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Review Article

A Review on Mobile Adhoc Network and Routing Protocols

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Abstract

A wireless ad-hoc network is a collection of mobile/semi-mobile nodes with no pre-established infrastructure, forming a temporary network. Each of the nodes has a wireless interface and communicates with each other over either radio or infrared. Laptop computers and personal digital assistants that communicate directly with each other are some examples of nodes in an ad-hoc network (Pang Yang, 2008), Nodes in the adhoc network are often mobile, but can also consist of stationary nodes, such as access points to the Internet. Semi mobile nodes can be used to deploy relay points in areas where relay points might be needed temporarily. Figure 2.1 shows a simple ad-hoc network with three nodes. The outermost nodes are not within transmitter range of each other. However the middle node can be used to forward packets between the outermost nodes. The middle node is acting as a router and the three nodes have formed an ad-hoc network (Abhishek Seth , 2007).In the current paper we are going the Manets and different routing protocols.

Keywords: *Wireless ad-hoc network, Wireless interface and communicates etc.*

1. Introduction

An ad-hoc network uses no centralized administration. This is to be sure that the network won't collapse just because one of the mobile nodes moves out of transmitter range of the others. Nodes should be able to enter/leave the network as they wish. Because the limited transmitters range of the nodes, multiple hops may be needed to reach other nodes. Every node wishing to participate in an ad-hoc network must be willing to forward packets for other nodes. Thus every node acts both as a host and as a router shown in figure 2.2. A node can be viewed as an abstract entity consisting of a router and a set of affiliated mobile hosts. A router is an entity, which, among other things runs a routing protocol (Stephen Mueller et al, 2003). A mobile host is simply an IP-addressable host/entity in the traditional sense. Ad-hoc networks are also capable of handling topology changes and malfunctions in nodes. It is fixed through network reconfiguration. For instance, if a node leaves the network and causes link breakages, affected nodes can easily request new routes and the problem will be solved. This will slightly increase the delay, but the network will still be operational. Wireless ad-hoc networks take advantage of the nature of the wireless communication medium (Tony Larsson et al, 1988). In other words, in a wired network the physical cabling is done a priori restricting the connection topology of the nodes. This restriction is not present in the wireless domain and, provided that two nodes are within transmitter range of each other, an instantaneous link between them may form.

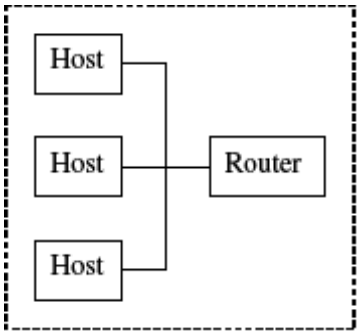

Fig. 1 Block diagram of mobile node acting both as hosts and as router

1.2 Characteristic

Ad-hoc networks are often characterized by a dynamic topology due to the fact that nodes change their physical location by moving around. This favors routing protocols that dynamically discover routes over conventional routing algorithms like distant vector and link state. Another characteristic is that a host/node has very limited CPU capacity, storage capacity, battery power and bandwidth, also referred to as a "thin client" (sometimes also called a lean or slim client) is a computer or a computer program which depends heavily on some other computer. This means that the power usage must be limited thus leading to a limited transmitter range (Serdang et al , 2009). The access media, the radio environment, also has special characteristics that must be considered when designing protocols for ad-hoc networks. One example of this may be unidirectional links. These links arise when for example two nodes have different strength on their transmitters,

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allowing only one of the hosts to hear the other, but can also arise from disturbances from the surroundings. Multihop in a radio environment may result in an overall transmit capacity gain and power gain, due to the squared relation between coverage and required output power. By using multihop, nodes can transmit the packets with a much lower output power (Bikash Rath et al, 2009).

1.3 Usage

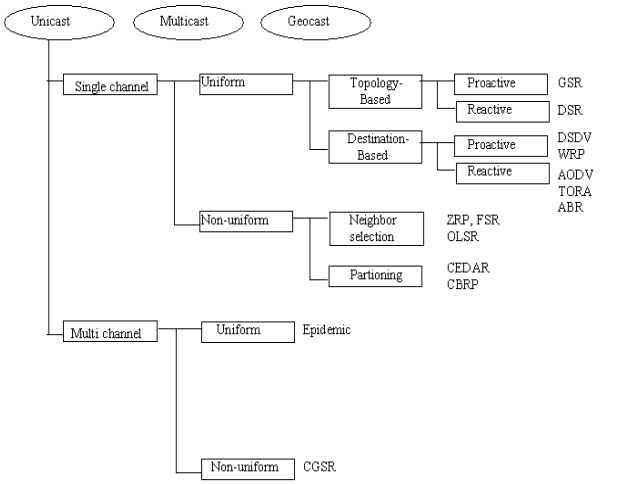
There is no clear picture of what these kinds of networks will be used for. The suggestions vary from document sharing at conferences to infrastructure enhancements and military applications. In areas where no infrastructure such as the Internet is available an ad-hoc network could be used by a group of wireless mobile hosts. This can be the case in areas where a network infrastructure may be undesirable due to reasons such as cost or convenience. Examples of such situations include disaster recovery personnel or military troops in cases where the normal infrastructure is either unavailable or destroyed. Other examples include business associates wishing to share files in an airport terminal, or a class of students needing to interact during a lecture. If each mobile host wishing to communicate is equipped with a wireless local area network interface, the group of mobile hosts may form an ad-hoc network. Access to the Internet and access to resources in networks such as printers are features that probably also will be supported.

