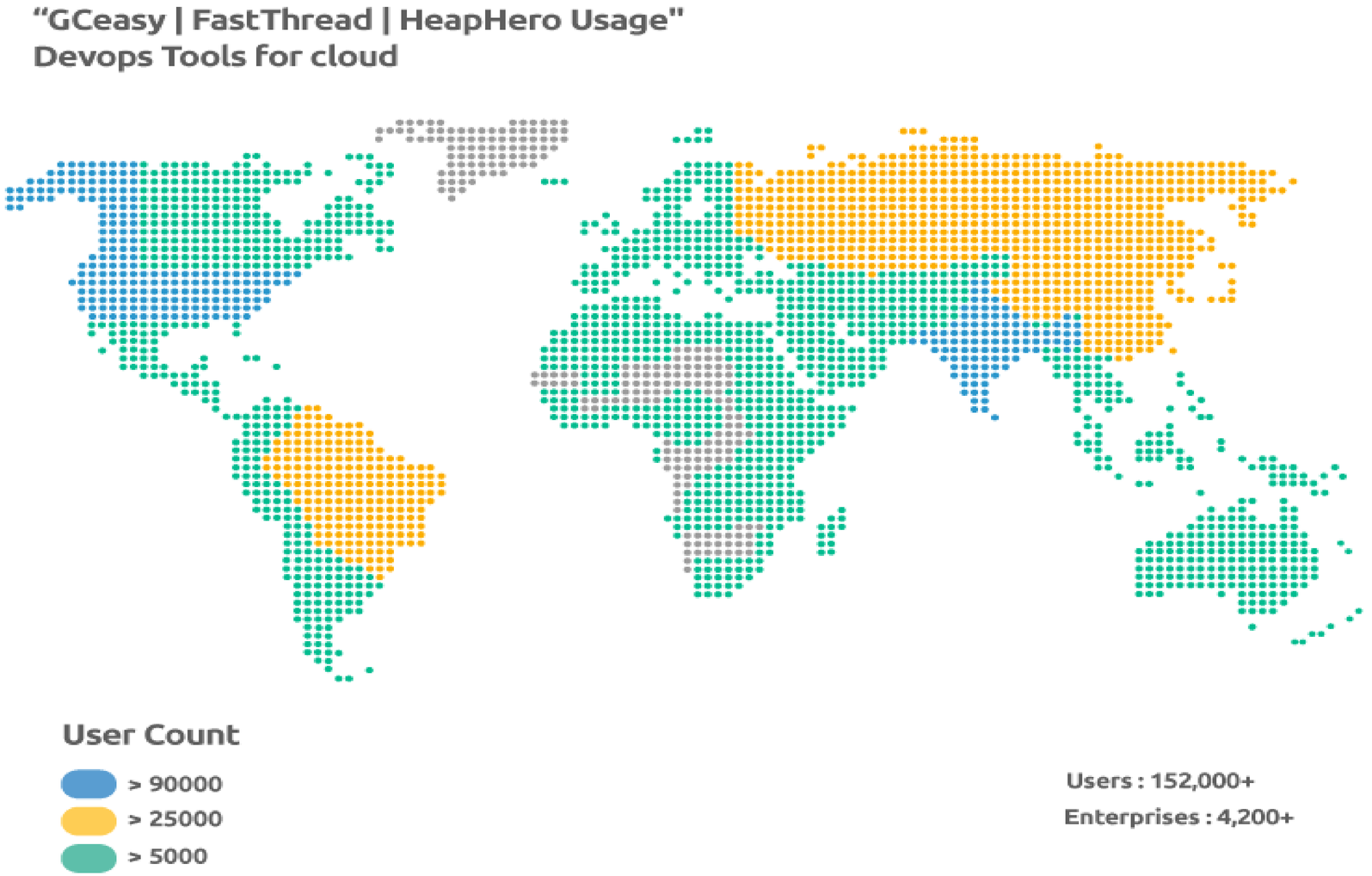
Micro-metrics to forecast performance tsunamis

