International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 4, April. 2015
Available at http://internationaljournalofresearch.org

MANET Issues & Routing Protocols

AMAN AGRAWAL[1], ANKIT NAIK[2], PURUSHOTTAM PATEL[3]
Student,CSE, Kirodimal Institute of Technology, Raigarh,India[1]
Lecturer CSE, Kirodimal Institute of Technology, Raigarh,India[2]
HOD CSE, Kirodimal Institute of Technology, Raigarh,India[3]

Abstract:

Mobile Ad hoc networks (MANET) are characterized by multihop wireless connectivity, infrastructure less environment and frequently changing topology. The nodes acts as router and communicate to each other. This paper aims to provide a means of understanding the issues and protocol (AODV, OLSR and GRP) of MANET. The increase in availability and popularity of mobile wireless devices hasl lead researchers to develop a wide variety of Mobile Ad-hoc Networking (MANET) protocols to exploit the unique communication opportunities presented by these devices.

Keywords: MANET, MANET protocols, routing protocol in MANET.

I. INTRODUCTION

Cell Mobile Ad-hoc Network (MANET) is a collection of wireless mobile nodes and connected in dynamic manner. Nodes forming a temporary/short-lived network without any fixed infrastructure where all nodes are free to move in any direction.[4]

Wireless technologies such as Bluetooth or the 802.11 standards enable mobile devices to establish a Mobile Ad-hoc Network (MANET) by connecting dynamically through the wireless medium without any central administration. [6] Which consists of mobile nodes that use a wireless interface to send packet data?

With current technology and the increasing popularity of notebook computers, interest in ad hoc networks has greatly peaked. Wireless links in MANET are highly error prone and can go down frequently due to mobility of nodes.[8]

MANETs offer several advantages over traditional networks including reduced infrastructure costs, ease of establishment and fault tolerance, as routing is performed individually by nodes using other intermediate network nodes to forward packets.[7]

II. Classification of Routing Protocols of MANET

A routing protocol is used to transmit a packet to a destination via number of nodes and numerous routing protocols have been proposed for such kind of ad- hoc networks. An ad-hoc routing protocol is a convention, or standard, that it improves the scalability of wireless networks compared to infrastructure based wireless networks because of its decentralized nature. Ad-hoc networks are best suited due to minimal configuration and quick operation.

Basically, routing protocols can be broadly classified into three types as:

A. *Proactive Protocol*

Proactive protocols relay upon maintaining routing tables of known destinations, this reduces the amount of control traffic overhead that proactive routing generates because packets are forwarded immediately using known routes, however routing tables must be kept up-to-date; this uses memory and nodes periodically send update messages to neighbors, even when no traffic is present, wasting bandwidth.[1]

In networks utilizing a proactive routing protocol, every node maintains one or more tables representing the entire topology of the network. These tables are updated regularly in order to maintain up-to-date routing information from each node to every other node. To maintain up-to-date routing information, topology information needs to be exchanged between the nodes on a regular basis which in turn leads to relatively high overhead on the network. The advantage is that routes will always be available on request.

B. *Reactive Protocol*

Unlike proactive routing protocols, reactive routing protocols do not make the nodes initiate a route discovery process until a route is required. This leads to higher latency than with proactive protocols, but lower overhead.

Reactive Protocols use a route discovery process to flood the network with route query requests when a packet needs to be routed using source routing or distance vector routing. Source routing uses data packet headers containing routing information meaning nodes don't need routing tables.[1] Distance vector routing uses next hop and destination addresses to route packets, this requires nodes to store active routes information until no longer required or an active route timeout occurs, this prevents stale routes.[1]

C. *Hybrid Protocol*

Hybrid protocols combine features from both reactive and proactive routing protocols, typically attempting to exploit the reduced control traffic overhead from proactive systems while reducing the route discovery delays of reactive systems by maintaining some form of routing table.[1]

No single MANET routing protocol is best for every situation meaning analysis of the network and environmental requirements is essential for selecting an effective protocol.

III. MANET ROUTING PROTOCOLS

The most popular ones are AODV, DSR (reactive), OLSR (proactive) and GRP (hybrid). This section describes the main features of three protocols AODV (Ad Hoc On-Demand Distance Vector Protocol), OLSR (Optimized Link State Routing) and GRP (Gathering-based Routing Protocol) deeply studied. An ad-hoc routing protocol is a convention, or standard, that it improves the scalability of wireless networks compared to infrastructure based wireless networks because of its decentralized nature. Ad-hoc networks are best suited due to minimal configuration and quick operation.

A. *Ad Hoc On-Demand Distance Vector Protocol(AODV)*

AODV is an on-demand routing algorithm that determines a route only when a node wants to send a packet to a destination. It is a relative of the Bellman-Ford distant vector algorithm, but is adapted to work in a mobile environment. Routes are maintained as long as they are needed by the source. AODV is capable of both unicast and multicast routing. In AODV every node maintains a table containing information about which direction to send the packets in order to reach the destination.

