Energy Efficient Techniques for Transmission of Data in Wireless Sensor Networks

Dr. M. Senthil Kumar
Associate Professor and Head, Department of ECE
Ranganathan Engineering College, Coimbatore, Tamil Nadu, India
kathir_senthil@yahoo.co.in

Abstract: **In this paper, wireless sensor networks have made the practical deployment of various services possible, which until a few years ago was considered extremely costly or labor intensive. The proposed model named as routing and multicast tree based technology has been designed for under water sensor networks. The protocol implementation for the application at hand must take care that power management strategies are employed at all layers beginning from proper hardware installation to proper selection of operating system. It provides a mathematical model for determining the optimal number of nodes in each cluster, so that the network is always an energy balanced state after the proposed multi hop data dissemination takes place. This paper informs the latest strategies and techniques of sensor management schemes and other technical issues.**

Keywords: **Multicast tree, Water sensor networks, Dynamic channel allocation, Channel interface, Load balancing, Energy efficiency.**

1. Introduction

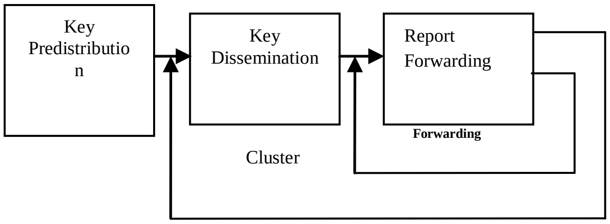
To decide which PHY-profile will be used for each PDU, there are several dozen potential profiles each with its own bandwidth requirements and robustness against transmission errors. It is not possible to use all profiles introduces a fixed significant OH in the DL map field of the framework and therefore because of throughput considerations, the scheduler should try to minimize the number of profiles accommodated in every frame to determine which PDU will be transmitted in the next frame. This decision has to be taken into account for many factors such as a quality of service, since some of the PDUs have a guaranteed upper bound on their max relay. The total throughput is maximum, since transmission to some of the hosts in difficult and require more bandwidth for reliable delivery and fairness. To decide where exactly in the frame every burst will be located. Here these are also several constraints some of which are power boosting namely the ability of the base situation to increase the transmission power used for other bursts transmitted at the same time on different sub channels, efficiency since the requirement that every PHY profile will be represented as a rectangle in the frame matrix may leave some unused space each rectangle [1-3]. Breaking the DFDMA scheduling problem and providing algorithms are the best performance guarantee for these problems by developing efficient and practical algorithms for these NP-hard scheduling problems. Specifically we provide an optimal macro scheduling problems and an algorithm with only 2.5% OH for the micro scheduling problem. MPLS can be used in traffic engineering applications to optimize network resource used by monitoring and controlling the traffic. MPLS requires processing of short labels only. This result in fast forwarding, the labeled switch paths can be specified explicitly. The traffic can be measured on every LSP [4-5].

2. Dynamic Online Routing Algorithm

The identification of the 'Critical' link leads to a severe computation complexity caused by max flow calculation performed each time a new light switched path or light path is established. The algorithm cannot estimate bottleneck on links that are 'critical' for clusters of nodes. MIRA [6] can be lead to unbalanced network utilization because it does not take into account the currently traffic load in routing decision. The main hop algorithm routes an incoming connection along the path which reaches the destination node using the min number of feasible links. The scheme based on the Digikra's algorithm is simple and computationally efficient [7].

However the use of min hop can result in heavily loaded bottleneck links in the network as it tends to overload some links leaving others underutilized. The cost given to each link in fact remains constant and independent of the current link and therefore min hop tends to use the same path until saturation is reached before switching to other path with underutilized links. Hence the dynamic online routing algorithm is proposed to distribute load evenly across the network. The exponential growth of internet has placed heavily burdens on network management and control applications. Adding more resource to the network may temperature relieve congestion coordinates but it is not a cost effective solution for solving resource congestion problems in the long run. The network providers are facing problems in setting upon demand network tunnels in backbone or transport network [8]. So addressed this issue but proposing a new routing algorithm called dynamic online routing algorithm (DORA) for circuit switched networks.

