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Congestion Control In Wireless Peer Networks

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Abstract
A Mobile Ad hoc Network (MANET) is a continuous self configuring infrastructure less network of mobile devices connected without wires. In this network several nodes exchange packets simultaneously to the destination node. Due to congestion in the network the transmitted packets doesn't get delivered to destination efficiently. So here AODV (Ad Hoc On Demand Distance Vector) protocol with ATIM (Ad Hoc Traffic Indication Message) window is used to overcome the problem of congestion and power saving is done through IEEE 802.11 power saving mechanisms. The conclusion of the paper is done by evaluating the performance of the AODV protocol with respect to Delay, Energy and Packet delivery fraction.
Keywords: *DSR, MANET, AODV, ATIM*

I. INTRODUCTION

A MANET is a wireless Network. In this network each device is free to move independently in any direction and will therefore change its links to other devices frequently. MANET may be peer to peer, self forming and self healing network [1].

A MANET forms the peer to peer (P2P) network. P2P network is deployed randomly to perform tasks such as sending and receiving packets.

A P2P network is a distributed architecture. In a P2P network, peers make a partition of their resources, such as processing power, disk storage and network bandwidth.

In P2P network, congestion occurs when a link or node is carrying so much data that its QoS (quality of services) deteriorates and this can also introduce queuing delay, packet loss and the blocking of new connections.

Congestion may also be caused during the following conditions [2].

- When the load in the link exceeds the carrying capacity.
- When the broadcasting packets are excess in nature.
- When the number of nodes increases for sending packets.

The rest of the paper is organized, as follows. Section II discusses about the proposed work, section III describes simulation results and comparisons on performance parameters.

II RELATED WORK

In this work talk about the literature survey details.

Sumit Kothari [2] have proposed a new multipath AC-AODV routing protocol for MANET with load balancing mechanism. There are two main contributions in this work. One is load balancing mechanism to honestly distribute the traffic on different active routes; the other is the route discovery mechanism parameters such as. Delivery Rate and Packet lost Rate.

B Brahma Reddy[4] have proposed a three protocols i.e. DSDV, AODV and AOMDV are compared with IEEE802.11 and IEEE802.15.4 standards.

Shivinder Kapoor [5] have proposed a routing protocol is use to improve the link failure prediction in terms of power between source to

destination. This routing protocol determines the minimum available power between source to destination. Then source node decided the path which has maximum available power between source node to destination node. By using the S-AODV protocol, improve the link failure problem due to power in between source to destination.

Abdelfattah Belghith [6] have proposed a new Traffic Aware PSM that optimizes transitions between the awake state to the doze state, hence allowing a station to be in the doze state instead being in the idle state whenever deemed possible. We showed that TA-PSM outperforms superbly PSM and thrives to deliver as much throughput as PSM, yet provides much better energy consumption.

Amith Khandakar [7] have a compared the three popular ad hoc routing protocols AODV, DSR and DSDV.AODV has a stable End to End Delay despite mobility as it has the feature of On-Demand Routing protocol and also maintains a Routing table.

III. PROPOSED WORK

In this work ATIM window is used for congestion control in AODV protocol and IEEE 802.11 Power saving mechanism (PSM) is used for power saving.

A. AODV protocol

The working of this protocol consists of two phases:

- Route discovery.
- Route maintenance.

In the route discovery process, the source node produces Route Request (RREQ) packet, if the path to the destination is not stored in the routing table, it routes it to the neighboring nodes [2,3]. The neighboring nodes will direct it to their neighbor and so on. When the packet come to the destination node, then the destination node generates Route Reply (RREP) packet and pass it back to the source node. Thus the path is generated between source and destination node.

Each node broadcasts periodic HELLO messages to advertise its presence. A node learns that a link to a neighbor is broken when it does not receive a HELLO from that neighbor for a predetermined time. When a broken link is detected, the detecting node sends Route Error (RERR) messages to all predecessor nodes that use the broken link to reach their respective destinations. This RERR packet travels back to the sources who reinitiate route discover [2,3,4,5].

B. Load balancing congestion control algorithm for AODV

- Sending Query to the neighbors for establishing path between source to destination.
- Sending the ATIM frame to neighbors in order to display the status of the buffer size.
- Selecting the route with minimum queue size.
- Sending the packet through alternate bypass route.
- If no route is available, then packets will be dropped.

C. IEEE 802.11 PSM

Power management in MANET is a difficult task, because of three main reasons.

The first reason is that the node doesn't act either as a source or destination of data traffic. It just participates in relaying (i.e., routing) traffic towards other destinations.

The second reason is that no central entity exists to control and maintain the power management mode of the nodes in the network. In such networks, power management must be in distributed fashion.

The third reason is that, even when no data is processed, the node will be active. This causes power loss. To overcome this power loss in node PSM scheme is used. In the IEEE 802.11 PSM, a node can be in one of two different power modes, i.e., active mode (AM) when a node can receive frames at any time and power-save mode (PS) when a node is in low-power state. This low-power state usually consumes at least an order of magnitude less power than in the active state.

In the PS mode a node can be in doze state and off state. In these two states node can consumes less power because in off state, the station wireless interface is completely powered off [3,6]. In the doze (sleep) state,

The transceiver (the radio) is powered off but the station wireless interface (the card) still consumes very little power. Hence Power save mode is comparatively better.

Fig.1 shows working of the IEEE 802.11 PSM [6]. This PSM scheme consumes less power, because the data exchange takes place only between A and B stations. Station C doesn't receive or send data. So station C goes to Doze state, then it consumes less power. The data sharing takes one beacon interval, at the start of each beacon interval, each station must stay awake during a fixed time period, called the ATIM (Ad-hoc Traffic Indication Message) window. This ATIM window shows the buffer states of the node. If the buffer of the receiving node is free, then data can be sent. Otherwise node will be congested.

