Distributed tracing

Know your enemy

Sergey
Sergey's team

Create a design

Search your designs

All your designs
Shared with you
Team members
Your brand
Team stream
Find templates
Explore Canva 2.0 BETA

Add new folder
business
family
my trips
work
Trash

Canva Empowering the world to design

Create a design

Use custom dimensions

Photo Collage

Facebook Cover

Presentation (16:...

A4

Facebook Post

Poster

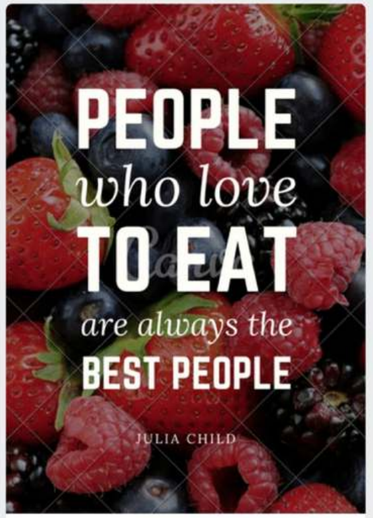
Presentation

More...

Dev | Colors
Like

Dev | Saving Orcas
Like

NEWTOWN
Like



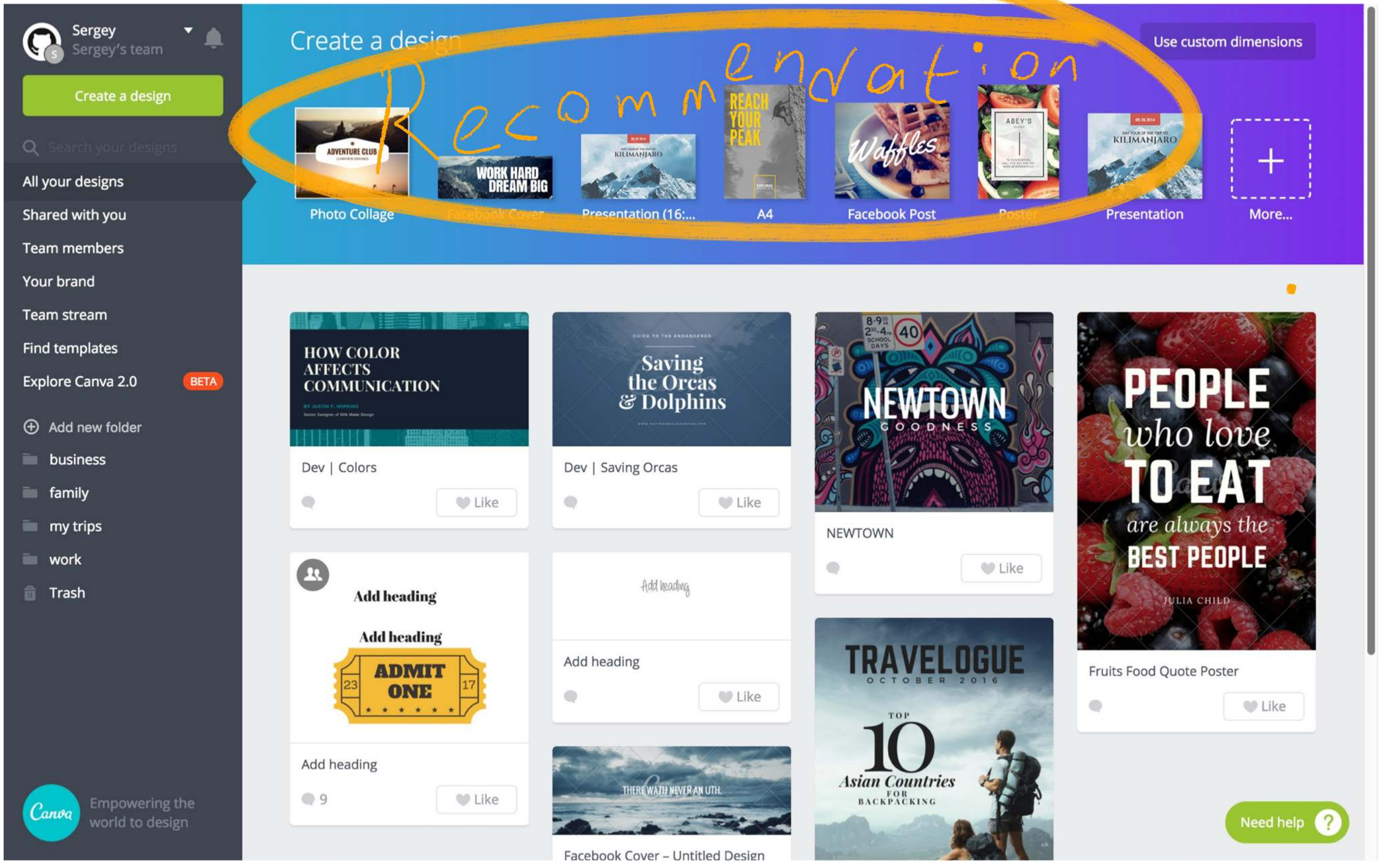
Fruits Food Quote Poster
Like

Add heading
9
Like

Add heading
Like

Facebook Cover – Untitled Design

Need help ?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A4
Facebook Post
Poster
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More...
HOW COLOR AFFECTS COMMUNICATION
Dev | Colors
Like
Saving the Orcas & Dolphins
Dev | Saving Orcas
Like
NEWTOWN
GOODNESS
NEWTOWN
Like
PEOPLE who love TO EAT are always the BEST PEOPLE
JULIA CHILD
Fruits Food Quote Poster
Like
Add heading
Add heading
ADMIT ONE
Add heading
9
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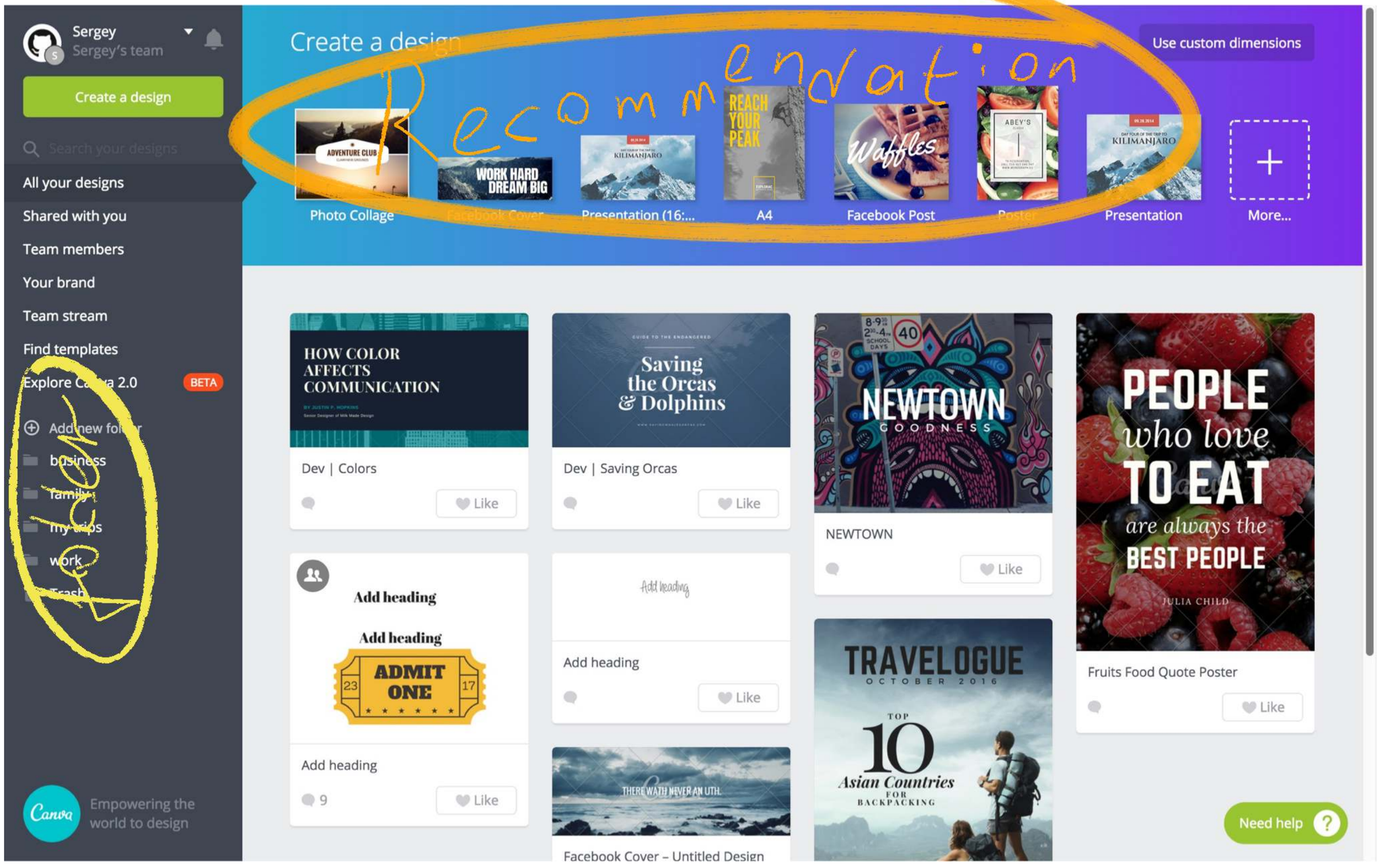
Like
TRAVELOGUE
OCTOBER 2016
TOP 10 Asian Countries FOR BACKPACKING
Facebook Cover – Untitled Design
Need help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Profile

Recommendation

Folders

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Photo Collage | Facebook Cover | Presentation (16:... | A4 | Facebook Post | Poster | Presentation | More...

