Introduction of Routing and its types

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Abstract

A computer network is a set of computers that are connected together the purpose of sharing resources and information. The most common resource shared today is an Internet. Routing is an important function of computer network. Routing is process of established the routes that data packets must follow to reach the destination. This paper discussed the various routing algorithms that are adaptive and non-adaptive routing algorithms.

Keywords: *computer network, routing, adaptive and non-adaptive, algorithm, path.*

I. INTRODUCTION

Today internet is the fastest infrastructure in everyday life .Human being is able to send and receive any   form of data. The routing algorithm is described by as network layer protocol that guides the packets through the communication layer to their correct destination. The performance of routing is assessed according the throughput in network. The main function is routing algorithm is deciding which route is better for packet.

Routing process is classified into two parts that are adaptive and non-adaptive algorithms. There are certain properties that are desirable in the routing algorithm.
1. Routing algorithm should be done properly and correctly.
2. Routing algorithm should be simple.
3. Routing algorithm should be stable under all circumstances.
4. Every node connected to the network should get a fair chance of transmitting their packets.
5. Routing algorithm should be optimal in term of throughput and minimize mean packets delays.

Moreover, a routing algorithm must be able to the global and distribute nature of physical networks. Routing algorithm need to cope with events such as node and link failure and recalculate paths. Finally, routing algorithm need to calculate paths to allow nodes to achieve high performance.

II. ROUTING ALGORITHMS

Routing is process of establishing the routes that data packets must follow to reach the destination. In this process, a routing table is created which contains information regarding routes which data packets follow. Various routing algorithm are used that are followed:

A. Adaptive Algorithm

The adaptive algorithms base their routing decision on measurement or estimate of the current traffic and topology. Adaptive algorithm are   divided into three parts:
a) Isolated routing
b)Centralized routing
c)Distributed routing

1) Isolated Routing

In this method, the node decides the routing without seeking information other nodes. The sending node does not know about status of a particular link.
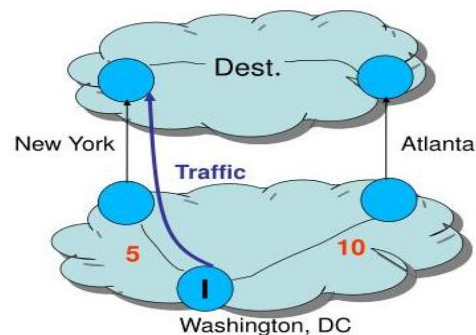

Fig: 2.1.1

There are some example of isolated routing that is Hot Potato and Backward Learning.

Hot Potato: Hot potato routing is a routing technique enabling packet routing without storing them in buffer.

Backward Learning: This method routing tables at each node gets modified information from incoming packet. The packets contain address of source machine too.

2) Central Routing

All routers are connected to centralized control core called Routing Control Center (RCC). Every router tells RCC which its neighbours and use information to create the map of network. Compute routing tables and communicate them to all routers.

From Node

To Node	1	2	3	4	5	6
1	-	2	3	2	2	2
2	1	-	1	6	6	6
3	1	1	-	4	5	1
4	6	6	3	-	5	6
5	4	4	3	4	-	4
6	2	2	2	4	4	-

Central Routing Directory

Fig: 2.1.2

a) Advantages of Central Routing

1. Routers have not a high computational capacity, all focused on single device.
2. The network administrator can get the map of whole network from a single device to check its correctness.
3. To update the algorithm just the control canter has to be update.

b) Disadvantages of Central Routing

1. The control canter is single point of failure that impact on all network.
2. It is not suitable for wide network such as Internet.

3) Distributed Routing

Distributed architecture is also convenient for adding a remotely installed control module onto an available data communications circuit, to minimize the installation costs of potentially long cable runs back to the access control panel location. There are two types of Distributed routing that are followed.
a)Distance vector
b) Link state vector

a) Distance Vector:

A Distance vector routing protocol requires that a router in form its neighbours of topology changes periodically.

