Java 垃圾回收

#从入门到吊打面试官

内容100%正确

100%够过面试

Java 之前的垃圾回收

C　malloc()/ralloc()/ calloc()/ free()

C++　new/destructors

Java 的垃圾回收

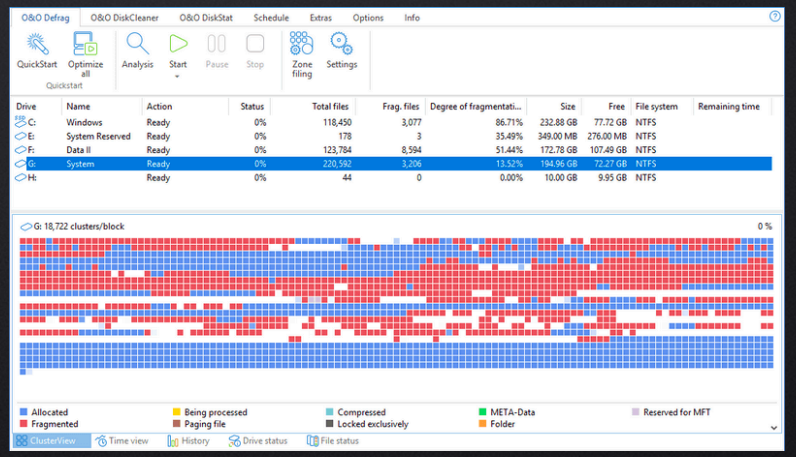
何为垃圾	**Heap** 中不再被引用的对象（Object） while(true) { new Student(); }
基本原理	移除不再被使用的对象（Object）
基本假设	大多数对象的生命周期都很短
两行代码	System.gc(); java.lang.OutOfMemoryError

