Performance Analysis of Spray and Wait Protocol and Epidemic Protocol in VDTN

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Abstract—Mobile ad hoc routing protocols allow nodes with wireless adaptors to communicate with one an- other without any pre-existing network infrastructure. Existing ad hoc routing protocols, while robust to rapidly changing network topology, assume the presence of a connected path from source to destination. Given power limitations, the advent of short-range wireless networks, and the wide physical conditions over which ad hoc networks must be deployed, in some scenarios it is likely that this assumption is invalid. In this work, we develop techniques to deliver messages in the case where there is never a connected path from source to destination or when a network partition exists at the time a message is originated. This paper mainly two DTN routing protocols: Epidemic Routing and Spray and Wait Routing, are advocated and compared in terms of Message Delivery Probability.

Keywords-Message delivery probability,Contacts,Average delay

I. CHALLANGES IN DTN

Many evolving and potential networks do not conform to the Internets underlying assumptions . These networks are characterized by:

Intermittent Connectivity: If there is no end-to-end path between source and destination called network partitioning end-to-end communication using the TCP/IP protocols does not work. Other protocols are required.

Long or Variable Delay: In addition to intermittent connectivity, long propagation delays between nodes and variable queuing delays at nodes contribute to end-to-end path delays that can defeat Internet protocols and applications that rely on quick return of acknowledgements or data.

Asymmetric Data Rates: The Internet supports moderate asymmetries of bi- directional data rate for users with cable TV or asymmetric DSL access. But if asymmetries are large, they defeat conversational protocols.

High Error Rates: Bit errors on links require correction or retransmission of the entire packet. For a given link-error rate, fewer retransmissions are needed for hop-by-hop than for end-to-end retransmission.[1]

II. SPRAY AND WAIT ROUTING PROTOCOL

This method consists of two phases

Spray phase: For every message originating at a source node, message copies are initially spread forwarded by the source and possibly other nodes receiving a copy to distinct relays.

Wait phase: If the destination is not found in the spraying phase, each of the nodes carrying a message copy performs direct transmission (i.e. will forward the message only to its destination) [2].

III. PROPOSED WORK

The motivation for this work comes from the idea that placing relay nodes at crossroads allows data deposit and pickup by passing mobile nodes, which will increase the delivered messages (probability) to the final destination.In this work by varying number of relay nodes and mobile nodes,compairing the results for spray and wait protocol and epidemic routing protocol.

IV. EPIDEMIC ROUTING PROTOCOL

Each node consists of message list, m-list and the immunity list, i-list both are lists of message ids. The immunity list contains message ids for those messages that are already delivered to their destination. Using the two lists, the individual nodes compile and exchange the message list they want from the other node. After receiving both nodes modify their m-list and i-list. At the end of a successful exchange, both nodes will have the same set of messages and their immunity lists modified to show receiving messages.[3]

A. Performance Parameters

The various network performance parameters considered inthis scheme are as follows [5],

(i) Message delivery probability: It is ratio of total number received messages to the total number of transmitted messages.

MDP = received messages / transmitted messages

(ii) Average delay: It is the mean of all delays.

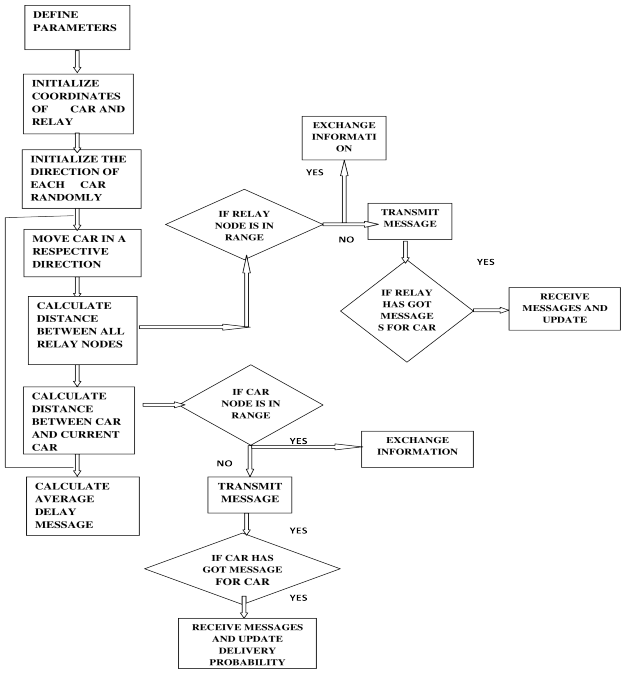

Fig. 1.Epidemic routing Protocol

B. Results and Discussion

Table 1. shows the performance analysis of Message Delivery Probability and Average Delay for the cars 20 and 40. From table it can be analysed that the Message delivery probability goes on increasing as no. of relays goes on increasing.

