

# aws INNOVATE

FOR EVERY APPLICATION EDITION

25 August, 2022

# Increase availability with AWS observability solutions

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Senior Developer Advocate

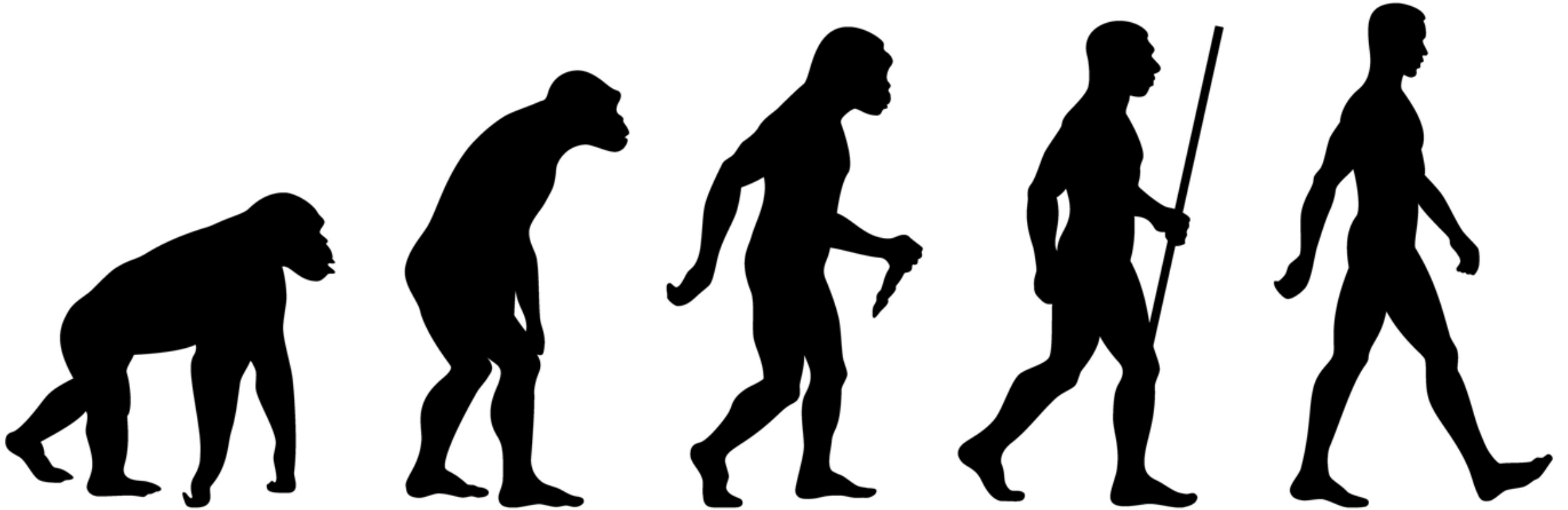
AISPL



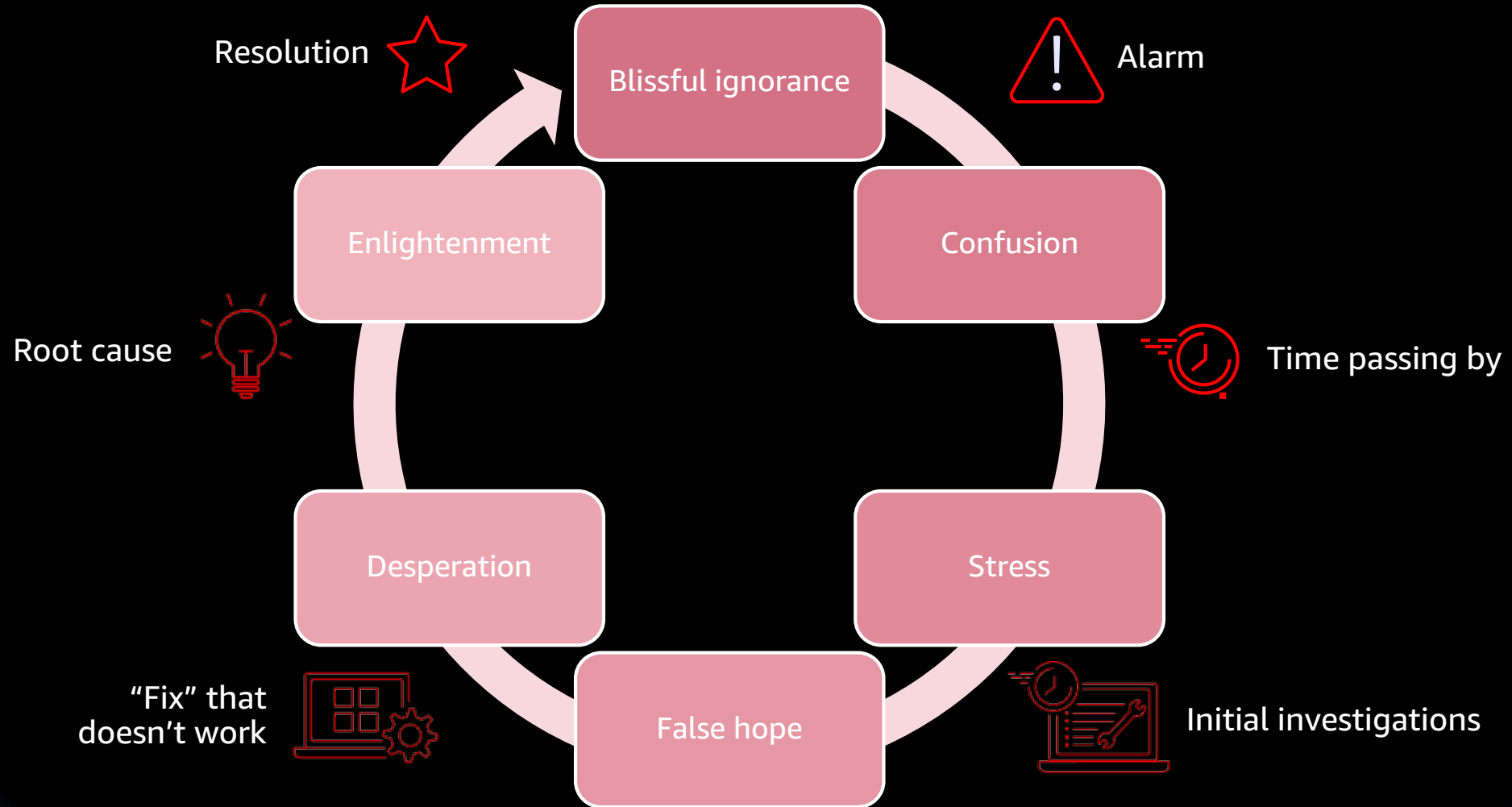
# Today's agenda

- Why monitoring must evolve
- What is observability?
- Foundation for observability
- AWS observability tools – Container insights, AWS Lambda insights
- Demo – Amazon CloudWatch ServiceLens
- Resources

# Monitoring must evolve



# Reactive monitoring



# Monitoring must evolve



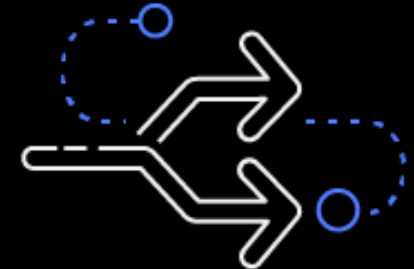
Monolithic to  
microservices



Short-lived  
resources



Devices  
Data



Faster release  
velocity

# What is Observability?



A measure of how well we can understand a system from the work it does

“90% of the methods in this service complete in under 200 milliseconds”

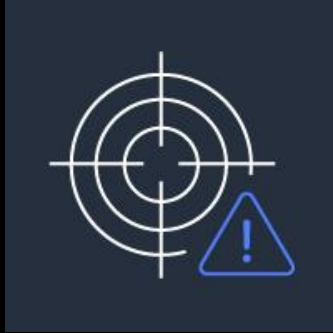
“This API is handling 203HTTP requests per second”

“CPU utilization for this service is at 85%”

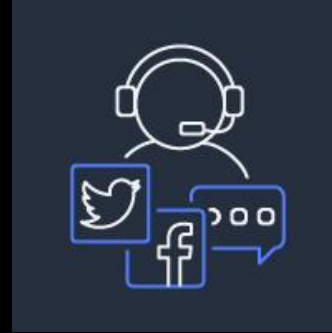
# Observability matters because ...



Visibility



Real-time  
troubleshooting



Customer  
experience



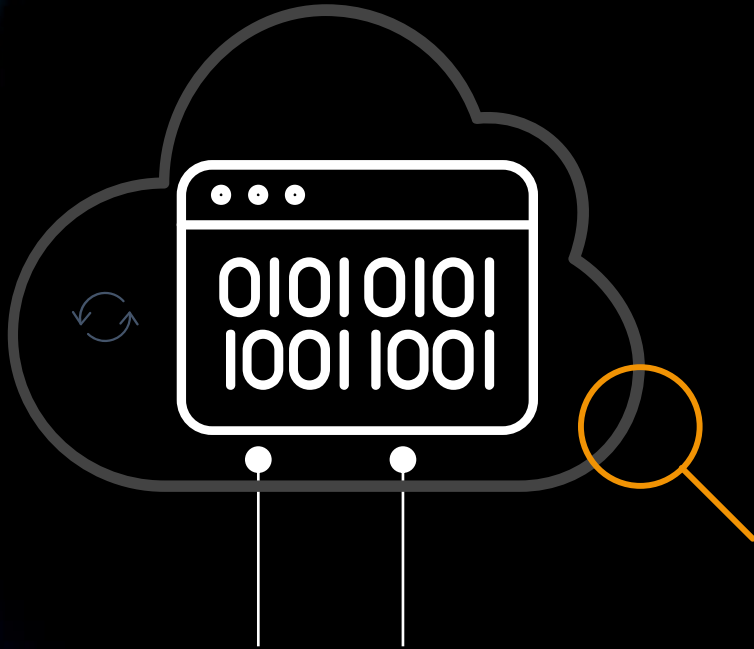
Applications = \$\$

Operational

Business



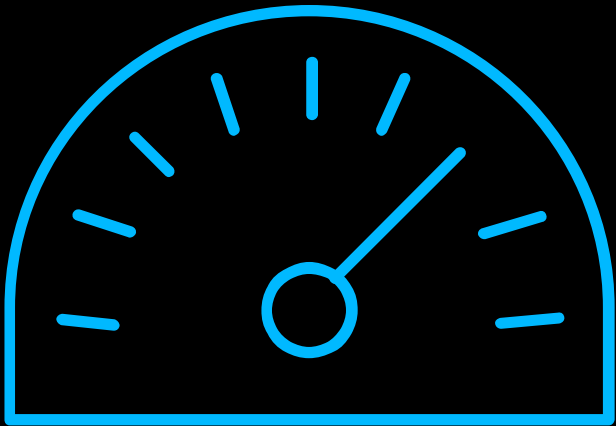
# What is instrumentation?



"Calls to this database took, on average, took 50 milliseconds"

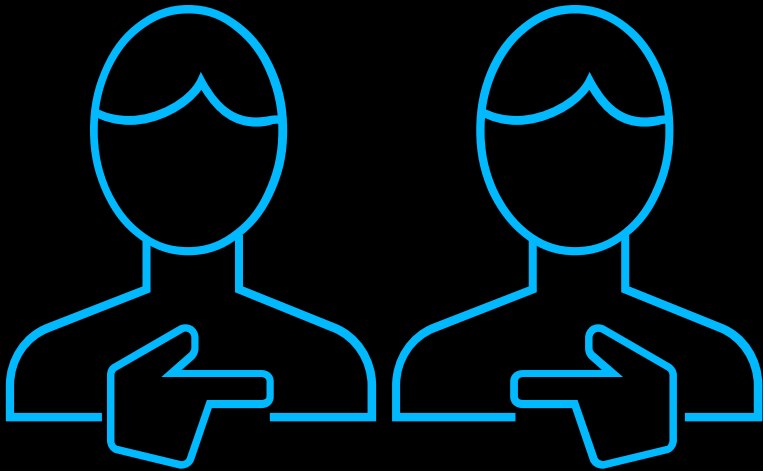
Instrumentation: measuring events in software using code  
(a type of white-box monitoring)

# ***Good data* can help with the technical shift to new systems**



- Improved debugging and troubleshooting
- Designs validated with data
- Reduced defects; more issues caught proactively
- Improved feature velocity

# ***Good data* can help with the cultural shift to new systems**

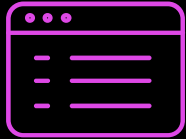


- Builds transparency across teams
- Shared understanding of complex components
- Decisions not (entirely) driven or explained by gut feelings or guessing
- Freedom to experiment
- Blameless culture
- Context not control

But...

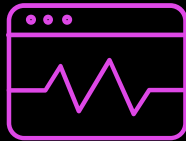
How do we make  
microservices and serverless functions  
observable?

