

Module02

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Metaspace      used 2728K, capacity 4486K, committed 4864K, reserved 1056768K
class space    used 296K, capacity 386K, committed 512K, reserved 1048576K
(base) 192-168-1-120:java gabriela$ java -XX:+PrintGCDetails -XX:+PrintGCDateStamps -XX:+UseSerialGC -Xms512m -Xmx512m GCLogAnalysis
正在执行 ...
2022-05-08T22:41:14.078-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.078-1000: [DefNew: 139707K->17472K(157248K), 0.0457993 secs] 139707K->46
607K(506816K), 0.0458587 secs] [Times: user=0.02 sys=0.02, real=0.05 secs]
2022-05-08T22:41:14.156-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.156-1000: [DefNew: 157248K->17471K(157248K), 0.0542525 secs] 186383K->89
643K(506816K), 0.0543159 secs] [Times: user=0.02 sys=0.03, real=0.06 secs]
2022-05-08T22:41:14.238-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.239-1000: [DefNew: 157247K->17468K(157248K), 0.0386015 secs] 229419K->12
8885K(506816K), 0.0386597 secs] [Times: user=0.02 sys=0.02, real=0.04 secs]
2022-05-08T22:41:14.309-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.309-1000: [DefNew: 157244K->17471K(157248K), 0.0397495 secs] 268661K->16
9820K(506816K), 0.0398136 secs] [Times: user=0.02 sys=0.02, real=0.04 secs]
2022-05-08T22:41:14.378-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.378-1000: [DefNew: 157247K->17470K(157248K), 0.0402344 secs] 309596K->21
3164K(506816K), 0.0402907 secs] [Times: user=0.02 sys=0.02, real=0.04 secs]
2022-05-08T22:41:14.447-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.447-1000: [DefNew: 157246K->17472K(157248K), 0.0489297 secs] 352940K->25
7235K(506816K), 0.0489887 secs] [Times: user=0.03 sys=0.02, real=0.05 secs]
2022-05-08T22:41:14.527-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.527-1000: [DefNew: 157248K->17472K(157248K), 0.0417817 secs] 397011K->30
0369K(506816K), 0.0418480 secs] [Times: user=0.02 sys=0.02, real=0.04 secs]
2022-05-08T22:41:14.596-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.596-1000: [DefNew: 157248K->17471K(157248K), 0.0397780 secs] 440145K->34
2134K(506816K), 0.0398325 secs] [Times: user=0.03 sys=0.02, real=0.04 secs]
2022-05-08T22:41:14.664-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.664-1000: [DefNew: 157247K->157247K(157248K), 0.0000255 secs] 2022-05-08T
22:41:14.664-1000: [Tenured: 324663K->266423K(349568K), 0.0604046 secs] 481910K->266423K(506816K), [Metaspace: 2721K->2721K(1056768K)], 0.0605027 s
ecs] [Times: user=0.06 sys=0.00, real=0.06 secs]
2022-05-08T22:41:14.749-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.749-1000: [DefNew: 139776K->17470K(157248K), 0.0096848 secs] 406199K->31
1189K(506816K), 0.0097430 secs] [Times: user=0.01 sys=0.00, real=0.01 secs]
2022-05-08T22:41:14.789-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.789-1000: [DefNew: 157246K->17471K(157248K), 0.0201103 secs] 450965K->35
4426K(506816K), 0.0201615 secs] [Times: user=0.01 sys=0.00, real=0.02 secs]
2022-05-08T22:41:14.837-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.837-1000: [DefNew: 157247K->157247K(157248K), 0.0000251 secs] 2022-05-08T
22:41:14.837-1000: [Tenured: 336954K->300639K(349568K), 0.0616917 secs] 494202K->300639K(506816K), [Metaspace: 2721K->2721K(1056768K)], 0.0618003 s
ecs] [Times: user=0.06 sys=0.00, real=0.06 secs]
2022-05-08T22:41:14.926-1000: [GC (Allocation Failure) 2022-05-08T22:41:14.926-1000: [DefNew: 139776K->17471K(157248K), 0.0106233 secs] 440415K->34
9023K(506816K), 0.0106810 secs] [Times: user=0.01 sys=0.00, real=0.01 secs]
执行结束!共生成对象次数:6862
Heap
def new generation      total 157248K, used 23135K [0x00000007a0000000, 0x00000007aaaa0000, 0x00000007aaaa0000)
