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Review on Hierarchical based Protocol in WSN

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Abstract
In a hierarchical architecture, higher en energy nodes can be used to process and send the information while low energy nodes can be used to perform the sensing in the proximity of the target. This means that creation of clusters and assigning special tasks to cluster heads can greatly contribute to overall system scalability, lifetime, and energy efficiency. Hierarchical routing is an efficient way to lower energy consumption within a cluster and by performing data aggregation and fusion in order to decrease the number of transmitted messages to the BS. Hierarchical routing is mainly two-layer routing where one layer is used to select cluster heads and the other layer is used for routing. Numbers of routing, power management, and data dissemination protocols have been specifically designed for WSNs where energy awareness is an essential design issue. The focus has been given to the hierarchical routing protocols which might differ depending on the application and network architecture. In this paper we discuss some of the hierarchical routing protocols that give an overview of different hierarchical routing strategies which is used in WSN and their performance is compared based on metrics such as localization, data aggregation, power usage**.**

Keywords*:* hierarchical routing protocol; routing protocol; clustering; lifetime; wireless sensor network

Introduction

Wireless Sensor Networks (WSN) is the innovation that comprises of expansive number of small sensor hubs disseminated in a specially appointed way. Sensors are by and large spread over a land range in profoundly thick way. These sensor hubs are of ease and low power which can perform different capacities. As the sensor hubs are scattered with no legitimate arranging they have to act naturally sorted out and can confront consistent reconfiguration. These sensors can correspond with one another or course the information to another sensors or back to the base station (sink).

Wireless Sensor Networks are being utilized for various applications like military applications, therapeutic field, training, security and so forth. As sensor hubs meet expectations upon battery, no battery source is accessible in remote territories to charge the sensor once more. Subsequently, it is compulsory to utilize the sensors productively with a specific end goal to improve their lifetime. Building design of a sensor hub is given in Figure.

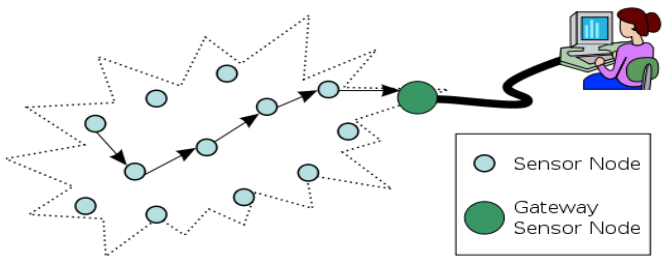

Fig.1: Architecture of a Wireless Sensor Node [1]

The survivability of sensor hubs can be expanded by controlling the exchange of information bundles from sensor hubs. This can be attained to by dispensing with the transmission of

excess information among sensor hubs.
The proposed convention in view of APTEEN (Adaptive Periodic Threshold Sensitive Energy Efficient Sensor Networks); a progressive convention lessens the transmission of repetitive information on the premise of separation parameter between every two sensor hubs inside a group. In APTEEN, information is transmitted occasionally without considering the element of excess information end.

Characterstics
The main characteristics of a WSN include:

- Power consumption constraints for nodes using batteries or energy harvesting
- Ability to cope with node failures (resilience)
- Some mobility of nodes
- Heterogeneity of nodes
- Scalability to large scale of deployment
- Ability to withstand harsh environmental conditions
- Ease of use
- Cross-layer design.

Cross-layer is becoming an important studying area for wireless communications. In addition, the traditional layered approach presents three main problems:

1. Traditional layered approach cannot share different information among different layers, which leads to each layer not having complete information. The traditional layered approach cannot guarantee the optimization of the entire network.
2. The traditional layered approach does not have the ability to adapt to the environmental change.
3. Because of the interference between the different users, access conflicts, fading, and the change of environment in the wireless sensor networks, traditional layered approach for wired networks is not applicable to wireless networks

Routing Challenges and Design Issues

- Node deployment.
- Network dynamics.
- Energy conservation.
- Fault-tolerance.
- Scalability.
- Hardware constraints.
- Sensor network topology.
- Transmission media.
- Data delivery model.
- Node capabilities.
- Data aggregation/fusion.

Hierarchical Based Protocol in WSN
Hierarchical routing protocol has become the center of attention of the routing technology with the compensation of suitable topology management, high-efficiency energy utilize,and trouble-free data fusion. Break system in clustered layer.Removing data redundancy.Information goes from lower grouped layer to higher. Increase network performance.

