CIVILIZING THE NETWORK LIFESPAN OF MANETS THROUGH COOPERATIVE MAC PROTOCOL MECHANISM

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Abstract - Our ultimate aim is to implement a high energy efficient data transmission protocol for Mobile Ad-hoc network. We have selected our research domain energy management system in MANET. Cooperative communication is a hopeful technique for saving the energy consumption in MANETs. CC is not always energy efficient compared to direct transmission. To deal with the tangled medium access interactions induced by relaying and hold the benefits of such cooperation, an efficient Cooperative Medium Access Control protocol is needed. The existing CMAC protocols mainly focus on the throughput enhancement while fail to investigate the energy efficiency or network lifetime. We propose DEL-CMAC that basis on the network lifetime extension, which is a less transverse aspect in the related work, by considering the energy consumption on both transmitter and receiver.

Keywords: MANET, CSMA/CA, CMAC, Energy efficiency.

1. Introduction:

A Mobile Ad-hoc Network (MANET) is a self-configured network of portable terminals coupled by wireless links. Portable terminals such as cell phones, moveable gaming devices, personal digital assistants, (PDAs) and tablets all include wireless networking capabilities. By participating in MANETs, these terminals may attain the Internet when they are not in the array of Wi-Fi access points or cellular base stations, or correspond through each other when no network communications is accessible. One chief issue with unremitting involvement in MANETs is the network lifetime, since the aforementioned wireless terminals are string powered, and energy is a limited reserve. Cooperative communication (CC) is a capable technique for conserving the energy utilization in MANETs. The transmit nature of the wireless medium (the so-called wireless broadcast advantage) is oppressed in cooperative manner. The wireless transmission amid a couple of terminals can be standard and processed at other terminals for performance gain, rather than be considered as an interference traditionally. CC can provide gains in terms of the required transmitting power due to the spatial diversity achieved via user cooperation. Though, if we acquire into report the extra dispensation and getting energy utilization necessary for assistance, CC is not always energy competent compared to shortest transmission. There is an exchange among the gains in transmitting power and the wounded in added energy utilization overhead.

2. Related work

Space, or multiple-antenna, diversity techniques are chiefly striking as they can be willingly shared with other forms of assortment, e.g., time and occurrence diversity, and quiet offer theatrical performance gains when other forms of diversity are occupied. We urbanized and examine little-complexity cooperative diversity protocols that contest fading induced by multipath broadcast in wireless networks. The essential techniques develop space diversity accessible through cooperating terminals' relaying signals for an alternative.

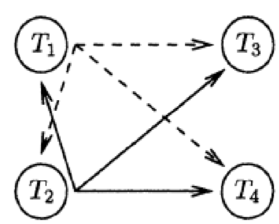

Fig.1 Illustration of radio signal paths in an example wireless network

With terminals T1 and T2 transmitting information to terminals T3 and T 4 respectively

Paper technique improved the quality of service in network performance, and it makes effective relaying in signal transmission. And disadvantage is not concentrating on the energy efficient transmission in wireless network .Wireless networks that offer multi-rate sustain give the stations the capability to adjust their transmission rate to the bond quality in order to make their transmissions more consistent. Thus, stations that experience poor channel conditions tend to use lower instead of sending its data directly to the destination using a Cooperative regions for Cooperative MAC low data rate transmission, transmits the data in a two-hop manner using the station S h as a helper. The advantage of the two-hop transmission is that the two links that are used are fast and thus the overall time for the transmission from the source to the destination is reduced. When the helper receives the casing from the source, it retransmits it to the destination after a SIFS time, and thus avoids need to compete for the standard. After the response of the edge transmission rates and vice versa. The basic functionality of the proposed protocol is illustrated in Fig. 2. In this figure, S is the source station; S d is the destination station and S h a potential helper. The potential helper is an intermediate station between the source and the destination that is able to exchange data with the source and the destination at rates higher than the rate of the direct link between them. As we can see in the figure, the source station, from the helper, the destination position sends a shortest ACK to the source, acknowledge the reception. We chiefly intent on the QOS enhancement not on the energy competence.

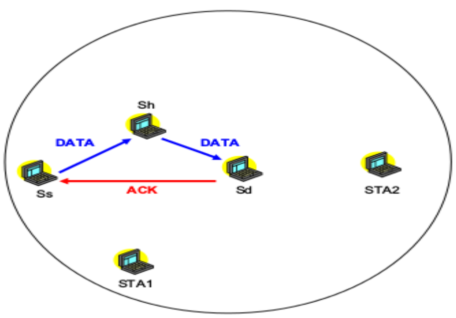

Fig:-2 exchange of data-ACK frames for cooperative MAC

Cooperative communication, which can achieve spatial diversity by exploiting distributed virtual antennas of cooperative nodes, has attracted much attention recently due to its ability to mitigate fading in wireless networks. The main feature of cooperative communication is the involvement of neighboring nodes in data transmissions. The novel aspect and core idea of the proposal is a cross-layer adaptive data transmission algorithm considering both the length of data frame at the MAC layer and instantaneous wireless channel conditions. Under this algorithm, direct transmission mode or proper cooperative transmission mode will be adaptively selected for data packets according to both MAC layer and physical layer information.

