

Energy Consumption Analysis For Progress Performance of Ad-Hoc Wireless Sensor Networks Environment



Computer Science

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ABSTRACT

Wireless sensor network the end user can remotely monitor the data transfer events in the environment depending upon the generic applications. Wireless antenna networks provide themselves to trade-offs in energy and quality of frequencies. The service lifetime of such sensor nodes depends on the power supply and energy consumption location, which is usually dominated by the communication subsystem memory values. One of the key challenges in unlocking the potential of such data gathering sensor networks is conserving energy so as to maximize their post deployment active lifetime data. Micro-sensors are loaded with a sensor module equipped with a sensor capable of sensing some quantity. This work described the research carried on the continual development of the novel energy efficient analysis of random placed nodes algorithm that increases the WSNs lifetime and improves on the QoS parameters yielding higher throughput, average end to end delay in next generation of WSNs.

INTRODUCTION

Ad hoc wireless sensor networks (WSNs) are formed from self-organizing configurations of distributed, energy-constrained, autonomous sensor nodes. The nodes are microelectronics devices is equipped with heavily integrated sensing, processing, and wireless communication capabilities and are equipped with an independent power source, such as a small battery [1]. One of the key challenges in unlocking the potential of such data gathering sensor networks is conserving energy so as to maximize their post-deployment active lifetime [2]. This not only increases the overhead cost of introducing synchronization packets, but also has detrimental effects on the network QoS parameters that introduce end to end delay, average jitter and results in decreased throughput [1] [5].

RELATED WORK

The most recent developments are the work by Arslan et al. [1], who design an efficient Wi-Max beamformer antenna and implement real prototypes, and several works on adaptive beamforming for indoor wireless LANs [5] that include real-world validations. We need to play on a different ground, as the solutions designed for cellular and ad-hoc wireless networks can hardly find their way in WSNs [2].

A significant body of work exists in this field [7]. In WSNs, traffic is largely many-to-one across an unstructured multi-hop topology. The literature investigating the use of ESD antennas in WSNs can be roughly divided in two categories, focusing either: i) on the design of antenna prototypes; or ii) on clean-slate design of network protocols. Works in i) were instrumental in concretely demonstrating the viability of ESD antennas in WSNs, showing that current technology can meet the requirements on form factor and energy consumption. However, these works rarely assess the impact of the prototypes on the network stack. Specifically, Giorgetti et al. [12] assess the improvements in link performance with a prototype designed by combining four patch antennas. Viani et al. [24] present a design based on parasitic elements, and analyze its ability to reduce interference and to support localization. Parasitic elements are a common choice to reduce cost and size [5] used also by Nilsson [19] in the SPIDA design, later assessed based on common metrics for WSNs [20]. SPIDA prototype, connected to a TMote Sky node. Other works focus on specific network services considered in isolation, e.g., neighbor discovery [23]. Key pre-distribution model mainly contains the pre-shared key model and the random key pre-distribution model. SPINS [2] uses a pre-shared key model, each ordinary node and the base station share a pair of master key.

Eschenauer and Gligor [6] proposed the basic probabilistic key pre-distribution, in which each sensor is assigned a random subset of keys from a key pool before the deployment of the network. Several techniques were proposed recently to address pairwise key establishments in wireless sensor networks [5,6], including the basic probabilistic key pre-distribution[6], the q-composite key predistribution [5] and the random pairwise keys scheme [5]. Among them, the random pairwise keys model has good performance: (1) provide the best node restoring force of capture: each pairwise key is the only, Any node that is captured reveals no information about links that it is not directly involved in. (2) in the same memory capacity, random pairwise key can support more large-scale network. Liu D G et al. [7] use the node position information to improve the performance of the pairwise key pre-distribution.

SYSTEM AND ENERGY MODEL

In a wireless sensor network sensors nodes are a low cost, resource constrained devices and are often positioned randomly.

The apparent network has the below characteristics:

Nodes are diffused in the zone randomly and are home generous.

