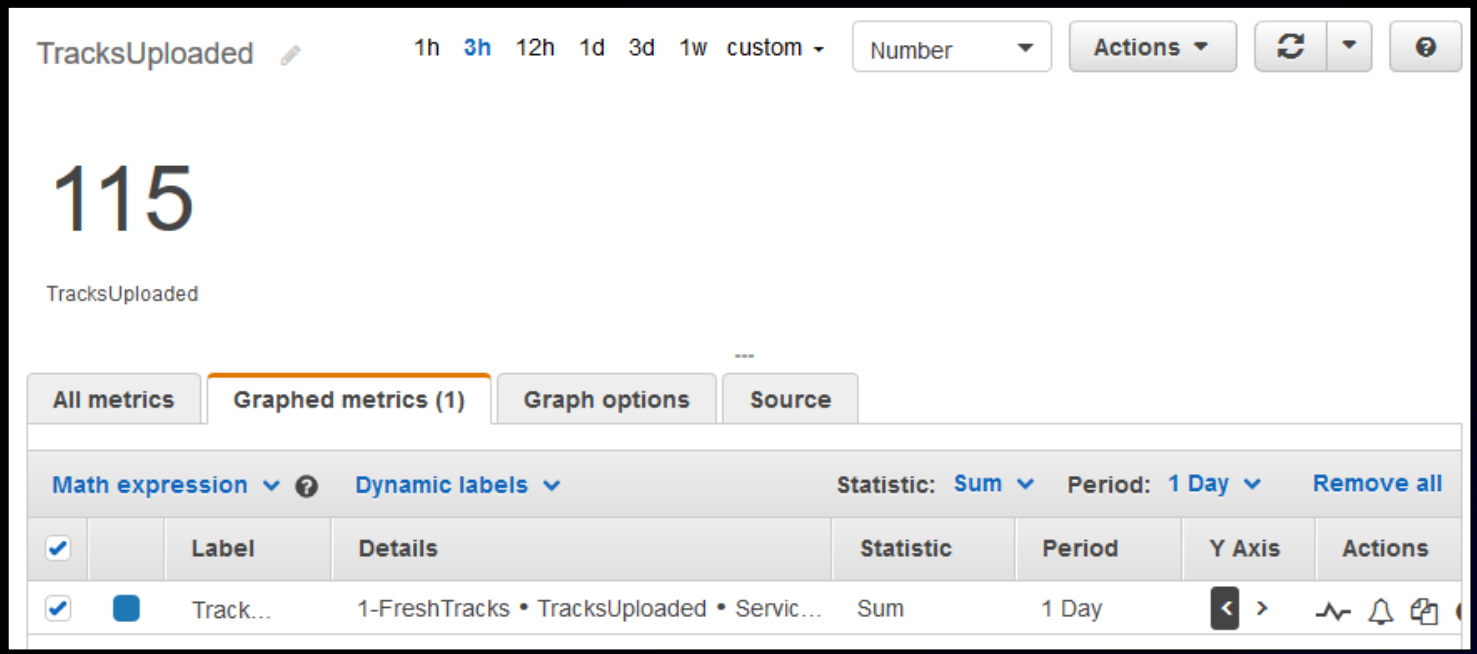
Metrics

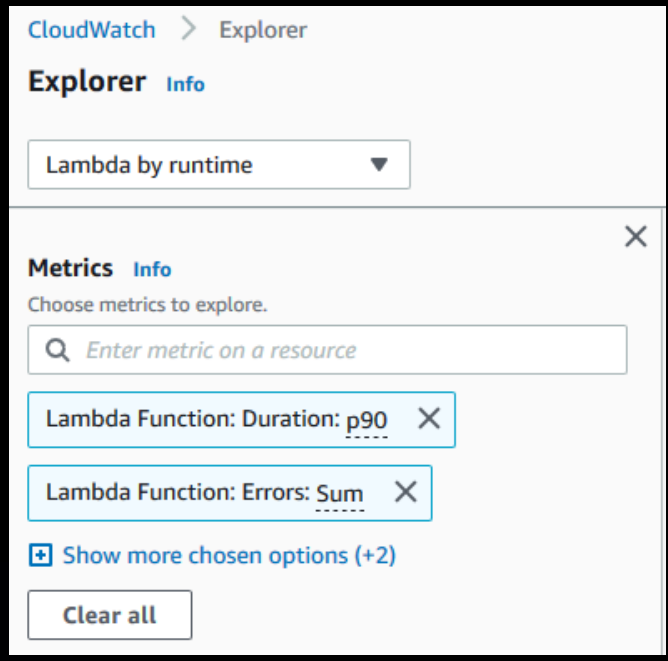


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Visualize with CloudWatch metrics graphs





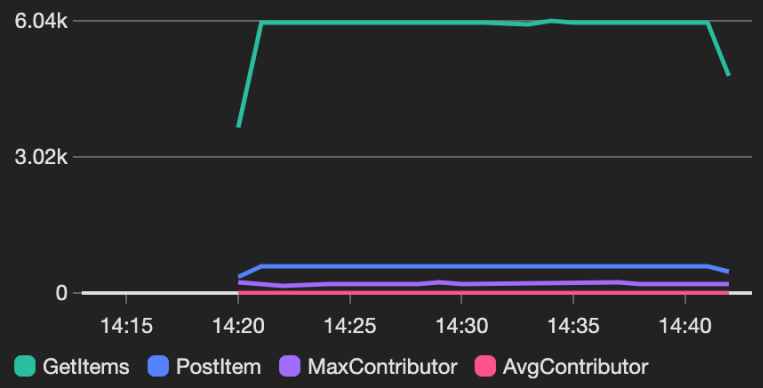


CloudWatch Metrics Explorer
https://s12d.com/cw-me

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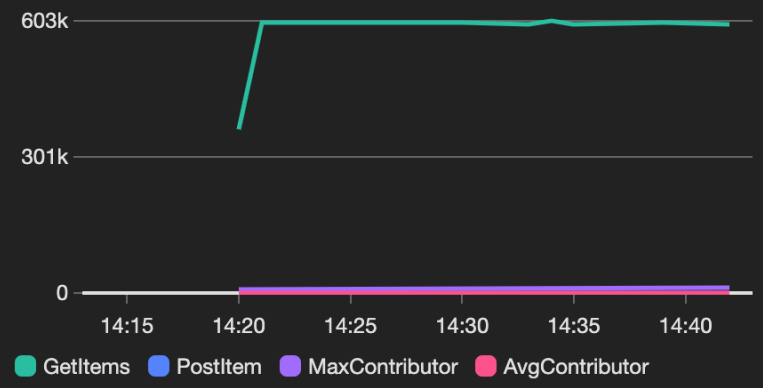
Requests

