```
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=51691

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_9_2.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 213639 rows, 72324 columns and 629811 nonzeros
Model fingerprint: 0x948c54c7
Variable types: 0 continuous, 72324 integer (60921 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, 5e+06]
Presolve removed 191231 rows and 3708 columns
Presolve time: 0.09s
Presolved: 22408 rows, 68616 columns, 66111 nonzeros
Variable types: 0 continuous, 68616 integer (57213 binary)

Root relaxation: objective 4.925552e+02, 2068 iterations, 0.09 seconds (0.18 work units)

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

     0     0  492.55520    0 1656          -  492.55520      -     -    0s
H    0     0                851.0000000  492.55520  42.1%     -    1s
H    0     0                845.0000000  513.87198  39.2%     -    2s
     0     0  513.87198    0 1652  845.00000  513.87198  39.2%     -    2s
     0     0  537.00000    0 1606  845.00000  537.00000  36.4%     -    5s
     0     0  537.00000    0 1646  845.00000  537.00000  36.4%     -    5s
     0     0  537.00000    0 1646  845.00000  537.00000  36.4%     -    5s
     0     0  537.00000    0 1473  845.00000  537.00000  36.4%     -    5s
     0     0  538.00000    0 1596  845.00000  538.00000  36.3%     -    7s
     0     0  538.00000    0 1597  845.00000  538.00000  36.3%     -    7s
     0     0  538.04439    0 1368  845.00000  538.04439  36.3%     -    8s
     0     0  538.05623    0 1263  845.00000  538.05623  36.3%     -    8s
     0     2  538.05623    0 1248  845.00000  538.05623  36.3%     -   12s
H  269   272                844.0000000  538.05623  36.2%  12.6   24s
   421   439  544.80757  106 1353  844.00000  538.05623  36.2%  11.1   25s
  1181  1092  621.47994  116 9022  844.00000  538.23207  36.2%  16.4   31s
  1184  1094  820.00000   29  260  844.00000  820.00000  2.84%  16.4   35s
  1208  1110  827.25831   19  611  844.00000  827.25831  1.98%  16.1   40s
  1227  1123  832.69157  278  339  844.00000  832.69157  1.34%  15.8   45s
  1240  1131  832.91013   84  299  844.00000  832.91013  1.31%  15.7   50s
  1250  1138  833.14602   14  262  844.00000  833.14602  1.29%  15.5   55s
  1268  1150  833.42135  223  262  844.00000  833.42135  1.25%  15.3   60s
  1282  1159  833.60618    8  253  844.00000  833.60618  1.23%  15.2   65s
  1299  1171  833.78342   73  248  844.00000  833.78342  1.21%  15.0   71s
  1316  1182  833.96045    3  245  844.00000  833.96045  1.19%  14.8   76s
  1336  1195  834.08467   70  282  844.00000  834.08467  1.17%  14.5   80s
  1350  1205  834.30155   14  268  844.00000  834.30155  1.15%  14.4   85s
  1379  1224  834.76755  169  247  844.00000  834.76755  1.09%  14.1   90s
  1401  1239  834.96661   47  259  844.00000  834.96661  1.07%  13.9   95s
  1420  1251  835.07869   89  296  844.00000  835.07869  1.06%  13.7  100s
  1443  1267  835.19798   78  300  844.00000  835.19798  1.04%  13.5  105s
  1460  1278  837.00000  264  303  844.00000  837.00000  0.83%  13.3  110s
  1478  1290  838.61892  188  342  844.00000  838.61892  0.64%  13.1  115s
  1501  1305  841.14432   47  330  844.00000  841.14432  0.34%  12.9  120s

Cutting planes:
  Learned: 209
  Gomory: 8
```

```
  Lift-and-project: 3
  Cover: 13
  Implied bound: 32
  Clique: 3
  MIR: 49
  StrongCG: 20
  Flow cover: 263
  Zero half: 38
  RLT: 27
  Relax-and-lift: 1026
  BQP: 3

Explored 1507 nodes (78207 simplex iterations) in 123.45 seconds (113.79 work units)
Thread count was 8 (of 8 available processors)

Solution count 3: 844 844 844
No other solutions better than 844

Optimal solution found (tolerance 1.00e-04)
Best objective 8.440000000000e+02, best bound 8.440000000000e+02, gap 0.0000%

Output optimal solution and the Optimal Obj:  844.0


Obj = 844.0

Solutions:
    The total pi =  153.0
    The total duration time in berth stage =  118.0
    The total duration time in quay crane scheduling stage =  28.0
    The total departure time in berth stage=  467.0
    The total departure time in quay crane scheduling stage =  377.0
    The total wasted crane work hour according QC0=  7.32961493529153
    The last depature time in quay crane scheduling stage =  68.0

The specific solution are as follows:
   Vessel i: 0:    li: 4,        pi: 14-18,        ai-di: 65-74,        taoi-deltai: 65-74,        periodi: 9,        taoPi_SP-deltaPi_SP: 65-67,        periodPi: 2,        c_i: 2306928,        dowork: 2372796,        fa_i: 4
   Vessel i: 1:    li: 4,        pi: 10-14,        ai-di: 6-16,        taoi-deltai: 6-16,        periodi: 10,        taoPi_SP-deltaPi_SP: 6-8,        periodPi: 2,        c_i: 2452992,        dowork: 2636440,        fa_i: 4
   Vessel i: 2:    li: 7,        pi: 25-32,        ai-di: 8-24,        taoi-deltai: 8-24,        periodi: 16,        taoPi_SP-deltaPi_SP: 8-13,        periodPi: 5,        c_i: 3969979,        dowork: 4218304,        fa_i: 2
   Vessel i: 3:    li: 4,        pi: 10-14,        ai-di: 65-73,        taoi-deltai: 65-73,        periodi: 8,        taoPi_SP-deltaPi_SP: 65-68,        periodPi: 3,        c_i: 1963640,        dowork: 1977330,        fa_i: 2
   Vessel i: 4:    li: 6,        pi: 19-25,        ai-di: 11-25,        taoi-deltai: 11-25,        periodi: 14,        taoPi_SP-deltaPi_SP: 11-14,        periodPi: 3,        c_i: 3679063,        dowork: 3691016,        fa_i: 4
   Vessel i: 5:    li: 5,        pi: 9-14,        ai-di: 38-53,        taoi-deltai: 38-50,        periodi: 12,        taoPi_SP-deltaPi_SP: 38-41,        periodPi: 3,        c_i: 2903940,        dowork: 3954660,        fa_i: 3
   Vessel i: 6:    li: 4,        pi: 30-34,        ai-di: 61-79,        taoi-deltai: 61-77,        periodi: 16,        taoPi_SP-deltaPi_SP: 61-66,        periodPi: 5,        c_i: 4137393,        dowork: 4218304,        fa_i: 2
   Vessel i: 7:    li: 6,        pi: 22-28,        ai-di: 53-68,        taoi-deltai: 53-67,        periodi: 14,        taoPi_SP-deltaPi_SP: 53-55,        periodPi: 2,        c_i: 3534144,        dowork: 3691016,        fa_i: 6
   Vessel i: 8:    li: 7,        pi: 14-21,        ai-di: 42-64,        taoi-deltai: 42-61,        periodi: 19,        taoPi_SP-deltaPi_SP: 42-45,        periodPi: 3,        c_i: 4756792,        dowork: 4877414,        fa_i: 7
TimeSolveModel: 132.000000

TimeAll: 136.000000
```