```
this paper\Scripts\python.exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=
   client --port=10681
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
   sys.path.extend(|'E:\\1 000\\3 0000\\1 00000\\1 000000\\1 00000\\1 LW 0000\\4 0000\\3 python code\\9 Code for this
   6
   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
 8
   >>> runfile('E:/1 000/3 0000/1 00000/1 000000/1 000000/1 000000/1 LW 000/3 python_code/9 Code for this paper/main_RO_TWS.py', wdir='E:/1 0000/3 0000/1 000000/1 000000/1 000000/1 000000/1 LW 000/3 python_code/9 Code for
   this paper')
   Backend TkAgg is interactive backend. Turning interactive mode on.
   Waiting 5s.....
   Set parameter MIPGap to value 1e-10
12
   Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
13
15
   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
16
   Optimize a model with 619028 rows, 58701 columns and 1738778 nonzeros
19
   Model fingerprint: 0x6d0d7cf6
   Variable types: 1 continuous, 58700 integer (58660 binary)
20
21
   Coefficient statistics:
    Matrix range [1e+00, 1e+10]
    Objective range [1e+00, 2e+01]
23
24
    Bounds range [1e+00, 1e+00]
                 [1e+00, 2e+10]
    RHS range
26
   Warning: Model contains large matrix coefficients
27
   Warning: Model contains large rhs
28
        Consider reformulating model or setting NumericFocus parameter
29
        to avoid numerical issues.
30
   Presolve removed 387375 rows and 28383 columns (presolve time = 5s) ...
31
   Presolve removed 536416 rows and 39539 columns
   Presolve time: 8.99s
   Presolved: 82612 rows, 19162 columns, 288490 nonzeros
   Variable types: 0 continuous, 19162 integer (19136 binary)
34
35
   Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
37
   Showing first log only...
38
39
   Root relaxation presolved: 19162 rows, 101774 columns, 307652 nonzeros
40
41
42
   Root simplex log...
43
44
   Iteration Objective
                        Primal Inf. Dual Inf.
       0 9.9100000e+02 0.000000e+00 1.206000e+03
45
                                                     10s
46
   Concurrent spin time: 0.00s
48
   Solved with dual simplex (primal model)
49
50
   Root relaxation: objective 9.910000e+02, 2421 iterations, 0.47 seconds (0.39 work units)
51
   Total elapsed time = 10.80s
52
53
     Nodes | Current Node | Objective Bounds | Work
54
    Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
55
56
      0
         0 991 00000 0 20
                                - 991 00000
                                              - - 11s
57
      0
         0 991.00000 0 93
                                - 991.00000
                                                 - 12s
58
         0 991.00000 0 104
                                 - 991.00000
                      6691.0000000 991.00000 85.2% - 13s
59
   H 0
          0
                      4611.0000000 991.00000 78.5%
60
   Η
      0
          0
         0 991.00000 0 104 4611.00000 991.00000 78.5%
62
         0 991.00000 0 19 4611.00000 991.00000 78.5%
                                                         - 14s
         0 991.00000 0 27 4611.00000 991.00000 78.5%
                                                        - 15s
63
      0
64
      0
         0 991.00000 0 92 4611.00000 991.00000 78.5%
                                                        - 17s
         0\ 991.00000\ 0\ 88\ 4611.00000\ 991.00000\ 78.5\%
65
      0
66 H 0 0
                      2611.0000000 991.00000 62.0% - 18s
67
      0
         0 991.00000 0 85 2611.00000 991.00000 62.0% - 19s
68
      0
         0 991.00000 0 68 2611.00000 991.00000 62.0%
         0 991.00000 0 68 2611.00000 991.00000 62.0%
69
70 H 0
                      1311 0000000 991 00000 24 4%
          0
                                                    - 20s
         2 991.00000 0 29 1311.00000 991.00000 24.4%
         8 991.00000 2 48 1311.00000 991.00000 24.4% 3389 25s
