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A Survey – Performance based Routing Protocols in Wireless Ad-hoc Networks Environment

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Abstract

A wireless ad hoc network is a decentralized type of network. The network is ad hoc because it does not rely on a preexisting infrastructure, such as routers in wired networks or access points in managed (infrastructure) wireless networks. Instead, each node participates in routing by forwarding data for other nodes, and so the determination of which nodes forward data is made dynamically based on the network connectivity. In addition to the classic routing, ad hoc networks can use flooding for forwarding the data. An ad hoc network typically refers to any set of networks where all devices have equal status on a network and are free to associate with any other ad hoc network devices in link range. Links are influenced by the node's resources (e.g. transmitter power, computing power and memory) and by behavioral properties (e.g. reliability), as well as by link properties (e.g. length-of-link and signal loss, interference and noise). Since links can be connected or disconnected at any time, a functioning network must be able to cope with this dynamic restructuring, preferably in a way that is timely, efficient, reliable, robust and scalable. In this paper we represents a survey of performance based routing and transport in wireless ad hoc networks and the techniques proposed to improve the performance of protocols. This paper also analyzes the research activities and problems requiring for possible further work.

Keywords- Wireless Ad-hoc Network, Routing protocols, Performance Analysis

INTRODUCTION

Wireless networking is becoming more and more popular nowadays. The mobile communication environment is often integrated into traditional networks like the Internet or Intranet. However there are base stations which directly keep track of the mobile hosts. The wireless communication only interacts between the mobile hosts and their access points on a fixed network. An ad-hoc network is temporarily formed by a group of mobile hosts communicating over wireless channels without any fixed network interaction and centralized administration. In the infrastructure, all the mobile hosts communicate with other mobile hosts in a wireless multi-hop routing style. All the mobile hosts act as routers in the network. Because the routers are mobile, the network topology is changed frequently by some events among mobile hosts. For examples, the mobile hosts switch on/off or the mobile hosts move from some place to another. The routing scheme in ad-hoc networks is more challenging than traditional networks in terms of dynamic network topology. In an ad-hoc network, all the mobile nodes communicate with each other by wireless channels. A physical medium that can sustain data communication between two nodes is called a link. A link may be asymmetric between two nodes. The transmission characteristics of a link depend upon the relative position or design characteristics of the transmitter and the receiver on the link. Due to the property of asymmetric links, a node may receive a message from another node but its transmitting message cannot reach the transmitting one. Also, a link may be symmetric. Both of the two nodes can communicate with each other by local broadcast. If there is a symmetric link between two nodes, we call them neighbors of each other. On the other hand, we call them semi-neighbors of each other in the case of an asymmetric link between two nodes. However, in ad-hoc networks the routing scheme is an important factor to improve the network efficiency. Recently there have been some researches on routing in ad-hoc networks. A mobile host propagates the route discovery message all over the network while a routing request is being issued. Each node that is forwarding this route discovery message adds its address into the source list. Finally the message reaches the destination node. The complete path from source to destination is listed in the packet. The route is replied to the source node. The routes discovered in this way or by hearing routing message in its neighborhood are recorded in the cache [1-3]. In this paper we analysis the performance of routing in wireless ad hoc networks and the techniques in proposed protocols.

BACKGROUND TECHNIQUES

Wireless Ad hoc Networks

With the advance of wireless communication technology, portable computers with radios are being increasingly deployed in common activities. Applications such as conferences, meetings, lectures, crowd control, search and rescue, disaster recovery, and automated battlefields typically do not have central administration or infrastructure available. In these situations, ad hoc networks, or packet radio networks consisting of hosts equipped with portable radios must be deployed impromptu without any wired base stations. In ad hoc networks, each host must act as a router since routes are mostly multi-hop. Nodes in such a network move arbitrarily, thus network topology changes frequently, unpredictably, and may consist of unidirectional links as well as bidirectional links. Moreover, wireless channel bandwidth is limited. The scarce bandwidth decreases even further due to the effects of multiple access, signal interference, and channel fading. Network hosts of ad hoc networks operate on constrained battery power which will eventually be exhausted. Ad hoc networks are also more prone to security threats. All these limitations and constraints make multi-hop network research more challenging [4-5].

