SREcon19 Americas

Visibility into Loggers

What is the cost of those log lines in your forest of code…?

Danny Chen
Trading Solutions SRE Team, Bloomberg, LP
dchen294@bloomberg.net

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cat captains.log | srecon_grep | stardate2EDT

```
Fall    1980 [Piscataway]    INFO  Joined Bell Labs
1982 or 1983 [Boston]        INFO  Attended my first USENIX conference
Summer  1988 [San Francisco] INFO  USENIX: talk on user/kernel tracing package
Winter  1990 [Washington DC] INFO  USENIX: talk on improving virtual mem perf
      ...                    TRACE woke up
      ...                    TMI   stuff
      ...                    TRACE went to bed
Spring  2015 [New York]      INFO  Joined Developer Experience @ Bloomberg LP
Winter  2019 [New York]      INFO  Joined Trading Solutions SRE @ Bloomberg LP
March   2019 [Brooklyn]      INFO  USENIX SRECon: talk on loggers
```

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Outline

1. Inspirations and motivations for this talk
2. Example logging patterns and sample data
3. Not just picking on logging
4. Why no visibility?
5. With better visibility...

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Inspirations for talk

- Last year's SRECon
  - History of Fire Escapes - Tanya Reilly, Squarespace
    - History of NYC fire codes
    - Evolution of fire escapes and eliminating fire traps
    - Software fire codes?
      - Me: Metrics primitives for UNIX!
  - Antics, Drift, and Chaos - Lorin Hochstein, Netflix
    - Antics and Drift are unavoidable in complex systems
      - Me: Visibility is important for software components with a history of hiccups and drift
- My "logger moment"...

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My logger moment...

- Financial Crisis (~2008)
  - Market volatility & large volume spikes
- Member of a middleware team
  - Messaging and distributed transaction management
  - Also responsible for a C++ logging library
- App team reporting 100% CPU utilization
  - Most of that time in our logger!
  - Most of that time in strftime!

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Where is the visibility?

- Don’t rely on outages!
- Impact does not always lead to outage
- Utilization (avg) of backend service can be related to latency (avg) but does not give latency distributions

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Example logging patterns (and data)

1. “Standard” file logging
2. Logging to an http logging forwarder
3. Synchronous writes

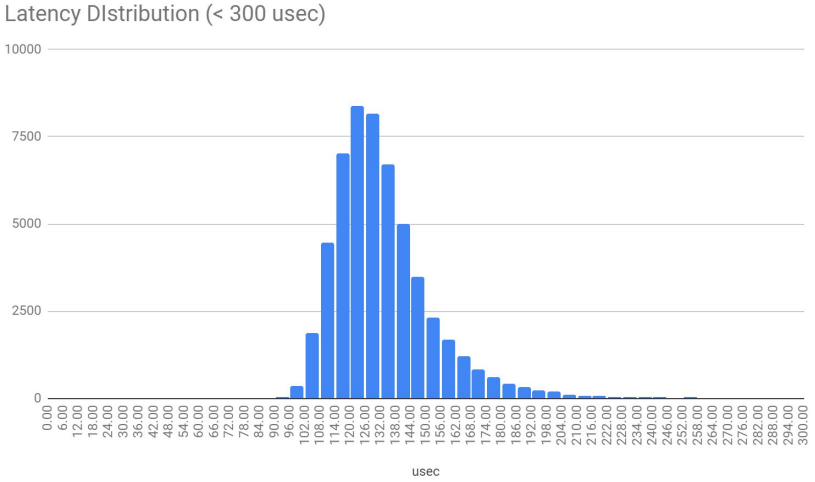
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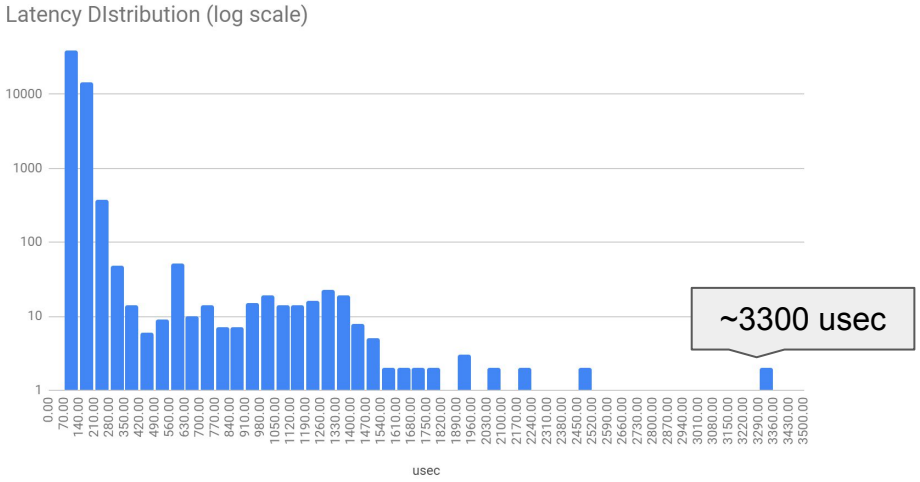


