

OPERATING SYSTEMS
Lab 2 Report
Threads

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New ID: 63.

Old ID: 64.

• **Problem Statement:**

- Implement the multi-threaded matrix multiplication using both methods described above.
- Compare the two implementations according to the following:
(1) the number of thread created and (2) the execution time taken.

• **code is organized:**

code is organized in 1 main file, and two text file for default matrices. First read two input matrices and store them by ReadMats, Then do matrices multiplication element, write result matrix in output file and time in stdout, Last do same thing with matrices multiplication row.

• **Major Functions:**

-ReadMats:

read matrices a & b from their files, check if their valid to multiply and store them in their global variables.

-EleMul:

Thread function that calculate of only element in out matrix.

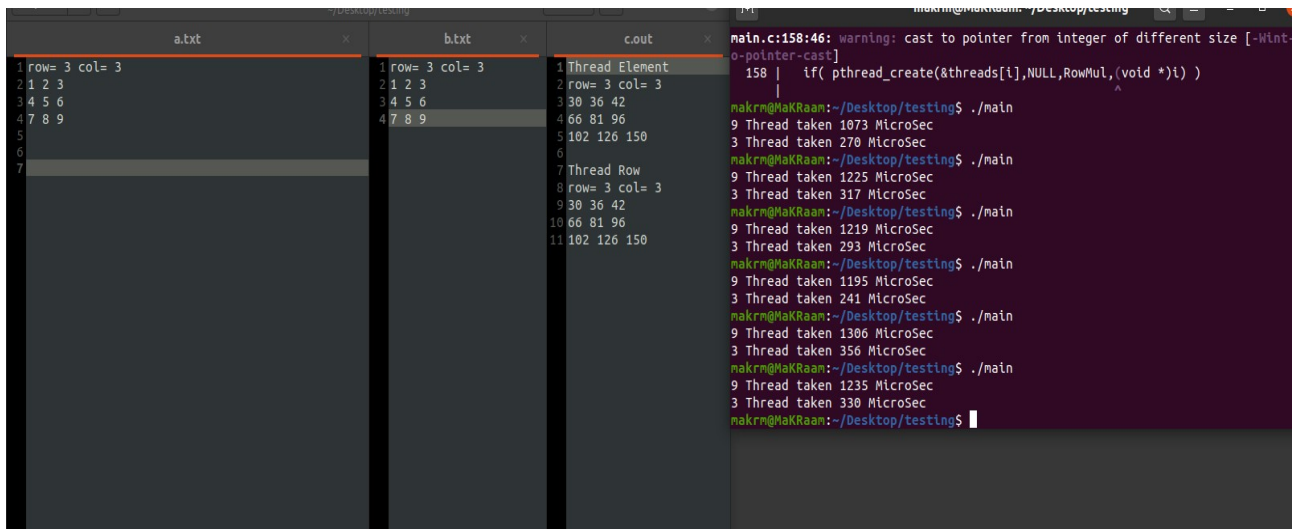
-RowMul:

Thread function that calculate of a row in out matrix.

• **Compile & run:**

it can run by terminal location then use “gcc -pthread -o main main.c” to compile with link pthread , last to run it use “./main Mat1 Mat2 MatOut”. Or just “./main”.

