INNOVATE

FOR EVERY APPLICATION EDITION

25 August, 2022

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Increase availability with AWS observability solutions

Rohini Gaonkar
Senior Developer Advocate
AISPL

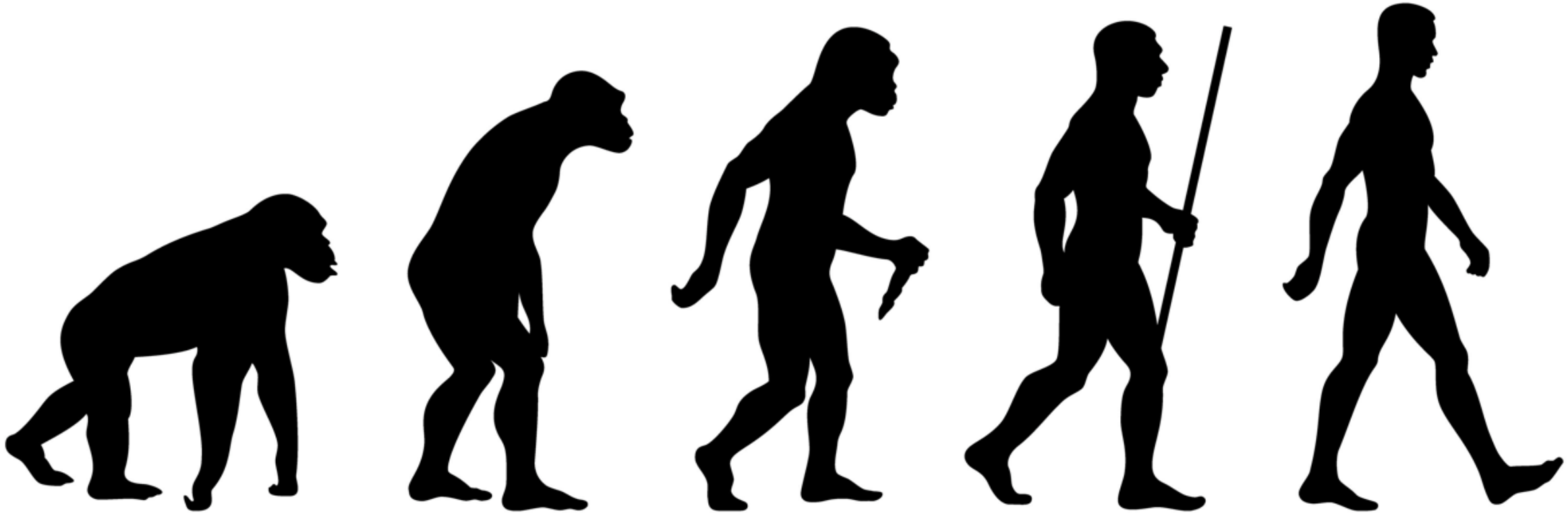
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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

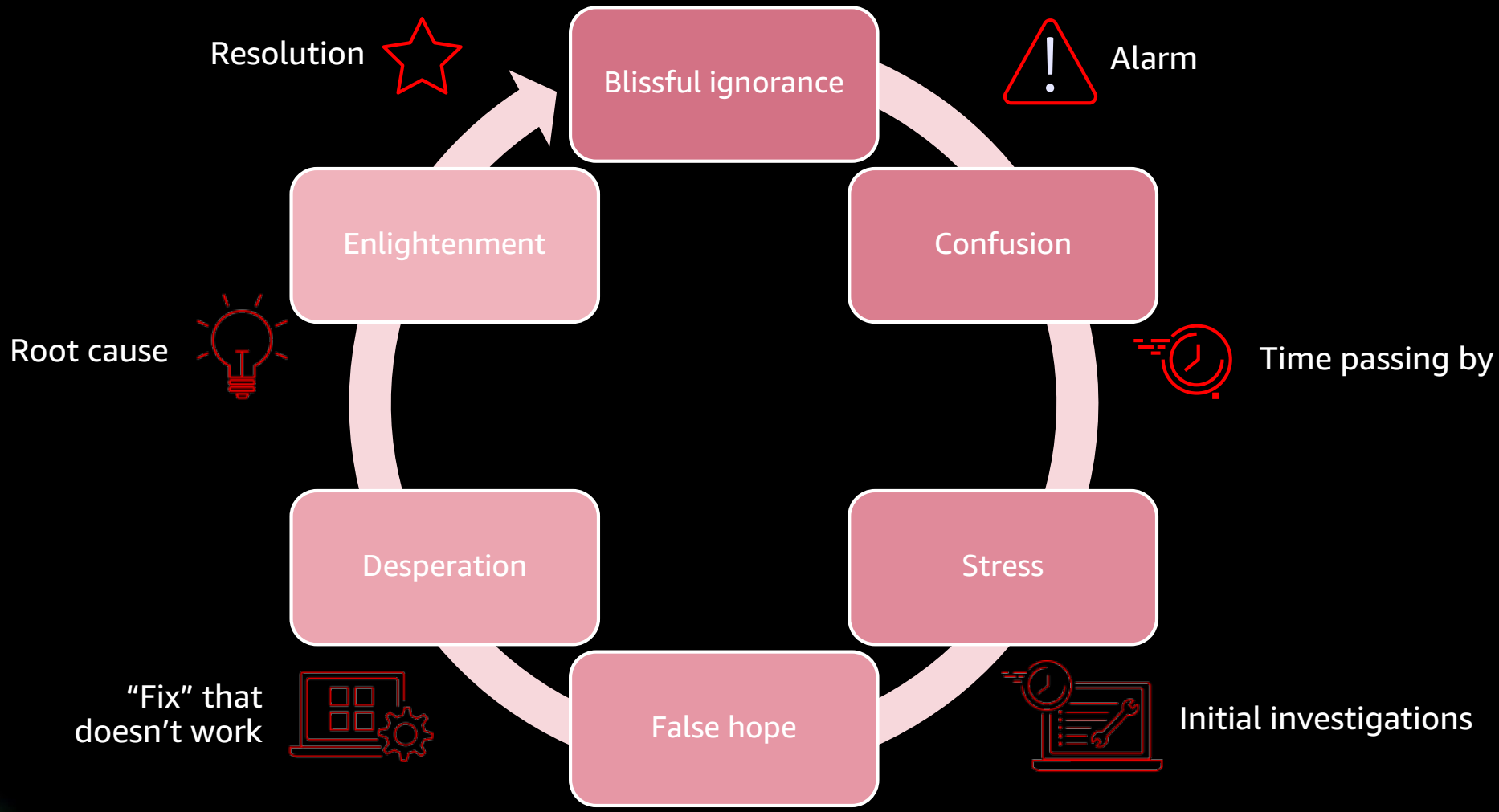
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Monitoring must evolve



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Reactive monitoring



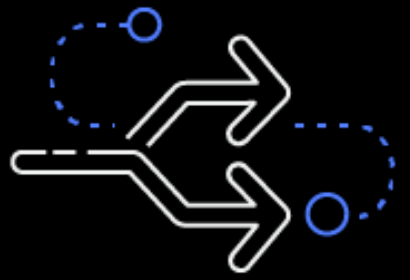
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Monitoring must evolve

Monolithic to microservices

Short-lived resources

Devices
Data



Faster release velocity

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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%"

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Observability matters because …

Visibility

Real-time troubleshooting

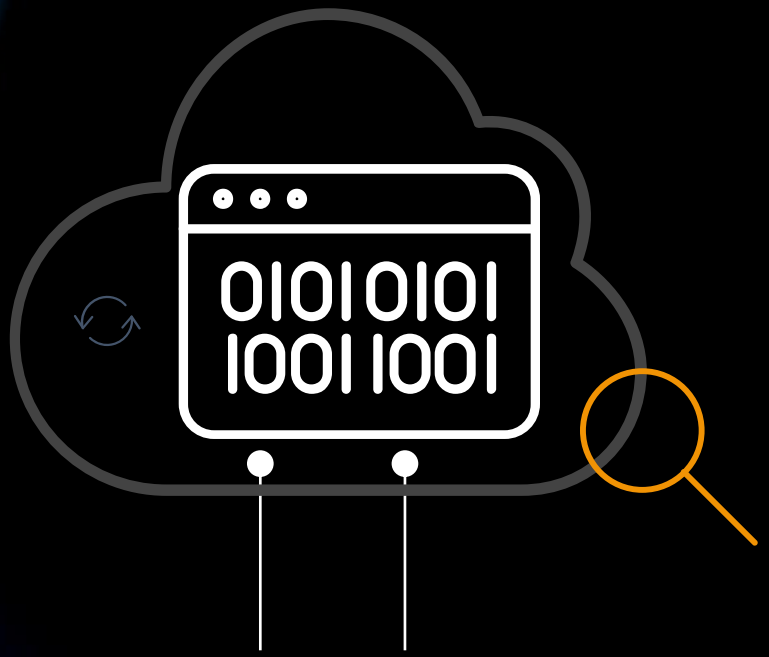
Customer experience

Applications = $$

Operational → **Business**

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

What is instrumentation?

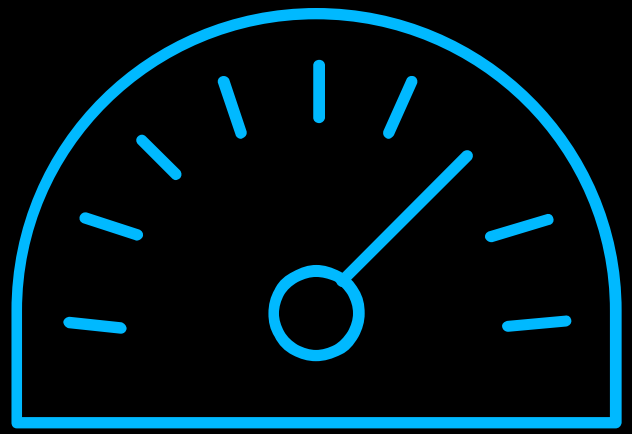


"Calls to this database took, on average, took 50 milliseconds"

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

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

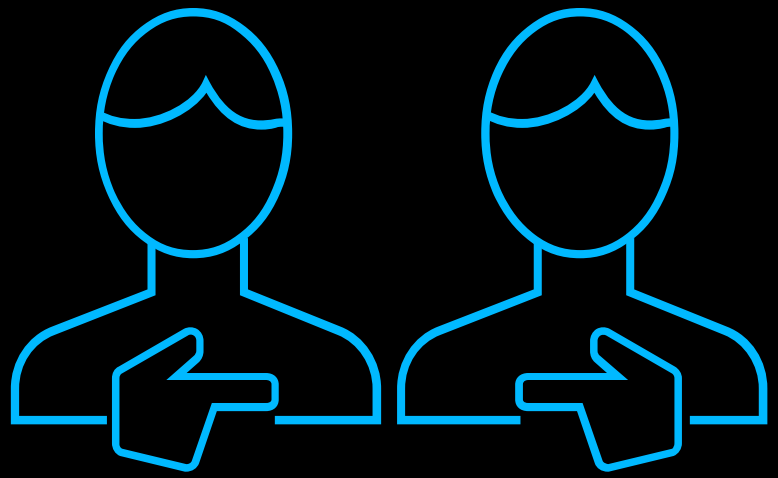
Good data can help with the technical shift to new systems



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

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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

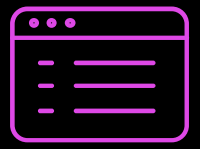
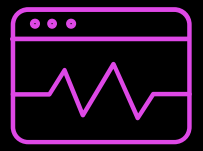
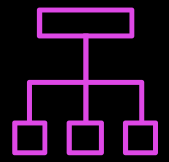
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

But...

How do we make
microservices and serverless functions
observable?

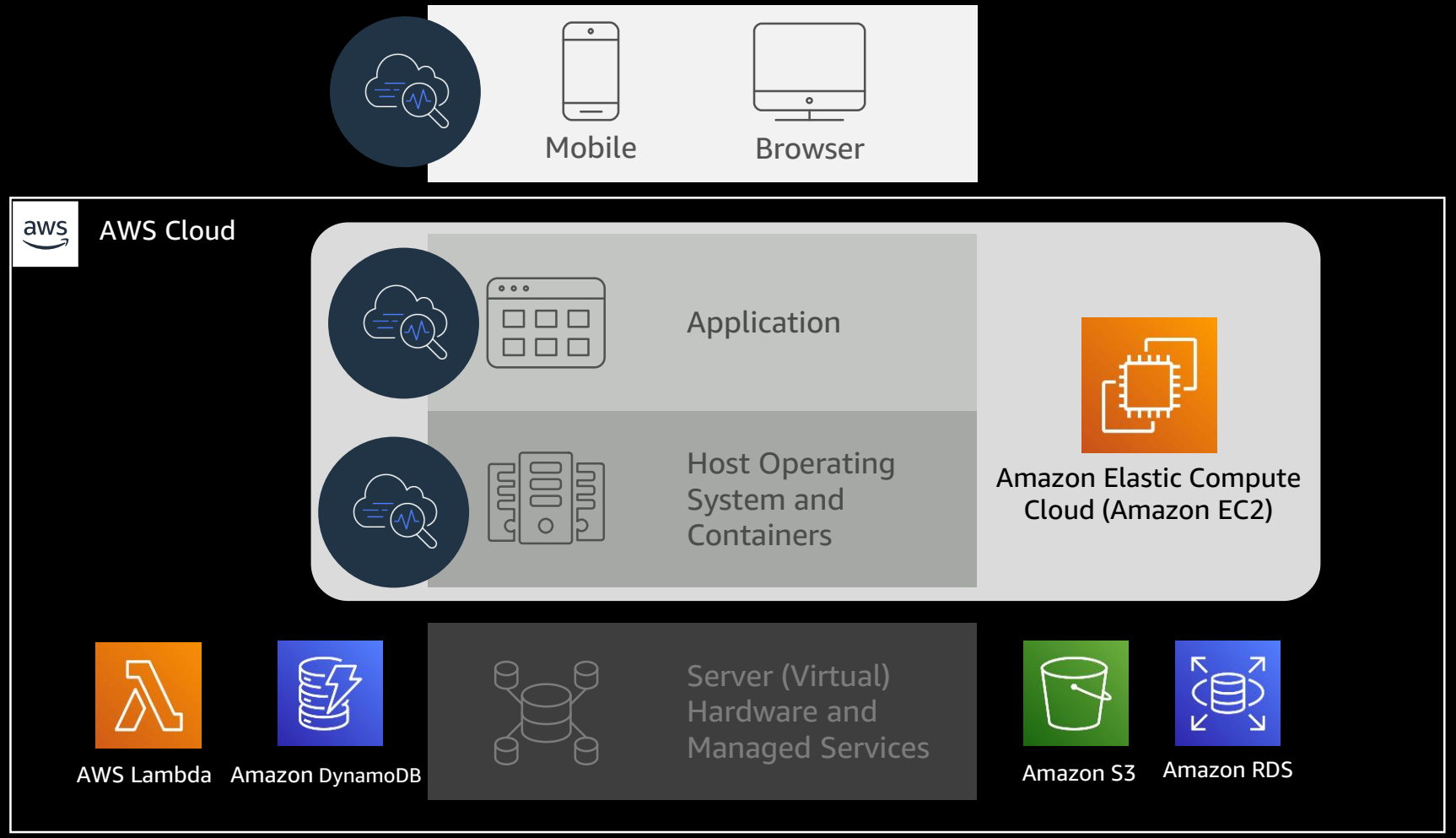
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