Routing Protocols

Routing protocols proposed for mobile ad hoc wireless networks can be generally categorized by the routing strategy. First, there are protocols that are distance vector typed. Pure distance vector algorithms do not perform well in mobile networks because of slow convergence problem. Thus, newly proposed protocols modify and enhance the distance vector algorithm. Protocols of this type include Wireless Routing Protocol (WRP). Destination Sequence Distance Vector (DSDV) routing protocol, Least Resistance Routing (LRR). Second, there are protocols that are based on link state algorithms. Protocols such as Global State Routing (GSR), Fisheye State Routing (FSR), Adaptive Link-State Protocol (ALP), Source Tree Adaptive Routing (STAR), Optimized Link State Routing (OLSR) protocol, and Landmark Ad Hoc Routing (LANMAR) fall into this category. Third, there are on-demand routing protocols that are proposed for ad hoc networks only. On-demand routing protocols do not maintain route to each destination of the network on a continual basis. Instead, routes are established on demand by the source. When a route is needed by the source, it floods a route request packet to construct a route. Upon receiving route requests, the destination selects the best route based on route selection algorithm. Route reply packet is then sent back to the source via the newly chosen route. In on-demand routing protocols, control traffic overhead is greatly reduced since no periodic exchanges of route tables are required. Numerous protocols of this type have been proposed. Lightweight Mobile Routing (LMR), Dynamic Source Routing (DSR), Temporarily Ordered Routing Algorithm (TORA), Ad-Hoc On Demand Distance Vector (AODV) routing, Associativity-Based Routing (ABR), Signal Stability-Based Adaptive (SSA) routing, Routing On-demand Acyclic Multipath (ROAM) algorithm, Multipath Dynamic Source Routing (MDSR), Relative Distance Micro-discovery Ad Hoc Routing (RDMAR) protocol, and Route-Lifetime Assessment Based Routing (RABR) protocol are typical on-demand routing protocols. Fourth, with the advent of GPS (Global Positioning System), protocols making use of node location information while building routes have been proposed recently. With the knowledge of node position, routing can be more effective at the cost of overhead required to exchange location information. Routing protocols that require GPS are Distance Routing Effect Algorithm for Mobility (DREAM), Location-Aided Routing (LAR), Zone-Based Hierarchical Link State (ZHLS), Flow Oriented Routing Protocol (FORP), Grid Location Service (GLS), and Greedy Perimeter Stateless Routing (GPSR) [5] and [6].

Wireless Routing Protocol

Wireless Routing Protocol (WRP) is a distance vector based protocol designed for ad hoc networks. WRP modifies and enhances distance vector routing in the following three ways. First, when there are no link changes, WRP periodically exchanges a simple Hello packet rather than exchanging the whole route table. If topology changes are perceived, only the `path-vector tuples that reflect the updates are sent. These path-vector tuples contain the destination, distance, and the predecessor (second-to-last-hop) node ID. Second, to improve reliability in delivering update messages, every neighbor is required to send acknowledgments for update packets received. Retransmissions are sent if no positive acknowledgments are received within the timeout period. Third, the predecessor node ID information allows the protocol to recursively calculate the entire path from source to destination. With this information, WRP substantially reduces looping situations, speeds up the convergence, and is less prone to the \count-to-infinity" problem. Still, temporary loops do exist and update messages are triggered frequently in networks with highly mobile hosts [1] and [2].

