Maximum Residual Multicast Protocol for Reducing Loss of Energy using O-Idling & E-Idling Methods

B. Vijayalakshmi [a,*], V.R.Balaji [b,1]

Abstract - **The objective of this project is to reduce the loss energy by using O-Idling and E-Idling methods. Overhearing problem occurs when an interface receives data and control packets that were transmitted to some other node. In the overhearing phenomena, node expends same energy, as it would have done during reception. Since MANET nodes typically run from limited energy portable batteries, a critical design is reducing the power consumption and Erroneous The method proposed is maximum residual multicast protocol for reducing loss energy by using O-idling and E-idling methods. The idea behind idling is, when a node starts receiving ECS signal, its wireless interface is forced to switch to the low-energy idling state till the transmission causing ECS is over. The proposed system, implemented with the help of Network simulator, is used to maximize residual energy, which was initially 0.853% and have been improved to 0.921% in O-idling method and 0.939% in E-idling method. The system also reduces the latency experienced in packet transmission, which was initially 0.00085% and have been reduced to 0.00047% in O-idling method and 0.00054% in E-idling method.**

Index Terms* - *E-idling, Erroneous carrier sensing, mobile adhoc networks, O-idling, routing protocols.

I. Introduction

A mobile ad hoc network (MANET), sometimes called a mobile mesh network, is a self-configuring network of mobile devices connected by wireless links. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Maximum-Residual Multicast Protocol for Large-Scale Mobile Ad Hoc Networks targets power aware routing when network topologies and data traffic may change quickly in an unpredictable way. It is proposed [1], a distributed algorithm and its realization to maximize the minimum residual energy of all the nodes for each multicast, where no global nodes.

It is prove that the derived tree is loop-free and theoretically optimal in the maximization of minimum residual energy. Since MANET nodes typically run from limited energy portable batteries, a critical design is reducing the power consumption .The method proposed is maximum residual multicast protocol for reducing overhearing energy by using O-idling[2] and E-idling[3] methods.

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II. Existing System

Routing over mobile ad hoc networks is complicated by the considerations of energy efficiency while the shortest paths are not favored in routing. In recent years, power-aware routing has received lots of attention and yielded a class of fundamental optimization problems over various routing metrics. One of the well known metrics under intensive study is Minimum-Energy Routing, which tries to minimize the total energy consumption in packet routing. Another popular direction for power-aware routing is based on Maximum-Lifetime Routing, where its problem instances are often formulated in terms of integer programming so as to maximize the first node failure (or network Partition) time.

Here Maximum-Residual Routing, where the minimum residual energy of nodes is maximized for each multicast. The objective is to prolong the first node failure time when network topologies and data traffic may change frequently in an unpredictable way. This concept was first raised by Singh et al. [8], [9], where no algorithm design and protocol implementation were presented in the work. Other closely related results are a heuristic algorithm for unicasting and an optimal algorithm for broadcasting.

Based on the proposed algorithm, it is developing a source-initiated on-demand routing protocol, referred to as Maximum- Residual Multicast Protocol (MRMP), which is adaptable to network topologies and resources that may change over time. In MRMP, no periodic control message is employed to Collect routing information or repair link breakages. When desiring a route, a source invokes a route discovery procedure over the network, and the individual decisions of intermediate nodes form a loop-free multicast tree naturally.

2.1 A Maximum-Residual Multicast Protocol

A distributed methodology and its implementation are proposed to resolve the maximum-residual multicast problem; it is proposing a distributed algorithm to derive a multicast tree with the best energy efficiency, where each node makes its own decision autonomously. A routing protocol is then developed in as a realization based on the proposed algorithm [4].

2.2.1 A Distributed Algorithm

Based on each multicast tree T derived by the to-be-proposed algorithm, every node is able to adjust its power level in packet transmissions so that the residual energy over a network G= (V, E) is maximized for a given multicast session S. Let the source and the destination set of S be denoted by s and R, respectively. Given each node $v \in V$ under considerations, $\pi[v]$ and $m[v]$ are used to keep track of its predecessor and estimation on the residual energy over a path from s to itself during the execution of the algorithm, respectively.

