Distance Vector approach:

Bellman ford algorithm is not directly suitable for a distributed environment.

If we rearrange the minimum cost computation to change the view from centralized to distributed.

$$\overline{D_{ij}} = \min_{k \neq j} \{ \overline{D_{ik}} + d_{kj} \} \quad \text{for } i \neq j$$

is changed to

$$\overline{D_{ij}} = \min_{k \neq i} \{ d_{ik} + \overline{D_{kj}} \} \quad \text{for } i \neq j$$

node i → outgoing link

k → directly connected node with i

d_{ik} → link cost from i to k (direct path)

$\overline{D_{kj}}$ → minimum cost from k to j without knowing how k determined this value.

N_i → Neighbors of i

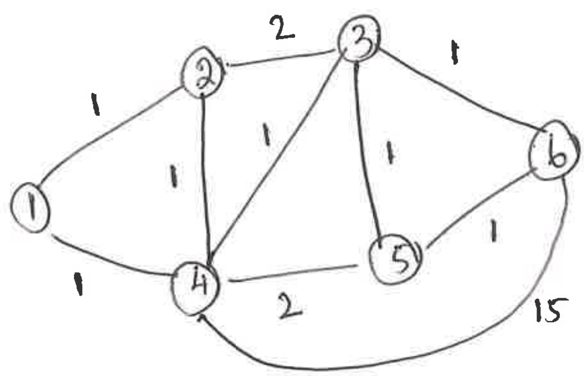
Distance vector approach!.

If node i finds out its minimum cost to a destination from its neighbor, it can use the information to ~~destina~~ determine cost to the destination by adding the outgoing link cost d_{ik}.

This notion is called distance vector approach.

It is applied in original ARPANET routing.

→ This approach helps in building a computational model for a distributed environment.



Algorithm!.

$\bar{D}_{ii}(t) = 0$ $\quad$ $\bar{D}_{ij}(t) = \infty$ (for node j that node i is aware of)

for (nodes j that node i is aware of) do

$$\bar{D}_{ij}(t) = \min_{\substack{k \text{ directly connected} \\ \text{to } i}} \left\{ d_{ik}(t) + \bar{D}_{kj}(t) \right\} \quad \text{for } j \neq i$$

Node 1 is directly connected to node 4 and node 2

So calculate $\bar{D}_{26}(t)$ and $\bar{D}_{46}(t)$

t=0 → what Nodes 4 sees about cost to node 6 when zero hops away.

t=1 → what node 4 sees about cost to node 6 when information from one hop away is received.

.. and so on.

$\bar{D}^{1}_{26}(t)$ → Node 1 is directly connected to node 2 and node 4 Node 1 will have $\bar{D}^{1}_{26}(t)$,

↳ The cost between node 2 and node 6 from node 2

$\bar{D}^{1}_{46}(t)$ → cost between node 4 and node 6 from node 4.

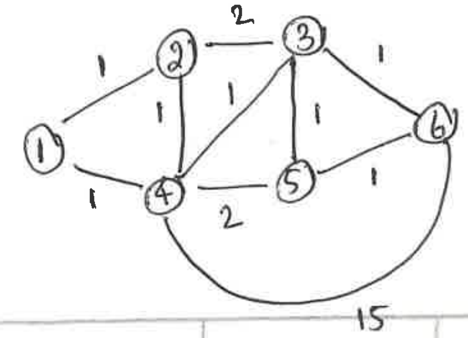
distance vector approach → A node relies on its neighbouring nodes known cost to a destination to determine its best path.

→ It will calculate periodic computation as and when it receives information from its neighbour.

Time $t=0$

$\overline{D}_{46}^{\,1}(t)$

$\overline{D}_{26}^{\,1}(t)$



Time t	$\bar{D}'_{46}(t)$	$D'_{46}(t)$	computation at node 1 $\min\{d_{14}(t)+\bar{D}'_{46}(t),\ d_{12}(t)+\bar{D}'_{26}(t)\}$	$\bar{D}_{16}(t)$
0	∞	∞	$\min(1+\infty,\ 1+\infty)$	∞
1	15	∞	$\min(1+15,\ 1+\infty)$	16
2	2	3	$\min(1+2,\ 1+3)$	3.

$$\bar{D}_{46} = \min\{d_{43}+\bar{D}_{36},\ d_{45}+\bar{D}_{56}\}$$
$$= \min\{1+1,\ 2+1\} = 2.$$

$$\bar{D}_{26} = \min\{d_{24}+\bar{D}_{46},\ d_{23}+\bar{D}_{36}\} = \min\{1+3,\ 2+1\}$$
$$= \min\{4, 3\} = 3.$$

$$\therefore \bar{D}_{16} = \min\{d_{14}(t)+\bar{D}_{46}(t),\ d_{12}(t)+\bar{D}_{26}(t)\}$$
$$= \min\{1+2,\ 1+3\} = 3.$$

actual path = 1 - 4 - 3 - 6.