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Comparative Analysis Between Prophet, Spray &Wait And Spray & Focus Protocol Of Wireless Opportunistic Networks

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ABSTRACT: In the past wireless LANS and Cellular networks were used for communication In case of wireless networks if the nodes are mobile then Manets (mobile ad-hoc networks) can be used for communication. If the distance between the nodes increases it is not possible to communicate so to remove this limitation the idea of opportunistic networks was developed because they can only work when distance is less. This network makes it possible to communicate between nodes irrespective of their distance and the type of node. An opportunistic network tries to remove the statement of physical end-to-end connectivity while providing connectivity opportunities to pervasive devices when they are not directly connected to the Internet. Enveloping devices, can opportunistically exploit their mobility and contacts for data delivery. In this paper we are going to compare three basic protocols used in this kind of network based on some common parameters.

Keywords: Prophet, Epidemic, Spray and wait, Spray and Focus,

INTRODUCTION

Opportunistic network is a kind of network where data is routed with tolerant delay from source to destination. This type of network is used for emergency applications. This network consists of mobile as well as fixed nodes. In this kind of network if a node moves towards another node then this is also taken as advantage in transmitting data

The main difference between opportunistic network and the traditional network is that in traditional network end to end path between the nodes is defined in advance for data forwarding. But in opportunistic network path is not fixed in advance between source and the destination due to mobile nodes. In this network, first small amounts of number of nodes are connected to form a seed oppnet. Then it starts searching for other devices for completing the task with tolerant delay. The detected devices are evaluated on the basis of their usability and resource availability such devices are integrated into the network to help other nodes. When all the devices are found which are enough for completing the task the task of integration is stopped and then routing take place with the aid of added nodes. Different nodes make association to exchange data from source to destination.

Message is delivered node to node closer to the destination. Routing decision is taken at each node when packets traverse through different nodes. Each node has local knowledge of the best nodes around it and it uses this knowledge to determine the best path to send out the message to the destination. When a node does not find any other to transfer the messages the node currently holding the message simply stores the message and waits for an opportunity.

A. Architecture

In an opportunistic network, a network is typically separated into several network partitions called regions. Traditional applications are not suitable for this kind of environment because they normally assume that the end to- end connection must exist from the source to the destination. The opportunistic network enables the devices in diverse regions to be linked by operating message in a store-carry-forward manner. The middle nodes execute the store-carry-forward message switching mechanism by overlaying a new protocol layer, called the bundle layer, on top of diverse region-specific lower layers. In an opportunistic network, each node is an entity with a bundle layer which can act as a host, a router or a gateway. When the node acts as a router, the bundle layer can store, carry and forward the entire bundles (or bundle fragments) between the nodes in the same region. On the other hand, the bundle layer of gateway is used to transfer messages across different region. A gateway can forward bundles between two or more regions and may optionally be a host, so it must have persistent storage and support custody transfers.

B. Challenges

In an opportunistic network, when nodes move away or turn off their power to conserve energy, links may be disrupted or shut down periodically. These events result in irregular connectivity. When no path exists between the source and the destination, the network partition occurs. Therefore, nodes need to communicate with each other via opportunistic contacts through store carry- forward operation. In this section, we consider two specific challenges in an opportunistic network: the contact opportunity and the node storage.

Contact: Due to the node mobility or the dynamics of wireless channel, a node might make contact with other nodes at an unpredicted time. Since contacts between nodes are hardly predictable, they must be exploited opportunistically for exchanging messages between some nodes that can move between remote fragments of the network. Hui et. al. [1] defines two parameters, contact duration and inter-contact time that are important parameters in determining the capacity of an opportunistic network.

Storage constraint: As described above, to avoid dropping packets, the intermediate nodes are requires having enough storage to store all messages for an unpredictable period of time until next contact occurs. We can say that the required storage space increases a function of the number of messages in the network. Therefore, the routing and replication strategies must take the storage constraint into consideration. Vahdat and Becker[2] used Epidemic Routing by flooding the network to exploit the best possible delivery delay brought by mobility. This scheme achieves the optimal delay with unlimited relay buffers. However, such a multiple-copy scheme generally incurs significant overhead on storage constraint.

