

Pomiary na macierzach : [4, 8, 16, 32, 64, 128, 256, 512, 1024]

Sekwencyjne:

```
[Running] python -u "c:\Users\kacpe\Desktop\Optymalizacja\matrix.py"
Sekwencyjne mnozenie macierzy 4x4 zakonczone w czasie: 0.000000 sekund
Zuzycie pamieci : 4.0 KB
Sekwencyjne mnozenie macierzy 8x8 zakonczone w czasie: 0.000000 sekund
Zuzycie pamieci : 0.0 KB
Sekwencyjne mnozenie macierzy 16x16 zakonczone w czasie: 0.001001 sekund
Zuzycie pamieci : 0.0 KB
Sekwencyjne mnozenie macierzy 32x32 zakonczone w czasie: 0.007998 sekund
Zuzycie pamieci : 0.0 KB
Sekwencyjne mnozenie macierzy 64x64 zakonczone w czasie: 0.065000 sekund
Zuzycie pamieci : 0.0 KB
Sekwencyjne mnozenie macierzy 128x128 zakonczone w czasie: 0.520801 sekund
Zuzycie pamieci : 132.0 KB
Sekwencyjne mnozenie macierzy 256x256 zakonczone w czasie: 4.109526 sekund
Zuzycie pamieci : 120.0 KB
Sekwencyjne mnozenie macierzy 512x512 zakonczone w czasie: 33.410848 sekund
Zuzycie pamieci : 1908.0 KB
Sekwencyjne mnozenie macierzy 1024x1024 zakonczone w czasie: 281.377434 sekund
Zuzycie pamieci : 6288.0 KB
```

Rozproszone (1 watek)

```
[Running] python -u "c:\Users\kacpe\Desktop\Optymalizacja\nodal_matrix.py"
```

```
Matrix Size: 4x4  
Scatter Time: 0.000071 s, Memory Usage: 92.00 KB  
Compute Time: 0.000059 s, Memory Usage: 52.00 KB  
Gather Time: 0.000022 s, Memory Usage: 20.00 KB  
Total Time: 0.000181 s, Total Memory Usage: 164.00 KB
```

```
Matrix Size: 8x8  
Scatter Time: 0.000019 s, Memory Usage: 0.00 KB  
Compute Time: 0.000149 s, Memory Usage: 0.00 KB  
Gather Time: 0.000013 s, Memory Usage: 0.00 KB  
Total Time: 0.000188 s, Total Memory Usage: 0.00 KB
```

```
Matrix Size: 16x16  
Scatter Time: 0.000015 s, Memory Usage: 4.00 KB  
Compute Time: 0.001122 s, Memory Usage: 4.00 KB  
Gather Time: 0.000020 s, Memory Usage: 0.00 KB  
Total Time: 0.001163 s, Total Memory Usage: 8.00 KB
```

```
Matrix Size: 32x32  
Scatter Time: 0.000021 s, Memory Usage: 0.00 KB  
Compute Time: 0.008255 s, Memory Usage: 4.00 KB  
Gather Time: 0.000025 s, Memory Usage: 0.00 KB  
Total Time: 0.008318 s, Total Memory Usage: 4.00 KB
```

```
Matrix Size: 64x64  
Scatter Time: 0.000084 s, Memory Usage: 32.00 KB  
Compute Time: 0.064766 s, Memory Usage: 60.00 KB  
Gather Time: 0.000024 s, Memory Usage: 0.00 KB  
Total Time: 0.064900 s, Total Memory Usage: 92.00 KB
```

```
Matrix Size: 128x128  
Scatter Time: 0.000058 s, Memory Usage: 124.00 KB  
Compute Time: 0.519469 s, Memory Usage: 132.00 KB  
Gather Time: 0.000030 s, Memory Usage: 0.00 KB  
Total Time: 0.519609 s, Total Memory Usage: 256.00 KB
```

```
Matrix Size: 256x256  
Scatter Time: 0.000313 s, Memory Usage: 1024.00 KB  
Compute Time: 4.123154 s, Memory Usage: 520.00 KB  
Gather Time: 0.000052 s, Memory Usage: 0.00 KB  
Total Time: 4.123547 s, Total Memory Usage: 1544.00 KB
```

```
Matrix Size: 512x512  
Scatter Time: 0.001397 s, Memory Usage: 4096.00 KB  
Compute Time: 33.386969 s, Memory Usage: 1264.00 KB  
Gather Time: 0.000532 s, Memory Usage: 2048.00 KB  
Total Time: 33.388921 s, Total Memory Usage: 7408.00 KB
```

```
Matrix Size: 1024x1024  
Scatter Time: 0.004693 s, Memory Usage: 16384.00 KB  
Compute Time: 284.517179 s, Memory Usage: 8332.00 KB  
Gather Time: 0.002433 s, Memory Usage: 6144.00 KB  
Total Time: 284.524435 s, Total Memory Usage: 30860.00 KB
```

Rozproszone (4 watki)

```
AssertionError: Number of processes must be a perfect square.  
PS C:\Users\kacpe\Desktop\Optymalizacja> mpiexec -n 4 python nodal_matrix.py  
  
Matrix Size: 4x4  
Scatter Time: 0.000193 s, Memory Usage: 120.00 KB  
Compute Time: 0.000097 s, Memory Usage: 52.00 KB  
Gather Time: 0.000020 s, Memory Usage: 20.00 KB  
Total Time: 0.003144 s, Total Memory Usage: 192.00 KB  
  
Matrix Size: 8x8  
Scatter Time: 0.000025 s, Memory Usage: 0.00 KB  
Compute Time: 0.000073 s, Memory Usage: 0.00 KB  
Gather Time: 0.000019 s, Memory Usage: 0.00 KB  
Total Time: 0.000133 s, Total Memory Usage: 0.00 KB  
  
Matrix Size: 16x16  
Scatter Time: 0.000035 s, Memory Usage: 8.00 KB  
Compute Time: 0.000310 s, Memory Usage: 4.00 KB  
Gather Time: 0.000016 s, Memory Usage: 4.00 KB  
Total Time: 0.000374 s, Total Memory Usage: 16.00 KB  
  
Matrix Size: 32x32  
Scatter Time: 0.000030 s, Memory Usage: 4.00 KB  
Compute Time: 0.002146 s, Memory Usage: 20.00 KB  
Gather Time: 0.000038 s, Memory Usage: 20.00 KB  
Total Time: 0.002226 s, Total Memory Usage: 44.00 KB  
  
Matrix Size: 64x64  
Scatter Time: 0.000037 s, Memory Usage: 12.00 KB  
Compute Time: 0.016180 s, Memory Usage: 32.00 KB  
Gather Time: 0.000040 s, Memory Usage: 0.00 KB  
Total Time: 0.016287 s, Total Memory Usage: 44.00 KB  
  
Matrix Size: 128x128  
Scatter Time: 0.000062 s, Memory Usage: 0.00 KB  
Compute Time: 0.139440 s, Memory Usage: 12.00 KB  
Gather Time: 0.000128 s, Memory Usage: 132.00 KB  
Total Time: 0.139675 s, Total Memory Usage: 144.00 KB  
  
Matrix Size: 256x256  
Scatter Time: 0.000297 s, Memory Usage: 248.00 KB  
Compute Time: 1.035432 s, Memory Usage: 64.00 KB  
Gather Time: 0.000146 s, Memory Usage: 512.00 KB  
Total Time: 1.035959 s, Total Memory Usage: 824.00 KB  
  
Matrix Size: 512x512  
Scatter Time: 0.000862 s, Memory Usage: 1024.00 KB  
Compute Time: 8.123646 s, Memory Usage: 236.00 KB  
Gather Time: 0.000512 s, Memory Usage: 2048.00 KB  
Total Time: 8.125189 s, Total Memory Usage: 3308.00 KB  
  
Matrix Size: 1024x1024  
Scatter Time: 0.003355 s, Memory Usage: 4104.00 KB  
Compute Time: 66.512430 s, Memory Usage: 2004.00 KB  
Gather Time: 0.002204 s, Memory Usage: 6144.00 KB  
Total Time: 66.518697 s, Total Memory Usage: 12252.00 KB
```

