IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 11, November 2015

Virtual Clustering Based Routing For Power Heterogeneous Manets

M. Vevagananthan[1], Mr.P.Vijayakumar[2]

Research scholar, Department of Computer Science, Sri Jayendra Saraswathy Maha Vidyalaya College of Arts & Science, Coimbatore[1]

Head, Department of Computer Applications, Sri Jayendra Saraswathy Maha Vidyalaya, College of Arts & Science Coimbatore[2]

Abstract: In MANETs, network may consist of devices with multiple characteristics in terms of transmission power, energy, capacity etc. Especially in MANETs, network may consist of devices with multiple, nodes are likely to transmit at different power levels, thereby causing conversation links varying. This causes link asymmetry problem. The link asymmetry problem can be solved by using a cross layer approach without considering the benefits from high power nodes and collision may be avoided using carrier sensing. The presence of high power nodes in MANETs has its own advantages like coverage area and reduction in transmission delay. At the same time, disadvantages like interference and noise .The existing cross layer approach does not address the above problem. At this context, we are considering the problem of improving the routing performance of power multiple MANETs efficiently exploiting the advantages and avoiding the disadvantages of high power nodes mentioned above. In a power heterogeneous network such as mentioned above, there are high power nodes as well as low power nodes. Due to interference raised by high power nodes, the throughput of such networks will be severely affected. To address this issue a loose-virtual-clustering (LVC) based routing protocol is proposed.

Keywords: Mobile ad hoc networks, LRPH, power heterogeneous, routing protocol, geographical routing.

I. INTRODUCTION

Wireless communication has become an integral part of computing and communication over the last few years. This is because it uses electromagnetic waves to transmit data through space without any wires, which is inexpensive and more practical compared to wired communication. Such type of communication has been recently adapted with mobile devices to facilitate network connectivity. Mobile devices like laptops, Personal Digital Assistant (PDA) and mobile phones are Computing systems, this can easily move from one place to another. Mobility and capabilities of such kinds of devices and the idea of wireless communication have resulted in the introduction of wireless data mobile networks. Recently wireless mobile networks have drawn a lot of attention in the research community.

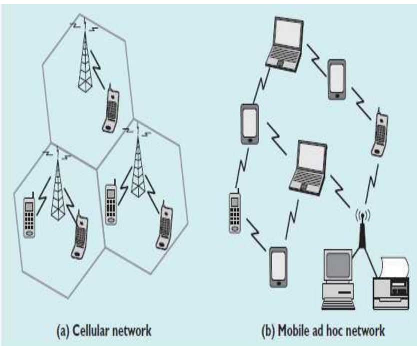


Figure 1.1 – Infrastructured and Infrastructureless network

Location awareness, network connectivity, quality of service (QOS), limited power supply, limited device capability, routing protocols, and medium access protocols are among the most issues under investigation with respect to wireless mobile networks .Wireless mobile networks are classified in two categories: infrastructure networks and ad hoc networks as shown in Figure1.1. A wireless network from the infrastructure category is a network with fixed and wired gateways called base stations.

A node in this network can communicate with the nearest base station in its coverage area. Wireless local area networks (WLAN) belong to this category. Ad Hoc Networks are self organizing, self healing, distributed networks which most often employ wireless communication techniques. "Ad Hoc" is actually a Latin phrase that means "for this purpose." This type of peer-to-peer system infers that each point, or user, in the network can act as a data endpoint or intermediate repeater. Thus, all users work to improve the reliability of network communications. These types of networks are also known as mesh networks due to the topology of network communications resembles a mesh. The redundant transmission paths provided by the ad-hoc mesh networks drastically improve fault tolerance for the network. Additionally, the ability for data packets to "hop" from one end to another end effectively extends the network coverage area and provides a solution to overcome non-line of sight (LOS) issues. Such scenarios require the use

DOI 10.17148/IJARCCE.2015.41197

of Mobile Ad hoc Networking (MANET) technology to ensure transmission routes are updated quickly and accurately.

