Node Mobility Control Mechanism of Mobile Ad-Hoc Network

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ABSTRACT
Mobile Ad-hoc Network (MANET) is a group of wireless mobile nodes forming a self-configuring network without any need of infrastructure. Routing protocol plays an important role for effective connection between mobile nodes and operates on the basic assumption that nodes are fully cooperative. Since MANETs are not presently deployed on a large scale, research in this area is primarily a simulation based. Among alternative simulation parameters, the mobility model plays a very vital role in determining the protocol performance in MANET.

The dynamic topology is one of the characteristics of Ad-hoc network; in which nodes change the location with respect to pause time and velocity. Due to the mobile nature of nodes, the probability of route break is high because nodes move frequently. Each node moves in any direction at any time with specific velocity. Thus the routing overhead increased and packet delivery decreased. The mobility of nodes impacts the performance of network in term of the packet delivery ratio and throughput. In this Paper, an approach is described which consider pause time and node velocity parameter. The main objective of approach is to evaluate and analyse network performance by affecting time and speed.

Keywords
Ad-hoc network, Challenges, Routing protocol, AODV, NS-2

1. INTRODUCTION
An Ad-hoc network is a collection of mobile nodes, which forms a momentary network without the support of centralized administration or standard support devices regularly available as conventional networks [1]. These nodes typically have a restricted transmission range and, so, every node seeks the help of its neighboring nodes in forwarding packets. Thus the nodes in an Ad-hoc network will act as both routers and host. A node might forward packets between other nodes as well as run user applications. These sorts of networks are appropriate for situations where either no fixed infrastructure exists or deploying network is not possible. Ad-hoc mobile networks have found several applications in various fields like emergency, military, sensor networks and conferencing. Each of application areas has its specific necessity for routing protocols.

1.1 Application of MANET
Ad-hoc network has several applications two major of them are crisis management and military operations. Along with these another application is Bluetooth that is designed for personal use and enables mobile phones, printers, scanners and music players to be connected wirelessly to a personal area network. This creates amazing flexibility because it enables devices to move freely between other networks. Ad-hoc networks can also be used in the multiplayer game, one can imagine a game played from a device that can establish communication with other nearby devices, and these devices can then establish a cluster of interconnected devices and use this as a platform for playing the game. There are many utilizations of Ad-hoc networks- one among them is today's laptops equipped with 802.11 wireless PCI cards; they create an Ad-hoc network if the Ad-hoc mode is set in motion. This can be particularly helpful for business meetings in places where no current infrastructure is available for example an Ad-hoc conference is on a restaurant. If those taking part wishes to share knowledge such as reports, diagrams and statistics, they can select their Ad-hoc mode and effortlessly transmit the data. This has proven extremely useful and eliminates completely the need for cable and routers [2].

1.2. Challenges Facing Ad-hoc Mobile Networks
There are some challenges while dealing with ad-hoc network as follows

1.2.1 Multicasting
The explosion within the range of web users is partially attributed to the presence of video and audio conference tools. Such multiparty communications are implemented through the presence of multicast routing protocols. Multicast Backbone comprises an interconnection of multicast routers that are capable of a passage from multicast packets to non-multicast routers [3]. Few multicast protocols use a broadcast and eliminate approach to form a multicast tree rooted at the source. Others use core nodes whenever the multicast tree originates. All such methods rely on the actual fact that routers are constant, and once the multicast tree is formed, tree nodes will not move. However, typically often not the case in Ad-hoc wireless networks.

1.2.2 Energy Efficiency
Most existing network protocols do not consider power consumption as a problem since they assume the presence of static hosts and routers, which are powered by main supplier. However, mobile devices these days are mostly operated by batteries. Battery technology continues to be dragging behind microprocessor technology. The life of associate Li-ion battery these days is barely 2-3 hours [3]. Such a limitation within the operational hours of a tool implies the requirement networks, as mobile devices plays the role of the user which interacts with associated user applications area unit. An intermediate system is executed for forwarding the packets. Hence, front-warding packets on the behalf of others can consume power, and this may be quite vital for nodes in Ad-hoc wireless network.

1.2.3 TCP Performance
TCP is an end-to-end protocol designed to supply flow and congestion control in a network. As we know TCP is a connection-oriented protocol, therefore a connection is

established before the data transmits. The connection is removed when data transmission is completed. In the existing Internet, the network protocol or Internet Protocol is actually connectionless. Therefore, if we have a connection-oriented and reliable transport protocol over an unreliable network protocol it is appropriate for transmission. However, Transmission Control Protocol assumes that nodes within the route are static, and solely performs flow and congestion activities at the source and destination nodes.

