

1、 执行语句是：java -Xmx1G -XX:+UseParallelGC GLogAnalysis

GLogAnalysis

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root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx1G -XX:+UseParallelGC GLogAnalysis
正在执行...
执行结束!共生成对象次数:15954
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx2G -XX:+UseParallelGC GLogAnalysis
正在执行...
执行结束!共生成对象次数:15338
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx4G -XX:+UseParallelGC GLogAnalysis
正在执行...
执行结束!共生成对象次数:16342
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx8G -XX:+UseParallelGC GLogAnalysis
正在执行...
执行结束!共生成对象次数:18158
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx16G -XX:+UseParallelGC GLogAnalysis
正在执行...
执行结束!共生成对象次数:17711
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx32G -XX:+UseParallelGC GLogAnalysis
正在执行...
执行结束!共生成对象次数:16633
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx512M -XX:+UseParallelGC GLogAnalysis
正在执行...
执行结束!共生成对象次数:9591
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx256M -XX:+UseParallelGC GLogAnalysis
正在执行...
Exception in thread "main" java.lang.OutOfMemoryError: Java heap space
    at GCLogAnalysis.generateGarbage(GCLogAnalysis.java:48)
    at GCLogAnalysis.main(GCLogAnalysis.java:25)
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx384M -XX:+UseParallelGC GLogAnalysis
正在执行...
执行结束!共生成对象次数:6442
root@minhu-System-Product-Name:/home/qingteng/桌面#
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结论：并行 GC 最优而配置是 8G，最大吞吐量是 18158

2、 分析并行 GC 的 GLog:

语句：java -Xmx512M -Xms512M -XX:+PrintGCDetails -XX:+PrintGCDateStamps -XX:+UseParallelGC GLogAnalysis

