```
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=3914
 3
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
 4
     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 00000/1 00000/1 00000/1 LW_000/4 000/3 python_code/9 Code for this paper/main_RO_BDC.py', wdir='E:/1 0000/3 0000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 000000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 000000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00
     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
17
     Optimize a model with 418250 rows, 34789 columns and 1145784 nonzeros
19
     Model fingerprint: 0xa9858bea
     Variable types: 1 continuous, 34788 integer (34764 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 216139 rows and 12332 columns (presolve time = 5s) ...
31
     Presolve removed 376302 rows and 22665 columns
     Presolve time: 7.82s
     Presolved: 41948 rows, 12124 columns, 174170 nonzeros
34
      Variable types: 0 continuous, 12124 integer (12106 binary)
35
     Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
37
     Showing first log only...
38
39
     Root relaxation presolved: 41941 rows, 12131 columns, 174149 nonzeros
40
41
42
     Root simplex log...
43
44
     Iteration Objective
                                     Primal Inf. Dual Inf.
           0 7.0700000e+02 8.037500e+01 1.732803e+08
45
46
     Concurrent spin time: 0.00s
48
     Solved with dual simplex (primal model)
49
50
     Root relaxation: objective 7.070000e+02, 2082 iterations, 0.25 seconds (0.28 work units)
51
52
         Nodes | Current Node | Objective Bounds
                                                                                Work
53
      Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
54
             0 707.00000 0 7
55
                                                 - 707.00000
                                   907.0000000 707.00000 22.1% -
56
    H \quad 0 \quad 0
57
         0 0 707.00000 0 15 907.00000 707.00000 22.1%
                                   707.0000000 707.00000 0.00% - 12s
58
    H 0 0
59
         0 0 707.00000 0 30 707.00000 707.00000 0.00% - 12s
60
     Explored 1 nodes (8613 simplex iterations) in 12.30 seconds (22.87 work units)
     Thread count was 8 (of 8 available processors)
62
63
64
     Solution count 2: 707 907
65
     Optimal solution found (tolerance 1.00e-10)
66
     Best objective 7.070000000000e+02, best bound 7.07000000000e+02, gap 0.0000%
67
      Set parameter MIPGap to value 1e-08
     Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
70
     CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
71
     Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
    Optimize a model with 1153929 rows, 901813 columns and 7830092 nonzeros
74
     Model fingerprint: 0xaca7330c
      Variable types: 441325 continuous, 460488 integer (456438 binary)
     Coefficient statistics:
77
78
       Matrix range [1e-01, 1e+10]
       Objective range [6e-05, 5e+01]
79
```

```
Bounds range
                    [1e+00, 8e+01]
 80
 81
     RHS range
                    [8e-01, 1e+10]
    Warning: Model contains large matrix coefficients
 82
 83
    Warning: Model contains large rhs
          Consider reformulating model or setting NumericFocus parameter
 85
          to avoid numerical issues.
 86 Presolve removed 1151590 rows and 900949 columns
 87 Presolve time: 2.51s
    Presolved: 2339 rows, 864 columns, 6249 nonzeros
    Variable types: 4 continuous, 860 integer (499 binary)
 90 Found heuristic solution: objective 2985.6639543
 92
    Root relaxation: objective 4.300667e+03, 681 iterations, 0.02 seconds (0.01 work units)
 93
 94
       Nodes | Current Node | Objective Bounds
                                                         Work
    Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
 95
 96
                     0 4300.6666667 4300.66667 0.00% - 3s
 97
 98
 99 Explored 1 nodes (681 simplex iterations) in 3.24 seconds (3.54 work units)
100 Thread count was 8 (of 8 available processors)
101
102 Solution count 2: 4300.67 2985.66
103
104 Optimal solution found (tolerance 1.00e-08)
105 Best objective 4.300666666667e+03, best bound 4.300666666667e+03, gap 0.0000%
106 SP is solved
107 SP's optimal solution is' □ 4300
108
109
     Itr = 0
110 Collect LB = [707.0]
111 Collect_UB = [9308.3333333333333]
112 Collect_Hua = [0.0]
113 Collect_SPObjVal = [4300.66666666668]
114 Collect MPObjValNHua = [707.0]
115
116
117 Set parameter TimeLimit to value 12000
118 Set parameter MIPGap to value 0.0005
119 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
120
121 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
122 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
123
124 Optimize a model with 422318 rows, 137605 columns and 1149879 nonzeros
125 Model fingerprint: 0xee3e97bf
126 Variable types: 1 continuous, 137604 integer (137580 binary)
127 Coefficient statistics:
128 Matrix range [1e+00, 1e+10]
     Objective range [1e+00, 2e+01]
129
130
     Bounds range [1e+00, 1e+00]
                   [1e+00, 2e+10]
     RHS range
    Warning: Model contains large matrix coefficients
132
    Warning: Model contains large rhs
133
134
          Consider reformulating model or setting NumericFocus parameter
135
          to avoid numerical issues.