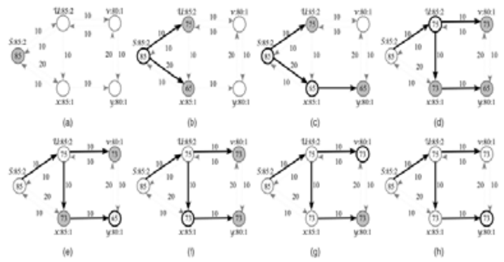

Figure 2.1 The execution of MRMA on an example network

MRMA is better illustrated by an example, as shown in Fig. 2.1 The two values following each node symbol are the amounts of its remaining energy and its energy consumption of receiving one session (originated from s), e.g.,“s : β(s)_ γ(s)” Suppose that all of the other nodes are the destinations .

2.2.2 Protocol Design

The MRMP, a realization of routing algorithm MRMA, is a pure source-initiated on-demand routing protocol, which establishes routes if and only if they are desired by sources. MRMP uses a broadcast route discovery mechanism, as used in other on-demand routing protocols [7] with special designs to adapt to large-scale mobile ad hoc networks with energy-energy considerations. In MRMP, a route is established by autonomous decisions of intermediate nodes, instead of being determined by the source with global information. Furthermore, no node regularly maintains routes to others.

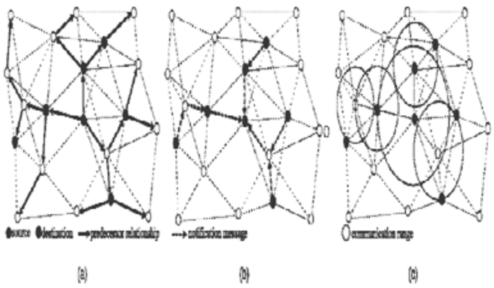

Figure 2.2 The maximum-residual multicast protocol (MRMP). (a) Route discovery; (b) Route establishment; and (c) Data forwarding

Since MRMA is realized by MRMP, control messages and table entries of MRMP directly correspond to their counterparts of MRMA. There are three major stages in MRMP: Whenever a source needs a route, the source requests for a route discovery within the network so that each node decides its predecessor [6], as shown in Fig. 2.2a. The destination nodes and their ancestors then inform their predecessors of the proper power levels during route establishment [5], as illustrated in Fig. 2.2b. Fig. 2.2c shows the forwarding of data packets by nodes at proper power levels on the established route.

2.4 Drawback of Existing System

1. Overhearing problem in existing wireless communication. In this problem may result in extra energy consumption.
2. Avoid overhearing problem the node has been set to sleep mode. But when it is in sleep mode there exist the problem of latency.

III. PROPOSED SYSTEM

Interface idling mechanism for improving energy efficiency of IEEE 802.11 based MAC hardware. A novel protocol state analysis techniques is developed for detecting time windows during which a wireless interface consumes energy due to 802.11 overhearing and which node consumes energy due to erroneous carrier sensing. During this window, energy savings at the MAC layer is accomplished by forcing the wireless interface to a relatively lower-energy idling state. In order to overcome the loss of energy by using O-idling and E-idling methods. Overhearing problem occurs during when an interface receives data and control packets that were transmitted to some other node. In the overhearing phenomena, a node expends same energy as it would have done during reception.

3.1 O-IDLING Method

The goal is to avoid spending energy on overhearing by using O-IDLING method. O-idling method is done by forcing A’s node radio interface to transition to a low-energy idling mode during B’s node transmission to c node.

It exploit the NAV (network allocation vector) mechanism in 802.11 accomplish forced idling. when A overhears the B->C RTS, it looks at the NAV value in RTS,which indicates the duration of packet transfer till the end of C->B ACK transmission. Upon overhearing the RTS,A should force its radio interface to idling state and schedule a transition back after the end of the C->B ACK Similar techniques are applicable for node D,which forces its interface to idle based on the NAV it has found in the overhear B->C data, even without forced idling it is likely to spend a significant part of that NAV duration idling, except when it overhears C->B ACK and possible erroneous carrier sense from nodes that are far. As a result reduction of overhearing energy at node D is less than that at a node A, At D,however,a certain amount of erroneous carrier sensing energy is saved due to O-idling.

