

A Survey on Lifetime Maximization in MANET

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Abstract-- Mobile Ad hoc Networks (MANETs) are created dynamically without the support of any infrastructure with less cost and the nodes in the network communicate in a peer-to-peer basis. The communication between the nodes in the network is established with well-defined routing protocols. The traditional routing protocols were modified to consider the limitations of MANETs and developed routing protocols like DSDV, DSR and AODV to suit the needs of this dynamic network. MANETs are used for real time traffic transportation like video and audio along with data traffic and for real time traffic, providing routing with QoS is a challenging task. Although the conventional routing protocols of MANETs had been modified to provide QoS, most of the proposed protocols either concentrate on one or two QoS parameters in identifying a path. The path stability is ignored where the path break happens often due to node mobility resulting in link break or drain in node energy leading to node failure.

Keywords-- Mobile Ad hoc Networks (MANETs), Quality of Service (QoS), Lifetime Maximization

I. INTRODUCTION

MANETs are dynamic, infrastructure-less networks formed by the collection of mobile hosts that are connected by radio links. The communication between these nodes is achieved either directly or through intermediate nodes acting as routers. The dynamic nature of the network leads to several issues and Challenges that have to be considered in developing routing protocols. The real time applications of MANET necessitate the need for QoS support such as efficient bandwidth, minimum delay, maximum throughput and maximum network lifetime along with routing protocols. These real time design issues motivated towards the objective of researching suitable Energy aware QoS based routing techniques for establishing rapid and reliable communication in MANET [1-3].

The Evolution of mobile devices is driving a revolutionary change in the society. This leads to the change from personal computing to pervasive computing as suggested by Weiser (1999). In pervasive computing, the mobile nodes communicate with each other and a user can get to all the expected data at whatever point and any place required. A major goal towards today's existence of 4G wireless evolution is to provide a pervasive environment that supports users in accessing information with others at anytime, anywhere. Specially appointed Organization, a fundamental innovation for giving inescapable processing environment is an infrastructure less, self-configuring network that can be established on the fly. Fixed back-bone networks are not required for communication among the nodes. Any hub can

join or leave the organization whenever. Every one of the hubs in the Specially appointed network are fit for speaking with one another without the guide of passageway. Each hub in the organization goes about as a switch and advances the bundle from one hub to the next [4, 5]. The hubs in the Impromptu organization are highly mobile and very difficult to form a route for communication. The nodes within their communication range can communicate with each other directly called single hop communication whereas the nodes that are out of communication range communicates indirectly through the intermediate nodes called multi-hop communication [6-9].

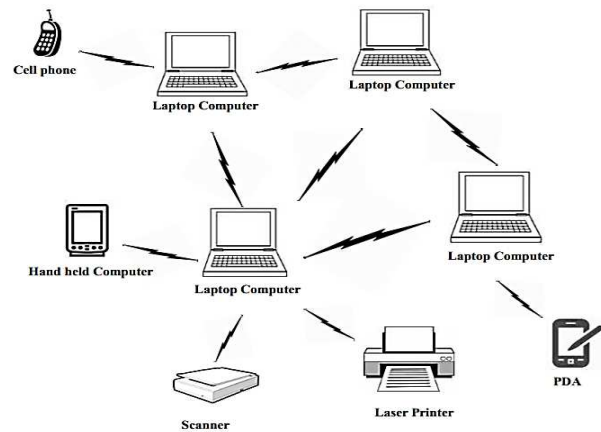


Fig. 1. Ad-hoc mode of Communication

Ad-hoc mode of communication is displayed in Fig. 1. The hubs in MANETs are free of one another and rely upon no prior foundation or base stations. Network Hubs in MANETs are allowed to move arbitrarily that changes the organization geography quickly and unusually. All organization exercises, for example, finding the geography and conveying information bundles, must be executed by the actual hubs, either independently or aggregately. Lack of infrastructure makes ad hoc network deployment rapid even in rural and military areas without any special hardware requirement for interconnection [10]. Such an organization might work in an independent style, or might be associated with the Web. Multi-bounce, portability and enormous organization size joined with gadget heterogeneity, transmission capacity and battery power imperatives make the plan of directing conventions a significant test. The performance of this adaptive network can be enhanced by introducing efficient routing schemes [11-12].