#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?”	✓

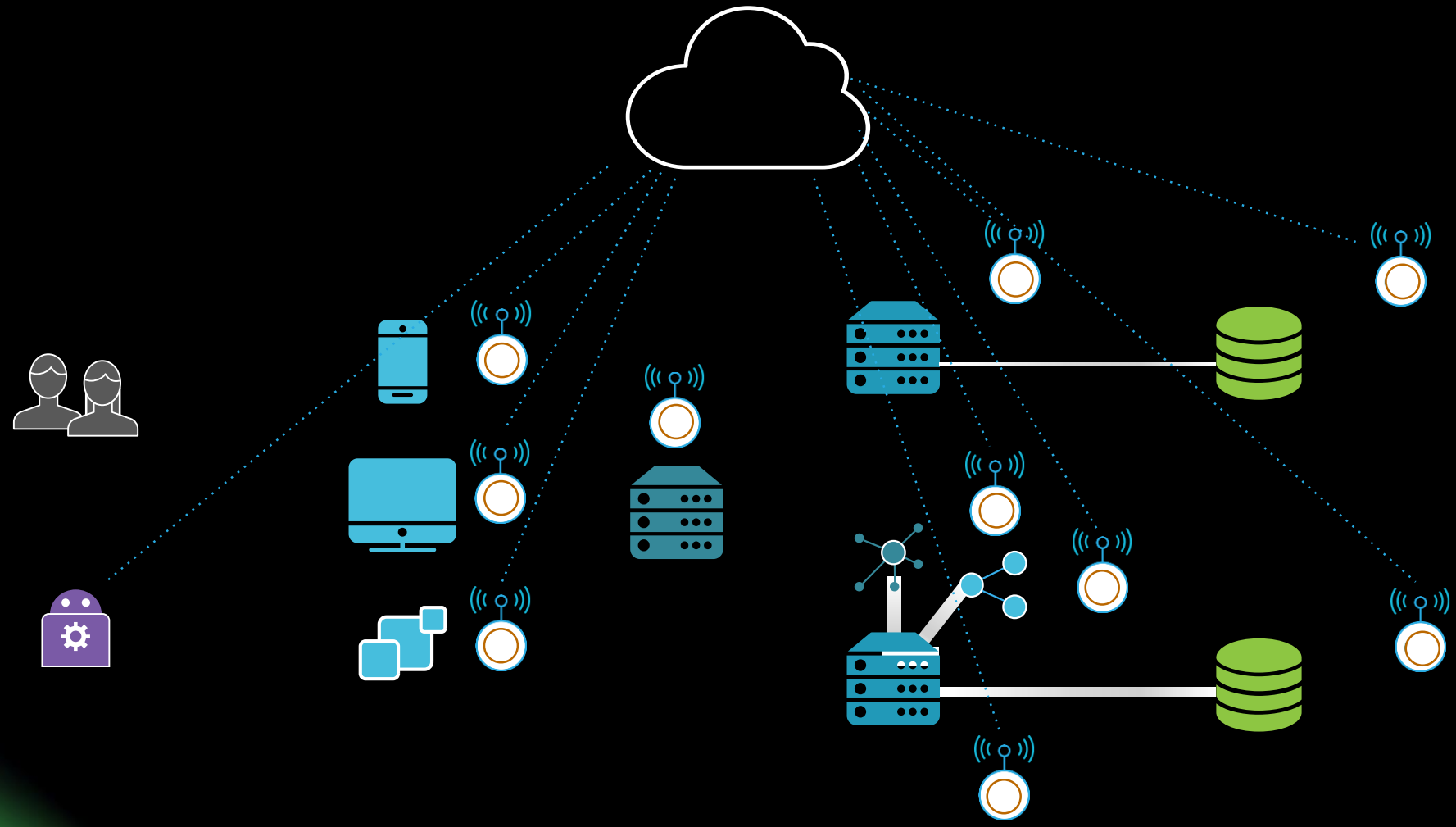
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

#2: All components should be instrumented



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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

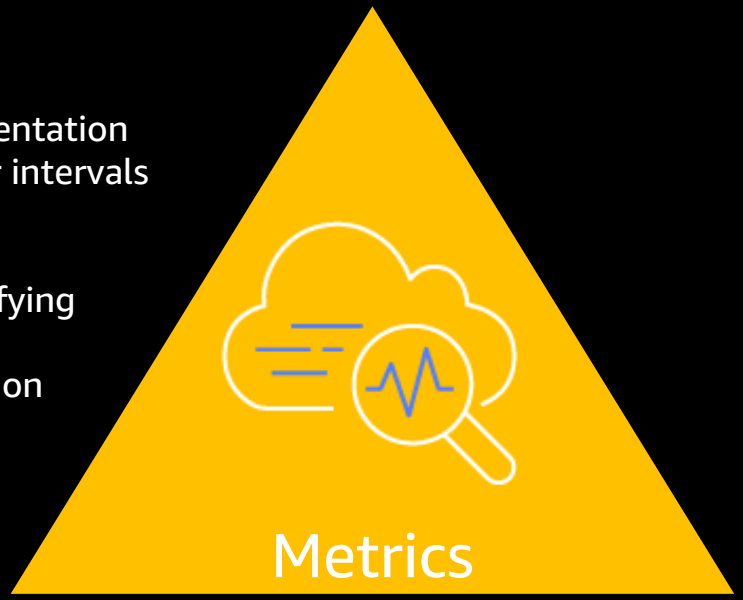


© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Foundation for Observability

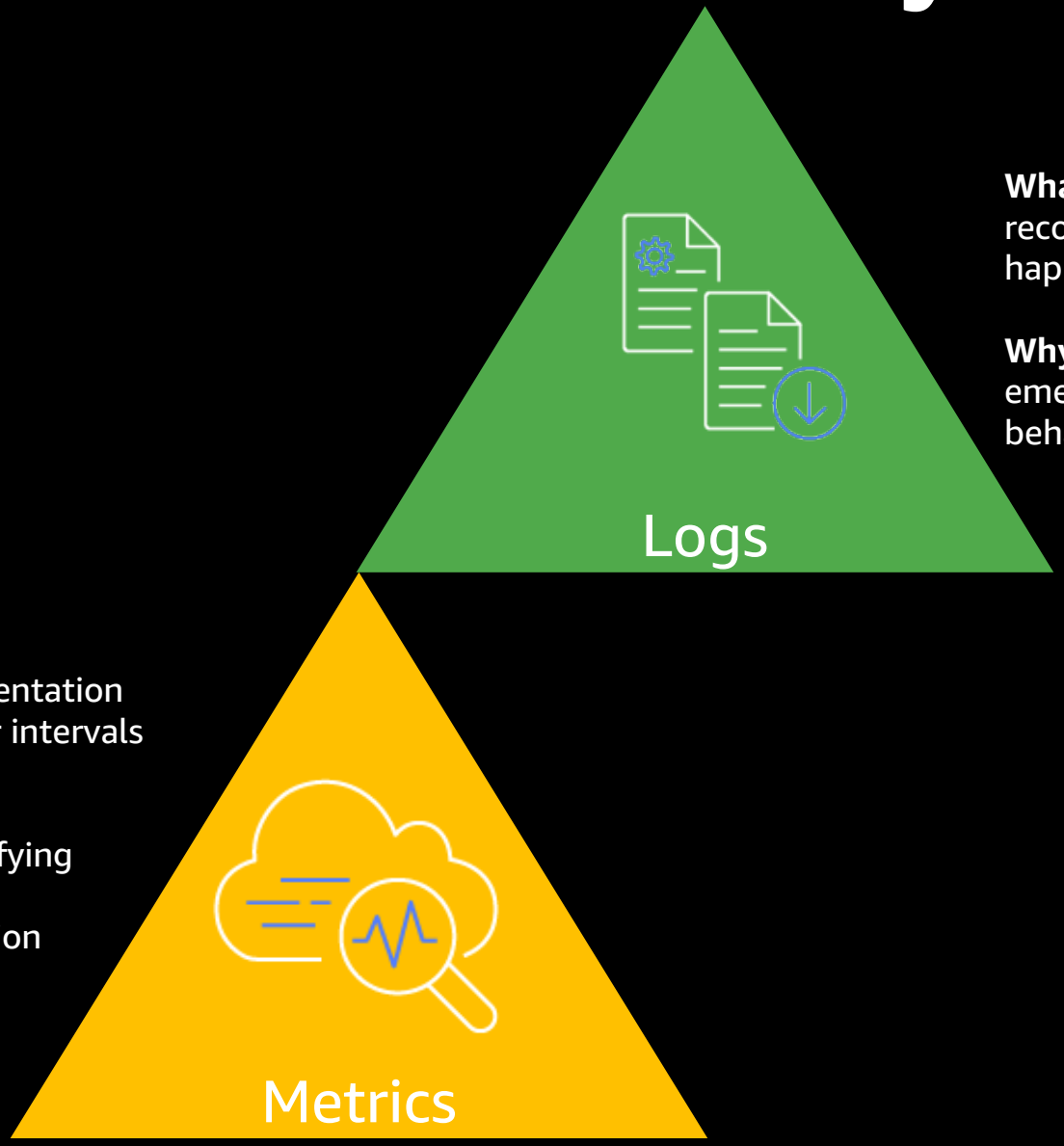
What: Numeric representation of data measured over intervals of time

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



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Foundation for Observability



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

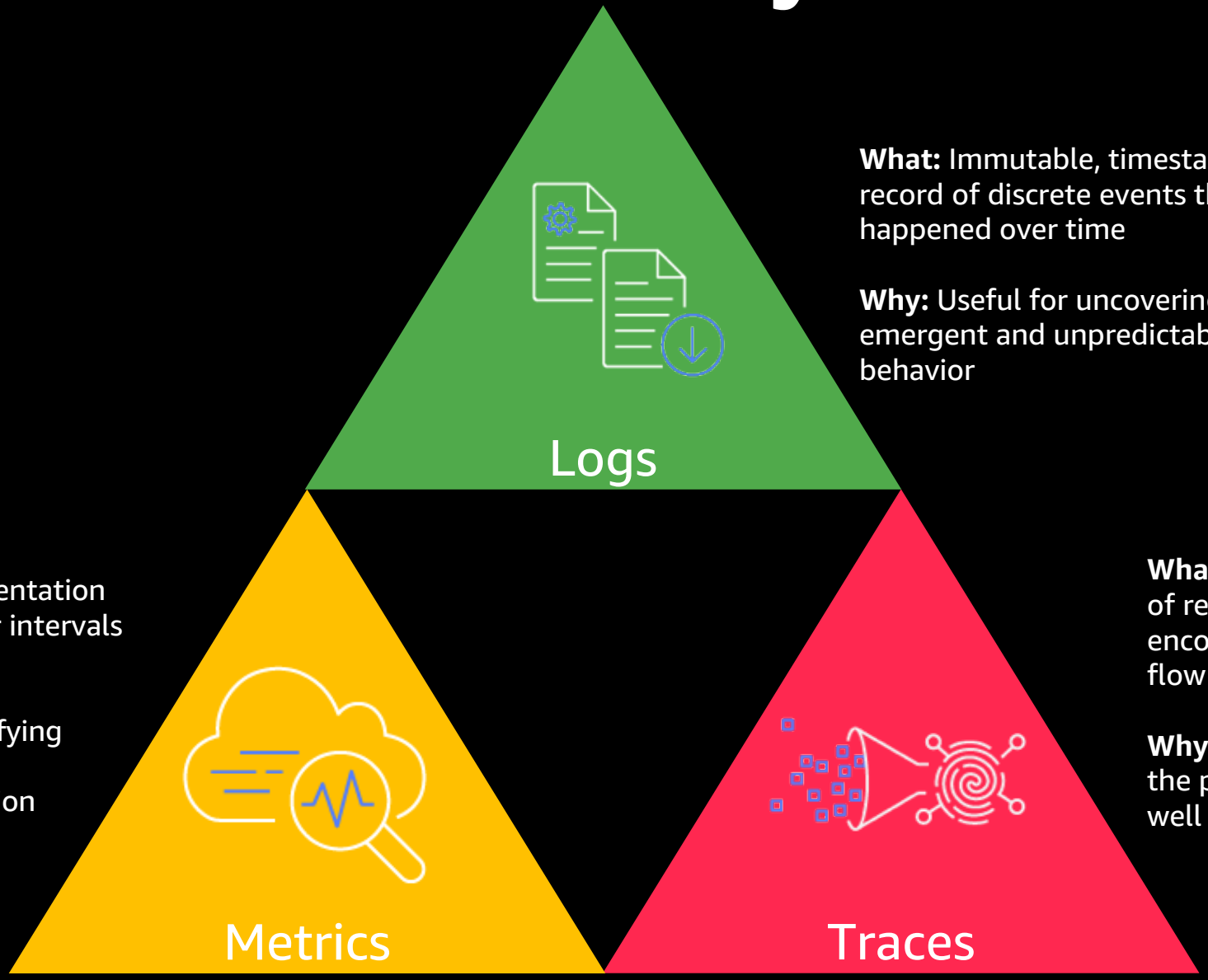
Why: Useful for uncovering emergent and unpredictable behavior

What: Numeric representation of data measured over intervals of time

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

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Foundation for Observability