Information in routing table of each node:
Iteration 1

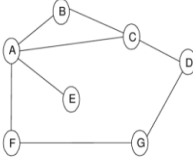| At node	Distance to reach node						
	A	B	C	D	E	F	G
A	0	1	1	x	1	1	x
B	1	0	1	x	x	x	x
C	1	1	0	1	x	x	x
D	x	x	1	0	x	x	1
E	1	x	x	x	0	x	x
F	1	x	x	x	x	0	1

Fig: 2.1.3(a)

- A Distance vector is defined as the list of <destination, cost> tuples, on tuple per destination Each routers maintains a distance vector.

- The cost in each tuple is equal the sum of costs on shortest path to the destination.

b) Link State Vector:

Link state vector was used in ARPANET up to 1979. After that it was replaced by Link state vector .The Link state vector is simple and each router has to perform the following five operations.
1. Each router should discover its neighbour and obtain their network.
2. It should measure the delay or cost to each of these neighbours.
3. It should construct a packet containing the network addresses and delay of all neighbours.
4. Send this packet to all other routers.
5. Compute the shortest path every other routers.
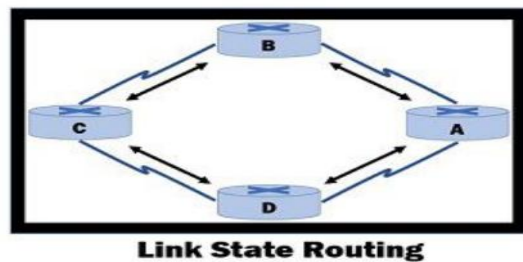Link state vector is used two types protocols that are OPSF and Is-Is Intermediate system.

Link State Routing

Fig: 2.1.3(b)

B. Non-Adaptive Algorithm:

In Non adaptive algorithm routing the of route is computed in advanced. The route distance line is computed off and down loaded IMP when network is booted.

Features of Non-Adaptive Algorithm:
1. In this algorithm, routing decision are not based on the measurement or estimate of current traffic and topology.
2. The route from a particular source to destination is calculated in advanced.
3. Non-Adaptive Algorithm have some types that are followed:
 ➢ Shortest path routing algorithm.
 ➢ Multipath routing algorithm.
 ➢ Flooding algorithm.
 ➢ Flow based algorithm.

1) Shortest Path Routing Algorithm:

In this technique to choose a route the algorithm find shortest path between two nodes. For measuring path length it can use number of hops, geographical distance in kilometres.
- The labelling of arcs can be done with queue and transmissions delay for a standard test of packet. It is based on hourly basis or daily basis or can be computed as function of bandwidth distance, communication cost and some other factors.
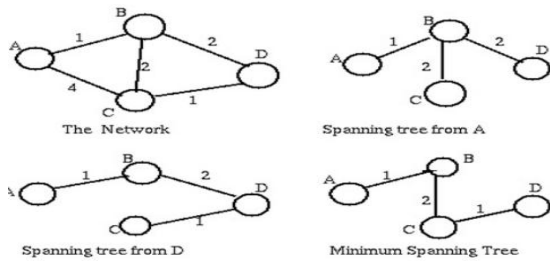
Fig: 2.2.1

2) *Multipath Routing Algorithm:*

In this routing, A network it is found that there are more than one path with shortest length between pairs of nodes.

- In such cases to reduce the load on each of communication lines.

- This technique of using multiple routes between a single pair of nodes is known as multiple routing also called bifurcated routing.

- The method is applicable to both the virtual and datagram subnets.

- Multiple routing is widely used to improve performance and reliability of subnet.

