1 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=59567

2

3 import sys; print('Python %s on %s' % (sys.version, sys.platform))

4 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'])

5

6 PyDev console: starting.

7

8 Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32

9 >>> 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')

10 Backend TkAgg is interactive backend. Turning interactive mode on.

11 Waiting 5s......

12

13 Optimize the ./R_5_10.xlsx instance

14

15 Set parameter TimeLimit to value 1200

16

17 Set parameter PoolSolutions to value 3

18 Set parameter PoolGap to value 0.05

19 Set parameter PoolSearchMode to value 2

20 Gurobi Optimizer version 11.0.0 build v11.0.0rc2 (win64 - Windows 10.0 (19045.2))

21

22 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]

23 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads

24

25 Optimize a model with 71827 rows, 39860 columns and 208375 nonzeros

26 Model fingerprint: 0x2566bc5d

27 Variable types: 0 continuous, 39860 integer (33525 binary)

28 Coefficient statistics:

29   Matrix range   [1e+00, 5e+05]

30   Objective range [1e+00, 1e+00]

31   Bounds range   [1e+00, 1e+00]

32   RHS range   [1e+00, 7e+06]

33 Presolve removed 51083 rows and 1249 columns

34 Presolve time: 0.11s

35 Presolved: 20744 rows, 38611 columns, 60130 nonzeros

36 Variable types: 0 continuous, 38611 integer (32281 binary)

37 Found heuristic solution: objective 684.0000000

38

39 Root relaxation: objective 2.770441e+02, 2118 iterations, 0.13 seconds (0.34 work units)

40

```
41       Nodes    |    Current Node    |     Objective Bounds      |     Work
42   Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time
43
44      0     0  277.04409    0 1725  684.00000  277.04409  59.5%     -    0s
45  H   0     0               430.0000000  277.04409  35.6%     -    1s
46  H   0     0               429.0000000  277.04409  35.4%     -    2s
47      0     0  290.41214    0 1742  429.00000  290.41214  32.3%     -    2s
48      0     0  324.00000    0 1613  429.00000  324.00000  24.5%     -   10s
49      0     0  324.00000    0 1730  429.00000  324.00000  24.5%     -   10s
50      0     0  324.00000    0 1729  429.00000  324.00000  24.5%     -   10s
51      0     0  324.00000    0 1555  429.00000  324.00000  24.5%     -   11s
52      0     0  325.00000    0 1681  429.00000  325.00000  24.2%     -   17s
53      0     0  325.00000    0 1520  429.00000  325.00000  24.2%     -   17s
54      0     0  325.00000    0 1516  429.00000  325.00000  24.2%     -   18s
55      0     2  325.00000    0 1514  429.00000  325.00000  24.2%     -   22s
56    652   678  325.00000  161 1367  429.00000  325.00000  24.2%  12.5   25s
57   3254  3192  381.42639  380  622  429.00000  325.00000  24.2%  18.7   30s
58   4136  3939  400.55996  626  513  429.00000  325.00000  24.2%  17.6   35s
59   4680  3981  325.00000   83 1516  429.00000  325.00000  24.2%  18.0   40s
60   4683  3983  412.00000  843 1425  429.00000  412.00000   3.96% 17.9   50s
61   4687  3986  417.34243  170 1427  429.00000  417.34243   2.72% 17.9   55s
62   4692  3989  418.36845   85 1496  429.00000  418.36845   2.48% 17.9   60s
63   5064  4210  418.36845   69  700  429.00000  418.36845   2.48% 33.6   65s
64   5598  4538  418.36845  125  804  429.00000  418.36845   2.48% 47.5   70s
65   5959  4727  418.36845  173  765  429.00000  418.36845   2.48% 56.4   81s
66   6308  4960  418.36845  230  718  429.00000  418.36845   2.48% 63.4   85s
67   6663  5102  418.36845  279  678  429.00000  418.36845   2.48% 73.7   90s
68   7040  5248  418.36845  323  614  429.00000  418.36845   2.48% 84.5   95s
69   7523  5232  418.36845  377  591  429.00000  418.36845   2.48% 90.0  100s
70   8135  5356  418.36845  460  483  429.00000  418.36845   2.48% 96.6  105s
71   8585  5592  418.36845   69  853  429.00000  418.36845   2.48%  102  110s
72   9191  5859  418.36845  156  774  429.00000  418.36845   2.48%  106  115s
73  10275  6672  418.36845  256  588  429.00000  418.36845   2.48%  109  122s
74  11787  7327  418.36845  360  562  429.00000  418.36845   2.48%  101  125s
75  12731  7474  418.36845  215  631  429.00000  418.36845   2.48% 95.8  130s
76  14009  8219  418.36845   69  592  429.00000  418.36845   2.48% 90.3  135s
77  14765  8505  infeasible 102       429.00000  418.36845   2.48% 87.8  141s
78  15008  9063  418.36845   44  553  429.00000  418.36845   2.48% 87.7  145s
79  16143  9795  418.36845  332  515  429.00000  418.36845   2.48% 82.7  155s
80  16885 10522  418.36845   89  667  429.00000  418.36845   2.48% 79.8  161s
