

使用 GCLogAnalysis.java 自己演练一遍串行/并行/CMS/G1的案例

串行GC

```
D:\workspace\Java_Advanced\src>java -XX:+UseSerialGC -Xms512m -Xmx512m
-Xloggc:serial.log -XX:+PrintGCDetails -XX:+PrintGCDateStamps week02.GCLogAnalysis
```

正在执行...

执行结束!共生成对象次数:12603

运行结果：

```
Java HotSpot(TM) 64-Bit Server VM (59.271-b09) for windows-amd64 JRE (1.8.0_271-b09), built on Sep 16 2020 19:14:59 by "" with MS VCH+ 15.9 (VS2017)
Memory: 4k page, physical 16623216k(12283364 free), swap 17671792k(11002176 free)
CommandLine Flags: -XX:InitialHeapSize=536870912 -XX:MaxHeapSize=536870912 -XX:+PrintGC -XX:+PrintGCDateStamps -XX:+PrintGCDetails -XX:+PrintGCTimeStamps -XX:+UseCompressedClassPointers -XX:+UseCompressedOops
-XX:+UseLargePagesIndividualAllocation -XX:+UseSerialGC
2020-10-28T19:53:05.325-0500: 0.119: [GC (Allocation Failure) 2020-10-28T19:53:05.325-0500: 0.119: [DefNew: 139620K->14742K(157248K), 0.0108617 secs] 139620K->45206K(506816K), 0.0189957 secs] [Times: user=0.00
sys=0.03, real=0.02 secs]
2020-10-28T19:53:05.362-0500: 0.151: [GC (Allocation Failure) 2020-10-28T19:53:05.362-0500: 0.151: [DefNew: 156664K->17471K(157248K), 0.0159786 secs] 188399K->92465K(506816K), 0.0200313 secs] [Times: user=0.00
sys=0.03, real=0.02 secs]
2020-10-28T19:53:05.396-0500: 0.185: [GC (Allocation Failure) 2020-10-28T19:53:05.396-0500: 0.185: [DefNew: 157247K->17471K(157248K), 0.0153633 secs] 232241K->137057K(506816K), 0.0154325 secs] [Times: user=0.02
sys=0.00, real=0.02 secs]
2020-10-28T19:53:05.424-0500: 0.213: [GC (Allocation Failure) 2020-10-28T19:53:05.424-0500: 0.213: [DefNew: 157247K->17472K(157248K), 0.0177680 secs] 276939K->92465K(506816K), 0.0178267 secs] [Times: user=0.00
sys=0.03, real=0.02 secs]
2020-10-28T19:53:05.453-0500: 0.243: [GC (Allocation Failure) 2020-10-28T19:53:05.453-0500: 0.243: [DefNew: 157248K->17471K(157248K), 0.0160775 secs] 329152K->236387K(506816K), 0.0161299 secs] [Times: user=0.00
sys=0.01, real=0.02 secs]
2020-10-28T19:53:05.482-0500: 0.271: [GC (Allocation Failure) 2020-10-28T19:53:05.482-0500: 0.271: [DefNew: 157247K->17472K(157248K), 0.0168444 secs] 376163K->286890K(506816K), 0.0168968 secs] [Times: user=0.00
sys=0.03, real=0.02 secs]
2020-10-28T19:53:05.510-0500: 0.300: [GC (Allocation Failure) 2020-10-28T19:53:05.510-0500: 0.300: [DefNew: 157248K->17471K(157248K), 0.0159059 secs] 425666K->330800K(506816K), 0.0159591 secs] [Times: user=0.02
sys=0.00, real=0.02 secs]
2020-10-28T19:53:05.539-0500: 0.328: [GC (Allocation Failure) 2020-10-28T19:53:05.539-0500: 0.328: [DefNew: 157247K->157244K(157248K), 0.0000140 secs] 2020-10-28T19:53:05.539-0500: 0.328: [Tenured:
313328K->273869K(349568K), 0.0292159 secs] 470876K->273869K(506816K), [Metaspace: 2791K->2791K(1066768K)], 0.0312832 secs] [Times: user=0.03 sys=0.00, real=0.03 secs]
