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2021



WHAT IS DISTRIBUTED TRACING, AND WHY SHOULD YOU CARE ABOUT IT?

RICARDO FERREIRA
PRINCIPAL DEVELOPER ADVOCATE
ELASTIC

A still from the movie L.A. Confidential featuring Brad Pitt and Morgan Freeman. Brad Pitt is on the left, wearing a white shirt, tie, and suspenders, with his arms crossed. Morgan Freeman is on the right, wearing a white shirt and a dark vest. They are in an office setting with blinds in the background.

CRIMINAL INVESTIGATION TV SHOWS AND MOVIES

- 
- COLLECT EVIDENCE
 - SEARCHING DATA
 - INTERROGATION
 - CREATING TIMELINES
 - FORENSIC SCIENCE
 - MOTIVE PROBING
 - HUMAN PSYCHOLOGY
 - BUILD STRONG CASE

AGENDA

- WHAT IS DISTRIBUTED TRACING?
- HOW DISTRIBUTED TRACING WORKS?
- BENEFITS OF DISTRIBUTED TRACING
- CHALLENGES: IT AIN'T ALL FLOWERS



WHO AM I?

- PRINCIPAL DEVELOPER 🥑 AT ELASTIC
- COMMUNITY, DEVELOPER RELATIONS
- BEFORE ELASTIC ➡ CONFLUENT, ORACLE, AND RED HAT (JBOSS)
- DISTRIBUTED SYSTEMS, DATABASES, OBSERVABILITY, STREAMING SYSTEMS
- [HTTPS://RIFERREI.COM](https://riferrei.com)

WHAT IS DISTRIBUTED TRACING?

FOR STARTERS: IT IS NOTHING NEW!

```
type Log struct {  
    request_path string  
    request_size int64  
    status int32  
    latency_ms float64  
}
```



```
logEntry := Log{  
    "/customers/find",  
    840, 200, 35  
}
```

```
fmt.Printf("%+v", logEntry)
```

EACH LOG STATEMENT
HAS ITS OWN "SCHEMA"

FOLLOW THE THREAD TROUBLESHOOTING

Log{"/api/find",
840, 200, 35}

Log{"/customer/find",
235, 200, 30}

Log{"/db/find",
450, 200, 5}

THREAD 1



THREAD 2



Log{"/api/find",
840, 200, 45}

Log{"/customer/find",
235, 200, 42}

Log{"/db/find",
450, 200, 3}

STITCHING THE THREADS MANUALLY

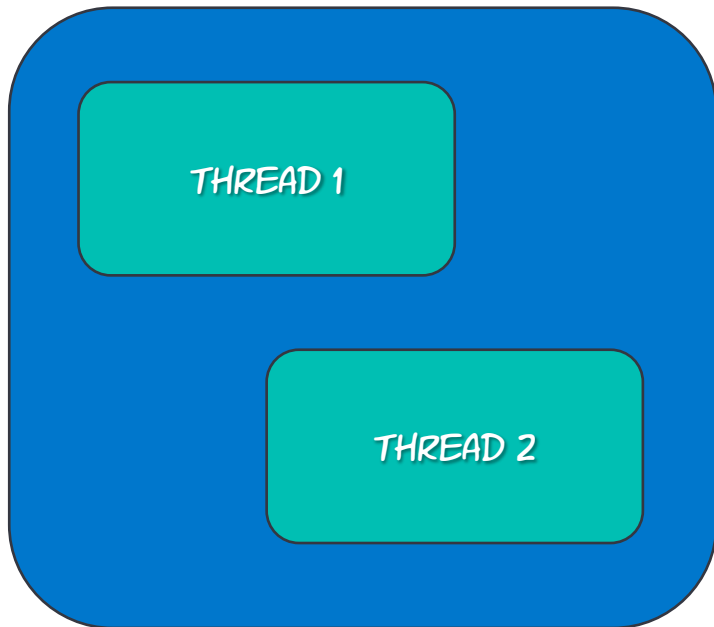
```
type CustomLog struct {  
    request_path string  
    request_size int64  
    status int32  
    latency_ms float64  
    customer_id int64  
    database_id int64  
}
```



