

Tracing across your distributed process boundaries using OpenTelemetry



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@dasiths

apidays
LIVE
AUSTRALIA

15-16 Sep 2021

Melb .NET
Meetup
5th Oct 2021



Agenda

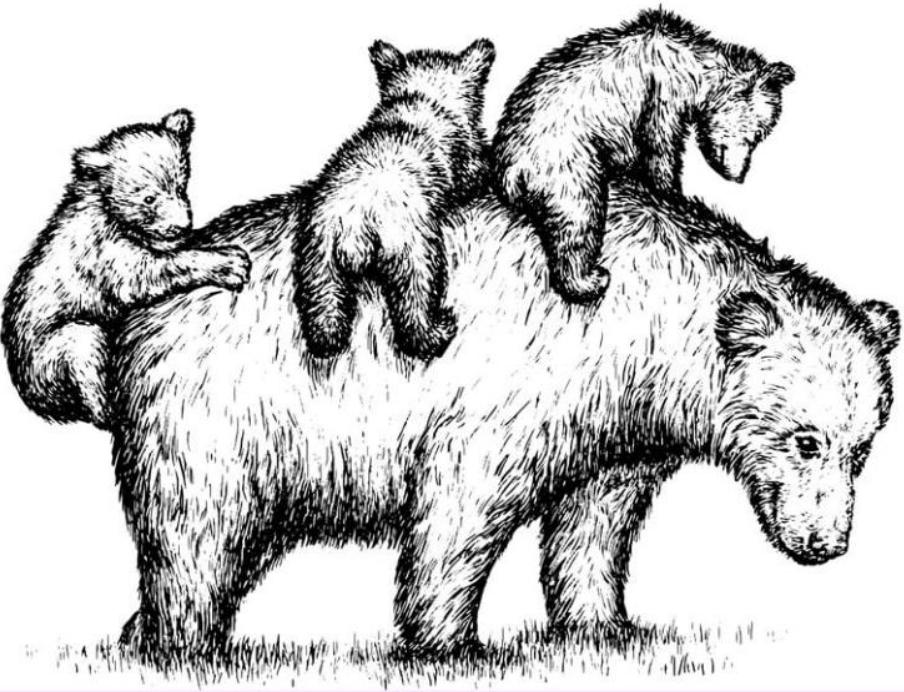
- Introduction to distributed tracing
- Introduction to OpenTelemetry
- Distributed tracing using OpenTelemetry
- Demo using OpenTelemetry .NET SDK

“

You can't manage what
you can't measure..

Peter Drucker

Getting the wrong idea from that conference talk you attended



Solving Imaginary Scaling Issues

At Scale

ORLY?

@ThePracticalDev

@dasiths

The background of the image is a close-up, slightly blurred photograph of dry, golden-brown grass or straw. A single green pushpin is visible, stuck vertically into the center of the grass. The lighting is warm and natural.

Introduction to

Distributed Tracing

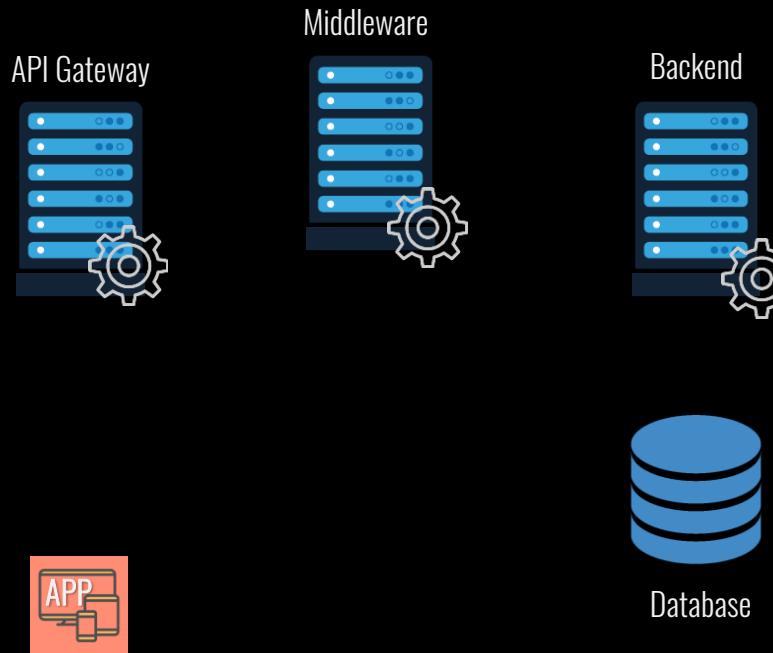
Distributed Tracing

Distributed tracing, also called distributed request tracing, is a method used to profile and monitor applications, especially those built using a microservices architecture. Distributed tracing helps pinpoint where failures occur and what causes poor performance.