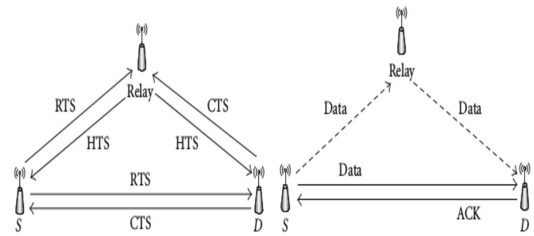

Fig-(a) control frame exchange (b) data frame exchange

When the length of a data frame is less than the RTS threshold, the source will transmit it directly to the destination by the basic access scheme of IEEE 802.11 DCF, which brings down the overhead in the network; otherwise, the source will send an RTS frame and wait for a CTS frame from the destination. If the source receives a CTS frame but does not receive any HTS frame from neighbor nodes in a certain interval, it will transmit the data packet by RTS/CTS direct transmission scheme. If both CTS and HTS frames are received in sequence, the source transmits the data packet according to the “transfer mode” piggybacked in the HTS frame. If an ACK is not received after an ACK timeout, the source should perform random back off; otherwise, the source will handle the next data packet in its queue. If the destination receives an RTS frame from the source, it sends a CTS frame including the measured channel conditions information between source and destination and waits for HTS frames from neighbor nodes. If any HTS frame is not received before receiving data packet, indicating that the source transmits data packet by RTS/CTS direct transmission scheme, the destination processes the unique data packet. If the destination receives an HTS frame before receiving data packet, it will process the received data packet according to the “transfer mode” piggybacked in HTS and then sends an ACK to the source. The neighbor node judges whether itself is a candidate relay node for a given source-destination pair. If it is, it will wait for the timer T r to expire and then broadcasts an HTS frame to declare itself; if it receives an HTS frame before the timer reaches zero meaning it is not the best relay node for the given source-destination pair, the neighbor node should back off. When overhearing a data packet, a candidate relay node extracts the “relay address” information to judge whether it is the relay node for the given source-destination pair. If it is, the node will decode and forward the data packet to the destination. It can avoid extra overhead, and this technique can improve the throughput by using the MAC and physical layer configuration. It cannot select the optimal relay, this technique not concentrating on the optimal relay selection process and power saving process. Wireless ad hoc networks are increasingly deployed for various applications. This wide application requires ad hoc networks to support different types of service ranging from slow rate data transmission to multimedia and real-time services. An effective solution to this problem is to use cooperative communications as it can exploit the spatial diversity from relaying paths via relaying nodes to increase the transmission reliability, enhance the network throughput, as well as reduce the transmission latency. we consider the design of a cross-layer medium access control protocol for wireless ad hoc cooperative networks. We proposed an improved cross-layer cooperative MAC protocol. Our idea is to simplify the signal message exchange process to reduce the protocol overhead. Specifically, instead of using a control frame to inform the source, we use a helper response pulse signal with shorter length (up to two mini-slots in IEEE 802.11 DCF). The shortened length of the HRP signal helps to reduce the protocol overhead, and thus improves the path throughput. The HRP signal with shorter length is transmitted more reliably over erroneous channels leading to higher cooperative opportunity. In our protocol, only one HRP signal is used at the randomly picked up mini-slot to inform the source even if there are more than one optimal helper. This design allows the protocol to switch from the unsuccessful cooperative mode to the direct transmission faster.

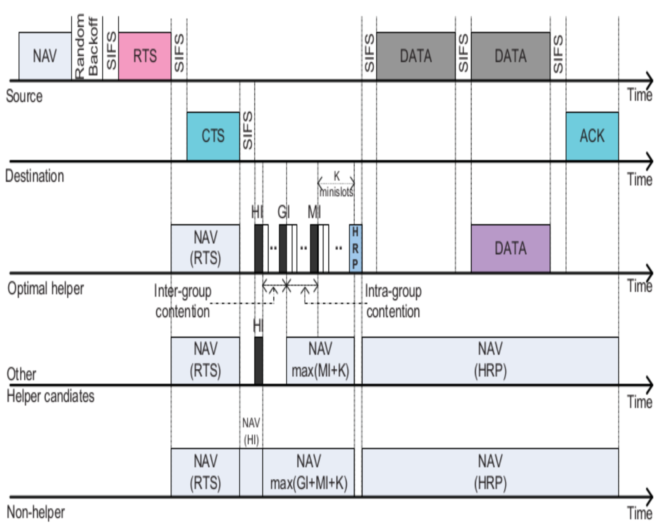

FIG:-proposed cooperative MAC protocol

This technique only concentrates on QOS parameters such as overhead and throughput. Spatial diversity has been extensively studied in the context of Multiple- Input-Multiple-Output (MIMO) systems to combat the effects of multipath fading.