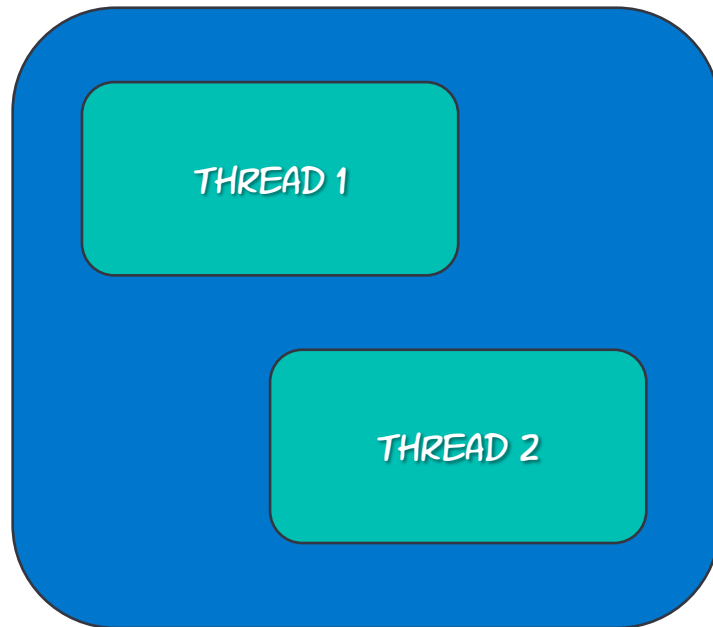
```
logEntry := CustomLog{  
    requestPath(),  
    requestSize(),  
    requestStatus(),  
    latencyMS(),  
    cust.customerID(),  
    db.databaseTenantID()  
}
```

