

Opentelemetry

101

@HackNightVLC ~ May 2023



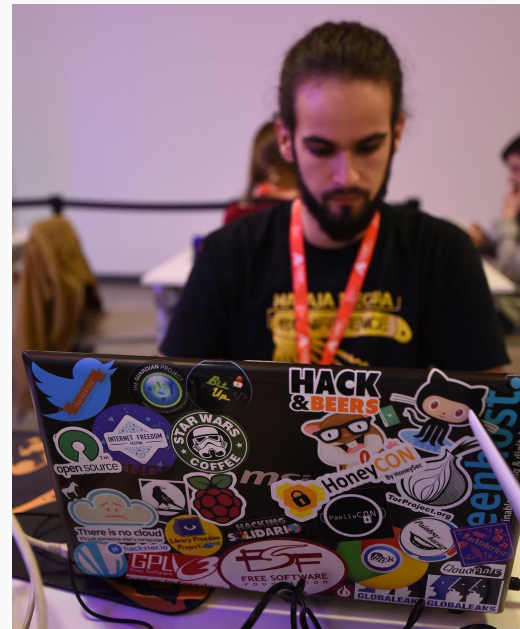
\$ whoami

Andoni Alonso Fernández

- SRE at Flywire
- Previously worked as Sysadmin

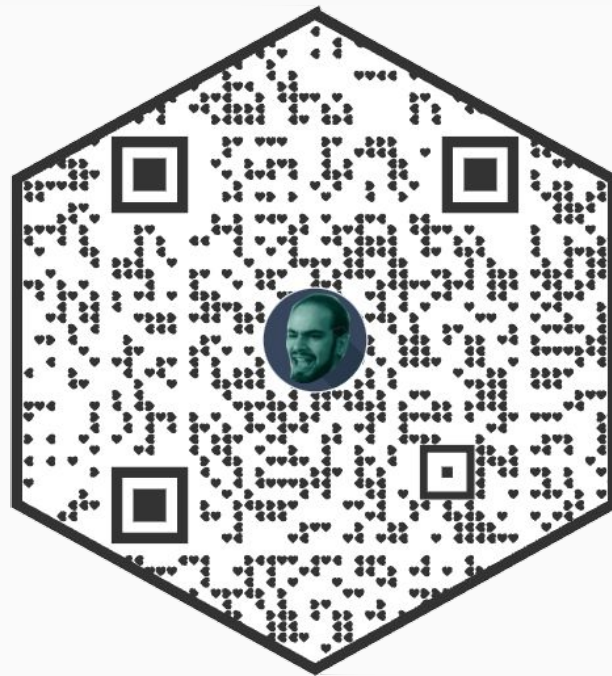
 @andoni013

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\$ 1s agenda/

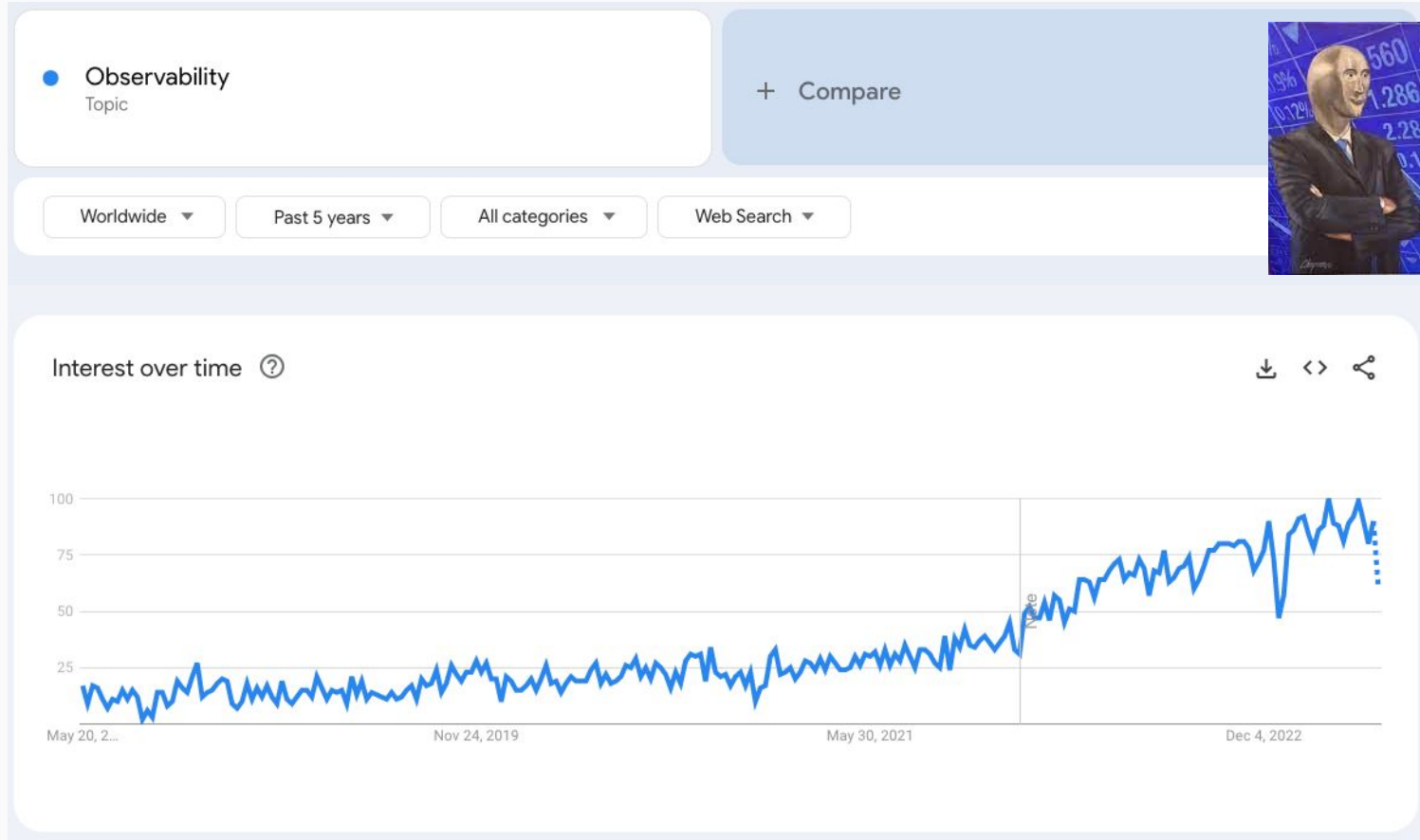
- What is observability?
- How does OpenTelemetry relate to observability?
- What concepts do I need to use OpenTelemetry?
- How do I record data using OpenTelemetry?