<https://opentracing.io/docs/overview/what-is-tracing/>

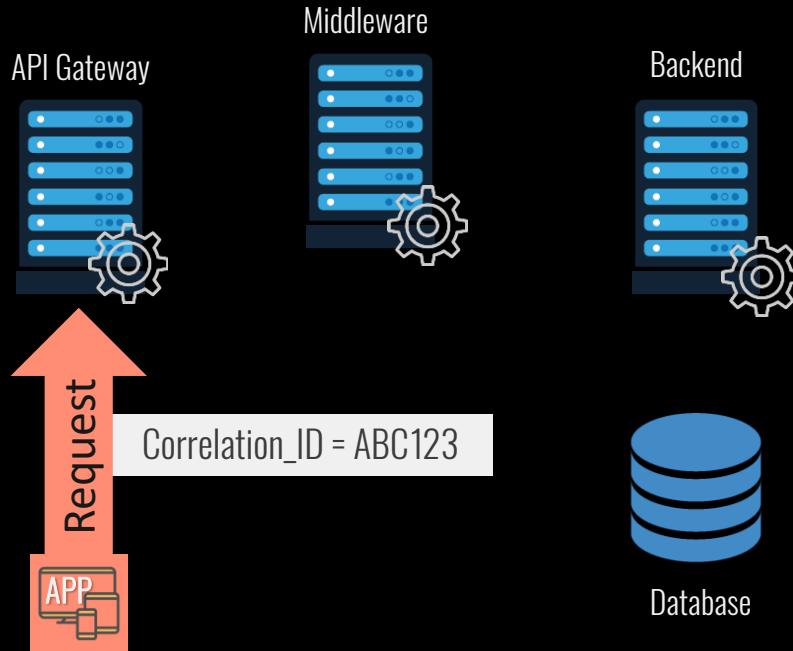
Distributed Tracing

Example



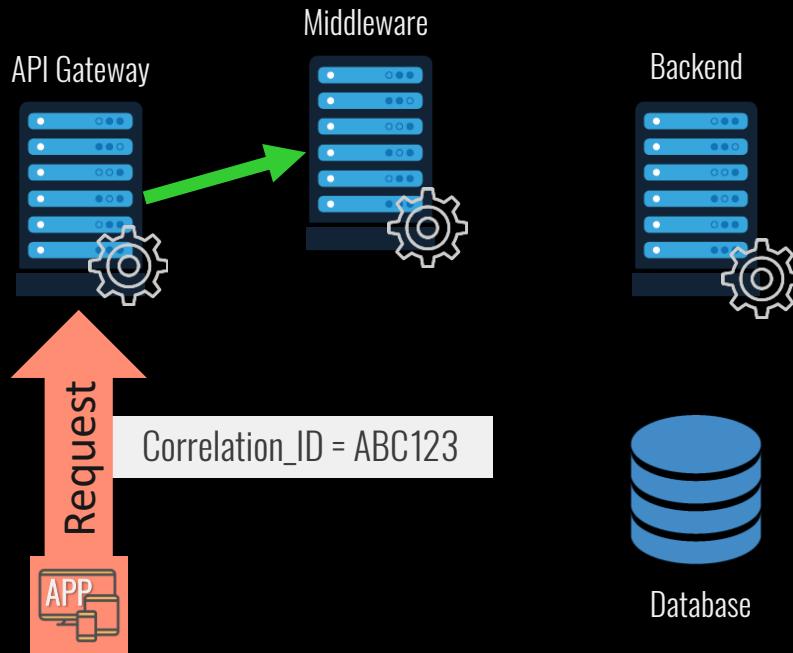
Distributed Tracing

Example



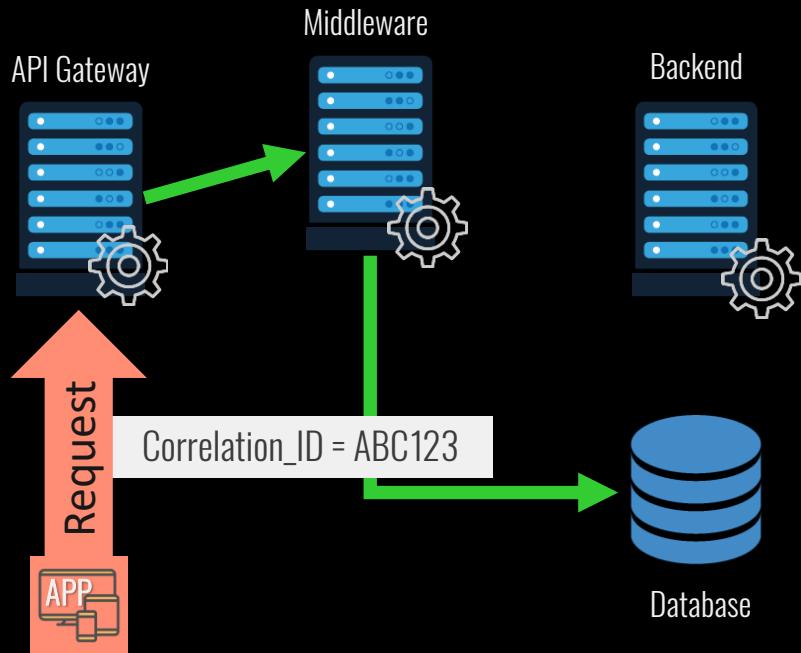
Distributed Tracing

Example



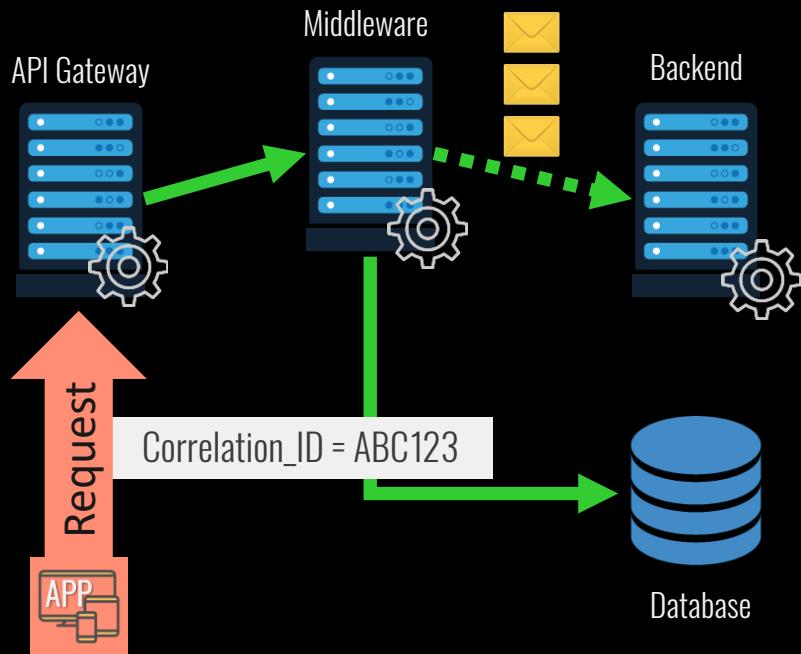
Distributed Tracing

Example



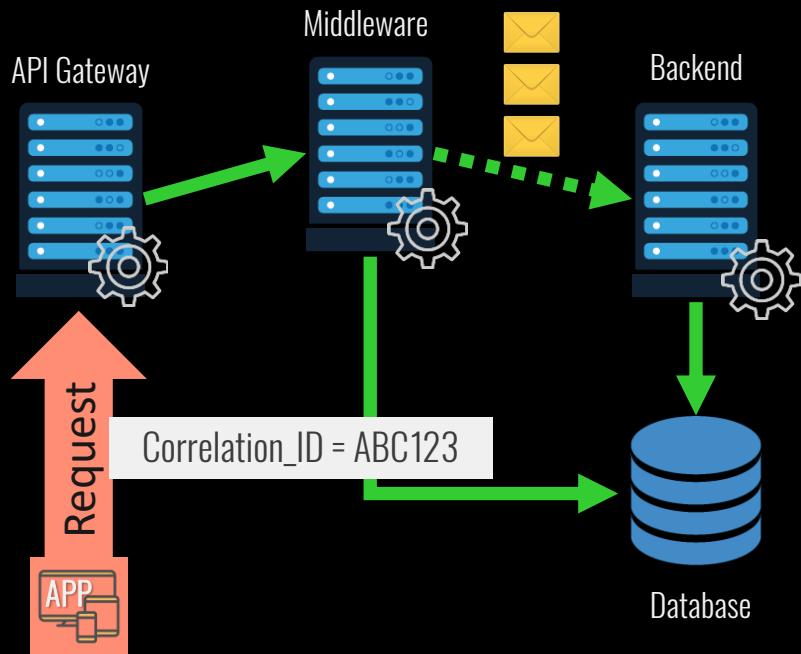
Distributed Tracing

Example



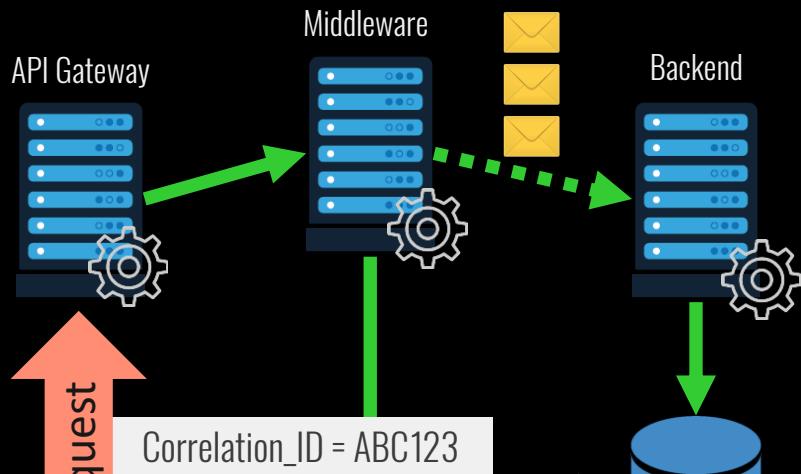
Distributed Tracing

Example

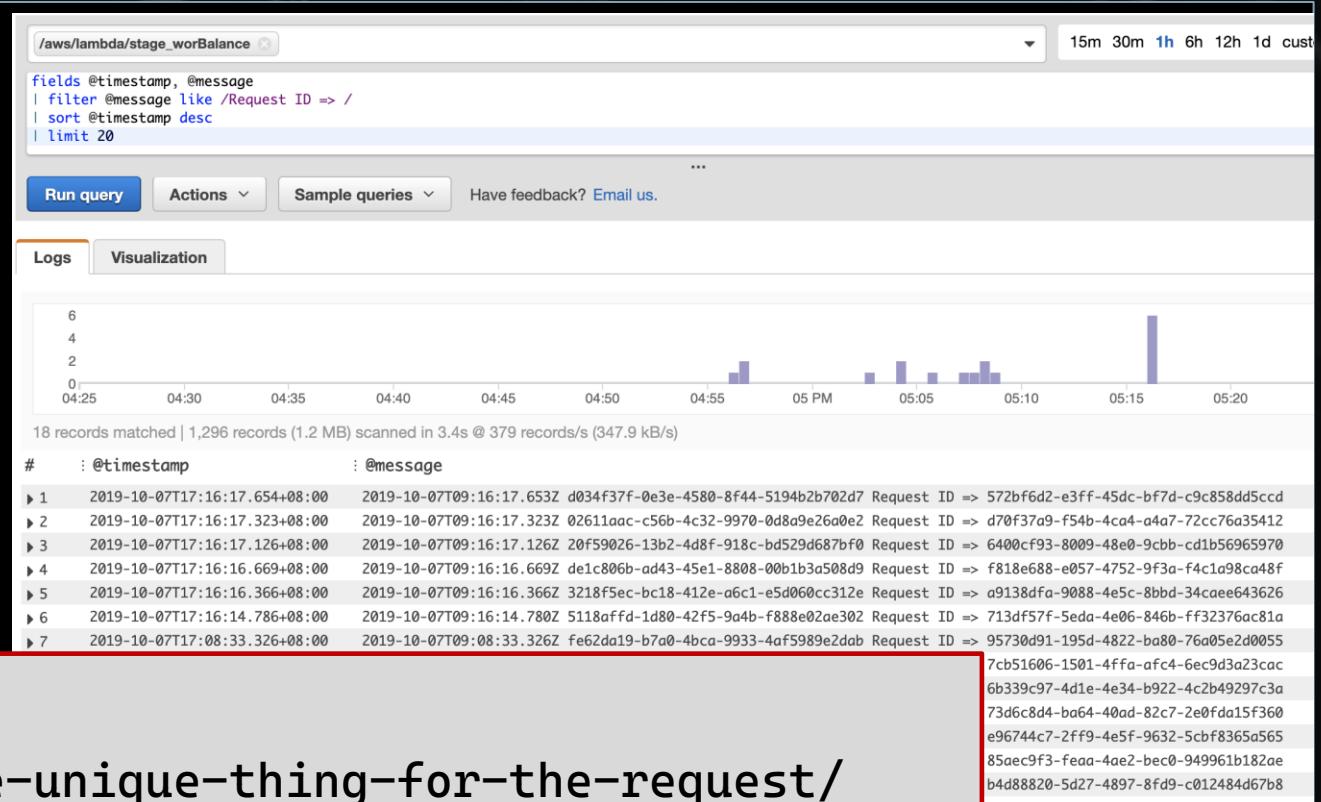


Distributed Tracing

Example

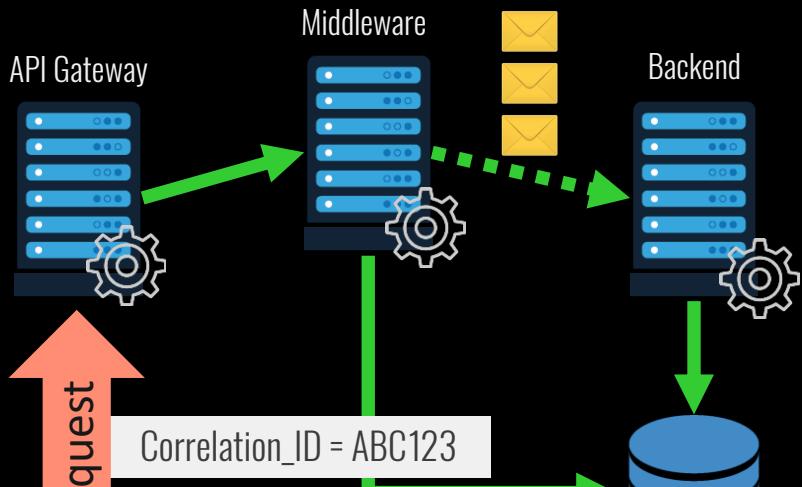


```
fields @timestamp, @message
| filter @message like /some-unique-thing-for-the-request/
| sort @timestamp desc
| limit 20
```



Distributed Tracing

Example



```
fields @timestamp, @message  
| filter @message like /some-unique-thing-for-the-request/  
| sort @timestamp desc  
| limit 20
```

```
/aws/lambda/stage_worBalance  
fields @timestamp, @message  
| filter @message like /Request ID => /  
| sort @timestamp desc  
| limit 20
```

Run query Actions Sample query

Logs Visualization



#	@timestamp	@message
1	2019-10-07T17:16:17.654+08:00	2019-10-07T09:16:17.653Z d034f37f-0e3e-4580-8f44-5194b2b702d7 Request ID => 572bf6d2-e3ff-45dc-bf7d-c9858dd5cccd
2	2019-10-07T17:16:17.323+08:00	2019-10-07T09:16:17.323Z 02611aac-c56b-4c32-9970-0d8a9e26a0e2 Request ID => d70f37a9-f54b-4ca4-a4a7-72cc76a35412
3	2019-10-07T17:16:17.126+08:00	2019-10-07T09:16:17.126Z 20f59026-13b2-4d8f-918c-bd529d687bf0 Request ID => 6400cf93-8009-48e0-9cb8-cd1b56965970
4	2019-10-07T17:16:16.669+08:00	2019-10-07T09:16:16.669Z de1c806b-ad43-45e1-8808-00b1b3a508d9 Request ID => f818e688-e057-4752-9f3a-f4c1a98ca48f
5	2019-10-07T17:16:16.366+08:00	2019-10-07T09:16:16.366Z 3218f5ec-bc18-412e-a6c1-e5d060cc312e Request ID => a9138dfa-9088-4e5c-8bbd-34cae643626
6	2019-10-07T17:16:14.786+08:00	2019-10-07T09:16:14.786Z 5118affd-1d80-42f5-9a4b-f888e02ae302 Request ID => 713df57f-5eda-4e06-846b-ff32376ac81a
7	2019-10-07T17:08:33.326+08:00	2019-10-07T09:08:33.326Z fe62da19-b7a0-4bca-9933-4af5989e2dab Request ID => 95730d91-195d-4822-ba80-76a05e2d0055
		7cb51606-1501-4ffa-afc4-6ec9d3a23cac
		6b339c97-4d1e-4e34-b922-4c2b49297c3a
		73d6c8d4-ba64-40ad-82c7-2e0fd415f360
		e9674ac7-2ff9-4e5f-9632-5cbf8365a565
		85aec9f3-faea-4ae2-bec0-949961b182ae
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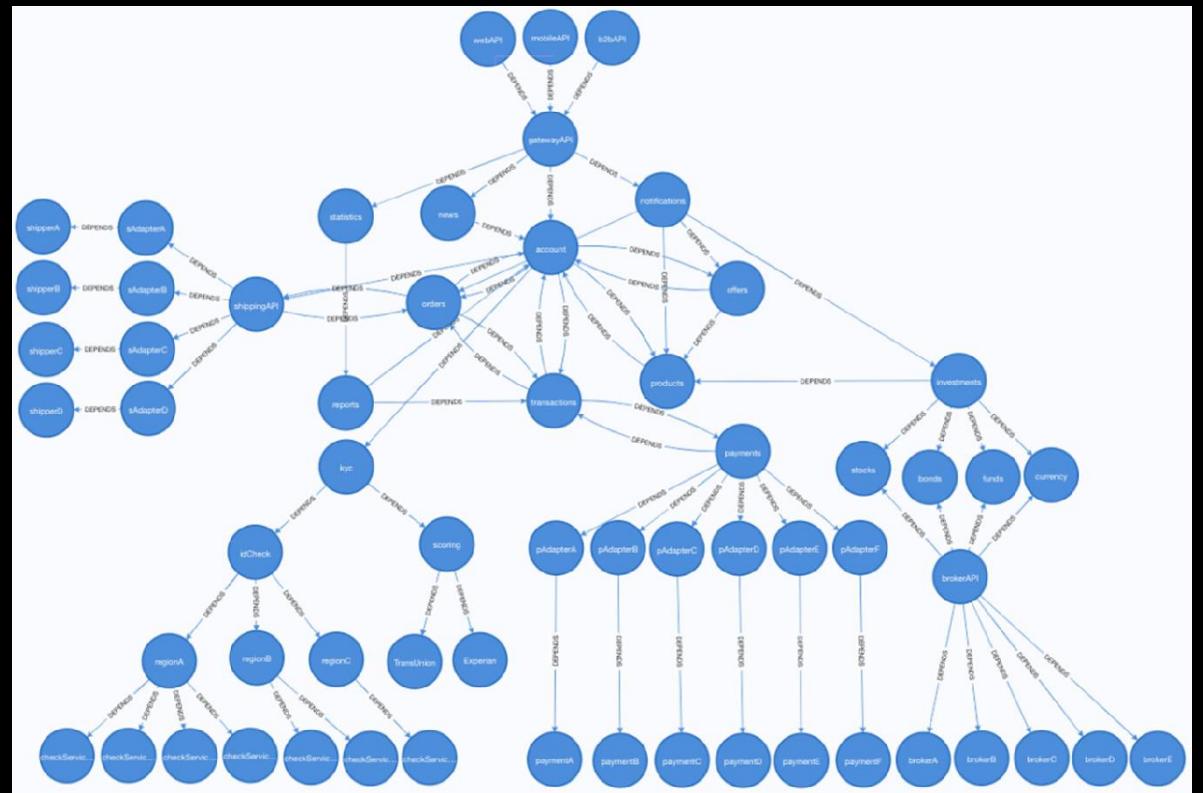
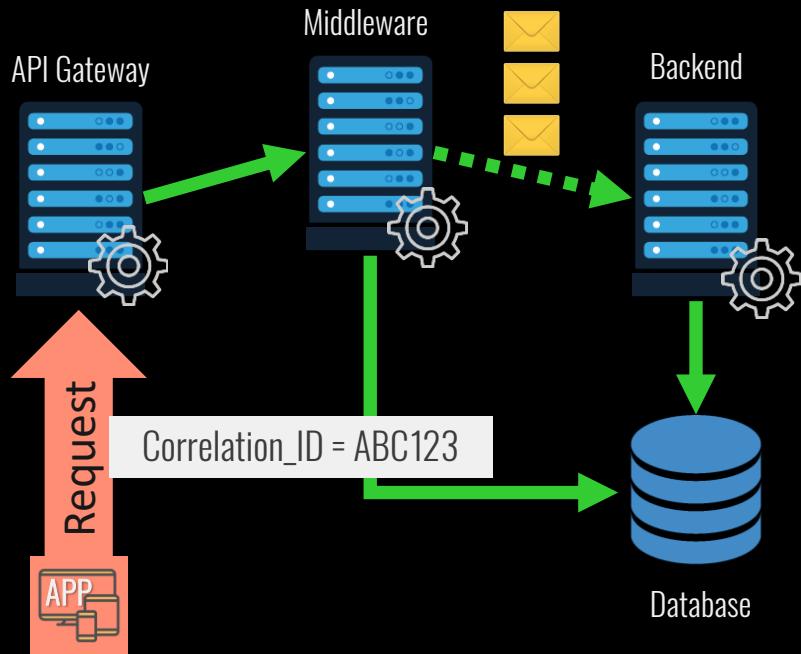


