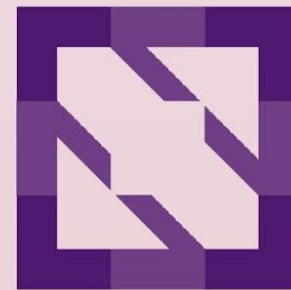




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**CloudNativeCon**

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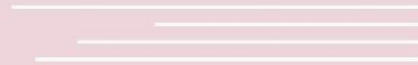


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# Build in Observability While Developing

*Jamie Danielson*



**KubeCon****CloudNativeCon**

---

North America 2023

---



# Jamie Danielson

Telemetry Engineer at Honeycomb  
Approver on OpenTelemetry JS





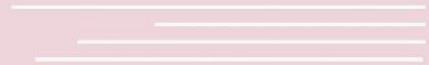
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# If you know how to log you know how to trace



# If you know how to log...



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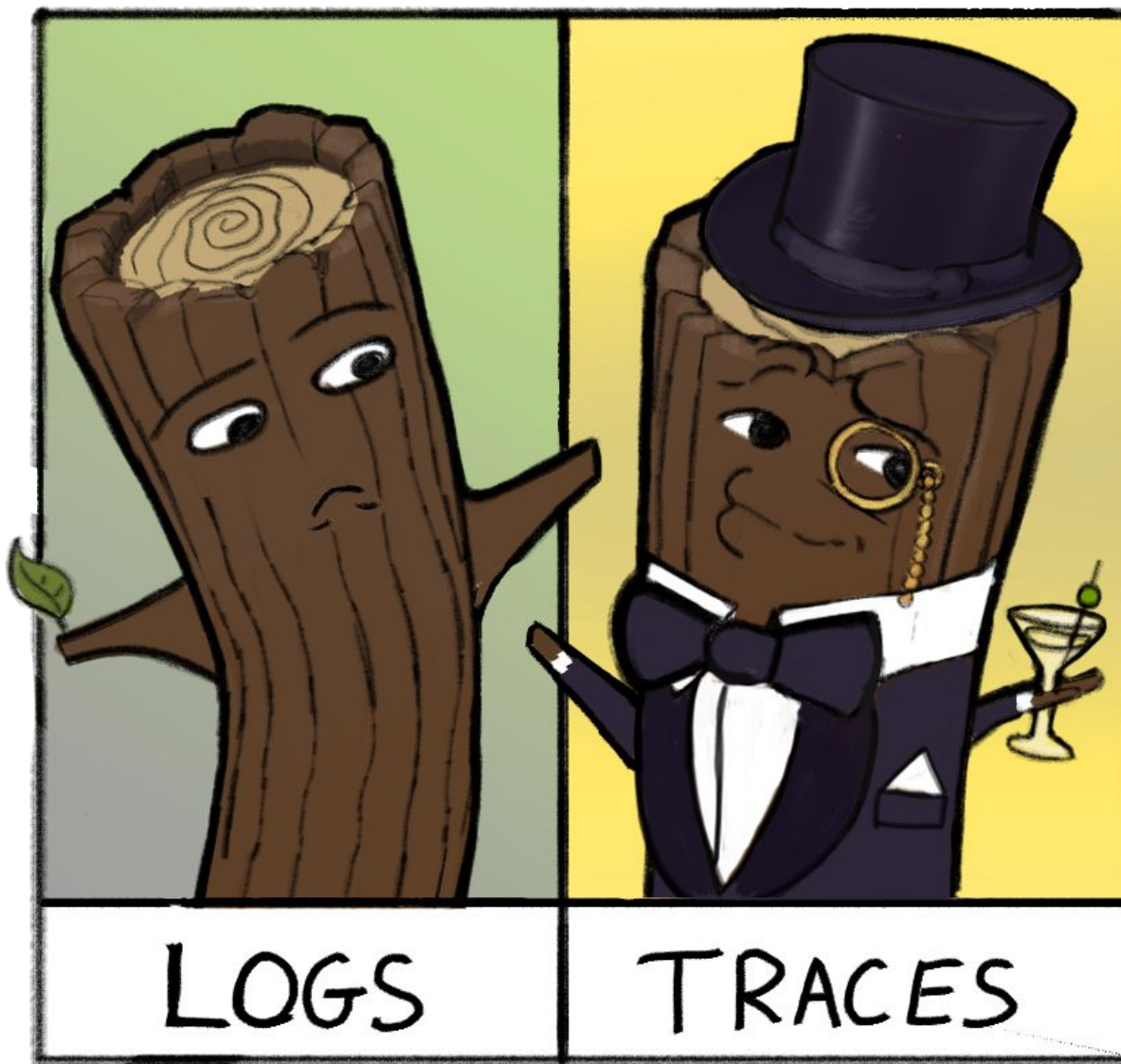
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```
"2023-11-01T12:34:50.789Z INFO "GET /books/book-123"  
"2023-11-01T12:34:51.789Z INFO "handle request"  
"2023-11-01T12:34:52.789Z INFO "route request"  
"2023-11-01T12:34:53.789Z INFO "lookup item in cache"  
"2023-11-01T12:34:54.789Z INFO "fetch resource for book"  
"2023-11-01T12:34:55.789Z INFO "return book info"  
"2023-11-01T12:34:56.789Z INFO "add book info to cache"
```



# If you know how to log...



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# If you know how to log...



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```
{  
  "timestamp": "2023-11-01T12:34:56.789Z"  
  "level": "info",  
  "message": "GET /books/book-123",  
}
```





