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A Study of Reactive Routing Protocols in Ad Hoc Networks with Different Network Ranges

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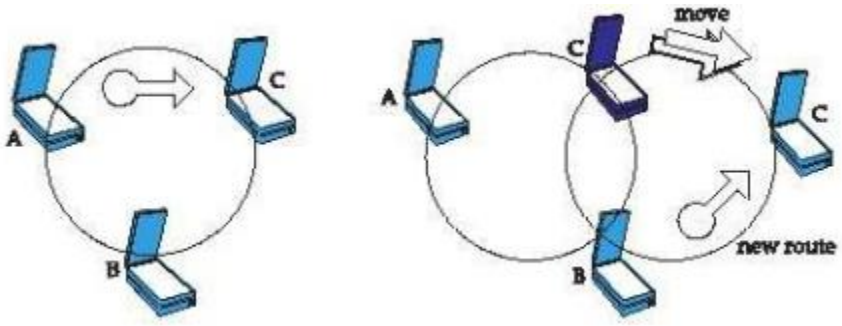
Abstract

A mobile ad-hoc network (MANET) is a wireless network in which nodes connect with one another without the need of infrastructure. The creation of resilient routing protocols is one of the primary issues in wireless Adhoc networks. MANETs are self-organizing, self-configuring networks in which mobile nodes move at their leisure. In MANETs, routing is a critical issue. The main purpose of an Adhoc network routing protocol like this is to find and set up a correct and efficient route between two nodes so that messages may be delivered on time. The overhead and bandwidth consumption of route construction should be kept to a minimum. As a result, the focus of this article is on comparing the performance of three routing protocols, DSDV, DSR, and AODV, for constant bit rate traffic over a wide range of network scopes. Packet delivery ratio (PDR), end-to-end latency, routing overhead, and throughput are the parameters considered in the evaluation.

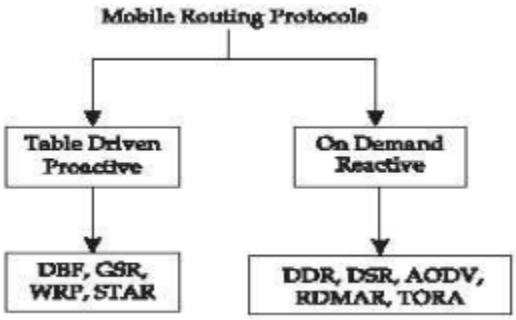
Keywords: Wireless Adhoc network, Routing protocols, Reactive routing protocols, Simulation, Mobility.

1. INTRODUCTION

Wireless and portable computers and gadgets are growing more powerful and sophisticated as technology improves. CPU speed, RAM size, storage space, and size and power consumption have all increased as a result of these advancements. The requirement for these devices to connect continually with one another and with wired networks is becoming increasingly important. MANETs make it possible for these devices to create networks on the fly.



Traditional wired network routing cannot be directly applied to mobile Adhoc networks due to unpredictable topology, absence of stable infrastructure, and frequent link breakdown. As a result, routing is the most researched issue in mobile ad hoc networks. Many dynamic routing systems have been developed to address these issues. In a mobile adhoc network, there are two types of routing protocols:



Each node in a proactive or table routing system must keep up-to-date routing information for every other node in the network. Reactive routing protocols choose a path based on the needs. Reactive protocols are seen to be the best fit for high-mobility networks. Proactive protocols are best suited to static networks with little change in node information, but they suffer from the loop to infinity problem when a connection fails.

2. BACKGROUND

2.1 Ad-hoc On demand Distance Vector Routing (AODV)

AODV was created with mobile ad-hoc networks in mind. RFC 3561 emphasises that AODV adapts quickly to topology changes. Because AODV is a reactive routing system, no resources are required when no route is required. A ROUTE REQUEST (RREQ) packet is broadcast when a route is required but not yet accessible in the routing database.

The AODV algorithm is a step forward from the DSDV algorithm. It used to reduce the number of needed broadcasts by constructing routes on demand rather than keeping a comprehensive list

of routes like the DSDV algorithm did. To guarantee that all routes are loop-free and contain the most up-to-date route information, AODV employs destination sequence numbers.

When a requesting node has an option between two routes to a destination, it must choose the one with the higher sequence number. The higher the sequence number, the more recent the route.

Route Requests (RREQs), Route Replies (RREPs), and Route Errors are the three types of messages described in AODV (RERRs). When a source node wants to deliver a message to a destination node but doesn't have a valid route, a path discovery procedure is started. The source broadcasts RREQ, and RREQ recipients who don't have the path to the destination pass the message. The message will be sent till it reaches its target.

