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Analyzing Zone Routing Protocol in MANETs and Applying Open SSL DES96 Enhancement Algorithm

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Abstract: Routing is an important part of wireless ad hoc network conventionally there are two approaches first one is Proactive and another one is Reactive. Both these approaches have some disadvantages and to overcome the problems hybrid routing protocols designed. ZRP (Zone Routing Protocol) is one of the hybrid routing protocols, it takes advantage of proactive approach by providing reliability within the scalable zone, and for beyond the scalable zone it looks for the reactive approach. It (ZRP) uses the proactive and the reactive routing according to the need of the application at that particular instance of time depending upon the prevailing scenario.In this paper we use ZRP that proactively maintains routes within a local region of the network (which we refer to as the routing zone). Knowledge of this routing zone topology is leveraged by the ZRP to improve the efficiency of a reactive route query/reply mechanism. we further incorporate security, provide guaranteed QoS and enhancement for use in heterogeneous mesh and sensor networks and this is accomplished by using Open SSL-DES96(double encryption) enhancement algorithm. The performance of this algorithm is evaluated through simulation and data transfer among the nodes is done through SFTP.

Keywords: Ad hoc network, hybrid routing, proactive routing, reactive routing, routing protocol, routing zone, zone routing protocol (ZRP), Multi clusterhead, Dominating Set.

I. INTRODUCTION

Ad hoc networks are self-organizing wireless networks composed of mobile nodes and requiring no fixed infrastructure. The limitations on power consumption imposed by portable wireless radios result in a node transmission range that is typically small relative to the span of the network. To provide communication throughout the entire network, each node is also designed to serve as a relay. The result is distributed multihop network with a time-varying topology. Because ad hoc networks do not rely on existing infrastructure and are self-organizing; they can be rapidly deployed to provide robust communication in a variety of hostile environments. Mobile ad hoc networks (MANETs) [1] are collections of mobile nodes, dynamically forming a temporary network without pre-existing network infrastructure or centralized administration. These nodes can be arbitrarily located and are free to move randomly at any given time, thus allowing network topology and interconnections between nodes to change rapidly and unpredictably. MANET is likely to be use in many practical applications, including personal area networks, home area networking, and military environments, and so on recent advances in wireless technology have enhanced the feasibility and functionality of wireless mobile ad hoc networks (MANETs).

One of the major challenges in designing a routing protocol for the MANET is to determine a packet route; a node needs to know at least about its neighbours. On the other hand in MANET wireless networks conditions changes frequently with time due to the mobile nodes thus routing becomes a challenging task. To serve this purposes various proactive, reactive and hybrid routing protocols are developed by researchers. Among all AODV, DSR, DYMO and ZRP are well known popular routing protocols and have been standardized by the IETF MANET WG. ZRP is a well known hybrid routing protocol.

II. ZONE ROUTING PROTOCOL(ZRP)

ZRP [2] is a framework by using it we can take advantage of both table driven and on demand driven protocol according to the application. In this separation of nodes, local neighborhood from the global topology of the entire network allows for applying different approaches and thus taking advantage of each technique's features for a given situation.

These local neighborhoods are called zones (hence the name) each node may be within multiple overlapping zones, and each zone may be of a different size. The "size" of a zone is not determined by geographical measurement, as one might expect, but is given by a radius of length α where α is the number of hops to the perimeter of the zone.

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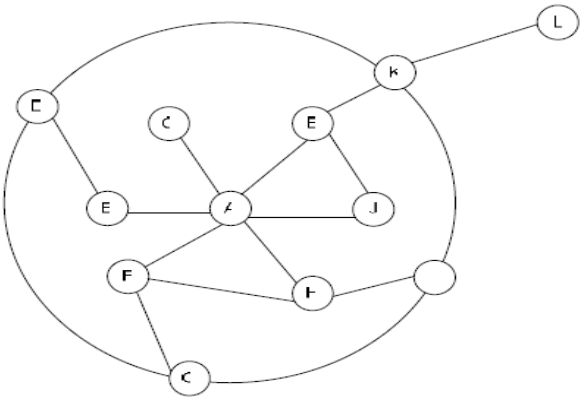

Figure 1: ZRP having Zone Radius α=2

In the above diagram ZRP, protocol having Zone radius 2 in this inside the zone communication done in proactive way and outside it between such zones in reactive way. A, E, F, H, J, C are interior node and D, G, I, k are border nodes communication between B and K is done through proactive way and L is located outside the zone. ZRP consist of [2] three parts IARP [3] proactive part, IERP [4] reactive part of it and BRP [5] used with IERP to reduce the query traffic.

