
AWS
re:Invent

CON301

Improving observability with AWS App Mesh and Amazon ECS

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AWS re:Invent

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What we will cover in this session

What is observability anyway?

What is Amazon Elastic Container Service (Amazon ECS)?
And what is AWS App Mesh?

What observability pieces does Amazon ECS supply?

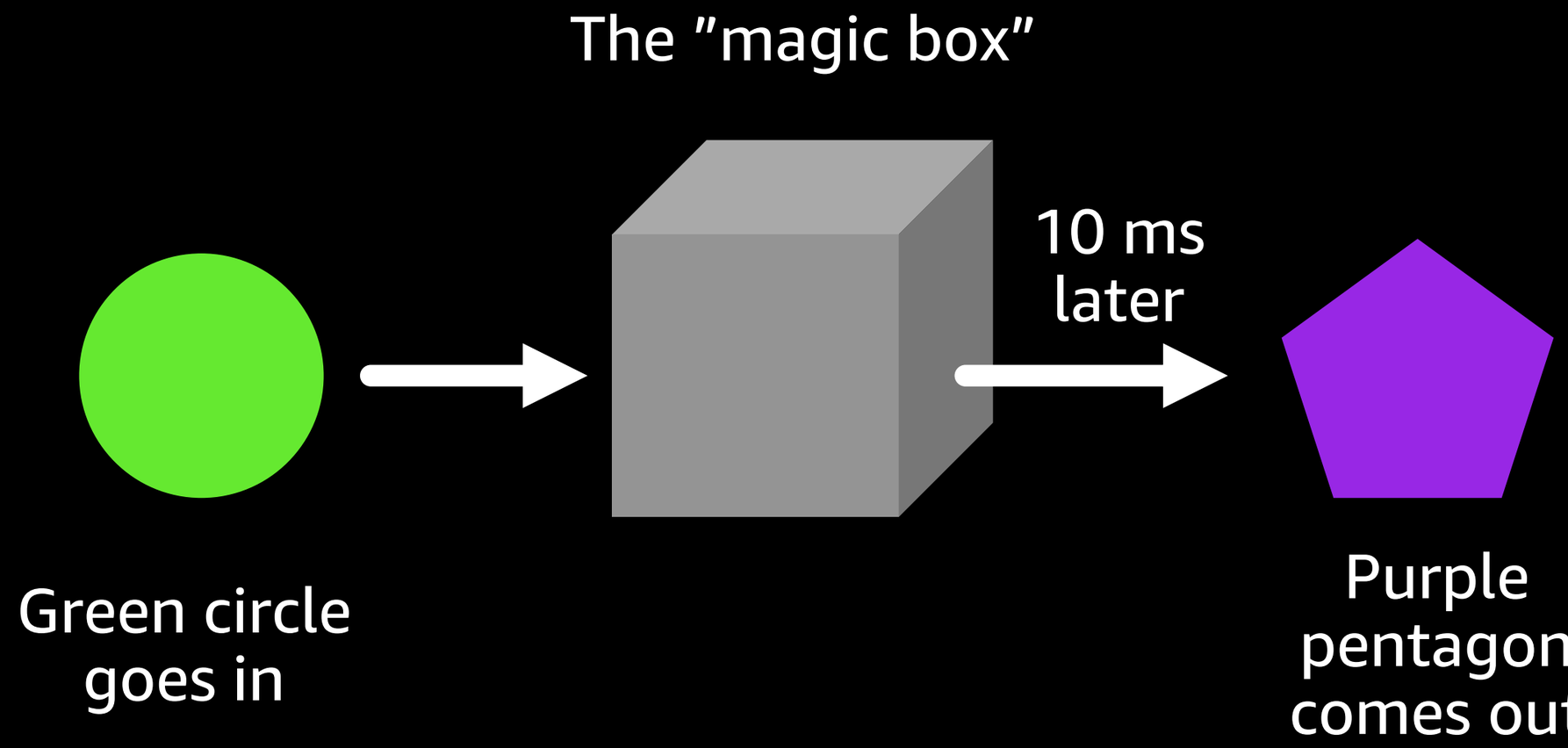
What observability pieces can I get from AWS App Mesh?

A look at all the pieces together

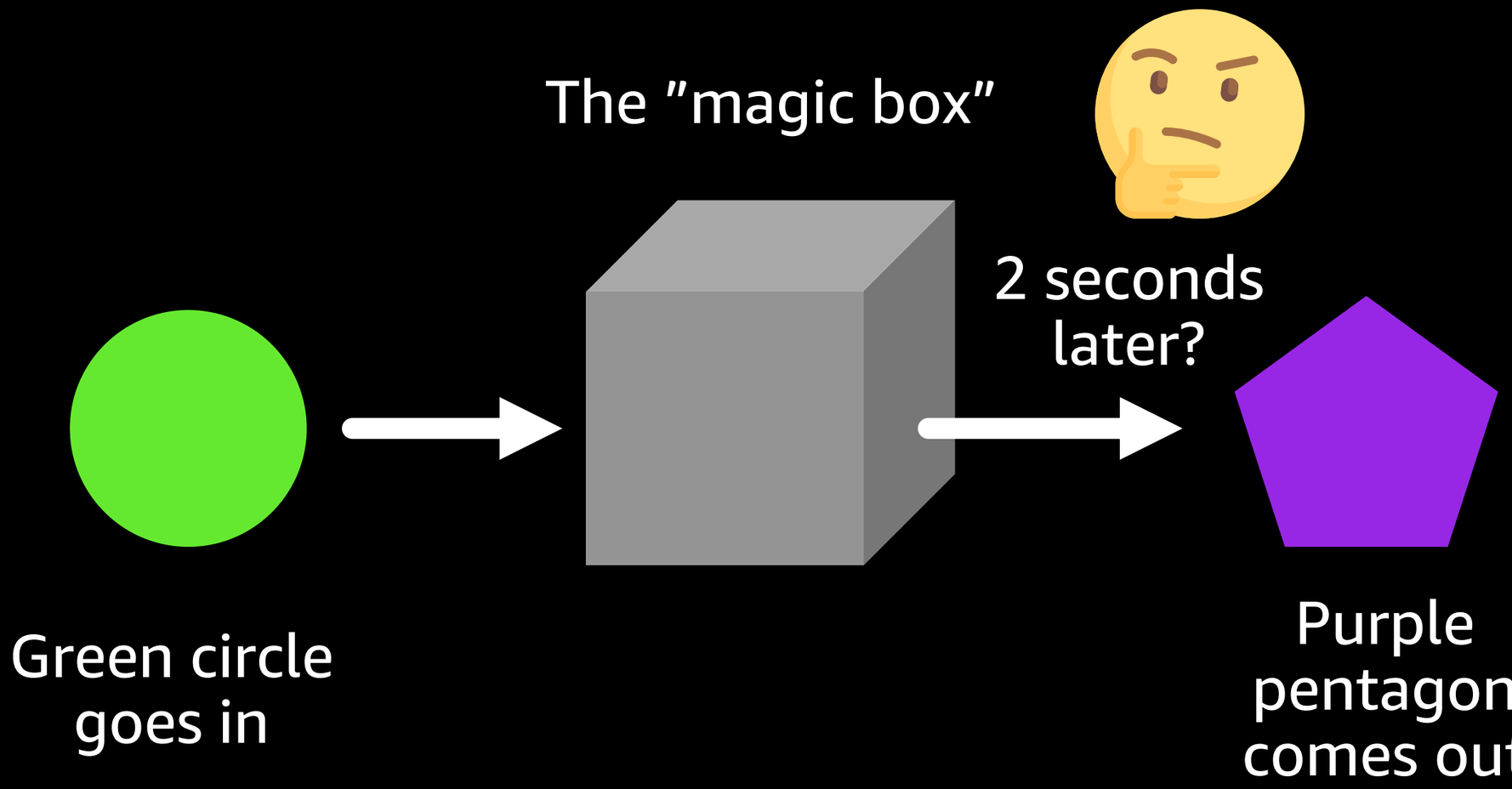


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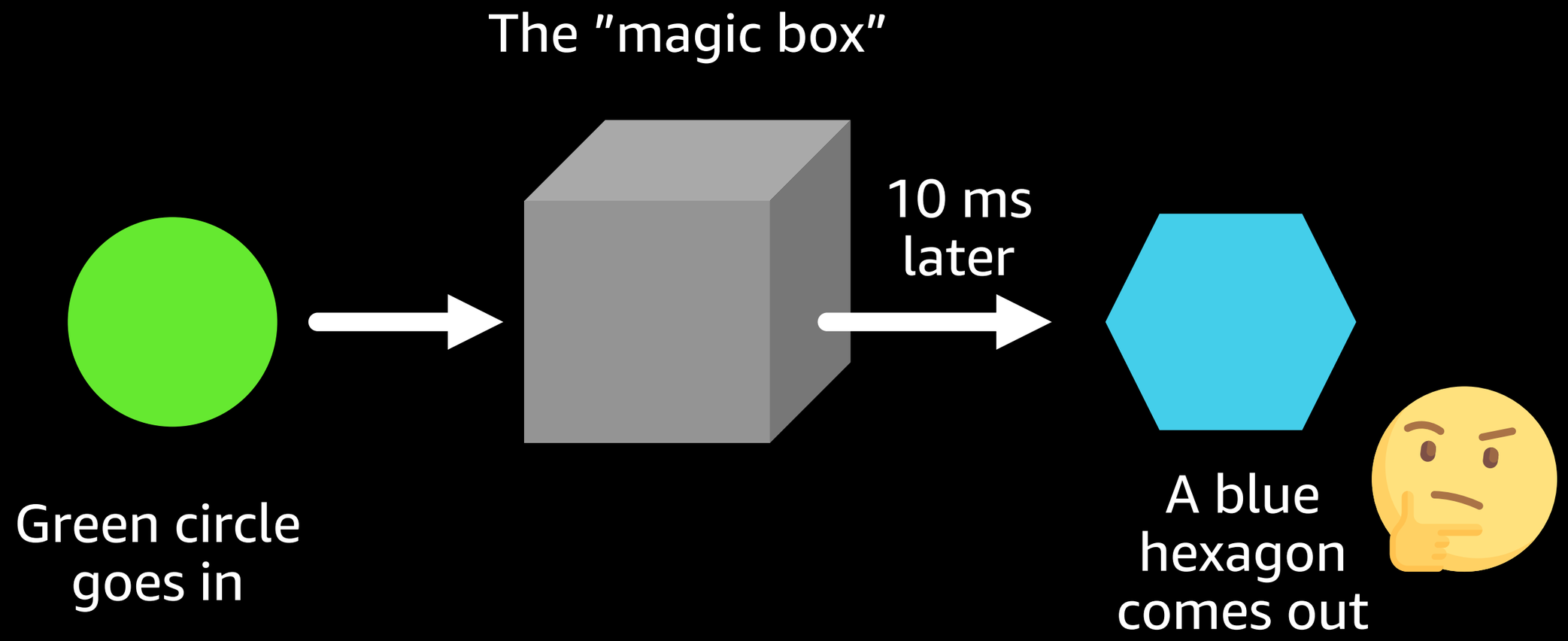
What is observability anyway?



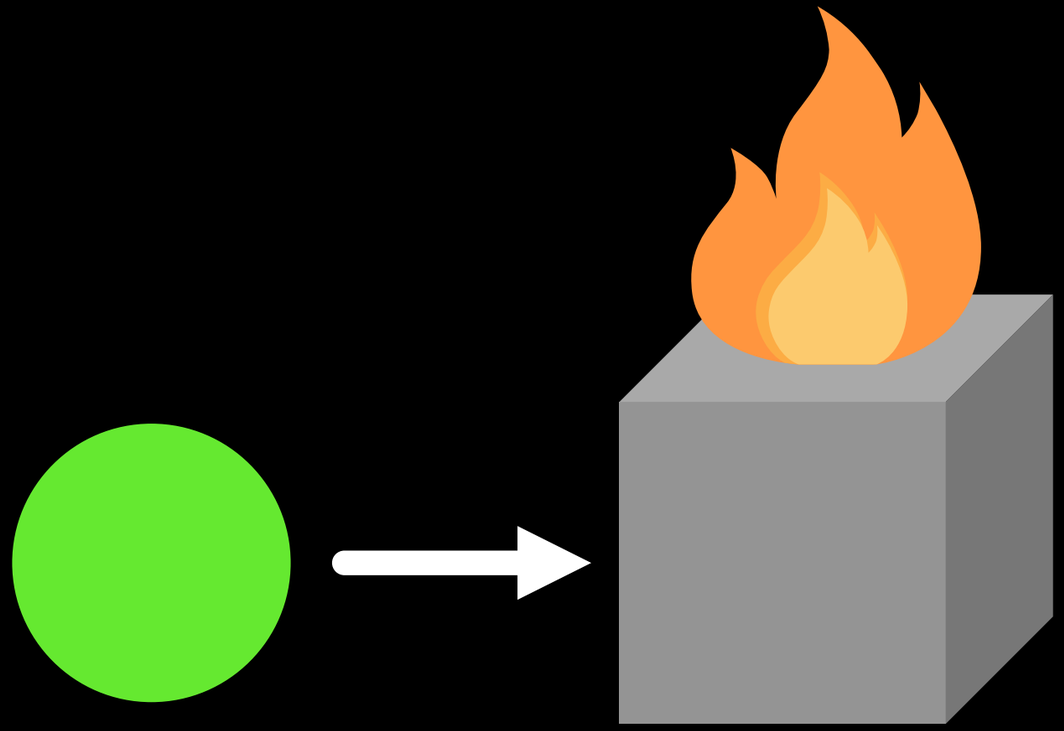
What is observability anyway?



What is observability anyway?



What is observability anyway?

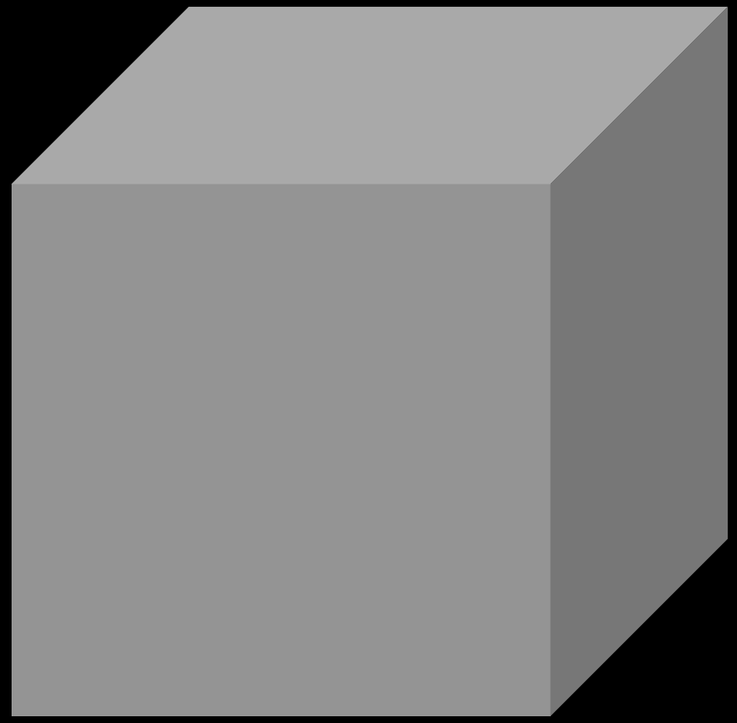


Green circle goes in

The "magic box" catches fire and nothing comes out!



