

MONITORING CASSANDRA: DON'T MISS A THING!

Alain Rodriguez

THE {LAST} PICKLE

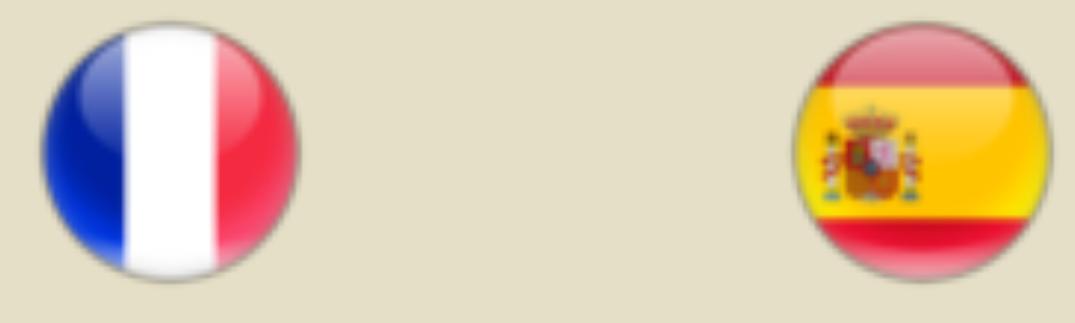
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Introduction

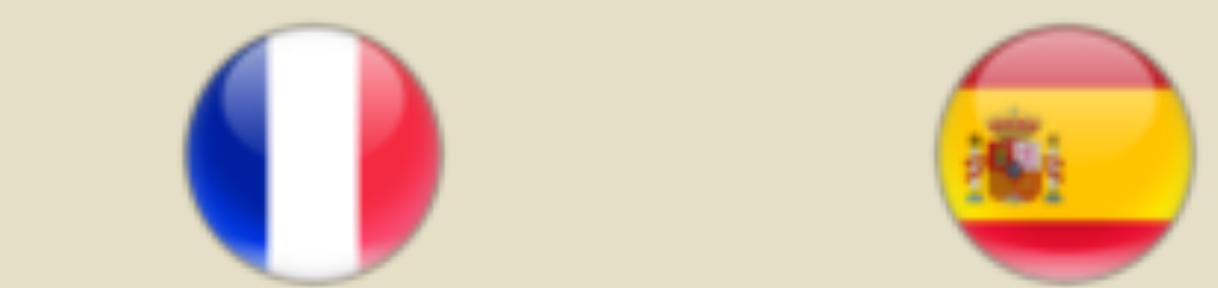
About The Last Pickle



About The Last Pickle and Alain Rodriguez



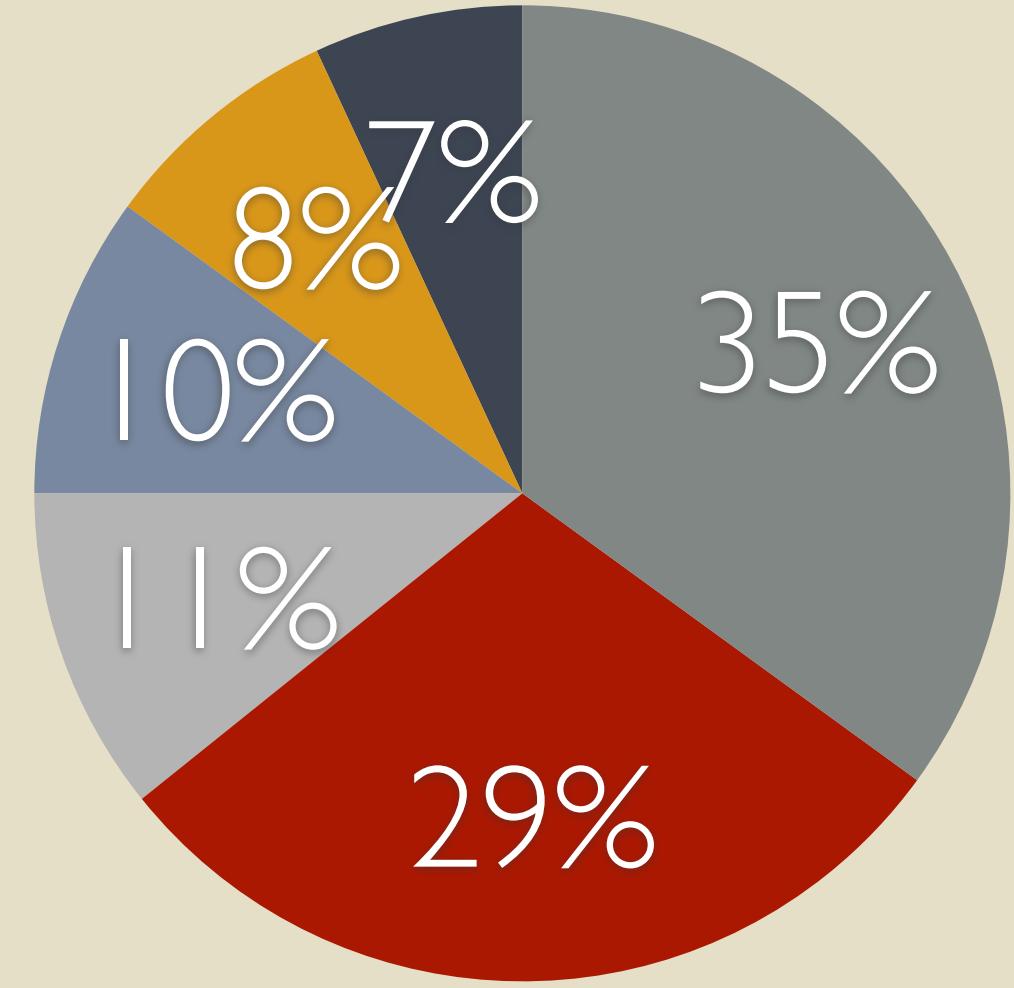
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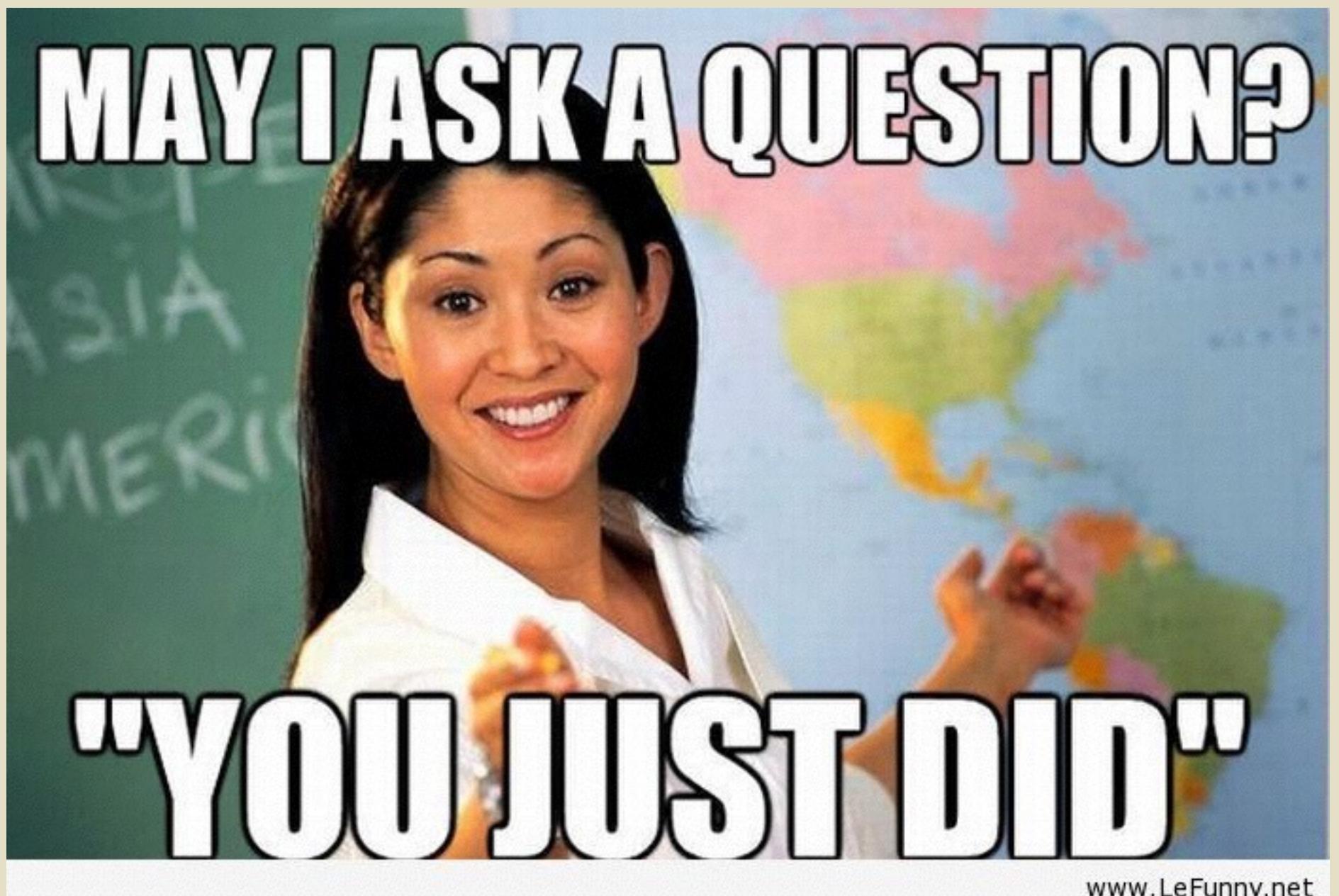




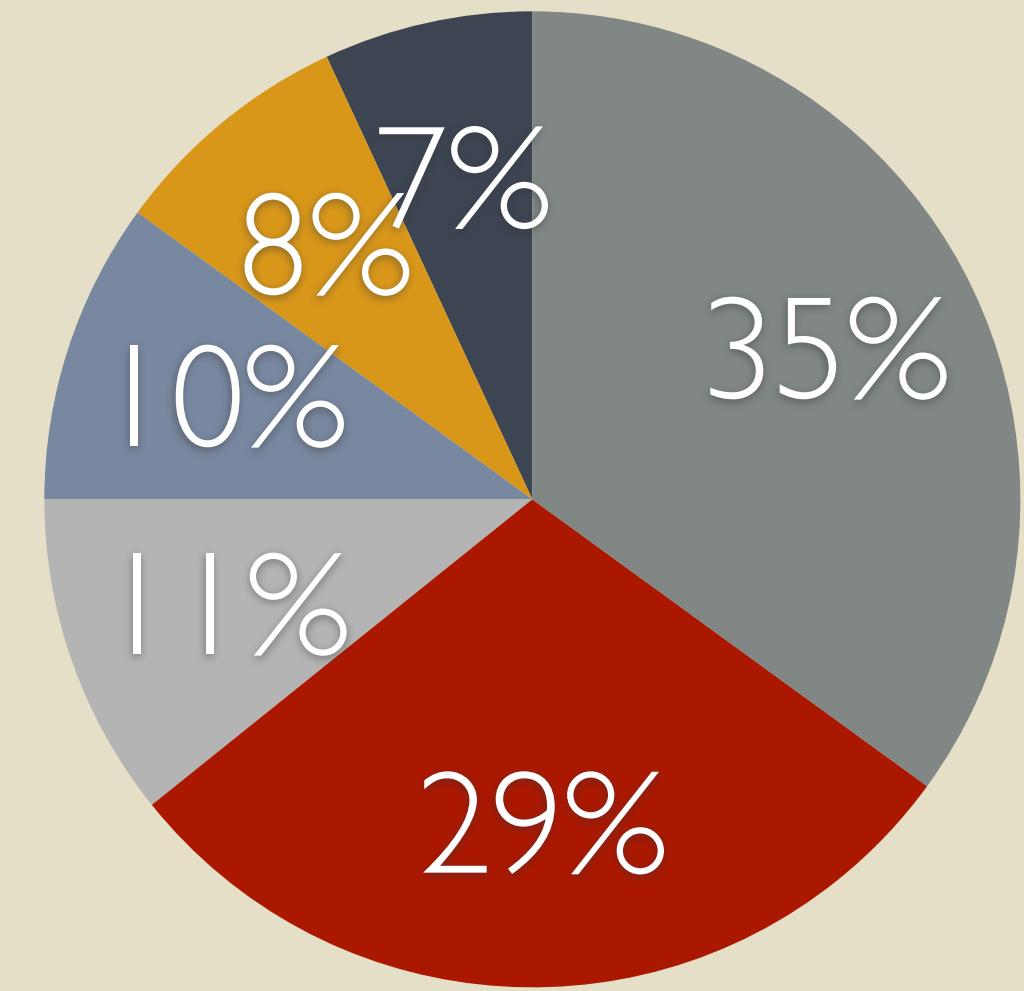
Poll time !



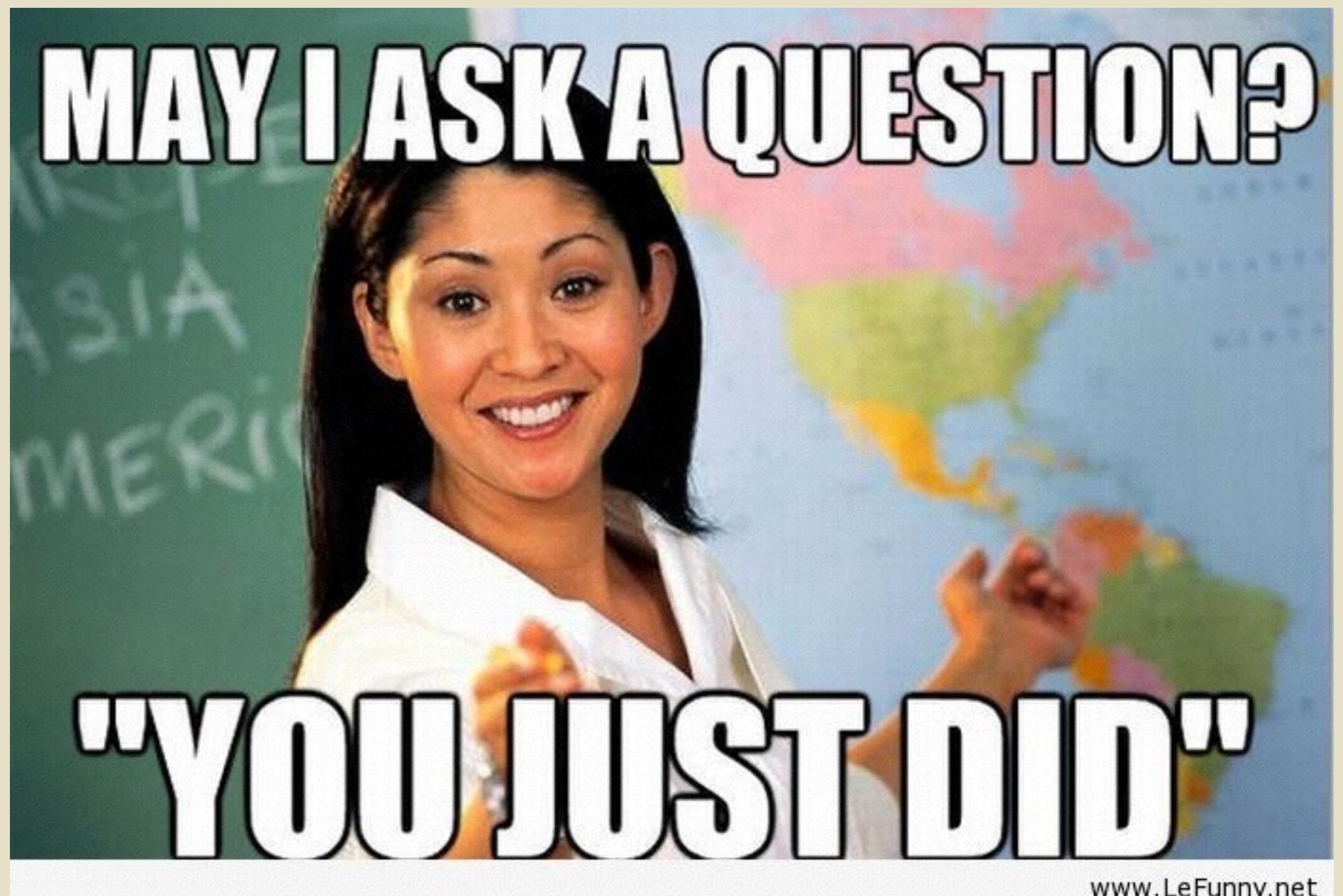
- How many of you are Cassandra users?



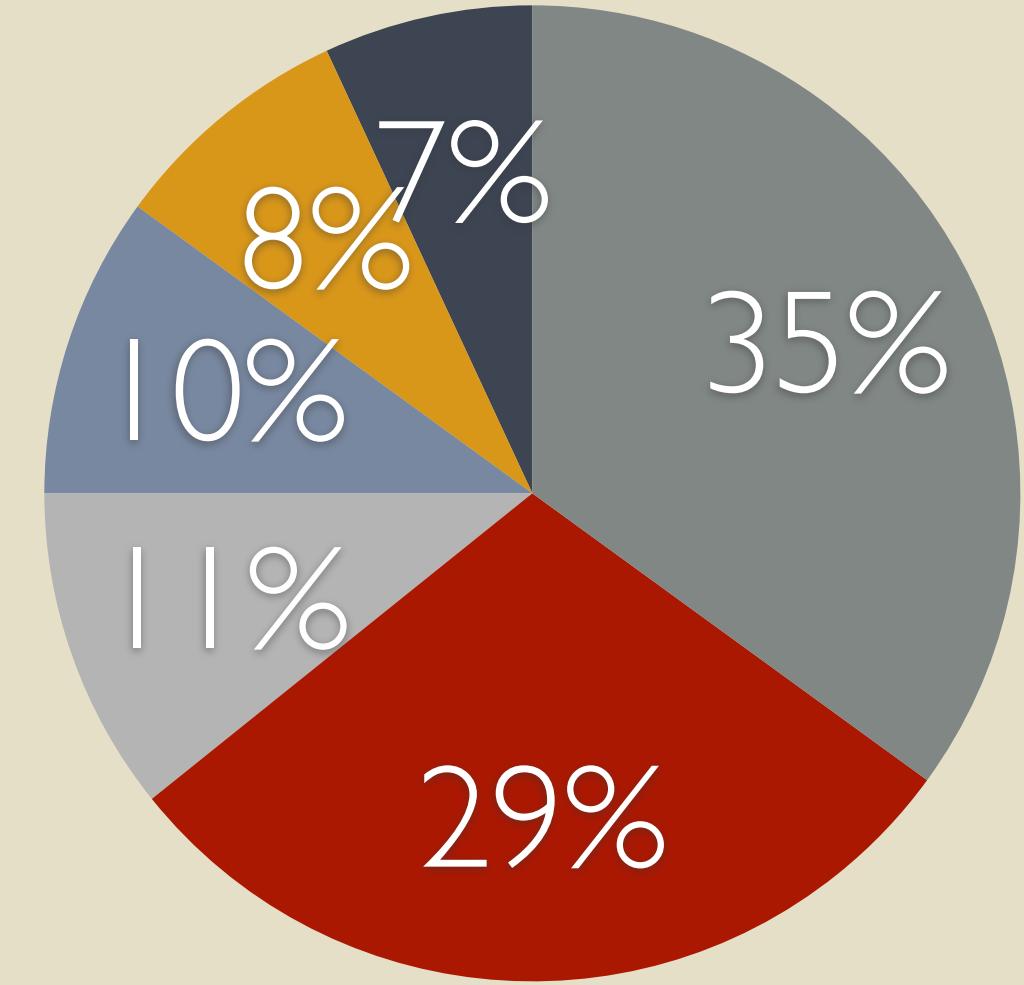
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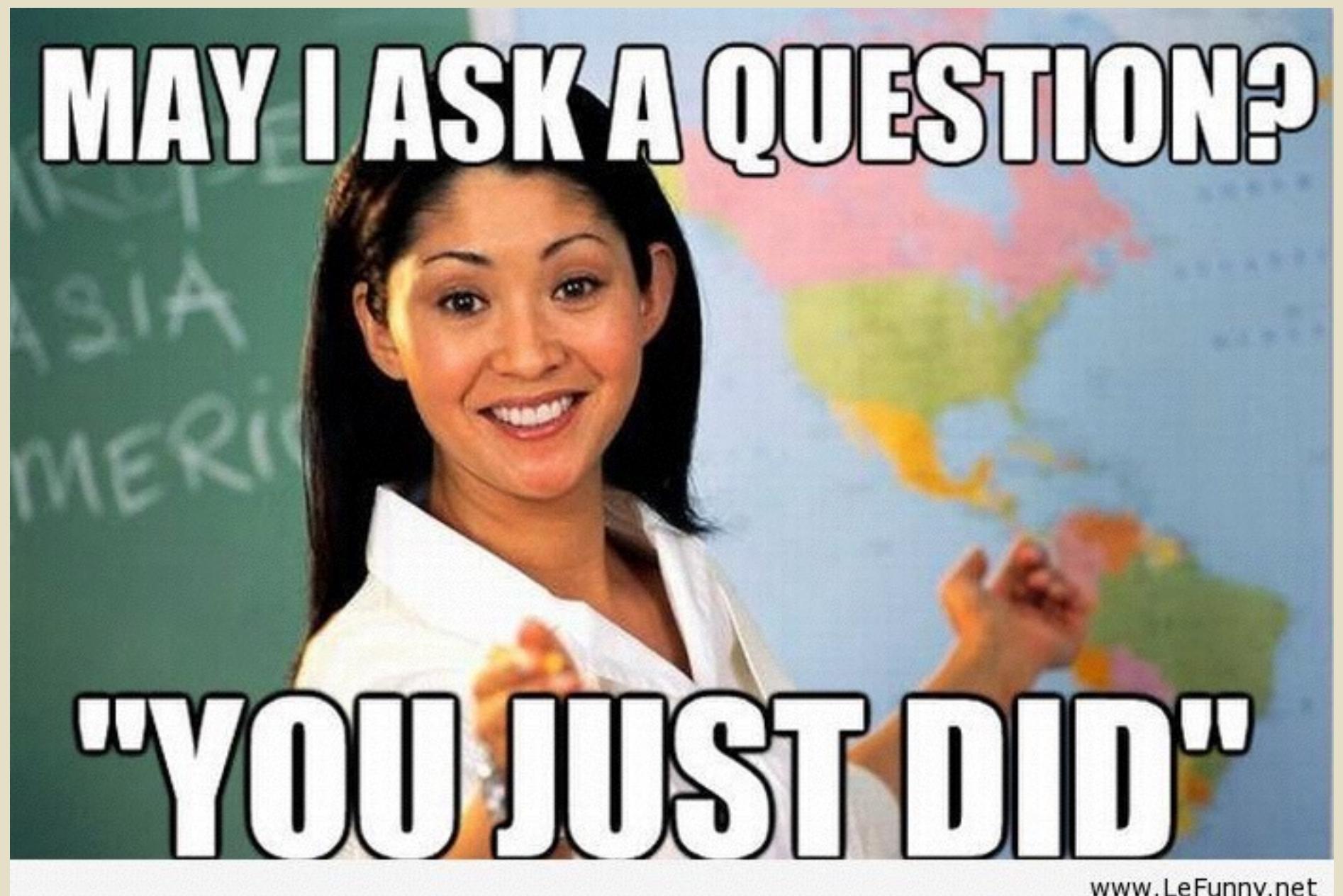
- How many of you are Cassandra users?
- ... are not using any monitoring tool?