# If you know how to log...

```
{  
  
  "timestamp": "2023-11-01T12:34:56.789Z"  
  "name": "GET /books/:searchParam",  
  "http.method": "GET",  
  "http.route": "/books/:searchParam",  
  "http.target": "/books/book-123"  
  "http.status_code": "200"  
  "http.status_text": "OK"  
  
  ...  
}  
  
  "timestamp": "2023-11-01T12:35:56.789Z"  
  ...  
}
```



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# ...then you know how to trace

```
{  
  "traceId": "2e47303e0997c98ecedd1aa5c589dbc0"  
  "timestamp": "2023-11-01T12:34:56.789Z"  
  "name": "GET /books/:searchParam",  
  "http.method": "GET",  
  "http.route": "/books/:searchParam",  
  "http.target": "/books/book-123"  
  "http.status_code": "200"  
  "http.status_text": "OK"  
  ...  
}  
{  
  "traceId": "2e47303e0997c98ecedd1aa5c589dbc0"  
  "timestamp": "2023-11-01T12:35:56.789Z"  
  ...  
}
```



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# Adding cache



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```
try {
  const cacheResults = await redisClient.get(searchParam);

  if (cacheResults) {
    results = JSON.parse(cacheResults);
    res.send({
      fromCache: true,
      data: results,
    });
  } else {
    next();
  }
} catch (error) {
  res.status(404);
}
```



# We love to log things



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```
try {
  const cacheResults = await redisClient.get(searchParam);

  if (cacheResults) {
    console.log('Data retrieved from the cache');
    results = JSON.parse(cacheResults);
    res.send({
      fromCache: true,
      data: results,
    });
  } else {
    console.log('Data not retrieved from the cache');
    next();
  }
} catch (error) {
  console.error(error);
  res.status(404);
}
```



# but wait we can do better

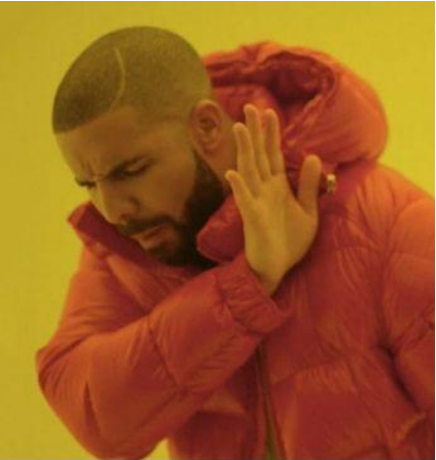


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```
console.log('found product in cache');  
logger.info('found product in cache');
```