73
     42 46 991.00000 6 146 1311.00000 991.00000 24.4% 848 30s
74
          79
                        991.0000000 991.00000 0.00% 1075 33s
   H 66
76
   Cutting planes:
    Gomory: 1
77
78
    Cover: 117
    Implied bound: 649
79
```

```
Clique: 4
 80
 81
      MIR: 102
      StrongCG: 56
 82
 83
      GUB cover: 11
      Zero half: 5
 85
      RLT: 10
      Relax-and-lift: 612
 86
 87
      BQP: 8
 88
 89 Explored 117 nodes (126391 simplex iterations) in 33.90 seconds (65.83 work units)
 90 Thread count was 8 (of 8 available processors)
    Solution count 5: 991 1311 2611 ... 6691
 93
 94 Optimal solution found (tolerance 1.00e-10)
 95 Best objective 9.910000000000e+02, best bound 9.91000000000e+02, gap 0.0000%
     Set parameter MIPGap to value 1e-08
 97
    Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
 98
 99 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
100 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
101
102 Optimize a model with 654086 rows, 16030 columns and 1337366 nonzeros
103 Model fingerprint: 0x45aafa6f
104 Variable types: 40 continuous, 15990 integer (9240 binary)
105 Coefficient statistics:
106 Matrix range [1e-01, 1e+10]
107
     Objective range [6e-05, 5e+01]
108
     Bounds range [1e+00, 1e+00]
109 RHS range
                   [8e-01, 1e+10]
110 Warning: Model contains large matrix coefficients
111 Warning: Model contains large rhs
112
          Consider reformulating model or setting NumericFocus parameter
          to avoid numerical issues.
113
114 Presolve removed 650289 rows and 14621 columns
115 Presolve time: 0.56s
116 Presolved: 3797 rows, 1409 columns, 10130 nonzeros
117 Variable types: 10 continuous, 1399 integer (819 binary)
118 Found heuristic solution: objective 4594.6120144
119 Found heuristic solution: objective 4599.2524802
120
121 Root relaxation: objective 6.569244e+03, 1373 iterations, 0.02 seconds (0.01 work units)
122
123
       Nodes | Current Node | Objective Bounds
124 Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
125
        0 0 6569.24444 0 33 4599.25248 6569.24444 42.8%
126
127 H 0 0
                         6539.4691941 6569.24444 0.46% - 0s
128 H 0 0
                         6546.4552604 6569.24444 0.35% - 0s
129 *
       0 0
                     0 6566.4444444 6566.44444 0.00% - 0s
130
131 Cutting planes:
132
     Learned: 1
133
     Gomory: 5
134
     Cover: 2
135
     Implied bound: 3
136
      MIR: 2
137
     Flow cover: 4
138
      RLT: 2
139
      Relax-and-lift: 1
140
     PSD: 1
141
142 Explored 1 nodes (1867 simplex iterations) in 0.78 seconds (1.03 work units)
143 Thread count was 8 (of 8 available processors)
144
145 Solution count 5: 6566.44 6546.46 6539.47 ... 4594.61
146
147 Optimal solution found (tolerance 1.00e-08)
148 Best objective 6.566444444444e+03, best bound 6.56644444444e+03, gap 0.0000%
149 SP is solved
150 SP's optimal solution is' ☐ 6566
151
152 Itr = 0
153 Collect LB = [991.0]
154 Collect_UB = [14123.888888888888]
155 Collect Hua = [0.0]
156 Collect_SPObjVal = [6566.444444444442]
157 Collect_MPObjValNHua = [991.0]
158
159
160 Set parameter MIPGap to value 1e-10
161 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
162
163 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
```

```
164 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
165
166 Optimize a model with 628195 rows, 344301 columns and 1747990 nonzeros
167 Model fingerprint: 0x0c2c46f6
168 Variable types: 1 continuous, 344300 integer (344260 binary)
169 Coefficient statistics:
170 Matrix range [1e+00, 1e+10]
171
     Objective range [1e+00, 2e+01]
      Bounds range [1e+00, 1e+00]
172
                   [1e+00, 2e+10]
     RHS range
173
174 Warning: Model contains large matrix coefficients
175
    Warning: Model contains large rhs
176
          Consider reformulating model or setting NumericFocus parameter
177
          to avoid numerical issues.
