Distance Vector Algorithm – Problems, Solutions and a Standard

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Recap

- Nodes exchange with their neighbors their current routing table information (destination, estimated cost)
- On receipt of a message, nodes update cost to destination based on Bellman-ford equation
- Messages sent periodically as well as when table changes

Example

Reference Node C

D	C	H
A	5	A
B	3	B
D	4	D

Routing Table of C

(1)

To	A
A	0
B	1
C	5

Message from A

C to A: C = 5

D	C	H
A	5	A
B	3	B
D	4	D

Routing Table of C

D	C	H
A	5	A
B	3	B
D	4	D

Routing Table of C

(2)

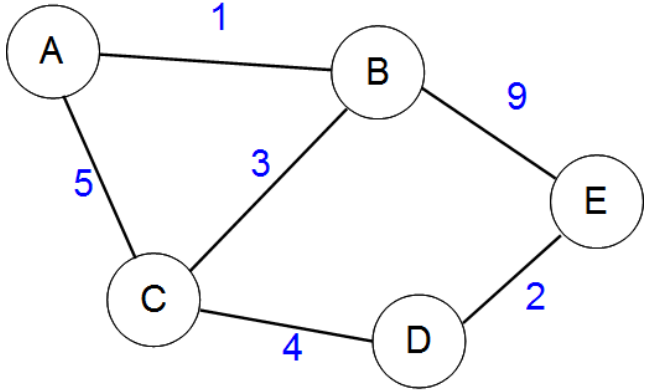
To	B
A	1
B	0
C	3
E	9

Message from B

C to B: C = 3

D	C	H
A	4	B
B	3	B
D	4	D
E	9	B

Routing Table of C



D	C	H
A	4	B
B	3	B
D	4	D
E	9	B

Routing Table of C

(3)

To	D
C	4
D	0
E	2

Message from D

C to D: C = 4

D	C	H
A	4	B
B	3	B
D	4	D
E	6	D

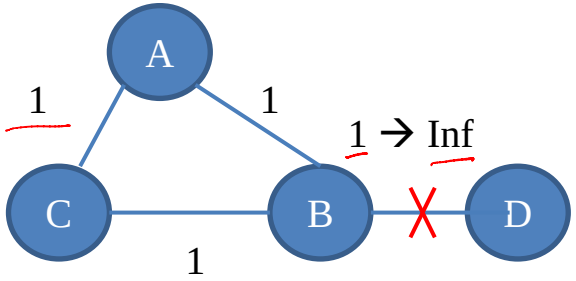
Routing Table of C

Every path has its puddle!

Counting to Infinity

Distance to Node D

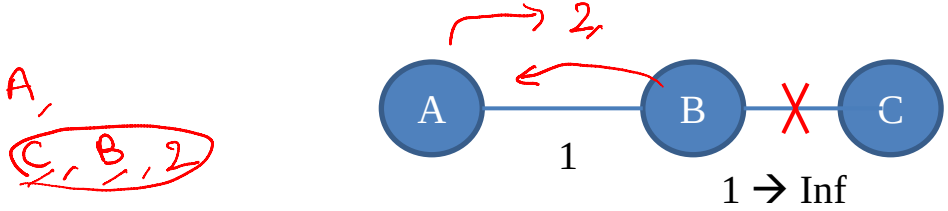
Mesg.	A	B	C
	2,B	∞,-	2,B
B→A	∞,-	∞,-	2,B
C→A	3,C	∞,-	2,B
B→C	3,C	∞,-	∞,-
A→B	3,C	4,A	∞,-
C→A	∞,-	4,A	∞,-
B→C	∞,-	4,A	5,B
A→B	∞,-	∞,-	5,B



State maintained by nodes A,B and C

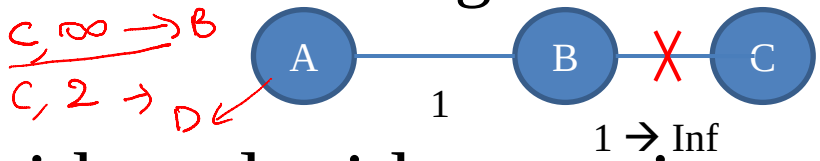
Partial Solutions

- Make infinity small
  - Use for example 16 to represent infinity (assumes max no of hops under 16)
  - Bounds time it takes to count to infinity
- Split horizon
  - Don't send routes learnt from a neighbor back to it

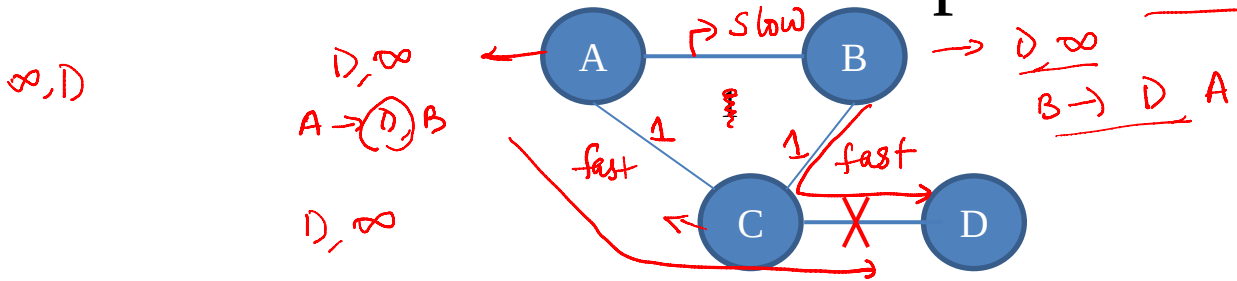


Partial Solutions

- Split horizon with poison reverse
  - Send routes learnt from a neighbor back to it but with infinite cost