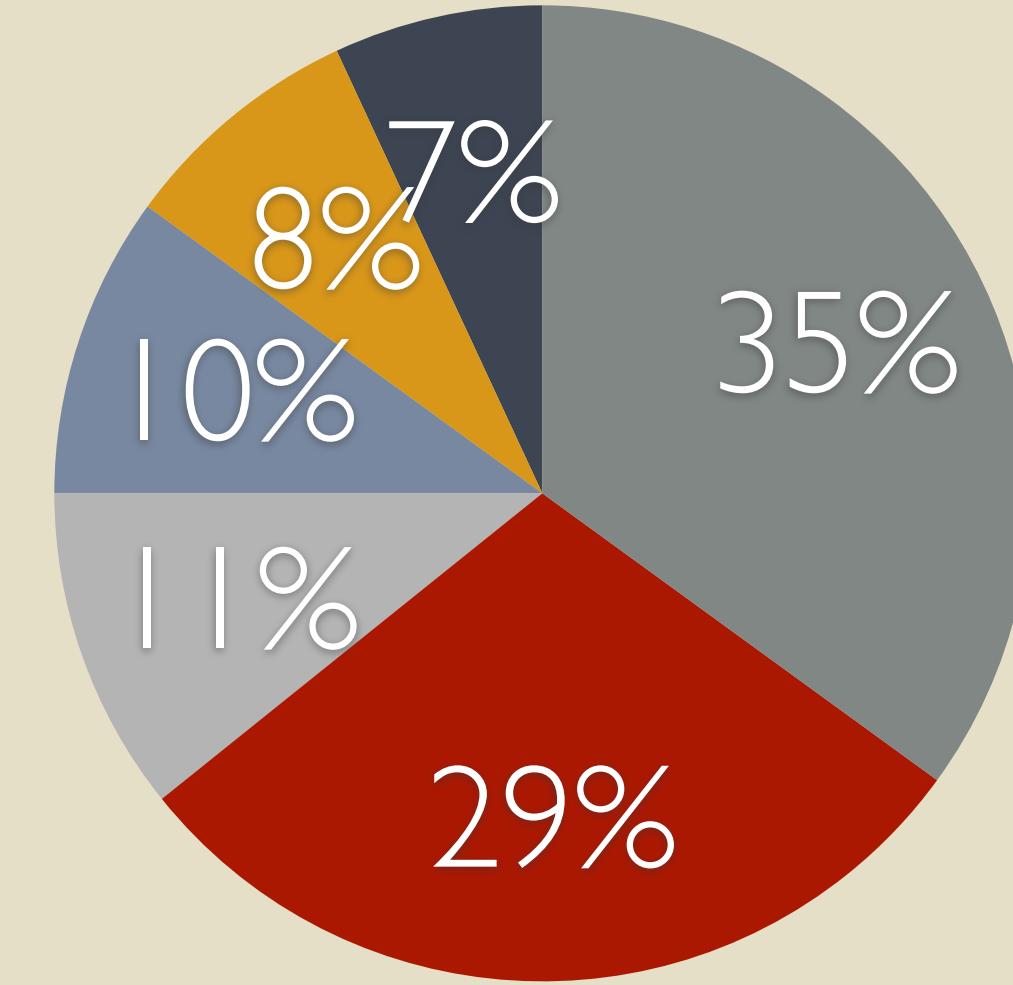
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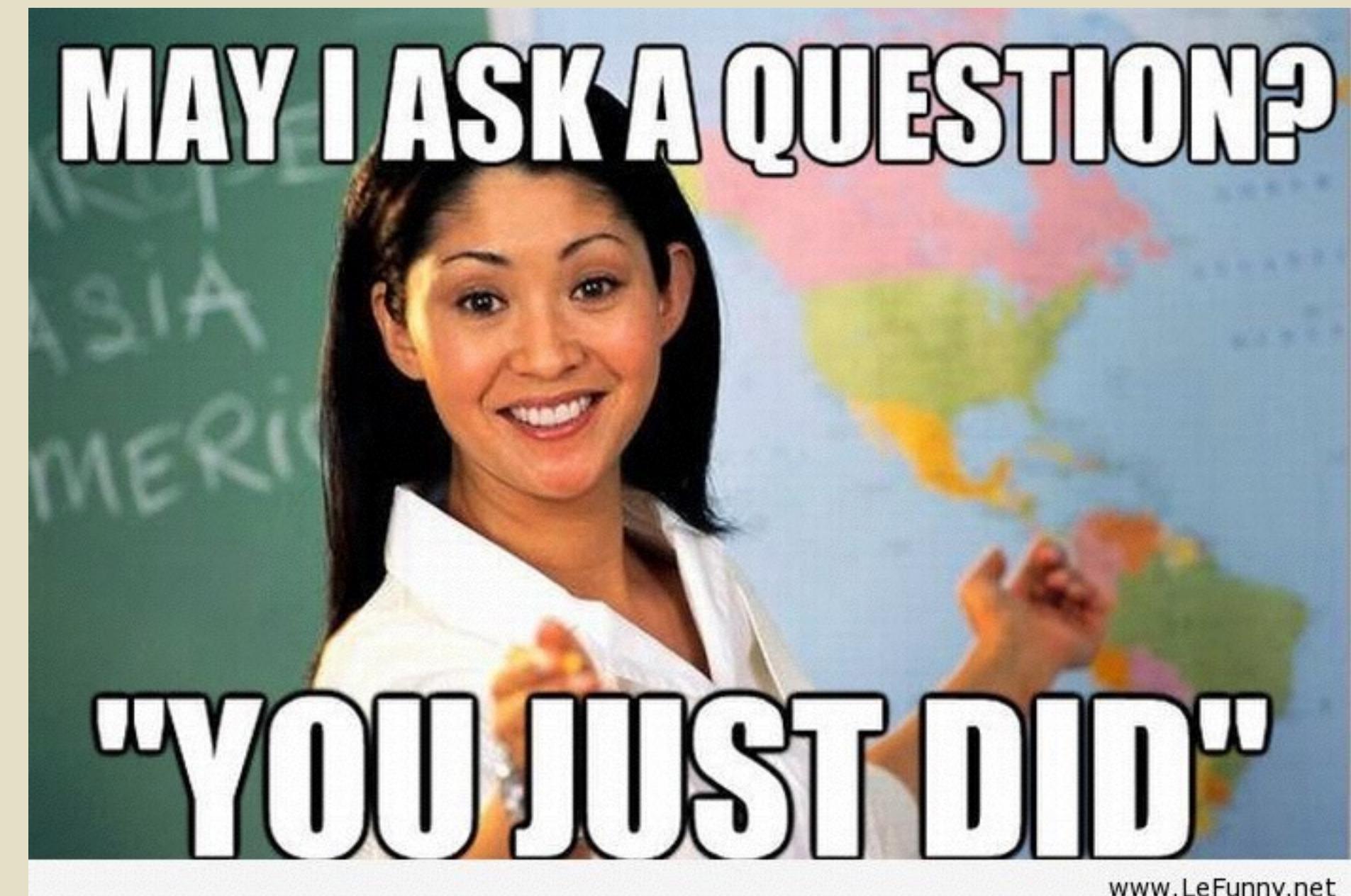
- How many of you are Cassandra users?
- ... are not using any monitoring tool?
- ... are using nodetool and logs at least?



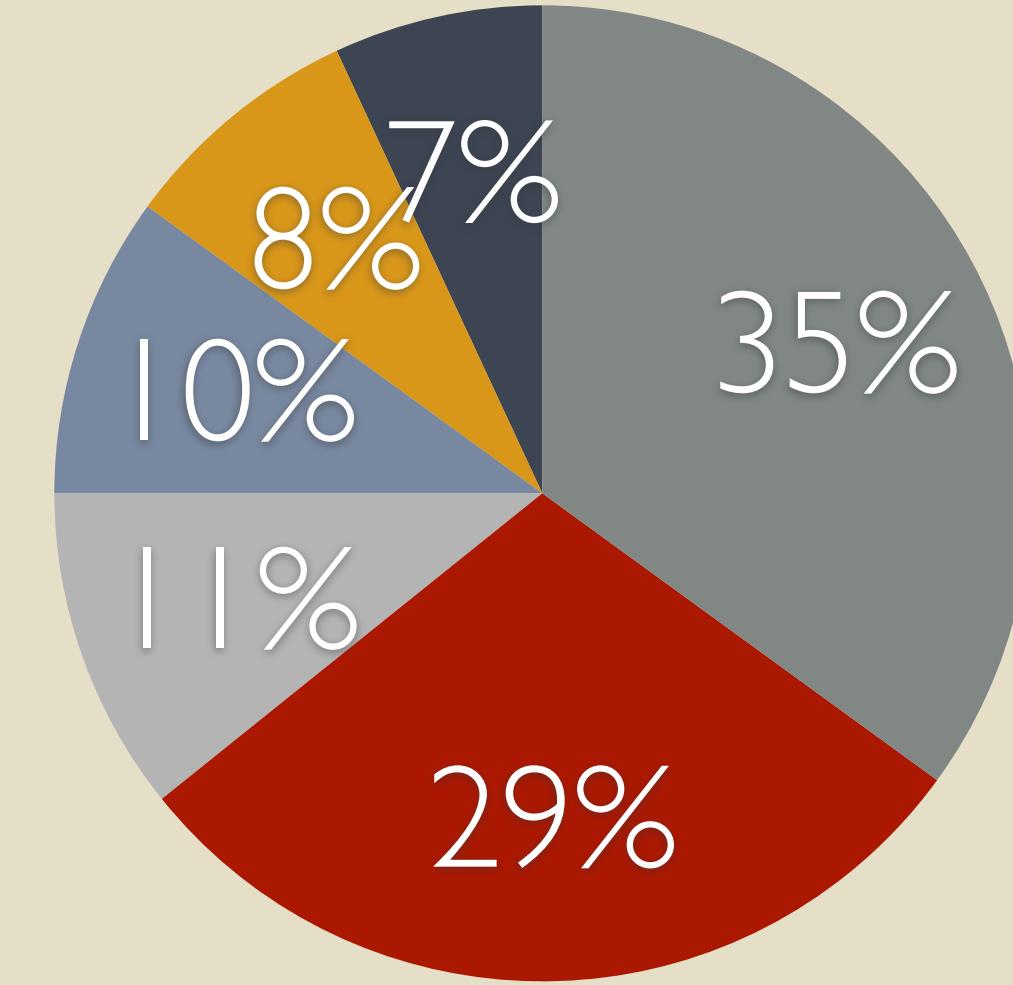
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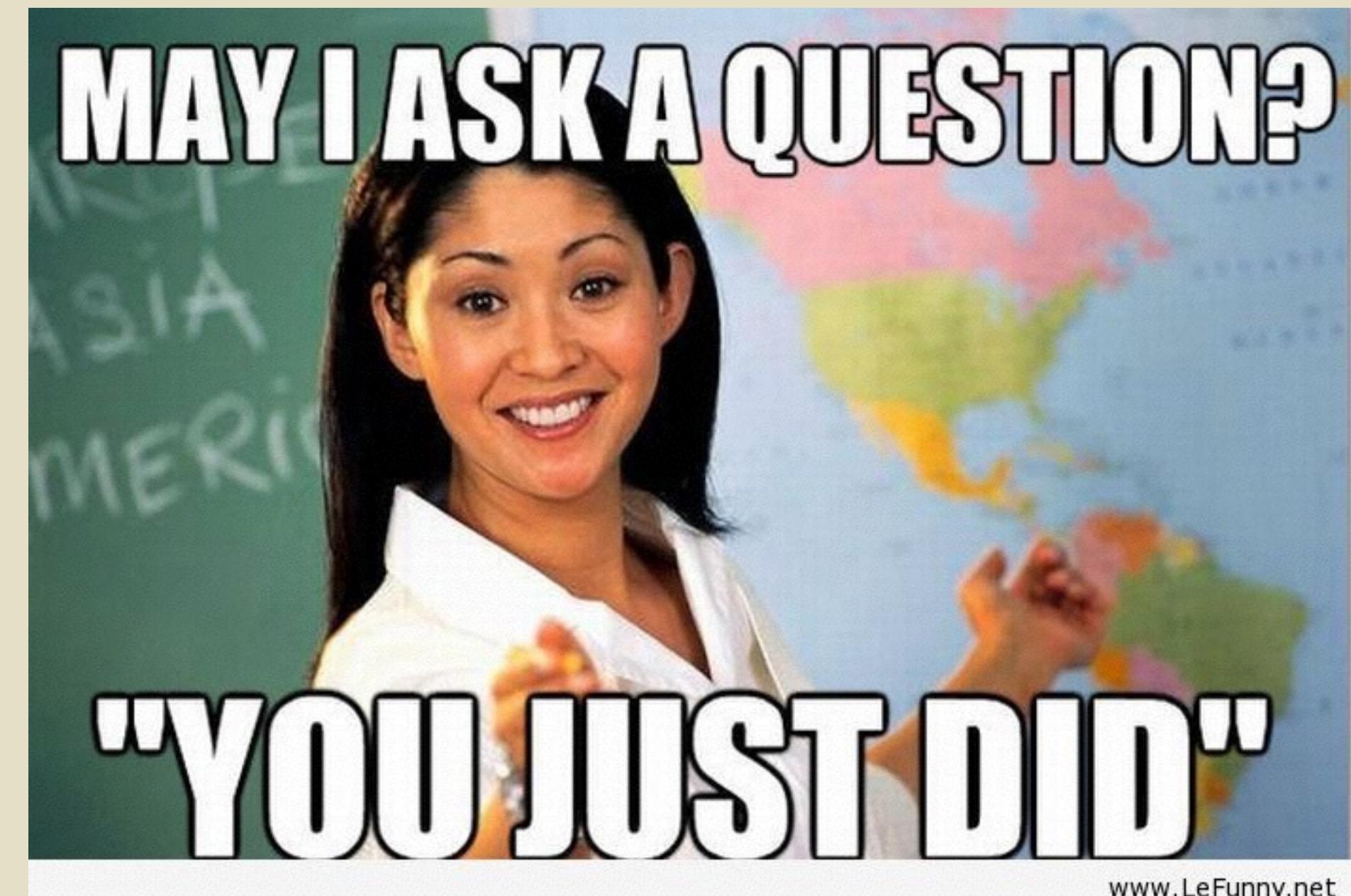
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- ... plugged a tool to build dashboards from Cassandra metrics?



Poll time !



- How many of you are Cassandra users?
- ... are not using any monitoring tool?
- ... are using nodetool and logs at least?
- ... plugged a tool to build dashboards from Cassandra metrics?
- ... are really happy with the set of dashboard you built?



CTO's call...

CTO:

“Hi Alain, WTF is happening with Cassandra?”

Many possible outcomes to this discussion...



**KEEP
CALM
AND LET THE
CTO
HANDLE IT**

CTO's call...

Without monitoring

Me: “What are you talking about? Anyway, ask the Devs about it!”



CTO's call...

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CTO's call...

Without monitoring - But I know context and am a bash expert !

Me: "It is probably due to incremental repairs switch, let me check"

Check = Look at the 42 nodes (or more...?)

Me: "I call you back, let me dig this"

Input to terminal: (Ctrl-A to enter control mode)

CTO's call...

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CTO's call...

With monitoring

Me: “I had a look. Latency went up to the roof,
let’s investigate this”

Minutes later...

“I investigated this and a client query should be rewritten”



CTO: call...

CTO:

"Hi Alain, WTF is happening with Cassandra..."

Many possible outcomes to this question...



KEEP
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CTO's call...

With good alerting - no call from CTO !

Me: “CTO FYI, it looks like latency went up to the roof. We can fix it by doing X”.

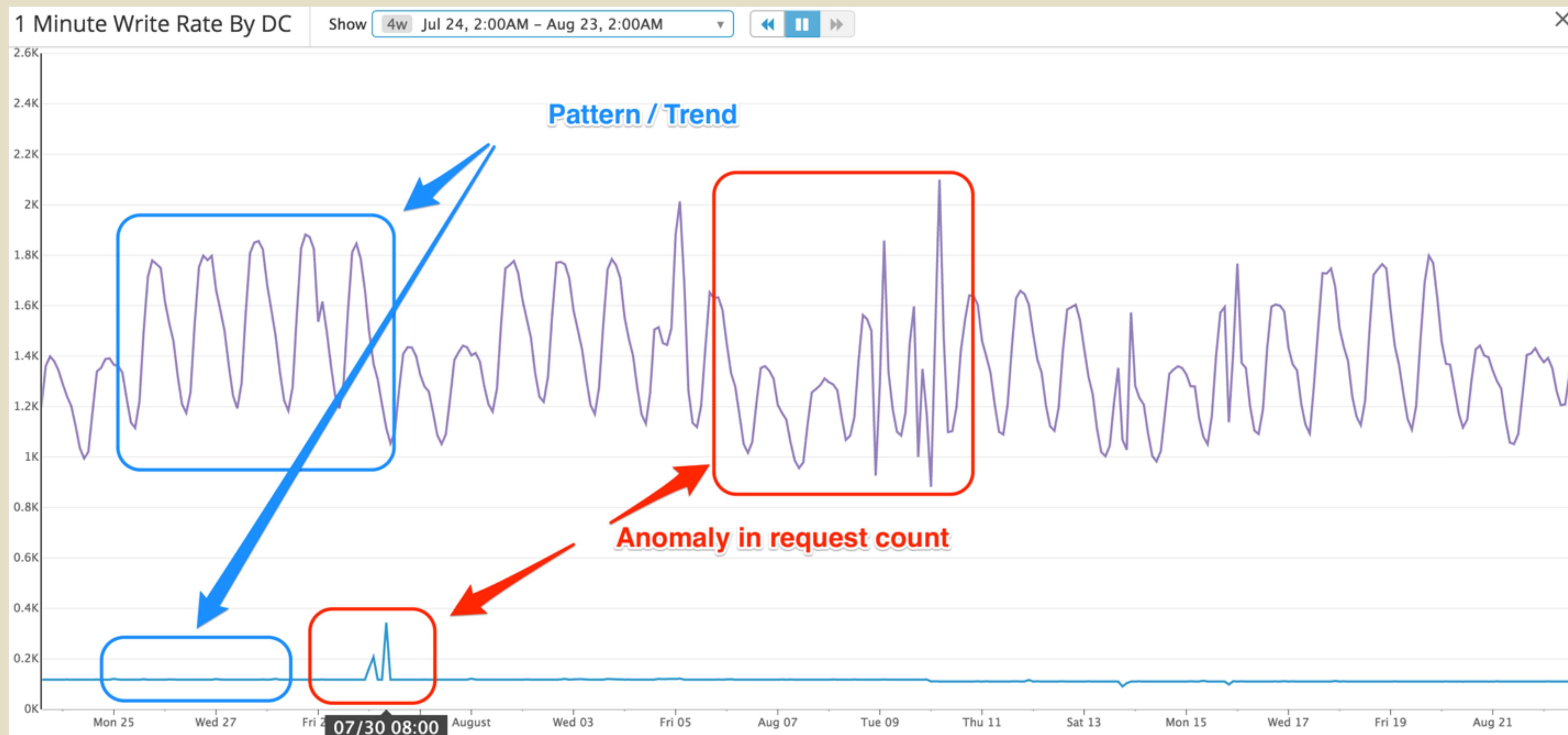


CTO: “Hi Alain, we didn’t even noticed latencies, good catch, let’s fix it!”

Why and what to monitor?