In the past, several routing algorithms have been proposed to improve the routing performance in opportunistic networks. Here, we divide the opportunistic routing protocols into four categories [3]: Direct Transmission, Flooding based, Prediction based, Content based and Coding based Schemes.

In direct transmission routing, the source node generates message and food it in its buffer until it meets the destination directly. In this transmission source node forwards a message to destination when it directly meets that node. This system has a boundless deliverance delay, but has the advantage of performing only a single transmission per message.

In flooding based routing, the source node generates numerous copies of the message and injects those into the network. This injection of replicated message is continued until destination receives the message.

In prediction based routing the overhead carried by flooding based routing schemes is further abridged by predicting the activities of the neighbor nodes for taking a few forwarding decisions. Probabilistic Routing scheme [4] calculates the delivery predictability from a node to a destination node based on the observed contact history. It forwards a message to its neighbor node if and only if that neighbor node has a higher delivery predictability value.

In context based routing prediction based approach is additionally polished by utilizing context information because Predictions botched in some cases and delivery proportion is also less in this. Chiara Boldrini et al [5] have proposed History based routing (HiBOp) that uses up to date context information for data forwarding decisions. It creates and handles the context of a user. Throughout context creation for every node Identity table (IT) is created to grasp the context information. This IT is used to exclusively identify the node in the network. Then it maintains a history table to document the quality information of the nodes to utilize similarities between encountered nodes and destination.

In coding based routing schemes, a message is altered into a new format prior to transmission. The design principle of coding based schemes is to implant additional information within the coded blocks such that the original message can be fruitfully reconstructed with only a assured number of the coded blocks.

LITERATURE SURVEY

Prophet Routing Protocol

Routing protocols that lie inside the mobility-based category use more context information to make decisions regarding message forwarding, like the mobility information of nodes. Node mobility has a great impact on the efficiency of routing in Opportunistic Networks, and [12] proved that it increases the performance of these kinds of networks, especially in the routing of messages when efficient routing techniques are deployed. The Probabilistic Routing scheme – PRoPHET [4] calculates the delivery predictability from a node to a particular destination node based on the observed contact history, and forwards a message to its adjacent node if and only if that neighbor node has a higher delivery predictability value. PRoPHET uses “History of past Encounters and Transitivity” to estimate each node’s delivery probability for each other node. The delivery predictability is the probability of a node encountering a certain destination. It increases when the node frequently meets the destination and decreases (according to an aging function) in the contrary. The context information used in PRoPHET is the regularity of meetings between nodes.

Spray and Wait Protocol

One approach to route packets in these kinds of networks is that in which spraying is controlled called – Spray and Wait. A small, fixed number of copies of messages are distributed to a number of different types of relays. Then, each relay holds its copy until it comes into the contact of destination or until the *TTL* of the packet expires. This way of having multiple relays looking independently and in parallel for the destination node enable us to explore the broad network more proficiently while keeping the resource usage per message low. It is one of the simplest spraying schemes as per the literature. Purposely, the source node forwards all the copies to the first encountered distinct nodes. Once these copies are circulated, each copy performs direct transmission. The logical model derived in [10] shows that L can be chosen based on a target average delay. The spray phase may be performed in many ways under the supposition that nodes movements are self-governing and identically distributed. Another way of spraying is the Binary Spray and Wait policy which is the best in terms of delay. Any node (including the sender) holding n copies $(n > 1)$ of the message hands over $(n/2)$ copies to the first encountered node, and keeps the left over copies for itself. When a node is left with only one copy of the message, it uses direct transmission and only transmits the message to the final destination node when (and if) it is met.

Spray and Focus Protocol

In Spray and Focus [9] rather than waiting for the destination to be encountered, each relay can forward its copy to a potentially more fitting relay, using a watchfully designed utility-based scheme. The potential relays are chosen based on There are a set of timers that record the time when two nodes last meet each other the potential relays are chosen based on such timers.Here, node mobility is subjugated to distribute destination location information. Each node maintains a local collection of tables which consist of time of its last encounter with other nodes and also its location in the network. The packets consult this database to get hold of estimates of their destination's current location. As a packet moves towards its destination, it is able to consecutively filter an estimate of the destination's exact location, because node mobility has "gentle" estimates of that location.

