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Quality of Services for Reactive Routing Protocol in Mobile Ad-hoc Network: Survey and Discussion

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Abstract: *Mobile Ad-hoc Network (MANET) is assumed an encouraging technology that constructs interim network connectivity without the aid of any prior architecture which is required during abnormal circumstances or in provisional events such as in emergencies, crisis conditions, and military conflicts. Source routing in MANET is challenged by arbitrary and random node mobility that triggers a lot of route discoveries due to frequent link breakages. This generates a massive number of Route Request (RREQ) packets resulting from the flooding procedure. The flooding procedure is used in the route discovery process and produces a storm of the broadcast, leading to an increase in packet loss and control overhead. In this work we study and evaluate the quality of services parameters for different routing protocol.*

Keywords:- Mobile Ad-hoc network, Wireless sensor network, Cognitive radio network, Performance parameter, Quality of services.

Introduction

Wireless technology may be managed by a core infrastructure that regulates the connections between network nodes, or it may operate as an infrastructure-free system known as an ad hoc network. The mobile ad hoc network (MANET) is a class of wireless ad hoc network (WANET) that provides a large number of applications in various fields. Mobile ad-hoc networks (MANET) are ambiguous networks comprising of mobile stations (MSs) furnished with wireless cellular and network abilities, collaborating without any network's central structure. The presence of this network opens the pat for a great variety of applications scenario like enterprise and home networks, emergency applications, wireless sensors networks, and vehicles communication applications, etc. The main characteristics of MANET include its fast deployable wireless network, and the fact that it is self-organizing as well as infrastructure-less. As a result, they are incredibly suitable for use in unique outdoor events, communication in areas without a crises, radio infrastructure, natural catastrophes, and military operations, among others. Mobile Ad-hoc Network

(MANET) is a collection of mobile nodes that moves arbitrarily without any fixed infrastructure and centralized management. MANET has been beneficially utilized in many domains which are described in Figure 1.

Figure 1: Example of mobile ad hoc network (MANET) structure [2].

The nodes in MANET can be thought of as either data sources, data destinations, or router nodes. Therefore, generally, a node is capable of delivering a message directly to all of its immediate neighbours or an additional inaccessible node via other intermediary nodes(s). Multi-hopping is the primary mechanism for increasing network capacity and performance. Within the multi-hop paradigm, the source node can communicate with its destination through intermediate nodes as the destination is out of the communication range of the source node. This means that even if the source is not in range, the destination can receive data from the source.

MANET is a collection of mobile nodes that communicate with other nodes in an open environment without the presence of any centralized authority. These networks are extremely versatile and can be used for a wide range of applications because they don't have any pre-existing infrastructure. The limited range of wireless interfaces necessitates the use of intermediary nodes in most cases. This means that each node in multi-hop ad-hoc networks has to act as a router, sender and receiver. Congestion is one of the challenges in the network, and it is not possible to remove congestion from the network. Heavy congestion means more loss of data. The senders are continuously sending the data packets, and the intermediate nodes' responsibility is to forward the data to the next node or destination. The nodes consumes energy for each and every operation, if a data packet is dropped, the data is again retransmitted to the destination. Retransmission means wastage of resources, and energy is a valuable resource for communication. The retransmission consumes bandwidth and affects the performance of new senders. Congestion can be reduced by using a multipath and buffer management scheme. Internal changes in the standardized packet format are required to control loss of resources. In mobile multi-hop ad-hoc networks, finding a route between communication endpoints is a major challenge. A number of approaches to this problem have been proposed in recent years, but no routing algorithm has yet been found that works in all circumstances.

The rest of this paper is organized as follows in the first section we describe an introduction of mobile ad-hoc network. In section II we discuss the classification of different routing protocol. In section III we discuss the literature study for different protocol with different number of quality of services parameters, finally in section IV we conclude the about our paper.