15m 30m 1h 6h 12h 1d cust

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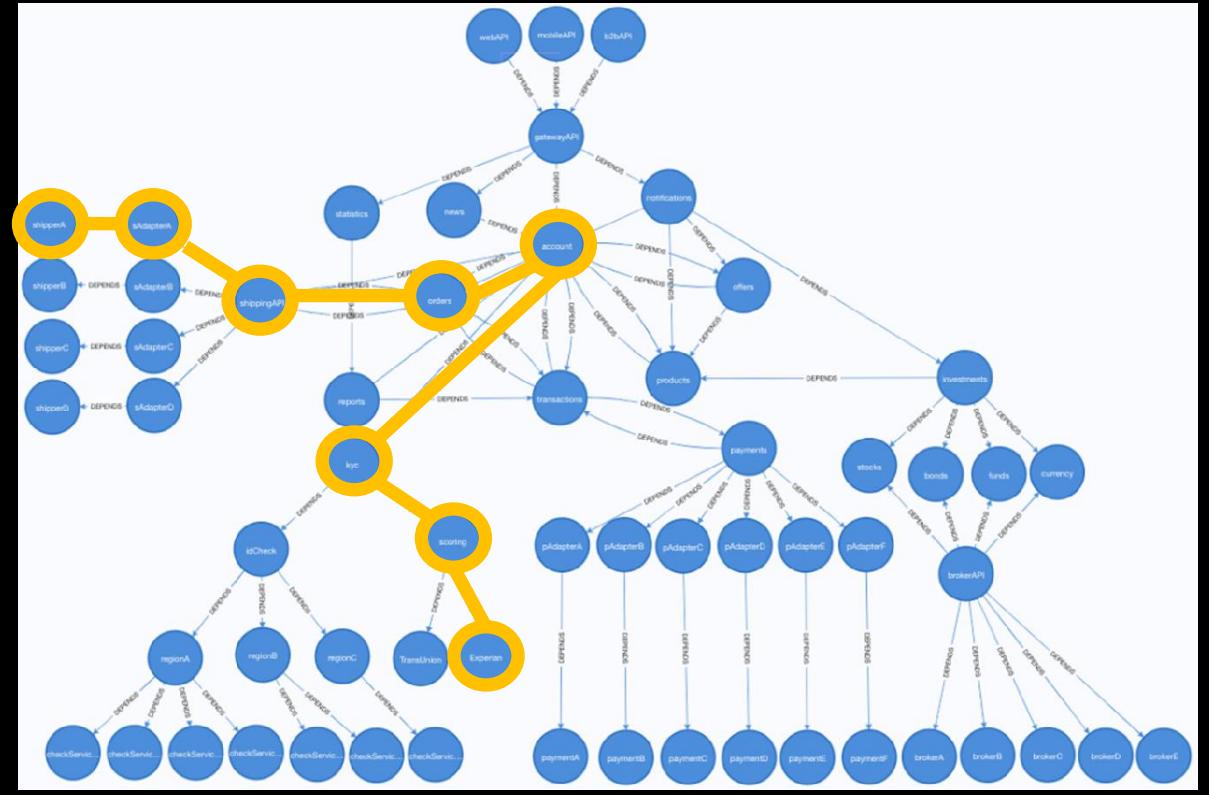
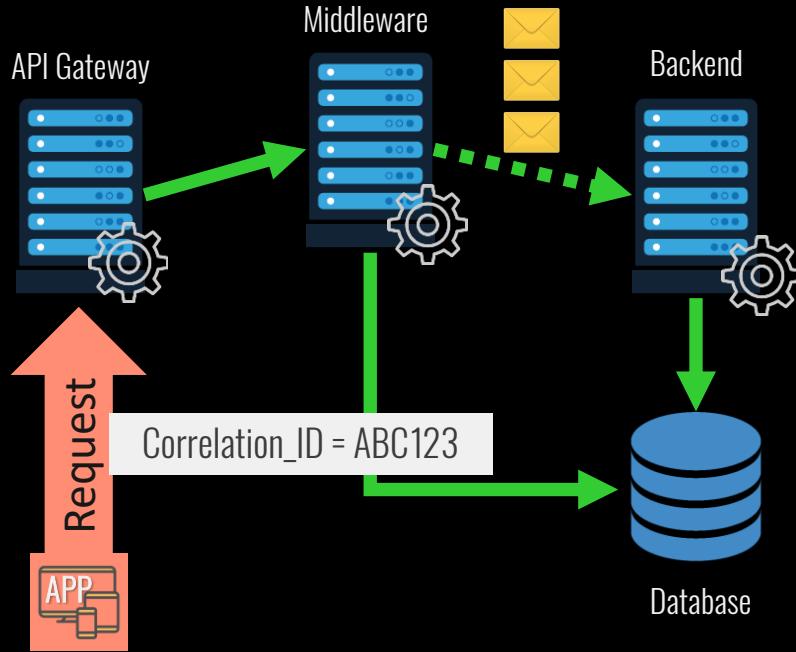
Distributed Tracing

Example



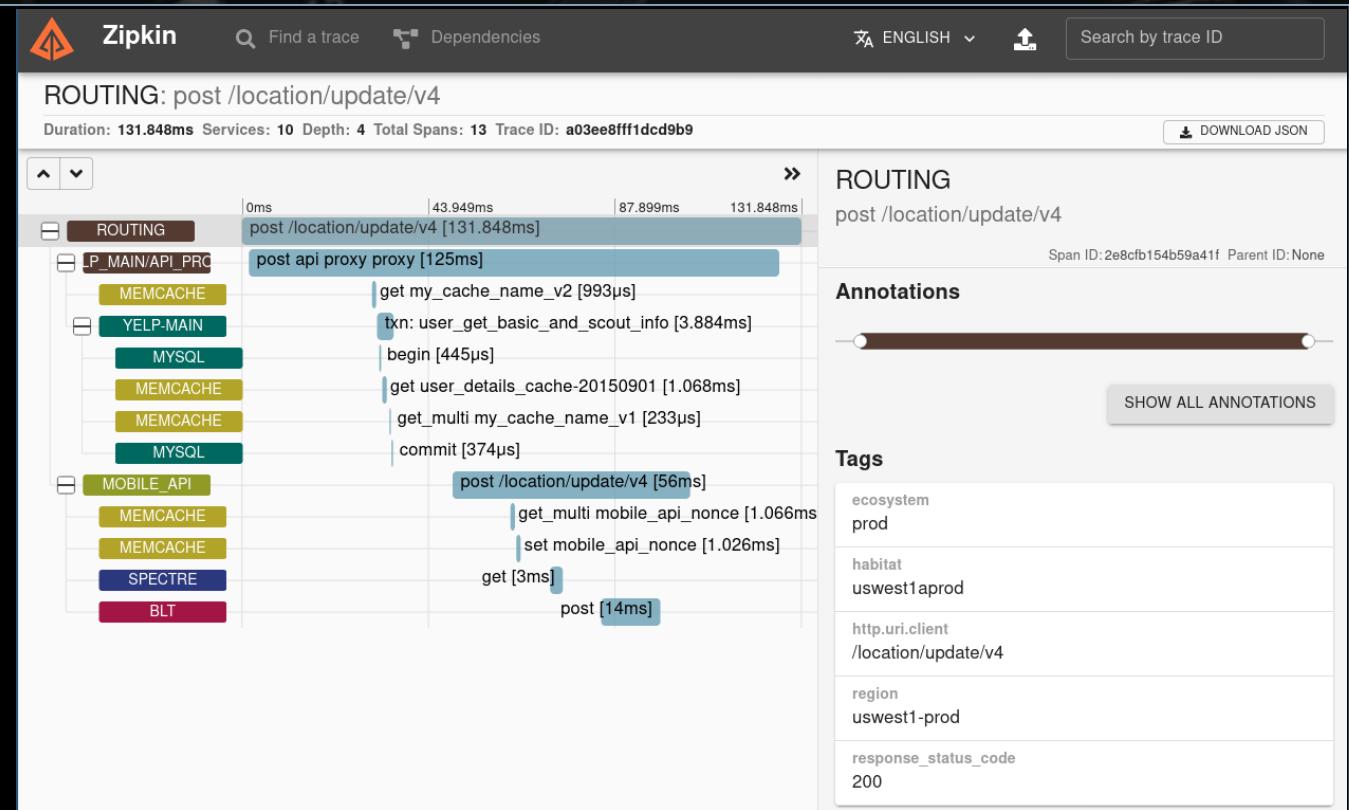
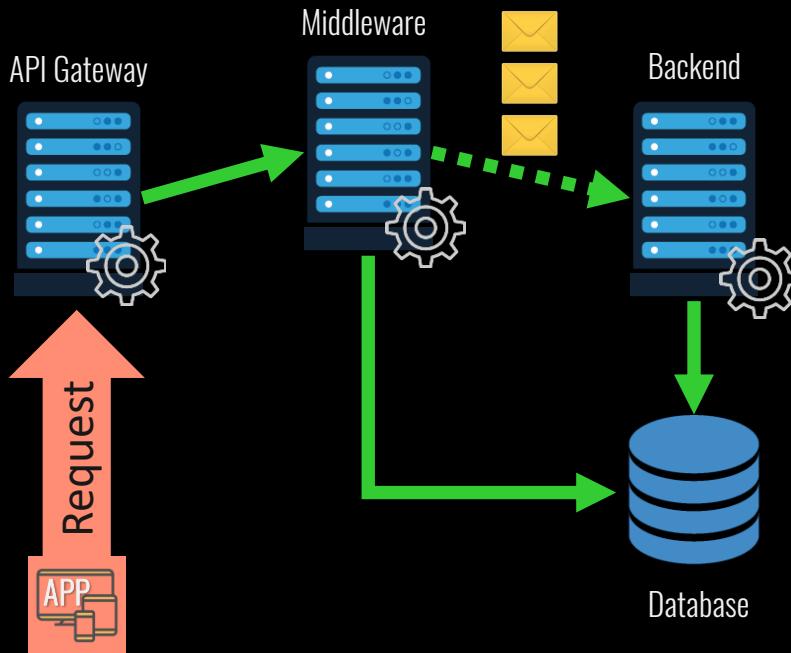
Distributed Tracing

Example



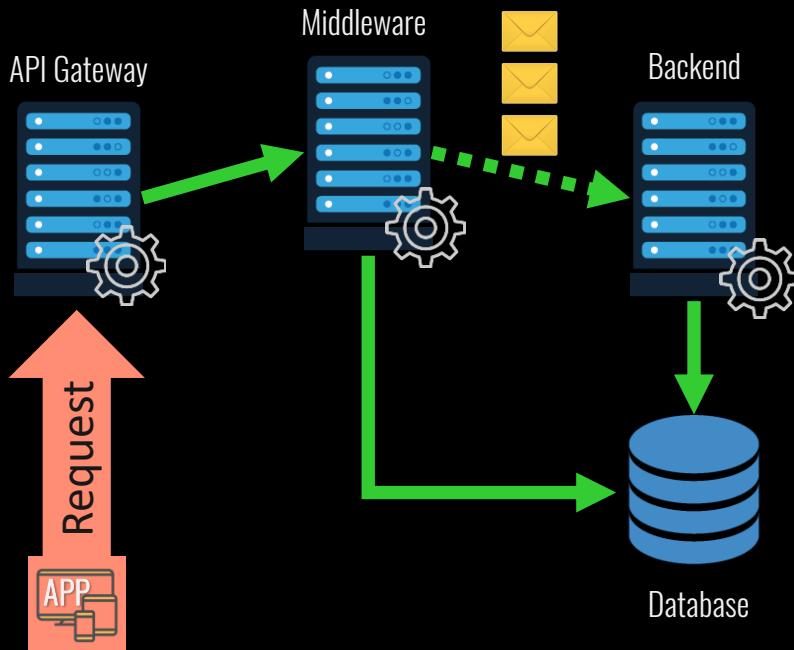
Distributed Tracing

Example



Distributed Tracing

Example



ROUTING: post /location/update/v4
Duration: 131.848ms Services: 10 Depth: 4 Total Spans: 13 Trace ID: a03ee8fff1dcd9b9

Zipkin ENGLISH Search by trace ID DOWNLOAD JSON

platformapi

Uses (traced requests)

Service Name	Call	Error
execution	14	0
bookie	17	0
gizmo	52	0
paperboy	1	0

Used (traced requests)

Service Name	Call	Error
strongman	30	0
stlogin	53	0

Distributed Tracing

Example

```
graph LR; APP[APP] -- Request --> API[API Gateway]; API --> Middleware[Middleware]; API --> Backend[Backend]; Backend --> Database[Database];
```

ROUTING: post /location/update/v4

Duration: 131.848ms Services: 10 Depth: 4 Total Spans: 10

Select... account alice app_db auth auth-service backend blt bookie

Uses (traced requests)

Service Name	Call	Error
execution	14	0
bookie	17	0
gizmo	52	0
paperboy	1	0

Used (traced requests)

Service Name	Call	Error
strongman	30	0
slogin	53	0

A photograph showing a close-up of a person's lower legs and feet. They are wearing dark blue jeans and brown leather boots with blue laces. The person is standing in a field of dry, golden-brown grass. In the background, there is a blurred landscape under a cloudy sky.

Looking at the

Modern Landscape

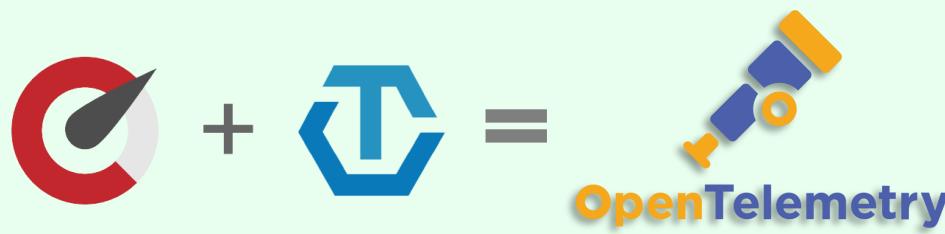
Modern Software..

- Runs natively on the cloud
- Distributed (i.e. Microservices)
- Managed by many teams
- Broad set of languages and frameworks
- Built on top of open source technologies



Enter

OpenTelemetry



@dasiths



OpenTelemetry

An observability framework for cloud-native software.

OpenTelemetry is a collection of tools, APIs, and SDKs. You can use it to instrument, generate, collect, and export telemetry data (metrics, logs, and traces) for analysis in order to understand your software's performance and behavior.



