IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 17, Issue 5, Ver. I (Sep. – Oct. 2015), PP 59-60
www.iosrjournals.org

Improved Energy Conscious Dynamic Source Routing (I-ECDSR) for Adhoc Networks

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Abstract: *Adhoc network is a collection of mobile devices that have a capability of organizing themselves into a temporary network. Efficient routing is one of the key challenges in Adhoc networks. In this paper, we propose a new reactive routing protocol for Adhoc networks that takes two factors viz. delay and hop count into consideration for selecting the path between the source and destination. The protocol ensures that path selected is reliable for transmitting data from source to the destination.*
Keywords: *Ad-hoc Networks, DSR, ECDSR, Delay, Hop Count*

I. Introduction

Adhoc network is a collection of mobile devices that have a capability of organizing themselves into a temporary network. It is also referred to as infrastructure less network because there is no need of pre-existing access point to connect nodes with each other. Since the nodes can directly communicate with each other, it is also called as peer to peer wireless networks. Adhoc networks have an advantage of quick and cost effective deployment and thus can be used in emergency situations for rescue operations. It also has applications in military, car parking, and other commercials applications, etc. Although the applications of Adhoc networks are growing fast, it also has certain issues in routing, security, energy management and deployment considerations.

On the basis of routing scheme, the ad-hoc networks are broadly classified into three categories viz Proactive, Reactive and Hybrid. In proactive routing protocols, the routes are pre-established by the destination node. In reactive routing protocols, the routes are derived only when needed by the source node. The hybrid routing protocol is the combination of both proactive and reactive routing protocols. [1]

II. Related Work

In this section, we present related works to our proposed protocol.

A. DSR

Dynamic Source Routing (DSR) is a reactive routing protocol that has two phases in its routing process. The two phases are route discovery and route maintenance. In the route discovery phase, the source node broadcasts the route request message to all its neighbors. The route request message contains source ID, Destination ID and sequence number. The intermediate node on receiving the route request message checks its cache for the route to the destination. If the route is available, then that is followed otherwise broadcasting is done till the route request reaches the destination. The destination node sends the route reply through the path with minimum number of hops.

If the breakage of link occurs in the path, the route maintenance is carried by sending the route error message to the source node by the node at which the link failure occurs. [2]

B. AODV

Adhoc On Demand Distance Vector (AODV) is an on demand routing protocol that overcomes the problem of packet header over growing in DSR by maintaining the routing tables at each node. The nodes in the routing path exchange routing tables with each other frequently for quick routing decisions. [3]

C. ECDSR

In Energy Conscious DSR (ECDSR), the destination node selects path on the basis of less delay instead of less hop count, which results in the communication over a long period of time. ECDSR has two phases: Energy Saving Phase and Energy Survival Phase. In energy saving phase, the route is selected on the basis of less delay which is inversely proportional to the residual energy. That is the routes with high energy can only participate in the communication.

$$\text{Delay} \propto 1/(\text{Residual Energy}) \qquad (1)$$

In the energy survival phase, when the energy of any node reaches to some threshold value, it stops participating in the communication and thus sends route error message to the source node. The source node on receiving the route error message starts new route formation, eliminating the nodes with energy below or equal to the threshold value. Such nodes with energy equal to the threshold can be used in critical situations. [4]

D. ABR

Associative Based routing (ABR) is reactive routing protocol that takes two factors into consideration for choosing the path from source to destination. The two factors are: link stability and shortest path. The stability of the link is determined by the number of associative ticks which is initially set to zero. High associative ticks mean high stability. Associative tick of any node depends on the number of times it receives the beckoning message. If the node does not receive any beckoning then its associative tick will be zero and thus unstable. If the two paths have same level of stability, then the path is chosen on the basis of shortest path. Further if large number shortest paths are available, then path is selected randomly among them. [5]

III. Proposed Protocol

The main aim of I-ECDSR is to select the path from source to destination in such a way that takes two parameters into consideration which include less delay and minimum hop count. This ensures that best possible route is selected for transmitting data. There are four phases in I-ECDSR which are as:

A. Source node processing

The source node broadcasts the route request packet to its neighboring nodes. Each neighboring node which receives the packet computes the delay and appends it to the header so that it can be processed further.

B. Intermediate node processing

Upon receiving the route request (RREQ), the intermediate node scans its cache to check if any other route request (RREQ) with same sequence number, source ID and destination ID has arrived first. If it has, it will discard that route request with same sequence number; otherwise it will check its cache again to find if it has any other routes available up to the destination. If any route is available, it will uni-cast the route request to the destination through that path otherwise it will broadcast the RREQ to its neighbors.

C. Destination node processing

Upon receiving the new route requests, the destination node computes the best possible path by taking into consideration two parameters which include delay and hop count, using the equation 2. Once the path is selected, the source node is sent route reply through that path. In the equation, A and B are constants which are used to give weight to each parameter.

$$Z = \min (A. \text{Delay} + B. \text{Hop Count}) \quad (2)$$

D. Data transmission: The source node starts data transmission through the path it has received route reply.

IV. Conclusions

In this paper, we present a new reactive routing protocol for Adhoc networks which take two factors into consideration for selecting the best possible path between the source and destination. DSR selects path on the basis of minimum hop count while as ECDSR selects path on the basis of less delay. The new I-ECDSR selects path using both the parameters minimum hop count and less delay with certain weight assigned to each parameter. The protocol can be simulated and results can be compared with DSR and ECDSR for performance evaluation.

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