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IMPROVEMENT IN REVERSE AODV (RAODV) ROUTING PROTOCOL IN MOBILE AD HOC NETWORKS

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Abstract: The Ad hoc On Demand Distance Vector (AODV) is a routing protocol designed and best suited for mobile ad hoc network. Most of the on demand routing protocol including AODV use single route reply along the reverse path. Due to rapid changes of topology the route reply may not arrive to the source node resulting in sending several route request messages and degrading the performance of the routing protocol. The extended AODV called Reverse Ad Hoc On-Demand Vector (R-AODV) protocol uses a reverse route discovery mechanism and performs well when link breakage is frequent. In this study, it is concluded that RAODV has several benefits over normal AODV and in future RAODV can be upgraded in various ways for better performance.
Keywords: Reverse AODV, MANET, Ad Hoc Network, Routing, RAODV

I. INTRODUCTION

In Mobile Ad Hoc Networks Nodes May Move From One Location To Another On Variety Of Node Speed. As The Result, the Network Topology Changes Continuously and Unpredictably. Only Within A Short Period Of Time Neighboring Nodes Can Loose Communication Link, Especially When The Mobility Is High. In On-Demand Routing Protocols, Loosing A Communication Link Between Nodes Brings Route Breaks And Packet Losses. Especially, Loosing The RREP Of AODV Protocol Produces A Large Impairment On The AODV Protocol. In Fact, A RREP Message Of AODV Is Obtained By The Cost Of Flooding The Entire Network Or A Partial Area. RREP Loss Leads To Source Node Reinitiate Route Discovery Process Which Causes Degrade Of The Routing Performance, Like High Power Consumption, Long End-To-End Delay And Inevitably Low Packet Delivery Ratio. Therefore, We Are Considering How Simply To Decrease The Loss Of RREP Messages. A Situation Is Explained In Figure 1, Where S Is A Source Node, D Is A Destination Node And Others Are Intermediate Nodes. In Traditional AODV, When RREQ Is Broadcasted By Node S And Each Node On A Path Builds Reverse Path To The Previous Node, Finally The Reverse Path D->3->2->1->S Is Built. This Reverse Path Is Used To Deliver RREP Message To The Source Node S. If Node 1 Moves Towards The Arrow Direction And Goes Out Of Transmission Range Of Node 2, RREP Missing Will Occur And The Route Discovery Process Will Be Useless. We Can Easily Know That Several Alternative Paths Built By The RREQ Message Are Ignored. There Are Some Possibilities That After Sending A Number Of RREQ Messages, Source Node Can Obtain A Route Reply Message. As Mentioned In Literature, When The Number Of Nodes Is 100 And The Number Of Flows Is 50, 14% Of Total RREP Messages Are Lost.

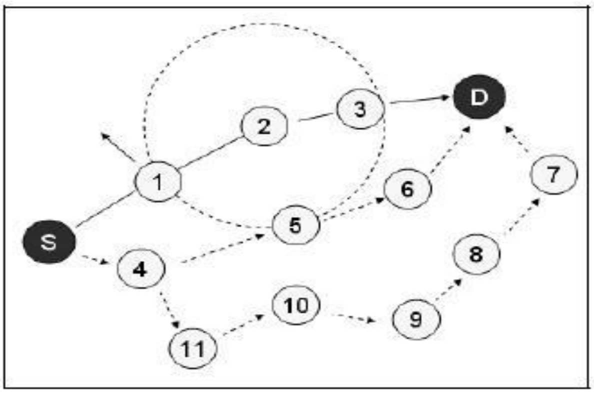


Fig. 1: RREP Delivery Fail

There Are Some Possibilities That After Sending A Number Of RREQ Messages, Source Node Can Obtain A Route Reply Message. As Mentioned In Literature, When The Number Of Nodes Is 100 And The Number Of Flows Is 50, 14% Of Total RREP Messages Are Lost. So The R-AODV Is Proposed To Avoid RREP Loss And Improve The Performance Of Routing In MANET. R-AODV Uses Absolutely Same Procedure of RREQ of AODV to Deliver Route Reply Message to Source Node. We Call the Route Reply Messages Reverse Request (R-RREQ). R-AODV Protocol Can Reply From Destination To Source If There Is At Least One Path To Source Node. In This Manner, R-AODV Prevents A Large Number Of Retransmissions Of Route Request Messages, And Hence Diminishes The Congestion In The Network. Moreover, R-AODV Will Improve The Routing Performance Such As Packet Delivery Ratio And End-To-End Delay.