Rozproszone (16 watkow)

```
Total Time: 0.0010097 s, Total Memory Usage: 12202.00 KB
PS C:\Users\kacpe\Desktop\Optymalizacja> mpiexec -n 16 python nodal_matrix.py

Matrix Size: 4x4
Scatter Time: 0.000597 s, Memory Usage: 128.00 KB
Compute Time: 0.000815 s, Memory Usage: 108.00 KB
Gather Time: 0.000058 s, Memory Usage: 20.00 KB
Total Time: 0.00147 s, Total Memory Usage: 256.00 KB

Matrix Size: 8x8
Scatter Time: 0.000058 s, Memory Usage: 0.00 KB
Compute Time: 0.000117 s, Memory Usage: 0.00 KB
Gather Time: 0.000061 s, Memory Usage: 0.00 KB
Total Time: 0.000293 s, Total Memory Usage: 0.00 KB

Matrix Size: 16x16
Scatter Time: 0.000049 s, Memory Usage: 4.00 KB
Compute Time: 0.000298 s, Memory Usage: 0.00 KB
Gather Time: 0.000063 s, Memory Usage: 0.00 KB
Total Time: 0.000442 s, Total Memory Usage: 4.00 KB

Matrix Size: 32x32
Scatter Time: 0.000089 s, Memory Usage: 8.00 KB
Compute Time: 0.001208 s, Memory Usage: 0.00 KB
Gather Time: 0.000097 s, Memory Usage: 16.00 KB
Total Time: 0.001429 s, Total Memory Usage: 24.00 KB

Matrix Size: 64x64
Scatter Time: 0.000156 s, Memory Usage: 8.00 KB
Compute Time: 0.008590 s, Memory Usage: 40.00 KB
Gather Time: 0.000101 s, Memory Usage: 16.00 KB
Total Time: 0.008913 s, Total Memory Usage: 64.00 KB

Matrix Size: 128x128
Scatter Time: 0.000374 s, Memory Usage: 8.00 KB
Compute Time: 0.065278 s, Memory Usage: 24.00 KB
Gather Time: 0.000143 s, Memory Usage: 16.00 KB
Total Time: 0.065918 s, Total Memory Usage: 48.00 KB

Matrix Size: 256x256
Scatter Time: 0.000755 s, Memory Usage: 0.00 KB
Compute Time: 0.493195 s, Memory Usage: 32.00 KB
Gather Time: 0.000218 s, Memory Usage: 388.00 KB
Total Time: 0.494326 s, Total Memory Usage: 420.00 KB

Matrix Size: 512x512
Scatter Time: 0.000838 s, Memory Usage: 252.00 KB
Compute Time: 3.390878 s, Memory Usage: 300.00 KB
Gather Time: 0.016680 s, Memory Usage: 2048.00 KB
Total Time: 3.408736 s, Total Memory Usage: 2600.00 KB

Matrix Size: 1024x1024
Scatter Time: 0.012826 s, Memory Usage: 1024.00 KB
Compute Time: 25.942720 s, Memory Usage: 596.00 KB
Gather Time: 0.079406 s, Memory Usage: 6152.00 KB
Total Time: 26.039120 s, Total Memory Usage: 7772.00 KB
```

Porównanie wyników:

1 watek:

```
PS C:\Users\kacpe\Desktop\Optymalizacja> python measurements_nodal.py
Results are the same!

Matrix Size: 4x4
Scatter Time: 0.000118 s, Memory Usage: 92.00 KB
Compute Time: 0.000078 s, Memory Usage: 44.00 KB
Gather Time: 0.000027 s, Memory Usage: 20.00 KB
Total Time: 0.000287 s, Total Memory Usage: 156.0 KB
Total Sequential Time: 0.000000 s, Sequential memory usage : 0.0 KB
Results are the same!

Matrix Size: 8x8
Scatter Time: 0.000034 s, Memory Usage: 0.00 KB
Compute Time: 0.000157 s, Memory Usage: 0.00 KB
Gather Time: 0.000017 s, Memory Usage: 0.00 KB
Total Time: 0.000220 s, Total Memory Usage: 0.0 KB
Total Sequential Time: 0.001001 s, Sequential memory usage : 4.0 KB
Results are the same!

Matrix Size: 16x16
Scatter Time: 0.000025 s, Memory Usage: 0.00 KB
Compute Time: 0.001074 s, Memory Usage: 4.00 KB
Gather Time: 0.000014 s, Memory Usage: 0.00 KB
Total Time: 0.001124 s, Total Memory Usage: 4.0 KB
Total Sequential Time: 0.000999 s, Sequential memory usage : 0.0 KB
Results are the same!

Matrix Size: 32x32
Scatter Time: 0.000051 s, Memory Usage: 4.00 KB
Compute Time: 0.008464 s, Memory Usage: 12.00 KB
Gather Time: 0.000022 s, Memory Usage: 0.00 KB
Total Time: 0.008559 s, Total Memory Usage: 16.0 KB
Total Sequential Time: 0.008000 s, Sequential memory usage : 8.0 KB
Results are the same!

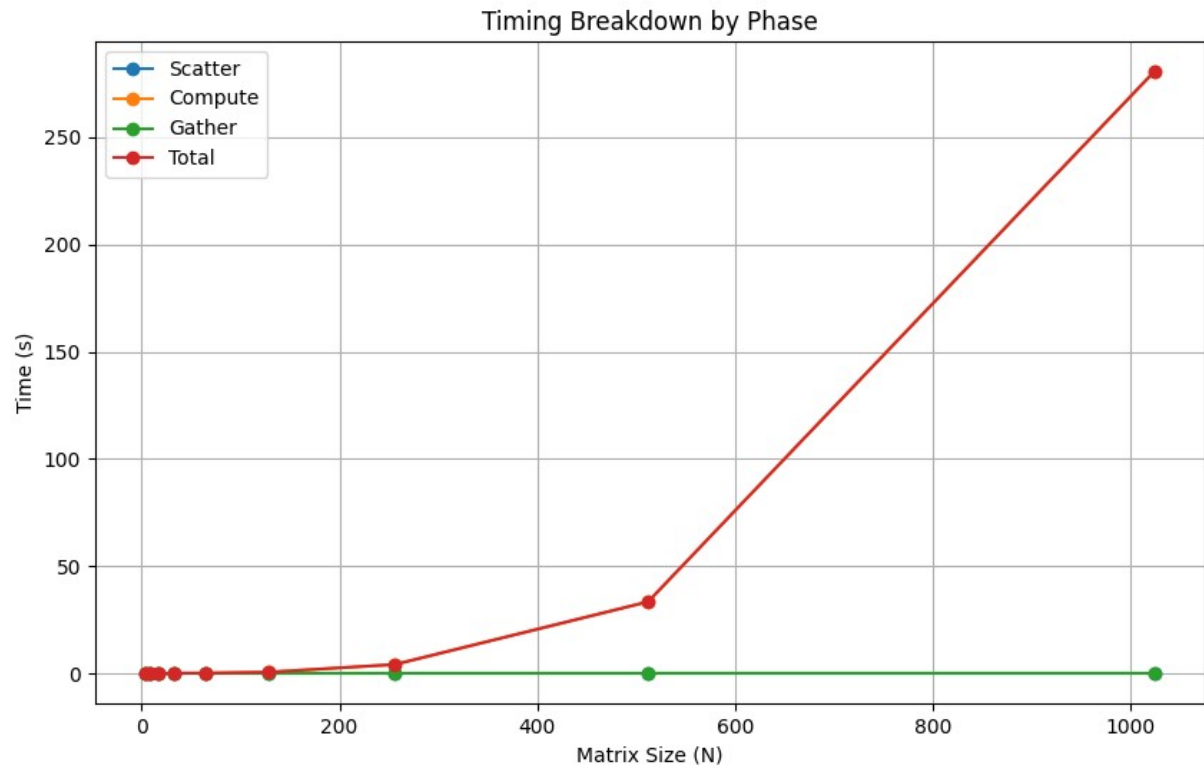
Matrix Size: 64x64
Scatter Time: 0.000044 s, Memory Usage: 0.00 KB
Compute Time: 0.064114 s, Memory Usage: 24.00 KB
Gather Time: 0.000025 s, Memory Usage: 0.00 KB
Total Time: 0.064196 s, Total Memory Usage: 24.0 KB
Total Sequential Time: 0.065112 s, Sequential memory usage : 20.0 KB
Results are the same!

Matrix Size: 128x128
Scatter Time: 0.000077 s, Memory Usage: 124.00 KB
Compute Time: 0.512274 s, Memory Usage: 140.00 KB
Gather Time: 0.000030 s, Memory Usage: 0.00 KB
Total Time: 0.512437 s, Total Memory Usage: 264.0 KB
Total Sequential Time: 0.515000 s, Sequential memory usage : 180.0 KB
Results are the same!

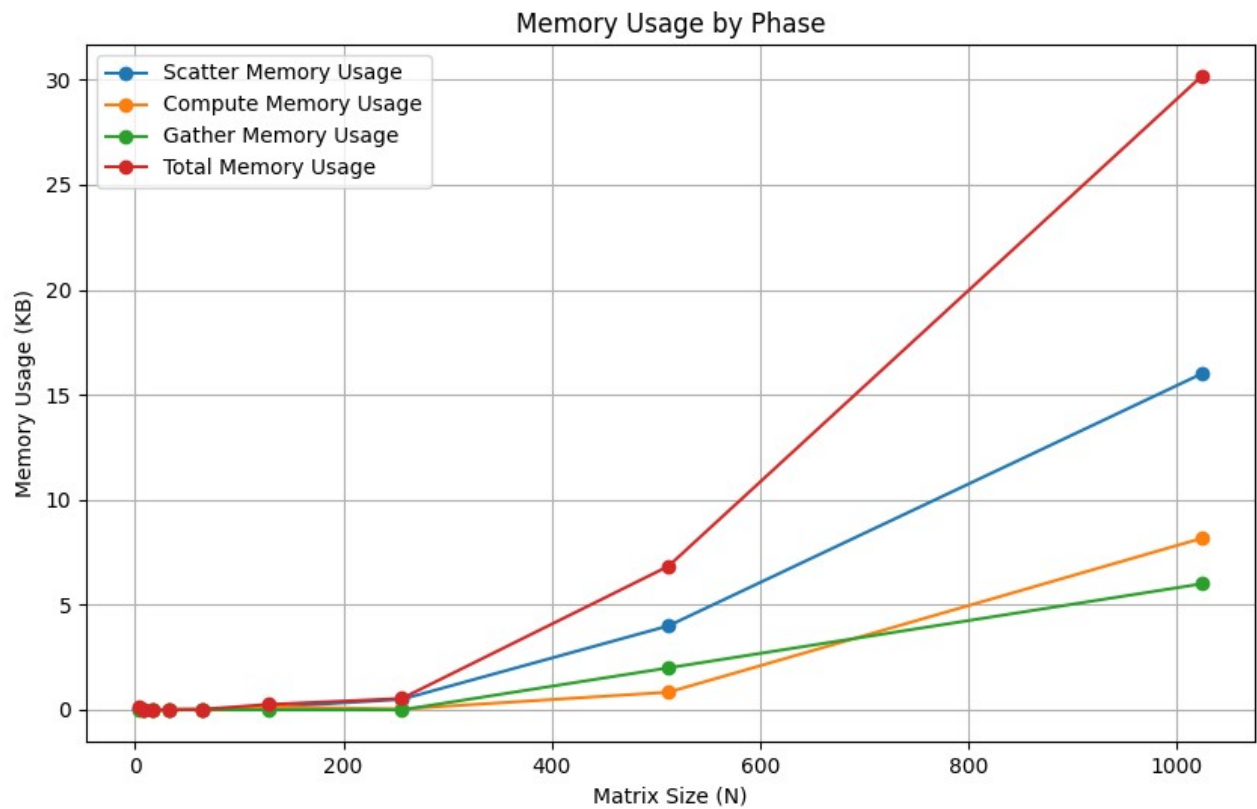
Matrix Size: 256x256
Scatter Time: 0.000177 s, Memory Usage: 512.00 KB
Compute Time: 4.114995 s, Memory Usage: 40.00 KB
Gather Time: 0.000043 s, Memory Usage: 0.00 KB
Total Time: 4.115234 s, Total Memory Usage: 552.0 KB
Total Sequential Time: 4.102413 s, Sequential memory usage : 248.0 KB
Results are the same!

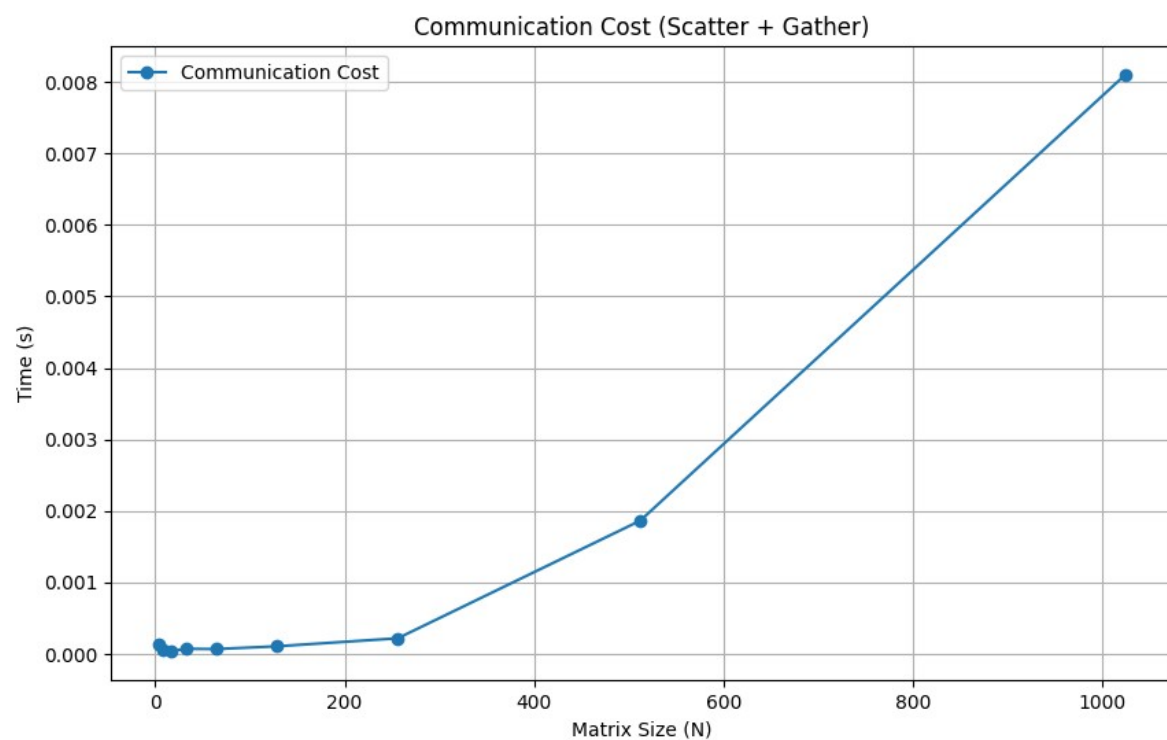
Matrix Size: 512x512
Scatter Time: 0.001304 s, Memory Usage: 4096.00 KB
Compute Time: 33.356386 s, Memory Usage: 860.00 KB
Gather Time: 0.000561 s, Memory Usage: 2048.00 KB
Total Time: 33.358642 s, Total Memory Usage: 7004.0 KB
Total Sequential Time: 33.466347 s, Sequential memory usage : 980.0 KB
Results are the same!

Matrix Size: 1024x1024
Scatter Time: 0.004498 s, Memory Usage: 16388.00 KB
Compute Time: 280.637244 s, Memory Usage: 8364.00 KB
Gather Time: 0.003600 s, Memory Usage: 6144.00 KB
Total Time: 280.645465 s, Total Memory Usage: 30896.0 KB
Total Sequential Time: 280.829262 s, Sequential memory usage : 6228.0 KB
|
```