What is observability anyway?



We have no observability!

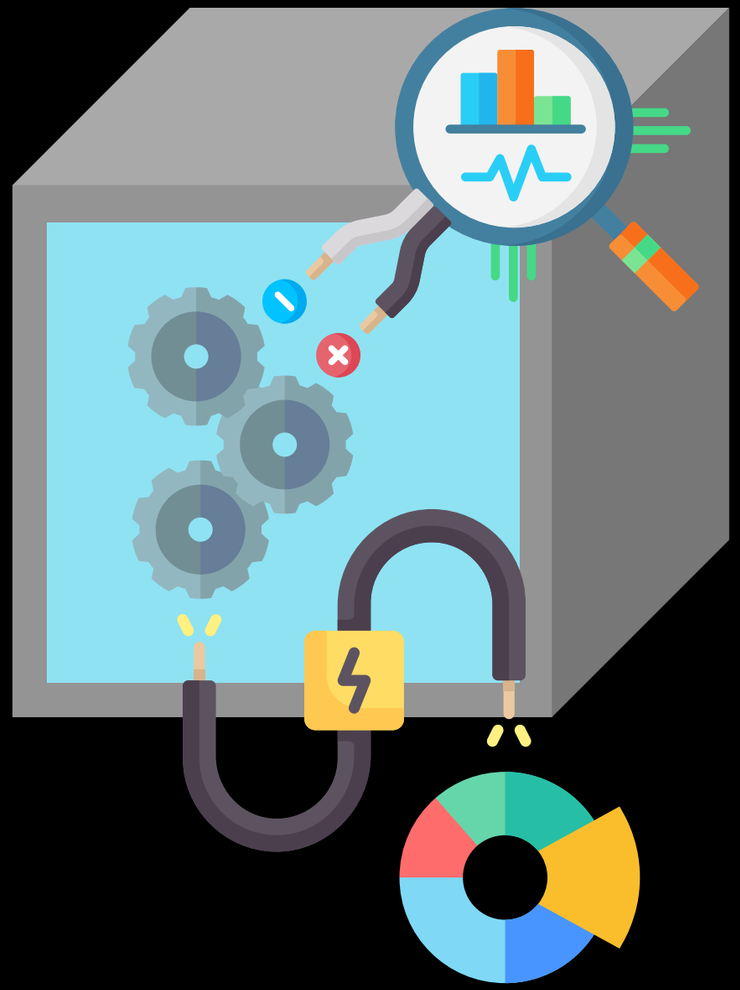
What's in the box?

Why does it behave the way it does?

When its behavior changes, why did it change?

What must be done to make this behavior more consistent?

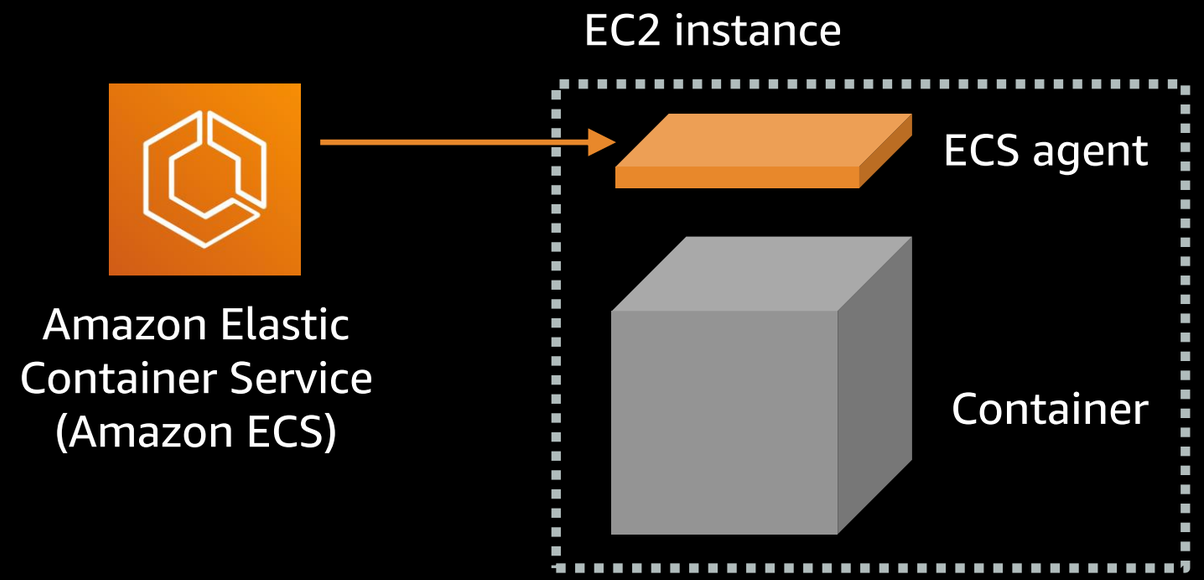
Observability must be proactive



Good observability allows you to answer questions you didn’t know you needed to ask

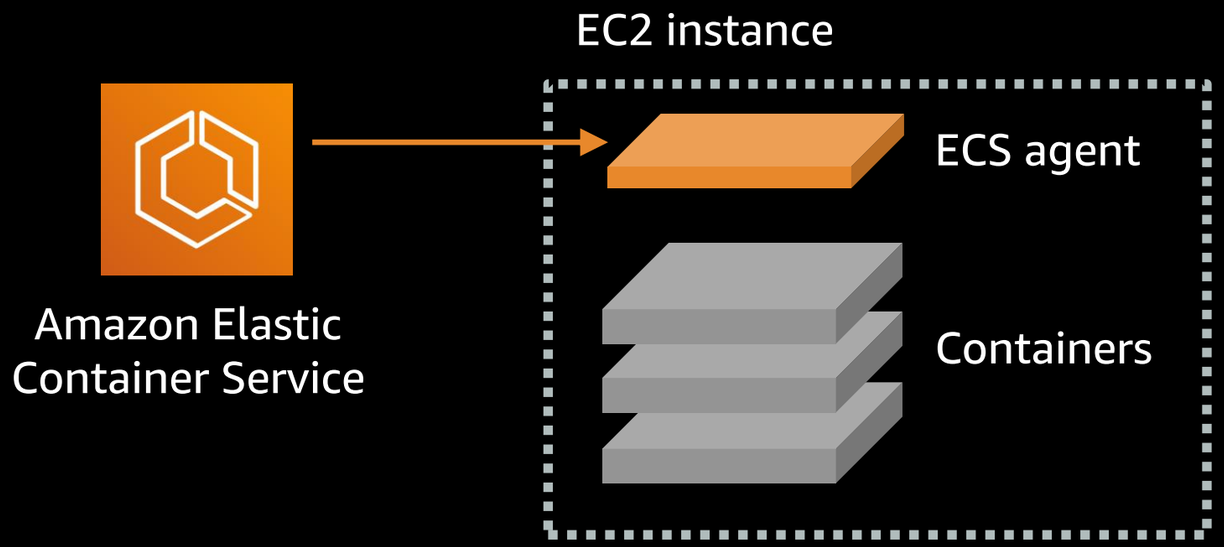
When a problem happens you can access data about the system and understand it

What is Amazon ECS?



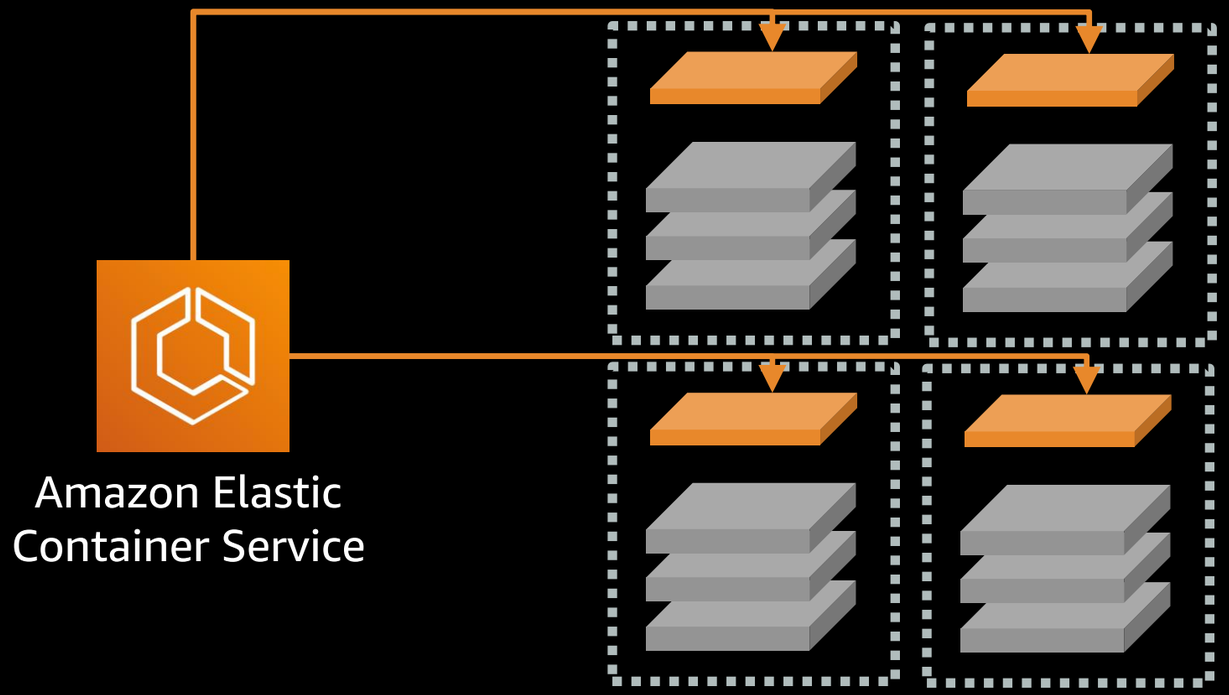
- Amazon ECS is a container orchestrator
- You give Amazon ECS your application as a Docker container
- Amazon ECS has an agent that runs on your Amazon EC2 instances
- It launches and monitors a container on your behalf

What is Amazon ECS?



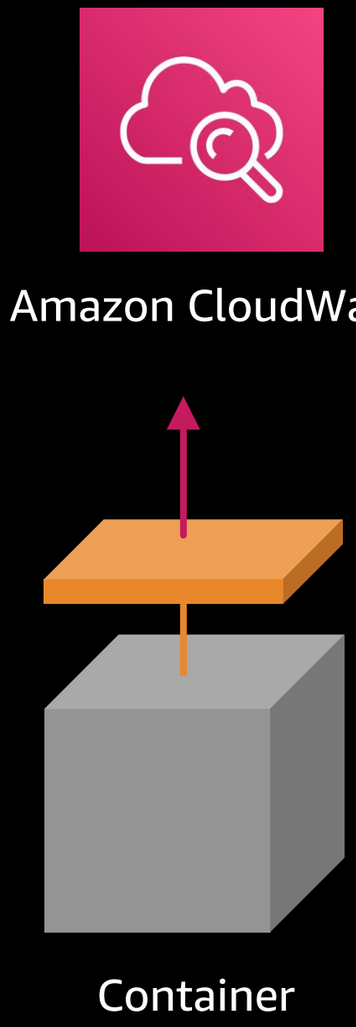
Amazon ECS can control and watch multiple application containers per EC2 instance

What is Amazon ECS?



And Amazon ECS can handle many containers across many EC2 instances in a cluster, even 1000s of EC2 instances

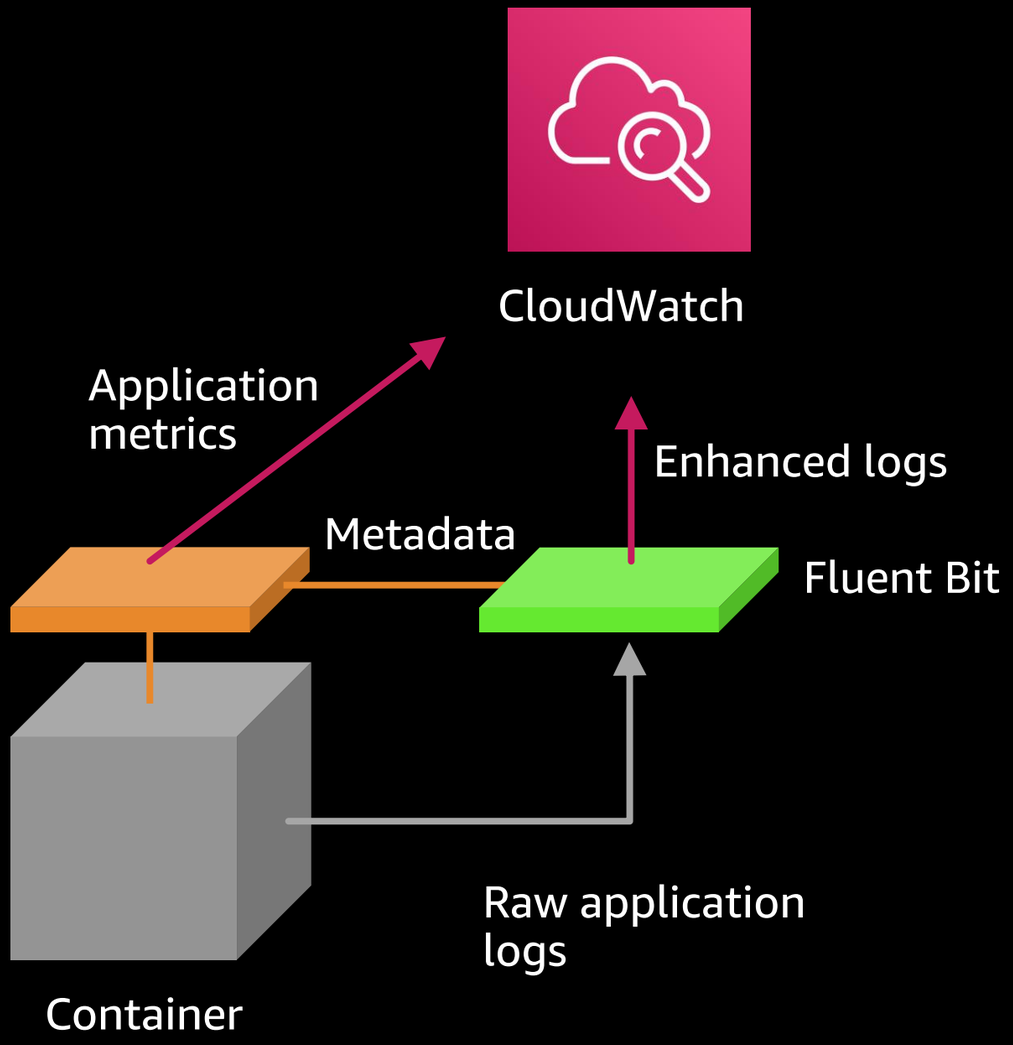
Amazon ECS helps with application observability