GC 的3个方法

Mark　从heap的根节点开始遍历整个heap，标记还“活着”的Object

Delete/Sweep　删除heap中的Object

Compating　碎片整理

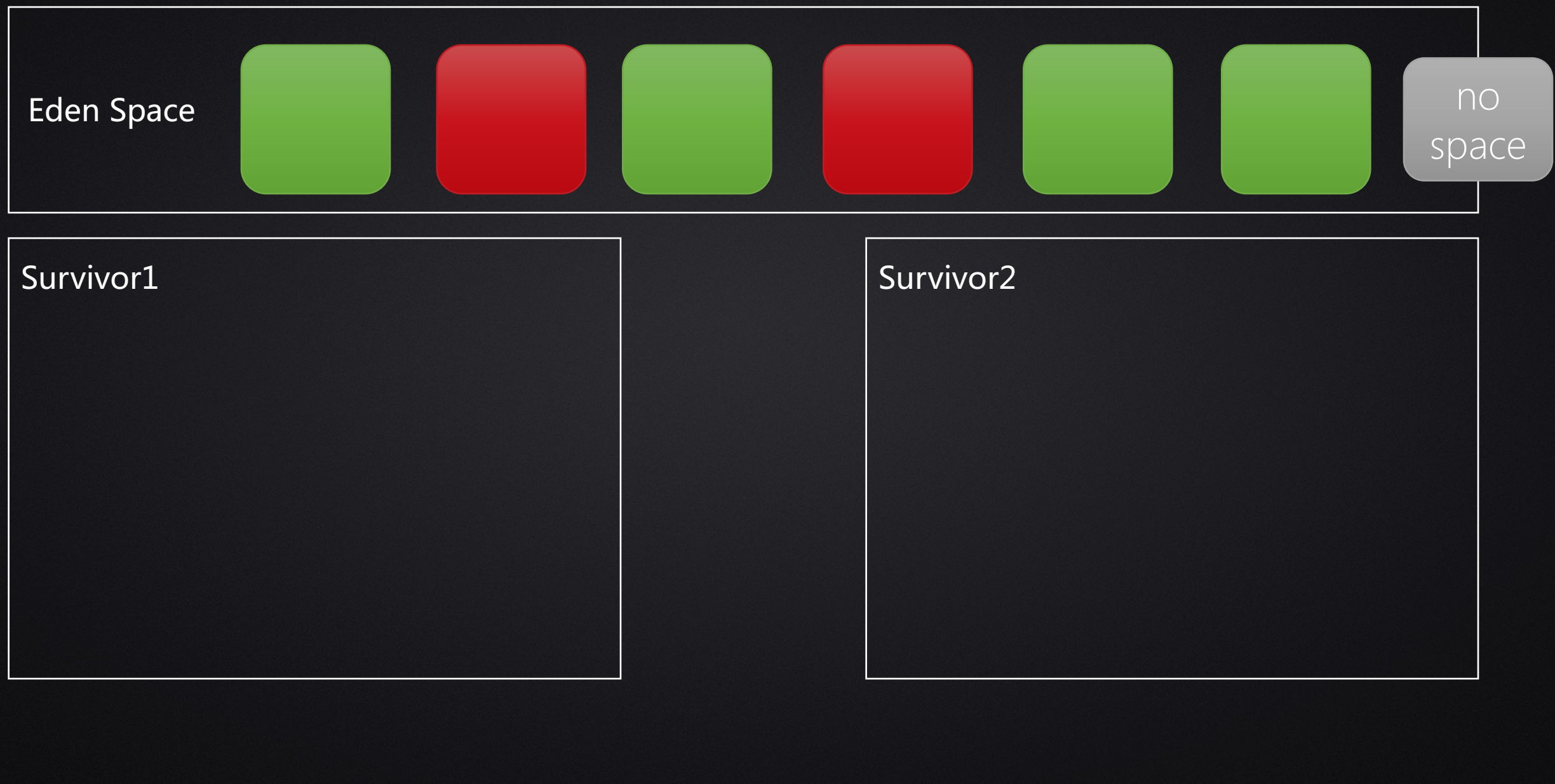


Generational collectors（分代收集器）

