DevOps Institute

ADVANCING THE HUMANS OF DEVOPS

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ADVANCING THE HUMANS OF DEVOPS

Observability & Monitoring

MODULE 6

Workshop Series Overview

Module 1

Presentation:
Available On-Demand

Practicing DevOps

In this first presentation you'll get an overview of the workshop series and receive practical instruction on how to build the right foundation for a successful DevOps practice in AWS.

Watch now >

Presentation:
July 29, 2021

Infrastructure as Code

Here you'll get the in and outs of how to really automate the Ops in DevOps. Craft templates and automate infrastructure provisioning to safely enable everyone with self-service environments.

Get updates >

Module 2

Presentation:
May 26, 2021

CI/CD Pipelines

In this module you'll learn how to implement a well-engineered CI/CD pipeline that considers governance and provides traceability from idea to production.

Register now >

Module 3

Presentation:
June 24, 2021

Evolving to Continuous Deployment

Deploying code changes live into production is still a terrifying prospect for many organizations. We'll dive deep into how using the right processes and tools can make this safe and advantageous.

Register now >

Module 5

Presentation:
Aug 26, 2021

Continuous Testing

Testing throughout every stage of the pipeline is critical to ensure quality for end users. In this session we'll dig into best practices for developers and architects, covering functional, integration, unit testing and more.

Get updates >

Module 6

Presentation:
Sept 15, 2021

Observability and Monitoring

This session will dive into strategies for knowing how elements of your applications interact and perform, when and where issues arise, and how to fix and prevent them.

Get updates >

Module 7

Presentation:
Oct 13, 2021

SRE and Incident Management

As reliable as we design our applications, there will always be incidents. In this session you'll learn how to make life easier when things go wrong and get immediate feedback to teams.

Get updates >

Module 8

Presentation:
Nov 18, 2021

DevSecOps

Organizations looking to achieve fast deployments need to do so safely. Participate in this module to learn how to achieve early, automated, and continuous remediation of security events.

Get updates >

MISSION: Bringing Joy to Work

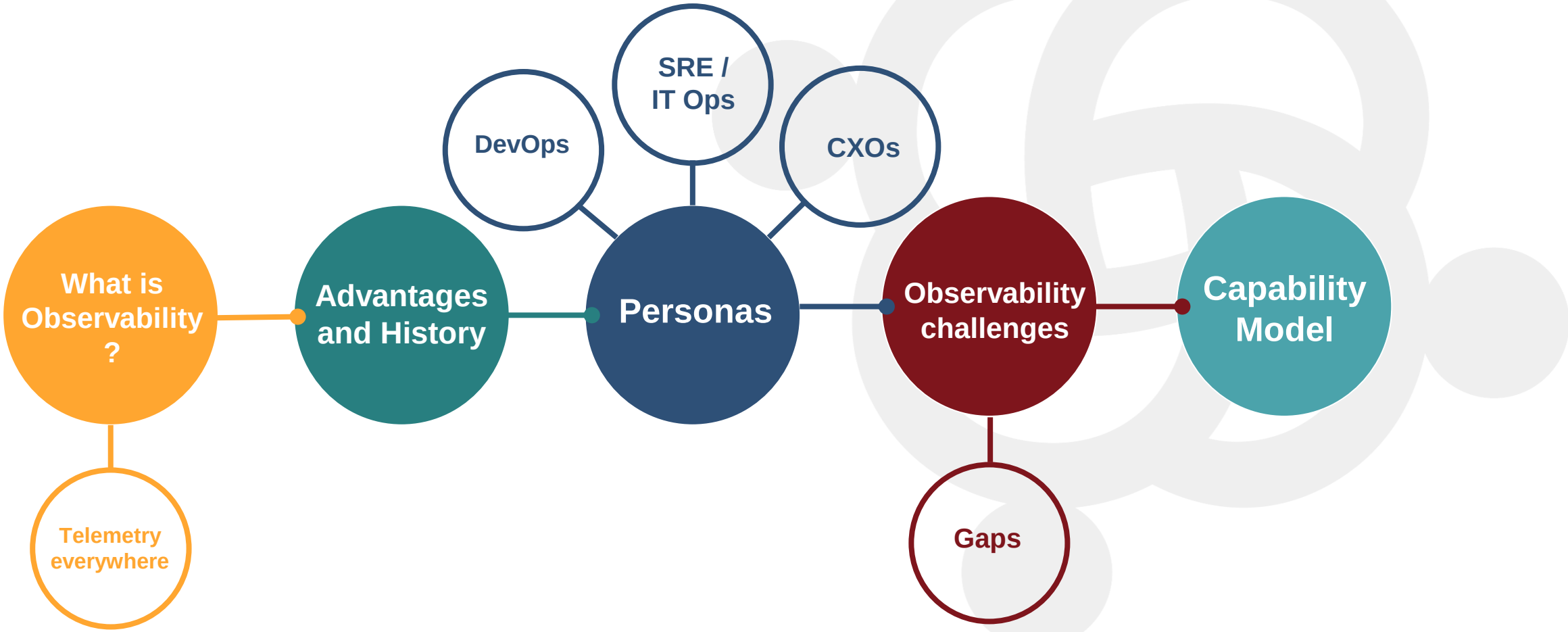
Helen Beal

Herder of Humans

@bealhelen

Helen Beal is a DevOps and Ways of Working coach, Chief Ambassador at DevOps Institute and an ambassador for the Continuous Delivery Foundation. She is the Chair of the Value Stream Management Consortium and provides strategic advisory services to DevOps industry leaders such as Plutora and Moogsoft. She is also an analyst at Accelerated Strategies Group. She hosts the Day-to-Day DevOps webinar series for BrightTalk, speaks regularly on DevOps topics, is a DevOps editor for InfoQ and also writes for a number of other online platforms. She regularly appears in TechBeacon's DevOps Top100 lists and was recognized as the Top DevOps Evangelist 2020 in the DevOps Dozen awards.

Flow: Talk Map



What is Observability?

Clue: It’s not monitoring.

Observability is a characteristic of systems; that they can be observed. It’s closely related to a DevOps tenet: ‘telemetry everywhere’, meaning that anything we implement is emitting data about its activities. It requires intentional behavior during digital product and platform design and a conducive architecture. It’s not monitoring. Monitoring is what we do when we observe our observable systems and the tools category that largely makes this possible.

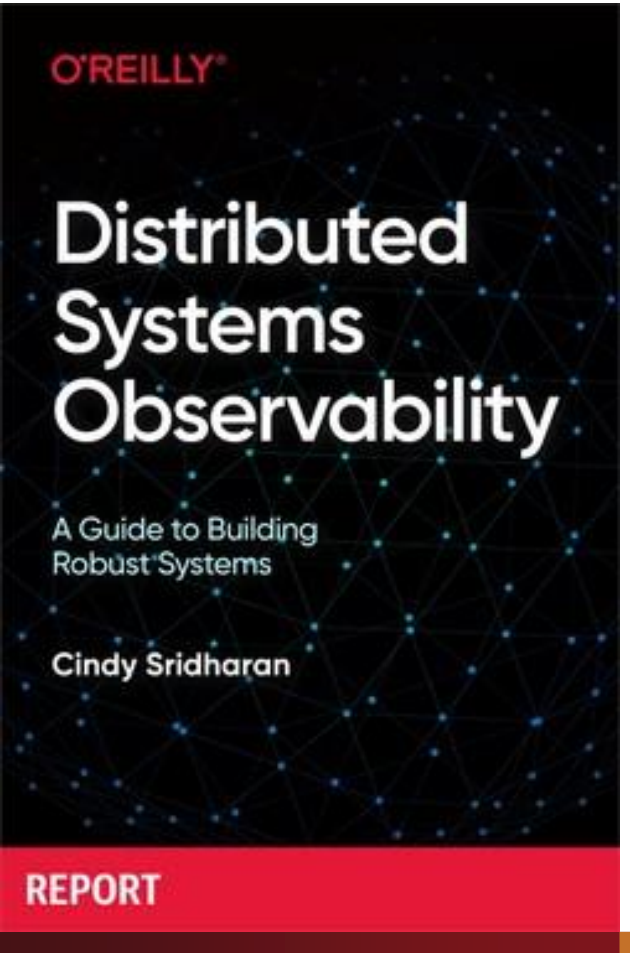
Where has the concept come from?

“On the General Theory of Control Systems’ by Rudolf E. Kálmán in 1960

In control theory, observability is defined as a measure of how well internal states of a system can be inferred from knowledge of its external outputs.

Applying Observability to Software Systems

Observability's origins are in mechanical engineering but...

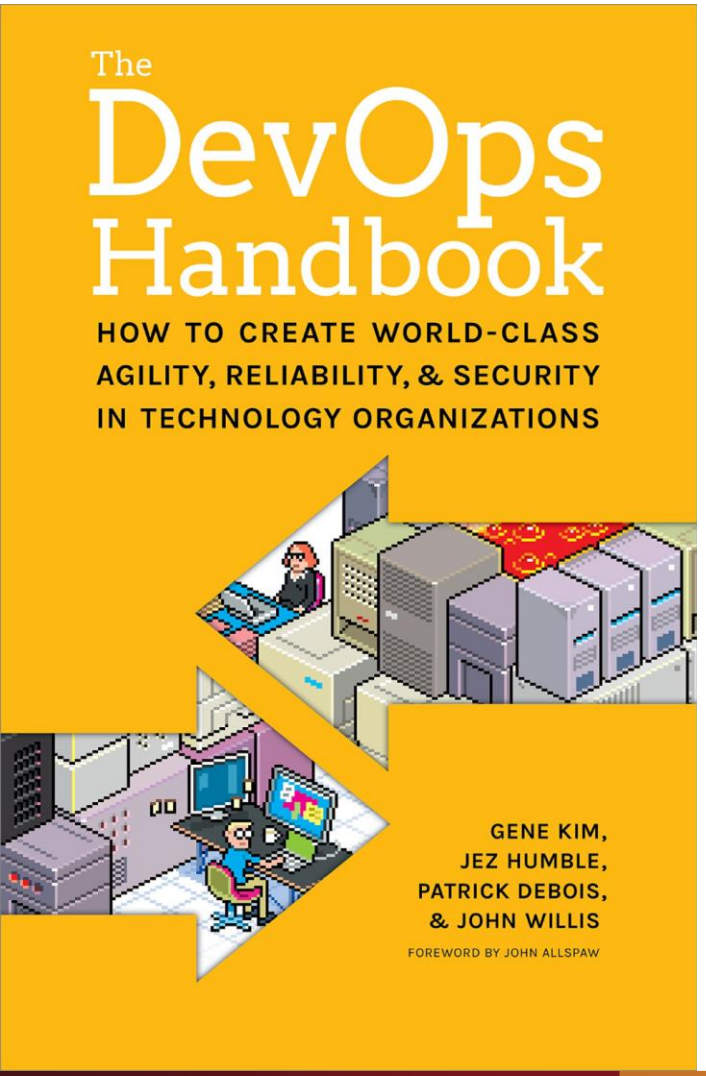


"We believe that observability requires evolving the essence of how we think about gathering the data needed to debug effectively. You must be able to understand:

- The inner workings of your applications/services
- Any system state your applications/services many have evolved to
- These things solely by observing that with external tools
- That state, no matter how extreme or unusual"

Telemetry Everywhere

Is it the same as observability?



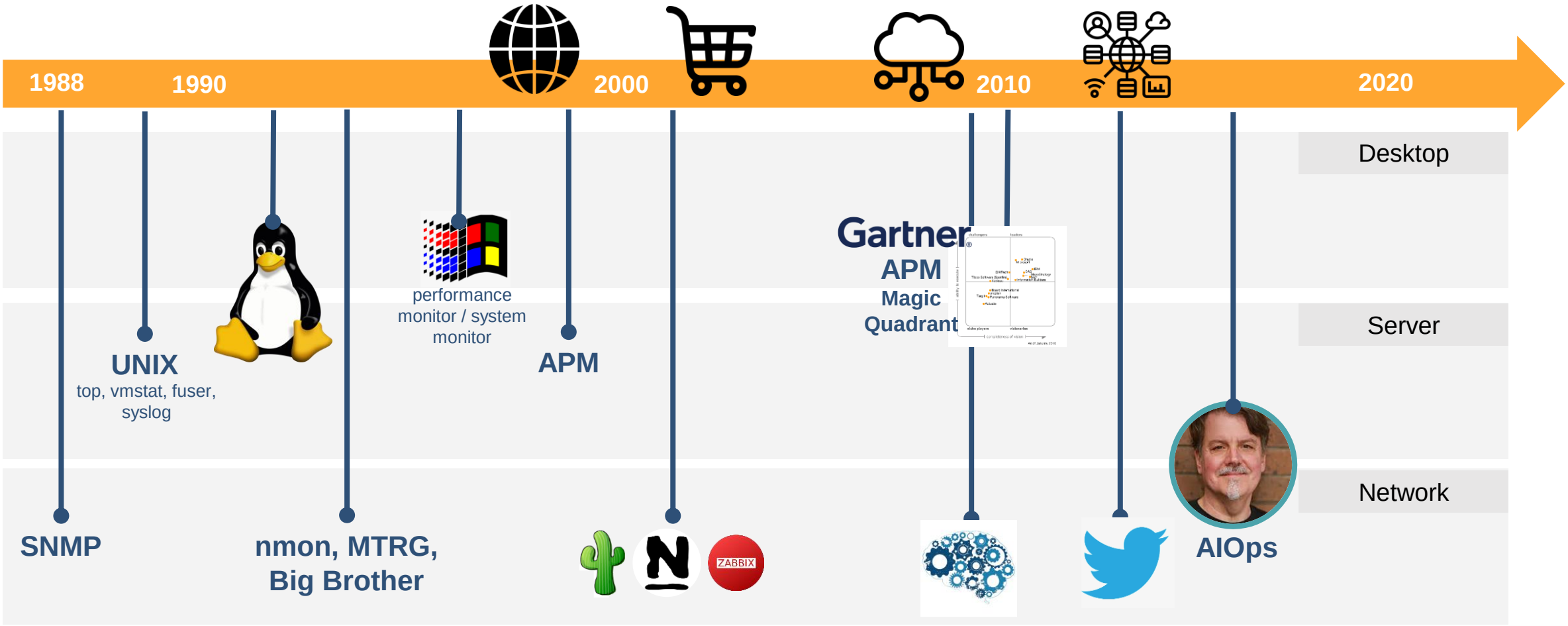
"We need to design our systems so that they are continually creating telemetry, widely."

"Telemetry is what enables us to assemble our best understanding of reality and detect when our understanding of reality is incorrect."

Check-in with Raj

How do you define observability?

Evolution of Monitoring to Observability



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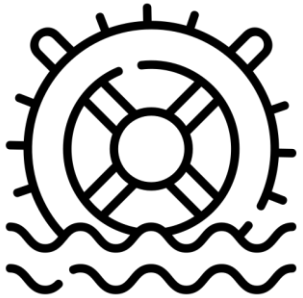

The industrial revolution

1771

2

The age of steam and railways

1829

3

Age of steel, electricity and heavy engineering

1875

4

Age of oil, automobiles and mass production

1908

5

Age of information and telecomms

1971

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Digital Disruption and Transformation

Digital transformation is the integration of digital technology into all areas of a business resulting in fundamental changes to how businesses operate and how they deliver value to customers. Beyond that, it's a cultural change that requires organizations to continually challenge the status quo, experiment often, and get comfortable with failure. This sometimes means walking away from long-standing business processes that companies were built upon in favor of relatively new practices that are still being defined.

Advantages of Observability

Leaders are...

- **2.9 times** as likely to enjoy better visibility into application performance
- Almost **twice as likely** to have better visibility into public cloud infrastructure
- **2.3 times** as likely to experience better visibility into security posture
- **Twice as likely** to benefit from better visibility into on-premises infrastructure
- **2.4 times** likelier to have a tighter grasp on applications, down to the code level
- **2.6 times** likelier to have a fuller view of containers (including orchestration)
- **6.1 times** likelier to have accelerated root cause identification (43% of leaders versus 7% of beginners)

CALMS and Observability

Culture	Automation	Lean	Measurement	Sharing
Visibility and transparency builds trust Data-driven not opinion-driven conversations Fast feedback on experiments A tool that supports team autonomy: “We build it, we own it”	Accelerated root cause(s) analysis and insights Pre-emptive warning and forecasting operating behavior Automated service assurance Data discovery, crunch & insights	Accelerates flow (MTTx) Removes handoffs and delays between teams Observability across the end-to-end value stream Focus on customer experience	Real data that measures progress and improvements operations, SRE, SLOs and error budgets Actionable insights based on streaming data Telemetry everywhere	Provides a shared platform for collaborative analysis Builds a knowledge base so local discoveries become global improvements ChatOps

The Three Pillars

LOGS

An event log is an immutable, timestamped record of discrete events that happened over time

Easy to generate and instrument.

Can cause performance issues.

METRICS

Numeric representation of data measured over intervals of time.

Well-suited to dashboards and aggregation.

Historically poor dimensionality.

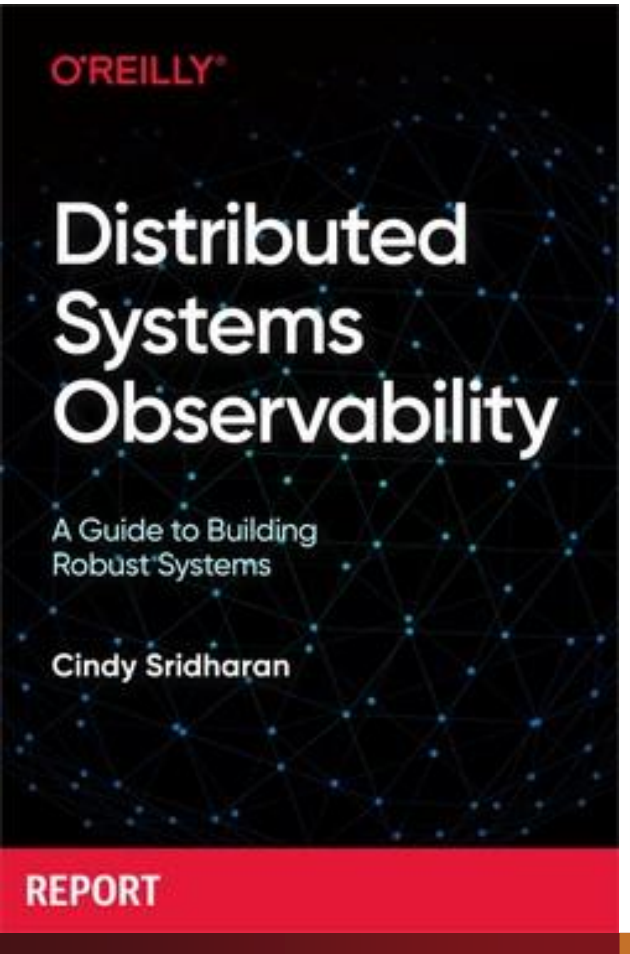
TRACES

A representation of a series of causally related distributed events that encode the end-to-end request flow through a distributed system.