HOW COLOR AFFECTS COMMUNICATION
Dev | Colors
Like

Saving the Orcas & Dolphins
Dev | Saving Orcas
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NEWTOWN GOODNESS
NEWTOWN
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TRAVELOGUE
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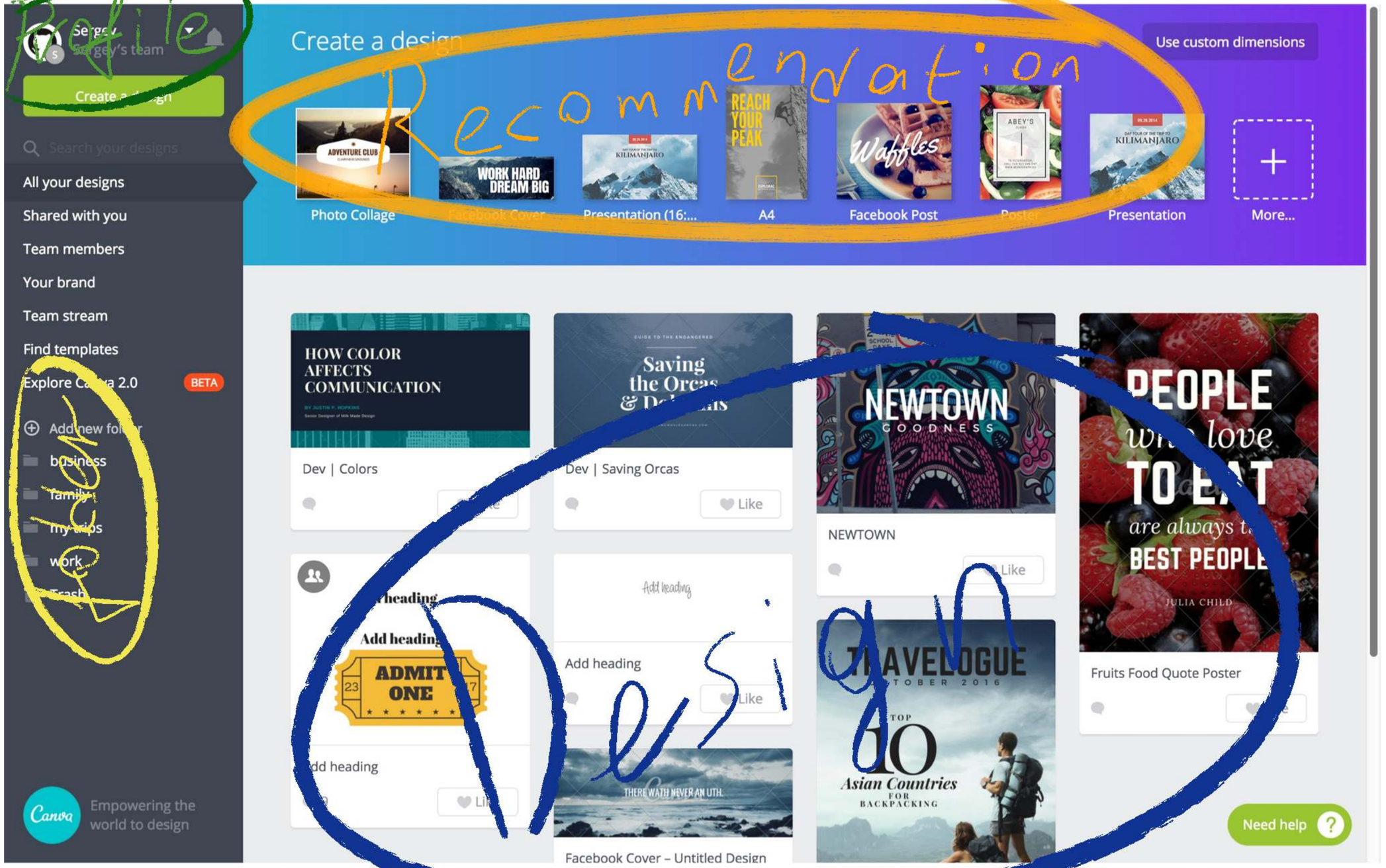
TOP 10 Asian Countries FOR BACKPACKING

THERE WATH NEVER AN UTH.
Facebook Cover – Untitled Design

Need help


Profile
Recommendation
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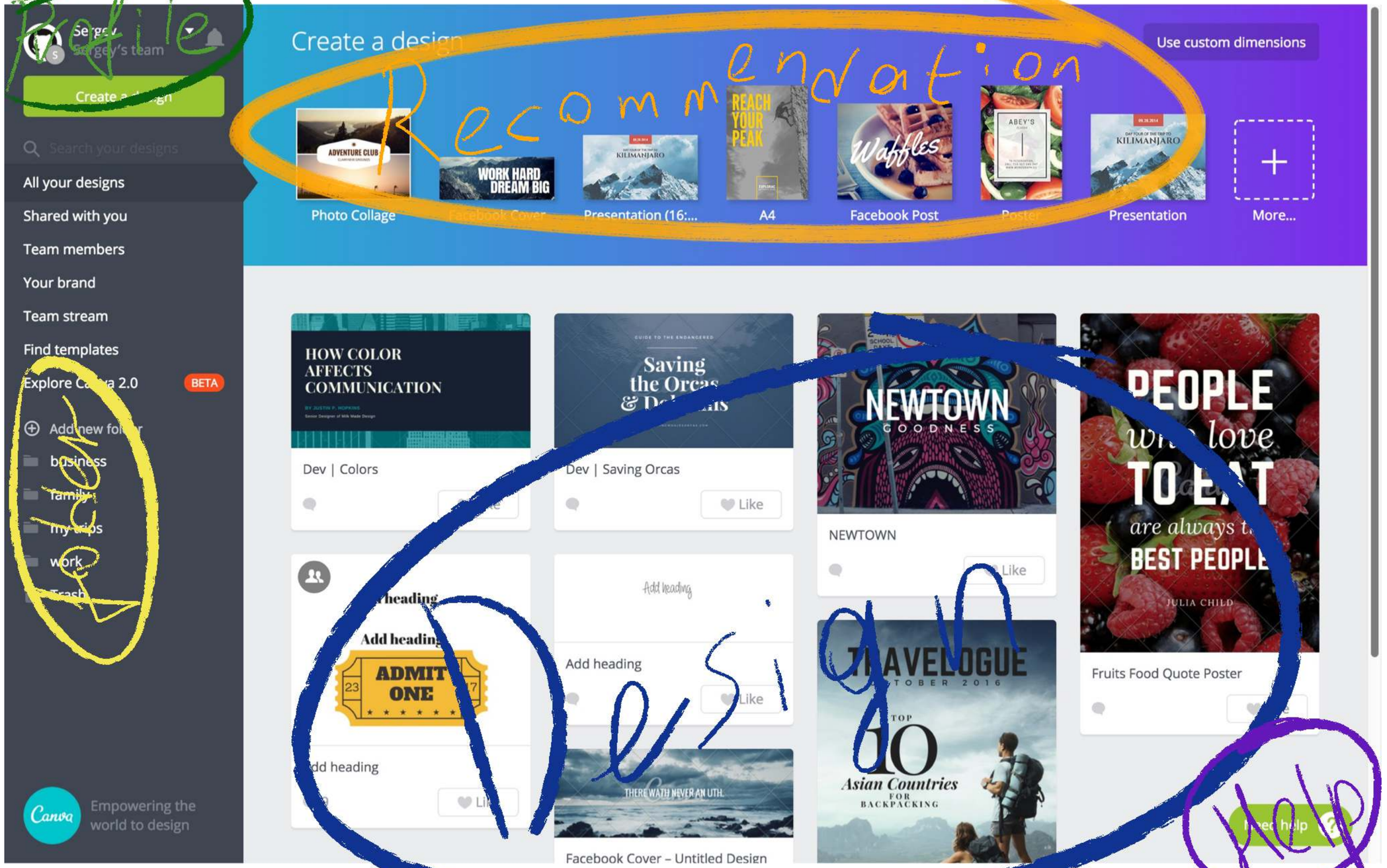
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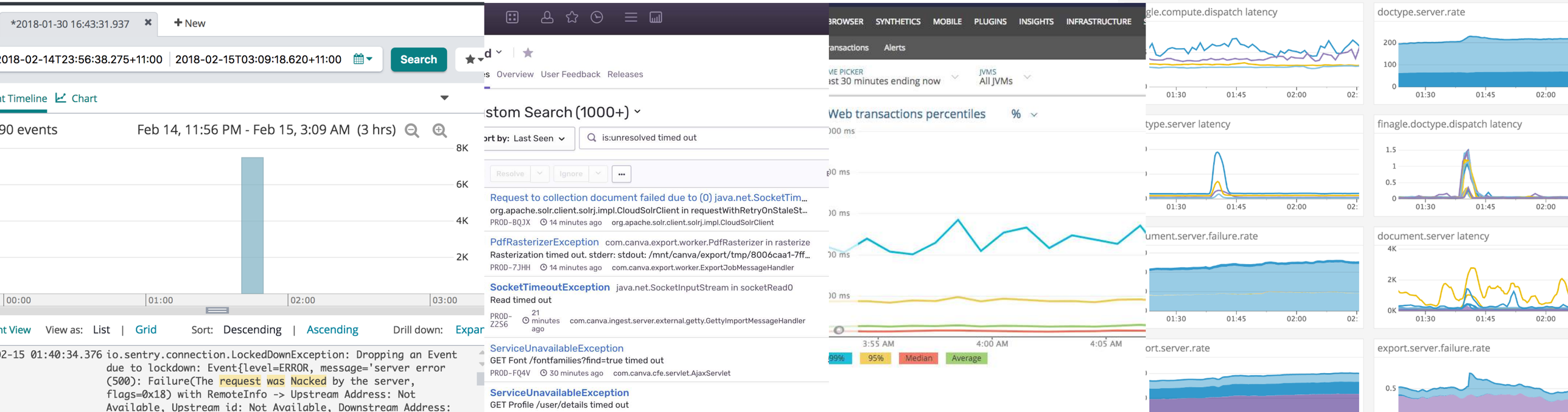
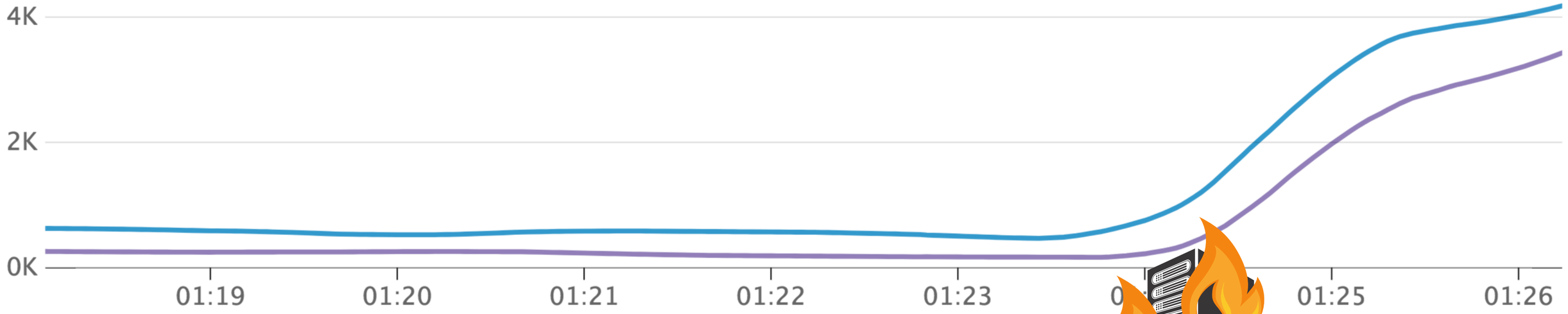
Add heading
Like
THERE WATH NEVER AN UTH
Facebook Cover – Untitled Design
TRAVELOGUE
TOP
10
Asian Countries
FOR
BACKPACKING
Need help?

Why does this take too long?

- Take a look at the logs?
- Check exceptions?
- Dive into loads of metrics?



