```
"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=31087

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_TWS.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 646413 rows, 64824 columns and 1832833 nonzeros
Model fingerprint: 0x2872db6c
Variable types: 1 continuous, 64823 integer (64779 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 395742 rows and 31115 columns (presolve time = 5s) ...
Presolve removed 542577 rows and 42602 columns
Presolve time: 9.36s
Presolved: 103836 rows, 22222 columns, 338252 nonzeros
Variable types: 0 continuous, 22222 integer (22193 binary)

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

Root relaxation presolved: 22222 rows, 126058 columns, 360474 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0    1.0160000e+03   0.000000e+00   1.256000e+03     10s
     364    1.0162009e+03   0.000000e+00   8.070676e+03     10s
Concurrent spin time: 0.02s

Solved with dual simplex (primal model)

Root relaxation: objective 1.016000e+03, 2750 iterations, 0.42 seconds (0.47 work units)

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

     0     0 1016.00000    0   10          - 1016.00000      -     -   11s
     0     0 1016.00000    0   27          - 1016.00000      -     -   12s
     0     0 1016.00000    0   20          - 1016.00000      -     -   13s
H    0     0                5096.0000000 1016.00000  80.1%     -   13s
     0     0 1016.00000    0   18 5096.00000 1016.00000  80.1%     -   14s
H    0     0                1416.0000000 1016.00000  28.2%     -   14s
     0     0 1016.00000    0   54 1416.00000 1016.00000  28.2%     -   15s
     0     0 1016.00000    0   54 1416.00000 1016.00000  28.2%     -   16s
H    0     0                1336.0000000 1016.00000  24.0%     -   17s
     0     2 1016.00000    0   51 1336.00000 1016.00000  24.0%     -   19s
     2     4 1016.00000    1   38 1336.00000 1016.00000  24.0%  1768   20s
    54    55 1016.00000    9   98 1336.00000 1016.00000  24.0%   313   25s
H  164   112                1176.0000000 1016.00000  13.6%   323   29s
   166   117 1016.00000   30   81 1176.00000 1016.00000  13.6%   349   31s
H  206   134                1136.0000000 1016.00000  10.6%   373   33s
   230   155 1016.00000   35  251 1136.00000 1016.00000  10.6%   386   35s
H  275   167                1016.0000000 1016.00000  0.00%   364   38s

Cutting planes:
  Cover: 299
  Implied bound: 1222
  Clique: 4
  MIR: 39
  StrongCG: 64
```

```
  GUB cover: 6
  RLT: 3
  Relax-and-lift: 422

Explored 319 nodes (151515 simplex iterations) in 38.42 seconds (80.32 work units)
Thread count was 8 (of 8 available processors)

Solution count 6: 1016 1136 1176 ... 5096

Optimal solution found (tolerance 1.00e-10)
Best objective 1.016000000000e+03, best bound 1.016000000000e+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 783600 rows, 17633 columns and 1599413 nonzeros
Model fingerprint: 0xea826290
Variable types: 44 continuous, 17589 integer (10164 binary)
Coefficient statistics:
  Matrix range     [1e-01, 1e+10]
  Objective range  [6e-05, 5e+01]
  Bounds range     [1e+00, 1e+00]
  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 778935 rows and 16036 columns
Presolve time: 0.53s
Presolved: 4665 rows, 1597 columns, 12489 nonzeros
Variable types: 9 continuous, 1588 integer (931 binary)
Found heuristic solution: objective 4116.7031603

Root relaxation: objective 6.543431e+03, 1418 iterations, 0.03 seconds (0.02 work units)

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

     0     0 6543.43142    0  154 4116.70316 6543.43142  58.9%     -    0s
H    0     0                6490.8160331 6543.43142  0.81%     -    0s
H    0     0                6530.8160331 6543.43142  0.19%     -    0s

Cutting planes:
  Learned: 50
  Gomory: 14
  Cover: 5
  Implied bound: 24
  Clique: 7
  MIR: 3
  Flow cover: 2
  Zero half: 1
  Network: 3

Explored 1 nodes (2278 simplex iterations) in 0.78 seconds (1.13 work units)
Thread count was 8 (of 8 available processors)

Solution count 3: 6530.82 6490.82 4116.7

Optimal solution found (tolerance 1.00e-08)
Best objective 6.530816033068e+03, best bound 6.530816033068e+03, gap 0.0000%
SP is solved
SP's optimal solution is'□6530

 Itr = 0
Collect_LB =   [1016.0]
Collect_UB =   [14077.632066136313]
Collect_Hua =   [0.0]
Collect_SPObjVal =   [6530.816033068157]
Collect_MPObjValNHua =   [1016.0]


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 658039 rows, 410400 columns and 1844514 nonzeros
Model fingerprint: 0x9d7f1390
Variable types: 1 continuous, 410399 integer (410355 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 494184 rows and 390193 columns (presolve time = 5s) ...
