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MINMIZE THE ENERGY-CONSUMPTION IN WIRELESS SENSOR NETWORKS USING THE SYNTHESIZED ADAPTIVE ROUTING PROTOCOL (SAR)

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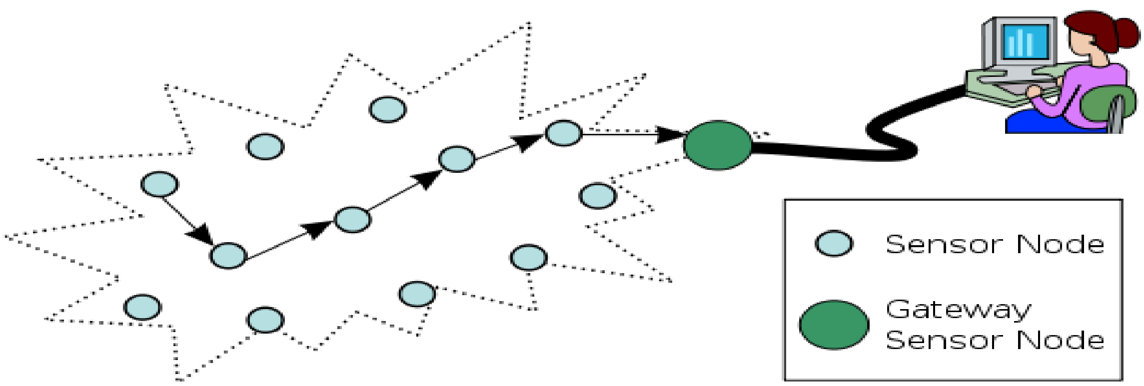
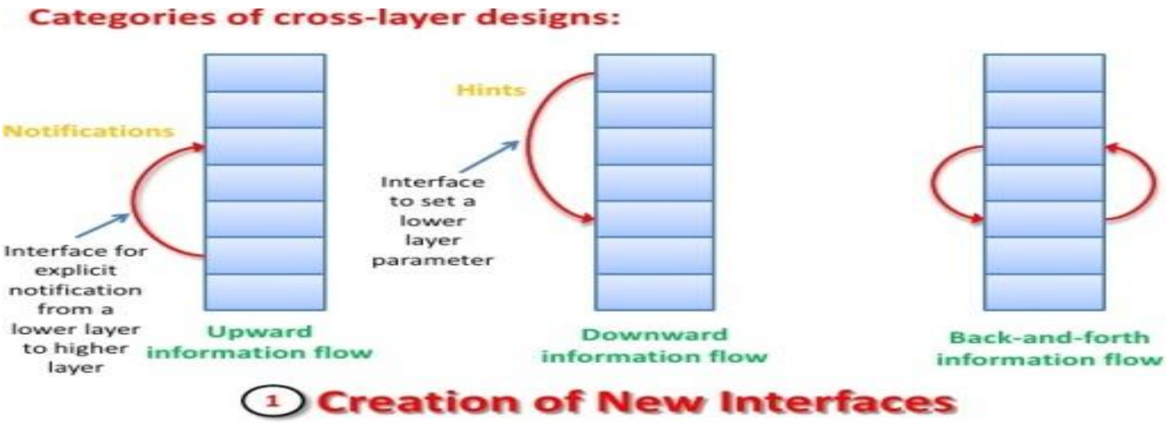
Abstract—Energy-efficient mechanism for wireless communication on each sensor node is so crucial. Specially, the jobs sending and processing sensing data information from on sensor node to the others are more majority parts than merely sensing some events. Energy-constrained sensor networks periodically place nodes to sleep in order to extend the network's lifetime. Denying sleep effectively attacks and traditional routing protocol mechanisms each sensor node's critical energy resources and rapidly drains the network's lifetime. Thus, energy-efficient routing protocol in wireless sensor networks is necessary for increasing the network lifetime and is also influenced by many challenging factors in terms of energy, processing, and storage capacities. In this paper, we designed and implemented a Synthesized Adaptive Routing (SAR) protocol for wireless sensor networks and evaluated the performance of SAR by comparing with existing routing protocols. Finally, the performance evaluation results show that SAR provides the facilities to reduce energy consumption along with increasing networks lifetime.
Keywords: Wireless sensor networks, energy-efficient, Synthesized (SAR) protocol, Routing protocol, Cross-Layer technologies.

1. INTRODUCTION

A wireless sensor network(WSN)of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting.