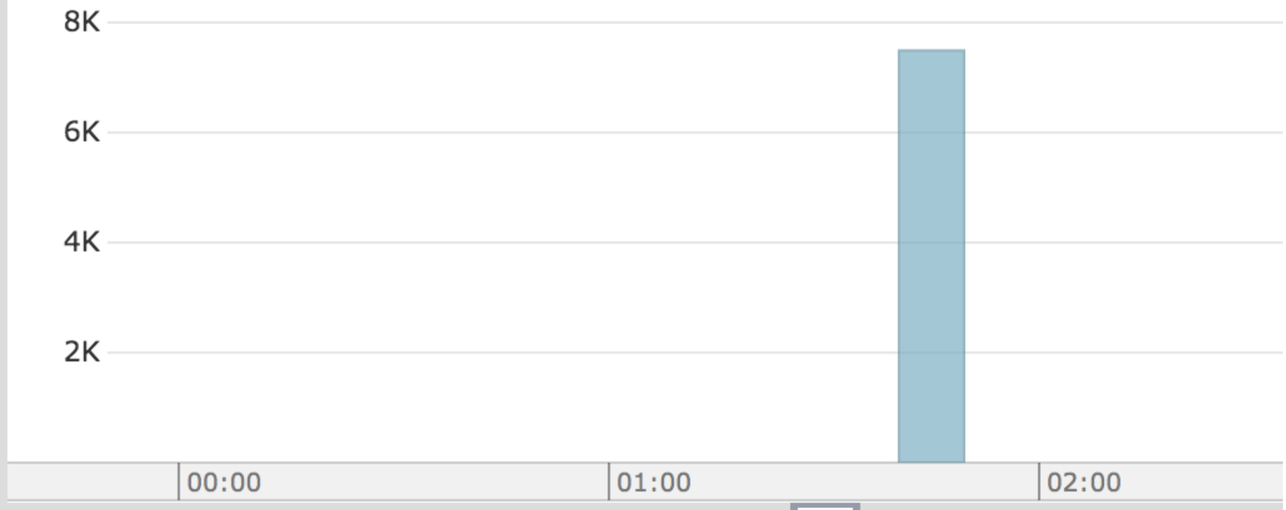
latency



2018-02-14T23:56:38.275+11:00 | 2018-02-15T03:09:18.620+11:00

Event Timeline | Chart

7,490 events — Feb 14, 11:56 PM - Feb 15, 3:09 AM (3

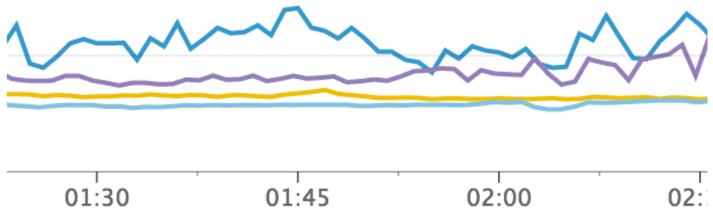


Event View | View as: List | Grid | Sort: Descending | Ascending

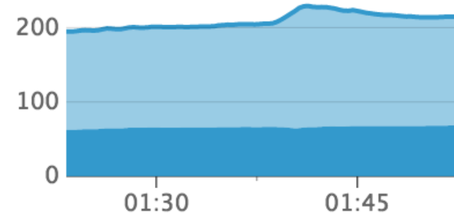
2018-02-15 01:40:34.376 io.sentry.connection.LockedDownException: Dr
due to lockdown: Event{level=ERROR, message=
(500): Failure(The request was Nacked by the
flags=0x18) with RemoteInfo -> Upstream Addr
Available, Upstream id: Not Available, Downs

client, Trace Id:
c1038cd5687d9da0.c1038cd5687d9da0<:c1038cd56
Service -> client (cause: The request was Na
server)',
logger='com.canva.cfe.servlet.ExceptionHandl

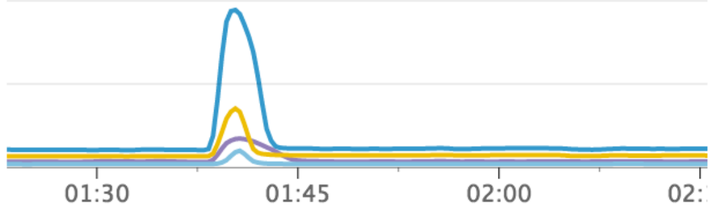
gle.compute.dispatch latency



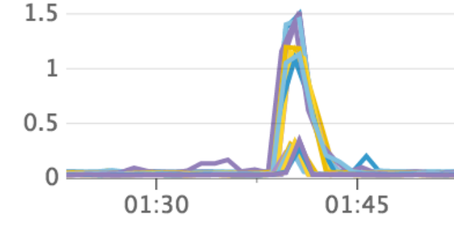
doctype.server.rate



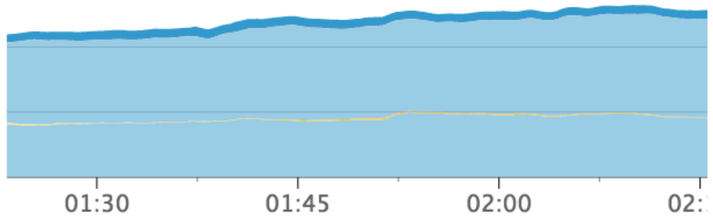
ype.server latency



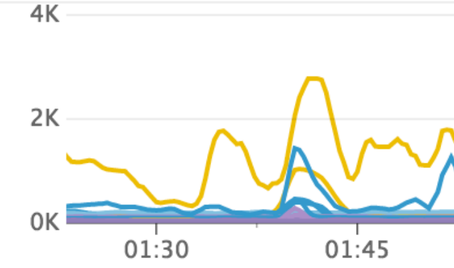
finagle.doctype.dispatch laten



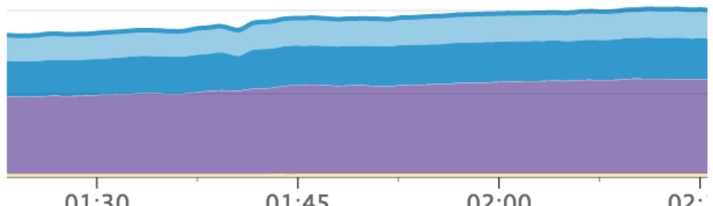
ument.server.failure.rate



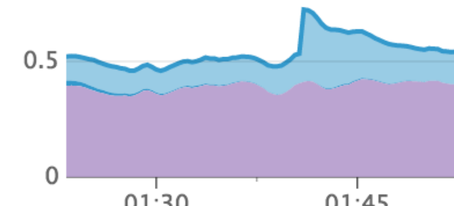
document.server latency



ort.server.rate



export.server.failure.rate



¯_(ツ)_/¯

Dapper paper

- Low overhead
- Application-level transparency
- Scalability

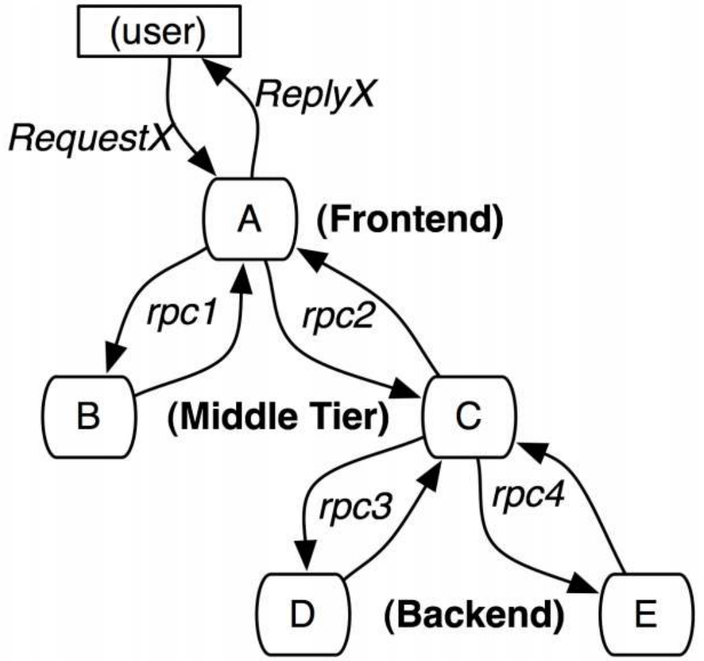
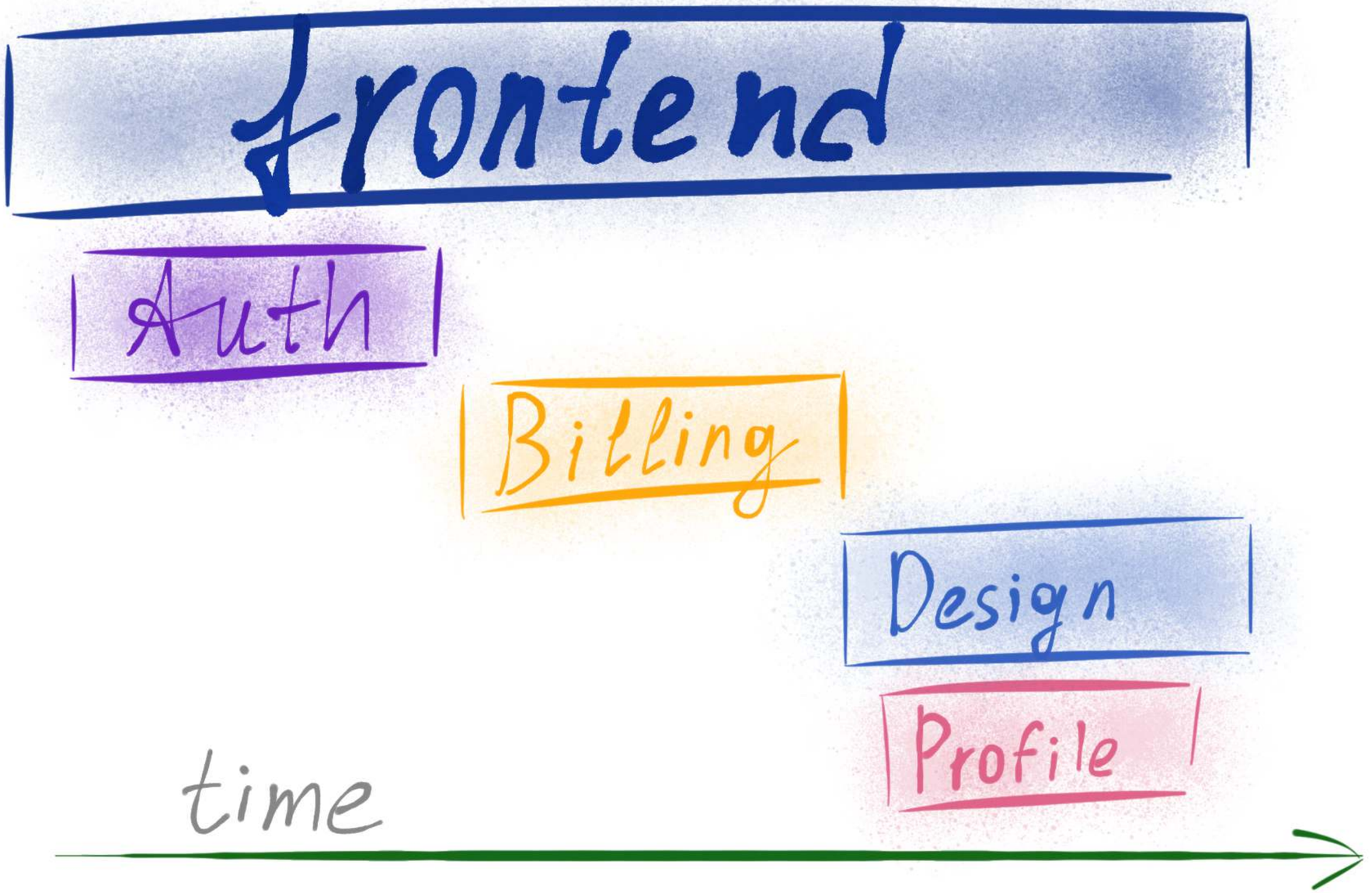
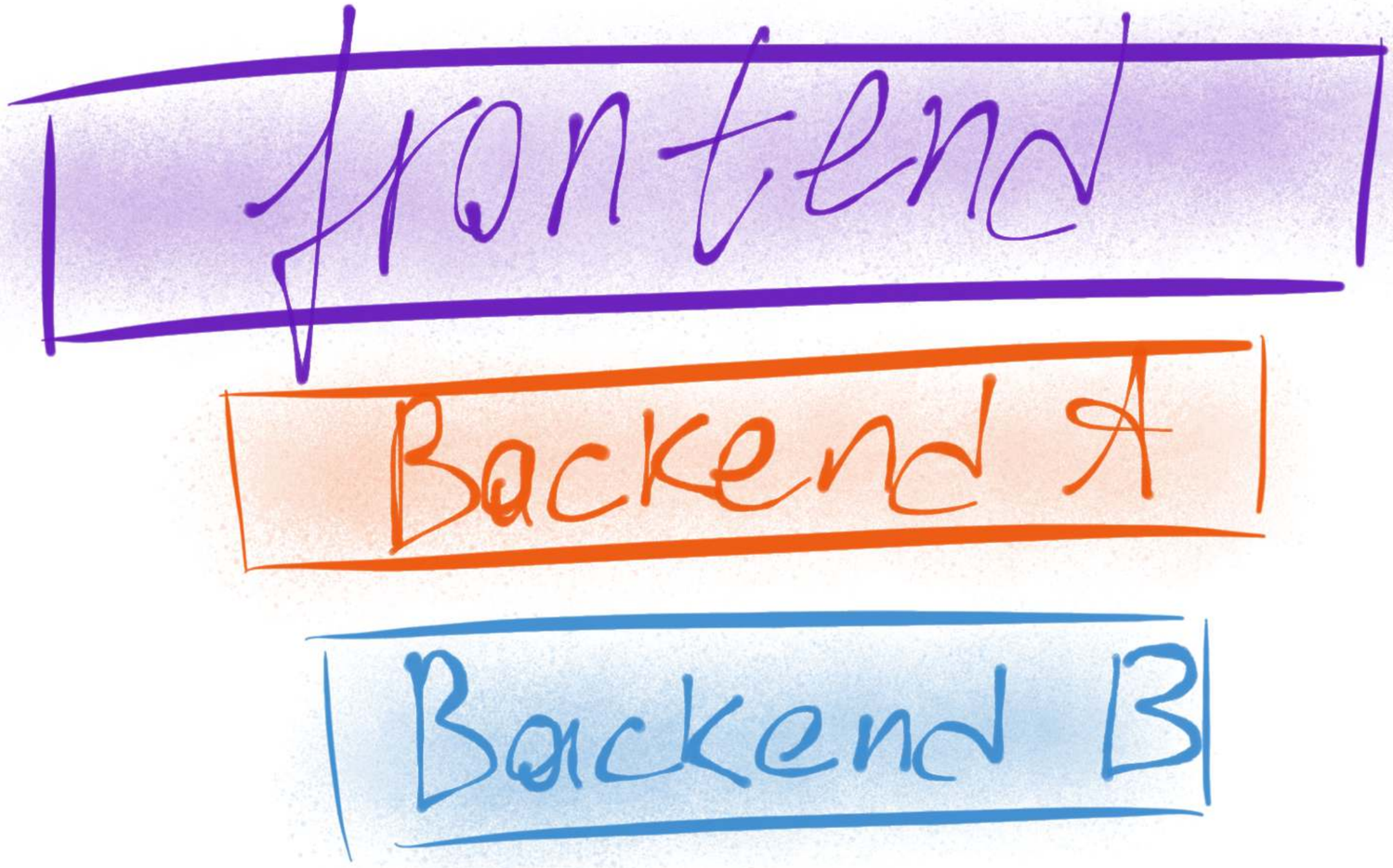


