Survey of Event-Aware Backpressure Scheduling Scheme for DTN Model

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Abstract: The Delay-Tolerant Network (DTN) routing architecture lies in the physical transportation of messages by the resource-bound nodes. This requires a demanding (node) buffer space for a seamless functioning of the routing protocols. Buffer dimensioning is therefore essential to design a practical and efficient DTN. This project addresses the problem of quantifying the buffer size of DTN source nodes, under replication based routing protocol, using large deviation techniques. The proposed EABS dimensioned-buffer model is shown to exhibit a routing performance of an equivalent infinite buffer model. In addition, the problem of routing in intermittently connected wireless networks comprising multiple classes of nodes is addressed. The proposed solution perform well in homogeneous scenarios, are not as competent in this setting. To this end, it proposes a class of routing schemes that can identify the nodes of "highest utility" for routing, improving the delay and delivery ratio By 4 − 5×. Additionally, it proposes an analytical framework based on fluid models that can be used to analyze the performance of various opportunistic routing strategies, in heterogeneous settings.

Keywords: **DTN, EABS, Buffer Dimension, QOS Clustering Base routing protocol, Multi Hop Communication**

1. INTRODUCTION

The DTN architecture handles such limitations with the help of store, carry, and forward paradigm, wherein the nodes physically carry the messages until they meet the destination. Underlying this paradigm is the node's buffer space that becomes a costly real estate. Unless this buffer space is properly quantified, the routing performance would severely degrade. Furthermore, the DTN routing protocols that embody this paradigm would also resort to replication based strategies, in which multiple nodes (a.k.a. relay nodes) carry the replica of the message. This is done in order to increase the delivery probability. Moreover, it inherently reduces the buffer loss at the source nodes when compared with the no relay nodes scenario. It would be interesting to investigate a way to quantify the buffer size and also perceive the reduction in buffer size of the source node with an increase in the number of relay nodes. At this juncture, a systematic way of quantifying the buffer size is of utmost importance to tackle the buffer loss, in an efficient manner.

There is no application with a feature to maintain the communication between members at a given period of time with minimum hops. So, this project identifies that and helps for users to prevent the unauthorized member communication efficiently.

Delay-Tolerant Networks (DTNs) operate in environments that are generally attributed by severe limitations such as intermittent connectivity. The DTN architecture handles such limitations with the help of store, carry, and forward paradigm, wherein the nodes physically carry the messages until they meet the destination. Underlying this paradigm is the node's buffer space that becomes a costly real estate. Unless this buffer space is properly quantified, the routing performance would severely degrade.

Furthermore, the DTN routing protocols that embody this paradigm would also resort to replication based strategies, in which multiple nodes (a.k.a. relay nodes) carry the replica of the message. This is done in order to increase the delivery probability. Moreover, it inherently reduces the buffer loss at the source nodes when compared with the no relay nodes scenario. It would be interesting to investigate a way to quantify the buffer size and also perceive the reduction in buffer size of the source node with an increase in the number of relay nodes.

- To make the size of node information small.
- To make the cluster head maintains most of the data.
- To increase the efficiency in path finding and increase the routing performance.
- To make nodes allocate less buffer during transmitting the data.

II. LITERATURE SURVEY

Konrad Lorincz, David J. Malan [1] describe a sensor networks, a new class of devices, have the potential to revolutionize the capture, processing, and communication of critical data for use by first responders. Sensor networks consist of small, low-power, and low-cost devices with limited computational and wireless communication capabilities. They represent the next step in wireless communication's miniaturization, and their power and size make it feasible to embed them into wearable vital sign monitors, location-tracking tags in buildings, and first responder uniform gear.

Stephan Bohacek [2] considering many paths in a multi-hop wireless setting, the variability of channels results in some pths providing better performance than other paths, i.e., path diversity. While it is well known that some paths are better than others, a significant number of routing protocols do not focus on selecting the optimal path. However cooperative diversity an area of recent interest, provides techniques to

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exploit path and channel diversity [5]. Here they examine the potential performance improvement when optimal paths are used. Three settings are examined, where the path loss can be neglected, where path loss is considered but channel correlation is not accounted for and where path loss and channel correlation are accounted for. It is shown that path diversity can lead to dramatic improvements in performance.

Jamal N. A [3] describe wireless communications capabilities. Many routing, power management, and data dissemination protocols have been specifically designed for WSNs where energy awareness is an essential design issue. The focus, however, has been given to the routing protocols which might differ depending on the application and network architecture. In this paper [11], they present a survey of the state-of-the-art routing techniques in WSNs. They first outline the design challenges for routing protocols in WSNs followed by a comprehensive survey of different routing techniques. Overall, the routing techniques are classified into three categories based on the underlying network structure: flat, hierarchical, and location-based routing. They study the design tradeoffs between energy and communication overhead savings in every routing paradigm. They also highlight the advantages and performance issues of each routing technique.

Xiaoxia Huang [4] present a distributed robust routing protocol in which nodes work cooperatively to enhance the robustness of routing against path breakage. They compare the energy efficiency of cooperative routing with non cooperative routing and show that their robust routing protocol can significantly improve robustness while achieving considerable energy efficiency

G. Santhosh Kumar[5] an improvement to the LEACHM protocol, which is suitable for mobile wireless sensor networks. The basic idea of this LEACH-Mobile-Enhanced (LEACH-ME) protocol is to make sure as much as possible that the cluster heads are from the group of mobile nodes having minimum node mobility or they are in a group motion with the other cluster members (as in RPGM model [20]). With the modified cluster heads election process, the proposed protocol makes sure that the clusters are disturbed minimally in the event of movement of cluster heads. The LEACH operations are mainly in two major phases - Set-up phase and Steady-state phase. Set-up phase is the initial one and this is the phase where all cluster formation takes place. This phase is relatively short compared to the steady state phase.