eden space 139776K,      4% used [0x00000007a0000000, 0x00000007a0587ec8, 0x00000007a8880000)
from space 17472K,      99% used [0x00000007a9990000, 0x00000007aaa9ff08, 0x00000007aaaa0000)
to space 17472K,        0% used [0x00000007a8880000, 0x00000007a8880000, 0x00000007a9990000)
tenured generation      total 349568K, used 331551K [0x00000007aaaa0000, 0x00000007c0000000, 0x00000007c0000000)
the space 349568K,      94% used [0x00000007aaaa0000, 0x00000007bee67fb0, 0x00000007bee68000, 0x00000007c0000000)
Metaspace               used 2728K, capacity 4486K, committed 4864K, reserved 1056768K
class space             used 296K, capacity 386K, committed 512K, reserved 1048576K
(base) 192-168-1-120:java gabriela$
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class space    used 296K, capacity 386K, committed 512K, reserved 1048576K
(base) 192-168-1-120:java gabriela$ java -XX:+PrintGCDetails -XX:+PrintGCDateStamps -XX:+UseSerialGC -Xms1g -Xmx1g GCLogAnalysis
正在执行 ...
2022-05-08T22:44:08.716-1000: [GC (Allocation Failure) 2022-05-08T22:44:08.716-1000: [DefNew: 279616K->34944K(314560K), 0.0672560 secs] 279616K->82
319K(1013632K), 0.0673163 secs] [Times: user=0.04 sys=0.04, real=0.07 secs]
2022-05-08T22:44:08.848-1000: [GC (Allocation Failure) 2022-05-08T22:44:08.848-1000: [DefNew: 314560K->34943K(314560K), 0.0996356 secs] 361935K->16
6741K(1013632K), 0.0996966 secs] [Times: user=0.05 sys=0.05, real=0.10 secs]
2022-05-08T22:44:09.010-1000: [GC (Allocation Failure) 2022-05-08T22:44:09.010-1000: [DefNew: 314559K->34943K(314560K), 0.0827424 secs] 446357K->24
7504K(1013632K), 0.0828194 secs] [Times: user=0.04 sys=0.04, real=0.08 secs]
2022-05-08T22:44:09.149-1000: [GC (Allocation Failure) 2022-05-08T22:44:09.150-1000: [DefNew: 314559K->34943K(314560K), 0.0756040 secs] 527120K->32
4997K(1013632K), 0.0756626 secs] [Times: user=0.04 sys=0.03, real=0.08 secs]
2022-05-08T22:44:09.281-1000: [GC (Allocation Failure) 2022-05-08T22:44:09.281-1000: [DefNew: 314559K->34943K(314560K), 0.1103940 secs] 604613K->39
8136K(1013632K), 0.1104587 secs] [Times: user=0.04 sys=0.04, real=0.11 secs]
2022-05-08T22:44:09.465-1000: [GC (Allocation Failure) 2022-05-08T22:44:09.465-1000: [DefNew: 314559K->34943K(314560K), 0.1131155 secs] 677752K->47
2105K(1013632K), 0.1131736 secs] [Times: user=0.04 sys=0.04, real=0.11 secs]
执行结束!共生成对象次数:6381
Heap
def new generation      total 314560K, used 46151K [0x0000000780000000, 0x0000000795550000, 0x0000000795550000)
eden space 279616K,      4% used [0x0000000780000000, 0x0000000780af2050, 0x0000000791110000)
from space 34944K,      99% used [0x0000000791110000, 0x000000079332ff68, 0x0000000793330000)
to space 34944K,        0% used [0x0000000793330000, 0x0000000793330000, 0x0000000795550000)
tenured generation      total 699072K, used 437161K [0x0000000795550000, 0x00000007c0000000, 0x00000007c0000000)
the space 699072K,      62% used [0x0000000795550000, 0x00000007b003a7c8, 0x00000007b003a800, 0x00000007c0000000)
Metaspace               used 2727K, capacity 4486K, committed 4864K, reserved 1056768K
class space             used 296K, capacity 386K, committed 512K, reserved 1048576K
(base) 192-168-1-120:java gabriela$
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SerialGC

串行 GC 对年轻代使用 mark-copy（标记—复制）算法，对老年代使用 mark-sweep-compact（标记—清除—整理）算法。

调整xms和xmx以后明显GC次数减少，但是GC时间变长很多。

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class space used 296K, capacity 386K, committed 512K, reserved 1048576K
(base) 192-168-1-120:java gabiela$ java -XX:+UseParallelGC -Xms512m -Xmx512m -XX:+PrintGCDetails -XX:+PrintGCDateStamps GCLogAnalysis
正在执行...
