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Resourceful and Proficient Exploitation of MDYMO in Mobile Ad hoc Networks

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Abstract: There are many reactive algorithms in use for mobile ad-hoc networks. The protocol we have taken into consideration is the multi-path dynamic MANET on-demand protocol. It uses 'Flooding Technique' for route discovery and special routing packets to accomplish its functionalities. A route request packet is used to discover all the available paths from the start point to the end point. A route reply message is sent which backtracks through the path in which route request arrived. Whenever the path from the starting place to the end breaks, the error is notified by means of RERR packets. The need for discovering multiple paths is that even when there is a break in one path, we make use of an alternative path to route the packets to the destination. The difficulty we are facing with the MDYMO protocol is that whenever a request from a node arrives, it floods packets to the entire network, thereby causing a broadcast overhead. In this study, we overcome the problem by coupling the Neighborhood Discovery Protocol (NHDP) along with MDYMO protocol. The NHDP protocol discovers and periodically updates information about its 1 and 2-hop neighbors, maintains them in its cache and uses it when a request arrives, thereby reducing the broadcast overhead.

Key words: Reactive, mobile ad hoc networks, multi-path dynamic MANET on-demand protocol, arrived, destination, updates

INTRODUCTION

In a Mobile Ad hoc Network (MANET), portable hubs move around self-assertively, hubs may join and leave whenever and the subsequent topology is continually changing. Routing in a MANET is testing a result of the dynamic topology and the absence of a current settled framework (Lee and Gerla, 2001). In a portable impromptu system (MANET), versatile hubs convey utilizing remote connections without a settled framework (Krasnovsky and Wieser, 2007), for example, base stations (get to focuses). Every versatile hub goes about as a switch to empower multi-bounce correspondence. A hub is allowed to move around arbitrarily and thus, the topology framed by the hubs is exceedingly powerful and erratic (Oh *et al*., 2007). The requirement for multi-bounce routing emerges when a few hubs are out of transmission scope of others. A hub just handles movement inside a nearby billow of remote gadgets. For instance, consider Fig. 1 in which the hover around the hubs shows the transmission go

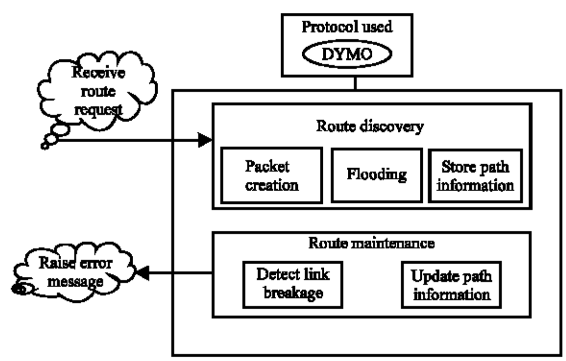

Fig. 1: Existing system design

(Koltsidas *et al*., 2007). For hub A to have the capacity to speak with hub C and D that both are out of the transmission scope of A, the transitional hub B should forward parcels to alternate hubs. The dynamic MANET on-request routing is a case for the reactive routing protocol (Galvez and Ruiz, 2007). Receptive routing protocols finds a course on request by flooding the

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system with route request parcels. The dynamic MANET on-request DYMO routing convention is a recently proposed convention as of now characterized in an IETF Internet-Draft in its 6th modification is still work in advance. DYMO is a successor of the AODV (Ad hoc On-Demand Distance Vector routing) routing convention and is the present designing concentration for receptive routing in the IETF MANET working gathering (Marina and Das, 2006). It works also to AODV. DYMO does not include additional components or develop the AODV convention, yet, rather rearranges it while holding the essential method of operation. This convention finds the course to goal which is at various jumps and furthermore discovers all the disjoint ways (Perkins *et al*., 2003).

Objective: The protocol that, we have taken into consideration is the multi-path dynamic MANET on-demand protocol. It uses 'Flooding Technique' for route discovery and special routing packets to accomplish its functionalities. A route request packet is used to discover all the available paths from the starting place to the end. A route reply message is sent which backtracks through the path in which route request arrived. Whenever the path from the starting place to the end breaks, the error is notified by means of RERR packets.

