```
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=2680

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_6_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 100206 rows, 47910 columns and 292506 nonzeros
Model fingerprint: 0x969816fb
Variable types: 0 continuous, 47910 integer (40308 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 73462 rows and 1641 columns
Presolve time: 0.16s
Presolved: 26744 rows, 46269 columns, 78061 nonzeros
Variable types: 0 continuous, 46269 integer (38673 binary)
Found heuristic solution: objective 792.0000000

Root relaxation: objective 3.205742e+02, 2308 iterations, 0.16 seconds (0.43 work units)

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

     0     0  320.57418    0 1930  792.00000  320.57418  59.5%     -    0s
H    0     0                       519.0000000  320.57418  38.2%     -    2s
H    0     0                       513.0000000  320.57418  37.5%     -    2s
H    0     0                       511.0000000  320.57418  37.3%     -    3s
     0     0  334.02097    0 1926  511.00000  334.02097  34.6%     -    3s
     0     0  349.00000    0 1930  511.00000  349.00000  31.7%     -   12s
     0     0  349.00000    0 1408  511.00000  349.00000  31.7%     -   12s
     0     0  350.00000    0 1886  511.00000  350.00000  31.5%     -   15s
     0     0  350.00000    0 1886  511.00000  350.00000  31.5%     -   15s
     0     0  350.00000    0 1648  511.00000  350.00000  31.5%     -   16s
     0     0  350.00000    0 1467  511.00000  350.00000  31.5%     -   17s
     0     2  350.00000    0 1419  511.00000  350.00000  31.5%     -   21s
   818   905  396.99985  198 1259  511.00000  350.00000  31.5%  12.9   25s
  2612  2526  472.35801  597  704  511.00000  350.00000  31.5%  20.3   39s
  2897  2770  446.05797  419 1467  511.00000  350.00000  31.5%  20.6   43s
  2899  2771  484.00000  539 1467  511.00000  484.00000  5.28%  20.6   48s
  2900  2772  484.00000  595  130  511.00000  484.00000  5.28%  20.6   54s
  2901  2773  487.54251  434  177  511.00000  487.54251  4.59%  20.6   57s
  2903  2774  489.10827  559  291  511.00000  489.10827  4.28%  20.6   62s
  2907  2777  491.01791  270  441  511.00000  491.01791  3.91%  20.5   65s
  2914  2781  493.50804  232  597  511.00000  493.50804  3.42%  20.5   75s
  2918  2784  495.18849  285  448  511.00000  495.18849  3.09%  20.5   81s
  2919  2785  495.48699   78  386  511.00000  495.48699  3.04%  20.5   85s
  2923  2787  495.65063  230  330  511.00000  495.65063  3.00%  20.4   90s
  2929  2791  496.32106  404  426  511.00000  496.32106  2.87%  20.4   98s
  2931  2793  496.40188   36  437  511.00000  496.40188  2.86%  20.4  100s
  2932  2793  496.53695  560  390  511.00000  496.53695  2.83%  20.4  115s
  2935  2795  496.67557  476  439  511.00000  496.67557  2.80%  20.4  121s
  2943  2802  498.46687  255  353  511.00000  498.46687  2.45%  36.2  126s
  2944  2803  499.88907  166  162  511.00000  499.88907  2.17%  36.2  130s
  2956  2811  502.81051  384  200  511.00000  502.81051  1.60%  36.1  135s
  2962  2815  503.27155  416  204  511.00000  503.27155  1.51%  36.0  141s
H 2963  2674                       510.0000000  503.36249  1.30%  36.0  148s
  2966  2676  503.41091  200  242  510.00000  503.41091  1.29%  36.0  153s
  2968  2677  503.54049  269  231  510.00000  503.54049  1.27%  35.9  157s
  2969  2678  503.54049  321  231  510.00000  503.54049  1.27%  35.9  161s
  2971  2680 infeasible   23       510.00000  503.58983  1.26%  39.9  165s
```

```
 81    3007  2704  504.40894   29  212  510.00000  504.32210  1.11%  41.0  170s
 82    3082  2749  507.00000   39  111  510.00000  504.32210  1.11%  48.0  175s
 83    3149  2784  505.03477   45  165  510.00000  504.32210  1.11%  55.3  180s
 84    3247  2792  508.10079   55   47  510.00000  504.32210  1.11%  61.3  186s
 85    3304  2789 infeasible   29       510.00000  504.34599  1.11%  64.2  193s
 86  H 3307  2654                       509.0000000  504.34599  0.91%  64.5  193s
 87    3319  2529  506.00000   31  124  509.00000  504.34599  0.91%  66.2  195s
 88    3397  2578  505.00000   37  106  509.00000  504.34599  0.91%  74.1  201s
 89    3466  2598  505.00000   44  116  509.00000  504.34599  0.91%  78.5  205s
 90    3583  2655  506.00000   57   59  509.00000  504.34599  0.91%  86.1  211s
 91    3707  2558  506.00000   55   88  509.00000  504.34599  0.91%  89.6  217s
 92    3800  2431  506.03420   35  134  509.00000  504.35452  0.91%  93.4  221s
 93    3894  2449  506.00000   32  100  509.00000  504.37207  0.91%  99.3  227s
 94    3971  2470  505.00000   42  136  509.00000  504.37207  0.91%   105  232s