2020-10-28T19:53:05.584-0500: 0.374: [GC (Allocation Failure) 2020-10-28T19:53:05.584-0500: 0.374: [DefNew: 139776K->17468K(157248K), 0.0046623 secs] 413645K->314923K(506816K), 0.0047177 secs] [Times: user=0.02
sys=0.00, real=0.00 secs]
2020-10-28T19:53:05.601-0500: 0.391: [GC (Allocation Failure) 2020-10-28T19:53:05.601-0500: 0.391: [DefNew: 157244K->157244K(157248K), 0.0000115 secs] 2020-10-28T19:53:05.601-0500: 0.391: [Tenured:
297454K->300904K(349568K), 0.0322627 secs] 454699K->300904K(506816K), [Metaspace: 2791K->2791K(1066768K)], 0.0323396 secs] [Times: user=0.03 sys=0.00, real=0.03 secs]
2020-10-28T19:53:05.648-0500: 0.438: [GC (Allocation Failure) 2020-10-28T19:53:05.648-0500: 0.438: [DefNew: 139776K->139776K(157248K), 0.0000121 secs] 2020-10-28T19:53:05.648-0500: 0.438: [Tenured:
300904K->316800K(349568K), 0.0384123 secs] 440600K->316800K(506816K), [Metaspace: 2791K->2791K(1066768K)], 0.0306911 secs] [Times: user=0.05 sys=0.00, real=0.03 secs]
2020-10-28T19:53:05.696-0500: 0.485: [GC (Allocation Failure) 2020-10-28T19:53:05.696-0500: 0.485: [DefNew: 139776K->139776K(157248K), 0.0000123 secs] 2020-10-28T19:53:05.696-0500: 0.485: [Tenured:
316800K->313772K(349568K), 0.0364794 secs] 454646K->313772K(506816K), [Metaspace: 2791K->2791K(1066768K)], 0.0365569 secs] [Times: user=0.05 sys=0.00, real=0.04 secs]
2020-10-28T19:53:05.746-0500: 0.536: [GC (Allocation Failure) 2020-10-28T19:53:05.746-0500: 0.536: [DefNew: 139776K->139776K(157248K), 0.0000128 secs] 2020-10-28T19:53:05.746-0500: 0.536: [Tenured:
313772K->320526K(349568K), 0.0355647 secs] 453848K->320526K(506816K), [Metaspace: 2791K->2791K(1066768K)], 0.0266821 secs] [Times: user=0.01 sys=0.00, real=0.03 secs]
2020-10-28T19:53:05.787-0500: 0.576: [GC (Allocation Failure) 2020-10-28T19:53:05.787-0500: 0.576: [DefNew: 139776K->139776K(157248K), 0.0000104 secs] 2020-10-28T19:53:05.787-0500: 0.576: [Tenured:
320526K->329205K(349568K), 0.0322145 secs] 472028K->329205K(506816K), [Metaspace: 2791K->2791K(1066768K)], 0.0222172 secs] [Times: user=0.03 sys=0.00, real=0.03 secs]
2020-10-28T19:53:05.834-0500: 0.624: [GC (Allocation Failure) 2020-10-28T19:53:05.834-0500: 0.624: [DefNew: 139614K->139614K(157248K), 0.0000110 secs] 2020-10-28T19:53:05.834-0500: 0.624: [Tenured:
339205K->347629K(349568K), 0.0361152 secs] 478819K->347629K(506816K), [Metaspace: 2791K->2791K(1066768K)], 0.0361899 secs] [Times: user=0.03 sys=0.01, real=0.04 secs]
2020-10-28T19:53:05.884-0500: 0.674: [GC (Allocation Failure) 2020-10-28T19:53:05.884-0500: 0.674: [DefNew: 139776K->139776K(157248K), 0.0000119 secs] 2020-10-28T19:53:05.884-0500: 0.674: [Tenured:
347629K->354248K(349568K), 0.0387664 secs] 487468K->354248K(506816K), [Metaspace: 2791K->2791K(1066768K)], 0.0388300 secs] [Times: user=0.05 sys=0.00, real=0.04 secs]