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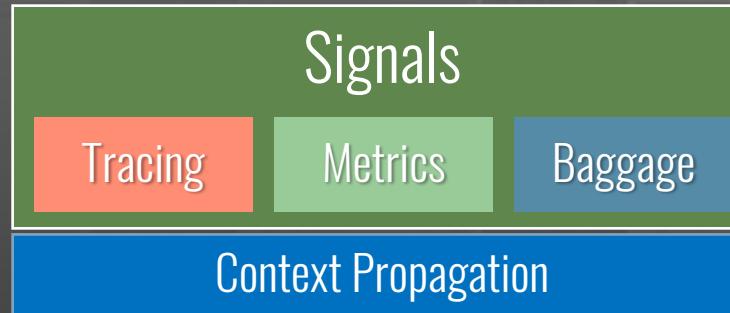
Broad Language Support

[Java](#) | [C#](#) | [Go](#) | [JavaScript](#) | [Python](#) | [Rust](#) | [C++](#) | [Erlang/Elixir](#)

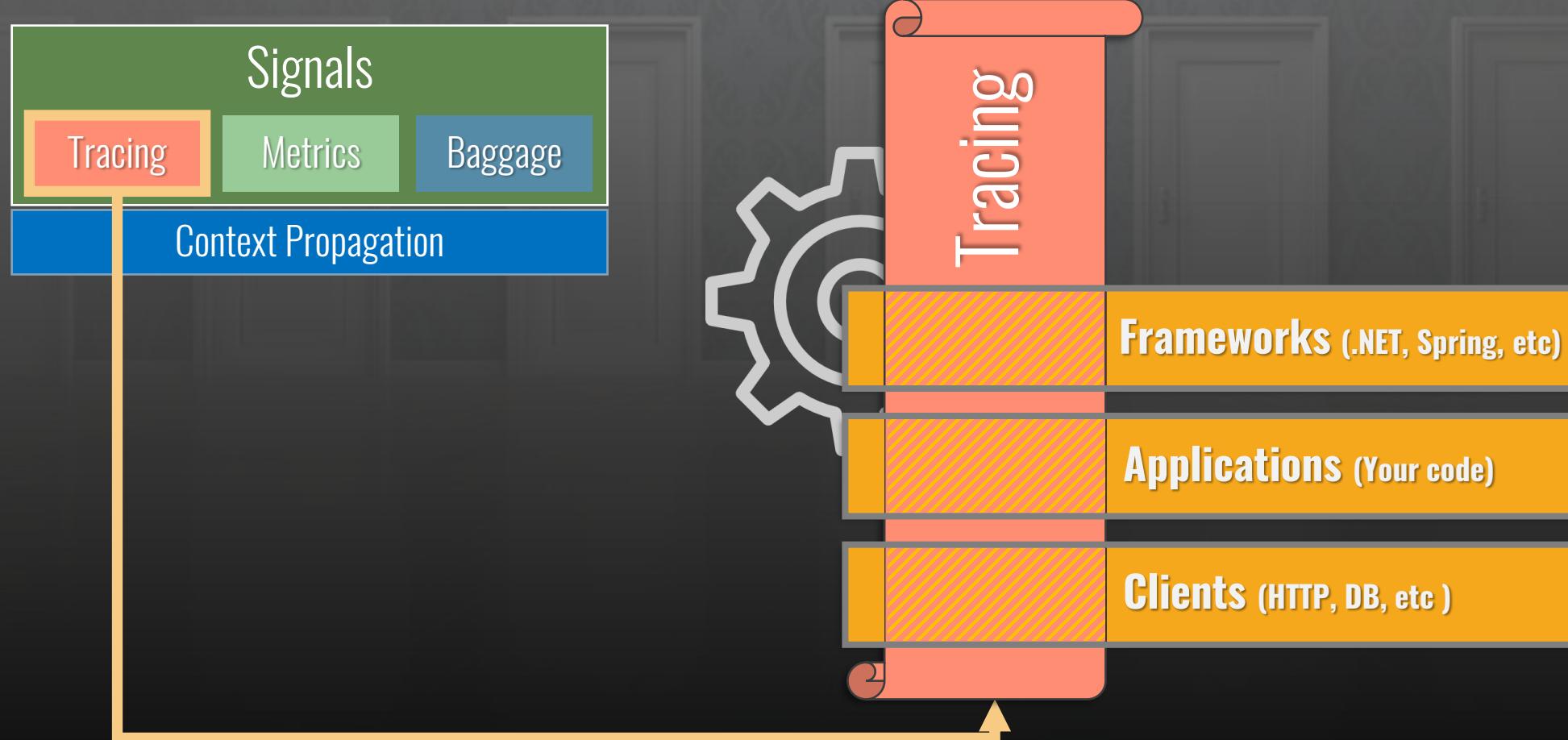
Integrates With Popular Frameworks and Libraries

[MySQL](#) | [Redis](#) | [Django](#) | [Kafka](#) | [Jetty](#) | [Akka](#) | [RabbitMQ](#) | [Spring](#) | [Quarkus](#) | [Flask](#) | [net/http](#) | [gorilla/mux](#) | [WSGI](#) | [JDBC](#) | [PostgreSQL](#)