Presolve removed 606382 rows and 401131 columns
Presolve time: 9.30s
Presolved: 51657 rows, 9269 columns, 133938 nonzeros
Variable types: 0 continuous, 9269 integer (9242 binary)
Root relaxation presolved: 9269 rows, 60926 columns, 143207 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0      handle free variables                         10s
    4281    9.2575497e+03   1.601634e+04   0.000000e+00     10s
    8105    7.9628160e+03   0.000000e+00   0.000000e+00     11s
    8105    7.9628160e+03   0.000000e+00   0.000000e+00     11s

Root relaxation: objective 7.962816e+03, 8105 iterations, 0.98 seconds (1.69 work units)

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

     0     0 7962.81603    0   38          - 7962.81603      -     -   11s
     0     0 7962.81603    0  103          - 7962.81603      -     -   11s
     0     0 7962.81603    0   38          - 7962.81603      -     -   11s
     0     0 7962.81603    0  311          - 7962.81603      -     -   12s
     0     0 7962.81603    0  278          - 7962.81603      -     -   12s
     0     0 7962.81603    0  381          - 7962.81603      -     -   13s
     0     0 7962.81603    0  325          - 7962.81603      -     -   13s
     0     0 7962.81603    0  300          - 7962.81603      -     -   13s
     0     0 7962.81603    0  136          - 7962.81603      -     -   15s
     0     0 7962.81603    0  249          - 7962.81603      -     -   16s
     0     0 7962.81603    0  212          - 7962.81603      -     -   17s
     0     0 7962.81603    0  196          - 7962.81603      -     -   18s
     0     0 7962.81603    0  433          - 7962.81603      -     -   18s
     0     0 7962.81603    0   59          - 7962.81603      -     -   20s
     0     0 7962.81603    0   42          - 7962.81603      -     -   20s
     0     0 7962.81603    0  343          - 7962.81603      -     -   21s
     0     0 7962.81603    0  340          - 7962.81603      -     -   21s
     0     0 7962.81603    0  470          - 7962.81603      -     -   21s
     0     0 7962.81603    0  470          - 7962.81603      -     -   21s
     0     0 7962.81603    0  120          - 7962.81603      -     -   24s
     0     0 7962.81603    0  429          - 7962.81603      -     -   25s
     0     0 7962.81603    0  426          - 7962.81603      -     -   25s
     0     0 7962.81603    0  259          - 7962.81603      -     -   27s
     0     0 7962.81603    0  338          - 7962.81603      -     -   27s
     0     0 7962.81603    0  296          - 7962.81603      -     -   27s
     0     2 7962.81603    0  296          - 7962.81603      -     -   29s
     1     5 7962.81603    1  317          - 7962.81603      -  2656   30s
    35    46 7980.01298    7  918          - 7962.81603      -  2592   35s
   176   214 8022.81603   25  605          - 7962.81603      -  1231   40s
   563   590 8362.81603   21  393          - 7962.81603      -   588   45s
  1069   791 8522.81603  225  433          - 7962.81603      -   389   64s
  1071   792 8714.39498   43   37          - 7962.81603      -   388   67s
  1073   794 9222.81603   30  795          - 7962.81603      -   387   73s
  1074   794 8122.81603  162  517          - 7962.81603      -   387   80s
  1076   796 8202.81603  206  320          - 7962.81603      -   386   87s
  1077   796 7962.81603    4  631          - 7962.81603      -   386   91s
  1078   797 8442.81603  198  350          - 7962.81603      -   385   96s
  1079   798 8462.81603   52  719          - 7962.81603      -   385  100s
  1080   798 8022.81603   32  552          - 7962.81603      -   385  106s
  1082   800 8162.81603  159  752          - 7962.81603      -   384  114s