- Where can I send my data?



\$ echo warning!



Observability – Ok, why?



Observability – Ok, why?

- Systems are complex.

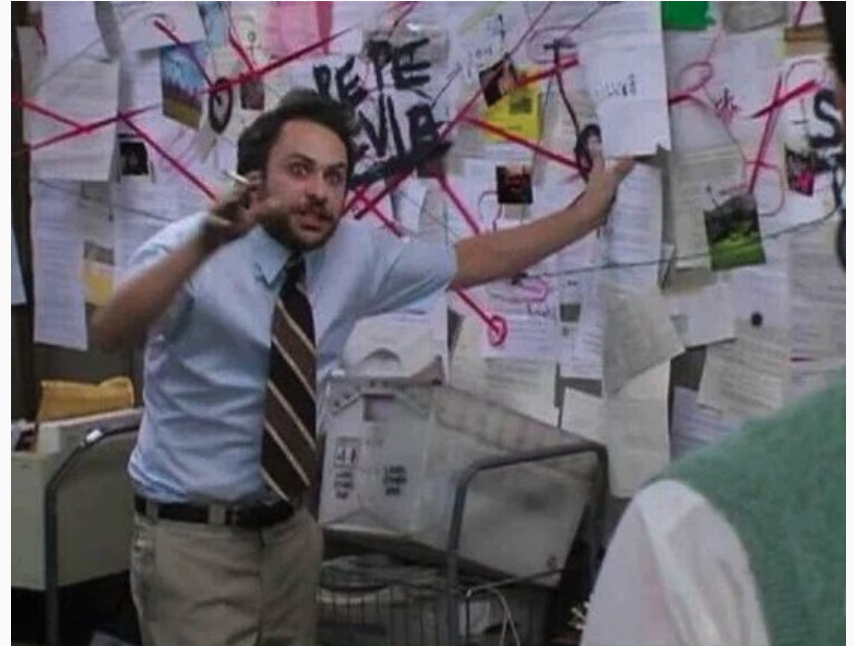
The same technology that simplifies life by providing more functions in each device also complicates life by making the device harder to learn, harder to use. This is the paradox of technology and the challenge for the designer.

The Design of Everyday Things
Don Norman



Observability – Ok, why?

- Systems are complex.
- Failures don't exactly repeat.



