The Phantom Pathways of a Distributed Trace

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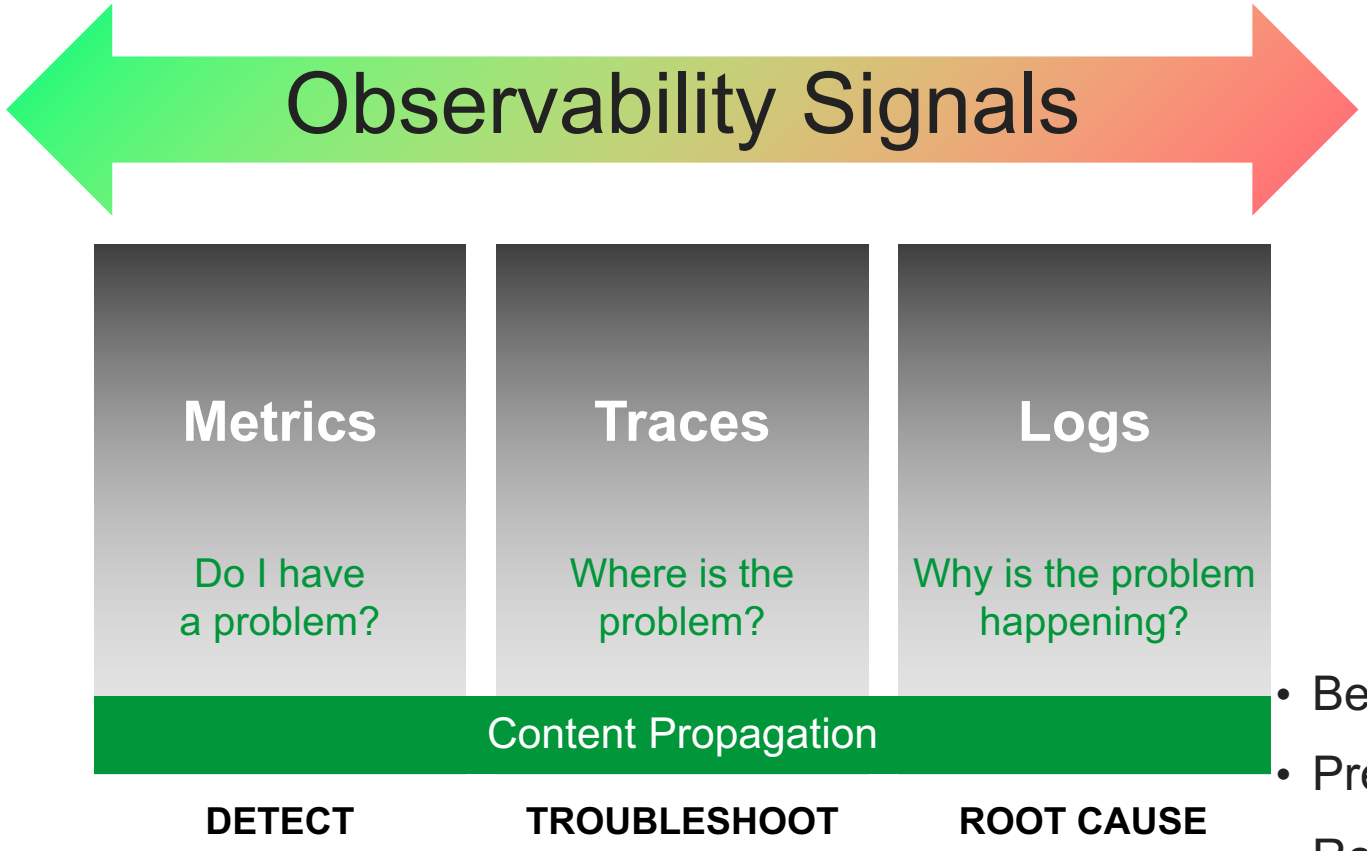
NGINX

Observability is a scary data problem

The more observable a system, the quicker we can understand why it's acting up and fix it

Observability

Observability helps detect, investigate and resolve the *unknown unknowns* – FAST



