distributed tracing

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motivation

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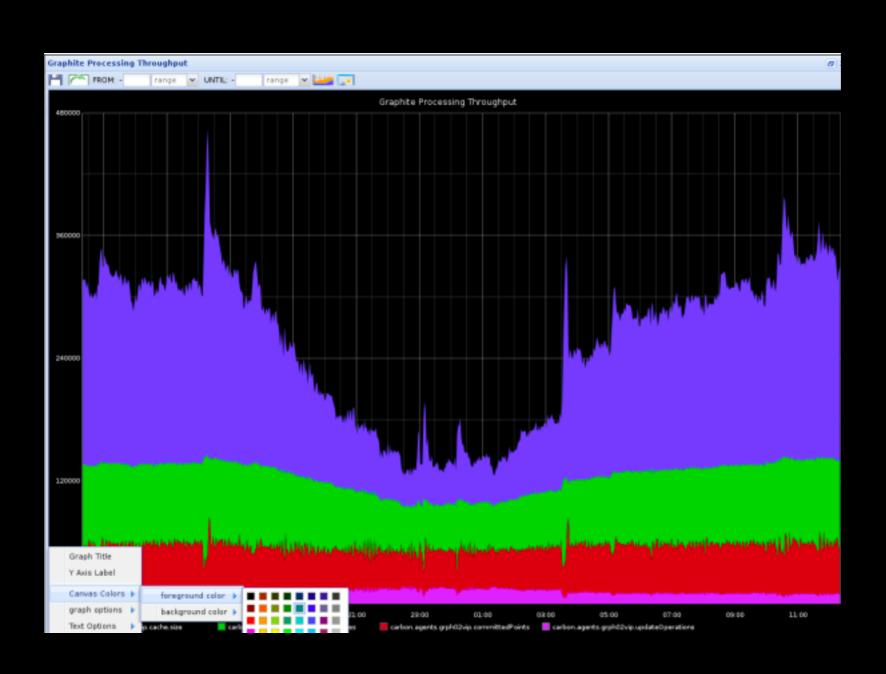
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38.8.4.32 internal force, trace trace (10 insp. 20 internal force) with the State of the State o

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causal flow of control

Unique identifier

- Unique identifier
 - propagate throughout

- Unique identifier
 - propagate throughout
 - write instrumentation for various transports

- Unique identifier
 - propagate throughout
 - write instrumentation for various transports

- Unique identifier
 - propagate throughout
 - write instrumentation for various transports
- Observe and correlate

- Unique identifier
 - propagate throughout
 - write instrumentation for various transports
- Observe and correlate
 - always on the outside black box

- Unique identifier
 - propagate throughout
 - write instrumentation for various transports
- Observe and correlate
 - always on the outside black box
 - difficult to get threaded + evented processes right

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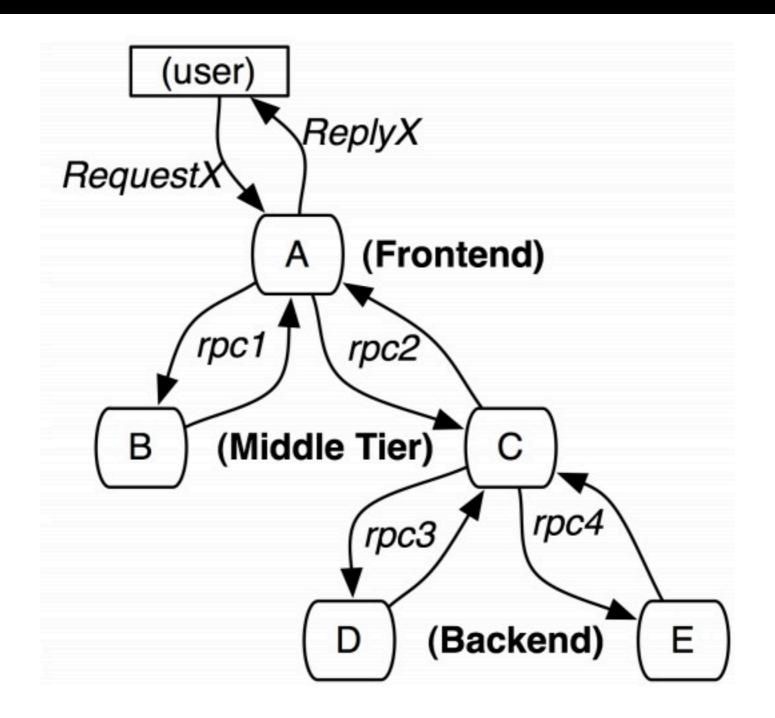


