Volume 6, Issue 12, December 2016 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Improved AODV Routing for Path Break Issue using Link Prediction Technique

Kirti Pandit
Computer Science Engineering, RGPV, Bhopal,
Madhya Pradesh, India

Abstract— The mobile ad hoc network is one of the most popular next generation technologies for communications. A number of networks such as VANET, WMN and the WSN are implemented with the help of similar concepts. But due to independent and frequent mobility in network the network suffer from various network level performance issues such as low throughput, frequent path break, frequent session establishments. Therefore a new technique is required to replace the traditional routing technology. In this presented work the key aim is to find the nodes which are going to be causes the path breaks by measuring their mobility conditions and the next prediction position of the concerned nodes. The proposed technique needs to be implementing with some probability model and with the radio strength based technique.

Keywords— VANET (Vehicle Ad-hoc Network), WMN (Wireless Mobile Network), WSN (Wireless Sensor Network) Mobility.

I. INTRODUCTION

Mobile Ad-hoc network is a wireless communication technique. In this network the nodes are frequently changes their positions, but the communication is carried out with their mobility. On the other hand the nodes are configured with the Wi-Fi devices thus the radio range for the communication is limited, therefore to communicate with the nodes that are far away from the radio range the relay concept is adopted in the network. In these conditions for finding the routes between the two nodes the routing techniques are used. The routing techniques are helps the network in two major phases first searching of shortest path between two nodes and secondly to maintain the routes during any issues occurred this phenomena is termed as the route maintenance. Wireless ad hoc network simulates some characteristics by which the network is differentiated from the other kind of networks.

- Each node acts as both host and router i.e. autonomous in behaviour.
- Multi-hop radio relaying- When a source node and destination node for a message is out of the radio range, the network is capable of multi-hop routing.
- Distributed nature of operation of security, routing and host constitution. A centralized firewall is absent here.
- The nodes can join or leave the network anytime, creating the network topology dynamic in nature.
- Mobile nodes are characterized with fewer memories, power and light weight features.
- The reliability, efficiency, stability and capacity of wireless links are often inferior when compared with wired links. This shows the patchy link bandwidth of wireless links.
- Mobile and spontaneous behaviour which demands minimum human intervention to configure the network.
- All nodes have identical features with similar responsibilities and capabilities and hence it forms a completely symmetric environment.
- High user density and large level of user mobility.
- Nodal connectivity is intermittent.

The above characteristics of MANET attract researchers in domain of MANET, but some key issues and challenges are also available which limit the performance and security of MANET. A MANET environment has to overcome certain issues of limitation and inefficiency. It contains [2]:

- The wireless link characteristics are time-varying in nature: There are transmission impediments like vanishing, path loss, blockage and interference that add to the susceptible behaviour of wireless channels. The steadfastness of wireless transmission is resisted by different factors.
- A limited range of wireless transmission – The limited radio band results in reduced data rates compared to the wireless networks. Hence the optimal usage of bandwidth is necessary by keeping low overhead as possible.
- Packet losses due to errors in transmission –MANETs experience higher packet loss due to factors such as hidden terminals that results in collisions, wireless channel issues (high BER), interference, and frequent breakage in paths caused by mobility of nodes, improved collisions due to the presence of hidden terminals and unidirectional links.

- Route changes due to mobility- The dynamic nature of network topology results in frequent path breaks.
- Frequent network partitions- The random movement of nodes often leads to the partition of the set of connections. This mainly affects the intermediate nodes.