2020-10-28T19:53:05.938-0500: 0.728: [GC (Allocation Failure) 2020-10-28T19:53:05.938-0500: 0.728: [DefNew: 139776K->139776K(157248K), 0.0000110 secs] 2020-10-28T19:53:05.938-0500: 0.728: [Tenured:
354248K->349526K(349568K), 0.0244629 secs] 474024K->349526K(506816K), [Metaspace: 2791K->2791K(1066768K)], 0.0246366 secs] [Times: user=0.02 sys=0.02, real=0.03 secs]
2020-10-28T19:53:05.978-0500: 0.768: [Full GC (Allocation Failure) 2020-10-28T19:53:05.978-0500: 0.768: [Tenured: 349526K->349561K(349568K), 0.0325153 secs] 506263K->350188K(506816K), [Metaspace:
2791K->2791K(1066768K)], 0.0328785 secs] [Times: user=0.03 sys=0.00, real=0.03 secs]
2020-10-28T19:53:06.025-0500: 0.814: [Full GC (Allocation Failure) 2020-10-28T19:53:06.025-0500: 0.814: [Tenured: 349561K->349201K(349568K), 0.0374455 secs] 506719K->370640K(506816K), [Metaspace:
2791K->2791K(1066768K)], 0.0375058 secs] [Times: user=0.03 sys=0.00, real=0.04 secs]
2020-10-28T19:53:06.077-0500: 0.867: [Full GC (Allocation Failure) 2020-10-28T19:53:06.077-0500: 0.867: [Tenured: 349201K->349498K(349568K), 0.0415095 secs] 505966K->356401K(506816K), [Metaspace:
2791K->2791K(1066768K)], 0.0415729 secs] [Times: user=0.05 sys=0.00, real=0.04 secs]
2020-10-28T19:53:06.134-0500: 0.924: [Full GC (Allocation Failure) 2020-10-28T19:53:06.134-0500: 0.924: [Tenured: 349498K->349244K(349568K), 0.0328388 secs] 506497K->377478K(506816K), [Metaspace:
2791K->2791K(1066768K)], 0.0329000 secs] [Times: user=0.03 sys=0.00, real=0.03 secs]
2020-10-28T19:53:06.180-0500: 0.970: [Full GC (Allocation Failure) 2020-10-28T19:53:06.180-0500: 0.970: [Tenured: 349532K->349490K(349568K), 0.0366597 secs] 506746K->379829K(506816K), [Metaspace:
2791K->2791K(1066768K)], 0.0357242 secs] [Times: user=0.05 sys=0.00, real=0.04 secs]
2020-10-28T19:53:06.228-0500: 1.019: [Full GC (Allocation Failure) 2020-10-28T19:53:06.228-0500: 1.019: [Tenured: 349490K->349532K(349568K), 0.0380273 secs] 506649K->384130K(506816K), [Metaspace:
2791K->2791K(1066768K)], 0.0380891 secs] [Times: user=0.03 sys=0.00, real=0.04 secs]
Heap
def new generation total 157248K, used 147067K (0x00000000e0000000, 0x00000000eaaa0000, 0x00000000eaaa0000)
eden space 139776K, 100% used [0x00000000e0000000, 0x00000000e8800000, 0x00000000e8800000, 0x00000000e8800000]
from space 17472K, 41% used [0x00000000e8800000, 0x00000000e8f9c0b0, 0x00000000e9590000, 0x00000000e9590000]
to space 17472K, 0% used [0x00000000e9590000, 0x00000000e9590000, 0x00000000e9aa0000, 0x00000000e9aa0000]
tenured generation total 349568K, used 349532K (0x00000000eaaa0000, 0x0000000010000000, 0x0000000010000000, 0x0000000010000000)
the space 349568K, 99% used [0x00000000eaaa0000, 0x000000000ffff7198, 0x000000000ffff7200, 0x00000000100000000]
Metaspace used 2790K, capacity 446K, committed 464K, reserved 1066768K
class space used 300K, capacity 360K, committed 512K, reserved 1048576K
```

