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AN APPROACH OF WIRELESS NETWORK FOR OPTIMAL BROADCAST USING CHORUS

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ABSTRACT

In Wireless Networks most of wireless broadcast protocols heavily rely on the MAC 802.11-based CSMA/CA Protocol. This Protocol will avoid interference and collision by conservative scheduling of transmissions. But this CSMA/CA Broadcast protocol will support only multiple concurrent unicast, it will not support Multicasting. This will degrade the broadcast performance of Wireless Network particularly in loss and large-scale networks. It also affects the Network Parameters like Delay, Packet Delivery Ratio when nodes are moving. The Chorus protocol improves the efficiency and scalability of broadcast service even though there is mobility in the nodes. This Chorus is built upon the observation that packets carrying the same data can be effectively detected and decoded, even when they colloid with each other and have comparable signal strengths. This will resolve collisions using symbol-level interference cancellation, and then combines the resolved symbols to restore the packet. This collision-tolerant mechanism significantly improves the Packet Delivery Ratio and at the same time reduces the delay in the wireless broadcasting. In Chorus broadcast protocol, cognitive sensing and scheduling algorithm is implemented in MAC layer that facilitates reduction in an asymptotic broadcast delay which is proportional to the network radius. It is evaluated that the Chorus PHY-layer collision resolution mechanism with symbol-level simulation, and validated the network-level performance via ns-2, in comparison with a Double Coverage Broadcast (DCB) which used typical CSMA/CA-based broadcast protocol.

Keywords: Wireless Sensor Network, Packet Delivery, Coverage Broadcast, Chorus

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1 INTRODUCTION

Broadcasting means to deliver a single packet from source node to all other nodes in the network. Broadcasting is the fundamental principle for any communication protocols in multihop wireless networks, that is for route discovery and information delivery. To do so an efficient broadcast protocol is required to deliver a single packet or a continuous stream of packets from the source node to all other nodes in the network, with high packet-delivery ratio (PDR) and less delay. To improve PDR in a lossy network, multiple relay nodes can forward and retransmit each packet. Due to this it will cause transmission diversity. So reduce delay and resource usage the number of transmissions must be kept to minimum. Otherwise redundant retransmissions waste channel time and slow down the packet's delivery in the network. Hence a delicate balance should maintained between PDR and delay. To do so an efficient broadcast protocol [1] is required. CSMA/CA is the mostly used MAC protocol focused on the MAC-layer scheduling and it has proven to be an effective distributed scheduling scheme, especially via the 802.11 family of MAC standards. But the limitation of CSMA/CA is that it is limited to concurrent unicasts, it will not support multicasting. This sensing and scheduling reduces collision, but misses' transmission opportunities which lowers channel usage and spatial reuse. conflict-aware network model[8], which uses these parameters to increase the probability of scheduling conflict-free transmissions, and thereby improve the reliability of the broadcast schedule. They present and prove correctness of a constant approximation algorithm for minimum-latency broadcast scheduling under this network model. They also present a greedy heuristic algorithm for the same problem. Experimental results are provided to evaluate the performance of our algorithms. In addition, the algorithms are analyzed to justify their performance trends.

The earliest protocol suggested for broadcasting and multicasting in ad hoc networks is flooding. In the flooding protocol, every node transmits the message to all its neighbors after receiving it. But this protocol can lead to severe contention, collision and retransmissions. This situation is referred to as a broadcast storm In this paper, we introduce a new broadcast protocol, Called Chorus, based on a MAC/PHY layer [2] that adopts CSMA with collision resolution (CSMA/CR) technique. Chorus is built upon the key that packets carrying the same data can be detected and decoded, even when they overlap at the receiver with comparable signal strength. At the MAC layer chorus adds Cognitive Sensing and Scheduling module to the 802.11 CSMA mechanism. Specifically senders back off only when they sense a packet on the air thar has a different identity from what they intend to transmit

2 RELATED WORK

Wireless networks are usually modeled as Graph G=(V,E). where Vertices(V) Represents the nodes and Edges(E) Represent the Reach ability of nodes. There are two types of graph models is there Un Directed graph(UDG) and Directed Graph(DG)[1]. UDG is usually used when all the nodes have equal transmission ranges whereas in DG nodes have different transmission range. In both cases sender and receiver must be in same transmission range.