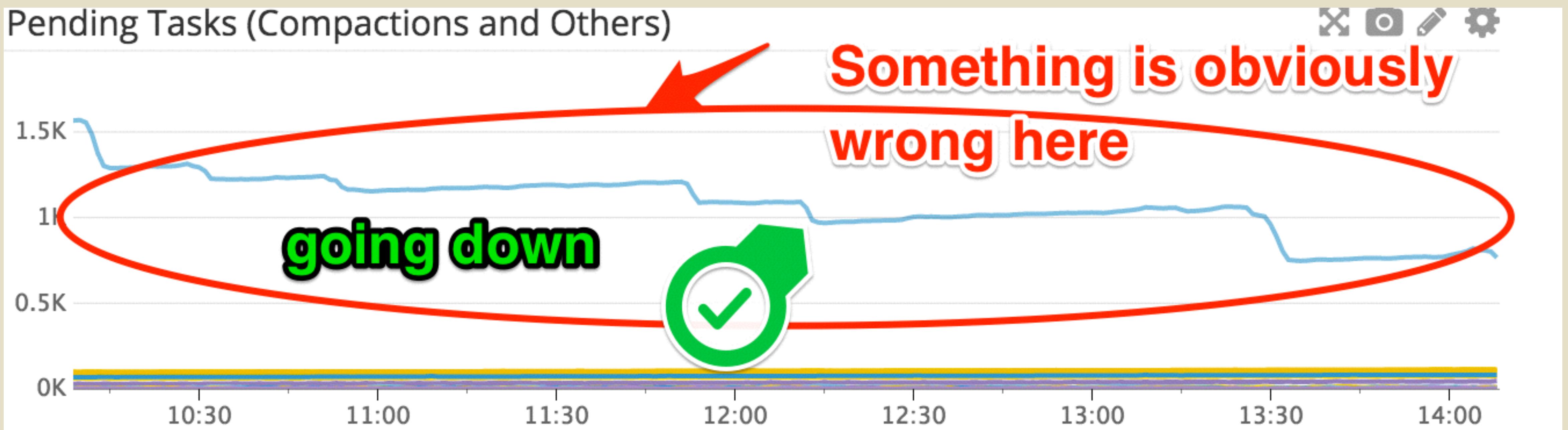
Why to monitor

1 - Understand patterns & Detect Anomalies



Why to monitor

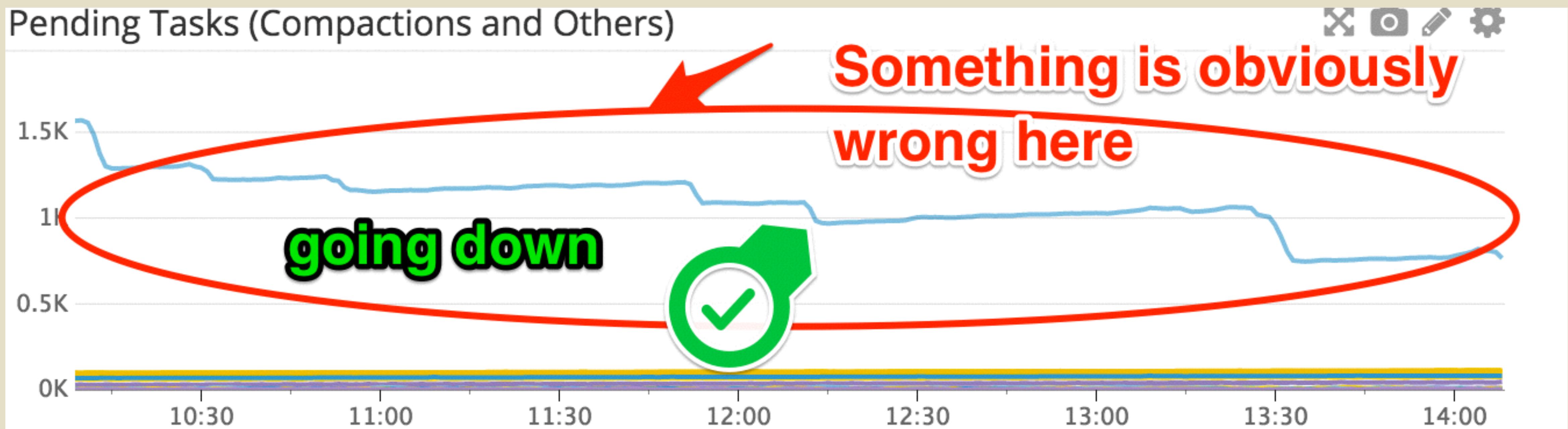
2 - Troubleshoot & Fix issues



Why to monitor

2 - Troubleshoot & Fix issues

3 - Understand internals & Optimize



What to monitor: Detect Anomalies!

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- What is necessary and sufficient to detect any issue



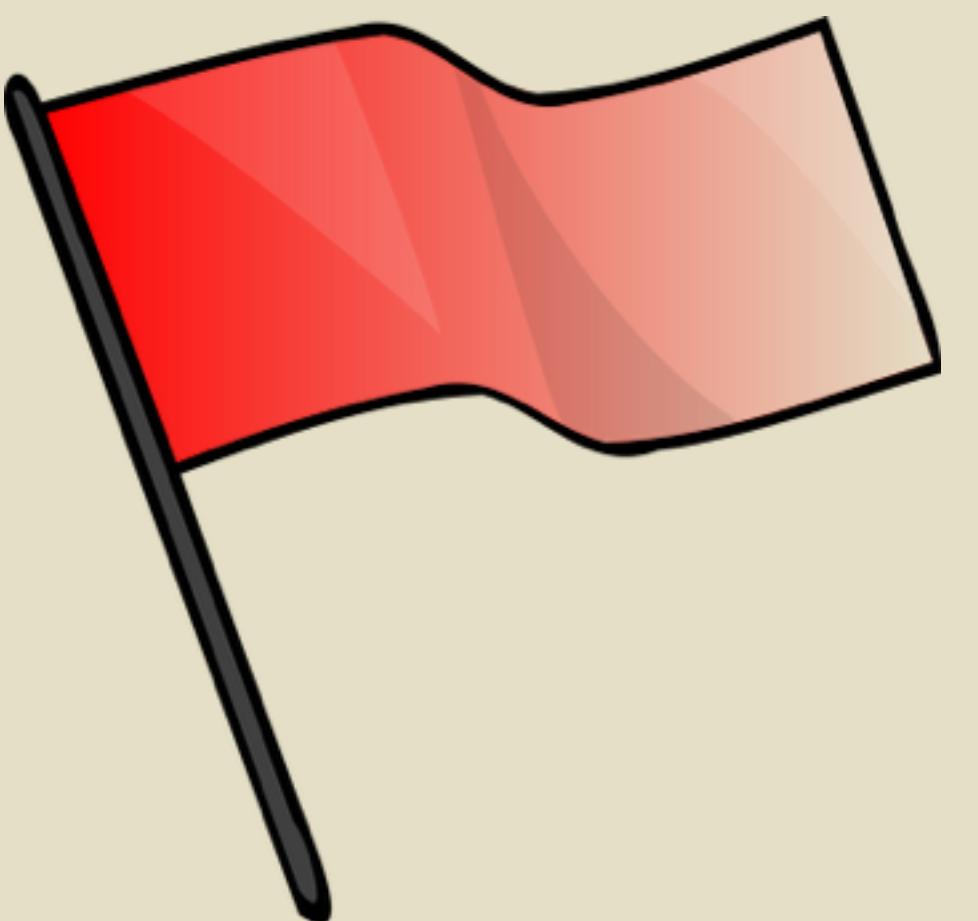
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- Think about **your** own KPI



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- Set alerts on this dashboard and / or keep an eye on it.