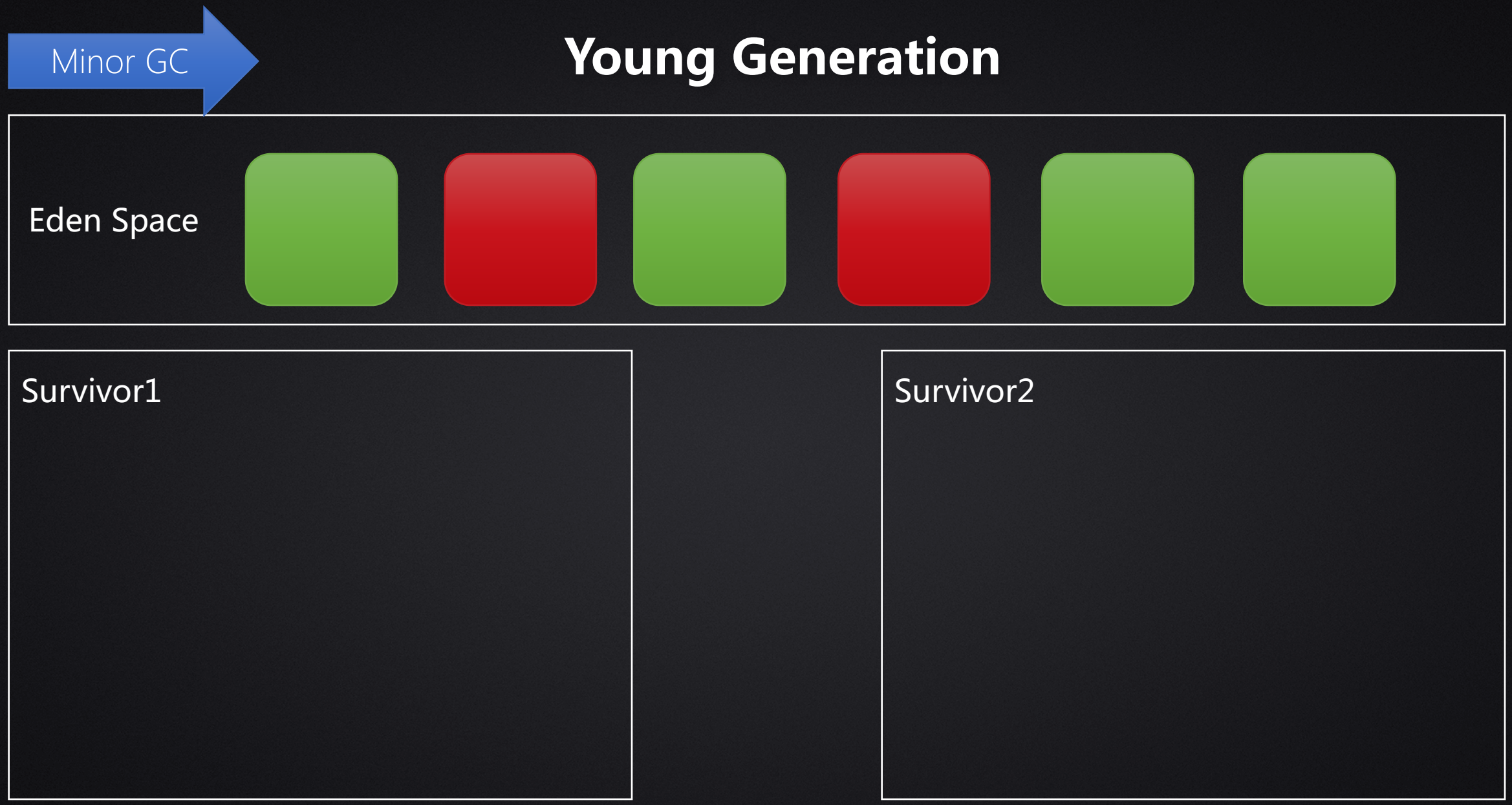
Young Generation

Young Generation

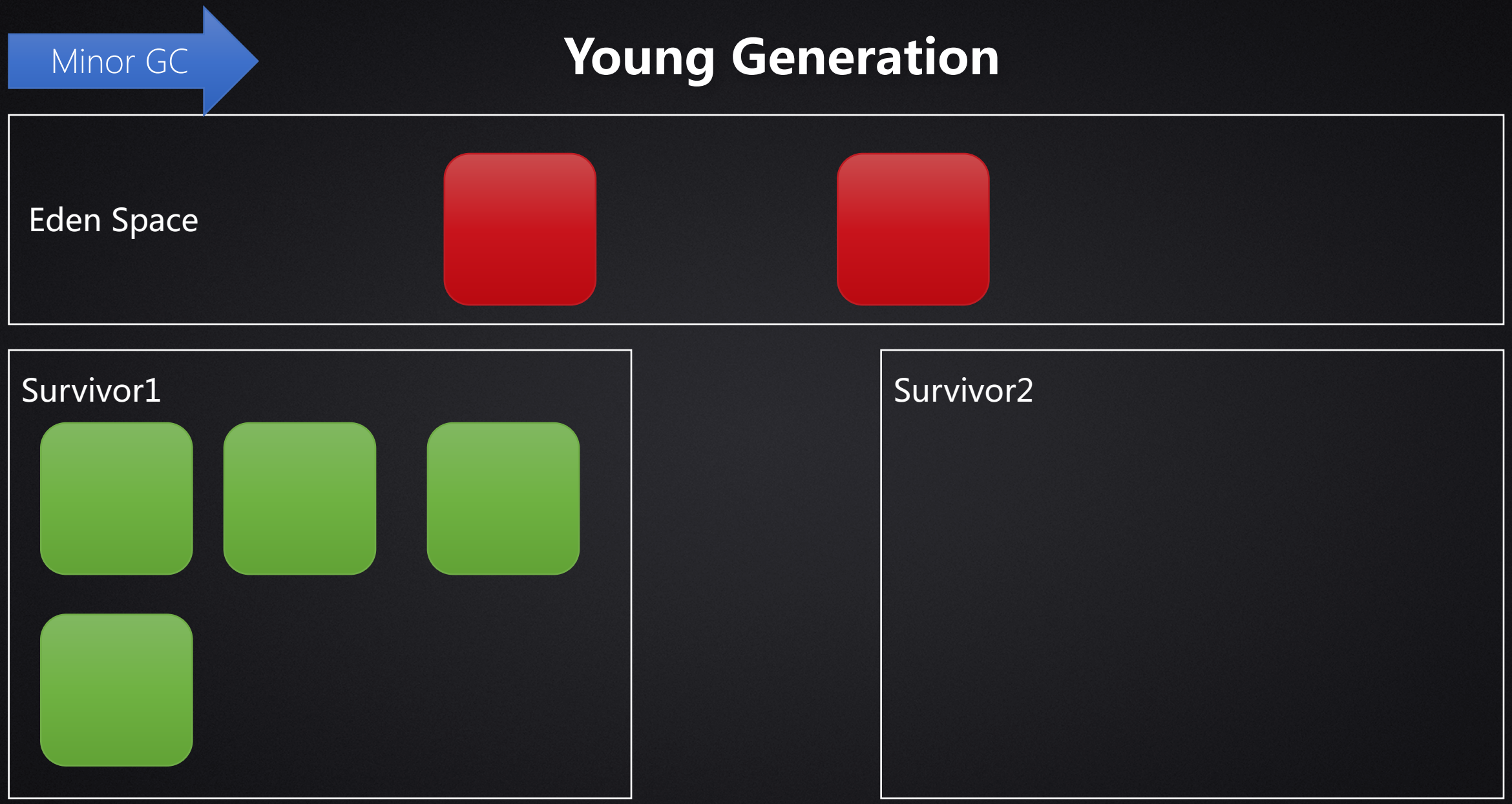
Young Generation



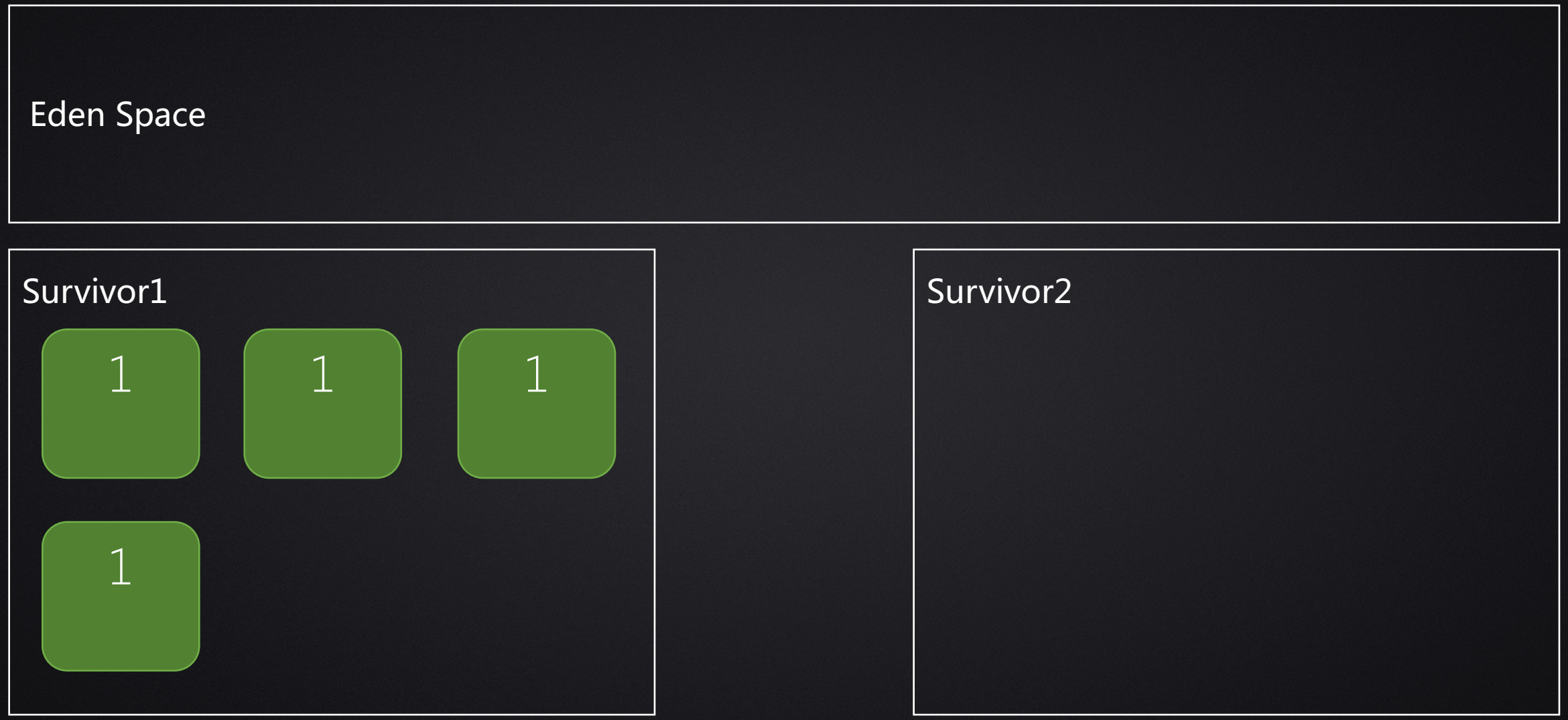
