```
 1  "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=7086
 2
 3  import sys; print('Python %s on %s' % (sys.version, sys.platform))
 4  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'])
 5
 6  PyDev console: starting.
 7
 8  Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
 9  >>> 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')
10  Backend TkAgg is interactive backend. Turning interactive mode on.
11  Waiting 5s......
12  Set parameter MIPGap to value 1e-10
13  Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
14
15  CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
16  Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
17
18  Optimize a model with 563169 rows, 46641 columns and 1548061 nonzeros
19  Model fingerprint: 0xb056c917
20  Variable types: 1 continuous, 46640 integer (46608 binary)
21  Coefficient statistics:
22    Matrix range     [1e+00, 1e+10]
23    Objective range  [1e+00, 2e+01]
24    Bounds range     [1e+00, 1e+00]
25    RHS range        [1e+00, 2e+10]
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 502066 rows and 36079 columns (presolve time = 5s) ...
31  Presolve removed 521900 rows and 36082 columns
32  Presolve time: 5.28s
33  Presolved: 41269 rows, 10559 columns, 151116 nonzeros
34  Variable types: 0 continuous, 10559 integer (10535 binary)
35
36  Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
37  Showing first log only...
38
39  Root relaxation presolved: 41268 rows, 10560 columns, 151113 nonzeros
40
41
42  Root simplex log...
43
44  Iteration    Objective       Primal Inf.    Dual Inf.      Time
45       0    7.7000000e+02   7.806250e+01   1.602493e+08      6s
46  Concurrent spin time: 0.02s
47
48  Solved with dual simplex (primal model)
49
50  Root relaxation: objective 6.100000e+02, 1744 iterations, 0.18 seconds (0.17 work units)
51
52      Nodes    |    Current Node    |     Objective Bounds     |     Work
53   Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time
54
55       0     0 610.00000    0   15          -  610.00000     -     -    6s
56  H    0     0                    1170.0000000  610.00000  47.9%     -    6s
57  H    0     0                     610.0000000  610.00000  0.00%     -    6s
58       0     0 610.00000    0  187  610.00000  610.00000  0.00%     -    6s
59
60  Cutting planes:
61    Gomory: 2
62    Cover: 8
63    Implied bound: 5
64    Clique: 5
65    MIR: 8
66    StrongCG: 9
67    GUB cover: 2
68    Zero half: 1
69    RLT: 3
70    Relax-and-lift: 2
71
72  Explored 1 nodes (7549 simplex iterations) in 6.50 seconds (13.37 work units)
73  Thread count was 8 (of 8 available processors)
74
75  Solution count 2: 610 1170
76
77  Optimal solution found (tolerance 1.00e-10)
78  Best objective 6.100000000000e+02, best bound 6.100000000000e+02, gap 0.0000%
79  Set parameter MIPGap to value 1e-08
```

```
 80  Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
 81
 82  CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
 83  Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
 84
 85  Optimize a model with 1983422 rows, 1559473 columns and 13694120 nonzeros
 86  Model fingerprint: 0xc6bcb8d1
 87  Variable types: 766961 continuous, 792512 integer (787112 binary)
 88  Coefficient statistics:
 89    Matrix range     [1e-01, 1e+10]
 90    Objective range  [6e-05, 5e+01]
 91    Bounds range     [1e+00, 8e+01]
 92    RHS range        [8e-01, 1e+10]
 93  Warning: Model contains large matrix coefficients
 94  Warning: Model contains large rhs
 95        Consider reformulating model or setting NumericFocus parameter
 96        to avoid numerical issues.
