EFFECTIVE GATEWAY DISCOVERY APPROACH FOR MOBILE AD HOC NETWORKS

Milind S. Chapekar[1], Dr. S. B. Pokle[2]

[1]VLSI Design, Shri Ramdeobaba College of Engineering and Management, Nagpur, (India)
[2]Professor, E &C, Shri Ramdeobaba College of Engineering. and Management, Nagpur, (India)

ABSTRACT

The Internet access from mobile networks is gaining great interest from the research community. Mobile Ad-hoc Networks consist of mobile nodes without central administration, having no physical links and not follow particular routing topology due to frequent mobility of nodes. Various routing protocols or Gateway Discovery Approaches have been designed to discover proper internet gateway and to deliver the information to MANET user in an appropriate way. The motto behind this work is to propose a gateway discovery mechanism to discover and dispatch proper Internet gateways based on its position and client capacity in MANET environment and provide services through it. This paper proposes a cloud-assisted gateway discovery mechanism for getting stable connection to the Internet with considering loading parameter of the gateway. The system performance will be evaluated based on various parameters like packet delivery ratio, end to end delay and throughput etc.

Keywords : AODV, DSDV, DSR, FSR Gateway Discovery Routing, Protocol, MANET.

I INTRODUCTION

An ad hoc network is a type of wireless network where wireless devices communicate with each other without wireless access point i.e. peer to peer communication. An ad-hoc routing protocol is a standard by which ad-hoc nodes decide the routing path of packets. As ad-hoc nodes in the MANET environment are mobile, the main motto of any routing protocol is to meet the challenge of dynamically changing topology.

An internet gateway is a modem or router or any other peripherals which allows you to access the internet. It provides means to connect mobile ad hoc networks with internet. So, for better transmission proper gateway must be selected. The gateway translates the MANET address space to the Internet and vice-versa. The following figure depicts the MANET-INTERNET integration as shown in Fig.1.

To provide global connectivity of all ad hoc nodes, the gateway discovery approach or routing protocol is required to localize the gateway within the ad-hoc network. The effective discovery and selection of internet gateways therefore significantly impacts the Quality of service.

For getting stable internet connection discovery of the proper gateway plays a very important role for that purpose study of different routing protocol is necessary. This paper discus the important Gateway discovery approaches (protocols) and suggests the client capacity control for better service.

1.1 Gateway Discovery Approaches

Mainly there are three types of gateway discovery approaches viz. Proactive, Reactive and Hybrid.

1.1.1 Proactive Gateway Discovery

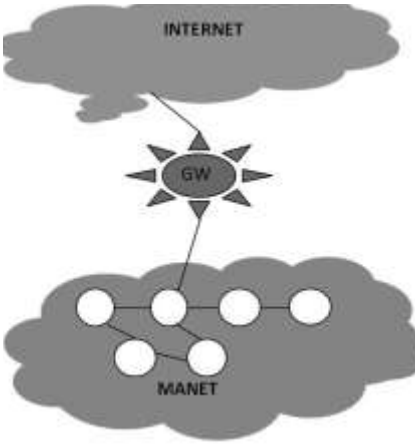

Fig. 1 MANET- INTERNET Interface

The process is initiated by the Gateway. In a proactive approach, as shown in Fig.2, gateways periodically broadcast advertisement messages to all mobile nodes in the network which is within a transmission range of gateway. Mobile nodes that already have a route to the gateway update their route entry for the gateway. Next, this advertisement is forwarded by the mobile nodes to other mobile nodes residing in their transmission range. To assure that all mobile nodes within the mobile ad hoc network receive the advertisement. As client receive advertisement message, it send a request message to advertising gateway to reserve it. Then gateway sends reservation message to client as an acknowledgement that gateway is ready to provide internet connection. The connection from the client to the cloud through the gateway is thus built. This approach achieves good connectivity but results in high overhead.