Myriad use cases.

Very challenging to retrofit.

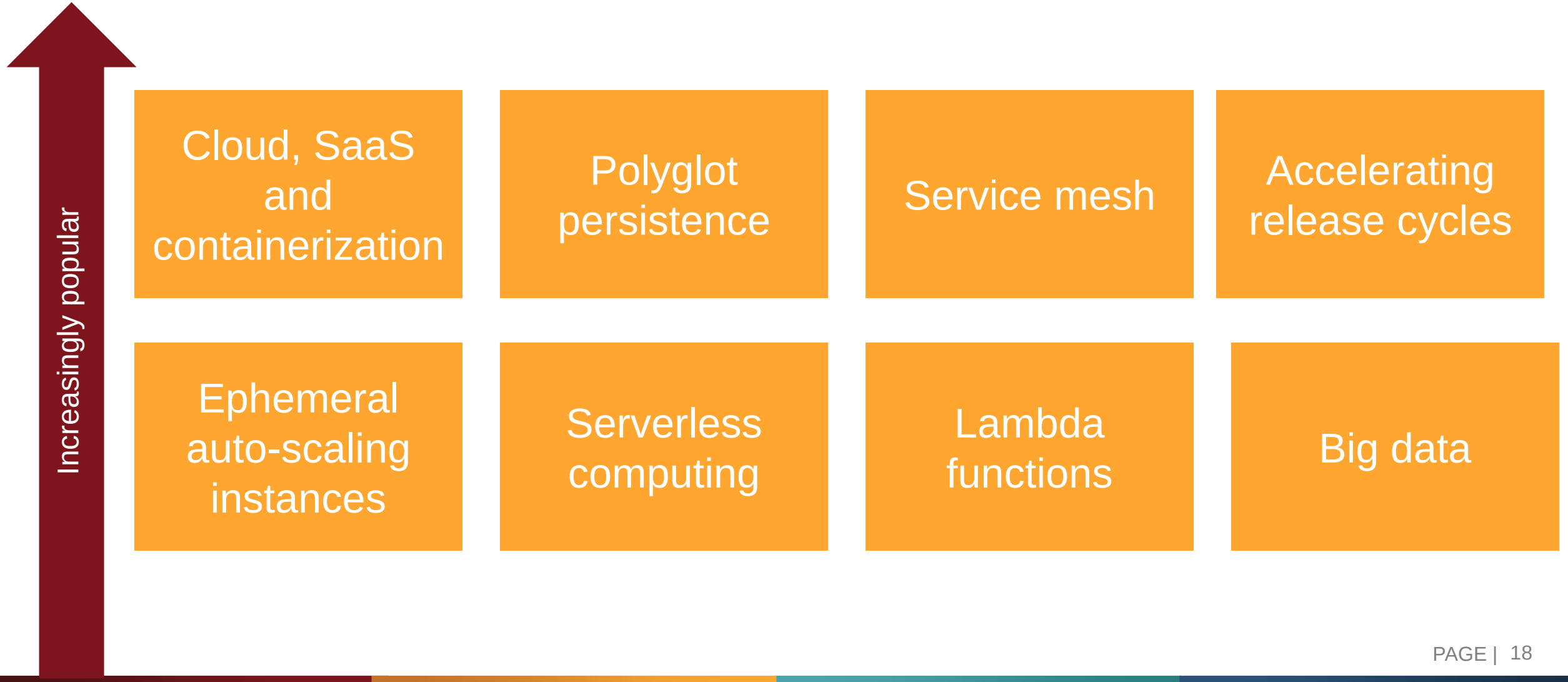
Hidden Assumptions of Metrics



- Your application is monolithic in nature
- There is one stateful data store (“the database”)
- Many low-level systems metrics are available and relevant (e.g., resident memory, CPU load average)
- The application runs on VMs or bare metal, giving you full access to system metrics
- You have a fairly static set of hosts to monitor
- Engineers examine systems for problems only after problems occur
- Dashboards and telemetry exist to serve the needs of operations engineers
- Monitoring examines “black-box” applications that are inaccessible
- Monitoring solely serves the purposes of operations
- The focus of monitoring is uptime and failure prevention
- Examination of correlation occurs across a limited (or small) number of dimensions

The Progressive Platforms

From monoliths to microservices - APIs rule



Cloud is a Critical Enabler

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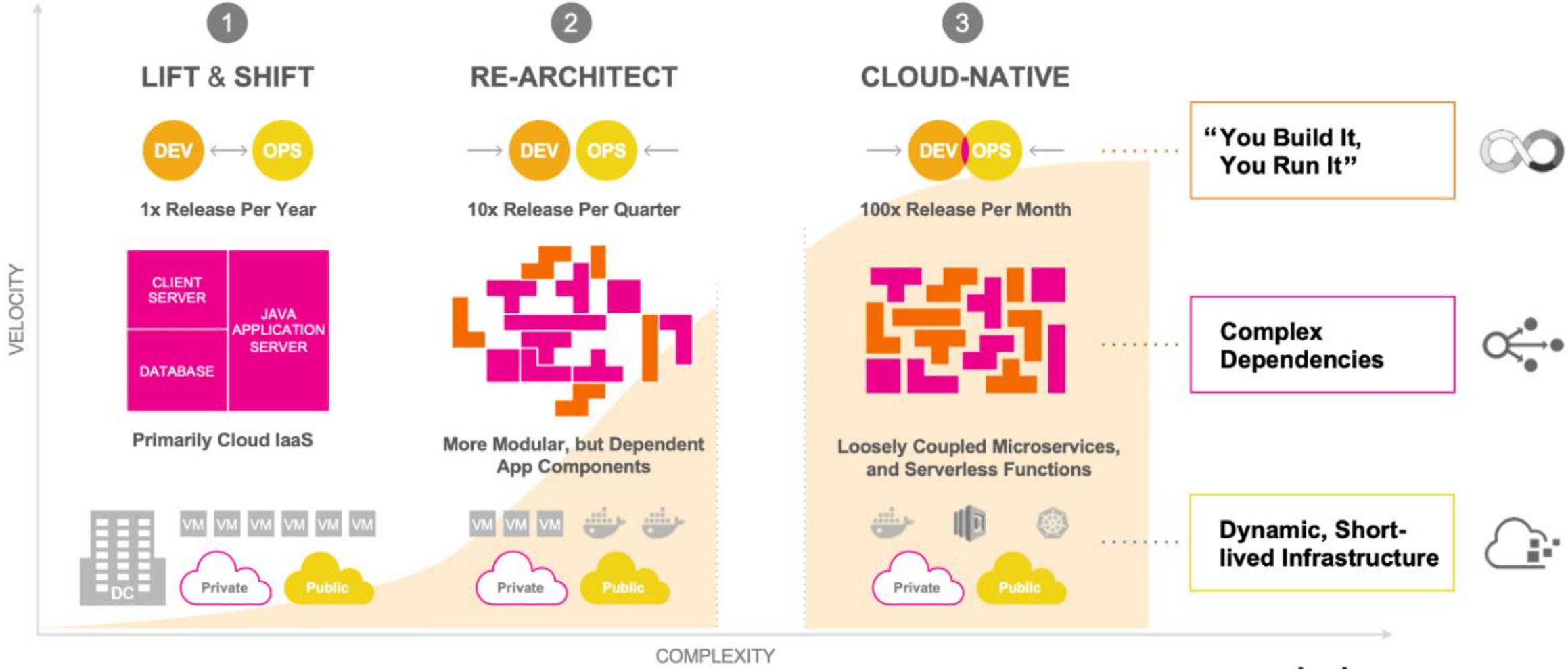
But it increases complexity



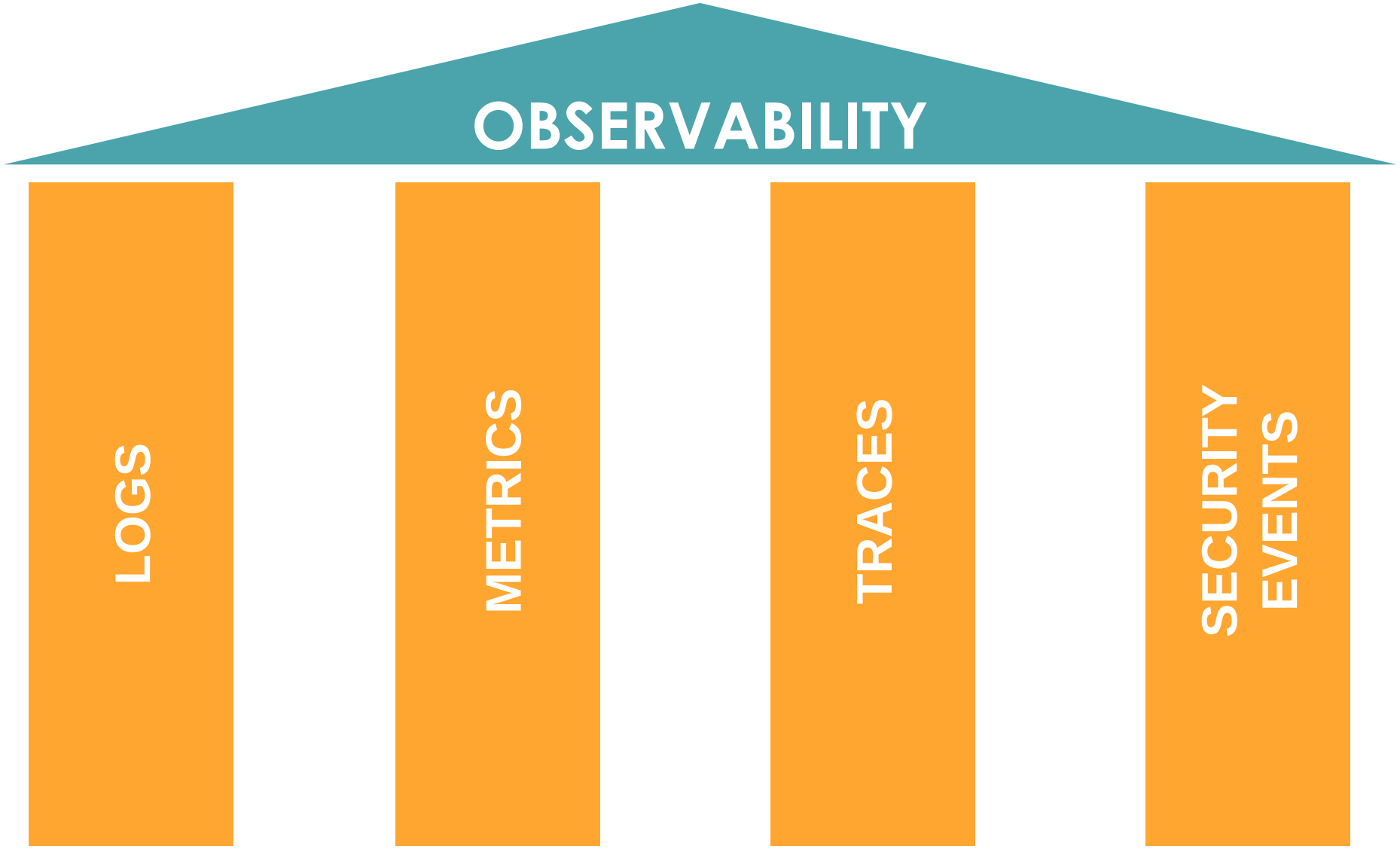
Mike Polisky, Splunk

Check-in with Raj

What are the key drivers for observability in your world?

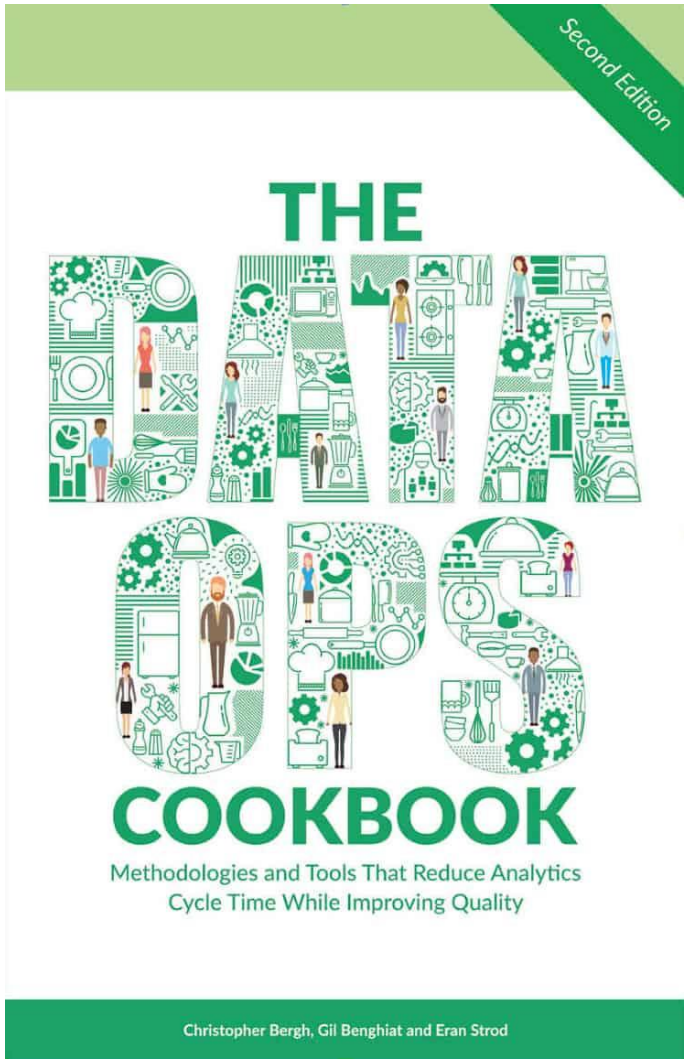
DevSecOps & Observability

Four Pillars!



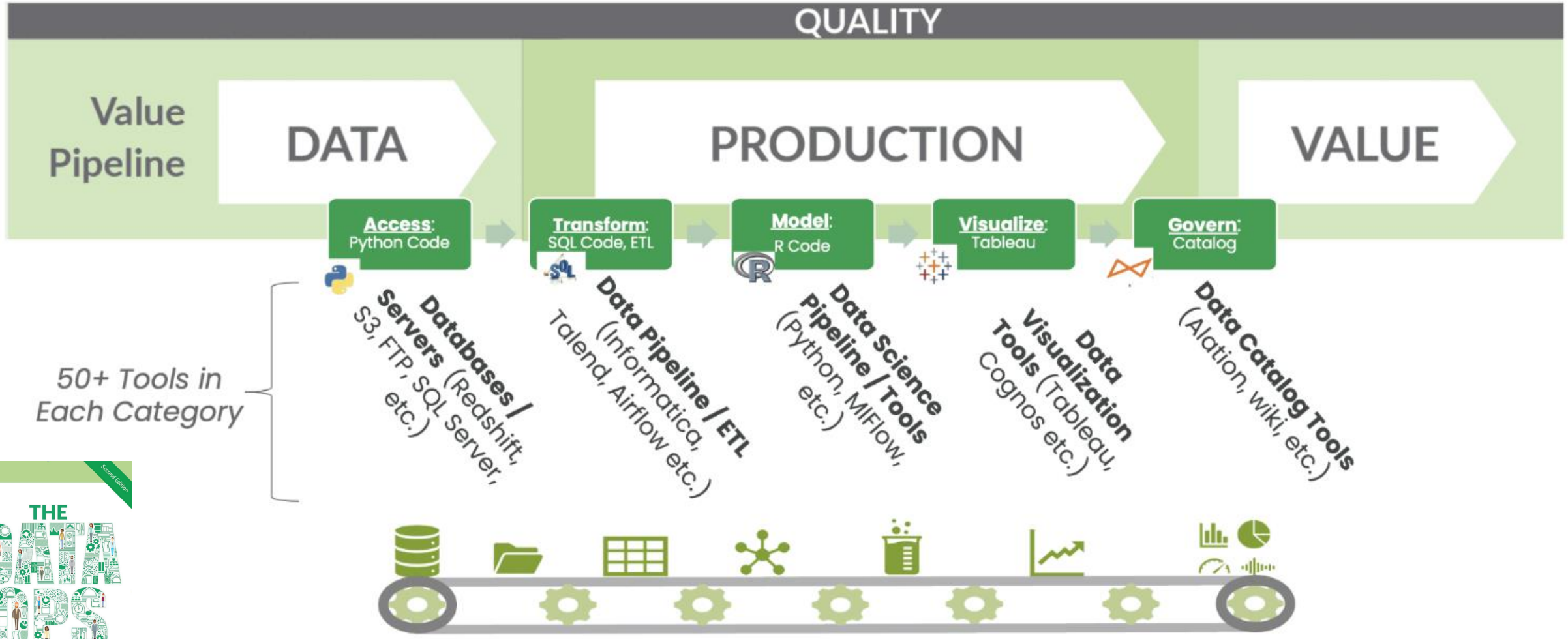
DataOps & Observability

The set of technical practices, cultural norms, and architecture that enable low error rates.



