* DATA FOR KONDILI : STN EXAMPLE 1

SETS
i Tasks /H,R1,R2,R3,S/
j Equipment /HT,R1,RII,F/
s States /A,B,C,hA,AB,BC,iE,P1,P2/
t Time periods /0*9/
u Utilities /U1/

JI(j,i) Compatible Unit-Task pairs
SI(i,s) State s input for i \ Task i consumes s
SO(i,s) State s output for i \ Task i produces s
Alias (t,t1);

PARAMETERS
iJI(j,i) 1 if task i can be carried out in unit j
PT(i) Processing Time of task i
Vmax(j) Capacity of Unit j
Cap(s) Storage capacity for state s
S0(s) Initial amount of state s
m(i,s) Mass fraction of state s in task i
Ua(u,i) Fixed amount of u required by i
Ub(u,i) Variable amount of u required by i
Umax(u) Maximum amount of utility u
g(s) Price of state s;

PARAMETER PT(i) /H 1, R1 2, R2 2, R3 1, S 2/;
PARAMETER Vmax(j) /HT 100, R1 50, RII 80, F 200/;
PARAMETER Cap(s) /A 2000, B 2000, C 2000, hA 1000, AB 500, BC 0, iE 1000, P1 2000, P2 2000/;
PARAMETER S0(S) /A 2000, B 2000, C 2000/;
PARAMETER g(s) /P1 1, P2 1/;

TABLE iJI(j,i)
H R1 R2 R3 S
HT 1
RI 1 1 1
RII 1 1 1
F

TABLE m(i,s) Mass fraction of state s in task i
A B C hA AB BC iE P1 P2
H -1 1
R1 -0.5 -0.5 1
R2 -0.4 0.6 -0.6 0.4
R3 -0.2 -0.8 1
S 0.1 -1 0.9;

Ua(u,i) = 0;
Ub(u,i) = 0;
Umax(u) = 1;