178 Presolve removed 471430 rows and 325200 columns (presolve time = 5s) ...
179 Presolve removed 578969 rows and 335642 columns
180 Presolve time: 9.16s
181 Presolved: 49226 rows, 8659 columns, 127720 nonzeros
182 Variable types: 0 continuous, 8659 integer (8636 binary)
183 Root relaxation presolved: 8659 rows, 57885 columns, 136379 nonzeros
184
185
186 Root simplex log...
187
188 Iteration Objective
                                                  Time
                           Primal Inf. Dual Inf.
                                             10s
189
            handle free variables
       4785 \quad 8.7463773e + 03 \quad 3.681598e + 03 \quad 0.000000e + 00
190
191
       7610 7.9174444e+03 0.000000e+00 0.000000e+00
                                                           11s
192
       7610 7.9174444e+03 0.000000e+00 0.000000e+00
                                                           11s
193
194 Root relaxation: objective 7.917444e+03, 7610 iterations, 1.03 seconds (1.55 work units)
195
196
       Nodes | Current Node | Objective Bounds
                                                      | Work
197
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
198
           0 7917.44444 0 45
                                    - 7917.44444
199
                                                       - 11s
200
       0
           0 7917.44444 0 198
                                     - 7917.44444
201
          0 7917.44444 0 162
                                     - 7917.44444
                                                       - 12s
                                    - 7917.44444
202
          0.7917.44444 0.377
       0
                                                   - - 13s
203
       0
           0 7917.44444 0 27
                                    - 7917.44444
                                                   - - 15s
                                    - 7917.44444
204
           0 7917.44444 0 238
205
       0
           0 7917.44444 0 131
                                     - 7917.44444
                                                       - 17s
                                                   - - 17s
206
           0.7917.44444 0.130
                                    - 7917 44444
       0
207
       0
           0 7917.44444 0 250
                                     - 7917.44444
                                                   - - 17s
           0.7917.44444 - 0.154
208
       0
                                     - 7917.44444
                                                   - - 19s
       0 0 7917.44444 0 248
                                    - 7917.44444
                                                   - - 19s
209
                                     - 7917.44444
210
       0 0 7917.44444 0 245
                                                   - - 19s
211 H 0 0
                       7917.4444444 7917.44444 0.00% - 21s
212
          0 7917.44444 0 211 7917.44444 7917.44444 0.00% - 21s
213
214 Cutting planes:
215 Learned: 4
216
     Gomory: 3
217
      Cover: 186
218
     Implied bound: 1306
219
      Clique: 443
      MIR: 193
220
221
      StrongCG: 125
222
      GUB cover: 43
223
      Zero half: 13
224
      RLT: 35
225
      Relax-and-lift: 104
      BQP: 25
226
227
228 Explored 1 nodes (40537 simplex iterations) in 21.90 seconds (27.92 work units)
229 Thread count was 8 (of 8 available processors)
230
231 Solution count 1: 7917.44
232
233 Optimal solution found (tolerance 1.00e-10)
234 Best objective 7.917444444444e+03, best bound 7.9174444444e+03, gap 0.0000%
235 Set parameter MIPGap to value 1e-08
236 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
237
238 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
239 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
240
241 Optimize a model with 654086 rows, 16030 columns and 1337366 nonzeros
242 Model fingerprint: 0x81e05b7d
243 Variable types: 40 continuous, 15990 integer (9240 binary)
244 Coefficient statistics:
245 Matrix range [1e-01, 1e+10]
246
      Objective range [6e-05, 5e+01]
247
      Bounds range [1e+00, 1e+00]
```

```
248
     RHS range
                    [8e-01, 1e+10]
249 Warning: Model contains large matrix coefficients
250 Warning: Model contains large rhs
251
          Consider reformulating model or setting NumericFocus parameter
252
          to avoid numerical issues.