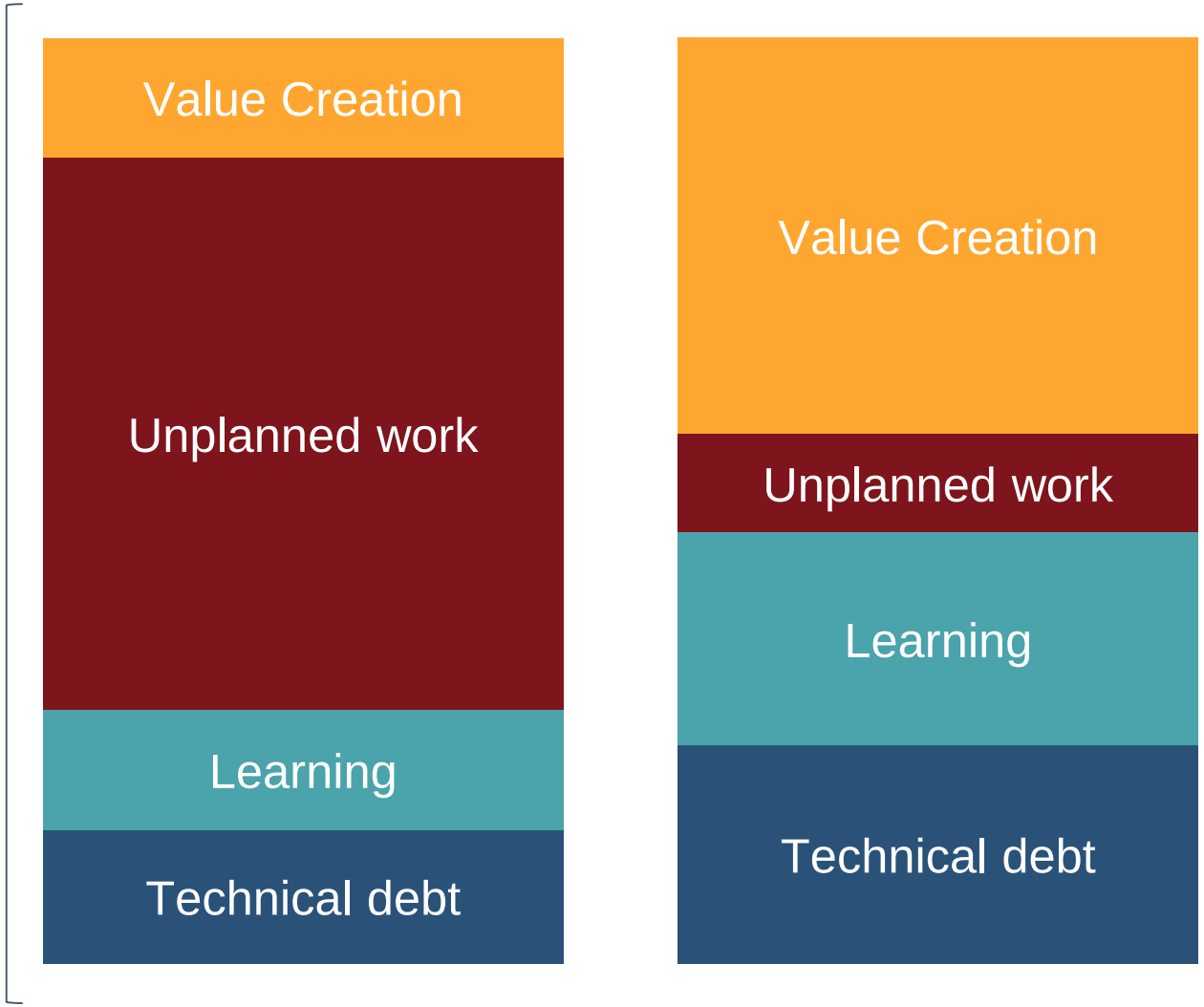
- Avoid manual tests
- Data operations is manufacturing
- Tie tests to alerts
- Focus on the process
- Errors are a huge team productivity drain
- Find errors before your customers do
- Data integrity over quality testing
- Run tests in preprod and live

The Data Factory



The Cost of Unplanned Work

What the team spends their time doing

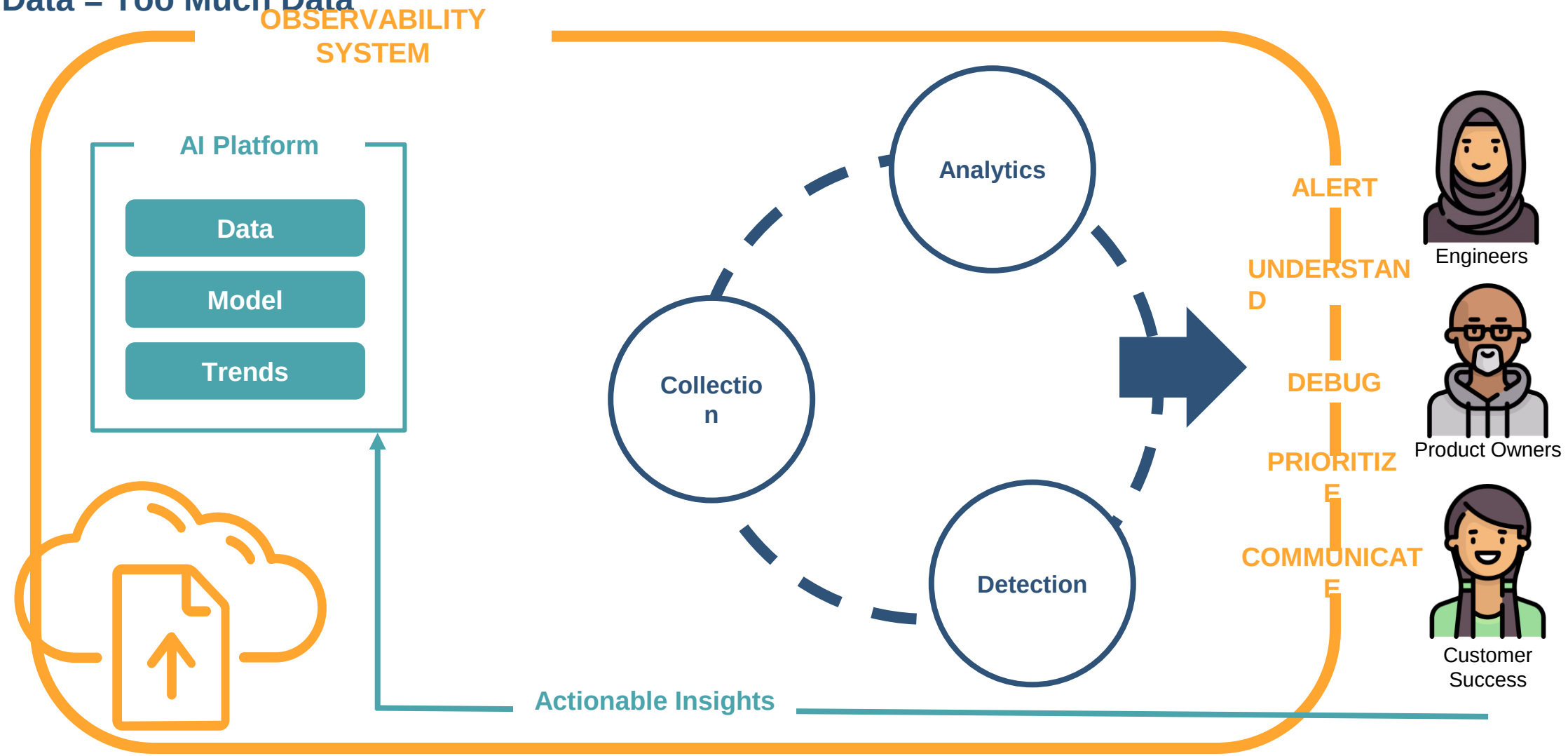


Without observability

With observability

AI and Observability

Big Data = Too Much Data



Cardinality Matters

High-cardinality data is the most useful for debugging

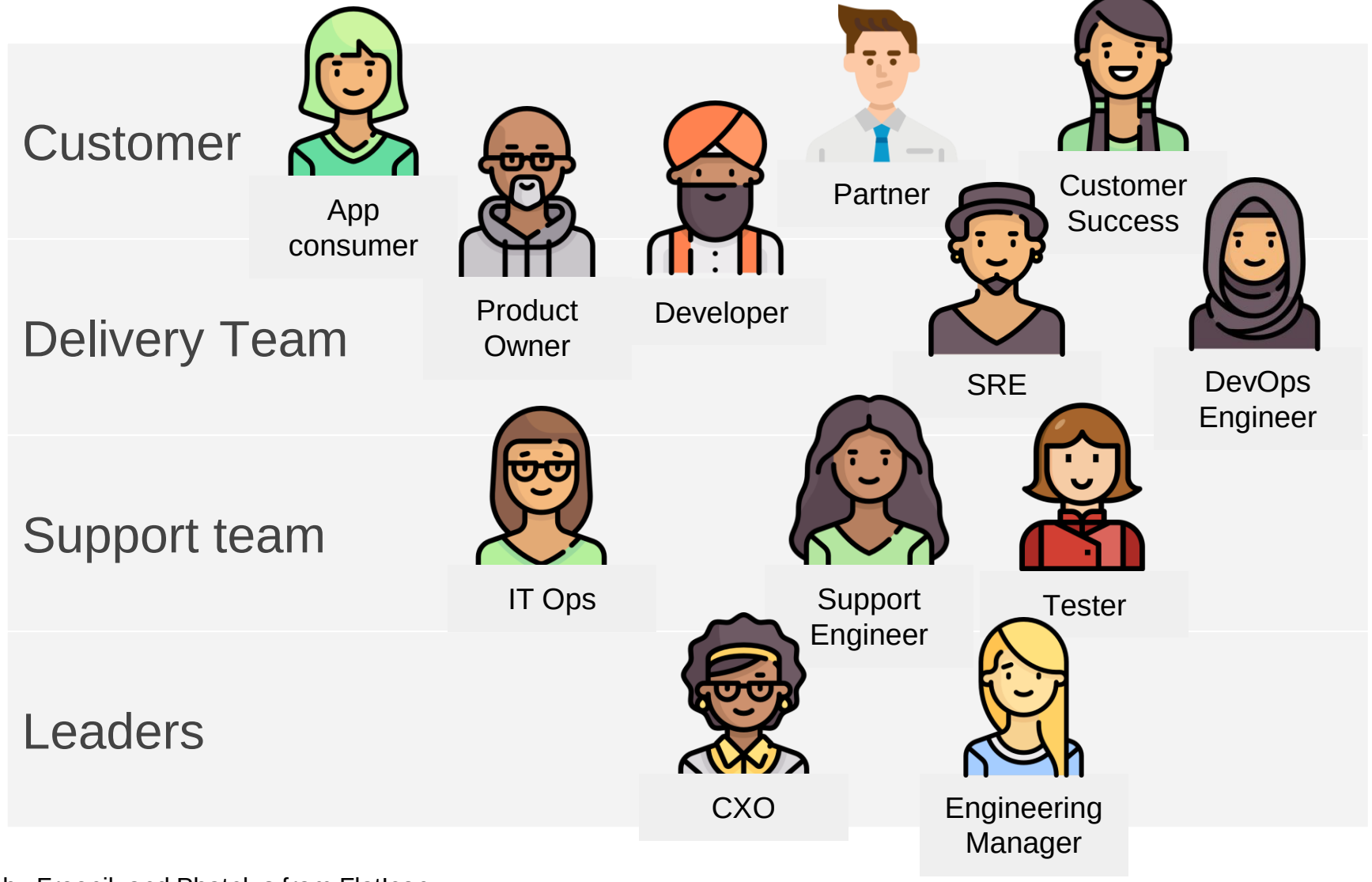
LOW	HIGH
Database column has lots of duplicate values in a data set	Database column has a large percentage of completely unique values

User ID	012345
First Name	Helen
Last Name	Beal
Gender	Female
Species	Human

Highest possible cardinality

Lowest possible cardinality

Observability Personas



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DevOps Persona

How Observability Helps Organizations Adopt CICD Practices

- Making CICD metrics available for data-driven conversations builds trust within and between teams and across the organization for continued DevOps investment
- Reducing the risks associated with test and release failures drives test automation coverage
- Using ODD drives developer behaviors based on feedback and the wisdom of production
- providing insights into the flow of work and feedback on value realization, alongside value stream management in particular
- Building resilience as the CICD pipeline and DevOps toolchain become business critical infrastructure

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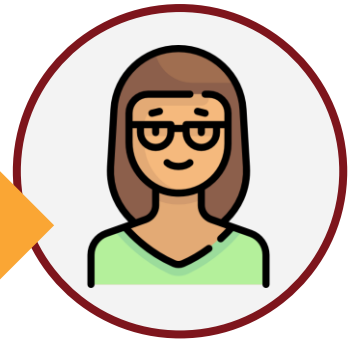
ITOps Persona

How Observability Helps IT Operations Evolve (AIOps)



Step 5	Add more automation for self-learning systems
Step 4	Use chaos engineering for antifragility
Step 3	Pay down technical debt for increased stability
Step 2	Automate toil using AI insights
Step 1	Reduce MTTR through noise reduction

More time for value experimentation

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The Developer Persona

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Observability Driven Development: X-Driven Development

Test-Driven	Behavior-Driven	Hypothesis-Driven	Impact-Driven	Observability-Driven
TDD	BDD	HDD	IDD	ODD
A software development process relying on software requirements being converted to test cases before software is fully developed, and tracking all software development by repeatedly testing the software against all test cases. This is as opposed to software being developed first and test cases created later.	An agile software development process that encourages collaboration among developers, quality assurance testers, and customer representatives in a software project. It encourages teams to use conversation and concrete examples to formalize a shared understanding of how the application should behave.	Hypothesis-driven development is a prototype methodology that allows product designers to develop, test, and rebuild a product until it's acceptable by the users. It is an iterative measure that explores assumptions defined during the project and attempts to validate it with users' feedbacks.	**EMERGING** Takes small steps towards achieving both impact and vision. Impact Driven Development balances the development of a vision with creating real impact for users. It makes sense that the first phase of your product development should involve some users.	**EMERGING** Adds another layer to software development by encouraging the development team to think about the application availability and uptime throughout their development process and similar to unit-testing development, wrap their code with more verbose logging, metrics and KPIs

SRE Persona

How Observability Supports SRE's Goals

- Reducing the toil associated with incident management – particularly around cause analysis – improving uptime and MTTR
- Providing a platform for inspecting and adapting according to SLOs and ultimately improving teams' ability to meet them
- Offering a potential solution to improve when SLOs are not met and error budgets are over-spent
- Relieving team cognitive load when dealing with vast amounts of data – reducing burnout
- Releasing humans and teams from toil, improving productivity, innovation and the flow and delivery of value
- Supporting multifunctional, autonomous teams and the "we build it, we own it" DevOps mantra
- Completing the value stream cycle by providing insights around value outcomes that can be fed back into the innovation phase

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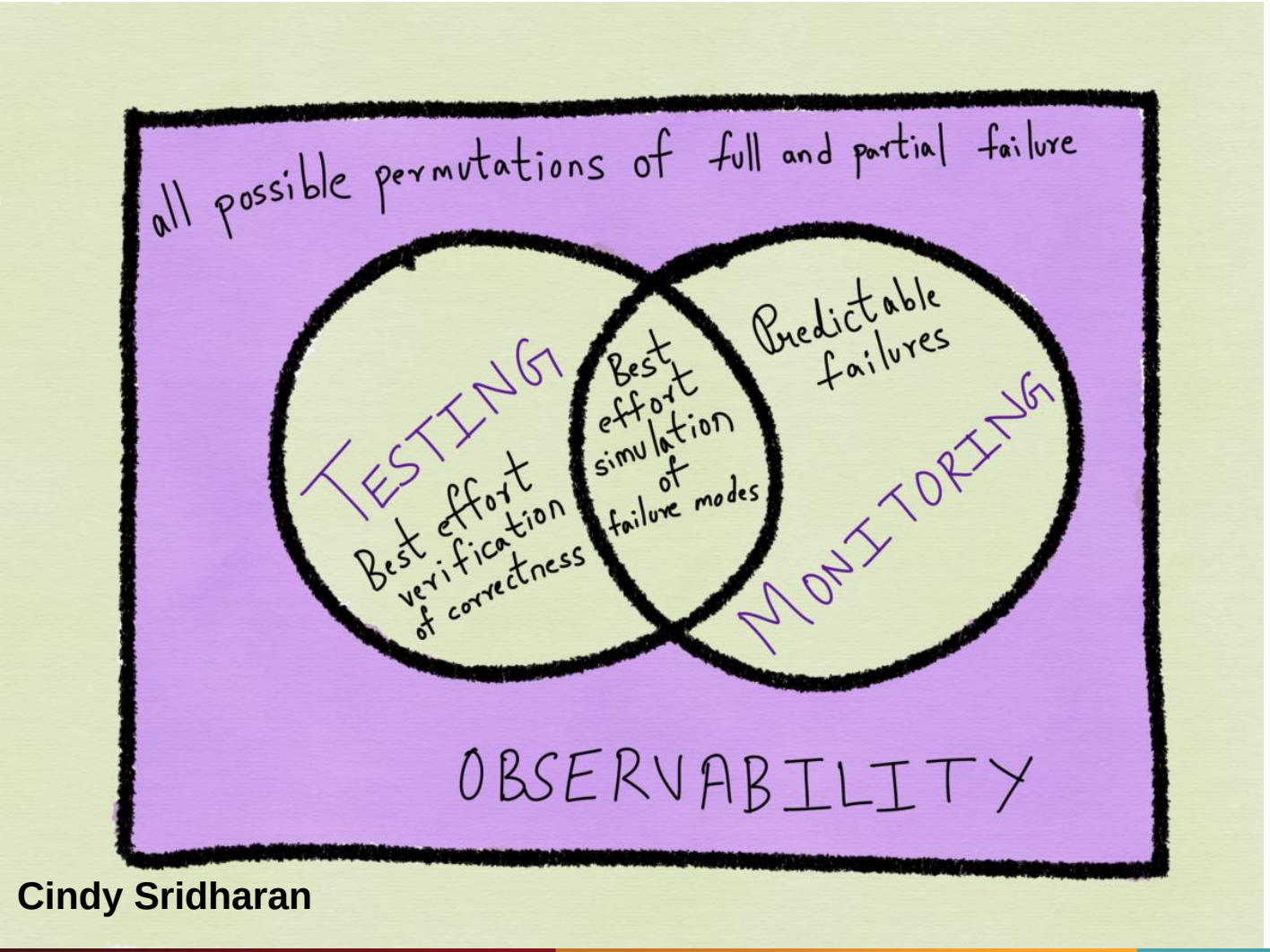
QA and Testing Persona

Observability is Testability



Cindy Sridharan

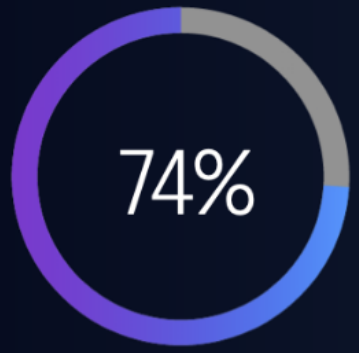
"As a by-product, TDD identifies the aspects/parts of the system can be certainly observed."

Venkatesh-Prasad Ranganath

CIO and Leaders

Every business is a technology business

A radically different approach is needed



of CIOs say their organization will lose their competitive edge if IT is unable to spend less time "keeping the lights on"

CIOs say the most critical capabilities they need to manage the performance of their digital services are:

Visibility across the entire cloud and IT environment	55%
Automation to reduce the need for manual instrumentation and intervention	54%
Ability to identify the relationship between IT performance and business metrics (i.e., conversions)	51%
Ease of use and rapid time to value from performance management solutions	51%
Ability to correlate alerts and reduce noise so IT teams can focus on what matters to the business	45%
The ability to capture metrics, logs, and traces in a single platform	41%

Check-in with Raj

How do you see the landscape of observability personas evolving?