RESULTS

Our main aim is to conduct a set of experiments to test the functionality of these protocols in message delivery. We will try to verify the performance of these protocols in scenarios such as mobility models, transmission range, number of nodes and buffer sizes and compare the results of these protocols used in Opportunistic Networks.

Scenario 1: Mobility Models: A mobility model decides the way of motion of the nodes in the network for the period of simulation.

Scenario 2: Buffer Sizes: Routing protocol exhibits different behaviors if the buffer size of node is varied. Due to the limited buffer space of the nodes the chances that packets will drop and affects the overall delivery ratio are more.

Scenario 3: Number Of Nodes: As the number of nodes increases in the network, more nodes has chance to be the part of routing. To a certain threshold it increases the delivery ratio. If the number of nodes increases to a certain threshold it may create congestion on network.

Scenario 4: Transmission ranges: Increased in transmission range also increases number of contacts among nodes, as more nodes comes in coverage area

We will measure the performance using the following parameters:

Delivery Ratio: It is the ratio of number of messages delivered over all generated messages.

Delivery Overhead Ratio: It is the ratio of number of message transmissions over the number of delivered messages.

Average Hop Count for Delivered Messages: The average number of nodes that messages traverse before reaching their destination.

Scenario 1 Parameters

Parameters	Values
Simulation area (width x height)	4500 X 3400 m
Time	4000sec
Buffer size	5 M
Transmission range	100 m
Number of nodes	150
Mobility Models	SPMBM,MBM,MRM,RWP

Scenario 2 Parameters

Parameters	Values
Simulation area (width x height)	4500 X 3400 m
Time	4000 sec
Buffer size	5M, 50 M, 100M
Transmission range	100 m
Number of nodes	150
Mobility models	SPMBM

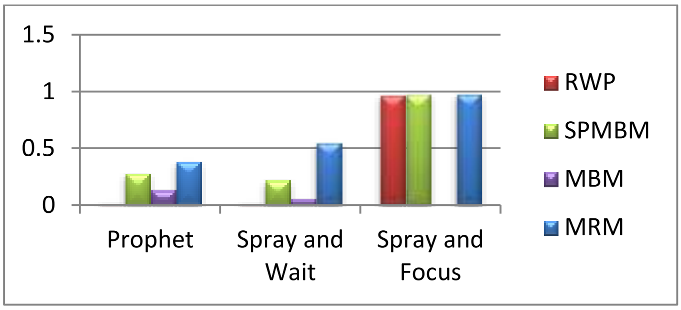
Scenario 3 Parameters

Parameters	Values
Simulation area (width x height)	4500 X 3400 m
Time	4000 sec
Buffer size	100M
Transmission range	100 m
Number of nodes	50,100,125,200
Mobility models	SPMBM

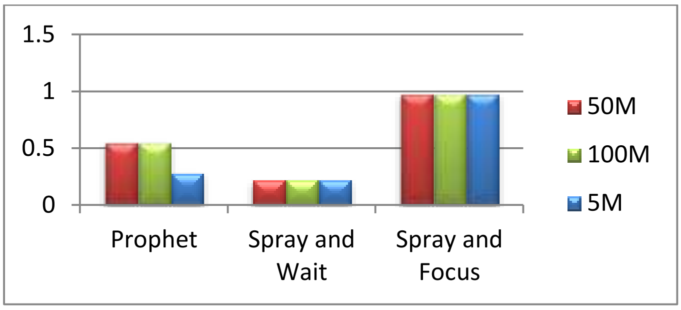
Scenario 4 Parameters

Parameters	Values
Simulation area (width x height)	4500 X 3400 m
Time	4000 sec
Buffer size	5 M
Mobility Models	SPMBM
Transmission range	10m, 50m, 100 m
Number of nodes	150

