Comparative Study of Selected Proactive Routing Protocols in MANET

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***Abstract*----Ad hoc network is a collection of wireless mobile nodes without any fixed infrastructure. Mobile ad-hoc network (MANET) is a sub class of ad-hoc network and it dynamically forms a temporary network without any support of central administration. The network is ad hoc because it does not rely on any pre-existing network infrastructure like routers in wired networks. Such networks have no fixed topology due to the high degree of node mobility. Node mobility may cause the routes change. Hence, routing in MANET is a critical task due to its highly dynamic environment. To accomplish this task, a variety of routing algorithms have been proposed and also the number remains increasing day by day. These protocols fall in to mainly three categories---Proactive, Reactive and Hybrid. But, it is difficult to determine which protocol performs best under a number of different scenarios. Hence, this paper presents review and a comparison of the typical representatives of proactive routing protocols designed for MANETs by presenting their characteristics, advantages and limitations.**

Keywords: MANET, Proactive routing protocols, DSDV, OLSR, CGSR, Comparative study.

I. INTRODUCTION

Wireless networks have become increasingly popular in the computing industry since their emergence in 1970s.It allows users to access information and services electronically, irrespective of their geographic location. But now, there is increasing demand for connectivity in situations/places where there is no base station / infrastructure available. This is where ad hoc network came into existence. Wireless networks can be classified into infrastructure networks and infrastructure less networks or mobile ad hoc networks (MANETs).

A MANET is a collection of mobile nodes that can communicate with each other without the use of predefined infrastructure or centralized administration [1]. Today, MANETs have been widely adopted in many applications which include students using laptop to participate in an interactive lecture, business associates sharing information during a conference, search & rescue operations etc. Recently, Mobile Ad-hoc networks have become a hot research topic among researchers due to their flexibility and independence of network infrastructures such as base stations. The infrastructure less and the dynamic nature of these networks demand new set of networking strategies to be implemented in order to provide efficient communication. MANETs can be deployed quickly at a very low cost and can be easily managed. In the future, there will be more and more ad-hoc networks, in which routing is one of the critical issues.

In a MANET, each mobile node acts as a router as well as a node. As these nodes may be mobile, entering and leaving the network, the topology of the network will change continuously. Mobility and the absence of any fixed infrastructure make routing in MANET, as one of the most challenging task. Routing in networking is the process of selecting paths in a network to send network packets. For this, there are several routing protocols already available. But, a heavy computational burden on mobile computers makes the use of conventional routing protocols inconvenient in a dynamic network [2]. So, a number of routing protocols have been developed which seamlessly adapt to changing network topology. These routing protocols can be divided into three categories: proactive (table driven routing protocols), reactive (on-demand routing protocols), and hybrid. The classifications of Routing Protocols are given below:

A.Proactive Protocols (Table-driven)

In networks using proactive routing protocol, every node builds and maintains routing information to all other nodes, so that when a packet needs to be forwarded the route is already known and can be immediately used. The route information is maintained in the routing tables and is updated regularly in order to maintain up-to-date routing information. For this, topology information needs to be exchanged between the nodes on a regular basis, leading to a high overhead on the network. One of the main advantages is that the routes will always be available on request. Examples are Destination-Sequence Distance Vector routing (DSDV), Optimized Link-State Routing(OLSR), Clusterhead Gateway Switch Routing(CGSR) etc.

B.Reactive Protocols (On-demand)

Reactive routing protocols do not make the nodes initiate a route discovery process until a route to a destination is required. That is, routes are discovered on demand and aren't famous before hand as in proactive protocols. A node wishing to communicate with another node first seeks for a route in its routing table. If it finds one, the communication starts immediately, otherwise the node initiates a *route discovery* phase. Once a Route has been established, it is maintained until either the destination becomes inaccessible, or until the route is no longer used, or expired. This leads to higher latency than with proactive protocols, but the overhead of maintaining routing table is reduced. Examples are Ad-Hoc On-demand Distance Vector (AODV), Dynamic Source Routing (DSR) etc.