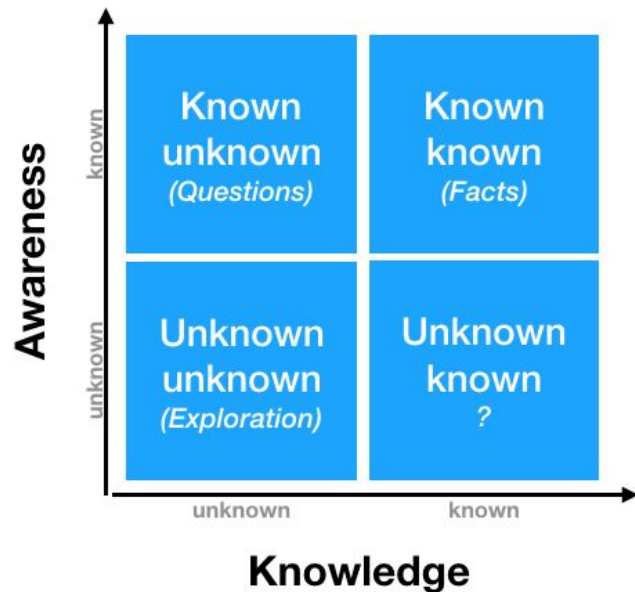
Observability – Ok, why?

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- Effective debugging.



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- Data driven decisions.



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Observability – What is?

Observability is the ability of gaining deep insights into the behavior and performance of complex systems by collecting and analyzing telemetry data, including metrics, traces, and logs.

It enables proactive issue detection, effective troubleshooting, and data-driven decision making, ultimately improving system reliability and user experience.



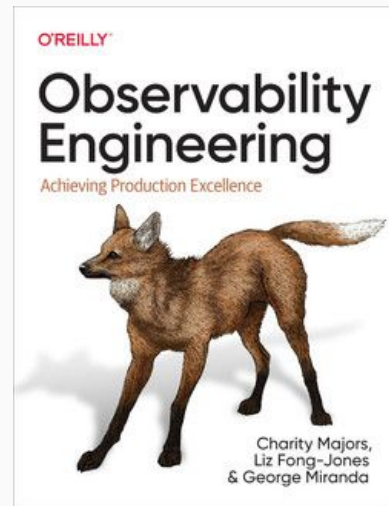
Observability – What is?

"You can understand the inner workings and system state solely by observing and interrogating with external tools".

"You can understand the internal state without shipping any new custom code to handle it"

"You can understand what any particular user of your software may be experiencing at any given time"

"You can compare any arbitrary groups of user requests in ways that let you correctly identify which attributes are commonly shared by all users who are experiencing unexpected behavior in your application"



Observability – Isn't that the same than telemetry?

- Telemetry data is the raw material.
- Observability is the practice that transforms that data into meaningful insights and actionable information.

