Delay Tolerance Network based on Time to Live and Reliability

Rohit Hirvey
Dept. of Computer Science & Engineering
Jawaharlal Institute of Technology Borawan
Dist. Khargoan, India

Ranjan Thakur
Dept. of Computer Science & Engineering
Jawaharlal Institute of Technology, *Borawan*, Distt. Khargone, India

ABSTRACT
In the area of Delay Tolerant Network there are many issues like egotistical and hostile behavior of nodes that can damage it and some essential things which are required to be realized. Hence designing a misconduct scheme is really a great provocation in DTN. For this a Delay Optimization model is proposed which will further be verified by the END-END Delay and packet delivery. It will fetch the data over the several proper communications between the base node and receiving node. This proposed model is implemented for the enhancement of quality of service given by wireless service providers.

Keywords
Delay, Tolerant Network, Security, Quality of Service

1. INTRODUCTION
Today's Internet has been very successful at connecting communicating devices round the globe. It has been made possible by using a set of protocols, which is widely known as TCP/IP protocol suite. Every device on the innumerous sub-networks that comprise the Internet uses this protocol for transferring the data from source to destination with the minimal possible delay and high reliability. The underlying principle on which TCP/IP works is based on end-to-end data transfer using number of potentially dissimilar link-layer technologies. However, there are many regions where the assumptions of the internet cannot be upheld. If at any instant there is no path between the sources to destination, then TCP/IP fails to work properly or might even stop working completely. Because of such circumstances, a newer network has evolved which is independent end to end connectivity between nodes. This system is called as Delay Tolerant Networks (DTN).

Delay Tolerant Networking (DTN) is a way to deal with PC system engineering that means to address the specialized issues in heterogeneous systems that experience absence of consistent system availability. Delay Tolerant Networks (DTNs) empower information exchange when versatile hubs are just discontinuously associated. Because of absence of reliable network, DTN directing typically takes after store-convey and-forward; i.e., in the wake of accepting a few packets, a node carries them around until it contacts another node and then forwards the packets. Since DTN routing relies on mobile nodes to forward bundles for each other, th routing performance (e.g., the number of packets delivered to their destinations) depends on whether the nodes come in contact with each other or not.[1]

These networks are characterized by the following. It is because of these characteristics that Internet Protocols fail or is rendered useless.

1. Lack of Connectivity: If at any moment, there is no limit to-end way amongst source and goal (widely called network partitioning), then end-to-end communication cannot take place using the TCP/IP protocols suite. Here DTN comes very useful.

2. Irregular Delays: Long delays can cause the TCP/IP protocol suite to function improperly. Propagation delays between transmitting nodes compounded with queuing delay at each node can topple the protocols which rely largely on quick return of acknowledgement of a sent data. This can be overcome using DTNs.

3. Asymmetric Bidirectional Data Rates: Moderate asymmetries of bidirectional data rate can be tolerated to an extent in conventional protocols. But if asymmetries are large, they can be defeated easily. Networks called as challenged networks violate the assumptions of the conventional Internet and hence TCP/IP protocols can't be used here. As described in [2] the examples of challenged systems can be Exotic Media Networks, Terrestrial Mobile Networks, and Sensor-based Networks etc.

2. MOBILE AHDOC NETWORK
While the "classical" MANET protocols look to build up a conclusion to-end way between the communicating peers and thus enable higher layer end-to-end protocols to operate largely unchanged, the need for operation in mobile ad-hoc networks with sparse node distribution has led to the development of specific application protocols that work using asynchronous communications and do not require an end-to-end path at any point in time. Different approaches have been studied for sensor networks [3, 4, 5], interpersonal communication [8], and Internet access in remote areas [1, 6] but also in support of mobile Internet access [7, 8], among others.

In this paper, authors focus on the DTN architecture for asynchronous communications as developed in the DTN Research Group (DTNRG) of the Internet Research Task Force (IRTF). Rather than exchanging (small) packets end-to-end, DTN endpoints use messages of arbitrary size (bundles) forwarded by DTN routers hop-by-hop from the source to the destination. The DTN bundle protocol operates above the transport layer and may interconnect different internets with arbitrary underlying protocol stacks [9]. Status reports may convey information about the delivery progress of a bundle

from intermediate routers as well as receipts from the receiver to achieve end-to-end semantics [10]. DTN endpoints and applications are identified by endpoint identifiers (EIDs) specified in a URI-style format: scheme: specific-address. The scheme defines the scope within which the specific address is interpreted.

