ENHANCING THE PERFORMANCE AND THE NETWORK LIFE TIME BY INTEGRATING PSM AND LLC FOR RIP PROTOCOL IN AD HOC NETWORKS

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Abstract
A mobile ad hoc network (MANET) is a collection of nodes equipped with wireless communications and a networking capability without central network control. Nodes in a MANET are free to move and organize themselves in an arbitrary fashion. Energy-efficient design is a significant challenge due to the characteristics of MANETs such as distributed control, constantly changing network topology, and mobile users with limited power supply. The IEEE 802.11 MAC protocol includes a power saving mechanism with logical link control(LLC), but it has many limitations. A new energy-efficient MAC protocol with logical link control (EE-MAC-LLC) is proposed in this paper. It is shown that EE-MAC-LLC performs better than IEEE 802.11 power saving mode and exceeds IEEE 802.11 with respect to balancing network throughput and energy savings. In RIP by integrating power save mode throughput is increased by 122 percent. Throughput is increased by 172 percent RIP replaced by RIP ng .QOS is enhanced in RIPng when compared with RIP
Keywords: RIPV2,RIPng, Energy-Efficient, MAC Protocol, IEEE 802.11PSM, LLC ,Ad Hoc Networks

I. Introduction

Energy efficiency is a major challenge in wireless networks. In order to facilitate untethered communication, most wireless network devices are portable and battery-powered and thus operate on an extremely constrained energy budget. However, progress in battery technology shows that only small improvements in battery capacity can be expected in the near future [1]. Furthermore, since recharging or replacing batteries is costly or, under some Circumstance, impossible, it is desirable to keep the energy-dissipation level of devices as low as possible.

A mobile ad hoc network is a collection of two or more nodes equipped with wireless communications and networking capabilities without central network control, i.e. an infrastructure-less mobile network. Energy-efficient design in MANETs is more important and challenging than with other wireless networks. First, due to the absence of an infrastructure, mobile nodes in an ad hoc network must act as routers and participate in the process of forwarding packets. Therefore, traffic loads in MANETs are heavier than in other wireless networks with fixed access points or base stations and thus MANETs have more energy consumption. Second, energy-efficient design needs to consider the trade-offs between different network performance criteria. For example, routing protocols usually try to find a shortest path from sources to destinations. It is likely that some nodes will over-serve the network and their energy will be drained quickly, and thus cause the network to be partitioned. Therefore simple solutions that only consider power constraints may cause a severe performance degradation. Third, no centralized control implies that energy-efficient management in MANETs must be done in a distributed and cooperative manner, which is difficult to achieve.

At the wireless interface, energy consumption in idle mode is only slightly less than transmit mode and almost equal to receive mode [2]. Therefore,

it is desirable to build a network protocol that maximizes the time the device is in sleep mode (the wireless interface turned off), and also maximizes the number of wireless devices in sleep mode. Many protocols have been proposed to deal with this challenge [3–6].
In this paper, a new energy-efficient MAC with LLC protocol , EE-MAC-LLC, is proposed. The design is based on the fact that most applications of ad hoc networks are data- driven, which means that the sole purpose of forming an ad hoc network is to collect and disperse data. Hence, keeping all network nodes awake is costly and unnecessary when some nodes do not have traffic to carry. The proposed protocol conserves energy by turning off the radios of specific nodes in the network. The goal is to reduce energy consumption without significantly reducing network performance. EE-MAC-LLC is based on IEEE 802.11 and its power saving mode with logical link control , and can provide useful information to the network layer for route discovery.

TABLE 1: SIMULATION PARAMETERS

Parameters	values
simulator	Exata5.4
Channel type	Channel/wireless channel
Antenna type	Omni-directional antenna
Network layer	PHY wireless
MAC protocol	MAC/802.11PSM/LLC
Network interface type	Physical/wireless phy
No nodes	20nodes
Topological area	1500X1500sq.m
Simulation time	600sec
Energy model	Generic model
Radio type	802.11b
Packet reception model	PHY802.11breception model
Data rate	2mbps
Mobility model	Random way point
Pause time	0 sec
Battery model	Linear model
Physical (radio propagation)	two-ray
Data link(MAC)	802.11MAC
mobility	10sec
Transmission power	15dBm
packetized	512bit/sec
Traffic model	CBR

