```
"E:\1 □□□□\3 □□□□□\1 □□□□□□\1 □□□□□□□□\1_□□□□□□_□□□□\1_LW _□□□□\4 □□□□\3 python_code\1 exzample\2 □□□□□□\9 Code for 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=50057

import sys; print('Python %s on %s' % (sys.version, sys.platform))
sys.path.extend(['E:\\1 □□□□\\3 □□□□□\\1 □□□□□□\\1 □□□□□□□□\\1_□□□□□□_□□□□\\1_LW _□□□□\\4 □□□□\\3 python_code\\9 Code for this paper', 'E:/1 □□□□/3 □□□□□/1 □□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□/4 □□□□/3 python_code/9 Code for this paper'])

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
>>> runfile('E:/1 □□□□/3 □□□□□/1 □□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□/4 □□□□/3 python_code/9 Code for this paper/main_RO_CCG.py', wdir='E:/1 □□□□/3 □□□□□/1 □□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□/4 □□□□/3 python_code/9 Code for this paper')
Backend TkAgg is interactive backend. Turning interactive mode on.
Waiting 5s.....
Set parameter MIPGap to value 1e-10
Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)

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

Optimize a model with 557467 rows, 58701 columns and 1576383 nonzeros
Model fingerprint: 0xaf759b0a
Variable types: 1 continuous, 58700 integer (58660 binary)
Coefficient statistics:
  Matrix range     [1e+00, 1e+10]
  Objective range  [1e+00, 2e+01]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 2e+10]
Warning: Model contains large matrix coefficients
Warning: Model contains large rhs
         Consider reformulating model or setting NumericFocus parameter
         to avoid numerical issues.
Presolve removed 342574 rows and 28008 columns (presolve time = 5s) ...
Presolve removed 342574 rows and 28008 columns (presolve time = 10s) ...
Presolve removed 444834 rows and 38927 columns
Presolve time: 11.74s
Presolved: 112633 rows, 19774 columns, 307906 nonzeros
Variable types: 0 continuous, 19774 integer (19744 binary)

Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
Showing first log only...

Root relaxation presolved: 19774 rows, 132407 columns, 327680 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    6.4900000e+02   0.000000e+00   9.500000e+02     13s
Concurrent spin time: 0.00s

Solved with dual simplex (primal model)

Root relaxation: objective 6.490000e+02, 2260 iterations, 0.72 seconds (0.44 work units)

    Nodes    |    Current Node    |     Objective Bounds      |     Work
 Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

     0     0  649.00000    0   28          -  649.00000      -     -   14s
     0     0  649.00000    0   91          -  649.00000      -     -   15s
     0     0  649.00000    0   84          -  649.00000      -     -   15s
H    0     0                4029.0000000  649.00000  83.9%     -   16s
H    0     0                1789.0000000  649.00000  63.7%     -   16s
H    0     0                 709.0000000  649.00000  8.46%     -   16s
     0     0  649.00000    0  188  709.00000  649.00000  8.46%     -   17s
     0     0  649.00000    0   15  709.00000  649.00000  8.46%     -   21s
H    0     0                 649.0000000  649.00000  0.00%     -   21s

Cutting planes:
  Gomory: 3
  Cover: 75
  Implied bound: 1
  MIR: 49
  StrongCG: 50
  GUB cover: 1
  Zero half: 4
  Relax-and-lift: 3

Explored 1 nodes (10906 simplex iterations) in 22.21 seconds (29.16 work units)
Thread count was 8 (of 8 available processors)

Solution count 4: 649 709 1789 4029
```

```
Optimal solution found (tolerance 1.00e-10)
Best objective 6.490000000000e+02, best bound 6.490000000000e+02, gap 0.0000%
Set parameter MIPGap to value 1e-08
Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)

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

Optimize a model with 3035470 rows, 2395885 columns and 21184668 nonzeros
Model fingerprint: 0x906aec28
Variable types: 1181973 continuous, 1213912 integer (1207162 binary)
Coefficient statistics:
  Matrix range     [1e-01, 1e+10]
  Objective range  [6e-05, 5e+01]
  Bounds range     [1e+00, 8e+01]
  RHS range        [8e-01, 1e+10]
Warning: Model contains large matrix coefficients
Warning: Model contains large rhs
         Consider reformulating model or setting NumericFocus parameter
         to avoid numerical issues.