The Amazon ECS container agent helps you with observability by gathering up some basic information:

- CPU usage
- Memory usage
- Application stdout and stderr
- Healthcheck status
- Container exit code

FireLens log router

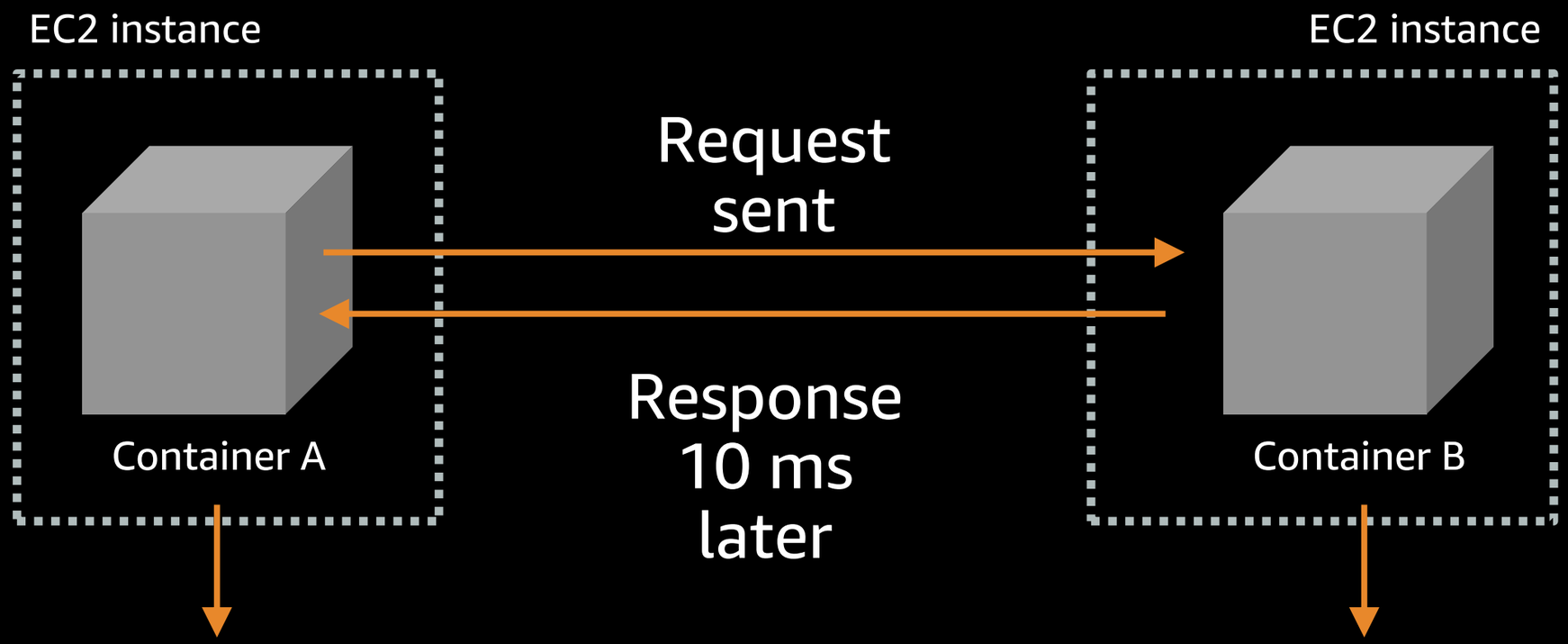


FireLens is a container log router for Amazon ECS

It automatically launches a Fluent Bit sidecar that can filter and route logs

Importantly it can also enhance logs with extra metadata like the specific EC2 instance, task ID, application version, etc.

Observing service communication is critical



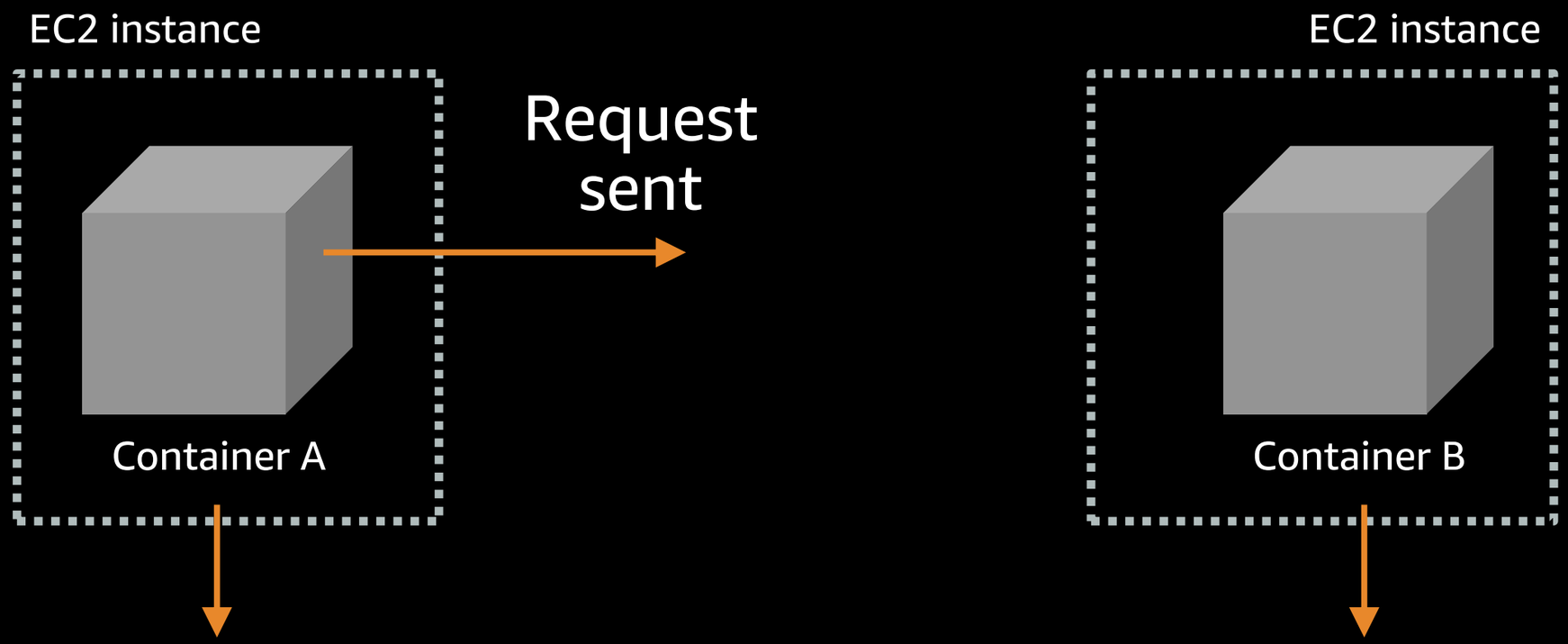
Access logs:

POST / user – 10ms

Access logs:

POST / user – 7ms

Access logs aren’t enough to diagnose issues



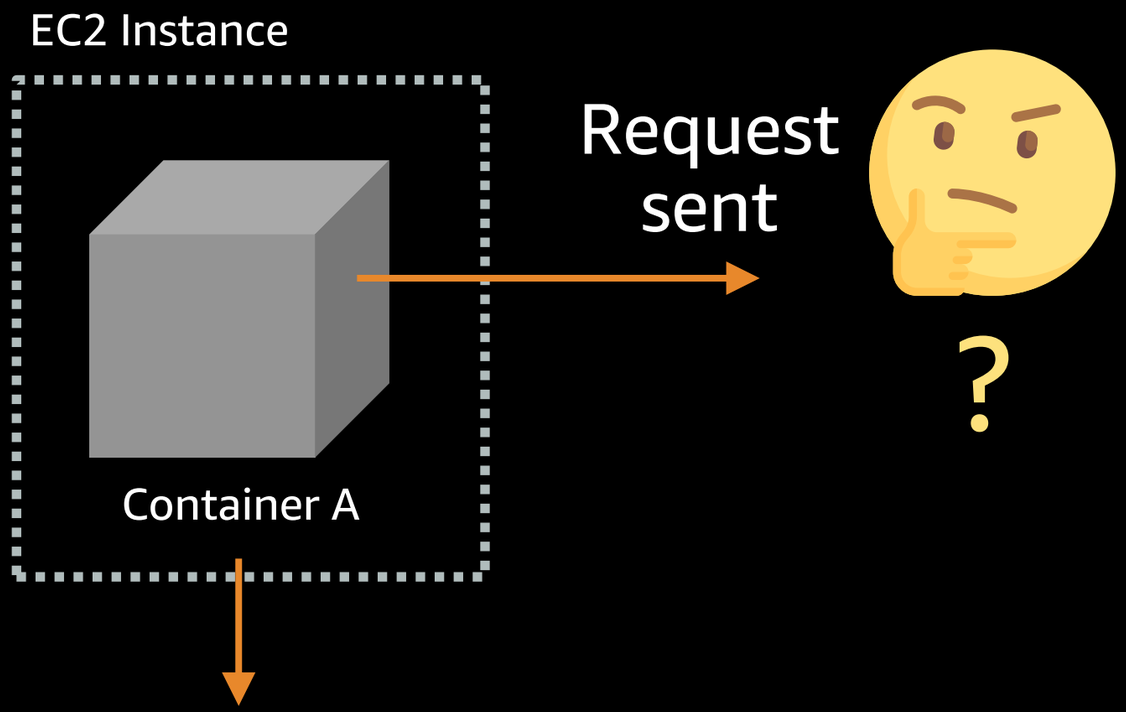
Access logs:

POST / user timeout

Access logs:

Nothing here

Questions but not enough info for an answer



Access logs:

POST / user timeout

Networking problem?

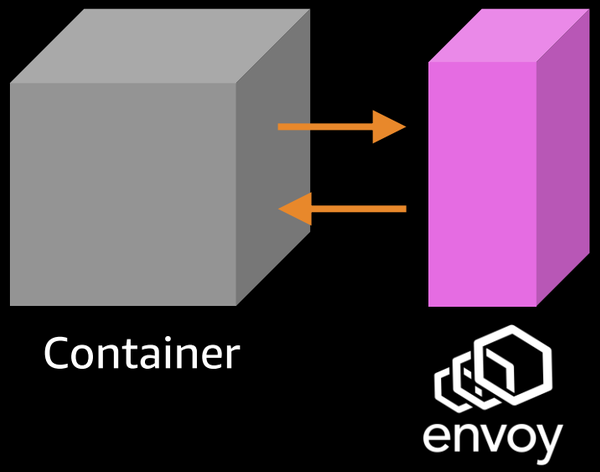
Security group rule?

EC2 host CPU or memory overloaded?

Container process hung in an infinite loop?

Container process crashed?

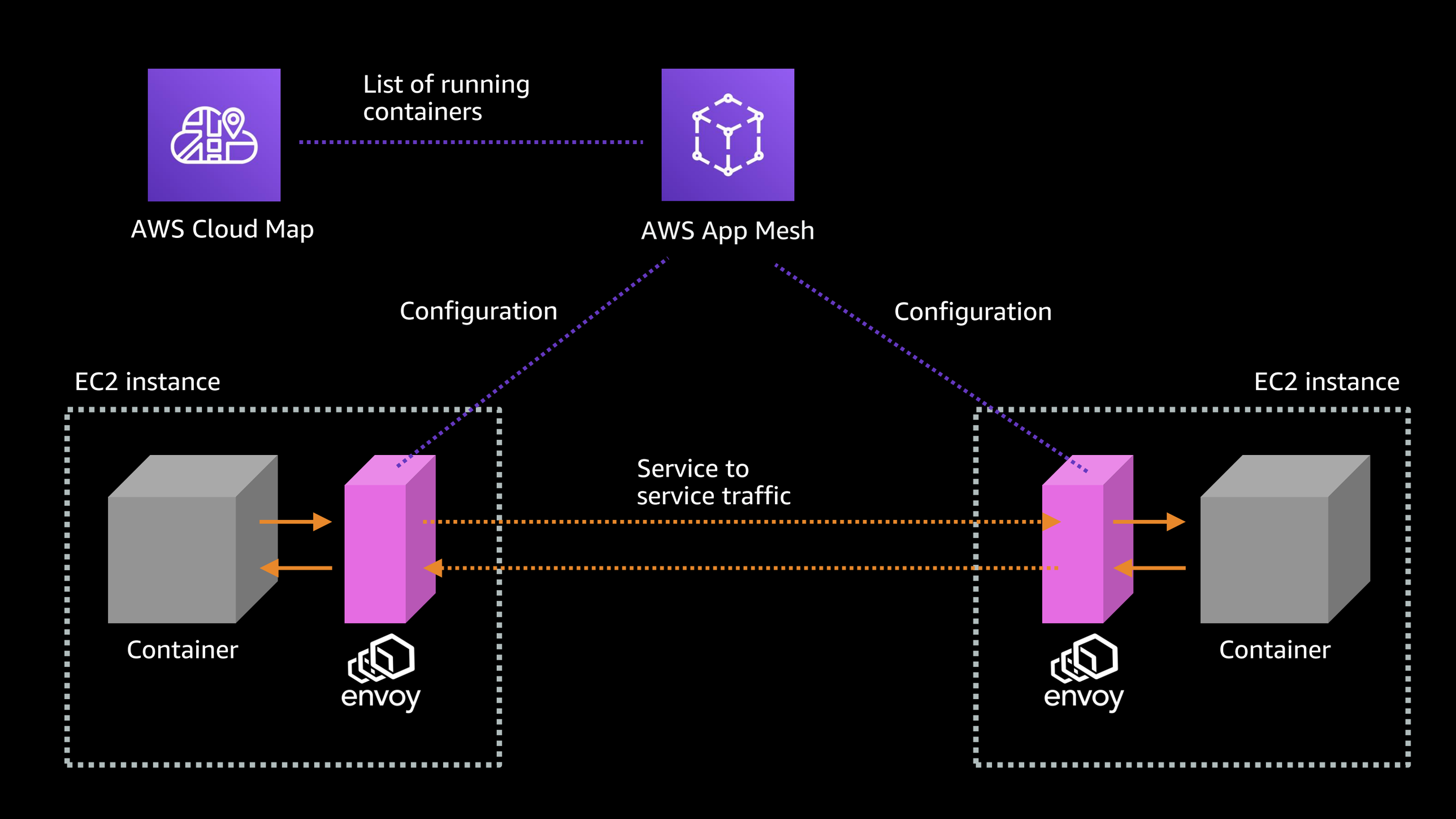
What is AWS App Mesh?