MANETs

Mobile Ad-hoc Network MANETs are an autonomous collection of mobile devices such as laptops, smart phones, etc. That communicate with each other over wireless links and co-operate in a distributed manner in order to provide the necessary network functionality. This type of network, operating as a stand-alone network or with one or more multiple points of attachment to the cellular networks or Internet, paves the way for numerous new and exciting applications. Unlike infrastructured wireless networks, MANETs do not rely on a fixed infrastructure for its operation (Figure 1.2

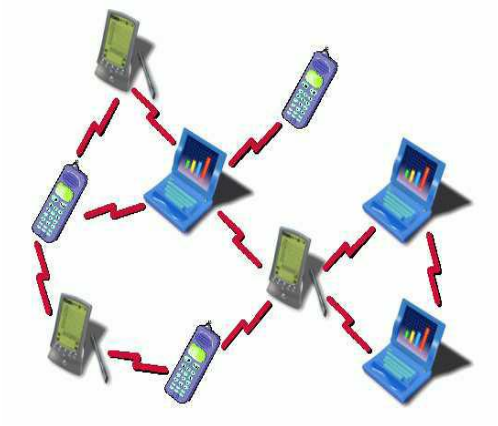


Figure 1.2 MANETs

II. REVIEW OF LITERATURE

Numerous routing protocol have been developed in the wireless networking community to target various scenarios, and much research effort has been paid through the taxonomy of ad-hoc routing protocol and to survey the representative protocols in different categories. Unfortunately, most of the existing protocols are limited to homogenous networks and perform ineffectively in power heterogeneous networks.

Peng Zhao, Xinyu Yang, Wei Yu, and Xinwen Fu [Peng Zhao, Xinyu Yang, Wei Yu, and XinwenFu, 2013] developed a loose-virtual-clustering-based (LVC) routing protocol for power heterogeneous MANETs i.e., LRPH. This protocol is compatible with the IEEE 802.11 distributed coordination function (DCF) protocol[1]. It does not rely on geographic information or multi radio multichannel and can be deployed on general mobile devices including laptops, personal digital assistant etc. LRPH takes the double-edged nature of high-power nodes into account. To exploit the benefit of high-power node, a novel hierarchical structure is maintained in LVC, where the unidirectional links are effectively detected. Clustering is the scheme to improve the performance of the network. In clustering, a loose coupling relationship is established between each node. Based on the LVC, LRPH is adaptive to the density of high-power nodes. High-power nodes with a larger communication range will create large interference areas and low channel spatial utilization. In such case, routing algorithms are developed to avoid packet forwarding via high-power nodes. From extensive analysis, simulations and real-world experiments the effectiveness of LRPH was validated. Simulation results show that LRPH achieves much better performance than the other existing protocols.

Multiclass (MC) [X. Du, D. Wu, W. Liu, and Y. Fang, 2006] is a position-aided routing protocol for power heterogeneous MANETs. The idea of multiclass is to divide the entire routing area into cells and to select a high power node in each cell as the backbone node (B-node)[2]. One B-node is maintained in each cell, and the routing among backbone node is very efficient and simply based on location and cell structure. A source discovers a route to destination in an on-demand way, and most of the routing activities (packet forwarding) are among B-nodes. This reduces the number of routing hops and make the routing more efficient and reliable, since B-nodes have large bandwidth, transmission range and are more reliable. Thus MC routing achieves good performance by exploiting node heterogeneity in many MANETs. Moreover, to further improve the performance of MC routing, a cross-layer approach was presented and a new medium access control (MAC) protocol was designed called Hybrid MAC (HMAC), to cooperate with multiclass routing. Extensive simulation results demonstrate that the MC routing achieves very good performance and out performs a popular routing protocol zone routing protocol in terms of reliability, scalability, route discover latency overhead as well as packet delay and throughput. Based on the cell structured and HMAC multiclass achieves better performance. However, a fixed cell makes MC to work well only in a network with high density of high-power nodes.

