Routing spec

A(1,1)

B(2,1)

C(3,1)

Initialize

neighbor of A : B

A route table

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (2,1) | 1 | neighbor |
|  |  |  |  |

neighbor of B: A and C

B route table

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (1,0) | (1,1) | 1 | neighbor |
| (3,0) | (3,1) | 1 | neighbor |

neighbor of D: B

C route table

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (2,1) | 1 | neighbor |
|  |  |  |  |

and then A update from B

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (2,1) | 1 | neighbor |
| (3,0) | (2,1) | 2 |  |
|  |  |  |  |

and then C update from B

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (2,1) | 1 | neighbor |
| (1,0) | (2,1) | 2 |  |
|  |  |  |  |

New node D available

A(1,1)

B(2,1)

C(3,1)

D(4,1)

C add a new neighbor

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (2,1) | 1 | neighbor |
| (1,0) | (2,1) | 2 |  |
| (4,0) | (4,1) | 1 | neighbor |
|  |  |  |  |

B update from C

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (1,0) | (1,1) | 1 | neighbor |
| (3,0) | (3,1) | 1 | neighbor |
| (4,0) | (3,1) | 2 |  |
|  |  |  |  |

A update from B

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (2,1) | 1 | neighbor |
| (3,0) | (2,1) | 2 |  |
| (4,0) | (2,1) | 3 |  |
|  |  |  |  |

D update from C

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (3,0) | (3,1) | 1 | neighbor |
| (2,0) | (3,1) | 2 |  |
| (1,0) | (3,1) | 3 |  |
|  |  |  |  |

New link between A and C available

A(1,1)

B(2,1)

C(3,1)

D(4,1)

A add a new neighbor C

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (2,1) | 1 | neighbor |
| (3,0) | (3,1) | 1 | neighbor |
| (4,0) | (2,1) | 3 |  |
|  |  |  |  |

C add a new neighbor A

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (2,1) | 1 | neighbor |
| (1,0) | (1,1) | 1 | neighbor |
| (4,0) | (4,1) | 1 | neighbor |
|  |  |  |  |

affer exchange route informations

A

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (2,1) | 1 | neighbor |
| (3,0) | (3,1) | 1 | neighbor |
| (4,0) | (2,1) | 2 |  |
|  |  |  |  |

B

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (1,0) | (1,1) | 1 | neighbor |
| (3,0) | (3,1) | 1 | neighbor |
| (4,0) | (3,1) | 2 |  |
|  |  |  |  |

C

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (2,1) | 1 | neighbor |
| (1,0) | (1,1) | 1 | neighbor |
| (4,0) | (4,1) | 1 | neighbor |
|  |  |  |  |

D

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (3,0) | (3,1) | 1 | neighbor |
| (2,0) | (3,1) | 2 |  |
| (1,0) | (3,1) | 2 |  |
|  |  |  |  |

link between B and C is partition

A(1,1)

B(2,1)

C(3,1)

D(4,1)

B update route info

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (1,0) | (1,1) | 1 | neighbor |
| (3,0) | (3,1) | INFI |  |
| (4,0) | (3,1) | INFI |  |
|  |  |  |  |

C update route info

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (2,1) | INFI |  |
| (1,0) | (1,1) | 1 | neighbor |
| (4,0) | (4,1) | 1 | neighbor |
|  |  |  |  |

affer exchange route informations

A

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (2,1) | 1 | neighbor |
| (3,0) | (3,1) | 1 | neighbor |
| (4,0) | (2,1) | 2 |  |
|  |  |  |  |

B

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (1,0) | (1,1) | 1 | neighbor |
| (3,0) | (1,1) | 2 |  |
| (4,0) | (1,1) | 3 |  |
|  |  |  |  |

C

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (2,0) | (1,1) | 2 |  |
| (1,0) | (1,1) | 1 | neighbor |
| (4,0) | (4,1) | 1 | neighbor |
|  |  |  |  |

D

|  |  |  |  |
| --- | --- | --- | --- |
| dst | next hop | metric |  |
| (3,0) | (3,1) | 1 | neighbor |
| (2,0) | (3,1) | 3 |  |
| (1,0) | (3,1) | 2 |  |
|  |  |  |  |

The rule

when startup, each snode initialize router table with its neignbors

dst = neighbor’s snode address

metric = 1

next\_hop = neighbor’s snode address

Problems

Count to Infinity

good news propagates quickly, but bad news propagates slowly

Tow-Node Loop

A

X

B

To X m=2

To X m=1

before failure

A

X

B

To X m=2

To X m=Infinity

B to X failure

A

X

B

To X m=2

To X m=2

A update X to B

A

X

B

To X m=3

To X m=2

B update X to A

Loop ...

A

X

B

To X m=infinity

To X m=infinity

Finally stable

Three-Node Instability

A

X

B

To X m=2

To X m=1

before failure

C

To X m=2

A

X

B

To X m=2

To X m=1

B send update to   
B and C , but packets to C is lost

C

To X m=2

A

X

B

To X m=2

To X m=3

C send (X m=2) B

C

To X m=2

A

X

B

To X m=2

To X m=1

send (X m=2) B

C

To X m=2

Solutions

For Two-Node Loop

Do not send the item which next hop is X to The Snode X

For Three-Node Instability

Max hop limit to 15, 16 means infinity.

Protocol Mesage format

struct message{

command:8;

version:8;

reserved:16;

struct {

family:16;

reserved:16;

address:64;

metric:32;

}fields[N];

};

Three Timers

Periodic Timer

Expiration Timer

Garbage Collection Timer