Figure 1: The path taken through a simple serving system on behalf of user request *X*. The letter-labeled nodes represent processes in a distributed system.

t = start

nginx

cache

python

db

internet

the java

t = start

nginx

cache

python

db

internet

the java

t = start

cache

python

db

internet

the java

piggyback rides

- More Doable
 - HTTP: x-headers
 - Thrift: secret argument
 - Internal RPC protocol: you're the boss
- Less Doable
 - SQL: one way ticket, also you're not percona
 - memcache: not extensible so not backwards compatible

timing and structure

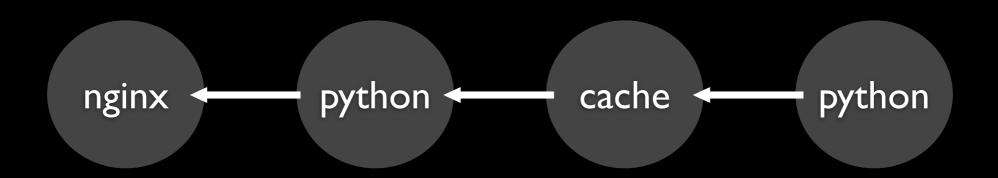
- Timing
 - distributed = clock skew
- Structure -- two approaches
 - Encode in ID
 - Encode in back-pointers

encode in ID?

- nginx1
- nginx1python1
- nginx1python1cache1
- nginx1python1cache1python2
- nginx1python1cache1python2sql
- nginx1python1cache1python2sql 1python3

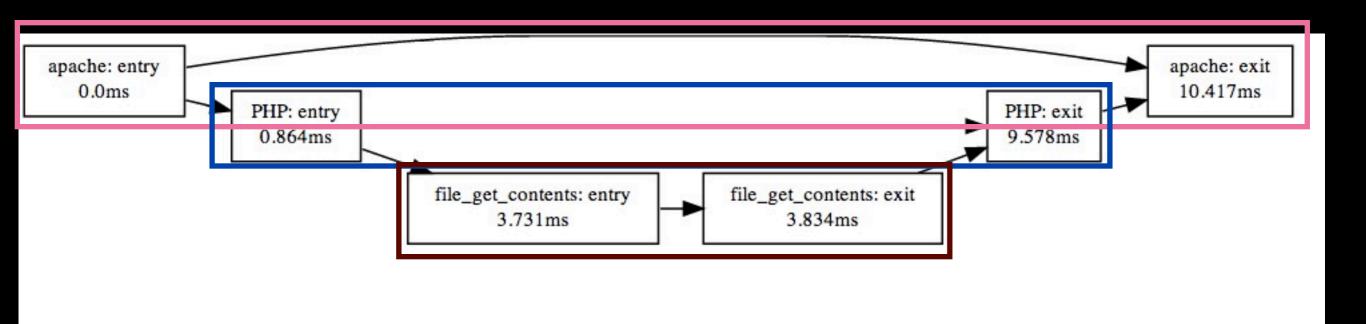
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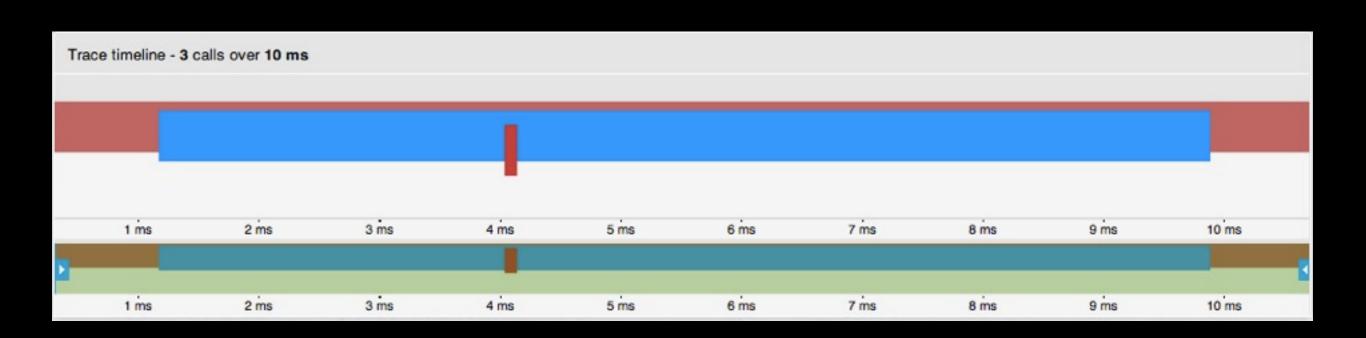
encode in back-pointer?

