In Campus Mobility Analysis for MANET by using Simulation technique and Live Test Bed

Husain Mohammad Mahbub Alam , Masum Billah

Abstract— now a day's most widely used and vastly developing technology is mobile communication. Mobility is one of the biggest issues for its future development. A mobility is fully depends on movement of mobile nodes is terms of different environment. Lots of development already took pleased in mobile technology, but more needs to improve. It is important to analysis the performance of mobile network with different topology and protocol in a various scenario model. In this paper we will discuss about the human mobility in a campus environment and behavior pattern in terms of Mobile Ad Hoc Network (MANET) protocol in live test bed as well as simulation theory.

Index Terms— MANET; Mobility; Ad Hoc Network; Routing; Simulation; Omnipeek; Live Test Bed

I. INTRODUCTION

A mobile AD-Hoc Network (MANET) is comprised of a group of mobile nodes which have the capability of self-organization in a decentralized fashion and without fixed infrastructure [1]. To create a consistence and reliable mobile ad hoc network need to consider the connection between nodes can be broken depend on several reasons like geographical obstacle, behavior and movement and distance between the nodes. Also need to consider the limited bandwidth and low battery power and frequent of node unreliability. The performance of a mobile ad hoc network (MANET) in terms of throughput, latency, and scalability is related to the efficiency of the routing protocol in adapting to changes in the network topology due to mobility of the nodes [2] [3] [4]. It is really a challenging work to analysis the performance by creating a real time scenario. We create a real live test bed to analysis the performance of mobility in MANET.

Several mobility models have been proposed for simulation of the movement of nodes in a MANET [2], [8], The current wireless communication and mobility make an ad hoc network same like traditional wired network, and required routing protocols used in ad hoc network based in different principle. Routing protocol is similarly an important issue for change environment of mobility model and interesting research area in MANET. Since mobile ad hoc network change their topology frequently, routing is challenge to full fill the task for MANET. Generally, routing protocol sense and maintain the best possible route to communicate between source an destination via intermediate nodes.

We will discuss several mobility models with routing protocol and finally work with one of them to analysis the performance matrix in terms of mobility. For this work we will to analysis the performance and mobility for mobile ad hoc network simulation is the best option till today. For this paper we will use simulation and live test to analysis the performance for mobile ad hoc network.

II. REVIEW OF MOBILITY MODEL

A. Mobility Model

Mobility is an important factor to analysis the performance factor for mobile ad hoc network. As the device is easily portable and the scenario to deployment is inherently dynamic, mobility becomes the key characteristics most of this networks. On its way the impact of mobility in MANETs goes in several ways, such as network capacity, routing performance and cluster maintenance. In short the evaluation of protocols and services for MANETs seems to be inseparable from them underlying mobility model [13]. It is also important to understand the performance of different routing protocols are using for MANETs. For In-campus mobility analysis by considering geographical area we can select Random-base Mobility Model in MANET. We discuss about the Random-base mobility model and then routing protocols.

B. Random Way Point Mobility Model

The Random Waypoint Mobility Model was first proposed by Johnson and Maltz, includes pause times between changes in direction and/or speed. The Random Way Point Model, Vmax and Tpause are two parameters that determine the mobility behaviour of nodes. Where Vmax means maximum allowable velocity and pause time parameter is Tpause. Pause time determine the establishment time between two nodes, if the pause time is 0 then nodes are moving randomly. Also it determines the node motion.

C. Random Walk Mobility Model

Naturally nodes are moving in extremely unpredictable ways. Random direction of movement does not have any pattern or sense of direction. The random walk was developed in an attempt to mimic the erratic movements of certain objects. Specifically, in the Random Walk Mobility Model, a host moves from its current location to a new location by randomly choosing a direction and speed in which to travel [7]. For this model speed and direction are both selected from pre-defined ranges, [speedmin, speedmax] and [0,2π] respectively all the movement of

nodes occurs in a constant time interval t, at the end of which a new direction and speed are calculated.

D. Random Direction Mobility Model

The Random Direction Mobility Model was created in order to overcome a flaw discovered in the Random Waypoint Mobility Model. MANETNs using the Random Waypoint Mobility Model often choose new destinations, and the probability of choosing a new destination that is located in the centre of the simulation area, or requires travel through the middle of the simulation area, is high [7].In Random Waypoint mobility Model nodes are appears to join, disperse and join again with each other, the Random Direction Mobility Model was developed to alleviate this type of behaviour and promote a semi-constant number of neighbours. In this model random direction are chosen to travel random destination in a particular area, when its reach the boundary MANET stop for certain period of time, and chose another angular direction between 0 to 180 degrees and continues the process.

E. Concept of Remoteness

Remoteness is another important issue for MANET. Remoteness is a concept where nodes can be move at anytime, anywhere without any condition and consistence. We introduce a mobility measure that is flexible and consistent. It is flexible because one can customize the definition for relevant mobility using a remoteness function for a given application [2]. This model forced MANET to travel to the edge of the simulation area before change changing the direction and speed.

