Volume 3, Issue 7, July 2013 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Analytical Study of ZRP and Content Negotiation

Ajay Jangra[1]
[1]Assistant Professor,
U.I.E.T. Kurukshetra University,
Kurukshetra, Haryana, INDIA

Manisha[2]
[2]Research Scholar,
U.I.E.T. Kurukshetra University
Kurukshetra, Haryana, INDIA

Abstract— Mobile adhoc networks (MANETs) are wireless networks consisting entirely of mobile nodes. Unlike traditional mobile wireless networks, adhoc networks do not rely on any fixed infrastructure, so they communicate on-the-move without base stations. Rapidly changing connectivity, collision interference, bandwidth and power constraints together pose new problems in network control. It is difficult to use existing routing techniques for network services. Basically two types of routing techniques are used in which protocols are categorized: Proactive approach, reactive approach and the origin of hybrid that consist advantages of both reactive and proactive. Eg.ZRP. This paper provides a survey of the past and current research in the area of routing protocols with focus on ZRP routing and also outlines the future research directions in the area of ZRP.

Keywords— Manets, routing protocols, reactive approach, proactive approach, hybrid approach, ZRP

I. INTRODUCTION OF MANETS

A mobile adhoc network (MANET) is generally defined as a network that has many free or autonomous nodes. A mobile adhoc network is formed by the association of mobile devices, usually wireless and capable of multi hop communication among themselves even if there is no networking infrastructure available. However, it is generally expected that, if some Manet nodes are connected to external IP networks (e.g. Internet), they might act as gateways towards those networks. Usually auto configuration of IP addresses in Manets is also required even when the Manet is isolated from external networks. Manets offer several significant advantages to a military force. A Manet's ability to self form and self manage eliminates the need for intensive central management of network links, thus reducing support personnel and equipment requirements in forward located areas. By their vary nature, Manet technologies allow a force of mobile nodes to more easily share data and attain greater situational awareness than a non networked force.

The Manet develops a forwarding protocol that can efficiently flood data packets to all the participating Manet nodes. The main aim of this mechanism is to multicast forwarding efficiently. This can be applied only in the Manet routing areas. The purpose of working is to standardize IP routing protocol that must be suitable for wireless routing applications within both static and dynamic topologies. Hybrid mesh infrastructures containing a combination of fixed and mobile routers are supported by Manet's specification and management. Manet nodes are equipped with wireless transmitters and receivers using antennas which may be omni directional (broadcast), highly directional (point-to-point), possibly steerable, or some combination thereof. Manet is not fundamentally flawed architecture. Mobile adhoc network is a collection of independent mobile nodes that can communicate each other via radio waves. The mobile nodes that are in radio range of each other can directly communicate, whereas other needs the aid of intermediate nodes to route their packets. These networks are fully distributed, and can work at any place without the help of any infrastructure. Due to the increased route length between two and nodes in a multihop Manet, The challenge is in the limited scalability.

II. ROUTING TECHNIQUES

Routing protocols determine hoe routers on a network communicate and exchange information with each other, and describes the best path to network. Every node participates in the routing whether it is source node or the destination node. It requires no external network setup as it is self configuring network. The main criteria would be that which path is chosen and who decides whether the source node or the intermediate nodes. The path is chosen by the source node that places the complete path to destination. The intermediate node just forwards the packets to the specified next hop. Like postal service that specify only the final destination on an envelope, and intermediate post offices select where to forward next. [3]There is high overhead in the source routing occur as all the path that to be chosen placed in the message header and route discovery messages. But the destination routing has no much overhead as there is no further node to which packets have to be forwarded further. Generally we try to optimize this by having some factors in mind that the path taken should be the shortest, the packets reach in small time and that must be utilize the available bandwidth. Three main issues in path discovery are: 1) Route Discovery: Searching for the places with data packets. 2) Packet Forwarding: Delivering data packets to next nodes. 3) Route Maintenance: when the nodes move to different place maintenance is required. There are mainly two types of routing protocols in Manets. A) Proactive protocols B) Reactive protocols.