- Split horizon with and without poison reverse



- Both don't work for loops with more than 2 nodes

Partial Solutions

- Hold-Down Timer: Wait some time before propagating link failure
  - Slows down convergence
- Path-vector routing is a variation of distance-vector
  - Each node sends to its neighbors not just the cost, but the entire path to the destination
  - Avoids the looping problem of DV but more overhead

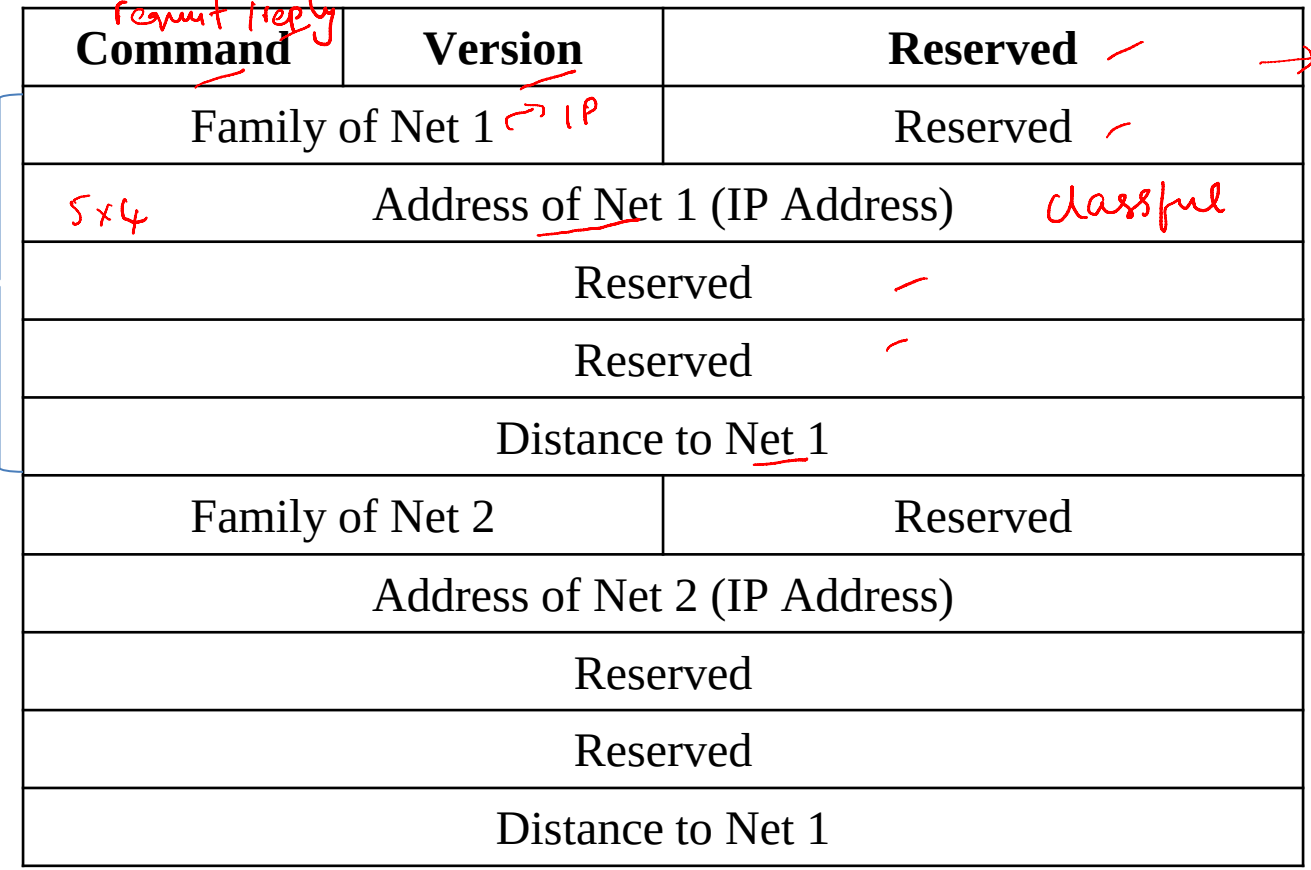
RIP

- Routing Information Protocol (RIP) is a standard that implements DV routing
- One of the oldest DV based protocol
  - Popular once, not used much due to convergence problems
    ↳ size

RIP Features

- Uses UDP and work over reserved port 520
- Period updates sent every 30 sec
- Supports multiple address families
- Cost of a link is 1 (finds minimum hop route)
- 16 represents infinity
- RIP can run only on very small networks

RIPv1 Packet Format



1 to 25 sets of entries, each entry is 20 bytes

Reserved fields are set to all zero

Summary

- Distance vector is a distributed, dynamic algorithm
- Exchanges information locally to determine routes
- Suffers from poor convergence, routing loops
- RIP is a standard that implements the DV protocol
  - Handles above problems via split horizon, hold-down timer and using a value of 16 to represent infinity
- Better approach: Link-state routing