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Performance Analysis of Dynamic Routing Protocols vs. Distance Vector Routing Protocols for Channel Error Rate on Multimedia Traffic.

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Abstract--The objective of the paper is to experimentally analyse the performance metric Peak Signal to noise ratio (PSNR) for varying channel error rates for multimedia (MPEG-4) traffic. The experiment is performed using two classes of routing protocols viz. dynamic routing protocol ie Ad-Hoc On-Demand Distance Vector (AODV)[3] and distance vector routing protocol ie Destination Sequenced Distance Vector (DSDV)[2]. Both the classes of routing protocols perform routing differently based on their algorithms which are complicated in case of dynamic routing protocols and relatively simpler in Distance vector. The effect of these routing algorithms not only affects the efficiency but also determines the optimization required for transmission of a particular class of traffic. The paper discusses the effect of these routing protocols in intricate detailing and concludes that simpler technique of routing ie distance vector proves more efficient in case of UDP based multimedia traffic.

Keywords: *PSNR, DSDV, AODV, MPEG-4, MANETs.*

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Introduction

The multimedia traffic ie MPEG-4 is evaluated in NS-2 by integrating a framework called EvalVid [1].The Evalvid makes the NS-2 compatible to send I, P, B frames over the network at different fragment sizes over UDP[4]. Furthermore this traffic class can be routed over the network using different routing protocols for efficient traffic management and Quality of Service.

In our paper we have tested and experimentally performed analysis of PSNR for two different routing protocols under different channel error rates.[6][7] Both the routing protocols' working is briefly explained below.

Destination-Sequenced Distance-Vector Routing (DSDV) [8] is a table-driven routing scheme for ad hoc mobile networks based on the Bellman–Ford algorithm. It was developed by C. Perkins and P.Bhagwat in 1994. 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. Routing information is distributed between nodes by sending full dumps infrequently and smaller incremental updates more frequently.

In AODV, the network is silent until a connection is needed. At that point the network node that needs a connection broadcasts a request for connection. Other AODV nodes forward this message, and record the node that they heard it from, creating an explosion of temporary routes back to the needy node. When a node receives such a message and already has a route to the desired node, it sends a message backwards through a temporary route to the requesting node. The needy node then begins using the route that has the least number of hops through other nodes. Unused entries in the routing tables are recycled after a time.

When a link fails, a routing error is passed back to a transmitting node, and the process repeats.

Much of the complexity of the protocol is to lower the number of messages to conserve the capacity of the network. For example, each request for a route has a sequence number. Nodes use this sequence number so that they do not repeat route requests that they have already passed on. Another such feature is that the route requests have a "time to live" number that limits how many times they can be retransmitted. Another such feature is that if a route request fails, another route request may not be sent until twice as much time has passed as the timeout of the previous route request.

The advantage of AODV is that it creates no extra traffic for communication along existing links. Also, distance vector routing is simple, and doesn't require much memory or calculation. However AODV requires more time to establish a connection, and the initial communication to establish a route is heavier than some other approaches.

Simulation Environment and Methodology

The simulations are performed on NS-2 integrated with Evalvid on Cygwin. The cygwin is a unix like environment virtually on windows (non Unix) machine. The Cygwin is installed on Windows Xp Machine. The simulation file is written in Octl script and has an extension .tcl and is

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executed in terminal window of Cygwin. The channel error rate parameter[5] is passed on the runtime as shown in the Fig.1

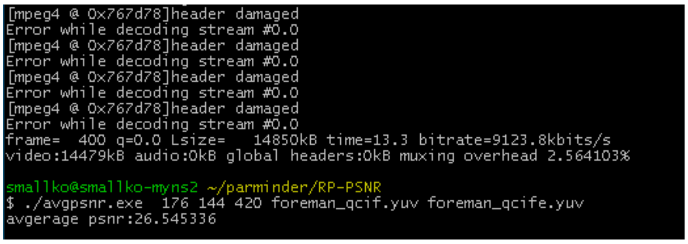

Fig.1 Terminal window of cygwin during execution of script file

The Simulation parameters are setup as in Table-1

Simulation Enviornment Parameters		
1	Channel	Wireless Channel
2	Propogation	Two Ray Ground
3	Network Interface Type	Wireless Physical
4	MAC Type	802_11
5	Interface Queue Type	Droptail
6	Link Layer Type	LL
7	Antenna Model	Omni Antenna
8	Max Packet in ifq	50
9	No Of Mobile Nodes	2
10	Routing Protocol	AODV/DSDV
11	Data Rate	2MB

Results

The result of the experiment for the calculation of PSNR at different channel error rates is presented in the tabular form below. The results clearly show a better performance of DSDV over AODV for vast majority of the channel error rates due to its simpler bellman for algorithm based on hop counts for smaller number of nodes.

