```
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=39205
     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 545514 rows, 52642 columns and 1523914 nonzeros
19
     Model fingerprint: 0x36f8316c
     Variable types: 1 continuous, 52641 integer (52605 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 250782 rows and 16421 columns (presolve time = 5s) ...
31
     Presolve removed 250782 rows and 16421 columns (presolve time = 10s) ...
     Presolve removed 445934 rows and 32558 columns
     Presolve time: 13.81s
     Presolved: 99580 rows, 20084 columns, 308743 nonzeros
34
35
     Variable types: 0 continuous, 20084 integer (20057 binary)
     Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
37
38
     Showing first log only..
39
40
     Root relaxation presolved: 20084 rows, 119664 columns, 328827 nonzeros
41
42
43
     Root simplex log...
44
45
     Iteration Objective
                                   Primal Inf. Dual Inf.
                                                                   Time
          0 7.1200000e+02 0.000000e+00 9.770000e+02
46
47
     Concurrent spin time: 0.01s
48
49
     Solved with dual simplex (primal model)
50
51
     Root relaxation: objective 7.120000e+02, 2890 iterations, 0.49 seconds (0.48 work units)
52
     Total elapsed time = 15.39s
53
54
        Nodes | Current Node |
                                              Objective Bounds
55
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
56
57
         0 0 712.00000 0 6
                                               - 712.00000 - - 15s
                                7012.0000000 712.00000 89.8% - 15s
58 H 0 0
59 H 0 0
                                6572.0000000 712.00000 89.2% - 15s
              60
              0 712.00000 0 112 6572.00000 712.00000 89.2%
                                4992.0000000 712.00000 85.7% - 16s
3392.0000000 712.00000 79.0% - 16s
62
    H \quad 0 \quad 0
63
    H 0
              0
64
         0
             0 712.00000 0 112 3392.00000 712.00000 79.0% - 16s
              0 712.00000 0 6 3392.00000 712.00000 79.0%
65
         0
66 H 0 0
                                1132.0000000 712.00000 37.1% - 18s
                                                                                  - 18s
67
        0
             0 712.00000 0 22 1132.00000 712.00000 37.1%
68
         0
              0 712.00000 0 10 1132.00000 712.00000 37.1%
69
    H \quad 0 \quad 0
                                1012.0000000 712.00000 29.6% - 24s
        0 0 712.00000 0 79 1012.00000 712.00000 29.6%
70
                                                                                   - 24s
71 H 0 0
                                 772.0000000 712.00000 7.77%
              0 712.00000 0 80 772.00000 712.00000 7.77%
73
         0
              0 712.00000 0 183 772.00000 712.00000 7.77%
                                                                                 - 25s
              - 27s
74
        0
                                                                           - 27s
75 H 0 0
                                 732.0000000 712.00000 2.73%
                                                                            - 28s
76
    Η
                                 712.0000000 712.00000 0.00%
             0 712.00000 0 250 712.00000 712.00000 0.00%
77
                                                                                  - 28s
78
79
     Cutting planes:
```

```
Gomory: 1
 80
 81
      Cover: 23
     Implied bound: 442
 82
 83
     Clique: 2
     MIR: 13
 85
      StrongCG: 8
     Flow cover: 3
 86
 87
     GUB cover: 5
     RLT: 19
 88
 89
     Relax-and-lift: 2
 90
 91
    Explored 1 nodes (25193 simplex iterations) in 28.31 seconds (46.88 work units)
    Thread count was 8 (of 8 available processors)
 93
 94 Solution count 9: 712 732 772 ... 7012
 95
 96 Optimal solution found (tolerance 1.00e-10)
 97 Best objective 7.120000000000e+02, best bound 7.12000000000e+02, gap 0.0000%
 98 Set parameter MIPGap to value 1e-08
    Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
100
101 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
102
103
104 Optimize a model with 2481762 rows, 1955335 columns and 17236452 nonzeros
105 Model fingerprint: 0xe5f662ad
106 Variable types: 963295 continuous, 992040 integer (985965 binary)
107 Coefficient statistics:
     Matrix range [1e-01, 1e+10]
108
109
     Objective range [6e-05, 5e+01]
110
     Bounds range [1e+00, 8e+01]
     RHS range
                   [8e-01, 1e+10]
111
112 Warning: Model contains large matrix coefficients
113 Warning: Model contains large rhs
114
          Consider reformulating model or setting NumericFocus parameter
          to avoid numerical issues.