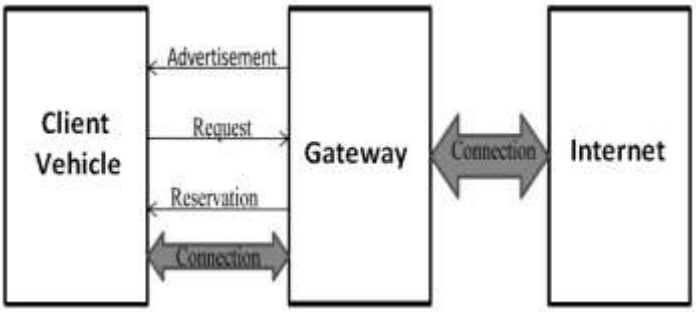

Fig. 2 Proactive Gateway Discovery

1.1.2 Destination Sequence Distance Vector Routing (DSDV)

In this protocol paths are made based on the control over the traffic and such paths are available all the time. Each node maintains one or more tables which contained the routing information about to other nodes. Such tables are continuously updated by the nodes and thus advertisements must be regular enough for proper routing.

1.1.3 Fisheye State Routing (FSR)

In this algorithm also the table is updated by the nodes but based on the information received from the neighbours. Table entries that are further in the distance are broadcast with the lower frequency than entries that are nearer. The problem with the FSR is that and the growing network sizes will also increase the routing tables, also if the topology changes increased then the route to a remote destination becomes inaccurate.

1.2 Reactive Gateway Discovery

The reactive gateway discovery is initiated by a mobile node that is to initialize or update information about the gateway. As shown in Fig.3, The client broadcasts a Solicitation message to all gateways within a transmission range. As the gateway received the Solicitation message, it sends back its own Advertisement message to the requesting client. As client receive advertisement message, it send a request message to advertising gateway to reserve it. Then gateway sends reservation message to client as an acknowledgement that gateway is ready to provide internet connection. Thus the connection from the client to the cloud through the gateway is built. The advantage of this approach is that requests are sent only when a mobile node needs the information about reachable gateways hence periodic flooding is prevented. The disadvantage of Reactive gateway discovery is that the load on forwarding mobile nodes, especially on those close to a gateway, is increased. This approach incurs low overhead for small networks but suffers from poor scalability.

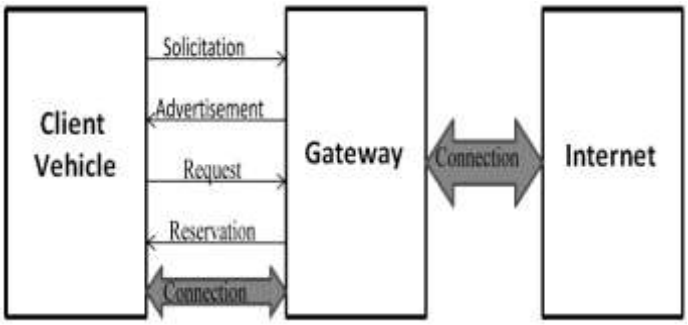

Fig. 3 Reactive Gateway Discovery

1.2.1 Ad Hoc On-Demand Distance Vector (AODV)

AODV routing protocol require each node to maintain a routing table containing one route entry for each of the destination that a node is communicating with. Each route entry keep a track of the certain field. Some of these fields are Destination IP Address, Destination Sequence Number, Next Hop, Hop Count, Lifetime, Routing Flags etc.

1.2.2 Dynamic Source Routing Protocol (DSR)

The sender knows the complete hop by hop route to the destination; these routes are stored in a route cache which is carried in the header of the packet. The process of finding new route to reach particular destination is started by sending a route request massage. This route request is broadcast along with the address of the source and destination which has unique identification. When received by a node, it checks the unique identification

and examine for duplicity if not duplicate then this node attach its address in the route request message and broadcasts else ignore.

Finally the destination receives the route message and transfer takes place with reply.

1.3 Hybrid Gateway Discovery

To minimize the disadvantages of proactive and reactive discovery of gateway, two approaches can be combined. This results in the hybrid proactive or reactive method for the gateway discovery.

1.3.1 Zone Routing Protocol (ZRP)

The proactive part uses a modified distance vector scheme within the routing zone of each node. The routing zone is determined by the zone radius, which is the minimum number of hops it should take to get to any node. Thus, each node has a routing zone, which is composed of nodes within its local area. This proactive component is called Intrazone Routing Protocol (IARP). The reactive component is called Interzone outing Protocol (IERP), and uses queries to get routes when a node is to send a packet to a node outside of its routing zone. ZRP uses a method called border casting in which a node asks all nodes on the border of its routing zone to look for the node outside of its routing zone.

