IJARCCE

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

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 5, Issue 7, July 2016

Link Lifetime Prediction in Mobile Adhoc Network: A Survey

Ashish Kumar Awadhiya[1], Subodh Mishra[2], Vivek Sharma[3]

TIT College, RGPV, Bhopal, M.P. India[1, 2, 3]

Abstract: In the recent years, wireless technology has enjoyed a tremendous rise in popularity and usage, thus opening new fields of applications in the domain of networking. Without using any fixed structural support the information is exchanging in the network of mobile devices. Such networks are termed as ad –hoc network. One of the most important of these fields concerns mobile ad hoc networks (MANETs), where the participating nodes do not rely on any existing network infrastructure. Ad hoc On-Demand Distance Vector (AODV) is a widely used routing protocol for mobile ad hoc networks (MANETs). The nodes in the network are themselves responsible for routing the packets from the source to the destination. These nodes are also responsible to make the transfer of packets secure. In the mobile Adhoc network environment, a number of factors such as noise, physical obstructions mobility, and weather conditions contribute to the difficulty of accurately modeling the behavior of the lifetime of a link between two mobile nodes. Due to the inherently dynamic nature of the network topology, the current links are frequently broken, and new links are frequently established. Mobile Adhoc network requires reliability and security of data packets. The quality of service must satisfy end to end data packet delivery and no packet data loss. In this paper we provide survey on the effects of mobility on the link lifetime.

Keywords: MANET, residual link lifetime, velocity change detection, Quality of service, Route Discovery.

1. INTRODUCTION

Digital information [1] are growing using the networks of mobile devices anywhere at any time and becoming the need of today. Without using any fixed structural support the information is exchanging in the network of mobile devices. Such networks are termed as ad –hoc network.

In the recent years, wireless technology has enjoyed a tremendous rise in popularity and usage, thus opening new fields of applications in the domain of networking. One of the most important of these fields concerns mobile ad hoc networks (MANETs)[1], where the participating nodes do not rely on any existing network infrastructure.

Ad hoc On-Demand Distance Vector (AODV). The nodes in the network are themselves responsible for routing the packets from the source to the destination. It is a widely used routing protocol for mobile ad hoc networks (MANETs). These nodes are also responsible to make the transfer of packets secure. AODV is a approachable routng set of rules i.e.it founds a source to a endpoint only on request. In dissimilarity, the widely used routing protocols of the WWW are proactive, i.e. they find routing track autonomously of the usage of the paths. AODV is, as the name suggests, a distance vector routing protocol. It is also used for other wireless ad-hoc networks.

In the mobile Adhoc network environment, a number of factors [2] such as noise, physical obstructions mobility, and weather conditions contribute to the difficulty of accurately modeling the behavior of the lifetime of a link between two mobile nodes.

Due to the inherently dynamic nature of the network topology, the current links are frequently broken, and new links are frequently established. Mobile Adhoc network requires reliability and security of data packets. The quality of service must satisfy end to end data packet delivery and no packet data loss. Data packets routed between a sender node (source) and a receiver node (destination) of a MANET often traverse along a path spanning multiple links, which is known as the multihop path. Residual link lifetime (RLL)[3] in mobile ad hoc networks (MANETs) can be find using the distances between the link's nodes. Random measurement errors are the dominant factor in prediction inaccuracy. In this paper we provide survey on the effects of mobility on the link lifetime.

The rest of the paper is organized as follows.
Section 2 provides the MANET, routing and background related to MANET and link lifetime prediction. Section 3 represents literature survey related to life time prediction, detection and failure. Section 4 provides the worked already done related to life time prediction and its algorithm. Section 5 concludes the paper with a summary of the survey and discussion of future research directions.

2. BACKGROUND

To set up the network for the nodes for short period of time is objective of the of ad-hoc network. A mobile ad hoc network is a collection of wireless nodes that can be rapidly deployed as a multi-hop packet radio network

 DOI 10.17148/IJARCCE.2016.57149

IJARCCE

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

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified

Vol. 5, Issue 7, July 2016

without the aid of any existing network infrastructure or centralized administration. Therefore, the interconnections between nodes are capable of changing on continual and arbitrary basis. Nodes within each other's radio range communicate directly via wireless links, while those that are further apart use other nodes as relays. Manet is a network which works on concept of having network without any infrastructure. Such network consists of mobile nodes which are free to move. They come together for a span of time for give and take process means to receive and give the information in return.

