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A Novel Protocol for Packet Arrivals in DTNs

K.Surekha[1], M. Srujan Reddy[2]
[1] *PG student, Department of CSE, Madanapalle Institute of Technology & Science, JNTUA University, A.P, India.*
kambam.surekha35@gmail.com
[2] *Assistant professor, Department of CSE, Madanapalle Institute Of Technology & Science, JNTUA University, A.P, India*
srujankumarreddym@gmail.com

Abstract— Delay tolerant Networks (DTNs) is an approach to network architecture which will targets the heterogeneous network. Delay tolerant network may will deals with mobile nodes even the mobile nodes don't have any end-to-end connection. From the above context, contacts between the two nodes are limited because of its low density of active network nodes. So make sure routing statics to permit the time delivery from source to destination with maximum probability. If the portability between nodes can't known before which may cost of repeat the actual information, this process may consume lots of power and storage resources. In this paper we explain about packet pair property in First-In-First-Out queuing networks and shown you how it can measure through bottleneck link bandwidth.

The First-In-First-Out queuing network judges the difference in two packet landing times with equal sizes from same source to destination. We have described the protocols for optimality of proper delivery and mean delay. Here we may differentiate the two conditions, one is source may overwrite its packets in relay nodes and second is source may not.

Keywords—*Delay tolerant network, network coding, rate less codes.*

1. Introduction

Delay Tolerant Networks (DTNs), also called as intermittently connected mobile networks, are wireless networks in which a fully connected path from source to destination is unlikely to exist. In these networks, for message delivery, nodes use store-carry-and-forward paradigm to route the messages. The examples of this networks are wildlife tracking, military networks etc. However, effective forwarding based on a limited knowledge of contact behavior of nodes is challenging. Although the connectivity of nodes is not constantly maintained, it is still desirable to allow communication between nodes. Each time the source meats a relay node, it chooses a frame for transmission with probability. In the basic scenario, the source has initially all the packets.

In the basic scenario, the source has initially all packets. The transmission policy has the brink format. It seems an excellent for using chances to pass packets for a while and gets stopped. The same scheme simulates the well-known "Drizzle-and-Stay" scheme. Initially here we assume that a more natural appearance method of packets don't need to be concurrently available for communication, It means when promoting the starts, In this bin, If bigger media files will record at that sends them out and do not wait for full file to be completed.

1.1 Augmentations

This project targets on common packet appearance at source point and two-hop routing. The augmentations are foothold.

- For work preserving schemes, we find out the protocols for optimist in terms of chances for perfect delivery with mean setback.
- We prove that work-conserving policies are always outperformed by so-called *piecewise threshold policies*. These policies are the extension of threshold policies, for the case of general packet arrival at the source.
- We continue the above mentioned investigation to case where duplicate packets are coded, and generated the both with linear block codes and rate less coding.
- We represent numerically the greater ability of piecewise threshold schemes differentiates with work conserving schemes by designing examining reductions of the edge for all flavours of coding.

2. Related Work

2.1 On coding for reliable communication over packet networks

As of now personally acknowledge the benefit of network code in less container networks. In appropriate acknowledging below statement: network nodes will save the data packet which they receive and they they forward the data packets from continues combinations of saved packets whenever they get the transmission opportunity. In this case, the intermediate network nodes performs extra coding yet don't decode not any waiting to a set of containers before sending the coded containers. Furthermore complete coded also decoded actions will have ramifications. Personally proved that container headers may used for carrying certain range of data which develops large, random continues coding gets container level range for both uni and mono cast connections and also applicable to wired connections, wireless connections. The outcome will influence till packets gets on links reach according to method which have average rates.

So for the same reason packet loss this links may show interrelations in time. In particular case Poisson traffic with losses, we will display error that compute the rate of failing of chances with coding suspension. Personal understanding of network coding appearance will achieves the container level.

2.2 Implementation and performance evaluation of LT and Raptor codes for multimedia applications.

A digital fountain can encode and transmits with many data packets till each user gets enough conformation that proper decoding. The best examples for the above scenario were multimedia broadcast and peer to peer application.

In the current paper practical implementation issues are of two classes of digital fountain codes, namely LT and Raptor codes, are analyzed. Moreover, the performance in terms of coding and decoding complexity is measured experimentally.

The packet loss in multicast using some UDP protocols may causes serious effect on video quality. This paper explains that the use of Raptor codes in video multicasting to increase the video quality. We also analyzed the rules of Raptor codes in detail and the rules are implemented and replaced in the media transmission system.