1.4 Routing

Routing is the process of selecting paths in a network along which to send network traffic. Routing is performed for many kinds of networks, including the telephone network, electronic data networks (such as the Internet), and transportation networks (Tanenbaum 2003). Routing in electronic data networks using packet switching technology because of the fact that it may be necessary to have several hops (multi-hop) before a packet reaches the destination, a routing protocol is needed. The routing protocol has two main functions: (i) selection of routes for various source-destination pairs (ii) and the delivery of messages to their correct destination. The second function is conceptually straightforward & is implemented using a variety of protocols and data structures (routing tables).

1.5 Routing Protocols in Manets

Routing protocols in conventional wired networks are usually based upon either distance vector or link state routing algorithms. Both of these algorithms require periodic routing advertisements to be broadcast by each router. In distance vector routing , each router broadcasts to all of its neighboring routers its view of the distance to all other nodes; the neighboring routers then compute the shortest path to each node. In link-state routing, each router broadcasts to its neighboring nodes its view of the status of each of its adjacent links; the neighboring routers then compute the shortest distance to each node based upon the complete topology of the network. These conventional routing algorithms are clearly not efficient for the type of dynamic changes which may occur in an ad-hoc network. In conventional networks, routers do not generally move around and only rarely leave or join the network. In an environment with mobile nodes, the changing topology will not only trigger frequent re-computation of routes but the overall convergence to stable routes may be infeasible due to the high-level of mobility.



1.5.1 Unipath Routing in MANETs

In unipath routing, only a single route is used between a source and destination node. Two main classes of ad hoc routing protocols are table-based and on-demand protocols In table-based protocols each node maintains a routing table containing routes to all nodes in the network. Nodes must periodically exchange messages with routing information to keep routing tables up-to-date. Therefore, routes between nodes are computed and stored, even when they are not needed. Table-based protocols may be impractical, especially for large, highly mobile networks. Because of the dynamic nature of ad hoc networks, a considerable number of routing messages may have to be exchanged in order to keep routing information accurate or up-to-date. In on-demand protocols nodes only compute routes when they are needed. Therefore, on-demand protocols are more scalable to dynamic, large networks. When a node needs a route to another node, it initiates a route discovery process to find a route. On-demand protocols consist of the following two main phases.

1. Route discovery: It is the process of finding a route between two nodes (fig 2)

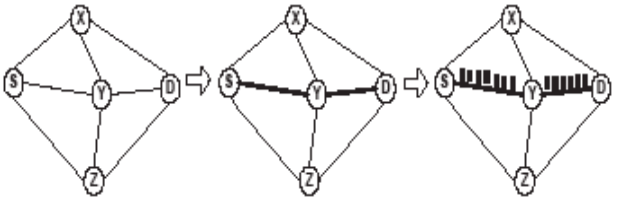


Fig. 2 An example of route discovery in an ad hoc network

In order for node S to send data to node D, it must first discover a route to node D. Node S discovers a route to node D going through node Y, and sets up the route. Once the route is established, node S can begin sending data to node D along the route.

2. Route maintenance is the process of repairing a broken route or finding a new route in the presence of a route failure.(fig 3)

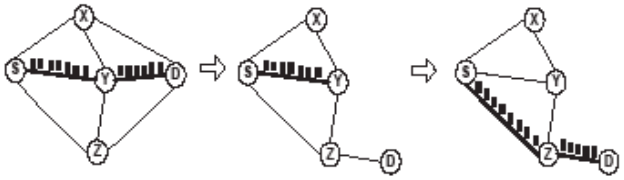


Fig. 3 An example of route maintenance in an ad hoc network

Node S sends data along an established route to node D through node Y. When node D moves out of range of node Y, this route breaks. Node S finds a new route to node D through node Z, and thus can begin sending data to node D again.