II. MANET

Wireless technologies are extensively used today across the world for supporting the communication based on the demand of end users. There are more than 4.77 billion wireless subscribers of cellular service today worldwide using mobile devices for communications. As a new technology for information procurement and the enormous growth of mobile devices, wireless network is of high research value and has vast application prospects. These days it is very hard for us to think a day without computers or mobile phones [13, 14]. As the use of these devices increases, it sets the new appeal for the connection between the devices. Wireless networks facilitate data communication between two or more devices that are not physically related. It uses infrared or radio frequency signals with a shared common channel for passing the information between the devices. These networks are categorized into infrastructure networks and infrastructure less networks [15].

Characteristics of MANETs-- MANETs are another worldview of organizations, offering unhindered portability without the fundamental foundation. Fundamentally an impromptu organization is an assortment of hubs speaking with one another by framing a multi-jump organization. Coming up next are the qualities of a MANET; No proper geography. The organization geography in an impromptu remote organization is very energetic because of the mobility of the nodes [16, 17]. Thus they can fluctuate in and out of range of each other.

Multi-hop Routing-- Routing is the process of forwarding the packets to proper destinations with the help of network nodes. These nodes can directly communicate Single-Hop otherwise, it makes use of other nodes as intermediate nodes for forwarding their packets (Multi-hop). So these nodes can act both as hosts and routers for forwarding packets [18].

Scalability-- Any node can attach and detach from the group at any time since there are no restrictions on the size and movement of nodes in the network [19, 20].

Ease of deployment-- MANETs does not require any fore-destined infrastructure for its functioning. These kinds of networks can be implemented anywhere, where there is little to no telecommunication infrastructure [21, 22].

Directing in an organization is a course of choosing ways to send the parcels [23]. Directing can happens either in level design or in a progressive construction. In level design, every one of the hubs in the organization are in a similar level and play a similar part. Albeit this approach is productive for little organization, it doesn't permit versatility when the quantity of hubs in the organization increments. The various leveled

approach comprises of partitioning the organization into little gatherings called groups [24-26].

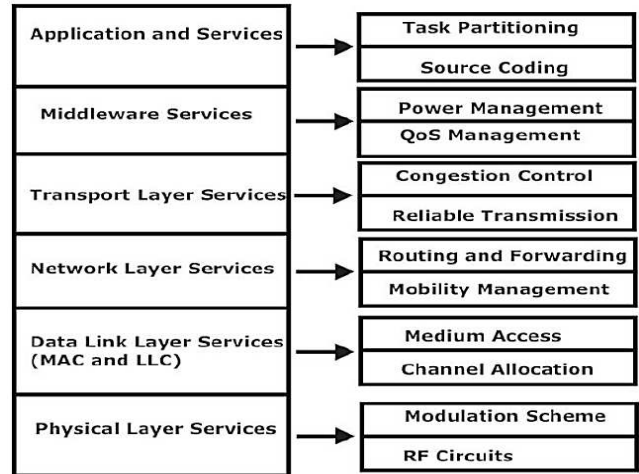


Fig. 2: Protocol stack in MANET

Various leveled steering is an answer for dealing with versatility in an organization where just chose hubs assume the liability of information directing. Notwithstanding, various leveled approaches go through nonstop geography changes [27, 28]. Hence, geography the board assumes a significant part preceding the real directing in MANET. Progressive construction has been utilized to further develop the directing effectiveness in unique organization. Single routing protocols have limitations in highly dynamic topology with limited resources. Therefore, multipath steering permits numerous ways to the objective with the advantages of burden adjusting, transfer speed accumulation, fault tolerance and improvements in the quality of service. The protocol stack in MANET is shown in Fig. 2 deals with many issues including the energy conservation, mobility management, reliable transmission and security [29, 30].

III. LITERATURE REVIEW

Mahmoud Abbasi et al. (2021, [1]), portrayed QoS provisioning depends on different organization the board strategies including asset the executives and medium access control (Macintosh). Different procedures have been acquainted with computerize organizing choices, especially at the Macintosh layer. Profound support learning (DRL), as an answer for consecutive dynamic issues traditional protocols are not applicable in emergency situations since it requires pre establishment path for forwarding the techniques. On the other hand, opportunistic routing technique can be used in such scenario as the routes are created dynamically which increases throughput and transmission reliability. This method utilizes the broadcasting ability of the wireless networks to forward the packets to their destinations. It has opportunistic routing method Location

Aided Routing (LAR), which requires more computations for maintaining topological information. Link correlation aware opportunistic method in which the nodes with the correlated link are selected as next forwarder link for forwarding the packets. The energy efficient forwarding technique is also needed for avoiding the battery getting exhausted when it is implemented in high density emergency scenarios.