Presolve removed 3032023 rows and 2394662 columns (presolve time = 5s) ...
Presolve removed 3033149 rows and 2394999 columns
Presolve time: 6.22s
Presolved: 2321 rows, 886 columns, 6181 nonzeros
Variable types: 10 continuous, 876 integer (524 binary)
Found heuristic solution: objective 3987.9062900

Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    8.4772222e+03   2.469038e+03   0.000000e+00      8s
     734    5.0084444e+03   0.000000e+00   0.000000e+00      8s

Root relaxation: objective 5.008444e+03, 734 iterations, 0.01 seconds (0.01 work units)

    Nodes    |    Current Node    |     Objective Bounds      |     Work
 Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

     0     0 5008.44444    0   38 3987.90629 5008.44444  25.6%     -    7s
H    0     0                4071.6766934 5008.44444  23.0%     -    7s
H    0     0                4115.0100267 5008.44444  21.7%     -    7s
     0     0 5008.44444    0   19 4115.01003 5008.44444  21.7%     -    7s
H    0     0                5004.9115810 5008.44444  0.07%     -    7s
H    0     0                5007.5041736 5008.44444  0.02%     -    7s
     0     0 5008.30159    0   12 5007.50417 5008.30159  0.02%     -    7s
     0     0 5008.30159    0   10 5007.50417 5008.30159  0.02%     -    7s
H    0     0                5008.3015873 5008.30159  0.00%     -    8s

Cutting planes:
  Learned: 1
  Cover: 12
  Implied bound: 19
  Clique: 8
  MIR: 11
  Zero half: 2
  RLT: 2
  Relax-and-lift: 16

Explored 1 nodes (1461 simplex iterations) in 8.33 seconds (8.99 work units)
Thread count was 8 (of 8 available processors)

Solution count 6: 5008.3 5007.5 5004.91 ... 3987.91

Optimal solution found (tolerance 1.00e-08)
Best objective 5.008301587302e+03, best bound 5.008301587302e+03, gap 0.0000%
SP is solved
SP's optimal solution is'□5008

 Itr = 0
Collect_LB =   [649.0]
Collect_UB =   [10665.603174603173]
Collect_Hua =   [0.0]
Collect_SPObjVal =   [5008.301587301587]
Collect_MPObjValNHua =   [649.0]


Set parameter MIPGap to value 0.05
Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)

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

Optimize a model with 1220537 rows, 366171 columns and 3647638 nonzeros
```

```
Model fingerprint: 0xdd4eae35
Variable types: 1 continuous, 366170 integer (353500 binary)
Coefficient statistics:
  Matrix range     [1e-01, 1e+10]
  Objective range  [1e+00, 2e+01]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 2e+10]
Warning: Model contains large matrix coefficients
Warning: Model contains large rhs
         Consider reformulating model or setting NumericFocus parameter
         to avoid numerical issues.
Presolve removed 1014941 rows and 340355 columns (presolve time = 5s) ...
Presolve removed 1049608 rows and 343084 columns (presolve time = 10s) ...
Presolve removed 1111170 rows and 350920 columns
Presolve time: 14.86s
Presolved: 109367 rows, 15251 columns, 341893 nonzeros
Variable types: 1 continuous, 15250 integer (12772 binary)

Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
Showing first log only...