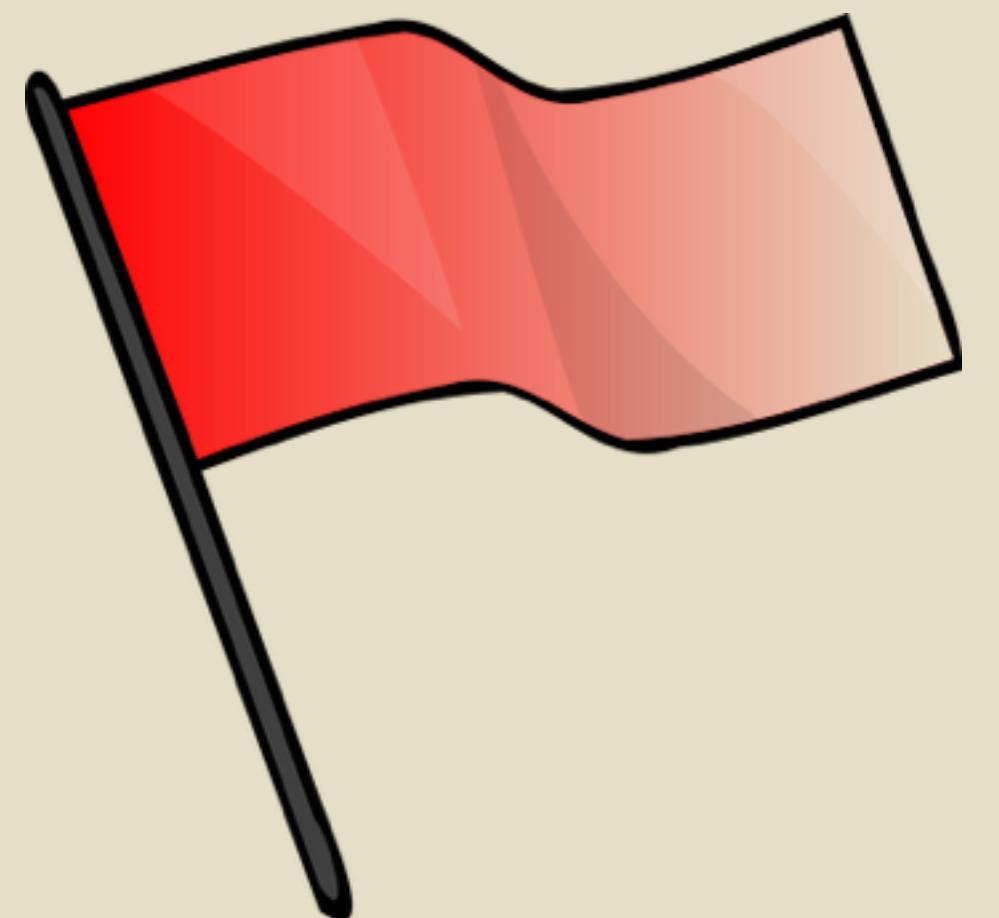


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Overview Dashboard

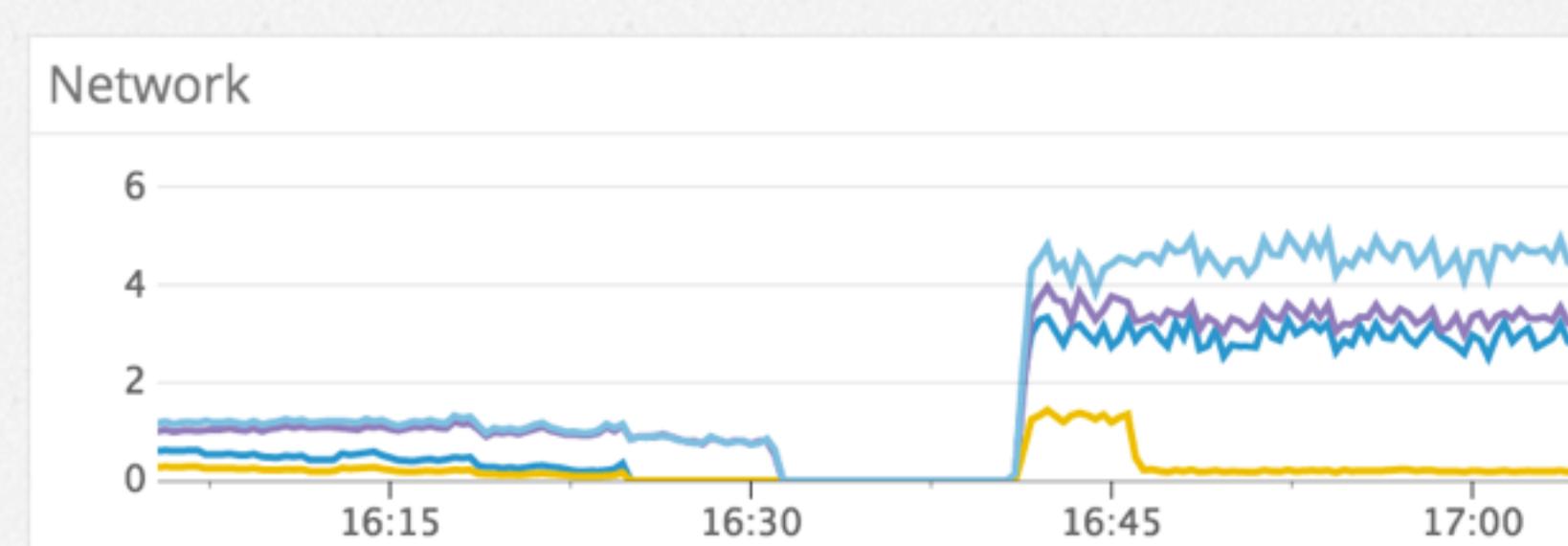
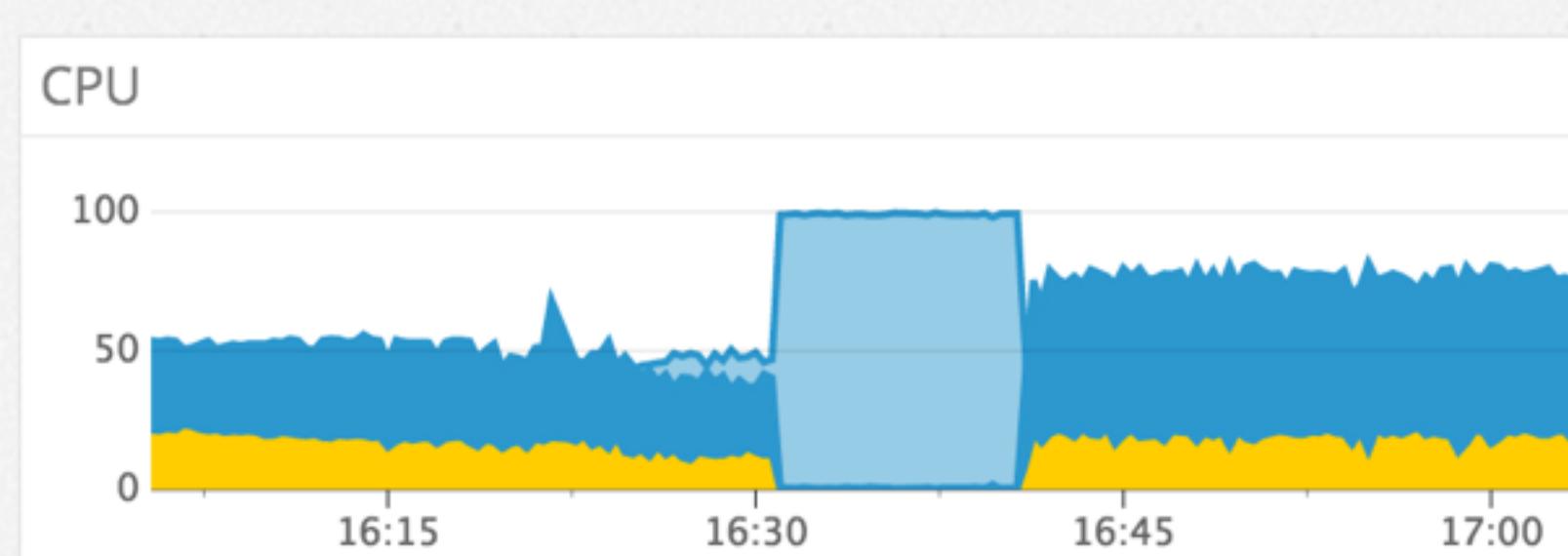
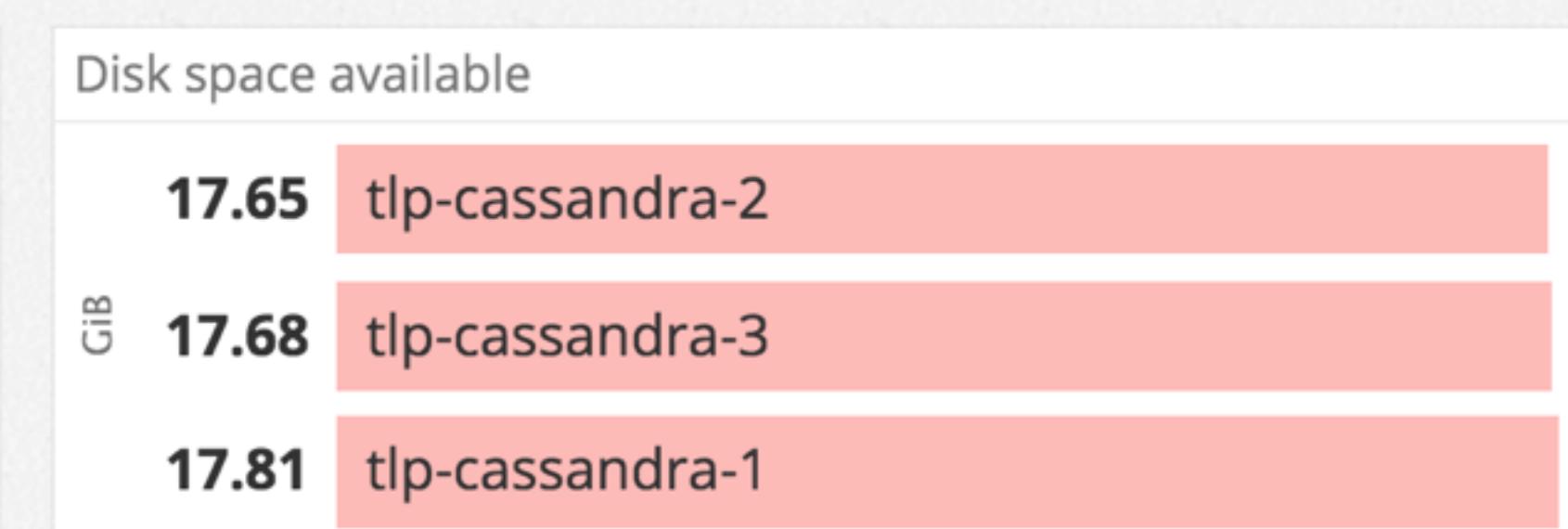
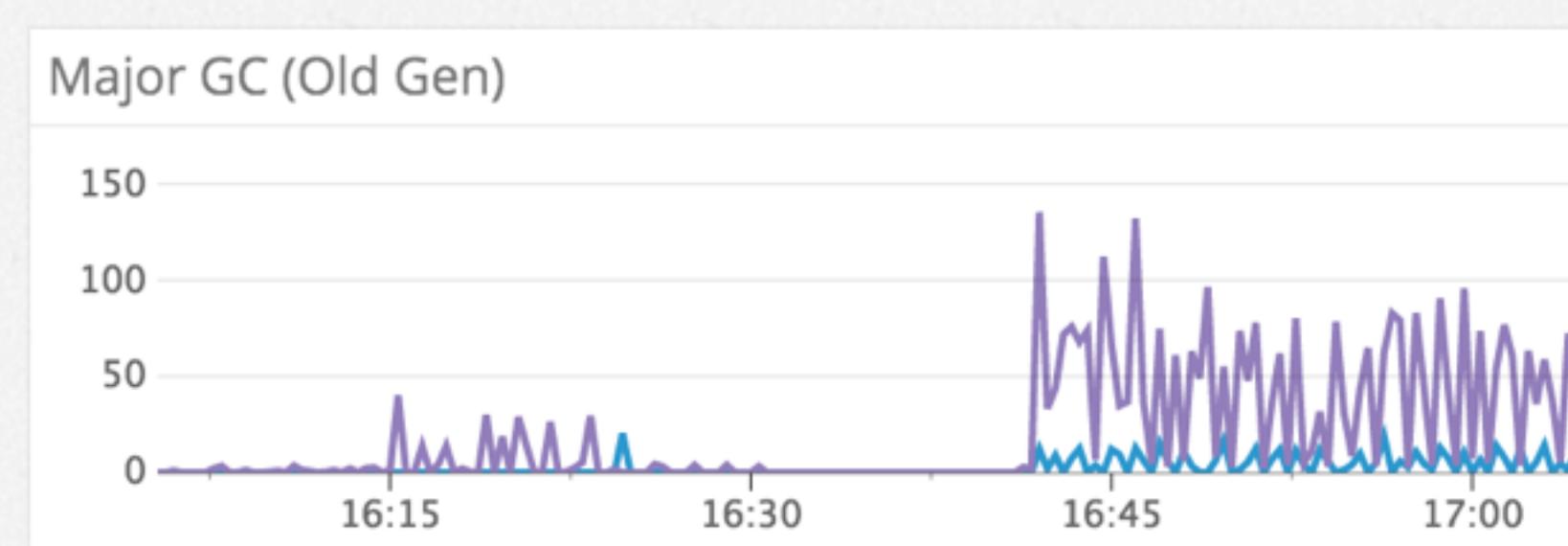
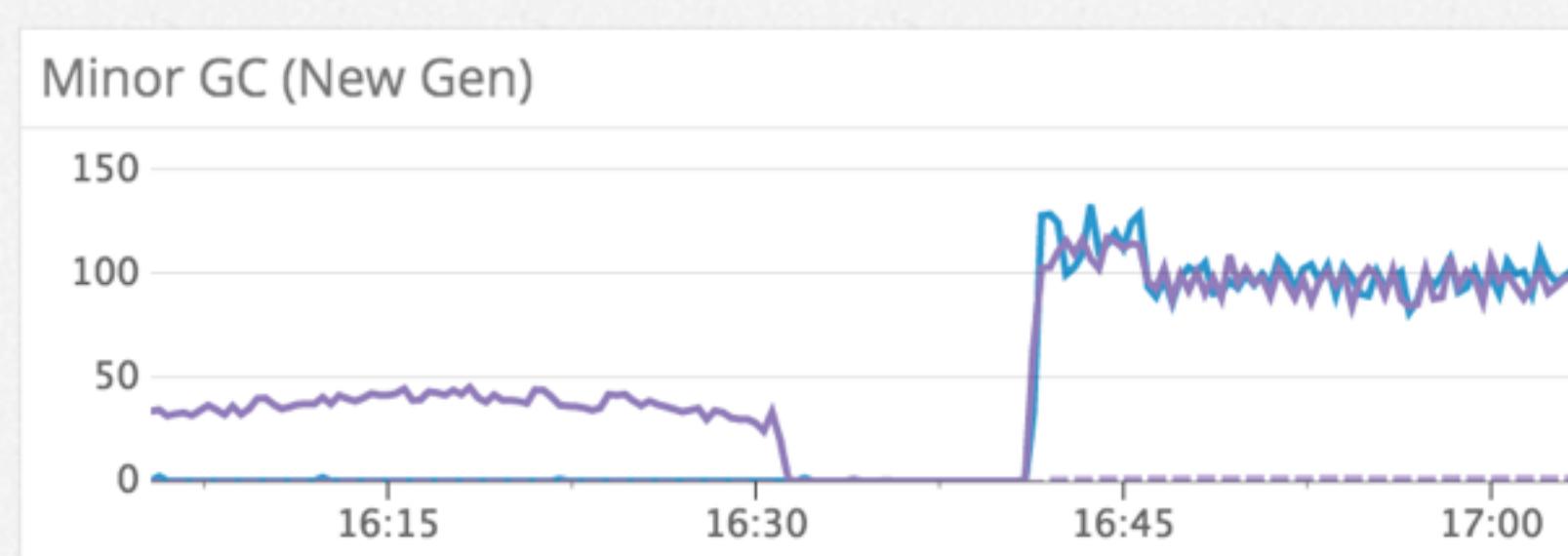
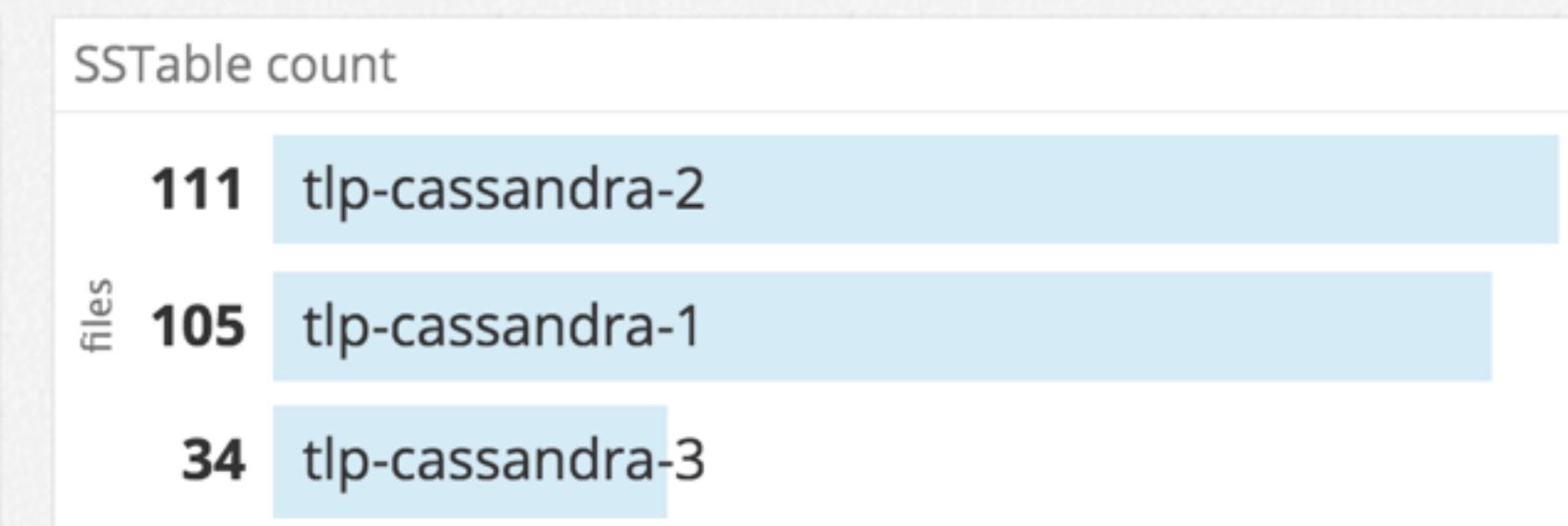
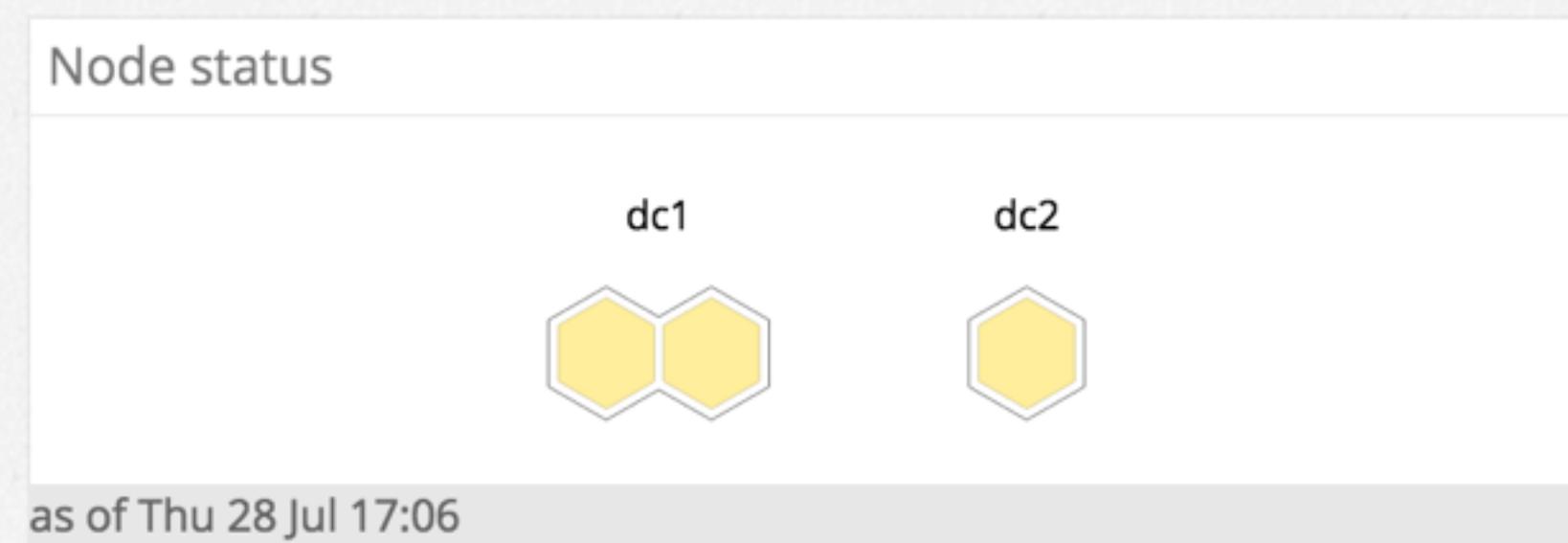
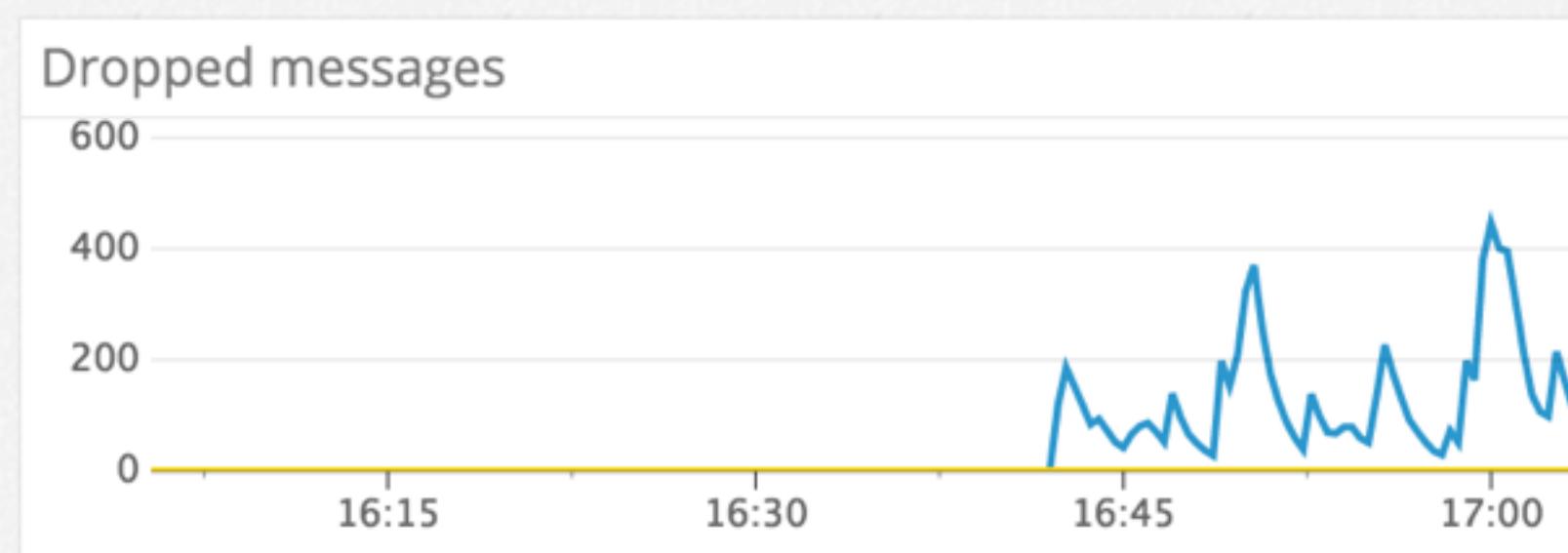
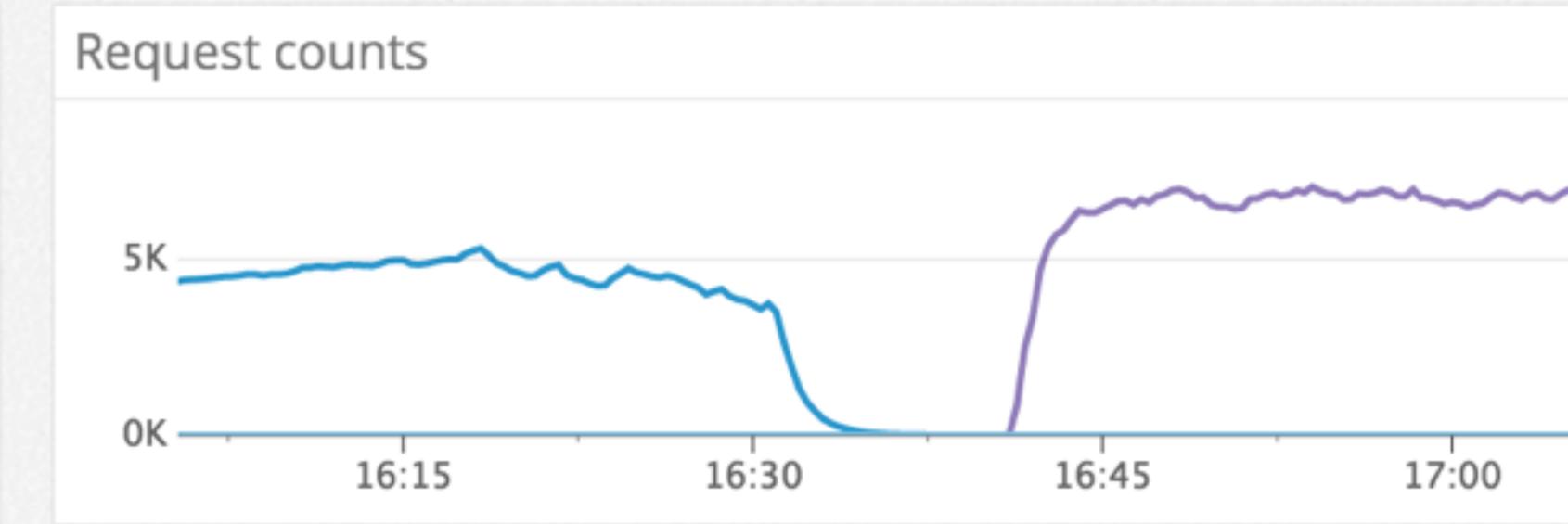
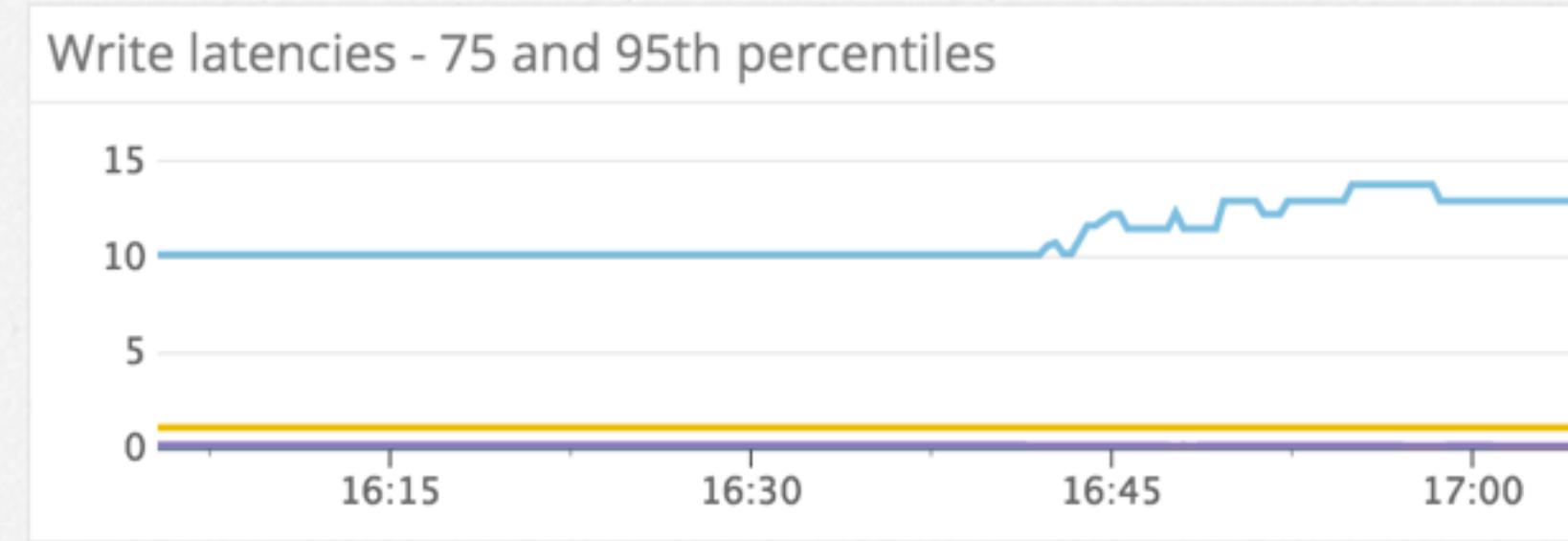
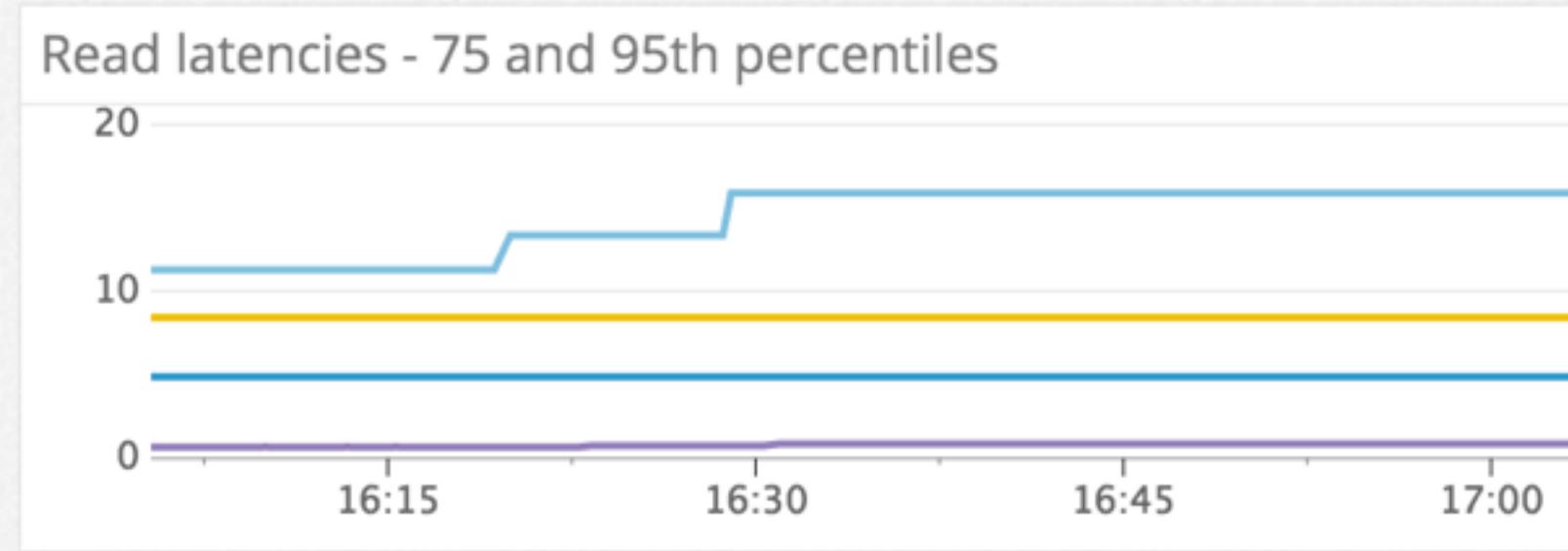


Search Events to overlay...



Show

60m Jul 28, 4:05PM – Jul 28, 5:05PM



What to monitor: Troubleshoot!

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- Maximise useful information



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- Themed dashboards (Read path, Client connections, ...)



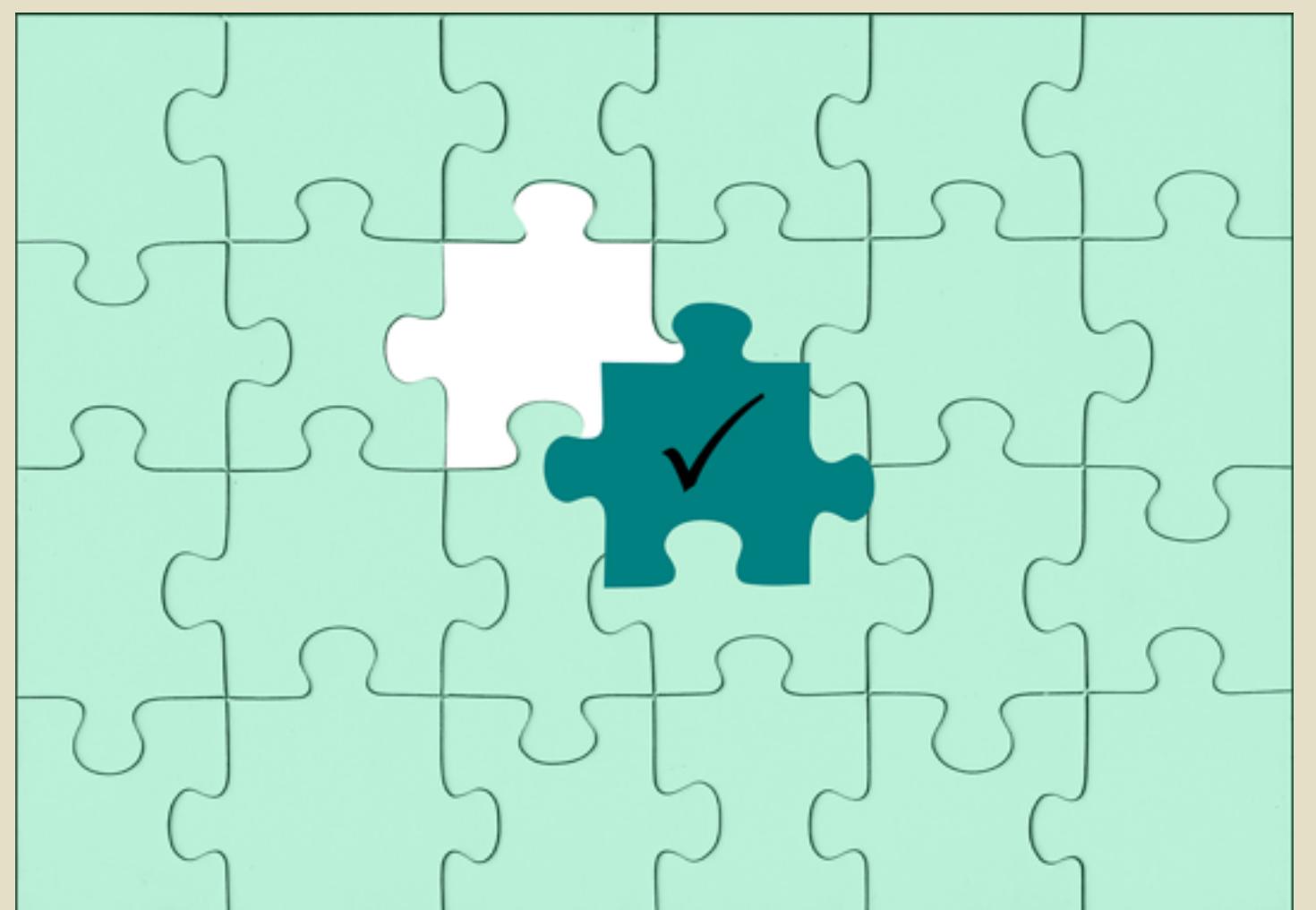
What to monitor: Troubleshoot!

