Registration and Aggregate Cache Routing for Ad hoc Network

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ABSTRACT

A Mobile Ad-hoc Network (MANET) is a temporary, infrastructure less wireless network composed of mobile nodes. Due to the limitations in the wireless environment, it may be necessary for one mobile host to enlist the aid of other hosts in forwarding a packet to its destination. Since traditional routing protocols cannot be directly applied in the MANET, a lot of routing protocols have been proposed. Though there are many wireless routing protocols developed, there is not a single algorithm to accomplish efficient route in dynamic environment. This paper presents a new routing technique based on registration of newly arrived nodes and checking the local cache for forwarding the packet to the desired destination called Registration and Aggregate Cache (RAC) routing algorithm. Theoretically RAC algorithm eliminates the drawback of Table Driven and On Demand routing algorithm.

Keywords - MANET, broadcast, multicast, routing protocol, unicast.

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I. Introduction

A Mobile Ad-hoc Network (MANET) is a temporary wireless network composed of mobile nodes [1], in which an infrastructure is absent. There are no dedicated routers, servers, access points and cables. MANETs basically originated from the DARPA [1], Packet Radio Network (PRNet) [2] and SURAN project [3]. Because of its speedy and convenient deployment, robustness and low cost, a MANET finds its applications in varied domains viz. military, search and rescue, vehicle-to-vehicle communication in intelligent transportation, temporary networks in meeting rooms, airports, personal area networks connecting cell phones, laptops, smart watches, and other wearable computers. If two mobile nodes are within each others transmission range, they can communicate with each other directly; otherwise, the nodes in between have to forward the packets for others. In such a case, every mobile node has to function as a router to forward the packets for others. Traditional routing protocols that are used in hardwired networks cannot directly be applied in the MANET. Hence there are many specific routing protocols developed for MANET [4-28]. Although many kinds of routing protocols have been developed, competing for the MANET, there is not a single protocol to fit all the different scenarios and traffic patterns of MANET applications. For example, proactive routing protocols are well suited for a small-scale, broad-band MANET with high mobility, while reactive routing protocols are well suited for a large-scale, narrow-band MANET with moderate or low mobility. As a result, the prospective standard for routing protocols in the MANET is very likely to combine some of the most competitive schemes. This paper proposes the routing protocol called Registration and Aggregate Cache Routing (RAC) for MANET. In this algorithm the cache (the fast memory) is maintained for the routes and the life time of routes in the cache are environment dependent. Route discovery and maintenance is controlled by the registration of mobile nodes. The aggregate cache maintained in RAC reduces the route discovery time and utilizes the network bandwidth efficiently. The RAC overcome the drawbacks of table driven and on demand routing algorithms. The paper is organized as follows: Section II Illustrate Mobile Ad-hoc Network (MANET) in general. Section III describes survey of some existing routing protocols. Section IV describes the Registration and Aggregate Cache Routing (RAC) algorithm, and Section V concludes the paper.

