Observability 3 ways

Logging, Metrics and Tracing

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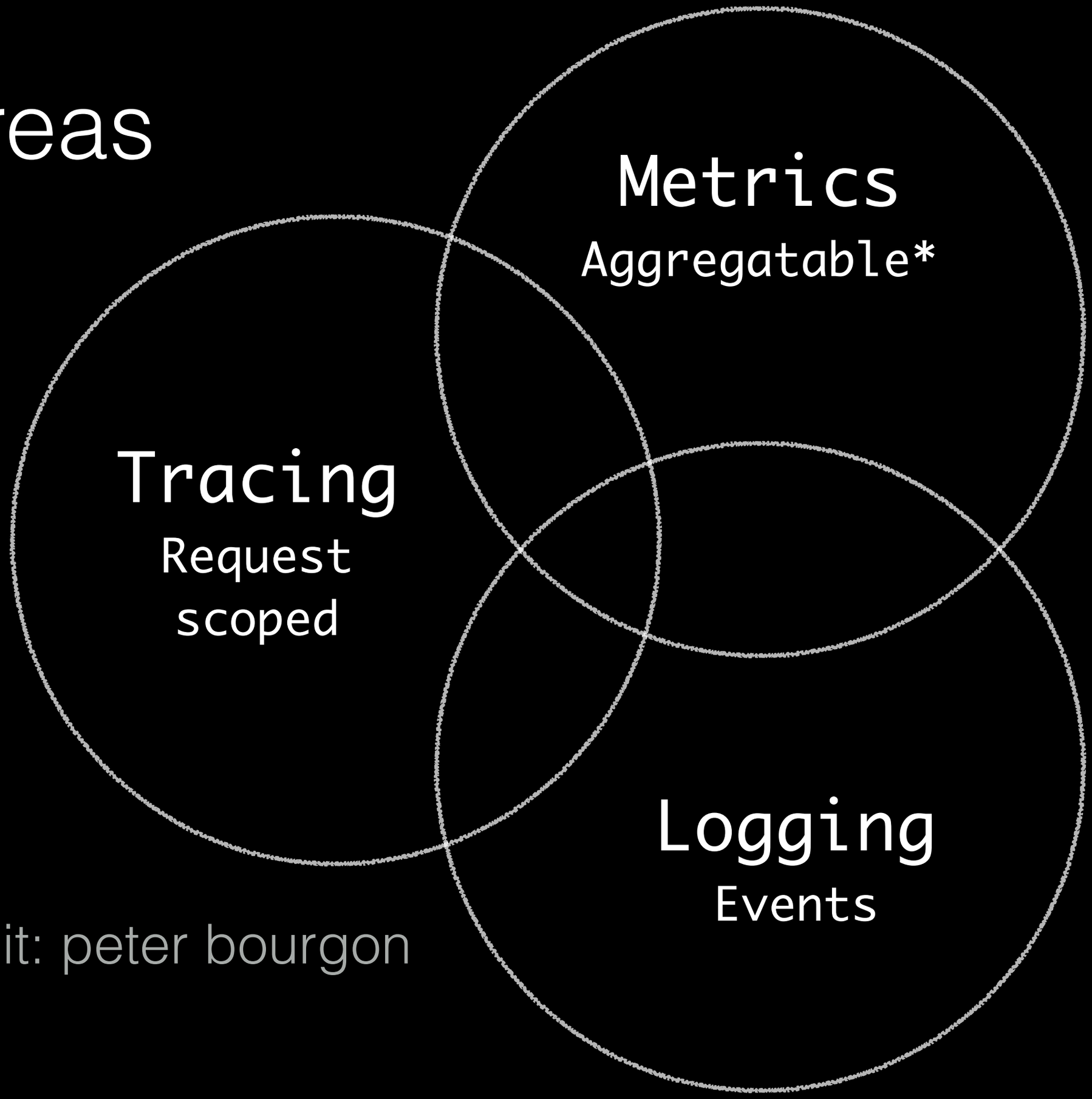
Unifying theory