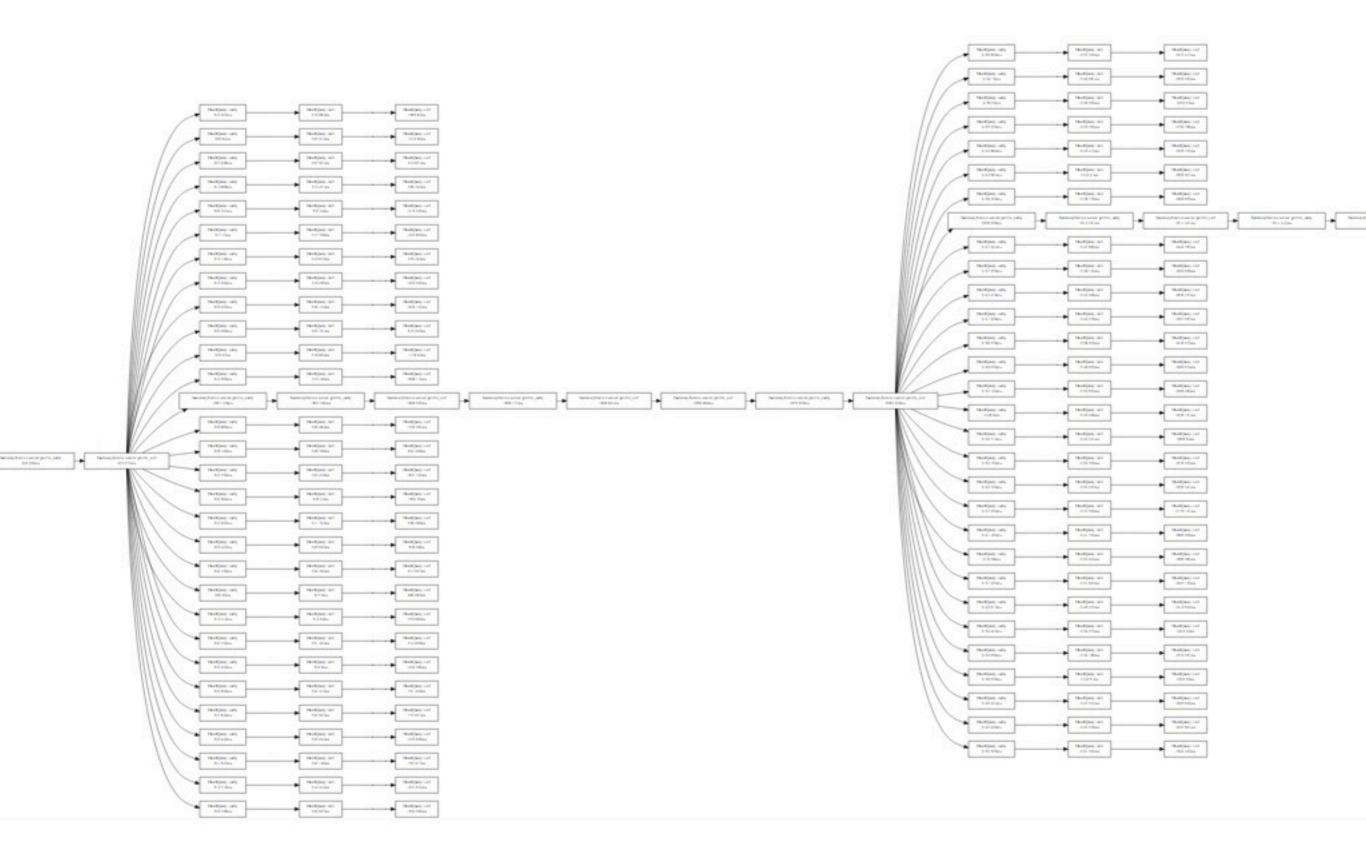


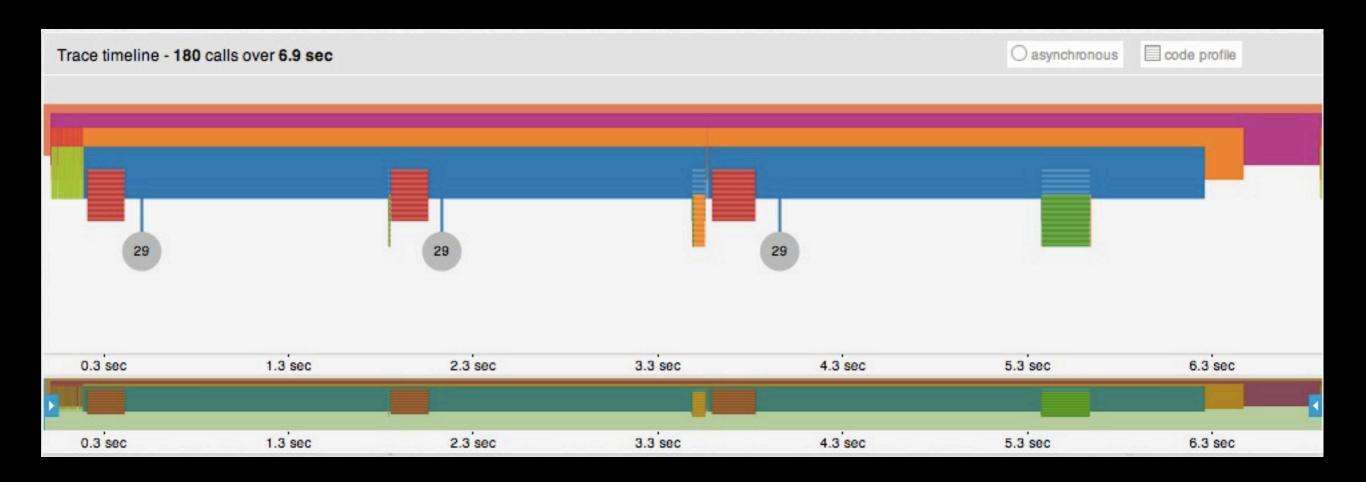
