

011y with Toli

102 - June 2022

Choosing Traces over Logs



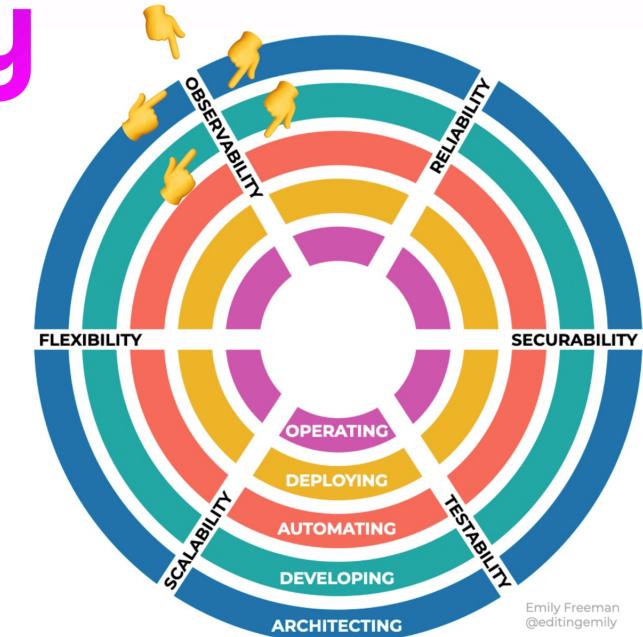
Huh?!

Observability matters.

Olly with Toli

May 2022

cinch



cinch

cinch

011y with Toli

102 - June 2022



Choosing Traces over Logs

cinch



Greg Farrow Thursday 11:59

🏛 Who is the Greek God of Observability? ⚡

No, it's not Zeus, it's Toli.



👍 2 ❤️ 6 😊 17



Do you ever wonder what all the fuss is about when it comes to Observability and the push to switch from using Logs to Traces? I do too! **Good news!** Our very own Greek God of Observability is going to explain why Traces can be so much more useful than logs in a talk on **Monday**.

If you are interested then join the Observability Community Day on Monday. We're in the office and also remote. **Everyone welcome** ❤️

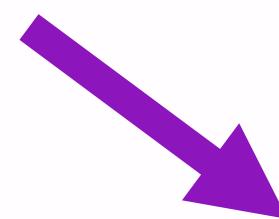
Just give me a shout for an invite, or turn up on Monday

[Greg Farrow: O11y Day #2 \(13th Jun\)](#)

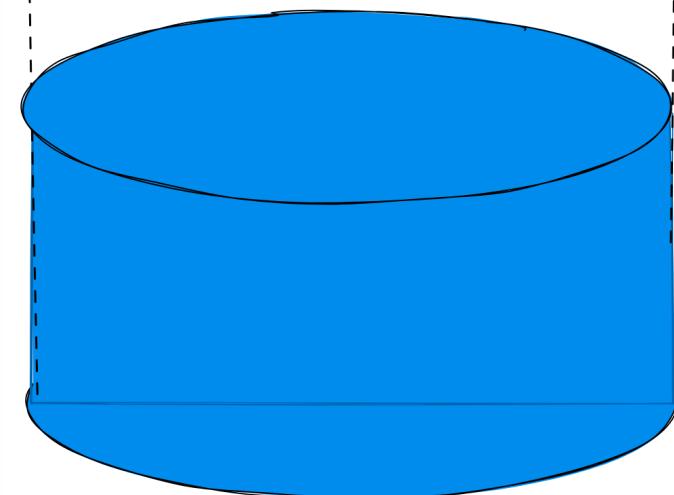
posted in [cinch Engineering / Ask Observability](#) at 6 June 2022 09:57:19 BST

“That's how excited people
are about learning about
logs”

Cognitive (observability) Load



Thinking



Which GUID is mine?

CloudWatch > Log groups > /aws/api-gateway/hello-component-dev

/aws/api-gateway/hello-component-dev

Actions ▾ View in Logs Insights Search log group

► Log group details

Log streams Metric filters Subscription filters Contributor Insights Tags

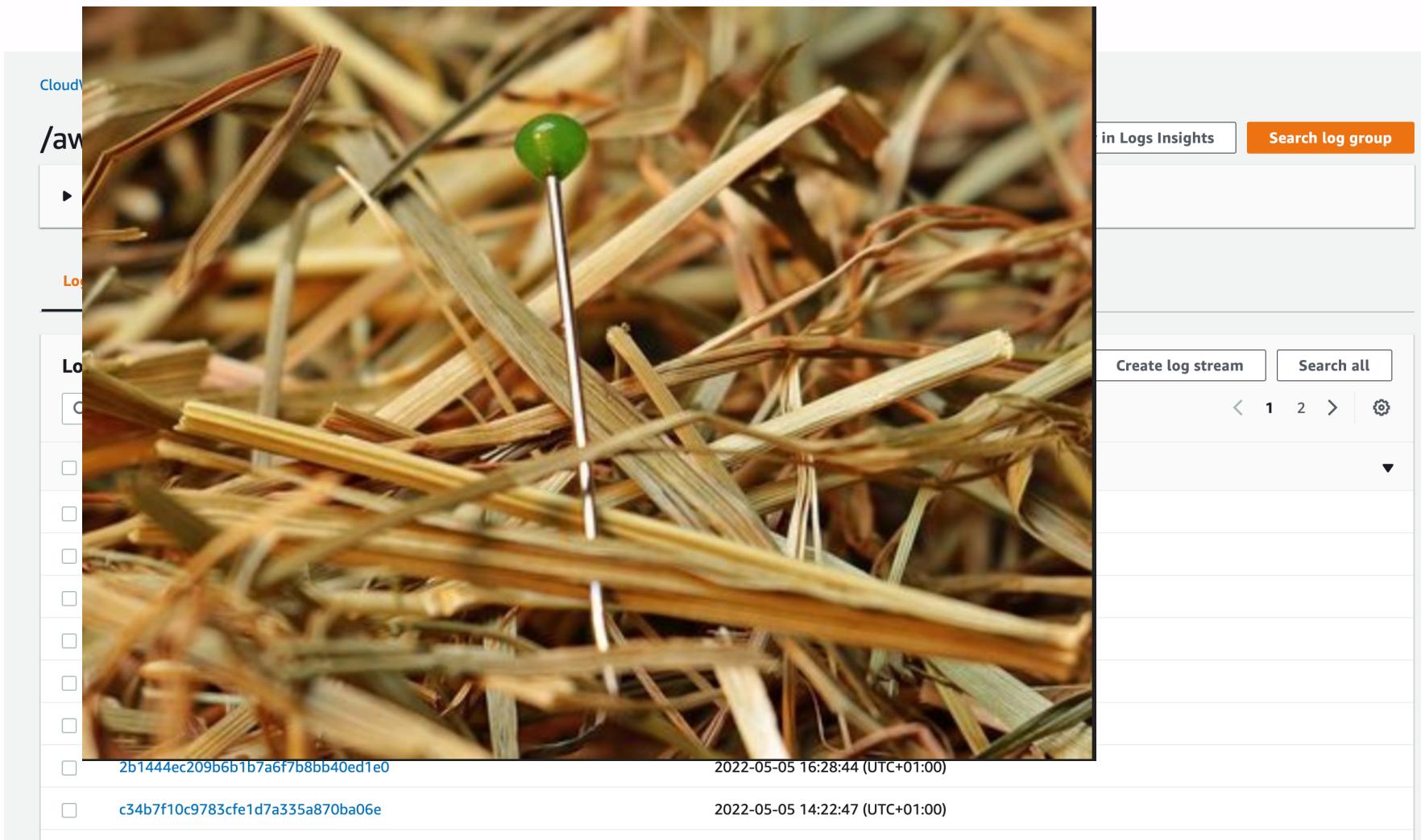
Log streams (78)

Filter log streams or try prefix search

C Delete Create log stream Search all

<input type="checkbox"/>	Log stream	Last event time
<input type="checkbox"/>	156f6d0a3cd815dc7fc34a3e3f7472c7	2022-05-06 13:40:25 (UTC+01:00)
<input type="checkbox"/>	c57b85cc9c121a91b636080d1a5a7011	2022-05-06 12:54:34 (UTC+01:00)
<input type="checkbox"/>	2b51f4d14bf5d3a3a657aee369f68ca1	2022-05-06 12:54:33 (UTC+01:00)
<input type="checkbox"/>	3de164f29b35652d16992d2d6689b3f6	2022-05-06 12:54:32 (UTC+01:00)
<input type="checkbox"/>	6f9fae46bb68b420816ce38e80e5a7b9	2022-05-06 12:54:31 (UTC+01:00)
<input type="checkbox"/>	e95e733cee6cacac9f8c165f2c05f9da	2022-05-06 12:54:31 (UTC+01:00)
<input type="checkbox"/>	2b1444ec209b6b1b7a6f7b8bb40ed1e0	2022-05-05 16:28:44 (UTC+01:00)
<input type="checkbox"/>	c34b7f10c9783cf1d7a335a870ba06e	2022-05-05 14:22:47 (UTC+01:00)

Which GUID is mine?



Random message hell

CloudWatch > Log groups > /aws/lambda/MarketplaceFulfilmentProcess-EventProducerF5BCB1AE-PFGDX1L5TL3T > 2021/04/16/[LATEST]773712c11c5d4835af5646cc5ef25e8f

Log events
You can use the filter bar below to search for and match terms, phrases, or values in your log events. [Learn more about filter patterns](#)

View as text C Actions ▾ Create Metric Filter

Filter events Clear 1m 30m 1h 12h Custom ⚙️

▶	Timestamp	Message
No older events at this moment. Retry		
▶	2021-04-16T11:23:44.180+01:00	START RequestId: b12ef268-a662-46db-8f33-59ae0d345380 Version: \$LATEST
▶	2021-04-16T11:23:44.260+01:00	{"e":1618568624.259,"m":"aws.lambda.enhanced.invocations","t":[{"region:eu-west-1","account_id:563314216495","functionname:Marketpl..."}]
▶	2021-04-16T11:23:44.300+01:00	{"batch": [{"eventID": "9d5a5ba7c8b753d5edcc9fff51757b0c", "eventName": "INSERT", "eventVersion": "1.1", "eventSource": "aws:dynamodb", "aw..."}]}
▶	2021-04-16T11:23:44.302+01:00	{"newState": "sold", "level": "info", "message": "New fulfilment state", "timestamp": "2021-04-16 10:23:44"}
▶	2021-04-16T11:23:44.340+01:00	{"event": {"EventBusName": "fulfilmentsupporttestLocalEventBusB06F12AA", "Source": "PartnerMarketplace", "DetailType": "FulfilmentStarte..."}}, {"traces": [{"trace_id": "78f18009500ad02a", "span_id": "28e87a003f59f38f", "parent_id": "78f18009500ad02a", "name": "http.request", "reso..."}]}
▶	2021-04-16T11:23:44.640+01:00	{"traces": [{"trace_id": "78f18009500ad02a", "span_id": "28e87a003f59f38f", "parent_id": "78f18009500ad02a", "name": "http.request", "reso..."}]}
▶	2021-04-16T11:23:44.699+01:00	END RequestId: b12ef268-a662-46db-8f33-59ae0d345380
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▶	2021-04-16T11:23:44.718+01:00	START RequestId: 11e2fc6f-0706-418c-8196-173bdc26083d Version: \$LATEST
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▶	2021-04-16T11:23:44.788+01:00	END RequestId: 11e2fc6f-0706-418c-8196-173bdc26083d
▶	2021-04-16T11:23:44.788+01:00	REPORT RequestId: 11e2fc6f-0706-418c-8196-173bdc26083d Duration: 67.01 ms Billed Duration: 68 ms Memory Size: 256 MB Max Memory Us...
No newer events at this moment. Auto retry paused. Resume		

Random message hell

START

END

REPORT

CloudWatch > Log groups > /aws/lambda/MarketplaceFulfilmentProcess-EventProducerF5BCB1AE-PFGDX1L5TL3T > 2021/04/16/[LATEST]773712c11c5d4835af5646cc5ef25e8f

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View as text [C](#) Actions ▾ Create Metric Filter

Filter events Clear 1m 30m 1h 12h Custom [Custom](#) [⚙️](#)

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Random message hell

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REPORT

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events

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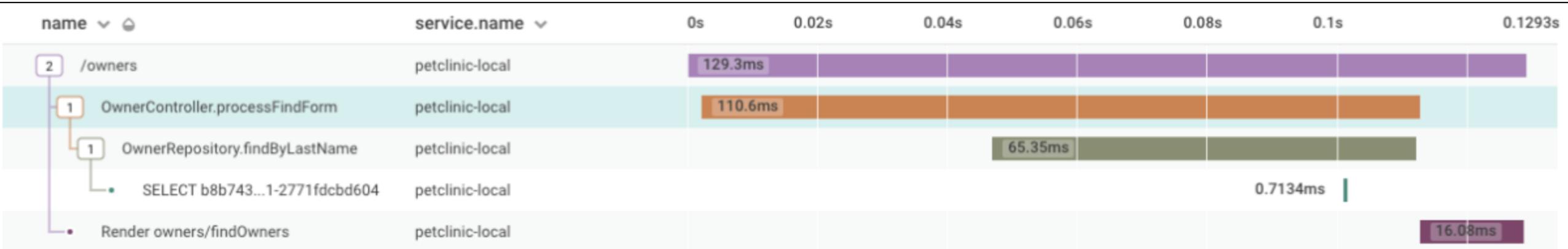
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Getting insights doesn't need to be
this hard.

It can be pretty.

And elegant.

And fun.



BREAK DOWN

flags.varstring

CALCULATE PER GROUP

COUNT

SUM(count)

AVG(cum_write_latency_msec)

AVG(cum_write_latency_msec)

FILTER

None; include all rows

ORDER

COUNT desc

LIMIT

None

Run Query

Run a month ago

Query at 7/10 3:21PM (Click to edit)

7/5 6:21am to 7/5 5:35pm

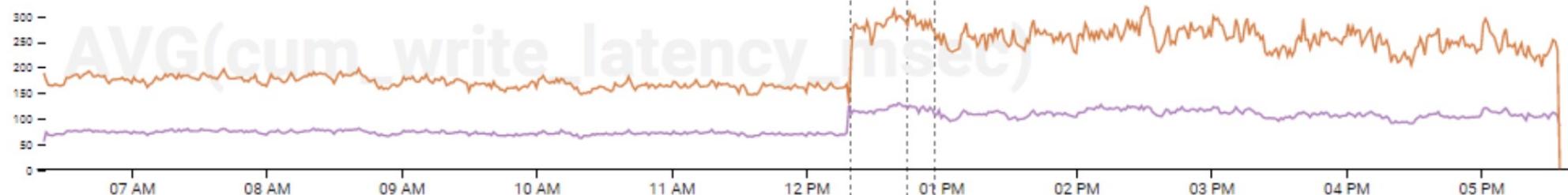
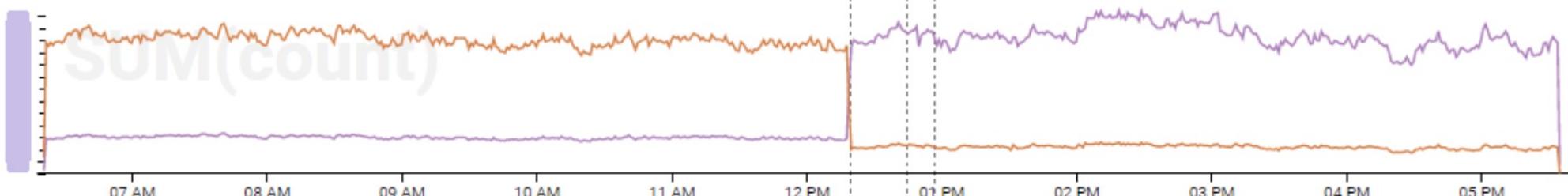
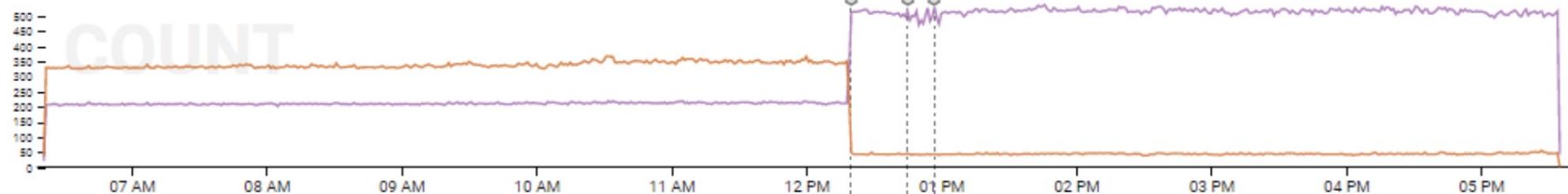
→ REL

Add to Playlist

Share

View Raw Data

Graph Settings



You will want to put
Observability concepts on
your CV.

What are the competing observability ideologies?

What are the competing observability ideologies?

What are Logs, Metrics and Traces?

What are the competing observability ideologies?

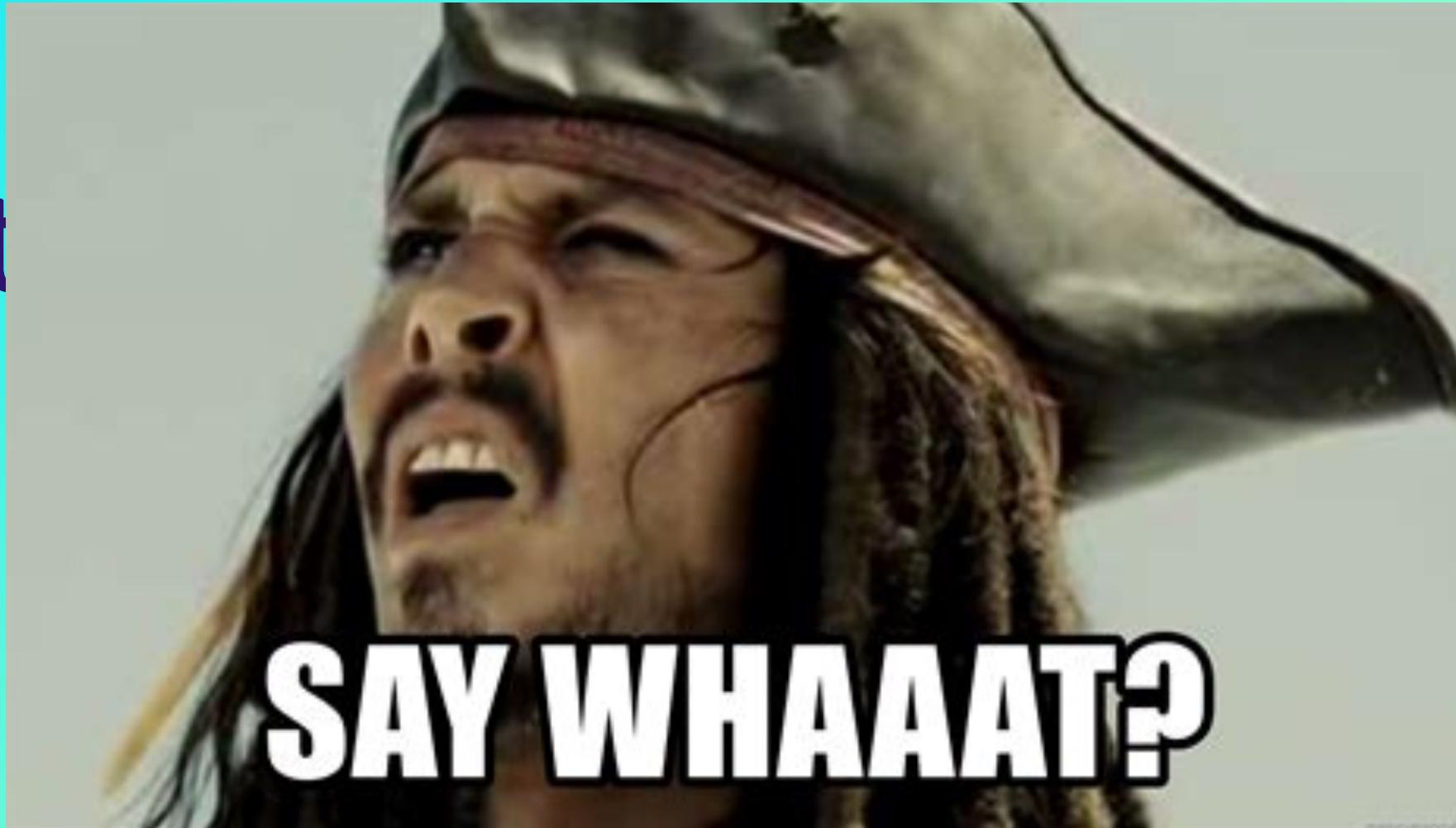
What are Logs, Metrics and Traces?

Why are Traces so much better than Logs?

What telemetry data structures should we use?

st

e?



cinch

Tele



Metry

Τηλέ



Μέτρον

Remote



Measurement

Data structure:

the ‘shape’ of the telemetry data
point

What telemetry data structures should we use?

Competing ideologies

“Everything is an event”



Charity Majors ✅
@mipsytipsy

“There are 3 pillars”



“Just log it out”

Linus Torvalds

torvalds-family.blogspot.com

Linus Benedict Torvalds is a Finnish-American software engineer who is the creator and, historically, the main developer of the Linux kernel, used by Linux distributions and other operating systems such as Android. He also created the distributed version control system Git and the scuba dive logging and planning software Subsurface. [Wikipedia](#)



Born: Linus Benedict Torvalds, December 28, 1969, Helsinki, Finland

Nationality: Finnish (by birth), American (naturalized)

Alma mater: University of Helsinki (M.S.)