Root relaxation presolved: 15251 rows, 124618 columns, 357144 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    5.6644444e+03   0.000000e+00   2.920602e+04     16s
   14924    5.6644444e+03   0.000000e+00   0.000000e+00     17s
   14924    5.6644444e+03   0.000000e+00   0.000000e+00     17s
Concurrent spin time: 0.32s

Solved with primal simplex

Root relaxation: objective 5.664444e+03, 14924 iterations, 1.93 seconds (2.77 work units)
Total elapsed time = 20.05s

     Nodes    |    Current Node    |     Objective Bounds      |     Work
  Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

     0     0 5664.44444    0  389          - 5664.44444      -     -   21s
     0     0 5664.44444    0  389          - 5664.44444      -     -   21s
     0     0 5664.44444    0  402          - 5664.44444      -     -   21s
     0     0 5664.44444    0  391          - 5664.44444      -     -   21s
     0     0 5664.44444    0  767          - 5664.44444      -     -   24s
     0     0 5664.44444    0  754          - 5664.44444      -     -   24s
     0     0 5664.44444    0  650          - 5664.44444      -     -   26s
     0     0 5664.44444    0  592          - 5664.44444      -     -   26s
     0     0 5664.44444    0  380          - 5664.44444      -     -   33s
     0     0 5664.44444    0  368          - 5664.44444      -     -   34s
     0     0 5664.44444    0  441          - 5664.44444      -     -   42s
     0     0 5664.44444    0  503          - 5664.44444      -     -   44s
     0     0 5664.44444    0  427          - 5664.44444      -     -   52s
     0     0 5664.44444    0  371          - 5664.44444      -     -   53s
H    0     0                    5664.4444444 5664.44444  0.00%     -   64s
     0     0 5664.44444    0  371 5664.44444 5664.44444  0.00%     -   64s

Cutting planes:
  Learned: 2
  Gomory: 2
  Cover: 421
  Implied bound: 506
  Clique: 773
  MIR: 65
  StrongCG: 19
  Flow cover: 4
  GUB cover: 25
  Zero half: 7
  RLT: 44
  Relax-and-lift: 275
  BQP: 31

Explored 1 nodes (142560 simplex iterations) in 64.21 seconds (166.74 work units)
Thread count was 8 (of 8 available processors)

Solution count 1: 5664.44

Optimal solution found (tolerance 5.00e-02)
Best objective 5.664444444444e+03, best bound 5.664444444444e+03, gap 0.0000%
Set parameter MIPGap to value 1e-08
Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)

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
```

```
248
249  Optimize a model with 3035470 rows, 2395885 columns and 21184668 nonzeros
250  Model fingerprint: 0xb434f964
251  Variable types: 1181973 continuous, 1213912 integer (1207162 binary)
252  Coefficient statistics:
253    Matrix range     [1e-01, 1e+10]
254    Objective range  [6e-05, 5e+01]
255    Bounds range     [1e+00, 8e+01]
256    RHS range        [8e-01, 1e+10]
257  Warning: Model contains large matrix coefficients
258  Warning: Model contains large rhs
259           Consider reformulating model or setting NumericFocus parameter
260           to avoid numerical issues.
261  Presolve removed 3030928 rows and 2394307 columns (presolve time = 5s) ...
262  Presolve removed 3030986 rows and 2394324 columns
263  Presolve time: 5.80s
264  Presolved: 4484 rows, 1561 columns, 11921 nonzeros
265  Variable types: 10 continuous, 1551 integer (916 binary)
266  Found heuristic solution: objective 4081.0564092
267
268  Root simplex log...
269
270  Iteration    Objective       Primal Inf.    Dual Inf.      Time
271         0    1.0648222e+04   4.021325e+03   0.000000e+00      7s
272      1367    5.8024444e+03   0.000000e+00   0.000000e+00      7s
273
274  Root relaxation: objective 5.802444e+03, 1367 iterations, 0.01 seconds (0.01 work units)
275
276      Nodes    |    Current Node    |     Objective Bounds      |     Work
277   Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time
