

A STUDY OF CONVERTING ON-DEMAND SINGLE PATH ROUTING PROTOCOL INTO PROACTIVE MULTIPATH ROUTING PROTOCOL

Srikanth G K and Dr. Pramod Pandurang Jadhav

Department of Computer Science & Engineering, Dr. A.P.J. Abdul Kalam University, Indore
(M.P.) - 452010

ABSTRACT—

A MANET is a self-motivated mobile wireless network that can be created exclusive of any former support. The challenge of MANET is to design robust routing algorithms which will satisfy all or few routing properties. Routing protocol in MANET can be categorized in various approaches depending upon network structure, communication model, routing strategy. Routing protocols can be further classified as proactive and reactive. Routing algorithms developed till today focused on the methods of routing. This article presents a survey of single /multipath routing algorithms, its advantages, and limitations. Researchers are attracted to rectify, design & develop concrete, routing algorithms which will fulfill the adequacy requirement of MANET users. This paper proposes the need robust routing protocol with security and energy efficient.

KEYWORDS— DSR, AODV; AOMDV; AOMDV-BR; Single path; multipath.

INTRODUCTION

MANET is a framework less, vigorous, decentralized network. Any node can take part in the network and depart the network at any moment. This feature of MANET helps to create a network anywhere as per the requirement for military, disaster, educational reason and mobile conferencing purpose. The nodes participated in a network are of nearby same configuration. As no central administration is available in the network each and every node in the network has to perform the various roles as the initiation of route discovery process, diverts the packets received at a node to its adjacent node, creating the shortest path, selecting the path between sources to destination and sending packets on this path. The nodes are associated with each other by a peer-to-peer network. Teamwork and faith among the nodes are the responsible factors for the proper functioning of the network [1]. If these factors work up to the satisfactory level the performance of the network is improved but if they fail to work up to a satisfactory level then networks performance will be degraded. This research area has many challenges like the large packet delivery ratio with minimum overhead, end to end data transfer, low error rate, link access control, security, providing real-time multimedia streaming and efficient routing [2]. For any network, routing is important because routing selects the most suitable path in a network for the communication between sources to destination nodes. The network has a main challenge to choose appropriate routing protocol for the network. Routing algorithms are of two types: single path and multi path [2][3]. Single-path routing protocols fail to perform in several environments. In contrast, multipath routing performs better in several environments. In single path routing mechanism a single route between the sources to destination is established, while in multipath routing technique several routes amongst the similar source to

destination are established. It has many advantages over the single path. It gives better network existence, power effectiveness & lower end-to-end delay.