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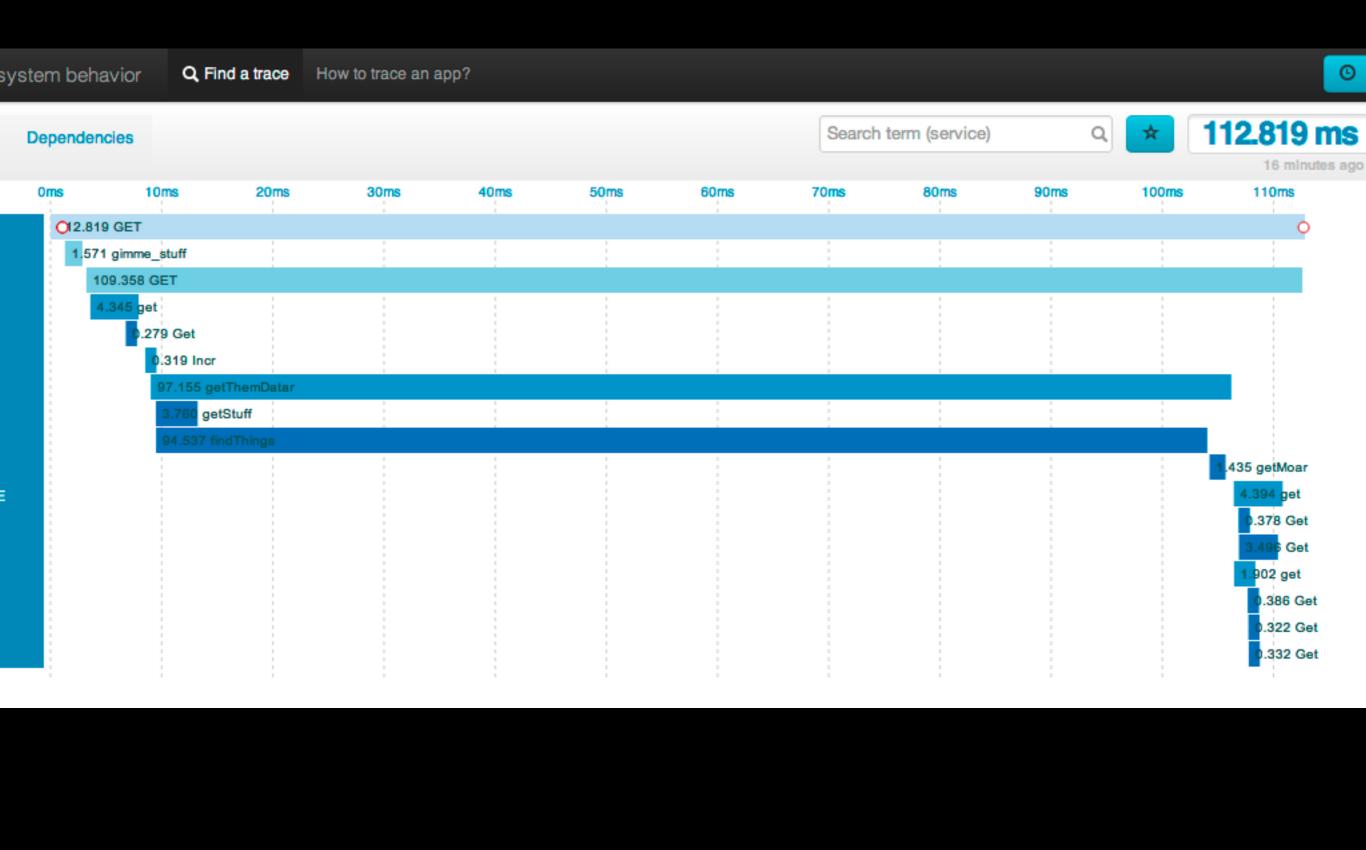