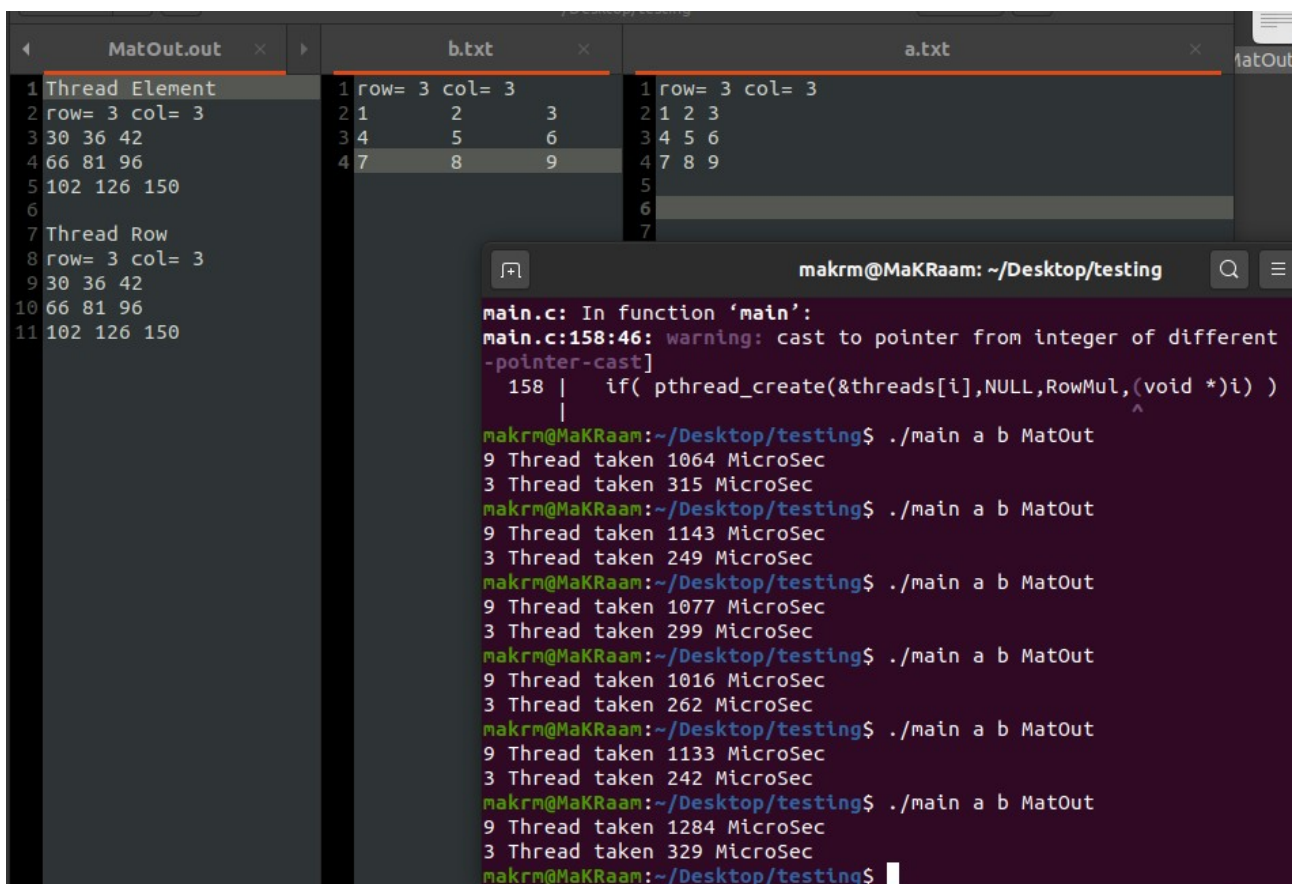
• Sample Runs:



```
a.txt
1 row= 3 col= 3
2 1 2 3
3 4 5 6
4 7 8 9
5
6
7

b.txt
1 row= 3 col= 3
2 1 2 3
3 4 5 6
4 7 8 9
5
6
7

c.out
1 Thread Element
2 row= 3 col= 3
3 30 36 42
4 66 81 96
5 102 126 150
6
7 Thread Row
8 row= 3 col= 3
9 30 36 42
10 66 81 96
11 102 126 150
```



```
MatOut.out
1 Thread Element
2 row= 3 col= 3
3 30 36 42
4 66 81 96
5 102 126 150
6
7 Thread Row
8 row= 3 col= 3
9 30 36 42
10 66 81 96
11 102 126 150

b.txt
1 row= 3 col= 3
2 1 2 3
3 4 5 6
4 7 8 9
5
6
7

a.txt
1 row= 3 col= 3
2 1 2 3
3 4 5 6
4 7 8 9
5
6
7

makrm@MaKRaam: ~/Desktop/testing
main.c: In function 'main':
main.c:158:46: warning: cast to pointer from integer of different
-size [-Wint-to-pointer-cast]
158 |   if( pthread_create(&threads[i],NULL,RowMul,(void *)i) )
    |   ^
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
9 Thread taken 1064 MicroSec
3 Thread taken 315 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
9 Thread taken 1143 MicroSec
3 Thread taken 249 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
9 Thread taken 1077 MicroSec
3 Thread taken 299 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
9 Thread taken 1016 MicroSec
3 Thread taken 262 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
9 Thread taken 1133 MicroSec
3 Thread taken 242 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
9 Thread taken 1284 MicroSec
3 Thread taken 329 MicroSec
makrm@MaKRaam:~/Desktop/testing$
```

```
a.txt      b.txt      c.out
row= 3 col= 3
1 2 3
4 5 6
7 8 9

1 row= 3 col= 2
2 1 2
3 3 4
4 5 6

1 Thread Element
2 row= 3 col= 2
3 22 28
4 49 64
5 76 100
6
7 Thread Row
8 row= 3 col= 2
9 22 28
10 49 64
11 76 100

makrm@MaKRaam: ~/Desktop/testing
3 Thread taken 232 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
6 Thread taken 953 MicroSec
3 Thread taken 104 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
6 Thread taken 1221 MicroSec
3 Thread taken 365 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
6 Thread taken 1304 MicroSec
3 Thread taken 380 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
6 Thread taken 1154 MicroSec
3 Thread taken 282 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
6 Thread taken 1216 MicroSec
3 Thread taken 323 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
6 Thread taken 1021 MicroSec