Routing in DTNs has been studied in general [11] as well as in the context of specific mobile ad-hoc networking environments. For the latter, DTN routing often relies on information replication for forwarding bundles to maximize delivery probability and/or minimize transit time. Such forwarding schemes follow, for example, the concept of epidemic routing [12]. Numerous variations and improvements have been developed such as [13, 14, 15]. While the issue of node mobility and non-available end-to-end paths have been recognized for MANET environments and DTN routing schemes for mobile networks are being studied and improved, the present approaches have in common that they take either a pure end-to-end packet-based approach to communications or use exclusively asynchronous hop-by-hop information exchange. Authors believe that schemes coupling DTN concepts and opportunities for end-to-end communications may help applications and may also benefit DTN routing itself as Authors outline in the next section.

3. DELAY TOLERANT IN NETWROK

Please use a 9-point Times Roman font, or other Roman font with serifs, as close as possible in appearance to Times Roman in which these guidelines have been set. The goal is to have a 9-point text, as you see here. Please use sans-serif or non-proportional fonts only for special purposes, such as distinguishing source code text. If Times Roman is not available, try the font named Computer Modern Roman. On a Macintosh, use the font named Times. Right margins should be justified, not ragged.

Tested systems emerge principally as an aftereffect of different types of host and switch portability, however may likewise appear as a consequence of detachment because of force administration or obstruction. Case of such systems incorporates Terrestrial Mobile Networks, Exotic Media Networks, Military Ad-Hoc Networks, and Sensor and Sensor/Actuator Networks. The DTN engineering [16] tries to address the correspondence needs of these tested situations through a message based store-and-forward overlay organize that influences an arrangement of meeting layers to adjust to a wide assortment of basic transports. What's more, the model likewise upholds novel ways to deal with application organizing and programming interface, discontinuity, unwavering quality, and constant state administration. The Haggle engineering expands on the first DTN design by giving an information driven design [17.18] where applications don't need to worry about the components of transporting information to the correct spot, since that makes them base ward. By appointing to Haggle the assignment of engendering information, applications can consequently exploit any association open doors that emerge, both nearby neighborhoods open doors and availability with servers on the Internet when accessible. This is obviously infeasible in the current TCP/IP engineering. The Haggle engineering is composed in view of the accompanying four standards.

1. Information Persists inside Haggle: The information on every hub in Haggle must be noticeable to and searchable by different hubs. By and by, this implies Haggle must oversee tireless information stockpiling for applications, rather than applications putting away information in a different record framework.
2. Organizing Protocols inside Haggle: Any application layer organizing convention incorporates inferred suspicions about the sort of system accessible. For instance, customer server conventions, for example, SMTP, POP and HTTP expect that Internet-based servers are contactable.
3. Name Graphs supporting Late Binding: Haggle keeps up its own naming store, with mappings from client level names to convention particular names, which determine the different approaches to get to the client level name. Moreover, the entire arrangement of mappings (the "name chart") is transmitted alongside the information, permitting even middle of the road transfer hubs to tie to convention particular names as late as could be allowed [19].
4. Incorporated Resource Management: One part of the systems administration engineering on each gadget is to choose what to do with each of its system interfaces now. Wrangle contains a unified asset administration segment, which settles on a cost/advantage examination premise what errands it performs on every system interface at a given minute.

4. VARIOUS TECHNIQUES OF DTN

In order to discuss the routing issues which are associated with the DTN, a model should be particularly designed that presents the network. A Delay-Tolerant-Network is a composition of some computing systems which can be considered as mobile nodes, these nodes can go up and down over time due to the failure of the network.

A. Challenges in DTN

DTN can introduce many issues and limitations that are not available in the traditional networks where the issues can be generated from the network disconnectivity due to signal propagation delays, any packets in a communication route which can be lost while communicating between a wide range of devices, and secondary problems are introduced when routing strategies deal with limited resources.

- Contact Schedules: If the size of the traffic in the network upsurges when there are large number of nodes connected with that particular network or where the large messages are being exchanged between nodes at that time capacity of the network is very much important. So the best contact or connectivity doesn’t sustain much.
- Contact Capacity: A question arises that is closely associated with the contact schedule is how much data can be transferred between two nodes. The capacity of the node to make contacts is completely dependent on the link technology and the duration of the connection between two nodes.
- The existing system allows computing the duration of packet holding capacity, however, it cannot be forecasted owing to the arbitrary nature of the topology.
- Buffer Space: Buffer space plays a critical role in delay tolerant network to increase the packet holding time. If the mobile nodes don’t have sufficient buffer space or memory, it will exhibit its nature of dropping the packets. Usually, in VANET, all the mobile nodes doesn’t have same physical characteristics for which

reason, ensuring the optimality in buffer space is quite a challenging task.