Young Generation



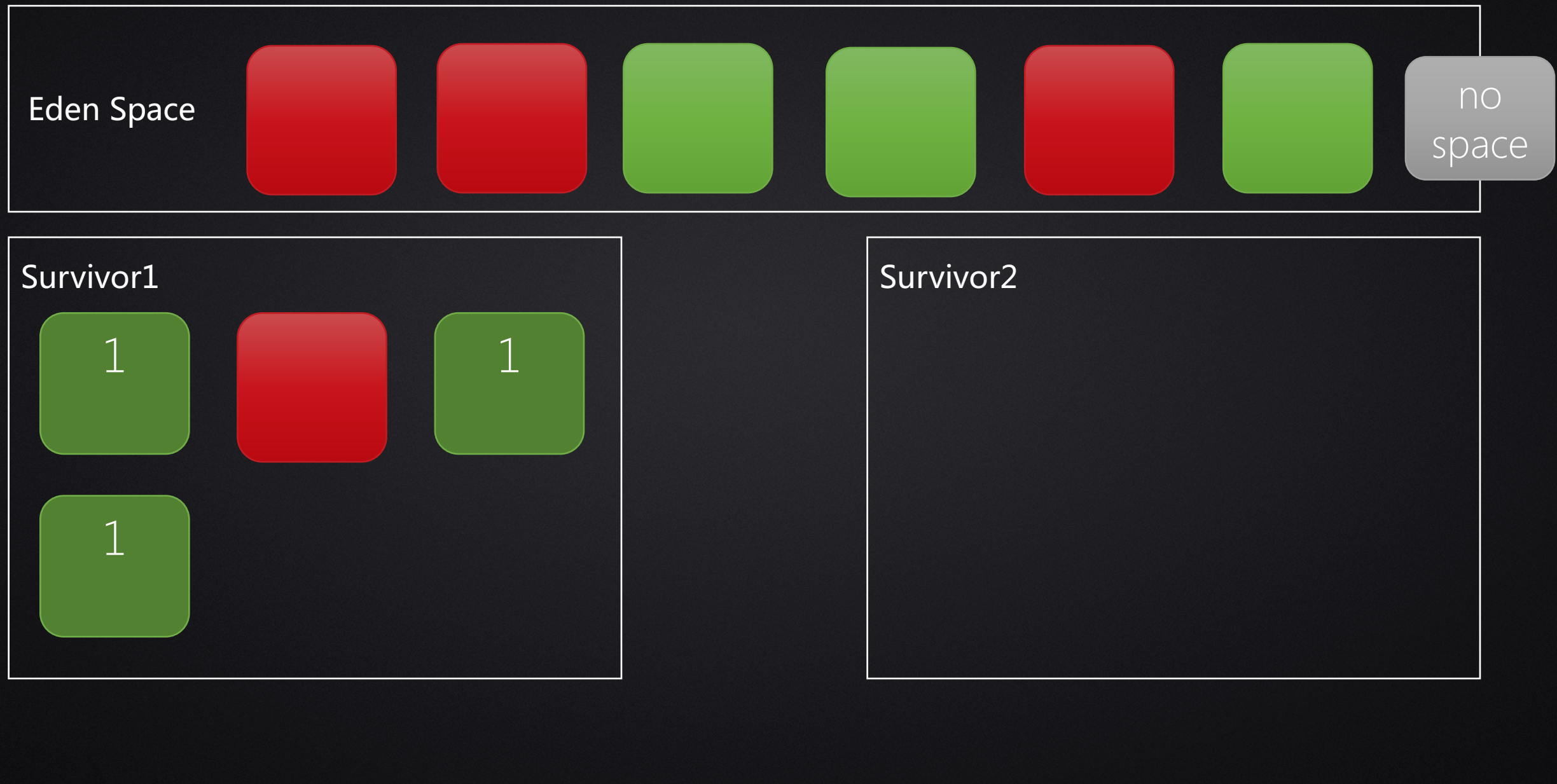
Young Generation



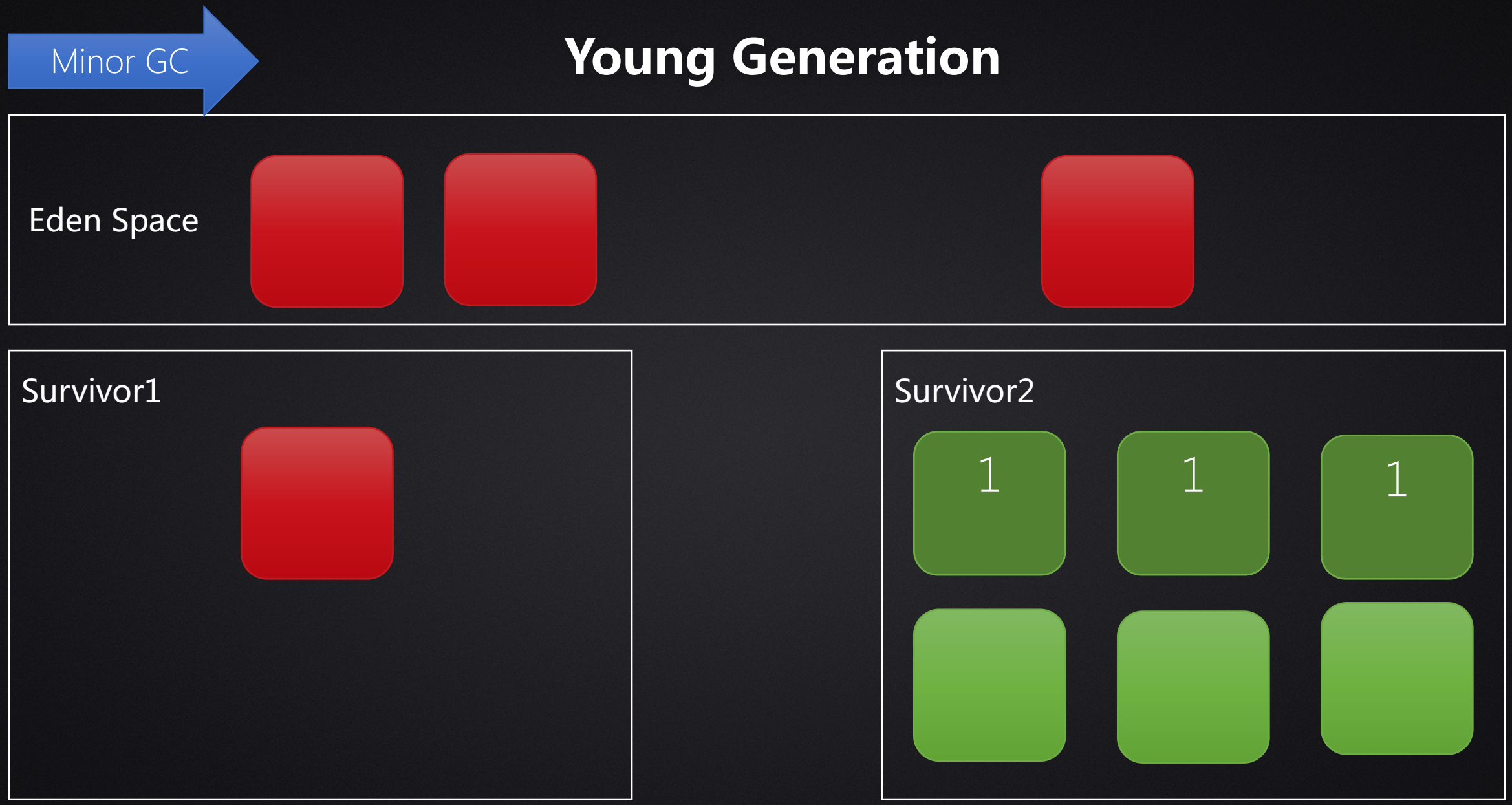
Young Generation