Multicast Protocols

Many different protocols for multicasting in mobile wireless networks have been proposed in recent years. Acharya and Badrinath were the first to address the issue of wireless multicast. Their protocol uses Mobile Support Stations (MSSs) to interconnect static networks with mobile hosts via wireless links. MSSs execute the protocol instead of mobile hosts to lessen the computation, memory, and power load on mobile hosts and wireless links. However, the protocol assumes that mobile hosts can only receive the multicast packets and senders are on the wired network. A similar protocol that is built on top of a user location strategy has been proposed for Personal Communication Service (PCS) networks. The protocol structures guarantees exactly one delivery without broadcasting. Mobile hosts can act both as a multicast receiver and sender. Mobile Multicast (MoM) protocol uses home agent functionality of Mobile IP to extend IP multicast to mobile hosts. It improves scalability by using Designated Multicast Service Providers (DMSP), but it suffers from routing latency. In addition, in order for MoM protocol to work properly, home agents and foreign agents need to be static. All of the protocols introduced above are designed to extend multicast from wired to wireless networks using stationary base stations or mobile support stations [3] and [5] and [7].

Source Routing

Source Routing (SR) was developed and it is a direct descendant of the source routing scheme used in bridged LANs. It uses source routing instead of hop-by-hop packet routing. Each data packet carries the list of routers in the path. The main benefit of source routing is that intermediate nodes need not keep route information because the path is explicitly specified in the data packet. SR does not require any kind of periodic message to be sent, supports uni-directional and asymmetric links, and sets up routes based on demand by the source. DSR consists of two phases: (a) route discovery and (b) route maintenance, which are explained below:

- ***Route Discovery***

When a source has a data packet to send but does not have any routing information to the destination, the source initiates a route discovery. To establish a route, the source floods a Route Request message with a unique request ID. When this request message reaches the destination or a node that has route information to the destination, it sends a Route Reply message containing path information back to the source. The \route cache" maintained at each node records routes the node has learned and overheard over time to reduce overhead generated by a route discovery phase. When a node receives a Route Request packet, this message is forwarded only if all of the following conditions are met: (a) the node is not the target (destination) of the Route Request packet, (b) the node is not listed in source route, (c) the packet is not a duplicate, and (d) no route information to the target node is available in its route cache. If all are satisfied, it appends its identification to the source route and broadcasts the packet to its neighbors. If condition (b) or (c) is not met, it simply discards the packet. If a node is the destination of the packet or has route information to the destination, it builds and sends a Route Reply to the source, as described above.

- ***Route Maintenance***

The main innovation of SR with respect to bridged LAN routing is in route monitoring and maintenance in the presence of mobility. SR monitors the validity of existing routes based on the acknowledgments of data packets transmitted to neighboring nodes. This monitoring is achieved by passively listening for the transmission of the neighbor to the next hop or by setting a bit in a packet to request an explicit acknowledgment. When a node fails to receive an acknowledgment, a Route Error packet is sent to the original sender to invoke a new route discovery phase. Nodes that receive a Route Error message delete any route entry (from their route cache) which uses the broken link. Note that a Route Error message is propagated only when a node has a problem sending packets through that link. Although this selective propagation reduces control overhead (if no packets traverse a link), it yields a long delay when a packet needs to go through a new link [6-8].