II. Mobile Ad-hoc Network (MANET)

The advances in wireless communication technology, low-cost and powerful wireless transceivers are widely used in mobile applications. Mobile networks have attracted significant interests in recent years because of their improved flexibility and reduced costs and have unique characteristics. In mobile networks, node mobility may cause frequent network topology changes, which are rare in wired networks. In contrast to the stable link capacity of wired networks, wireless link capacity continually varies because of the impacts from transmission power, receiver sensitivity, noise, fading and interference. Additionally, wireless mobile networks have a high error rate, power restrictions and bandwidth limitations. Mobile networks can be classified into infrastructure based networks and mobile ad hoc networks [1]. In an infrastructure mobile network, mobile nodes have wired access points (or base stations) within their transmission range. In contrast, mobile ad hoc networks are autonomous, self-organized networks without infrastructure support. In a mobile ad hoc network, nodes move arbitrarily, therefore the network may experiences rapid and unpredictable topology changes. Additionally, because nodes in a mobile ad hoc network normally have limited transmission ranges, some nodes cannot communicate directly with each other. Hence, routing paths in mobile ad hoc networks potentially contain multiple hops, and every node in mobile ad hoc networks has the responsibility to act as a router. Mobile ad hoc networks originated from the DARPA [1] Packet Radio Network (PRNet) [2] and SURAN project [3]. Being independent on pre-established infrastructure, mobile ad hoc networks have advantages such as rapid and ease of deployment, improved flexibility and reduced costs. They are appropriate for mobile applications either in hostile environments where no infrastructure is available, or temporarily established mobile applications which are cost crucial. In recent years, application domains of mobile ad hoc networks gain more and more importance in non-military public organizations and in commercial and industrial areas. The typical application scenarios include the rescue missions, the law enforcement operations, the cooperating industrial robots, the traffic management, and the educational operations in campus. Active research work for mobile ad hoc network is being carried out on mainly in the fields of medium access control, routing, resource management, power control and security. Because of the importance of routing protocols in dynamic multi-hop networks, lots of routing protocols have been proposed in the last few years. There are some challenges that make the design of mobile ad hoc network routing protocols a tough task. Firstly, in mobile ad hoc networks, node mobility causes frequent topology changes and network partitions. Secondly, because of the variable and unpredictable capacity of wireless links, packet losses may happen frequently. Moreover, the broadcast nature of wireless medium introduces the hidden terminal and exposed terminal problems. Additionally, mobile nodes have restricted power, computing and bandwidth resources and require effective routing schemes.

III. ROUTING PROTOCOLS

Since a Mobile Ad-hoc Network (MANET) is a temporary wireless network composed of mobile nodes, there are no dedicated routers, servers, access points and cables. If two mobile nodes are within each others transmission radio range, they can directly communicate with each other, otherwise, the nodes in between have to forward the packets for them. In such a case, every mobile node has to function as a router to forward the packets for others. Although the traditional routing protocols are widely used in the Internet backbone and wired networks, they cannot be used in the MANET directly because of the obvious differences between the hardwired network and the MANET:

a) The effective bandwidth in the MANET is far below.
b) Network topology is almost dynamic in MANET.
c) Transmission range of mobile nodes is limited.
d) MANET operates with degraded and weak signals.
e) MANETs lacks centralized control facility.

Most of the research effort has been put for developing routing protocols for the MANET. These can be summarized under following categories:

A) Unicast routing protocols
- a) Topology-based routing protocols
  - i) Proactive routing protocols
  - ii) Reactive routing protocols
  - iii) Hybrid routing protocols
- b) Geographical-based routing protocols

B) Hierarchical routing protocols
C) Multicast routing protocols
D) Broadcast routing protocols

3.1 Unicast Routing Protocols: URP

Unicast routing algorithms are very simple and used in most of the applications. In unicast routing, the router node uses the address of the destination from the data packet for routing. The packet is sent to the longest matching destination address found in the table through the corresponding next hop. The problem that arises here is how the routing table is built in the nodes. Unlike the hosts in a traditional hardwired network, the nodes in the MANET are free to move arbitrarily and as a result, the network topology changes more frequently. Many routing protocols have been proposed to incorporate the mobility of the nodes. Unicast routing protocols are further divided into topology-based protocols and graphical-based protocols. The topology-based protocols uses the routing table and the destination address in the forwarding decision, while the graphical-based protocols uses location service and the destinations position information. Depending upon the mechanism of ensuring the freshness of the routing information, topology-based protocols can be further divided into proactive protocols, reactive protocols, and hybrid protocols.

3.1.1 Proactive unicast routing protocols: These algorithms are table driven and stem from traditional link state routing algorithms. The shortest path from the source to every destination is computed by periodic broadcast of network topology updates (e.g., distance vector or link state information). This strategy particularly consumes a lot of bandwidth. The topology information needed by proactive routing protocols (such as Destination-Sequenced Distance Vector Routing Protocol (DSDV) [7]) in the MANET needs to be updated at a higher frequency than in the hardwired network. Since high communication overhead, the usage of these is discouraged in the MANET.

Optimized Link State Routing Protocol: The Optimized Link State Routing Protocol (OLSR) [4] is one of the link state routing protocol. OLSR exchanges the topology information periodically with the other nodes in the network. It is based on a Multipoint Relaying (MPR) flooding technique [5] to reduce the number of topology broadcast packets. This protocol reduces the number of superfluous broadcast packet retransmissions and reduces the size of the link state (LS) update packets, leading to efficient flooding of control messages in the network. It is particularly suited for large or dense networks.

