
AWS
re:Invent
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BOA310

Building observable applications with OpenTelemetry

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Agenda

Complexity

Observability

OpenTelemetry

AWS Distro for OpenTelemetry (ADOT)

Demo – Using OpenTelemetry on AWS

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Monolithic application

Services

Microservices

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“Complexity arises when the dependencies among the elements become important.”

Scott E. Page and John H. Miller

From their book “Complex Adaptive Systems”

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"A complex system that works is invariably found to have evolved from a simple system that worked."

Gall's Law

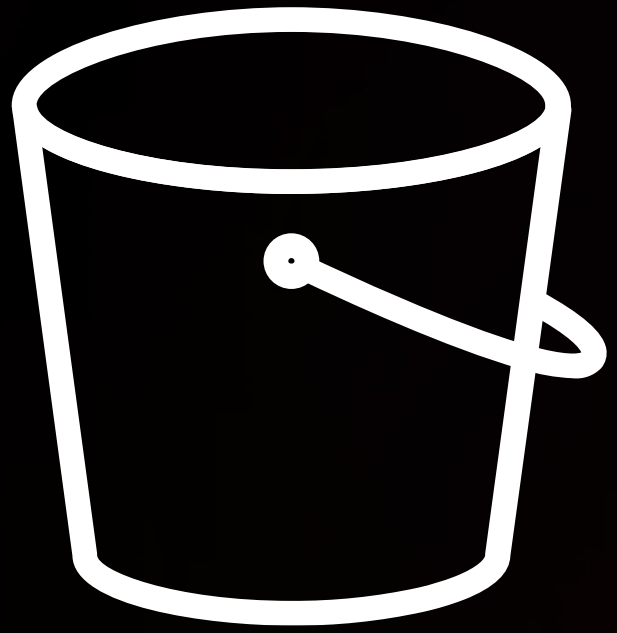
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“A complex system designed from scratch never works and cannot be patched up to make it work. You have to start over with a working simple system.”

John Gall

From his book “Systemantics: How Systems Work and Especially How They Fail”

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“Amazon S3 is intentionally built with a minimal feature set. The focus is on simplicity and robustness.”

Amazon S3 Press Release
March 14, 2006

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Amazon S3

8 → more than 200 microservices

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What is observability?

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Observability and instrumentation

- “Observability lets us understand a system from the **outside**, by letting us ask **questions** about that system without knowing its inner workings.”
- “In order to be able to ask those questions of a system, the application must be properly instrumented. That is, the application code must emit **signals** such as **traces**, **metrics**, and **logs**.”
- “An application is properly **instrumented** when developers don’t need to add more instrumentation to **troubleshoot** an issue, because they have all of the information they need.”

https://opentelemetry.io/docs/concepts/observability-primer/#what-is-observability

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Don’t build a network of connected “black boxes”

Building observable applications
is a **developer responsibility**

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OpenTelemetry

An open-source framework for instrumenting, generating, collecting, and exporting telemetry data

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What is OpenTelemetry (OTel)?

- CNCF second most popular project
- Instrument once
- Collect and aggregate
- Send to multiple destinations
- Cloud-centered framework
- Supports hundreds of destinations and 11 programming languages



