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Recital Investigation of Unlike Routing Etiquettes in Ad-Hoc Milieu Using Stream Control Transmission Etiquette as Transport Layer Etiquette

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Abstract: ***Ad-hoc networks are decentralized wireless networks without infrastructures, where nodes communicate over wireless channels. Ad-hoc networks lack infrastructure such as routers or access points, each node participates in routing by forwarding data to other nodes dynamically, depending on the network connectivity at that point of time. For this reason, the ad-hoc routing etiquettes are different from the conventional routing etiquettes used in networks with infrastructure. The nodes, in an ad-hoc network, can move freely and are allowed to join and leave the network at any point of time. This results in problems for the upper layers, when it unexpectedly exits lower layer at the etiquette stack. SCTP is a message oriented and reliable transport layer etiquette which has been proven to be a reliable alternatives to TCP in the ad-hoc milieu because of its multi homing and multi streaming features. In this paper we have compared multiple ad-hoc routing etiquettes with SCTP as the transport layer etiquette. Recital parameters such as packet delivery ratio, throughput and end-to-end delay have been taken into account and analyzed for the various routing etiquettes in both single homing and multi homing milieus.***

Keywords: ad-hoc network, SCTP, transport layer, routing protocol.

I. INTRODUCTION

Wireless ad hoc networks are characterized by unique properties and challenging environments which limit the utilization of traditional networking techniques. Wireless links are highly error prone and they can break frequently because of node mobility, interference and channel fading. It implies that the end-to-end paths between the source and sink frequently change. It is very hard to maintain end-to end routing because of the dynamic topology of the system. As a consequence of its unique characteristics, the wireless ad hoc environment has its own set of routing protocols under the general reactive, proactive and hybrid categories such as AODV, AOMDV, DSDV, DSR, TORA, etc,.

Stream Control Transmission Protocol (SCTP) is message oriented and reliable transport layer protocol. It serves in similar roles as the popular TCP and UDP protocols. It is message oriented like UDP but ensures reliable, in-sequence transmission of message like TCP, with congestion control. SCTP has certain notable features and characteristics which distinguish it from these popular protocols and make it unique. Among these features is the support for multi-homing. tn the multi-homing mode SCTP allows one or both end points of a connection to have more than one IP address, enabling transparent fail over between redundant network paths. The delivery is message oriented even within independent streams. This clearly eliminates most of the head-of-line blocking unlike the TCP byte stream delivery. Moreover the validation and acknowledgement mechanisms provide notifications of duplicate or missing data chunks. In this paper we have implemented SCTP in ad-hoc environment using the network simulator NS2. Routing protocols such as AODV, DSDV, DSR and AOMDV have been implemented alongside SCTP. Performance parameters such as packet delivery ratio, throughput and end-to-end delay have been evaluated from the trace files obtained from the simulations of each case. The variation of each performance parameter has been recorded against that of the number of nodes and that of pause-time i.e. mobility of the nodes.

II. EXISTING WORK

Some researchers have paid attention to how SCTP supports ad-hoc scenarios. In [2] a brief comparison between the performances of TCP vs. SCTP within ad-hoc networks was presented. The analysis was performed through simulations with reference to nodes mobility. For analysis they used the simulator NS2, while the scenario used was constituted by 46 mobile nodes inside an area of 1000 x 300 m^2 with CBR traffic. The authors shown the faster decreasing of the SCTP performances in term of goodput, in comparison with TCP, they in fact, from their point of view, assess that the TCP outperforms SCTP. Besides increasing the mobility, the number of retransmissions goes and the dissertation is too short to explain the issue well. In [3] the authors have evaluated performances of SCTP with two different routing protocols: AODV and DSR. In [4] SCTP investigated with reference to the effect of congestion on the throughput. The simulative study was performed on static scenarios constituted by four hosts along a straight line.

III. PROPOSED WORK

a. Simulation Phase

The simulation phase has been divided into the following steps as depicted in the block diagram. These steps in the simulation phase are repeated over for varying conditions of mobility and traffic for various routing protocols, for both multi-homing and single-homing conditions.

Ad-hoc scenario generation

The dimensions of the network such as area, the number of nodes and their mobility are specified here. It generates a scenario file as its output.

Ad-hoc traffic generation

The number of nodes maximum number of active connections in the network, mode of SCTP i.e. whether single-homing or multi-homing are generated here. It generates another tcl file as its output which contains these parameters.

Tcl scripts

The main tcl scripts used for simulation takes the output tcl files of the above traffic generation and scenario generation stages. Node configuration is done in the simulation file. It gives the trace file of the simulation as the output.

