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A Reducing Data Traffic and Enhancing Data Availability to Deliver Packet in Mobile Ad-Hoc Network

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Abstract

Ad hoc networks are self-forming, auto configuring without any kind of pre-existing infrastructure. With the dearth of pre-defined topology there is no router or controlling device. Two mobile nodes can exchange data directly if they are in the defined range of each other. If not, nodes can communicate via a multi-hop route with the help of other mobile nodes. In this paper we have proposed an approach to reduce the data traffic and to increase data available in the mobile ad-hoc network. In the proposed method, MANET is server client based network, means a mobile host acts as a server and fulfill the others node's request. Each mobile node has a buffer for temporary storing data segment for a particular time, If a mobile node requests for a particular data segment and the request is multi hoped, then first request is sent to its (requester) neighbor node, neighbor node first match requested data segment with holed copy of data segment, if it is matched the request will be responded by this neighbor otherwise request will be routed to mobile server. In this way the overhead of the server and data traffic in the server zone will be reduced. The proposed method reduces time consumed by multiple nodes and data availability will be enhanced. Another approach lifetime ratio (LR) of the active route for the intermediate node is introduced to increase the number of unsuccessful packets delivery. Simulation results focused on the improvement of the packet delivery in the routing protocol.

Keywords

Ad hoc networks, mobile node, mobile networks, routing protocols, mobile server, buffer.

1. Introduction

A wireless network is an emerging technology that allows users to access data and information electronically, irrespective of their geographic position that means a host or a device can be moved, while communication, in defined area. Wireless networks are classified into two, first is infrastructure based network and infrastructure less (ad hoc) networks. Infrastructure based network uses the fixed and predefined structured. A connected mobile computer or device can access data and services while moving in defined geographic location. A wireless cellular network is divided over land areas called cells, each served by at least one fixed-location transceiver known as a cell site or base station. When joined together these cells provide radio coverage over a wide geographic area. This enables a large number of portable transceivers to communicate with each other and with fixed transceivers and telephones anywhere in the network, via base stations, even if some of the transceivers are moving through more than one cell during transmission, that means when it goes out of range (defined area) of one base station, it connects with new base station and starts communicating through it. This is called handoff. In this approach the base stations are fixed [5].

2. Mobile Ad-Hoc Network (MANET)

A mobile ad-hoc network is a category of wireless network. Ad hoc means it does not depend on a predefined network structure or topology, such as access points (AP) manages in (infrastructure) wireless networks. Instead, each node participates in routing by forwarding data for other nodes, and so the determination of which nodes forward data is made dynamically based on the network connectivity. In addition to the classic routing, ad hoc networks can use flooding for forwarding the data. Ad hoc networks require no centralized administration or fixed network infrastructure such as base stations or access points , and can be quickly and inexpensively set up as needed [7,5].

3. Routing in Mobile Ad-Hoc Networks

Mobile Ad-hoc networks are self-configuring multi hop wireless networks, the formation of the network

changes dynamically.In [13], the authors proposed a tree-based routing protocol, named MAODV (Multicast Ad Hoc On-Demand Distance Vector Protocol), This is essentially due to the mobility of the nodes [3]. Mobile nodes transmit and receive data with help of multi hop forwarding. The node in the network not only acts as hosts but also as routers that route data to/from other nodes in network [6]. In mobile ad-hoc networks there is no infrastructure support since a destination node might be out of range of a source node transferring packets; so there is need of a routing procedure. A path has to be found every time for forwarding the packets properly between the source and the destination. Within a cell, a base station can reach all mobile nodes without routing via broadcast in common wireless networks. In the case of ad-hoc networks, each node must be able to forward data for other nodes [8].

4. Problem in Mobile Ad-Hoc Networks

A mobile ad-hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless links. A mobile node, in a MANET can move freely in any place. Transmission, Security and Power consumed by mobile nodes, are the major concern of the mobile ad hoc network. Here we have not only focused on reduction of traffic for data access but also maintaining the data availability. Data availability means data is present and ready for use at all time. In mobile ad hoc network, mobile nodes consume more power during data transmission exhaust their batteries in a short time because battery capacities of mobile hosts are limited [2]. In this case, if a large number of mobile hosts leave the network and the network becomes meagre, and then data availability becomes lower. As a result, it is a significant research concern to reduce power consumption and make data availability as much as possible.