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root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx512M -Xms512M -XX:+PrintGCDetails -XX:+PrintGCDateStamps -XX:+UseParallelGC GLogAnalysis
正在执行...
2021-01-22T20:31:03.174-0800: [GC (Allocation Failure) [PSYoungGen: 131584K->21488K(153088K)] 131584K->41276K(502784K), 0.0063106 secs] [Times: user=0.01 sys=0.00, real=0.01 secs]
2021-01-22T20:31:03.199-0800: [GC (Allocation Failure) [PSYoungGen: 152978K->21498K(153088K)] 172766K->30762K(502784K), 0.0127331 secs] [Times: user=0.02 sys=0.02, real=0.01 secs]
2021-01-22T20:31:03.228-0800: [GC (Allocation Failure) [PSYoungGen: 152956K->21502K(153088K)] 212221K->118327K(502784K), 0.0149026 secs] [Times: user=0.04 sys=0.01, real=0.02 secs]
2021-01-22T20:31:03.258-0800: [GC (Allocation Failure) [PSYoungGen: 153086K->21502K(153088K)] 249911K->156753K(502784K), 0.0102782 secs] [Times: user=0.01 sys=0.02, real=0.01 secs]
2021-01-22T20:31:03.286-0800: [GC (Allocation Failure) [PSYoungGen: 153086K->21490K(153088K)] 288337K->203947K(502784K), 0.0109494 secs] [Times: user=0.02 sys=0.01, real=0.01 secs]
2021-01-22T20:31:03.314-0800: [GC (Allocation Failure) [PSYoungGen: 153032K->21495K(80384K)] 335489K->244684K(430080K), 0.0082902 secs] [Times: user=0.01 sys=0.01, real=0.01 secs]
2021-01-22T20:31:03.330-0800: [GC (Allocation Failure) [PSYoungGen: 80225K->36627K(116736K)] 303414K->265963K(466432K), 0.0061816 secs] [Times: user=0.02 sys=0.00, real=0.01 secs]
2021-01-22T20:31:03.342-0800: [GC (Allocation Failure) [PSYoungGen: 95507K->54028K(116736K)] 324843K->287802K(466432K), 0.0072573 secs] [Times: user=0.02 sys=0.00, real=0.00 secs]
2021-01-22T20:31:03.356-0800: [GC (Allocation Failure) [PSYoungGen: 11285K->5785K(116736K)] 34668K->308249K(466432K), 0.0103917 secs] [Times: user=0.03 sys=0.00, real=0.01 secs]
2021-01-22T20:31:03.374-0800: [GC (Allocation Failure) [PSYoungGen: 116044K->37969K(116736K)] 366438K->324377K(466432K), 0.0089729 secs] [Times: user=0.02 sys=0.01, real=0.01 secs]
2021-01-22T20:31:03.389-0800: [GC (Allocation Failure) [PSYoungGen: 90322K->22894K(116736K)] 382731K->344326K(466432K), 0.0091390 secs] [Times: user=0.02 sys=0.01, real=0.02 secs]
2021-01-22T20:31:03.398-0800: [Full GC (Ergonomics) [PSYoungGen: 22894K->0K(116736K)] [ParOldGen: 321431K->235427K(349696K)] 344326K->235427K(466432K), [Metaspace: 2536K->2536K(1056768K)], 0.0311394 secs] [Times: user=0.09 sys=0.00, real=0.02 secs]
2021-01-22T20:31:03.437-0800: [GC (Allocation Failure) [PSYoungGen: 58800K->20629K(116736K)] 294307K->256057K(466432K), 0.0040585 secs] [Times: user=0.02 sys=0.00, real=0.01 secs]
2021-01-22T20:31:03.449-0800: [GC (Allocation Failure) [PSYoungGen: 79509K->21269K(116736K)] 314937K->276725K(466432K), 0.0062562 secs] [Times: user=0.02 sys=0.00, real=0.01 secs]
2021-01-22T20:31:03.463-0800: [GC (Allocation Failure) [PSYoungGen: 80114K->22519K(116736K)] 335570K->298089K(466432K), 0.0063168 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2021-01-22T20:31:03.476-0800: [GC (Allocation Failure) [PSYoungGen: 81336K->23488K(116736K)] 356823K->320852K(466432K), 0.0077347 secs] [Times: user=0.02 sys=0.00, real=0.01 secs]
2021-01-22T20:31:03.492-0800: [GC (Allocation Failure) [PSYoungGen: 82368K->19318K(116736K)] 379732K->339019K(466432K), 0.0049049 secs] [Times: user=0.02 sys=0.00, real=0.00 secs]
2021-01-22T20:31:03.497-0800: [Full GC (Ergonomics) [PSYoungGen: 19318K->0K(116736K)] [ParOldGen: 319701K->267297K(349696K)] 339019K->267297K(466432K), [Metaspace: 2536K->2536K(1056768K)], 0.0268011 secs] [Times: user=0.08 sys=0.01, real=0.03 secs]
2021-01-22T20:31:03.531-0800: [GC (Allocation Failure) [PSYoungGen: 58800K->22382K(116736K)] 326097K->289679K(466432K), 0.0028965 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2021-01-22T20:31:03.542-0800: [GC (Allocation Failure) [PSYoungGen: 81252K->19592K(116736K)] 348549K->308436K(466432K), 0.0057060 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2021-01-22T20:31:03.555-0800: [GC (Allocation Failure) [PSYoungGen: 78472K->23211K(116736K)] 367316K->330389K(466432K), 0.0062505 secs] [Times: user=0.02 sys=0.00, real=0.01 secs]
2021-01-22T20:31:03.569-0800: [GC (Allocation Failure) [PSYoungGen: 82091K->17691K(116736K)] 389269K->347059K(466432K), 0.0116482 secs] [Times: user=0.01 sys=0.00, real=0.02 secs]
2021-01-22T20:31:03.652-0800: [Full GC (Ergonomics) [PSYoungGen: 17691K->0K(116736K)] [ParOldGen: 327828K->306067K(349696K)] 347059K->287465K(466432K), [Metaspace: 2536K->2536K(1056768K)], 0.0345416 secs] [Times: user=0.09 sys=0.01, real=0.03 secs]
2021-01-22T20:31:03.622-0800: [GC (Allocation Failure) [PSYoungGen: 58800K->21209K(116736K)] 346345K->308675K(466432K), 0.0043001 secs] [Times: user=0.02 sys=0.00, real=0.00 secs]
2021-01-22T20:31:03.633-0800: [GC (Allocation Failure) [PSYoungGen: 80889K->22086K(116736K)] 367555K->330181K(466432K), 0.0056035 secs] [Times: user=0.02 sys=0.00, real=0.01 secs]