 97  Presolve removed 1980324 rows and 1558437 columns
 98  Presolve time: 3.95s
 99  Presolved: 3098 rows, 1036 columns, 8188 nonzeros
100  Variable types: 6 continuous, 1030 integer (594 binary)
101  Found heuristic solution: objective 3236.4887888
102
103  Root simplex log...
104
105  Iteration    Objective       Primal Inf.    Dual Inf.      Time
106       0    6.5912222e+03   4.623986e+03   0.000000e+00      5s
107    1009    4.1285519e+03   0.000000e+00   0.000000e+00      5s
108
109  Root relaxation: objective 4.128552e+03, 1009 iterations, 0.01 seconds (0.01 work units)
110
111      Nodes   |    Current Node    |     Objective Bounds      |     Work
112   Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time
113
114      0     0 4128.55187    0   25 3236.48879 4128.55187  27.6%     -    5s
115  H   0     0                    4069.9910418 4128.55187  1.44%     -    5s
116      0     0 4123.88521    0   35 4069.99104 4123.88521  1.32%     -    5s
117      0     0 4123.88521    0    9 4069.99104 4123.88521  1.32%     -    5s
118  H   0     0                    4108.5518738 4123.88521  0.37%     -    5s
119  H   0     0                    4114.5518738 4123.88521  0.23%     -    5s
120      0     0   cutoff    0      4114.55187 4114.55187  0.00%     -    5s
121
122  Cutting planes:
123    Learned: 2
124    Gomory: 3
125    Implied bound: 16
126    Clique: 7
127    MIR: 2
128    Zero half: 1
129    Network: 1
130    RLT: 2
131    PSD: 1
132
133  Explored 1 nodes (1416 simplex iterations) in 5.28 seconds (6.02 work units)
134  Thread count was 8 (of 8 available processors)
135
136  Solution count 4: 4114.55 4108.55 4069.99 3236.49
137
138  Optimal solution found (tolerance 1.00e-08)
139  Best objective 4.114551873823e+03, best bound 4.114551873823e+03, gap 0.0000%
140  SP is solved
141  SP's optimal solution is'☐4114
142
143    Itr = 0
144  Collect_LB =   [610.0]
145  Collect_UB =   [8839.103747646237]
146  Collect_Hua =   [0.0]
147  Collect_SPObjVal =   [4114.5518738231185]
148  Collect_MPObjValNHua =   [610.0]
149
150
151  Set parameter TimeLimit to value 10800
152  Set parameter MIPGap to value 0.05
153  Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
154
155  CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
156  Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
157
158  Optimize a model with 996872 rows, 246921 columns and 2921564 nonzeros
159  Model fingerprint: 0x7ed7d012
160  Variable types: 1 continuous, 246920 integer (236784 binary)
161  Coefficient statistics:
162    Matrix range     [1e-01, 1e+10]
163    Objective range  [1e+00, 2e+01]
```

```
164    Bounds range    [1e+00, 1e+00]
165    RHS range       [1e+00, 2e+10]
166  Warning: Model contains large matrix coefficients
167  Warning: Model contains large rhs
168       Consider reformulating model or setting NumericFocus parameter
169       to avoid numerical issues.
170  Presolve removed 880552 rows and 231242 columns (presolve time = 5s) ...
171  Presolve removed 934827 rows and 236970 columns
172  Presolve time: 9.50s
173  Presolved: 62045 rows, 9951 columns, 196331 nonzeros
174  Variable types: 1 continuous, 9950 integer (8281 binary)
175  Root relaxation presolved: 9951 rows, 71996 columns, 206282 nonzeros
176
177
178  Root simplex log...
179
180  Iteration    Objective     Primal Inf.   Dual Inf.     Time
181      0     handle free variables              10s
182    9513    4.8245519e+03  0.000000e+00  0.000000e+00    12s
183    9513    4.8245519e+03  0.000000e+00  0.000000e+00    12s
184
185  Root relaxation: objective 4.824552e+03, 9513 iterations, 1.97 seconds (2.97 work units)
186
187      Nodes    |    Current Node    |     Objective Bounds     |     Work
188  Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time
189
190      0     0 4824.55187    0  230         -  4824.55187      -     -   13s
191      0     0 4824.55187    0  577         -  4824.55187      -     -   18s
192      0     0 4824.55187    0  546         -  4824.55187      -     -   18s
193      0     0 4824.55187    0  509         -  4824.55187      -     -   19s
194      0     0 4824.55187    0  310         -  4824.55187      -     -   28s
195      0     0 4824.55187    0  247         -  4824.55187      -     -   28s
196      0     0 4824.55187    0  398         -  4824.55187      -     -   29s
197      0     0 4824.55187    0  264         -  4824.55187      -     -   38s
198      0     0 4824.55187    0  309         -  4824.55187      -     -   41s
199      0     0 4824.55187    0  260         -  4824.55187      -     -   41s
200      0     0 4824.55187    0  207         -  4824.55187      -     -   49s
201      0     0 4824.55187    0  360         -  4824.55187      -     -   49s
202      0     0 4824.55187    0  251         -  4824.55187      -     -   53s
203      0     2 4824.55187    0  230         -  4824.55187      -     -   57s
