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OPTIMIZATION BASED ON EFFICIENT CLUSTER - BASED ROUTING PROTOCOL FOR DELAY - TOLERANT MOBILE NETWORKS

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Abstract- In this paper the main goal is to group mobile nodes distributive into clusters, which can then exchange and share their resources, to achieve proficient and scalable routing in DTMNs (Delay-Tolerant Mobile Networks) that may lack in network connectivity. Routing in DTMNs is based on nodal contact probabilities. The cluster-based routing protocol based on exponentially weighted moving average (EWMA) scheme is engaged for on-line updating nodal contact probability. Simulations have been carried out to evaluate the efficiency of the proposed cluster-based routing protocol and it is compared with the non-EWMA. The result shows that it achieves higher delivery ratio and significantly lower overhead and end-to-end delay, compared with its non-EWMA part. Finally comparison is made on no of packets received, Average no of cluster heads, Average no of cluster member, Throughput and Energy consumption which obviously shows EWMA yields better performance**.**

Keywords:-DTMN, EWMA,

I.INTRODUCTION

In this paper due to sporadic connectivity among mobile nodes, especially under low nodal density and short radio transmission range, the Delay-Tolerant Network (DTN) technology [1], [2] has been introduced to mobile wireless communications. DTN is necessarily an communication system, where communication links only exist momentarily, provides it impossible to establish end-to-end connections for data delivery but this is possible in the case of flat networks since it is scalable where as in the case of large networks this seemed to be a failure. So various clustering algorithm have been implemented in MANETS. However these (EWMA) scheme is employed for on-line updating nodal contact possibilities, with its mean proven to converge to the true contact possibility. Subsequently, a set of functions including Sync (), Leave (), and join () are devised to form clusters and select gateway nodes based on nodal contact probabilities. Finally, the gateway nodes exchange network information and perform routing in scattered clustering and cluster based routing**.**

II. Existing system

It is given in the previous research Context-Aware Routing (CAR) algorithm. CAR is a novel approach to the provision of asynchronous communication in partially-connected mobile ad hoc networks, based on the intelligent placement of messages. It is discusses that the details of the algorithm, and then present simulation results demonstrating that it is possible for nodes to exploit context information in making local decisions that lead to good delivery ratios and latencies with small overheads and presented that the Context-aware Adaptive Routing (CAR) protocol, an approach to delay-tolerant unicast communication mobile ad hoc network routing that uses prediction to allow the efficient routing of messages to the recipient.

III. CLUSTERING IN DELAY TOLERANT MOBILE NETWORKS

Intermittently connected mobile networks are light wireless networks where most of the time there does not exist a complete path from the source to the destination. These networks fall into the general category of Delay Tolerant Networks. The fundamental idea is to autonomously learn unknown and possibly

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random mobility parameters and to group mobile nodes with similar mobility pattern into the same cluster. The nodes in a cluster can then interchangeably share their resources for overhead reduction and load balancing; aiming to achieve resourceful and scalable routing in DTMN .Clustering in DTMN is unique and non-trivial, because the network is not fully connected.

As a result, it becomes challenging to acquire necessary information to form clusters and ensure their convergence and stability. This is the first effort to investigate the clustering problem and cluster based routing in non-deterministic intermittent environment along with which we aim to achieve the power consumption using this naive approach of a routing-aware optimal cluster planning and a clustering-aware optimal random relay.

IV. SCATTERED CLUSTERING

The proposed clustering algorithm for DTMN, which undergoes the following steps. First, each node learns direct contact probabilities to other nodes. It is not necessary that a node stores contact information of all other nodes in network. Second, a node decides to join or leave a cluster based on its contact probabilities to other members of that cluster. Since our objective is to group all nodes with high pair-wise contact probabilities together, a node joins a cluster only if it's pair-wise contact probabilities to all existing members are greater than a threshold . A node leaves the current cluster if its contact probabilities to some cluster members drop below . Once clusters are formed, gateway nodes are identified for inter-cluster communications. Two clusters communicate to each other mostly via gateways.

1. Sync:

The Sync () procedure is invoked when two cluster constituents rally and both pass the association check. It is designed to swap and synchronize two local tables. The synchronization process is necessary because each node discretely learns network parameters, which may fluctuate from nodes to nodes. The Time Stamp field is used for the "enhanced" awareness of the network to deal with any disagreement.

2. Leave:

The node with subordinate stability must depart the cluster. The permanence of a node is defined to be its least amount contact probability with cluster members. The departing node then empties its gateway table and reorganizes its Cluster ID.

3. Join:

The join () practice is employed for a node to join a "enhanced" cluster or to amalgamate two separate clusters. A node will join the other's cluster if **i**t passes association check of all current members**.** By joining new cluster, it will copy the gateway table from the other node and update its cluster ID accordingly

Three events occur here

1. Slot-timeout experience
2. Meet a node experience
3. Gateway outdate experience

Slot time-out experience

A Slot-Timeout episode is generated by the finish of each time slot, triggering the practice of updating the contact probabilities by using the EWMA method Once the contact possibility are updated, the Gateway Update () process is invoked to update the gateway counter.