The nodes are able to adjust their ability of emission according to their distance from the specify receiver whys is essential for the network sequence [15].

The method of the emission of the gathered data in every head cluster towards the adjacent head cluster send data to the heads cluster that are closer to the base station, have lesser density and more energy (Fig.3). In case of path traffic we can choose better path among the other path.



Figure. 1 Data emission to adjacent heads cluster

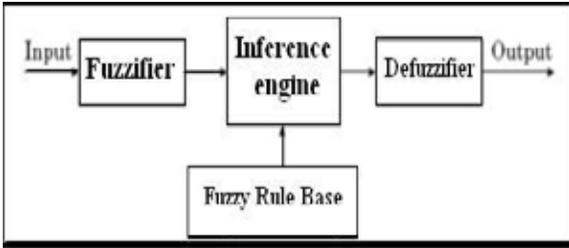


Figure. 2 Fuzzy system members

The W_D is a weight given to direct trust and W_I to the indirect trust where $W_D + W_I = 1$. Weights can be assigned using different approaches. Sometimes DT may be given more weight, and IT may be given less weight i.e. $W_D > W_I$. Hence, we define a new equation for trusting one sensor node by the other in Wireless Sensor Networks as shown below.

$$T^{A,B} = W_D \times DT^{A,B} + W_I \times IT^{A,B}$$

$$T^{A,B} = W_D \times \left\{ W_H^{DT} \times \left[\prod_{m=1}^k tm_m^{A,B} \right]^{1/k} + W_L^{DT} \times \frac{1}{l} \left[\sum_{m=1}^l tm_m^{A,B} \right] \right\}$$

$$+ W_I \times \left\{ W_H^{IT} \times \left[\prod_{j=1}^s W_{A,N_j} \times T^{N_j,B} \right]^{1/s} + W_L^{IT} \times \frac{1}{s} \sum_{j=1}^s (W_{A,N_j} \times T^{N_j,B}) \right\}$$

where, A is the node that is evaluating its trustworthiness on node B, k is higher priority trust metrics, l is lower priority trust metrics, s is most trustworthy neighbours, s is ordinary neighbours,

$tm_m^{A,B}$ is m^{th} higher priority trust metric of node A on node B,

$tm_n^{a,b}$ is n^{th} lower priority trust metric of node A on node B,

W_H^{DT} is higher priority trust metric weight, W_L^{DT} is lower priority trust metric weight,

W_H^{IT} is higher priority neighbour weight, W_L^{IT} is lower priority neighbour weight,

W_{A,N_j} is weight for recommendation made by j^{th} neighbour,

$T^{N_j,B}$ is trust given by neighbour N_j about node B, and

W_D, W_I are weights of direct and indirect trusts respectively.

Figure 4, shows the relation among the direct trust, indirect trust and the trust graphically for $W_D = 0.75$ and $W_I = 0.25$ respectively. From Figure 4, we can also see the trustworthy area where trust quantity will be towards 1.0 and risky area where trust quantity will be towards 0.0.

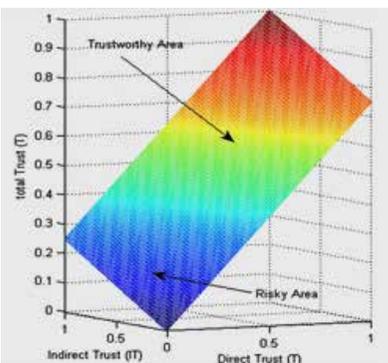


Figure. 3. Path Traffic

Performance Analysis

Security Analysis

- (1) The Sybil attack
- (2) Bogus routing information
- (3) Selective forwarding

Overheads Analysis

Finally we examine the overheads of security mechanisms. Most of the overheads will come from extra transmissions required by the protocols, with which it shares the polynomial exceeds t.

