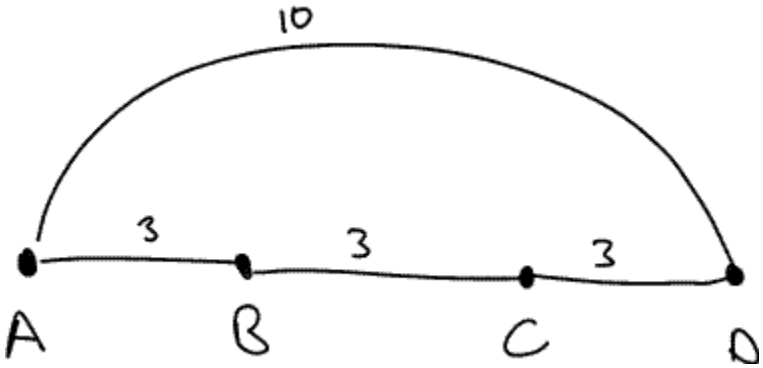
Distance vector calculations

In the following tables, each entry corresponds to a source (determined by its row) and a destination (determined by its column). The notation "N/X", where N is a number and X is a node, means "shortest route from source to destination goes through X and has cost N" — and note that X will always be a neighbor of the source, thus specifying the next hop for the route to the destination . For example, if "6/B" is an entry whose source (row) is A and destination (column) is C, this means the shortest route from A to C has cost 6, and goes through B, which is a neighbor of A — so A should forward to B any packets whose destination is C.

1. Longhand and shorthand method

There are two ways of recording the distance vector information stored in the network. This is explained by using an example.
Assume we have the following network:



1.1 Longhand method

Then after the distance vector algorithm has been run to convergence, the information stored at each node is as follows:

Information at A:

	destination				
source		A	B	C	D
	A	–	3/B	6/B	9/B
	B	3/A	–	3/C	6/C
	D	9/C	6/C	3/C	–

Information at B:

	destination				
source		A	B	C	D
	A	–	3/B	6/B	9/B
	B	3/A	–	3/C	6/C
	C	6/B	3/B	–	3/D

Information at C:

	destination				
source		A	B	C	D
	B	3/A	–	3/C	6/C
	C	6/B	3/B	–	3/D
	D	9/C	6/C	3/C	–

Information at D:

	destination				
source		A	B	C	D
	A	–	3/B	6/B	9/B
	C	6/B	3/B	–	3/D
	D	9/C	6/C	3/C	–

1.2 Shorthand method

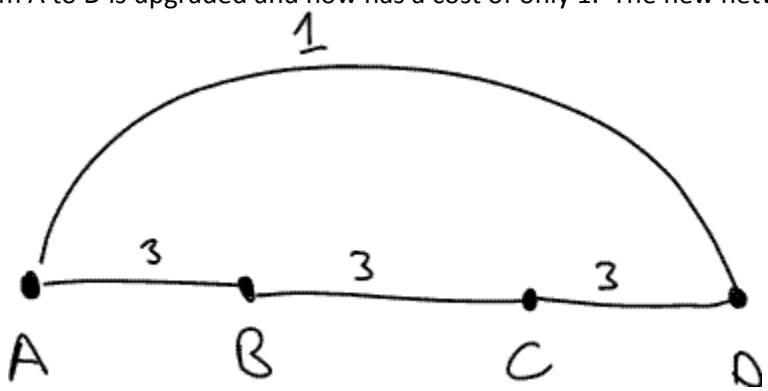
However, the previous "longhand" method involves a lot of repeated information. For example, B's distance vector is a stored in three places: A, B, and C. As long as you understand that multiple copies of the distance vector are stored, we can get away with using a "shorthand" method that only bothers to write down one copy of each distance vector. Using this method, we assume that each node keeps an up-to-date copy of its distance vector and those of its neighbors. We can write the information stored by the system more compactly as follows:

	destination				
source		A	B	C	D
	A	–	3/B	6/B	9/B
	B	3/A	–	3/C	6/C
	C	6/B	3/B	–	3/D
	D	9/C	6/C	3/C	–

In the remaining examples, we use only the shorthand method.

2. Example of an update

Suppose the link from A to D is upgraded and now has a cost of only 1. The new network is as follows:



The distance vectors are updated as follows. Note that when several distance vectors need to be updated, we could choose any one of them to update first. In this example, we always choose the earliest row that needs updating.