- Processing Power: Energy or power have always played an important role in ensuring link connectivity and extended operation of mobile nodes. Processing power will refer to power required by the node to hold the packet for a specific period of data packet holding time. As the nodes are usually heterogeneous type, so the rate of energy dissipation is non-uniform, for which reason, it is less possible to come up with power control strategies in DTN.
- Energy: Energy is a scarce resources for the mobile nodes in delay tolerant network as they are deployed as a mobile device or they are presented in a human inaccessible location where they cannot get connected with the power grid, routing in the delay tolerant network are responsible for the energy depletion in the network while sending, receiving and storing messages where performance computation is also an issue. Hence, energy gives rise to various issues in DTN.

B. Evaluation Criteria

Delivery Ratio: In Delay Tolerant Network the most important network performance metric is the delivery ratio, however it can be said that in DTN technology a message will not easily be lost, and it happens that the message has not delivered to the destination within an acceptable amount of time.

- Latency: It can be said that the secondary metric which is considered as the latency, the latency is the time between the generation of the message and the receiving of the message by the destination node, even that network can be capable of toleration long waits, there are so many applications that have some time window where the data is very much essential for example DTN is used to deliver email to a mobile user so here one main objective of DTN is to deliver the message in the mobile of the client before he/she comes out from that particular area of the network. [16].

5. RELATED WORK

In paper "Reliability Management in the Social Internet of Things", IEEE Transactions On Knowledge And Data Engineering, May 2014, M. Nitti, R. Girau, and L. Atzori,[1] concentrated on how the data gave by individuals from the social IoT to manufacture a dependable framework on the premise of the conduct of the articles.

The author proposed two model for the trustworthiness management such as subjective and objective model. In paper "A Probabilistic Misbehavior Detection Scheme toward Efficient Trust Establishment in Delay-Tolerant Networks", IEEE Transactions on Parallel and Distributed Systems, Jan 2014, Haojin Zhu[2] has examined that a vindictive and childish conduct is not kidding danger directing in postponement/disturbance tolerant systems (DTNs). The creator proposed a probabilistic Trust model for bad conduct location keeping in mind the end goal to build up trust among the hubs.

In paper "A Trust Based Approach for Increasing Security in Cloud Computing Infrastructure", IEEE UKSim fifteenth International Conference on Computer Modeling and Simulation, 2013, H. Banirostam, A. Hedayati, A. Zadeh, and E. Shamsinezhad[3] has talked about Cloud registering is turned into a quickly developing trendy expression, at present not having proper instruments for their confirmation of secrecy, security arrangement, figuring precision, and information respectability. Consequently creator proposed new approach called Trusted Cloud Computing Infrastructure.

In paper "Protection Preserving Data Sharing With Anonymous ID Assignment", IEEE Transactions On Information Forensics And Security, Vol. 8, No. 2, February 2013, Larry A. Dunning, and Ray Kresman[4] has examined that in system, with a specific end goal to sharing of privatedata among hub, allocating secure and one of a kind ID's is required. The creators look at existing and new calculations for doling out mysterious IDs, concerning exchange offs amongst correspondence and computational necessities [4].