Figure 1.1



Complexity analysis:
N= Number of nodes
M = Number of edges for the average case
For DORA

$O(N * M^2*P^2)$
$O(N * M)$
$O(N*M^2)$
$O(N*M)$
$O(N^3*M^2)$
$O(N*M)$
$(N*M^2)$
$O(N*M)$

The number of steps used to compute the PPV array is replaced by a simple formula to find LPV. In DORA every time a request is made it is necessary to map the PPV array corresponding to the (S, D) pair. This is actually an added delay to setup a path, but considering the case of MDORA based on LPV there is no need for mapping. Considering 100 nodes in a network under the worst case, it requires 10000 PPV arrays as per DORA. The size of each PPV array is maintained for the entire network. So the size of the LPV array depends only on the number of links in the network and not on the number of nodes.

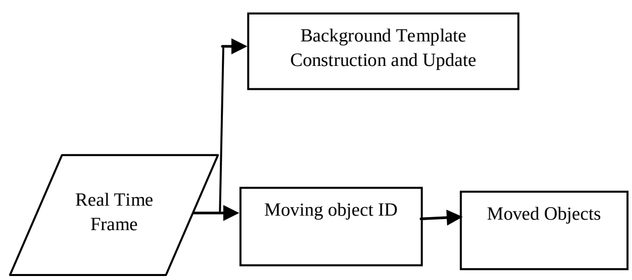
2.1 Capacity of the Hybrid Network

In computing the down link capacity we consider interface from surrounding cells. We account for such interface when modeling both direct BS to user communications and Ad hoc user to user communications. Unlike in previous efforts such as [9, 10] our model reflects the impact of the distance spanned by the link on the achieved rate. In other words, we examine the impact of rate Vs range tradeoff on the capacity of the hybrid network. Unlike most previous efforts our model account for the fact that the BS is always at one end of every communications. Given that cellular user typically download content from the internet our work focuses on downlink communications. Note that the considered traffic pattern has a big impact on the computed capacity since it affects it extent of possible spatial reuse in the adhoc part of the network with the considered traffic pattern in the hybrid network nodes, that are closer to the BS carry more traffic and thus are likely to be active more often. We take this into account in our analysis. We consider a fixed spectral band i.e. shared between the direct cellular communications and the adhoc communications. Most previous efforts assure the use of an additional spectral band for supporting multihop communications [11-12]. Our approach facilitates a fair comparison between the capacities of the hybrid network and its original pure cellular counterpart. In addition to validating our simulation analysis shows that the capacity achieved by placing users randomly within the network is similar to that with the regular placement of users.

2.2 Network Organization and Framework

The subscribers are requesting IP services and several classes of services are available. The subscribers are modeled using points of demand such that each point of demand represent are subscriber or allocated subscribers note that a POTS point of demand contains only POTS subscriber. Four architectures are considered in the access network XDSL from the CO, FTTN, and FTTP.Each point of demand can be served or not but in the later case a penalty cost is considered. All optical fibers are installed using predetermined aerial or buried corridors. The XDSL from the CO, architecture is used for the POTS points of demand with ADSL, ADSL@, and VDSL technologies. The DSLAM are included in the COS. The several types of DSLAM are considered such that each type is characterized by its cost and its number of slots. Several types of line cards for the DSLAM are considered such that, each type is characterized by its cost and is number of parts.