B. *Optimized Link State Routing(OLSR)*

The Optimized Link State Routing (OLSR) is a table-driven, proactive routing protocol developed for MANETs. It is an optimization of pure link state protocols that reduces the size of control packets as well as the number of control packet transmissions required. OLSR reduces the control traffic overhead by using Multipoint Relays (MPR), which is the key idea behind OLSR.Each node in the network keeps a list of MPR nodes. This MPR selector is obtained from HELLO packets sending between in neighbor nodes. These routes are built before any source node intends to send a message to a specified destination In order to exchange the topological information; the Topology Control (TC) message is broadcasted throughout the network. Each node maintains the routing table in which routes for all available destination nodes are kept. Control traffic in OLSR is exchanged through two different types of messages: “HELLO” and “TC” messages.HELLO messages are exchanged periodically among neighbor nodes, in order to detect links to neighbors, to detect the identity of neighbors and to signal MPR selection. TC messages are periodically flooded to the entire network, in order to signal link-state information to all nodes. The best working environment for OLSR protocol is a dense network, where the most communication is concentrated between a large numbers of nodes.

C. *Gathering-based Routing Protocol(GRP)*

Gathering-based Routing Protocol combines the advantages of Proactive Routing Protocol (PRP) and of Reactive Routing protocol (RRP). PRP are suitable for supporting the delay sensitive data such as voice and video but it consumes a great portion of the network capacity. While RRP is not suitable for real-time communication, the advantage of this approach is it can dramatically reduce routing overhead when a network is relatively static and the active traffic is light. However, the source node has to wait until a route to the destination can be discovered, increasing the response time.

The function of Gathering-based Routing Protocol (GRP) for mobile ad hoc network is to gather network information rapidly at a source node without spending a large amount of overheads. It offers an efficient framework that can simultaneously draw on the strengths of Proactive routing protocol (PRP) and reactive routing protocol (RRP) collects

International Journal of Research (IJR)
e-ISSN: 2348-6848, p- ISSN: 2348-795X Volume 2, Issue 4, April. 2015
Available at http://internationaljournalofresearch.org

network information at a source node at an expense of a small amount of control overheads. The source node can equip promising routes on the basis of the collected information, thereby continuously transmitting data packets even if the current route is disconnected, its results in achieving fast (packet) transfer delay without unduly compromising on (control) overhead performance.

IV. Issues in Designing MANET

Mobile Ad-hoc Network is highly dynamic in nature and no fixed infrastructure in this type of network. Due to this, issues in designing Mobile Ad-hoc Networks using a routing protocol are explaining as:

A. *Error-prone channel state*

The characteristics of the links in a wireless network typically vary, and this calls for an interaction between the routing protocols.

B. *Hidden problem*

Node detects any interference on the wireless medium. A and node C are in range for communicating with node B, but not with each other. In the event that both try to communicate with node B simultaneously, A and C might not Thus, the signals collide at node B, which in turn will be unable to receive the transmissions from either node.

The typical solution for this so-called "Hidden terminal" problem is that the nodes coordinate transmissions themselves by asking and granting permission to send and receive packets.

This scheme is often called RTS/CTS (Request to Send/Clear to send).The basic idea is to capture the channel by notifying other nodes about an upcoming transmission. This is done by stimulating the receiving node to output a short frame so that nearby nodes can detect that a transmission is going to take place. The nearby nodes are then expected to avoid transmitting for the duration of the upcoming (large) data frame.

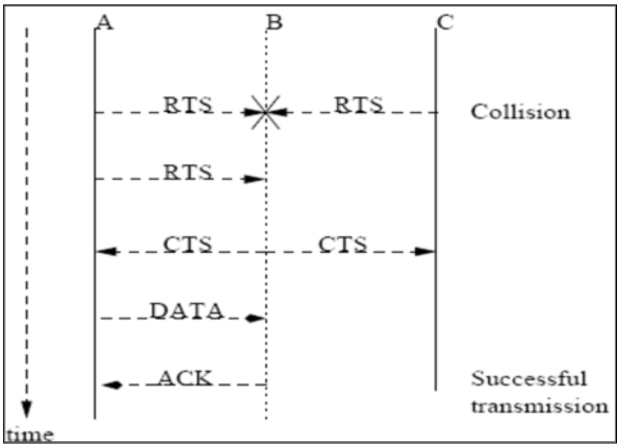

Fig 1 Hidden Problem

C. *Exposed terminals:-*

Consider a topology similar to that of previous figure, but with an added node D only reachable from node C. Furthermore, suppose node B communicates with node A, and node C wants to transmit a packet to node D. During the transmission between node B and node A, node C senses the channel as busy. Node C falsely concludes that it may not send to node D, even though both the transmissions (i.e., between node B and node A, and between node C and node D) would succeed. Bad reception would only occur in the zone between node B and node C, where neither of the receivers is located.This problem is often referred to as "the exposed terminal problem". Both the hidden and the exposed terminal problem cause significant reduction of network throughput when the traffic load is high.