	Date,Time	1RSS (dB)	2RSS (dB)	RQly (%)	RSNR (dB)	RFMD,TPWR (mW)	TRSS (dB)	TQly (%)	TSNR (dB)	Ptch (rad)	Roll (rad)	Yaw (rad)
1	01/10/2018,44:37.9	51,51,100,57,2,10,39,100,62,-0.05,0.01,0.67,0.16,7.8,62,-11,337,-121,-28,701,-14,-1024,-981										
2	01/10/2018,44:38.1	49,49,100,55,2,10,37,100,64,-0.05,0.01,0.67,0.16,7.8,62,-9,337,-340,-21,701,-14,-1024,-981										
3	01/10/2018,44:38.3	51,51,100,59,2,10,38,100,65,-0.05,0.01,0.67,0.16,7.8,62,-24,319,-387,-9,701,-15,-1024,-981										
4	01/10/2018,44:38.5	54,54,100,53,2,10,41,100,57,-0.05,0.01,0.67,0.16,7.8,62,-9,293,-369,-18,701,-14,-1024,-981										
5	01/10/2018,44:38.7	52,52,100,52,2,10,39,100,57,0.84,-0.06,0.71,0.16,3.7,4.66,-13,240,-375,-4,701,-14,-1024,-981										
6	01/10/2018,44:38.9	50,50,100,54,2,10,37,100,71,0.84,-0.06,0.71,0.16,3.7,4.66,-82,160,-513,-34,701,-14,-1024,-981										
7	01/10/2018,44:39.1	50,50,98,51,2,10,36,98,71,0.84,-0.06,0.71,0.16,3.7,4.66,-34,117,-400,-126,701,-14,-1024,-981										
8	01/10/2018,44:39.3	48,48,97,52,2,10,35,98,67,0.84,-0.06,0.71,0.16,3.7,4.66,-21,20,-375,-161,701,-14,-1024,-981										
9	01/10/2018,44:39.5	48,48,97,62,2,10,35,98,72,0.84,-0.06,0.71,0.16,3.7,4.66,-17,-62,-345,-85,701,-14,-1024,-981										
10	01/10/2018,44:39.7	49,49,100,56,2,10,35,100,61,1.1,-0.22,0.64,0.16,3.6,4.68,-9,-154,-280,22,701,-14,-1024,-981										
11	01/10/2018,44:39.9	49,49,100,60,2,10,36,100,69,1.1,-0.22,0.64,0.16,3.6,4.68,-9,-223,-262,126,701,-14,-1024,-981										
12	01/10/2018,44:40.1	51,51,100,54,2,10,38,100,66,1.1,-0.22,0.64,0.16,3.6,4.68,-8,-222,-221,161,701,-14,-1024,-981										
13	01/10/2018,44:40.3	49,49,100,60,2,10,37,100,67,1.1,-0.22,0.64,0.16,3.6,4.68,-11,-180,-218,166,701,-14,-1024,-981										
14	01/10/2018,44:40.5	50,50,99,60,2,10,35,100,54,1.1,-0.22,0.64,0.16,3.6,4.68,-17,-84,-346,151,701,-14,-1024,-981										
15	01/10/2018,44:40.7	43,43,99,67,2,10,30,100,73,1.1,-0.22,0.64,0.16,3.10,9.70,1,-89,-288,146,701,-14,-1024,-981										
16	01/10/2018,44:40.9	42,42,100,63,2,10,30,100,74,0.6,0.12,0.55,0.16,3.10,9.70,1,-59,-273,95,701,-14,-1024,-981										
17	01/10/2018,44:41.1	49,49,100,56,2,10,35,100,65,0.6,0.12,0.55,0.16,3.10,9.70,1,-285,19,701,-14,-1024,-981										
18	01/10/2018,44:41.3	47,47,100,60,2,10,34,100,64,0.6,0.12,0.55,0.16,3.10,9.70,1,-80,-335,9,701,-14,-1024,-981										