并行GC

```
D:\workspace\Java_Advanced\src>java -XX:+UseParallelGC -Xms512m -Xmx512m
-Xloggc:paralle.log -XX:+PrintGCDetails -XX:+PrintGCDateStamps week02.GCLogAnalysis
```

正在执行...

执行结束!共生成对象次数:9153

```
Java HotSpot(TM) 64-Bit Server VM (25.371-b09) for windows-amd64 JRE (1.8.0_271-b09), built on Sep 18 2020 18:14:58 by "" with MS VC++ 13.5 (VR2017)
Memory: 4k page, physical 1463224K(11504608 free), swap 1717172K(10904496 free)
Command-line flags: -XX:InitialHeapSize=536770912 -XX:MaxHeapSize=536770912 -XX:-PrintGCDateStamps -XX:-PrintGCOptions -XX:-PrintGCTimeStamps -XX:-UseCompressedClassPointers -XX:-UseCompressedOops -XX:-UseLargePageIndividualAllocation -XX:-UseParallelGC
2020-10-27T15:50:45.359-0500: 0.133: [GC (Allocation Failure) [PSYoungGen: 121504K->21450K(153088K)] 121504K->44230K(502784K), 0.0097001 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
2020-10-27T15:50:45.359-0500: 0.133: [GC (Allocation Failure) [PSYoungGen: 153088K->21502K(153088K)] 177672K->84048K(502784K), 0.0095581 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
2020-10-27T15:50:45.464-0500: 0.162: [GC (Allocation Failure) [PSYoungGen: 183008K->21448K(183088K)] 214638K->124448K(502784K), 0.0076477 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
2020-10-27T15:50:45.424-0500: 0.171: [GC (Allocation Failure) [PSYoungGen: 183008K->21448K(183088K)] 266496K->179367K(502784K), 0.0076009 secs] [Times: user=0.02 sys=0.14, real=0.01 secs]
2020-10-27T15:50:45.447-0500: 0.191: [GC (Allocation Failure) [PSYoungGen: 153048K->21502K(153088K)] 305411K->125112K(502784K), 0.007118K secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
2020-10-27T15:50:45.464-0500: 0.162: [GC (Allocation Failure) [PSYoungGen: 183008K->21448K(183088K)] 348748K->187407K(493088K), 0.0072118 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
2020-10-27T15:50:45.490-0500: 0.224: [GC (Allocation Failure) [PSYoungGen: 90032K->26072K(116736K)] 316207K->276170K(466432K), 0.0046165 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.490-0500: 0.234: [GC (Allocation Failure) [PSYoungGen: 90032K->26072K(116736K)] 335500K->259552K(466432K), 0.0006065 secs] [Times: user=0.14 sys=0.02, real=0.00 secs]
2020-10-27T15:50:45.501-0500: 0.246: [GC (Allocation Failure) [PSYoungGen: 110828K->26782K(116736K)] 348318K->331780K(466432K), 0.0078249 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
2020-10-27T15:50:45.516-0500: 0.260: [GC (Allocation Failure) [PSYoungGen: 47432K->41428K(116736K)] 374708K->324037K(466432K), 0.0078181 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
2020-10-27T15:50:45.525-0500: 0.267: [Full GC (Ergonomics) [PSYoungGen: 41128K->0K(116736K)] [PermGen: 294708K->130348K(184544K)] 326307K->330548K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0250023 secs] [Times: user=0.31 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.559-0500: 0.303: [GC (Allocation Failure) [PSYoungGen: 69408K->22491K(116736K)] 324804K->258918K(466432K), 0.0028461 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.559-0500: 0.314: [GC (Allocation Failure) [PSYoungGen: 90208K->18821K(116736K)] 318408K->277678K(466432K), 0.0044700 secs] [Times: user=0.16 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.551-0500: 0.325: [GC (Allocation Failure) [PSYoungGen: 77434K->14357K(116736K)] 335238K->300237K(466432K), 0.0050723 