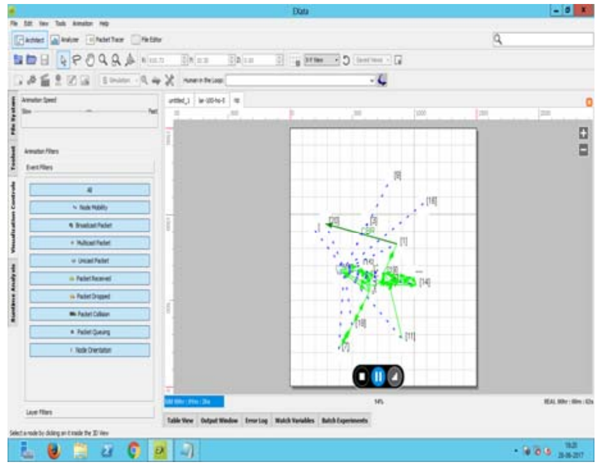


FIG1: SCENIRIO DIAGRAM

Energy Consumed in Transmit mode:
A node is said to be in transmission mode when it sends data packet to other nodes in network. These nodes require energy to transmit data packet, such energy is called Transmission Energy (Tx), of that nodes. Transmission energy is depended on size of data packet (in Bits), means when the size of a data packet is increased the required transmission energy is also increased. The transmission energy can be formulated as:
PT= Tx / Tt

Where Tx is transmission Energy, PT is Transmission Power, Tt is time taken to transmit data packet and Plength is length of data packet in Bits

Energy Consumed in Receive Mode:
When a node receives a data packet from other nodes then it said to be in Reception Mode and the energy taken to receive packet is called Reception Energy (Rx), then Reception Energy can be given as:
PR = Rx / Tr

Where Rx is a Reception Energy, PR is a Reception Power, Tr is a time taken to receive data packet, and Plength is length of data packet in Bits.

Energy Consumed in Idle Mode:
The node is neither transmitting nor receiving any data packets. But this mode consumes power because the nodes have to listen to the wireless medium continuously in order to detect a packet that it should receive, so that the node can then switch into receive mode from idle mode.
PI= PR

Where PI is power consumed in Idle Mode and PR is power consumed in Reception Mode.

Performance Results

Simulation Environment

Our conclusions are based on the results gathered by extensive simulation of a network model which implements EE-MAC-LLC. For the simulations, we used Network Exata 5.4 Simulator. Exata is a popular package which has been widely used in mobile ad hoc network studies. For comparison with EE-MAC-LLC, we also implemented IEEE 802.11 and its PSM mode with comparison RIPV2 and RIPng.

We consider 20 nodes moving in a square area of 1500m×1500m, 750m×750m and 1000m×1000m based on a mobility model called *random waypoint.* Initially, each node chooses a random position in the area, chooses a random destination, chooses a speed at random uniformly distributed between 0m/s and 10m/s, and moves towards the destination at the chosen speed. The node then pauses for a period of time before repeating the same process. Longer pause times reflect lower node mobility and shorter pause times reflect higher mobility. Simulations were performed for 600 seconds, so a 400 second pause time means no node mobility.

The nodes have 2 Mbps bandwidth and 250m radio range. Each source node generates a Constant-Bit-Rate (CBR) flow to the destination with 256 byte packets. We vary the number of sources and the number of packets sent per second to change the network load. A network load of 10% means that the total bit rate of all traffic sources is 2×10% = 0.2 Mbps. RIP is used as the routing protocol. For the energy model, we use the data shown in Table.

We use the following metrics to evaluate network performance:

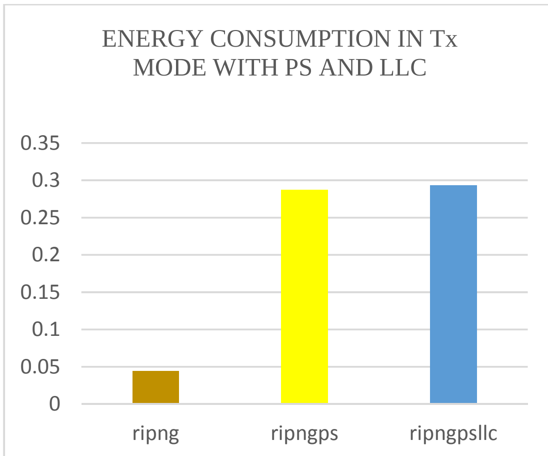
Data packet delivery ratio: The data packet delivery ratio is the ratio of the number of packets generated at the sources to the number of packets received by the destinations. This metric reflects the network throughput.

