

# CN ASSIGNMENT-3

## Distance Vector Routing

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### Instructions to run the code:

On cmd line run: **python BT18CSE107\_dvr.py filename.txt**

For eg: cmd> python BT18CSE107\_dvr.py input1.txt

### Working:

#### Data Structure Used

- For storing router information:
  - **Router** is a dictionary with keys as **node names**. For each node name there is a subsequent dictionary with keys:
    - **neighbours**: to store list of all neighbours of that node
    - **dvr**: to store distance vector table of that node
- For storing shared information:
  - **Shared** is a dictionary with keys as :
    - **node-names**: For each node name there is a tuple of the queue and its lock
    - **counter**: to store a list of nodes that have computed the new table so that the second iteration starts only when all the threads are completed
    - **printLock**: lock for appending the updated dvr table of each node to the final string
    - **finalString**: string that has the final information after each iteration which is printed

## Execution Flow

- Create a new thread for each node/ router and pass its personal router information (neighbour list and its dvr table) and the shared data structure.
- First the routing tables are shared to queues of all neighbours of each router after acquiring queue lock.
- Once all neighbours of a node have shared their dvr information, re-computation of tables takes place using the Bellman-Ford Equation.
- The updated dvr tables of each node are printed and the threads wait for 2s before the next iteration.

## Test Case 1

```
3
A B C
A B 5
A C 2
B C 8
EOF
```

```
((base) vanshikajain@Vanshikas-MacBook-Air Assign4 % python dvr.py input1.txt
-----INITIAL-----
ROUTER: A
Destination Cost Next Hop
A 0 A
B 5.0 B
C 2.0 C

ROUTER: B
Destination Cost Next Hop
A 5.0 A
B 0 B
C 8.0 C

ROUTER: C
Destination Cost Next Hop
A 2.0 A
B 8.0 B
C 0 C

-----ITERATION 1-----
ROUTER: A
Destination Cost Next Hop
A 0 A
B 5.0 B
C 2.0 C

ROUTER: B
Destination Cost Next Hop
A 5.0 A
B 0 B
* C 7.0 A

ROUTER: C
Destination Cost Next Hop
A 2.0 A
* B 7.0 A
C 0 C

-----ITERATION 2-----
ROUTER: A
Destination Cost Next Hop
A 0 A
B 5.0 B
C 2.0 C

ROUTER: B
Destination Cost Next Hop
A 5.0 A
B 0 B
C 7.0 A

ROUTER: C
Destination Cost Next Hop
A 2.0 A
B 7.0 A
C 0 C
```

Test Case 2

5  
A B C D E  
A B 1  
A C 5  
B C 3  
C D 4  
B E 9  
D E 2  
EOF

```
(base) vanshikajain@Vanshikas-MacBook-Air Assign4 % python dvr.py input2.txt
-----INITIAL-----
ROUTER: A
Destination Cost Next Hop
A 0 A
B 1.0 B
C 5.0 C
D inf NA
E inf NA

ROUTER: B
Destination Cost Next Hop
A 1.0 A
B 0 B
C 3.0 C
D inf NA
E 9.0 E

ROUTER: C
Destination Cost Next Hop
A 5.0 A
B 3.0 B
C 0 C
D 4.0 D
E inf NA

ROUTER: D
Destination Cost Next Hop
A inf NA
B inf NA
C 4.0 C
D 0 D
E 2.0 E

ROUTER: E
Destination Cost Next Hop
A inf NA
B 9.0 B
C inf NA
D 2.0 D
E 0 E

-----ITERATION 1-----
ROUTER: A
Destination Cost Next Hop
A 0 A
B 1.0 B
* C 4.0 B
* D 9.0 C
* E 10.0 B

ROUTER: B
Destination Cost Next Hop
A 1.0 A
B 0 B
C 3.0 C
* D 7.0 C
E 9.0 E

ROUTER: C
Destination Cost Next Hop
* A 4.0 B
B 3.0 B
C 0 C
D 4.0 D
E 6.0 D

ROUTER: D
Destination Cost Next Hop
* A 8.0 C
B 7.0 C
C 4.0 C
D 0 D
E 2.0 E

ROUTER: E
Destination Cost Next Hop
A 10.0 B
B 9.0 B
C 6.0 D
D 2.0 D
E 0 E
```

```
ROUTER: C
Destination Cost Next Hop
* A 4.0 B
B 3.0 B
C 0 C
D 4.0 D
* E 6.0 D

ROUTER: D
Destination Cost Next Hop
* A 9.0 C
* B 7.0 C
C 4.0 C
D 0 D
E 2.0 E

ROUTER: E
Destination Cost Next Hop
* A 10.0 B
B 9.0 B
* C 6.0 D
D 2.0 D
E 0 E

-----ITERATION 2-----
ROUTER: A
Destination Cost Next Hop
A 0 A
B 1.0 B
C 4.0 B
* D 8.0 B
E 10.0 B

ROUTER: B
Destination Cost Next Hop
A 1.0 A
B 0 B
C 3.0 C
D 7.0 C
E 9.0 E

ROUTER: C
Destination Cost Next Hop
A 4.0 B
B 3.0 B
C 0 C
D 4.0 D
E 6.0 D

ROUTER: D
Destination Cost Next Hop
* A 8.0 C
B 7.0 C
C 4.0 C
D 0 D
E 2.0 E

ROUTER: E
Destination Cost Next Hop
A 10.0 B
B 9.0 B
C 6.0 D
D 2.0 D
E 0 E
```