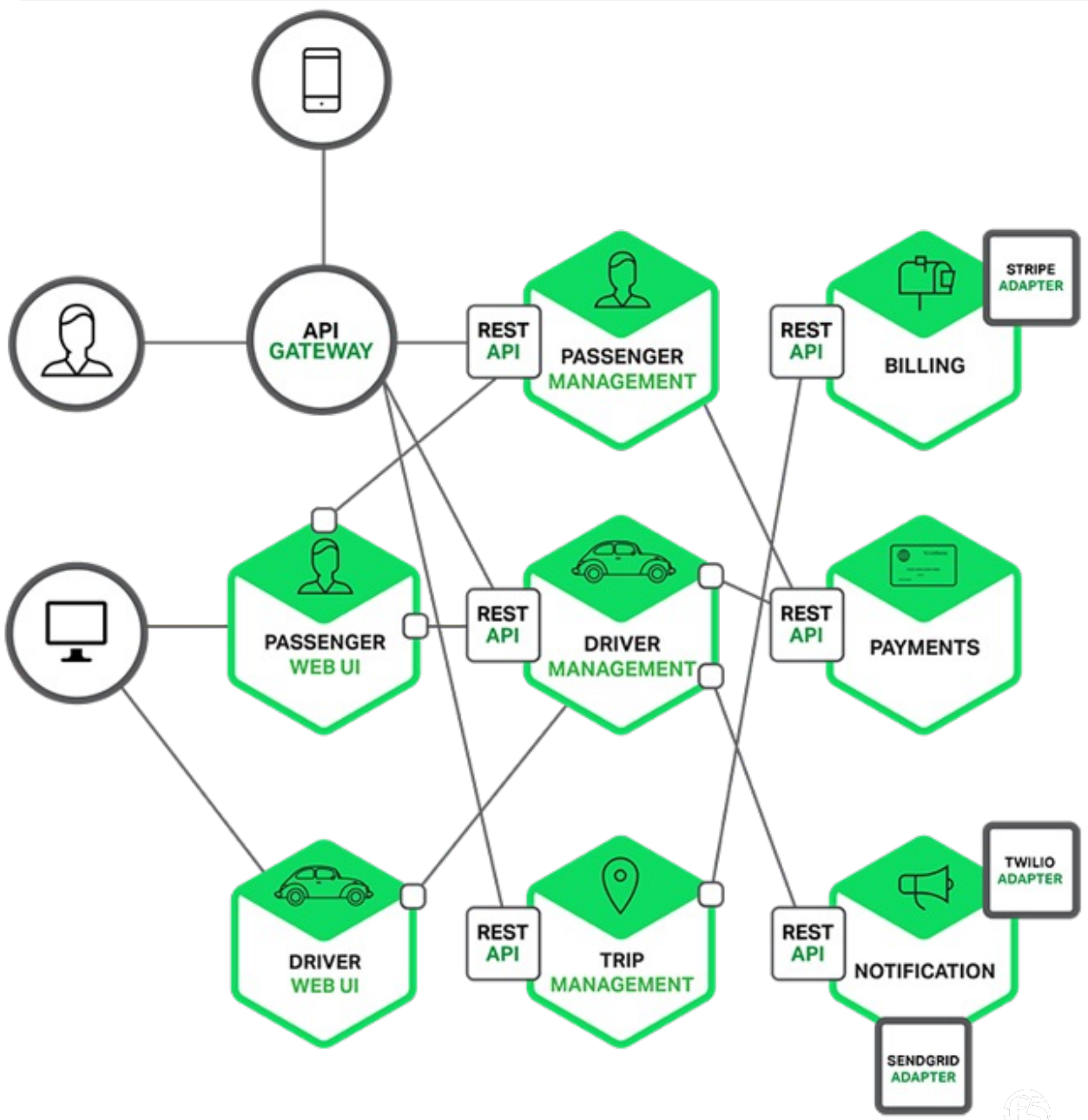
- Better visibility to the state of the system
- Precise and predictive alerting
- Reduces Mean Time to Clue (MTTC) and Mean Time to Resolution (MTTR)

So why observability?

Microservices!