Fisheye State Routing Protocol: Fisheye State Routing Protocol (FSR)[6] is simple and efficient link state type routing algorithm, which maintains the topological map at each node and propagates link state update. It is similar conventional LS, but to exchanges the entire information with neighbors instead of flooding. The exchange is periodic and event triggered that is essential in unreliable network and in mobility. Periodic broadcasting is carried out with different frequencies that depend on the hop count; far destinations are transmitted on lower frequencies than nearby.

Topology Broadcast Based on Reverse-Path Forwarding Routing Protocol (TBRPF): The TBRPF [7] is also one of the link state routing protocols. It consists of two separate modules: the neighbor discovery module (NDM), and the routing module. NDM is performed through periodically differential HELLO message that report only the changes of neighbors. The routing module operates based on partial topology information obtained through both periodic and differential topology updates. TBRPF aims at several hundreds of mobile nodes and with higher mobility.

Destination-Sequenced Distance Vector Routing (DSDV): DSDV [8] is a table driven algorithm based on modification made to the Bellman-Ford routing mechanism [8]. Each node in the network maintains a routing table that has entries for each of the destination in the network and the number of hops required to reach each of them. Each entry has a sequence number to identifying stale entries and to avoid formatting of routing loops. Each node periodically sends updates tagged through out the network with a monotonically increasing even sequence number to advertise its location. The route labeled with the most recent sequence number is always used.

3.1.2 Reactive unicast routing protocols

To reduce the wastage of bandwidth, the concept of reactive routing protocol is proposed. These algorithms are called on demand (also called as source-initiated). They create routes only when desired by the source node and initiate a route discovery process within the network, until a route is found or all possible route permutations have been examined. Once a route has been established, it is maintained by a route maintenance procedure either until the destination becomes inaccessible along every path from the source or until the route is no longer desired. The most typical reactive routing protocols are DSR [9] and AODV [10].

Dynamic Source Routing Protocol: This aims at the MANET with up to two hundred mobile nodes. Unlike other unicast routing protocols, DSR does not maintain the routing table, because it utilizes the source routing option in data packets. It uses Route Cache instead, which store the complete list of IP addresses of the nodes along the path towards the destination. DSR uses source routing i.e. the packet contains the full route to Destination and the intermediate nodes do not have to make any routing decisions. It has two principal components: Route Discovery and route Maintenance. A ROUTE REQUEST packet is used for route discovery. A ROUTE REPLY packet answers this from the destination node. To reduce the overhead for the Route Discovery, nodes maintain a cache of learnt routes. In this, the routing information is cached in the routing tables at the host and thus results in reducing network bandwidth overhead.

Ad hoc On-Demand Distance Vector Routing Protocol: The AODV [10] is another reactive routing protocol and is a combination of DSR [9] and DSDV [8]. It uses route Discovery and Route Maintenance like DSR [9], but it employs hop-by-hop routing and sequence numbers like DSDV [8]. As in DSR [9] a ROUTE REQUEST packet is used for Route Discover. The ROUTE REPLY packet contains the necessary number of hops to reach the destination and the latest sequence number. For route maintenance each node periodically sends out a HELLO message.

3.1.3 Hybrid unicast routing protocols: Based on proactive and reactive routing protocols, some hybrid routing protocols are proposed to combine their advantages. The most typical hybrid routing protocol is Zone Routing Protocol.

Zone Routing Protocol: Zone Routing Protocol (ZRP) [11] is a framework of hybrid routing protocol suite. It comprises of i) Intra-zone routing protocol [12], ii) Inter-zone routing protocol [13], and iii) Border cast resolution protocol [14]. Since it is a hybrid routing protocol, it combines both proactive and reactive routing strategies and hence benefits from advantages of both. The basic idea is that each node has a pre-defined zone centered at itself in terms of number of hops. For nodes within the zone, it uses proactive routing protocol to maintain routing information. For those nodes outside of its zone, it does not maintain routing information in a permanent base, instead, on demand routing strategy is adopted.