LEACH (Low-Energy Adaptive Clustering Hierarchy)
LEACH is an initial energy efficient routing protocol which is avoided an energy consumption and improved network lifetime.base station is positioned in the centre of the simulation region and bounded by multiple clusters. Selection of the cluster head is forever done depending on the highest residual energy.

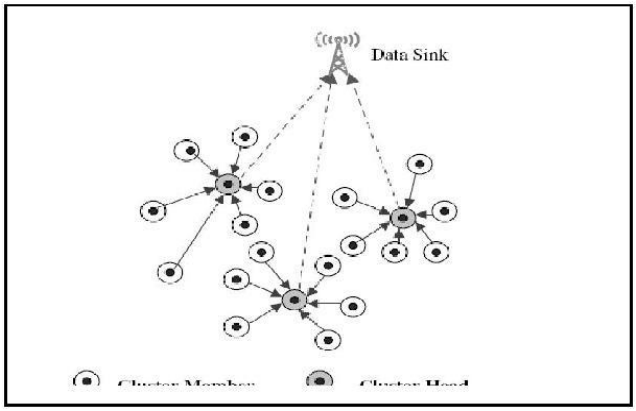

Fig. 2: Clustering in LEACH Protocol

LEACH uses TDMA scheduling to combine the physical data from the member nodes on single cluster. The whole operation of the LEACH is voted for using set up phase (Cluster-constructing) and steady phase (Working steadily).

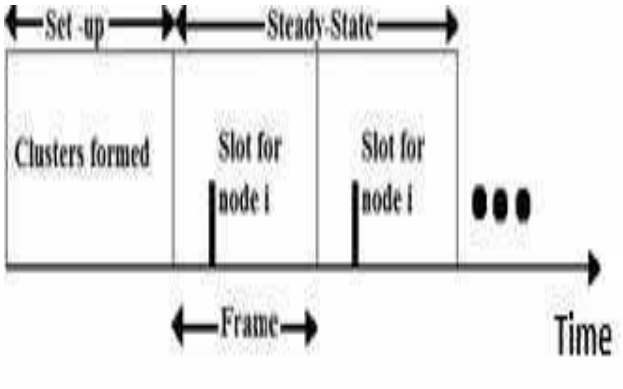

Fig.3: Time Line operation of LEACH

TEEN (Threshold sensitive energy efficient sensor network)
TEEN uses hierarchical network architecture with data centric mechanism. These protocols are very useful in time critical applications, where wireless network is reactive.In TEEN, sensor nodes sense the medium continuously, but data transmission is done less frequently. Cluster stability is higher in teen based protocol.

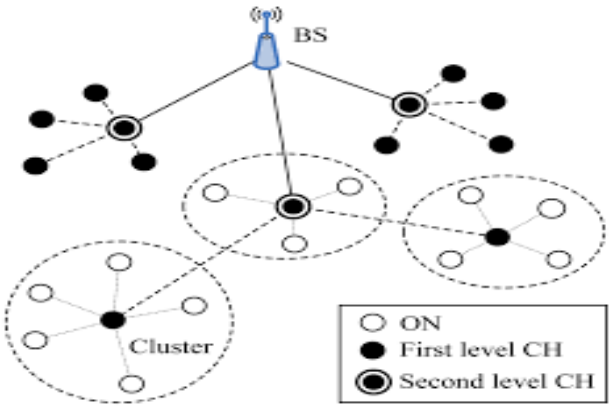

Fig.4: Architecture design of teen,apteen and dapteen)

APTEEN (Threshold sensitive energy efficient sensor network)

These protocols are bit different from LEACH protocols because it uses the sensored attributes such as temporary for communication. These protocols are very useful in time critical applications, where wireless network is reactive. In LEACH is the network is proactive where there is no event driven things occur where as in reactive network the things which are event driven which are sensitive to nodes sensitivity like temperature, weather or any other environmental conditions. TEEN uses hierarchical network architecture with data centric mechanism. The figure shows the mechanism of cluster forming in TEEN and APTEEN. As shown in figure clusters are formed and this process of formation of cluster is continued to the second level till the base station (sink) is reached. There are two types of thresholds: hard and soft.

After formation of cluster head's the cluster head will broadcast the threshold to the common nodes in its clusters. The first threshold sent to all nodes by cluster head is hard threshold which is the minimum value of sensory attributes to trigger node for switching on its transmitter. So, transmission occurs only when the node's sensed attribute in turn lower the number of transmissions. Once, the node had sensed a value beyond hard threshold, it only transmits a data when value of sensed attribute changes by an amount equal or greater than the soft threshold. So, soft threshold will also decreases the number of transmissions.The APTEEN gives the facilities which TEEN does not gives as follows:

In APTEEN cluster head's broadcast the attributes the threshold values and schedule of transmission of all nodes.

