

Solution:

1. List of sensor covers:

SC1={S1,S4}

SC2={S1,S3}

SC3={S2,S3}

SC4={S2,S5}

1. variables:

Consider variables t1, t2, t3, t4 for sensor covers SC1, SC2, SC3,SC4 respectively.

Number of variables=4;

number of constraints=(5+4=9)

1. Objective:

Maximize t1+t2+t3+t4

1. Subject to: t1, t2, t3, t4>=0

t1+t26

t3+t43

t2+t3 2

t1 3

t4 4

2. Give the optimal solution for the above linear program

   t1 =   3          , t2=  2      , t3=   0       , t4=3

Optimal solution=8

dual: 9

6y1+3y2+2y3+3y4+4y5-> min

y1+y41

y1+y31

y2+y31

y2+y51

y3,y4,y5=1; y1,y2=0

or

y1=y2=1; y3,y4,y5=0



Garg-Konemann:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
| Iteration3 | Iteration2 | Iteration1 | Sensors | SC1 | SC2 | SC3 | SC4 | Battery |
| 1/20 | 1/20 | 1/30 | S1 | 1 | 1 | 0 | 0 | 6 |
| 2/15 | 1/15 | 1/15 | S2 | 0 | 0 | 1 | 1\* | 3 |
| 1/10 | 1/10 | 1/10 | S3 | 0 | 1\* | 1 | 0 | 2 |
| 2/15 | 2/15 | 1/15 | S4 | 1\* | 0 | 0 | 0 | 3 |
| 7/80 | 1/20 | 1/20 | S5 | 0 | 0 | 0 | 1 | 4 |
|  |  |  |  |  |
|  | 1/10\* | 4/30 | 1/6 | 7/60 |
|  | 11/60 | 3/20 | 1/6 | 7/60\* |
|  | 11/60 | 3/20\* | 7/30 | 53/240 |

Iteration1: SC1

Iteration2: SC4

Iteration3: SC2

4. Give all shifts of the Load Balancing Protocol for the instance above

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sensor | B | S1 | B | S2 | B | S3 | B | S4 | B | S5 | B | S6 | B | S7 | B | S8 | B |
| 1 | 6 | A | 5 | A | 4 | A | 3 | I | 3 | A | A | I | 2 | A | 1 | I | 1 |
| 2 | 3 | I | 3 | I | 3 | I | 3 | A | 2 | I | I | A | 1 | I | 1 | A | 0 |
| 3 | 2 | I | 2 | I | 2 | A | 1 | I | 1 | I | I | I | 1 | A | 0 | I | 0 |
| 4 | 3 | A | 2 | A | 1 | I | 1 | I | 1 | A | A | I | 0 | I | 0 | I | 0 |
| 5 | 4 | I | 4 | I | 4 | I | 4 | A | 4 | I | I | A | 3 | I | 2 | A | 1 |

I = Idle, A = Active,

B = Battery left

S1,S2 . . . = Shifts

Shift 1 = 1,4

Shift 2 = 1,4

Shifts 3 1,3

Shifts 4 2.5

Shifts 5 1,4

Shift 6 2,5

Shift 7 1,3

Shift 8 2,3,5

Shift 9 = 2,3,4 are dead ; 1 & 5 cannot cover all the targets .

. Time = 8