Everything is based on events

- Logging - recording events
- Metrics - data combined from measuring events
- Tracing - recording events with causal ordering

credit: coda hale

Focal areas



credit: peter bourgon

Let’s use latency to compare a few tools

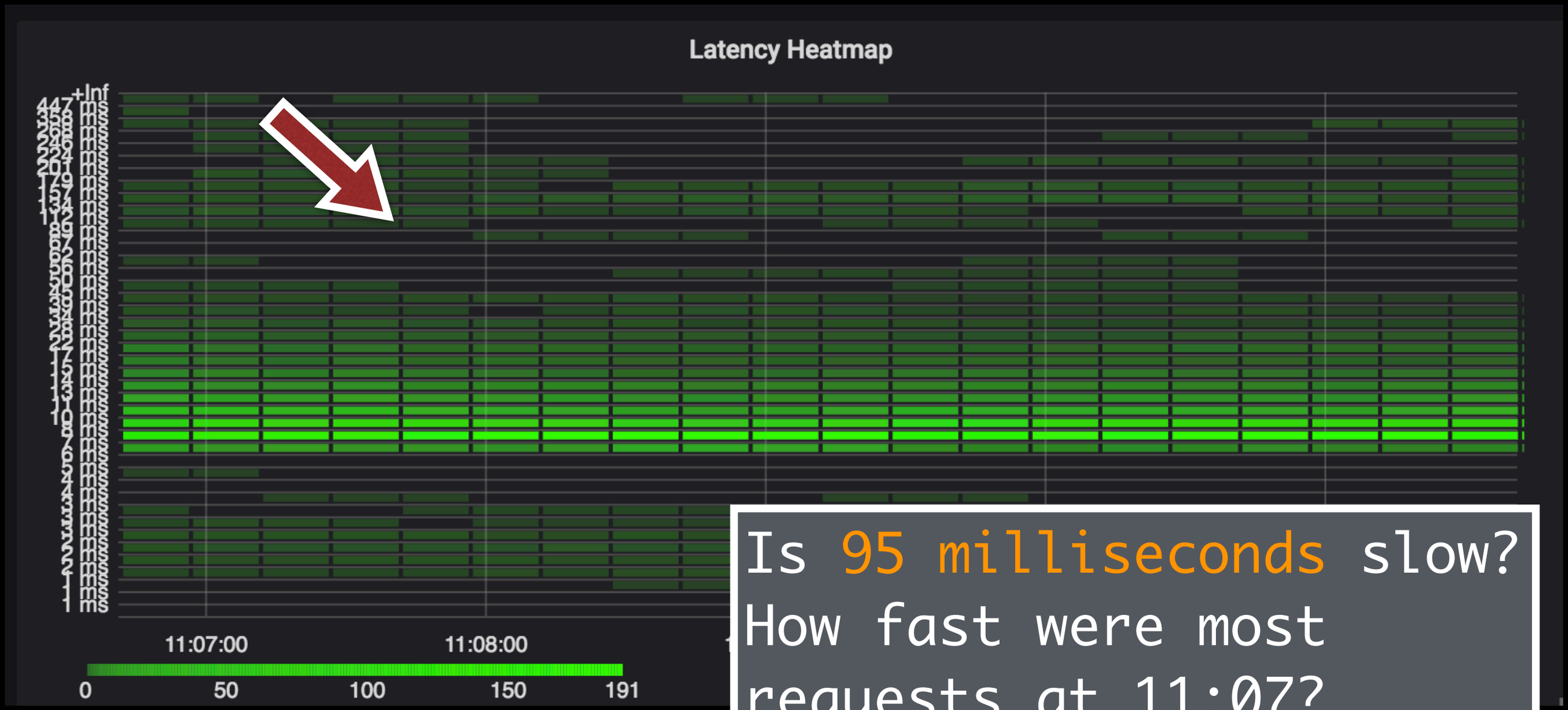
- Log - event (response time)
- Metric - value (response time)
- Trace - tree (response time)

