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An Optimal Group Based Routing Using Social Behavior

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ABSTRACT: DTN (Delay Tolerant Networks) are defined by the continuous endless connection due to node mobility, limited storage and constrained power resources. Several routing protocols assumed the subsistence continuous connection. This type of attitude of those protocols created a data packet failure problem. In order to overcome the above issue along with the frequent disconnections, DTN stored the data packets for long time and transmits the data packets to their neighbor node. This paper deals with the two main objectives which are maximizing the delivery ratio and reducing the storage and energy consumption. This paper proposes the scheme ESGBR [Enhanced social group behavior based routing] with a Meta heuristic method with ORACO [optimal routing based on ant colony optimization] protocol. Simulation results show that the optimal routing ORACO can not only have a higher delivery ratio and lower delay, but also have a lower data forwarding cost, in terms of the number of relays used. The ESGBR, that utilizes the social relations between nodes to reduce redundant copying of packets and Tabu search helps to identify the optimal path for every data. This also compared the ESGBR with the existing SGBR technique with various QOS parameters. The earned Results shows that the proposed scheme attained higher delivery ratio and less delay compared to other schemes

KEYWORDS: Delay Tolerant Networks, DTN Protocol, Optimal Routing, Social Grouping

I.INTRODUCTION

DTN represents a unique wireless network architecture enabling mobile nodes to have communications with each node in environment where there is no continual route between end nodes. DTN are alternative structures to traditional networks facilitating connectivity of system and network regions with sporadic or unstable communication links. In networks with such circumstance mobile relay node are used to carry and forwarding message and make communication possible among other nodes. Depending on DTN type communication opportunities could be either scheduled over time or completely random. In ESGBR the Meta heuristic model for optimal routing considers Meta information of the global observer using ORACO protocol, which selectively spreads the data copy to the selected nodes in the network. The routing ORACO can yield a higher delivery ratio and lower delay and also have a lower data forwarding cost, which means of the number of relays used in the data forwarding. The ESGBR, that utilizes the social relations between nodes to reduce redundant copying of packets and Tabu search helps to identify the optimal path for every data.

The objective of the proposed work is to develop a routing protocol that spreads the packets in an optimal path, this also reduces the copies of redundant data packets to reduce network overhead, and the system also aims to collect all reliable information about the node and the network for optimal node selection. Finally the system also aims to provide the better performance with most satisfied QOS results.

- To achieve that goal the system exploits the enhanced social grouping characteristic of DTN nodes using ant colony optimization.
- To effectively find nodes, which belongs to the same social group.
- If the nodes are contact each other frequently compared to their contacts with other nodes.

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II. RELATED WORKS

The related works depends on different routing protocols used in delay tolerant networks.Routing protocols are classified according to the amount and type of information used to take the routing decision [2].

Blind routing protocols aim at fast spreading of packets in the network. They do not collect information about other nodes because they do not use a node selection criterion. They vary according to their spreading mechanism and amount. [3][4][5]
Guided routing protocols aim at efficiently selecting the relay nodes to enhance the delivery probability in case of limited storage and energy resources [6][8][9]. To select relay nodes, they have to collect information about other nodes in the network. Guided Protocols vary in the type and amount of information gathered. Guided routing protocols collect information about other nodes in the network to guide packets to their destinations. Guided routing protocols outperform blind protocols in the delivery ratio, but increase the average packet delay. [10][11] [12]

Epidemic Routing [3] was historically the first DTN routing protocol. In Epidemic Routing, nodes transfer copies of all the packets they have to all the other nodes they become in contact (limited by the contact duration). Packets are dropped when they expire or a destination delivery acknowledgment is received. Because of the limited storage space and contact durations, the protocol performance drops significantly with the high-traffic rates. To overcome this problem, other routing protocols limit the flooding of packets to a certain number of copies or hops.

Spray-and-Wait (SnW) [4] protocol proposed a simple scheme that manages to overcome the shortcomings of epidemic routing and other flooding-based schemes, and avoids the performance problem inherent in utility-based schemes. Spray-and-Wait (SnW) [4] protocol limits the number of copies by associating with each copy the number of extra copies to spread. When no more spreading is allowed the carrying node keeps the packet until it either meets the destination or the packet is dropped due to buffer overflow or lifetime expiry. In this work they investigated the problem of efficient routing in intermittently connected mobile networks and SnW leaves some work for future work which intends to look in detail into schemes that spray a number of copies quickly and then use utility based or other efficient single-copy schemes to route each copy independently.

These protocols assign weights to nodes using information collected from the network. This information could be topological [8][9][11][12] environmental and energy aware [13], or content based [14]. The collected information can be used to detect social relations among the network nodes as in [8], [9], [10], [16], and [17]. One of the earliest papers, and well known protocols, that predict contacts among DTN nodes is the PROPHET protocol [8]. PROPHET estimates a node metric by tracing the number of meetings between nodes. When two nodes meet, they increase their link weight toward each other and toward the nodes met by the other node. Similar to PROPHET, MAXPROP [9] strengthens the link between two nodes using the number of meetings.

