ITCS 6166 – Computer Communications and Networks– Spring 2016 – Programming Project 2

Distance Vector Routing Algorithm

Distance vector routing is a simple distributed routing protocol. Distance vector routing allows routers to automatically discover the destinations reachable inside the network as well as the shortest path to reach each of these destinations. The shortest path is computed based on *metrics* or *costs* that are associated to each link. A router that uses distance vector routing regularly sends its distance vector over all its interfaces. The distance vector is a summary of the router's routing table that indicates the distance towards each known destination.

Each node constructs a one-dimensional array containing the "distances"(costs) to all other nodes and distributes that vector to its immediate neighbors.

a. The starting assumption for distance-vector routing is that each node knows the cost of the link to each of its directly connected neighbors.
b. A link that is down is assigned an infinite cost.

Advantages:

a. It is simpler to configure than Link state.
b. It is easier to maintain.

[Note: Link state routing protocol-The link-state protocol is performed by every switching node in the network. The basic concept of link-state routing is that every node constructs a map of the connectivity to the network, in the form of a graph, showing which nodes are connected to which other nodes. Each node then independently calculates the next best logical path from it to every possible destination in the network. The collection of best paths will then form the node's routing table.]

Disadvantages:

a. It is at risk from the count-to-infinity problem-The count-to-infinity problem happens when a router is unable to reach an adjoining network. A second router, 1 hop away from the first router, thinks that the unreachable network is 2 hops away. Meanwhile, the first router then updates its records to say it is 3 hops away from the unreachable network based on the fact it is 1 hop from the second router, which says it is 2 hops from the unreachable network. The routers continue incrementing their hop count until the maximum (15), "infinity", is reached.