Logs show response time

[20/Apr/2017:11:07:07 +0000] "GET / HTTP/1.1" 200 7918 "" "Mozilla/5.0 (X11; U; Linux i686; en-US; rv: 1.8.1.11) Gecko/20061201 Firefox/2.0.0.11 (Ubuntu-feisty)" **0/**95491****

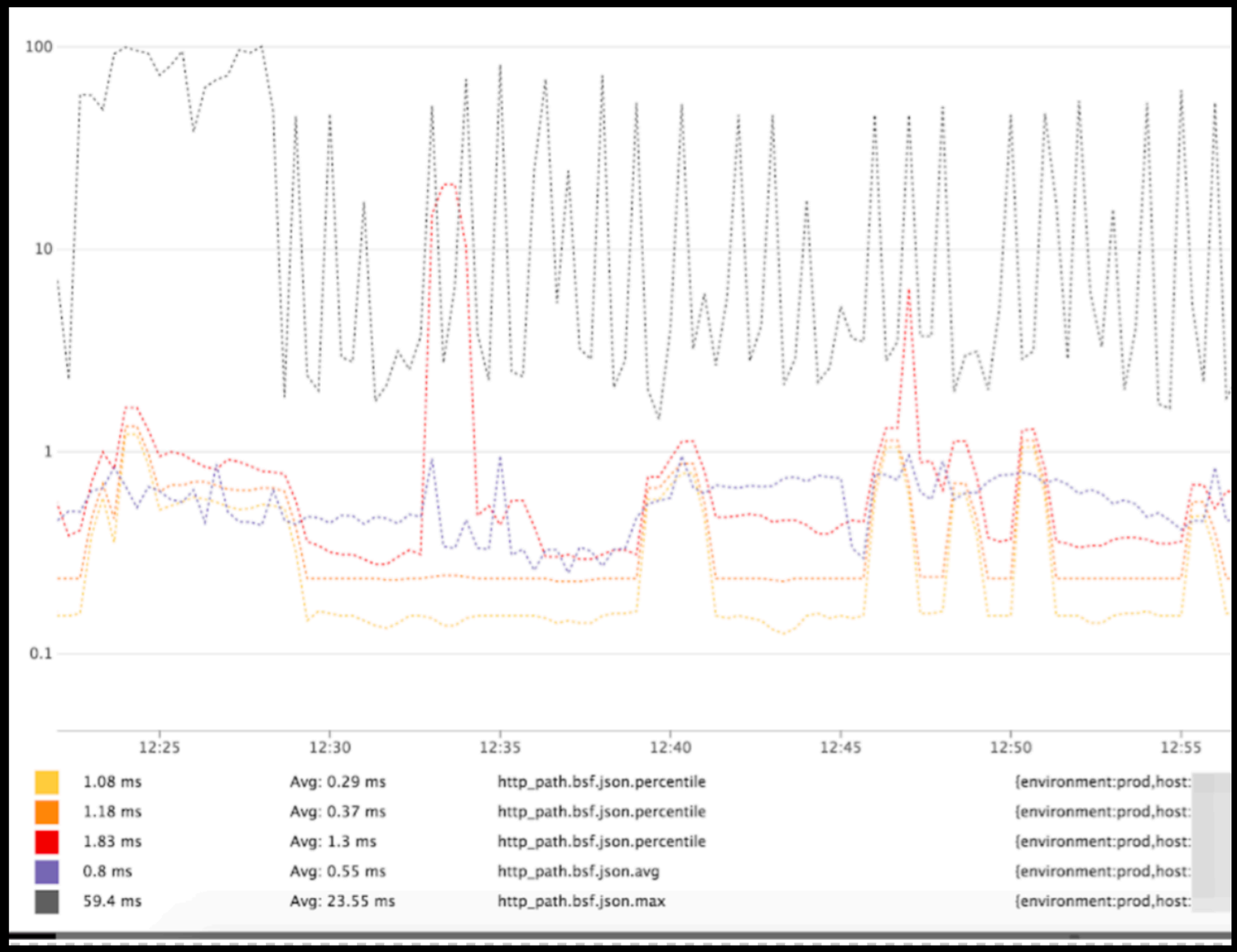
Look! this request took 95 milliseconds!