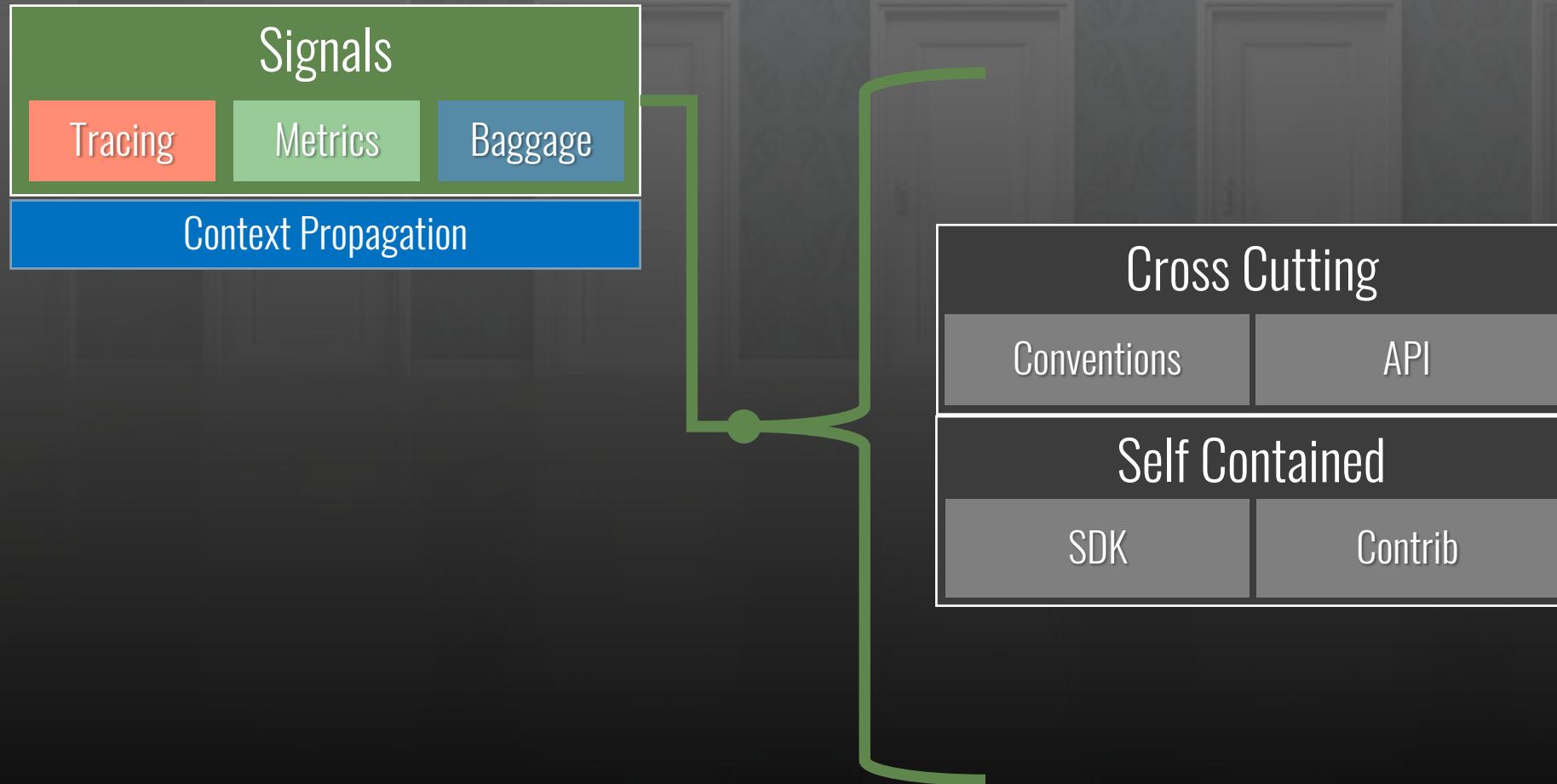
OpenTelemetry Architecture



OpenTelemetry Architecture



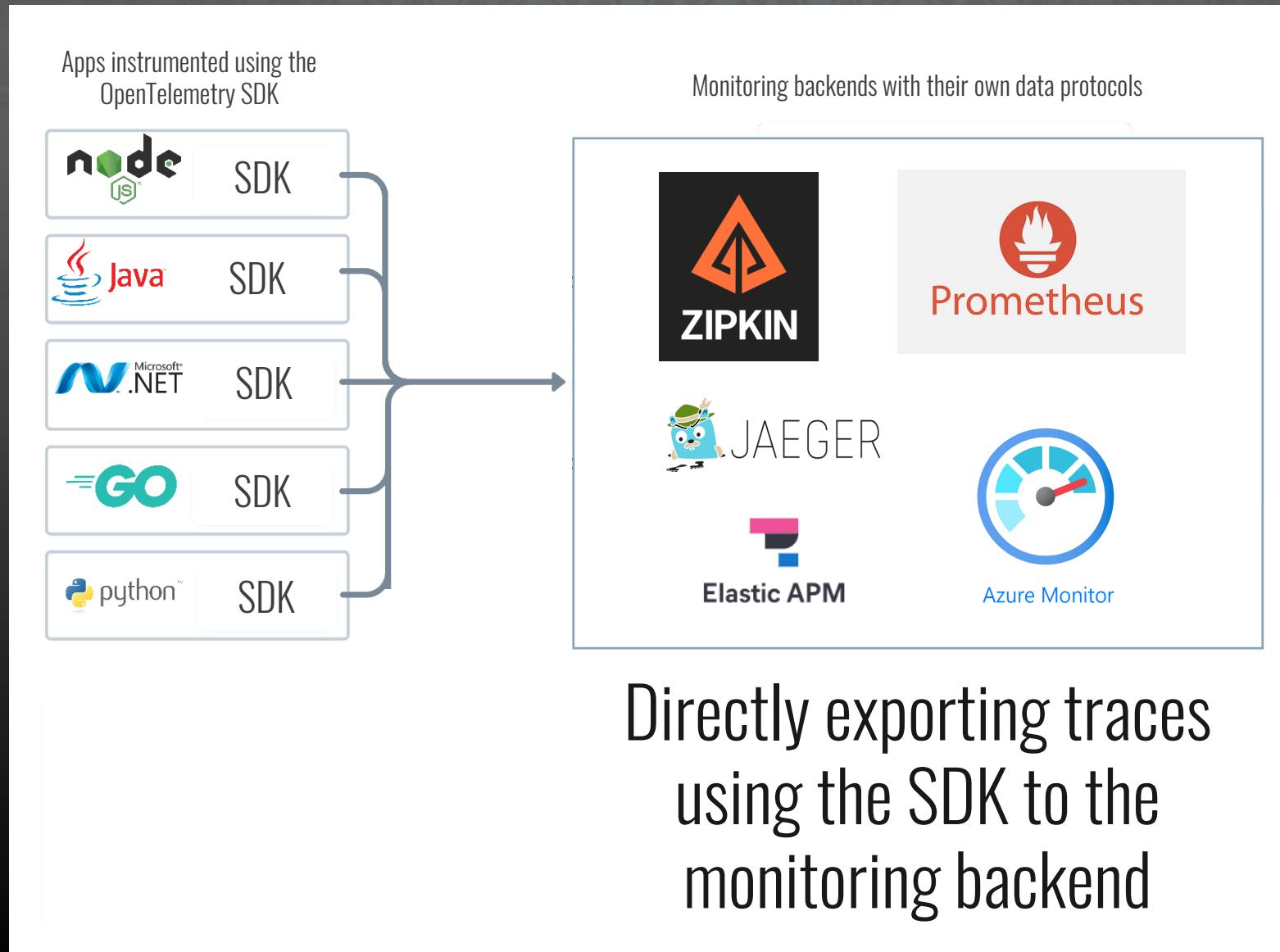
OpenTelemetry Architecture



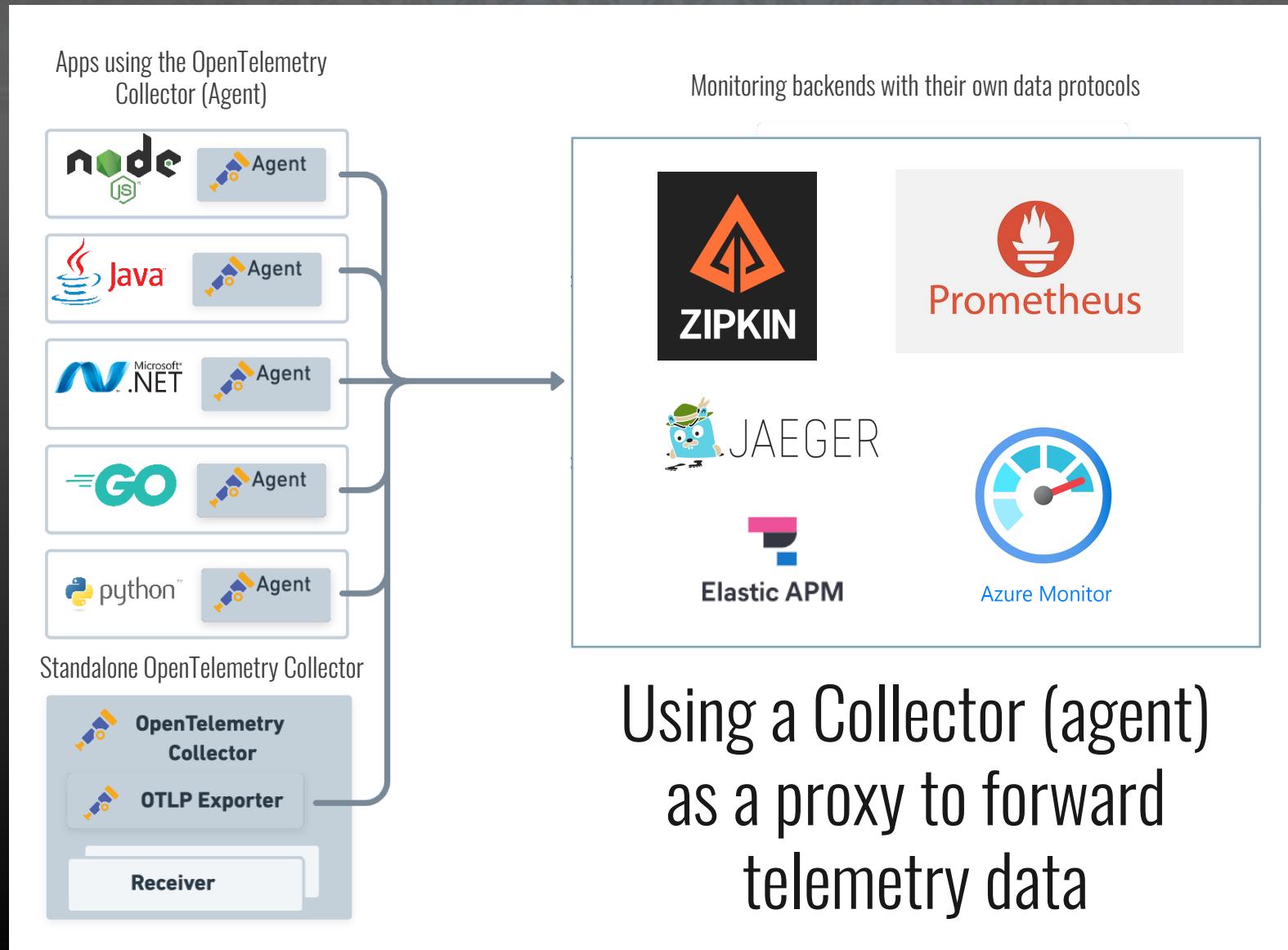
OpenTelemetry Components

- Proto
- Specification
- Instrumentation Libraries
- Collector

Collectors and Exporters



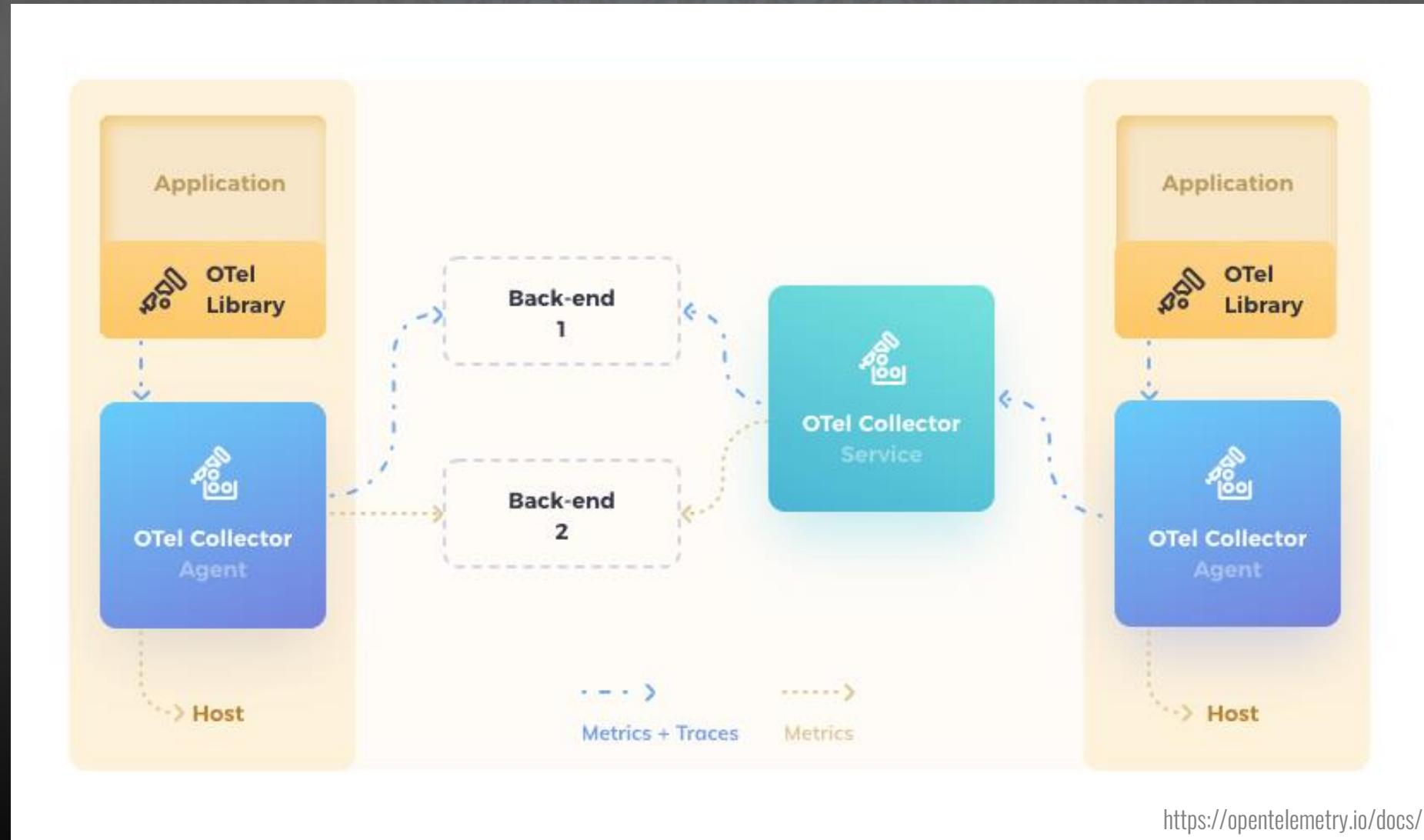
Collectors and Exporters



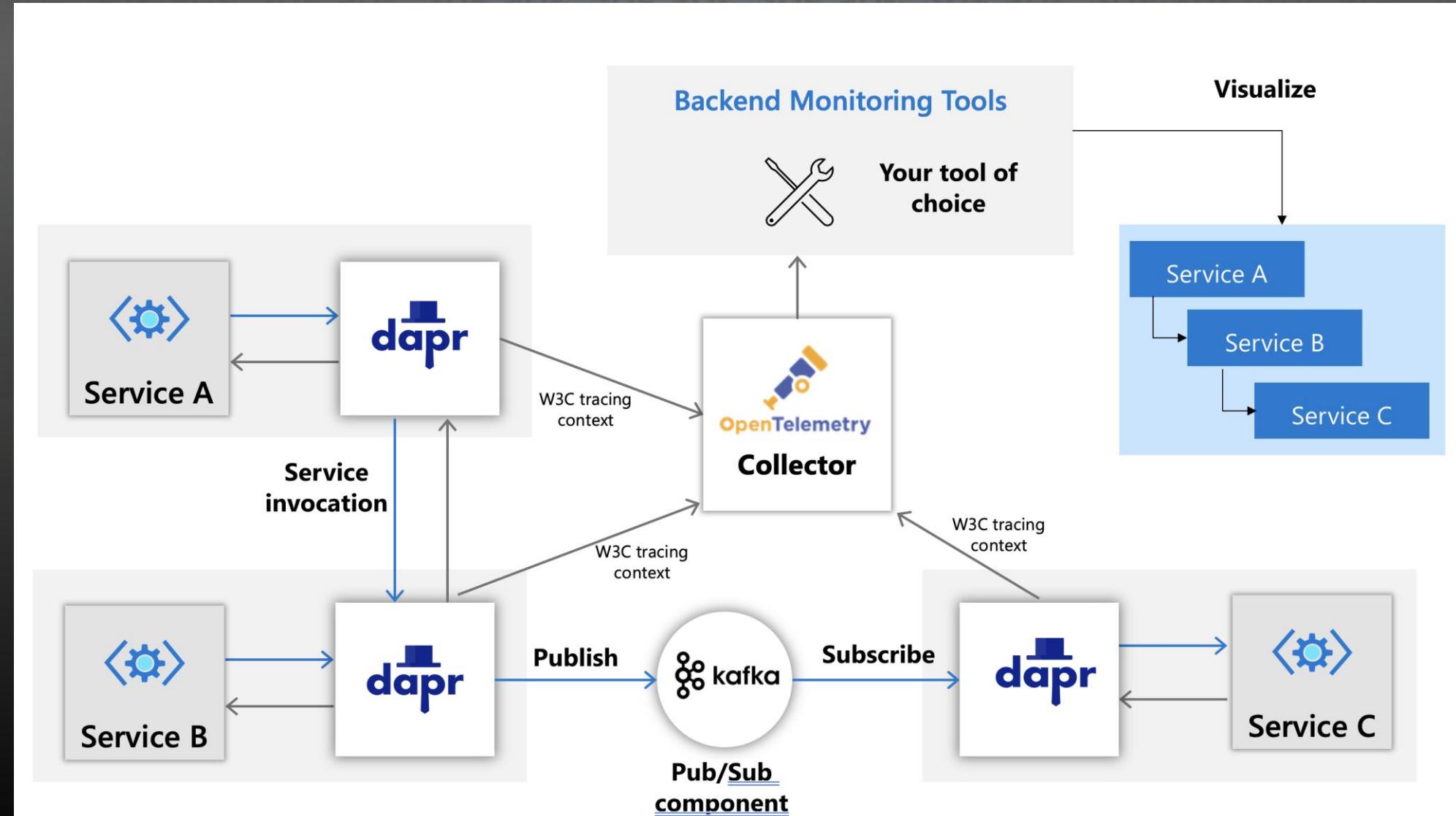
Closer Look At The Collector



Reference Architecture



Example: Dapr

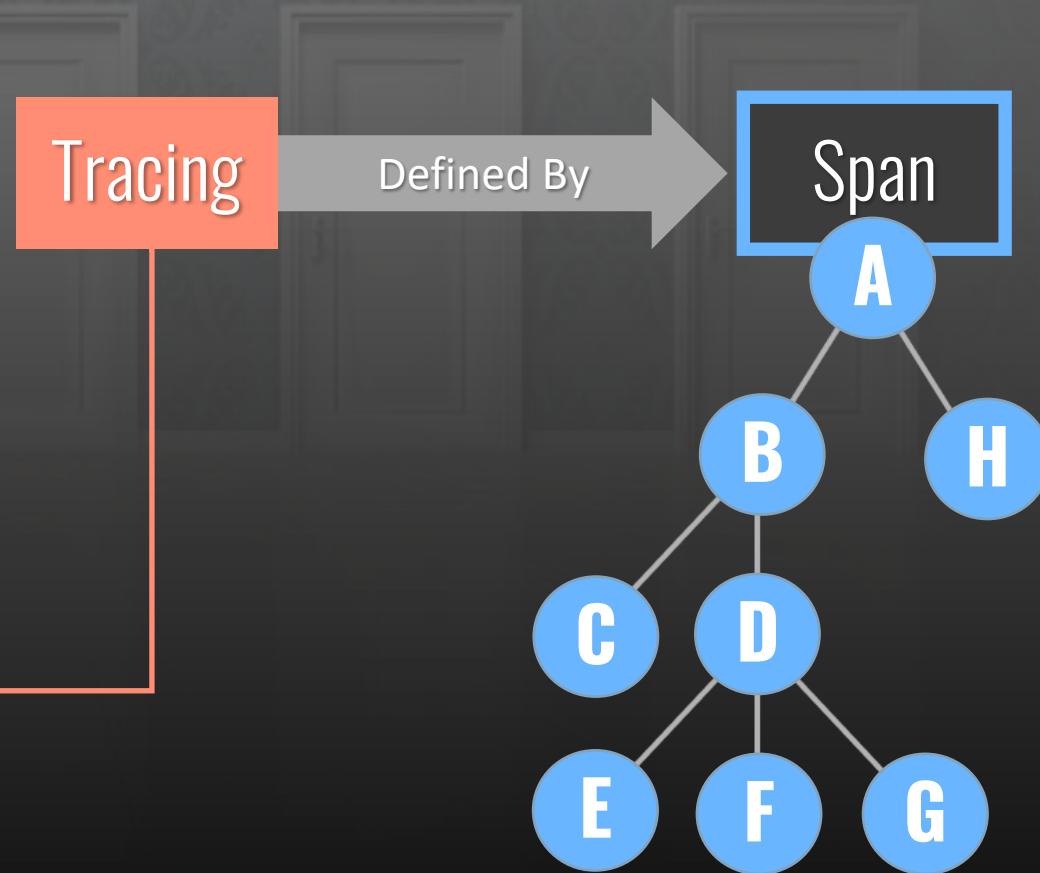
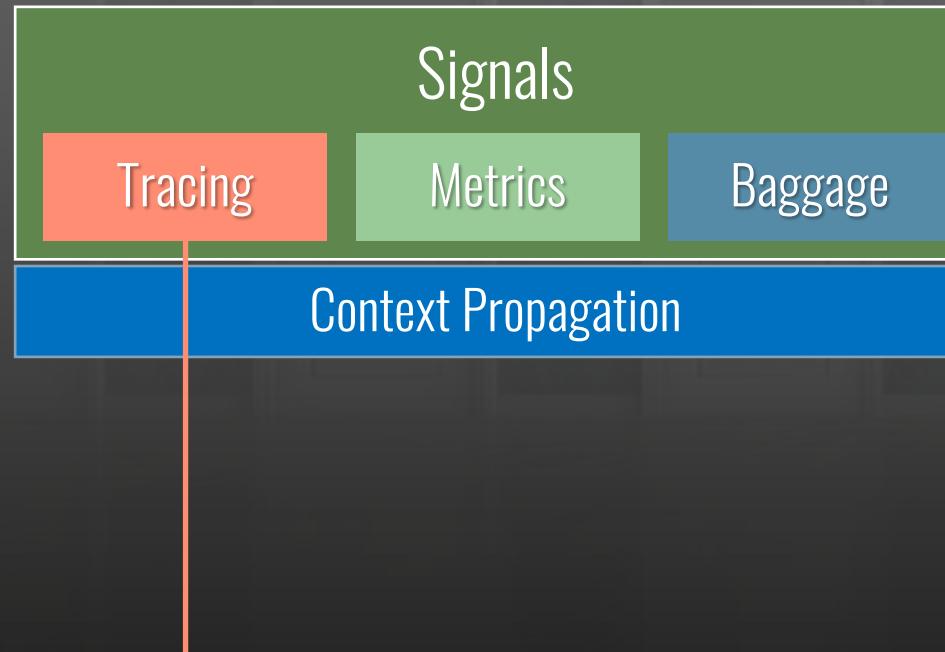