253 Presolve removed 647393 rows and 13825 columns
254 Presolve time: 0.50s
255 Presolved: 6693 rows, 2205 columns, 17882 nonzeros
256 Variable types: 10 continuous, 2195 integer (1261 binary)
257 Found heuristic solution: objective 4878.5754258
258
259 Root relaxation: objective 7.123111e+03, 1790 iterations, 0.02 seconds (0.02 work units)
260
261
       Nodes | Current Node | Objective Bounds

↓ Work

262
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
263
264
       0 0 7123.11111 0 17 4878.57543 7123.11111 46.0% - 0s
265 H 0 0
                         7104.4444444 7123.11111 0.26% - 0s
266 *
       0 0
                     0 7120.444444 7120.44444 0.00% - 0s
267
268 Cutting planes:
269
     Learned: 2
270
      Gomory: 5
271
      Cover: 1
272
     Implied bound: 2
273
      Flow cover: 3
274
      Zero half: 1
275
      RLT: 4
276
      Relax-and-lift: 5
277
      PSD: 1
278
279 Explored 1 nodes (2545 simplex iterations) in 0.77 seconds (1.06 work units)
280 Thread count was 8 (of 8 available processors)
282 Solution count 3: 7120.44 7104.44 4878.58
283
284 Optimal solution found (tolerance 1.00e-08)
285 Best objective 7.12044444444e+03, best bound 7.1204444444e+03, gap 0.0000%
286 SP is solved
287 SP's optimal solution is' □7120
288
289 Itr = 1
290 Collect LB = [991.0, 7917.44444444442]
291 Collect_UB = [14123.88888888883, 8471.44444444445]
292 Collect_Hua = [0.0, 6566.44444444442]
293 Collect SPObjVal = [6566.44444444442, 7120.44444444445]
294 Collect_MPObjValNHua = [991.0, 1351.0]
295
296
297 Set parameter MIPGap to value 1e-10
298 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
299
300 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
301 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
302
303 Optimize a model with 628195 rows, 344301 columns and 1747990 nonzeros
304 Model fingerprint: 0x59b64541
305 Variable types: 1 continuous, 344300 integer (344260 binary)
306 Coefficient statistics:
     Matrix range [1e+00, 1e+10]
307
308
     Objective range [1e+00, 2e+01]
309
      Bounds range [1e+00, 1e+00]
                   [1e+00, 2e+10]
310 RHS range
311 Warning: Model contains large matrix coefficients
312 Warning: Model contains large rhs
313
          Consider reformulating model or setting NumericFocus parameter
314
          to avoid numerical issues.
315 Presolve removed 472886 rows and 325364 columns (presolve time = 5s) ...
316 Presolve removed 579366 rows and 335687 columns
317 Presolve time: 9.20s
318 Presolved: 48829 rows, 8614 columns, 126604 nonzeros
319 Variable types: 0 continuous, 8614 integer (8591 binary)
320 Root relaxation presolved: 8614 rows, 57443 columns, 135218 nonzeros
321
322
323 Root simplex log...
324
325 Iteration Objective
                           Primal Inf. Dual Inf.