# #1: Observable systems should emit events: Metrics, logs, and traces



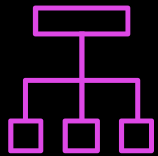
Logs

"The database won't start after the update"



Metrics

"Our application is 35% slower than last week after this configuration change"

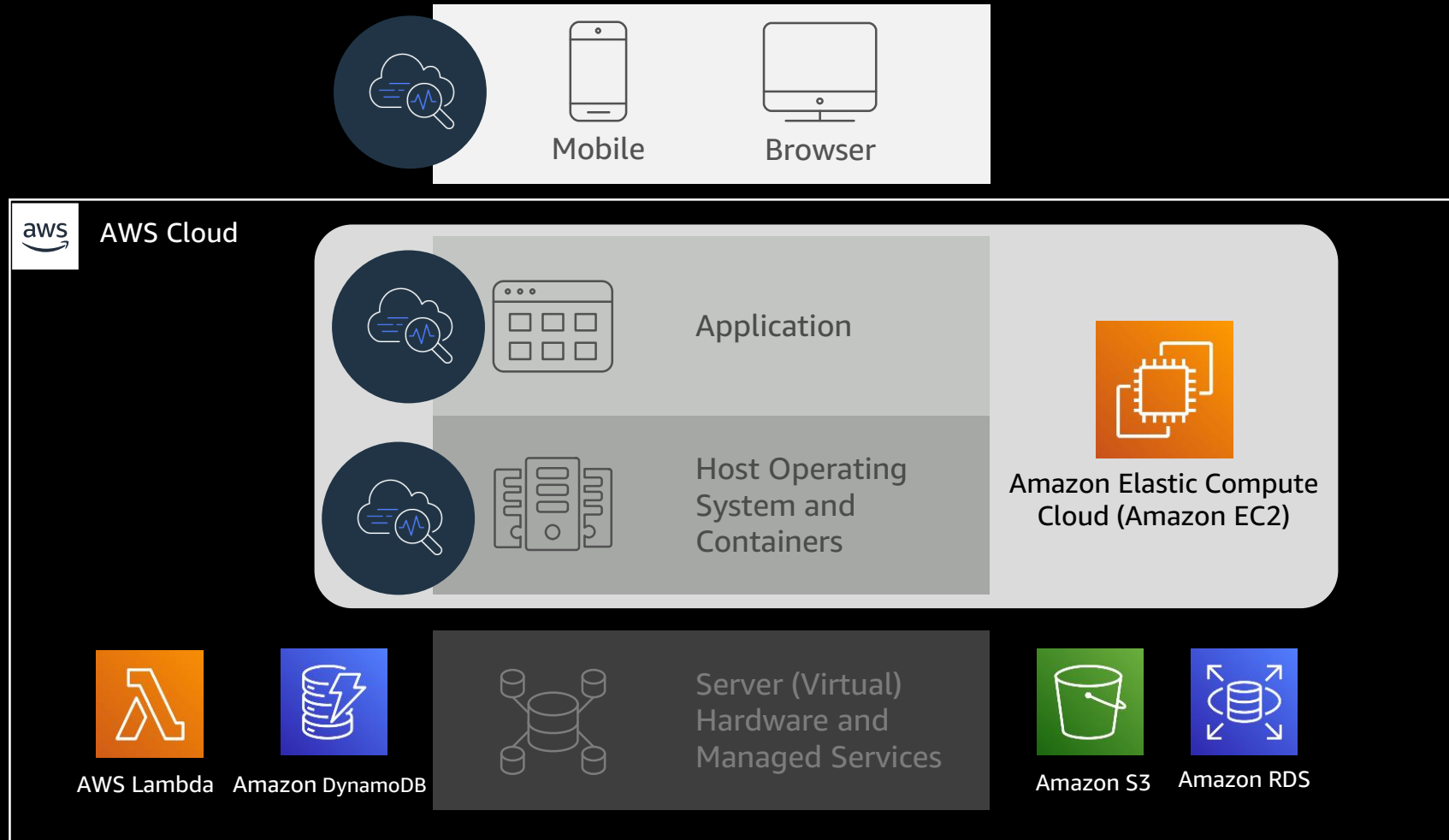


Traces

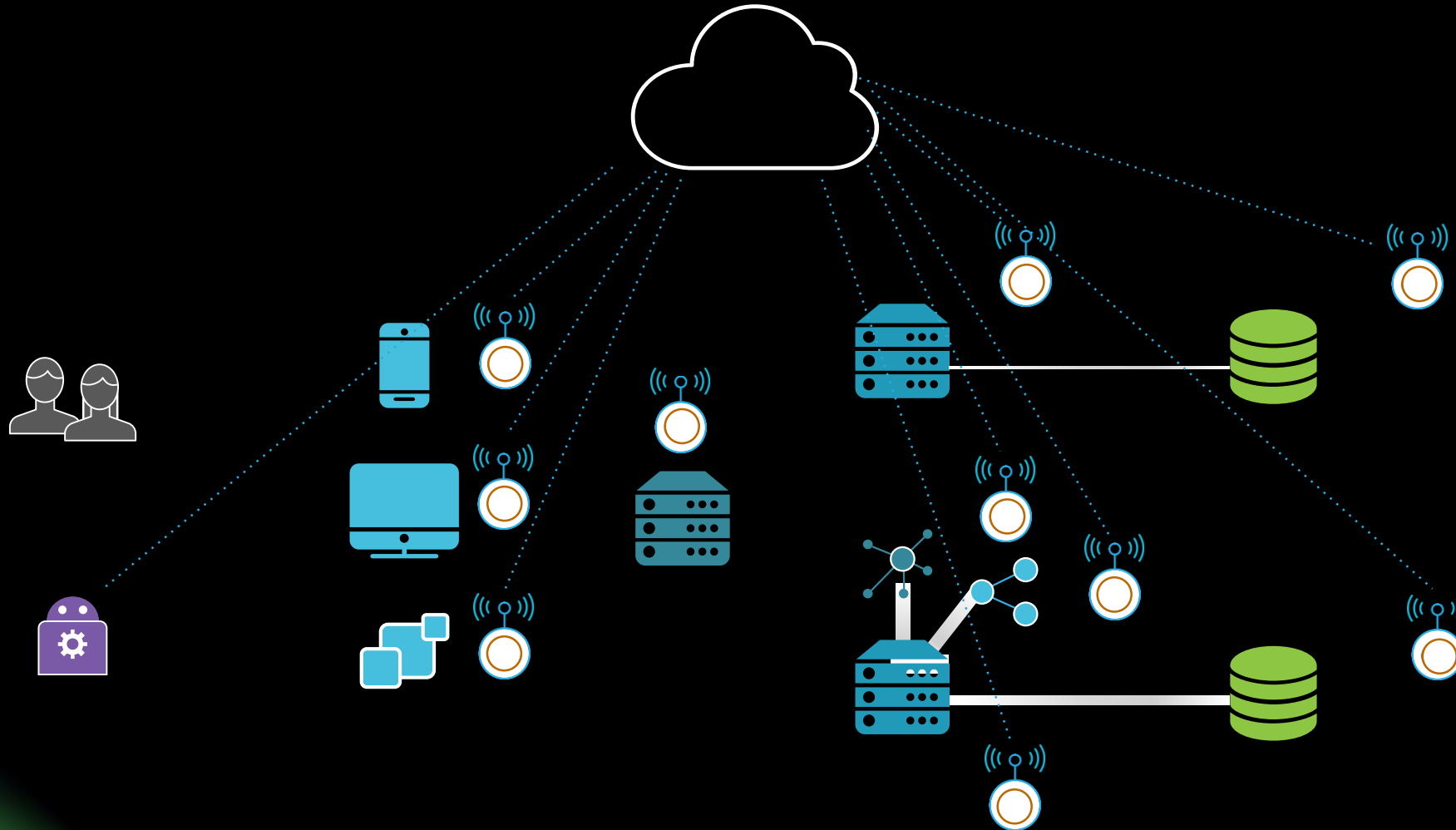
"What are the dependencies for this service?"



# #2: All components should be instrumented



# #3: Instrumentation should not be opt-in, manual, or hard to do



# Foundation for Observability

**What:** Numeric representation of data measured over intervals of time

**Why:** Useful for identifying trends, mathematical modeling, and prediction



Metrics



# Foundation for Observability



Logs

**What:** Immutable, timestamped record of discrete events that happened over time

**Why:** Useful for uncovering emergent and unpredictable behavior



Metrics

**What:** Numeric representation of data measured over intervals of time

**Why:** Useful for identifying trends, mathematical modeling, and prediction

# Foundation for Observability



Logs

**What:** Immutable, timestamped record of discrete events that happened over time

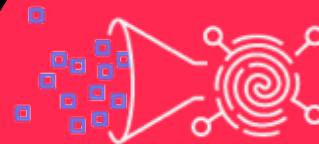
**Why:** Useful for uncovering emergent and unpredictable behavior



Metrics

**What:** Numeric representation of data measured over intervals of time

**Why:** Useful for identifying trends, mathematical modeling, and prediction



Traces

**What:** Representation of a series of related distributed events that encode the end-to-end request flow through a distributed system

**Why:** Provides visibility into both the path traversed by a request as well as the structure of a request

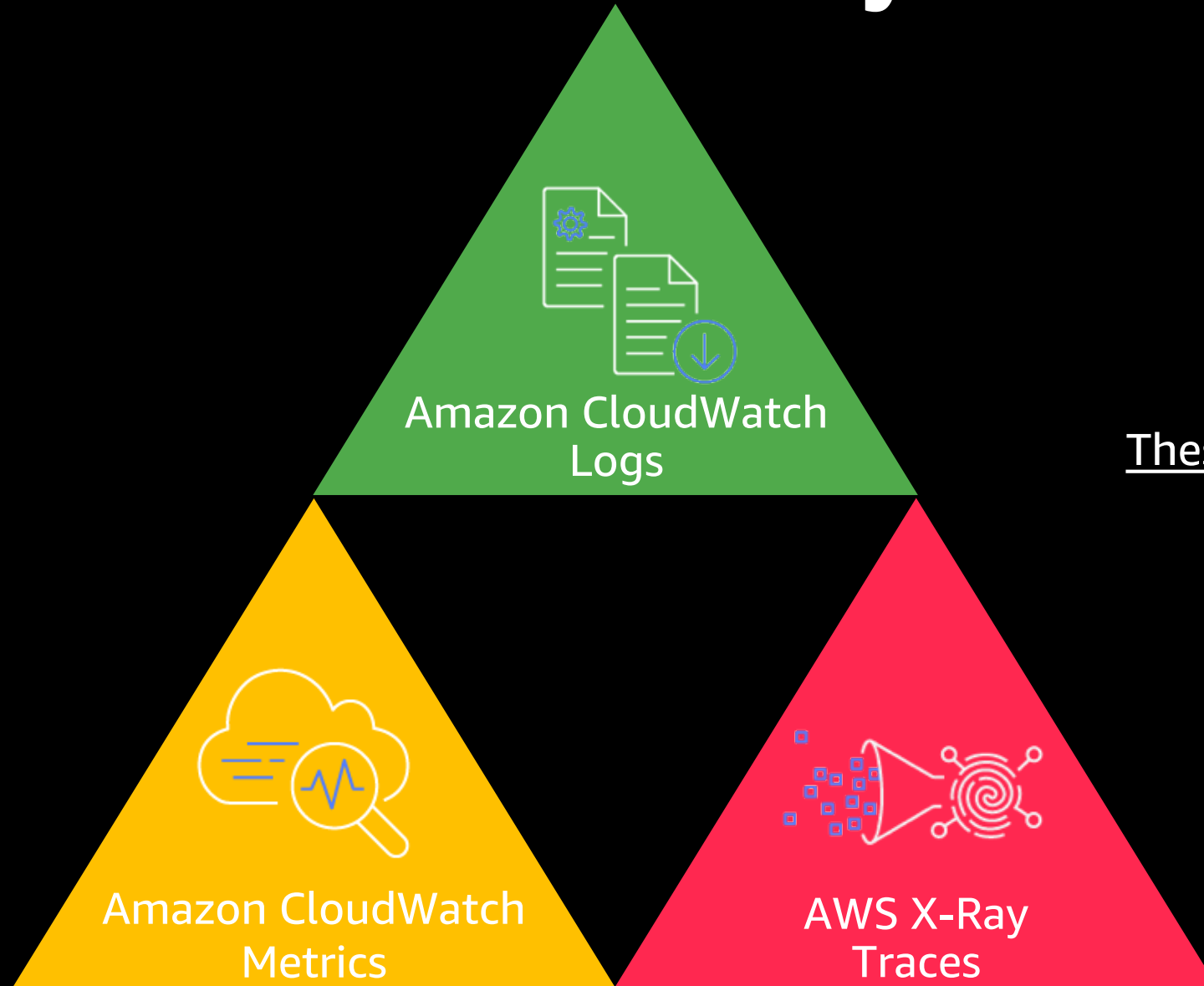
# AWS Services for Observability



Amazon  
CloudWatch



AWS X-Ray



These are the tools

# Amazon CloudWatch

OBSERVABILITY OF YOUR AWS RESOURCES AND APPLICATIONS



Amazon  
CloudWatch

Dashboards

Logs

Metrics

Alarms

Events



## Collect

Metrics and logs from all your AWS resources, applications and services that run on AWS and on-premise servers



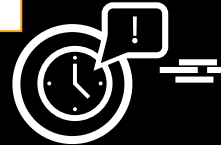
## Monitor

Visualize applications and infrastructure with Amazon CloudWatch dashboards; correlate logs and metrics side-by-side to troubleshoot and set alarms with Amazon CloudWatch alarms



## Amazon CloudWatch

Complete visibility into your cloud resources and applications



## Act

Automate response to operational changes with Amazon CloudWatch Events and Autoscaling.