136 Presolve removed 250143 rows and 119726 columns (presolve time = 5s) ...
137 Presolve removed 399036 rows and 130133 columns
138
    Presolve time: 9.17s
139 Presolved: 23282 rows, 7472 columns, 100054 nonzeros
140 Variable types: 0 continuous, 7472 integer (7454 binary)
141
142 Root simplex log...
143
144 Iteration Objective
                           Primal Inf. Dual Inf.
145
        0 \quad 5.0076667e + 03 \quad 7.540000e + 02 \quad 0.0000000e + 00
146
       3666 5.0076667e+03 0.000000e+00 0.000000e+00
147
148 Root relaxation: objective 5.007667e+03, 3666 iterations, 0.09 seconds (0.11 work units)
149
150
       Nodes | Current Node | Objective Bounds
151
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
152
153
          0 5007.66667 0 18
                                     - 5007.66667
                        6507.6666667 5007.66667 23.0% - 10s
154 H 0 0
                         6407.6666667 5007.66667 21.8%
155 H 0 0
          0 5007.66667 0 125 6407.66667 5007.66667 21.8% - 10s
156
157
           0 5007.66667 0 95 6407.66667 5007.66667 21.8% - 10s
158
           0 5007.66667 0 169 6407.66667 5007.66667 21.8%
                                                               - 11s
       0
159
       0
           0 5007.66667 0 183 6407.66667 5007.66667 21.8%
                                                                - 12s
                          0 321 6407.66667 5007.66667 21.8%
160
       0
           0 5007.66667
                                                                - 13s
           0 5007.66667 0 256 6407.66667 5007.66667 21.8%
       0
                                                                - 13s
161
           0\ 5007.66667 \quad 0\ 111\ 6407.66667\ 5007.66667\ 21.8\%
162
       0
                                                                - 15s
       0
           0\ 5007.66667\ \ 0\ \ 84\ 6407.66667\ 5007.66667\ \ 21.8\%
163
```

```
164
           0 5007.66667 0 49 6407.66667 5007.66667 21.8%
165
           2 5007.66667 0 46 6407.66667 5007.66667 21.8%
           10 5007.66667 3 106 6407.66667 5007.66667 21.8% 2293 20s
166
167
       28
           27 5007.66667 6 289 6407.66667 5007.66667 21.8% 2570 25s
       93 69 5128.52111 22 1193 6407.66667 5007.66667 21.8% 1889 31s
168
169 H 202 128
                           5887.6666667 5007.66667 14.9% 1386 34s
      227 207 5007.66667 61 144 5887.66667 5007.66667 14.9% 1363 39s
170
171
      357\ \ 468\ 5007.66667\ \ 94\ \ 403\ \ 5887.66667\ \ 5007.66667\ \ 14.9\%\ \ 1195\ \ \ 48s
                               5887.66667 5007.66667 14.9% 840 55s
172
      749 852 infeasible 158
     1278 1509 5067.66667 326 945 5887.66667 5007.66667 14.9% 610 60s
173
                       309 5207.6666667 5007.66667 3.84% 536 60s
174 * 1561 1095
175
     2233 635 5027.66667 404 49 5207.66667 5007.66667 3.84% 423 67s
     2238 638 5107.66667 101 484 5207.66667 5007.66667 3.84% 422 70s
176
                           5127.6666667 5007.66667 2.34% 421 75s
177 H 2241 607
178
179 Cutting planes:
180
     Gomory: 13
      Cover: 339
181
182
     Implied bound: 334
183
      Projected implied bound: 456
      Clique: 179
184
185
      MIR: 153
      StrongCG: 110
186
187
      Flow cover: 188
188
      GUB cover: 56
189
      Zero half: 14
190
      RLT: 4
      Relax-and-lift: 176
191