BEGIN OF CHAOS: DISTRIBUTED COMPUTING

HOST 1

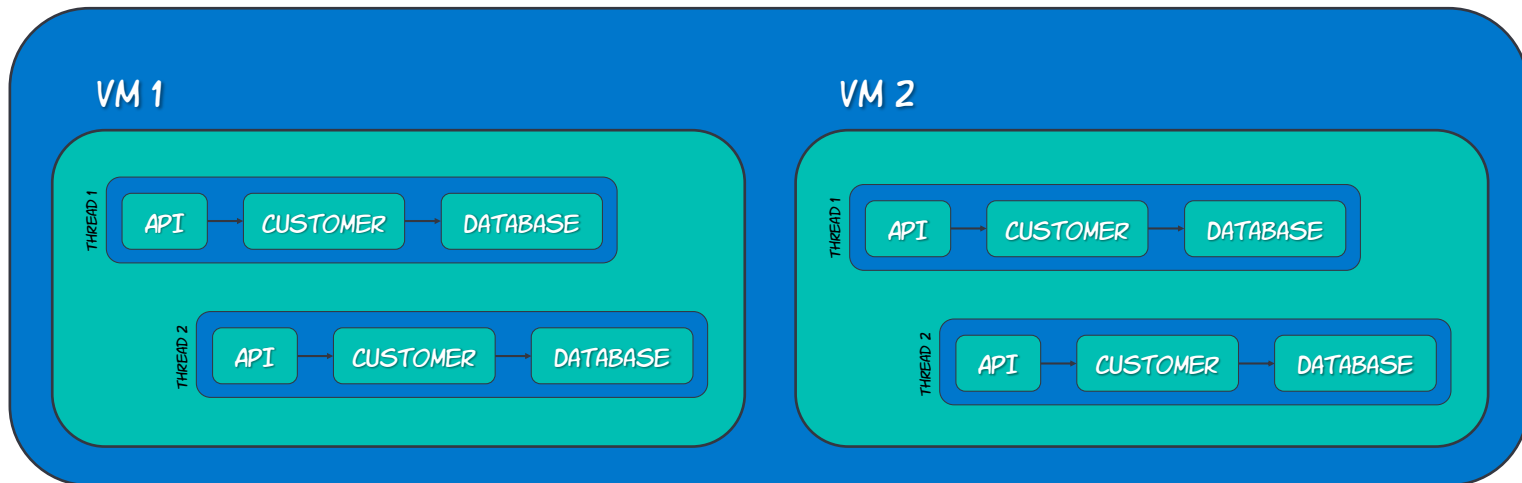


HOST 2



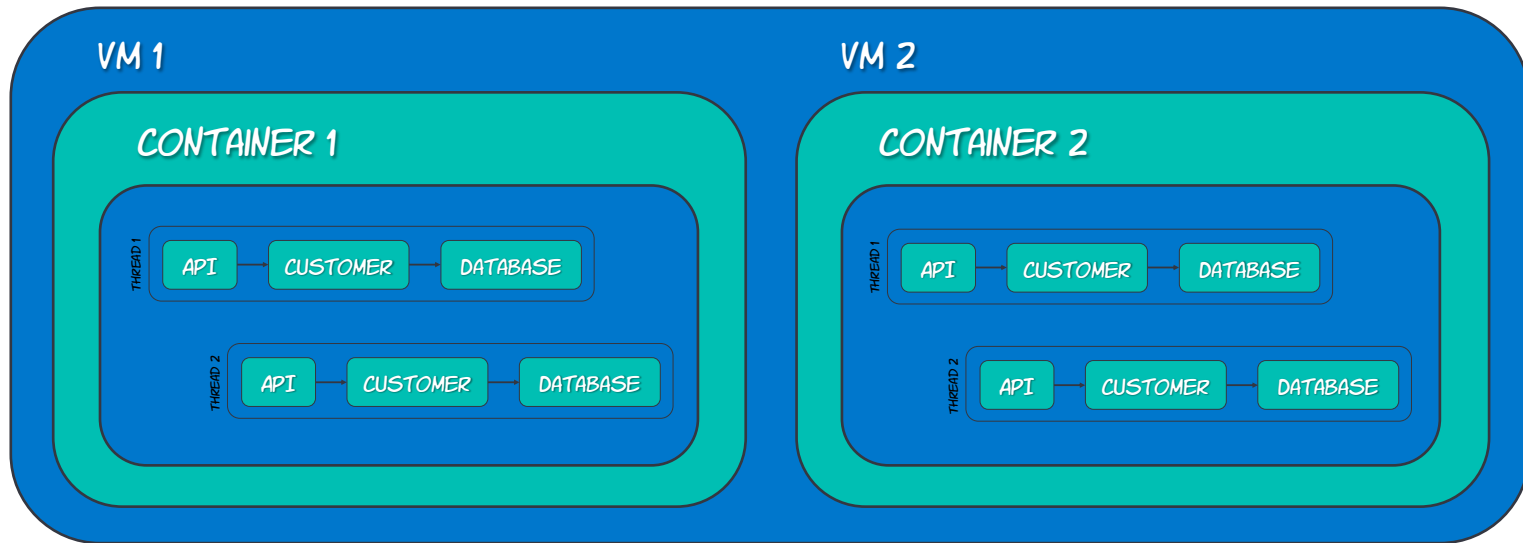
USING VIRTUALIZATION

HOST 1



USING CONTAINERIZATION

HOST 1





"LET'S NOW BREAK
DOWN THE SERVICES
INTO FUNCTIONS"

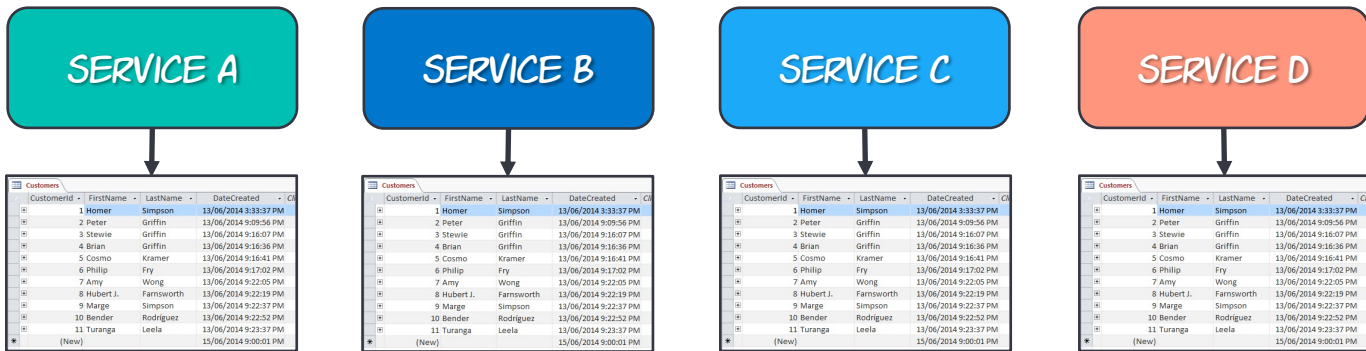
OPS:

IS THIS A
JOKE TO YOU?

