```
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=43494
 3
      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 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 563169 rows, 46641 columns and 1548061 nonzeros
19
     Model fingerprint: 0xb056c917
      Variable types: 1 continuous, 46640 integer (46608 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 429490 rows and 29177 columns (presolve time = 5s) ...
      Presolve removed 521900 rows and 36082 columns
31
      Presolve time: 5.89s
     Presolved: 41269 rows, 10559 columns, 151116 nonzeros
34
      Variable types: 0 continuous, 10559 integer (10535 binary)
35
     Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
37
      Showing first log only...
38
39
      Root relaxation presolved: 41268 rows, 10560 columns, 151113 nonzeros
40
41
42
     Root simplex log...
43
44
     Iteration Objective
                                       Primal Inf. Dual Inf.
            0 7.7000000e+02 7.806250e+01 1.602493e+08
45
46
     Concurrent spin time: 0.03s
48
     Solved with dual simplex (primal model)
49
50
     Root relaxation: objective 6.100000e+02, 1744 iterations, 0.20 seconds (0.17 work units)
51
52
         Nodes | Current Node | Objective Bounds
                                                                                Work
53
       Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
54
              0 610.00000 0 15
55
                                                     - 610.00000
                                    1170.0000000 610.00000 47.9% - 6s
56 H 0 0
57
     Η
                                     610.0000000 610.00000 0.00% - 7s
          0 \quad 0 \ 610.00000 \quad 0 \ 187 \ 610.00000 \ 610.00000 \ 0.00\%
59
60 Cutting planes:
       Gomory: 2
62
       Cover: 8
63
       Implied bound: 5
64
       Clique: 5
       MIR: 8
65
       StrongCG: 9
66
       GUB cover: 2
67
68
       Zero half: 1
69
       RLT: 3
70
       Relax-and-lift: 2
      Explored 1 nodes (7549 simplex iterations) in 7.26 seconds (13.37 work units)
     Thread count was 8 (of 8 available processors)
73
74
75
      Solution count 2: 610 1170
76
     Optimal solution found (tolerance 1.00e-10)
     Best objective 6.100000000000e+02, best bound 6.10000000000e+02, gap 0.0000%
     Set parameter MIPGap to value 1e-08
```

```
80 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
 81
     CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
 82
 83
    Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
 85 Optimize a model with 1983520 rows, 1559473 columns and 13694414 nonzeros
 86 Model fingerprint: 0xa050e9b1
 87 Variable types: 766961 continuous, 792512 integer (787112 binary)
 88 Coefficient statistics:
     Matrix range [1e-01, 1e+10]
 89
     Objective range [6e-05, 5e+01]
 90
 91
      Bounds range [1e+00, 8e+01]
                   [8e-01, 1e+10]
     RHS range
     Warning: Model contains large matrix coefficients
 93
 94
     Warning: Model contains large rhs
 95
          Consider reformulating model or setting NumericFocus parameter
 96
          to avoid numerical issues.
 97 Presolve removed 1980422 rows and 1558437 columns
 98 Presolve time: 4.38s
    Presolved: 3098 rows, 1036 columns, 8188 nonzeros
100 Variable types: 6 continuous, 1030 integer (594 binary)
101 Found heuristic solution: objective 3236.4887888
102
103 Root simplex log...
104
105 Iteration Objective
                          Primal Inf. Dual Inf.