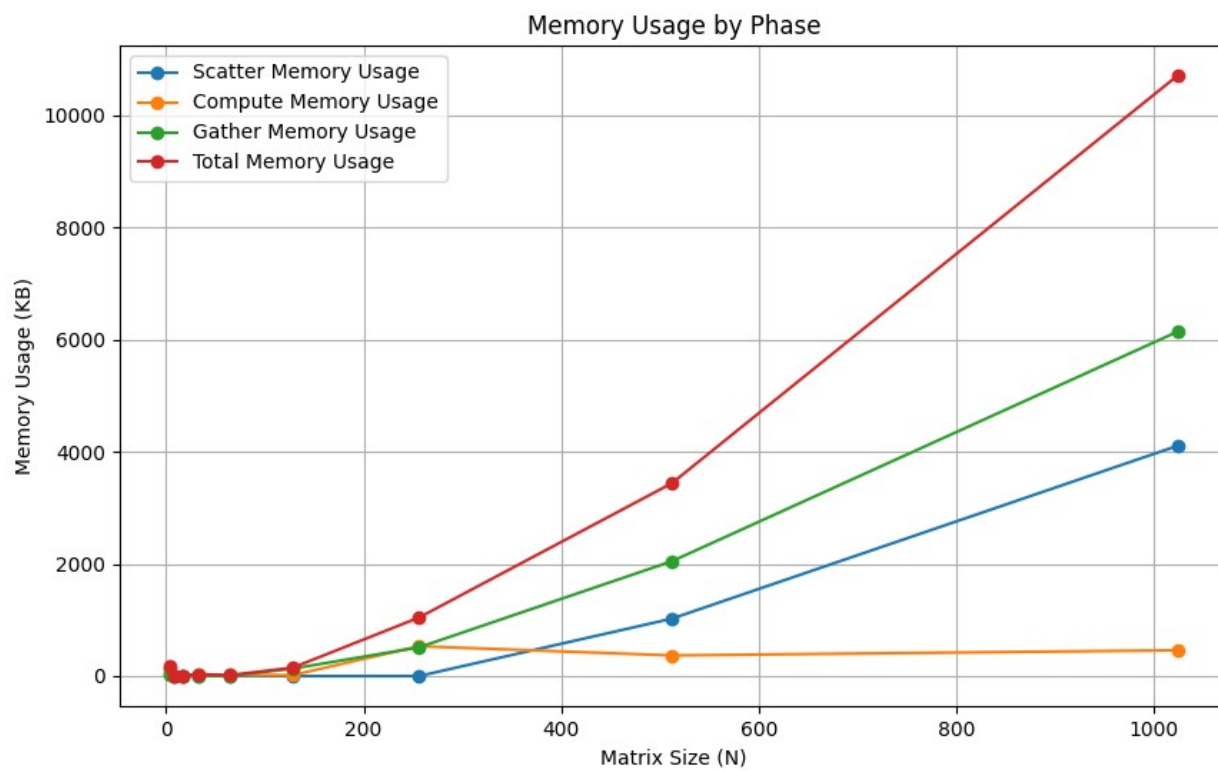
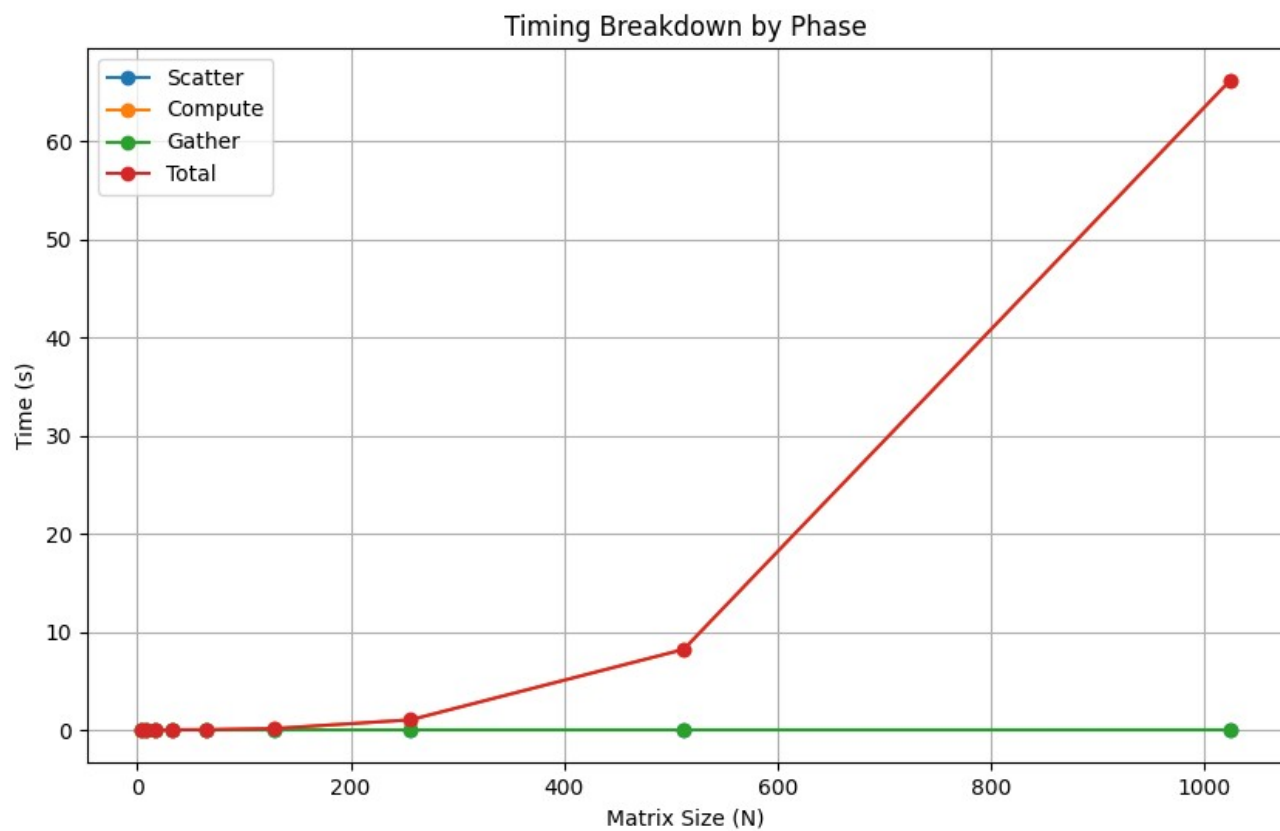


