[sfeir]

G1-GC

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Dev FullStack

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GC

What is the purpose of a GC ?

Automatically free memory while my program is (almost) running

Garbage collected languages

Native GC languages

- LISP (1959)
- C#
- GO
- Haskell
- JAVA …

Third party implemented GC for

- C (Boehm)
- C++ (Boehm) …

C

```c
int **matrice;
matrice = malloc( 3 * sizeof(int*));
free(matrice);
```

GC (java)

```java
int[][] matrice = new int[3][3];
```

How to do so ?

- keep track on **variables / objects**
- if is not referenced
- free the memory

Differents algorithms

- Counting references
- Tracing
  - mark and sweep
  - copy collector
- Generational*

GC main characteristics
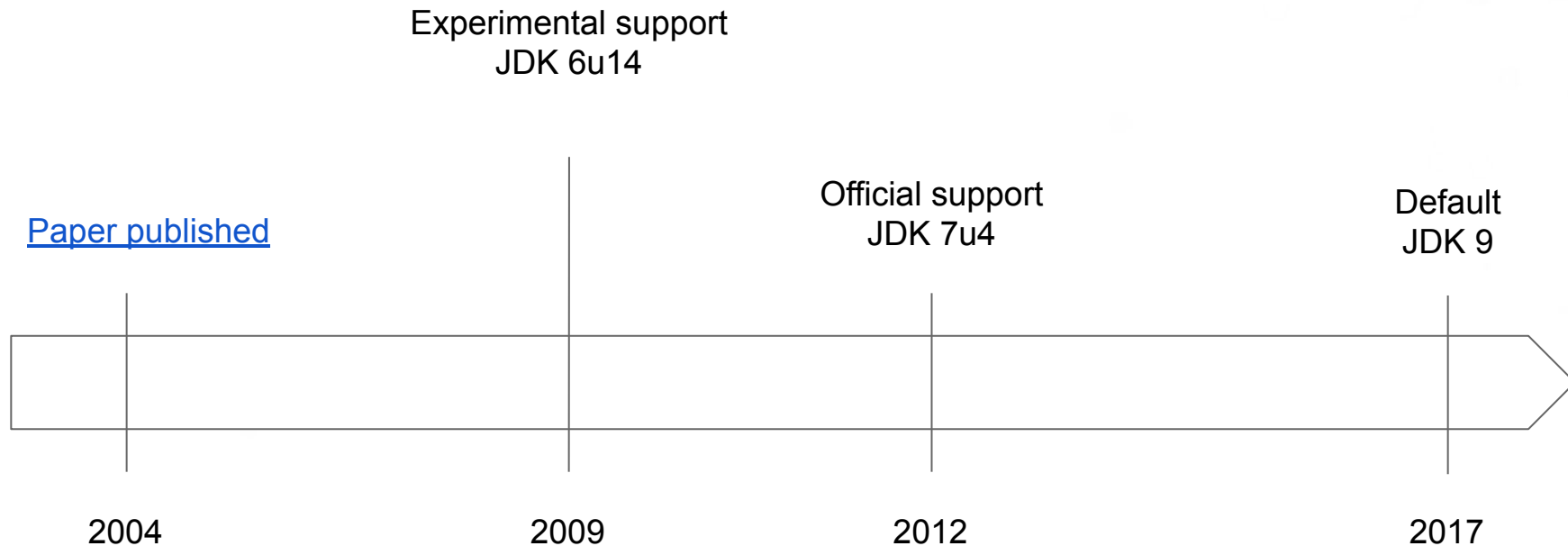
Throughput

Latency

2 History of G1

G1 History

Experimental support
JDK 6u14

Official support
JDK 7u4

Default
JDK 9

Paper published

2004   2009   2012   2017

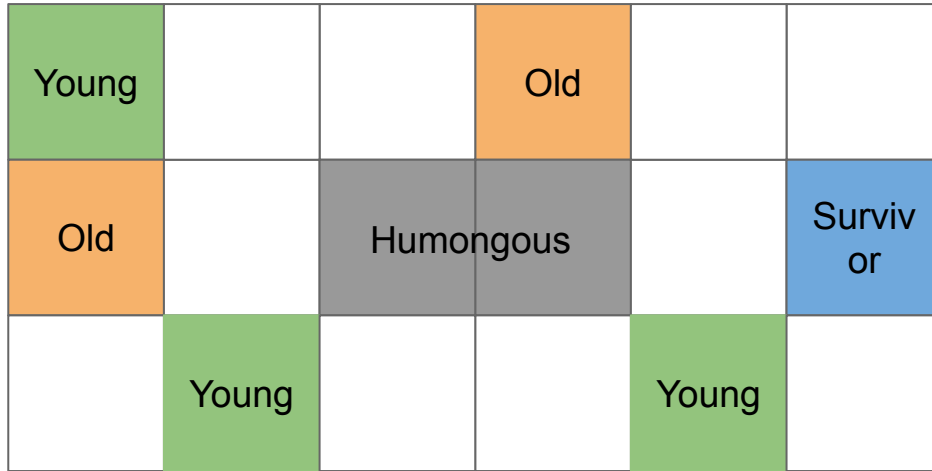# 3 How does it work (G1) ?

Big picture

- Generational
- Regionalized

- Most garbage first

- Collection Set
- Remembered Set

- Low pause

Track (regionalized and generational)
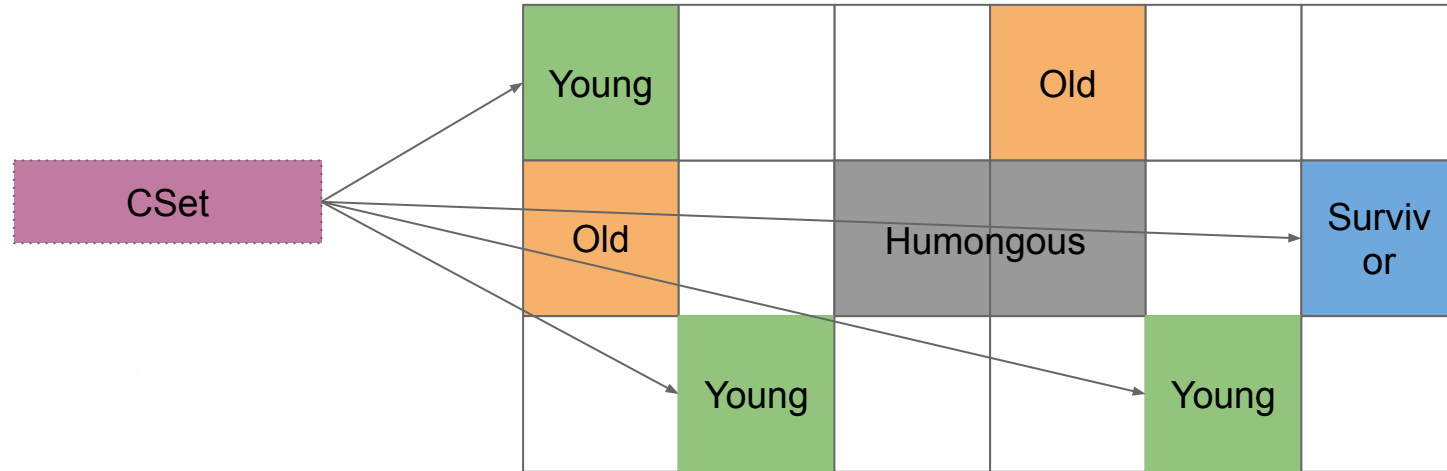
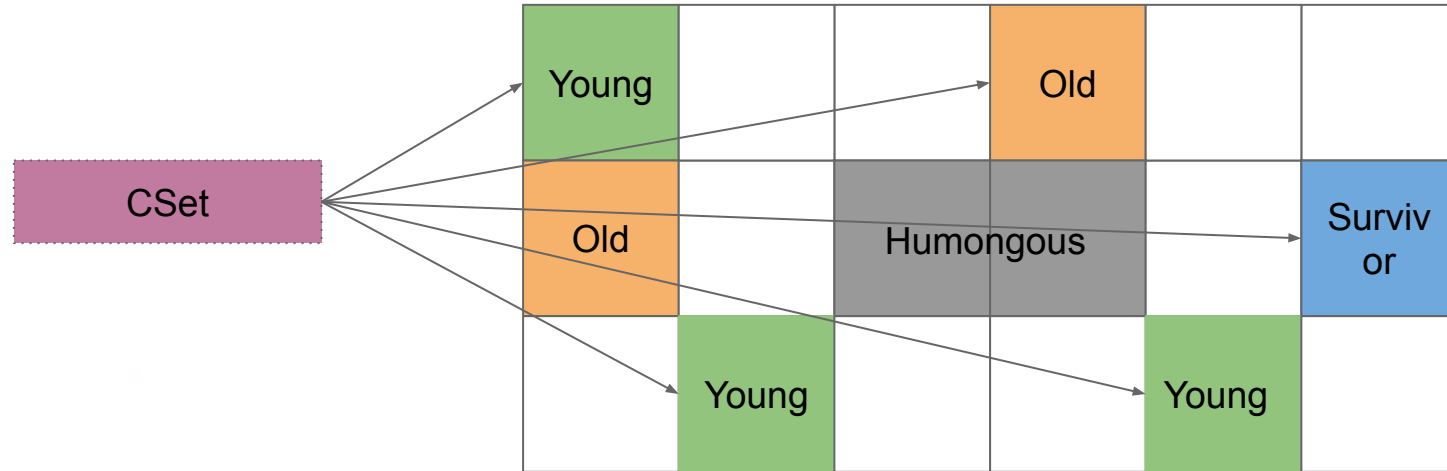Heap

