```
"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=43494

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_BDC.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 563169 rows, 46641 columns and 1548061 nonzeros
Model fingerprint: 0xb056c917
Variable types: 1 continuous, 46640 integer (46608 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 429490 rows and 29177 columns (presolve time = 5s) ...
Presolve removed 521900 rows and 36082 columns
Presolve time: 5.89s
Presolved: 41269 rows, 10559 columns, 151116 nonzeros
Variable types: 0 continuous, 10559 integer (10535 binary)

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

Root relaxation presolved: 41268 rows, 10560 columns, 151113 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    7.7000000e+02   7.806250e+01   1.602493e+08      6s
Concurrent spin time: 0.03s

Solved with dual simplex (primal model)

Root relaxation: objective 6.100000e+02, 1744 iterations, 0.20 seconds (0.17 work units)

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

     0     0  610.00000    0   15          -  610.00000      -     -    6s
H    0     0                1170.0000000  610.00000  47.9%     -    6s
H    0     0                610.0000000  610.00000  0.00%     -    7s
     0     0  610.00000    0  187  610.00000  610.00000  0.00%     -    7s

Cutting planes:
  Gomory: 2
  Cover: 8
  Implied bound: 5
  Clique: 5
  MIR: 8
  StrongCG: 9
  GUB cover: 2
  Zero half: 1
  RLT: 3
  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)

Solution count 2: 610 1170

Optimal solution found (tolerance 1.00e-10)
Best objective 6.100000000000e+02, best bound 6.100000000000e+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 1983520 rows, 1559473 columns and 13694414 nonzeros
Model fingerprint: 0xa050e9b1
Variable types: 766961 continuous, 792512 integer (787112 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 1980422 rows and 1558437 columns
Presolve time: 4.38s
Presolved: 3098 rows, 1036 columns, 8188 nonzeros
Variable types: 6 continuous, 1030 integer (594 binary)
Found heuristic solution: objective 3236.4887888

Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    6.5912222e+03   4.623986e+03   0.000000e+00      6s
    1009    4.1285519e+03   0.000000e+00   0.000000e+00      6s

Root relaxation: objective 4.128552e+03, 1009 iterations, 0.02 seconds (0.01 work units)

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

     0     0 4128.55187    0   25 3236.48879 4128.55187  27.6%     -    5s
H    0     0                    4069.9910418 4128.55187  1.44%     -    5s
     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%     -    5s
H    0     0                    4108.5518738 4123.88521  0.37%     -    5s
H    0     0                    4114.5518738 4123.88521  0.23%     -    5s
     0     0    cutoff    0      4114.55187 4114.55187  0.00%     -    5s

Cutting planes:
  Learned: 2
  Gomory: 3
  Implied bound: 16
  Clique: 7
  MIR: 2
  Zero half: 1
  Network: 1
  RLT: 2
  PSD: 1

Explored 1 nodes (1416 simplex iterations) in 5.85 seconds (6.01 work units)
Thread count was 8 (of 8 available processors)

Solution count 4: 4114.55 4108.55 4069.99 3236.49

Optimal solution found (tolerance 1.00e-08)
Best objective 4.114551873823e+03, best bound 4.114551873823e+03, gap 0.0000%
SP is solved
SP's optimal solution is'□4114

  Itr = 0
Collect_LB =   [610.0]
Collect_UB =   [8839.103747646237]
Collect_Hua =   [0.0]
Collect_SPObjVal =   [4114.55187382311 85]
Collect_MPObjValNHua =   [610.0]


Set parameter TimeLimit to value 12000
Set parameter MIPGap to value 0.0005
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 566810 rows, 229425 columns and 1551746 nonzeros
Model fingerprint: 0x94356014
Variable types: 1 continuous, 229424 integer (229392 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 467876 rows and 216529 columns (presolve time = 5s) ...