115
116 Presolve removed 2477808 rows and 1953996 columns (presolve time = 5s) ...
117 Presolve removed 2478884 rows and 1954390 columns
118 Presolve time: 5.36s
119 Presolved: 2878 rows, 945 columns, 7637 nonzeros
120 Variable types: 8 continuous, 937 integer (551 binary)
121 Found heuristic solution: objective 3593.0500186
122 Found heuristic solution: objective 3842.0500186
123
124 Root simplex log...
125
126 Iteration Objective
                          Primal Inf. Dual Inf.
                                                  Time
127
           7.4314519e+03 2.380082e+03 0.000000e+00
128
       794 5.0566703e+03 0.000000e+00 0.000000e+00
129
130 Root relaxation: objective 5.056670e+03, 794 iterations, 0.00 seconds (0.01 work units)
131
132
       Nodes | Current Node | Objective Bounds
                                                          Work
133
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
134
                         5056.6702574 10385.7410 105% - 6s
135 H 0 0
136
                  - 0
                        5056.67026 5056.67026 0.00% - 6s
137
138 Explored 1 nodes (1210 simplex iterations) in 7.06 seconds (7.16 work units)
139 Thread count was 8 (of 8 available processors)
140
141 Solution count 3: 5056.67 3842.05 3593.05
142
143 Optimal solution found (tolerance 1.00e-08)
144 Best objective 5.056670257367e+03, best bound 5.056670257367e+03, gap 0.0000%
145 SP is solved
146 SP's optimal solution is' □ 5056
147
148 Itr = 0
149 Collect_LB = [712.0]
150 Collect_UB = [10825.340514734511]
151 Collect_Hua = [0.0]
152 Collect SPObjVal = [5056.6702573672555]
153 Collect MPObjValNHua = [712.0]
154
155
156 Set parameter TimeLimit to value 12000
157 Set parameter MIPGap to value 0.0005
158 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
159
160 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
161 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
162
    Optimize a model with 552258 rows, 283978 columns and 1530712 nonzeros
163
```

```
164 Model fingerprint: 0xcbac55c2
165 Variable types: 1 continuous, 283977 integer (283941 binary)
166 Coefficient statistics:
     Matrix range [1e+00, 1e+10]
167
     Objective range [1e+00, 2e+01]
     Bounds range [1e+00, 1e+00]
169
     RHS range
                  [1e+00, 2e+10]
170
171 Warning: Model contains large matrix coefficients
172
    Warning: Model contains large rhs
173
         Consider reformulating model or setting NumericFocus parameter
174
         to avoid numerical issues.
175 Presolve removed 305128 rows and 255611 columns (presolve time = 5s) ...
176 Presolve removed 305128 rows and 255611 columns (presolve time = 10s) ...
177 Presolve removed 305128 rows and 255611 columns (presolve time = 15s) ...
178 Presolve removed 498317 rows and 271277 columns
179 Presolve time: 17.15s
    Presolved: 53941 rows, 12701 columns, 182064 nonzeros
180
181
    Variable types: 0 continuous, 12701 integer (12674 binary)
182
183
    Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
184
    Showing first log only...
185
186 Root relaxation presolved: 53921 rows, 12721 columns, 182004 nonzeros
187
188
189 Root simplex log...
190
191 Iteration Objective
                         Primal Inf. Dual Inf.