D. *Bandwidth-constrained, variable capacity links*

Wireless links will continue to have significantly lower capacity than their hardwired counterparts. In addition, the realized throughput of wireless communications--after accounting for the effects of multiple access, fading, noise, and interference conditions etc. is often much less than a radio's maximum transmission rate. One effect is congestion is typically the norm rather than the exception, i.e. aggregate application demand will likely approach or exceed network capacity frequently. As the mobile network is often simply an extension of the field network infrastructure, mobile ad hoc users will demand similar services. These demands will continue to increase as multimedia computing and collaborative networking applications rise.[3]

E. *Energy-constrained operation*

Some or all of the nodes in a MANET may relay on batteries or other exhaustible means for their energy. For these nodes, the most important system design criteria for optimization may be energy conservation. It should be noted that the energy consumed during sending a packet is the largest source of energy consumption of all modes. This is followed by the energy consumption during receiving a packet. Despite the fact that while in idle mode the node does not actually handle data communication operations, it has been found that the wireless interface consumes a considerable amount of energy nevertheless. [3]

This amount approaches the amount that is consumed in the receive operation. Idle energy is a wasted energy that should be eliminated or reduced through energy-efficient schemes. Through energy consumption measurements studies, experiments have also been conducted to determine the power consumption patterns in the different active modes. In some experiments, the instantaneous power consumption per communication mode, e.g. send, receive, idle and sleep modes, has been measured.[3]

F. *Security Issues*

Mobile wireless networks are generally more prone to security threats than are fixed- cable nets. The increased possibility of eavesdropping, spoofing, and denial-of-service attacks should be carefully considered. Existing link security techniques are often applied within wireless networks to reduce security threats. Snooping is unauthorized access to another person's data. It is similar to eavesdropping but is not necessarily limited to gaining access to data during its transmission. Snooping can include casual observance of an e-mail that appears on another's computer screen or watching what someone else is typing.[3]

V. Conclusion

In this paper, we discussed in the three routing protocols (AODV, OLSR and GRP), based on OPNET simulations. Our motive was to check the performance of these three routing protocols in MANET in the above mentioned parameters. The simulation study of this paper consisted of three routing protocols AODV, OLSR and GRP deployed over MANET.

A common theme across many of the papers we have reviewed is the exclusive usage of random waypoint mobility model for simulations despite several researchers identifying limitations with this approach to testing. The collections of metrics from simulations is another area which was highlighted in several of the reviewed papers, researchers focus upon very specific metric collection but exclude collection of core metrics such as network throughput or delay which are essential for understanding the performance of a protocol. This is also true in the case of simulations which perform testing of protocols in isolation; this reduces the applicable value of the results because they cannot be directly compared to available alternatives.

Reference

1. [1]H. Amri, M. Abolhasan, and T. Wysocki, “Scalability of MANET routing protocols for heterogeneous and homogenous networks,” Computers and Electrical Engineering, vol. 36, no. 4, pp. 752–765, 2010.
2. [2]Dow C R, Dow C R, Lin P J, et al, “A study of recent research trends and experimental guidelines in mobile ad-hoc network,” AdvancedInformation Networking and Applications, P72-771, 2005.
3. [3]S. Corson & J. Macker“Mobile Ad hoc Networking:Routing Protocol Performance Issues and Evaluation Considerations”, RFC 2501, Oct. 1999.
4. [4]Vijay Kumar1 and Ashwani Kush. “A New Scheme for Secured on Demand Routing” IISTE Network and Complex Systems ,Vol 2, No.2, 2012.ISSN 2224-610X (Paper), 2225-0603
5. [5]Donatas Sumyla, Mobile Ad-hoc Networks, 03/20/2006. Available: http://ecom.umfk.maine.edu/MMobile%20Ad.pdf
6. [6]E. Alotaibi and B. Mukherjee, “A survey on routing algorithms for wireless Ad-Hoc and mesh networks,” Computer Networks: The International Journal of Computer and Telecommunications Networking, vol. 56, no. 2, pp. 940–965, October 2011.
7. [7]M. Zhang and P. H. J. Chong, “Performance Comparison of Flat and Cluster-Based Hierarchical Ad Hoc Routing with Entity and Group Mobility,” in Proc. of IEEE Communications Society conference on Wireless Communications & Networking, Budapest, Hungary, 2009, pp. 2450-2455.
8. [8]Sunil Taneja & Ashwani Kush“PERFORMANCE EVALUATION OF DSR AND AODV OVER UDP AND TCP CONNECTIONS” International Journal of Computing and Business Research (IJCBR), Volume 1, No. 1 December . 2010