Jitter Analysis for Moving Vehicle in IEEE 802.11 Ad Hoc Scenario

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ABSTRACT

Jitter is used to calculate the variation of packet transmission time between two communicating devices or nodes. A high deviation of packet receiving time either in terms of early receiving or late receiving of packet may create problem for storage or waiting time respectively. Here we assume two moving vehicles run in the city with a constant speed, they communicate through a metropolitan access network using the video conferencing service. A high delay of packet transmission between them may disturb their communication. Here we analyze the performance of DSDV, AODV and DSR routing protocols in IEEE 802.11 environment with moving nodes.

Keywords— Jitter, IEEE 802.16, AODV,DSDV and DSR

1. INTRODUCTION

Wireless computing is a rapidly emerging technology providing users with network connectivity without being tethered off of a wired network. Wireless local area networks (WLANs), like their wired counterparts, are being developed to provide high bandwidth to users in a limited geographical area. Mobile Ad Hoc Networks (MANETs) are composed of nodes which can move randomly, and they have already attracted widespread attention in recent years. A mobile ad hoc network (MANET) is a wireless communication network, where nodes that are not within the direct transmission range [1] of each other require other nodes to forward data. It can operate without existing infrastructure and support mobile users, and it falls under the general scope of multihop wireless networking. In recent years, a variety of routing protocols targeted specifically at this environment have been developed and some performance simulations are made. Each device in a MANET is free to vary independently in any direction, and will therefore change its links to other devices frequently. All must forward traffic unrelated to its self use, & therefore be a router.

2. INTRODUCTION TO IEEE 802.11

With the recent adoption of new standards for high-rate wireless LANs, mobile users can realize levels of performance, throughput, and availability comparable to those of traditional wired Ethernet. As a result, WLANs are on the verge of becoming a mainstream connectivity solution for a broad range of business customers. The IEEE 802.11 is currently the most famous technology for infrastructure-based Wireless LANs (WLANs). The IEEE 802.11 standard defines two operational types for WLANs: infrastructure-based and infrastructure-less or ad hoc. Outside of the standards bodies, wireless industry leaders have united to form the Wireless Ethernet Compatibility Alliance (WECA). WECA's mission is to certify cross-vendor interoperability and compatibility of IEEE 802.11b wireless [2] networking products and to promote that standard for the enterprise, the small business, and the home. The Institute of Electrical and Electronics Engineers (IEEE) ratified the original 802.11 specification in 1997 as the standard for wireless LANs. That version of 802.11 provides for 1 Mbps and 2 Mbps data rates and a set of fundamental signaling methods and other services.

3. JITTER

Jitter is the time variation between when packets leave one system and reach another system, affecting real time communications like VoIP and video conferencing. Jitter is specific issue that normally exists in packet networks and this phenomenon is usually not causing any communication problems. TCP/IP is responsible for dealing with the jitter impact on communication. When someone is sending VoIP communication at a normal interval (let's say one frame every 10 ms) those packets can stuck somewhere in between inside the packet network and not arrive at expected regular pace to the destined station. That's the whole jitter phenomenon all about so we can say that the anomaly in tempo with which packet is expected and when it is in reality received is jitter.

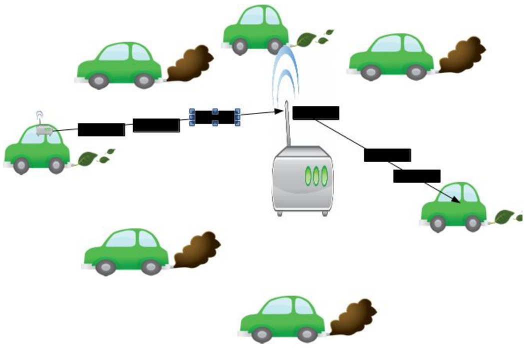

Figure 1: Jitter variation in moving scenario

In the above figure, you can notice that jitter is mainly caused in moving vehicles. MANET is a technology that uses moving vehicles as nodes in a network to create a mobile network. MANET turns every participating car into a wireless router or node, allowing cars to create a network with a wide range. As cars fall out of the signal range and drop out of the network, other cars can join in, connecting vehicles to one another so that a [3] mobile Internet is created. The time taken by packets at sender side is not the same as the period in which the packets will arrive at the receiver side. One of the packets encounters some delay on his way and it is received little later than it was assumed. MANET assists vehicle drivers to communicate and to coordinate among themselves in order to avoid any critical situation through vehicle to vehicle (V2V) communication. For example, road side accidents, traffic jams, speed control free passage of emergency vehicles and unseen obstacles etc.

4. ROUTING PROTOCOLS

Various routing protocols have been specified to increase the performance of network. Each routing protocols has its specific functionality to be designed to undergo in some situation.

4.1 Ad Hoc on Demand Distance Vector Routing: In November 2001 the MANET (Mobile Ad-hoc Networks) Working Group for routing of the IEFT community has introduced the first version [4] of the AODV Routing Protocol (Ad hoc On Demand Distance Vector). AODV belongs to the member of Distance Vector Routing Protocols (DV). In a DV every node knows its neighbors' and the values to reach them. A node maintains its own routing table, storing all nodes of the network, the distance and the next hop to them. If a node is not reachable the distance to it is set to infinity. Every node received its neighbors' periodically its whole routing table. So they can find if there is a useful route to another node using this neighbor as next hop. AODV is an 'on demand routing protocol' with less delay. That means that routes generate when needed to reduce traffic overhead. It is a reactive protocol. The reactive routing protocols do not periodically update the [2] routing table like table driven proactive protocols. In AODV, when there is some data to send, they initiate route discovery process through flooding which is their main routing overhead. Whenever a node wants to communicate with another node, it looks for an available path to the destination node, in its local routing table. If there is no path exists, then it broadcasts a route request (RREQ) message to its neighborhood nodes. Any node that receives this message for route discovery looks for a path leading to the respective destination node. If there is no path exist then, it will re-broadcasts the RREQ message and sets up a path leading to RREQ originating node.