Jaideep Lakhotia [6] advancement in CBRM[24] protocol in terms of energy efficient cluster head selection. It select cluster head based on primary criteria i.e. low mobility, high residual energy and secondary criteria i.e. distance between node to base station which is used in case of a tie occur after checking primary criteria. This routing protocol considers link failure that can occur due to the movement of mobile nodes. In this Base Station select two deputy cluster head and one cluster head in each cluster. These deputy cluster head in cluster management in case of link failure. A node that cannot send a data to cluster head due to link failure can send it to deputy cluster head and deputy cluster head forwards it to Base Station.

Simerjeet Sharma[7] describe an IFCP-MWSN protocol that supports mobility of sensor nodes, sensor localization and mobility of cluster head. Cluster mobility is considered one of the most important aspect in WSN applications and unique in this proposed protocols of WSN. In this section, they presented the working principle of their proposed ILFCP-MWSN in several phases. The proposed algorithm works with the following assumptions. All sensors are mobile. Once a node is selected as a CH, Cluster Head (CH) is mobile. Initially, all sensors have the same energy. A node in each cluster is equipped with GPS and work only for localisation. This node is known as an anchors node. Sensors are heterogeneous in terms of their roles since they work as anchor nodes, cluster heads and cluster members.

Riad Kouah et al [8] describe a GPSR-MS operates without organizing network in clusters, while the majority of existing routing protocols designed for mobile WSNs are cluster based where the maintenance process s consumes many resources of sensor nodes. In existing cluster-based routing protocols, the greedy forwarding mode is not applied, while the GPSR-MS protocol is based on this scalable and efficient mode. Few of existing routing protocols are designed for mobile WSNs. Therefore, the GPSR-MS protocol strengthens this class of protocols. Their objective is to maximize the packet delivery ratio with the minimum consumption of energy.

T. Hayes, F.H. Ali[9] presents a novel multihop routing protocol for mobile wireless sensor networks called PHASeR (Proactive Highly Ambulatory Sensor Routing). The proposed protocol uses a simple hop-count metric to enable the dynamic and robust routing of data towards the sink in mobile environments. It is motivated by the application of radiation mapping by unmanned vehicles, which requires the reliable and timely delivery of regular measurements to the sink. PHASeR maintains a gradient metric in mobile environments by using a global TDMA MAC layer. It also uses the technique of blind forwarding to pass messages through the network in a multipath manner. PHASeR is analysed mathematically based on packet delivery ratio, average packet delay, throughput and overhead.

III.METHODOLOGY

NO RELAY NODE SCENARIO

In this model , the source node does not propagate data to intermediate nodes. The data is directly transmitted to destination node.

WITH RELAY NODE SCENARIO

In this model, the source node propagates data to intermediate nodes. The intermediate nodes replicate the message copy so as to send to their neighbor nodes. The data is transmitted through multiple intermediate nodes to destination node. The intermediate nodes (relay nodes) inter-meeting time is said to follow exponential distribution with the rate parameter μ

$$\mu = \frac{8vR}{\pi A}$$

where v is the constant velocity of the nodes, R is the transmission radius of the nodes, and A is the area of the square terrain.

ADD NODE

In this form, the node details are added so that the network can be drawn in route discovery process. The node contains id, isSource node, isATMn node and isDestination node details. All the nodes can be viewed in nodes list.

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ROUTE DISCOVERY

In this model, a network is 'n' nodes is drawn and given as input for the algorithm process. The first node is taken as 'Source Node' and last node is taken as 'Destination Node'.

SET ATMn

The Node with ID '2', '3' or '4' which is immediate right node is taken as ATMn Node. Then Route discovery process continues. For sake of convenience, the node with ID '2' or '4' is randomly chosen as ATMn node.

ROUTE REQUEST (RREQ)

All neighbors of the ATMn are calculated through algorithm step and further forwarding the RREQ message to their neighbors is carried on, until either the destination or an intermediate Mobile Node with a fresh route to the destination and path trustworthiness above PATH THRESHOLD is reached.

ROUTE REPLY (RREP) AND TRUST REQUEST (TREQ)

During the process of sending/forwarding the RREP message, every Mobile Node in the reverse path broadcasts trust request (TREQ) message, shouting for trust value of the nexthop Mobile Node in the upstream from its neighbors. The broadcast is only to one-hop Mobile Nodes.

TRUST REPLY (TREP)

Upon receipt of TREQ message, the neighbors broadcast trust reply (TREP) message with trust value of the upstream Mobile Node in their respective node trust table. The broadcast is only to one-hop Mobile Nodes.

TRUST EVALUATE (TEVAL)

In order to evaluate the trustworthiness of the discovered path, the ATMn of the source Mobile Node unicasts trust evaluate (TEVAL) message to the destination with a FLAG set. The FLAG is set to ensure that its acknowledgment is only from the destination node.

IV. CONCLUSION

In sensor network, each node works not only for itself but also for other nodes. Under such environment, some nodes may misbehave for individual interests. So reputation and trust are instrumental to deal with such misbehaving nodes. Further, in an application perspective WSNs, they are equally prone to security threats as that are in wireline networks.

In this paper, the proposed solution has not only made the feasibility for placement of buffer to that matins threats that are common to wire line networks, but also exploited dynamic and cooperative features of WSNs to deal with missing packet nodes in discovering path. Future work includes cross-correlation of monitored traffic under mobility scenarios. The future work can be focused on improving the contact information compression algorithms. Relaxing the constraints in our DTN model and making necessary changes to the hierarchical clustering and routing algorithms are also very important future work to increase the applicability of DTN models.

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