INCLUDE /var/www/html/interfaces/cgi-bin/stn/equ.inc

** ** ** ** ** ** Equation File ** ** ** ** ** **
JI(j,i) = YES$(iJI(j,i) eq 1);
56  SI(i,s) = YES$(m(i,s) lt 0);
57  SO(i,s) = YES$(m(i,s) gt 0);
58
59  VARIABLES
60  W(i,j,t) 1 if task i starts on j at t
61  B(i,j,t) Batch size of task i on j at t
62  ST(s,t)  Inventory of s at t
63  Ut(u,t) Utility consumed at t
64  PROF  Profit;
65
66  BINARY VARIABLES W;
67  POSITIVE VARIABLES B, ST, Ut;
68
69  EQUATIONS ASS, CAP1, MB0, MBT, CAP2, UTIL, CAP3, OBJ;
70
71  ASS(j,t)..               sum((i,t1)$(JI(j,i) AND (ord(t1) ge (ord(t)-pt(i)+1)) AND (ord(t1) le ord(t))), W(i,j,t1)) =L= 1;
72  CAP1(i,j,t)$JI(j,i)..    B(i,j,t) =L= Vmax(j)*W(i,j,t);
73  MB0(s)..                 ST(s,'0') =E= S0(s) + sum((i,j)$(SI(i,s) AND JI(j,i)), m(i,s)*B(i,j,'0'));
74  MBT(s,t)$(ord(t) gt 1).. ST(s,t) =E= ST(s,t-1) + sum((i,j)$(SI(i,s) AND JI(j,i)), m(i,s)*B(i,j,t) + sum((i,j)$(SO(i,s) AND JI(j,i) AND (ord(t1) eq (ord(t)-pt(i)))), m(i,s)*B(i,j,t1) ));
75  CAP2(s,t)..              ST(s,t) =L= Cap(s);
76  UTIL(u,t)..              Ut(u,t) =E= sum((i,j,t1)$(JI(j,i) AND (ord(t1) ge (ord(t)-pt(i)+1)) AND (ord(t1) le ord(t))), Ua(u,i)*W(i,j,t1) + Ub(u,i)*B(i,j,t1) );
77  OBJ..                    PROF =E=  sum((s,t)$(ord(t) eq card(t)), g(s)*ST(s,t)) ;
78
79  *MODEL STN1 /ASS, CAP1, MB0, MBT, CAP2, UTIL, CAP3, OBJ/ ;
80  MODEL STN1 /ALL/ ;
81
82  *OPTION SOLPRINT = OFF ;
83  OPTION SYSOUT = OFF ;
84  OPTION LIMROW = 0 ;
85  OPTION LIMCOL = 0 ;
86  OPTION RESLIM = 1000 ;
87  OPTION OPTCR = 0.0 ;
88  OPTION MIP = CPLEX ;
89  OPTION RMIP = CPLEX ;
90
91  SOLVE STN1 MAXIMIZING PROF USING RMIP ;
92  SOLVE STN1 MAXIMIZING PROF USING MIP ;
93  DISPLAY W.L, B.L, ST.L ;
94
95  INCLUDE /var/www/html/interfaces/cgi-bin/stn/graph1.inc
96
97
98
99
100 parameter acc1,acc;
loop(i,
loop(j,
Loop(t,
if(b.l(i,j,t) eq 0,
  w.l(i,j,t) = 0;
);
);
);
);
);
if(b.l(i,j,t) eq 0,
  w.l(i,j,t) = 0;
);
);
);
);
if(b.l(i,j,t) eq 0,
  w.l(i,j,t) = 0;
);
);
);
);
* * * * * * * inventory graph for products & intermediates * * * * * * * *
file res13/hA/
file res14/AB/
file res15/BC/
file res16/iE/
file res17/P1/
file res18/P2/
loop(t,
  acc1 = 0;
  acc = acc1 + st.l('hA',t);
  put res13 (ord(t)-0.25):10:3, acc1:10:2/;
  put res13 (ord(t)+0.25):10:3, acc1:10:2/;
  put res13 (ord(t)-0.25):10:3, acc:10:2/;
  put res13 (ord(t)+0.25):10:3, acc:10:2/;
  put res13 (ord(t)-0.25):10:3, acc1:10:2/;
  put res13 /;
  acc1 = acc;
  acc = acc1 + st.l('AB',t);
  put res14 (ord(t)-0.25):10:3, acc1:10:2/;
  put res14 (ord(t)+0.25):10:3, acc1:10:2/;
  put res14 (ord(t)+0.25):10:3, acc:10:2/;
  put res14 (ord(t)-0.25):10:3, acc:10:2/;
  put res14 (ord(t)-0.25):10:3, acc1:10:2/;
  put res14 /;
  acc1 = acc;
  acc = acc1 + st.l('BC',t);
  put res15 (ord(t)-0.25):10:3, acc1:10:2/;
  put res15 (ord(t)+0.25):10:3, acc1:10:2/;
  put res15 (ord(t)+0.25):10:3, acc:10:2/;
  put res15 (ord(t)-0.25):10:3, acc:10:2/;
  put res15 (ord(t)-0.25):10:3, acc1:10:2/;
  put res15 /;
  acc1 = acc;
  acc = acc1 + st.l('iE',t);
  put res16 (ord(t)-0.25):10:3, acc1:10:2/;
  put res16 (ord(t)+0.25):10:3, acc1:10:2/;
  put res16 (ord(t)+0.25):10:3, acc:10:2/;
  put res16 (ord(t)-0.25):10:3, acc:10:2/;
  put res16 (ord(t)-0.25):10:3, acc1:10:2/;
  put res16 /;
  acc1 = acc;
  acc = acc1 + st.l('P1',t);
  put res17 (ord(t)-0.25):10:3, acc1:10:2/;
model.lst

