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A COOPERATIVE DIVERSITY USING MAC PROTOCOL

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Abstract: *To deliver the frames faster by using multi-rate capability, this does not necessarily enhance the communication reliability in interference-rich environment. Cooperative communication at the PHY layer attracts a lot of researchers' attention because it directly enhances the link reliability. Co-operative communication exploits diversity offered by multiple users, known as multiuser or cooperative diversity. It dramatically improves the bit error rate (BER), resulting in a more reliable transmission and a higher throughput. The important thing is the primary motivation of cooperative diversity in this paper is to improve the link reliability over wireless fading channels. The proposed CD-MAC operates on a single channel and uses a single partner (relay).Meanwhile, the relays do not store a copy of client's data, and it only delivers the data from sender to receiver. For more accurate evaluation, we use BER and frame error rate (FER) statistics derived from the product specification. End-to-end packet delay is evaluated and compared between CD-MAC. CD_MAC is to overcome the link breakage problem due to un-reliable, fluctuating communication environment. In CDMAC, each node proactively selects one partner device for its cooperative communication. Two-node cooperation is advantageous compared to multi-node cooperation.*

Keywords: Cooperative layer, Error rate and multi-node, Bit error rate, Single partner.

1. INTRODUCTION

In ad hoc networks, signal fading (due to communication environment) and interference (due to other nodes) are two major obstacles in realizing their full potential in delivering signals. Cooperation among the nodes is considered critically important in addressing these problems. Conventional routing layer solutions support the cooperative delivery of information by selecting intermediate forwarding nodes for a given source-destination pair. However, it may be difficult to maximize the performance unless nodes are coordinated to cooperate at lower levels. This is because the network capacity is often determined by the underlying MAC- and PHY-layer protocols. For example, consider a carrier sense (CS)-based medium access control (MAC) protocol such as Distributed Coordination Function (DCF)[8] in the IEEE 802.11 standard. A node is regarded as a greedy adversary to other nodes in its proximity as they compete with each other to grab the shared medium, interfere each other's communication, and cause collisions.

At the physical layer, a node's data transfer not only provides interference to other nodes depriving their opportunity of using the medium but also incurs energy wastage by rendering them to overhear. Recently, there has been active research in developing cooperative MAC algorithms such as path-centric medium access and MAC-layer packet relaying. For example, in Coop MAC [1] and DCF [8], cooperating relay nodes are determined in a proactive manner and are used to forward frames at higher bit rates. Their objective is to deliver frames faster by using multi rate capability, which does not necessarily enhance the communication reliability in interference-rich environment. On the other hand, cooperative communication at the PHY layer attracts a lot of researchers' attention because it directly enhances the link reliability.

2. RELATED WORKS

"Maximizing communication concurrency via link–layer packet salvaging in mobile ad-hoc network." Here Carrier-sense Medium Access Control (MAC) [1] protocols such as Distributed Coordination Function (DCF) [8] avoid collisions by holding up pending packet transmission requests when a carrier signal is observed above a certain threshold. However, this often results in unnecessarily conservative communication, thus making it difficult to maximize the utilization of the spatial spectral resource.

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On the other hand, the communication distance is generally neither short nor adjustable because multihop routing protocols strive for providing minimum hop paths. It proposes a new MAC algorithm, called Multiple Access with Salvation Army (*MASA*), which adopts less sensitive carrier sensing to promote more concurrent communications and adjusts the communication distance adaptively via "packet salvaging'' at the MAC layer.

"Cooperative Regions for Coded Cooperative Systems "here the Cooperation of mobiles provides signal diversity in Ad hoc networks. Here a coded cooperative system under Rayleigh fading and path loss. For an arbitrary signal to noise ratio, we find conditions on the user geometry for two-user cooperation to be beneficial. The cooperation is useful or not is only determined by the cooperation decision parameter (CDP). For which cooperation results in a gain in Frame Error Rate (FER) [2] for individual users and use the analytical formulation of the CDP to investigate how locations of the user and the partner affect the user cooperation gain. It also provides insights on how a user can choose among many partners to maximize cooperation gain. Cooperative communication enables nodes to use each other's antennas to obtain an effective form of spatial diversity in a fading wireless environment. Channel coding for cooperative systems have been used in cooperative coding to extend multiple input and multiple output systems, where partnering nodes may have different number of antennas.

