ISSN: 2278 – 1323
International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)
Volume 1, Issue 7, September 2012

Traffic Estimation in Mobile Ad Hoc Network Using Probe Packets

Chetan Kumar Kalaskar,Sujatha P.Terdal
Dept. of Computer Science and Engineering
Poojya Doddappa Appa College of Engineering Gulbarga 585102 Karnataka India

Abstract - **This paper presents a new method for estimating of traffic in mobile ad hoc by using probe packets. Probing based approaches involves sending test transactions over the network to monitor the path and performance of network. These test transactions are called probes. Probes are used to monitor a wide array of performance parameters including delay, loss, available bandwidth, traffic composition, routing behavior. It relies on Self-induced congestion, and repeatedly samples of traffic in network path with sequence of probe packets, Send randomized rates. This method requires little computation at each iteration, and add small of probe traffic. It maintains current estimates, which is incrementally improved with each new measurement with each new measurement of inter packet time separation in sequence of probe packet pairs and also provide quality of service by transferring data on path with best available bandwidth. We compare the performance of traffic estimation with that of Ad-Hoc Distance Vector Routing Protocol in OMNET 3.3 network simulators.**

I. INTRODUCTION

Mobile Ad-Hoc Network (MANET) is one of the most important technologies that have gained interest due to recent development in both in hardware and software technologies[1].MANET allows set of mobile user equipped with radio interface dynamically form communication network. MANET incorporates routing functionality into Mobile nodes so that they became capable forwarding data on the behalf of the intermediate and effective becomes the infrastructure.

In a communication network, traffic that transits through the network has a source where that particular traffic flows enter the network and destination where it exits the network. Traffic estimation reflects the volume of traffic that flows between all possible paths between source and destination in Mobile Ad-hoc Network In this paper we present analytic model for estimation of traffic in MANET using of probe packet. Traffic estimation reflects the amount the traffic that flows between all the possible paths between source to destination.

Probe packets are classified into two types passive and active probe packet [2].

Passive probing uses local Information or by observing the behavior of the whole network. Implementation of passive probing in principle would be possible, if could access all the network nodes in path. However, in Practice this is typically not possible and Traffic estimation in only feasible by active probing of the Network path. By injecting probe traffic into the network, and then analyzing the observed effects of probes, we can estimate the traffic. This kind of active measurement only requires access to the sender and receiver hosts.

This method provides the convenient measure inter-packet separation strain of consecutive probe packets. When there is no congestion, this strain is zero on average. When the total load starts to become larger than the path's bottleneck capacity, the strain becomes proportional to the overload.

II. RELATED WORK

A number of papers have appeared in recent years in the field of traffic estimation.

Somarriba and Robertazzi[3][4] have proposed traffic estimation in which the traffic load that can be expected to flow in each link is based on the number of routes that the link use one of the shortcoming of this work was it assumes traffic on each route is equal. Calculation of traffic estimation for each individual node by summing up load of all the outing links of that node. In order to estimate traffic over different links was proposed [5].

In this work of traffic estimation exponential filter is used to generate an estimate based on the size and intensity of arrival of the transmission by measuring inter arrival time two packets Δt seconds and size of packet ΔL as shown in figure 1.

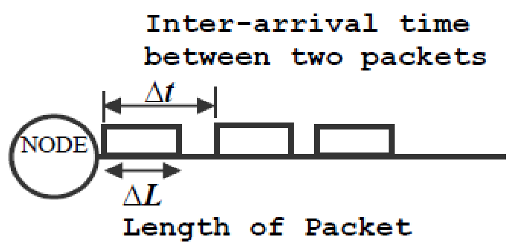

Fig.1. Fig.1. Inter-arrival time between two packets and size of packet.

one of the shortcoming of this method is that it pays equal importance all the packets over specified window size.In exponential decrease function packet tn that arrived at most recent is given more weight compared to packet that have arrived earlier as shown in figure 2.

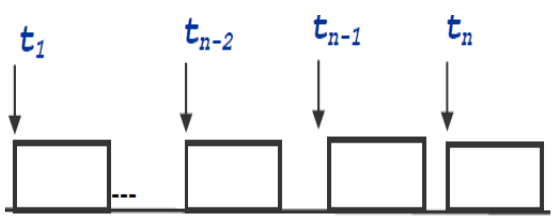

Fig.2. Total Time for *n* packets to be received.