192
      BQP: 5
193
194 Explored 2244 nodes (1038432 simplex iterations) in 79.39 seconds (167.79 work units)
195 Thread count was 8 (of 8 available processors)
196
197 Solution count 5: 5127.67 5207.67 5887.67 ... 6507.67
198
199 Optimal solution found (tolerance 5.00e-04)
200 Best objective 5.127666666667e+03, best bound 5.127666666667e+03, gap 0.0000%
201 Set parameter MIPGap to value 1e-08
202 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
203
204 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
205 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
206
207 Optimize a model with 1153929 rows, 901813 columns and 7830092 nonzeros
208 Model fingerprint: 0x3d6a0be7
209 Variable types: 441325 continuous, 460488 integer (456438 binary)
210 Coefficient statistics:
     Matrix range [1e-01, 1e+10]
212
     Objective range [6e-05, 5e+01]
     Bounds range [1e+00, 8e+01]
213
214
     RHS range
                    [8e-01, 1e+10]
215 Warning: Model contains large matrix coefficients
216 Warning: Model contains large rhs
217
          Consider reformulating model or setting NumericFocus parameter
218
          to avoid numerical issues.
219 Presolve removed 1149196 rows and 900304 columns
220 Presolve time: 2.42s
221 Presolved: 4733 rows, 1509 columns, 12713 nonzeros
222
    Variable types: 4 continuous, 1505 integer (872 binary)
223 Found heuristic solution: objective 3164.6666667
224
225 Root relaxation: objective 4.562667e+03, 1278 iterations, 0.01 seconds (0.02 work units)
226
227
       Nodes | Current Node | Objective Bounds
                                                         Work
228
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
229
230 H 0 0
                         4562.6666667 13320.0000 192% - 3s
231
       0 0
                  - 0
                        4562,66667 4562,66667 0.00% - 3s
232
233 Explored 1 nodes (1939 simplex iterations) in 3.20 seconds (3.27 work units)
234 Thread count was 8 (of 8 available processors)
235
236 Solution count 2: 4562.67 3164.67
237
238 Optimal solution found (tolerance 1.00e-08)
239 Best objective 4.562666666667e+03, best bound 4.56266666667e+03, gap 0.0000%
240 SP is solved
241 SP's optimal solution is' □ 4562
242
243 Itr = 1
244 Collect LB = [707.0, 5127.66666666668]
245 Collect_UB = [9308.33333333336, 5389.666666666668]
246 Collect_Hua = [0.0, 4300.66666666668]
247 Collect_SPObjVal = [4300.6666666668, 4562.6666666668]
```

```
248 Collect MPObjValNHua = [707.0, 827.0]
249
250
251
    Set parameter TimeLimit to value 12000
    Set parameter MIPGap to value 0.0005
253 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
254
255 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
256
    Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
257
258 Optimize a model with 422319 rows, 137605 columns and 1149892 nonzeros
259
    Model fingerprint: 0x0dd00630
260 Variable types: 1 continuous, 137604 integer (137580 binary)
261 Coefficient statistics:
262
     Matrix range [1e+00, 1e+10]
     Objective range [1e+00, 2e+01]
263
     Bounds range [1e+00, 1e+00]
RHS range [1e+00, 2e+10]
264
265
266 Warning: Model contains large matrix coefficients
267
    Warning: Model contains large rhs
         Consider reformulating model or setting NumericFocus parameter
268
         to avoid numerical issues.