Nodes in wireless sensor networks [1] have to manage several performance aspects like system management and power management that cut across traditional layers. For example, both medium access and routing decisions have significant impact on power consumption, and the joint consideration of both can yield more efficient power consumption thereby increasing the battery life. The strict boundary separation of layers in the layered architecture and standard interlayer interfaces in traditional approaches do not permit adequate communication among layers to make joint decisions to optimize these cross-layer aspects. This has led to the proposal of new interaction models to support cross-layering[11], ranging from a more relaxed information flow and sharing between layers to full-fledged merging of layer functionalities.



This paper analyzes the vulnerabilities of a denial of sleep attack and energy consumption according to number of nodes and packet size by SAR protocol using the concept of cross-layer technology.

2. RELATED WORK

A large number of Cross Layer Designs have been proposed. In that upward flow of information design to what can be called as self- adaptation loops at a layer. Self-adaptation loops do not require new interfaces to be created from the lower layer(s) to the higher layer. Hence in this paper we directly implement SAR protocol without design new interfaces. The new protocol synthesized adaptive protocol(SAR),which is the combination of Gateway MACT(G-MACT) and (REART) Reliable Energy Aware Routing Protocol to avoid the power consumption problems[12][13].

2.1 Gateway MAC with traditional protocols (G-MACT)

It is a proposed energy-efficient sensor **MAC** protocol designed to coordinate transmissions within a cluster[3]. Like the WSN traditional **MAC** protocols, all nodes have equally limited resources and have traffic intended to pass to neighboring nodes for in-network processing and out of the network to designated applications (network sink) for further processing. **G-MACT** has several energy-saving features which not only show promise in extending the network lifetime, but the centralized architecture makes the network more resistant to denial of sleep attacks [1].

2.2 Reliable Energy Aware Routing Protocol with traditional protocols (REART)

Energy variance of REAR is gradually increased than that of traditional routing protocols according to elapsed time (minutes). It supports the secondary backup routing path mechanism when first used routing path is faulted and allows more having energy capacity sensor nodes to participate in routing path by laziness mechanism[8]. Thus, we can notice that REAR can uniformly use overall energy capacity in network area [6].Network simulators like OPNET, OMNeT++, NetSim, and NS2 can be used to simulate a wireless sensor network. By using the network simulator (NS2) we evaluate the performance of G-MACT, REART, SAR protocols.

2.2.1 Network Simulator: *ns* is an object oriented simulator, written in C++, with an OTcl interpreter as a frontend. The simulator supports a class hierarchy in C++ (also called the compiled hierarchy in this document), and a similar class hierarchy within the OTcl interpreter (also called the interpreted hierarchy in this document). The two hierarchies are closely related to each other; from the user's perspective, there is a one-to-one correspondence between a class in the interpreted hierarchy and one in the compiled hierarchy. The root of this hierarchy is the class TclObject. Users create new simulator objects through the interpreter; these objects are instantiated within the interpreter, and are closely mirrored by a corresponding object in the compiled hierarchy.

The interpreted class hierarchy is automatically established through methods defined in the class TclClass. user instantiated objects are mirrored through methods defined in the class TclObject. There are other hierarchies in the C++ code and OTcl scripts; these other hierarchies are not mirrored in the manner of TclObject.

2.2.2 Concept Overview: *Why two languages? ns* uses two languages because simulator has two different kinds of things it needs to do. On one hand, detailed simulations of protocols requires a systems programming language which can efficiently manipulate bytes, packet headers, and implement algorithms that run over large data sets. For these tasks run-time speed is important and turn-around time (run simulation, find bug, fix bug, recompile, re-run) is less important.

On the other hand, a large part of network research involves slightly varying parameters or configurations, or quickly exploring a number of scenarios. In these cases, iteration time (change the model and re-run) is more important. Since configuration runs once (at the beginning of the simulation), run-time of this part of the task is less important. *ns* meets both of these needs with two languages, C++ and OTcl. C++ is fast to run but slower to change, making it suitable for detailed protocol implementation. OTcl runs much slower but can be changed very quickly (and interactively), making it ideal for simulation configuration. *ns* (via tclcl) provides glue to make objects and variables appear on both languages. For more information about the idea of scripting languages and split-language programming, see Ousterhout's article in IEEE Computer.

We started from the number of nodes as 90-150 and fixed packet size(300kb) and evaluate the results of three protocols as mentioned in fig 1.The next observation is we fixed number of nodes as 90 and varied packet size (100kb-500kb) and evaluate the results of three protocols as mentioned in fig2.

