Table 1 Pixel Count Performance Times on all Platforms all Datasets

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **GLC** | | | | **MERIS** | | |  | **NLCD** | | |  |
| Partition size | PostGIS | GeoTrellis | GeoTrellis (Cached) | SCIDB | PostGIS | GeoTrellis | GeoTrellis (Cached) | SCIDB | PostGIS | GeoTrellis | GeoTrellis (Cached) | SCIDB |
| 25 |  | 1.498 | 0.080 |  |  | 10.548 | 0.207 |  |  | 97.047 | 10.917 |  |
| 50 | 2.611 | 1.231 | 0.053 |  | 16.164 | 10.010 | 0.129 |  | 1184.822 | 84.956 | 6.112 |  |
| 100 | 2.009 | 1.183 | 0.042 |  | 13.680 | 10.317 | 0.104 |  | 1039.693 | 86.418 | 5.101 |  |
| 200 | 1.893 | 1.316 | 0.034 |  | 12.834 | 11.508 | 0.103 |  | 1000.756 | 100.159 | 5.305 |  |
| 300 | 1.876 | 1.492 | 0.048 |  | 12.526 | 12.885 | 0.098 |  | 994.960 | 119.041 | 5.767 |  |
| 400 | 1.823 | 1.750 | 0.045 |  | 13.392 | 14.722 | 0.105 |  | 990.351 | 137.887 | 6.281 |  |
| 500 | 1.844 | 1.965 | 0.037 | 0.325 | 12.562 | 16.704 | 0.094 | 0.581 | 991.586 | 167.465 | 6.942 | 17.603 |
| 600 | 2.025 | 2.215 | 0.038 |  | 13.356 | 18.864 | 0.103 |  | 996.428 | 196.552 | 7.454 |  |
| 700 | 1.852 | 2.603 | 0.041 |  | 13.545 | 21.478 | 0.100 |  | 991.928 | 231.496 | 7.961 |  |
| 800 | 2.083 | 2.965 | 0.045 |  | 13.665 | 24.712 | 0.116 |  | 999.223 | 258.017 | 8.461 |  |
| 900 | 2.021 | 3.532 | 0.052 |  | 12.784 | 27.174 | 0.102 |  | 1005.009 | 309.726 | 9.123 |  |
| 1000 | 2.205 | 3.714 | 0.054 | 0.200 | 13.922 | 30.229 | 0.106 | 0.564 | 1005.128 | 355.632 | 9.849 | 14.363 |
| 1500 | 1.848 |  |  | 0.189 | 13.121 |  |  | 0.428 | 1002.517 |  |  | 21.935 |
| 2000 | 2.435 |  |  | 0.192 | 17.032 |  |  | 0.489 | 1032.112 |  |  | 19.495 |
| 2500 |  |  |  | 0.244 |  |  |  | 0.528 |  |  |  | 19.856 |
| 3000 |  |  |  | 0.211 |  |  |  | 0.481 |  |  |  | 20.794 |
| 3500 |  |  |  | 0.239 |  |  |  | 0.503 |  |  |  | 21.867 |
| 4000 |  |  |  | 0.236 |  |  |  |  |  |  |  | 20.955 |

Table 3 Focal Performance Times on all Platforms all Datasets

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **GLC** | | | | |
| Partition size | PostGIS | GeoTrellis | GeoTrellis (Cached) | SCIDB | SciDB\_overlap |
| 25 |  | 1.563 | 0.135 |  |  |
| 50 | 118.883 | 1.272 | 0.124 |  |  |
| 100 | 123.314 | 1.309 | 0.114 |  |  |
| 200 | 126.583 | 1.393 | 0.109 |  |  |
| 300 | 128.053 | 1.581 | 0.138 |  |  |
| 400 | 127.472 | 1.821 | 0.146 |  |  |
| 500 | 128.040 | 2.086 | 0.156 | 8.380 | 4.420 |
| 600 | 128.084 | 2.355 | 0.179 |  |  |
| 700 | 129.083 | 2.689 | 0.188 |  |  |
| 800 | 128.354 | 3.263 | 0.208 |  |  |
| 900 | 128.390 | 3.524 | 0.272 |  |  |
| 1000 | 128.422 | 3.828 | 0.275 | 14.148 | 8.243 |
| 1500 |  |  |  | 19.708 | 7.223 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **MERIS** | | | | |
| Partition size | PostGIS | GeoTrellis | GeoTrellis (Cached) | SCIDB | SciDB\_overlap |
| 25 |  | 11.058 | 0.608 |  |  |
| 50 | 1231.641 | 10.670 | 0.570 |  |  |
| 100 | 1280.320 | 10.763 | 0.520 |  |  |
| 200 | 1311.697 | 11.984 | 0.547 |  |  |
| 300 | 1317.308 | 13.446 | 0.592 |  |  |
| 400 | 1322.023 | 15.375 | 0.745 |  |  |
| 500 | 1327.230 | 17.291 | 0.721 | 37.672 | 8.501 |
| 600 | 1327.812 | 19.693 | 0.738 |  |  |
| 700 | 1330.271 | 22.085 | 0.681 |  |  |
| 800 | 1327.911 | 25.583 | 0.780 |  |  |
| 900 | 1333.428 | 27.942 | 0.774 |  |  |
| 1000 | 1336.509 | 31.150 | 0.785 | 39.628 | 37.444 |
| 1500 |  |  |  | 42.295 | --- |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **NLCD** | | | | |
| Partition size | PostGIS | GeoTrellis | GeoTrellis (Cached) | SCIDB | SciDB\_overlap |
| 25 |  | 137.310 | 52.299 |  |  |
| 50 |  | 122.124 | 44.903 |  |  |
| 100 |  | 124.050 | 43.732 |  |  |
| 200 |  | 140.795 | 47.232 |  |  |
| 300 |  | 162.284 | 50.222 |  |  |
| 400 |  | 183.028 | 53.012 |  |  |
| 500 |  | 214.100 | 55.736 | --- | --- |
| 600 |  | 244.912 | 57.261 |  |  |
| 700 |  | 280.607 | 58.864 |  |  |
| 800 |  | 308.179 | 59.607 |  |  |
| 900 |  | 359.523 | 61.130 |  |  |
| 1000 |  | 407.264 | 62.609 | --- | --- |
| 1500 |  |  |  |  |  |