3 Thread taken 274 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
6 Thread taken 1260 MicroSec
3 Thread taken 282 MicroSec
makrm@MaKRaam:~/Desktop/testing$
```

```
a.txt      b.txt      MatOut.out
row= 3 col= 3
1 2 3
4 5 6
7 8 9

1 row= 3 col= 2
2 1 2
3 3 4
4 5 6

1 Thread Element
2 row= 3 col= 2
3 22 28
4 49 64
5 76 100
6
7 Thread Row
8 row= 3 col= 2
9 22 28
10 49 64
11 76 100

makrm@MaKRaam: ~/Desktop/testing
3 Thread taken 346 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
6 Thread taken 1276 MicroSec
3 Thread taken 298 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
6 Thread taken 1224 MicroSec
3 Thread taken 433 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
6 Thread taken 1150 MicroSec
3 Thread taken 282 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
6 Thread taken 1168 MicroSec
3 Thread taken 328 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
6 Thread taken 998 MicroSec
3 Thread taken 271 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
6 Thread taken 1242 MicroSec
3 Thread taken 338 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main a b MatOut
6 Thread taken 1131 MicroSec
3 Thread taken 343 MicroSec
makrm@MaKRaam:~/Desktop/testing$
```

```
Open  MatOut.out  Mat2.txt  Mat1.txt
~/Desktop/testing

1 Thread Element
2 row= 3 col= 2
3 22 28
4 49 64
5 76 100
6
7 Thread Row
8 row= 3 col= 2
9 22 28
10 49 64
11 76 100

1 row= 3 col= 2
2 1 2
3 3 4
4 5 6

1 row= 3 col= 3
2 1 2 3
3 4 5 6
4 7 8 9

makrm@MaKRaam: ~/Desktop/testing
| char * | char (*)[50]
main.c: In function 'main':
main.c:162:46: warning: cast to pointer from integer of different
o-pointer-cast]
162 | if( pthread_create(&threads[i],NULL,RowMul,(void *)i) )
| ^
makrm@MaKRaam:~/Desktop/testing$ ./main Mat1 Mat2 MatOut
6 Thread taken 1134 MicroSec
3 Thread taken 335 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main Mat1 Mat2 MatOut
6 Thread taken 1155 MicroSec
3 Thread taken 333 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main Mat1 Mat2 MatOut
6 Thread taken 1184 MicroSec
3 Thread taken 338 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main Mat1 Mat2 MatOut
6 Thread taken 1121 MicroSec
3 Thread taken 272 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main Mat1 Mat2 MatOut
6 Thread taken 1225 MicroSec
3 Thread taken 384 MicroSec
makrm@MaKRaam:~/Desktop/testing$
```

