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A Self–Adaptive Utility Routing Protocol for Delay Tolerant Networks

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Abstract: Network communication made by routing protocol called Self-Adaptive utility routing protocol for delay tolerant networks are possibly composed of vast number of devices in smart phones of heterogeneous capacities in terms of energy resources. Identifying messages to their destinations a novel utility function mechanism environment parameters such as wireless channel condition nodal buffer occupancy and perform statistics considered. Re sending of message around nodes experiencing high buffer wireless interference congestion while taking a considerably small number of transmissions. Self-Adaptive utility based networks proved to be able to achieve optimal performance developed model and compare analysis shows the delay transmissions required for each message delivery able to achieve optimal performance, which is further analyzed via a stochastic modeling approach.

Keywords: Stochastic Model, Delay Tolerant, MANETS, Routing Algorithms, SAURP Protocol.

I. INTRODUCTION

Delay Tolerant Network routing is usually referred to as encounter-based, store-carry-forward or mobility-assisted routing, due to the fact that nodal mobility serves as a significant factor for the forwarding decision of each message. The Delay Tolerant Network [1] is a lack of end-to-end paths for a given node pair for extended periods, which poses a completely different design scenario from that for conventional mobile ad-hoc networks. Due to the intermittent connections in Delay Tolerant Network s, a node is allowed to buffer a message and wait until the next hop node is found to continue storing and carrying the message. This model of routing is significantly different from that employed in the MANETs. Depending on the number of copies of a message that may coexist in the network, two major categories of encounter-based routing schemes are defined: single copy and multi-copy. Single copy carries by any node at any instance single copy lies in how to effectively deal with the interruptions of network connectivity and node failures have been reported to suffer from long delivery delays and large message loss. Multiple copy routing schemes allows the network to have multiple copies of the same message that can be routed independently and in parallel increase, multi-copy routing protocols are flooding throughout the network controlled flooding based that distribute a subset of message copies or utility based approaches that determine a message should be copied to contacted node simply based on a developed utility function. Although improved in terms of performance reported multi-copy is subject to problems and difficulties schemes take large number of transmissions energy consumption and vast amount of transmission bandwidth and nodal memory space, delay tolerant networks are expected to operate in an environment with large number of miniature hand held devices such as smart phones and mobile sensors such scenario may no longer be the case that nodal contact frequency serves as the only dominant factor for the message delivery performances as that assumed by most existing Delay Tolerant Networks.

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II. RELATED WORK

A MANET is a type of ad hoc network that can change locations and configure itself on the fly. Because MANETS are mobile, they use wireless connections to connect to various networks. This can be a standard Wi-Fi connection, or another medium, such as a cellular or satellite transmission. Some MANETs are restricted to a local area of wireless devices (such as a group of laptop computers), while others may be connected to the Internet. For example, A VANET (Vehicular Ad Hoc Network), is a type of MANET that allows vehicles to communicate with roadside equipment. While the vehicles may not have a direct Internet connection, the wireless roadside equipment may be connected to the Internet, allowing data from the vehicles to be sent over the Internet. The vehicle data may be used to measure traffic conditions or keep track of trucking fleets. Because of the dynamic nature of MANETs, they are typically not very secure, so it is important to be cautious what data is sent over a MANET.

Routing in delay-tolerant networking concerns itself with the ability to transport, or route, data from a source to a destination, which is a fundamental ability all communication networks must have. Delay- and disruption-tolerant networks (DTNs) are characterized by their lack of connectivity, resulting in a lack of instantaneous end-to-end paths. In these challenging environments, popular ad hoc routing protocols such as AODV and DSR fail to establish routes. This is due to these protocols trying to first establish a complete route and then, after the route has been established, forward the actual data. However, when instantaneous end-to-end paths are difficult or impossible to establish, routing protocols must take to a "store and forward" approach, where data is incrementally moved and stored throughout the network in hopes that it will eventually reach its destination.[3][4][5] A common technique used to maximize the probability of a message being successfully transferred is to replicate many copies of the message in hopes that one will succeed in reaching its destination.[6]

III. PROBLEM STATEMENT

The implementation of single-copy schemes lies in how to effectively deal with the interruptions of network connectivity and node failures. Thus, single-copy schemes have been reported to seriously suffer from long delivery delays and/or large message loss ratio.