        0 6.5912222e+03 4.623986e+03 0.000000e+00
106
       1009 4.1285519e+03 0.000000e+00 0.000000e+00
107
108
109 Root relaxation: objective 4.128552e+03, 1009 iterations, 0.02 seconds (0.01 work units)
110
       Nodes | Current Node | Objective Bounds
                                                      Work
111
112
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
113
114
       0 0 4128.55187 0 25 3236.48879 4128.55187 27.6%
115 H 0 0
                        4069.9910418 4128.55187 1.44% - 5s
116
       0 0 4123.88521 0 35 4069.99104 4123.88521 1.32% - 5s
       0 0 4123.88521 0 9 4069.99104 4123.88521 1.32% -
117
                                                                 5s
                        4108.5518738 4123.88521 0.37% - 5s
118 H 0 0
119 H 0 0
                        4114.5518738 4123.88521 0.23%
                                                              5s
120
       0 0 cutoff 0 4114.55187 4114.55187 0.00%
121
122 Cutting planes:
123
     Learned: 2
124
      Gomory: 3
     Implied bound: 16
125
126
      Clique: 7
127
      MIR: 2
128
     Zero half: 1
129
      Network: 1
130
      RLT: 2
131
      PSD: 1
132
133 Explored 1 nodes (1416 simplex iterations) in 5.85 seconds (6.01 work units)
134 Thread count was 8 (of 8 available processors)
135
136 Solution count 4: 4114.55 4108.55 4069.99 3236.49
137
138 Optimal solution found (tolerance 1.00e-08)
139 Best objective 4.114551873823e+03, best bound 4.114551873823e+03, gap 0.0000%
140 SP is solved
141 SP's optimal solution is'□4114
142
143
     Itr = 0
144 Collect_LB = [610.0]
145 Collect_UB = [8839.103747646237]
146 Collect_Hua = [0.0]
147 Collect_SPObjVal = [4114.5518738231185]
148 Collect MPObjValNHua = [610.0]
149
150
151 Set parameter TimeLimit to value 12000
152
     Set parameter MIPGap to value 0.0005
153 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
154
155 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
156 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
157
158 Optimize a model with 566810 rows, 229425 columns and 1551746 nonzeros
159 Model fingerprint: 0x94356014
160 Variable types: 1 continuous, 229424 integer (229392 binary)
161 Coefficient statistics:
      Matrix range [1e+00, 1e+10]
162
      Objective range [1e+00, 2e+01]
163
```

```
Bounds range
                    [1e+00, 1e+00]
164
165
     RHS range
                   [1e+00, 2e+10]
    Warning: Model contains large matrix coefficients
166
167
    Warning: Model contains large rhs
         Consider reformulating model or setting NumericFocus parameter
169
         to avoid numerical issues.
170 Presolve removed 467876 rows and 216529 columns (presolve time = 5s) ...
171 Presolve removed 533352 rows and 223346 columns
    Presolve time: 6.62s
173 Presolved: 33458 rows, 6079 columns, 89413 nonzeros
174
    Variable types: 0 continuous, 6079 integer (6058 binary)
175
    Root relaxation presolved: 6079 rows, 39537 columns, 95492 nonzeros
176
177
178 Root simplex log...
179
180 Iteration Objective
                          Primal Inf. Dual Inf.
                                                Time
181
           handle free variables
182
       5322 4.8245519e+03 0.000000e+00 0.000000e+00
183
       5322 \quad 4.8245519e + 03 \quad 0.000000e + 00 \quad 0.000000e + 00
184
185 Root relaxation: objective 4.824552e+03, 5322 iterations, 0.55 seconds (0.97 work units)
186
187
       Nodes | Current Node | Objective Bounds
                                                       Work
188
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
189
190
           0 4824.55187 0 23
                                   - 4824.55187
191
       0
           0.4824.55187 0 40
                                   - 4824.55187
                                                        8s
                                   - 4824.55187
192
       0
           0.4824.55187
                         0.130
                                                     - 8s
193
           0 4824.55187 0 253
                                   - 4824.55187
194
       0
           0 4824.55187 0 290
                                   - 4824.55187
195
           0.4824.55187 0.112
                                                     - 10s
                                   - 4824.55187
       0
196
           0.4824.55187 \quad 0.139
                                    - 4824.55187
                                                     - 10s
197
           0 4824.55187 0 447
                                   - 4824.55187
       0
198
           0 4824.55187 0 336