S. Yang, X. Yang, and H. Yang [S. Yang, X. Yang, and H. Yang, 2009] presented a cross-layer approach that simultaneously spans the MAC and network layers for multiple MANETs (HMANETs)to minimize the problems caused by link asymmetry and exploit the advantages of MANETs continuously. At the network layer, a multiple Location service (HLS) protocol was designed which is based on node's random distribution characteristics and take advantage of powerful node's high capability to achieve, low overhead, accurate location and high robustness. Second, based on HLS, Heterogeneous Position based Routing (HPR) protocol was proposed that rarely generates routing packets and adapts to different node densities. And finally a new multiple MAC (HMAC) protocol that closely ties in with the routing protocol to solve the MAC problems such as heterogeneous hidden terminal problem and failure of MAC Layer Acknowledgement[4]. It is seen that it work well in networks with a low density of powerful nodes, and can significantly reduce device cost (powerful nodes are usually more expensive than low power node). It scales well and can achieve good performance especially low end-to-end delay. It also provides robustness in case of failure in some powerful nodes. Simulation results show that HLR achieve very good high-layer performance in terms of control overhead, end-to-end delay and packet delivery ratio and HMAC significantly alleviate MAC problems caused by link asymmetry.

W. Liu, C. Zhang, G. Yao, and Y. Fang [W. Liu, C. Zhang, G. Yao, and Y. Fang, 2011] proposes across-layer-designed device–energy–load aware relaying DELAR framework that achieve energy conservation from multiple facets, including power of routing, communication scheduling, and power control[3]. DELAR mainly focuses on addressing the issue of energy conservation in. Main focus of this paper is multiple ad-hoc network, where most nodes, denoted as B-node, are equipped with limited power source like batteries, while some other nodes, denoted as P node, have relatively unlimited power supplies. First, following the cross-layer design philosophy, a Device-Energy-Load Aware Relaying framework, named DELAR, is proposed to achieve energy conservation by utilizing the characteristic of heterogeneity of node power capabilities. Second, a hybrid transmission scheduling scheme, is designed combining both the reservation-based and contention based medium access control schemes, to coordinate the transmissions among P-node and B-node, which attempts to make the best use of powerful nodes while controlling their interference to other ongoing transmissions. Third, "mini-routing" and asymmetric MAC (A-MAC) protocols are developed to support the MAC layer acknowledgement over unidirectional links due to the use of asymmetric transmission power levels between P-node and B-node. Finally, a multi- packet transmission technique is presented to further improve the delay performance. DELAR can reduce the energy consumption and this prolong the network lifetime even with just a few P-node placed in the network. With this framework, various energy conservation techniques such as power saving mode, transmission power control and power aware of routing can be integrated to jointly achieve better energy conservation. More importantly, this framework provides a platform to address other challenging issues such as QoS provisioning and security support as well. However, this scheme is hard to deploy, because it relies on global synchronization of network node and assume that all frames will be successfully transmitted.

My T. Thai, Ravi Tiwari , et.al.; (My T. Thai, Ravi Tiwari, and Ding-Zhu Du ,2008 and Yi-yuSu, Shiow-Fen Hwang and Chyi-ren Dow , 2008) proposed tunneling-based approaches to eliminate asymmetrical links by establishing reserve paths by multi hop low-power nodes, which are used to route control frames at the MAC layer[5]. These approaches hide unidirectional links from upper layer protocol to transparently facilitate their operation. With increasing the probability to access the channel from high-power node, these tunnel-based schemes could potentially increase collisions and reduce the spatial utilization of network channel resources. In this paper, the advantages of multi-hop acknowledgement are taken into consideration and clustering technique is employed to design an efficient hybrid routing protocol in ad hoc networks with unidirectional links.

V. Shah, E. Gelal, and S. V. Krishnamurthy [V. Shah, E. Gelal, and S. V. Krishnamurthy ,2007] proposes a cross-layer approach to establish the reverse paths for unidirectional links by integrating the topology information into the MAC layer. Several flaws exist in this scheme[6]. First, this scheme strictly assumes that the transmission range ratio between the high-power node and low power node is strictly set to 2 : 1. This limits the feasibility of this scheme in general network systems. Second, because each node maintain topology information within two hops, reserve paths may not be constructed successfully. Third, BW RES frames are flooded to all high-power nodes, incurring a high chance of collision to the network. Finally, this scheme fail to deal with timing issues related to routing control frames at the MAC layer through multi-hops.