Table 4 Polygonal Summaries on all Platforms for all Datasets

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **GLC** | PostGIS | PostGIS | Post GIS | PostGIS | SciDB Join Only | SciDB Join Only | SciDB Join Only | SciDB Join Only | SciDB  All Operations | SciDB  All Operations | SciDB  All Operations | SciDB  All Operations | GeoTrellis | GeoTrellis | GeoTrellis |
| **Partition size** | **regions** | **states** | **counties** | **tracts** | **regions** | **states** | **counties** | **tracts** | **regions** | **states** | **counties** | **tracts** | **states** | **counties** | **tracts** |
| 25 |  |  |  |  |  |  |  |  |  |  |  |  | 257.76 | 1881.55 | 40685.15 |
| 50 | 4.85 | 5.69 | 13.51 | 106.60 |  |  |  |  |  |  |  |  | 69.21 | 619.06 | 12982.88 |
| 100 | 2.74 | 3.89 | 9.84 | 78.88 |  |  |  |  |  |  |  |  | 21.17 | 242.25 | 4897.61 |
| 200 | 2.24 | 3.85 | 8.85 | 73.48 |  |  |  |  |  |  |  |  | 7.77 | 100.15 | 2205.59 |
| 300 | 2.48 | 4.33 | 9.21 | 86.45 |  |  |  |  |  |  |  |  | 5.49 | 78.06 | 1747.58 |
| 400 | 2.41 | 4.70 | 10.20 | 106.00 |  |  |  |  |  |  |  |  | 4.60 | 70.39 | 1579.98 |
| 500 | 2.61 | 4.82 | 11.58 | 134.25 | 1.38 | 1.37 | 1.40 | 1.41 | 16.77 | 16.80 | 18.03 | 24.45 | 4.31 | 68.79 | 1486.75 |
| 600 | 2.74 | 4.99 | 13.29 | 166.94 |  |  |  |  |  |  |  |  | 4.33 | 75.33 | 1571.24 |
| 700 | 3.21 | 5.00 | 15.36 | 210.62 |  |  |  |  |  |  |  |  | 4.39 | 80.38 | 1647.18 |
| 800 | 3.75 | 5.07 | 17.76 | 260.27 |  |  |  |  |  |  |  |  | 4.57 | 82.52 | 1726.48 |
| 900 | 3.95 | 5.19 | 20.84 | 321.47 |  |  |  |  |  |  |  |  | 4.81 | 97.42 | 1881.31 |
| 1000 | 3.75 | 5.43 | 23.43 | 372.19 | 1.73 | 1.60 | 1.67 | 1.55 | 16.06 | 16.81 | 16.65 | 22.56 | 4.96 | 94.26 | 1909.86 |
| 1500 |  |  |  |  | 1.81 | 1.95 | 1.93 | 1.86 | 16.15 | 16.15 | 15.32 | 23.28 |  |  |  |
| 2000 |  |  |  |  | 2.29 | 2.37 | 2.41 | 2.35 | 16.12 | 16.66 | 17.42 | 30.88 |  |  |  |
| 2500 |  |  |  |  | 3.45 | 3.40 | 3.40 | 3.34 | 18.79 | 18.40 | 18.30 | 34.80 |  |  |  |
| 3000 |  |  |  |  | 4.35 | 4.29 | 4.26 | 4.37 | 21.84 | 23.53 | 21.83 | 27.54 |  |  |  |
| 3500 |  |  |  |  | 4.991 | 5.033 | 4.936 | 4.948 | 22.491 | 24.544 | 23.306 | 29.860 |  |  |  |
| 4000 |  |  |  |  | 5.532 | 5.550 | 5.584 | 5.467 | 23.274 | 26.491 | 24.858 | 43.031 |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **MERIS** | PostGIS | | PostGIS | | Post GIS | | PostGIS | | SciDB Join Only | | SciDB Join Only | | SciDB Join Only | | SciDB Join Only | | SciDB  All Operations | | SciDB  All Operations | | SciDB  All Operations | | SciDB  All Operations | | GeoTrellis | | GeoTrellis | | GeoTrellis | |
| **Partition size** | | **regions** | | **states** | | **counties** | | **tracts** | | **regions** | | **states** | | **counties** | | **tracts** | **regions** | **states** | | **counties** | | **tracts** | | **states** | | **counties** | | **tracts** | |
