

Traffic and Energy Aware Routing for Heterogeneous Wireless Sensor Networks

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ABSTRACT: The energy efficiency of routing algorithm is crucial for improving wireless sensor networks. Consideration of nodes heterogeneity in routing is essential for achieving optimal resource utilization. This letter considers sensor nodes with random initial energies. TEAR (traffic and energy aware routing) scheme to improve stability model. The letter presents an energy model for the scenario and proposes a Traffic and Energy Aware Routing scheme to improve the stability period. The simulation results indicate that TEAR outperforms other clustering based routing algorithms under the scenario.

I. INTRODUCTION

Internet of Things envisions invulnerability of heterogeneous devices to support diverse applications, and the Wireless Sensor Network technology is an important building block of sphere. Consideration of heterogeneity (e.g., energy, link and computational heterogeneities) can improve the performance of WSN routing algorithms in terms of network lifetime, stability, reliability, network delay, etc. The energy heterogeneity in WSN routing is pursued widely; however, the link and computation heterogeneities, which are generally used along with the energy heterogeneity, are relatively less explored areas. In the early work in WSN routing algorithms for energy heterogeneous scenarios, Stable Election Protocol considers two-level energy heterogeneity in Low-Energy Adaptive Clustering Hierarchy like cluster-head role rotation environment. SEP proposes weighted election probabilities based on heterogeneity