## Analyze

Up to 1-second metrics, extended data retention (15 months), and real time analysis with Amazon CloudWatch Metric-Math



Application  
monitoring



System-wide  
visibility

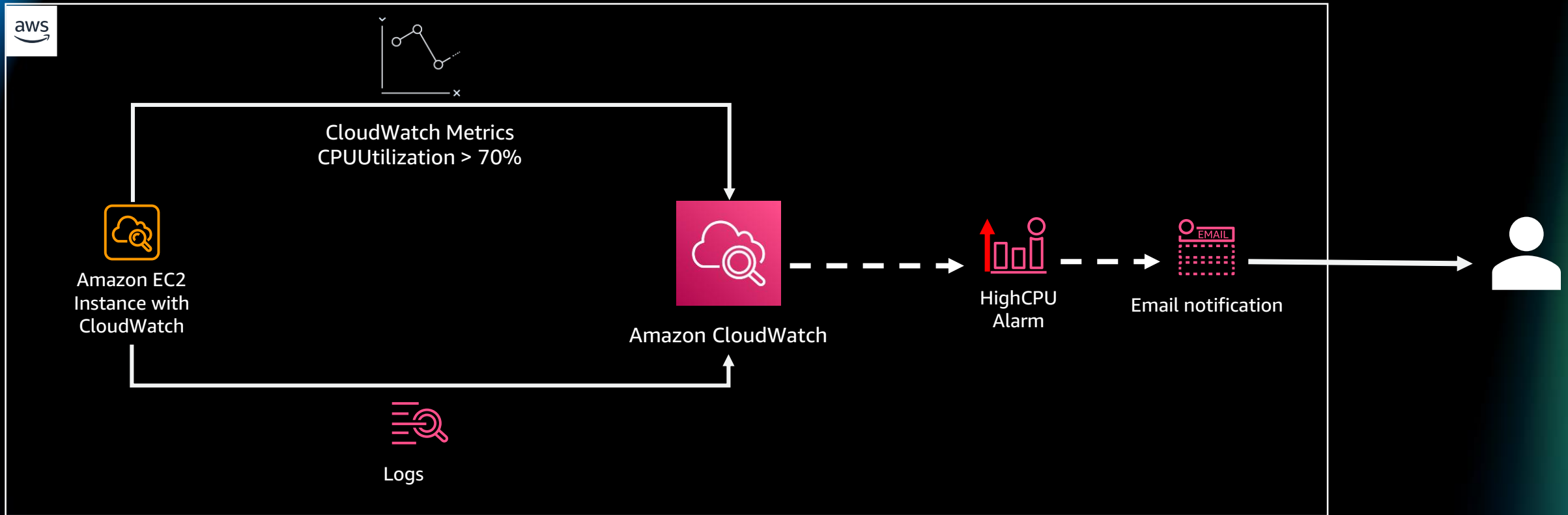


Resource  
optimization



Unified  
operational  
health

# Amazon CloudWatch Metrics



## Metric Alarm States

**OK** – The metric or expression is within the defined threshold.

**ALARM** – The metric or expression is outside of the defined threshold.

**INSUFFICIENT\_DATA** – The alarm has just started, the metric is not available, or not enough data is available for the metric to determine the alarm state.

# Amazon CloudWatch Logs & Logs Insights

- Move logs off host
- Store in secure, scalable and durable storage
- Create metrics and alarms
- Analyze logs

CloudWatch > CloudWatch Logs > Logs Insights

Select log group(s) 5m 30m 1h 3h 12h Custom

Clear /ecs/PetListAdoptions X Query


```
1 fields @timestamp, @message
2 | sort @timestamp desc
3 | limit 20
4 | filter @message like /brown/
```

Run query Save History

Distribution of log events over time

Logs Visualization Export results Add to dashboard

Showing 20 of 4,925 records matched ⓘ  
15,819 records (2.8 MB) scanned in 3.1s @ 5,164 records/s (931.8 kB/s) Hide histogram



#	@timestamp	@message
▶ 1	2021-03-24T11:02:09....	{"caller":"repository.go:104","method":"GetTopTransactions","petcolor":"brown","petid":"007","pettype":"puppy","repo":"sql","ts":"2021-03-24T15:..."}
▶ 2	2021-03-24T11:02:09....	{"caller":"repository.go:104","method":"GetTopTransactions","petcolor":"brown","petid":"010","pettype":"puppy","repo":"sql","ts":"2021-03-24T15:..."}
▶ 3	2021-03-24T11:01:46....	{"caller":"repository.go:104","method":"GetTopTransactions","petcolor":"brown","petid":"010","pettype":"puppy","repo":"sql","ts":"2021-03-24T15:..."}
▶ 4	2021-03-24T11:01:46....	{"caller":"repository.go:104","method":"GetTopTransactions","petcolor":"brown","petid":"024","pettype":"bunny","repo":"sql","ts":"2021-03-24T15:..."}
▶ 5	2021-03-24T11:01:46....	{"caller":"repository.go:104","method":"GetTopTransactions","petcolor":"brown","petid":"024","pettype":"bunny","repo":"sql","ts":"2021-03-24T15:..."}
▶ 6	2021-03-24T11:01:46....	{"caller":"repository.go:104","method":"GetTopTransactions","petcolor":"brown","petid":"003","pettype":"puppy","repo":"sql","ts":"2021-03-24T15:..."}
▶ 7	2021-03-24T11:01:46....	{"caller":"repository.go:104","method":"GetTopTransactions","petcolor":"brown","petid":"024","pettype":"bunny","repo":"sql","ts":"2021-03-24T15:..."}
▶ 8	2021-03-24T11:01:46....	{"caller":"repository.go:104","method":"GetTopTransactions","petcolor":"brown","petid":"020","pettype":"kitten","repo":"sql","ts":"2021-03-24T15:..."}

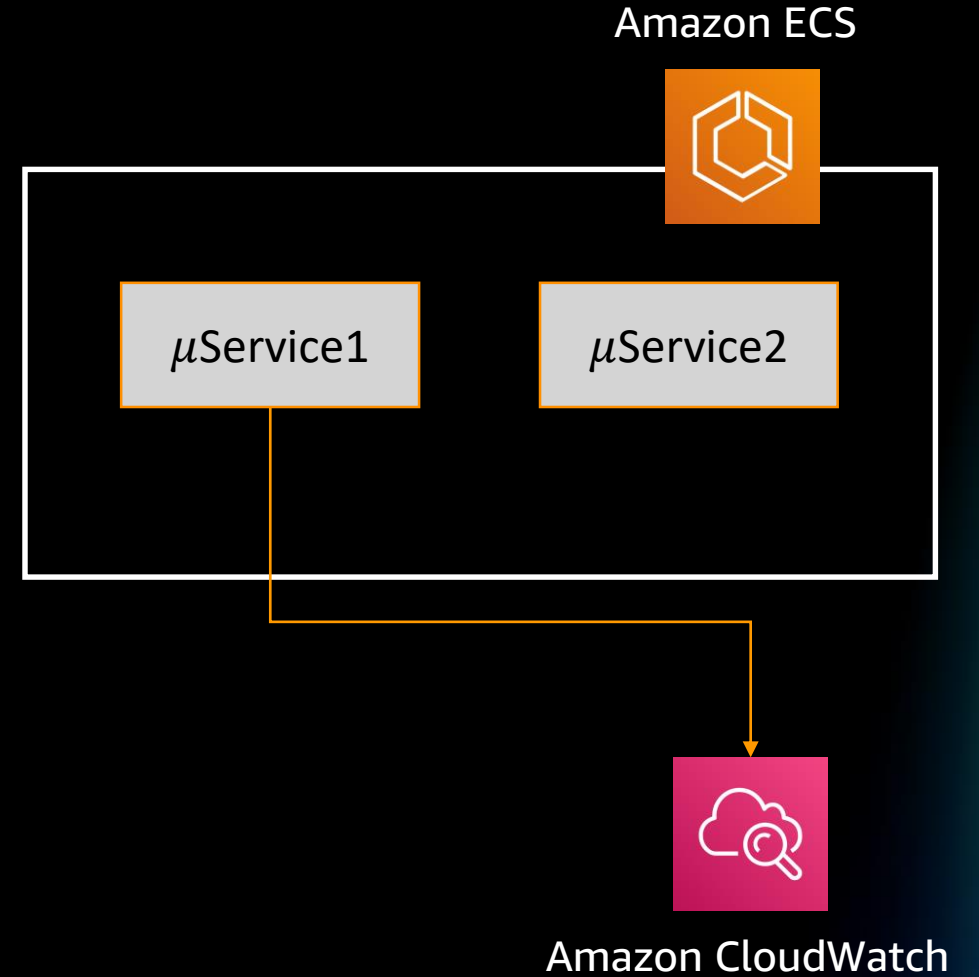
Custom log data from the application

## **Logs collection for**

- Amazon Elastic Container Service (Amazon ECS)**
- Amazon Elastic Kubernetes Service (Amazon EKS)**

# Amazon CloudWatch logs for **Amazon ECS**

1. Microservices running on Amazon ECS can send application **logs** directly to Amazon CloudWatch Logs using **awslogs** driver

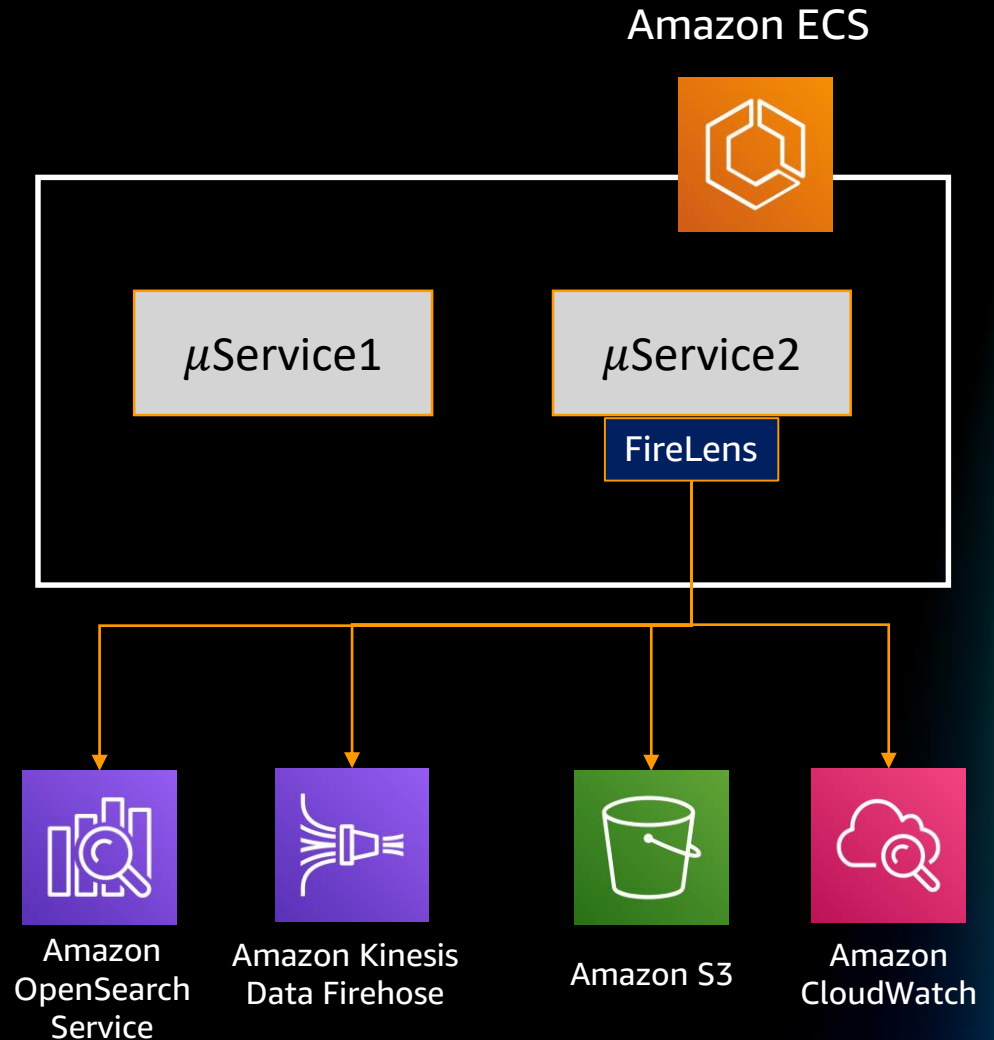




# Amazon CloudWatch logs for Amazon ECS

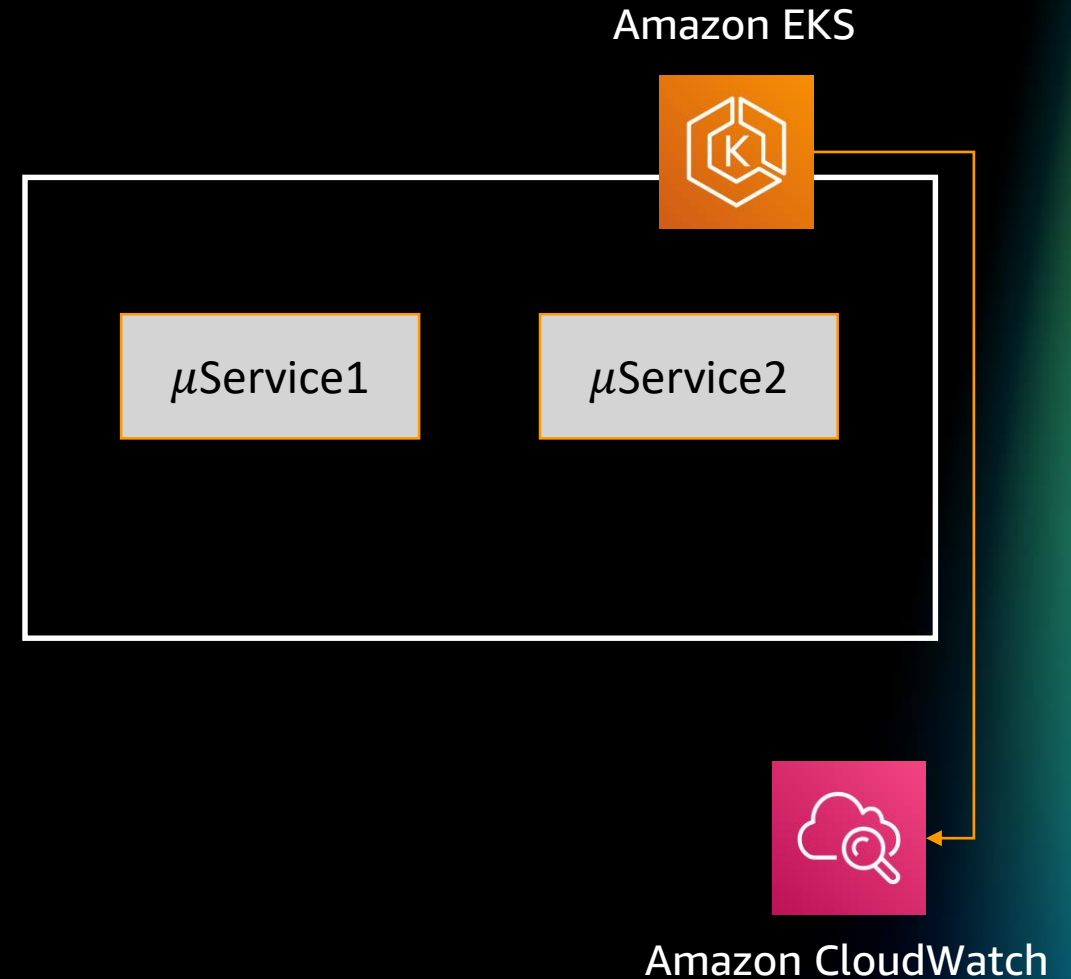
1. Microservices running on Amazon ECS can send application logs directly to Amazon CloudWatch Logs using awslogs driver
2. **FireLens** for Amazon ECS enables applications to send logs to many other destinations by using the awsfirelens driver; works with both FluentD and FluentBit