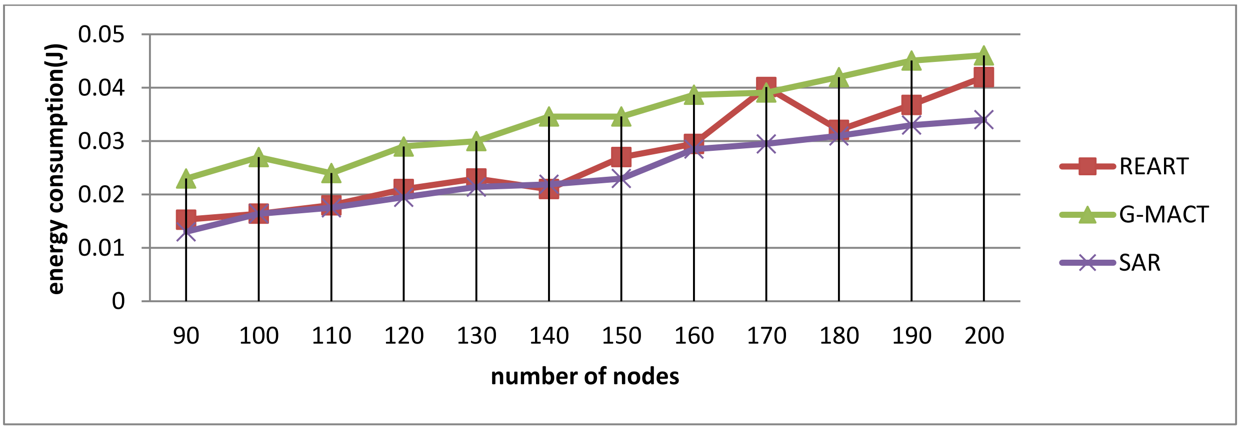


Figure1: Increase number of nodes with constant packet size.

Fig1 illustrates the energy consumption of G-MACT, REART and SAR. By considering the observations the SAR is the best protocol for large area networks.

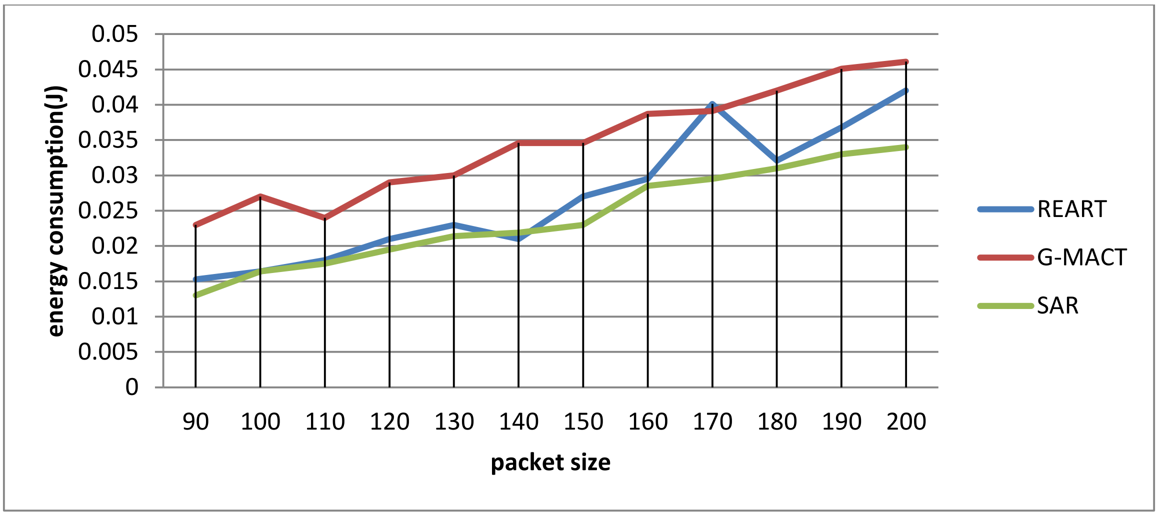


Figure2: Increase packet size with number of nodes.

Fig2 illustrates the energy consumption of three protocols and we found that SAR is efficient protocol to transmit large amount of packets.

3. FUTURE WORK AND CONCLUSIONS

This paper describes Gateway **MACT,** established an effective denial of sleep defense by centralizing cluster management and **REART** supports multi-path routing for energy efficiency and resilient data transmission. In this paper we have proposed a new technique for data dissemination. In this technique we have used the concepts of cross-layer architecture which is the strong pillar of merging protocols. The results obtained shows that **synthesized adaptive protocol (SAR)** attenuate the power consumption. The future work of this technique can be done by synthesize physical layer protocol to application layer protocol and There are two ways to improve the network lifetime. One way is to reduce the energy consumption for transmitter or receiver using protocols. The other way is to optimize the network topology. It is worthy to research in the future.

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