Though, in wireless networks, particularly antenna networks, it might not be viable to fix more than one antenna on the wireless terminal as of space limits or the requisite simplicity in completion. To resolve such problems, supportive diversity has been introduced. The critical and statistical results expose that for minute distance partition amid the source and destination, through transmission is more energy competent than relaying. The results also reveal that equal power allowance performs as well as optimal power allocation for some scenarios. We compare the act of two communication scenarios. In the primary scenario only direct transmission among the source and destination nodes is allowable, and this accounts for predictable direct transmission. In the second communication scenario, we believe a two-phase cooperation protocol. In the first phase, the source transmits a signal to the destination, and due to the broadcast nature of the wireless medium the relay can overhear this signal. If the destination receives the packet from this phase correctly, then it sends back an acknowledgement (ACK) and the relay just idles. On the added hand, if the destination cannot translate the received packet properly, then it sends back a negative acknowledgement (NACK). In this case, if the relay was deliver to receive the packet correctly in the first phase, then it forwards it to the destination. The source node transmits its packets to the destination and the relays try to decode this packet. If the destination does not decode the packet correctly, it sends a NACK that can be heard by the relays. If the first relay is able to decode the packet correctly, it forwards the packet with power P 1 to the destination. If the destination does not receive correctly again, then it sends a NACK and the second candidate relay, if it received the packet correctly, forwards the source's packet to the destination with power P 2. Paper effectively describes about the necessary of cooperative communication in wireless sensor network when the direct communication fails. And it provides another best solution to improve the power saving by using the power allocation method. It mainly suitable for wireless sensor network with different fixed power levels, and further improvement is needed with this concept for mobile adhoc network.

2.1. Existing work summary:

In this paper, we propose an improved cross-layer cooperative MAC protocol. Our idea is to simplify the signal message exchange process to reduce the protocol overhead. Specifically, this protocol can switch from the unsuccessful cooperative mode to the direct transmission faster. The existing CMAC protocols mostly center on the throughput improvement as fading to examine the energy competence or network lifetime.

3. Proposed system:

We propose a technique with the objective of prolonging the network lifetime and increasing the energy efficiency, we present a novel CMAC protocol, namely DEL-CMAC, for multi-hop MANETs. We also address the issue of effective coordination over multiple concurrent cooperative connections with dynamical transmitting power. A distributed energy-aware location-based best relay selection strategy is incorporated in our proposed system. In this section, with the objective of prolonging the network lifetime and increasing the energy efficiency, we present a novel CMAC protocol, namely DEL-CMAC, for multi-hop MANETs. When cooperative relaying is involved, the channel reservation needs to be extended in both space and time in order to coordinate transmissions at the relay. To deal with the relaying and dynamic transmitting power, besides the conventional control frames RTS, CTS and ACK, additional control frames are required. DEL-CMAC introduces two novel manage frames to assist the cooperation, i.e., Eager-To-Help (ETH) and Interference-Indicator (II). The ETH edge is used for selecting the finest relay in a dispersed and lightweight manner, which is sent by the winning relay to notify the source, destination and lost relays.

In this paper, the best relay is defined as the relay that has the maximum residual energy and requires the minimum transmitting power among the capable relay candidates. The II frame is utilized to reconfirm the interference range of allocated transmitting power at the winning relay, in order to enhance the spatial reuse. Between each frames, RTS, CTS, ETH and ACK are transmitted by even power. And the transmitting power for the II frame and information packet is vigorously owned. We stipulate gathering for the transmission of Request to send, Clear to send, Eager to help, ACK and II frames by TRTS, TCTS, TETH, TACK and T II, respectively.

3.1 conclusion :

We have projected a novel distributed energy-adaptive location-based CMAC protocol for MANETs. By introducing DEL-CMAC, equally energy gain and location gain can be oppressed thus the network lifetime is absolute significantly. We have also proposed an effective relay selection strategy to choose the best relay terminal and a cross-layer optimal power allocation scheme to set the transmitting power. Moreover, we have enhanced the spatial reuse to minimize the interference among different connections by using novel NAV settings. Our chief aim to widen the network lifetime.

3.2 Enhancement:

It uses the method to decide the finest route. The formula is predicated on the hop count and also the least residual energy and the cooperative communication. There is no debate about security issues in MANET. In our improvement work we suggest a solution to address the energy based attack. In mobile adhoc network, one of the main problem is energy saving. The attackers mainly focusing on node energy level, and reduce energy level of intermediate node. So in our proposed solution we are introducing the energy trust management system with network layer.

3.2 Algorithm:

1) If node has *data*
    a. If Medium free
        i. Send RTS
        ii. Set medium NAV_
2) If pkt recv in *j*
    a. If pkt =RTS
        i. Store $Src \rightarrow Help_{src}$
        ii. If j==dst
            1. Send CTS
        iii. Wait for CTS
            1. If not
                a. Go to *sleep*
    b. If pkt=CTS
        i. If $Help_{src}$=dst
            1. Send ETH
            2. Wait
                a. Send II
        ii. Else if j=dst
            1. Wait for ETH
                a. If not
                    i. Direct transmission
        iii. Else
            1. Go toSleep
    a. If pkt=ETH
        iv. Send Data to helper
        v. Go to sleep
    b. If (pkt=data) & Helper
        vi. Forward to receiver

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