Trace files

The recorded simulated results act as a result of the performed simulation.

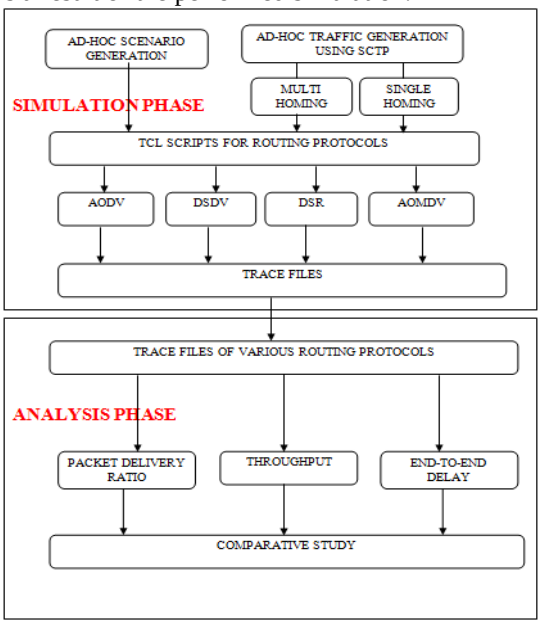

Figure: Block Diagram

b. Analysis Phase

The trace files obtained are used to arrive at values for the following performance parameters by using awk codes.

Packet Delivery Ratio

Ratio of number of successfully delivered packets to the total number of packets transmitted.

End-to-End Delay

Time taken for the packet to be transmitted across the network from source to destination.

Throughput

Rate of successfully message delivery over a communication channel with respect to time.

IV. ANALYSIS

4.1 Single Homing VS Multi Homing

4.1.1 Packet Delivery Ratio

Comparison of Packet Delivery Ratio between Single Homing VS Multi Homing using AODV with variation in number of nodes.

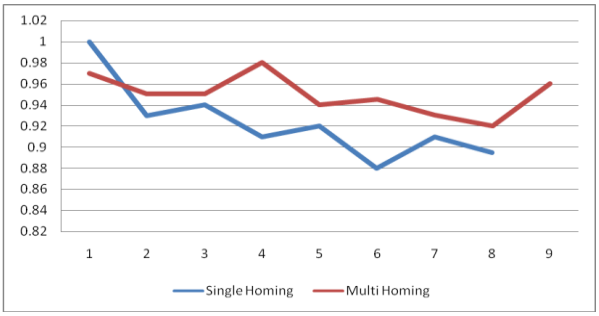

Figure: 1 (Packet Delivery Ratio vs no. of nodes – AODV)

In figure 1, Packet Delivery Ratio comparison between single and multi homing for ad-hoc networks using SCTP has been done and it has been observed that with the increase in network traffic rate, multi-homing has performed better than single homing for AODV.

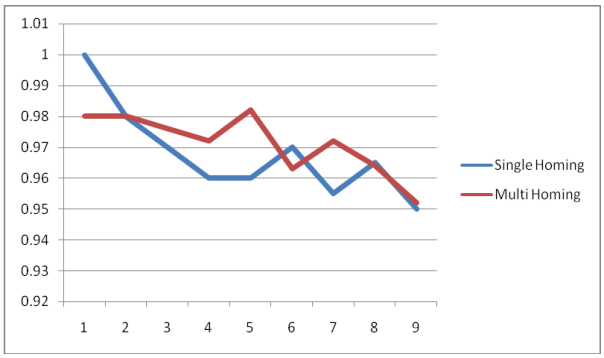

Figure: 2 (Packet Delivery Ratio vs no. of nodes – DSDV)

In figure 2, Packet Delivery Ratio comparison between single and multi homing for ad-hoc networks using SCTP has been done for the routing protocol DSDV, and it was observed that the protocol has performed better when SCTP was used in multi homing mode than when it was used in single homing mode.

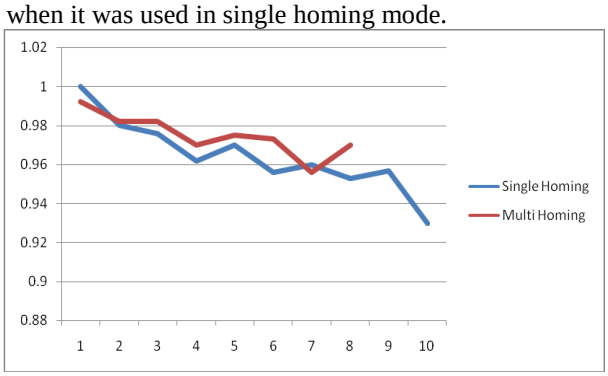

Figure: 3 (Packet Delivery Ratio vs no. of nodes – AOMDV)

In figure 3, Packet Delivery Ratio comparison between single and multi homing for ad-hoc networks using SCTP has been done for the routing protocol AOMDV, and it was observed that the protocol has performed better when SCTP was used in multi homing mode than when it was used in single homing mode, with increase in network traffic.