II. CHALLENGES OF AD-HOC NETWORK

- Limited Bandwidth: Wireless link continue to have significantly lower capacity than infrastructure networks. In addition, the realized throughput of wireless Communication after accounting for the effect of multiple access, fading, noise, and interference conditions, etc., is often much less than a radio's maximum transmission rate.
- Dynamic topology: Dynamic topology membership may disturb the trust relationship among nodes. The trust may also be disturbed if some nodes are detected as compromised.
- Routing Overhead: In wireless ad hoc networks, nodes often change their location within network. So, some stale routes are generated in the routing table which leads to unnecessary routing overhead.
- Hidden terminal problem: The hidden terminal problem refers to the collision of packets at a receiving node due to the simultaneous transmission of those nodes that are not within the direct transmission range of the sender, but are within the transmission range of the receiver.
- Packet losses due to transmission errors: Ad hoc wireless network experiences a much higher packet loss due to factors such as increased collisions due to the presence of hidden terminals, presence of interference, unidirectional links, frequent path breaks due to mobility of nodes.
- Mobility-induced route changes: The network topology in an ad hoc wireless network is highly dynamic due to the movement of nodes; hence an on-going session suffers frequent path breaks. This situation often leads to frequent route changes.
- Battery constraints: Devices used in these networks have restrictions on the power source in order to maintain portability, size and weight of the device
- Security threats: The wireless mobile ad hoc nature of MANETs brings new security challenges to the network design. As the wireless medium is vulnerable to eavesdropping and ad hoc network functionality is established through node cooperation, mobile ad hoc networks are intrinsically exposed to numerous security attacks.

III. LITERATURE SURVEY

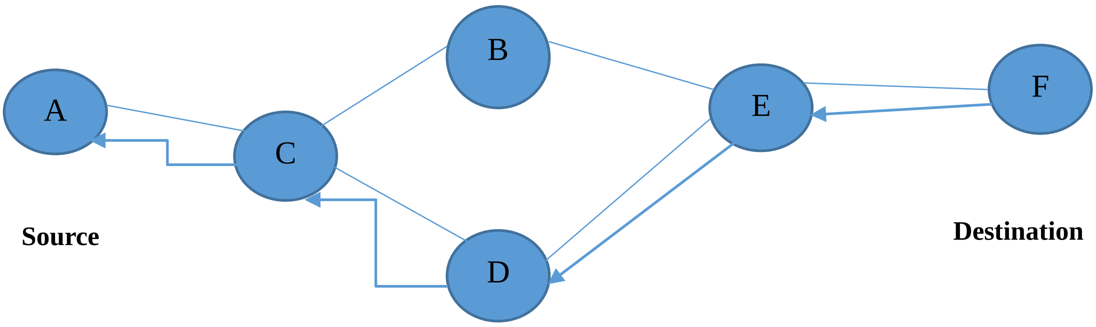
This section includes the different research article and the papers that are providing us guidelines for improving the network topology and performance using predictive techniques. Mobility of sensor nodes in wireless sensor networks significantly reduces the quality of services returned by broadcasting and routing protocols. ***Sibashrit Pattnaik et al [1]*** investigates the mobility factors in predicting the next location of sensor node to guarantee the accuracy of forwarding decisions. Based on historical location information and angular movement, node predicts the positions of one-hop neighbours. Since this work predicts the basic mobility behaviours of the sensor nodes (i. e. speed, direction and degree of randomness), it can be also used to estimate neighbourhood time, route reliability and so on. The simulation results show that the proposed work precisely estimates the next location of sensor nodes. Link estimation is a fundamental component of forwarding protocols in wireless sensor networks. In low power forwarding, however, the asynchronous nature of widely adopted duty-cycled radio control brings new challenges to achieve accurate and real-time estimation. First, the repeatedly transmitted frames (called wake-up frame) increase the complexity of accurate statistic, especially with bursty channel contention and coexistent interference. Second, frequent update of every link status exhausts the limited energy supply due to long duration of beacon broadcast. In this paper, ***Daibo Liu et al [2]*** propose meter (Distributed Frame Counter), which takes the opportunities of link overhearing to update link status in real time. Furthermore, meter does not only depend on counting the successfully decoded wakeup frames, but also counts the corrupted ones by exploiting the feasibility of ZigBee identification based on short-term sequence of the received signal strength. We implement meter in TinyOS and further evaluate the performance through extensive experiments on indoor and outdoor test beds. The results demonstrate that meter can significantly improve the performance of the state-of-the-art link estimation schemes. Timely segregation of connectivity-centric critical/non-critical nodes is extremely crucial in mobile ad hoc and sensor networks to assess network vulnerabilities against critical node failures and provide precautionary means for survivability. ***Muhammad Imran et al [3]*** presents a localized algorithm for segregation of critical/non-critical nodes (LASCNN) that opts to distinguish critical/non-critical nodes to the network connectivity based on limited topology information. Each node establishes and maintains a k-hop connection list and employ LASCNN to determine whether it is critical/noncritical. Based on the list, LASCNN marks a node as critical if its k-hop neighbour's become disconnected without the node, non-critical otherwise. Simulation experiments demonstrate the scalability of LASCNN and shows the performance is quite competitive compared to a scheme with global network information. The accuracy of LASCNN in determining critical nodes is 87% (1-hop) and 93% (2-hop) and non-critical nodes 91% (1-hop) and 93% (2-hop).

