```
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=27281
 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_CCG.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 360923 rows, 34789 columns and 1002717 nonzeros
19
     Model fingerprint: 0xa61a2c1f
     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 176910 rows and 12747 columns (presolve time = 5s) ...
31
     Presolve removed 307571 rows and 21407 columns
     Presolve time: 8.96s
     Presolved: 53352 rows, 13382 columns, 204541 nonzeros
34
      Variable types: 0 continuous, 13382 integer (13364 binary)
35
     Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
     Showing first log only...
37
38
39
     Root relaxation presolved: 53351 rows, 13383 columns, 204538 nonzeros
40
41
42
     Root simplex log...
43
44
     Iteration Objective
                                       Primal Inf. Dual Inf.
           0 1.1240000e+03 9.687500e+01 1.931714e+08
45
46
     Concurrent spin time: 0.03s
48
     Solved with dual simplex (primal model)
49
50
     Root relaxation: objective 8.040000e+02, 1859 iterations, 0.38 seconds (0.23 work units)
51
     Total elapsed time = 10.01s
52
53
         Nodes | Current Node | Objective Bounds |
                                                                                  Work
54
      Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
55
56
         0 0 804.00000 0 2
                                                   - 804.00000
                                   2244.0000000 804.00000 64.2% - 11s
57 H 0 0
                                   1364.0000000 804.00000 41.1%
58 H 0 0
59
         0 0 804.00000 0 19 1364.00000 804.00000 41.1% - 12s
                                    804.0000000 804.00000 0.00% - 14s
60 H 0 0
              0 804.00000 0 7 804.00000 804.00000 0.00%
62
63 Cutting planes:
64
       Cover: 122
65
       Implied bound: 610
66
       Clique: 3
67
       MIR: 4
68
       StrongCG: 3
69
       GUB cover: 1
70
       Zero half: 2
71
       Relax-and-lift: 19
73
     Explored 1 nodes (13323 simplex iterations) in 14.85 seconds (15.78 work units)
74
     Thread count was 8 (of 8 available processors)
76
     Solution count 3: 804 1364 2244
78
     Optimal solution found (tolerance 1.00e-10)
     Best objective 8.040000000000e+02, best bound 8.04000000000e+02, gap 0.0000%
```

```
Set parameter MIPGap to value 1e-08
 80
    Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
 83 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
 84 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
 85
 86 Optimize a model with 1153684 rows, 901813 columns and 7829291 nonzeros
 87 Model fingerprint: 0x84063345
    Variable types: 441325 continuous, 460488 integer (456438 binary)
 89 Coefficient statistics:
     Matrix range [1e-01, 1e+10]
 90
 91
      Objective range [6e-05, 5e+01]
      Bounds range [1e+00, 8e+01]
 93
     RHS range
                    [8e-01, 1e+10]
 94
    Warning: Model contains large matrix coefficients
    Warning: Model contains large rhs
          Consider reformulating model or setting NumericFocus parameter
 96
 97
          to avoid numerical issues.
 98 Presolve removed 1151313 rows and 900957 columns
    Presolve time: 2.74s
100 Presolved: 2371 rows, 856 columns, 6316 nonzeros
101 Variable types: 0 continuous, 856 integer (503 binary)
102 Found heuristic solution: objective 4207.6666667
103
Root relaxation: objective 5.149667e+03, 652 iterations, 0.01 seconds (0.01 work units)
105
106
       Nodes | Current Node | Objective Bounds
107 Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
108
109 *
                     0 5149.6666667 5149.66667 0.00% - 3s
110
111 Explored 1 nodes (652 simplex iterations) in 3.58 seconds (3.48 work units)
112 Thread count was 8 (of 8 available processors)
114 Solution count 2: 5149.67 4207.67
115
116 Optimal solution found (tolerance 1.00e-08)
117 Best objective 5.14966666667e+03, best bound 5.14966666667e+03, gap 0.0000%
118 SP is solved
119 SP's optimal solution is' □5149
120
121
     Itr = 0
122 Collect LB = [804.0]
123 Collect_UB = [11103.33333333333333]
124 Collect_Hua = [0.0]
125 Collect SPObjVal = [5149.66666666668]
126 Collect_MPObjValNHua = [804.0]
127
128
129 Set parameter MIPGap to value 0.05
130 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
131
132 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
133 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
134
135 Optimize a model with 619788 rows, 150727 columns and 1825935 nonzeros
136 Model fingerprint: 0x6b305609
137 Variable types: 1 continuous, 150726 integer (143124 binary)
138 Coefficient statistics:
139 Matrix range [1e-01, 1e+10]
140
     Objective range [1e+00, 2e+01]
141
      Bounds range [1e+00, 1e+00]
                    [1e+00, 2e+10]
     RHS range
143 Warning: Model contains large matrix coefficients
144 Warning: Model contains large rhs
145
          Consider reformulating model or setting NumericFocus parameter
146
          to avoid numerical issues.