Metrics show response time



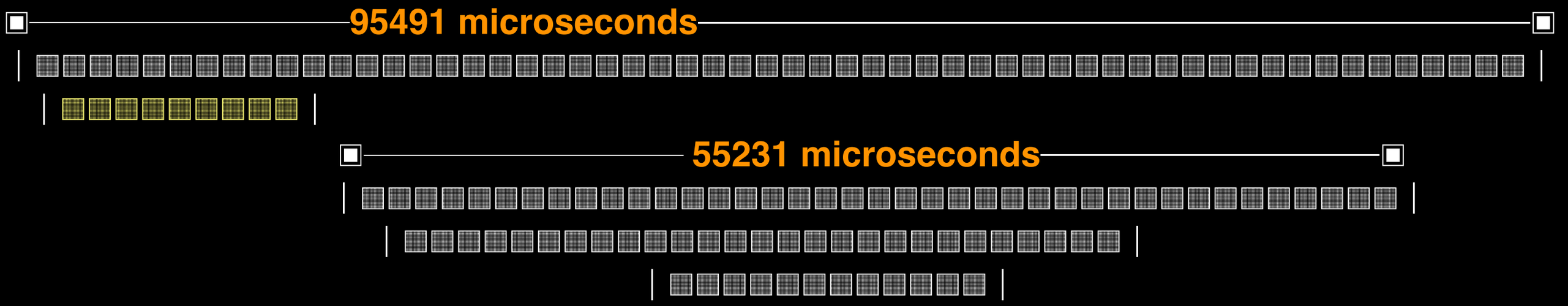
Is 95 milliseconds slow?
How fast were most requests at 11:07?

Alert on max, performance tune to high percentiles.



@jon_k_schneider

Traces show response time



What caused the request to take 95 milliseconds?

First thoughts…

- Log - easy to “grep”, manually read
- Metric - can identify trends
- Trace - identify cause across services

How do you write timing code?

- Log - time and write formatted or structured logs
- Metric - time and store the number
- Trace - start, propagate and finish a “span”

Jargon alert! span == one operation in the call graph

Logging response time

```
long tookMs = TimeUnit.NANOSECONDS.toMillis(System.nanoTime() - startNs);

logger.log("<-- " + response.code() + ' ' + response.message() + ' '
    + response.request().url() + " (" + tookMs + "ms" + (!logHeaders ? ", "
    + bodySize + " body" : "") + ')');
```

Find the thing you want and time it, format the result into a log statement.

Metric’ing response time

```
def apply(request: Req, service: Service[Req, Rep]): Future[Rep] = {
  val sample = Timer.start(Clock.SYSTEM)

  service(request).respond { response =>
    sample.stop(
      Metrics.timer(“request.latency”, “code”, response.status())
    )
  }
}
```

Initialize something to record duration and add to it

Tracing response time

```
Span span = handler.handleReceive(extractor, httpRequest);
try {
  chain.doFilter(httpRequest, httpResponse);
} finally {
  servlet.handleAsync(handler, httpRequest, httpResponse, span);
}
```

Create and manage a span. Pass it on via headers

Impact of timing code

- Log - ubiquitous apis, but requires coordination
- Metric - easy, but least context
- Trace - hardest, as identifiers must be passed within and between services