                                              Time
        0 5.7686703e+03 3.265000e+02 4.047642e+08
192
                                                     18s
193 Concurrent spin time: 0.14s
194
195 Solved with dual simplex (primal model)
196
197 Root relaxation: objective 5.768670e+03, 6266 iterations, 0.92 seconds (1.44 work units)
198
                                                  Work
199
      Nodes | Current Node | Objective Bounds
200
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
201
202
          0.5768.67026 0.29
                                 - 5768.67026
                                               - - 19s
203
       0
          0\ 5768.67026\quad 0\quad 72
                                 - 5768.67026
204 H 0
                       7608.6702574 5768.67026 24.2% - 21s
205 H 0
          0
                       7568.6702574 5768.67026 23.8%
       0 \quad 0.5768.67026 \quad 0.188.7568.67026.5768.67026.23.8\%
206
207
          22s
          0\ 5768.67026\quad 0\quad 83\ 7568.67026\ 5768.67026\ 23.8\%
208
209
       0
          0.5768.67026 0.318.7568.67026.5768.67026.23.8%
                                                            31s
          0\ 5768.67026\quad 0\quad 81\ 7568.67026\ 5768.67026\ 23.8\%
210
       0
                                                          - 34s
211 H 0
           0
                      7388.6702574 5768.67026 21.9%
          212
213
          0
                                                          - 36s
214 H 0 0
                      6808.6702574 5768.67026 15.3% - 39s
       0 0 5768.67026 0 96 6808.67026 5768.67026 15.3% - 40s
215
          0 5768.67026 0 93 6808.67026 5768.67026 15.3%
216
       0
                                                          - 40s
          0\ 5768.67026\quad 0\ 232\ 6808.67026\ 5768.67026\ 15.3\%
217
       0
                                                          - 41s
                                                           - 41s
218
          0 5768.67026 0 386 6808.67026 5768.67026 15.3%
219
       0
                                                           - 43s
220
       0
          0.5768.67026 0.364.6808.67026.5768.67026.15.3%
                                                          - 43s
221
       0
          - 46s
222
       0
          0.5768.67026 \quad 0.151\ 6808.67026\ 5768.67026\ 15.3\%
                                                          - 47s
223 H 0 0
                      5768.6702574 5768.67026 0.00% - 50s
          224
225
226 Cutting planes:
227
     Learned: 1
228
     Gomory: 2
229
     Cover: 62
230
     Implied bound: 37
231
     Clique: 735
232
     MIR: 46
233
     StrongCG: 34
234
     GUB cover: 15
235
     Zero half: 3
236
     RLT: 7
237
     Relax-and-lift: 28
238
     BOP: 24
239
240 Explored 1 nodes (125472 simplex iterations) in 50.96 seconds (71.19 work units)
241 Thread count was 8 (of 8 available processors)
242
243 Solution count 5: 5768.67 6808.67 7388.67 ... 7608.67
244
245 Optimal solution found (tolerance 5.00e-04)
246 Best objective 5.768670257367e+03, best bound 5.768670257367e+03, gap 0.0000%
    Set parameter MIPGap to value 1e-08
247
```

```
248 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
249
250 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
251 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
253 Optimize a model with 2481762 rows, 1955335 columns and 17236452 nonzeros
254 Model fingerprint: 0x73e2def3
255 Variable types: 963295 continuous, 992040 integer (985965 binary)
256 Coefficient statistics:
     Matrix range [1e-01, 1e+10]
257
258
     Objective range [6e-05, 5e+01]
259
      Bounds range [1e+00, 8e+01]
260
     RHS range
                    [8e-01, 1e+10]
261 Warning: Model contains large matrix coefficients
262 Warning: Model contains large rhs
          Consider reformulating model or setting NumericFocus parameter
263
          to avoid numerical issues.
264
265 Presolve removed 2477083 rows and 1953782 columns (presolve time = 5s) ...
266 Presolve removed 2477083 rows and 1953782 columns
267 Presolve time: 5.21s
268 Presolved: 4679 rows, 1553 columns, 12419 nonzeros
269 Variable types: 8 continuous, 1545 integer (897 binary)
270 Found heuristic solution: objective 3675.0646186
271
272 Root simplex log...
273
274 Iteration Objective
                          Primal Inf. Dual Inf.