TRACING AUTOMATES SYSTEM-WIDE STITCHING

TRANSACTION DATA IS COLLECTED AND BECOMES SEARCHABLE READY

TRANSACTION



- 
- COLLECT EVIDENCE ✓
 - SEARCHING DATA ✓
 - INTERROGATION ✓
 - CREATING TIMELINES
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 - BUILD STRONG CASE

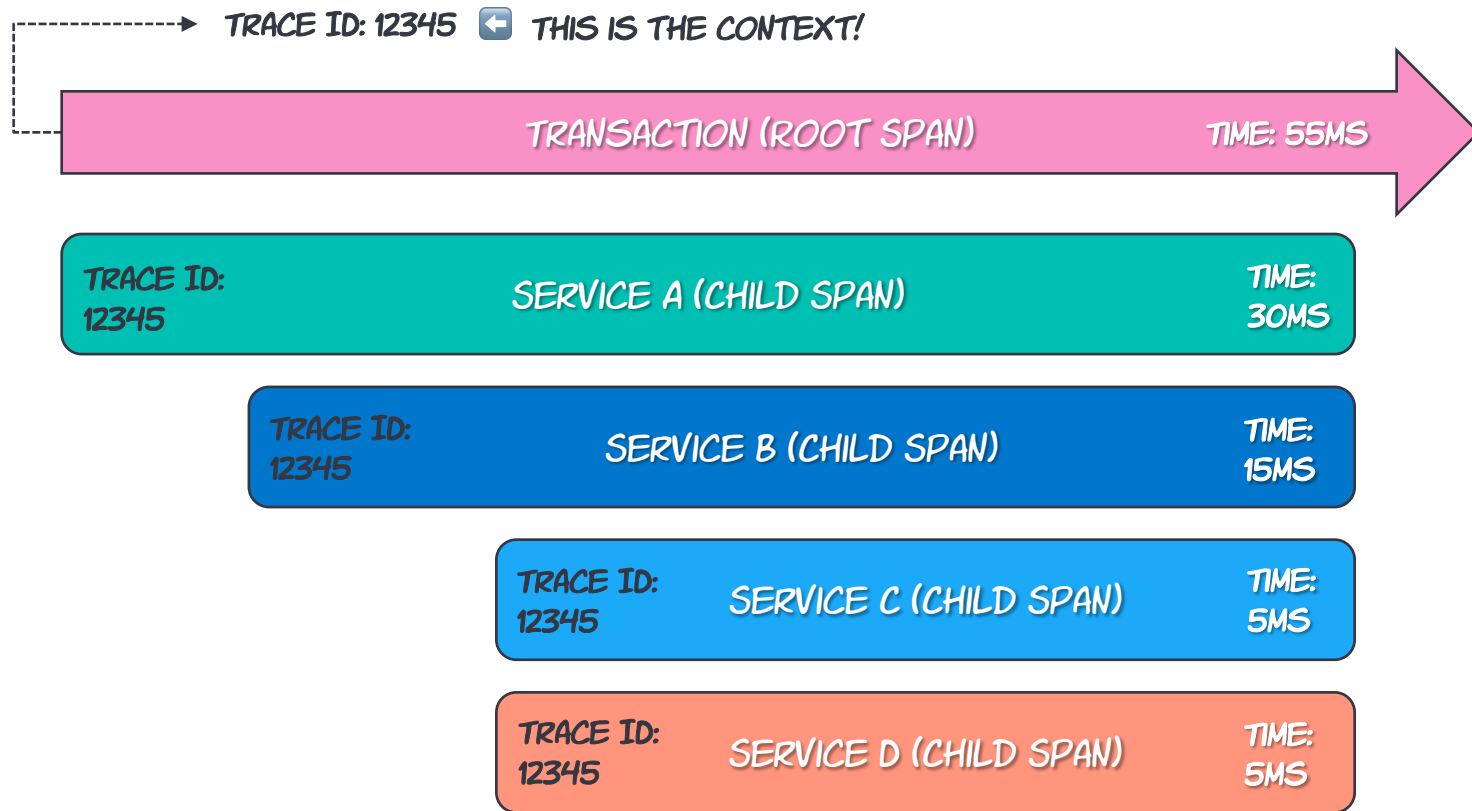
HOW DISTRIBUTED TRACING WORKS?