Single application composed of many loosely coupled and independently deployable smaller services

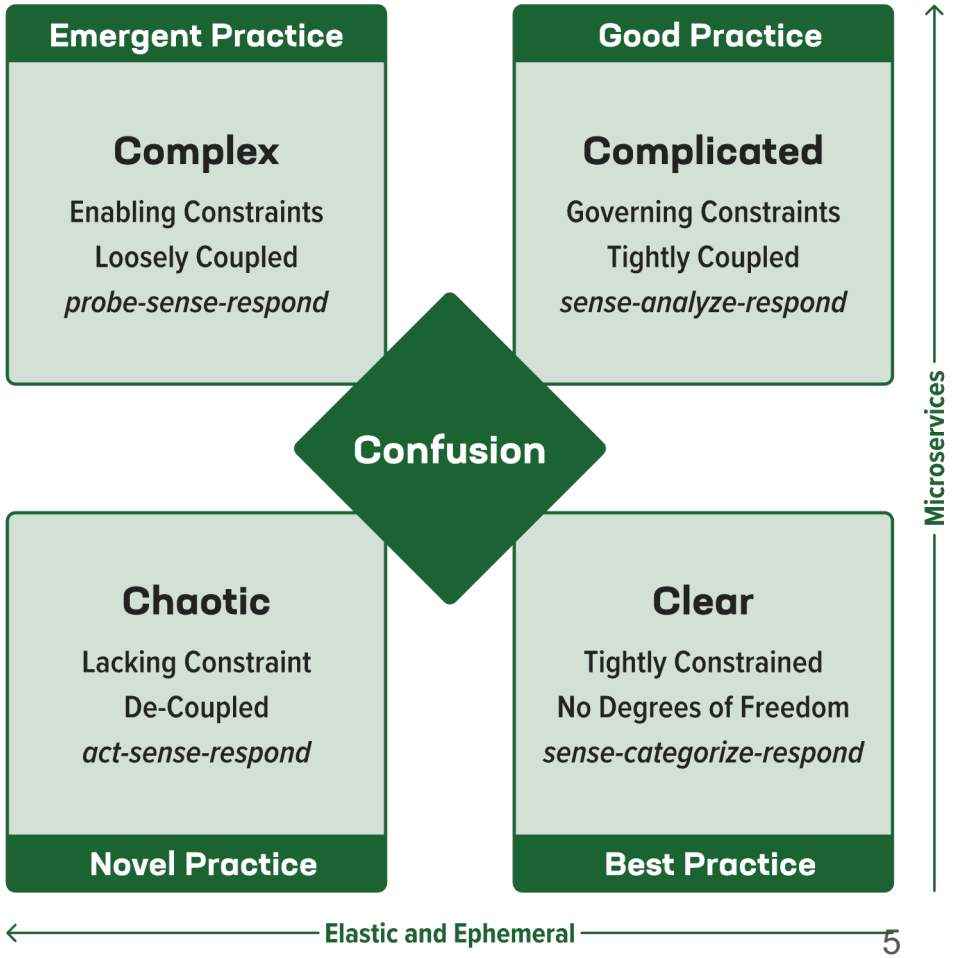
- Often polyglot in nature
- Highly maintainable and testable
- Loosely coupled
- Independently deployable
- Often in Cloud environments
- Organized around business capabilities
- Each potentially owned by a small team



µServices add challenges

Especially when we consider this in a cloud

- Microservices create complex interactions.
- Failures don't exactly repeat.
- Debugging multitenancy is painful.
- So much data!



