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Comparative Study of Delay-Oriented and Hybrid Load Balancing Routing Protocols in Mobile Ad Hoc Networks

Bahram Najafpour[1], Behzad Mahdavi[2], Vahab Ashrafian[3], Narges Latifi Avid[4], Mehdi Sadeghzadeh[5]

[1]Sama technical and vocational training college, Islamic Azad University, Ardabil Branch, Ardabil, Iran.
[2,3,4]Department of Computer Engineering, Science and Research branch, Islamic Azad University, Ardabil, Iran.
[5]Department of Computer Engineering, mahshahr branch, Islamic Azad University, mahshahr, Iran.

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ABSTRACT

Mobile ad hoc network is a collection of nodes with high mobility that without any central management they are dynamic topology due to mobility of nodes, may cause the network topology change, thus creating a high reliability routing is one of the important aspects of these networks. Network load balancing and congestion are a major problem in mobile Ad hoc networks, number of tasks and many routing protocols have been proposed for load balancing, The majority of proposals for routing overhead is currently trying to achieve load balancing and avoid of adding additional routing overhead during a route is created. Metrics selected for most of the proposed protocol is based on the traffic loads which try to distribute the traffic load on their network nodes. Choose an appropriate metric can help to improve network performance. We studying load balancing metric for each of the protocols put. Therefore, a comparative study of load balancing using two techniques of load balancing routing protocols and results in the tables show for each load balancing techniques.
KEYWORDS: Mobile ad hoc networks, routing, load balancing, congestion.

1. INTRODUCTION

Due to the instability and lack of a centralized topology routing in MANET [1] is a challenge in these networks. Many routing protocols attempt to provide a standard algorithm for load balancing which can undermine the important criteria of a route is very important. Among the most prominent AODV [2] and DSR [3] routing protocols using the basic steps of choosing the most efficient route, but as the number of steps when there is congestion and bottlenecks on the network, it is not possible, Thus a path metric selection should be a network from all directions, both for its node, the neighbor nodes or consider other options. Ad hoc traditional routing protocols can be classified into two types.

For example, Active and Reactive. Efforts to protect the active routing protocols adaptation, routing information at each node by propagating across the network, although it can always be a route to the destination (if any) using the data collected at the national level is used.

The general approach needs to large number of packets transmission, which cause to the power consumption of a node. In contrast, reactive protocols find a route from source to destination only when the source is required [4] [5]. Using of appropriate metrics can affect the performance of the selected route, Most of the routing protocols consider load balancing metric chosen in order to a path high performance. Consider Most of the traffic-oriented routing protocol structure is traditional DSR protocol. Therefore, in this study we consider the load balancing techniques are important, In separate studies conducted in our load balancing protocol routing protocols into two categories: delay-oriented and hybrid division we put in a comparative study.

2. Congestion and the Need to Load Balancing

Ad hoc mobile networks (MANETs) have limited communication bandwidth and range than other wireless networks. MANET routing is one of the most challenging aspects of and all these constraints with dynamic network topology, routing in MANET is to add complexity. Low bandwidth devices in MANET means that probability there is network congestion, when congestion occurs, appropriate measures should be taken to avoid congestion. Over the years, many routing protocols for MANET are proposed with emphasis on load balancing [6] [7].

The main goal of the load balance protocols is to divert traffic from congested paths and nodes that currently exist in / or large number of data is going to transit other nodes or other host route. If there is no load balancing mechanism, delayed will be increases. Suitable solve for traffic congestion on routes where there are relatively fewer total throughput and reduced latency generally increases traffic congestion, Including packet loss rate, end-to-end delay and battery power consumption.

This motivation cause to increase the study of load balancing routing protocol [8] [9] [10] to disperse the crowd by choosing the appropriate path by the routing stage. Several Ad hoc routing protocols using route as a routing metric.

Although it is perceptible and simple, we did not consider the link capacity. Most of routing protocols try to avoid congestion on routes and consider a metric to measure and calculating an amount of congestion on the routes and nodes between source and destination pairs. Values can be achieved by using the proper distribution of the load of different trails less crowded it is done.

Corresponding author: Bahram Najafpour, Sama technical and vocational training college, Islamic Azad University, Ardabil Branch, Ardabil, Iran. Email address: B.Najafpour@iauardabil.ac.ir; Mobile: 0098-9398444054

3. Nodes Load Balancing

Load balancing is an important part of a fit network. For example, if huge loads to the nodes with low processing capabilities and none of the nodes have to share the load, the result is complex. Potential load imbalance due to the processing / computing power than uniform systems there are, for example many idle nodes and other nodes are also full time. A node with high processing power after finishes its work quickly estimates low load [11]. So there are more needs to node balance.

Multi-path routing can balance the load better than single-path routing in networks Ad hoc, the first choice for the shortest path routing is used. It is possible just for a large number of nodes in the network between any pair of source. It is impossible to build such a system and keeping it affordable for the large number route.