Existing problem: The existing system that has been designed implements the MDYMO protocol. The interface provided to the user consists of nodes placed randomly on the screen. The nodes placed keep moving around after a few seconds as the underlying network in this case is a mobile network (Ganjali and Keshavarzian, 2004; Pearlman *et al*., 2000) (Fig. 1).

Each node has a region of coverage that is represented by a circle that is drawn keeping the node itself as the center. The user of the system has to start the routing operations by first giving the source and destination to be reached. Once, the source and destination have been entered, the route discovery operation begins.

Route discovery for MDYMO: The route discovery is to discover the various (if present) paths from a source to a destination. The following are the steps involved in discovery of a route Any information within a network is transferred using packets. So, a packet is created at the source node entered. The packet contains information like the source id, destination id, sequence number, hop count, etc. The packet created at each node is called the RERQ message (Route Request).

After the creation of the packet, this packet is broadcasted or flooded throughout the network. This is done by finding the neighbors of the node at which the packet is created. Every hub is said to be a neighbor of another hub just in the event that, it is inside the scope of each other which is determined using the distance formula. After the neighbors are discovered, packets are again created at those nodes and they are in turn flooded across their neighbors until the destination is reached.

Every time the destination is reached, i.e., for all disjoint paths the path to this destination node is stored for performance analysis. Also, the user of the system is notified regarding the path information to this destination. After the path has been discovered, the path is traversed in the reverse order to inform the source regarding the route to the destination. The packet created for this is the RERP (Route Response) message.

The route discovery stops when the route to a destination has been found. There is a possibility that an error might during the route discovery and any other errors which is handled by route maintenance.

Route maintenance for MDYMO: The route maintenance is to handle any kind of link breakage or any case of in ability of the system to deliver the packet to its neighbor. The following are the steps involved in route maintenance. During route discovery if a node doesn't have any neighbor then a message called an RERR (Route Error) is transmitted to the source indicating that there is no path to the destination. Also when packets are repeatedly send from a starting place to end, the path between the two might not exist for long time as the nodes would move away. In this case again the route maintenance is used to send an error indicating the absence of the path. When this error is generated, the corresponding path is updated, so that, when a packet is again sent, the path discovery is done again.

MATERIALS AND METHODS

Proposed solution: The enhanced system uses the Neighborhood Discovery Protocol (NHDP) along with the DYMO protocol in order to overcome the drawbacks of the existing system (Fig. 2).

The basic difference between the existing system and the enhanced system is when the system is idle (Johnson *et al*., 2001). In the existing system only when there is a route request the neighbor information are collected but in the enhanced system the neighbor information is found even when the system is idle.

Neighbourhood Discovery Protocol (NHDP): In the enhanced system, the NHDP protocol is used in order to