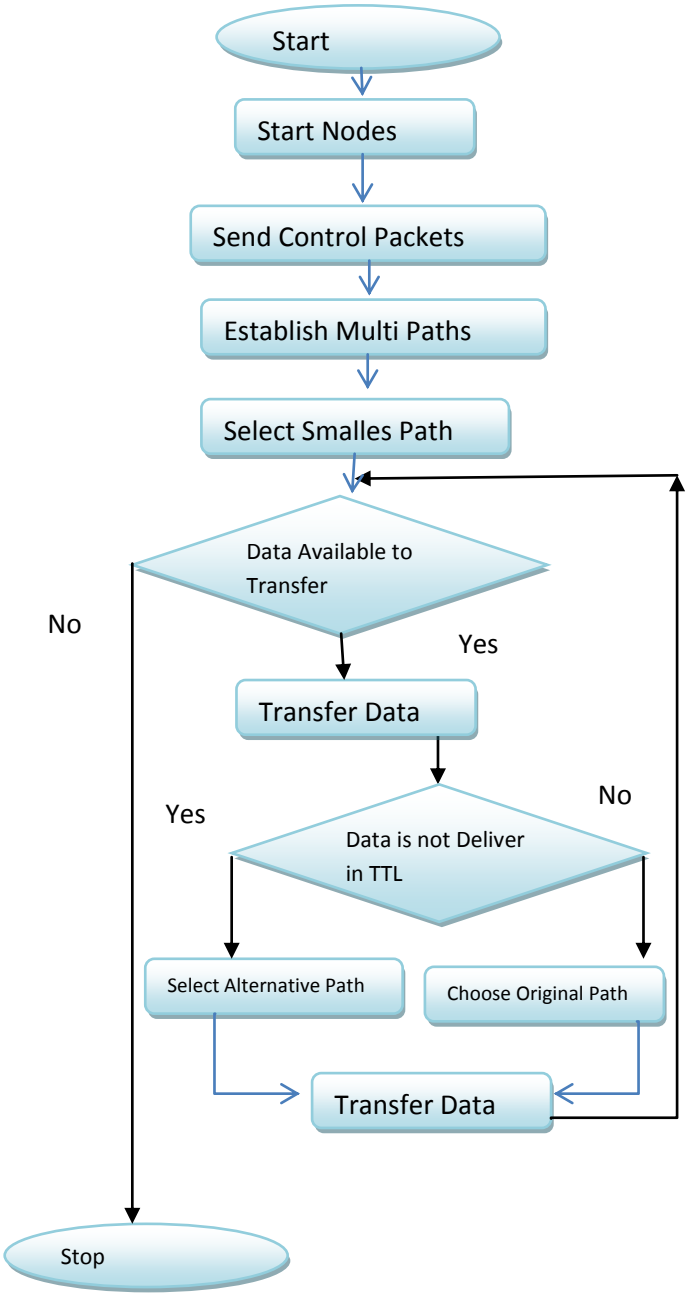

Figure 1: Proposed Work

6. PROPOSED WORK

This section is most important section of the article as Authors are going to discuss and describe the proposed work and it's architecture. This proposed work is specially meant for the wireless environment. This environment is mainly responsible for the collision and other issues which could become the reason for the delay in the network.

There are two main conditions are there in proposed work as shown in figure 1. First condition checks the willingness or availability of the data at various nodes and Second will check the time to live by any packet in any network.

7. RESULT ANALYSIS

This section is mainly divided into two parts. First part is all about the simulation parameter which means it will show the environment in which the experiment is performed. Second part deals with the Result and it's analysis part. In this second part Authors will see various result along with the significance of those.

Part 1: Simulation Parameter

This is shown in table I , as shown bellow:

Table 1: Simulation Parameters

Property	Values
set val(chan)	Channel/WirelessChannel
set val(prop)	Propagation/TwoRayGround
set val(netif)	Phy/WirelessPhy
set val(ifq)	Queue/DropTail/PriQueue
set val(ll)	LL
set val(ant)	Antenna/OmniAntenna
set val(x)	1000
set val(y)	1000
set val(stop)	60
set val(ifqlen)	100
set val(nn)	50
set val(rp)	AODV
set val(mac)	Mac/802_11

Part 2:

Packet Delivery Ratio: It is a static quantity which shows the number of packets deliver to destination from the source node.

PDR = (Number of Received Packet *100)/ Number of Send Packet

Table I: PDR of Existing and Proposed Work

	Existing Work	Proposed Work
PDR (in %)	84.65	96.36

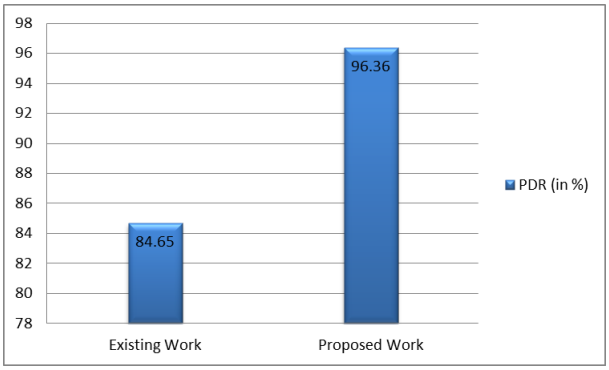

Figure 2: PDR of Existing and Proposed Work

End-End Delay: It is a static quantity which shows the time taken in between sender and receiver. In other words , it is taken time between these two nodes while transmission of the data.

The Average time taken by each and every pair of node which do transmission and receiving of the data in the network are called Average End-End Delay.