147 Presolve removed 457892 rows and 131808 columns (presolve time = 5s) ...
148 Presolve removed 457892 rows and 131808 columns (presolve time = 10s) ...
149 Presolve removed 457892 rows and 131808 columns (presolve time = 15s) ...
150 Presolve removed 540701 rows and 140038 columns (presolve time = 20s) ...
151 Presolve removed 568819 rows and 140043 columns
152 Presolve time: 20.78s
153 Presolved: 50969 rows, 10684 columns, 198392 nonzeros
154 Variable types: 0 continuous, 10684 integer (8834 binary)
155
156 Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
157 Showing first log only...
158
159 Root relaxation presolved: 50969 rows, 10684 columns, 198392 nonzeros
160
161
162 Root simplex log...
163
```

```
164 Iteration Objective
                          Primal Inf. Dual Inf.
                                                  Time
165
        0 9.2400000e+02 2.328407e+03 1.517823e+09
166 Concurrent spin time: 0.17s
167
168 Solved with dual simplex (primal model)
169
170 Root relaxation: objective 6.073667e+03, 4608 iterations, 0.87 seconds (0.64 work units)
171
172
       Nodes | Current Node | Objective Bounds
                                                        Work
173
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
174
175
           0 6073.66667 0 151
                                     - 6073.66667
                                                       - 23s
176
       0
           0 6073.66667 0 427
                                     - 6073.66667
                                                       - 27s
177
                                     - 6073.66667
                                                       - 27s
       0
           0.6073.66667 0.570
178
       0
           0 6073.66667
                         0 493
                                     - 6073.66667
                                                          28s
179
           0 6073.66667 0 491
                                     - 6073.66667
180
       0
           0 6073.66667 0 402
                                    - 6073.66667
                                                       - 29s
                                                       - 33s
           0.6073.66667 0.133
                                    - 6073.66667
181
       0
182
           0 6073.66667 0 133
                                    - 6073.66667
                                                       - 33s
183
       0
           0 6073.66667 0 244
                                     - 6073.66667
                                                       - 34s
                                                       - 43s
184
           0 6073.66667 0 117
       0
                                    - 6073.66667
185
       0
           0 6073.66667 0 97
                                    - 6073.66667
                                                   - - 43s
186
       0
           0 6073.66667 0 152
                                                       - 45s
                                    - 6073.66667
           0 6073.66667 0 148
187
       0
                                     - 6073.66667
                                                       - 45s
188 H 0 0
                       6073.6666667 6073.66667 0.00% - 53s
189
       0 0 6073.66667 0 202 6073.66667 6073.66667 0.00%
190
191 Cutting planes:
192
      Gomory: 10
193
      Cover: 407
194
      Implied bound: 825
195
      Clique: 1465
196
      MIR: 194
197
      StrongCG: 15
198
     Flow cover: 2
199
      GUB cover: 41
200
      Zero half: 30
201
      RLT: 35
202
      Relax-and-lift: 890
203
      BQP: 18
204
      PSD: 1
205
206 Explored 1 nodes (48234 simplex iterations) in 53.14 seconds (37.31 work units)
207 Thread count was 8 (of 8 available processors)
208
209 Solution count 1: 6073.67
210
211 Optimal solution found (tolerance 5.00e-02)
212 Best objective 6.073666666667e+03, best bound 6.073666666667e+03, gap 0.0000%
213 Set parameter MIPGap to value 1e-08
214 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
215
216 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
217 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
218
219 Optimize a model with 1153684 rows, 901813 columns and 7829291 nonzeros
220 Model fingerprint: 0x03399a85
221 Variable types: 441325 continuous, 460488 integer (456438 binary)
222 Coefficient statistics:
223
    Matrix range [1e-01, 1e+10]
     Objective range [6e-05, 5e+01]
224
225
      Bounds range [1e+00, 8e+01]
226
                    [8e-01, 1e+10]
     RHS range
227
     Warning: Model contains large matrix coefficients
228 Warning: Model contains large rhs
229
          Consider reformulating model or setting NumericFocus parameter
230
          to avoid numerical issues.