"Cooperative Diversity Models, Algorithms, and Architectures. "Here Cooperative diversity allows a collection of radio terminals that relay signals for each other to emulate an antenna array and exploit spatial diversity in wireless fading channels. For a variety of processing algorithms and transmission protocols, performance improvements in terms of transmission rate and reliability have been demonstrated. It uses low-complexity processing algorithms and transmission protocols for cooperative diversity, it summarizes performance predictions in terms of information-theoretic outage probability, and how such constructs can be integrated into ad hoc network architectures, both existing and new. Because cooperative communications is inherently a network problem, issues of protocol layering and cross-layer architectures naturally arise. Starting as low as the physical layer, encoding and signal processing algorithms are required in at the source(s) and relay(s), and signal processing and decoding algorithms are required at the destination(s). However, such issues can be addressed as part of link layer coding and retransmissions, such as automatic repeat request (ARQ)[3]. For transmissions in time and frequency must be addressed by protocols in the link layer and medium-access control sub layer in coordination with the physical layer.

"Impact of Relay Selection Overhead in Cooperative Diversity Protocols **"**here Cooperative diversity is a promising technique for improving link reliability in fading-rich environments where nodes can overhear signal transmissions between a communicating pair and retransmit data to the destination. It can be applied for small and low-cost radios, for instance, where multiple antennas and sophisticated receivers cannot be used. The relay selection procedure is essential for efficient operation of cooperative diversity. Numerous relay selection protocols have been proposed and analyzed so far. The impact of selection overhead on overall protocol performance, propose an analytical model for throughput analysis of cooperative relaying with consideration of signalling overhead. Using a protocol in which a relay is selected upon source destination transmission and always retransmits the received message, results illustrate the tradeoffs between throughput and time allocated for selection. The selection of a fixed relay happens very rarely; thus the selection overhead can be neglected, and results of and can be applied. Using relay communication with reactively selected relays, however, requires a significant signalling overhead.

"Cooperative Communication for Sensors Networks[4]"in this paper new Mac layer scheme (WSC-MAC)[1] for Sensor Network improving the overall the network reliability by using cooperative communication. It defines a relay node among the neighborhood of a node, efficiently and with only few signaling messages. As the sensor nodes switch from active mode to sleep mode, the Long Preamble Emulation (LPE) Mac layer Algorithm which emulates the asynchronous MAC protocol proposed increases the overall reliability of the sensor network and adjusts to large variety of node density. Nodes in cooperative network are efficiently using broadcast property of the wireless medium to improve the communication between two nodes in the networks by sending on the same channel a copy of the main communication. The Link State algorithm is running on each node that has been elected to act as a relay node during automatic forwarding selection process. This process will help the elected relay to determine if it should be involved into the relaying process.

