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Horizontal Hand off Between Heterogeneous Wi-Fi Networks Using Reactive and Proactive Routing Protocol

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ABSTRACT

To facilitate the user with service continuity there is a need to combine various wireless access technologies so that user gets non interrupted service. Now a day there are various wireless technologies such as Wi-Fi which allow the user seamless connectivity to the internet. But range of Wi-Fi is limited. Thus by providing the horizontal handoff between two Wi-Fi networks using different routing protocols such as AODV, AOMDV and DSDV we can create a wireless solution which can provide efficient speed and coverage for mobile users. In this context comparison of three routing protocols for handoff is an important parameter which defines the switching between the two networks using different routing protocols. In this paper we use AODV, AOMDV and DSDV protocol to analyse the performance of horizontal handover between two Wi-Fi networks.

Keywords: Handoff, Wi-Fi, AODV, AOMDV, DSDV

INTRODUCTION

In this paper we are dealing with the horizontal Handoff using different routing protocols. In this process the handoff occurs between the two access points having the same access technology or among the homogeneous base stations. In this process there is no connection break between the two cells [1]. Vertical handoff is the process of handoff for a mobile terminal amongst access points supporting dissimilar network technologies. Such as vertical handoff process is considered when the signal transmission changeover from base station of an IEEE 802.11b to an overlaid cellular net-work. The first comparative protocol used is AODV routing protocol. The most commonly used reactive on demand routing protocols in mobile ad hoc network is Ad hoc on-demand Distance Vector (AODV). Also the reactive enhancement of the DSDV protocol is AODV protocol. The route discovery process involves ROUTE REPLY (RREP) packets and ROUTE REQUEST (RREQ).

The second comparative protocol using is AOMDV. Ad Hoc on demand multipath distance vector routing protocol having main feature is to compute multiple paths during route discovery. It uses routing information already available in the underlying AODV protocol as much as possible. Thus additional overhead is required for the computation of multiple paths [3].

In AOMDV to establish & maintain multiple loop-free paths at each node a route updates rules are required, and to find link disjoint paths a distributed protocol is required.

Destination
Sequence Number
Hop count
Next hop
Expiration. time-out

Fig.1 Structure of routing table entries for AODV

Destination
Sequence Number
Advertise-Hop count
List of Route
Expiration. timeout

Fig.2 Structure of routing table entries for AOMDV

The third comparative protocol using is DSDV. Proactive routing protocol maintains regular and updated routing information for each pair of networking nodes by propagating route updates pro-actively at predetermined interval of time. The periodic and event-driven messages are accountable for route establishment and route maintenance. The Destination-Sequenced Distance Vector (DSDV) protocol is the commonly used proactive routing protocol in mobile ad hoc network. In DSDV, each node maintains a routing table with one route entry for each destination in which the shortest path is recorded. It uses a destination sequence number to avoid routing loops.

COMPUTING MULTIPLE LOOP FREE PATH

For AODV each rout arriving at the node, route discovery exponentially defines an alternate path to the source of the destination. Each copy of the RREQ packet arriving at the node defines an alternate path return back to the source. All such copies to construct route will lead to routing loop. For AOMDV advertised hop count I for destination d represents the maximum hop count for the multiple path d available at I. Maximum hop count is then considered as advertised hope count can never change for same sequence no. [3].

Basically algorithm is based on distance and time with consideration of threshold value for desired condition. if the required time is greater than threshold value processed for distance measurement, if previous distance is less than available distance then handoff is generated else we remain in same condition. As shown in fig. 4, we are considering two access points mobile node which is moving from the area of Ap1 to Ap2, this movement is calculated using above algorithm as shown in fig3.the threshold value is check and accordingly handoff is generated. Proposed work is based on three different routing protocols AODV, AOMDV and DSDV. We compare these protocols for four parameters like throughput, delay, energy and jitter.