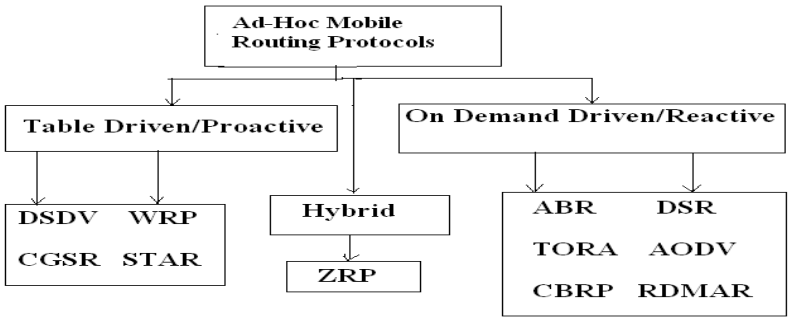

Fig. 1 classification of Manets

Proactive protocols ***(Table-Driven approach) 1)***Traditional distributed shortest-path protocols 2)Maintain routes between every host pair at all times 3)Each node periodically forwards routing table to neighbors 4)High routing overhead 5)Example: DSDV (destination sequenced distance vector)
Reactive protocols *(Demand-Based approach)* 1) Determine route if and when needed 2) Source initiates route discovery 3) Example: DSR (dynamic source routing)
Comparison of reactive and proactive protocols**:** i) Average end-to-end delay or the time taken by the data to reach the destination from the source is variable in Reactive Protocols but remains constant in Proactive Protocols for a given Ad hoc network. ii) The delivery of packet data is much more efficient in Reactive Protocols than in Proactive Protocols. iii) Reactive Protocols are much faster in performance than Proactive protocols. iv)Reactive Protocols are much more adaptive and work much better in different topographies than Proactive Protocols.

III. ORIGIN OF HYBRID PROTOCOLS

In the proactive protocol the disadvantage is that the control packets overhead is large since they are sent periodically to maintain all routes although not all routes will be necessarily used. Thus, the limited network bandwidth is consumed by control overhead. In Reactive routing protocols, the routes are discovered only when the source needs to transmit data packets. Thus, the control packets are broadcasted just when the connection is required to establish. So, the broadcast overhead is reduced. In these protocols, there are two stages for routing process. These two phases are route discovery and route maintenance. Since the nature of the ad hoc network is highly mobile, the topology of the network is changed often. When the route to destination is broken, the route maintenance phase is started to keep route available. This method suffers from large end to end delay to have route available before sending data packets in large networks.

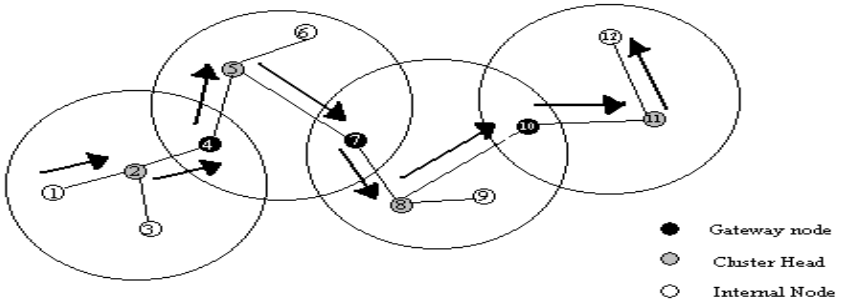

Fig.2 ZRP protocol

To overcome all the disadvantages of reactive and proactive protocols, the hybrid approach is applied. In hybrid protocols, there are two zones defined the inside zone and the outside zone. Each node maintains a neighbor table with n hops. These nodes are considered to be in the inside zone of the node. Thus, the hybrid protocols act as proactive protocols in the inside zone and reactive protocols in the outside zone. Each node periodically broadcasts control packets in the inside zone to build a routing table for all nodes in the inside zone. When a node wishes to send data to a destination node that resides in the outside zone, it uses a reactive protocol. Thus, a route discovery phase is invoked to establish the route to the destination node. An example of Hybrid routing protocols is ZRP. ZRP is a unicast routing protocol. In ZRP, a node will receive a lot of duplicate queries due to zone overlapping even under the case that the nodes are uniformly distributed in the network. In ZRP, when a node border casts a route query, the node's entire routing zone is effectively covered by the query. However, since neighbouring routing zones heavily overlap with each other, excess route query traffic will be generated as a result of query messages returning to covered zones. Query control mechanisms are proposed to reduce route query traffic by directing query messages outward from the query source and away from covered routing zones.[4] Each node, individually creates its own neighborhood which it calls a routing zone. The zone is defined as a collection of nodes whose minimum distance (in hops) from the node in question is no greater than a value that is called the "zone radius". Peripheral nodes are those nodes whose minimum distance from the node in