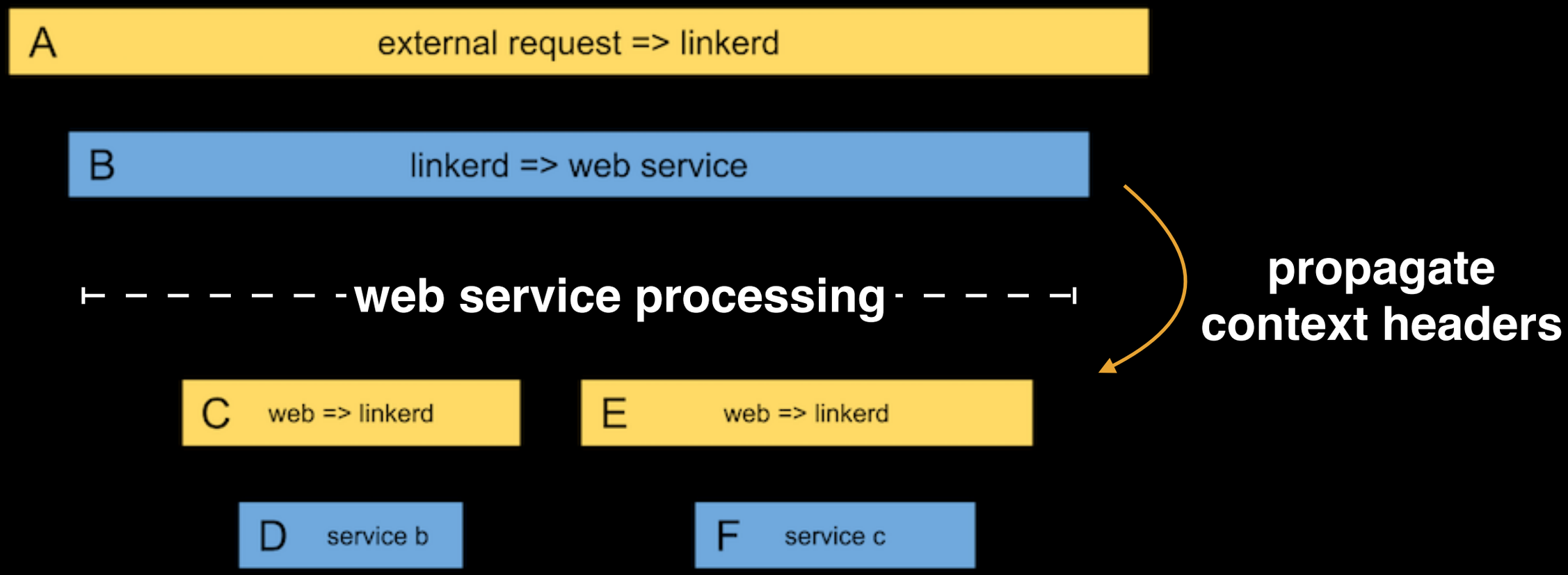
Should you write timing code?

- Frameworks usually have metrics built-in
- Many frameworks have tracing built-in
- Lots of edge cases in this sort of code!

How to not see tracing code?

- Buddy - another process intercepts yours
- Agent - code patches code
- Framework - code intercepts or configures code

Buddy tracing



Use a service mesh to trace around your services

Agent tracing

```
if ("spark/webserver/JettyHandler".equals(className)) {
  ClassPool cp = new ClassPool();
  cp.appendClassPath(new LoaderClassPath(loader));

  CtClass ct = cp.makeClass(new ByteArrayInputStream(classfileBuffer));

  CtMethod ctMethod = ct.getDeclaredMethod("doHandle");
  ctMethod.insertBefore("{ $4.setHeader(\"TraceId\", MagicTraceId.get()); }");

  return ct.toBytecode();
}
```

We have ways of making code traced..

Framework Tracing

```
@Configuration
@AutoConfigureAfter(TraceAutoConfiguration.class)
@ConditionalOnClass(HystrixCommand.class)
@ConditionalOnBean(Tracer.class)
public class SleuthHystrixAutoConfiguration {

  @Bean
  SleuthHystrixConcurrencyStrategy sleuthHystrixConcurrencyStrategy(
    Tracer tracer, TraceKeys traceKeys) {
      return new SleuthHystrixConcurrencyStrategy(tracer, traceKeys);
  }
}
```

Framework code configures libraries

How is timing data shipped?