Epidemic Routing Protocol Results For Cars 20 and 40

	For No of Cars 20		For No. of Cars 40	
No.oF Relays	MDP	AD	MDP	AD
0	0.05	5.37	0.09	11.07
2	0.08	5.81	0.23	14.9
4	0.14	17.33	0.28	13.33
6	0.37	18.78	0.28	14.07
8	0.13	14.28	0.56	20.6
10	0.22	16.46	0.63	20.81
12	0.23	18.55	0.62	19.94
14	0.62	23.56	0.6	26.8
16	0.43	26.56	0.61	24.06
18	0.36	14.11	0.69	22.25
20	0.54	21.03	0.59	25.57
22	0.62	20.55	0.62	21.57
24	0.54	25.54	0.62	22.21
26	0.6	22.16	0.56	16.53
28	0.54	23.09	0.66	22.56
30	0.56	20.59	0.75	23.8

Table 1.Effect of change in no. of relay nodes and vehicles on message delivery probability and average delay for Epidemic protocol.

Fig.2. shows the Performance analysis for Delivery probability against number of nodes for 15,20,25,30,35,40 cars respectively.It shows that the probability of delivery increases the total number of relay nodes in the network increases.

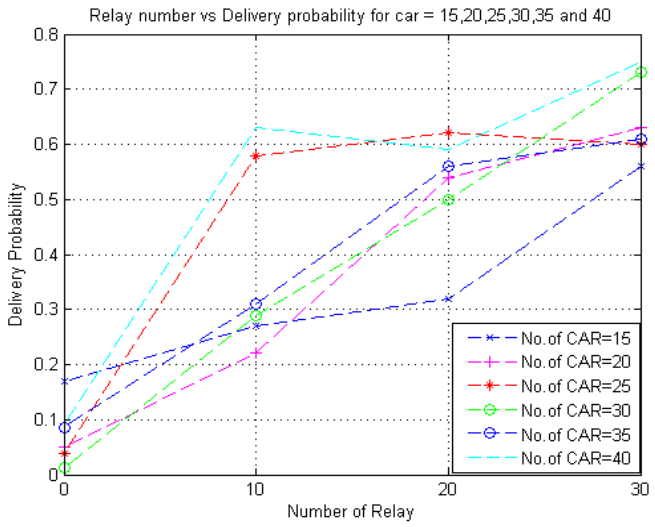

Fig.2.Effect of change in no. of relay nodes on message delivery probability.

Fig.3. shows the Performance analysis for Delivery probability against number of nodes for 15,20,25,30,35,40 cars.It is observe that the probability of delivery increases the total number of relay nodes in the network increases. probability of delay in minutes is directly proportional to the total number of relay nodes in the network.

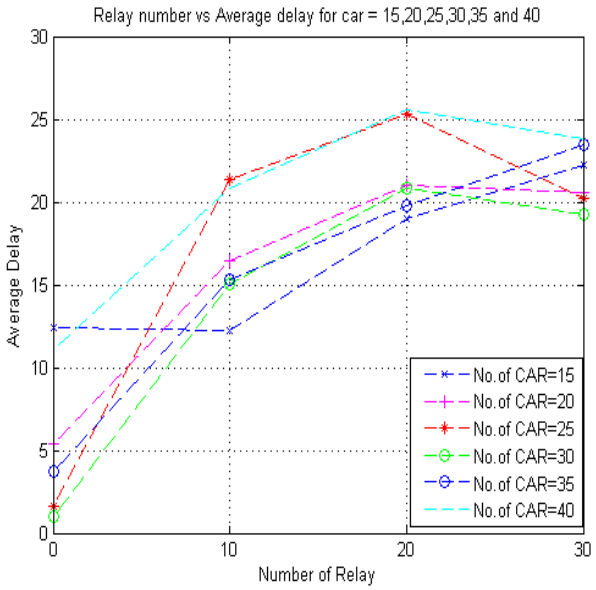

Fig.3.Effect of change in no.of relay nodes on Average Delay

V. Performance analysis between Spray and Wait and Epidemic routing protcol

Table shows the comparision between two routing protocols in terms of the message delivery probability and Average delay for 20 vehicles.

