ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 1.852

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

Survey on Reactive Routing Protocols for Wireless Ad Hoc Networks

Sakthi Nathiarasan A [*1], Kalaiyarasi P [2]

[*1] PG Student, Department of CSE, Adhiyamaan College of Engineering, Hosur, India

[2] PG Student, Department of CSE, Adhiyamaan College of Engineering, Hosur, India

Sakthi.adhiyamaanhosur@gmail.com

Abstract

Networks without fixed infrastructure are generally termed as Ad Hoc Networks. Ad Hoc Networks finds application in various areas including Military, Forestry where centralized base station is not feasible. Selecting an effective routing protocol is a major challenge in Ad Hoc Networks. Reactive or on-demand routing protocols are more suitable as it reduces control overhead as well as reduction in control packet flooding. Here we presented a survey on various on-demand or Reactive routing protocols used in Ad Hoc Networks. And hence our article acts as guide for future researches in Ad Hoc Routing.

Keywords: Ad Hoc Networks, Routing, Reactive Routing.

Introduction

Mobile networks can be classified into infrastructure networks and mobile Ad Hoc networks according to their dependence on fixed infrastructures. In an infrastructure mobile network, mobile nodes have wired access points within their transmission range. The access points compose the backbone for an infrastructure network. In contrast, mobile Ad Hoc networks are autonomously self-organized networks without infrastructure support. In a mobile Ad Hoc network, nodes move arbitrarily, therefore the network may experiences rapid and unpredictable topology changes. Additionally, because nodes in a mobile Ad Hoc network normally have limited transmission ranges, some nodes cannot communicate directly with each other. Hence, routing paths in mobile Ad Hoc networks potentially contain multiple hops, and every node in mobile Ad Hoc networks has the responsibility to act as a router.

Active research work for mobile Ad Hoc network is carrying on mainly in the fields of medium access control, battery management, routing, resource management, power control and security. Because of the importance of routing protocols in dynamic multi-hop networks, a lot of mobile Ad Hoc network routing protocols have been proposed in the last few years. There are some challenges that make the design of mobile Ad Hoc network routing protocols a tough task. Firstly, in mobile Ad Hoc networks, node mobility causes frequent topology changes and network partitions. Secondly, because of the variable and unpredictable capacity of wireless links, packet losses may happen frequently. Moreover, the broadcast nature of wireless medium introduces the hidden terminal and exposed terminal problems. Additionally, mobile nodes have restricted power, computing and bandwidth resources and require effective routing schemes.

Routing is a fundamental issue for networks. A lot of routing algorithms have been proposed for wired networks and some of them have been widely used. Dynamic routing approaches are prevalent in wired networks. Distance Vector routing and Link State routing are two of the most popular dynamic routing algorithms used in wired networks. One of the most popular method to distinguish mobile Ad Hoc network routing protocols is based on how routing information is acquired and maintained by mobile nodes. Using this method, mobile Ad Hoc network routing protocols can be divided into proactive routing, reactive routing and hybrid routing. A proactive routing protocol is also called "table driven" routing protocol. Using a proactive routing protocol, nodes in a mobile Ad Hoc network continuously evaluate routes to all reachable nodes

ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 1.852

and attempt to maintain consistent, up-to-date routing information. Therefore, a source node can get a routing path immediately if it needs one. In proactive routing protocols, all nodes need to maintain a consistent view of the network topology. When a network topology change occurs, respective updates must be propagated throughout the network to notify the change. Most proactive routing protocols proposed for mobile Ad Hoc networks have inherited properties from algorithms used in wired networks. To adapt to the dynamic features of mobile Ad Hoc networks, necessary modifications have been made on traditional wired network routing protocols. Using proactive routing algorithms, mobile nodes proactively update network state and maintain a route regardless of whether data traffic exists or not, the overhead to maintain up-to-date network topology information is high. Reactive routing protocols for mobile Ad Hoc networks are also called "on-demand" routing protocols. In a reactive routing protocol, routing paths are searched only when needed. A route discovery operation invokes a route-determination procedure. The discovery procedure terminates either when a route has been found or no route available after examination for all route permutations. In a mobile Ad Hoc network, active routes may be disconnected due to node mobility. Therefore, route maintenance is an important operation of reactive routing protocols. Compared to the proactive routing protocols for mobile Ad Hoc networks, less control overhead is a distinct advantage of the reactive routing protocols. Thus, reactive routing protocols have better scalability than proactive routing protocols in mobile Ad Hoc networks. In this article we presented a survey on various Reactive routing protocols with their merits and their drawbacks.