                                                  Time
326
            handle free variables
                                              10s
       5415 8.8213760e+03 1.846503e+03 0.000000e+00
                                                            10s
327
             8.5114444e+03 0.000000e+00 0.000000e+00
328
                                                            11s
       7450 8.5114444e+03 0.000000e+00 0.000000e+00
329
330
331 Root relaxation: objective 8.511444e+03, 7450 iterations, 1.08 seconds (1.56 work units)
```

```
332
333
       Nodes | Current Node | Objective Bounds
                                                       Work
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
334
335
336
           0 8511.44444 0 48
                                   - 8511.44444
                                                 - - 11s
337
       0
           0 8511.44444
                         0 359
                                   - 8511.44444
                                                     - 12s
                                                 - - 12s
338
           0.8511.44444
                         0.371
                                   - 8511.44444
       0
                                                     - 13s
339
           0 8511.44444
                         0 168
                                   - 8511.44444
340
       0
           0 8511.44444
                         0 198
                                   - 8511.44444
                                                     - 13s
                                                     - 15s
                                   - 8511.44444
341
           0.8511.44444 0.170
       0
           0 8511.44444
                                   - 8511.44444
342
       0
                         0.211
                                                     - 16s
343
       0
           0 8511.44444
                         0 221
                                   - 8511.44444
344
       0
           0 8511.44444
                         0 404
                                   - 8511.44444
                                                 - - 17s
           0.8511.44444
                         0.379
                                   - 8511.44444
345
                                                     - 17s
       0
346
       0
           0 8511.44444
                         0 250
                                   - 8511.44444
                                                     - 23s
           0 8511.44444
                         0 248
347
                                   - 8511.44444
348
       0
           0 8511.44444 0 562
                                   - 8511.44444
                                                     - 24s
                                                 - - 24s
349
           0.8511.44444 0.424
                                   - 8511.44444
       0
350
           0 8511.44444 0 421
                                   - 8511.44444
                                                     - 24s
351
       0
           0 8511.44444 0 279
                                   - 8511.44444
                                                     - 27s
352
           0.8511.44444 0.109
                                   - 8511.44444
                                                 - - 27s
       0
                                                 - - 30s
353
       0
           2 8511.44444 0 109
                                   - 8511.44444
                                                  - 2420 35s
354
           18 8511.44444 5 429
                                    - 8511.44444
       15
           47 8518.40097 11 697
355
       42
                                     - 8511.44444
                                                  - 2133 41s
356
           62 8551.44444 13 852
                                     - 8511.44444
                                                   - 2035 45s
       61
357
       83
           87 infeasible 21
                                  - 8511.44444 - 1874 50s
      217 241 8831.44444 77 190
                                    - 8511.44444 - 1115 58s
358
      320 352 8831.44444 128 192
359
                                      - 8511.44444
                                                     - 836 62s
360
      561 573 8871.44444 256 193
                                      - 8511.44444
                                                    - 541 67s
      723 611 8831.44444 4 438
                                      -8511.44444 - 473 70s
361
362
      887
          753 infeasible 24
                                   - 8511.44444 - 430 76s
      1077 952 8911.44444 20 399
                                      - 8511.44444 - 396 81s
363
364
      1373 1259 8911.44444 230 148
                                        - 8511.44444
                                                     - 353 87s
      1604 1415 8911.44444 252 260
                                                     - 325 90s
365
                                        - 8511.44444
366
      1786 1416 8547.50078 56 109
                                       - 8511.44444
                                                     - 312 106s
                                       - 8511.44444 - 311 112s
- 8511.44444 - 311 116s
      1789 1418 8951.44444 257 223
367
368
      1790 1419 8511.44444 7 439
                                       - 8511.44444
      1791 1419 9111.44444 480 375
369
                                       - 8511.44444
                                                     - 311 121s
      1793 1421 8751.44444 162 597
370
                                       - 8511.44444
                                                     - 311 130s
                                                     - 310 139s
371
      1795 1422 9231.44444 42 317
                                       - 8511.44444
      1796 1423 8951.44444 572 716