                                   - 4824.55187
                                                 - - 11s
       0
199
           0.4824.55187 0.121
                                   - 4824.55187
                                                     - 12s
200
       0
           0 4824.55187 0 267
                                   - 4824.55187
                                                 - - 12s
201
       0
          0 4824.55187 0 91
                                   - 4824.55187
                                                 - - 13s
                       7304.5518738 4824.55187 34.0% - 13s
202 H 0 0
203
       0 0 4824.55187 0 91 7304.55187 4824.55187 34.0%
204 H 0 0
                       6004.5518738 4824.55187 19.7% - 14s
205
           2 4824.55187 0 91 6004.55187 4824.55187 19.7%
       0
           5 4824.55187 2 274 6004.55187 4824.55187 19.7% 1747 15s
206
207
      41
           49 4824.55187 11 213 6004.55187 4824.55187 19.7% 1134 20s
           96 4824.55187 27 379 6004.55187 4824.55187 19.7% 777
208
      138
      223 206 4824.55187 38 340 6004.55187 4824.55187 19.7% 867 33s
209
210 H 326 206
                          5344.5518738 4824.55187 9.73% 747 33s
211
    H 367 225
                          5224.5518738 4824.55187 7.66% 692
                          5184.5518738 4824.55187 6.94% 759 43s
212 H 436 259
      566 308 infeasible 83 5184.55187 4824.55187 6.94% 800 50s
213
      764 532 4824.55187 11 237 5184.55187 4824.55187 6.94% 735 57s
214
      1180 716 4924.55187 108 330 5184.55187 4824.55187 6.94% 607 62s
      1437 717 4924.55187 66 91 5184.55187 4824.55187 6.94% 576 69s
216
      1439 718 5144.55187 30 31 5184.55187 4824.55187 6.94% 575
217
218
      1443 721 5024.55187 196 368 5184.55187 4824.55187 6.94% 574 76s
     1445 722 4924.55187 33 475 5184.55187 4824.55187 6.94% 573 80s
219
220 H 1447 687
                          5064.5518738 4824.55187 4.74% 572 86s
      1450\ \ 689\ 5004.55187\ \ 142\ \ 641\ \ 5064.55187\ \ 4824.55187\ \ 4.74\%\ \ \ 571
221
      1454 691 4828.08129 75 441 5064.55187 4824.55187 4.74% 570 96s
222
223 H 1455 657
                          5024.5518738 4824.55187 3.98% 569 100s
224 H 1455 624
                          5004.5518738 4826.64905 3.55% 569 100s
225 H 1455 593
                          4984.5518738 4826.64905 3.17% 569 100s
                          4964.5518738 4826.64905 2.78% 569 100s
226 H 1455 563
227
     1461 568 4964.55187 83 201 4964.55187 4826.64905 2.78% 638 105s
           574 4964.55187 73 435 4964.55187 4826.64905 2.78% 640 110s
228
      1467
229
     1489 589 4849.55397 61 677 4964.55187 4849.55397 2.32% 630 115s
230
     1508 601 4964.55187 28 648 4964.55187 4864.55187 2.01% 622 120s
231 H 1520 577
                          4924 5518738 4864 55187 1 22% 618 123s
     1527 582 4904.55187 22 753 4924.55187 4864.55187 1.22% 615 125s
232
233
           592 4924.55187 63 687 4924.55187 4904.55187 0.41% 654 130s
234
     1558 604 4904.55187 35 698 4924.55187 4904.55187 0.41% 647 135s
235
236
    Cutting planes:
237
     Learned: 4
238
     Gomory: 8
239
      Cover: 134
240
      Implied bound: 37
241
      Projected implied bound: 71
242
      Clique: 38
243
      MIR: 31
244
      StrongCG: 13
245
     Flow cover: 127
246
     GUB cover: 50
      Zero half: 60
247
```

```
248
      RLT: 37
249
      Relax-and-lift: 175
     BQP: 4
250
251
      PSD: 1
252
253 Explored 1563 nodes (1066273 simplex iterations) in 135.90 seconds (224.96 work units)
254 Thread count was 8 (of 8 available processors)
255
256 Solution count 10: 4924.55 4964.55 4964.55 ... 5344.55
257
258 Optimal solution found (tolerance 5.00e-04)
259 Best objective 4.924551873823e+03, best bound 4.924551873823e+03, gap 0.0000%
260 Set parameter MIPGap to value 1e-08
261 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
262
263 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
264 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
265
266 Optimize a model with 1983520 rows, 1559473 columns and 13694414 nonzeros
267 Model fingerprint: 0x695455f3
268 Variable types: 766961 continuous, 792512 integer (787112 binary)
269 Coefficient statistics:
270
     Matrix range [1e-01, 1e+10]
271
     Objective range [6e-05, 5e+01]
     Bounds range [1e+00, 8e+01]
272
273
      RHS range
                    [8e-01, 1e+10]
274 Warning: Model contains large matrix coefficients
275 Warning: Model contains large rhs
276
          Consider reformulating model or setting NumericFocus parameter
277
          to avoid numerical issues.