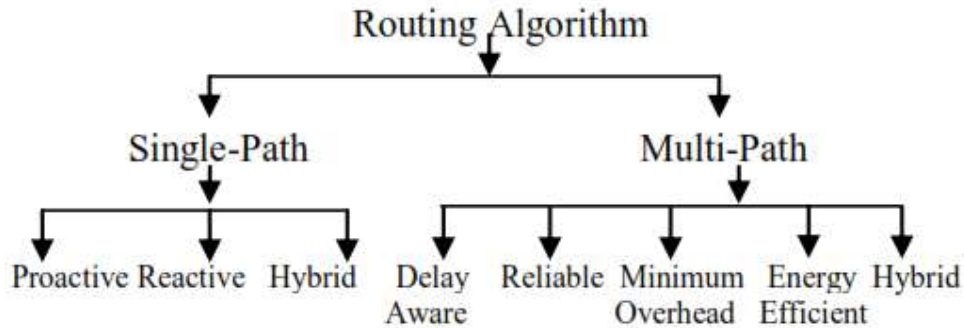


Fig1. Taxonomy of Routing Protocol

A. Single- Path:

As shown in above taxonomy single-path routing are of type , reactive, proactive and hybrid. Along with these, there is power aware & secure routing mechanisms were developed. A source node in proactive strategy maintains all possible routes information. Each node consists of routing table to keep route information, which will be frequently updated. This updated route information is share amongst the each node present in the network. The benefit of this is that trajectories are rapidly explored and a session is created. The drawback of this mechanism is consumption of high bandwidth and degraded the performance of the network in the conditions of routes are broken & topology changes. Sharing updated route information amongst the nodes present in the network produces a huge amount of control messages because of this it is not suitable for MANET. The examples are DSDV, WRP, and OLSR. To overcome the constraints, reactive routing strategy has been proposed for MANET. A source node in reactive mechanism initiates route discovery process only when a source wants to communicate with the destination. Once the route is detected amongst source to a destination then that route is preserved by route preservation process. As compared to the proactive performance of reactive mechanism is far better. The problem of this is high latency in the route discovery process and performance degrades for larger networks. The examples are AODV, DSR, and TORA. This mechanism determines the shortest path between the sources to destination. Studies provide evidence for using shortest path, may not be a suitable choice for MANETs. To overcome the restrictions of the shortest single path, researchers have recommended multipath routing. By combining features of reactive and proactive hybrid type of routing mechanism is developed. The beauty of this strategy is, as network topology changes it can change. The weakness of this technique is high complexity. The various hybrid routing protocols are ZRP and GRP.

B. Multipath:

Route recovery process is started in multipath reactive routing mechanism rapidly and dynamically if a route is a failure in a network. This feature attracts many researchers to invent multipath routing algorithms for the network. More than one paths are established from source to destination node. Amongst these several routes, at least one path is main and remaining one or more alternate paths are available between sources to destination. A source node in this technique is having the ability to discover multiple routes between sources to destination in a single route discovery process. As shown in fig1. Taxonomy of routing protocol multipath

routing mechanisms is projected for MANET is categorized as per their behavior. These are (a) Delay aware (b) Reliable (c) least overhead (d) Energy efficient (e) Hybrid. The delay aware behavior selects several paths, for improving overall delay performance of a network. Reliable methodology continues with trustworthy data transmission amongst source to destination. Minimum overhead methodology determines multiple paths by using the merest overhead of control messages. Energy efficient methodology energy effect path is selected to improve the liveliness of network. Various techniques are used for determining energy efficient path amongst source to destination node. The hybrid strategy includes best features of shortest path and the multipath algorithms. Every multipath routing algorithm holds remarkable benefits and limitations. There is some propose disagreement in common, such as (1) Conceiving multiple paths (2) Selection of these paths 3) Disseminating loads between this trajectories. Routing protocols are redesign to illuminate disagreement stated earlier. Determination of an appropriate algorithm or a set of algorithms that render entire necessities of an efficient routing algorithm. Presently the numbers of routing protocols have been recommended in MANET, with a different objective, and for specific various needs. Routing protocols prefer single path and forward the entire packets over that path. However, single path routing protocols fail to perform in many environments. Single-path routing may increase end-to-end delay, consumes more time for discovery of path in case of topology changes. Multi-path routing consumes less time to discover multiple paths. Multi-path routing selects several routes among the same source to destination. There are so many advantages of multi-path routing as compared to a single path shown in Table1[4][5][6][7][8].It gives better lifetime, power efficiency and lower end to end delay. They also have some challenges in terms of data packet ordering, path maintenance, selection of multiple paths, etc.

TABLE I. COMPARISON OF SINGLE-PATH WITH MULTI-PATH

Parameter	Single path Routing	Multi Path Routing
No of Routes	Single	Multiple
Data Sending	Through Single path	Single as well as several paths also
Latency	High	Reduced latency as compared to the single path
Route Recovery Time	Requires more time as compared to multipath	Requires less time as compared to Single path
Bandwidth	Not provide enough bandwidth	Higher .
Throughput	Less throughput	Better throughput
Network Lifetime	Life time of network is less	Life time of network is better
end-to-end delay	Higher	Lower
Routing Table space	Required less as compared to multipath	Required extra as compared to single path
Computation overload	Required less as compared to multipath	Required extra as compared to single path

Even though multipath routing algorithms enhance load disposal, trustworthiness, delay and power efficiency, they also have several shortcomings. The advantages and disadvantages are listed in Table 2[4][5][6][7][8].