• Compare between two methods:

for a good compare I try a matrices of size = 25,50,75,100
with random value using rand()%500.

-at size =25.

```
1 row= 25 col= 25
2 383 277 293 386 149 362 190 263 40 172 211 67 282 362 67 429 22
69 393 11 229 421 284 198 315
3 413 91 456 362 496 305 84 336 346 313 124 82 314 434 43 87 276
288 403 254 432 176 239 226 94
4 295 434 467 97 317 152 301 286 365 444 440 31 97 481 209 67 497
86 306 219 28 232 3 270 208
5 340 296 118 346 421 379 264 341 193 34 124 487 243 227 359 432
437 275 474 358 29 235 318 143 428
6 276 443 113 106 404 128 369 417 324 470 490 272 144 5 454 169 42
197 355 348 122 299 246 340 311
7 105 161 378 320 444 22 208 282 424 62 100 452 379 468 473 381
433 160 199 399 459 313 190 426 84
8 90 376 436 445 179 387 348 159 336 342 206 213 321 319 221 439
440 205 127 484 420 422 396 130 292
9 172 125 222 140 398 298 24 209 319 232 494 379 273 350 360 79
493 121 4 461 326 444 202 284 342
10 28 372 458 36 253 303 133 390 67 368 0 288 249 303 363 253 186
152 475 157 436 414 460 28 50
11 56 294 199 39 428 0 147 159 35 339 215 4 49 285 343 177 238 449
367 292 243 329 182 41 326
12 261 360 23 81 190 496 177 190 24 114 205 312 100 226 416 78 446
147 51 131 357 312 214 12 412
13 110 189 355 120 487 338 270 356 106 349 205 217 445 373 373 289
107 257 471 100 118 25 74 157 493
14 270 417 69 122 173 431 182 292 57 21 74 447 231 37 54 98 81 16
231 296 338 218 470 312 477
15 36 176 207 357 499 127 236 318 63 244 305 291 455 89 493 305 322
217 93 126 486 43 314 179 262
16 88 210 294 346 137 153 73 425 210 217 463 90 130 71 133 289 104
305 368 485 195 449 467 263 96
17 365 36 270 211 32 379 270 172 234 283 398 63 450 73 59 47 82 232
454 398 140 159 262 41 223
18 272 154 321 365 171 269 201 153 407 228 297 84 334 491 398 52
189 6 16 109 0 109 81 338 426
```

```
1 row= 25 col= 25
2 386 415 335 492 421 27 59 426 426 236 368 429 30 123 135 302 58
167 456 42 373 419 37 324 370
3 326 480 373 170 281 425 327 5 229 357 395 45 367 364 250 308 178 84
151 399 60 368 12 86 39
4 70 378 101 402 492 256 280 441 189 119 229 117 271 175 427 356 353
465 183 124 371 329 19 368 215
5 149 223 245 451 55 488 228 350 0 264 414 356 491 365 436 51 228
407 121 395 237 293 428 11 29
6 404 263 38 340 318 188 417 496 243 183 499 225 90 139 286 82 464 7
304 111 328 343 68 422 310
7 301 230 305 236 126 465 416 258 137 124 36 399 50 71 131 430 394
163 481 496 273 168 95 466 340
8 184 42 107 256 418 412 172 9 210 87 301 372 255 99 404 311 167 228
150 158 224 269 81 84 472
9 350 385 299 42 213 190 90 81 336 155 4 269 276 255 142 384 205 67
113 254 259 202 6 21 368
10 189 408 498 308 248 333 148 254 246 29 46 297 4
496 188 229 460 421 304 27 248
11 402 197 43 2 403 181 38 151 134 192 127 129 464
289 488 295 144 390 340 69 232
12 42 117 261 309 425 367 234 126 57 168 358 386 3
470 80 93 127 386 355 90 479
13 469 274 141 433 388 66 284 417 260 237 59 18 28
314 229 459 438 388 233 181 358
14 199 339 363 294 347 462 390 291 115 157 491 451
139 404 80 21 362 379 185
15 404 483 259 244 411 450 60 105 49 211 434 375 1
30 74 93 253 74 213 377 275
16 419 232 17 235 191 443 328 291 18 336 55 358 40
250 3 6 139 120 226 177 481
17 60 455 18 342 196 321 484 427 40 72 330 347 30
443 486 278 262 183 348 324
18 122 335 457 247 276 218 203 433 459 386 220 308
10 224 39 378 53 114 489 67
```

```
1 Thread Element
2 row= 25 col= 25
3 1361485 1852467 1501542 1694701 1583090 1902811
1356271 1558252 1374564 1145948 1640197 1744629
1434003 1261601 1473195 1518569 1789511 1248447
1474006 1558804 1503134 1527880 1114047 1313826
1441908
4 1726718 2068136 1739663 1979154 1800852 2090995
1423121 1922636 1651722 1215760 1795898 1835244
1719985 1474231 1885984 1640497 1862419 1447290
1653423 1504008 2003235 1676136 1234428 1573786
1553348
5 1467586 1891760 1708265 1615944 1915590 1984391
1231899 1560053 1454248 1222305 1664303 1700731
1707585 1495832 1789757 1717503 1762377 1340541
1323016 1264117 1661496 1727002 1146645 1430092
1642482
```