II. Classification of Routing Protocol

Ad hoc networks are made up of an autonomous system of mobile devices which act as both hosts and routers. This permits the mobile devices to interconnect one another through multi-hops without a predefined communication. Ad hoc networks may support different wireless standards, the present state-of the-art remains to be mostly limited to their operations in the 900 MHz and the 2.4 GHz industrial, scientific and medical (ISM) bands. With exponentially growing growth of wireless devices, these bands are increasingly getting congested. Simultaneously, there are lots of frequency bands licensed to operators, for example in the 400–700 MHz range, that are used sporadically or under-utilized for transmission. There are three types of MANET routing protocols categorized as proactive, reactive, and hybrid. System wide broadcasts are required for proactive protocols developed from static networks, as they need periodic routing information with neighbor nodes. These protocols refer to storing a routing entry for every possible network destination[5]. A reactive routing protocol builds a route when a network node connects with another node. Node-to-node route discovery occurs anytime a node wishes to go to another location. This approach saves the route when the destination is no longer accessible by all possible routes from the source or if the route is no longer wanted. Routers that use a hybrid protocol have both proactive and reactive features.

The FCC has recently approved the usage of unlicensed devices in licensed bands. Consequently, dynamic spectrum access (DSA) techniques are proposed to solve these current spectrum inefficiency problems. This new area of research foresees the development of cognitive radio (CR) networks to improve spectrum efficiency [1].

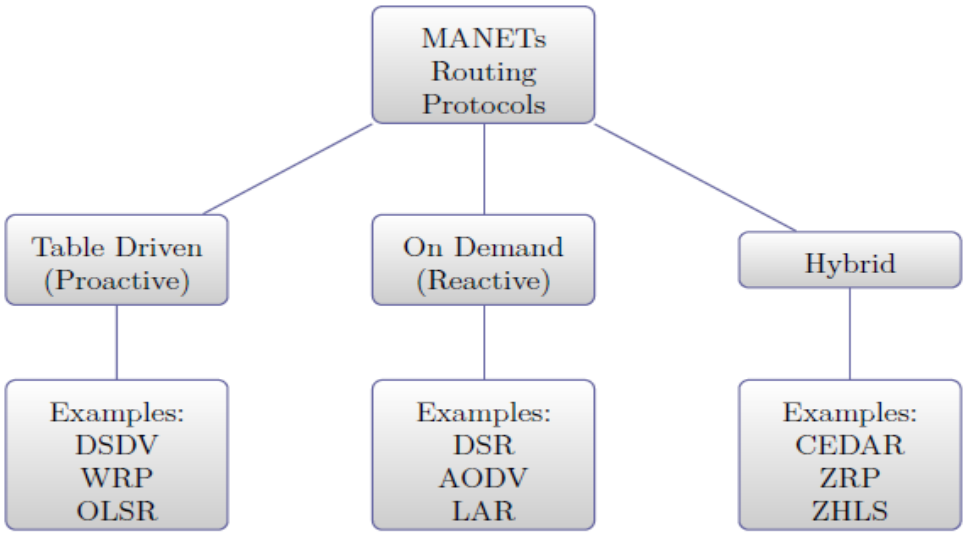

Figure 2: Different types of mobile ad-hoc network routing protocol [5].

III. Literature Survey

Two kinds of MANET protocols are dominantly used: proactive and reactive protocols. While proactive protocols, such as optimized link state routing (OLSR), construct the routing table in advance, reactive protocols, such as ad-hoc on-demand distance vector routing (AODV), process route search whenever a packet delivery is required.

[1] Mobile ad-hoc wireless networks give us the high probability and high properties to create networks, without any central management or infrastructure, independent and temporary network, that is means wide ubiquitous networks. The intermediate nodes should be able to communicate between them to send and receive the data with ability using at anytime and anywhere, the mobility of the intermediate node between the source and destination gives us unstable topology maybe the connection between the nodes will be break often. Therefore, the strategies to design any wireless depend on path routing and protocol selection. In this paper they study and evaluate the effect of mobility on the routing protocols DSDV, AODV and DSR in two different scenarios, the density of nodes and different area in NS2.35 simulation by using three performance metrics in the evaluating the routing protocols are Average Throughput, Packet Delivery Ratio and Average End-to-End Delay.

