```
D:\Python\Python\setroute\python.exe "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=50477

import sys; print('Python %s on %s' % (sys.version, sys.platform))
sys.path.extend(['E:\\1 □□□□\\3 □□□□□\\1 □□□□□□□\\1 □□□□□□□□□\\1_□□□□□□_□□□□\\1_LW _□□□□1\\4 □□□□\\3 python_code\\9 Code for this paper', 'E:/1 □□□□/3 □□□□□/1 □□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□1/4 □□□□/3 python_code/9 Code for this paper'])

PyDev console: starting.

Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
>>> runfile('E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□1/4 □□□□/3 python_code/9 Code for this paper/main_DM.py', wdir='E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□1/4 □□□□/3 python_code/9 Code for this paper')
Backend TkAgg is interactive backend. Turning interactive mode on.
Waiting 5s.....

Optimize the  ./R_8_8.xlsx  instance

Set parameter TimeLimit to value 1200

Set parameter PoolSolutions to value 3
Set parameter PoolGap to value 0.05
Set parameter PoolSearchMode to value 2
Gurobi Optimizer version 11.0.0 build v11.0.0rc2 (win64 - Windows 10.0 (19045.2))

CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads

Optimize a model with 171112 rows, 64136 columns and 503224 nonzeros
Model fingerprint: 0x56855348
Variable types: 0 continuous, 64136 integer (54000 binary)
Coefficient statistics:
  Matrix range     [1e+00, 5e+05]
  Objective range  [1e+00, 1e+00]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 7e+06]
Presolve removed 150024 rows and 3124 columns
Presolve time: 0.11s
Presolved: 21088 rows, 61012 columns, 61197 nonzeros
Variable types: 0 continuous, 61012 integer (50884 binary)

Root relaxation: objective 5.231979e+02, 2228 iterations, 0.09 seconds (0.16 work units)

    Nodes    |    Current Node    |     Objective Bounds      |     Work
 Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

     0     0  523.19794    0 1647          -  523.19794      -     -    0s
H    0     0                887.0000000  523.19794  41.0%     -    1s
H    0     0                883.0000000  555.23271  37.1%     -    2s
H    0     0                879.0000000  555.23271  36.8%     -    2s
     0     0  555.23271    0 1629  879.00000  555.23271  36.8%     -    2s
H    0     0                877.0000000  555.36228  36.7%     -    5s
     0     0  573.95267    0 1539  877.00000  573.95267  34.6%     -    5s
     0     0  573.99244    0 1635  877.00000  573.99244  34.6%     -    5s
     0     0  574.74630    0 1408  877.00000  574.74630  34.5%     -    5s
     0     0  576.74630    0 1600  877.00000  576.74630  34.2%     -    6s
     0     0  576.74630    0 1598  877.00000  576.74630  34.2%     -    6s
     0     0  577.69666    0 1399  877.00000  577.69666  34.1%     -    7s
     0     0  577.71218    0 1392  877.00000  577.71218  34.1%     -    7s
     0     0  577.71218    0 1376  877.00000  577.71218  34.1%     -    7s
     0     2  577.71218    0 1358  877.00000  577.71218  34.1%     -   11s
   245   259  578.91053   63 1362  877.00000  577.71218  34.1%  16.6   20s
H  248   259                872.0000000  577.71218  33.7%  16.4   20s
  2367  2394  694.00000  456  722  872.00000  577.71218  33.7%  27.6   25s
  3573  3439  599.87013   94  898  872.00000  577.71218  33.7%  55.9   30s
  4559  4037  675.00000  598 10496  872.00000  577.71218  33.7%  59.8   38s
  4561  4038  844.05085  480 1244  872.00000  844.05085  3.21%  59.7   41s
  4562  3837  845.00000  714 1319  872.00000  845.00000  3.10%  59.7   46s
  4564  3838  850.40806  486 1437  872.00000  850.40806  2.48%  59.7   52s
  4574  3845  856.00000  854 1443  872.00000  856.00000  1.83%  59.6   55s
