Latency and Routing analysis in Throw box based DTN for challenged networks

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ABSTRACT- ***Disruption Tolerant Network (DTN) technology becoming a supreme solution that allows wireless devices to communicate with each other and they can access the private or secrecy information. The main goal of DTN is to provide interaction among dissimilar kinds of networks. Wireless nodes support a wide range of communications, allowing users to quickly configure their optimal network. Almost all the wireless devices are capable of detecting, storing, processing, and transmitting environmental information, where the end nodes are consistence as well as inconsistence in connection. To improve reliability in mobile DTN is by placing additional consistent nodes called throw boxes. Throw boxes are very effective in improving throughput for the inefficiencies in DTN's message delivery. Throw boxes are capable of delivering more messages within shorter delay time period, therefore extends the network diligently. Throw boxes are wireless nodes that act as relays and creating additional opportunities in DTN. By Careful deployment of the throw-boxes, the network connectivity can be enhanced and decreases the transmission delay in Delayed Tolerant Network. In a wireless network, the connectivity in multi-hop way is generally affected by node density, transmission range, residual energy and node mobility. Throw-box assisted message dissemination and propose the corresponding models to analyse the message delivery rate and related latency distribution. The messages left at throw box could be carried by one or more mobile nodes to other boxes in order to enhance the probability for being collected by the receiver. Routing schemes are needed for the selection of best path in transmission.***

KEYWORDS: Wireless Nodes, Connectivity, Throw Boxes, Latency, Routing, Traffic analysis

I. INTRODUCTION

Wireless Technology has brought a significant change in our daily file. The mobile wireless devices such as laptops, netbooks, tablet PCs, Ultra mobile PCs, Mobile internet Devices, Smart phones, PDAs, Digital still cameras have become necessary part in our life to share information. Networking can be achieved by wired and wireless networks. But the wireless networks can cover more areas than wired networks. Wireless networking has its own advantages when we compare with wired networking. Meanwhile the introduction of ad hoc networking inherited new challenges in network research areas. In traditional networking the source and destination is available within the network connected regions. But the mobility of wireless nodes causes limited transmission range, low density and high latency in network nodes. The mobility of wireless nodes could cause the network has no continues connection between source node and destination node. Every mobile node in ad hoc network could participate in routing mechanism, such mobile nodes transmits information through store and forward mechanism. These types of networks are generally referred as Disruption Tolerant Networks or Delayed Tolerant Networks.

DTNs are relying on mutual cooperation of mobile nodes without infrastructure. DTNs require hardware that can store large amounts of data. DTN supports the internet in challenged Mobile Networks, Media Networks, Military Ad-Hoc Networks, Sensor Networks, vehicular network (VANET), and planned networks in space, etc. [**Y. Sobhan Babu, Research Scholar, Shri Venkateshwara University, Dr Duvvuri B K Kamesh,, Professor - The Significance of Delayed and Disrupted Tolerant Networks for Challenged Internet Where the End Nodes are Inconsistent – IJASTEMS - ISSN:2454-356X Volume.3, Issue.10, October 2017].** In this paper my study is on the issues, such as networking connectivity evolution, latency analysis, routing strategies, Traffic analysis and picking the best Throw Box, in throw-box based DTNs.

Throw boxes are small and inexpensive devices equipped with wireless interfaces and storage. Wireless interface and storage capable very small and less expensive devices are Throw boxes. Connectivity between the nodes depends on node density, transmission range, residual energy and node mobility. Some recent works have used the idea of deploying stationary devices at specific locations [**W. Zhao, Y. Chen, M. Ammar, M.**

Corner, B. Levine, and E. Zegura. Capacity enhancement using throwboxes in dtns. In Proc. IEEE Intl Conf on Mobile Ad hoc and Sensor Systems (MASS), pages 31-40, 2006]. The stationary devices called throw-box can be small and cheap devices with wireless antennas and limited memory. Latency is the amount of time a message takes to traverse from source to destination over the network. Time it takes for a packet of data to traverse from one designated node to another. It is also indicated as the time required for a packet to be returned to its sender.

Routing is the process of moving packets across a network from one host to another. It is usually performed by dedicated devices called routers. Packets are the fundamental unit of information transport in all modern computer networks.

II. CONNECTIVITY IN WIRELESS AD HOC AND SENSOR NETWORKS

Data and applications can access from anywhere and anytime expected by users, these expectations can be a huge burden on wireless networks. The Pillars of Wireless Networking are 1. Security services ensure the safety of the infrastructure 2. Management technology provides wireless network administrators with the ability to dynamically reconfigure the network to meet changing needs. 3. Ease of deployment is critical in ensuring an efficient, effective rollout of wireless networking. 4. Bandwidth requirements continue to grow at a rapid rate. In a wireless network, the connectivity in multi-hop way is often affected by node density, transmission range, residual energy and node mobility. A partitioned wireless ad hoc network can turn into a connected network when some of the above factors change. The number of nodes being deployed in a designated area can influence the network connectivity greatly.

