International Journal of Information Processing, 6(3), 23-31, 2012
ISSN : 0973-8215
IK International Publishing House Pvt. Ltd., New Delhi, India

An Energy Aware Transport Protocol in Wireless Sensor Networks

Prabhudutta Mohanty[a], Manas Ranjan Kabat[a] and Manoj Kumar Patel[a]

[a]Department of Computer Science and Engineering, VSS University of Technology, Burla, Sambalpur, Odisha, India,768018, Contact: prabhu99.mohanty@gmail.com

One of the most important challenges in the design of Wireless Senor Networks (WSN) is to maximize their lifetime. Sensor nodes are energy constrained in nature. Therefore, energy efficient communication techniques are necessary to increase the lifetime of sensor nodes. Redundant data increases the energy consumption during data transmission. In this paper, we present an Energy Efficient Transmission Control Protocol (EETCP) for data gathering and data transmission within the network. We aim to minimize the redundant data transmission with the co-ordination of Base-station, to increase the lifetime of the network. The performance of the proposed protocol is studied through simulations. It is observed that the protocol fits to all modes of transmission and it increases the life time of the network and Packet Delivery Ratio.

Keywords : Energy Efficient Transmission, EETCP, Redundancy, Transport Protocol, Wireless Sensor Network.

1. INTRODUCTION

A sensor network consists of hundreds or thousands of inexpensive, tiny recourse constraints sensor nodes which has some computational power and sensing capabilities. It is a self configured dynamic Network. WSN can be deployed in various domains and applications like agriculture or environmental sensing, object tracking, wild life monitoring, health care, military surveillance, industrial control, home automation, security *etc.* [1–3]. Some of its application areas deal with redundant data and some deal with non- redundant data [4]. There are many reasons of redundant data in WSN such as multiple sensor sensing same phenomena, slow change in phenomena, presence of malicious nodes in WSN, flooding techniques or multipath data transmission techniques *etc.*. The lifetime of the sensor nodes mostly depend on the power supply unit. Power is stored either in Batteries or Capacitors in a sensor node. A sensor network consumes energy while sensing a phenomenon, transmitting and processing data. Energy required for data communication is more than that for sensing and data processing. Redundant data transmission affects the WSN severely. It drains the energy of the node. Redundant data increases congestion, communication and computational overhead. Malicious nodes may take the advantage of redundant data and cause energy drain by injecting redundant data in the network (*i.e.*, replay attack) [5]. That may lead to routing holes [5].

A sensor network transmits all its collected data using different modes of communication [5–7]. The power consumption of the network depends on the communication mode and type of traffic. Traffic in sensor networks can be classified into one of three categories one-to-many, many-to-one and local communication. In many-to-one mode of communication multiple sensor nodes send sensor readings to a base station or aggregation point in the network. In one-to-many mode of communication a single node (typically a base station or a cluster head) multicast or flood a query or control information to several sensor nodes. In Local communication, neighboring nodes send localized messages to discover and coordinate with each other. In WSNs, sensor nodes sense and transmit the data to the sink nodes in two tech-

Figure 11 and Figure 12, shows the analysis of packet loss ratio in high and low network congestion senario. These figures show that the percentage of packet loss ratio of our proposed protocol is less than the discused communiacation models. Simulation result shows that, the packet loss ratio is less afected by the different level of congestion.

4. CONCLUSION

In this paper, we make a comprehensive study about the effect of redundant data on transmission. We minimize the redundant data transmission with the co-ordination of base station. Our proposed model processes the redundant data at base station without being transmitted by the sensor node. Our proposed transmission control protocol is compatible with different modes of communication. We simulated our proposed protocol with all modes of communication and it is observed that our proposed protocol increases the life time of network significantly. The simulation results show that our proposed protocol out performs in different level of network congestion.

