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Study of Challenges and Survey on Protocols Based on Multiple Issues in Mobile Adhoc Network

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Abstract
In Mobile Adhoc Networks (MANET) data transmission is very challenging as there is no dedicated infrastructure, so forwarding data from source to destination through a multi-hop communication is difficult due to frequent change in network topology. There are other constraints such as limited battery power of the nodes, high mobility rate of nodes, delay constraints, Qos requirements of multi cast and real time communication etc. The Objective of this paper is to make a comprehensive study on heterogeneous challenges faced by MANET, basically for dynamic routing purpose and to present a report on novel proposals with technical mechanism used in them to meet such challenges. Objective and Feature of all the novel works are listed out here which opens better opportunity to work in new research areas in MANET in order to solve the practical challenges related to such a dynamic network.

Keywords—MANET, QoS, Delay; Throughput, PDR

Introduction

In Emergency and relief operations MANETs are very useful because they can be created quickly as and when required without an existing infrastructure. In Wireless Mobile Network there are Access points connected to backbone network and they control operation of mobile nodes, but in MANET there is no infrastructure and o access points, so only nodes form a network for adhoc basis and they are self configurable.
Fig.2 shows a MANET scenario created using NS2 Simulator, where the mobile nodes continuously sending hello packets in order to identify their presence in the network. In this figure voice data communication is taking place between node 8 and node 12.

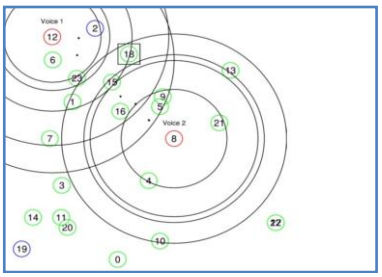

Fig.2 A MANET simulated in ns2

Challenges in manet

Limited battery power in nodes **–** Mobile nodes are equipped with limited battery power which are consumed during various network activities such as routing, forwarding, broadcasting, path finding etc. using different protocols. Due to high rate of node mobility in MANET, the power consumption rate increases, resulting in reduction of limited battery power of the nodes. Fig. 3 illustrates how average battery power level of nodes gradually decreases with increase of mobile nodes.

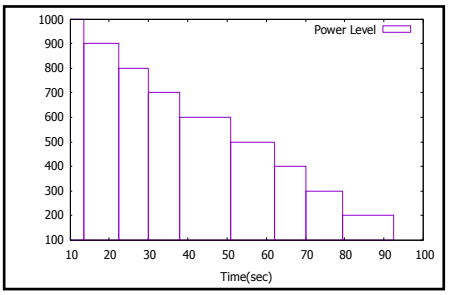

Fig. 3: Power Level vs. Node Mobility

Higher data loss rate **–** Packet drop rate increases with increase in traffic density. Due to the limited battery capacity of the mobile nodes, lot of energy is spent in packet sending, forwarding and processing task which reduces the energy efficiency of the nodes resulting in packet dropping, hence the rate of packet loss increases.Fig.4 shows the graph describing how data drop rate gradually increases with gradual decrease in power level across the network activation time.

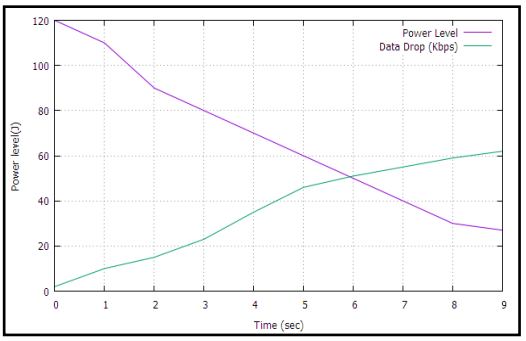

Fig. 4. Data drop vs. Average Power Level

Node Mobility **–** Due to high mobility rate of nodes, the topology changes frequently. So there should be easy adaptability to the topology change by the routing protocol for successful transmission of data without any interferences.

Future Challenges **–** In future communication network, MANETs are going to play a very important role and QoS support is going to be very challenging.It is really interesting and exciting for the new age researchers to develop Qos-based MANET protocols. Such electrifying areas include location-based routing, variable speed mobility of nodes, resource allocation probability, effective power consumption, high frequency of route failure etc.

Heterogeneous MANETs in future-There are some issues in heterogeneous MANETs which are to be strictly handled differently than homogeneous MANETs, so it is going to be really tricky. Handling the problem of misbehaving nodes (due to malicious, overloading, broken link or selfish) effectively, security problems, considering multi-level service support during transmission are some of the probable challenges.

Network Lifetime **–** Starting from the network setup to the deactivation stage of a network is normally referred to as Life time of the Network. When an active node in the network goes to dead stage when the battery power is finished and many nodes die and gradually packet drop ratio increases, it affects the network life time directly.