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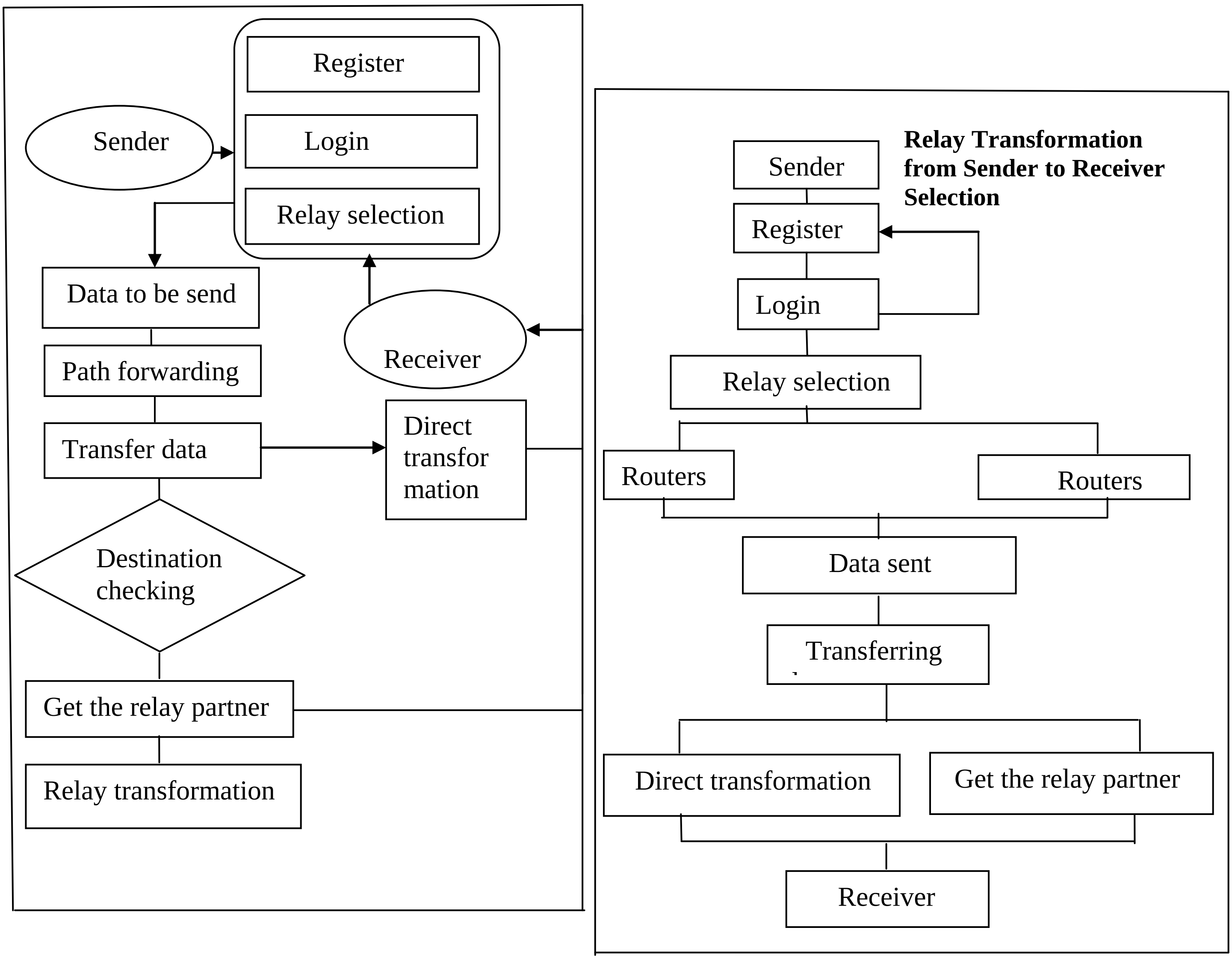

Figure 1: CD-MAC SYSYTEM

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In the existing system, without relay the data will send from a client and a receiver. If some traffic arises the data will be lost. There is no intermediate between a client and a receiver. No acknowledgement of the data sent. The path will not check the closest path of the nearest node. If the sever is busy in the network there is no other service for the retransmission and the data will be lost permanently. There is no trust worthy server. In the network path, there is lot of fluctuation, un-availability and delay of the process. You may lose some features or experience some incompatibilities between a client and a receiver due to the mobility and reliability. Without intermediate we cannot transfer the data through the network. The user will be concern after sending the packets. There is no confirmation about the delivery of the packets and also no acting server.

3. PROPOSED SYSYTEM

The objective is to deliver frames faster by using multi-rate capability, which does not necessarily enhance the communication reliability interference-rich environment. It is important to note that the primary motivation of cooperative diversity [5] in this paper is to improve the link reliability over wireless fading channels. It refers to scenarios in which distributed radios interact with each other to jointly transmit information in wireless environments. In other words, cooperative communication exploits diversity offered by multiple users, known as multiuser or cooperative diversity. It dramatically improves bit error rate (BER), resulting in a more reliable transmission and a higher throughput. It is important to note that the primary motivation of cooperative diversity in this paper is to improve the link reliability over wireless fading channels while that in previous study is to lengthen the transmission range.