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Execution Steps

1. Open Command prompt in the **src** folder.
2. Type "javac project.java"
3. Type "java Project"

Output

```
Network Simulator v1.0
Enter trace level (>= 0): [0] 2
Will the link change (1 = Yes, 0 = No): [0]
Enter random seed: [random]
Entity0 Initializion Complete at 0.0. Distance Table is:

           via
 D0 |   1   2   3
----+------------
   1| 999 999 999
   2| 999 999 999
   3| 999 999 999
Entity1 Initializion Complete at 0.0. Distance Table is:

         via
 D1 |   0   2
----+--------
   0| 999 999
   2| 999 999
   3| 999 999
Entity2 Initializion Complete at0.0. Distance Table is:

           via
 D2 |   0   1   3
----+------------
   0| 999 999 999
   1| 999 999 999
   3| 999 999 999
Entity3 Initializion Complete at 0.0. Distance Table is:

         via
 D3 |   0   2
```

```
----+--------
   0| 999 999
   1| 999 999
   2| 999 999

main(): event received.  t=1.675073245953393, node=2
  src=3, dest=2, contents=[7, 999, 2, 0]
Entity2 Update Complete at 1.675073245953393. Distance Table is:

           via
 D2 |   0   1   3
----+------------
   0| 999 999   9
   1| 999 999 999
   3| 999 999   2

main(): event received.  t=2.274462157486109, node=2
  src=0, dest=2, contents=[0, 1, 2, 7]
Entity2 Update Complete at 2.274462157486109. Distance Table is:

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

main(): event received.  t=3.3812418454920565, node=1
  src=2, dest=1, contents=[3, 1, 0, 2]
Entity1 Update Complete at3.3812418454920565. Distance Table is:

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

main(): event received.  t=3.408208194953617, node=3
  src=0, dest=3, contents=[0, 1, 2, 7]
Entity1 Update Complete at 3.408208194953617. Distance Table is:
```

```
         via
 D3 |   0   2
----+--------
   0|   7 999
   1|   8 999
   2|   9 999

main(): event received.  t=4.449236182742565, node=2
  src=1, dest=2, contents=[1, 0, 1, 999]
Entity2 Update Complete at 4.449236182742565. Distance Table is:

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

main(): event received.  t=4.734355692061754, node=0
  src=2, dest=0, contents=[3, 1, 0, 2]
Entity0 Update Complete at 4.734355692061754. Distance Table is:

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

main(): event received.  t=6.403960197872448, node=3
  src=2, dest=3, contents=[3, 1, 0, 2]
Entity1 Update Complete at 6.403960197872448. Distance Table is:

         via
 D3 |   0   2
----+--------
   0|   7   5
   1|   8   3
   2|   9   2
```

```
main(): event received.  t=6.932099246604798, node=1
  src=2, dest=1, contents=[2, 1, 0, 2]
Entity1 Update Complete at6.932099246604798. Distance Table is:

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

main(): event received.  t=7.745459257854462, node=0
  src=2, dest=0, contents=[2, 1, 0, 2]
Entity0 Update Complete at 7.745459257854462. Distance Table is:

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

main(): event received.  t=7.920859708805635, node=0
  src=1, dest=0, contents=[1, 0, 1, 999]
Entity0 Update Complete at 7.920859708805635. Distance Table is:

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

main(): event received.  t=7.949244963627658, node=0
  src=3, dest=0, contents=[7, 999, 2, 0]
Entity0 Update Complete at 7.949244963627658. Distance Table is:

           via
 D0 |   1   2   3
----+------------
   1|   1   3 999
```

```
   2|   2   2   6
   3| 999   4   4

main(): event received.  t=8.37652295246885, node=3
  src=0, dest=3, contents=[0, 1, 2, 4]
Entity1 Update Complete at 8.37652295246885. Distance Table is:

         via
 D3 |   0   2
----+--------
   0|   5   5
   1|   6   3
   2|   7   2

main(): event received.  t=9.179423512908619, node=1
  src=0, dest=1, contents=[0, 1, 2, 7]
Entity1 Update Complete at9.179423512908619. Distance Table is:

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

main(): event received.  t=9.835808117771132, node=3
  src=2, dest=3, contents=[2, 1, 0, 2]
Entity1 Update Complete at 9.835808117771132. Distance Table is:

         via
 D3 |   0   2
----+--------
   0|   5   4
   1|   6   3
   2|   7   2

main(): event received.  t=9.848324769271585, node=2
  src=3, dest=2, contents=[7, 8, 2, 0]
Entity2 Update Complete at 9.848324769271585. Distance Table is:

           via
```

```
 D2 |   0   1   3
----+------------
   0|   3   2   9
   1|   4   1  10
   3|  10 999   2

main(): event received.  t=11.563135335354426, node=0
  src=3, dest=0, contents=[7, 8, 2, 0]
Entity0 Update Complete at 11.563135335354426. Distance Table is:

           via
 D0 |   1   2   3
----+------------
   1|   1   3  12
   2|   2   2   6
   3| 999   4   4

main(): event received.  t=13.258392850160671, node=1
  src=0, dest=1, contents=[0, 1, 2, 4]
Entity1 Update Complete at13.258392850160671. Distance Table is:

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

main(): event received.  t=13.437147922865682, node=0
  src=3, dest=0, contents=[5, 3, 2, 0]
Entity0 Update Complete at 13.437147922865682. Distance Table is:

           via
 D0 |   1   2   3
----+------------
   1|   1   3   7
   2|   2   2   6
   3| 999   4   4

main(): event received.  t=13.675423787427707, node=2
  src=1, dest=2, contents=[1, 0, 1, 3]
```

```
Entity2 Update Complete at 13.675423787427707. Distance Table is:

           via
 D2 |   0   1   3
----+------------
   0|   3   2   9
   1|   4   1  10
   3|  10   4   2

main(): event received.  t=13.734602898936838, node=2
  src=0, dest=2, contents=[0, 1, 2, 4]
Entity2 Update Complete at 13.734602898936838. Distance Table is:

           via
 D2 |   0   1   3
----+------------
   0|   2   2   9
   1|   3   1  10
   3|   6   4   2

main(): event received.  t=15.712582086436933, node=2
  src=3, dest=2, contents=[5, 3, 2, 0]
Entity2 Update Complete at 15.712582086436933. Distance Table is:

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

main(): event received.  t=15.82804260892253, node=0
  src=1, dest=0, contents=[1, 0, 1, 3]
Entity0 Update Complete at 15.82804260892253. Distance Table is:

           via
 D0 |   1   2   3
----+------------
   1|   1   3   7
   2|   2   2   6
   3|   4   4   4
```

```
main(): event received.  t=18.90398007739022, node=2
  src=3, dest=2, contents=[4, 3, 2, 0]
Entity2 Update Complete at 18.90398007739022. Distance Table is:

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

main(): event received.  t=22.57348545811517, node=0
  src=3, dest=0, contents=[4, 3, 2, 0]
Entity0 Update Complete at 22.57348545811517. Distance Table is:

           via
 D0 |   1   2   3
----+------------
   1|   1   3   7
   2|   2   2   6
   3|   4   4   4

Simulator terminated at t=22.57348545811517, no packets in medium and the
Distance tables are as follows

           via
 D0 |   1   2   3
----+------------
   1|   1   3   7
   2|   2   2   6
   3|   4   4   4

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

           via
```