  1083   800 8042.81603  196  859          - 7962.81603      -   384  117s
  1084   801 8112.81603  104  496          - 7962.81603      -   383  122s
  1085   802 8222.81603  151  868          - 7962.81603      -   383  126s
  1086   802 8162.81603  134  502          - 7962.81603      -   383  132s
  1087   803 8714.39498   41 1004          - 7962.81603      -   382  135s
  1088   804 8142.81603  164  663          - 7962.81603      -   382  141s
  1089   804 8262.81603  109  989          - 7962.81603      -   381  145s
  1091   806 8062.81603   56  478          - 7962.81603      -   381  153s
  1092   806 8602.81603  195  478          - 7962.81603      -   380  157s
  1093   810 7962.81603   10  465          - 7962.81603      -   575  161s
  1095   813 7962.81603   11  446          - 7962.81603      -   585  165s
H 1099   775                    8202.8160331 7962.81603  2.93%   601  168s
H 1103   737                    8162.8160331 7962.81603  2.45%   619  174s
H 1103   700                    8042.8160331 7962.81603  0.99%   619  174s
  1107   698 7962.81603   13  643 8042.81603 7962.81603  0.99%   700  176s
H 1133   650                    7982.8160331 7962.81603  0.25%   728  180s
```

```
 H 1138   614                 7962.8160331 7962.81603  0.00%   727  180s

Cutting planes:
  Learned: 2
  Gomory: 5
  Cover: 171
  Implied bound: 38
  Clique: 31
  MIR: 45
  StrongCG: 26
  Flow cover: 26
  GUB cover: 30
  Zero half: 14
  RLT: 18
  Relax-and-lift: 60
  BQP: 13

Explored 1139 nodes (878518 simplex iterations) in 180.50 seconds (326.79 work units)
Thread count was 8 (of 8 available processors)

Solution count 5: 7962.82 7982.82 8042.82 ... 8202.82

Optimal solution found (tolerance 1.00e-10)
Best objective 7.962816033068e+03, best bound 7.962816033068e+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 783600 rows, 17633 columns and 1599413 nonzeros
Model fingerprint: 0x9202f5f4
Variable types: 44 continuous, 17589 integer (10164 binary)
Coefficient statistics:
  Matrix range     [1e-01, 1e+10]
  Objective range  [6e-05, 5e+01]
  Bounds range     [1e+00, 1e+00]
  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 776211 rows and 15274 columns
Presolve time: 0.56s
Presolved: 7389 rows, 2359 columns, 19792 nonzeros
Variable types: 10 continuous, 2349 integer (1343 binary)

Root relaxation: objective 7.317111e+03, 2159 iterations, 0.03 seconds (0.03 work units)

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

     0     0 7317.11111    0   48          - 7317.11111      -     -    0s
H    0     0                7296.4444444 7317.11111  0.28%     -    0s
H    0     0                7301.1111111 7317.11111  0.22%     -    0s
H    0     0                7314.4444444 7317.11111  0.04%     -    0s

Cutting planes:
  MIR: 1

Explored 1 nodes (2933 simplex iterations) in 0.84 seconds (1.30 work units)
Thread count was 8 (of 8 available processors)

Solution count 3: 7314.44 7301.11 7296.44

Optimal solution found (tolerance 1.00e-08)
Best objective 7.314444444444e+03, best bound 7.314444444444e+03, gap 0.0000%
SP is solved
SP's optimal solution is'□7314

 Itr = 1
Collect_LB =   [1016.0, 7962.816033068157]
Collect_UB =   [14077.632066136313, 8746.444444444445]
Collect_Hua =   [0.0, 6530.816033068157]
Collect_SPObjVal =   [6530.816033068157, 7314.444444444445]
Collect_MPObjValNHua =   [1016.0, 1432.0]


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 658039 rows, 410400 columns and 1844514 nonzeros
Model fingerprint: 0xc171d781
Variable types: 1 continuous, 410399 integer (410355 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 495171 rows and 390316 columns (presolve time = 5s) ...