II RELATED WORKS

In [1] authors proposed a gateway discovery approach named cloud assisted gateway discovery. In this protocol they have made the use of concept cloud computing. The key concept in this discovery mechanism is to maintain the DaaS Registrar and the DaaS Dispatcher. DaaS Registrar maintains related information of the gateways. DaaS Dispatcher is responsible of discovering and dispatching the gateways for the client vehicles. The gateway willing to support gateway service registers its state information with the DaaS Registrar in advance. The state information of the gateway includes current location, speed, direction, and QoS level (i.e. available resources). The DaaS Registrar then assigns a GID (Gateway ID) to the gateway. After that, the gateway renews its status periodically.

[2] is the survey paper for the above mentioned protocol discussing all the routing protocols viz. Proactive, Reactive and Hybrid and simulation results are compared between stationary gateways and moving gateways. It is shown that moving gateways outperform over the stationary gateways in many aspects like packet delivery ratio, signalling overhead etc.

In [3] authors proposed the Broadcast control based routing protocol in VANET. Broadcast Control-Based Routing Protocol for Internet Access in VANETS, has three desirable features: (1) it supplements the fixed infrastructure by providing alternative opportunistic access to the Internet using mobile gateways; (2) it generates considerably less overhead when determining routes, between vehicles and mobile gateways, by selecting the most suitable nodes to act as forwarders during the route discovery process; and (3) it takes into account the stability of the wireless links when determining routes to reduce routes' failures caused by frequent handoffs.

Deepak Kumar and Rakesh Kumar in [4] propose Adaptive Gateway discovery protocol and evaluated its relative performance. Basically the protocol explained runs as follows: - 1) Whenever any mobile node wants to deliver or receive the data traffic to the infrastructure network such as internet, it uses the gateway selection mechanism to select the appropriate gateway on the basis of the most optimal path . 2) The mobile nodes send

the data traffic to the internet node using the selected gateway. 3) The gateway obtains the required information i.e. the number of hops to the active sources which is needed for adaptation and stores it in its routing table. This information is obtained from the IP header of the data packet sent by the active sources. 4) Each intermediate node in the path from the active source towards the gateway gets the number of hops information too and stores it in its routing table. This node is distinguished from other node by the fact that it is used as the node to relay the traffic from active source. This node also gets the source address information as well.

In [5] the authors have predicted the link lifetime for the optimal routing protocol. In this work, authors explained the route establishment with respect to link lifetime which represents the time association between two reachable neighbouring nodes. It can be inferred from the paper that even though the number of long-lived links is not very large, compared with the total amount of links in the network, those long-lived links can form a 'backbone' network which provides more reliable connections between source and destination nodes.

III PROPOSED WORK

The system aims for accessing cloud services from mobile ad hoc networks and for that the gateway discovery mechanism is of utmost importance for proper communication. All the protocols that have been depicted in literature review are basically of Proactive, Reactive or Hybrid type. Each protocol is emphasizing on one or more aspect and tries to improve the performance over previous. Each has one way or other has pros and cons considering all the aspects of wireless communication. But it is common trend found that; the quality of service starts to deteriorate when the certain gateway is connected with lot of number of mobile devices. Thus we are proposing that; the threshold number of mobile devices upto which certain gateway works well within the expectations could be found and such number could be called as capacity for that gateway. After that in the optimal gateway discovery protocol; before connecting any node to the gateway its capacity should be checked for the optimal results. The flow graph is shown in the Fig.4.

The key concept of our protocol is to check the capacity of the Gateway before connecting any mobile node to it. For that each gateway could be kept updated with number of mobile nodes attached with it in the form of routing table or register.

The Client mobile or Client Vehicle (CV) broadcast request messages CV_REQ_GW to all gateways within its hearing range. At first, Gateway nearest to client response to request and selects as the portal to the internet until it is overloaded and send acknowledgement message GW_ACK to requesting client. Once it becomes overloaded, next nearer gateway is selected as best gateway to provide service to client vehicle. Then CV requesting for data to cloud by sending CV_REQ_DATA message through selected gateway. Cloud sends ACK_DATA message as an acknowledgement that whether the requesting data is available or not to requesting CV. Once it gets acknowledgement, client vehicle send CV_RDY_DATA message to cloud when it becomes ready to accept data.

IV CONCLUSION

Gateway Discovery Approaches or Routing Protocols are the heart of Mobile Ad-hoc Network. For effective communication within the MANET, it is very important that the given mobile node should be connected to proper Gateway. The common trend in the routing protocols for the MANET for selecting proper Gateway is maximum time link. However, this approach works fine upto certain number of mobile nodes, after which the quality of service deteriorate. Thus limiting the mobile nodes within threshold could certainly improve the effectiveness of the optimal protocol.