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

Why: Useful for uncovering emergent and unpredictable behavior

What: Numeric representation of data measured over intervals of time

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

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

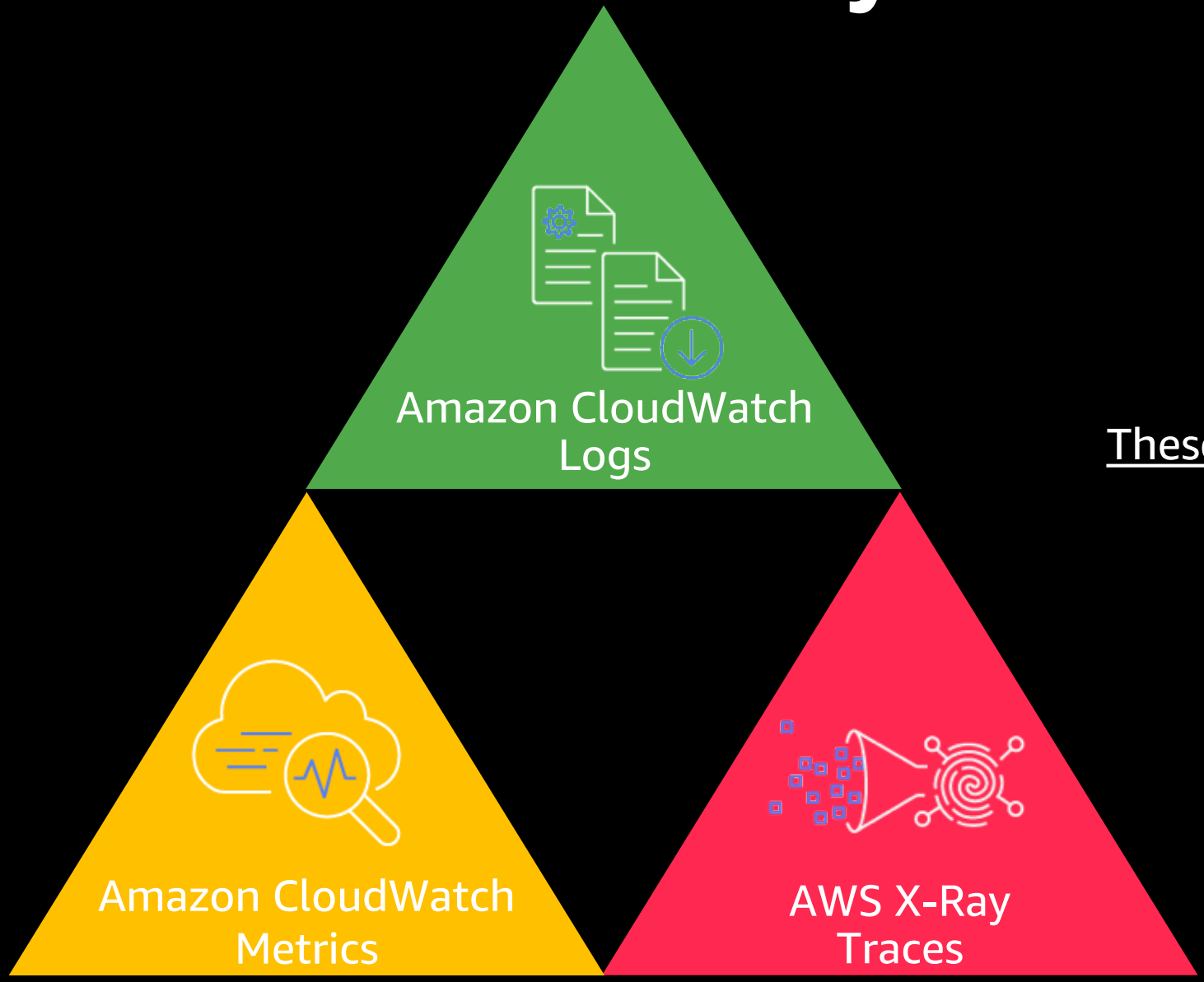
aws

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

AWS Services for Observability

Amazon CloudWatch

AWS X-Ray



These are the tools

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Amazon CloudWatch

OBSERVABILITY OF YOUR AWS RESOURCES AND APPLICATIONS

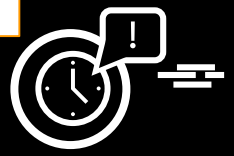
Amazon CloudWatch

Dashboards
Logs
Metrics
Alarms
Events

Amazon CloudWatch
Complete visibility into your cloud resources and applications

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; corelate logs and metrics side-by-side to troubleshoot and set alarms with Amazon CloudWatch alarms

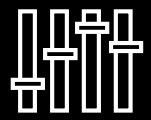


Act
Automate response to operational changes with Amazon CloudWatch Events and Autoscaling.

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

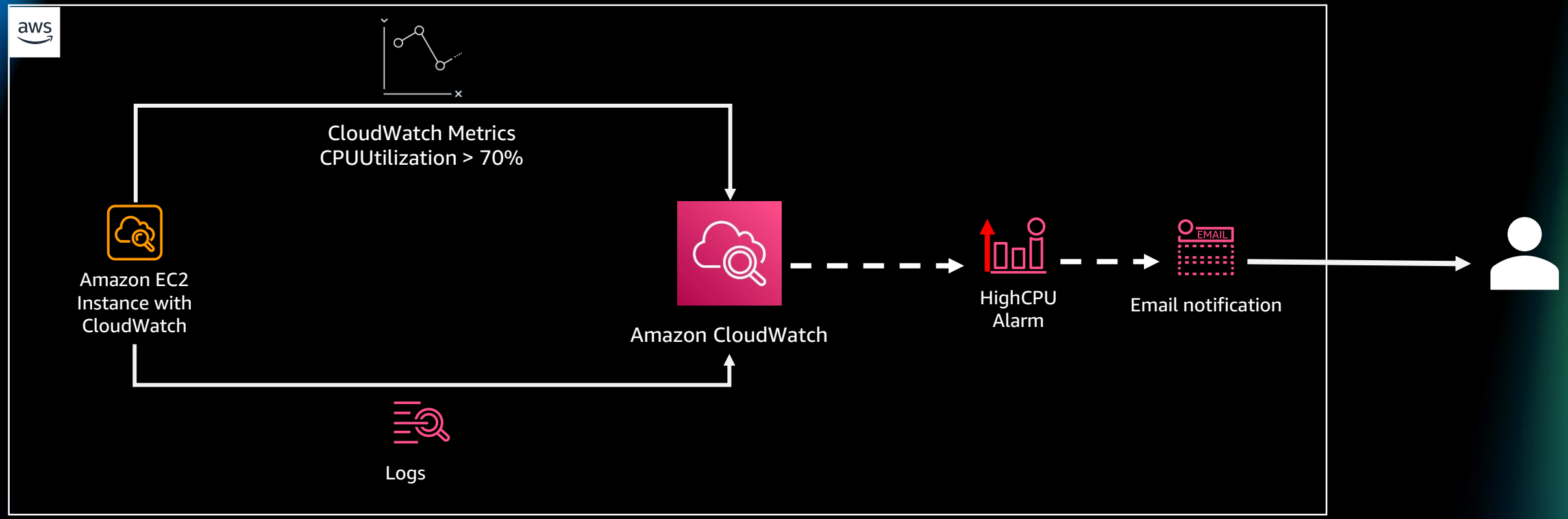


Resource optimization

Unified operational health

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Amazon CloudWatch Metrics



Metric Alarm States

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

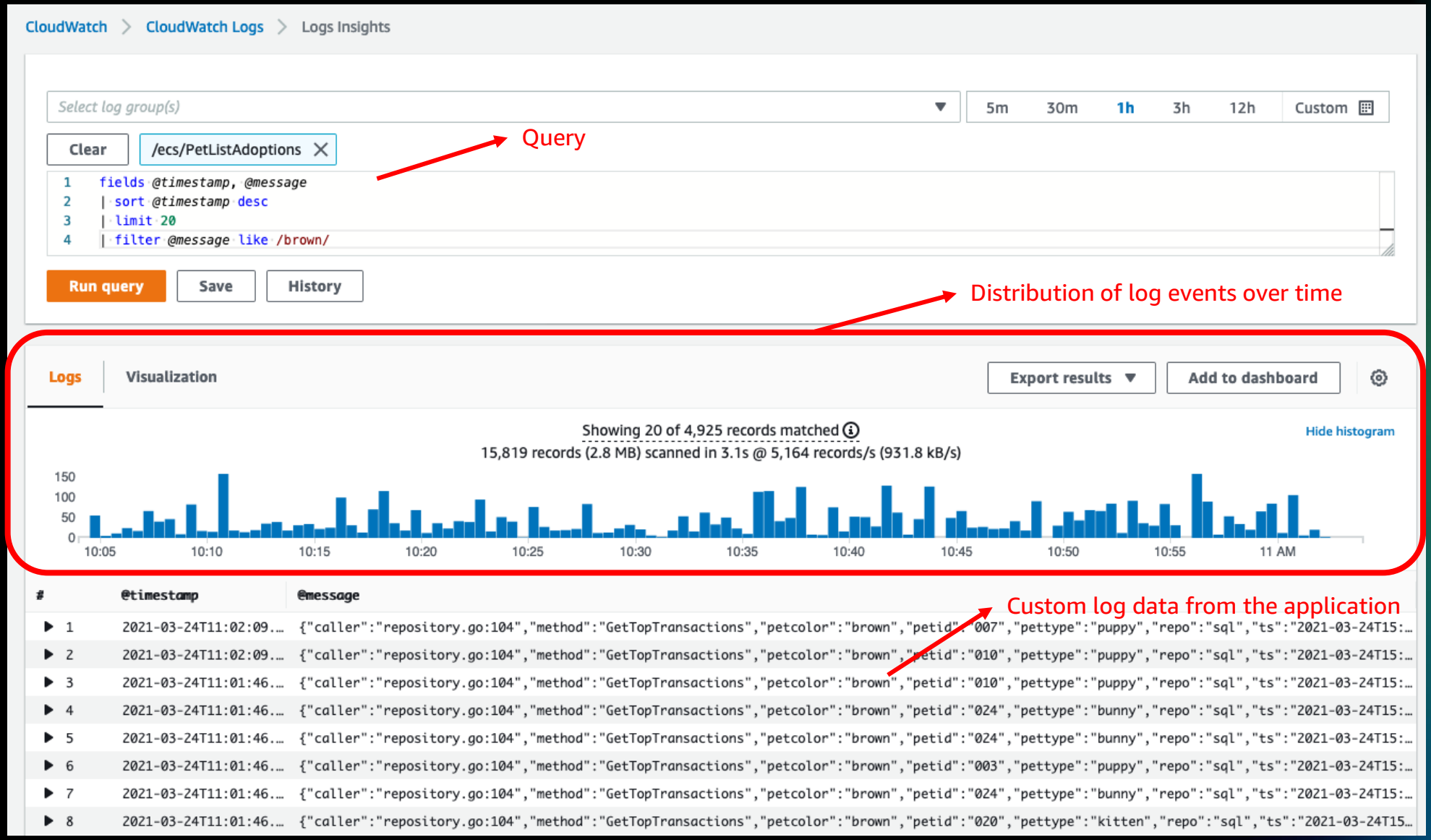
ALARM – The metric or expression is outside of the defined threshold.

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.

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Amazon CloudWatch Logs & Logs Insights

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



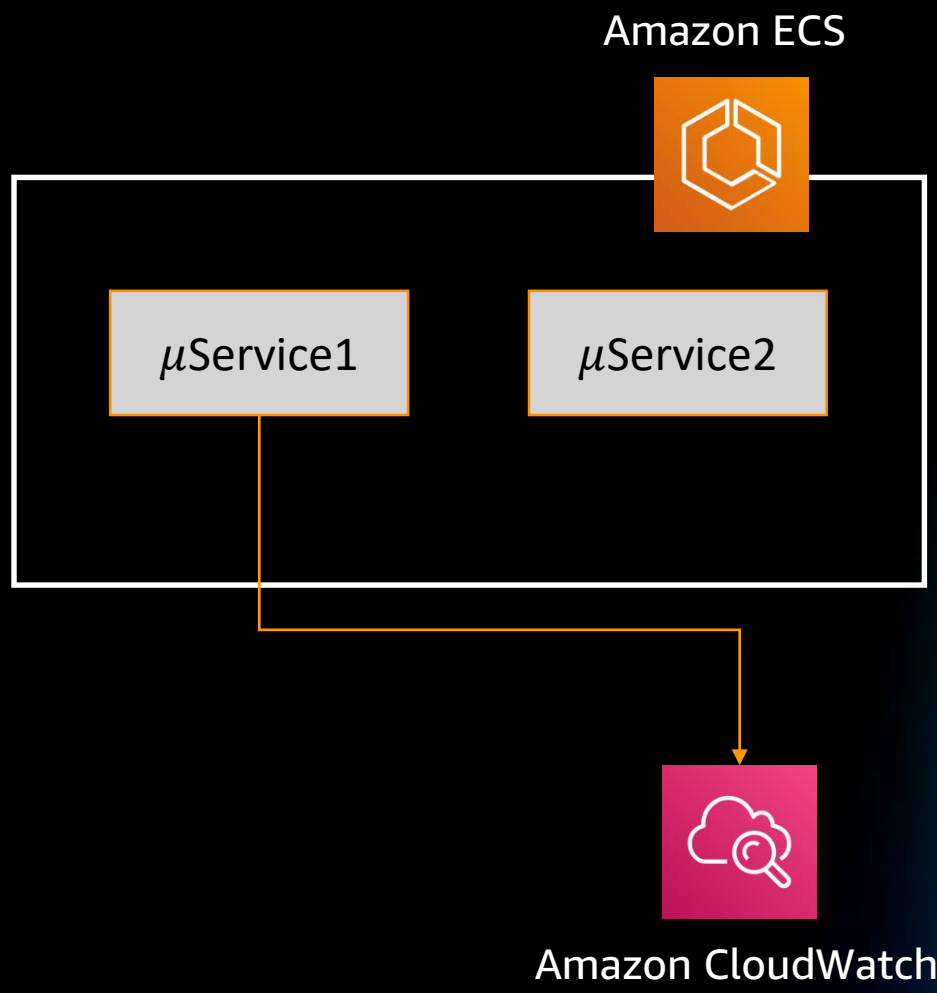
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Logs collection for
- Amazon Elastic Container Service (Amazon ECS)
- Amazon Elastic Kubernetes Service (Amazon EKS)

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Amazon CloudWatch logs for Amazon ECS