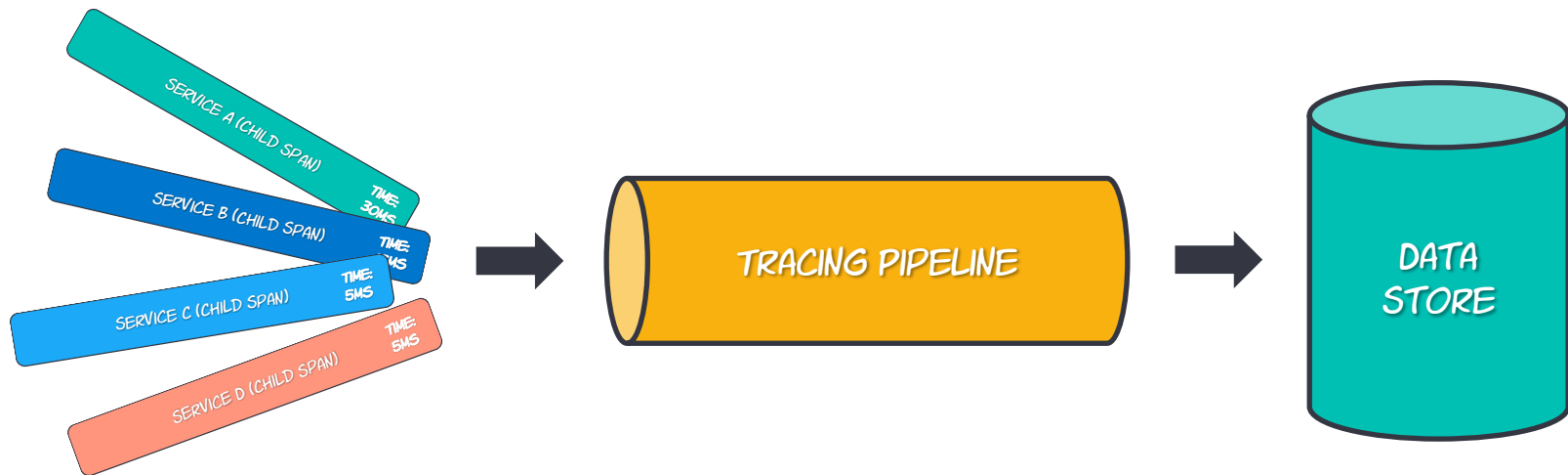
"WATCHA TALKIN' ABOUT WILLIS?"