4.2 Destination Sequenced Distance Vector (DSDV) Protocol: DSDV (Destination-Sequenced Distance-Vector routing) protocol is a proactive unicast mobile ad hoc which is based on the Bellman-Ford algorithm adding a few improvements, which implies that each node shares its routing table with neighbors. The route information includes road, the destination address, and the distance to destination in terms of jump. In DSDV routing tables, we find:

- All destinations.
- The number of hops (or nodes) needed to reach the destination.
- The sequence number (SN: sequence number) corresponding to a destination node.

Sequence numbers are used in DSDV to distinguish old and new roads and to prevent formation of loops. Each node periodically transmits updates, including routing information to its immediate neighbors. Routing information is advertised by broadcasting or multicasting. Packets are transmitted periodically and incrementally as changes are detected. In a wireless medium broadcasts are limited by the physical characteristic of medium. If a node invalidates its entry to a destination due to loss of next hop node, it increments its sequence number and uses new sequence number in its next advertisement of the route.

4.3 Dynamic Source Routing (DSR): In DSR, when a mobile (source) needs a route to another mobile (destination), it initiates a route discovery process which is based on flooding. The source originates a RREQ packet that route [5] discovery process which is based on flooding. The source originates a RREQ packet that route request packet as it is propagated through the network. Once the RREQ reaches either the destination or a node that knows a route to the destination, it responds with a RREP along the reverse of the route collected by the RREQ. This means that the source may receive several RREP messages corresponding, in general, to different routes to the destination. DSR selects one of these routes (for example the shortest), and it maintains the other routes in a cache. The routes in the cache can be used as substitutes to speed up the route discovery if the selected route gets disconnected. To avoid that RREQ packets travel forever in the network, nodes, that have already processed a RREQ, discard any further RREQ bearing the same identifier. The main difference between DSR and AODV is in the way they keep the information about the routes: in DSR it is stored in the source while in AODV it is stored in the intermediate nodes. However, the route discovery phase of both is based on flooding. This means that all nodes in the network must participate in every discovery process, regardless of their potential in actually contributing to set up the route or not, thus increasing the network load.

5. RESULTS

In this paper we have compared three routing protocols (AODV, DSDV and DSR) based on jitter delay of data packets.

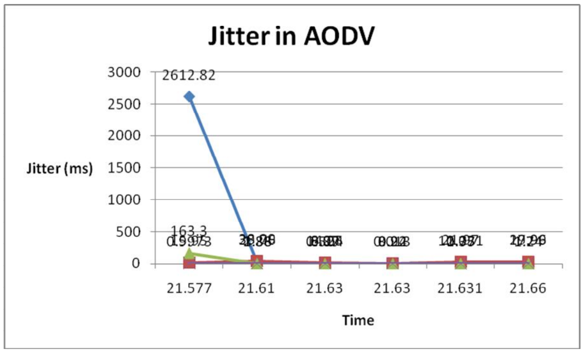

Figure 2: Jitter in AODV routing protocol

In the above figure, it is clearly seen that the variation between packets is very little.

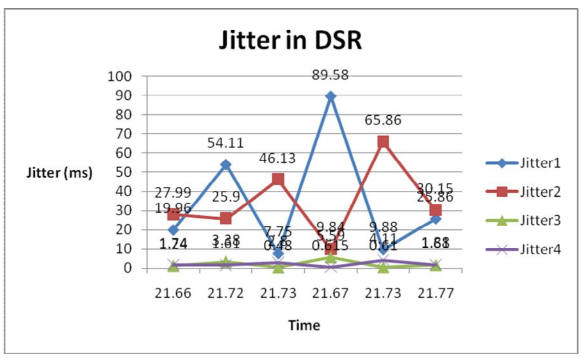

Figure 2: Jitter in DSR routing protocol

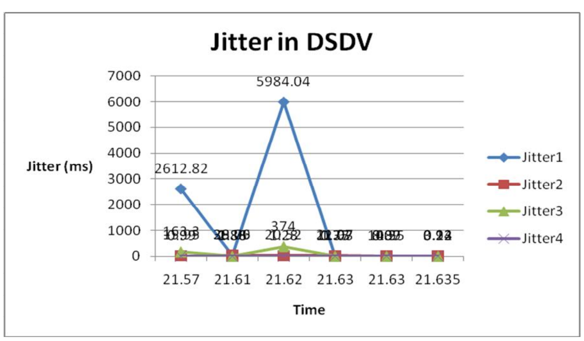

Figure 2: Jitter in DSDV routing protocol

6. CONCLUSION

In this paper we have analyzed that DSDV routing protocol is better as compared to AODV and DSR routing protocols in moving scenario. DSDV is table drive protocol and AODV is reactive protocol that basically works on Adhoc basis criteria.

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