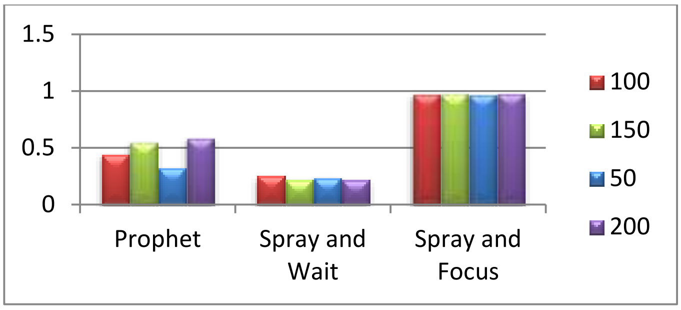
Delivery Ratio for mobility models



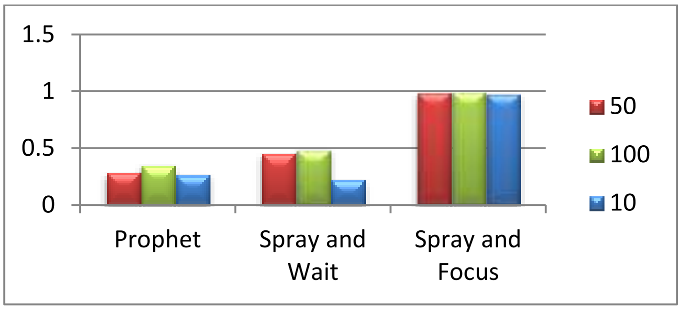
Delivery Ratio for Buffer sizes



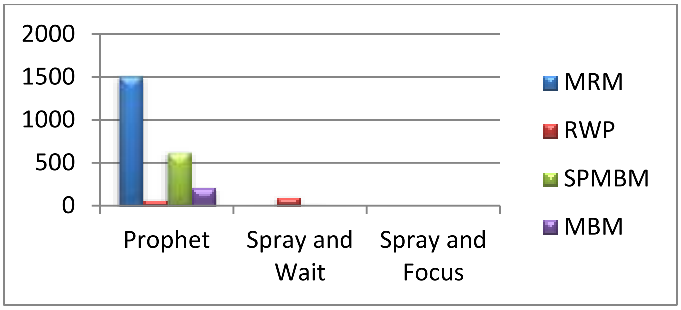
Delivery Ratio for number of nodes



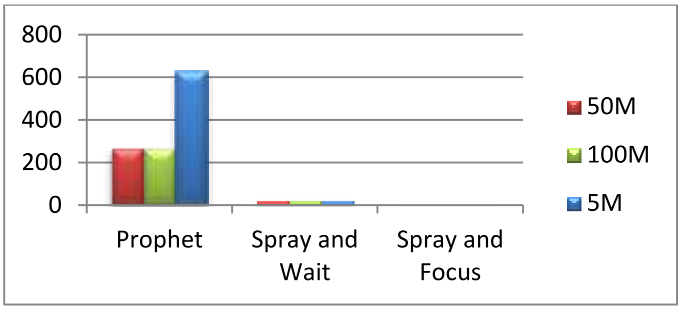
Delivery Ratio for transmission ranges



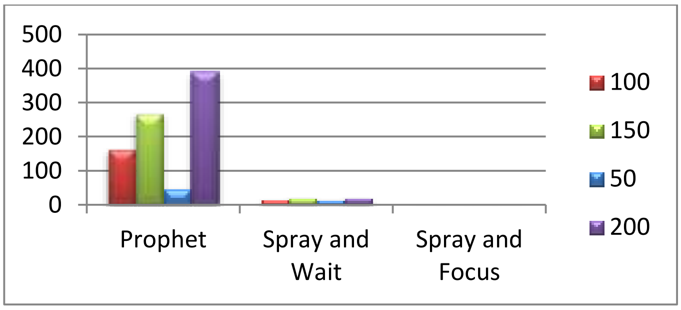
Delivery Overhead Ratio for mobility models