Scheduling is good way of avoiding interference Signal to Interference Noise Ratio (SINR) model[3]. SINR compares the level of desired signal to the level of background noise. Here Broadcast latency is the problem. The time by which all the nodes receive the message is called as the Broadcast Latency.

Collision and Hidden Terminal[12] are well known problem. Collision means that when two or more nodes transmit the message to common neighbor at the same time, the common node will not receive any of these messages we say that collision occurred. So wireless network rely on CSMA to limit the collision sender will sense the medium, if medium is free it starts transmitting Zigzag decoding is one of the technique to combat collisions caused by hidden terminal. But this may cause error propagation.

One of the broadcast protocol is Double coverage broadcast [6]. It uses the broadcast redundancy to improve the delivery ratio in the high transmission error rate. Here only selected set of nodes will forward the broadcast message. That selected set of nodes will forward the broadcast message. Selected nodes called Forwarding nodes. It has two requirements

(i) Forward node covers the senders 2hop neighbor set.

(ii) They cover the senders 1hop non forwarding nodes.

The sender will not receive Acknowledgement from forwarding nodes not from the non forwarding nodes. If the sender fails to detect all its forwarding nodes retransmission, it repeatedly resends the packet until it detects that all the retransmission or the maximum number of retries is reached.

Here we are proposing a new broadcast protocol Chorus which improves the efficiency and scalability of network even when there is mobility in the network. Chorus will find the packet which carrys the same data can be effectively detected and decoded.

3 COLLISION RESOLUTION IN CHORUS

Collision resolution scheme of chorus in physical layer which focus on how to detect, decode and combine the collided packets to achieve the diversity gain.

3.1 DETECTION

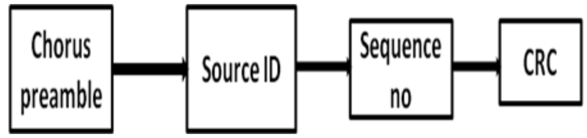
A known random sequence is attached by the transmitter at the beginning of each packet as a preamble. The receiver then uses a matched filter to detect the exact arrival time of this preamble. A matched filter is an optimal correlate that maximizes the SNR value whenever the correlating unknown signal with known signal. It outputs the peak value whenever the packet preamble is detected

3.2 DECODE

We can identify the collision of two packets by detecting their preambles. We first decode the clean symbol and then subtract the collided symbol with that clean symbol in order to achieve the desired symbol

3.3 PACKET FORMAT IN CHORUS

Known random sequence is attached known as Chorus Preamble. Chorus header field informs broadcast source id, sequence number which is nothing but identity to the receiver. Cyclic Redundancy Check (CRC)after decoding then proceeds with CRC, if CRC check fails then packet will discarded.



4. COGNITIVE SENSING AND SCHEDULING

Chorus physical layer collision resolution must be integrated inorder to reduce unresolvable collisions. Transmitter has 3 rules

(i) Transmit the packet if channel is idle.
(ii) If the channel is busy, check the packet in the queue and the packet on the air is same then transmit.
(iii) If the channel is busy, but a preamble cannot be detected header field is cannot be detected then it start back off procedure.

To prevent unresolvable collision chorus starts back off procedure.

Rule(ii) is unique to the chorus CSMA/CR. It enforces the principle of chorus. Instead by collision resolution these packets offer transmit diversity.

5. CONCLUSION

This project aims to model Collision Resolution Protocol for wireless broadcast to improve the Packet Delivery Ratio (PDR) in lossy network. This is done by using Chorus protocol, which allows forwarders with to transmit packets at the same time. Then it employs physical layer iterative decoding to resolve collision at the receiver side. Chorus achieves transmit diversity and improves loss resilience without any retransmission. More importantly, with its collision-tolerant MAC, Chorus significantly simplifies the CSMA scheduling and improves its spatial reuse.

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