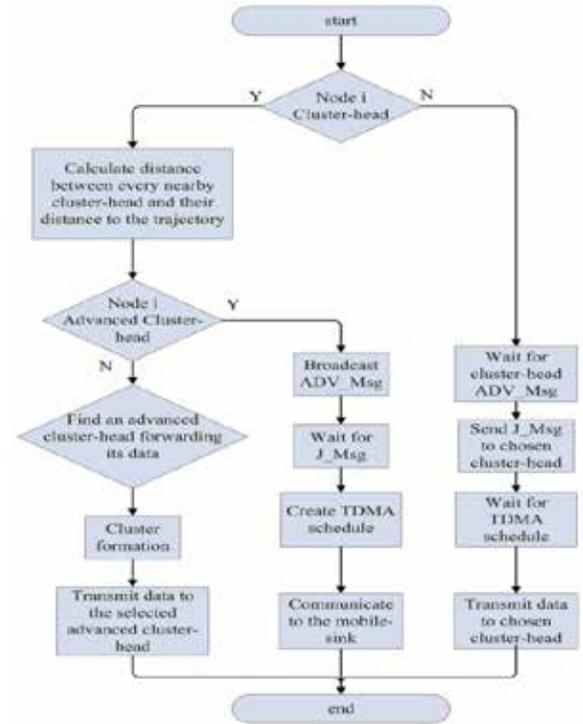


Figure 4. Flowchart for Design overview

Design Overview

We now present our central contribution: a comprehensive, scalable, network-wide solution for managed software evolution in WSANs. While this design was originally developed on top of Lorien, it is in principle applicable to any modular OS environment with reflective capabilities. Outside the WSAN our design employs two architectural elements: portals and clients. A portal is a program that runs on a PC-class machine connected to one or more 'gateway' nodes of the WSAN (see Fig. 2).

They are defined as follows:

- Multi-channel staged collection.
- Multi-fragment information delivery.
- Multi-channel node instruction.
- Multi-fragment information dissemination.

way so it can be straightforwardly adapted to different environments – e.g. for environments that support a routing infrastructure, our basic overlay protocol OLP could be replaced with a protocol such as AODV or OLSR.

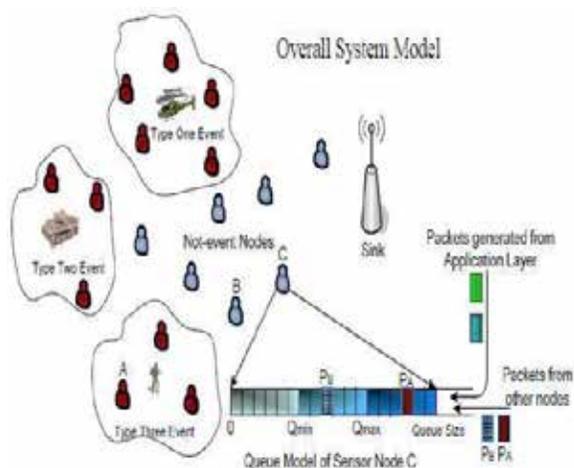


Figure 5. Overall System Model

A smart grid's communication network can be conceptualized figure 4.3 as generally having three levels, each with distinct technologies. The base level is a home area network (HAN), interconnecting electric devices such as household appliances within the customer's premises. Given all the design challenges, relying on a single network infrastructure is neither efficient nor economic.

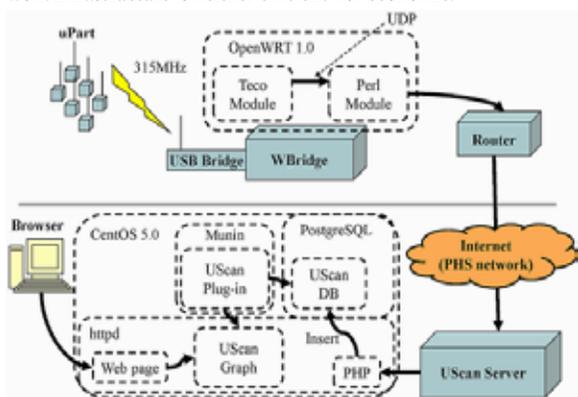


Figure 6. Overview of Design

Information acquired by the HAN is aggregated at the smart meter for the second-level communications via a neighborhood area network (NAN).