II. R-AODV (REVERSE AODV) ROUTING PROTOCOL OVERVIEW

After Analyzing Various Protocols, We Can Say That Most Of On-Demand Routing Protocols, Except Multipath Routing, Uses Single Route Reply Along The First Reverse Path To Establish Routing Path. As We Mentioned Before, In High Mobility, Pre-Decided Reverse Path Can Be Disconnected And Route Reply Message From Destination To Source Can Be Missed. In This Case, Source Node Needs To Retransmit Route Request Message. Purpose Of Our

Study Is To Increase Possibility Of Establishing Routing Path With Less RREQ Messages Than Other Protocols Have On Topology Change By Nodes Mobility. Specifically, The Proposed R-AODV Protocol Discovers Routes On-Demand Using A Reverse Route Discovery Procedure. During Route Discovery Procedure Source Node And Destination Node Plays Same Role From The Point Of Sending Control Messages. Thus, After Receiving RREQ Message, Destination Node Floods Reverse Request (R-RREQ), To Find Source Node. When Source Node Receives An R-RREQ Message, Data Packet Transmission Is Started Immediately.

A. Route Discovery in R-AODV

Since R-AODV Is Reactive Routing Protocol, No Permanent Routes Are Stored In Nodes. The Source Node Initiates Route Discovery Procedure by Broadcasting. The RREQ Message Contains Following Information: Message Type, Source Address, Destination Address, Broadcast ID, Hop Count, Source Sequence Number, Destination Sequence Number, Request Time (Timestamp). Whenever The Source Node Issues A New RREQ, The Broadcast ID Is Incremented By One. Thus, The Source And Destination Addresses, Together With The Broadcast ID, Uniquely Identify This RREQ Packet. The Source Node Broadcasts The RREQ To All Nodes Within Its Transmission Range. These Neighboring Nodes Will Then Pass on the RREQ to Other Nodes in the Same Manner. As The RREQ Is Broadcasted In The Whole Network, Some Nodes May Receive Several Copies Of The Same RREQ. When An Intermediate Node Receives A RREQ, The Node Checks If Already Received A RREQ With The Same Broadcast Id And Source Address. The Node Cashes Broadcast Id And Source Address For First Time And Drops Redundant RREQ Messages.

The Procedure Is The Same With The RREQ Of AODV. When The Destination Node Receives First Route Request Message, It Generates So Called Reverse Request (R-RREQ) Message And Broadcasts It To Neighbor Nodes Within Transmission Range Like The RREQ Of Source Node Does. R-RREQ Message Contains Following Information: Reply Source Id, Reply Destination Id, Reply Broadcast Id, Hop Count, Destination Sequence Number, and Reply Time (Timestamp). When Broadcasted R-RREQ Message Arrives To Intermediate Node, It Will Check For Redundancy. If It Already Received The Same Message, The Message Is Dropped, Otherwise Forwards To Next Nodes. Furthermore, Node Stores Or Updates Following Information Of Routing Table: Destination Node Address, Source Node Address, Hops Up To Destination, Destination Sequence Number, Route Expiration Time And Next Hop To Destination Node. And Whenever the Original Source Node Receives First R-RREQ Message It Starts Packet Transmission, And Late Arrived R-Rees Are Saved For Future Use. The Alternative Paths Can Be Used When The Primary Path Fails Communications.