19	01/10/2018,44:41.5	46,46,100,55,2,10,33,100,72,0.6,0.12,0.55,0.16,3.10,9.70,1,-335,-92,701,-14,-1024,-981										
20	01/10/2018,44:41.7	47,47,100,59,2,10,34,100,69,0.6,0.12,0.55,0.16,2.8,8.73,5,-3,-349,-151,701,-14,-1024,-981										
21	01/10/2018,44:41.9	50,50,100,53,2,10,36,100,66,0.56,0.08,0.59,0.16,2.8,8.73,-13,0,-473,-98,701,-15,-1024,-981										
22	01/10/2018,44:42.1	52,52,100,52,2,10,38,100,68,0.56,0.08,0.59,0.16,2.8,8.73,8,-461,-84,701,-14,-1024,-981										
23	01/10/2018,44:42.3	56,56,100,48,2,10,42,100,64,0.56,0.08,0.59,0.16,2.8,8.73,37,10,-461,-82,701,-14,-1024,-981										
24	01/10/2018,44:42.5	59,59,100,48,2,10,46,100,56,0.56,0.08,0.59,0.16,2.8,8.73,38,-13,-414,4,701,-15,-1024,-981										
25	01/10/2018,44:42.7	58,58,99,48,2,10,45,100,51,0.56,0.08,0.59,0.16,3.5,8.75,37,-43,-375,89,701,-14,-1024,-981										
26	01/10/2018,44:42.9	56,56,98,49,2,10,43,100,63,0.56,-0.11,0.62,0.16,3.5,8.75,42,-1,-374,73,701,-14,-1024,-981										
27	01/10/2018,44:42.9	56,56,98,49,2,10,43,100,63,0.56,-0.11,0.62,0.16,3.5,8.75,42,-1,-374,73,701,-14,-1024,-981										

2023 Miami Grand Prix - Race - Top Speed (km/h) for Each Lap													
STR	351	347	346	345	345	344	344	343	343	342	342	342	344
VER	350	346	345	345	344	342	341	339	337	335	327	325	337
HAM	348	344	343	343	341	341	341	341	341	340	340	340	342
ALB	347	345	344	344	343	343	343	343	342	342	342	341	343
ZHO	346	343	342	342	341	340	340	339	339	339	338	337	340
HUL	345	345	344	344	343	343	342	342	341	341	341	340	342
RUS	344	342	342	338	338	338	338	337	336	336	336	334	337
TSU	344	344	343	343	343	342	342	342	342	342	340	340	342
MAG	343	340	340	339	338	338	336	335	332	331	328	327	333
GAS	343	341	337	337	335	334	334	332	332	331	330	325	332
OCO	343	340	338	338	336	336	335	335	334	334	334	334	336
NOR	342	340	339	338	335	332	326	326	323	322	322	322	329
PIA	342	341	335	328	325	323	323	322	322	321	321	321	326
SAI	341	340	340	338	335	335	335	335	334	333	333	331	336
LEC	341	341	341	340	337	337	335	335	335	334	333	333	336
PER	340	333	325	324	324	324	323	323	323	323	322	321	325
BOT	337	337	336	332	331	327	324	322	320	320	320	319	327
DEV	335	334	334	333	330	325	323	323	322	322	321	321	326
ALO	333	331	331	329	324	324	324	324	323	323	323	322	326
SAR	330	329	325	324	324	324	324	323	323	323	323	323	324

