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|  | 2 x quad core Xeon E5345 @ 2.33 GHz | | | | |
|  | 8 GB | | | | |
|  | 1 Gbps | | | | |
|  | Scientific Linux 6.3 | | | | |
|  | 32 | | | | |
|  | Open MPI 1.6.3 | | | | |
|  | GCC 4.4.6 | | | | |
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| 10k | 499,950 | 2,499,750 | 4,999,500 | 7,499,250 | 9,999,000 |
| 20k | 1,999,900 | 9,999,500 | 19,999,000 | 29,998,500 | 39,998,000 |
| 30k | 4,499,850 | 22,499,250 | 44,998,500 | 67,497,750 | 89,997,000 |
| 40k | 7,999,800 | 39,999,000 | 79,998,000 | 119,997,000 | 159,996,000 |
| 50k | 12,499,750 | 62,498,750 | 124,997,500 | 187,496,250 | 187,496,250 |
| 60k | 17,999,700 | 89,998,500 | 179,997,000 | 269,995,500 | 359,994,000 |
| 70k | 24,499,650 | 122,498,250 | 244,996,500 | 367,494,750 | 489,993,000 |
| 80k | 31,999,600 | 159,998,000 | 319,996,000 | 479,994,000 | 639,992,000 |
| 90k | 40,499,550 | 202,497,750 | 404,995,500 | 607,493,250 | 809,991,000 |
| 100k | 49,999,500 | 249,997,500 | 499,995,000 | 749,992,500 | 999,990,000 |
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| 4 | 4 | 1 | 10k - 50k |  |  |
| 8 | 8 | 1 | 10k - 60k |  |  |
| 16 | 16 | 1 | 10k - 80k |  |  |
| 32 | 32 | 1 | 10k - 100k |  |  |
| 64 | 32 | 2 | 10k - 100k |  |  |
| 128 | 32 | 4 | 10k - 100k |  |  |
| 256 | 32 | 8 | 10k - 100k |  |  |

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|  |  | Total | Sort | Comm | Parse |  | Total | Comm | Parse |
| 4 | 10k | 0.122 | 0.09 | 0.004 | 0.037 |  | 1.933 | 1.629 | 0.073 |
| 20k | 0.491 | 0.408 | 0.006 | 0.191 |  | 4.324 | 3.136 | 0.276 |
| 30k | 1.148 | 0.979 | 0.016 | 0.472 |  | 7.515 | 4.803 | 0.628 |
| 40k | 2.12 | 1.819 | 0.045 | 0.815 |  | 11.353 | 6.601 | 1.181 |
| 50k | 3.435 | 3.004 | 0.051 | 1.011 |  | 15.682 | 8.292 | 1.791 |
| 60k |  |  |  |  |  |  |  |  |
| 70k |  |  |  |  |  |  |  |  |
| 80k |  |  |  |  |  |  |  |  |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 8 | 10k | 0.086 | 0.046 | 0.012 | 0.048 |  | 2.418 | 2.261 | 0.036 |
| 20k | 0.281 | 0.206 | 0.008 | 0.161 |  | 4.97 | 4.368 | 0.125 |
| 30k | 0.628 | 0.491 | 0.014 | 0.356 |  | 8.268 | 6.893 | 0.292 |
| 40k | 1.136 | 0.928 | 0.017 | 0.629 |  | 11.518 | 9.111 | 0.529 |
| 50k | 1.825 | 1.519 | 0.033 | 0.435 |  | 14.88 | 10.833 | 0.879 |
| 60k | 2.643 | 2.228 | 0.043 | 0.7 |  | 18.925 | 13.578 | 1.342 |
| 70k |  |  |  |  |  |  |  |  |
| 80k |  |  |  |  |  |  |  |  |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 16 | 10k | 0.056 | 0.022 | 0.006 | 0.038 |  | 4.661 | 4.581 | 0.04 |
| 20k | 0.177 | 0.101 | 0.011 | 0.124 |  | 9.457 | 9.141 | 0.151 |
| 30k | 0.371 | 0.24 | 0.019 | 0.341 |  | 14.572 | 13.857 | 0.32 |
| 40k | 0.639 | 0.449 | 0.023 | 0.518 |  | 19.685 | 18.455 | 0.596 |
| 50k | 0.99 | 0.733 | 0.028 | 0.778 |  | 24.974 | 23.065 | 0.971 |
| 60k | 1.509 | 1.079 | 0.132 | 1.148 |  | 30.279 | 27.553 | 1.359 |
| 70k | 1.939 | 1.515 | 0.044 | 0.986 |  | 35.889 | 32.206 | 1.852 |
| 80k | 2.597 | 2.012 | 0.116 | 1.23 |  | 41.477 | 36.679 | 2.408 |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 32 | 10k | 0.052 | 0.011 | 0.011 | 0.04 |  | 5.881 | 5.834 | 0.027 |
| 20k | 0.131 | 0.048 | 0.014 | 0.137 |  | 11.699 | 11.525 | 0.088 |
| 30k | 0.251 | 0.115 | 0.022 | 0.298 |  | 17.924 | 17.547 | 0.198 |
| 40k | 0.409 | 0.215 | 0.028 | 0.535 |  | 23.967 | 23.321 | 0.378 |
| 50k | 0.607 | 0.352 | 0.035 | 0.826 |  | 30.189 | 29.19 | 0.593 |