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

D3	via 0	via 2
0	5	4
1	6	3
2	7	2

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Screenshots

```
:\Classes\CN\Project\PP-2\src>java Project
etwork Simulator v1.0
nter trace level (>= 0): [0] 2
ill the link change (1 = Yes, 0 = No): [0]
nter random seed: [random]
ntity0 Initializion Complete at 0.0. Distance Table is:

          via
D0 |   1   2   3
---+------------
  1| 999 999 999
  2| 999 999 999
  3| 999 999 999
ntity1 Initializion Complete at 0.0. Distance Table is:

        via
D1 |   0   2
---+--------
  0| 999 999
  2| 999 999
  3| 999 999
ntity2 Initializion Complete at0.0. Distance Table is:

          via
D2 |   0   1   3
---+------------
  0| 999 999 999
  1| 999 999 999
  3| 999 999 999
ntity3 Initializion Complete at 0.0. Distance Table is:

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

ain(): event received.  t=1.675073245953393, node=2
 src=3, dest=2, contents=[7, 999, 2, 0]
ntity2 Update Complete at 1.675073245953393. Distance Table is:

          via
D2 |   0   1   3
---+------------
  0| 999 999   9
  1| 999 999 999
  3| 999 999   2
```

```
main(): event received.  t=2.274462157486109, node=2
  src=0, dest=2, contents=[0, 1, 2, 7]
Entity2 Update Complete at 2.274462157486109. Distance Table is:

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

main(): event received.  t=3.3812418454920565, node=1
  src=2, dest=1, contents=[3, 1, 0, 2]
Entity1 Update Complete at3.3812418454920565. Distance Table is:

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

main(): event received.  t=3.408208194953617, node=3
  src=0, dest=3, contents=[0, 1, 2, 7]
Entity1 Update Complete at 3.408208194953617. Distance Table is:

        via
 D3 |   0   2
----+--------
   0|   7 999
   1|   8 999
   2|   9 999

main(): event received.  t=4.449236182742565, node=2
  src=1, dest=2, contents=[1, 0, 1, 999]
Entity2 Update Complete at 4.449236182742565. Distance Table is:

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

main(): event received.  t=4.734355692061754, node=0
  src=2, dest=0, contents=[3, 1, 0, 2]
Entity0 Update Complete at 4.734355692061754. Distance Table is:

          via
 D0 |   1   2   3
```

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```
          via
 D0 |   1   2   3
----+------------
   1| 999   3 999
   2| 999   2 999
   3| 999   4 999

main(): event received.  t=6.403960197872448, node=3
  src=2, dest=3, contents=[3, 1, 0, 2]
Entity1 Update Complete at 6.403960197872448. Distance Table is:

        via
 D3 |   0   2
----+--------
   0|   7   5
   1|   8   3
   2|   9   2

main(): event received.  t=6.932099246604798, node=1
  src=2, dest=1, contents=[2, 1, 0, 2]
Entity1 Update Complete at6.932099246604798. Distance Table is:

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

main(): event received.  t=7.745459257854462, node=0
  src=2, dest=0, contents=[2, 1, 0, 2]
Entity0 Update Complete at 7.745459257854462. Distance Table is:

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

main(): event received.  t=7.920859708805635, node=0
  src=1, dest=0, contents=[1, 0, 1, 999]
Entity0 Update Complete at 7.920859708805635. Distance Table is:

          via
 D0 |   1   2   3
----+------------
   1|   1   3 999
   2|   2   2 999
   3| 999   4 999
```