CER	PSNR
0.1	26.828076
0.2	26.769184
0.3	26.545336
0.4	26.608261
0.5	25.726981
0.6	25.023216
0.7	23.831431
0.8	21.882381
0.9	17.634333

Fig.2 Channel Error Rate vs PSNR for AODV

CER	PSNR
0.1	26.82808
0.2	26.79989
0.3	26.596
0.4	26.63191
0.5	26.05569
0.6	24.82062
0.7	24.36927
0.8	21.85667
0.9	18.80372

Fig.3 Channel Error Rate vs PSNR for DSDV

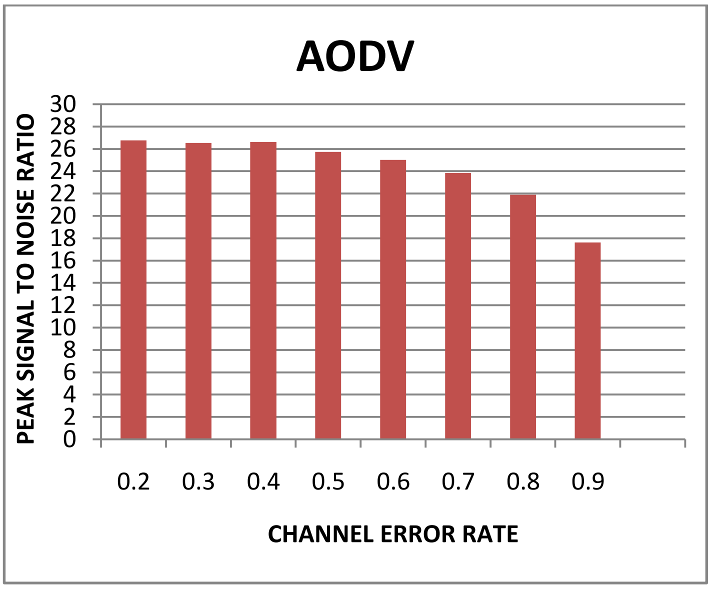

Table.2 Channel Error Rate vs PSNR for AODV

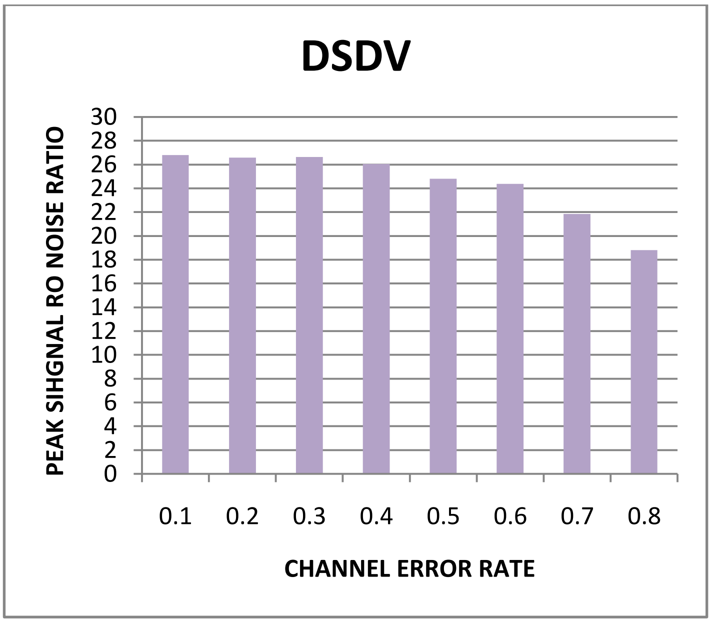

Table.3 Channel Error Rate vs PSNR for DSDV

Conclusion

The paper presents a conclusion for an optimized performance is obtained for multimedia traffic performance metric Peak signal to noise ratio (PSNR). We recommend using a distance vector routing protocol over an on demand dynamic routing protocol for UDP based multimedia traffic. The ease of flow for non acknowledged transmission over noisy or erroneous channels is complimented by the simpler hop-count algorithm of DSDV.

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