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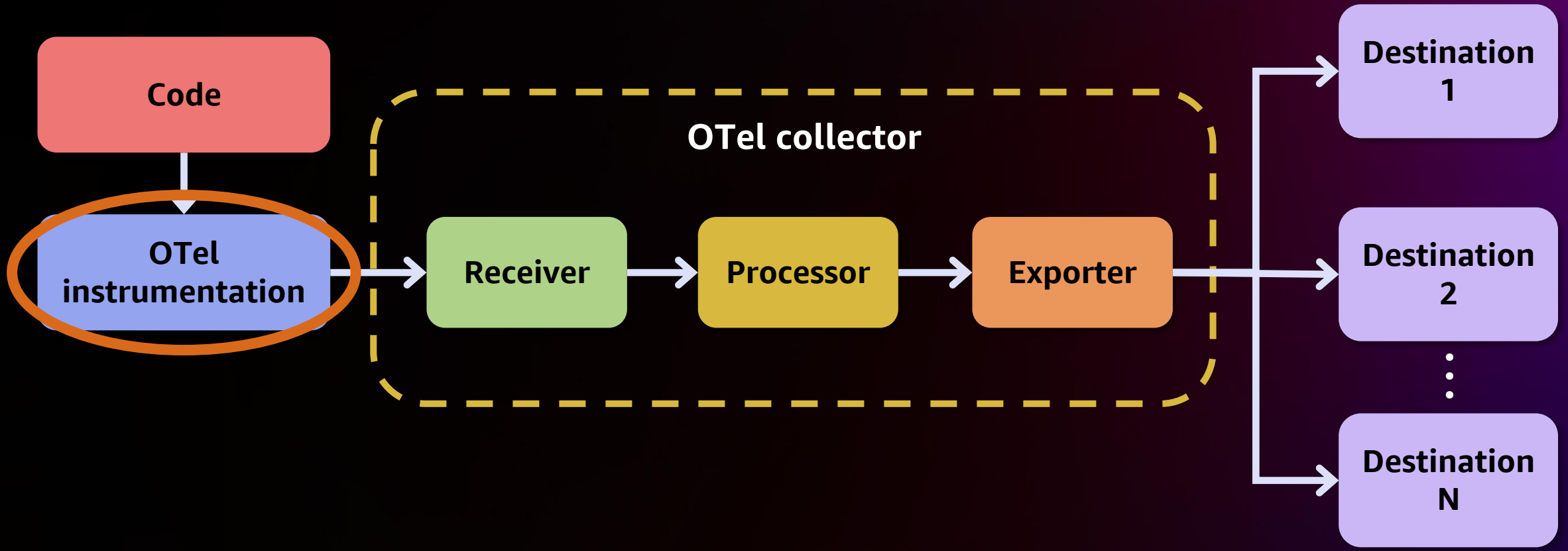
OpenTelemetry data sources and protocol

- Traces – What happens when a request is made by user or an application
- Metrics – A measurement about a service, captured at runtime
- Logs – A timestamped text record with metadata
- Baggage – Contextual information that's passed between spans
- OpenTelemetry Protocol (OTLP) – Telemetry data delivery protocol

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Reference architecture



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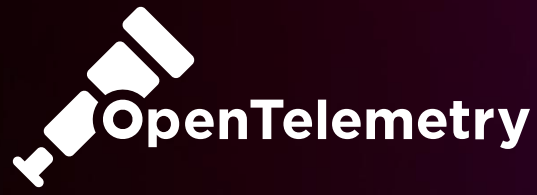
Working with the open-source community













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AWS Distro for OpenTelemetry (ADOT)