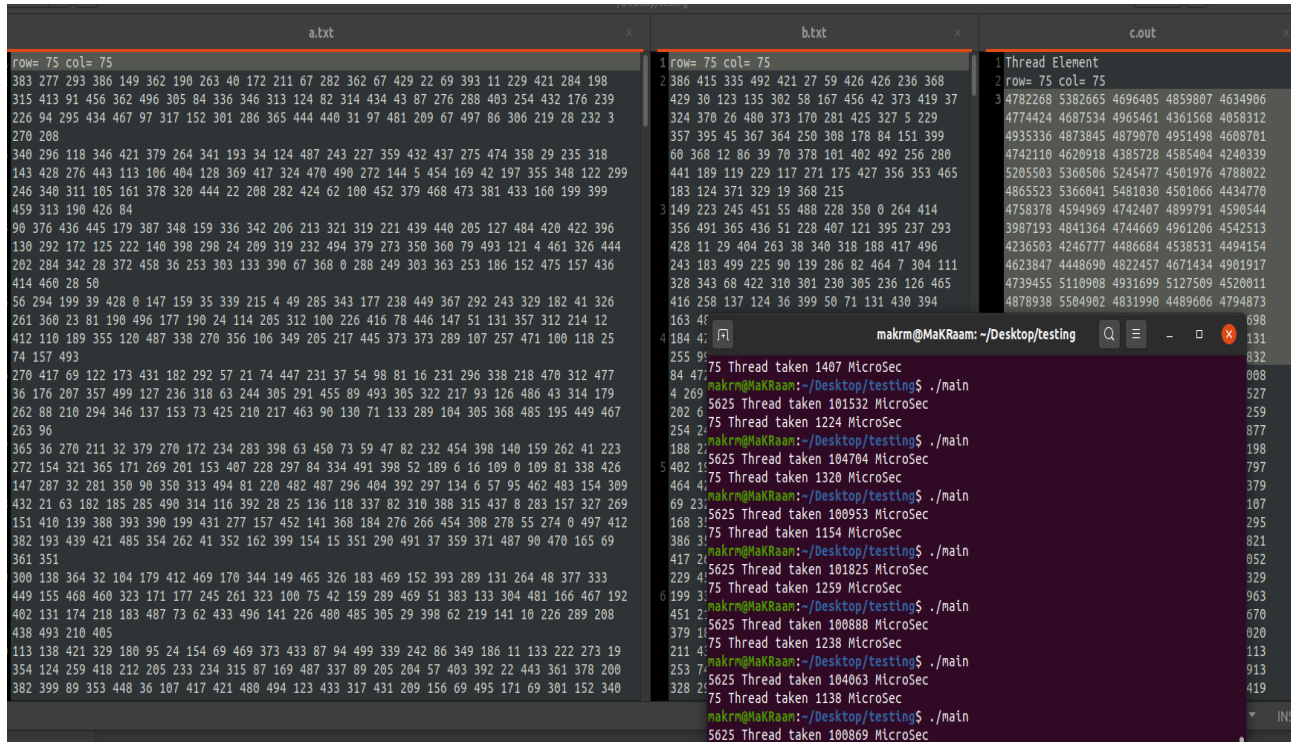
```
makrm@MaKRaam: ~/Desktop/testing
main.c:162:46: warning: cast to pointer from integer of different size [-Wint-to-pointer-cast]
162 | if( pthread_create(&threads[i],NULL,RowMul,(void *)i) )
    |                                     ^
makrm@MaKRaam:~/Desktop/testing$ ./main
625 Thread taken 17282 MicroSec
25 Thread taken 498 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
625 Thread taken 18446744073708566129 MicroSec
25 Thread taken 472 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
625 Thread taken 15411 MicroSec
25 Thread taken 505 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
625 Thread taken 35833 MicroSec
25 Thread taken 678 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
625 Thread taken 15846 MicroSec
25 Thread taken 491 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
625 Thread taken 15443 MicroSec
25 Thread taken 502 MicroSec
makrm@MaKRaam:~/Desktop/testing$
```

-at size =50.

```
1 row= 50 col= 50
2 383 277 293 386 149 362 190 263 40 172 211 67 282 362 67 429 22
69 393 11 229 421 284 198 315
3 413 91 456 362 496 305 84 336 346 313 124 82 314 434 43 87 276
226 94
4 295 434 467 97 317 152 301 286 365 444 440 31 97 481 209 67 497
86 306 219 28 232 3 270 208
5 340 296 118 346 421 379 264 341 193 34 124 487 243 227 359 432
143 428
6 276 443 113 106 404 128 369 417 324 470 490 272 144 5 454 169 42
197 355 348 122 299 246 340
7 105 161 378 320 444 22 208 282 424 62 100 452 379 468 473 381
433 160 199 399 459 313 190 426 84
8 90 376 436 445 179 387 348 159 336 342 206 213 321 319 221 439
440 205 127 484 420 422 396 130 292
9 172 125 222 140 398 298 24 209 319 232 494 379 273 350 360 79
493 121 4 461 326 444 202 284 342
10 28 372 458 36 253 303 133 390 67 368 0 288 249 303 363 253 186
152 475 157 436 414 460 28 50
11 56 294 199 39 428 0 147 159 35 339 215 4 49 285 343 177 238 449
367 292 243 329 182 41 326
12 261 360 23 81 190 496 177 190 24 114 205 312 100 226 416 78 446
147 51 131 357 312 214 12 412
13 110 189 355 120 487 338 270 356 106 349 205 217 445 373 373 289
107 257 471 100 118 25 74 157 493
14 270 417 69 122 173 431 182 292 57 21 74 447 231 37 54 98 81 16
231 296 338 218 470 312 477
15 36 176 207 357 499 127 236 318 63 244 305 291 455 89 493 305 322
217 93 126 486 43 314 179 262
16 88 210 294 346 137 153 73 425 210 217 463 90 130 71 133 289 104
305 368 485 195 449 467 263 96
17 365 36 270 211 32 379 270 172 234 283 398 63 450 73 59 47 82 232
454 398 140 159 262 41 223
18 272 154 321 365 171 269 201 153 407 228 297 84 334 491 398 52
189 6 16 109 0 109 81 338 426
```

```
1 row= 50 col= 50
2 386 415 335 492 421 27 59 426 426 236 368
429 30 123 135 302 58 167 456 42 373 419 37
324 370 26 480 373 170 281 425 327 5 229
357 395 45 367 364 250 308 178 84 151 399
60 368 12 86 39
3 70 378 101 402 492 256 280 441 189 119 229
117 271 175 427 356 353 465 183 124 371 329
19 368 215 149 223 245 451 55 488 228 350 0
264 414 356 491 365 436 51 228 407 121 395
237 293 428 11 29
4 404 263 38 340 318 188 417 496 243 183 499
225 90 139 286 82 464 7 304 111 328 343 68
422 310 301 230 305 236 126 465 416 258 137
124 3
273 1
5 184 4:
255 9:
84 47:
4 269:
202 6:
6 189 4:
297 4:
304 2:
192 1:
144 3:
7 42 11:
386 3:
90 47:
237 5:
438 3:
8 199 3:
451 2:
379 1:
211 4:
makrm@MaKRaam:~/Desktop/testing$ ./main
2500 Thread taken 18446744073708602024 MicroSec
50 Thread taken 856 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
2500 Thread taken 55895 MicroSec
50 Thread taken 829 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
2500 Thread taken 59955 MicroSec
50 Thread taken 833 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
2500 Thread taken 50905 MicroSec
50 Thread taken 857 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
2500 Thread taken 52214 MicroSec
50 Thread taken 869 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
2500 Thread taken 51617 MicroSec
50 Thread taken 920 MicroSec
makrm@MaKRaam:~/Desktop/testing$ ./main
```

