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Performance Analysis of Routing with the Node Mobility in Mobile Adhoc Networks

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Abstract- *Mobile adhoc Networks (MANETs) technologies have been gradually impacting almost all spheres of our lives. Recently, the Mobile adhoc Networks (MANETs) are gaining increased attention for generating extensive wireless communication. Routing protocols for ad hoc wireless networks must be able to perform efficient and effective mobility management. Most existing ad hoc routing protocols are susceptible to node mobility, especially for large-scale networks. Also in Mobile adhoc network, the node mobility and the location update interval are main factors leading to packet forwarding failure due to the receiver moving from one position to another. Focused this concern Spot based Opportunistic Routing Protocol (SOR) has been proposed to face issues of the high node mobility. This proposed scheme is designed for the dynamic nature of MANETs associated with various constraints. SOR routing protocol which takes advantage of find an effective routing which is used to transmit information from source to destination across the whole network topology. End of the results shows that SOR achieves excellent performance even under high node mobility with acceptable overhead.*

Keywords *- MANETs, SOR, Mobility, Data Delivery, Location Update Interval.*

I. INTRODUCTION

Realizing the necessity of open standards in this emerging area of computer communication, a working group within the Internet Engineering Task Force (IETF), termed the name Mobile ad hoc networks (MANETs) working group was formed to standardize the routing protocols and functional specifications. MANETs routing functionality is to mainly support for the self-organizing mobile networking infrastructure. Even though ad hoc networks are expected to work in the absence of any fixed infrastructure. Mobile Ad hoc networks are defined as the category of wireless networks that utilize multi-hop radio relaying and are capable of operating without the support of any fixed infrastructure. MANETs are self-organizing networks and they have been made up of mobile nodes, which are using their neighbors as a mean of communication with other nodes in the network.

All available MANETs routing protocols were consumes the solitary route that is done for source and destination node pair combination. Also Owing to node mobility, the node failures and the dynamic characteristics of the radio channel, available links in a route may become temporarily unreachable, and they making the route has been unsound.

The overhead of discovery alternative any other routes mounts along with supplementary packet delivery delay. The Mobile Adhoc networks (MANETs) change their topology, and it has been expressed by the node connectivity over time, as the nodes change their position in the air. [1] Also the Mobile ad hoc networks are were characterized by the dynamic topology because of its node mobility, restricted channel bandwidth and restricted battery power of nodes.

The key challenge here is to be able to route with low overheads even in dynamic conditions [2]. Adhoc mobile networks are very dynamic, self-organizing, self-healing distributed networks which support data networking without an infrastructure. [4] Mobile Ad hoc Networks consists of a set of wireless mobile nodes communicating to each other without any centralized control or fixed network infrastructure and can be deployed quickly [5]. Adhoc mobile networks are very dynamic, self-organizing, and self-healing distributed networks which support data networking without an infrastructure. Due to lack of trusted nodes, MANETs require specialized authenticated protocol [6]. Mobile Adhoc Network is an autonomous system consisting of a set of mobile hosts that are free to move without the need for a wired backbone or a fixed base station. [7] Mobile Adhoc Networks having self-organizing and self-configuring network without the need of any centralized base station and physical connections of mobile devices. The Mobile ad-hoc network has no fixed topology due to mobility of nodes, interference, path loss and multipath propagation. Mobile Ad hoc Networks is a robust infrastructure less wireless network having mobile nodes. Basically MANETs can be created by the mobile nodes by the both static and dynamic model of mobile nodes in their region. A mobile node has arbitrarily associated with each other forming uniformed topologies. They serve up as both routers and hosts. [8] The Mobile Adhoc

Network is a collection of autonomous wireless mobile nodes forming frequently changing network topology. Which nodes can communicate with each other through wireless links that needs efficient this is enough for into dynamic routing protocols [9].

To summarize, this paper is organized as follows. Section II provides details of the various classifications of Routing protocols, Section III Existing MANETs Routing Protocol, Section IV Literature Survey, V. Proposed System, and the conclusion of the paper in Section VI.