2022-05-08T22:47:13.292-1000: [GC (Allocation Failure) [PSYoungGen: 131584K->21496K(153088K)] 131584K->43202K(502784K), 0.0245518 secs] [Times: use
r=0.02 sys=0.05, real=0.02 secs]
2022-05-08T22:47:13.349-1000: [GC (Allocation Failure) [PSYoungGen: 153080K->21487K(153088K)] 174786K->90498K(502784K), 0.0409271 secs] [Times: use
r=0.04 sys=0.08, real=0.05 secs]
2022-05-08T22:47:13.417-1000: [GC (Allocation Failure) [PSYoungGen: 153071K->21500K(153088K)] 222082K->134160K(502784K), 0.0309526 secs] [Times: us
er=0.03 sys=0.04, real=0.03 secs]
2022-05-08T22:47:13.477-1000: [GC (Allocation Failure) [PSYoungGen: 153084K->21491K(153088K)] 265744K->177418K(502784K), 0.0366943 secs] [Times: us
er=0.04 sys=0.04, real=0.04 secs]
2022-05-08T22:47:13.549-1000: [GC (Allocation Failure) [PSYoungGen: 152661K->21498K(153088K)] 308588K->218003K(502784K), 0.0348503 secs] [Times: us
er=0.04 sys=0.04, real=0.04 secs]
2022-05-08T22:47:13.616-1000: [GC (Allocation Failure) [PSYoungGen: 153082K->21492K(153088K)] 349587K->259331K(430080K), 0.0302888 secs] [Times: use
r=0.03 sys=0.05, real=0.03 secs]
2022-05-08T22:47:13.668-1000: [GC (Allocation Failure) [PSYoungGen: 80354K->36019K(116736K)] 318192K->280065K(466432K), 0.0096304 secs] [Times: use
r=0.02 sys=0.01, real=0.01 secs]
2022-05-08T22:47:13.687-1000: [GC (Allocation Failure) [PSYoungGen: 94573K->47912K(116736K)] 338618K->296757K(466432K), 0.0117268 secs] [Times: use
r=0.03 sys=0.00, real=0.01 secs]
2022-05-08T22:47:13.711-1000: [GC (Allocation Failure) [PSYoungGen: 106792K->57843K(116736K)] 355637K->318664K(466432K), 0.0196089 secs] [Times: us
er=0.03 sys=0.02, real=0.02 secs]
2022-05-08T22:47:13.741-1000: [GC (Allocation Failure) [PSYoungGen: 116448K->41193K(116736K)] 377269K->333559K(466432K), 0.0318489 secs] [Times: us
er=0.04 sys=0.03, real=0.03 secs]
2022-05-08T22:47:13.773-1000: [Full GC (Ergonomics) [PSYoungGen: 41193K->0K(116736K)] [ParOldGen: 292365K->236555K(349696K)] 333559K->236555K(46643
2K), [Metaspace: 2721K->2721K(1056768K)], 0.0543842 secs] [Times: user=0.11 sys=0.02, real=0.05 secs]
2022-05-08T22:47:13.844-1000: [GC (Allocation Failure) [PSYoungGen: 58789K->17549K(116736K)] 295344K->254104K(466432K), 0.0036799 secs] [Times: use
r=0.01 sys=0.00, real=0.00 secs]
2022-05-08T22:47:13.861-1000: [GC (Allocation Failure) [PSYoungGen: 76429K->16607K(116736K)] 312984K->270175K(466432K), 0.0084007 secs] [Times: use
r=0.02 sys=0.00, real=0.01 secs]