SURVEY ON ROUTING PROTOCOL IN WIRELESS AD-HOC NETWORKS

The Effective Multicasting Routing Protocol in Wireless Mobile Ad-hoc Network

G.Narsimha and Dr. A.Venugopal Reddy and Prof. S .S.V.N.Sarma et. al. proposed new techniques to enhance the effectiveness and efficiency of ODMRP. Primary Goals of Enhanced ODMRP: Improve adaptivity to node movement patterns. Transmit control packets only when necessary, Reconstruct routes in anticipation of topology changes, Improve hop-by-hop transmission reliability, and Eliminate route acquisition latency. In Adhoc networks, each host must act as a router since routes are mostly multi hop. Nodes in such a networks move arbitrarily, thus network topology changes frequently. The protocol termed ODMRP is a mesh-based instead of tree based, multicast protocol that provides richer connectivity among multicast members. The major strengths of ODMRP are its simplicity. They used a protocol termed ODMRP (On Demand Multicast Routing Protocol), which is a mesh based multicast protocol that provides richer connectivity among multicast members. By building a mesh and supplying multiple routes, multicast packets can be delivered to destinations on the face of node movements and topology changes. To establish a mesh for each multicast group, ODMRP uses the concept of forwarding group. The forwarding group is a set of nodes responsible for forwarding multicast data on shortest paths between any member pairs. ODMRP also applies on-demand routing techniques to avoid the channel overhead and improve scalability. A soft-state approach is taken to maintain multicast group members. The major strengths of ODMRP are its simplicity. They introduced new techniques to enhance the effectiveness and the efficiency of ODMRP. The protocols were evaluated as a function of a) Speed and b) Multicast group size. In the first set of experiments, the size of multicast group was set constant to 10 and speed varied from 0 km/hr to 72 km/hr. In the second set of simulations, node mobility speed was constant at 18 km/hr and the multicast group size varied from 2(unicast) to 20. The metrics of interest are: Packet delivery ratio, end-to-end delay, control overhead and number of total packets transmitted per data packet delivered. They had applies a new route selection algorithm to choose routes that will stay valid for the longest duration of time. The usage of stable routes further reduces the control overhead. And it also introduced a method to eliminate the route acquisition latency. Simulation results showed that the new methods improved the basic scheme significantly. More data packets were delivered to destinations, less control packets were produced in low mobility, control packets were utilized more efficiently in high mobility, and end-to-end delay was shorter. The proposed technique need to enhance more channel access quality in future [1].

Performance Evaluation and Analysis of Cluster Based Routing Protocols in MANETs

Yogesh Chaba and Yudhvir Singh and Manish Joon et. al. focused on cluster-based routing protocol (CBRP) and its comparative analysis with two other routing protocols : Ad-hoc On Demand Distance Vector(AODV) and Dynamic Source Routing (DSR) on the basis of packet delivery fraction, normalized routing overhead and average delay with varying number of sources and pause time. Due of the limited transmission range of wireless network, multiple "hops" are needed to exchange data across the network. In order to facilitate communication within the network, a routing protocol is used to discover routes between nodes. The primary goal of such an ad-hoc network routing protocol is efficient route establishment between a pair of nodes so that messages may be delivered in a timely manner. Route construction should be done with a minimum of overhead and bandwidth consumption. This paper evaluated and compared CBRP, AODV and DSR routing algorithms using the GLOMOSIM. DSR and CBRP achieve a low Routing Overhead than AODV, and among three DSR achieve lowest routing overhead. AODV has lowest average end to end delay. Packet delivery ratio of CBRP and DSR is almost same (90 %) and is better than AODV which gives 82.8% PDR. The proposed protocols performance improves as pause time increases but it is not sufficient, it need more improve for better performance in pause time and QoS [2].

A Framework to Provide a Bidirectional Abstraction of the Asymmetric Network to Routing Protocols

Vikram Bali, Rajkumar Singh Rathore, Amit Sirohi, and Prateek Verma et. al. presented a study of various routing protocols and the impact of asymmetric links on network connectivity. It then presents a framework that provides a bidirectional abstraction of the asymmetric network to routing protocols. This new framework works by maintaining multi-hop reverse routes for unidirectional links and provides three new abilities: improved connectivity by taking advantage of the unidirectional links, reverse route forwarding of control packets to enable off-the shelf routing protocols, and detection packet loss on unidirectional links. This framework takes the approach of discovering and maintaining reverse paths for unidirectional links. Experiments were conducted in ns2 simulator with the design of bidirectional routing abstraction to maintain reverse routes for unidirectional links in an efficient and scalable manner. Performance evaluation shows how a typical routing protocol, such as the well-known AODV, layered on this framework achieves superior connectivity in asymmetric networks. Bidirectional routing abstraction can be done in existing AODV algorithm making it work in reverse route forwarding method. It has been implemented in Network Simulator (ns2) A. Topology Models First they experimented AODV's performance under unidirectional link conditions through the following scenarios.

P-model (probabilistic model): This model simulates unidirectional links created by random irregularities in signal propagation due to ambient conditions. This model takes a basic, bidirectional topology with a transmission range of 220 m for each node and then probabilistically converts links to become unidirectional. N-model (Noise model): This model simulates unidirectional topologies created by external radio sources that increase noise and congest some nodes. In this model, the noise sources are randomly distributed throughout the network with uniform probability.

