Survey on Adaptive Routing Algorithms

A. Vinothini

Research Scholar, School of Computer Science, Engineering and Applications, Bharathidasan University

---

Abstract – *A routing algorithm is used to set of step-by step operations direct internet traffic source to destination , there are many different path it can take to target the routing this algorithm is used to verify mathematically the best path .*

Different routing algorithms use different methods to verify the best path. For example, a distance vector algorithm calculates a graph of all available routes by having each point (called a node) determine the "cost" of travelling to each immediate neighbor. This information is collected for every node to create a distance table; which is used to determine the best path to from any one node to another.

Key Words: wireless network, routing algorithm

1. INTRODUCTION

Routing is the operate of moving information across an inter-network from a source to a destination. Along the way, on the least one intermediate node typically is encountered. It's also referred to as the process of choose a path over which to send the packets. Routing is often contrasted with bridging, which is might seem to accomplish precisely the same thing to the casual observer

Routing procedure of selecting a path of traffic in a network is between are across multiple networks. Broadly routing is performances are many type of networks are circuit –switching networks and public switched telephone network and computer such as the internet.

Wireless Routing Protocol (WRP) Is used to routing nodes communicate the distance and second to-last hop for each destination. WRP reduces the number of cases in which a temporary routing loop can occur, which accounts for its fast meeting properties. A compare to algorithms Bellman-Ford Algorithm (DBF), DUAL (a loop-free distance-vector algorithm) and Ideal Link-state Algorithms (ILS), which represent is the state of art of internet routing. The model of the results indicates that WRP is the most efficient of alternatives analyzed.

2. Routing Algorithms

Routing is process of forwarding of a packet in a network so that it reaches its intended destination.

Classification of routing algorithm:

The routing algorithm may be classified as follows:

2.1Adaptive routing algorithm

These algorithms change their routing decisions to return changes in the topology and traffic as well. These get optimization parameter are the distance, number of hop and estimated transmisted transit time. This can be further classified as follow:

1. Centerlized
2. Isolated

2.2 Centralized trust based secure routing used dijkstra algorithm

centralized trust-based routing scheme has been proposed to enhance reliable data transmission over networks that experience advanced attacks. CSR improves the routing performance by avoiding malicious nodes and effectively isolating false trust information offered by malicious nodes through a weight function. In addition, CSR considers nodal trust as well as directional trust to formulate a more reliable routing path.

Dijkstra algorithm has a constraint that the distance between each link must be positive to find the shortest path correctly. However, in the CSR's modified Dijkstra algorithm, the total cost is obtained by multiplication of the link costs.

Algorithm 1: Optimal routing path selection

Data: G: input graph, s: source vertex, N: set of vertices

Function Modified Dijkstra algorithm (G, s)

For all $u \in N$, $c(u) = \infty$, $c(s) = 0$, $V = \{\}$

while $V \neq N$ do

Select $u \notin V$ with smallest $c(u)$

$V = V \cup \{u\}$

For all vertices v adjacent to u

if u = s (initial case) **then**

$c(v) = l(s, v)$

else

if c(v) > c(u)l (u, v) **then**

c(v) = c(u)l(u, v)

end

end

end

3. A-star Adaptive Routing

The ASA-routing uses the information of the routing table to select as non-congested as possible of output channels to forward packets. The congestion information should be dynamically updated according to the transmission latency of the previous routed packets. Experimental results for different traffic patterns and network loads indicate that how our method applied to the repetitive turn model routing and the odd-even turn routing yields an improvement in both the average latency and the throughput.

ASA used path finding and graph traversal it problem solve possible path choose optimal path first away.

Algorithm 1: findNextNode()

Input: curNode, dstNode;

openList = Ø;

closeList = Ø;

openList.add(curNode)

while openList is not empty **do**

tempCurNode = findM inF NodeInOpenList();

closeList.add(tempCurNode);

neighborNodes = f indNeighborNodes();

for each nextNode of neighborNodes **do**

if nextNode is in openList **then**

new- g = G(tempCurNode) + c(tempCurNode, nextNode);

if new- g < G(nextNode) then

F(nextNode) = new- g + H(nextNodee);

set tempCurNode as parent to nextNode ;

end if

else

openList.add(nextNode)

set tempCurNode as parent to nextNode;

end if

end for

if dst Node is in openList then

return

end if

end while

4. Fault aware routing algorithm

Fault-aware routing method consists of fault detection method, fault-aware routing scheme, and fault- tolerant mapping method. On the basis of solution path matrix, the fault-tolerant routing algorithm completes the packet transmission by passing the faulty nodes or faulty links.