Both methods work on Amazon EC2 and AWS Fargate



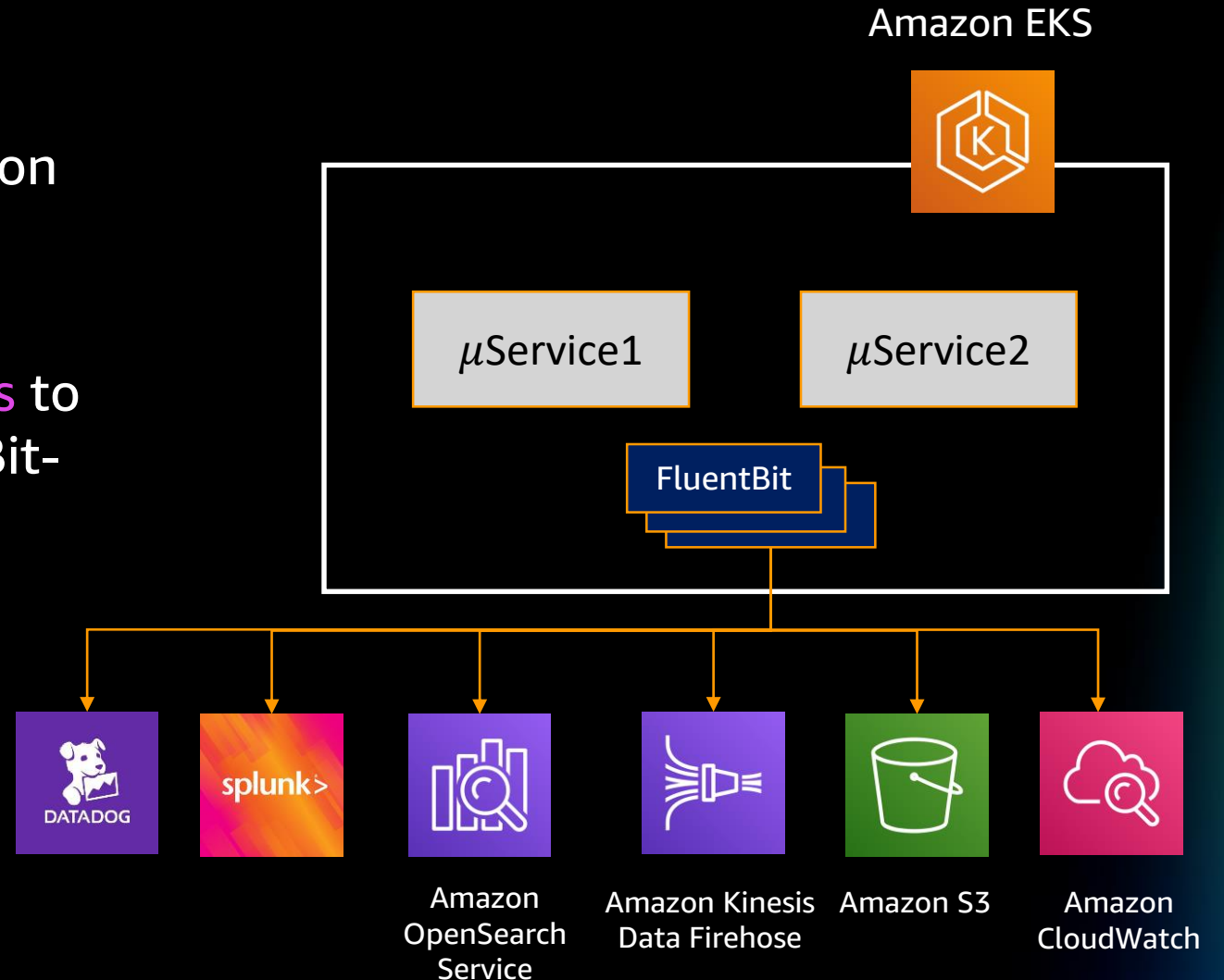
# Amazon CloudWatch logs for Amazon EKS

1. Audit and diagnostic logs from Amazon EKS Control Plane can be sent to Amazon CloudWatch



# Amazon CloudWatch logs for Amazon EKS

1. Audit and diagnostic logs from Amazon EKS Control Plane can be sent to Amazon CloudWatch
2. Use **FluentBit** to send application logs to destination of your choosing. FluentBit-based logging is also supported in Amazon EKS on AWS Fargate



# AWS X-Ray

ANALYZE AND DEBUG PRODUCTION, DISTRIBUTED APPLICATIONS



AWS X-Ray

Traces  
Analytics  
Service map



**AWS X-Ray**

AWS X-Ray helps you analyze and debug modern applications built using microservices and serverless architecture and quantify impact



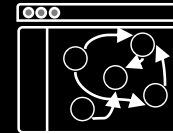
## Collect traces

Collect data about the request from each underlying application service it passes through



## Record traces

X-Ray combines the data gathered from each service into singular units called traces



## View service map

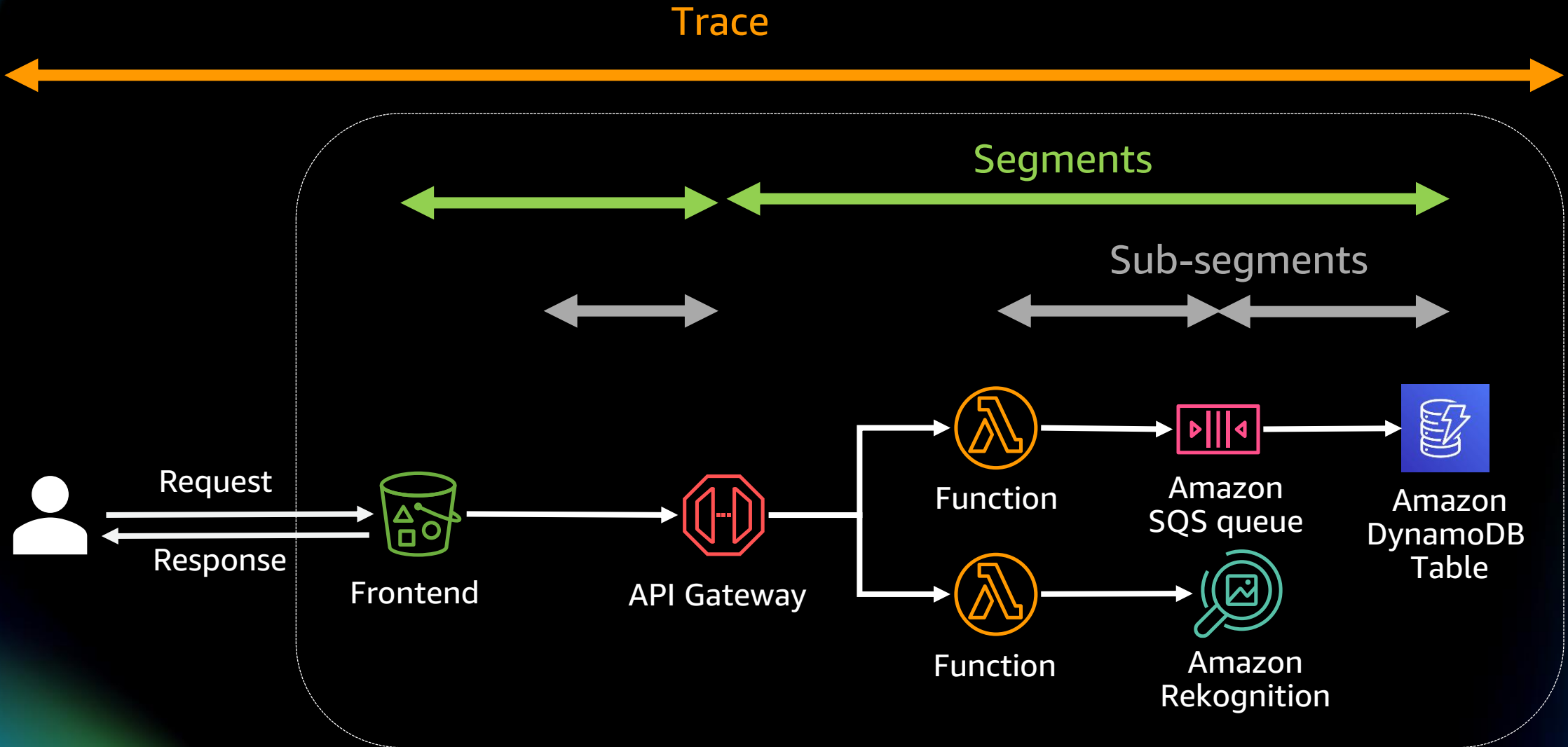
View the service map to see trace data such as latencies, HTTP statuses, and metadata for each service



## Analyze issues

Drill into the service showing unusual behavior to identify root issue

# AWS X-Ray Concepts



# AWS X-Ray Service Maps

IDENTIFY PERFORMANCE BOTTLENECKS

Enter service name, annotation, trace ID. Or click the Help icon for additional details.



Last 5 minutes



## Service map

Updated on 2018/03/22 12:38:29 (UTC -07:00)



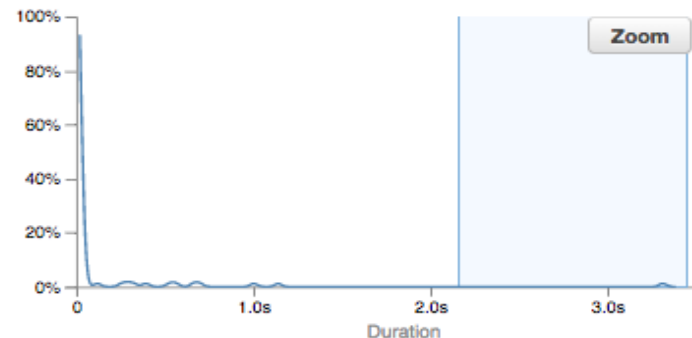
### Service details ?

Name: awseb-e-96vjw2bqv9-stack-StartupSignupsTable-U2AMYWVTO6ET

Type: AWS::DynamoDB::Table

### Response distribution

Click and drag to select an area to zoom in on or use as a latency filter when viewing traces.



### Response status

Choose response statuses to add to the filter when viewing traces.

- ☐ OK: 82% ☐ Error: 18%  
☐ Fault: 0% ☐ Throttle: 0%

Close

View traces >

# AWS X-Ray Traces

IDENTIFY PERFORMANCE BOTTLENECKS

Traces > Details

Timeline

Raw data

Method	Response	Duration	Age	ID
POST	201	2.1 sec	36.3 min	1-5aac255f-f211cd8deb4

Name	Res.	Duration	Status	0.0ms	200ms	400ms	600ms	800ms	1.0s	1.2s	1.4s	1.6s	1.8s	2.0s	2.2s
------	------	----------	--------	-------	-------	-------	-------	-------	------	------	------	------	------	------	------

mysignupfrontend.2mbmtepd39.us-west-2.elasticbeanstalk.com AWS::ElasticBeanstalk::Environment

mysignupfrontend.2mbmtepd39.us-west-2.elastic

201

2.1 sec

✓

POST ... /remoteSignup

mysignupapi.2mbmtepd39.us-west-2.elasticbea

201

2.1 sec

✓

Remote: POST ... /signup

mysignupapi.2mbmtepd39.us-west-2.elasticbeanstalk.com AWS::ElasticBeanstalk::Environment

mysignupapi.2mbmtepd39.us-west-2.elasticbeans

201

2.1 sec

✓

POST ... /signup

DynamoDB

200

2.1 sec

✓

PutItem: awseb-e-96vjw2bqv9-stack-StartupSignupsTable-U2AMY...

SNS

200

31.0 ms

✓

Publish

DynamoDB AWS::DynamoDB::Table (Client Response)

mysignupapi.2mbmtepd39.us-west-2.elasticbeans

200

2.1 sec

✓

PutItem: awseb-e-96vjw2bqv9-stack-StartupSignupsTable-U2AMY...

