A SURVEY ON CACHE ROUTE SCHEMES TO IMPROVE QOS IN AD-HOC NETWORKS

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ABSTRACT

MANET (Mobile Ad-hoc Network) is a wireless Ad-hoc network which serves all necessities in a real-time world since it possesses dynamic infrastructure qualities. Although MANET works as a best for all fields it also experiences drawbacks based on routing and overall data access process. To trounce with this problem, cache optimization mechanisms along with dynamic routing procedures have been practiced wide to make an improvement in quality factors. Among the cache optimization mechanisms, cache route optimization schemes serve the best in showing signs of development in overall QoS factors. This paper summarizes the possible cache route optimization mechanisms to advance the QoS metrics are Routing Overhead that reducing overhead in route discovery, Packet Delivery Ratio, Packet Drop, minimizes the difference between number of packets send and received over the total time require to touch the destination and reduce the energy consumption by each node.

Index Terms – Cache Route, Cache Optimization, QoS, MANET, U-DSR

I. INTRODUCTION

A MANET is a constantly self-configuring, infrastructure-less connections of mobile devices linked wirelessly. In MANET, each device is free to go separately in some way, along with, it modifies relations to further devices regularly. Everyone should forward traffic not related to its personal use, with so being a router. The process of setting up the routing process in MANET involves the following stages [18, 19].

(1) Route Discovery – This process deals with identifying the destination nodes and determining the path through neighbouring nodes.
(2) Configuring – This process deals with assigning a unique identifier for each node in MANET before initialization of routing.
(3) Broadcasting – The broadcasting deals with the passing of control and status messages to all nodes connected to the networks. Every time a fresh node is additional or a position of a node is to be known then the broadcasting will be carried out.

The routing challenges in MANET are security, bandwidth optimization and energy consumption. A security issue arises during the start of the routing process. Here the routing process may be disturbed using physical damage or unauthenticated factors. The second issue, namely the bandwidth has to be consumed at the higher rate for the benefit of the successive transaction of data. The final issue which is the most effective challenge in routing is energy consumption. By consuming the energy; the router can extend its maximum limit of communication with other nodes.

Route cache strategy has a great impact on MANET. To transmit packets from one mobile node to other by using route discovery mechanism and this process may be tedious most of the time. In demand to evade such route-finding mechanism every time the caching mechanism is used for transmitting the packets. The major approach is for avoiding the route discovery operation as much as possible to diminish the network flooding. Because the regular use of this method is very expensive in terms of consuming bandwidth and delay, which can reason obstruction and lengthy delay [21].

Route caching is a readily cached available route to the challenging node by reducing the latency considerably and also it avoids the processing of route finding and decreases the traffic that is essential in finding a new route. It supplies the routes from the source node and for avoiding the redundant route discovery process that needed every time to transmit the data packet. For the reason, to re-initiating, a route discovery method in taking place of demand routing protocols are expensive in terms of delay, usage of high battery, and utilization of bandwidth owed to network flooding, which can cause the delay in sending the first data packet. The protocols performance generally depends on a well-organized execution of route cache.

One method to reduce the worthless route cache is to flush out for accessing the cache later than a few Time-To-Live (TTL) interval. If TTL is set excessively small, suitable routes are probably toward not needed, in addition to that while searching the new route every time results in delaying routing and increases the traffic overheads. On another part, TTL is set excessively huge, worthless route caching are used, and in further the both issues like delays in routing and overheads nodes during communication.

An effectiveness of caching the route place among two conflicting situations, that is how often to purge similarities in order toward evading invalid routes and how extended to store the route for consequent utilize. The intent in two cases are to stay away from overheads as well as save bandwidth and reduce latency.

This paper structured as follows: In the sect.2, gives a background of MANET and its protocols. In the sect.3, gives the overview of literature surveys and discusses the problems. In the sect. 4, we describe the performance metrics from the literature survey. Finally, in the sect. 5, a conclusion is made.

II.BACKGROUND

A. Overview of MANET

The most recent advent technology in network field is Mobile Ad-Hoc Network (MANET) and the recent research activities are carried on this popular field. MANET is a dynamic self-configuring wireless network. It is an autonomous collection of nodes and the communication are operated without centralizing authority [21]. In MANET every node operates as a router and also provides access points or base station for communication between nodes. MANET provides the provision of adding or removing any node at any point to the network [15]. Fig. 1 represents the structure of MANET and its connectivity.

Fig. 1: Structure of MANET

B. Basic MANET Protocols

There are basically three categories of MANET protocols which are widely used. The protocols are categorized based on the routing conditions exist during communication [17]. Fig. 2. Portrays the basic protocols of MANET. The protocols are as follows:

1) PRP (Proactive Routing Protocols) - In PRP, the routes are prefixed and each communication takes place from the routing table information. For every fixed time interval, the routing information is updated. Here, all node maintains a table for routing which represents the data from one node to all other nodes.