All information is used by each device, can be assumed as producers and consumers in an ad-hoc network. While nodes are moving in the network they interchange the information to each other and may continue to move here and there and so the network must be prepared. Ad hoc network decreases the dependence of infrastructure and deploy the speed. Mobile devices are not having the centralized control, therefore they are free to move, and hence the topology of such network changes expeditiously. The study and growth of mobile devices and 802.11 Wi-Fi wireless networks is on demand topic of research in manet. Since the mid of 90's many research paper appraise working abilities of protocols by assuming variations of mobility in degrees with the space boundations. A MANET is a gathering of wireless nodes that can dynamically be set up anytime and anywhere without using any pre existing network arrangement.

The main wireless communication objectives are low node cost, small node size, low power consumption, scalability, self-configurability, better channel utilization, fault tolerance, adaptability, Qos support and security. Nodes in WSNs are disposed to letdown due to hardware letdown, energy reduction, communication link faults, mischievous attack, and so on.
Some of the applications of MANET are: Military drill or police routine, Disaster relief operations, Mine site operations, Urgent meetings, Robot data acquirement, Packet radio network, Commercial application like third generation network.

Regardless of the attractive applications, the features of MANET introduce several challenges that must be studied carefully before a wide commercial deployment can be expected. These include Routing, Security and Reliability, Quality of Service (QoS), Internetworking, Power Consumption.

MANET routing protocols

Table 2.1 Routing protocols

	Reactive Protocol	Proactive Protocols
Link State Protocols	DSR, TORA	OLSR, TBRPF, TORA, LANMAR/FSR
Distance Vector Protocols	AODV	DSDV
Distance Vector Protocols	AODV	DSDV

Link state protocols [4] - Routers using a link state routing protocol maintain a full or partial copy of the network topology and costs for all known links.

Distance-vector protocols - Routers using a distance-vector protocol keep only information about next hops to adjacent neighbors and costs for paths to all known destinations.

3. LITERATURE SURVEY

Although single link failures are more common, multiple link failures occur due to shared risks such as failure of a link while another link is under maintenance, or natural disasters that cause links traversing a region to fail. In [5], the authors use monitoring paths and cycles to localize single link and Shared Risk Link Group (SRLG) failures. They also prove that (k+ 2) - edge connectivity was necessary and sufficient to uniquely localize all SRLG failures involving up to k links with one monitor. In practice, however, not all sensor networks can satisfy this strict condition, especially in the cases we spread the sensor nodes randomly in the area of interest. In addition, in most cases we are not allowed to set any more monitors after the deployment. What we expect is to utilize the rule-free probes (i.e., without computing the exact probing paths) to achieve link scan. One of the most peculiar routing characteristics of WSN is routing dynamics. It is not surprising that a sensor node frequently changes its parent to forward packets. Unfortunately, many existing approaches just aim to detect the faulty links which had been behaving badly, but fail to offer an inspection on other unused ones, thus have no guidance to reroute when the current routing strategy is less than satisfactory. To solve the above problems, in this work we propose Link Scanner (LS), a passive and rule-free detection approach for discovering faulty links in sensor networks. The object of LS is to provide a blacklist containing all possible faulty links. With such a blacklist, further analysis and recovery processes become possible, including (i) exploring the root causes of observed symptoms in the network, (ii) adjusting routing strategy for the related nodes, (iii) offering the spare list of links for every node. As a result, we not only achieve the goal of diagnosis, but also take a big picture of wholly link performance.

To maintain a sensor network running in a normal condition, many applications in flooding manner are necessary, such as time synchronization, reprogramming, protocol update, etc. In the flooding process, each node is expected to receive multiple probe messages through different paths. By embedding lightweight data into the flooding packet, LS passively collects hop counts of received probe messages at sensor nodes. Since faulty links may cause probes dropped, there must be mismatches between the received hop counts in sensor nodes and expectations according to the topology. With a probabilistic and heuristics based inference model, LS analyzes the mismatches and deduces the faulty links.

A wireless network often contains a large number of links which virtually exist in the air, but can never directly observe whether they perform well or not. Proposes a passive and low-cost link scanning scheme LS for faulty link detection. LS infers all links statuses on the basis of data collection from a prior probe flooding process, in which leverage hop count to reflect the in/out-going link performances. In the inference model, use DLP[5] to describe the inner relationship among the links, and finally output the optimal fault report with some constraints, which reversely generates a feedback for DLP's next computation. The algorithm through a testbed consisting of 60 TelosB sensor motes and an extensive simulation study, while a real outdoor system is deployed to links including those potential but not used ones in sensor networks. Item According to the exceptional features of sensor networks, develop an efficient investigation marking scheme that exposes the innermost dependencies of sensor networks. Link scanner proposes characterized implication models to get the multi-level dependences between the network elements and accomplish great precision. Further introduce a learning-based inference scheme which increases the inspection accuracy and is thus scalable for large scale networks. A field study on a real outdoor deployment is also presented to verify that LS is practical to surveillance networks.