TABLE II MULTIPATH ROUTING PROTOCOL ADVANTAGES AND DISADVANTAGES

Sr. no	Advantages	Disadvantages
1	Fault tolerance	Longer path
2	Load Balancing	Special Control Message
3	Bandwidth aggregation	Route Request Strom
4	Reduced delay	Inefficient route discovery
5	No Duplicate Packet Processing	Duplicate packet processing

The study says that routing in MANET is a monotonous job. In a wired network the task of routing is performed by dedicated routers. Whereas wireless network does not have any dedicated router, since the routing task is to be done by the ordinary node. Routing is one of the requirements of networking for delivering data from one node to the other. Routing algorithm plays an important role in MANET, In MANET all nodes are acting as routers, servers, and access points. Routing is a basic operation of the MANET. Not a single routing protocol design and developed till today are full proof. If any routing protocol is reliable then there will be a performance issue. In some routing protocol only trusted and the best path is used frequently then the nodes present in the path may suffer from power efficiency. Many routing protocols are suffering from various attacks. Security is a major issue with the routing protocol. For resolving issues related to the routing, protocol modification is done by many researchers but it overcomes the existing issues but leads to new issues. This attracts researchers to model and evolves a contemporary routing protocol with all or meager properties.

SINGLE PATH REACTIVE ROUTING PROTOCOLS:

For MANET several single paths routing protocols are designed. This section deals with some single path reactive routing protocols.

A-1 DSR

In this routing protocol, the sender knows the entire path to the destination. It is simple and efficient. It is based on RFC 4278.it is loop-free routing protocol. DSR routing protocol is designed for particularly to be used in multihop ad hoc networks. The nodes in MANET which is using DSR protocol have the capability to organizing and configuring the MANET by itself. This routing protocol does not generate a periodic routing message, therefore, it reduces network bandwidth, reduces routing updates and it conserves battery power of the nodes present in the MANET. This protocol does not contain routing table rather than all routing information is available in the packet header. Disadvantages of DSR are it is not scalable to the bigger network, requires more processing time.

A-2 AODV

Ad hoc On Demand Vector routing protocol is based on DSDV routing protocol. It creates the path with the destination node when the source wants to transmit a packet to the destination. AODV routing protocol is ability to unicast, multicast, and broadcast communication. AODV

uses broadcasting for the creation of the route between source to destination and once the route is created then it will unicast the packet amongst the source to destination. AODV routing algorithms have several advantages like decreased overhead, lower step delay, versatility to dynamic network and it uses the least congested route. This protocol is an ability to change according to the topological changes in the network this feature makes this routing protocol more popular in MANET. AODV routing algorithms have some disadvantages are required periodic updates and unpredictable routes. AODV is vulnerable to various kinds of attacks. [03]

A-3 Power Aware Routing protocol

Each node in MANET is battery operated. Since each node is battery operated it may have limited energy, computational ability. For MANET recharging to the nodes, the mechanism is not available, once the node losses it's all energy, causes to be removed from the network. Looking to this there is a necessity of designing a power aware routing protocols. [09] Describes the survey of energy aware routing based on energy drain rate, Local energy routing protocol (LEAR-DSR), a novel DSR-Based energy efficient routing protocol (EDDSR). In energy aware based on energy drain rate mechanism, each node cost is found out. This cost will determine the lifetime of the node in the MANET. This mechanism selects the higher lifetime path amongst all available paths. Local energy routing protocol (LEAR-DSR) in this mechanism the before establishing route it checks that the node must have a battery power more than the threshold value. If the node does not possess this requirement then that node will not take a part in route formation. In EDDSR each node has the choice to participate in the route creation process. If the battery power of the node is not more than the threshold then it will not take part in the network. [09][10]

A-4 Security based Routing protocol.