231 Presolve removed 1148884 rows and 900158 columns
232 Presolve time: 2.71s
233 Presolved: 4800 rows, 1655 columns, 12735 nonzeros
234 Variable types: 4 continuous, 1651 integer (960 binary)
235 Found heuristic solution: objective 3772.8300722
236
237 Root relaxation: objective 5.402667e+03, 1384 iterations, 0.02 seconds (0.01 work units)
238
239
       Nodes | Current Node | Objective Bounds
                                                        Work
240
    Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
241
242 H 0 0
                        5402.6666667 14440.0000 167% - 3s
243
       0 0
                  - 0
                         5402.66667 5402.66667 0.00% - 3s
244
245 Explored 1 nodes (1986 simplex iterations) in 3.60 seconds (3.30 work units)
246 Thread count was 8 (of 8 available processors)
247
```

```
248 Solution count 2: 5402.67 3772.83
249
250 Optimal solution found (tolerance 1.00e-08)
251 Best objective 5.402666666667e+03, best bound 5.40266666667e+03, gap 0.0000%
253 SP's optimal solution is' ☐ 5402
254
255 Itr = 1
256 Collect_LB = [804.0, 6073.666666666666]
257 Collect_UB = [11103.33333333336, 6326.66666666668]
258 Collect_Hua = [0.0, 5149.66666666666]
259 Collect_SPObjVal = [5149.6666666668, 5402.6666666668]
260 Collect MPObjValNHua = [804.0, 924.0]
261
262
263 Set parameter MIPGap to value 0.05
264 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
265
266 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
267
    Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
268
269 Optimize a model with 872342 rows, 163849 columns and 2642827 nonzeros
270 Model fingerprint: 0x2336ce8c
271 Variable types: 1 continuous, 163848 integer (148668 binary)
272 Coefficient statistics:
273
     Matrix range [1e-01, 1e+10]
      Objective range [1e+00, 2e+01]
274
      Bounds range [1e+00, 1e+00]
275
276
      RHS range
                    [1e+00, 2e+10]
277
     Warning: Model contains large matrix coefficients
278 Warning: Model contains large rhs
279
          Consider reformulating model or setting NumericFocus parameter
280
          to avoid numerical issues.
281 Presolve removed 670594 rows and 139786 columns (presolve time = 5s) ...
282 Presolve removed 681093 rows and 140834 columns (presolve time = 10s) ...
283 Presolve removed 681093 rows and 140834 columns (presolve time = 15s) ...
284 Presolve removed 768112 rows and 148889 columns
285 Presolve time: 17.62s
286 Presolved: 104230 rows, 14960 columns, 337457 nonzeros
287
     Variable types: 0 continuous, 14960 integer (11278 binary)
288
289 Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
290 Showing first log only...
291
292 Root relaxation presolved: 14960 rows, 119190 columns, 352417 nonzeros
293
294
295 Root simplex log...
296
297 Iteration Objective
                           Primal Inf. Dual Inf.