A SECURE, PRODUCTION-READY OPEN-SOURCE DISTRIBUTION SUPPORTED BY AWS



Upstream-first distro of the popular CNCF project

Certified by AWS for security and predictability

Backed by AWS support

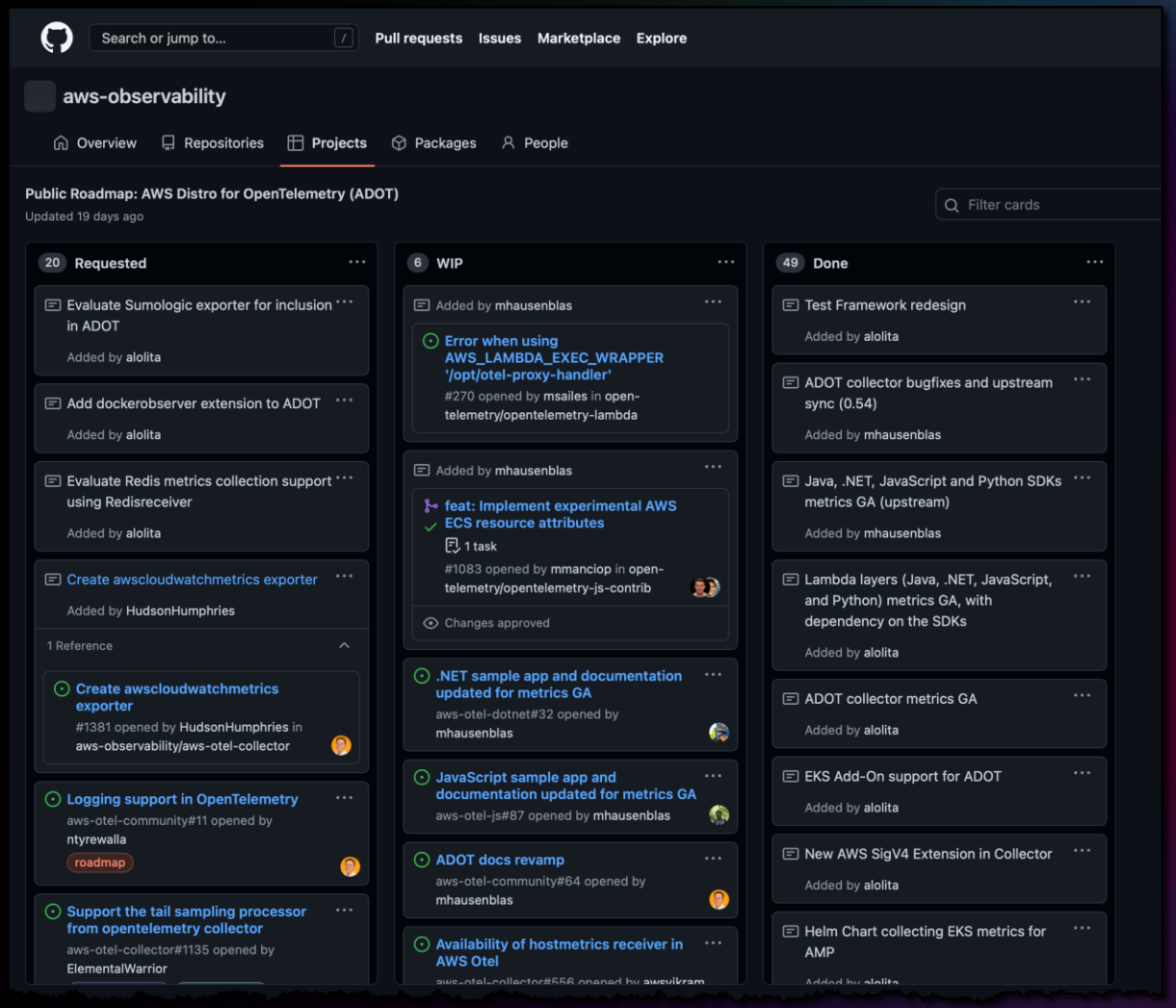
One-click deploy and configure from AWS container and AWS Lambda consoles

Exporters for AWS monitoring solutions including Amazon CloudWatch, AWS X-Ray, Amazon OpenSearch Service, Prometheus, SigV4Auth, and partner solutions

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ADOT public roadmap



https://github.com/orgs/aws-observability/projects/4

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Tracing with AWS auto-instrumentation agent

SAMPLE DOCKERFILE

```
ADD https://github.com/aws-observability/
    aws-otel-java-instrumentation/releases/download/
    version/aws-opentelemetry-agent.jar /app/aws-opentelemetry-agent.jar

ENV JAVA_TOOL_OPTIONS="-javaagent:/app/aws-opentelemetry-agent.jar"


ENV OTEL_RESOURCE_ATTRIBUTES="service.name=MyApp"

ENV OTEL_IMR_EXPORT_INTERVAL="10000”

ENV OTEL_EXPORTER_OTLP_ENDPOINT="http://localhost:4317"
```

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Custom tracing attributes using annotations

SAMPLE JAVA CODE

```
import io.opentelemetry.extension.annotations.WithSpan;
import io.opentelemetry.extension.annotations.SpanAttribute;

public class MyObservedClass {
  @WithSpan
  public void myObservedMethod(@SpanAttribute("param1") String param1,
                               @SpanAttribute("param2") long param2) {
      <...>
  }
}
```

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Instrument once, send to multiple destinations