3.2 Geographical-based unicast routing protocols: The advances in the development of GPS make it possible to provide location information with a precise in the order of a few meters and also provide universal timing. While location information can be used for directional routing in distributed ad hoc network, the universal clock can provide global synchronizing among GPS equipped nodes. All the protocols [15-17] under this assume that the nodes know their positions.

3.2.1 Location-Aided Routing: LAR

LAR [15] is an on-demand protocol based on source routing. The protocol utilizes location information to limit the area for discovering a new route to a smaller request zone. Consequently, the number of route request messages is reduced. The operation of LAR [15] is almost similar to DSR. Using location information, LAR [15] performs the route discovery through limited flooding. Only nodes in the request zone will forward route request.

3.2.2 Geographic Addressing and Routing: GAR

GAR [16] allows sending messages to all the nodes in a specific geographical area, using geographic information instead of logical addresses. A geographic destination address is expressed in three ways: point, circle, and polygon. A point is represented by geographic coordinates (Latitude and longitude). When the destination of a message is a polygon or a circle, every node within the geographic region of the polygon or circle will receive the message.

3.2.3 Distance Routing Effect Algorithm for Mobility:

DREAM [17] is based on the distance effect, it uses the fact that the greater the distance separating two nodes, the slower they appear to be moving with respect to each other. Accordingly, the location information in routing tables can be updated as a function of the distance. Thus, the routing information about the slower moving nodes needs to be updated less frequently than that of highly mobile nodes, thus reduce the bandwidth, leading to a fully distributed and self optimizing system.

3.3 Hierarchical routing:

When wireless size increases, the flat routing schemes become infeasible because of link and processing overhead. One way to solve this problem and to produce scalable and efficient solutions is hierarchy routing. The idea is based on organizing nodes in groups and then assigning nodes different functionalities inside and outside of a group. Both routing table size and update packet size are reduced by including in them only part of the network (instead of whole) thus control overhead is reduced.

3.3.1 Cluster head-Gateway Switch routing: CGSR

CGSR [24] is a stable clustering algorithm used to partition the whole network in clusters. In each cluster a head is elected. It is a DVR algorithm where two tables, a cluster member table and a distance vector routing table. The cluster member table records the cluster head for each and broadcast periodically. A node will update its member table upon receiving such a packet. The routing table only maintains one entry for each cluster recording the path to its cluster head, no matter how many members it has. To route a data packet, current node first looks up the cluster head of the destination node from the cluster member table. Then, it consults its routing table to find the next hop to that destination cluster and route the packet.

3.3.2 Hierarchical State Routing: HSR

HSR [25] is a multi-level, clustering based link state routing protocol. It maintains a logical hierarchical topology by using the clustering scheme recursively. The nodes at the same logical level are grouped in to cluster, the elected cluster head at the lower level become member of the next higher level. These new members in turn organize themselves in clusters, and so on. The goal of clustering is to reduce routing overhead at each level.

3.3.3 Landmark Routing Protocol: LANMAR

LANMAR [26] utilizes the concept of landmark for scalable routing in large networks. It relies on the notion of group mobility: i.e. a logical group moves in a coordinated fashion. The existence of such logical group can be efficiently reflected in the addressing scheme. It assumes that an IP like address is used consisting of group ID and a host ID. The route to a landmark is propagated throughout the network using a DV mechanism. Separately, each node in the network uses a scoped routing algorithm (e.g., FSR) to learn about routes within a given scope. LANMAR [26] dramatically reduces routing table size and routing update overhead in large networks. The dynamic election of landmarks enables LANMAR [26] to cope with mobile environments.

3.3.4 Grid system

Grid system [27] is a hierarchical location service. The area of the MANET in grid system is divided into many small first order squares. Every four adjacent first order squares form a bigger second order square, and so on. A mobile node keeps the other nodes in the same first order square informed of its up-to-date location. As to n-order square where n is greater than 1, every mobile node recruits one node in each of four (n-1) order squares to keep its location information. The node will be chosen with the least great node ID in each (n-1)-order square. It is independent of unicast routing protocols, which means location updates and location queries are forwarded based on location information as well.

