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Improved PROPHET Routing Protocol in DTN

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Abstract- ***Delay-tolerant Networking (DTN) makes successful communication in sparse mobile ad-hoc networks and other challenged environments where there is no end to end path established unlike traditional networking. PRoPHET routing protocol in DTN uses for delivery predictability of node combat to select and forward bundles to its neighbor node indifferent of the distance between them. The work proposed in this report I look into a number of "single-copy" routing schemes that use only one copy per message, and hence significantly reduce the resource requirements of flooding-based algorithms. in this paper exploration of the single-copy routing space in order to identify efficient single-copy solutions that (i) can be employed when low resource usage is critical, and (ii) can help improve the design of general routing schemes that use multiple copies. Also focused on some of the multi copy case techniques to decrease delivery ratio and delay.***

Keywords*: DTN network,(PRoPHET) protocol, single copy routing.*

1. INTRODUCTION

DELAY-TOLERANT networks (DTNs) have the ability to connect the nodes and have the capacity to serve areas of the world that are being serviced by general networks.
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.
Node store the message in its buffer memory until the next tenure-holder is found in the path towards to reach destination. Because of buffer size is limited node should follow some policy for decide which message is dropped in case of the buffer size is full.

Knowledge obtained from past combat with other nodes is used to improve the packet delivery and its delivery performance packet.

2. ROUTING PROTOCOLS for DTN

The main feature of packet delivery is large end-to-end route latency and a DTN routing protocols has to cope with general disconnections.

Majority of forwarding and routing methods uses asynchronous message passing scheme [1].

A. First Contact

This is easier technique to transmit the data from source to destination in DTN.
This is possible when the source and destination are one hop aside or immediate neighbor to each other [3].

B. Direct Delivery

In this method the source hold the data until it comes in contact with the destination. Hence if there is no contact occurs, message is not delivered [3].

C. Epidemic Routing and n-Epidemic Routing

Epidemic Routing [4] has been proposed as an approach for routing in sparse and /or highly mobile Networks in which there may not be a contemporaneous path from source to destination.

D. Prophet (Probabilistic Routing Protocol using History of Encounters and Transitivity)

Prophet [5] is a DTN routing protocol aiming at using knowledge obtained from past encounters with other nodes to optimize the packet delivery.
Each node keeps a vector of delivery predictability estimates, and uses it to decide whether an encountered Node was carrier for a DTN packet.

E. Prophet++

The PRoPHET++ routing protocol [5] is a hybrid of Epidemic protocol and PRoPHET Protocol. The main idea in the proposed protocol is to accelerate the broadcasting

of messages in the of message delivery phase, by employing Epidemic protocol.

F. 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".

• Wait phase: if the destination is not found in the first phase, each of the nodes carrying a copy of message performs direct transmission of data packets.

3. DTN Routing Protocol Strategy [9]

Many challenges affect the routing in DTN such as the changing network topology, low delivery ratio and high delay. The problem can be mitigated by using different routing strategy.

DTN Routing Protocol Strategy can be divided into three main Categories and they are Flooding, Replication and Forwarding.

3.1 Flooding

in Flooding method extended the number of copies of each message to various group of nodes, this node works like relays in the network .

It is based on Flooding delivery and the data delivery results in inadequate use of the network resources such as bandwidth, power and buffer space at each node. See the Fig. 1 there are all nodes of network have the packet, where A is source and G is destination for sending the data.

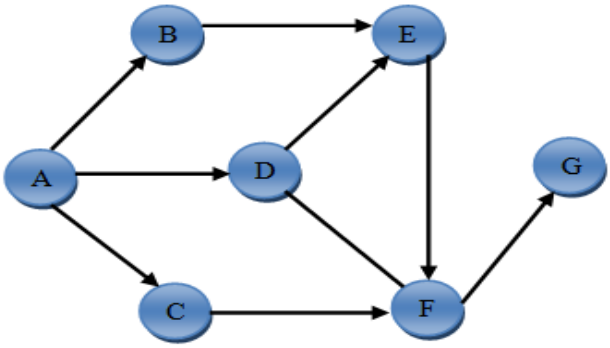

Fig: 1- Flooding schema [9]

3.2Replication

Replication scheme insert multiple copies, or replicas of message into the network in order to increase the probability of message delivery that one of them will finds its way to the destination. This scheme further separated into two classes based on the no. of replicas created in two different ways that are Quota **based** and **flooding based**.

In first part it spread the sufficient number of message copies. In the wait phase if the destination is not reach in the spray stage. See the fig.2 all nodes of network have message except E.