AWS PARTNERS



















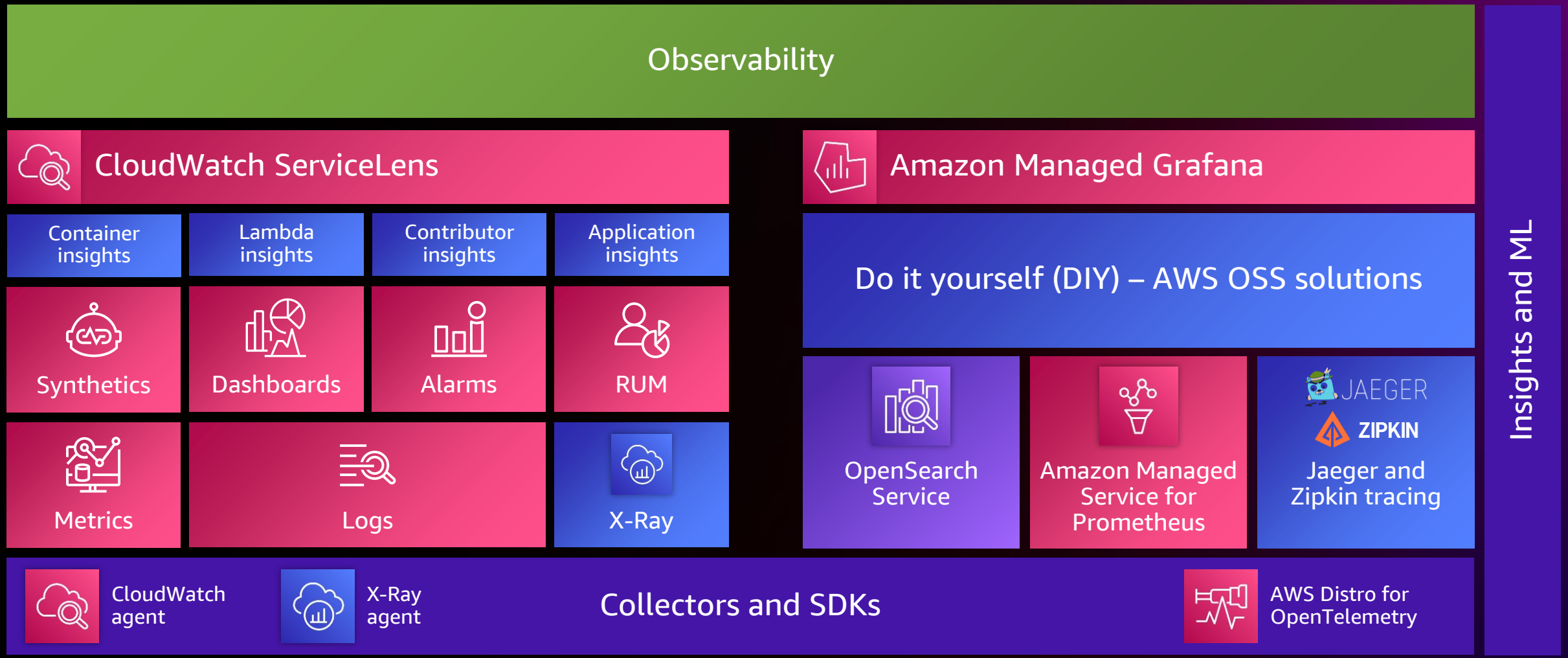


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AWS observability options



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Demo

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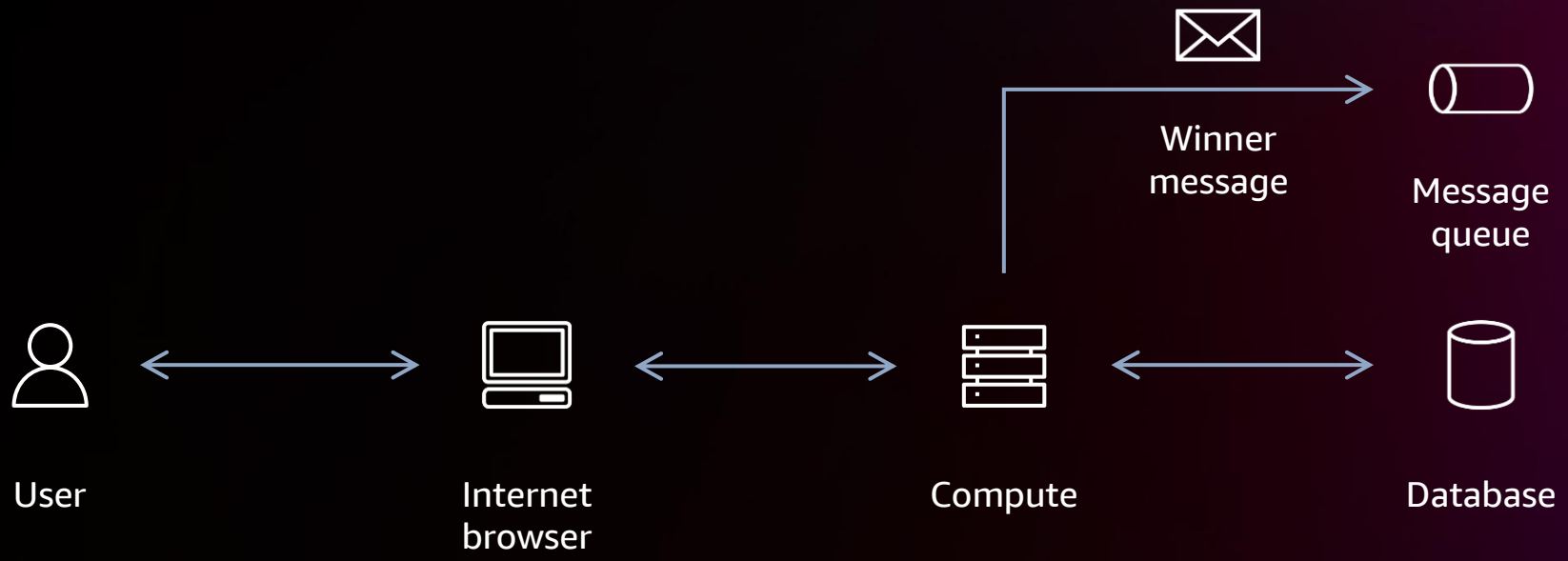
“Guess the number” app