3.4 Multicast Routing Protocols

The multicast routing is not much popular in MANET, but it is expected to be in near future for multimedia communications. Data packets, in the MANET, can be sent to multiple receivers simultaneously by the simplest broadcast method. Since broadcast consumes considerable bandwidth and power, it should be avoided as much as possible. There are many multicast routing protocols proposed in the literature [19-23]. These multicast routing protocols are mainly divided in to; tree-based protocols and mesh-based protocols.

3.4.1 Tree-based multicast routing protocols: The tree-based multicast routing protocols are the alternative to the pure broadcast in hardwired networks. In this protocol the group members and some non-members form a shared multicast tree. Whenever the sender node sends out a data packet, the receiver receives it from its upstream node in the tree and forwards it along the downstream links in the tree. Since only the tree members participate in the packet transmission, a lot of bandwidth is saved compared to pure broadcast. Some of the tree-based multicast routing protocols are MAODV [19], AMRoute [20], and AMRIS [21].

3.4.2 Multicast Ad-hoc On-Demand Distance Vector Routing Protocol: MAODV

MAODV [19] is an extension of AODV [10] for multicast routing. In AODV [10] every destination has a unique sequence number and MAODV [19] has a sequence number to multicast group. To support multicast transmission, a multicast tree is formed on-demand to include all the group members and some non-members which are relay nodes.

3.4.3 Adhoc Multicast Routing Protocol: AMRoute

AMRoute [20] is another tree-based multicast routing protocol. The main properties of AMRoute [20] are: 1) It builds a user multicast tree, in which only the group members are included; 2) Since non-members are not included in the tree, the links in the tree are virtual; 3) AMRoute depends on the underlying unicast routing protocol to deal with network dynamics. Like MAODV [20], there is only one logical core in the multicast tree, which is responsible for group member maintenance and multicast tree creation.

3.4.4 Ad hoc Multicast routing protocol utilizing Increasing id-numberS

In AMRIS [21] every node is assigned an id-number. The source of the multicast session has the smallest id. Their ids increase with their distance from the source. To build a tree, the source generates its own id and then broadcasts a NEWSESSION message throughout the MANET. Every group member broadcasts a one-hop beacon message to maintain link availability. If a link is broken, the node with a larger id tries to reconstruct the branch. If it is within one-hop distance of another group member, it will rejoin the delivery tree after it receives the beacon message from its on-tree neighbor; otherwise, it broadcasts a JOIN-REQ message.

3.4.5 Mesh-based Multicast routing protocols:

This group of multicast routing protocols uses a mesh instead of multicast tree. It provides redundant links among group members. Compared with tree-based routing protocols, they may consume more bandwidth. However, they are more resilient to network dynamics. The most popular among mesh-based routing protocols are ODMRP [22] and NSMP [23].

3.4.6 On-Demand Multicast Routing Protocol

On-Demand Multicast Routing Protocol (ODMRP) [22] is a reactive multicast routing protocol. The source establishes and maintains group membership and multicast mesh on demand if it needs to send data packets to the multicast group, which is somewhat similar to MAODV [20]. However, it builds a mesh instead of tree for packet transmission.

3.4.7 Neighbor Supporting Ad hoc Multicast Routing Protocol:

NSMP [23] is another mesh-based multicast routing protocol. In NSMP [23], the source, relaying nodes, and the receivers are designated as forwarding nodes, which form a multicast mesh. All the nodes that are adjacent to at least one forwarding node are designated as neighbor nodes.

3.5 Broadcast routing protocols

The simplest method is to receive and then forward the data packet for every node except the node on which it receives the packet. There are many broadcast routing algorithms in the literature; few among them are MPR [33] and SBA [34].

3.5.1 Multipoint Relaying: MPR:

In Multipoint Relaying MPR [5] every node keeps on broadcasting one-hop neighbor information in periodic to all its neighbors. Thus every node knows local topology about one-hop neighbors and two-hop neighbors. When a node broadcasts, all its one-hop neighbors will receive the packet. To save the bandwidth in the further forwarding, MPR selects a subset of one-hop neighbors as relays which can reach all the two-hop neighbors. These selected neighbors are called MPRs (multipoint relay). When those MPRs forward, they again choose their own MPRs to forward the packet. This procedure is repeated until all the nodes receive the packet.