Figure 1.2



For a blind mouse whose sensing range is smaller than or equal to the cats we drop an optimal dynamic program for the mouse to maximize its expected detection time given statistical knowledge about the cat's movements in the form of presence matrix. We also discuss how they can optimize their presence matrix to minimize the expected detection time assuming that each position is equally likely to be the mouse starting position. The optimal cat and mouse strategies are in NASH equilibrium. For a seeing mouse having a layer sensing range than that of the cats we show how the mouse can use its local observations of the cat's movements to maximize the expected detection time. We show how a network of cats in playing against the seeing mouse can coordinate their movement to maximize their ability to catch the mouse. First we show that 2 cats who fail within each other sensing range can attempt to minimize the overlap in spatial coverage by moving away from each other and that such a strategy can reduce the detection time. Second, if the cats can additionally communicate within a wireless range the cats can opportunities from a co host to minimize the mouse degree of freedom in escaping while maximizing the barrier coverage by the co host members. We show that the communication enabled coordination protocol can perform significantly better than the approach enabled by the sensing only. We present extensive experimental results to evaluate how the player's strategies can affect the detection time [13-14].

2.3 Priority Mechanism

This allows user to assign arbitrarily defined packet classes to queue with different priorities. Since queue are served based on their priority this allows specified packet types to be always sent before packet types. With PSS each traffic class in proportion to their respective weights. There is no strict priority difference between classes. There are different ways to implement this scheduling mechanism. Weight fair queuing, weighted round robin and weighted fair queuing and the custom queuing in WRR. This restricts the max rate of traffic class. Traffic that exceeds the rate parameter is usually duple. The traffic class cannot barrow unused bandwidth from others. The probe OH of packet loss metric is larger than the two. Obviously the loss rate difference will not be come evident until the associated link is saturated and begins to drop packets. This simple observation defines the basis of loss based inference approach. In order to reveal packet forwarding priorities are need to saturate the path available bandwidth for a given class to produce loss rate difference among different classes. On the other hand packet ordering as soon as queue begins to build up. We do not need to send as much traffic as the loss based approach for the reordering and delay based approach. Loss difference can be observed for all kinds of QOS mechanism while the other two cannot. Although usage delay and reordering metric can result in fewer probes OH they cannot detect certain router QOS mechanism simply because those mechanisms do not generate delay at all. According to our test on a real Cisco router policy does not generate any packet reordering nor delay differences. However any kinds of router QOS mechanism will ultimately generate loss rates difference because of the purpose of configuring such mechanisms. Packet delay difference can be caused by many other mechanisms than QOS. The root cause of packet reordering is the existence of parallel packet links between 2 routers, or different routers over several hops. When packets are split to these parallel patch according to their packets types and these path have different delays. We will observe asymmetric packet reordering and delay differences in packet types. The probe OH of packet loss metric is larger than the other two. Obviously loss rate difference will not be come evident the associated link is saturated and begins to drop packets. This simple observation defines the basis of loss based interference approach. In order to reveal packet forwarding priorities one need to saturate the path available bandwidth for a given class to produce loss rates different among different classes. On the other hand packet recording and comparing all P_i the loss rate of packet 'I' using parametric statistical methods. However our probe packets are sent in large packet bursts. Packet losses in burst are not independent but correlated. We are not aware of any well known model for packet losses in a large packet burst in the internet. Hence we employ a non parametric method based on rates which is independent to underlying packet loss model correlations.

The accuracy of end to end interference of router properties can be severely affected by background traffic fluctuations clearly if one probing introduces relatively small additional traffic whenever solely on the amount of background traffic. To make our approach more resistant to background traffic fluctuations we opt for sending relatively large amount of traffic to temporarily saturate bottleneck traffic class capacity which increases the possibility of observations and loss rate difference. To note the sender may not be able to saturate the bottle neck link due to limited resources which is an inherent limitation of this method. Probe traffic of a relative large packet burst rate neither independent nor strongly correlated. Once the loss rate for each packet type is obtained, we need to determine whether the loss rate different among them is large enough to conclude that they are treated differently. When packet losses can be described with a good mathematical model for ex. Independent and identical distribution process we can determine if the loss rate of different packet types were evidently different or not by comparing all p_i the loss rate of packet type 'I' using parametric statistical methods.

