```
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=43463
 3
   import sys; print('Python %s on %s' % (sys.version, sys.platform))
 4
   5
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
   paper')
10 Backend TkAgg is interactive backend. Turning interactive mode on.
   Waiting 5s....
12
   Set parameter TimeLimit to value 3600
   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 652792 rows, 47910 columns and 1908962 nonzeros
19
   Model fingerprint: 0x3beaf000
   Variable types: 0 continuous, 47910 integer (40308 binary)
20
21
   Coefficient statistics:
    Matrix range [1e-01, 1e+15]
    Objective range [1e+00, 5e+01]
23
24
    Bounds range [1e+00, 1e+00]
                [1e+00, 2e+15]
    RHS range
26
   Warning: Model contains large matrix coefficient range
27
   Warning: Model contains large rhs
28
        Consider reformulating model or setting NumericFocus parameter
29
       to avoid numerical issues.
30 Presolve removed 435552 rows and 24179 columns (presolve time = 5s) ...
31
   Presolve removed 449583 rows and 24884 columns (presolve time = 10s) ...
   Presolve removed 456963 rows and 25568 columns (presolve time = 15s) ...
   Presolve removed 456963 rows and 25568 columns (presolve time = 20s) ...
   Presolve removed 456963 rows and 25568 columns (presolve time = 25s) ...
34
35
   Presolve removed 545434 rows and 33943 columns
   Presolve time: 27.03s
   Presolved: 107358 rows, 13967 columns, 321664 nonzeros
37
38
   Variable types: 0 continuous, 13967 integer (13684 binary)
39
40
   Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
41
   Showing first log only...
42
43
   Root relaxation presolved: 13959 rows, 121301 columns, 334953 nonzeros
44
45
46
   Root simplex log...
47
48
   Iteration Objective
                      Primal Inf. Dual Inf.
                                           Time
      0 -9.4420000e+03 0.000000e+00 1.362140e+05
49
50
     9373 6.7636155e+02 0.000000e+00 5.064189e+03
51
    10115 6.6352553e+02 0.000000e+00 0.000000e+00
                                                   36s
    10115 6.6352553e+02 0.000000e+00 0.000000e+00
52
                                                   36s
53
    10115 \quad 6.6352553e + 02 \quad 0.000000e + 00 \quad 0.000000e + 00
54
   Concurrent spin time: 0.20s
55
56
   Solved with primal simplex
57
58
   Root relaxation: objective 6.635255e+02, 10115 iterations, 7.07 seconds (3.13 work units)
59
60
     Nodes | Current Node | Objective Bounds |
                                                 Work
    Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
61
62
63
         0 663 52553 0 279
                              - 663 52553
                                           - - 40s
64
     0
         0 674.29800 0 660
                              - 674.29800
                                              - 45s
         0 674.29800
65
                     0 658
                               - 674.29800
                                                 46s
                                              - 50s
66
         0 677.63134
                    0 409
                              - 677.63134
     0
                     0 528
67
     0
         0 683.80204
                              - 683.80204
                                                51s
68
     0
         0 683.83813
                     0 564
                              - 683.83813
                                                 51s
69
         0 683.89292
                     0.553
                              - 683.89292
                                                51s
70
                              - 683 91157
                                                52s
     0
         0 683 91157
                     0.582
71
     0
         0 683.91234
                     0 570
                              - 683.91234
                                                52s
         0 684.30770
                     0 637
                               - 684.30770
                                                 54s
73
     0
         0 684.66667
                     0 129
                               - 684.66667
                                                 56s
74
     0
         0 684.66667
                     0 131
                               - 684,66667
                                                56s
75
         0 685.00700
                     0 828
                               - 685.00700
                                                 59s
     0
76
     0
         0 686.49997
                     0 834
                               - 686.49997
                                                62s
         0 686.49997
                     0 834
                               - 686,49997
                                              - 62s
77
     0
78
     0
         0 686.55484
                     0 914
                               - 686.55484
                                           _
                                              - 63s
     0
         0 686.59062
                     0 930
                               - 686.59062
79
                                                64s
```

```
0 686.70326 0 922
                                    - 686.70326
                                                        64s
 80
       0
 81
           0 686.80617
                         0 909
                                    - 686.80617
                                                        65s
                         0.911
                                    - 686.83571
 82
           0.686.83571
                                                        65s
 83
       0
           0 686.90125
                         0 929
                                    - 686.90125
                                                        66s
           0 686.90125
                         0 894
                                    - 686.90125
                                                         66s
 85
       0
           0 686.96846
                         0 845
                                    - 686.96846
                                                        67s
           0 686.98925
                                    - 686.98925
 86
       0
                         0 824
                                                        68s
 87
       0
           0 686.98925
                         0 846
                                    - 686.98925
                                                         68s
           0 686.98925
                                    - 686.98925
 88
       0
                         0 830
                                                         69s
 89
           0.688.85611
                         0.691
                                    - 688.85611
                                                        78s
       0
 90
                         0.707
                                    - 688.95813
       0
           0.688.95813
                                                        80s
 91
       0
           0 688.98856
                         0 781
                                    - 688.98856
                                                        80s
 92
       0
           0 689.02914
                         0 1105
                                    - 689.02914
                                                         81s
 93
           0 689.02914
                                    - 689.02914
       0
                         0.1105
                                                         81s
 94
       0
           0\ 689.02914
                         0 1056
                                     - 689.02914
                                                         82s
 95
           0 689.25075
                                     - 689.25075
                         0 1216
                                                         86s
 96
       0
           0 689.25075