Young Generation



Young Generation



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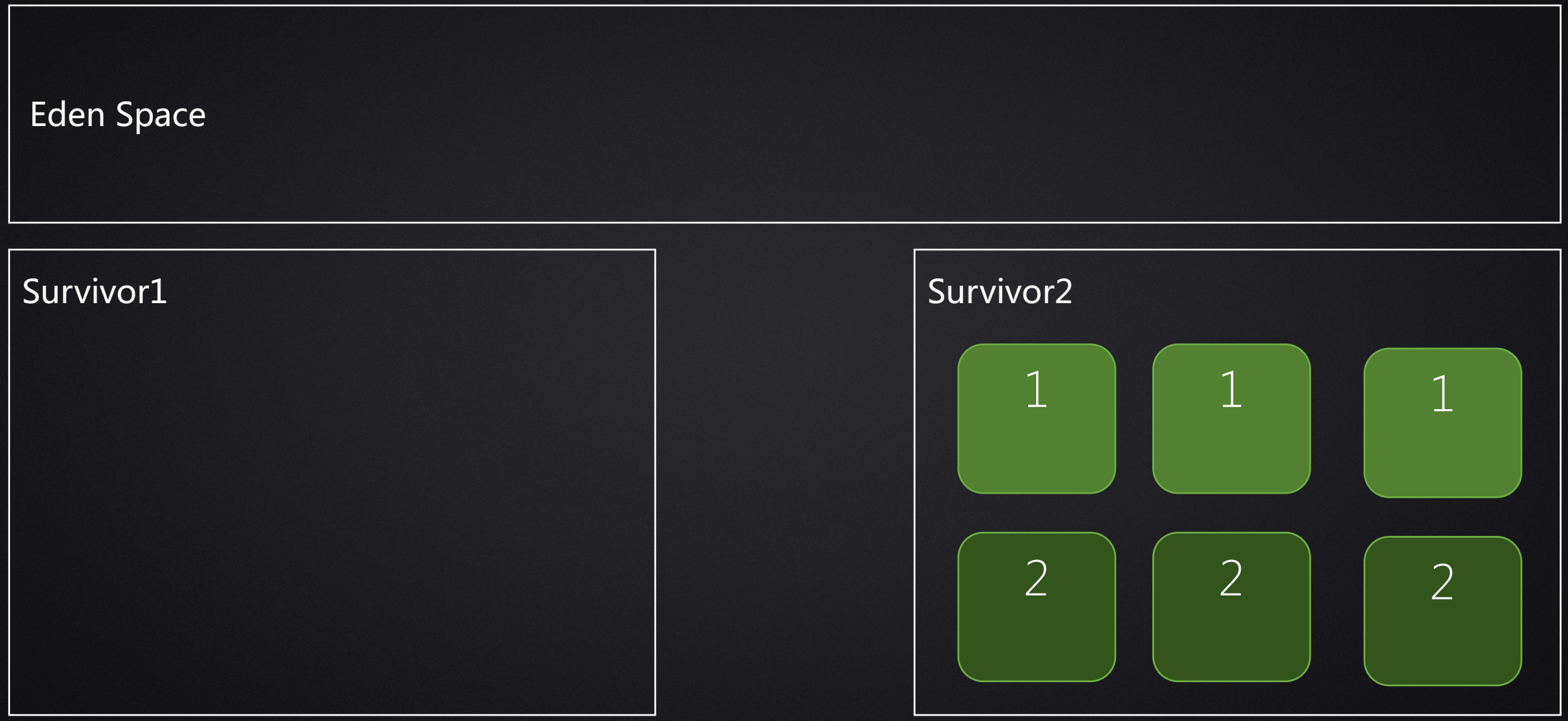
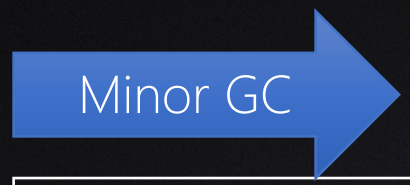