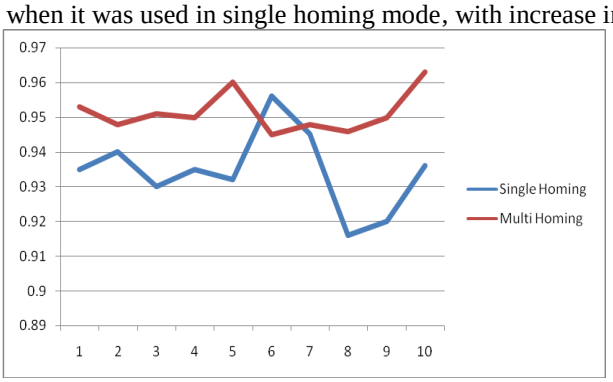

Figure: 4 (Packet Delivery Ratio vs Pause Time – AODV)

In figure 4, Packet Delivery Ratio for an ad hoc network using SCTP as transport layer protocol, for the routing protocol AODV, pause time was increased and still it was observed that in multi homing mode the performance was better than in single homing.

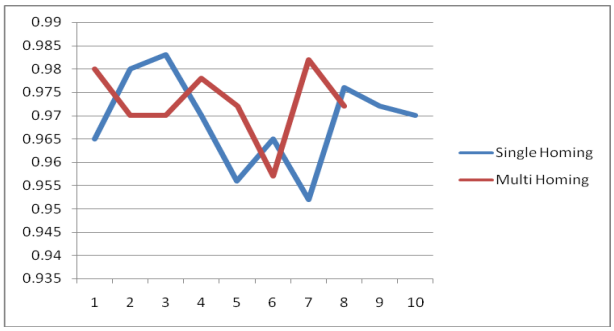

Figure: 5(Packet Delivery Ratio vs Pause Time – DSDV)

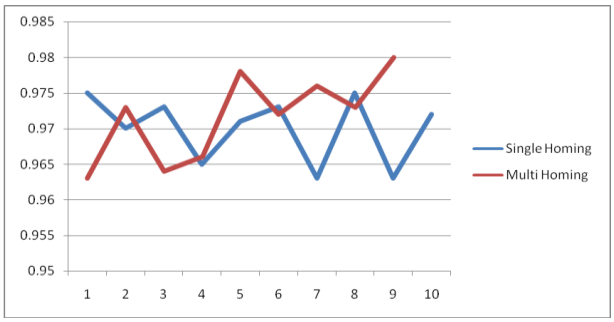

Figure: 6 (Packet Delivery Ratio vs Pause Time – AOMDV)

4.1.2 Throughput

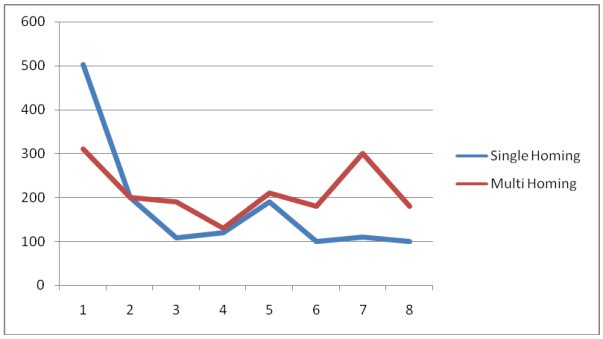

Figure: 7 (Throughput vs no. of nodes – AODV)

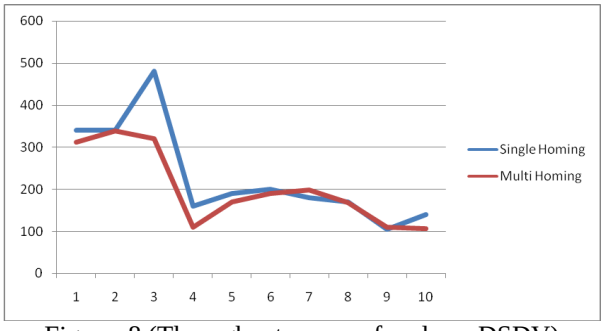

Figure: 8 (Throughput vs no. of nodes – DSDV)