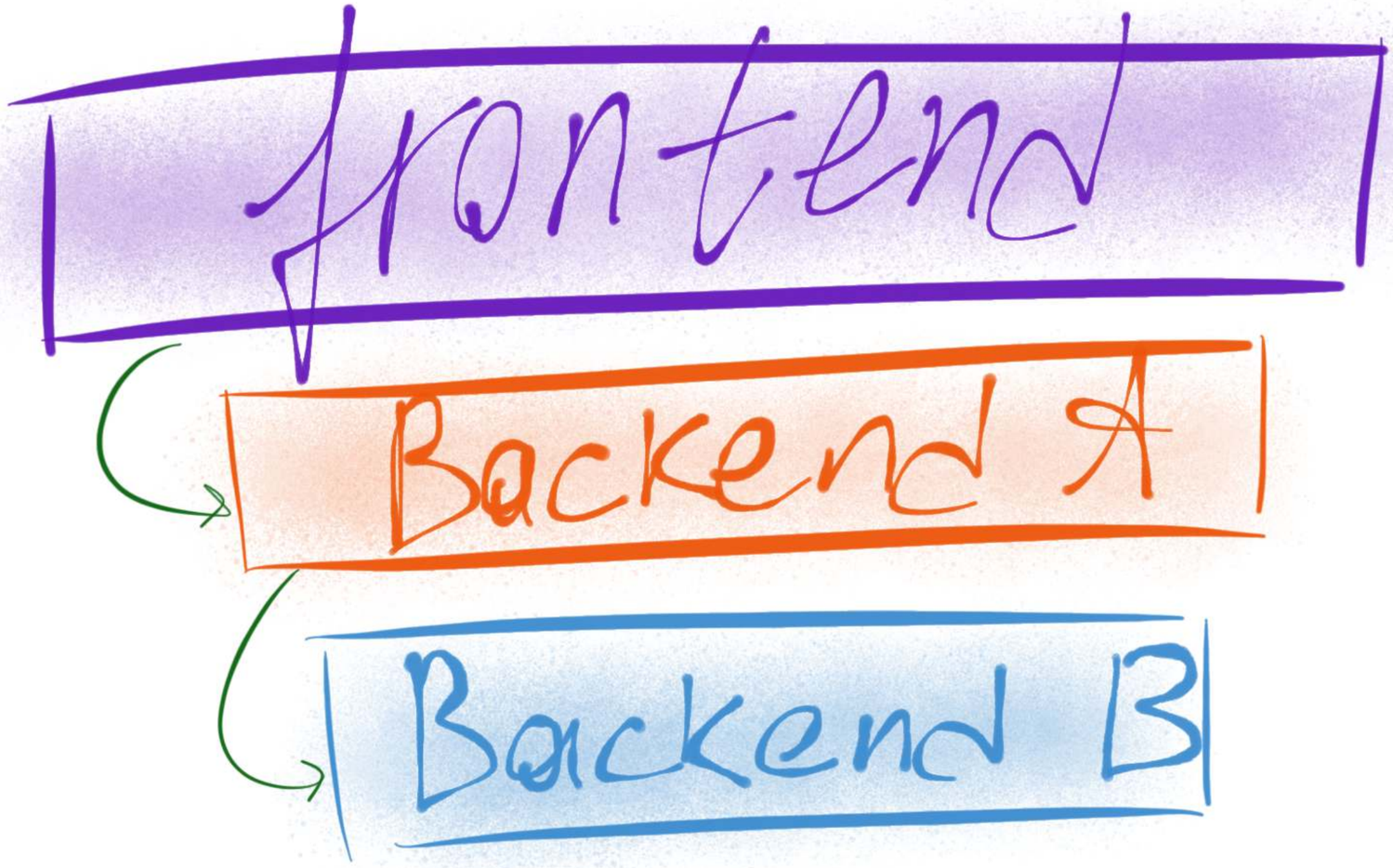
Figure 1: The path taken through a simple serving system on behalf of user request *X*. The letter-labeled nodes represent processes in a distributed system.

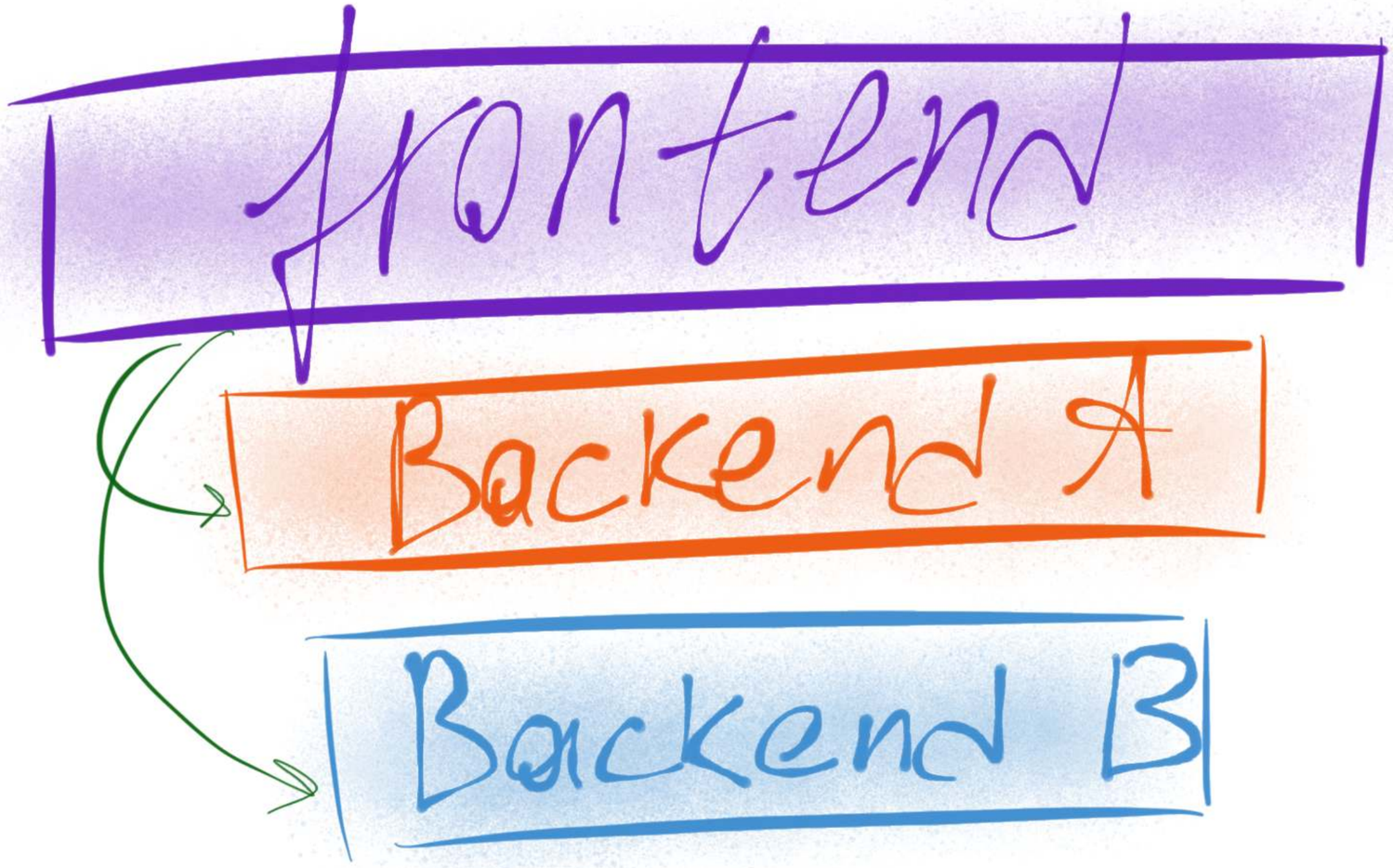
- *Span* - a unit of work
- *Trace* - a tree of spans representing a single request