2022-05-08T22:47:13.882-1000: [GC (Allocation Failure) [PSYoungGen: 75487K->21121K(116736K)] 329055K->290455K(466432K), 0.0108508 secs] [Times: use
r=0.02 sys=0.00, real=0.01 secs]
2022-05-08T22:47:13.905-1000: [GC (Allocation Failure) [PSYoungGen: 80001K->19127K(116736K)] 349335K->308523K(466432K), 0.0074424 secs] [Times: use
r=0.02 sys=0.00, real=0.01 secs]
2022-05-08T22:47:13.929-1000: [GC (Allocation Failure) [PSYoungGen: 78007K->20118K(116736K)] 367403K->327845K(466432K), 0.0150270 secs] [Times: use
r=0.02 sys=0.02, real=0.02 secs]
2022-05-08T22:47:13.944-1000: [Full GC (Ergonomics) [PSYoungGen: 20118K->0K(116736K)] [ParOldGen: 307726K->273697K(349696K)] 327845K->273697K(46643
2K), [Metaspace: 2721K->2721K(1056768K)], 0.0530034 secs] [Times: user=0.11 sys=0.02, real=0.05 secs]
2022-05-08T22:47:14.027-1000: [GC (Allocation Failure) [PSYoungGen: 58880K->20401K(116736K)] 332577K->294099K(466432K), 0.0060043 secs] [Times: use
r=0.01 sys=0.00, real=0.01 secs]
2022-05-08T22:47:14.046-1000: [GC (Allocation Failure) [PSYoungGen: 78993K->20664K(116736K)] 352690K->313647K(466432K), 0.0096525 secs] [Times: use
r=0.02 sys=0.00, real=0.01 secs]
2022-05-08T22:47:14.078-1000: [GC (Allocation Failure) [PSYoungGen: 79544K->18062K(116736K)] 372527K->329992K(466432K), 0.0088956 secs] [Times: use
r=0.02 sys=0.01, real=0.00 secs]
2022-05-08T22:47:14.079-1000: [Full GC (Ergonomics) [PSYoungGen: 18062K->0K(116736K)] [ParOldGen: 311929K->288139K(349696K)] 329992K->288139K(46643
2K), [Metaspace: 2721K->2721K(1056768K)], 0.0607594 secs] [Times: user=0.12 sys=0.00, real=0.07 secs]
执行结束!共生成功对象次数:5832
Heap
PSYoungGen total 116736K, used 57288K [0x00000007b5580000, 0x00000007c0000000, 0x00000007c0000000)
2022-05-08T22:47:14.079-1000: [Full GC (Ergonomics) [PSYoungGen: 18062K->0K(116736K)] [ParOldGen: 311929K->288139K(349696K)] 329992K->288139K(46643
2K), [Metaspace: 2721K->2721K(1056768K)], 0.0607594 secs] [Times: user=0.12 sys=0.00, real=0.07 secs]
执行结束!共生成功对象次数:5832
Heap
PSYoungGen total 116736K, used 57288K [0x00000007b5580000, 0x00000007c0000000, 0x00000007c0000000)
eden space 58880K, 97% used [0x00000007b5580000, 0x00000007b8d721d8, 0x00000007b8f00000)
from space 57856K, 0% used [0x00000007bc780000, 0x00000007bc780000, 0x00000007c0000000)
to space 57856K, 0% used [0x00000007b8f00000, 0x00000007b8f00000, 0x00000007bc780000)
ParOldGen total 349696K, used 288139K [0x00000007a0000000, 0x00000007b5580000, 0x00000007b5580000)
object space 349696K, 82% used [0x00000007a0000000, 0x00000007b1962f60, 0x00000007b5580000)