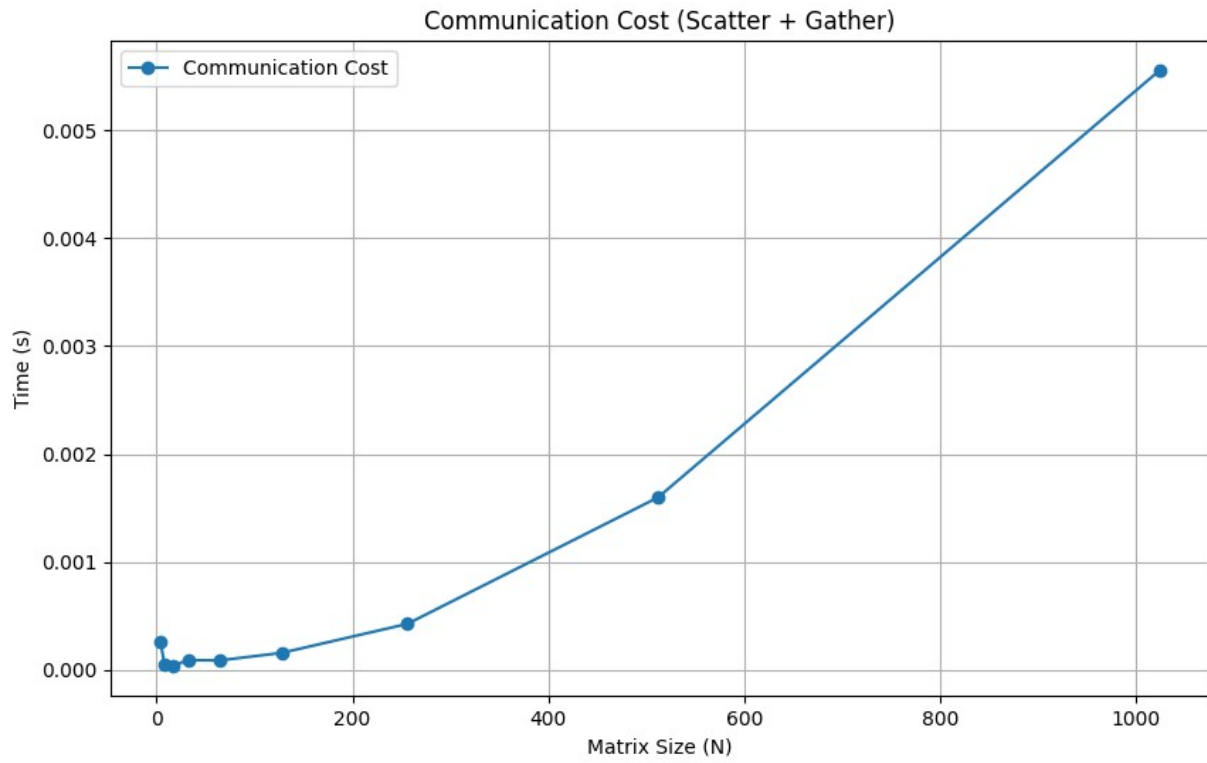
(MB, błąd w kodzie, dzieliłem przez 1024 w 2 miejscach)





4 watki





Results are the same!

Matrix Size: 4x4

Scatter Time: 0.000214 s, Memory Usage: 120.00 KB

Compute Time: 0.000101 s, Memory Usage: 44.00 KB

Gather Time: 0.000046 s, Memory Usage: 20.00 KB

Total Time: 0.000665 s, Total Memory Usage: 184.0 KB

Total Sequential Time: 0.000000 s, Sequential memory usage : 0.0 KB

Results are the same!

Matrix Size: 8x8

Scatter Time: 0.000035 s, Memory Usage: 0.00 KB

Compute Time: 0.000077 s, Memory Usage: 0.00 KB

Gather Time: 0.000016 s, Memory Usage: 0.00 KB

Total Time: 0.000145 s, Total Memory Usage: 0.0 KB

Total Sequential Time: 0.001001 s, Sequential memory usage : 0.0 KB

Results are the same!

Matrix Size: 16x16

Scatter Time: 0.000024 s, Memory Usage: 4.00 KB

Compute Time: 0.000303 s, Memory Usage: 4.00 KB

Gather Time: 0.000014 s, Memory Usage: 0.00 KB

Total Time: 0.000360 s, Total Memory Usage: 8.0 KB

Total Sequential Time: 0.001000 s, Sequential memory usage : 0.0 KB

Results are the same!

Matrix Size: 32x32

Scatter Time: 0.000040 s, Memory Usage: 4.00 KB

Compute Time: 0.002582 s, Memory Usage: 20.00 KB

Gather Time: 0.000052 s, Memory Usage: 12.00 KB

Total Time: 0.002691 s, Total Memory Usage: 36.0 KB

Total Sequential Time: 0.008000 s, Sequential memory usage : 12.0 KB

Results are the same!

Matrix Size: 64x64

Scatter Time: 0.000057 s, Memory Usage: 0.00 KB

Compute Time: 0.016567 s, Memory Usage: 16.00 KB

Gather Time: 0.000033 s, Memory Usage: 0.00 KB

Total Time: 0.016688 s, Total Memory Usage: 16.0 KB

Total Sequential Time: 0.064000 s, Sequential memory usage : 20.0 KB

Results are the same!

Matrix Size: 128x128

Scatter Time: 0.000074 s, Memory Usage: 0.00 KB

Compute Time: 0.132159 s, Memory Usage: 16.00 KB

Gather Time: 0.000085 s, Memory Usage: 132.00 KB

Total Time: 0.132361 s, Total Memory Usage: 148.0 KB

Total Sequential Time: 0.514333 s, Sequential memory usage : 4.0 KB

Results are the same!

Matrix Size: 256x256

Scatter Time: 0.000279 s, Memory Usage: 0.00 KB

Compute Time: 1.023422 s, Memory Usage: 532.00 KB

Gather Time: 0.000149 s, Memory Usage: 512.00 KB

Total Time: 1.023934 s, Total Memory Usage: 1044.0 KB

Total Sequential Time: 4.128687 s, Sequential memory usage : 0.0 KB

Results are the same!

Matrix Size: 512x512

Scatter Time: 0.001016 s, Memory Usage: 1024.00 KB

Compute Time: 8.199867 s, Memory Usage: 368.00 KB

Gather Time: 0.000583 s, Memory Usage: 2048.00 KB

Total Time: 8.201635 s, Total Memory Usage: 3440.0 KB

Total Sequential Time: 33.526490 s, Sequential memory usage : 504.0 KB

Results are the same!

