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Self Adaptive Contention Aware Routing Protocol for Intermittently Connected Mobile Networks

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Abstract: ***A novel multi-copy routing protocol, called Self Adaptive Utility-based Routing Protocol (SAURP), for Delay Tolerant Networks (DTNs) that consists of a many number of devices in miniature such as smart phones of heterogeneous capacities in terms of energy resources and buffer spaces. 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/congestion, while taking a considerably small number of transmissions. The developed utility function in SAURP is proved to be able to achieve optimal performance. Extensive simulations are conducted to verify the developed analytical model and compare the proposed SAURP with a number of recently reported encounter-based routing approaches in terms of delivery ratio, delivery delay, and the number of transmissions required for each message delivery. The simulation results show that SAURP outperforms all the counterpart multi-copy encounter-based routing protocols considered in the study.***

Keywords: DTN, Encounter Based Routing, Channel Bandwidth, Traffic Load, Community –Based mobility.

1. Introduction

Delay Tolerant Network (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. 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.

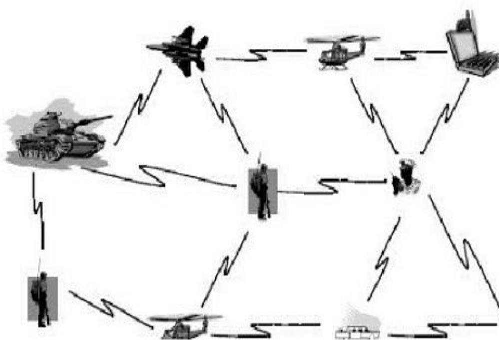

Figure 1: MANETs

As shown in the Fig 1, MANET does not require fixed network infrastructure, thus all nodes are free to move in a random fashion. Nodes can communicate with each other even if they are out of their communication range.

2. Related Work

2.1 Literature Survey

In [1]: Author proposes a wireless network has witnessed an explosion of interest from consumers in recent years for its applications in mobile and personal communications. As wireless networks become an integral component of modern communication infrastructure, energy efficiency will be an important design consideration due to the limited battery life of the mobile terminals. Power conservation techniques are commonly used in hardware design of such systems. Since the network interface is the significant consumer of the power, considerable research has been devoted to low power design of entire n/w protocol stack of wireless network in an effort to enhance the energy efficiency.

In [2]: Author proposes a mobile ad hoc network(or MANET), wireless nodes which cooperatively form a network independent of any fixed infrastructure or centralized administration. In particular, manet has no base stations a node communicates directly with nodes within wireless range and indirectly with all other nodes using a dynamically-computed, multi-hop route via the other nodes of the manet. Simulation and experimental results are combined to show the energy and bandwidth are substantively different metrics and that resource utilization in manet routing protocols is not fully addressed by bandwidth –centric analysis.

In [3]: Author suggests mobile ad hoc routing protocols allow nodes with wireless adaptors to communicate with one another without any pre-existing network infrastructure. Existing ad hoc routing protocol, while robust to rapidly changing network topology, assume the presence of connected path from source to destination. Techniques to deliver messages in case where there is never a connected path from source to destination or when network a network partition exists at time a message is originated. Epidemic Routing, where random pair-wise exchanges of messages among mobile hosts ensure eventual message delivery. The goals of Epidemic Routing are to:1)minimize message delivery rate,2)minimize message latency ,and 3)minimize the total resources consumed in message delivery.

In [4]: Author examine the fundamental properties that determine the basic performance metrics for opportunistic communications .consider the distribution of inter-contact times between mobile devices. Using a diverse set of measured mobility traces, invariant property that there is a characteristic time which the distribution in many cases follows a power law. The existing results on the performance of forwarding schemes based on power –law tails might be overly pessimistic.

In [5]: Traditionally ad hoc networks have been viewed as a connected graph over which end-to-end routing paths had to be established. Mobility can be turned into a useful by making nodes carry data around the network instead of transmitting them. A mobility –assisted protocol forwards data when appropriate relays encounter each other, and thus the time between such encounters, called hitting or meeting times are of high importance. Hitting time results can be used to analyze the performance of the mobility assisted routing. Thus helps in better understanding the performance of various approaches in different settings and can facilitate the design of new improved protocols.