II. CLASSIFICATION ON ROUTING PROTOCOLS

Mobile Adhooc Network (MANETs) is a collection of wireless mobile nodes dynamically forming a temporary network without the use of any pre-existing network infrastructure or centralized administration. MANETs have become of increasing interest in view of their promise to extend connectivity beyond traditional fixed infrastructure networks. Every node in MANET not only serves as a single terminal but also acts as a router to establish a route. The routing protocols were in Mobile adhoc networks (MANETs) can be broadly classified into four categories. They can be further divided into,

- Update mechanism in Routing information
- Use of temporal information for routing
- Routing topology
- Utilization of specific resources

A. *Based on the Update Mechanism in Routing Information*

Actually in MANETs Based on the Update Mechanism in Routing information network routing protocols can be broadly classified into three major categories. They are as follows,

- Table-driven or Proactive routing protocols
- On-Demand or Reactive routing protocols
- Hybrid routing protocols

B. *Based on the Temporal Information for Routing usage.*

This type of classification in routing protocols is naturally based on the temporal information which has been used for routing. Mobile adhoc networks (MANETs) are extremely high dynamic and routing path breaks are considerably more frequent than in wired networks, also the use of temporal information regarding the lifetime of the wireless links and the lifetime of the paths selected assumes significance. These kind of routing protocols that fall under this category and it can be listed as follows.

- Routing protocols using past temporal information
- Routing protocols using future temporal information

C. *Based on the Routing Topology*

Routing topology being used in the Internet is hierarchical in order to reduce the state information maintained at the core routers found. MANETs, due to their relatively smaller number of nodes, can make use of either a flat topology or a hierarchical topology which is applied for routing.

- Flat topology routing protocols
- Hierarchical topology routing protocols

D. *Based on the Utilization of Specific Resources:*

Based on the Utilization of specific resources in MANETs has been classified in the following ways. They are as follows

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- Power-aware routing
- Geographical information assisted routing

III. EXISTING MANETs ROUTING PROTOCOLS

In a MANET reactive routing protocol, a route is searched and established only when two nodes intend to transfer data. Therefore, it is called an On-Demand routing protocol.

The available category of Update mechanism in the routing information were On-Demand or Reactive Routing protocols execute the process, finding the path and the exchanging available routing information only when a routing path which is required by a node to communicate with a destination. Most widely used on-demand routing protocols are

Ad hoc On-Demand Distance Vector (AODV) and Dynamic Source Routing (DSR). The following section which is briefly explores about the top list Reactive routing protocols in detail.

- Dynamic source routing protocol (DSR)
- Ad hoc on-demand distance vector (AODV)
- Location-aided routing protocol (LAR)

A. *Dynamic Source Routing Protocol(DSR)*

Necessity to reduce routing overheads, on-demand routing protocols are build and maintain the routes only when needed routes. In on-demand protocols, a route discovery process is initiated whenever a route is needed.

Initially Route Request (RREQ) packet has to be sent to that destination. In entire network RREQ process has been flooded throughout. Each node which is available in the network, upon receiving a RREQ packet, which is Rebroadcasts the packet to its neighbors if it has not forwarded already or else if the node is not the destination node, then it's provided the packet's from Time to Live(Ti-Li) because counter has not exceeded.

Sequence number generated by the source node for the Each RREQ and the route path it has been traversed. Always the packet is forwarded only if it is not a duplicate RREQ. The Sequence Number (SEQNUM) on the packet which is used to prevent loop formations and especially which is used to avoid multiple transmissions.

A destination node, after receiving the first RREQ Packet, which is replies to the source node through the same reverse path to the RREQ packet had traversed. This DSR protocol uses Route cache which is used to stores all possible information extracted from the source route contained in a data packet. Also the same methodologies which is used at the time of routing construction phase.

Advantages

In on-demand protocols, route discovery procedure is used by nodes to obtain routes on an 'as needed' basis. DSR Routing Protocol which eliminates the need to sequentially flood the network with table update messages at periodically. Route Cache (RCache) information efficiently reduces the control overhead, which is greatly utilized over the region.

Disadvantages

DSR Routing protocol performs greatly well and efficiently in static and low-mobility environments, at one stage when the performance degrades rapidly with increasing mobility.