D-model (diversity model): Finally, the D-model stimulates unidirectional topologies caused by diversity in the transmission power of nodes. They define the diversity D of a topology as the difference between the maximum and the minimum transmission ranges of the nodes in the network and then assign each node a transmission range picked randomly (uniform distribution) from a set of transmission ranges in the interval, where is the nominal transmission range.

This paper made three overall contributions: First, it presented a quantitative analysis of how network asymmetry caused by alien radio sources, heterogeneity in transmission power, and random fluctuations in signal propagation that affect conventional MANET routing protocols. Second it presented the design of BRF, based on a novel protocol to maintain reverse routes for unidirectional links in an efficient and scalable manner. Finally, it showed through extensive evaluation how a typical routing protocol, such as the well-known AODV, layered on BRF achieves superior connectivity in asymmetric networks. Proposed routing works with little overhead under asymmetric condition and also it does not avoid unidirectional links, this framework can be easily used to enhance the performance of the existing protocols. In future, this framework can be used as a general purpose framework for all the routing protocols used in Mobile Ad-hoc networks [3].

AODV Routing Protocol with Selective Flooding

Geetam S. Tomar, Manish Dixit & Shekhar Verma et. al. compared the relative performance of existing protocols and evaluates them. It has been determined that under similar conditions AODV outperforms the other protocols. In this work they had proposed an algorithm to overcome flooding problem in the network. The proposed algorithm is selective flooding in place of broadcasting. It is proposed to lessen the number of packets within the network. This reduces the routing Packet overhead. The algorithm was incorporated in the AODV algorithm and simulated in the identical environment.

The paper was basically divided in to two phases for executing the work. In first phase three protocols DSDV, DSR and AODV, and these protocols were compared on performance basis, which was based on various parameters concerned with network. In second phase, a correction in

AODV was proposed and implemented. The overall performance of the network is improved in terms of throughput and delivery rate, which was the objective of the proposed modification. The basic emphasis was given on bandwidth as scarcity of bandwidth is day to day phenomena and has to be taken care due to air interface constraints for the wireless networks. The proposed scheme can't solve properly the low bandwidth problem in ad-hoc networks though with an increase in delay. The increase in delay in not to the extent, which can hamper its usual operation and delivery of the packets and it need to improve [4].

Enhancing Quality of Service in MANETS byEffective Routing

J.Premalatha and P.Balasubramanie et. al. evaluates the performance evaluation by combining Network layer and MAC layer protocols with Transport layer congestion control mechanisms operating in a mobile adhoc network. In Adhoc networks, certain QoS parameters like error rate, delay and packet loss are increased and certain parameters like throughput and delivery ratio are decreased in Transport layer is due to MAC problems and disconnection is also possible due to mobility because the network layer is not able to detect the path to deliver the packets. So, combine the mechanisms of these three layers to improve the QoS drastically. They examined the effects of two different MAC protocols— IEEE 802.11and IEEE802.11e with AODV and DSR of routing algorithms with Slow start and Arithmetic Increase and Multiplicative Decrease (AIMD) mechanism of TCP.IEEE802.11uses distributed coordination function (DCF) where EEE802.11e uses enhanced distributed coordination function (EDCF). Specifically, they accessed the impact of multiple wireless hops and node mobility on the throughput performance of TCP on each MAC protocol with two routing algorithms. Additionally the other QoS parameters of delay, Bandwidth delay product, delivery ratio and packet loss is also investigated. To improve the performance of QoS the transport layer will require the design of distributed medium access control scheme like IEEE802.11e and proper packet transmission mechanism like slow start with suitable routing algorithm AODV. This results show that the interaction between transport layer with the Network and MAC protocols has a significant impact on the achievable throughput, Packet Delivery Ratio, Bandwidth Delay Product and packet loss in ad hoc networks. Results show that in all instances, the QoS parameters, packet loss is reduced drastically to 40-50% in IEEE802.11e with slow start and AODV than IEEE802.11 with slow start and DSR. Results shows, the QoS parameters 35-40% improvement in throughput, 25-30% improvement in bandwidth-delay product, 15-20% improvement in delivery ratio, packet loss is reduced drastically to 20-25% in IEEE802.11e with AIMD and AODV than IEEE802.11 with slow start and DSR. The future work is to implement Cross layer architecture and these three layers know the status of other layers and collectively improve the QoS performance in ad-hoc networks [5].