Young Generation



Eden Space

no space

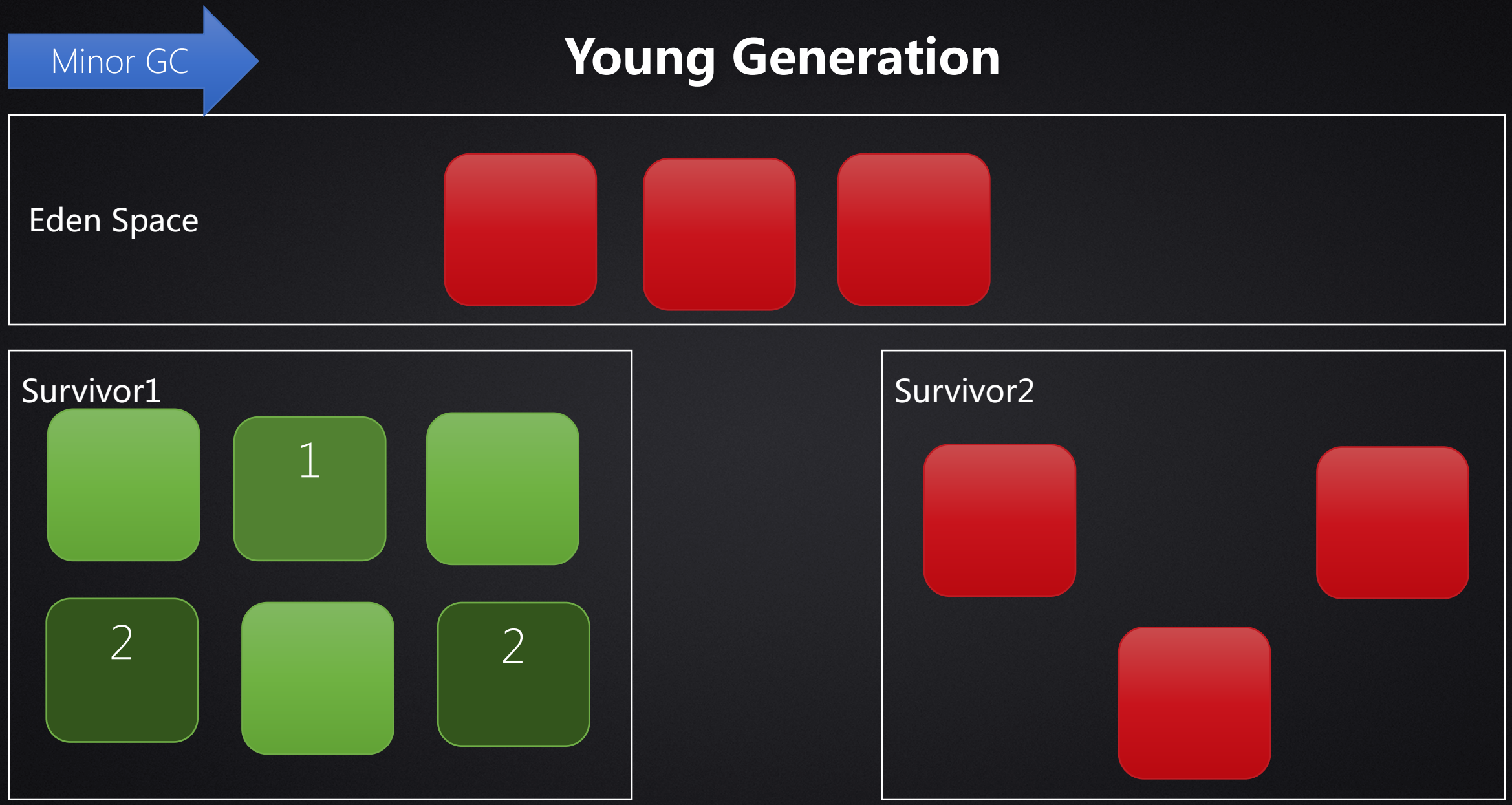
Survivor1

Survivor2

1

2

2


Minor GC
Young Generation
Eden Space
Survivor1
1
2
2
Survivor2

何时进入Old Generation?

Survivor空间不够

-XX:MaxTenuringThreshold存储空间4 bit (二进制1111)(十进制15)

Old Generation何时GC?