```
main(): event received.  t=7.949244963627658, node=0
  src=3, dest=0, contents=[7, 999, 2, 0]
Entity0 Update Complete at 7.949244963627658. Distance Table is:

          via
 D0 |   1   2   3
----+------------
   1|   1   3 999
   2|   2   2   6
   3| 999   4   4

main(): event received.  t=8.37652295246885, node=3
  src=0, dest=3, contents=[0, 1, 2, 4]
Entity1 Update Complete at 8.37652295246885. Distance Table is:

        via
 D3 |   0   2
----+--------
   0|   5   5
   1|   6   3
   2|   7   2

main(): event received.  t=9.179423512908619, node=1
  src=0, dest=1, contents=[0, 1, 2, 7]
Entity1 Update Complete at9.179423512908619. Distance Table is:

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

main(): event received.  t=9.835808117771132, node=3
  src=2, dest=3, contents=[2, 1, 0, 2]
Entity1 Update Complete at 9.835808117771132. Distance Table is:

        via
 D3 |   0   2
----+--------
   0|   5   4
   1|   6   3
   2|   7   2

main(): event received.  t=9.848324769271585, node=2
  src=3, dest=2, contents=[7, 8, 2, 0]
Entity2 Update Complete at 9.848324769271585. Distance Table is:

          via
 D2 |   0   1   3
```

```
          via
 D0 |   1   2   3
----+------------
   1|   1   3  12
   2|   2   2   6
   3| 999   4   4

main(): event received.  t=13.258392850160671, node=1
  src=0, dest=1, contents=[0, 1, 2, 4]
Entity1 Update Complete at13.258392850160671. Distance Table is:

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

main(): event received.  t=13.437147922865682, node=0
  src=3, dest=0, contents=[5, 3, 2, 0]
Entity0 Update Complete at 13.437147922865682. Distance Table is:

          via
 D0 |   1   2   3
----+------------
   1|   1   3   7
   2|   2   2   6
   3| 999   4   4

main(): event received.  t=13.675423787427707, node=2
  src=1, dest=2, contents=[1, 0, 1, 3]
Entity2 Update Complete at 13.675423787427707. Distance Table is:

          via
 D2 |   0   1   3
----+------------
   0|   3   2   9
   1|   4   1  10
   3|  10   4   2

main(): event received.  t=13.734602898936838, node=2
  src=0, dest=2, contents=[0, 1, 2, 4]
Entity2 Update Complete at 13.734602898936838. Distance Table is:

          via
 D2 |   0   1   3
----+------------
   0|   2   2   9
   1|   3   1  10
   3|   6   4   2
```

```
main(): event received.  t=15.712582086436933, node=2
  src=3, dest=2, contents=[5, 3, 2, 0]
Entity2 Update Complete at 15.712582086436933. Distance Table is:

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

main(): event received.  t=15.82804260892253, node=0
  src=1, dest=0, contents=[1, 0, 1, 3]
Entity0 Update Complete at 15.82804260892253. Distance Table is:

          via
 D0 |   1   2   3
----+-----------
   1|   1   3   7
   2|   2   2   6
   3|   4   4   4

main(): event received.  t=18.90398007739022, node=2
  src=3, dest=2, contents=[4, 3, 2, 0]
Entity2 Update Complete at 18.90398007739022. Distance Table is:

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

main(): event received.  t=22.57348545811517, node=0
  src=3, dest=0, contents=[4, 3, 2, 0]
Entity0 Update Complete at 22.57348545811517. Distance Table is:

          via
 D0 |   1   2   3
----+-----------
   1|   1   3   7
   2|   2   2   6
   3|   4   4   4

Simulator terminated at t=22.57348545811517, no packets in medium and the Distance tables are as follows


          via
 D0 |   1   2   3
----+-----------
```

```
          via
 D0 |   1   2   3
----+------------
   1|   1   3   7
   2|   2   2   6
   3|   4   4   4

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

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

         via
 D3 |   0   2
----+--------
   0|   5   4
   1|   6   3
   2|   7   2
```