SNS AWS::SNS (Client Response)

mysignupapi.2mbmtepd39.us-west-2.elasticbeans

200

31.0 ms

✓

Publish



# AWS X-Ray SDK

Available for Java, .NET, .NET Core, Ruby, Python, Go, and Node.js

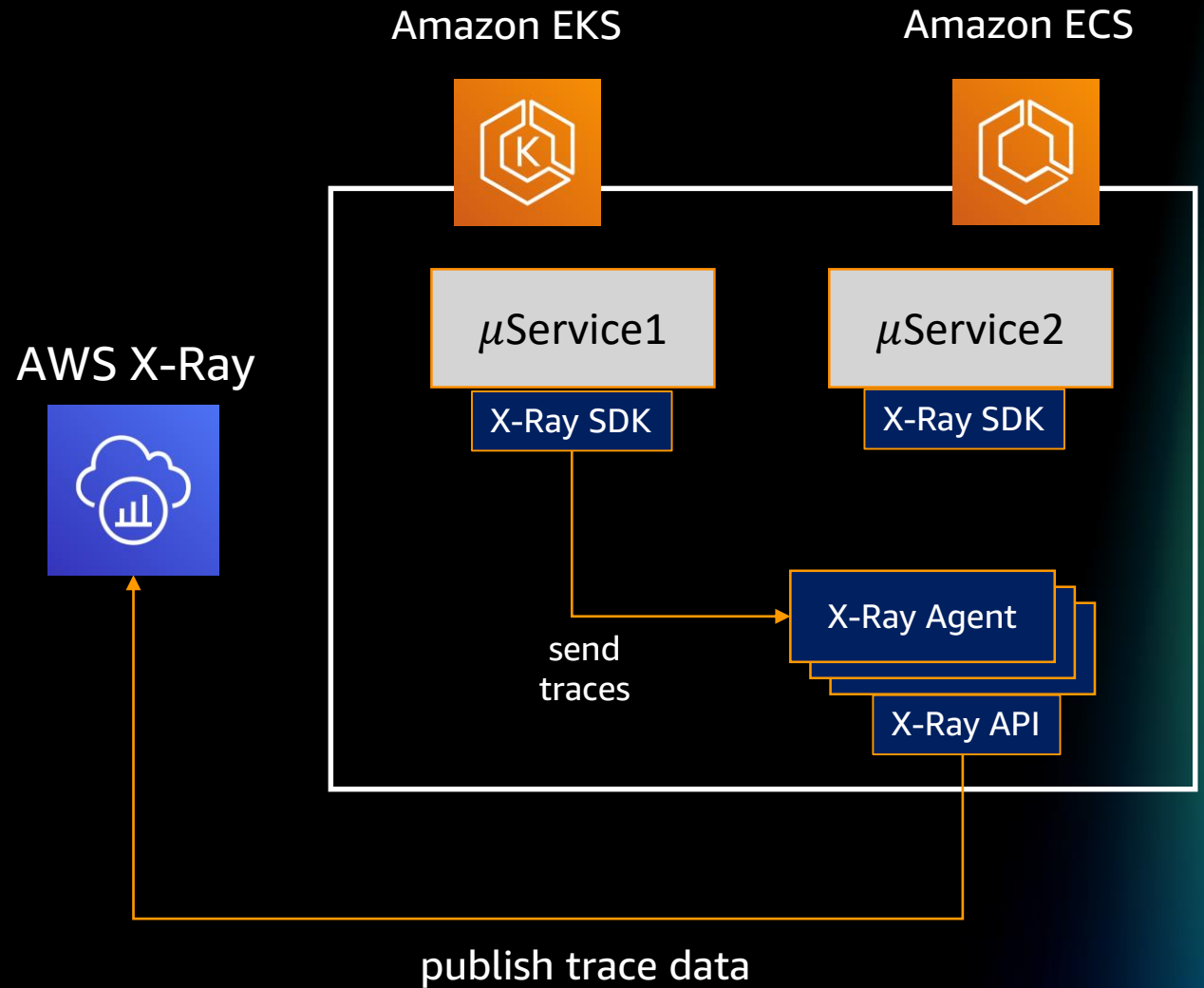
Adds filters to automatically capture metadata for calls to

- AWS services using the AWS SDK
- Non-AWS services over HTTP and HTTPS (third-party APIs)
- Databases (MySQL, PostgreSQL, and Amazon DynamoDB)
- Queues (Amazon SQS)



# AWS X-Ray for Amazon ECS/Amazon EKS

- Microservices instrumented with X-Ray SDK send **segment** data to X-Ray agent in the cluster
- X-Ray agent buffers segments in a queue and uploads them to X-Ray in batches
- X-Ray groups segments that have a common request into **traces** which are used to generate a **service graph** that provides a visual representation of your application

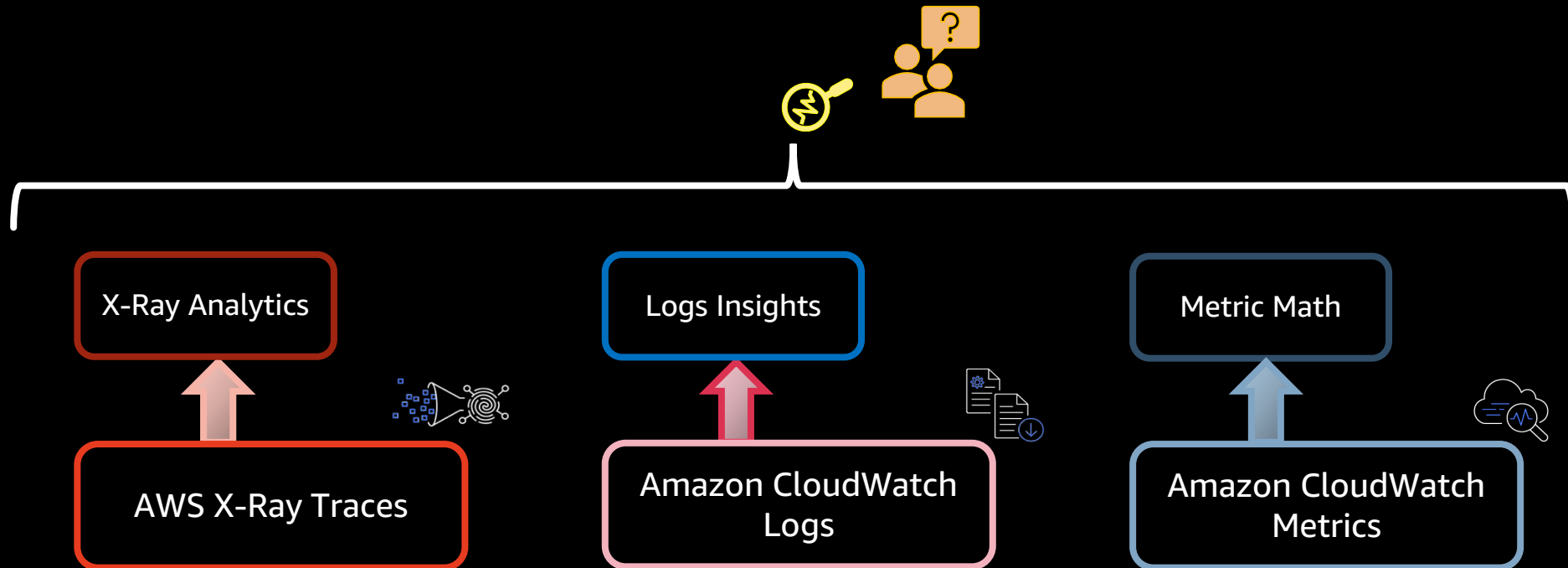


# AWS X-Ray for **AWS Lambda**

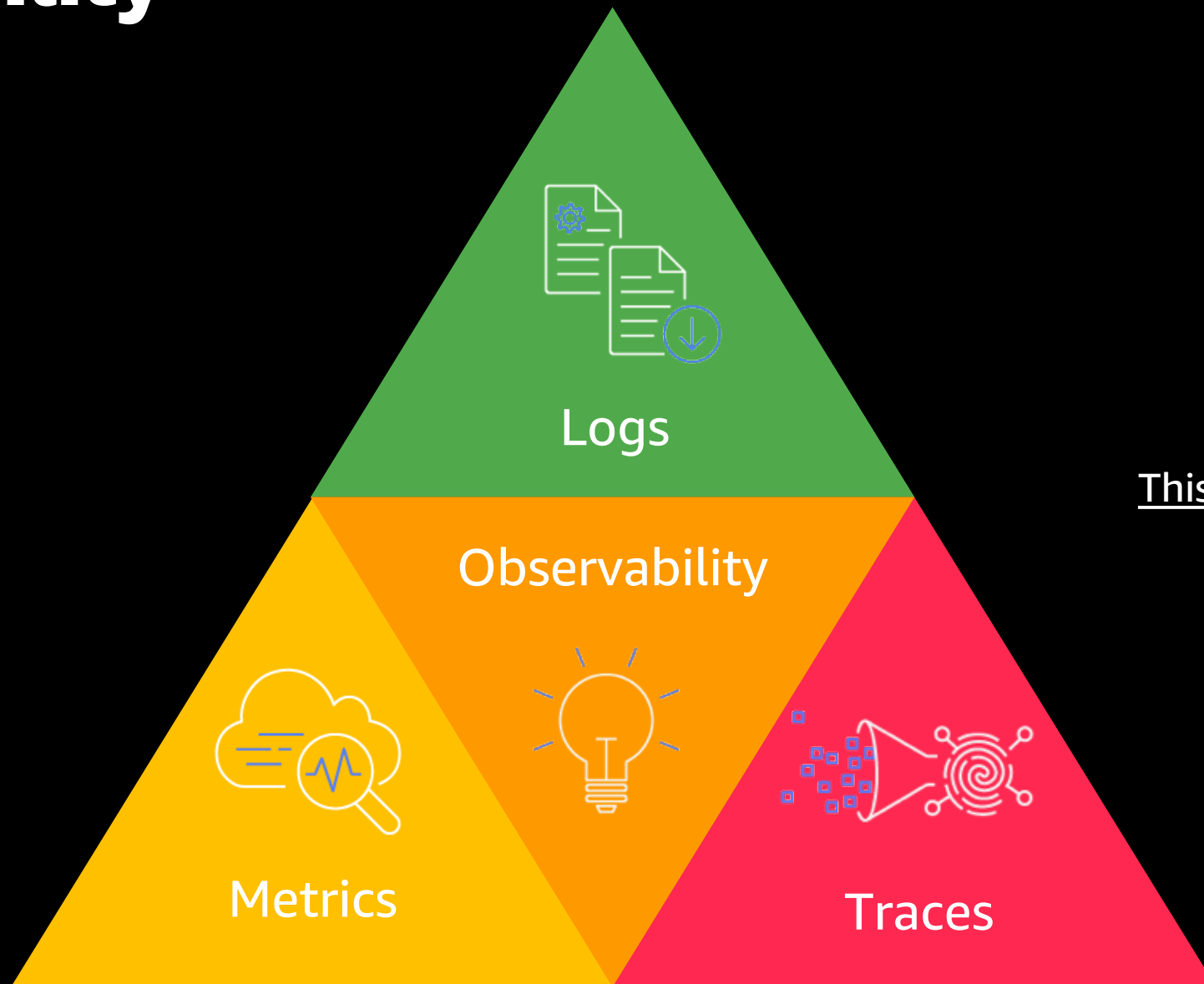
- AWS X-Ray agent is natively built into AWS Lambda
- Identify initialization and cold starts in AWS Lambda
- Pinpoint issues in downstream services called from your AWS Lambda function
- Happens with low latency in real time; can see traces in seconds

# Tools and challenges

- Want to be able to get a 360° view of a problem
- Need to correlate logs, metrics and traces to get deeper insights
- Repetitive troubleshooting process
- Data introspection