        0 8.9524519e+03 3.695526e+03 0.000000e+00
275
276
       1583 5.3206703e+03 0.000000e+00 0.000000e+00
277
278 Root relaxation: objective 5.320670e+03, 1583 iterations, 0.01 seconds (0.02 work units)
279
280
       Nodes | Current Node | Objective Bounds
                                                       | Work
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
281
282
                         5320.6702574 13891.7410 161% - 6s
283 H 0 0
284
       0 0
                  - 0
                         5320.67026 5320.67026 0.00% - 6s
285
286 Explored 1 nodes (2262 simplex iterations) in 6.87 seconds (7.06 work units)
287
    Thread count was 8 (of 8 available processors)
288
289 Solution count 2: 5320.67 3675.06
290
291 Optimal solution found (tolerance 1.00e-08)
292 Best objective 5.320670257367e+03, best bound 5.320670257367e+03, gap 0.0000%
293 SP is solved
294 SP's optimal solution is' ☐ 5320
295
296 Itr = 1
297 Collect_LB = [712.0, 5768.6702573672555]
298 Collect UB = [10825.340514734511, 6032.6702573672555]
299 Collect_Hua = [0.0, 5056.6702573672555]
300 Collect SPObjVal = [5056.6702573672555, 5320.6702573672555]
301 Collect_MPObjValNHua = [712.0, 712.0]
302
303
304 Set parameter TimeLimit to value 12000
305 Set parameter MIPGap to value 0.0005
306 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
307
308 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
309 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
310
311 Optimize a model with 552259 rows, 283978 columns and 1530731 nonzeros
312 Model fingerprint: 0x2d4ad06b
313 Variable types: 1 continuous, 283977 integer (283941 binary)
314 Coefficient statistics:
315 Matrix range [1e+00, 1e+10]
316
     Objective range [1e+00, 2e+01]
      Bounds range [1e+00, 1e+00]
                   [1e+00, 2e+10]
318
     RHS range
319 Warning: Model contains large matrix coefficients
320 Warning: Model contains large rhs
321
          Consider reformulating model or setting NumericFocus parameter
          to avoid numerical issues
322
323 Presolve removed 305578 rows and 255677 columns (presolve time = 5s) ...
324 Presolve removed 305578 rows and 255677 columns (presolve time = 10s) ...
325 Presolve removed 305578 rows and 255677 columns (presolve time = 15s) ...
326 Presolve removed 447505 rows and 271325 columns (presolve time = 20s) ...
327 Presolve removed 498941 rows and 271325 columns
328 Presolve time: 20.69s
329 Presolved: 53318 rows, 12653 columns, 181007 nonzeros
330 Variable types: 0 continuous, 12653 integer (12626 binary)
331
```

```
332 Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
333 Showing first log only...
334
335 Root relaxation presolved: 53299 rows, 12672 columns, 180950 nonzeros
336
337
338 Root simplex log...
339
340 Iteration Objective
                           Primal Inf. Dual Inf.