Matrix Size: 1024x1024

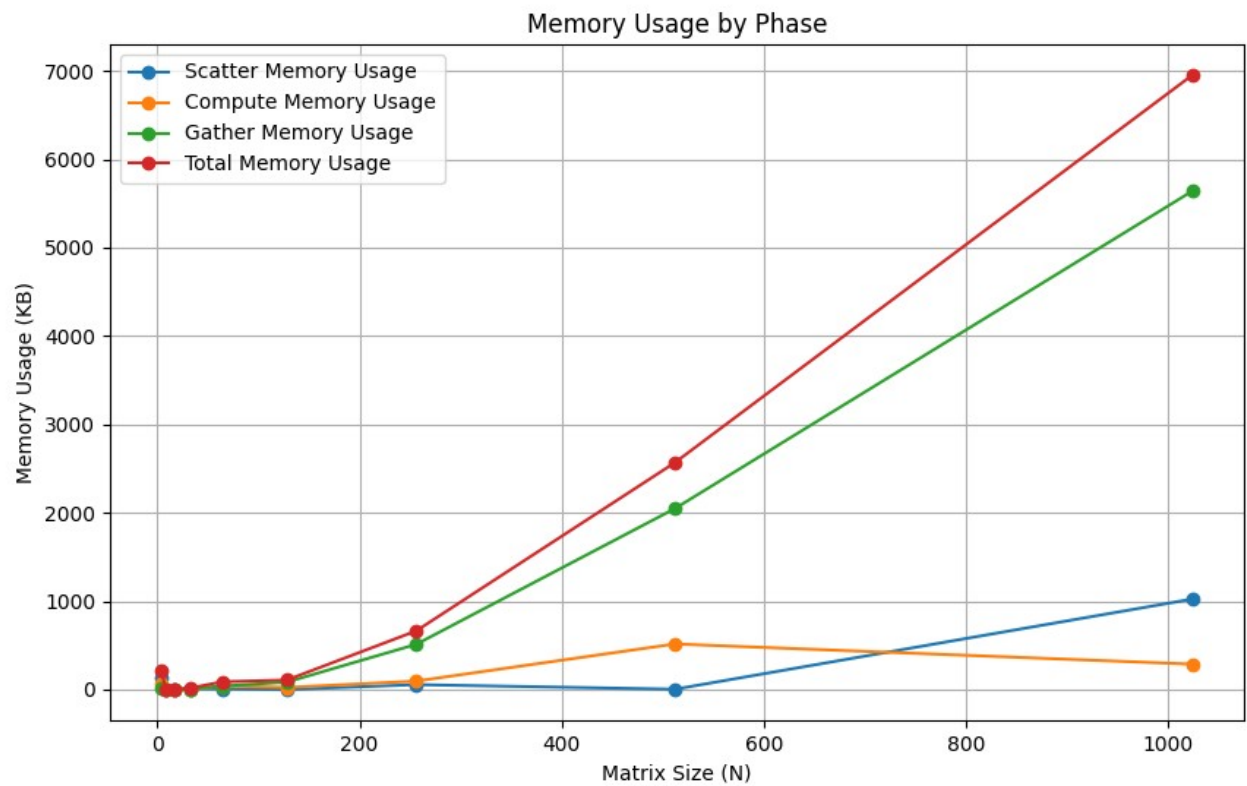
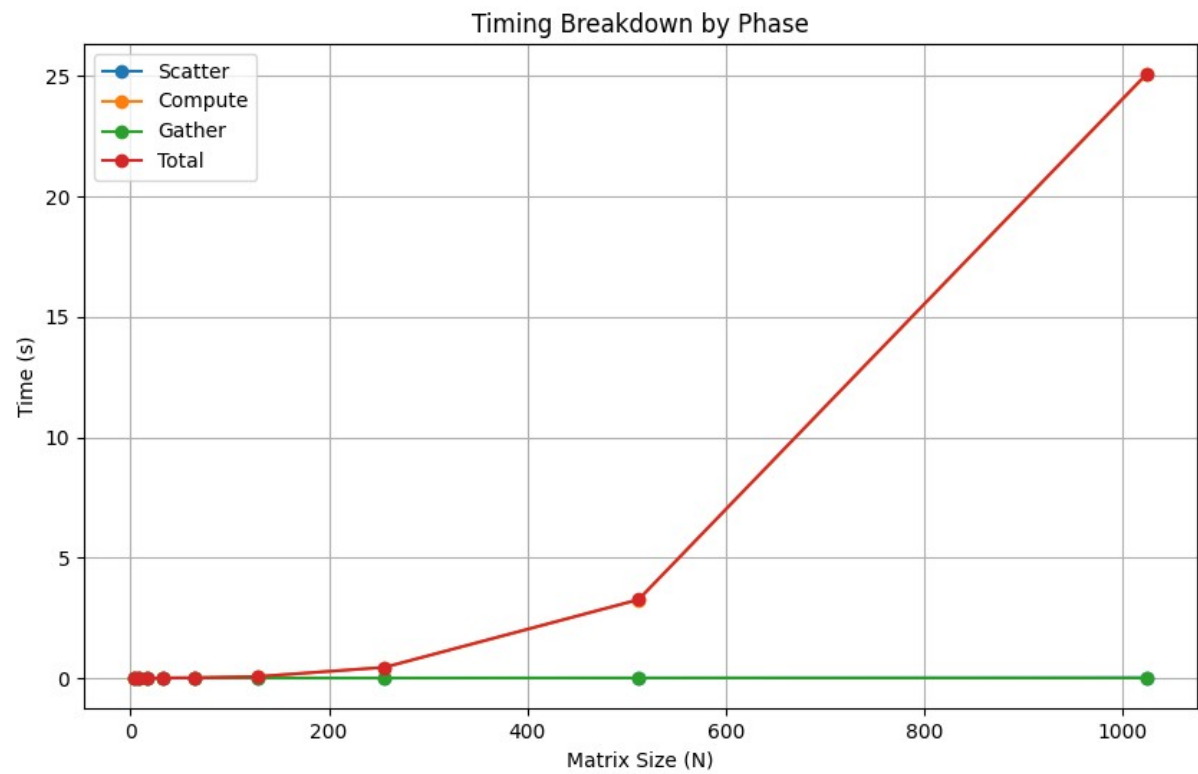
Scatter Time: 0.003144 s, Memory Usage: 4108.00 KB

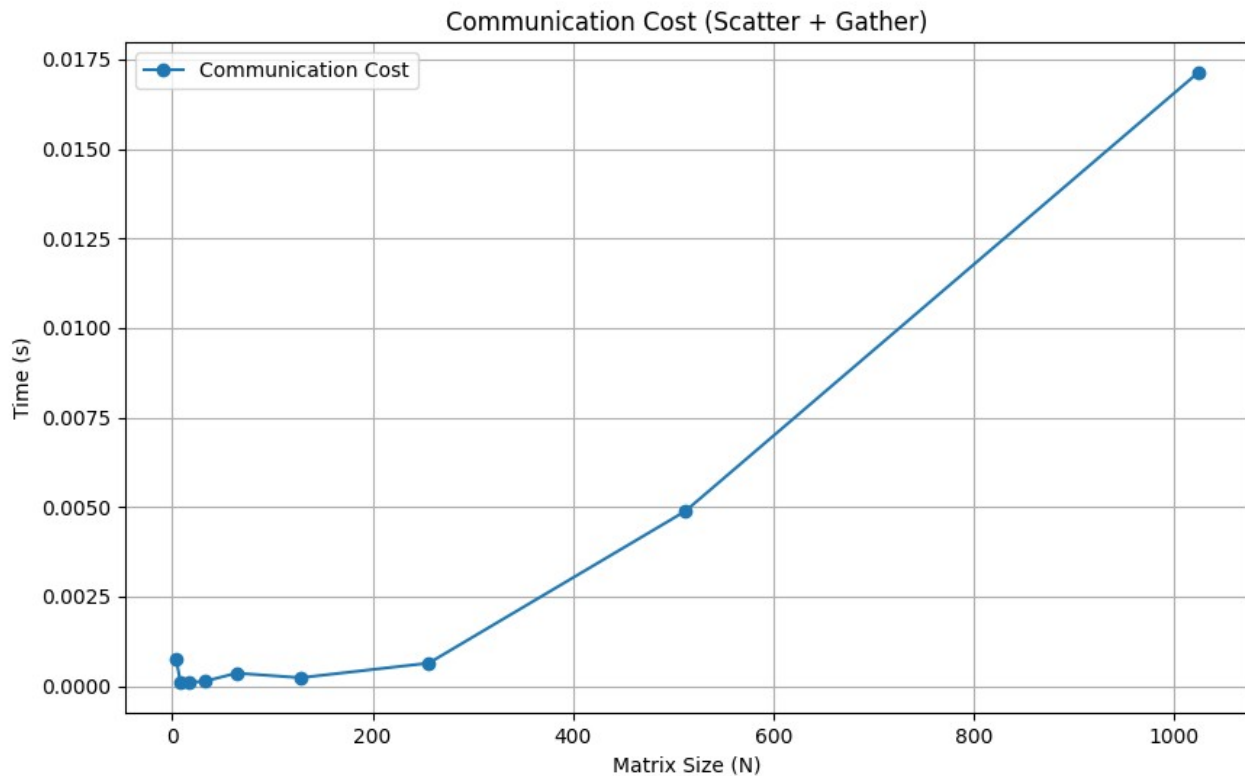
Compute Time: 66.140089 s, Memory Usage: 460.00 KB

Gather Time: 0.002408 s, Memory Usage: 6144.00 KB

Total Time: 66.146236 s, Total Memory Usage: 10712.0 KB

Total Sequential Time: 279.796756 s, Sequential memory usage : 6324.0 KB





Results are different!

