International Journal of Engineering Research-Online
A Peer Reviewed International Journal
Email:editorijoer@gmail.com http://www.ijoer.in

Vol.4., Issue.2., 2016
(Mar-Apr)

RESEARCH ARTICLE

ISSN: 2321-7758

ANALYSIS OF MANET ROUTING PROTOCOLS USING MOBILITY AND TRAFFIC MODELS

NILESH V.WANKHEDE[1]*, Prof.S.S.ASOLE[2]

[1]M.E. Student, Department of CSE, B.N.C.O.E., Pusad, India.

[2]Assistant Professor, Department of CSE, B.N.C.O.E., Pusad, India.

ABSTRACT

Now a day there is a remarkable growth in telecommunication technology which makes users of mobile electronic devices accessible to a communication network. These electronic devices are nothing but the nodes of the Mobile Ad hoc Network (MANET). Each node can move from one place to other during communication and this mobility is having its effect on performance of the network. Mobility changes when speed of the node and pause time with which it moves changes. In this paper, we address an important problem in mobile ad hoc networks, namely, the intrinsic inefficiency of the standard transmission control protocol (TCP), which has not been designed to work in these types of networks. After an initial training phase, we predict the mobility status of the network through a probabilistic approach, and we propose a series of ad hoc strategies to counteract the TCP inefficiency based on this prediction.

Keywords: Mobility Model, Sensor Network, Adhoc Routing, Simulation, MANET, statistical inference, Traffic Model

1. INTRODUCTION

The last-mile multiple hops crossed by each connection before reaching their respective destinations can be seen as a “wireless appendix” which is attached to the worldwide (wired) web. These types of networks are named mobile ad hoc networks (MANETs). A MANET is characterized by a self configuring infrastructure less architecture, which can handle the communications in a highly dynamic network topology. It can provide connectivity also in areas with no network infrastructure, and can be a valuable and inexpensive solution for many networking problems. For these reasons, a broad set of research contributions has been carried out in this area. One of the main issues that should be addressed in order to design a MANET is the fact that a fast changing topology creates significant problems to the standard transport layer protocol. In MANETs, mobile nodes (MNs) operate as routers and end-system connecting points in order to forward packets while moving about, change location frequently and also organize them into a temporary ‘ad-hoc’ network. Because of this, MANETs can offer a larger degree of freedom at a considerably lower cost than other networking solutions. Special routing algorithms are often needed to accommodate changing topology. So far, method for determining the efficient routing paths and delivering messages in an ad hoc environment

where the network topology changes have yet to receive much attention. New prototypes are needed to describe the mobile ad hoc feature of wireless networks; and new algorithms are required to effectively and efficiently route data packets to mobile destination in order to support many of multimedia applications.

2. RELATED WORKS

Comprehensive MMs survey was carried out by Su et al. [3]. A Study by Coroson et al. [1] examined the Routing Protocol Performance Issues and Evaluation Considerations. In this paper, the advantages and limitations of the protocols were examined and expressed as qualitative and quantitative attributes. Paper [5] evaluated the MANET routing protocol AODV under different MMs. In this paper only topology based routing protocols were considered. Paper by Malarkodi et al. [7] gives a more detailed classification in four categories: temporal dependency, spatial dependency, geographic restriction and hybrid characteristic. In this paper, it emphasizes that the results of simulative performance evaluation strongly depends on the models used. Bettstetter et al. [2] examined the spatial node distribution of the random waypoint mobility model. The goal was to define MMs based on motion matrices class and the impact of these metrics on routing performance. Paper [9] investigated throughout simulation the impact of unidirectional link on topology based routing protocols. It indicates, the power control affects the performance of the network layer. In this research, we investigate through a simulation the impact of the transmission power on the performance of position based routing protocols under different MMs (Dependent and Independent). The impact of transmission power and MMs, on position based routing protocols in MANETs have not been considered before. One of our contributions is investigating the correct adjustment of the MN radio transmission range in order to achieve connected MANETs. In the Ad Hoc network simulation research, mobility model is used to describe the node's movable pattern, which uses statistical method to simulate the mobile law of nodes in the practical scene [4, 6]. When the linear distance of two nodes is within the range of wireless communication, it is probable to set up a wireless link between each other [5,7].Thus, the mobile rule of nodes will explicitly control the connection condition of the wireless link. Mobility models are proposed to focus on individual movement patterns due to point to point communication in cellular networks [4, 5] whereas Ad Hoc networks are designed for group communication. Such models [8] are recommended to retain movement, and efficient transmission among nodes in real life applications. In addition to this, these models mainly focus on the individual motion behavior between mobility eras with minimum simulation time in which a mobile node moves with stable speed and direction.

