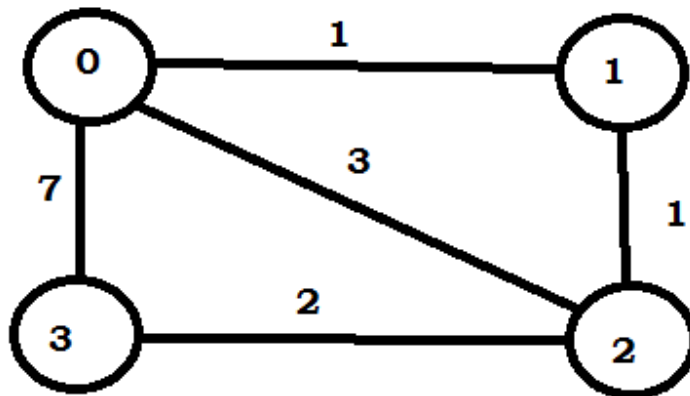


- **Given Network**



- **Method of implementation.**

All the basic methods like sending the packets between node and data structures to maintain the table and methods to print the tables were already provided in the skeleton code. In this project The Distance vector routing algorithm is implemented using distributed Bellman Ford Algorithm.

All the method is implementation described below is same across all entities.

In the constructor part we first fetch the cost that are assigned in `NetworkSimulator.cost[][][]`. Then an array is used to hold the current minimum distance cost values. These distances are feeded to the distance vector table which is a 4X4 matrix and represents `DistanceTable[to node][via node]`. Once all these are done these tables are formed into packets and they are sent to their neighbors using `NetworkSimulator.toLayer2(packet p)` method.

In the update method (this is called when an entity received packets from its neighbors). Here as soon as we get a packet we get its source of origin. And we use an array called `minlist` to hold current least cost values. Then we apply the Distributed Bellman Ford algorithm to find the least cost paths. After this we update the table.

If the cost from a node to its neighbor has changed then we have to notify our neighbors, So, to do this we use a update flag which gets set when there is a change. If this flag is set then we send our current table to all our neighbors.

- **Output**

```

Network Simulator v1.0
Enter trace level (>= 0): [0] 2
Will the link change (1 = Yes, 0 = No): [0] 0
Enter random seed: [random] 34
toLayer2(): WARNING: Identical source and destination in packet; ignoring.
Node 0 Initialization Complete. Distance Table is:
  
```

time0.0

	via		
D0	1	2	3
-----+-----			
1	1	999	999
2	999	3	999
3	999	999	7

Node 1 Initialization Complete. Distance Table is:  
time0.0

	via	
D1	0	2
-----+-----		
0	1	999
2	999	1
3	999	999

Node 2 Initialization Complete. Distance Table is:  
time0.0

	via		
D2	0	1	3
-----+-----			
0	3	999	999
1	999	1	999
3	999	999	2

Node 3 Initialization Complete. Distance Table is:

	via	
D3	0	2
-----+-----		
0	7	999
1	999	999
2	999	2

main(): event received. t=1.1695435547147661, node=0  
src=1, dest=0, contents=[1, 0, 1, 999]  
Node 0 Updated Distance Table:  
Time : 1.1695435547147661

	via		
D0	1	2	3
-----+-----			
1	1	999	999
2	2	3	999
3	999	999	7

main(): event received. t=3.941814746747075, node=2  
src=0, dest=2, contents=[0, 1, 3, 7]  
Node 2 Updated Distance Table:  
Time : 3.941814746747075

	via		
D2	0	1	3
-----+-----			
0	3	999	999

```

1| 4 1 999
3| 10 999 2

```

```

main(): event received. t=5.681637887123123, node=0
src=2, dest=0, contents=[3, 1, 0, 2]
Node 0 Updated Distance Table:
Time : 5.681637887123123

```

```

      via
D0 | 1 2 3
----+-----
1| 1 4 999
2| 2 3 999
3| 999 5 7

```

```

main(): event received. t=6.720014990622261, node=3
src=2, dest=3, contents=[3, 1, 0, 2]
Node 3 Updated Distance Table:
Time : 6.720014990622261

```

```

      via
D3 | 0 2
----+-----
0| 7 5
1| 999 3
2| 999 2

```

```

main(): event received. t=7.334775893675707, node=2
src=1, dest=2, contents=[1, 0, 1, 999]
Node 2 Updated Distance Table:
Time : 7.334775893675707

