```
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=21309

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_10_5.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 260882 rows, 80570 columns and 770550 nonzeros
Model fingerprint: 0xc478544d
Variable types: 0 continuous, 80570 integer (67900 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 179214 rows and 2216 columns
Presolve time: 0.53s
Presolved: 81668 rows, 78354 columns, 241731 nonzeros
Variable types: 0 continuous, 78354 integer (65694 binary)
Root relaxation presolved: 81623 rows, 78399 columns, 241605 nonzeros

Deterministic concurrent LP optimizer: primal and dual simplex
Showing primal log only...

Concurrent spin time: 0.00s

Solved with dual simplex

Root relaxation: objective 3.176651e+02, 5353 iterations, 0.78 seconds (1.20 work units)

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

     0     0  317.66511    0 3727          -  317.66511      -     -    2s
H    0     0                       522.0000000  317.66511  39.1%     -    3s
     0     0  333.79811    0 2766  522.00000  333.79811  36.1%     -    5s
H    0     0                       520.0000000  333.80146  35.8%     -   17s
     0     0  336.12157    0 2991  520.00000  336.12157  35.4%     -   18s
     0     0  336.63501    0 3659  520.00000  336.63501  35.3%     -   18s
     0     0  336.71922    0 3744  520.00000  336.71922  35.2%     -   19s
     0     0  336.73199    0 3744  520.00000  336.73199  35.2%     -   19s
     0     0  336.74364    0 3744  520.00000  336.74364  35.2%     -   19s
     0     0  336.74518    0 3744  520.00000  336.74518  35.2%     -   19s
     0     0  339.32504    0 2683  520.00000  339.32504  34.7%     -   20s
     0     0  339.79299    0 3668  520.00000  339.79299  34.7%     -   21s
     0     0  339.80667    0 3668  520.00000  339.80667  34.7%     -   22s
     0     0  339.80681    0 3668  520.00000  339.80681  34.7%     -   22s
     0     0  340.99083    0 2564  520.00000  340.99083  34.4%     -   23s
     0     0  341.09684    0 3017  520.00000  341.09684  34.4%     -   26s
     0     0  341.24715    0 3000  520.00000  341.24715  34.4%     -   27s
     0     0  341.26127    0 3425  520.00000  341.26127  34.4%     -   27s
     0     0  341.26618    0 3443  520.00000  341.26618  34.4%     -   27s
     0     0  342.19563    0 2959  520.00000  342.19563  34.2%     -   28s
     0     0  342.40875    0 2973  520.00000  342.40875  34.2%     -   33s
     0     0  342.41945    0 3337  520.00000  342.41945  34.2%     -   33s
     0     0  342.55442    0 2577  520.00000  342.55442  34.1%     -   34s
     0     0  342.56735    0 3283  520.00000  342.56735  34.1%     -   38s
     0     0  342.78069    0 2515  520.00000  342.78069  34.1%     -   39s
     0     0  342.82789    0 3244  520.00000  342.82789  34.1%     -   41s
     0     0  342.82842    0 3246  520.00000  342.82842  34.1%     -   41s
     0     0  342.97471    0 2731  520.00000  342.97471  34.0%     -   42s
     0     0  343.00366    0 3204  520.00000  343.00366  34.0%     -   44s
     0     0  343.00500    0 3208  520.00000  343.00500  34.0%     -   44s
```