III. INTRA ZONE ROUTING PROTOCOL (IARP)

The Intra zone Routing Protocol (IARP) [3] is a limited scope proactive routing protocol, which used to support a primary global routing protocol. The routing zone radius shows the scope of the proactive part, the distance in hops that IARP route updates relayed. IARP's proactive tracking of local network connectivity provides support for route acquiring and route maintenance. First, routes to local nodes are immediately available, avoiding the traffic overhead and latency of a route discovery. Traditional proactive link state protocols modified to serve as an IARP by limiting link state updates to the scope of the link source's routing zone.

IV. INTER ZONE ROUTING PROTOCOL (IERP)

The Inter zone Routing Protocol (IERP) is the global reactive routing component of the Zone Routing Protocol (ZRP).IERP adapts existing reactive routing protocol Implementations to take advantage of the known topology of each node's surrounding R-hop neighborhood (routing zone), provided by the Intra zone outing Protocol (IARP)[3]. The availability of routing zone routes allows IERP [4] to suppress route queries for local destinations. When a global route discovery is required, the routing zone based border cast service [5] used for efficiently guide route queries outward, rather than blindly relaying queries from neighbor to neighbor. Once a route discovered, IERP can use routing zones automatically to redirect data around failed links similarly, suboptimal route segments identified and traffic re-routed along shorter paths.

V. BORDER CAST RESOLUTION PROTOCOL (BRP)

The Border Cast Resolution Protocol (BRP) [5] provides the border casting packet delivery service. The BRP uses a map of an extended routing zone, provided by the local proactive Intra zone Routing Protocol (IARP) [3], to construct Border cast (multicast) trees along which query packets are directed. (Within the context of the hybrid ZRP, the BRP used to guide the route requests of the global reactive Inter zone Routing Protocol (IERP) [4]). The BRP uses special query control mechanisms to steer route requests away from areas of the network that have already covered by the query. The combination of multicasting and zone based query control makes Border casting an efficient and tunable service that is more suitable than flood searching for network probing applications like route discovery. The Border cast Resolution Protocol (BRP) is a packet delivery service, not a full featured routing protocol. Border casting enabled by local proactive Intra zone Routing Protocol (IARP) and supports global reactive Inter zone Routing Protocol (IERP).

VI. RELATED WORK

Nicklas Beijar in 2001[6] first discuss the problem in proactive and reactive routing and then how they move towards the ZRP (Zone Routing Protocol) paper describe the architecture of the ZRP also describe the working of the protocol with an example. In 2002 Jan Schaumann [2] analyze the ZRP in mobile Ad hoc network discuss the basic of MANET and implication on routing and problems occur due to rapidly changing topology without fixed router. In paper author, also discuss the ZRP hybrid routing protocol having both proactive and reactive protocol in context to other routing protocol. In 2003, David Oliver Jorg discusses the performance comparison of MANET routing protocol in different network size in that paper they discuss the problem due to the mobility of different nodes they test the routing performance of four different routing protocol. [7]in this examine the analytical simulation result for the routing protocol DSR ,TORA and ZRP emphasizing on the ZRP and impact of some of it most important attributes to the network performance. Julian Hsu, Sameer Bhatia, Mineo Takai, Rajive Bagrodia,[8] discuss the performance of common MANET routing protocol under realistic scenarios protocols include AODV OSPFv2 and ZRP which comprise all proactive, reactive ,hybrid routing protocol.
In [9] discuss some of the factor that affects the routing algorithm like such as variable wireless link quality, propagation path loss, fading; multi-user interference, power expended and topological changes become important issues.. In paper, discuss about the proactive DSDV, WRP, CGSR, reactive SSR, AODV, RDMAR, Hybrid routing protocol like, ZRP. In [10] paper presents the idea of integrating the layer-II label-switching technique with layer-III and study the effect of

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Multiprotocol Label Switch (MPLS) mechanism on the performance Ad-Hoc Networks (MANETs). In 2007[11] discuss the performance of three routing protocol DSR, AODV, LAR1 the performance is analyzed using varying, mobility and network size perform simulation on GLOMOSIM network simulator.

VII. PROPOSED SYSTEM

This proposed routing protocol has been implemented by the Network Simulator2 (NS2). The Network Simulator is mainly utilized to implement the routing protocols in the networking research. The Main focus of our analysis is reducing the time delay, traffic, less packet loss and good packet delivery ratio. The simulation results are shown below.

