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

Reference Node C

Example

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

Routing Table of C

(1)

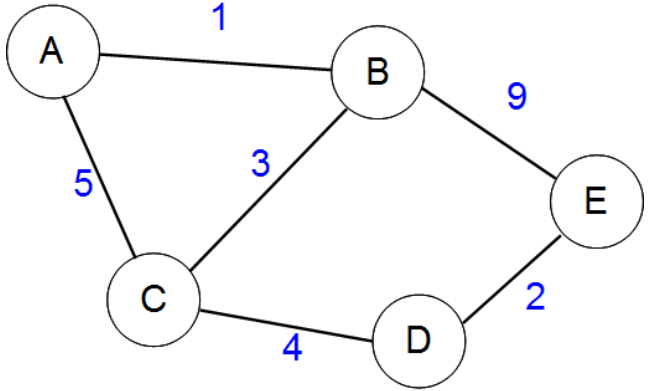
To	A
A	0
B	1
C	5

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	12	B

Routing Table of C

D	C	H
A	4	B
B	3	B
D	4	D
E	12	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

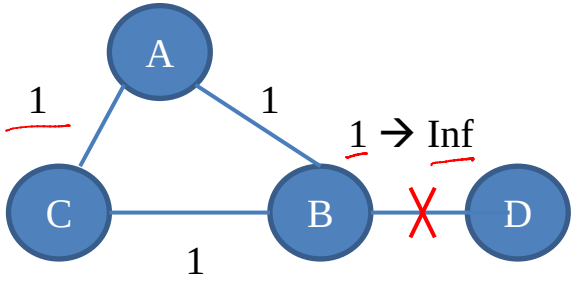
Distance to Node D

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

PERIODIC UPDATE

State maintained by nodes A,B and C

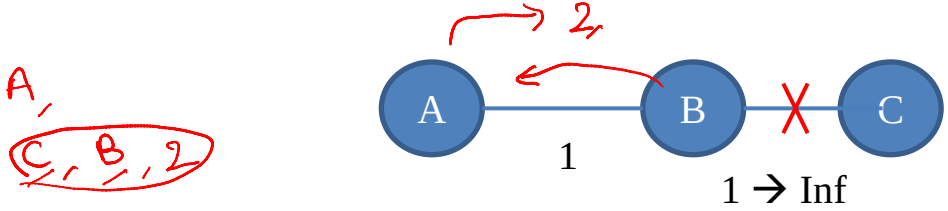
Algo introduces loops when network topologu changes



each thinks there is a path to D via some other node, and it keeps on going on till infinity

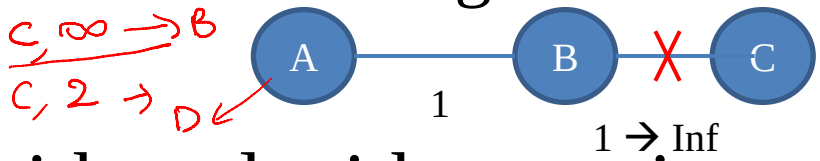
Partial Solutions

- 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

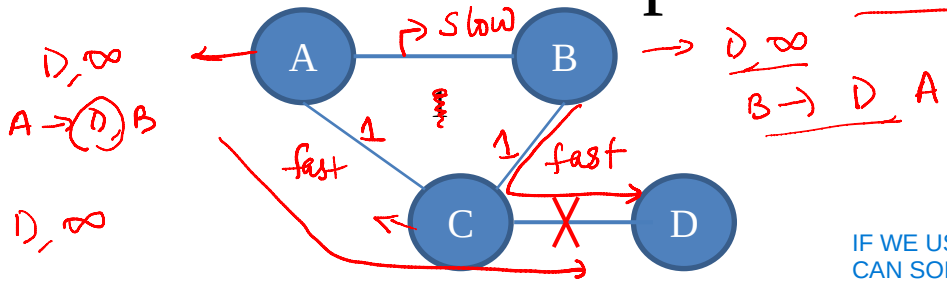


Partial Solutions

- 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



A,B send each other periodic updates, but they go slowly .. and reach B,A slowly

IF WE USE POISON REVERSE, THEN WE CAN SOLVE THIS ABOVE PROBELM with 1 table exchange itself