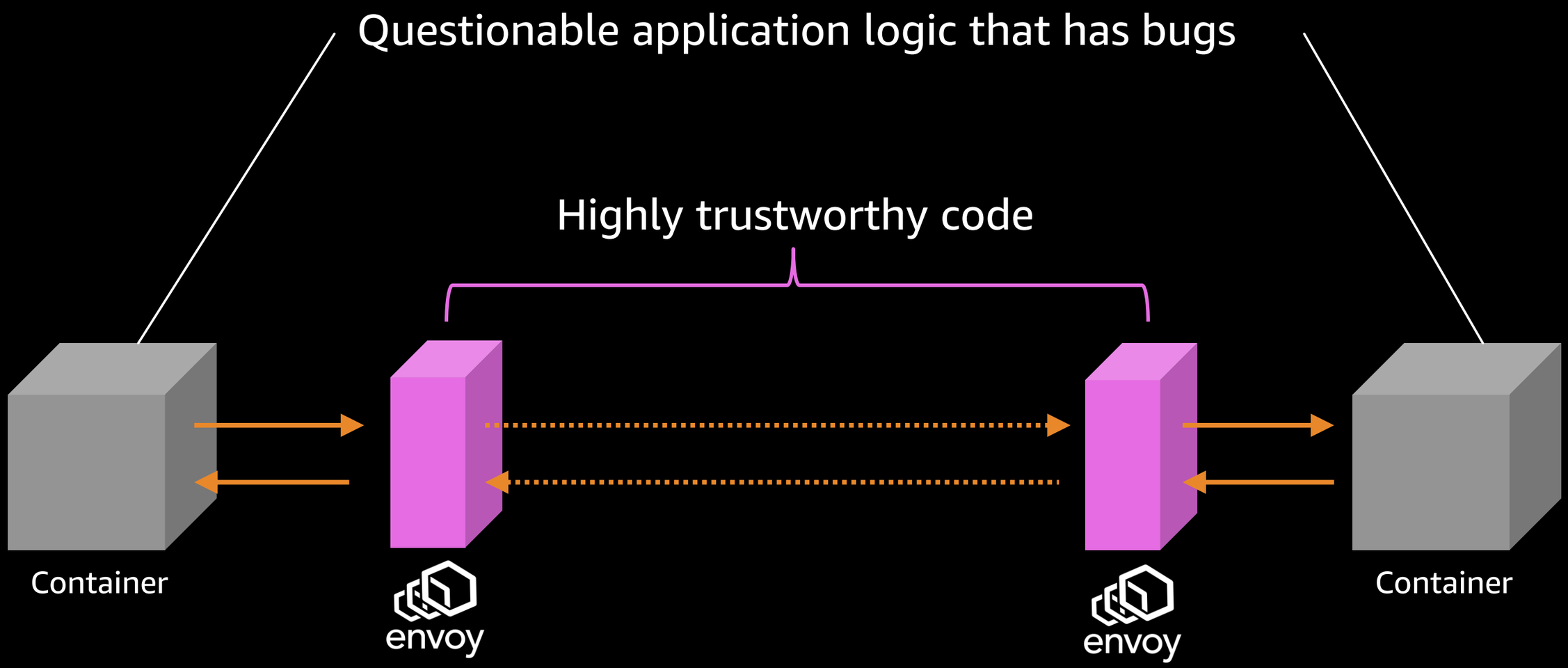
App Mesh is a service mesh

The core piece is a sidecar container that is launched beside each copy of your application container

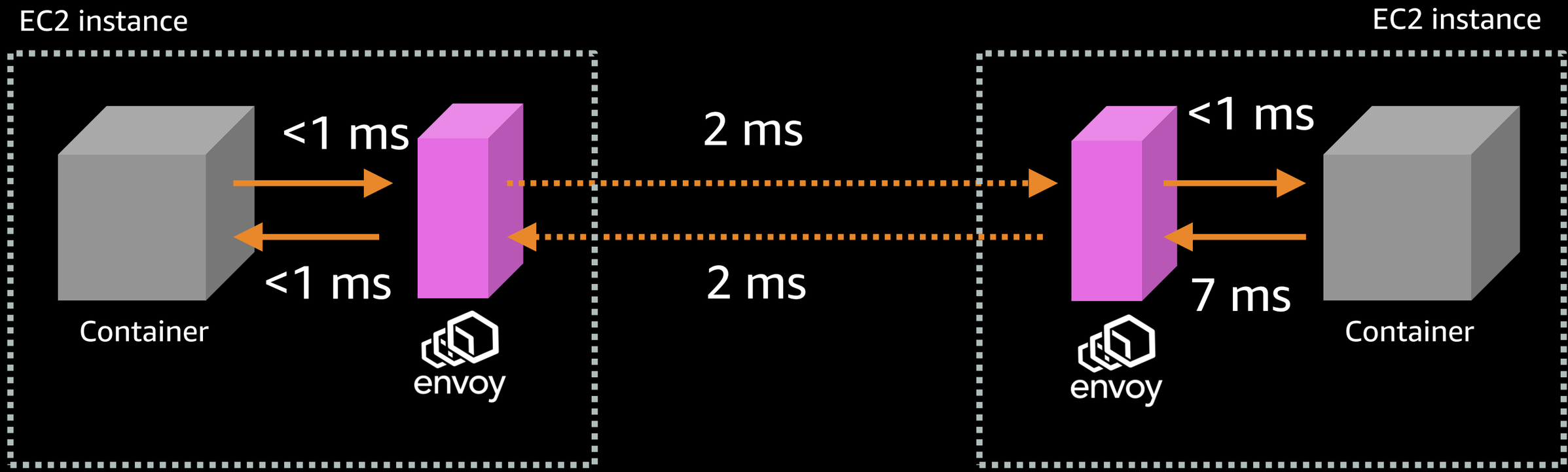
All inbound and outbound traffic are proxied through this container, allowing it to route and observe all connections to and from your application


List of running containers
AWS Cloud Map
AWS App Mesh
Configuration
Configuration
EC2 instance
EC2 instance
Service to service traffic
Container
envoy
envoy
Container

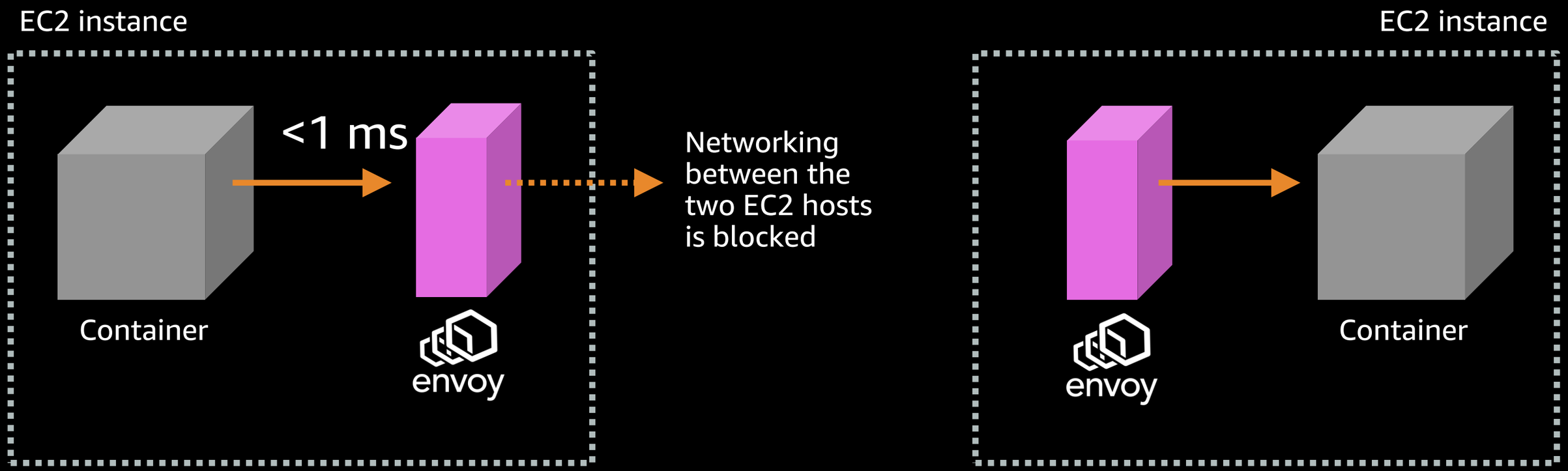
Reliable tunnel between unreliable components



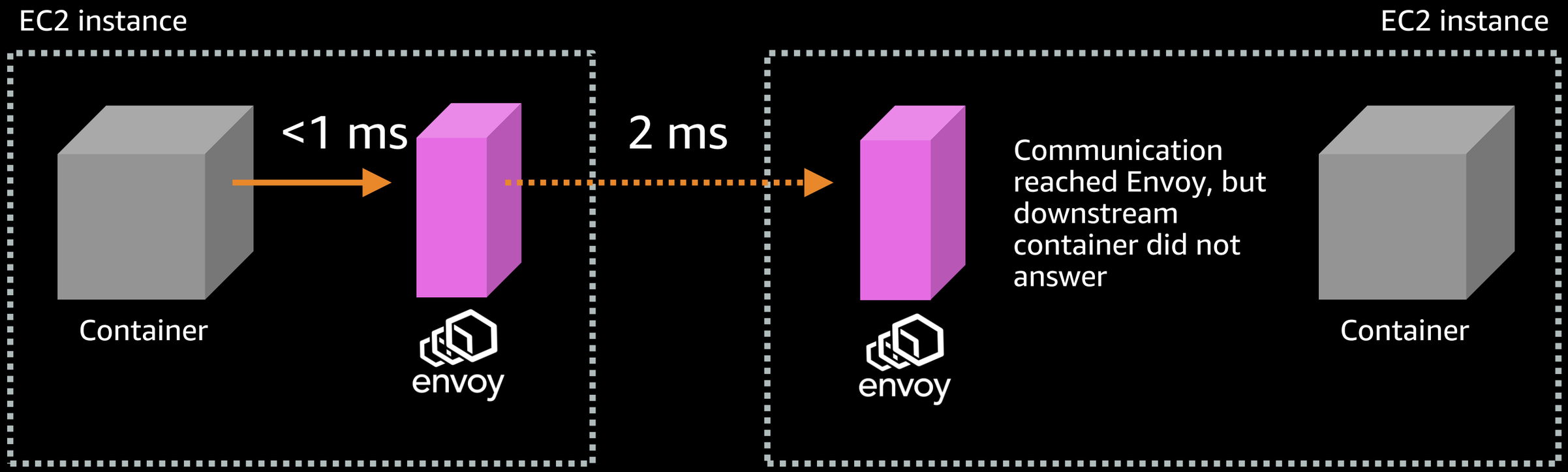
You can measure the latency at each hop separately



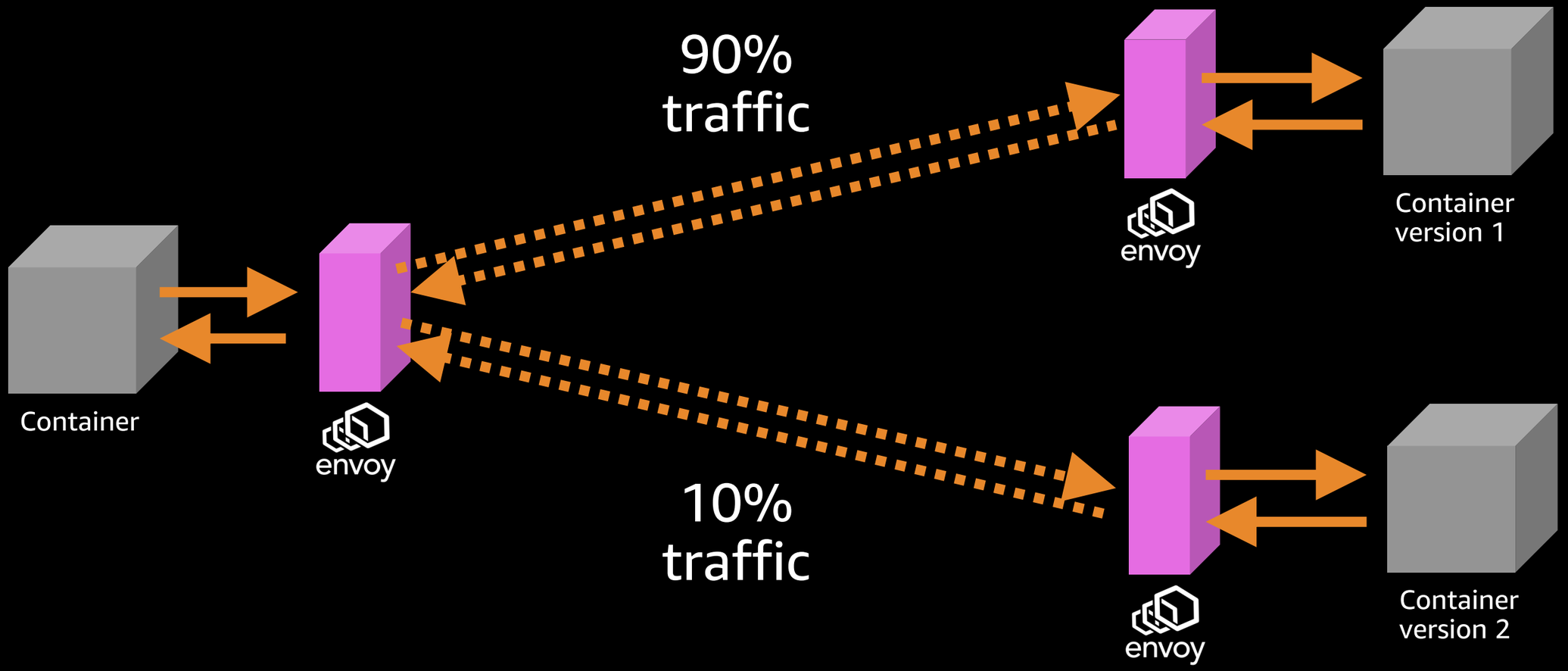
You can tell exactly where communications break



You can tell exactly where communications break



You can shape traffic patterns to test new versions



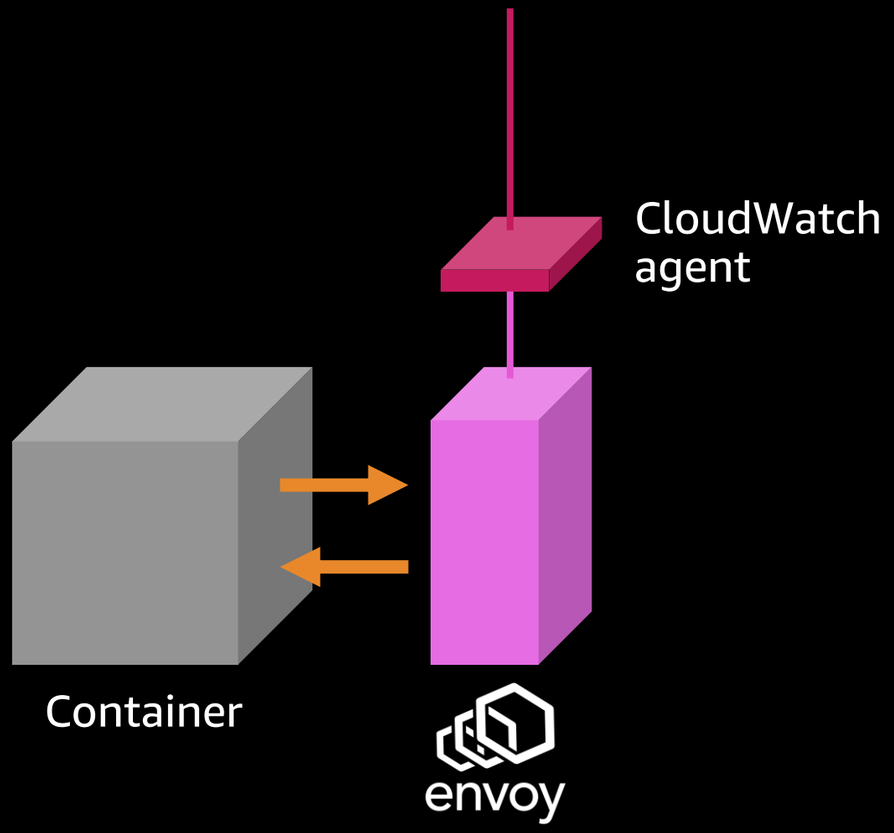
Each Envoy sidecar produces metrics that can be sent to CloudWatch