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.594-0500: 0.339: [GC (Allocation Failure) [PSYoungGen: 98000K->17445K(116736K)] 341380K->311238K(466432K), 0.0049386 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.599-0500: 0.344: [Full GC (Ergonomics) [PSYoungGen: 17545K->0K(116736K)] [PermGen: 300708K->270030K(184544K)] 310238K->270030K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0272343 secs] [Times: user=0.31 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.636-0500: 0.380: [GC (Allocation Failure) [PSYoungGen: 58976K->12098K(116736K)] 325448K->259498K(466432K), 0.0031075 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.644-0500: 0.390: [GC (Allocation Failure) [PSYoungGen: 81448K->14238K(116736K)] 342182K->311094K(466432K), 0.0044441 secs] [Times: user=0.16 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.657-0500: 0.401: [GC (Allocation Failure) [PSYoungGen: 74788K->22208K(116736K)] 343942K->321558K(466432K), 0.0048501 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.676-0500: 0.406: [Full GC (Ergonomics) [PSYoungGen: 23008K->0K(116736K)] [PermGen: 309468K->235118K(184544K)] 311558K->235118K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0255446 secs] [Times: user=0.31 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.696-0500: 0.444: [GC (Allocation Failure) [PSYoungGen: 58424K->19413K(116736K)] 341432K->312738K(466432K), 0.0036040 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.710-0500: 0.456: [GC (Allocation Failure) [PSYoungGen: 74928K->19798K(116736K)] 371408K->329128K(466432K), 0.0042924 secs] [Times: user=0.16 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.716-0500: 0.455: [Full GC (Ergonomics) [PSYoungGen: 19798K->0K(116736K)] [PermGen: 311732K->303579K(184544K)] 311518K->303579K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0250021 secs] [Times: user=0.17 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.733-0500: 0.497: [GC (Allocation Failure) [PSYoungGen: 68470K->11734K(116736K)] 342418K->324738K(466432K), 0.0038881 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.763-0500: 0.498: [GC (Allocation Failure) [PSYoungGen: 80268K->18978K(116736K)] 324672K->342444K(466432K), 0.0041243 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.768-0500: 0.512: [Full GC (Ergonomics) [PSYoungGen: 109716K->0K(116736K)] [PermGen: 323608K->214220K(184544K)] 342444K->341420K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0209413 secs] [Times: user=0.31 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.806-0500: 0.580: [Full GC (Ergonomics) [PSYoungGen: 588118K->0K(116736K)] [PermGen: 314220K->311640K(184544K)] 370328K->331640K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0304890 secs] [Times: user=0.30 sys=0.01, real=0.03 secs]
2020-10-27T15:50:45.846-0500: 0.599: [Full GC (Ergonomics) [PSYoungGen: 58494K->0K(116736K)] [PermGen: 318408K->32043K(184544K)] 370494K->32043K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0302643 secs] [Times: user=0.31 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.894-0500: 0.629: [Full GC (Ergonomics) [PSYoungGen: 58474K->0K(116736K)] [PermGen: 314220K->326128K(184544K)] 375118K->326128K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0324147 secs] [Times: user=0.16 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.926-0500: 0.649: [Full GC (Ergonomics) [PSYoungGen: 