- Log - pull raw events into a parsing pipeline
- Metric - report duration buckets near-real time
- Trace - report spans near-real time

Parsing latency from events

```
input {
  file {
    path => "/var/log/http.log"
  }
}
```

```
filter {
  grok {
    match => { "message" => "%{IP:client} %{WORD:method} %
{URIPATHPARAM:request} %{NUMBER:bytes} %{NUMBER:duration}" }
  }
}
```

Identify the pattern and parse into indexable fields

Bucketing duration

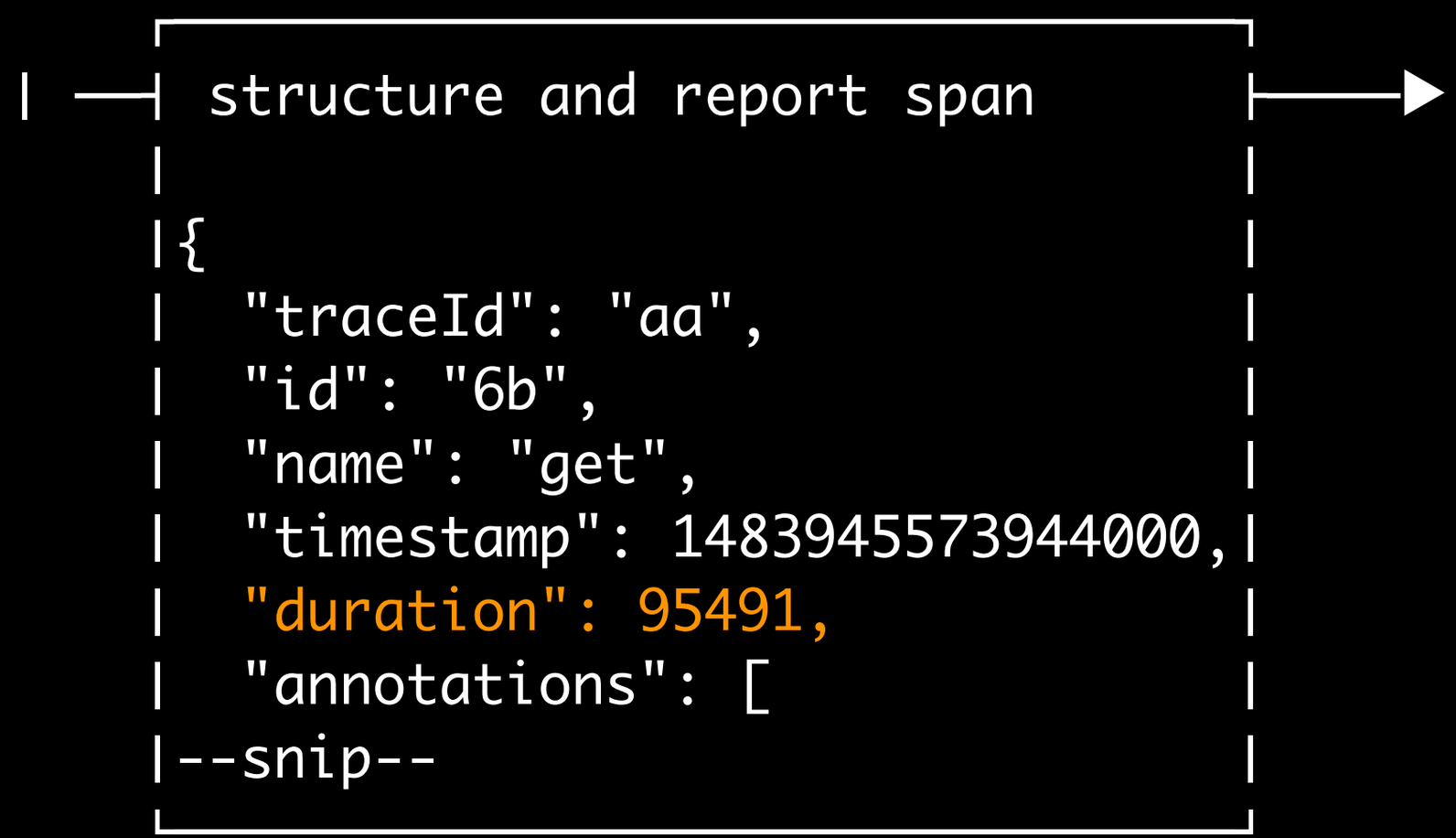
define boundaries up front...

```
boundaries[0] = 1; // 0 to < 1ms
boundaries[1] = 1000; // 1ms to < 1s
boundaries[2] = 50000; // 1s to < 50s
```

add values by incrementing count in a bucket

```
for (int i = 0; i < boundaries.length; i++) {
  if (duration < boundaries[i]) {
    bucket[i]++;
    return;
  }
}
bucket[boundaries.length]++; // overflow!
```