TCP depends on measuring the round-trip time (RTT) and packet loss to confirm if congestion has occurred in the network. Unfortunately, TCP is unable to identify the presence of mobility and network traffic jam. Mobility by nodes in a connection can result in packet loss and long RTT [3]. Hence, few improvements or changes are needed to ensure that the transport protocol performs properly without affecting the end-to-end communication.

1.2.4 Security & Privacy
Ad-hoc networks are intranets and they remain as intranets unless there is linking to the Internet. Such limited communications have already private attackers who are not local in the area. Remark that this is not the case for wired and wireless-last hop users. Through neighbor identity authentication, a user can know if neighboring users are friendly or helping. Information sent in an Ad-hoc route can be protected in some way but since multiple nodes are involved, the broadcast of packets has to be authenticated by recognizing the originator of the packet and the flow ID or label [3].

2. RELATED STUDY
2.1 TOPOLOGY and Mobility Considerations in Mobile Ad-hoc Networks
A highly dynamic topology is a distinguishing feature and challenge of a mobile Ad-hoc network. Connection between nodes are created and broken, as the nodes move within the network [4]. This node mobility affects not only the source and/or destination, as in a typical wireless network, on the other hand also intermediate nodes too, due to the network's multihop nature. The resulting routes can be intensely volatile, making successful Ad-hoc routing dependent on efficiently reacting to these topology changes. In sequence to better understand this environment, a number of characteristics have been examined concerning the links and routes that make up an Ad-hoc network. Many network parameters are examined which contain network dimensions, number of nodes, and radio transmission range, as well as mobility parameters for highest speed and wait times. In addition to suggesting guidelines for the evaluation of Ad-hoc networks, the results reveal various properties that should be considered in the design and optimization of MANET protocols.

2.2 Aspects of Decentralized Time Synchronization in Vehicular Ad-hoc Networks
Active safety and advanced driver assistance systems based on vehicular Ad-hoc networks can significantly increase passenger safety and comfort [5]. For communication systems based on time-slotted multiple access schemes, time synchronization among the fast moving vehicles is required. In this work, a new scheme for decentralized time synchronization is advised. It will be derived analytically, that using current schemes, a familiar systematic drift of the node timing can be noticed, caused by the delay. If the average propagation delay to nodes within the respective synchronization range differs from node to node, a remaining timing offset will be noticed between stations, in a uniform state. Depending on the network topology, this timing offset can be big enough to violate the constraints for a synchronous operation. In contrast, using the proposed scheme, a systematic drift of the node timing can be avoided, completely. Compared to existing schemes, the remaining timing offset is much smaller and the requirements for synchronous operation can be met.

2.3 Accurate Time Synchronization for Wireless Sensor Networks
Time synchronization is very important for any distributed system. Specially, wireless sensor networks make extensive use of synchronized time in many contexts (e.g. for data fusion, synchronized sleep periods, TDMA schedules, etc.). Existing time synchronization methods were not designed with wireless sensor networks in mind, and need to be extended or redesigned. Author solution concentrates around the development of a deterministic time synchronization method relevant for wireless sensor networks [6]. The proposed solution features minimal complexity in network bandwidth, storage and processing and can accomplish good efficiency. Highly relevant for sensor networks, it also provides stiff, deterministic bounds on both the offsets and clock drifts. A scheme to synchronize the entire network in preparation for data fusion is represented. A real implementation of a wireless Ad-hoc network is used to judge the performance of the proposed approach.

2.4 Selection of Optimal Transmission Power for Ad-hoc Networks
This work investigates the problem of selecting an energy-efficient transmission power for Ad-hoc networks. Specifically, author examines how to determine a network-wide transmission power that reduces global energy consumption, with aimed lower bounds on connectivity and capacity. Supported by recent empirical measurements of energy consumption in wireless modems, author derives an analytical model for parameterized by density, network-wide energy consumption, packet size, MAC protocol and radio characteristics [7]. Author then uses this model to derive the optimal transmission power at which end-to-end energy consumption is minimized. As the selection of transmission range not only effect energy consumption but also bandwidth, latency, and network connectivity, author discusses the tradeoff between these metrics and demonstrates that the "average neighborhood size" is a useful parameter for finding the optimal balance point. Based on this discussion, author presents a practical scheme for choosing a transmission power that can make an informed tradeoff between capacity, energy efficiency, latency, and connectivity.

3. PROPOSED APPROACH

An ad-hoc network may be a group of communications devices (nodes) that wish to communicate, however don't have any fixed infrastructure offered and don't have any pre-determined organization of accessible links. Individual nodes are responsible for dynamically discovering that alternative nodes they can directly connect with. Major assumption is that not all nodes can directly connect with each other, so nodes are required to carry packets on behalf of alternative nodes in order to deliver data across the network. A key feature of ad-hoc network is that rapid changes in connectivity and link characteristics are introduced due to node moment. Ad-hoc networks will be designed around any wireless technology. Due to the mobile nature of nodes, the probability of route break is high because nodes move frequently. Each node moves in any direction at any time with specific velocity. Thus the routing overhead increased and packet delivery decreased. The mobility of nodes impacts the performance of network in term of the packet delivery ratio and drop ratio. Since Ad-hoc networks do not assume the supplies of a established infrastructure, it follows that respective nodes may have to trust multi hop of Ad-hoc networks until today. Most existing solutions for saving hop in Ad-hoc network revolve around the protocol used by the selecting routes that require many short hops or a few longer hops.