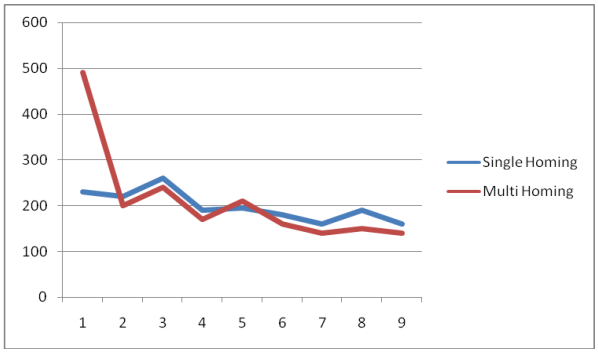

Figure: 9 (Throughput vs no. of nodes – AOMDV)

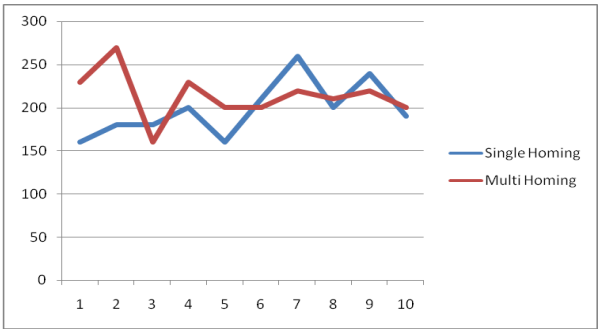

Figure: 10 (Throughput vs Pause Time – AODV)

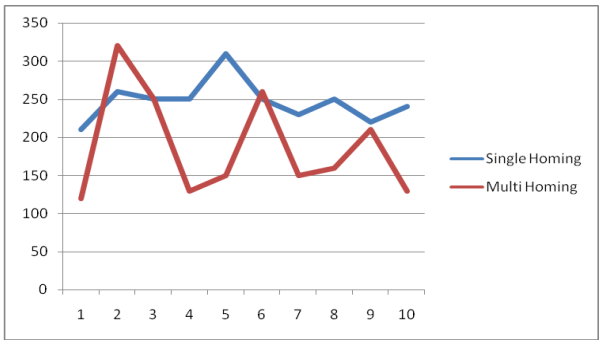

Figure: 11 (Throughput vs Pause Time – DSDV)

4.1.3 End-to-End Delay

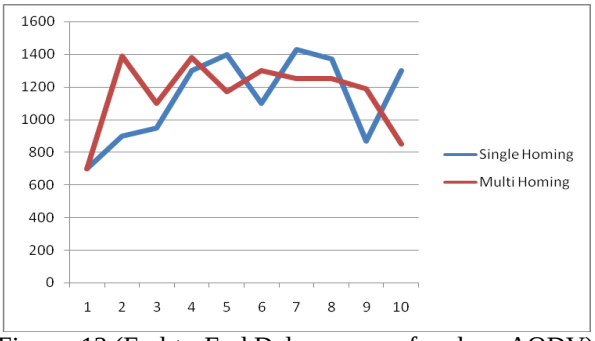

Figure: 12 (End-to-End Delay vs no. of nodes - AODV)

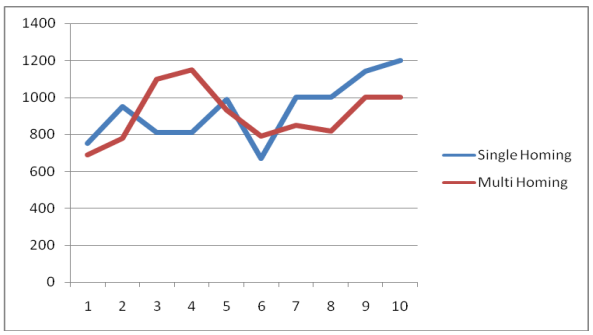

Figure: 13 (End-to-End Delay vs no. of nodes - DSDV)

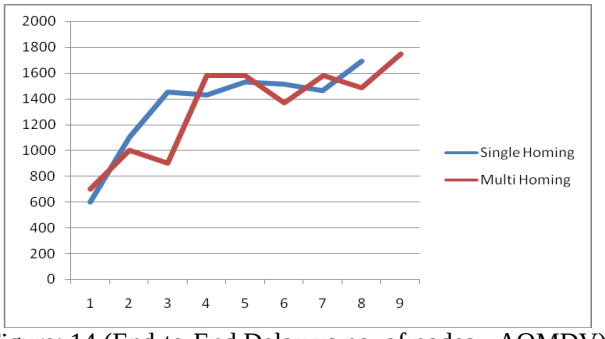

Figure: 14 (End-to-End Delay vs no. of nodes - AOMDV)