Load balancing by using multiple paths instead of using a short path is improved. Thus a network for better load balancing in distributed multi-path load sharing strategy requires good design [12]. The basic structure of multi-path routing protocol using multi-path routing protocol AOMDV [13] routing is used for the calculation. And can balance the load better than single-path routing protocols to communicate.

4. Optimal Route Selection

The main question that arises load balancing routing protocols. Optimal path selection for load balancing. Identify nodes that are more active and taking various other parameters can be optimized route network to get better performance. A path is an activity that most packet delivery rate, end-to-end delay is reduced and better throughput between source and destination pairs for the network to. And the direction in which traffic is prevented. So choose the optimal route that can provide better load balance is important. Two paths to consider choosing the optimal path is: Active path and Inactive path.

Active path: ACK message back to the path chosen by the source is sent to the destination node to route the call active. Data source node and the destination send along this path.

Inactive path: the direction in which the activity is to establish the relationship between source and destination pairs, and the nodes along these paths are not optimal. For load balancing and load this route is not considered disabled.

5. Protocol Classifying Based on the Load Balancing

Over the years, many routing protocols have been proposed Ad hoc load balancing. Most methods of application protocols that are based on load balancing strategies are combined with the route discovery [14].

Low load path, which is usually chosen, may be from source to destination. As shown in (Fig. 1), the routing protocols can generally be divided into two types (based on load balancing) are classified as:

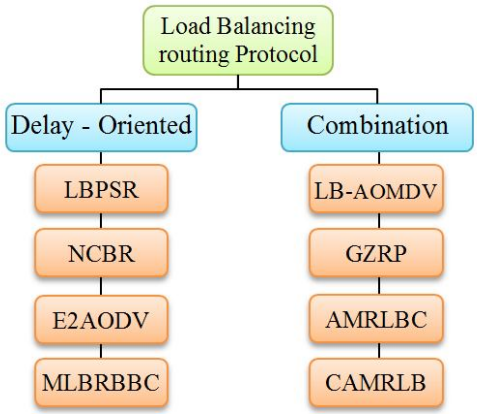

Fig. 1. Classification of load balancing routing protocols

5.1. Based Delay

To prevent node where load balancing is achieved by Delay the link above.

5.2. Based Combination

Load balancing, is combination of Delay and Traffic characteristics.

6. The Structure of Load Balancing Routing Protocols

Structure of most of routing protocols is AODV and DSR routing protocol .Routing protocols load balance by considering a suitable structure try to improve performance and suitable load distribution among network nodes. Usually shift inherently routing network and node mobility in mobile networks makes it difficult. Using appropriate routing, thereby transmit and adjust the load on multi-path and congestion control instead of selecting a suitable structure is important.

7. Routing Protocols for Load Balancing in Mobile Ad hoc Networks

Here we examine load balancing routing protocols. The examination of protocols in this chapter in terms of load balancing techniques and Comparative study and performance evaluation of different ways to balance the load in the

proposed protocol are discussed. In this section we examine the selection criteria according to the load balancing techniques.

7.1. Delay Oriented Load Balancing Routing Protocols

In This section, delay-oriented load balancing routing protocols are studied.

7.1.1. Using the success rate of packet for load balancing routing

In this protocol LBPSR [15] (success rate of packet routing, load balancing), a new efficient routing, named load balancing, by using of the success rate of packet routing is proposed. That traffic load balancing using PSR (success rate of packet) MAC layer as a metric to choose the optimal gains. This method makes use of DSR, this protocol to avoid crowded and unstable nodes which are full time; some of the nodes that are located in shortest path with good performance, trying to balance the load on each node are given capacity.

7.1.2. Node-centric load balancing routing protocol

This protocol NCBR [16] (node-centric load balancing routing) algorithm is similar to AODV does. In This protocol, each node will touch congestion and toothily will be avoided. Diverting of congestion from or other alternative routes that might exist is the responsibility of the network.

The main goal of this protocol is to prevent the formation of new routes through a node is busy and congested. Each node uses to obtain the status of congestion its current size of the queue.

7.1.3. Protocol for load balancing

This protocol E^2 AODV [17] calculate different routes with links stable routes to avoid congestion. In this protocol, an energy-efficient load balancing mechanisms, given the congestion and energy consumption of the nodes is proposed. Different routes to a destination choose a single path and the less hop count and higher obsolescence of the network provides. In this protocol, each node length interface queue it's to judge if the intermediate node full time changing the Queue interface nodes has been used in the reverse path. Thus, the threshold has been set according to the network load.

7.1.4. Multi-path load balancing and congestion control based on rate

The protocol MLBRBBCC [18] (multi-path load balancing and congestion control based on rate) A method new multi-path load balancing and congestion control in communication networks based on the rates provided.in This study on adaptive rate control protocol based on a technique in which the destination node, the estimated rate of intermediate nodes can copy, and with feedback to sender sends the REEP packet.

Source of node data packet to the destination node during the intermediate node sends the data getting, Percent channels productivity and queue lengths at intermediate nodes along the path to a destination can be estimated and transmitted to the destination based on these values congestion status and rate calculation. The estimated rate of the intermediate node sends a RREP to the sender. Sender rate control based on the estimated rate of RREP Packet does.