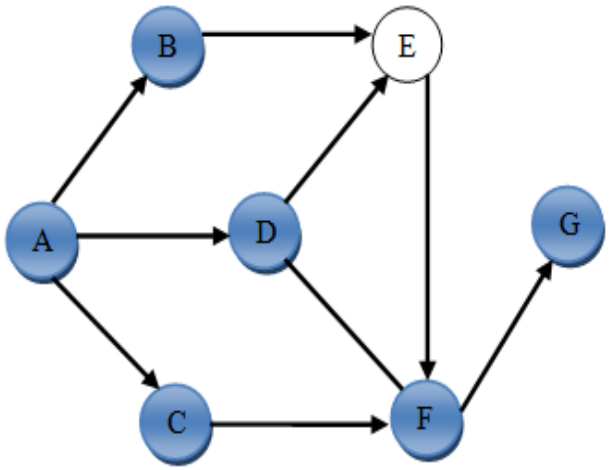

Fig: 2 Replication Strategies [9]

3.3 Forwarding

In this routing strategy, node keeps a single-copy of message in the network and forward that copy through successive intermediate node to the destination. It takes more general approach on the basis of network topology knowledge to routing data in a DTN network.

See the Fig. 3 represent the forwarding strategy in which A, D, F and G node have messaged.

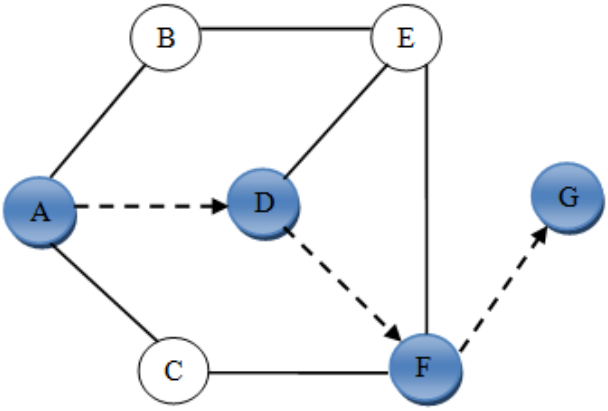

Fig: 3 Forwarding Strategies [9]

3.4 single-copy strategy

In **single-copy** schemes, there is only one node in the network that carries a copy of the message at any given time period. When the intermediate node forwards the copy to particular next hop, this becomes the message's new tenure-holder,

See the fig.4 of single copy strategy,

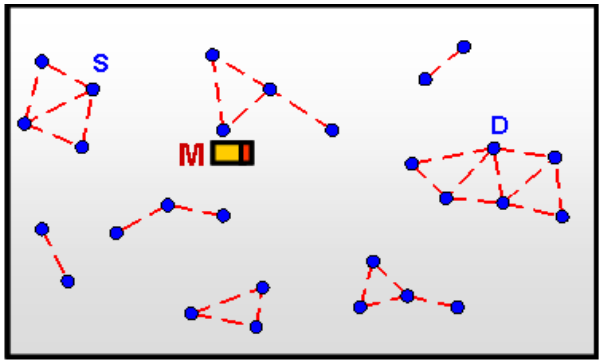

Fig: 4 Single copy case

One method to deal with networks or connectivity "disruptions " which is reinforce connectivity on demand
The simplest possible approach is to source or a moving node carries the message all the way to the destination . Although this scheme performs only one transmission, it is extremely slow.
A faster way to perform routing in DTN network, called Epidemic Routing, is to flood the message in whole the network.

4. PROPHET [7],[8]

Prophet routing protocol called as Probabilistic routing protocol provides parameters based on non-randomness of mobility which gives advantage in mobile applications to improve routing performance.
Instead of delivering replicas of messages in the form of bundles in the network, it implements the "probabilistic routing".

PRoPHET [10] is a prediction-based scheme, and it is one of the few DTN routing protocols that have an IETF draft. It implements a quality related metric called combat predictability for measure the capacity of the combats nodes which transmit the message to the destination or not.

In PRoPHET methodology, a two-phase Information Exchange Phase (IEP) is assigned when a communication opportunity exists between two PRoPHET nodes in the network.
In the first phase of IEP, the combat nodes exchange their summary information (using a Hello message) including delivery predictability values to update the internal delivery predictability vector of each node, and later they exchange bundle information.