[2] Mobile Ad-hoc Networks (MANETs) are self-sufficient networks that can work without the need for centralized controls, pre-configuration to the routes or advance infrastructures. The nodes of a MANET are autonomously controlled, which allow them to act freely in a random manner within the MANET. The nodes can leave their MANET and join other MANETs at any time. These characteristics, however, might negatively affect the performance of the routing protocols and the overall topology of the networks. Subsequently, MANETs comprise specially designed routing protocols that reactively and proactively perform the routing. This paper evaluates and compares the performance of two routing protocols which are Ad-Hoc On-Demand Distance Vector (AODV) and Optimized Link State Routing (OLSR) in MANET environment. The study includes implementing a simulation to examine the performance of the routing protocols based on the variables of the nodes' number and network size. The evaluation results show that the AODV outperforms the OLSR in most of the simulated cases. The results further show that the number of nodes and network size has a great impact on the Throughput (TH), Packet Delivery Ratio (PDR), and End-to-End delay (E2E) of the network.

[3] A mobile ad-hoc network is a collection of mobile nodes that goatherd to exchange data and information from source to destination. Typically, MANET has no infrastructure, which can call it an infrastructure-less network. The node in the network communicates directly with the neighbor nodes that are already within the wireless range of that node. MANET has several types of routing protocols that can be used to establish links between nodes. These routing protocols are different in their mechanisms, which are AODV and DSR. in this paper this simulation study carries out two routing protocols to evaluate their performance and quality of service in terms of energy consumption and packet delivery ratio. The comparison study was carried out using the NS2 simulator. The results of the simulations show better performance of DSR over AODV in different scenarios.

[4] VANET is a branch of MANETS, where each vehicle is a node, and a wireless router will run. The vehicles are similar to each other will interact with a wide range of nodes or vehicles and establish a network. VANETs provide us with the infrastructure to build new solutions for improving safety and

comfort for drivers and passengers. There are several routing protocols proposed and evaluated for improving VANET's performance. The simulator is preferred over external experience because it is easy, simple, and inexpensive. In this paper, we choose AODV protocol, DSDV protocol, and DSR protocol with five different nodes density. For each protocol, as regards specific parameters like (throughput, packet delivery ratio, and end- to- end delay). On simulators that allow users to build real-time navigation models of simulations using VANET. Tools (SUMO, MOVE, and NS-2) were used for this paper, then graphs were plotted for evaluation using Trace-graph. The results showed the DSR is much higher than AODV and DSDV, In terms of throughput. While DSDV is the best choice because of the low average end to end delay. From the above, we conclude that each strategy has its own negative and positive aspects that make it ideally suited to a particular scenario than other scenarios.

[5] The most important experiences we discovered from several disasters are that cellular networks were vulnerable, and the loss of the communication system may have a catastrophic consequence. Mobile ad-hoc networks (MANETs) play a significant role in the construction of campus, resident, battlefield and search/rescue region. MANET is an appropriate network for supporting a communication where is no permanent infrastructure. MANET is an effective network that uses to establishing urgent communication between rescue members in critical situations like, disaster or natural calamities. The sending and receiving data in MANET is depending on the routing protocols to adapt the dynamic topology and maintain the routing information. Consequently, This paper evaluates the performance of three routing protocols in MANET: ad-hoc on-demand distance vector (AODV), destination sequenced distance vector (DSDV), and ad-hoc on-demand multipath distance vector (AOMDV). These protocols are inherent from different types of routing protocols: single-path, multi-path, reactive and proactive mechanisms. The NS2 simulator is utilized to evaluate the quality of these protocols. Several metrics are used to assess the performance of these protocols such: packet delivery ratio (PDR), packet loss ratios (PLR), throughput (TP), and end-to-end delay (E2E delay). The outcomes reveal the AOMDV is the most suitable protocol for time-critical events of search and rescue missions.