Survey work

Dynamic Source Routing(DSR)

It is an on-demand routing protocol, in which bandwidth conservation can be made easy. Unlike table-driven protocols here no beacon packets are used. During route construction phase, source node performs flooding of RouteRequest packet. Each node in the network on receiving the RouteRequest packet, rebroadcast the packets to its neighbors based on TTL value in the RouteRequest packet as well as non-duplication condition. Each RouteRequest packet carries a sequence number. Every node in the network checks sequence number before forwarding in order to avoid duplicate delivery as well as loop formation. The destination node on receiving the first RouteRequest packet reply with RouteReply packet with the reverse path following the RouteRequest packet. Whenever a wireless link gets broken RouteError packet is generated from the adjacent node to inform the source node. The advantage of this protocol is no flooding of periodic control packets. The major drawback is that performance degradation when increased mobility of nodes exist making it unfit for practical real-time applications.

Ad Hoc On-Demand Distance-Vector Routing Protocol(AODV)

The difference between DSR and AODV, is that in DSR, source routing is employed. i.e., the data packet carries the complete path to be traversed. Here in AODV, the intermediate nodes are also involved in deciding the path to be traversed. Whenever there is no direct path exist between sender and receiver, sender floods RouteRequest packet to all its neighbors, and neighbors will forward to their neighbors if it doesn't know the route to destination. Or else it sends RouteReply packet to source. When RouteRequest packet reaches the destination, the destination relies with RouteReply packet based on first received route. Here each node in the neighbor maintains a Routecache which holds the past information of packets that traversed through its wireless links. Whenever a broken link occurs, the adjacent notifies other nodes with RoureError packets. The advantages of this protocol are connection setup delay is very less and the drawbacks are inconsistent routes due to stale cache information.

Temporally Ordered Routing Protocol (TORA)

It is a source initiated on-demand routing protocol. It uses link reversal algorithm in order to provide loop free routing. In TORA, each node maintains one hop information. TORA limits the forwarding of control packets within a distance. TORA has three main functions: establishing, maintaining and erasing routes. During route establishment the source node floods Querypacket to all its neighbors, the process is done by all the node until Querypacket reaches the destination. Then the destination replies by sending Updatepacket to sender. On link failure the directivity of the link gets reversed and again Query/Update process gets repeated until link failure is intimated to all the nodes. The advantage of TORA is minimization of control packets and the drawback is that local route reconfiguration results in non-optimal routes.

ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 1.852

Location Aided Routing(LAR)

LAR utilizes the location information through Global Positioning system(GPS). It classifies the geographical regions into ExpectedZone and RequestZone. The ExpectedZone is the area in which destination node is assumed to be exist. RequestZone is the zone where transmission of control packets is allowed. Two versions of LAR are widely used. In LAR1 every node forwards the RouteRequest packet if the destination node is within ExpectedZone otherwise it will discard the packet without forwarding. In LAR2 each and every node in the ExpectedZone forwards the RouteRequest packet to its adjacent node only if the distance between source to destination is greater than the node to destination. The advantage of this algorithm is limited control overhead. But it suffers from drawback that GPS dependency exists.

Associativity Based Routing(ABR)

ABR is a distributed routing protocol, that selects a wireless link based on stability on wireless links. It is a beacon-based on-demand routing protocol. The stability of a link is determined by number of beacon messages traversed through that link. Based on this criterion the links are classified as stable and unstable links. Initially the sender floods the RouteRequest packet to its neighbors. A node forwards the packet to its neighbors only if stable link exists. This process continues until all the RouteRequest packet reaches the destination. The destination node one of the stable route between source to destination. If two or more stable route exist then shortest stable route is chosen. On link failure, local query messages are used for intimation and to find alternative stable routes. This method is more efficient in implementing priority scheduling. The advantage of this protocol is reduction in selecting failure routes. The drawback is that sometimes chosen route might not be shortest path.

Signal Stability Based Adaptive Routing Protocol

It is one of the on-demand routing protocol that uses signal stability as the prime factor for finding stable routes. Signal strength is measured for received beacon messages. Based on signal strength, links are classified as stable or strong link and unstable or weak link. Every node maintains a table which holds information about beacons received with their signal strength. Here source node broadcasts RouteRequest packet for finding the route to the destination node. Each node forwards the packet only through its strong links. Finally the destination node receives RouteRequest packet from more than one path. Now it is the duty of the destination to select one of the route with more stable links as optimal link and sends RouteReply packet to the source. The advantages of this protocol is that more stable routes are used and hence packet delivery ratio is very high compared to other protocols discussed above. The drawbacks are increase in path setup time and strong conditions are applied for finding optimal paths.