Table II: AVG End-End Delay of Existing and Proposed Work

	Existing Work	Proposed Work
AVG End-End Delay (in Second)	11.25	10.95

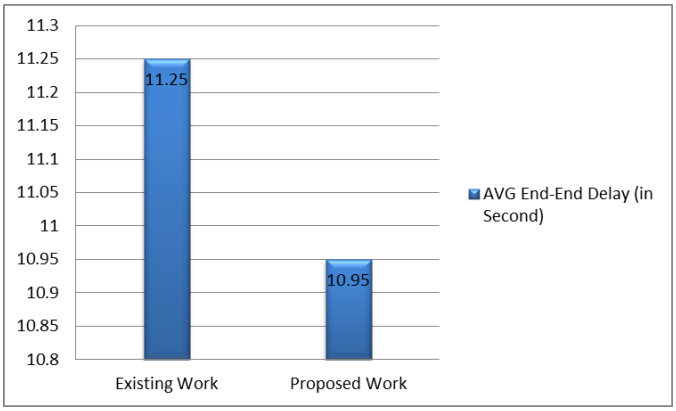

Figure 3: AVG End-End Delay of Existing and Proposed work

8. CONCLUSION

In this paperhas presented DTN and a portion of the various open issues in the Delay Tolerant Network's. This paper can serve a managing way to the analyst to locate the open issues and the ranges which should be re-sought in the delay and packet delivery of DTN. Directly and indirectly the issue of security in any wireless network could be part of the security measurement. The previous section of the article clearly shows something through the table 1 and 2 along with the figure 2 and 3 that the way this proposed work has chosen , certainly work efficient than existing work.

9. REFERENCES

[1] Ashwini Borkar et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 6 (1) , 2015, 658-660, "A Review of Trust Model in Delay Tolerant Network".

[2] Adjie-Winoto, W., Schwartz, E., Balakrishnan, H., and Lilley, J. The design and implementation of an intentional naming system. In *Proceedings of SOSP* (Dec. 1999), pp. 186–201.

[3] L. Qiu, Y. R. Yang, Y. Zhang, and S. Shenker. *On Selfish Routing* in Internet-Like Environments.In Proc. of ACM SIGCOMM, August, 2003.

[4] Ashwini Borkar et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 6 (1) , 2015, 658-660," A Review of Trust Model in Delay Tolerant Network"

[5] K. Fall. A Delay-Tolerant Network Architecture for Challenged Internets. In Proceedings of ACM SIGCOMM 2003, Karlsruhe, Germany, August 2003.

[6] Kevin Fall, Intel Research, Berkeley, "A Delay-Tolerant Network Architecture for Challenged Internets".

[7] K. Harras, K. Almeroth, and E. Belding-Royer. Delay tolerant mobile networks (DTMNs): Controlled flooding schemes in sparse mobile networks. In IFIP Networking, 2005.

[8] Wireless Sensor Network, 2010, 2, 645-648, "Considerations and Open Issues in Delay Tolerant Network'S (DTNs) Security".

[9] S. Jain, K. Fall, and R. Patra. Routing in Delay Tolerant Networks. Proceedings of the ACM SIGCOMM 2004, Portland, OR, USA, 2004.

[10] P. Juang, H. Oki, Y. Wang, M. Martonosi, L. S. Peh, and D. Rubenstein. Energy-efficient computing for wildlife tracking: Design tradeoffs and early experiences with zebranet. In Proceedings of the ASPLOS-X conference, San Jose, CA, USA, October 2002.

[11] A. Lindgren and A. Doria. Probabilistic Routing Protocol for Intermittently Connected Networks. Internet Draft draftlindgren- dtnrg-prophet-02, Work in Progress, March 2006.

[12] Volume 5, Issue 6, June 2015 ISSN: 2277 128X, International Journal of Advanced Research in Computer Science and Software Engineering, "Issues in Delay Tolerant Networks: A Comparative Study".

[13] International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 5, Issue 3, March 2014), "Reviewing the Existing Research techniques of Delay Tolerant Networkand Scaling its Effectiveness".

[14] J. Ott and D. Kutscher. Applying DTN to Mobile Internet Access: An Experiment with HTTP. Technical Report TR-TZI-050701, Universit¨at Bremen, July 2005.

[15] A. Pentland, R. Fletcher, and A. Hasson. DakNet: Rethinking Connectivity in Developing Nations. 37(1):78–83, January 2004.

[16] K. L. Scott and S. C. Burleigh. Bundle Protocol Specification. Internet Draft draft-irtf-dtnrg-bundle-spec-02, Work in progress, September 2005.

[17] A. Vahdat and D. Becker. Epidemic routing for partially connected ad hoc networks. Technical Report CS-200006, Duke University, April 2000.

[18] Y. Wand and H. Wu. DTN-MSN: The Delay Fault Tolerant Mobile Sensor Network for Pervasive Information Gathering. In Proceedings of IEEE Infocom 2006, Barcelona, Spain, April 2006.

[19] W. Zhao, M. Ammar, and E. Zegura. A Message FerryingApproach for Data Delivery in Sparse Mobile Ad Hoc Networks. In Proceedings of ACM Mobihoc, Tokyo, 2004.