| 60k | 0.874 | 0.52 | 0.075 | 1.152 |  | 36.377 | 34.967 | 0.815 |

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|  | 70k | 1.128 | 0.733 | 0.051 | 2.236 |  | 42.771 | 40.871 | 1.326 |
| 80k | 1.446 | 0.966 | 0.067 | 2.045 |  | 48.958 | 46.325 | 1.438 |
| 90k | 1.894 | 1.251 | 0.15 | 4.181 |  | 55.526 | 52.437 | 1.929 |
| 100k | 2.389 | 1.58 | 0.234 | 5.178 |  | 62.101 | 58.297 | 2.497 |
|  |  |  |  |  |  |  |  |  |  |
| 64 | 10k | 0.066 | 0.006 | 0.027 | 0.056 |  | 5.707 | 5.66 | 0.055 |
| 20k | 0.114 | 0.023 | 0.014 | 0.133 |  | 11.94 | 11.765 | 0.14 |
| 30k | 0.204 | 0.058 | 0.021 | 0.355 |  | 17.889 | 17.512 | 0.295 |
| 40k | 0.307 | 0.103 | 0.032 | 0.534 |  | 24.209 | 23.563 | 0.537 |
| 50k | 0.435 | 0.17 | 0.036 | 0.846 |  | 30.318 | 29.317 | 0.832 |
| 60k | 0.591 | 0.253 | 0.052 | 1.215 |  | 36.747 | 35.332 | 1.164 |
| 70k | 0.774 | 0.354 | 0.071 | 1.623 |  | 42.872 | 40.975 | 1.686 |
| 80k | 0.983 | 0.471 | 0.099 | 2.164 |  | 49.554 | 47.083 | 2.178 |
| 90k | 1.2 | 0.606 | 0.109 | 2.705 |  | 55.556 | 52.474 | 2.757 |
| 100k | 1.407 | 0.782 | 0.068 | 3.459 |  | 61.29 | 57.484 | 3.439 |
|  |  |  |  |  |  |  |  |  |  |
| 128 | 10k | 0.056 | 0.003 | 0.018 | 0.024 |  | 6.169 | 6.141 | 0.023 |
| 20k | 0.107 | 0.011 | 0.014 | 0.089 |  | 12.308 | 12.215 | 0.088 |
| 30k | 0.184 | 0.027 | 0.023 | 0.201 |  | 18.652 | 18.453 | 0.195 |
| 40k | 0.267 | 0.049 | 0.031 | 0.354 |  | 25.063 | 24.73 | 0.36 |
| 50k | 0.37 | 0.082 | 0.044 | 0.54 |  | 30.73 | 30.214 | 0.663 |
| 60k | 0.467 | 0.122 | 0.044 | 0.778 |  | 37.199 | 36.479 | 0.941 |
| 70k | 0.601 | 0.17 | 0.066 | 1 |  | 42.961 | 41.996 | 1.089 |
| 80k | 0.743 | 0.229 | 0.081 | 1.392 |  | 48.231 | 46.979 | 1.35 |
| 90k | 0.914 | 0.3 | 0.11 | 1.707 |  | 56.615 | 55.05 | 1.732 |
| 100k | 1.093 | 0.38 | 0.135 | 2.204 |  | 62.781 | 60.85 | 2.201 |
|  |  |  |  |  |  |  |  |  |  |
| 256 | 10k | 0.047 | 0.003 | 0.009 | 0.023 |  | 7.83 | 7.804 | 0.043 |
| 20k | 0.107 | 0.011 | 0.013 | 0.087 |  | 15.497 | 15.434 | 0.1 |
| 30k | 0.182 | 0.027 | 0.021 | 0.19 |  | 23.915 | 23.801 | 0.196 |
| 40k | 0.268 | 0.05 | 0.03 | 0.353 |  | 32.014 | 31.838 | 0.448 |
| 50k | 0.363 | 0.081 | 0.039 | 0.521 |  | 40.203 | 39.958 | 0.569 |
| 60k | 0.466 | 0.12 | 0.045 | 0.72 |  | 48.361 | 48.039 | 0.794 |
| 70k | 0.595 | 0.173 | 0.057 | 0.998 |  | 56.796 | 56.384 | 1.136 |
| 80k | 0.753 | 0.229 | 0.091 | 1.334 |  | 63.758 | 63.244 | 1.419 |
| 90k | 0.897 | 0.309 | 0.083 | 1.705 |  | 72.448 | 71.826 | 1.776 |
| 100k | 1.07 | 0.385 | 0.112 | 2.047 |  | 80.431 | 79.692 | 2.192 |

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|  |  | Total | Sort | Comm | Parse |  | Total | Comm | Parse |
| 4 | 10k | 0.594 | 0.512 | 0.01 | 0.307 |  | 1.966 | 1.642 | 0.387 |
| 20k | 2.589 | 2.307 | 0.016 | 0.977 |  | 4.605 | 3.338 | 1.28 |
| 30k | 6.167 | 5.52 | 0.066 | 2.047 |  | 7.772 | 4.881 | 3.085 |
| 40k | 11.579 | 10.401 | 0.151 | 3.275 |  | 11.553 | 6.481 | 5.726 |
| 50k | 18.937 | 17.089 | 0.271 | 4.997 |  | 16.089 | 8.201 | 9.784 |
| 60k |  |  |  |  |  |  |  |  |
| 70k |  |  |  |  |  |  |  |  |
| 80k |  |  |  |  |  |  |  |  |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 8 | 10k | 0.341 | 0.261 | 0.021 | 0.47 |  | 2.551 | 2.384 | 0.442 |
| 20k | 1.354 | 1.169 | 0.018 | 1.469 |  | 4.986 | 4.341 | 1.491 |
| 30k | 3.178 | 2.806 | 0.019 | 3.315 |  | 8.164 | 6.703 | 3.163 |