5. Data Access in MANET

A mobile ad hoc network (MANET) encompasses a set of wireless nodes (devices) that can move around freely and assist in transmitting packets on behalf of one another [3]. A MANET does not require a fixed infrastructure or centralized management. The remote nodes communicate through multi-hop paths. Unlike Internet, most applications of MANET engage in one-to-many (multicast) and many-to-many communication [3]. In this paper, we have proposed a data transmission method for not only maintaining data availability but also reducing traffic for data access. In our proposed method, each mobile host sends a data request attached with the deadline to receive the requested data item by the determined time. Moreover, each mobile host collects multiple requests for data items and transmits the requested data items by multi-cast. Therefore, our proposed method reduces data traffic. We verify the effectiveness of our proposed method by simulation experiments using a network simulator, NS-2 [10]. Note that a mobile host that issues a data request is called a data requester whereas a mobile host that transmits a data item in response to a request is called a data sender. A mobile host can become a data requester and a data sender at the same time.

6. Proposed Method

In our proposed method, we consider MANET as server client architecture, in our proposed architecture on the first hand MANET consists mobile nodes, all nodes use same protocol which is used in original mobile ad-hoc network. On the other hand a mobile node acts as mobile server; mobile server is capable of fulfilling request of all mobile clients. Mobile server has database or MANET may different database server. Data availability is a major challenge in mobile ad-hoc network. Database does not mean collection of data and software by which data can be accessed, updated and deleted. Data or database may be a file, collection of files or it may be any type of data. In this work, we have proposed a data transmission method for not only maintaining data availability but also reducing traffic for data access.

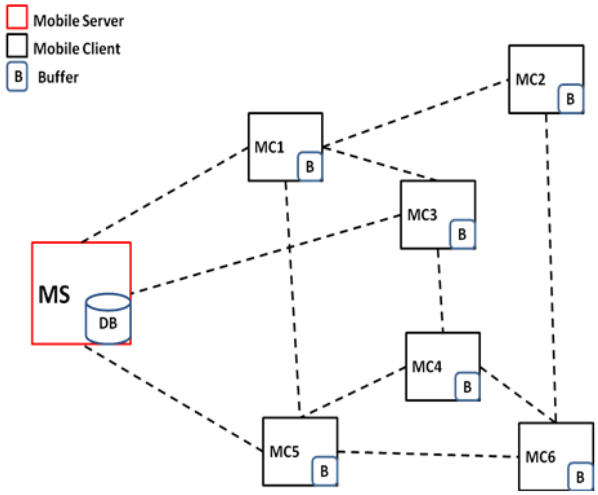

Figure 1. MANET with a Mobile Server & Buffer on Each Mobile Node

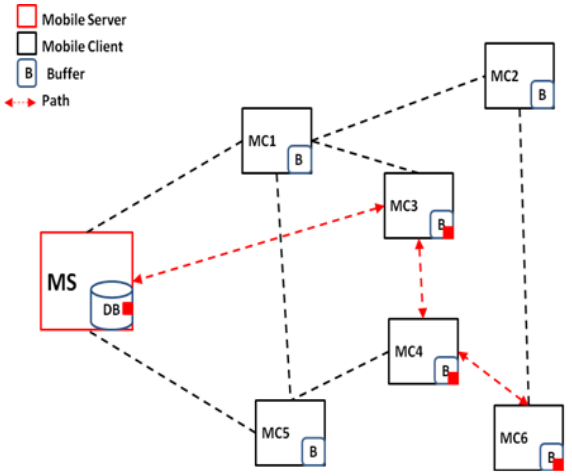

Figure 2. MANET with Data Segment Buffered on Each Mobile Node

Above diagram shows that how a mobile client requests for particular service or data segment. If any mobile node requests for particular data segment, first node communicates with its neighbour mobile node, neighbour mobile node forwards this request to next mobile node, in this way request is sent to the mobile server, the same path may be used for response to the requested node or it may be changed, it depends on current location of the mobile nodes. In above diagram shows that mobile client (MC6) requests for a specific data segment or file, which is available on mobile server, first of all, mobile client (MC6) sends a request to its neighbour which is MC4 in current situation, location of each mobile nodes can be changed because of ad hoc network, MC4 forwards this request to its neighbour which is MC3, now mobile client 3 sends this request to the mobile server where requested data is available. Now mobile server will fulfil the request of mobile client 6 (MC6). The replying path may the same or it may be changed. Involved in communication and power consumption are major challenges in mobile ad-hoc network. Here four mobile nodes are involved in communication between mobile server and mobile client 6, mobile nodes consume more power during data transmission exhaust their batteries in a short time because battery capacities of mobile hosts are limited [2], hop count is three, and four mobile node's battery power is using in communication. This is all because data is only available on mobile server, there was needed to increase data availability in mobile ad-hoc network. Data availability means data is present and ready for use prolong time. Here we have not only focused on reduction of traffic for data access but also maintaining the data availability.