B. *Adhoc On-Demand Distance-Vector Routing Protocol*

In AODV, whenever a traffic source needs a route to a destination, it initiates a route discovery by flooding a Route Request (RREQ) for the destination in the network and then waits for a Route Reply (RREP). When an intermediate node receives the first copy of a RREQ packet, it sets up a reverse path to the source using the previous hop of the RREQ as the next hop on the reverse path. In addition, if there is a valid route available for the destination, it unicasts a RREP back to the source via the reverse path. Otherwise, it Re-broadcasts the RREQ packet. Duplicate copies of the RREQ are immediately discarded upon reception at every node. The destination on receiving the first copy of a RREQ packet forms a reverse path in the same way as the intermediate nodes; it also unicasts a RREP back to the source along the reverse path. As the RREP proceeds towards the source, it establishes a forward path to the destination at each hop. A node updates its path information only if the Destination Sequence Number (DSN) of the current packet received is greater than the last DSN stored at the node.

A RREQ carries the Source IDentifier (SourceID), the Destination IDentifier (DestinationID), the Source Sequence Number (SSN), the Destination Sequence Number (DSN), the Broadcast IDentifier (BroadcastID), and Time to Live (TL) field. Destination Sequence Number indicates the freshness of the route that is accepted by the source. When an intermediate node receives a RREQ, it either forwards it or prepares a Route Reply if it has a valid route to the destination.

The validity of a route at the intermediate node is determined by comparing the sequence number at the intermediate node with the destination sequence number in the RREQ packet. If a RREQ is received multiple times, which is indicated by the BroadcastID-SourceID pair, the duplicate copies are discarded. All intermediate nodes having valid routes to the destination, or the destination node itself, are allowed to send RREP packets to the source.

Every intermediate node, while forwarding a RREQ, enters the previous node address and it's BroadcastID. A timer is used to delete this entry in case a RREP is not received before the timer expires. This helps in storing an active path at the intermediate node as AODV does not employ source routing of data packets. When a node receives a RREP packet,

information about the previous node from which the packet was received is also stored in order to forward the data packet to this next node as the next hop toward the destination.

Advantages

The main advantage of this protocol is that routes are established on demand and destination sequence numbers are used to find the latest route to the destination. The connection setup delay is less.

Disadvantages

Drawbacks of AODV protocol is that intermediate nodes can lead to inconsistent routes if the source sequence number is very old and the intermediate nodes have a higher but not the latest destination sequence number, thereby having stale entries and also multiple RREP packets in response to a single RREQ packet can lead to heavy control overhead.

C. Location-aided routing protocol (LAR)

Location-aided Routing Protocol used position information to control the flooding certain area of cost. This is done in a similar fashion of the Restricted Directional Flooding approach [2].LAR reduces the control overhead by limiting the search area for finding a path. The efficient use of geographical position information, reduced control overhead, and increased utilization of bandwidth are the major advantages of this Location-aided routing protocol. The applicability of this protocol depends heavily on the availability of GPS infrastructure or similar sources of location information. Hence, this protocol cannot be used in situations where there is no access to such information.

IV. LITERATURE SURVEY

A. *A performance Comparison of Multi-hop Wireless ad hoc network Routing Protocols [1]*

Traditional routing algorithms prove to be inefficient in such a changing environment. Ad-hoc routing protocols such as dynamic source routing (DSR), ad-hoc on-demand distance vector routing (AODV) and destination-sequence distance vector (DSDV) have been proposed to solve the multi hop routing problem in ad-hoc networks. Performance studies of these routing protocols have assumed constant bit rate (CBR) traffic. Real-time multimedia traffic generated by video-on demand and teleconferencing services are mostly variable bit rate (VBR) traffic. Most of this multimedia traffic is encoded using the MPEG standard.When video traffic is transferred over MANETs a series of performance issues arise. This paper presents a performance comparison of three ad-hoc routing protocols - DSR, AODV and DSDV when streaming MPEG4 traffic. Simulation studies show that DSDV performs better than AODV and DSR. However all three protocols fail to provide good performance in large, highly mobile network environments.

B. *A Survey on Position-based Routing in Mobile ad hoc networks [2]*

A survey on position-based routing in mobile ad hoc networks paper presents an overview of ad hoc routing protocols that make forwarding decisions based on the geographical position of a packet's destination. However, there still exist a number of issues and problems has been identified towards the destination's position, also were each node need know only its own position and the position of its one-hop neighbors in order to forward packets. .The main prerequisite for position-based routing is that a sender can obtain the current position of the destination. To overcome this issue non-position based approaches evaluations have been performed in existing.

