Volume 6, Issue 4, April 2016 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Improved Routing Protocol for Delay Tolerant Network

Naviya Dayanand, Amarsinh Vidhate
Department of Computer Engineering, Ramrao Adik Institute of Technology,
Maharashtra, India

Abstract— At present, the internet has grown exponentially due to its wide connectivity with different sets of devices. The only issue is the tolerances towards delay which leads to disconnection in case the delay is above tolerance level. Delay Tolerant Network (DTN) is the latest development to sustain longer delays by allowing disconnected operations. Among the various problems like buffering, resources allocation and energy consumption, routing is a major issue. Specially designed routing protocols for DTN includes Epidemic routing protocols and Spray Wait. So we have compared these two routing protocol on the basis of end-to-end delay, packet delivery ratio and bundle hop count. Based on this analysis we found that epidemic routing performs well. But if we set the buffer size dynamically we can improve the packet delivery ratio of epidemic routing.

Keywords— DTN, Routing protocols, Latency, Delivery ratio.

I. INTRODUCTION

Internet have connected communicating devices around the world. They are connected by using the TCP/IP protocol. All the network connected through internet use TCP/IP protocol to send the data from source to destination with less delay and high reliability. However, there are many regions where the assumptions of the internet cannot be upheld. If there is no available route from source to destination, the TCP/IP may cease to function properly. So a new network must be created so as to connect nodes independently. Such networks are called DTN.DTN works in disconnected network. As the networks are not connected, DTN uses the store, carry and forward. The flow of paper goes as follows, Sectional II contains review of various routing protocols designed for DTN networks. Later in section III we have discussed two major routing protocols in DTN namely Epidemic routing and Spray and wait routing protocol. Section IV defines issues in epidemic and spray and wait routing techniques. To resolve this issue we have proposed improved technique in section V.

II. RELATED WORK

An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.

There are many proposals and research papers based on DTN. In this section, we will go through few papers.

Paritosh Puri et al., proposed a combined study on Delay Tolerant Networks which was originally designed for interplanetary internet. It describes the basics of DTN area and Routing techniques used in DTN. Also comprises the comparisons of different routing protocols in DTN.[1]

K. Fall, proposed a network architecture and application interface structured around optionally-reliable asynchronous message forwarding, with limited expectations of end-to-end connectivity and node resources. The architecture operates as an overlay above the transport layers of the networks it interconnects, and provides key services such as in-network data storage and retransmission, interoperable naming, authenticated forwarding and a coarse-grained class of service.[2]

S.Jain et al., proposed a framework for evaluating routing algorithms in the environments where messages are to be moved end-to-end across a connectivity graph that is time varying but whose dynamics may be known in advance.

E.P.C.Jones et al., proposed the area of routing in delay tolerant networks and presents a system for classifying the proposed routing strategies.

Harminder Singh Bindra et al., have investigated the performance of three different routing protocols namely Epidemic, Prophet and Rapid against varying message TTL.

After going through the papers from literature survey we have extracted the issues like routing, energy, buffer space and resource allocation. As each issue itself is a big challenge so we shortlisted routing for our analysis work. The present study analyses the fundamental issues of routing in DTN and the state of the art analysis have been presented in succeeding chapters.

III. ROUTING IN DTN

Routing issue is very important issue as there are limited resources available for storing the message and forwarding it. The Routing issues are considered by many researchers and this have resulted in many routing protocol.

A good routing protocol should have least transmission in any scenario. It should have less contention window even in heavy traffic. Packet delivery ratio also plays important role in routing, it should be as high as possible. Routing protocol should perform well no matter what network size and node density is. The design of routing protocol should as simple as possible, which will facilitate routing with least control messages.

In standard routing protocols paths are been selected from the available options. But DTN tries to find the best path from the few available paths. Thus DTN is designed based on the practical scenarios these protocols are classified on how they find the destination and if the replicas of messages are transmitted or not.

A. Epidemic Routing

In this routing, the message is sent to all the available paths and nodes present in the network. In Epidemic algorithms there are many number of random exchanges of data. Thus all nodes will eventually receive all messages. So there is confirmation that the target node will get the data.