278
279       0     0 5802.44444    0   29 4081.05641 5802.44444  42.2%     -    7s
280  H    0     0                5462.3314436 5802.44444  6.23%     -    7s
281       0     0 5802.44444    0   21 5462.33144 5802.44444  6.23%     -    7s
282  H    0     0                5802.0420358 5802.44444  0.01%     -    7s
283  H    0     0                5802.2686653 5802.44444  0.00%     -    7s
284  H    0     0                5802.3314436 5802.44444  0.00%     -    7s
285       0     0 5802.44444    0   13 5802.33144 5802.44444  0.00%     -    7s
286       0     0 5802.44444    0    8 5802.33144 5802.44444  0.00%     -    7s
287       0     0 5802.44444    0    3 5802.33144 5802.44444  0.00%     -    7s
288  H    0     0                5802.4444444 5802.44444  0.00%     -    7s
289
290  Explored 1 nodes (2051 simplex iterations) in 7.89 seconds (8.61 work units)
291  Thread count was 8 (of 8 available processors)
292
293  Solution count 6: 5802.44 5802.33 5802.27 ... 4081.06
294
295  Optimal solution found (tolerance 1.00e-08)
296  Best objective 5.802444444444e+03, best bound 5.802444444444e+03, gap 0.0000%
297  SP is solved
298  SP's optimal solution is'□5802
299
300    Itr = 1
301  Collect_LB =   [649.0, 5664.444444444443]
302  Collect_UB =   [10665.603174603173, 6458.587301587302]
303  Collect_Hua =   [0.0, 5008.301587301587]
304  Collect_SPObjVal =   [5008.301587301587, 5802.444444444445]
305  Collect_MPObjValNHua =   [649.0, 656.1428571428569]
306
307
308  Set parameter MIPGap to value 0.05
309  Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
310
311  CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
312  Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
313
314  Optimize a model with 1874576 rows, 388041 columns and 5709817 nonzeros
315  Model fingerprint: 0x4359ac0d
316  Variable types: 1 continuous, 388040 integer (362740 binary)
317  Coefficient statistics:
318    Matrix range     [1e-01, 1e+10]
319    Objective range  [1e+00, 2e+01]
320    Bounds range     [1e+00, 1e+00]
321    RHS range        [1e+00, 2e+10]
322  Warning: Model contains large matrix coefficients
323  Warning: Model contains large rhs
324           Consider reformulating model or setting NumericFocus parameter
325           to avoid numerical issues.
326  Presolve removed 1601563 rows and 355589 columns (presolve time = 5s) ...
327  Presolve removed 1658364 rows and 360770 columns (presolve time = 10s) ...
328  Presolve removed 1667407 rows and 361529 columns (presolve time = 16s) ...
329  Presolve removed 1704406 rows and 367164 columns (presolve time = 20s) ...
330  Presolve removed 1711492 rows and 367164 columns
331  Presolve time: 20.49s
```

```
Presolved: 163084 rows, 20877 columns, 536262 nonzeros
Variable types: 1 continuous, 20876 integer (15974 binary)

Deterministic concurrent LP optimizer: primal simplex, dual simplex, and barrier
Showing barrier log only...

Root relaxation presolved: 20877 rows, 183961 columns, 557139 nonzeros

Root barrier log...

Ordering time: 2.44s

Barrier statistics:
 Dense cols : 32
 Free vars  : 769
 AA' NZ     : 6.006e+05
 Factor NZ  : 2.022e+07 (roughly 240 MB of memory)
 Factor Ops : 4.862e+10 (roughly 1 second per iteration)
 Threads    : 1

                  Objective                Residual
Iter       Primal          Dual         Primal    Dual     Compl     Time
   0  -7.35797780e+07  3.21168556e+04  2.77e+04 1.11e+03  7.73e+04    27s

Barrier performed 0 iterations in 26.52 seconds (46.92 work units)
Barrier solve interrupted - model solved by another algorithm

Concurrent spin time: 1.28s (can be avoided by choosing Method=3)

Solved with primal simplex

Root relaxation: objective 6.461444e+03, 23618 iterations, 5.48 seconds (6.82 work units)
Total elapsed time = 31.61s

     Nodes    |    Current Node    |     Objective Bounds      |     Work
  Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

     0     0 6461.44444    0  717          - 6461.44444      -     -   35s
     0     0 6461.44444    0  733          - 6461.44444      -     -   35s
     0     0 6461.44444    0  733          - 6461.44444      -     -   35s
     0     0 6461.44444    0 1194          - 6461.44444      -     -   44s
     0     0 6461.44444    0 1194          - 6461.44444      -     -   51s
     0     0 6461.44444    0  646          - 6461.44444      -     -   68s
     0     0 6461.44444    0  744          - 6461.44444      -     -   74s
     0     0 6461.44444    0  599          - 6461.44444      -     -   89s
     0     0 6461.44444    0  554          - 6461.44444      -     -   94s
     0     0 6461.44444    0  604          - 6461.44444      -     -  104s
     0     0 6461.44444    0  498          - 6461.44444      -     -  106s
     0     0 6461.44444    0  438          - 6461.44444      -     -  116s
     0     0 6461.44444    0  520          - 6461.44444      -     -  118s
     0     0 6461.44444    0  223          - 6461.44444      -     -  126s
     0     0 6461.44444    0  223          - 6461.44444      -     -  127s
     0     0 6461.44444    0  223          - 6461.44444      -     -  132s
     0     0 6461.44444    0  193          - 6461.44444      -     -  134s
     0     2 6461.44444    0  193          - 6461.44444      -     -  144s
     1     4 6461.44444    1  333          - 6461.44444      -  3952  146s
     3     8 6461.44444    2  343          - 6461.44444      -  3043  156s
    11    16 6461.44444    3  523          - 6461.44444      -  3339  161s
    19    24 6461.44444    5  477          - 6461.44444      -  2805  166s
    27    32 6461.44444    6  557          - 6461.44444      -  2953  170s
    31    37 6461.44444    6  492          - 6461.44444      -  3042  181s
    36    56 6461.44444    7  594          - 6461.44444      -  4636  196s
    56   110 6461.44444   11  283          - 6461.44444      -  4886  220s
   129   197 6461.44444   49  335          - 6461.44444      -  3410  255s
   303   379 6481.44444  129  432          - 6461.44444      -  2043  290s
   571   648 6481.44444  265  400          - 6461.44444      -  1294  318s
   900   867 6481.44444  408  337          - 6461.44444      -   915  342s
H  970   430                6481.4444444 6461.44444  0.31%   856  342s

Cutting planes:
  Learned: 9
  Gomory: 6
  Cover: 975
  Implied bound: 1278
  Clique: 2897
  MIR: 512
  StrongCG: 136
  Flow cover: 39
  GUB cover: 139
  Zero half: 52
  RLT: 169
  Relax-and-lift: 624
  BQP: 74
  PSD: 2
```

```
416
417  Explored 1217 nodes (1193463 simplex iterations) in 342.92 seconds (952.67 work units)
418  Thread count was 8 (of 8 available processors)
419
420  Solution count 1: 6481.44
421
422  Optimal solution found (tolerance 5.00e-02)
423  Best objective 6.481444444444e+03, best bound 6.461444444444e+03, gap 0.3086%
424  Warning: linear constraint 566499 and linear constraint 1220538 have the same name "ConSP25_1[0,0]"
425  Set parameter MIPGap to value 1e-08
426  Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
427
428  CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
429  Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
430
431  Optimize a model with 3035470 rows, 2395885 columns and 21184668 nonzeros
432  Model fingerprint: 0x32f9e72f
433  Variable types: 1181973 continuous, 1213912 integer (1207162 binary)
434  Coefficient statistics:
435    Matrix range     [1e-01, 1e+10]
436    Objective range  [6e-05, 5e+01]
437    Bounds range     [1e+00, 8e+01]
438    RHS range        [8e-01, 1e+10]
439  Warning: Model contains large matrix coefficients
440  Warning: Model contains large rhs
441           Consider reformulating model or setting NumericFocus parameter
442           to avoid numerical issues.