58880K->0K(116736K)] [PermGen: 324158K->332238K(184544K)] 380338K->332238K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0307200 secs] [Times: user=0.30 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.967-0500: 0.711: [Full GC (Ergonomics) [PSYoungGen: 58880K->0K(116736K)] [PermGen: 332198K->333738K(184544K)] 391148K->333738K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0320375 secs] [Times: user=0.28 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.967-0500: 0.716: [Full GC (Ergonomics) [PSYoungGen: 58880K->0K(116736K)] [PermGen: 333708K->336278K(184544K)] 392348K->336278K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0313007 secs] [Times: user=0.17 sys=0.00, real=0.00 secs]
2020-10-27T15:50:45.980-0500: 0.794: [Full GC (Ergonomics) [PSYoungGen: 58880K->0K(116736K)] [PermGen: 336378K->335648K(184544K)] 395248K->335648K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0315139 secs] [Times: user=0.31 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.980-0500: 0.794: [Full GC (Ergonomics) [PSYoungGen: 58880K->0K(116736K)] [PermGen: 336468K->335648K(184544K)] 396468K->335648K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0320073 secs] [Times: user=0.31 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.151-0500: 0.875: [Full GC (Ergonomics) [PSYoungGen: 58450K->0K(116736K)] [PermGen: 335608K->34344K(184544K)] 395454K->34344K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0318792 secs] [Times: user=0.30 sys=0.02, real=0.03 secs]
2020-10-27T15:50:45.151-0500: 0.816: [Full GC (Ergonomics) [PSYoungGen: 58880K->0K(116736K)] [PermGen: 341648K->342148K(184544K)] 402328K->342148K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0308848 secs] [Times: user=0.31 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.214-0500: 0.938: [Full GC (Ergonomics) [PSYoungGen: 58880K->0K(116736K)] [PermGen: 341648K->340148K(184544K)] 401048K->340148K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0326768 secs] [Times: user=0.31 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.257-0500: 1.001: [Full GC (Ergonomics) [PSYoungGen: 58880K->0K(116736K)] [PermGen: 340108K->33674K(184544K)] 395048K->33674K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0344778 secs] [Times: user=0.19 sys=0.00, real=0.03 secs]
2020-10-27T15:50:45.171-0500: 0.962: [GC (Ergonomics) [PSYoungGen: 58474K->0K(116736K)] [PermGen: 336748K->336838K(184544K)] 395408K->336838K(466432K), [Metaspace: 2751K->2751K(1064768K)], 0.0306884 secs] [Times: user=0.30 sys=0.00, real=0.03 secs]
Heap
  PSYoungGen      total 11739K, used 2371K [0x00000000f5800000, 0x0000000100000000, 0x0000000100000000, 0x0000000100000000)
 eden space 58880K, 4k used [0x00000000f5800000, 0x00000000f5800000, 0x00000000f5800000, 0x00000000f5800000)
 from space 57848K, 0k used [0x00000000f5800000, 0x00000000f5800000, 0x00000000f5800000, 0x00000000f5800000)
 to space 57848K, 0k used [0x00000000f5800000, 0x00000000f5800000, 0x00000000f5800000, 0x00000000f5800000)
 PermGen      total 34948K, used 33483K [0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000)
 objects space 34948K, 97k used [0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000)
 Metaspace      used 2759K, capacity 4656K, committed 4656K, reserved 104576K
Class space      used 369K, capacity 384K, committed 512K, reserved 104576K
```