269
270 Presolve removed 250143 rows and 119725 columns (presolve time = 5s) ...
271 Presolve removed 399036 rows and 130132 columns
272 Presolve time: 8.85s
273
    Presolved: 23283 rows, 7473 columns, 100061 nonzeros
    Variable types: 0 continuous, 7473 integer (7454 binary)
275
276 Root simplex log...
277
278 Iteration Objective
                         Primal Inf. Dual Inf.
                                                 Time
        0 2.0696667e+03 9.251875e+02 0.000000e+00
279
280
       2754 5.3696667e+03 0.000000e+00 0.000000e+00
281
282
    Root relaxation: objective 5.369667e+03, 2754 iterations, 0.35 seconds (0.83 work units)
283
    Total elapsed time = 10.04s
284
285
       Nodes | Current Node | Objective Bounds
                                                    Work
286
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
287
288
           0 5369.66667 0 11
                                   - 5369.66667
289
       0
           0 5369.66667 0 118
                                    - 5369.66667
                                                      - 11s
290
       0
           0.5369.66667 0.265
                                    - 5369 66667
                                                      - 11s
291
       0
           0 5369.66667 0 66
                                   - 5369.66667
                                                  - - 12s
           0 5369.66667
292
       0
                         0 310
                                    - 5369.66667
                                                      - 13s
                                                      - 13s
293
       0
           0.5369.66667 \quad 0.301
                                    - 5369,66667
                       5549.6666667 5369.66667 3.24% - 14s
294 H 0
            0
295
           0 5369.66667 0 26 5549.66667 5369.66667 3.24%
           0 5369.66667 0 104 5549.66667 5369.66667 3.24%
296
           0\ 5369.66667\ \ 0\ \ 215\ 5549.66667\ 5369.66667\ \ 3.24\%
297
       0
                                                              - 15s
298
       0
           0 5369.66667 0 380 5549.66667 5369.66667 3.24%
                                                              - 15s
299
           0 5369.66667 0 436 5549.66667 5369.66667 3.24%
300
           0 5369.66667 0 15 5549.66667 5369.66667 3.24%
       0
                                                              - 17s
           0.5369.66667 0.258.5549.66667.5369.66667.3.24%
301
       0
                                                              - 17s
302
           0 5369.66667 0 257 5549.66667 5369.66667 3.24%
                                                              - 17s
303
       0
           0 5369.66667
                         0 303 5549.66667 5369.66667 3.24%
                                                              - 17s
           0 5369.66667 0 117 5549.66667 5369.66667 3.24%
304
       0
                                                              - 18s
305
           0\ 5369.66667\ \ 0\ \ 398\ 5549.66667\ 5369.66667\ \ 3.24\%
                                                              - 18s
306
       0
           0 5369.66667
                         0 307 5549.66667 5369.66667 3.24%
                                                                19s
307
           0 5369.66667 0 305 5549.66667 5369.66667 3.24%
                                                              - 19s
       0
           0 5369.66667 0 242 5549.66667 5369.66667 3.24%
308
       0
                                                              - 20s
309
    Η
       0
                        5469.6666667 5369.66667 1.83% - 20s
           0 5369.66667 0 14 5469.66667 5369.66667 1.83%
310
311
       0
           0 5369.66667 0 292 5469.66667 5369.66667 1.83%
                                                              - 21s