| 25 | |  | |  | |  | |  | |  | |  | |  | |  |  |  | |  | |  | | 17025.81 | | 2605.76 | | 380758.74 | |
| 50 | | 29.19 | | 17.95 | | 35.58 | | 205.84 | |  | |  | |  | |  |  |  | |  | |  | | 4610.52 | | 678.45 | | 101375.91 | |
| 100 | | 12.59 | | 13.11 | | 37.72 | | 163.39 | |  | |  | |  | |  |  |  | |  | |  | | 1379.44 | | 185.95 | | 30047.95 | |
| 200 | | 8.45 | | 12.61 | | 42.87 | | 149.54 | |  | |  | |  | |  |  |  | |  | |  | | 522.58 | | 60.97 | | 11309.04 | |
| 300 | | 8.02 | | 14.91 | | 45.67 | | 160.30 | |  | |  | |  | |  |  |  | |  | |  | | 359.90 | | 37.52 | | 7602.61 | |
| 400 | | 8.25 | | 15.98 | | 48.58 | | 182.26 | |  | |  | |  | |  |  |  | |  | |  | | 312.80 | | 32.18 | | 6524.13 | |
| 500 | | 9.15 | | 20.96 | | 50.94 | | 211.98 | | 9.21 | | 9.33 | | 9.11 | | 9.24 | 109.63 | 131.42 | | 133.56 | | 170.66 | | 265.54 | | 29.25 | | 5542.39 | |
| 600 | | 9.79 | | 21.89 | | 53.82 | | 253.80 | |  | |  | |  | |  |  |  | |  | |  | | 233.64 | | 29.18 | | 4957.02 | |
| 700 | | 10.22 | | 25.62 | | 57.12 | | 305.09 | |  | |  | |  | |  |  |  | |  | |  | | 227.49 | | 30.39 | | 4837.95 | |
| 800 | | 10.26 | | 26.06 | | 59.86 | | 358.73 | |  | |  | |  | |  |  |  | |  | |  | | 244.42 | | 33.91 | | 5201.31 | |
| 900 | | 10.96 | | 28.57 | | 64.03 | | 425.06 | |  | |  | |  | |  |  |  | |  | |  | | 228.50 | | 35.90 | | 4699.39 | |
| 1000 | | 13.30 | | 30.90 | | 68.28 | | 498.24 | | 9.76 | | 9.72 | | 9.71 | | 9.76 | 126.60 | 112.14 | | 120.60 | | 190.55 | | 244.88 | | 37.89 | | 5268.79 | |
| 1500 | |  | |  | |  | |  | | 11.20 | | 11.46 | | 10.85 | | 11.10 | 121.77 | 130.77 | | 115.43 | | 157.33 | |  | |  | |  | |
| 2000 | |  | |  | |  | |  | | 11.67 | | 11.61 | | 11.61 | | 11.43 | 121.92 | 110.03 | | 118.53 | | 222.65 | |  | |  | |  | |
| 2500 | |  | |  | |  | |  | | 12.86 | | 12.80 | | 12.97 | | 12.83 | 142.16 | 132.85 | | 118.29 | | 203.43 | |  | |  | |  | |
| 3000 | |  | |  | |  | |  | | 14.30 | | 14.11 | | 14.38 | | 14.22 | 170.52 | 193.08 | | 122.11 | | 255.34 | |  | |  | |  | |
| 3500 | |  | |  | |  | |  | | 13.29 | | 13.43 | | 13.36 | | 13.25 | 145.26 | 132.03 | | 136.39 | | 141.79 | |  | |  | |  | |
| 4000 | |  | |  | |  | |  | | 16.82 | | 17.51 | | 16.53 | | 16.73 | 141.18 | 142.98 | | 135.49 | | 299.22 | |  | |  | |  | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **NLCD** | PostGIS | | PostGIS | | Post GIS | | PostGIS | | SciDB Join Only | | SciDB Join Only | | SciDB Join Only | | SciDB Join Only | | SciDB  All Operations | | SciDB  All Operations | | SciDB  All Operations | | SciDB  All Operations | | GeoTrellis | | GeoTrellis | | GeoTrellis | |
| **Partition size** | | **regions** | | **states** | | **counties** | | **tracts** | | **regions** | | **states** | | **counties** | | **tracts** | **regions** | **states** | | **counties** | | **tracts** | | **states** | | **counties** | | **tracts** | |