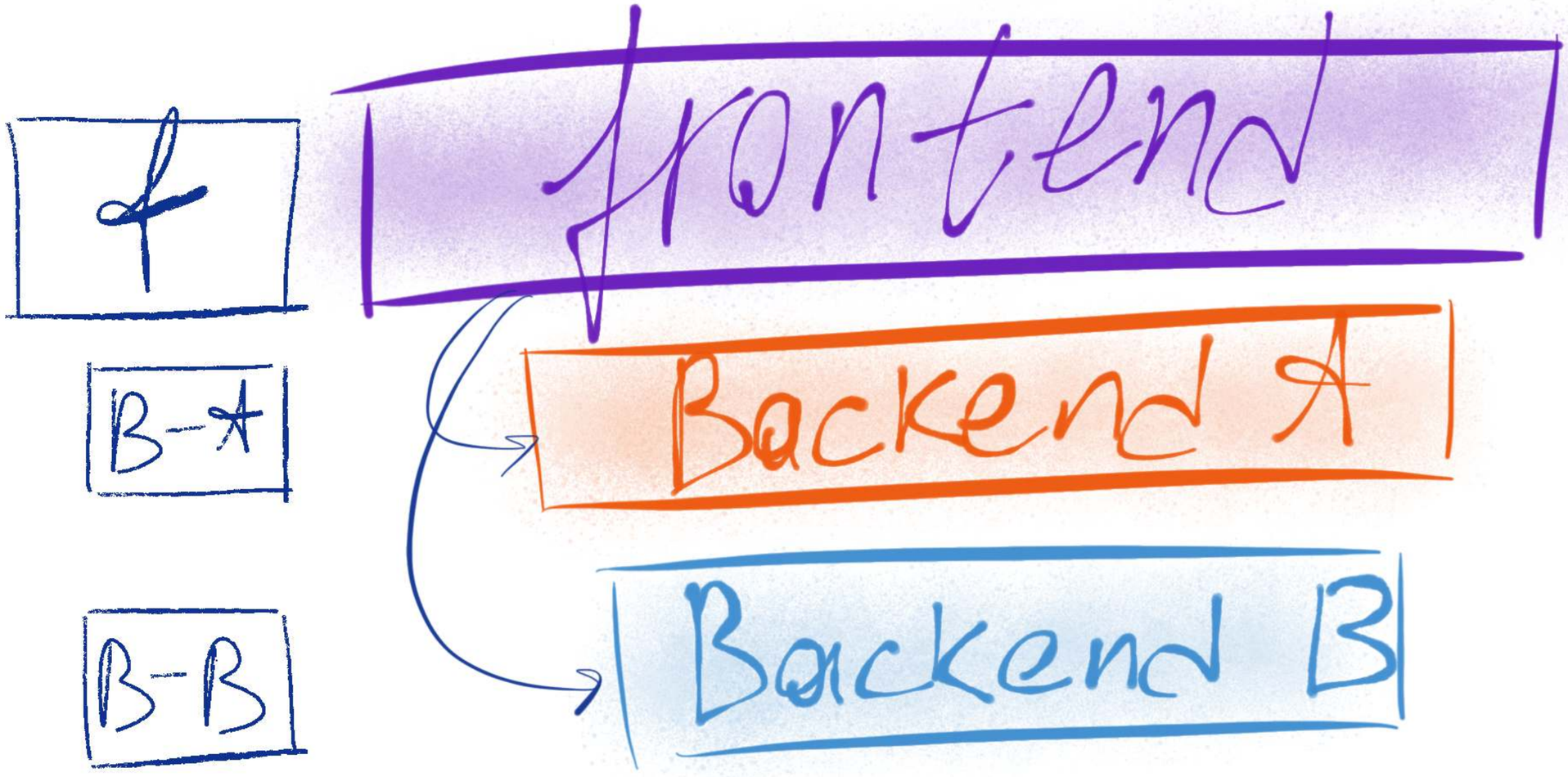


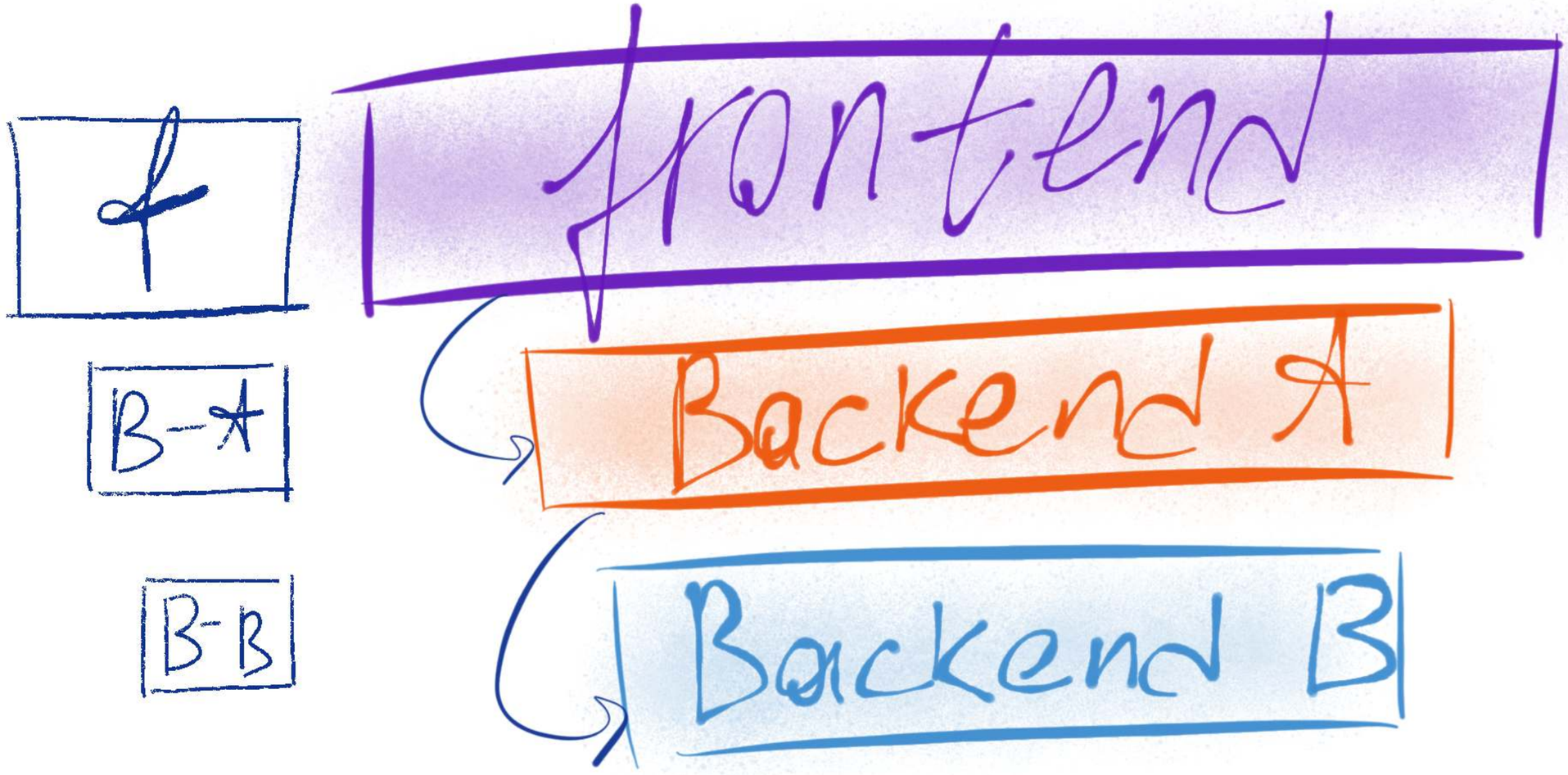

ns
1600 ms
1700 ms
1800 ms
1900 ms
2000 ms
2100 ms
2200
98.7 ms
103.9 ms
304.5 ms
454.7 ms
Main Thread
La…)
L…t
Evaluate Script (app-min.240ac4cf.js:1)
Eval…:1)
(anonymous function)
(an…n)
(anonymous function)
(a…)
e
(…
(anonymous function)
a
e
e
e
e
each
each
(…)
(a…n)
each
each
(…)
e
(… (an…n)
o
(…
e
(a…)
e
(…)
(a…)
(…)
e
(…
e
e
(…)
(…)
e
e

