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Performance Analysis of Reactive Routing Protocol in Mobile Ad Hoc Networks

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ABSTRACT

On-demand routing protocols for Mobile Ad-hoc networks registers unexpected performance behavior when multiple data streams are sent to common destination. Wireless mobile networks without fixed infrastructure consist of mobile hosts that move randomly in and out of each other communication range resulting in frequent connection breaks and topology varies stochastically. Traditional table-driven routing protocols cannot perform in such environment resulting in development of on-demand routing protocols for ad hoc networks. The two prominent on-demand routing protocols are AODV (Ad hoc on-demand distance vector) and DSR(Dynamic Source Routing). In this work the simulation result shows that throughput and packet delivery ratio of AODV protocol is better than the DSR protocol, End to end delay is also less of AODV protocol than the comparison from the DSR protocol.

Keywords:- Dynamic Source Routing(DSR), Ad-Hoc on Demand Distance Vector (AODV), Throughput, Packet Delivery Ratio.

INTRODUCTION

Ad-hoc network is a group collection of mobile node. During the last few years we have all witnessed steadily increasing growth in the deployment of wireless and mobile communication networks [1].

Mobile ad hoc networks consist of nodes that are able to communicate through the use of wireless mediums and form dynamic topologies. The basic characteristic of these networks is the complete lack of any kind of infrastructure, and therefore the absence of dedicated nodes that provide network management operations as do the traditional routers in fixed networks. In order to maintain connectivity in a mobile ad hoc network all participating nodes have to perform routing of network traffic [5].

The cooperation of nodes cannot be enforced by a centralized administration authority since one does not exist. MANETs are also capable of handling topology changes and malfunctions in nodes through network reconfigurations. Examples include on-the-fly conferencing applications, networking intelligent devices or sensors etc.

Ad hoc and wireless sensor networks (WSNs) have enabled a large variety of applications. Environmental and wildlife monitoring, clinical medical and home-care monitoring, monitoring and control of industrial processes including agriculture, and smart houses or cities are just some of the examples of ad hoc and WSN applications, where low-cost and easily deployed multi-functional sensor nodes are the ideal solution. As a result, during the

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past few years we have experienced the emergence of a new paradigm called the Internet of Things (IoT) in which smart and connected objects cooperatively construct a (wireless) network of things. However, the unique features of ad hoc and WSN technologies can pose significant challenges. Hence, envisioned solutions must be verified before being deployed in a real-world WSN deployment, either by utilizing simulators or emulators or through experimentations by employing test beds

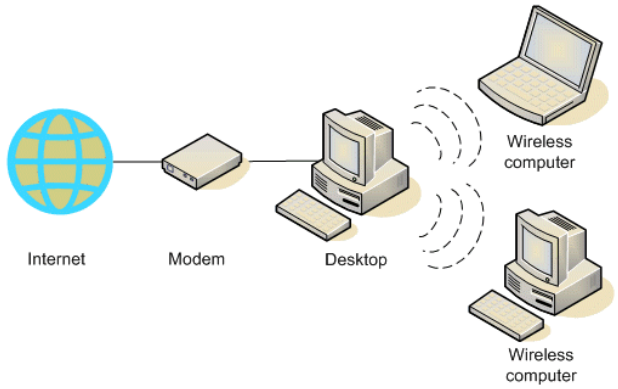

Fig 1: Ad Hoc Network.

Recent scientific and technological developments are so rapidly paced that what was not even predicted before has become a reality and part of our life today. One of the notable inventions of the recent time is the small sized electronic device called sensor which has the capability to observe various parameters like object movement, light intensity, temperature, magnetism, seismic activities, and so on. These sensors, often with own capability of communicating within themselves or with other devices, are developed to gather data and store the recorded data to process further if needed. Such communications could take place via wired as well as wireless mode giving scope to their (i.e. the sensors) increase in number for a particular system or network.

Mobile ad hoc networks are likely to become an essential part in future because it provide persistent computer environments that support users in accomplishing their tasks, accessing information and communicating anytime, anywhere and from any device. Below table provides an overview of applications of MANET [8].

Application	**Service**
Military battlefield	Provides advantage of commonplace network technology to maintain an information network between the soldiers, vehicles, and military information head quarter.
Emergency services	Search and rescue operations, Disaster recovery, Replacement of fixed infrastructure, in case of environmental disasters, Policing and fire fighting, Supporting doctors and nurses in hospitals
Commercial and civilian Sectors	Ecommerce, Business, Vehicular services, Networks of visitors at airports.
Education	Universities and campus settings, Virtual classrooms, Ad hoc communications during meetings or lectures
Coverage extension	Extending cellular network access, Linking up with the Internet, intranets, etc.
Personal area network and Bluetooth	A personal area network is a short range, localized network where nodes are usually associated with a given person. Short-range MANET such as Bluetooth can simplify the inter communication between various mobile devices such as a laptop, and a mobile phone

Table 1: Application of MANET.