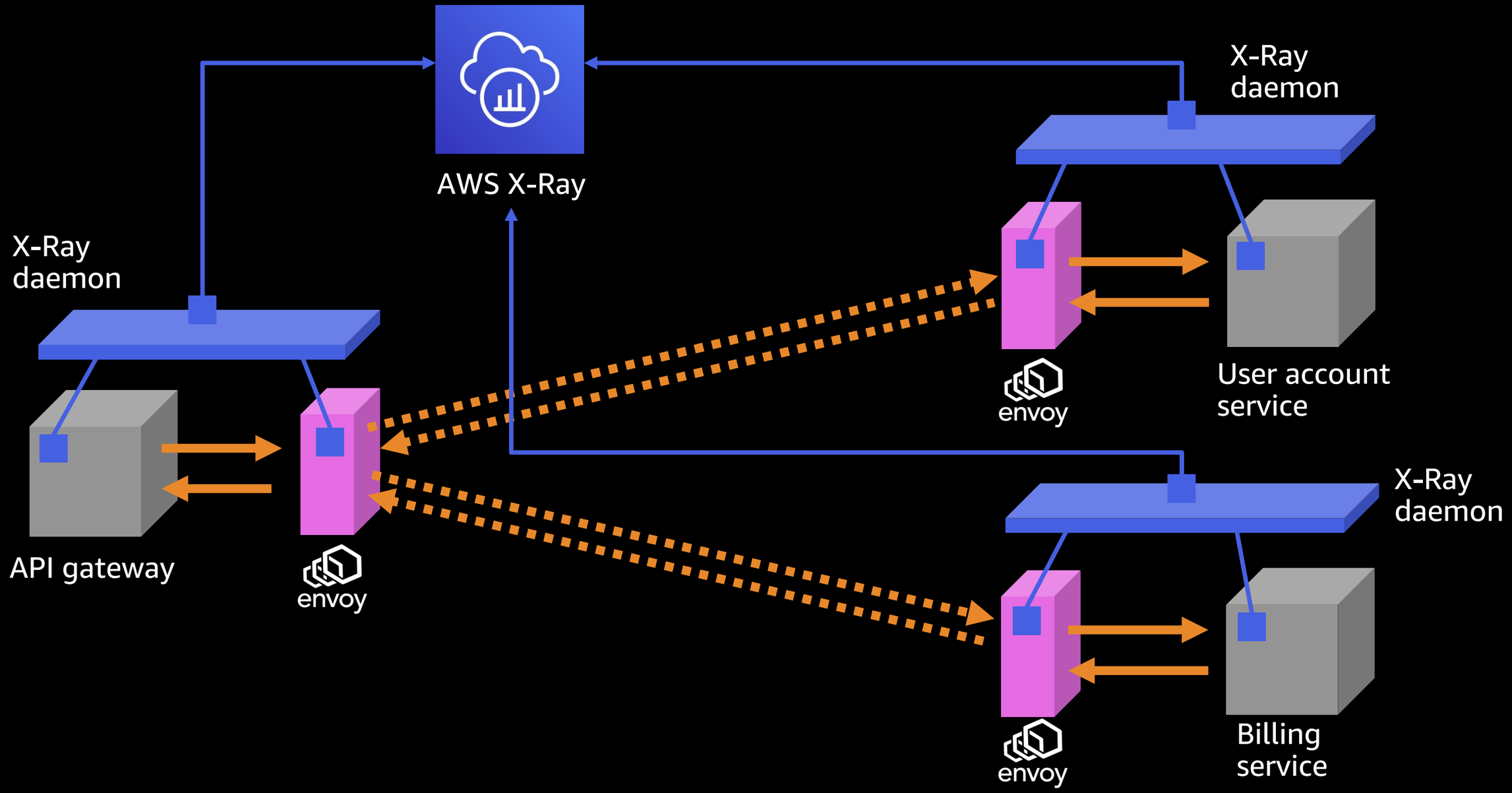
Amazon CloudWatch

Envoy sidecars produce statistics in statsd format

CloudWatch has a lightweight agent sidecar you can run to consume these statsd metrics and store them for you



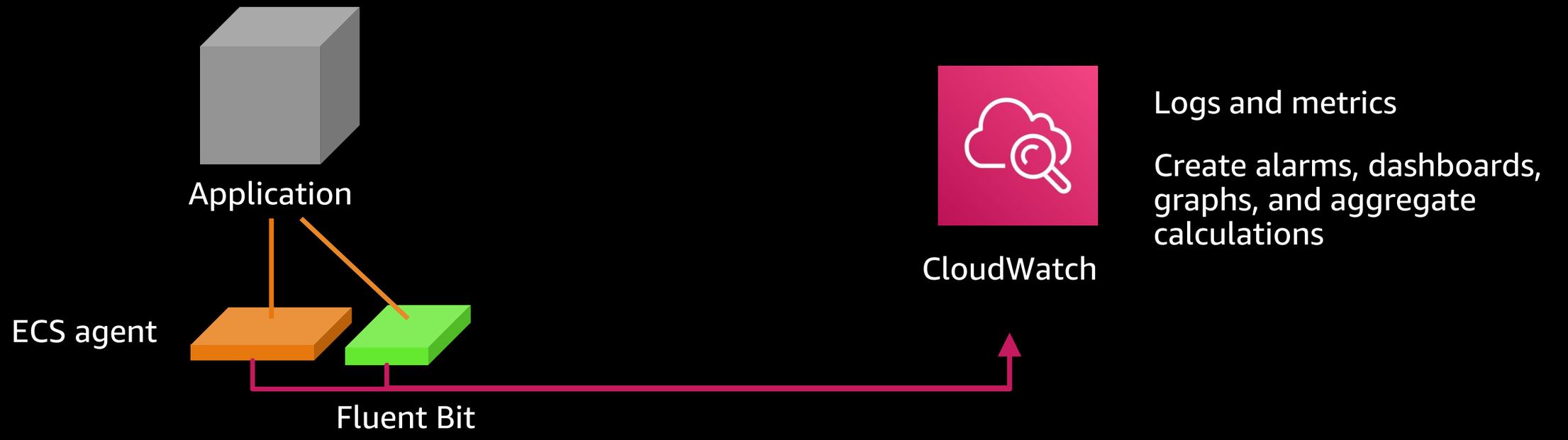
AWS X-Ray integration for tracing requests