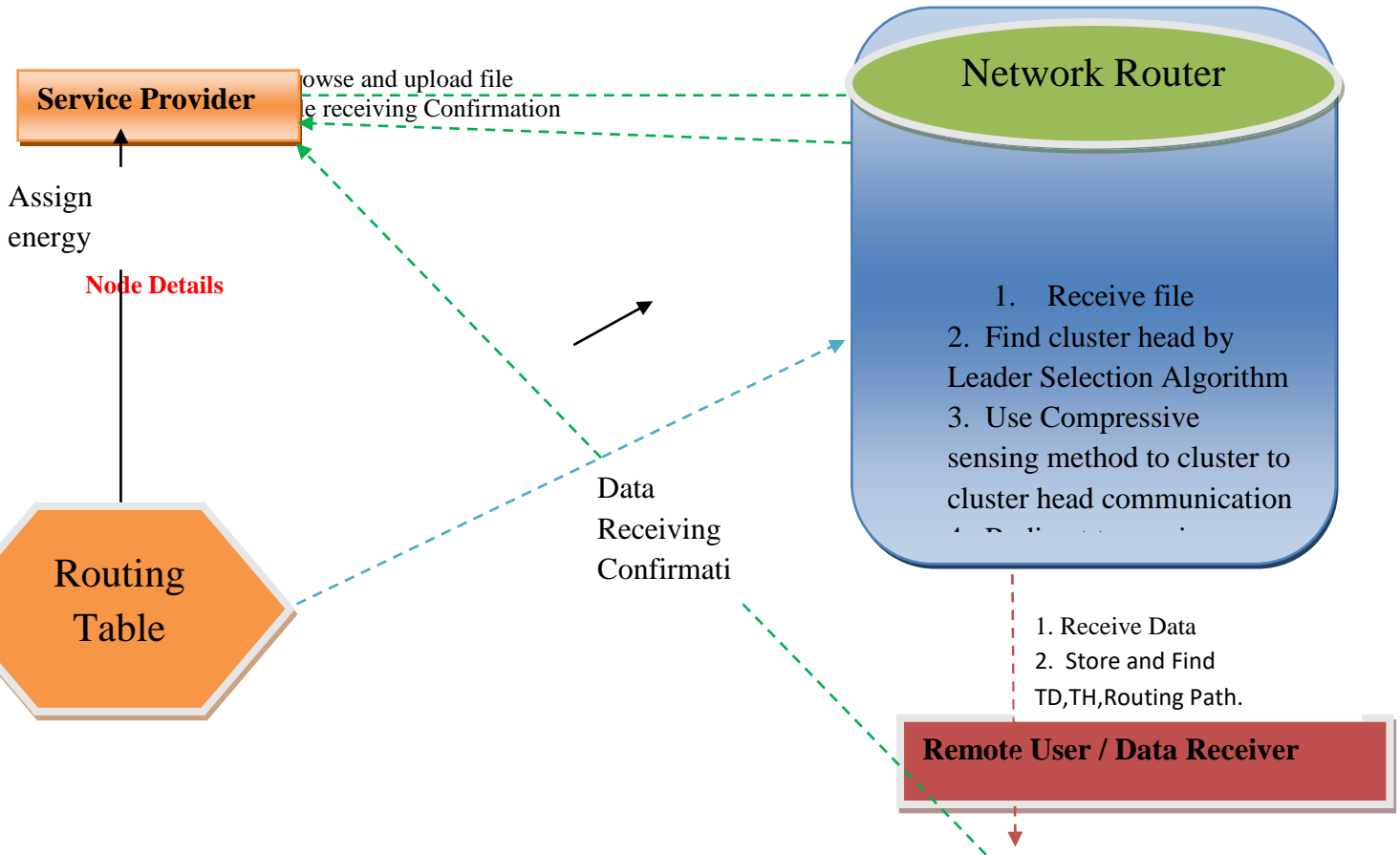
The heterogeneity in terms of disparities in data generation rate (traffic) is considered under computation heterogeneity. The effect of traffic heterogeneity in homogeneous WSN routing (LEACH) algorithm. Energy Dissipation Forecast and Clustering Management considers traffic heterogeneity along with energy heterogeneity in a very specific two-level WSN. Further, EDFCM considers additional nodes (management nodes) to control the number of clusters, which makes its natural distributed localized decision-making behavior questionable. The consideration of traffic heterogeneity along with energy heterogeneity is crucial for modeling realistic WSNs with application heterogeneity and event-driven scenarios. This letter considers both, energy and traffic heterogeneities, with multiple random levels. An energy model is presented for the multi-heterogeneity scenario, where consideration of multi-level traffic heterogeneity is a novel concept. A novel routing algorithm named Traffic and Energy Aware Routing is presented, which considers node's traffic requirements along with its energy levels while making CH selection. TEAR shows improvements in terms of stability period over existing algorithms (LEACH, SEP and DEEC) under the scenario. The rest of this letter is arranged as follows. Section II presents the system model, which includes the energy model for the multi-heterogeneous scenario. In Section III, the proposed routing algorithm is described.