                                                                21s
           0.5369.66667 0.285.5469.66667.5369.66667.1.83%
312
       0
313
           0 5369.66667 0 275 5469.66667 5369.66667 1.83%
314
       0
           0 5369.66667 0 151 5469.66667 5369.66667 1.83%
                                                                22s
315
       0
           0.5369.66667 0.139.5469.66667.5369.66667.1.83%
                                                              - 22s
316
           0 5369.66667 0 599 5469.66667 5369.66667 1.83%
                                                              - 22s
                         0 578 5469.66667 5369.66667 1.83%
317
           0 5369.66667
           0 5369.66667 0 180 5469.66667 5369.66667 1.83%
318
       0
319
       0
           0.5369.66667 0.179.5469.66667.5369.66667.1.83%
                                                                24s
320
       0
           0 5369.66667 0 179 5469.66667 5369.66667 1.83%
           2 5369.66667 0 179 5469.66667 5369.66667 1.83%
321
      295 217 5369.66667 43 358 5469.66667 5369.66667 1.83% 326 30s
322
      1045 648 5429.66667 46 436 5469.66667 5369.66667 1.83%
323
                                                                221
                                                                     39s
324
      1047 649 5382.92077 160 36 5469.66667 5369.66667 1.83% 221
325
      1050 651 5409.66667 80 575 5469.66667 5369.66667 1.83%
                                                                220 45s
      1052 653 5369.66667 106 612 5469.66667 5369.66667 1.83%
                                                                 220 50s
326
327 H 1053 620
                           5449.6666667 5369.66667 1.47% 220 55s
                           5409.6666667 5369.66667 0.74% 220
328
    H 1053
                                                                55s
                           5389.6666667 5369.66667 0.37% 219 59s
329 H 1055 561
     1056 561 5369.66667 30 636 5389.66667 5369.66667 0.37% 219 60s
330
           564 5372.56857 145 757 5389.66667 5369.66667 0.37% 218 65s
331
      1060
```

```
71s
332
      1064 567 5389.66667 52 766 5389.66667 5369.66667 0.37% 217
333
      1069 571 5369.66667 30 436 5389.66667 5369.66667 0.37% 288 76s
      1075 575 5369.66667 54 708 5389.66667 5369.66667 0.37% 287 81s
334
335
      1078 577 5389.66667 11 758 5389.66667 5369.66667 0.37% 286 86s
336
337 Cutting planes:
338
     Gomory: 6
339
      Cover: 387
340
      Implied bound: 82
341
      Projected implied bound: 152
342
      Clique: 102
343
      MIR: 35
344
      StrongCG: 13
345
      Flow cover: 354
346
      GUB cover: 73
347
      Zero half: 126
348
      RLT: 9
349
      Relax-and-lift: 158
350
     BQP: 2
351
352 Explored 1081 nodes (417610 simplex iterations) in 89.93 seconds (119.89 work units)
353 Thread count was 8 (of 8 available processors)
354
355 Solution count 5: 5389.67 5409.67 5449.67 ... 5549.67
356
357 Optimal solution found (tolerance 5.00e-04)
358 Best objective 5.389666666667e+03, best bound 5.38966666667e+03, gap 0.0000%
359 Set parameter MIPGap to value 1e-08
360 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
361
362 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
363 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
364
365 Optimize a model with 1153929 rows, 901813 columns and 7830092 nonzeros
366 Model fingerprint: 0x9fa1e7fd
367 Variable types: 441325 continuous, 460488 integer (456438 binary)
368 Coefficient statistics:
369 Matrix range [1e-01, 1e+10]
370
     Objective range [6e-05, 5e+01]
371
      Bounds range [1e+00, 8e+01]
                    [8e-01, 1e+10]
     RHS range
373 Warning: Model contains large matrix coefficients
374 Warning: Model contains large rhs
375
          Consider reformulating model or setting NumericFocus parameter
376
          to avoid numerical issues.