```

```

      via
D2 | 0 1 3
----+-----
0| 3 2 999
1| 4 1 999
3| 10 999 2

```

```

main(): event received. t=7.554523142005022, node=1
src=0, dest=1, contents=[0, 1, 3, 7]
Node 1 Updated Distance Table:
Time : 7.554523142005022

```

```

      via
D1 | 0 2
----+-----
0| 1 999
2| 4 1
3| 8 999

```

```

main(): event received. t=7.665921197589372, node=1
src=2, dest=1, contents=[3, 1, 0, 2]
Node 1 Updated Distance Table:
Time : 7.665921197589372

```

via		
D1	0	2
-----		
0	1	4
2	4	1
3	8	3

main(): event received. t=7.717060612460303, node=3  
 src=0, dest=3, contents=[0, 1, 3, 7]  
 Node 3 Updated Distance Table:  
 Time : 7.717060612460303

via		
D3	0	2
-----		
0	7	5
1	8	3
2	10	2

main(): event received. t=8.346142613644094, node=2  
 src=3, dest=2, contents=[7, 999, 2, 0]  
 Node 2 Updated Distance Table:  
 Time : 8.346142613644094

via			
D2	0	1	3
-----			
0	3	2	9
1	4	1	999
3	10	999	2

main(): event received. t=9.033634255220027, node=3  
 src=2, dest=3, contents=[3, 1, 0, 2]  
 Node 3 Updated Distance Table:  
 Time : 9.033634255220027

via		
D3	0	2
-----		
0	7	5
1	8	3
2	10	2

main(): event received. t=9.275989665571888, node=0  
 src=3, dest=0, contents=[7, 999, 2, 0]  
 Node 0 Updated Distance Table:  
 Time : 9.275989665571888

via			
D0	1	2	3
-----			
1	1	4	999
2	2	3	9
3	999	5	7

main(): event received. t=10.403451778194395, node=2  
 src=3, dest=2, contents=[5, 3, 2, 0]

Node 2 Updated Distance Table:

Time : 10.403451778194395

via			
D2	0	1	3
-----			
0	3	2	7
1	4	1	5
3	10	999	2

main(): event received. t=11.129529338071485, node=2  
src=0, dest=2, contents=[0, 1, 2, 7]

Node 2 Updated Distance Table:

Time : 11.129529338071485

via			
D2	0	1	3
-----			
0	3	2	7
1	4	1	5
3	10	999	2

main(): event received. t=11.36706421237108, node=0  
src=2, dest=0, contents=[3, 1, 0, 2]

Node 0 Updated Distance Table:

Time : 11.36706421237108

via			
D0	1	2	3
-----			
1	1	4	999
2	2	3	9
3	999	5	7

main(): event received. t=12.610792117615524, node=0  
src=2, dest=0, contents=[2, 1, 0, 2]

Node 0 Updated Distance Table:

Time : 12.610792117615524

via			
D0	1	2	3
-----			
1	1	4	999
2	2	3	9
3	999	5	7

main(): event received. t=13.84942861946574, node=3  
src=0, dest=3, contents=[0, 1, 2, 7]

Node 3 Updated Distance Table:

Time : 13.84942861946574

via		
D3	0	2
-----		
0	7	5
1	8	3

```
2| 9 2
```

```
main(): event received. t=13.927440422821412, node=3
```

```
src=2, dest=3, contents=[2, 1, 0, 2]
```

```
Node 3 Updated Distance Table:
```

```
Time : 13.927440422821412
```

```
      via
D3 | 0 2
----+-----
0| 7 4
1| 8 3
2| 9 2
```

```
main(): event received. t=14.115794630822865, node=0
```

```
src=1, dest=0, contents=[1, 0, 1, 8]
```

```
Node 0 Updated Distance Table:
```

```
Time : 14.115794630822865
```

```
      via
D0 | 1 2 3
----+-----
1| 1 4 999
2| 2 3 9
3| 9 5 7
```

```
main(): event received. t=14.277959410491043, node=1
```

```
src=2, dest=1, contents=[3, 1, 0, 2]
```

```
Node 1 Updated Distance Table:
```

```
Time : 14.277959410491043
```

```
      via
D1 | 0 2
----+-----
0| 1 4
2| 4 1
3| 8 3
```

```
main(): event received. t=16.394407502042256, node=0
```

```
src=3, dest=0, contents=[5, 3, 2, 0]
```

```
Node 0 Updated Distance Table:
```

```
Time : 16.394407502042256
```

```
      via
D0 | 1 2 3
----+-----
1| 1 4 10
2| 2 3 9
3| 9 5 7
```

```
main(): event received. t=16.511120355346193, node=0
```

```
src=2, dest=0, contents=[2, 1, 0, 2]
```

```
Node 0 Updated Distance Table:
```

```
Time : 16.511120355346193
```

```
      via
```