Thus we have overviewed all the types of gateway discovery approaches i.e. Proactive, Reactive and Hybrid. Generally the Hybrid type of protocol is used for the optimal results. We have also pointed out that; how limiting the capacity of the gateway could outperform over the existing protocol.

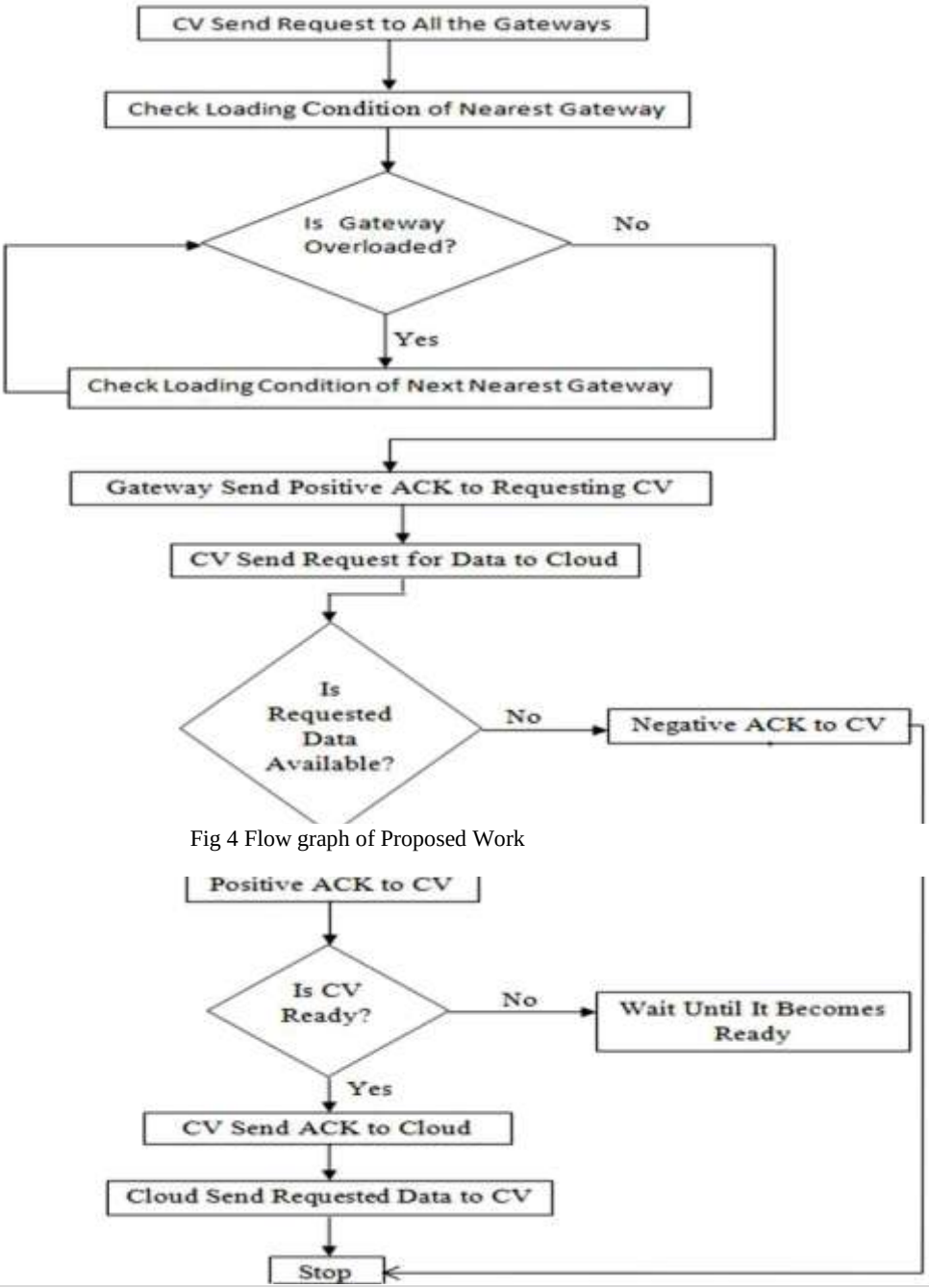

Fig 4 Flow graph of Proposed Work

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