K. M. Mahesh, R. D. Samir et.al.; [K. M. Mahesh and R. D. Samir, 2002 and T. Maekawa, H.Tada, N. Wakamiya, M. Imase, and M. Murata, 2006] studied the performance of three techniques for AODV for efficient operation in presence of unidirectional links, viz., Black Listing, Hello, and Reverse Path Search[7]. While Black Listing and Hello techniques explicitly eliminate unidirectional links, the Reverse Path Search technique exploits the greater network connectivity offered by the existence of multiple paths between nodes. It is observed that the Reverse Path Search technique performs the best because of its ability to explore multiple paths. It exhibits a dual advantage, both in terms of immunity from unidirectional links and from mobility-induced link failures. Besides, the performance study also revealed that 802.11 MAC performance degrades in the presence of unidirectional links. These observations suggest the need for more efficient MAC protocols to handle unidirectional links, as such links may be inevitable in certain ad hoc network scenarios (for example, a network of nodes with heterogeneous powers).

Yuefeng Huang, Xinyu Yang etal, Yuefeng Huang, Xinyu Yang, Shuseng Yang, Wei Yu, and Xinwen Fu, 2011 have developed a cross layer based on approach the several challenging problems raised by link asymmetry in mesh access networks working in an ad hoc model[8]. They developed algorithms to establish reverse paths for unidirectional link at the network layer and share the topologic information with the MAC layer. Novel handshake and channel reservation mechanism have been developed to address the multiple hidden and heterogeneous exposed problem at the MAC layer. Via theoretical analysis and extended simulations, it is proved that this approach is more efficient in terms of high throughput and incurs lower cost for Wireless MAN, in comparison with a few representative protocols.

III. PROPOSED SYSTEM

MANET networks consist of a multitude of tiny mobile nodes capable for wireless communication and a few powerful base stations. The mobile nodes usually perform some monitoring task (e.g., measure various

IJARCCE

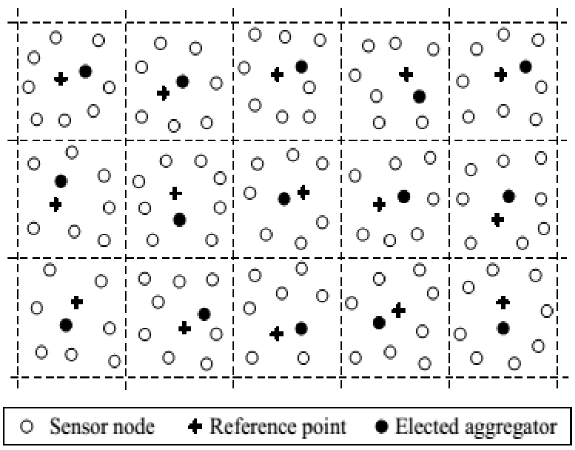
ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 11, November 2015

environmental parameters). The base stations collect sensor reading and forward them for further processing to a service center. Based on how the sensor readings reach the base station, synchronous and asynchronous sensor networks can be distinguished. In the synchronous case, the sensors readings are sent to the base station in real-time using multi-hop wireless communications, where the mobile nodes cooperatively forward data packets on behalf of other mobile nodes towards the base station. In the asynchronous case, the sensors readings are fetched by the base station after some delay example once every day or week. In this case the base stations are often mobile and they physically approach the sensors in order to fetch their data through a single wireless hop.

MODIFIED SYSTEM

We introduce PANEL is a position based aggregator node election protocol for wireless sensor networks. As its name indicates PANEL used for geographical position information of the nodes to determine which of them should be the aggregators. Like other aggregator node election protocol, PANEL also ensures load balancing in the sense that each node is elected aggregator nearly, equally and frequently. The salient feature of PANEL that makes it novel and different from other aggregator node election protocols is that besides synchronous application, PANEL also supports asynchronous application.