Cynefin Framework

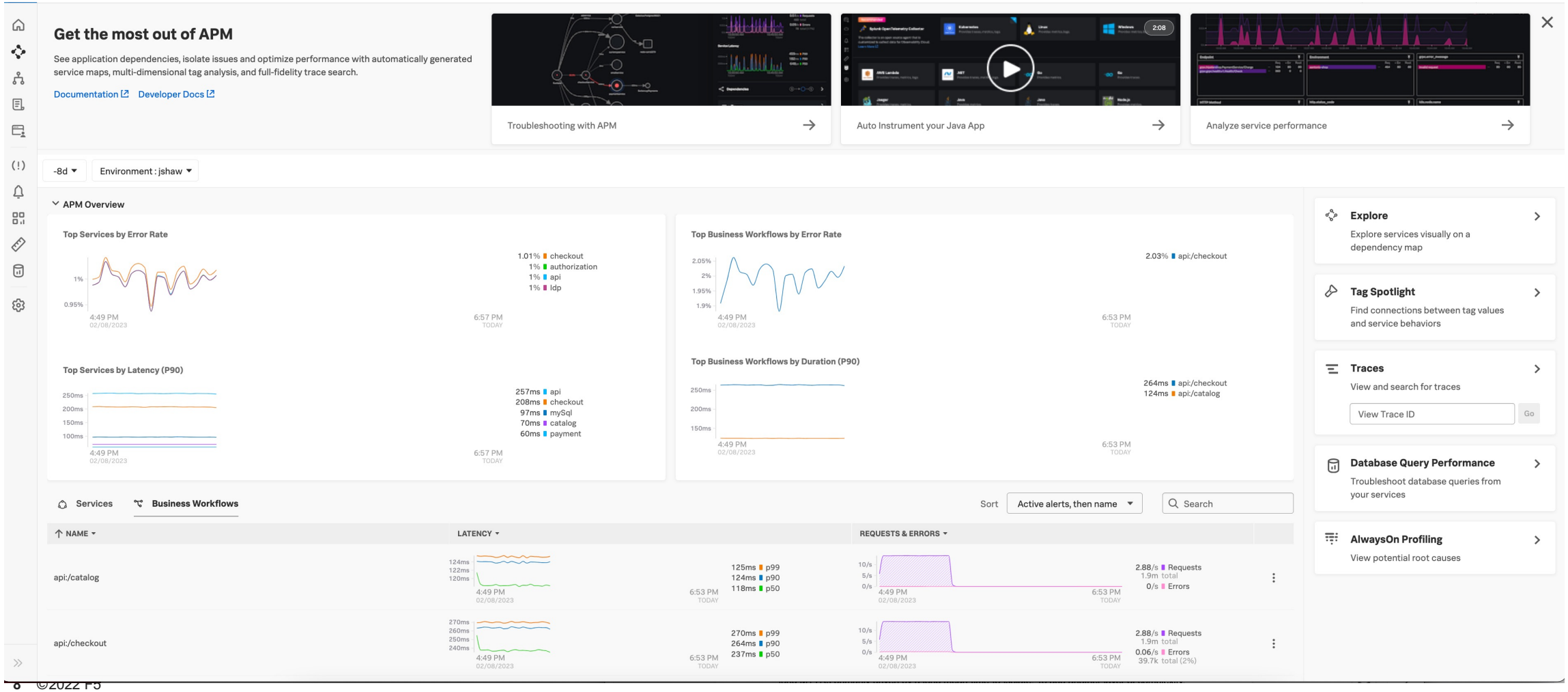
Tracing is a data problem

So what's distributed tracing good for?

- Tracks requests
- Provides actionable insights into app/user experiences
- Defines additional metrics for alerting, debugging
- Rapid MTTC, MTTR

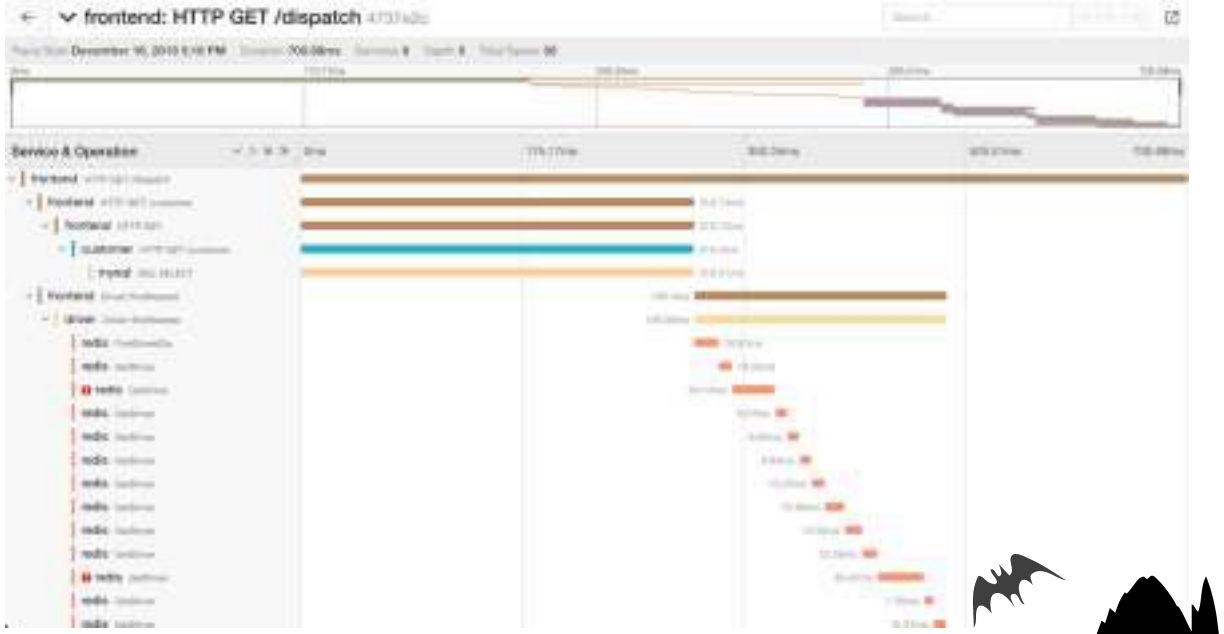
Different models driven by observability signals