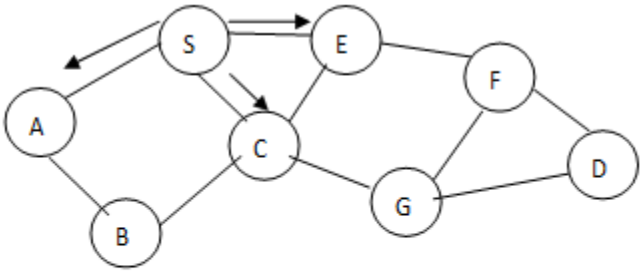


Fig1:Sourcefloodsrouterequestinthenetwork

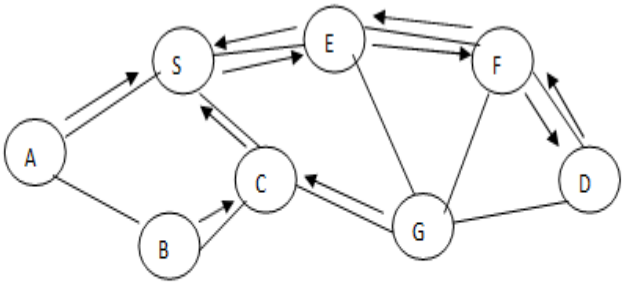


Fig2:ROUTEREPLYisforwardedviathereversepath,Forwardedpathi susedtoroutedatapackets

Instead of transmitting RREQ, the intermediate node responds to the RREP when it discovers a fresh enough route in its route cache. Each node has its own broadcast ID and sequence number. The most recent sequence number it knows for the destination in the RREQ is contained in the broadcast ID of the source node. Only intermediate nodes with a route to the destination whose corresponding destination sequence number is equal to or greater than the sequence number contained in RREQ respond to the RREQ with an RREP packet. The address of the neighbors from which the original copy of the broadcast packet is received is entered into the routing table of the intermediate nodes when forwarding the RREQ. The duplicate copies of the RREQ are discarded by Node. Each route entry is unique.

2.2 Dynamic Source Routing (DSR)

Another novel technique to Adhoc networking is Dynamic Source Routing. The benefits of source routing are explored in depth by DSR. It's one of the most pure instances of an on-demand service. All activities are executed only when a route is genuinely required, according to the protocol.DSR is a multi-hop wireless network protocol that is both simple and efficient. discovery of a path DSR operates in two phases:

(i)Finding a route

(ii)Maintenance of the route

In the header of each data packet is an ordered list of all nodes along the path. This eliminates loops and eliminates the need for up-to-date information in the intermediate the packet is routed across nodes.

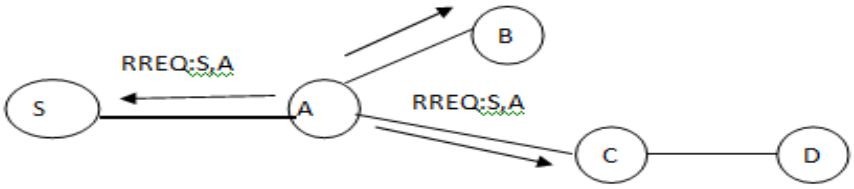


Fig3:ROUTEREQUEST(SneedsaroutetoD)

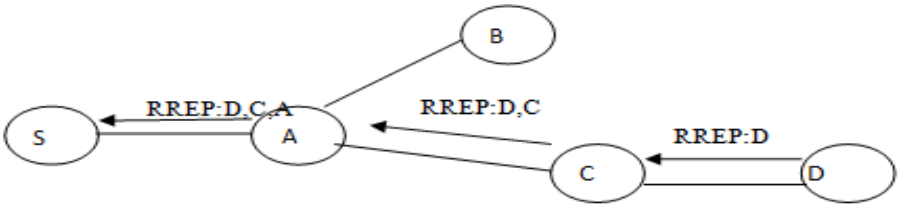


Fig4:ROUTEREPLY(NodeSreceivesRREP)

ROUTEMAINTENANCEMODE:

Route maintenance is performed via route error packets (Fig. 3) and acknowledgments. Each node sends out packets and waits for responses. If a node does not receive an acknowledgment after forwarding a packet, it sends an acknowledgment request. If the node does not receive a reply within a certain time, it creates a RERR message and transmits it to the sender of the packets.