Metaspace used 2728K, capacity 4486K, committed 4864K, reserved 1056768K
class space used 296K, capacity 386K, committed 512K, reserved 1048576K
```

ParallelGC

并行垃圾收集器这一类组合，在年轻代使用“标记—复制（mark-copy）算法”，在老年代使用“标记—清除—整理（mark-sweep-compact）算法”。年轻代和老年代的垃圾回收都会触发 STW 事件，暂停所有的应用线程来执行垃圾收集。两者在执行“标记和复制/整理”阶段时都使用多个线程。通过并行执行，使得 GC 时间大幅减少。

并行垃圾收集器适用于多核服务器，主要目标是增加吞吐量。

与 SerialGC 相比，GC 暂停时间大幅减少。


```
class space used 296K, capacity 386K, committed 512K, reserved 1048576K
[(base) 192-168-1-120:java gabiela$ java -XX:+UseConcMarkSweepGC -Xms512m -Xmx512m -XX:+PrintGCDetails -XX:+PrintGCDateStamps GCLogAnalysis
正在执行...
2022-05-08T22:57:21.364-1000: [GC (Allocation Failure) 2022-05-08T22:57:21.364-1000: [ParNew: 139776K->17471K(157248K), 0.0752469 secs] 139776K->46
409K(506816K), 0.0757740 secs] [Times: user=0.04 sys=0.04, real=0.08 secs]
2022-05-08T22:57:21.473-1000: [GC (Allocation Failure) 2022-05-08T22:57:21.473-1000: [ParNew: 157247K->17472K(157248K), 0.1095741 secs] 186185K->88
874K(506816K), 0.1096371 secs] [Times: user=0.05 sys=0.05, real=0.11 secs]
2022-05-08T22:57:21.615-1000: [GC (Allocation Failure) 2022-05-08T22:57:21.615-1000: [ParNew: 157136K->17472K(157248K), 0.0580305 secs] 228539K->13
038K(506816K), 0.0580960 secs] [Times: user=0.10 sys=0.03, real=0.06 secs]
2022-05-08T22:57:21.704-1000: [GC (Allocation Failure) 2022-05-08T22:57:21.704-1000: [ParNew: 157248K->17472K(157248K), 0.0649501 secs] 270079K->17
424K(506816K), 0.0650135 secs] [Times: user=0.11 sys=0.03, real=0.06 secs]
2022-05-08T22:57:21.800-1000: [GC (Allocation Failure) 2022-05-08T22:57:21.800-1000: [ParNew: 157182K->17472K(157248K), 0.0632711 secs] 313959K->22
0780K(506816K), 0.0633369 secs] [Times: user=0.09 sys=0.03, real=0.06 secs]
2022-05-08T22:57:21.864-1000: [GC (CMS Initial Mark) [1 CMS-initial-mark: 203317K(349568K)] 223927K(506816K), 0.0049326 secs] [Times: user=0.00 sys
=0.00, real=0.00 secs]
2022-05-08T22:57:21.869-1000: [CMS-concurrent-mark-start]
2022-05-08T22:57:21.888-1000: [CMS-concurrent-mark: 0.011/0.011 secs] [Times: user=0.01 sys=0.01, real=0.02 secs]
2022-05-08T22:57:21.888-1000: [CMS-concurrent-preclean-start]
2022-05-08T22:57:21.881-1000: [CMS-concurrent-preclean: 0.001/0.001 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2022-05-08T22:57:21.881-1000: [CMS-concurrent-abortable-preclean-start]
2022-05-08T22:57:21.905-1000: [GC (Allocation Failure) 2022-05-08T22:57:21.905-1000: [ParNew: 157248K->17470K(157248K), 0.0675343 secs] 360565K->26