The full observability picture



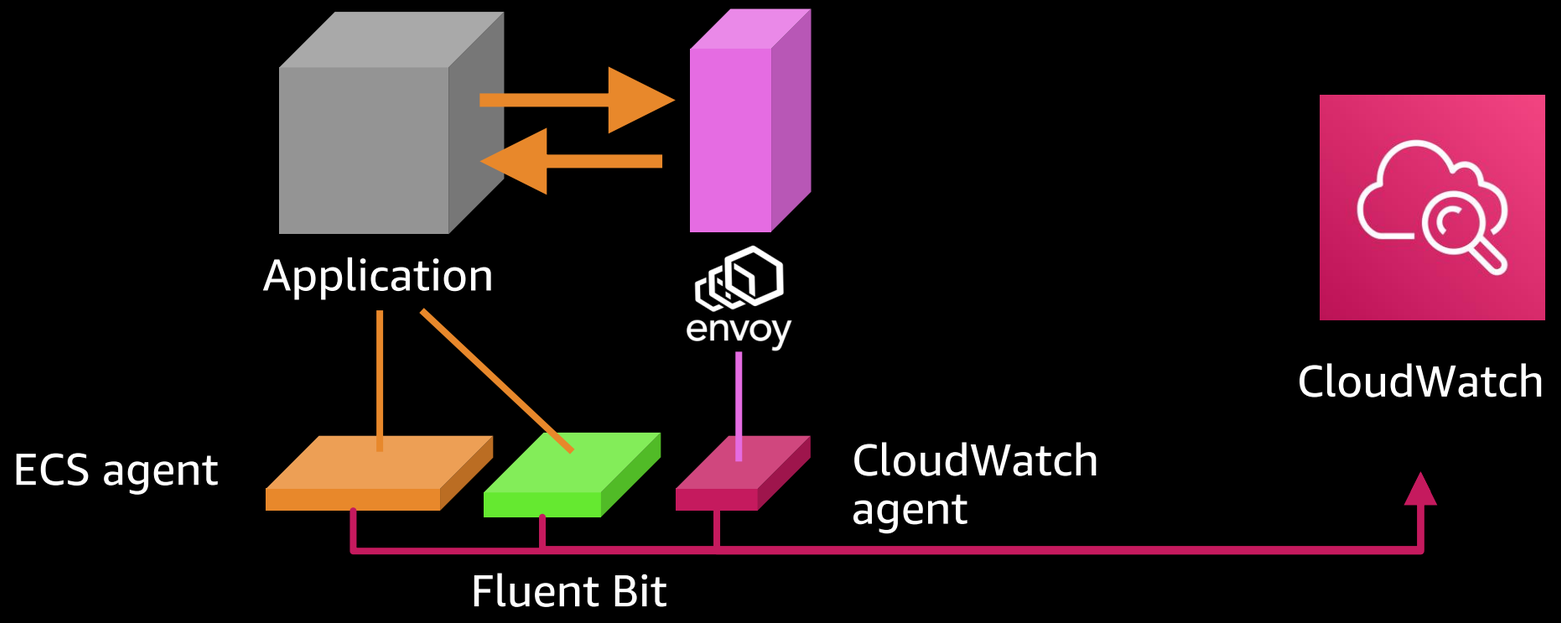
The full observability picture



Logs and metrics

Create alarms, dashboards, graphs, and aggregate calculations

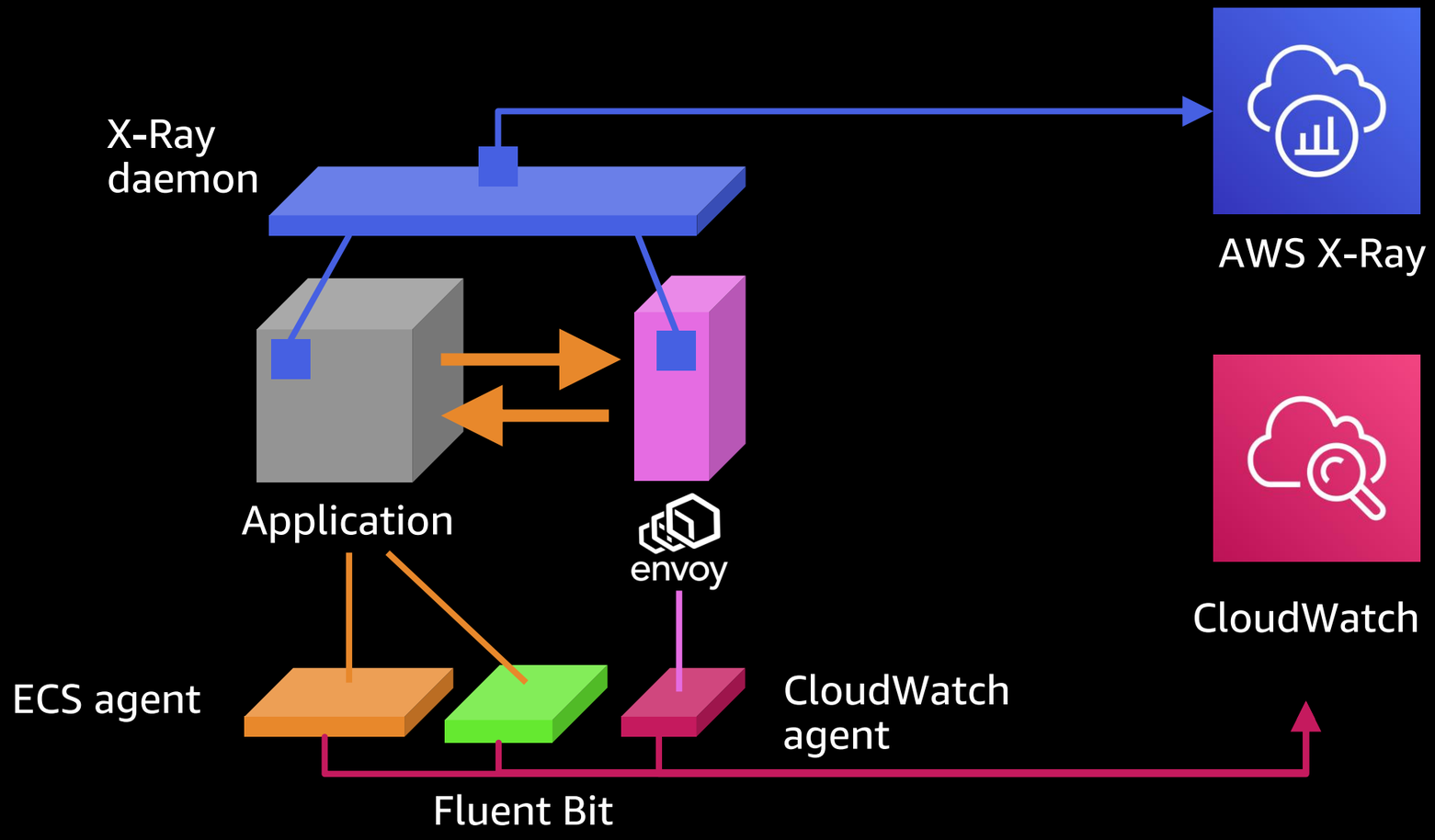
The full observability picture



Logs and metrics

Create alarms, dashboards, graphs, and aggregate calculations

The full observability picture



AWS X-Ray

Trace information on all network requests

Investigate a specific error

CloudWatch

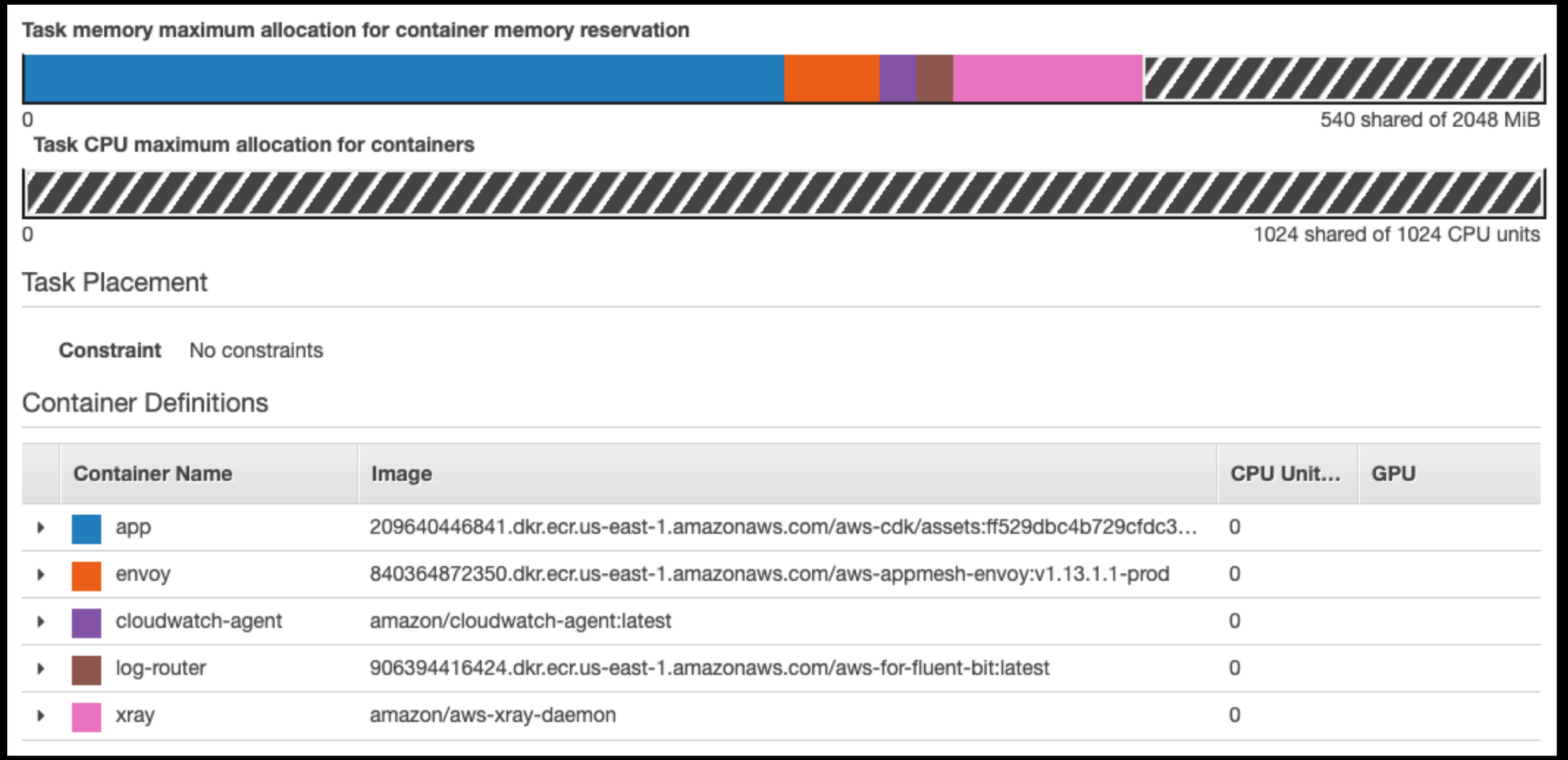
Logs and metrics

Create alarms, dashboards, graphs, and aggregate calculations

All the pieces together, in action



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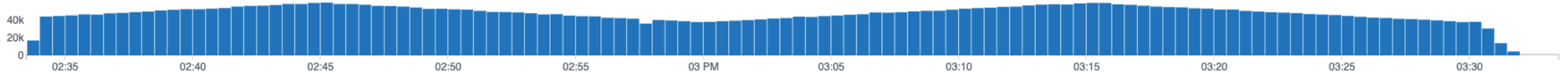


Use an Amazon ECS task definition to launch observability sidecars alongside the application

Showing 1000 of 5,630,689 records matched

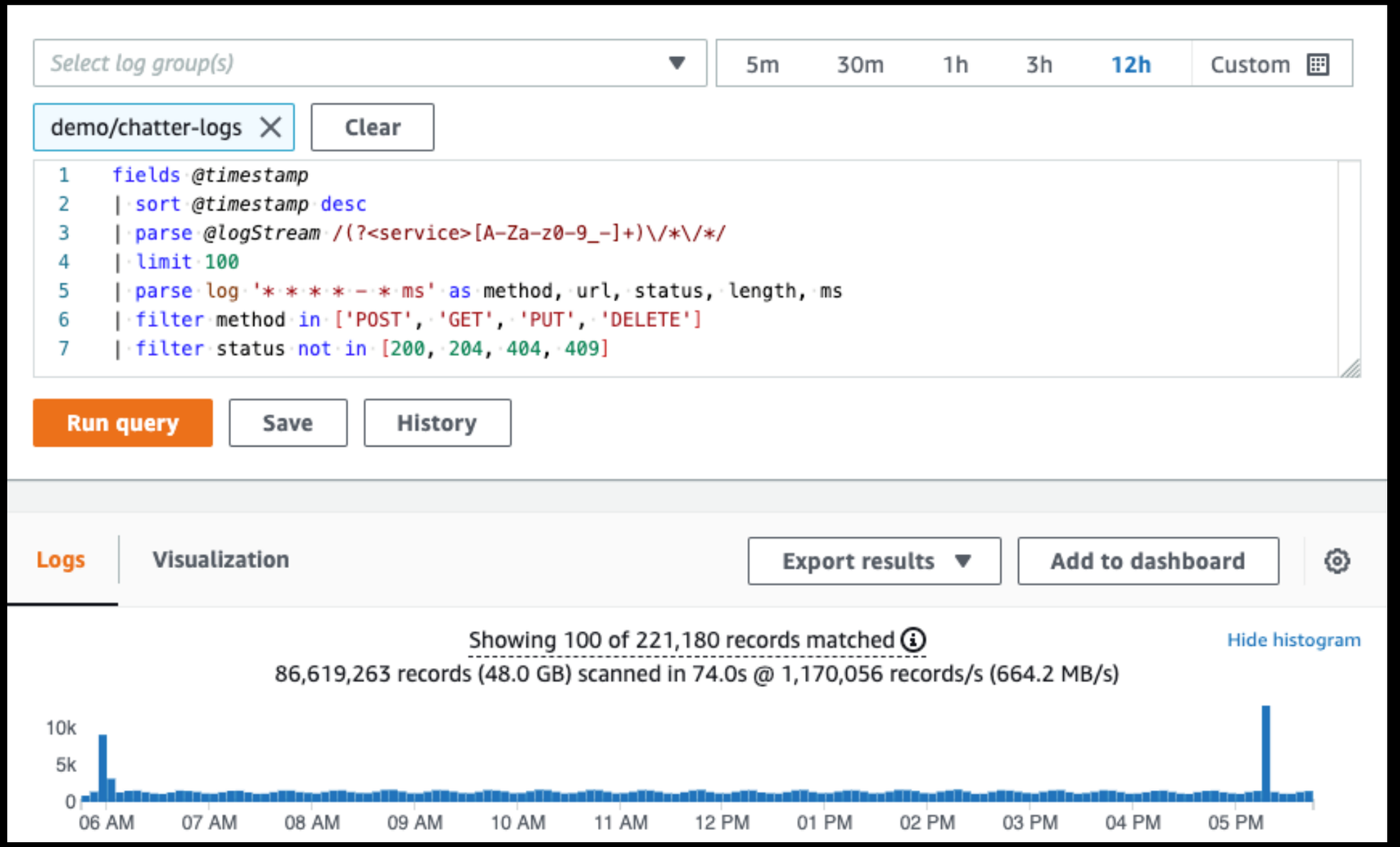
5,789,176 records (1.2 GB) scanned in 11.6s @ 498,250 records/s (105.8 MB/s)

Hide histogram

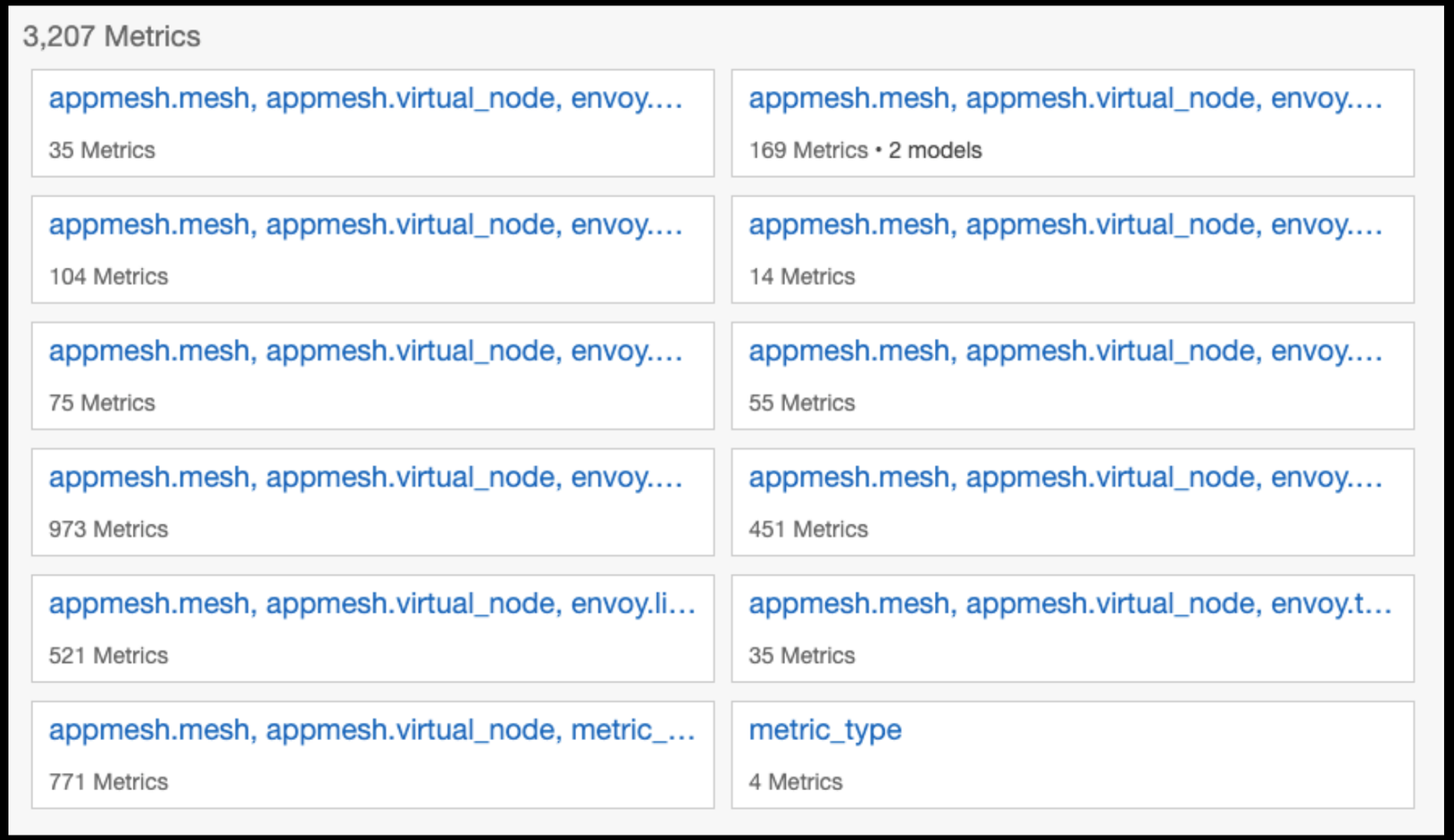


#	startTime	method	url	protocol	respons…	respons…	bytesReceived	bytesSent	duration	upstreamServiceT…	xForwardFor	userAge…	requestId
▶ 1	2020-09-29T19:31:37.5…	POST	/api/auth/challenge	HTTP/1.1	200	-	81	169	76	75	54.224.18.142	-	299621e8-fa50-9dee
▶ 2	2020-09-29T19:31:37.5…	GET	/api/timeline/hashtag/ijustsignedup	HTTP/1.1	200	-	0	8180	23	23	54.224.18.142	-	dfc6987a-171d-9bec
▶ 3	2020-09-29T19:31:37.5…	POST	/api/user/bulk-fetch	HTTP/1.1	200	-	541	4038	7	7	-	-	8ad7d258-4ac1-9a56
▶ 4	2020-09-29T19:31:37.5…	GET	/api/feed/to%3A5f738b8ad179da63df6cadd1	HTTP/1.1	200	-	0	605	4	4	-	-	98162d5c-2cc0-9e79
▶ 5	2020-09-29T19:31:37.4…	GET	/api/timeline/users/5f738b6bdfe17ee6c2a144a8/to	HTTP/1.1	200	-	0	2932	74	74	3.93.40.251	-	cbe12f6e-b1ba-925c
▶ 6	2020-09-29T19:31:37.5…	POST	/api/user/bulk-fetch	HTTP/1.1	200	-	82	612	6	6	-	-	51483ed4-6b9e-9caf
▶ 7	2020-09-29T19:31:37.5…	POST	/api/message/bulk-fetch	HTTP/1.1	200	-	541	3580	7	7	-	-	daf91426-18ec-9309
▶ 8	2020-09-29T19:31:37.5…	GET	/api/user/usernames/vena_dickinson_1601407894460	HTTP/1.1	200	-	0	197	8	8	-	-	330f00cd-6267-9915
▶ 9	2020-09-29T19:31:37.5…	POST	/api/message/bulk-fetch	HTTP/1.1	200	-	406	2217	25	25	-	-	24520253-e593-9901
▶ 10	2020-09-29T19:31:37.5…	GET	/api/feed/%23ijustsignedup	HTTP/1.1	200	-	0	1779	5	5	-	-	7d3db655-6159-973a
▶ 11	2020-09-29T19:31:37.4…	GET	/api/timeline/hashtag/ijustsignedup	HTTP/1.1	200	-	0	8180	71	71	34.205.75.17	-	a720e704-5e1a-9f2a
▶ 12	2020-09-29T19:31:37.5…	POST	/api/user/bulk-fetch	HTTP/1.1	200	-	541	4038	6	6	-	-	2a3cd4b4-b594-9a3c
▶ 13	2020-09-29T19:31:37.5…	POST	/api/message/bulk-fetch	HTTP/1.1	200	-	541	3580	9	8	-	-	92670e25-9de3-9503
▶ 14	2020-09-29T19:31:37.4…	GET	/api/timeline/hashtag/ijustsignedup	HTTP/1.1	200	-	0	8180	77	77	3.80.162.6	-	1d03a71b-0f07-91c7
▶ 15	2020-09-29T19:31:37.5…	POST	/api/user/bulk-fetch	HTTP/1.1	200	-	541	4038	7	6	-	-	e48df65e-1e00-9ee4
▶ 16	2020-09-29T19:31:37.5…	GET	/api/timeline/users/5f738b94a9704ce8c7eb20d8/to	HTTP/1.1	200	-	0	26	6	6	34.205.75.17	-	78090a47-ad23-98bc
▶ 17	2020-09-29T19:31:37.4…	GET	/api/feed/to%3A5f738b6bdfe17ee6c2a144a8	HTTP/1.1	200	-	0	1496	40	40	-	-	a9dc3498-2569-9871
▶ 18	2020-09-29T19:31:37.5…	GET	/api/feed/to%3A5f738b94a9704ce8c7eb20d8	HTTP/1.1	200	-	0	2	5	5	-	-	ffd6fc51-76c3-952c
▶ 19	2020-09-29T19:31:37.4…	GET	/api/feed/%23ijustsignedup	HTTP/1.1	200	-	0	1779	54	53	-	-	0c079f5b-244b-99f7