| 40k | 5.868 | 5.19 | 0.079 | 4.36 |  | 11.554 | 8.987 | 4.994 |
| 50k | 9.619 | 8.491 | 0.211 | 6.806 |  | 15.336 | 11.355 | 6.367 |
| 60k | 14.384 | 12.518 | 0.56 | 12.161 |  | 19.102 | 13.39 | 15.673 |
| 70k |  |  |  |  |  |  |  |  |
| 80k |  |  |  |  |  |  |  |  |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 16 | 10k | 0.193 | 0.127 | 0.018 | 0.254 |  | 4.738 | 4.649 | 0.404 |
| 20k | 0.706 | 0.575 | 0.014 | 0.836 |  | 9.42 | 9.084 | 1.246 |
| 30k | 1.632 | 1.376 | 0.026 | 1.868 |  | 14.618 | 13.865 | 2.3 |
| 40k | 3.209 | 2.55 | 0.285 | 3.165 |  | 19.867 | 18.557 | 4.084 |
| 50k | 4.817 | 4.159 | 0.098 | 5.417 |  | 25.075 | 23.017 | 6.355 |
| 60k | 7.088 | 6.22 | 0.087 | 10.798 |  | 30.44 | 27.531 | 11.108 |
| 70k | 9.929 | 8.593 | 0.272 | 20.187 |  | 35.837 | 31.908 | 18.752 |
| 80k | 13.391 | 11.681 | 0.349 | 25.717 |  | 42.113 | 36.993 | 25.604 |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 32 | 10k | 0.127 | 0.061 | 0.019 | 0.782 |  | 5.898 | 5.845 | 0.754 |
| 20k | 0.389 | 0.276 | 0.017 | 2.291 |  | 11.415 | 11.233 | 2.291 |
| 30k | 0.868 | 0.666 | 0.027 | 4.221 |  | 17.698 | 17.299 | 4.272 |
| 40k | 1.574 | 1.232 | 0.071 | 8.425 |  | 24.121 | 23.437 | 8.548 |
| 50k | 2.603 | 1.995 | 0.221 | 13.309 |  | 30.007 | 28.949 | 13.479 |
| 60k | 3.935 | 2.97 | 0.433 | 17.868 |  | 36.535 | 35.039 | 17.852 |

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|  | 70k | 5.342 | 4.21 | 0.446 | 26.872 |  | 42.972 | 40.954 | 26.088 |
| 80k | 7.073 | 5.739 | 0.468 | 36.913 |  | 49.215 | 46.594 | 36.794 |
| 90k | 9.088 | 7.471 | 0.537 | 48.687 |  | 55.386 | 52.105 | 48.031 |
| 100k | 11.172 | 9.07 | 0.786 | 61.141 |  | 61.679 | 57.631 | 60.339 |
|  |  |  |  |  |  |  |  |  |  |
| 64 | 10k | 0.132 | 0.029 | 0.048 | 0.861 |  | 6.187 | 6.157 | 0.916 |
| 20k | 0.252 | 0.133 | 0.027 | 2.291 |  | 12.362 | 12.264 | 2.346 |
| 30k | 0.516 | 0.325 | 0.034 | 5.432 |  | 18.872 | 18.661 | 5.271 |
| 40k | 0.946 | 0.608 | 0.106 | 9.219 |  | 25.07 | 24.716 | 9.596 |
| 50k | 1.55 | 1.02 | 0.2 | 14.176 |  | 31.345 | 30.798 | 15.046 |
| 60k | 2.213 | 1.574 | 0.228 | 20.214 |  | 37.219 | 36.452 | 21.009 |
| 70k | 3.051 | 2.175 | 0.337 | 28.4 |  | 43.946 | 42.919 | 28.942 |
| 80k | 3.979 | 2.788 | 0.548 | 40.816 |  | 49.667 | 48.335 | 39.101 |
| 90k | 4.938 | 3.583 | 0.546 | 50.622 |  | 56.517 | 54.852 | 49.812 |
| 100k | 6.254 | 4.66 | 0.65 | 63.307 |  | 63.842 | 61.785 | 80.5 |
|  |  |  |  |  |  |  |  |  |  |
| 128 | 10k | 0.101 | 0.014 | 0.045 | 1.117 |  | 6.954 | 6.931 | 1.066 |
| 20k | 0.217 | 0.065 | 0.058 | 2.686 |  | 13.464 | 13.398 | 2.691 |
| 30k | 0.407 | 0.155 | 0.095 | 5.357 |  | 19.779 | 19.647 | 5.476 |
| 40k | 0.747 | 0.291 | 0.236 | 9.454 |  | 26.179 | 25.965 | 9.519 |
| 50k | 0.993 | 0.518 | 0.177 | 15.341 |  | 32.464 | 32.144 | 15.212 |
| 60k | 1.38 | 0.786 | 0.206 | 21.569 |  | 39.409 | 38.969 | 22.116 |
| 70k | 1.847 | 1.167 | 0.214 | 29.357 |  | 46.239 | 45.661 | 29.671 |
| 80k | 2.422 | 1.49 | 0.34 | 39.727 |  | 51.726 | 50.987 | 40.283 |
| 90k | 2.997 | 1.908 | 0.415 | 50.97 |  | 58.451 | 57.534 | 51.181 |
| 100k | 3.771 | 2.331 | 0.663 | 63.602 |  | 66.124 | 65.004 | 65.392 |
|  |  |  |  |  |  |  |  |  |  |
| 256 | 10k | 0.101 | 0.007 | 0.045 | 1.03 |  | 9.103 | 9.077 | 1.015 |
| 20k | 0.195 | 0.03 | 0.064 | 2.591 |  | 16.5 | 16.436 | 2.635 |
| 30k | 0.335 | 0.076 | 0.096 | 5.773 |  | 24.208 | 24.093 | 5.65 |