# Test Case 3

6  
A B C D E F  
A B 6  
A C 3  
B C 2  
B D 7  
C E 9  
D E 1  
D F 8  
E F 4  
EOF

(base) vanshikajain@Vanshikas-MacBook-Air Assign4 % python dvr.py input3.txt

INITIAL

ROUTER: A		
Destination	Cost	Next Hop
A	0	A
B	6.0	B
C	3.0	C
D	inf	NA
E	inf	NA
F	inf	NA

ROUTER: B		
Destination	Cost	Next Hop
A	6.0	A
B	0	B
C	2.0	C
D	7.0	D
E	inf	NA
F	inf	NA

ROUTER: C		
Destination	Cost	Next Hop
A	3.0	A
B	2.0	B
C	0	C
D	inf	NA
E	9.0	E
F	inf	NA

ROUTER: D		
Destination	Cost	Next Hop
A	inf	NA
B	7.0	B
C	inf	NA
D	0	D
E	1.0	E
F	8.0	F

ROUTER: E		
Destination	Cost	Next Hop
A	inf	NA
B	inf	NA
C	9.0	C
D	1.0	D
E	0	E
F	4.0	F

ROUTER: F		
Destination	Cost	Next Hop
A	inf	NA
B	inf	NA
C	inf	NA
D	8.0	D
E	4.0	E
F	0	F

ITERATION 1

ROUTER: A		
Destination	Cost	Next Hop
A	0	A
* B	5.0	C
C	3.0	C
* D	13.0	B
* E	12.0	C
F	inf	NA

ROUTER: B		
Destination	Cost	Next Hop
* A	5.0	C
B	0	B
C	2.0	C
D	7.0	D
* E	8.0	D
* F	15.0	D

ROUTER: C		
Destination	Cost	Next Hop
A	3.0	A
B	2.0	B
C	0	C
* D	9.0	B
E	9.0	E
* F	13.0	E

ROUTER: D		
Destination	Cost	Next Hop
* A	13.0	B
B	7.0	B
* C	9.0	B
D	0	D
E	1.0	E
* F	5.0	E

ROUTER: E		
Destination	Cost	Next Hop
* A	12.0	C
* B	8.0	D
C	9.0	C
D	1.0	D
E	0	E
F	4.0	F

ROUTER: F		
Destination	Cost	Next Hop
A	inf	NA
* B	15.0	D
* C	13.0	E
* D	5.0	E
E	4.0	E
F	0	F

-----ITERATION 2-----

ROUTER: A  
 Destination Cost Next Hop  
 A 0 A  
 B 5.0 C  
 C 3.0 C  
 \* D 12.0 C  
 E 12.0 C  
 \* F 16.0 C

ROUTER: B  
 Destination Cost Next Hop  
 A 5.0 C  
 B 0 B  
 C 2.0 C  
 D 7.0 D  
 E 8.0 D  
 \* F 12.0 D

ROUTER: C  
 Destination Cost Next Hop  
 A 3.0 A  
 B 2.0 B  
 C 0 C  
 D 9.0 B  
 E 9.0 E  
 F 13.0 E

ROUTER: D  
 Destination Cost Next Hop  
 \* A 12.0 B  
 B 7.0 B  
 C 9.0 B  
 D 0 D  
 E 1.0 E  
 F 5.0 E

ROUTER: E  
 Destination Cost Next Hop  
 A 12.0 C  
 B 8.0 D  
 C 9.0 C  
 D 1.0 D  
 E 0 E  
 F 4.0 F

ROUTER: F  
 Destination Cost Next Hop  
 \* A 16.0 E  
 \* B 12.0 E  
 C 13.0 E  
 D 5.0 E  
 E 4.0 E  
 F 0 F

-----ITERATION 3-----

ROUTER: A  
 Destination Cost Next Hop  
 A 0 A  
 B 5.0 C  
 C 3.0 C  
 D 12.0 C  
 E 12.0 C  
 F 16.0 C

ROUTER: B  
 Destination Cost Next Hop  
 A 5.0 C  
 B 0 B  
 C 2.0 C  
 D 7.0 D  
 E 8.0 D  
 F 12.0 D

ROUTER: C  
 Destination Cost Next Hop  
 A 3.0 A  
 B 2.0 B  
 C 0 C  
 D 9.0 B  
 E 9.0 E  
 F 13.0 E

ROUTER: D  
 Destination Cost Next Hop  
 A 12.0 B  
 B 7.0 B  
 C 9.0 B  
 D 0 D  
 E 1.0 E  
 F 5.0 E

ROUTER: E  
 Destination Cost Next Hop  
 A 12.0 C  
 B 8.0 D  
 C 9.0 C  
 D 1.0 D  
 E 0 E  
 F 4.0 F

ROUTER: F  
 Destination Cost Next Hop  
 A 16.0 E  
 B 12.0 E  
 C 13.0 E  
 D 5.0 E  
 E 4.0 E  
 F 0 F