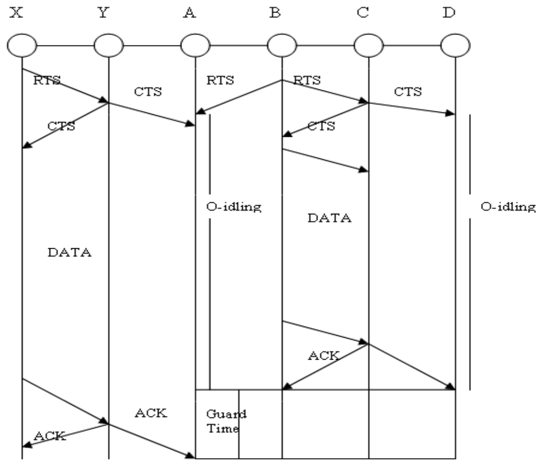

Figure 3.1 O-idling Method

3.2 E-IDLING Method

E -idling as a mechanism for reducing energy consumption due to erroneous carrier sensing (ECS). The idea behind e-idling is when a node starts receiving ECS signal, its wireless interface is forced to switch to the low-energy idling state till the transmission causing ECS is over. Consider the scenario in Fig 3.2, in which node A is outside node D’s receive range but within its carrier sense range. Node C, on the other hand, is within the receive range of D. After an RTS-CTS transaction, when D starts sending a data packet to node C, D’s transmission appears as ECS signal to A, which cannot transmit or receive during this packet duration. According to e-idling, upon reception of the ECS signal the interface at node A goes to a forced idling state and eventually transitions back after anticipated data duration T^{MAX}Data.

In between, the interface wakes up twice; first time after an anticipated MAC layer control packet duration $T^{Max}_{MAC-Ctrl}$ and for a second time which is after an anticipated AODV control packet duration $T^{Max}_{Aodv\_ctrl}$. The rationale behind first intermediate wakeup is to respond to the scenario where the received ECS signal corresponds to a MAC layer RTS or CTS.

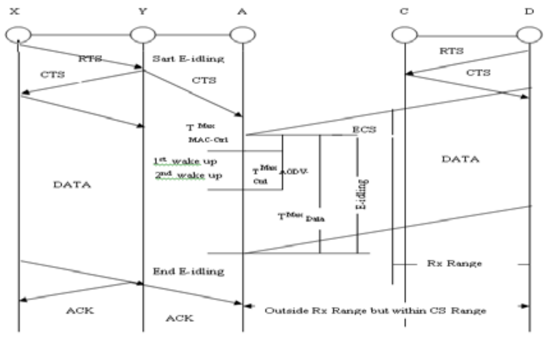

Figure 3.2 E-Idling Method

IV. IMPLEMENTATION & SIMULATION

Implementation is done using NS2. The method proposed is maximum residual multicast protocol for reducing loss energy by using O-idle and E-idle method. O-idling method is used to avoid spending energy on overhearing by forcing the overhearing nodes radio interface to transition to a low energy idling method and E-idling method is used for reducing energy consumption due to erroneous carrier sensing (ECS).The idea behind E-idling is when a node starts receiving ECS signal, its wireless interface is forced to switch to the low-energy idling state till the transmission causing ECS is over.

4.1 Residual Energy Comparison

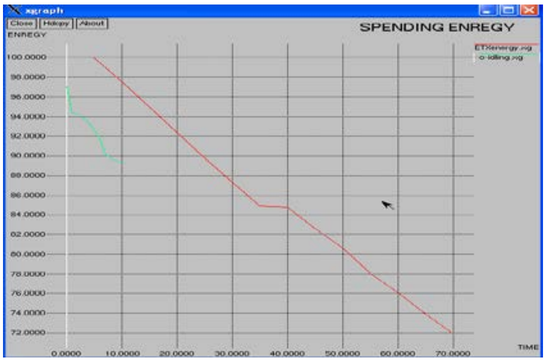

Figure 4.1 Residual energy Vs Time

Fig 4.1 shows Residual energy comparison between (Existing system and O-idling method) Green line show that the Residual energy in proposed system (O-idling) and red line shows that the Residual energy in existing system. Residual energy maximized in the proposed system (O-idling method) and thus has better performance than the existing system.

