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Carrier Sense Multiple Access (CSMA) Network

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ABSTRACT: The main reason of congestion is sensor nodes that are allowed to transmit packets as many as they can which result in collisions and packet corruption. Since corrupted packets must be retransmitted, collisions increase latency and incur excess energy consumption. It is one of the major factor that reduce the overall energy efficiency of the network.

KEYWORDS: Collisions Transmitted, Network, Packet.

I. INTRODUCTION

This subsection provides details about the work to create a K-map of wireless sensor nodes. It discusses the method and technique regarding how to form a K-map of N sensor nodes. It also describes how to obtain K-graph from a K-map.The conventional Karnaugh map or K-map is a technique to simplify Boolean algebraic expressions. The required Boolean results are transferred from a truth table onto a two- dimensional grid where the cells are ordered in grey code and each cell position represents one combination of input conditions. Again each cell value represents the corresponding output value. A k-variable K-map contains N = 2k minterms (m0 , m1 , m2 ,...,mN −1) and the size of the K-map is equal to the total number of minterms. But K-map of sensor nodes is somewhat different. A wireless sensor network comprising of N sensor nodes, can be represented as a k-variable K-map that contains N sensor nodes and k = rlgN l. The size of the K-map becomes the network size N and minterms become the sensor members. It is a diagram consisting of a rectangular array of squares where each cell represents a different sensor node. Cells are occupied based on node association request with a sink. The way K-map rules of pair to group adjacent cells are applied to simplify Boolean expressions; same rules can be used to determine node adjacency information in a network. The advantage of a K-map is, if a particular node is selected and nodes belong to its adjacent cells are grouped, all nearby nodes can be determined. Rules evaluate that each node $i \in N$ of a k-variable K-map can have at most k number of neighbour nodes and node degree becomes k. If $\forall i \in N$, node degree d(i) = k, K-graph transforms into k-regular K- graph. Node adjacency information prepares node adjacency list to form a K-graph of N sensor nodes.

A)Adjacency list of 4 nodes

Node	Adjacency Relationship
0	$1 \rightarrow 2 \rightarrow NULL$
1	$0 \rightarrow 3 \rightarrow NULL$
2	$0 \rightarrow 3 \rightarrow NULL$
3	$1 \rightarrow 2 \rightarrow NULL$

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Node	Adjacency Relationship
0	$1 \rightarrow 2 \rightarrow 4 \rightarrow NULL$
1	$0 \rightarrow 3 \rightarrow 5 \rightarrow NULL$
2	$0 \rightarrow 3 \rightarrow 6 \rightarrow NULL$
3	$1 \rightarrow 2 \rightarrow 7 \rightarrow NULL$
4	$0 \rightarrow 5 \rightarrow 6 \rightarrow NULL$
5	$1 \rightarrow 4 \rightarrow 7 \rightarrow NULL$
6	$2 \rightarrow 4 \rightarrow 7 \rightarrow NULL$
7	$3 \rightarrow 5 \rightarrow 6 \rightarrow NULL$

N0	N1
N2	N3

(a) K-map of 4 Nodes

N0	N1	N3	N2
N4	N5	N7	N6

(b) K-map of 8 Nodes

II. Related work

A mobile ad hoc network (MANET) is a self-organising multi-hop wireless network in which all nodes participate in the routing and data forwarding process. Such networks can be deployed easily in situations where a base station is not available and a network must be built spontaneously. In a number of applications, such as vehicle-to-vehicle communications, battlefield communications, national crisis management, disaster recovery and sensor deployment, wired networks are not available and ad hoc networks provide the only feasible means of communication and information access.One important requirement in MANETs is that the routing protocol must work well in a small network, and also maintain the efficiency and scalability of the network as it expands and the application transmits greater volumes of data. In such environments, mobility, channel error and congestion are the main causes of packet loss. One specific type of routing protocol called Geographic routing is based on position information of nodes in the network. The early proposals of geographic routing were purely greedy nature (without guarantee of

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successful delivery). At each intermediate node, the packet is forwarded to the neighbour node that is closest to the destination. Several works have pointed out that greedy approach can results in severe congestion and hence performance degradation. In two previous works of geographic routing, connectionless approach (CLA) (Ho et al., 2004) and contention-based forwarding (CBF) (Füßler et al., 2003), we observed that the performance benefit decreases as the number of communication sessions increases These problems become more visible in traffic-intensive environments, such as multimedia applications, where congestion is more probable and the negative impact of packet loss on the service quality is more significant. The above problem is often caused by network congestion, and the standard solution is to leave congestion control to the MAC layer. Unfortunately, similar techniques are not available for greedy techniques (i.e., geographic routing) MANETs. It is not possible to adapt the existing techniques since there is no hop-by-hop route in a greedy approach routing.