Shipping spans



Spans represent operations and are structured

How timing data grows

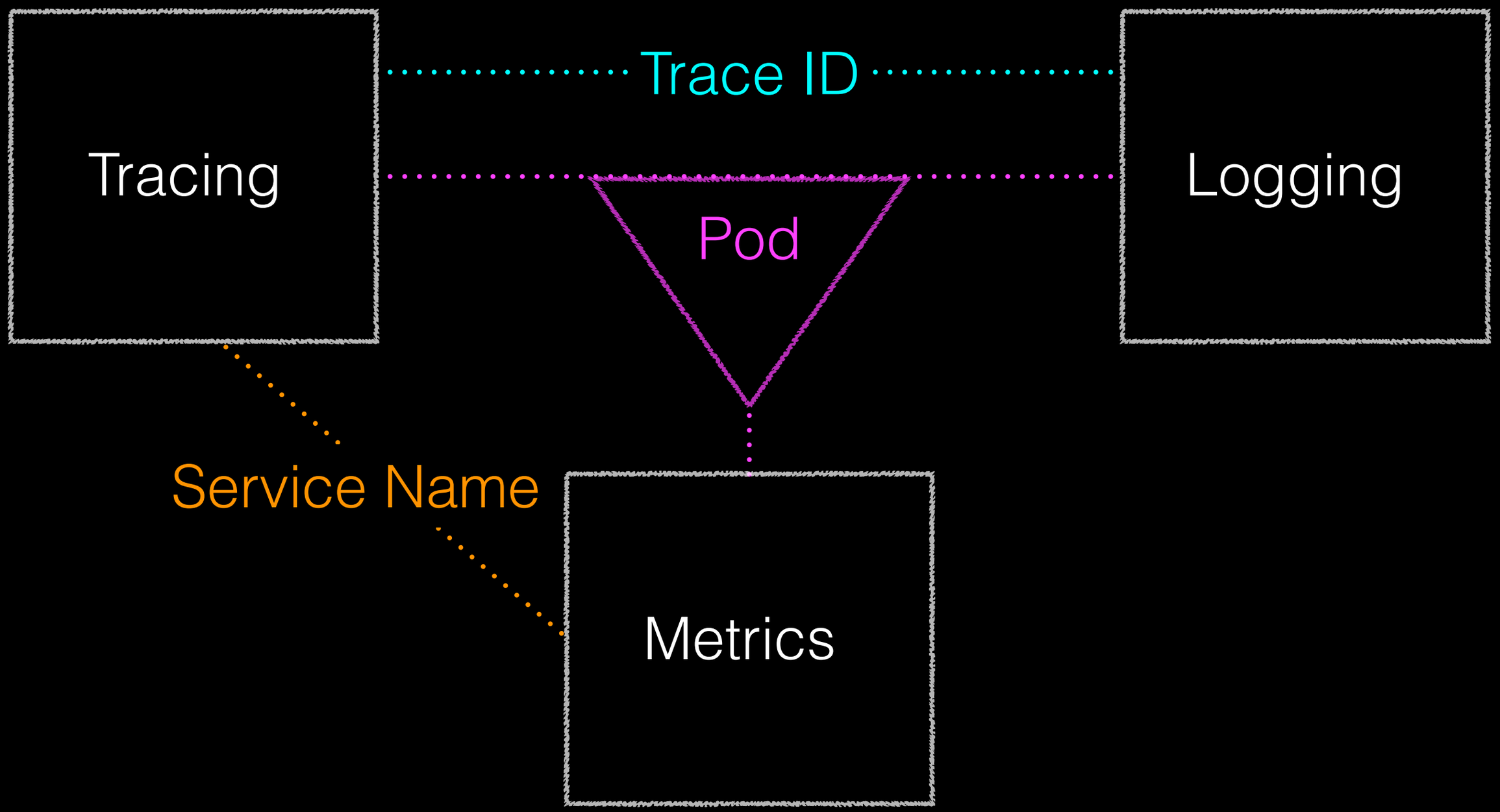
- Log - grows with traffic and verbosity
- Metric - fixed wrt traffic
- Trace - grows with traffic