1348K(506816K), 0.0677017 secs] [Times: user=0.12 sys=0.03, real=0.07 secs]
2022-05-08T22:57:22.005-1000: [GC (Allocation Failure) 2022-05-08T22:57:22.005-1000: [ParNew: 157246K->17470K(157248K), 0.0614996 secs] 401124K->30
4789K(506816K), 0.0615616 secs] [Times: user=0.08 sys=0.03, real=0.06 secs]
2022-05-08T22:57:22.103-1000: [GC (Allocation Failure) 2022-05-08T22:57:22.103-1000: [ParNew2022-05-08T22:57:22.171-1000: [CMS-concurrent-abortable
-preclean: 0.007/0.290 secs] [Times: user=0.41 sys=0.08, real=0.29 secs]
: 157246K->17471K(157248K), 0.0798562 secs] 444565K->348206K(506816K), 0.0799175 secs] [Times: user=0.14 sys=0.03, real=0.08 secs]
2022-05-08T22:57:22.183-1000: [GC (CMS Final Remark) [YG occupancy: 17979 K (157248 K)]2022-05-08T22:57:22.183-1000: [Rescan (parallel) , 0.0006981
secs]2022-05-08T22:57:22.184-1000: [weak refs processing, 0.0000306 secs]2022-05-08T22:57:22.184-1000: [class unloading, 0.0003823 secs]2022-05-08
T22:57:22.184-1000: [scrub symbol table, 0.0006223 secs]2022-05-08T22:57:22.185-1000: [scrub string table, 0.0002426 secs][1 CMS-remark: 330735K(34
9568K)] 348714K(506816K), 0.0021130 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2022-05-08T22:57:22.186-1000: [CMS-concurrent-sweep-start]
2022-05-08T22:57:22.187-1000: [CMS-concurrent-sweep: 0.001/0.001 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2022-05-08T22:57:22.187-1000: [CMS-concurrent-reset-start]
2022-05-08T22:57:22.188-1000: [CMS-concurrent-reset: 0.001/0.001 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
执行结束!共生成对象次数:4579
Heap
par new generation total 157248K, used 134996K [0x00000007a0000000, 0x00000007aaaa0000], 0x00000007aaaa0000)
eden space 139776K, 84% used [0x00000007a0000000, 0x00000007a72c5470, 0x00000007a8880000)
from space 17472K, 99% used [0x00000007a8880000, 0x00000007a999fc00, 0x00000007a9990000)
to space 17472K, 0% used [0x00000007a9990000, 0x00000007a9990000, 0x00000007aaaa0000)
concurrent mark-sweep generation total 349568K, used 288080K [0x00000007aaaa0000, 0x00000007c0000000, 0x00000007c0000000)
Metaspace used 2728K, capacity 4486K, committed 4864K, reserved 106768K
class space used 296K, capacity 386K, committed 512K, reserved 1048576K
(Heap: 100.41M / 100.41M, 1.00% used)
```

CMSGC

以获取最短回收停顿时间为目标的收集器，基于并发“标记清理”实现。

```
Error: A fatal exception has occurred. Program will exit.
[(base) 192-168-1-120:java gabiela$ java -XX:+UseG1GC -Xms512m -Xmx512m -XX:+PrintGCDetails -XX:+PrintGCDateStamps GCLogAnalysis
正在执行...