D0	1	2	3
-----+	-----	-----	-----
1	1	4	10
2	2	3	9
3	9	5	7

main(): event received. t=16.71388751356732, node=0  
 src=1, dest=0, contents=[1, 0, 1, 3]  
 Node 0 Updated Distance Table:  
 Time : 16.71388751356732

	via		
D0	1	2	3
-----+	-----	-----	-----
1	1	4	10
2	2	3	9
3	4	5	7

main(): event received. t=16.950272720916914, node=2  
 src=1, dest=2, contents=[1, 0, 1, 8]  
 Node 2 Updated Distance Table:  
 Time : 16.950272720916914

	via		
D2	0	1	3
-----+	-----	-----	-----
0	3	2	7
1	4	1	5
3	10	9	2

main(): event received. t=17.02860704385273, node=1  
 src=0, dest=1, contents=[0, 1, 2, 7]  
 Node 1 Updated Distance Table:  
 Time : 17.02860704385273

	via	
D1	0	2
-----+	-----	-----
0	1	4
2	3	1
3	8	3

main(): event received. t=17.287985306436823, node=2  
 src=0, dest=2, contents=[0, 1, 2, 5]  
 Node 2 Updated Distance Table:  
 Time : 17.287985306436823

	via		
D2	0	1	3
-----+	-----	-----	-----
0	3	2	7
1	4	1	5
3	8	9	2

main(): event received. t=18.050824939739094, node=2

```
src=3, dest=2, contents=[5, 3, 2, 0]
Node 2 Updated Distance Table:
Time : 18.050824939739094
```

		via		
D2	0	1	3	
-----+-----				
0	3	2	7	
1	4	1	5	
3	8	9	2	

```
main(): event received. t=18.746169943780483, node=3
src=0, dest=3, contents=[0, 1, 2, 5]
Node 3 Updated Distance Table:
Time : 18.746169943780483
```

		via	
D3	0	2	
-----+-----			
0	7	4	
1	8	3	
2	9	2	

```
main(): event received. t=18.785243922626474, node=0
src=2, dest=0, contents=[2, 1, 0, 2]
Node 0 Updated Distance Table:
Time : 18.785243922626474
```

		via		
D0	1	2	3	
-----+-----				
1	1	4	10	
2	2	3	9	
3	4	5	7	

```
main(): event received. t=19.865751480429456, node=1
src=2, dest=1, contents=[2, 1, 0, 2]
Node 1 Updated Distance Table:
Time : 19.865751480429456
```

		via	
D1	0	2	
-----+-----			
0	1	3	
2	3	1	
3	8	3	

```
main(): event received. t=19.914034809896947, node=0
src=1, dest=0, contents=[1, 0, 1, 3]
Node 0 Updated Distance Table:
Time : 19.914034809896947
```

		via		
D0	1	2	3	
-----+-----				
1	1	4	10	



```

2| 2 3 9
3| 4 5 7

```

main(): event received. t=20.18913690715984, node=3

src=2, dest=3, contents=[2, 1, 0, 2]

Node 3 Updated Distance Table:

Time : 20.18913690715984

```

      via
D3 | 0 2
----+-----
0| 7 4
1| 8 3
2| 9 2

```

main(): event received. t=20.253634700934406, node=2

src=1, dest=2, contents=[1, 0, 1, 3]

Node 2 Updated Distance Table:

Time : 20.253634700934406

```

      via
D2 | 0 1 3
----+-----
0| 3 2 7
1| 4 1 5
3| 8 4 2

```

main(): event received. t=20.482637545550148, node=3

src=0, dest=3, contents=[0, 1, 2, 5]