A key element of the CD-MAC is the selection of partner; each node monitors its neighbors and dynamically determines a single partner as the one that exhibits the best link quality. In the original CD-MAC algorithm [7], a sender and its partner cooperatively [6] transmit a frame whenever the sender experiences a transmission failure. However a transmission, failure due to collisions/interference should be treated differently from that due to channel error. If it is due to the latter, it helps because the communication becomes more robust in the presence of channel error. While most of studies concentrated on evaluating BER and outage probability via cooperative diversity, this paper evaluates system-level performance such as packet delivery capability. For more accurate evaluation, we use BER and frame error rate (FER) statistics derived from the product specification. End-to-end packet delay is evaluated and compared between CD-MAC (See Fig 1). CD_MAC is to overcome the link breakage problem due to un-reliable, fluctuating communication environment. In CDMAC, each node proactively selects one partner [6] device for its cooperative communication. Two-node cooperation is advantageous compared to multi-node cooperation.

4. MODULES

There are five modules in the cooperative diversity process to make the data transfer more effective in the distributed network. They are sender node, Receiver node, Partner selection, Relay performance and report.

4.1 Sender node

This module is the initiate module (See Fig 2.) for the data transfer between the nodes in network communication. A sender node is the data source node which will transmit that data into the valid destination /receiver node. Before the data initiated, here the sender should choose its partner/rely to retransmit the data while channel failure occurs. Once it sends the data it will receive the acknowledgement for the data from corresponding destination.

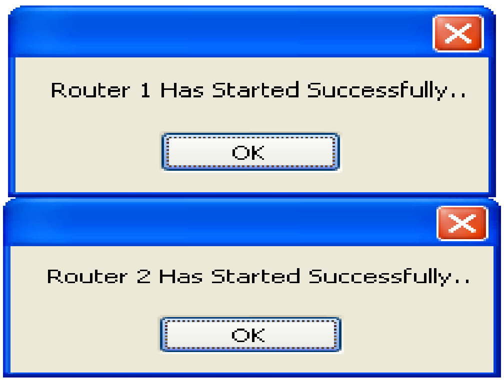

Figure 2: Router Starting Process

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4.2 Receiver node
This is the destination node where the sender data have to reach. Receiver nodes are generally aware of its neighbor nodes to get the data from sender (See Fig 3). Like the sender node this also chooses the partner of the communication with sender. After it received the data exactly receiver node should send acknowledgement to the sender to intimate that the data was received.

Figure 3: Receiving Node

4.3 Partner selection
Partner selection module is main process of the project, here the node will chooses a neighbor node which is actually better in performance to transmit data to destination (See Fig 4).
It will use the performance between the sharing data among nodes and its corresponding neighbors. RTS/CTS are not the mandatory in this CD-MAC so there is no need of much concentrate here. These request are improves the additional performance about the network communication.

Figure 4: Selecting Partner

4.4 Relay performance
Once sender chooses the relay partner, performance depend data transfer will be maintain in the network. These performance are mainly depend on following two factors such as Data sharing, Most nearer, Data availability. If the relay performance are poor than the sender node then that transmission depends the next nearest neighbor.

4.5 Report
This module is the final module, which explains the overall data transfers, node problems, relay details and the data sharing with the admin part. If the sender and receiver nodes use the CTS/RTS then that details are reported to the admin respectively.

5. CONCLUSION
This paper proposes CD-MAC and discusses design issues and performance benefits in wireless ad hoc networks Performance .When a communication link is unreliable, a sender transmits its signal together with its partner delivering the signal more reliably. In order to select a partner, each node monitors its neighbors with respect to link quality by receiving periodic hello packets and overhearing ongoing communications. The proposed CD-MAC is designed based on the IEEE 802.11 standards and does not require any changes in frame formats. For accurate performance study, we developed a realistic reception model based on BER and FER, which are derived from Intersil radio hardware specification. According to the system-level simulation results, CD-MAC significantly outperforms the conventional DCF of the original standards, particularly in a harsh environment.

5.1 FUTURE ENCHANCEMENT
As a future work, exploiting cooperative diversity based on multichannel interfaces will be investigated. It is also a promising future work to develop a cooperative diversity aware routing algorithm. We expect that this cross-layer approach can dramatically boost the network performance because it gives us a way to exploit other advantages of cooperative communication such as lengthening the transmission range in addition to improving the link reliability. More efficient partner selection is another important future work.

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