II. EXISTING SYSTEM

Stable Election Protocol (SEP) considers two-level energy heterogeneity in Low-Energy Adaptive Clustering Hierarchy (LEACH) like cluster-head (CH) role rotation environment. SEP proposes weighted election probabilities supported the initial energies of the nodes to offer energy-rich nodes more chances of becoming CHs.

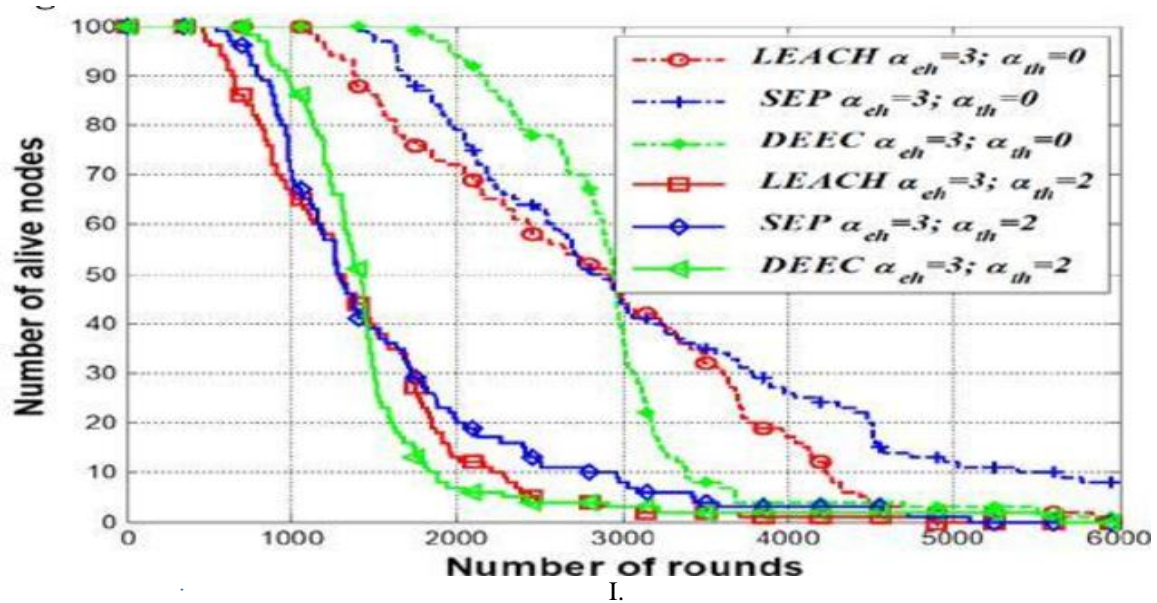
Distributed Energy-Efficient Clustering (DEEC) considers the multi-level energy heterogeneous WSN and prefers the nodes with higher initial energy and residual energy for CH role. Sharma et al. analysed the effect of traffic heterogeneity in homogeneous WSN routing (LEACH) algorithm. Energy Dissipation Forecast and Clustering Management (EDFCM) considers traffic heterogeneity along side energy heterogeneity during a very specific two-level WSN. Further, EDFCM considers additional nodes (management nodes) to control the number of clusters, which makes its natural distributed localised decision-making behavior questionable.

III. ARCHITECTURE DIAGRAM



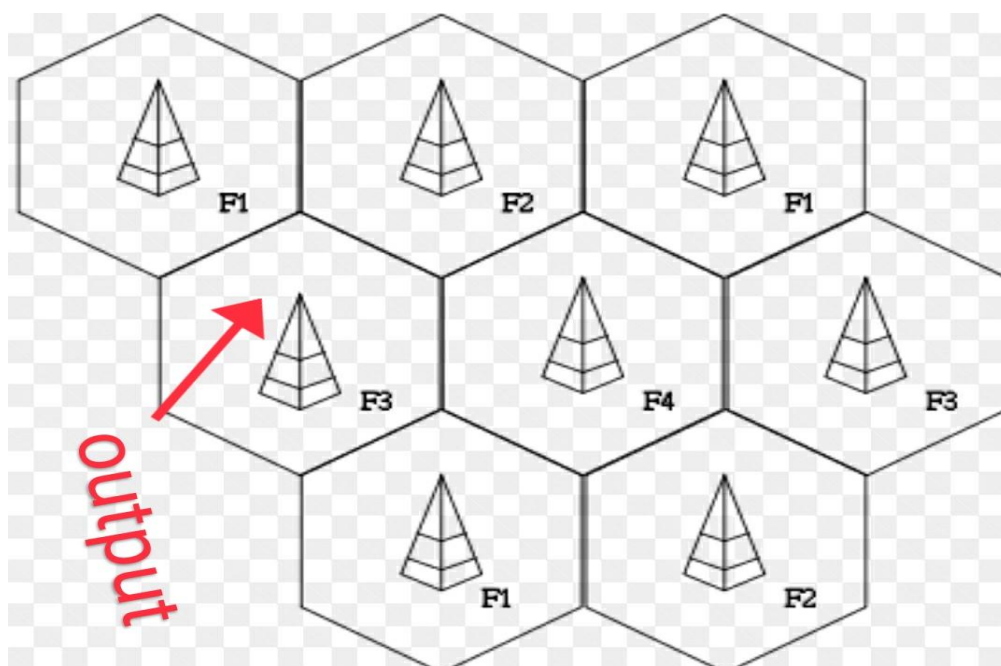
IV. RESULTS AND DISCUSSION

The simulation setup considers 100 nodes with randomness in energy and traffic levels, deployed uniformly in a 100m x 100m (R×R) area with BS located at the centre of the region. The system model for the multi heterogeneity approach is based all the scenarios have been simulated in MATLAB and the simulation parameters are detailed in TABLE I. LEACH and SEP have been modified to support multi-level energy heterogeneity . Further, the algorithms are customized to support energy consumption in multi-level traffic heterogeneity, where nodes consider their specific traffic and the aggregated message sent from CH to BS is while maintaining the energy heterogeneity the three algorithms.