Events vs 3 Pillars vs Logs



Charity Majors ✅
@mipsytipsy



Linus Torvalds
torvalds-family.blogspot.com



Linus Benedict Torvalds is a Finnish-American software engineer who is the creator and, historically, the main developer of the Linux kernel, used by Linux distributions and other operating systems such as Android. He also created the distributed version control system Git and the scuba dive logging and planning software Subsurface. [Wikipedia](#)

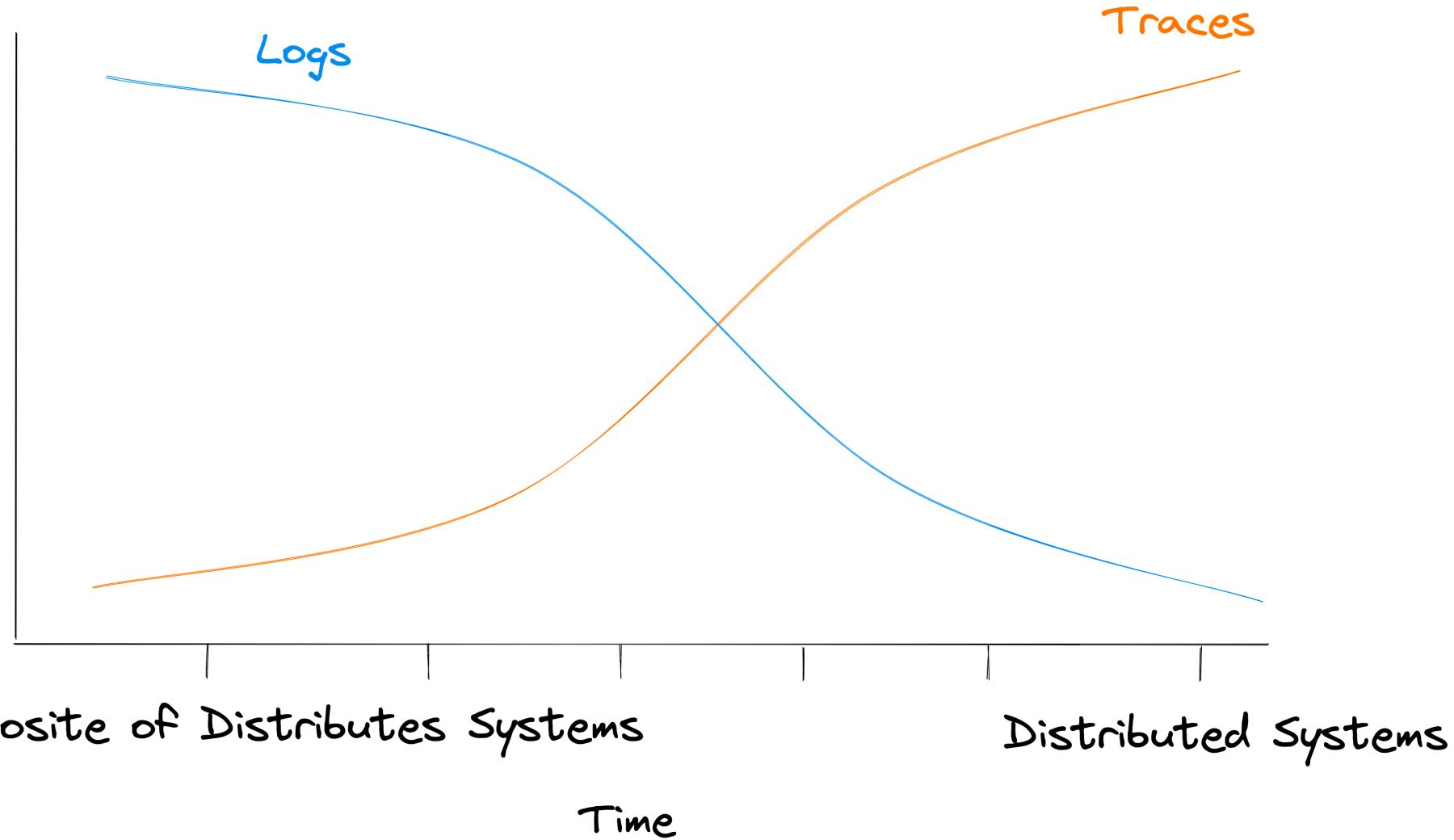
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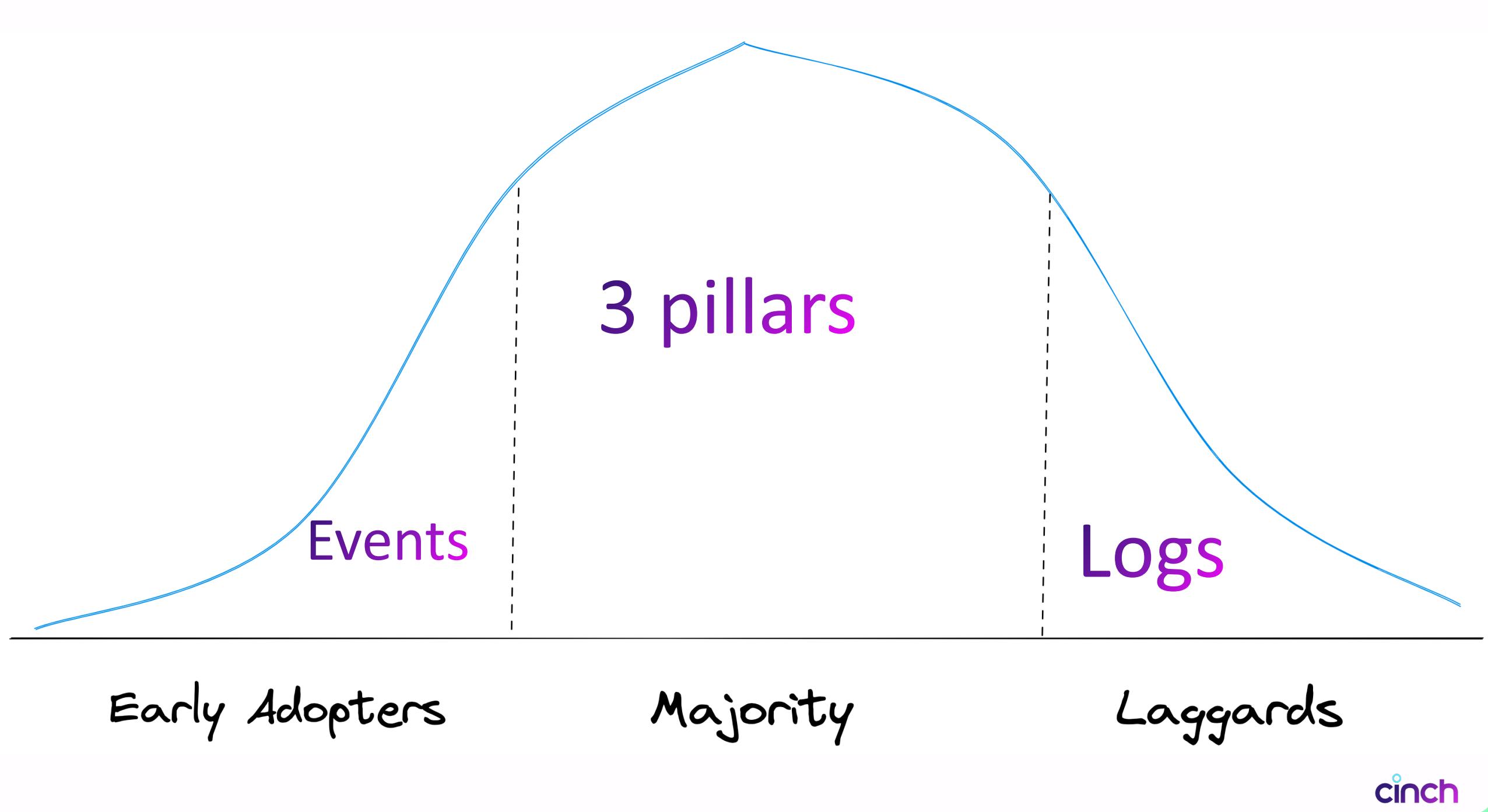
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Telemetry Data Structures







Charity Majors ✅
@mipsytipsy

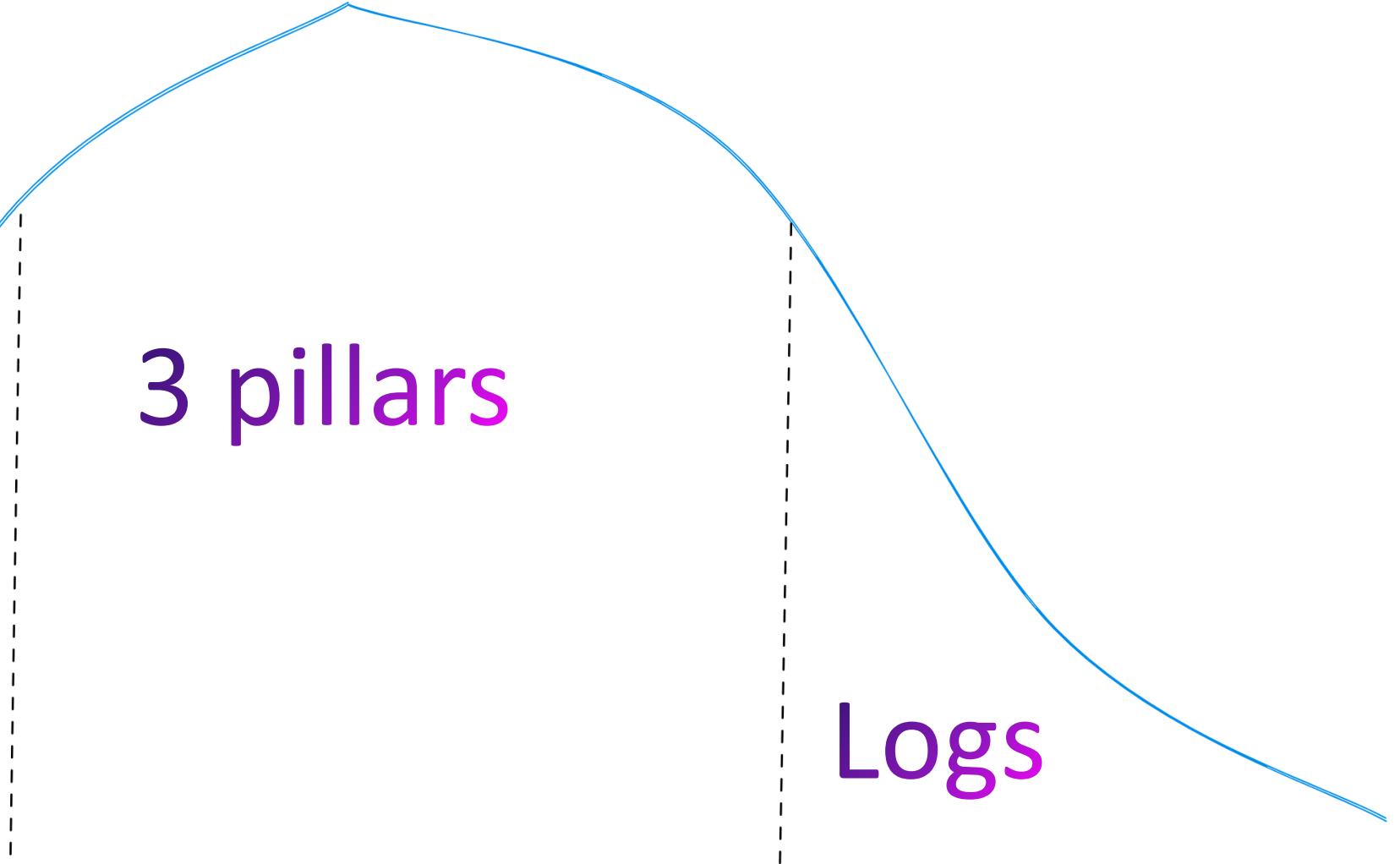
Nearly 7 years ago we started talking about a new generation of tooling. Not monitoring, not APM, not logs, something *new* -- && powerful enough to supersede them all.

The newly released Gartner's Magic Quadrant for 2022 agrees -- and names us a Leader.

Honeycomb Named a Leader in the 2022 Gartner® Magic Quadrant™ for APM and Observability

honeycomb.io
Honeycomb Cements Its Position as a Leader in 2022 Gartner® Magic Quadra...
Honeycomb is recognized by Gartner as a Leader in the Magic Quadrant for Application Performance Monitoring and Observability.

1:40 AM · Jun 14, 2022 · Twitter Web App



3 pillars

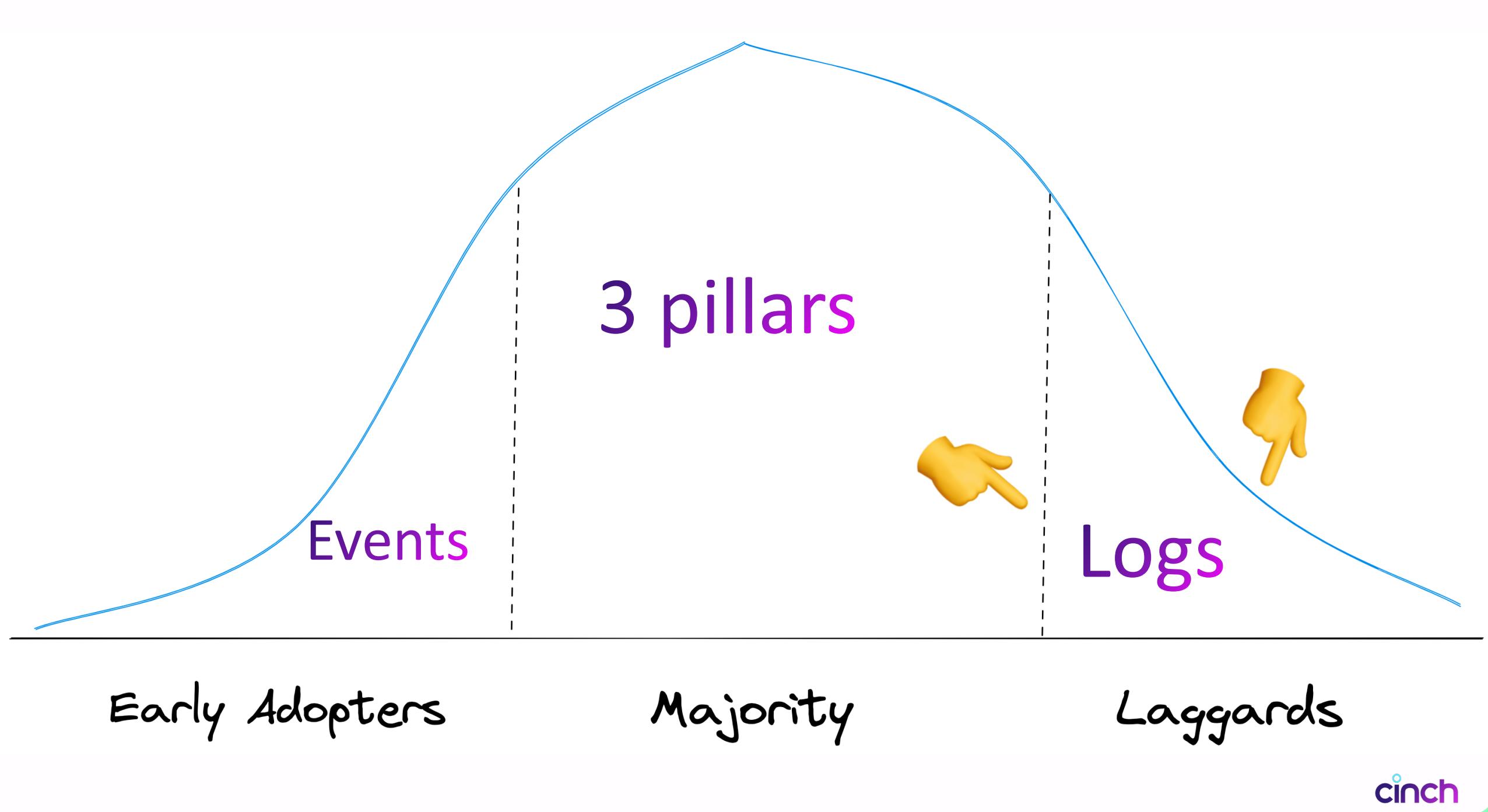
Logs

Early Adopters

Majority

Laggards

We started from Logs



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

Plain Text

Structured

Binary

```
log.info("We have sold a car!")
```

```
log.info("We have sold a car!",  
vehicle.id)
```

```
dsmfkdmakfmkdmkfmqewkm
```

```
log.info("Customer is requesting to sell a  
car!")
```

```
If (carSold)
```

```
    log.info("We have sold a car!")
```

```
Else
```

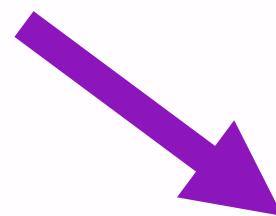
```
    log.info("Oops we didn't sell a car!")
```

Log Context

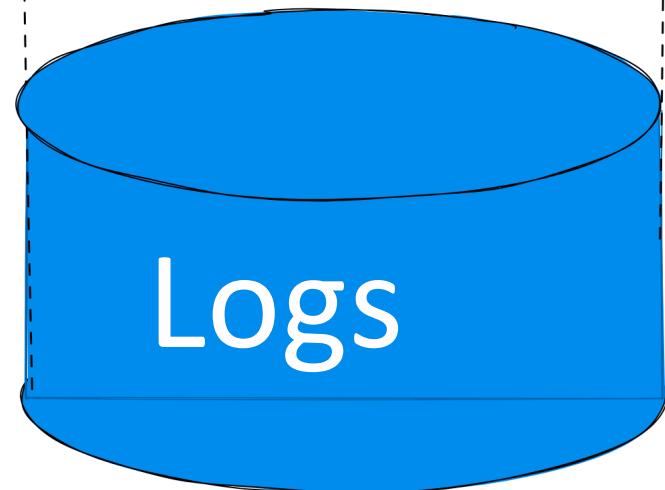
Event Attributes Trace Metrics Processes

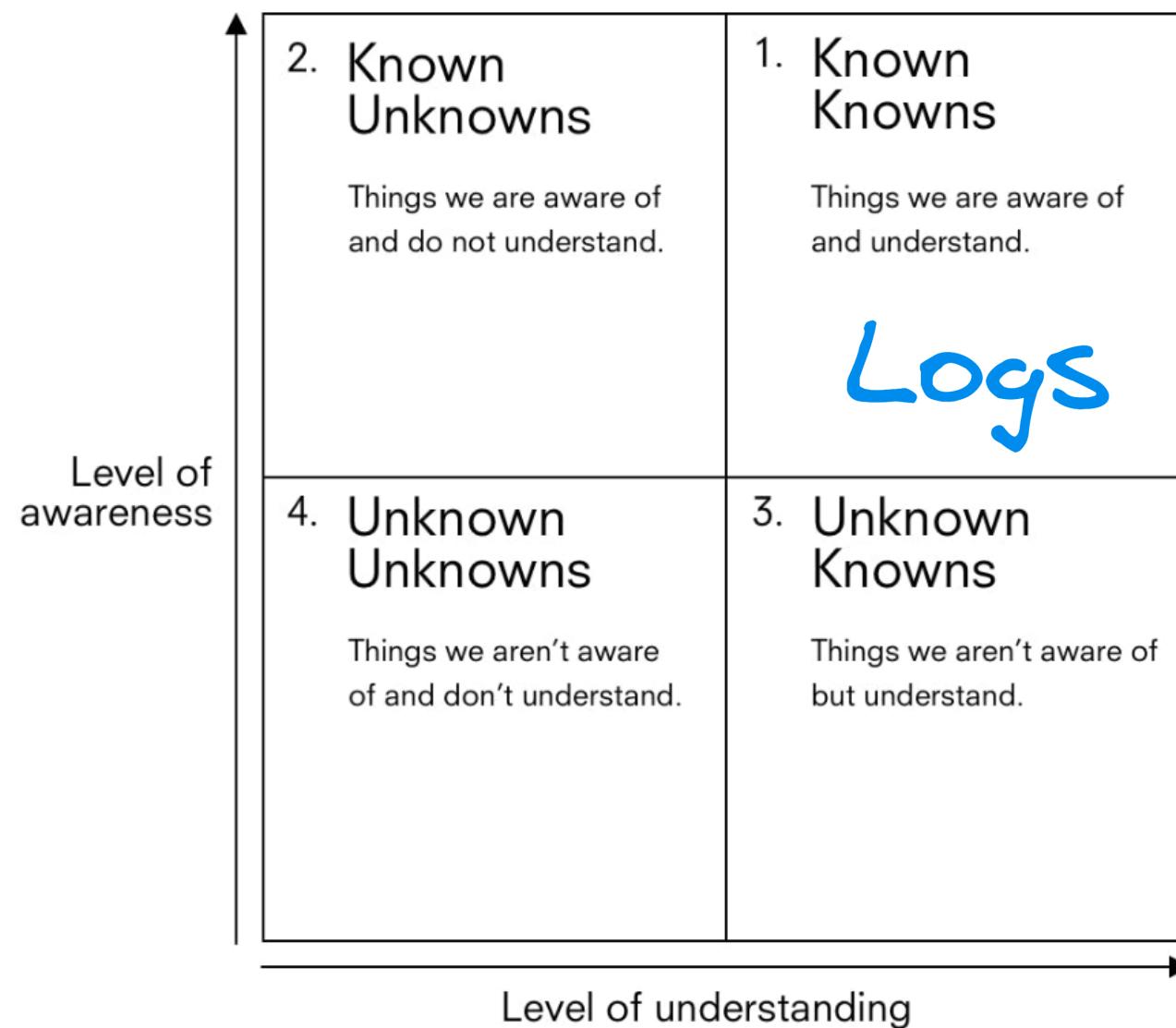
```
{  
    aws_level      INFO  
    dd {  
        env         prod  
        service     finance-application-component  
        trace_id   [  
            4855133545783490055,  
            4855133545783490055  
        ]  
        version     v1.4.9  
    }  
    hostname       arn:aws:lambda:eu-west-1:956165690157:function:finance-  
                   application-compo-depositrangelambda538b5b-5ri2ro3zyqet  
    lambda {  
        arn         arn:aws:lambda:eu-west-1:956165690157:function:finance-  
                   application-compo-depositrangelambda538b5b-5ri2ro3zyqet  
        request_id  2776e43c-5e92-4cc2-a924-0815eea3c9f6  
    }  
    level          info  
    message        Get Deposit Range  
    service        finance-application-component  
    status         info  
    time          2022-06-12T22:24:38.764Z  
    timestamp     1655072678764
```