| 40k | 0.595 | 0.144 | 0.223 | 10.722 |  | 32.543 | 32.354 | 9.82 |
| 50k | 0.915 | 0.336 | 0.273 | 16.821 |  | 40.672 | 40.422 | 15.958 |
| 60k | 1.136 | 0.504 | 0.24 | 23.089 |  | 47.856 | 47.515 | 23.687 |
| 70k | 1.513 | 0.686 | 0.333 | 33.241 |  | 55.72 | 55.285 | 33.151 |
| 80k | 1.813 | 0.912 | 0.298 | 44.31 |  | 63.857 | 63.326 | 43.8 |
| 90k | 2.293 | 1.069 | 0.519 | 57.505 |  | 70.992 | 70.328 | 56.956 |
| 100k | 2.783 | 1.512 | 0.465 | 68.14 |  | 79.234 | 78.458 | 69.468 |

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|  |  | Total | Sort | Comm | Parse |  | Total | Comm | Parse |
| 4 | 10k | 1.28 | 1.092 | 0.052 | 1.029 |  | 1.984 | 1.634 | 0.933 |
| 20k | 5.505 | 4.9 | 0.084 | 4.388 |  | 4.534 | 3.146 | 3.318 |
| 30k | 13.221 | 11.93 | 0.172 | 8.988 |  | 8.031 | 4.914 | 5.917 |
| 40k | 24.282 | 21.678 | 0.59 | 15.301 |  | 12.017 | 6.545 | 13.129 |
| 50k | 38.468 | 35.218 | 0.171 | 23.258 |  | 16.703 | 8.188 | 20.935 |
| 60k |  |  |  |  |  |  |  |  |
| 70k |  |  |  |  |  |  |  |  |
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| 8 | 10k | 0.679 | 0.566 | 0.026 | 1.328 |  | 2.393 | 2.212 | 1.104 |
| 20k | 2.875 | 2.509 | 0.067 | 5.169 |  | 5.146 | 4.452 | 3.665 |
| 30k | 6.93 | 6.008 | 0.274 | 9.436 |  | 8.209 | 6.634 | 7.612 |
| 40k | 13.474 | 11.127 | 1.168 | 17.505 |  | 11.72 | 8.953 | 12.705 |
| 50k | 19.94 | 17.855 | 0.356 | 28.556 |  | 15.479 | 11.183 | 18.179 |
| 60k | 29.342 | 26.347 | 0.504 | 43.713 |  | 19.72 | 13.485 | 44.118 |
| 70k |  |  |  |  |  |  |  |  |
| 80k |  |  |  |  |  |  |  |  |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 16 | 10k | 0.394 | 0.292 | 0.037 | 1.3 |  | 4.679 | 4.581 | 1.351 |
| 20k | 1.5 | 1.285 | 0.033 | 5.17 |  | 9.517 | 9.154 | 5.335 |
| 30k | 3.604 | 3.042 | 0.181 | 9.611 |  | 14.86 | 14.052 | 11.602 |
| 40k | 6.529 | 5.643 | 0.247 | 17.884 |  | 19.866 | 18.454 | 20.365 |
| 50k | 10.608 | 9.08 | 0.371 | 27.74 |  | 25.201 | 23.009 | 33.005 |
| 60k | 15.283 | 13.365 | 0.531 | 39.381 |  | 31.054 | 27.922 | 47.203 |
| 70k | 20.624 | 18.363 | 0.372 | 67.19 |  | 36.534 | 32.298 | 66.996 |
| 80k | 27.728 | 24.221 | 0.992 | 89.916 |  | 42.526 | 37.004 | 89.559 |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 32 | 10k | 0.231 | 0.13 | 0.042 | 1.408 |  | 5.916 | 5.863 | 1.472 |
| 20k | 0.759 | 0.59 | 0.039 | 5.55 |  | 11.873 | 11.677 | 5.541 |
| 30k | 1.843 | 1.449 | 0.144 | 11.832 |  | 17.968 | 17.541 | 12.473 |
| 40k | 3.279 | 2.67 | 0.133 | 20.134 |  | 24.21 | 23.476 | 22.09 |
| 50k | 5.342 | 4.428 | 0.288 | 33.295 |  | 30.382 | 29.248 | 34.9 |
| 60k | 7.761 | 6.476 | 0.372 | 49.641 |  | 36.61 | 34.995 | 50.275 |

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|  | 70k | 11.083 | 8.941 | 1.008 | 67.892 |  | 42.877 | 40.709 | 68.883 |
| 80k | 13.928 | 11.831 | 0.655 | 90.201 |  | 49.314 | 46.491 | 90.435 |
| 90k | 17.846 | 15.206 | 0.833 | 118.631 |  | 56.118 | 52.581 | 119.478 |
| 100k | 21.881 | 18.812 | 0.84 | 139.403 |  | 62.666 | 58.3 | 138.571 |
|  |  |  |  |  |  |  |  |  |  |
| 64 | 10k | 0.162 | 0.063 | 0.057 | 1.478 |  | 6.08 | 6.049 | 1.512 |
| 20k | 0.437 | 0.283 | 0.042 | 5.589 |  | 12.209 | 12.104 | 5.592 |
| 30k | 0.976 | 0.686 | 0.097 | 12.239 |  | 18.602 | 18.377 | 12.445 |
| 40k | 1.952 | 1.301 | 0.355 | 21.877 |  | 24.77 | 24.392 | 22.172 |
| 50k | 2.958 | 2.195 | 0.317 | 34.414 |  | 30.824 | 30.237 | 35.841 |