  4580  3849  856.00000  201 1301  872.00000  856.00000  1.83%  59.5   60s
  4581  3850  856.00000  246 1385  872.00000  856.00000  1.83%  59.5   65s
  4590  3856  856.00000  496 1332  872.00000  856.00000  1.83%  59.4   72s
  4601  3863  856.00000  314 1409  872.00000  856.00000  1.83%  59.2   75s
  4609  3868  856.00000  404 1379  872.00000  856.00000  1.83%  59.1  101s
  4619  3875  857.00000  261 1372  872.00000  857.00000  1.72%  59.0  111s
  4627  3880  857.00000  221 1371  872.00000  857.00000  1.72%  58.9  122s
  4635  3886  857.00000  444 1286  872.00000  857.00000  1.72%  58.8  133s
  4644  3892  857.00000  524 1376  872.00000  857.00000  1.72%  58.7  138s
  4659  3902  857.00000  598 1294  872.00000  857.00000  1.72%  58.5  140s
  4660  3902  857.00000   14 1391  872.00000  857.00000  1.72%  58.5  151s
  4670  3909  857.00000  318 1379  872.00000  857.00000  1.72%  58.3  161s
  4683  3918  857.00000  696 1368  872.00000  857.00000  1.72%  58.2  173s
  4690  3922  857.05403  496 1397  872.00000  857.05403  1.71%  58.1  175s
```

```
  81    4691  3923  857.05403  790 1352  872.00000  857.05403  1.71%  58.1  180s
  82    4706  3933  858.00000  289 1361  872.00000  858.00000  1.61%  57.9  191s
  83    4720  3942  858.00000  377 1335  872.00000  858.00000  1.61%  57.7  202s
  84    4734  3952  858.00000  166 1386  872.00000  858.00000  1.61%  57.6  221s
  85    4747  3960  858.00000  519 1385  872.00000  858.00000  1.61%  57.4  235s
  86    4762  3970  859.00000  714 1383  872.00000  859.00000  1.49%  57.2  252s
  87    4778  3981  859.00000  149 1344  872.00000  859.00000  1.49%  57.0  286s
  88    4790  3989  859.00000  496 1267  872.00000  859.00000  1.49%  56.9  304s
  89    4795  3992  859.00000   74 1317  872.00000  859.00000  1.49%  56.8  305s
  90    4801  3996  859.00000  314 1381  872.00000  859.00000  1.49%  56.8  372s
  91    4809  4002  859.00000  404 1351  872.00000  859.00000  1.49%  56.7  375s
  92    4814  4005  859.00000  725 1422  872.00000  859.00000  1.49%  56.6  481s
  93    4821  4010  859.00000  709 1407  872.00000  859.00000  1.49%  56.5  485s
  94    4826  4013  859.00000  185 1390  872.00000  859.00000  1.49%  56.5  491s
  95    4827  4014  859.00000  221 1408  872.00000  859.00000  1.49%  56.4  517s
  96    4843  4024  859.00000  733 1472  872.00000  859.00000  1.49%  56.3  520s
  97    4844  4025  859.00000  524 1385  872.00000  859.00000  1.49%  56.3  526s
  98    4858  4034  859.00000  725 1428  872.00000  859.00000  1.49%  56.1  549s
  99    4861  4036  859.00000  480 1409  872.00000  859.00000  1.49%  56.1  550s
 100    4878  4048  859.00000  149 1403  872.00000  859.00000  1.49%  55.9  578s
 101    4886  4053  859.00000   65 1456  872.00000  859.00000  1.49%  55.8  580s
 102    4891  4056  859.00000  790 1385  872.00000  859.00000  1.49%  55.7  613s
 103    4902  4064  859.00000  700 1466  872.00000  859.00000  1.49%  55.6  615s
 104    4906  4066  859.00000  289 1418  872.00000  859.00000  1.49%  55.5  665s
 105    4917  4074  859.00000  682 1409  872.00000  859.00000  1.49%  55.4  703s
 106    4921  4076  859.00000  709 1440  872.00000  859.00000  1.49%  55.4  705s
 107    4933  4084  859.00000  667 1426  872.00000  859.00000  1.49%  55.2  742s
 108    4948  4094  859.00000  708 1458  872.00000  859.00000  1.49%  55.1  746s
 109    4949  4095  859.00000  294 1406  872.00000  859.00000  1.49%  55.1  801s
 110    4965  4106  859.00000  377 1468  872.00000  859.00000  1.49%  54.9  806s
 111    4966  4106  859.00000  688 1380  872.00000  859.00000  1.49%  54.9  850s
 112    4978  4114  859.00000  149 1380  872.00000  859.00000  1.49%  54.7  934s
 113    4979  4115  859.00000  768 1400  872.00000  859.00000  1.49%  54.7  935s