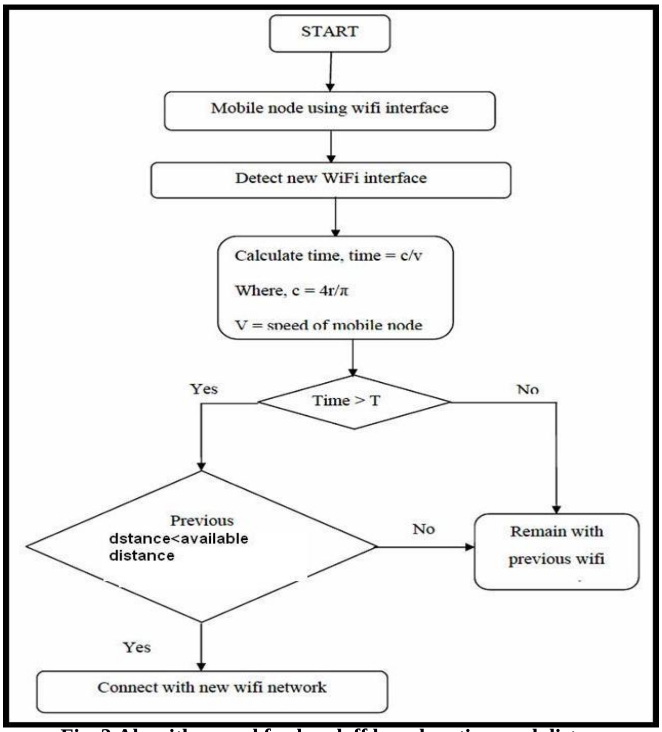

Fig. 3 Algorithm used for handoff based on time and distance

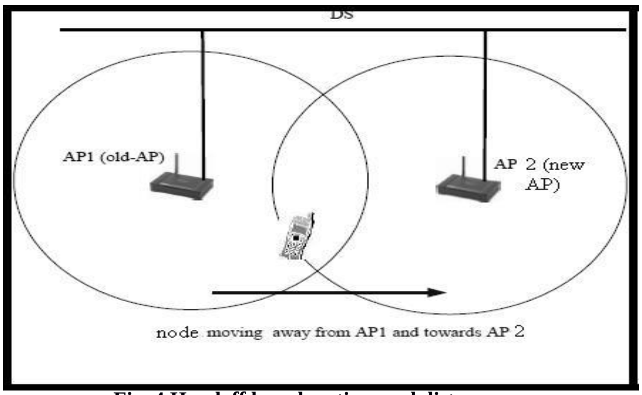

Fig. 4 Handoff based on time and distance

RELATED EQUATIONS FOR HANDOFF WITH REFERENCE TO THE AOBOVE ALGORITHM

$$Rss = Ptx - Plref - \frac{10nlog(lop)}{dref} + x \quad (1)$$

Rss- Received signal strength, ptx- Transmited power, Plref-path loss, n- path loss exponent, dref- reference distance lop- distance between mobile and access point and X-standard deviation of Gaussian distribution function.

$$R = \frac{dref(ptx - plref - Rsse)}{n} \quad (2)$$

R- Radius of the cellular and Rsse- Rss at the edge of the cellular

$$los = \frac{dref(ptx - plref - Rss)}{n} \quad (3)$$

los- Distance between access point and sampling point

$$T = \frac{[R2 - los2 + v2(ts - tpi)2]}{v2(ts - tpi)} \quad (4)$$

T- Travelling time in cell, v- velocity of mobile user, ts- time of sampling, tpi- time of entering the cell.

If value of T is in between 0 and 2R/v, find PDF and CDF using

$$fT = 2/\pi\sqrt{(}4R2 - v2T2 \quad (5)$$

$$FT = 2cos - 1\left(\frac{vT}{2R}\right) \quad (6)$$

Otherwise fT=0 and FT=1

$$T1 = 2R\sqrt{v}\sin[\ sin - 1\left(\frac{vTi}{2R}\right) - \frac{\pi}{2}\ pf] \quad (7)$$

T1- Time threshold parameter, pf- Required probability of handoff and Ti- Handoff Delay

PERFORMANCE EVALUATION

We have evaluated the performance of handoff between two Wi-Fi networks using AODV, AOMDV and DSDV routing protocol using ns-2 simulation. The goal is to address the following question:

How does handoff take place?
Comparison between AODV, AOMDV, DSDV routing protocol.