Ram Lakshmanan - Architect

GCeasy.io, fastThread.io, HeapHero.io

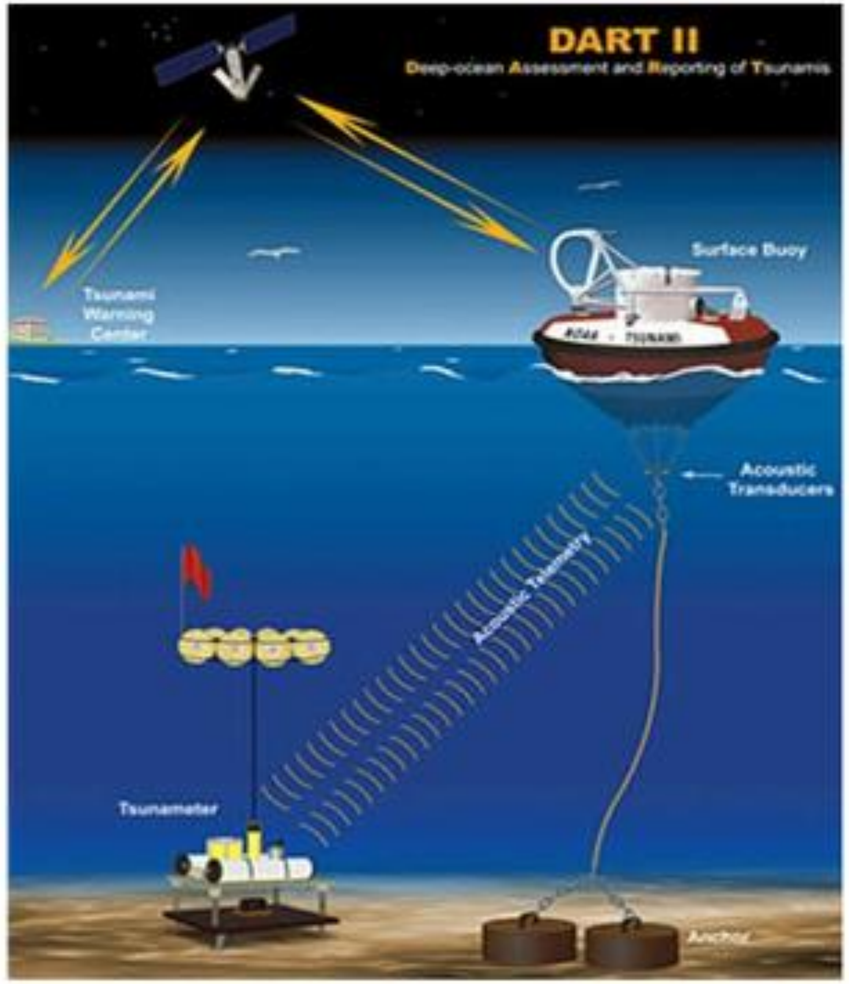
About me

- Architect of DevOps Tools
- Speaker
- Troubleshooter



How Tsunamis are detected?