2.3 Performance modeling of epidemic routing

The poor performance of delay tolerant networks (DTN) will be increase with additional or replacement of nodes with higher capacity or transmission power.This paper deals with implementations of trade offs in delay tolerant networks in two different types of mobile nodes namely normal nodes and super nodes. We need to examine the capacity of Nodes in different random directions with different intervals.

Later, we examine the two-dimensional continuous time Markov chain model with absorption state, used for testing the performance of the delay tolerant networks. We prove that the performance increases of by including super nodes are not linear. Finally, Fluid Flow Approximation (FFA) and Moment Closure Methods for solving the CTMC with various error rates were developed to allow faster analysis of networks with large number of nodes.

2.4 Message Delay in Mobile AD-Hoc Network

One of the great framework and protocols of internet may serve poorly which may causes huge delay routes and common network barriers. These problems are annoyed by end nodes with low power and very less storage resources. Usually expand in mobile and acute environments may causes inconsistent connections, these type of networks have their own appropriate protocols and they never use their IP.

To accomplish interoperability between the nodes , personally come up with network structure and application compound framework around deliberately reliable non synchronous information forwarding, with less confidence of end-to-end connection and node assets. The framework served as coat over the transport layers of the networks it annex, and gives us key services such as in-network information storage and retransmission, interoperable naming, authenticated forwarding and a coarse-grained class of service

3. Existing Methodology

Delay Tolerant Networks (DTNs), also called as intermittently connected mobile networks, are wireless networks in which a fully connected path from source to destination is unlikely to exist. In these networks, for message delivery, nodes use store-carry-and-forward paradigm to route the messages. The examples of this networks are wildlife tracking, military networks etc. However, effective forwarding based on a limited knowledge of contact behavior of nodes is challenging. Although the connectivity of nodes is not constantly maintained, it is still desirable to allow communication between nodes. Each time the source meats a relay node, it chooses a frame for transmission with probability. In the basic scenario, the source has initially all the packets.

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3.1 Disadvantages

- ✓ The main issue with existing system is that lack of connectivity between the nodes. For the same reason the messages are not delivered properly to the destination.
- ✓ There are no proper routing schemes to improve the delay of message delivery and connectivity between nodes.
- ✓ If we wish to transfer a large file from one node to another, all the packets didn't available at source node before first transmission.
- ✓ Consumes more power and memory resources.

4. Proposed Methodology

In earlier **t**imes we have studied reproduction mechanisms which will includes Reed Solomon type codes along with network coding to increase the chances of successful message delivery within a short and limited period of time.

We proposed an analytic method to figure out these and also study the reaction of coding on the performance of network while minimizing the parameters that manage routing.

This project targets on common packet appearance at source point and two-hop routing. The augmentations are foothold

- For work preserving schemes, we find out the protocols for optimist in terms of chances for perfect delivery with mean setback.
- We prove that work-conserving policies are always outperformed by so-called piecewise threshold policies. These policies are the extension of threshold policies, for the case of general packet arrival at the source.
- We continue the above mentioned investigation to case where duplicate packets are coded, and generated the both with linear block codes and rate less coding.
- We represent numerically the greater ability of piecewise threshold schemes differentiates with work conserving schemes by designing examining reductions of the edge for all flavours of coding.

4.1 Advantages

- ✓ In delay tolerant network structure overcomes the periodic disconnection between the network nodes is very challenging. In this paper we proposed analytic methods to protect or secure code file and divide the produced code bricks over large number of broadcasts in delay tolerant network, to improve the effectiveness of delay tolerant networks under unclear mobility patterns.
- ✓ The achievement gain of coding technique is differentiating with simple reproduction. The advantage of coding is approached by extensive simulations, also for various routing protocols which will also combine two hop routing.
- ✓ The current paper is addresses to the implementation of stateless routing protocols with dependency of network coding under fit fill end to end connection.

4.2 Algorithms

We have implemented two algorithms in this paper, which are explained below,

Algorithm 1: Constructing an optimal WC policy

Step1: Use P1 = e1 at time t set element of t1 and t2

i.e., t∈ (t1, t2)

Step2: Use p1 = e2 from time t2 till s(1,2) = min (s(2,{1,2},t3)

If(s(1,2) < t3)

{

Switch p1= ½(e1+e2)

}

Step3:

.3 Define $t_{K+1} = \tau$. Repeat the following for $i = 3, ..., K$:

A3.1 Set $j = i$. Set $s(i, j) = t_i$

A3.2 Use $p_t = \frac{1}{i+1-j} \sum_{k=j}^{i} e_k$ from time $s(i, j)$ till $s(i, j-1) := \min(S(j, \{1, 2, ..., i\}), t_{i+1})$. If $j = 1$ then end.

