```
"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=58198

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_DM.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 TimeLimit to value 10800
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 787055 rows, 56000 columns and 2313377 nonzeros
Model fingerprint: 0x40c6fe2a
Variable types: 0 continuous, 56000 integer (47131 binary)
Coefficient statistics:
  Matrix range     [1e-01, 1e+15]
  Objective range  [1e+00, 5e+01]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 2e+15]
Warning: Model contains large matrix coefficient range
Warning: Model contains large rhs
         Consider reformulating model or setting NumericFocus parameter
         to avoid numerical issues.
Presolve removed 582383 rows and 32915 columns (presolve time = 5s) ...
Presolve removed 591781 rows and 33341 columns (presolve time = 10s) ...
Presolve removed 598870 rows and 33753 columns (presolve time = 15s) ...
Presolve removed 620026 rows and 35038 columns (presolve time = 20s) ...
Presolve removed 620026 rows and 35038 columns (presolve time = 25s) ...
Presolve removed 620026 rows and 35038 columns (presolve time = 30s) ...
Presolve removed 620026 rows and 35038 columns (presolve time = 35s) ...
Presolve removed 688117 rows and 42154 columns
Presolve time: 37.86s
Presolved: 98938 rows, 13846 columns, 301745 nonzeros
Variable types: 0 continuous, 13846 integer (13569 binary)

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

Root relaxation presolved: 13838 rows, 112760 columns, 315027 nonzeros


Root simplex log...

Iteration    Objective       Primal Inf.    Dual Inf.      Time
       0   -8.6810000e+03   0.000000e+00   1.146506e+05     40s
    3235    4.5619091e+02   0.000000e+00   1.880413e+05     40s
Concurrent spin time: 0.73s

Solved with dual simplex (primal model)

Root relaxation: objective 4.830536e+02, 2745 iterations, 2.77 seconds (1.82 work units)

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

     0     0  483.05359    0  582          -  483.05359      -     -   45s
     0     0  494.15654    0  938          -  494.15654      -     -   50s
     0     0  494.15654    0  927          -  494.15654      -     -   50s
     0     0  494.80811    0  970          -  494.80811      -     -   51s
     0     0  494.86093    0 1214          -  494.86093      -     -   51s
     0     0  494.87948    0 1224          -  494.87948      -     -   52s
     0     0  495.02242    0 1285          -  495.02242      -     -   52s
     0     0  495.09995    0 1273          -  495.09995      -     -   52s
     0     0  495.14872    0 1197          -  495.14872      -     -   53s
     0     0  495.17775    0 1278          -  495.17775      -     -   53s
     0     0  495.18879    0 1275          -  495.18879      -     -   53s
     0     0  495.19958    0 1269          -  495.19958      -     -   54s
     0     0  495.23030    0 1269          -  495.23030      -     -   54s
     0     0  495.24373    0 1264          -  495.24373      -     -   54s
     0     0  495.25227    0 1267          -  495.25227      -     -   54s
     0     0  495.31264    0 1673          -  495.31264      -     -   54s
     0     0  495.32167    0 1736          -  495.32167      -     -   55s
     0     0  495.34178    0 1786          -  495.34178      -     -   55s