Various units



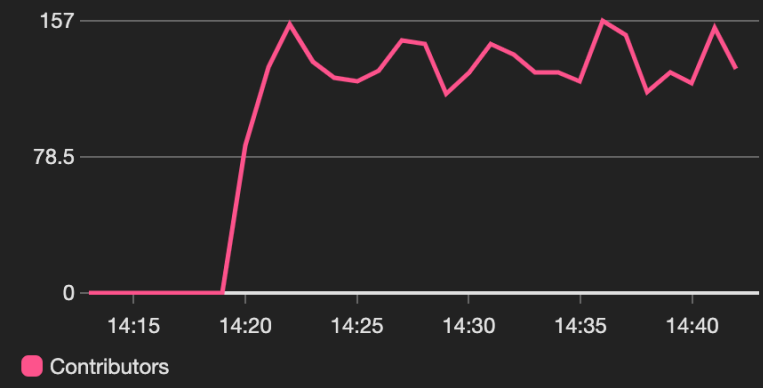
Items

No unit



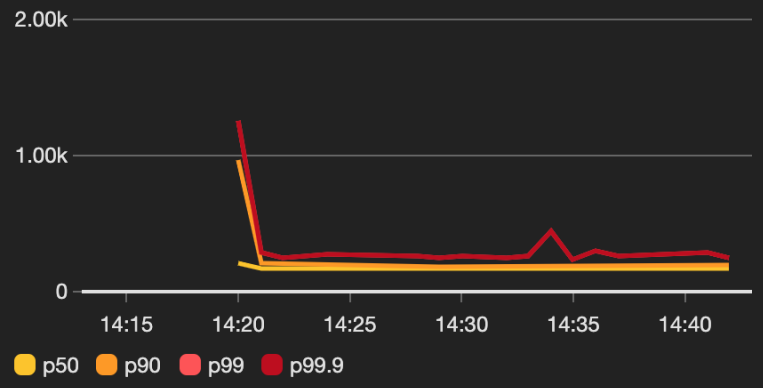
Number of contributors

No unit



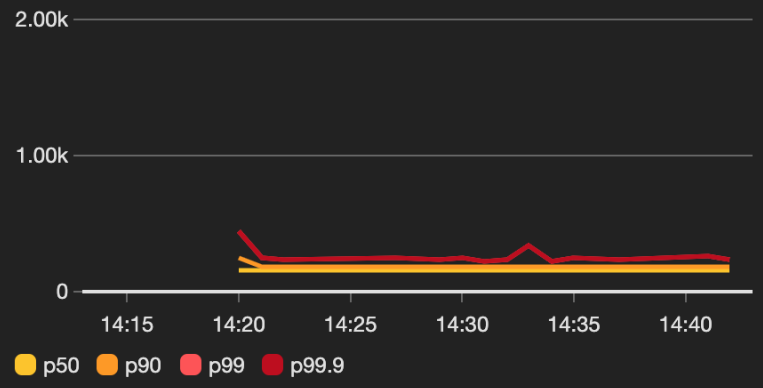
API Gateway Latency

Milliseconds



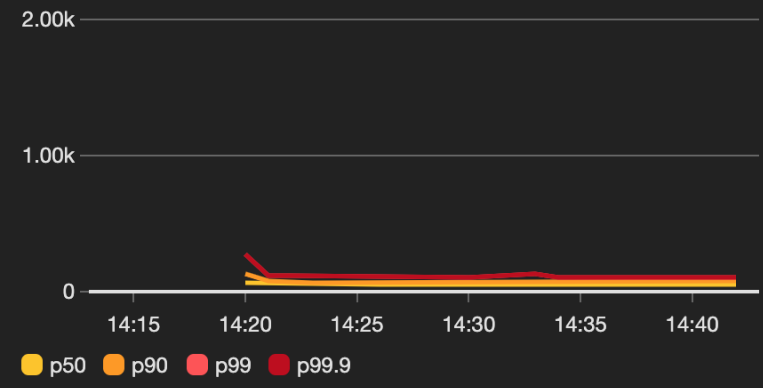
GetItems Duration

Milliseconds



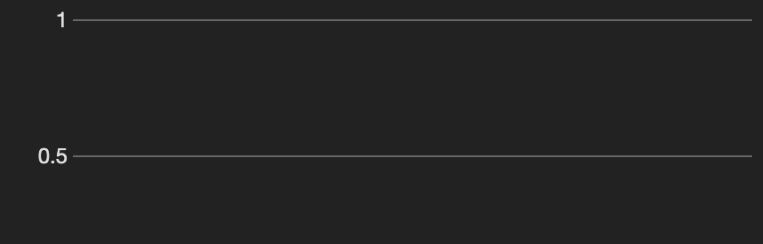
PostItem Duration

Milliseconds



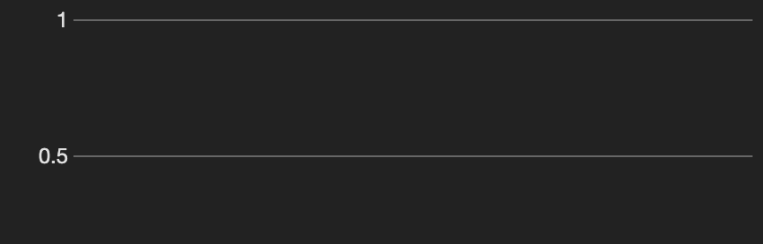
Backend Errors

Count



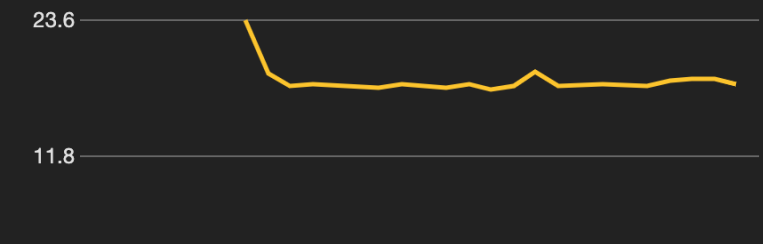
Throttles

Count

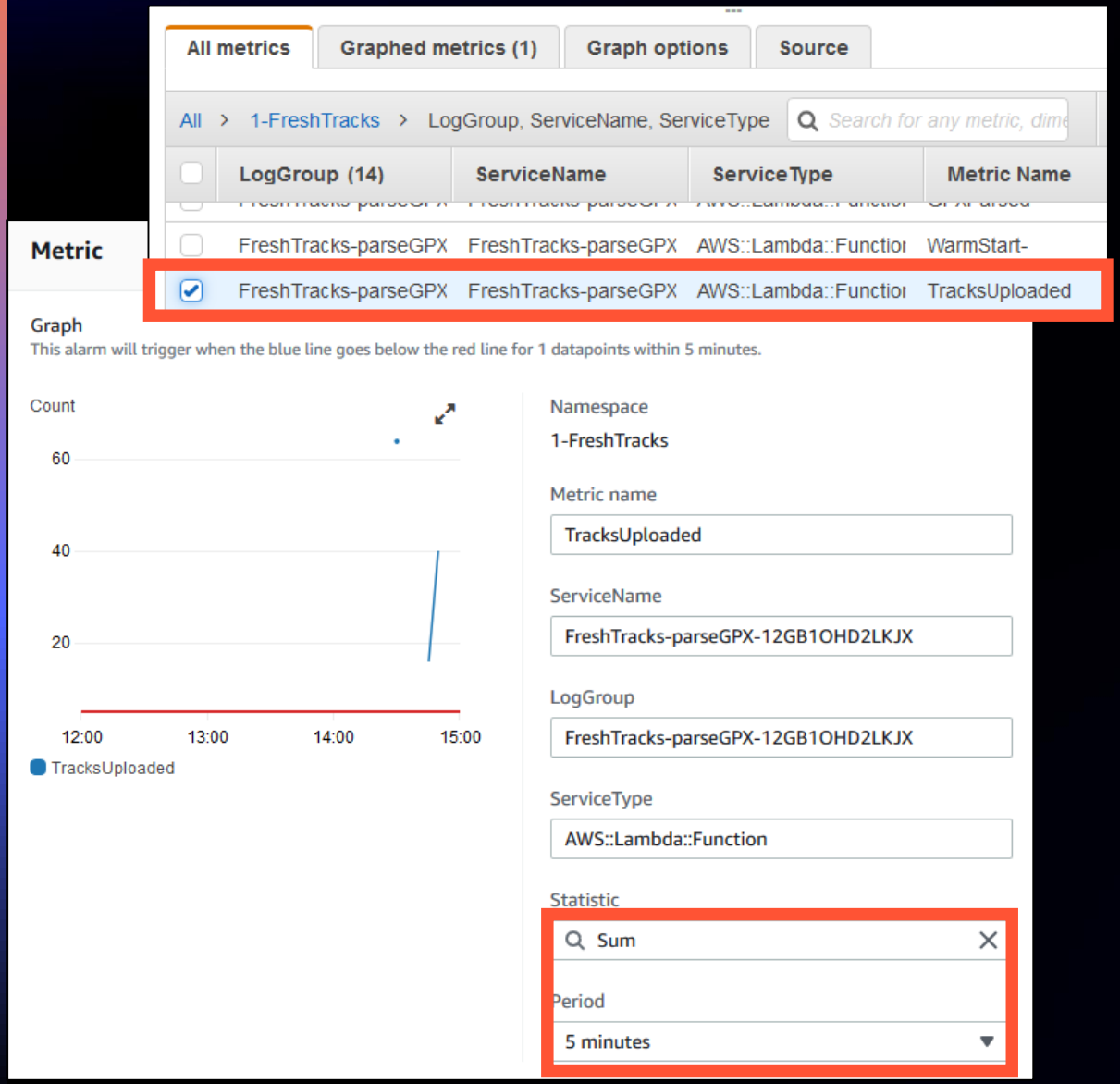


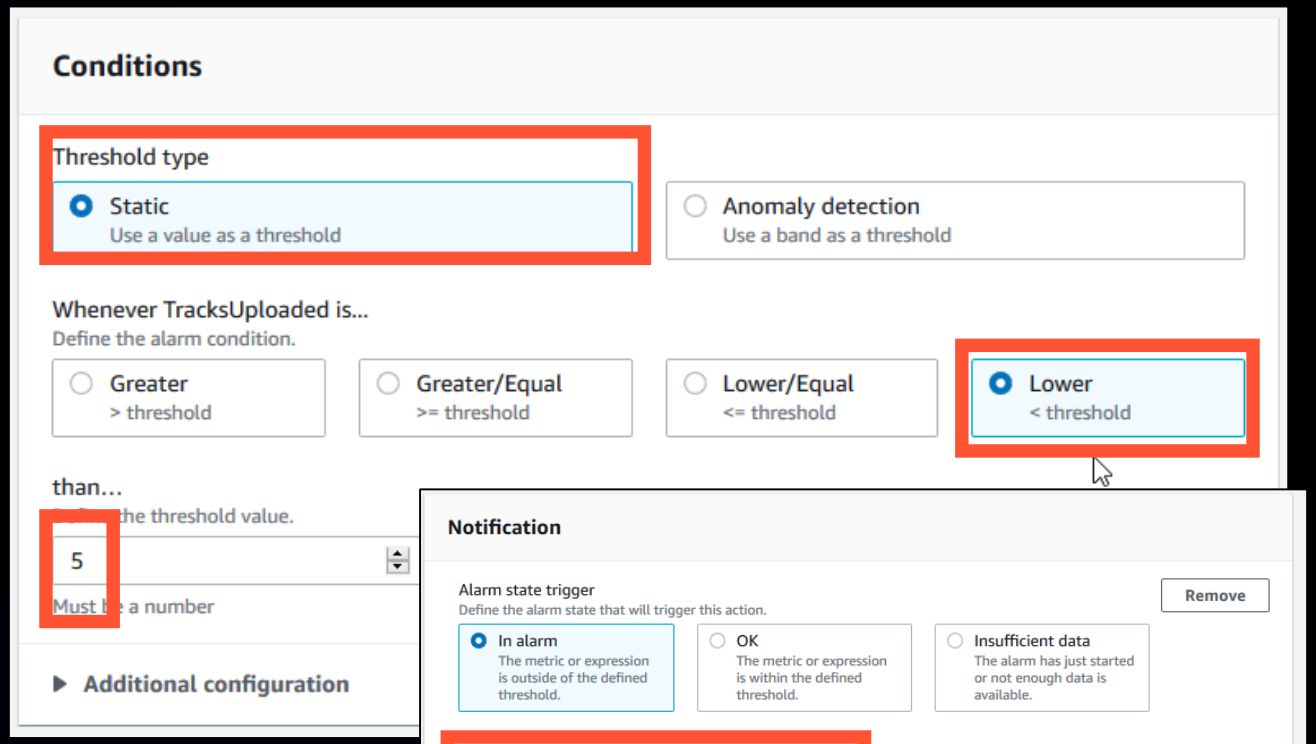
Concurrent Executions

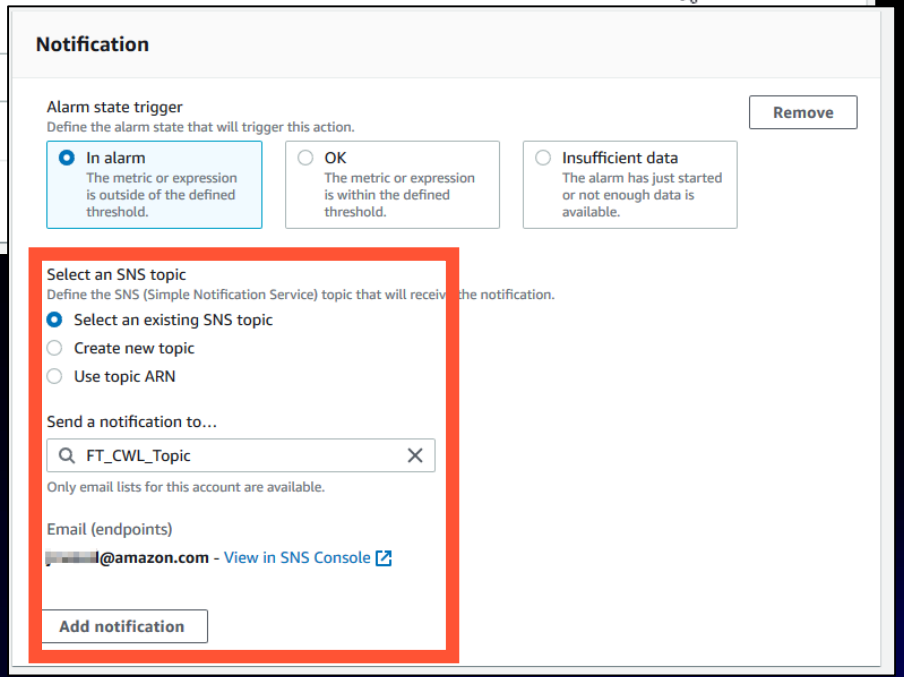
Count



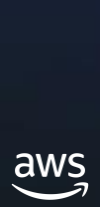
Creating CloudWatch alarms







Logs



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Language logging (Python example)

```
import os
def lambda_handler(event, context):
    print('Hi From Lambda!')
    print('## ENVIRONMENT VARIABLES: ', os.environ)
    print('## EVENT: ', event)
```

```
START RequestId: 8f507cfc-xmpl-4697-b07a-ac58fc914c95 Version: $LATEST
Hi from Lambda!
## ENVIRONMENT VARIABLES: environ({'AWS_LAMBDA_LOG_GROUP_NAME': '/aws/lambda/my-funct
## EVENT: {'key': 'value'}
END RequestId: 8f507cfc-xmpl-4697-b07a-ac58fc914c95