| 60k | 4.218 | 3.259 | 0.364 | 50.33 |  | 37.405 | 36.525 | 50.569 |
| 70k | 5.929 | 4.46 | 0.697 | 68.856 |  | 43.569 | 42.466 | 69.24 |
| 80k | 7.473 | 5.82 | 0.696 | 90.568 |  | 49.919 | 48.485 | 92.627 |
| 90k | 9.711 | 7.632 | 0.878 | 118.842 |  | 56.755 | 54.962 | 119.453 |
| 100k | 12.235 | 9.342 | 1.473 | 149.839 |  | 62.754 | 60.539 | 150.528 |
|  |  |  |  |  |  |  |  |  |  |
| 128 | 10k | 0.148 | 0.03 | 0.073 | 1.669 |  | 6.953 | 6.93 | 1.883 |
| 20k | 0.369 | 0.139 | 0.128 | 5.665 |  | 13.16 | 13.09 | 5.87 |
| 30k | 0.647 | 0.335 | 0.134 | 12.451 |  | 19.73 | 19.59 | 12.361 |
| 40k | 1.182 | 0.618 | 0.31 | 22.233 |  | 26.177 | 25.95 | 22.224 |
| 50k | 1.796 | 1.194 | 0.253 | 35.047 |  | 32.661 | 32.322 | 35.003 |
| 60k | 2.544 | 1.589 | 0.488 | 50.653 |  | 39.153 | 38.684 | 50.754 |
| 70k | 3.406 | 2.397 | 0.413 | 69.602 |  | 45.784 | 45.168 | 69.391 |
| 80k | 4.491 | 3.156 | 0.618 | 90.687 |  | 52.519 | 51.728 | 91.336 |
| 90k | 5.646 | 3.976 | 0.792 | 120.041 |  | 59.128 | 58.147 | 123.023 |
| 100k | 6.881 | 4.695 | 1.163 | 150.333 |  | 65.751 | 64.554 | 153.753 |
|  |  |  |  |  |  |  |  |  |  |
| 256 | 10k | 0.12 | 0.018 | 0.054 | 1.684 |  | 8.912 | 8.886 | 1.738 |
| 20k | 0.235 | 0.065 | 0.063 | 5.882 |  | 16.341 | 16.276 | 5.965 |
| 30k | 0.573 | 0.174 | 0.223 | 12.549 |  | 24.42 | 24.297 | 12.411 |
| 40k | 0.958 | 0.383 | 0.326 | 22.221 |  | 32.297 | 32.109 | 21.858 |
| 50k | 1.382 | 0.782 | 0.256 | 36.069 |  | 39.737 | 39.467 | 37.13 |
| 60k | 1.838 | 1.011 | 0.38 | 51.318 |  | 47.473 | 47.121 | 52.656 |
| 70k | 2.582 | 1.49 | 0.533 | 72.321 |  | 55.604 | 55.154 | 73.419 |
| 80k | 3.329 | 1.788 | 0.859 | 93.065 |  | 63.654 | 63.085 | 95.741 |
| 90k | 4.107 | 2.501 | 0.736 | 124.18 |  | 71.946 | 71.257 | 122.96 |
| 100k | 4.813 | 2.866 | 0.936 | 151.926 |  | 79.304 | 78.451 | 154.839 |

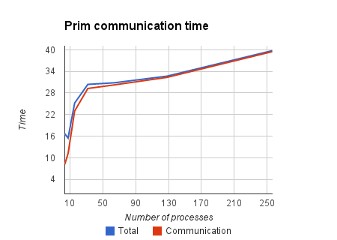
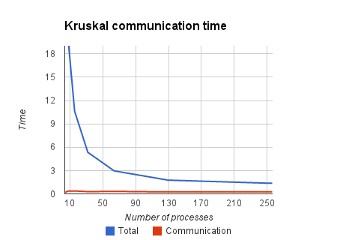
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|  |  | Total | Sort | Comm | Parse |  | Total | Comm | Parse |
| 4 | 10k | 1.984 | 1.736 | 0.053 | 1.311 |  | 2.005 | 1.63 | 1.186 |
| 20k | 8.475 | 7.567 | 0.161 | 4.975 |  | 4.697 | 3.229 | 4.723 |
| 30k | 20.575 | 18.443 | 0.473 | 9.107 |  | 8.2 | 4.857 | 8.983 |
| 40k | 37.912 | 34.692 | 0.294 | 14.88 |  | 12.349 | 6.476 | 17.944 |
| 50k | 59.623 | 54.887 | 0.157 | 25.188 |  | 17.279 | 8.138 | 33.589 |
| 60k |  |  |  |  |  |  |  |  |
| 70k |  |  |  |  |  |  |  |  |
| 80k |  |  |  |  |  |  |  |  |
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| 100k |  |  |  |  |  |  |  |  |
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| 8 | 10k | 1.055 | 0.865 | 0.074 | 1.226 |  | 2.46 | 2.266 | 1.263 |
| 20k | 4.636 | 3.922 | 0.293 | 4.876 |  | 5.227 | 4.484 | 4.761 |
| 30k | 10.603 | 9.498 | 0.184 | 9.913 |  | 8.446 | 6.755 | 7.873 |
| 40k | 20.548 | 18.212 | 0.718 | 18.666 |  | 12.043 | 9.072 | 16.771 |
| 50k | 32.597 | 29.266 | 0.81 | 31.533 |  | 15.917 | 11.307 | 26.671 |
| 60k | 46.075 | 41.618 | 0.808 | 46.676 |  | 20.15 | 13.534 | 49.662 |
| 70k |  |  |  |  |  |  |  |  |
| 80k |  |  |  |  |  |  |  |  |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 16 | 10k | 0.529 | 0.421 | 0.024 | 1.458 |  | 4.706 | 4.604 | 1.344 |
| 20k | 2.255 | 1.871 | 0.138 | 5.689 |  | 9.729 | 9.342 | 5.437 |
| 30k | 5.348 | 4.651 | 0.176 | 12.093 |  | 14.729 | 13.864 | 13.549 |
| 40k | 10.204 | 8.765 | 0.538 | 19.711 |  | 20.421 | 18.91 | 18.323 |