OVERVIEW OF PANEL

PANEL assumes that the mobile s nodes are deployed in a bounded area and this area is partitioned into geographical cluster. For simplicity in this paper, it assumes that the deployment area is a rectangle, and the clusters are equal size square. We emphasize however that the ideas behind PANEL are general, and PANEL could also be used for area and cluster form with more complex shapes. The clustering is determined before the deployment of the network, and each mobile node is pre-loaded with the geographical information of the cluster which it belongs to. In our simplified case, each mobile node is pre-loaded with the coordinates of the lower-left corner of cluster as well as with the size d of the cluster. In addition as we mention before each node I is aware of own geographical positions $\vec{P}_i$.

Geographical clustering in PANEL

At the beginning of each processing, a reference point $\vec{R}_j$ is computed in each cluster j by every node in a completely distributed manner. In fact the computation of the reference point depends only on the epoch number, and it can be executed by every node independently and locally. Once the reference point is computed, the nodes in the cluster elect the node that is the closest to the reference point as the aggregator for the given epoch. The aggregator node election procedures need communications within the cluster.

PANEL also includes a position-based routing protocol that is used in inter-cluster communications. As the nodes are aware of their geographical position, this seems to be a natural choice that does not result in additional overhead. The position-based routing protocol is used for routing messages from a distant base station or from a distant aggregator towards the reference point of a given cluster. Once the message enters the cluster, it is routed further towards the aggregator using the intra-cluster routing protocol based on the routing tables established during the aggregator node election procedure. Any position-based routing protocol can be integrated with PANEL. PANEL can also support reliable persistent data storage applications such as Tiny PEDS. Reliability can be achieved by replicating the data aggregated by the aggregator nodes at other aggregator nodes. For this purpose, the aggregator nodes need to be able to communicate with each other.

The routing protocols of PANEL can support this by routing the messages containing the replicated data using PANEL's position-based inter-cluster routing protocol towards the reference point of the selected backup cluster, and then switching to the intra-cluster routing protocol of PANEL to deliver the data to the aggregator of that cluster. In PANEL, the reference points of the clusters are re-computed and the aggregator election procedure is re executed in each epoch. This ensures load balancing in the sense that each node of the cluster can become aggregator with nearly equal probability.

IV. EXPERIMENTAL RESULTS AND DISCUSSION

The performance of clustering algorithms, LRPH and PANEL-GEAR are described. The following graph shows the Network Energy Consumption of LRPH and PANEL-GEAR. The energy consumption is increased when number of nodes increased. The PANEL algorithm reduces the energy consumption compared with existing LRPH algorithm. LRPH preferentially selects nodes with high energy consumption rate and hop count from the sink. But in PANEL the routing takes place based on location of nodes. PANEL clustering technique minimizes energy depletion throughout the network and prevents formation of energy holes and also increase the network lifetime. Energy holes are likely to occur when there is non-uniform depletion of energy in the network.

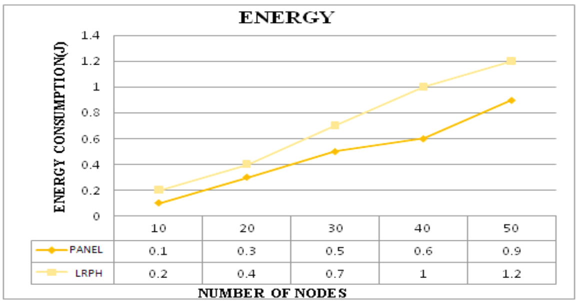


Figure: 4.1 Energy consumption of PANEL and LRPH

This graph shows that the PANEL has less energy consumption than the other existing system. This graph describes about energy consumption between method PANEL and LRPH. The energy consumed by LRPH is more than energy consumed by PANEL. Energy is measured by joules(J). For example figure 4.1, If Number of nodes is 10.energy consumed by PANEL is 0.1j and LRPH is 0.2