During the handoff decision process, two factors should be considered. On one hand, the MH should try maximising the utilisation of a high bandwidth and low cost access network. On the other hand, the number of unnecessary handoffs should be minimised to avoid degrading the quality of service of current communication and overloading the network with signalling traffic [3 and 6]. The fundamental aim of handoff is to make good use of network bandwidth and improve the quality of service of applications. The required QoS of the network should be minimum delay and jitter with maximum throughput [7].

SIMULATION ENVIRONMENT

We use detailed simulation model using ns-2 [4]. The distribution coordination function [DCF] of IEEE 802.11 for wireless LANs used as a MAC Layer [5]. Here we are considering the two overlapping cell using Wi-Fi network as shown in fig. 4 with two access point. Mobile node is moving from AP1 (old access point) toward AP2 (new access point). For this we are using distance and time base algorithm as shown in fig. 3. Simulation is done under 19 nodes, for 200 seconds. After simulation it gives the position of 19 nodes and between which two nodes handoff got takes place. For the evaluation we are comparing three different routing protocols AODV, AOMDV, DSDV with respect to different parameters for analysis such as throughput, delay, energy and jitter. The AOMDV protocol is adjusted to solve a connection issue in network topology [8].

As a remedy, we propose a Horizontal handoff method by taking into consideration the service history of user traffic, which plays an important role in justifying instable handoff decisions. The proposed method can be adopted easily and combined with existing HHO algorithms. Simulation results shows which routing algorithm is superior to use for handoff.

RESULTS AND DISCUSSION

From the table -1, we can observe the readings generated by the simulation environment using NS2.first parameter we are calculating here is throughput which is nothing but successful delivery of message over a communication channel in a given simulation time. Here we can observe that throughput generated using DSDV routing protocol is best amongst the other two protocols. Second parameter for calculation is delay where delay is the time required to travel by the data from one node to another node across the network and it should be as minimum as possible. From the above table we can observe that delay is less in AOMDV routing protocol.

Third parameter is energy and as per observation energy utilization is very less in AODV protocol. AODV uses traditional routing tables with unique entry to per destination [9] Fourth parameter is jitter which should be less and we are having least values by using DSDV routing protocol. AOMDV having more routing overhead and packet delay than AODV but it had a better efficiency when we deal with number of packets dropped and packet delivery [10-11].

Table -1 Parameter Evaluation

Parameter	Routing Protocol Used		
	AODV	AOMDV	DSDV
Throughput (kbps)	98.97	100.28	99.77
Delay(msec)	0.00084	0.0010	0.0013
Energy(watt)	136.55	136.99	182.90
Jitter(sec)	3.91	3.04	-1.06