```
span.setAttribute('app.product.name', found.Name);  
span.setAttribute('app.in_cache', true);
```



# logs to attributes



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```
if (cacheResults) {  
  console.log('Data retrieved from the cache');  
  const activeSpan = trace.getActiveSpan();  
  activeSpan?.setAttribute('app.in_cache', true);  
  results = JSON.parse(cacheResults);  
  res.send({  
    fromCache: true,  
    data: results,  
  });  
} else {  
  console.log('Data not retrieved from the cache');  
  const activeSpan = trace.getActiveSpan();  
  activeSpan?.setAttribute('app.in_cache', false);  
  next();  
}  
catch (error) {
```



# those logs from earlier...



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```
"2023-11-01T12:34:50.789Z INFO "GET /books/book-123"  
"2023-11-01T12:34:51.789Z INFO "handle request"  
"2023-11-01T12:34:52.789Z INFO "route request"  
"2023-11-01T12:34:53.789Z INFO "lookup item in cache"  
"2023-11-01T12:34:54.789Z INFO "fetch resource for book"  
"2023-11-01T12:34:55.789Z INFO "return book info"  
"2023-11-01T12:34:56.789Z INFO "add book info to cache"
```



# ...are related and have an order



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```
"2023-11-01T12:34:50.789Z INFO "GET /books/book-123"  
  "2023-11-01T12:34:51.789Z INFO "handle request"  
  "2023-11-01T12:34:52.789Z INFO "route request"  
  "2023-11-01T12:34:53.789Z INFO "lookup item in cache"  
    "2023-11-01T12:34:54.789Z INFO "fetch resource for book"  
    "2023-11-01T12:34:55.789Z INFO "return book info"  
      "2023-11-01T12:34:56.789Z INFO "add book info to cache"
```





# Time to start tracing



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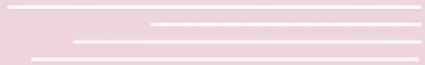
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# Start small and get value quickly



# OpenTelemetry



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**OpenTelemetry** is a standardized way to instrument, generate, collect, and export telemetry data.



# Automatic Instrumentation

---

Instrument your code *without actually touching your code*



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# Automatic Instrumentation



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## No-code automatic Instrumentation with the OpenTelemetry k8s Operator

- Supports many languages
  - Java
  - Node.js
  - Python
  - DotNet
  - Go (using eBPF)
  - Nginx, Apache HTTPD



# OTel Operator



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```
kubectl apply -f - <<EOF
apiVersion: opentelemetry.io/v1alpha1
kind: Instrumentation
metadata:
  name: demo-instrumentation
spec:
  exporter:
    endpoint: http://demo-collector:4317
  propagators:
    - tracecontext
    - baggage
  sampler:
    type: parentbased_traceidratio
    argument: "1"
EOF
```

```
instrumentation.opentelemetry.io/inject-nodejs: "true"
```



10 spans at Nov 6 2023 21:01:12 UTC-06:00

## Search spans



0 spans with errors



## Fields

name	library.name	0s	0.2s	0.4s	0.6s	0.8s	1s	1.2s	1.4s	1.53s
7 GET /books/:searchParam	@opentelemetry/instrumentation-http	1.530s								
middleware - query	@opentelemetry/instrumentation-express	0.3273ms								
request handler - /books/:searchParam	@opentelemetry/instrumentation-express	5.38µs								
middleware - expressInit	@opentelemetry/instrumentation-express	77.5µs								
redis-GET	@opentelemetry/instrumentation-redis-4	1.154ms								
fs realpathSync	@opentelemetry/instrumentation-fs	41.9µs								
1 GET	@opentelemetry/instrumentation-http	510.8ms								
1 tls.connect	@opentelemetry/instrumentation-net	40.94ms								
tcp.connect	@opentelemetry/instrumentation-net	19.21ms								
redis-SET	@opentelemetry/instrumentation-redis-4	0.6900ms								



# In-code setup



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V1-23

```
// tracing.ts

import process from 'process';
import { NodeSDK } from '@opentelemetry/sdk-node';
import { getNodeAutoInstrumentations } from '@opentelemetry/auto-instrumentations-node';
import { OTLPTraceExporter } from '@opentelemetry/exporter-trace-otlp-proto';