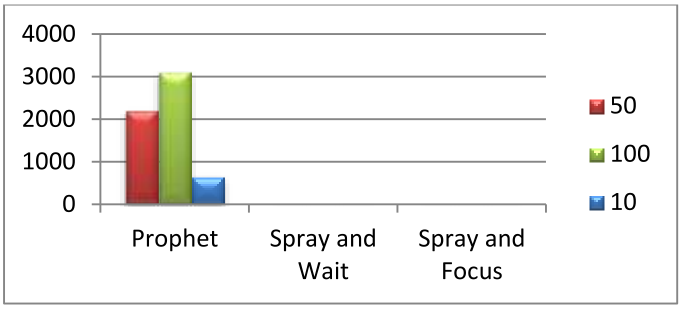
Delivery Overhead Ratio for Buffer sizes



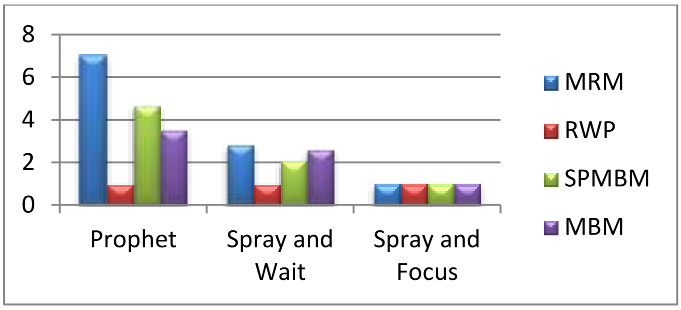
Delivery Overhead Ratio for number of nodes



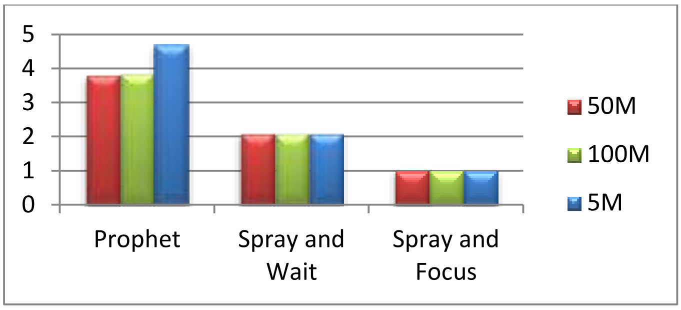
Delivery Overhead Ratio for transmission ranges



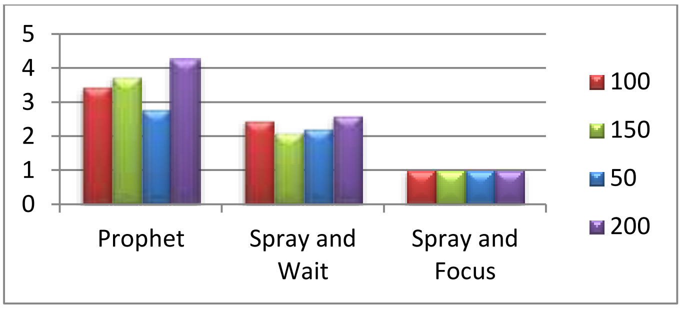
Average Hop Count for mobility models



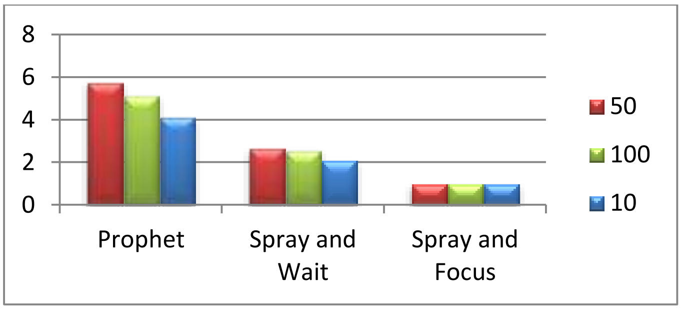
Average Hop Count for Buffer sizes



Average Hop Count for number of nodes



Average Hop Count for transmission ranges



CONCLUSION AND FUTURE SCOPE

The above simulation results shows that in different scenarios and with different parameters the spray and focus protocols shows excellent results. The results of this protocol are same in different scenarios and are better than other protocols that means that it is better in any case and environment. Our conclusion is that we should use this protocol in opportunistic network for better message delivery and low overhead. For future we suggest you to compare this simulation results with results of some other simulators like omnet,ns2,oppnet etc.

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