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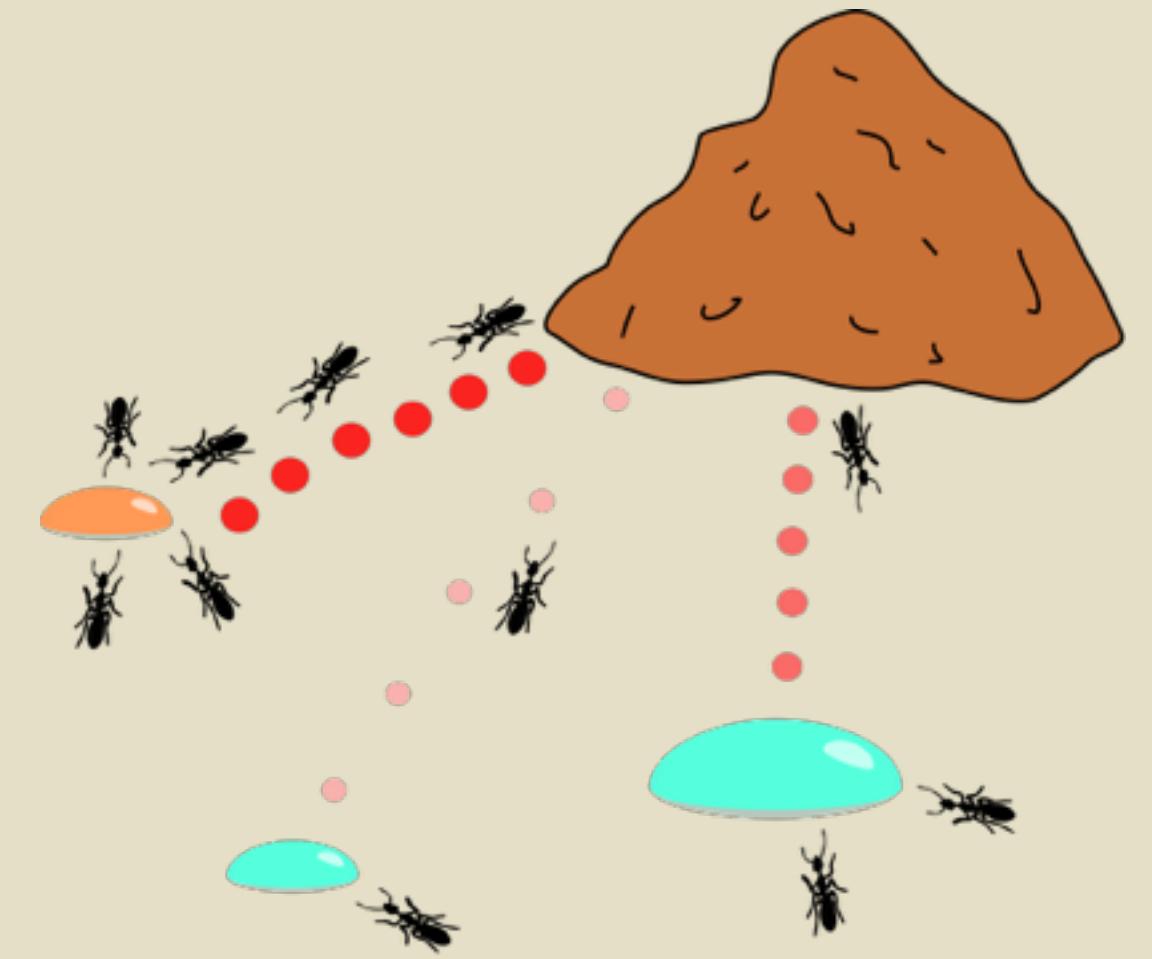


What to monitor: Troubleshoot!

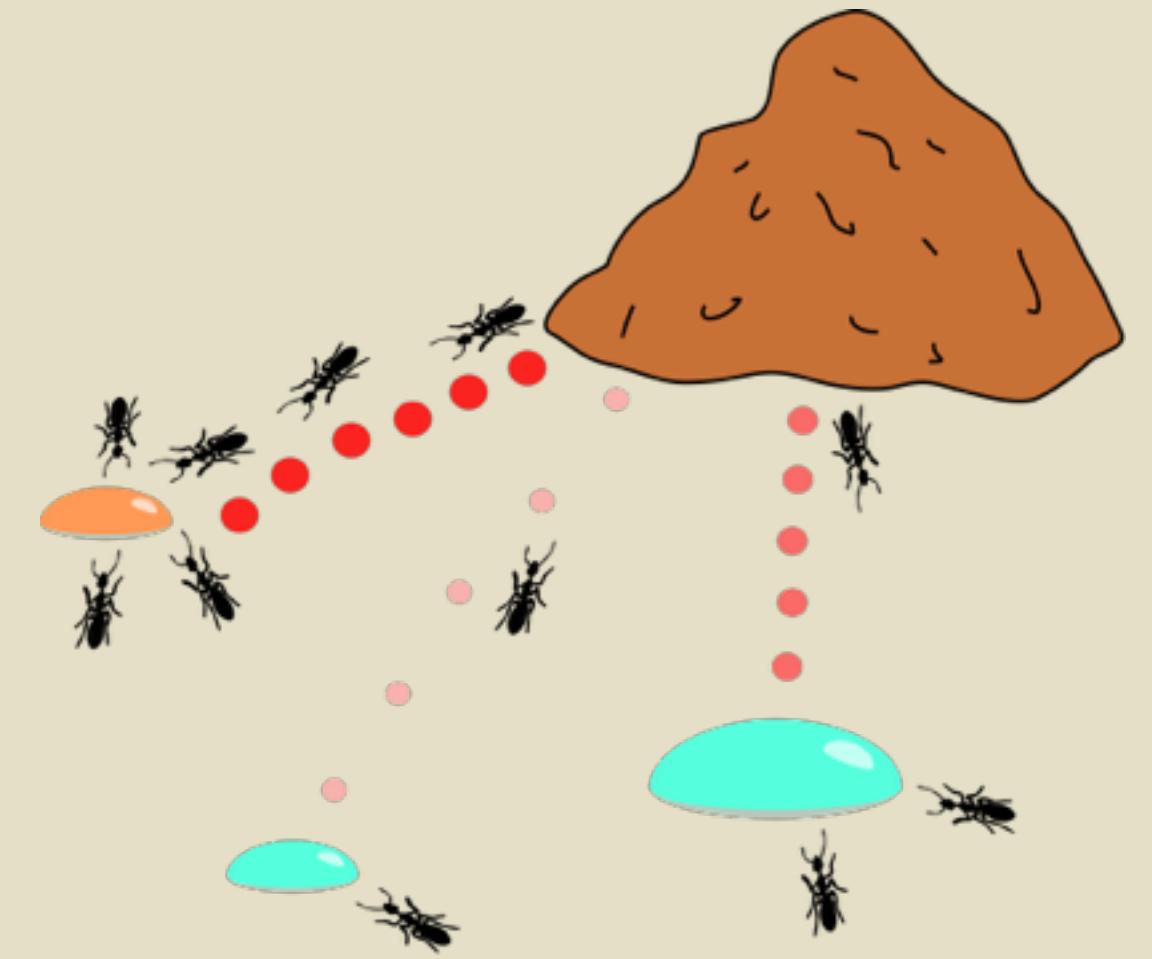
- Maximise useful information
- Themed dashboards (Read path, Client connections, ...)
- Reuse charts and metrics, when relevant
- Missing something? Add it!



What to monitor: Optimize!

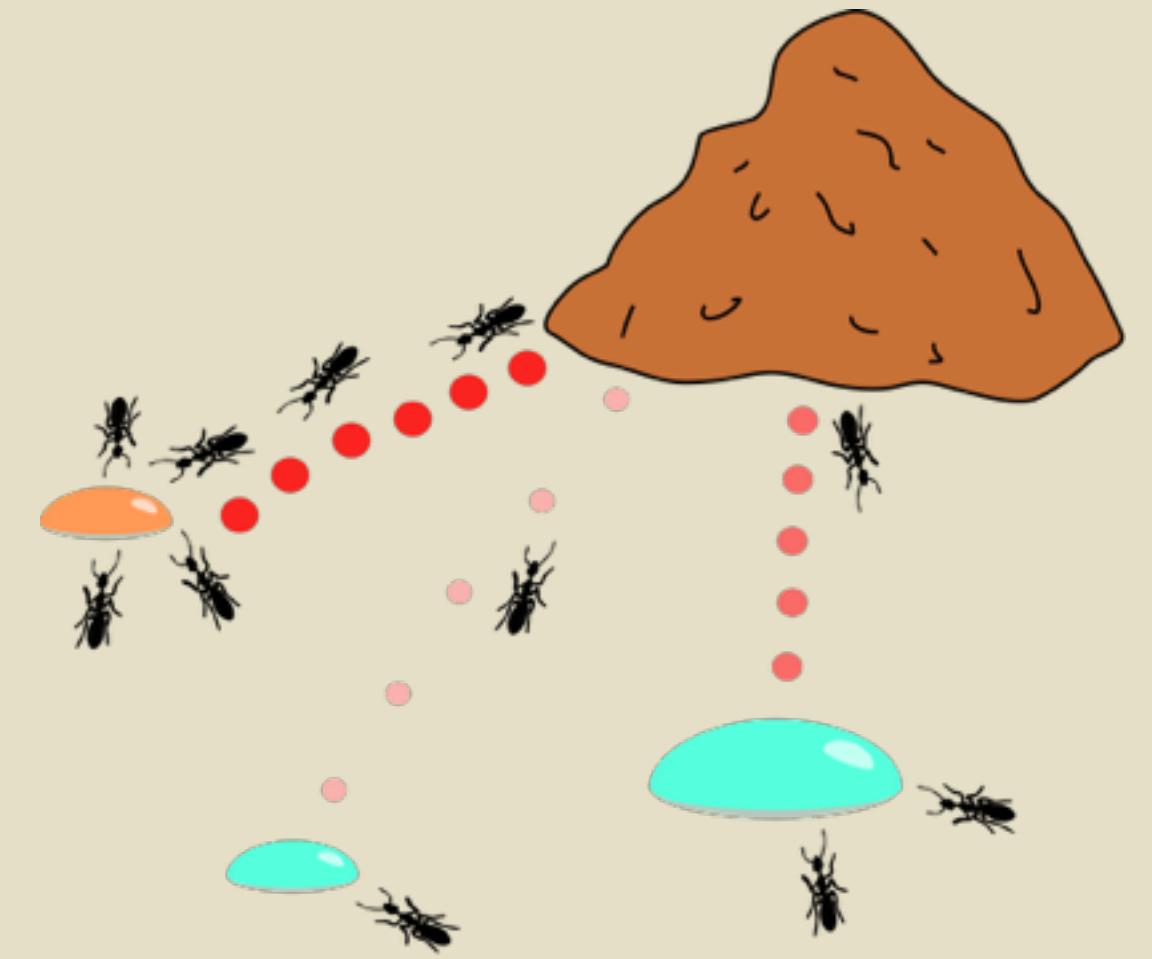


What to monitor: Optimize!



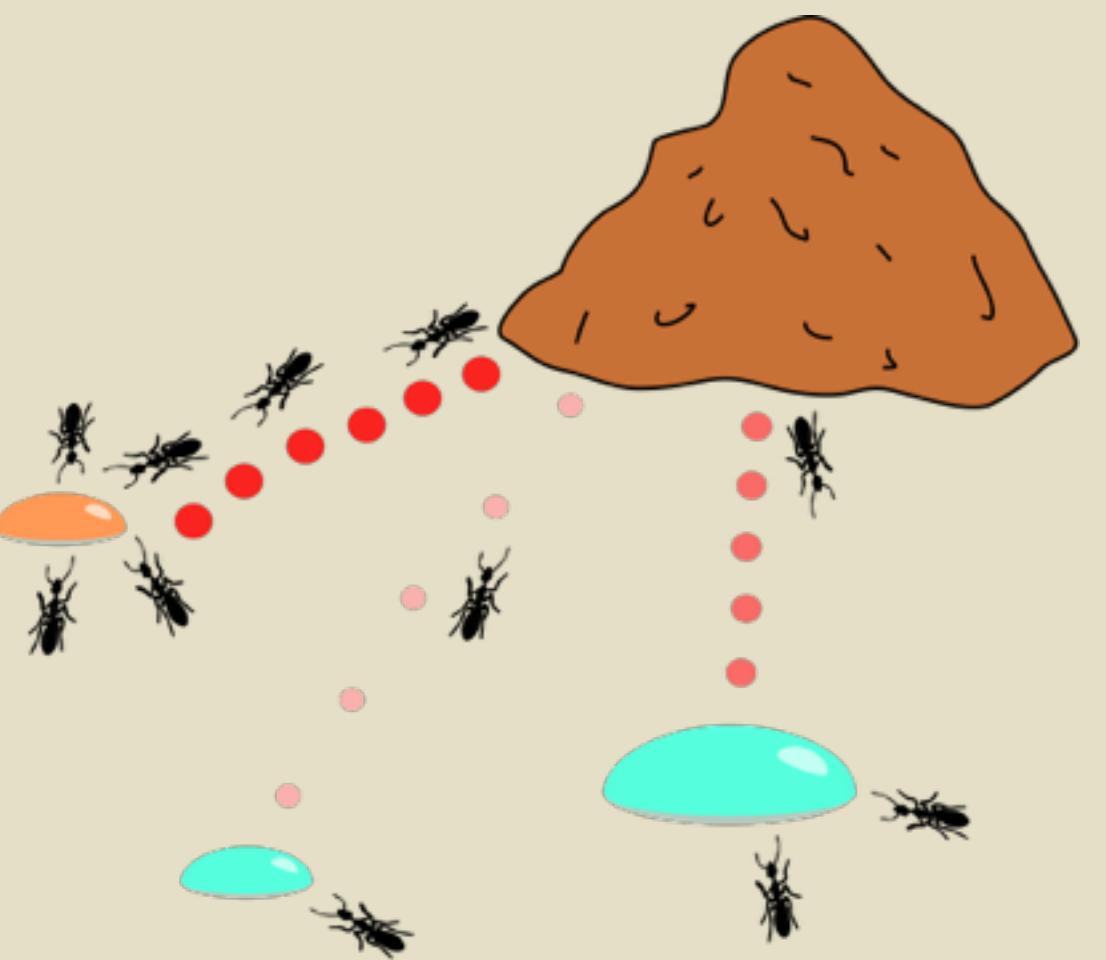
- Mostly using same dashboards than for troubleshooting

What to monitor: Optimize!

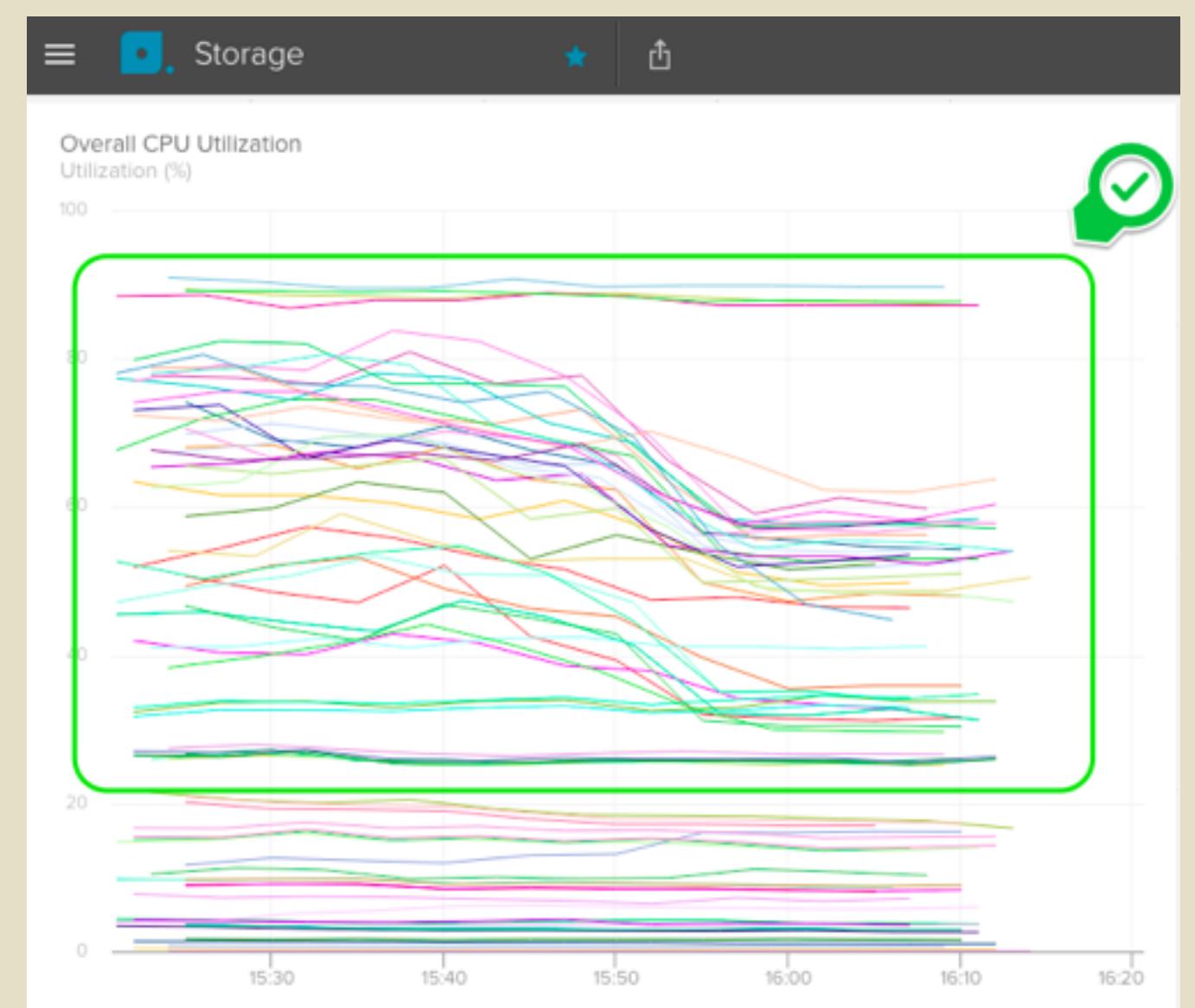


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- Having a good set of dashboards highlights bottlenecks

What to monitor: Optimize!



- Mostly using same dashboards than Troubleshooting
- Having a good set of dashboards highlights bottlenecks
- Check for impacts of recent tuning or operations



Monitoring limits

Monitoring limits: No relevant dashboard

- Tons of metrics available from the agent / reporter

Documentation: <http://cassandra.apache.org/doc/latest/operating/metrics.html>
(Thanks to Jake Luciani - @tjake)

Monitoring

Metrics in Cassandra are managed using the [Dropwizard Metrics](#) library. These metrics can be queried via JMX or pushed to external monitoring systems using a number of [built in](#) and [third party](#) reporter plugins.

Metrics are collected for a single node. It's up to the operator to use an external monitoring system to aggregate them.

Metric Types

All metrics reported by cassandra fit into one of the following types.

Gauge

An instantaneous measurement of a value.

Counter

A gauge for an [AtomicLong](#) instance. Typically this is consumed by monitoring the change since the last call to see if there is a large increase compared to the norm.

Histogram

Measures the statistical distribution of values in a stream of data.

In addition to minimum, maximum, mean, etc., it also measures median, 75th, 90th, 95th, 98th, 99th, and 99.9th percentiles.

Timer

Measures both the rate that a particular piece of code is called and the histogram of its duration.

Latency

Special type that tracks latency (in microseconds) with a [Timer](#) plus a [Counter](#) that tracks the total latency accrued since starting. The former is useful if you track the change in total latency since the last check. Each metric name of this type will have 'Latency' and 'TotalLatency' appended to it.

Meter

A meter metric which measures mean throughput and one-, five-, and fifteen-minute exponentially-weighted moving average throughputs.

Name	Type	Description
MemtableOnHeapSize	Gauge<Long>	Total amount of data stored in the memtable that resides on-heap , including column related overhead and partitions overwritten.
MemtableOffHeapSize	Gauge<Long>	Total amount of data stored in the memtable that resides off-heap , including column related overhead and partitions overwritten.
MemtableLiveDataSize	Gauge<Long>	Total amount of live data stored in the memtable, excluding any data structure overhead.
AllMemtablesOnHeapSize	Gauge<Long>	Total amount of data stored in the memtables (2i and pending flush memtables included) that resides on-heap .
AllMemtablesOffHeapSize	Gauge<Long>	Total amount of data stored in the memtables (2i and pending flush memtables included) that resides off-heap .
AllMemtablesLiveDataSize	Gauge<Long>	Total amount of live data stored in the memtables (2i and pending flush memtables included) that resides off-heap , excluding any data structure overhead.
MemtableColumnsCount	Gauge<Long>	Total number of columns present in the memtable.
MemtableSwitchCount	Counter	Number of times flush has resulted in the memtable being switched out.
CompressionRatio	Gauge<Double>	Current compression ratio for all SSTables.
EstimatedPartitionSizeHistogram	Gauge<long[]>	Histogram of estimated partition size (in bytes).
EstimatedPartitionCount	Gauge<Long>	Approximate number of keys in table.
EstimatedColumnCountHistogram	Gauge<long[]>	Histogram of estimated number of columns.
SSTablesPerReadHistogram	Histogram	Histogram of the number of sstable data files accessed per read.
ReadLatency	Latency	Local read latency for this table.
RangeLatency	Latency	Local range scan latency for this table.
WriteLatency	Latency	Local write latency for this table.
CoordinatorReadLatency	Timer	Coordinator read latency for this table.
CoordinatorScanLatency	Timer	Coordinator range scan latency for this table.
PendingFlushes	Counter	Estimated number of flush tasks pending for this table.
BytesFlushed	Counter	Total number of bytes flushed since server [re]start.
CompactionBytesWritten	Counter	Total number of bytes written by compaction since server [re]start.
PendingCompactions	Gauge<Integer>	Estimate of number of pending compactions for this table.
LiveSSTableCount	Gauge<Integer>	Number of SSTables on disk for this table.
LiveDiskSpaceUsed	Counter	Disk space used by SSTables belonging to this table (in bytes).
TotalDiskSpaceUsed	Counter	Total disk space used by SSTables belonging to this table, including obsolete ones waiting to be GC'd.
MinPartitionSize	Gauge<Long>	Size of the smallest compacted partition (in bytes).
MaxPartitionSize	Gauge<Long>	Size of the largest compacted partition (in bytes).
MeanPartitionSize	Gauge<Long>	Size of the average compacted partition (in bytes).
BloomFilterFalsePositives	Gauge<Long>	Number of false positives on table's bloom filter.
BloomFilterFalseRatio	Gauge<Double>	False positive ratio of table's bloom filter.