allocated memory

free memory
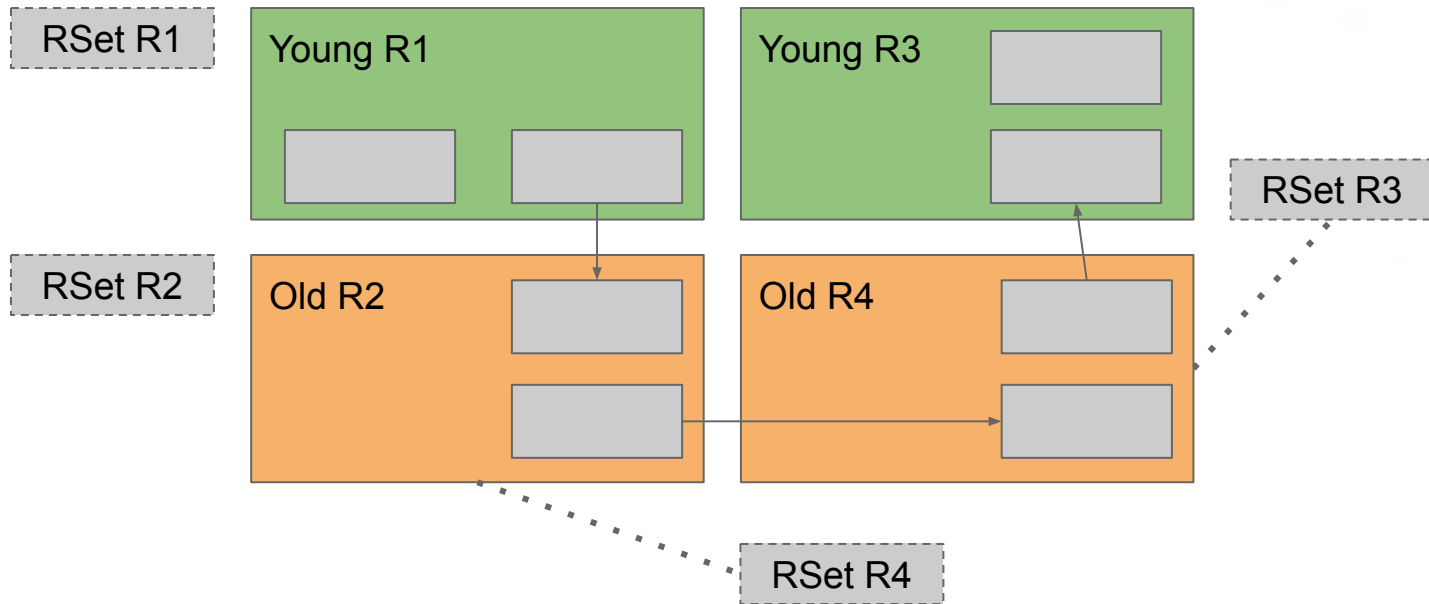
Track **young** gen / Collection Set (CSet)
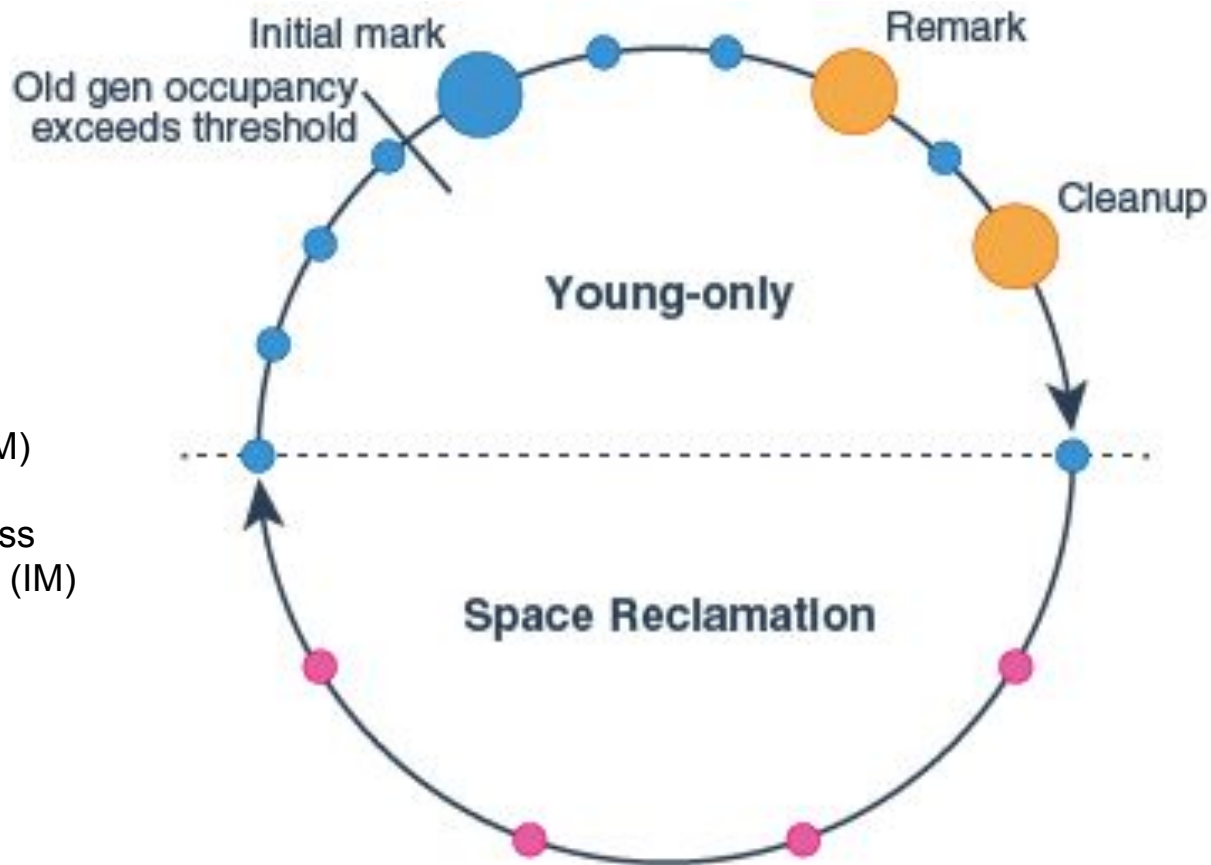
Track **mixed** gen / Collection Set (CSet)