Working of Epidemic Routing: Here the message which is sent is kept in buffer and its given a unique ID. When two nodes meet each other they first exchange all the message IDs that are present in the buffers called the summary vector. Now all the nodes have same messages in their buffer. When two nodes connect, they send each other the list of all the messages Ids they have in their buffers, called the summary vector. Using the summary vector, the nodes exchange the messages they do not have. When this operation completes, the nodes have the same messages in their buffers.

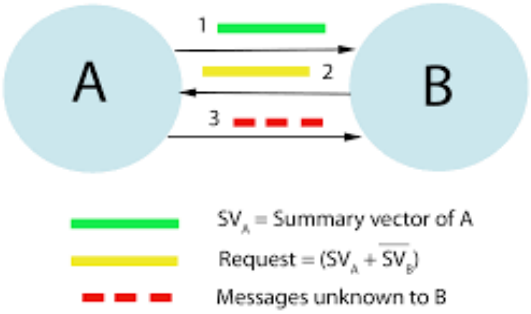

Fig. 1. Epidemic Routing

This routing method has lots of redundancy as every nodes receive every message. This makes the method robust to node and network failures. It also reduces the time it take to deliver the message and the total resources consumed.

Considering example in figure 2 data sent via A-B-C-E. Every nodes will get the message except node F. Because node E does not replicate messages that are destined for itself. Node F will not get the message from E. Because node E is the destination.

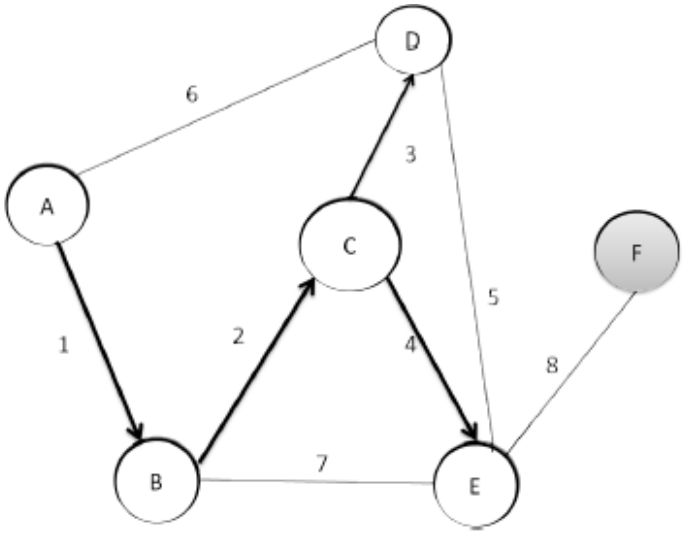

Fig. 2. Epidemic Routing Example[4]

Such routing type will result in inefficient use of the network resources such as power due to forwarding of multiple copies of the same message, bandwidth and costly in terms of energy consumption and memory. Epidemic protocol consumes a lot of battery for processing the messages and swapping them in and out of the buffer. Flooding causes a huge number of control packets in control channels, which can result in network congestion. One of the problems is that the message continues to propagate through the network, even after it has been delivered. The original epidemic algorithms paper proposed death certificates to solve this problem. The idea is that a new message is propagated informing nodes to delete the original message and to not request it again. Ideally, the death certificate will be much smaller than the original message, so overall the resource consumption is reduced.

B. Spray and Wait Routing Protocol

The Spray and Wait that is simple yet efficient, and meets the above goals. Spray and Wait routing decouples the number of copies generated per message, and therefore the number of transmissions performed, from the network size. Spray and Wait 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 spraying phase, each of the L nodes carrying a message copy performs direct transmission (i.e. will forward the message only to its destination).

Spray and wait uses epidemic routing methodology in the initial phase of routing. And in further process of routing it uses direct contact routing strategy.

The main difference from epidemic routing is that Spray and Wait limits the total number of disseminated copies of the same message to a constant number L.

IV. PROBLEM DEFINITION

The traditional routing protocols does not works in delay tolerant network(DTN). So we have routing protocols specially designed for DTN which includes epidemic routing protocol and spray and wait routing protocol. As per our analysis done in previous chapters epidemic routing protocol lags in packet delivery ratio. Although the spray and wait routing protocol has good packet delivery ratio there is scope to improve it more efficiently. So to increase packet delivery we are introducing acknowledged based scheme with dynamic bundle size.