| 50k | 16.339 | 13.916 | 1.009 | 32.118 |  | 25.729 | 23.381 | 35.652 |
| 60k | 24.634 | 20.64 | 2.007 | 53.493 |  | 31.347 | 27.989 | 59.629 |
| 70k | 32.467 | 28.639 | 1.071 | 79.604 |  | 37.201 | 32.66 | 87.947 |
| 80k | 42.351 | 37.443 | 1.313 | 109.488 |  | 43.231 | 37.311 | 117.509 |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 32 | 10k | 0.313 | 0.203 | 0.035 | 1.559 |  | 5.867 | 5.807 | 1.594 |
| 20k | 1.144 | 0.924 | 0.059 | 6.202 |  | 11.969 | 11.761 | 6.288 |
| 30k | 2.756 | 2.259 | 0.165 | 14.668 |  | 18.019 | 17.565 | 15.561 |
| 40k | 5.137 | 4.243 | 0.344 | 25.494 |  | 24.174 | 23.391 | 27.423 |
| 50k | 8.164 | 6.932 | 0.349 | 41.955 |  | 30.518 | 29.305 | 42.492 |
| 60k | 12.054 | 9.923 | 0.997 | 63.443 |  | 36.93 | 35.209 | 62.123 |

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|  | 70k | 16.173 | 13.691 | 0.951 | 87.911 |  | 43.09 | 40.767 | 85.754 |
| 80k | 21.116 | 18.233 | 0.883 | 117.117 |  | 49.59 | 46.566 | 115.271 |
| 90k | 27.017 | 22.929 | 1.579 | 156.331 |  | 56.354 | 52.557 | 156.342 |
| 100k | 34.01 | 28.945 | 1.908 | 204.781 |  | 62.984 | 58.303 | 188.123 |
|  |  |  |  |  |  |  |  |  |  |
| 64 | 10k | 0.199 | 0.097 | 0.055 | 1.671 |  | 6.237 | 6.205 | 1.851 |
| 20k | 0.59 | 0.448 | 0.017 | 6.247 |  | 12.206 | 12.095 | 6.252 |
| 30k | 1.409 | 1.062 | 0.117 | 15.993 |  | 18.572 | 18.332 | 15.9 |
| 40k | 2.872 | 2.044 | 0.458 | 27.035 |  | 24.786 | 24.381 | 28.314 |
| 50k | 4.539 | 3.319 | 0.697 | 42.826 |  | 30.998 | 30.372 | 44.192 |
| 60k | 6.377 | 4.92 | 0.688 | 63.929 |  | 37.264 | 36.384 | 64.044 |
| 70k | 8.848 | 6.752 | 1.108 | 88.465 |  | 43.652 | 42.472 | 88.159 |
| 80k | 11.251 | 9.189 | 0.839 | 117.715 |  | 50.168 | 48.633 | 117.671 |
| 90k | 14.444 | 11.704 | 1.203 | 156.841 |  | 56.683 | 54.761 | 157.207 |
| 100k | 18.589 | 14.702 | 2.011 | 210.932 |  | 63.171 | 60.801 | 210.896 |
|  |  |  |  |  |  |  |  |  |  |
| 128 | 10k | 0.169 | 0.055 | 0.068 | 2.308 |  | 6.75 | 6.726 | 2.3 |
| 20k | 0.437 | 0.211 | 0.112 | 7.228 |  | 13.074 | 13.002 | 7.166 |
| 30k | 0.866 | 0.511 | 0.162 | 15.938 |  | 19.628 | 19.482 | 16.015 |
| 40k | 1.698 | 1.035 | 0.376 | 28.276 |  | 26.251 | 26.012 | 28.243 |
| 50k | 2.589 | 1.707 | 0.456 | 44.37 |  | 32.817 | 32.458 | 44.762 |
| 60k | 3.745 | 2.47 | 0.732 | 64.755 |  | 39.219 | 38.721 | 64.505 |
| 70k | 5.276 | 3.604 | 0.97 | 89.693 |  | 45.89 | 45.235 | 88.651 |
| 80k | 6.458 | 4.823 | 0.796 | 118.385 |  | 52.54 | 51.692 | 120.05 |
| 90k | 8.49 | 6.012 | 1.443 | 157.566 |  | 59.272 | 58.226 | 158.707 |
| 100k | 10.383 | 7.557 | 1.569 | 212.033 |  | 65.974 | 64.697 | 211.537 |
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| 256 | 10k | 0.119 | 0.022 | 0.048 | 2.276 |  | 8.635 | 8.608 | 2.318 |
| 20k | 0.309 | 0.103 | 0.096 | 6.809 |  | 16.261 | 16.192 | 6.987 |
| 30k | 0.782 | 0.274 | 0.322 | 15.98 |  | 24.238 | 24.114 | 16.409 |
| 40k | 1.339 | 0.584 | 0.491 | 29.134 |  | 31.766 | 31.572 | 31.503 |
| 50k | 1.95 | 1.019 | 0.528 | 44.91 |  | 39.627 | 39.352 | 49.635 |
| 60k | 2.778 | 1.537 | 0.753 | 65.623 |  | 48.025 | 47.646 | 68.609 |
| 70k | 3.679 | 2.075 | 0.934 | 89.581 |  | 55.551 | 55.069 | 91.268 |
| 80k | 4.705 | 2.606 | 1.325 | 120.624 |  | 64.019 | 63.437 | 121.132 |
| 90k | 5.861 | 3.504 | 1.397 | 159.601 |  | 71.944 | 71.223 | 171.285 |
| 100k | 7.247 | 4.467 | 1.617 | 213.633 |  | 80.094 | 79.24 | 213.064 |