162          put res17 (ord(t)+0.25):10:3, acc1:10:2;/
163          put res17 (ord(t)+0.25):10:3, acc:10:2;/
164          put res17 (ord(t)-0.25):10:3, acc:10:2;/
165          put res17 (ord(t)-0.25):10:3, acc1:10:2;/
166          put res17 /;
167          acc1= acc;
168          acc= acc1 + st.l('P2',t);
169          put res18 (ord(t)-0.25):10:3, acc1:10:2;/
170          put res18 (ord(t)+0.25):10:3, acc1:10:2;/
171          put res18 (ord(t)+0.25):10:3, acc:10:2;/
172          put res18 (ord(t)-0.25):10:3, acc:10:2;/
173          put res18 (ord(t)-0.25):10:3, acc1:10:2;/
174          put res18 /;
175          acc1= acc;
176  );
177  
178  file res123/inv.dem/;
179  
180  PUT RES123 "set title ' '="/;
181  PUT RES123 "set xlabel ' time period (days)'="/;
182  PUT RES123 "set ylabel 'inventory level'="/;
183  PUT res123 "set xrange [ 0 : " (card(t)+2):2:0 "]="/;
184  PUT RES123 "set nogrid="/;
185  PUT RES123 "set time="/;
186  *PUT RES123 "plot 'P2'  w l 6 19,'P1' w l 3 19, "/;
187  PUT RES123 "plot 'P2'  w l ls 6,'P1' w l ls 3, "/;
188  *PUT RES123 "'iE' w l 1 19,'BC' w l 4 9, "/;
189  PUT RES123 "'iE' w l ls 1,'BC' w l ls 4, "/;
190  *PUT RES123 "'AB' w l 8 19,'hA' w l 2 11="/;
191  PUT RES123 "'AB' w l ls 8,'hA' w l ls 2="/;
192  PUT RES123 "pause 0 ' ' "/;
193  PUT RES123 "pause 0 ' ' "/;
194  PUT RES123 "pause 0 ' ' "/;
195  PUT RES123 "pause 0 ' ' "/;
196  PUT RES123 "pause 0 ' ' "/;
197  *PUT RES123 "pause -1 ' Press Return ' "/;
198  PUT RES123 "set terminal png="/;
199  PUT RES123 "set nogrid="/;
200  PUT RES123 "set time="/;
201  *PUT RES123 "set output 'inventory.png' "/;
202  PUT RES123 "set output '.../stn/inventory.png' "/;
203  PUT RES123 "replot ";
204  
205  * * * * * * * inventory graph * * * * * * * * * * * * *
206  
207  file res10/A/;
208  file res11/B/;
209  file res12/C/;
210  
211  loop(t,
212      acc= acc1 + st.l('A',t);
213      put res10 (ord(t)-0.25):10:3, acc1:10:2;/
215       put res10 (ord(t)+0.25):10:3, acc:10:2;/
216       put res10 (ord(t)+0.25):10:3, acc:10:2;/
217       put res10 (ord(t)-0.25):10:3, acc:10:2;/
218       put res10 (ord(t)-0.25):10:3, acc:10:2;/
219       put res10 /
220       acc= acc + st.l('B',t);
221       put res11 (ord(t)-0.25):10:3, acc:10:2;/
222       put res11 (ord(t)+0.25):10:3, acc:10:2;/
223       put res11 (ord(t)+0.25):10:3, acc:10:2;/
224       put res11 (ord(t)-0.25):10:3, acc:10:2;/
225       put res11 (ord(t)-0.25):10:3, acc:10:2;/
226       put res11 (ord(t)-0.25):10:3, acc:10:2;/
227       put res11 /
228       acc= acc + st.l('C',t);
229       put res12 (ord(t)-0.25):10:3, acc:10:2;/
230       put res12 (ord(t)+0.25):10:3, acc:10:2;/
231       put res12 (ord(t)+0.25):10:3, acc:10:2;/