Understanding the transition phase of the network between partition and connectivity can help network management, planning, maintenance and performance monitoring. The importance of the connectivity issue has drawn great attention recently to obtain fundamental properties of the problem in many application domains. For example, the minimum number of average neighbours for network connectivity in static topology [**F. Xu and P. Kuma, 2004**] the last connection time and the first partition time about node failure models in wireless networks [**F. Xing and W. Wang, 2008**]; the impact of interference on the connectivity [**O. Douse, F. Bacilli, and P. Thiram, 2005**] the relationship between power saving on sensor networks and maintaining connectivity **[O. Douse, P. Mannersalo, and P. Thiran, 2004][Z. Kong and E. M. Yen, 2007].** In these works, the percolation theory has been used leading to results of critical densities defined based on statistical concept of giant component [**H. Kestin Thesis, 1982**].

Figure 1: Delay Tolerant Network

The self-supporting feature of ad hoc network makes quite useful in situations where the natural disasters, emergency military operations, or even quickly transfer information among different nodes. The types of ad hoc networks are Mobile ad hoc networks (A self-forming network of mobile devices), Wireless mesh networks (A communications network of radio nodes structured in a mesh topology).Wireless sensor networks(employs sensor based devices observe physical or environmental settings such as sound, pressure, climatic changes, and so on).

Figure 2: Ad Hoc Mesh or Mobile Network

III. SIGNIFICANCE OF THROW BOXES IN DTNS

Throw boxes have the capacity to buffer any packet for any long time period and provides links of Throw boxes. Throw boxes have optimization problems. Reliability of network can be increased by providing Active throw boxes.

Optimization problems in throw boxes have defined K-Throw box problem and min-Throw box problem.

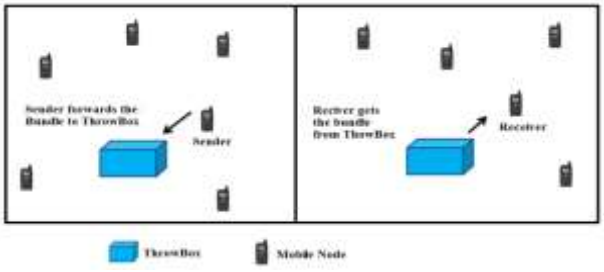

Figure 3: Throw Boxes and Mobile Nodes

3.1 K-THROW BOX PROBLEM

In this method the selection of throw boxes increases the reliability of network. Here k represents a certain number of throw boxes i.e 1 to 9. Brute force algorithm is used for small networks. Even though there is an incompatibility between network reliability and time complexity. [**S. Sekar & Dr. C. Poongodi-"Optimization Of Throw Box Deployment In Delay Tolerant Network" Volume 1, Issue 2, 2016-IJCRD].**

3.2 MIN THROW BOX PROBLEMS

In this method the throw box uses the random networks like k- throw boxes with the constraint g ranging from 0:40 to 0:60. But it confirms that, if we use more numbers of throw boxes the increases the contact possibility in network. [**S. Sekar & Dr. C. Poongodi-"Optimization Of Throw Box Deployment In Delay Tolerant Network" Volume 1, Issue 2, 2016-IJCRD]**

3.3 CHOOSING THE BEST THROW BOX

The description of selecting Throw box can be performed into two different criteria. In order to choose the active Throw box in each round to be added or to remove from the network the below criteria have to be executed.

3.3.1 NODE DEGREE CRITERIA

In network each Throw box will make a new connection and forward the message or opportunity to the mobile users. By using greedy iteration add the Throw box with larger or remove the Throw boxes with smallest. The main goal of using Throw box is for better connectivity to improve the reliability among mobile users. The time complexity of Greedy selects based on the degree of node. [**S. Sekar & Dr. C. Poongodi-"Optimization Of Throw Box Deployment In Delay Tolerant Network" Volume 1, Issue 2, 2016-IJCRD]**

3.3.2 RELIABILITY CHANGE IN NODE

The node reliability changes according to the adding and removing throw boxes in Greedy iteration process. Generally adding throw boxes to largest reliability increases the communication time. Obviously, this technique is more effective for the optimization goal or constraint with node degrees. For r rounds of t times Dijkstra's algorithm are used. In term of complexity, it much larger than other algorithms based on node degrees. Greedy algorithm almost uses node degree technique to select a Throw box that is to be added in each network cycle.