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The rest of this paper is organized as follows in the first section we describe an introduction of about Mobile ad-hoc network and routing protocol. In section II we discuss about the reactive routing protocol. In section III we discuss about the rich literature survey for the reactive routing protocol and their performance, finally in section IV we conclude the about our paper which is based on the literature survey and specify the future scope.

II ROUTING PROTOCOLS

In order to facilitate communication within the network, a routing protocol is used to discover routes between nodes. The primary goal of such an ad-hoc network routing protocol is correct and efficient route establishment between a pair of nodes so that messages may be delivered in a timely manner. Route construction should be done with a minimum of overhead and bandwidth consumption.

An Ad-hoc routing protocol is a convention or standard that controls how nodes come to agree which way to route packets between computing devices in a MANET. In ad-hoc networks, nodes do not have a priori knowledge of topology of network around them, they have to discover it.

The basic idea is that a new node announces its presence and listens to broadcast announcements from its neighbors. The node learns about new near nodes and ways to reach them, and announces that it can also reach those nodes. As time goes on, each node knows about all other nodes and one or more ways how to reach them.

Routing algorithms have to:

- Keep routing table reasonably small
- Choose best route for given destination (this can be the fastest, most

Reliable, highest throughput, or cheapest route)

- Keep table up-to-date when nodes die, move or join
- Require small amount of messages/time to converge

In a wider context, an ad-hoc protocol can also mean an improvised and often impromptu protocol established for a particular specific purpose. Since the advent of DARPA packet radio networks in the early 1970s, numerous protocols have been developed for ad-hoc mobile networks. Such protocols must deal with the typical limitations of these networks, which include high power consumption, low bandwidth, and high error rates. As shown in Figure 1 below, these routing protocols may generally be categorized as: (a) table-driven and (b) source-initiated on-demand driven. Solid lines in this figure represent direct descendants while dotted lines depict logical descendants. Despite being designed for the same type of underlying network, the characteristics of each of these protocols are quite distinct.

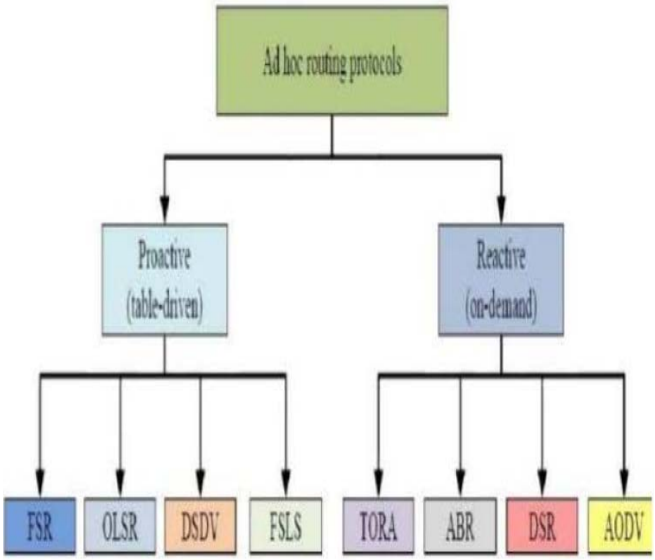

Fig 2: Classification of Routing Protocols in MANET.

Routing is the process of finding a path from a source to destination among randomly distributed routers. The broadcasting is inevitable and a common operation in ad-hoc network. It consists of diffusing a message from a source node to all the nodes in the network. Broadcast can be used to diffuse information to the whole network. It is also used for route discovery protocols in ad-hoc networks. The routing protocols are classified as follows on the basis of the way the network information is obtained in these routing protocols.

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III EXPERIMENTAL WORK

A network is a place where two or more communicating devices involve for the exchange of data with the principle of a store and forward. The network is categorized into two types which are wire-based network and wireless-based network. The existing protocols are suffering by enormous energy consumption and end-to-end delay due to poor selection of routing path for data packet towards destination. Congestion is considered as an important reason for enormous energy consumption, throughput and end-to-end delay. If congestion is not considered or treated in an appropriate time, it will lead to network failure. The proposed work reduces the energy consumption, throughput and end-to-end delay sharing the congestion information to the neighbor nodes.