[11][12] Authors discussed the comparative study of existing security aware routing protocol for MANET. This article discussed to different approaches of secure routing protocol as cluster based routing protocol and non-cluster based routing protocol. They discussed future challenges and issues regarding design and development of security in MANET. The study shows that the existing secure aware routing protocols are not efficient due to high energy consumption and high communication overhead. [13] Authors focused on the factors which are discriminating the routing algorithms. These factors are the ability to select best path amongst the available paths, the amount of routing traffic generated and convergence of time. Convergence time is a major factor in determining the performance of dynamic routing protocol. This paper compares the convergence duration of routing protocols RIP, EIGRP, OSPF.

NEED OF ENERGY EFFICIENT AND SECURE ROUTING PROTOCOL FOR MANET

MANET is a collection of mobile devices which are operated with limited energy resource. Mobile nature of these devices makes them useful everywhere. Mobile nodes can be a part of the network and depart the network at any time. In MANET there is no central management system so that all nodes have liberty to move in the network, as well as there is no central control on their behavior. Due to that, any node can disturb the network by creating various types of attacks or malicious nodes are easily degrading the overall performance of the network.

With this malicious behavior network has to perform various activities to identify and avoid such things from the network while doing so network may face the energy-related problem with the nodes, which will reduce the overall lifetime of the network. Researchers deal with security mechanisms and energy related mechanisms separately. To protect the network from such attackers which will cause to decrease the energy of nodes and to improve the performance of network, security mechanisms by considering energy issues must be implemented in the network. Security in MANET is one of demanding task. Researchers attacks to propose the various mechanisms for identifying and resolving the various types of attacks from the network. Till today researchers identified various attacks such as black hole/gray hole/denial of service etc. Black hole attack is the major security problems in ad hoc networks. Numerous solutions have been projected for recognition of the existence of black hole node/s in the network. These projected solutions are able to identify and avoid only single node as black hole node but fail to identify and avoid a cooperative node which will cooperatively work as black hole nodes. Presently proposed techniques selects mainly appropriate route, amongst multiple existing routes between sources to a destination. If every time more appropriate path is selected, then the same nodes are used repeatedly. Limited energy resource with these nodes may disappear after some time interval from the trajectory or from the network. While designing routing protocols for a wireless network, preserving energy is a significant issue, because of the majority mobile nodes of the network are battery operated. There is a limitation on the battery capacity used in this node. Energy exhaustion of a node not only affects to the node itself but also affects the overall network existence. Therefore it is the need of MANET to design a mechanism for power management and security awareness issues combined is the direction of future research. Routing algorithms developed till today focused on the methods of routing. Types of routing protocols single as well as multipath are designed for a specific goal; these are either for security aware or energy efficient purpose. Till today separate work in only Security and power efficient routing protocols are done. But the routing algorithm with security and power aware concerns are not designed. This type of routing algorithm is the demand of future. Proficient routing protocols for MANET required being developed for future, which might take security, QoS, and power efficient as the major concerns.

CONCLUSION

In this article, we review the existing single /multipath routing algorithms and their advantages and disadvantages. We have listed the types of single/multipath routing algorithms. After the comparative study of single /multipath routing protocols concludes to, multipath routing is more appealing and has several benefits compared to single path routing. This paper put focus on routing algorithms designed with aspects like delay aware, energy aware and security based. Detail study of a number of multipath routing schemes is projected for wireless ad hoc networks, aspiring to fulfill strategy either energy or secure. Multipath routing has many challenges and disadvantages. By overcoming proposed challenges and disadvantages from existing multipath routing protocol researchers can develop new routing protocol which will be robust, efficient, and secure routing algorithm. In MANET multiple routes are helpful in network communication because routes are frequently disconnected due to poor wireless link quality, mobility and non-availability of node due to battery life.

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