1.6 Background on Multipath Routing

Multipath routing has been explored in several different contexts. Traditional circuit switched telephone networks used a type of multipath routing called alternate path routing. In alternate path routing, each source node and destination node have a set of paths (or multipaths) which consist of a primary path and one or more alternate paths. Alternate path routing was proposed in order to decrease the call blocking probability and increase overall network utilization. In alternate path routing, the shortest path between exchanges is typically one hop across the backbone network; the network core consists of a fully connected set of switches. When the shortest path for a particular source destination pair becomes unavailable (due to either link failure or full capacity), rather than blocking a connection, an alternate path, which is typically two hops, is used. Well known alternate path routing schemes such as Dynamic Nonhierarchical Routing and Dynamic Alternative Routing are proposed and evaluated in Multipath routing has also been addressed in data networks which are intended to support connection-oriented service with QoS.

1.6.1Multipath Routing Components: Multipath routing consists of three components: route discovery, route maintenance, and traffic allocation.

a) Route Discovery and Maintenance. Route discovery and route maintenance consists of finding multiple routes between a source and destination node. Multipath routing protocols can attempt to find node disjoint, link disjoint, or non-disjoint routes. Node disjoint routes, also known as totally disjoint routes, have no nodes or links in common. Link disjoint routes have no links in common, but may have nodes in common . Non-disjoint routes can have nodes and links in common. Refer to Figure 4 for examples of the different kinds of multipath routes.

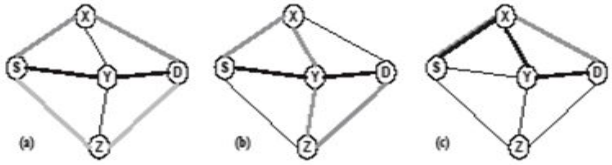


Fig. 4 Routes SXD, SYD, and SZD in (a) have no links or nodes in common and are therefore node disjoint. Routes SXYZD and SYD in (b) have node Y in common and are therefore only link disjoint. Routes SXD and SXYD in (c) have node X and link SX in common and are therefore non-disjoint.

Disjoint routes offer certain advantages over non-disjoint routes. For instance, non-disjoint routes may have lower aggregate resources than disjoint routes, because non-disjoint routes share links or nodes. In principle, node disjoint routes offer the most aggregate resources, because neither links nor nodes are shared between the paths. Disjoint routes also provide higher fault-tolerance. When using non-disjoint routes, a single link or node failure can cause multiple routes to fail. In node or link disjoint routes, a link failure will only cause a single route to fail. However, with link disjoint routes, a node failure can cause multiple routes that share that node to fail. Thus, node disjoint routes offer the highest degree of fault-tolerance. The main advantage of non-disjoint routes is that they can be more easily discovered.

b) Multicast Protocols

There is a need for multicast traffic also in ad hoc networks. The value of multicast features with routing protocols is even more relevant in ad hoc networks, because of limited bandwidth in radio channels. Some multicast protocols are based to form and maintain a routing tree among group of nodes. Some other are based on to use routing meshes that have more connectivity than trees. This approach is justified by the reason that maintaining a routing tree can have remarkable control traffic.

c) Geocast Protocols

The goal of geo cast protocols is to deliver data packets to a group of nodes that are inside a specified geographical area. Geo cast could be understood to a some kind of enlargement of multicast operations. In multicasting nodes may join or leave multicast group as desired. In geocasting nodes join or leave the group by entering or leaving the defined geocast region. The applications of geocast can vary from military purposes to civil traffic coordination areas. The applicability of these protocols require some location information at hand. The protocols to perform geo cast operations can be divided to two categories: data-transmission oriented protocols and routing-creation oriented protocols (Rozner et al, 2009). To the data-transmission oriented category belong such protocols as Location Based Multicast (LBM).

1.6.2 Hybrid Routing Protocols: Since proactive and reactive protocols each work best in oppositely different

scenarios, hybrid method uses both. It is used to find a balance between both protocols. Proactive operations are restricted to small domain, whereas, reactive protocols are used for locating nodes outside those domains (Jack Tsai et al, 2006). Examples of hybrid protocols are: Zone Routing Protocol, (ZRP)**,** Wireless Ad hoc Routing Protocol, (WARP) (M. Saravana et al, 2010)

1.6.3 Hierarchical Routing Protocols: As the size of the wireless network increases, the flat routing protocols may produce too much overhead for the MANETs. In this case a hierarchical solution may be preferable (David .B .Johnson et al, 2002) .Examples of Hierarchical Routing Protocols are: Hierarchical State Routing (HSR), Zone Routing Protocol (ZRP), Cluster-head Gateway Switch Routing Protocol (CGSR), Landmark Ad Hoc Routing Protocol (LANMAR)

Conclusion

In the current paper we have present the Manets and different types of Routing protocol. Ad-hoc networking is a rather hot concept in computer communications. This means that there is much research going on and many issues that remains to be solved. Due to limited time, we have only focused on the routing protocols. However there are many issues that could be subject to further studies. First of all, the simulator environment could be improved. In future we will work on security of manets

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