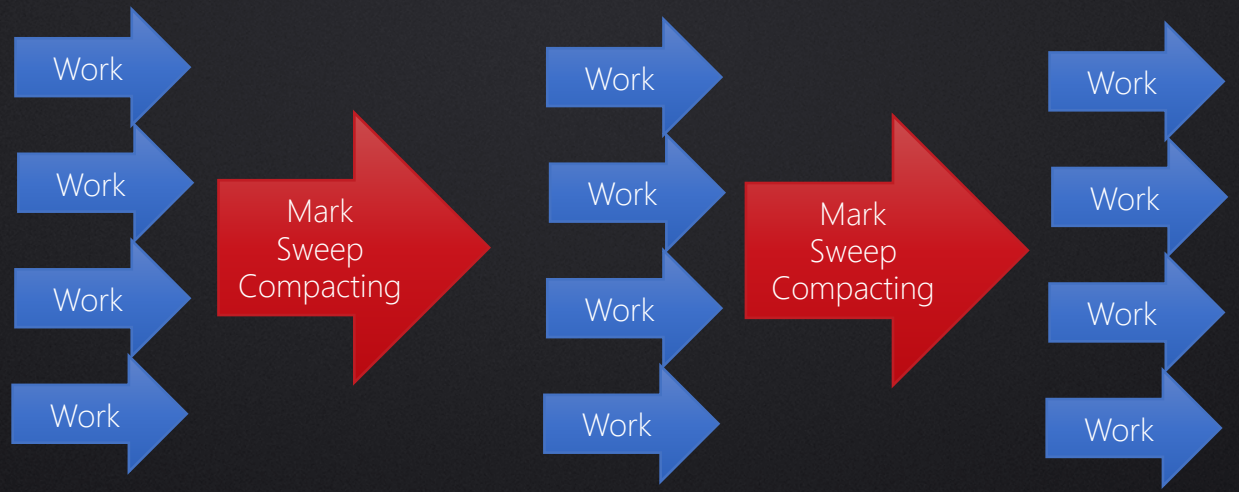
快满时执行Major GC

mark/ sweep/ compacting 整个heap（成本高）

Java 垃圾收集器

Serial Collector

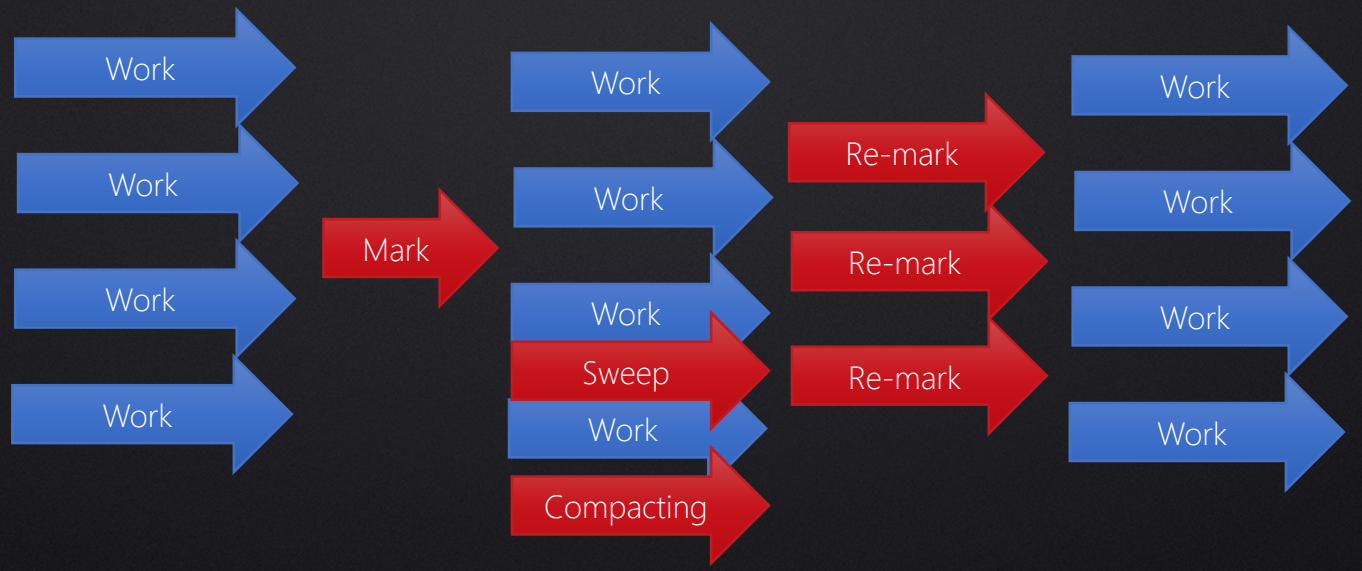
最基础的一种收集器，单线程，适用于非常基础的应用场景



Java 垃圾收集器

Concurrent Collector (CMS)(Concurrent Mark Sweep)

应用程序运行时在后台**同时**运行的一种收集器，不是等待Old Generation即将满了的时候才进行数据收集，而是在后台同时进行。只在mark/ re-mark 的时候"stop-the-world"



Java 垃圾收集器

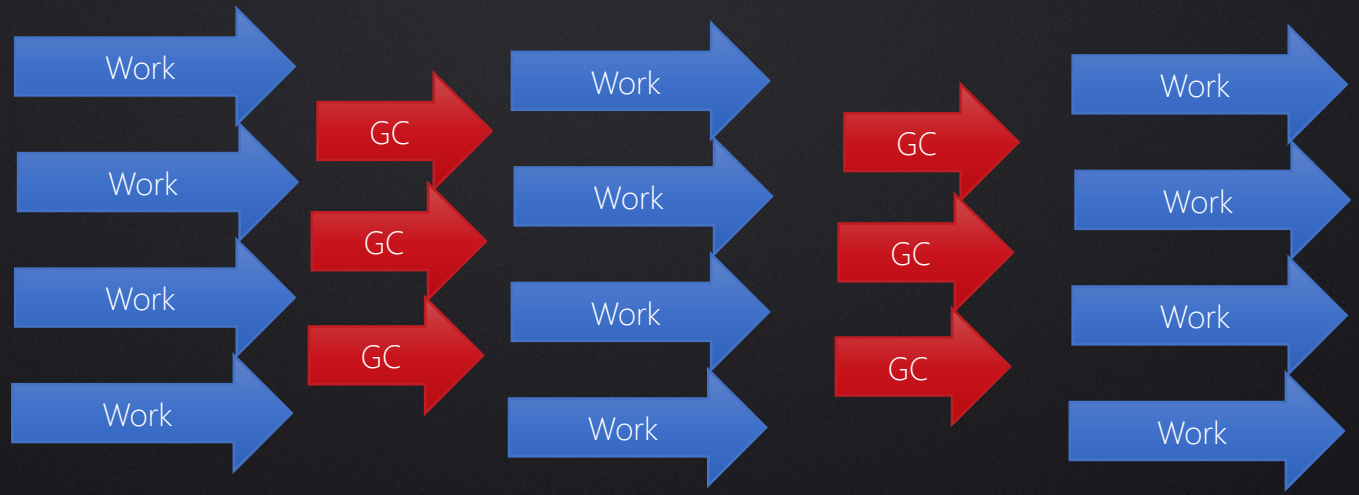
Concurrent Collector 的应用场景

- 足够的内存
- 足够的CPU资源（因为需要提供系统资源给一个常驻后台并不停做清理的线程）
- 较小延迟需求

Java 垃圾收集器

Parallel Collector (并行收集器)

使用CPU多核资源、多线程去处理 mark/ sweep 等操作。仅当heap快满了时才触发，"stop-the-world"



Java 垃圾收集器

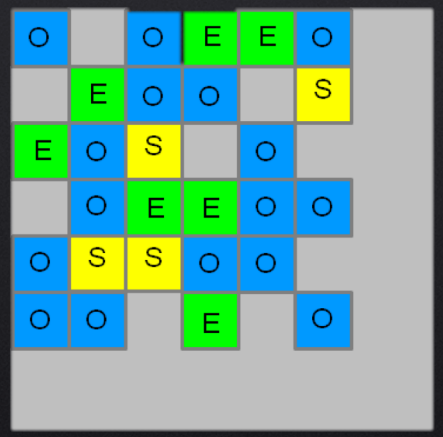
Parallel Collector的应用场景

- 内存有限
- CPU资源有限
- app需要更高的吞吐量并能接受延迟

Java 垃圾收集器

G1 (Garbage-1st)