IT IS ALL
ABOUT
SETTING THE
CONTEXT

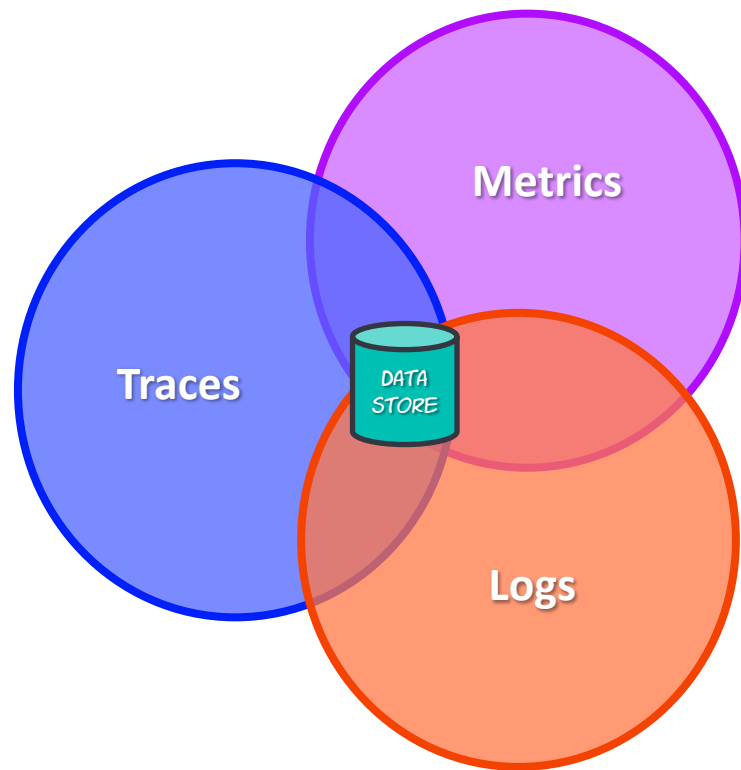
TRACING, SPANS, AND CONTEXT PROPAGATION



CAPTURE, PROCESS, STORE, REPEAT



ONE HECK OF A DATA STORE 💡



- 
- COLLECT EVIDENCE ✓
 - SEARCHING DATA ✓
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BENEFITS OF DISTRIBUTED TRACING

REDUCED MEAN TIME TO RESOLUTION (MTTR)

10%

SUSPECT

- WATCHING METRIC VALUES
- CAUGHT UP WITH ALERTS
- BRINGING PEOPLE ONBOARD

60%

DRILL DOWN

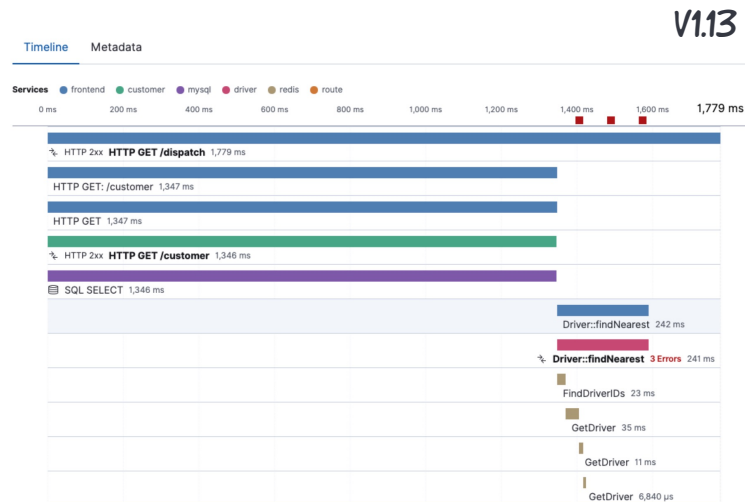
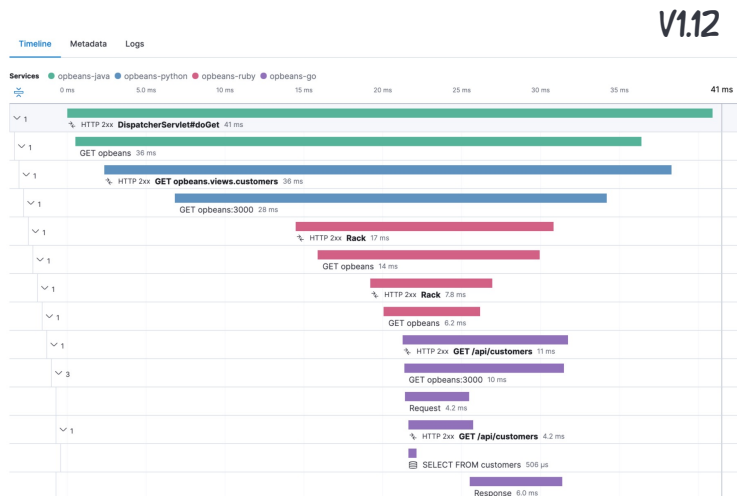
- UNDERSTAND TOPOLOGIES
- ISOLATE THE ANOMALIES
- COLLECT CONTEXTUAL DATA