Meet-a-node experience

The Meet-A-Node episode is generated upon getting the Hello message (exchanged between two meeting node). If both the nodes are same in

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the cluster then the relationship check function is summoned to confirm if they are still competent to stay in the same cluster.

Gateway out-date experience

When the time Stamp of any ingress in the gateway table is older than average, A, a Gateway-Outdate Event is engender for that entry meeting. No imparting node is necessarily concerned.

FLOWCHART FOR THE WORKS

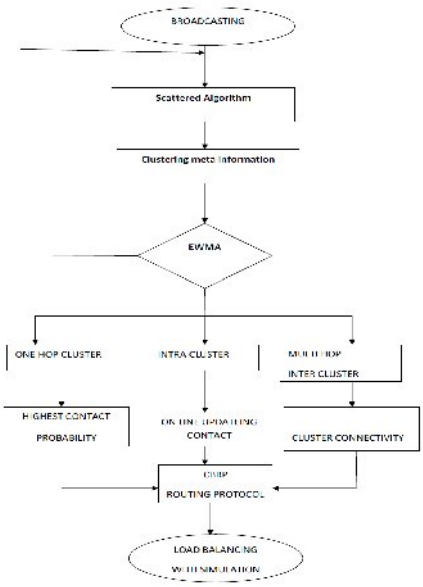

Fig.1 Flow chart for the works

CLUSTER-BASED ROUTING

CBR (Cluster Based Routing) is an on-demand routing, where the nodes are divided into clusters. A Node S (source) has to send data to node D (destination). S sends route requests to all the neighboring cluster-heads, and only to the cluster-heads. When a cluster-head receives the route request, it checks if the node D is in his cluster. If this is the case, the cluster-head sends the request directly to the destination. But when D isn't in the cluster, it sends the route request to all the adjacent cluster-heads. In the Cluster Based Routing, when a node receives the reply of the destination to the source, it tries to find the farthest node in the route that is its neighbor. With this principle the route between source and destination can be reduced.

This is done based on

1. intra-cluster routing
2. solitary-hop inter-cluster routing
3. Multi-hop inter-cluster routing.

INTRA CLUSTER ROUTING

If Nodes I and J are in the identical cluster, they have elevated chance to meet each other, thus Node I will transmit the data message to Node j unswervingly upon their.

Fig.2 Diagram for intra cluster routing

One hop inter cluster routing

If they are not in the same cluster, Node i look up gateway information to Node j's cluster in its gateway table. If an entry is found, Node i send the data message to that gateway. Upon receiving the data message, the gateway will forward it to any node

Fig.3 One hop inter-cluster routing

Multi-hop inter-cluster routing

If Node i does not have any information about Node j, the data transmission needs a multi-cluster routing scheme.

A link state like protocol is being implemented Cluster Connectivity Packet (CCP), and distributes it to other gateways in the network. The CCP of a Gateway comprises its cluster ID and a list of clusters to which it serves

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as gateway along with analogous contact probabilities.

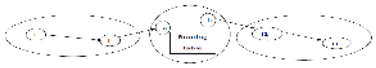

Fig.4 Multi hop inter cluster routing

V RESULTS

NODE CREATION

The clustering consists of isolating the network into numerous groups named as ”clusters”. One node in each cluster is chosen as a “cluster head” and is given some responsibilities including the description of the constituent of the cluster and the maintenance of the cluster. Ten such clusters are formed with each consisting of five nodes along with the cluster skull.

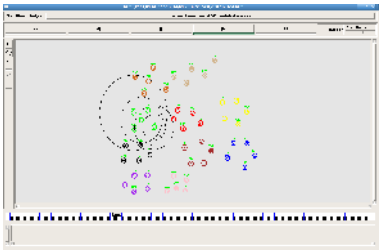

Fig.5 Node Creation

A Cluster head is chosen among each cluster. The information transfer takes place among the clusters and data are transferred among them through a gateway node. The information transfer takes place as Cluster Head-to-Cluster Head manner.

Average number of cluster member used

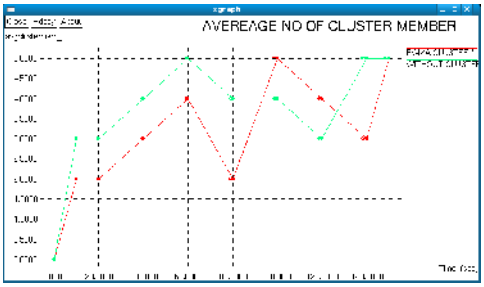

Fig.6 Average number of cluster member used

A comparative study, of the average number of cluster members used, is done based on the usage of EWMA scheme and non-EWMA. The number of cluster members is taken along the y-axis and the time in seconds is taken along the x-axis. It is shown that the average number of clusters used in EWMA is lesser than when compared to the non-EWMA.