Cognitive (observability) Load

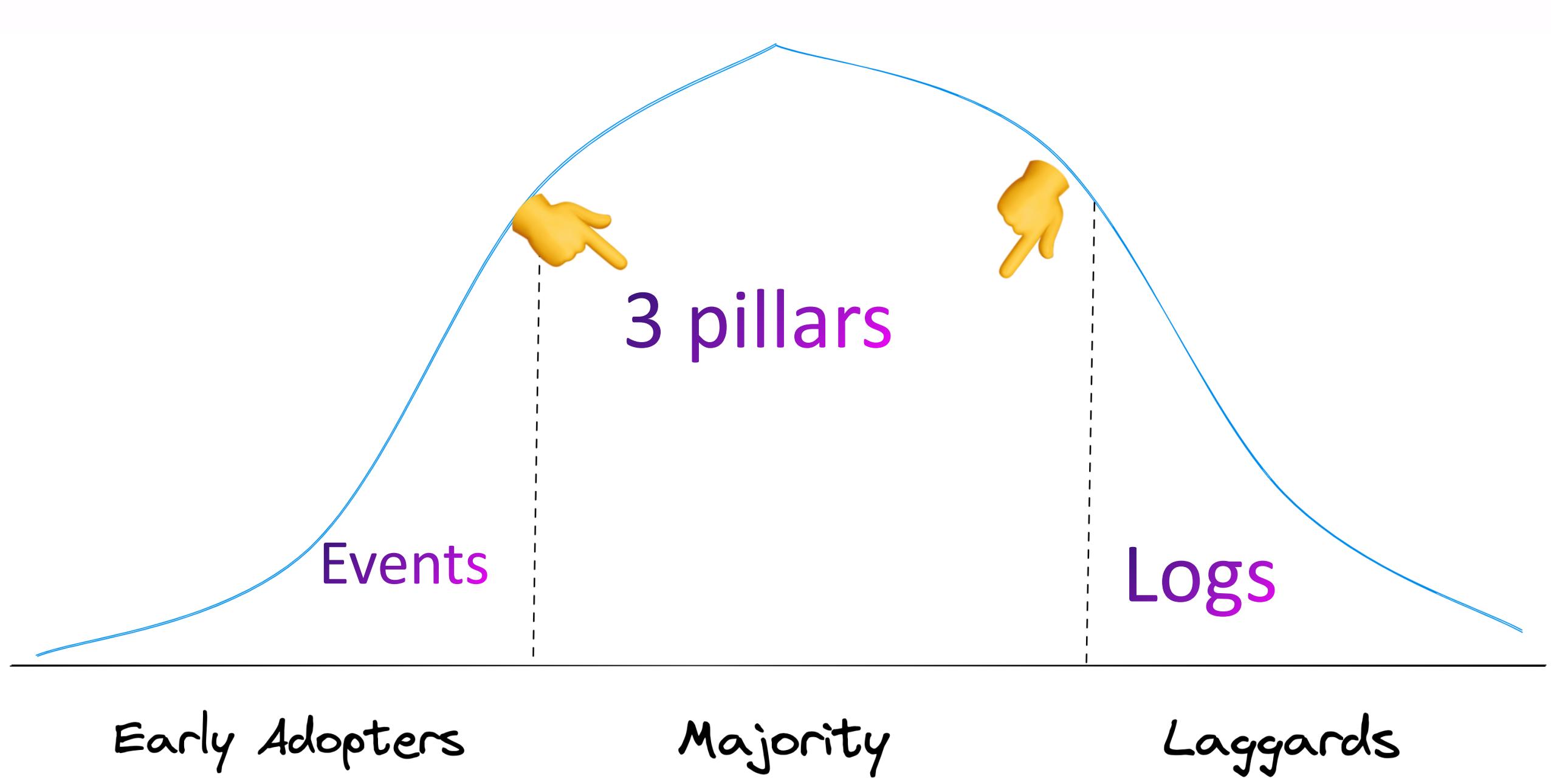


Thinking





From Logs to Traces



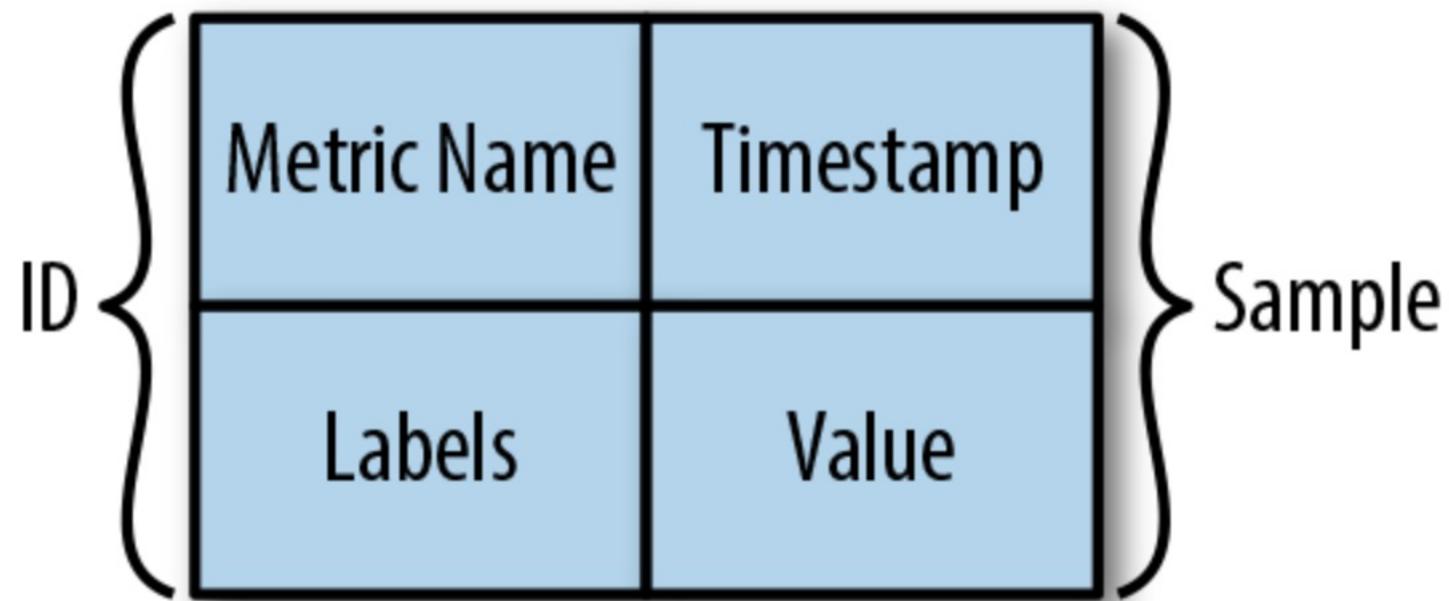






Metrics are a numeric representation of data measured over intervals of time.

Metrics can harness the power of mathematical modeling and prediction to derive knowledge of the behavior of a system over intervals of time in the present and future.



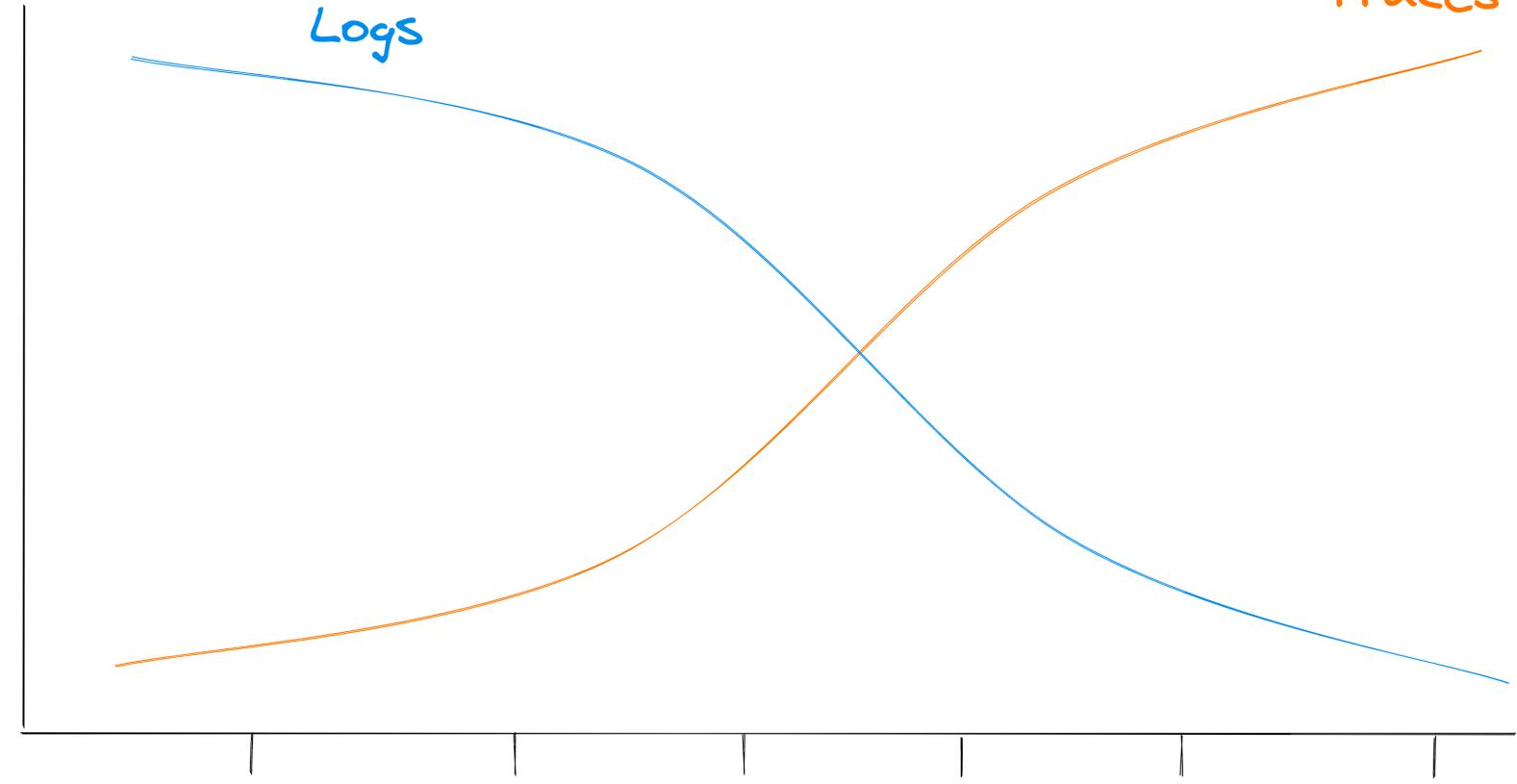
```
sendMetric(  
    metric_name: "cars_sold",  
    number_of_cars_sold: 1,  
    tags: "service:car-seller")
```



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

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

Telemetry Data Structures



The opposite of Distributions Systems

Time

Distributed Systems



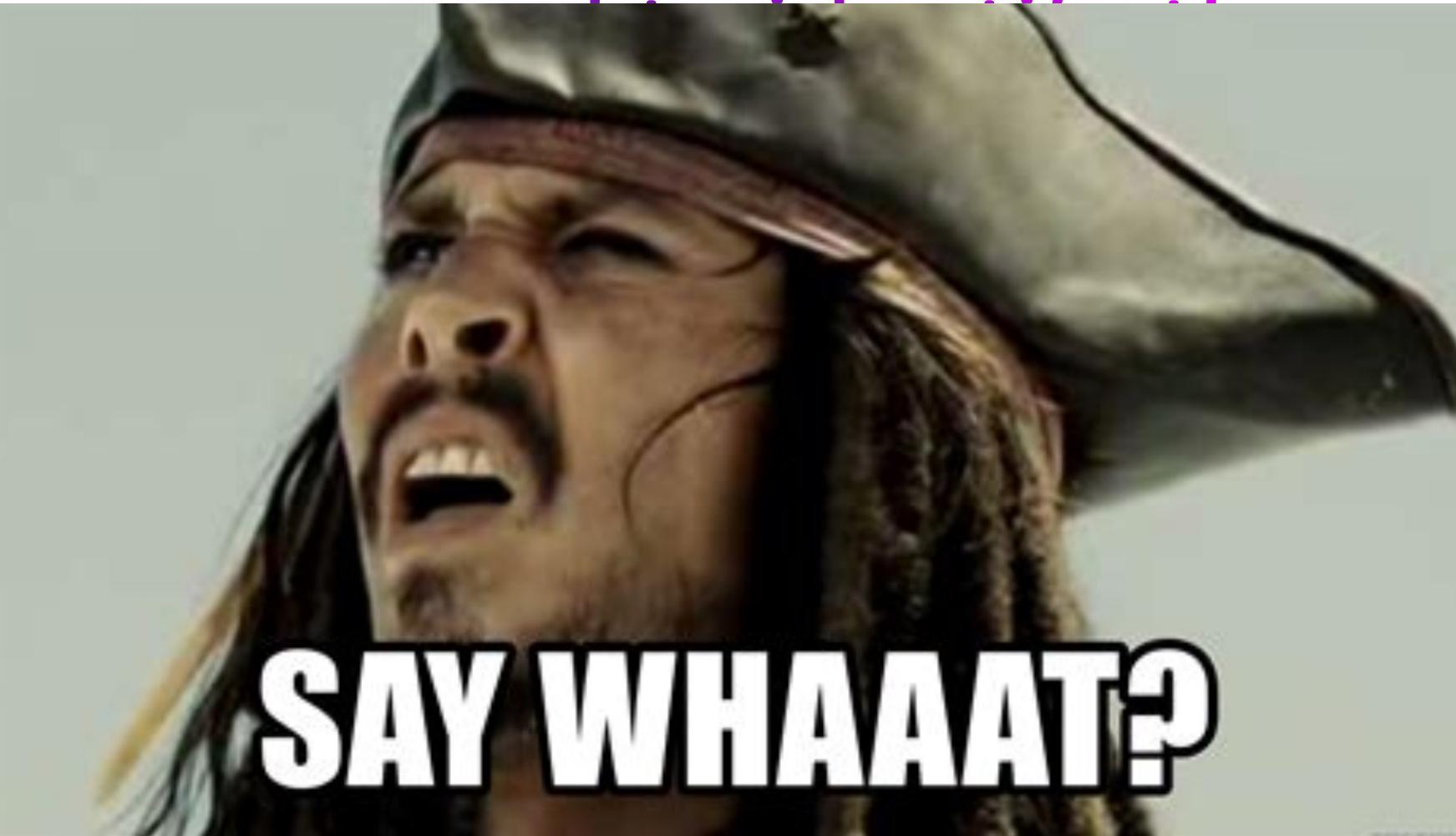
Traces

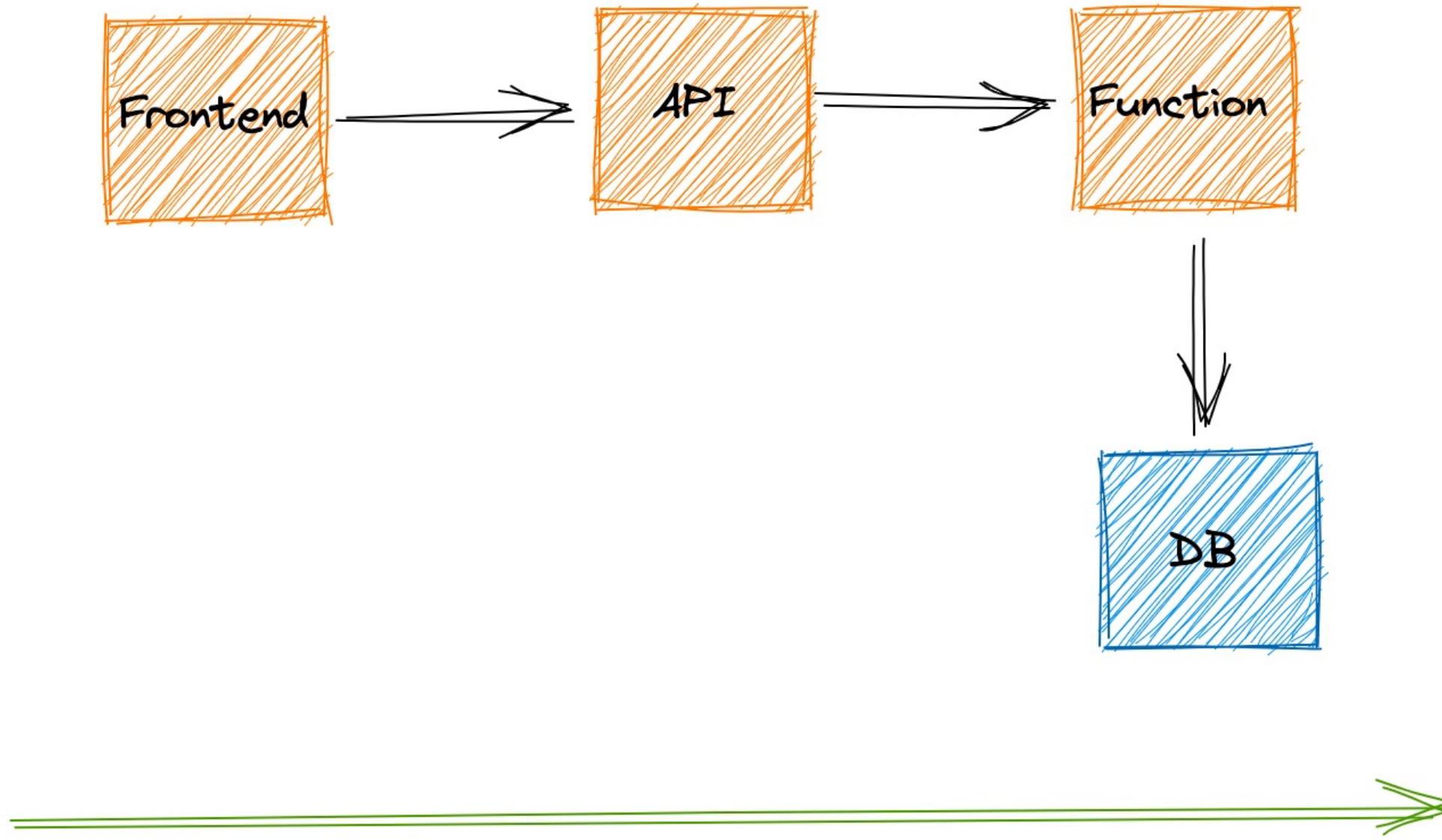


cinch

Traces are used to identify the amount of work done at each layer while preserving causality by using *happens-before* semantics.