Monitoring limits: No relevant dashboard

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- Building dashboard is not straightforward, many options available

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Monitoring limits: No relevant dashboard

- Tons of metrics available from the agent / reporter
- Building dashboard is not straightforward, many options available
- Double expertise needed
- No end user pressure like for a new feature
- Often no one's responsibility to build charts

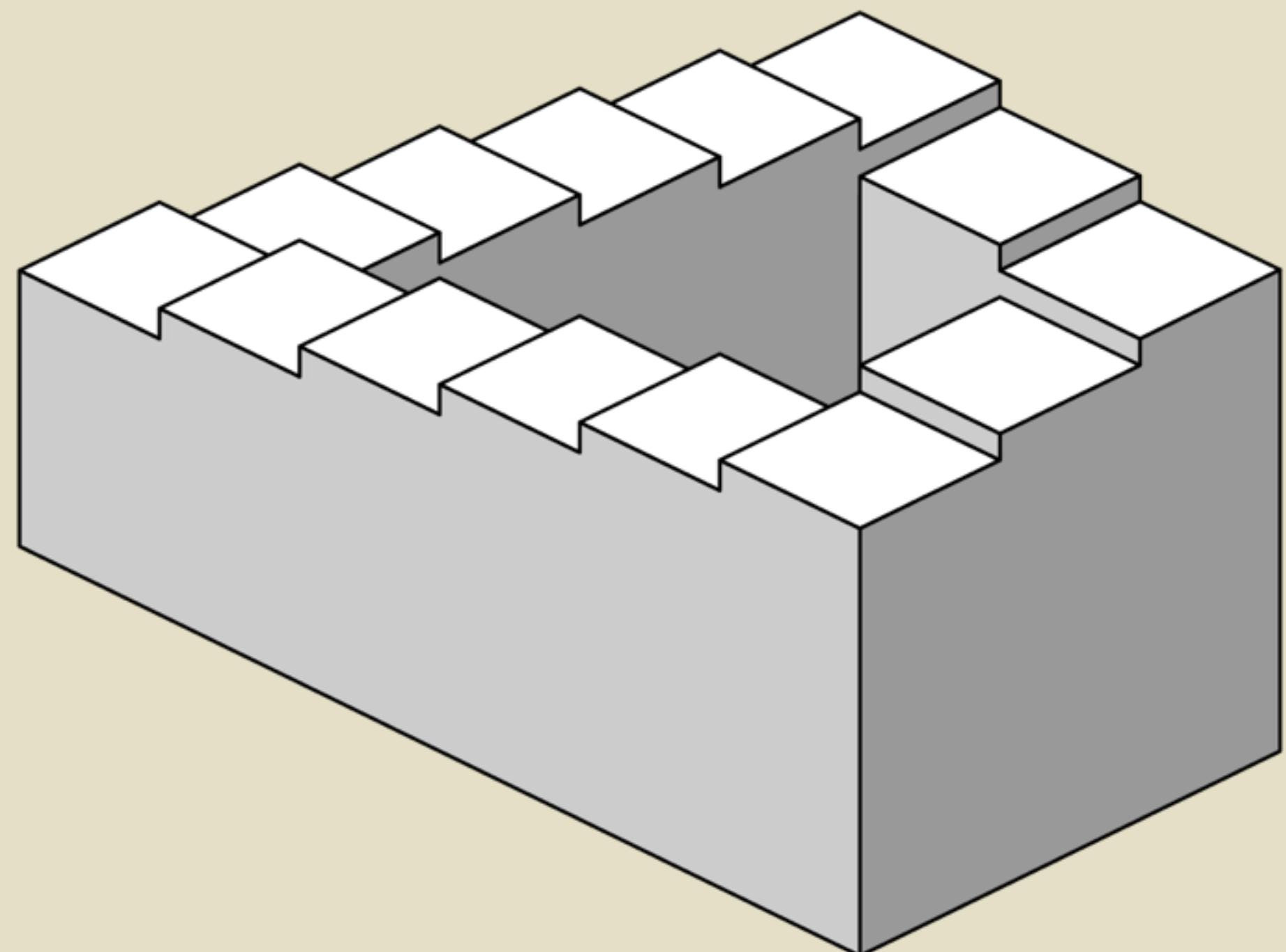
Monitoring limits: Monitoring can fail

- Do not trust monitoring 100%
- In case of doubt, double check !



Monitoring limits: Tip for Datastax Opscenter

- Troubles with Datastax Opscenter in the past
- Opscenter data should be stored outside from the production C* cluster



Building dashboards

Building dashboards: Some existing pluggable solutions



DATADOG



Commercial



Free

Building dashboards: Existing expert set of dashboard

- No “out of the box” and “complete” dashboards available

Building dashboards: Existing expert set of dashboard

- No “out of the box” and “complete” dashboards available
- Sematext-SPM is the winner from this perspective

SPM ▾
Performance MonitoringSA ▾
Search AnalyticsLogsene ▾
Data and Log Analytics

cassandra-spm-app

App Settings:

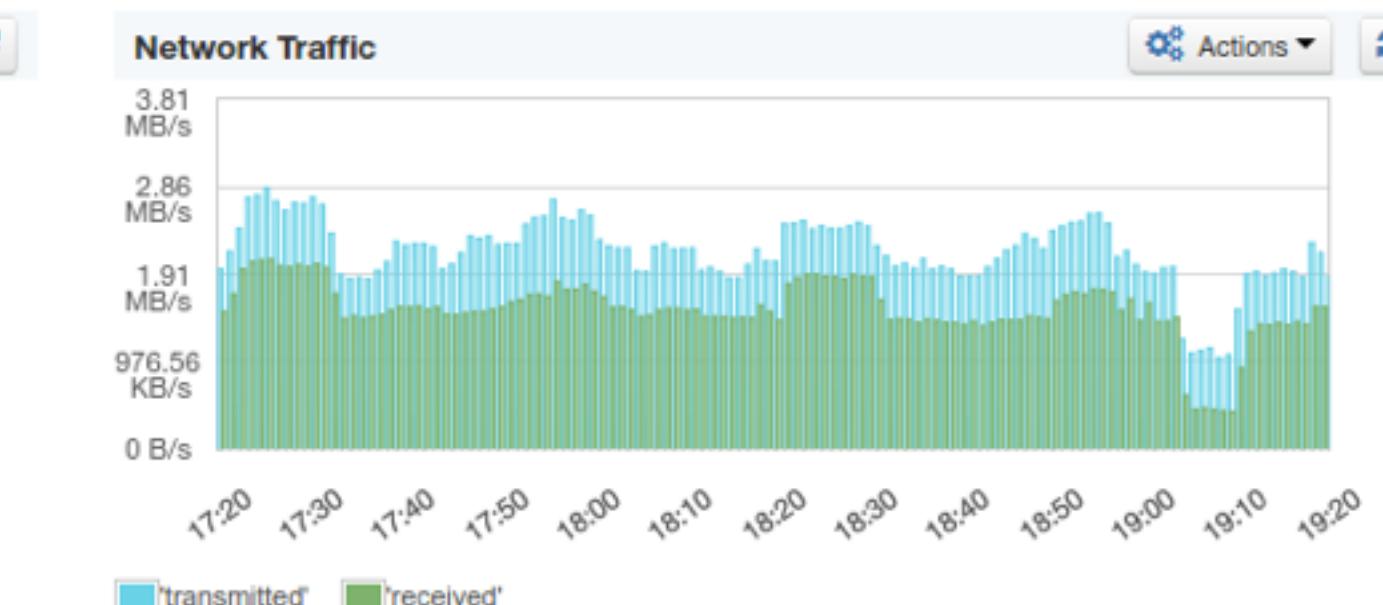
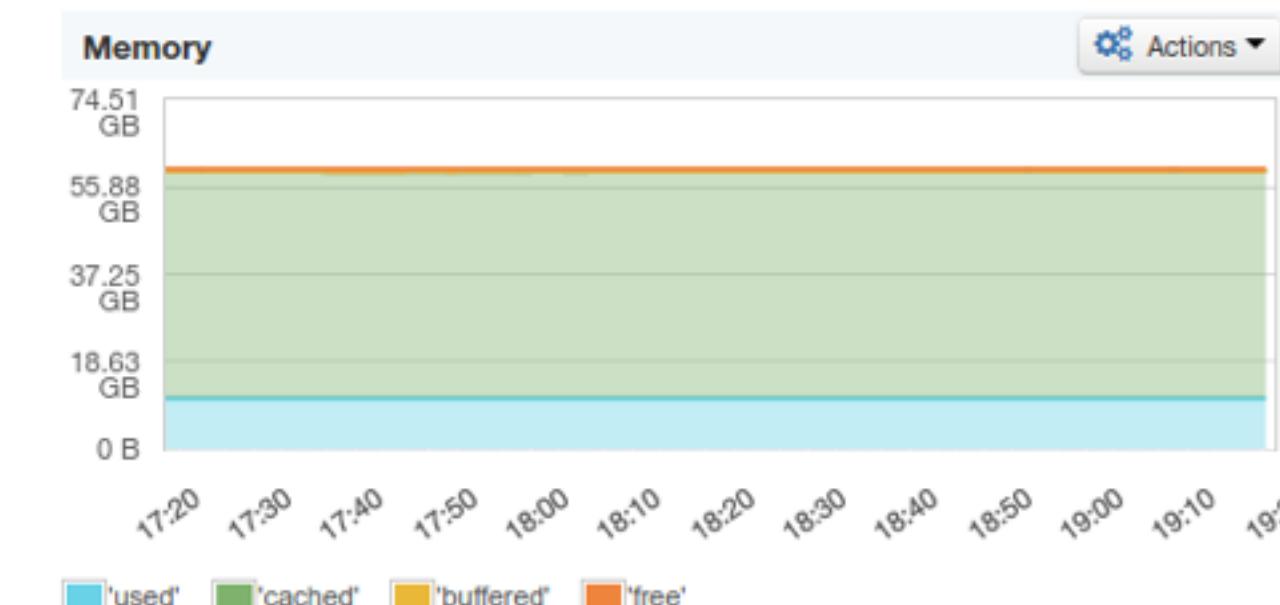
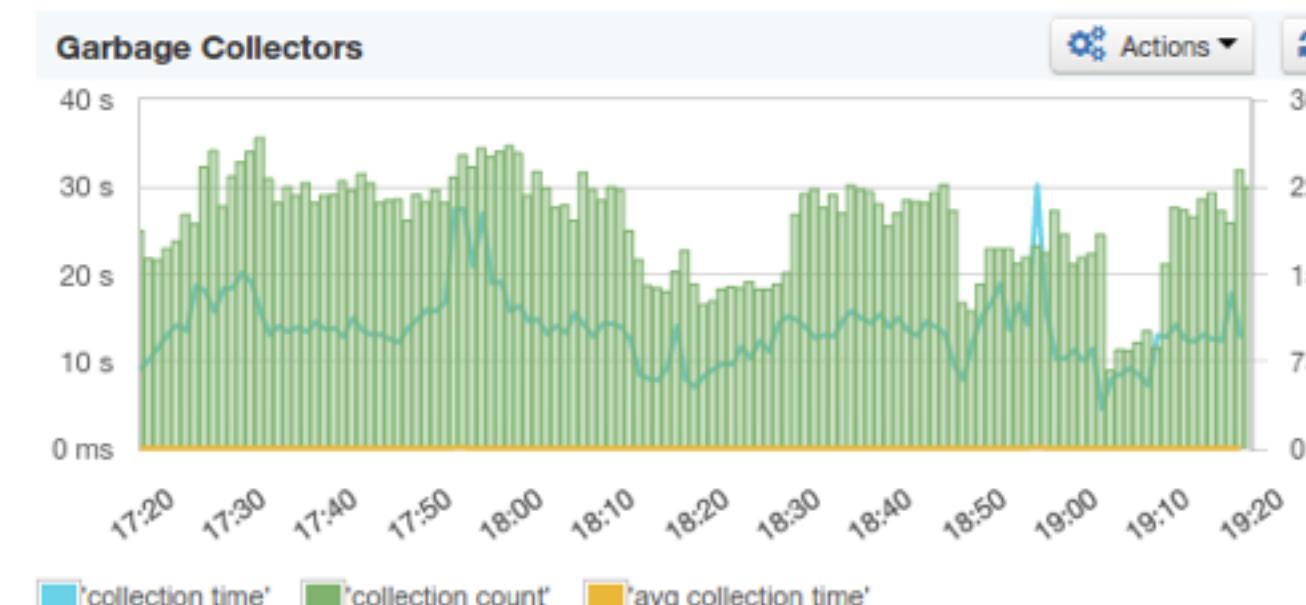
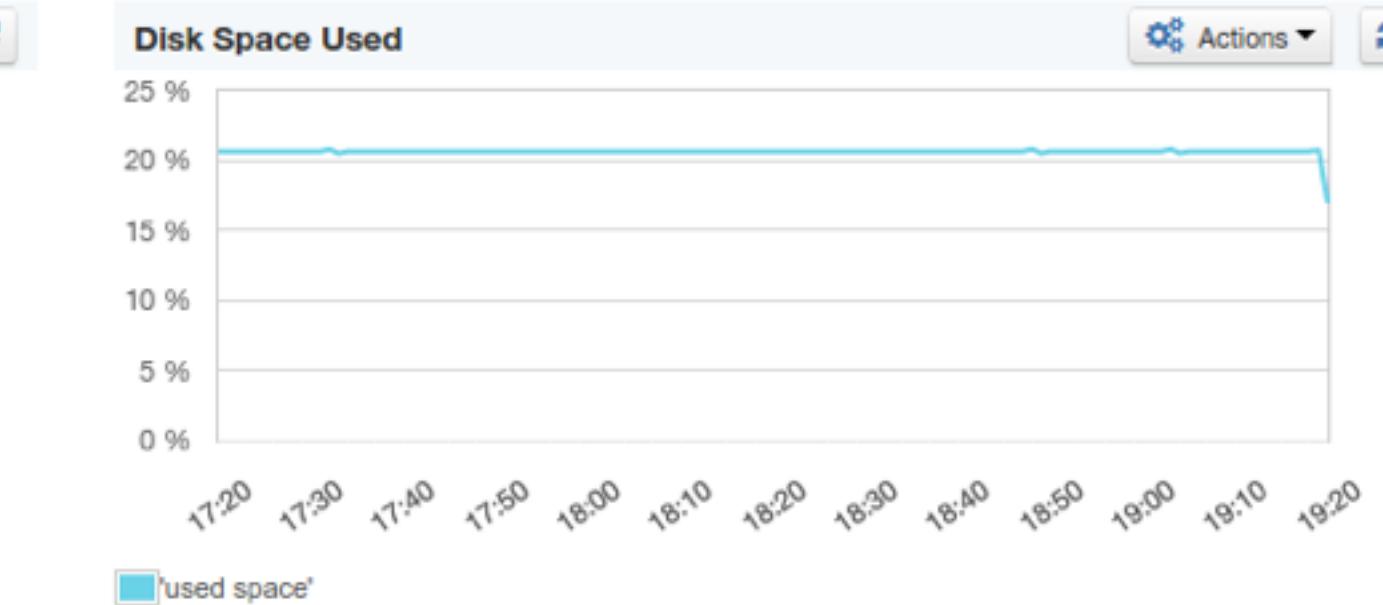
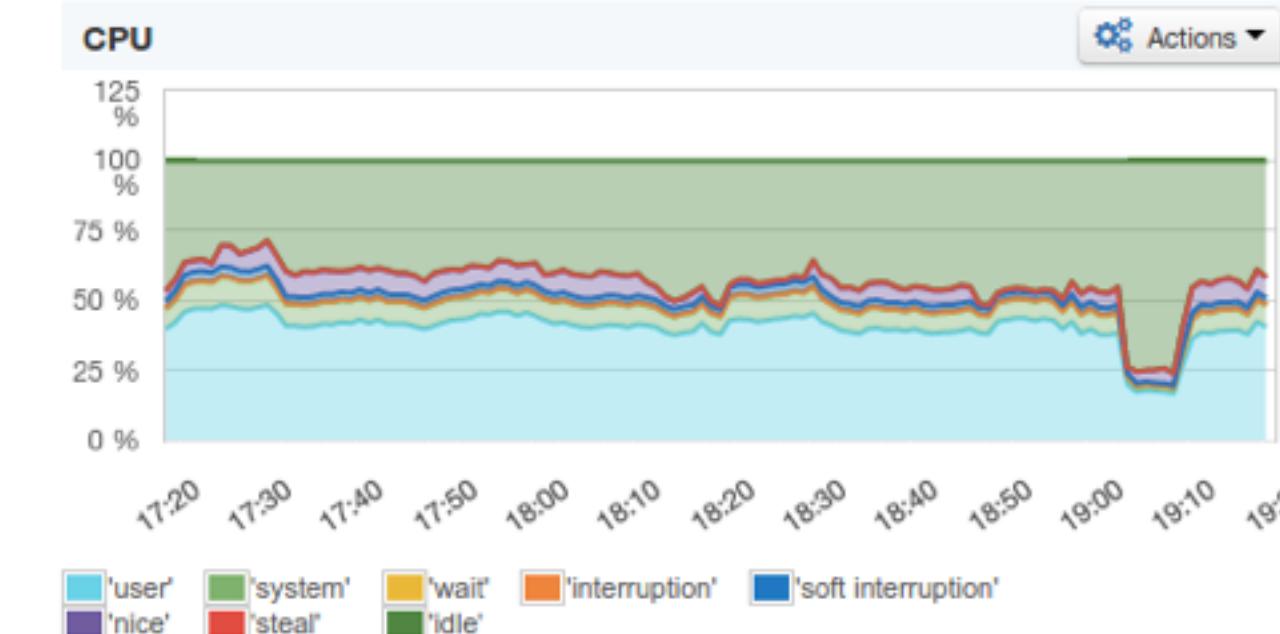
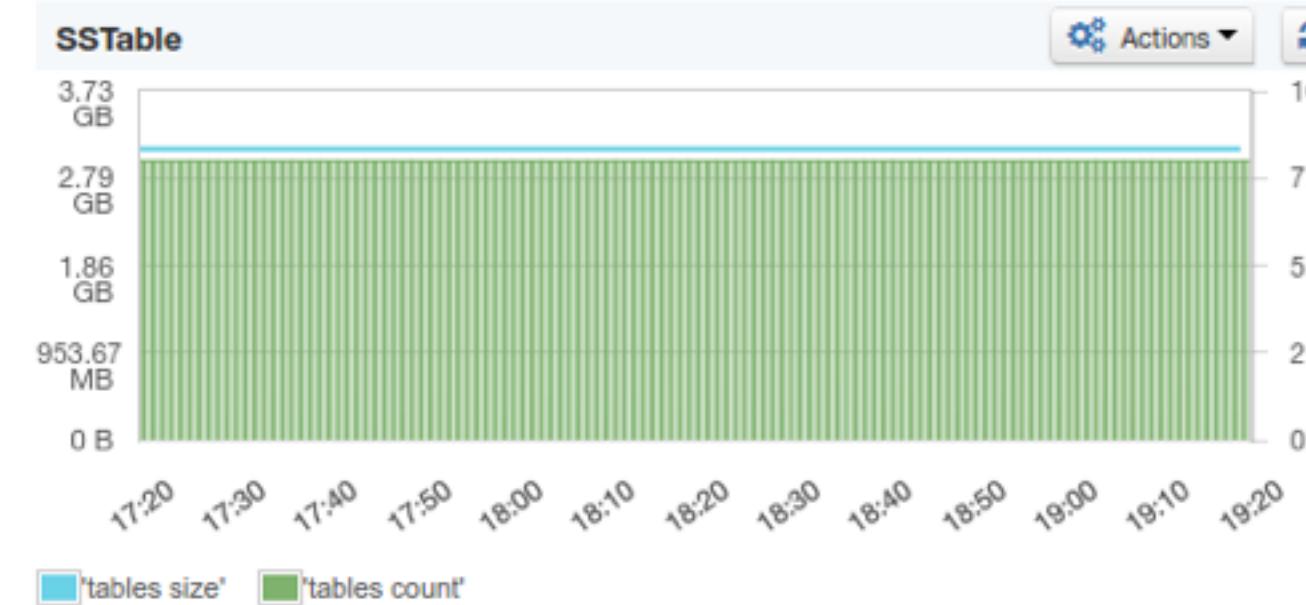
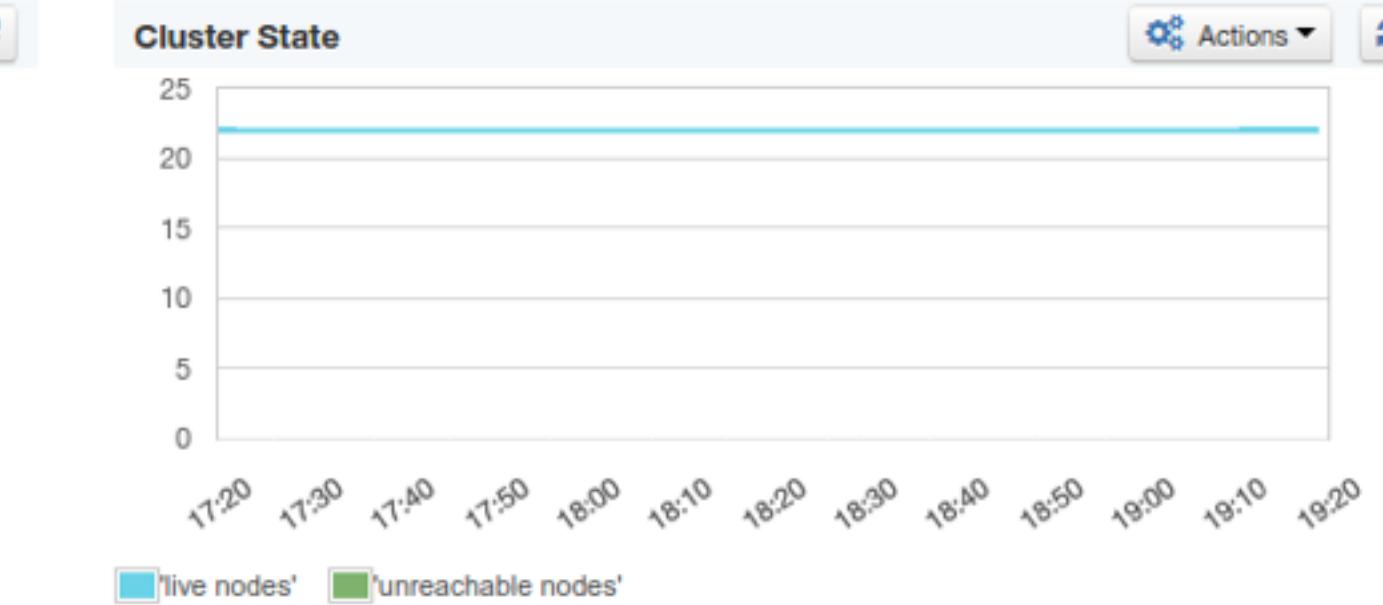
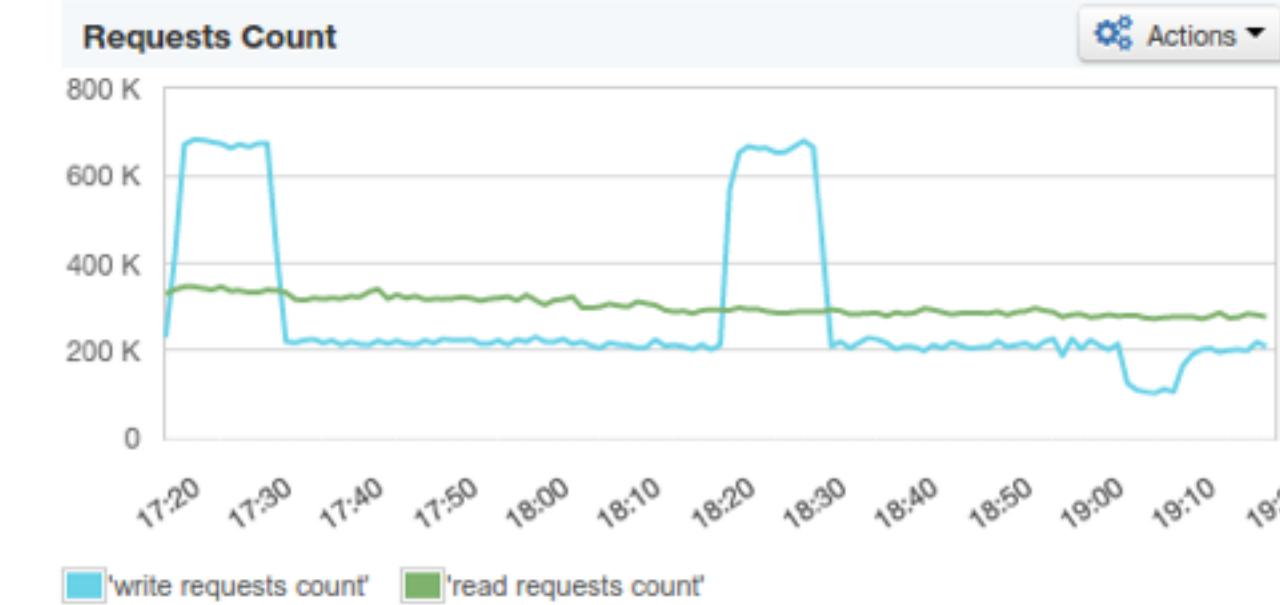
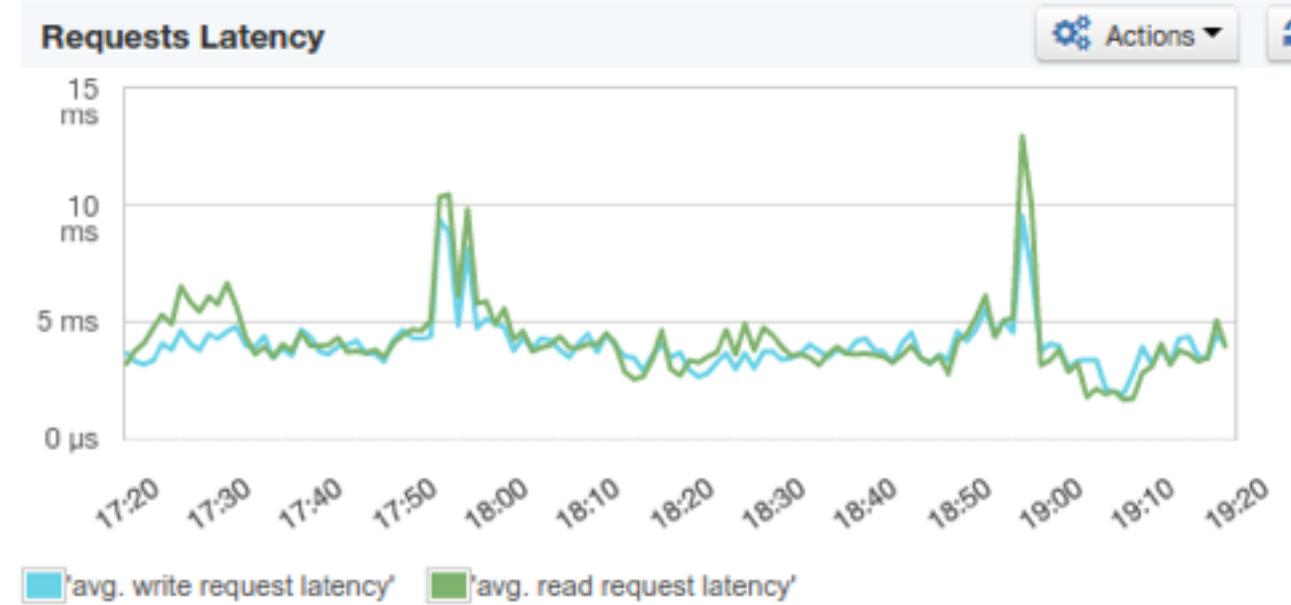