443  Presolve removed 3030053 rows and 2394143 columns (presolve time = 5s) ...
444  Presolve removed 3030081 rows and 2394151 columns
445  Presolve time: 5.74s
446  Presolved: 5389 rows, 1734 columns, 14476 nonzeros
447  Variable types: 10 continuous, 1724 integer (1002 binary)
448
449  Root simplex log...
450
451  Iteration    Objective       Primal Inf.    Dual Inf.      Time
452         0    1.0384000e+04   5.309060e+03   0.000000e+00      7s
453      1447    5.8204444e+03   0.000000e+00   0.000000e+00      7s
454
455  Root relaxation: objective 5.820444e+03, 1447 iterations, 0.02 seconds (0.01 work units)
456
457      Nodes    |    Current Node    |     Objective Bounds      |     Work
458   Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time
459
460       0     0 5820.44444    0   18          - 5820.44444      -     -    7s
461  H    0     0                    5820.4444444 5820.44444  0.00%     -    7s
462
463  Explored 1 nodes (2036 simplex iterations) in 7.67 seconds (8.61 work units)
464  Thread count was 8 (of 8 available processors)
465
466  Solution count 1: 5820.44
467
468  Optimal solution found (tolerance 1.00e-08)
469  Best objective 5.820444444444e+03, best bound 5.820444444444e+03, gap 0.0000%
470  SP is solved
471  SP's optimal solution is'□5820
472
473    Itr = 2
474  Collect_LB =   [649.0, 5664.444444444443, 6481.444444444445]
475  Collect_UB =   [10665.603174603173, 6458.587301587302, 6458.587301587302]
476  Collect_Hua =   [0.0, 5008.301587301587, 5802.444444444445]
477  Collect_SPObjVal =   [5008.301587301587, 5802.444444444445, 5820.444444444445]
478  Collect_MPObjValNHua =   [649.0, 656.1428571428569, 679.0]
479
480
481    Reach the termination conditions, stop iteration
482    Values adopted from the judgeCount's th iteration, and Itr = {2}, judgeCount = {1}
483
484  ~~~~~~~~~~judgeCount = 1, SPObj_SPF = 5802.444444444445
485  Vessel i: 0:      pi: 0-5,      ai-di: 9-20,      gi_SP-gpi_SP: 0.000000-0.000000,      ai_SP-di: 9-20,      taoi-deltai: 9-18,      taoPi_SP-deltaPi_SP: 9-18,      betaNi: 9,
       bi: 9
486  Vessel i: 1:      pi: 0-5,      ai-di: 33-51,      gi_SP-gpi_SP: 0.000000-0.000000,      ai_SP-di: 33-51,      taoi-deltai: 33-49,      taoPi_SP-deltaPi_SP: 33-49,      betaNi:
       16,      bi: 16
487  Vessel i: 2:      pi: 10-15,      ai-di: 57-67,      gi_SP-gpi_SP: 0.000000-0.000000,      ai_SP-di: 57-67,      taoi-deltai: 57-65,      taoPi_SP-deltaPi_SP: 57-65,
       betaNi: 8,      bi: 8
488  Vessel i: 3:      pi: 6-11,      ai-di: 15-27,      gi_SP-gpi_SP: 0.000000-0.000000,      ai_SP-di: 15-27,      taoi-deltai: 15-25,      taoPi_SP-deltaPi_SP: 15-25,      betaNi
       : 10,      bi: 10
489  Vessel i: 4:      pi: 5-10,      ai-di: 42-62,      gi_SP-gpi_SP: 0.000000-0.000000,      ai_SP-di: 42-62,      taoi-deltai: 42-60,      taoPi_SP-deltaPi_SP: 42-60,      betaNi
       : 18,      bi: 18
490  Vessel i: 5:      pi: 22-28,      ai-di: 17-40,      gi_SP-gpi_SP: 0.000000-1.000000,      ai_SP-di: 17-40,      taoi-deltai: 18-28,      taoPi_SP-deltaPi_SP: 18-28,
       betaNi: 10,      bi: 10
491  Vessel i: 6:      pi: 19-24,      ai-di: 21-48,      gi_SP-gpi_SP: 1.000000-0.480650,      ai_SP-di: 29-48,      taoi-deltai: 29-42,      taoPi_SP-deltaPi_SP: 29-42,
       betaNi: 13,      bi: 13
492  Vessel i: 7:      pi: 13-19,      ai-di: 37-57,      gi_SP-gpi_SP: 0.500000-0.519350,      ai_SP-di: 42-57,      taoi-deltai: 40-44,      taoPi_SP-deltaPi_SP: 42-44,
```

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betaNi: 4,      bi: 4
Vessel i: 8:      pi: 14-19,      ai-di: 8-41,      gi_SP-gpi_SP: 0.500000-1.000000,      ai_SP-di: 11-41,      taoi-deltai: 12-29,      taoPi_SP-deltaPi_SP: 12-29,      betaNi: 17,      bi: 17
Vessel i: 9:      pi: 24-29,      ai-di: 25-58,      gi_SP-gpi_SP: 1.000000-0.000000,      ai_SP-di: 32-58,      taoi-deltai: 32-54,      taoPi_SP-deltaPi_SP: 32-54,      betaNi: 22,      bi: 22

round LB =   [649, 5664, 6481]
round UB =   [10666, 6459, 6459]
round Hua =   [0, 5008, 5802]
round SPObjVal =   [5008, 5802, 5820]
round MPObjValNHua =   [649, 656, 679]

Time: 1079.000000
```