3.5.2 Scalable Broadcast Algorithm: SBA:

SBA [28] is almost similar to MPR [5], especially; SBA utilizes 2-hop neighbor information as in case of MPR. Although both MRP and SBA utilize 2-hop neighbor information to reduce unnecessary retransmission of broadcast packets, they are different in making decision on choosing the subset of the neighbors to forward. In MPR, the sender uses a sophisticated algorithm to actively choose some neighbors to be the relays, and informs them in the periodical exchanged HELLO messages; while in SBA, the receivers make local decision whether it should forward the packet or not.

IV. REGISTRATION AND AGGREGATE CACHE ROUTING

Research on MANET has mainly focused on developing routing protocols viz, DSR [9], AODV [10], DSDV [8], TORA [18] etc. and their variations.

Although there are different routing protocols competing for unicast, multicast, hierarchical and broadcast communication for the MANET, it seems that one protocol cannot fit all the different scenarios and traffic patterns of MANET applications. For example, proactive routing protocols are well suited for a small-scale, broad-band MANET with high mobility, while reactive routing protocols are well suited for a large-scale, narrow-band MANET with moderate to low mobility. If the mobile nodes in the MANET move too quickly, they have to resort to broadcast to achieve peer-to-peer communication. Since every routing protocol has its strengths and drawbacks, and aims at a specific application. Thus the motivation for this work is, the prospective standard for routing protocols in the MANET is very likely to combine some of the most competitive schemes. The major issues considered in the proposed protocol are the following

i) Minimum protocol processing overhead.
ii) Minimum route construction overhead.
iii) Environment aware protocol.
iv) Optimum bandwidth consumption.
v) Minimum route distribution overhead.

The present routing algorithms assume that transmitter nodes know the locations of the receiver nodes based on the route information, which is accumulated and analyzed by route discovery and or route maintenance algorithms.

Although a route discovery operation captures the current network topology and related information, it has to be executed whenever and node needs to transmit information. To void repetitive route discovery, the nodes can cache the previous routes and the route of the newly arrived nodes and, thus the efficient utilization bandwidth and minimum route processing overhead. Most of the present routing algorithms assume a well known and only one kind of environment. The dynamic environment is the major characteristic of the MANET. The proposed routing algorithm is intelligent to adapt the routes and procedure based on the dynamics of the environment.
The related work is divided into two parts A) registration and B) cache management policy

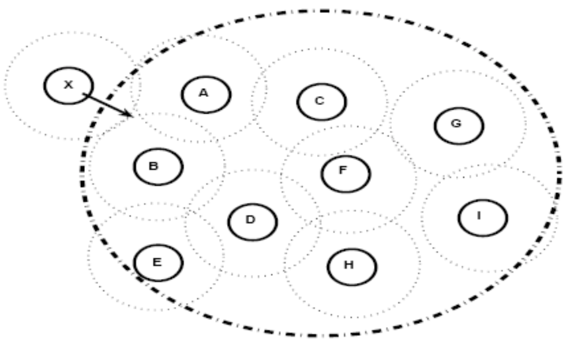

Fig. 1. Diagram illustrating typical MANET configuration

4.1 REGISTRATION

When ever a new node arrives, it must get register itself to the network available. The newly arrived node first checks its registration counter (initialized to “α” designed parameter) and if it is zero then it transmits a signal called Registration Signal (RS). As shown in the Fig 1 node “X” is trying to enter the region shown by dotted line circle. Since “X” is in the radio range of “A” and “B”, hence “A” and “B” receive the RS Signal from “X”, then “A” and “B” will check their local cache for type and source ID, if match found it will be discarded, else they make an entry into the local cache for further communications with “X”. After that “A” and “B” will send Response Registration Signal (RRS) to “X” so that the local cache of “X” will also be updated with information about “A” and “B”. Then “A” and “B” will transmit the same RS signal received from “X” to the other neighborhood nodes in their radio range with the increased hop count (C, D, E). Similarly the other nodes also run the same algorithm to check the cache and if not found then enter into the cache. Again send RRS signal to “X” through intermediate nodes. This process continues till every node learn about the new node and the new node will learn the routes to every nodes in the present network.