Observability and Value Stream Management

How Observability Helps Organizations Adopt VSM Practices

- Shortening MTTR means more time for innovation and more time to spend on adapting ways of working to optimize flow and more value outcomes delivered to customers
- Reducing the risk and costs associated with outages directly improving a product teams Profit and Loss (P&L) or cost:value ratio
- Improving customer delight which can be understood by metrics such as Net Promoter Score (NPS) and referrals
- Using observability throughout the value stream, so in pre-production and across the DevOps toolchain, means less defects and more predictability in production
- Making the value stream visible and making value measureable

Observability Gaps

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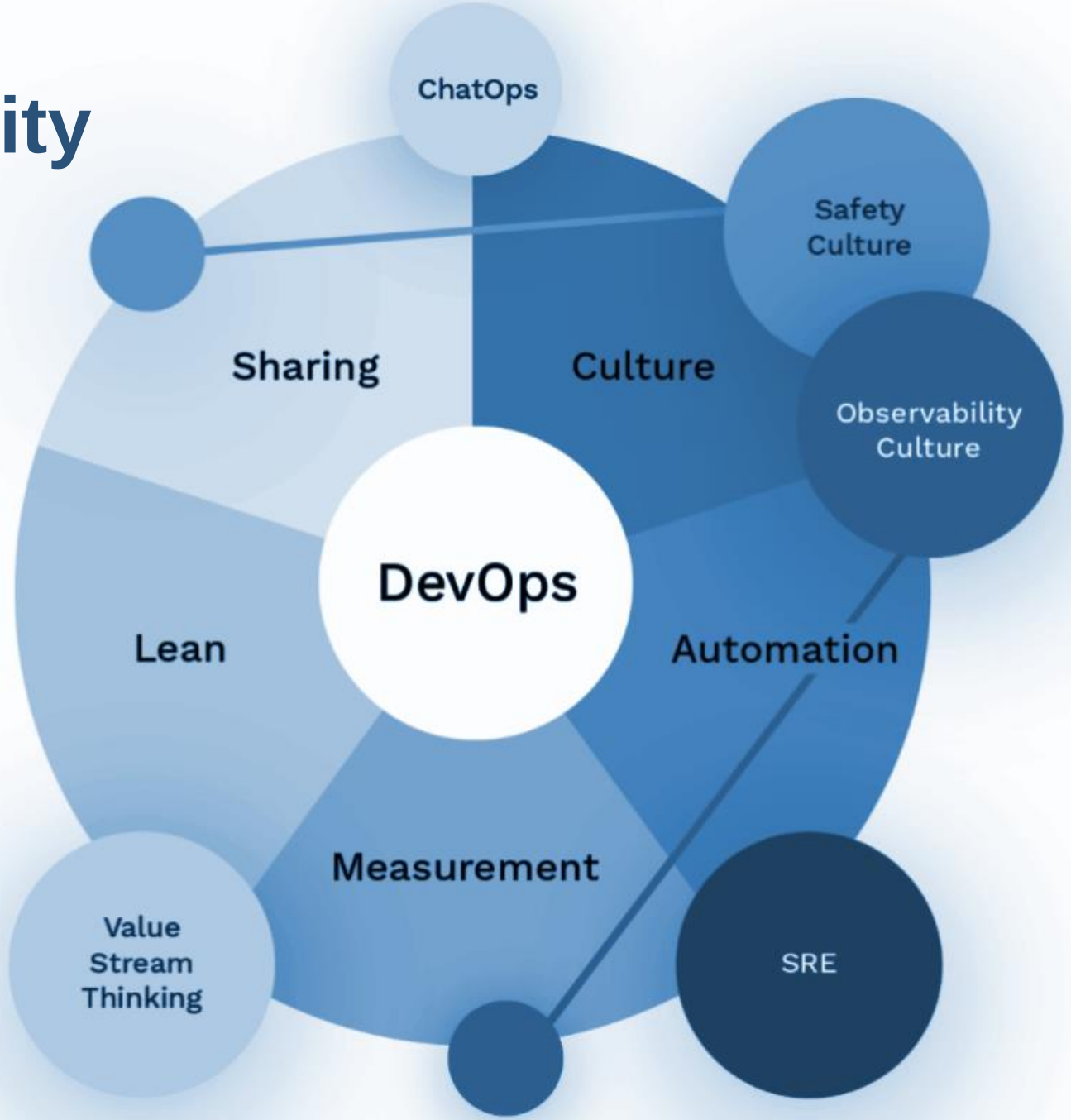
UNKNOWN UNKNOWNS

Observability Culture

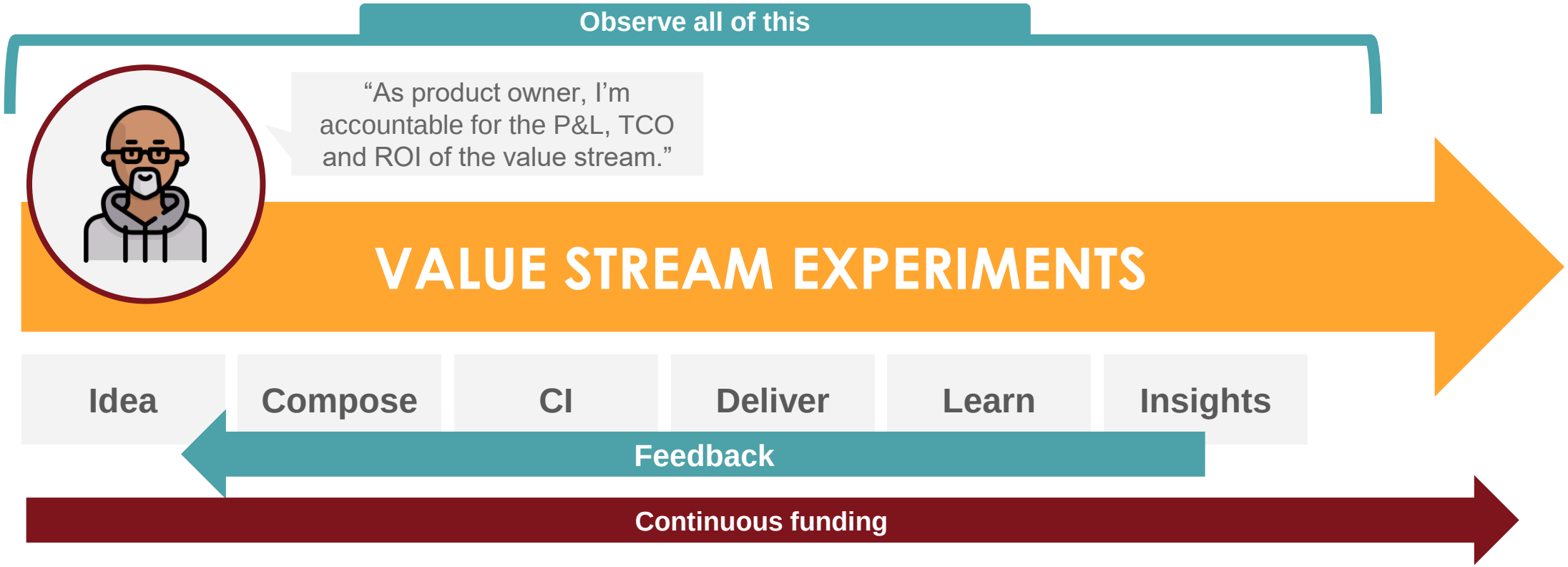


Check-in with Raj

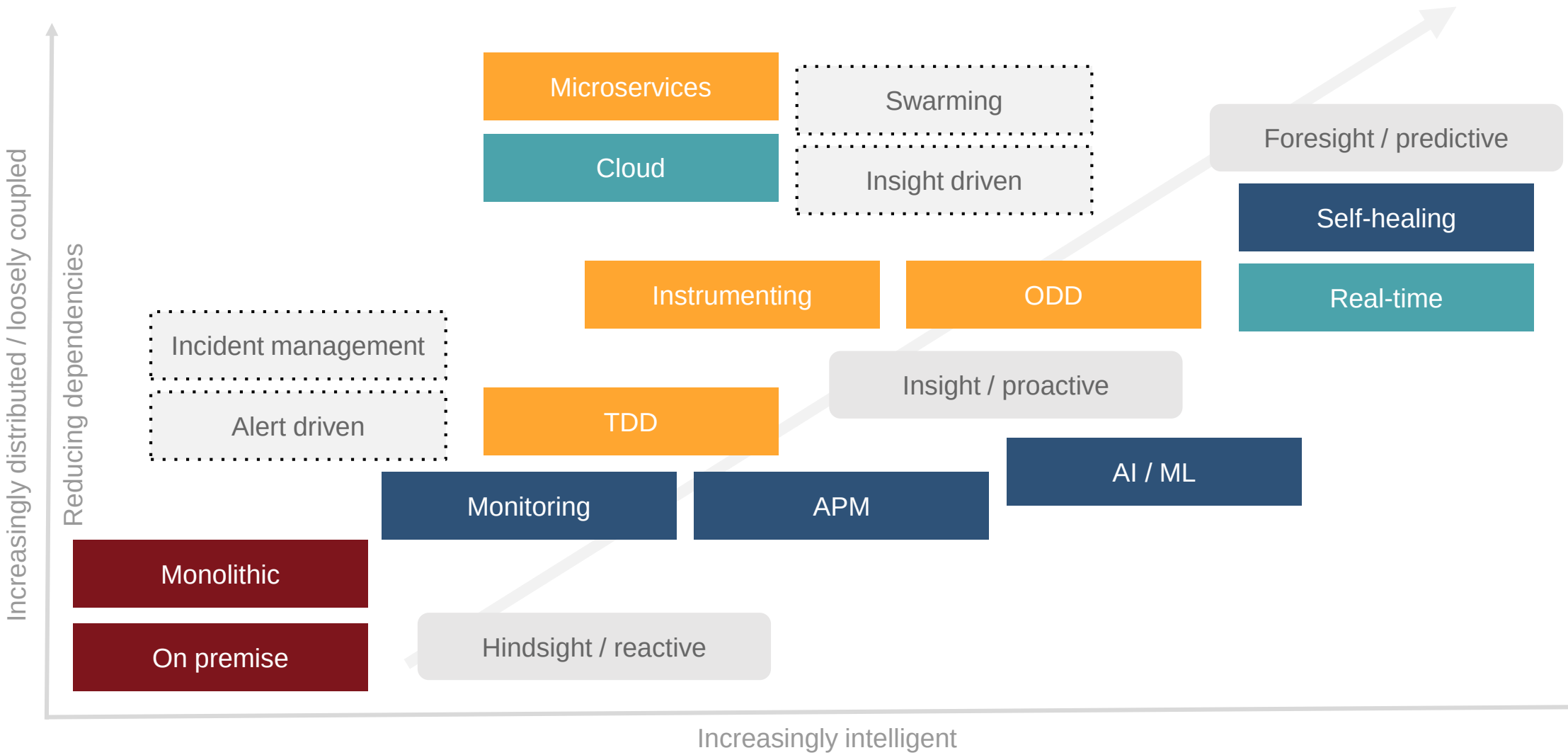
How can people nurture an observability culture?

Observability and Funding

The value stream or product owner is a mini-CEO



Observability Capability Model



Where to Get Started

1	Set your vision: define your goals as “just enough” observability
2	Understand your priorities
3	Extract data from the digital services you don’t own (realtime)
4	Instrument your own digital products and services

Instrumentation Principles

1. Generate unique request IDs
2. Generate one event per service/hop/query/etc
3. Wrap any call out to any other service/data store as a timing event
4. Collect lots of context
5. Add redundant information
6. Add two fields for errors
7. Opt for wider events (more fields)
8. Don’t be afraid to add fields that don’t exist in wider contexts
9. Spend time thinking about field names
10. Add units to field names

What Fields?

WHO'S TALKING TO YOUR SERVICE?

- IP address
- load balancer
- proxy
- User ID
- email address
- user_agent
- SDK version

WHAT ARE THEY ASKING?

- URL request
- Handler
- HTTP headers
- Accept/refuse
- Pass garbage?
- Batched?
- Zipped?
- Object ID?

HOW DID THE SERVICE RESPOND?

- Response time
- Service calls
- Metadata
- Success
- Object ID?
- Host name
- Container ID
- Build ID
- K8s pod
- AWS cluster

Sampling

Observability at scale

Constant sampling	Dynamic sampling	Constant throughput	Constant throughput per key	Average sample rate
Submit one event for every n events you wish to represent	Vary the sample rate based on characteristics of the incoming traffic	Specify the maximum number of events per time period you want to send	Maximum number of events sent per key	A given overall sample rate across all traffic to capture more of the infrequent traffic
Simple and easy to implement	Tremendous flexibility in how you choose the individual events that will be representative of the entire stream of traffic	With a relatively even split of traffic among your keys and fewer keys than desired throughput rate, great at capping resources	Scales: retain detail per-key as the key space grows	Good when rare events are more interesting than common events
Lack of flexibility	If there are too many different types of traffic, enumerating them all to set a specific sample rate for each can be difficult	Doesn’t scale at all	As traffic grows within an individual key, visibility into the details for that key is lost	High-volume traffic is sampled very aggressively, which may not be desirable

Implementation Challenges

And how to overcome them

Challenge	Try This
No time	Build time into your sprints, calculate how much time you will save in the future to justify the investment now
No skills	Build learning time into your sprints or hackathons, dynamic learning organizations are the most successful - justify not building cultural debt
Other priorities	Work with the PO/business to limit WIP and justify through future increases in capacity for innovation
No tools	Practice ODD and build instrumentation in
Technical debt	Build time into sprints and identify technical debt as user stories in the product backlog
Wrong architecture	Work with architects to use strangler pattern to reduce dependencies in the monolith and incrementally work towards loosely-coupled

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THANK YOU

and over to Raj

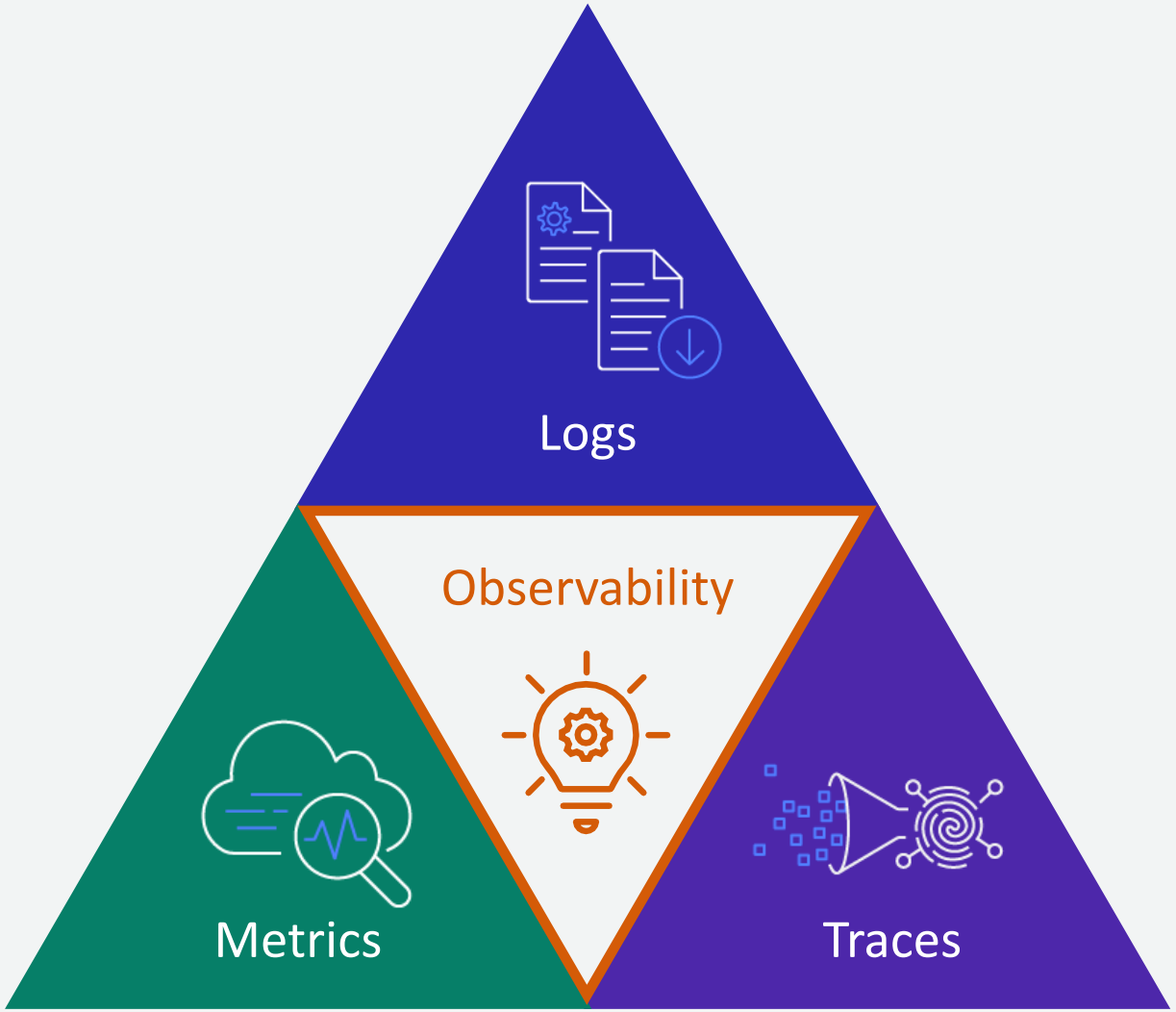
aws marketplace

Shashiraj Jeripotula (Raj)