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

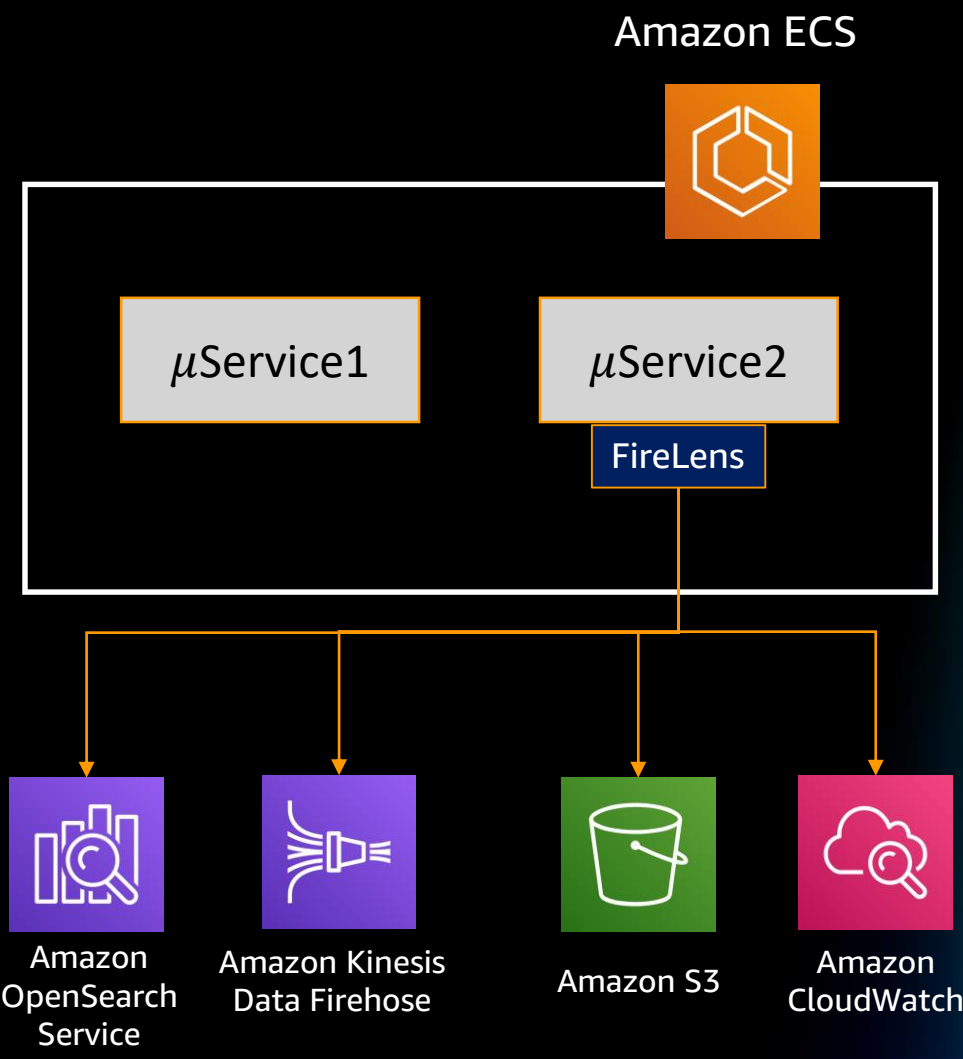


© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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

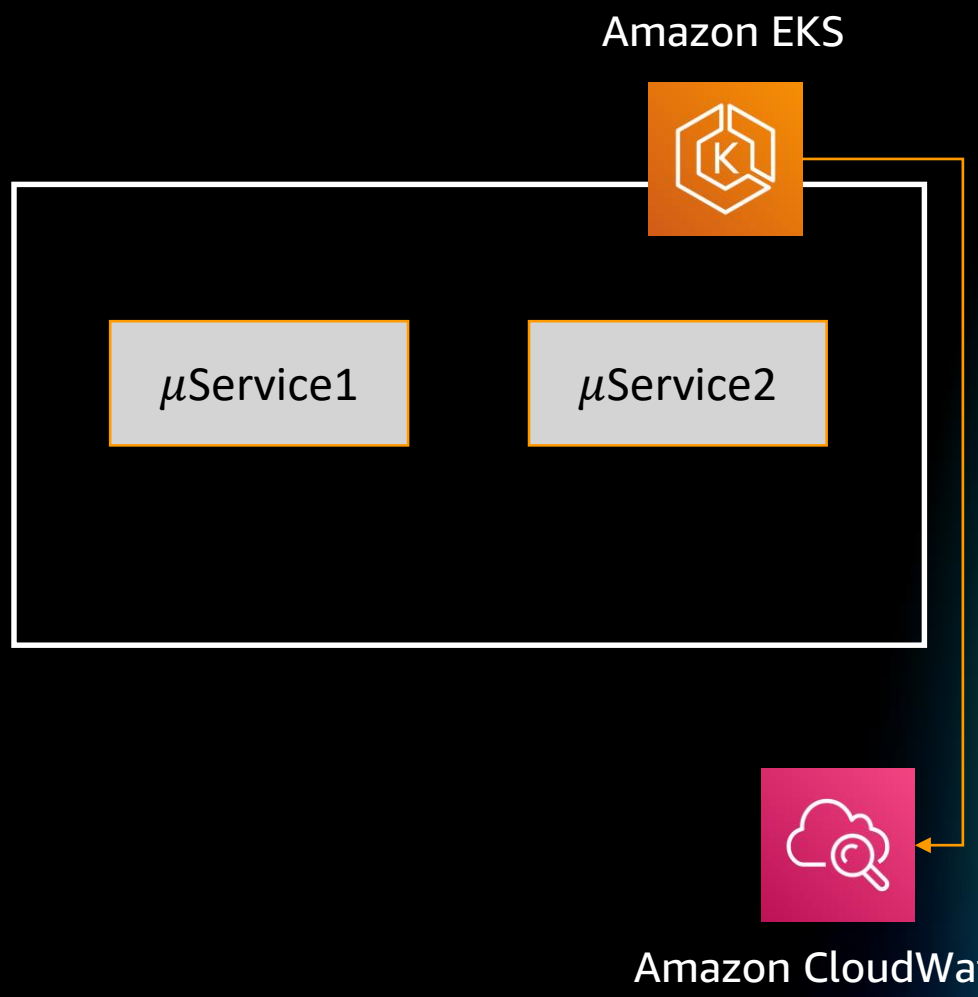
Both methods work on Amazon EC2 and AWS Fargate



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Amazon CloudWatch logs for Amazon EKS

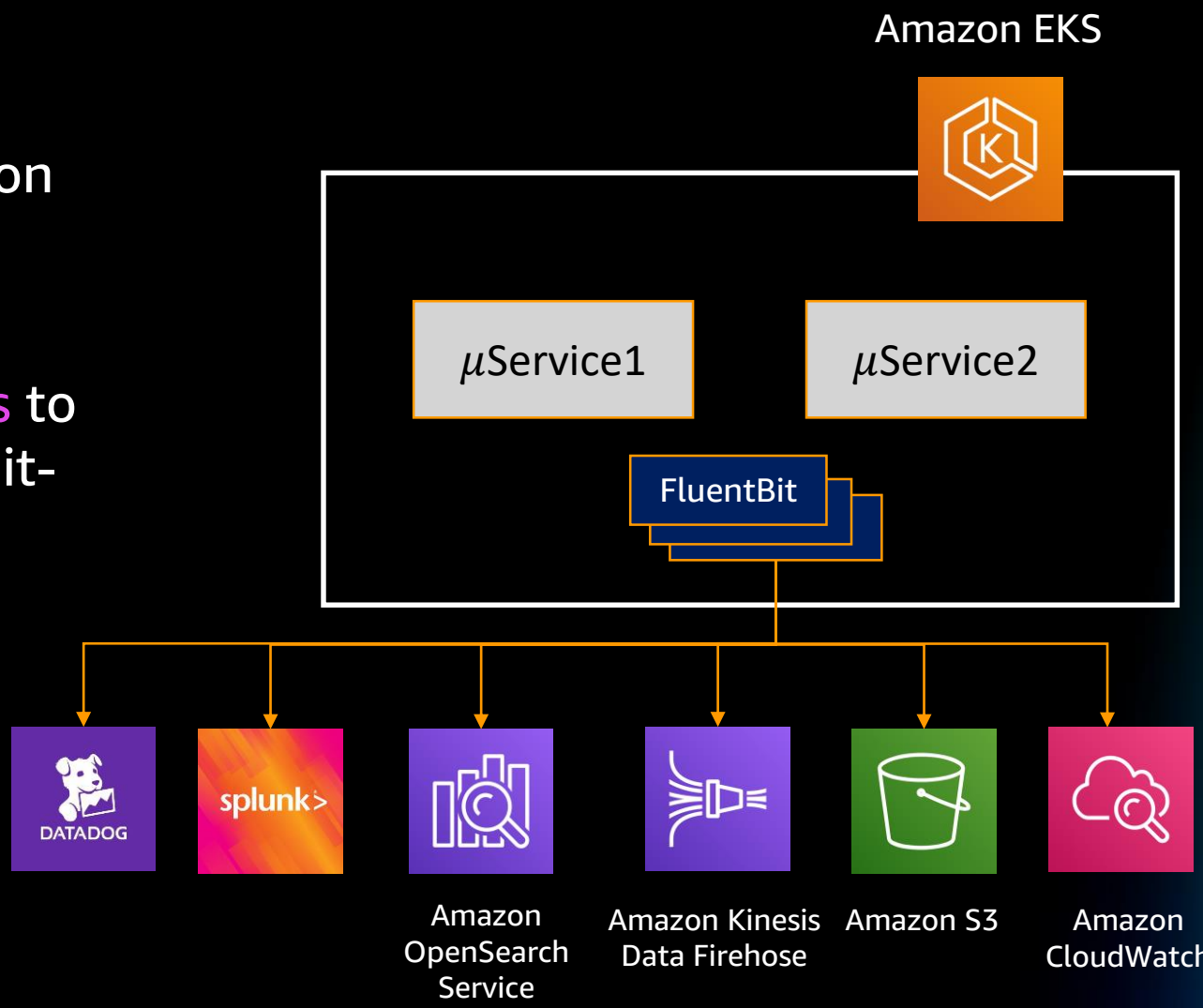
1. Audit and diagnostic logs from Amazon EKS Control Plane can be sent to Amazon CloudWatch



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

AWS X-Ray

ANALYZE AND DEBUG PRODUCTION, DISTRIBUTED APPLICATIONS

AWS X-Ray

Traces
Analytics
Service map

AWS X-Ray

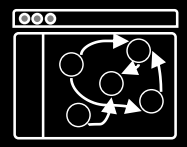
AWS X-Ray helps you analyze and debug modern applications built using microservices and serverless architecture and quantify impact

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

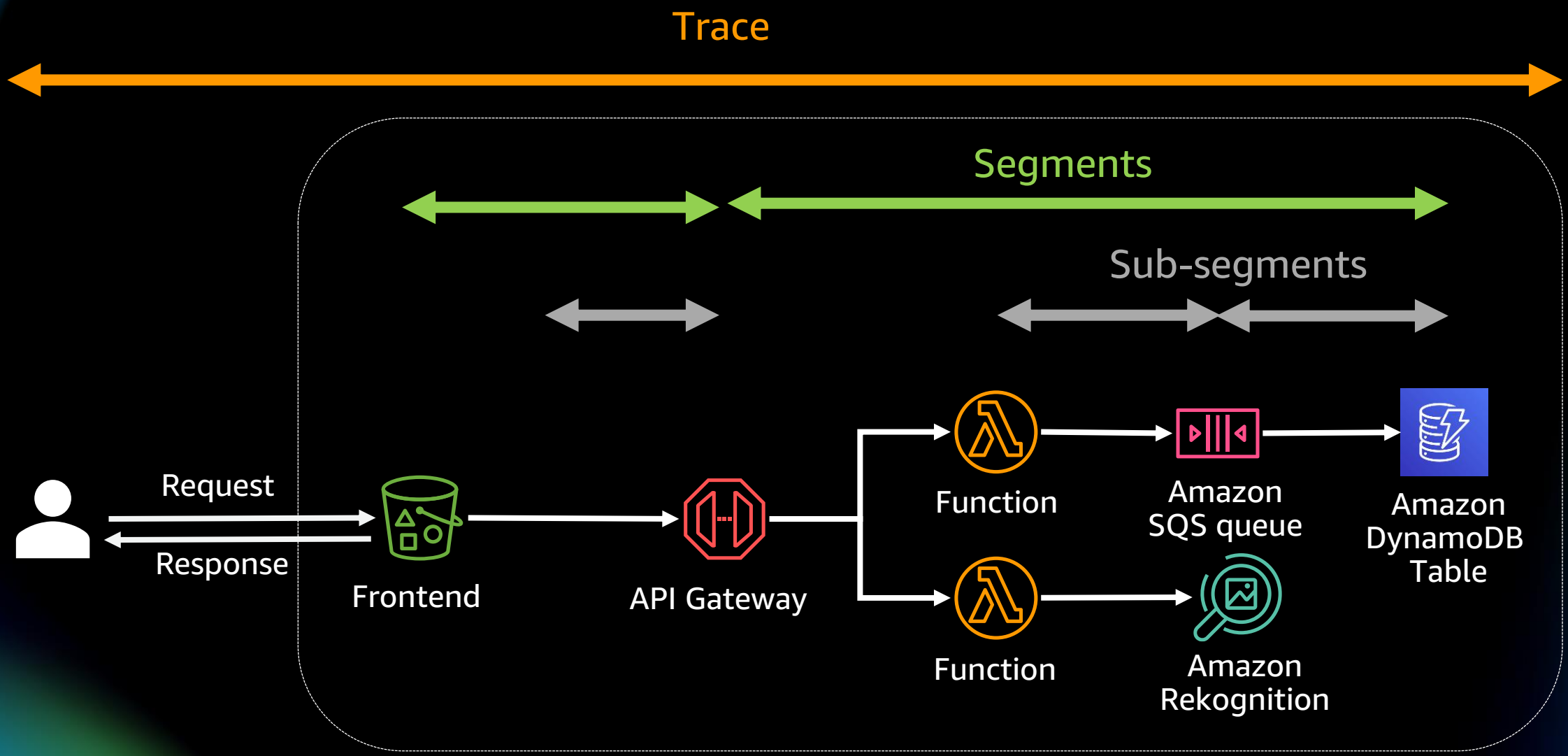
View the service map to see trace data such as latencies, HTTP statuses, and metadata for each service