Laps Sorted by maximum Speed (15 Best Shown, Average on the Right)

OpenTelemetry – What is?

- Is an open-source observability framework that allows you to capture telemetry data from your applications.
- Vendor-agnostic
- Generate, emit, collect, process and export telemetry data



OpenTelemetry – What is not?

- Is not an observability back-end like Jaeger, Prometheus or Grafana
- Is not observability itself



OpenTelemetry – Key concepts

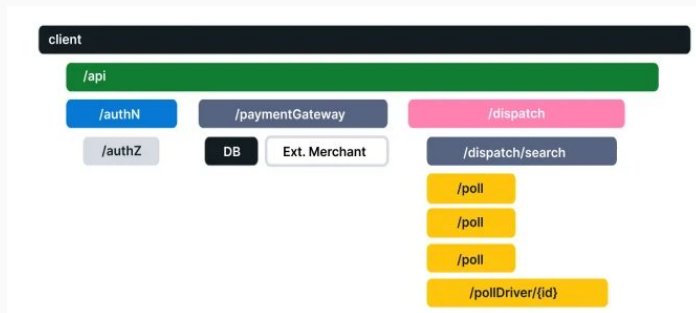
- Metrics
 - Aggregated summary statistics.
- Logs
 - Detailed debugging information emitted by processes.
- Distributed Tracing
 - Provides insights into the full lifecycles, aka traces of requests to a system, allowing you to pinpoint failures and performance issues.

OpenTelemetry – Key concepts: Metrics

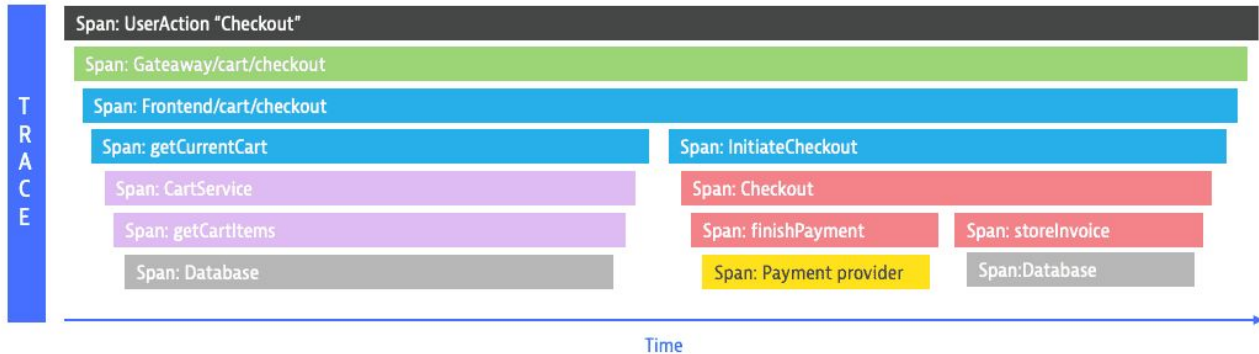
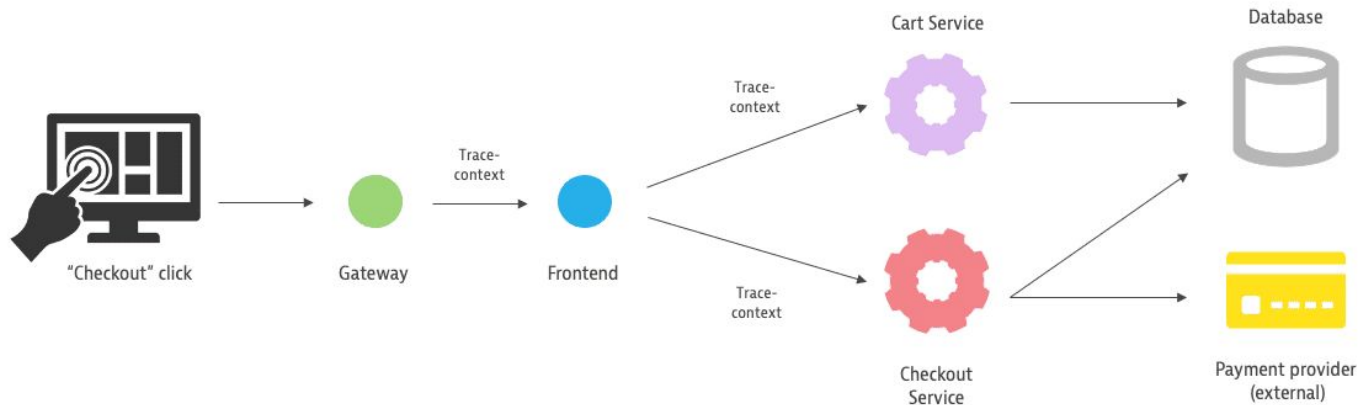
- **Gauges**
 - Instantaneous point-in-time value (e.g. CPU utilization)
- **Cumulative counters**
 - Cumulative sums of data since process start (e.g. request counts)
- **Cumulative histogram**
 - Grouped counters for a range of buckets (e.g. 0-10ms, 11-20ms)
- **Rates**
 - The derivative of a counter, typically. (e.g. requests per second)
- **Aggregation by tags**
 - Data can be joined along shared tags (e.g. hostname, cluster name).