| 25 | |  | |  | |  | |  | |  | |  | |  | |  |  |  | |  | |  | | --- | | --- | | --- | |
| 50 | | 2090 | | 873 | | 520 | | 1303 | |  | |  | |  | |  |  |  | |  | |  | | --- | | --- | | --- | |
| 100 | | 800 | | 533 | | 514 | | 1144 | |  | |  | |  | |  |  |  | |  | |  | | --- | | --- | | --- | |
| 200 | | 468 | | 432 | | 629 | | 1390 | |  | |  | |  | |  |  |  | |  | |  | | --- | | --- | | --- | |
| 300 | | 404 | | 413 | | 783 | | 1711 | |  | |  | |  | |  |  |  | |  | |  | | --- | | --- | | --- | |
| 400 | | 385 | | 414 | | 954 | | 2013 | |  | |  | |  | |  |  |  | |  | |  | | --- | | --- | | --- | |
| 500 | | 386 | | 422 | | 1130 | | 2361 | | 39.5 | | 39.3 | | 39.5 | | 42.2 | 13365.3 | 11549.8 | | 16045.2 | | 20641.8 | | --- | | --- | | --- | |
| 600 | | 377 | | 423 | | 1311 | | 2574 | |  | |  | |  | |  |  |  | |  | |  | | --- | | --- | | --- | |
| 700 | | 380 | | 439 | | 1489 | | 2791 | |  | |  | |  | |  |  |  | |  | |  | | --- | | --- | | --- | |
| 800 | | 377 | | 453 | | 1641 | | 2973 | |  | |  | |  | |  |  |  | |  | |  | | --- | | --- | | --- | |
| 900 | | 379 | | 461 | | 1807 | | 3170 | |  | |  | |  | |  |  |  | |  | |  | | --- | | --- | | --- | |
| 1000 | | 378 | | 481 | | 1944 | | 3367 | | 60.0 | | 60.4 | | 59.7 | | 62.3 | 15302.1 | 17836.7 | | 17536.2 | | 19319.1 | |  | |  | |  | |
| 1500 | |  | |  | |  | |  | | 74.5 | | 74.8 | | 74.4 | | 75.7 | 16612.9 | 16732.7 | | 16802.4 | | 19457.6 | |  | |  | |  | |
| 2000 | |  | |  | |  | |  | | 90.4 | | 90.4 | | 91.1 | | 91.1 | 16450.0 | 16855.3 | | 15461.1 | | 18509.7 | |  | |  | |  | |
| 2500 | |  | |  | |  | |  | | 121.9 | | 121.9 | | 122.1 | | 123.8 | 16538.2 | 15568.9 | | 15960.0 | | 18384.0 | |  | |  | |  | |
| 3000 | |  | |  | |  | |  | | 144.3 | | 144.1 | | 146.2 | | 144.9 | 17623.4 | 18052.5 | | 17653.1 | | 18703.4 | |  | |  | |  | |
| 3500 | |  | |  | |  | |  | | 169.1 | | 169.4 | | 171.3 | | 171.0 | 15337.7 | 17863.2 | | 16750.4 | | 22298.1 | |  | |  | |  | |
| 4000 | |  | |  | |  | |  | | 175.2 | | 175.1 | | 175.7 | | 177.0 | 16477.3 | 17026.3 | | 18416.2 | | 20002.9 | |  | |  | |  | |

Table 10 SciDB Zonal Operation Components by Percentage of Time

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Raster | Vector | Rasterize | Load | Redimension | Join |
| GLC | states | 7.9% | 31.7% | 35.7% | 24.7% |
|  | counties | 7.6% | 32.0% | 36.9% | 23.4% |
|  | tracts | 31.8% | 31.9% | 21.5% | 14.9% |
| MERIS | states | 31.6% | 19.2% | 36.3% | 12.8% |
|  | counties | 36.6% | 17.5% | 34.8% | 11.1% |
|  | tracts | 46.6% | 18.0% | 28.4% | 7.0% |
| NLCD | states | 20.0% | 9.3% | 65.7% | 5.1% |
|  | counties | 22.5% | 8.8% | 63.7% | 5.0% |
|  | tracts | 44.4% | 4.6% | 46.7% | 4.2% |