- Nice way to test a new programming language or new environments
  - Random number between 1 and 100
  - Try your guess
  - Too high, too low, correct

- What happens if I want to run a scalable, multi-tenant version?

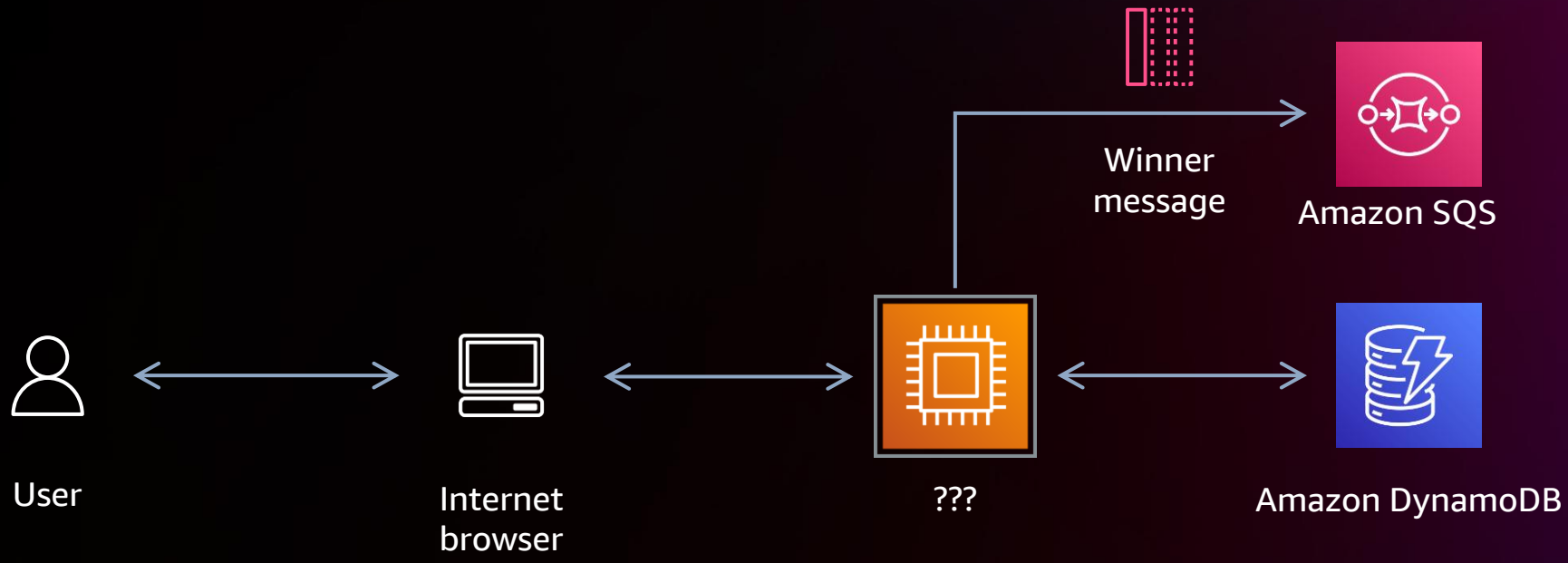
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“Guess the number” app architecture