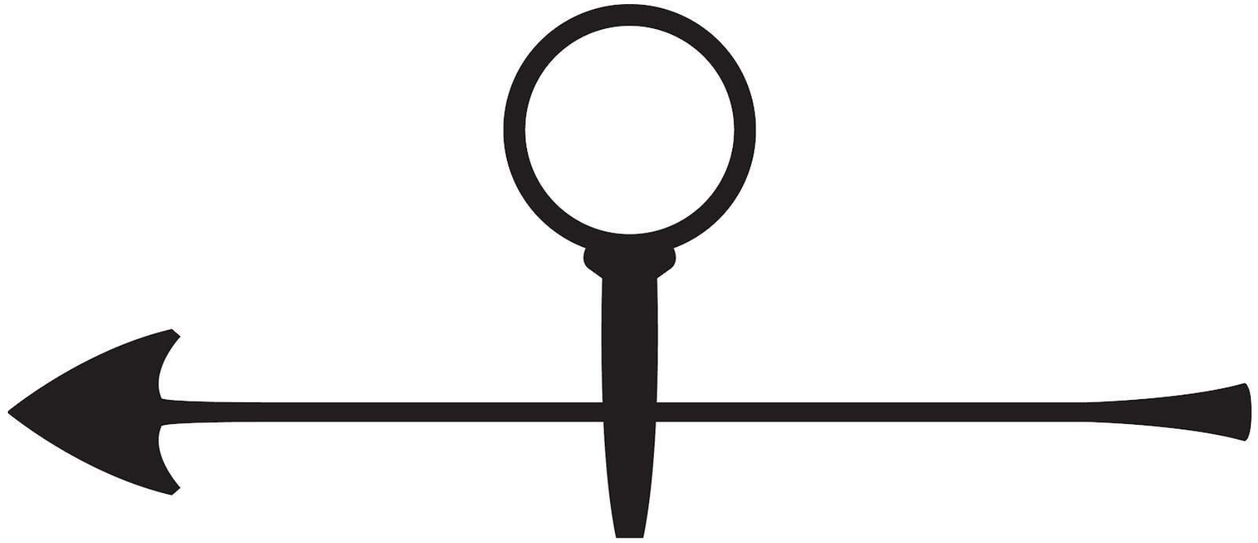

frontend
Backend A
Backend B


frontend
Backend A
Backend B

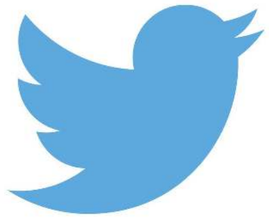

frontend
Backend A
Backend B


f
B-A
B-B
frontend
Backend A
Backend B

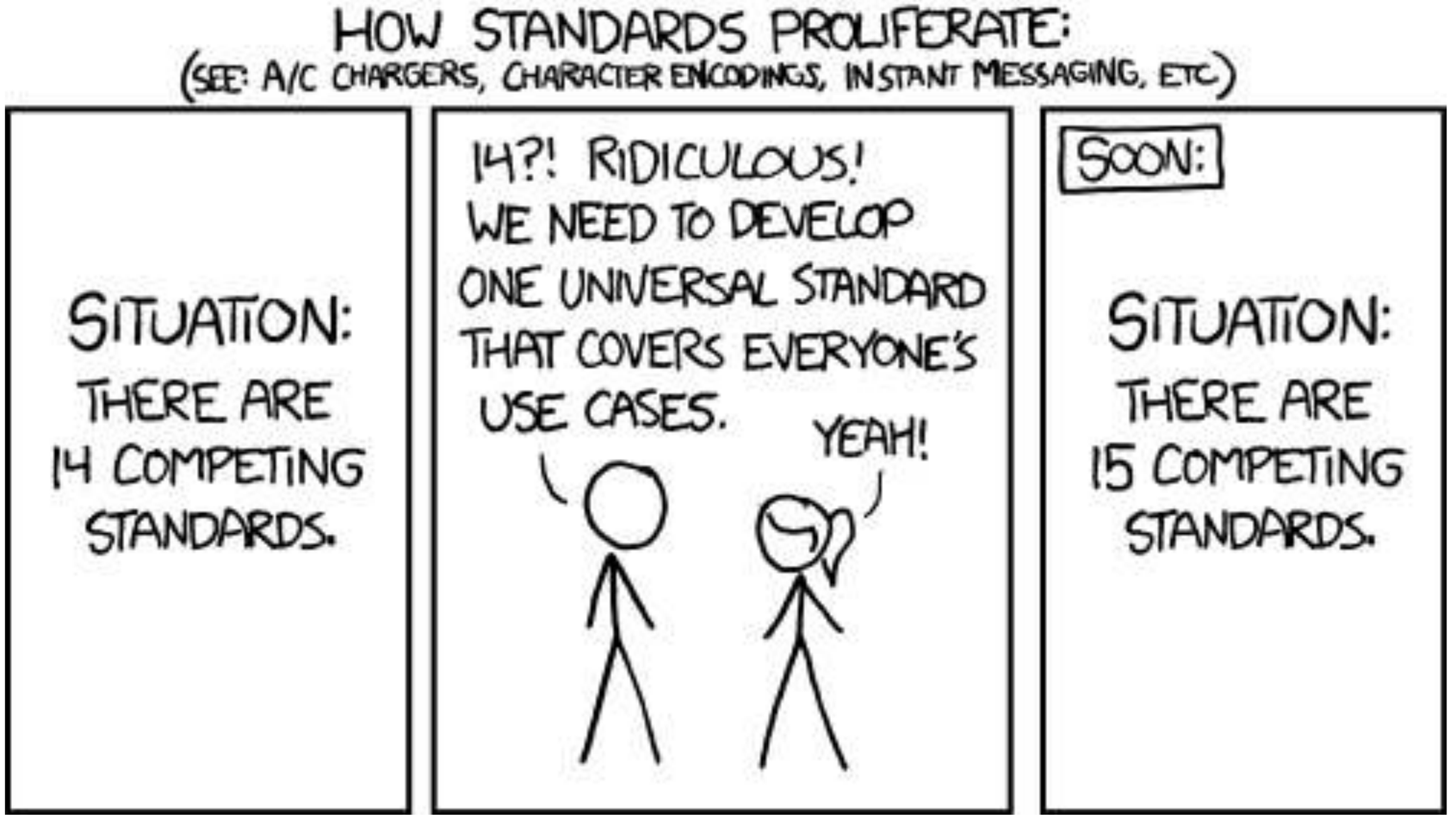

f
B-A
B-B
frontend
Backend A
Backend B



ZIPKIN

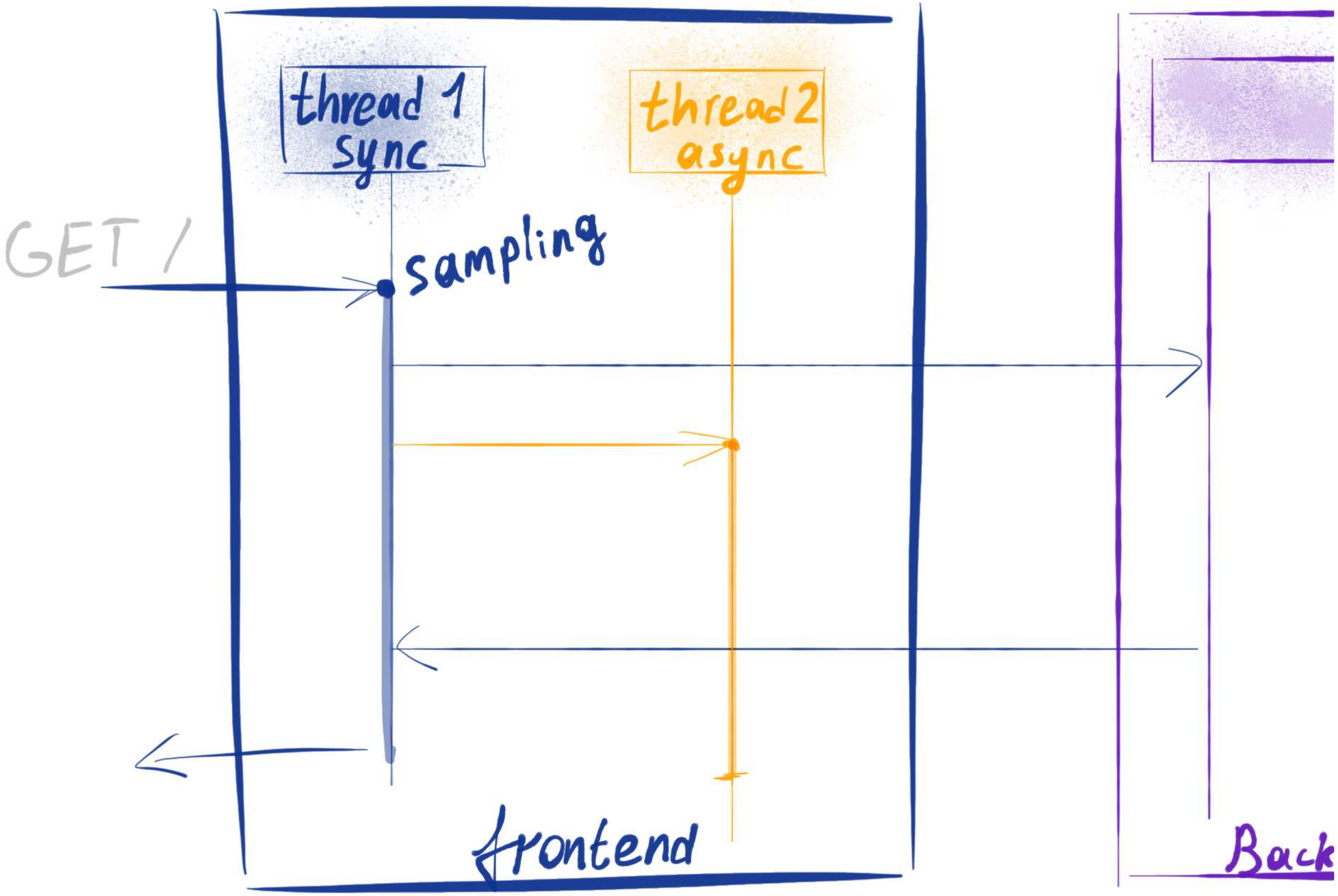


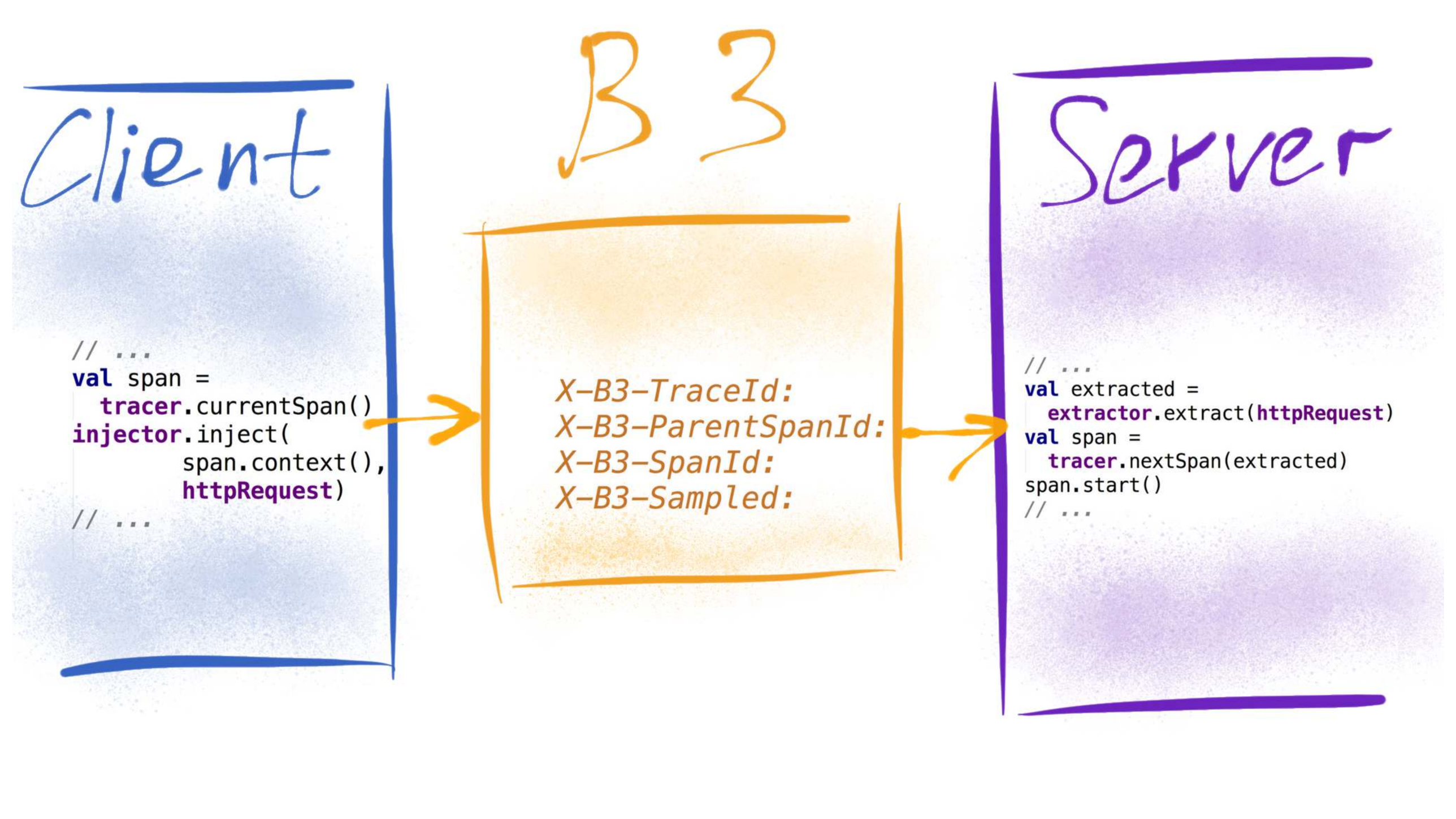
OPENTRACING


HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC)
SITUATION:
THERE ARE
14 COMPETING
STANDARDS.
14?! RIDICULOUS!
WE NEED TO DEVELOP
ONE UNIVERSAL STANDARD
THAT COVERS EVERYONE'S
USE CASES.
YEAH!
SOON:
SITUATION:
THERE ARE
15 COMPETING
STANDARDS.