TEEN and APTEEN gives better performance than LEACH. Energy dissipation of APTEEN is in between of LEACH and TEEN.

Compared to LEACH, TEEN/APTEEN has overhead and complexity of cluster formation and problem of giving threshold based functions.

DAPTEEN (Distance adaptive teen)

In DAPTEEN, data redundancy is removed by using adaptiveness measure on the basis of distance between nodes within a cluster. When the sensor nodes sense the data from their region; then first of all distance between every two nodes is evaluated. As closer nodes senses the almost same data. Therefore, among two nearer nodes on the basis of evaluated distance, only one node sends the data.

Applications of Hierarchical Routing Protocols

1. Area monitoring: Area monitoring is a common application of WSNs. In area monitoring, the WSN is deployed over a region where some phenomenon is to be monitored. A military example is the use of sensors detect enemy intrusion; a civilian example is the geo-fencing of gas or oil pipelines.

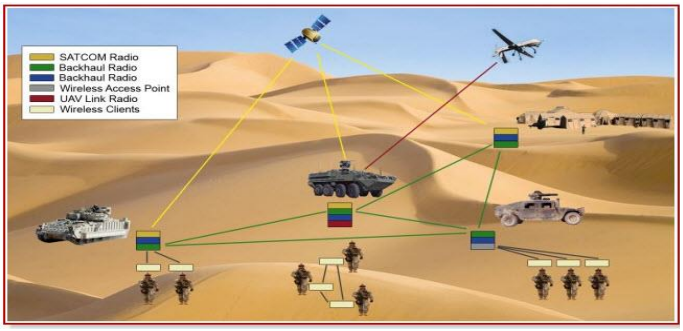

Fig.5: Area monitoring in military

2. Health care monitoring: The medical applications can be of two types: wearable and implanted. Wearable devices are used on the body surface of a human or just at close proximity of the user. The implantable medical devices are those that are inserted inside human body. There are many other applications too e.g. body position measurement and location of the person, overall monitoring of ill patients in hospitals and at homes. Body-area networks can collect information about an individual's health, fitness, and energy expenditure.

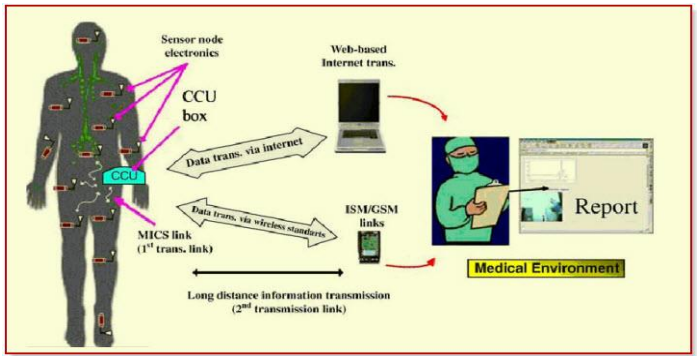

Fig.6: health care monitoring

3. Home Energy Consumption: A Wireless-sensor-network-based system is used in high energy requiring home appliances like white goods, audio/video devices, communication equipment, air conditioning systems, heating and cooling system.

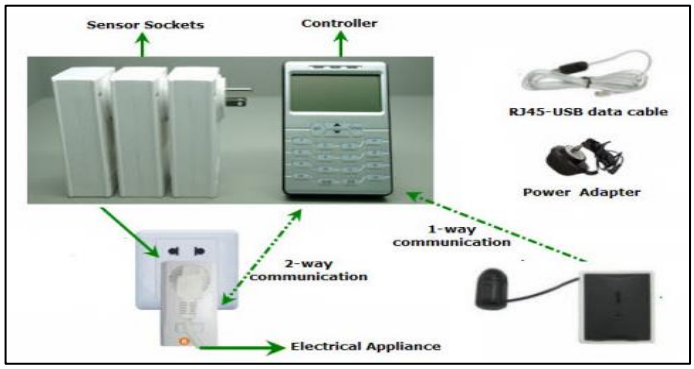

Fig.7: home energy consumptions

4. Mobile and Wireless Sensor Network based application to create a farm field monitoring and plant protection for sustainable crop production and poverty reduction.