232       put res12 (ord(t)-0.25):10:3, acc:10:2;/
233       put res12 (ord(t)-0.25):10:3, acc:10:2;/
234       put res12 (ord(t)-0.25):10:3, acc:10:2;/
235       put res12 /
236       acc= acc;
237 
238       file res1230/inv-rm.dem/
239
240       PUT RES1230 "set title ''";/
241       PUT RES1230 "set xlabel ' time period (days)'";/
242       PUT RES1230 "set ylabel 'inventory level'";/
243       PUT res1230 "set xrange [ 0 : " (card(t)+2):2:0 "]";/
244       PUT RES1230 "set nogrid";/
245       PUT RES1230 "set time";/
246       *PUT RES1230 "plot 'C' w l 1 1 19,'B' w l 12 12, "/;
247       PUT RES1230 "plot 'C' w l 1 1 s 1,'B' w l 1 s 12, "/;
248       *PUT RES1230 "A' w l 8 19";/
249       PUT RES1230 "A' w l 1 s 8";/
250       PUT RES1230 "pause 0 ' Press Return ' ";/
251       PUT RES1230 "set terminal png";/
252       PUT RES1230 "set nogrid";/
253       .*PUT RES1230 "set output 'inv-rm.png' "/;
254       PUT RES1230 "set output '.../stn/inv-rm.png' "/;
255       PUT RES1230 "replot";
256
257
258 * * * * * * * UTILITIES GRAPH * * * * * * * * * * * *
259
260 file res110/utility/;
268  loop(u,
269    loop(t,
270       acc1 = 0;
271       acc = acc1 + ut.l(u,t);
272       put res110 (ord(t)-0.25):10:3, acc1:10:2/;
273       put res110 (ord(t)+0.25):10:3, acc1:10:2/;
274       put res110 (ord(t)+0.25):10:3, acc:10:2/;
275       put res110 (ord(t)-0.25):10:3, acc:10:2/;
276       put res110 (ord(t)-0.25):10:3, acc1:10:2/;
277       put res110 /;
278       acc1 = acc;
279    );
280  );
281
282  file res223/utility.dem/;
283  PUT RES223 "set title ''"/;
284  PUT RES223 "set xlabel ' time period'"/;
285  PUT RES223 "set ylabel 'inventory level'"/;
286  *PUT res223 "set xrange [ 0 : " (card(t)+2):2:0 " ]"/;
287  PUT RES223 "set nogrid"/;
288  PUT RES223 "set time"/;
289  *PUT RES223 "plot 'utility' w l 6 19"/;
290  PUT RES223 "plot 'utility' w l ls 6"/;
291  PUT RES223 "pause 0 ' ' "/;
292  PUT RES223 "pause 0 ' ' "/;
293  PUT RES223 "pause 0 ' ' "/;
294  PUT RES223 "pause 0 ' ' "/;
295  PUT RES223 "pause 0 ' ' "/;
296  *PUT RES223 "pause -1 ' Press Return ' "/;
297  PUT RES223 "set terminal png"/;
298  PUT RES223 "set nogrid"/;
299  PUT RES223 "set time"/;
300  *PUT RES223 "set output 'utility.png' "/;
301  PUT RES223 "set output '..../stn/utility.png' "/;
302  PUT RES223 "replot";
303  ** * * * * * * * * * TASK ASSIGNMENT CHART ** * * * * * * * * * *
304  *i     Tasks /H,R1,R2,R3,S/
305  *j     Equipment /HT,RI,RII,F/
306
307  parameter xx,level(i);
308
309  loop(i,
310    level(i) = 0;
311  loop(j,
312     if(iJI(j,i)eq 1,
313        level(i) = level(i)+1;
314     );
315  );
316  );
317
318  FILE RES2 /HT/;
319  FILE RES3 /RI/;
FILE RES4 /RII/;
FILE RES5 /F/;
FILE res423 /labels.inc/;