278 Presolve removed 1979528 rows and 1558182 columns
279 Presolve time: 4.26s
280 Presolved: 3992 rows, 1291 columns, 10640 nonzeros
281 Variable types: 6 continuous, 1285 integer (746 binary)
282 Found heuristic solution: objective 3254.6554554
283 Found heuristic solution: objective 3262.4332332
284
285 Root simplex log...
286
287 Iteration Objective
                           Primal Inf. Dual Inf.
288
        0 7.7280000e+03 2.184281e+03 0.000000e+00
289
       1262 4.5351111e+03 0.000000e+00 0.000000e+00
290
291 Root relaxation: objective 4.535111e+03, 1262 iterations, 0.02 seconds (0.02 work units)
292
293
       Nodes | Current Node | Objective Bounds
                                                          Work
294
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
295
296
       0 0 4535.11111 0 50 3262.43323 4535.11111 39.0%
297 H 0 0
                         3768.1111111 4535.11111 20.4%
298 H 0 0
                         3815.1111111 4535.11111 18.9%
299
       0 \quad 0.4535.11111 \quad 0.29.3815.11111.4535.11111.18.9\% \quad -
300 H 0 0
                        4529.9777997 4535.11111 0.11% - 5s
                         4535.1111111 4535.11111 0.00%
301 H 0 0
302
       0 \quad 0.4535.11111 \quad 0 \quad 29.4535.11111 \quad 4535.11111 \quad 0.00\%
303
304 Cutting planes:
305
      Gomory: 2
306
      Cover: 1
307
      Implied bound: 2
308
      Clique: 22
309
      MIR: 1
310 Flow cover: 2
311
     Relax-and-lift: 2
312
313 Explored 1 nodes (2188 simplex iterations) in 5.87 seconds (5.83 work units)
314 Thread count was 8 (of 8 available processors)
315
316 Solution count 6: 4535.11 4529.98 3815.11 ... 3254.66
317
318 Optimal solution found (tolerance 1.00e-08)
319 Best objective 4.5351111111111e+03, best bound 4.535111111111e+03, gap 0.0000%
320 SP is solved
321 SP's optimal solution is' □4535
322
323 Itr = 1
324 Collect_LB = [610.0, 4924.5518738231185]
325 Collect_UB = [8839.103747646237, 5345.11111111111095]
326 Collect Hua = [0.0, 4114.5518738231185]
327 Collect SPObjVal = [4114.5518738231185, 4535.11111111111095]
328 Collect MPObjValNHua = [610.0, 810.0]
329
330
331 Set parameter TimeLimit to value 12000
```

```
Set parameter MIPGap to value 0.0005
332
333 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
334
335 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
336 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
337
338 Optimize a model with 566811 rows, 229425 columns and 1551763 nonzeros
339 Model fingerprint: 0x1d12fe8e
340 Variable types: 1 continuous, 229424 integer (229392 binary)
341 Coefficient statistics:
     Matrix range [1e+00, 1e+10]
342
343
      Objective range [1e+00, 2e+01]
      Bounds range [1e+00, 1e+00]
344
     RHS range
                   [1e+00, 2e+10]
345
346
     Warning: Model contains large matrix coefficients
    Warning: Model contains large rhs
347
348
          Consider reformulating model or setting NumericFocus parameter
349
          to avoid numerical issues.
350 Presolve removed 471489 rows and 216970 columns (presolve time = 5s) ...
351 Presolve removed 535234 rows and 223431 columns
352 Presolve time: 6.48s
353 Presolved: 31577 rows, 5994 columns, 86462 nonzeros
    Variable types: 0 continuous, 5994 integer (5973 binary)
355 Root relaxation presolved: 5994 rows, 37571 columns, 92456 nonzeros
356
357
358 Root simplex log...
359
360 Iteration Objective
                           Primal Inf. Dual Inf.
