Mobile Ad-hoc Network Performance Analysis: A Survey

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ABSTRACT- Wireless Mobile Ad Hoc Network in a self organized network having dynamic topology and nodes uses shared channel with wireless links for communication with each other. In mobile environment, nodes can join and leave the network any time and there is no provision to monitor and control their activities. Due to the excessive node movement in the network, it may be unstable and control over head increases. In mobile environment network performance may suffer in terms of Packet loss, Routing information loss Congestion, Contention, Variation in routing load and Variation in throughput etc. So in this paper, we will explore the efforts done by the other researchers in order to overcome from all these issues.

Keywords- Wireless Ad hoc networks, Black Hole, Security, flooding, Attacks

I. INTRODUCTION
A MANET consists of mobile nodes, a router with multiple hosts and wireless communication devices (transmitters, receivers and smart antennas). These antennas can be of any kind and nodes (mobile phone, laptop, PDA and PC) can be fixed or mobile. Nodes can connect each other randomly and forming arbitrary topologies. Nodes communicate to each other and also forward packets to neighbor nodes as a router. The ability of self configuration of these nodes makes them more suitable for urgently required network connection [1].

1.2 MANETs have several salient characteristics:
1) Dynamic topologies
2) Bandwidth-constrained, variable capacity links
3) Energy-constrained operation
4) Limited physical security

II. LITERATURE REVIEW
Ad-hoc networks are formed in situations where mobile devices require networking applications while a fixed network infrastructure is not available or not preferred to be used. In these cases mobile devices could initialize a wireless network for the communication. Wireless ad-hoc networks are conceptually compared to traditional wireless cellular networks in which mobile users or mobile devices spread over a certain geographical area [1][2].

Cai, Lu and Wang [3], described a distributed clustering algorithm for multihop ad hoc networks. They proposed a randomized control channel broadcast access method to maximize the worst-case control channel efficiency, based on which a distributed clustering algorithm is proposed. The proposed algorithm takes much less time and overhead to cluster a given network.

Olascuaga, Mellado, Mendez- azquez, and Ramos-Corchado [4] proposed a cluster-based self-organizing strategy for building a backbone among the mobile devices, detecting segmentation and recovery. In this approach, each mobile device is controlled by a multi-role agent, which performs these tasks efficiently based only on local interactions. Energy saving is achieved by adapting the time interval and power of transmission after the network formation.

Dias De Amorim and Fddia [5] proposed a logical decomposition of a Self-organizing networks (SONs) routing architecture into four fundamental functionalities namely, addressing, dissemination, discovery, and forwarding. They concluded that routing architectures should be scenario-driven, in the sense that the configuration parameters are not necessarily universally good for all application scenarios.

Durvy, Dousse and Thiran [6] introduced a class of continuous Markov chain models, which explains accurately this observation but also shows that the performance of these protocols vary with the capture and sensing capabilities of the network nodes. On the positive side, They found that for a given (finite) access intensity, CSMA/CA protocols are fairer when the receiving and carrier sensing ranges are significantly different (asymmetric case) than when they have virtually the same values (symmetric case). On the negative side, we show that the price to pay for this higher fairness is a lower spatial reuse. In addition, we demonstrate that, when, the capture capabilities of the network nodes play a decisive role on the performance of the protocol. In the asymmetric case with full capture (as well as in the commonly adopted symmetric case), the spatial reuse is maximal but all the links that do not belong to the patterns of maximal spatial reuse are starved. In contrast, in the asymmetric case with limited capture, the spatial reuse is not maximal but starvation can be avoided.

Karnik and Anurag Kumar [7] viewed performance optimization as the objective for self-organization in sensor networks. They argued that the rate at which a sensor network can process data in a distributed fashion is governed by its communication throughput; hence sensors must organize themselves in such a way as to optimize their communication throughput. They showed that the network topology and the transmission attempt
rate are the critical factors which determine the throughput. They obtained an optimal topology by the maximum average weight (MAWSS) formulation and optimal attempt probabilities by maximizing the minimum sensor throughput (MMTAP). The MMTAP were found to have an important throughput-equalizing property. The MAWSS algorithm is distributed and uses connectivity and probability of successful transmission information obtained locally.