C.Hybrid Protocols

These types of protocols combine proactive and reactive protocols to try and exploit their strengths. It was proposed to reduce the control overhead of proactive routing protocols and also decrease the latency caused by route discovery in reactive routing protocols. Routing is initially established with some of the proactively prospected routes and then serves the demand from additionally activated nodes through reactive flooding. Examples are Zone Routing Protocol (ZRP), Sharp Hybrid Adaptive Routing Protocol (SHARP) etc.

Until now, many researchers performed valuable research with reference to routing in MANETs. In this paper we present the review and comparison of selected proactive protocols--- DSDV, OLSR and CGSR. The rest of the article is organized as follows. Section II discusses proactive routing protocols in detail with special reference to DSDV, OLSR and CGSR. Their advantages and disadvantages are also pointed out. Section III focuses on the comparative study of these routing protocols. Lastly, section IV concludes the article.

II. PROACTIVE ROUTING PROTOCOLS

Proactive protocols are known as proactive since they maintain the routing information before it is needed. Every node in the network maintains routing information about how to reach every other node in the network. It continuously evaluates all the routes within a network regardless of whether or not it is needed. That is, the protocol maintains fresh lists of destinations and their routes by periodically distributing routing tables throughout the network. So that when a packet needs to be forwarded, a route is already known and can be used soon. Once the routing tables are setup, then data transmissions will be as fast and easy as in the traditional wired networks. Unfortunately, it is a big overhead to maintain routing tables in the mobile ad hoc network environment. Proactive protocols produce higher routing efficiency than reactive protocols in the network with scattered traffic. But proactive protocols use more bandwidth and resources like battery power, than reactive protocols. Thus, the proactive protocols cannot be used in resource critical solutions. There are various existing proactive routing protocols. The routing protocols that are compared in this paper are DSDV, OLSR and CGSR.

A. Destination-Sequence Distance Vector (DSDV) routing protocol

DSDV (Destination-Sequence Distance Vector) [3], [4] is a predictably performing routing protocol designed by Charles E. Perkins and Pravin Bhagwat. It is a table-driven, unicast MANET routing protocol. This protocol is based on Bellman-Ford algorithm [5]. The improvements made to the Bellman-Ford algorithm include freedom from loops in routing tables. Every mobile node in the network maintains a routing table. It contains the list of all possible destinations in that network. An entry in the table stores the destination address, the next hop towards the destination, the cost metric for the routing path to the destination in terms of hop count and a destination sequence number created by the destination node. The sequence numbers enable the mobile nodes to distinguish stale routes from new ones, so that routing loops can be avoided. Preference is given to the route with the greater sequence number. Routing table updates are periodically transmitted throughout the network in order to maintain updated information in the table. These route updates can be either time-driven or event-driven. In time -driven, every node periodically transmits updates including its routing information to its immediate neighbors. But in event-driven, a node propagates its changed routing table since the last update in an event-triggered style.

In DSDV there are two ways for sending routing table updates. One is known as *full dump* and it carries full routing information during the update. So, it requires many packets. During periods of infrequent movement, these packets are transmitted occasionally. The other, known as incremental packets are used to transmit only that information which has changed since the last full dump. Incremental packets may fit in one packet. The mobile nodes maintain an additional table where they store the data sent in the incremental routing information packets.

1)Advantages

- Efficient protocol for route discovery. Whenever a route to a new destination is required, it already exists at the source.
- Hence, latency for route discovery is very low.
- DSDV also guarantees loop-free paths.
- Count to infinity problem is reduced.
- It is quite suitable for creating ad-hoc networks with small number of nodes.
- Freshness of routing information available in the routing table is ensured by the Sequence number.
- Usage of incremental updates instead of full dumps avoids extra traffic.
- The amount of space in routing table is reduced as DSDV maintains only the best path or shortest path to every destination.