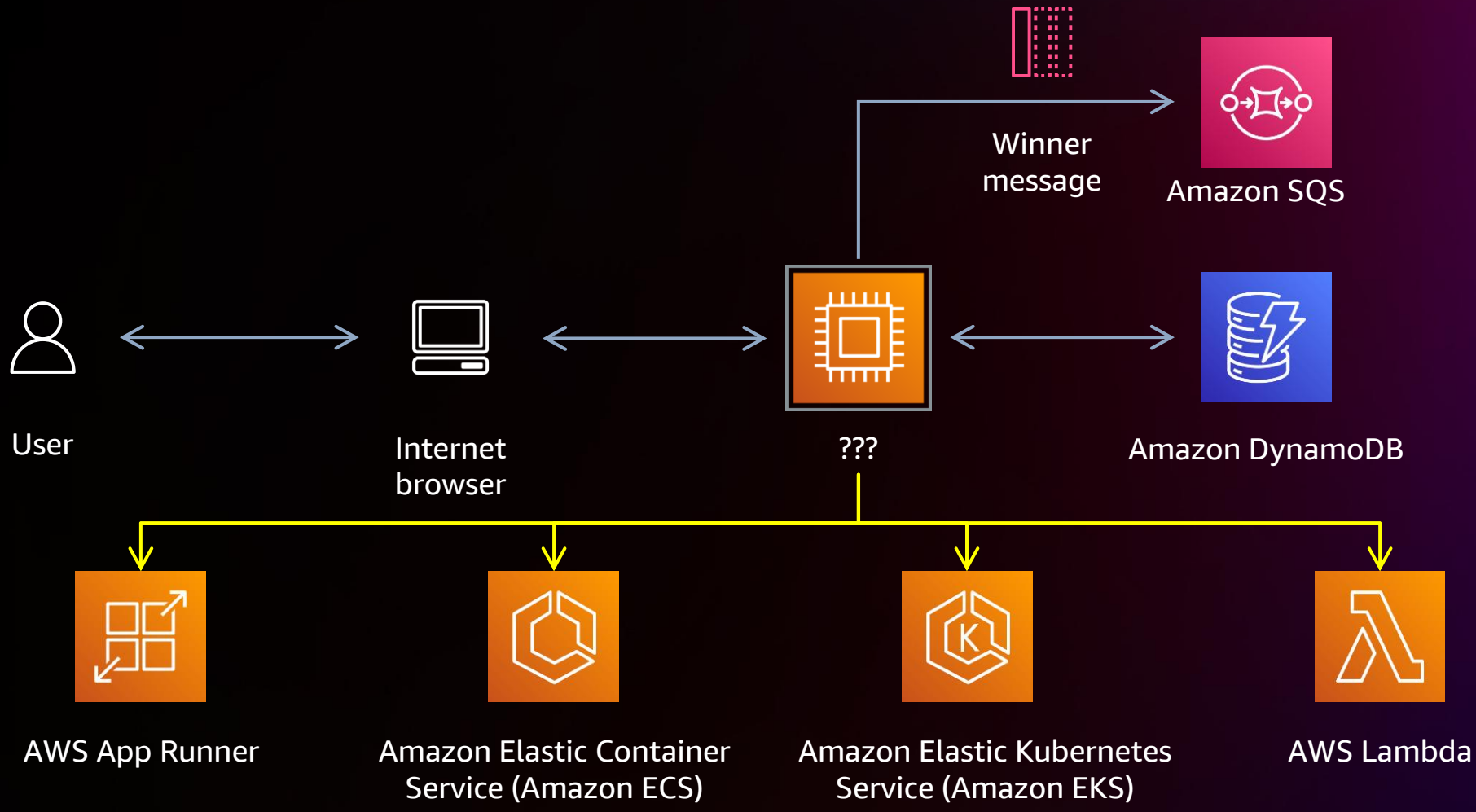
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“Guess the number” app architecture



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“Guess the number” app architecture



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“Guess the number” compute



App Runner

Single web container

Managed OTel agent

Tracing (X-Ray)



Amazon ECS

Any container

OTel sidecar
Simplified console experience

Tracing
Metrics



Amazon EKS

Any container

OTel sidecar
Amazon EKS add-on
support for ADOT operator

Tracing
Metrics



Lambda

Serverless function

X-Ray active tracing
Lambda layer
with OTel agent

Tracing
Metrics

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What’s next?