        0 6.0326703e+03 3.243750e+02 4.038423e+08
341
342 Concurrent spin time: 0.16s
343
344 Solved with dual simplex (primal model)
345
Root relaxation: objective 6.032670e+03, 5942 iterations, 1.32 seconds (1.48 work units)
347
348
                                  Objective Bounds
      Nodes | Current Node |
                                                         Work
349
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
350
351
           0.6032.67026 \quad 0 \quad 39
                                    - 6032.67026
352
           0.6032.67026 0 71
                                    - 6032.67026
       0
                                                         27s
353
       0
           0 6032.67026 0 64
                                    - 6032.67026
                                                       - 27s
354
       0
           0.6032.67026 \quad 0.273
                                     - 6032.67026
355
       0
           0 6032.67026 0 262
                                     - 6032.67026
356
           0 6032.67026 0 119
                                     - 6032.67026
                                                        - 37s
       0
357
       0
           0.6032.67026 \quad 0.210
                                     - 6032.67026
                                                        - 37s
           0 6032.67026 0 224
358
                                     - 6032.67026
359
           0 6032.67026 0 213
                                    - 6032.67026
       0
                                                       - 53s
           0.6032.67026 \quad 0 \quad 77
360
       0
                                    - 6032.67026
                        9972.6702574 6032.67026 39.5% - 61s
361 H 0 0
362
       0 0 6032.67026 0 77 9972.67026 6032.67026 39.5% - 62s
                       7752.6702574 6032.67026 22.2% - 64s
363 H 0 0
364 H 0 0
                        6032.6702574 6032.67026 0.00%
       0 0 6032.67026 0 77 6032.67026 6032.67026 0.00%
365
366
367 Cutting planes:
368
     Learned: 4
369
     Cover: 15
     Implied bound: 406
370
371
     Clique: 275
     MIR: 91
373
     StrongCG: 40
     GUB cover: 4
374
375
     RLT: 14
     Relax-and-lift: 58
376
377
     BOP: 38
378
379 Explored 1 nodes (98657 simplex iterations) in 68.04 seconds (71.47 work units)
380 Thread count was 8 (of 8 available processors)
381
382 Solution count 3: 6032.67 7752.67 9972.67
383
384 Optimal solution found (tolerance 5.00e-04)
385 Best objective 6.032670257367e+03, best bound 6.032670257367e+03, gap 0.0000%
386
    Set parameter MIPGap to value 1e-08
387 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
388
389 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
390 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
391
392 Optimize a model with 2481762 rows, 1955335 columns and 17236452 nonzeros
393 Model fingerprint: 0xc551aa33
394 Variable types: 963295 continuous, 992040 integer (985965 binary)
395 Coefficient statistics:
     Matrix range [1e-01, 1e+10]
396
397
     Objective range [6e-05, 5e+01]
398
     Bounds range [1e+00, 8e+01]
399
     RHS range
                    [8e-01, 1e+10]
400 Warning: Model contains large matrix coefficients
401 Warning: Model contains large rhs
402
         Consider reformulating model or setting NumericFocus parameter
         to avoid numerical issues.
403
404 Presolve removed 2477053 rows and 1953772 columns (presolve time = 5s) ...
405 Presolve removed 2477059 rows and 1953772 columns
406 Presolve time: 5.47s
407 Presolved: 4703 rows, 1563 columns, 12438 nonzeros
408 Variable types: 8 continuous, 1555 integer (901 binary)
409 Found heuristic solution: objective 3687.8601380
410
411 Root simplex log...
412
413 Iteration Objective
                         Primal Inf. Dual Inf.
                                                  Time
        0 8.9924519e+03 3.690101e+03 0.000000e+00
414
       1269
             5.3328601e+03 0.000000e+00 0.000000e+00
415
```

```
unknown
416
417 Root relaxation: objective 5.332860e+03, 1269 iterations, 0.01 seconds (0.01 work units)
418
419
        Nodes | Current Node | Objective Bounds
                                                       Work
      Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
420
421
        0 0 5332.86014 0 5 3687.86014 5332.86014 44.6% - 6s
422
423 H 0 0
                          5312.8601380 5332.86014 0.38% - 6s
                          5332.8601380 5332.86014 0.00%
424 H 0 0
425
        0 0 5332.86014 0 5 5332.86014 5332.86014 0.00%
426
427 Explored 1 nodes (1866 simplex iterations) in 7.28 seconds (7.07 work units)
428 Thread count was 8 (of 8 available processors)
429
430 Solution count 3: 5332.86 5312.86 3687.86
431
432 Optimal solution found (tolerance 1.00e-08)
433 Best objective 5.332860137998e+03, best bound 5.332860137998e+03, gap 0.0000%
434 SP is solved
435 SP's optimal solution is' □ 5332
436
437 	ext{ Itr} = 2
438 Collect_LB = [712.0, 5768.6702573672555, 6032.6702573672555]
439 Collect UB = [10825.340514734511, 6032.6702573672555, 6032.6702573672555]
440 Collect_Hua = [0.0, 5056.6702573672555, 5320.6702573672555]
441 Collect_SPObjVal = [5056.6702573672555, 5320.6702573672555, 5332.8601379975335]
442 Collect MPObjValNHua = [712.0, 712.0, 712.0]
443
444
445
      Reach the termination conditions, stop iteration
446
      Values adopted from the Itr' th iteration, and Itr = \{2\}, judgeCount = \{2\}
447
448 ~~
               ~~~judge = 2, SPObj_SPF = 5332.8601379975335
     Vessel i: 0:
                   pi: 0-5, ai-di: 38-81, gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                                                      taoPi_SP-deltaPi_SP: 38-50,
449
                                                                                ai_SP-di: 38-81,
                                                                                                  taoi-deltai: 38-50,
                                                                                                                                                   betaNi:
     12, bi: 12
450 Vessel i: 1:
                                          gi_SP-gpi_SP: 0.000000-0.000000,
                                                                               ai_SP-di: 8-18, taoi-deltai: 8-13, taoPi_SP-deltaPi_SP: 11-13, betaNi: 5
                   pi: 0-5,
                            ai-di: 8-18,
         bi: 5
     Vessel i: 2:
                   pi: 5-11,
                              ai-di: 32-67,
                                             gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                 ai SP-di: 32-67,
                                                                                                   taoi-deltai: 32-53,
                                                                                                                       taoPi SP-deltaPi SP: 32-53,
                                                                                                                                                     betaNi
      : 21. bi: 21
     Vessel i: 3:
                   pi: 5-10,
                              ai-di: 12-38,
                                             gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                 ai_SP-di: 12-38,
                                                                                                    taoi-deltai: 12-25,
                                                                                                                       taoPi_SP-deltaPi_SP: 12-25,
                                                                                                                                                     betaNi
      : 13, bi: 13
                   pi: 13-18,
                                              gi SP-gpi SP: 0.000000-0.000000,
                                                                                  ai SP-di: 43-81,
                                                                                                                        taoPi SP-deltaPi SP: 43-54,
     Vessel i: 4:
                               ai-di: 43-81.
                                                                                                    taoi-deltai: 43-54.
                   bi: 11
     betaNi: 11.
     Vessel i: 5:
                   pi: 20-25,
                                ai-di: 11-45,
                                              gi_SP-gpi_SP: 0.000000-0.600000,
                                                                                  ai SP-di: 11-45,
                                                                                                    taoi-deltai: 11-26,
                                                                                                                        taoPi SP-deltaPi SP: 11-26,
      betaNi: 15,
                   bi: 15
455
     Vessel i: 6:
                   pi: 11-18,
                                ai-di: 3-60,
                                             gi_SP-gpi_SP: 1.000000-0.000000,
                                                                                 ai_SP-di: 11-60,
                                                                                                    taoi-deltai: 11-39,
                                                                                                                       taoPi_SP-deltaPi_SP: 11-39,
                                                                                                                                                     betaNi
            bi: 28
      : 28,
     Vessel i: 7:
                   pi: 18-23,
                                ai-di: 31-79,
                                              gi_SP-gpi_SP: 0.600000-1.000000,
                                                                                  ai_SP-di: 37-79,
                                                                                                     taoi-deltai: 35-39,
                                                                                                                         taoPi_SP-deltaPi_SP: 37-39,
     betaNi: 4,
                  bi: 4
                   pi: 28-34,
     Vessel i: 8:
                                ai-di: 19-68,
                                              gi SP-gpi SP: 0.800000-0.800000,
                                                                                  ai SP-di: 24-68,
                                                                                                    taoi-deltai: 26-41,
                                                                                                                        taoPi SP-deltaPi SP: 26-41,
     betaNi: 15,
                   bi: 15
458
459 round LB = [712, 5769, 6033]
460 round UB = [10825, 6033, 6033]
461 round Hua = [0, 5057, 5321]
     round SPObjVal = [5057, 5321, 5333]
462
463 round MPObjValNHua = [712, 712, 712]
464
465 OptimalObj = 6032.6702573672555
466 Time: 635.000000
467
468
469
470
```