Node 3 Updated Distance Table:

Time : 20.482637545550148

```

      via
D3 | 0 2
----+-----
0| 7 4
1| 8 3
2| 9 2

```

main(): event received. t=21.253178741144875, node=0

src=3, dest=0, contents=[5, 3, 2, 0]

Node 0 Updated Distance Table:

Time : 21.253178741144875

```

      via
D0 | 1 2 3
----+-----
1| 1 4 10
2| 2 3 9
3| 4 5 7

```

main(): event received. t=21.29090096088441, node=3

src=2, dest=3, contents=[2, 1, 0, 2]

Node 3 Updated Distance Table:

Time : 21.29090096088441

```

      via
D3 | 0 2

```

```

-----+-----
0 | 7 4
1 | 8 3
2 | 9 2

```

```

main(): event received. t=22.305871516157552, node=2
src=1, dest=2, contents=[1, 0, 1, 3]
Node 2 Updated Distance Table:
Time : 22.305871516157552

```

```

          via
D2 | 0 1 3
-----+-----
0 | 3 2 7
1 | 4 1 5
3 | 8 4 2

```

```

main(): event received. t=24.927569547793436, node=1
src=0, dest=1, contents=[0, 1, 2, 5]
Node 1 Updated Distance Table:
Time : 24.927569547793436

```

```

          via
D1 | 0 2
-----+-----
0 | 1 3
2 | 3 1
3 | 6 3

```

```

main(): event received. t=25.128028789974937, node=0
src=2, dest=0, contents=[2, 1, 0, 2]
Node 0 Updated Distance Table:
Time : 25.128028789974937

```

```

          via
D0 | 1 2 3
-----+-----
1 | 1 4 10
2 | 2 3 9
3 | 4 5 7

```

```

main(): event received. t=25.449955126583248, node=2
src=1, dest=2, contents=[1, 0, 1, 3]
Node 2 Updated Distance Table:
Time : 25.449955126583248

```

```

          via
D2 | 0 1 3
-----+-----
0 | 3 2 7
1 | 4 1 5
3 | 8 4 2

```

```

main(): event received. t=26.118916140819966, node=2
src=3, dest=2, contents=[5, 3, 2, 0]

```

Node 2 Updated Distance Table:

Time : 26.118916140819966

		via		
D2		0	1	3
-----+-----				
0		3	2	7
1		4	1	5
3		8	4	2

main(): event received. t=26.201461099947345, node=1  
src=2, dest=1, contents=[2, 1, 0, 2]

Node 1 Updated Distance Table:

Time : 26.201461099947345

		via	
D1		0	2
-----+-----			
0		1	3
2		3	1
3		6	3

main(): event received. t=26.53080101034394, node=2  
src=0, dest=2, contents=[0, 1, 2, 5]

Node 2 Updated Distance Table:

Time : 26.53080101034394

		via		
D2		0	1	3
-----+-----				
0		3	2	7
1		4	1	5
3		8	4	2

main(): event received. t=27.713692964988017, node=0  
src=3, dest=0, contents=[5, 3, 2, 0]

Node 0 Updated Distance Table:

Time : 27.713692964988017

		via		
D0		1	2	3
-----+-----				
1		1	4	10
2		2	3	9
3		4	5	7

main(): event received. t=28.520378439671816, node=3  
src=2, dest=3, contents=[2, 1, 0, 2]

Node 3 Updated Distance Table:

Time : 28.520378439671816

		via	
D3		0	2
-----+-----			
0		7	4
1		8	3

```
2| 9 2
```

```
main(): event received. t=29.35836153589058, node=3
src=0, dest=3, contents=[0, 1, 2, 5]
```

```
Node 3 Updated Distance Table:
```

```
Time : 29.35836153589058
```

```
via
D3 | 0 2
----+-----
0| 7 4
1| 8 3
2| 9 2
```

```
main(): event received. t=29.528954480475793, node=1
src=2, dest=1, contents=[2, 1, 0, 2]
```

```
Node 1 Updated Distance Table:
```

```
Time : 29.528954480475793
```

```
via
D1 | 0 2
----+-----
0| 1 3
2| 3 1
3| 6 3
```

```
main(): event received. t=29.585774748651296, node=0
src=1, dest=0, contents=[1, 0, 1, 3]
```

```
Node 0 Updated Distance Table:
```

```
Time : 29.585774748651296
```

```
via
D0 | 1 2 3
----+-----
1| 1 4 10
2| 2 3 9
3| 4 5 7
```

```
main(): event received. t=30.41953760605223, node=0
src=2, dest=0, contents=[2, 1, 0, 2]
```

```
Node 0 Updated Distance Table:
```

```
Time : 30.41953760605223
```

```
via
D0 | 1 2 3
----+-----
1| 1 4 10
2| 2 3 9
3| 4 5 7
```

```
main(): event received. t=31.687321814707936, node=2
src=0, dest=2, contents=[0, 1, 2, 5]
```

```
Node 2 Updated Distance Table:
```

```
Time : 31.687321814707936
```

```
via
```