C. *A framework for reliable routing in mobile ad hoc networks [21]*

This papers propose a modified version of the popular AODV Routing protocol that allows us to discover multiple node-disjoint paths from a source to a destination.

A framework for reliable which is essential to provide redundancy in terms of providing multiple node-disjoint paths from a source to a destination. From that methodologies, can conclude that it is necessary to place for call reliable nodes in the network for efficient operations. The proposed method of a framework for deployment strategy that determines the positions and the trajectories of these reliable nodes such that achieve a framework for reliably routing information.

D. *Survey on Opportunistic Routing in Multi hop Wireless Networks [10]*

The study of Opportunistic routing is based on the use of broadcast transmissions to expand the potential forwarders that can assist in the retransmission of the data packets. The receptors need to be coordinated in order to avoid duplicated transmissions. This is could be achieved by ordering the forwarding nodes and in the position-based packet forwarding strategies. This proposed Opportunistic routing protocols differ in the criterion to order the receptors and the way of the receptors coordinate. This paper presents a survey of the most significant opportunistic routing protocols for multi hop wireless networks.

E. *ExOR: Opportunistic Multi Hop Routing for Wireless Networks [6]*

This paper describes ExOR, an integrated routing for wireless networks. Naturally an MAC protocol that increases the throughput of large unicast transfers in multi-hop wireless networks. According to that ExOR must chooses the best forwarder with the lowest remaining cost to the ultimate destination. At the time of pairs between which traditional

routing uses one or two hops, ExOR's opportunistic multihop routing results robust acknowledgments prevent unnecessary retransmissions, increasing throughput by nearly 35%. Actually For more distant pairs, ExOR takes advantage of the choice of forwarders to provide throughput gains.

F. *On-demand Multipath Distance Vector Routing in Ad Hoc Networks[20]*

This paper proposes multipath extensions to a well-studied single path routing protocol known as Ad hoc On-demand Distance Vector (AODV). The main idea in AOMDV is to compute multiple paths during route discovery. It is designed primarily for highly dynamic ad hoc networks where link failures and route breaks occur frequently. When single path on-demand routing protocol such as AODV is used in such networks, a new route discovery is needed in response to every route break. Each route discovery is associated with high- overhead and latency. This inefficiency can be avoided by having multiple redundant paths available.. Thus little additional overhead is required for the computation of multiple paths.The AOMDV protocol has two main components:

1. a route update rule to establish and maintain multiple loop-free paths at each node.
2. a distributed protocol to find link-disjoint paths.The resulting protocol is referred to as Ad hoc On-demand Multipath Distance Vector (AOMDV).

V. **PROPOSED SYSTEM**

The design process of Spot based Opportunistic Routing Protocol (SOR) is based on geographic routing and opportunistic forwarding. The nodes are assumed to be aware of their own locations and the positions of their direct neighbors. In SOR Routing Protocol choosing the candidates and assigning priority among nodes for the forwarding candidates plays a major role while designing this routing protocol. Actually candidate means the node assigned as next hop which is selected among all nodes in the direction of forwarding region. The forwarding area has been determined by sender and the next hop node.

