卫星通信网络中带宽动态分配的Lingo仿真程序

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Model:

Title Bandwidth allocation;

Sets:
     NumST/1..3/;                                          !终端，集合I;
     NumCH/1..4/;                                          !信道，集合K;
     NSlotPerCH/1..10/: L1, L2;                            !每信道的时隙，集合L;
     Priority/1..3/;                                       !优先级，集合J;

     SuccessAssigned(NumST, NumCH, NSlotPerCH): X;     !X_ikl;
     CHAssigned(NumST, NumCH): Y;                          !Y_ik;
     PriBound(Priority): lb, ub;                           !lb_j, ub_j;
     Spacing(NumST, NSlotPerCH, NSlotPerCH): W, p, q;  !w_il1l2;
     AvailabeSlot(NumCH, NSlotPerCH): a;                   !a_kl;
     AvailabeCH(NumCH): c;                                 !c_k;
     UseSlot(NumST, NSlotPerCH): v;                        !v_il;
     TempU(NumST, NSlotPerCH, NSlotPerCH): u;          !u_il1l2;
     Sizing(NumST, Priority): Z, Rmin, Rmax;           !z_ij, min_ij, max_ij;

endsets

data:
     CHmax = 2;
     Lambda1 = 0.0000005;
     Lambda2 = 0.999999;
     Lambda3 = 0.0000005;
     M = 10000000;
     !a = 0 1 0 0 1 1 1 0 0 1
         1 1 0 1 1 1 1 1 1 1
         1 0 0 1 1 1 0 1 1 1
         1 0 1 1 1 0 1 1 1 1;
     !c = 5 9 7 8;
     !a = 1 1 0 1 0 1 1 0 0 1
         1 0 1 1 0 1 1 1 0 1
         1 1 0 1 1 1 1 1 1 1
         0 1 0 0 1 1 1 0 0 1;
     !c = 6 7 9 5;
     a = 0 1 0 1 0 1 1 1 1 1
         0 0 0 0 1 1 1 0 1 1
         0 1 0 0 1 1 1 1 0 1
         0 0 0 1 0 1 1 0 1 1;
     c = 7 5 6 5;
     L1 = 1 2 3 4 5 6 7 8 9 10;
     L2 = 1 2 3 4 5 6 7 8 9 10;
     !lb = 0     0     0;
     !ub = 0.222 0.333 0.444;
enddata
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```
[obj] min = Lambda1 * @sum(NumST(i): @sum(NSlotPerCH(l)| L1(l)
#LT# L2(l): p(i,L1(l),L2(l)) + q(i,L1(l),L2(l)))) -
            Lambda2 * @sum(NumST(i): @sum(NumCH(k): @sum(NSlotPerCH(l): X(i,k,l)))) +
            Lambda3 * @sum(PriBound(j): ub(j) - lb(j));


     @for(NumST(i):
      @for(NSlotPerCH(l):
       @sum(NumCH(k): X(i,k,l)) <=1 ));

     @for(NumCH(k):
      @for(NSlotPerCH(l):
       @sum(NumST(i): X(i,k,l)) <= a(k,l)));

     @for(NumST(i):
      @for(NumCH(k):
       @sum(NSlotPerCH(l): X(i,k,l)) <= c(k)*Y(i,k)));

     @for(NumST(i):
      @sum(NumCH(k): Y(i,k)) <= CHmax);

     @for(NumST(i):
      @sum(NumCH(k):
       @sum(NSlotPerCH(l): X(i,k,l))) =
                 @sum(Priority(j): Z(i,j)));

     @for(NumST(i):
      @for(Priority(j):
          Z(i,j) >= Rmin(i,j)));

     @for(NumST(i):
      @for(Priority(j):
          Z(i,j) <= Rmax(i,j)));

     @for(NumST(i):
      @for(Priority(j): (Z(i,j)-Rmin(i,j))/(Rmax(i,j)-Rmin(i,j)) >= lb(j)));

     @for(NumST(i):
      @for(Priority(j): (Z(i,j)-Rmin(i,j))/(Rmax(i,j)-Rmin(i,j)) <= ub(j)));

     @for(NumST(i):
      @for(NSlotPerCH(l):
          v(i,l) = @sum(NumCH(k): X(i,k,l))));

     @for(NumST(i):
      @for(NSlotPerCH(l)| L1(l) #LT# L2(l):
       v(i,L1(l)) + v(i,L2(l)) - (1 + @sum(NSlotPerCH(l)|
       (l #GE# (L1(l)+1)) #AND# (l #LE# (L2(l)-1)): v(i,l))) <=
       w(i,L1(l),L2(l))));

     @for(NumST(i):
      @for(NSlotPerCH(l)| L1(l) #LT# L2(l):
       v(i,L1(l)) + v(i,L2(l)) >= 2*u(i,L1(l),L2(l))));

     @for(NumST(i):
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```
      @for(NSlotPerCH(l)| L1(l) #LT# L2(l):
       v(i,L1(l)) + v(i,L2(l)) - 1 <= u(i,L1(l),L2(l))));

     @for(NumST(i):
      @for(NSlotPerCH(l)| L1(l) #LT# L2(l):
       v(i,L1(l)) + v(i,L2(l)) >= 2*w(i,L1(l),L2(l)) +
       @sum(NSlotPerCH(l)| (l #GE# (L1(l)+1)) #AND# (l #LE# (L2(l)-1)):
        (u(i,L1(l),l) + u(i,l,L2(l))))/M));


     @FOR(Sizing: @GIN( Z));
     @FOR( Spacing: @GIN( p));
     @FOR( Spacing: @GIN( q));
     @FOR( SuccessAssigned: @BIN( X));
     @FOR( CHAssigned: @BIN( Y));
     @FOR( Spacing: @BIN( W));
     @FOR( Sizing: @BND(1, Rmin, 5));
     @FOR( Sizing: @BND(10, Rmax, 10));
     @FOR( Sizing: @GIN( Rmin));
     @FOR( Sizing: @GIN( Rmax));
     @FOR( UseSlot: @BIN( v));
     @FOR( TempU: @BIN( u));
     @FOR( Sizing: @FREE( Rmin));
     @FOR( Sizing: @FREE( Rmax));
     @FOR( Sizing: @FREE( Z));
     @FOR( Spacing: @FREE( p));
     @FOR( Spacing: @FREE( q));
     @FOR( SuccessAssigned: @FREE( X));
     @FOR( CHAssigned: @FREE( Y));
     @FOR( Spacing: @FREE( W));
     @FOR( UseSlot: @FREE( v));
     @FOR( TempU: @FREE( u));
END
```