```

80	0	0	495.37156	0	1809	-	495.37156	-	-	55s
81	0	0	495.38999	0	1825	-	495.38999	-	-	55s
82	0	0	495.40340	0	1646	-	495.40340	-	-	56s
83	0	0	495.41074	0	1631	-	495.41074	-	-	56s
84	0	0	495.42702	0	1604	-	495.42702	-	-	56s
85	0	0	495.50449	0	1950	-	495.50449	-	-	57s
86	0	0	495.50947	0	2025	-	495.50947	-	-	57s
87	0	0	495.50954	0	2026	-	495.50954	-	-	57s
88	0	0	496.67039	0	1731	-	496.67039	-	-	60s
89	0	0	496.67039	0	1740	-	496.67039	-	-	60s
90	0	0	497.07501	0	1633	-	497.07501	-	-	61s
91	0	0	497.27048	0	1796	-	497.27048	-	-	61s
92	0	0	497.38347	0	1789	-	497.38347	-	-	62s
93	0	0	497.40161	0	1761	-	497.40161	-	-	62s
94	0	0	497.41993	0	1778	-	497.41993	-	-	62s
95	0	0	497.42254	0	1808	-	497.42254	-	-	62s
96	0	0	497.42533	0	1826	-	497.42533	-	-	62s
97	0	0	497.42550	0	1837	-	497.42550	-	-	62s
98	0	0	504.30177	0	1645	-	504.30177	-	-	66s
99	0	0	505.70235	0	1787	-	505.70235	-	-	67s
100	0	0	506.19917	0	1785	-	506.19917	-	-	68s
101	0	0	506.26848	0	1753	-	506.26848	-	-	68s
102	0	0	506.33171	0	1756	-	506.33171	-	-	68s
103	0	0	506.36969	0	1963	-	506.36969	-	-	69s
104	0	0	506.42520	0	1998	-	506.42520	-	-	69s
105	0	0	506.51014	0	1843	-	506.51014	-	-	69s
106	0	0	506.51014	0	1863	-	506.51014	-	-	69s
107	0	0	508.12602	0	1531	-	508.12602	-	-	72s
108	0	0	508.12602	0	1530	-	508.12602	-	-	72s
109	0	0	509.84216	0	1954	-	509.84216	-	-	74s
110	0	0	512.37058	0	1649	-	512.37058	-	-	75s
111	0	0	513.44344	0	1499	-	513.44344	-	-	75s
112	0	0	513.46548	0	1519	-	513.46548	-	-	76s
113	0	0	513.47238	0	1476	-	513.47238	-	-	76s
114	0	0	513.47986	0	1546	-	513.47986	-	-	77s
115	0	0	513.47986	0	1503	-	513.47986	-	-	77s
116	0	0	513.97670	0	1432	-	513.97670	-	-	79s
117	0	0	513.97670	0	1428	-	513.97670	-	-	79s
118	0	0	514.02910	0	1286	-	514.02910	-	-	80s
119	0	0	514.04057	0	1255	-	514.04057	-	-	80s
120	0	0	514.04088	0	1283	-	514.04088	-	-	81s
121	0	0	515.12547	0	1231	-	515.12547	-	-	82s
122	0	0	516.85347	0	1572	-	516.85347	-	-	84s
123	0	0	516.87453	0	1509	-	516.87453	-	-	84s
124	0	0	516.87775	0	1560	-	516.87775	-	-	85s
125	0	0	517.85416	0	1220	-	517.85416	-	-	87s
126	0	0	517.99415	0	1202	-	517.99415	-	-	88s
127	0	0	518.00155	0	1222	-	518.00155	-	-	88s
128	0	0	518.00155	0	1225	-	518.00155	-	-	88s
129	0	0	518.17975	0	1363	-	518.17975	-	-	90s
130	0	0	518.25893	0	1328	-	518.25893	-	-	91s
131	0	0	518.26776	0	1417	-	518.26776	-	-	91s
132	0	0	518.26825	0	1452	-	518.26825	-	-	91s
133	0	0	518.34560	0	1432	-	518.34560	-	-	93s
134	0	0	518.34560	0	1430	-	518.34560	-	-	93s
135	0	0	518.37185	0	1412	-	518.37185	-	-	94s
136	0	0	518.37185	0	1357	-	518.37185	-	-	94s
137	0	0	518.49920	0	1365	-	518.49920	-	-	96s
138	0	0	518.50652	0	1346	-	518.50652	-	-	97s
139	0	0	518.58520	0	1346	-	518.58520	-	-	100s
140	0	0	518.60217	0	1241	-	518.60217	-	-	101s
141	0	0	518.61198	0	1292	-	518.61198	-	-	102s
142	0	0	518.61198	0	1312	-	518.61198	-	-	103s
143	0	0	518.68963	0	1213	-	518.68963	-	-	108s
144	0	0	518.69791	0	1306	-	518.69791	-	-	111s
145	0	0	518.80666	0	1299	-	518.80666	-	-	116s
146	0	0	518.83189	0	1273	-	518.83189	-	-	119s
147	0	0	518.83189	0	1203	-	518.83189	-	-	121s
148	0	0	518.87885	0	1293	-	518.87885	-	-	129s
149	0	0	518.87885	0	1281	-	518.87885	-	-	130s
150	0	0	518.88285	0	1339	-	518.88285	-	-	134s
151	0	0	518.97655	0	1385	-	518.97655	-	-	143s
152	0	0	518.97655	0	1384	-	518.97655	-	-	143s
