**Assignment – 5 (Parallel Sorting)**

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***Your task is to implement a parallel sorting algorithm such that each partition of the array is sorted in parallel. You will consider two different schemes for deciding whether to sort in parallel.***

**Main.java:**

Graphical user interface

Description automatically generated with low confidence

Graphical user interface

Description automatically generated with medium confidence

Graphical user interface, text, application

Description automatically generated

**ParSort.java:**

Graphical user interface, text

Description automatically generated with medium confidence

Text

Description automatically generated

**Outputs: (Refer 2M, 3M, 4M folders)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Number of Threads: 2** | |  |  |
|  |  |  |  |
| **2M** | **3M** | **4M** | **Cutoff\*10/Array** |
| 938 | 1434 | 1747 | 0.1 |
| 737 | 1074 | 1414 | 0.15 |
| 685 | 1051 | 1445 | 0.2 |
| 699 | 1012 | 1408 | 0.25 |
| 696 | 1008 | 1563 | 0.3 |
| 793 | 1048 | 1410 | 0.35 |
| 726 | 1047 | 1418 | 0.4 |
| 729 | 1063 | 1426 | 0.45 |
| 702 | 1048 | 1397 | 0.5 |
| 700 | 1055 | 1404 | 0.55 |
| 700 | 1051 | 1423 | 0.6 |
| 748 | 1182 | 1662 | 0.65 |
| 763 | 1209 | 1792 | 0.7 |
| 770 | 1274 | 1782 | 0.75 |
| 765 | 1348 | 1574 | 0.8 |
| 751 | 1135 | 1550 | 0.85 |
| 758 | 1209 | 1673 | 0.9 |
| 802 | 1097 | 1629 | 0.95 |
| 752 | 1156 | 1574 | 1 |
| 763 | 1181 | 1553 | 1.05 |
| 779 | 1191 | 1491 | 1.1 |
| 752 | 1144 | 1553 | 1.15 |
| 765 | 1150 | 1498 | 1.2 |
| 763 | 1124 | 1553 | 1.25 |
| 803 | 1206 | 1661 | 1.3 |
| 796 | 1233 | 1689 | 1.35 |
| 817 | 1203 | 1653 | 1.4 |
| 830 | 1258 | 1699 | 1.45 |
| 787 | 1346 | 1806 | 1.5 |
| 800 | 1283 | 1860 | 1.55 |
| 805 | 1311 | 1656 | 1.6 |
| 790 | 1223 | 1549 | 1.65 |
| 832 | 1204 | 1690 | 1.7 |
| 814 | 1277 | 1615 | 1.75 |
| 824 | 1345 | 1601 | 1.8 |

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| **Number of Threads: 4** | |  |  |
|  |  |  |  |
| **2M** | **3M** | **4M** | **Cutoff\*10/Array** |
| 1132 | 1373 | 1690 | 0.1 |
| 640 | 914 | 1206 | 0.15 |
| 641 | 872 | 1158 | 0.2 |
| 613 | 873 | 1157 | 0.25 |
| 613 | 881 | 1174 | 0.3 |
| 617 | 894 | 1164 | 0.35 |
| 620 | 861 | 1168 | 0.4 |
| 633 | 867 | 1145 | 0.45 |
| 631 | 880 | 1153 | 0.5 |
| 619 | 877 | 1145 | 0.55 |
| 625 | 879 | 1148 | 0.6 |
| 630 | 961 | 1276 | 0.65 |
| 631 | 1013 | 1429 | 0.7 |
| 630 | 1019 | 1435 | 0.75 |
| 628 | 1076 | 1303 | 0.8 |
| 631 | 958 | 1214 | 0.85 |
| 627 | 887 | 1228 | 0.9 |
| 637 | 887 | 1217 | 0.95 |
| 622 | 899 | 1202 | 1 |
| 638 | 891 | 1199 | 1.05 |
| 632 | 911 | 1250 | 1.1 |
| 630 | 909 | 1196 | 1.15 |
| 638 | 914 | 1201 | 1.2 |
| 631 | 892 | 1199 | 1.25 |
| 661 | 925 | 1229 | 1.3 |
| 681 | 969 | 1333 | 1.35 |
| 680 | 1027 | 1300 | 1.4 |
| 684 | 986 | 1311 | 1.45 |
| 720 | 1001 | 1345 | 1.5 |
| 708 | 977 | 1429 | 1.55 |
| 785 | 943 | 1376 | 1.6 |
| 742 | 998 | 1277 | 1.65 |
| 701 | 980 | 1274 | 1.7 |
| 642 | 1055 | 1344 | 1.75 |
| 642 | 1017 | 1383 | 1.8 |