2021-01-22T20:31:03.647-0800: [GC (Allocation Failure) [PSYoungGen: 80960K->18776K(116736K)] 389801K->34605K(466432K), 0.0054049 secs] [Times: user=0.01 sys=0.00, real=0.01 secs]
2021-01-22T20:31:03.652-0800: [Full GC (Ergonomics) [PSYoungGen: 18776K->0K(116736K)] [ParOldGen: 327828K->306067K(349696K)] 34605K->306067K(466432K), [Metaspace: 2536K->2536K(1056768K)], 0.0390166 secs] [Times: user=0.10 sys=0.00, real=0.04 secs]
2021-01-22T20:31:03.699-0800: [GC (Allocation Failure) [PSYoungGen: 5839K->19174K(116736K)] 364906K->325242K(466432K), 0.0032393 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2021-01-22T20:31:03.710-0800: [GC (Allocation Failure) [PSYoungGen: 78054K->18243K(116736K)] 384122K->342479K(466432K), 0.0051722 secs] [Times: user=0.01 sys=0.00, real=0.01 secs]
2021-01-22T20:31:03.825-0800: [Full GC (Ergonomics) [PSYoungGen: 18243K->0K(116736K)] [ParOldGen: 324236K->307803K(349696K)] 342479K->307803K(466432K), [Metaspace: 2536K->2536K(1056768K)], 0.0310725 secs] [Times: user=0.10 sys=0.00, real=0.03 secs]
2021-01-22T20:31:03.755-0800: [GC (Allocation Failure) [PSYoungGen: 58800K->19960K(116736K)] 366743K->327824K(466432K), 0.0032362 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2021-01-22T20:31:03.766-0800: [GC (Allocation Failure) [PSYoungGen: 78400K->17965K(116736K)] 386704K->345687K(466432K), 0.0060273 secs] [Times: user=0.02 sys=0.00, real=0.01 secs]
2021-01-22T20:31:03.772-0800: [Full GC (Ergonomics) [PSYoungGen: 17965K->0K(116736K)] [ParOldGen: 327722K->314039K(349696K)] 345687K->314039K(466432K), [Metaspace: 2536K->2536K(1056768K)], 0.0325361 secs] [Times: user=0.08 sys=0.00, real=0.03 secs]
2021-01-22T20:31:03.813-0800: [GC (Allocation Failure) [PSYoungGen: 5849K->20448K(117248K)] 372889K->334488K(466944K), 0.0043289 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2021-01-22T20:31:03.825-0800: [GC (Allocation Failure) [PSYoungGen: 7964K->36639K(116736K)] 393734K->350679K(466432K), 0.0049641 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2021-01-22T20:31:03.837-0800: [GC (Allocation Failure) [PSYoungGen: 95895K->22446K(118784K)] 409934K->371410K(468480K), 0.0089569 secs] [Times: user=0.02 sys=0.01, real=0.01 secs]
2021-01-22T20:31:03.846-0800: [Full GC (Ergonomics) [PSYoungGen: 22446K->0K(118784K)] [ParOldGen: 348964K->326047K(349696K)] 371410K->326047K(468480K), [Metaspace: 2536K->2536K(1056768K)], 0.0323834 secs] [Times: user=0.09 sys=0.01, real=0.04 secs]
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[Times: user=0.00 sys=0.00, real=0.03 secs]
2021-01-22T20:31:03.813+0800: [GC (Allocation Failure) [PSYoungGen: 58849K->20448K(117248K)] 372889K->334488K(466944K), 0.0043289 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2021-01-22T20:31:03.825+0800: [GC (Allocation Failure) [PSYoungGen: 79694K->36639K(116736K)] 393734K->350679K(466432K), 0.0049641 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2021-01-22T20:31:03.837+0800: [GC (Allocation Failure) [PSYoungGen: 95895K->22446K(118784K)] 409934K->371410K(468480K), 0.0089569 secs] [Times: user=0.02 sys=0.01, real=0.01 secs]
2021-01-22T20:31:03.846+0800: [Full GC (Ergonomics) [PSYoungGen: 22446K->0K(118784K)] [ParOldGen: 348964K->326047K(349696K)] 371410K->326047K(468480K), [Metaspace: 2536K->2536K(1056768K)], 0.0323834 secs] [Times: user=0.09 sys=0.01, real=0.04 secs]
2021-01-22T20:31:03.886+0800: [Full GC (Ergonomics) [PSYoungGen: 60875K->0K(118784K)] [ParOldGen: 326047K->329189K(349696K)] 386923K->329189K(468480K), [Metaspace: 2536K->2536K(1056768K)], 0.0349786 secs] [Times: user=0.10 sys=0.00, real=0.04 secs]
2021-01-22T20:31:03.927+0800: [Full GC (Ergonomics) [PSYoungGen: 60424K->0K(118784K)] [ParOldGen: 329189K->331026K(349696K)] 389614K->331026K(468480K), [Metaspace: 2536K->2536K(1056768K)], 0.0335737 secs] [Times: user=0.10 sys=0.00, real=0.04 secs]
2021-01-22T20:31:03.968+0800: [Full GC (Ergonomics) [PSYoungGen: 60928K->0K(118784K)] [ParOldGen: 331026K->334549K(349696K)] 391954K->334549K(468480K), [Metaspace: 2536K->2536K(1056768K)], 0.0344168 secs] [Times: user=0.10 sys=0.00, real=0.04 secs]
2021-01-22T20:31:04.013+0800: [Full GC (Ergonomics) [PSYoungGen: 60928K->0K(118784K)] [ParOldGen: 334549K->338831K(349696K)] 395477K->338831K(468480K), [Metaspace: 2536K->2536K(1056768K)], 0.0345156 secs] [Times: user=0.10 sys=0.00, real=0.03 secs]
2021-01-22T20:31:04.055+0800: [Full GC (Ergonomics) [PSYoungGen: 60835K->0K(118784K)] [ParOldGen: 338831K->337909K(349696K)] 399666K->337909K(468480K), [Metaspace: 2536K->2536K(1056768K)], 0.0348342 secs] [Times: user=0.10 sys=0.00, real=0.04 secs]
2021-01-22T20:31:04.097+0800: [Full GC (Ergonomics) [PSYoungGen: 60261K->0K(118784K)] [ParOldGen: 337909K->342362K(349696K)] 398170K->342362K(468480K), [Metaspace: 2536K->2536K(1056768K)], 0.0330073 secs] [Times: user=0.10 sys=0.00, real=0.03 secs]
执行结束!共生成对象次数:19807
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结论：发生 YoungGC 次数大概是 32 次，时间大概是 0.0089569 secs 左右。FullGC 次数大概是 12 次，时间 0.04 secs