Means to reduce volume

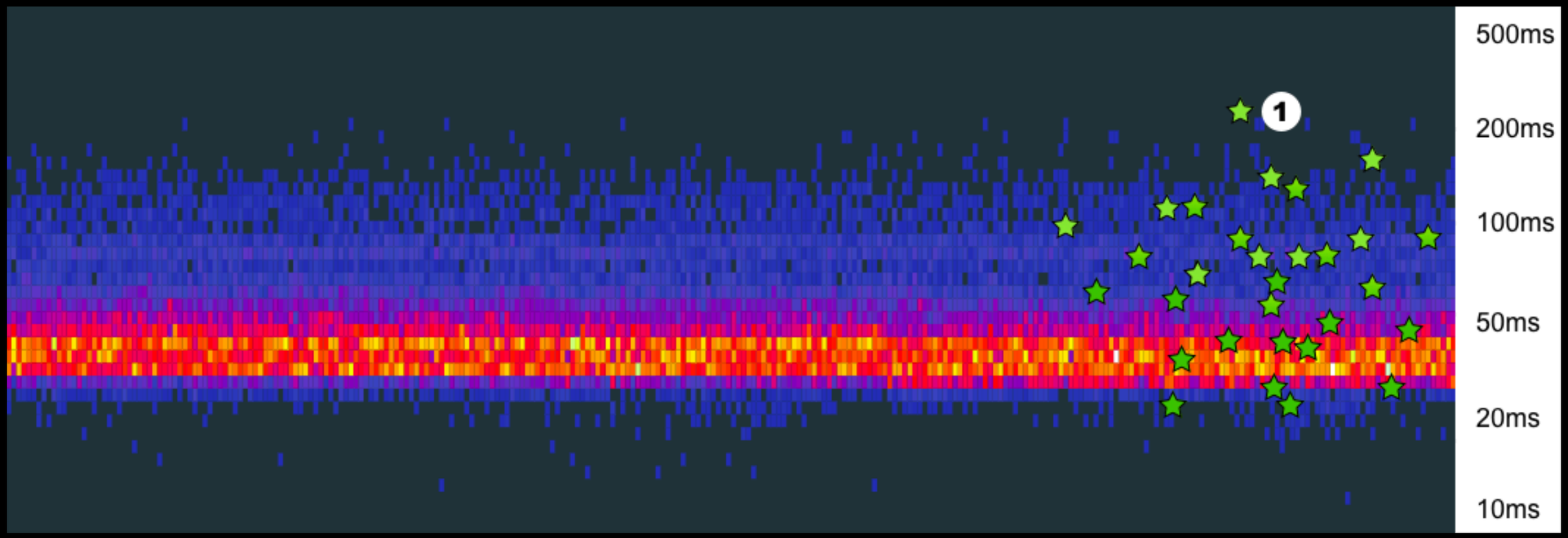
- Log - don’t log irrelevant data, filtering
- Metric - read-your-writes, coarser grain
- Trace - sampling, but needs to be consistent

Each have different retention, too!

Stitching all 3 together



Correlating Metrics and Tracing Data



https://medium.com/observability/want-to-debug-latency-7aa48ecbe8f7

Leverage strengths while understanding weaknesses

- Log - monoliths, black boxes, exceptional cases
- Metric - identify patterns and/or alert
- Trace - distributed services “why is this slow”

Was this helpful?

If so, thank folks who helped with this!

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If not, blame me, @adrianfcole