Train
am
wh
usi

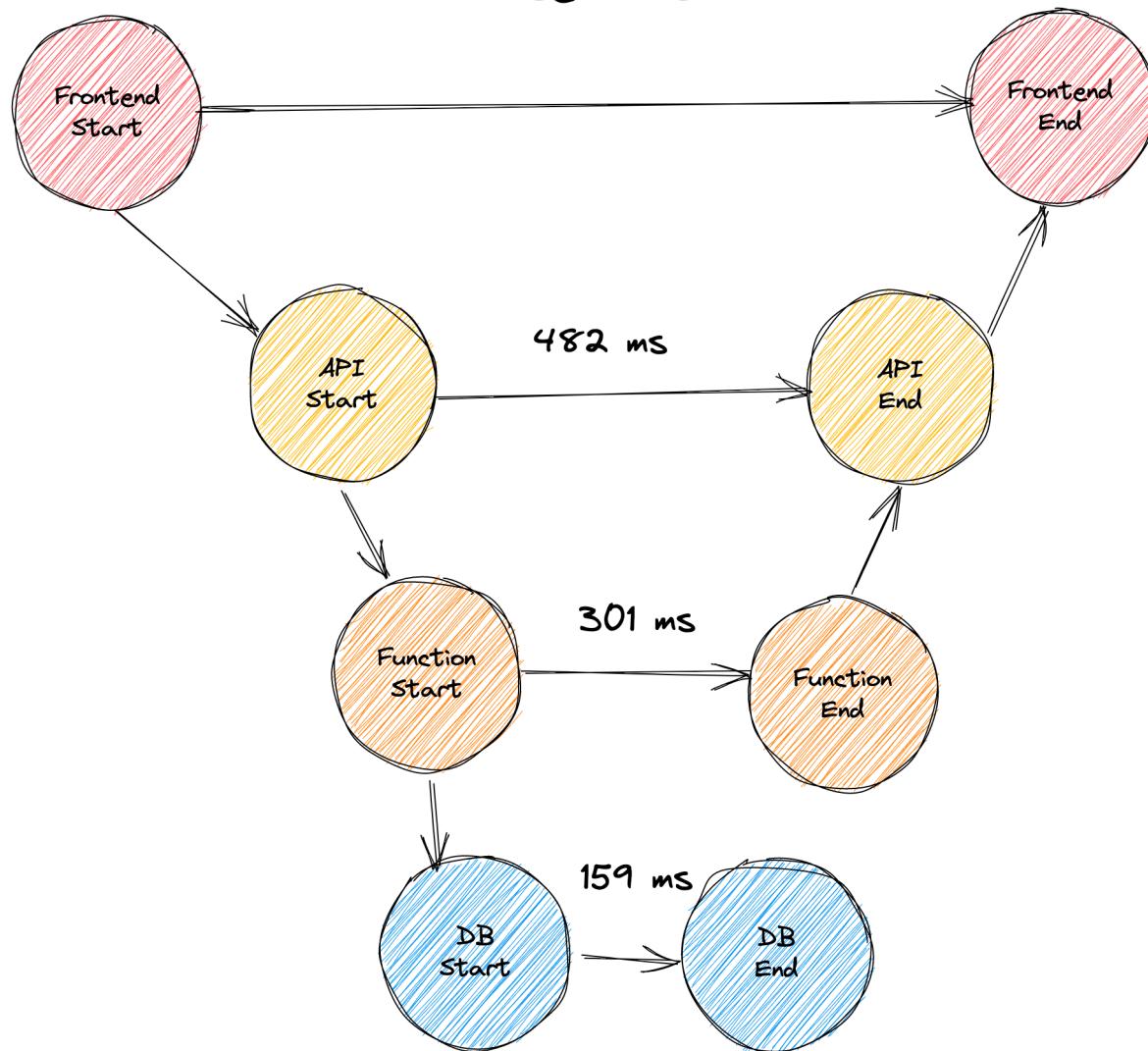




Request from start to finish

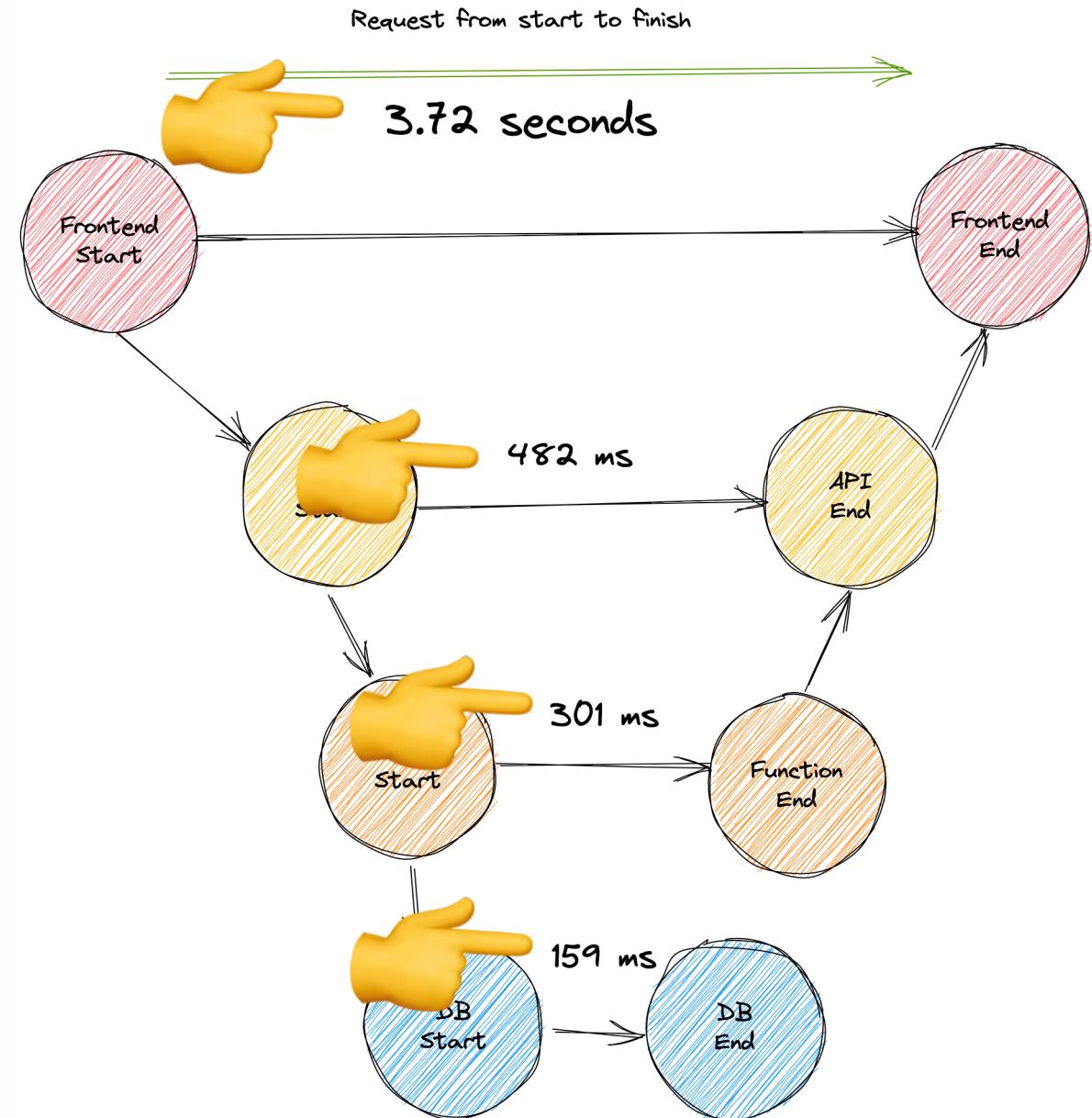
Request from start to finish

3.72 seconds

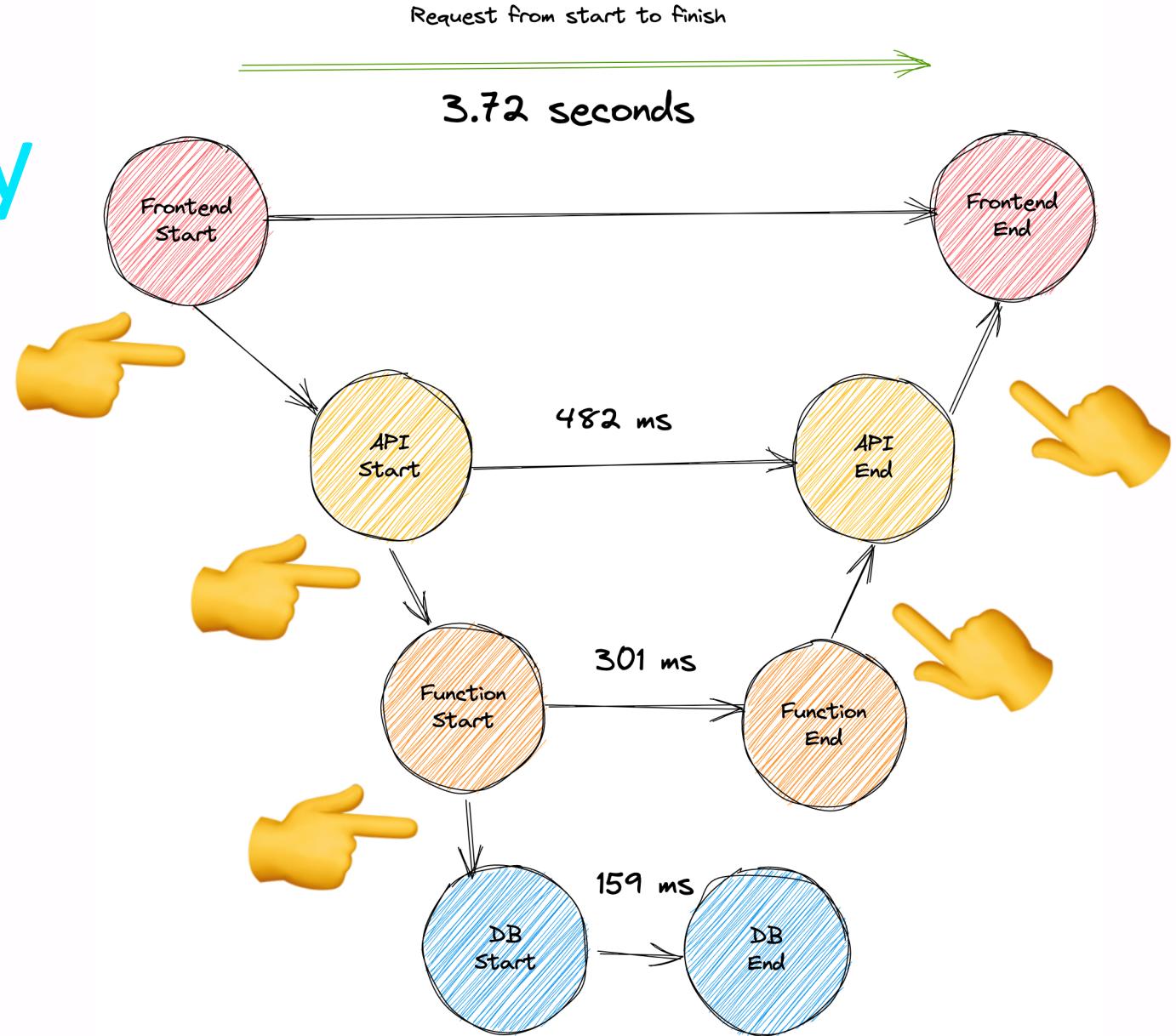


Traces are used to identify the amount of work done at each layer while preserving causality by using *happens-before* semantics.

Amount of work

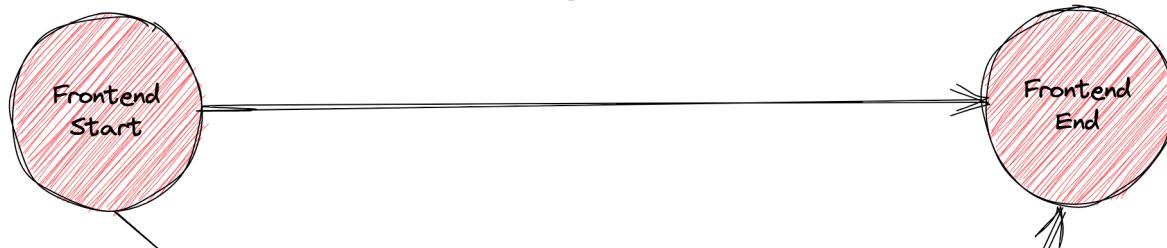


Preserving causality



Request from start to finish

3.72 seconds



START



END



CloudWatch > Log groups > /aws/lambda/MarketplaceFulfilmentProcess-EventProducerF5BCB1AE-PFGDX1L5TL3T > 2021/04/16/[LATEST]773712c11c5d4835af5646cc5ef25e8f

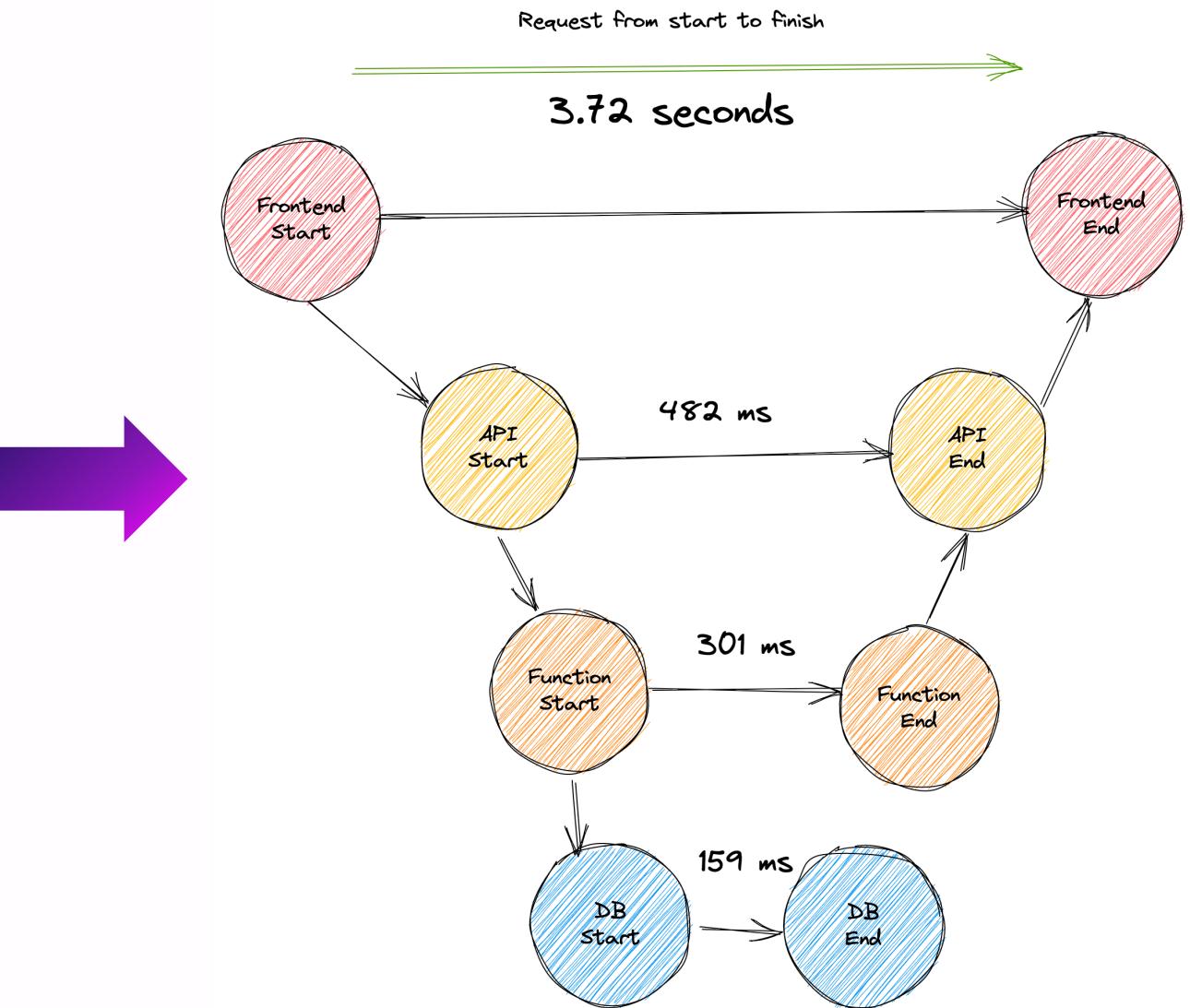
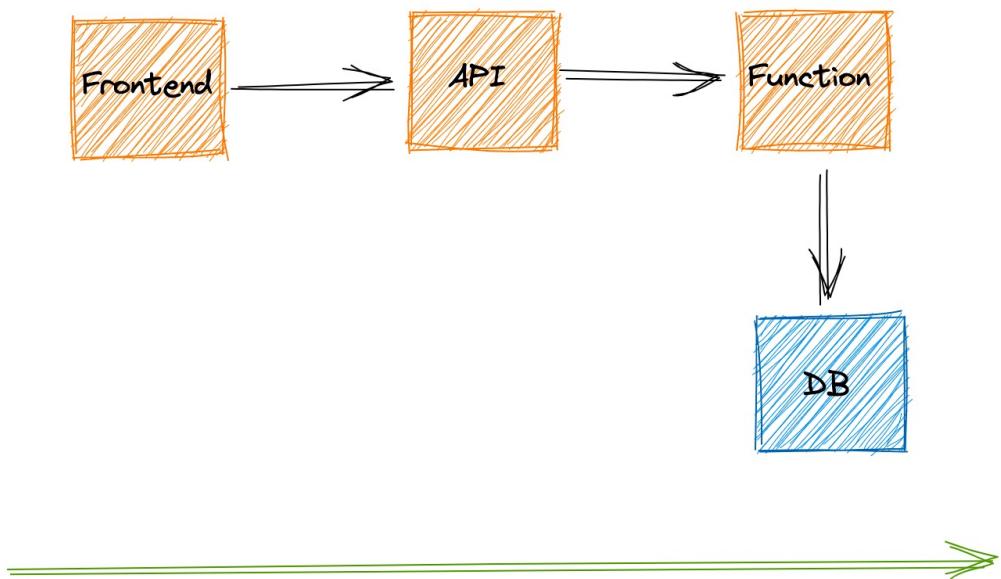
Viewing events

can use the filter bar below to search for and match terms, phrases, or values in your log events. [Learn more about filter patterns](#)

View as text [C](#) Actions ▾ Create Metric Filter

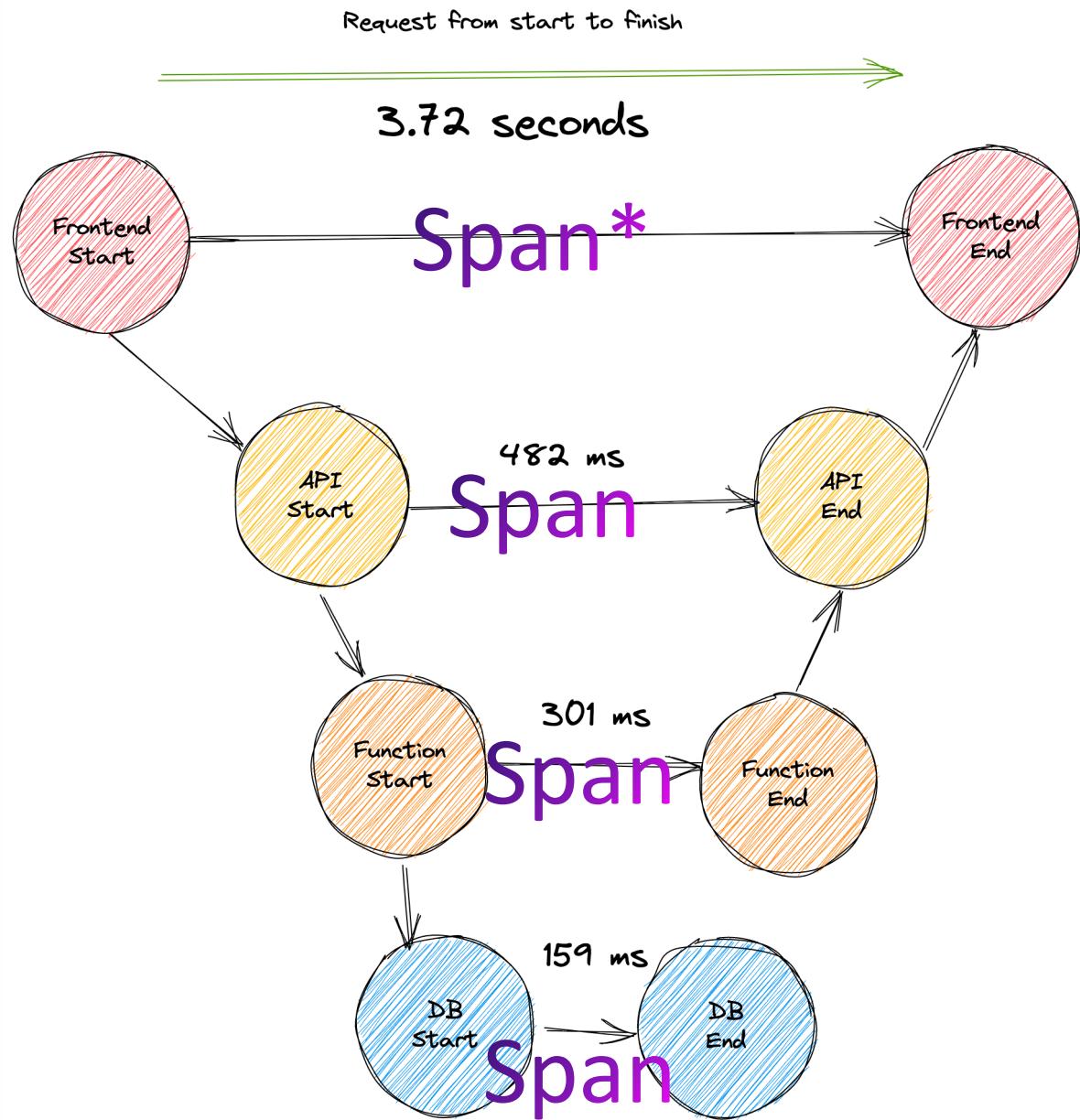
Filter events Clear 1m 30m 1h 12h Custom [Custom](#) [⚙️](#)

Timestamp	Message
	No older events at this moment. Retry
2021-04-16T11:23:44.180+01:00	START RequestId: b12ef268-a662-46db-8f33-59ae0d345380 Version: \$LATEST
2021-04-16T11:23:44.260+01:00	{"e":1618568624.259,"m":"aws.lambda.enhanced.invocations","t":["region:eu-west-1","account_id:563314216495","functionname:Marketpl...}
2021-04-16T11:23:44.300+01:00	{"batch":[{"eventID":"9d5a5ba7c8b753d5edcc9fff51757b0c","eventName":"INSERT","eventVersion":"1.1","eventSource":"aws:dynamodb","aw...}
2021-04-16T11:23:44.302+01:00	{"newState":"sold","level":"info","message":"New fulfilment state","timestamp":"2021-04-16 10:23:44"}
2021-04-16T11:23:44.340+01:00	{"event":{"EventBusName":"fulfilmentsupporttestLocalEventBusB06F12AA","Source":"PartnerMarketplace","DetailType":"FulfilmentStarte...}}
2021-04-16T11:23:44.640+01:00	{"traces":[[{"trace_id":"78f18009500ad02a","span_id":"28e87a003f59f38f","parent_id":"78f18009500ad02a","name":"http.request","reso...}}
2021-04-16T11:23:44.699+01:00	END RequestId: b12ef268-a662-46db-8f33-59ae0d345380
2021-04-16T11:23:44.699+01:00	REPORT RequestId: b12ef268-a662-46db-8f33-59ae0d345380 Duration: 519.00 ms Billed Duration: 520 ms Memory Size: 256 MB Max Memory ...
2021-04-16T11:23:44.718+01:00	START RequestId: 11e2fc6f-0706-418c-8196-173bdc26083d Version: \$LATEST
2021-04-16T11:23:44.723+01:00	{"e":1618568624.723,"m":"aws.lambda.enhanced.invocations","t":["region:eu-west-1","account_id:563314216495","functionname:Marketpl...}
2021-04-16T11:23:44.723+01:00	{"batch":[{"eventID":"4f23151834cfea75207cddb7fb6f4a9","eventName":"MODIFY","eventVersion":"1.1","eventSource":"aws:dynamodb","aw...}}
2021-04-16T11:23:44.724+01:00	{"newState":"complete","level":"info","message":"New fulfilment state","timestamp":"2021-04-16 10:23:44"}

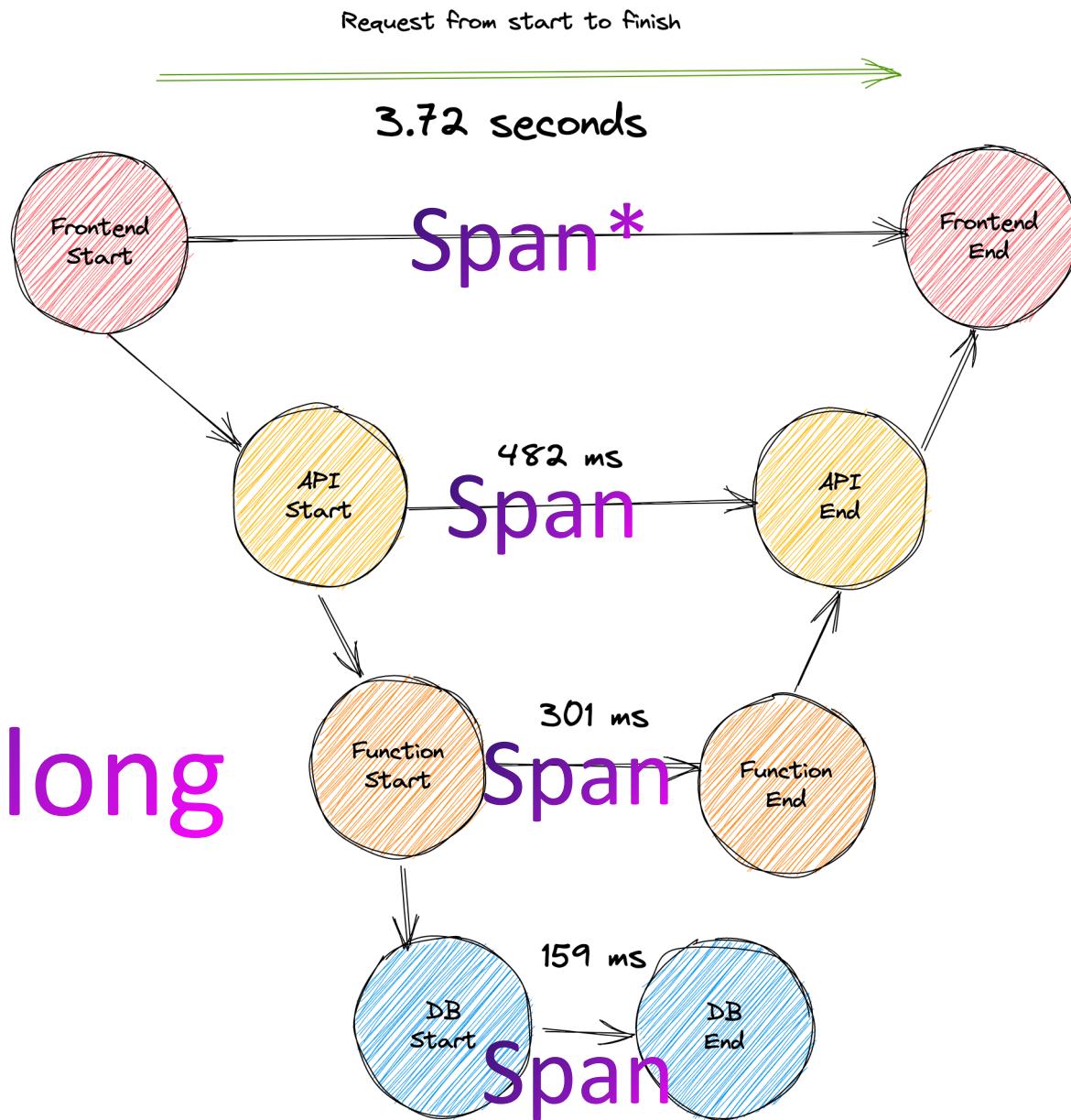


A trace is a directed acyclic graph (DAG) of *spans**¹, where the edges between spans are called *references*.

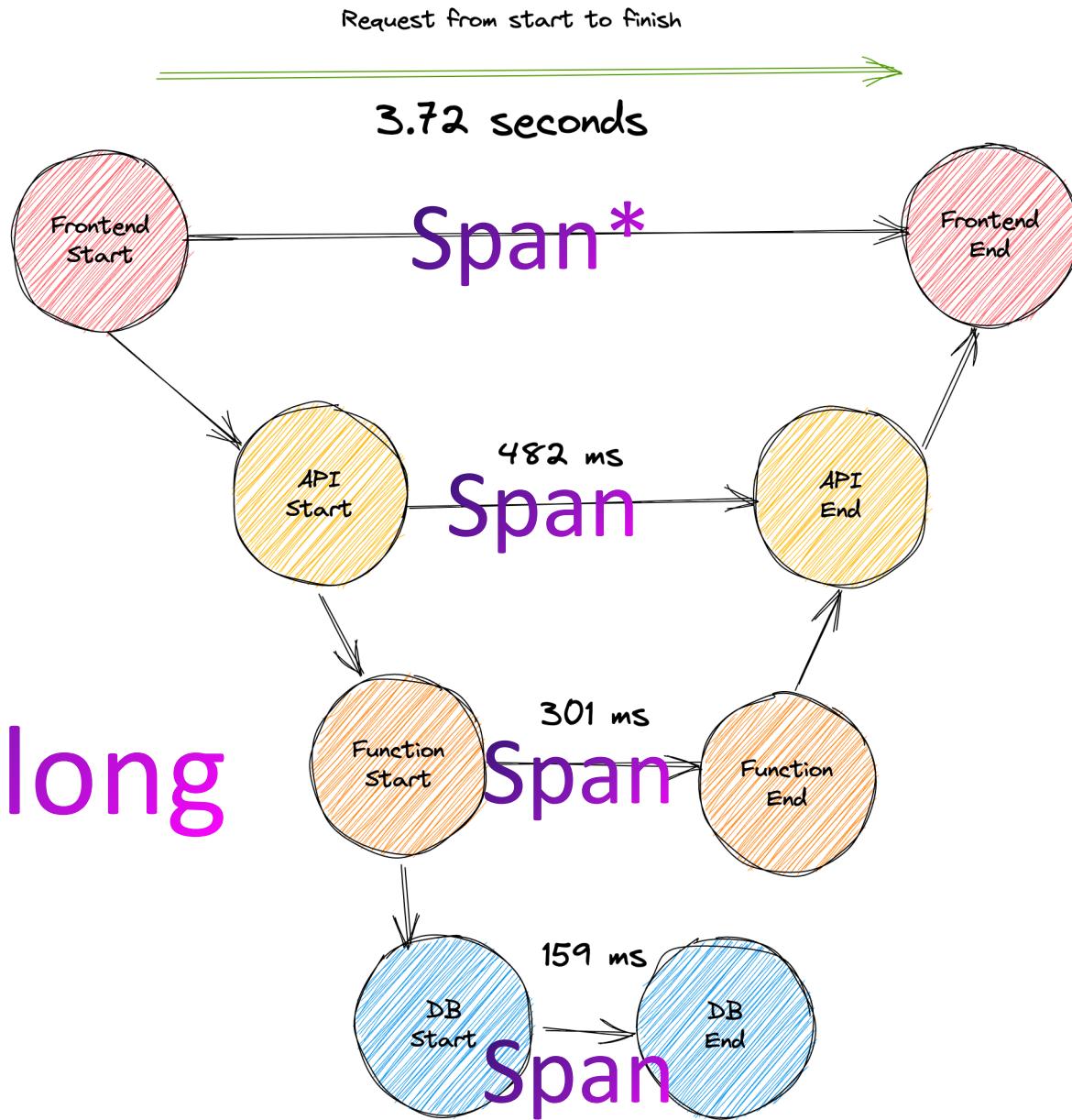
*hold tight, I'll explain.