Melander et al. Trains of packet pairs (TOPP) [6]. Uses probe Packets sent at various rates and attempt to estimate point of Congestion, i, e probe rate where delay

ISSN: 2278 – 1323
International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)
Volume 1, Issue 7, September 2012

starts increasing. TOPP Fits data to a straight line in order to arrive at an estimate. This Method uses substantial time for measurement and analysis before producing an estimate, and not suitable for of real time traffic Estimation.

Ribeiro have developed pathChrip [7], pathChrip uses probe trains with internally varying inter packet separation, In order to scan a range of probe rates with each train. By analyzing the internal delay signature of each chrip, an estimate of traffic is Produced. Estimates are smoothed by averaging over sliding window.

III. PROPOSED WORK

In this proposed technique source initiates process of finding a path to destination when it has data to send. Source first sends the route request packets to all its immediate neighboring nodes with source id and destination id. Once source node obtain path to required destination source nodes initiates probing is divided into two phases the data collection phase and the analysis phase.

In the data collection phase, a probe generator i,e source node injects probe packets along the path to be measured. The probing scheme (i.e. the dispersion or separation between probes) is predefined by sender. The initial probe packet dispersion is proportional to the probe rate. The dispersion between successive probe packets changes when the probe packets traverse the network path. It either changes due to limited link capacity or due to congestion. Limited link capacity will increase the dispersion between probe packets while packet interactions may increase as well as decrease the dispersion. The probe packets are received by a probe receiver. Upon reception, the probe packets are time stamped. Using these time stamps the probe packet dispersion at the receiver is calculated.

The second phase, the analysis, uses the dispersion values obtained from the data collection phase to produce an estimate. The difference between the initial probe packet dispersion and the received probe packet dispersion is used to produce an estimate of the path capacity or the available bandwidth. The data collection and the analysis phases combined is called a measurement session.

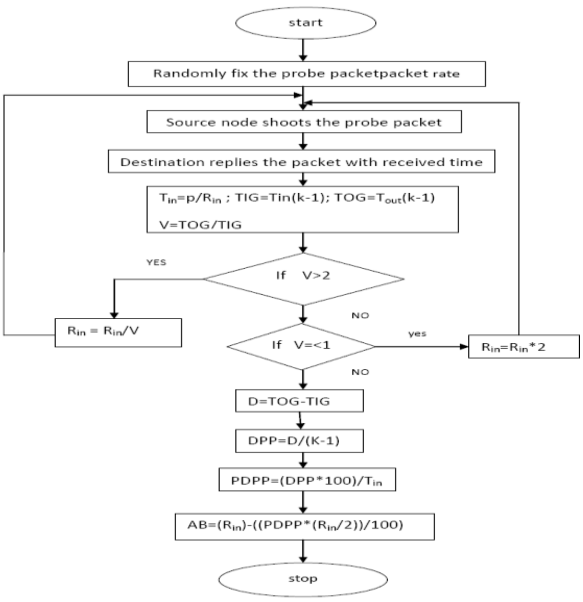

Fig.3Flow chart of working proposed system

Consider the size of probe packet is P, R_{in} is the rate of transmission of probe packets so the input probe packet gap is $T_{in.}$ The total input probe packet pair gap TIG and the total output probe packet pair gap TOG can be calculated by the following formulas: where 'K' is the number of probe packets and T_{out} is the output probe packet gap. 'V' is the ratio of total output gap and total input gap, it decides the current iteration transmission rate, if the ratio is greater than 2 then current iteration rate reduced to 'V' times of its last iteration rate, and if the ratio is equal to or less than 1 then the iteration rate increases to double of its last iteration rate The total difference between the total output gap and total input gap, D. where DPP is the difference between each probe packet pair at destination side and PDPP is the percentage of difference between each probe packet pair at destination side.

Unused link capacity, also called available bandwidth (ABW). ABW is the difference between the link capacity and the traffic load on that link at a given time.

ABW measurement scheme iteratively shoots the fixed size of probe packets from a source node to a destination node at a specific transmission rate and checks the change of probe pair gap at the destination to estimate packet transmission capacity. The change in probe pair gap at the destination end (i.e. the output gap) is affected by the tight-link capacity during the estimation period. If the probe transmission rate is lower than or equal to the ABW, no change in the output gap occurs. To determine the probe rate at each iteration, a proposed algorithm is adopted Figure 3 shows the flowchart for the proposed algorithm ABW measurement scheme. Figure 3 shows a flowchart that describes the ABW measurement scheme. In this scheme, the source node shoots the probe packets towards the destination at random rate.