F. Routing in Mobile Ad hoc Networks

Several different routing algorithms are working for MANET, but all the routing protocols are behave differently in term of mobility, already we discuss several mobility models and their behaviour pattern. For all routing protocol have some advantage and disadvantage. According to the characteristic routing protocol can be divided in to two parts, the proactive or drive routing algorithm and the reactive or on demand routing algorithm. As we are doing in campus mobility analysis for MANET, need to select model and routing protocol according to our scenario. Also before selecting routing protocol some factor need to be consider, as the mobile nodes are resource-constrained with only limited energy, computing power and memory.

Proactive routing protocol is the constant maintaining of a route by each node to all other nodes in a network. These types of protocol create and maintenance network using both periodic and event-driven massage. Various proactive routing protocols are introduced for MANET, like Destination-Sequenced Distance Vector (DSDV), Optimized Link State Routing (OLSR) and Topology Dissemination Based on Reserve Path Forwarding (TBRPF).

Reactive Routing Protocol is mostly discovering the node only when it's needed. There are different types of routing protocol such as Dynamic Source Routing (DSR), Ad Hoc On-Demand Distance Vector (AODV) and temporary Ordered Routing Algorithm (TORA) and etc. DSR is a loop free source based on demand routing protocol, (DSR) is a simple and efficient routing protocol designed specifically for use in multi-hop wireless ad hoc networks of mobile nodes [15]. And AODV is similar like DSR and its only minimize the number of route broadcasts by creating routes on demand. In this paper we will work with these two routing protocol and analysis the performance against the Random Waypoint Mobility model in MANET.

III. Simulation Analysis

Ns2 Network Simulator for this work we will work with network simulator Ns2 and live test system to compare the data between two systems. For this work we select most recent one Ns-2.34 released Jun 17 2009. Ns-2 is a discrete event, object oriented, simulator developed by the VINT project research group at the University of California at Berkeley targeted at networking research [16]. The simulator has been extended by the Monarch research group at Carnegie Mellon University to include: nodes mobility, a realistic physical layer that includes a radio propagation model, and the IEEE 802.11 Medium Access Control (MAC) protocol. For live test bed we took four wireless node twos are fixed and rest of the two are fully mobile, to collect and analysis the data we use Omnipeek wild packet tracer.

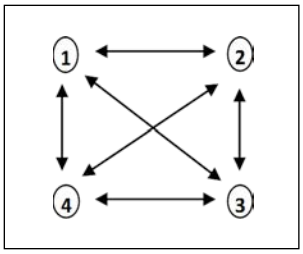
A. Simulation Scenerio

Scenerio1 (SC1)

We create a mobile ad hoc network with a 4 node using random waypoint mobility model. Nodes are moving 600m X 600m area as we are considering in campus mobility where area will be smaller and movement will be restrictive. Traffic are created by using cbrgen.tcl create CBR and TCP traffics connections between wireless mobile nodes. For this network we create 6 connections between 4 nodes using seed value 2 and rate 4.0. To create a node movement we can conceder maxspeed 20 m/s according area or location.

Scenerio2 (SC2)

In a university campus we create connection between four nodes through the wireless access point to establish a mobile ad hoc network by creating a domain address with subnet mask. For this scenario we use one fixed node as network administrator or like host and rest of the nodes are connected through the host node. And provide a ping request with each other to follow the traffic between the nodes. Fig1 & 2 two will shows the packet flow direction between the nodes and movement of nodes in a limited area 600m X 600m. . In figure 2 will show the traffic movement for Sc1 and SC2



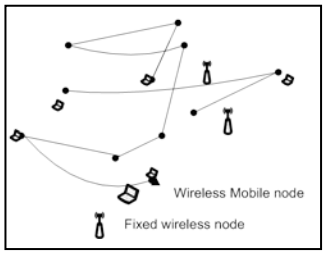


Fig1: Node Movement
Fig2: Traffic Flow Between nodes

B. Performance Matrices

A majority of the previous studies on MANETs concentrated for performance matrices between mobility and routing protocol. The performance of routing protocol across different parameters number of node and speed and the selection of mobility model with required data traffic pattern significantly influence protocol [7]. And the consistency of the mobility measure was demonstrated by the simulation results, which showed the ability of the mobility measure to reliably predict the link changes for various simulation scenarios [2]. Most of the mobility model is design without considering geographical obstacle with the node movement area and human movement pattern. Compare to this few of them work with live test system that does the network performance in a real life scenario with a particular mobility model. To analysis the performance of MANET we use packet drop, node movement and distance covered by the node from start point to end point. Network scenario created with realistic environments is used to analysis the performance of Random Mobility Model using DSR routing protocol.

IV. Simulation Result and Discussion

In this section we present some of the result collected from the simulation and live test bed. Two set of analysis need to be present according to the created scenario and then need to be comparing with simulation and realistic result to analysis the performance of mobility over MANET.