E.g. DSDV (Destination Sequence Distance Vector)

2) RRP (Reactive Routing Protocols) – In RRP, the routes are defined only at communication time. The routing scheme is decided at transmission time. In a case of unusual conditions, control messages are used to know the status of the node or the network. Reactive routing protocols are comfortable for routing due to dynamic route fixation.

E.g. AODV (Ad-hoc on demand Distance Vector)

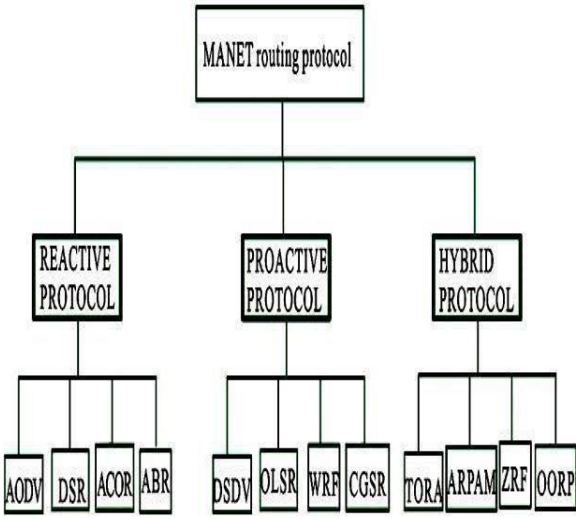

Fig. 2: Basic Routing Protocols

3) HRP (Hybrid Routing Protocols) - In HRP are the combination of Proactive and reactive protocols where the routes are also fixed and altered for compatibility.

E.g. ZRP (Zone Routing Protocol)

III.RELATED WORKS

Mandhare, [1] d eveloped cache update scheme using distributed route cache update algorithm. In conservative approach, simply the nodes concerned with the direction-finding path knows on an error in the route and those nodes only update their cache. But in Updated –Dynamic Source Routing (U-DSR), the source node transmit the route error information to all its neighbors. Hence all neighbors replace the fault routes in their cache.

Experimental evaluation is done using the network simulator (NS2) of monarch group. The proposed approach shows improvement in dissimilar QoS parameters like Packet Delivery Ratio (PDR), Packet Drop (DP), End-to- End Delay (EED), as well as Energy Consumption (EC). The major challenge in the routing protocol is how effectively, they handle when the topology is changed. This approach briefs that the protocol utilization increases in the performance of network.

Song Guo and Oliver Yang [2] presented and adaptive cache timeout method for routing protocol in MANET is BSR that maintains and establishes support routes for the primary path breaks. In order to discover both techniques quantitatively, that is backup routes and cache-timeout system, a simulation study has been produced to show that both the methods have an effect on the routing performance. The following two features are observed: (1) the backup route method is hav-ing an impor--tant factor in nearly all cases, and (2) Improving the high-level mobility by performing notable timeout method. It extensively minimizes the discovery of nodes from timeout mechanism and backup nodes. It also considering in truncating the packet drops,

shorter the EED, and improved competence compared with DSR.

Ashokraj, et al., [5] recommended an approach is that how to reduce the problem in route caching. Thus, traversing the nodes in the network and collecting the information over the network by using the smartest packet (control packet). This concept is termed as SP (Smart Packet) based on DSR-SP (Dynamic Source Routing). After collecting information, the route cache is updated by using it.

The above said approach is used to get the better effectiveness of cache and SP are created with the help of linking path in DSR to reduce the overhead. Entries of invalid cache has been observed to lower the packet advent, network density, and mobility in the defined network. The PD ratio is maintained evenly in the channels during the transmissions of SP. Therefore, the network loads the packets into the network. Although the energy decreases, SP is compensated to increase the effecttiveness of cache and delivering the better results. Based on this outcome obtained, it is practical in that decreasing the invalid cache entries, packet advent, intended for low as well as medium density networks, at higher mobility.

Yaoda et al., [8] suggested a new scheme of cache linking adaptive timeout. Then, this cache scheme link will be timed-out by the lifetime link. The results explain that how this proposal can adjust to changing the effective scenario and working well in conditions of PDR (Packet Delivery Ratio) on overhead and PD.

Vineet Joshi et al., [10] described CMR protocol designed for MANET and explains that how to find there discovering of routes for distributing every packet. The study of this based on customized Timer based caching technique to GZRP. The outcome of this work is an improvement in GZRP with caching over standard GZRP. Application of this scheme avoids the route stale and improves searching. The packets multiple new paths and how that can be enhanced on for reusing and reducing the participation at the destination side. This protocol describes how the disjoint pair of nodes dealing with several routes which are derived from the stored route information from the neighboring nodes. Consequently, routing problems are reduced and better throughput is obtained.

Ying-Hong et al., [3] have described DBRR with aid of this mechanism, a large number of data repetitions and data path in the hierarchy of MAN-ET can be cached in numerous unique changeable nodes. It shortened the data access in terms of routes and time and reusing data rate is improved to minimize the bandwidth usage as well as consuming the battery power.