In this fault aware routing algorithm reduces the packet loss rate and increases the reliability in comparison to the existing fault tolerant routing algorithm. This routing algorithm is also evaluated on larger networks by varying the position and number of faults, which shows that it can be efficiently used for large network on chip (NoCs).

```
Routing (in- mesh[row][col],xco,yco,move)
{
   If((yco==desy-yco)&&(xco==dest-xco))
     {
       Sol[xco][yco]=1;
         Return true;
       }
 Else if (yco==col-1)
  {
If(move==south)
     {
       If(in-mesh[xco+1][yco]==fail)
```

```
      Routing(in-mesh,xco,yco-1,west);
     }
     Routing (in-mesh,xco+1,yco,south);
     }
      Else if(xco==row-1)
      {
        If(move==east)
        {
         If(in-mesh[xco][yco+1]==fail)
           Routing (in –mesh,xco-1,yco,north);
         }
         Routing (in-mesh,xco,yco+1,east);
        }
       Else if (move==west)
        {
            If(in-mesh[xco+1][yco]!=fail)
           Routing (in-mesh,xco+1,yco,south);
         else if (in-mesh,[xco][yco-1]!=fail)
           Routing (in-mesh,xco,yco-1,west);
         Else if(in-mesh[xco-1][yco]!=fail)
          Routing(in-mesh,xco-1,yco,north);
      }
Else if (move==north)
     {
      If(in-mesh[xco][yco-1]!=fail)
         Routing (in-mesh,xco,yco-1,west);
    Else
      Routing (in-mesh,xco,yco+1,east);
   }
Else
{
 Routing(in-mesh,xco,yco+1,east);
 Routing(in-mesh,xco+1,yco,south);
 If((in-mesh[xco][yco+1]==fail) &&(in-mesh[xco+1][yco]==fail))
  Routing(in-mesh,xco,yco-1,west);
 }
}
Sol[xco][yco]=0;
Return false;
}
{
    Sol[xco][yco]=1;
      Return true;
      }
 Else if (yco==col-1)
  {
   If(move==south)
     {
      If(in-mesh[xco+1][yco]==fail)
       Routing(in-mesh,xco,yco-1,west);
      }
      Routing (in-mesh,xco+1,yco,south);
      }
       Else if(xco==row-1)
       {
        If(move==east)
        {
          If(in-mesh[xco][yco+1]==fail)
            Routing (in –mesh,xco-1,yco,north);
          }
          Routing (in-mesh,xco,yco+1,east);
        }
```

```
        Else if (move==west)
         {
            If(in-mesh[xco+1][yco]!=fail)
            Routing (in-mesh,xco+1,yco,south);
           else if (in-mesh,[xco][yco-1]!=fail)
            Routing (in-mesh,xco,yco-1,west);
          Else if(in-mesh[xco-1][yco]!=fail)
           Routing(in-mesh,xco-1,yco,north);
       }
 Else if (move==north)
     {
       If(in-mesh[xco][yco-1]!=fail)
         Routing (in-mesh,xco,yco-1,west);
     Else
       Routing (in-mesh,xco,yco+1,east);
   }
Else
{
 Routing(in-mesh,xco,yco+1,east);
 Routing(in-mesh,xco+1,yco,south);
 If((in-mesh[xco][yco+1]==fail) &&(in-mesh[xco+1][yco]==fail))
  Routing(in-mesh,xco,yco-1,west);
}
}
Sol[xco][yco]=0;
Return false;
}
```

5. Improved dynamic routing algorithm in elastic optical networks

There are two types of algorithms used in improved dynamic routing algorithms in elastic optical networks. The first one is based on a set of shortest paths whose lengths are determined by the number of links in the network. The second one is a modified version of Dijkstra's algorithm. this algorithm is based on weights of the network links depending on the operation of the links and the introduction of an aggregated spectrum of the path that is being selected.

Input: Ǵ(N, E). Set of k shortest paths between each pair of nodes. The request path selection for C b/s between node s and d.

Output: The shortest path p for request of C b/s and fa , fb.

Improved kSP algorithm;

1. status← false; l←1;

2. while not(status) and (l ≤ k) do

3. ( ) l s d l s d i j p S p Si j , , , , ∈ ← { Aggregation bandwidth l-th path l s d p , }

4. ( ) l dist ← dist ps,d {calculate the actual length of the path}

5. m ← m( ) dist { designate the modulation level m}

6. n ← n( ) C,m { determine the required number of slots n}

7. if FF(S l ,n G) sd p + then { First Fit function finds the n + G adjacent slots}

8. Status← true

9. end if

10. l←l+1;

11. end while

12. if status then

13. return pts,d , a b f , f { fb − f a = n + G +1 }

14. else Blocking

15. end

Modified shortest path 2 algorithm

Input: Graph Ǵ (N, E). The request path selection for C b/s between node s and d.

Output:

The shortest path p for request of C b/s and fa, fb.