153	0	0	518.98717	0	1264	-	518.98717	-	-	146s
154	0	0	518.98717	0	1263	-	518.98717	-	-	146s
155	0	0	518.98719	0	1287	-	518.98719	-	-	147s
156	0	0	519.05957	0	1223	-	519.05957	-	-	151s
157	0	0	519.07118	0	1304	-	519.07118	-	-	154s
158	0	0	519.07729	0	1226	-	519.07729	-	-	156s
159	0	0	519.12293	0	1200	-	519.12293	-	-	163s
160	0	0	519.12330	0	1228	-	519.12330	-	-	166s
161	0	0	519.12330	0	1158	-	519.12330	-	-	171s
162	0	0	519.12330	0	576	-	519.12330	-	-	175s
163	0	2	519.12330	0	557	-	519.12330	-	-	200s

```
164      11   16  541.91454    4  742         -  528.42568     -  385  207s
165      23   28  559.00000    5  168         -  528.42568     -  592  211s
166      31   38  590.85185    6  149         -  528.42568     -  616  215s
167      82   95  539.80000   16   82         -  528.42568     -  352  220s
168     267  240  550.48492   13  616         -  533.35116     -  195  225s
169  *  271  224            56    653.0000000  533.35116  18.3%   197  225s
170  H  279  219                 559.0000000  533.35116  4.59%   201  226s
171     347  217     cutoff   29       559.00000  539.00000  3.58%   195  230s
172     395  227  540.25000   23  162  559.00000  539.00000  3.58%   204  237s
173     430  213  542.33333   31  212  559.00000  539.00000  3.58%   206  241s
174     461  217     cutoff   32       559.00000  539.00000  3.58%   221  247s
175     494  217  539.00000   17  256  559.00000  539.00000  3.58%   234  251s
176     514  213  541.00000   21  266  559.00000  539.00000  3.58%   249  257s
177     533  233  544.00000   22  228  559.00000  539.00000  3.58%   265  263s
178     554  229  544.00000   23  224  559.00000  539.00000  3.58%   269  266s
179     598  240  544.00000   23  253  559.00000  539.00000  3.58%   278  274s
180     623  227     cutoff   25       559.00000  539.00000  3.58%   275  277s
181     664  187  545.66667   15  576  559.00000  539.00000  3.58%   270  361s
182     666  188  547.33333   20  247  559.00000  539.00000  3.58%   269  376s
183     667  189  542.25099   28  226  559.00000  539.00000  3.58%   269  385s
184     670  191  545.66667   25   90  559.00000  539.00000  3.58%   268  392s
185     671  192  540.07143   22   92  559.00000  539.00000  3.58%   267  395s
186     673  193  549.00000   28  156  559.00000  539.00000  3.58%   267  403s
187     674  194  547.36667   18  182  559.00000  539.00000  3.58%   266  405s
188     678  196  549.00000   32  150  559.00000  539.00000  3.58%   265  411s
189     680  198  549.00000   20  152  559.00000  539.00000  3.58%   264  417s
190     681  198  540.25786   21   88  559.00000  539.00000  3.58%   263  427s
191     682  199  544.55556   20   92  559.00000  539.00000  3.58%   263  430s
192     686  202  554.00000   31   82  559.00000  539.00000  3.58%   262  435s
193     690  206  544.00000   18  576  559.00000  539.00000  3.58%   315  501s
194     692  207  554.00000   31   81  559.00000  539.00000  3.58%   314  514s
195     693  208  547.09524   24   31  559.00000  539.00000  3.58%   313  517s
196     694  209  544.00000   28  197  559.00000  539.00000  3.58%   313  520s
197     699  212  549.00000   24   51  559.00000  539.00000  3.58%   311  526s
198     703  215  549.00000   20   36  559.00000  539.00000  3.58%   309  531s
199     709  219  542.33333   27   52  559.00000  539.00000  3.58%   306  536s