REPORT RequestId: 8f507cfc-xmpl-4697-b07a-ac58fc914c95  Duration: 15.74 ms
Billed Duration: 16 ms Memory Size: 128 MB Max Memory Used: 56 MB
Init Duration: 130.49 ms
XRAY TraceId: 1-5e34a614-10bdxmplf1fb44f07bc535a1   SegmentId: 07f5xmpl2d1f6f85 Sampl
```

aws

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Amazon CloudWatch embedded metric format

AUTOMATICALLY CREATE METRICS FROM LOG ENTRIES

Event payload

```
message = {
  "PriceInCart": 100,
  "QuantityInCart": 2,
  "ProductId": "a23390f3",
  "CategoryId": "bca4cec1",
  "Environment": "prod",
  "UserId": "31ba3930",
  "CartId": "58dd189f",
"LogLevel": "INFO",
  "Timestamp": "2019-12-11
12:44:40.300473",
  "Message": "Added 2 items
'a23390f3' to cart '58dd189f'"
}
```

Log entry

```
[...]
  "_aws": {
 "functionVersion": "$LATEST",
   "Timestamp": 1576064416496,
    "CloudWatchMetrics": [{
      "Namespace": "ecommerce-cart",
      "Dimensions": [
        ["Environment", "CategoryId"]
      ],
      "Metrics": [
        {"Name": "PriceInCart", "Unit": "None"},
        {"Name": "QuantityInCart", "Unit": "None"}
      ]}],
 "Environment": "prod",
 "CategoryId": "bca4cec1"
 "PriceInCart": 100,
 "QuantityInCart": "2"