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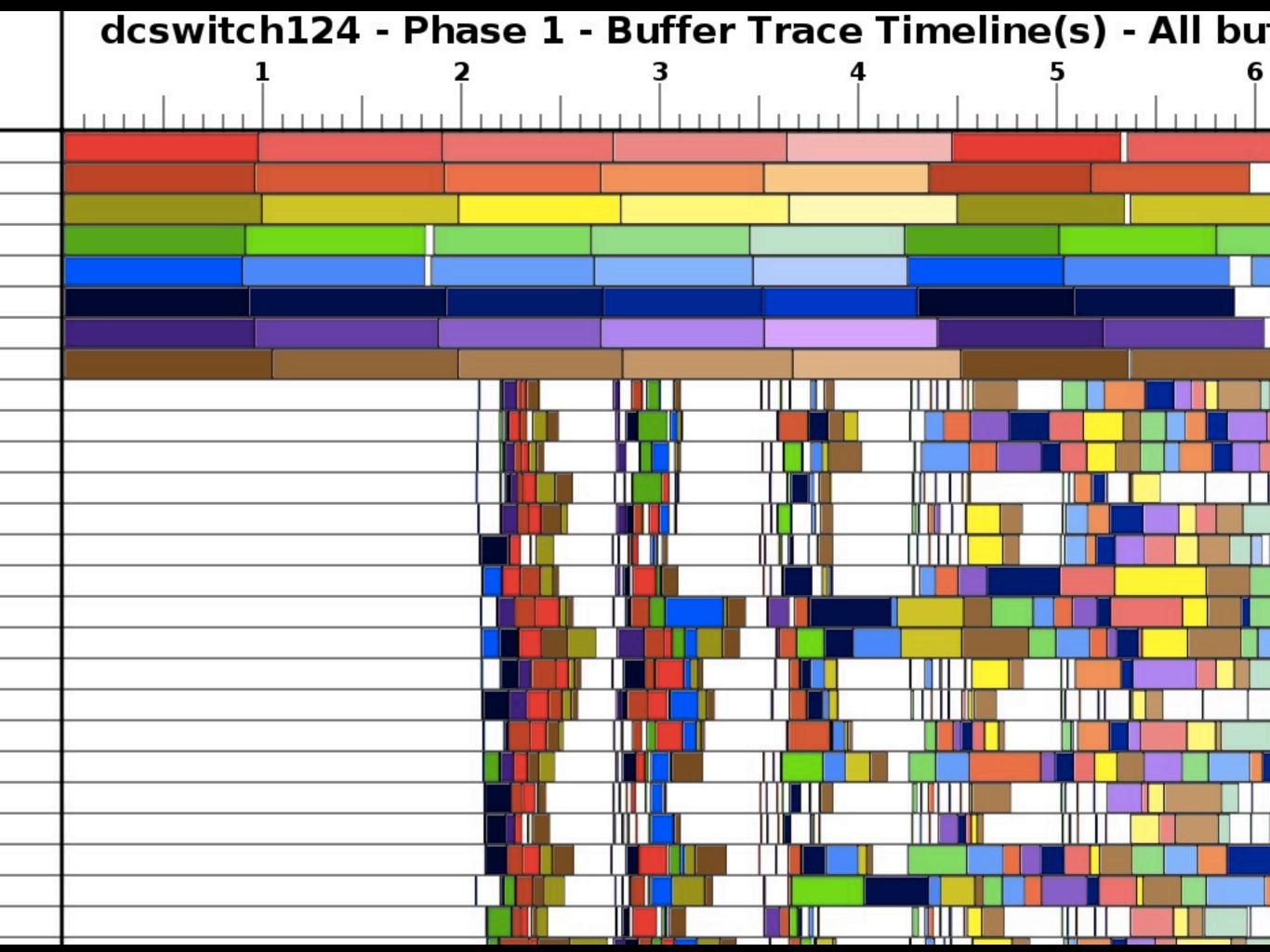