Derr and Manic [8] presented a new technique, an extended VSM (EVSM) algorithm that provides up to 16% more coverage and is 3.5 times faster than VSM in environments with eight obstacles. The EVSM algorithm has proven to be an effective distributed self-organizing algorithm for deploying a MANET in an area with obstacles. The collective behavior of the MANET nodes (global cooperation) emerges from the interactions of the individual nodes with no global control.

Mottola, Cugola, and Picco [9] presented COMAN, a protocol for maintaining a tree-shaped network to tolerate the dynamics of the underlying physical network characteristic of MANETs and to minimize the number of brokers, whose routing information is affected by topological changes. Results show that the protocol they propose meets the requirements for use in a CBR network and yields good performance.

Ji, Yu and Ray Liu [10] studied how to conduct efficient pricing based routing in self-organized MANET. by assuming that the packet-forwarding will incur a cost to the relay node and the successful transmission brings benefits to the source destination pairs. Considering the dynamic nature of MANET, we model the routing procedure as a multi-stage pricing game and propose an optimal dynamic pricing-based routing approach to maximize the payoffs of the source-destination pair while keeping the forwarding incentives of the relay nodes on the selected routes by optimally pricing their packet forwarding services through the auction protocol. It is important to notice that not only the path diversity but also the time diversity in MANETs can be exploited by our dynamic pricing-based approach. Also, the optimal dynamic auction algorithm is developed to achieve the optimal allocation of packets to be transmitted, which provides the corresponding pricing rules while taking into consideration of the node’s mobility and the routing dynamics. Extensive simulations have been conducted to study the performances of the proposed approach. The results illustrate that the proposed approach achieves significant performance gains over the existing static routing approaches.

Biskupski and Dowling [11] introduces an agent-based model of self-organizing MANET and P2P systems and shows how it is realized in three existing network systems. The model is based on concepts such as partial views, evaluation functions, system utility, feedback and decay. They review the three network systems, Ant HocNet, SAMPLE, and Freenet, and show how they can achieve high scalability, robustness and adaptability to unpredictable changes in their environment, by using self-organizing mechanisms similar to those found in nature.

Savyasachi Samal [12], proposed a mobility pattern aware DSDV routing algorithm which is self learning about the underlying mobility pattern. Standard DSV assumes that nodes always move in a random fashion; hence it expends considerable amount of network resources in maintaining topology and connectivity information. He had mentioned in the motivation section of this thesis that the performance of DSDV can be improved if it had knowledge about the underlying mobility pattern of the nodes. Since, DSDV then would not waste its efforts, in trying to maintain the topology and connectivity information.

III. Problem Formulation

Mobility is the major factor that affects the performance of the protocol. Due to high mobility of the nodes, unnecessary control information is exchanged and that can degrade the performance of entire network. Due to the excessive node movement in the network, it may be unstable and control over head increases. Due to Mobility there may be:

1. Packet loss
2. Routing information loss
3. Congestion
4. Contention
5. Variation in routing load
6. Variation in throughput

All above factors can affect the overall performance of routing load as well as the output of entire network and in the case of clustered network; it becomes more difficult to maintain the performance of network. So there is need to have an efficient mobility control algorithm for the network.

Each routing protocol has the following common phases:
- Neighbor Discovery
- Topology Organization
- Route reorganization

We will study the Mobility issues over mobile ad hoc network and how we can improve the network performance by managing mobility.
CONCLUSION
In this paper, we explored the different methods to work in mobile environment. Researchers explored the behavior of nodes in mobile environment by introducing the mobility pattern, self organized nodes, self learning algorithms, cluster-based self organized networks etc. Their experimental results show that the proposed approaches achieve significant performance gains over the existing approaches. In future, we will explore the impact of mobility on the different layers and will provide a solution for the same.

IV. REFERENCES