Sr. Partner Solutions Architect at AWS

shashirajjeripotula

Observability is the goal



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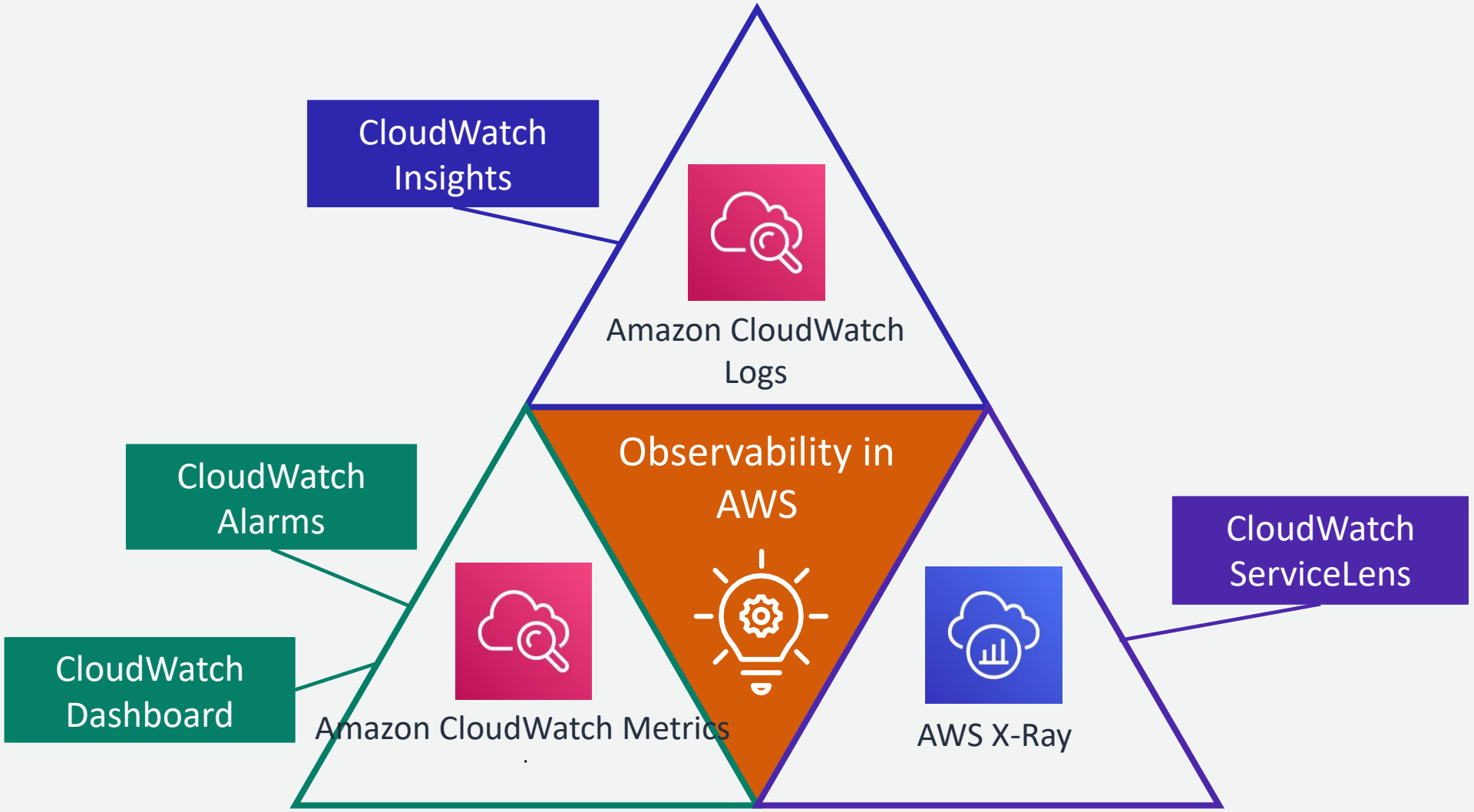
Observability in AWS



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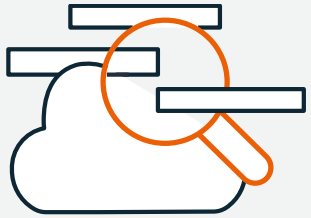
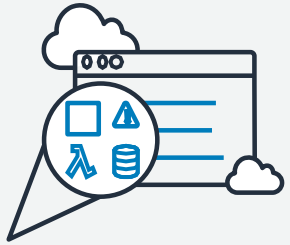
AWS DevOps Tooling for Monitoring and Logging

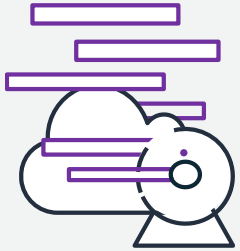
Record logs and monitor application and infrastructure performance in near real-time



Cloud and network monitoring with Amazon CloudWatch



Distributed tracing with AWS X-Ray



Activity and API usage tracking with AWS CloudTrail

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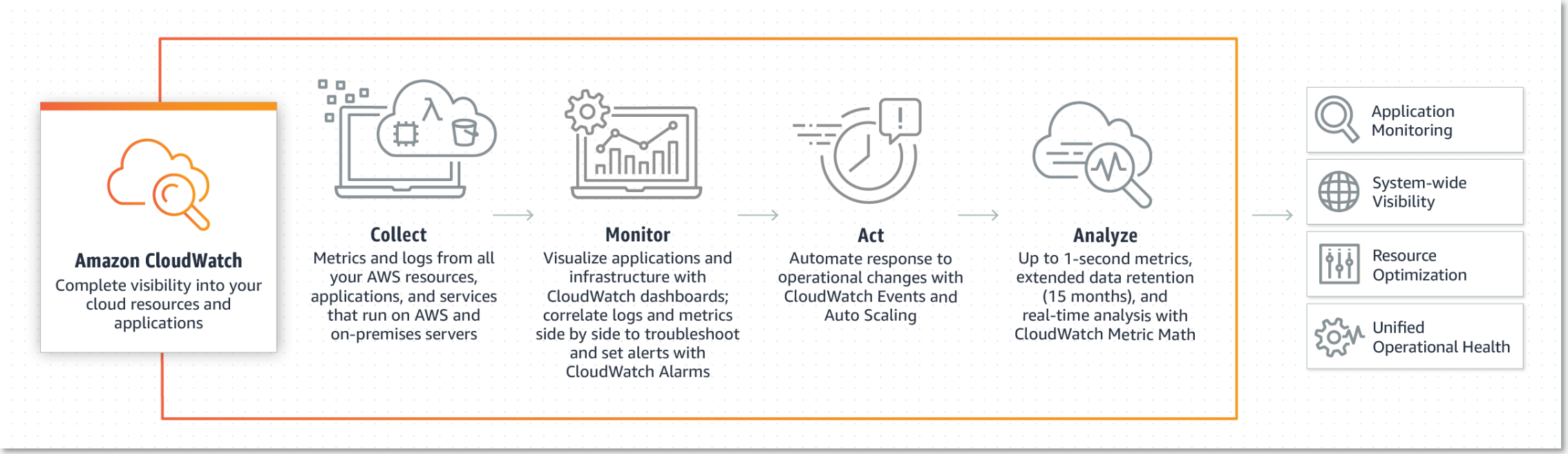
Amazon CloudWatch Anomaly Detection

Continuously analyze telemetry data and identify anomalous behavior



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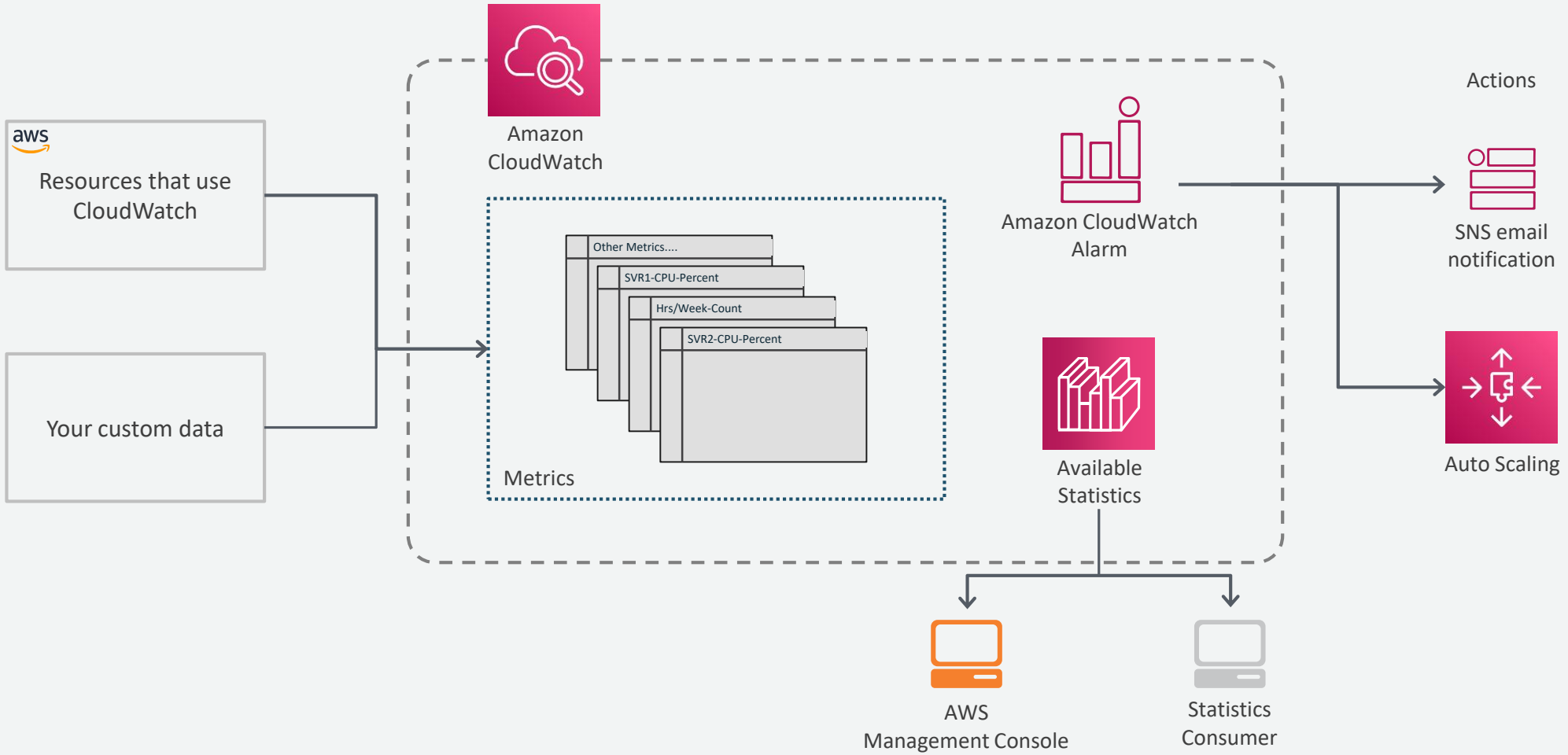
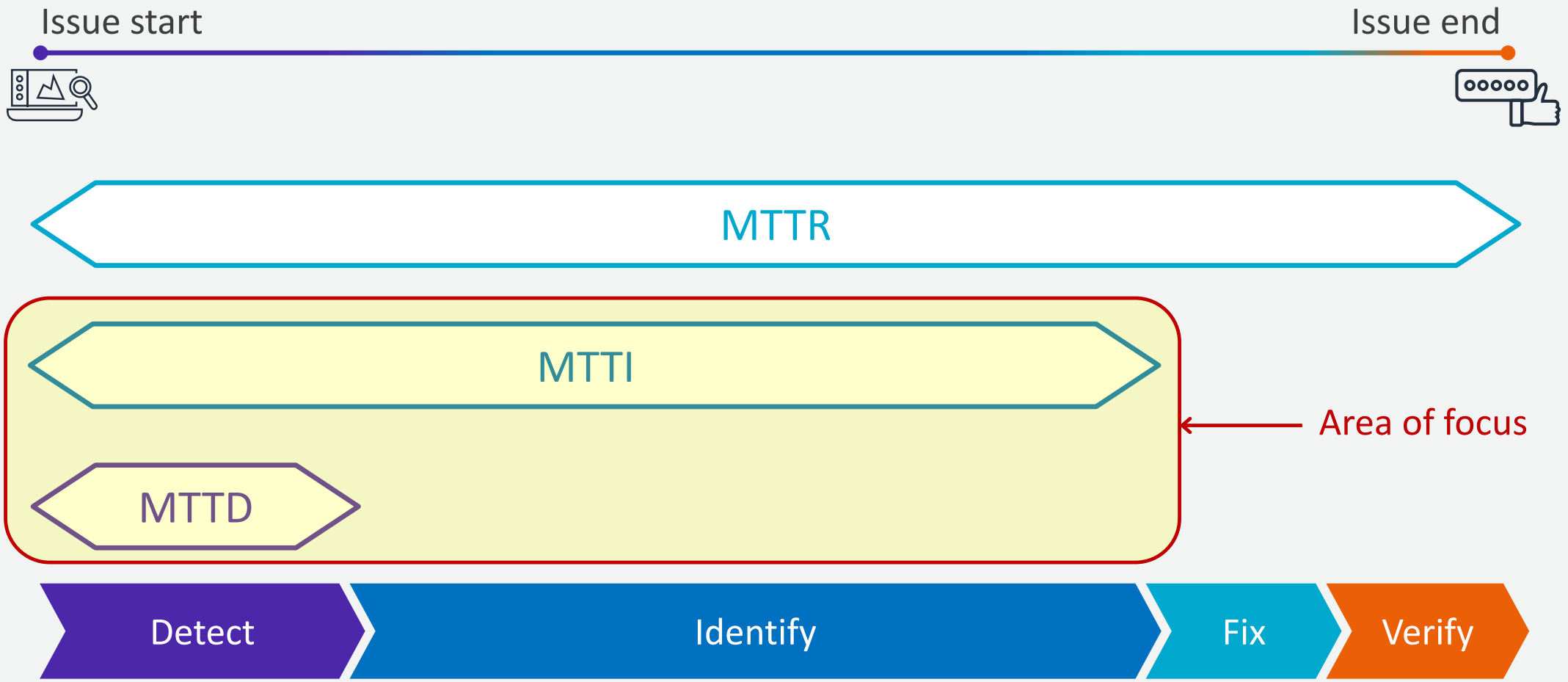
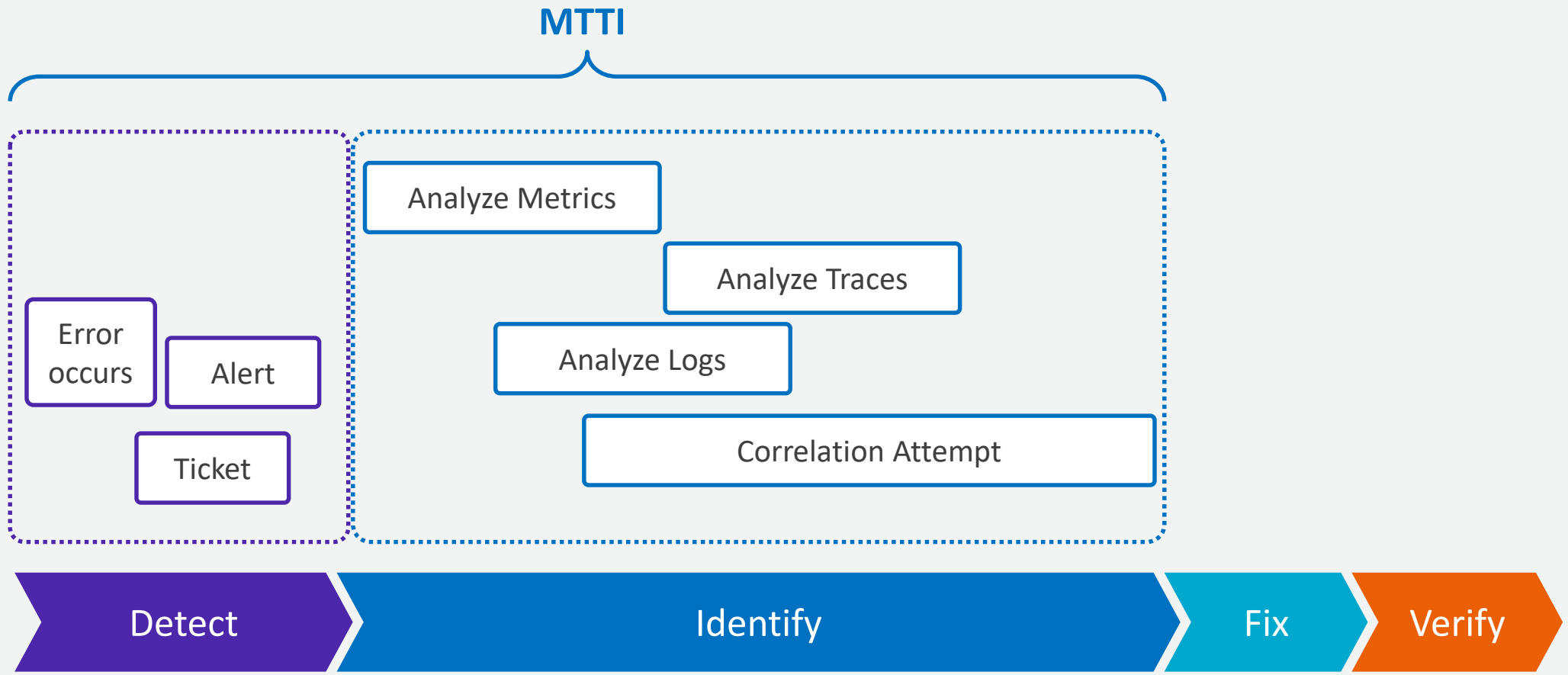
How Amazon CloudWatch works