[7] The existing network infrastructure may not work well in a disaster environment caused by a fire or an earthquake. Instead of relying on the existing infrastructure, communicating through a mobile ad hoc network (MANET) is recommended because MANET can configure a network without an infrastructure communication system. In addition, firefighters conducting emergency activities in harsh environments surrounded by flames and smoke need a communication system to assist their rapid firefighting operations. Existing work is not suitable for indoor firefighters communications because they did not consider the indoor disaster environment well. In this proposed scheme, dual channels (i.e., 2.4 GHz and sub-GHz bands) are used for an efficient routing table configuration. Data frame and HELLO message are exchanged through the 2.4 GHz band, while the neighbor list of each node is exchanged through the sub-GHz band. Each node can configure the routing table based on the exchanged neighbor list. A performance evaluation is conducted to compare the proposed technique with enhanced versions of optimized link state routing (OLSR) and destination-sequenced distance vector routing (DSDV). The results show that the proposed scheme outperforms the other two MANET routing algorithms (i.e., OLSR-mod and DSDV-mod) in terms of the packet delivery ratio (PDR), end-to-end delay, and initial routing table configuration time approximately 27.8%, 4.7%, and 166.7%, respectively.

[8] Disasters could cause communication systems to partially or completely down. In such a case, relief operations need a rapidly deployed communication system to save lives. Exchanging information among the

rescue team is a vital factor to make important decisions. Communication system required to be robust to failures, rapidly deployable, easily maintainable to provide better services. Wireless ad-hoc networks could be the choice of establishing communication with the aid of existing infrastructure in a post-disaster case. To optimize mobile ad-hoc network performance, address the challenges that could lead to unreliable performance is required. One and the most crucial key challenge is routing information from a sender to a receiver. Due to the characteristics of a disaster environment such as signal attenuation, communication links exist between rescue crew is short-lived, suffer from frequent route breakage, and may result in unreliable end-to-end services. Many routing protocols have been proposed and evaluated in different network environments. This paper presents the basic taxonomy of Mobile Ad Hoc Networks and the state of the art in routing categorizes (Proactive, Reactive, Geographic-aware and Delay tolerant Networks (DTN)).

[11] Recently a great deal of attention has been paid to Mobile Ad Hoc Networks (MANETs) due to their important roles in many different applications that include, but are not limited to: civil, military, and health applications. This kind of network can reach places that difficult for human beings to reach such as disaster areas. In spite of the rapid development of MANET technologies, the routing process still poses a real challenge due to the high mobility and dynamic topology features of such networks. This paper presents an investigation into some popular MANET routing protocols. This investigation aims to evaluate the performance of MANET routing protocols using the key performance indicators: throughput, end to end delay, and data packet delivery ratio. These indicators are commonly used in such evaluations. Our investigation results showed that DSR and AODV outperform DSDV. In a high-density network (a network with a large number of nodes), AODV outperforms DSR; while, in a low-density network the DSR performs better than the AODV.

[12] A mobile Ad hoc and sensor wireless network commonly includes various mobile devices and sensors with limited resources. In such network, energy constraint and link stability are the most critical parameters to take into consideration when deploying routing mechanisms, to assure reliable communication between nodes. These requirements are due to the network scalability and the absence of a fixed infrastructure, which may cause a rapid depletion of the nodes batteries and leads onto network link breakages. LE-OLSR (Lifetime Enhancement - Optimized Link State Protocol) is a variant of the existing OLSR. This latter is widely used as routing protocol for mobile ad-hoc and wireless sensor networks. LE-OLSR implements a new load balancing algorithm; it takes into account energy constraints of a node when selecting routers, responsible for forwarding data packets over the entire network. The aim of our work is to study and simulate the LE-OLSR protocol behavior in realistic mobile environments, including scenarios with various residual energy constraints schemes. The performed simulations had shown that LE-OLSR performances decrease compared to the case of ideal mobile network. Nevertheless, LE-OLSR had shown persistence and fair results in the realistic environment. The obtained results show that LE-OLSR protocol is an adequate and a prime solution for dense mobile ad-hoc networks.

IV. Conclusion

Mobile Ad Hoc Networks have evolved rapidly and are finding numerous applications in the areas of self-creating, self-organizing and self-administering wireless networks. The present paper describes use of and comparison of three routing protocols. The parameters used for comparison are throughput and delay in response by varying the number of mobile nodes. A random waypoint mobility model was used for fixing the mobile nodes. In this paper we study different research work using different protocol, In future we also

increase the performance for these quality of services parameters, there are some parameters are network overhead, end to end delay, throughput and packet delivery ratio.

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