3.4 MOBILE THROW BOXES

Static throw boxes are used in increasing contact probability at certain time period. But in some situations the static throw boxes are idle. If we use mobile throw boxes, in such case further enhancement in contact opportunities among mobile nodes. My concept is that instead of adopting the static throw boxes. A new model and advanced methods can be directly applied to mobile throw boxes.[**Fan Li Zhiyuan Yin ; Shaojie Tang ; Yu Cheng ; Yu Wang-Optimization Problems in Throw box-Assisted Delay Tolerant Networks- IEEE Transactions on Computers (Volume: 65, Issue: 5, May 1 2016)]**

3.5 LATENCY DEPENDENCE IS ONE OF THE ISSUES IN THROW BOXES BASED DTNS.

High Latency communication may encounter in wide region where limited mobile nodes are present. In such regions throw boxes are employed to minimize latency duration and increase the frequency of message delivery. Message collectors participated in data distribution. They take the responsibility of transferring the message among mobile nodes. Here two different types of message collectors are discussed in this process. The first type is independent collector, which are used to collect the messages independently and do not transfer the collected messages to other uninformed collector. The other type collector is cooperative collector. It can be noticed as the sender without having data in the beginning and initiates to relay data and drop message at another visiting box for other uninformed collector.

3.5.1 MESSAGE DISTRIBUTION MODEL

In DTNs the static communication and storage devices i.e Throw boxes are employed, in the regions where there is frequent availability of sender and receiver. Once any node or the throw box receives the message, it must provide a chance to share the same message to other throw box. The box with message indicates it as "message box", whereas the null indicates it as "empty box". The site or position of this throw box should be in connected area where the sender and receiver are frequently attending. In such scenario there is probability to deliver the message with in short latency time period. **.[Bo Gu, Xiaoyan Hong,Pu Wang, Richard Borie-Latency Analysis for Thrown Box Based Message Dissemination-publication in the IEEE Globe com**

2010 proceedings January 2011]

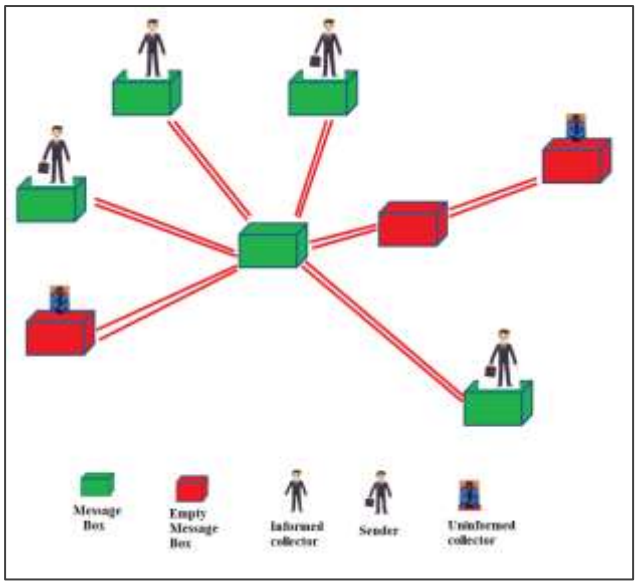

Figure 4: Scenario of message distribution

IV. ROUTING APPROACHES IN THROW BOXES

Store, carry and forward mechanism is adopted in Disrupted Tolerant Network. Later the support of throw boxes enhanced the Capacity of nodes and developed the prospect of node encounter. Based on time and network links a group of throw boxes are contingent, where the mobile nodes are existed. It is a bundle throw boxes transmission where numerous boxes are makes use in particular time period. My concept is used to know and adopt the best path in transmission.

4.1 METHOD OF ROUTING APPROACH

The suggested capacity-aware routing protocol applies one single copy of a message during its delivery time. Mobile nodes move from one place to another place , in such situation, boxes which runs CA makes forwarding decisions and corresponding actions.

Each box runs CA as well as a background agent. According to the Markov Model, the state of link changes in box with the help of background agent. Markov Model is one of the Probability models. In probability theory, a Markov model is a stochastic model used to model randomly changing systems. A stochastic model is a tool for estimating probability distributions of potential outcomes by allowing for random variation in one or more inputs over time. During the availability of mobile nodes multiple links occur in current state. CA consists three components namely forwarding the decision for the current state, Path selection and forwarder selection.

4.1.1 FORWARDING DECISION, PATH SELECTION AND FORWARDER SELECTION

In this process link delay or mobile node with same load capacity is taken. The aim of forwarding decision is to transfer the message to end point link in short time where in each link stage ,outgoing message box chooses whether to make use of the current link or not. In case of high Latency in current link ,the box needs to wait for the next stage with low Latency to transfer the message.

In path selection process independent of the load capacity , finds the best path to route the message to the end point with in short period of time. The box choses shortest delay link among multiple links to transfer message from the current stage.