2022-05-08T23:00:52.012-1000: [GC pause (G1 Evacuation Pause) (young), 0.0108998 secs]
[Parallel Time: 7.1 ms, GC Workers: 4]
[GC Worker Start (ms): Min: 145.1, Avg: 145.9, Max: 147.0, Diff: 2.0]
[Ext Root Scanning (ms): Min: 0.0, Avg: 0.2, Max: 0.7, Diff: 0.7, Sum: 0.9]
[Update RS (ms): Min: 0.0, Avg: 0.0, Max: 0.0, Diff: 0.0, Sum: 0.0]
[Processed Buffers: Min: 0, Avg: 0.0, Max: 0, Diff: 0, Sum: 0]
[Scan RS (ms): Min: 0.0, Avg: 0.0, Max: 0.0, Diff: 0.0, Sum: 0.0]
[Code Root Scanning (ms): Min: 0.0, Avg: 0.0, Max: 0.0, Diff: 0.0, Sum: 0.0]
[Object Copy (ms): Min: 4.6, Avg: 5.7, Max: 6.3, Diff: 1.7, Sum: 22.6]
[Termination (ms): Min: 0.0, Avg: 0.2, Max: 0.3, Diff: 0.3, Sum: 0.7]
[Termination Attempts: Min: 1, Avg: 1.0, Max: 1, Diff: 0, Sum: 4]
[GC Worker Other (ms): Min: 0.0, Avg: 0.0, Max: 0.1, Diff: 0.1, Sum: 0.2]
[GC Worker Total (ms): Min: 5.0, Avg: 6.1, Max: 7.0, Diff: 2.0, Sum: 24.5]
[GC Worker End (ms): Min: 152.0, Avg: 152.1, Max: 152.1, Diff: 0.0]
[Code Root Fixup: 0.0 ms]
[Code Root Purge: 0.0 ms]
[Clear CT: 0.1 ms]
[Other: 3.7 ms]
[Choose CSet: 0.0 ms]
[Ref Proc: 0.1 ms]
[Ref Enq: 0.0 ms]
[Redirty Cards: 0.1 ms]
[Humongous Register: 0.0 ms]
[Humongous Reclaim: 0.0 ms]
[Free CSet: 0.0 ms]
[Eden: 25.0M(25.0M)->0.0B(21.0M) Survivors: 0.0B->4096.0K Heap: 34.7M(512.0M)->14.2M(512.0M)]
[Times: user=0.02 sys=0.01, real=0.01 secs]
2022-05-08T23:00:52.038-1000: [GC pause (G1 Evacuation Pause) (young), 0.0049180 secs]
[Parallel Time: 4.4 ms, GC Workers: 4]
[GC Worker Start (ms): Min: 167.1, Avg: 167.4, Max: 168.1, Diff: 1.0]
[Ext Root Scanning (ms): Min: 0.0, Avg: 0.2, Max: 0.4, Diff: 0.4, Sum: 0.7]
[Update RS (ms): Min: 0.0, Avg: 0.0, Max: 0.0, Diff: 0.0, Sum: 0.0]
[Processed Buffers: Min: 0, Avg: 0.5, Max: 2, Diff: 2, Sum: 2]
[Scan RS (ms): Min: 0.0, Avg: 0.0, Max: 0.0, Diff: 0.0, Sum: 0.0]
[Code Root Scanning (ms): Min: 0.0, Avg: 0.0, Max: 0.0, Diff: 0.0, Sum: 0.0]
[Object Copy (ms): Min: 3.3, Avg: 3.6, Max: 3.7, Diff: 0.5, Sum: 14.2]
[Termination (ms): Min: 0.0, Avg: 0.3, Max: 0.5, Diff: 0.5, Sum: 1.1]
[Termination Attempts: Min: 1, Avg: 1.0, Max: 1, Diff: 0, Sum: 4]
[GC Worker Other (ms): Min: 0.0, Avg: 0.0, Max: 0.0, Diff: 0.0, Sum: 0.1]
[GC Worker Total (ms): Min: 3.3, Avg: 4.1, Max: 4.4, Diff: 1.0, Sum: 16.3]
```

G1GC

G1 GC 这是一种兼顾吞吐量和停顿时间的 GC 实现，是 Oracle JDK 9 以后的默认 GC 选项。G1 可以直观的设定停顿时间的目标，相比于 CMS GC，G1 未必能做到

CMS 在最好情况下的延时停顿，但是最差情况要好很多。