}
```

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message =
  "PriceInCart": 100,
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  "CategoryId": "bca4cec1",
  "Environment": "prod",
  "UserId": "[redacted]",
  "CartId": "58dd189f",
"LogLevel": "INFO",
  "Timestamp": "2019-12-11
12:44:40.300473",
  "Message": "Added 2 items
'a23390f3' to cart '58dd189f'"
}
```

Log entry

```
"functionVersion": "$LATEST",
96,
e-cart",
egoryId"]
t", "Unit": "None"},
Cart", "Unit": "None"}
"CategoryId": "bca4cec1"
"PriceInCart": 100,
"QuantityInCart": "2"
}
```

Open-source client libraries available for

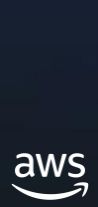
- Node.js
- Python
- Java

https://s12d.com/cwl-emf-client

aws

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Tracing



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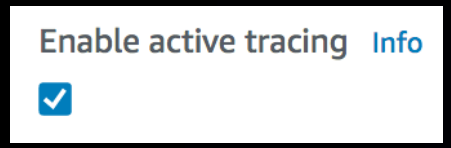
AWS X-Ray

End-to-end view of requests flowing through an application

- AWS Lambda – instruments incoming requests for all supported languages and can capture calls made in code

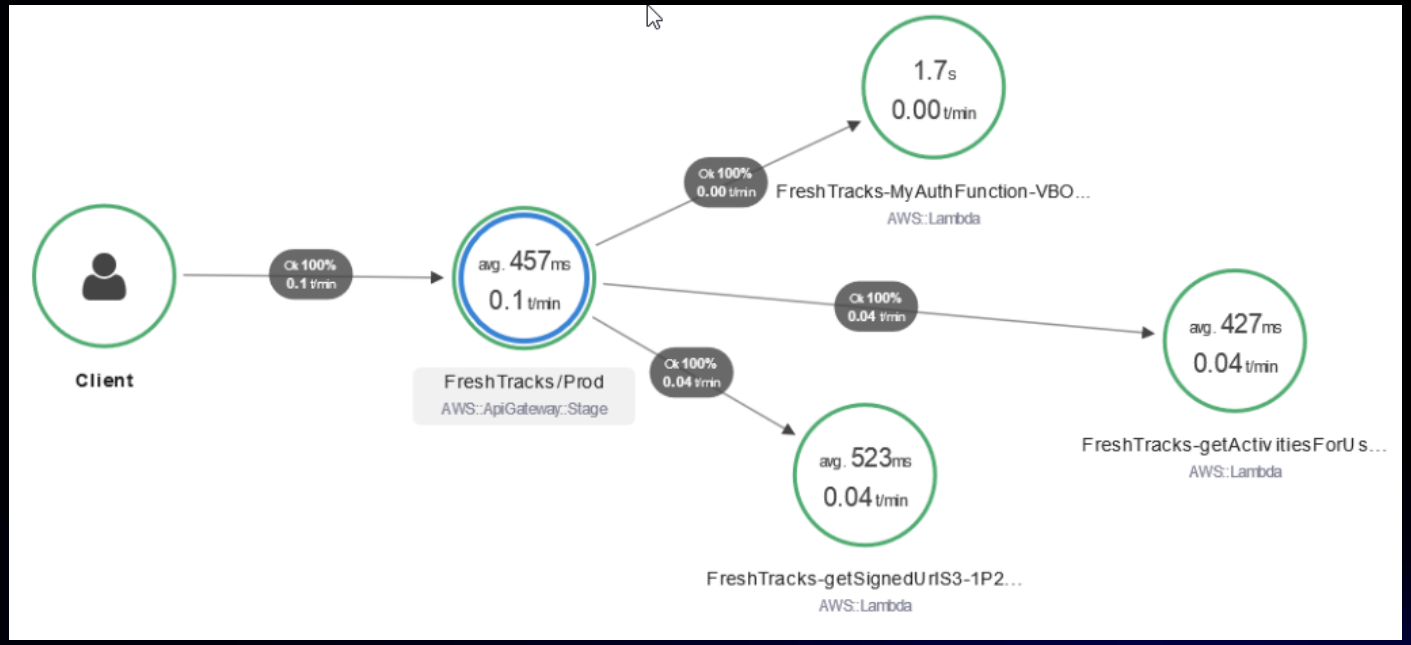


- Amazon API Gateway – inserts a tracing header into HTTP calls as well as reports data back to X-Ray itself




