Connectivity Restoration In Partitioned WSN, A Review

Qurat Ul Ain, [2]Amit Jain
[1]Student, [2]Assistant Professor
Panchkula Enginerring College
Panchkula, India

***Abstract* - Partitioning in wireless sensor network is an important aspect of research in wireless networks. Clusters or partitions in the network can be formed on the basis of either geographical area of the nodes or on the basis of some performance parameters. Also the nodes which form the cluster are either homogenous or heterogeneous in nature. In this paper a review of the various techniques proposed in recent past and compared on the basis of parameters like end to end delay and throughput. In future various improvements in the recent technique must be implemented which reduces the relay nodes in the network.**

***Keywords* - WSN, Partitioning**

I. INTRODUCTION

In most wireless sensor network (WSN) applications nowadays the entire network must have the ability to operate unattended in harsh environments in which pure human access and monitoring cannot be easily scheduled or efficiently managed or it's even not feasible at all. Based on this critical expectation, in many significant WSN applications the sensor nodes are often deployed randomly in the area of interest by relatively uncontrolled means (i.e., dropped by a helicopter) and they form a network in an ad hoc manner [1]. Moreover, considering the entire area that has to be covered, the short duration of the battery energy of the sensors and the possibility of having damaged nodes during deployment, large populations of sensors are expected; it's a natural possibility that hundreds or even thousands of sensor nodes will be involved [2]. In addition, sensors in such environments are energy constrained and their batteries usually cannot be recharged. Therefore, it's obvious that specialized energy-aware routing and data gathering protocols offering high scalability should be applied in order that network lifetime is preserved acceptably high in such environments [3]. Naturally, grouping sensor nodes into clusters has been widely adopted by the research community to satisfy the above scalability objective and generally achieve high energy efficiency and prolong network lifetime in large-scale WSN environments [4].

Partitioning is one of the most popular unsupervised learning techniques (i.e. used for connecting the causative gap between input and output observation) [5]. Partitioning is "the process of organizing objects into groups whose members are similar in some ways". Basically, partitioning is to find the internal set of unlabeled information. In partitioning, we organize the information in the form of packets. A sensor is susceptible to failure due to the small form factor and limited onboard energy supply. Moreover, a WSN deployed in a harsh environment is susceptible to partitioning due to:

(i) A failure of a single node caused by battery depletion, malfunction of external hazard, if the faulty node is a cut vertex.
(ii) Simultaneous failure of multiple collocated nodes.
(iii) Connected Restoration algorithm in a partitioned WSN with Assured Fault Tolerance (CRAFT) also choose to: (i) reduce the maximum path length between pairs of segments in order to Help in bounding the inter-partition data latency, and (ii) boost the average node degree in order to further provide route alternatives and enable load balancing.
(iv) CRAFT strives to identify an inner ring formed by exploiting the Steiner Point (SPs) which connect outer partitions with the fewest relays based on which non-ring partitions are bi-connected by exploiting the found SPs to the ring.

II. LITERATURE SURVEY

Lee, Sookyoung, Mohamed Younis et al. 2015 [1] this paper presented CRAFT which is a novel approach that forms a bi-connected network topology by populating relay nodes. CRAFT strives to reduce the required relay count and make the resulting topology efficient with respect to connectivity. It first identifies a backbone ring BP constructed around at the core of the area of interest where no partitions lies inside and then bi-connect each partition to the BP based on proximity. The simulation results have demonstrated the effectiveness of CRAFT and highlighted its performance advantages over competing techniques in the literature.

Dang, Ha, and Hongyi Wu. et al. 2010 [2] in this paper distributed partioning approach has been presented which is used for delay tolerant mobile networks. The main goal in this paper is to attain stability which becomes the main challenges in distributed clustering approach. Final simulation is being carried out in order to evaluate the effectiveness and efficiency of the cluster based routing. The performance indicates that the proposed scheme attained higher delivery ratio, end to end delay and lower overhead.

Abbasi, Ameer Ahmed, Kemal Akkaya et al. 2007 [3] proposed Distributed Actor Recovery Algorithm that is efficiently restoring the connectivity of the inter-actor network that has been affected by the failure of an actor. The main goal is to find the

least set of actors that should be repositioned in order to establish connectivity among disjoint network partitions. Distributed Actor Recovery Algorithm strives to localize the scope of the recovery process and minimize the movement overhead imposed on the involved actors. The simulation results indicate that the proposed approach is very effective.