Issue timeline

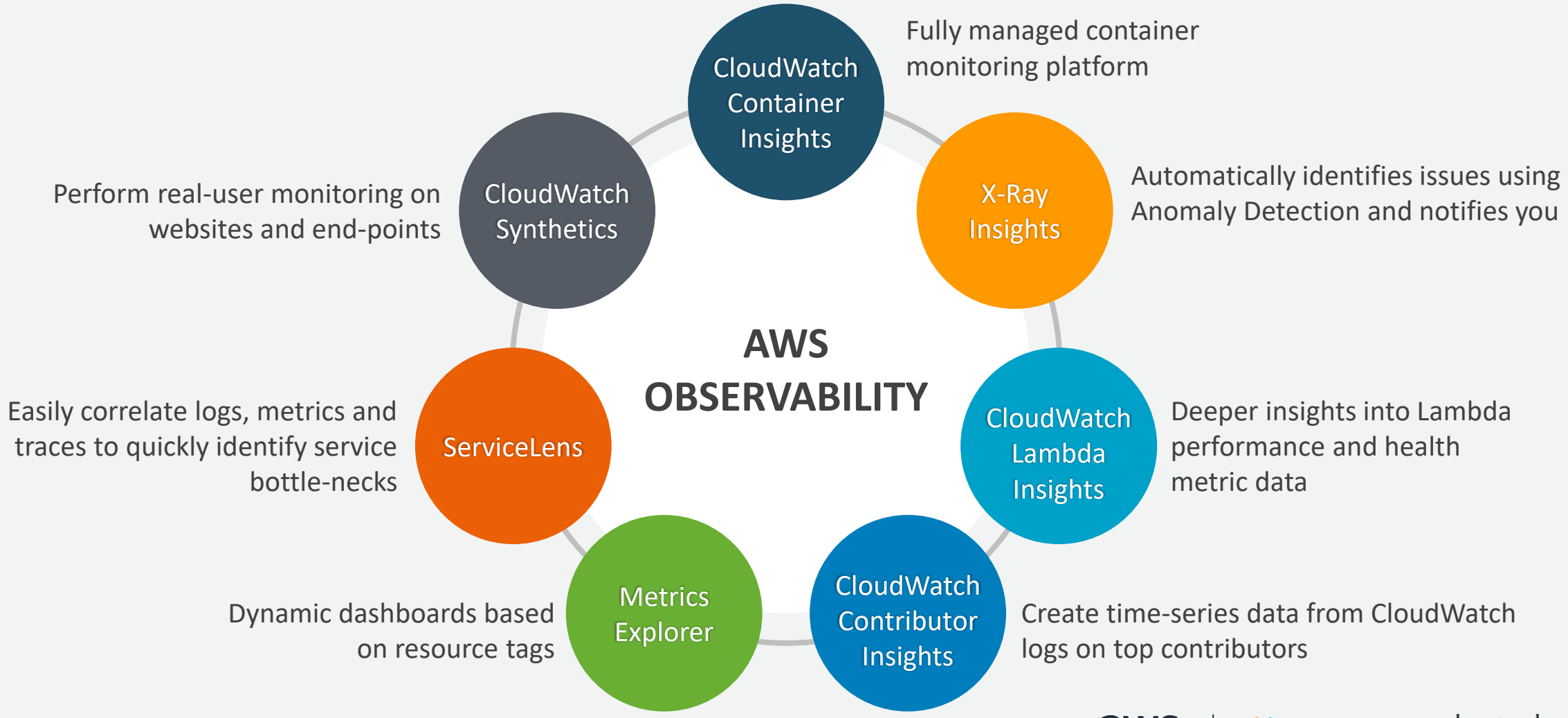


Typical troubleshooting workflow



AWS observability tools

Infrastructure, application, and synthetic monitoring



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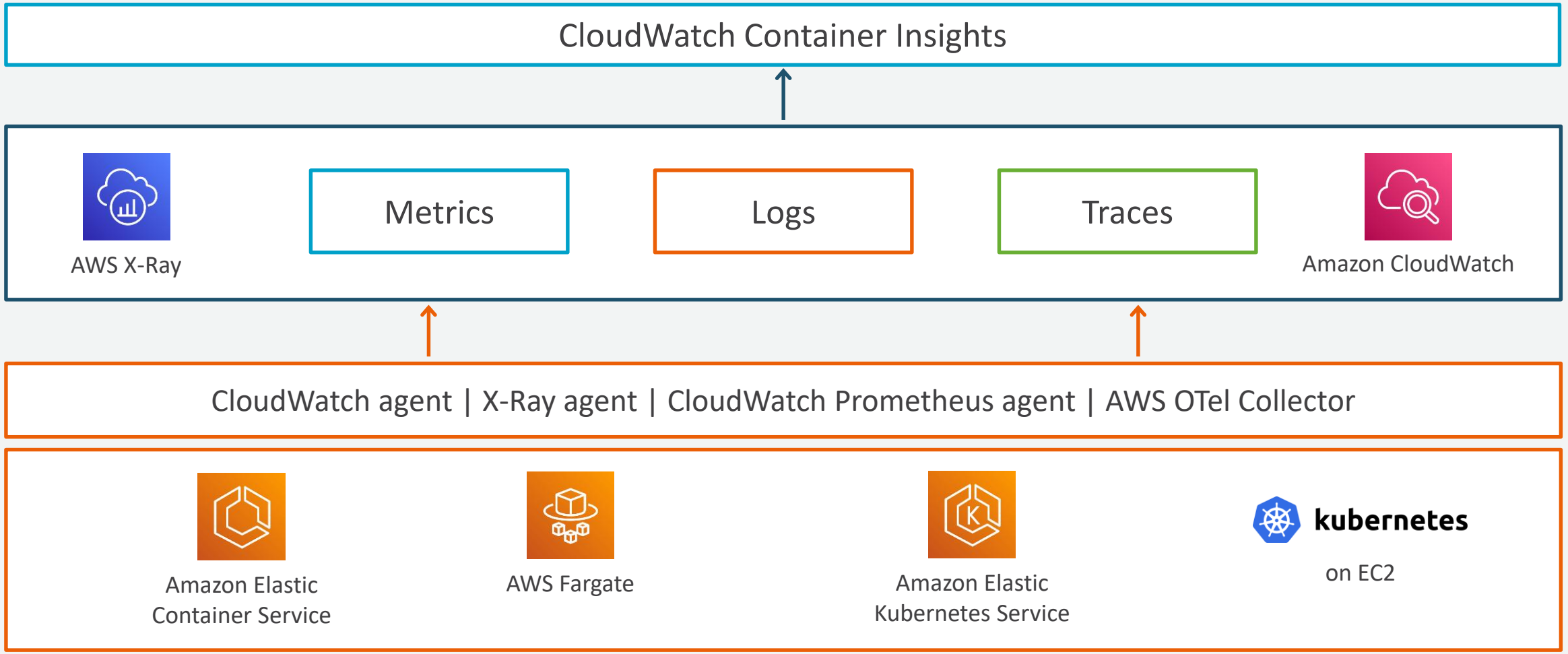
CloudWatch Container Insights

Collect, aggregate, and summarize metrics and logs containerized apps and services



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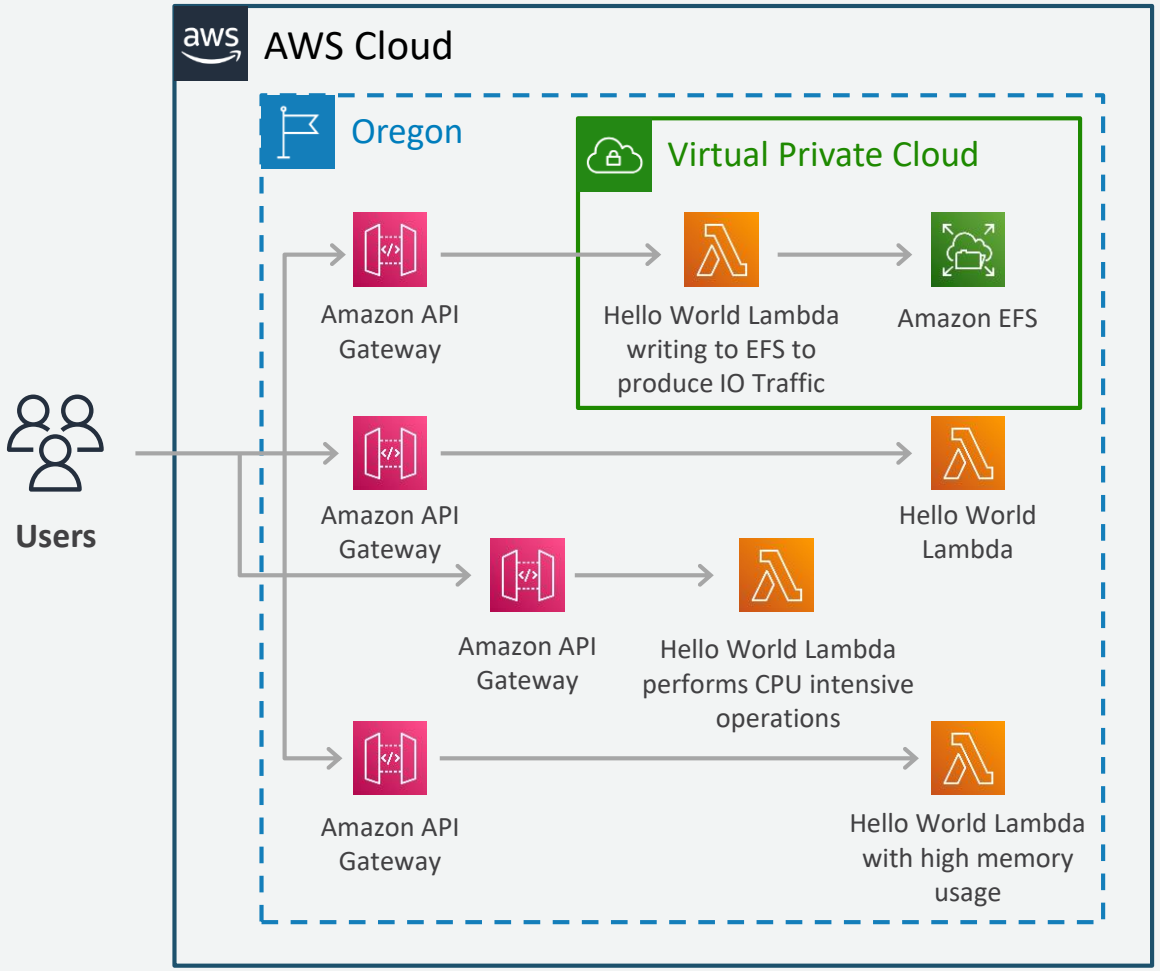
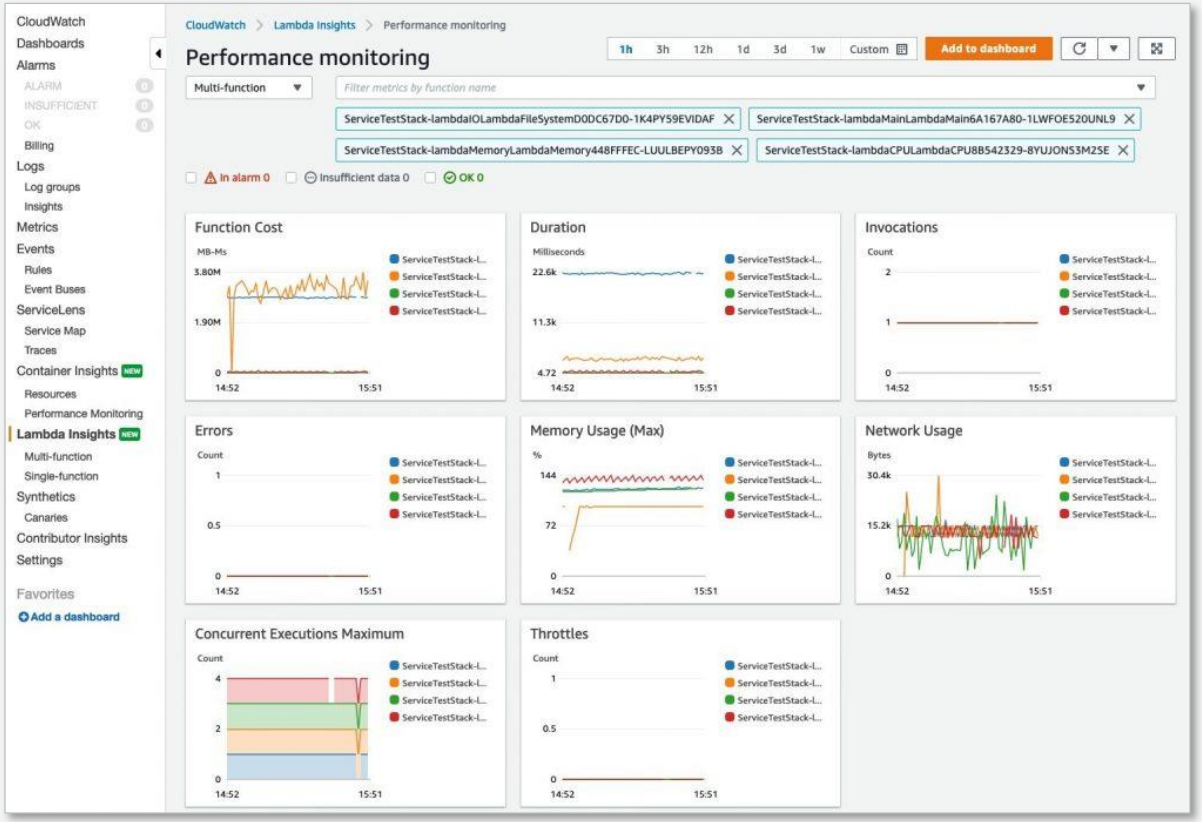
CloudWatch Lambda Insights

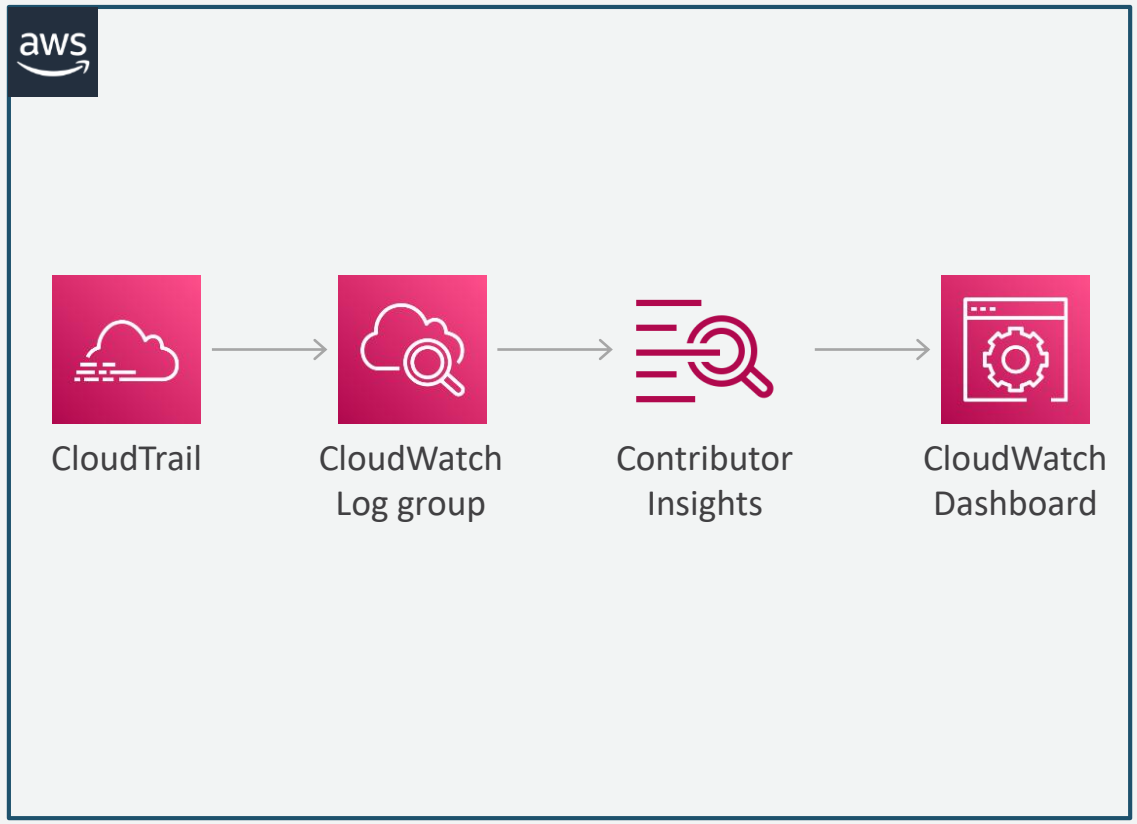
Monitoring and troubleshooting for serverless apps on AWS Lambda