特点：
适用场景：

3、串行 GC：

语句：java -Xmx512M -Xms512M -XX:+PrintGCDetails -XX:+PrintGCDateStamps -XX:+UseSerialGC GCLogAnalysis

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root@lnhu-System-Product-Name:/home/qingteng/桌面# java -Xmx512M -Xms512M -XX:+PrintGCDetails -XX:+PrintGCDateStamps -XX:+UseSerialGC GCLogAnalysis
正在执行...
2021-01-22T20:35:46.676+0800: [GC (Allocation Failure) 2021-01-22T20:35:46.676+0800: [DefNew: 139776K->17472K(157248K), 0.0223212 secs] 139776K->53500K(506816K), 0.0223625 secs] [Times: user=0.00 sys=0.02, real=0.03 secs]
2021-01-22T20:35:46.718+0800: [GC (Allocation Failure) 2021-01-22T20:35:46.718+0800: [DefNew: 157248K->17471K(157248K), 0.0261710 secs] 193276K->103002K(506816K), 0.0262108 secs] [Times: user=0.01 sys=0.02, real=0.02 secs]
2021-01-22T20:35:46.766+0800: [GC (Allocation Failure) 2021-01-22T20:35:46.766+0800: [DefNew: 156726K->17471K(157248K), 0.0173715 secs] 242256K->143989K(506816K), 0.0174110 secs] [Times: user=0.01 sys=0.01, real=0.02 secs]
2021-01-22T20:35:46.803+0800: [GC (Allocation Failure) 2021-01-22T20:35:46.803+0800: [DefNew: 156909K->17471K(157248K), 0.0203357 secs] 283428K->187776K(506816K), 0.0203713 secs] [Times: user=0.00 sys=0.01, real=0.02 secs]
2021-01-22T20:35:46.846+0800: [GC (Allocation Failure) 2021-01-22T20:35:46.846+0800: [DefNew: 157247K->17471K(157248K), 0.0196746 secs] 327552K->229415K(506816K), 0.0197039 secs] [Times: user=0.00 sys=0.02, real=0.02 secs]
2021-01-22T20:35:46.883+0800: [GC (Allocation Failure) 2021-01-22T20:35:46.883+0800: [DefNew: 157248K->17470K(157248K), 0.0206218 secs] 369191K->274758K(506816K), 0.0206846 secs] [Times: user=0.00 sys=0.01, real=0.02 secs]
2021-01-22T20:35:46.920+0800: [GC (Allocation Failure) 2021-01-22T20:35:46.920+0800: [DefNew: 157246K->17471K(157248K), 0.0238505 secs] 414526K->329521K(506816K), 0.0238830 secs] [Times: user=0.01 sys=0.02, real=0.02 secs]
2021-01-22T20:35:46.962+0800: [GC (Allocation Failure) 2021-01-22T20:35:46.962+0800: [DefNew: 157247K->157247K(157248K), 0.0000140 secs] 2021-01-22T20:35:46.963+0800: [Tenured: 312049K->271121K(349568K), 0.0314792 secs] [Times: user=0.03 sys=0.00, real=0.03 secs]
2021-01-22T20:35:47.014+0800: [GC (Allocation Failure) 2021-01-22T20:35:47.014+0800: [DefNew: 139776K->17471K(157248K), 0.0059017 secs] 410897K->316424K(506816K), 0.0059342 secs] [Times: user=0.01 sys=0.00, real=0.01 secs]
2021-01-22T20:35:47.038+0800: [GC (Allocation Failure) 2021-01-22T20:35:47.038+0800: [DefNew: 157247K->17471K(157248K), 0.0146537 secs] 456200K->356962K(506816K), 0.0146859 secs] [Times: user=0.01 sys=0.00, real=0.01 secs]
2021-01-22T20:35:47.071+0800: [GC (Allocation Failure) 2021-01-22T20:35:47.071+0800: [DefNew: 157247K->157247K(157248K), 0.0000123 secs] 2021-01-22T20:35:47.071+0800: [Tenured: 339490K->307469K(349568K), 0.0375960 secs] 496738K->307469K(506816K), [Metaspace: 2536K->2536K(1056768K)], 0.0376491 secs] [Times: user=0.03 sys=0.00, real=0.03 secs]
2021-01-22T20:35:47.126+0800: [GC (Allocation Failure) 2021-01-22T20:35:47.126+0800: [DefNew: 139731K->139731K(157248K), 0.0000135 secs] 2021-01-22T20:35:47.126+0800: [Tenured: 307469K->319354K(349568K), 0.0361007 secs] 447201K->319354K(506816K), [Metaspace: 2536K->2536K(1056768K)], 0.0361546 secs] [Times: user=0.03 sys=0.00, real=0.04 secs]
2021-01-22T20:35:47.178+0800: [GC (Allocation Failure) 2021-01-22T20:35:47.178+0800: [DefNew: 139776K->139776K(157248K), 0.0000133 secs] 2021-01-22T20:35:47.178+0800: [Tenured: 319354K->311189K(349568K), 0.0399736 secs] 459130K->311189K(506816K), [Metaspace: 2536K->2536K(1056768K)], 0.0400339 secs] [Times: user=0.04 sys=0.00, real=0.04 secs]
2021-01-22T20:35:47.236+0800: [GC (Allocation Failure) 2021-01-22T20:35:47.236+0800: [DefNew: 139776K->139776K(157248K), 0.0000128 secs] 2021-01-22T20:35:47.236+0800: [Tenured: 311189K->337852K(349568K), 0.0292267 secs] 469656K->337852K(506816K), [Metaspace: 2536K->2536K(1056768K)], 0.0292802 secs] [Times: user=0.02 sys=0.00, real=0.03 secs]
2021-01-22T20:35:47.283+0800: [GC (Allocation Failure) 2021-01-22T20:35:47.283+0800: [DefNew: 139776K->139776K(157248K), 0.0000127 secs] 2021-01-22T20:35:47.283+0800: [Tenured: 337852K->343700K(349568K), 0.0341999 secs] 476828K->343700K(506816K), [Metaspace: 2536K->2536K(1056768K)], 0.0342522 secs] [Times: user=0.04 sys=0.00, real=0.03 secs]
2021-01-22T20:35:47.334+0800: [GC (Allocation Failure) 2021-01-22T20:35:47.334+0800: [DefNew: 139768K->139768K(157248K), 0.0000136 secs] 2021-01-22T20:35:47.334+0800: [Tenured: 343700K->349294K(349568K), 0.0404304 secs] 483468K->349294K(506816K), [Metaspace: 2536K->2536K(1056768K)], 0.0405265 secs] [Times: user=0.04 sys=0.00, real=0.04 secs]
2021-01-22T20:35:47.392+0800: [GC (Allocation Failure) 2021-01-22T20:35:47.392+0800: [DefNew: 139661K->139661K(157248K), 0.0000441 secs] 2021-01-22T20:35:47.392+0800: [Tenured: 349294K->338749K(349568K), 0.0440141 secs] 488956K->338749K(506816K), [Metaspace: 2536K->2536K(1056768K)], 0.0440993 secs] [Times: user=0.04 sys=0.00, real=0.04 secs]
2021-01-22T20:35:47.455+0800: [GC (Allocation Failure) 2021-01-22T20:35:47.455+0800: [DefNew: 139776K->139776K(157248K), 0.0000306 secs] 2021-01-22T20:35:47.455+0800: [Tenured: 338749K->349525K(349568K), 0.0312024 secs] 478525K->354110K(506816K), [Metaspace: 2536K->2536K(1056768K)], 0.0313324 secs] [Times: user=0.03 sys=0.00, real=0.03 secs]
2021-01-22T20:35:47.507+0800: [Full GC (Allocation Failure) 2021-01-22T20:35:47.507+0800: [Tenured: 349525K->349481K(349568K), 0.0383473 secs] 506438K->359412K(506816K), [Metaspace: 2536K->2536K(1056768K)], 0.0344579 secs] [Times: user=0.03 sys=0.00, real=0.04 secs]
2021-01-22T20:35:47.560+0800: [Full GC (Allocation Failure) 2021-01-22T20:35:47.560+0800: [Tenured: 349481K->349529K(349568K), 0.0383473 secs] 506438K->359412K(506816K), [Metaspace: 2536K->2536K(1056768K)], 0.0383991 secs] [Times: user=0.04 sys=0.00, real=0.04 secs]
执行结束!共生成对象次数:10608
Heap
def new generation total 157248K, used 15893K [0x00000000e0000000, 0x00000000eaa00000, 0x00000000eaa00000)
eden space 139776K, 11% used [0x00000000e0000000, 0x00000000e0f85520, 0x00000000e8880000)
from space 17472K, 0% used [0x00000000e9990000, 0x00000000e9990000, 0x00000000eaa00000)
to space 17472K, 0% used [0x00000000e8880000, 0x00000000e8880000, 0x00000000e9990000)
tenured generation total 349568K, used 349529K [0x00000000aaaa0000, 0x0000000100000000, 0x0000000100000000)
the space 349568K, 99% used [0x00000000eaa00000, 0x00000000ffff64b8, 0x00000000ffff6600, 0x0000000100000000)
Metaspace used 2543K, capacity 4486K, committed 4864K, reserved 1056768K
class space used 275K, capacity 380K, committed 512K, reserved 1048576K
```

结论：串行 GC，发生 YoungGC 次数 18 次，每次大概时间 0.0223625 secs，FULL GC 次数 2 次，0.04 secs。YoungGC 的时间远远大于并行 GC。

4、串行 GC