                                                 Time
        0 6.3266667e+03 0.000000e+00 6.277989e+04
298
299 Concurrent spin time: 0.50s
300
301
    Solved with dual simplex (primal model)
302
303 Root relaxation: objective 6.326667e+03, 6079 iterations, 2.04 seconds (1.63 work units)
304
305
       Nodes | Current Node | Objective Bounds

↓ Work

306
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
307
           0 6326.66667 0 115
308
                                     - 6326,66667
                                                       - 23s
309
       0
           0 6326.66667
                         0.607
                                     - 6326.66667
                                                         27s
310
           0 6326.66667
                         0 521
                                     - 6326.66667
311
       0
           0 6326.66667 0 699
                                     - 6326.66667
                                                          30s
312
       0
           0 6326.66667 0 688
                                     - 6326.66667
                                                         30s
313
           0 6326.66667
                         0 106
                                     - 6326.66667
                                                          34s
314
       0
           0 6326.66667
                         0 105
                                     - 6326.66667
                                                          34s
           0 6326.66667
                                                       - 35s
315
       0
                         0.155
                                    - 6326.66667
316
       0
           0 6326.66667
                         0 77
                                    - 6326.66667
                                                       - 38s
317
           0 6326.66667
                         0 112
                                     - 6326.66667
                                                         38s
           0 6326.66667 0 228
                                                       - 40s
318
       0
                                     - 6326.66667
319
       0
           0 6326.66667 0 258
                                     - 6326.66667
                                                       - 40s
320
       0
           0 6326.66667
                         0 130
                                     - 6326.66667
                                                       - 43s
321
           0 6326.66667
                         0 133
                                     - 6326.66667
                                                      - 44s
322
           0.6326.66667
                                    - 6326 66667
                                                   - - 46s
       0
                         0 72
323
       0
           2 6326.66667
                         0 70
                                    - 6326.66667
                                                   - - 53s
324
           4 6326.66667 1 136
                                     - 6326.66667
                                                    - 5278 55s
325
       7
           12 6326.66667 3 183
                                     - 6326.66667
                                                    - 3235 60s
326
       15
           20 6326.66667 4 369
                                                    - 2722 67s
                                      - 6326.66667
327
       23
           28 6326.66667 6 497
                                      - 6326.66667
                                                     - 2714 70s
328
       33
           38 6326.66667
                           7 518
                                      - 6326.66667
                                                     - 2566
                                                             76s
329
       37
           48 6326.66667
                          7 510
                                      - 6326.66667
                                                     - 3102 81s
330
       47
           83 6326.66667 11 125
                                      - 6326.66667
                                                      - 3380 90s
      102
           144 6326.66667 29 31
                                       - 6326.66667
                                                      - 2174 102s
331
```

```
332 * 148 144
                       72 6326.6666667 6326.66667 0.00% 1502 102s
333
334 Cutting planes:
335
     Learned: 1
336
     Gomory: 6
337
      Cover: 412
     Implied bound: 66
338
339
      Clique: 2611
340
      MIR: 94
      StrongCG: 26
341
342
      Flow cover: 4
343
      GUB cover: 41
344
      Zero half: 37
345
      RLT: 46
346
      Relax-and-lift: 623
      BQP: 22
347
348
      PSD: 4
349
350 Explored 201 nodes (325493 simplex iterations) in 102.36 seconds (153.47 work units)
351 Thread count was 8 (of 8 available processors)
352
353 Solution count 1: 6326.67
354
355 Optimal solution found (tolerance 5.00e-02)
356 Best objective 6.32666666667e+03, best bound 6.32666666667e+03, gap 0.0000%
357 Warning: linear constraint 367235 and linear constraint 619789 have the same name "ConSP25_1[0,0]"
358 Set parameter MIPGap to value 1e-08
359 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
360
361 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
362 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
363
364 Optimize a model with 1153684 rows, 901813 columns and 7829291 nonzeros
365 Model fingerprint: 0xc36b8a52
366 Variable types: 441325 continuous, 460488 integer (456438 binary)
367 Coefficient statistics:
368
     Matrix range [1e-01, 1e+10]
369
     Objective range [6e-05, 5e+01]
     Bounds range [1e+00, 8e+01]
370
371
      RHS range
                    [8e-01, 1e+10]
372 Warning: Model contains large matrix coefficients
373 Warning: Model contains large rhs
374
          Consider reformulating model or setting NumericFocus parameter
375
          to avoid numerical issues.