End-to-end delay: This metric not only includes the delays due to data propagation and transfer, but also those caused by buffering, queuing and retransmitting data packets.

Throughput: This metrics is used to measure the degradation of the network with the amount of node density.

Energy Model	RIPng	RIPng PS	RIPng PSLLC
Energy consumed (in mwh) transmitt	0.044037	0.28693	0.293428
Energy consumed (in mwh) transmitt	0.015399	0.047285	0.047016
Energy consumed (in mwh) transmitt	19.9821	2.45714	2.47047
Energy consumed (in mwh) total =	20.04154	2.791355	2.810914

TABLE 2 ENERGY MODEL COMPARISON FOR RIPng



IGURE2 ENERGY CONSUMPTION IN TRASMITTE MODE

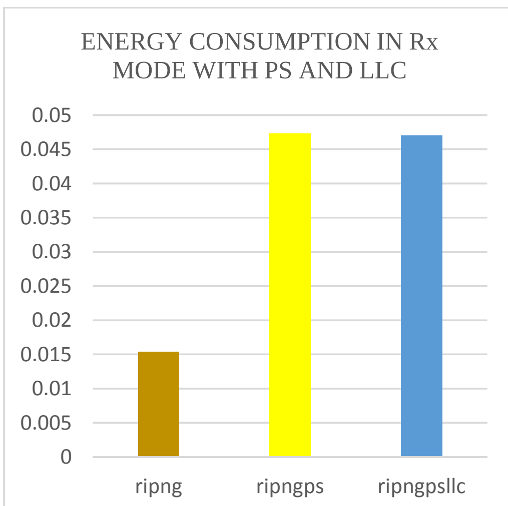


FIGURE3 ENERGY CONSUMPTION IN RECEIVED MODE

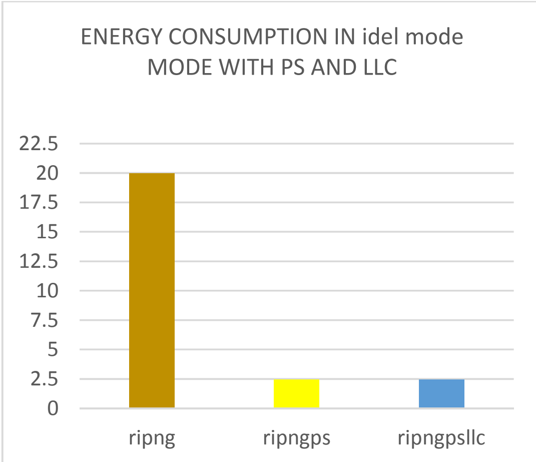


FIGURE4 ENERGY CONSUMPTION IN IDLE MODE

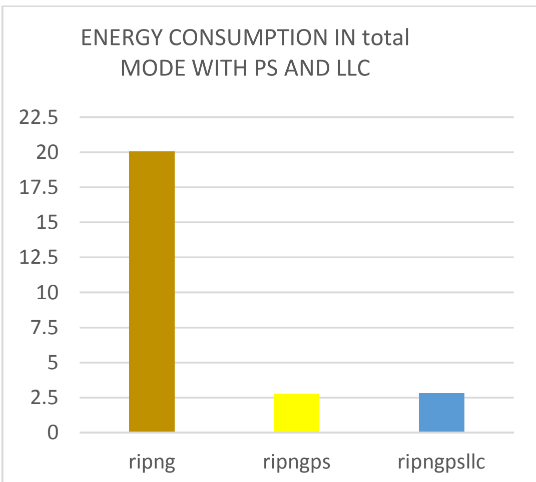


FIGURE5 ENERGY CONSUMPTION IN IDLE MODE

TABLE 3 ENERGY MODEL COMPARISON FOR RIP

	RIP	RIPPS	RIPPSLLC
Energy consumed (in mwh) transmitt mode	0.036846	0.280235	0.272946
Energy consumed (in mwh) transmitt mode	0.013392	2.43302	2.40874
Energy consumed (in mwh) transmitt mode	19.9846	2.43302	2.40874
Energy consumed (in mwh) total = transmit+received+idle mode	20.03484	2.759961	2.728674