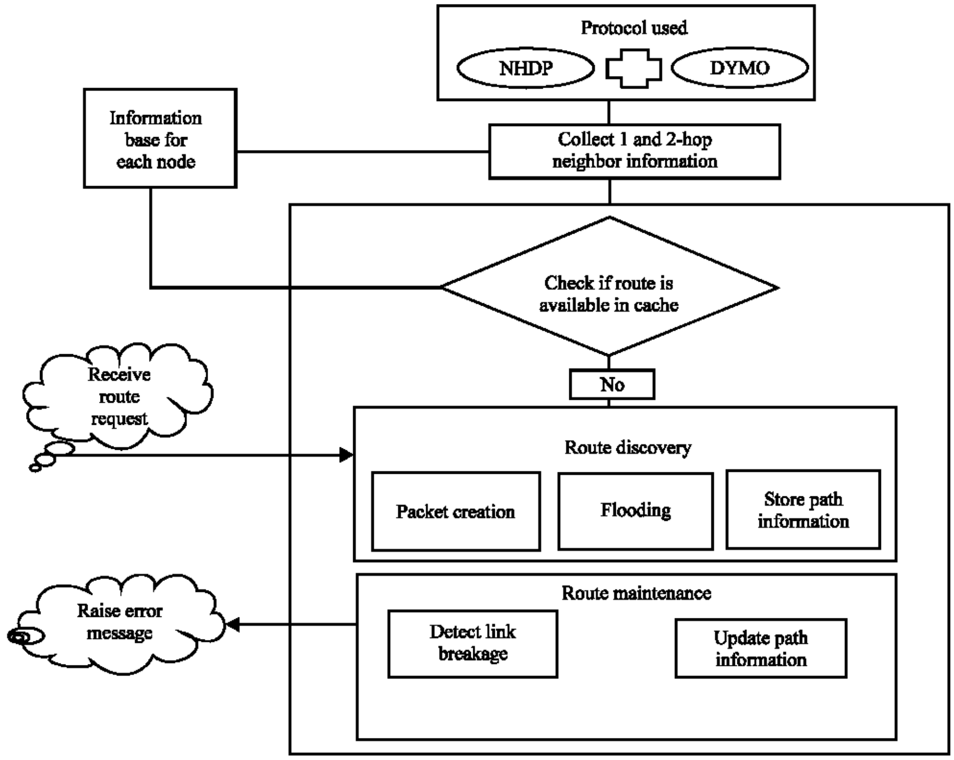

Fig. 2: Enhanced system design

improve the performance of the existing system. The following are the steps involved in the NHDP protocol. The first step in this protocol is that each node finds its one-hop neighbors and stores it in an information base. The information base will be present at each and every node.

In the next step, the two hop neighbors of each node are computed using its one-hop neighbors. This information is also stored in the information base at each node. The information is obtained according to the current state of the network.

Route discovery for MDYMO using NHDP: When a route request is issued in the network, the enhanced system first checks the information base of the source if there is a path available to that destination. If a path is available in the information base, then the system collects that information and the packet is delivered directly to the destination. This reduces the broadcast overhead as the request packet is not forwarded further in the network. If a path is not found in the information base, then the route discovery as in existing system is followed in order to determine the route to the destination. The route discovery in this case will produce the same kind of overhead and time as in the existing system. But if the path is found in the information base then the time taken for the route discovery is lesser compared to the existing system. The route maintenance in the enhanced system is similar to the one presented in the existing system.

RESULTS AND DISCUSSION

Dijkstra algorithm for finding shortest path: It is a diagram look calculation that settles the single source most brief way issue for a chart with non-negative edge cost delivering a briefest way tree. this is frequently utilized as a part of routing.

Let call the hub we have beginning with an underlying node. let the separation of a hub x be the separation from the underlying hub to it. Dijkstra calculation will allocate some underlying separation values and will attempt to enhance them by well ordered.

Steps:

1. Assign to every node a distance value. Set it to zero for a initial node and infinity for all other nodes
2. Mark all the nodes as unvisited. Set initial node as current
3. For current node consider all its unvisited neighbors and calculate their distance from the initial node
4. When we are done considering all the neighbors of the current node, mark it as visited. A visited node will not be checked ever again.Its distance now recorded is final and minimal
5. Set the unvisited node with the smallest distance from the initial node as the next “current node” and continue from step 3

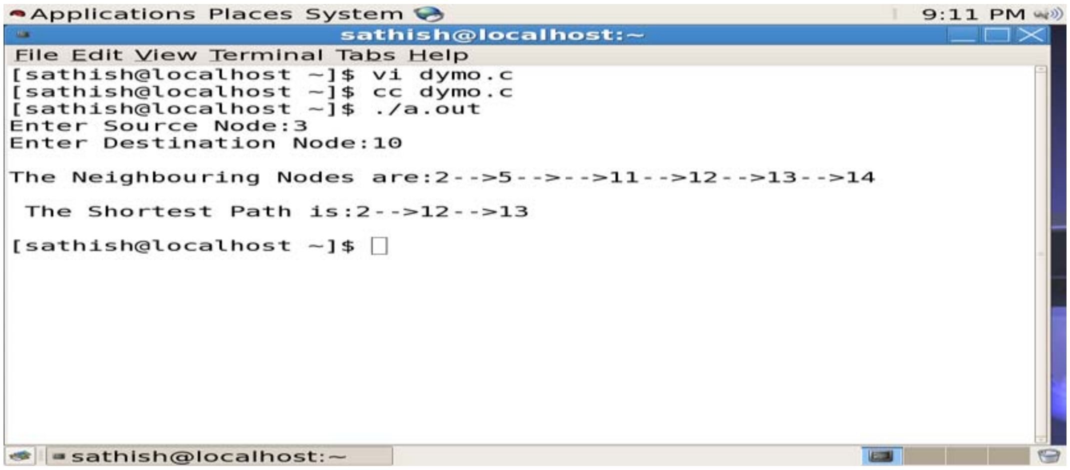

Fig. 3: Execution of ‘c’ program with the input displaying the shortest path and neighbouring nodes