The source node computes the probe pair input gap Tin and destination node computes the probe pair output gap Tout affected by the bottle neck, the output gap results are sent back to the source and compares output gap and input probe pair gap at source. If ratio of the total input gap and total output gap is grater then 2 then reduce the sending probing packet rate to 'V' times of its last iteration rate (Rin/V) where 'V' is the ratio of total input gap and total output probe packet gap, else the ratio of input gap and output probe packet gap less than or equal to 1 and then the probe packet is sent at the rate of "Rin×2". If the probing packet rate is in between 1 & 2 then stop the iteration and go to calculation to check the differences between total output gap and total input gap (D=TOG–TIG) and then it evaluates the difference between pair of packet gap and the percentage of pair of packet gap differences and finally evaluates the available bandwidth calculation "ABW=R_{in}-((PDPP*(R_{in}/2))/100)". This proposed algorithm reduces the number of iterations and increases the accuracy.

IV. PERFORMANCE ANALYSIS

The simulation is carried out in OMNET 3.3 network simulator. The setup of the simulation depicts an ad hoc network that consists of a varying number of Mobile

ISSN: 2278 – 1323
International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)
Volume 1, Issue 7, September 2012

Hosts (MHs) that move randomly in a square field free of obstacles.

Routing	AODV
Channel Bandwidth	2500Kbits/s
Channel Delay	0.0001 sec
Channel Error Rate	0.000001
Channel Data Rate	250Kbits/s
Node Placement	Random
Mobility Model	RWP
Message Packet Size	512 bytes
Simulation Area	650 x 650 m
Mobility max, min speed	2 m/s
Number of nodes	10-35

Simulation Set up.

In our simulation, we simulated a scenario of 20 nodes in square area of 650m x 650m. The mobility model is random waypoint model. At the beginning, each node has random initial location, it will move to random destination with random speed. Simulation runs for 100 seconds. Metrics used for the performance of network are

1. Packet Delivery Ratio is defined by a factor of number of packets received by number of packets transmitted.
2. Network throughput is number of packets received.
3. Latency is the amount of time that is required for a packet to travel from source to destination.

Simulation Outcome.

Now we shall compare each and every simulation parameter for both proposed traffic estimation best path routing (TEB) and present ad hoc on demand distance vector routing (AODV).By plotting graph for both method.

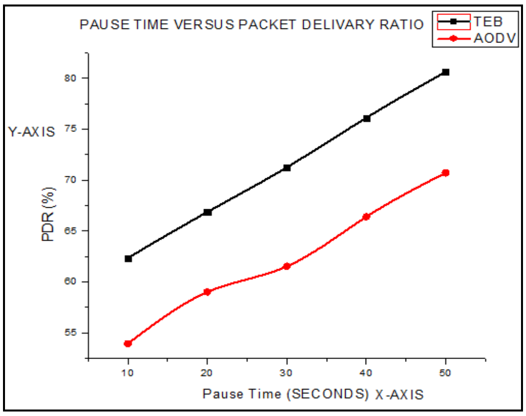

Figure 4: Pause time versus PDR.

Figure 4 and 5 graphs are plotted keeping the constant number of nodes 20, and increase in the pause time from 10 to 50 seconds as seen from the above outcome of proposed method for traffic estimation(TEB) performs better in both cases when compared to ad-hoc on demand routing protocol(AODV).

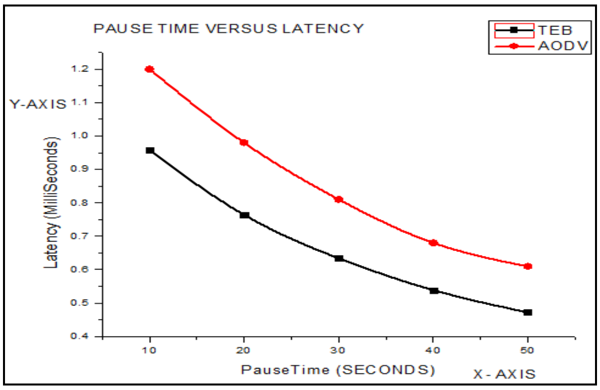

Figure 5: Pause time versus Latency.