                                                   Time
361
            handle free variables
362
       4761
             5.3851111e+03 0.000000e+00 0.000000e+00
                                                             7s
363
             5.3851111e+03 0.000000e+00 0.000000e+00
       4761
                                                             7s
364
    Root relaxation: objective 5.385111e+03, 4761 iterations, 0.53 seconds (0.92 work units)
365
366
367
                                                          Work
       Nodes | Current Node | Objective Bounds
368
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
369
370
       0
           0.5385.11111 0 19
                                     - 5385.11111
                                                           7s
371
       0
           0 5385.11111 0 64
                                     - 5385.11111
                                                          8s
                                     - 5385.11111
372
           0 5385.11111
                          0 179
373
           0 5385.11111 0 146
                                     - 5385.11111
       0
                                                           8s
374
       0
           0.5385 11111 0 43
                                     - 5385 11111
375
        0
           0 5385.11111 0 103
                                     - 5385.11111
                                                       - 9s
376
        0
           0.5385.111111 \quad 0 \quad 88
                                     - 5385.11111
377
       0
           0.5385.11111 0 82
                                     - 5385,11111
                                                    - - 10s
378
        0
           0 5385.11111 0 133
                                     - 5385.11111
379 H 0
                        8345.1111111 5385.11111 35.5%
380
       0 0 5385.11111 0 133 8345.11111 5385.11111 35.5% - 11s
                        7185.1111111 5385.11111 25.1% - 11s
381 H 0 0
                         5385.1111111 5385.11111 0.00% - 12s
382 H 0 0
        0 0 5385.11111 0 133 5385.11111 5385.11111 0.00% - 13s
383
384
385 Cutting planes:
386
      Cover: 218
387
      Implied bound: 240
388
      Clique: 15
389
      MIR: 44
390
      StrongCG: 21
391
      GUB cover: 7
392
      Zero half: 1
393
      Relax-and-lift: 2
394
      BQP: 3
395
      PSD: 1
396
397
     Explored 1 nodes (27518 simplex iterations) in 13.04 seconds (20.58 work units)
398
    Thread count was 8 (of 8 available processors)
399
400 Solution count 3: 5385.11 7185.11 8345.11
401
402 Optimal solution found (tolerance 5.00e-04)
403 Best objective 5.385111111111e+03, best bound 5.385111111111e+03, gap 0.0000%
404
     Set parameter MIPGap to value 1e-08
405 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
406
407 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
408 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
409
410 Optimize a model with 1983520 rows, 1559473 columns and 13694414 nonzeros
411 Model fingerprint: 0xd1541698
    Variable types: 766961 continuous, 792512 integer (787112 binary)
412
413 Coefficient statistics:
414
      Matrix range [1e-01, 1e+10]
      Objective range [6e-05, 5e+01]
415
```

```
Bounds range
                      [1e+00, 8e+01]
416
417
      RHS range
                     [8e-01, 1e+10]
     Warning: Model contains large matrix coefficients
418
419
     Warning: Model contains large rhs
420
          Consider reformulating model or setting NumericFocus parameter
421
          to avoid numerical issues.
422 Presolve removed 1979454 rows and 1558165 columns
423 Presolve time: 4.24s
424 Presolved: 4066 rows, 1308 columns, 10903 nonzeros
425 Variable types: 6 continuous, 1302 integer (752 binary)
426 Found heuristic solution: objective 3271.9442784
42.7
428 Root simplex log...
429
430 Iteration Objective
                            Primal Inf. Dual Inf.