Presolve removed 606591 rows and 401179 columns
Presolve time: 9.21s
Presolved: 51448 rows, 9221 columns, 133168 nonzeros
Variable types: 0 continuous, 9221 integer (9195 binary)
Root relaxation presolved: 9221 rows, 60669 columns, 142389 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0      handle free variables                         10s
    5693    9.0919336e+03   1.441587e+03   0.000000e+00     10s
    7699    8.7964444e+03   0.000000e+00   0.000000e+00     10s
    7699    8.7964444e+03   0.000000e+00   0.000000e+00     10s

Root relaxation: objective 8.796444e+03, 7699 iterations, 0.89 seconds (1.64 work units)

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

     0     0 8796.44444    0   37          - 8796.44444      -     -   10s
     0     0 8796.44444    0  163          - 8796.44444      -     -   12s
     0     0 8796.44444    0  352          - 8796.44444      -     -   12s
     0     0 8796.44444    0  201          - 8796.44444      -     -   12s
     0     0 8796.44444    0  162          - 8796.44444      -     -   12s
     0     0 8796.44444    0  529          - 8796.44444      -     -   13s
     0     0 8796.44444    0  496          - 8796.44444      -     -   13s
     0     0 8796.44444    0  158          - 8796.44444      -     -   15s
     0     0 8796.44444    0  654          - 8796.44444      -     -   16s
     0     0 8796.44444    0  558          - 8796.44444      -     -   17s
     0     0 8796.44444    0  245          - 8796.44444      -     -   19s
     0     0 8796.44444    0  289          - 8796.44444      -     -   20s
     0     0 8796.44444    0  329          - 8796.44444      -     -   20s
     0     0 8796.44444    0  189          - 8796.44444      -     -   22s
     0     0 8796.44444    0  209          - 8796.44444      -     -   22s
     0     0 8796.44444    0  344          - 8796.44444      -     -   23s
     0     0 8796.44444    0  301          - 8796.44444      -     -   23s
     0     0 8796.44444    0  369          - 8796.44444      -     -   25s
     0     0 8796.44444    0  369          - 8796.44444      -     -   25s
     0     2 8796.44444    0  365          - 8796.44444      -     -   27s
     7    12 8876.44444    3  551          - 8796.44444      -  2404   30s
    39    52 8896.44444    8  753          - 8796.44444      -  1647   36s
    69   103 8896.44444   23  430          - 8796.44444      -  1927   43s
   139   196 9256.44444   49  233          - 8796.44444      -  1342   47s
   266   289 9256.44444   96  170          - 8796.44444      -   839   50s
H  285   289                9256.4444444 8796.44444  4.97%   793   50s
   491   266 8796.44444   12  770 9256.44444 8796.44444  4.97%   575   55s
H  499   263                9236.4444444 8796.44444  4.76%   590   55s
   679   453 8856.44444   29  787 9236.44444 8796.44444  4.76%   496   61s