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Monitoring must evolve



User experience



Ephemeral resources



More devices, services, data



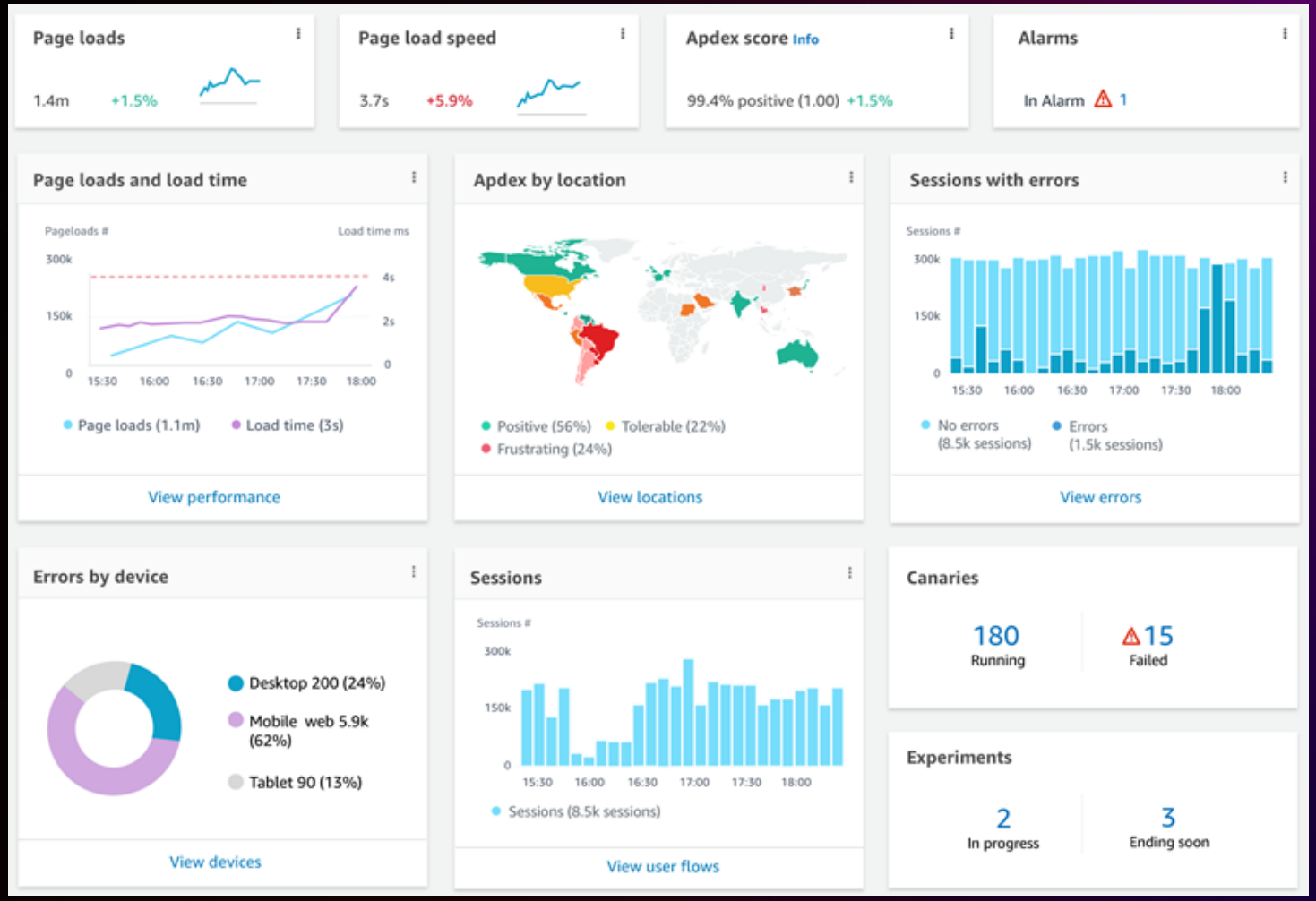
Fast time to market

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Amazon CloudWatch RUM

Real user monitoring

Enable web application developers and DevOps engineers in optimizing end-user experience