Evaluation of Ad-hoc networks with different Multicast Routing Protocols and Mobility Models

B.Malarkodi,P.Gopal and B.Venkataramani et. al. presented the results on the simulation study of the impact of different mobility models on Multicast Routing Protocols. The performance of On Demand multicast Routing Protocol (ODMRP) and ad-hoc demand Driven Multicast Routing (ADMR) protocol under different mobility scenario is evaluated. The results show that the throughput of ADMR is higher than of ODMRP at high mobility. This is achieved at the cost of increase in delay and transmission over head. Under low mobility, ODMRP has higher throughput than AMDR. Among the three mobility models considered, the throughput of ODMRP is the highest at low mobility. In their simulation, the channel capacity of mobile hosts is set as 2 Mbps. A free space propagation model with a threshold cutoff is used as the channel model. In the free space model, the power of a signal attenuates as 1/r2, where r is the distance between mobile hosts. In the radio model, capture effects are taken into account. They used the Distributed Coordination Function (DCF) of IEEE 802.11 for wireless LANs as the MAC layer protocol. It has the functionality to notify the network layer about link failures. The simulated traffic is Constant Bit Rate (CBR) traffic. The results show that mobility pattern influences the connectivity graph which in turn influences the protocol performance. They analyzed the performance of ADMR and ODMRP multicast routing protocols under different mobility patterns. The result shows that ADMR is able to maintain good throughput even at high mobility as compared to ODMRP.

We observed that delay and transmission over head does not sufficient for mobilityr, so the mobility need to improve more in future [6].

Position Based Multicast Routing Protocol for AD-hoc Wireless Network Using Backpressure Restoration

A K Daniel and R Singh and Zubair Khan et. al. proposed a novel scheme PBMRP–BR (position-based Multicast Routing Protocol for Ad-hoc Network Using Backpressure Restoration) for efficient transmission of multimedia applications in Ad-hoc Network, which provides priorities for routing based on Distance of path, Load at the node (ie , traffic) and queue length at the node(ie ,bandwidth). It also keeps the path information including bandwidth resources of each node for routing decisions. The problem of the link failure in the channel during the call in progress thus lead in the degradation of the QoS (Quality of Service).To deal this they were using a Backpressure Technique The simulation results shows that the proposed algorithm is able to find a better solution, fast convergence speed and high reliability. The simulation results showed the proposed PBMRP-BR protocol achieve the above objectives and gives the batter results than previous schemes like DSR for the maintenance of overheads and the path reliability. The proposed scheme adopts the path information kept at each node and bandwidth information. It is compared to traditional schemes. The simulation show that the proposed PBMRP-BR protocol achieved the above objectives and is superior to that of the DSR scheme for the maintenance overhead and the path reliability. The proposed scheme will need to improve the congestion reduction in network and improving bandwidth utilization in future [7].

Enhance Topology Control Protocol (ECEC) to Conserve Energy based clusteringin Wireless Ad Hoc Networks