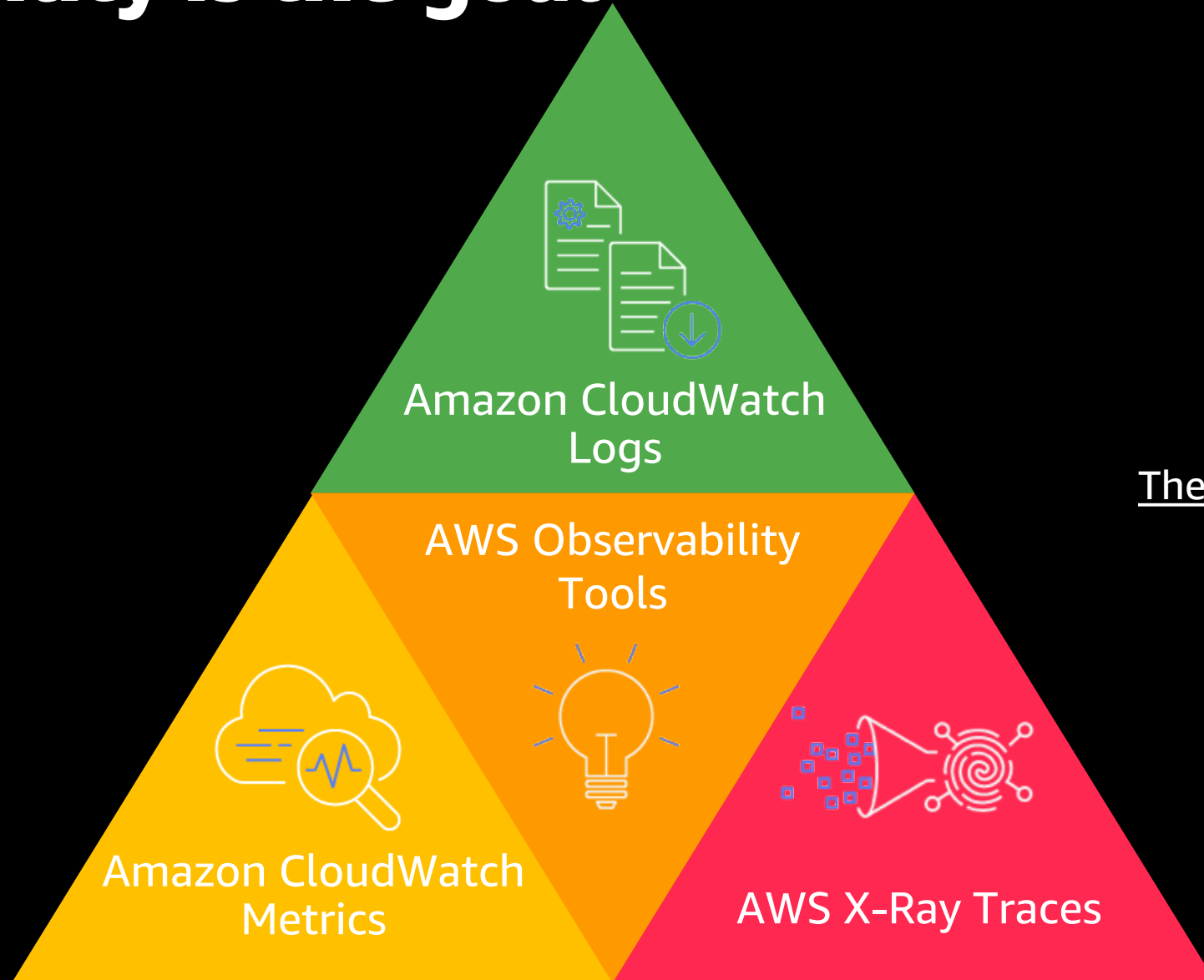


# Observability



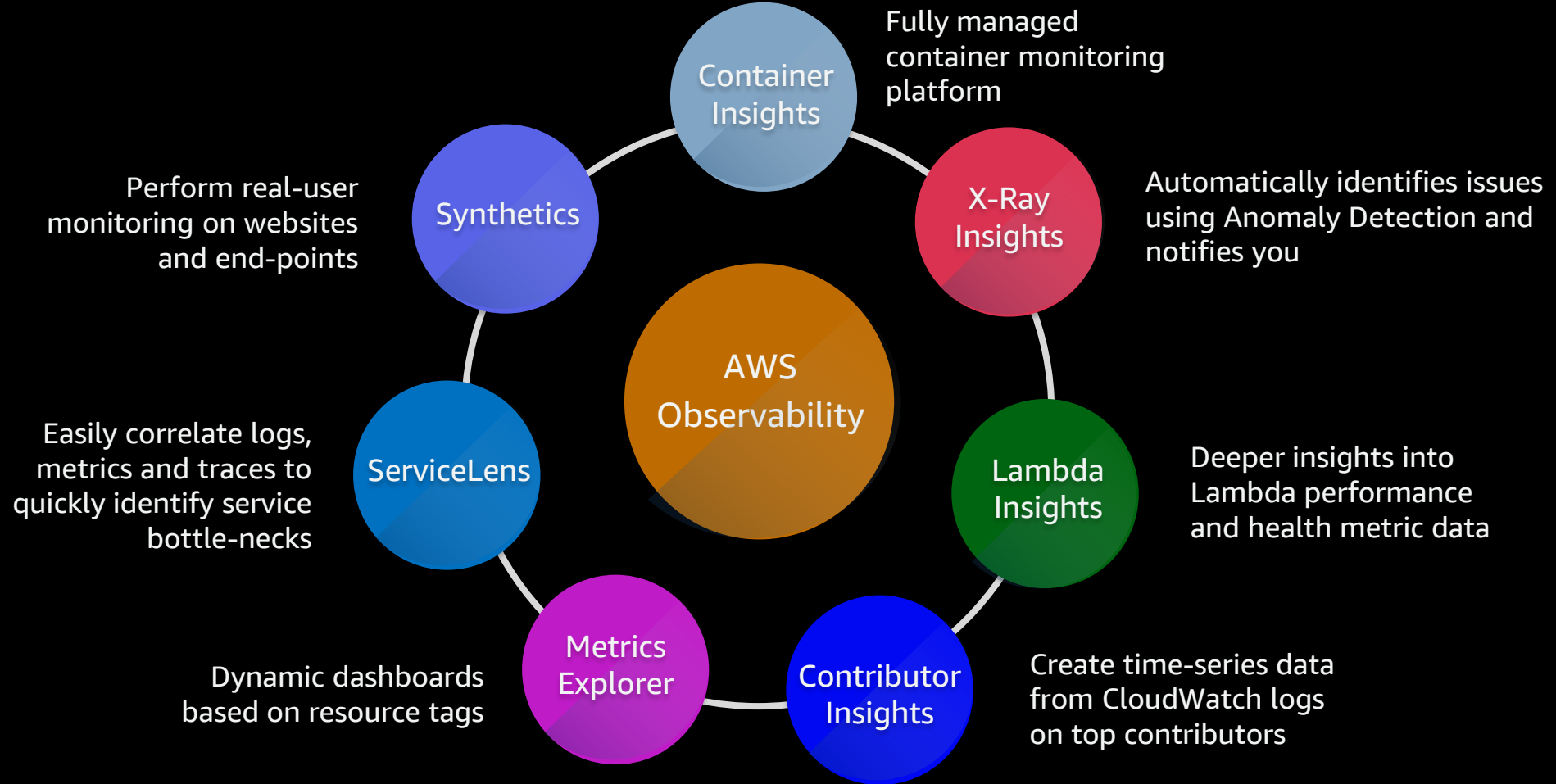
This is the goal

# Observability is the goal



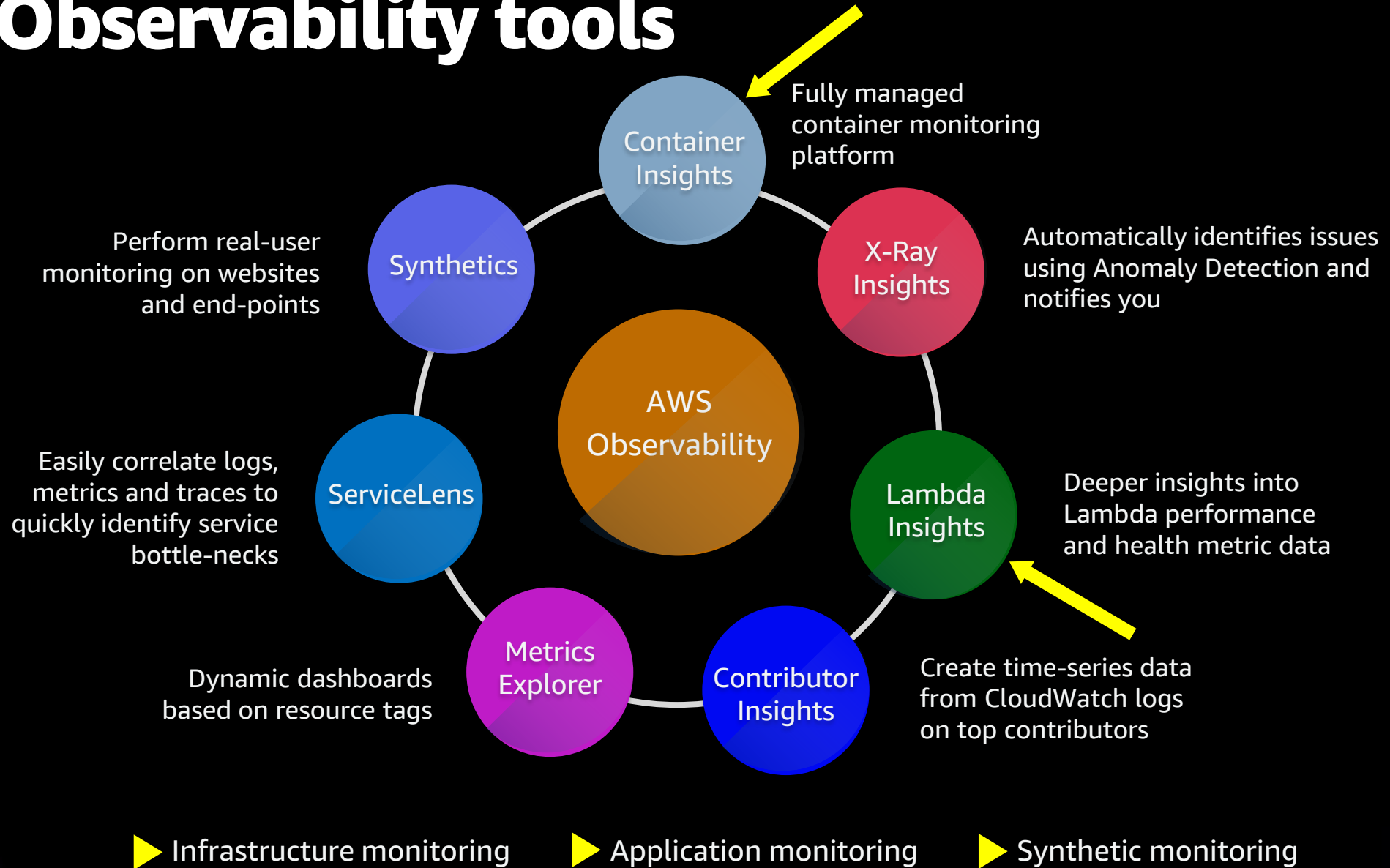
These are the tools

# AWS Observability tools



► Infrastructure monitoring    ► Application monitoring    ► Synthetic monitoring

# AWS Observability tools



# Amazon CloudWatch Container Insights

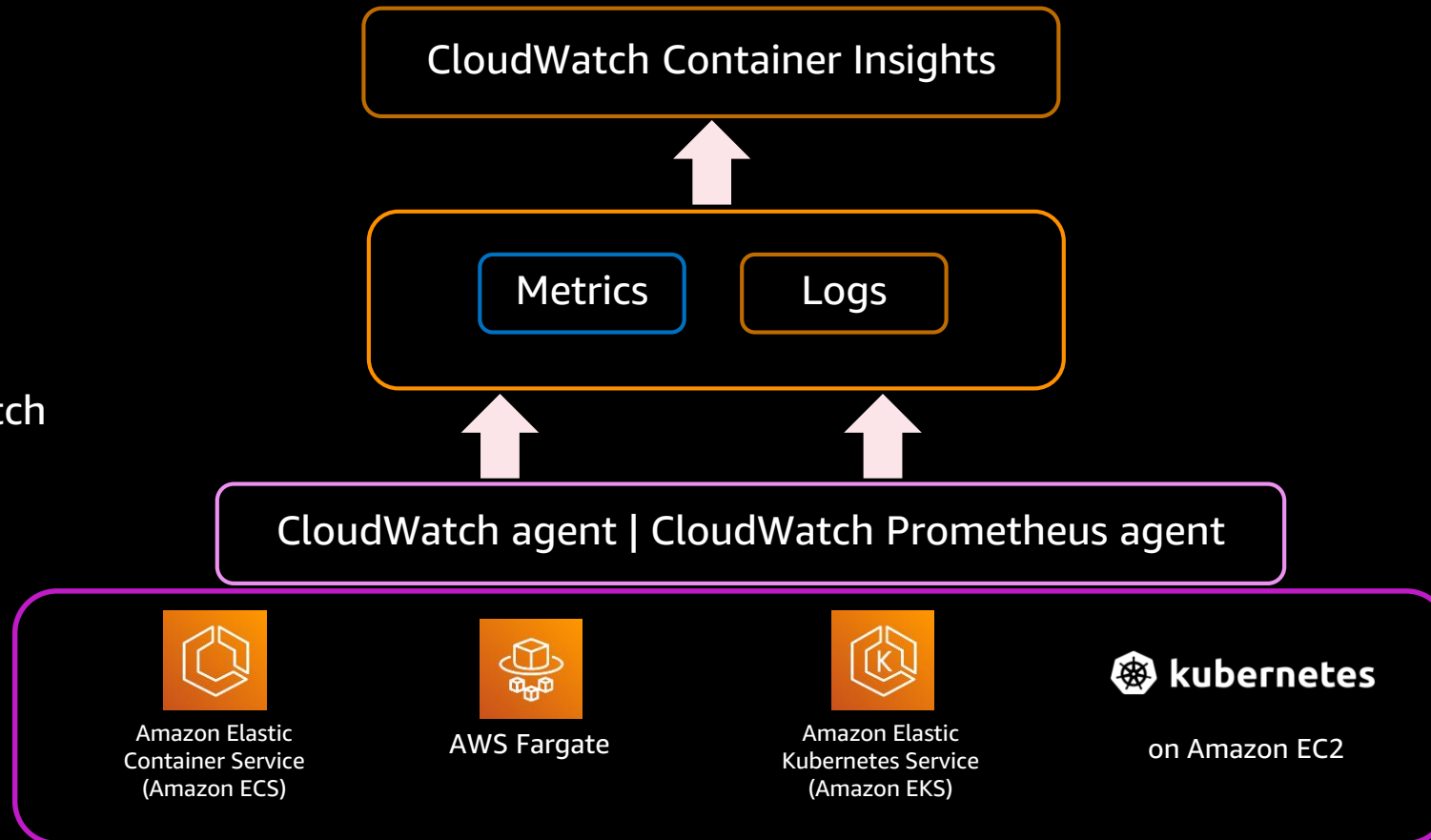
Built-in dashboards to see performance metrics for cluster resources at different levels

Out of the box dashboards for popular workloads such as AppMesh, Java/JMX, NGINX, HAProxy etc