Grouping is needed for multiple packet types probing if we only probe 2 packet types at one time simply determining whether they are treated differently is enough. However we some times probe more than two packet types and needed to group them based on their properties. Here we assign a rank based metric to each packet type and use hierarchical clustering method to group them.

3. Methodology

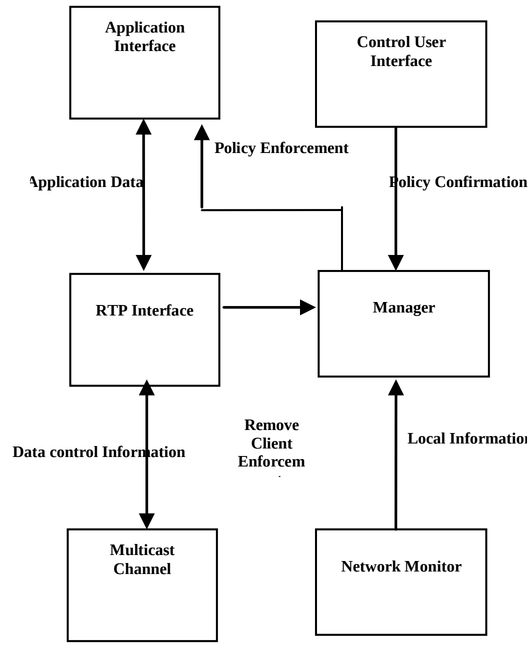
Correctness ratio which is the fraction of the internal nodes in the ground truth topology that are correctly inferred averaged overall rounds. An internal node in the ground truth topology is correctly inferred if and only if there is an internal node in the inferred topology with the same set of destination nodes descending from it. A higher correctness ratio means better accuracy of the interference scheme. Node ration which is the ratio of the number of internal nodes in the inferred topology averaged overall rounds. An accurate interference has a node ratio is closed to one. If the node ratio is larger than one then the interference algorithm returns more internal nodes in the inferred topology. Traffic matrix indicates the amount of traffic between all pairs of input routers. Physical topology constructed in the optical layer that consists of OXC's and WDM optical fibers 2.0XC's are connected by a optical fiber. The optical layer path configured between two directly or indirectly connected oxc's. An optical layer path is a set of optical fiber between the two oxc's determined by the optical layer TE. An optical layer path occupies one wavelength of each optical fiber on the route of the optical layer path. VNT a topology constructed with an optical layer path is regarded as a single directly connected between IP routers. Packet layer path an end to end packet layer traffic bandwidth. Route of a packet layer path a set of optical layer path passed by the packet layer path utilization of an optical layer path amount of traffic traversing the optical layer path divided by the capacity of the optical layer path. Identify the packet layer path including non negligible changes. Remote the information about the traffic of the identified path from the information monitored at the previous stages. Estimate the traffic matrix by using the information in which information about the traffic of the identified path is removed.

4. Enhanced Image Transmission and Error Control

In best transformation in terms of cumulative time, computation time is very high and simplicity. HWT is very simple and memory efficient since it can be calculated in place without temporary array. For fairness, both non optimal and optimal approaches are targeted to achieve similar PSNR. The data signals are much more important than v data segments. Usually p data has 6-10db more importance than v data. It is clear that the packet loss ratio of important v data ratio is more.

5. Simulation Results

Figure 1.3



The comprised node can send the false report contain some forged or non existence events 'occurring' in their clusters. Moreover, given sufficient secret information they may even impersonate some uncompromised nodes of other clusters. These false reports not only cause false alarm at the base station but also drain out the limited energy of forwarding nodes. DOS attacks, the compromised nodes can prevent the legitimate report from the beginning nodes delivered to the base station by either selectively dropping some reports or internationally inserting invalid authentication information into the report to make them filtered by other forwarding nodes [10]. Our scheme drops false reports earlier even with lower memory requirements. In some scenario, it can drop false reports in 6 hops with only 25 keys stored in each node but another scheme needs 12 hops even with 50 keys stored. Our scheme can better deal with the dynamic topology of sensor networks. It achieves a higher filtering capacity and filter out more false reports than other in dynamic network. Hill climbing increases, the filtering capacity of our scheme greatly balances the memory requirement among sensor nodes.