OpenTelemetry – Key concepts: Tracing

- **Span**
 - Represents a single **unit of work** in a system.
 - Typically encapsulates: operation name, a start and finish timestamp, the parent span identifier, the span identifier, and context items.
- **Attribute**
 - Key-value that contains metadata
- **Trace**
 - Made of one or more spans.
 - Graph of spans where the edges between spans are defined as parent/child relationships.
- **DistributedContext**
 - Contains the tracing identifiers, tags, and options that are propagated from parent to child spans



OpenTelemetry – Key concepts: Tracing

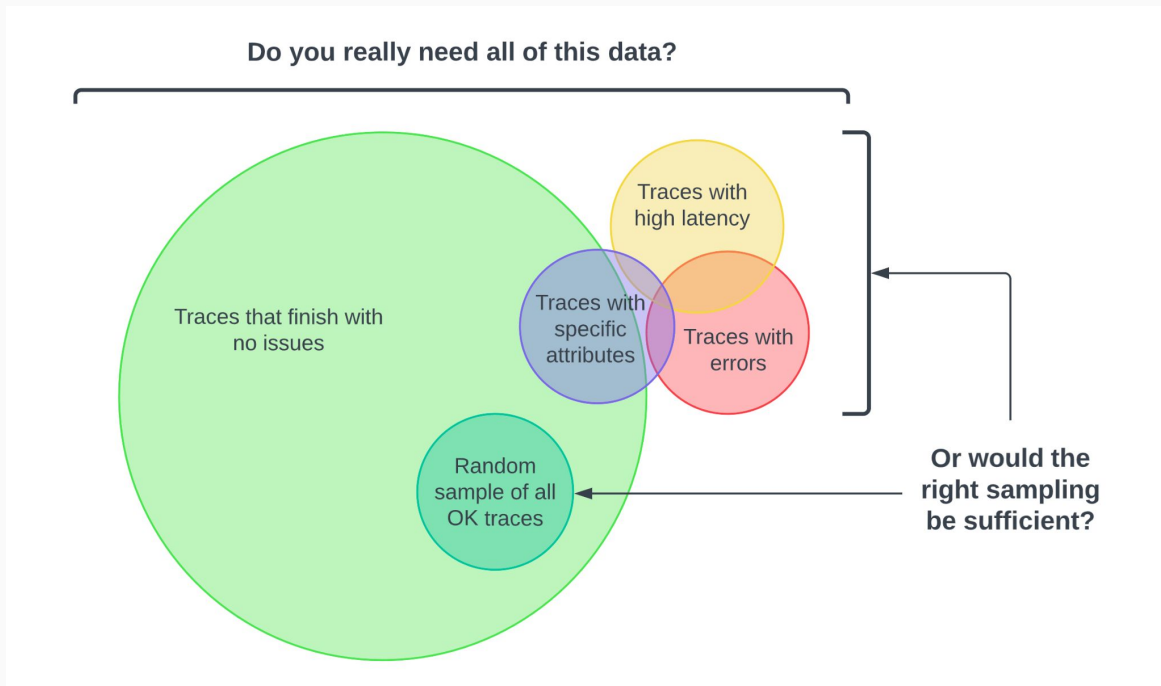


OpenTelemetry – Key concepts: Sampling

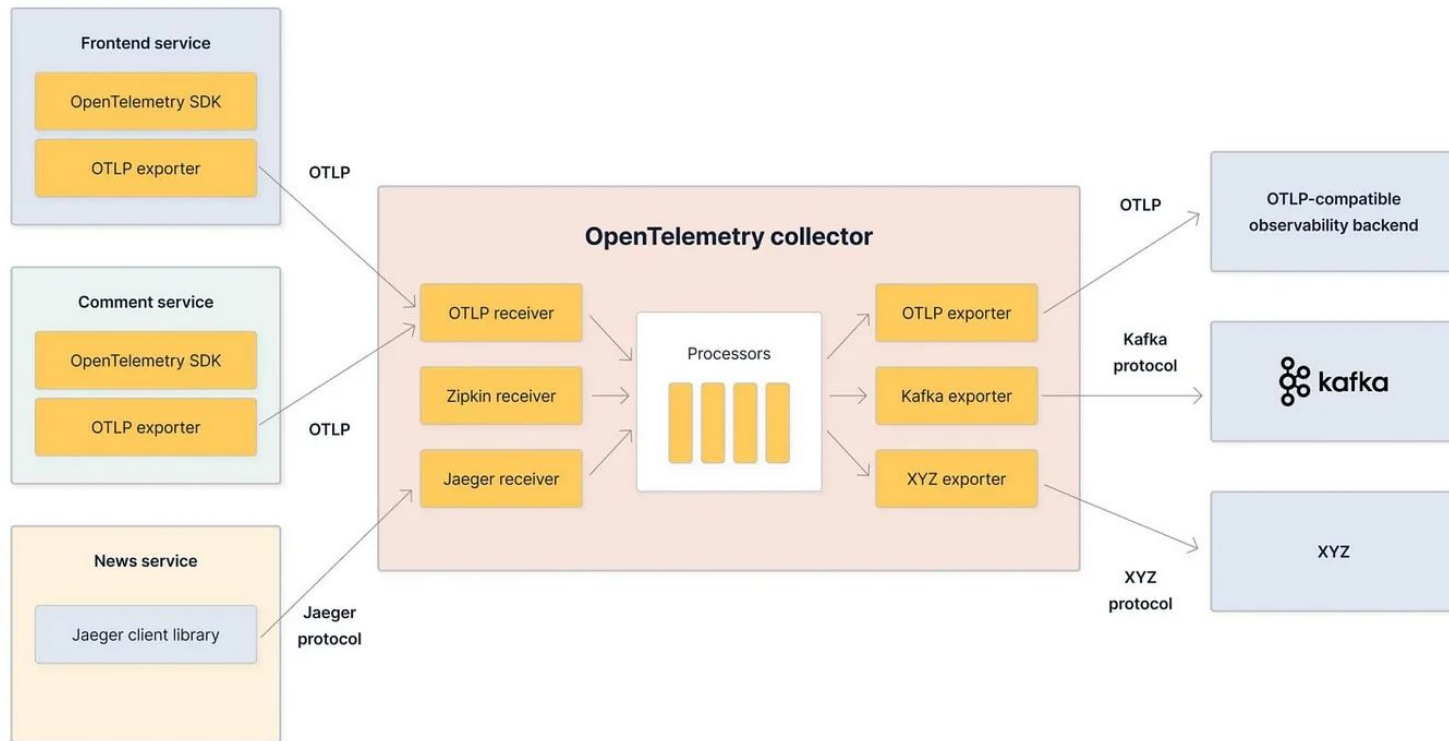


OpenTelemetry – Key concepts: Sampling

- Focus on interesting traces
- Manage costs
- Filter noise



OpenTelemetry – Key concepts: Collector

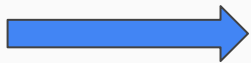


OpenTelemetry – How do I implement this?

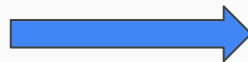
- You need an instrumentation framework!
- and a place to send the data!
- and a way to visualize the data!



Our service



otel-collector



SaaS backend

OpenTelemetry – How do I implement this?