I. Effect of traffic heterogeneity on WSN routing algorithms

The number of messages transmitted to the base station is reduced by data aggregation and fusion, which reduces the overall energy consumption. The cluster-based routing is mainly implemented as a two-layer strategy. One layer is used to select the cluster heads, and other layer is used for routing. The high-energy nodes can be used to process and send information, whereas low energy nodes can be used to perform sensing in close proximity to the target. The clustering algorithm is based on cluster selecting, which incurs an additional energy cost. However, most existing energy aware routing algorithms assume that energy consumption in WSNs is evenly distributed or that a WSN is deployed as a specific scenario when analysing the validity of its routing algorithm. The analyses the effectiveness of LEACH protocol in cluster-head selection, and proposes an improved clustering algorithm. The new algorithm takes nodes residual energy and site information under consideration, optimises the choice method of threshold for electing cluster-head, improves optimal cluster-head selection strategy that's normal nodes select optimal cluster-head based on the cost.



V. CONCLUSION

Consideration of multi-heterogeneity in WSN routing algorithms can help in achieving optimal resource utilisation in realistic scenarios. This considers WSN nodes with random levels of energy and traffic heterogeneities. It devises a traffic and energy aware routing (TEAR) technique with an improved CH selection method, which considers node's traffic along with its initial energy and residual energy. TEAR performs better, in terms of stability period, over legacy algorithms (LEACH, SEP and DEEC) in the multi heterogeneous scenario. Further, the multi-heterogeneity concept (especially the traffic heterogeneity consideration) could be helpful in developing more effective routing algorithms for realistic WSN and Internet of Things applications with heterogeneous sensing requirements.

REFERENCES

- [1] S. Tanwar, N. Kumar, and J. J. Rodrigues, "A systematic review on heterogeneous routing protocols for wireless sensor network," *Journal of network and the computer applications*, vol. 53, pp. 39-56, 2015.
- [2] G. Smaragdakis, I. Matta, and A. Bestavros, "SEP: A stable election protocol for clustered heterogeneous wireless sensor networks," in the *Second international workshop on sensor and the actor network protocols and applications (SANPA 2004)*, 2004.
- [3] W. B. Heinzelman, A. P. Chandrakasan, and H. Balakrishnan, "An application-specific protocol architecture for wireless microsensor networks," *Wireless Communications, IEEE Transactions on*, vol. 1, pp. 660-670, 2002.
- [4] L. Qing, Q. Zhu, and M. Wang, "Design of a distributed energy efficient clustering algorithm for heterogeneous wireless sensor networks," *The computer communications*, vol. 29, pp. 2230-2237, 2006.
- [5] H. Zhou, Y. Wu, Y. Hu, and G. Xie, "A novel stable selection and reliable transmission protocol for clustered heterogeneous wireless sensor networks," *Computer communications*, volume.33, pp. 18431849, 2010.
- [6] D. Sharma, A. P. Bhondekar, A. Ojha, A. Shukla, and C. Ghanshyam, "A traffic aware cluster head selection mechanism for hierarchical wireless sensor networks routing," in *IEEE Parallel, Distributed and Grid Computing (PDGC), 2016 4th International Conference on*, 2016, pp. 673-678.
- [7] M.-Y. Wang, J. Ding, W.-P. Chen, and W.-Q. Guan, "SEARCH: A stochastic election approach for heterogeneous wireless sensor networks," *The communication Letters, IEEE*, vol. 19, pp. 443-446, 2015.