question is equal to the zone radius. Routing zones of nodes might overlap heavily. The zone should be large depend upon two factors: 1) If it is too large, then updates too much 2) If it is too small, often resort to reactive methods. Advantages of ZRP are that it provides some notion of scalability and the absence of hierarchies eliminates definitive points of congestion.

IV. PAST RESEARCHES IN ZRP

ZRP is the combination of reactive and proactive protocols. Each node periodically broadcasts control packets in the inside zone to build a routing table for all nodes in the inside zone known as intrazone, it uses the proactive protocol. When a node wishes to send data to a destination node that resides in the outside zone, it uses a reactive protocol. Thus, a route discovery phase is invoked to establish the route to the destination node. Now this paper discussed the research done in the area of ZRP. A cross layer collaboration routing metric "Weighted Signal to noise ratio average (WSA)" and its implementation on the Dynamic Sequence Distance Vector (DSDV) routing protocol is proposed in 1996[5]. The WSA metrics utilizes the SNR information provided by the physical layer to weight the quality of the link, and requires no additional traffic on the shared bandwidth. The new metrics is implemented in one of the MANET common routing protocols DSDV. Simulation Scenarios are implemented to study and to compare the performance of WSA. The results show that WSA improves the performance of the MANET in terms of throughput and delay.

Bit error rate (BER)-based routing is considered by the Wisitpongphan, Ferrari, Panichpapiboon and Parikh [6] where the chosen route is the one which guarantees the lowest BER at the ending node. In other words, consider the providing QoS in terms of BER at the destination node. Analysis showed that, according to this criterion, shortest path (SP) routing is not always the optimal choice as it often selects a path with unacceptable BER which can directly affect the end-to-end packet delay and good throughput. A novel energy-efficient rate adaptation protocol is proposed [7] that select modulation schemes online to maximize throughput based on channel state while saving energy. This protocol uses the distributed power control (DPC) algorithm to accurately determine the necessary transmission power and to reduce the energy consumption.

Designing a network layer protocols presented when the unit disk graph (UDG) model is replaced by a more realistic physical layer model by Stojmenovic and Nayak Kuruvila [8]. Instead of merely using the transmission radius in the UDG model, physical, MAC, and network layers share the information about a bit and/or packet reception probability as a function of distance between nodes they assume that all nodes use the same transmission power for sending messages, and that a packet is received when all its bits are correctly received.

An analytical approach to study the effects of node mobility in mobile ad hoc wireless networks is presented. The bit error rate is evaluated by Farhadi and Beaulieu over fast Rician fading channels in 2006. [9]It is shown that there is a threshold node velocity, and that a network with a certain number of mobile nodes (following the random waypoint mobility scheme) with slower velocities than the threshold velocity performs better than the corresponding network with static nodes. In particular, for a given signal- to-noise ratio and transmission range, the minimum threshold velocity is obtained. Restricting the velocities of the nodes to be at most this minimum threshold velocity results is an improvement in the bit error rate performance of ad hoc networks with an arbitrary number of nodes.

A refined model to evaluate the impact of these factors on the performance of the IEEE 802.11 DCF MAC protocol is proposed. In the analysis, X. Li and Q.A. Zeng described the channel is modeled by a finite-state Markov (FSM) chain [10]. In each channel state, the operation of the IEEE 802.11 DCF MAC protocol is modeled by an embedded Markov chain. Using these two Markov chains, the average throughput of the IEEE 802.11 DCF MAC protocol can be very accurately calculated. The results show that the performance of DCF strongly depends on the network size, the incoming traffic load, and the bit error rate (BER).