```
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx512M -Xms512M -XX:+PrintGCDateStamps -XX:+UseSerialGC GCLogAnalysis
正在执行...
执行结束!共生成对象次数:11402
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx1G -Xms1G -XX:+PrintGCDateStamps -XX:+UseSerialGC GCLogAnalysis
正在执行...
执行结束!共生成对象次数:15340
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx2G -Xms2G -XX:+PrintGCDateStamps -XX:+UseSerialGC GCLogAnalysis
正在执行...
执行结束!共生成对象次数:13209
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx4G -Xms4G -XX:+PrintGCDateStamps -XX:+UseSerialGC GCLogAnalysis
正在执行...
执行结束!共生成对象次数:12624
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx8G -Xms8G -XX:+PrintGCDateStamps -XX:+UseSerialGC GCLogAnalysis
正在执行...
执行结束!共生成对象次数:8256
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx16G -Xms16G -XX:+PrintGCDateStamps -XX:+UseSerialGC GCLogAnalysis
Java HotSpot(TM) 64-Bit Server VM warning: INFO: os::commit_memory(0x0000000515550000, 11453267968, 0) failed; error='Cannot allocate memory' (errno=12)
#
# There is insufficient memory for the Java Runtime Environment to continue.
# Native memory allocation (mmap) failed to map 11453267968 bytes for committing reserved memory.
# An error report file with more information is saved as:
# /home/qingteng/桌面/hs_err_pid19962.log
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx32G -Xms32G -XX:+PrintGCDateStamps -XX:+UseSerialGC GCLogAnalysis
Java HotSpot(TM) 64-Bit Server VM warning: INFO: os::commit_memory(0x00007f1c97c00000, 11453202432, 0) failed; error='Cannot allocate memory' (errno=12)
#
# There is insufficient memory for the Java Runtime Environment to continue.
# Native memory allocation (mmap) failed to map 11453202432 bytes for committing reserved memory.
# An error report file with more information is saved as:
# /home/qingteng/桌面/hs_err_pid20097.log
```

结论：串行最优配置是 1G, 最大吞吐量是 15340

堆太小，OOM

堆太大，不一定是最优

相同的配置情况下，并行 GC 虽然发生的 YoungGC 次数比串行的多，但是整体暂停时间比串行 GC 少很多。

5、CMS GC

命令：java -Xmx512M -Xms512M -XX:+PrintGCDetails -XX:+PrintGCDateStamps -XX:+UseConcMarkSweepGC GCLogAnalysis