3.1 Proposed Solution

Ad-hoc wireless networks are having some features such as Multi-hop packet forwarding; also have Infrastructure-less design pattern and random mobility of nodes. There are different path switching between the above two intermittently connected network. A node may leave/join network and/or randomly change its neighbourhood. Packets are sent, received and dropped with limited energy. A novel scheme is proposed which use the two basic concepts pause time and velocity parameter with AODV, DSR, OLSR routing protocol to all node and also analyses sent packets, received packets and dropped packets, packet delivery ratio, and throughput. The proposed work has some set of nodes which move with some pause time and velocity. In this work affecting pause time in seconds and velocity in meter per second the communication of node is set by using above discussed protocol. For simulate proposed approach, NS-2 (Network Simulator-2) will used. Network simulator is suitable for measuring any network protocol, performance and vulnerability of any protocol. In this work analysis of different scenarios can be visualized by plotting various graphs of sent packets, received packets, dropped packets, packet delivery ratio and drop ratio.

3.2 Scenario

The proposed work considers two different mobility scenario sets; one with constant pause time and variable velocity of nodes mobility and another one with variable pause time and constant velocity of nodes mobility. This work is expressed by taking different scenarios with different time and speed parameters which are mentioned in Table I, after initialization of below parameters, simulation process of 22 sec is done. In the simulation 10 nodes are initialized with 2 TCP connections i.e. from node 0 to 7 and from node 1 to 8.The result is analysed on the basis of considering the different scenarios. The main objective of the work is to emphasize time and velocity parameters which are different for all scenarios.

- Pause Time
- Velocity

3.3 Algorithm

The proposed algorithm is explained:

1. Define Simulation parameters.

2. Initialize routing protocol.

3. Initialize all the nodes.

4. Define initial position for nodes.

5. Define and initialize movements for nodes with respect to specific time and velocity.

6. To define Time and velocity of nodes considering different

 count of time & velocity

 Pause_Time [1.00, 1.25, 1.50, 1.75, 2.00]

 Velocity [5, 10, 15, 20, 25]

7. Repeat i=1 to 5

8. Repeat j=1 to 5

 Pause_Time=time[i]

 Velocity=velocity[j]

 Simulation

 Repeat step 8 until j<=5

 Repeat step 7 until i<=5

9. End

The simulation parameters are defined in the above algorithm. Routing protocol and all the nodes are initialized. After defining initial position for all the nodes, movements for nodes with respect to specific time and velocity are also defined. An array of time and velocity are considered with respect to values, after initialization of those values, simulation is done. End of the simulation is done by calling stop procedure.

4. CONCLUSION

An Ad-hoc network may be a group of communication nodes that wish to communicate, however these don't have any fixed infrastructure offered neither have any pre-determined organization of accessible links. Individual nodes are responsible for dynamically discovering that alternative nodes can directly connect with. Major assumption is that not all nodes can directly connect with each other, so nodes are required to carry packets on behalf of alternative nodes in order to deliver data across the network. A main feature of Ad-hoc network is that rapid changes in connectivity and link characteristics are introduced due to node movement and power control practices. Ad-hoc networks will be designed around any wireless technology.

Most of the previous works have addressed Ad-hoc network problem. Due to the mobile nature of nodes, the probability of route break is high because nodes move frequently. Each node moves in any direction at any time with specific velocity. Thus routing overhead increased and packet delivery decreased. The mobility of nodes impacts the performance of network in term of packet delivery ratio, drop ratio and throughput. This work considered some set of nodes which move with time and velocity. This work has taken two different mobility scenario sets; one with constant time and variable velocity of nodes mobility and another one with variable time and constant velocity of nodes mobility.

This work has attempted to provide an overview of the current research status of mobility modeling and analysis. The work presents an analysis of time and velocity parameter to generate realistic mobility traces for MANET simulations. This allows less retransmission of packets while routes available during the communication and encourages designing of approach or protocol for topology control.

In this work the values chosen for the different parameters of the networking algorithm make a big difference in the performance of the network. Moreover, there is not one set of parameters that's the most effective, since the performance of a group of parameters depends greatly on the conditions underneath that the network is working. This makes the matter of choosing a decent set of parameters a vital and troublesome one. This work has enhanced the multi hop link performance; Routing overload and high link break are minimized.

5. REFERENCES

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