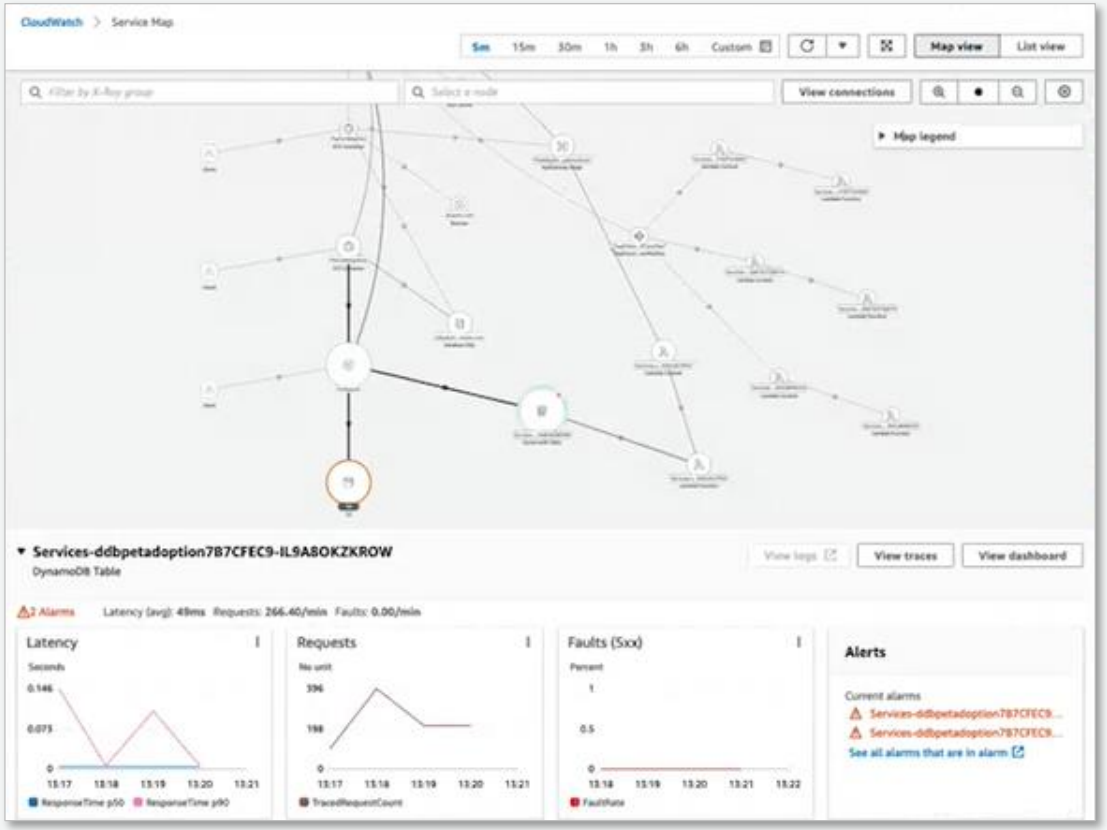




CloudWatch Contributor Insights

Analyze log data and create time series that display contributor data





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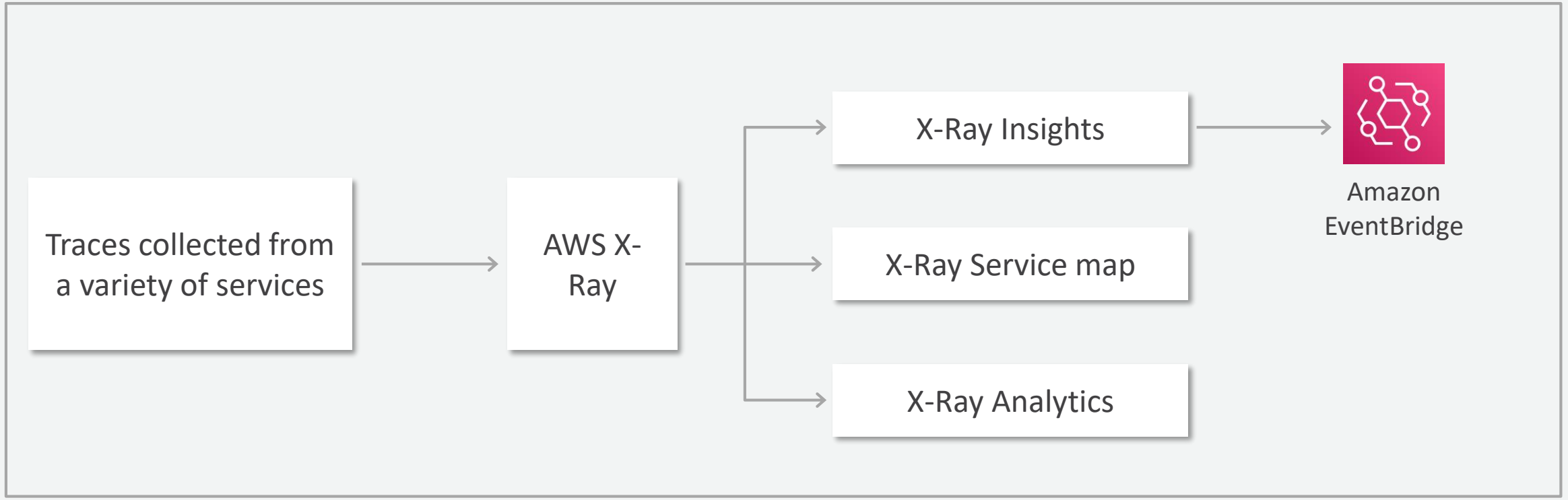
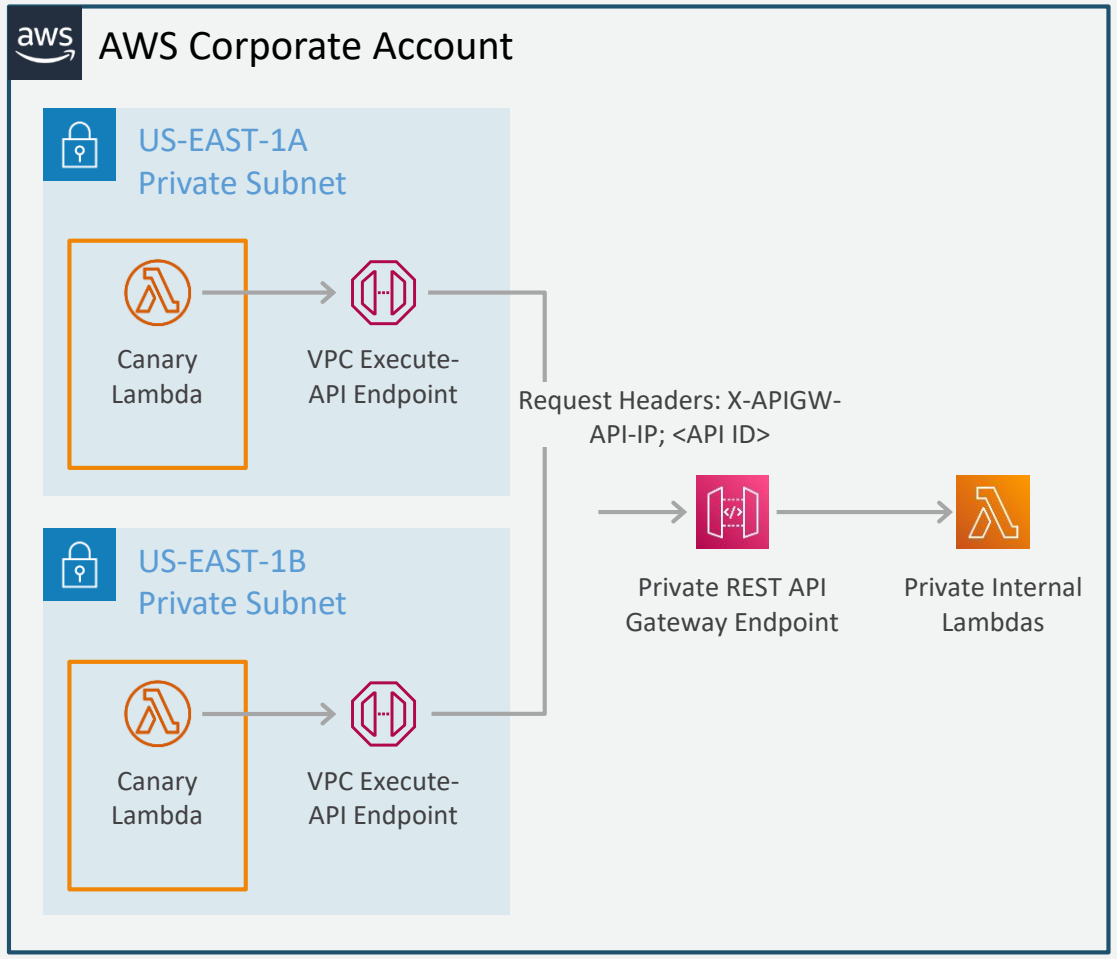
X-Ray Insights

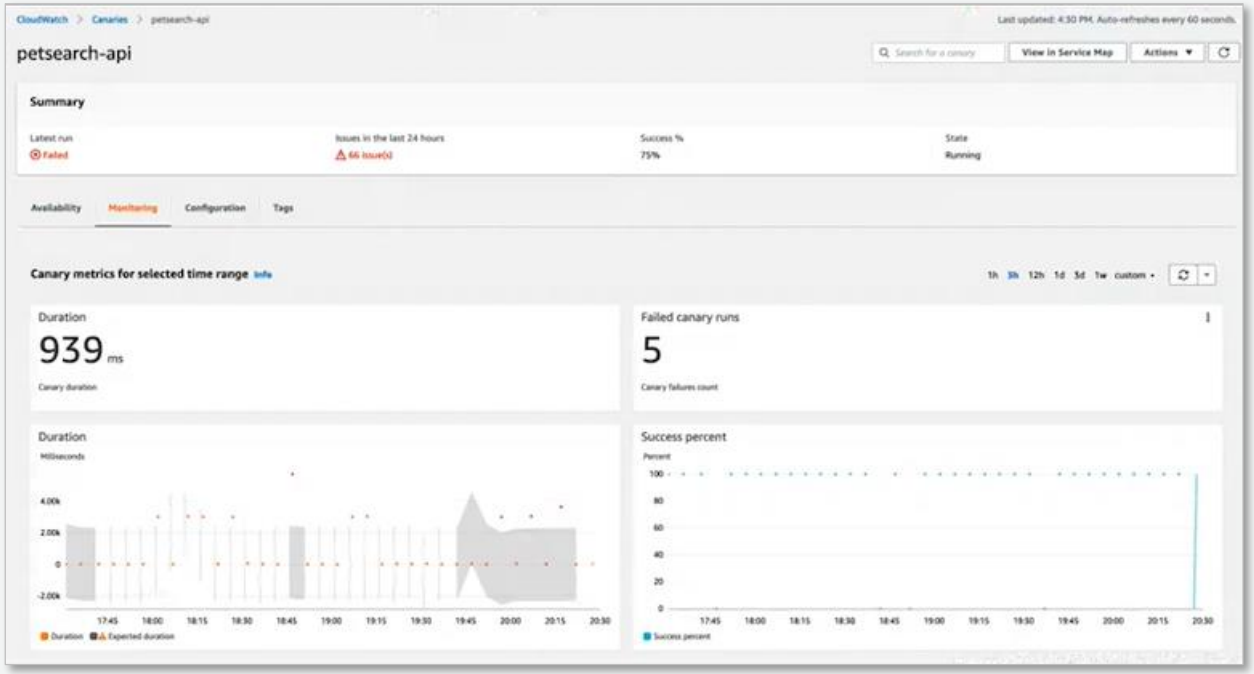
Create actionable insights about application anomalies



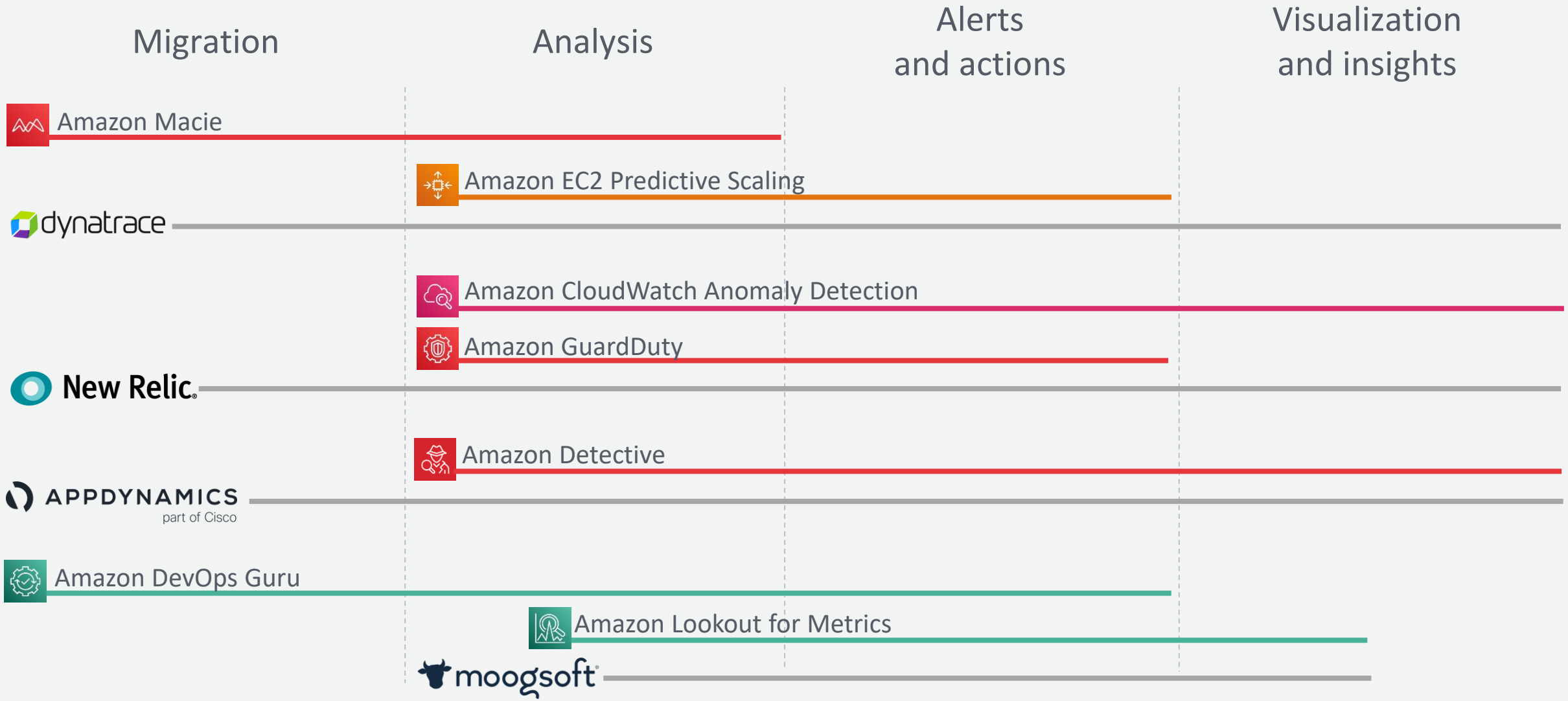
CloudWatch Synthetics

Create canaries to monitor your endpoints and APIs





AWS solutions



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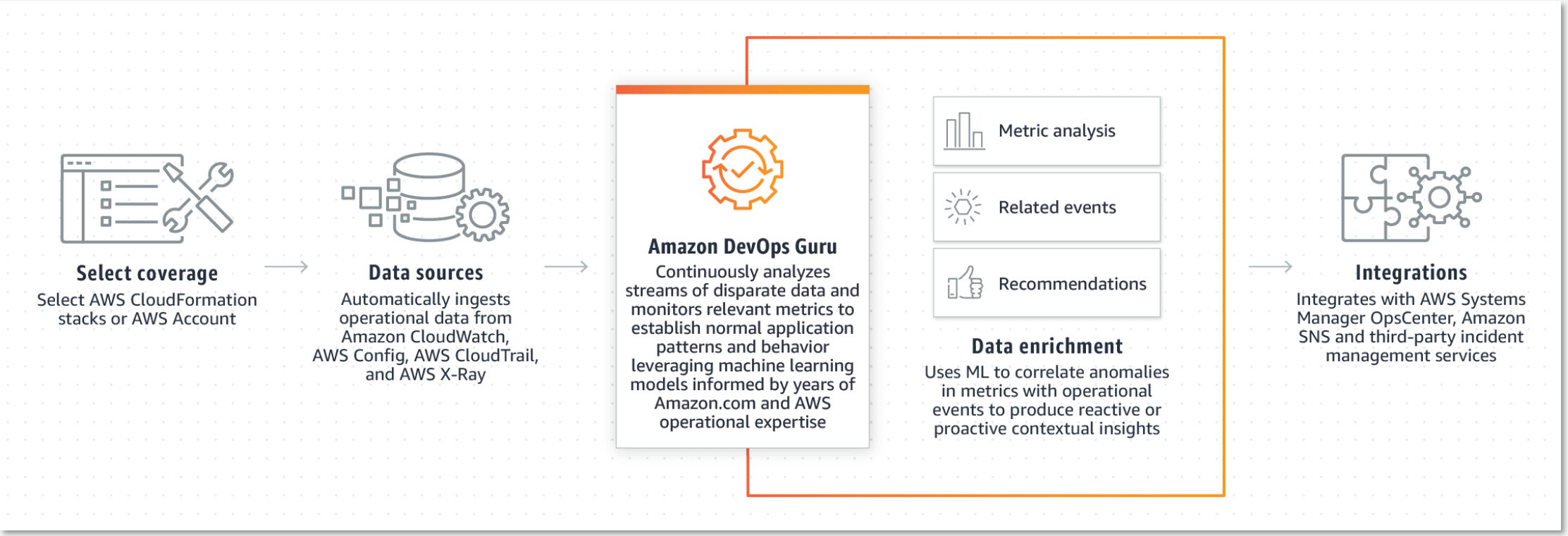
Amazon DevOps Guru

ML-powered cloud operations service to improve application availability



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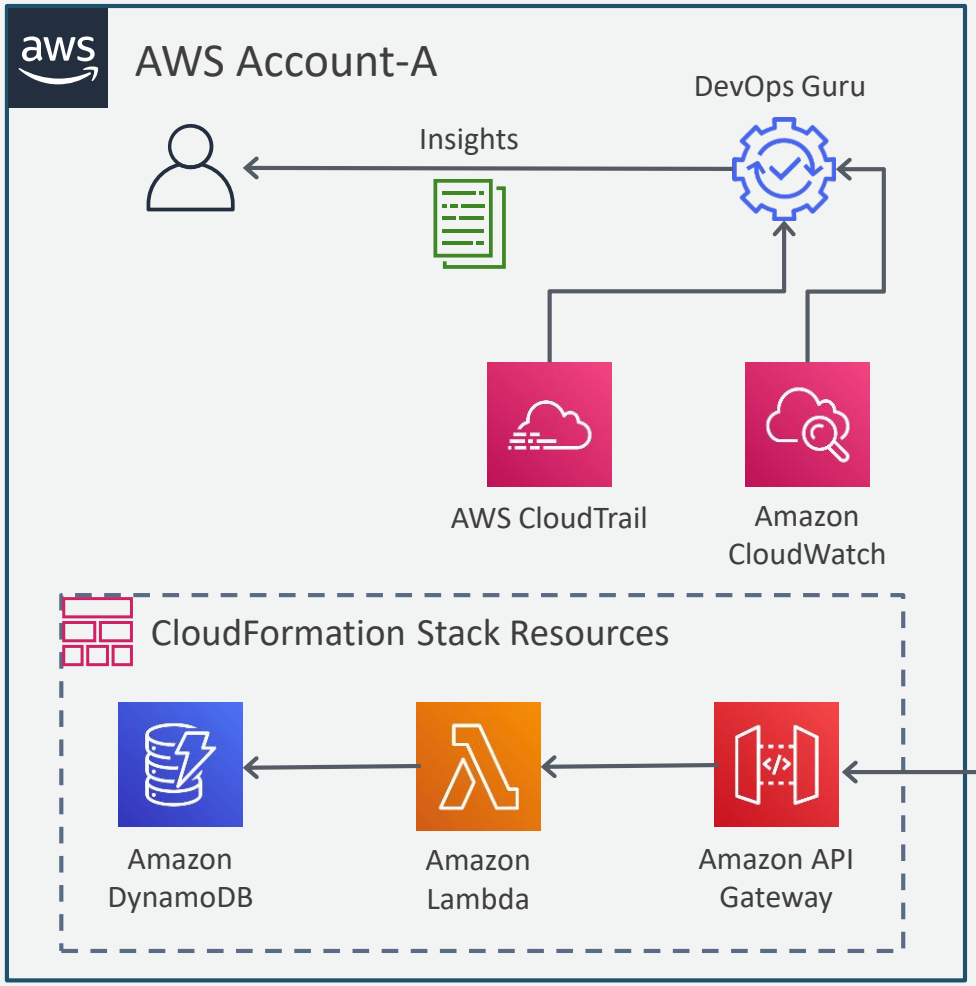
Amazon DevOps Guru

ML-powered cloud operations service to improve application availability



1. Enabling DevOps Guru for the CloudFormation stack

To enable DevOps Guru for CloudFormation, complete the following steps:

- Run the CloudFormation template to enable DevOps Guru for this CloudFormation stack:

Bash

```
aws cloudformation create-stack \
--stack-name EnableDevOpsGuruForServerlessCfnStack \
--template-body file:///$PWD/EnableDevOpsGuruForServerlessCfnStack.yaml \
--parameters ParameterKey=CfnStackNames,ParameterValue=myServerless-Stack \
--region ${AWS_REGION}
```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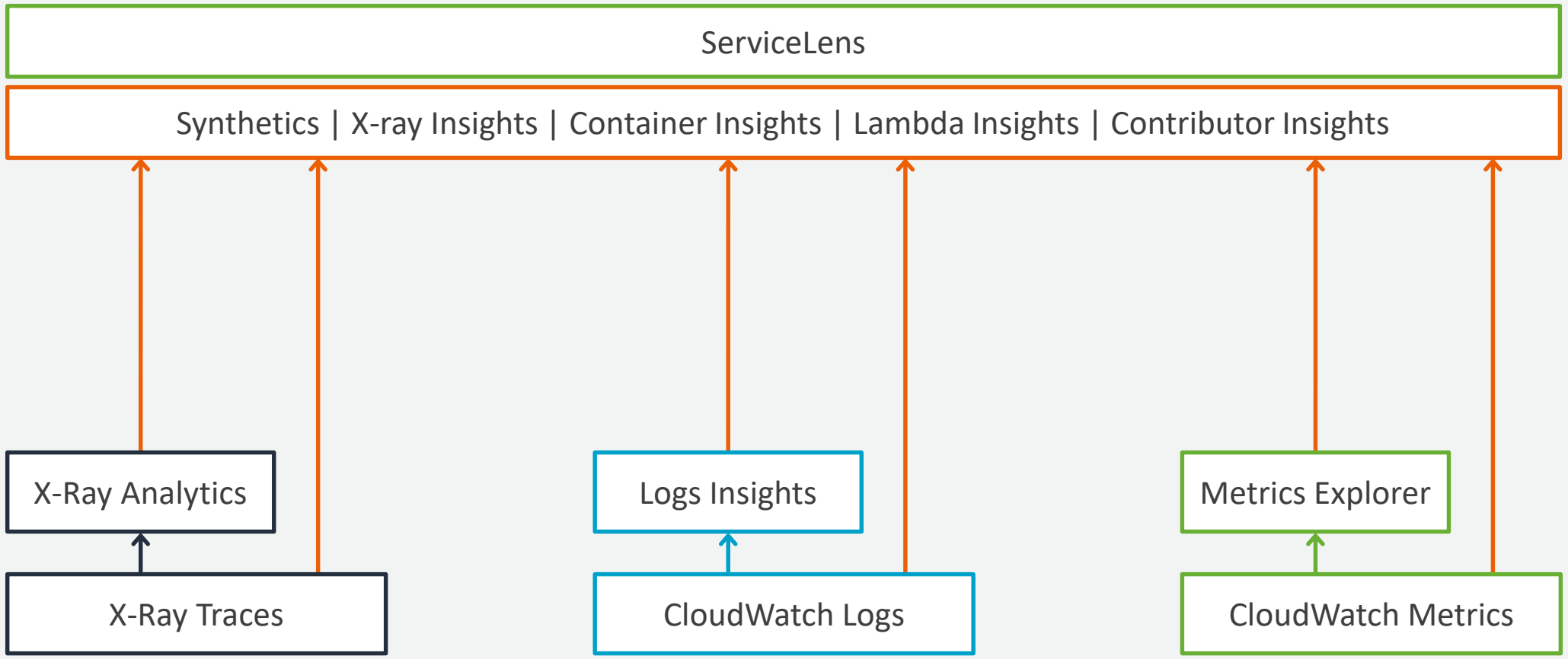
Insights into apps and infrastructure