 114    4997  4127  859.00000  282 1372  872.00000  859.00000  1.49%  54.5  969s
 115    5001  4130  859.00000  314 1405  872.00000  859.00000  1.49%  54.5  970s
 116    5011  4136  859.00000  727 1365  872.00000  859.00000  1.49%  54.4 1002s
 117    5025  4146  859.00000  336 1479  872.00000  859.00000  1.49%  54.2 1006s
 118    5026  4146  859.00000  185 1434  872.00000  859.00000  1.49%  54.2 1039s
 119    5028  4148  859.05475  163 1464  872.00000  859.05475  1.48%  54.2 1040s
 120    5042  4157  859.06327  551 1492  872.00000  859.06327  1.48%  54.0 1083s
 121    5049  4162  859.93582  294 1480  872.00000  859.93582  1.38%  54.0 1085s
 122    5060  4169  860.00000   14 1425  872.00000  860.00000  1.38%  53.8 1116s
 123    5075  4179  860.00000  719 1506  872.00000  860.00000  1.38%  53.7 1120s
 124    5076  4180  860.00000  508 1449  872.00000  860.00000  1.38%  53.7 1133s
 125    5084  4185  860.00000  571 1462  872.00000  860.00000  1.38%  53.6 1135s
 126    5090  4189  860.00000  496 1459  872.00000  860.00000  1.38%  53.5 1181s
 127    5104  4198  860.00000  177 1519  872.00000  860.00000  1.38%  53.4 1185s
 128
 129  Cutting planes:
 130    Learned: 12
 131    Implied bound: 3
 132    MIR: 72
 133    Flow cover: 644
 134    Zero half: 15
 135    RLT: 3
 136    Relax-and-lift: 2442
 137
 138  Explored 5104 nodes (426575 simplex iterations) in 1202.49 seconds (1111.75 work units)
 139  Thread count was 8 (of 8 available processors)
 140
 141  Solution count 3: 872 872 875
 142
 143  Time limit reached
 144  Best objective 8.720000000000e+02, best bound 8.600000000000e+02, gap 1.3761%
 145
 146  Output one feasible solution with limited computation time
 147
 148  Optimization was stopped with status 9
 149
 150  Number of solution stored: 3
 151     872  872  875
 152
 153  Obj = 872.0
 154
 155  Solutions:
 156       The total pi =  123.0
 157       The total duration time in berth stage =  141.0
 158       The total duration time in quay crane scheduling stage =  33.0
 159       The total departure time in berth stage=  490.0
 160       The total departure time in quay crane scheduling stage =  382.0
 161       The total wasted crane work hour according QC0=  14.414703160322253
 162       The last depature time in quay crane scheduling stage =  70.0
 163
 164  The specific solution are as follows:
```

```
Vessel i: 0: li: 5, pi: 9-14, ai-di: 14-34, taoi-deltai: 14-34, periodi: 20, taoPi_SP-deltaPi_SP: 14-18, periodPi: 4, c_i: 5152510, dowork: 6327456, fa_i: 4
Vessel i: 1: li: 7, pi: 17-24, ai-di: 46-67, taoi-deltai: 46-67, periodi: 21, taoPi_SP-deltaPi_SP: 46-52, periodPi: 6, c_i: 5370529, dowork: 5536524, fa_i: 4
Vessel i: 2: li: 6, pi: 11-17, ai-di: 44-60, taoi-deltai: 44-60, periodi: 16, taoPi_SP-deltaPi_SP: 44-47, periodPi: 3, c_i: 4131348, dowork: 4218304, fa_i: 5
Vessel i: 3: li: 7, pi: 14-21, ai-di: 10-21, taoi-deltai: 10-21, periodi: 11, taoPi_SP-deltaPi_SP: 10-13, periodPi: 3, c_i: 2656889, dowork: 3954660, fa_i: 3
Vessel i: 4: li: 4, pi: 30-34, ai-di: 63-76, taoi-deltai: 63-76, periodi: 13, taoPi_SP-deltaPi_SP: 63-67, periodPi: 4, c_i: 3320921, dowork: 3691016, fa_i: 2
Vessel i: 5: li: 5, pi: 12-17, ai-di: 65-83, taoi-deltai: 65-89, periodi: 24, taoPi_SP-deltaPi_SP: 65-70, periodPi: 5, c_i: 6243810, dowork: 6591100, fa_i: 4
Vessel i: 6: li: 6, pi: 24-30, ai-di: 45-76, taoi-deltai: 45-72, periodi: 27, taoPi_SP-deltaPi_SP: 45-51, periodPi: 6, c_i: 6915563, dowork: 6986566, fa_i: 3
Vessel i: 7: li: 6, pi: 6-12, ai-di: 62-75, taoi-deltai: 62-71, periodi: 9, taoPi_SP-deltaPi_SP: 62-64, periodPi: 2, c_i: 2218324, dowork: 2504618, fa_i: 5
TimeSolveModel: 1211.000000

TimeAll: 1214.000000
```