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| **Number of Threads: 8** | |  |  |
|  |  |  |  |
| **2M** | **3M** | **4M** | **Cutoff\*10/Array** |
| 913 | 1304 | 1697 | 0.1 |
| 679 | 1044 | 1287 | 0.15 |
| 586 | 853 | 1180 | 0.2 |
| 588 | 828 | 1179 | 0.25 |
| 559 | 819 | 1181 | 0.3 |
| 578 | 806 | 1159 | 0.35 |
| 576 | 822 | 1169 | 0.4 |
| 575 | 819 | 1164 | 0.45 |
| 564 | 853 | 1164 | 0.5 |
| 574 | 925 | 1168 | 0.55 |
| 575 | 912 | 1162 | 0.6 |
| 573 | 836 | 1191 | 0.65 |
| 573 | 822 | 1343 | 0.7 |
| 575 | 793 | 1207 | 0.75 |
| 574 | 807 | 1154 | 0.8 |
| 579 | 909 | 1242 | 0.85 |
| 574 | 806 | 1213 | 0.9 |
| 573 | 839 | 1174 | 0.95 |
| 574 | 812 | 1269 | 1 |
| 576 | 799 | 1174 | 1.05 |
| 574 | 802 | 1289 | 1.1 |
| 581 | 833 | 1173 | 1.15 |
| 576 | 802 | 1298 | 1.2 |
| 574 | 798 | 1227 | 1.25 |
| 564 | 807 | 1221 | 1.3 |
| 560 | 861 | 1235 | 1.35 |
| 557 | 844 | 1228 | 1.4 |
| 570 | 802 | 1194 | 1.45 |
| 563 | 795 | 1227 | 1.5 |
| 553 | 921 | 1278 | 1.55 |
| 566 | 818 | 1279 | 1.6 |
| 559 | 789 | 1227 | 1.65 |
| 551 | 862 | 1152 | 1.7 |
| 566 | 855 | 1212 | 1.75 |
| 560 | 769 | 1131 | 1.8 |

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| **Number of Threads: 16** | |  |  |
|  |  |  |  |
| **2M** | **3M** | **4M** | **Cutoff\*10/Array** |
| 911 | 1407 | 1607 | 0.1 |
| 559 | 906 | 1156 | 0.15 |
| 531 | 848 | 1137 | 0.2 |
| 523 | 833 | 1112 | 0.25 |
| 527 | 827 | 1110 | 0.3 |
| 522 | 810 | 1092 | 0.35 |
| 520 | 824 | 1093 | 0.4 |
| 516 | 825 | 1094 | 0.45 |
| 520 | 819 | 1100 | 0.5 |
| 516 | 813 | 1085 | 0.55 |
| 517 | 819 | 1081 | 0.6 |
| 520 | 874 | 1089 | 0.65 |
| 526 | 811 | 1095 | 0.7 |
| 526 | 801 | 1093 | 0.75 |
| 526 | 812 | 1093 | 0.8 |
| 525 | 795 | 1084 | 0.85 |
| 526 | 802 | 1085 | 0.9 |
| 521 | 802 | 1087 | 0.95 |
| 533 | 802 | 1092 | 1 |
| 525 | 827 | 1111 | 1.05 |
| 523 | 798 | 1104 | 1.1 |
| 525 | 791 | 1170 | 1.15 |
| 524 | 804 | 1227 | 1.2 |
| 523 | 804 | 1108 | 1.25 |
| 517 | 836 | 1078 | 1.3 |
| 514 | 850 | 1167 | 1.35 |
| 502 | 853 | 1120 | 1.4 |
| 504 | 782 | 1191 | 1.45 |
| 505 | 826 | 1134 | 1.5 |
| 510 | 881 | 1158 | 1.55 |
| 513 | 781 | 1174 | 1.6 |
| 508 | 783 | 1105 | 1.65 |
| 505 | 807 | 1094 | 1.7 |
| 506 | 916 | 1217 | 1.75 |
| 515 | 844 | 1104 | 1.8 |

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| **Number of Threads: 32** | |  |  |
|  |  |  |  |
| **2M** | **3M** | **4M** | **Cutoff\*10/Array** |
| 969 | 1412 | 1671 | 0.1 |
| 627 | 900 | 1283 | 0.15 |
| 534 | 849 | 1172 | 0.2 |
| 537 | 839 | 1186 | 0.25 |
| 532 | 848 | 1167 | 0.3 |
| 540 | 828 | 1158 | 0.35 |
| 523 | 820 | 1158 | 0.4 |
| 531 | 812 | 1164 | 0.45 |
| 531 | 814 | 1163 | 0.5 |
| 523 | 803 | 1161 | 0.55 |
| 532 | 842 | 1139 | 0.6 |
| 528 | 964 | 1164 | 0.65 |
| 529 | 903 | 1207 | 0.7 |
| 535 | 941 | 1159 | 0.75 |
| 530 | 976 | 1176 | 0.8 |
| 537 | 839 | 1166 | 0.85 |
| 531 | 825 | 1169 | 0.9 |
| 534 | 908 | 1160 | 0.95 |
| 529 | 950 | 1160 | 1 |
| 532 | 808 | 1152 | 1.05 |
| 533 | 873 | 1149 | 1.1 |
| 532 | 843 | 1142 | 1.15 |
| 534 | 839 | 1158 | 1.2 |
| 535 | 860 | 1149 | 1.25 |
| 526 | 845 | 1151 | 1.3 |
| 514 | 861 | 1247 | 1.35 |
| 517 | 807 | 1268 | 1.4 |
| 513 | 824 | 1271 | 1.45 |
| 520 | 944 | 1197 | 1.5 |
| 516 | 814 | 1145 | 1.55 |
| 520 | 777 | 1149 | 1.6 |
| 516 | 827 | 1257 | 1.65 |
| 516 | 875 | 1170 | 1.7 |
| 523 | 813 | 1147 | 1.75 |
| 515 | 911 | 1152 | 1.8 |

**Conclusion:**

Upon increasing the number of threads, I noticed that there was no significant difference in performance.