Omar et al. (2021, [2]), proposed the requirement for solid and adaptable remote organizations has essentially expanded lately, as per the developing dependence of a gigantic number of gadgets on these organizations to lay out interchanges and access administration. MANETs permit the remote organization to lay out correspondences without the requirement for foundation by permitting the hubs to convey each other's parcels to their objective. Such organizations expanded adaptability however require more-complex directing strategies. Based on the analysis, reliable and effective communication is highly important during emergency situations like disaster rescue and recovery operations. So it is essential to provide a technique which ensures minimal damage to life and property. This gave the motivation to do the research in the construction of temporary networks which is used for providing reliable communications during emergency situations.

K. S. Arikumar et al. (2020, [3]), the world has experienced a number of natural hazards over the years, causing huge loss in biodiversity and infrastructure. Natural disasters like earthquakes, floods, and hurricanes constantly strike in different areas at unpredictable times which lead to loss of life and property. The Indian Tsunami in 2004 is one among the many that have made us fully grasp the proliferation of damage that the natural disaster can produce in unpredictable situations as discussed. Existing communication networks are usually disturbed during catastrophic events. Repairing damaged infrastructure could be time-consuming and leads to unnecessary loss of lives and property. So the use of mobile networks in such affected areas becomes imperative as discussed. In such extreme emergency scenarios, routing protocols need to be energy efficient, scalable and provides better security.

Murtadha M. et al. (2020, [4]), with the dependence of people on versatile savvy gadgets that have remote correspondence, modules have fundamentally expanded lately. Utilizing these gadgets to speak with the survivors during a fiasco or its repercussions can on a very basic level form the chances of finding and saving them. Similarly, a technique is proposed in this survey to widen the lifetime of the center points in a MANET while staying aware of exchanges with the nearest BS. Such a methodology allows the fast groundwork of temporary exchanges with these survivors, as restoring the confounding system is a drawn-out cycle. The proposed system achieves the more broadened lifetime of the association by changing the store all through the centers and

avoids weakening those with limited extra energy. The proposed technique has shown gigantic improvement in the lifetime of the MANET while staying aware of relative PDR and course age time, stood out from existing procedures.

Xiu Zhang et al. (2020, [5]), because of the nonstop turn of events and progress of remote correspondence innovation and sensor network innovation, remote sensor organizations (WSNs) have slowly turned into an alluring innovation that works with individuals' lives. Because of the broad utilization of WSNs, augmenting the lifetime of WSNs to acquire ongoing and viable data has turned into a basic concern. This paper concentrates on the existence of portable remote sensor organizations (MWSNs). MWSNs are an uncommon sort of WSN in that the sensor hubs are portable inside a specific region. A framework model is created to delay the organization lifetime of MWSNs. This paper utilizes five developmental figuring (EC) calculations to foster the MWSN lifetime advancement model. Mathematical reenactments are performed to concentrate on the benefits and impediments of the five calculations for settling the model. The examination and conversation can give exhortation to utilizing EC calculations to tackle MWSN lifetime amplification issues.

Michael E. et al. (2020, [6]), Machine-to-machine (M2M) interchanges is one of the major empowering innovations for the acknowledgment of the Internet of Things (IoT). Most machine-type specialized gadgets (MTCs) are battery fueled, and the battery lifetime of these gadgets fundamentally influences the general exhibition of the organization and the nature of administration (QoS) of the M2M applications. This paper proposes a lifetime-mindful asset allotment calculation as a curved enhancement issue for M2M interchanges in the uplink of a solitary transporter recurrence division numerous entrance (SC-FDMA)- based heterogeneous organization. A K-implies grouping is acquainted with decrease energy utilization in the arrange and moderate impedance from MTCs in adjoining bunches. The most extreme number of not really set in stone utilizing the elbow technique. The recreation results show that the proposed calculation outflanks the heuristic calculation and intently model the ideal calculation with a satisfactory degree of intricacy. The proposed calculation offers critical upgrades in the energy proficiency and organization lifetime, just as a quicker union and lower computational intricacy.