4.2 CACHE MANAGEMENT POLICY

This paper presents the cache management policy including aggregate caching, update timing and cache shedding.

4.2.1 AN AGGREGATE CACHE:

Here the route information of the mobile nodes are aggregated in the local cache of every node. When ever new node arrives it gets registered and hence routing table of all the nodes is updated. Like table driven routing algorithms, RAC also maintains the routing table, but unlike table driven it maintains in the local cache and accumulates all the routing information of the present network topology. Caching the route information in the local cache helps in reducing the route discovery time and hence the efficient utilization of network bandwidth. Since the access time for cache memory is very less compare to any other memories so the route discovery phase can be eliminated. If any node wants to communicate to any other node in the network, then it will check the local cache if it found then it can directly send the data to the desired destination, without going through the path discovery phase (a time consuming process). If another node is located along the path in which the requested packet travels to the destination, and has the requested route in its cache then it can serve the request without going for the route discovery phase. Since the local cache of the node, virtually form an aggregate cache, a decision as to whether to cache the route depends not only on the node itself, but also on the neighboring nodes. Therefore, periodic update interval and cache shedding policy is proposed.

4.2.2 THE PERIODIC UPDATE INTERVAL

Here all nodes periodically send out their whereabouts information after a fixed interval say “ß” (design parameter). The nodes randomize this period a bit to ensure that not all nodes send out their updates at the same time. If the updates are sent at about, the same time then there will be a lot of route change, which will cause another spate of updates. In short, the routing tables will take a long time to stabilize which can be disastrous in a mobile scenario. The periodic update interval governs the time required by a node to learn about a new neighbor because normally it will receive message from the new neighbor only when that node sends out its periodic update. The update interval also determines the time required for a node to decide whether a neighbor has moved out of its range, and marks a link to be broken if a message has not been received for a fixed number of periodic update intervals. In short, the value of the update interval determines the performance of the RAC protocol. The periodic update interval is also and mainly decided by the environment where the node is operating. This particular policy is important in MANET, as network is dynamic and random. Environment like battle field and shopping complexes where the mobility of the nodes is very high, hence network structure is highly dynamic. In these kind of scenario the update interval is kept as low as possible since it is excepted that the node links will be broken within very short interval. The environment like offices and residential places the mobility of the nodes are comparatively low and hence updates intervals can be changed to bigger one. Since this policy is incorporated in

RAC protocol, it can be said that RAC is an environment aware routing protocol.

4.2.3 CACHE SHEDDING

Since the local cache is expensive and used to store all the routing information, it may grow to infinity because of network dynamics. Hence a cache shedding policy is proposed in this work. In cache shedding policy, every node will intelligently manage their caches by deleting the routing information that is no longer available. Once again here also time for deleting the entry is environment aware as discussed above. Every node here will wait for amount of time "δ" (design parameter) and if no response comes from the source then the particular entry will be deleted. Therefore, it is the responsibility of every node to get it known to every body in the network before the expiry time.

V. CONCLUSION

This paper discusses the present routing protocol state-of the-art survey and proposes the Registration and Aggregate
Cache Routing algorithm for MANET. This survey studied unicast and multicast routing protocols together with broadcast algorithms for MANETs. According to the description and comparison of their schemes, we can arrive at the following conclusions: i) Different protocols have different strengths and drawbacks. One protocol may be best suited for one scenario and may not for other. ii) Since once protocol can not fit into all the possible scenarios and traffic patterns of MANET applications. Thus the future research is to combine some competitive schemes. iii) The reactive routing protocols outperform proactive routing protocols in terms of communication overhead. As a result, the former is preferred in many applications. iv) Hybrid unicast routing protocol seems to be a better candidate
than pure proactive and reactive routing protocols. Taking some of the above issues in to consideration authors have proposed the RAC routing protocol that deals with registration of newly arrived node in the network and then maintain the entries in the local cache. The updating and deleting entries of the cache are environment aware. The proposed algorithms theoretically overcome drawbacks of the table driven and on demand routing algorithms. In addition RAC is intelligent to adapt to the environment dynamics.

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