DEMO

tiny.cc/sydkotlin


thread 1
sync
thread 2
async
GET /
sampling
frontend
Back


Client
// ...
val span =
tracer.currentSpan()
injector.inject(
span.context(),
httpRequest)
// ...
B 3
X-B3-TraceId:
X-B3-ParentSpanId:
X-B3-SpanId:
X-B3-Sampled:
Server
// ...
val extracted =
extractor.extract(httpRequest)
val span =
tracer.nextSpan(extracted)
span.start()
// ...

Propagation

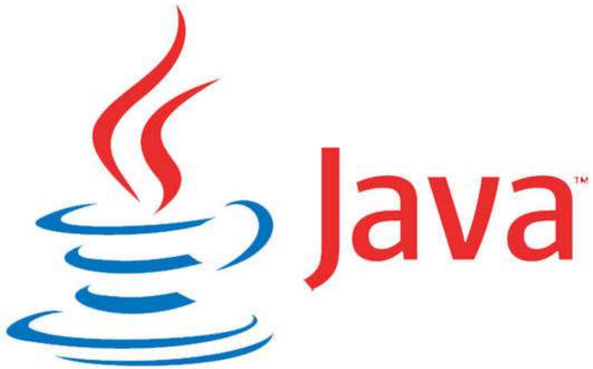
```
try (ScopedSpan span = tracer.startScopedSpan("encode")) {
    // long operation
    return encoder.encode(data);
} catch (Exception e) {
    span.error(e);
}
```

Propagation

```
try (ScopedSpan span = tracer.startScopedSpan("encode")) {
    // long operation
    return encoder.encode(data);
} catch (Exception e) {
    span.error(e);
}
```

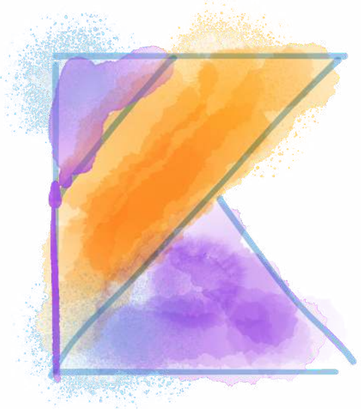
Propagation

```
ScopedSpan span = tracer.startScopedSpan("encode");
try {
    // long operation
    return encoder.encode(data);
} catch (Exception e) {
    span.error(e);
    throw e;
} finally {
    span.finish();
}
```