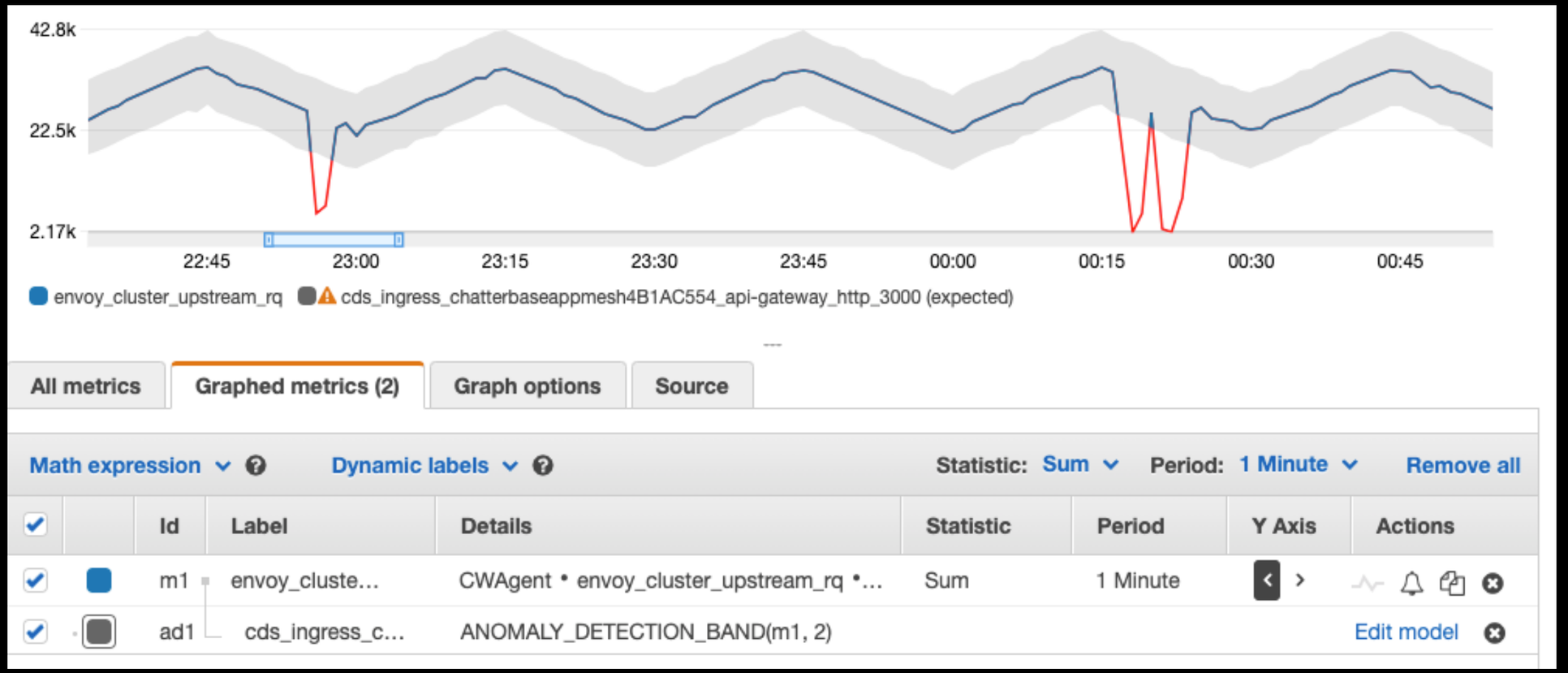
You can explore the Envoy Proxy logs for detailed information about requests coming into your services



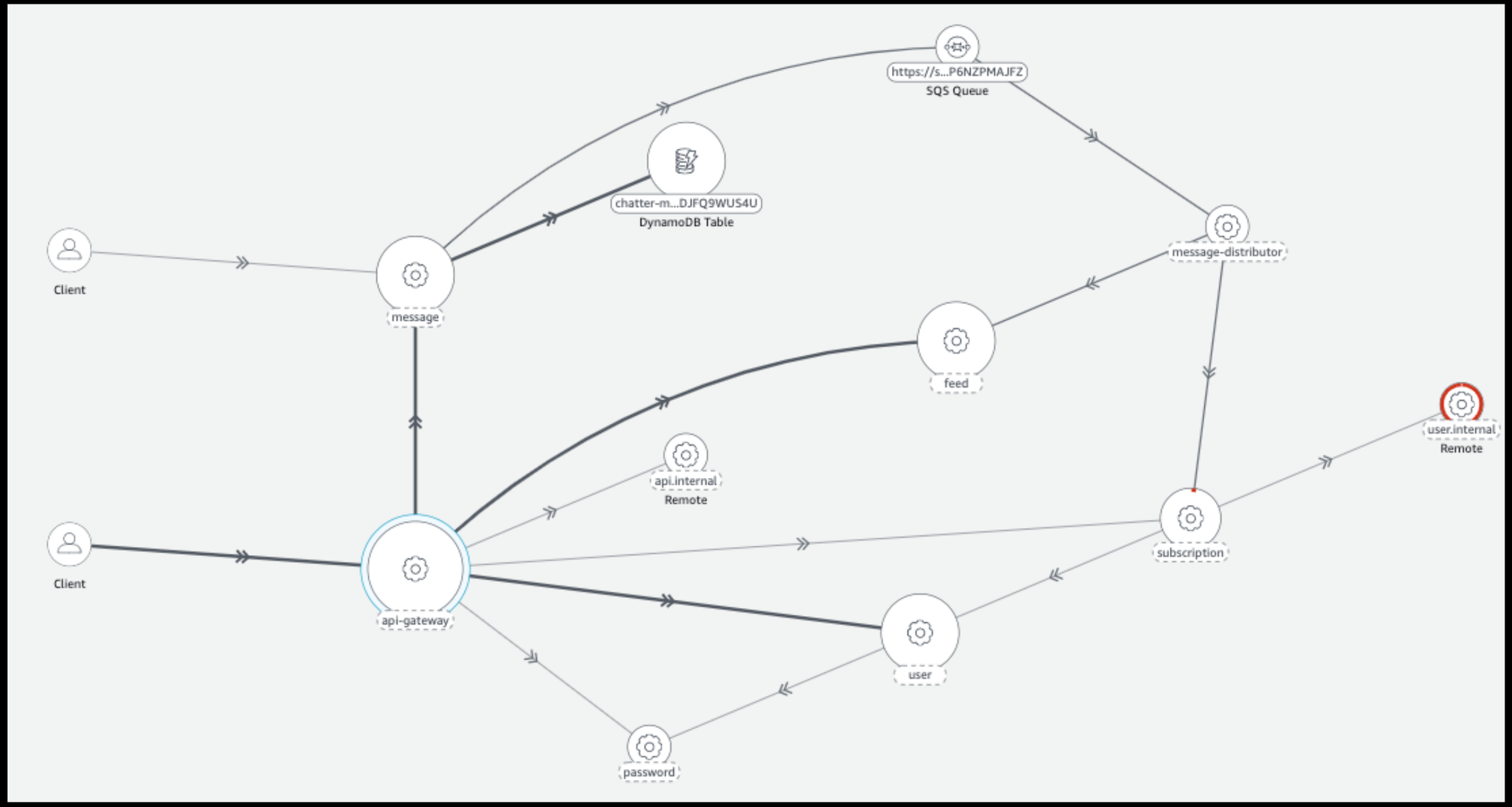
CloudWatch Logs Insights provides a powerful query language and engine for exploring logs



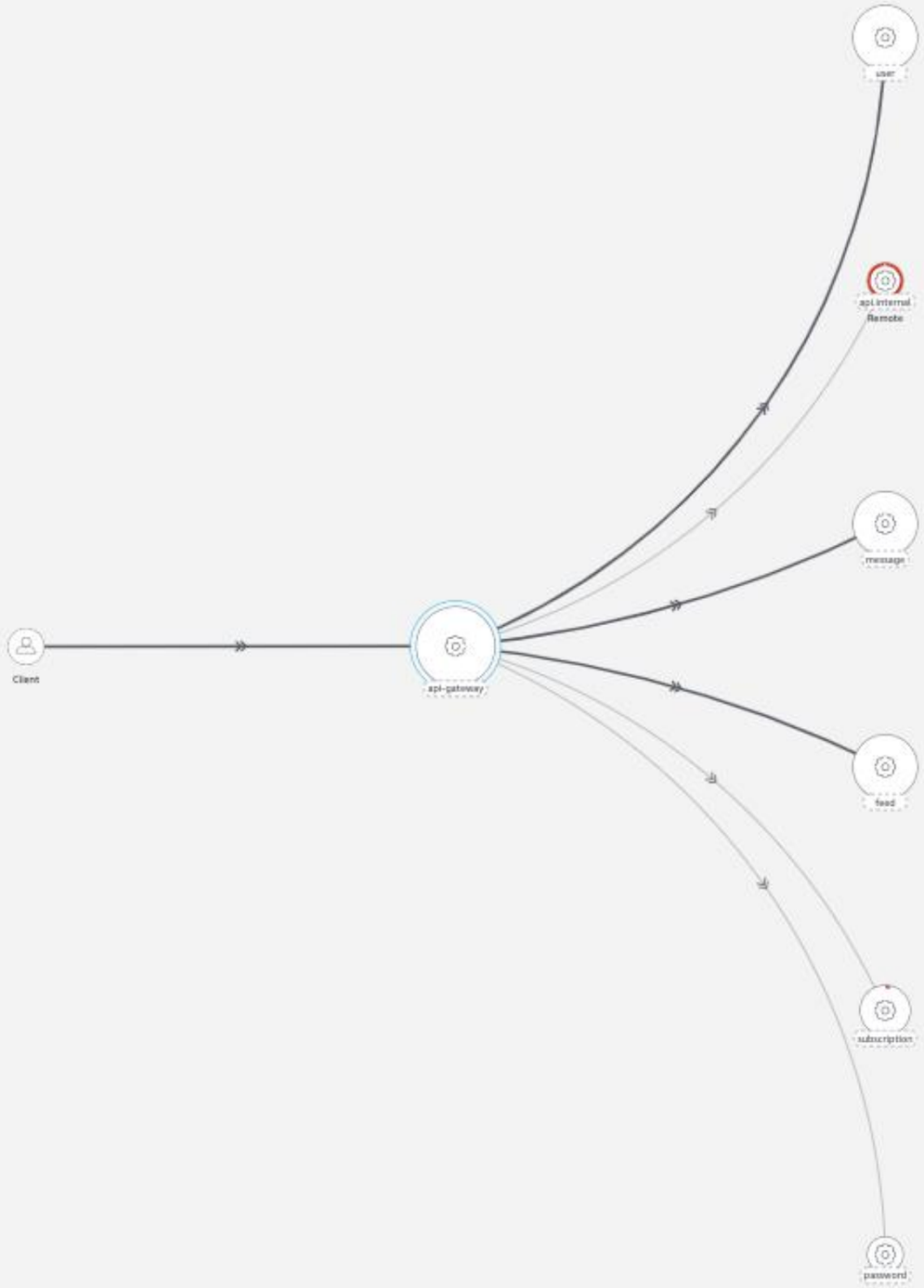
The App Mesh Envoy proxy captures 3,207 different metrics for this small cluster of microservices



Sum up requests to api-gateway service per minute and show an anomaly detection band to highlight unexpected spikes or drops



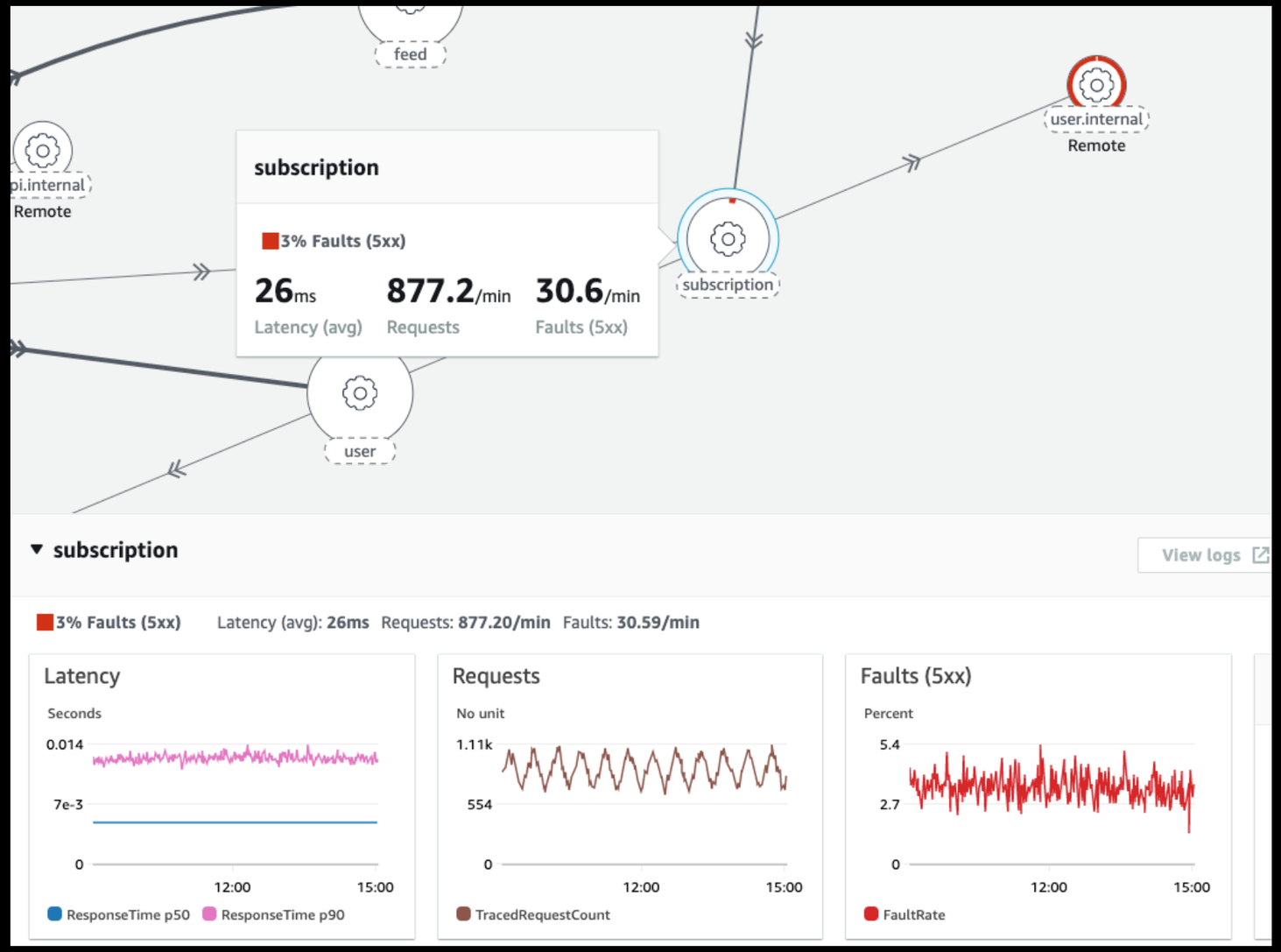
AWS X-Ray + Amazon CloudWatch ServiceLens helps you to see a map of the services in your mesh and how they communicate with each other