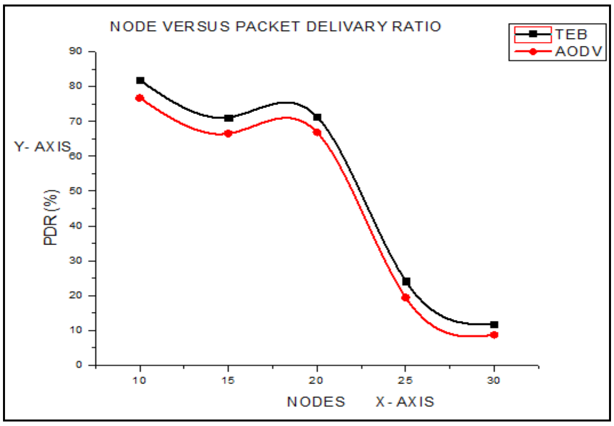

Figure 6: Node versus PDR.

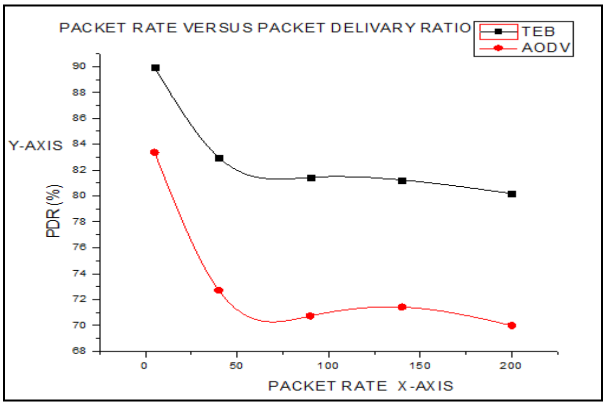

Figure 7: Packet rate versus PDR

From the above graph it is clear that proposed traffic estimation as the better packet delivery ratio when compared to AODV with nodes ranging from 10 to 30 Packet delivery ratio drops when there is increase in number of nodes because there might be increase in level of congestion as well as bottleneck. And even when there is change in packet rate traffic estimation based method performs better than AODV. One of the reason why TEB method performs well it selects path with best available from obtained multipath which is least congested and has better throughput and less latency.

V.CONCLUSION AND FUTURE WORK

Traffic estimation and traffic dependable QOS routing are important aspects of QOS provisioning in Mobile Ad hoc Network. In this work we have proposed unique traffic measured technique by generating probing packet through obtained path. Generation and measurement of probing packet is varied depending upon previous measurement. Once the source obtains multiple paths source node selects the path with best available bandwidth. Information is incorporated in route discovery process and multipath are acquired bandwidth of the route are updated periodically. Results show that the system produces better results than the normal multiple or QOS routing. The system can be further improved, if the probe packets are sent by the destination only, the source node could still correctly estimate how busy the paths are because the information needed is still in the received probe packets. However the overhead and consumed network resources are reduced to half.

REFERENCES

[1] C.E Perkins : “Adhoc networking”,Addison Wesley 2000.

[2] Cheikh Sarr, Claude Chaudet, Guillaume Chelius, and Isabelle Gue´ rin Lassous, “Bandwidth Estimation for IEEE 802.11-BasedAd Hoc Networks”, IEEE transactions on mobile computing, vol. 7, no. 10, October 2008.

[3] Somarriba O., "Multihop Packet Radio Systems in Rough Terrain", Licentiate Thesis, Radio Communications Systems, Department of Signals, Sensors and Systems, Royal. Institute of Technology, 100 44 Stockholm, Sweden, October1995.

[4] Robertazzi, T., Shor, J., “Traffic Sensitive Algorithms for Generating Self Organizing Network Schedules”, Dept. of Electrical Engineering, SUNY at Stony.

[5] Syed Mushhar Sadiq Master Thesis on “Traffic Estimation in mobile ad- hoc networks”, Royal Institute Of Technology,2003.

[6] B. Melander, M. Björkman, and P. Gunningberg, “A new end-to-end probing and analysis method for estimating bandwidth bottlenecks,” in Proc. IEEE Globecomm 00, San Francisco, USA, November 2000.

[7] V. Ribeiro, R. Riedi, R. Baraniuk, J, Navratil, and L.Cottrell, “pathChirp: efficient available bandwidth estimation for network paths,” in Proc. Passive and Active Measurement workshop (PAM), 2003.

[8] R. Prasad, M. Murray, C. Dovrolis, and K. Claffy, “Bandwidth estimation: metrics,measurement techniques, and tools,” in IEEE Network, November/December 2003

[9] Varga, A. and Hornig, R. (2008), "An overview of the OMNeT++ simulation environment", Simutools '08: Proceedings of the 1st international conference on Simulation tools and techniques for communications, networks and systems.
& workshops: 1--10