                                                     - 310 142s
                                       - 8511.44444
373
      1797 1423 8511.44444 22 507
                                       - 8511.44444
                                                     - 310 148s
      1798 1424 8871 44444 353 999
                                                     - 310 153s
374
                                       - 8511.44444
                                                     - 310 158s
- 310 161s
375
     1799 1425 9791.44444 181 665
                                        - 8511.44444
     1800 1425 8911.44444 295 904
376
                                        - 8511.44444
                           8631.4444444 8511.44444 1.39% 310 169s
377 H 1800 1353
      1802 1355 8591.44444 211 645 8631.44444 8511.44444 1.39% 309 172s
378
379
      1805 1358 8552.62092 38 109 8631.44444 8511.44444 1.39% 385 176s
380
      1810 1363 8631.44444 231 109 8631.44444 8511.44444 1.39% 389 181s
      1813 1365 8631.44444 511 427 8631.44444 8511.44444 1.39% 388 185s
381
382
      1816 1367 8631.44444 170 497 8631.44444 8511.44444 1.39% 388 190s
383 H 1818 1299
                           8591.4444444 8511.44444 0.93% 387 196s
384
385 Cutting planes:
386
     Learned: 1
387
      Gomory: 53
388
     Cover: 175
389
     Implied bound: 45
390
      Projected implied bound: 9
391
      Clique: 74
392
      MIR: 54
393
      StrongCG: 15
394
      Flow cover: 117
395
      GUB cover: 86
396
      Zero half: 15
397
      RLT: 60
398
      Relax-and-lift: 98
399
      BOP: 2
400
    Explored 1818 nodes (810195 simplex iterations) in 196.21 seconds (299.91 work units)
401
402 Thread count was 8 (of 8 available processors)
403
404 Solution count 2: 8591.44 8631.44
405
406 Optimal solution found (tolerance 1 00e-10)
407
    Best objective 8.59144444444e+03, best bound 8.5914444444e+03, gap 0.0000%
408
    Set parameter MIPGap to value 1e-08
409 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
410
411 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
412
    Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
413
414 Optimize a model with 654086 rows, 16030 columns and 1337366 nonzeros
415 Model fingerprint: 0xba419400
```

```
416 Variable types: 40 continuous, 15990 integer (9240 binary)
417 Coefficient statistics:
      Matrix range [1e-01, 1e+10]
418
419
      Objective range [6e-05, 5e+01]
      Bounds range [1e+00, 1e+00]
420
421
      RHS range
                     [8e-01, 1e+10]
422 Warning: Model contains large matrix coefficients
423 Warning: Model contains large rhs
424
          Consider reformulating model or setting NumericFocus parameter
425
          to avoid numerical issues.
426 Presolve removed 647707 rows and 13921 columns
427 Presolve time: 0.50s
428 Presolved: 6379 rows, 2109 columns, 17146 nonzeros
429 Variable types: 10 continuous, 2099 integer (1212 binary)
430 Found heuristic solution: objective 4929.7421607
431 Found heuristic solution: objective 4933.6310496
432
433 Root relaxation: objective 7.128444e+03, 1822 iterations, 0.02 seconds (0.02 work units)
434
435
       Nodes | Current Node | Objective Bounds
                                                            Work
436
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
437
                          7128.4444444 19593.7778 175% - 0s
438 H 0 0
439
        0 0
                   - 0
                         7128.44444 7128.44444 0.00% - 0s
440
441 Explored 1 nodes (2536 simplex iterations) in 0.74 seconds (1.00 work units)
442 Thread count was 8 (of 8 available processors)
443
444 Solution count 3: 7128.44 4933.63 4929.74
445
446 Optimal solution found (tolerance 1.00e-08)
447 Best objective 7.12844444444e+03, best bound 7.1284444444e+03, gap 0.0000%
448 SP is solved
449 SP's optimal solution is' ☐ 7128
450
451 Itr = 2
452 Collect LB = [991.0, 7917.44444444442, 8591.44444444445]
453 Collect UB = [14123.8888888888888, 8471.4444444445, 8471.4444444445]
454 Collect_Hua = [0.0, 6566.44444444442, 7120.444444444445]
455 Collect_SPObjVal = [6566.444444444442, 7120.44444444445, 7128.44444444445]
456 Collect_MPObjValNHua = [991.0, 1351.0, 1471.0]
457
458
459
      Ops, stop iteration
460
     Values adopted from the Itr-1' th iteration, and Itr = \{2\}, judgeCount = \{1\}
461
                ~judgeCount = 1, SPObj_SPF = 7120.444444444445
462
463
    Vessel i: 0:
                   pi: 12-18,
                              ai-di: 2-15,
                                            gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                  ai_SP-di: 2-15,
                                                                                                   taoi-deltai: 2-15,
                                                                                                                      taoPi_SP-deltaPi_SP: 2-15, betaNi: 13
        bi: 13
464
                  pi: 6-12,
                                             gi_SP-gpi_SP: 0.000000-0.000000,
     Vessel i: 1:
                              ai-di: 14-36,
                                                                                 ai_SP-di: 14-36,
                                                                                                    taoi-deltai: 14-37,
                                                                                                                        taoPi SP-deltaPi SP: 14-37, betaNi
           bi: 23
     : 23,
     Vessel i: 2:
                  pi: 18-25,
                               ai-di: 14-25,
                                              gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                   ai_SP-di: 14-25,
                                                                                                     taoi-deltai: 14-21,
                                                                                                                         taoPi_SP-deltaPi_SP: 14-21,
     betaNi: 7.