Average number of cluster head used

The average number of cluster head is taken along the y-axis and time in seconds is taken along the x-axis. The comparative study of using EWMA and non-EWMA in the usage of the number of cluster heads shows that the usage of CHs is not more when compared with the non-EWMA scheme.

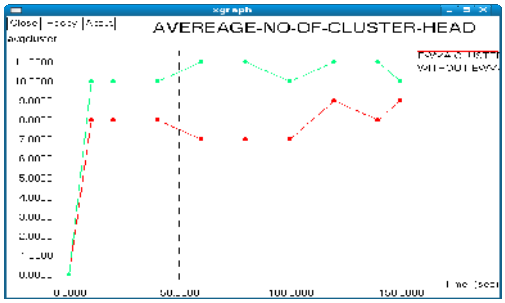

Fig.7 **Average number of cluster head used**

Energy consumption

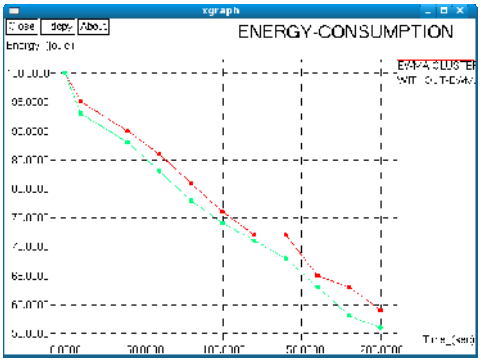

Fig.7 Energy consumption

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A comparative study of the total energy consumed using EWMA and non-EWMA is done. Energy in joules is taken along the y-axis and time in seconds is taken along the x-axis. It shows that the total energy consumed using EWMA scheme is less than with the non-EWMA. It gives a result of a good amount of energy is being saved while using the EWMA scheme.

Throughput

Throughput is the ratio of number of packets sent to time. In communication networks, it is the average rate of successful message delivery over a communication channel.

Throughput in percentage is taken along the y-axis and time in seconds is taken along the x-axis. It is shown that the throughput is increased in the EWMA scheme than when compared with the non-EWMA scheme.

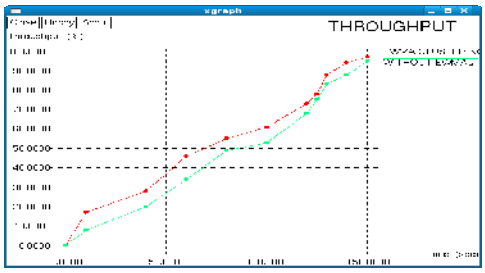

Fig.8 Throughput

Packets received

The packets are transferred from the source node to the destination node.

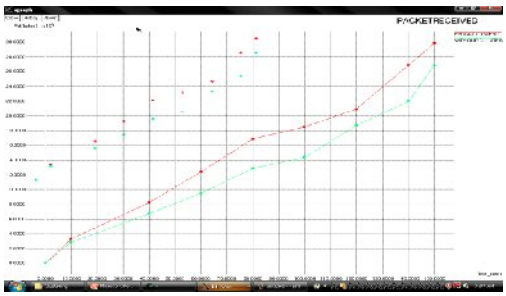

Fig.9 Packets received

The number of packets received in bytes is taken along the y-axis and the time in sec is taken along the x-axis. The number of packets received is greater when EWMA scheme is used than when compared with the non-EWMA.

End-to-end delay

End-to-end delay refers to the time taken for a packet to be transmitted across a network from source to destination.

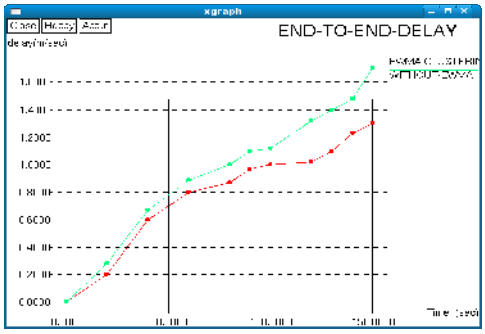

Fig.10 End-to-end delay

End-to-end delay is the time it takes a packet to travel across the network from source to destination. Delay jitter is the fluctuation of end-to-end delay from packet to the next packet.

VI.CONCLUSION

Establishing end-to-end connections for data delivery among Delay-Tolerant Mobile Networks becomes impossible as communication links only exist temporarily. In such networks, routing is largely based on nodal contact probabilities. To solve this problem, an exponentially weighted moving average (EWMA) scheme is employed for on-line updating nodal contact probability. A set of functions including sync (), leave (), and join () are devised for cluster formation and gateway selection. Finally the gateway nodes exchange network information and perform routing. The results have shown that it achieves higher delivery ratio and significantly lower overhead and end-to-end delay, compared with its non-EWMA.

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