3. MANET ROUTING PROTOCOLS

There are two types of Routing Protocols in Mobile Ad Hoc Networks: Reactive Routing Protocols and Proactive Routing Protocols.

1) Reactive Routing Protocols

Reactive protocols also known as On-demand routing protocols which takes the passive approach or lazy to routing which is different with proactive routing protocols. Router are identified and maintained for nodes that require sending data to destination this is done by routing discovery mechanism to find the path to the destination [10]. This type of protocols find route by flooding the network with route request packets [12]. The reactive protocols discovered when needed. In this source nodes initiate route discover broadcasting route request into the network [15]. The discovered route maintained in the routing table however valid and kept and the old one are deleted after active route timeout. A serious issue for MANET occurs when the links are failure due to high node mobility. This is cause for increase in the traffic with link break make effects of intermediate nodes [15]. AODV, DSR, ROAM, LMR, TORA, ABR, SSA, RDMAR, LAR, ARA, FORP and CBRP are the example of routing protocols.

2) Proactive Routing Protocols

Routing protocols are table-Driven protocols when each nodes maintain a route to old destination in its routing table [1]. Proactive protocols also determine the route for various

nodes in the network in advance, so that the route is already present whenever needed. Route overhead are larger in such schemes in compare to reactive protocols [10]. DSDV, WRP, GSR, FSR, STAR, DREAM, MMWN, HSR, OLSR and TBRPF are some of example of proactive protocols. In case of route failure error packet is sent by the source to destination nodes. V-Destination sequence distance vector protocol [10] is a table-driven routing scheme for ad hoc mobile networks based on the Bellman-Ford algorithm and developed by C. Perkins in 1994. This algorithm is used for calculating or finding the shortest path between the multiple paths and as the same suggest the source select the path which has minimum, distance from source to destination. The main contribution of the algorithm was to solve the routing loop problem. Each entry in the routing table contains a sequence number, the sequence numbers are generally even if a link is present; else, an odd number is used. The number is generated by the destination, and the emitter needs to send out the next update with this number. The update in the table can be done by two method one is full dump where node transmit their Routing table entry and other is incremental method where the node only forward newly updated entry[15].

4. MOBILITY MODELS

A mobility model which represents movement behavior of considered application scenarios should incorporate and is an important feature that may change characteristics of mobile nodes. It describes how speed, acceleration and direction of the node changes over time. In order to check the performance of various mobility model the result of a protocol for an ad hoc network, the protocol should be tested under realistic conditions such as the transmission of the packets in sensible transmission range, limited buffer space for storage of messages with various data traffic models, and realistic movement of mobile nodes. In the MANET there are various mobility models [11,14] such as Random Walk Mobility Model, Random Waypoint Mobility Model, Reference Point Group mobility Model, Boundless Simulation Area Mobility Model, Gauss-Markov Mobility Model, Probe Walk Mobility Model, Column Mobility Model and City Section Mobility Model. In this paper we are comparing the performance of various reactive and proactive protocols with the RPGM and CMM mobility models with aim to packet delivery ratio, throughput and end to end delay and routing overhead.

1. RPGM (Reference Point Group mobility Model)

RPGM is a mobility model with spatial dependency to simulate group behavior in [11, 14] where each node belongs to a group where every node follows a logical center (group leader) that determines the group's motion behavior. RPGM is a group mobility model where the nodes form a group and then moves in a coordinate manner. It also represents the random motion of a group of mobile nodes as well as the random motion of each individual mobile node within the group. The nodes in a group are usually randomly distributed around the reference point. Group movements are based upon the path traveled by a logical center for the group. There may be a case where Individual mobile nodes randomly move about their own pre-defined reference points and there may be change in the performance of the network. The different nodes use their own mobility model and are then added to the reference point which drives them in the direction of the group. At each instant, every node has a speed and direction that is derived by randomly deviating from that of the group leader. This general description of group mobility can be used to create a variety of models for different kinds of mobility applications.

2. CMM (Column Mobility Model)

CMM [11,14] is a mobility model with spatial dependency also and this model is derived from RPGM. It is a set of mobile nodes that move around a given line or column, which is moving in a forward direction or row. A minor modification of the Column Mobility Model allows the individual mobile nodes to follow one another node at the time of movement. For the implementation of this model, we have an initial reference grid which forms the column for mobile nodes. Each mobile node is then placed in relation to its reference point in reference grid; the mobile node is then allowed to move randomly around its reference point via an entity mobility model.