                 bi: 7
     Vessel i: 3:
                   pi: 12-17,
                               ai-di: 20-44,
                                              gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                   ai_SP-di: 20-44,
                                                                                                     taoi-deltai: 20-41,
                                                                                                                         taoPi_SP-deltaPi_SP: 20-41,
     betaNi: 21,
                  bi: 21
     Vessel i: 4:
                  pi: 17-24,
                               ai-di: 24-30,
                                              gi SP-gpi SP: 0.000000-0.000000,
                                                                                   ai SP-di: 24-30,
                                                                                                     taoi-deltai: 24-29,
                                                                                                                         taoPi SP-deltaPi SP: 24-29,
     betaNi: 5.
                  bi: 5
468
     Vessel i: 5:
                  pi: 17-23,
                               ai-di: 29-48,
                                              gi_SP-gpi_SP: 0.200000-1.000000,
                                                                                   ai_SP-di: 30-48,
                                                                                                     taoi-deltai: 32-50,
                                                                                                                         taoPi_SP-deltaPi_SP: 32-50,
     betaNi: 18,
                  bi: 18
                                             gi_SP-gpi_SP: 1.000000-0.600000,
                  pi: 9-15,
                                                                                                                        taoPi_SP-deltaPi_SP: 42-71,
                              ai-di: 34-63.
                                                                                  ai_SP-di: 42-63,
                                                                                                    taoi-deltai: 42-71.
                                                                                                                                                      betaNi
     Vessel i: 6:
           bi: 29
     . 29
                                                                                   ai_SP-di: 42-43,
     Vessel i: 7:
                  pi: 28-34,
                               ai-di: 34-43,
                                              gi_SP-gpi_SP: 0.800000-0.400000,
                                                                                                     taoi-deltai: 38-45,
                                                                                                                         taoPi SP-deltaPi SP: 42-45,
     betaNi: 7,
                 bi: 7
                  pi: 28-34,
                               ai-di: 47-66,
                                              gi_SP-gpi_SP: 0.000000-1.000000,
                                                                                   ai_SP-di: 47-66,
                                                                                                                         taoPi_SP-deltaPi_SP: 47-67,
     Vessel i: 8:
                                                                                                     taoi-deltai: 47-67.
     betaNi: 20,
                  bi: 20
     Vessel i: 9:
                  pi: 17-23,
                                              gi_SP-gpi_SP: 1.000000-0.000000,
                                                                                                                         taoPi_SP-deltaPi_SP: 57-74,
                               ai-di: 50-68,
                                                                                   ai_SP-di: 57-68,
                                                                                                     taoi-deltai: 57-74,
     betaNi: 17,
                  bi: 17
473
474 round LB = [991, 7917, 8591]
475 round UB = [14124, 8471, 8471]
476 round Hua = [0, 6566, 7120]
     round SPObjVal = [6566, 7120, 7128]
477
478
     round MPObjValNHua = [991, 1351, 1471]
479
480 OptimalObj = 8591.44444444445
481 Time: 334.000000
482
483
484
485
```