Deep-ocean Assessment and Reporting of Tsunamis DART II



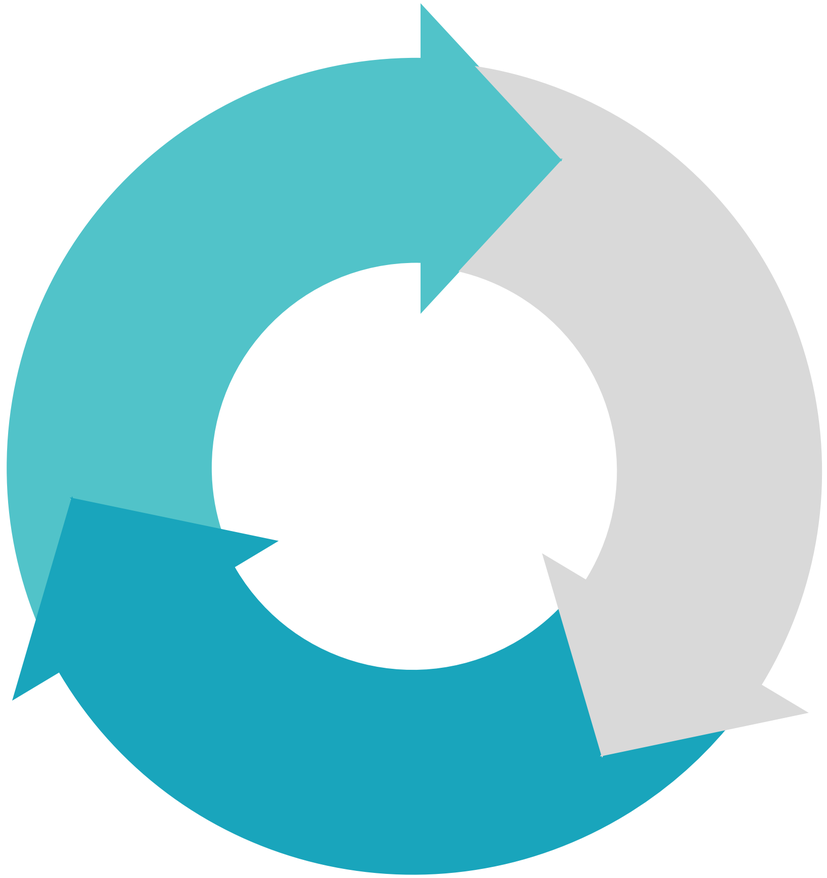
6000m

6000m = 20 x Eiffel tower

5 cm = height of credit card

Even if 5 cm change, alerts triggered

Agenda



1: What?

What are the micrometrics that you want to monitor?

2: How?

How to source these metrics?

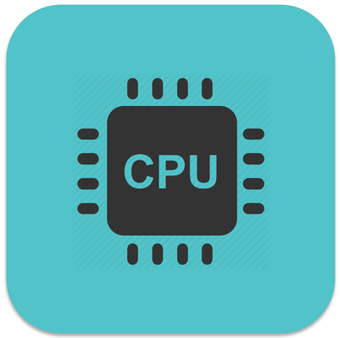
3: Where?

Where to use these metrics?