loop(j,
   xx=ord(j)-1;
   loop(i,
      loop(t,
         if((ord(j) eq 1),
            put $(w.l(i,j,t) eq 1) res2 (ord(t)-1):10:0  xx:10:0/;
            put $(w.l(i,j,t) eq 1) res2 (ord(t)+pt(i)-1):10:0  xx:10:0/;
            put $(w.l(i,j,t) eq 1) res2 (ord(t)-1):10:0 (xx+1):10:0/;
            put $(w.l(i,j,t) eq 1) res2 (ord(t)-1):10:0  xx:10:0/;
            put $(w.l(i,j,t) eq 1) res2 /;
            put $(w.l(i,j,t) eq 1) res423 'put res323 "set label";
            put $(w.l(i,j,t) eq 1) res423 "" b.l(i,j,t):5:2 " at" (ord(t)
            -.75):5:2 "," (xx+0.25):5:2;
         );
         if((ord(j) eq 2),
            put $(w.l(i,j,t) eq 1) res3 (ord(t)-1):10:0  xx:10:0/;
            put $(w.l(i,j,t) eq 1) res3 (ord(t)+pt(i)-1):10:0  xx:10:0/;
            put $(w.l(i,j,t) eq 1) res3 (ord(t)-1):10:0 (xx+1):10:0/;
            put $(w.l(i,j,t) eq 1) res3 (ord(t)-1):10:0  xx:10:0/;
            put $(w.l(i,j,t) eq 1) res3 /;
            put $(w.l(i,j,t) eq 1) res423 'put res323 "set label";
            put $(w.l(i,j,t) eq 1) res423 "" b.l(i,j,t):5:2 " at" (ord(t)
            -.75):5:2 "," (xx+0.25):5:2;
         );
         if((ord(j) eq 3),
            put $(w.l(i,j,t) eq 1) res4 (ord(t)-1):10:0  xx:10:0/;
            put $(w.l(i,j,t) eq 1) res4 (ord(t)+pt(i)-1):10:0  xx:10:0/;
            put $(w.l(i,j,t) eq 1) res4 (ord(t)-1):10:0 (xx+1):10:0/;
            put $(w.l(i,j,t) eq 1) res4 (ord(t)-1):10:0  xx:10:0/;
            put $(w.l(i,j,t) eq 1) res4 /;
            put $(w.l(i,j,t) eq 1) res423 'put res323 "set label";
            put $(w.l(i,j,t) eq 1) res423 "" b.l(i,j,t):5:2 " at" (ord(t)
            -.75):5:2 "," (xx+0.25):5:2;
         );
         if((ord(j) eq 4),
            put $(w.l(i,j,t) eq 1) res5 (ord(t)-1):10:0  xx:10:0/;
            put $(w.l(i,j,t) eq 1) res5 (ord(t)+pt(i)-1):10:0  xx:10:0/;
            put $(w.l(i,j,t) eq 1) res5 (ord(t)-1):10:0 (xx+1):10:0/;
            put $(w.l(i,j,t) eq 1) res5 (ord(t)-1):10:0  xx:10:0/;
            put $(w.l(i,j,t) eq 1) res5 /;
            put $(w.l(i,j,t) eq 1) res423 'put res323 "set label";
            put $(w.l(i,j,t) eq 1) res423 "" b.l(i,j,t):5:2 " at" (ord(t)
            -.75):5:2 "," (xx+0.25):5:2;
         );
      );
   );
);
373 * xx=xx+level(i);
model.lst Tue Dec 04 21:58:01 2018

