



Dynamic Source Routing (DSR) Protocol in Wireless Networks

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Abstract: A Mobile Ad Hoc Network is a network having a number of nodes which are capable of communicating with each other without taking any help from the network infrastructure. Each node participating in the network works both as host as well as a router. Each node must be willing to forward packets for other nodes. For this purpose, a routing protocol is needed. The Dynamic Source Routing protocol, a simple as well as an efficient routing protocol is designed for use in multi-hop wireless networks, which allows the network to be entirely self-organizing and self-configuring, without the requirement of any network infrastructure or the administration. The protocol work entirely on-demand, allowing the routing packet overhead to scale automatically as per the need.

Keywords: Routing, Protocol, Path discovery, Route Discovery, Proactive

I. Introduction

Dynamic Source Routing is a self-maintaining routing protocol for used in wireless networks. The protocol can also work with cellular telephone systems and mobile networks having up to 200 nodes. A Dynamic Source Routing network can configure itself independently without the intervention of human administrators [1]. It forms a route on-demand when a transmitting node requests. It uses source routing instead of relying on the routing table at each intermediate device. Determining source routing requires gathering the address of each node between the source and destination during route discovery. The gathered information is used by nodes processing the route discovery packets. The acquired paths are used to route packets. The routed packets contain the address of each device the packet will traverse [2]. In this paper the routing protocols have been explained in sections II, working of DSR is analyzed in section III and the topic is concluded in section IV.

II. Routing Protocol

Routing protocols are the protocols which are required for sending packets from source to destination. Before a packet reaches to its final destination, it has to go through several hops as multi hopping is required for routing protocols. The routing protocol perform following two main tasks:-

- Finding routes for various source-destination pairs
- Delivery of different messages to the destination.

The second method is conceptually straight forward and it uses a variety of protocols and data structures in the form of routing tables.

Routing Protocols can be divided into following types:

1. Centralized and Distributed
2. Static and Adaptive
3. Reactive and Proactive

In centralized routing protocols, all route selected by a central node, on the other hand, in distributed algorithms, the selection of routes is shared among different network nodes.

The second category of protocols is static versus Adaptive. In static algorithm, the route from source node to destination node is fixed regardless of traffic conditions in the network at a particular time [4]. It will change if there is a node or link failure. This type of algorithm is not very good because it cannot achieve high throughput under a variety of traffic input patterns. Majority of the networks uses some form of adaptive routing where the routes between source node and destination node may change according to traffic conditions in the network.

The third classification is either proactive or reactive. Proactive protocols attempt to continuously evaluate the routes within the network, to send the packets to their destination node immediately. The family of distance vector protocols is a good example of proactive schemes. Reactive protocols, on the other hand, invoke a route determination procedure on demand only. When a route is needed, some sort of global search procedure is employed. All the flooding algorithms are member of the reactive group. Proactive schemes have the advantage that when the route is needed to send a packet, the delay before sending the packets can be very small. On the other hand reactive schemes needs time to attain a stable state. This can cause problem if the topology is changing frequently [5].

III. Working of DSR

To send a packet from source to destination node, the sender constructs a source route in the packet's header. This route has the address of each node in the network through which the packet will be forwarded in order to reach the destination node. The sender transmits the packet over the network by finding the first node in the source route. When a packet is received at host, it checks its header and if this host is not the final destination of the packet, it simply transmits the packet to the next node found in the source route in the packet's header. As it reaches its final destination, the packet is delivered to the network layer of that host [3]. This may result in high overhead for long paths or large addresses. To avoid using source routing, DSR protocol also uses a flow id option that allows packets to be forwarded

on a hop by hop basis. This protocol maintain information on mobile nodes because it is based on source routing.

It has only two major phases:-

Route Discovery

Route Maintenance.

Route Reply is generated if the message has reached the required destination node and to return the Route Reply, the destination node must have a route to the source node. If the route is in the route cache of destination node. This route would be used to send route reply. Otherwise, the node will reverse the route found in the Route Request message header. The Route Discovery Phase is initiated to determine the most feasible route.

Dynamic source routing protocol (DSR) is an on-demand protocol which helps to control the bandwidth consumed by control packets in ad hoc wireless networks. In this protocol there is no need to do extra work for updating the table according to the latest network conditions as is done in table driven approaches. The major difference between this and the other on-demand routing protocols is that it does not require hello packet transmissions, which are used by a node to inform other nearby nodes about its presence. The basic technique used in this protocol while selecting a route is to establish a route by flooding Route Request packets in the network. When destination node receive a Route Request packet, it responds by sending a Route Reply packet back to the source. The Route Reply packet carries the route traversed by the Route Request packet which was received at the destination node.

Advantages

This protocol uses a reactive approach which does not need to flood the network with table update messages periodically, so extra work is not required in this approach, opposed to table-driven approach. In this protocol, a route is established as per requirement, so the need to find routes to all other nodes in the network is eliminated. The intermediate nodes also utilize the stored route information efficiently to reduce the control overhead.

Disadvantages

In this protocol the route maintenance mechanism is not helpful to repair a broken link. The old information in route cache could also result in inconsistencies while reconstructing the route. The connection setup delay is higher than in table-driven protocols. Even though the protocol well suited in static and low-mobility environments, the performance degrades rapidly as mobility increases. As DSR, uses source routing mechanism, so substantial routing overhead is involved. This routing overhead is proportional to the path length.

IV. Conclusion

The Dynamic Source Routing protocol (DSR) provides an excellent performance for routing in multi-hop wireless ad hoc networks. This paper has presented a protocol for routing packets between wireless mobile nodes in an ad hoc network. This protocol uses dynamic source routing which adapts quickly to routing changes when host moves frequently, and requires little overhead during periods in which hosts move less frequently.

References:

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