Analyze issues

Drill into the service showing unusual behavior to identify root issue

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

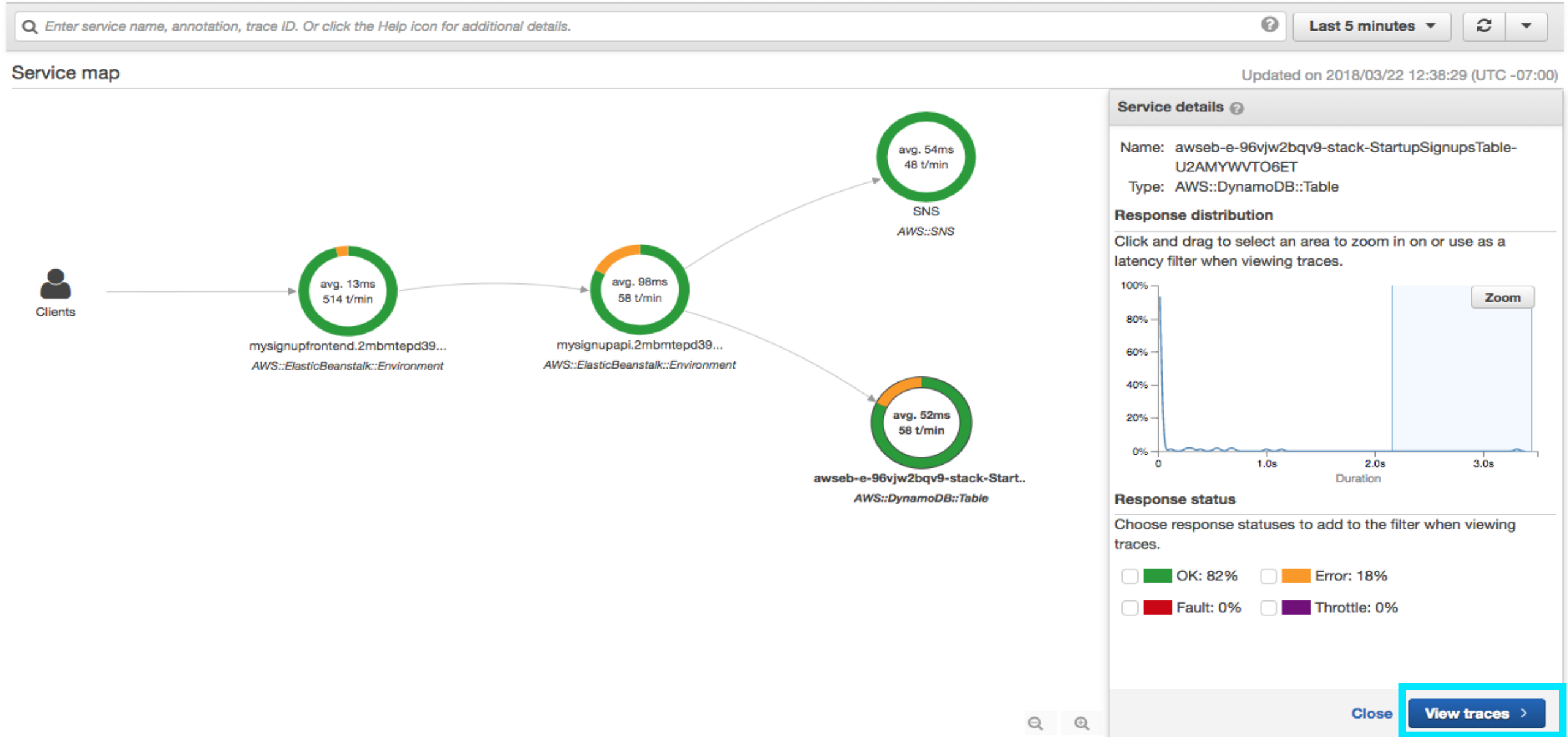
AWS X-Ray Concepts



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

AWS X-Ray Service Maps

IDENTIFY PERFORMANCE BOTTLENECKS



AWS X-Ray Traces

IDENTIFY PERFORMANCE BOTTLENECKS

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

AWS X-Ray SDK

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

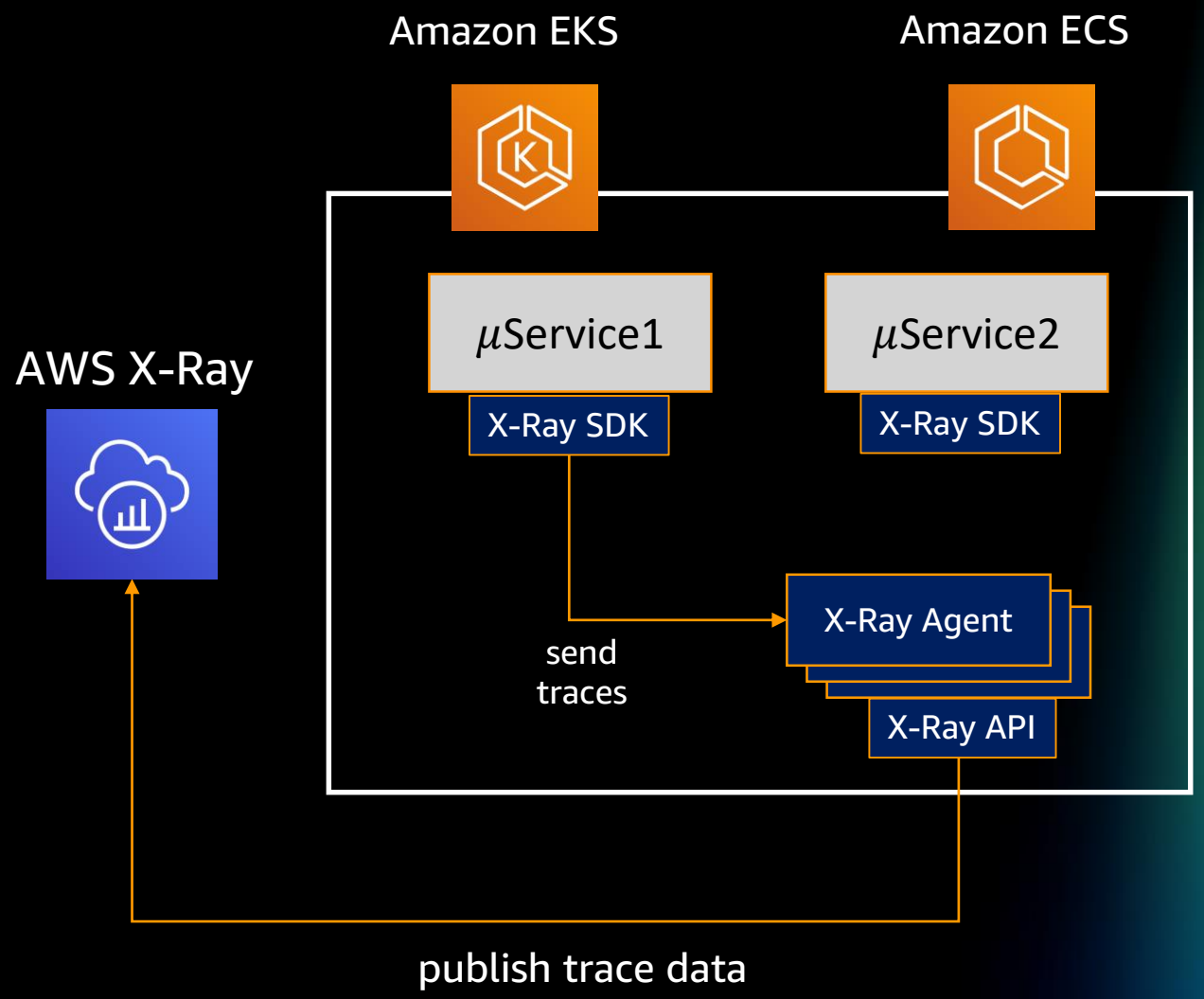
Adds filters to automatically capture metadata for calls to

- 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)

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

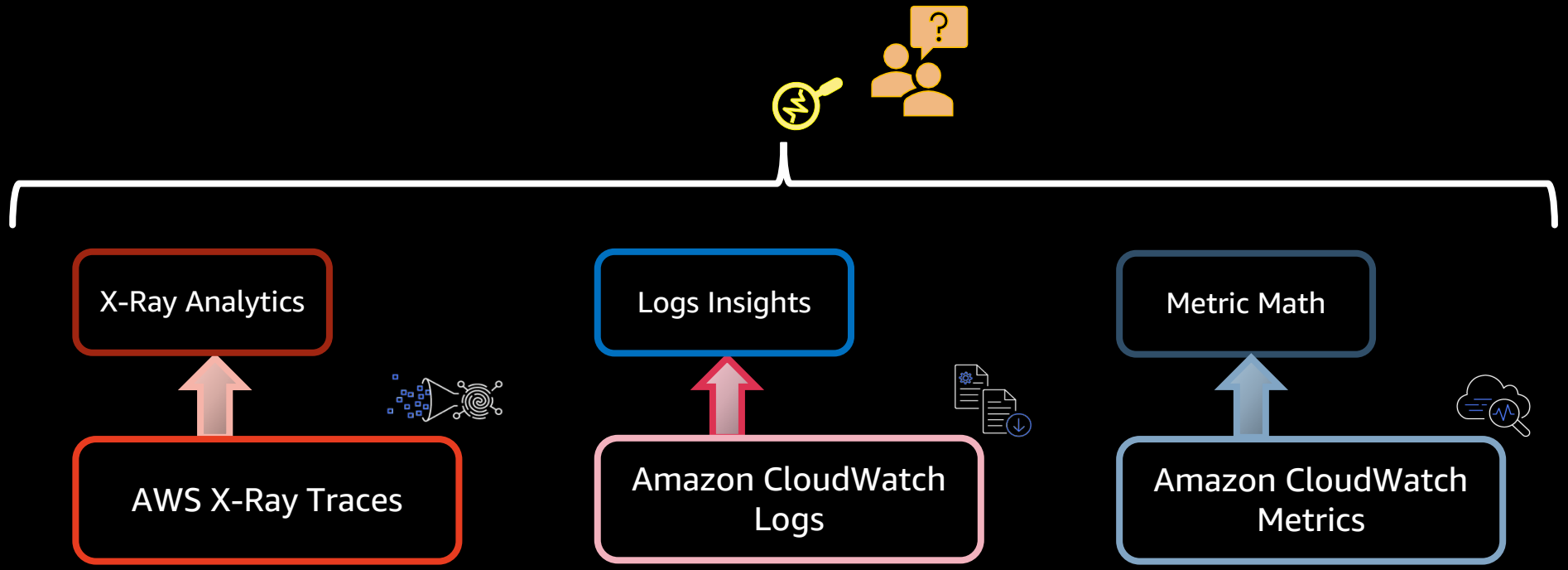
AWS X-Ray for AWS Lambda

- 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

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

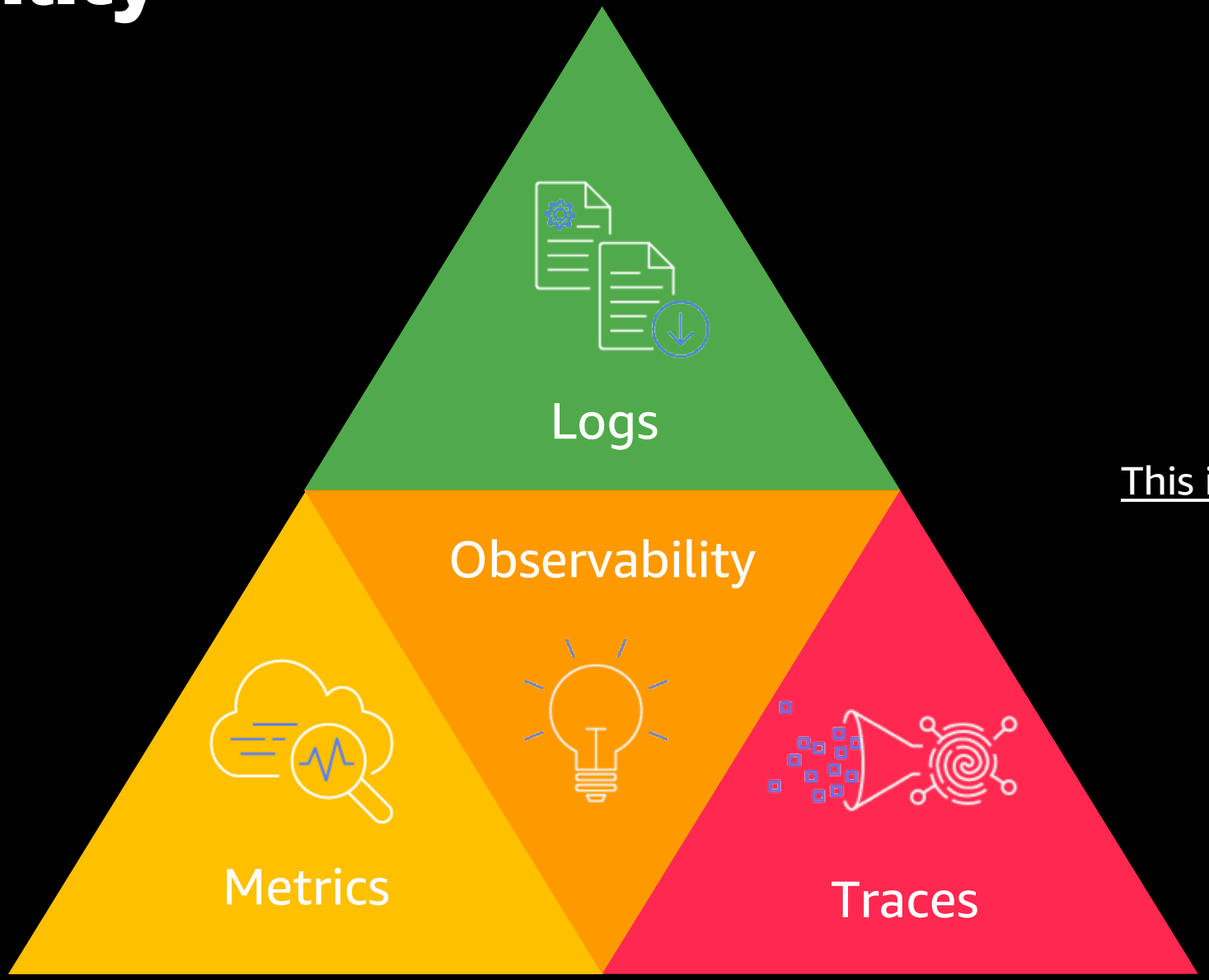
Tools and challenges

- Want to be able to get a 360^0 view of a problem
- Need to correlate logs, metrics and traces to get deeper insights
- Repetitive troubleshooting process
- Data introspection