GRAPHS RELATED TO AODV ROUTING PROTOCAL

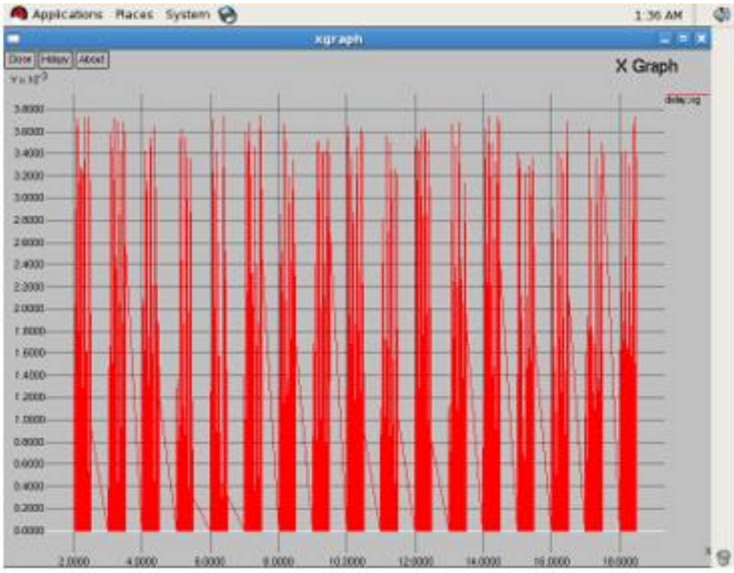

Fig.5 Graph for Delay

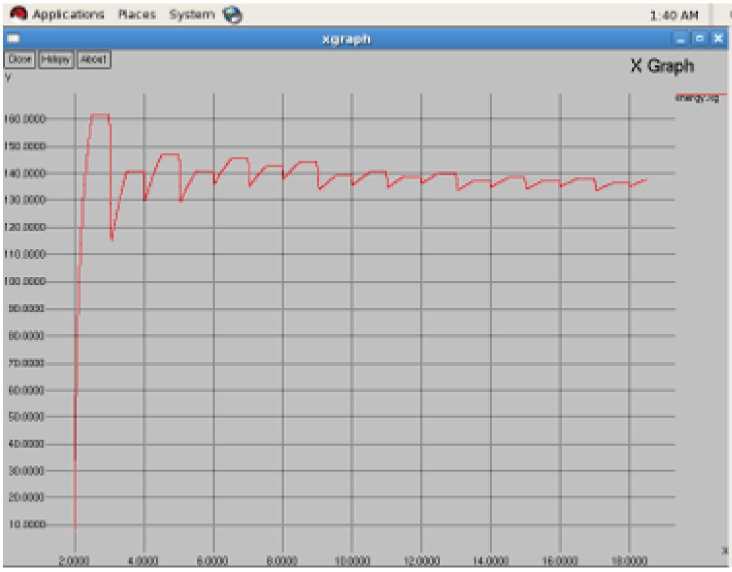

Fig.6 Graph for Energy

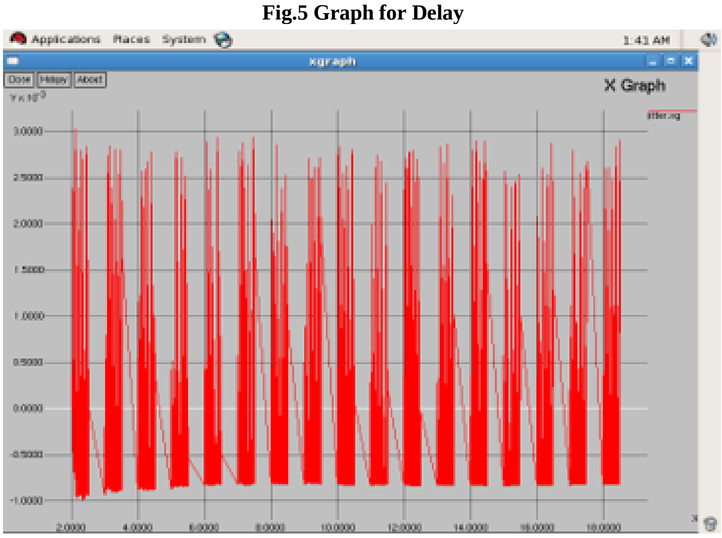

Fig.7 Graph for Jitter

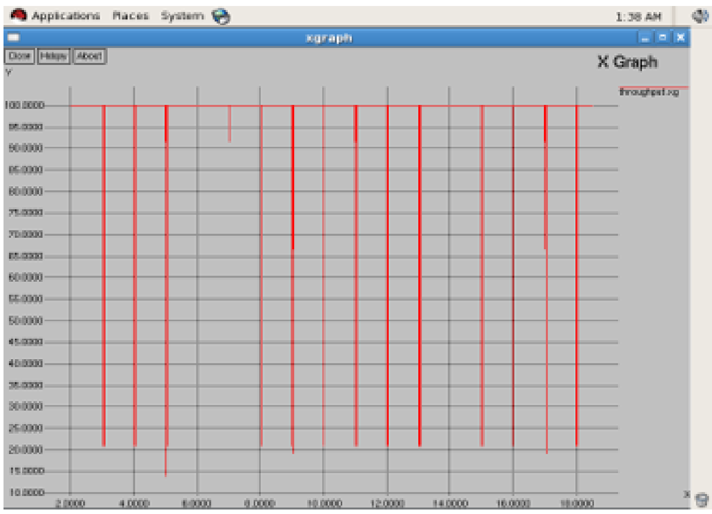

Fig.8 Graph for Throughput

GRAPHS RELATED TO AOMDV ROUTING PROTOCAL

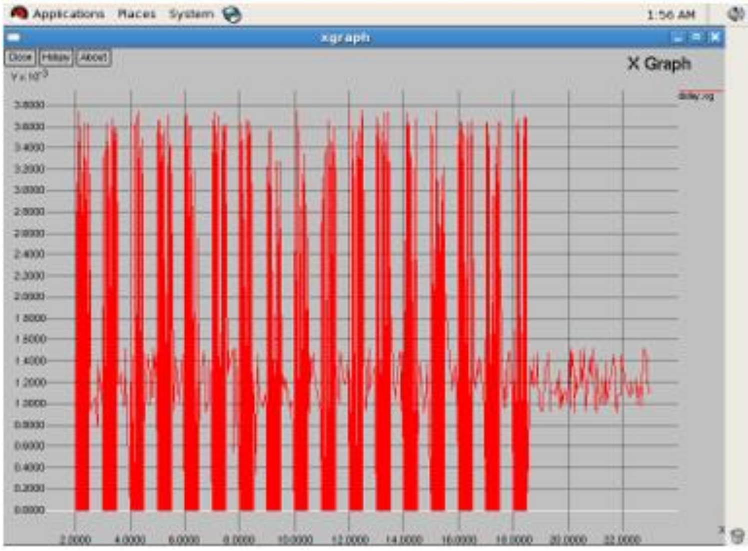

Fig.9 Graph for Delay