GAMS 24.4.1 r50296 Released Dec 20, 2014 LEX-LEG x86 64bit/Linux

General Algebraic Modeling System
Compilation

374       xx=xx+card(j);
375    );
376
377  loop(i,
378    put res423 'put res323 "set label' ;
379    put res423 "' i.tl:0:0 " at " ((card(t))+1):5:2 " , (ord(i)*4-2):5:2;
380    put res423 '";'/;
381  );
382
383  file res323/assignments.dem/;
384
385  PUT res323 "set title 'GANTT CHART' "/;
386  PUT res323 "set xlabel ' time period (days)'";/
387  PUT res323 "set y2label ' tasks'";/
388  PUT res323 "set key left";/
389  PUT res323 'set ytics (';
390  loop(j,
391    PUT res323 '" ' ((ord(j)-1)*card(j)):3:0 ',';
392    PUT res323 '" ' (card(j)*card(j)):3:0;
393  )';
394  PUT res323 ')'/;
395  PUT res323 "set xtics nomirror 1";/
396  PUT res323 "set grid";/
397  PUT res323 "set xrange [ 0 : " (card(t)+2):2:0 "];/
398  *PUT res323 "set yrange [ 0 : " (sum(i,level(i))):2:0 "];/
399  PUT res323 "set yrange [ 0 : " (card(i)*card(j)):2:0 "];/
400  PUT res323 "set time";/
401  *PUT res323 "plot 'F' w l 6 19, 'RI' w l 1 2, 'RII' w l 3 4, 'HT' w l 12 6";/
402  PUT res323 "plot 'F' w l 1s 6, 'RI' w l 1s 1, 'RII' w l 1s 3, 'HT' w l 1s 12";/
403  PUT res323 "pause 0 " ;";
** * * * * * * * * * OUTPUT FILE ** * * * * * * * * * * * * * * * * * * * * * * *

```
427 PUT res323 "pause 0 ' ' ";
428 PUT res323 "pause 0 ' ' ";
429 PUT res323 "pause 0 ' ' ";
430 *PUT res323 "pause -1 ' Press Return ' ";
431 PUT res323 "set terminal png";
432 PUT res323 "set time";
433 PUT res323 "set grid noxtics ";
434 PUT res323 "show grid";
435 *PUT res323 "set output 'assignments.png' ";
436 PUT res323 "set output '../stn/assignment.png' ";
437 PUT RES323 "replot"
438
439
440 FILE RES1 /"output.html/
441 FILE RES1 '/../stn/output.html"
442 PUT RES1 "<html><head><title>OUTPUT</title>"
443 PUT RES1 '<style type="text/css">
444 PUT RES1 "      HR {
445 PUT RES1 "              border : thick outset #800000;
446 PUT RES1 "              font-color: #800000;
447 PUT RES1 "      }
448 PUT RES1 "      TD.ref {
449 PUT RES1 "              border : thick outset #FFFF130;
450 PUT RES1 "              background-color : #C0C0C0;
451 PUT RES1 "              padding-left : 1ex;
452 PUT RES1 "              width : 50%;
453 PUT RES1 "              font-size : small;
454 PUT RES1 "              font-color: #800000;
455 PUT RES1 "              padding-top : 6px;
456 PUT RES1 "              padding-right : 6px;
457 PUT RES1 "              padding-bottom : 6px;
458 PUT RES1 "              padding-left : 6px;
459 PUT RES1 "              text-align : 1em;
460 PUT RES1 "              vertical-align : top;
461 PUT RES1 "              font-weight : bold;
462 PUT RES1 "      }
463 PUT RES1 "</style>
464 PUT RES1 "</head><body alink=#800000 link=#800000>"
465 PUT RES1 "<hr> <b>STN</b></hr><hr>
466 PUT RES1 "<h4>  </h4><br>
467 PUT RES1 "<p><table align=center  border =4 bordercolor=#800000>"
468 PUT RES1 "<td align=center><b>PROBLEM NETWORK</b></td>
469 PUT RES1 '<img src="http://newton.cheme.cmu.edu/interfaces/stn/network.png">
470 PUT RES1 "<th colspan =4 bgcolor=#C0C0><center><b>OPTIMAL SOLUTION</b></center>
471 PUT RES1 "<tr><td><b>PROFIT: $" prof.l:0:2 " 
```

480
481
482  PUT RES1 "<table align=center border =4 bordercolor=#800000>";/
483  PUT RES1 "<td align=center><b>SCHEDULE</b>";/
484  PUT RES1 '<tr><td><img src="http://newton.cheme.cmu.edu/interfaces/stn/assignment.png"><br>';/
485  PUT RES1 "</table><br>";/
486  PUT RES1 "<p><table align=center  border =4 bordercolor=#800000>";/
487  PUT RES1 "<td align=center><b>INVENTORY LEVEL FOR RAW MATERIALS</b>";/
488  PUT RES1 '<tr><td><img src="http://newton.cheme.cmu.edu/interfaces/stn/inv-rm.png"><br>';/
489  PUT RES1 "</table>";/
490
491
492  PUT RES1 '<br><table align=center><td class="ref">';/
493  PUT RES1 '<a href="model.pdf" target=new_window>GAMS LIST FILE</a>";/
494  PUT RES1 "</table></body></html>";/