The performance comparision of BER based routing protocols under relastic environment was done in 2011 by Yelemou and Hilt[11]. Here BER-based enhancement of AODV and OLSR is compared when they have to deal with mobility and multi-communication. This result in link quality, influenced by obstacles in the propagation field, should be taken into account in MANET routing protocols enhancement simulations

Modified Ad-hoc On Demand Distance Vector routing based on Bit Error Rate (MAODV-BER) is proposed by Dahal and R.S in October 2011[12]. In this approach, route discovery of AODV has been modified to achieve the stable route by obtaining Bit Error Rate (BER) information from physical layer through cross-layer approach. Due to the use of multimedia applications in Mobile Ad-hoc Networks (MANET) strict Quality of Service (QoS) is required. So, for QoS fulfillment, the bandwidth and delay requirements are added in each route message. Finally, the path having minimum BER as well as minimum hop count and fulfilling QoS requirements is selected.

A Binary Error Rate (BER) based approach of ZRP (BER-ZRP) was proposed by Yelemou, Meseure, P, Poussard in 2012 [13]. With BER-ZRP, all phases of link-state recording and routing tables calculation are under Quality of Service control so that better paths in terms of BER are preferred. The overhead induced by route maintenance and route discovery processes is better managed. This approach allows to improve ZRP Packet Delivery Ratio and Normalized Oversize Load.

An energy efficient routing algorithm for CDMA wireless ad hoc networks was proposed by Waqas, Q.i.Azam and Mahmood in international conference held in 2013[14]. The presented solution ensures the existing links throughput of active routes as the nodes enter or leave the network. As the new nodes join the network, the interference observed by the communicating nodes increases and as a result, decreases the link signal to interference plus noise ratio. Consequently, this increase in interference decreases the links throughput for all the communicating nodes. The new routing algorithm mitigates the effect of interference created by the change in number of nodes. In addition to the throughput, the energy consumption is critically analyzed in order to maintain the usage to a minimum level. The algorithm iteratively re-

established the existing routes until the quality of service parameters; in particular, throughput, bit error rate, and energy consumption are satisfied.

V. CHALLENGES IN MANETs

Some of the problems occurred in researched techniques are:

1. Hardware dependent: Most of the techniques require some special hardware to work with efficient hybrid routing, and some of techniques cause high overhead. [54]So we have to developed techniques that does not requires any special hardware or provide security at less cost by consuming less energy or power which are limited resources in Manets.

2. Location information: Techniques based on location information ensures that the recipient of the packet is within a certain distance from the sender and [55] also ensures that the packet has an upper bound on its lifetime, which restricts the maximum travel distance.

3. High overhead: Some of the techniques cause high overhead on each participating node because all nodes contain information about itself and[56] its neighbors also as it uses the proactive technique for the interzone.

4. GPS based solutions: Some techniques based on GPS system for their location information, which is very costly in Mobile adhoc network.[57]

5. Degradation of Performance: In Hybrid routing protocol performance is less due to high load overhead and less packet delivery ratio.

VI. CONCLUSION

ZRP is a hybrid routing protocol suitable for a wide variety of MANET. Its implementation has three components: IntrA zone Routing Protocol (IARP), Inter zone Routing Protocol (IERP) and Bordercast Resolution Protocol (BRP). IARP is a limited-scope proactive routing protocol. When a global route search is needed, IARP routing zones can be used to efficiently guide route queries outwards rather than blindly relaying queries from neighbor to neighbor. The proactive maintenance of routing zones also helps to improve the quality of discovered routes, by making them more robust to changes in network topology. Once routes have been discovered, IARP routing zone offers enhanced, real-time, route maintenance. Link failures can be bypassed by multiple-hop paths within the routing zone. One of the challenges is in terms of Quality of service and performance metrices. The quality of an algorithm is judged in terms of performance measures as well as bandwidth utilized.

VII. PROPOSED WORK

One of the future research problem can be design an algorithm which help in improving the performance of ZRP and utilize the maximum bandwidth so the efficiency would be better. For a better exploitation of network capabilities that algorithm should be applied at different stages of path selection stages or at the communication path. Keeping this in view there is needed to develop new techniques that overcome from these limitations at the cost of very little resources and in very efficient manner.