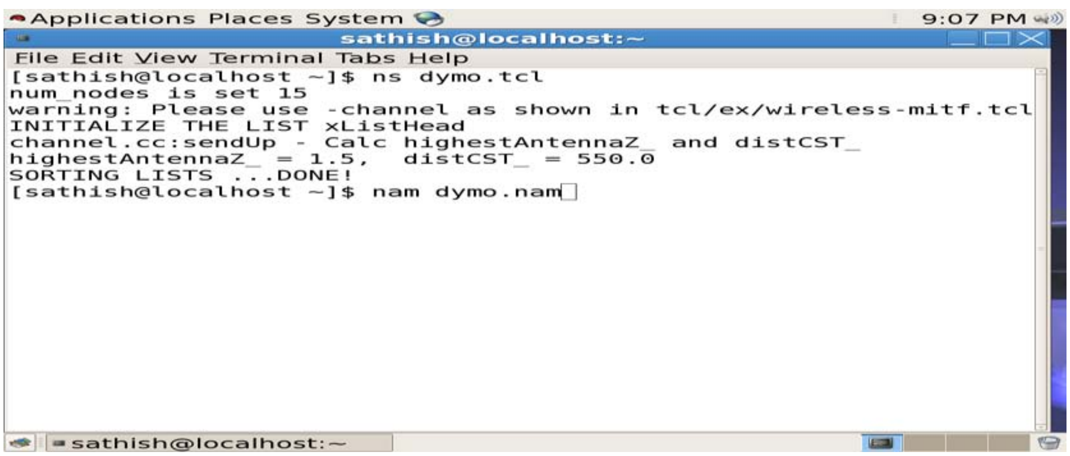

Fig. 4: Execution of ‘TCL’ program

Performance metrics: The performances of dynamic MANET on-demand protocol system and dynamic MANET on-demand-neighborhood discovery protocol coupled system are measured and compared. The metrics that have been used for measuring the performance of the systems are:

- Broadcast overhead
- Packet delivery ratio
- End-to-end time delay

Figure 3 shows the execution of ‘C’ program which gets source and destination nodes as input and displays the shortest path and neighboring nodes in mesh topology as output. Figure 4 shows the execution of ‘TCL’ program .This program creates ‘trace’ file and ‘nam’ file for DYMO program while execution. Figure 5 shows the initial state of the mesh network which contains 15 nodes for wireless routing. Figure 6 shows routing of packets from node 3 to node 2 for 0.5 msec.The working of this figure is also displayed at the mean time at the bottom of the simulation window. Figure 7 shows routing of acknowledgement from node 10-6 for 0.5 msec. The working of this Fig. 8 is also displayed at the mean time at the bottom of the simulation window. Figure 9 shows the broadcast overhead for MDYMO with time as X-axis and received packets as Y-axis. In DYMO the broadcast overhead is high and suffers more from congestion. MDYMO cope better with congestion, since, they have less overhead because of fewer route discoveries.