B. Route Update and Maintenance

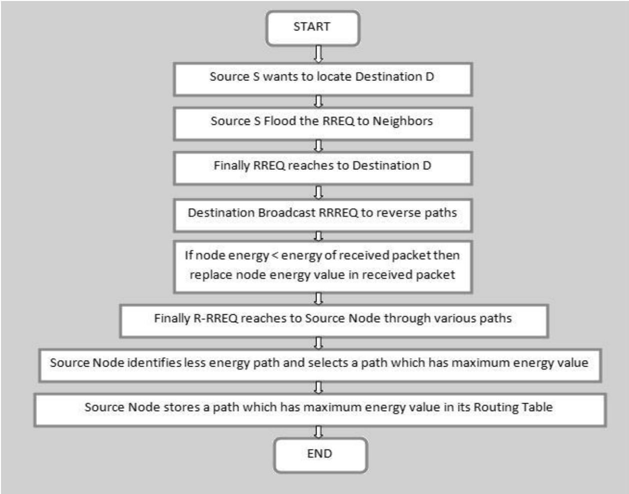
When Control Packets Are Received, The Source Node Chooses The Best Path To Update, I.E. First The Node Compares Sequence Numbers, And Higher Sequence Numbers Mean Recent Routes. If Sequence Numbers Are Same, Then Compares Number Of Hops Up To Destination, Routing Path With Fewer Hops Is Selected. Since The Wireless Channel Quality Is Time Varying, The Best Path Varies Over Time. The Feedback From The MAC Layer Can Be Used To Detect The Connectivity Of The Link. When A Node Notifies That Its Downstream Node Is Out Of Its Transmission Range, The Node Generates A Route Error (RERR) To Its Upstream Node. If Fail Occurs Closer To Destination Node, RRER Received Nodes Can Try Local-Repair, Otherwise The Nodes Forward RRER Until It Reaches The Source Node. The Source Node Can Select Alternative Route or Trigger A New Route Discovery Procedure.

III. PROBLEM FORMULATION

As Given In [1], Successful Delivery Of RREP Messages Is Important In On-Demand Routing Protocols For Ad Hoc Networks. The Loss of Rreps Causes Serious Impairment on the Routing Performance. This Is Because The Cost Of A RREP Is Very High. If The RREP Is Lost, A Large Amount Of Route Discovery Effort Will Be Wasted. Furthermore, The Source Node Has To Initiate Another Round Of Route Discovery To Establish A Route To The Destination. The Proposed R-AODV Route Discovery Succeeds In Fewer Tries Than AODV. The Results Show That R-AODV Improves The Performance Of AODV In Most Metrics, As The Packet Delivery Ratio, End To End Delay, And Energy Consumption. Future Work Is Proposed To Study Practical Design And Implementation Of The R-AODV. As Given In [2], It Does The Comparison Of RAODV And MRAODV Routing Protocols. In MRAODV Authors Have Changed Route Replay Packet Configuration of RAODV and Named It RRREQ. These Packets Should Be Transmitted To Destination Node For Building Multiple Routes.

According To The Simulation Results, This Algorithm Is Better Than Other Version Of AODV Algorithm. For The Future Work, In MRAODV The Concept Of Energy Is Also Included And So Assigns The Priority Of Different Dedicated Paths Between Source And Destination On The Basis Of Both Energy As Well As The Stability Of Nodes Or Paths. As Given In [3], It Presented A New Protocol For Mobile Ad Hoc Networks Based On Link Stability And Energy Of Paths. Authors Have Changed MRAODV Routing Algorithm And Made An Optimized Version Of AODV. New Method Shows Good Performance in Some Ways. In IMRAODV They Changed Route Replay Packet Content Of MRAODV. These Packets Should Be Transmitted To Destination Node For Building Multiple Routes. According To The Theoretical Concept, This Algorithm Is Better Than Other Version Of AODV Algorithm.

IV. PROPOSED METHODOLOGY



V. CONCLUSION

After Going Through The Various Articles On The Reverse AODV Routing Protocols And From Comparative Study Of Various Reverse AODV Based Routing Protocols, We Conclude That Revese AODV Is Best For MANET To Assure Better Handling Of Route Breakages. RAODV Routing Protocol Is Already Proposed In The Literature. So We Can Find Out Various Ways To Optimize The Functioning Of RAODV. Also After Identifying Problem Formulation, One Can Research In That Area.

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