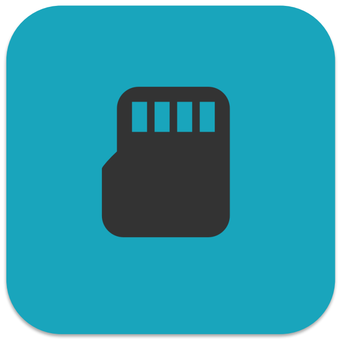
Macrometrics

Primary Macro-metrics that are monitored today

1. Response Time



2. CPU Utilization



3. Memory

Can’t forecast problems

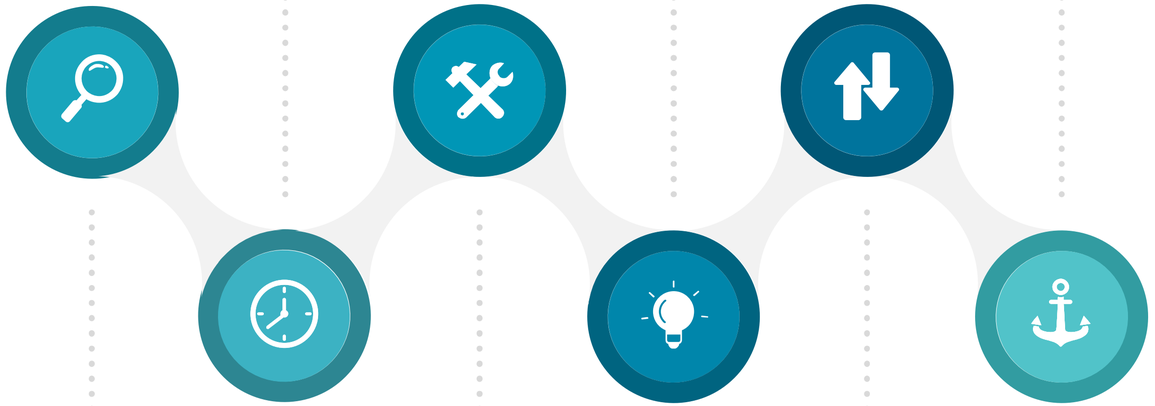
Micrometrics

Monitor these metrics in addition to Macrometrics

2. GC Latency

4. Thread count & states

6. File Descriptors



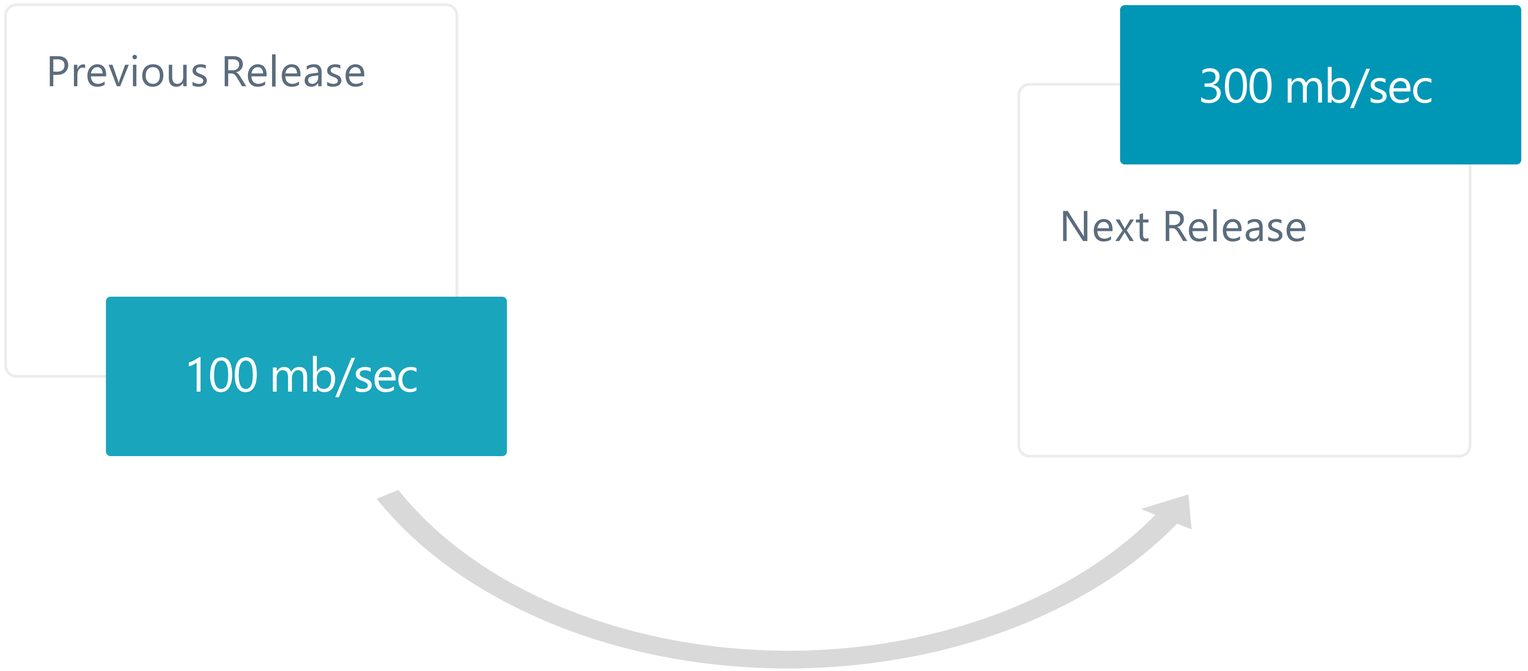
1. Object Creation Rate

3. GC Throughput

5. Memory wasted

1. Object Creation rate

Amount of objects created in a unit of time



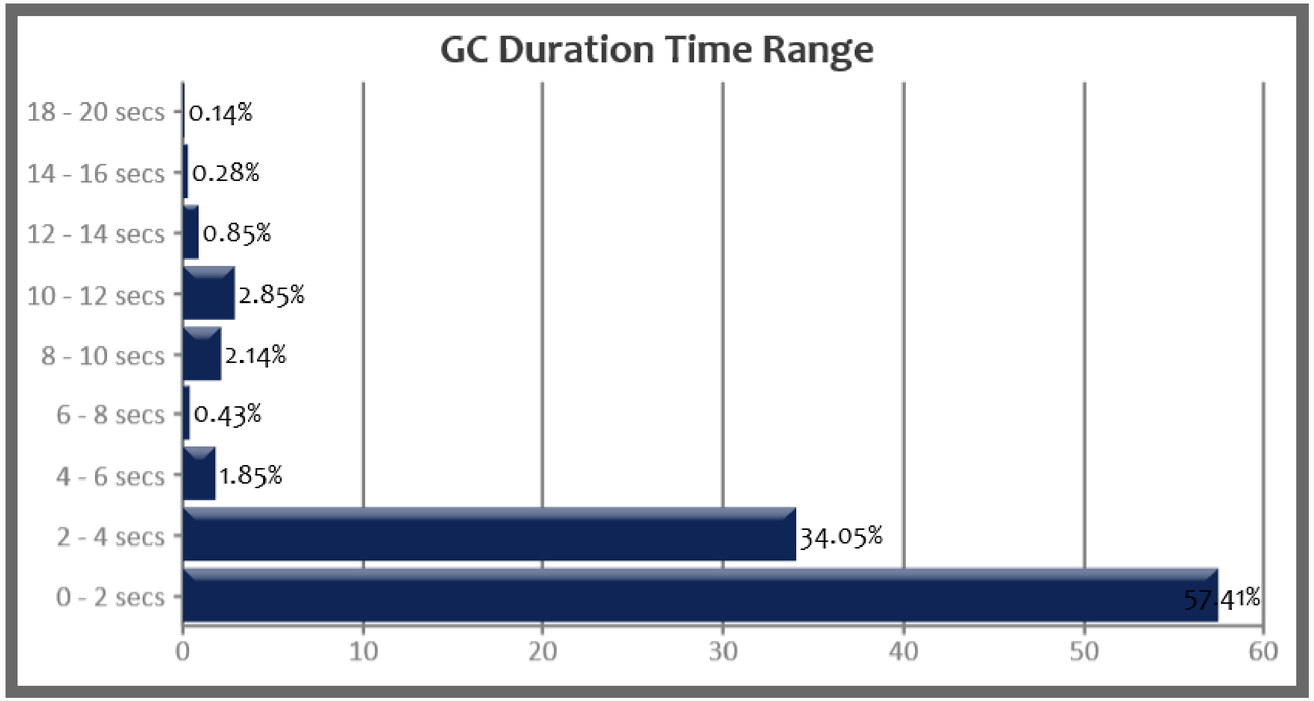
2. Garbage Collection Latency

Amount of time application is paused for doing Garbage Collection