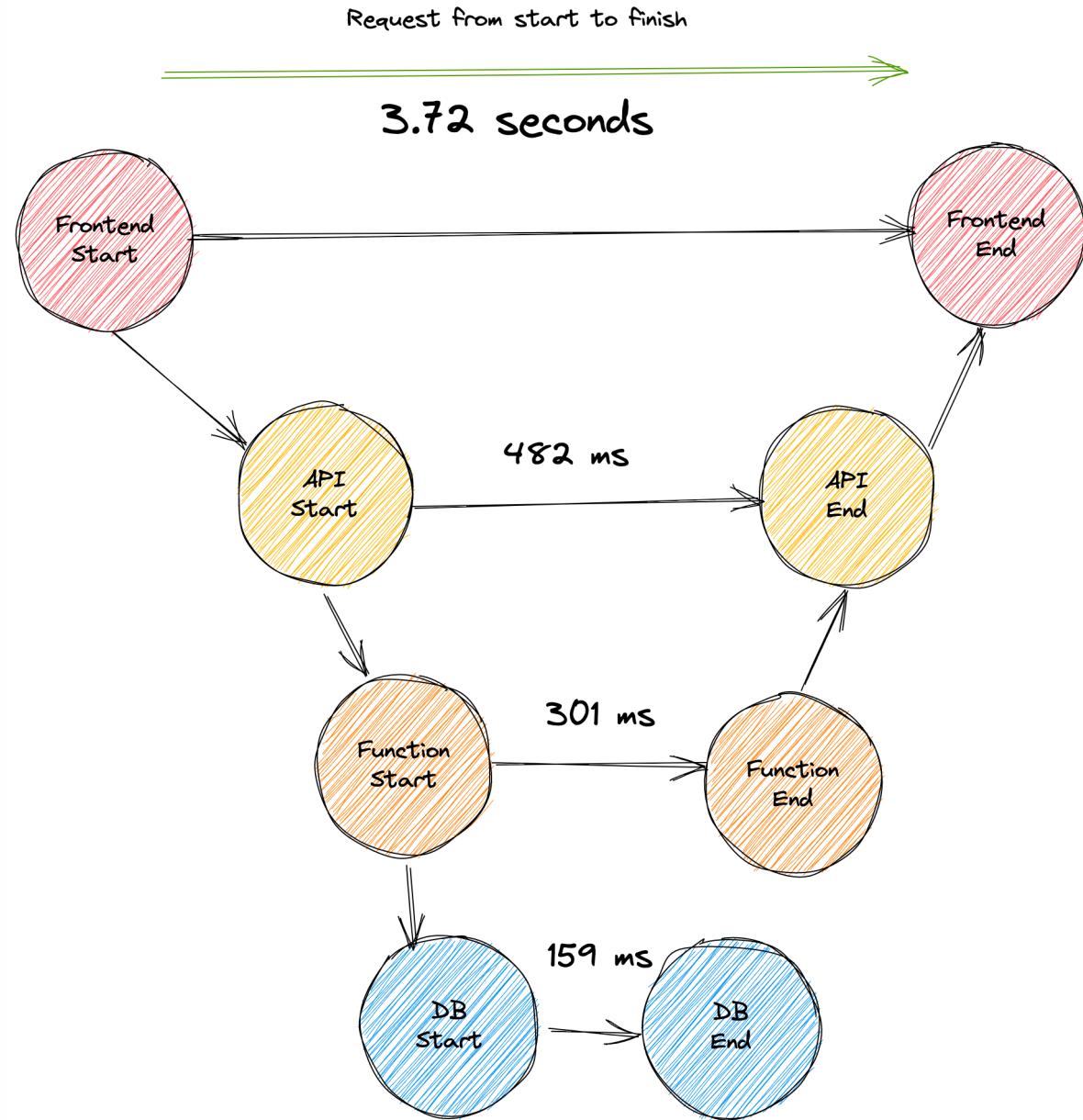
*a ‘hop’ along
the flow



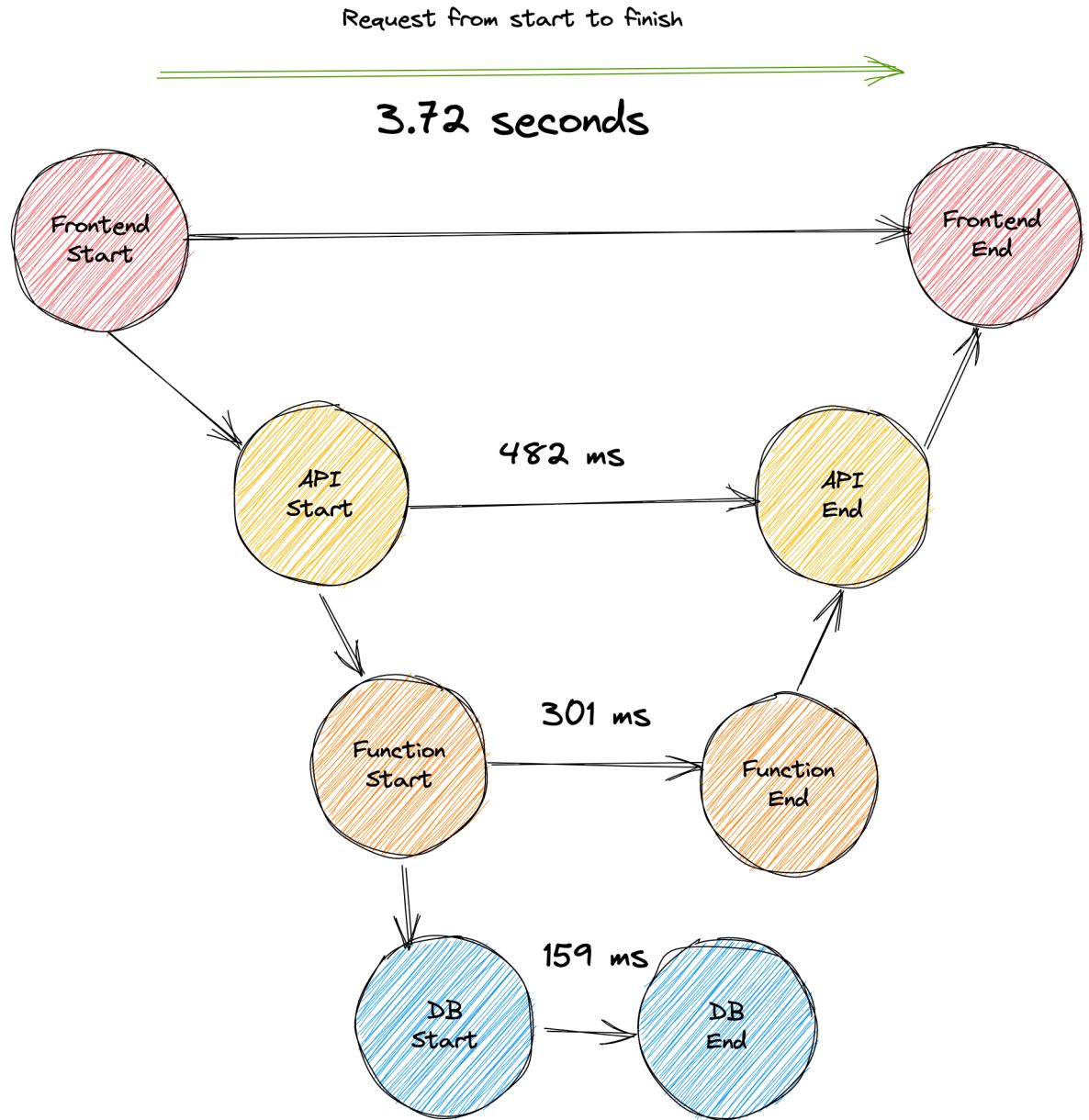
*a ‘hop’ along
the flow



A reference



A reference

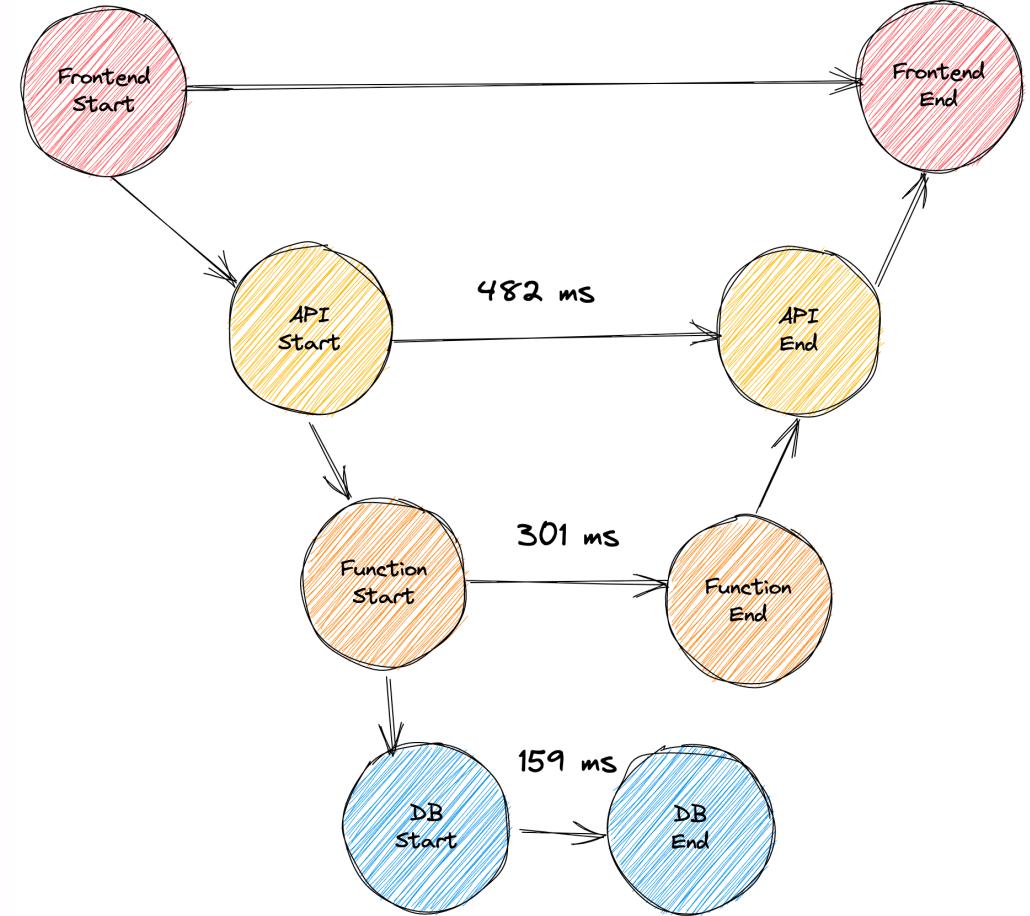


Another
reference

A directed acyclic graph (DAG) because...

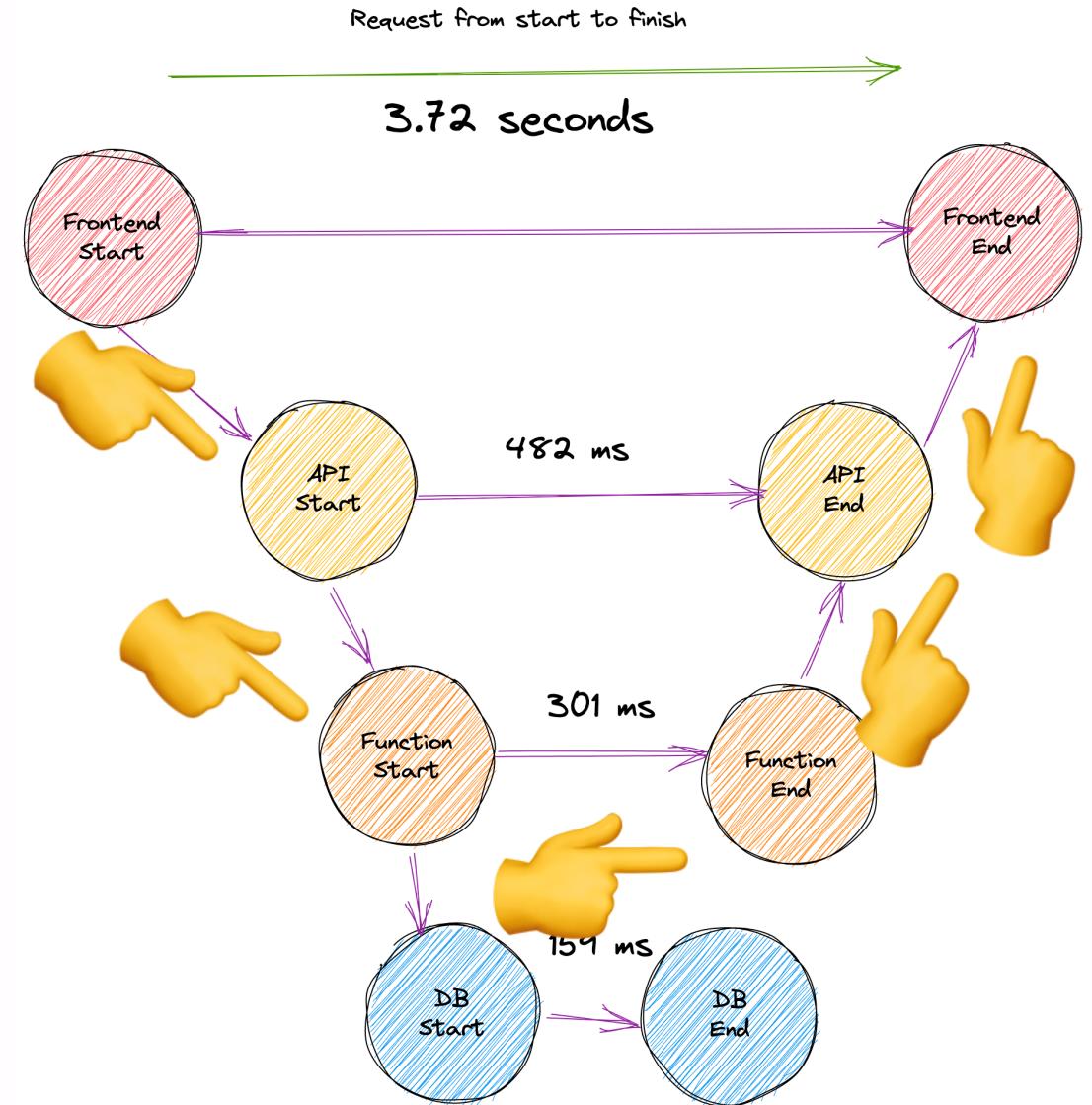
Request from start to finish

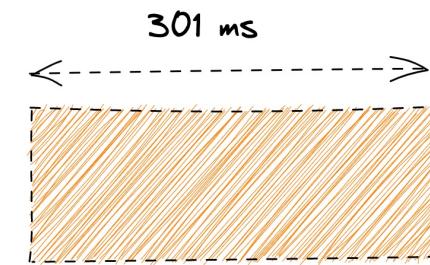
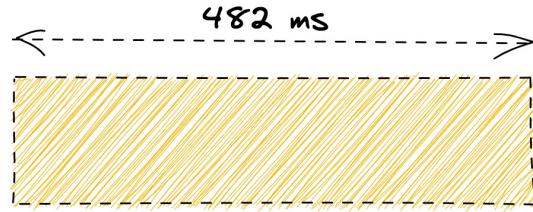
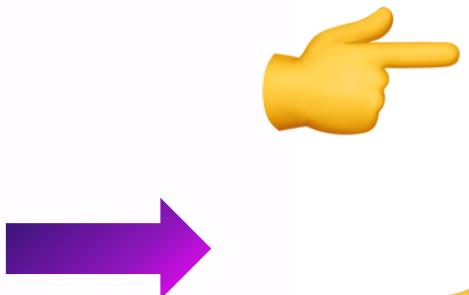
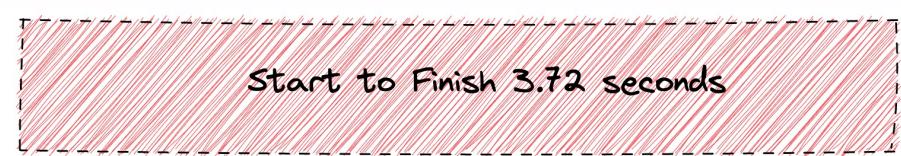
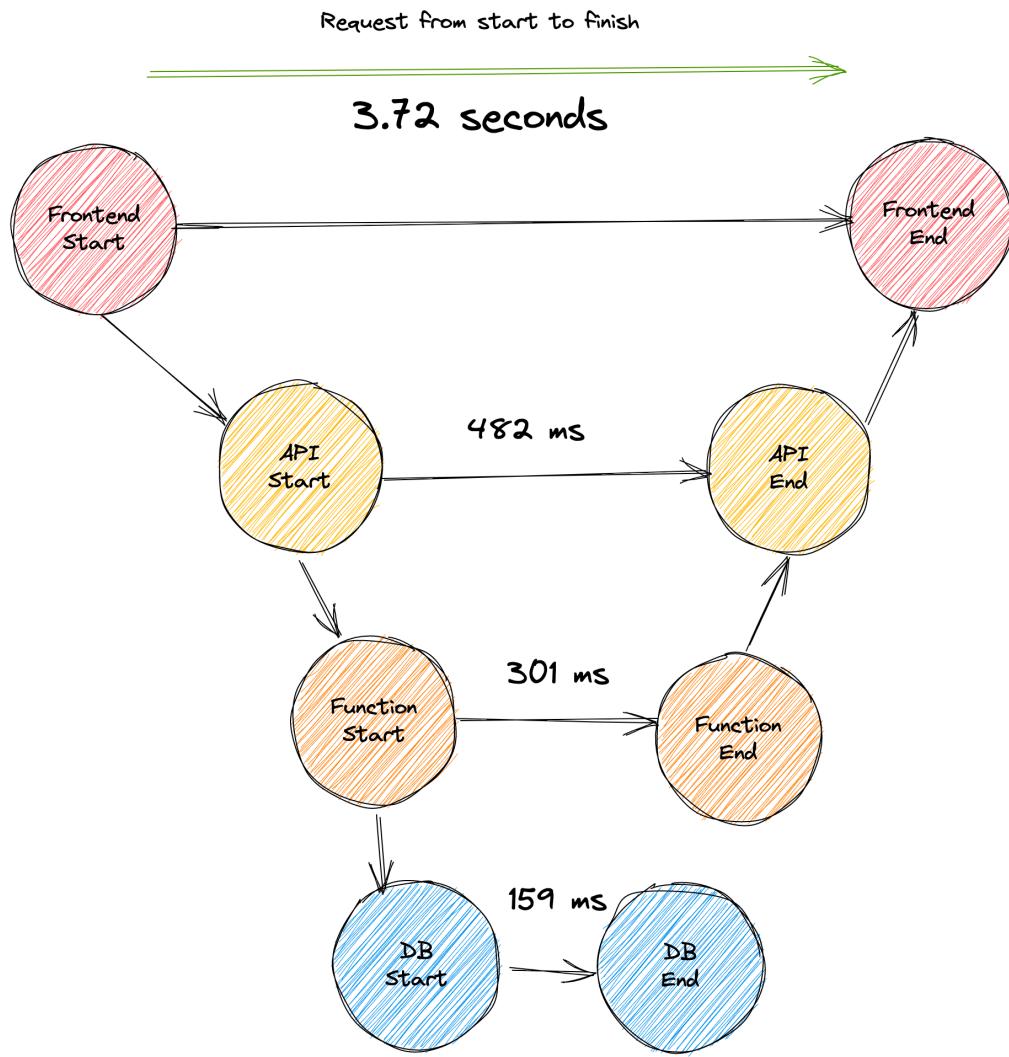
3.72 seconds



A directed acyclic graph (DAG) because...

It goes in one single direction.