The reliability [6] of individual links' performance is crucial in these applications, e.g., in a surveillance network, the transmissions must be reliable to avoid false alarms and missed detections. Compared to the wired networks, it seems much more essential to detect link faults rather than node faults in WSNs. A wireless link itself virtually exists, which means we can't directly observe and assess whether it performs well or not. It proves difficult to localize the faulty links under a dynamic mal-condition in the wild, for the link quality will be significantly impacted by the natural environment like trees in the forest and flow in the ocean. Multi-hop networks suffer more harm than single- hop networks due to link failures. Accordingly, compared to single-hop networks, faulty link detection becomes more difficult in the multi-hop networks due to topology features. Therefore, faulty link detection becomes one of the most critical issues in multi-hop network diagnosis. One of the most peculiar routing characteristics of WSN is routing dynamics. It is not surprising that a sensor node frequently changes its parent to forward packets. Unfortunately, many existing approaches just aim to detect the faulty links which had been behaving badly, but fail to offer an inspection on other unused ones, thus have no guidance to reroute when the current routing strategy is less than satisfactory. The object of link scanner is to provide a blacklist containing all possible faulty links. With such a blacklist, further analysis and recovery processes become possible, including exploring the root causes of observed symptoms in the network, adjusting routing strategy for the related nodes, offering the spare list of links for every node.

That is, a link is considered alive or up when the Euclidean distance between the link's two nodes is less than the minimum of the two transmission ranges of the nodes; otherwise, the link is deemed broken or down.
The full link lifetime (FLL)[4] is defined as the time duration from the moment the two nodes enter each other's transmission range until the time that the link breaks. The residual link lifetime (RLL) at some time t ($0 \le t \le$ FLL), denoted as RLL(t), is the time duration from t until the time at which the link breaks, i.e., RLL(t) + t = FLL. For t > FLL, RLL(t) = 0. The residual path lifetime (RPL) at some time t is the minimum of the RLLs of its constituent links, and it is denoted as RPL(t).

The ability to characterize statistically RPL(t) would facilitate better prediction of the times at which a path breaks, allowing us to plan ahead and to take appropriate measures of protecting data in transit before the breakage occurs. Such a prediction would first require the residual lifetime estimation of the constituent links of the path. In this paper, we propose a mobile-projected trajectory (MPT)[4] algorithm that estimates the relative trajectory between two nodes of a link from periodically measured distances between the nodes. Using the relative trajectory, the MPT estimates the link's RLL. To account for velocity changes during the link's lifetime, the MPT is augmented with a velocity-change detection (VCD) test. The new algorithm, which is referred to as MPT-VCD, significantly improves the RLL prediction accuracy. As we shall see, neither MPT nor MPT-VCD requires any information about node velocity or its position.

Mobile-projected trajectory (MPT) algorithm, which estimates the relative trajectory between two nodes from periodical measurements of the distances between them. Using the relative trajectory, the algorithm estimates the RLL of the link between the two nodes.
Performance evaluation demonstrates robustness in RLL prediction for piecewise-linear trajectory and multiple velocity changes during the link lifetime.

4. RELATED WORK

Associated to the wired networks, it seems considerable more important to sense link faults rather than node responsibilities in WSNs. A wireless link itself nearly exists, which means we can't directly see and appraise whether it achieves well or not. It demonstrates problematic to localize the broken-down links under a dynamic mal-condition in the remote, for the link quality

IJARCCE
ISSN (Online) 2278-1021
ISSN (Print) 2319 5940
International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 5, Issue 7, July 2016

will be meaningfully impacted by the natural environment like flow in the ocean and trees in the forest. Damaged link discovery becomes more difficult in the multi-hop networks due to topology structures. Damaged connection detection plays a noteworthy role in network failure detection and network administration. Technique enthusiastically detects the damaged link and immediately report to the system and performs data transmission with secure route. Here verification framework is used to remove outside competitors and guarantee that only permissible nodes accomplish certain operations. The key is used for secure data transmission. The backup route cache is fetched from the backup node to check link damage failure. This message is used by backup node to replace the contents of data packet. This packet is used to inform all the nodes about route changes in the network. After getting the message source node S directs the packets with new and secured node.