Dr. M. Duraipandian et al. (2019, [7]), the quick advances in remote correspondence innovation has prompted a phenomenal advancement in the adhoc kind of arranging. The routing table is maintained by each node which contains the information related to the neighboring nodes. Routing protocols in the MANETs are classified as proactive protocols, reactive protocols, hybrid, geographical, hierarchical, multi path and power aware protocols as discussed. The routing information of all the nodes is

maintained by proactive protocols even if the routes are inoperative. The Topology Control (TC) messages are periodically broadcasted into the network for keeping the routing table with up to date information. So it has low latency and high communication overhead. In contrast, in reactive protocols, the routing information is maintained only for the active nodes in the network.

WenjingGuo et al. (2019, [8]), in remote sensor organizations, improving the organization lifetime is a significant issue. The majority of the current works characterize network lifetime as when the main sensor hub depletes the entirety of its energy. Notwithstanding, such time isn't really significant. This is on the grounds that when a sensor hub kicks the bucket, the entire organization is probably going to work appropriately. In this article, we first make a general thought of the interest of utilizations and characterize the organization lifetime in three perspectives. Then, at that point, we develop an exhibition assessment system for directing conventions. To accomplish the streamlining of organization lifetime in completely characterized viewpoints, we propose a support learning-based directing convention. Support learning-based directing convention exploits the astute calculation of support figuring out how to search for the best controlling way for data transmission. In the importance of compensation work, factors, for instance, associate distance, extra energy, and bob move toward the sink are considered to slash down the outright energy usage, balance the energy use, and further create the parcel conveyance.

Jaewoong Kang et al. (2019, [9]), propose another way to deal with increment the maintainability of the WSN hubs by expanding their lifetimes. To do as such, we endeavor to track down the ideal upsides of the assortment stretch. It does not exchange any periodic control message for maintaining the topological information and routing paths are established only when needed. When compared to proactive routing protocol it has low communication overhead and high latency. The route is removed from the routing table when that route is inactive or its lifetime is over. The characteristics of MANETs like distributed operation, ease of deployment, autonomous operation makes MANET suitable for emergency communications. Communications play a vital role in disasters recovery and emergency management scenarios. The infrastructure-less property and dynamic nature of MANETs creates an interest for the researchers to implement these networks in disasters recovery and rescue operations.

Santosh Soni et al. (2018, [10]), in this examination study, two novel calculations are proposed in view of support figuring out how to take care of problem area issue in remote sensor organization. The main proposed calculation RLBCA, made group As the point of interest used to be more on deploying the ad-hoc emergency network and its security,

very few papers have been worked on secure effective transmission between the mobile nodes. Node mobility is the main factor which affects the performance of the existing routing protocols. In these traditional protocols, fixed route is established between nodes before communication phase, so its performance is devaluated with dynamic topology and node mobility. This leads to data loss inside the network which is not agreeable in emergency conditions.

RaoufBoutaba et al. (2018, [11]), the limitation of existing traditional ad hoc routing protocols is that they do not consider energy, link quality, available bandwidth, security and priority of the nodes during the route setup. Hence, they cannot balance the network load on different routes. But it may not be the optimal solution because it has high packet drop rate. Hence traditional routing protocols are not feasible for high mobility emergency environments. Researchers have demonstrated that MANET is successfully used for emergency and rescue operations. A mesh based routing mechanism for the disaster area network, but it uses the broadcasting method which generates more redundant links which leads to more energy consumption.

Indhu Ramalingam et al. (2018, [12]), the breakdown in a machine made by an issue will extraordinarily influence the plant activity. The casing work of shortcoming conclusion of machines utilizing AI procedures is a laid out region. Here, the shortcoming finding framework is carried out with the assistance of WSN. The signs/messages from every hub are communicated to a base station, which goes about as a focal control unit for the whole plant. Issue conclusion involving WSN in a production line arrangement has not many difficulties. For illustrative reason, a very much revealed bearing shortcoming conclusion informational collection is taken up and blame finding contextual investigation was performed according to remote sensor networks perspective (exploratory review).

Bhattacharya et al. (2017, [13]), a basic issue in the plan of impromptu organization is the improvement of proficient steering conventions that can give top notch correspondence to every information meeting and particularly within the sight of a lot of traffic. A few directing conventions have previously been proposed. In any case, the greater part of them center about single way steering. In this paper, we propose a heap adjusting procedure in view of multipath steering called LOBAM (load adjusted multipath directing) and apply our plan as an expansion to the OLSR (enhanced connect state directing) convention. In LOBAM directing, traffic is steered over numerous ways at the same time. Our convention utilizes a for each parcel portion plan to disseminate information bundles into different ways thinking about the heap in its area. A reenactment study is acted in vigorously stacked organization to show the viability of our proposed conspire in correlation with the current best

exertion OLSR convention as far as lining delay, cushion size and parcel conveyance.