376 Presolve removed 1148165 rows and 899983 columns
377 Presolve time: 2.96s
378 Presolved: 5519 rows, 1830 columns, 14680 nonzeros
379 Variable types: 4 continuous, 1826 integer (1050 binary)
380 Found heuristic solution: objective 3825.2733636
381
382 Root relaxation: objective 5.402667e+03, 1469 iterations, 0.02 seconds (0.02 work units)
383
384
       Nodes | Current Node | Objective Bounds
                                                      Work
385
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
386
                         5402.6666667 16220.0000 200% - 3s
387 H 0 0
                        5402.66667 5402.66667 0.00% - 3s
388
                  - 0
389
390 Explored 1 nodes (1867 simplex iterations) in 4.10 seconds (3.29 work units)
391 Thread count was 8 (of 8 available processors)
392
393 Solution count 2: 5402.67 3825.27
394
395 Optimal solution found (tolerance 1.00e-08)
396 Best objective 5.402666666667e+03, best bound 5.402666666667e+03, gap 0.0000%
397 SP is solved
398 SP's optimal solution is' ☐ 5402
399
400 	ext{ Itr} = 2
401 Collect_LB = [804.0, 6073.66666666666, 6326.66666666666]
402 Collect_UB = [11103.33333333336, 6326.66666666668, 6326.6666666668]
403 Collect_Hua = [0.0, 5149.66666666666, 5402.666666666666]
404 Collect_SPObjVal = [5149.66666666668, 5402.6666666668, 5402.666666668]
405 Collect MPObjValNHua = [804.0, 924.0, 924.0]
406
407
408
     Reach the termination conditions, stop iteration
409
     Values adopted from the Itr' th iteration, and Itr = \{2\}, judgeCount = \{2\}
410
                 -judge = 2, SPObj_SPF = 5402.6666666668
411
                  pi: 7-13, ai-di: 3-37, gi SP-gpi SP: 0.000000-0.000000, ai SP-di: 3-37, taoi-deltai: 3-35, taoPi SP-deltaPi SP: 3-35, betaNi: 32
412 Vessel i: 0:
        bi: 32
                  pi: 13-20, ai-di: 17-33, gi_SP-gpi_SP: 0.000000-0.000000, ai_SP-di: 17-33, taoi-deltai: 17-31, taoPi_SP-deltaPi_SP: 17-31,
    Vessel i: 1:
     betaNi: 14,
                  bi: 14
```

```
414 Vessel i: 2:
                   pi: 20-26,
                                ai-di: 23-49,
                                               gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                   ai_SP-di: 23-49,
                                                                                                      taoi-deltai: 23-47,
                                                                                                                          taoPi_SP-deltaPi_SP: 23-47,
     betaNi: 24,
                   bi: 24
415
     Vessel i: 3:
                   pi: 11-17,
                                ai-di: 41-57,
                                              gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                   ai_SP-di: 41-57,
                                                                                                      taoi-deltai: 41-55,
                                                                                                                          taoPi_SP-deltaPi_SP: 41-55,
     betaNi: 14,
                   bi: 14
     Vessel i: 4:
                   pi: 17-23,
                                ai-di: 50-74,
                                               gi_SP-gpi_SP: 0.200000-1.000000,
                                                                                   ai SP-di: 51-74,
                                                                                                      taoi-deltai: 51-73,
                                                                                                                          taoPi_SP-deltaPi_SP: 51-73,
     betaNi: 22,
                   bi: 22
417
                                ai-di: 51-75,
                                              gi_SP-gpi_SP: 1.000000-0.200000,
                                                                                   ai_SP-di: 58-75,
                                                                                                      taoi-deltai: 59-81,
                                                                                                                          taoPi_SP-deltaPi_SP: 59-81,
     Vessel i: 5:
                   pi: 10-17,
     betaNi: 22,
                   bi: 22
418
419 round LB = [804, 6074, 6327]
420 round UB = [11103, 6327, 6327]
421 round Hua = [0, 5150, 5403]
422 round SPObjVal = [5150, 5403, 5403]
423 round MPObjValNHua = [804, 924, 924]
424
425 Time: 495.000000
426
427
428
429
```