Key calculating is the important steps in work. The key is used for secure data transmission. The next step is secure node verification which verifies the node for secure data transmission. Damaged connection detection plays a noteworthy role in network failure detection and network administration. Technique enthusiastically detects the damaged link and immediately report to the system and performs data transmission with secure route. Technique enthusiastically detect the damaged link and immediately report to the system and perform data transmission with secure route. Damaged link detection becomes more problematic in the multi-hop networks due to topology structures. Damaged link discovery plays an important part in network failure detection and network management. After detection of damaged link data can be securely transferred to the destination and improve the performance of wireless sensor network. The data transmission is possible only if like failure does not occur in wireless sensor network. In any circumstances if link down the network cannot continue to transfer the data to destination.

With the help of reverse route the node will send link damage message to the upstream node. This error message is used by node to detect link failure in the wireless sensor network. This error message is used by node to change the protected and backup route for better data transmission.
The backup route cache is fetched from the backup node to check link damage failure. This message is used by backup node to replace the contents of data packet. This packet is used to inform all the nodes about route changes in the network. After getting the message source node S directs the packets with new and secured node.

Using the observation that some link lifetimes are extremely long, Korsnes et al. [6] modeled the link lifetime as a heavy-tailed distribution. They proposed a prediction criterion, whereby a link with an older age is assumed to have a longer expected RLL. Gerharz et al. [7] used a histogram of FLL from statistics collected by simulations to probabilistically compute the RLL. Subsequently, they proposed several strategies of finding stable paths with link-age-based criteria [8]. Hua and Haas [9] studied the behavior of RLL as a function of link age under different mobility models through simulations and proposed several path-selection algorithms for MANETs [10].

Some published works aim to estimate the link and route lifetimes by employing parameters that characterize network dynamics. Priyadharshini and ThamaraiRubini [11] developed an algorithm that utilized the energy consumption to predict the node and link lifetime, from which the least dynamic routing path is computed. Karthik and Senthilbabu [12] proposed a routing protocol that reduced the node energy consumption to increase the network lifetime. Kumar et al. [13] developed a route-selection algorithm by computing link lifetimes to choose the least dynamic route; the link lifetimes were computed by the energy drain rate and estimated relative motion between the nodes. Chen et al. [14] proposed a model to study the detection of the acoustic channel state to predict link and route interruption in an underwater acoustic sensor network; the link interruption prediction was achieved by assuming periodicity of some environmental changes. Zhang et al. [15] studied the effects of node mobility and energy consumption on node and link lifetimes, and they applied the estimated node and link lifetimes to predict the route lifetime. Noureddine et al. [16] proposed a link lifetime-prediction algorithm applicable to greedy and contention-based routing; it required the input of node position, speed, and direction for computing the link lifetime.
A number of works employing distance measurements for various objectives have been published in the literature.

Su et al. [17] computed the link expiration time between two neighboring nodes, with velocity and location information provided by the GPS. Savvides et al. [18] employed the time-of-arrival (ToA) ranging technique to obtain distance measurements for node localization in a stationary wireless sensor network. The technique relies on a few beacon nodes, which possess precise position information provided by either predeployment manual configuration or GPS. Guan et al. [9] employed a link-duration method for provision of cognitive capability to routing protocols.
In contrast with previous works, algorithm does not necessitate GPS support, is designed for a network with mobile nodes all with basic functionality, requires no beacon nodes to provide location information, and treats the case where the velocity does not remain constant.

5. CONCLUSION

Digital information are growing using the networks of mobile devices anywhere at any time and becoming the need of today. MANET is a network which works on concept of having network without any infrastructure.

Regardless of the attractive applications, the features of MANET introduce several challenges that must be studied carefully before a wide commercial deployment can be expected. These include Routing, Security and Reliability, Quality of Service (QoS), Internetworking, Power Consumption. Although single link failures are more common, multiple link failures occur due to shared risks such as failure of a link while another link is under maintenance, or natural disasters that cause links traversing a region to fail. Residual link lifetime (RLL) in mobile ad hoc networks (MANETs) can be find using the distances between the link's nodes. In this paper we provide survey on the effects of mobility on the link lifetime.