Max difference: 1.0692617368493176

Mean difference: 0.12001191707372927

Matrix Size: 4x4

Scatter Time: 0.000636 s, Memory Usage: 136.00 KB

Compute Time: 0.001078 s, Memory Usage: 64.00 KB

Gather Time: 0.000115 s, Memory Usage: 20.00 KB

Total Time: 0.009102 s, Total Memory Usage: 220.0 KB

Total Sequential Time: 0.000000 s, Sequential memory usage : 0.0 KB

Results are different!

Max difference: 0.7766729686388931

Mean difference: 0.13906771954543357

Matrix Size: 8x8

Scatter Time: 0.000057 s, Memory Usage: 0.00 KB

Compute Time: 0.000145 s, Memory Usage: 0.00 KB

Gather Time: 0.000052 s, Memory Usage: 0.00 KB

Total Time: 0.000323 s, Total Memory Usage: 0.0 KB

Total Sequential Time: 0.000527 s, Sequential memory usage : 0.0 KB

Results are different!

Max difference: 1.2982341956330288

Mean difference: 0.2030029880841948

Matrix Size: 16x16
Scatter Time: 0.000027 s, Memory Usage: 0.00 KB
Compute Time: 0.000358 s, Memory Usage: 0.00 KB
Gather Time: 0.000081 s, Memory Usage: 0.00 KB
Total Time: 0.000512 s, Total Memory Usage: 0.0 KB
Total Sequential Time: 0.001553 s, Sequential memory usage : 0.0 KB
Results are different!
Max difference: 1.94102376502964
Mean difference: 0.24765736740127167

Matrix Size: 32x32
Scatter Time: 0.000049 s, Memory Usage: 8.00 KB
Compute Time: 0.001188 s, Memory Usage: 0.00 KB
Gather Time: 0.000084 s, Memory Usage: 8.00 KB
Total Time: 0.001393 s, Total Memory Usage: 16.0 KB
Total Sequential Time: 0.008533 s, Sequential memory usage : 12.0 KB
Results are different!
Max difference: 4.06222610668155
Mean difference: 0.38066186756602405

Matrix Size: 64x64
Scatter Time: 0.000236 s, Memory Usage: 8.00 KB
Compute Time: 0.009367 s, Memory Usage: 40.00 KB
Gather Time: 0.000127 s, Memory Usage: 40.00 KB
Total Time: 0.009914 s, Total Memory Usage: 88.0 KB
Total Sequential Time: 0.067414 s, Sequential memory usage : 4.0 KB
Results are different!
Max difference: 5.304364234194935
Mean difference: 0.5265021800014229

Matrix Size: 128x128
Scatter Time: 0.000098 s, Memory Usage: 0.00 KB
Compute Time: 0.060375 s, Memory Usage: 24.00 KB
Gather Time: 0.000139 s, Memory Usage: 84.00 KB
Total Time: 0.061442 s, Total Memory Usage: 108.0 KB
Total Sequential Time: 0.510001 s, Sequential memory usage : 132.0 KB
Results are different!
Max difference: 8.623787578736078
Mean difference: 0.7547608589947449

Matrix Size: 256x256
Scatter Time: 0.000450 s, Memory Usage: 56.00 KB
Compute Time: 0.444146 s, Memory Usage: 96.00 KB
Gather Time: 0.000194 s, Memory Usage: 512.00 KB
Total Time: 0.445749 s, Total Memory Usage: 664.0 KB
Total Sequential Time: 4.169017 s, Sequential memory usage : 444.0 KB
Results are different!
Max difference: 12.704605150719786
Mean difference: 1.062523514212506

Matrix Size: 512x512

Scatter Time: 0.001143 s, Memory Usage: 4.00 KB

Compute Time: 3.252873 s, Memory Usage: 516.00 KB

Gather Time: 0.003742 s, Memory Usage: 2048.00 KB

Total Time: 3.259632 s, Total Memory Usage: 2568.0 KB

Total Sequential Time: 33.266242 s, Sequential memory usage : 860.0 KB

Results are different!

Max difference: 17.83027469115831

Mean difference: 1.5077517020711557

Matrix Size: 1024x1024

Scatter Time: 0.012611 s, Memory Usage: 1024.00 KB

Compute Time: 25.067348 s, Memory Usage: 288.00 KB

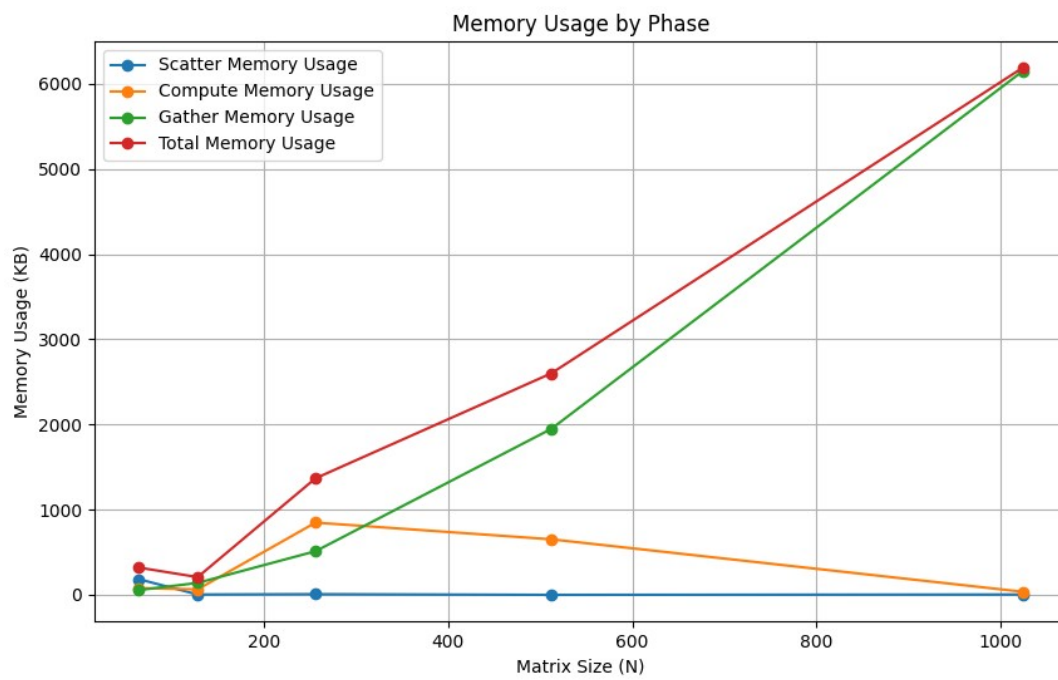
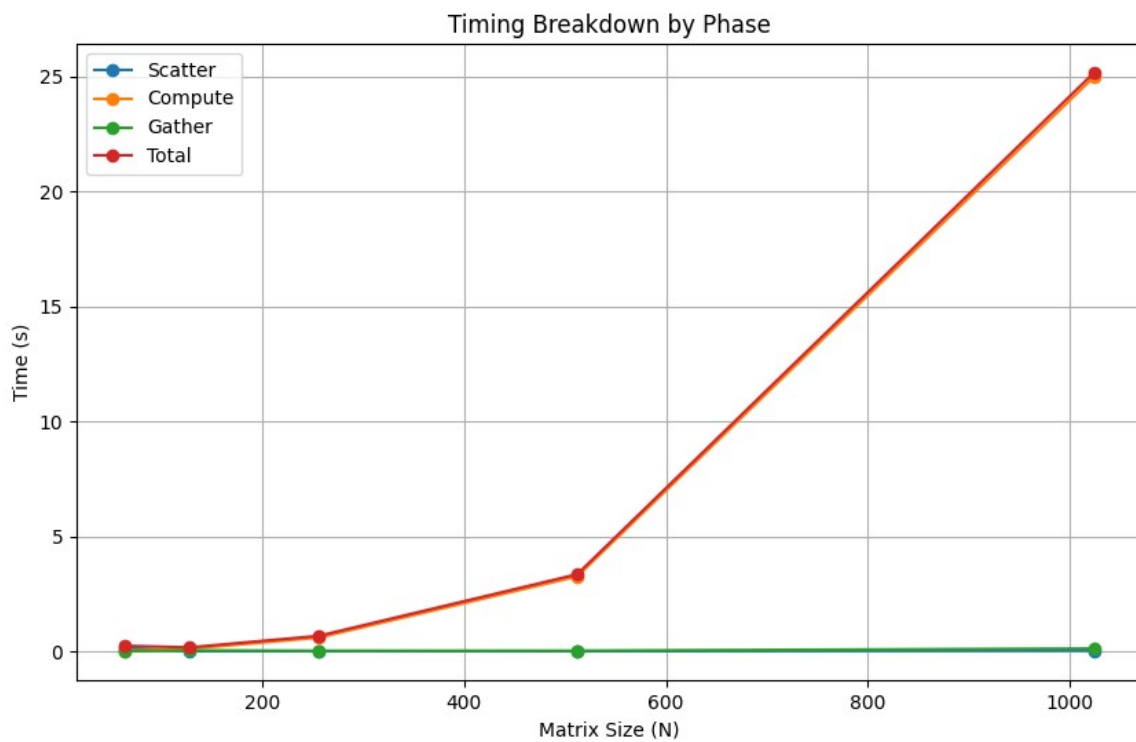
Gather Time: 0.004522 s, Memory Usage: 5640.00 KB