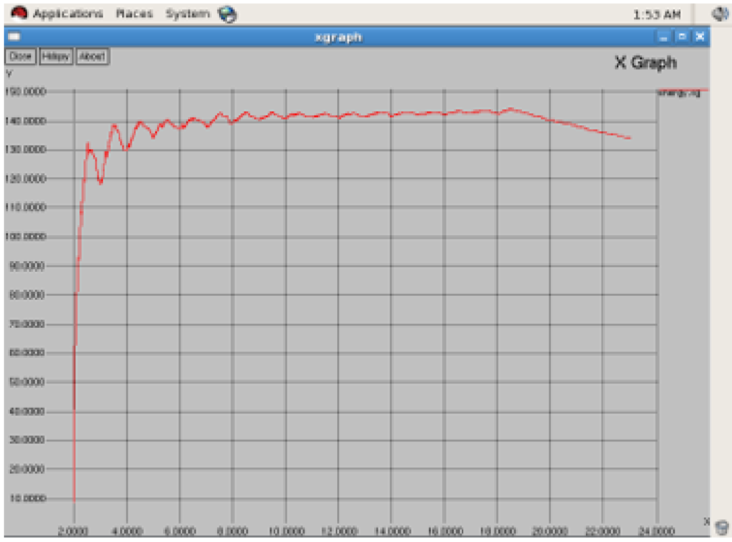

Fig.10 Graph for Energy

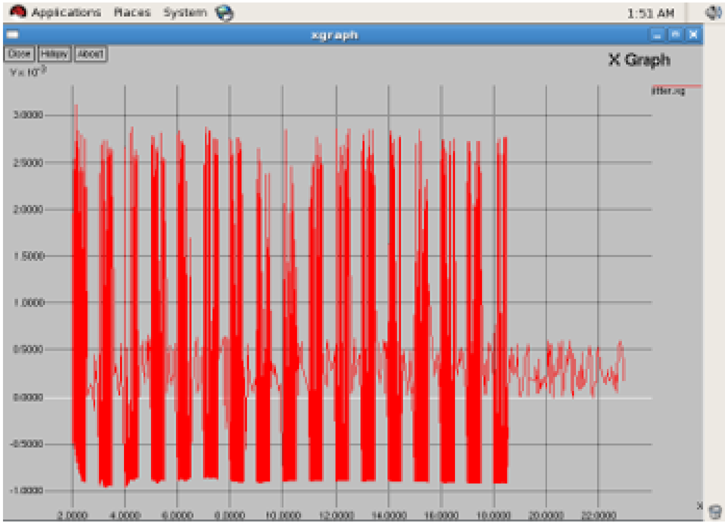

Fig.11 Graph for Jitter

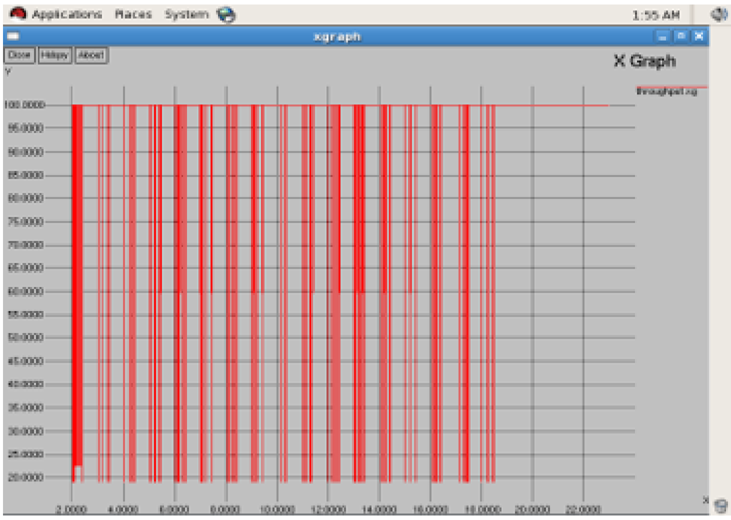

Fig.12 Graph for Throughput

GRAPHS RELATED TO DSDV ROUTING PROTOCAL

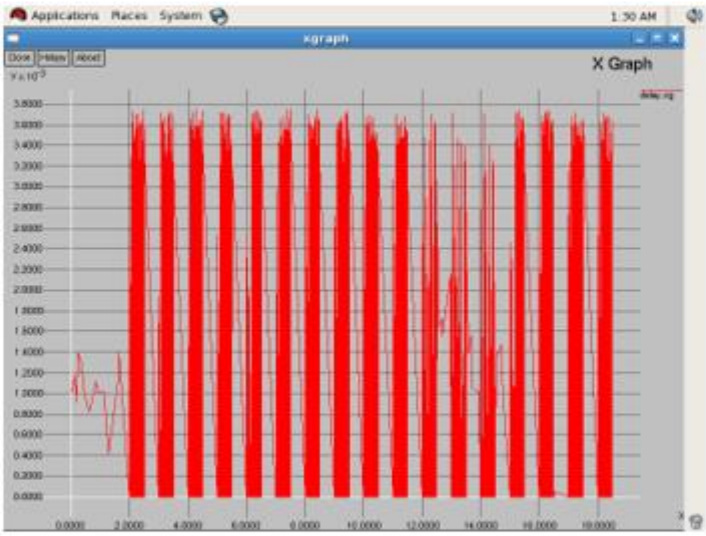

Fig.13 Graph for Delay

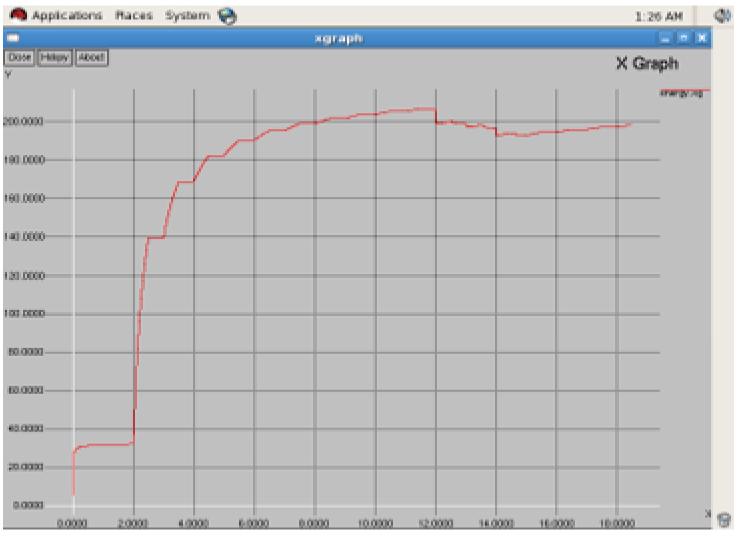

Fig.14 Graph for Energy

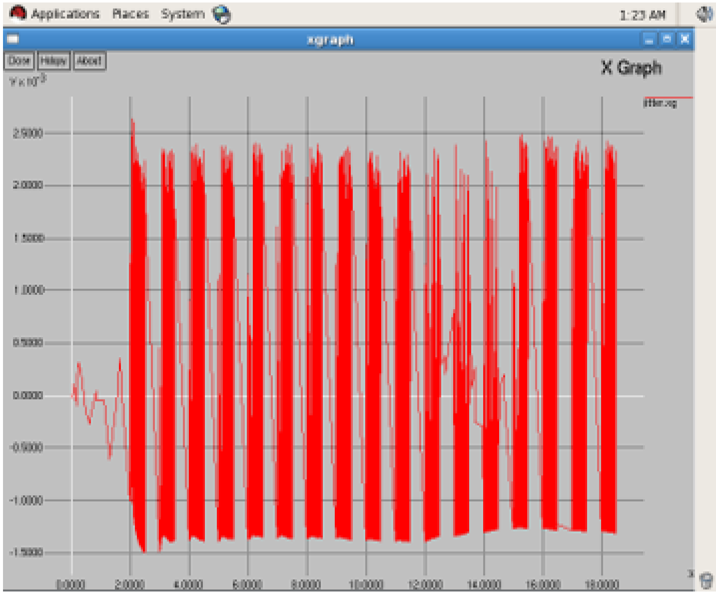

Fig.15 Graph for Jitter