In [6]: Author proposes in ad hoc networks with the optimal performance, i.e. allow for reroute messages to their destination experiencing high buffer occupancy. Analyze the performance of the mobility assisted routing. Opportunistic routing techniques are employed.

In [7]: Communication networks are assumed to be connected. However, emerging wireless applications such as vehicular networks, pocket –switched networks, etc. coupled with volatile links, node mobility, and power outages, will require the network to operate despite frequent disconnections. Opportunistic routing techniques have been proposed, where a node may store-and-carry a message for some time, until a new forwarding opportunities arises. Although a number of such algorithms exist , most focus on relatively homogenous settings of nodes. In [8]: Efficient routing in intermittently connected mobile networks i.e. the multiple-copy case, identifying potential opportunities for forwarding messages to their destinations. The best carrier for a message is determined by the prediction result using a nodal contact model.

3. Proposed Work

In this, a novel DTN routing protocol, called Self Adaptive Utility-based Routing Protocol (SAURP), that aims to overcome the shortcomings of the previously reported multi-copy schemes. Our goal is to achieve a superb applicability to the DTN scenario with densely distributed hand-held devices. The 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. 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. Novel transitivity update rule, which can perfectly match with the proposed routing model and the required design premises. 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. Hence shown via extensive simulations that the proposed SAURP can achieve significant performance.

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 $\Delta T^{(i)}_{(A,D)} > \Delta T^{(i)}_{(B,D)}$ *do*
        if message tokens >1 *then*
            apply weighted copy rule
        end if
        else if $\Delta T^{(i)}_{(A,D)} > \Delta T^{(i)}_{(B,D)} + \Delta T_{th}$ *then*
            A forwards message to B
        end else if
    end else if
end for

3.1 System Design

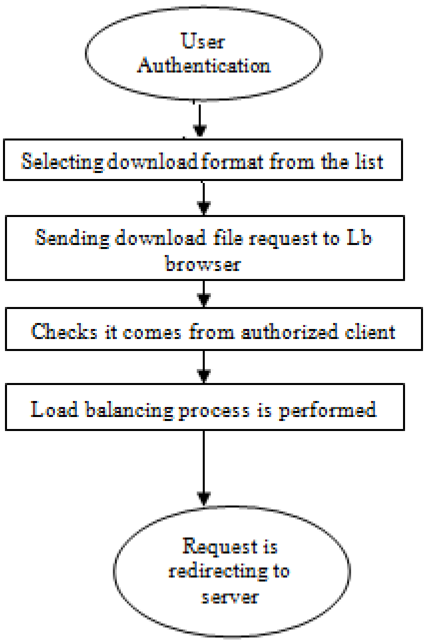

Figure 2: Data Flow Diagram

In real time context the users accessing shared common resources the authentication and authorization process plays a very important role. As shown in the above figure first step is employing a very robust authorization method to validate users. The input request from the users contains the credentials; these credentials are validated with that of stored in the database. In case the user is valid dynamically allocate incoming external load to one of the node. The threshold value is dynamically changes this is very significant to allocate server to an incoming request. The load balancing process is performed using threshold values these values are again used for other incoming request handling. Based on the availability of the servers the user request is redirected to a particular server determined by the load balancing mechanism

4. System Implementation

4.1 Modules

a) Partitioned Network Construction
b) Synchronous Delivery Message
c) Asynchronous Delivery Message
d) Select Best Carrier Host

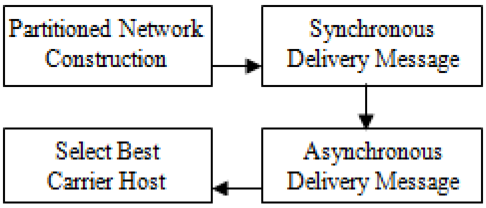

Figure 3: SAURP modules

a) **Partition Network Construction**
This module is used to construct partitioned network it means, we construct two networks by entering the number of hosts which are registered in network. After that registration, the host's details for that user must enter the hostname; port no, IP address of the host. After entering the details it checks into database that host details already exit or not. If details exit in the database it display message "hostname must be unique" if host details host details does not exit then they get stored into database .Using that hostname details we can construct two networks by using unidirectional and bidirectional connections between hosts.

b) **Synchronous Delivery Message**
After constructing 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 exits between the source and destination then it is a synchronous delivery.

c) Asynchronous Delivery Message
After constructing 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 and send 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 sends response to requested server the destination is available. That delivery message is asynchronous delivery. Then choose the best carrier host for send the message to destination.

d) Select Best Carrier Host
In this module select the best carrier host for asynchronous delivery message. Calculate the delivery probability in between the networks using utility function. Based on highest delivery probability, it selects the best carrier host from between networks.