The contribution in MAXPROP can be observed in its buffer management technique that encourages forwarding packets with lower number of hops over those traveled far in the network without reaching their destinations.

The paper [15] presented a heuristic routing protocol that utilizes the social relations between nodes to reduce redundant copying of packets. The results of [15] show that the proposed protocol significantly reduces number of transmissions leading to a considerable saving in energy consumption, while keeping same or higher delivery ratio. The study also shows that increasing the delivery ratio causes an increase in the average packet delay which is acceptable in delay tolerant networks.

III.EXISTING OF SGBR IN DTN

In existing a new heuristic multiple-copy routing protocol, social groups-based routing (SGBR), is proposed. The protocol exploits social grouping among network nodes to increase the packet delivery probability, without flooding the network with many redundant copies. . A mathematical model of single-copy optimal routing, OPT, is formulated,

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assuming the availability of present and future node contacts and buffer information. The results are used as a performance benchmark to compare with the heuristic protocols. The main drawback in the SGBR is searching for group and group members are very complicated and the process increases the communication cost in the DTN.

IV PROBLEM DEFINITION

Several research techniques and protocols failed to perform the following metrics together in DTN.

- Storage management
- Reliability
- Energy and resources
- And security

Those metrics are considered as main drawback of the system. The major challenges in DTN Routing protocols are described in this chapter. All routing protocols developed for DTN should be adapted to many challenging environment by sending multiple copies of data packets to increase the possibilities that one of the copy reaches the destination at a transaction. Here the protocols should maintain the nodes to store them until they meet other nodes or meet their destinations. The main challenge in DTN is maximizing packet delivery ratio and minimizing the delivery cost. Maximizing delivery ratio requires increasing the number of packet copies spread throughout the network to increase the probability of reaching the destination, while minimizing delivery cost, in terms of network overhead, requires decreasing the number of copies.

Another challenge is the compromising nature regarding the amount of information collected to guide the packets to their destinations. Collecting information from the network helps in selecting the relaying nodes to the destination, but requires time to collect the information that increases the packet delays. On the other hand, collecting little or no information leads to spreading the packet copies blindly, and decreases the probability of reaching the destination unless a large number of copies were spread.

V. BEST RESULT USING ESGBR WITH TABU SEARCH

NUMBER OF NODES

The node is a computer or a host which sends and receives the data. The nodes are connected to a router to route the data to host which is in another area. There are 12 nodes in the implementation infrastructure which are connected and route the message via the router.

NUMBER OF ROUTERS

Routers perform forwarding logic based on the destination IP address of a packet. Routers are the best networking device to connect to a WN (Wireless Network). Routers were designed to allow interconnection of Local Area Network. The proposed system consists of four routers which are interconnected and formed the complete wired mesh topology.

QoS METRICES

The goal of QoS is to provide guarantees on the ability of a network to deliver predictable results. Elements of network performance within the scope of QoS often include availability (uptime), bandwidth (throughput), latency (delay), and error rate.

DELAY

Delay refers to the length of time required to move a packet from source to destination through the internetwork. Delay depends on many factors, including the bandwidth of intermediate network links, the port queues at each router along the way, network congestion on all intermediate network links, and the physical distance to be traveled.

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BANDWIDTH

Bandwidth refers to the number of bits per second that can be sent by a device. Simply, it refers to the speed of the link. Bandwidth is a rating of the maximum attainable throughput on a link; routes through links with greater bandwidth do not necessarily provide better routes than routes through slower links. For example, if a faster link is busier, the actual time required to send a packet to the destination could be greater.

END- TO-END LATENCY

For each message, the time at which it was sent from source and the time at which this message arrived in destination were recorded. **Average end-to-end latency** is the average value of over all the messages received at the destination.

MESSAGE LOSS RATE

The ratio of the number of messages that were not received at the destination to the number of messages that were sent from the source was the message loss rate.

VI. RESULT

The result analysis gives the comparative analysis of existing and proposed system in terms of Qos. The graph shows that the existing system achieved the improved QoS.

PACKET DELIVERY RATIO (PDR)

The ratio of number of packets send from source and number of packets reach the destination. The ratio of the number of packets received and the number of packets expected to be received. So the ratio is the total number of received packets over the multiplication of the group size and the number of originated packets.