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

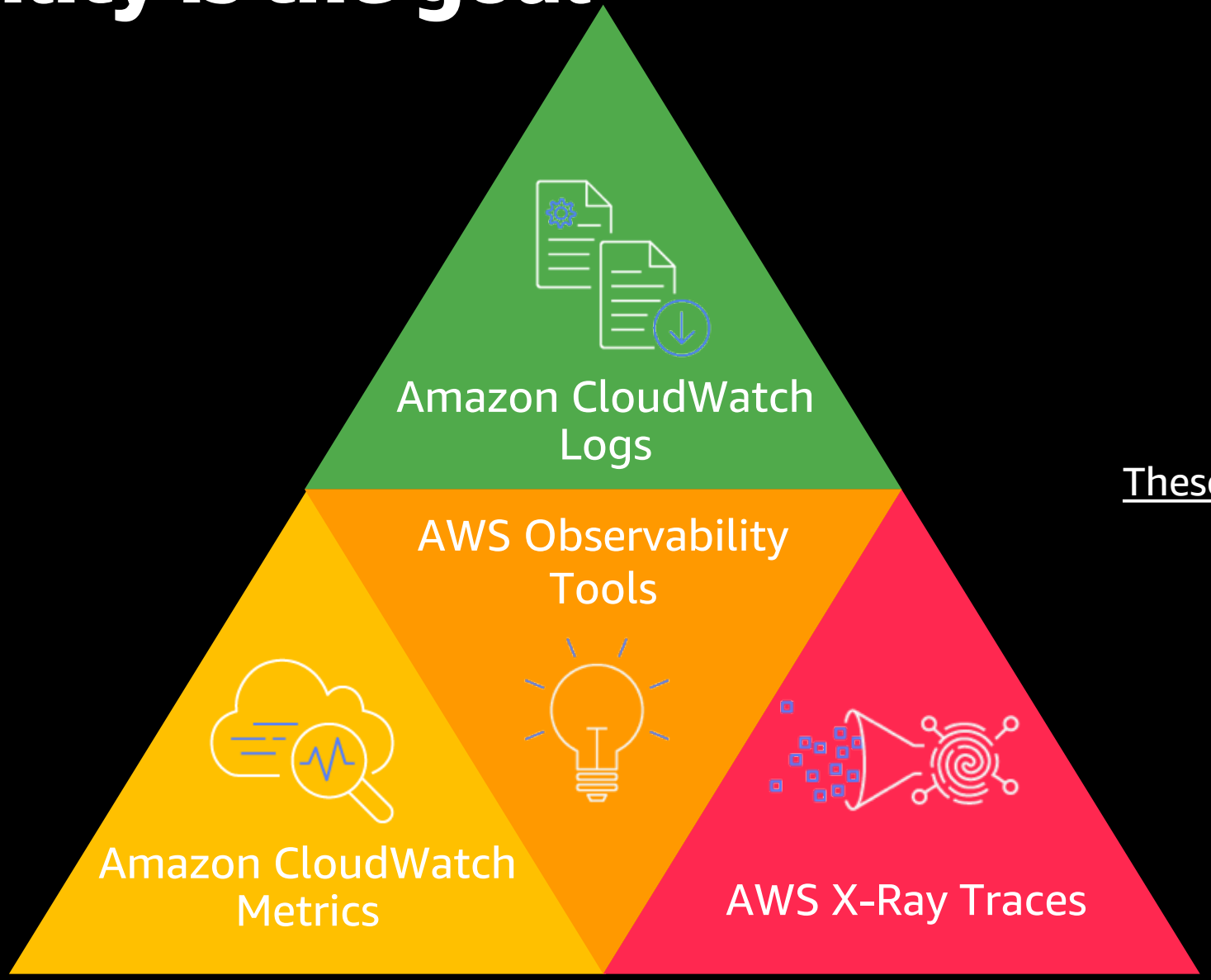
Observability



This is the goal

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

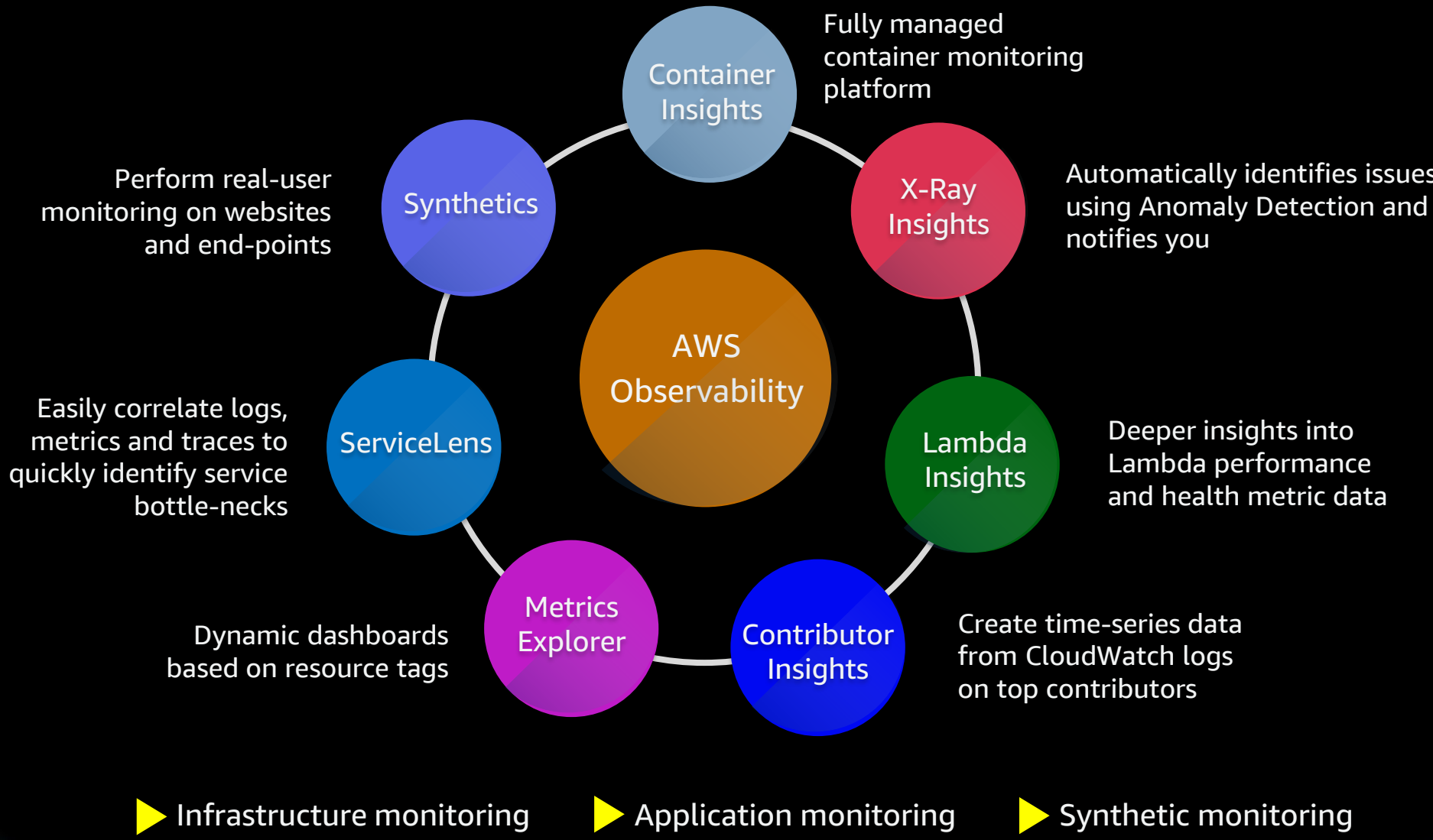
Observability is the goal



These are the tools

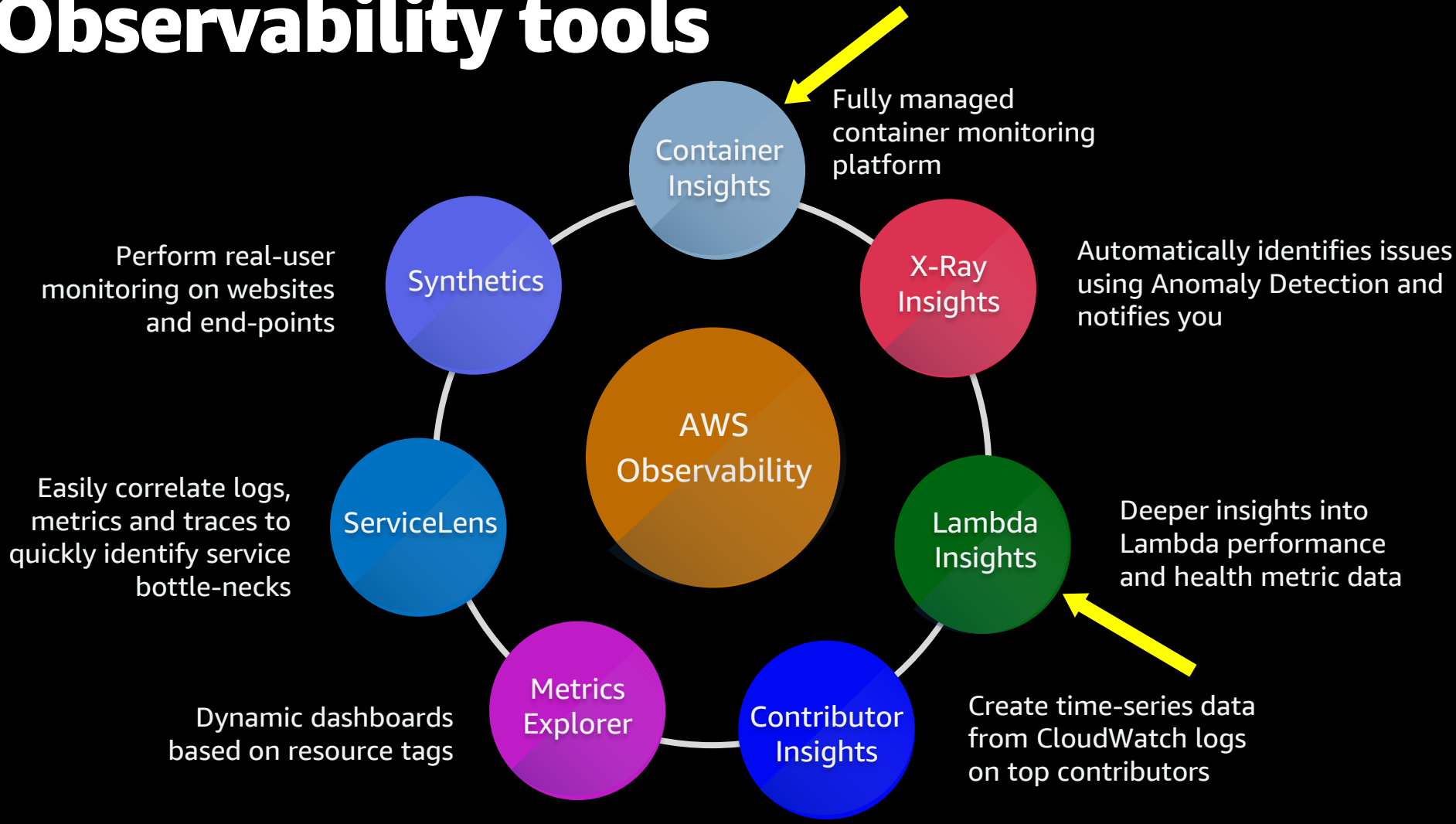
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