   888   487 8856.90486   56  757 9236.44444 8796.44444  4.76%   439   65s
  1144   636 9096.44444   28  369 9236.44444 8796.44444  4.76%   387   82s
  1147   638 9196.44444  120  367 9236.44444 8796.44444  4.76%   386   86s
  1149   639 9176.44444  117  372 9236.44444 8796.44444  4.76%   385   92s
H 1150   607                8896.4444444 8796.44444  1.12%   385   98s
  1152   608 8896.44444   58  789 8896.44444 8796.44444  1.12%   384  100s
  1157   613 8816.44444  125   75 8896.44444 8796.44444  1.12%   428  105s
  1160   615 8896.44444  105  404 8896.44444 8796.44444  1.12%   426  112s
  1162   617 8896.44444  166  414 8896.44444 8796.44444  1.12%   426  117s
H 1163   586                8876.4444444 8796.44444  0.90%   425  121s
H 1164   557                8816.4444444 8799.77778  0.19%   425  122s

Cutting planes:
  Gomory: 9
  Cover: 207
  Implied bound: 78
  Projected implied bound: 23
  Clique: 12
  MIR: 48
  StrongCG: 27
  Flow cover: 59
  GUB cover: 57
```

```
  Zero half: 10
  RLT: 26
  Relax-and-lift: 40
  BQP: 5

Explored 1164 nodes (636181 simplex iterations) in 122.10 seconds (234.81 work units)
Thread count was 8 (of 8 available processors)

Solution count 5: 8816.44 8876.44 8896.44 ... 9256.44

Optimal solution found (tolerance 1.00e-10)
Best objective 8.816444444444e+03, best bound 8.816444444444e+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 783600 rows, 17633 columns and 1599413 nonzeros
Model fingerprint: 0x4689685f
Variable types: 44 continuous, 17589 integer (10164 binary)
Coefficient statistics:
  Matrix range     [1e-01, 1e+10]
  Objective range  [6e-05, 5e+01]
  Bounds range     [1e+00, 1e+00]
  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 776672 rows and 15408 columns
Presolve time: 0.55s
Presolved: 6928 rows, 2225 columns, 18620 nonzeros
Variable types: 10 continuous, 2215 integer (1270 binary)
Found heuristic solution: objective 5258.2267544

Root relaxation: objective 7.303159e+03, 2105 iterations, 0.03 seconds (0.03 work units)

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

     0     0 7303.15873    0    8 5258.22675 7303.15873  38.9%     -    0s
H    0     0                6869.1587302 7303.15873  6.32%     -    0s
H    0     0                7256.1587302 7303.15873  0.65%     -    0s
H    0     0                7303.1587302 7303.15873  0.00%     -    0s
     0     0 7303.15873    0    4 7303.15873 7303.15873  0.00%     -    0s

Cutting planes:
  Gomory: 2
  Cover: 13
  Implied bound: 4
  Clique: 2
  Zero half: 2
  RLT: 1

Explored 1 nodes (2921 simplex iterations) in 0.83 seconds (1.28 work units)
Thread count was 8 (of 8 available processors)

Solution count 4: 7303.16 7256.16 6869.16 5258.23

Optimal solution found (tolerance 1.00e-08)
Best objective 7.303158730159e+03, best bound 7.303158730159e+03, gap 0.0000%