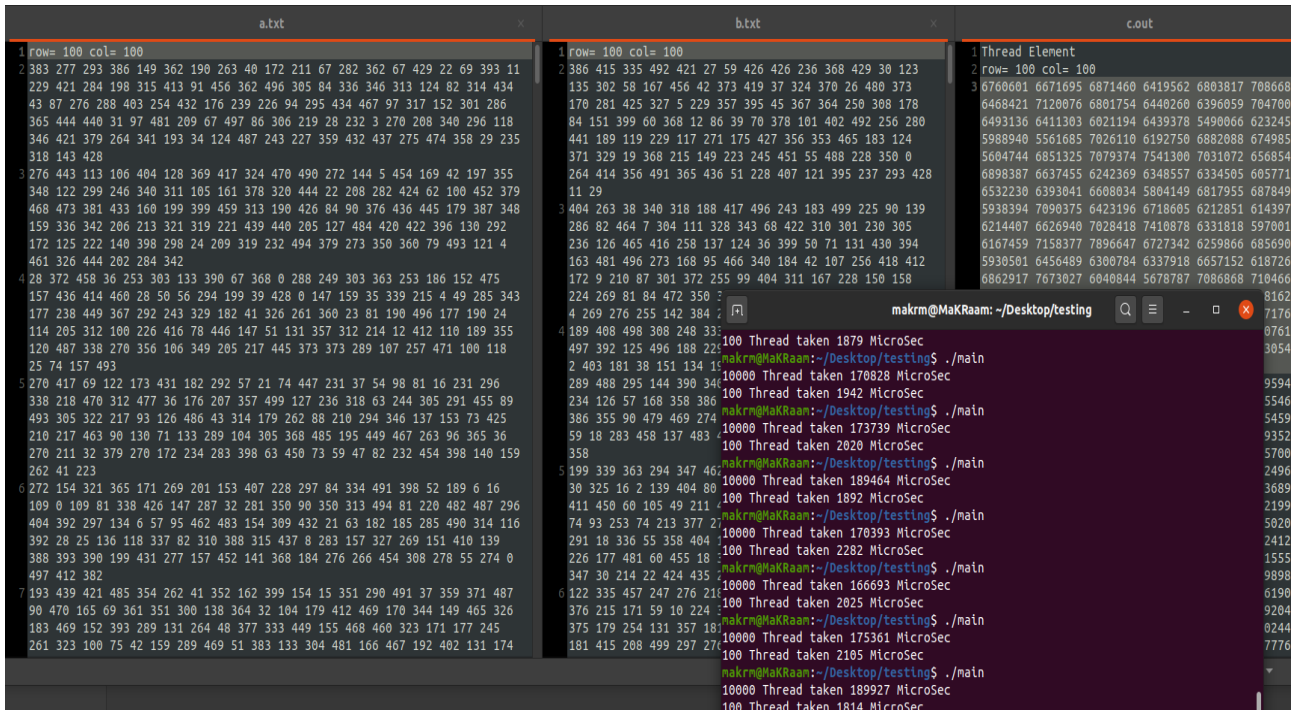

at size =75.



```
row= 75 col= 75
383 277 293 386 149 362 190 263 40 172 211 67 282 362 67 429 22 69 393 11 229 421 284 198
315 413 91 456 362 496 305 84 336 346 313 124 82 314 434 43 87 276 288 403 254 432 176 239
226 94 295 434 467 97 317 152 301 286 365 444 440 31 97 481 209 67 497 86 306 219 28 232 3
270 288
340 296 118 346 421 379 264 341 193 34 124 487 243 227 359 432 437 275 474 358 29 235 318
143 428 276 443 113 106 404 128 369 417 324 470 490 272 144 5 454 169 42 197 355 348 122 299
246 340 311 105 161 378 320 444 22 208 282 424 62 100 452 379 468 473 381 433 160 199 399
459 313 190 426 84
90 376 436 445 179 387 348 159 336 342 206 213 321 319 221 439 440 205 127 484 420 422 396
130 292 172 125 222 140 398 298 24 209 319 232 494 379 273 350 360 79 493 121 4 461 326 444
202 284 342 28 372 458 36 253 303 133 390 67 368 0 288 249 303 363 253 186 152 475 157 436
414 460 28 50
56 294 199 39 428 0 147 159 35 339 215 4 49 285 343 177 238 449 367 292 243 329 182 41 326
261 360 23 81 190 496 177 190 24 114 205 312 100 226 416 78 446 147 51 131 357 312 214 12
412 110 189 355 120 487 338 270 356 106 349 205 217 445 373 373 289 107 257 471 100 118 25
74 157 493
270 417 69 122 173 431 182 292 57 21 74 447 231 37 54 98 81 16 231 296 338 218 470 312 477
36 176 207 357 499 127 236 318 63 244 305 291 455 89 493 305 322 217 93 126 486 43 314 179
262 88 210 294 346 137 153 73 425 210 217 463 90 130 71 133 289 104 305 368 485 195 449 467
263 96
365 36 270 211 32 379 270 172 234 283 398 63 450 73 59 47 82 232 454 398 140 159 262 41 223
272 154 321 365 171 269 201 153 407 228 297 84 334 491 398 52 189 6 16 109 0 109 81 338 426
147 287 32 281 350 90 350 313 494 81 220 482 487 296 404 392 297 134 6 57 95 462 483 154 309
432 21 63 182 185 285 490 314 116 392 28 25 136 118 337 82 310 388 315 437 8 283 157 327 269