Presolve removed 533352 rows and 223346 columns
Presolve time: 6.62s
Presolved: 33458 rows, 6079 columns, 89413 nonzeros
Variable types: 0 continuous, 6079 integer (6058 binary)
Root relaxation presolved: 6079 rows, 39537 columns, 95492 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0     handle free variables                         7s
    5322    4.8245519e+03   0.000000e+00   0.000000e+00      8s
    5322    4.8245519e+03   0.000000e+00   0.000000e+00      8s

Root relaxation: objective 4.824552e+03, 5322 iterations, 0.55 seconds (0.97 work units)

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

     0     0 4824.55187    0   23          - 4824.55187      -     -    7s
     0     0 4824.55187    0   40          - 4824.55187      -     -    8s
     0     0 4824.55187    0  130          - 4824.55187      -     -    8s
     0     0 4824.55187    0  253          - 4824.55187      -     -    9s
     0     0 4824.55187    0  290          - 4824.55187      -     -    9s
     0     0 4824.55187    0  112          - 4824.55187      -     -   10s
     0     0 4824.55187    0  139          - 4824.55187      -     -   10s
     0     0 4824.55187    0  447          - 4824.55187      -     -   11s
     0     0 4824.55187    0  336          - 4824.55187      -     -   11s
     0     0 4824.55187    0  121          - 4824.55187      -     -   12s
     0     0 4824.55187    0  267          - 4824.55187      -     -   12s
     0     0 4824.55187    0   91          - 4824.55187      -     -   13s
H    0     0                 7304.5518738 4824.55187  34.0%     -   13s
     0     0 4824.55187    0   91 7304.55187 4824.55187  34.0%     -   13s
H    0     0                 6004.5518738 4824.55187  19.7%     -   14s
     0     2 4824.55187    0   91 6004.55187 4824.55187  19.7%     -   14s
     3     5 4824.55187    2  274 6004.55187 4824.55187  19.7%  1747   15s
    41    49 4824.55187   11  213 6004.55187 4824.55187  19.7%  1134   20s
   138    96 4824.55187   27  379 6004.55187 4824.55187  19.7%   777   25s
   223   206 4824.55187   38  340 6004.55187 4824.55187  19.7%   867   33s
H  326   206                5344.5518738 4824.55187  9.73%   747   33s
H  367   225                5224.5518738 4824.55187  7.66%   692   37s
H  436   259                5184.5518738 4824.55187  6.94%   759   43s
   566   308 infeasible   83      5184.55187 4824.55187  6.94%   800   50s
   764   532 4824.55187   11  237 5184.55187 4824.55187  6.94%   735   57s
  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
  1439   718 5144.55187   30   31 5184.55187 4824.55187  6.94%   575   70s
  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
H 1447   687                5064.5518738 4824.55187  4.74%   572   86s
  1450   689 5004.55187  142  641 5064.55187 4824.55187  4.74%   571   90s
  1454   691 4828.08129   75  441 5064.55187 4824.55187  4.74%   570   96s
H 1455   657                5024.5518738 4824.55187  3.98%   569  100s
H 1455   624                5004.5518738 4826.64905  3.55%   569  100s
H 1455   593                4984.5518738 4826.64905  3.17%   569  100s
H 1455   563                4964.5518738 4826.64905  2.78%   569  100s
  1461   568 4964.55187   83  201 4964.55187 4826.64905  2.78%   638  105s
  1467   574 4964.55187   73  435 4964.55187 4826.64905  2.78%   640  110s