200     726  233  539.00000   30   59  559.00000  539.00000  3.58%   331  540s
201     785  246  550.18182   37   89  559.00000  539.00000  3.58%   328  545s
202     880  229     cutoff   47       559.00000  539.00000  3.58%   322  551s
203     954  201  545.25000   32  143  559.00000  539.00000  3.58%   329  555s
204    1007  187  552.33333   38  173  559.00000  539.00000  3.58%   331  560s
205    1065  172  552.33333   43  166  559.00000  539.00000  3.58%   333  565s
206    1127  141  542.33333   33  255  559.00000  539.00000  3.58%   326  570s
207    1194  108     cutoff   39       559.00000  542.33333  2.98%   319  576s
208    1419    2     cutoff   38       559.00000  552.33333  1.19%   285  581s
209
210  Cutting planes:
211    Gomory: 28
212    Cover: 30
213    Implied bound: 1
214    Clique: 16
215    MIR: 20
216    StrongCG: 10
217    Flow cover: 29
218    GUB cover: 25
219    Zero half: 13
220    RLT: 11
221    Relax-and-lift: 23
222
223  Explored 1432 nodes (463294 simplex iterations) in 581.12 seconds (329.92 work units)
224  Thread count was 8 (of 8 available processors)
225
226  Solution count 2: 559 653
227
228  Optimal solution found (tolerance 1.00e-04)
229  Best objective 5.590000000000e+02, best bound 5.590000000000e+02, gap 0.0000%
230  Optimal Obj:  559.0
231  Obj = 559.0
232  Solutions
233  Vessel i: 0:     li: 5,     pi: 23-28,     ai-di: 2-10,     taoi-deltai: 2-8,     periodi: 6,     taoPi_SP-deltaPi_SP: 2-4,     periodPi: 2,     betaNi: 4,     bi: 6,     Txijt: 30
       ,     o1i: 30,     o2i: 40,     o3i: -100,     o4i: 80,     Ti: 50
234  Vessel i: 1:     li: 7,     pi: 7-14,     ai-di: 1-25,     taoi-deltai: 1-23,     periodi: 22,     taoPi_SP-deltaPi_SP: 1-7,     periodPi: 6,     betaNi: 15,     bi: 22,     Txijt:
       154,     o1i: 154,     o2i: 120,     o3i: -432,     o4i: 300,     Ti: 142
235  Vessel i: 2:     li: 5,     pi: 16-21,     ai-di: 3-10,     taoi-deltai: 3-8,     periodi: 5,     taoPi_SP-deltaPi_SP: 3-5,     periodPi: 2,     betaNi: 3,     bi: 5,     Txijt: 25
       ,     o1i: 25,     o2i: 40,     o3i: -75,     o4i: 60,     Ti: 50
236  Vessel i: 3:     li: 5,     pi: 14-19,     ai-di: 22-40,     taoi-deltai: 22-38,     periodi: 16,     taoPi_SP-deltaPi_SP: 22-26,     periodPi: 4,     betaNi: 10,     bi: 16,
       Txijt: 80,     o1i: 80,     o2i: 80,     o3i: -300,     o4i: 200,     Ti: 60
237  Vessel i: 4:     li: 5,     pi: 29-34,     ai-di: 20-45,     taoi-deltai: 20-29,     periodi: 9,     taoPi_SP-deltaPi_SP: 20-23,     periodPi: 3,     betaNi: 5,     bi: 9,     Txijt
       : 45,     o1i: 45,     o2i: 60,     o3i: -150,     o4i: 100,     Ti: 55
238  Vessel i: 5:     li: 7,     pi: 7-14,     ai-di: 28-68,     taoi-deltai: 28-50,     periodi: 22,     taoPi_SP-deltaPi_SP: 28-34,     periodPi: 6,     betaNi: 13,     bi: 22,
       Txijt: 154,     o1i: 154,     o2i: 120,     o3i: -432,     o4i: 260,     Ti: 102
239  Vessel i: 6:     li: 5,     pi: 20-25,     ai-di: 35-65,     taoi-deltai: 35-45,     periodi: 10,     taoPi_SP-deltaPi_SP: 35-39,     periodPi: 4,     betaNi: 6,     bi: 10,
       Txijt: 50,     o1i: 50,     o2i: 80,     o3i: -150,     o4i: 120,     Ti: 100
240  TimeSolveModel: 643.000000
```

```
241
242
243
244   TimeAll: 649.000000
245
246
247
248
```