Imran, Muhammad, Mohamed Younis et al. 2012, [4] this paper presents DCR, a novel distributed partitioning detection and connectivity restoration algorithm to tolerate the failure of actors. DCR proactively identifies actors that are critical to the network connectivity based on local topological information, and designates appropriate, preferably non-critical, backup nodes. The proposed algorithms strive to avoid procrastination, localize the scope of recovery and minimize the movement overhead. Simulation results validate the performance of the proposed algorithms.

Chen, Ing-Ray, Anh Phan Speer et al. 2011 [5] Propose adaptive fault-tolerant quality of service (QoS) control algorithms based on hop-by-hop data delivery utilizing "source" and "path" redundancy. The main aim is to satisfy the application QoS requirements. Numerical data are presented and validated through extensive simulation, with physical interpretations given, to demonstrate the feasibility of our algorithm design.

Enan A. Khalil, Bara'a A. Attea et.al 2011 [6] presented energy aware routing protocol for clustering. The main objective of the paper is to provide effective results in comparison with the protocol which already exist. This proposed protocol assured better results in terms of energy consumption and stability period.

Imran, Muhammad, Abas Md Said et al. 2010 [7] a novel distributed partitioning detection and connectivity restoration algorithm has been proposed. PCR proactively identifies critical actors based on local topological information and designate appropriate backup nodes (preferably non-critical) to handle their failure. A backup actor detects the failure and initiates a recovery process that may involve coordinated multi-actor relocation. The purpose is to avoid procrastination, localize the scope of recovery process and minimize the movement overhead.

Abas Md Said, and Halabi Hasbullah et al. 2010, [8] this paper presents VCR, a novel distributed algorithm that opts to repair severed connectivity while imposing minimal overhead on the nodes. In VCR the neighbors of the failed actor volunteer to restore connectivity by exploiting their partially utilized transmission range and by repositioning closer to the failed actor. Furthermore, a diffusion force is applied among the relocating actors based on transmission range in order to reduce potential of interference, and improve connectivity.

III. CONCLUSION

Relay or ferry node placement in the wireless sensor networks is an important issue of concern in recent years. Many approaches are proposed by the researchers in recent times which uses the relay nodes an important addition in the network from the point of view of energy consumption. Relay nodes only serve the purpose of providing the communication between source and destination, it will not generate any sensor data. These approaches are implemented and compared with the existing techniques and an analysis is performed on the basis of their merits and demerits. In few of the techniques a bi connected network topology CRAFT is proposed and implemented which identifies the backbone ring and send data according to the ring data. Number of nodes to be used between the partitions is an area of concern and be improved in the future work.

IV. REFERENCES

[1] Lee, Sookyoung, Mohamed Younis, and Meejeong Lee. "Connectivity restoration in a partitioned wireless sensor network with assured fault tolerance." *Ad Hoc Networks* 24 (2015): 1-19.

[2] Dang, Ha, and Hongyi Wu. "Clustering and cluster-based routing protocol for delay-tolerant mobile networks." *IEEE Transactions on Wireless Communications* 9, no. 6 (2010): 1874-1881.

[3] Abbasi, Ameer Ahmed, Kemal Akkaya, and Mohamed Younis. "A distributed connectivity restoration algorithm in wireless sensor and actor networks." In*Local Computer Networks, 2007. LCN 2007. 32nd IEEE Conference on*, pp. 496-503. IEEE, 2007.

[4] Imran, Muhammad, Mohamed Younis, Abas Md Said, and Halabi Hasbullah. "Localized motion-based connectivity restoration algorithms for wireless sensor and actor networks." *Journal of Network and Computer Applications*35, no. 2 (2012): 844-856.

[5] Chen, Ing-Ray, Anh Phan Speer, and Mohamed Eltoweissy. "Adaptive fault-tolerant QoS control algorithms for maximizing system lifetime of query-based wireless sensor networks." *Dependable and Secure Computing, IEEE Transactions on* 8, no. 2 (2011): 161-176.

[6] Khalil, Enan A., and A. Attea Bara'a. "Energy-aware evolutionary routing protocol for dynamic clustering of wireless sensor networks." *Swarm and Evolutionary Computation* 1, no. 4 (2011): 195-203.

[7] Imran, Muhammad, Mohamed Younis, Abas Md Said, and Halabi Hasbullah. "Partitioning detection and connectivity restoration algorithm for wireless sensor and actor networks." In *Embedded and Ubiquitous Computing (EUC), 2010 IEEE/IFIP 8th International Conference on*, pp. 200-207. IEEE, 2010.

[8] Mohamed Younis, Abas Md Said, and Halabi Hasbullah. "Volunteer-instigated connectivity restoration algorithm for wireless sensor and actor networks." In *Wireless Communications, Networking and Information Security (WCNIS), 2010 IEEE International Conference on*, pp. 679-683. IEEE, 2010.

.