```
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx512M -Xms512M -XX:+PrintGCDetails -XX:+PrintGCDateStamps -XX:+UseConcMarkSweepGC GCLogAnalysis
正在执行...
2021-01-22T20:39:24.144+0800: [GC (Allocation Failure) 2021-01-22T20:39:24.144+0800: [ParNew: 139776K->17472K(157248K), 0.0108999 secs] 139776K->42679K(506816K), 0.0109541 secs] [Times: user=0.01 sys=0.02, real=0.01 secs]
2021-01-22T20:39:24.173+0800: [GC (Allocation Failure) 2021-01-22T20:39:24.173+0800: [ParNew: 157248K->17472K(157248K), 0.0153264 secs] 182455K->90799K(506816K), 0.0153704 secs] [Times: user=0.01 sys=0.03, real=0.01 secs]
2021-01-22T20:39:24.208+0800: [GC (Allocation Failure) 2021-01-22T20:39:24.208+0800: [ParNew: 157248K->17471K(157248K), 0.0347116 secs] 230575K->136886K(506816K), 0.0347547 secs] [Times: user=0.07 sys=0.02, real=0.04 secs]
2021-01-22T20:39:24.260+0800: [GC (Allocation Failure) 2021-01-22T20:39:24.260+0800: [ParNew: 157247K->17472K(157248K), 0.0189514 secs] 276662K->185643K(506816K), 0.0189980 secs] [Times: user=0.06 sys=0.01, real=0.02 secs]
2021-01-22T20:39:24.297+0800: [GC (Allocation Failure) 2021-01-22T20:39:24.297+0800: [ParNew: 157248K->17469K(157248K), 0.0178121 secs] 325419K->227646K(506816K), 0.0178563 secs] [Times: user=0.05 sys=0.02, real=0.02 secs]
2021-01-22T20:39:24.314+0800: [GC (CMS Initial-Mark) [1 CMS-Initial-mark: 210176K(349568K)] 230575K(506816K), 0.0002204 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.315+0800: [CMS-concurrent-mark-start]
2021-01-22T20:39:24.320+0800: [CMS-concurrent-mark: 0.005/0.005 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
2021-01-22T20:39:24.322+0800: [CMS-concurrent-preclean-start]
2021-01-22T20:39:24.322+0800: [CMS-concurrent-preclean: 0.001/0.001 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.322+0800: [CMS-concurrent-abortable-preclean-start]
2021-01-22T20:39:24.333+0800: [GC (Allocation Failure) 2021-01-22T20:39:24.333+0800: [ParNew: 156802K->17468K(157248K), 0.0205086 secs] 366978K->276054K(506816K), 0.0205480 secs] [Times: user=0.05 sys=0.02, real=0.02 secs]
2021-01-22T20:39:24.371+0800: [GC (Allocation Failure) 2021-01-22T20:39:24.371+0800: [ParNew: 157244K->17471K(157248K), 0.0195131 secs] 415830K->323265K(506816K), 0.0195618 secs] [Times: user=0.06 sys=0.01, real=0.02 secs]
2021-01-22T20:39:24.408+0800: [GC (Allocation Failure) 2021-01-22T20:39:24.408+0800: [ParNew: 157247K->157247K(157248K), 0.0000149 secs] 2021-01-22T20:39:24.408+0800: [CMS2021-01-22T20:39:24.408+0800: [CMS-concurrent-abortable-preclean: 0.003/0.007 secs] [Times: user=0.16 sys=0.03, real=0.08 secs]
(current node failure): 305793K->256004K(349568K), 0.0330474 secs] 463041K->256004K(506816K), [Metaspace: 2536K->2536K(1056768K)], 0.0331099 secs] [Times: user=0.03 sys=0.00, real=0.04 secs]
2021-01-22T20:39:24.459+0800: [GC (Allocation Failure) 2021-01-22T20:39:24.459+0800: [ParNew: 139776K->17471K(157248K), 0.0080817 secs] 395780K->306828K(506816K), 0.0081235 secs] [Times: user=0.02 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.467+0800: [GC (CMS Initial-Mark) [1 CMS-Initial-mark: 289356K(349568K)] 309768K(506816K), 0.0001540 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.467+0800: [CMS-concurrent-mark-start]
2021-01-22T20:39:24.470+0800: [CMS-concurrent-mark: 0.002/0.002 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.470+0800: [CMS-concurrent-preclean-start]
2021-01-22T20:39:24.470+0800: [CMS-concurrent-preclean: 0.001/0.001 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
2021-01-22T20:39:24.470+0800: [CMS-concurrent-abortable-preclean-start]
2021-01-22T20:39:24.481+0800: [GC (Allocation Failure) 2021-01-22T20:39:24.481+0800: [ParNew: 157247K->17471K(157248K), 0.0197344 secs] 446604K->353788K(506816K), 0.0197699 secs] [Times: user=0.04 sys=0.02, real=0.02 secs]
2021-01-22T20:39:24.501+0800: [CMS-concurrent-abortable-preclean: 0.001/0.003 secs] [Times: user=0.05 sys=0.02, real=0.03 secs]
2021-01-22T20:39:24.501+0800: [GC (CMS Final Remark) [YG occupancy: 20593 K (157248 K)] 2021-01-22T20:39:24.501+0800: [Rescan (parallel), 0.0009206 secs] 2021-01-22T20:39:24.502+0800: [weak refs processing, 0.0000157 secs] 2021-01-22T20:39:24.502+0800: [class unloading, 0.0001470 secs] 2021-01-22T20:39:24.502+0800: [scrub symbol table, 0.0001986 secs] 2021-01-22T20:39:24.502+0800: [scrub string table, 0.000118 secs] [1 CMS-remark: 336316K(349568K)] 356916K(506816K), 0.0014384 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.506+0800: [CMS-concurrent-sweep-start]
2021-01-22T20:39:24.507+0800: [CMS-concurrent-sweep: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.507+0800: [CMS-concurrent-reset-start]
2021-01-22T20:39:24.507+0800: [CMS-concurrent-reset: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.519+0800: [GC (Allocation Failure) 2021-01-22T20:39:24.519+0800: [ParNew: 157247K->157247K(157248K), 0.0000173 secs] 2021-01-22T20:39:24.519+0800: [CMS: 302592K->291658K(349568K), 0.035930 secs] 459048K->291658K(506816K), [Metaspace: 2536K->2536K(1056768K)], 0.0360458 secs] [Times: user=0.03 sys=0.00, real=0.03 secs]
2021-01-22T20:39:24.555+0800: [GC (CMS Initial-Mark) [1 CMS-Initial-mark: 291658K(349568K)] 294807K(506816K), 0.0002653 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.555+0800: [CMS-concurrent-mark-start]
2021-01-22T20:39:24.557+0800: [CMS-concurrent-mark: 0.002/0.002 secs] [Times: user=0.01 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.557+0800: [CMS-concurrent-preclean-start]
2021-01-22T20:39:24.558+0800: [CMS-concurrent-preclean: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.558+0800: [CMS-concurrent-abortable-preclean-start]
2021-01-22T20:39:24.571+0800: [GC (Allocation Failure) 2021-01-22T20:39:24.571+0800: [ParNew: 139776K->17469K(157248K), 0.0060074 secs] 431434K->341119K(506816K), 0.0060593 secs] [Times: user=0.02 sys=0.00, real=0.00 secs]
```