The proposed SAURP is characterized by the ability of adapting itself to the observed network behaviors, which is made possible by employing an efficient time window based update mechanism for some network status parameters at each node. We use time-window based update strategy because it is simple in implementation and robust against parameter fluctuation. Note that the network conditions could change very fast and make a completely event-driven model unstable [7].

Algorithm 1 The forwarding strategy of SAURP

On contact between node A and B
Exchange summary vectors
for every message M at buffer of custodian node A *do*
    if destination node D in transmission range of B *then*
        A forwards message copy to B
    end if
    else if $\triangle T^{(i)}_{(A,D)} > \triangle T^{(i)}_{(B,D)}$ *do*
        if message tokens >1 *then*
            apply weighted copy rule
        end if
        else if $\triangle T^{(i)}_{(A,D)} > \triangle T^{(i)}_{(B,D)} + \triangle T_{th}$ *then*
            A forwards message to B
        end else if
    end else if
end for

A. SAURP Protocol

SAURP is characterized by the ability of identifying potential opportunities for forwarding messages to their destinations via a novel utility function based mechanism, in which a suite of environment parameters, such as wireless channel condition, nodal buffer occupancy, and encounter statistics, are jointly considered. Thus, SAURP can reroute messages around nodes experiencing high buffer occupancy, wireless interference, and/or congestion, while taking a considerably small number of transmissions. The developed utility function in SAURP is proved to be able to achieve optimal performance, which is further analyzed via a stochastic modeling approach.

B. Delay Tolerant Networks

DTN is characterized by the lack of end-to-end paths for a given node pair for extended periods, which poses a completely different design scenario from that for conventional mobile ad-hoc networks (MANETs). Due to the intermittent connections in DTNs, a node is allowed to buffer a message and wait until the next hop node is found to continue storing and carrying the message. Such a process is repeated until the message reaches its destination. This model of routing is significantly different from that employed in the MANETs[2]. DTN routing is usually referred to as encounter-based, store-carry-forward, or mobility-assisted routing, due to the fact that nodal mobility serves as a significant factor for the forwarding decision of each message.

C. Encounter Based Routing

Two major categories of encounter-based routing schemes are defined: single copy and multi-copy. With the single-copy schemes, no more than a single copy of a message can be carried by any node at any instance. Although simple and resource efficient, the main challenge in the implementation of single-copy schemes lies in how to effectively deal with the interruptions of network connectivity and node failures. Thus, single-copy schemes have been reported to seriously suffer from long delivery delays and/or large message loss ratio. On the other hand, multiple-copy (or multi-copy) routing schemes allow the networks to have multiple copies of the same message that can be routed independently and in parallel so as to increase robustness and performance. It is worth noting that most multi-copy routing protocols are flooding based, that distribute unlimited numbers of copies throughout the network, or controlled flooding-based, that distribute just a subset of message copies, or utility-based approaches that determine whether a message should be copied to a contacted node simply based on a developed utility function.

D. Multiple-copy Routing

Multiple-copy (or multi-copy) routing schemes allow the networks to have multiple copies of the same message that can be routed independently and in parallel so as to increase robustness and performance. It is worth noting that most multi-copy routing protocols are flooding based, that distribute unlimited numbers of copies throughout the network, or controlled flooding-based, that distribute just a subset of message copies, or utility-based approaches that determine whether a message should be copied to a contacted node simply based on a developed utility function.

IV. PARTITIONED NETWORK CONSTRUCTION

This is used to construct the partitioned Network it means we construct the two networks by entering the how many number of hosts are register in the network. After that register the host's details for that user must enter the hostname, port no, IP address of the host. After enter that details it checks into the database that host details are already exist or not. If that details are exist in the database it display message "hostname must be unique" .if that host details are not exist that host details are stored into database. Using that hostname details we can construct two networks. For that using unidirectional and bidirectional connections between hosts, suppose we are choosing unidirectional connection it will connect the first host to second host and randomly allocates the weight for that connection. Suppose we are choosing bidirectional connection it will connect the first host to second host and also connect the second host to first host and also randomly allocate the weight for those connections.