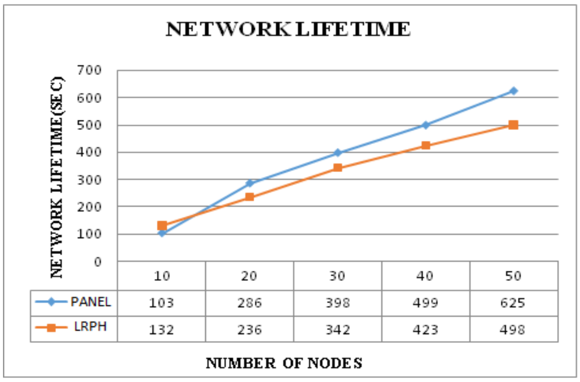


Figure:4.2 Network lifetime of PANEL and LRPH

This graph shows the comparison between PANEL and LRPH and PANEL gives higher lifetime than others. This graph describes about network lifetime between method PANEL and LRPH. The time taken by LRPH is more than PANEL. Time is measured by seconds. For example 4.2, If Number of nodes is 10,time taken by PANEL is 103s and LRPH is 132s.

V. CONCLUSION

In this paper, we have studied the problem of an energy and security in MANETs. First, we have characterized position based on a geometric analysis of the intersection of disks of cluster group. We have also computed a bound on the cluster field. Second we have proved that coverage connectivity of the cluster members. Third, we have proposed centralized, GEAR_PANEL protocols to solve the coverage problem in WSNs. It is also useful for applications that require data aggregation and those where all data originated from sources should reach the sink without prior aggregation. Our simulation results show that GEAR_PANEL is more energy-efficient than Existing method, with respect to the number of active sensors required for coverage and network operational lifetime.

Future work such as, First, we will extend our analysis to account for Poly sensors, same capability in terms of energy and their activity and communication ranges. Second, we plan to extend our work to 3D MANETs, such as underwater MANETs. Third, we are investigating stochastic models of activity and communication ranges. Fourth, we focus on group members and data forwarding in MANETs. Finally, our ultimate goal is to implement our protocols using a sensor-test bed to assess their applicability in real world applications.

REFERENCES

[1]. Peng Zhao, Xinyu Yang, Wei Yu, and Xinwen Fu, “A Loose-Virtual-Clustering based Routing for Power Heterogeneous MANETs,” IEEE transactions on vehicular technology, vol. 62, no. 5, June 2013.

[2] Y. Huang, X. Yang, S. Yang, W. Yu, and X. Fu, “A cross-layer approach handling link asymmetry for wireless mesh access networks,” IEEE Trans. Veh. Technol., vol. 60, no. 3, pp. 1045–1058, Mar. 2011.

[3] Wei Liu; Chi Zhang; Guoliang Yao; Yuguang Fang, “Delar: A device energy-load aware relaying framework for heterogeneous mobile ad-hoc networks eous networks, ”IEEE Journal on Selected Areas in Communications, vol. 29, no. 8, pp. 1572–1584,September 2011.

[4] X. Du, D. Wu, W. Liu, and Y. Fang, “Multiclass routing and medium access control for heterogeneous mobile ad hoc networks,” IEEE Trans. Veh. Technol., vol. 55, no. 1, pp.270–277, Jan. 2006.

[5] Y. Y. Su, S. F. Hwang, and C. R. Dow, “An efficient cluster-based routing algorithm I node hoc networks with unidirectional links,” J. Inf. Sci. Eng., vol. 24, no. 5, pp. 1409–
1428, 2008.

[6] A. Jeng and R.-H.Jan, “Adaptive topology control for mobile ad hoc networks,” IEEETrans. Parallel Distrib. Syst., vol. 22, no. 12, pp. 1953– 1960, Dec. 2011.

[7] C. H. Yeh, “The heterogeneous hidden/exposed terminal problem for power-controlled ad hoc MAC protocols and its solutions,” in Proc. IEEE 59th VTC, May 2004, pp. 2548–2554.

[8] H. Zhai “Physical carrier sensing and spatial reuse in multi rate and multi hop wireless ad hoc networks,” in Proc. IEEE INFOCOM, Barcelona, Spain, Apr.2006, pp. 1–12.

[9] Jie Wu and Fai Dai, “Virtual backbone construction in mantes using adjustable transmission ranges,” IEEE Transactions on Mobile Computing, vol. 5, no. 9, pp. 1188–1200, Sep. 2006.