Avg Pause GC Time	**2 sec 350 ms**
Max Pause GC Time	**19 sec 30 ms**

GC **Pause** Duration Time Range:

Duration (secs)	No. of GCs	Percentage
0 - 2	403	57.407%
2 - 4	239	91.453%
4 - 6	13	93.305%
6 - 8	3	93.732%
8 - 10	15	95.869%
10 - 12	20	98.718%
12 - 14	6	99.573%
14 - 16	2	99.858%
18 - 20	1	100.0%



3. Garbage Collection Throughput

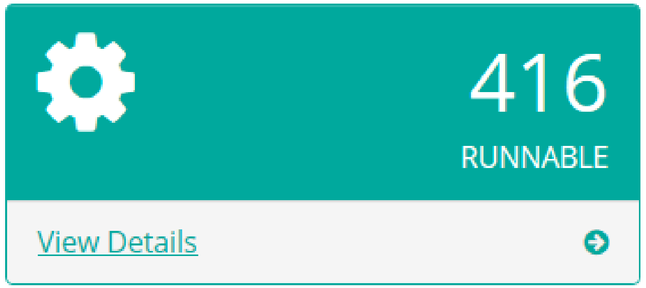
Productive work vs non-productive work

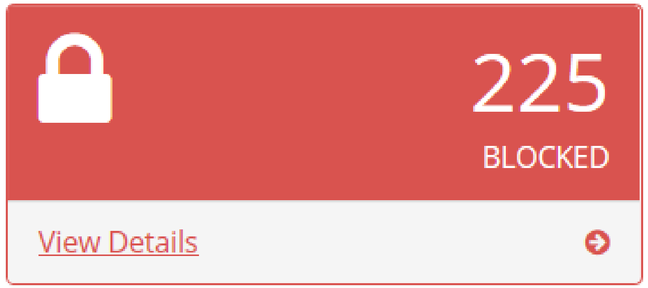
99.675%

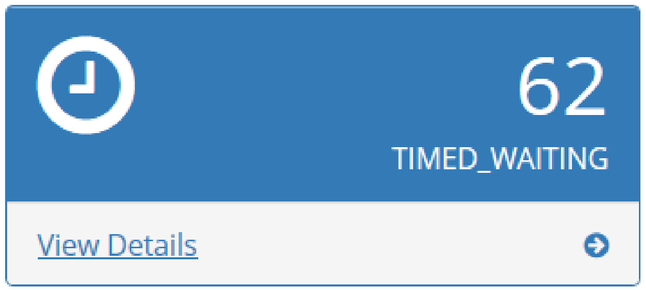
Percentage of time spent in processing customer transactions vs time spent in GC activity.