151 410 139 388 393 390 199 431 277 157 452 141 368 184 276 266 454 308 278 55 274 0 497 412
382 193 439 421 485 354 262 41 352 162 399 154 15 351 290 491 37 359 371 487 90 470 165 69
361 351
300 138 364 32 104 179 412 469 170 344 149 465 326 183 469 152 393 289 131 264 48 377 333
449 155 468 460 323 171 177 245 261 323 100 75 42 159 289 469 51 383 133 304 481 166 467 192
402 131 174 218 183 487 73 62 433 496 141 226 480 485 305 29 398 62 219 141 10 226 289 208
438 493 210 405
113 138 421 329 180 95 24 154 69 469 373 433 87 94 499 339 242 86 349 186 11 133 222 273 19
354 124 259 418 212 205 233 234 315 87 169 487 337 89 205 284 57 403 392 22 443 361 378 200
382 399 89 353 448 36 107 417 421 480 494 123 433 317 431 209 156 69 495 171 69 301 152 340

1 row= 75 col= 75
2 386 415 335 492 421 27 59 426 426 236 368
429 30 123 135 302 58 167 456 42 373 419 37
324 370 26 480 373 170 281 425 327 5 229
357 395 45 367 364 250 308 178 84 151 399
60 368 12 86 39 70 378 101 402 492 256 280
441 189 119 229 117 271 175 427 356 353 465
183 124 371 329 19 368 215
3 149 223 245 451 55 488 228 350 0 264 414
356 491 365 436 51 228 407 121 395 237 293
428 11 29 404 263 38 340 318 188 417 496
243 183 499 225 90 139 286 82 464 7 304 111
328 343 68 422 310 301 230 305 236 126 465
416 250 137 124 36 399 50 71 131 430 394
163 40
4 184 40
255 90
84 472
4 269
5625 Thread taken 1407 MicroSec
202 6
5625 Thread taken 101532 MicroSec
254 2
5625 Thread taken 1224 MicroSec
188 2
5625 Thread taken 104704 MicroSec
5 402 11
5625 Thread taken 1320 MicroSec
464 40
5625 Thread taken 100953 MicroSec
69 23
5625 Thread taken 1154 MicroSec
168 3
5625 Thread taken 101825 MicroSec
386 3
5625 Thread taken 1259 MicroSec
229 3
5625 Thread taken 100888 MicroSec
379 11
5625 Thread taken 1238 MicroSec
211 4
5625 Thread taken 104063 MicroSec
253 7
5625 Thread taken 1138 MicroSec
328 2
5625 Thread taken 100869 MicroSec
makrm@MaKRaam: ~/Desktop/testing
```