- Routing tables are maintained at each node which contains choices with destination node, line and respective probability.
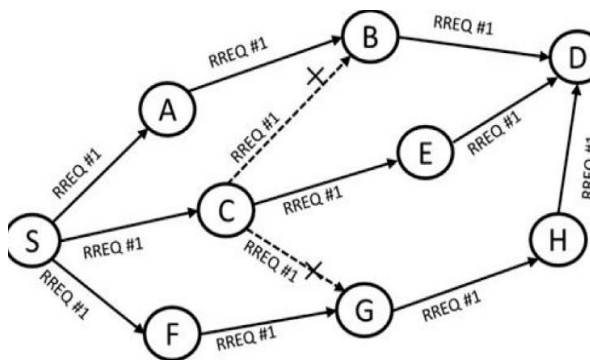

Fig: 2.2.2

3) *Flooding Algorithm*

Flooding is another static routing algorithm, in which every incoming packet is sent out on every outgoing line except the one it arrived on.

- Flooding creates vast number of duplicate packets.

- To reduce, a counter is used with each packet which is decremented at each hope and one whose counter value is zero is discard.

- The sender know the path length of destination but if in case it does not know the counter in initialized by a number equal to full diameter of the subnet.

- Flooding is not practical in most of applications.

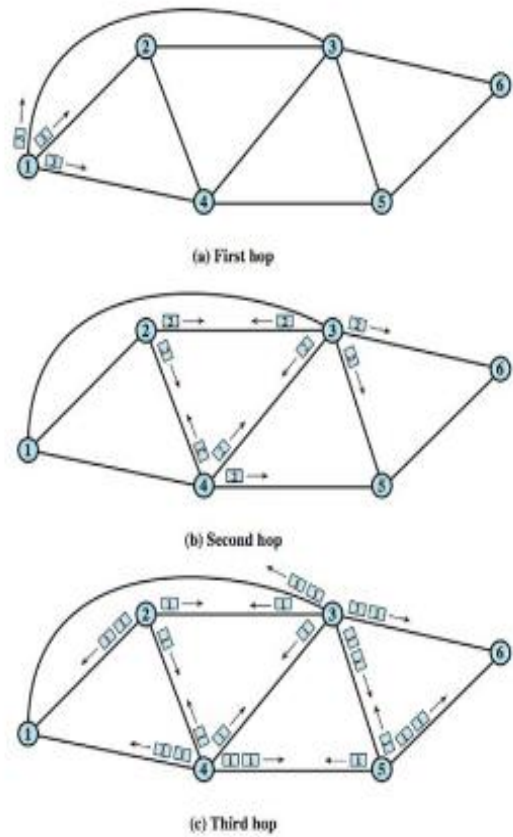- A more practical variation is called as selective flooding.

(a) First hop

(b) Second hop

(c) Third hop

Fig: 2.2.3

4) *Flow Based Algorithm*

Flow based routing is static algorithm that uses both topology and load for routing for deciding a route. To use this technique, certain information must be known advance.

- First the subnet topology must be known.
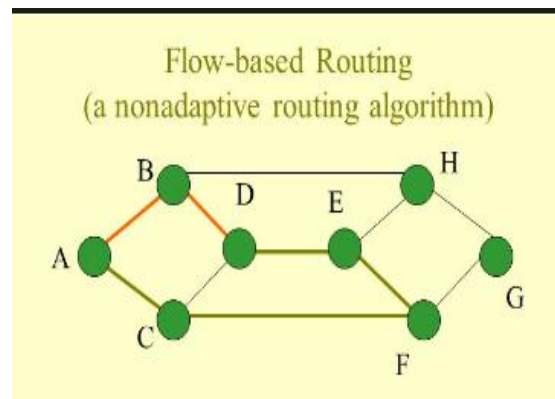
- The traffic matrix.

- The line capacity matrix.

Flow-based Routing
(a nonadaptive routing algorithm)

Fig:2.2.4

III. CONCLUSION

Network security is the vast topic that is becoming a more important because the world is highly interconnected .This paper discussed different types of routing algorithms. The reviews made a conclusion that the adoptive routing algorithms such

as distance vector algorithm, link state algorithm and so on gives better performance metric when compared with the non adoptive routing algorithms such as flooding, shortest path algorithm, random walk and so on.

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