A. Analysis of mibility for Scenerio1

In SC1 we use four nodes using with different speed and pause time to create the node movement randomly. For simulation we use 400ms. By analyzing the trace file using Perl script through put of the network is 84%. But if we look node by node performance, then it is clear that most speed and distance travel by the node dropped maximum amount of data.

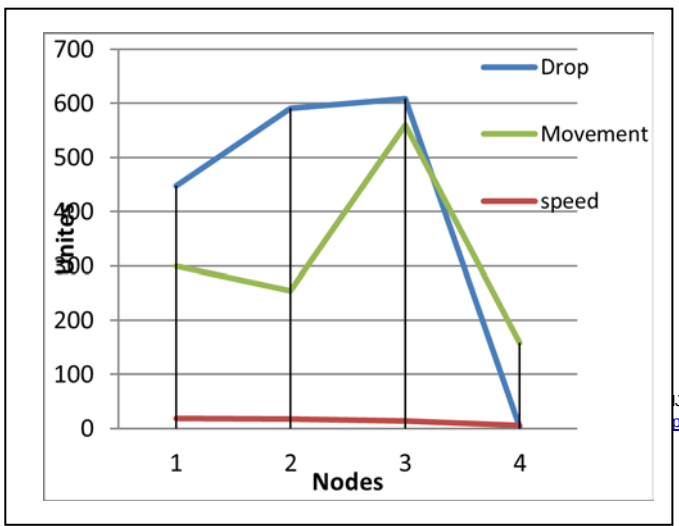


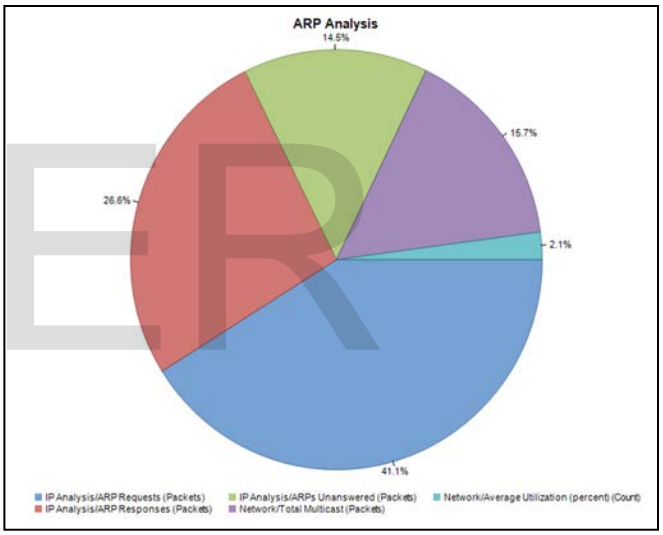
Fig 3: Mobility V Packet Drop & Speed using DSR protocol

In this case node 1 have top speed 19 an total distance covered 300m which define the movement of node1 by this way node 3 have max speed 14 but it was moved longer distance and drop maximum number of nodes apart from other.

B. Analysis of mibility for Scenerio2

In live test system two nodes are fixed and rest are mobile, we receive simulation data by using Omnipeek packet tracer, where fixed nodes are used mostly and mobile node can used less only 19.8%. I. So mobility makes an impact for transmit data. It is important to understand the mobility and its impact of network to establish MANET.

Fig 4: ARP Analysis for Live Testing System



C. Comparision Analysis of SC1 & SC2

After getting result from two scenarios it is clear that mobility make an effect for reliable connection for MANET. Here in a table1 will show the performance matrices for two scenarios. And finally we can get a full picture about MANET.

Scenario	Network Performance Analysis		
	Network Utilization	*Packet Receive*	*PACKET DROP*
Scenerio1	25.84	8683	16.28%
Scenerio2	2.1	1827	24.5%

TABLE I. NETWORK PERFORMACE

TABLE II. NODE UTILIZATION

Scenario Packet receive	Node Performance Analysis			
	Node 1	*Node 2*	*Nod e3*	*Node 4*
Scenerio1	216	8435	4328	78
Scenerio2	458	328	138	155

And table two showing the node analysis by counting the receive data because node can transmit data easily but data will drop when it being received, to justify the node performance between nodes data receiving is a important fact, as we can see in table 2 – in sc1 node 2 and 3 receive most of network traffic and constantly drop most data cause of mobility. But this was a case where random way mobility model have a limitation that it does not consider geographical obstacle. If we compare the live test bed we find that compare to them it send less packet because of its live condition where geographical obstacle. And also considering fact that in live test bed movable mobile nodes are received comparatively less traffic according to the fixed wireless node other node.

V. CONCLUSIONS AND FUTURE WORK

Random way mobility model are most popular because of its transparence, but it was failed to some extent. Other mobility models have been proposed based on social network theory, but the mobility models which most closely reflect real life are the ones founded on accurate real trace data, i.e. trace-driven mobility models [17]. Here it is clear that by using simulation technique we can reach up to some extent but to find out the accurate result, need to implement the Live testing system.

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