AWS Observability tools



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

AWS Observability tools



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

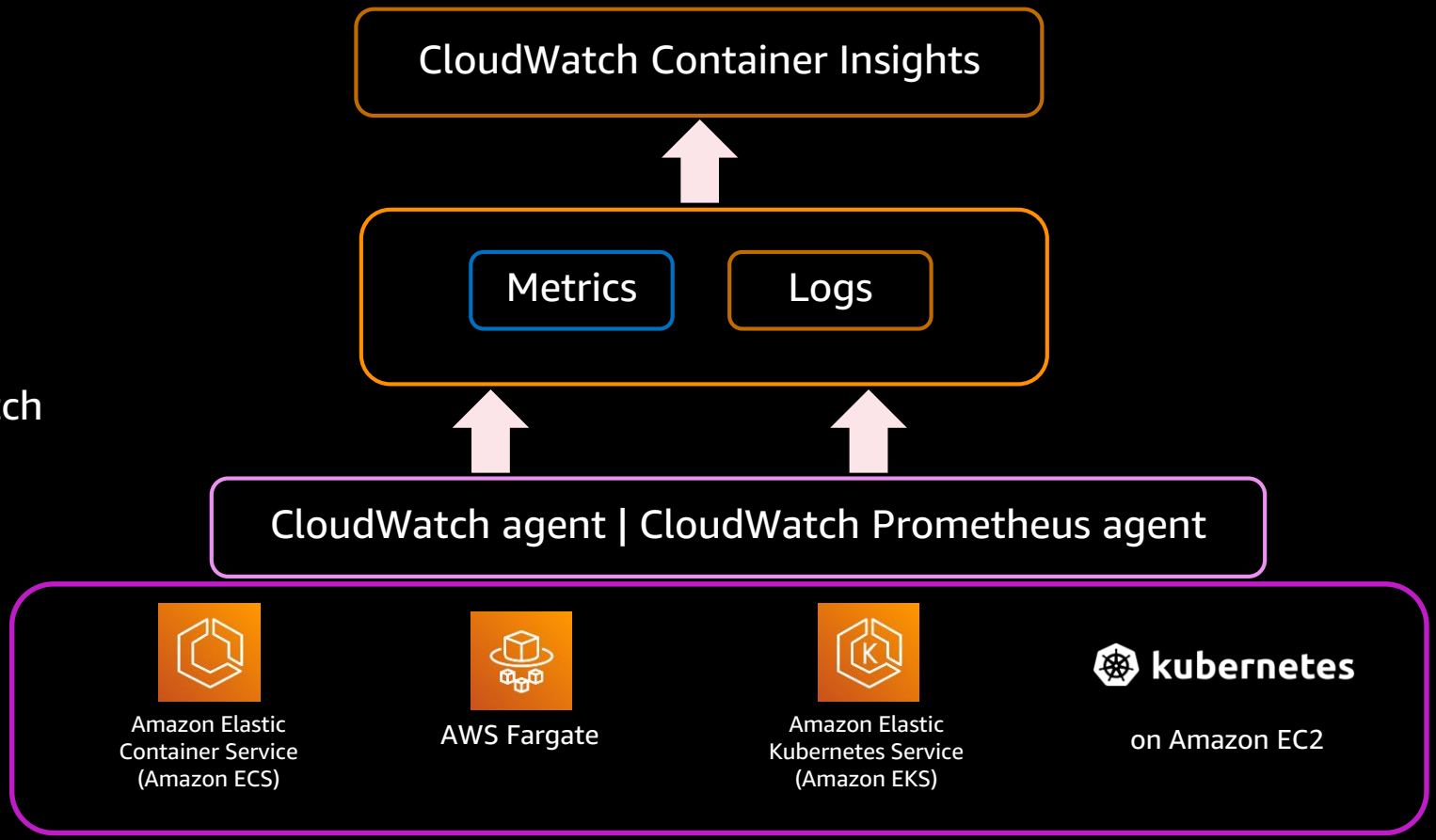
Amazon CloudWatch Container Insights

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

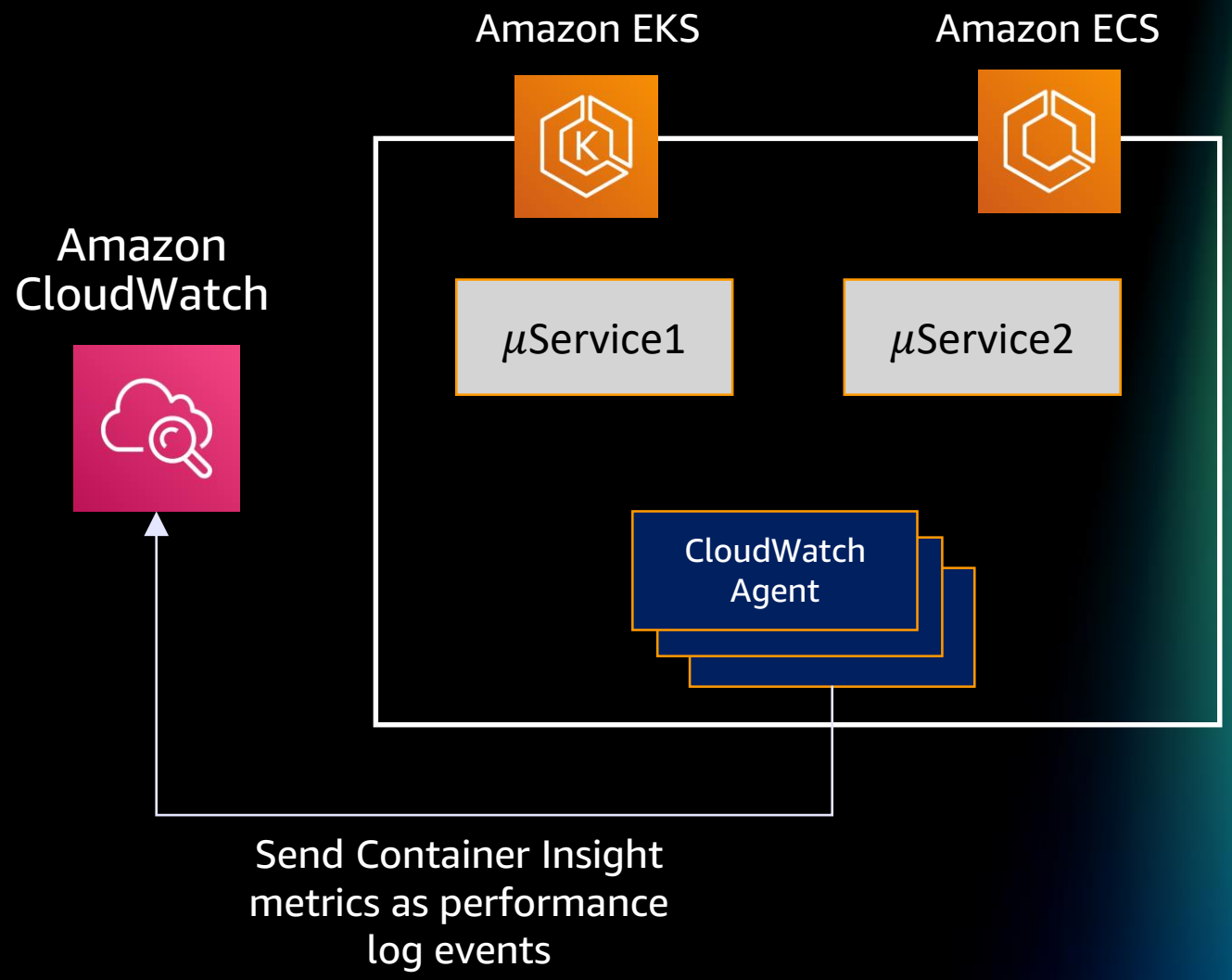
Amazon CloudWatch



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Amazon CloudWatch Container Insights

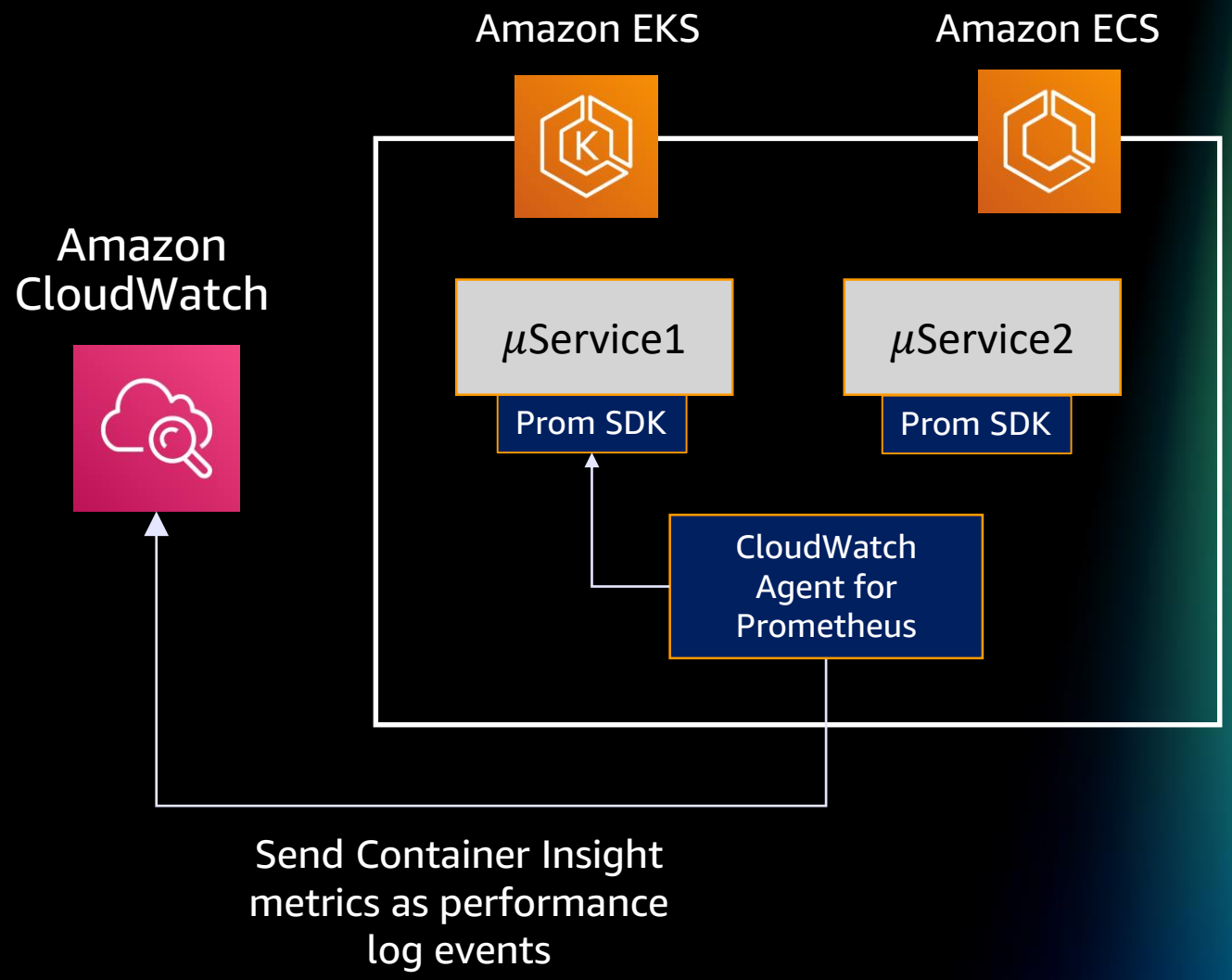
- Collect, aggregate and summarize metrics and logs from containerized applications
- Collect instance-level metrics such as CPU, memory, disk and network usage
- Operational data collected as performance log events with EMF from which metrics are extracted



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Amazon CloudWatch Container Insights for Prometheus

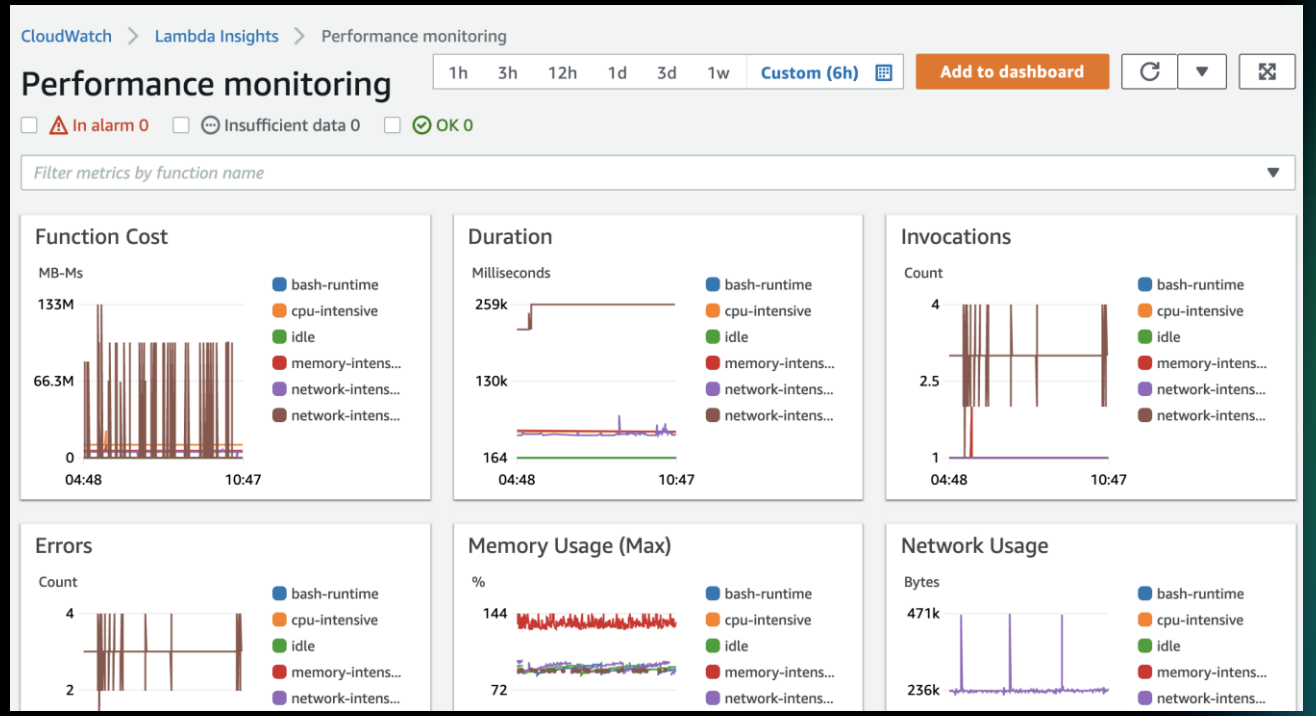
- Collect, aggregate and summarize metrics and logs from containerized applications
- Collect instance-level metrics such as CPU, memory, disk and network usage
- Operational data collected as performance log events with EMF from which metrics are extracted



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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.



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

AWS Lambda Extensions

Receive and control Lambda lifecycle events

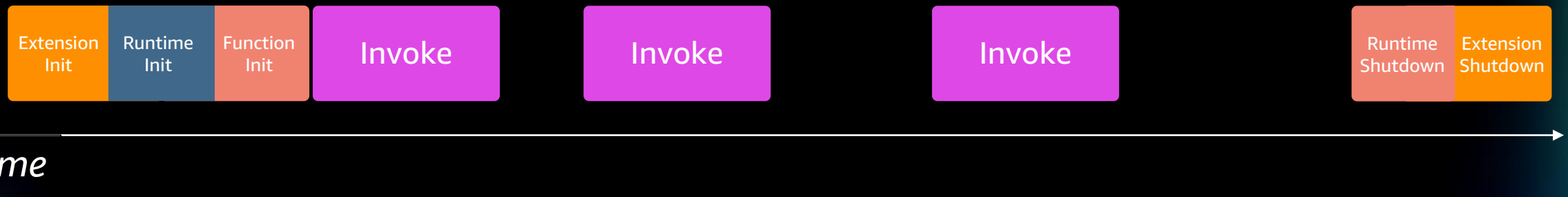
Delivered via Lambda Layers

Register via Extensions API for lifecycle events:

- Init
- Invoke
- shutdown

Primary use cases:

- Monitoring
- Configuration
- Security



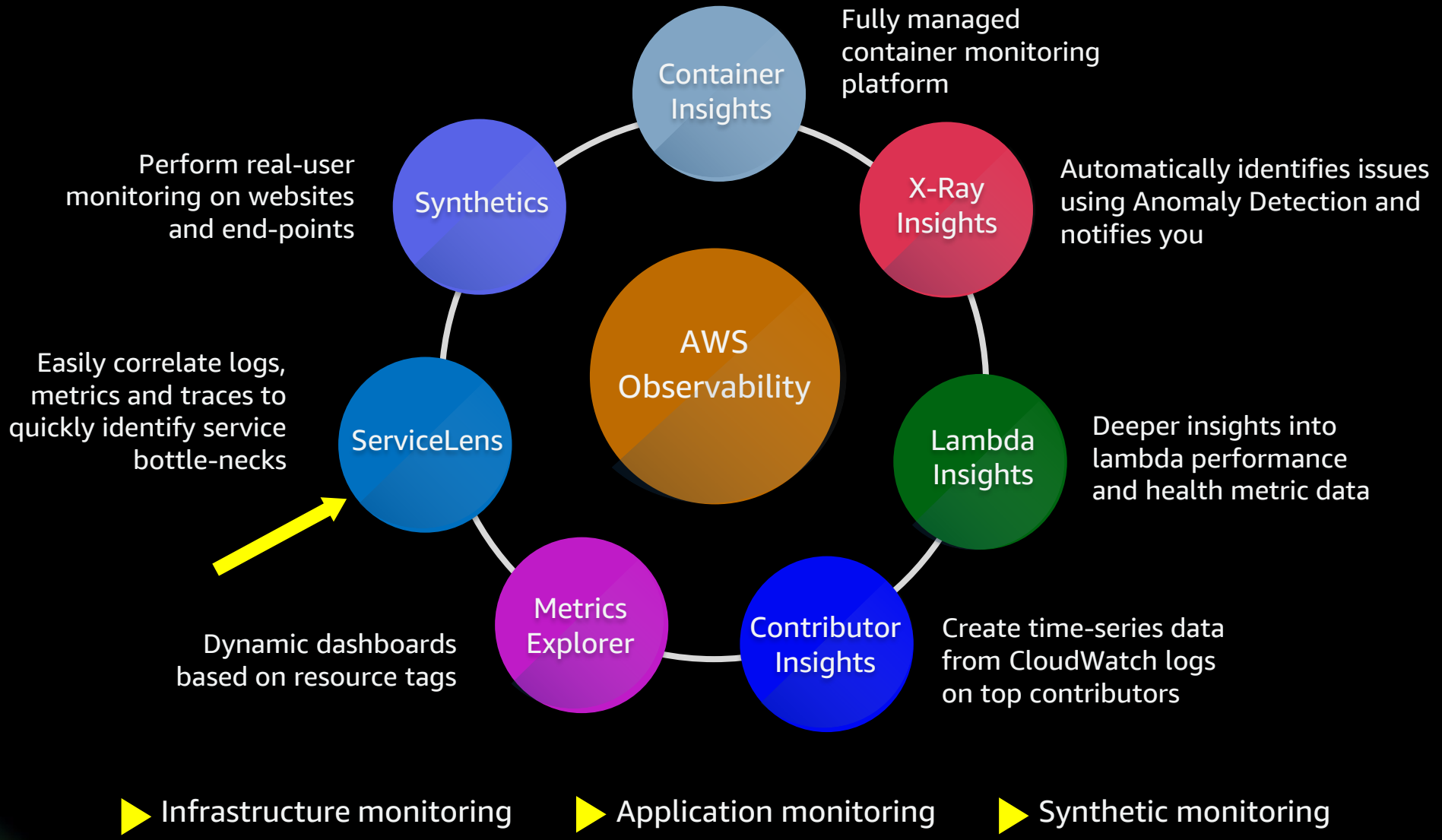
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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

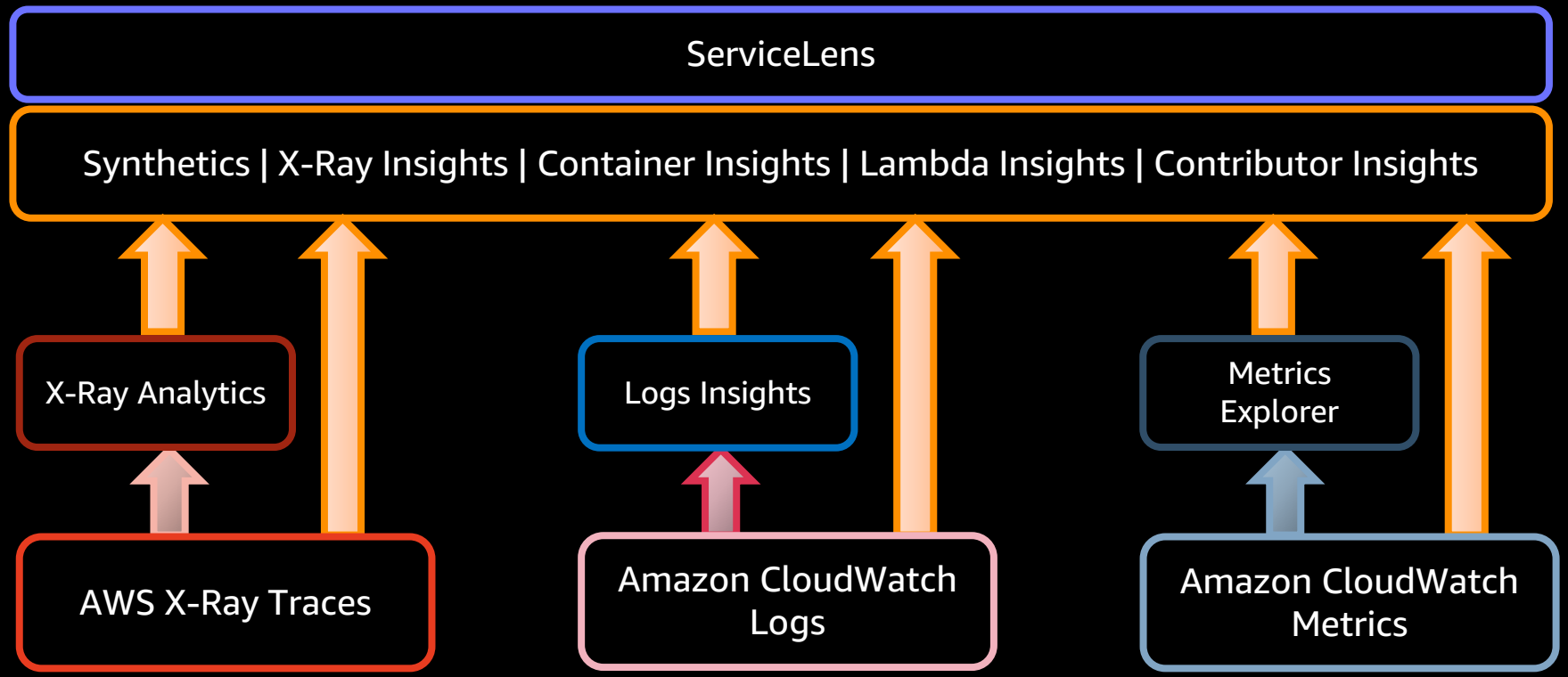
© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

AWS Observability tools



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Insights into apps and infrastructure

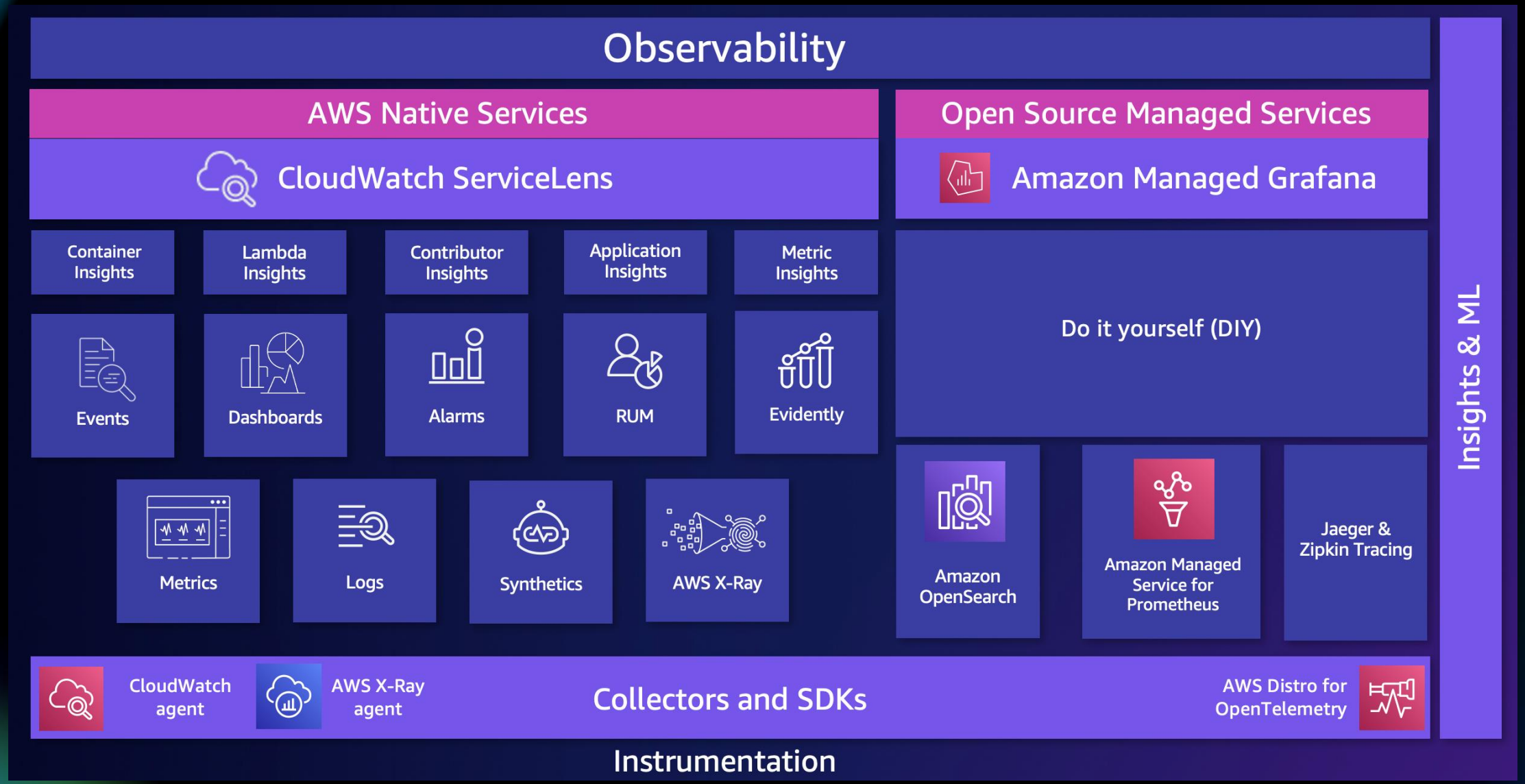


© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Amazon CloudWatch ServiceLens Demo

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

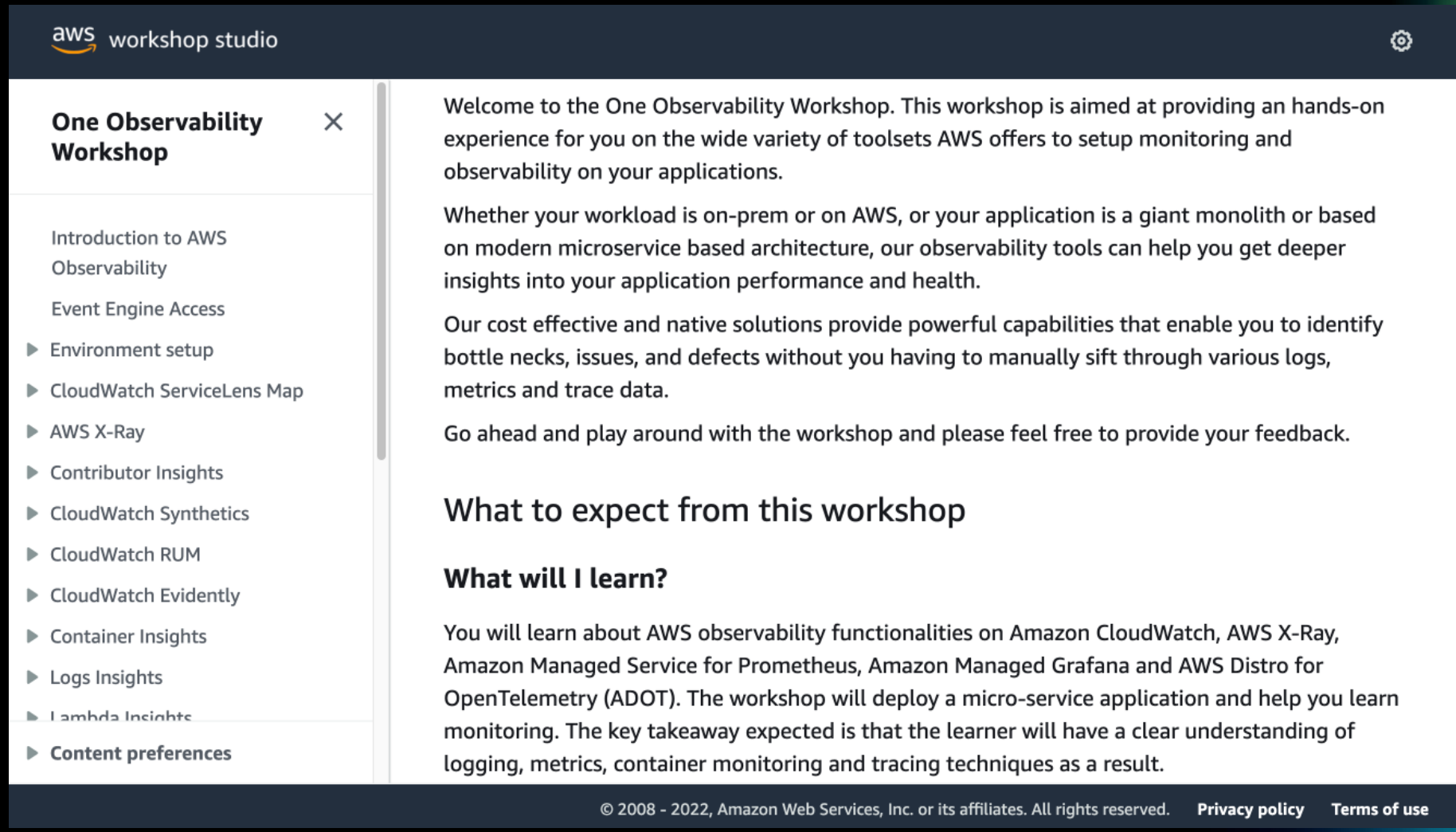
Summary



© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Hands-on experience

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



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

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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/

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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

AWS Certification

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

go.aws/3PwN3ff

aws

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

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.

aws-apj-marketing@amazon.com

twitter.com/AWSCloud

facebook.com/AmazonWebServices

youtube.com/user/AmazonWebServices

slideshare.net/AmazonWebServices

twitch.tv/aws

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Thank you!

© 2022, Amazon Web Services, Inc. or its affiliates. All rights reserved.