Zooming in on one service to exclusively view its own connections

Requests come in from clients and go out to 7 other destinations

Node size and thickness of line highlight the destinations that receive the most traffic

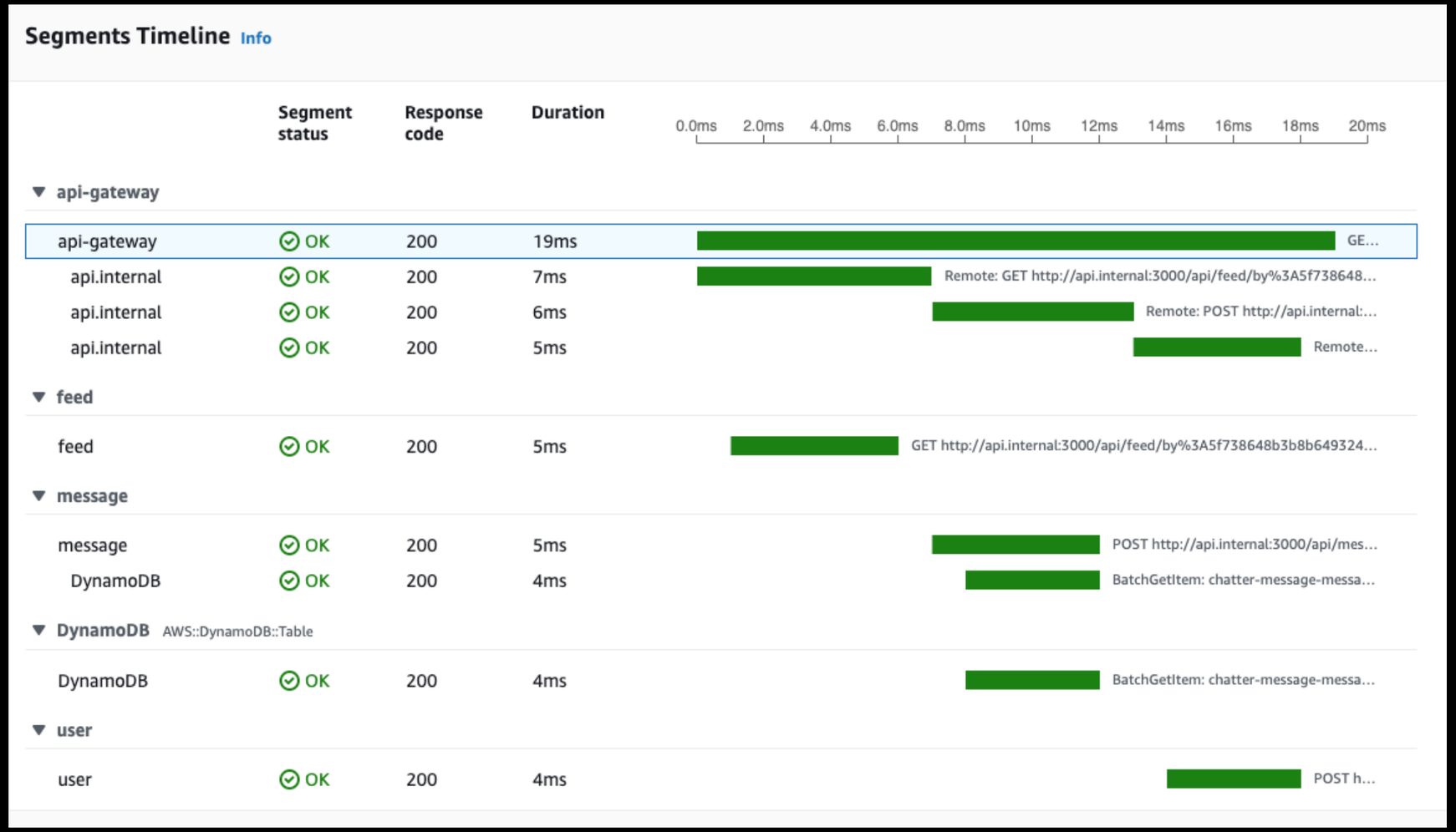


You can zoom in on issues in the map

For example, the subscription service has a 3% to 4% fault rate

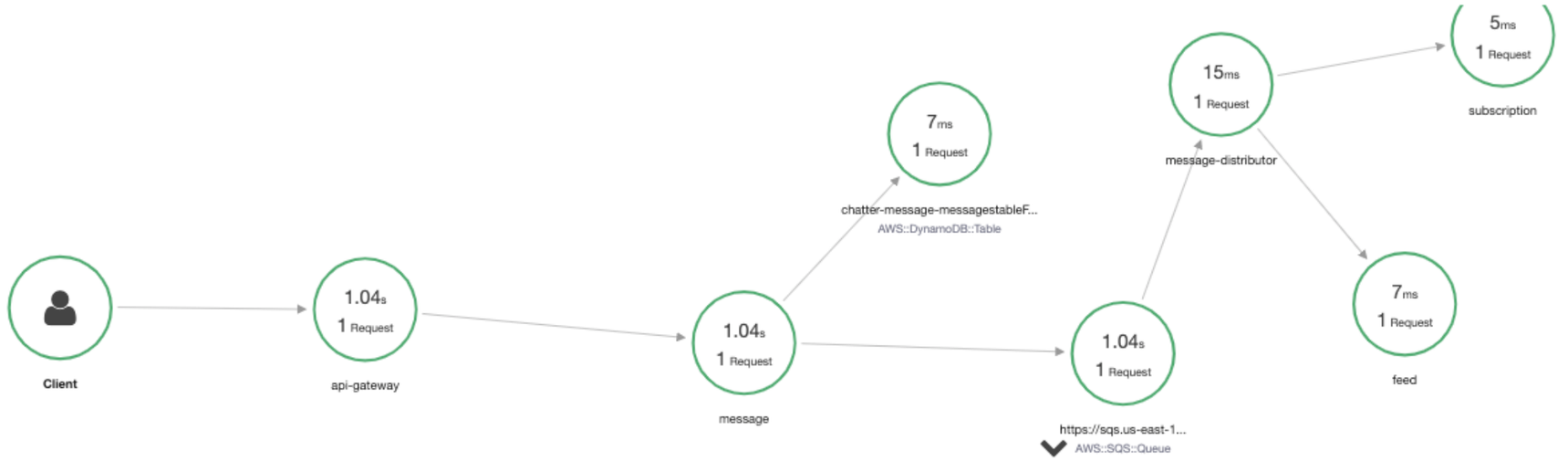


For service api-gateway, graph the p95 latency of requests to each downstream service

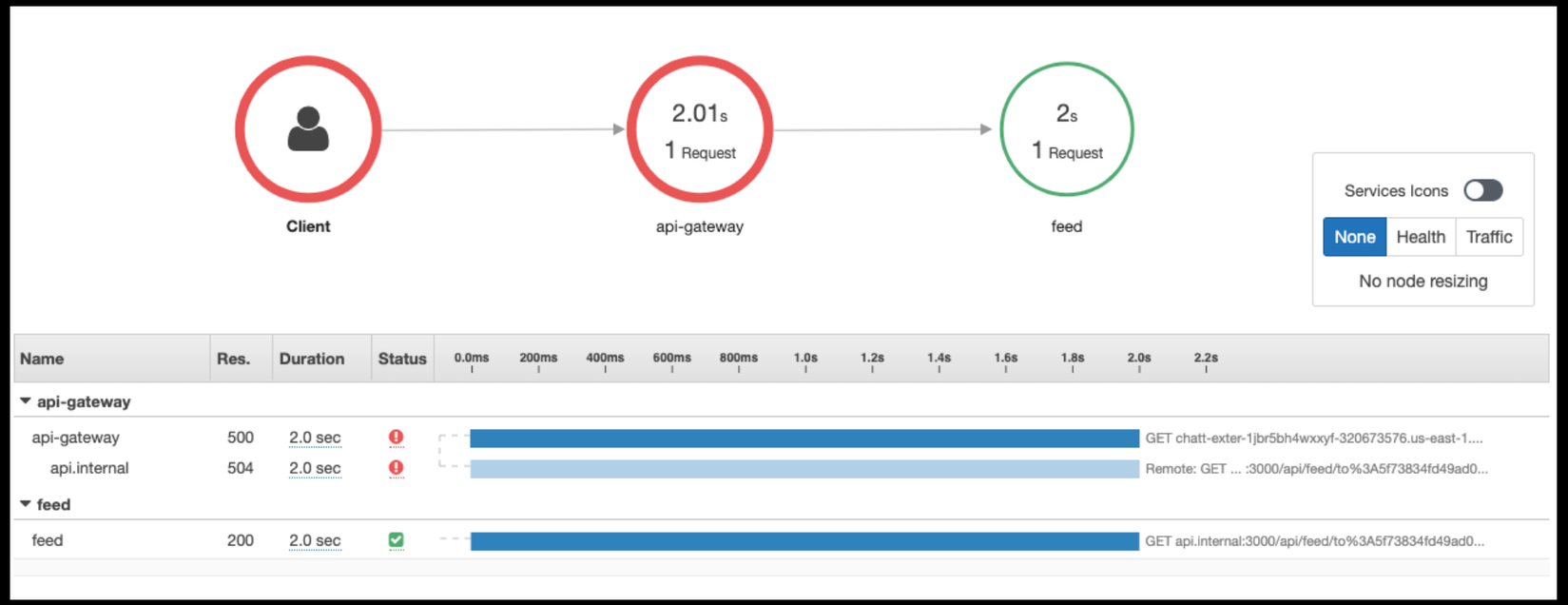


With X-Ray you can zoom in and view the individual requests and execution spans that took place as part of serving a single request

Trace Map



Name	Res.	Duration	Status	0.0ms 100ms 200ms 300ms 400ms 500ms 600ms 700ms 800ms 900ms 1.0s 1.1s 1.2s
api-gateway				
api-gateway	200	1.0 sec	✓	POST chatt-exter-1jbr5bh4wxxyf-320673576.us-east-1...
api.internal	200	1.0 sec	✓	Remote: POST ... :3000/api/message
message				
message	200	1.0 sec	✓	POST api.internal:3000/api/message
DynamoDB	200	7.0 ms	✓	PutItem: chatter-message-messagestableF96F9F5F-17IDJFQ9WUS4...
SQS	200	1.0 sec	✓	SendMessage: https://sqs.us-east-1.amazonaws.com/209640446841/c...
message-distributor				
message-distributor	-	15.0 ms	✓	
subscription.internal	200	7.0 ms	✓	Remote: GET ... :3000/api/subscription/users/5f738...
feed.internal	204	8.0 ms	✓	Remote: POST ... :3000/api/feed
subscription				
subscription	200	5.0 ms	✓	GET ... /.internal:3000/api/subscription/users/5f7...
feed				
feed	204	7.0 ms	✓	POST ... /.internal:3000/api/feed
DynamoDB AWS::DynamoDB::Table (Client Response)				
SQS AWS::SQS::Queue (Client Response)				

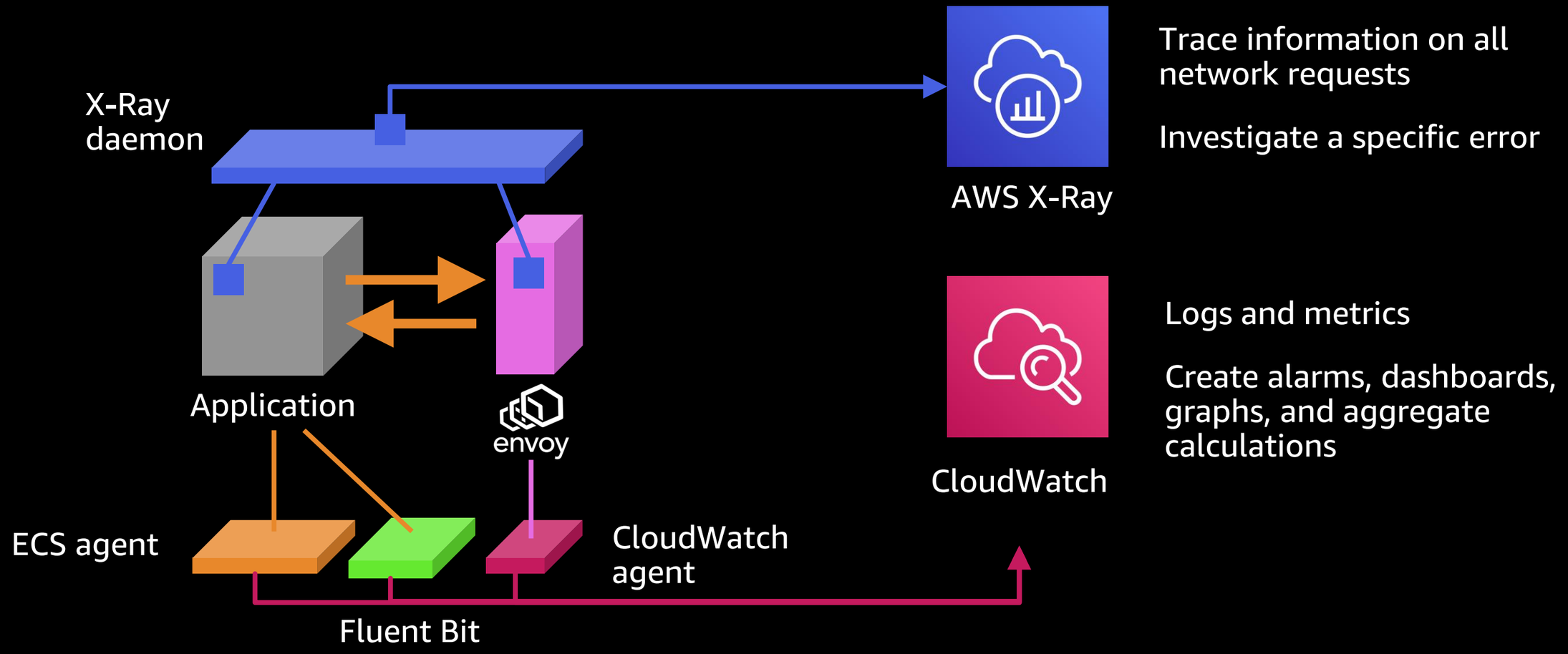


Trace shows a request that times out after 2 seconds

Corresponding logs in CloudWatch Logs Insights allow us to see the application's stderr output for the same event



Amazon ECS and AWS App Mesh observability



Trace information on all network requests

Investigate a specific error

Logs and metrics

Create alarms, dashboards, graphs, and aggregate calculations

Thank you!

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