D2	0	1	3
-----+-----			
0	3	2	7
1	4	1	5
3	8	4	2

main(): event received. t=31.812834350715544, node=3  
 src=0, dest=3, contents=[0, 1, 2, 5]

Node 3 Updated Distance Table:

Time : 31.812834350715544

	via		
D3	0	2	
-----+-----			
0	7	4	
1	8	3	
2	9	2	

main(): event received. t=32.02874481948231, node=1  
 src=0, dest=1, contents=[0, 1, 2, 5]

Node 1 Updated Distance Table:

Time : 32.02874481948231

	via		
D1	0	2	
-----+-----			
0	1	3	
2	3	1	
3	6	3	

main(): event received. t=33.07916430607561, node=2  
 src=1, dest=2, contents=[1, 0, 1, 3]

Node 2 Updated Distance Table:

Time : 33.07916430607561

	via		
D2	0	1	3
-----+-----			
0	3	2	7
1	4	1	5
3	8	4	2

main(): event received. t=34.53013716524018, node=3  
 src=0, dest=3, contents=[0, 1, 2, 4]

Node 3 Updated Distance Table:

Time : 34.53013716524018

	via		
D3	0	2	
-----+-----			
0	7	4	
1	8	3	
2	9	2	

main(): event received. t=35.510609819723044, node=2  
 src=3, dest=2, contents=[4, 3, 2, 0]

Node 2 Updated Distance Table:

Time : 35.510609819723044

	via		
D2	0	1	3
-----+-----			
0	3	2	6
1	4	1	5
3	8	4	2

main(): event received. t=36.70608133676908, node=0

src=3, dest=0, contents=[4, 3, 2, 0]

Node 0 Updated Distance Table:

Time : 36.70608133676908

	via		
D0	1	2	3
-----+-----			
1	1	4	10
2	2	3	9
3	4	5	7

main(): event received. t=36.76611575365053, node=3

src=2, dest=3, contents=[2, 1, 0, 2]

Node 3 Updated Distance Table:

Time : 36.76611575365053

	via	
D3	0	2
-----+-----		
0	7	4
1	8	3
2	9	2

main(): event received. t=37.16755665490566, node=2

src=0, dest=2, contents=[0, 1, 2, 5]

Node 2 Updated Distance Table:

Time : 37.16755665490566

	via		
D2	0	1	3
-----+-----			
0	3	2	6
1	4	1	5
3	8	4	2

main(): event received. t=37.59598891913142, node=0

src=1, dest=0, contents=[1, 0, 1, 3]

Node 0 Updated Distance Table:

Time : 37.59598891913142

	via		
D0	1	2	3
-----+-----			
1	1	4	10
2	2	3	9
3	4	5	7

```
main(): event received.  t=38.48063087095286, node=1
  src=2, dest=1, contents=[2, 1, 0, 2]
Node 1 Updated Distance Table:
Time : 38.48063087095286
```

	via	
D1	0	2
-----		
0	1	3
2	3	1
3	6	3

```
main(): event received.  t=39.190485927144756, node=2
  src=0, dest=2, contents=[0, 1, 2, 4]
Node 2 Updated Distance Table:
Time : 39.190485927144756
```

	via		
D2	0	1	3
-----			
0	3	2	6
1	4	1	5
3	7	4	2

```
main(): event received.  t=39.307148482621315, node=0
  src=2, dest=0, contents=[2, 1, 0, 2]
Node 0 Updated Distance Table:
Time : 39.307148482621315
```