A station temporarily buffers data frames destined to other stations in the doze state. These buffered data frames are announced during the ATIM window using unicast ATIM frames. Upon reception of an ATIM frame, a station replies immediately (after a SIFS) by sending an ATIM-ACK and stays awake for the entire beacon interval waiting for the announced frames to be received. If a station doesn't receive an ATIM frame, it may enter the doze state at the end of the ATIM window. Announced frames are transmitted after the ATIM window using the normal Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) back off procedure [3, 6].

A station having sent at least one ATIM frame shall stay awake during the current beacon interval. Station A sends an ATIM frame to station B during the ATIM window. B responds by sending an ATIM-ACK. Both stations stay awake during the entire beacon interval. After completion of ATIM-ACK both station A and station B should be exchanging the data. Station C hasn't received or sent any ATIM frame so it enters the doze state at the end of the ATIM window.

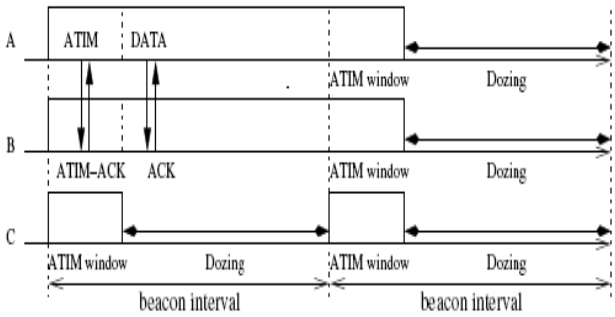

Fig.1 IEEE 802.11 power saving mechanisms

IV. SIMULATION RESULTS

To compare the performance of the AODV protocol with the DSR protocol, for the simulation following metrics are considered.

A. Energy consumption

It is defined as the subtraction of remaining energy from total energy.

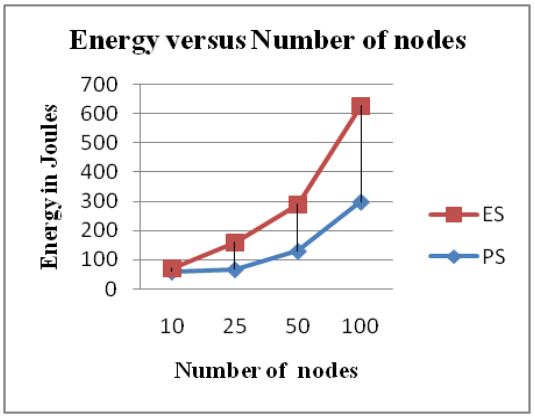

Fig.2 Graph between Energy and no. of Nodes

Fig.2 shows the simulation result of proposed AODV protocol compared with the existing DSR Protocol. It suggests that as the number of nodes increases, then energy consumption also increases. Here, the proposed AODV protocol consumes less energy compared to the existing DSR Protocol.

B. End to End delay

It is defined as the average time taken by a data packet to propagate from source to destination across the network. It includes various delays introduced because of route discovery, queuing, propagation and transition time.

Figure.3 shows the change in End to end delay for different number of nodes. It suggests that as the number of nodes increases, then delay also increases.

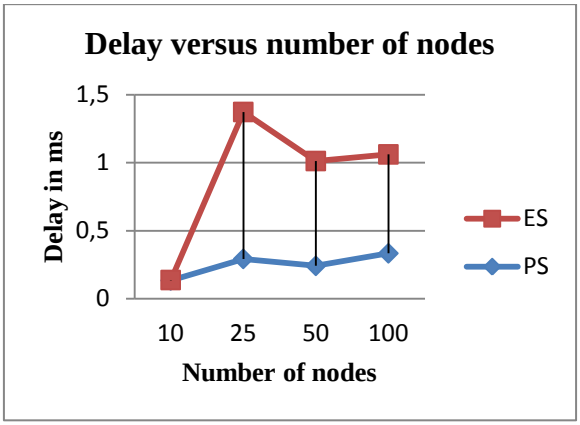

Fig. 3 Graph between Delay and no. of Nodes

The proposed AODV protocol takes less delay compared to the existing DSR protocol.

C. Packet Delivery Ratio (PDR)

It is defined as the no. of packets received to the no. of packets sent.

The fig.4 shows the proposed AODV protocol has a superior packet delivery ratio compared with the existing DSR protocol.

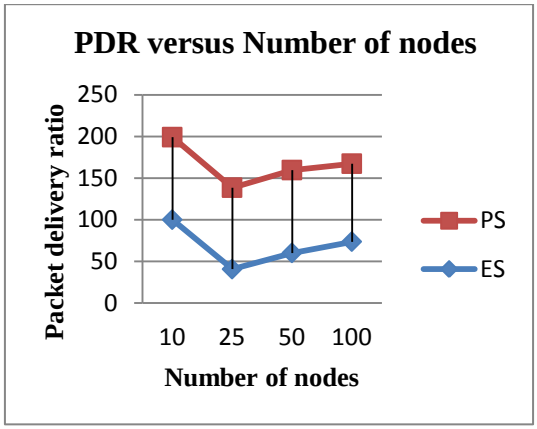

Fig.4 Graph between PDR and no. of Nodes

CONCLUSION

In this paper for a highly mobile ad hoc network, when the buffer size is very less, congestion increases. Hence the number of packets reduces. The proposed system overcomes this problem using AODV protocol with ATIM window. Some nodes are unnecessarily active. This causes power loss. To overcome this power loss in nodes IEEE 802.11 PSM scheme is used.

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