```

2021-01-22T20:39:24.937+0800: [GC (CMS Final Remark) [YG occupancy: 27334 K (157248 K)]2021-01-22T20:39:24.937+0800: [Rescan (parallel), 0.0007747 secs]2021-01-22T20:39:24.937+0800: [weak refs processing 0.0000115 secs]2021-01-22T20:39:24.938+0800: [class unloading, 0.0001537 secs]2021-01-22T20:39:24.938+0800: [scrub symbol table, 0.0002408 secs]2021-01-22T20:39:24.938+0800: [scrub string table, 0.0001215 secs][1 CMS-remark: 342066K(349568K) 369400K(506816K), 0.0013458 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
2021-01-22T20:39:24.938+0800: [CMS-concurrent-sweep-start]
2021-01-22T20:39:24.938+0800: [CMS-concurrent-sweep: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.939+0800: [CMS-concurrent-reset-start]
2021-01-22T20:39:24.939+0800: [CMS-concurrent-reset: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.951+0800: [GC (Allocation Failure)2021-01-22T20:39:24.951+0800: [ParNew: 139770K->139770K(157248K), 0.0000262 secs]2021-01-22T20:39:24.952+0800: [CMS: 341995K->343059K(349568K), 0.0431977 secs]2021-01-22T20:39:24.952+0800: [Metaspace: 2536K->2536K(1056768K), 0.0431964 secs] [Times: user=0.04 sys=0.00, real=0.04 secs]
2021-01-22T20:39:24.952+0800: [GC (Initial Mark) [1 CMS-Initial-mark: 343059K(349568K) 346248K(506816K), 0.0002489 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.995+0800: [CMS-concurrent-mark-start]
2021-01-22T20:39:24.998+0800: [CMS-concurrent-mark: 0.002/0.002 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.998+0800: [CMS-concurrent-preclean-start]
2021-01-22T20:39:24.998+0800: [CMS-concurrent-preclean: 0.001/0.001 secs] [Times: user=0.00 sys=0.00, real=0.01 secs]
2021-01-22T20:39:24.998+0800: [CMS-concurrent-abortable-preclean-start]
2021-01-22T20:39:24.998+0800: [CMS-concurrent-abortable-preclean: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:24.999+0800: [GC (CMS Final Remark) [YG occupancy: 36784 K (157248 K)]2021-01-22T20:39:24.999+0800: [Rescan (parallel), 0.0001987 secs]2021-01-22T20:39:24.999+0800: [weak refs processing 0.0000092 secs]2021-01-22T20:39:24.999+0800: [class unloading, 0.0001424 secs]2021-01-22T20:39:24.999+0800: [scrub symbol table, 0.0001948 secs]2021-01-22T20:39:24.999+0800: [scrub string table, 0.0001260 secs]
2021-01-22T20:39:24.999+0800: [CMS-concurrent-sweep-start] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:25.000+0800: [CMS-concurrent-sweep: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:25.000+0800: [CMS-concurrent-reset-start]
2021-01-22T20:39:25.000+0800: [CMS-concurrent-reset: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:25.012+0800: [GC (Allocation Failure)2021-01-22T20:39:25.012+0800: [ParNew: 139214K->139214K(157248K), 0.0000465 secs]2021-01-22T20:39:25.012+0800: [CMS: 340789K->342784K(349568K), 0.0456026 secs]2021-01-22T20:39:25.012+0800: [Metaspace: 2536K->2536K(1056768K), 0.0457851 secs] [Times: user=0.05 sys=0.00, real=0.04 secs]
2021-01-22T20:39:25.058+0800: [GC (CMS Initial Mark) [1 CMS-Initial-mark: 342784K(349568K) 346497K(506816K), 0.0002256 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:25.058+0800: [CMS-concurrent-mark-start]
2021-01-22T20:39:25.061+0800: [CMS-concurrent-mark: 0.002/0.002 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:25.061+0800: [CMS-concurrent-preclean-start]
2021-01-22T20:39:25.062+0800: [CMS-concurrent-preclean: 0.001/0.001 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:25.062+0800: [CMS-concurrent-abortable-preclean-start]
2021-01-22T20:39:25.062+0800: [CMS-concurrent-abortable-preclean: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:25.063+0800: [GC (Allocation Failure)2021-01-22T20:39:25.063+0800: [ParNew: 3696K->3696K(157248 K)]2021-01-22T20:39:25.063+0800: [Rescan (parallel), 0.0001763 secs]2021-01-22T20:39:25.062+0800: [weak refs processing 0.0000129 secs]2021-01-22T20:39:25.062+0800: [class unloading, 0.0001602 secs]2021-01-22T20:39:25.062+0800: [scrub symbol table, 0.0001934 secs]2021-01-22T20:39:25.062+0800: [scrub string table, 0.0001214 secs][1 CMS-remark: 342784K(349568K) 379731K(506816K), 0.0007052 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:25.063+0800: [CMS-concurrent-sweep-start]
2021-01-22T20:39:25.063+0800: [CMS-concurrent-sweep: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:39:25.063+0800: [CMS-concurrent-reset-start]
2021-01-22T20:39:25.063+0800: [CMS-concurrent-reset: 0.000/0.000 secs] [Times: user=0.00 sys=0.00, real=0.00 secs]
执行结束! 共生成对象次数: 10729

```

YoungGC, 大概每次时间是 0.0169421 secs, 暂停时间长, 比串行 GC 的短一点, 比并行 GC 的长。

6、 CMS 比对:

```
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx256M -Xms256M -XX:+PrintGCDateStamps -XX:+UseConcMarkSweepGC GCLogAnalysis
正在执行...
执行结束!共生成对象次数:4903
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx512M -Xms512M -XX:+PrintGCDateStamps -XX:+UseConcMarkSweepGC GCLogAnalysis
正在执行...
执行结束!共生成对象次数:11806
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx1G -Xms1G -XX:+PrintGCDateStamps -XX:+UseConcMarkSweepGC GCLogAnalysis
正在执行...
执行结束!共生成对象次数:16648
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx2G -Xms2G -XX:+PrintGCDateStamps -XX:+UseConcMarkSweepGC GCLogAnalysis
正在执行...
执行结束!共生成对象次数:14508
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx4G -Xms4G -XX:+PrintGCDateStamps -XX:+UseConcMarkSweepGC GCLogAnalysis
正在执行...
执行结束!共生成对象次数:13395
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx8G -Xms8G -XX:+PrintGCDateStamps -XX:+UseConcMarkSweepGC GCLogAnalysis
正在执行...
执行结束!共生成对象次数:11500
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx16G -Xms16G -XX:+PrintGCDateStamps -XX:+UseConcMarkSweepGC GCLogAnalysis
Java HotSpot(TM) 64-Bit Server VM warning: INFO: os::commit_memory(0x00000003d4cc0000, 16830955520, 0) failed; error='Cannot allocate memory' (errno=12)
#
# There is insufficient memory for the Java Runtime Environment to continue.
# Native memory allocation (mmap) failed to map 16830955520 bytes for committing reserved memory.
# An error report file with more information is saved as:
# /home/qingteng/桌面/hs_err_pid25205.log
```

分析结论:

最优配置是 1G, 最大吞吐量是 16648

堆太小，会导致应用出现 OOM。

堆太大，可能导致 YGC、FULLGC，消耗很长时间用来做 GC，导致吞吐量小。

CMS GC 的 YoungGC 比串行 GC 的好一点，比并行 GC 差。

7、 G1GC

命令: `java -Xmx16G -Xms16G -XX:+PrintGCDateStamps -XX:+UseG1GC GCLogAnalysis`