2)Limitations

- DSDV requires large amount of overhead due to the requirement of periodic routing table update messages.
- This may generate high volume of traffic for high-density and highly mobile networks which makes them in-effective in large networks.
- Regular update of its routing tables, uses up battery power and a small amount of bandwidth even when the network is idle.
- Wastage of bandwidth takes place due to needless advertising of routing information even if there is no change in the network topology.
- Whenever the topology of the network changes, a new sequence number is necessary before the network re-converges which again makes DSDV not suitable for highly dynamic or large scale networks.
- It doesn't support multi path routing.
- There is no commercial implementation of this algorithm

B.Optimized Link State Routing (OLSR) Protocol

The Optimized Link State Routing (OLSR) protocol [6] is a modification of original Link State routing and it was modified for improved operation in ad hoc networks. But, it can also be used in other wireless networks. It is a proactive and non-uniform link state routing approach. In the original Link State algorithm, each node broadcasts its link state information to all other nodes in the network. But in OLSR only fewer nodes re-broadcast link state information there by reducing the overhead.

The main feature of OLSR is its use of *multipoint relays* (MPRs) to reduce the overhead of network floods. The MPR set for a given node is the set of neighbours that covers the two-hop neighbourhood of the node. We could also say that MPR of a node N is the minimal set of N's one-hop neighbors such that each of N's two-hop neighbors has at least one of N's multipoint relays as its one-hop neighbor. An illustration of multipoint relays is shown in figure 1.

When a node broadcasts a message, all of its neighbours will receive the message. But, only those nodes in its MPR set which have not seen the message before rebroadcast the message. Other neighbours process the message but not rebroadcast it. Therefore, the overhead for message flooding can be greatly reduced.

Node selects their MPR independently from its set of neighbours in different ways. One is through the periodic exchange of *Hello messages*. Each node periodically transmits a list of neighbours within a Hello message. An attribute including the directionality of the link to a neighbor is associated with each neighbour. The node is labeled *symmetric* if the link to the neighbour is bidirectional, or *asymmetric* if a Hello has been received from that node but the link has not been confirmed as bidirectional. A node obtains complete knowledge of its two-hop neighbour set at that point of time when a node receives this Hello message from each of its neighbours. Further, it knows the link with that neighbour is bidirectional if its own address is listed in the Hello message. Then the status of that neighbour can be updated to be symmetric.

OLSR may use an extraction algorithm for MPR selection [7] which is as follows. Each node starts with an empty MPR set. The *N* is defined to be the set of one-hop neighbours with which there exists bidirectional connectivity and the set of *N2* is the set of two-hop bidirectional neighbours. The first nodes that are selected for the MPR set are those nodes in *N* that are the only neighbours of some node in *N2*. Next, the degree of each node *n* in *N* that is not in the MPR set is calculated., where the degree is the number of nodes in *N2* that are not covered by nodes in the MPR set, the node in *N* that has the highest degree is included in the MPR set. Once all the nodes in *N2* are covered, the process terminates.

Routing path within the network can be determined when each node's MPR set is selected. Each node maintains a route to every other node in the network as OLSR is a proactive protocol. Nodes periodically exchange topology control (TC) messages with their neighbours to diffuse topology information. The TC message for a given node only lists its connections to those neighbours that have selected it as an MPR. Those neighbours are called *MPR Selectors*. Only this set of nodes is advertised within the network.

The link state update is sent whenever a change of the MPR set has been detected. The period of link state exchange is set to a minimum value if the MPR set has been changed. If the MPR set remains stable, the period is increased until it reaches a refresh interval value. Each node obtains network topology information and constructs its routing table through link state messages. Only MPRs are included as intermediate nodes in routes used in OLSR.