Request from start to finish

Trace: Flame Graph Span List 5 Map



browser.request /coffee/types

3.72 s

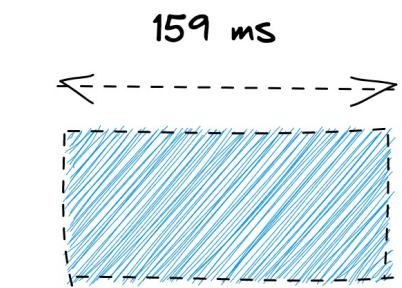
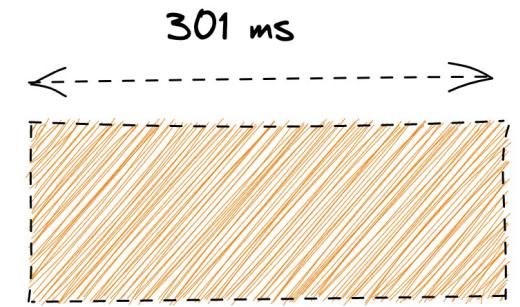
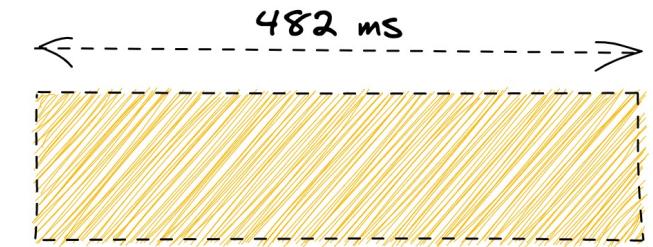
aws.apigateway cinch-brew-api.dev.api.cinch.co.uk 482 ms

aws.lambda LISTCoffeeBeanTypes 301 ms

GetAvailableCoffeeBeans 300 ms

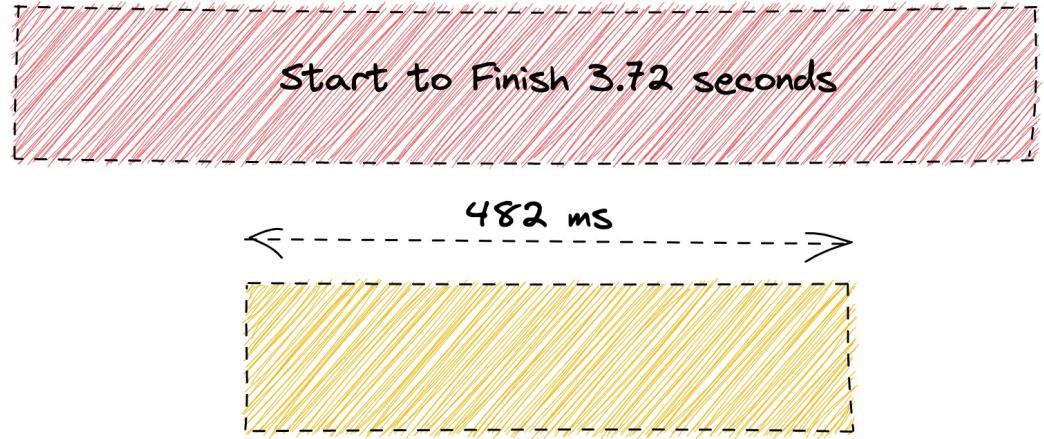
http.request POST 159 ms

Trace_id =
4003964570065526982



Request from start to finish

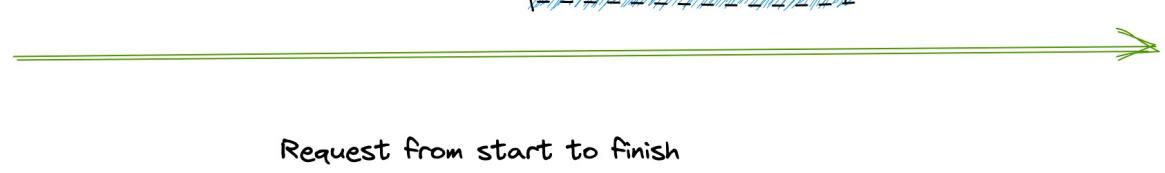
```
span.setTag(  
    vehicle_reg,  
    "BXPB 5XG")
```



```
span.setTag(  
    vehicle_reg,  
    "BXPB 5XG")
```



```
span.setTag(  
    vehicle_sold,  
    true)
```



Span: Info

Metrics

Logs

0

✓ Span Tags

{

account_id 563314216495
apiid blf0zukdpk
aws_account 563314216495
dd_extension_version 21
domain_name cinch-brew-api.dev.api.cinch.co.uk
env dev

■ http {

host cinch-brew-api.dev.api.cinch.co.ukundefined
method GET
path_group /
status_code 200
url cinch-brew-api.dev.api.cinch.co.ukundefined

}

language

nodeis

Span Context



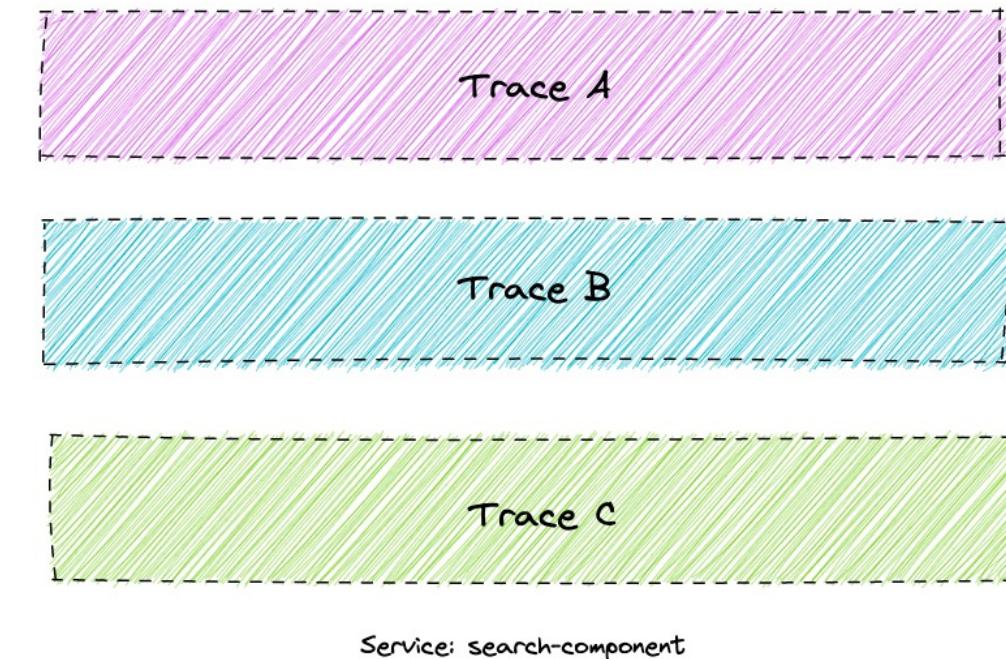
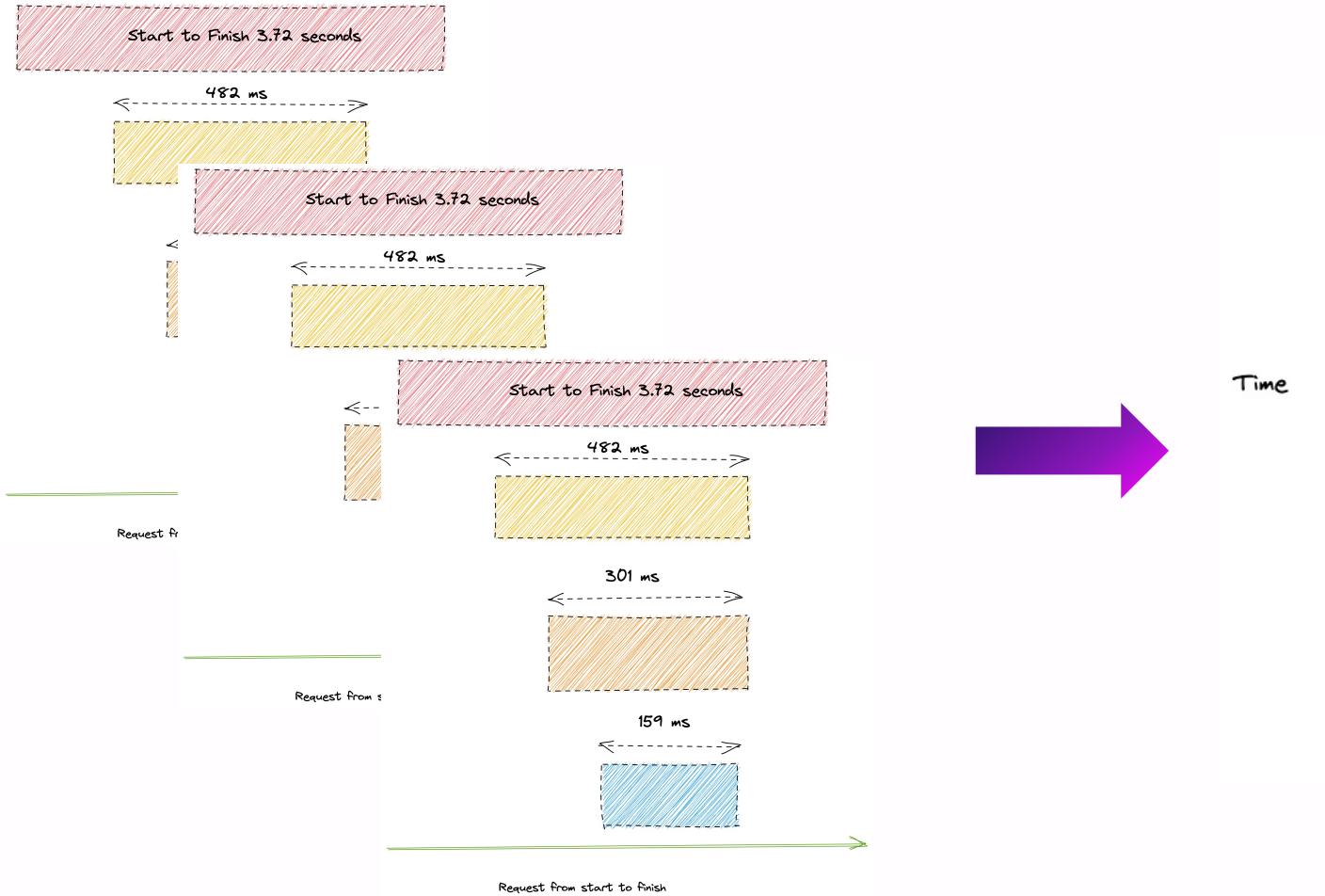
Span Context

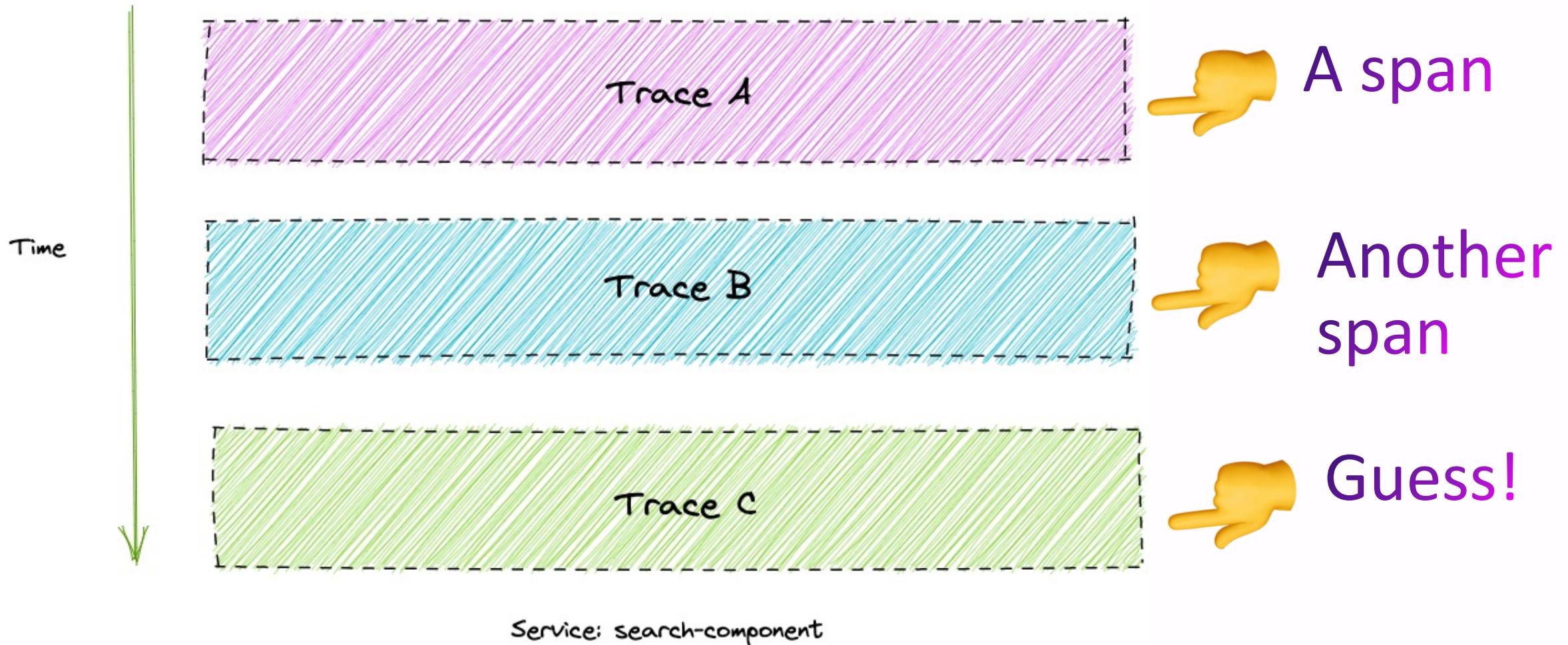
Span:	Metrics	Logs	0
▼ Span Tags			
{			
account_id	563314216495		
apiid	blf0zukdpk		
aws_account	563314216495		
dd_extension_version	21		
domain_name	cinch-brew-api.dev.api.cinch.co.uk		
env	dev		
http {			
host	cinch-brew-api.dev.api.cinch.co.uk	undefined	
method	GET		
path_group	/		
status_code	200		
url	cinch-brew-api.dev.api.cinch.co.uk	undefined	
}			
language	nodejs		

Log Context

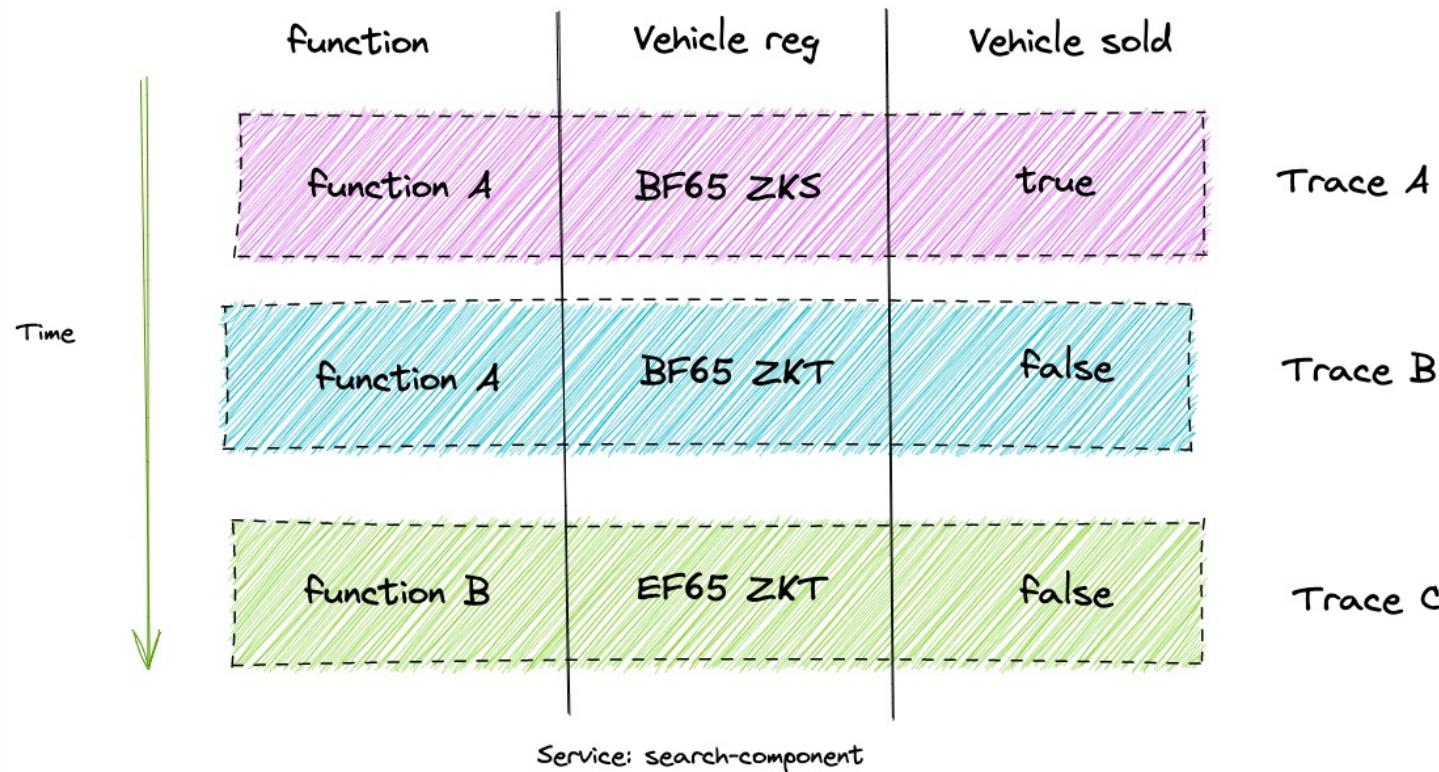
Event Attributes	Trace	Metrics	Processes
{			
aws_level	INFO		
dd {			
env	prod		
service	finance-application-component		
trace_id [
4855133545783490055,			
4855133545783490055			
]			
version	v1.4.9		
}			
hostname	arn:aws:lambda:eu-west-1:956165690157:function:finance-application-compo-depositrangela538b5b-5ri2ro3zyqet		
lambda {			
arn	arn:aws:lambda:eu-west-1:956165690157:function:finance-application-compo-depositrangela538b5b-5ri2ro3zyqet		
request_id	2776e43c-5e92-4cc2-a924-0815eea3c9f6		
}			
level	info		
message	Get Deposit Range		
service	finance-application-component		
status	info		
time	2022-06-12T22:24:38.764Z		
timestamp	1655072678764		

Across requests too!

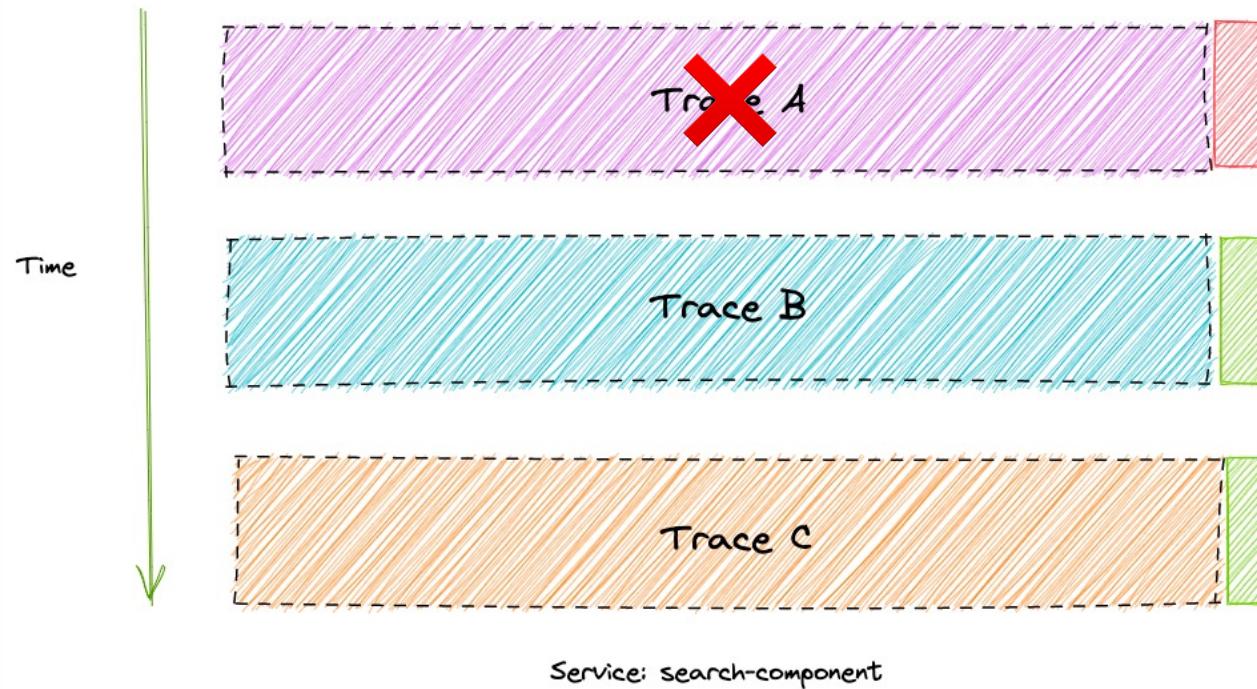




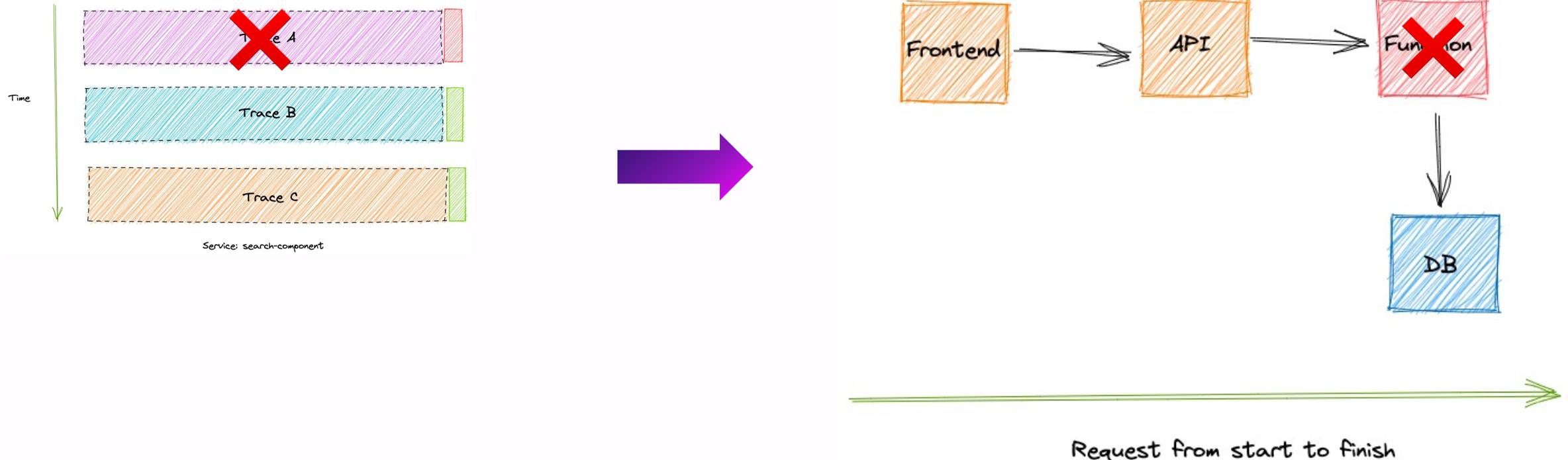
More than requests and traces



A failed span is a failed function invocation



A failed span is a failed function invocation



16.0 ms total duration

GET sb1-vehicle-search.dev.api.cinc...