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|  |  | Total | Sort | Comm | Parse |  | Total | Comm | Parse |
| 4 | 10k | 2.587 | 2.306 | 0.025 | 1.637 |  | 2.058 | 1.658 | 1.65 |
| 20k | 11.408 | 10.197 | 0.234 | 6.847 |  | 4.97 | 3.404 | 6.263 |
| 30k | 27.605 | 24.522 | 0.877 | 13.67 |  | 8.647 | 5.082 | 12.654 |
| 40k | 49.853 | 45.217 | 0.724 | 26.001 |  | 13.182 | 6.916 | 26.907 |
| 50k | 79.198 | 72.427 | 0.683 | 40.108 |  | 17.789 | 8.036 | 45.654 |
| 60k |  |  |  |  |  |  |  |  |
| 70k |  |  |  |  |  |  |  |  |
| 80k |  |  |  |  |  |  |  |  |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 8 | 10k | 1.393 | 1.393 | 0.047 | 1.719 |  | 2.5 | 2.293 | 1.709 |
| 20k | 6.107 | 5.324 | 0.238 | 6.819 |  | 5.53 | 4.729 | 6.939 |
| 30k | 14.676 | 12.616 | 0.849 | 13.728 |  | 8.576 | 6.775 | 15.405 |
| 40k | 27.102 | 23.759 | 1.202 | 25.132 |  | 12.583 | 9.414 | 24.461 |
| 50k | 42.079 | 37.597 | 1.139 | 40.427 |  | 16.33 | 11.41 | 40.91 |
| 60k | 61.272 | 55.702 | 0.731 | 68.116 |  | 20.846 | 13.789 | 75.259 |
| 70k |  |  |  |  |  |  |  |  |
| 80k |  |  |  |  |  |  |  |  |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 16 | 10k | 0.714 | 0.59 | 0.029 | 1.807 |  | 4.652 | 4.542 | 1.837 |
| 20k | 3.04 | 2.586 | 0.143 | 7.561 |  | 9.385 | 8.974 | 8.212 |
| 30k | 7.279 | 6.467 | 0.144 | 15.632 |  | 14.812 | 13.891 | 13.537 |
| 40k | 14 | 11.84 | 0.995 | 28.776 |  | 19.99 | 18.379 | 26.105 |
| 50k | 21.78 | 19.081 | 0.883 | 47.571 |  | 25.53 | 23.029 | 50.559 |
| 60k | 31.76 | 27.699 | 1.4 | 77.617 |  | 31.078 | 27.5 | 74.834 |
| 70k | 43.298 | 38.006 | 1.717 | 108.589 |  | 37.329 | 32.488 | 104.325 |
| 80k | 56.92 | 50.178 | 2.045 | 147.282 |  | 43.128 | 36.813 | 137.896 |
| 90k |  |  |  |  |  |  |  |  |
| 100k |  |  |  |  |  |  |  |  |
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| 32 | 10k | 0.395 | 0.292 | 0.031 | 1.928 |  | 5.924 | 5.863 | 1.89 |
| 20k | 1.623 | 1.334 | 0.095 | 8.127 |  | 11.955 | 11.732 | 8.111 |
| 30k | 3.781 | 3.103 | 0.188 | 17.627 |  | 18.08 | 17.593 | 18.697 |
| 40k | 6.921 | 5.683 | 0.555 | 29.973 |  | 24.217 | 23.384 | 31.263 |
| 50k | 10.663 | 9.008 | 0.643 | 50.9 |  | 30.589 | 29.297 | 50.7 |
| 60k | 15.574 | 13.411 | 0.664 | 75.616 |  | 36.732 | 34.899 | 74.482 |

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|  | 70k | 21.503 | 18.396 | 1.154 | 105.703 |  | 43.137 | 40.666 | 104.971 |
| 80k | 28.48 | 24.401 | 1.505 | 144.21 |  | 49.457 | 46.239 | 142.881 |
| 90k | 36.433 | 31.48 | 1.678 | 198.43 |  | 56.452 | 52.41 | 195.26 |
| 100k | 44.926 | 39.075 | 1.783 | 265.067 |  | 63.356 | 58.361 | 257.128 |
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| 64 | 10k | 0.262 | 0.134 | 0.077 | 2.034 |  | 6.173 | 6.139 | 1.943 |
| 20k | 0.773 | 0.607 | 0.025 | 8.086 |  | 12.392 | 12.274 | 8.098 |
| 30k | 1.872 | 1.468 | 0.138 | 19.453 |  | 18.831 | 18.577 | 18.98 |
| 40k | 3.899 | 2.837 | 0.635 | 30.996 |  | 24.803 | 24.374 | 31.926 |
| 50k | 5.917 | 4.614 | 0.653 | 50.798 |  | 31.19 | 30.527 | 51.921 |
| 60k | 8.889 | 6.646 | 1.362 | 76.073 |  | 37.163 | 36.229 | 75.03 |
| 70k | 11.451 | 9.099 | 1.174 | 107.039 |  | 43.688 | 42.432 | 105.938 |
| 80k | 15.442 | 12.223 | 1.708 | 147.133 |  | 49.992 | 48.359 | 145.777 |
| 90k | 19.65 | 15.779 | 1.993 | 200.479 |  | 56.822 | 54.778 | 195.441 |
| 100k | 23.784 | 19.938 | 1.515 | 275.991 |  | 63.31 | 60.766 | 268.336 |