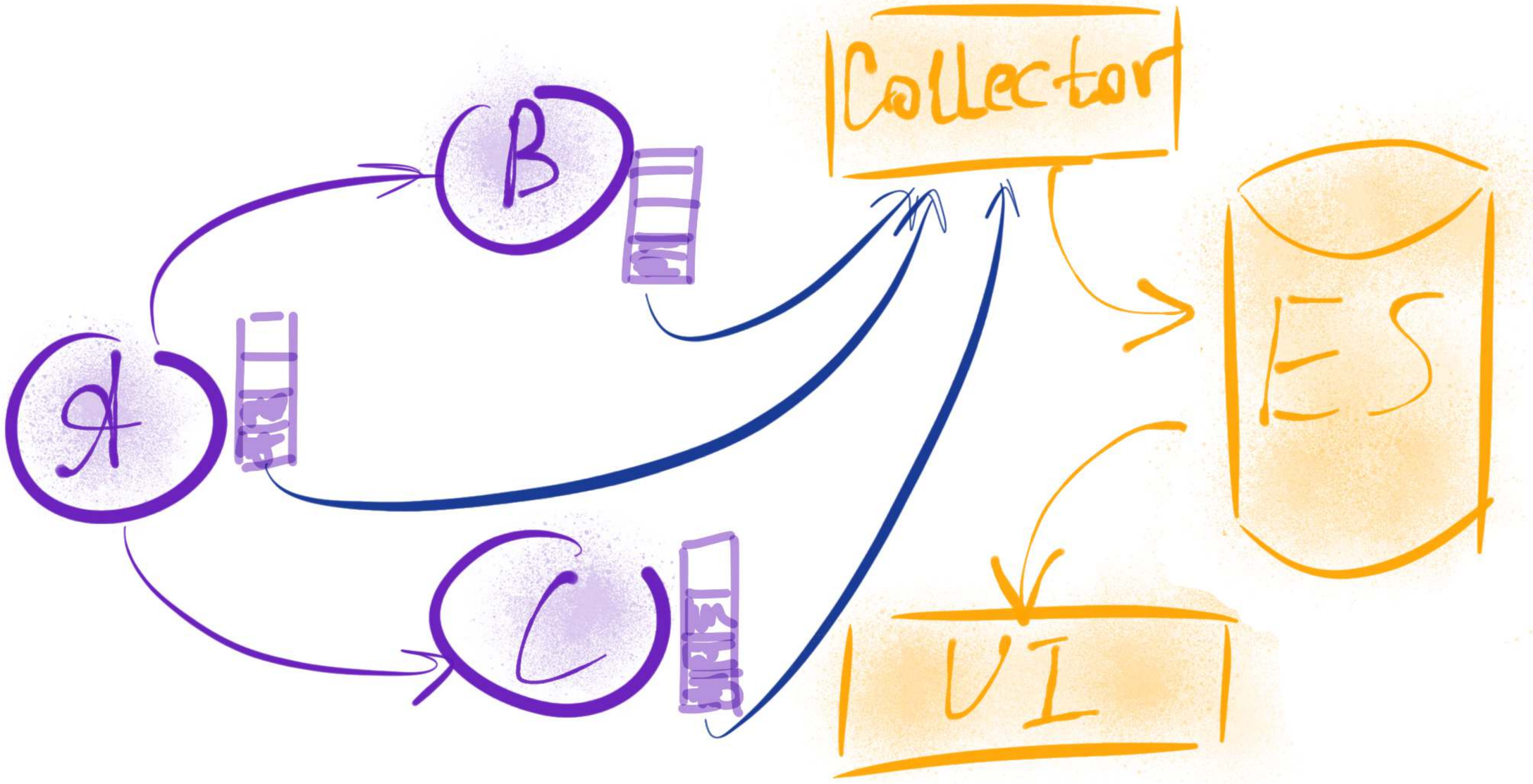


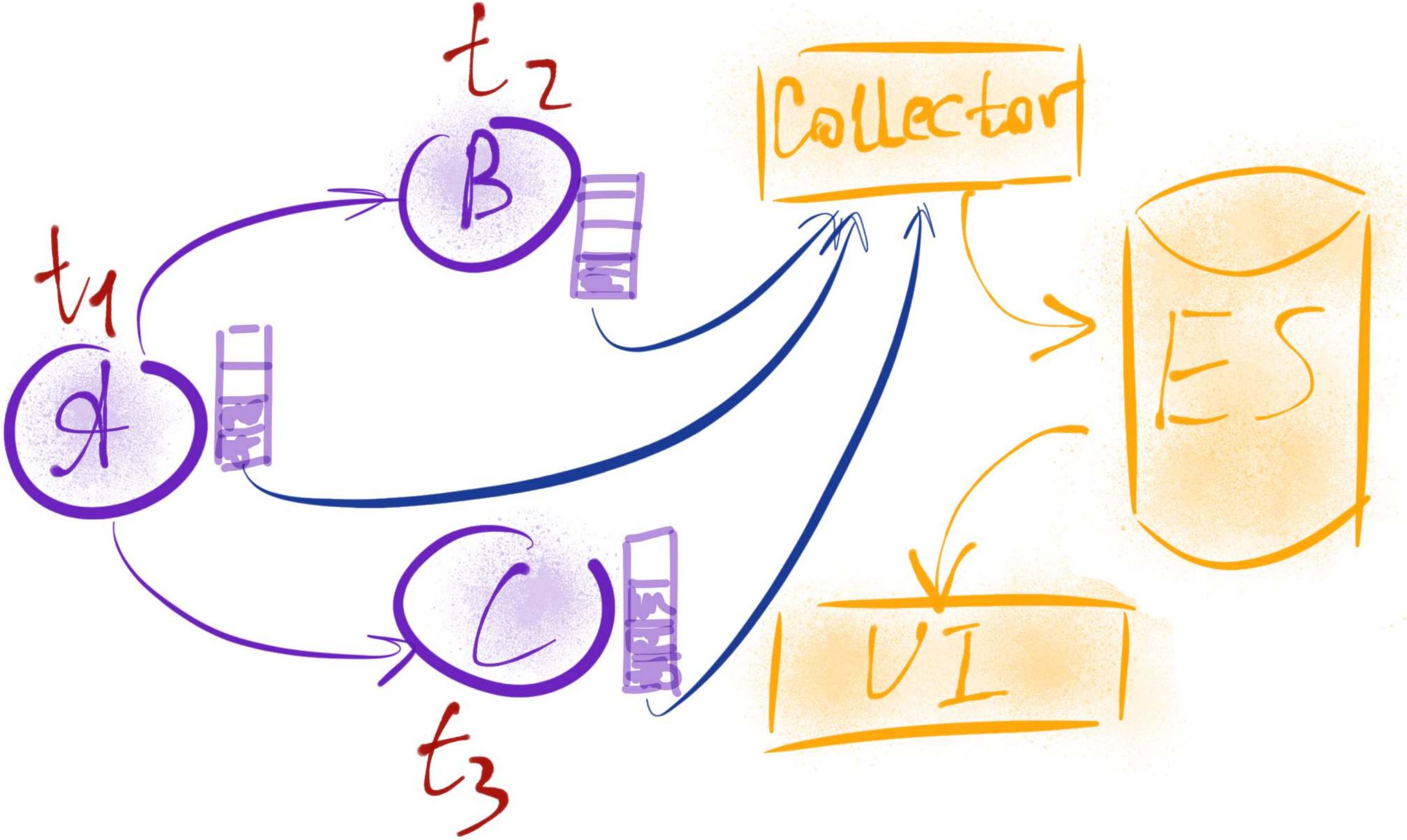
Propagation

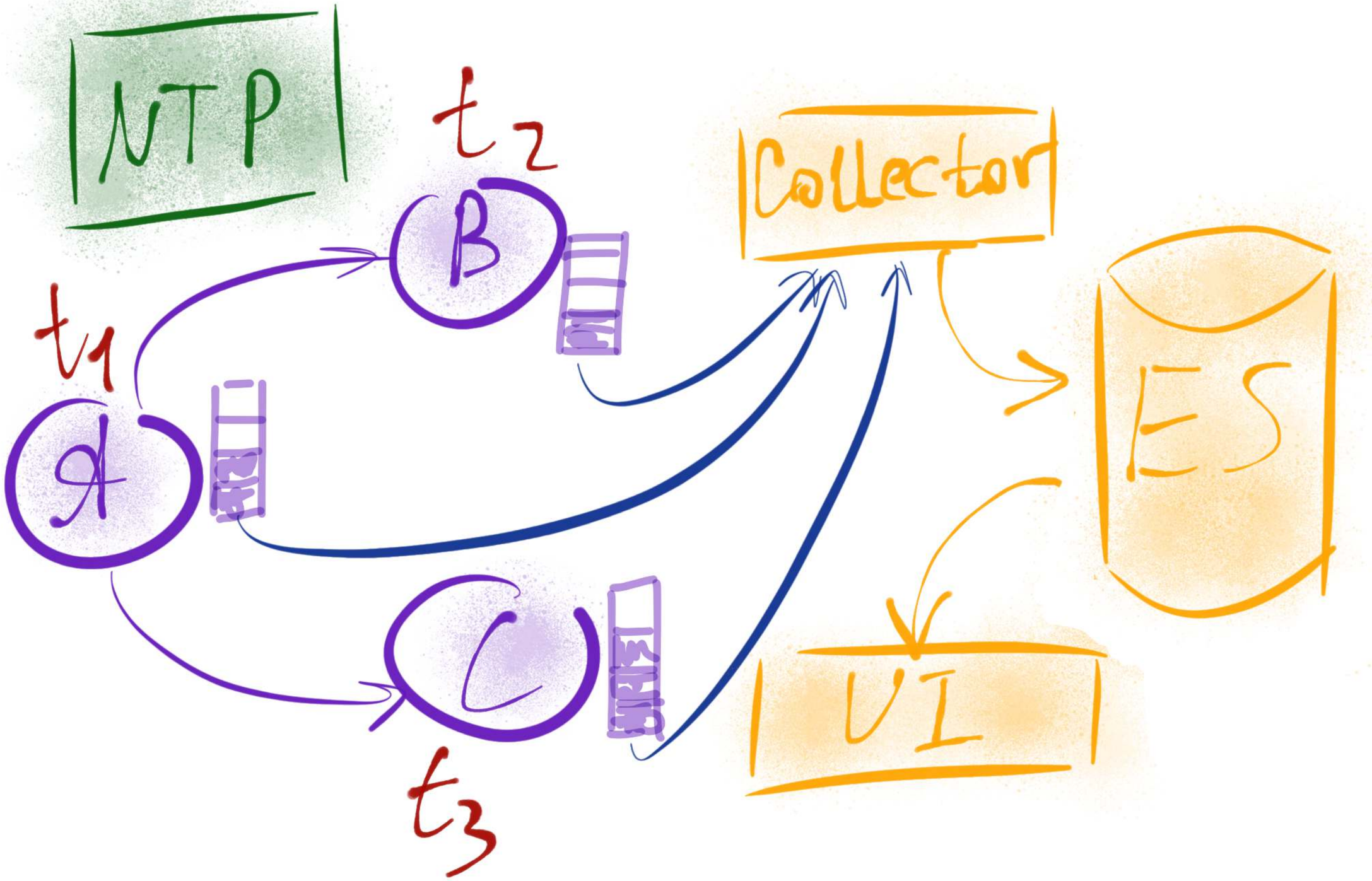
```
tracer.startScopedSpan( name: "encode") {
    // long operation
    encoder.encode(data)
}
```

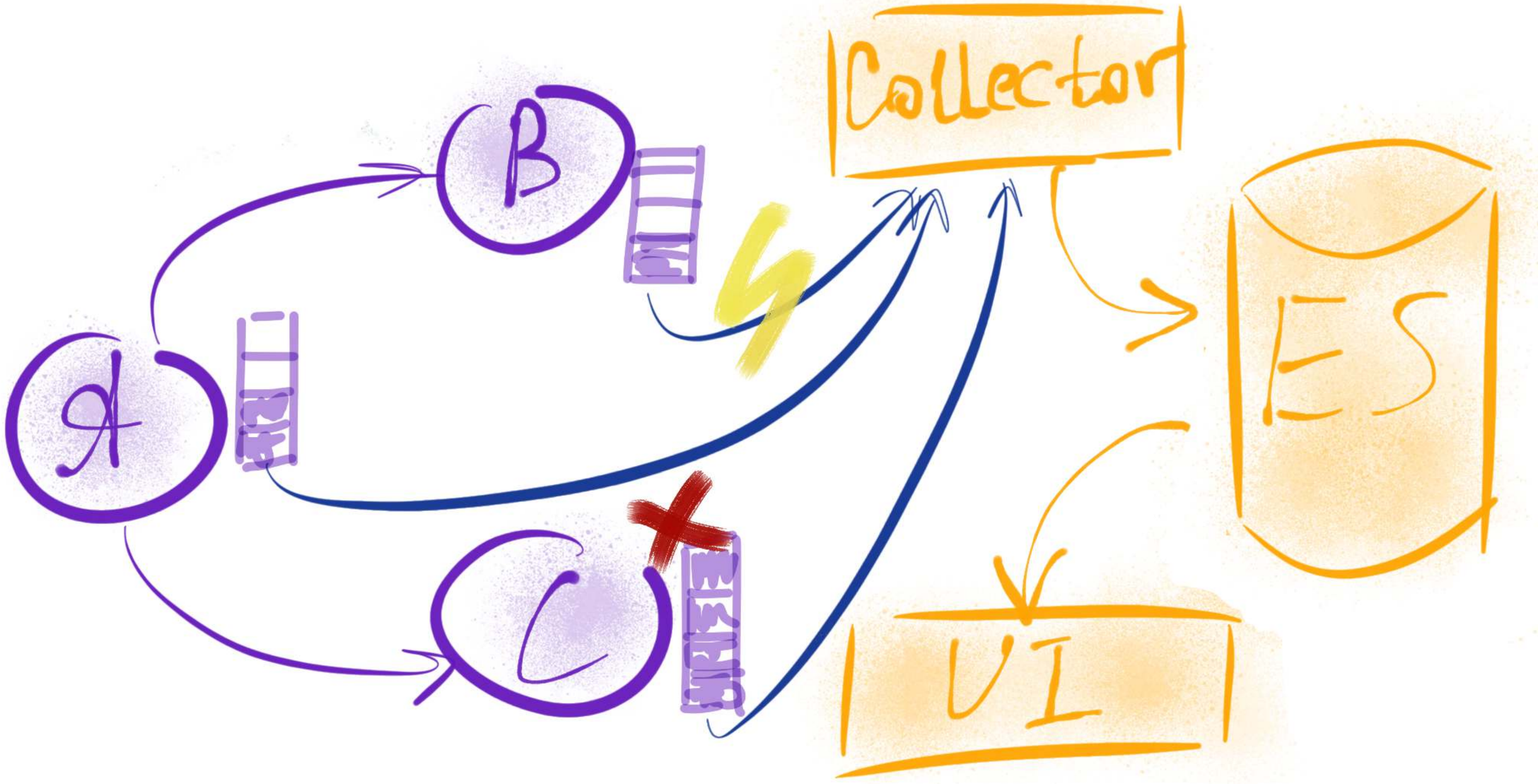


```
inline fun <T> Tracer.startScopedSpan(name: String, f: () -> T): T {
    val span = startScopedSpan(name)
    try {
        return f()
    } catch (e: Exception) {
        span.error(e)
        throw e
    } finally {
        span.finish()
    }
}
```


Collector
A
B
C
ES
UI


t2
B
Collector
t1
A
ES
C
UI
t3


NTP
t2
B
Collector
t1
A
ES
C
UI
t3

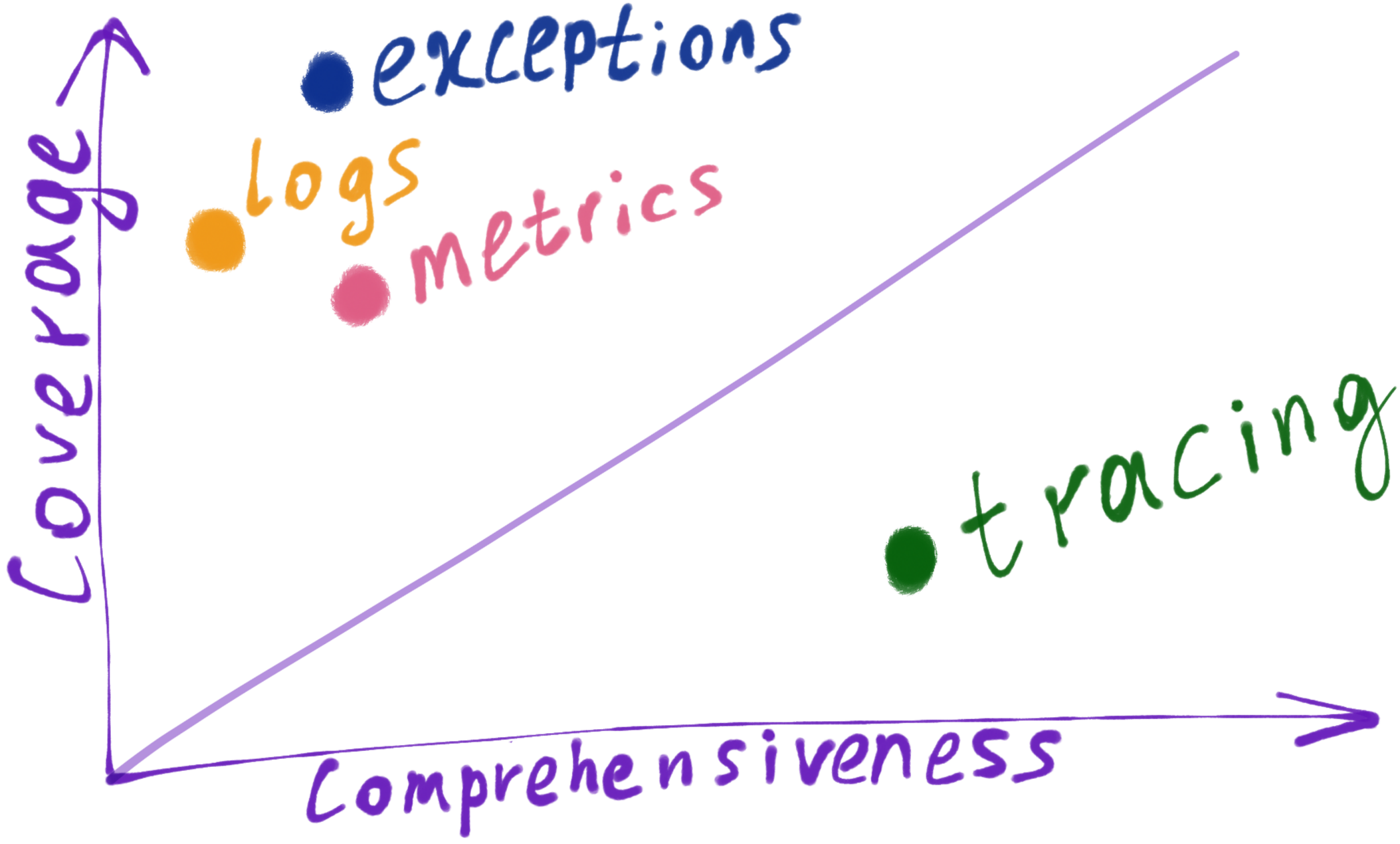

Collector
A
B
C
ES
UI

Caveats

- Clock skew
- Don't blindly trust the data
- Opentracing abstraction is sometimes leaky
- Not all popular libraries support tracing
- Injecting tracers might be tricky

Wins

- Discovering N+1 issues
- Greater observability
- Sampling rate


exceptions
logs
metrics
tracing
Coverage
Comprehensiveness

References

- Dapper - *https://ai.google/research/pubs/pub36356*
- The mystery machine - *https://research.fb.com/publications/the-mystery-machine-end-to-end-performance-analysis-of-large-scale-internet-services/*
- Canopy - *https://research.fb.com/publications/canopy-end-to-end-performance-tracing-at-scale/*
- Zipkin - *https://zipkin.io/*
- OpenTracing - *http://opentracing.io/*
- *AWS NTP - https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/set-time.html*

Q / A

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sergeicelov@gmail.com
serce.me