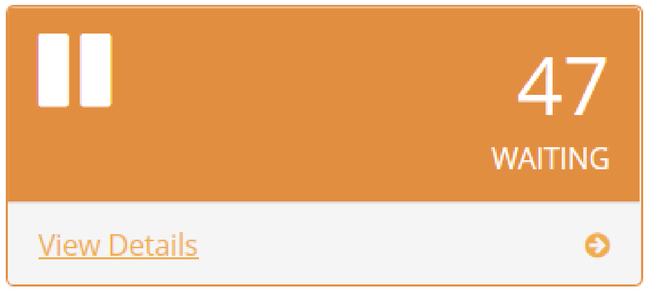
4. Thread Count & Thread States

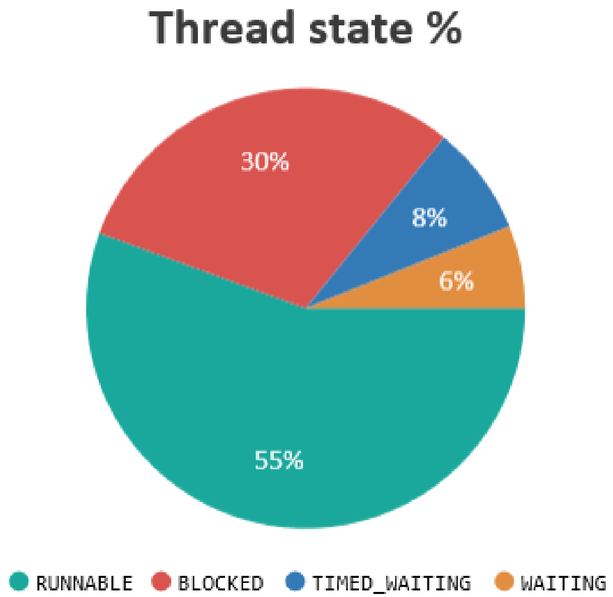
Number of Threads and their states







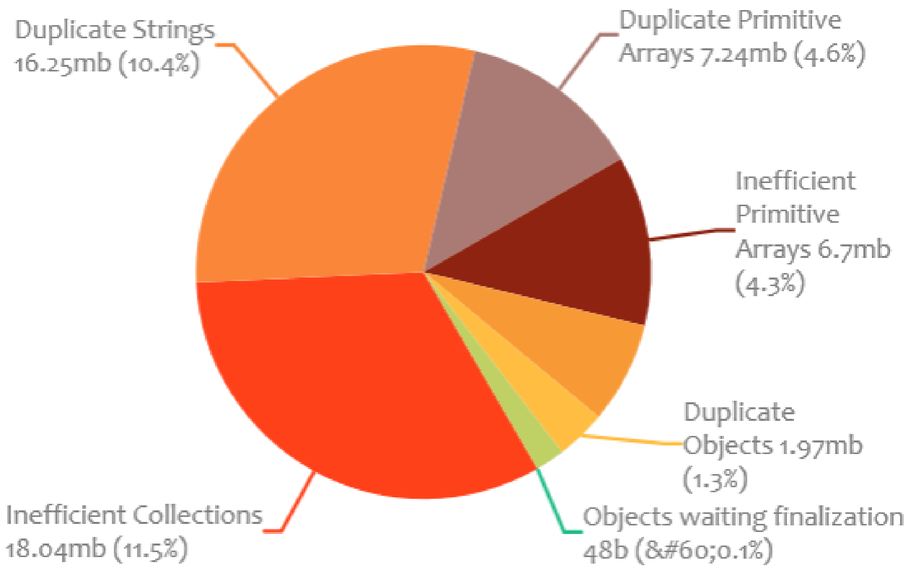




5. Memory Wasted

Amount of memory wasted due to inefficient programming practices

Memory wasted: 55.35mb (35%)



How all memory is wasted?

How all memory is wasted?