Ad hoc On-Demand Distance Vector, AODV, is a distance vector routing protocol that is reactive. The reactive property of the routing protocol implies that it only requests a route when it needs one and does not require that the mobile nodes maintain routes to destinations that are not communicating [5, 6]. AODV guarantees loop-free routes by using sequence numbers that indicate how new, or fresh, a route is. The AODV protocol is one of the on-demand routing protocols for ad-hoc networks which are currently developed by the IETF Mobile Ad-hoc Networks (MANET) working group. It follows the distance vector approach instead of source routing. In AODV, every node keeps a local routing table that contains the information to which of it neighbors it has to forward a data packet so that it reaches eventually the desired destination. In general, it is desirable to use routes which have minimal length according to hop-count as a distance metric. However, AODV provides the functionality like DSR, namely to transport data packets from one node to another by finding routes and taking advantage of multiple hop communication. Moreover, it requires that every node can be addressed by a network wide unique IP address and sends packets correctly by placing its IP address into the sender field of the IP packets. This means also that AODV is expected to run in a friendly network, where security is a minor concern. It should be mentioned that there are some attempts to extend AODV to prevent malicious nodes from attacking the integrity of the network by using digital signatures to secure routing control packets. AODV requires each node to maintain a routing table containing one route entry for each destination that the node is communicating with. Each route entry keeps track of certain fields.

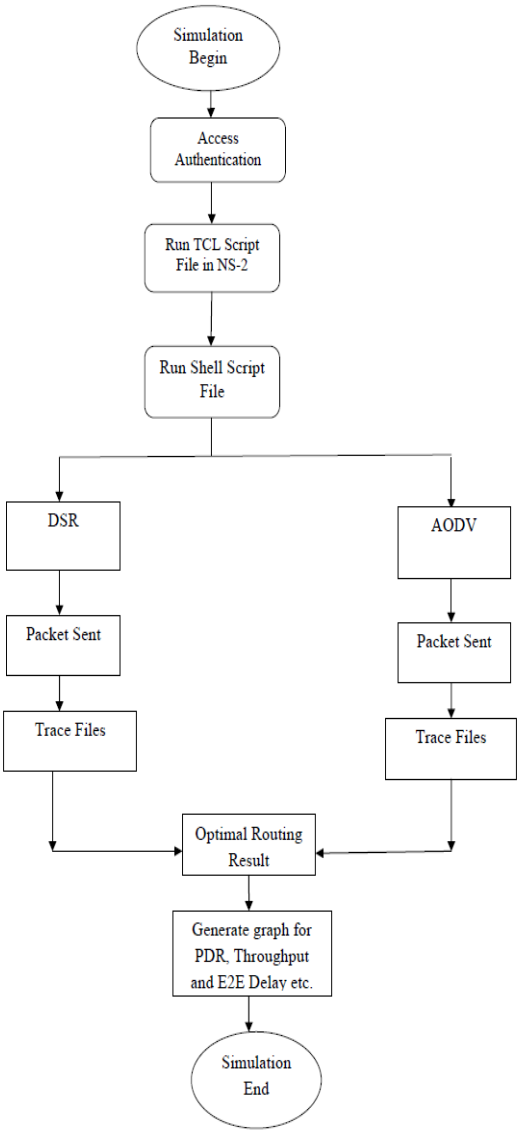

Fig 3: Proposed flow graph for simulation work.

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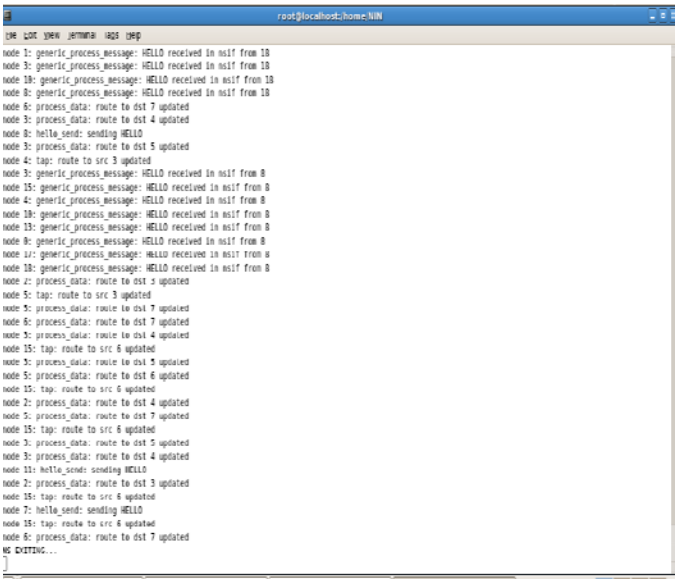

Fig 4: This window shows the running shell files output and their description used in a network simulator.

IV CONCLUSION NAD FUTURE WORK

The DSR protocol is a proactive protocol that can manage source routing networks without the need for routing tables and updating them. In the DSR protocol, the sender specifies all of the source paths to the destination and stores all the middle nodes in the packets. This protocol operates on the basis of link state algorithms, meaning each node can store the best route to the destination. Also, if a change occurs in the network, all network nodes are notified through the general flooding of this change. In this paper we proposed the comparative experimental study between the existing and proposed protocol and our proposed ad-hoc on demand distance vector routing protocol is very efficient in compression in dynamic source routing protocol. For the evaluation of performance our protocol tested in different network scenario tested through simulations for different distributions of nodes.

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