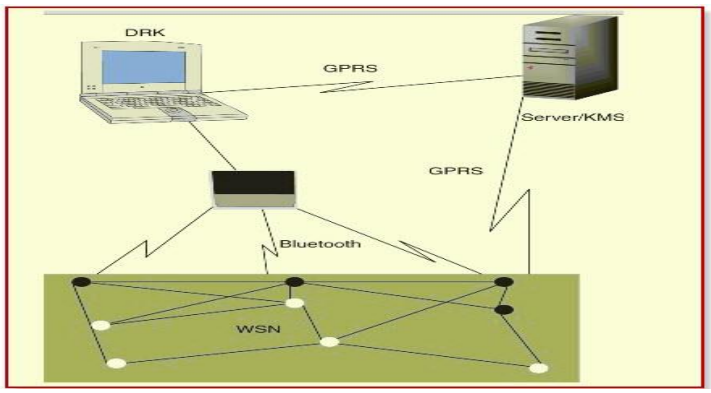

Fig.8: farm field monitoring and plant protection

5. Air pollution monitoring: deployed in several cities to monitor the concentration of dangerous gases for citizen.

Fig.9: Air pollution monitoring

Some other major applications are:

- Landslide detection
- Water quality monitoring
- Natural disaster prevention
- Data center monitoring
- Data logging
- Water/waste water monitoring
- Structural health monitoring

Conclusion

The energy efficiency is one of the main design challenges of protocols for WSNs due to the limited energy resources of sensors. WSN have the common objective of trying to extend the lifetime of the sensor network, while not compromising data delivery. Data redundancy should be removed and network performance.

Refrences

1. Anjali, Anshul Garg and Suhali "Distance Adaptive Threshold Sensitive Energy Efficient Sensor Network (DAPTEEN) Protocol in WSN" 2015 conference (ISPCC).
2. Harneet Kour1 Ajay K Sharma," Performance Evaluation of HEED and H-HEED Protocol for Realistic Models in WSN" IEEE International Conference on Computer, Communication and Control (IC4-2015).
3. Xin Tan and S.S. Iyengar, "Localization in Cooperative Wireless Sensor Networks: A Review,"
4. M. R. Ghafouri Fard, "Angle of Arrival Localization for Wireless Sensor Networks,"
5. Ravi chander Janapati, H.C. So, W.K. Ma, Y.T. Chan, ''Received Signal Strength Based Mobile Positioning via Constrained Weighted Least Squares,'' Proc. of Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP 2003), vol. 5, 2015.
6. Kai Yik Tey, H. Lichtenegger, and J. Collins, Global Positioning System: Theory and Practice, 3 rd Ed. New York, NY: Springer-Verlag, 2014.
7. Chen Liang, H. Balakrishnan, E. Demine, and S. Teller, "Anchor Free Distributed Localization in Sensor Networks," Tech Report "Designing a positioning system for finding things and people indoors,".
8. Hanen Ahmadi, C. Lanzl, "Designing a positioning system for finding things and people indoors," *Spectrum, IEEE,* 35(9), 71-78, 2013.
9. [9] Yao-Hung Wu, "A distributed location system for the active office," *IEEE Network*, 8(1), 62-70, 2013.
10. Neal Patwari and V. Padmanabhan, "RADAR: An in-building RF-based user location and tracking system" *Proc. Of INFOCOM,* pp. 775–784, March 2013.
11. S. Alireza Motevallian, A. Chakraborthy, and H. Balakrishnan, "The cricket location support system," *Proc. of ACM/IEEEInt. Conf. on Mobile Computing and Networking (MOBICOM),* August 2013.
12. Mostafa Mofarreh-Bonab, J. Heidemann, and D. Estrin. "GPS-less Low Cost Outdoor Localization for Very Small Devices," *IEEE Personal Communications Magazine*, 7(5), 28-34, Oct. 2013.
13. Liang Yuan, H. Shrobe and J. Bachrach, "Organizing a Global Coordinate System from Local Information on an Ad Hoc Sensor Network,"
14. Bin Li, H. Park and M.B. Srivastava, "The n-Hop Multilateration Primitive for Node Localization Problems," Mobile Networks and Applications, 8, 443-451, 2013.
15. Sol Lederer, Chu Du, Li Shu, Gerhard Hancke, Jianwei Niu, and Huansheng Ning, "An Energy-Balanced Heuristic for Mobile Sink Scheduling in Hybrid WSNs", IEEE Transactions On Industrial Informatics (2015), 1-12.