A. Synchronous Delivery Message

After construct the partitioned network login the hosts in the two networks. Select the destination hostname from source hostname. And select which message wants to send the message from source to destination. It will check that destination is available in the same network or Not. Suppose destination is available in the same network and path is exists between the source and destination it's a synchronous delivery. Find the possible path from source to destination. Select the best path from possible path from source to destination. Using that best path we can transfer the message to destination ,after sending the message to destination it will display one dialog box message sent .message received in that destination host name.

B. Asynchronous Delivery Message

After construct the partitioned network login the hosts in the two networks. Select the destination hostname from source hostname. And select which message wants to send the message from source to destination. It will check that destination is available in the same network or Not. Suppose destination is not available in the same network send the request to another server that destination is available in that network or not. That destination is not available that server send the response to requested server the destination is not available. That destination is available in that network that server send the response to requested server the destination is available. That delivery message to destination is asynchronous delivery. Then choose the best carrier host for send the message to destination.

C. Select Best Carrier Host

In this Module select the best carrier host for asynchronous delivery message. For hat calculate the delivery probability in the between networks using utility function. Based on highest delivery probability selects the best carrier host from between networks, best carrier host that message is sent from source to best carrier host and that message stored in that buffer of best carrier host. And select the best carrier host from another network. That disconnects the best carrier host in that network. And connect that host in another network based on highest delivery probability. And find the possible path between best carrier hosts to destination. In that possible path choose the best path from source to destination. In that best path deliver the message to destination.

V. COMPARATIVE STUDY

The previously reported multi-copy schemes are subject to the following problems and implementation difficulties. First, these schemes inevitably take a large number of transmissions, energy consumption, and a vast amount of transmission bandwidth and nodal memory space, which could easily exhaust the network resource. Second, they suffer from contention in case of high traffic loads, when packet drops could result in a significant degradation of performance and scalability. Note that the future DTNs are expected to operate in an environment with a large number of miniature hand-held devices such as smart phones, tablet computers, personal digital assistants (PDAs), and mobile sensors. In such a scenario, it may no longer be the case that nodal contact frequency serves as the only dominant factor for the message delivery performance as that assumed by most existing DTN literature. Therefore, limitations on power consumption, buffer spaces, and user preferences should be jointly considered in the message forwarding process. Compare to earlier system main feature of SAURP is the strong capability in adaptation to the fluctuation of network status, traffic patterns/characteristics, user encounter behaviors, and user resource availability, so as to improve network performance in terms of message delivery ratio, message delivery delay, and number of transmissions. Our proposed work implements all the below technique to better efficient.

- Proposed work develops a novel DTN routing scheme which incorporates with some parameters that have not been jointly considered in the literature. The parameters include link quality/availability and buffer occupancy statistics, which are obtained by sampling the channels and buffer space during each contact with another node.

- Introduce a novel transitivity update rule, which can perfectly match with the proposed routing model and the required design premises.
- A novel adaptive time-window update strategy for maintaining the quality metric function at each node, aiming at an efficient and optimal decision making process for each active data message.
- An analytical model is developed for the proposed SAURP, and its correctness is further verified. We show via extensive simulations that the proposed SAURP can achieve significant performance gain over the previously reported counterparts under the considered scenarios.

VI. CONCLUSION

The paper introduced a novel multi-routing algorithm, called SAURP, for intermittently connected MANETS that are possibly formed by densely distributed and hand-held devices such as smart phones and personal digital assistants. This algorithm to explore the possibility of taking mobile nodes as message carriers in order for end-to-end delivery of the messages, carrier for a message is determined by the prediction result using a novel contact model, where the network status, including wireless link condition and nodal buffer availability, are jointly considered. We provided an analytical model for SAURP, whose correctness was further verified via simulation. We further compared SAURP with a number of counterparts via extensive simulations. It was shown that SAURP can achieve shorter delivery delays than all the existing spraying and flooding based schemes when the network experiences considerable.

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