30%

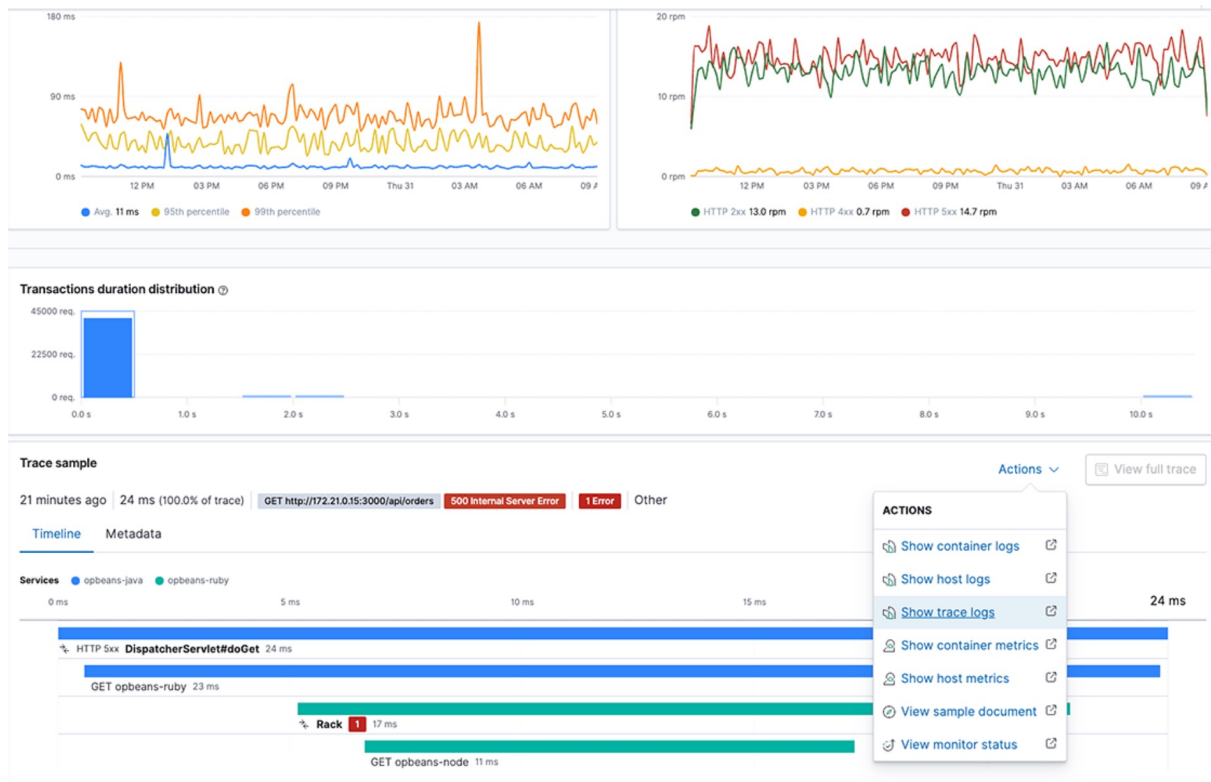
SOLVE

- READ LOGS AND EVENTS
- CREATE CODE PATCHES
- CREATE A NEW RELEASE

FINDING BUGS BETWEEN RELEASES



IMPROVED TEAM COLLABORATION



- 
- COLLECT EVIDENCE ✓
 - SEARCHING DATA ✓
 - INTERROGATION ✓
 - CREATING TIMELINES ✓
 - FORENSIC SCIENCE ✓
 - MOTIVE PROBING ✓
 - HUMAN PSYCHOLOGY ✓
 - BUILD STRONG CASE ✓

CHALLENGES:
BECAUSE IT AIN'T
ALL FLOWERS

PICKING OPEN-SOURCE IS NOT ALWAYS EASY



AGENT FOR MY
PROGRAMMING
LANGUAGE?

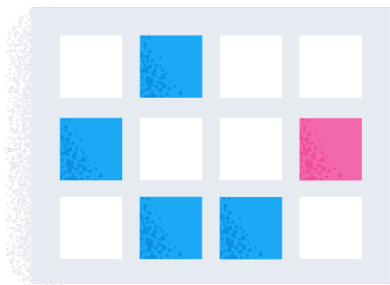
FRAMEWORKS
VERSUS
LIBRARIES?

DATA STORE
SCALABILITY?

DOES MY
ARCHITECTURE
FIT?