                                     - 689.25075
                         0.1206
                                                         86s
 97
           0.689.30412
       0
                         0.1164
                                    - 689.30412
                                                         87s
 98
           0 689.31664
                         0 1247
                                    - 689.31664
                                                         87s
 99
       0
           0 689.34971
                         0 1256
                                     - 689.34971
                                                         88s
100
           0 689.35577
                         0.1222
                                     - 689.35577
       0
                                                         88s
101
       0
           0 689.35577
                         0.1191
                                     - 689.35577
                                                         89s
102
       0
           0 689.79891
                                     - 689.79891
                                                         93s
                         0 1191
103
       0
           0 690.15897
                         0 1216
                                     - 690.15897
                                                         95s
                                                      - 96s
104
           0 690.39414
                                    - 690.39414
       0
                         0.1263
105
       0
           0\ 690.40537
                         0 1380
                                    - 690.40537
                                                      - 97s
           0 690.40537
                                                      - 97s
106
                         0 1417
                                     - 690.40537
           0 690.52718
                                     - 690.52718
                                                      - 102s
107
       0
                         0.1135
108
       0
           0 690.56216
                         0.1118
                                    - 690.56216
                                                      - 103s
109
           0 690.58002
                         0 1271
                                     - 690.58002
                                                      - 104s
                                                      - 105s
- 109s
110
       0
           0 690.58002
                         0 1360
                                     - 690.58002
           0 690.58592
                                    - 690.58592
       0
                         0.1215
111
112
       0
           0 690.58592
                         0 1204
                                     - 690.58592
                                                      - 109s
       0
           0\ 690.58592
                                     - 690.58592
113
                         0 1182
                                                      - 110s
114
       0
           0 690.58592
                         0 1177
                                     - 690.58592
                                                      - 111s
           0 690.63114
                         0.1072
                                     - 690.63114
115
       0
                                                      - 114s
116
       0
           0 690.63114
                         0 1070
                                    - 690.63114
                                                      - 114s
                                                      - 115s
117
       0
           0 690.66792
                         0 1400
                                     - 690.66792
       0
           0 690,67237
                         0.1425
                                     - 690.67237
118
                                                      - 116s
119
       0
           0\ 690.67237
                         0 1419
                                    - 690.67237
                                                      - 116s
120
           0 690.70668
                                     - 690.70668
                                                      - 118s
                         0 1240
                                                      - 119s
- 119s
121
       0
           0 690.71722
                         0 1280
                                     - 690.71722
122
           0 690.71722
                         0.1273
                                    - 690 71722
       0
123
       0
           0 690.71722
                         0 1250
                                    - 690.71722
                                                      - 120s
124
       0
           0\ 690.75330
                         0 1408
                                     - 690.75330
                                                      - 124s
           0 690.75495
                                                      - 125s
125
       0
                         0 1362
                                    - 690.75495
           0 690.75495
                                    - 690.75495
126
       0
                         0.1356
                                                      - 125s
                                                      - 129s
- 130s
127
       0
           0 690.84309
                         0 1046
                                     - 690.84309
128
           0 690.85670
                         0 1129
                                     - 690.85670
       0
                                                      - 130s
129
           0 690.85670
                                    - 690.85670
       0
                         0.1089
130
       0
           0 690.85670
                         0 1076
                                    - 690.85670
                                                      - 131s
           0 690.96660
                                     - 690.96660
                                                     - 133s
131
                         0 1331
                                                     - 133s
- 134s
132
           0 690.96660
                                     - 690.96660
       0
                         0 1332
           0 690,97926
                                    - 690.97926
133
       0
                         0.1307
134
       0
           0 690.97926
                         0 1301
                                     - 690.97926
                                                      - 134s
135
       0
           0 691.43178
                         0 1319
                                     - 691.43178
                                                      - 138s
                                                      - 138s
136
       0
           0 691.43178
                         0.1311
                                    - 691,43178
137
       0
           0 691.58054
                         0 1259
                                    - 691.58054
                                                      - 139s
                                                      - 140s
138
       0
           0 691.58054
                         0 1258
                                     - 691.58054
                                                      - 140s
139
           0 691.58671
                         0 1243
                                     - 691.58671
       0
140
                                    - 691.58671
       0
           0 691.58671
                         0.1240
                                                      - 141s
141
       0
           0 691.59015
                         0.1259
                                    - 691.59015
                                                      - 141s
                                                     - 144s
142
           0 691.61060
                                    - 691.61060