  1489   589 4849.55397   61  677 4964.55187 4849.55397  2.32%   630  115s
  1508   601 4964.55187   28  648 4964.55187 4864.55187  2.01%   622  120s
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
  1541   592 4924.55187   63  687 4924.55187 4904.55187  0.41%   654  130s
  1558   604 4904.55187   35  698 4924.55187 4904.55187  0.41%   647  135s

Cutting planes:
  Learned: 4
  Gomory: 8
  Cover: 134
  Implied bound: 37
  Projected implied bound: 71
  Clique: 38
  MIR: 31
  StrongCG: 13
  Flow cover: 127
  GUB cover: 50
  Zero half: 60
```

```
  RLT: 37
  Relax-and-lift: 175
  BQP: 4
  PSD: 1

Explored 1563 nodes (1066273 simplex iterations) in 135.90 seconds (224.96 work units)
Thread count was 8 (of 8 available processors)

Solution count 10: 4924.55 4964.55 4964.55 ... 5344.55

Optimal solution found (tolerance 5.00e-04)
Best objective 4.924551873823e+03, best bound 4.924551873823e+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

Optimize a model with 1983520 rows, 1559473 columns and 13694414 nonzeros
Model fingerprint: 0x695455f3
Variable types: 766961 continuous, 792512 integer (787112 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 1979528 rows and 1558182 columns
Presolve time: 4.26s
Presolved: 3992 rows, 1291 columns, 10640 nonzeros
Variable types: 6 continuous, 1285 integer (746 binary)
Found heuristic solution: objective 3254.6554554
Found heuristic solution: objective 3262.4332332

Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    7.7280000e+03   2.184281e+03   0.000000e+00      6s
    1262    4.5351111e+03   0.000000e+00   0.000000e+00      6s

Root relaxation: objective 4.535111e+03, 1262 iterations, 0.02 seconds (0.02 work units)

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

     0     0 4535.11111    0   50 3262.43323 4535.11111  39.0%     -    5s
H    0     0                3768.1111111 4535.11111  20.4%     -    5s
H    0     0                3815.1111111 4535.11111  18.9%     -    5s
     0     0 4535.11111    0   29 3815.11111 4535.11111  18.9%     -    5s
H    0     0                4529.9777997 4535.11111  0.11%     -    5s
H    0     0                4535.1111111 4535.11111  0.00%     -    5s
     0     0 4535.11111    0   29 4535.11111 4535.11111  0.00%     -    5s

Cutting planes:
  Gomory: 2
  Cover: 1
  Implied bound: 2
  Clique: 22
  MIR: 1
  Flow cover: 2
  Relax-and-lift: 2

Explored 1 nodes (2188 simplex iterations) in 5.87 seconds (5.83 work units)
Thread count was 8 (of 8 available processors)

Solution count 6: 4535.11 4529.98 3815.11 ... 3254.66

Optimal solution found (tolerance 1.00e-08)
Best objective 4.535111111111e+03, best bound 4.535111111111e+03, gap 0.0000%
SP is solved
SP's optimal solution is'□4535

 Itr = 1
Collect_LB =   [610.0, 4924.5518738231185]
Collect_UB =   [8839.103747646237, 5345.1111111111095]
Collect_Hua =   [0.0, 4114.5518738231185]
Collect_SPObjVal =   [4114.5518738231185, 4535.1111111111095]
Collect_MPObjValNHua =   [610.0, 810.0]


Set parameter TimeLimit to value 12000
```

```
Set parameter MIPGap to value 0.0005
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 566811 rows, 229425 columns and 1551763 nonzeros
Model fingerprint: 0x1d12fe8e
Variable types: 1 continuous, 229424 integer (229392 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 471489 rows and 216970 columns (presolve time = 5s) ...