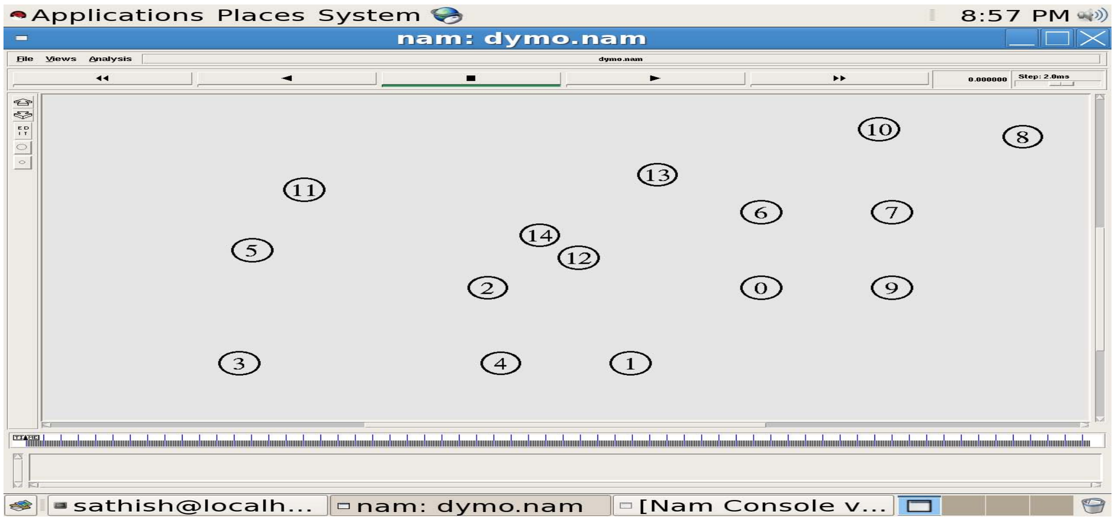

Fig. 5: Mesh network before routing

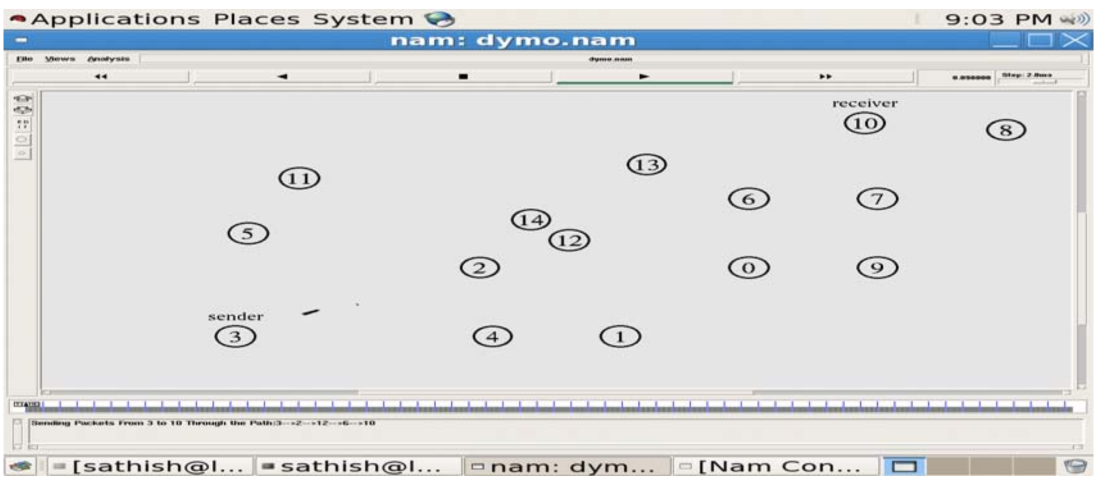

Fig. 6: The packets being sent from node 3-2

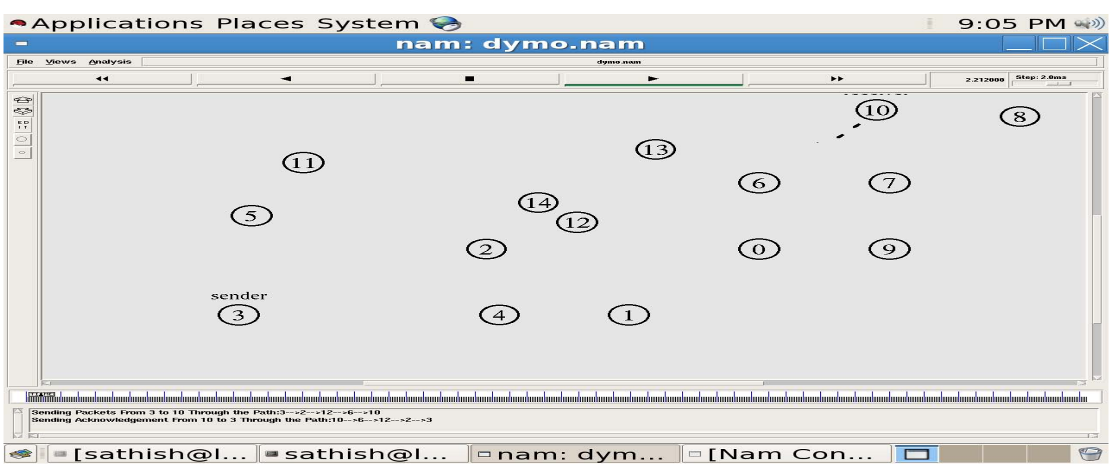

Fig. 7: The acknowledgement being sent from node 10-6

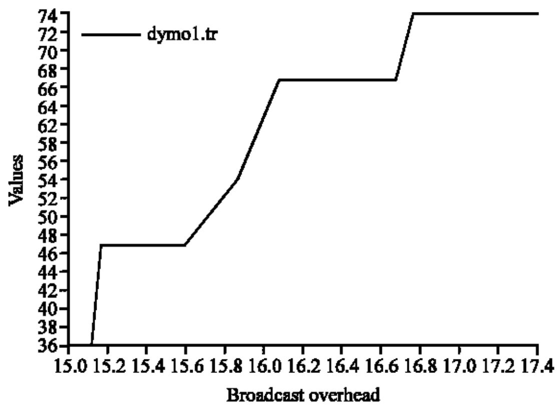

Fig. 8: X-graph for time vs. received packets showing broadcast overhead

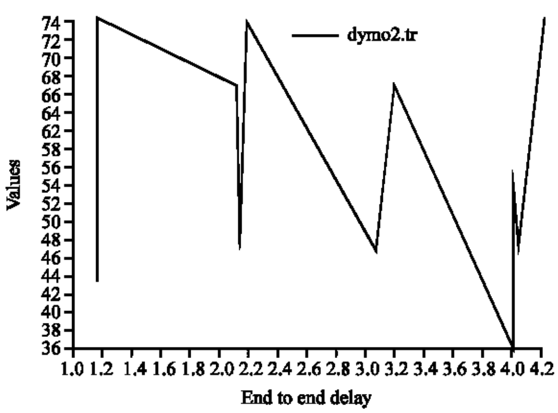

Fig. 9: X-graph for time vs. received packets showing end to end delay

CONCLUSION

This study combines the existing multipath dynamic MANET on demand protocol with neighborhood discovery protocol to overcome the drawbacks in the existing system. These problems can be overcome by coupling the Neighborhood Discovery Protocol (NHDP) along with MDYMO protocol. The NHDP protocol discovers and periodically updates information about its 1 and 2-hop neighbors, maintains them in its cache and uses it when a request arrives, thereby reducing the broadcast overhead. Also, since, 2-hop neighbors are stored in cache for each node,we can retrieve the smaller paths (≤2 hops) directly from the cache and thereby reducing the time taken to establish the path. However, in case of networks where the destination usually lies at a longer range from the source it takes several hops for a packet to reach the destination. In such cases, NHDP will not have much effect and hence, we have provided an option for users to toggle between existing and enhanced system. Hence, in case of networks with resource constraints one can choose the existing protocol and hence, avoiding the extra memory for maintaining neighboring information for each node.

RECOMMENDATIONS

Security can be added to the exchange of data between the source and destination. This is because the mobile ad hoc network is an unsecure network and there is more chance that our critical data can be tapped by some intruder who gets inside the network. There is a probability of stretching out MDYMO keeping in mind the end goal to find spatially disjoint ways, along these lines developing the materialness of the convention to different situations, for example, stack adjusting, course versatility. Stack adjusting grants a source to send information simultaneously along different ways, giving a higher data transmission to adapt the constrained limit of MANETs. Course versatility is that if a hub has various backup ways to go to a goal, when a course falls flat the source can change to a backup way to go, bypassing the huge overhead and dormancy of another course disclosure.

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