Qos Support **–** To support the Quality of Service for multicasting real time data packets is very challenging in MANET protocols as there is deadline for transmission and the jitter problem.

Real time Transmission **–** It is very challenging to efficiently handle real time data such as audio, video, film and multimedia over the transmission media as they have to be sent without any delay. Fig.5 shows a scenario from MANET during realtime transmission between voice 1 and voice 2 which is simulated in NS2.

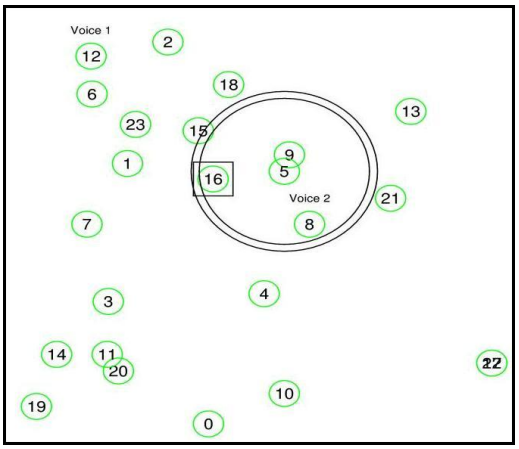

Fig5. Real time transmission in MANET between node 8 and 12

Related work

Many exceptional cases in MANET scenario are studied by researchers and scientific methodology are proposed to improve the efficiency of protocols as well as overall network performance. Rational methods are examined and used in multi-hop situation to calculate positional location in [1].Two useful calculation methods are proposed in this paper called RPA(Relative Proximity Algorithm) and ERPA(Enhanced Relative Proximity Algorithm).In paper [2], MANET-based attacks are considered and to protect the mobile devices from attack, intelligent security based concept is proposed. Similarly in [6] a very innovative mechanism is offered at the sensory layer that has capability to find out doubtful transactions in the network hence preventing them.In [11] a broad classification is given for MANET routing protocols which is shown in Fig.8.

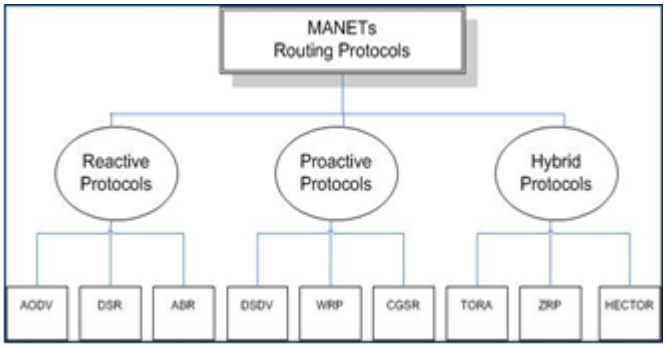

Fig.8. Classification of MANET Routing Protocols [11]

MANET Routing Protocols Based on Multiple Challenging Issues

Our extensive study on heterogeneous protocols and routing issues are presented in Table 1 and Table 2 which gives better understanding of the studied issues and better solution of those issues in MANET routing and these information exposes related research areas for efficient routing in MANET.Examination of suitable relational methods in multi hop situations to calculate positional location has been done in [1].Two suitable calculation methods are presented here-RPA (Relative Proximity Algorithm) and ERPA(Enhanced Relative Proximity Algorithm). These two when compared with already existing methods found to be more accurate estimation and additional information. In paper [2] an optimized concept is introduced to protect the wireless devices used in MANETs which are prone to attacks. Paper [3] aims at a logical comparison between useful two protocols projected at the IETF, RPL (IPv6 Routing Protocol for Low-Power and Lossy Networks) which is the proactive candidate, and LOAD (LLN On-demand Ad-hoc Distance vector routing protocol – next generation) which is the reactive candidate, using the real traffic scenarios and setting up different topology of variable size.

In [4], the concept of dual-region mobility management is presented for efficient location management. The fundamental idea is to engage local regions to convert home region locations service scheme. In this way every station unconventionally finds out its local region size and home region size hence, increasing efficiency during mobility. In

the proposal given in paper [5] a fuzzy ant colony based approach is used in the routing protocol while preserving the advantages of Swarn Intelligence logic. In [6], the design and implementation of a creative mechanism is presented at the middleware (sensory layer) which is able to differentiate suspicious detection of activities that lessens the chance of any abnormal event to happen in Mobile adhoc networks.

In [7] a new scheme is proposed to declare a time-dependent value of a packet, which is based on value of the packet to the stream when it will be delivered to the final target node. Here the authors proposed a scheduling scheme based on the packet cost and then by using OPNET based simulation study it is shown that the proposed scheduler can drop the packets which are affected by extreme delays. The methodology in [12] is centered on Alamouti's impact of the signal-to-interference-plus-noise ratio (SINR) at any station while receipt of a frame at the access point of multiple access interference (MAI).Simulation of this concept exhibits higher rate of throughput.