III. PROPOSED ALGORITHM

Opportunistic routing (OR) is a concept to benefit from multi-user diversity (MUD)in WMNs. The wireless communication is prone to transmission errors in a differentand more serious way than communication via wires. For example, empirical resultssuggest that the majority of links in a WMN are of intermediate quality [1]. Thus,instead of transparently hiding the characteristic of wireless links from the upper lay-ers, the advent of cross-layer routing metrics like ETX [20] and ETT [22], for example,indicates that there are strong incentives for WMN-aware network and routing lay-ers. The rationale of OR is to mitigate transmission errors via the simultaneous usageof multiple candidate receivers. Due to the broadcast nature of the wireless medium,the transmitter does not have to specify the relay on the next hop a priori. Instead, the routing decision is made a posteriori relying on the information which candidate ac-tually received the frame. The additional process of determining the next-hop relay within the MAC transaction is called forwarder selection or alternatively relay (self)-selectionCSMA/CA as a Markov Random Field During the MAC transaction, one transmitter tries to send a frame to at least one receiver. We assume that the MAC operates bidirectional, so that transmitter and re-ceiver(s) can exchange signaling information. Furthermore, we assume that the MACtransaction is opaque in terms of interference, i.e. the same interference constraintsapply to all involved nodes in the same way. For example, we do not allow that an-other transmission takes place even if it would interfere with the transmitter of an on-going transmission only, which is the well-known exposed node situation [55]. Thisway, an actual MAC protocol remains flexible in the realization of signaling schemes,since there are no temporal dependencies between different links involving the roleassignment.A wireless link can be in one of the following four states: In the contending state(0), the link is idle and tries to get access to the medium. If it wins the contention, itenters one of the probing states (1, 3). Both states are technically equivalent, however,we associate two different values to emphasize the outcome of the probe. If the probeis successful (state 1), the link enters the data transmission state (2), otherwise it pro-ceeds from state 3 to state 0. Our objective is to understand and control opportunistic routing (OR) in WMNsbased on carrier sense multiple access (CSMA). The paper builds upon a broad foun-dation of related work. The most important categories of related work cover theconcepts OR and CSMA, of course. However, we need a further means which al-lows us to understand the cross-layer interaction between both concepts and pro-vides us hints how to design a practical cross-layer protocol. We have found such a means within network utility maximization (NUM). In the following, we will intro-duce NUM, CSMA and OR in short. For the sake of presentation, we postpone the presentation of further related work to the sections it is referenced. Wireless technology has helped to simplify networking by enabling multiple computer users to simultaneously share resources in a home or business without additional or intrusive wiring. These resources might include a broadband Internet connection, network printers, data files, and even streaming audio and video. This kind of resource sharing has become more prevalent as computer users have changed their habits from using single,stand-alone computers to working on networks with multiple computers, each with potentially different operating systems and varying peripheral hardware.

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IV. SIMULATION RESULTS

In this paper, we address the question of how opportunistic routing (OR) should be used in wireless mesh networks (WMNs) based on carrier sense multiple access (CSMA) in order to efficiently utilize multi-user and spatial diversity. OR mitigates the channel impairments using multiple candidate receivers, which comes at the expense of reduced spatial reuse. Based on a cross-layer optimization framework, we design a cross- layer protocol for congestion control,

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opportunistic routing and CSMA scheduling for WMNs that is able to handle the described tradeoff. It is completely distributed and relies on local and neighboring information only.

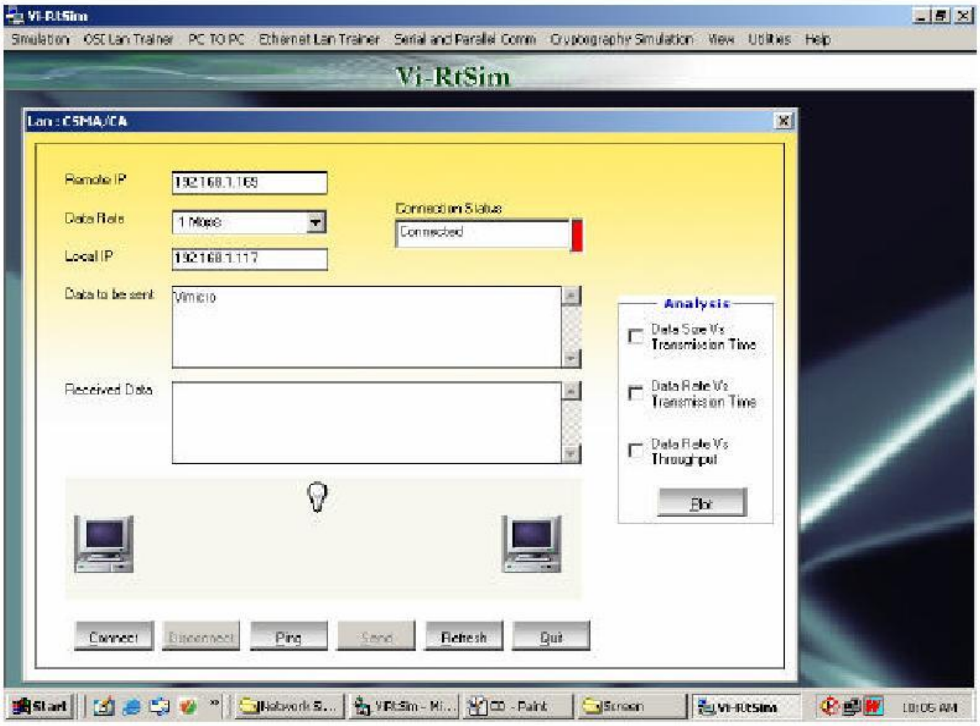

Figure 1

V. FUTURE WORK

Traffic analysis based on deep packet inspection (DPI) and a wide range of other techniques is now well - established as a means for operators to better understand IP network traffic. This information is used for a widening range of purposes,including policy management, service assurance, security, customer experience management and evelopment of new services.DPI is now embedded in many types of equipment, including network gateways (e.g.,GGSN and P-GW); policy enforcement appliances; service assurance elements such as network probes; load balancers; applications delivery control-lers; analytics platforms, and others. However, the coming transformation of networks by ETSI NFV, SDN, and cloud servicesposes some new questions. In particular:What is the role of DPI and related techniques in a virtualized network and a cloud-based service delivery environment networking products offer a variety of solutions to seamlessly integrate computers, peripherals, and data.

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