All About The

SPAN

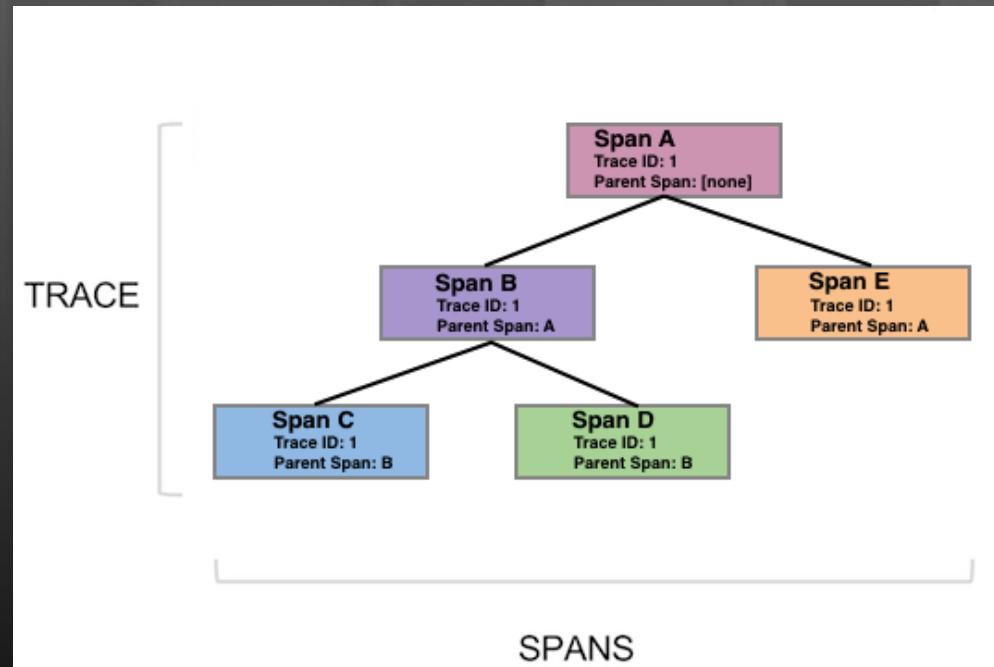


All About The Span

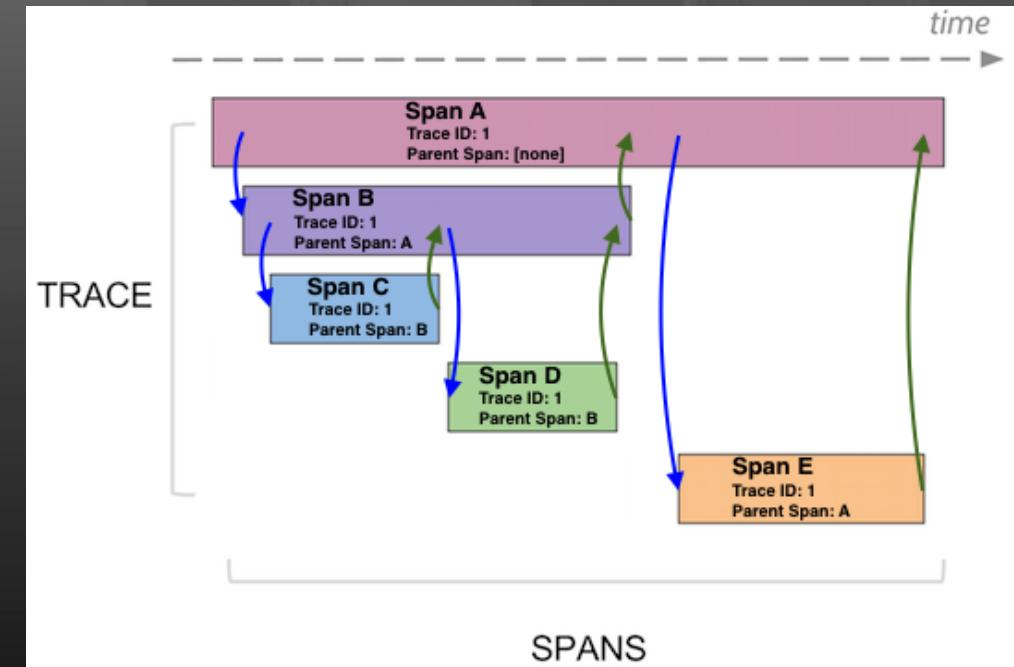


All About The Span

Casual Relationship



Temporal Relationship



Context Propagation

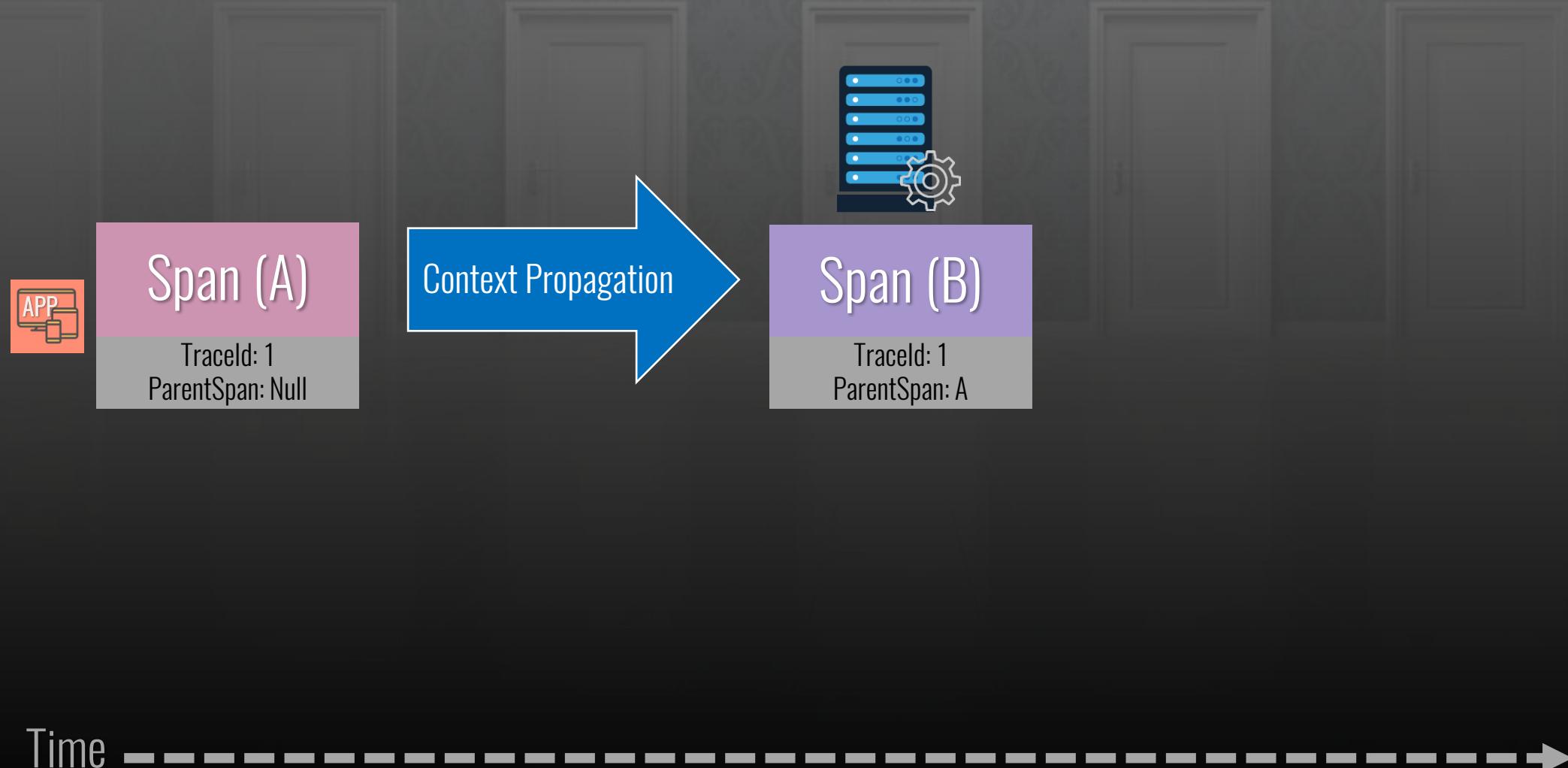


Span (A)