No.of Relays	Spary & Wait for Cars 20		Epidemic for cars 20	
	DP	AD	DP	AD
0	0.13	7.3	0.05	5.37
2	0.16	17.39	0.08	5.81
4	0.39	18.11	0.14	17.33
6	0.24	15.19	0.37	18.78
8	0.8	24.83	0.13	14.28
10	0.15	10.48	0.22	16.46
12	0.37	18.06	0.23	18.55
14	0.35	18.98	0.62	23.56
16	0.7	16.27	0.43	26.56
18	0.37	15.48	0.36	14.11
20	0.7	20.94	0.54	21.03
22	0.85	20.09	0.62	20.55
24	0.76	19.97	0.54	25.54
26	0.74	21.39	0.6	22.16
28	0.74	21.77	0.54	23.09
30	0.58	23.95	0.56	20.59

Table 2.Effect of change in no. of relay nodes and vehicles on message delivery probability and average delay for 20 vehicles

No.of Relays	Spary & Wait for Cars 40		Epidemic for cars 40	
	DP	AD	DP	AD
0	0.14	3.95	0.09	11.07
2	0.16	11.07	0.23	14.9
4	0.29	18.71	0.28	13.33
6	0.39	15.8	0.28	14.07
8	0.5	20.6	0.56	20.6
10	0.48	17.97	0.63	20.81
12	0.73	22.55	0.62	19.94
14	0.6	17.61	0.6	26.8
16	0.78	20.42	0.61	24.06
18	0.49	16.48	0.69	22.25
20	0.86	21.49	0.59	25.57
22	0.74	17.24	0.62	21.57
24	0.68	18.15	0.62	22.21
26	0.88	21.98	0.56	16.53
28	0.9	20.6	0.66	22.56
30	0.88	16.25	0.75	23.8

Table 3.Effect of change in no. of relay nodes and vehicles on message delivery probability and average delay for 40 vehicles

Fig.4.shows the Performance analysis for Delivery probability against number of nodes for 40 vehicles.It shows that the probability of delivery increases the total number of relay nodes in the network increases.

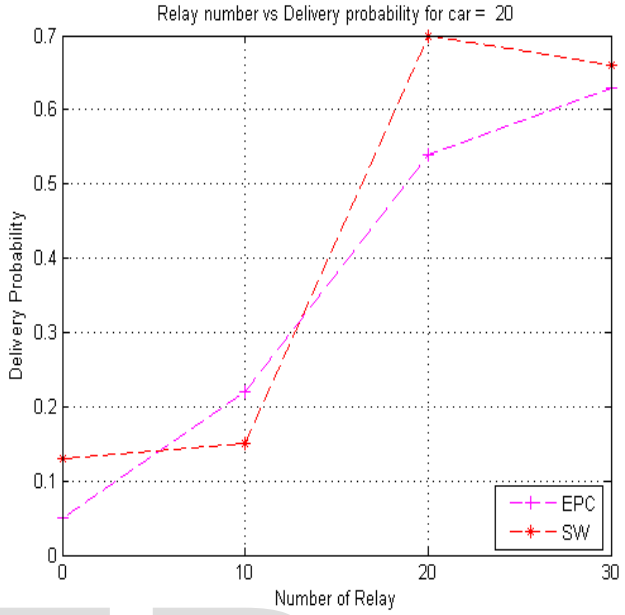

Fig.4. Effect of change in no. of relay nodes on message delivery probability

Fig.5.shows the Performance analysis for Average Delay against number of nodes for 40 vehicles.It shows that the probability of delivery increases the total number of relay nodes in the network increases.