Wireless networks have evolved considerably in the recent years thanks to the advancement of technology that has made devices more portable, smarter, and more energy efficient. In particular, Mobile Ad hoc Networks (MANETs) that are formed without any centralized infrastructure, have received a lot of attention as they can be used in many real life applications. Yet, compared to static wireless networks, less academic research has been done on MANETs, especially when all the nodes are in continuous movement. In particular, ***Abedalmotaleb Zadin et al [4]*** consider MANETs that broadcast HELLO messages at regular time intervals in order to maintain dynamic neighbourhood information. The range of velocities of the nodes and the HELLO message interval duration can significantly affect the performance of routing protocols in MANETs. In this work, they study the effect of varying these two main characteristics on the performance of MANETs in terms of delivered packets and packets delivery ratio that reflect routing paths stability. Authors present a comprehensive experimental analysis of the effect of such variations on three position-based stability-oriented routing protocols, namely, Greedy-based Backup Routing (GBR), LEARN-based Backup Routing (LBR), and GBR combined with a Conservative Neighbourhood Range (GBR-CNR).

Network reliability of Wireless Sensor Networks (WSNs) is difficult to be evaluated because of its complexity, multi-states, and dynamic characteristics. To satisfy the user's need of reliability evaluation for network transmission we propose some evaluation models and a dynamical evaluation framework. The evaluation models are mission-oriented and based on transmission paths (uplink and downlink). The dynamic evaluation framework can be on-demand customized and it will be auto updated once the communication environment changes or the nodes fail. Finally, ***Xiaojuan Zhu et al [5]*** simulated clustered and mesh WSNs with NS-2. Simulation result shows that the proposed evaluation framework was effective and accurate.

IV. MOBILITY PREDICTION

Basic Mechanism: In our approach, we assume a free space propagation model, where the received signal strength solely depends on its distance to the transmitter. We also assume that all nodes in the network have their clock synchronized; for example, by using the NTP (Network Time Protocol) or the GPS clock itself. Therefore, if the motion parameters of two neighbors (such as speed, direction, and radio propagation range) are known, we can determine the duration of time these two nodes will remain connected. Assume two nodes i & j are within the transmission range r of each other. Let (xi ,yi) be the coordinate of mobile host i and (xj, yj) be that of mobile host j . Also let vi & vj be the speeds, and Θi and Θj ($0 \leq \Theta i, \Theta j < 2\Omega$) be the moving directions of nodes i and j respectively. Then, the amount of time two mobile hosts to destination node F. Nodes B, C, D and E forward the FLOW-REQ message and append information of their node IDs and the LET of the link that the message was received from. Therefore, two FLOW-REQ messages arrive at node F. One contains a path <A, B,C,E, F> with LETs =<4,4,3,6> , and the other contains a path<A ,B ,D ,E ,F> with LETs = <4,5,4,6 > Since RET is the minimum of the set of LETs for the route, node F obtains the RET for both routes. Path <A, B, D, E, F> is more stable since it has a larger RET value of four compared with three of path <A,B ,C ,E ,F>,and is chosen as the route to set up the flow. As shown in Figure 1, node then sends a FLOW-SETUP message and intermediate nodes set up the flow states.



