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Comparison of Routing Protocols Performance by Random Way Point Movement Model in ON

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Abstract— *An Opportunistic Networks (ONs) illustrate the range of wireless networks which can measure frequent and long-term partition because of scattered distribution of the nodes in network topology. ONs used Store-carry-forward principle for routing packets. this paper presents performance of some most eminent routing Protocols mainly Epidemic, Prophet, Direct delivery routing and Spray & Wait of ONs is evaluated. Epidemic is Flooding based scheme, Prophet Send message to node having highest probability, Direct delivery deploy least bandwidth and resources, and flooding of messages is control by Spray & Wait in network. Performance of ONs routing protocols have been evaluated by a Random Way-Point movement model.*

Keywords*: Opportunistic Networks, Movement models, Routing protocols, TTL, ONE simulator.*

1. INTRODUCTION

Opportunistic networks (ONs)presents a wireless networks where there is no connection between a source and the destination. In ONs, network is divided into various sub-networks. It presents a Infrastructure-less wireless systems which support functionality of the networks facing numerous and long lasting partitions. Opportunistic networks[1] has received significant interest from research area in recent years. Therefore in ON, the main issue for routing packets is to locate the in-between nodes as there is no path connected to destination [2,3]. When two node comes in contact with each other, they can exchange the packets and this opportunity is known as encounter. In ON, store–carry–forward model is used for delivering the packets. According to this model, each and every node along the path receives the packets from the preceding node when it comes in contact with that exact node. After that the node nearby stores the packet until it encounters next intermediary node. When encounter occurs the packet is given to next intermediate node. Same procedure is followed awaiting the destination is reached [4,5].In ON Routing and forwarding of data packets is very complex task because of the doubtfulness of mobility and intermittent behaviour of nodes [6]. There are various issues in ON that needs to be concerned. The most vital factor are network capacity ,encounter schedule, storage capacity,etc [7].ONs may be defined by the combination of any of following:

• Intermittent connectivity: If there is no reliable end-to-end path between the source and destination

• Asymmetric data rates: The Internet supports a range of the asymmetric bi-directional data, such as in cable TV .

• High error rates: In ON, the link error rates are very high.

• Ambiguous mobility patterns: distinct the case of open bus services which keep fixed routes or planetary trajectories, the future behaviour of node is not completely known for many ON applications.

The remainder of this paper is characterised as follows. Section 2 represents the background and related work which is important for the complete understanding of ON. In Section 3, the simulation setup and different assumptions are used to simulate various routing protocols of ON are detailed. Section 4 Simulation results are defined in thus section. Section 5 is devoted to the work and provides some insight on the future work.

2. RELATED WORK

In this section, an overview of four routing protocols for ON, namely Epidemic [11,1], PRoPHET [9] ,Direct delivery[10] and Spray &wait [11], along with relative pros and cons have been explained.

2.1 Epidemic

Vahdat& Becker [10] proposed one of the easiest and earliest routing schemes for ON. It is Flooding-based scheme.but this routing scheme results in ineffective use of the network resources like bandwidth, power, and buffer at each node. Davis *et al.*, [11] epidemic scheme is improved by the introduction of adaptive dropping policies. Harras *et al.*, [12] further defined Time-To-Live (TTL) as well as an expiry time linked with every message for forced flooding in ONs.

2.2 Prophet

If network resources are in excess Epidemic Routing performs well. But in practical, the network resources(bandwidth, buffer space) are not unlimited. Therefore, in order to influence mobility and use of scarce resources effectively , Lindgren *et al.*, [9] by using the history of Encounters and Transitivity he proposed the Probabilistic Routing Protocol (PRoPHET) [9].In this approach message which is forwards to the node by the sender with highest probability . This method relies on the implicit supposition that all the nodes assist to message forwarding. As compared to Epidemic Routing, this protocol has very less message exchanges, fewer communication overhead, less delay, and more delivery success rate.

2.3 Spray and wait

Spyropoulos [8] To control the flooding in the network a very effective routing approach name as Spray and wait routing scheme is proposed In this scheme, there are two types of phases:

• Spray phase (only once): *L* message copies are firstly spread to the *L* distinct "relays".

• Wait phase: In the spray phase if the target is not reached, the *L* nodes carries a message copy achieve direct transmission.

This protocol has fewer number of transmissions and less delivery delay therefore it is better than Epidemic Routing

2.4 Direct Delivery Routing

The source node does not transmit the message until it comes in direct contact of destination node. the message is not passed to the adjacent nodes.it is the simplest of all as it deploy minimum bandwidth and resources.

3. RANDOM WAY – POINT MOVEMENT MODEL

In this model all nodes move randomly and message sends from sender to receiver randomly. the quantity of nodes increases the throughput also increases. The throughput is highest in epidemic routing protocol. the delivery ratio increases because the number of nodes increases. The delivery probability is highest in epidemic routing. value of time to live field increases, the standard buffer time also increases.