Tracking Remembered Set (RSet)

- Old -> Young
- Old -> Old

RSet R1

RSet R2

RSet R3

RSet R4

Young R1

Young R3

Old R2

Old R4

Free memory phases

In parallel:

➔ Concurrent Marking (IM)
  ◆ track refs
  ◆ pre region liveness
➔ Root Region Scanning (IM)

Sum up

- Generational / Regionalized
- Predictible
    - Autodiagnose
    - Hyper customizable
- Compacting GC
- No full GC (almost)

Kisses and questions

- What about mutability?
- What is the point of implementing a GC with OOP languages?
- What language should I use?

I love you mom & dad.

Ints

- Check my previous presentation about JVisual VM

- HashMap / HashSet load factor
  https://docs.oracle.com/javase/9/docs/api/java/util/HashMap.html

Resources

- [Monica Beckwith](#)
- [Simone Bordet](#)
- [JVisual VM prez](#)
  - **Release date**: November 2017
  - **Author**: Julian Sabos
- [On-the-fly garbage collection: an exercise in cooperation.](#)
  - **Release date**: 20th of October 1975
  - **Authors**: Edsger W.Dijkstra, Leslie Lamport, A.J.Martin, C.S.Scholten, E.F.M.Steffens
- [GC (wikipedia)](#)
- [Tracing GC strategy (wikipedia)](#)
- [G1 GC](#)
  - **Release date**: August 2013
  - **Author**: Oracle
- [GHC vs GOGC](#)
  - **Release date**: 16th of May 2016
  - **Author**: Pusher