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# Performance Analysis of Source Spray and Wait and Binary Spray and Wait Protocols in DTN

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**Abstract:** *Delay-tolerant Networking (DTN) makes successful communication in sparse mobile ad-hoc networks and other challenged environments with verities of protocols. In this paper we have analyzed performance of two different protocols that use Spray and Wait mechanism to transfer message between nodes. Through the evolution of both routing protocol in different scenario using simulation tool comparative study can be done. This paper focus on the performance of Source Spray and Wait Routing Protocol and Binary Spray and Wait Routing protocol in random way point mobility model.*

**Keywords:** *Binary Spray and Wait, Source Spray and Wait, Delay Tolerent Network; routing; DTN.*

## I. INTRODUCTION

Today's communication over Internet is done by TCP/IP where end to end path has been established and then message is transferred from source to destination with high bandwidth and low delay. Also the message delivery probability is very higher with very low error rate. In Challenged Networks (such as Interplanetary Network, Military Battle Field, Sensor Network, Mobile Network) Communication where the destination is not always in direct touch with sender or far away from sender or having no Internet access TCP/IP scenario doesn't work [1]. In this case, Delay Tolerant Network concept will provide necessary facility for data transfer.

The main difference between Internet and DTN communication is absent of end to end communication path which leads disconnection, variable delay, and high error rate in communication. DTN uses store and forward concept to send message or packet from source to destination. DTN has various routing protocol based on knowledge or replication strategy for successful delivery of packet from sender to receiver. Protocols which works on knowledge of nodes or network (such as location based routing, Gradient Routing, Link Metrics) are decrease the delay but delivery probability is very low [2]. The new routing scheme, called Spray and Wait, in which works in two phases "Spray" phase number copies of message are generated and spread into network "Wait" phase will wait until the message meets to its destination node [3]. On other hand the routing using replication of message (such has in Direct Contact, Two way Hope, Tree Based routing, Epidemic Routing) delivery ration can be increased but resource consumption is high [3]. Binary Spray and Wait improves Spray and Wait with dividing initial number of copies [4].

## II. SPRAY AND WAIT FLOODING SCHEME

The Spray and Wait protocol works in two different phases; "Spray" will spread number of copies and "Wait" will assure the copy meet to the destination [3][5].

### *A. Source Spray and Wait*

Spray and Wait [6] routing consists of the following two phases:

- Spray phase: for every message originating at a source node, L message copies are initially spread – forwarded by the source and possibly other nodes receiving a copy – to L distinct "relays". (Details about different spraying methods will be given later.) [9]

- Wait phase: if the destination is not found in the spraying phase, each of the L nodes carrying a message copy performs direct transmission (i.e. will forward the message only to its destination).

*B. Binary Spray and Wait*

Binary Spray and wait protocol will split number of copy in spray phase.

- Spray phase: for every message originating at a source node, L/2 message copies are initially spread – forwarded by the source and possibly other nodes [7].

- Wait phase: In the Wait phase, we permit nodes to deliver the messages to the destinations using direct transmission only or drop the message when the TTL expires [8].

## III. SIMULATION ENVIRONMENT

The ONE simulator is used for simulation. The simulation parameter setup is as per Table 1.

| SIMULATION CONFIGURATION | |
|---|---|
| Simulation Time | 2000s |
| Buffer Size | 5 MB |
| Number of Nodes | 10 ~ 50 |
| Message Size | 50k ~ 100k |
| Message Generation (Event Interval) | 1 ~ 25 |
| Message Lifetime | 300s |
| Mobility Model | Random Way Point |

**Table 1:** Simulation Configuration

| Scenario | Event Interval |
|---|---|
| 1 | 1-5 |
| 2 | 5-10 |
| 3 | 10-15 |
| 4 | 15-20 |
| 5 | 20-25 |

**Table 2:** Event Interval Scenario

## IV. SIMULATION RESULT

The simulation result has been analyzed and compared in five different scenarios. Each scenario has different event interval as per Table 1.