```

```
 81  17658 10827 418.36845 293  399 429.00000 418.36845 2.48% 76.9  167s
 82  18007 11121 418.36845 120  557 429.00000 418.36845 2.48% 76.0  171s
 83  18387 11420 418.36845 196  472 429.00000 418.36845 2.48% 75.2  176s
 84  18780 11650 418.36845 108  504 429.00000 418.36845 2.48% 74.5  181s
 85  19082 11766 418.36845  19  923 429.00000 418.36845 2.48% 74.1  185s
 86  19250 12295 418.36845  31  910 429.00000 418.36845 2.48% 73.9  191s
 87  19829 12541 infeasible 127     429.00000 418.36845 2.48% 72.3  197s
 88  20186 12909 418.36845  51  378 429.00000 418.36845 2.48% 71.9  204s
 89  20636 13632 418.36845 124  433 429.00000 418.36845 2.48% 71.2  220s
 90  21543 13978 418.36845 217  634 429.00000 418.36845 2.48% 69.2  226s
 91  21950 14090    cutoff  381     429.00000 418.36845 2.48% 68.8  233s
 92  22247 14156 418.36845  95  480 429.00000 418.36845 2.48% 69.0  238s
 93  22497 14473 418.36845 128  410 429.00000 418.36845 2.48% 69.3  245s
 94  23019 14719 418.36845 157  516 429.00000 418.36845 2.48% 68.9  251s
 95  23397 14928 418.36845 105  892 429.00000 418.36845 2.48% 68.8  257s
 96  23687 15260 418.36845  90  521 429.00000 418.36845 2.48% 68.4  264s
 97  24166 15681 418.36845 110  885 429.00000 418.36845 2.48% 68.0  269s
 98  24675 15995 infeasible 319     429.00000 418.36845 2.48% 67.4  276s
 99  25093 16284 infeasible  68     429.00000 418.36845 2.48% 67.1  281s
100  25468 16574 418.36845 146  216 429.00000 418.36845 2.48% 66.8  288s
101  25914 16627 infeasible 168     429.00000 418.36845 2.48% 66.6  294s
102  26144 16680 infeasible 197     429.00000 418.36845 2.48% 67.1  299s
103  26464 16924 infeasible 216     429.00000 418.36845 2.48% 67.1  305s
104  26923 17175 418.36845  75  297 429.00000 418.36845 2.48% 66.8  311s
105  27258 17431 infeasible 196     429.00000 418.36845 2.48% 66.6  317s
106  27664 17878 424.07261 233  355 429.00000 418.36845 2.48% 66.6  323s
107  28210 18300 418.36845  75  440 429.00000 418.36845 2.48% 65.8  329s
108  28738 18497 418.36845 184  337 429.00000 418.36845 2.48% 65.3  336s
109  29009 18694 418.36845 116  323 429.00000 418.36845 2.48% 65.3  341s
110  29366 19249 infeasible  88     429.00000 418.36845 2.48% 65.4  348s
111  30027 19553 418.36845 246  366 429.00000 418.36845 2.48% 64.6  354s
112  30392 19735 418.36845  94  284 429.00000 418.36845 2.48% 64.3  361s
113  30648 20235 infeasible 154     429.00000 418.36845 2.48% 64.5  369s
114  31231 20236 418.36845 175 1516 429.00000 418.36845 2.48% 63.7  530s
115  31234 20238 418.36845  99  119 429.00000 418.36845 2.48% 63.7  535s
116  31240 20242 418.36845 178  546 429.00000 418.36845 2.48% 63.7  545s
117  31242 20243 418.36845 130  494 429.00000 418.36845 2.48% 63.7  551s
118  31244 20245 418.36845 211  491 429.00000 418.36845 2.48% 63.7  559s
119  31245 20245 418.36845 198  500 429.00000 418.36845 2.48% 63.7  563s
120  31246 20246 418.36845 256  472 429.00000 418.36845 2.48% 63.7  566s
121  31248 20247 418.36845 271  558 429.00000 418.36845 2.48% 63.7  573s
122  31251 20249 422.06545 197  699 429.00000 418.36845 2.48% 63.7  575s
123  31253 20251 418.36845 210  693 429.00000 418.36845 2.48% 63.7  580s
124  31255 20252 418.36845 214  660 429.00000 418.36845 2.48% 63.7  585s
125  31256 20253 418.36845 120  666 429.00000 418.36845 2.48% 63.7  595s
126 H31256 19239            428.0000000 418.36845 2.25% 63.7  595s
127  31258 19240 418.36845 204  597 428.00000 418.36845 2.25% 63.7  600s
128  31261 19242 418.36845 372  557 428.00000 418.36845 2.25% 63.7  607s
129  31263 19243 418.36845 197  576 428.00000 418.36845 2.25% 63.7  612s
130  31264 19244 418.36845 342  611 428.00000 418.36845 2.25% 63.7  615s
131  31266 19245 418.36845  31  689 428.00000 418.36845 2.25% 63.7  624s
132  31267 19246 418.36845 134  586 428.00000 418.36845 2.25% 63.7  626s
133  31268 19247 418.36845 184  641 428.00000 418.36845 2.25% 63.7  630s
134  31270 19248 418.36845 404  681 428.00000 418.36845 2.25% 63.7  641s
135  31271 19249 418.36845 131  701 428.00000 418.36845 2.25% 63.7  646s
136  31272 19249 422.05110 273  688 428.00000 418.36845 2.25% 63.6  664s
137  31273 19250 418.36845 307  666 428.00000 418.36845 2.25% 63.6  677s
138  31274 19251 420.27893 260  647 428.00000 418.36845 2.25% 63.6  695s
139  31275 19251 427.05502 171  673 428.00000 418.36845 2.25% 63.6  707s
140  31276 19252 421.19190 357  633 428.00000 418.36845 2.25% 63.6  750s
141  31277 19253 418.36845 207  668 428.00000 418.36845 2.25% 63.6  766s
142  31278 19253 418.36845  62  692 428.00000 418.36845 2.25% 63.6  783s
143  31279 19254 418.36845 157  714 428.00000 418.36845 2.25% 63.6  792s