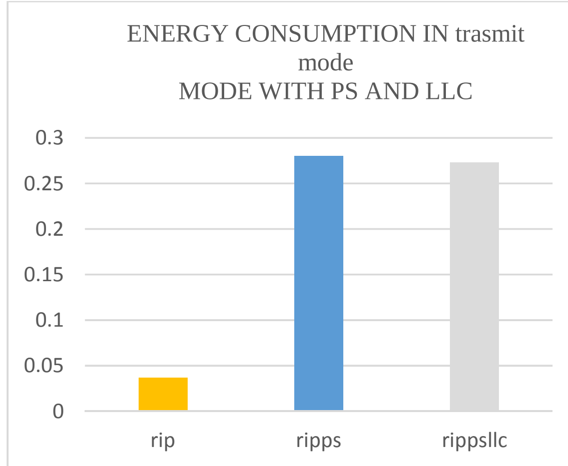


FIGURE6 ENERGY CONSUMPTION IN TRASMISSION MOD

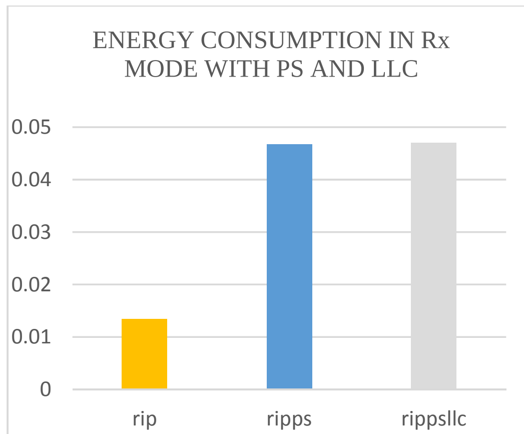


FIGURE7 ENERGY CONSUMPTION IN RECEIVED MODE

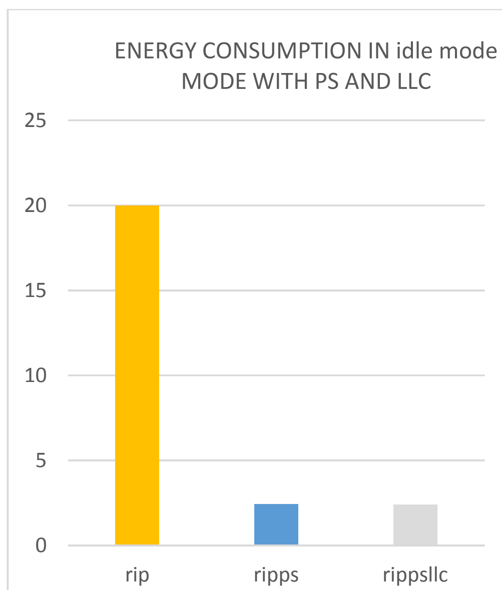


FIGURE8 ENERGY CONSUMPTION IN IDLE MODE

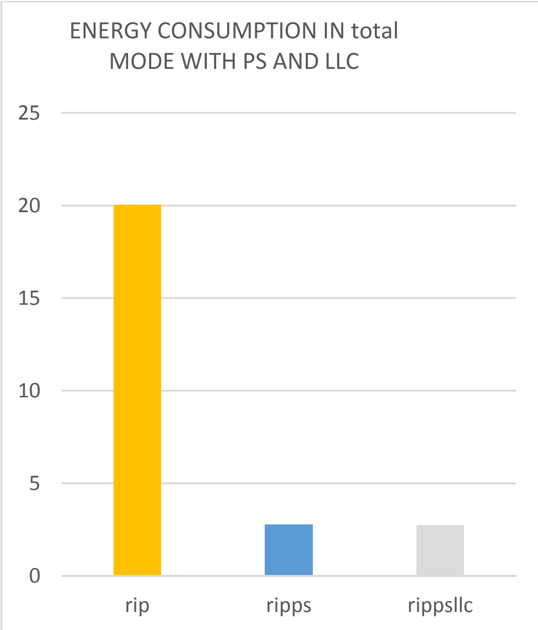


FIGURE9 ENERGY CONSUMPTION FOR TOTAL MODE

	average unicast jitter(seconds)
RIP	0.000892979
RIPLLC	0.00107555
RIPngLLC	0.0009969
RIPngPSLLC	4.92326
RIPngPS	5.7326
RIPPS	7.40549