REFERENCES

[1] T. Camp, J. Boleng, and V. Davies, "A survey of mobility models for AdHoc network research," Wireless Commun. Mobile Comput. Special Issue Mobile Ad Hoc Netw.: Res., Trends, Appl., vol. 2, no. 5, pp. 483–502, Aug. 2002.

[2] S. S. Ahuja, S. Ramasubramanian, and M. M. Krunz, "Single-link failure detection in all-optical networks using monitoring cycles and paths," IEEE/ACM Trans. Netw., vol. 17, no. 4, pp. 1080–1093, Aug. 2009.

[3] Edward Y. Hua and Zygmunt J. Haas," Mobile-Projected Trajectory Algorithm With Velocity-Change Detection for Predicting Residual Link Lifetime in MANET", IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, VOL. 64, NO. 3, 2015, pp. 1065-1079

[4] A. Cerpa, J. L. Wong, L. Kuang, M. Potkonjak, and D. Estrin, "Statistical model of lossy links in wireless sensor networks," in Proc. IEEE IPSN, 2005, pp. 81–88.

[5] Qiang Ma, Kebin Liu, Zhichao Cao, Tong Zhu, Yunhao Liu, Link Scanner: Faulty Link Detection for Wireless Sensor Networks, IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS, VOL. 14, pp 4428-4438, Aug 2015

[6] R. Korsnes, K. Ovsthus, F. Y. Li, L. Landmark, and O. Kure, "Link lifetime prediction for optimal routing in mobile ad hoc networks," in Proc. MILCOM, Oct. 17–20, 2005, vol. 2, pp. 1245–1251.

[7] M. Gerharz, C. de Waal, M. Frank, and P. Martini, "Link stability in mobile wireless ad hoc networks," in Proc. IEEE Conf. Local Comput. Netw., Nov. 6–8, 2002, pp. 30–39.

[8] M. Gerharz, C. de Waal, P. Martini, and P. James, "Strategies for finding stable paths in mobile wireless Ad Hoc networks," in Proc. IEEE Conf. Local Comput. Netw., Oct. 20–24, 2003, pp. 130–139.

[9] E. Y. Hua and Z. J. Haas, "Study of the effects of mobility on residual path lifetime in mobile ad hoc networks," in Proc. 2nd IEEE Upstate NY Workshop Commun. Netw., Nov. 18, 2005, pp. 33–37.

[10] E. Y. Hua and Z. J. Haas, "Path selection algorithms in homogeneous mobile ad hoc networks," in Proc. ACM Int. Wireless Commun. Mobile Comput. Conf., Jul. 3–6, 2006, pp. 275–280.

[11] C. Priyadharshini and K. ThamaraiRubini, "Predicting route lifetime for maximizing network lifetime in MANET," in Proc. ICCEET, Mar. 21/22, 2012, pp. 792–797.

[12] M. Karthik and P. Senthilbabu, "PESR protocol for predicting route lifetime in mobile ad hoc networks," in Proc. ICON3C, 2012, pp. 22–27.

[13] A. Kumar, S. Jophin, M. S. Sheethal, and P. Philip, "Optimal route life time prediction of dynamic mobile nodes in manets," in Proc. Adv. Intell. Syst. Comput., 2012, vol. 167, pp. 507–517.

[14] J. Chen, Y. Han, D. Li, and J. Nie, "Link prediction and route selection based on channel state detection in UASNs," in International Journal of Distributed Sensor Networks, vol. 2011. New York, NY, USA: Hindawi.

[15] X. M. Zhang, F. F. Zou, E. B. Wang, and D. K. Sung, "Exploring the dynamic nature of mobile nodes for predicting route lifetime in MANETS," IEEE Trans. Veh. Technol., vol. 59, no. 3, pp. 1567–1572, Mar. 2010.

[16] H. Noureddine, Q. Ni1, G. Min, and H. Al-Raweshidy, "A new link lifetime prediction method for greedy and contention-based routing in mobile ad hoc networks," in Proc. IEEE 10th Int. Conf. Comput. Inf. Technol., Jun. 29–Jul. 1, 2010, pp. 2662–2667.

[17] W. Su, S.-J. Lee, and M. Gerla, "Mobility prediction and routing in ad hoc wireless networks," Int. J. Netw. Manag., vol. 11, no. 1, pp. 3–30, Jan./Feb. 2001

[18] A. Savvides, C.-C. Han, and M. B. Strivastava, "Dynamic fine-grained localization in ad hoc networks of sensors," in Proc. MobiCom, Jul. 16–21, 2001, pp. 166–179.