377 Presolve removed 1149327 rows and 900340 columns
378 Presolve time: 2.46s
379 Presolved: 4602 rows, 1473 columns, 12351 nonzeros
380 Variable types: 4 continuous, 1469 integer (846 binary)
381 Found heuristic solution: objective 3125.6666667
382 Found heuristic solution: objective 3263.6666667
383
Root relaxation: objective 4.520667e+03, 1332 iterations, 0.02 seconds (0.02 work units)
385
386
       Nodes | Current Node | Objective Bounds
387
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
388
389
       0 0 4520.66667 0 10 3263.66667 4520.66667 38.5%
390 H 0 0
                        4520.6666667 4520.66667 0.00%
391
          0 4520.66667 0 10 4520.66667 4520.66667 0.00% - 3s
392
393 Explored 1 nodes (1890 simplex iterations) in 3.27 seconds (3.45 work units)
394 Thread count was 8 (of 8 available processors)
395
396 Solution count 3: 4520.67 3263.67 3125.67
397
398 Optimal solution found (tolerance 1.00e-08)
399 Best objective 4.520666666667e+03, best bound 4.52066666667e+03, gap 0.0000%
400 SP is solved
401 SP's optimal solution is' \square 4520
402
403 Itr = 2
404 Collect_LB = [707.0, 5127.66666666668, 5389.66666666666]
405 Collect UB = [9308.3333333333336, 5389.666666666668, 5347.66666666668]
406 Collect Hua = [0.0, 4300.6666666668, 4562.66666666666]
407 Collect_SPObjVal = [4300.666666666668, 4562.6666666668, 4520.6666666668]
408 Collect_MPObjValNHua = [707.0, 827.0, 827.0]
409
410
411 Ops, stop iteration
412
     Values adopted from the Itr-1' th iteration, and Itr = \{2\}, judgeCount = \{1\}
413
414
                ~judgeCount = 1, SPObj_SPF = 4562.6666666668
415 Vessel i: 0:
                           ai-di: 5-27,
                                        gi_SP-gpi_SP: 0.000000-0.000000,
                                                                             ai SP-di: 5-27,
                                                                                             taoi-deltai: 5-15, taoPi SP-deltaPi SP: 5-15,
                 pi: 0-7,
```

```
unknown
415
          bi: 10
416 Vessel i: 1:
                                               gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                     ai_SP-di: 11-28,
                    pi: 7-13,
                                ai-di: 11-28,
                                                                                                        taoi-deltai: 11-16,
                                                                                                                             taoPi_SP-deltaPi_SP: 11-16,
                                                                                                                                                             betaNi
      : 5, bi: 5
     Vessel i: 2:
                    pi: 13-20,
                                 ai-di: 13-54,
                                                gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                      ai_SP-di: 13-54,
                                                                                                         taoi-deltai: 13-42,
                                                                                                                              taoPi_SP-deltaPi_SP: 13-42,
      betaNi: 29,
                    bi: 29
      Vessel i: 3:
                    pi: 7-13,
                                ai-di: 33-64,
                                               gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                     ai_SP-di: 33-64,
                                                                                                        taoi-deltai: 33-52,
                                                                                                                             taoPi_SP-deltaPi_SP: 33-52,
                                                                                                                                                             betaNi
      : 19, bi: 19
419
     Vessel i: 4:
                    pi: 20-27,
                                 ai-di: 27-65,
                                                gi_SP-gpi_SP: 0.200000-1.000000,
                                                                                      ai_SP-di: 28-65,
                                                                                                         taoi-deltai: 28-54,
                                                                                                                              taoPi_SP-deltaPi_SP: 28-54,
      betaNi: 26,
                    bi: 26
                                                                                      ai_SP-di: 38-60,
      Vessel i: 5:
                    pi: 14-20,
                                 ai-di: 30-60,
                                                gi_SP-gpi_SP: 1.000000-0.200000,
                                                                                                         taoi-deltai: 43-61,
                                                                                                                              taoPi_SP-deltaPi_SP: 43-61,
      betaNi: 18,
                    bi: 18
421
422 round LB = [707, 5128, 5390]
423 round UB = [9308, 5390, 5348]
424 round Hua = [0, 4301, 4563]
425 round SPObjVal = [4301, 4563, 4521]
426 round MPObjValNHua = [707, 827, 827]
427
428 OptimalObj = 5389.66666666666
429 Time: 405.000000
430
431
432
433
```