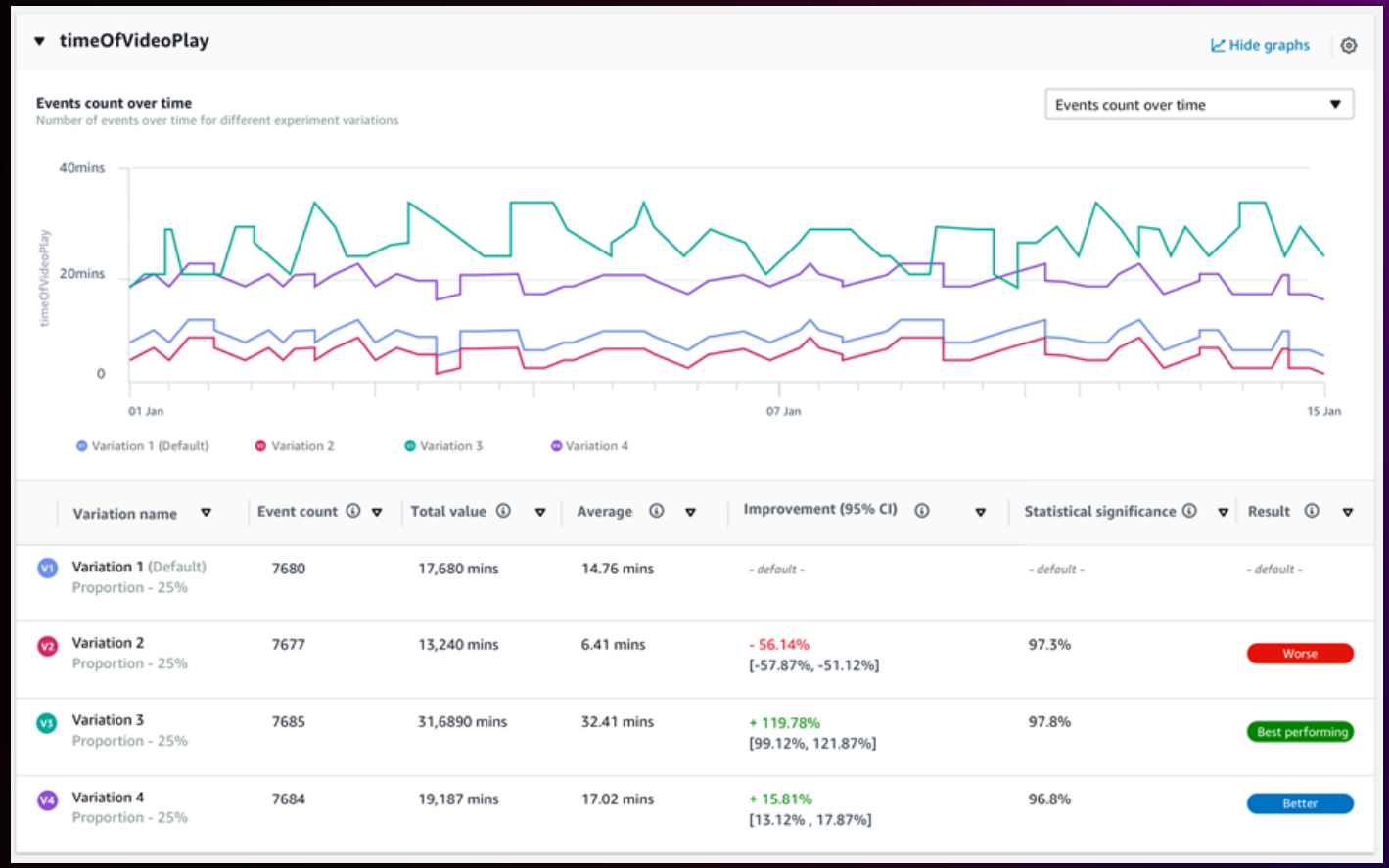


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Amazon CloudWatch Evidently

Safe feature launch, A/B tests, and rollout monitoring

Safely deploy new features and validate web application choices by conducting online experiments



Variation name	Event count	Total value	Average	Improvement (95% CI)	Statistical significance	Result
Variation 1 (Default) Proportion - 25%	7680	17,680 mins	14.76 mins	- default -	- default -	- default -
Variation 2 Proportion - 25%	7677	13,240 mins	6.41 mins	- 56.14% [-57.87%, -51.12%]	97.3%	Worse
Variation 3 Proportion - 25%	7685	31,6890 mins	32.41 mins	+ 119.78% [99.12%, 121.87%]	97.8%	Best performing
Variation 4 Proportion - 25%	7684	19,187 mins	17.02 mins	+ 15.81% [13.12% , 17.87%]	96.8%	Better

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Code and workshop

Code used in the demo



https://github.com/danilop/reInvent2022-BOA310

AWS Observability Workshop



https://catalog.workshops.aws/observability/en-US

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Takeaways

Complexity

Observability

OpenTelemetry

AWS Distro for OpenTelemetry (ADOT)

Instrument once → Collect and analyze everywhere

Experiment and learn

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Thank you!

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