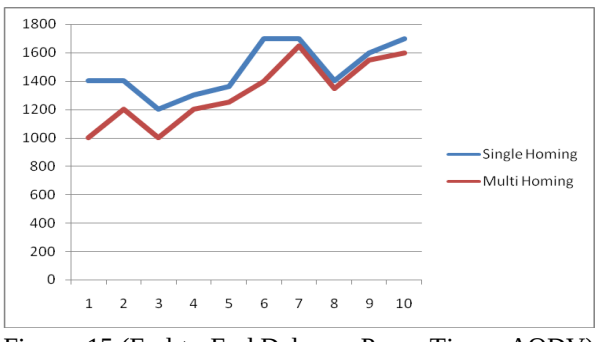

Figure: 15 (End-to-End Delay vs Pause Time - AODV)

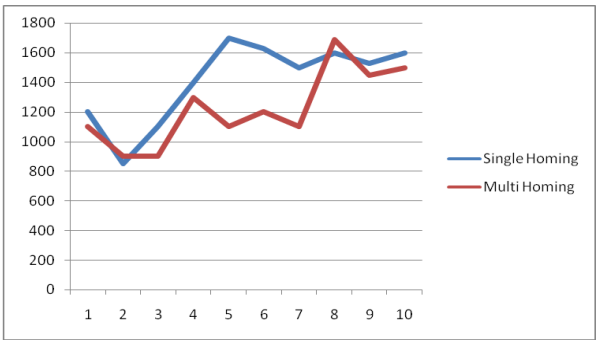

Figure: 16 (End-to-End Delay vs Pause Time - DSDV)

4.2 Comparison between various routing protocols

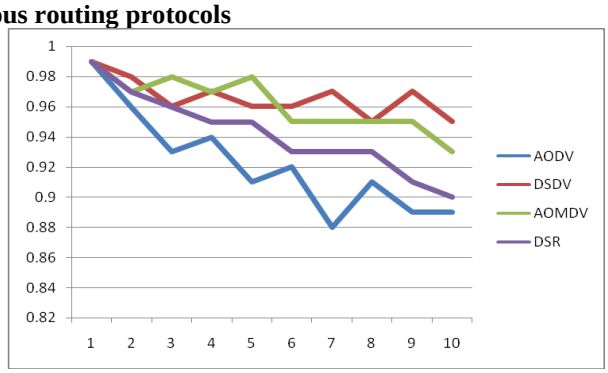

Figure: 17 (Packet Delivery Ratio vs no. of nodes)

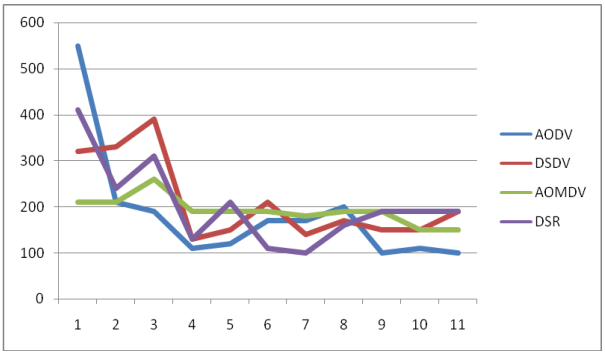

Figure: 18 (Throughput vs no. of nodes)

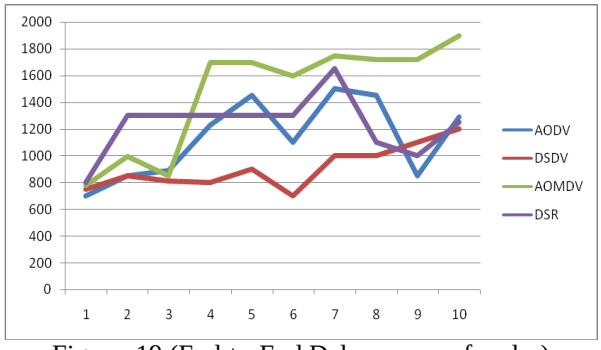

Figure: 19 (End-to-End Delay vs no. of nodes)

V. CONCLUSION

For the parameter Packet Delivery Ratio, AOMDV and DSDV are the best performers in all cases. AODV has the worst Packet Delivery Ratio in most cases.

For the parameter End-to-End Delay DSDV is the best performance in the most cases. AOMDV has given the worst End-to-End Delay in most cases.

For the parameter Throughput there is no clear best or worst performers, as most of the values have insignificant differences.

From the above statements we can say that DSDV gives an overall better performance than all other routing protocols we simulated keeping SCTP as the transport layer protocol. It is clear that SCTP performs better in the multi homing mode than the single homing mode for all routing protocols.

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