CMS GC

D:\workspace\Java Advanced\src>java -XX:+UseConcMarkSweepGC -Xms512m

-Xmx512m -Xloggc:cms.log -XX:+PrintGCDetails -XX:+PrintGCDateStamps

week02.GCLogAnalysis

正在执行...

执行结束!共生成对象次数:12944

```
seen[2020-10-28T20:02:30.358-0500: 0.902: [class unloading, 0.0001764 secs][2020-10-28T20:02:30.358-0500: 0.902: [scrub symbol table, 0.0002810 secs][2020-10-28T20:02:30.358-0500: 0.902: [scrub string table, 0.0000900 secs][1 CMS remark: 349397K(349368K)] 374678K(504148K), 0.0009795 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.394-0500: 0.903: [CMS-concurrent-sweep: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.394-0500: 0.903: [CMS-concurrent-reset: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.412-0500: 0.914: [GC (Allocation Failure) 2020-10-28T20:02:30.412-0500: 0.914: [ParNew: 187138K->187171K(187248K), 0.0000136 secs][2020-10-28T20:02:30.412-0500: 0.914: [CMS: 349104K->349484K(349648K), 0.0404619 secs]
504768K->352108K(504148K), [Metaspace: 2751K->2751K(1064768K)], 0.0405467 secs] [Times: user=0.06 sys=0.00, real=0.04 secs]
2020-10-28T20:02:30.450-0500: 0.967: [GC (CMS Initial Mark) [1 CMS-initial-mark: 349484K(349648K)] 352107K(504148K), 0.0007287 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.450-0500: 0.968: [CMS-concurrent-mark: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.455-0500: 0.969: [CMS-concurrent-mark: 0.001/0.001 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.456-0500: 0.969: [CMS-concurrent-preclean: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.464-0500: 0.969: [CMS-concurrent-preclean: 0.002/0.001 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.494-0500: 0.980: [CMS-concurrent-abortable-preclean: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.494-0500: 0.980: [CMS-concurrent-preclean: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.495-0500: 0.960: [GC (CMS Final Remark) [GC occupancy: 22175 K (187248 K)] [2020-10-28T20:02:30.456-0500: 0.960: [HeapScan (parallel), 0.0004204 secs][2020-10-28T20:02:30.456-0500: 0.960: [weak refs processing, 0.0000086 secs][2020-10-28T20:02:30.456-0500: 0.960: [class unloading, 0.0001771 secs][2020-10-28T20:02:30.456-0500: 0.961: [scrub symbol table, 0.0000161 secs][2020-10-28T20:02:30.457-0500: 0.961: [scrub string table, 0.0000082 secs][1 CMS remark: 349484K(349484K)] 374678K(504148K), 0.0012981 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.457-0500: 0.961: [CMS-concurrent-sweep: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.457-0500: 0.962: [CMS-concurrent-reset: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.457-0500: 0.962: [CMS-concurrent-reset: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.471-0500: 0.975: [GC (Allocation Failure) 2020-10-28T20:02:30.471-0500: 0.975: [ParNew: 187138K->187199K(187248K), 0.0000131 secs][2020-10-28T20:02:30.471-0500: 0.975: [CMS: 349494K->349541K(349648K), 0.0401089 secs]
504768K->349598K(504148K), [Metaspace: 2751K->2751K(1064768K)], 0.0401893 secs] [Times: user=0.06 sys=0.00, real=0.04 secs]
2020-10-28T20:02:30.511-0500: 1.018: [GC (CMS Initial Mark) [1 CMS-initial-mark: 349541K(349648K)] 352107K(504148K), 0.0007479 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.511-0500: 1.016: [CMS-concurrent-mark: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.511-0500: 1.017: [CMS-concurrent-mark: 0.001/0.001 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.511-0500: 1.017: [CMS-concurrent-preclean: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.514-0500: 1.018: [CMS-concurrent-preclean: 0.001/0.001 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.514-0500: 1.018: [CMS-concurrent-abortable-preclean: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.514-0500: 1.018: [CMS-concurrent-preclean: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.514-0500: 1.018: [GC (CMS Final Remark) [GC occupancy: 21124 K (187248 K)] [2020-10-28T20:02:30.514-0500: 1.018: [HeapScan (parallel), 0.0007047 secs][2020-10-28T20:02:30.514-0500: 1.018: [weak refs processing, 0.0000086 secs][2020-10-28T20:02:30.514-0500: 1.018: [class unloading, 0.0001765 secs][2020-10-28T20:02:30.514-0500: 1.018: [scrub symbol table, 0.0000759 secs][2020-10-28T20:02:30.514-0500: 1.018: [scrub string table, 0.0000087 secs][1 CMS remark: 349541K(349484K)] 374678K(504148K), 0.0012981 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.514-0500: 1.018: [CMS-concurrent-sweep: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.514-0500: 1.018: [CMS-concurrent-reset: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.514-0500: 1.018: [CMS-concurrent-reset: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.529-0500: 1.033: [GC (Allocation Failure) 2020-10-28T20:02:30.529-0500: 1.033: [ParNew: 187022K->187023K(187248K), 0.0000182 secs][2020-10-28T20:02:30.529-0500: 1.033: [CMS: 349517K->349524K(349648K), 0.0405911 secs]
505408K->350508K(505018K), [Metaspace: 2751K->2751K(1064768K)], 0.0406717 secs] [Times: user=0.03 sys=0.00, real=0.04 secs]
2020-10-28T20:02:30.570-0500: 1.074: [GC (CMS Initial Mark) [1 CMS-initial-mark: 349524K(349648K)] 352107K(504148K), 0.0006006 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.571-0500: 1.075: [CMS-concurrent-mark: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.571-0500: 1.076: [CMS-concurrent-mark: 0.001/0.001 secs] [Times: user=0.06 sys=0.00, real=0.00 secs]
2020-10-28T20:02:30.571-0500: 1.076: [CMS-concurrent-preclean: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
Heap
 par new generation total 187248K, used 18314K [0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000)
 eden space 197776K, 10k used [0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000)
 from space 17472K, 0k used [0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000)
 to space 17472K, 0k used [0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000)
 concurrent mark-sweep generation total 34948K, used 34932K [0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000, 0x00000000e0000000)
 Metaspace      used 2759K, capacity 4656K, committed 4656K, reserved 104576K
class space      used 369K, capacity 384K, committed 512K, reserved 104576K
```