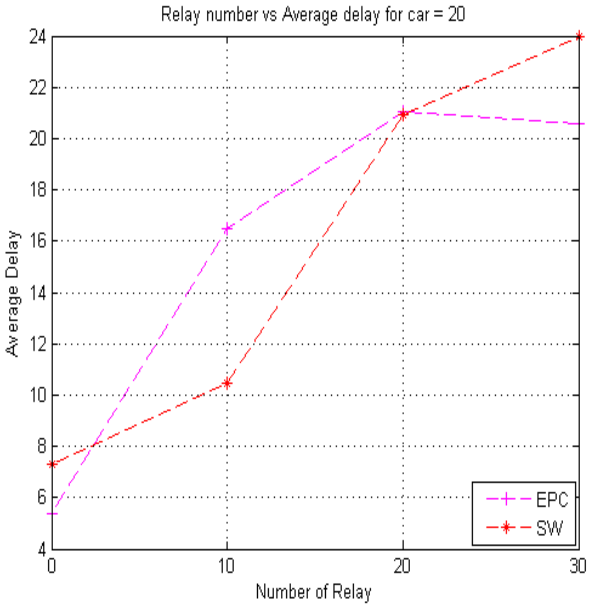

Fig.5.Effect of change in no.of relay nodes on Average Delay

Fig.6.shows the Performance analysis for Delivery probability against number of nodes for 40 vehicles.It shows that the probability of delivery increases the total number of relay nodes in the network increases.

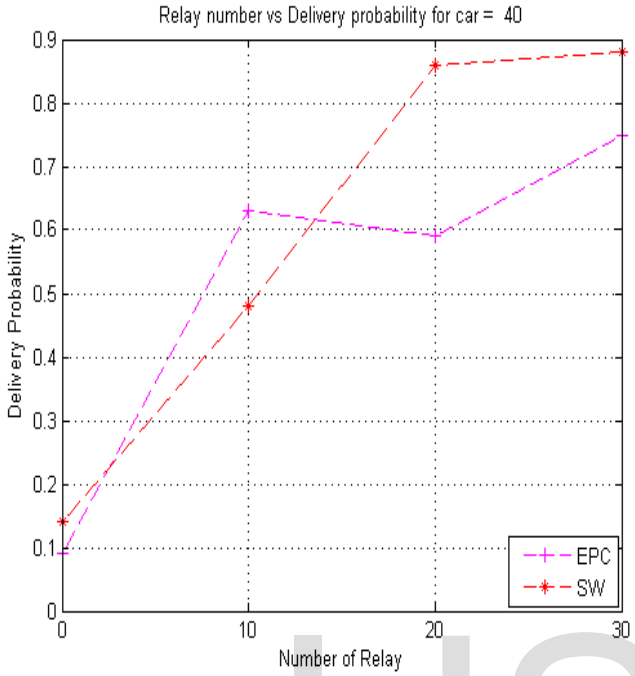

Fig.6.Effect of change in no.of relay nodes on message delivery probability

Fig.7. shows the Performance analysis for Average Delay against number of nodes for 40 vehicles.It shows that the probability of delivery increases the total number of relay nodes in the network increases.

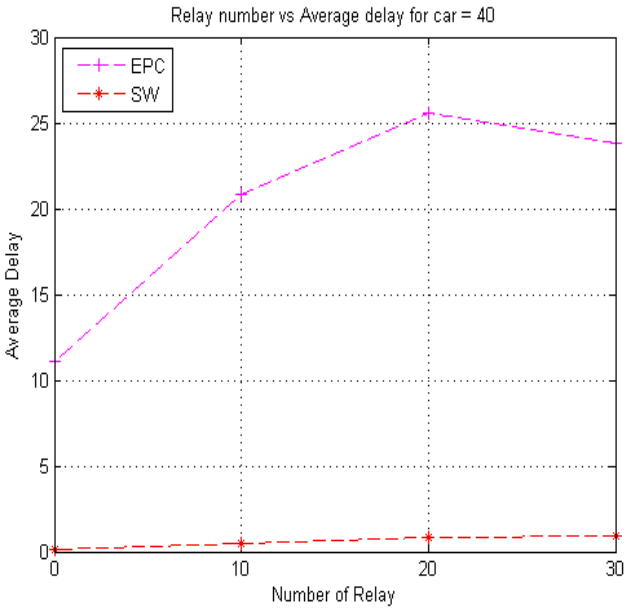

Fig.7.Effect of change in no.of relay nodes on Average Delay

VI. CONCLUSION

After analysing both routing protocols it is observed that the Spray and wait routing protocol gives better Message delivery probability with better Average Delay than Epidemic routing protocol.

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