Flow Oriented Routing Protocol

This protocol employs a prediction based multi-hop-handoff mechanism which makes it suitable for real-time and time-sensitive traffic. Here Link Expiration Time(LET) of a particular link is calculated to determine whether a particular link works well without any failure. Whenever a sender wish to establish a path for sending real time packets, it broadcast Flow-REQ packet to all its neighbors. A neighbor node on receiving Flow-REQ packet checks the sequence number with the sequence number of its own, and if it is higher, it forwards the Flow-REQ packet to their neighbors. Finally the destination node receives Flow-REQ packet through more than one path, and it is the time for the destination node to estimate the best path using LET parameter. Now the destination node selects a best path and sends back Flow-SETUP packet to the sender. Whenever a link failure occurs, special Flow-HANDOFF packets are used for notification as well as for finding new alternative optimal path.

Conclusion

Networks which doesn't have any fixed infrastructure are generally said to be Ad Hoc networks. Several issues related to Ad Hoc networks exits. Selecting a routing protocol is one among the problem. Here in this article we made a survey on various on-demand routing protocols for wireless Ad Hoc networks. As per our survey LAR, ABR, SSA are some of the efficient on-demand routing protocols. Our survey serves as a pathway for future researches in Ad Hoc routing protocols, as well as guidance for various researches related to Ad Hoc Networks.

References

[1] D. B. Johnson, and D. A. Maltz," Dynamic Source Routing in Ad Hoc Wireless Networks," in Mobile compting,Kiuwer Academic Publishers, Vol 53,PP. 153-181,1996.

ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 1.852

[2] *C. E. Perkins and E. M. Royer, "Ad Hoc On-Demand Vector Routing," in Proc. IEEE Workshop on Mobile Computing Systems and Applications,pp 99-100, February 1999.*

[3] *V. D. Park and M. S. Corson, "A Highly Adaptive Distributed Routing Algorithm for Mobile Wireless Networks," in Proc. IEEE INFOCOM, April 1997, pp. 1405–1413.*

[4] *C. K. Toh, " Associativity-Based Routing for Ad Hoc Mobile Networks," Wireless Personal Communications, Vol 4, no 2, pp 1-36, March 1997.*

[5] *Y. Ko and N. H. Vaidya, "Location Aided Routing in Mobile Ad Hoc Networks," in Proc. ACM MOBICOM, pp. 66-75, October 1998.*

[6] *H. Bakht, M. Merabti, and R. Askwith. "Centralized frame for routing in mobile ad-hoc networks. in International Conference on Computer Communication" September, 2004. Beijing, China*

[7] *T. Wan, E. Kranakis, and P. Van Oorschot. "Securing the Destination Sequenced Distance Vector Routing Protocol (S-DSDV)". in 6th International Conference on Information and Communications Security. Oct. 27-29, 2004. Malaga, Spain: Springer Verlag.*

[8] *Charles E. Perkins and Elizabeth M. Royer, "Ad-hoc On-Demand Distance Vector Routing," Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems and Applications, February 1999: p. pp. 90-100.*

[9] *Z.J. Haas and M.R. Pearlman, "The Performance of the Zone Routing Protocol in Reconfigurable Wireless Networks," IEEE JSAC Issue on Ad-Hoc Networks, June,1999.*

Author Biblography

SAKTHI NATHIARASAN A
He received B.Tech degree in Information Technology from Sri Krishna College of Engineering and Technology, Coimbatore, India in the year of 2013. He is currently doing his M.E degree in Computer Science and Engineering in Adhiyamaan College of Engineering, Hosur and he published 5 research articles in international journals and conferences. His area of interests includes Wireless Ad Hoc Networks, Cryptography and Network security, Utility Mining, Genetic Algorithms and Autonomic Computing.
Email:sakthi.adhiyamaanhosur@gmail.com

KALAIYARASI P
she received the B.E degree in Computer Science and Engineering from Sona College of Technology, Salem, India. After that she worked as Software Tester in Cognizant Technology Solutions, Chennai. She is currently doing her M.E degree in Computer Science and Engineering in Adhiyamaan College of Engineering, Hosur and she published 3 research articles in international journals and conferences. Her area of interests includes Software Engineering, Data Mining, Ad Hoc Networks and Optimization Techniques.
Email: contact2kalai@gmail.com