Presolve removed 535234 rows and 223431 columns
Presolve time: 6.48s
Presolved: 31577 rows, 5994 columns, 86462 nonzeros
Variable types: 0 continuous, 5994 integer (5973 binary)
Root relaxation presolved: 5994 rows, 37571 columns, 92456 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0     handle free variables                         7s
    4761    5.3851111e+03   0.000000e+00   0.000000e+00      7s
    4761    5.3851111e+03   0.000000e+00   0.000000e+00      7s

Root relaxation: objective 5.385111e+03, 4761 iterations, 0.53 seconds (0.92 work units)

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

     0     0 5385.11111    0   19          - 5385.11111      -     -    7s
     0     0 5385.11111    0   64          - 5385.11111      -     -    8s
     0     0 5385.11111    0  179          - 5385.11111      -     -    8s
     0     0 5385.11111    0  146          - 5385.11111      -     -    8s
     0     0 5385.11111    0   43          - 5385.11111      -     -    9s
     0     0 5385.11111    0  103          - 5385.11111      -     -    9s
     0     0 5385.11111    0   88          - 5385.11111      -     -   10s
     0     0 5385.11111    0   82          - 5385.11111      -     -   10s
     0     0 5385.11111    0  133          - 5385.11111      -     -   11s
H    0     0                 8345.1111111 5385.11111  35.5%     -   11s
     0     0 5385.11111    0  133 8345.11111 5385.11111  35.5%     -   11s
H    0     0                 7185.1111111 5385.11111  25.1%     -   11s
H    0     0                 5385.1111111 5385.11111  0.00%     -   12s
     0     0 5385.11111    0  133 5385.11111 5385.11111  0.00%     -   13s

Cutting planes:
  Cover: 218
  Implied bound: 240
  Clique: 15
  MIR: 44
  StrongCG: 21
  GUB cover: 7
  Zero half: 1
  Relax-and-lift: 2
  BQP: 3
  PSD: 1

Explored 1 nodes (27518 simplex iterations) in 13.04 seconds (20.58 work units)
Thread count was 8 (of 8 available processors)

Solution count 3: 5385.11 7185.11 8345.11

Optimal solution found (tolerance 5.00e-04)
Best objective 5.385111111111e+03, best bound 5.385111111111e+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

Optimize a model with 1983520 rows, 1559473 columns and 13694414 nonzeros
Model fingerprint: 0xd1541698
Variable types: 766961 continuous, 792512 integer (787112 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 1979454 rows and 1558165 columns
Presolve time: 4.24s
Presolved: 4066 rows, 1308 columns, 10903 nonzeros
Variable types: 6 continuous, 1302 integer (752 binary)
Found heuristic solution: objective 3271.9442784

Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    8.0740000e+03   4.433505e+03   0.000000e+00      5s
    1182    4.4821111e+03   0.000000e+00   0.000000e+00      5s

Root relaxation: objective 4.482111e+03, 1182 iterations, 0.02 seconds (0.02 work units)

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

*    0     0               0    4482.1111111 4482.11111  0.00%     -    5s

Explored 1 nodes (1590 simplex iterations) in 5.63 seconds (5.63 work units)
Thread count was 8 (of 8 available processors)

Solution count 2: 4482.11 3271.94

Optimal solution found (tolerance 1.00e-08)
Best objective 4.482111111111e+03, best bound 4.482111111111e+03, gap 0.0000%
SP is solved
SP's optimal solution is'□4482

 Itr = 2
Collect_LB =   [610.0, 4924.5518738231185, 5385.1111111111095]
Collect_UB =   [8839.103747646237, 5345.1111111111095, 5332.111111111111]
Collect_Hua =   [0.0, 4114.5518738231185, 4535.1111111111095]
Collect_SPObjVal =   [4114.5518738231185, 4535.1111111111095, 4482.111111111111]
Collect_MPObjValNHua =   [610.0, 810.0, 850.0]


 Ops, stop iteration
 Values adopted from the Itr-1' th iteration, and Itr = {2}, judgeCount = {1}

~~~~~~~~~~judgeCount = 1, SPObj_SPF = 4535.1111111111095
Vessel i: 0:     pi: 0-7,     ai-di: 1-7,     gi_SP-gpi_SP: 0.000000-0.000000,     ai_SP-di: 1-7,     taoi-deltai: 1-6,     taoPi_SP-deltaPi_SP: 1-6,     betaNi: 5,     bi: 5
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: 4
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
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,     taoPi_SP-deltaPi_SP: 10-18,     betaNi: 8,     bi: 8
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,     betaNi: 28,     bi: 28
Vessel i: 5:     pi: 10-17,     ai-di: 16-37,     gi_SP-gpi_SP: 0.000000-1.000000,     ai_SP-di: 16-37,     taoi-deltai: 21-40,     taoPi_SP-deltaPi_SP: 21-40,     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
Vessel i: 7:     pi: 17-23,     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

round LB =   [610, 4925, 5385]
round UB =   [8839, 5345, 5332]
round Hua =   [0, 4115, 4535]
round SPObjVal =   [4115, 4535, 4482]
round MPObjValNHua =   [610, 810, 850]

OptimalObj = 5385.1111111111095
Time: 537.000000
```