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STUDY AND COMPARISION OF PROACTIVE AND REACTIVE ROUTING PROTOCOL FOR MULTICHANNEL WIRELESS AD-HOC NETWORK

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Abstract

Wireless Ad-hoc network consist of collection of nodes that form a network and are capable of communicating with each other without the help of satisfactory infrastructure such as access points. Many of multichannel protocols are designed to share multiple channels and allow non interfering use of channels through single transceiver. Therefore multiple communications can occur at same time offering the opportunity to increase throughput and reliability. We present an innovative routing protocol that utilizes multiple channels simultaneously to improve the performance of multiple MAC protocol in ad-hoc network. Our main aim is to compare the proactive and reactive routing protocol in multichannel environment so it affects the networks capacity and throughput of existing channel of MAC protocol.

Keywords: Ad hoc network, medium access control, multi-channel

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1. INTRODUCTION

A medium access control (MAC) protocol for ad hoc wireless networks that utilizes multiple channels dynamically to improve performance. The IEEE 802.11 standard allows for the use of multiple channels available at the physical layer, but its MAC protocol is designed only for a single channel. A single-channel MAC protocol does not work well in a multi-channel environment, because of the multi-channel hidden terminal problem. MMAC protocol [1] enables hosts to utilize multiple channels by switching channels dynamically, thus increasing network throughput. The protocol requires only one transceiver per host, but solves the multi-channel hidden terminal problem using temporal synchronization. We present an innovative routing protocol that utilizes multiple channels simultaneously to improve the performance of multiple MAC protocol in ad-hoc network. Routing protocol in needed to send data from one device to another. Whenever the packet is to travel to its destination via several intermediate modes routing protocol is needed. Several well know routing protocols are

1.1 Table Driven (Proactive) Routing Protocol.

They maintain global topology information in form of tables at every node. There tables are updated frequently in order to maintain consistent and network state information. In proactive routing protocols nodes continuously search for routing information within a network, so that when route is needed the route is already known. The Destination is an example of proactive routing protocol [7]

1.1.1 DSDV Routing Protocol:

DSDV routing protocol is based on the classical bellman ford routing algorithm every mobile node in the network maintain routing table in which all possible destination within the network and no. of hops to each destination are recorded. Each entry is marked with the sequence no. assigned by destination mode.

1.2 Reactive routing protocol

These protocols are also referring as on demand Driven or source initiated routing protocol. In this type of routing protocol, it creates routes only when desired by source nodes

when a node requires a route to destination it initiates route discover process within the network. This process completes once one route is found or all possible route are examined.

1.2.1AD-HOC On demand Distance vector (AODV) Routing Protocol

AODV [3] is an improvement on DSDV because it typically minimizes the no. of required broadcast by creating routes on a demand basis as opposed to maintaining a complete list of routes as in DSDV algorithms. It is pure on demand route acquisition system since nodes that are not on a selected path do not maintain routing information or participating in routing table exchange. [3]

When a source mode is desired to send a message to some destination mode and does not already have a valid route to that destination, it initiates a path discovery process to locate other mode. It broad casts a route request (RREQ) packets to its neighboring modes, which then forward the request to its neighbors, and so on until either the destination or intermediate mode with a fresh enough, route to the destination is located.

There have been many research efforts focusing on multichannel scheme for ad-hoc network. Previously proposed multichannel MAC protocol in Ad-hoc networks handling hidden terminal problem using single transceiver [1]. It enables nodes to negotiate channels dynamically so that multiple communication flows can occur in the same region simultaneously. Every node listens to common channel to negotiate channels in the ATIM window at the start of each beacon interval.

Through previous research of multi channel MAC protocol [1] our scheme focus on the comparison of proactive and reactive routing protocol for variation of network load. Proactive Routing protocol for multiple only proactive routing protocol are capable for providing each modes with full topology Information for the network [3].Nodes can use these topology information for initial channel Assignment and for channel Switching for data communication.

2. MULTI-CHANNEL MAC (MMAC) PROTOCOL

In this section, we present MMAC protocol. Some assumptions are-

• *N* channels are available for use and all channels have the same bandwidth.

• Each host is equipped with a single half-duplex transceiver. So a host can either transmit or listen, but cannot do both simultaneously [1]. Also, a host can listen or transmit on only one channel at a time. So when listening to one channel, it cannot carrier sense on other channels.

• The transceiver is capable of switching its channel dynamically.

• Nodes are synchronized, so that all nodes begin their beacon interval at the same time.

2.1 Channel negotiation and Data exchange in MMAC

Suppose that node A has packets for B and thus sends an ATIM packet to B during the ATIM window, with A's PCL [1] included in the packet. On receiving the ATIM request from A, B decides which channel to use during the beacon interval, based on its PCL and A's PCL. After selecting the channel, B sends an ATIM-ACK packet to A, specifying the channel it has chosen. When A receives the ATIM-ACK packet, A will see if it can also select the channel specified in the ATIM-ACK packet. If it can, it will send an ATIM-RES packet to B, with A's selected channel specified in the packet. If A cannot select the channel which B has chosen, it does not send an ATIM-RES packet to B. The process of channel negotiation and data exchange in MMAC is illustrated in Figure 1. During the ATIM window, A sends ATIM to B and B replies with ATIM-ACK indicating to use channel 1. This ATIM-ACK is overheard by C, so channel 1 will be in LOW state in C's PCL. When D sends ATIM to C, C selects channel 2. After the ATIM window, the two communications (between A and B, and C and D) can take place simultaneously.