Md. Ahsan Habib et al. (2016, [14]), the issue of boosting lifetime of a sensor network is as yet provoking mostly because of the rigid postponement cutoff time of continuous applications and heterogeneity of sensor gadgets. The issue is additionally confounded when the organization contains numerous deterrents. In amplifying network lifetime, existing writing works either only location issues of use delay-cutoff time and presence of deterrents, or examine crude information assortment approaches for such a climate. In this paper, we plan ideal information assortment timetable of a portable sink in a deterred sensor network as a blended whole number straight programming (MILP) issue. The proposed information assortment booking finds an ideal arrangement of meeting hubs over a preformed Starfish directing spine, and comparing stay term to boost the organization lifetime while keeping up with delay-cutoff time requirement in a hindered network. The proposed Starfish-planning guarantees a circle free voyaging way for a versatile sink across the organization. The consequences of execution assessment, acted in network test system 2, portray the appropriateness of Starfish booking as it outflanks cutting edge works as far as broadening network lifetime and information conveyance throughput as well as lessening normal start to finish delay.

Jain et al. (2012, [15]), MANET comprise of an assortment of remote portable hubs which progressively trade information among themselves without the dependence on a proper base station or a wired spine organization and it makes the steering a urgent issue to the plan of the MANET. Various way steering conventions are demonstrated to be execution compelling options over single-way directing for impromptu organizations and it addresses a promising directing strategy for remote portable impromptu organizations. Multi-way directing accomplishes load adjusting and is stronger to course disappointments. Table I show the summary of all the literature survey findings. In this paper we propose an energy proficient multipath shortcoming lenient steering convention to work on the unwavering quality of information directing in versatile impromptu organizations.

TABLE I. SUMMARY OF LITERATURE REVIEW

Author/Publication	Network	Model	Learning Algorithm	Improved QoS Factor (s)
Mahmoud Abbasi et al. / Elsevier 2021 [1]	MANET	MAC	DL + RL	Data rate control and resource sharing
Omar S. Almolaet al. / Turkish 2021 [2]	MANET	SDN	DRL	PDR and Throughput

K. S. Arikumar et al. / Springer 2020 [3]	WSN	CHs	PSO + FIS	EELTM
Murtadha et al. / Hindawi 2020 [4]	MANET	SDN	CNN	PDR and route generation time
Xiu Zhang et al. / Elsevier 2020 [5]	MWSN	CHs	Evolutionary computing	Lifetime maximization
Michael E. Tarerefa et al. / Wiley 2020 [6]	MANET	IOT, M2M	K-means clustering	Lower computational complexity
Dr. M. Duraipandian et al. / TCSST 2019 [7]	MANET	CHs	ML + RL	Energy consumption, PDR and transmission delay
WenjingGuo et al. / IJDSN 2019 [8]	WSN	Routing	RL	Energy efficiency, PDR and lifetime
Jaewoong Kang et al. / JISIS 2019 [9]	WSN	Routing	ML	Energy efficiency and lifetime
Santosh Soni et al. / Hindawi 2018 [10]	WSN	CHs	RL	Energy efficiency and lifetime

IV. CONCLUSION

In original network models, traffic transmission was only for the best efforts which ensured that there was no guarantee of quality for a transmission. QoS becomes demanding with real-time traffic transmission in a network. Also due to restricted network assets, particularly remote organizations continuous traffic requires higher need to guarantee convenient landing in objections. The exploration centers around four execution measurements for assessment of created steering plans which are quantitatively estimated that incorporates normal start to finish delay, throughput, Control above and Leftover energy. Amount of the deferral caused at every hub and edge along the way. It incorporates Lining deferral and proliferation delay. The time contrast between Steady Piece Rate (CBR) parcels sent at source and got at objective is recorded, that comprises start to finish delay forgot bundle. Bring down the parcel conveyance time prompting decreased start to finish delay, execution of the application is better. The aggregate sum of information arriving at a collector from a shipper each second is alluded to as throughput and communicated in bits each second/parcels each second. Regular geography changes, problematic correspondence, restricted transmission capacity and restricted energy are throughput affecting factors. Better results are obtained for higher values and this characterizes the routing protocols completeness, correctness and reliability through its effectiveness.

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