REFERENCES

[1] Tawan Thongpook "Load Balancing Adaptive Zone Routing In Adhoc Networks", IEEE 2004

[2] Yannick Lacharité, Dang Quan Nguyen, Maoyu Wang, and Louise Lamont "A Trust-Based Security Architecture for Tactical Manets", IEEE 2008

[3] Yuki Sato, Akio Koyama, Leonard Barolli "A Zone Based Routing Protocol for Ad Hoc Networks and Its Performance Improvement by Reduction of Control Packets", International Conference on Broadband, Wireless Computing, Communication and Applications, IEEE 2010

[4] Savita Gandhi SMIEEE1, Nirbhay Chaubey, Naren Tada, Srushti Trivedi "Scenario-based Performance Comparison of Reactive, Proactive & Hybrid Protocols in MANET", International Conference on Computer Communication and Informatics (ICCCI -2012), Jan. 10 – 12, 2012, Coimbatore, INDIA, 2012

[5]. Elshaikh, M. ; Fadzil, M.F.M. ; Kamel, "Weighted Signal-to-noise ratio average routing metric for Dynamic Sequence Distance Vector routing protocol in mobile ad-hoc networks",Signal Processing and its Applications (CSPA), 1996 IEEE 8th International Colloquium, IEEE, March 1996

[6] Wisitpongphan, N. ; Dept. of Electr. & Comput. Eng., Carnegie Mellon Univ., Pittsburgh, PA, USA ; Ferrari, G. ; Panichpapiboon, S. ; Parikh, J.S., "QoS provisioning using BER-based routing in ad hoc wireless networks", Vehicular Technology Conference, 2005 VTC 2005-Spring. 2005 IEEE 61st (Volume:4)

[7] Zawodniok, M.; Dept. of Electr. & Comput. Eng., Missouri Univ., Rolla, MO, USA; Jagannathan, S., "Energy-efficient rate adaptation MAC protocol for ad hoc wireless networks", Performance, Computing, and Communications Conference . IPCCC 2005. 24th IEEE International April 2005

[8] Stojmenovic, I. ; SITE, Ottawa Univ., Ont., Canada ; Nayak, A. ; Kuruvila," Design guidelines for routing protocols in ad hoc and sensor networks with a realistic physical layer", Communications Magazine, IEEE (Volume:43 , Issue: 3), March 2005

[9] Farhadi, G. ; Dept. of Electr. & Comput. Eng., Univ. of Alberta, Edmonton, AB ; Beaulieu, N.C, "WLC07-5: The Effects of Mobility on the Bit Error Rate Performance of Ad Hoc Wireless Networks", Global Telecommunications Conference, 2006. GLOBECOM '06. IEEE

[10] Xiaolong Li ; Dept. of Ind. & Eng. Technol., Morehead State Univ., KY ; Qing-An Zeng, "Influence of Bit Error Rate on the Performance of IEEE 802.11 MAC Protocol" , Wireless Communications and Networking Conference, 2007.WCNC 2007. IEEE

[11] Yelemou, T. ; XLIM-SIC Lab., Univ. of Poitiers, Poitiers, France ; Ledy, J. ; Hilt, B. ; Poussard, A.-M. more authors, "Performance comparison of BER-based routing protocols under realistic conditions", ocal Computer Networks (LCN), 2011 IEEE 36th Conference-Oct. 2011

[12] Dahal, R.S. ; Asian Inst. of Technol., Inf. & Commun. Technol. FoS, Pathumthani, Thailand Sanguankotchakorn, T, "QoS routing in MANET through cross-layer design with BER and modifying AODV", Internet (AH-ICI), 2011 Second Asian Himalayas International Conference-Nov. 2011

[13] Yelemou, T. ; XLIM-SIC Lab., Univ. of Poitiers, Poitiers, France ; Meseure, P. ; Poussard, A.-M, "Improving ZRP performance by taking into account quality of links", Wireless Communications and Networking Conference (WCNC), 2012 IEEE

[14] Waqas, A. ; Dept. of Electron., Quaid-i-Azam Univ., Islamabad, Pakistan ; Mahmood, H, "Interference Aware Adaptive Routing for CDMA Based Mobile Ad Hoc Networks", Intelligent Systems Modelling & Simulation (ISMS), 2013 4th International Conference-Jan. 2013