// configure the SDK to export telemetry data to Honeycomb
const traceExporter = new OTLPTraceExporter({
  url: 'https://api.honeycomb.io/v1/traces',
  headers: {
    'x-honeycomb-team': process.env.HONEYCOMB_API_KEY,
  },
});

const sdk = new NodeSDK({
  traceExporter,
  instrumentations: [getNodeAutoInstrumentations()],
});

sdk.start();
```

# Lots of events



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Overview

BubbleUp

Correlations

Traces

Events

library.name



COUNT



@opentelemetry/instrumentation-fs

...

2,561

...



@opentelemetry/instrumentation-express

...

150

...



@opentelemetry/instrumentation-redis-4

...

51

...



@opentelemetry/instrumentation-http

...

51

...



@opentelemetry/instrumentation-net

...

2

...

# Disable unwanted spans



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```
const sdk = new NodeSDK({
  traceExporter,
  instrumentations: [
    getNodeAutoInstrumentations({
      // disable fs instrumentation if it's too noisy
      '@opentelemetry/instrumentation-fs': {
        enabled: false,
      },
    }),
  ],
});
```





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# Trace 364fdb78219cdb1f897b1b3d1baae766

9 spans at Nov 6 2023 20:05:11 UTC-06:00



0 spans with errors

Fields

name	library.name	0s	0.1s	0.2s	0.3s	0.4s	0.5178s
... 6 GET /book/:searchParam	@opentelemetry/instrumentation-http	517.8ms					
• middleware - expressInit	@opentelemetry/instrumentation-express	0.1972ms					
• middleware - query	@opentelemetry/instrumentation-express	0.3112ms					
• request handler - /book/:searchParam	@opentelemetry/instrumentation-express	11.1µs					
• redis-GET	@opentelemetry/instrumentation-redis-4	1.756ms					
1 GET	@opentelemetry/instrumentation-http	497.6ms					
1 tls.connect	@opentelemetry/instrumentation-net	40.89ms					
• tcp.connect	@opentelemetry/instrumentation-net	19.02ms					
• redis-SET	@opentelemetry/instrumentation-redis-4					1.119ms	



# Ignore middleware



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```
instrumentations: [  
  getNodeAutoInstrumentations({  
    // disable fs instrumentation as it's too noisy  
    '@opentelemetry/instrumentation-fs': {  
      enabled: false,  
    },  
    // ignore middleware from express instrumentation  
    '@opentelemetry/instrumentation-express': {  
      ignoreLayersType: [ExpressLayerType.MIDDLEWARE],  
    },  
  ]  
}
```







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# Trace d63fc9e8e93880cc872d51709e1345e0

7 spans at Nov 6 2023 20:17:05 UTC-06:00



0 spans with errors

Fields

name	library.name	0s	0.1s	0.2s	0.3s	0.4s	0.5s	0.5847s
... 4 GET /book/:searchParam	@opentelemetry/instrumentation-http	584.7ms						
request handler - /book/:searchParam	@opentelemetry/instrumentation-express	0.1268ms						
redis-GET	@opentelemetry/instrumentation-redis-4	1.662ms						
1 GET	@opentelemetry/instrumentation-http	566.6ms						
1 tls.connect	@opentelemetry/instrumentation-net	56.78ms						
tcp.connect	@opentelemetry/instrumentation-net	25.24ms						
redis-SET	@opentelemetry/instrumentation-redis-4	1.049ms						



# Tying things together



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## Manual/Custom Instrumentation

Add to your source code to get more granularity and context

- Auto-instrumentation is typically higher level, and connects A to B to C
- Manual instrumentation allows you to break down A and B further and add more context and detail based on your specific application





# logs to attributes



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```
if (cacheResults) {  
  console.log('Data retrieved from the cache');  
  const activeSpan = trace.getActiveSpan();  
  activeSpan?.setAttribute('app.in_cache', true);  
  results = JSON.parse(cacheResults);  
  res.send({  
    fromCache: true,  
    data: results,  
  });  
} else {  
  console.log('Data not retrieved from the cache');  
  const activeSpan = trace.getActiveSpan();  
  activeSpan?.setAttribute('app.in_cache', false);  
  next();  
}  
catch (error) {
```



# Confirm expectations





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http.route		http.target		app.in_cache		MAX(duration_ms)
	/books/:searchParam	...	/books/fahrenheit-451	...	false	1,437.33625
	/books/:searchParam	...	/books/fahrenheit-451	...	true	4.05804