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

Partial Solutions

- Hold-Down Timer: Wait some time before propagating link failure

  after hearing abt inf, and next hear abt some other value .. dont immediately change inf to that value

  – 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

it is running as a application layer process and port 520

- 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

IP

split horizon, hold-down timer

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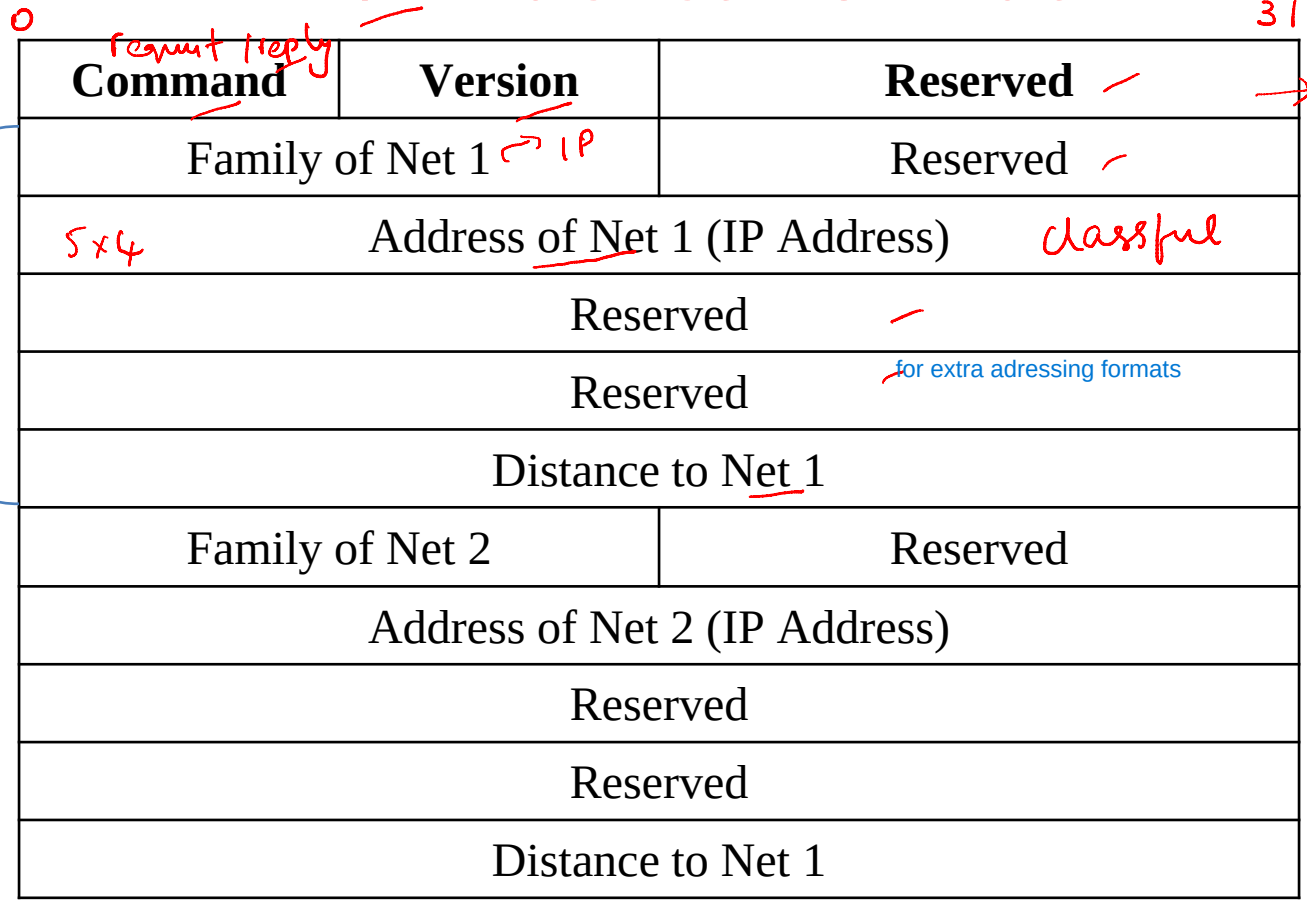
RIPv1 Packet Format



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