500 INTERNAL SERVER ERROR

on Jun 13 17:02:53.653 (3d ago)

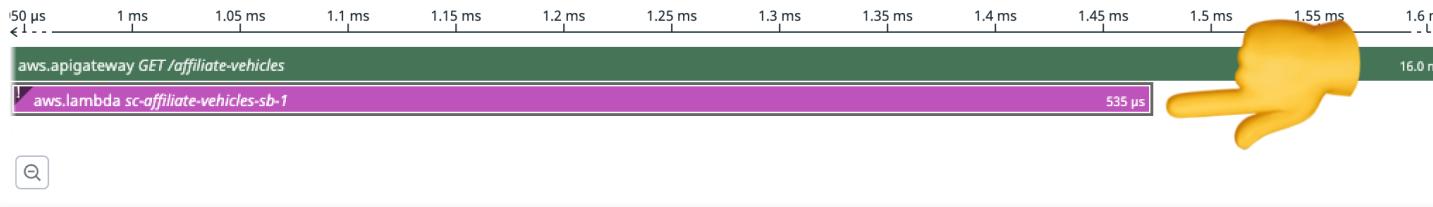
Trace: Flame Graph

Span List

2

Map

Hide Legend



Service	% Exec Time
sb1-vehicle-sea...	96.7%
search-compon...	3.34%

fx search-component aws.lambda > ! sc-affiliate-vehicles-sb-1

535 μs p16 ▲ (3.35% of total duration)

Span: Info Errors 1 Infrastructure Metrics Logs 3

search-component sc-affiliate-vehicles-sb-1

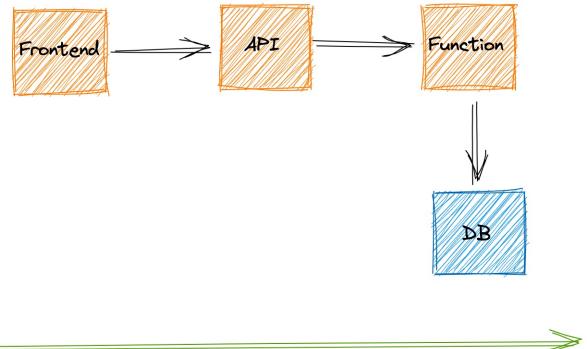
Error: Invalid parameters

View similar errors | This issue is 9 days old (v. 1) - Last seen 3 days ago (v. 1)

DATE	SERVICE	RESOURCE	DURATION	METHOD	STATUS CODE
Jun 13 17:02:59.565	search-component	sc-affiliate-vehicles-sb-1	38.2 ms	GET	200
Jun 13 17:02:53.654	search-component	sc-affiliate-vehicles-sb-1	535 μs	GET	500
Jun 13 17:02:41.492	search-component	sc-affiliate-vehicles-sb-1	2.72 ms	GET	500
Jun 13 17:01:34.334	search-component	sc-affiliate-vehicles-sb-1	83.5 ms	GET	200
Jun 13 16:51:33.107	search-component	sc-affiliate-vehicles-sb-1	115 ms	GET	200
Jun 13 16:50:39.631	search-component	sc-affiliate-vehicles-sb-1	14.8 ms	GET	200
Jun 13 16:50:35.315	search-component	sc-affiliate-vehicles-sb-1	151 ms	GET	200

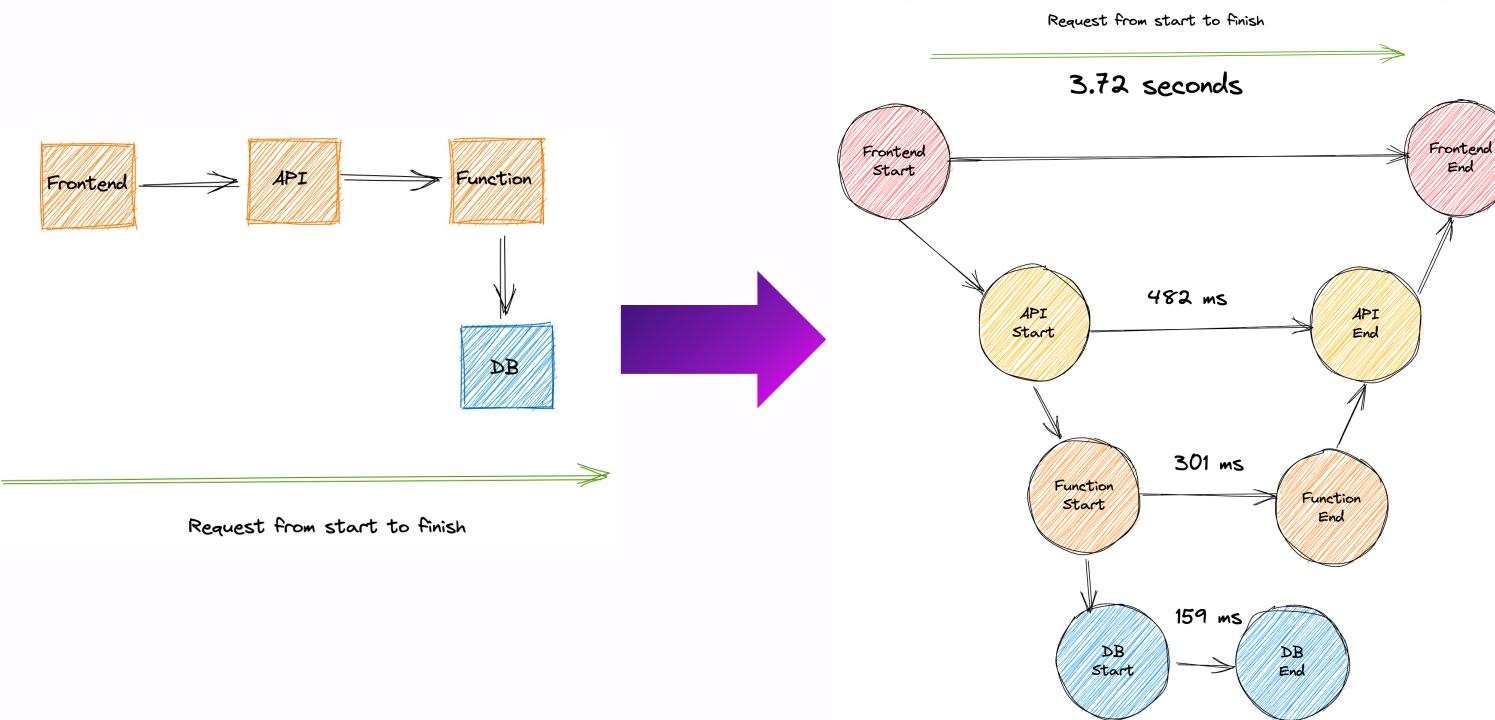
So, why bother?

'Hops' across services



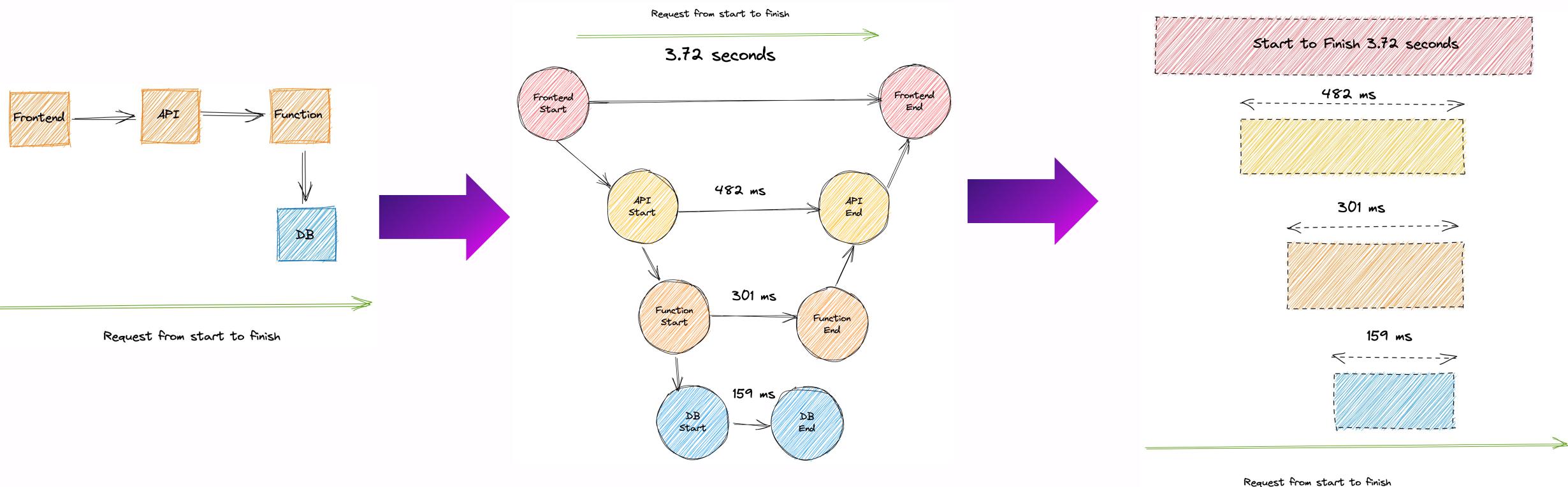
'Hops' across services

Amount of work + causality



'Hops' across services

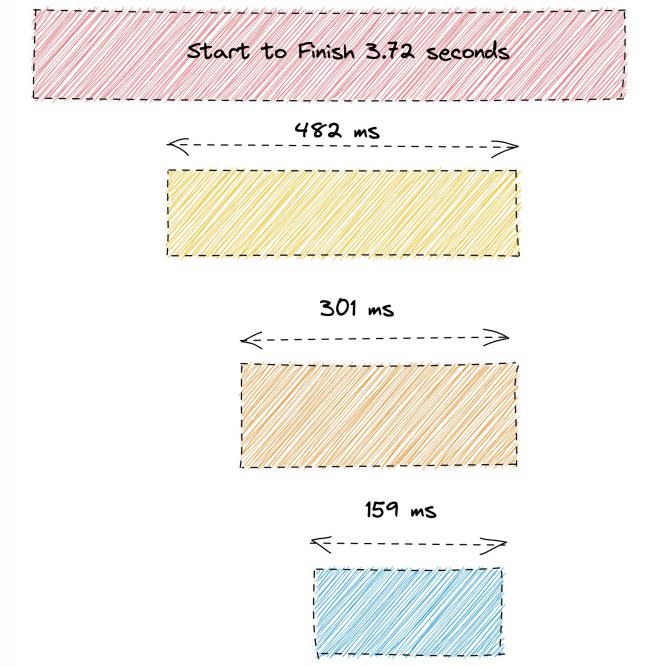
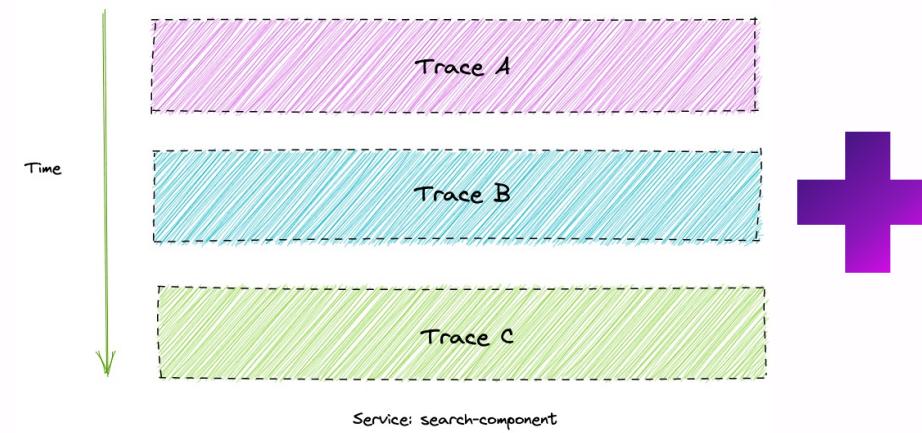
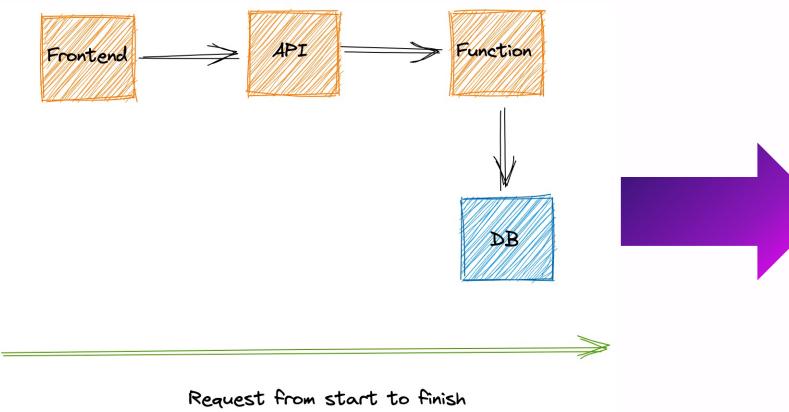
Amount of work + causality

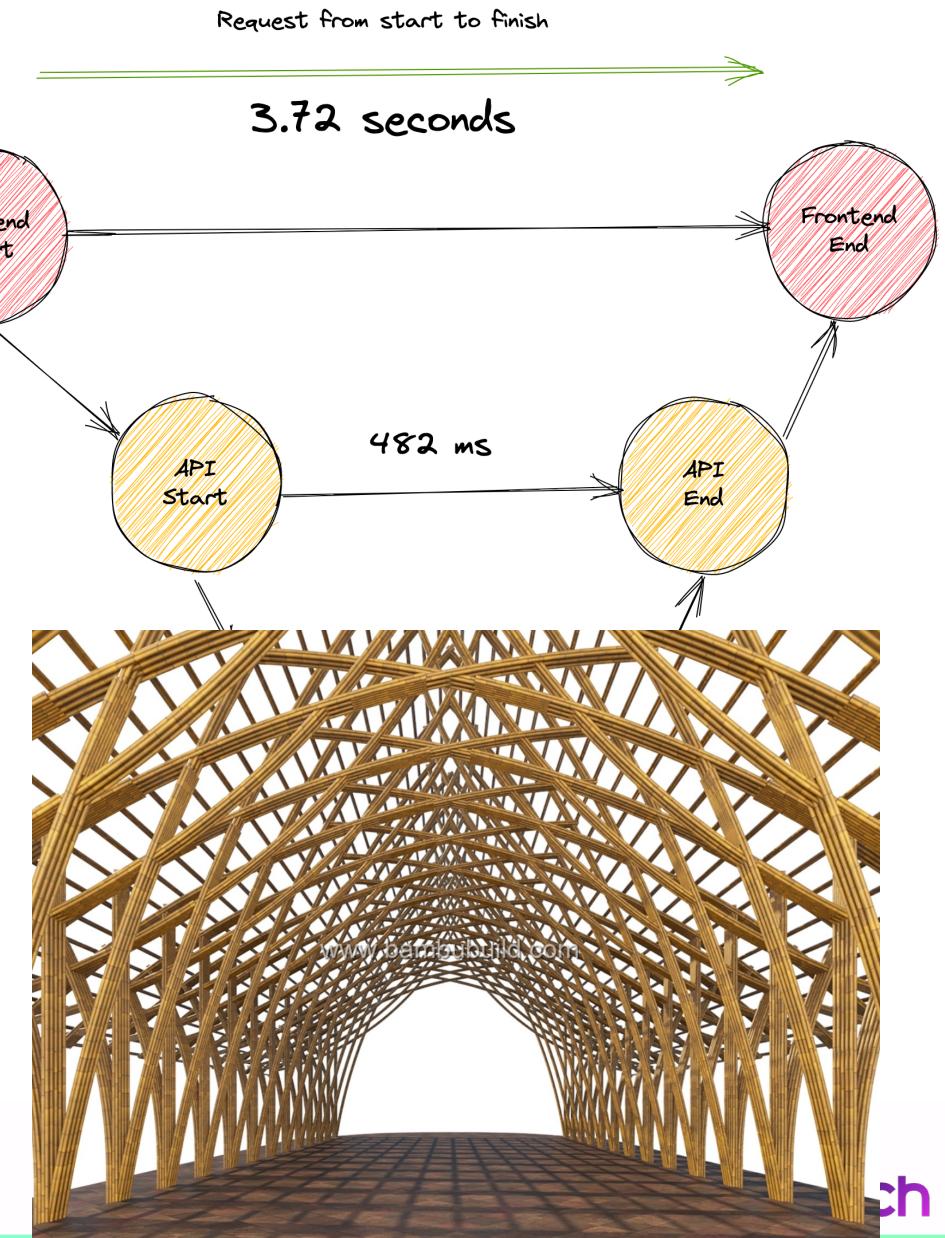
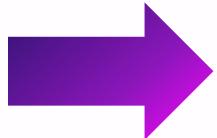
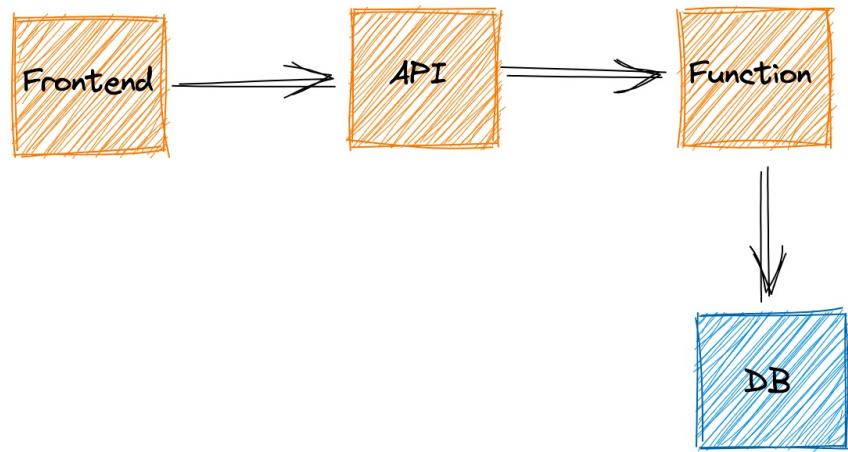


'Hops' across services

Dataset of spans

Request as a Trace





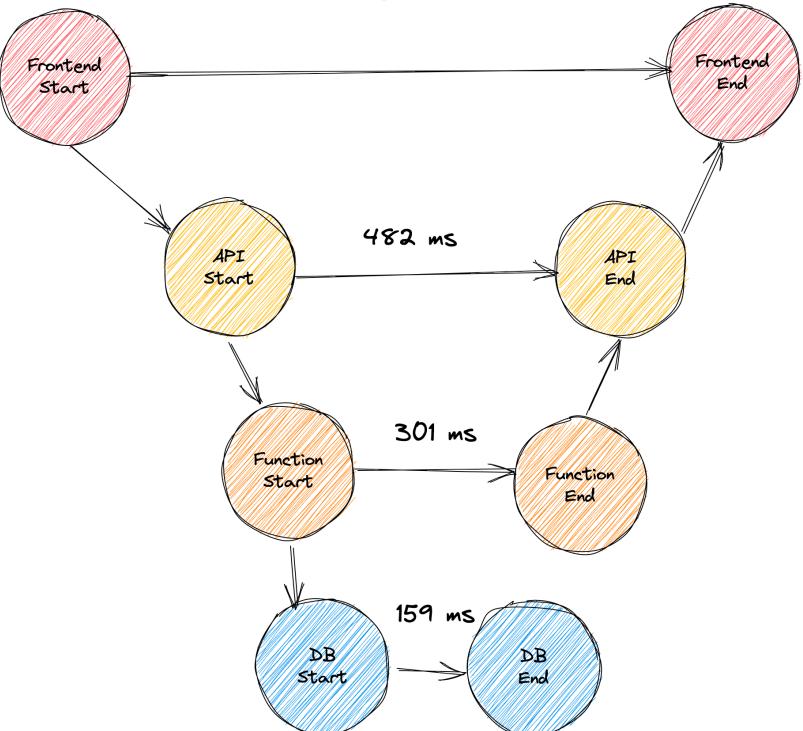
Log groups (2300+)By default, we only load up to 10000 log groups. [Load more](#).

finance

 Log group /aws/api-gateway/finance-component-davew /aws/api-gateway/finance-component-dev /aws/api-gateway/finance-component-int-d01403cf4 /aws/api-gateway/finance-component-int-seb /aws/api-gateway/finance-component-jr-d /aws/api-gateway/finance-component-sa-d /aws/api-gateway/finance-component-seb-int /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-14IT6O261KH4V /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-1I2X0NPUJ1XF /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-1NGWJY60N1P8Q /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-47DKDEYPMT37 /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-4UZFDQHOADX2 /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-76GS8OFXT0R /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-GPWHBVJSNB9M /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-O1O5GFEGXMED

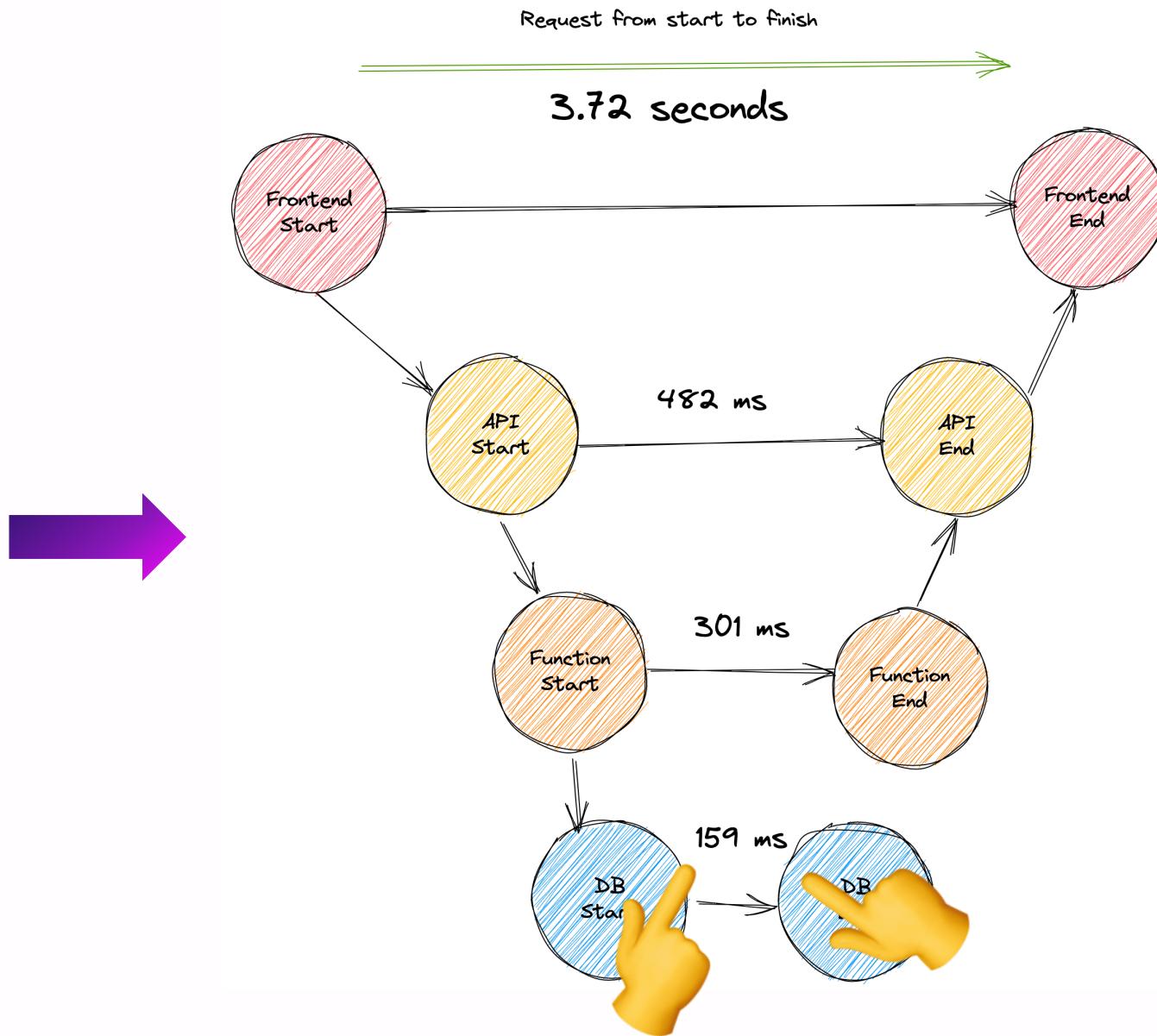
Request from start to finish

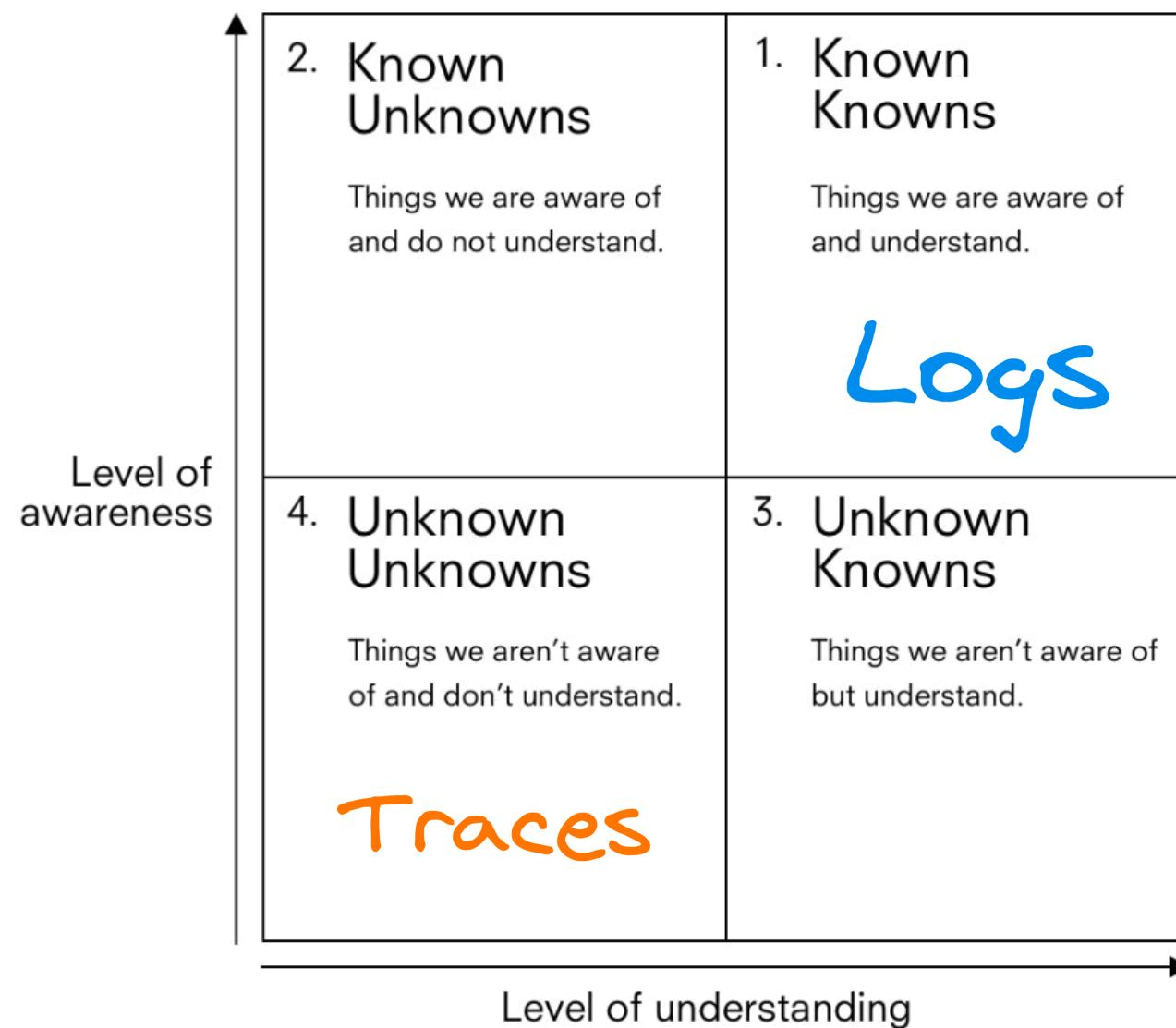
3.72 seconds



Log groups (2300+)By default, we only load up to 10000 log groups. [Load more.](#)