144  31280 19255 418.36845 476  710 428.00000 418.36845 2.25% 63.6  814s
145  31281 19255 418.36845 369  669 428.00000 418.36845 2.25% 63.6  826s
146  31282 19256 423.26608 163  721 428.00000 418.36845 2.25% 63.6  842s
147  31283 19257 418.36845 333  661 428.00000 418.36845 2.25% 63.6  852s
148  31284 19257 418.36845 297  708 428.00000 418.36845 2.25% 63.6  871s
149  31285 19258 418.36845 132  772 428.00000 418.36845 2.25% 63.6  883s
150  31286 19259 418.36845 104  641 428.00000 418.36845 2.25% 63.6  906s
151  31287 19259 418.36845 183  795 428.00000 418.36845 2.25% 63.6  910s
152  31289 19261 418.36845  95  713 428.00000 418.36845 2.25% 63.6  916s
153  31290 19261 418.36845 300  735 428.00000 418.36845 2.25% 63.6  921s
154  31292 19263 418.36845 146  734 428.00000 418.36845 2.25% 63.6  928s
155  31293 19263 418.36845 325  744 428.00000 418.36845 2.25% 63.6  933s
156  31294 19264 418.36845 167  756 428.00000 418.36845 2.25% 63.6  937s
157  31295 19265 422.05626 194  750 428.00000 418.36845 2.25% 63.6  941s
158  31296 19265 427.07278 207  660 428.00000 418.36845 2.25% 63.6  969s
159  31297 19266 418.36845 162  797 428.00000 418.36845 2.25% 63.6  984s
160  31298 19267 418.36845 143  783 428.00000 418.36845 2.25% 63.6  987s
161  31299 19267 418.36845 284  743 428.00000 418.36845 2.25% 63.6  990s
162  31301 18305 418.36845 102  737 428.00000 418.36845 2.25% 63.6  996s
163  31302 18305 418.36845 117  734 428.00000 418.36845 2.25% 63.6 1001s
164  31304 18307 418.36845 186  690 428.00000 418.36845 2.25% 63.6 1007s
```

```
165   31305 18307  418.36845  166  745  428.00000  418.36845  2.25%  63.6 1010s
166   31306 18308  418.36845  197  771  428.00000  418.36845  2.25%  63.6 1031s
167   31307 18309  418.36845  200  755  428.00000  418.36845  2.25%  63.6 1040s
168   31309 18310  418.36845  168  773  428.00000  418.36845  2.25%  63.6 1045s
169   31311 18311  418.36845  415  771  428.00000  418.36845  2.25%  63.6 1050s
170   31313 18313  418.36845  180  784  428.00000  418.36845  2.25%  63.6 1056s
171   31315 18314  418.36845  221  805  428.00000  418.36845  2.25%  63.6 1062s
172   31316 18315  418.36845  226  743  428.00000  418.36845  2.25%  63.6 1088s
173   31317 18315  418.36845  125  759  428.00000  418.36845  2.25%  63.6 1090s
174   31318 18316  418.36845  391  766  428.00000  418.36845  2.25%  63.6 1095s
175   31320 18317  418.36845  148  750  428.00000  418.36845  2.25%  63.6 1101s
176   31322 18319  418.36845   79  785  428.00000  418.36845  2.25%  63.5 1106s
177   31324 18320  418.36845  216  746  428.00000  418.36845  2.25%  63.5 1113s
178   31325 18321  422.11078  215  779  428.00000  418.36845  2.25%  63.5 1115s
179   31326 18321  427.05356  175  754  428.00000  418.36845  2.25%  63.5 1128s
180   31327 18322  418.36845  194  778  428.00000  418.36845  2.25%  63.5 1130s
181   31328 18323  418.36845  209  753  428.00000  418.36845  2.25%  63.5 1135s
182   31329 18323  418.36845  260  758  428.00000  418.36845  2.25%  63.5 1141s
183   31330 18324  418.36845  174  702  428.00000  418.36845  2.25%  63.5 1154s
184   31331 18325  418.36845  175  786  428.00000  418.36845  2.25%  63.5 1166s
185   31332 18325  418.36845  161  723  428.00000  418.36845  2.25%  63.5 1182s
186   31333 18326  418.36845  300  747  428.00000  418.36845  2.25%  63.5 1195s
187
188   Cutting planes:
189     Learned: 15
190     Lift-and-project: 10
191     Implied bound: 38
192     Clique: 1
193     MIR: 99
194     StrongCG: 6
195     Flow cover: 583
196     Zero half: 12
197     RLT: 6
198     Relax-and-lift: 2133
199     BQP: 1
200
201   Explored 31333 nodes (2183446 simplex iterations) in 1200.73 seconds (680.00 work units)
202   Thread count was 8 (of 8 available processors)
203
204   Solution count 3: 428 428 429
205
206   Time limit reached
207   Best objective 4.280000000000e+02, best bound 4.190000000000e+02, gap 2.1028%
208
209   Output one feasible solution with limited computation time
210
211   Optimization was stopped with status 9
212
213   Number of solution stored: 3
214     428  428  429
215
216   Obj = 428.0
217
218   Solutions:
219     The total pi = 75.0
220     The total duration time in berth stage = 122.0
221     The total duration time in quay crane scheduling stage = 24.0
222     The total departure time in berth stage= 263.0
223     The total departure time in quay crane scheduling stage = 165.0
224     The total wasted crane work hour according QC0= 7.150680463048657
225     The last depature time in quay crane scheduling stage = 53.0
226
227   The specific solution are as follows:
```