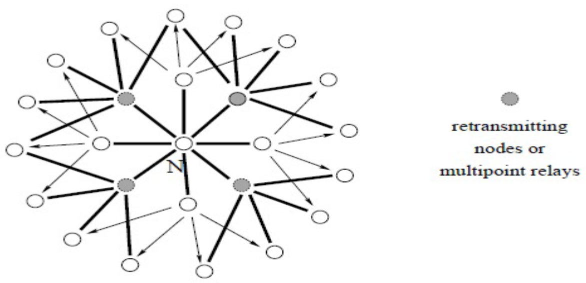

Fig. 1: An illustration of Multipoint relays

1)Advantages

- Routes are immediately available when needed due to its proactive nature.
- Has less average end to end delay.
- Implementation is more user-friendly.
- Does not need central administrative system to handle its routing process.
- The rapid change of the source and destination pairs makes it more suitable for ad hoc networks.
- Does not require that the link is reliable for the control messages, since the messages are sent periodically and the delivery does not have to be sequential.
- Its simplicity in using interfaces makes it easy to integrate the routing protocol in the existing operating

systems without changing the format of the header of the IP messages. The protocol only interacts with the host's routing table.

- This protocol is well suited for applications which do not allow the long delays in the transmission of the data packets.
- Flooding is minimized by the use of MPRs
- OLSR's best working environment is a dense network where most of the communications is concentrated between a large number of nodes.
- OLSR has also extensions to allow for hosts to have multiple OLSR interface addresses and provide the external routing information giving the possibility for routing to the external addresses.
- It immediately knows the status of the link and it is possible to extend the quality of service (QoS) information to such protocol so that the hosts know in advance the quality of the route.
- Timeout values and validity information is contained within the messages conveying information allowing for different timer values to be used at differing nodes.

2)Limitations

- Needs more time re-discovering a broken link.
- Wider delay distribution.
- Requires more processing power when discovering an alternate route.
- The path that OLSR provides is not necessarily the shortest path, because every route involves forwarding through a MPR node.
- Has routing delays and bandwidth overhead at the MPR nodes as they act as localized forwarding routers.
- OLSR does not include any provisions for sensing of link quality; it simply assumes that a link is up if a number of Hello packets have been received recently.
- Being a proactive protocol, OLSR uses power and network resources in order to propagate data about possibly unused routes.
- OLSR requires a reasonably large amount of bandwidth and CPU power to compute optimal paths in the network.
- Maintain information about routes that may never be used, hence wasting possibly scarce resources.

C. The Clusterhead Gateway Switch Routing (CGSR)

The Clusterhead Gateway Switch Routing (CGSR) [8] is a hierarchical routing protocol which is similar to DSDV. It differs from the previous protocols in the type of addressing and network organization scheme employed. It uses a hierarchical network topology, unlike other table driven approaches that employ flat topologies [9]. CGSR is a clustered multihop mobile wireless network with several heuristic routing schemes. The cluster structure improves performance of the routing protocol because it provides effective membership and traffic management. Cluster construction and clusterhead selection algorithms are important components of cluster based routing protocols.

In cluster construction, mobile nodes are aggregated into clusters and a special node termed cluster-head is elected for each cluster which coordinates the members of the cluster. To elect a node as the cluster head a cluster head selection algorithm is used within the cluster. The problem of having a cluster head scheme is that changing of the cluster heads frequently can adversely affect routing protocol performance as nodes are busy in cluster head selection instead of packet relaying. So, a Least Cluster Change (LCC) clustering algorithm is introduced to improve the performance of CGSR. Using LCC, cluster heads only change when two cluster heads come into contact, or when a node moves out of contact of all other cluster heads [10].

When a node as cluster head comes under the range of another cluster head, a tie is broken either using lowest ID or highest connectivity algorithm [9]. All member nodes of a cluster can be reached by the cluster head within a single hop, thereby enabling the cluster head to provide improved coordination among nodes that fall under its cluster [10].

CGSR modifies DSDV by using hierarchical clusterhead-to-gateway routing approach to route traffic from source to destination. Gateway nodes are nodes that are within communication range of two or more cluster heads. These gateway nodes are responsible for communication between the cluster heads. A packet sent by a node is first routed to its cluster head, and then the packet is routed from the cluster head to a gateway to another cluster head, and so on until the cluster head of the destination node is reached. The packet is then transmitted to the destination.