1	destination				needs updating
	A	B	C	D	
A	–	3/B	6/B	9/B	y
B	3/A	–	3/C	6/C	
C	6/B	3/B	–	3/D	
D	9/C	6/C	3/C	–	y

source

2	destination				needs updating
	A	B	C	D	
A	–	3/B	~~6/B~~ 4/D	~~9/B~~ 1/D	~~y~~
B	3/A	–	3/C	6/C	y
C	6/B	3/B	–	3/D	
D	9/C	6/C	3/C	–	y

source

3	destination				needs updating
	A	B	C	D	
A	–	3/B	~~6/B~~ 4/D	~~9/B~~ 1/D	~~y~~ y
B	3/A	–	3/C	~~6/C~~ 4/A	~~y~~
C	6/B	3/B	–	3/D	y
D	9/C	6/C	3/C	–	y

source

4	destination				needs updating
	A	B	C	D	
A	–	3/B	~~6/B~~ 4/D	~~9/B~~ 1/D	~~y~~ ~~y~~
B	3/A	–	3/C	~~6/C~~ 4/A	~~y~~
C	6/B	3/B	–	3/D	y
D	9/C	6/C	3/C	–	y

source

5	destination				needs updating
	A	B	C	D	
A	–	3/B	~~6/B~~ 4/D	~~9/B~~ 1/D	~~y~~ ~~y~~
B	3/A	–	3/C	~~6/C~~ 4/A	~~y~~
C	6/B	3/B	–	3/D	~~y~~
D	9/C	6/C	3/C	–	y

source

6	destination				needs updating
source		A	B	C	D	
	A	–	3/B	~~6/B~~ 4/D	~~9/B~~ 1/D	~~y~~ ~~y~~ y
	B	3/A	–	3/C	~~6/C~~ 4/A	~~y~~
	C	6/B	3/B	–	3/D	~~y~~ y
	D	~~9/C~~ 1/A	~~6/C~~ 4/A	3/C	–	~~y~~

7	destination				needs updating
source		A	B	C	D	
	A	–	3/B	~~6/B~~ 4/D	~~9/B~~ 1/D	~~y~~ ~~y~~ ~~y~~
	B	3/A	–	3/C	~~6/C~~ 4/A	~~y~~
	C	6/B	3/B	–	3/D	~~y~~ y
	D	~~9/C~~ 1/A	~~6/C~~ 4/A	3/C	–	~~y~~

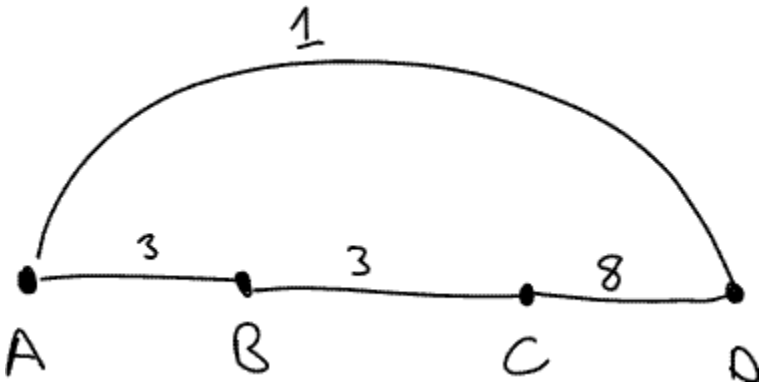
8	destination				needs updating
source		A	B	C	D	
	A	–	3/B	~~6/B~~ 4/D	~~9/B~~ 1/D	~~y~~ ~~y~~ ~~y~~
	B	3/A	–	3/C	~~6/C~~ 4/A	~~y~~ y
	C	~~6/B~~ 4/D	3/B	–	3/D	~~y~~ ~~y~~
	D	~~9/C~~ 1/A	~~6/C~~ 4/A	3/C	–	~~y~~ y

9	destination				needs updating
source		A	B	C	D	
	A	–	3/B	~~6/B~~ 4/D	~~9/B~~ 1/D	~~y~~ ~~y~~ ~~y~~
	B	3/A	–	3/C	~~6/C~~ 4/A	~~y~~ ~~y~~
	C	~~6/B~~ 4/D	3/B	–	3/D	~~y~~ ~~y~~
	D	~~9/C~~ 1/A	~~6/C~~ 4/A	3/C	–	~~y~~ y

10	destination				needs updating
source		A	B	C	D	
	A	–	3/B	~~6/B~~ 4/D	~~9/B~~ 1/D	~~y~~ ~~y~~ ~~y~~
	B	3/A	–	3/C	~~6/C~~ 4/A	~~y~~ ~~y~~
	C	~~6/B~~ 4/D	3/B	–	3/D	~~y~~ ~~y~~
	D	~~9/C~~ 1/A	~~6/C~~ 4/A	3/C	–	~~y~~ ~~y~~

3. Another example of an update

Work this one out for yourself. Suppose the network changes again, this time updating the cost of the link from C to D to be 8:



You can write all the updates on the following single table, just by crossing out entries and writing new ones. For full credit, follow the same convention as the previous example: when multiple rows need to be updated, always update the earliest one first. The initial values are entered for you.

	destination					needs updating
source		A	B	C	D	
	A	–	3/B	4/D	1/D	
	B	3/A	–	3/C	4/A	
	C	4/D	3/B	–	3/D	
	D	1/A	4/A	3/C	–	