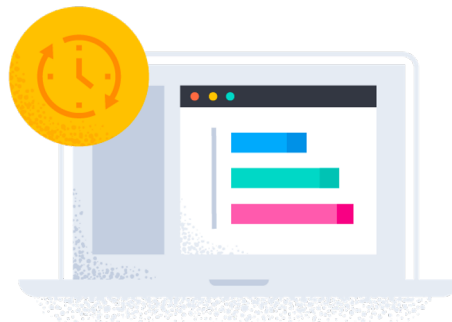
BLACK-BOX VERSUS WHITE-BOX TRACING

BLACK-BOX



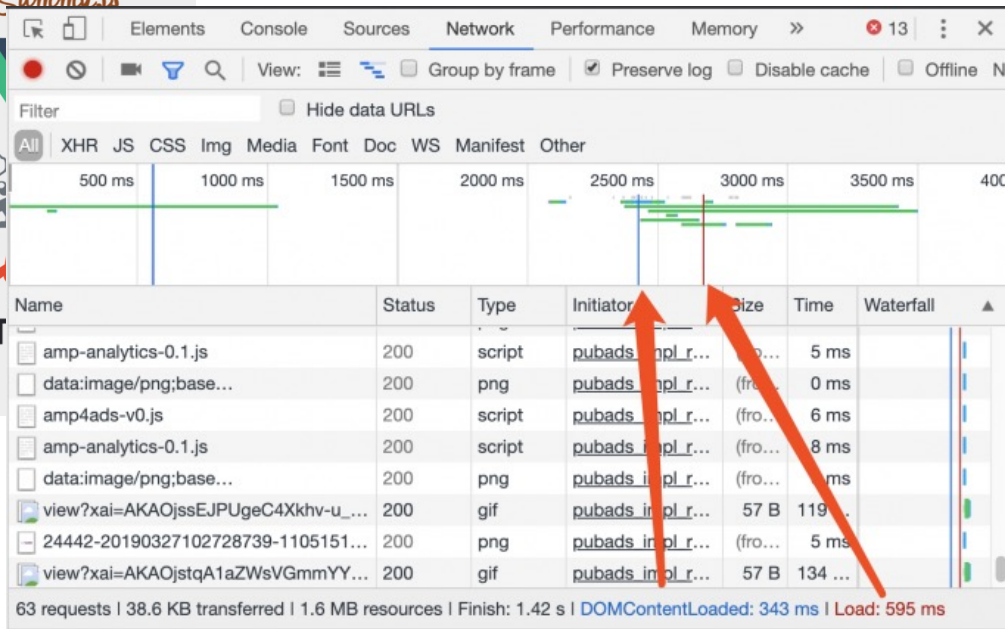
- CODE IS NOT CHANGED
- HANDLED BY THE RUNTIME
- MINIMAL EXECUTION VISIBILITY

WHITE-BOX



- REQUIRE CODE CHANGES
- HANDLED BY THE APPLICATION
- FULL EXECUTION VISIBILITY

CLIENT-SIDE TRACING IS ON ITS EARLY DAYS



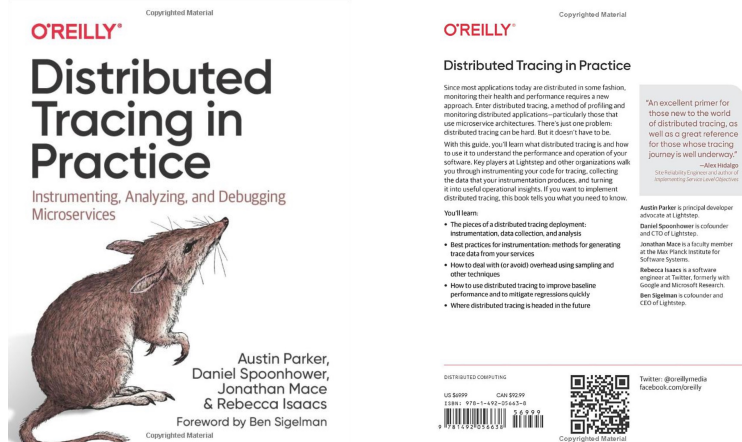
SAMPLING EVERYTHING COMES AT A PRICE



WRAPPING UP

USEFUL RESOURCES

- ✓ JOIN #OPENTELEMETRY ON [HTTPS://SLACK.CNCF.IO](https://slack.cncf.io)
- ✓ [HTTPS://GITHUB.COM/RIFERREI/OTEL-WITH-JAVA](https://github.com/riferrei/otel-with-java)
- ✓ BOOK ➡ DISTRIBUTED TRACING IN PRACTICE ✓



ADDITIONAL RESOURCES

DISCUSS
FORUM



ELASTIC
COMMUNITY



RICARDO'S
CHANNEL





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THANK YOU