The packet delivery ratio is calculated as follows:

PDR = (No of packets Received / No of packets send) * 100

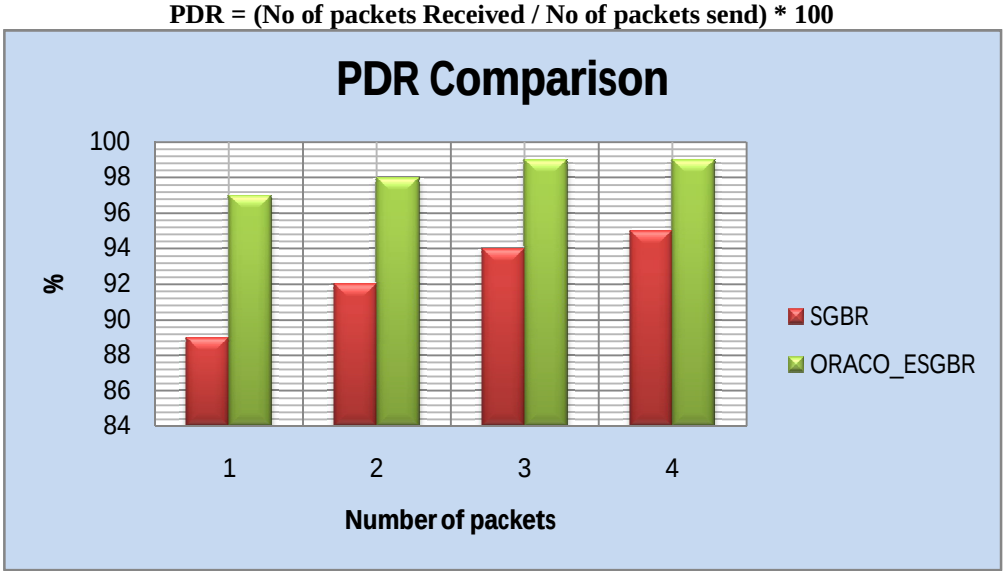

Fig 1 Performance comparison

In this fig.1 compared Performance comparison of proposed ORACO_ESGBR using TABU SEARCH with existing SGBR approach. The ratio is the total number of received packets over the multiplication of the group size and the number of originated packets.

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DELIVERY TIME

The proposed system schedules the message in optimal node and the message reach the destination in any of the available best nodes and paths .Thus Delivery time of proposed system decreases when compared to the existing system. Delivery time is calculated as follows:

Delivery Time = Receiving time – Sending time

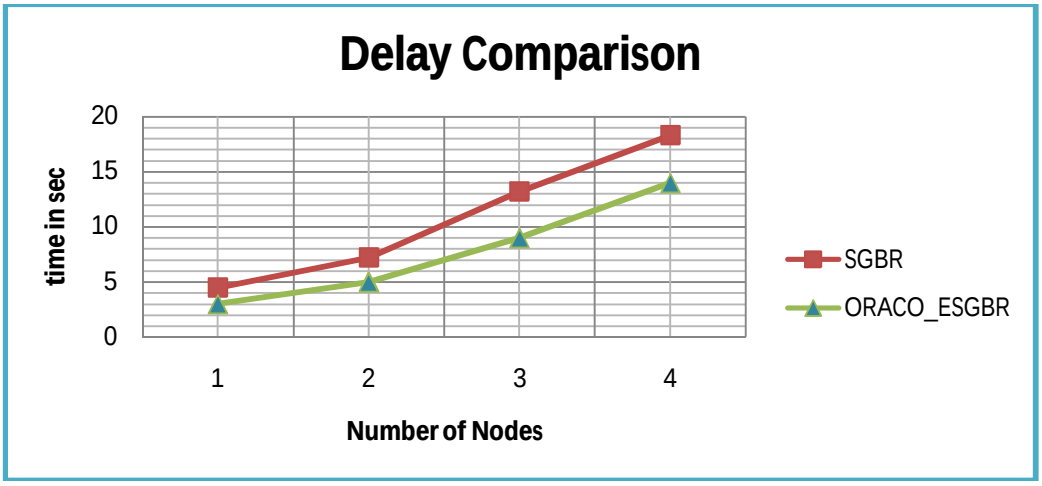

Fig 2 Delay Comparison

In this Fig.2 The proposed system schedules the message in optimal node and the message reach the destination in any of the available best nodes and paths.Time comparison of proposed ORACO_ESGBR using TABU SEARCH with existing SGBR approach.

VI.CONCLUSION

The system successfully implemented a novel protocol named as "ORACO" which is a meta heuristic protocol with the combination of different effective algorithms such as Tabu search and social grouping. The system has n number of procedures to deal the social grouping and several constraints to handle a packet in the network. In DTN the performance should be maximized, several protocols and techniques in literature tried to achieve the above, but the performance not improved that much in all constraints. Due to lack of end to end connection between the source and destination in DTN, the intermediate need to store data packets for a long period. This increases the buffer overhead. So the system reduces the need of long storage of data in the intermediates, so this implements a ESGBR which is the next enhanced version of existing social group based routing along with some other parameters. The ESGBR, that utilizes the social relations between nodes to reduce redundant copying of packets and Tabu search helps to identify the optimal path for every data. The system performs the comparison of ESGBR to the optimal results, with the existing SGBR.

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