	via		
D0	1	2	3
-----			
1	1	4	10
2	2	3	9
3	4	5	7

```
main(): event received.  t=41.304718424883085, node=0
  src=2, dest=0, contents=[2, 1, 0, 2]
Node 0 Updated Distance Table:
Time : 41.304718424883085
```

	via		
D0	1	2	3
-----			
1	1	4	10
2	2	3	9
3	4	5	7

```
main(): event received.  t=41.66114004200862, node=1
  src=0, dest=1, contents=[0, 1, 2, 5]
Node 1 Updated Distance Table:
Time : 41.66114004200862
```

via

```

D1 | 0 2
----+-----
0 | 1 3
2 | 3 1
3 | 6 3

```

```

main(): event received. t=42.116765993541705, node=3
src=2, dest=3, contents=[2, 1, 0, 2]

```

```

Node 3 Updated Distance Table:

```

```

Time : 42.116765993541705

```

```

via
D3 | 0 2
----+-----
0 | 7 4
1 | 8 3
2 | 9 2

```

```

main(): event received. t=45.058557444010134, node=1
src=2, dest=1, contents=[2, 1, 0, 2]

```

```

Node 1 Updated Distance Table:

```

```

Time : 45.058557444010134

```

```

via
D1 | 0 2
----+-----
0 | 1 3
2 | 3 1
3 | 6 3

```

```

main(): event received. t=45.49289866858552, node=1
src=0, dest=1, contents=[0, 1, 2, 5]

```

```

Node 1 Updated Distance Table:

```

```

Time : 45.49289866858552

```

```

via
D1 | 0 2
----+-----
0 | 1 3
2 | 3 1
3 | 6 3

```

```

main(): event received. t=48.21879362769726, node=3
src=2, dest=3, contents=[2, 1, 0, 2]

```

```

Node 3 Updated Distance Table:

```

```

Time : 48.21879362769726

```

```

via
D3 | 0 2
----+-----
0 | 7 4
1 | 8 3
2 | 9 2

```

```

main(): event received. t=48.87582110700118, node=0
src=2, dest=0, contents=[2, 1, 0, 2]

```

```

Node 0 Updated Distance Table:

```



Time : 48.87582110700118

	via		
D0	1	2	3
-----+-----			
1	1	4	10
2	2	3	9
3	4	5	7

main(): event received. t=50.96329881679931, node=1  
src=2, dest=1, contents=[2, 1, 0, 2]

Node 1 Updated Distance Table:

Time : 50.96329881679931

	via	
D1	0	2
-----+-----		
0	1	3
2	3	1
3	6	3

main(): event received. t=51.30060851922301, node=1  
src=0, dest=1, contents=[0, 1, 2, 4]

Node 1 Updated Distance Table:

Time : 51.30060851922301

	via	
D1	0	2
-----+-----		
0	1	3
2	3	1
3	5	3

main(): event received. t=54.35057587739848, node=3  
src=2, dest=3, contents=[2, 1, 0, 2]

Node 3 Updated Distance Table:

Time : 54.35057587739848

	via	
D3	0	2
-----+-----		
0	7	4
1	8	3
2	9	2

main(): event received. t=56.74096611025308, node=0  
src=1, dest=0, contents=[1, 0, 1, 3]

Node 0 Updated Distance Table:

Time : 56.74096611025308

	via		
D0	1	2	3
-----+-----			
1	1	4	10
2	2	3	9
3	4	5	7

```
main(): event received.  t=58.81873138061738, node=2
    src=1, dest=2, contents=[1, 0, 1, 3]
Node 2 Updated Distance Table:
Time : 58.81873138061738
```

D2	via		
	0	1	3
-----+-----			
0	3	2	6
1	4	1	5
3	7	4	2

```
main(): event received.  t=59.77645325787776, node=1
    src=2, dest=1, contents=[2, 1, 0, 2]
Node 1 Updated Distance Table:
Time : 59.77645325787776
```

D1	via	
	0	2
-----+-----		
0	1	3
2	3	1
3	5	3

```
main(): event received.  t=67.69166290721117, node=1
    src=2, dest=1, contents=[2, 1, 0, 2]
Node 1 Updated Distance Table:
Time : 67.69166290721117
```

D1	via	
	0	2
-----+-----		
0	1	3
2	3	1
3	5	3

Simulator terminated at t=67.69166290721117, no packets in medium.