AWS observability options

OBSERVABILITY

AWS NATIVE MONITORING SERVICE

CloudWatch ServiceLens

- Container Insights
- Lambda Insights
- Synthetics
- Contributor Insights

CloudWatch Logs

CloudWatch Metrics

AWS X-Ray

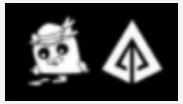
OPEN-SOURCE MANAGED SERVICES

Amazon Managed Service for Grafana

Do it Yourself (DIY)

Amazon Elasticsearch Service—Logs

Amazon Managed Service for Prometheus



Jaeger & Zipin —Tracing

INSIGHTS AND MACHINE LEARNING

CloudWatch Agent

X-Ray agent

INSTRUMENTATION

AWS Distro for OpenTelemetry (ADOT)

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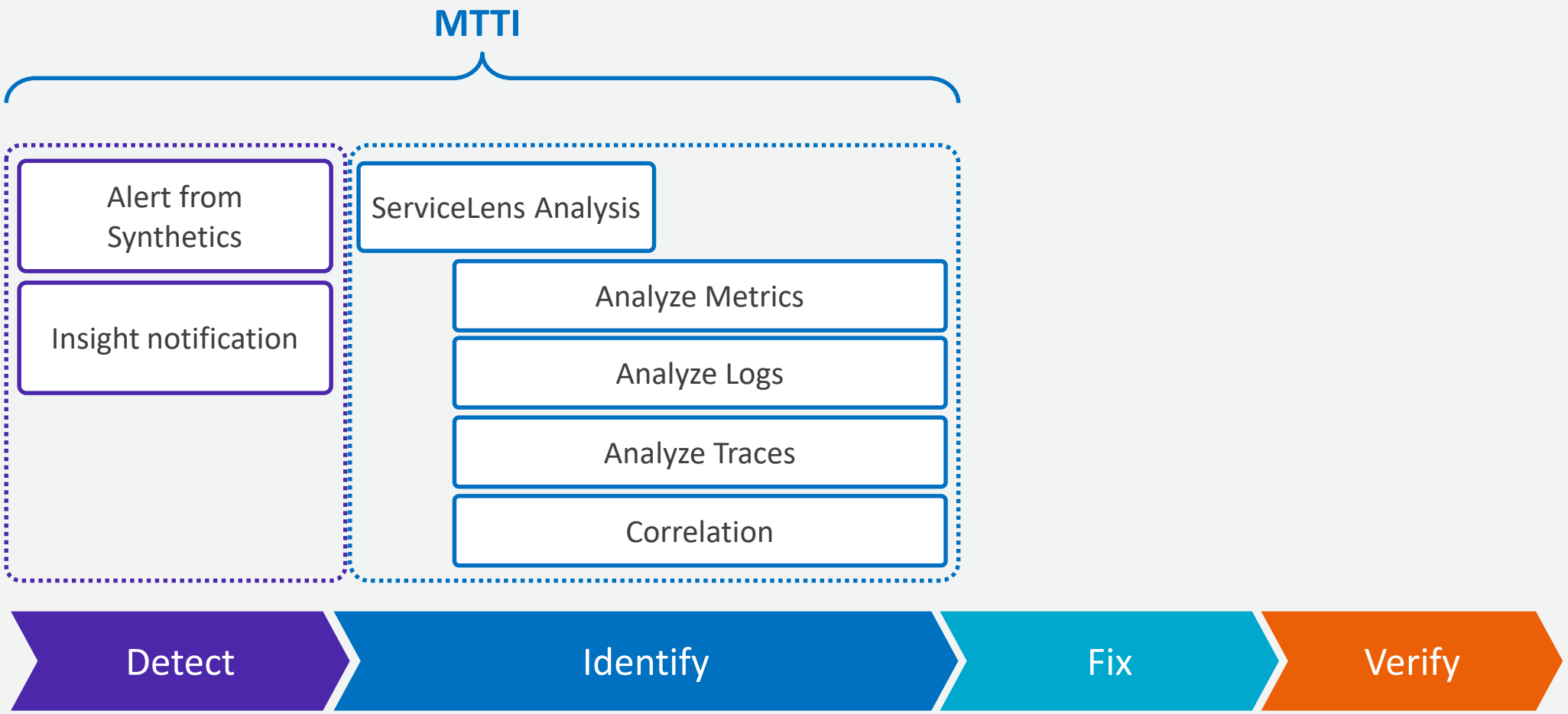
New troubleshooting workflow



Interacting with Amazon CloudWatch

AWS Management Console

AWS CLI

Amazon CloudWatch API

AWS SDKs

ISVs Using CloudWatch

dynatrace

sumo logic

logz.io

LogicMonitor

PagerDuty

splunk>

New Relic.

APPDYNAMICS

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AWS Marketplace observability and monitoring solutions

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How can you get started?

Find

A breadth of DevOps monitoring solutions:

dynatrace

APPDYNAMICS part of Cisco

New Relic.

moogsoft

splunk>

sumo logic

THUNDRA

lumigo

bigpanda

Buy

Through flexible pricing options:

Free trial

Pay-as-you-go

Budget alignment

Bring Your Own License (BYOL)

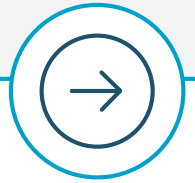
Private Offers

Billing consolidation

Enterprise Discount Program

Private Marketplace

Deploy



With multiple deployment options:

SaaS

Amazon Machine Image (AMI)

CloudFormation Template

Containers

Amazon EKS/ Amazon ECS

AI / ML models

AWS Data Exchange

AWS Control Tower

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aws marketplace

8,000+ listings • **1,600+** ISVs • **24** regions • **290,000+** customers • **1.5M+** subscriptions

AWS Marketplace DevOps Workshop Series participating partner hands-on labs

GitLab, JFrog, circleci, harness, CloudBees., armory, puppet, Quali, TRICENTIS, MICRO FOCUS, sumo logic, LaunchDarkly, GENYMOTION, TREND MICRO, PagerDuty, Gremlin, New Relic., Gatling, dynatrace, APPDYNAMICS, CONTRAST SECURITY, CORESTACK

And more coming soon!

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Next steps

- Bookmark the Workshop Series landing page, check back for new content or subscribe to email updates
- Start your lab of choice
- Move on to Module 7: SRE and Incident Management
- Visit the AWS Marketplace website to experiment with DevOps tooling

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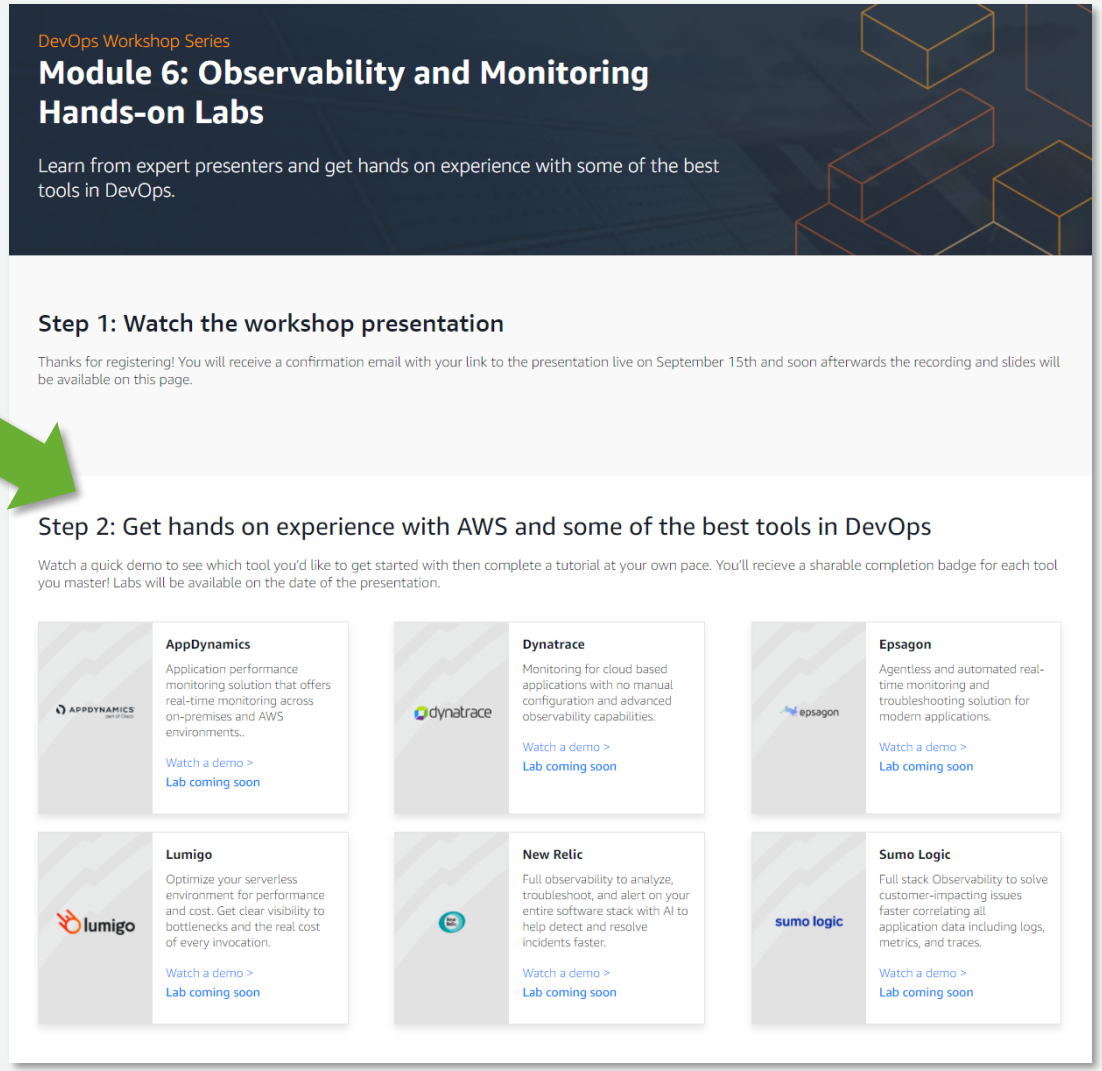
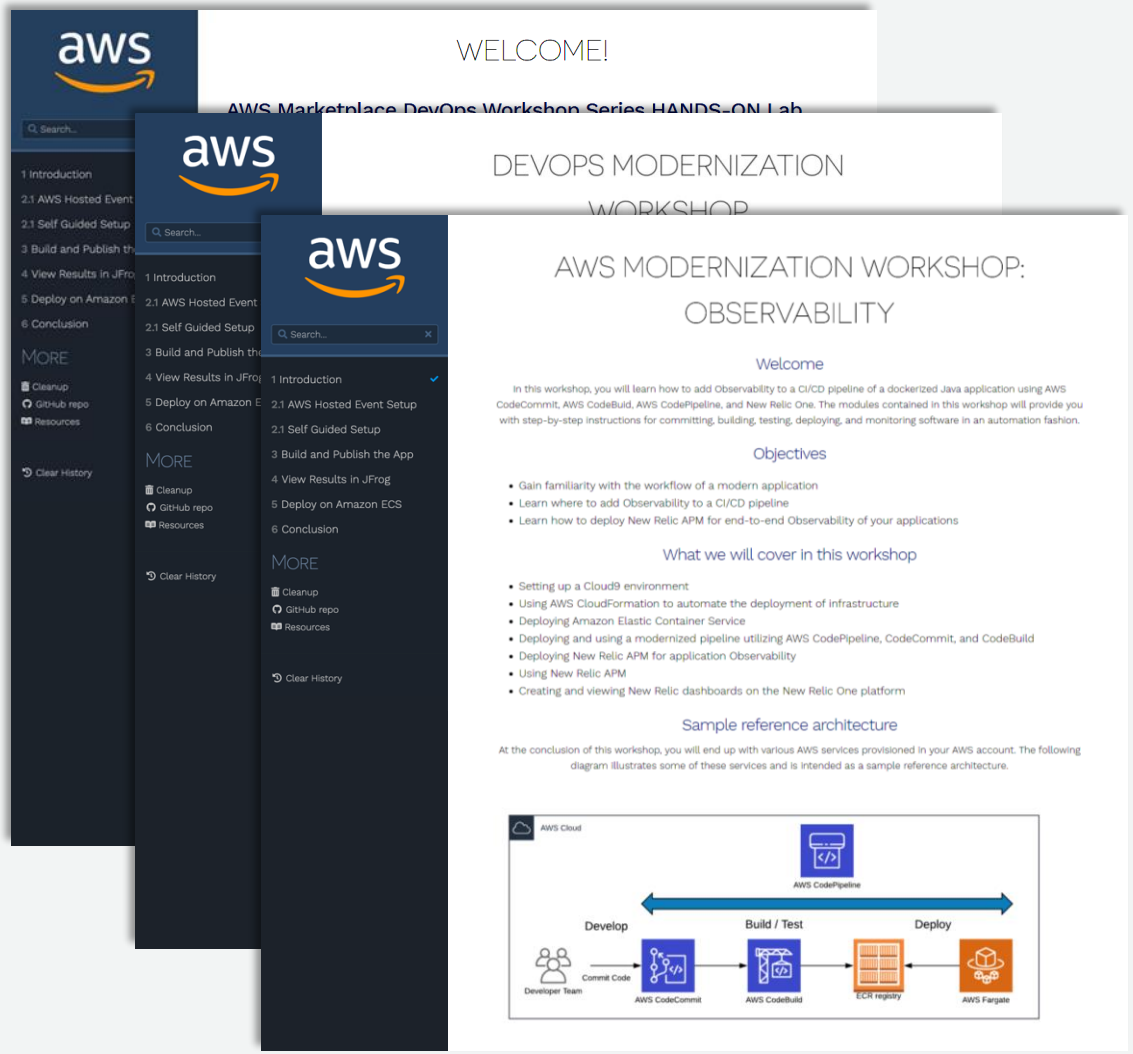
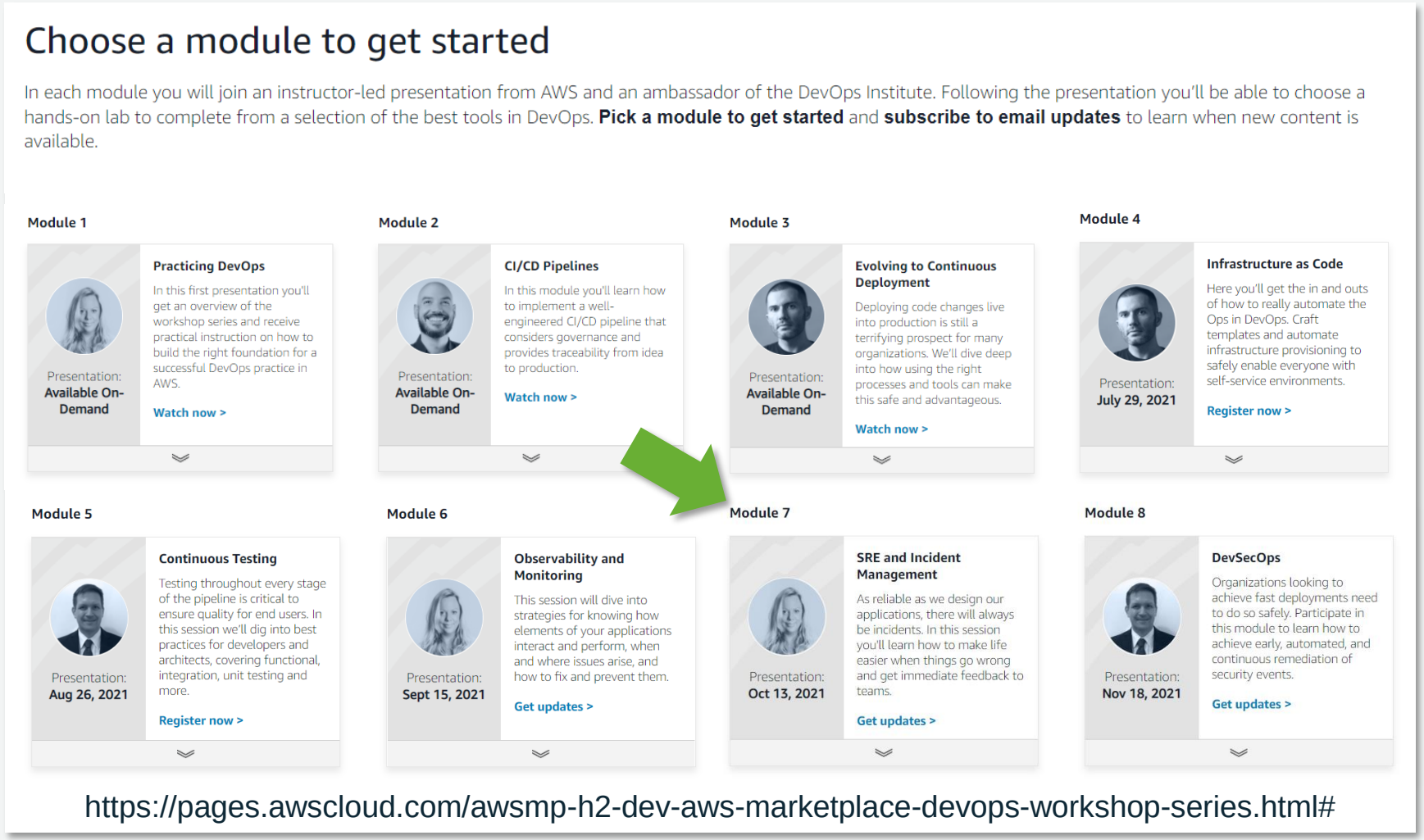
Module 6 Hands-on Labs





Move on to Module 7: SRE and Incident Management



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