```
 81      0    0  343.10377    0 2237  520.00000  343.10377  34.0%    -   45s
 82      0    0  343.13251    0 3189  520.00000  343.13251  34.0%    -   49s
 83      0    0  343.14213    0 3191  520.00000  343.14213  34.0%    -   49s
 84      0    0  343.31724    0 3148  520.00000  343.31724  34.0%    -   50s
 85      0    0  343.33958    0 3155  520.00000  343.33958  34.0%    -   56s
 86      0    0  343.34102    0 3153  520.00000  343.34102  34.0%    -   56s
 87      0    0  343.43490    0 2174  520.00000  343.43490  34.0%    -   57s
 88      0    0  343.44522    0 3143  520.00000  343.44522  34.0%    -   60s
 89      0    0  343.56404    0 2691  520.00000  343.56404  33.9%    -   61s
 90      0    0  343.58147    0 2487  520.00000  343.58147  33.9%    -   62s
 91  H   0    0               519.0000000  364.00000  29.9%    -   69s
 92      0    2  364.00000    0 2482  519.00000  364.00000  29.9%    -   70s
 93    274  281  364.00000   68 2236  519.00000  364.00000  29.9%  27.3   75s
 94    715  748  364.00000  181 2115  519.00000  364.00000  29.9%  18.7   80s
 95   1098 1134  375.12499  292 1973  519.00000  364.00000  29.9%  24.6   85s
 96   1497 1586  413.78574  401 1311  519.00000  364.00000  29.9%  38.6   90s
 97   2115 2194  382.43204  502 1108  519.00000  364.00000  29.9%  42.9   95s
 98   2472 2558  386.01227  579 1312  519.00000  364.00000  29.9%  45.8  105s
 99   2860 2887  389.00000  631 1143  519.00000  364.00000  29.9%  62.3  111s
100   3182 3252  393.00000  707 1019  519.00000  364.00000  29.9%  74.6  116s
101   3470 3649  397.00000  780 1005  519.00000  364.00000  29.9%  79.6  120s
102   4112 4100  410.00000  926  879  519.00000  364.00000  29.9%  79.5  127s
103   4419 4471  421.00000  985  822  519.00000  364.00000  29.9%  82.6  131s
104  H 4655  4471                518.0000000  364.00000  29.7%  82.1  142s
105   4656  4248  374.61349  240 2487  518.00000  364.00000  29.7%  82.1  148s
106   4658  4249  400.97151  271 2076  518.00000  364.00000  29.7%  82.0  157s
107   4659  4037  497.00000  241 2117  518.00000  497.00000  4.05%  82.0  170s
108  H 4662  3837                517.0000000  498.73553  3.53%  82.0  173s
109   4665  3839  504.00000  498  150  517.00000  504.00000  2.51%  81.9  175s
110   4669  3842  508.30409 1094  140  517.00000  508.30409  1.68%  81.8  180s
111  H 4669  3650                516.0000000  508.30409  1.49%  81.8  181s
112   4690  2436  514.22896  373  124  516.00000  514.22896  0.34%  92.4  185s
113
114  Optimal solution found at node 4698 - now completing solution pool...
115   4699  2095  515.02778  938   14  517.00000  515.02778  0.38%  92.5  186s
116
117  Cutting planes:
118    Gomory: 13
119    MIR: 1
120    Flow cover: 20
121    Zero half: 1
122    RLT: 1
123    Relax-and-lift: 2
124
125  Explored 4699 nodes (456112 simplex iterations) in 186.69 seconds (308.14 work units)
126  Thread count was 8 (of 8 available processors)
127
128  Solution count 3: 516 516 516
129  No other solutions better than 516
130
131  Optimal solution found (tolerance 1.00e-04)
132  Best objective 5.160000000000e+02, best bound 5.160000000000e+02, gap 0.0000%
133
134  Output optimal solution and the Optimal Obj:  516.0
135
136
137  Obj = 516.0
138
139  Solutions:
140      The total pi =  164.0
141      The total duration time in berth stage =  123.0
142      The total duration time in quay crane scheduling stage =  27.0
143      The total departure time in berth stage=  306.0
144      The total departure time in quay crane scheduling stage =  210.0
145      The total wasted crane work hour according QC0=  5.592059747234908
146      The last depature time in quay crane scheduling stage =  59.0
147
148  The specific solution are as follows:
149      Vessel i: 0:     li: 5,          pi: 9-14,          ai-di: 56-69,          taoi-deltai: 56-69,          periodi: 13,          taoPi_SP-deltaPi_SP
     : 56-59,                    periodPi: 3,                    c_i: 3191174,                    dowork: 3427372,                    fa_i: 4
150      Vessel i: 1:     li: 5,          pi: 25-30,          ai-di: 15-45,          taoi-deltai: 15-21,          periodi: 6,          taoPi_SP-deltaPi_SP
     : 15-16,                    periodPi: 1,                    c_i: 1577868,                    dowork: 1581864,                    fa_i: 4
151      Vessel i: 2:     li: 5,          pi: 3-8,          ai-di: 19-50,          taoi-deltai: 19-28,          periodi: 9,          taoPi_SP-deltaPi_SP:
     19-22,                    periodPi: 3,                    c_i: 2274298,                    dowork: 2372796,                    fa_i: 3
152      Vessel i: 3:     li: 6,          pi: 8-14,          ai-di: 9-55,          taoi-deltai: 9-35,          periodi: 26,          taoPi_SP-deltaPi_SP: 9
     -15,                    periodPi: 6,                    c_i: 6695649,                    dowork: 6722922,                    fa_i: 4
153      Vessel i: 4:     li: 5,          pi: 14-19,          ai-di: 20-42,          taoi-deltai: 20-25,          periodi: 5,          taoPi_SP-deltaPi_SP
     : 20-21,                    periodPi: 1,                    c_i: 1246108,                    dowork: 1581864,                    fa_i: 4
154      Vessel i: 5:     li: 5,          pi: 14-19,          ai-di: 3-61,          taoi-deltai: 3-11,          periodi: 8,          taoPi_SP-deltaPi_SP: 3
     -5,                    periodPi: 2,                    c_i: 1949433,                    dowork: 2240974,                    fa_i: 4
155      Vessel i: 6:     li: 6,          pi: 19-25,          ai-di: 9-72,          taoi-deltai: 9-26,          periodi: 17,          taoPi_SP-deltaPi_SP
     : 9-12,                    periodPi: 3,                    c_i: 4381617,                    dowork: 4481948,                    fa_i: 4
156      Vessel i: 7:     li: 5,          pi: 29-34,          ai-di: 2-77,          taoi-deltai: 2-8,          periodi: 6,          taoPi_SP-deltaPi_SP: 2-4
     ,                    periodPi: 2,                    c_i: 1561690,                    dowork: 1713686,                    fa_i: 3
```

```
157     Vessel i: 8:    li: 6,  pi: 25-31,  ai-di: 22-62,  taoi-deltai: 22-32,  periodi: 10,  taoPi_SP-
        deltaPi_SP: 22-24,  periodPi: 2,  c_i: 2378507,  dowork: 2504618,  fa_i: 4
158     Vessel i: 9:    li: 7,  pi: 18-25,  ai-di: 28-79,  taoi-deltai: 28-51,  periodi: 23,  taoPi_SP-
        deltaPi_SP: 28-32,  periodPi: 4,  c_i: 5961199,  dowork: 6063812,  fa_i: 4
159 TimeSolveModel: 197.000000
160
161 TimeAll: 201.000000
162
163
```