In forwarder selection process if the mobile node passing through the boxes ,it forms time dependent links between the nodes and boxes. When the mobile node visits the box with outgoing messages ,then the box concludes to take it as a message forwarder. Based on the routing table the forwarding decision of the stage can be resolved. It the result is WAIT , then the present node disregarded, if the result if ACCEPT , the routing direction and moving direction of the present node is further processed for checking.

V. CONCLUSION

Delay tolerant networks are different from the traditional wireless networks in terms of network connectivity. Throw boxes are effective in improving throughput and delay, especially for multi-path routing and predictable node mobility. Recent studies have shown that deployment of TBs can significantly enhance the DTN routing performances. This paper studies throwbox placement problem in a large-scale mobile DTN. In this paper we have tried to provide the latency analysis and Routing strategies of Throw boxes in a brief manner which will provide the basic knowledge to the reader about the Throw box based Disrupted Tolerant Networks.

REFERENCES

[1] Y. Sobhan Babu, Research Scholar, Shri Venkateshwara University, Dr Duvvuri B K Kamesh,, Professor - The Significance of Delayed and Disrupted Tolerant Networks for Challenged Internet Where the End Nodes are Inconsistent – IJASTEMS - ISSN:2454-356X Volume.3, Issue.10, October 2017.

[2] W. Zhao, Y. Chen, M. Ammar, M. Corner, B. Levine, and E. Zegura. Capacity enhancement using

throwboxes in dtns. In Proc. IEEE Intl Conf on Mobile Ad hoc and Sensor Systems (MASS), pages 31-40, 2006.

[3] F. Xing and W. Wang. On the critical phase transition time of wireless multi-hop networks with random failures. In Proceedings of the 14th ACM international conference on Mobile computing and networking, San Francisco, California, USA, 2008.

[4] F. Xue and P. Kumar. The number of neighbors needed for connectivity of wireless networks. Kluwer Wireless Networks, 10(2):169-181, 2004.

[5] O. Dousse, F. Baccelli, and P. Thiran. Impact of interferences on connectivity in ad hoc networks. IEEE/ACM Transactions on Networking (TON), 13(2):425 { 436, 2005.

[6] O. Dousse, P. Mannersalo, and P. Thiran. Latency of wireless sensor networks with uncoordinated power saving mechanisms.In Proceedings of the 5th ACM international symposium on Mobile ad hoc networking and computing, Roppongi Hills, Tokyo, Japan, 2004.

[7] Z. Kong and E. M. Yeh. Distributed energy management algorithm for large-scale wireless sensor networks. In Proceedings of the 8th ACM international symposium on Mobile ad hoc networking and computing, Montreal, Quebec, Canada, 2007.

[8] H. Kesten. Percolation theory for mathematics. Birkhauser, 1982.

[9] S. Sekar & Dr. C. Poongodi- "Optimization Of Throw Box Deployment In Delay Tolerant Network" Volume 1, Issue 2, 2016-IJCRD.

[10] Fan Li Zhiyuan Yin ; Shaojie Tang ; Yu Cheng ; Yu Wang-Optimization Problems in Throw box-Assisted Delay Tolerant Networks- IEEE Transactions on Computers (Volume: 65, Issue: 5, May 1 2016.

[11] Bo Gu, Xiaoyan Hong,Pu Wang, Richard Borie-Latency Analysis for Thrown Box Based Message Dissemination-publication in the IEEE Globe com 2010 proceedings January 2011.

[12] Fan Li, Zhiyuan Yin, Shaojie Tang, Chao Zhang, Yu Cheng§ Yu Wangk-Throwbox Placement Problem in Throwbox-Assisted Delay Tolerant Networks-Globecom 2014 Ad Hoc and Sensor Networks.

[13] Y. Sobhan Babu, Research Scholar, Shri Venkateshwara University, Dr Duvvuri B K Kamesh,, Professor - Scenario of Cipher text Policy Attribute Based Encryption for Secure Data Sharing. (IJASTEMS-ISSN: 2454-356X) Volume.3,Issue.8,August.2017

[14] Pradosh kumar Gantayat*, Sambit Mohanty, Sudip Kumar Gochayat- Routing Strategy In Delay Tolerant Network- Int. J. of Intelligent Computing and Applied Sciences- ISSN (Print) : 2322-0031 , Vol. 5, Issue 1, 2017.

[15] Ji Li 1, Lachlan L.H. Andrew 2, Chuan Heng Foh 3; Moshe Zukerman 4 and Hsiao-Hwa Chen 5-Connectivity, Coverage and Placement Wireless Sensor Networks- Sensors 2009, 9, 7664-7693; doi: 10.3390/s91007664- ISSN 1424-8220.

[16] Harminder Singh Bindra, Amrit Lal Sangal-Considerations and Open Issues in Delay Tolerant Network'S (DTNs) Security- Wireless Sensor Network, 2010, 2, 645-648.