LAFTRA (Learning Automata based Fault-Tolerant Routing Algorithm) is proposed in [13] which has capability to route a packet in existence of faulty nodes in MANETs using multi-path routing. Theory of Learing Automata used in this approach for the optimized path selection process. Article [14] highlights on application independent oriented multicast routing protocols. Features and comparison of multicast routing protocols are also presented here.

TABLE 1. Summary of MANET Routing protocols based on Challenging issues

Sl. No	Literature	Year	Challenging Issues
1	V.Perez, et al [1]	2015	Balanced position location in MANETs
2	E.Hoque, et al [2]	2015	Defense tool for malware prevention
3	J.Tripathi, et al [3]	2014	Routing comparison between Low-Power Lossy Networks (LLNs) and MANET
4	I.Chen, et al [4]	2014	Mobility Management in Adhoc network based on dual-region
5	K.Thangadurai, et al [5]	2014	Multi-path routing protocol based on fuzzycost
6	D.Perez, et al [6]	2013	Proposal for middle ware for MANET
7	A.Jayasuriya, et al [7]	2013	Improved scheduling scheme for WLAN
8	E.Andrade, et al [12]	2013	Discrete event simulation of alamouti scheme in MANETs
9	S.Misra, et al [13]	2012	Based on learning automata a routing algorithm is presented Application independent
10	J.Kumar, et al [14]	2012	centered MANET routing protocols
11	J.Singh, et al [15]	2012	Effect of mobility on path selection
12	A.Hilal, et al [16]	2012	Effect of mobility on co-operation of nodes Examination of DoS(Denial
13	H.Rutvij, et al [8]	2012	of Service) attacks in MANET
14	S.Fujiwara, et al[9]	2012	Inter-domain routing using packet conversion

Table 2 below describes the basic mechanism used in the related issues studied in Table 1 along with routing factors considered.

Table.2 Basic mechanism used in protocols discussed in Table 1.

Literature	Basic Mechanism used
V.Perez, et al [1]	Two position calculation technique are proposed RPA and ERPA
E.Hoque, et al [2]	Alerts malware attack in time constrained environment.
J.Tripathi, et al [3]	Limitations and excellency of different protocols are examined
I.Chen, et al [4]	Design of dual-region mobility management to satisfy scalability & efficiency
K.Thangadurai, et al [5]	A new approach based on SI(Swarn Intelligence) is proposed
D.Perez, et al [6]	New abstraction level is introduced that prevents irrelevant events
A.Jayasuriya, et al [7]	Estimation of cost of the packet is time-dependent in the scheduling logic
E.Andrade, et al [12]	High throughput when CCAmechanism is based on average energy established across all antenna
S.Misra, et al [13]	Handle time sensitive data in MANET
J.Kumar, et al [14]	Classification and analysis of multicast routing protocols
J.Singh, et al [15]	Analysis of path length variation between source and destination
A.Hilal, et al [16]	A Game Model is proposed that shows the topology change effects
H.Rutvij, et al [8]	Detail survey on existing approaches to handle the attack
S.Fujiwara, et al [9]	ATR(Adhoc Traversal Routing) is proposed to provide interoperability between diff. networks

In article [15], the variation of path length has been analyzed between source and destination during mobile scenario of mobile adhoc network. The study utilizes the following four models (i) Manhattan Grid mobility model (ii) Gauss-Markov mobility model, and (iii) Reference Point Group mobility model and (iv) Random Way Point mobility model. In paper [16], a coalition game model is used for collaboration among mobile nodes in mobile ad hoc networks (MANETs) which demonstrates that the impact of topology changes due to mobility on the collaboration method can be moderated keeping the collaboration constant. In paper [8] a brief introduction about routing protocols has been given, the activities of different types of DoS attacks(Denial-of-Service) at the network layer are discussed and defensive approaches of this attack are debated. ATR (Adhoc Traversal Routing) is proposed in [9] to support interoperability between varying networks. Using this technique communication is possible between randomly taken two nodes those belongs to two different networks by altering control messages among two

networks. Paper [14] shows the requirement of a well-adjusted matrix format of forwarding nodes using the relay packets on lengthy routes in a noisy channel. Therefore a Poisson-line MANET Model is used to avoid the end-to-end delay and faster packet delivery purpose.

V.CONCLUSION

A widespread study has been done in this paper regarding major challenges faced by Mobile Adhoc Network. Some exceptional cases are also studied here such as effect of mobility on cooperation among nodes, Effect of mobility on path selection, End-to-end performance of linear nearest neighbor routing and possible proposals are discussed with intelligent solutions. The challenging issues and basic solution mechanism in every case have been summarized and presented in tabular form. Such results show that every challenging area discussed has scope of further improvement. So this research provides plenty of opportunities for new researchers to work in the vast area of MANET.

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