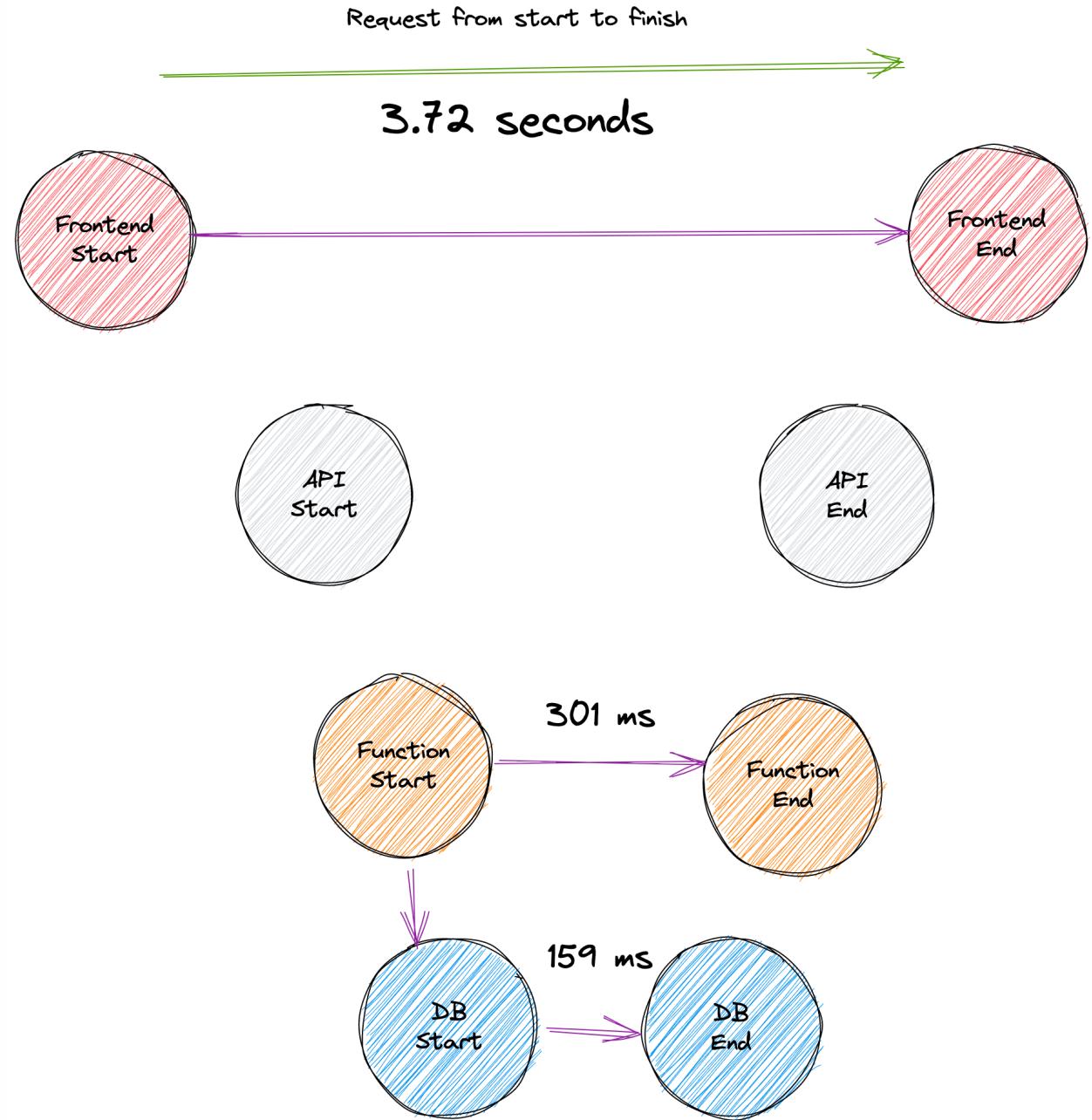
finance

 Log group /aws/api-gateway/finance-component-davew /aws/api-gateway/finance-component-dev /aws/api-gateway/finance-component-int-d01403cf4 /aws/api-gateway/finance-component-int-seb /aws/api-gateway/finance-component-jr-d /aws/api-gateway/finance-component-sa-d /aws/api-gateway/finance-component-seb-int /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-14IT6O261KH4V /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-1I2X0NPUJ1XF /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-1NGWJY60N1P8Q /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-47DKDEYPMT37 /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-4UZFDQHOADX2 /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-76GS8OFXT0R /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-GPWHBVJSNB9M /aws/lambda/FinanceLenderEmailImporte-AWS679f53fac002430cb0da5-O1O5GFEGXMED

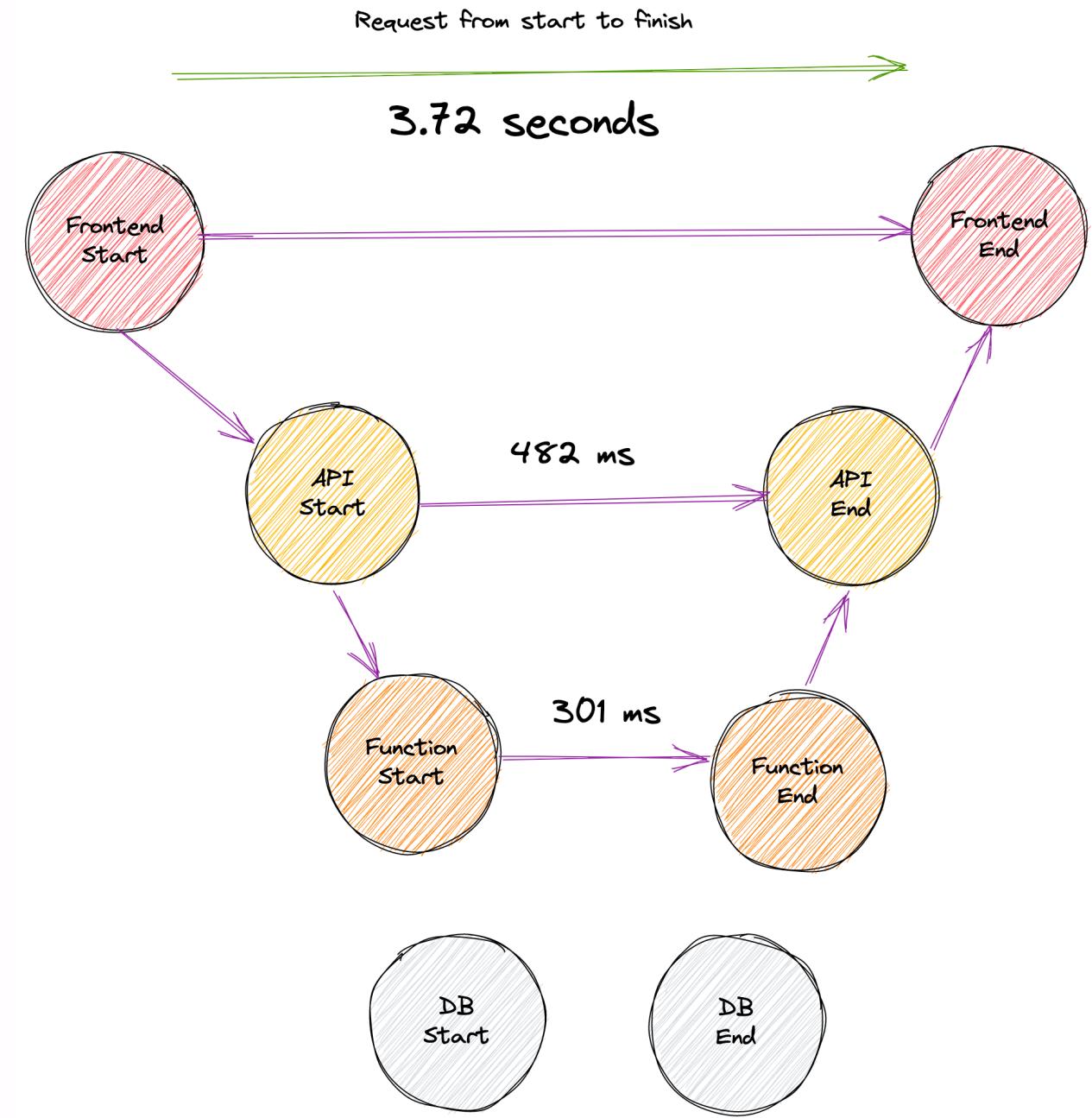


Drawbacks of tracing

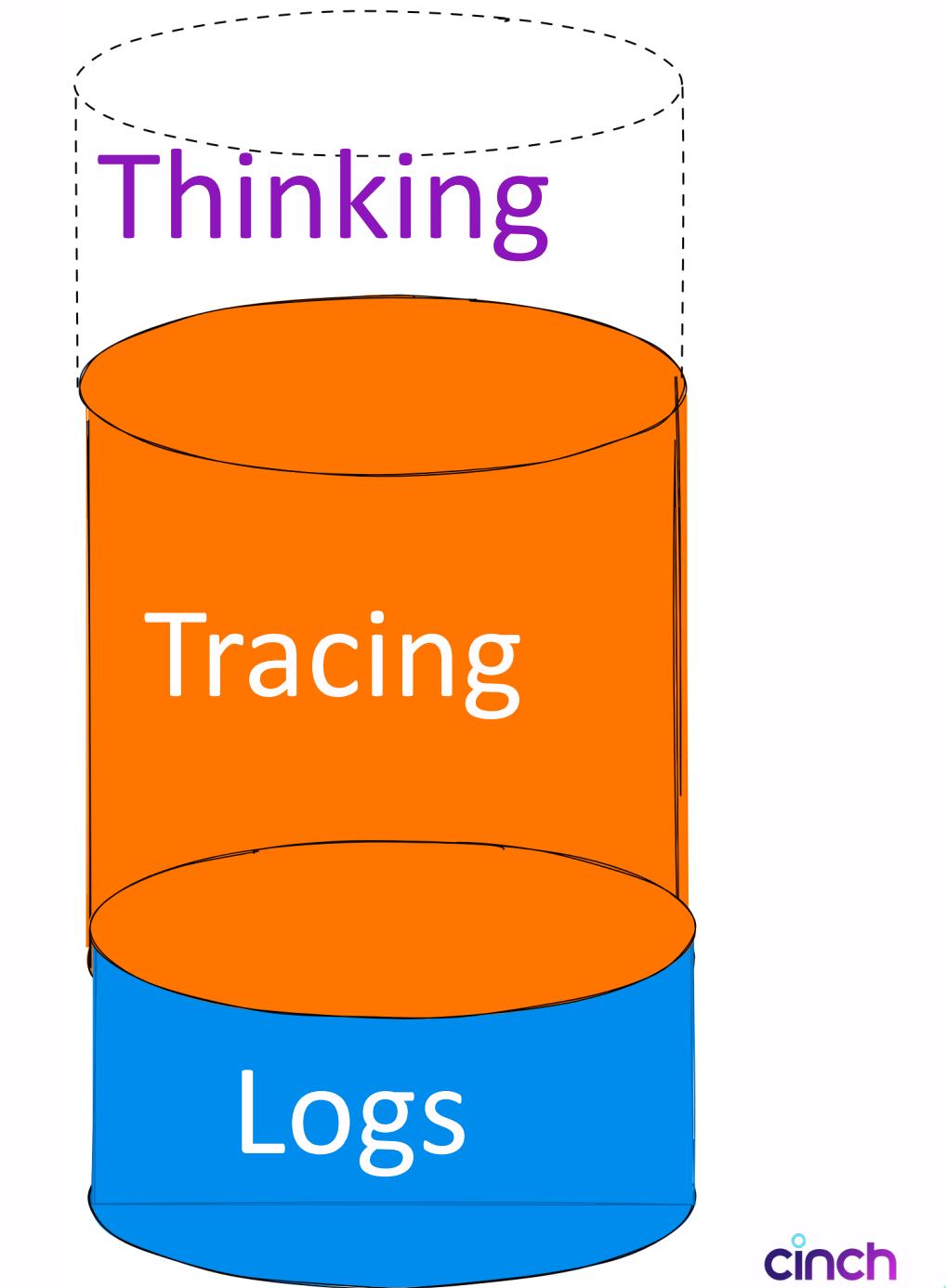
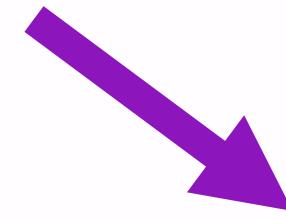
Components in request not traced



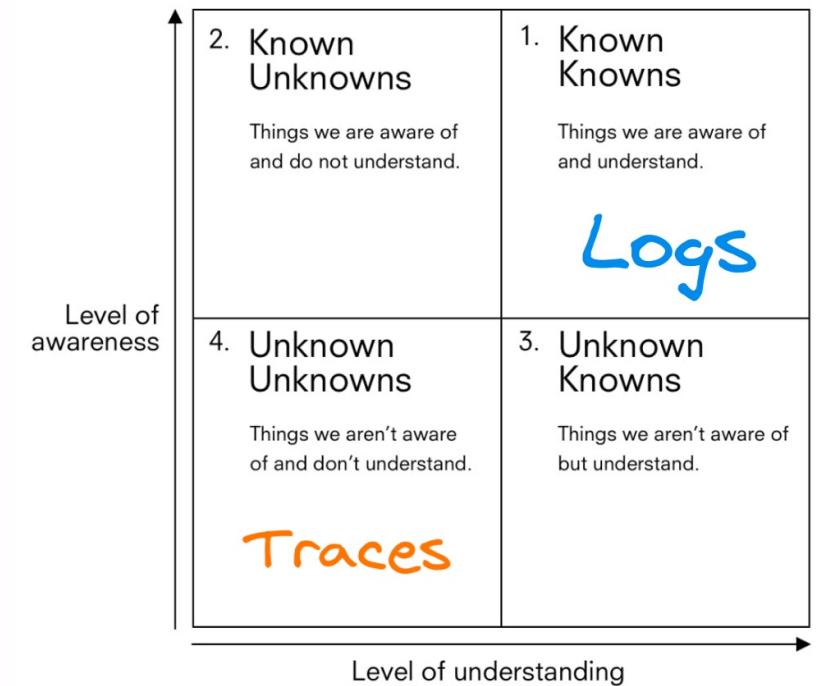
3rd party components not traced



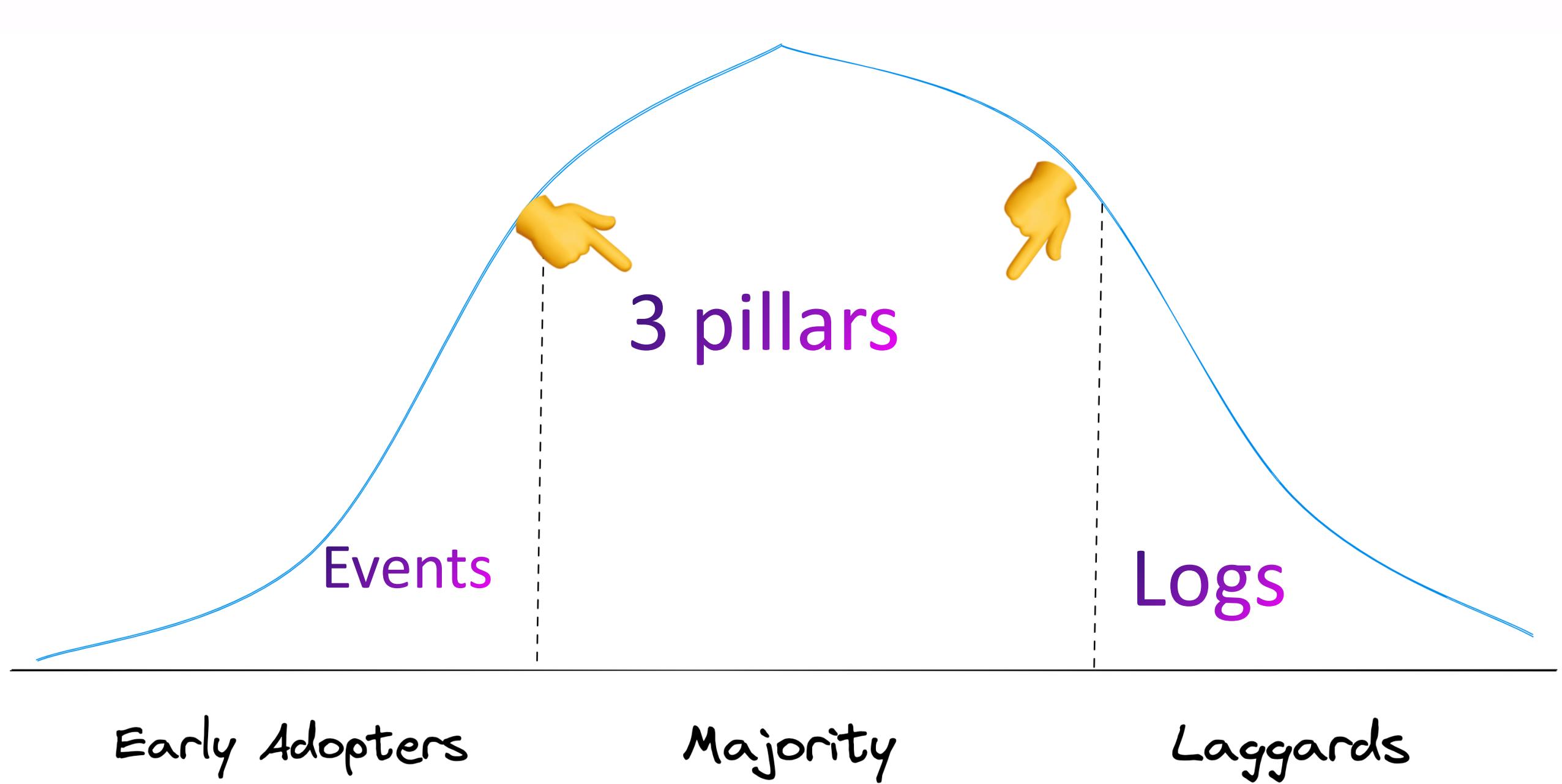
Cognitive (observability) Load



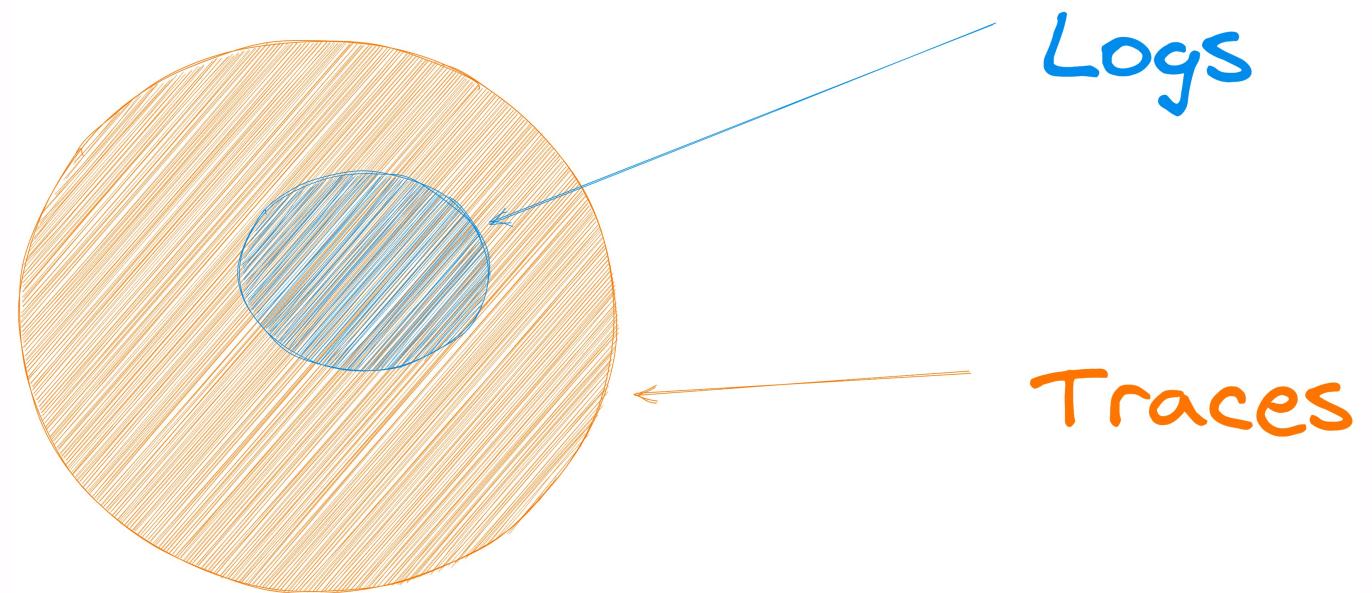
So, am I banking too much
on tracing?



Conclusion



Traces are a superset of Logs



Logs are built for
monoliths.

Traces are built for
distributed systems.

You will start seeing
the unknown
unknowns all over
the place.

Thanks!



Chapter 4. The Three Pillars of Observability

Logs, metrics, and traces are often known as the three pillars of observability. While plainly having access to logs, metrics, and traces doesn't necessarily make systems more observable, these are powerful tools that, if understood well, can unlock the ability to build better systems.