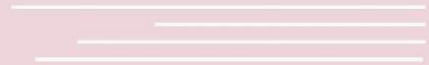
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# Iterate based on results in prod



# Test in prod

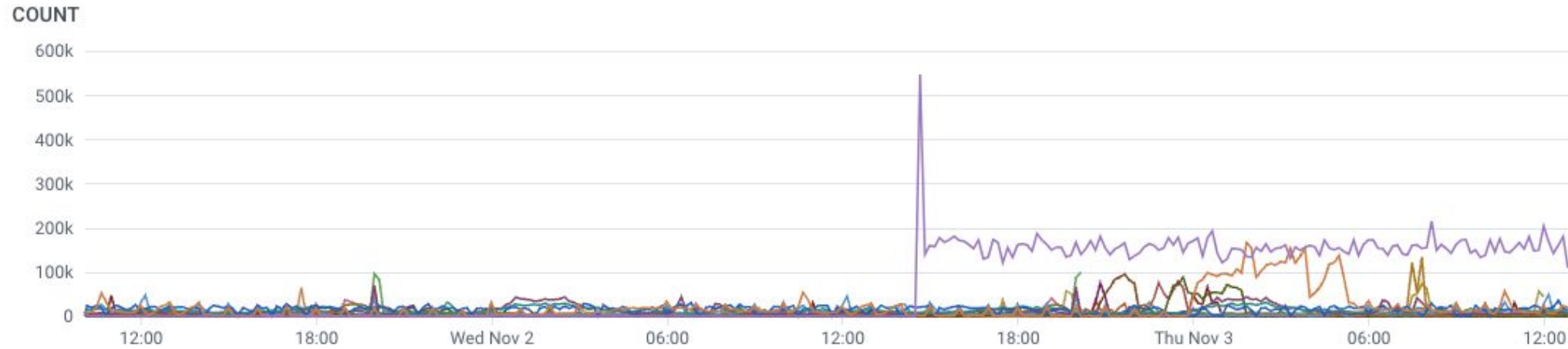


KubeCon

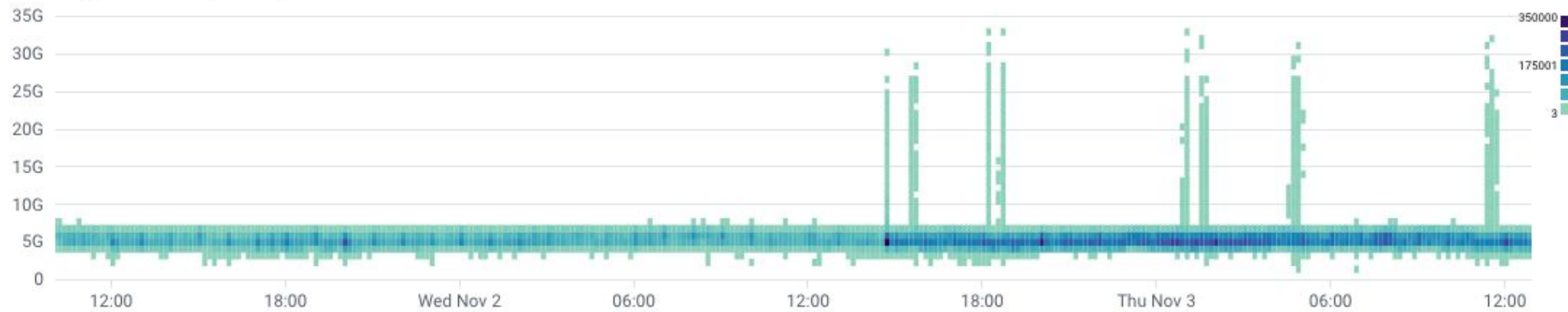


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HEATMAP(global.memory\_inuse)