204      3     8 4824.55187    2  515         -  4824.55187      -  4209   62s
205     11    13 4824.55187    3  810         -  4824.55187      -  4589   65s
206     31    30 4824.55187    7  750         -  4824.55187      -  2511   70s
207     65    58 4824.55187   11  279         -  4824.55187      -  1793   77s
208     93    68 4824.55187   20  345         -  4824.55187      -  1421   81s
209    148    83 4824.55187   35  451         -  4824.55187      -  1062   85s
210    187   103 4824.55187   53  254         -  4824.55187      -   989   90s
211    243   130 4824.55187   74  241         -  4824.55187      -   912   96s
212    311   274 4824.76841   94  908         -  4824.55187      -   911  107s
213    578   324 4826.13488   76  857         -  4824.55187      -   593  114s
214    732   443 5024.55187  107  455         -  4824.55187      -   535  121s
215  *  899   349              167    5344.5518738 4824.55187  9.73%   464  121s
216    953   323 5024.55187  149  217 5344.55187 4824.55187  9.73%   468  128s
217  H  979   297                    5264.5518738 4824.55187  8.36%   459  128s
218   1107   590 5041.98942   74  967 5264.55187 4824.55187  8.36%   450  134s
219  H 1474   588                    5224.5518738 4824.55187  7.66%   365  134s
220   1492   588 5144.55187  194  251 5224.55187 4824.55187  7.66%   376  148s
221   1494   589 5104.55187  122  259 5224.55187 4824.55187  7.66%   376  152s
222   1495   590 5164.55187  107  362 5224.55187 4824.55187  7.66%   376  156s
223   1497   591 5104.55187  106  344 5224.55187 4824.55187  7.66%   375  163s
224   1498   592 5104.55187  121  625 5224.55187 4824.55187  7.66%   375  166s
225   1499   593 5024.55187  119  792 5224.55187 4824.55187  7.66%   375  172s
226   1501   594 5144.55187  174  747 5224.55187 4824.55187  7.66%   374  185s
227   1502   595 5144.55187  174  866 5224.55187 4824.55187  7.66%   374  190s
228   1503   595 5144.55187  191  762 5224.55187 4824.55187  7.66%   374  201s
229  H 1503   565                    5144.5518738 4824.55187  6.22%   374  205s
230  H 1503   536                    5104.5518738 4824.55187  5.49%   374  205s
231   1505   538 4864.55187  100  778 5104.55187 4824.55187  5.49%   373  213s
232   1506   538 5024.55187  101  954 5104.55187 4824.55187  5.49%   373  217s
233   1507   539 5104.55187  121  389 5104.55187 4824.55187  5.49%   373  224s
234   1508   540 5064.55187  100  844 5104.55187 4824.55187  5.49%   372  229s
235   1509   540 4964.55187   63  498 5104.55187 4824.55187  5.49%   372  236s
236   1511   542 4864.55187   88  498 5104.55187 4824.55187  5.49%   372  241s
237   1514   549 4824.55187   17  429 5104.55187 4824.55187  5.49%   477  246s
238   1538   563 4824.55187   20  456 5104.55187 4824.55187  5.49%   490  251s
239   1548   571 4824.55187   22  696 5104.55187 4824.55187  5.49%   500  256s
240   1554   577 4824.55187   23  717 5104.55187 4824.55187  5.49%   514  261s
241   1563   576 4826.58190   24  876 5104.55187 4824.55187  5.49%   549  267s
242   1571   600 4826.58190   25  854 5104.55187 4824.55187  5.49%   583  275s
243   1600   642 4844.55187   27  609 5104.55187 4824.55187  5.49%   628  285s
244   1687   651    cutoff   22      5104.55187 4824.55187  5.49%   660  292s
245  H 1731   609                    5084.5518738 4824.55187  5.11%   666  292s
246   1771   651 4884.55187   40  489 5084.55187 4824.55187  5.11%   665  301s
247  H 1790   619                    5004.5518738 4824.55187  3.60%   685  301s
```

```
248
249  Cutting planes:
250    Gomory: 8
251    Cover: 318
252    Implied bound: 152
253    Projected implied bound: 6
254    Clique: 82
255    MIR: 67
256    StrongCG: 27
257    Flow cover: 117
258    GUB cover: 117
259    Zero half: 48
260    RLT: 65
261    Relax-and-lift: 128
262    BQP: 6
263
264  Explored 1842 nodes (1371710 simplex iterations) in 301.77 seconds (628.88 work units)
265  Thread count was 8 (of 8 available processors)
266
267  Solution count 7: 5004.55 5084.55 5104.55 ... 5344.55
268
269  Optimal solution found (tolerance 5.00e-02)
270  Best objective 5.004551873823e+03, best bound 4.824551873823e+03, gap 3.5967%
271  Set parameter MIPGap to value 1e-08
272  Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
273
274  CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
275  Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
276
277  Optimize a model with 1983422 rows, 1559473 columns and 13694120 nonzeros
278  Model fingerprint: 0xc4992b01
279  Variable types: 766961 continuous, 792512 integer (787112 binary)
280  Coefficient statistics:
281    Matrix range     [1e-01, 1e+10]
282    Objective range  [6e-05, 5e+01]
283    Bounds range     [1e+00, 8e+01]
284    RHS range        [8e-01, 1e+10]
285  Warning: Model contains large matrix coefficients
286  Warning: Model contains large rhs
287         Consider reformulating model or setting NumericFocus parameter
288         to avoid numerical issues.