SP is solved
SP's optimal solution is'□7303

 Itr = 2
Collect_LB =   [1016.0, 7962.816033068157, 8816.444444444445]
Collect_UB =   [14077.632066136313, 8746.444444444445, 8746.444444444445]
Collect_Hua =   [0.0, 6530.816033068157, 7314.444444444445]
Collect_SPObjVal =   [6530.816033068157, 7314.444444444445, 7303.158730158728]
Collect_MPObjValNHua =   [1016.0, 1432.0, 1502.0]


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

~~~~~~~~~~judgeCount = 1, SPObj_SPF = 7314.444444444445
Vessel i: 0:     pi: 0-5,     ai-di: 72-81,     gi_SP-gpi_SP: 0.000000-0.000000,     ai_SP-di: 72-81,     taoi-deltai: 72-77,     taoPi_SP-deltaPi_SP: 72-77,     betaNi: 5,     bi: 5
Vessel i: 1:     pi: 12-18,     ai-di: 2-15,     gi_SP-gpi_SP: 0.000000-0.000000,     ai_SP-di: 2-15,     taoi-deltai: 2-15,     taoPi_SP-deltaPi_SP: 2-15,     betaNi: 13,     bi: 13
Vessel i: 2:     pi: 6-12,     ai-di: 14-36,     gi_SP-gpi_SP: 0.000000-0.000000,     ai_SP-di: 14-36,     taoi-deltai: 14-37,     taoPi_SP-deltaPi_SP: 14-37,     betaNi: 23,     bi: 23
Vessel i: 3:     pi: 18-25,     ai-di: 14-25,     gi_SP-gpi_SP: 0.000000-0.000000,     ai_SP-di: 14-25,     taoi-deltai: 14-21,     taoPi_SP-deltaPi_SP: 14-21,
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496 betaNi: 7,  bi: 7
497 Vessel i: 4:  pi: 12-17,  ai-di: 20-44,  gi_SP-gpi_SP: 0.000000-0.000000,  ai_SP-di: 20-44,  taoi-deltai: 20-41,  taoPi_SP-deltaPi_SP: 20-41,
    betaNi: 21,  bi: 21
498 Vessel i: 5:  pi: 18-25,  ai-di: 24-30,  gi_SP-gpi_SP: 0.000000-0.000000,  ai_SP-di: 24-30,  taoi-deltai: 24-29,  taoPi_SP-deltaPi_SP: 24-29,
    betaNi: 5,  bi: 5
499 Vessel i: 6:  pi: 17-23,  ai-di: 29-48,  gi_SP-gpi_SP: 0.500000-1.000000,  ai_SP-di: 31-48,  taoi-deltai: 32-50,  taoPi_SP-deltaPi_SP: 32-50,
    betaNi: 18,  bi: 18
500 Vessel i: 7:  pi: 9-15,  ai-di: 34-63,  gi_SP-gpi_SP: 1.000000-0.389633,  ai_SP-di: 42-63,  taoi-deltai: 42-71,  taoPi_SP-deltaPi_SP: 42-71,  betaNi
    : 29,  bi: 29
501 Vessel i: 8:  pi: 28-34,  ai-di: 34-43,  gi_SP-gpi_SP: 0.900000-0.610367,  ai_SP-di: 43-43,  taoi-deltai: 39-46,  taoPi_SP-deltaPi_SP: 43-46,
    betaNi: 7,  bi: 7
502 Vessel i: 9:  pi: 15-21,  ai-di: 47-66,  gi_SP-gpi_SP: 0.600000-1.000000,  ai_SP-di: 51-66,  taoi-deltai: 54-74,  taoPi_SP-deltaPi_SP: 54-74,
    betaNi: 20,  bi: 20
503 Vessel i: 10:  pi: 28-34,  ai-di: 50-68,  gi_SP-gpi_SP: 0.000000-0.000000,  ai_SP-di: 50-68,  taoi-deltai: 50-67,  taoPi_SP-deltaPi_SP: 50-67,
    betaNi: 17,  bi: 17
504
505 round LB =  [1016, 7963, 8816]
506 round UB =  [14078, 8746, 8746]
507 round Hua =  [0, 6531, 7314]
508 round SPObjVal =  [6531, 7314, 7303]
509 round MPObjValNHua =  [1016, 1432, 1502]
510
511 OptimalObj = 8816.444444444445
512 Time: 427.000000
513
514
515
516
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