```
const AWSXRay = require('aws-xray-sdk-core');
const AWS = AWSXRay.captureAWS(require('aws-sdk'));

const documentClient = new AWS.DynamoDB.DocumentClient();
```



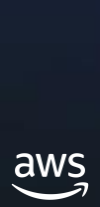
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X-Ray trace example



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Tooling



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My Fresh Tracks | CloudWatch Management Conso

console.aws.amazon.com/cloudwatch/home?region=us-east-1#servicelens:map

aws Services Search for services, features, marketplace products, and docs [Alt+S] Twitter:@julian_wood N. Virginia Support

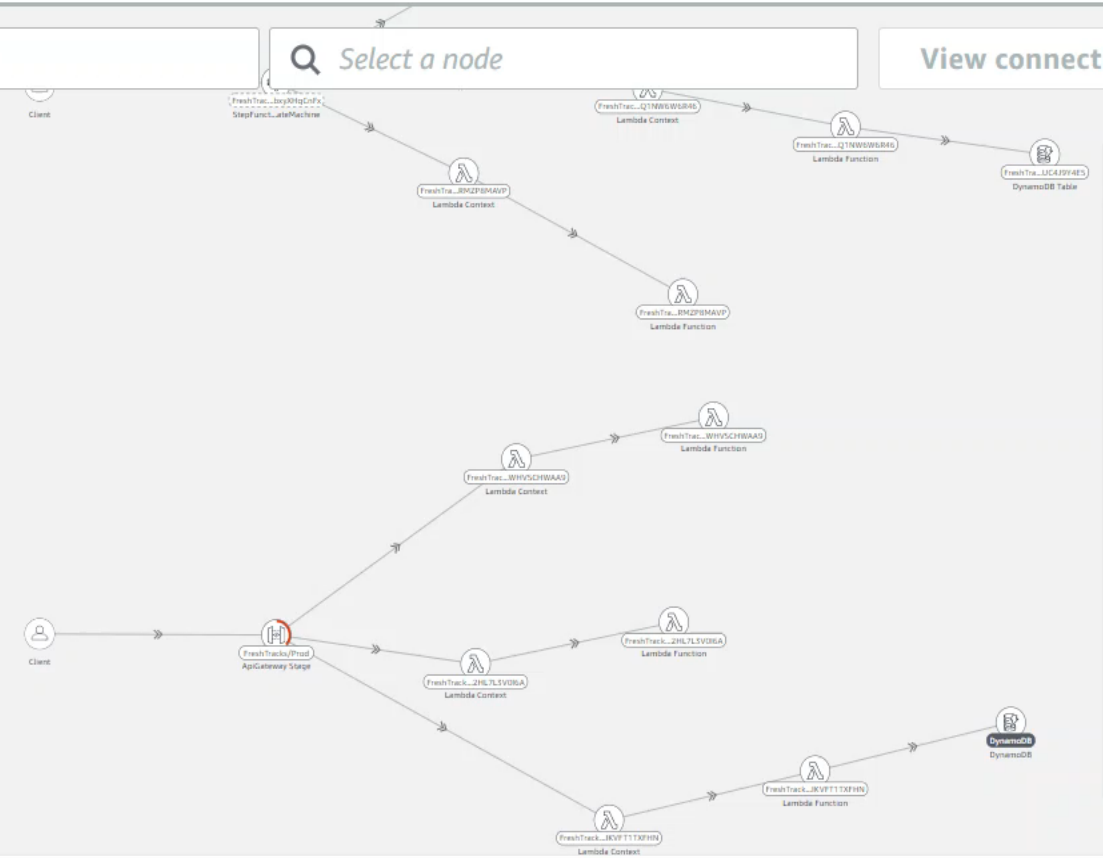
CloudWatch

- Dashboards
- Alarms
  - In alarm 0
  - Insufficient data 0
  - OK 2
  - Billing
- Logs
  - Log groups
  - Insights
- Metrics
  - Explorer New
- Events
  - Rules
  - Event Buses
- ServiceLens
  - Service Map
  - Traces
- Container Insights New
  - Resources
  - Performance monitoring

CloudWatch > Service Map

5m 15m 30m 1h 3h 6h Custom | Map view | List view

Filter by X-Ray group | Select a node | View connections



Map legend

- Fault (5xx)
- Error (4xx)
- Throttle
- Current alarms
- AWS service: Service name
- AWS resource: Resource name
- Unknown node: Node name

Settings

- Size is requests
- Canaries with faults or errors

No node selected

View logs | View traces | View dashboard

Feedback English (US)

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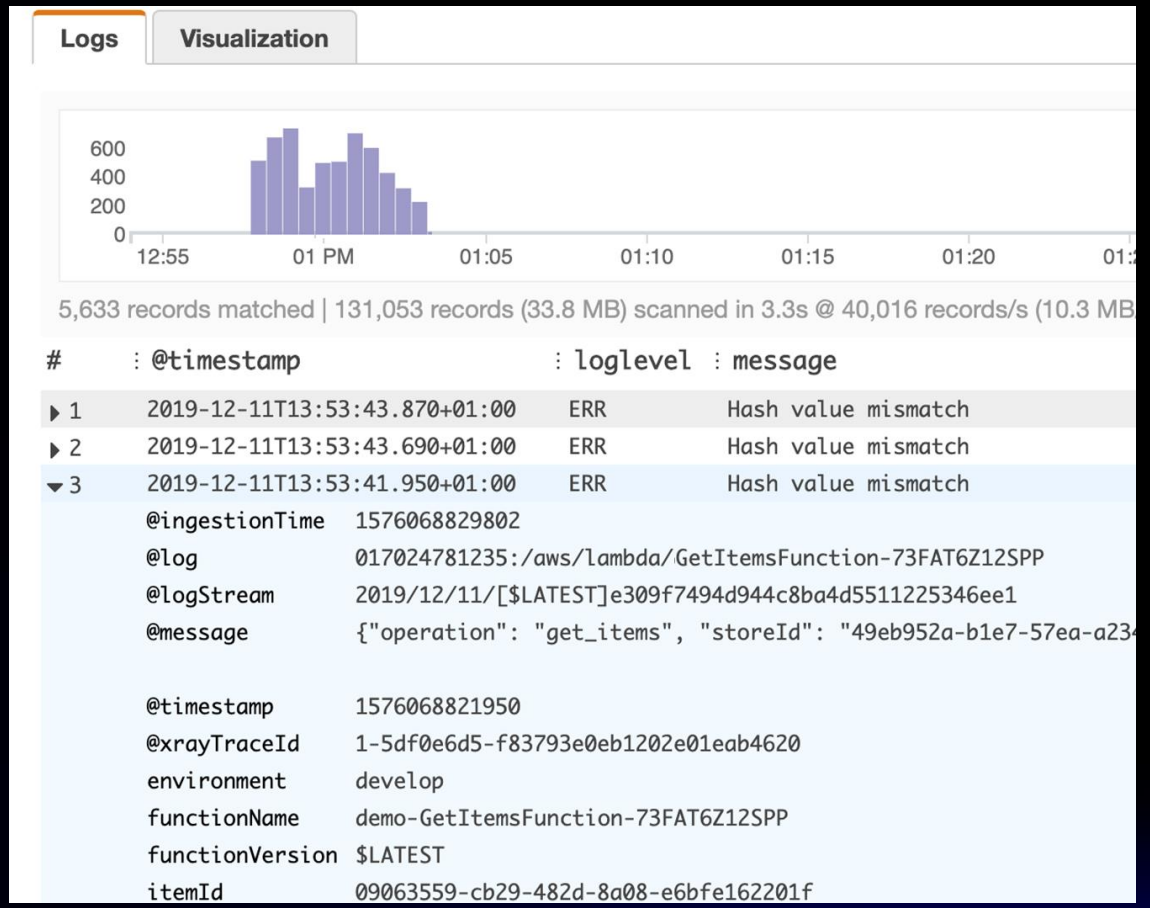
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CloudWatch Logs Insights

INTERACTIVELY SEARCH AND ANALYZE YOUR LOG DATA IN CLOUDWATCH LOGS

- Processes structured log data
- Flexible purpose-built query language
- Query up to 20 log groups
- Save queries