5. System Architecture

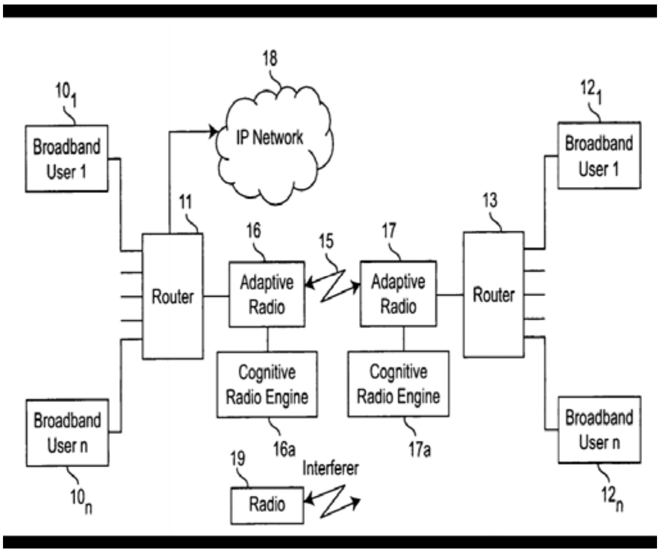

Figure 4: System Architecture

Adaptive QOS routing is a cross-layer optimization adaptive routing mechanism. The cross-layer mechanism provides up-to-date local QoS information for the adaptive routing algorithm, by considering the impacts of node mobility and lower-layer link performance. The multiple QoS requirements are satisfied by adaptively using forward error correction and multipath routing mechanisms, based on the current network status. The complete routing mechanism includes three parts: (1) a modified dynamic source routing algorithm that handles route discovery and the collection of QoS related parameters; (2) a local statistical computation and link monitoring function located in each node; and (3) an integrated decision-making system to calculate the number of routing paths, coding parity length, and traffic distribution rates.

6. Simulation and Result

In the simulation, 110 nodes move according to CBMM in 600*600 meter network. The simulation duration is 40,000 time .The message inter-arrival time is uniformly distributed in such a way that the traffic can be varied from low (10 messages per node in 40,000 times units) to high(70 messages per node in 40,000 times units).The message time to live(TTL) is set 9,000 time units. Each source node selects a random destination node, begins generating messages to it during simulation time. The simulation results show that SAURP outperforms all the counterpart multi-copy encounter –based routing protocols .Extensive simulations conducted to verify the developed analytical model and compare the proposed SAURP in terms of delivery ratio, delivery delay, and the number of transmissions required for each message delivery.

a) Result

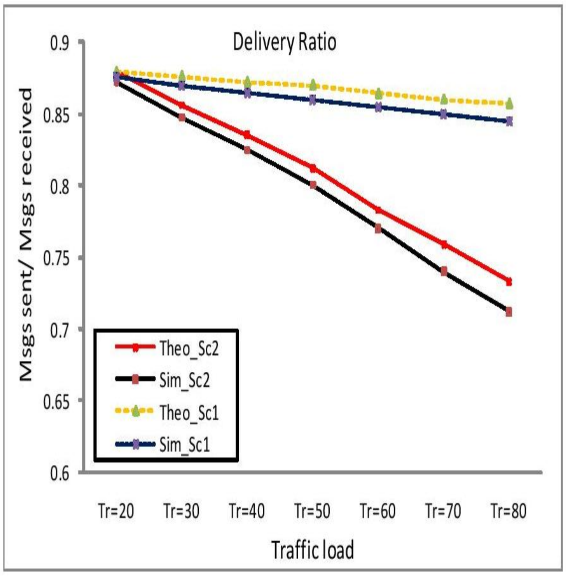

Figure 5: The theoretical and simulation results of delivery ratio.