4. SIMULATION SETUP

For the simulation,one simulator[12] is used in this work . Movement models are there in ONE simulator, as follows Random Way point [13]has been used for simulation. In this work, the nodes are assumed movable in nature. The various types of simulation parameters taken in this work are given as per below table:

Sim−time 20000 sec Sim−area (4500∗3400 m) Helsinki downtown area Bluetooth−interface−transmit−speed 250 kbps Bluetooth−interface−transmit−range 10 kbps Number of groups 6 Buffer−size 5MB TTL 100 sec

The setting and configurations used for varying the fields are as follows:

- Varying the Message Time to live : The TTL is varied from 100→200→300 seconds.

The total numbers of nodes are set at 160 and the speed of all group nodes is kept between 2.5–5.0m/s

The following performance metrics are considered for comparative analysis of the routing protocols:

- Throughput: It is distinct as the ratio of number of messages delivered to the destination and the number of messages produced by source node.
- Message delivery probability: It is the probability of the messages that are accurately received by the destination within given time period.
- Overhead ratio: to calculate overhead ratio by using this formula:

(No. of Relayed Messages – No. of Delivered Messages) ⁄ Number of Delivered Messages

5. SIMULATION RESULTS:

When all routing protocols are compared and time to live varied from 100 to 300sec.result obtained depicted by these figures. In figure 1,epidemic routing have highest dropped ratio and direct delivery have lowest dropped ratio as compared to other routing protocols. In figure 2,delivery ratio of epidemic routing have highest but its required additional resource like buffer space .in figure 3 , direct delivery routing have zero overhead ratio but epidemic routing have a highest overhead ratio .all values are considered with random way point movement model.