228   Vessel i: 0:   li: 7,   pi: 7-14,   ai-di: 12-37,   taoi-deltai: 12-35,   periodi: 23,   taoPi_SP-deltaPi_SP : 12-16,   periodPi: 4, c_i: 6050849,   dowork: 6063812,   fa_i: 5

229   Vessel i: 1:   li: 6,   pi: 14-20,   ai-di: 24-51,   taoi-deltai: 24-49,   periodi: 25,   taoPi_SP-deltaPi_SP: 24-29,   periodPi: 5, c_i: 6455019,   dowork: 6459278,   fa_i: 4

230   Vessel i: 2:   li: 5,   pi: 20-25,   ai-di: 26-55,   taoi-deltai: 26-53,   periodi: 27,   taoPi_SP-deltaPi_SP: 26-32,   periodPi: 6, c_i: 7105369,   dowork: 7250210,   fa_i: 5

231   Vessel i: 3:   li: 5,   pi: 9-14,   ai-di: 49-75,   taoi-deltai: 49-72,   periodi: 23,   taoPi_SP-deltaPi_SP : 49-53,   periodPi: 4, c_i: 5964543,   dowork: 7382032,   fa_i: 5

232   Vessel i: 4:   li: 5,   pi: 25-30,   ai-di: 30-62,   taoi-deltai: 30-54,   periodi: 24,   taoPi_SP-deltaPi_SP: 30-35,   periodPi: 5, c_i: 6285418,   dowork: 6591100,   fa_i: 3

```
233   TimeSolveModel: 1207.000000
234
235   TimeAll: 1212.000000
236
237
```