289  Presolve removed 1979499 rows and 1558195 columns
290  Presolve time: 3.82s
291  Presolved: 3923 rows, 1278 columns, 10417 nonzeros
292  Variable types: 6 continuous, 1272 integer (740 binary)
293  Found heuristic solution: objective 3282.4332332
294  Found heuristic solution: objective 3290.2110110
295
296  Root relaxation: objective 4.552711e+03, 1279 iterations, 0.01 seconds (0.02 work units)
297
298     Nodes    |    Current Node    |     Objective Bounds      |     Work
299   Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time
300
301      0     0 4552.71111    0   46 3290.21101 4552.71111  38.4%     -    4s
302  H   0     0                    3986.0703923 4552.71111  14.2%     -    4s
303  H   0     0                    3987.1111111 4552.71111  14.2%     -    4s
304  H   0     0                    4376.0703923 4552.11111  4.02%     -    4s
305      0     0 4552.11111    0   18 4376.07039 4552.11111  4.02%     -    5s
306  H   0     0                    4383.4777997 4552.11111  3.85%     -    5s
307  H   0     0                    4548.4777997 4552.11111  0.08%     -    5s
308  H   0     0                    4551.0703923 4552.11111  0.02%     -    5s
309  H   0     0                    4552.1111139 4552.11111  0.00%     -    5s
310
311  Cutting planes:
312    Learned: 8
313    Gomory: 5
314    Cover: 12
315    Implied bound: 12
316    Clique: 21
317    MIR: 8
318    StrongCG: 1
319    Flow cover: 2
320    Network: 5
321    RLT: 3
322    Relax-and-lift: 13
323    PSD: 8
324
325  Explored 1 nodes (2304 simplex iterations) in 5.25 seconds (5.84 work units)
326  Thread count was 8 (of 8 available processors)
327
328  Solution count 9: 4552.11 4551.07 4548.48 ... 3282.43
329
330  Optimal solution found (tolerance 1.00e-08)
331  Best objective 4.552111113911e+03, best bound 4.552111113911e+03, gap 0.0000%
```

```
332   SP is solved
333   SP's optimal solution is'□4552
334
335    Itr = 1
336   Collect_LB =  [610.0, 5004.5518738231185]
337   Collect_UB =  [8839.103747646237, 5442.111113911109]
338   Collect_Hua =  [0.0, 4114.5518738231185]
339   Collect_SPObjVal =  [4114.5518738231185, 4552.111113911109]
340   Collect_MPObjValNHua =  [610.0, 890.0]
341   Time: 548.000000
342
343
344
345
346
347   Set parameter TimeLimit to value 10800
348   Set parameter MIPGap to value 0.05
349   Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
350
351   CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
352   Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
353
354   Optimize a model with 1426935 rows, 264417 columns and 4291399 nonzeros
355   Model fingerprint: 0x21113f61
356   Variable types: 1 continuous, 264416 integer (244176 binary)
357   Coefficient statistics:
358     Matrix range     [1e-01, 1e+10]
359     Objective range  [1e+00, 2e+01]
360     Bounds range     [1e+00, 1e+00]
361     RHS range        [1e+00, 2e+10]
362   Warning: Model contains large matrix coefficients
363   Warning: Model contains large rhs
364         Consider reformulating model or setting NumericFocus parameter
365         to avoid numerical issues.
366   Presolve removed 5904 rows and 196394 columns
367   Presolve time: 0.23s
368
369   Explored 0 nodes (0 simplex iterations) in 0.58 seconds (0.79 work units)
370   Thread count was 1 (of 8 available processors)
371
372   Solution count 0
373
374   Model is infeasible
375   Best objective -, best bound -, gap -
376   Traceback (most recent call last):
377     File "<input>", line 1, in <module>
378     File "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\_pydev_bundle\pydev_umd.py", line 198, in runfile
379       pydev_imports.execfile(filename, global_vars, local_vars)  # execute the script
380     File "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\_pydev_imps\_pydev_execfile.py", line 18, in execfile
381       exec(compile(contents+"\n", file, 'exec'), glob, loc)
382     File "E:/1 □□□□/3 □□□□□/1 □□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□/4 □□□□/3 python_code/9 Code for this paper/
        main_RO_CCG.py", line 1363, in <module>
383       HuaValG = Hua.x
384     File "src\gurobipy\var.pxi", line 125, in gurobipy.Var.__getattr__
385     File "src\gurobipy\var.pxi", line 153, in gurobipy.Var.getAttr
386     File "src\gurobipy\attrutil.pxi", line 100, in gurobipy.__getattr
387   AttributeError: Unable to retrieve attribute 'x'
388
```