D:\workspace\Java Advanced\src>java -XX:+UseG1GC -

```

[Code Root Purge: 0.0 ms]
[Clear CT: 0.1 ms]
[Other: 0.3 ms]
  [Evacuation Failure: 0.1 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: 0.0B(24.0M)->0.0B(25.0M) Survivors: 1024.0K->0.0B Heap: 420.9M(512.0M)->420.9M(512.0M)]
[Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:04:16.578-0500: 1.065: [GC pause (G1 Evacuation Pause) (young), 0.0005258 secs]
[Parallel Time: 0.2 ms, GC Workers: 10]
  [GC Worker Start (ms): Min: 1065.1, Avg: 1065.1, Max: 1065.1, Diff: 0.0]
  [Ext Root Scanning (ms): Min: 0.1, Avg: 0.1, Max: 0.1, Diff: 0.0, Sum: 0.8]
  [Update RS (ms): Min: 0.0, Avg: 0.0, Max: 0.1, Diff: 0.1, Sum: 0.2]
  [Processed Buffers: Min: 0, Avg: 0.9, Max: 2, Diff: 2, Sum: 9]
  [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: 0.0, Avg: 0.0, Max: 0.0, Diff: 0.0, Sum: 0.0]
  [Termination (ms): Min: 0.0, Avg: 0.1, Max: 0.1, Diff: 0.1, Sum: 1.0]
  [Termination Attempts: Min: 1, Avg: 1.0, Max: 1, Diff: 0, Sum: 10]
  [GC Worker Other (ms): Min: 0.0, Avg: 0.0, Max: 0.0, Diff: 0.0, Sum: 0.0]
  [GC Worker Total (ms): Min: 0.2, Avg: 0.2, Max: 0.2, Diff: 0.0, Sum: 2.1]
  [GC Worker End (ms): Min: 1065.3, Avg: 1065.3, Max: 1065.3, Diff: 0.0]
[Code Root Fixup: 0.0 ms]
[Code Root Purge: 0.0 ms]
[Clear CT: 0.1 ms]
[Other: 0.2 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: 0.0B(25.0M)->0.0B(25.0M) Survivors: 0.0B->0.0B Heap: 420.9M(512.0M)->420.9M(512.0M)]
[Times: user=0.00 sys=0.00, real=0.00 secs]
2020-10-28T20:04:16.578-0500: 1.066: [Full GC (Allocation Failure) 420M->355M(512M), 0.0304050 secs]
[Eden: 0.0B(25.0M)->0.0B(25.0M) Survivors: 0.0B->0.0B Heap: 420.9M(512.0M)->355.4M(512.0M)], [Metaspace: 2791K->2791K(1056768K)]
[Times: user=0.03 sys=0.00, real=0.03 secs]
2020-10-28T20:04:16.609-0500: 1.096: [GC concurrent-mark-abort]
Heap
garbage-first heap total 524288K, used 263952K [0x00000000e0000000, 0x00000000e0101000, 0x0000000010000000)
region size 1024K, 1 young (1024K), 0 survivors (0K)
Metaspace used 2798K, capacity 4486K, committed 4864K, reserved 1056768K
class space used 309K, capacity 386K, committed 512K, reserved 1048576K

```