                                                    Time
         0 \quad 8.0740000e{+03} \quad 4.433505e{+03} \quad 0.000000e{+00} \\
431
432
       1182 4.4821111e+03 0.000000e+00 0.000000e+00
433
434 Root relaxation: objective 4.482111e+03, 1182 iterations, 0.02 seconds (0.02 work units)
435
436
       Nodes | Current Node | Objective Bounds
                                                        Work
437
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
438
439
                      0 4482.1111111 4482.11111 0.00% - 5s
440
441 Explored 1 nodes (1590 simplex iterations) in 5.63 seconds (5.63 work units)
442 Thread count was 8 (of 8 available processors)
443
444 Solution count 2: 4482.11 3271.94
445
446 Optimal solution found (tolerance 1.00e-08)
447 Best objective 4.482111111111e+03, best bound 4.482111111111e+03, gap 0.0000%
448 SP is solved
449 SP's optimal solution is' □4482
450
451 Itr = 2
452 Collect LB = [610.0, 4924.5518738231185, 5385.11111111111095]
453 Collect UB = [8839.103747646237, 5345.111111111111095, 5332.111111111111]
454 Collect_Hua = [0.0, 4114.5518738231185, 4535.11111111111095]
455 Collect_SPObjVal = [4114.5518738231185, 4535.11111111111095, 4482.111111111111]
456 Collect_MPObjValNHua = [610.0, 810.0, 850.0]
457
458
459
     Ops, stop iteration
     Values adopted from the Itr-1' th iteration, and Itr = \{2\}, judgeCount = \{1\}
460
461
                 ~judgeCount = 1, SPObj_SPF = 4535.11111111111095
462
                                                                                              taoi-deltai: 1-6,
463
     Vessel i: 0:
                   pi: 0-7, ai-di: 1-7,
                                         gi_SP-gpi_SP: 0.000000-0.000000,
                                                                               ai_SP-di: 1-7,
                                                                                                               taoPi SP-deltaPi SP: 1-6,
                                                                                                                                            betaNi: 5,
464
    Vessel i: 1:
                   pi: 8-13,
                             ai-di: 2-8,
                                          gi_SP-gpi_SP: 0.000000-0.000000,
                                                                               ai SP-di: 2-8,
                                                                                               taoi-deltai: 2-6,
                                                                                                                 taoPi_SP-deltaPi_SP: 2-6,
                                                                                                                                            betaNi: 4.
                                                                                                                                                          bi:
465
    Vessel i: 2:
                   pi: 4-10,
                              ai-di: 6-28,
                                            gi SP-gpi SP: 0.000000-0.000000,
                                                                                 ai SP-di: 6-28,
                                                                                                  taoi-deltai: 7-27, taoPi SP-deltaPi SP: 7-27, betaNi: 20
         bi: 20
                                                                                                                          taoPi SP-deltaPi SP: 10-18,
466
     Vessel i: 3:
                   pi: 10-16,
                               ai-di: 10-20.
                                              gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                   ai_SP-di: 10-20,
                                                                                                     taoi-deltai: 10-18,
     betaNi: 8,
                 bi: 8
467
     Vessel i: 4:
                  pi: 18-23,
                               ai-di: 9-39,
                                             gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                  ai_SP-di: 9-39,
                                                                                                    taoi-deltai: 9-37,
                                                                                                                      taoPi_SP-deltaPi_SP: 9-37,
         bi: 28
468
     Vessel i: 5:
                   pi: 10-17,
                                              gi_SP-gpi_SP: 0.000000-1.000000,
                                                                                   ai_SP-di: 16-37,
                                                                                                     taoi-deltai: 21-40,
                                                                                                                          taoPi SP-deltaPi SP: 21-40,
                               ai-di: 16-37,
     betaNi: 19,
                   bi: 19
     Vessel i: 6:
                   pi: 28-34,
                               ai-di: 29-44,
                                              gi_SP-gpi_SP: 1.000000-0.275896,
                                                                                   ai_SP-di: 37-44,
                                                                                                      taoi-deltai: 32-45,
                                                                                                                          taoPi_SP-deltaPi_SP: 37-45,
     betaNi: 13,
                   bi: 13
                   pi: 17-23,
     Vessel i: 7:
                               ai-di: 33-41,
                                              gi_SP-gpi_SP: 0.800000-0.524104,
                                                                                   ai_SP-di: 41-41,
                                                                                                     taoi-deltai: 38-44,
                                                                                                                          taoPi SP-deltaPi SP: 41-44,
     betaNi: 6,
                 bi: 6
471
472 round LB = [610, 4925, 5385]
473 round UB = [8839, 5345, 5332]
474 round Hua = [0, 4115, 4535]
475 round SPObjVal = [4115, 4535, 4482]
476 round MPObjValNHua = [610, 810, 850]
477
478 OptimalObj = 5385.11111111111095
479 Time: 537.000000
480
481
482
483
```