Get Client

?

- [Overview](#)
- [Cluster](#)
- [Write Requests](#)
- [Read Requests](#)
- [Pending Writes](#)
- [Pending Reads](#)
- [Pending Cluster Ops](#)
- [Compactions](#)
- [Cache](#)
- [Local Writes](#)
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- [SSTable](#)
- [Bloom Filter](#)
- [CPU & Memory](#)
- [Disk](#)
- [Network](#)
- [GC](#)
- [JVM Memory](#)
- [JVM Threads](#)
- [JVM Open Files](#)
- [Custom Metrics](#)

auto granularity ▾ 01/27/2015 17:20 - 01/27/2015 19:20

30m 1h 6h 1d 2d 1w 30d 60d auto-refresh 

Building dashboards: Templates idea origin

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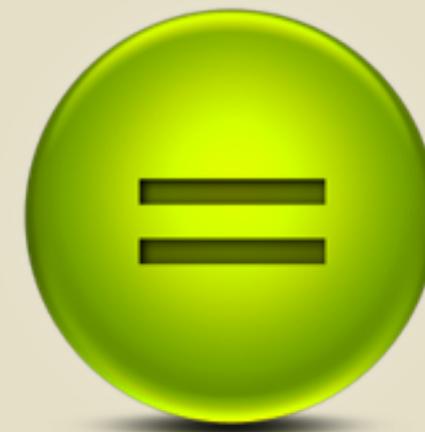
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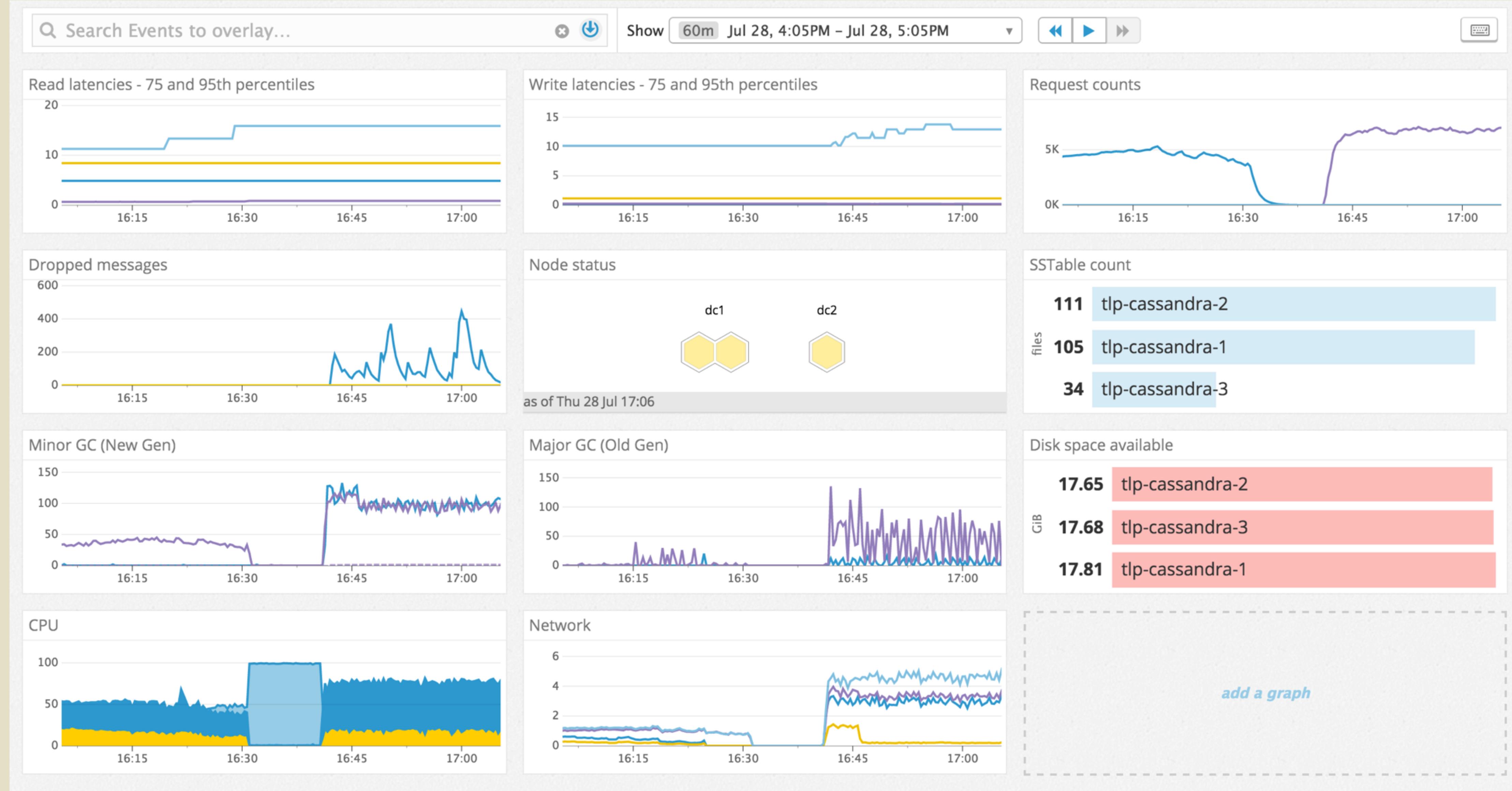
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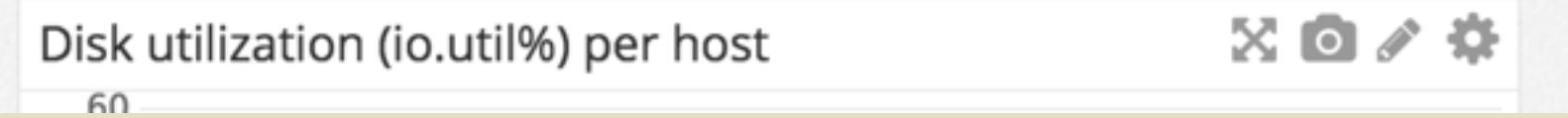
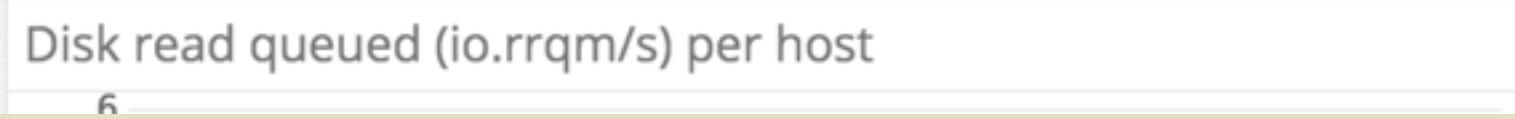
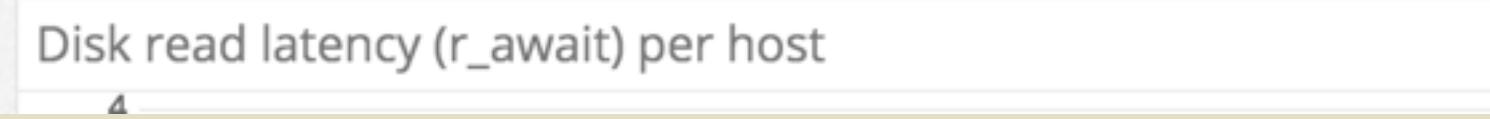
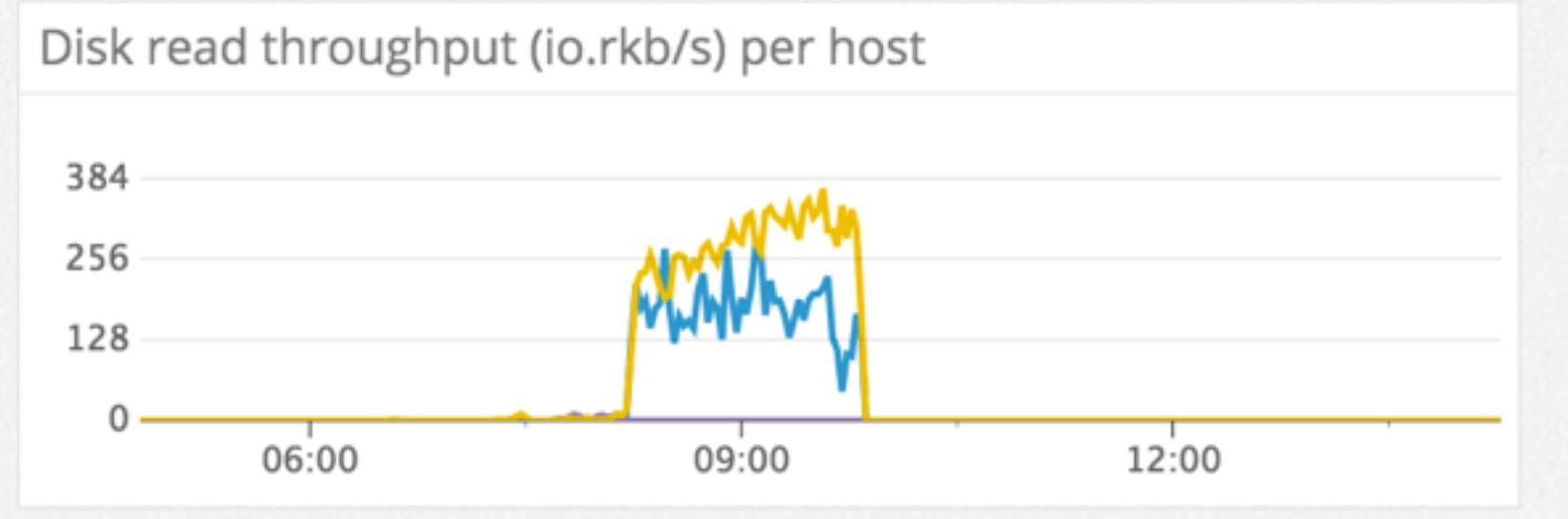
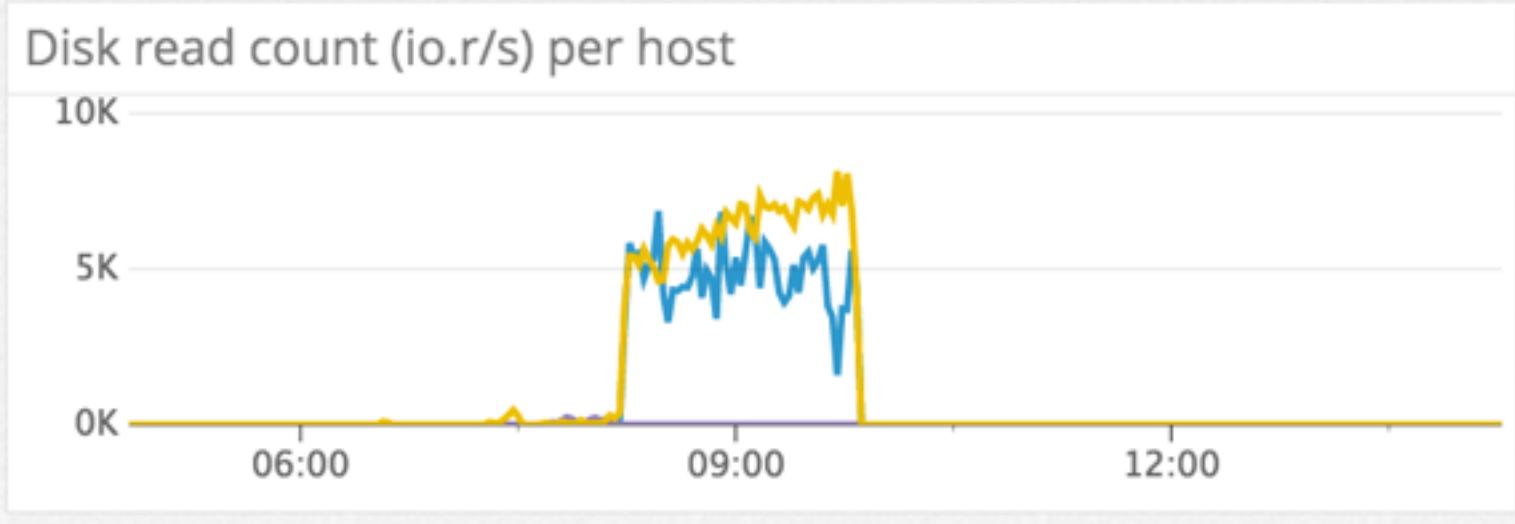
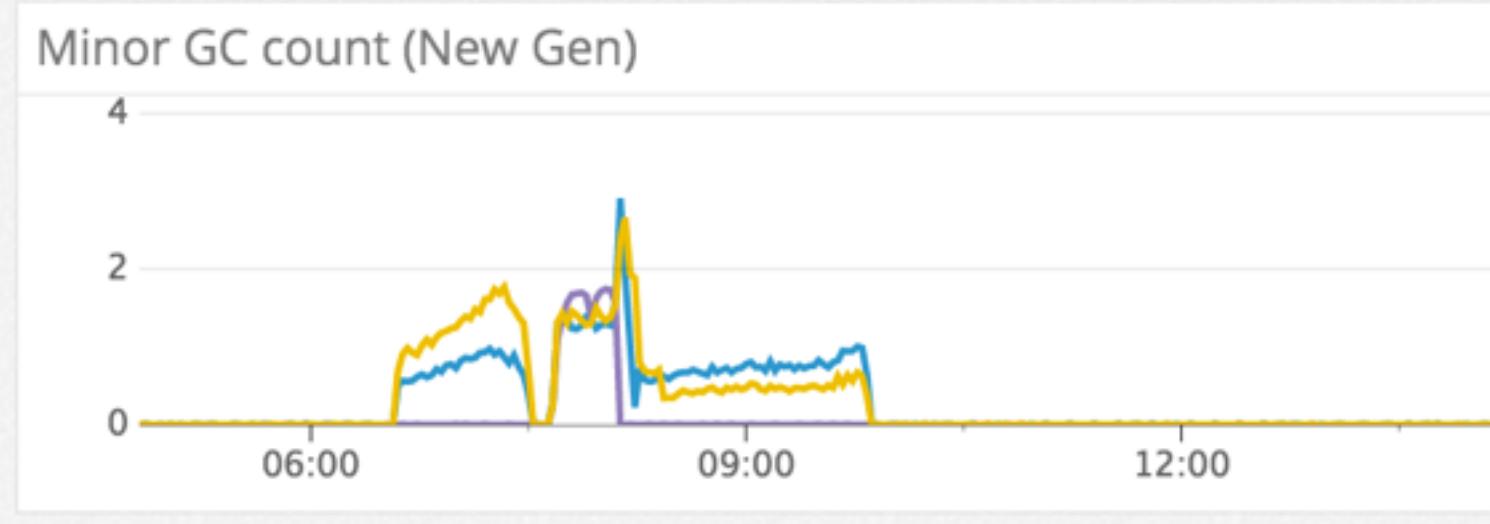
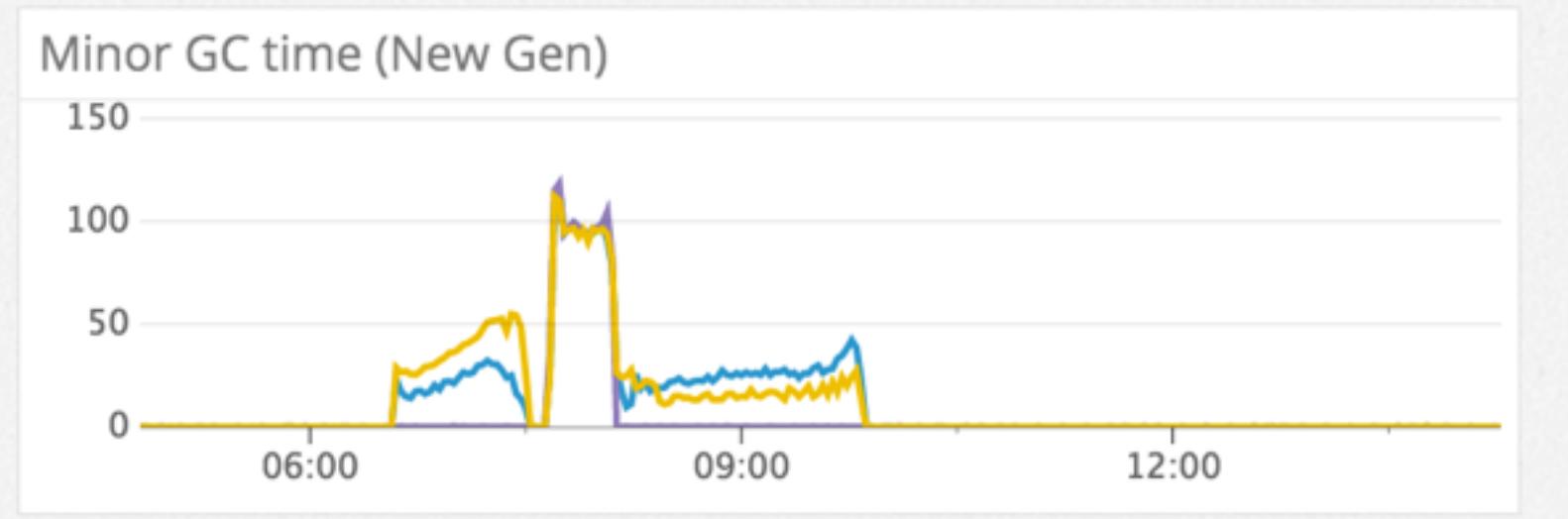
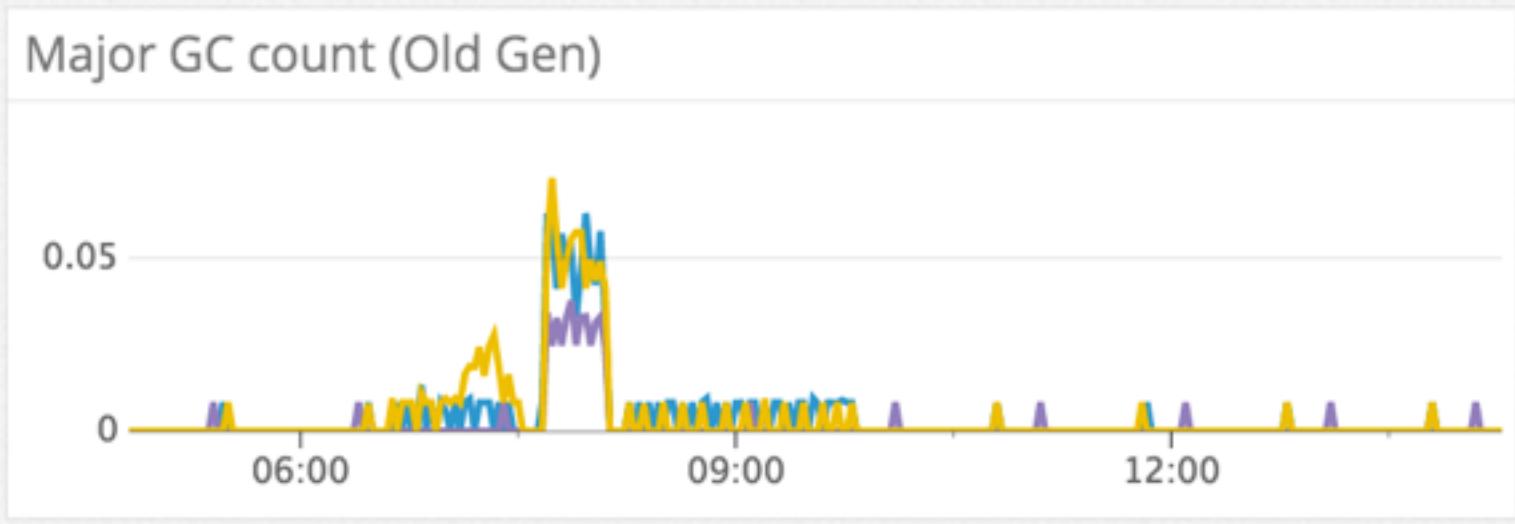
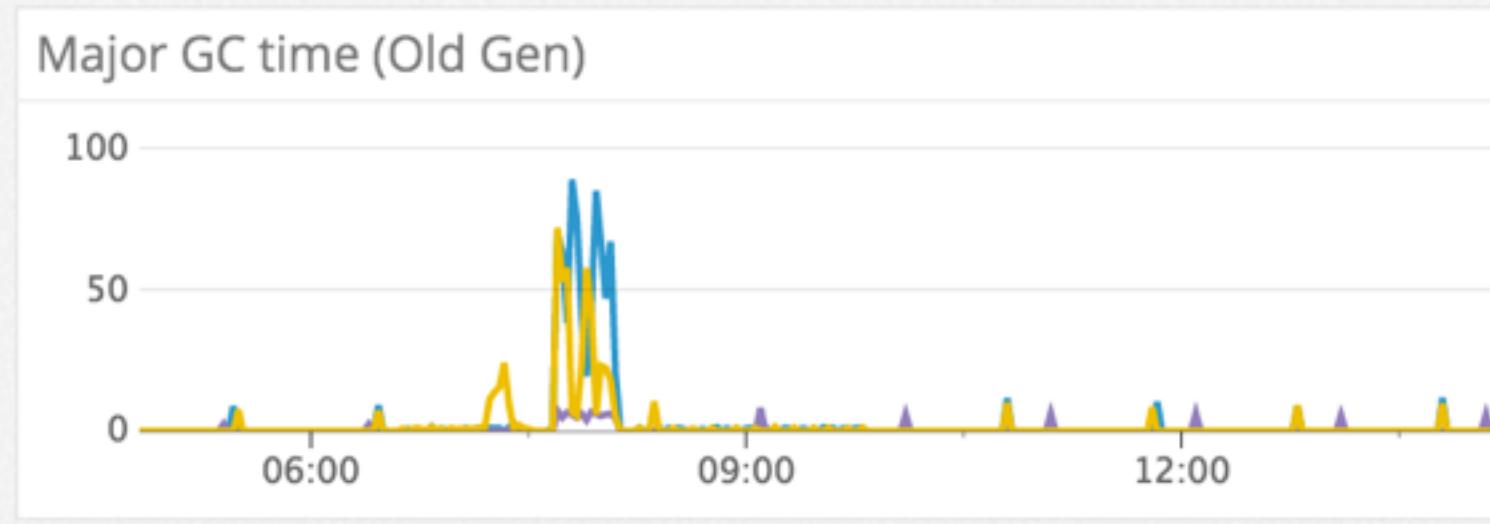
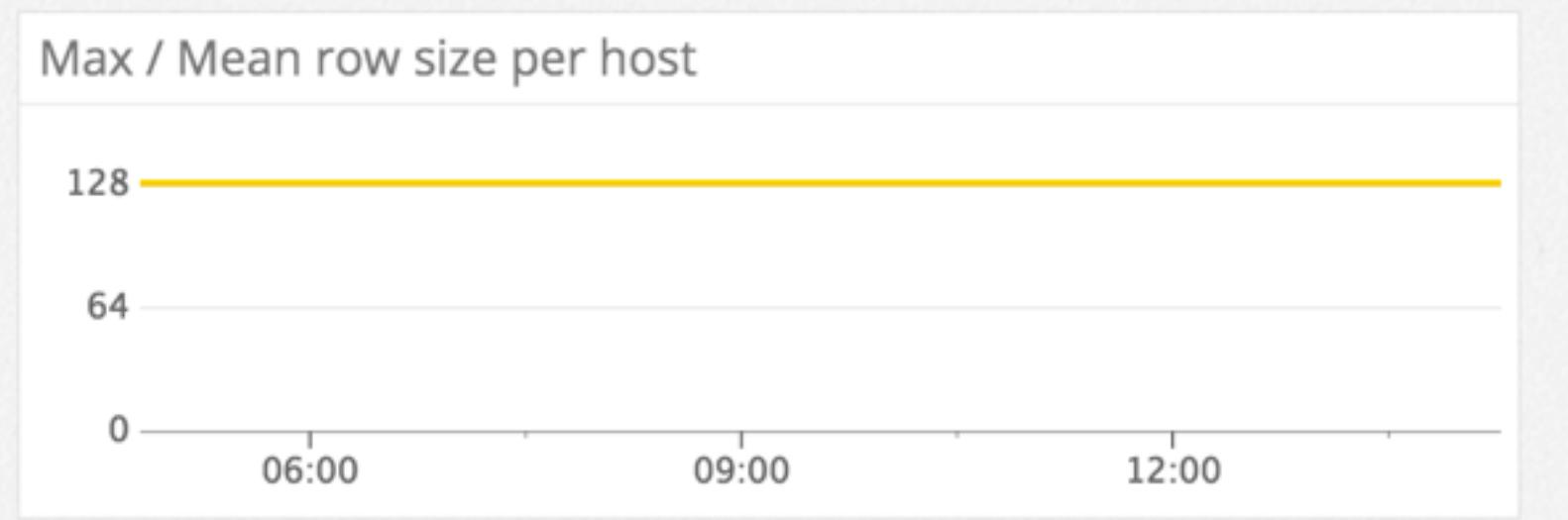
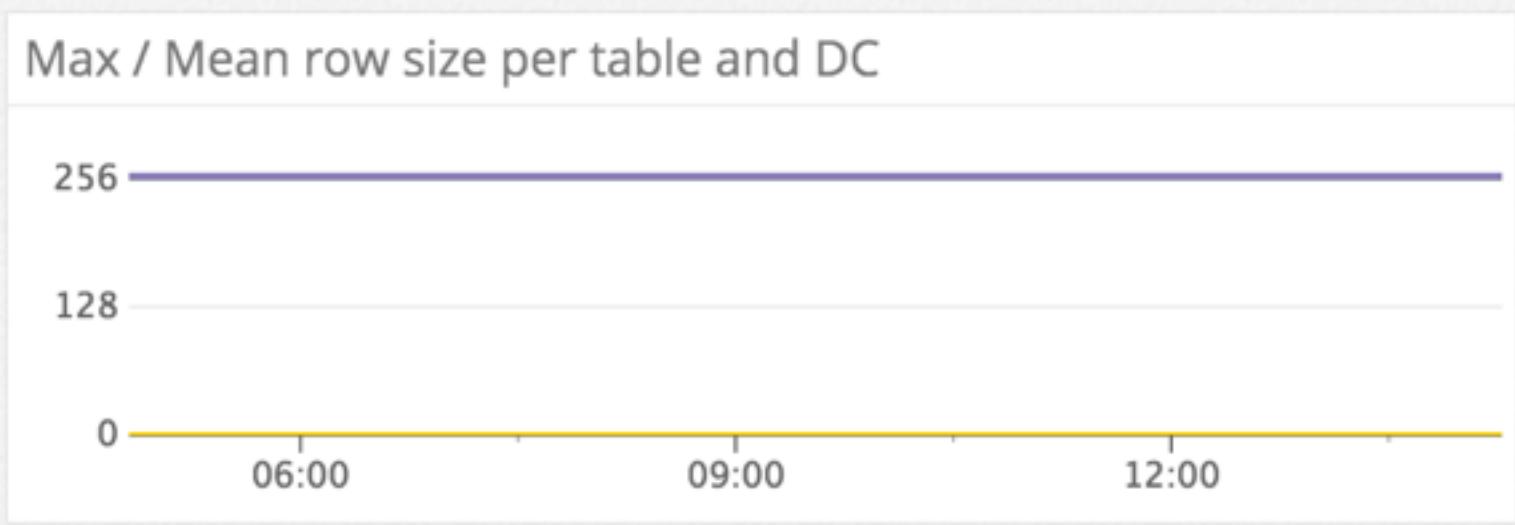
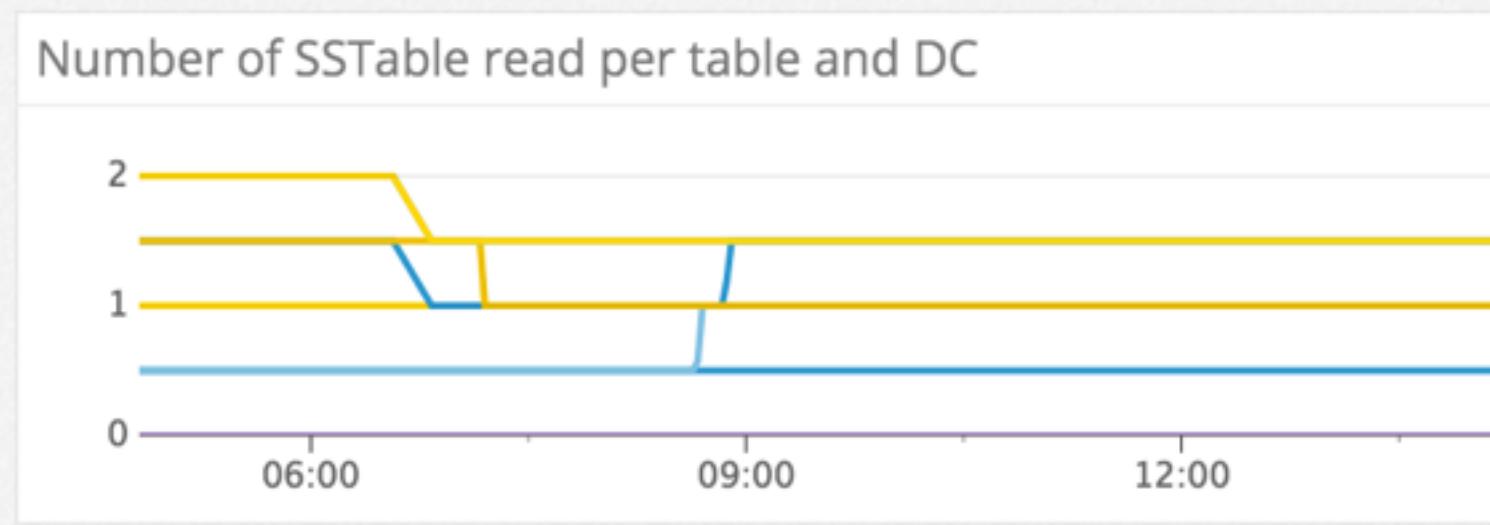
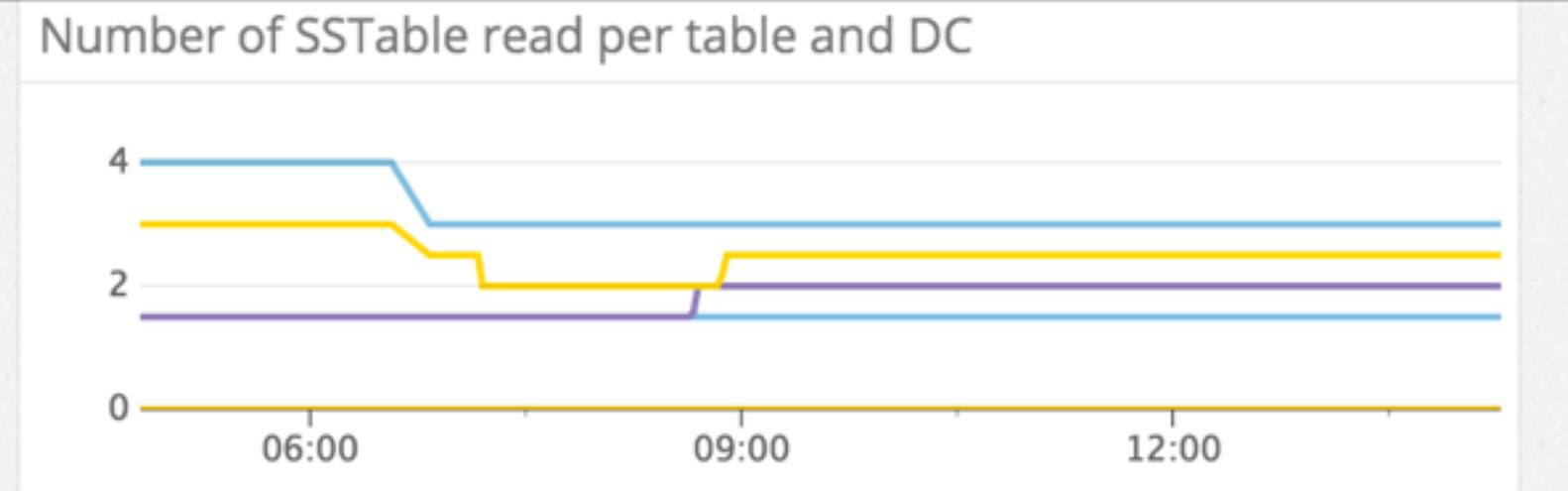