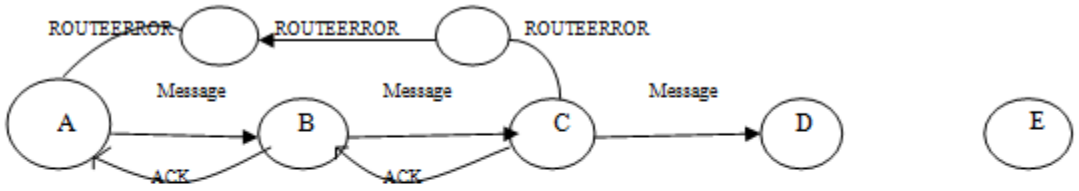


Fig3:TheAcknowledgementmechanismworkslikeachain

2.3 Zone routing protocol (Zrp)

ZRP is a hybrid reactive/proactive routing protocol that combines the properties of reactive and proactive routing protocols. It's safe to assume that the majority of traffic in an ad-hoc network is directed to neighbouring nodes. As a result, the proactive scope of ZRP is reduced to a zone centred on each node. The preservation of route information is easier in a small node. ZRP also features a network-wide flat view. Because the zones overlap, ZRP may be classified as a flat protocol. As a result, the best paths may be found and network congestion can be decreased. ZRP's behaviour is adaptable. The behaviour is determined by the network's present setup and the behaviour of the users.

2.3.1 ZRP Architecture

The idea of zones underpins the Zone Routing Protocol. Each node has its own routing zone, which overlaps with nearby nodes' zones. The radius of the routing zone is Hops are used to express this. As a result, the zone includes the nodes that must be discovered. The ZRP uses a Neighbor Discovery system to identify new neighbour nodes and network faults. The Media Access Control (MAC) layer provides the Network Data Protocol (NDP). "Hello," says NDP. At regular intervals, there will be beacons. The neighbour table is updated when a beacon is received. If the MAC is set to Because the layer lacks an NDP, IARP must supply the functionality.

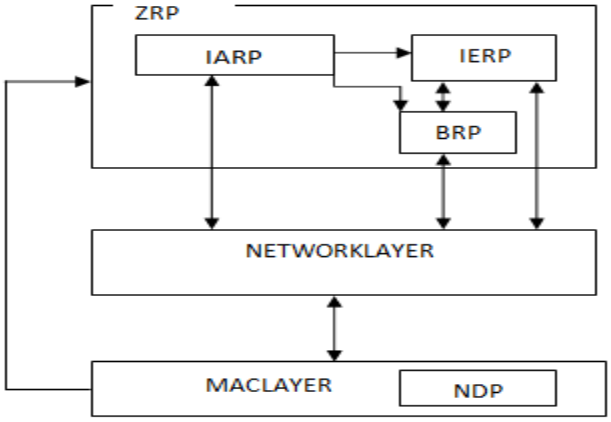


Fig:ZRPArchitecture

3. PERFORMANCE MATRICS:

This paper's main goal is to compare the performance of the DSDV, AODV, and DSR routing protocols using the following metrics:

Average End-to-End Delay: This is the time it takes for a packet to get from point A to point B. It takes into account all forms of delays, including queue delays, route finding delays, and interface delays, among others. It's also known as the average time between transmitting and receiving a packet correctly.

The ratio of data packets delivered to the destination to those created by the sources is known as the packet delivery fraction.

Any routing protocol's throughput is defined as the total size of packets received at all destination nodes in a given amount of time. Throughput is measured in kilobits per second (kbps).

Routing Load (Normalized): The number of routing packets transmitted per data packet.

Energy Consumption: When a node transmits and receives packets, as well as processes packets, energy is spent. It also consumes power when it is not in use. A node's energy consumption is mostly The condition of a mobile node has an impact.

4. CONCLUSION:

I briefly addressed various existing routing protocols in ad hoc networks in this study. I learnt a lot about wireless networks and ad hoc networks throughout the course of the research. I learnt about ad hoc network routing protocols including AODV, DSR, and ZRP, as well as solutions like improving routing algorithm efficiency, safeguarding the routing protocol, and securing packet forwarding. I've read a few articles and done a lot of research on the internet. I'm going to try to mimic various routing techniques and compare their performance.

5. FUTURE WORK:

Mobile computing and communication is a new topic that is catching the attention of scholars all around the world. As a result, there is a huge potential for additions and improvements.

As a result, I'll try to replicate various routing protocols using a simulator such as Omnet or NS2, and then analyse and compare the performance of each routing protocol through a simulation study. We may create a new energy-efficient routing algorithm for wireless networks and then conduct a simulation research to compare its performance to other routing algorithms.

On the basis of the newly designed routing protocol, we may extend this work to include the implementation of a more safe and efficient security mechanism on wireless Adhoc networks.

During the research, I discovered a few topics that may be investigated further in the future, such as certain elements of the new routing protocol and some security issues, such as intrusion detection techniques on wireless networks. I'm going to try to go a little more into this study topic.

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