In the PRoPHET protocol as shown in Fig. 5 (sequentially from subfigure 1.a to 1.d),

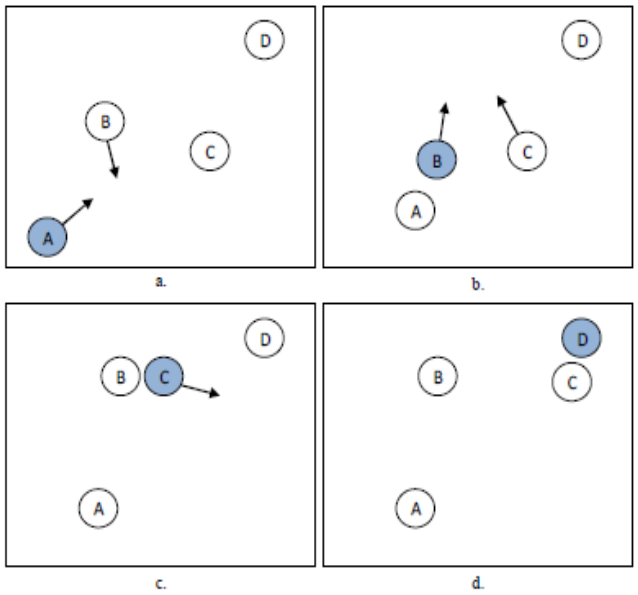

Fig 5. Node Encounters in PRoPHET [8]

There are three main parts of the delivery predictability calculation. First, the delivery predictability parameters is updated whenever nodes combat, so that nodes that are often combat have high delivery predictability.

The **delivery predictability** must pair of nodes does not combat each other for a any moment of time.

Transitivity factor is also implements in PRoPHET Protocol. Based on the observation that if node A randomly combat node B, and node B also randomly combat node C, hence node C has a good probably node for forward messages destined for node A.

5. LITERATURE REVIEW

In [11] in this work, they have dealt with the problem of single copy routing in intermittently connected mobile networks. They have presented a number of increasingly

sophisticated single-copy strategies, and used theory and simulations to extensively evaluate their performance.

In [12] they proposed two efficient multi-copy schemes, called Spray and Wait and Spray and Focus that manage to overcome the shortcomings of flooding-based and other existing schemes. Spray and Focus strategy can stable the performance advantage of Spray and Wait with only a small overhead on total transmissions cost.

In [13] Delay and Disruption-Tolerant Networking (DTN) is a new communication paradigm that can span across multiple networks and cope with harsh conditions not envisioned in the Internet model. Disregard the wide variation of operating conditions. The DTN implementations achieve in providing sufficient performance for most situation.

In [14] this paper discusses the Delay Tolerant Network (DTN) service and protocol stack and presents an implementation of it on the Android platform that is called "Bytewalla". It allows the use of phones for the physical transportation of data between network nodes in areas where there are no other links is available for sending the data, or where existing links need to be avoided for security reasons.

In [15] this paper, they argue that it is not so much the choice or sophistication of social metrics and algorithms that bears the most weight on performance, but rather the mapping from the mobility process generating contacts to the aggregated social graph.
Propose algorithm that uses concepts of unsupervised learning and graph theory to educe this "correct" graph structure. This algorithm allows each node to locally identify and adjust to the optimal operating point, and achieves good performance in all situation considered.

In [16] Describe opportunistic routing techniques have been proposed, whereas node may store-and-carry a message for some time, until anew forwarding opportunity arises. this algorithms most focus on relatively homogeneous settings of nodes. However, in many future applications, participating nodes may be include handhelds, vehicles, sensors, etc.

In [17] this paper, they proposed a practical and efficient joint scheduling and drop policy that can optimize different performance metrics, such as average delay and delivery probability. They first use the theory of combat-based message broadcast to derive the optimal policy based on global knowledge about the network. Then, introduce a method that estimates all necessary parameters which using locally collected statistics information.

In [18] the Coupled with node heterogeneity and volatile links will likely change the typical conditions under which networks operate. In fact, in such scenarios, networks maybe mostly disconnected. Most of time, end-to-end paths connecting every node pair does not exist. To cope with frequent, long-lived disconnections, op-opportunistic routing techniques have been proposed in which, at every hop, a node decides whether it should forward or store-and-carry a message.

6. PROPOSED WORK

Single Copy Case – Direct Transmission

In this section we the problem space of single copy routing in ICMNs. Our problem setup consists of number of nodes moving independently according to some stochastic mobility model. Additionally, we assume that the network is disconnected at most times, and that transmissions are faster than the node movement.
Further, in order to avoid a message constantly jumping back and forth between two nodes within range, we assume that, when a node receives a message, it is not allowed to send the message back to the node it received it from, for a given amount of time (the two nodes are tagged as "coupled" until a timer expires).