In this method, each node must keep a "cluster member table" where it stores the destination cluster head for each mobile node in the network. These cluster member tables are broadcast by each node periodically using the DSDV algorithm. After receiving broadcasts from other nodes, a node updates its cluster member table. Along with this table, each node must also maintain a routing table which is used to determine the next hop in order to reach the destination. In CGSR, when forwarding a packet, a node first checks both these tables and tries to find the nearest cluster-head along the routing path to the destination. Next, the node will check its routing table to determine the next hop used to reach the selected cluster head. It then transmits the packet to this node. The route traffic follows:
Source→Clusterhead→Gateway→Clusterhead→………
→ Destination.

Figure 2 shows an example of this routing scheme [10].In this; the source (node 1) transmits the packet to its cluster-head (node 2). From the cluster-head, the packet is sent to the gateway node (node 3) that is connected to this cluster-head and the next cluster-head (node 4).Node 4 then sends the packet to the gateway node (node 6) which sends the packet to the next cluster-head (node 7), i.e. the destination cluster-head. The destination cluster-head then transmits the packet to the destination (node 8).

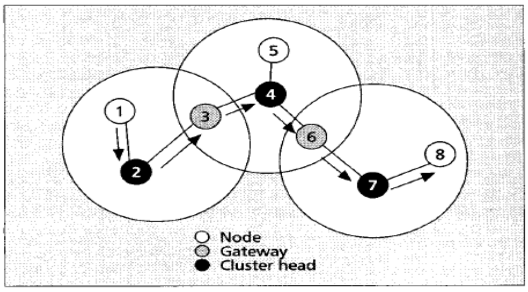

Fig. 2: CGSR Routing Scheme

1)Advantages

- By having a cluster head controlling a group of ad hoc nodes, a framework for code separation (among clusters), channel access, routing, and bandwidth allocation can be achieved.
- Better bandwidth utilization reduces the size of distance vector table because the routing is performed only over cluster head.
- Performance of this protocol is high in comparison to other routing protocols.
- Reduces communication and control overheads due to predetermined paths of communication through cluster heads.
- Increases the network lifetime.
- Decreases transmission overhead by updating the routing tables after topological changes occur.[11]
- It helps to aggregate topology information as the nodes of a cluster are smaller when compared to the nodes of entire network. Here each node stores only a fraction of the total network routing information.
- Saves energy and communication bandwidth in ad-hoc networks.[12]
- In case of a route failure the entire route doesn't need to be recalculated. Only the part of the route in the sector where the route has been broken needs to be recalculated.

2)Limitations

- More time is spent in selection of cluster heads and gateways.
- If the mobile node uses CDMA/TDMA then it can take some time to get permission to send packets.
- Changes in the cluster-head may result in multiple path breaks.
- Construction and maintenance of cluster structure requires additional costs as compared to a topology control without cluster.
- Power consumption of nodes like cluster heads and gateways are high as they manage and forward all messages of the local cluster. This may cause ultimate shutdown of nodes.[13]
- As the network topology changes, a number of information message exchange is required which consumes a lot of network bandwidth and energy in mobile nodes.
- Movement or death of mobile node may lead to the re-election of a new cluster head which may cause re-elections in the whole of the cluster structure. This may cause the performance degradation of the upper layer protocols.

III. COMPARATIVE STUDY

Having discussed the operations and characteristics of three of the existing table-driven routing protocols, it is important to have a comparative study. Routing is an essential component of communication protocols in mobile ad hoc networks. The design of the protocols are driven by specific goals and requirements based on respective assumptions about the network properties or application area. This section provides comparative analysis between routing protocols described in the previous section. The protocols are compared based on some important parameters in table 1. Time complexity is defined as the number of steps needed to perform a protocol operation, and communication complexity is the number of messages needed to perform a protocol operation. Storage complexity is the amount of space needed to perform protocol operations [14], [15]. Note that the performance metrics represent the worst case scenario of each routing protocol. Control traffic overhead and loop-free properties are two important issues with proactive routing protocols in MANETs.