- 把heap切成小的区块放到内存中
- 每一个区块可能被划分为 Eden space, survivor space或 old space
- 当某个区块出现较多垃圾时，该区块会被GC



Java 垃圾收集器

G1 (Garbage-1st)

- G1 即是Concurrent 的，又是parallel 的
  - Parallel: 因为会在某区块快满时进行GC，且处理多个区块时CPU会用到多个内核
  - Concurrent: 只会停掉某一区块，不会stop-the-world
- 更好的利用了heap资源（之前的垃圾收集器都是一整块，G1内存使用切成小块）
- 高效且低延迟

如何让JVM使用某种垃圾收集器

-XX:+UseSerialGC
-XX:+UseParallelGC: Young generation 设置为parallel, Old generation设置为单线程的GC
-XX:+UseParallelOldGC: Young generation 和Old generation都用 parallel
-XX:+UseParNewGC: 只对Young generation设置Parallel
-XX:+UseConcMarkSweepGC: Old Generation 设置为concurrent. Young generation设置为ParNewGC
- -XX:+UseG1GC
1.6 Parallel, 1.7 update4 G1

对JVM的Heap大小进行调整

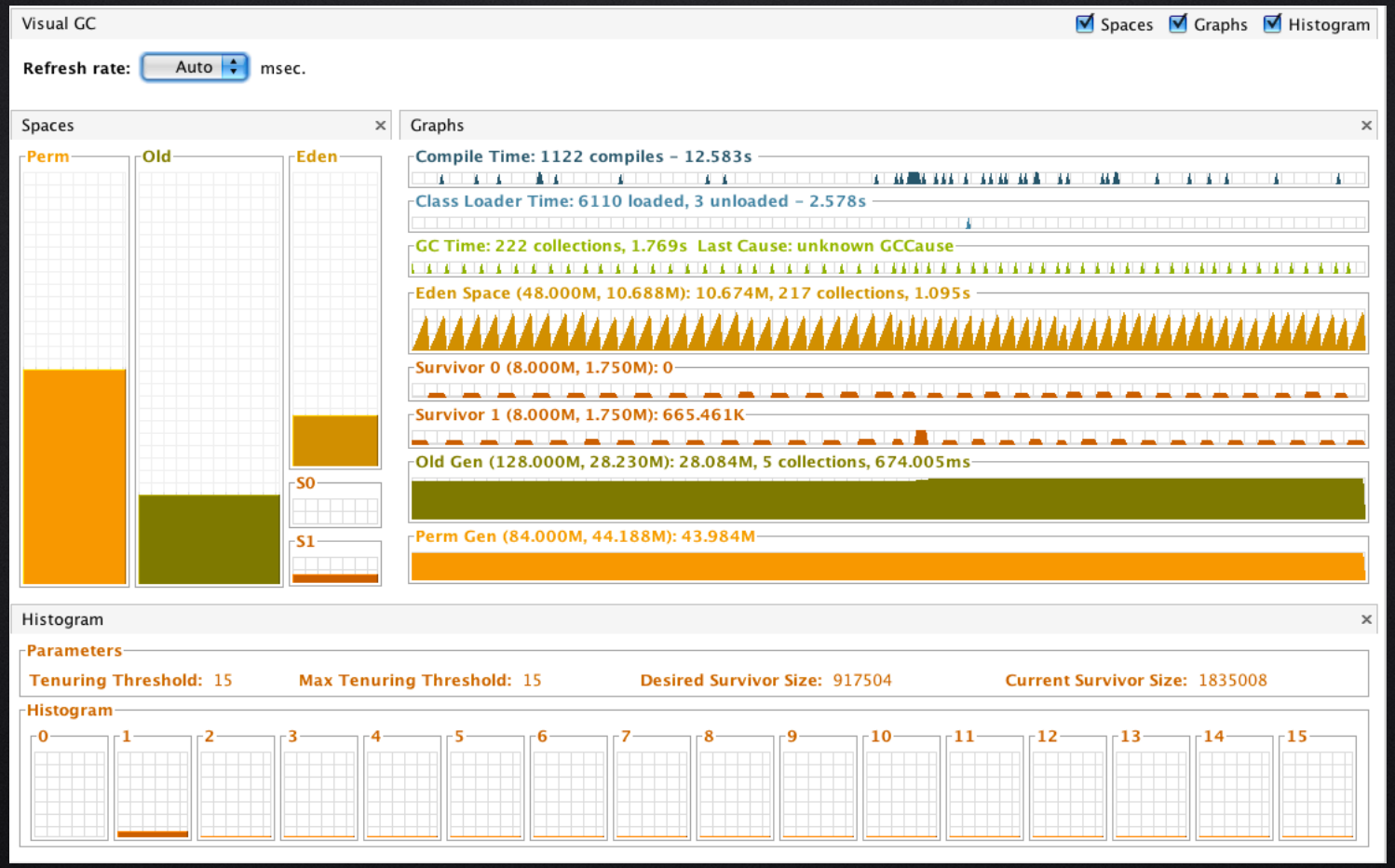
-Xmsvalue (设置heap 的最小值)
-Xmxvalue (设置heap 的最大值) (default:256M)
-XX:NewRatio=ratio (设置为2: Young generation: old generation = 1:2; 1/3 的内存资源分给Young generation; 2/3的内存资源分给Old generation)
-XX:NewSize=size: 设置Eden space 大小
-XX:MaxNewSize=size: 设置Eden space 最大值
-XX:PermSize: 设置Permgen 大小 (method data/ static object....)
-XX:MaxPermSize: 设置Permgen 最大值(def: 64M)

如何打印GC log

-verbose:gc
-XX:+PrintGCDetails
-Xloggc:gc.log

分析GC有没有好用的工具

jvisualvm: gc 可视化插件



还要不要听我讲JVM原理？