 95    4073  2477 infeasible   53       509.00000  504.37460  0.91%   110  237s
 96    4115  2485  507.00000   35   75  509.00000  504.37460  0.91%   113  240s
 97    4219  2508  505.00000   32  100  509.00000  504.43294  0.90%   118  246s
 98    4344  2508  506.00000   42  102  509.00000  504.43710  0.90%   124  254s
 99    4410  2518  505.00000   36  133  509.00000  504.66115  0.85%   126  258s
100    4463  2511 infeasible   42       509.00000  504.66587  0.85%   130  263s
101    4510  2528  505.00000   37  125  509.00000  504.68793  0.85%   132  267s
102    4594  2526  505.00000   36  124  509.00000  504.71945  0.84%   134  271s
103    4681  2523  506.00000   41   77  509.00000  504.78686  0.83%   137  277s
104    4772  2617  505.00000   39  117  509.00000  505.00000  0.79%   140  294s
105    5104  2630  505.00000   41  106  509.00000  505.00000  0.79%   150  310s
106    5418  2633  506.00000   53  103  509.00000  505.00000  0.79%   158  330s
107    5778  2674  505.00000   41  113  509.00000  505.00000  0.79%   166  345s
108    6164  2650  507.00000   50   43  509.00000  505.00000  0.79%   174  357s
109    6521  2641 infeasible   61       509.00000  505.00000  0.79%   182  360s
110    7072  2671  506.00000   47   82  509.00000  505.00000  0.79%   194  367s
111    7557  2663  507.01667   47   91  509.00000  505.00000  0.79%   199  370s
112    8415  2610     cutoff   44       509.00000  505.00000  0.79%   208  376s
113    9143  2590 infeasible   51       509.00000  505.00000  0.79%   217  381s
114    9869  2729 infeasible   50       509.00000  505.00000  0.79%   224  386s
115   10310  2732  506.00000   45  166  509.00000  505.00000  0.79%   226  390s
116   10321  2739  505.39765   52  180  509.00000  505.39765  0.71%   226  395s
117
118  Cutting planes:
119    Learned: 1
120    Gomory: 16
121    Lift-and-project: 7
122    MIR: 31
123    StrongCG: 5
124    Flow cover: 102
125    Zero half: 7
126    RLT: 8
127    Relax-and-lift: 76
128
129  Explored 10473 nodes (2383480 simplex iterations) in 399.60 seconds (280.70 work units)
130  Thread count was 8 (of 8 available processors)
131
132  Solution count 3: 509 509 509
133  No other solutions better than 509
134
135  Optimal solution found (tolerance 1.00e-04)
136  Best objective 5.090000000000e+02, best bound 5.090000000000e+02, gap 0.0000%
137
138  Output optimal solution and the Optimal Obj:  509.0
139
140
141  Obj = 509.0
142
143  Solutions:
144       The total pi =  94.0
145       The total duration time in berth stage =  133.0
146       The total duration time in quay crane scheduling stage =  32.0
147       The total departure time in berth stage=  305.0
148       The total departure time in quay crane scheduling stage =  204.0
149       The total wasted crane work hour according QC0=  3.003079910788791
150       The last depature time in quay crane scheduling stage =  45.0
151
152  The specific solution are as follows:
153       Vessel i: 0:      li: 6,          pi: 6-12,          ai-di: 31-54,          taoi-deltai: 31-52,          periodi: 21,          taoPi_SP-deltaPi_SP
     : 31-38,          periodPi: 7,          c_i: 5359714,          dowork: 5404702,          fa_i: 3
154       Vessel i: 1:      li: 4,          pi: 17-21,          ai-di: 40-61,          taoi-deltai: 40-59,          periodi: 19,          taoPi_SP-
     deltaPi_SP: 40-45,          periodPi: 5,          c_i: 4895377,          dowork: 5141058,          fa_i: 3
155       Vessel i: 2:      li: 5,          pi: 12-17,          ai-di: 29-58,          taoi-deltai: 29-56,          periodi: 27,          taoPi_SP-
     deltaPi_SP: 29-34,          periodPi: 5,          c_i: 7083212,          dowork: 7250210,          fa_i: 4
156       Vessel i: 3:      li: 4,          pi: 10-14,          ai-di: 15-28,          taoi-deltai: 15-26,          periodi: 11,          taoPi_SP-
     deltaPi_SP: 15-17,          periodPi: 2,          c_i: 2853823,          dowork: 3031906,          fa_i: 4
157       Vessel i: 4:      li: 7,          pi: 21-28,          ai-di: 24-57,          taoi-deltai: 24-51,          periodi: 27,          taoPi_SP-
     deltaPi_SP: 24-29,          periodPi: 5,          c_i: 6925790,          dowork: 6986566,          fa_i: 4
158       Vessel i: 5:      li: 6,          pi: 28-34,          ai-di: 33-64,          taoi-deltai: 33-61,          periodi: 28,          taoPi_SP-
     deltaPi_SP: 33-41,          periodPi: 8,          c_i: 7286814,          dowork: 7382032,          fa_i: 2
```

```
TimeSolveModel: 407.000000

TimeAll: 410.000000


```