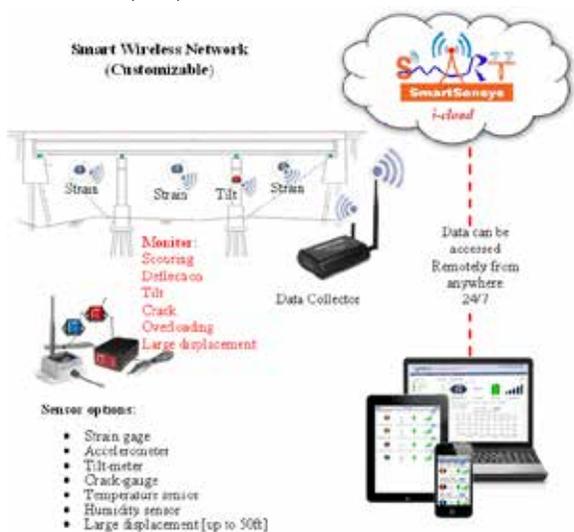


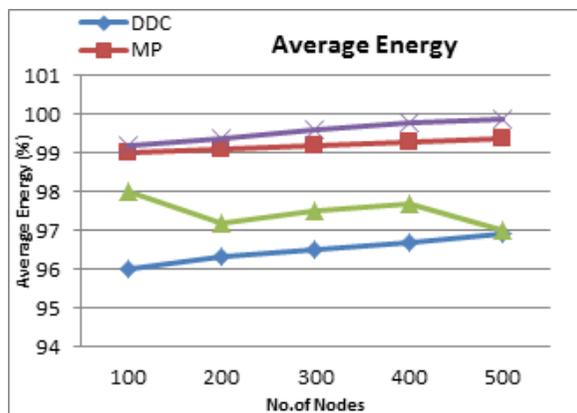
Figure 7 Smart wireless network

5. Result and Discussion

Various performance metrics are used for comparing different routing strategies in WSNs. We have used the following:

- Average Energy:
- Energy consumption:
- The standard deviation of energy:
- Network lifetime:

By using a simulator developed by MATLAB, the proposed scheme was compared with the DDC [17] distributed dynamic clustering algorithm and the other two kinds of multipath algorithms and, respectively. We evaluated these four algorithms over a set of sensor networks with the number of nodes ranging from 500 to 1000. For the same number of nodes, we randomly generated ten network topologies and ran these algorithms over them to obtain the average results. In each network, the sensor nodes are randomly distributed on a $M \times M$ region with $M = 200$ m. For radio power consumption setting, we adopt the first-order model [11] and set $E_{elec} = 50$ nJ/bit, $E_{amp} = 10$ pJ/bit/m². The energy for data aggregation is set to $EDA = 5$ nJ/bit. The parameters ($k_1, k_2, k_3, k_4, k_5, k_6, k_7, k_8, k_9, k_{10}, k_{11}, k_{12}$) are set to (0.5, 0.1, 0.4, 2, 1, 1, 0.4, 0.2, 0.4, 0.5, 0.3, 0.2).



presents the results of the simulation for the studied metrics to different network scale in scenario one. It can be seen that WSN performed better than the other algorithms.

6. CONCLUSION and FUTURE WORK

6.1 Conclusion

Ad hoc wireless sensor networks (WSNs) are formed from self-organising configurations of distributed, energy constrained, autonomous sensor nodes.

6.2 Future Work

In our work, nodes use the received beacon signal strength to compute the approximate distance from each other, assuming that the transmitting power is known. However, there is a premise that we do not take the noise into consideration. Therefore, errors will arise when our proposed protocol is put into use in real network environment. Our future work is to increase the robustness of our proposed protocol.