OpenTelemetry – Automatic instrumentation

```
gem 'opentelemetry-sdk'  
gem 'opentelemetry-exporter-otlp'  
gem 'opentelemetry-instrumentation-all'
```

```
# config/initializers/opentelemetry.rb  
  
require 'opentelemetry/sdk'  
require 'opentelemetry/exporter/otlp'  
require 'opentelemetry/instrumentation/all'  
  
OpenTelemetry::SDK.configure do |c|  
  c.service_name = '<YOUR_SERVICE_NAME>'  
  c.use_all() # enables all instrumentation!  
end
```

OpenTelemetry – Automatic instrumentation

```
el-latigo | W, [2023-04-13T08:36:26.045949 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::Trilogy failed to install
el-latigo | W, [2023-04-13T08:36:26.046019 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::ActiveSupport failed to
install
el-latigo | W, [2023-04-13T08:36:26.047099 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::ActionPack failed to
install
el-latigo | W, [2023-04-13T08:36:26.047116 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::ActiveJob failed to install
el-latigo | W, [2023-04-13T08:36:26.047129 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::ActiveRecord failed to
install
el-latigo | W, [2023-04-13T08:36:26.047141 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::ActionView failed to
install
el-latigo | W, [2023-04-13T08:36:26.047483 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::Faraday failed to install
el-latigo | W, [2023-04-13T08:36:26.047496 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::GraphQL failed to install
el-latigo | W, [2023-04-13T08:36:26.047508 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::HttpClient failed to
install
el-latigo | W, [2023-04-13T08:36:26.047597 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::Mongo failed to install
el-latigo | W, [2023-04-13T08:36:26.047627 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::Mysql2 failed to install

el-latigo | W, [2023-04-13T08:36:26.048144 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::Rails failed to install
el-latigo | I, [2023-04-13T08:36:26.048668 #1] INFO -- : Instrumentation: OpenTelemetry::Instrumentation::Rake was successfully
installed with the following options {}
el-latigo | W, [2023-04-13T08:36:26.048690 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::Rdkafka failed to install
el-latigo | I, [2023-04-13T08:36:26.049032 #1] INFO -- : Instrumentation: OpenTelemetry::Instrumentation::Redis was successfully
installed with the following options {:peer_service=>nil, :trace_root_spans=>true, :db_statement=>:obfuscate}
el-latigo | W, [2023-04-13T08:36:26.049054 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::RestClient failed to
install
el-latigo | W, [2023-04-13T08:36:26.049066 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::Resque failed to install
el-latigo | W, [2023-04-13T08:36:26.049078 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::RubyKafka failed to install
el-latigo | W, [2023-04-13T08:36:26.049089 #1] WARN -- : Instrumentation: OpenTelemetry::Instrumentation::Sidekiq failed to install
el-latigo | I, [2023-04-13T08:36:26.049125 #1] INFO -- : Instrumentation: OpenTelemetry::Instrumentation::Sinatra was successfully
installed with the following options {}
```

OpenTelemetry – Automatic instrumentation

```
gem 'opentelemetry-sdk'  
gem 'opentelemetry-exporter-otlp'  
gem 'opentelemetry-instrumentation-sinatra'  
gem 'opentelemetry-instrumentation-faraday'
```

```
# config/initializers/opentelemetry.rb
```

```
require 'opentelemetry/sdk'
```

```
OpenTelemetry::SDK.configure do |c|  
  c.service_name = '<YOUR_SERVICE_NAME>'  
  c.use 'OpenTelemetry::Instrumentation::Sinatra'  
  c.use 'OpenTelemetry::Instrumentation::Faraday', { opt: 'value' }  
end
```

OpenTelemetry – Automatic instrumentation

```
gem 'opentelemetry-sdk'
```

```
# config/initializers/opentelemetry.rb
```

```
require 'opentelemetry/sdk'
```

```
OpenTelemetry::SDK.configure do |c|  
  c.service_name = '<YOUR_SERVICE_NAME>'  
end
```

```
# 'Tracer' can be used throughout your code now
```

```
MyAppTracer = OpenTelemetry.tracer_provider.tracer('<YOUR_TRACER_NAME>')
```

OpenTelemetry – Manual instrumentation

```
# config/initializers/opentelemetry.rb

require 'opentelemetry/sdk'

OpenTelemetry::SDK.configure do |c|
  c.service_name = '<YOUR_SERVICE_NAME>'
end

# 'Tracer' can be used throughout your code now
MyAppTracer = OpenTelemetry.tracer_provider.tracer('<YOUR_TRACER_NAME>')
```

```
def do_work
  MyAppTracer.in_span("do_work") do |span|
    # do some work that the 'do_work' span tracks!
  end
end
```



Questions?

Thoughts?

Thanks!



\$ more info.lst

- [Opentelemetry Docs - Getting Started](#)
- [Observability with OpenTelemetry](#)

\$ more references.1st

- “OpenTelemetry In Practice” by the OpenTelemetry Authors. (2019)