```
fields Timestamp, LogLevel, Message
| filter LogLevel == "ERR"
| sort @timestamp desc
| limit 100
```



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CloudWatch Logs Insights examples

- Most recent 100 errors
- Top 100 most expensive invocations
- Cold start percentage over time
- Cold starts and InitDuration
- Checking Lambda performance
- Exclude informational logs
- Invocations using 100% assigned memory
- Over-provisioned memory
- Upload file sizes
- Latency report

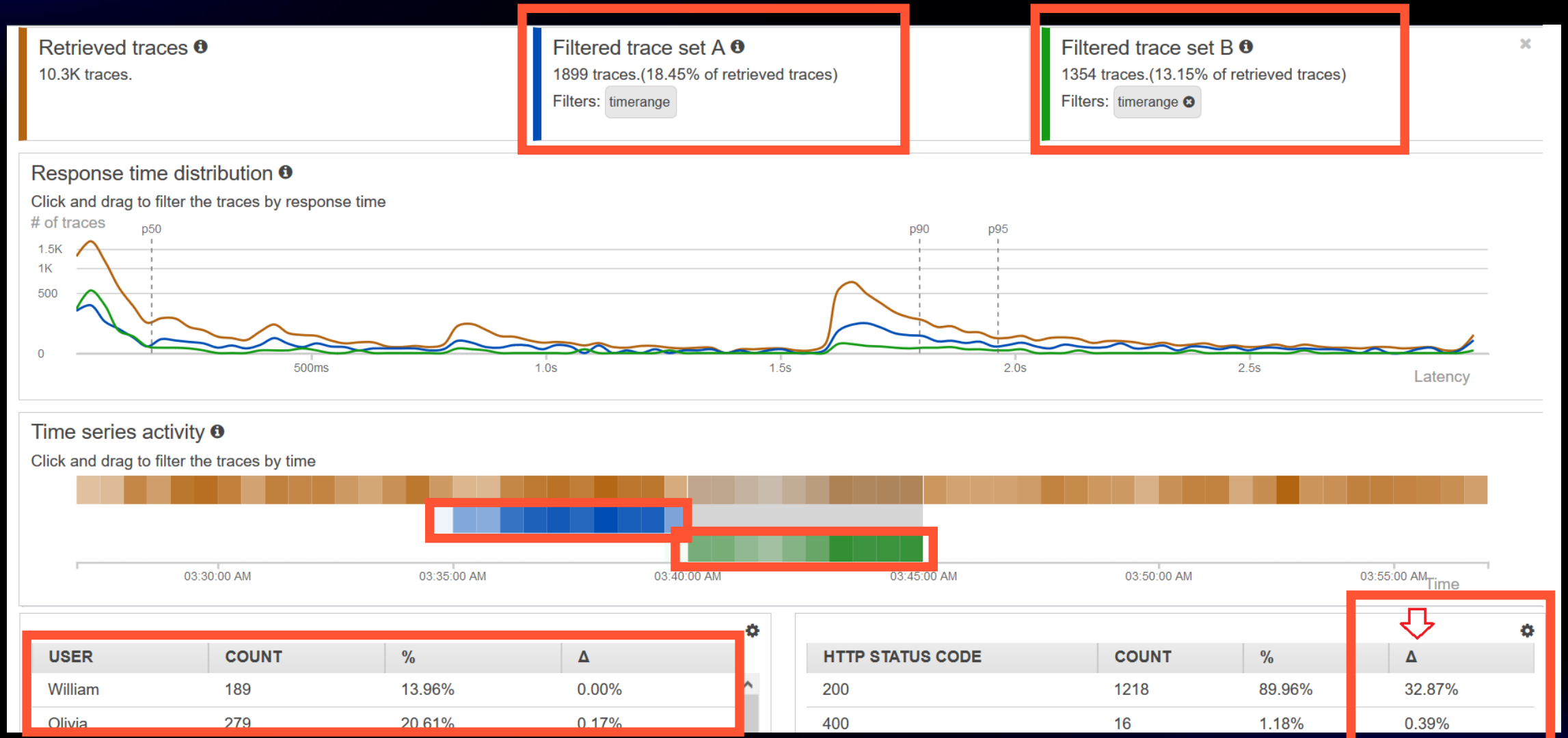


https://s12d.com/loginsights-examples

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X-Ray Analytics example



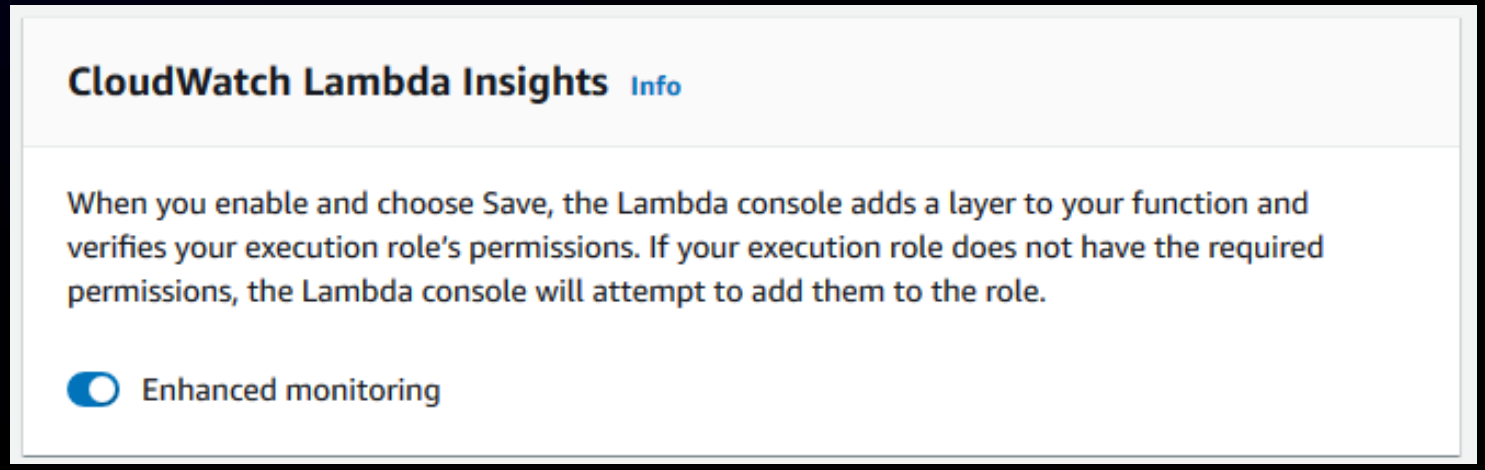
USER	COUNT	%	Δ
William	189	13.96%	0.00%
Olivia	279	20.61%	0.17%

HTTP STATUS CODE	COUNT	%	Δ
200	1218	89.96%	32.87%
400	16	1.18%	0.39%

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CloudWatch Lambda Insights

MONITOR, TROUBLESHOOT, AND OPTIMIZE THE PERFORMANCE OF LAMBDA FUNCTIONS



Use cases

- Identify function issues, such as memory leaks
- Identify high-cost functions
- Identify performance changes caused by new function versions
- Understand latency drivers in functions

Features

- Deep linking and correlations across metrics, logs, and traces
- Automated dashboards showing function performance and health