Probabilistic Movement Routing Algorithm (PMA)

Designed for DTNs where there is no fixed infrastructure topology or process schedule. All data forwarding happens at opportunistic combat between nodes. Patterns in the mobility are used to improve resources usage as compared with Epidemic Routing to which it is related.
In our proposed work we defined some basically step of proposed work

- Mobility is not truly random as in the sense of 'white noise'
- Human activity imposes patterns on the mobility
- The mobility has a characteristic time interval that depends on the sort of
- Activity we are talking about typically this is much longer than the sort of delays that are normally found in the connected Internet On the order of hours or days in many circumstances such as N4Cs test the essence of the mobility pattern of nodes
- abstracts 'History of Encounters' into delivery predictability parameter
- Aim to avoid sending bundles only on paths that have a low probability of reaching the bundle's destination

See the flow chart of proposed methodology shown in following fig.6

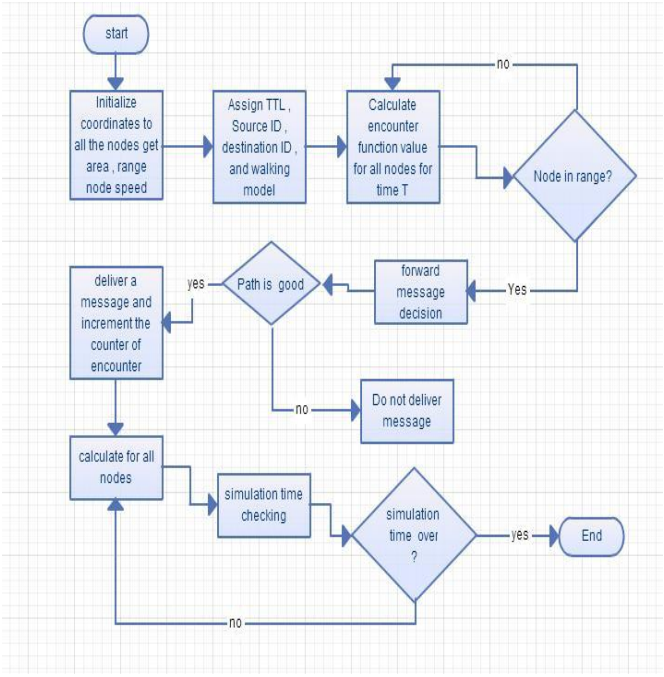

Fig 6. Flow chart of proposed work

7. SIMULATION RESULT

Here we use simulator ONE for implement our approach .ONE is an agent-based event simulation engine. At each simulation procedure the engine updates a number of modules that implementing the main simulation functions. The main functions of the ONE simulator are the modeling of node movement, inter-node contacts, routing and message handling.
Here we take different area parameters to take different results from simulator and then we compare them. Some simulation results are shown in following figure,