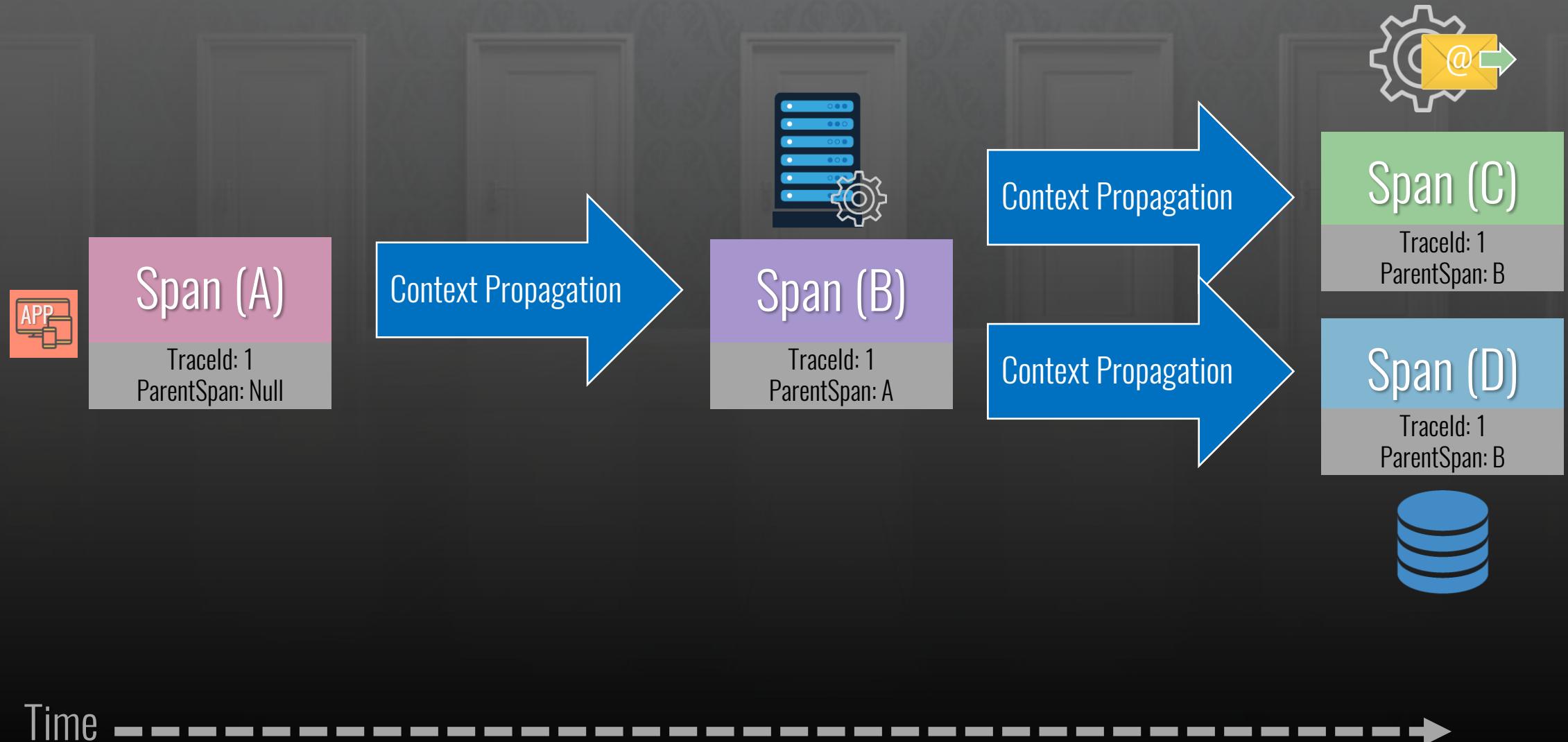
Traceld: 1
ParentSpan: Null

Time →

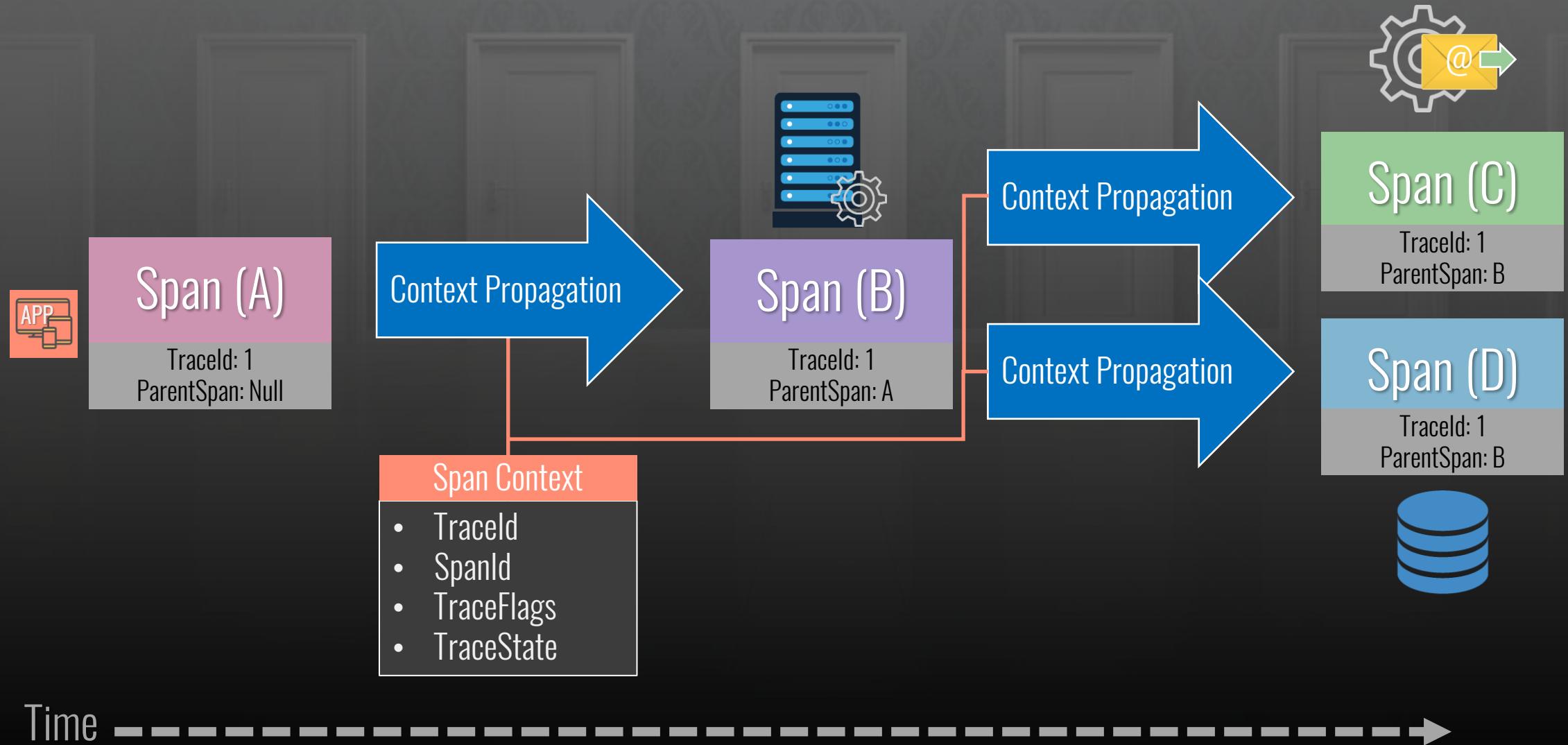
Context Propagation



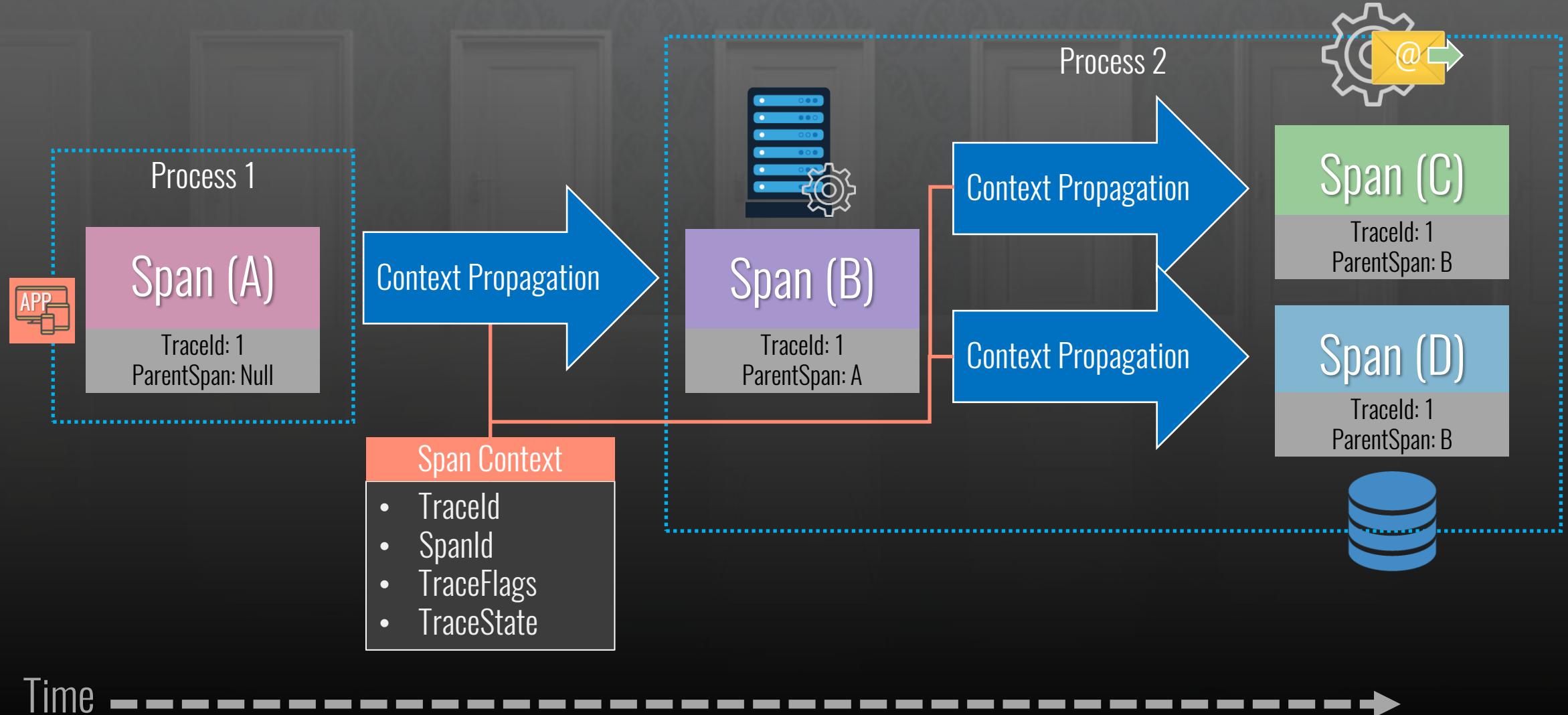
Context Propagation



Context Propagation

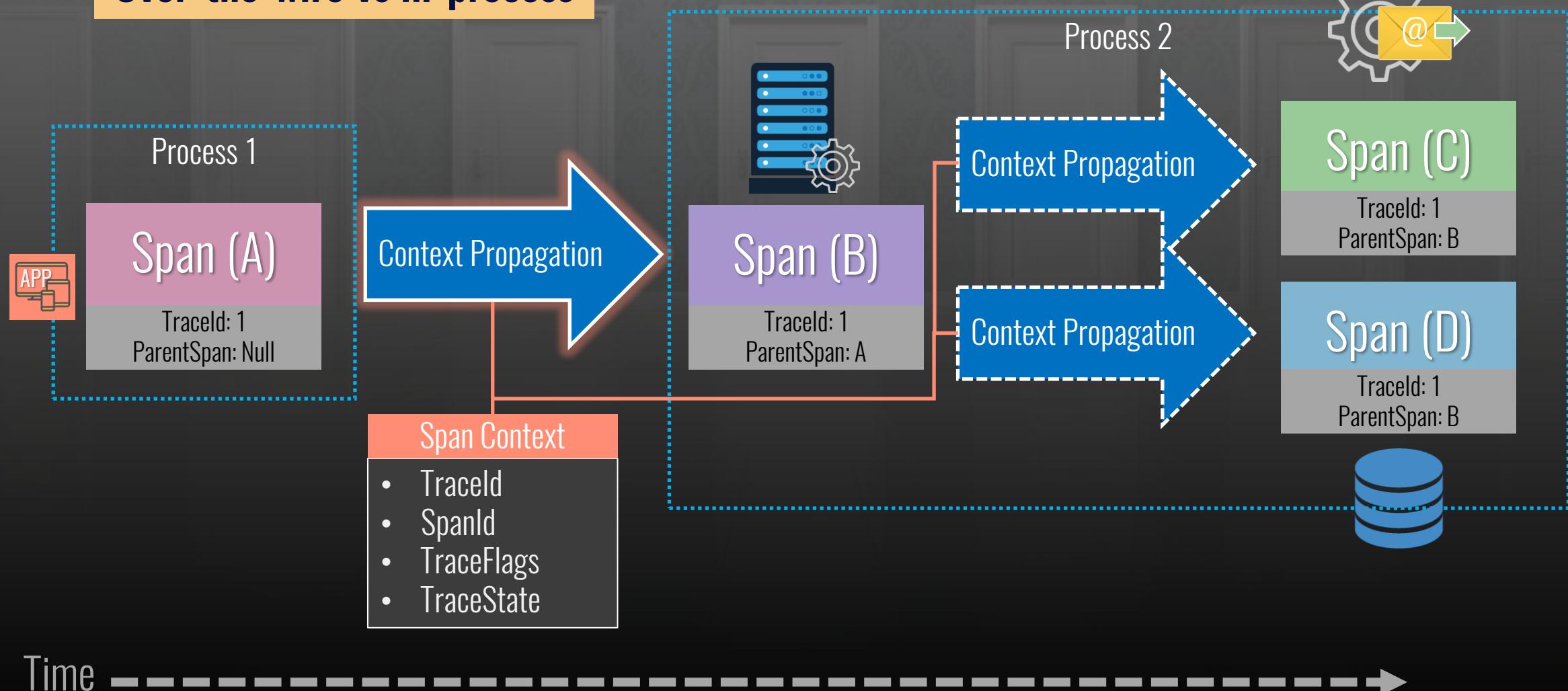


Context Propagation



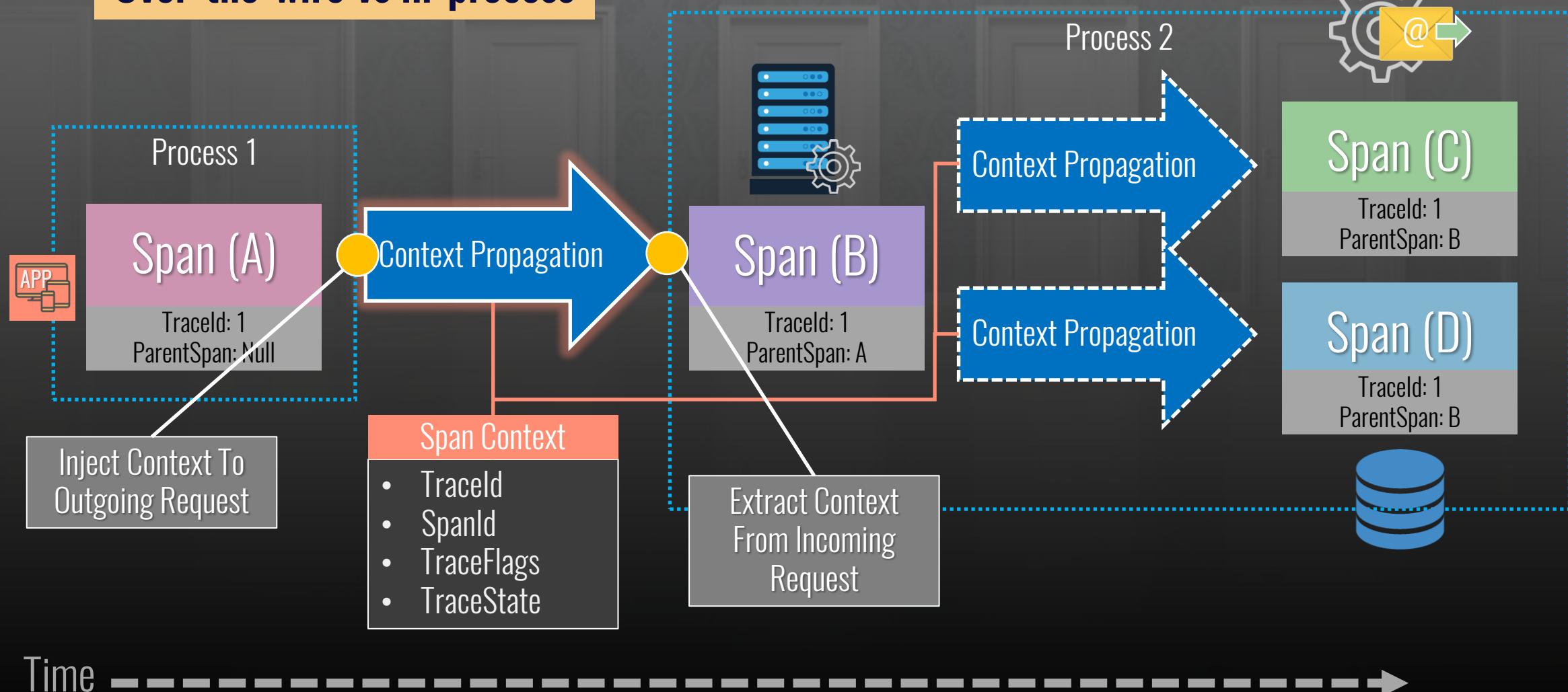
Context Propagation

Over-the-wire vs in-process

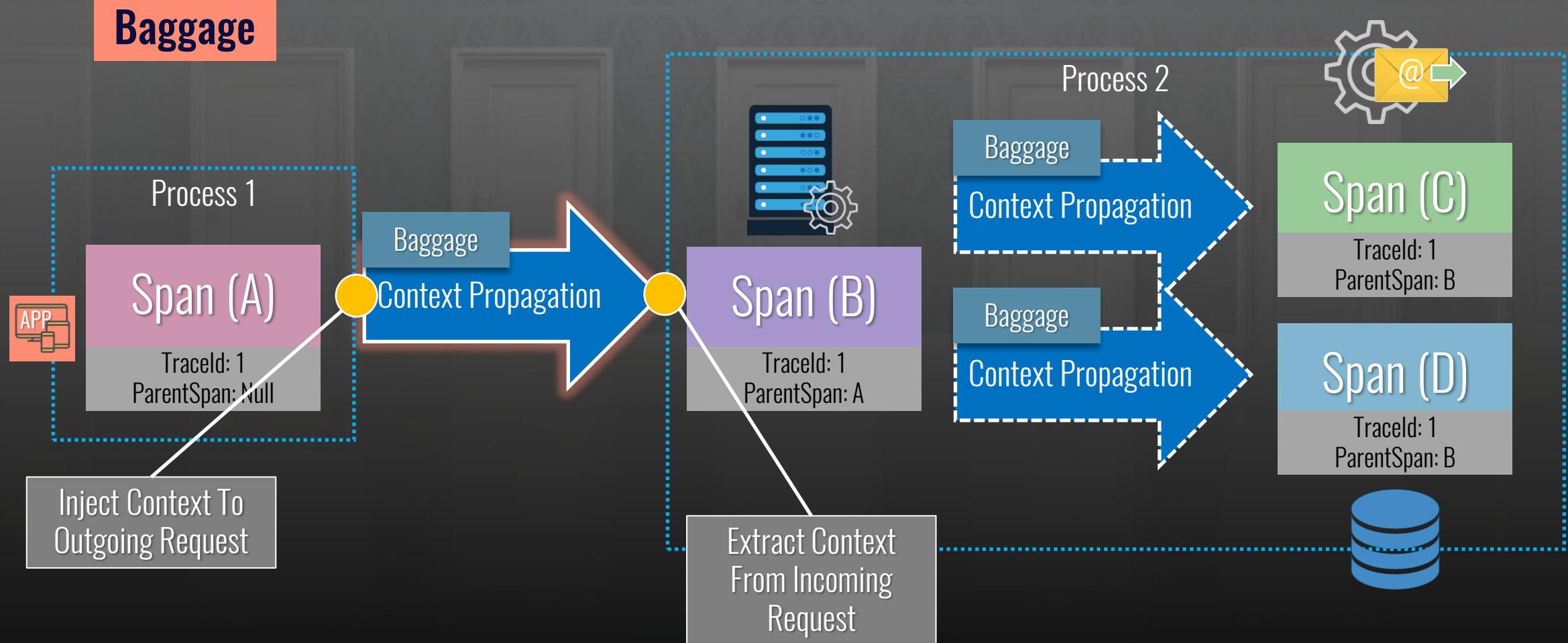


Context Propagation

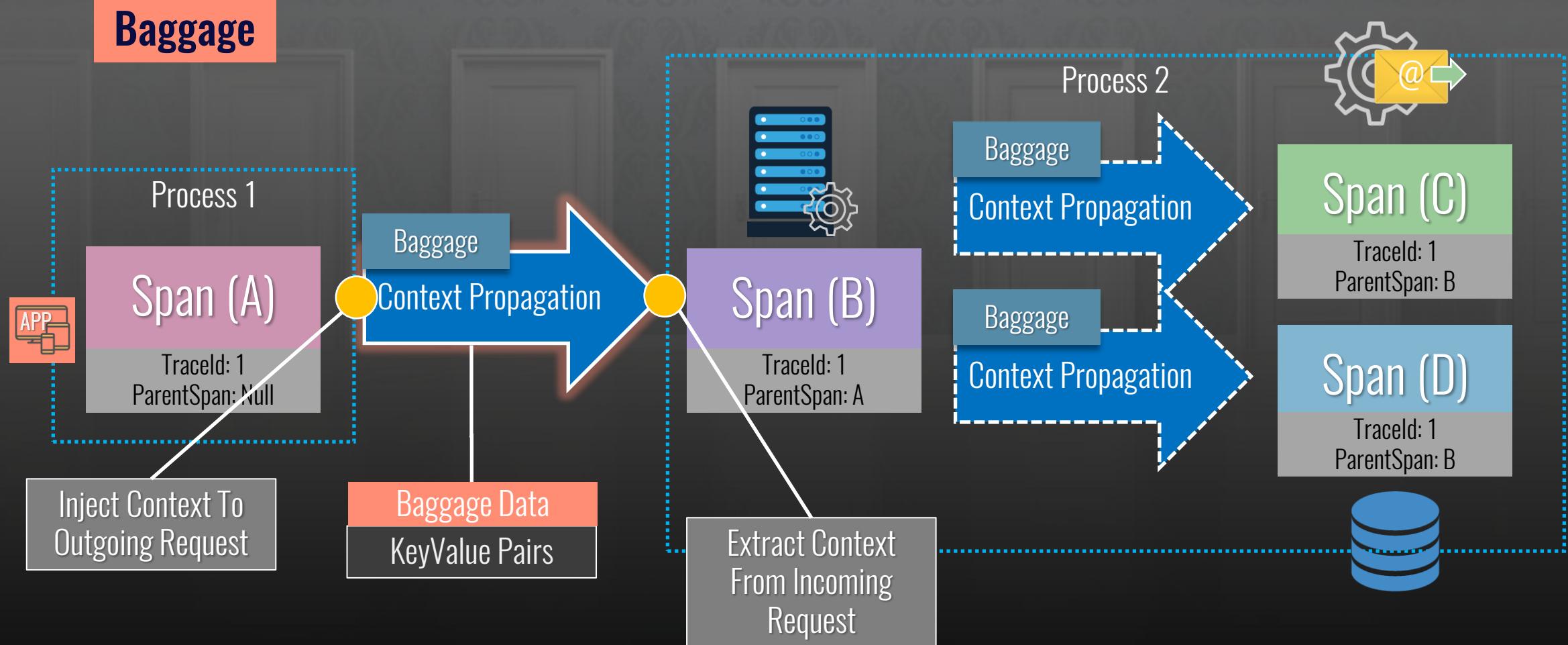
Over-the-wire vs in-process



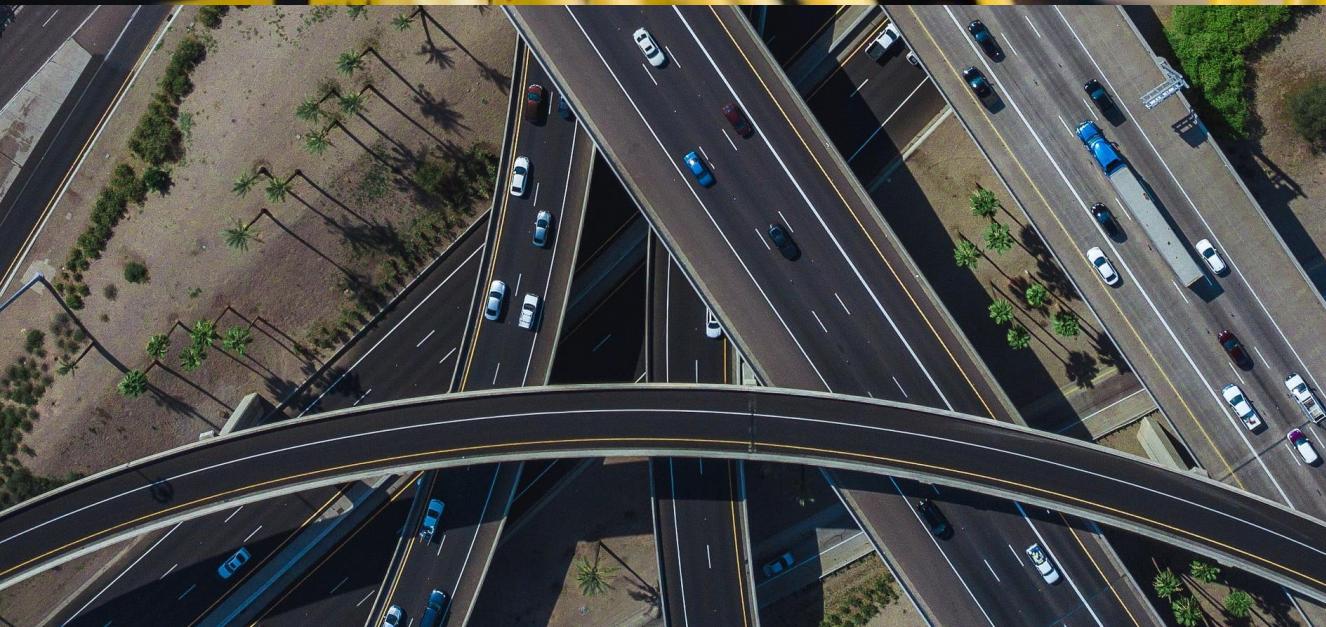
Context Propagation



Context Propagation



<https://github.com/dasiths/OpenTelemetryDistributedTracingSample>



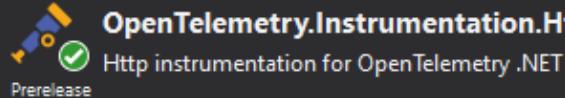
DEMO



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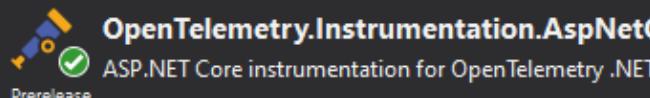
Demo Highlights

- Span (Activity) + Baggage
 - Trace Context, Parent->Child, Tags, Events
- Context Propagation
 - Injecting & extracting, built-in vs custom instrumentation
 - HTTP W3C trace context vs custom serialisation
- Exporting
 - Forwarding to & observing the traces in Zipkin



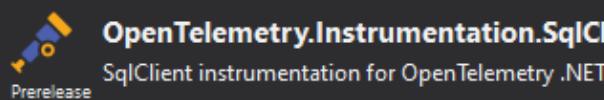
OpenTelemetry.Instrumentation.Http by OpenTelemetry Authors, 1.25M downloads

Http instrumentation for OpenTelemetry .NET



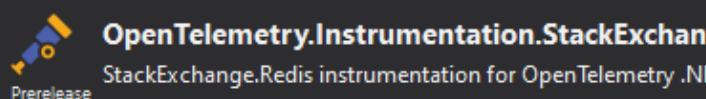
OpenTelemetry.Instrumentation.AspNetCore by OpenTelemetry Authors, 1.39M downloads

ASP.NET Core instrumentation for OpenTelemetry .NET



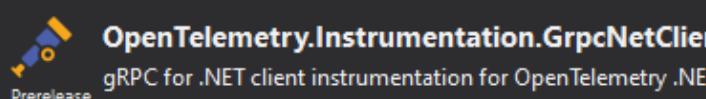
OpenTelemetry.Instrumentation.SqlClient by OpenTelemetry Authors, 497K downloads

SqlClient instrumentation for OpenTelemetry .NET



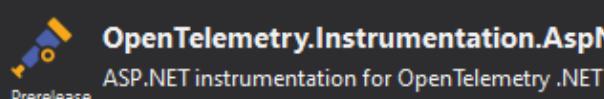
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StackExchange.Redis instrumentation for OpenTelemetry .NET