REFERENCES

1. Ruizhong L, Zhi W, Youxian S. Wireless Sensor Networks Solutions for Real Time Monitoring of Nuclear Power Plant, *The Proceedings of the 5th World Congress on intelligent Control and Automation*, Hangzhou. P.R. China, pages 3663- 3667, 2004.
2. Romer K. The Design Space of Wireless Sensor Networks, *IEEE Wireless Communications*, pages 54-61, 2004.
3. Yoneki E, Bacon J. A Survey of Wireless Sensor Network Technologies Research Trends and Middlewares role,*Technical Report*, 2005.
4. Krishnamachari B, Estrin D, Wicker S. Modelling Data-Centric Routing in Wireless Sensor Networks, *IEEE INFOCOM* , pages 1-11, 2002.
5. Karlof C, Wagner D. Secure Routing in Wireless Sensor Networks Attacks and Countermeasures, *University of California at Berkeley*, CA 94720, Berkeley, USA, 2003.
6. Wang J, Niu Y, Cho J, Lee S. Analysis of Energy Consumption in Direct Transmission and Multi-hop Transmission for Wireless Sensor Networks, *Third International IEEE Conference on Signal-Image Technologies and Internet-Based System*, SITIS '07, pages 270-280, 2007.
7. Faouzi N E EI, Leung H, Kurian A. Data Fusion in Intelligent Transportation Systems Progress and Challenges Survey, *Elsevier*, pages 4-10, 2010.
8. Younis O, Fahmy Y S. HEED: A Hybrid, Energy-Efficient, Distributed Clustering Approach for Ad Hoc Sensor Networks, *IEEE Transactions on Mobile Computing*, 3:366-379, 2004.
9. Heinzelman W B, Chandrakasan A P, Balakrishnan H. Energy-Efficient Communication Protocol for Wireless Microsensor Networks, *Proceedings of the 33rd Hawaii International Conference on System Sciences* (HICSS '00), 8: 2000.
10. Manjeshwar A, Agarwal D P. TEEN: A Routing Protocol for Enhanced Efficiency in Wireless Sensor Setworks, *1st International Workshop on Parallel and Distributed Computing Issues in Wireless Networks and Mobile Computing*, 2001.
11. Mohanty P, Panigrahi S, Sarma N, Satapathy S S. HCEPSN: A Hierarchical Cluster based Energy Efficient Data Gathering Protocol for Sensor Network, *ICIT*, Bhubneswar, pages 207-212, 2009.
12. Bhuyan B, Sarma H K D, Sharma N, Kar A. Mall R, Quality of Service(QoS) Provisions in Wireless Sensor Networks and Related Challenges, *Scientific Research Journal for Wireless Sensor Networks*, pages 861-868, 2010.
13. Talak S, Abu-Ghazaleh N, Heinzelman W. A Taxonomy of Wireless Micro Sensor Network Communication Models, *ACM Mobile Computing and Communications*, 7:16-27, 2000.
14. Ayadi Ahamed. Energy-Efficient and Reliabile Transport Protocols for Wirless Sensor Networks, *State-of Art: Wirless Sensor Network, Scientific Research*, pages 106-113, 2011.
15. Le Tuan, Hu Wen, Corke Peter, Jha Sanjaya. ERTP: Energy Efficient and Reliability Transport Protocol for Data Streaming in Wirless Sensor Networks, *Computer Communcations Elsevier*, pages 1154-1171, 2009.

Prabhudutta Mohanty is currently pursuing his Ph.D from Veer Surendra Sai University of Technology, Burla, India. He has received his M.Sc in Computer Science and Master degree in Computer Science and Technology from IASE Deemed University and Tezpur University respectively. His area of interest is Wireless Sensor Network, Internet and QoS routing. He has published 8 research papers in various International Journals and Conferences

Manas Ranjan Kabat is currently the Senior Lecturer, Veer Surendra Sai University of Technology, Burla, India. He obtained his Bachelor of Engineering from Utkal University. He received his Masters degree in Computer Science and Technology and Ph.D in Engineering from Bengal Engineering college, Howrah and Sambalpur University respectively. His area of interest is WSN, Internet and QoS routing. He has published 15 research papers in various International Journals and Conferences

Manoj Kumar Patel has received his M.Sc in Mathematics and Master in Computer Applications from Sambalpur University and IGNOU, India. He is currently pursuing Ph.D under Sambalpur University, India. He is also working as a Technical Asst. Gr-I(Computer) in the Department of Computer Science and Engineering at Veer Surendra Sai University of Technology, India. His research area includes QoS Routing, Reliable Multicast and Soft Computing Techniques. He has published about 07 research papers in various International Journals and Conferences.