MSP2 algorithm;

1. status ← false;
2. m← M
3. while not(status) and (m > 0) do
4. n ← n( ) C,m {specify the required number of slots n}
5. MSP($D_{'}$,$p_{'}$,f_b , f_a)
6. MSP($D_{'}$,$p_{'}$, $f_{a'}{}^{s}$,$f_{b'}$)
7. if (dist(p) ≤TD_{max}(m)) and dist($p_{'}$) ≤TD_{max} (m)) then
8. status←true,p←p ' ,f_{a}←f_{a},f_{b}←f_{b}
9. else if dist(p) ≤ TD_{max} (m)) then
10. status←true
11. else m ← m −1
12. end if
13. end if
14. end while
15. If status then
16. return p , f_a , f_b { fb − f a = n + G +1 }
17. else Request blocked
18. end if

6. An Efficient Adaptive Routing Algorithm for Application- Specific Network-on-Chip

One of the main factors which effects the overall performance of a Network-on-Chip(NoC) is represented by the routing algorithm.

The methodology can be applied to regular and irregular network topology for Network –on chip and can be done in polynomial time. The results obtained show that the efficiency of the proposed methodology is verified through a case study of an Audio-Video application. Our approach consists in finding all **Strongly Connected Component**(SCC) of the Application Specific Channel Dependency Graph(ASCDG), and to work on it instead of working.

Algorithm 1 BreakSCC

Input : A set of SCC (SCC[N]), Routing Table(RT)

Output: Routing Table(RT)

1: for i ∈[0,N−1] do

2: GetacycleDc = d1,d2,⋯,ck ⊆ D ∈ SCC[i];

3: if (It's not reduced to one node) then

4: for j ∈[0,k−1] do

5: if (ExistsEscapePath(src(d[j]),Label(src[dj])) then

6: Remove the Dc from the SCC[i]

7: end if

8: end for

9: if (j ≥(k +1)) then

10: for (j ∈[1,k]) do

11: Compute: λdj (cf. Section 3)

12: end for

13: for (j ∈[1,k]) do

14: if (The λdj is the minimal and |Θ(c,d)|≥1) then

15: Remove the dj

16: Update RT

17: else

18: Return(fail)

19: end if

20: end for

21: end if

22: BreakSCC(FindSCC(SCC[i]−Dc))

23: end if

24: end for

25: Return(RT), success)

7. Advantages and disadvantages of algorithms

S. no	Algorithms	Advantages	Disadvantages
1	Dijkstra	centralized trust based Secure routing scheme can avoid the	In black hole attack malicious behavior is consistent because they drop packet

		malicious nodes effectively, thus it achieves high reliability under advanced network attack.	regardless of target.
2	A-star Adaptive Routing	This to make packets to reach the destination free of congested areas, thus alleviating congestion in the network.	The disadvantage of this model is that the degree of adaptiveness in half case is the same with fully adaptive routing, however in the other case is one.
3	Falut aware routing	Falut aware routing algorithm route the data through alternate paths to the destination and at the same time the traffic congestion around the faults is also reduced.	One common property of these algorithms is that blocking of the packets is the only way to acknowledge the faults.
4	Ksp&&msp2	This algorithms reject the lower traffic volume as compared to well-known algorithms.	Modified shortest path 2 algorithm uses utilization of the network links, so loaded links are omitted on the calculated paths.
5	Strongly Connected component(SCC)	The methodology can be applied to regular and irregular network topology for NoC and can be done in polynomial time.	APSRAs routing cannot scale to large designs for the technique for proving deadlock-freeness, based on search and elimination of cycles in the extended dependency graph, and requires exponential time in the worst case.

8. CONCLUSION

This paper presents different type of routing algorithms in wireless networks. Routing is the act of moving information across an inter-network from a source to a destination A Routing algorithms routing the information varies route depending on the routing algorithm. Present **routing protocols** are classified according to the existing study direction and the performance issues of each routing protocol are highlighted.

REFERENCES

[1] YunSunho Seo, and Jong-Moon Chung, jusik yun, Centralized Trust Based Secure Routing in Wireless Networks, IEEE WIRELESS COMMUNICATIONS, Vol num:7 pg no:1066-1069.

[2] Yuan Cai Xiang Ji1 ASA-routing: A-Star Adaptive Routing Algorithm for Network-on-Chips, International conference on algorithms and architectures for parallel processing,Vol:11335 pg no:187-198 year-2018.

[3] Jyoti Khichar 1 and Sudhanshu Choudhary Fault Aware Adaptive Routing Algorithm for Mesh based NoCs International conference inventertive computing and information, Year 2017.

[4] Ireneusz Olszewsk, Improved dynamic routing algorithms in elastic optical network, VOLUME: 15 | NUMBER: 3 | 2017 | SEPTEMBER.

[5] Zongliang ZhuanSun, Keqiu Li and Yanming Shen, An Efficient Adaptive Routing Algorithm for Application-Specific Network-on-Chip, institute of electrical and electrical engineers,Year:2011.