5. TRAFFIC MODELS

An analytical approach is deployed to determine a traffic model, assuming a certain number of channels in cell system, which is also homogenous in the entire mobile communication network. The cell is assumed to contain a certain number of channels. The queuing theory is deployed as model technique, assuming the calls enter the system in an orderly sequence. The developed traffic model is design based on the arrival rate, holding time, which is statistical distributed among subscriber making calls within the cell and handover calls. The Markov chain is used to analyze queuing theory which operates on memory less system, using steady state transition diagram. Also the traffic data are collected from the OMC-counter, which is inbuilt in mobile network. In order, to estimate the volume of offered traffic load in Erlanger place on mobile communication network capacity and the proportion number of block calls(subscribers) in the system, will need to deploy a model. From literature review, it is observed that queuing model have been successfully applied to area such a capacity planning and performance analysis [16,13]. A model is a mathematical expression or diagram or algorithms that represent traffic characteristics [17]. This traffic model show the relationship between these components, channels resource (V), traffic load in erlang (A) and blocking probabilities (Pb). The relationship between traffic loads and services state, show that as the offered traffic load increases and service render to subscribers decline in a constant capacity (channels). Therefore there is need to predicted accurate traffic load in line with adequate capacity (channels) in mobile communication network to minimize block calls experience by subscribers.

1. The greedy source model

A simplified packet data model is the greedy source model. It may be useful in analyzing the maximum throughput for best-effort traffic (without any quality-of-service guarantees). Many traffic generators are greedy sources.

2. Payload data model

The actual content of the payload data is typically not modeled, but replaced by dummy packets. However, if the payload data is to be analyzed on the receiver side, for example regarding bit-error rate, a Bernoulli process is often assumed, i.e. a random sequence of independent binary numbers. In this case a channel model reflects channel impairments such as noise, interference and distortion.

RESULTS AND DISCUSSION:

In this paper, we use NS-2 simulator for simulating different routing protocols. NS simulator uses a visual tool called NAM. NAM is a Tcl/TK based animation tool for viewing network simulation traces and real world packet trace data. We are using the topology of 700x700 m2 with 25, 50, 75,100 nodes we are increasing only total number of nodes with keeping the total area constant i.e 700x700 m2, speed 20 ± 3 m/s, pause time 15 ± 3 s, packet size 512 B, simulation time is 300s and Traffic Node 10, 20, 40, 60 respectively with 25, 50, 75,100 nodes in the simulation. We discuss the effect of mobility on the Packet delivery Ratio, Average End-to-End delay, Normalized Routing Load and Throughput of the mobile ad-hoc network.

1. Packet Delivery Ratio:

Packet delivery Ratio (PDR): this is the ratio of total number of packets successfully received by the destination nodes to the number of packets sent by the source nodes throughout the simulation. It also describes the loss rate that of the packets, which in turn affects the maximum throughput that the network can support.

2. Average End To End Delay:

Average End-to-End delay (AED): this is defined as the average delay in transmission of a packet between two nodes and a higher value of end-to-end delay means that the network is congested and hence the routing protocol does not perform well Average end-to-end delay (AED) is calculated.

3. Normalized Routing Load:

This is calculated as the ratio between the numbers of routing Packets transmitted to the number of packets actually received (thus accounting for any dropped packets). The higher the NRL, higher the overhead of routing packets and consequently the lower the efficiency of the

protocol. It is defined as Number of routing packets "transmitted" per data packet "delivered" at destination. Each hop-wise transmission of a routing is counted as one transmission. It is the sum of all control packet sent by all node in network to discover and maintain route.

It is expected that the analytical model provided in this paper would help design and develop new routing protocols suitable for different types of ad hoc networks. The model also provides an insight into the impact of mobility on routing protocols. It also points out that routing protocol should be equipped with the functionality of choosing paths with higher duration, in order to improve the network performance. The proposed model could be extended to include protocol dependent factors that contribute to path duration. This would help in the accurate prediction of mobility and traffic models for various routing protocols.

CONCLUSION

The simulation results indicate that even setting the same parameters, different MMs have a different impact on the performance evaluation of protocols. Therefore, choosing an appropriate mobility model as well as setting appropriate parameters serves as the key role for protocol evaluation. We have to make an attempt to find the best routing protocols with the help of mobility models using NS-2 simulation tool. Then evaluate the performance of routing protocols with the help of traffic models using NS-2 simulation tool. We have to evaluate the use of routing protocols and their analysis of performance in the mobility models and traffic models. Finally we should found the best routing protocol under suitable conditions in the mobile Ad hoc networks.