Figure 1.4

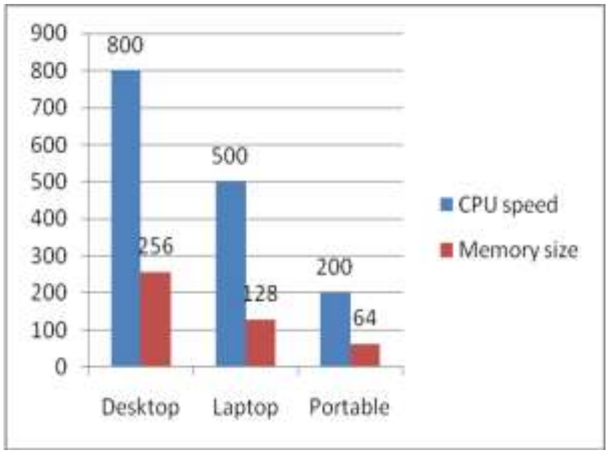


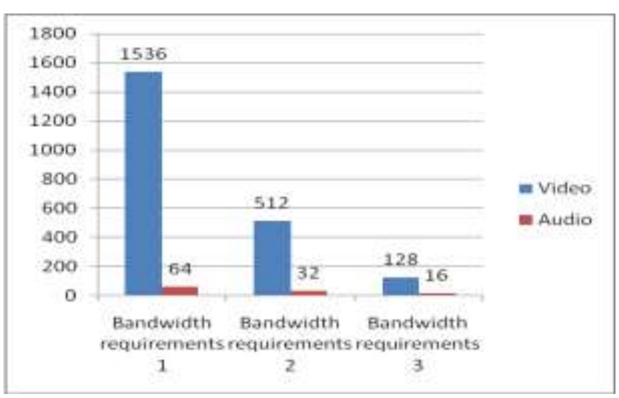
Table 1.1

Media	Bandwidth requirements 1	Bandwidth requirements 2	Bandwidth requirements 3
Video	1.5 mbps	512 kbps	128 kbps
Audio	64 kbps	32kbps	16 kbps

Table 1.2

Type of input	Color	Shape	Texture
Text	0.93	0.93	0.86
Image	1.0	0.93	0.86
Image with Text	1.0	0.93	0.93
For multi images	0.66	0.93	0.93
Image with text(multi images)	0.73	0.80	0.93

Figure 1.5



6. Discussions and Conclusion

Municipalities whose public safety agencies are stranding to address a growing number of threats with flat or shrinking resources must consider wireless mesh networks to support mobile broadband data, voice and video applications like a. lowest total cost of ownership and fastest return on investment, b. broadcast and most flexible product portfolio, c. best wireless network performance as measured in both lab tests and in live deployments, d. best municipal scale wireless network coverage at lower nodal density, e. best capacity scaling, f. lowest most predictable latency for delay sensitive applications and g. highest reliability. In addition, we are improving to front end interface by adding features to graphically indicate to the user the current state of nodes on the map. The feature is under deployment include color coding of nodes in the map which are agreeing and other color to indicate nodes whose neighbor have detected an event of interest. The improved interface will also provide more advanced grouping flexibility for easier manipulation of node configuration. It will also include an additional advanced option into enable users to specify maximum cluster sizes, so that the server can allocate the address.

References

[1] Robinpreet Kaur and Mritunjay Kumar Rai, “A Novel Review on Routing Protocols in MANETs”, Undergraduate Academic Research Journal (UARJ), ISSN: 2278 – 1129, Volume-1, Issue-1, 2012

[2] Ammar Odeh, Eman AbdelFattah and Muneer Alshowkan, “Performance Evaluation of AODV and DSR Routing Protocols in MANET Networks”, International Journal of Distributed and Parallel Systems (IJDPS) Vol.3, No.4, July 2012.