A. *SOR Protocol Design*

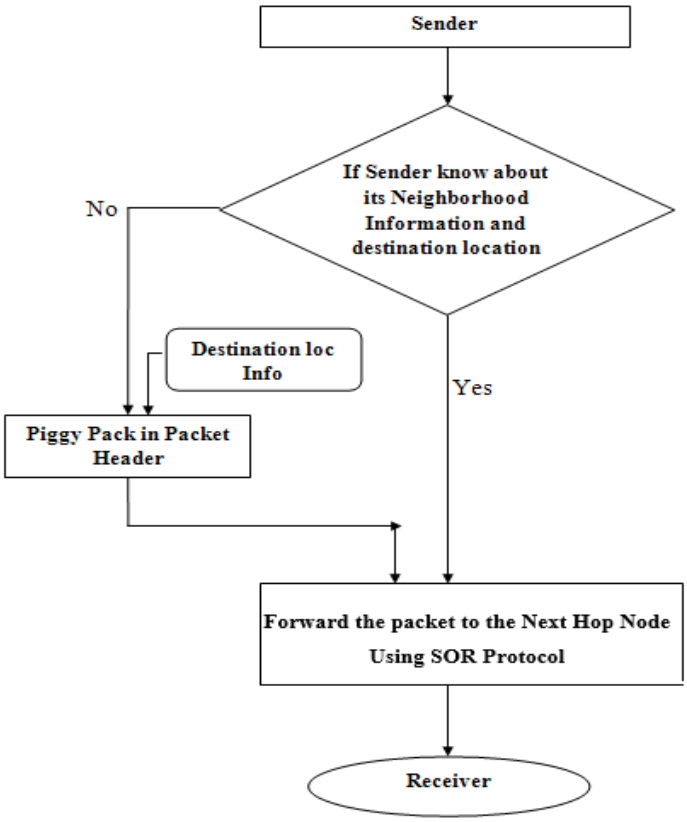

Figure 1 – SOR Protocol Designing Process flow

Spot based Opportunistic Routing Protocol (SOR) designing process flow is shown in Figure 1. An SOR algorithm which takes the responsibility to rectify the problems which is found in the candidate selection process and it takes the advantages at the time of gives the priority to forwarding candidates for the consistency. Whenever the nodes located in the direction of forwarding region may get the chance to be backup nodes. Focused this concern an SOR Protocol has been designed in the following ways.

- Location Information adding in Packet header
- Candidate node selection

- Distance calculation between Each Node
- Priority assigning for the forwarding candidates
- Collects the Neighbor node List details
- Receiver details

From the above module details lists towards Candidate selection process location information adding in packet header which has been added and it has been primarily taken while designing SOR Protocol.

B. *Candidate Selection Process in SOR protocol*

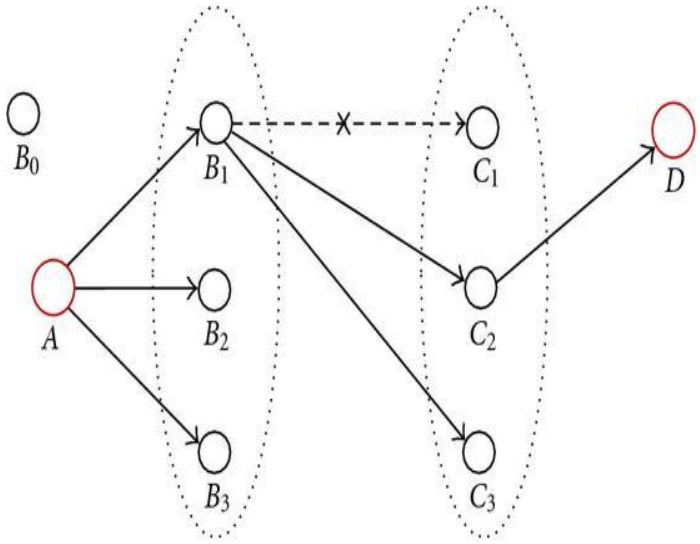

Figure 2: Candidate Selection process in SOR Protocol

Candidate selection process in Spot based Opportunistic Routing Protocol (SOR) is shown in the above Figure 2. Actual determination of the forwarding area is done by the sender and the next hop node. The node located in the forwarding area satisfies the following conditions. First one is that it might be present in the positive progress towards the destination. Next one important condition is that its distance to the next hop node should not exceed half of the transmission range of a wireless node. Based on that in above figure 2 the nodes from the A to D positive progress may take from the nodes B1, C1 and C2.Likewise the candidate process has been done by the SOR Routing Protocol.

VI. CONCLUSION

This paper addresses the problem of reliable data delivery in highly dynamic mobile ad hoc networks. Constantly changing network topology makes conventional ad hoc routing protocols incapable of providing satisfactory performance. In the face of frequent link break due to node mobility, substantial data packets would either get lost, or experience long latency before restoration of connectivity. The efficacy of the involvement of forwarding candidates against node mobility, as well as the overhead due to opportunistic forwarding is analysed. Through implementation, confirm the effectiveness and efficiency of SOR high packet delivery ratio may achieve while the delay and duplication are the lowest.

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