7.1.5. A comparative study of delay-oriented load routing

In this section we study the comparison routing protocols are based on a delay-oriented load routing.

Table 1. Compares the delay-oriented load balancing routing protocols

Parameters	LBPSR	NCBR	E^2AODV	MLBRBCC
Routing path	Single path	Single path	Single path	Multi path
Category	Channel access Probability	Traffic size	Packet in interface Queue	Node delay
Traditional protocol used	DSR	AODV	AODV	-
Neighboring load	Yes	Yes	Yes	No
Load balancing used	Node	Node	Node	Node
Interface queue	Yes	Yes	Yes	Yes
Metric used	Packet Success Rate	Current congestion status	interface queue length	Rate control
Routing structure	Reactive	Reactive	Reactive	-
Load balancing effect	Network	Intermediate nodes	Network	Network
Complexity of capturing load	High	Low	High	High
Consideration Load balancing	Destination Based	Source Based	Source Based	Source Based

7.2. A Comparative Study of Combined Routing

In this section we study the comparison routing protocols are based on a combination routing.

7.2.1. Multiple path routing mechanism

Protocol LB-AOMDV [19] (multi-path routing mechanism) by using of multi-path routing and traffic distribution on actively routing and less congestion, trying to distribute of the load balancing across all the nodes in the network. Present protocol with a new metric that buffer size is provides better load balancing.

7.2.2. Adaptive Multi-path routing for load balancing

This algorithm AMRLBC [20] (adaptive multi-path routing, load balancing) multi-path routes, measure routes of the various fail-safe. A different path with fail-safe contains a node with more battery power, minimum load and remaining battery power. When average load in the present links increase and the remaining battery power of a node is less than a threshold, Traffic distribution over multi-path routes discrete congestion is to reduce the traffic load on the link.

7.2.3. Adaptive congestion multi-path routing for load balancing

Protocol CAMRLB [21] (adaptive multi-path routing, congestion) is presented to avoid congestion. In this method, when the average link load increases beyond the defined threshold and the available bandwidth and reduce energy remains under the threshold, Traffic over different routes fail-safe in order to reduce the traffic load on the link is congested distribution. Metrics calculated in this algorithm: calculate the available bandwidth, estimated load and estimated remaining battery power.

7.2.4. Load balancing in genetic territorial routing protocol for MANET

Genetic territorial routing protocol [22] is extension combining routing protocol ZRP by using of genetic algorithm. GZRP by using of GA in IERP and BRP part of ZRP represents limited collection of alternative paths for distension in order to network load balancing and stability during link refraction/node in intuition path processing. GZRP for its action achieve good result in comparison with ZRP scale.

In this approach, GZAR create alternative paths GA with genetic activity according to network topologic data, to preserve number of moderated paths that are used to reduce path end to end correlation and delay. These alternative paths that have been created by G pocket distribution are used to several paths for network balancing. GZRP like ZRP when destination node acts within zone routing source nodes (or routing schedule) pay attention to improve 11% or 14% according to mobility and criterion. The proposed approach has represented nature of load balancing and nature of lapse tolerance whole of alternative paths without any needs to path intuitions.

7.2.5. Comparative studying of combined routing

This section is a comparative study of combined routing.

Table 2. Compares the combination load balancing routing protocols

Parameters	LB-AOMDV	GZRP	AMRLBC	CAMRLB
Routing path	Multi path	Multi path	Multi path	Multi path
Category	Packets in Interface queue	Channel access Probability	Traffic size	Traffic size
Traditional protocol used	AOMDV	ZRP	AOMDV	QMRB
Neighboring load	Yes	Yes	Yes	Yes
Load balancing used	Node	Node	Link-Node	Link-Node
Interface queue	Yes	No	Yes	Yes
Metric used	Buffer size	Alternative routes	fail-safe	fail-safe
Routing structure	Reactive	Hierarchical	Reactive	Reactive
Load balancing effect	Network	Network	Network	Network
Complexity of capturing load	Low	High	High	High
Consideration Load balancing	Destination Based	Destination Based	Intermediate nodes	Intermediate nodes

8. Conclusions

Routing problem in the MANET is a challenging issue. How to select multiple paths and load proper distribution of these path ways is important. The purpose of load balancing increased capacity and fault tolerance of networks. Load balancing is optimal resource utilization, maximize throughput, minimize response time and avoid overload.

Paths select for load balancing and consider the effectiveness and sustainability of the network will result in an appropriate metric. These Paths leads to better delivery of packets and end to end delay is reduced. The controversy surrounding the nodes to balance the load on the network should be considered.

Our main focus is on the study protocol load balancing mechanism compared to distribute traffic over multiple active paths between selected pairs of source and destination. Many of the algorithms for load balancing routing protocols DSR, AODV for load balancing routing. Hence, load balancing routing protocols using different metrics to the traffic distribution among the network nodes. Criteria considered in most protocols to distribute the load on the paths chosen number of hops, buffer size and battery power remaining.

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