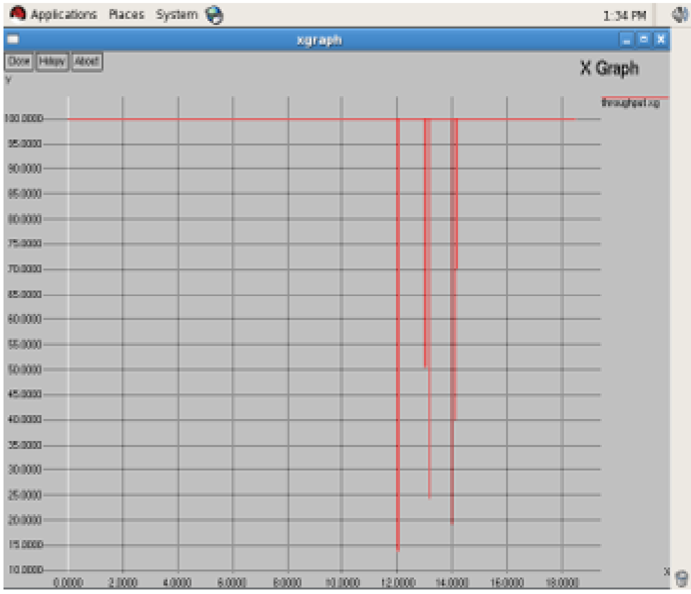

Fig.16 Graph for Throughput

CONCLUSION

Simulation results reveals that Congestion improvement, route failure flexibility, routing overheads and end to end delay minimization is achieved using multipath routing protocols. DSDV is preferable for a network having low mobility with less number of nodes. AODV performs enhances with high mobility, crowded nodes, large area, more amount of traffic and for longer period of sustainable network pattern. AOMDV achieve minimum routing over-head, lower end-to-end delay, more flexibility for route failures and improve traffic congestion for high mobility, dense nodes and traffic is more for longer period of sustainable network pattern. The overall conclusion is that for a better Quality of Service AOMDV is best routing protocol.

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