RUM, Synthetics, NPM, APM, Infrastructure

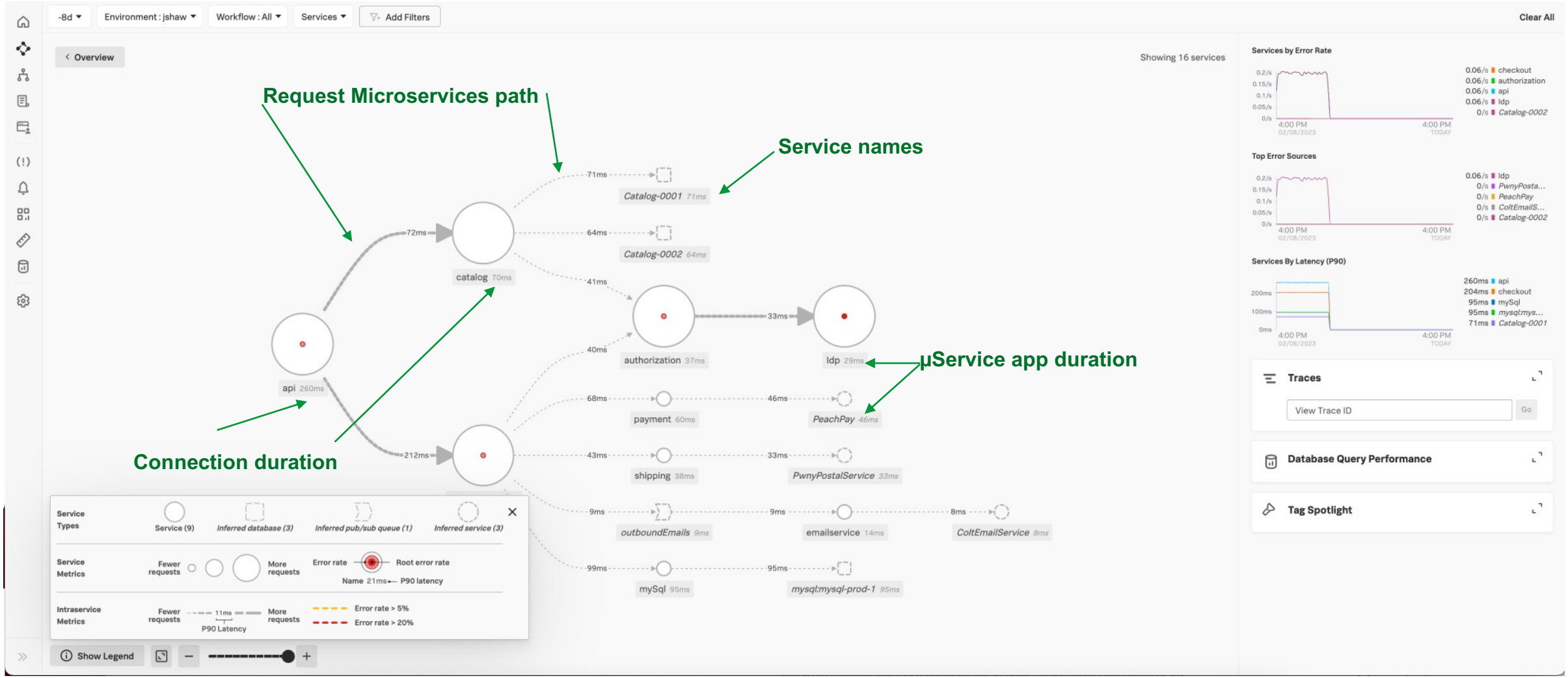


Tracing concepts

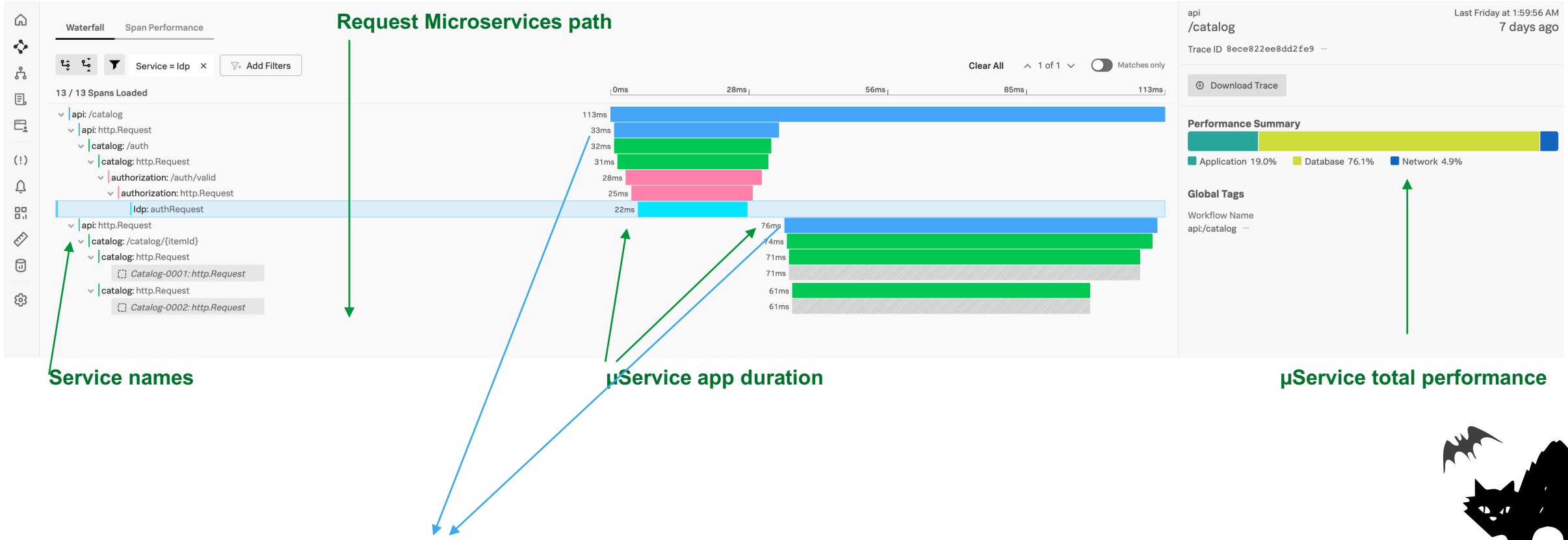
- Span
  - Represents a **single unit of work** in a system
- Trace
  - Defined implicitly by its spans
- Distributed Context
  - Tracing identifiers
  - Tags
  - Options that are propagated from parent to child spans