V. PROPOSED SYSTEM

To increase the packet delivery ratio of spray and wait routing protocol we are introducing an acknowledgement scheme with dynamic bundle size. In spray and wait routing protocol the buffer size is fixed but if we set the buffer size dynamically then we can increase delivery probability of a bundle. Working of proposed protocol is as follows, On receiving Buffer size request packet , the node sends back Buffer size acknowledgement packet specifying the packet size. After this agreement source node will initiate data transmission. This process will repeat for every hop to hop transmission.

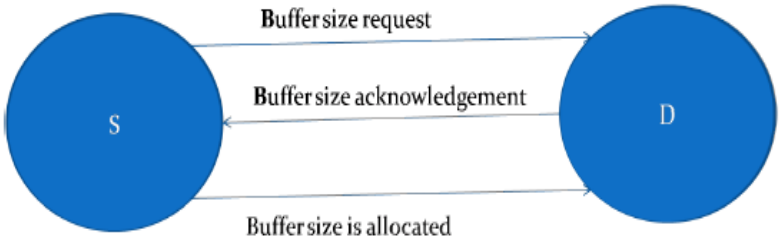

Fig. 3. Proposed System

Consider an example shown in the figure 3 if the source S wants to send a data to destination D, it will first ask the buffer capacity of destination node as it is unaware of its buffer size. So the source S will send Buffer size request packet to neighbouring node A ,the node A will send the required buffer capacity (10kb) to node S using Buffer size acknowledgement packet. Then source node S will send bundle of size specified in Buffer size acknowledgement packet (10kb).

IV. CONCLUSIONS

In our study have studied about epidemic and spray & wait routing protocol for DTN. Based on the analysis we found that epidemic routing gives better results than spray and wait routing.The packet delivery probability can be increased by introducing hop-to-hop acknowledgement scheme and dynamic bundle size.

REFERENCES

[1] Paritosh Puri and M.P Singh , A Survey Paper on Routing in Delaytolerant Networks, International Conference on Information Systems and Computer Networks 2013.

[2] K. Fall, A delaytolerant network architecture for challenged internets, in Proceedings of ACM SIGCOMM, pp. 2734, August 2003.

[3] S. Jain, K. Fall, and R. Patra, Routing in a delay tolerant network, in Proceedings of ACM SIGCOMM, vol. 34, pp. 145158, ACM Press, October 2004.

[4] E.P.C. Jones, L. Li, P.A.S. Ward, Routing Stragies for Delay-tolerant Networks, Submitted to Computer Communication Review,2008.

[5] Harminder Singh Bindra and A. L. Sangal, Performance Comparison of RAPID, Epidemic and Prophet Routing Protocols for Delay Tolerant Networks, in International Journal of Computer Theory and Engineering Vol. 4, No. 2, April 2012.

[6] Jian Shen, Sangman moh and Ilyong Chung, Routing Protocols in Delay Tolerant Networks: Comparative Survey in The 23rd International Technical Conference on Circuits/Systems, Computers and Communication (ITC-CSCC 2008)

[7] Kyungrak Lee, Yong Li, Inwhee Joe and Yeonyi Choi, Selective 2-Phase Spray and Wait Routing for Overhead Reduction in Delay Tolerant Networks IEEE, 2014.

[8] T. Spyropoulos, K. Psounis, and C. Raghavendra. Efficient Routing in Intermittently Connected Mobile Networks: The Multiple-copy Case. ACM/IEEE Transactions on Networking, Feb. 2008.

[9] A. Vahdat and D. Becker, Epidemic routing for partially-connected adhoc networks, Tech. Rep. CS-2000-06, Duke University, July 2000.

[10] B. Aruna, L. B. Neil, and V. Arun, DTN Routing as a Resource Allocation Problem, SIGCOMM07, Kyoto, Japan, August 2731, 2007.

[11] Karimzadeh, Morteza," Effient routing protocols in delay tolerant networks(DTN)" in Master of Science thesis, May 2011.

[12] M. Grossglauser and D. N. C. Tse, Mobility increases the capacity ofad hoc wireless networks, IEEE/ACM Transactions on Networking, vol.10, pp. 477486, August 2002. Kevin Fall. A Delay-Tolerant Network Architecture for Challenged Internets. 2003.