- Deeper integration with CloudWatch Logs Insights and CloudWatch ServiceLens
- New Lambda performance metrics with observable context

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Lambda extensions

A NEW WAY TO INTEGRATE WITH THE LAMBDA EXECUTION ENVIRONMENT

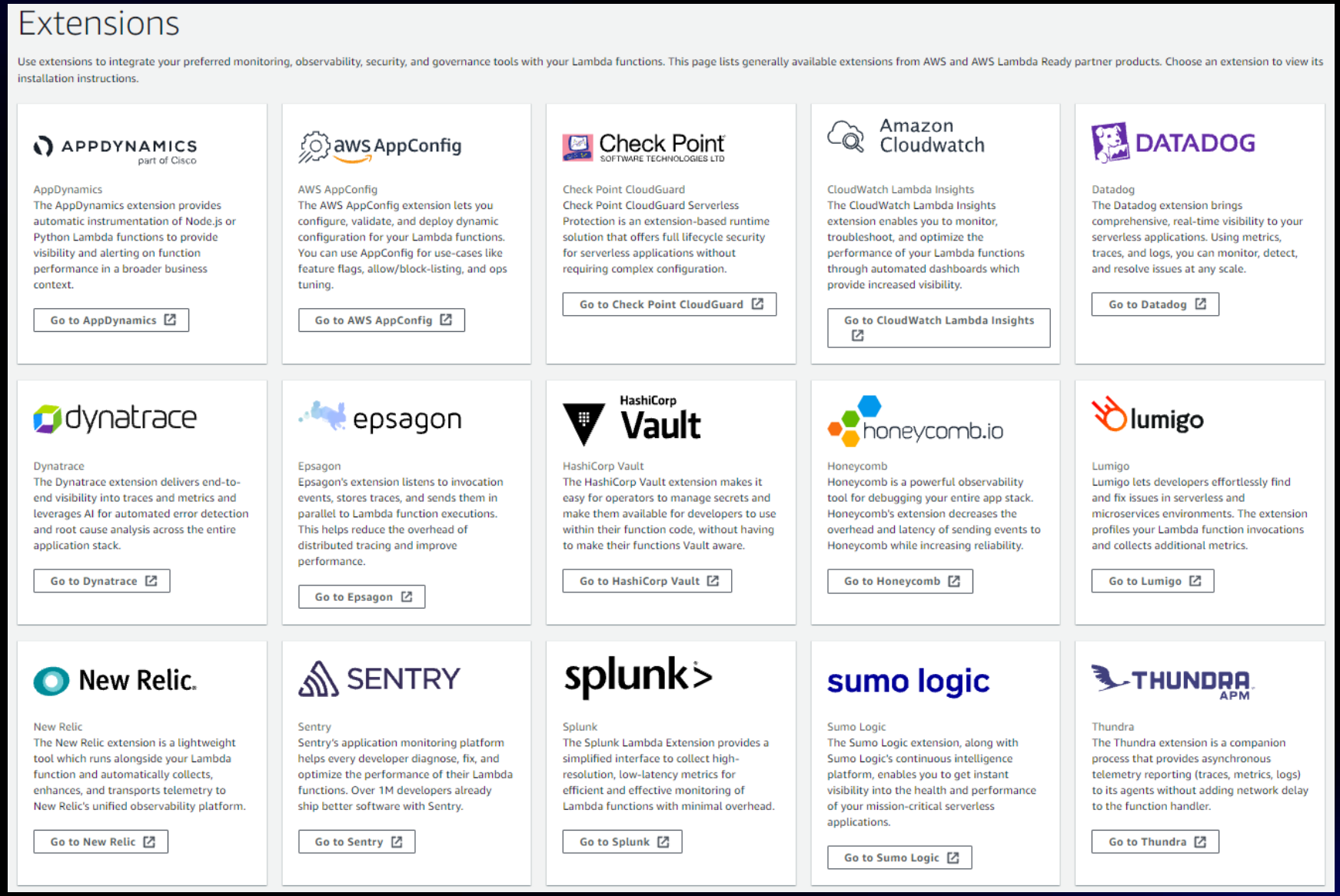
- Easier to integrate your existing tools with Lambda
- No complex installation or configuration
- Tools integrate deeply into the Lambda environment

- Capture diagnostic information before, during, and after function invocation
- Automatically instrument your code without needing code changes
- Fetch configuration settings or secrets before the function invocation
- Detect and alert on function activity through hardened security agents

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Extensions available today



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Lambda Powertools

A SUITE OF UTILITIES FOR LAMBDA FUNCTIONS

Logging: Output as structured JSON

Tracing: Send traces to AWS X-Ray

Metrics: Custom metrics with embedded metric format

Utilities: Parameters, Amazon SQS batch processing, etc.

Python

https://github.com/awslabs/aws-lambda-powertools-python

Java

https://github.com/awslabs/aws-lambda-powertools-java

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Summary