Let’s look at a trace

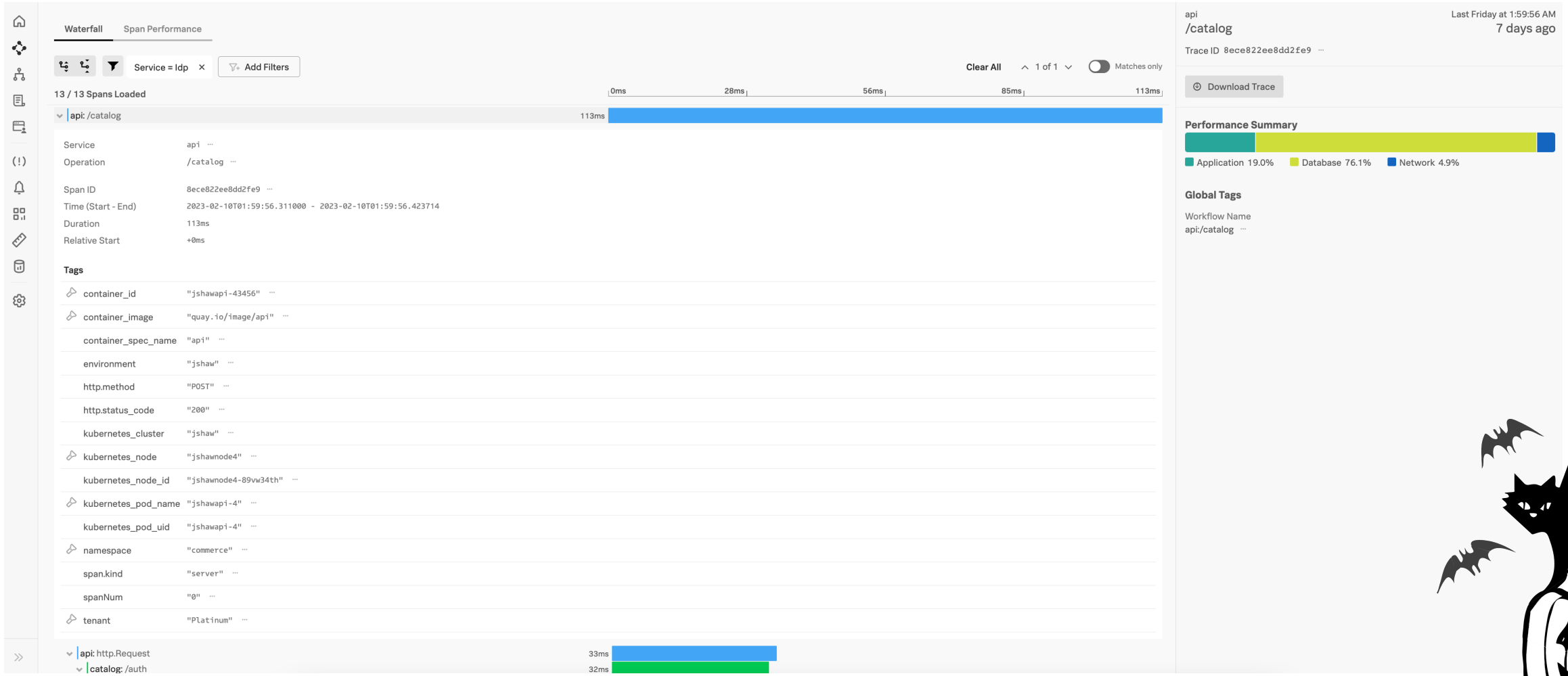


A different way of looking at a trace



Note the 2 spans makes up the trace duration (almost)

Observability includes baggage



What do we need for tracing?

- Generated unique IDs
- Auto propagation
- Telemetry consolidation
- Distributed environment capable

- Standards-based agents, cloud-integration
- Automated code instrumentation
- Support for developer frameworks
- Any code, any time

Tracing API concepts - OpenTelemetry

- TracerProvider is the entry point of the API. It provides access to Tracers.
  - Stateful object holding configuration with a global provider and possibly additional ones.
- Tracer is the class responsible for creating Spans.
  - Named and optionally versioned with each instrumentation library using values guaranteed to be globally-unique.
  - Delegates getting active Span and marking a given Span as active to the Context.
- Span is the API to trace an operation.
  - Immutable SpanContext represents the serialized and propagated portion of a Span.

Enabling distributed tracing

- Two basic options
  - Traffic Inspection (e.g., service mesh with context propagation)
  - Code Instrumentation with context propagation

- Focusing on Code
  - Add a client library dependency
  - Focus on instrumenting all service-to-service communication
  - Enhance spans (key value pairs, logs)
  - Add additional instrumentation (integrations, function-level, async calls)

What this basically means

Traces

1. Instantiate a tracer
2. Create spans
3. Enhance spans
4. Configure SDK

- Automatic
  - Just add the appropriate files to the app. This is language dependent
- Manual
  - Import the OTel API and SDK
  - Configure the API
  - Configure the SDK
  - Create your traces
  - Create your metrics
  - Export your data

What problems are you trying to solve?