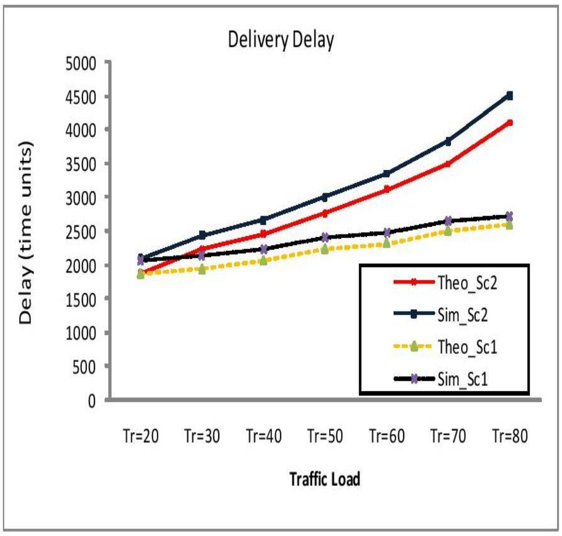

Figure 6: The simulation results of delivery delay

In Fig 5 and Fig 6 compare the simulation results in terms of delivery ratio and delivery delay of the considered scenarios. As seen from the figures , when the network resources are enough to handle all the traffic loads , there is no dramatic change in the obtained delivery ratio and delivery delay for all traffic loads. That is because messages follow the best forwarding paths that lead to best performance.

7. Conclusion

SAURP aims to explore the possibility of taking mobile nodes as message carriers in order for end-to-end delivery of the messages. The best 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.

SAURP can achieve shorter delivery delays than all the existing spraying and flooding based schemes when the network experiences considerable contention on wireless links and/or buffer space. DTN routing performance can be significantly improved by further considering other resource limitations in the utility function and message waiting forwarding process.

References

[1] Z. Lan, V.E. Taylor, and G. Bryan, “Dynamic Load Balancing for Adaptive Mesh Refinement Application,” Proc. Int’l Conf. Parallel Processing (ICPP), 2001.

[2] T.L. Casavant and J.G. Kuhl, “A Taxonomy of Scheduling in General-Purpose Distributed Computing Systems,” IEEE Trans.Software Eng., vol. 14, pp. 141-154, Feb. 1988.

[3] G. Cybenko, “Dynamic Load Balancing for Distributed Memory Multiprocessors,” J. Parallel and Distributed Computing, vol. 7, pp. 279-301, Oct. 1989.

[4] C. Hui and S.T. Chanson, “Hydrodynamic Load Balancing,” IEEE Trans. Parallel and Distributed Systems, vol. 10, no. 11, pp. 1118- 1137, Nov. 1999.

[5] B.W. Kernighan and S. Lin, “An Efficient Heuristic Procedure for Partitioning Graphs,” The Bell System Technical J., vol. 49, pp. 291- 307, Feb. 1970.

[6] M.M. Hayat, S. Dhakal, C.T. Abdallah, J.D. Birdwell, and J. Chiasson, “Dynamic Time Delay Models for Load Balancing. Part II: Stochastic Analysis of the Effect of Delay Uncertainty,” Advances in Time Delay Systems, vol. 38, pp. 355-368, Springer-Verlag, 2004.

[7] S. Dhakal, B.S. Paskaleva, M.M. Hayat, E. Schamiloglu, and C.T. Abdallah, “Dynamical Discrete-Time Load Balancing in Distributed Systems in the Presence of Time Delays,” Proc. IEEE Conf. Decision and Controls (CDC ’03), pp. 5128-5134, Dec. 2003.

[8] S. Dhakal, M.M. Hayat, M. Elyas, J. Ghanem, and C.T. Abdallah, “Load Balancing in Distributed Computing over Wireless LAN:Effects of Network Delay,” Proc. IEEE Wireless Comm. And Networking Conf. (WCNC ’05), Mar. 2005.

[9] D.L. Eager, E.D. Lazowska, and J. Zahorjan, “Adaptive Load Sharing in Homogeneous Distributed Systems,” IEEE Trans. Software Eng., vol. 12, no. 5, pp. 662-675, May 1986.

[10] J. Liu and V.A. Saletore, “Self-Scheduling on Distributed-Memory Machines,” Proc. ACM Int’l Conf. Supercomputing, pp. 814-823, Nov. 1993.