[3] P.G. Argyroudis and D. O’mahony, University Of Dublin, Trinity College, “Secure Routing for Mobile Ad hoc Networks”.

[4] Y. Hu, A. Perrig and D. Johnson, Ariadne: “A Secure On-demand Routing Protocol for Ad Hoc Networks”, Proceedings of ACM MOBICOM’02, 2012.

[5] A. K. Gupta, H. Sadawarti, and A. K. Verma, “A Review of Routing Protocols for Mobile Ad Hoc Networks,” SEAS Transactions on Communications, ISSN: 1109-2742, Issue 11 Vol.10, November 2011, pp. 331-340.

[6] P. Papadimitratos and Z. J. Haas. “Secure routing for mobile ad hoc networks”, SCS Communication Networks and Distributed Systems Modeling and Simulation Conference (CNDS 2002), Jan 2002.

[7] T. A. Wysocki, A. Dadej and B.J. Wysocki, “Secure Routing Protocols for Mobile Ad-Hoc Wireless Networks”, Advanced Wired and Wireless Networks, Eds. Springer, 2004

[8] N. S. Yadav and R.P. Yadav “Performance Comparison and Analysis of Table- Driven and On- Demand Routing Protocols for Mobile Ad-hoc Networks,” International Journal of Information Technology, vol.4, no. 2, pp 101-109, 2007.

[9] Chalermek Intanagonwiwat, Ramesh Govindan, Deborah Estrin, John Heidemann, and Fabio Silva “Directed Diffusion

for Wireless Sensor Networking", ACM/IEEE Transactions on Networking, 11 (1), pp. 2-16, February, 2012.
[10] H. Wang, Z. Shi, A. Ge and C. Yu, "An optimized ant colony algorithm based on the gradual changing orientation factor for multi-constraint QoS routing", Computer Communication, vol. 32, no. 4, pp. 586–593, Mar. 2013.
[11] P. Venkata Krishna, V. Saritha, G. Vedha Bhiwal and S. Chawla, "Quality-of-service-enabled ant colony-based multipath routing for mobile ad hoc networks", IET Communication, vol. 6, no. 1, p.76, 2012.
[12] M. Mohanapriya and I. Krishnamurthi, "Modified DSR protocol for detection and removal of selective black hole attack in MANET", Computer Electronics Engineering, vol. 40, no. 2, pp. 530–538, Feb. 2014.
[13] Shipra Gautam, Rakesh Kumar, "Modified Energy Saving DSR Protocol for MANETs", International Journal of Electronics and Computer Science Engineering, Vol.1, No.4, pp. 1982-1993, 2014.
[14] Pariza Kamboj and Ashok K. Sharma, "Energy Efficient Multicast Routing Protocol for MANET with Minimum Control Overhead", International Journal of Computer Applications, Vol. 8, No.7, 2014.

Acknowledgement

The author is thankful to the beloved chairman of Ranganathan Educational Institutions, Coimbatore and former Vice-Chancellor of Anna University of Technology, Madurai Prof. Dr. R. Murugesan for his constant support to contribute this article.

Author Details

Prof. Dr. Senthilkumar Meyyappan Servai was born in Ramanathapuram District, Tamil Nadu, India in 1982. He obtained his B.Sc., M.Sc., M.Tech. and Ph.D. degrees in Electronics in the years 2002, 2004, 2006 and 2013 respectively. He has more than 9 years of teaching experience. He has presented more than 30 research papers in various national and international conferences. He has published more than 20 research papers in reputed international journals. He has guided several UG and PG students for their project work. His area of interest is Energy Conservation and Optimization Techniques in Wireless Sensor Networks. Currently, he is with Ranganathan Engineering College, Coimbatore, India, as Associate Professor and Head of the Department of Electronics and Communication Engineering.