A tiny subset of answers*

- Performance issues
- Mean time to resolution and detection is too high
- Metrics and logs are missing valuable context
- More data types to provide better answers

A span for everything or bare minimum

It depends

Remember why you want to trace

Start with service boundaries and 3rd party calls

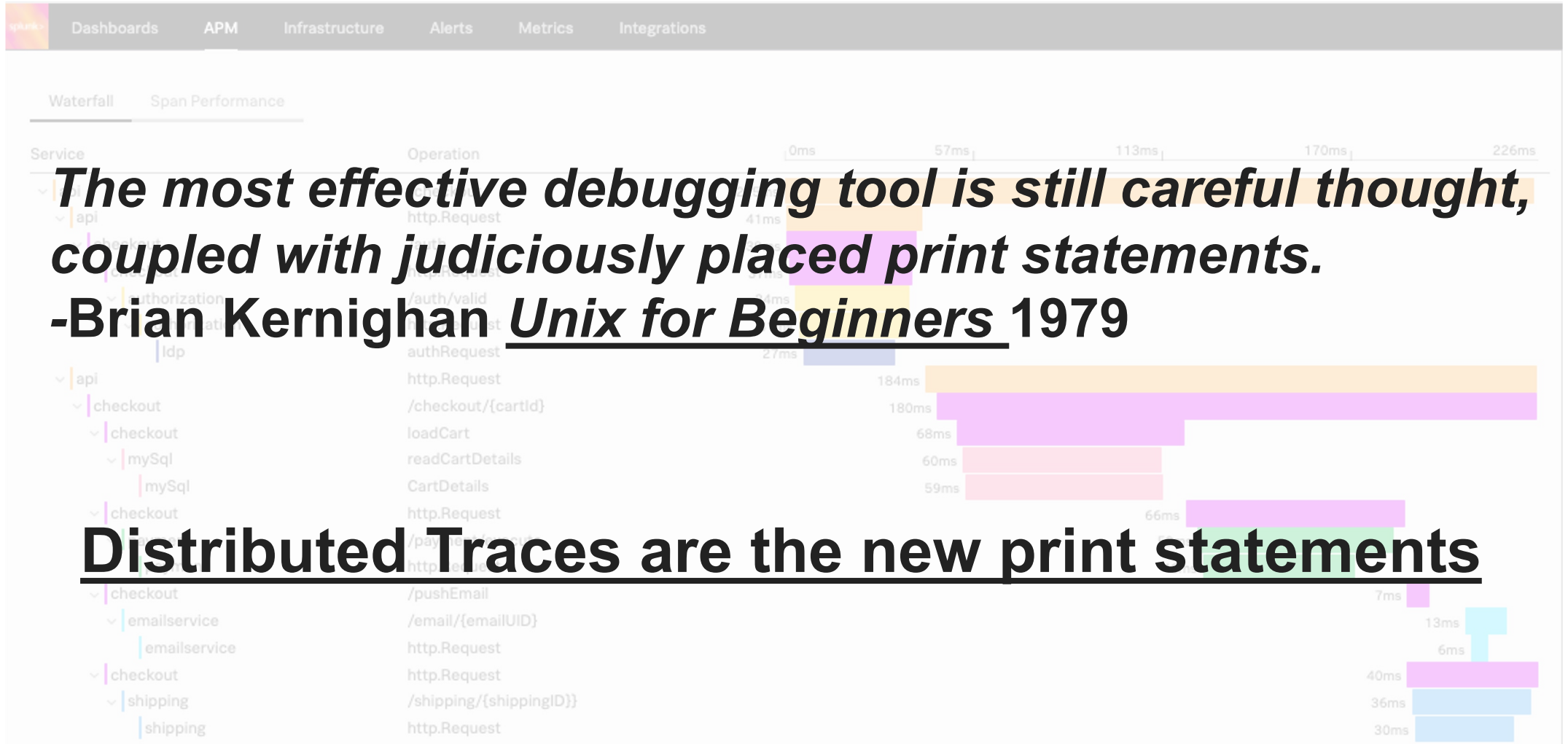
Iterative process

Beware of information overload

Distributed Tracing Summary

- Gives insights into the app and its infrastructure
- Requires effort to return value
  - The “win” is when the project is already Otel instrumented
- Is a good ”User Happiness” proxy
- Does not magically solve your issues

Closing Thought



The most effective debugging tool is still careful thought, coupled with judiciously placed print statements.

-Brian Kernighan *Unix for Beginners* 1979

Distributed Traces are the new print statements

Thanks!

Slides on GitHub

Linkedin: in/davemc

NGINX Community Slack

THANKS!