ACKNOWLEDGMENT

We thank anonymous reviewers for their insightful comments. This work is supported in part by NSF CNS-1223477 and CNS-1117106. Our Department of Computer Science and Engineering also acknowledges the fund from the college B.N.C.O.E.Pusad, India.

REFERENCES

[1]. S. Corson and J. Macker, "Mobile Ad hoc Networking (MANET): Routing Protocol Performance Issues and Evaluation Considerations", RFC: 2701, January 1999.

[2]. C. Bettstetter and C. Wagner, "The spatial node distribution of the random waypoint mobility model", in Proc. 1st German Worksh. Mob. Ad-Hoc Netw. WMAN'02, Ulm, Germany, 2002, pp. 41–58.

[3]. F. Akyildiz, W. Su, et. al., "A Survey on Sensor Networks", IEEE Communication Magazine, August 2002, pp. 102-114.

[4]. Xavier P.C., Christian B., Hannes H.. Toward a mobility metric for comparable & reproducible results in Ad Hoc networks research. Mobile Computing and Communications Review, 2003, 7(4): 58-60.

[5]. C. Perkins, E. Royer and S. Das, "Ad hoc On-Demand Distance Trajectory,(AODV)routing"IETF,RFC3561:http://tools.ietf.org/html/rfc3561 (July 2003).

[6]. Mehdi SABEUR, Ghazi AL SUKKAR, Badii JOUABER, Djamal ZEGHLACHE, "Mobile Party: A Mobility Management Solution for Wireless Mesh Network", Third IEEE International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob 2007), 0-7695-2889-9/07 $25.00 © 2007

[7]. B. Malarkodi., P.Gopal, B.Venkataramani, "Performance Evaluation of Adhoc Networks with Different Multicast Routing Protocols and Mobility Models," International Conference on Advances in Recent Technologies in Communication and Computing, pp.81-84, 2009.

[8]. V. Vetriselvi, "Trace Based Mobility Model for Ad Hoc Networks" Third IEEE International Conference on Wireless and Mobile Computing, Networking and Communications (WiMob 2007)0-7695-2889-9/07 $25.00 © 2007

[9]. M. Zuhairi, D. Harle, A simulation study on the impact of mobility models on routing protocol performance with unidirectional

link presence, International Conference on Information Networking, 2011.

[10]. Azzedine Boukerche, "Performance Evaluation of Routing Protocols for Ad Hoc Wireless Networks", Journal of Mobile Networks and Application, Vol. 9, No 4. pp.333-342, 2004.

[11]. Santosh Kumar ,S C Sharma and Bhupendra Suman ,"Classification and Evaluation of Mobility Metrics for Mobility Model Movement Patterns in Mobile Ad-Hoc Networks ",International journal on applications of graph theory in wireless ad hoc networks and sensor networks (GRAPH-HOC) Vol.3, No.3, September 2011.

[12]. E.M. Royer, C.-K. Toh, A review of current routing protocols for ad hoc mobile wireless networks, IEEE Personal Communications 6 (2) (1999) 46–55.

[13]. Singh L.K and Srivastava R. (2007) "Memory estimation of internet server using queuing theory: comparative study between M/G/1,G/M/1 &G/G/1 queuing model" world academy of science, engineering and Technology 33 page 153-157.

[14]. Santosh Kumar, S C Sharma, Bhupendra Suman,"Simulation Based Performance Analysis of routing {rptpcp;s Isomg Ramdp, Waypoint Mobility Model in Mobile Ad Hoc Network", Global Journals inc. (USA),Vol.11,Issue 1.Version 1.0 Feb.2011, ISSN:0975-4172

[15]. M. Abolhasan, T. Wysocki, "A review of routing protocols for mobile ad hoc networks", Ad Hoc Networks, Vol. 2, Issue 1, pp 1-22, 1 January 2004.

[16]. Yuguang Fang (2005)"Modeling and Performance Analysis for wireless mobile networks: A New Analytical Approach" IEEE/ACM Transactions on Networking,Vol. 13,NO. 5, PP 989-1002.

[17]. Zukerman Moshe (2010) "Introduction to queue theory and stochastic tele traffic model"pp 45-67, 87,104-127. http://www.ee city u.edu.hk/Zukerman/classnote pdf.