at size = 100.



```
1 row= 100 col= 100
2 383 277 293 386 149 362 190 263 40 172 211 67 282 362 67 429 22 69 393 11
229 421 284 198 315 413 91 456 362 496 305 84 336 346 313 124 82 314 434
43 87 276 288 403 254 432 176 239 226 94 295 434 467 97 317 152 301 286
365 444 440 31 97 481 209 67 497 86 306 219 28 232 3 270 208 340 296 118
346 421 379 264 341 193 34 124 487 243 227 359 432 437 275 474 358 29 235
318 143 428
3 276 443 113 106 404 128 369 417 324 470 490 272 144 5 454 169 42 197 355
348 122 299 246 340 311 105 161 378 320 444 22 208 282 424 62 100 452 379
468 473 381 433 160 199 399 459 313 190 426 84 90 376 436 445 179 387 348
159 336 342 206 213 321 319 221 439 440 205 127 484 420 422 396 130 292
172 125 222 140 398 298 24 209 319 232 494 379 273 350 360 79 493 121 4
461 326 444 202 284 342
4 28 372 458 36 253 303 133 390 67 368 0 288 249 303 363 253 186 152 475
157 436 414 460 28 50 56 294 199 39 428 0 147 159 35 339 215 4 49 285 343
177 238 449 367 292 243 329 182 41 326 261 360 23 81 190 496 177 190 24
114 205 312 100 226 416 78 446 147 51 131 357 312 214 12 412 110 189 355
120 487 338 270 356 106 349 205 217 445 373 373 289 107 257 471 100 118
25 74 157 493
5 270 417 69 122 173 431 182 292 57 21 74 447 231 37 54 98 81 16 231 296
338 218 470 312 477 36 176 207 357 499 127 236 318 63 244 305 291 455 89
493 305 322 217 93 126 486 43 314 179 262 88 210 294 346 137 153 73 425
210 217 463 90 130 71 133 289 104 305 368 485 195 449 467 263 96 365 36
270 211 32 379 270 172 234 283 398 63 450 73 59 47 82 232 454 398 140 159
262 41 223
6 272 154 321 365 171 269 201 153 407 228 297 84 334 491 398 52 189 6 16
109 0 109 81 338 426 147 287 32 281 350 90 350 313 494 81 220 482 487 296
404 392 297 134 6 57 95 462 483 154 309 432 21 63 182 185 285 490 314 116
392 28 25 136 118 337 82 310 388 315 437 8 283 157 327 269 151 410 139
388 393 390 199 431 277 157 452 141 368 184 276 266 454 308 278 55 274 0
497 412 382
7 193 439 421 485 354 262 41 352 162 399 154 15 351 290 491 37 359 371 487
90 470 165 69 361 351 300 138 364 32 104 179 412 469 170 344 149 465 326
183 469 152 393 289 131 264 48 377 333 449 155 468 460 323 171 177 245
261 323 100 75 42 159 289 469 51 383 133 304 481 166 467 192 402 131 174

1 row= 100 col= 100
2 386 415 335 492 421 27 59 426 426 236 368 429 30 123
135 302 58 167 456 42 373 419 37 324 370 26 480 373
170 281 425 327 5 229 357 395 45 367 364 250 308 178
84 151 399 60 368 12 86 39 70 378 101 402 492 256 280
441 189 119 229 117 271 175 427 356 353 465 183 124
371 329 19 368 215 149 223 245 451 55 488 228 350 0
264 414 356 491 365 436 51 228 407 121 395 237 293 428
11 29
3 404 263 38 340 318 188 417 496 243 183 499 225 90 139
286 82 464 7 304 111 328 343 68 422 310 301 230 305
236 126 465 416 258 137 124 36 399 50 71 131 430 394
163 481 496 273 168 95 466 340 184 42 107 256 418 412
172 9 210 87 301 372 255 99 404 311 167 228 150 158
224 269 81 84 472 350
4 269 276 255 142 384
4 189 408 498 208 248 333
497 392 125 496 188 225
2 403 181 38 151 134 15
289 488 295 144 390 340
234 126 57 168 358 386
386 355 90 479 469 274
59 18 283 458 137 483
358
5 199 339 363 294 347 467
30 325 16 2 139 404 80
411 450 60 105 49 211
74 93 253 74 213 377 27
291 18 336 55 358 404
226 177 481 60 455 18
347 30 214 22 424 435
6 122 335 457 247 276 211
376 215 171 59 10 224
375 179 254 131 357 181
181 415 208 499 297 270
100 Thread taken 1879 MicroSec
5625 Thread taken 170828 MicroSec
100 Thread taken 1942 MicroSec
5625 Thread taken 173739 MicroSec
100 Thread taken 2020 MicroSec
5625 Thread taken 189464 MicroSec
100 Thread taken 1892 MicroSec
5625 Thread taken 170393 MicroSec
100 Thread taken 2282 MicroSec
5625 Thread taken 166693 MicroSec
100 Thread taken 2025 MicroSec
5625 Thread taken 175361 MicroSec
100 Thread taken 2105 MicroSec
5625 Thread taken 189927 MicroSec
100 Thread taken 1814 MicroSec
makrm@MaKRaam: ~/Desktop/testing
```

so from all test with different sizes it obviously says that Element Thread take long time and Threads than Row Thread, because of parallel much in Row.