4.2 Delay Comparison

Fig 4.2 shows Delay comparison between (Existing system and O-idling method) Green line show that the Delay in proposed system (O-idling) and red line shows that the Delay in existing system. Delay is minimized in the proposed system (O-idling method) and thus has better performance than the existing system.

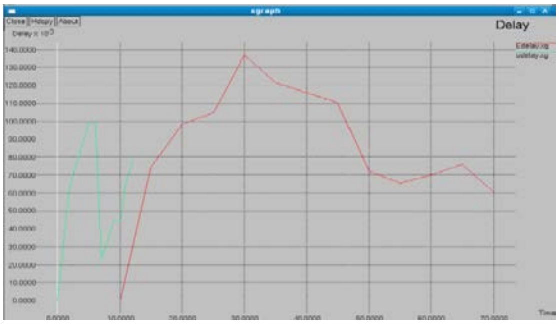

Figure 4.2. Delay versus Time

Fig4.3 shows Delay comparison between (Existing system and E-idling method) Green line show that the Delay in proposed system (E-idling) and red line shows that the Delay in existing system. Delay is minimized in the proposed system (E-idling method) and thus has better performance than the existing system.

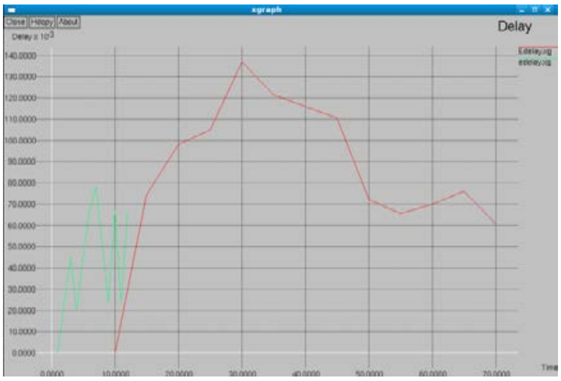

Figure 4.3 Delay versus Time

Advantages

1. Latency will be reduced by using O-idling and E-idling methods.
2. Less energy consumption.

V. CONCLUSION

It is proposed and analyzed a forced interface idling mechanism for reducing loss of energy due to overhearing and erroneous carrier sensing in wireless interfaces. A novel state analysis technique is developed for detecting time windows during which node consumes loss energy during overhearing and erroneous carrier sensing. During this window, energy saving at MAC layer is accomplished by forcing a wireless interface to a relatively low-energy idling state by using O-idling and E-idling methods. To summarize, Idling mechanism offer an efficient means for reducing loss of energy.

The proposed system, implemented with the help of Network simulator, is used to maximize residual energy, which was initially 0.853% and have been improved to 0.921% in O-idling method and 0.939% in E-idling method. The system also reduces the latency experienced in packet transmission, which was initially 0.00085% and have been reduced to 0.00047% in O-idling method and 0.00054% in E-idling method.

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BIOGRAPHY

B.Vijayalakshmi received the BE degree in Electronics and communication engineering from Raja college of Engineering and Technology, Anna University in 2010 and pursuing ME degree in communication systems from Sri Krishna College of Engineering and Technology, Anna University of technology, Coimbatore. She had presented national conferences and international conferences in various fields. She had presented the paper in IEECONS held in Dr.PAULS ENGINEERING COLLEGE. She is an active member of IETE. She has done the project in the area of embedded systems. Now currently doing the project in the field of wireless sensor networks. Her area of interest is computer networks, micro-processor, optical communication and wireless communication.

V.R.Balaji received the BE degree in Electronics and communication engineering from VLB Janakiammal College of Engineering and Technology, Anna university in 2003 and the ME degree in VLSI from Kongu Engineering College, Anna university in Coimbatore in 2005 and pursuing the Ph.D degree in the field of speech processing in Electronics and Communication Engineering from the Anna University of Technology at Coimbatore. Currently working in the Sri Krishna College of Engineering and Technology as an assistant professor in the ECE department. He has three years teaching experience. He has presented many papers in the national conference and also in the inter-national conference. Under his guidance, the final year students are doing their project in various fields. His field of interest is digital signal processing, signals and systems, speech processing and image processing.