7.1 Statistical Analysis

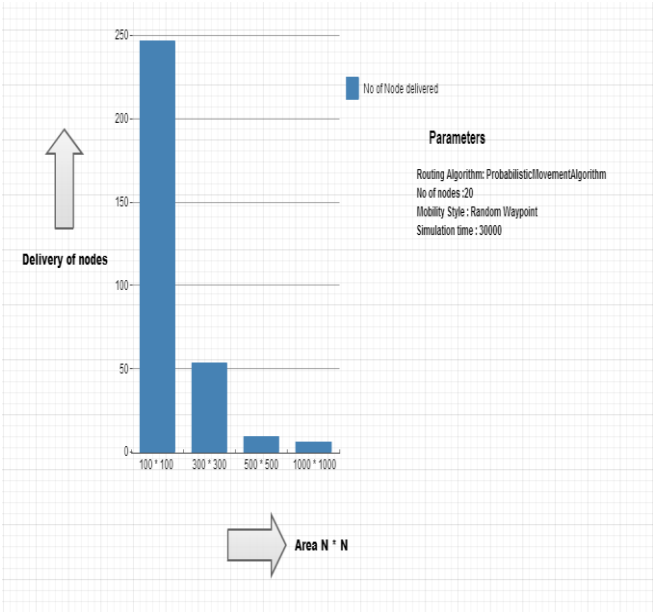

Fig 7. Statistics for random way point PMA

7.2 Typical results by Probabilistic Movement Model

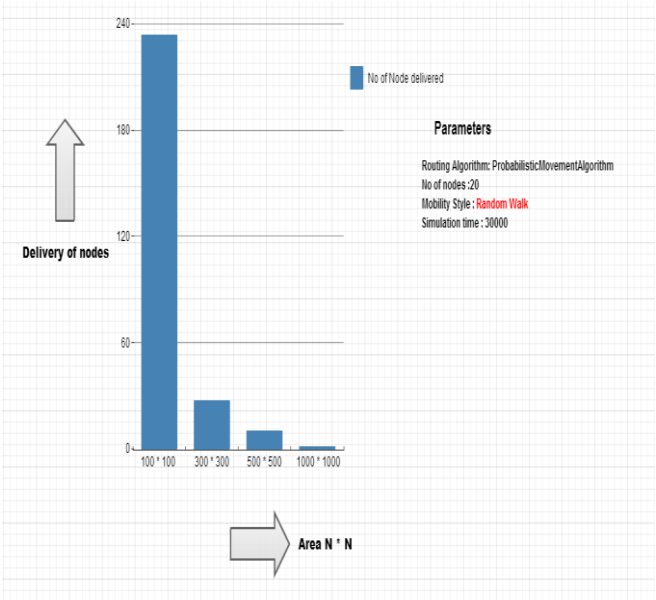

Fig 8. Statistics for PMA random walk

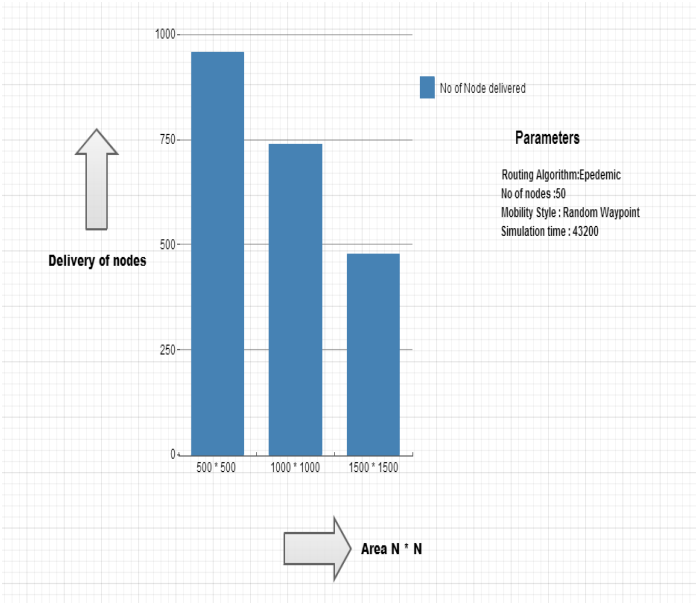

Fig 9 Statistics for PMA 50 nodes

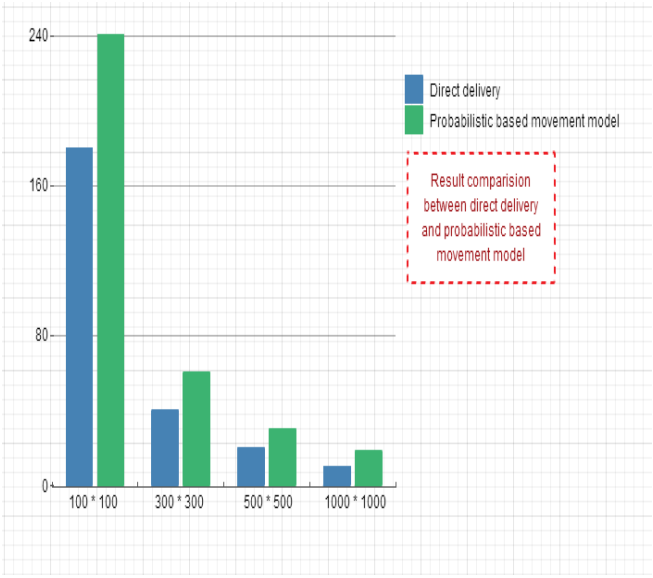

Fig 10. PMA results comparisons

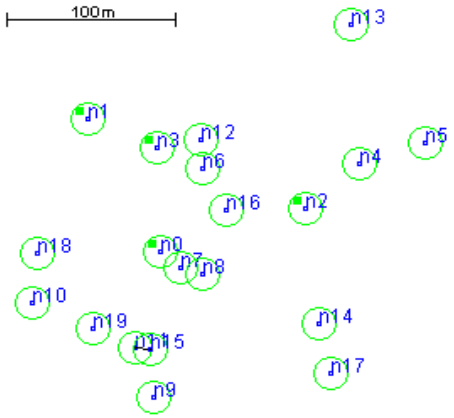

Fig 11. 300 * 300 area simulation

8. CONCLUSION

The proposed algorithm would give better result in comparison of epidemic routing and direct delivery routing protocol. Most important factors are torus size, mobility model and routing algorithm. To prevent resource contention is algorithm is used and analyzed. Mobility models include only random walk and random way point but new mobility model is to be implemented in existing model to improve this result.