Chao-Tsun Chang [6] suggested a novel hash caching mechanism as well as distributed hashing routing methods to get better cache power, the performance of routing, and maintenance efficiency. Experimental results prove that the proposed mechanism of this work outperforms related works, including Path cache, Link cache, and Vector caches of cache capacity, the size of the cache, complexity in routing, the length of routing, packets control, PD, faults in route, EED, and throughput in networks. Furthermore, this method is accessible intended for the hosts with lesser cache needed.

Weibo et al., [7] described fresh reactive zone-based routing (two-level) protocol with a location-based caching policy for MANETs. During the valuation, this protocol minimizes the overhead control and delay in PD simultaneously through the grouping of two-stage reactive route discovery process and location- based expiry time prediction caching mechanism.

Mostafa [9] identified the problem in joint routing and caching in the hybrid network which contains mobile nodes and mobile infrastructure. The path of the cellular is modeled as either (i) a congestion-insensitive constant delay path or (ii) a congestion-sensitive a modelling the path in an M/M/1 queue. This establishes static caching based on comfortable popularity and to it has been showed that the route caching is optional. The routed request to the cellular paths in the congestion-insensitive case and ought to be a divide among the cellular infrastructure and the cache in the congestion-sensitive case.

Sateesh Kumar and Ramachandram [11] presented GZRP which leads to an expansion of ZRP functional by means of Genetic Algorithms (GA). It is used for finding the other routes into load balancing in a network as well as to resist the link and/or failures of nodes. The caching which is previously discovered is needed to avoid release be seen to an upper limit of 40% in the cache development GZRP with load balance, fault manipulation and caching. The remaining time selection in route cache influences the performance of route cache.

Fenglien Lee et al., [12] have proposed an effective algorithm for managing route discovery and handling mobility on -demand cache routing on MANET. The L-2 caches are applied for creating, updating, and maintaining the route table. This algorithm with double-level route caching solved nearly all issues in on-demand routing. The results of OCR show that this algorithm outperforms AODV, DSR, and CSOR in PDR, the average EED and average routing load. This algorithm would be a huge involvement for MANET routing.

Hao-jun Li et al., [13] analyzed the principle and the caching methods in ZRP. About the issues in early-detection and late-detection in ZRP, the optimized A-ZRP which links the routing information priority with the latest access time is proposed. It improves storage cache format information in the routing table. The results (simulation) shows that AZRP is having advantages over ZRP in view of the radius of routing zone, overhead in routing, delivery fraction and load transmission. In A-ZRP, the processing of reducing the time in path discovery, decreasing the route overhead and improves PD.

Wenbo Zhu et al., [16] presented the CPDSR method as well as the time reaction which determines accurately when a node's link is unstable. Preemptive routing increases the QoS in the network greatly because it alleviates common route failures and subsequent packet losses to a wide extent. The warnings related to routing are more accurate in CPDSR than PDSR, and there will be a sufficient increase in throughput specially, with the low node mobility.

IV. PERFORMANCE METRICS

The Commonly used performance metrics for examining cache routing are listed [1]

- Packet Delivery Ratio – It is amount of packet, successfully reached to the destination.
- End–To-End Delay- It is defined as the ratio between time variation on the numbers of packet send and received over the total time require to attain the destination. If delay reduces, the network performance will show positive signs.
- Routing Overhead – When routing and data packets shares the same bandwidth in the same network the particular condition is referred as routing overhead. If routing overhead is high, the protocol's performance will be reduced. This leads to poor QoS in MANET.
- Packet Drop – It refers to the situation where the packets from the source are not received at the destination.
- Energy Consumption-average energy consumed by single node. While numbers of message flooded are high, then more energy is consumed by each node.
- Average Reliability (Route Life Time)– discovering average interval between two following routes in a node to the same destination over all the sessions

Table 1: Summary of cache routing protocols metrics

Cache Routing	QoS Support Metrics
U-DSR	PDR,EED
BSR	AR,PD
DSR-SP	AR,EC
OR-AT	PDR,RO
CMR	RO,PDR
DBRRP	PDR,EC
SBR-HC	PDR,EC,RO,EED (Low Density Network alone)
RZRP	AR,BU
DCR	PDR,EC
GZRP	RO,BU
OCR	PDR,AR
AZRP	PDR,EED
CPDSR	RO,EED

*Improved -> Packet Delivery Ratio (PDR)
Energy Consumption (EC)

*Reduced -> Routing Overhead (RO)
End-to–End Delay(EED)
Packet Drop(PD)
Average Reliability (AR)

The above table 1 concluded the summary of survey showing the improved quality metrics.

V. CONCLUSION

From the survey, it is clear that the cache routing portraits a major role in reducing great hurdles in the communications of the MANET. The routing of caches reduces the route detection sequences as much as possible and also significantly improves the QoS. It concentrates more on reducing routing overhead, EED, increased PDR and the improved Energy efficiency.

In most of the study, the cache routing shows effective results in developing the QoS on medium level nodes and low-level nodes, whereas at the point of the higher-level node. It shows less impact and will be solved by future research works.

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