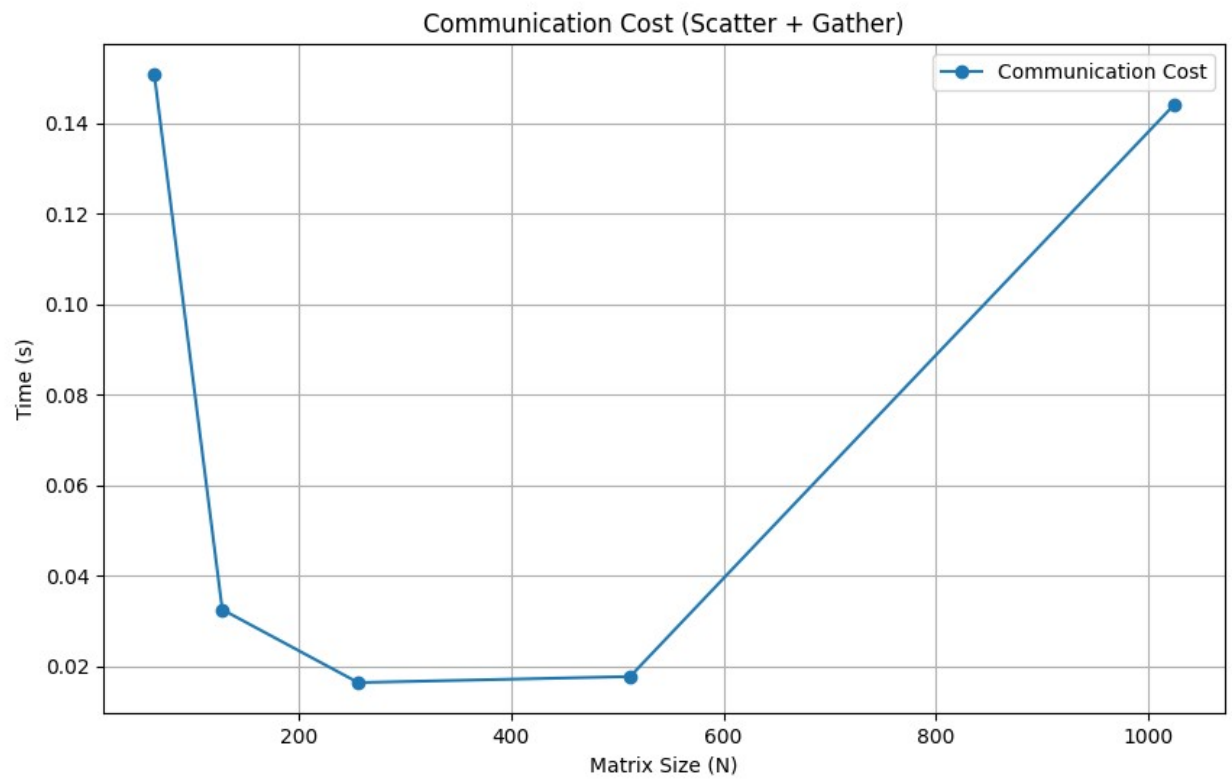
Total Time: 25.087863 s, Total Memory Usage: 6952.0 KB

Total Sequential Time: 278.487080 s, Sequential memory usage : 6312.0 KB

[64, 128, 256, 512, 1024]

64 watki





```
PS C:\Users\kacpe\Desktop\Optymalizacja> mpiexec -n 64 python measurements_nodal.py
Results are different!
Max difference: 4.237467821906344
Mean difference: 0.5568524011110136

Matrix Size: 64x64
Scatter Time: 0.147943 s, Memory Usage: 184.00 KB
Compute Time: 0.012496 s, Memory Usage: 80.00 KB
Gather Time: 0.002786 s, Memory Usage: 56.00 KB
Total Time: 0.234206 s, Total Memory Usage: 320.0 KB
Total Sequential Time: 0.065000 s, Sequential memory usage : 32.0 KB
Results are different!
Max difference: 4.769609965608225
Mean difference: 0.8114408218743573

Matrix Size: 128x128
Scatter Time: 0.000154 s, Memory Usage: 4.00 KB
Compute Time: 0.101735 s, Memory Usage: 64.00 KB
Gather Time: 0.032386 s, Memory Usage: 140.00 KB
Total Time: 0.164739 s, Total Memory Usage: 208.0 KB
Total Sequential Time: 0.521526 s, Sequential memory usage : 132.0 KB
Results are different!
Max difference: 8.150480654297724
Mean difference: 1.1306885713378239

Matrix Size: 256x256
Scatter Time: 0.004893 s, Memory Usage: 8.00 KB
Compute Time: 0.588419 s, Memory Usage: 848.00 KB
Gather Time: 0.011523 s, Memory Usage: 512.00 KB
Total Time: 0.666202 s, Total Memory Usage: 1368.0 KB
Total Sequential Time: 4.168612 s, Sequential memory usage : 248.0 KB
Results are different!
Max difference: 12.106126596879136
Mean difference: 1.596818361353377

Matrix Size: 512x512
Scatter Time: 0.001011 s, Memory Usage: 0.00 KB
Compute Time: 3.253103 s, Memory Usage: 652.00 KB
Gather Time: 0.016740 s, Memory Usage: 1948.00 KB
Total Time: 3.346572 s, Total Memory Usage: 2600.0 KB
Total Sequential Time: 33.565380 s, Sequential memory usage : 1024.0 KB
Results are different!
Max difference: 17.579930292849156
Mean difference: 2.2552334296276877

Matrix Size: 1024x1024
Scatter Time: 0.027487 s, Memory Usage: 4.00 KB
Compute Time: 24.985480 s, Memory Usage: 36.00 KB
Gather Time: 0.116468 s, Memory Usage: 6148.00 KB
Total Time: 25.166743 s, Total Memory Usage: 6188.0 KB
Total Sequential Time: 282.585354 s, Sequential memory usage : 6164.0 KB
```