DSDV is a typical proactive distance-vector routing protocol in which each node holds a routing table including the next-hop information for each possible destination. CGSR is also a distance-vector routing protocol as it is based on DSDV. It is also a cluster based routing protocol and routing in CGSR occurs over cluster-heads and gateways. In this, every node keeps routing information for other nodes in both the cluster member table and the routing table. OLSR protocol, on the other hand is a modification of original Link State routing in which only fewer nodes (MPRs) re-broadcast link state information there by reducing the overhead. It is a core-node based routing protocol in which the routing table is based on the information contained in the local link information base and the topology set. Thus, each node has a routing table, neighbor table and a topology table. In this, the core-node extraction method is a key component.

In CGSR, because routing performance is dependent on the status of specific nodes (cluster head, gateway, or normal nodes), time complexity of a link failure associated with a cluster head is higher than DSDV, given the additional time needed to perform cluster head reselection. Similarly, this applies to the case of link additions associated with the cluster head. There is no gateway selection in CGSR since each node declares it is a gateway node to its neighbors if it is responding to multiple radio codes. If a gateway node moves out of range, the routing protocol is responsible for routing the packet to another gateway. In terms of communication complexity, DSDV, OLSR and CGSR have the same degree of complexity during link failures and additions.

When storage complexity is considered, all the three have different complexities among which that of OLSR is the highest. The storage complexity of the OLSR protocol is related on how much hosts are in the network. It is because the OLSR has to have all possible routes in Routing Table. In the addition, the OLSR must keep the topology information in the topology set, MPR information in MPR selector set and also update the state information about the links and neighbours [16]. The function for periodic maintainability of the routes consumes a lot of resources. In OLSR it is done by TC messages.

The nodes in a MANET generally have a limited transmission range, so each node seeks the assistance of its neighboring nodes in forwarding packets. Thus data is sent between nodes by hopping through the intermediate nodes. So, all the three protocols have multi-hop forwarding strategy. And none of them have multicast capability. All the three protocols are loop free which utilizes destination sequence number to avoid route loops.

DSDV and CGSR provide only one path to the destination and it will be the shortest path. But OLSR has multiple route support. Both periodic and triggered updates are utilized in DSDV. Therefore, their performance is tightly related with the network size and node mobility pattern. But in OLSR and CGSR only periodic updates are used.

A study of performance evaluation on DSDV shows that DSDV is able to deliver virtually all data packets when each node moves with relatively low speed. However, when the mobility of each node increases, the speed at which the system converges to the correct path decreases [17]. One advantage of CGSR is that several heuristic methods can be employed to improve the protocol's performance. These methods include priority token scheduling, gateway code scheduling, and path reservation [18]. So the performance of the protocols is high in comparison to other routing protocols. OLSR reduce the control overhead forcing the MPR to propagate the updates of the link state, also the efficiency is gained compared to classical link state protocol when the selected MPR set is as small as possible. But the drawback of this is that it must maintain the routing table for all the possible routes, so there is no difference in small networks, but when the number of the mobile hosts increase, then the overhead from the control messages is also increasing. This constrains the scalability of the OLSR protocol. OLSR showed good performance with the constantly changing hosts, so that the network structure is always changing. OLSR has advantage in networks with high density and highly sporadic traffic. But their scalability is limited when network size increases.

Another consideration is whether a flat or hierarchical addressing scheme should be used. Both DSDV and OLSR use a flat addressing scheme. But, CGSR uses hierarchical addressing scheme. Among the flat routed global routing the OLSR may scale well. The scalability in OLSR is achieved by reducing the number of rebroadcasting through the MPR mechanism. The MPR is used to elect only a number of neighbouring nodes for rebroadcasting the message. A downside to OLSR is that it must maintain information about routes that may never be used, hence wasting possibly scarce resources.

The one great advantage of the OLSR protocol is that it immediately knows the status of the link and it is possibly to extend the quality of service information to such protocol so that the hosts know in advantage the quality of the route. Extending the OLSR protocol the quality of service feature will result additional latency and overhead. [19], [20].In addition, OLSR protocol also uses the Hello messages for maintaining the neighbour's status. During link additions, hello messages are used as a presence indicator in DSDV and OLSR, such that the routing table entry can be updated. But, this only affects neighboring nodes. But CGSR do not use hello messages.