```

root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx16G -Xms16G -XX:+PrintGCDateStamps -XX:+UseG1GC GLogAnalysis
Java HotSpot(TM) 64-Bit Server VM warning: INFO: os::commit_memory(0x00000003c0000000, 17179869184, 0) failed; error='Cannot allocate memory' (errno=12)
#
# There is insufficient memory for the Java Runtime Environment to continue.
# Native memory allocation (mmap) failed to map 17179869184 bytes for committing reserved memory.
# An error report file with more information is saved as:
# /home/qingteng/桌面/hs_err_pid27055.log
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx8G -Xms8G -XX:+PrintGCDateStamps -XX:+UseG1GC GLogAnalysis
正在执行...
执行结束!共生成对象次数:18422
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx4G -Xms4G -XX:+PrintGCDateStamps -XX:+UseG1GC GLogAnalysis
正在执行...
执行结束!共生成对象次数:16958
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx2G -Xms2G -XX:+PrintGCDateStamps -XX:+UseG1GC GLogAnalysis
正在执行...
执行结束!共生成对象次数:17953
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx2G -Xms2G -XX:+PrintGCDateStamps -XX:+UseG1GC GLogAnalysis
正在执行...
执行结束!共生成对象次数:16208
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx1G -Xms1G -XX:+PrintGCDateStamps -XX:+UseG1GC GLogAnalysis
正在执行...
执行结束!共生成对象次数:13523
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx512M -Xms512M -XX:+PrintGCDateStamps -XX:+UseG1GC GLogAnalysis
正在执行...
执行结束!共生成对象次数:16940
root@minhu-System-Product-Name:/home/qingteng/桌面# java -Xmx256M -Xms256M -XX:+PrintGCDateStamps -XX:+UseG1GC GLogAnalysis
正在执行...
Exception in thread "main" java.lang.OutOfMemoryError: Java heap space
    at java.util.Arrays.copyOfRange(Arrays.java:3664)
    at java.lang.String.<init>(String.java:207)
    at java.lang.StringBuilder.toString(StringBuilder.java:407)
    at GLogAnalysis.generateGarbage(GLogAnalysis.java:58)
    at GLogAnalysis.main(GLogAnalysis.java:25)

```

最优的配置是 8G，最大吞吐量是 18422.

8、 G1GC 详细分析：

```

2021-01-22T20:24:59.492+0800: [GC concurrent-root-region-scan-start]
2021-01-22T20:24:59.492+0800: [GC concurrent-root-region-scan-end, 0.0000174 secs]
2021-01-22T20:24:59.492+0800: [GC concurrent-mark-start]
2021-01-22T20:24:59.492+0800: [GC pause (G1 Evacuation Pause) (young) (to-space exhausted), 0.0015166 secs]
    [Parallel Time: 0.8 ms, GC Workers: 4]
        [GC Worker Start (ms): Min: 1063.3, Avg: 1063.5, Max: 1064.1, Diff: 0.7]
        [Ext Root Scanning (ms): Min: 0.0, Avg: 0.1, Max: 0.1, Diff: 0.1, Sum: 0.4]
        [Update RS (ms): Min: 0.0, Avg: 0.0, Max: 0.1, Diff: 0.1, Sum: 0.2]
            [Processed Buffers: Min: 0, Avg: 1.2, Max: 3, Diff: 3, Sum: 5]
        [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: 0.4, Max: 0.6, Diff: 0.6, Sum: 1.8]
            [Termination Attempts: Min: 1, Avg: 1.2, Max: 2, Diff: 1, Sum: 5]
        [GC Worker Other (ms): Min: 0.0, Avg: 0.0, Max: 0.0, Diff: 0.0, Sum: 0.0]
        [GC Worker Total (ms): Min: 0.0, Avg: 0.6, Max: 0.8, Diff: 0.8, Sum: 2.3]
        [GC Worker End (ms): Min: 1064.1, Avg: 1064.1, Max: 1064.1, Diff: 0.0]
    [Code Root Fixup: 0.0 ms]
    [Code Root Purge: 0.0 ms]
    [Clear CT: 0.0 ms]
    [Other: 0.7 ms]
        [Evacuation Failure: 0.0 ms]
        [Choose CSet: 0.0 ms]
        [Ref Proc: 0.6 ms]
        [Ref Enq: 0.0 ms]
        [Redirty Cards: 0.0 ms]
        [Humongous Register: 0.0 ms]
        [Humongous Reclaim: 0.0 ms]
        [Free CSet: 0.0 ms]
    [Eden: 1024.0K(25.0M)->0.0B(25.0M) Survivors: 0.0B->0.0B Heap: 423.7M(512.0M)->423.7M(512.0M)]
    [Times: user=0.00 sys=0.00, real=0.00 secs]
2021-01-22T20:24:59.494+0800: [Full GC (Allocation Failure) 423M->348M(512M), 0.0343124 secs]
    [Eden: 0.0B(25.0M)->0.0B(25.0M) Survivors: 0.0B->0.0B Heap: 423.7M(512.0M)->348.3M(512.0M)], [Metaspace: 2536K->2536K(1056768K)]
    [Times: user=0.04 sys=0.00, real=0.03 secs]
执行结束!共生成对象次数:113072021-01-22T20:24:59.528+0800: [GC concurrent-mark-abort]

```

结论：G1 GC 暂停的时间 0.8ms 很少，大部分时间在工作。最优堆配置是 8G.最大吞吐量为：18422

jdk1.8 默认是并行 GC