Afsaneh fathi and Dr hasan taheri et. al. presented new topology control protocols that extend the lifetime of dense ad hoc networks while preserving connectivity, the ability for nodes to reach each other. Our protocols conserve energy by identifying redundant nodes and turning their radios off. Cluster-based Energy Conservation (CEC) directly observes radio connectivity to determine redundancy nodes and so can be more aggressive at identifying duplication and more robust to radio fading. In CEC, if the lifetime of any gateway (LTgateway) of the cluster is less than life time of the cluster, then there will not be any connectivity in the network for L T-cluster, L T- gateway amount of time. Their protocol ensures that the connectivity in the network is maintained even in the case of the above stated scenario while consuming minimum energy. In this protocol (ECEC), those nodes that can hear multiple cluster-heads broadcast velocity, position, and transmission rate and life time information, then c1usterhead base on quality after sorting; in this paper we select 2 nodes as gateways, one of them as primary gateway and the other one as reserved gateways. ECEC is an energy efficient topology control protocol for wireless Ad hoc networks which ensures minimum connectivity in the network at all times. Simulation results and analysis of the ECEC algorithm prove that ECEC outperforms existing topology control protocols in terms of performance metrics like network lifetime and power consumption. The proposed energy control mechanism will need improve the traffic control scheme for better performance [8].

Multipath Routing Protocol using Cross-layer based QoS Metrics for IEEE 802.11e WLAN

Shaik Madhar Saheb and A. K. Bhattacharjee and Dharmasa, et. al. proposed a multipath routing protocol using cross-layer based metrics for improving the QoS of multimedia traffic in IEEE 802.11e networks. Initially a combined cost metric is formed based on traffic contention time, average transmission delay and signal fading values. The path with minimum combined cost is chosen as the primary path from the multiple disjoint paths discovered. In case of failed data transmission, the traffic is re-routed through an alternate path with next minimum cost. The route with least cost value is selected by the source from the total RREP it receives. In case of failure or breakage in any route in the transmitted path, it selects the next available best path from the multiple disjoint paths and reroutes the data through that path. The performance is mainly evaluated according to: a) Average Ratio of Packet Delivery: It is the proportion of the total packets received to the total packets transmitted. b) Throughput: The average throughput received measured in Mb/sec, and c) Average End-to-End Delay: The average surviving data packets from source to destination. The simulation results demonstrate that the proposed Multi-path routing protocol helps in achieving better delivery ratio and throughput with reduced delay.

The proposed routing protocol need to improve energy efficient rule using end to end delay reduce [9].

Efficient Routing Protocol to Support QoS in Wireless Mesh Network

Chems-eddine BEMMOUSSAT, Fedoua DIDI, Mohamed FEHAM, et. al. designed QoS to promote and support multimedia applications (audio and video), real time. However guarantee of QoS on wireless networks is a difficult problem by comparison at its deployment in a wired IP network. In this paper, they presented an efficient routing protocol named as “QoS- Cluster Based Routing Protocol” (Q-CBRP) to support QoS in Wireless Mesh Network. This paper compared the performance of our Algorithm Q-CBRP in WMN and others two routing protocols used in WSN, Ad-hoc and MANETs network (CBRP and AODV). These routing protocols were compared in terms of Packet delivery ratio, Average delay and routing overhead when subjected to change in pause time and varying number of Mesh clients. The results show that by comparing the performance between Q-CBRP, CBRP and AODV, they can concluded that cluster topologies bring scalability and routing efficiency for a WMN as network size increase.

In future it can be improved to use a random mobility for Mesh clients, and also specify the type of traffic and it will measure the different criteria of QoS in a mobile WMN [10].

CONCLUSION

An ad hoc network is a collection of wireless mobile nodes dynamically forming a temporary network without the use of any preexisting network infrastructure or centralized administration. Routing protocols used in ad hoc networks must automatically adjust to environments that can vary between the extremes of high mobility with low bandwidth, and low mobility with high bandwidth. The topology of the network can be controlled by controlling which links are allowed to be present or absent in the network. In a wireless network, a link is present between two nodes, if both of them are within range of each other. Thus in this case topology control boils down to controlling the transmitting ranges i.e., the transmitting power of the nodes. A lot of research of mobile ad hoc networks has focused on the development of routing protocols. Thus, a lot of research has since focused on mechanisms to improve the performance in cellular wireless systems. In this paper we present a survey of advanced routing protocol in wireless ad-hoc network. During the survey, we also find some points that can be further explored in the future, such as to find some effective solutions of the routing protocols in wireless ad-hoc network using modified efficient routing technique.