V. DISTANCE VECTOR ROUTING PREDICTION

Distance vector routing protocol maintain the most recent routing information by exchanging route tables with neighbor nodes. The performance of distance vector protocols is very sensitive to the periodic update interval. In high mobility conditions, routes need to be updated more often and the update interval must be shortened to handle mobility. Shorter update intervals however, increase routing overhead.

We propose Distance Vector with Mobility Prediction. The protocol uses the route expiration time as the metric in the route table. Triggered update transmissions are eliminated because routes are established based on stability. Hence, routing update interval is relaxed and frequent updates are not required. In addition, using stable routes minimizes the disruption caused by mobility since a different route with a greater expiration time is used prior to a given route gets disconnected. To utilize the prediction information (LET and RET), mobility vector field must be appended to the route update packet. In addition, the RET metric is inserted into routing table entry. Each node periodically broadcasts a route table. A sequence number is issued when generating updates, and collisions. Finding the optimal flooding interval is critical in ODMRP performance. By using mobility prediction, ODMRP can adapt the flooding interval to mobility patterns and speeds. With the predicted time of route disconnection, query packets are only flooded when route breaks of ongoing data sessions are imminent.

VI. PREDICTION ACCURACY

So far we assumed nodes have simple mobility patterns (for example, no sudden change of direction and constant velocity). Under these conditions, we can accurately predict route disconnection times. This assumption however, cannot hold in some scenarios. A node accelerates, decelerates, and changes direction during movements. All these factors make Mobility prediction inaccurate since such events are generally not predictable. In Section IV, we investigate the impact of prediction accuracy on routing performance.

VII. CONCLUSIONS

In order to enhance the network performance of the traditional network routing protocols the following strategy is need to implement. Effectively delivering data packets and minimizing connection disruption are crucial in ad hoc networks. In this paper we examined the use of mobility prediction to anticipate topology changes and perform rerouting prior to route breaks. We applied mobility prediction mechanism to some of the most popular representatives of the wireless ad hoc Routing family, namely an on-demand unicast routing protocol, a distance vector routing protocol. Routes that stay connected longest are chosen by utilizing the mobility prediction. Simulation results indicate that with mobility prediction enhancements, more data packets were delivered to destinations.

REFERENCES

[1] Sibashrit Pattnaik, Arunanshu Mahapatro, "Energy Aware Mobility Prediction in Wireless Sensor Networks", 2015 International Conference on Technologies for Sustainable Development (ICTSD-2015), Feb. 04–06, 2015, Mumbai, India

[2] Daibo Liu, Zhichao Cao, Mengshu Hou, and Yi Zhang, "Frame Counter: Achieving Accurate and Real-Time Link estimation in Low Power Wireless Sensor Networks", IPSN '16, April 11-14, 2016, Vienna, Austria Copyright is held by the owner/author(s). Publication rights licensed to ACM. ACM

[3] Muhammad Imran, Mohamed A. Alnuem, Mahmoud S. Fayed, Atif Alamri, "Localized Algorithm for Segregation of Critical/Non-critical Nodes in Mobile Ad Hoc and Sensor Networks", Procedia Computer Science 19 (2013) 1167 – 1172, 2013 The Authors. Published by Elsevier B.V.

[4] Abedalmotaleb Zadin, Thomas Fevens, Taoufik Bdiri, "Impact of Varying Node Velocity and HELLO Interval Duration on Position-Based Stable Routing in Mobile Ad Hoc Networks", The 11th International Conference on Future Networks and Communications (FNC-2016), Procedia Computer Science 94 (2016) 353 – 358, 2016 Published by Elsevier B.V.

[5] Xiaojuan Zhu, Yang Lu, Jianghong Han, and Lei Shi, "Transmission Reliability Evaluation for Wireless Sensor Networks", Hindawi Publishing Corporation International Journal of Distributed Sensor Networks Volume 2016, Article ID 1346079, 10 pages

[6] Anita Yadav, Y. N. Singh, R. R. Singh, "Improving Routing Performance in AODV with Link Prediction in Mobile Adhoc Networks", Wireless Pers Commun (2015) 83:603–618 DOI 10.1007/s11277-015-2411-5, Springer Science+Business Media New York 2015