The performance result is considered based on two parameters Delivery Ratio and Overhead Ration.

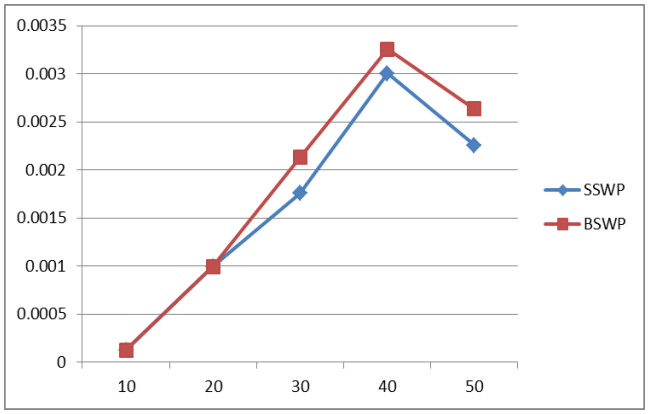


**Fig. 1:** Delivery Ratio in Scenario 1

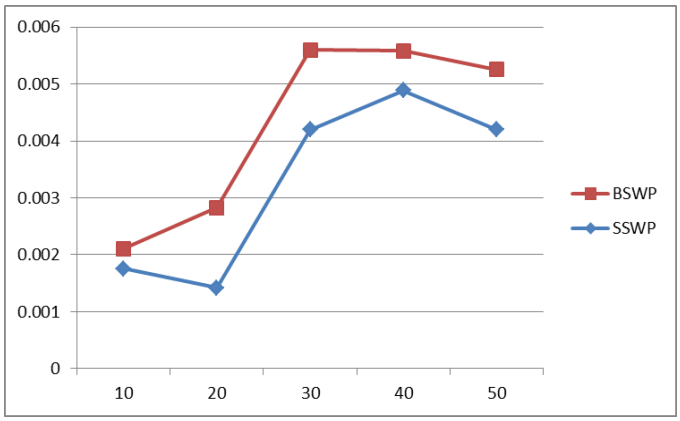


**Fig. 2:** Delivery Ratio in Scenario 2

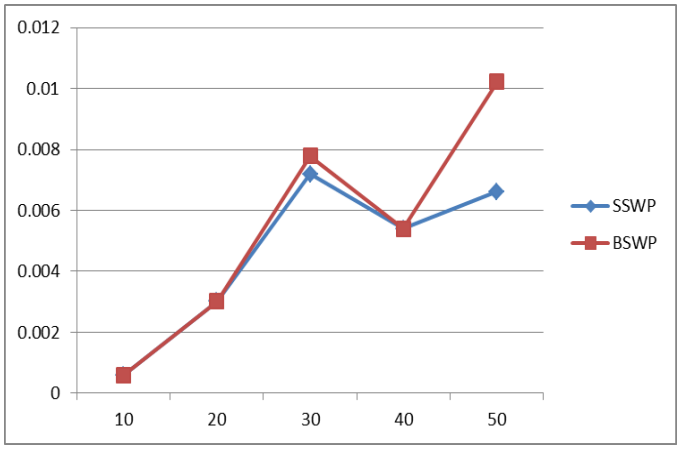


**Fig. 3:** Delivery Ratio in Scenario 3

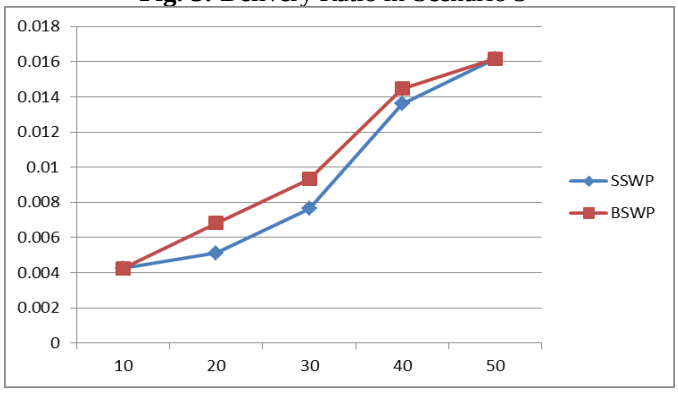


**Fig. 4:** Delivery Ratio in Scenario 4

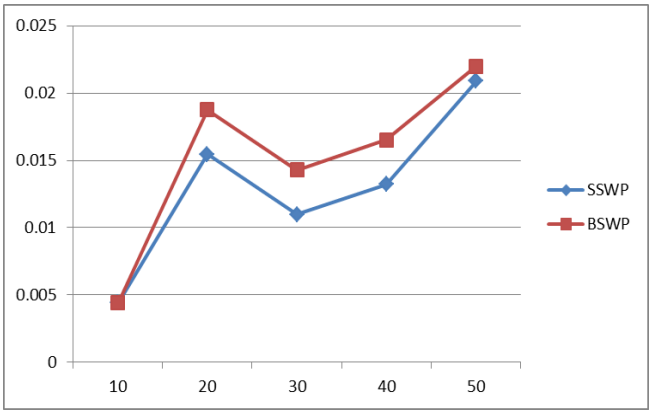


**Fig. 5:** Delivery Ratio in Scenario 5

Fig. 1 to 5 shows the result comparison of delivery ration between Source Spray & Wait and Binary Spray & Wait on various event intervals.

In all scenarios of various event intervals we can see the Binary Spray and Wait give better delivery ratio compare to Source Spray and Wait either we increase the number of node or we change event interval.