TABLE 1
CHARACTERISTIC COMPARISON OF DSDV, OLSR AND CGSR

Parameter	DSDV	OLSR	CGSR
Basis of routing	Typical Proactive	Core-node based	Cluster based
Routing Mechanism	Uni-cast	Broadcast	Uni-cast
Forwarding Strategy	Multi-hop	Multi-hop	Multi-hop
Routing type	Flat	Flat	Hierarchical
Time complexity (link addition/failure)	O(d)	O(d)	O(d)
Communication complexity (link addition/failure)	O(N)	O(N)	O(N)
Storage Complexity	O(N)	$O(N^2)$	O(2N)
Overall Complexity	High	Low	High
Loop-free	Yes	Yes	Yes
Multicast capability	No	No	No
Tables required	One	Three (Routing, neighbour and topology tables)	Two(Cluster member table and routing table)
Frequency of update transmissions	Periodically and as needed (Hybrid)	Periodically	Periodically
Updates transmitted to	Neighbours	Neighbours	Neighbours & Clusterheads
Sequence nos.	Yes	Yes	Yes
Hello messages	Yes	Yes	No
Critical nodes	No	Yes(MPRs)	Yes(Clusterhead)
Routing Matrics	Shortest Path	Shortest Path	Shortest Path
QoS Support	No	Yes	No
Multiple route support	No	Yes	No
Security	No	No	No
Cluster Head & Gateway	No	No	Yes
Distributed	Yes	Yes	Yes
Uniformity	Uniform	Non uniform	Non uniform
Works most efficiently in	Small Networks	Dense networks	Large networks
ControlOverhead	High	Reduced	Reduced
Use of MPR	No	Yes	No
Protocol type	Distance Vector	Link-state	Distance Vector
Scalability	Yes	Yes(Limited when network size increases)	No

Abbreviations:
N = Number of nodes in the network
d = Network diameter

All the three protocols do not specify any special security measurements, but there are recommendations how the security could be done. The protection of the network from the other hosts can be done by encrypting all messages with some public key cryptography. However, there were not any issues about denial of service attack, because it seems impossible task to implement in such networks.

IV. CONCLUSION AND FUTURE WORK

Mobile ad-hoc networks (MANETS) are expected to play an important role in the deployment of future wireless communication systems. The routing in ad-hoc networks is much more difficult than in conventional networks because of its dynamic topology and unpredictability in wireless links. The design of the routing protocols are driven by specific goals and requirements based on respective assumptions about the network properties or application area. Each protocol introduced in this paper has its own advantages and disadvantages in different MANET settings or environments. Therefore, it is hard to say which one is the best. The study suggests that not a single routing protocol is best suited for all scenarios of MANET. So, the choice of routing protocol should be done carefully according to the requirements of the specific application.

In this paper, we performed a comprising survey and compare different proactive routing protocol using some parameters. The three proactive routing protocols taken in to consideration are DSDV, OLSR & CGSR and their core architecture is described. The basic actions related to these routing protocols are studied in detail. Also the advantages and disadvantages of the protocols based on their routing processes are pointed out. Each routing protocol has unique features. The comparison of the routing protocols indicates that the design of a secure ad hoc routing protocol constitutes a challenging research problem against the existing solutions. We also discussed some important characteristics of the three routing strategies (proactive, reactive and hybrid).

DSDV, CGSR and OLSR have distinctive characteristics which makes the one better suited than the other one, depending on the situation. The OLSR protocol is more efficient in networks with high density and highly sporadic traffic. But the best situation is when between large numbers of hosts. It also has QoS support and their performance depends a lot from the network environment. DSDV works most efficiently in small networks as its control overhead is high. We have also seen the structure and the working of the cluster-based routing protocol. It is best suited for large networks. Cluster-based approaches on routing in mobile ad-hoc networks are good methods to decrease network traffic and routing overhead.

The focus of the study in our future research work is to propose an extension of the existing conventional routing protocols which will be better in terms of security as none of the three protocols specify any special security measurements.

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