This algorithm only provides mechanism to decrease resource contention but we also want to increase delivery ratio.PMA algorithm uses some main factor that forwarding decision made based on probability and movement of nodes. Though this algorithm also works on random walk and random waypoint algorithm and gives also some different results.PMA algorithm uses some main factor that forwarding decision made based on probability and movement of nodes. Though this algorithm also works on random walk and random waypoint algorithm and gives also some different results.

REFERENCES

[1] Forest Warthman, “Delay Tolerant Networks (DTNs)” Warthman Association Version 1.1.

[2] Paritosh Puri and M P Singh “A Survey Paper on Routing in Delaytolerant Networks” IEEE 2013 ”

[3] S. Jain, K.R. Fall, and R.K. Patra, “Routing in a delay tolerant network”, 2004

[4] T. Spyropoulos, K. Psounis, and C. S. Raghavendra, "Single-copy routing in intermittently connected mobile networks," in Proc.IEEE

[5] Sukhbir and Dr. Rishipal Singh, “Effective Routing Protocols for Delay Tolerant Network” International Journal of MordenEngineering Research, July-Aug 2012

[6] Thrasyvoulos Spyropoulos, Konstantinos Psounis and Cauligi S. Raghavendra, "Spray and Wait: An Efficient Routing Scheme forIntermittently Connected Mobile Networks" SIGCOMM'05 Workshops, August 22–26, 2005, Philadelphia, PA, USA.Copyright 2005 ACM 1-59593-026-4/05/0008

[7] Prophet Routing Protocols for Delay Tolerant Networks",International Journal of Computer Theory and Engineering Vol. 4,No. 2, April 2012

[8] Phearin Sok,Keecheon Kim"Distance-based PRoPHET Routing Protocol in Disruption Tolerant Network",978-1-4799-0698-7/13/$31.00 ©2013 IEEE

[9] S. Almelu, Anjna Jayant Deen, Sanjay Silakari,"DELAY TOLERANT NETWORK ROUTING PROTOCOL: A COMPREHENSIVE SURVEY WITH HYBRID TECHNIQUE",IJRET

[10] Biren Patel1, Dr. Vijay Chavda,"Comparative Study of DTN Routing Protocols",International Journal of Advanced Research in Computer and Communication EngineeringVol. 4, Issue 5, May 2015.

[11] ThrasyvoulosSpyropoulos,Konstantin's Psounis, CauligiRaghavendra,"Efficient Routing in Intermittently Connected Mobile Networks: The Single-copy Case",IEEE

[12] ThrasyvoulosSpyropoulos,Konstantin's Psounis, CauligiRaghavendra,"Efficient Routing in Intermittently Connected Mobile Networks: The Multi-copy Case ",IEEE

[13] Artemios G. Voyiatzis."A Survey of Delay- and Disruption-Tolerant ",IEEE

[14] Hervé Ntareme,"Delay Tolerant Network on smart phones: Applications for communication challenged areas ",Royal Institute of Technology, KTH Forum 120, 164 40 Kista

[15] TheusHossmann, ThrasyvoulosSpyropoulos, and Franck Legendre,"Know Thy Neighbor: Towards Optimal Mapping ofContacts to Social Graphs for DTN Routing",Computer Engineering and Networks Laboratory ETH Zurich, Switzerland , IEEE member

[16] ThrasyvoulosSpyropoulos,Thierry Turletti,Katia Obraczka,"Routing in Delay Tolerant Networks Comprising Heterogeneous Node Populations ",Member, IEEE

[17] Amir Krifa, ChadiBarakat,"Message Drop and Scheduling in DTNs: Theory and Practice",Senior Member, IEEE

[18] Thrasyvoulos Spyropoulos,RaoNaveed Bin Rais,Thierry Turletti,"Routing for Disruption Tolerant Networks: Taxonomy and Design ".