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Example 1: “Standard” file logging





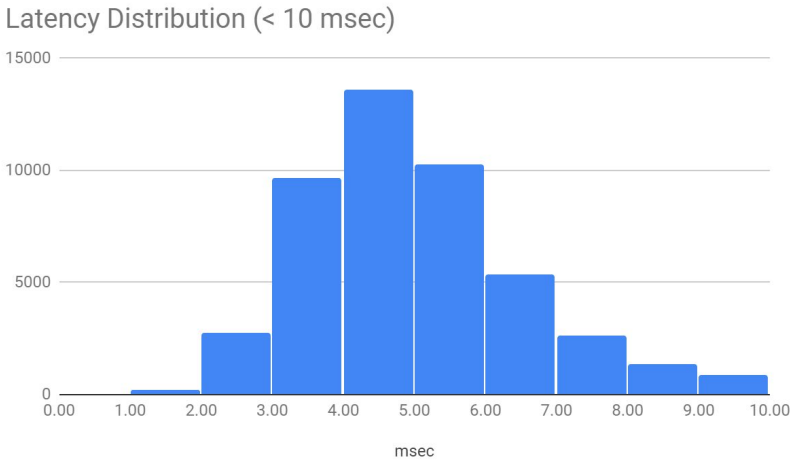
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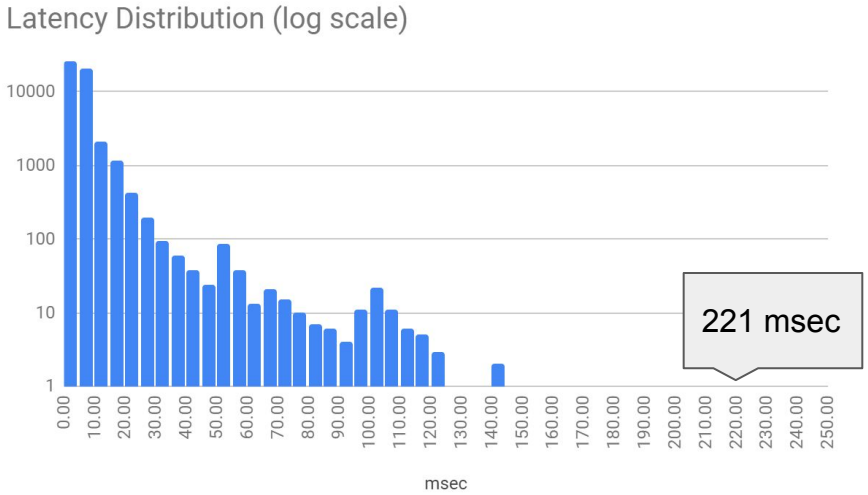
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Example 2: Logging to an http log forwarder