Observability is more than just monitoring metrics

- Gathering as much data as required
- Making the right data-driven decisions
- Adding business-relevant information
- Being able to observe the unexpected

Amazon CloudWatch and AWS X-Ray give you tools to gain visibility into how your systems are performing

- Embedded metric format is a powerful 2 for 1
- Use CloudWatch Logs Insights to query and analyze log data interactively
- ServiceLens gives you that “single-pane” view into your applications
- Extensions – more easily use your existing tools
- Powertools – coding utilities for observability

Resources

https://s12d.com/304-ri21

aws

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Serverless observability learning path

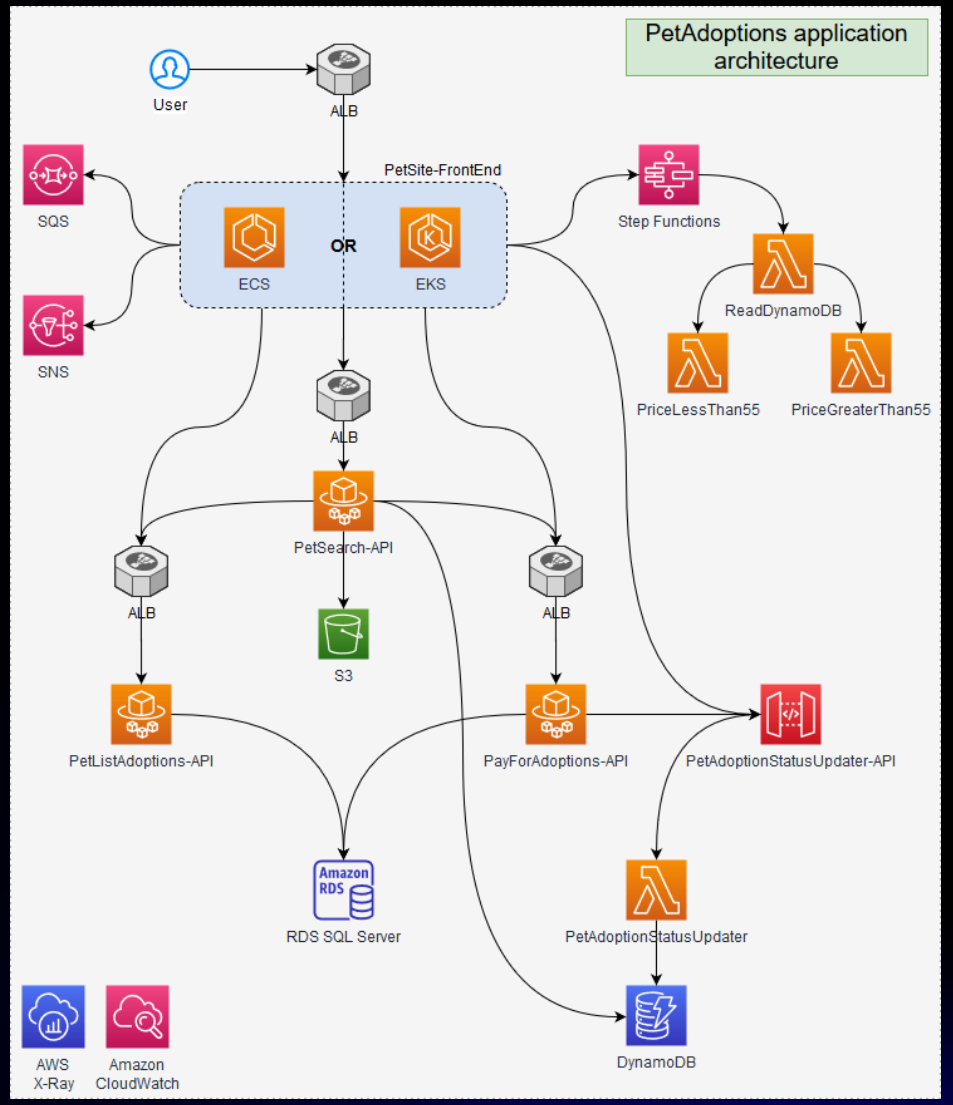


s12d.com/mastering-observability

Serverless observability workshop

https://observability.workshop.aws

re:Invent SVS307



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Welcome to **Serverless** Land

This site brings together all the latest blogs, videos, and training for AWS Serverless. Learn to use and build apps that scale automatically on low-cost, fully-managed serverless architecture.



Thank you!

Julian Wood

Senior Developer Advocate, Serverless
AWS

@julian_wood

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