143
       0
           0 691.61060
                         0 964
                                    - 691,61060
                                                     - 145s
                                                     - 148s
144
       0
           0 691.71134
                         0.958
                                    - 691.71134
145
           0 691.71134
                         0 954
                                    - 691.71134
                                                      - 148s
146
       0
           0 691.71419
                         0 728
                                    - 691.71419
                                                      - 149s
                                    - 691.81619
                                                     - 152s
147
       0
           0 691 81619
                         0.871
148
           0 691.81619
                         0.881
                                    - 691.81619
                                                     - 152s
149
           0\ 691.82142
                                                     - 154s
       0
                         0 862
                                    - 691.82142
150
           0 691.83534
                        0 949
                                    - 691.83534
                                                     - 157s
       0
151
       0
           0 691.83544
                         0.951
                                    - 691.83544
                                                      - 158s
152
       0
           0 691.87025
                         0 1051
                                    - 691.87025
                                                      - 161s
153
           0 691.87025
                         0.1004
                                    - 691.87025
                                                      - 161s
154
           0 691 87025
                        0.498
                                    - 691.87025
                                                  - - 165s
       0
155
       0
           2 691.87025 0 494
                                    - 691.87025
                                                      - 180s
156
       33
           38 infeasible 8
                                    696.74588
                                               - 345 186s
                                                   - 440 190s
157
       59
           59 718.00000 12 228
                                     - 696.74588
158
       91
           78 718 00000 16 306
                                     - 696.74588
                                                   - 560 195s
159
      115 105 718.00000 25 188
                                      - 696.74588 - 569 200s
                       24 698.0000000 696.74588 0.18% 551 200s
160
     * 123 105
161
162
    Cutting planes:
163
     Learned: 642
```

```
unknown
164
       Gomory: 30
165
       Lift-and-project: 3
       Cover: 509
166
167
       Implied bound: 133
168
       Clique: 83
       MIR: 435
169
       StrongCG: 84
170
171
       Flow cover: 35
172
       GUB cover: 99
       Zero half: 16
173
174
       RLT: 166
175
       Relax-and-lift: 506
       BQP: 9
176
177
178 Explored 154 nodes (142122 simplex iterations) in 200.43 seconds (168.70 work units)
179 Thread count was 8 (of 8 available processors)
180
181 Solution count 1: 698
182
183 Optimal solution found (tolerance 1.00e-04)
184 Best objective 6.980000000000e+02, best bound 6.98000000000e+02, gap 0.0000%
185 Optimal Obj: 698.0
186 Obj = 698.0
187 Solutions
                             pi: 16-21, ai-di: 3-22,
                                                                                             taoPi_SP-deltaPi_SP: 3-8, periodPi: 5, betaNi: 10, bi: 18, Txijt:
188 Vessel i: 0:
                    li: 5,
                                                        taoi-deltai: 3-21,
                                                                              periodi: 18,
      90, o1i: 90, o2i: 100, o3i: -325, o4i: 200, Ti: 65
189 Vessel i: 1: li: 7, pi: 9-16, ai-di: 4-25, taoi-deltai: 4-24, 140, o1i: 140, o2i: 140, o3i: -351, o4i: 240, Ti: 169
190 Vessel i: 2: li: 6, pi: 21-27, ai-di: 18-26, taoi-deltai: 18-
                                                                            periodi: 20,
                                                                                            taoPi SP-deltaPi SP: 4-11, periodPi: 7,
                                                                                                                                                         bi: 20,
                                                                                                                                          betaNi: 12,
                                                                                                                                                                  Txijt:
                                                                                              taoPi_SP-deltaPi_SP: 18-21, periodPi: 3,
                                                           taoi-deltai: 18-25,
                                                                                periodi: 7,
                                                                                                                                              betaNi: 4,
                                                                                                                                                         bi: 7, Txijt
      : 42, o1i: 42, o2i: 60, o3i: -104, o4i: 80, Ti: 78
                   li: 6, pi: 14-20, ai-di: 26-61, taoi-deltai: 26-60, o1i: 204, o2i: 180, o3i: -650, o4i: 400, Ti: 134
      Vessel i: 3: li: 6,
                                                                                periodi: 34,
                                                                                               taoPi SP-deltaPi SP: 26-35,
                                                                                                                                periodPi: 9,
                                                                                                                                               betaNi: 20,
                                                                                                                                                              bi: 34,
      Txijt: 204,
      Vessel i: 4:
                    li: 6, pi: 28-34, ai-di: 20-68,
                                                          taoi-deltai: 20-47,
                                                                                periodi: 27,
                                                                                               taoPi_SP-deltaPi_SP: 20-27,
                                                                                                                                periodPi: 7,
                                                                                                                                               betaNi: 16,
                                                                                                                                                              bi: 27,
      Txijt: 162,
                    o1i: 162, o2i: 140, o3i: -520, o4i: 320, Ti: 102
     Vessel i: 5:
                                                        taoi-deltai: 35-44,
                    li: 6, pi: 8-14, ai-di: 35-60,
                                                                               periodi: 9,
                                                                                             taoPi SP-deltaPi SP: 35-40, periodPi: 5, betaNi: 5, bi: 9, Txijt:
           o1i: 54, o2i: 100, o3i: -104, o4i: 100, Ti: 150
     TimeSolveModel: 248.000000
195
196
197
198 TimeAll: 253.000000
199
200
201
202
```