|  |  |  |  |  |  |  |  |  |  |
| 128 | 10k | 0.195 | 0.062 | 0.085 | 2.933 |  | 6.833 | 6.808 | 2.984 |
| 20k | 0.494 | 0.29 | 0.075 | 8.829 |  | 13.031 | 12.955 | 8.804 |
| 30k | 1.177 | 0.715 | 0.251 | 19.015 |  | 19.503 | 19.349 | 18.982 |
| 40k | 2.296 | 1.479 | 0.489 | 31.896 |  | 26.206 | 25.953 | 31.657 |
| 50k | 3.388 | 2.278 | 0.629 | 52.111 |  | 32.592 | 32.214 | 52.499 |
| 60k | 4.919 | 3.414 | 0.882 | 76.645 |  | 38.883 | 38.357 | 75.784 |
| 70k | 6.842 | 4.754 | 1.256 | 108.187 |  | 45.66 | 44.966 | 108.94 |
| 80k | 8.944 | 6.477 | 1.487 | 147.337 |  | 52.533 | 51.643 | 147.369 |
| 90k | 10.919 | 8.327 | 1.346 | 205.34 |  | 59.12 | 58.013 | 197.476 |
| 100k | 13.617 | 10.285 | 1.815 | 276.279 |  | 65.99 | 64.635 | 271.285 |
|  |  |  |  |  |  |  |  |  |  |
| 256 | 10k | 0.184 | 0.036 | 0.094 | 3.014 |  | 8.557 | 8.529 | 3.011 |
| 20k | 0.368 | 0.176 | 0.08 | 8.56 |  | 15.788 | 15.716 | 8.115 |
| 30k | 0.967 | 0.373 | 0.396 | 19.283 |  | 24.218 | 24.088 | 19.794 |
| 40k | 1.617 | 0.882 | 0.446 | 34.654 |  | 31.91 | 31.707 | 37.15 |
| 50k | 2.332 | 1.409 | 0.496 | 54.16 |  | 42.341 | 42.053 | 60.099 |
| 60k | 3.471 | 1.947 | 0.997 | 83.732 |  | 50.086 | 49.696 | 88.719 |
| 70k | 4.556 | 2.758 | 1.087 | 117.95 |  | 55.983 | 55.475 | 123.037 |
| 80k | 5.841 | 3.934 | 1.036 | 152.553 |  | 63.848 | 63.232 | 162.137 |
| 90k | 7.803 | 5.117 | 1.651 | 202.807 |  | 71.435 | 70.683 | 210.08 |
| 100k | 9.73 | 5.996 | 2.382 | 273.669 |  | 79.32 | 78.376 | 276.018 |

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| Kruskal | 50k, 10% | 4 | 38.468 | 0.171 |  | 4 | 8 | 16 | 32 | 64 | 128 | 256 |  |  |
|  |  | 8 | 19.94 | 0.356 | Total | 38.468 | 19.94 | 10.608 | 5.342 | 2.958 | 1.796 | 1.382 |  |  |
|  |  | 16 | 10.608 | 0.371 | Communic | 0.171 | 0.356 | 0.371 | 0.288 | 0.317 | 0.253 | 0.256 |  |  |
|  |  | 32 | 5.342 | 0.288 |  |  |  |  |  |  |  |  |  |  |
|  |  | 64 | 2.958 | 0.317 |  |  |  |  |  |  |  |  |  |  |
|  |  | 128 | 1.796 | 0.253 |  |  |  |  |  |  |  |  |  |  |
|  |  | 256 | 1.382 | 0.256 |  |  |  |  |  |  |  |  |  |  |
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| Prim | 50k, 10% | 4 | 16.703 | 8.188 |  | 4 | 8 | 16 | 32 | 64 | 128 | 256 |  |  |
|  |  | 8 | 15.479 | 11.183 | Total | 16.703 | 15.479 | 25.201 | 30.382 | 30.824 | 32.661 | 39.737 |  |  |
|  |  | 16 | 25.201 | 23.009 | Communic | 8.188 | 11.183 | 23.009 | 29.248 | 30.237 | 32.322 | 39.467 |  |  |
|  |  | 32 | 30.382 | 29.248 |  |  |  |  |  |  |  |  |  |  |
|  |  | 64 | 30.824 | 30.237 |  |  |  |  |  |  |  |  |  |  |
|  |  | 128 | 32.661 | 32.322 |  |  |  |  |  |  |  |  |  |  |
|  |  | 256 | 39.737 | 39.467 |  |  |  |  |  |  |  |  |  |  |
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|  | 50k, 10% |  |  |  |  | 4 | 8 | 16 | 32 | 64 | 128 | 256 |  |  |
|  |  |  |  |  | Kruskal | 38.468 | 19.94 | 10.608 | 5.342 | 2.958 | 1.796 | 1.382 |  |  |
|  |  |  |  |  | Prim | 16.703 | 15.479 | 25.201 | 30.382 | 30.824 | 32.661 | 39.737 |  |  |
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| 50k p = 32 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 1% | 5% | 10% | 15% | 20% |  |  |  |  |  |  |  |  |  |
| Kruskal | 0.607 | 2.603 | 5.342 | 8.164 | 10.663 |  |  |  |  |  |  |  |  |  |
| Prim | 30.189 | 30.007 | 30.382 | 30.518 | 30.589 |  |  |  |  |  |  |  |  |  |
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