1: Duplicate Strings

2: Wrong memory size settings

3: Inefficient Collections

4: Duplicate Objects

5: Duplicate arrays

6: Inefficient arrays

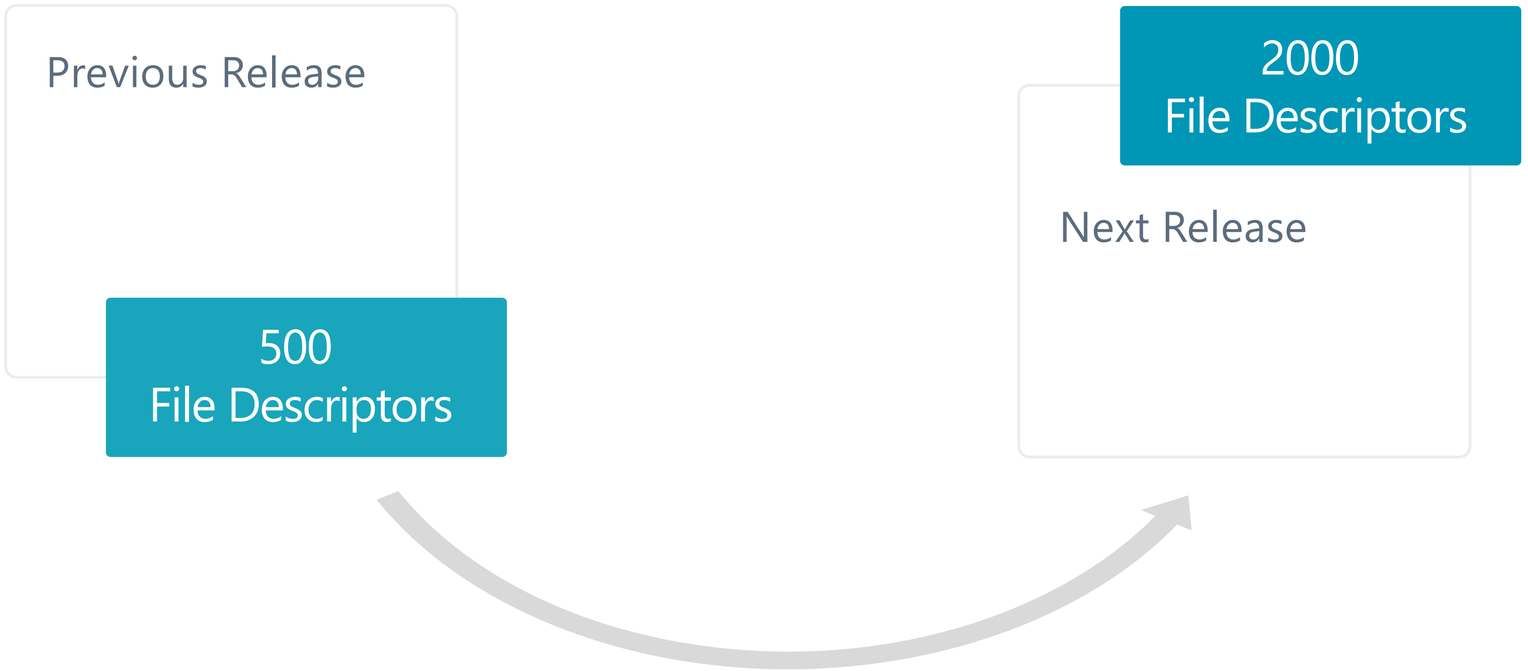
7: Objects waiting for finalization

8: Boxed numbers

9: Overhead caused by Object Headers

6. File Descriptors

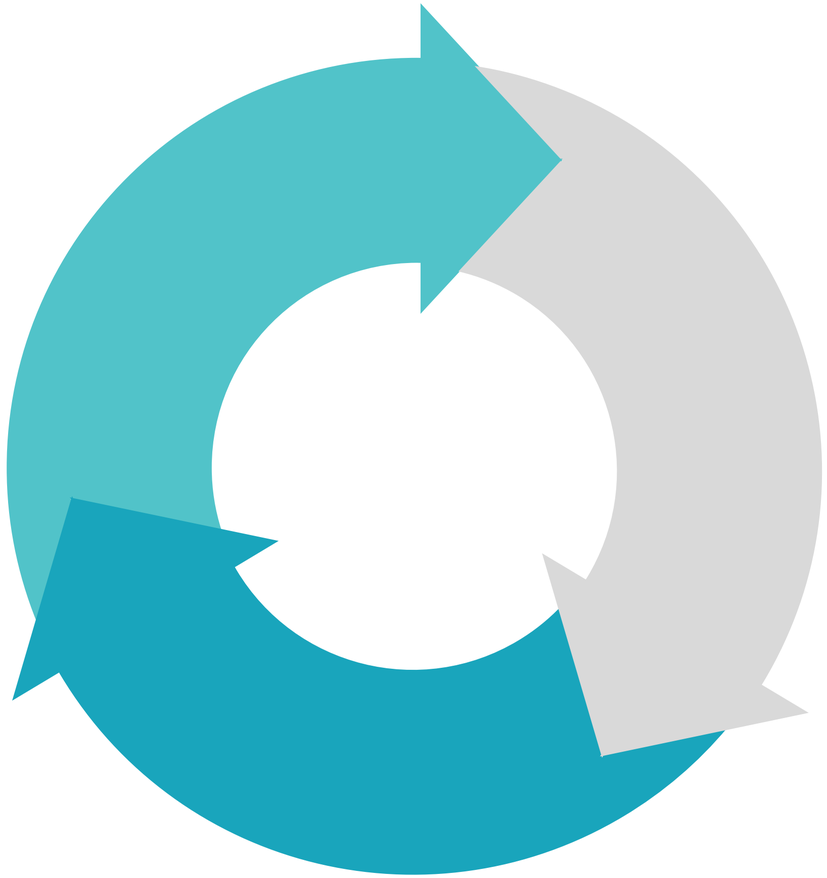
Number of open File Descriptors



File Descriptors:

- Open File Handles
- Open Network connections
- Pipes

Agenda



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Garbage Collection Logs

How to enable Garbage Collection Logs?