495
496
497  INCLUDE /var/www/html/interfaces/cgi-bin/stn/network.inc
498  *                   NETWORK FILE FOR STN INTERFACE
499  *                              APRIL, 2003
500
501  FILE RES1001 /states/
502  put res1001;
503  scalars yy,xx3,xx2,yy3,mm;
504  yy=0;
505  xx3=0;
506  xx2=0.5;
507  loop(s,
508      put /;
509      for (mm = 0 to 10,
510          yy3=sqrt(0.25-(xx3-xx2)*(xx3-xx2))+yy;
511          put (xx3):8:4;
512          put yy3:8:4;
513          xx3=xx3+0.1;
514          put /;
515      );
516  xx3=xx3-0.1;
517  for (mm = 0 to 10,
518      yy3=-sqrt(0.25-(xx3-xx2)*(xx3-xx2))+yy;
519      put (xx3):8:4;
520      put yy3:8:4;
521      xx3=xx3-0.1;
522      put /;
523  );
524  yy=yy+3
525  );
FILE RES1002 /tasks/
put res1002;

yy=2;
xx3=card(s)*3-5;
xx2=xx3+4;

loop(i,
  put (xx3):8:4 yy:8:4;/
  put (xx2):8:4 yy:8:4;/
  put (xx2):8:4 (yy+2):8:4;/
  put (xx3):8:4 (yy+2):8:4;/
  put (xx3):8:4 yy:8:4;
  put //;
  yy=yy+4;
);

file res1000/network.dem/;

PUT res1000 "set title 'NETWORK' ";
PUT res1000 "set size square";
PUT res1000 "set xrange [-2 : " (card(s)*3):2:0 "]";
PUT res1000 "set yrange [-1 : " (card(s)*3.5):2:0 "]";
PUT res1000 "set nokey";
PUT res1000 "set noborder";
PUT res1000 "set noxtics";
PUT res1000 "set noytics";
PUT res1000 "set label 'states' at -2," (card(s)*3-0.5):5:2 /
PUT res1000 "set label 'tasks' at " (card(i)*4+1):5:2 /

loop(i,
  PUT res1000 "set label '" i.tl "' at " (xx3+1):5:2 "," ((ord(i)-1)*4.25):5:2 /
);

loop(s,
  PUT res1000 "set label '" s.tl "' at -1," ((ord(s)-1)*3+0.5):5:2 /
  if(m(i,s) lt 0,
    PUT res1000’set arrow from 0.75 , "((ord(s)-1)*3-0.2):5:2 " to ";
    PUT res1000 xx3:5:2 " , "((ord(i)-1)*4.25):5:2 " lt 8";/
  );
  if(m(i,s) gt 0,
    PUT res1000 "set arrow from " xx3:5:2 " , "((ord(i)-1)*4+3.25)
  );
  PUT res1000 " to 0.75 , " ((ord(s)-1)*3+0.55):5:2 " lt 1";/
);

*PUT res1000 "plot 'states' w l 6 19, 'tasks' w l 6 19";/
PUT res1000 "plot 'states' w l 16 6, 'tasks' w l 16 6";/
PUT res1000 "pause 0 " "";/
PUT res1000 "pause 0 " "";/
PUT res1000 "pause 0 " "";/
PUT res1000 "pause -1 " Press Return " ";
PUT res1000 "set terminal png";/
PUT res1000 "set time";
586  *PUT res1000 "set output 'newtwork.png' ";
587  PUT res1000 "set output '../..../stn/network.png' ";
588  PUT res1000 "replot";
589
590
Include File Summary

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COMPILATION TIME = 0.003 SECONDS  3 MB  24.4.1 r50296 LEX-LEG
General Algebraic Modeling System

Model Statistics  SOLVE STN1 Using RMIP From line 95

MODEL STATISTICS

BLOCKS OF EQUATIONS = 8  SINGLE EQUATIONS = 321
BLOCKS OF VARIABLES = 5  SINGLE VARIABLES = 261
NON ZERO ELEMENTS = 800  DISCRETE VARIABLES = 80

GENERATION TIME = 0.003 SECONDS  4 MB  24.4.1 r50296 LEX-LEG

EXECUTION TIME = 0.003 SECONDS  4 MB  24.4.1 r50296 LEX-LEG
Solution Report
SOLVE STN1 Using RMIP From line 95