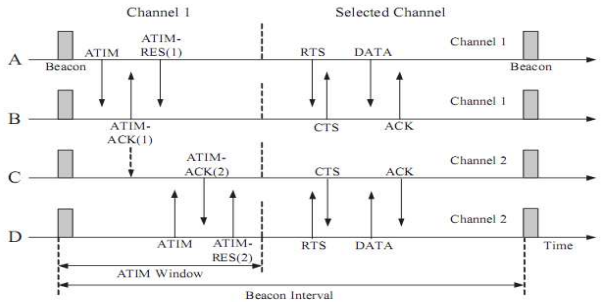

Figure 1: Process of channel negotiation and data exchange in MMAC.

3 SIMULATION MODEL

For simulation we have used ns-2 [4] with CMU wireless extension [5] Bit rate for each channel is 2Mbps, transmission range of each node is approx 250 m and beacon interval is set to 100ms.Each source node generates and transmits CBR traffic. We assume channels. The parameter we vary number of nodes, and routing agent.

3.1 AODV Routing Protocol for Multichannel MAC

In simulated wireless LAN, the number of nodes we considered are 10, 30, 50.Firstly we present results for simulation performed for AODV Routing Protocol in fig 2 and fig 5 shows packet delivery ratio and packet arrival rate of multichannel MAC protocol for Ad-hoc network for 10 nodes and as network load increases from 10 nodes to 30 nodes in fig 3 and 4 then throughput varies. Similarly end to end delay shows variation on increasing end to end delay as in fig 7 and fig 8.

3.2 DSDV Routing Protocol for Multichannel MAC

Similarly when DSDV routing protocol uses in multichannel MAC protocol as routing agent we consider 10,30,50 nodes we present results for simulation performed for AODV Routing Protocol fig 2,3,4and figure 5,6,7 shows packet delivery ratio and packet arrival rate of multichannel MAC protocol for Ad-hoc network as network load increases.

4 SIMULATION RESULTS

Simulation results are presented in the graphs, the curve labeled as “MMACd” refer to MMAC protocol through DSDV routing agent. The curve labeled as “MMACa” refer to MMAC protocol through AODV routing agent. First we present results from simulations performed for a wireless LAN in Fig 2, 3, 4 shows the aggregate throughput of different protocols as the network load increases 10, 30, and 50 respectively. When network load is low, then AODV routing protocol for MMAC perform better throughput. As network load increases AODV routing agent show higher throughput because the proactive routing protocols are capable of providing each node with full topology information for the network. Nodes can use this topology information for the initial channel assignments and for channel switching for data transmission. Multi-channel wireless ad-hoc network architecture requires topology discovery, traffic profiling, channel assignment, and routing [9]. However, proactive routing protocols can be inefficient because of the need for periodic updates, regardless of the number of network topology changes and network traffic.

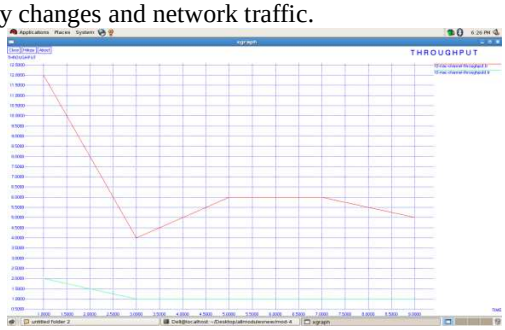

Figure 2. Throughput Graph for 10 nodes of MMAC using AODV and DSDV Routing Protocol

Figure 3.Throughput Graph for 30 nodes of MMAC using AODV and DSDV Routing Protocol

Figure 4. Throughput Graph for 50 nodes of MMAC using AODV and DSDV Routing Protocol

Fig 5, 6, 7 shows the end to end delay of different protocols as the network load increases 10, 30, and 50 respectively. In case of AODV routing protocol, the packets started dropping from the start when ad-hoc network contain 10 nodes. For certain time interval AODV routing protocol dropping packet more than DSDV when 10 nodes are considered. Similarly in other Ad-hoc network contains 30 and 50 nodes, the packets started dropping in case of DSDV is more because number of packet lost are more endless in AODV routing protocol.

Figure 5.End to End delay Graph for 10 nodes of MMAC using AODV and DSDV Routing Protocol

Figure 6.End to End delay Graph for 30 nodes of MMAC using AODV and DSDV Routing Protocol

Figure 7.End to End delay Graph for 50 nodes of MMAC using AODV and DSDV Routing Protocol

CONCLUSIONS

In this paper, we have presented a multi-channel MAC Protocol that utilizes multiple channels to improve throughput in wireless networks through AODV routing protocol. By simulating it can argued that if delay is the main criteria then DSDV routing protocol can be the best chaise but if throughput and reliability are the main parameter for the selection then AODV gives the better result. While through this paper we focus only on network throughput, delay and reliability, it would be interesting to consider other metrics like power consumption, fault tolerance, minimizing the number of control packets.

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