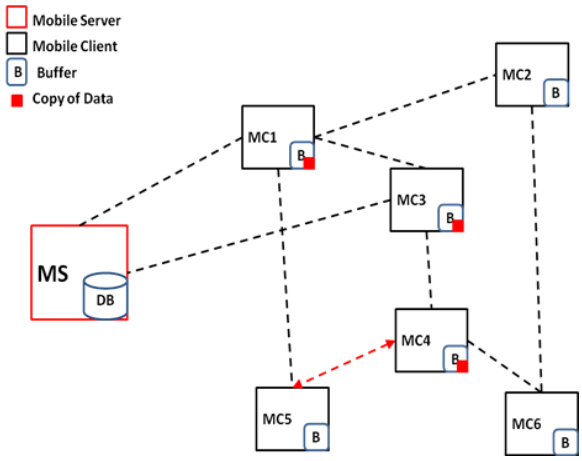

Figure 2. A Mobile Nodes with Responding for a Requested Data Segment

If any mobile client requests for particular data segment or file, first of all this node's request forwards to the mobile server via proper route, after getting request mobile server send back response to the requested mobile client, via same route or different route or path, but in situation mobile hosts are involved in communication. When mobile server sends back response by using other mobile nodes, when server sends requested data segment to its neighbor, this node which is neighbor of server or may be middle mobile node, which is involved in communication, keeps a copy of data segment and forwards this data segment to its neighbor, which is involved in communication. Here no need to forward request to the mobile server. This is our proposed method by which we can increase data availability as well as we can reduced network traffic in mobile ad-hoc network. Mobile client 5 request for same data segment which was requested by mobile client 6 (MC6), mobile client 5 (MC5) sends its request to its neighbor which is MC4, now MC4 has a copy of data segment stored in buffer, first MC4 matches data segment number with requested segment number, if it is matched then reply with requested data segment, otherwise forwards request for mobile server. In above example there is only one hop count for fulfilling request to the mobile client. The concept of temporary storage of data segment for particular time, enhance the data availability and reduces network traffic in mobile ad-hoc network. Our proposed method is not much generalized, but it is very effective to increase network traffic. Here database means it may be a file, number of files, an audio file, and a video file. Data may combination of these; it must be divided into segments or chunks. To

share data by our proposed method, we have used Transmission Control Protocol (TCP). The size of buffer is depended on the size of data segment. It is not our overhead to divide data into segments, it has already defined in TCP protocol how data is divided into segments, how many segments are there, what number policies are used, such type of problems are handled by TCP.

least recently used segment will be stored in the buffer, for example there is a live video communication or chatting with in mobile ad-hoc environment, every mobile node will ask for same data packet, we can store it in mobile node's buffer and send it in the behalf of server, this way network traffic and power of mobile node will be reduced. Now problem is that data or segment coherency, if data, which is stored at server, gets updated, how data will be updated at mobile node's buffer. So, we are using time-out concept, the time concept is that, if mobile nodes buffered any segment and no request comes for certain period of time, that is time slice, now buffered copy of a segment will be considered as a older one, if any mobile node requests after a certain period of time for the same packet or segment, the request will be sent to the server, instead of sending buffered copy to requested mobile node. Here both are used Least Recently Used (LRU) policy as well as Time Out Concept that makes buffer refreshment better data availability and reduce.

7. Result Analysis

In this section, we explain a data transmission method proposed in this paper. Ad hoc networks are self-forming, auto configuring without any kind of pre-existing infrastructure. With the dearth of pre-defined topology there is no router or controlling device. Two mobile nodes can exchange data directly .Table 1 contains three columns, one for number of node in mobile ad-hoc network, second columns i.e. Received packets by existing method (E_Rec_Pckts AODB Protocol), contains no of packet to be send in mobile ad-hoc environment, every packet to send through the server by which communication take places, and the last column i.e. Received packets by proposed method (P_Rec_Pckts SMRP) consists segment multicast routing protocol. Over method contains no of packet to be send in mobile ad-hoc environment, every packet to send through the client to reduce data traffic and enhance data availability. In over method to reduce server load. And maintain data traffic.