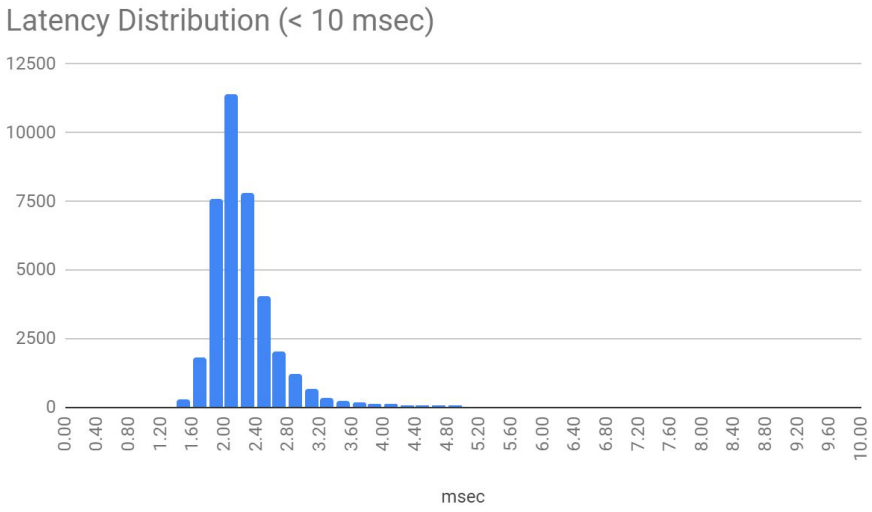
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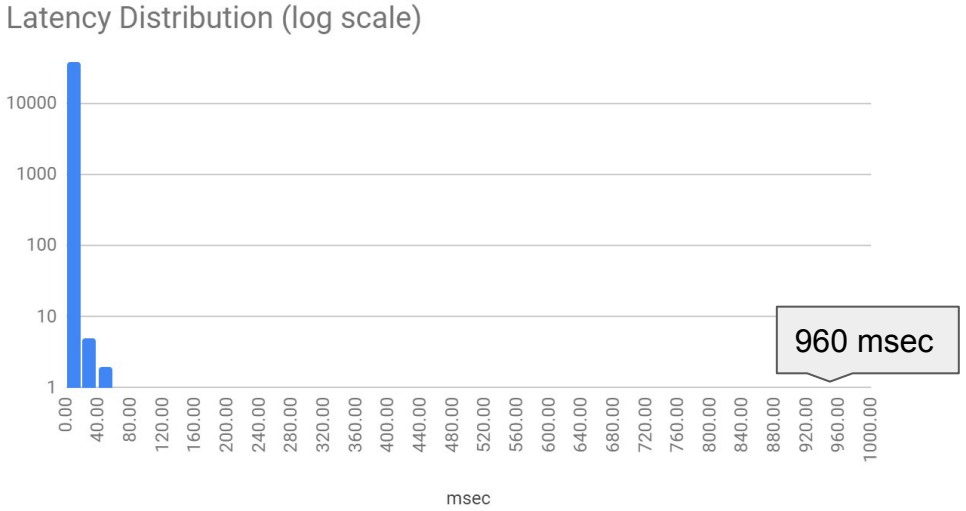
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Example 3: Synchronous writes





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Logs are used to infer latencies

Example pseudo code

```
log(“Starting talk…”)

do_talk(args…)

log(“Done!”)
```

Corresponding log

```
Mar  2 20:12:06.335 Starting talk...

Mar  2 20:12:06.337 Done!
```


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I’m not picking on logging...

My malloc moment:

- ~2007
- Serialized guaranteed messaging broker
- The server would get “tired” as the week progressed
- Profiling pointed to memory allocation!
- Instrumentation and code inspection:
  - Blew away my mental model of the costs of alloc/free
  - Free list searching/maintenance
  - Lock acquisition (between threads)

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I’m not picking on logging...

- DNS
- LDAP
- DB access
- ...

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Why no visibility?

1. Confusion between metrics and logging
2. Lack of a good standard way for processes to expose metrics
3. Ceding responsibility for visibility to “others”

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Why no visibility: Confusion between metrics and logging

Metrics vs Logging

`talk_cnt++`	`log("Starting talk", args, …)`
	`Serialize args objects`
	`Obtain timestamp`
	`Format log record`
	`Emit record`

Logging is not the only way to expose metrics

- In fact, it is a pretty expensive way to expose metrics
- UNIX and Linux kernels have historically provided "hooks" to call in to access system metrics
- JVMs provide JMX (RPC mechanism)
- **The "almost free lunch": shared memory!**

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Why no visibility: Lack of good standard for process application metrics

- Needs to be usable for both app code AND libraries
- Needs to be “low level” (introduce no higher level dependencies)
- /proc provides a great model for discovery and access
- JMX provides a pretty good model for registration and discovery
- Prior work
  - Performance Management Working Group (PMWG)
    - Universal Measurement Architecture
    - Data Capture Interface
    - My prototype provided a model for low cost access to metrics

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Why no visibility: Ceding Responsibility

- Don’t wait
  - for standards
  - for vendors
  - for code to instrument itself
- Leverage modern dynamic runtimes and late binding
  - Native shared objects: interposers and LD_PRELOAD
  - Java:
    - “Wiring”
    - Dynamic proxies
    - Byte code editing
  - Requires good interfaces and tests and buy in!

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With more visibility into logging latency...

- **More**, better visibility!
  - Programmer/SRE design for visibility
    - Metrics and/or Logs (at various logging levels)
  - Encoding
    - Binary logs?
    - Epoch based timestamps?
    - Standardized “last log elapsed time” field?
  - Forwarders and persistors
    - Async loggers vs better filesystem strategies
    - Better statistical sampling techniques?
- Better runtime monitoring and controls
  - Don’t rely on outages!

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Thanks!

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