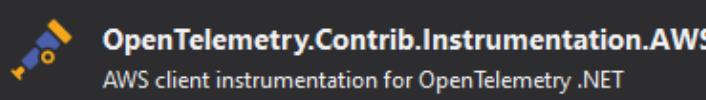
OpenTelemetry.Instrumentation.GrpcNetClient by OpenTelemetry Authors

gRPC for .NET client instrumentation for OpenTelemetry .NET



OpenTelemetry.Instrumentation.AspNet by OpenTelemetry Authors, 6

ASP.NET instrumentation for OpenTelemetry .NET



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AWS client instrumentation for OpenTelemetry .NET



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AWS Lambda tracing wrapper for OpenTelemetry .NET



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OpenTelemetry instrumentation for WCF



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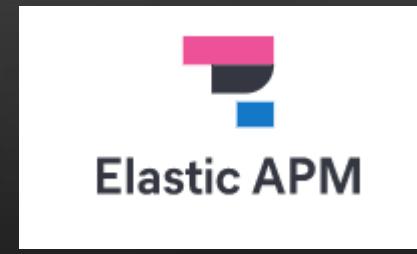
.NET gRPC Core based client and server interceptors for OpenTelemetry.



OpenTelemetry.Contrib.Instrumentation.ElasticsearchClient by OpenTelemetry authors, 8.24K downloads

Elasticsearch instrumentation for OpenTelemetry .NET

Exporters (Traces + Metrics)



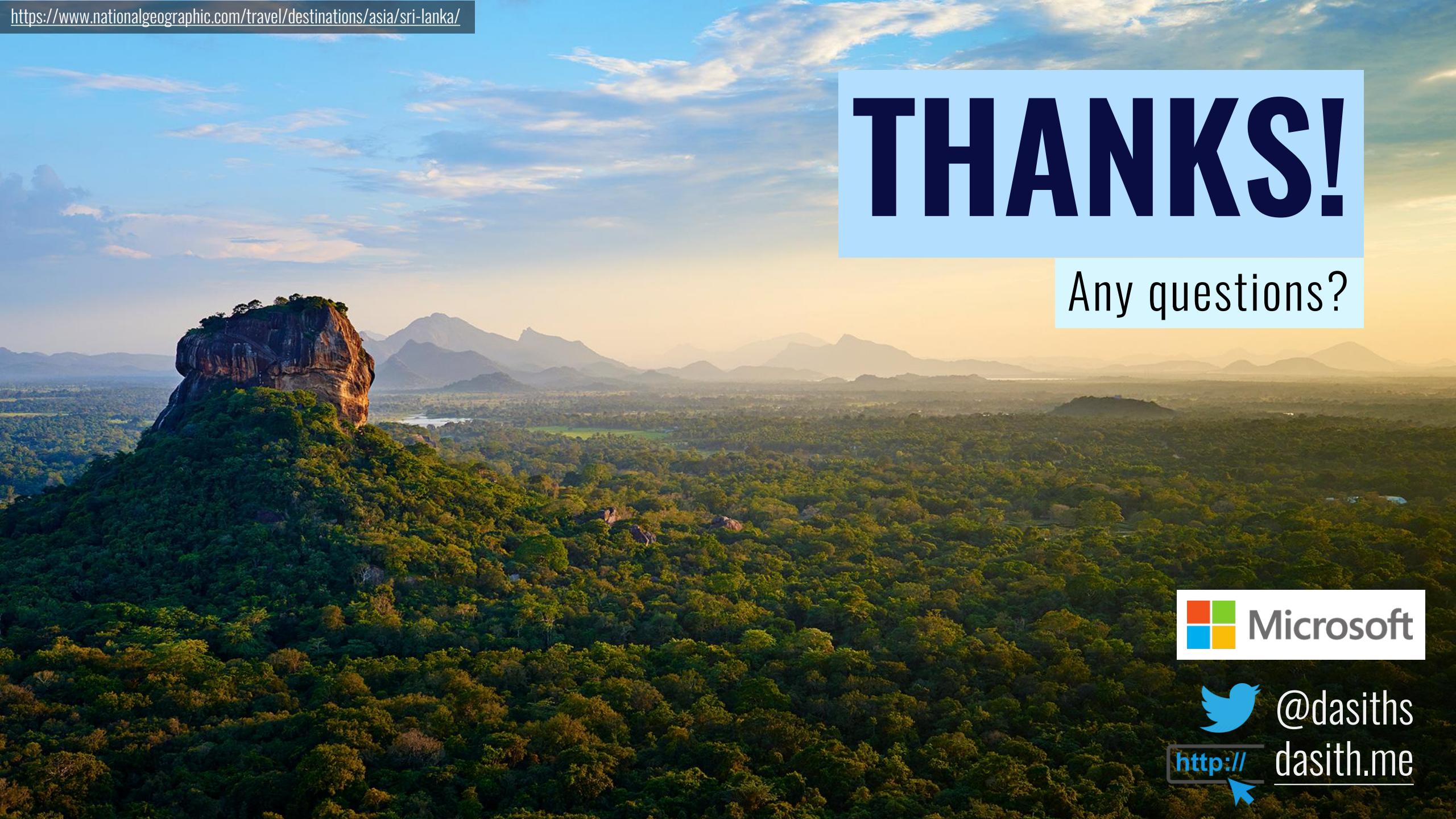
And lots more...

Start using OpenTelemetry today!

Distributed tracing is essential for performance and reliability of modern cloud native software.

It's no longer a "nice to have".



The background image shows a vast landscape of Sri Lanka. On the left, the iconic Sigiriya Rock stands prominently against a backdrop of rolling green hills and mountains under a clear blue sky. The foreground is filled with dense green vegetation.

THANKS!

Any questions?



CREDITS

Special thanks to all people who made and shared these awesome resources for free:

- Presentation template designed by powerpointify.com
- Photographs by unsplash.com

Free Fonts used:

<https://www.fontsquirrel.com/fonts/oswald>



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