Till Java 8:

-XX:+PrintGCDetails -XX:+PrintGCDateStamps -Xloggc:<file-path>

From Java 9:

-Xlog:gc*:file=<file-path>

Tools

GCeasy.io

IBM Pattern Modeling and Analysis Tool for Java Garbage Collector

HP Jmeter

Google Garbage Cat

API

https://blog.gceasy.io/2016/06/18/garbage-collection-log-analysis-api/

1. Object Creation rate
2. GC Latency
3. GC Throughput

Thread Dumps

How to capture thread dumps?
jstack
jmc
jcmd
https://blog.fastthread.io/2016/06/06/how-to-take-thread-dumps-7-options/

4. Thread count & States

Tools
fastThread.io
Custom Scripting

API
https://blog.fastthread.io/2016/10/27/thread-dump-analysis-api/

Heap Dumps

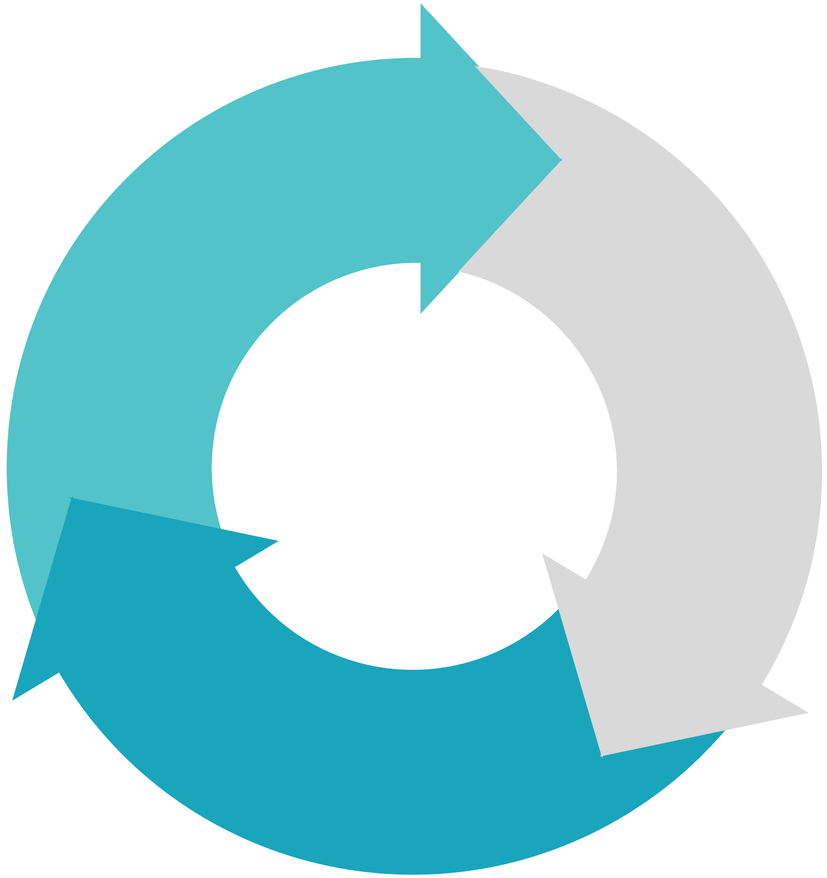
How to capture Heap dumps?
Jstack
JMC
Jcmd
https://blog.fastthread.io/2016/06/06/how-to-take-thread-dumps-7-options/

4. Memory Wasted

Tools
Eclipse MAT
HeapHero.io
Jhat

API
https://blog.heaphero.io/2018/06/22/heap-dump-analysis-api/

Agenda



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Where?

Where to use these metrics?

CI/CD

Fail the build if any of the micrometrics thresholds are breached

CI/CD

Performance Tests

Performance Tests

Examine micrometrics in each release

Production

You can use this micrometrics for production monitoring

Production

Thank You

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