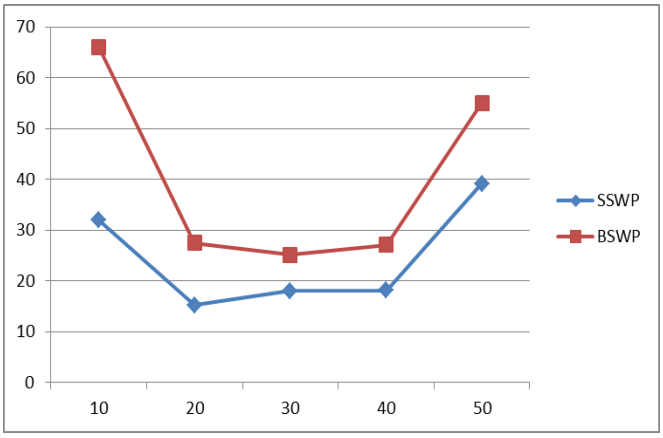


**Fig. 6:** Overhead Ratio in Scenario 1

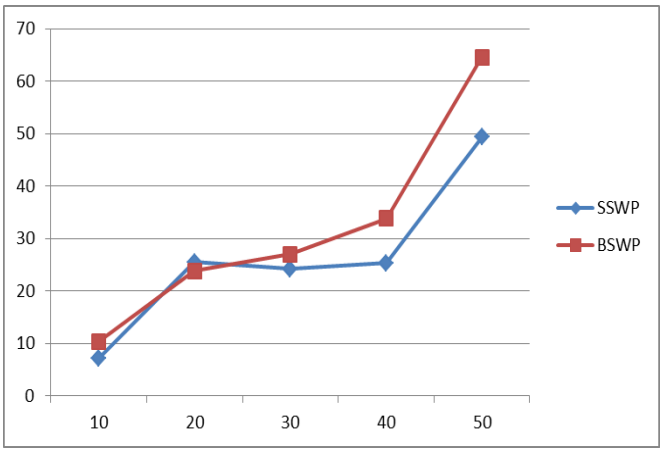


**Fig. 7:** Overhead Ratio in Scenario 2

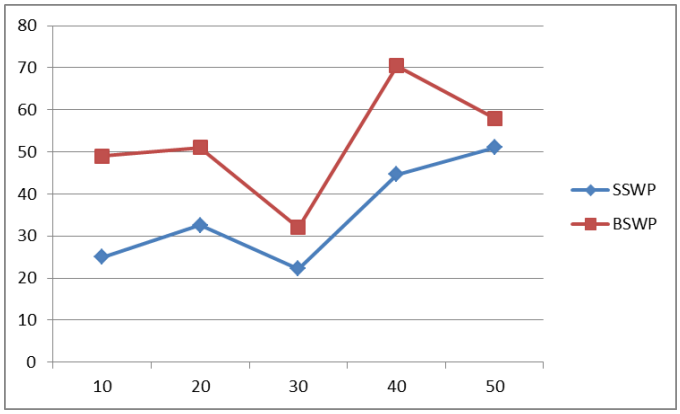


**Fig. 8:** Overhead Ratio in Scenario 3

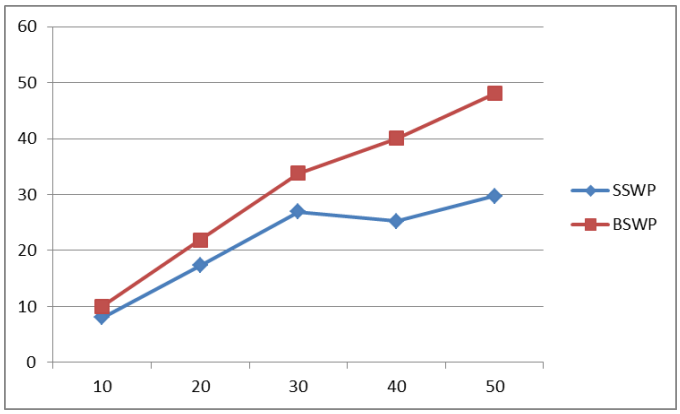


**Fig. 9:** Overhead Ratio in Scenario 4

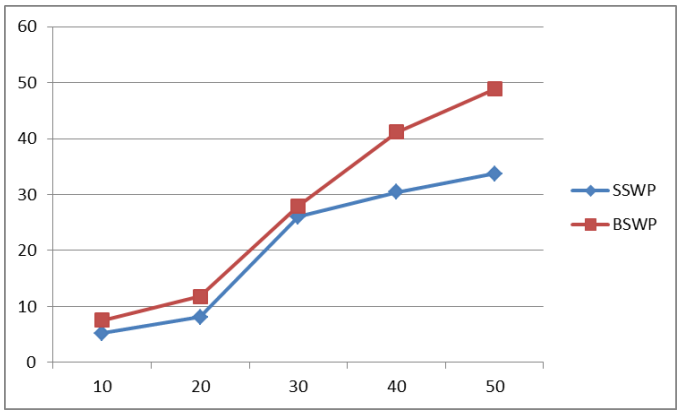


**Fig. 10:** Overhead Ratio in Scenario 5

Fig. 6 to 10 shows the result comparison of overhead ration between Source Spray & Wait and Binary Spray & Wait on various event intervals.

In all scenario of various event intervals we can see the Source Spray and Wait give lower overhead ratio compare to Binary Spray and Wait either we increase the number of node or we change event interval.

## V. CONCLUSION

In this paper the result from simulation and comparison of various scenarios on Spray and Wait and Binary

Spray and Wait, result shows that Binary Spray and Wait provides better delivery ratio compare to Source Spray and Wait Protocol but the overhead ratio is very high compare to Source Spray and Wait, which occupy more resource and burden on network.

As the message copies are static in both the protocol we cannot improve both at same time. If we required higher delivery ratio than Binary Spray and Wait better but for lower overhead ratio Source Spray and wait is good.

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