Collect Prometheus metrics from workloads



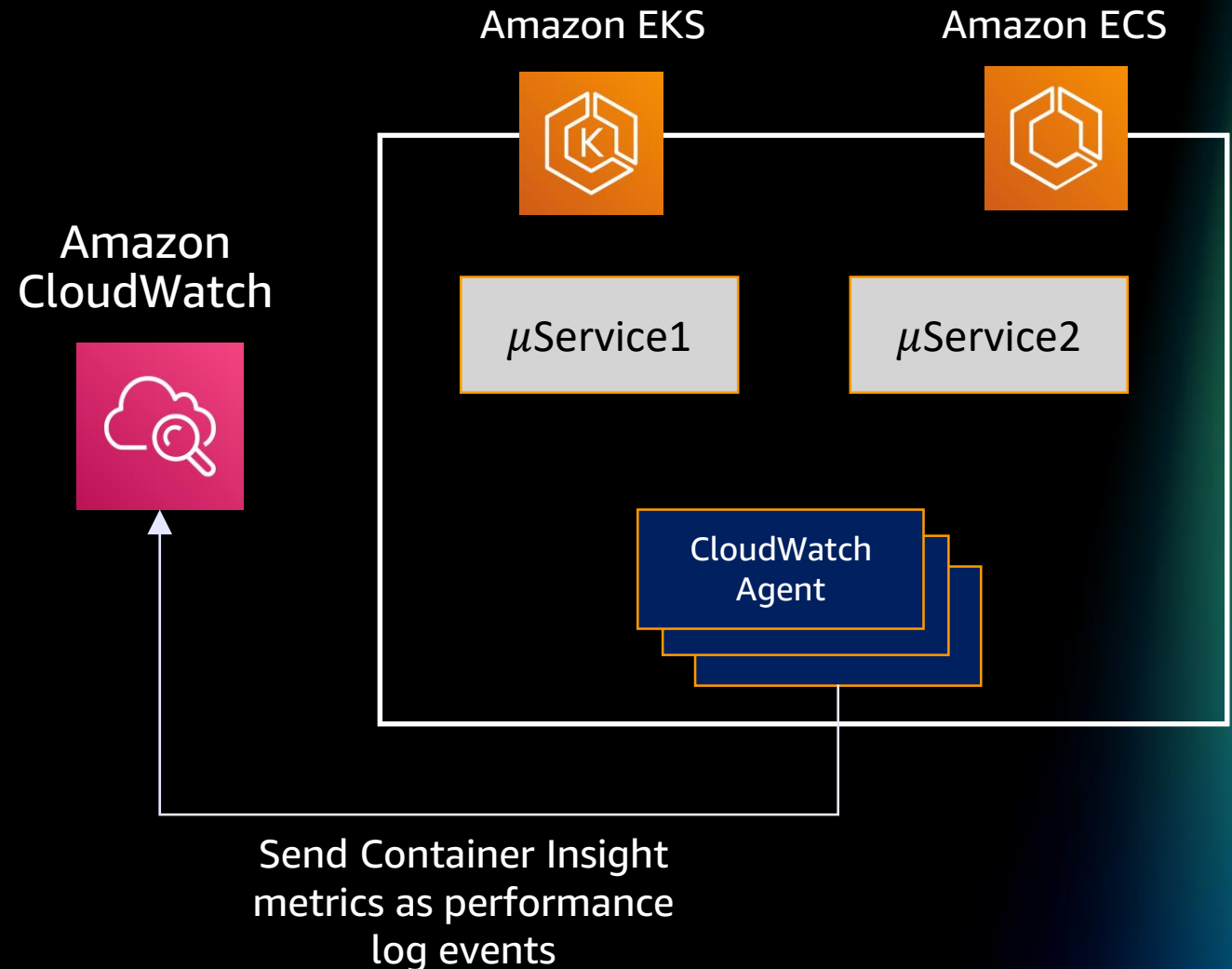
Amazon CloudWatch





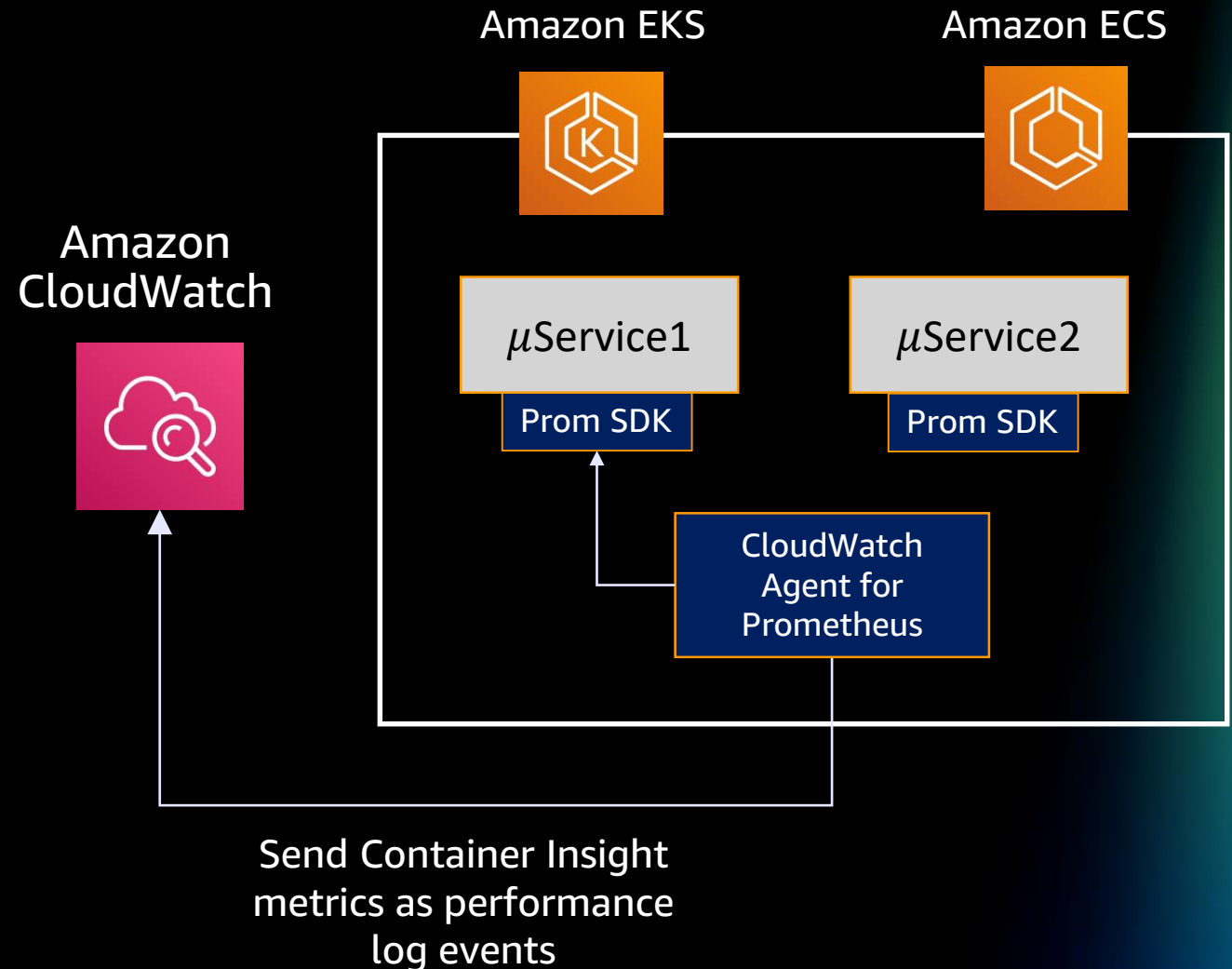
# Amazon CloudWatch **Container** Insights

- Collect, aggregate and summarize **metrics** and **logs** from containerized applications
- Collect instance-level metrics such as CPU, memory, disk and network usage
- Operational data collected as performance log events with EMF from which metrics are extracted



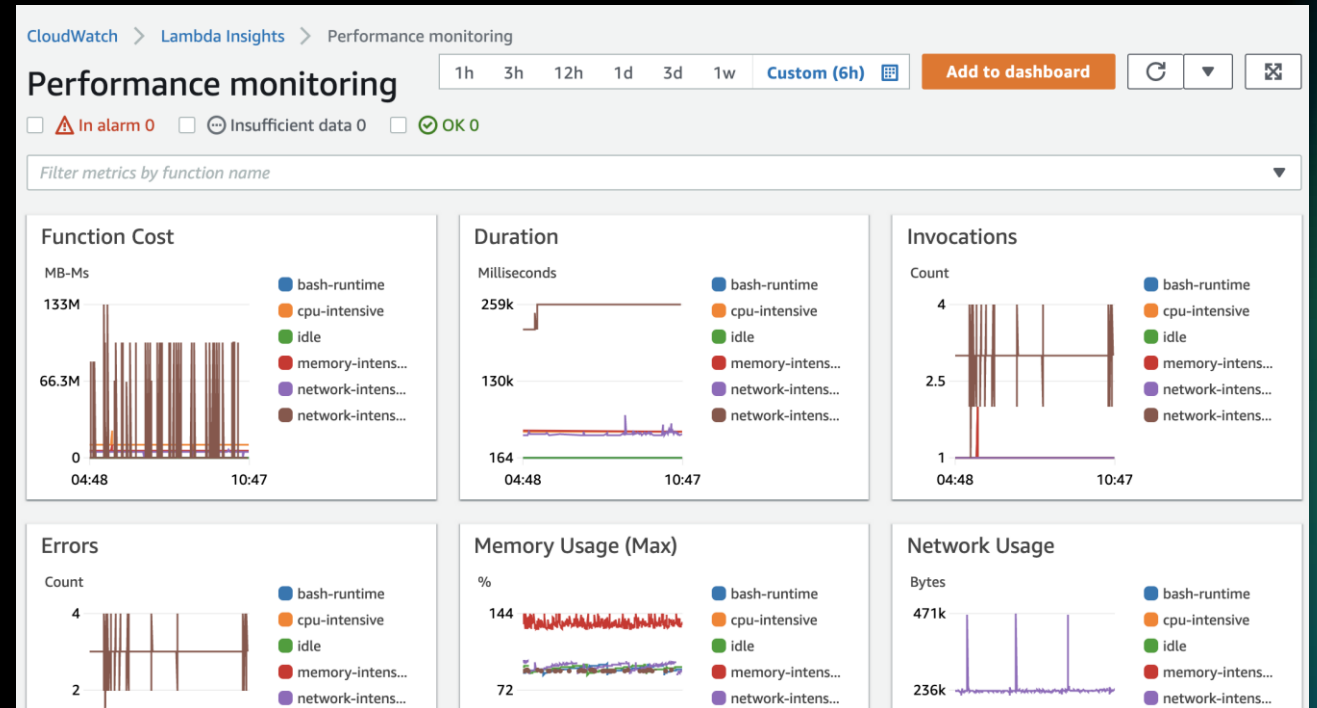
# Amazon CloudWatch **Container** Insights for **Prometheus**

- Collect, aggregate and summarize **metrics** and **logs** from containerized applications
- Collect instance-level metrics such as CPU, memory, disk and network usage
- Operational data collected as performance log events with EMF from which metrics are extracted



# Amazon CloudWatch **Lambda** Insights

- Get deeper insights into Lambda function executions using system-level **metrics**.
- Easily enabled on a per-function basis.
- Review KPIs using CloudWatch dashboard; either multi-function overview, or focus on a single function.
- Metrics are sent to CloudWatch as a single performance log event with EMF for every execution.



# AWS Lambda Extensions

## Receive and control Lambda lifecycle events

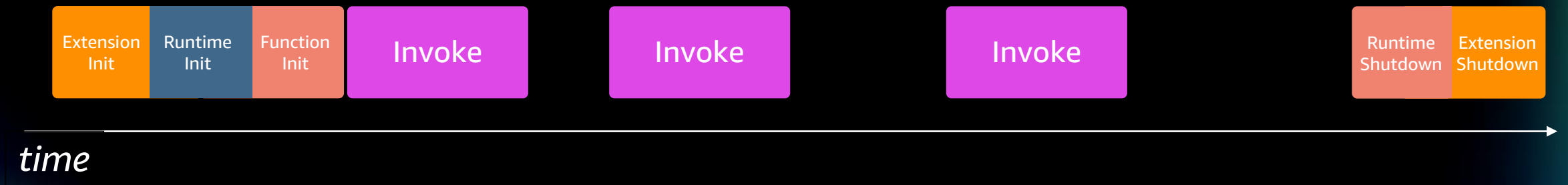
Delivered via Lambda Layers

Register via **Extensions** API for lifecycle events:

- Init
- Invoke
- shutdown

Primary use cases:

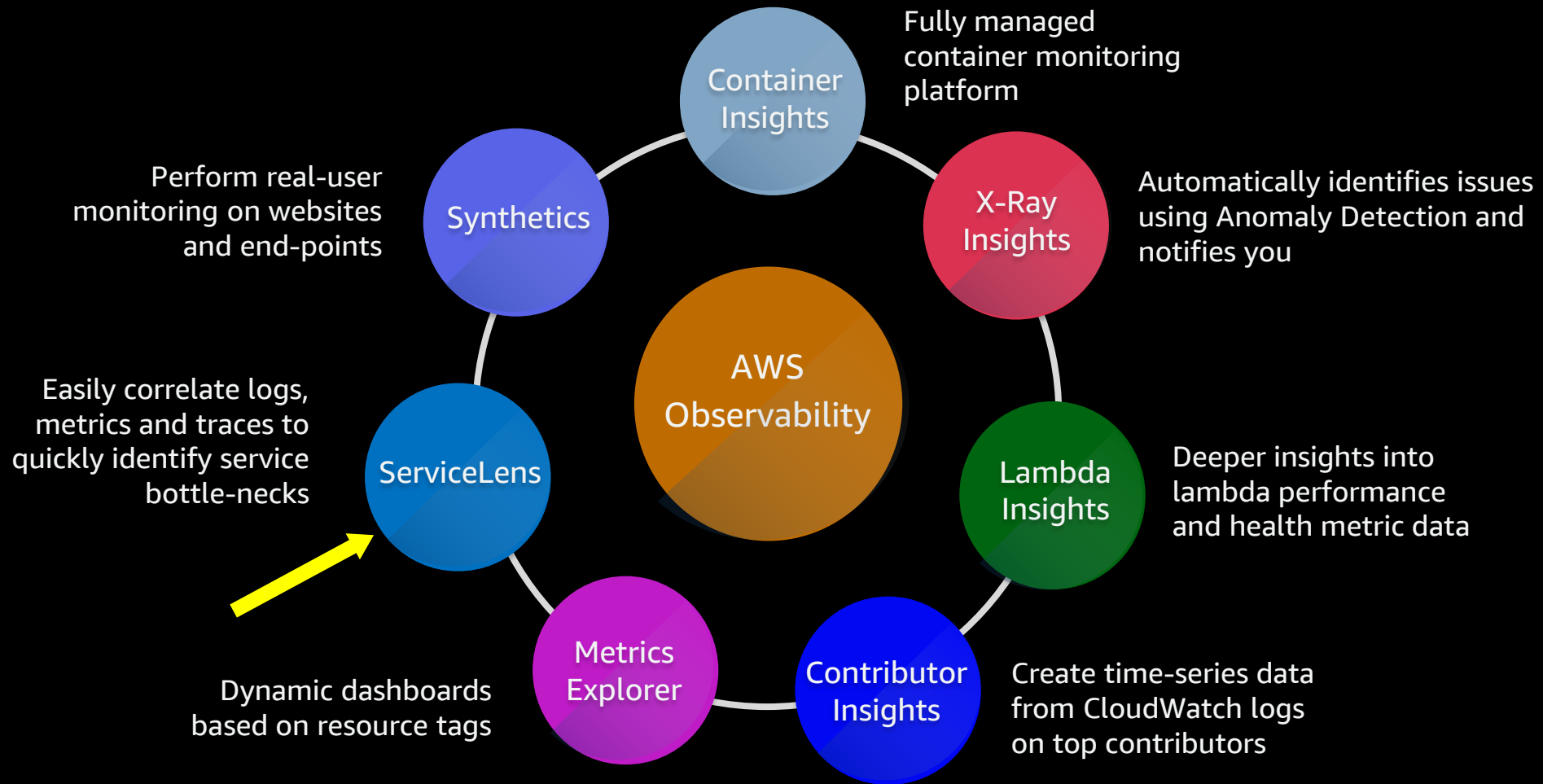
- Monitoring
- Configuration
- Security



# AWS Lambda logs API

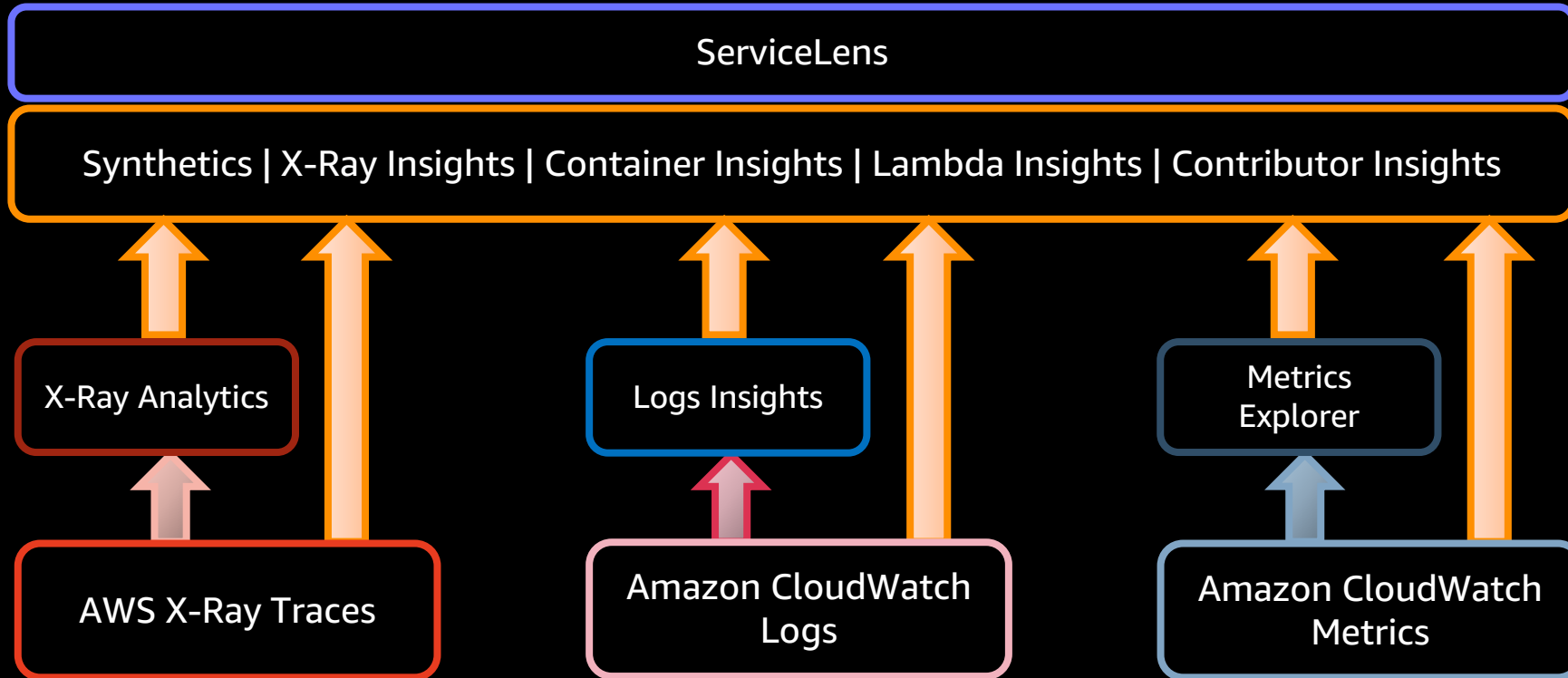
1. Send **log** streams to preferred destinations directly from Lambda execution environment
2. Build your own
3. Partner integrations:
  - i. Datadog
  - ii. Lumigo
  - iii. New Relic
  - iv. Coralogix
  - v. Honeycomb
  - vi. Sumo Logic
4. Optionally disable logging to CloudWatch Logs via AWS IAM permissions

# AWS Observability tools



► Infrastructure monitoring    ► Application monitoring    ► Synthetic monitoring

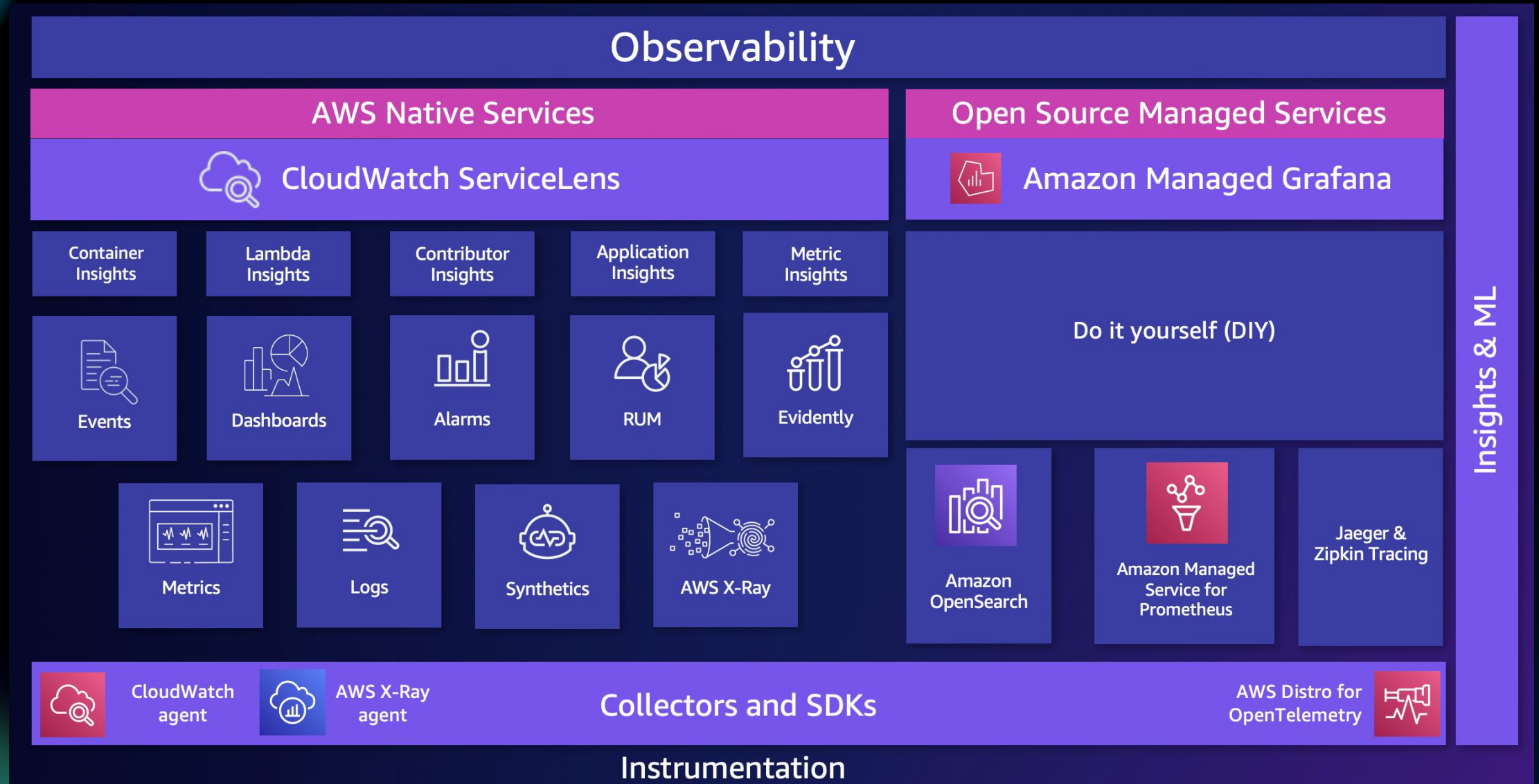
# Insights into apps and infrastructure



# Amazon CloudWatch ServiceLens Demo



# Summary



# Hands-on experience

- Get a hands-on experience on all AWS Observability features
- Available in English, Japanese, Spanish and Korean languages

The screenshot shows the AWS Workshop Studio interface for the 'One Observability Workshop'. The left sidebar contains a table of contents with items like 'Introduction to AWS Observability', 'Event Engine Access', and various AWS services (X-Ray, CloudWatch, etc.). The main content area on the right provides a welcome message, explains the workshop's purpose, and lists what users can expect to learn. The footer includes copyright information and links to privacy policy and terms of use.

aws workshop studio

## One Observability Workshop

- Introduction to AWS Observability
- Event Engine Access
- ▶ Environment setup
- ▶ CloudWatch ServiceLens Map
- ▶ AWS X-Ray
- ▶ Contributor Insights
- ▶ CloudWatch Synthetics
- ▶ CloudWatch RUM
- ▶ CloudWatch Evidently
- ▶ Container Insights
- ▶ Logs Insights
- ▶ Lambda Insights
- ▶ Content preferences

Welcome to the One Observability Workshop. This workshop is aimed at providing an hands-on experience for you on the wide variety of toolsets AWS offers to setup monitoring and observability on your applications.

Whether your workload is on-prem or on AWS, or your application is a giant monolith or based on modern microservice based architecture, our observability tools can help you get deeper insights into your application performance and health.

Our cost effective and native solutions provide powerful capabilities that enable you to identify bottle necks, issues, and defects without you having to manually sift through various logs, metrics and trace data.

Go ahead and play around with the workshop and please feel free to provide your feedback.

### What to expect from this workshop

#### What will I learn?

You will learn about AWS observability functionalities on Amazon CloudWatch, AWS X-Ray, Amazon Managed Service for Prometheus, Amazon Managed Grafana and AWS Distro for OpenTelemetry (ADOT). The workshop will deploy a micro-service application and help you learn monitoring. The key takeaway expected is that the learner will have a clear understanding of logging, metrics, container monitoring and tracing techniques as a result.

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<https://observability.workshop.aws/en/>

# Resources

- What is Observability?

<https://aws.amazon.com/products/management-and-governance/use-cases/monitoring-and-observability/>

- AWS X-Ray Serverless Samples

<https://github.com/aws-samples/aws-xray-serverless-samples>

- Amazon CloudWatch Custom Metrics

<https://aws.amazon.com/premiumsupport/knowledge-center/cloudwatch-push-custom-metrics/>

# Visit the AWS resource hub

Start building upon a scalable, reliable, and globally available infrastructure so that you can focus on innovation and bringing new applications to market. Dive deeper with these resources today.

- Accelerate innovation with AWS
- Get more performance for your applications at lower costs with AWS
- Global-scale solutions
- How startups succeed with AWS



<https://tinyurl.com/for-every-app-hub-aws>

Visit resource hub



# AWS Training and Certification



## Self – Paced Digital Training on AWS

Explore learning plans and 500+ digital courses from our new learning center, AWS Skill Builder, to help you achieve your goals on your schedule.

[bit.ly/3lzVj0g](https://bit.ly/3lzVj0g)



## AWS Certification

Validate technical skills and cloud expertise to grow your career and business.

[go.aws/3PwN3ff](https://go.aws/3PwN3ff)

# Thank you for attending AWS Innovate – For Every Application Edition

We hope you found it interesting! A kind reminder to **complete the survey**.  
Let us know what you thought of today's event and how we can improve the event  
experience for you in the future.



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# Thank you!