Table 1. Request Received by server

No of Node	E_Rec Packet of AODV	P_Rec_Packet SMRP
10	798	417
20	1593	1360
30	2386	1845
40	3165	2742
50	3942	3837

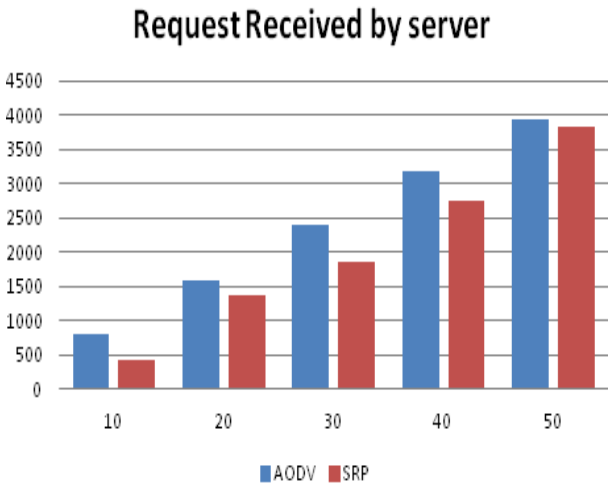

Figure 4. Request Received by server

Table 2. Request Replay by Server

No of Node	E_Rec Packet of AODV	P_Rec_Packet SMRP
10	797	416
20	1591	1600
30	2377	2388
40	3149	3173
50	3928	3896

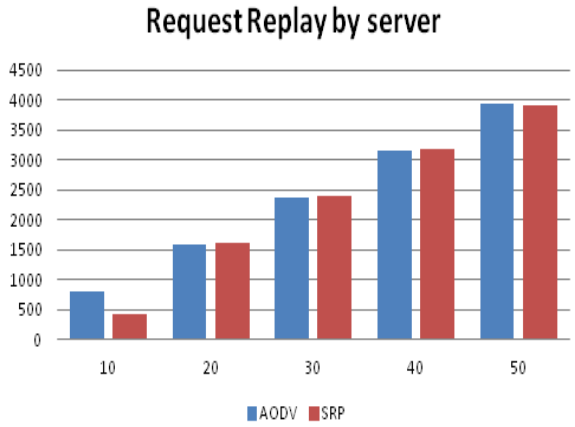

Figure 5. Request Replay by Server

Table 3. Request send by client

No of Node	E_Rec Packet of AODV	P_Rec_Packet SMRP
10	800	800
20	1600	1600
30	2400	2400
40	3200	3200
50	4000	4000

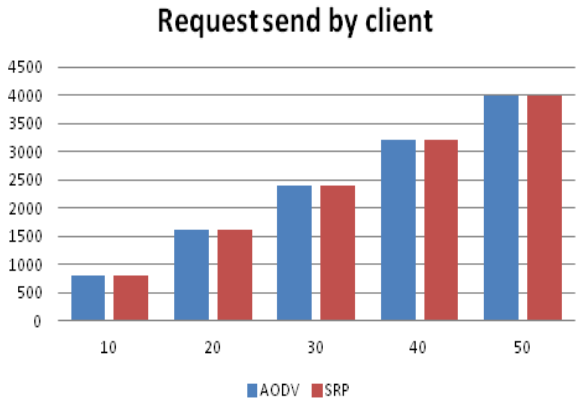

Figure 6. Request send by client

8. Conclusion

In this paper, we proposed a data transmission method for not only maintaining data availability but also reducing traffic for data access,We have proposed an innovative approach for ad-hoc networks; it shows the way to reduce broadcasting resulting with higher throughput. The proposed technique shows very better performance in dense networks than in a normal network. In this work, we assume an ad-hoc mobile network environment with server client architecture. However, in a real environment, there is no specific server but every mobile node acts as independent node. Our approach is very effective for network traffic reduction, maintaining data availability and also for enhancing battery life of mobile hosts. The approach is, every mobile node has a buffer for temporary storing data segment and responds to requests from other clients similar to the servers. In this way, we prevent a server and clients from redundantly transmit the same data item. As part of our future work, we plan to enhance our method for each environment. We also showed our experimental result with comparison of existing method.

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