REFERENCE

- [1] T. van Dam and K. Langendoen, (2003) "An adaptive energy efficient MAC protocol for wireless sensor networks," in ACM SenSys 03. | [2] Heinzelman, W. R., A. Chandrakasan, et al. (2000). "Energy-efficient communication protocol for wireless micro-sensor networks." *System Sciences*, | [3] V. Rajendran, K. Obraczka, and J. Garcia-Luna-Aceves, (2003) "Energy-efficient, collision-free medium access control for wireless sensor networks," in ACM SenSys 03 | [4] Iqbal, Q. R., D. J. Holding, et al. (2007). "Energy efficient radio range allocation in ad hoc wireless sensor networks." *Proceedings of the 2007 spring simulation multi-conference-Volume 1*: 58-65. | [5] Al-Obaisat Y, Braun R (2006) "On Wireless Sensor Networks: Architectures, Protocols, Applications, and Management" *Auswireless Conference*. | [6] M. Takai, J. Martin, and R. Bagrodia. (2001), "Effects of wireless physical layer modeling in mobile ad hoc networks". pp. 87–94. ACM Press. | [7] I. Rhee et al., (2005) "Z-MAC: a Hybrid MAC for Wireless Sensor Networks". ACM SenSys, San Diego, CA, Nov. 2005. | [8] M. Zorzi and R. R. Rao, (1997), "Energy constrained error control for wireless channels," *IEEE Personal Communications*, pp. 27-33, December 1997. | [8] W. Ye, J. Heidemann, and D. Estrin, (2002), "An Energy-Efficient MAC Protocol for Wireless Sensor Networks". *INFOCOM 2002*, volume 3, pp 1567-1576. | [9] Li, J., D. Cordes, "Power-aware routing protocols in ad hoc wireless networks, (2005)," *Wireless Communications, IEEE*: 69-81. | [10] V. Rajendran, K. Obraczka, and J. Garcia-Luna-Aceves, (2003), "Energy-efficient, collision-free medium access control for wireless sensor networks," in ACM SenSys 03, November 2003. | [11] Giridhar, A. and P. R. Kumar (2005), *Maximizing the functional lifetime of sensor networks*, IEEE Press Piscataway, NJ, USA. | [12] S. Singh and C. Raghavendra. (1998), *PAMAS: Power aware multi-access protocol with signalling for ad hoc networks*. ACM SIGCOMM Computer Communication Review, vol. 28(3):pp. 5–26. | [13] Y. Tseng, C. Hsu, and T. Hsieh. (2002), "Power-saving protocols for IEEE 802.11-based multi-hop ad hoc networks". In 21st Conference of the IEEE Computer and Communications Societies (INFOCOM 2002), vol. 1, pp. 200–209. New York. | [14] Chao Wang, Hailing Wang et al. (2006) "The Studies on Energy Control of Protocols in Wireless Sensor Networks", *IEEE Communication Magazine*. | [15] Baiping Li, Xiaoqin Zhang et al. (2012) "Research and Improvement of LEACH Protocol for Wireless Sensor Network". | [16] Chen Yueyun, Zhu Yue-long, An Jianwei, et al. (2012) "An Energy-saving Routing Protocol Based on LEACH", *IEEE*. | [17] Hung Le Xuan, Sungyoung Lee, et al. "Two Energy-Efficient Routing Algorithms for Wireless Sensor Networks", Department of Computer Engineering, Kyung Hee University, Korea. | [18] Shio Kumar Singh, M P Singh, D K Singh, et al. (2010) "Routing Protocols in Wireless Sensor Networks –A Survey", *JCSSES*, November 2010. | [19] W. Heinzelman, A. Chandrakasan, and H. Balakrishnan, (2000), "Energy-Efficient Communication Protocol for Wireless Microsensor Networks", In *Proceedings of the Hawaii Conference on System Science*. | [20] Sinchan Roychowdhury, Chiranjib Patra, (2010) "Geographic Adaptive Fidelity and Geographic Energy Aware Routing in Ad Hoc Routing", *IJCCT*.