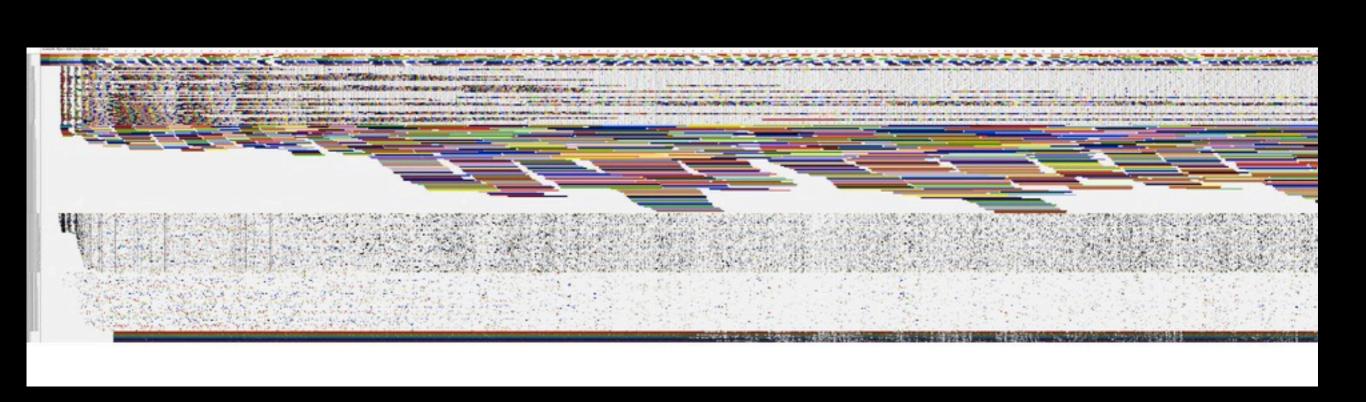












other things worth figuring out

- sampling
- reporting
- aggregate analysis

thanks!

tracelytics.com
@dankosaur
dan@tracelytics.com

resources

- X-Trace: http://x-trace.net
 - http://x-trace.net/pubs/xtr-nsdi07.pdf
- Google Dapper: http://research.google.com/
 pubs/pub36356.html
- Twitter Zipkin: https://github.com/twitter/zipkin
- CMU PDL: <u>www.pdl.cmu.edu</u>
 - StarDust: http://www.pdl.cmu.edu/PDL-FTP/
 SelfStar/thereska_sigmetrics06.pdf
 - Trace Diff: http://www.pdl.cmu.edu/PDL-FTP/ SelfStar/NSDI11.pdf