After surveying different techniques on wireless routing we define the Advantages and Disadvantages or future work of techniques in the table:

Techniques	Advantages	Disadvantages / Future Works
Wireless Ad-hoc Networks, ODMRP, Multi-casting	The usage of stable routes further reduces the control overhead. And it also introduced a method to eliminate the route acquisition latency. Simulation results showed that the new methods improved the basic scheme significantly. More data packets were delivered to destinations, less control packets were produced in low mobility, control packets were utilized more efficiently in high mobility, and end-to-end delay was shorter.	The proposed technique need to enhance more channel access quality in future [1].
CBRP, AODV, DSR, MANET	The primary goal of such an ad-hoc network routing protocol is efficient route establishment between a pair of nodes so that messages may be delivered in a timely manner. Route construction should be done with a minimum of overhead and bandwidth consumption.	The proposed protocols performance improves as pause time increases but it is not sufficient, it need more improve for better performance in pause time and QoS [2].
Asymmetry, Routing, Unidirectional links	Proposed routing works with little overhead under asymmetric condition and also it does not avoid unidirectional links, this framework can be easily used to enhance the performance of the existing protocols.	In future, this framework can be used as a general purpose framework for all the routing protocols used in Mobile Ad-hoc networks [3].
Multi-hop, Routing, Flooding, Clustering	The overall performance of the network is improved in terms of throughput and delivery rate, which was the objective of the proposed modification. The basic emphasis was given on bandwidth as scarcity of bandwidth is day to day phenomena and has to be taken care due to air interface constraints for the wireless networks.	The proposed scheme can't solve properly the low bandwidth problem in ad-hoc networks though with an increase in delay. The increase in delay in not to the extent, which can hamper its usual operation and delivery of the packets and it need to improve [4].
MAC, TCP, AODV, DSR, QoS	This results show that the interaction between transport layer with the Network and MAC protocols has a significant impact on the achievable throughput, Packet Delivery Ratio, Bandwidth Delay Product and packet loss in ad hoc networks. Results show that in all instances, the QoS parameters, packet loss is reduced drastically to 40-50% in IEEE802.11e with slow start and AODV than IEEE802.11 with slow start and DSR.	The future work is to implement Cross layer architecture and these three layers know the status of other layers and collectively improve the QoS performance in ad-hoc networks [5].
MANET, Random way point, Random Drunken	The results show that mobility pattern influences the connectivity graph which in turn influences the protocol performance. They analyzed the performance of ADMR and ODMRP multicast routing protocols under	We observed that delay and transmission over head does not sufficient for mobility, so the mobility need to improve more in future [6].

	different mobility patterns. The result shows that ADMR is able to maintain good throughput even at high mobility as compared to ODMRP.	
Wireless Ad-hoc network, Routing Protocol, Multicasting,	The simulation show that the proposed PBMRP-BR protocol achieved the above objectives and is superior to that of the DSR scheme for the maintenance overhead and the path reliability.	The proposed scheme will need to improve the congestion reduction in network and improving bandwidth utilization in future [7].
Wireless Ad Hoc networks, clustering, cluster head, gateway, Topology control, Energy conservation	Simulation results and analysis of the ECEC algorithm prove that ECEC outperforms existing topology control protocols in terms of performance metrics like network lifetime and power consumption.	The proposed energy control mechanism will need improve the traffic control scheme for better performance [8].
WLAN, Routing Protocol, QoS	The simulation results demonstrate that the proposed Multi-path routing protocol helps in achieving better delivery ratio and throughput with reduced delay.	The proposed routing protocol need to improve energy efficient rule using end to end delay reduce [9].
Wireless Mesh, Routing Protocol, QoS	The results show that by comparing the performance between Q-CBRP, CBRP and AODV, they can concluded that cluster topologies bring scalability and routing efficiency for a WMN as network size increase.	In future it can be improved to use a random mobility for Mesh clients, and also specify the type of traffic and it will measure the different criteria of QoS in a mobile WMN [10].

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