Number of Nodes	50
Packet size	512bytes
Transmission Radius	2200x2200
Simulation Time	300 (sec)
Antenna	Omni antenna
Channel	Wireless channel
Bandwidth	$2x10^6$
Propagation Model	Two Ray Ground
Queue	Drop tail/ Pri Queue
Layer	Link layer
X Width	2200
Y Width	2200
Supporting protocol	DSDV
Bit Rate	CBR

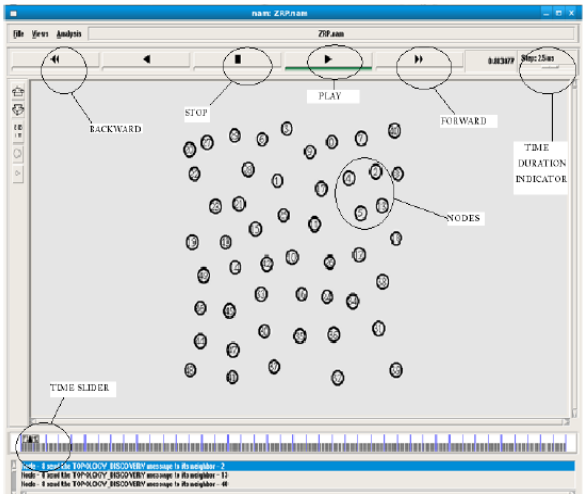

Fig1 Node Placement

The below screen shots describe how the cluster head is formed and how packets are being transmitted from source to destination. Here in our experiment we have considered 50 nodes and packet size of 512 bytes. All the simulations are carried out in NS2 environment.

The Fig1 represents that each node is positioned according to their program for suitable transmission and receiving.

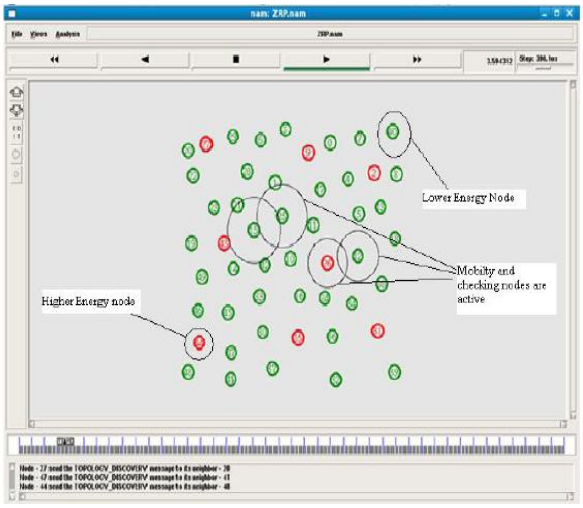

Fig2 Selection of energy level nodes

Fig 2 Shows, the red color nodes are higher energy level nodes. The energy levels are based on maximum number of data transmitting and receiving. Green color nodes are lower energy level. By using broadcasting check the active mobility of nodes.

Fig3 Clustering

From Fig3 Shows the cluster members are selected in the cluster Head. The Cluster Head selections are based on energy levels. The energy levels are calculated based on the capability of maximum transmitting and receiving of data's. Here the red color nodes are cluster heads and blue color nodes are cluster members.

Fig 4 shows the source node transmits a data to source cluster head and it transmits a data to destination cluster head and it sent to destination node.

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Thus this is how packet transfer takes place.