# Test in prod



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```
if val, truncatedBytes := getValue(attr.Value); val != nil {  
    attrs[attr.Key] = val  
    if truncatedBytes != 0 {  
        // if we trim a field, add telemetry about it; because we trim at 64K and  
        // a whole span can't be more than 100K, this can't happen more than once  
        // for a single span. If we ever change those limits, this will need to  
        // become additive.  
        attrs["meta.truncated_bytes"] = val  
        attrs["meta.truncated_field"] = attr.Key  
    }  
}
```



# Test in prod



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V1-23



**jamie**  1:55 PM

**This PR** has been merged to bump Husky to v0.18.0, which includes the OTLP size fix and marshalling of kvlist and byte arrays. We tested the same setup that caused 502s in dogfood, using a prshepherd, and no 502s showed in kibble.



**“**

**...there's no way we would have been able to track it down to "this specific customer sending this specific form of data" without all our telemetry**





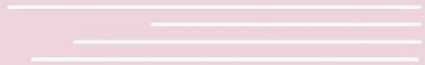
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# Observability is about confidence



# Confidence

Ever gotten a bug report and you were the last one who worked on the code?



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# Confidence

---

The best time to instrument your code is while you're writing the code.



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# Confidence

---

- How does my code fit in with the rest of the system?



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---

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---



# Confidence

---

- How does my code fit in with the rest of the system?
- Will my changes have the impact I expect?



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# Confidence

---

- How does my code fit in with the rest of the system?
- Will my changes have the impact I expect?
- Will I know if something is wrong?



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---

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---



# Confidence

---

- How does my code fit in with the rest of the system?
- Will my changes have the impact I expect?
- Will I know if something is wrong?
- Will I know if someone is using my new code path?



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---





# Confidence

---



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- How does my code fit in with the rest of the system?
- Will my changes have the impact I expect?
- Will I know if something is wrong?
- Will I know if someone is using my new code path?
- Can I show others what this will look like in production before it gets to production?



# Recap



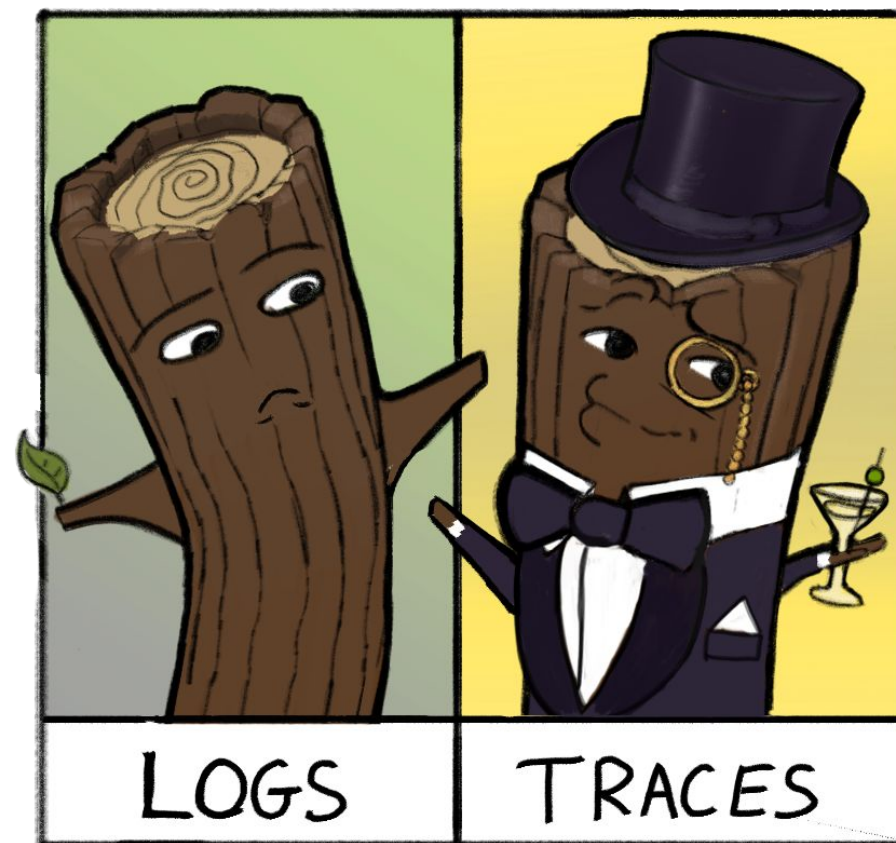
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- If you know how to log you know how to trace
- Start small and get value quickly
- Iterate based on results in prod
- Observability is about confidence





**Feedback**

# **Stop by the Honeycomb booth!**

**Booth N22**

**Resources**