SOLVE SUMMARY

MODEL    STN1          OBJECTIVE  PROF
TYPE     RMIP          DIRECTION MAXIMIZE
SOLVER   CPLEX         FROM LINE 95

**** SOLVER STATUS    1 Normal Completion
**** MODEL STATUS     1 Optimal
**** OBJECTIVE VALUE  214.1100

RESOURCE USAGE, LIMIT       0.006  1000.000
ITERATION COUNT, LIMIT     23     2000000000

IBM ILOG CPLEX 24.4.1 r50296 Released Dec 20, 2014 LEG x86 64bit/Linux
--- GAMS/Cplex licensed for continuous and discrete problems.
Cplex 12.6.1.0

Space for names approximately 0.01 Mb
Use option 'names no' to turn use of names off
LP status(1): optimal
Cplex Time: 0.00sec (det. 0.42 ticks)
Optimal solution found.
Objective : 214.110000

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### Solution Report

**SOLVE STN1 Using RMIP From line 95**

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General Algebraic Modeling System
Solution Report SOLVE STN1 Using RMIP From line 95

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0 INFEASIBLE  
0 UNBOUNDED
MODEL STATISTICS

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BLOCKS OF VARIABLES           5     SINGLE VARIABLES          261
NON ZERO ELEMENTS             800     DISCRETE VARIABLES         80

GENERATION TIME      =        0.004 SECONDS      3 MB  24.4.1 r50296 LEX-LEG

EXECUTION TIME       =        0.006 SECONDS      3 MB  24.4.1 r50296 LEX-LEG
Solution Report     SOLVE STN1 Using MIP From line 96

**SOLVE SUMMARY**

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**** SOLVER STATUS 1 Normal Completion  
**** MODEL STATUS 1 Optimal  
**** OBJECTIVE VALUE 205.3333

RESOURCE USAGE, LIMIT 0.029 1000.000  
ITERATION COUNT, LIMIT 104 2000000000

IBM ILOG CPLEX 24.4.1 r50296 Released Dec 20, 2014 LEG x86 64bit/Linux  
--- GAMS/Cplex licensed for continuous and discrete problems.  
Cplex 12.6.1.0

Space for names approximately 0.01 Mb  
Use option 'names no' to turn use of names off  
MIP status(101): integer optimal solution  
Cplex Time: 0.02sec (det. 5.97 ticks)  
Fixing integer variables, and solving final LP...  
Fixed MIP status(1): optimal  
Cplex Time: 0.00sec (det. 0.27 ticks)  
Proven optimal solution.

MIP Solution: 205.333333 (101 iterations, 6 nodes)  
Final Solve: 205.333333 (3 iterations)  
Best possible: 205.333333  
Absolute gap: 0.000000  
Relative gap: 0.000000

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Solution Report

SOLVE STN1 Using MIP From line 96

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SOLVE STN1 Using MIP From line 96

#### VAR W  

1 if task i starts on j at t

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res15 /var/www/html/interfaces/cgi-bin/stn/BC
res16 /var/www/html/interfaces/cgi-bin/stn/iE
res17 /var/www/html/interfaces/cgi-bin/stn/P1
res18 /var/www/html/interfaces/cgi-bin/stn/P2
res123 /var/www/html/interfaces/cgi-bin/stn/inv.dem
res10 /var/www/html/interfaces/cgi-bin/stn/A
res11 /var/www/html/interfaces/cgi-bin/stn/B
res12 /var/www/html/interfaces/cgi-bin/stn/C
res1230 /var/www/html/interfaces/cgi-bin/stn/inv-rm.dem
res110 /var/www/html/interfaces/cgi-bin/stn/utility
EXECUTION TIME = 0.007 SECONDS 3 MB 24.4.1 r50296 LEX-LEG

USER: Eval License Carnegie Mellon University G180112/0001AS-GEN
Dept. of Chemical Engineering DC9476
License for teaching and research at degree granting institutions

**** FILE SUMMARY

Input /var/www/html/interfaces/cgi-bin/stn/model.gms
Output /var/www/html/interfaces/cgi-bin/stn/model.lst