TABLE4 : AVERAGE UNICAST JITTER

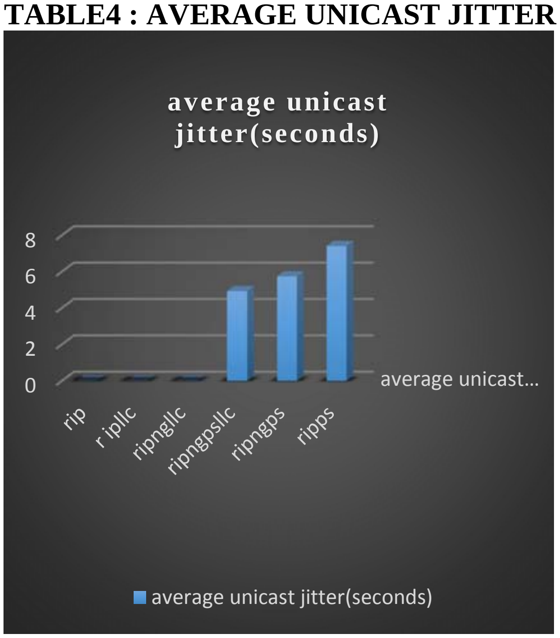


FIGURE10: AVERAGE UNICAST JITTER

	average unicast end-to-end delay(seconds)
RIP	0.00836995
RIPLLC	0.0061775
RIPngLLC	0.0085094
RIPngPSLLC	266.194
RIPngPS	291.317
RIPPS	396.88

TABLE5: AVERAGE END-TO-END DELAY

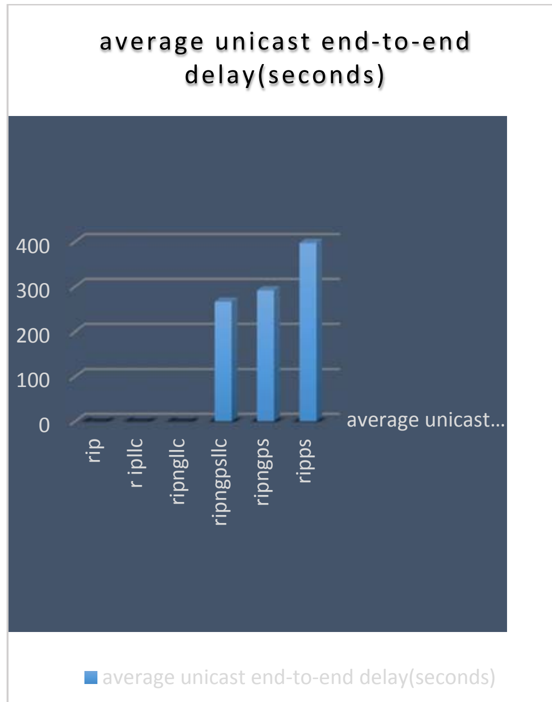


FIGURE 11 : AVERAGE END-TO-END DELAY

	unicast received throughput(bits/seconds)
RIP	**288.65**
RIPLLC	**295.52**
RIPngLLC	**296.019**
RIPngPSLLC	**805.279**
RIPngPS	**804.021**
RIPPS	**641.566**

TABLE 6 : UNICAST RECEIVED THROUGHPUT

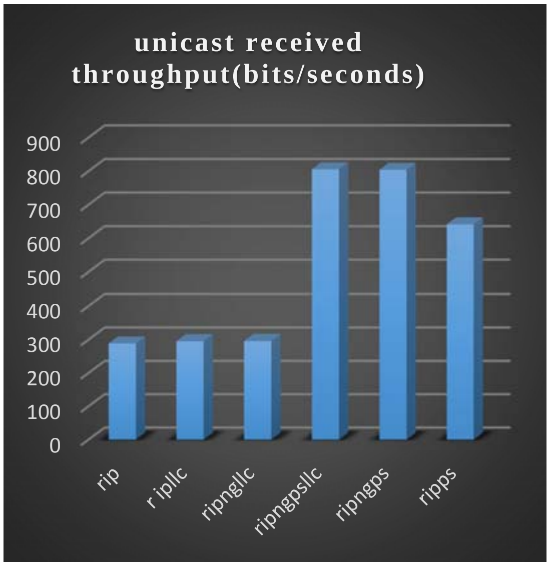


FIGURE12 : UNICAST RECEIVED THROUGHPUT

Conclusions

This paper presented EE-MAC-LLC, an energy-efficient MAC with LLC protocol for mobile ad hoc networks. In RIP by integrating power save mode throughput is increased by 122 percent. Throughput is increased by 172 percent RIP replaced by RIP ng .QOS is enhanced in RIPng when compared with RIP.

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