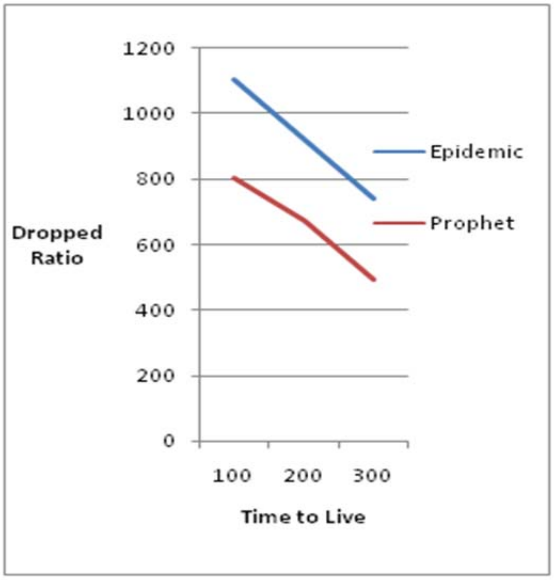

Fig 1: Dropped ratio of Epidemic vs. Prophet

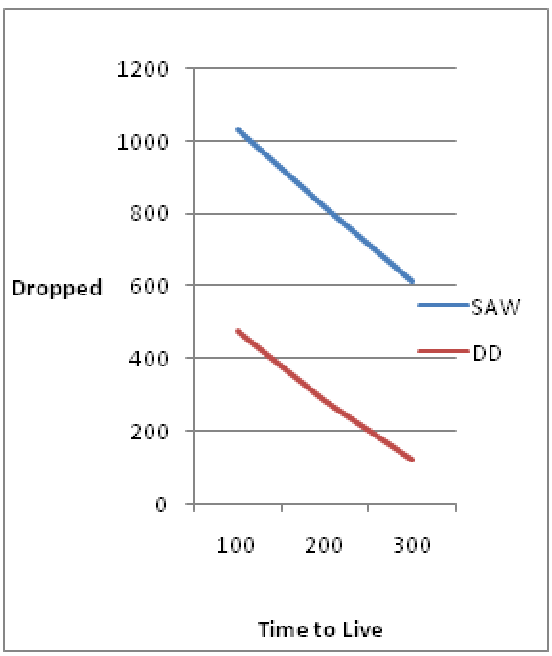

Fig 2: Dropped ratio of SAW vs. DD

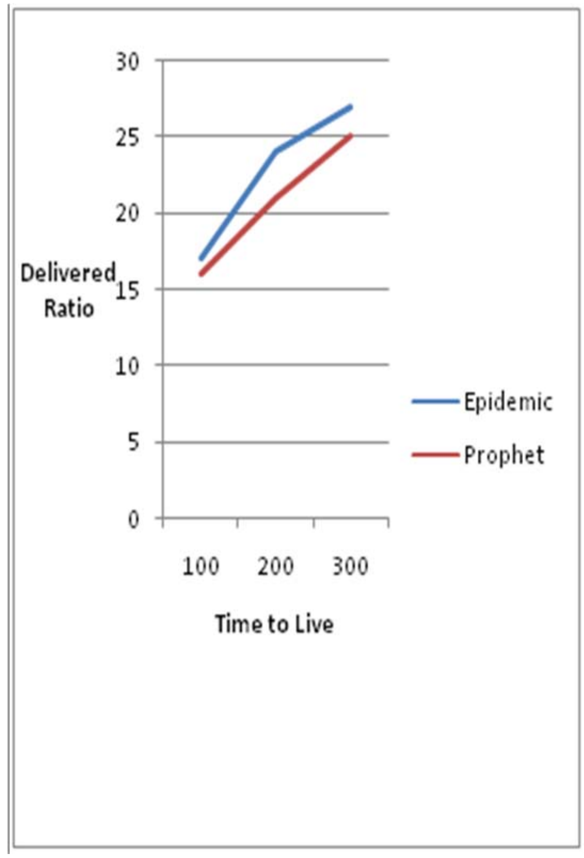

fig 3:Delivered ratio of Epidemic vs. Prophet

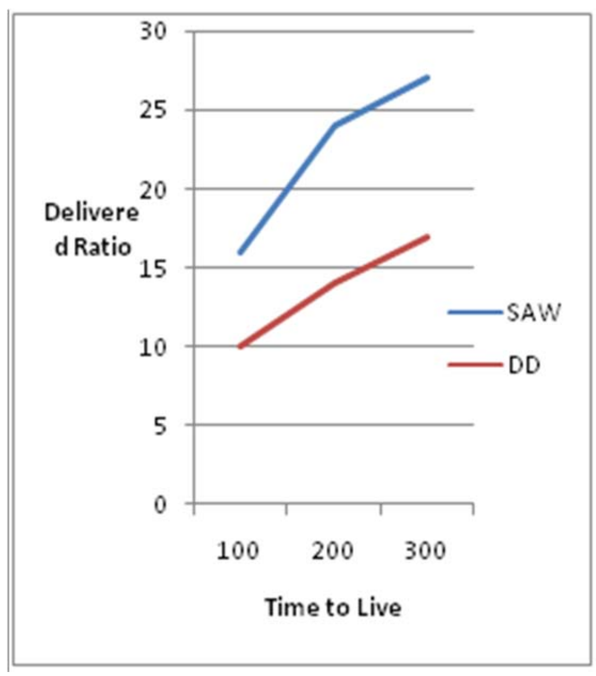

fig 4: Delivered ratio of SAW vs. DD

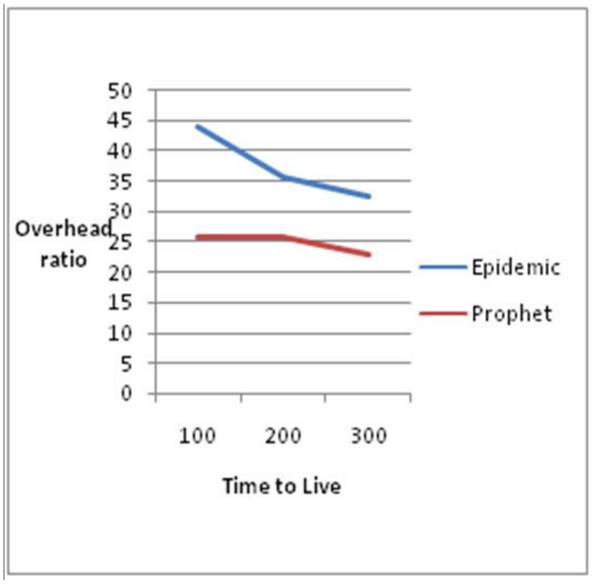

Fig. 5: Overhead ratio of Epidemic vs. Prophet

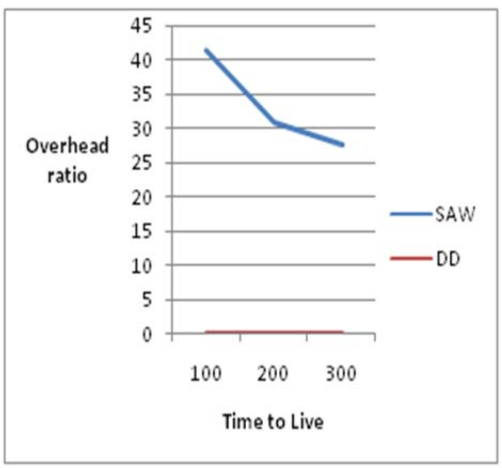

Fig 6: Overhead ratio of SAW vs. DD

6. CONCLUSION

There are various routing protocols provided by ON for its challenging environment to transmit packets between nodes. In this paper ,different routing scheme are evaluated with Random way point model. Movement model decides the movement of these node. Random way point are move randomly. To simulate these routing protocols using an open source java based simulator has been considered name ONE simulator. For simulation, time to live has been varied from 100 to 300.result shows that delivery ratio is higher in epidemic routing and dropped ratio is low in Direct delivery and higher in epidemic.

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