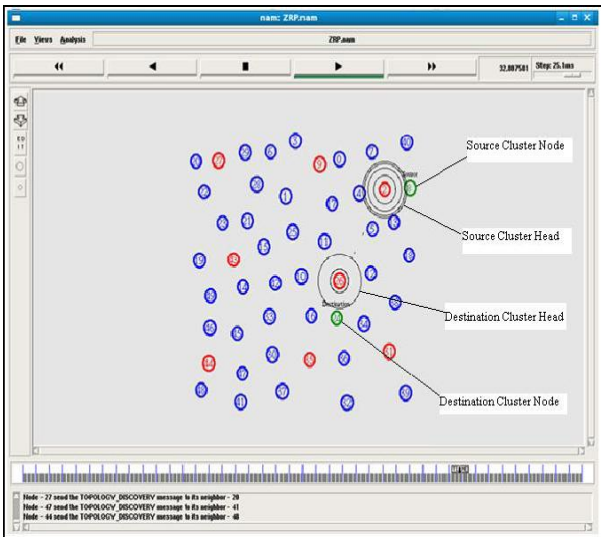


Fig 4 Data transmitting from source to destination

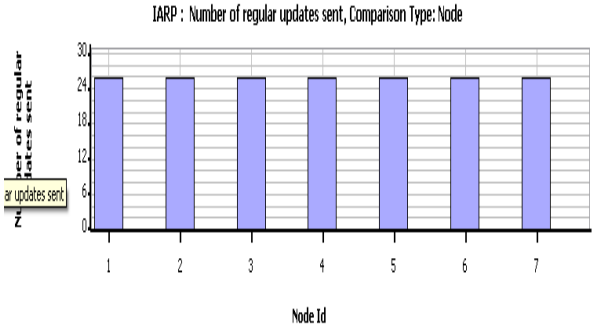
We incorporate security, provide guaranteed QoS and enhancement for use in heterogeneous mesh and sensor networks and this is accomplished by using SSL-DES-96(double encryption) enhancement algorithm[12]. The performance of this algorithm is evaluated through simulation and data transfer among the nodes is done through SFTP.

VIII. EXPERIMENTAL RESULTS

The idea of ZRP is to utilize the features of both proactive and reactive routing protocols. With proactive routing inside a limited zone, the connection establishment time can be reduced. Reactive routing reduces the amount of control traffic by discovering the path on demand for destinations outside the routing zone.

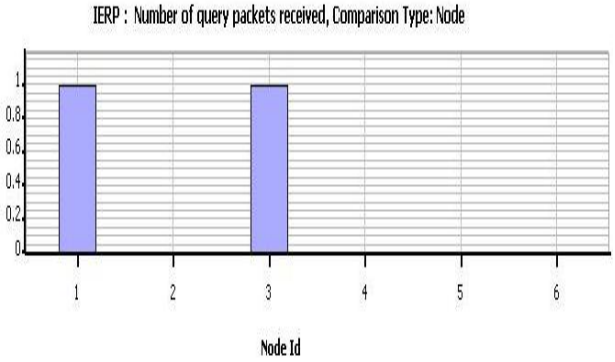
The Experimental results show the packet transmissions in both proactive and reactive routing protocols.

Packets Sent in IARP

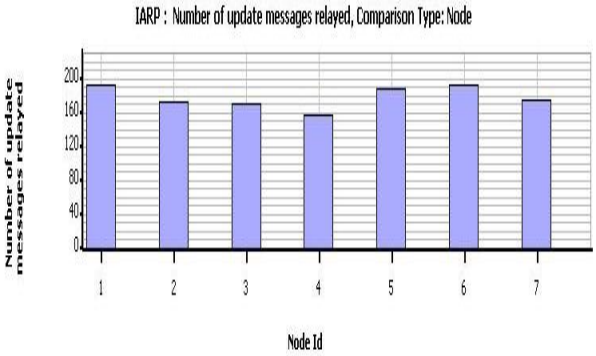


The Encryption and Decryption time comparisons between DES and DES 96 .These algorithms are necessary for providing security among the nodes.

Packets Sent in IERP



Packets Relayed in IARP



Packets Relayed in IERP

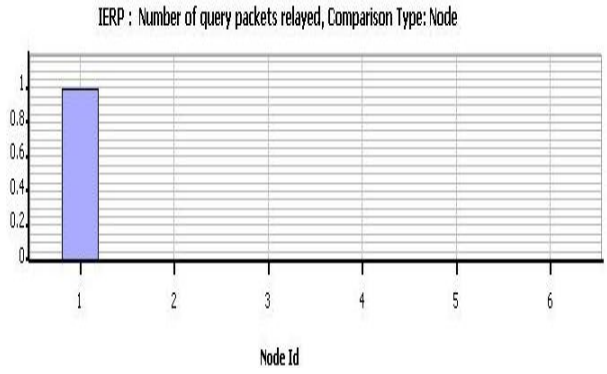


Table 1: Time comparisons between DES and DES 96

S.NO	LOP	Time taken in DES (ms)		Time taken in DES96 (ms)		Time taken in DES96 with Open SSL(ms)	
		ENC	DEC	ENC	DEC	ENC	DEC
1	26	31	31	188	125	470	241
2	24	35	47	125	109	435	180
3	51	47	32	219	156	763	577
4	43	49	47	235	156	649	361
5	58	89	76	266	250	514	663
6	21	31	10	141	94	566	254

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IX. CONCLUSION

The Zone Routing Protocol (ZRP) combines both reactive and pro active routing protocols. When ZRP is used in packet transmission it yielded better results when compared to other routing protocols. Apart from this we have also provided security feature which enhances Quality of Service in packet transmission.

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