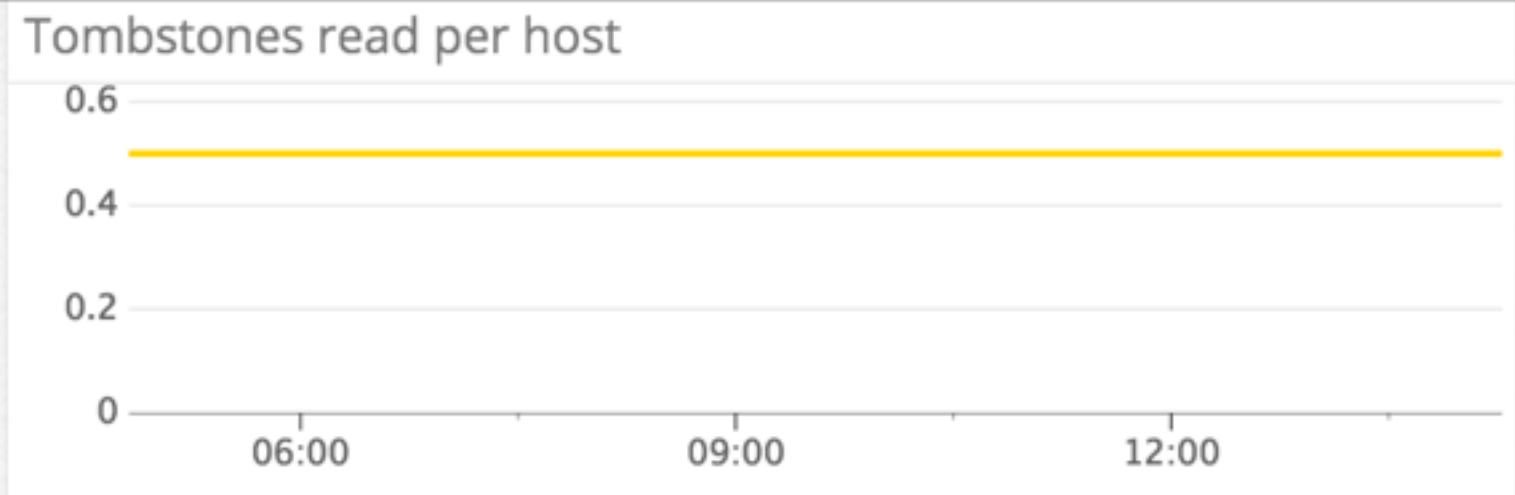
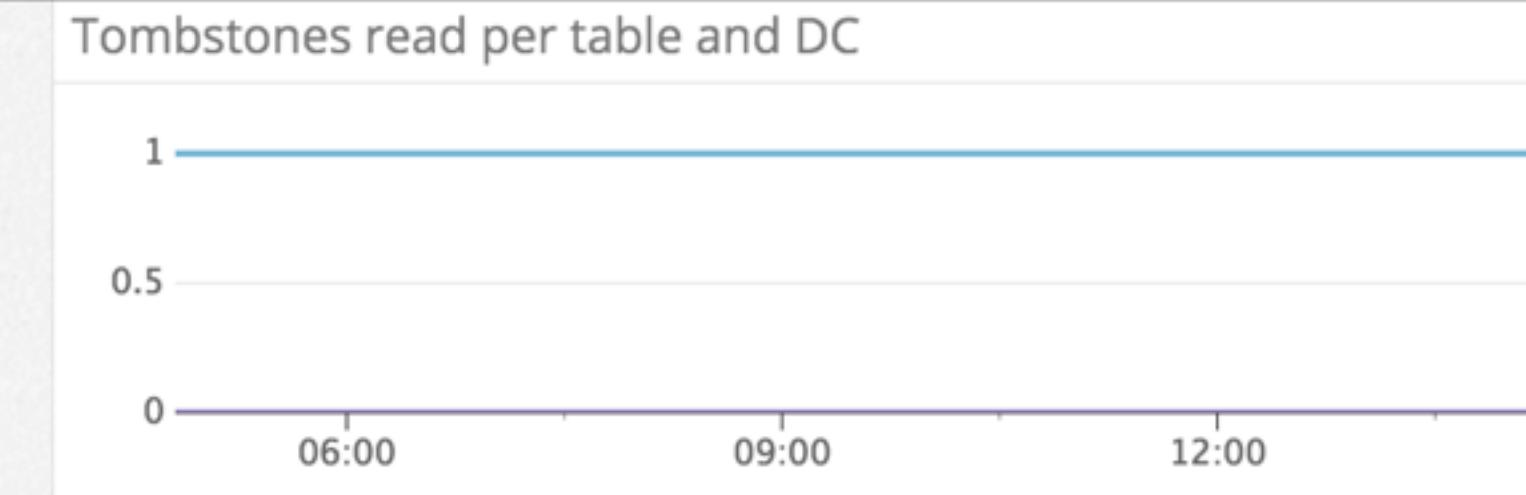
=> Decided to build templates and share to the community



Building dashboards: Overview Dashboard!



Building dashboards: Read path dashboard!



Building dashboards: Ongoing work

- This is an ongoing work



Building dashboards: Ongoing work

- This is an ongoing work
- Template will be shared and maintained by TLP (+ Monitoring provider)



Building dashboards: Ongoing work

- This is an ongoing work
- Template will be shared and maintained by TLP (+ Monitoring provider)
- Corresponding reporter / agent configuration will be shared



Building dashboards: Ongoing work

- This is an ongoing work
- Template will be shared and maintained by TLP (+ Monitoring provider)
- Corresponding reporter / agent configuration will be shared
- We will explain our choices and provide metrics in use



DATADOG



Conclusion

Make sure you are actually monitoring something!

- Monitoring is important for QoS and saving money.
- Having a monitoring tool doesn't mean things are monitored



Make sure you are actually monitoring something!

Always wonder:

- Was I able to detect latest outages?
- Would I now be able to detect outages I faced in the past?
- Do I find enough info to easily troubleshoot issues I face?
- Am I able to see impacts when I tune Cassandra?

Thank you
Questions ?