A3.3 If $s(i, j-1) < t_{i+1}$ then take $j = \min(j : j \in J(t, \{1, ..., i\}))$ and go to step [A3.2].

The above algorithm is based on the following theorem,

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Theorem 3.3: Let u* be the policy obtained by Algorithm A when substituting there $\tau = \infty$. Then

(i) u* is optimal for P2.

(ii) Consider some finite τ. If in addition $\int_0^{\tau} X^i(t)dt$ are the same for all i's, then u* is optimal for P1.

In this algorithm we used ring network with the spatial reuse, the stream of traffic may come and exit the network at any node.

Algorithm 2: Rate less coding after tK

C1 Use $p_t = e_1$ at time $t \in [t_1, t_2)$.

C2 Use $p_t = e_2$ from time t_2 till $s(1,2) = \min(S(2,\{1,2\}), t_3)$. If $s(1,2) < t_3$ then switch to $p_t = \frac{1}{2}(e_1 + e_2)$ till time t_3.

C3 Repeat the following for $i = 3, ..., K-1$:

- C3.1 Set $j = i$. Set $s(i,j) = t_i$
- C3.2 Use $p_t = \frac{1}{i+1-j}\sum_{k=j}^{i} e_k$ from time $s(i,j)$ till $s(i,j-1) := \min(S(j,\{1,2,...,i\}), t_{i+1})$. If $j = 1$ then end.
- C3.3 If $s(i,j-1) < t_{i+1}$ then take $j = \min(j : j \in J(t,\{1,...,i\}))$ and go to step [C3.2].

C4 From $t = t_K$ to $t = \tau$, use all transmission opportunities to send an RLC of information packets, with coefficients picked uniformly at random in $\mathbb{F}_q$.

4.3 Algorithm Discription:

Rateless codes are a relatively new class of linear error-control codes. The idea behind the rateless codes is that every receiver continues collecting the encoded data until the decoding can be finished successfully. To generate an encoding symbol in a rate less code, a degree d is chosen randomly from a given degree distribution. Then, d information symbols are selected randomly and their values are XORed. This encoded symbol is then transmitted. Decoding of rate fewer codes is bases on belief propagation, which is an iterative algorithm. A receiver can recover k information symbols if it receives k encoding symbol, where. We investigated rate less codes for the following applications: * UEP-Rate less Codes: We developed, for the first time, rate less codes that can provide UEP. We analyzed the proposed codes under both iterative decoding and maximum-likelihood decoding. Results are very promising and show the applicability of UEP-rate less codes in many important applications, such as transferring data frames or video/audio-on-demand streaming. * Maximum-likelihood Decoding of Rateless Codes: we derived upper and lower bounds on maximum-likelihood (ML) decoding bit error probabilities of finite-length rateless codes over the binary erasure channel. The bounds on ML decoding are of interest, as it provides an ultimate indication on the system performance. Simulation results depict that the bounds are tight. * Efficient Broadcast/Multicast Protocols via Rateless Coding: See our research section in Sensor Nets Broadcast Protocols for details of these activities.

The following figure shows the data transfer between DTN senders to DTN receiver.

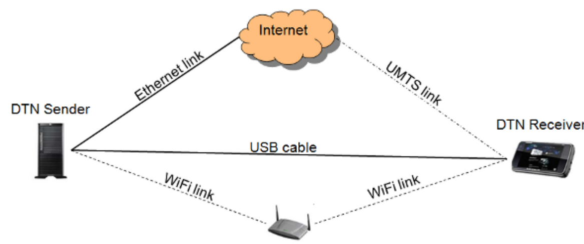

Fig.1: Architecture

5. Implementation

5.1 Modules

This paper consists of four modules. The description of the respective modules is as follows,

5.2 List of modules

- Network Module
- Routing Module
- Simulation module
- Evolution module

5.3 Module Description

5.3.1 Network Module

This module is mainly deals with network construction. In this module user will construct their own network, where the network will consists of three segments namely Source, Destination and Router. Where Source acts as the sender and receiver acts as the listener/receiver. Router is the interface for source and destination if both are of with in radio signal range. In the Router part the communication between source and destination is bidirectional and the duration of such communication is sufficient to one packet in each direction with node buffer size as one packet.

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5.3.2 Routing Module

In general every routing module implementation consists of three functional blocks

List of Functional blocks:

- Routing Agent
- Route Logic
- Classifiers

Blocks description:

a) Routing Agent: Routing agent is used to exchange the routing packets from source to destination.
b) Route Logic: It acts as a reference logic and will uses the information collected by routing agent.
c) Classifiers: Classifiers are the part of nodes which will used to implement the packet transmission between source and destination.

Notice that when implementing a new routing protocol, one does not necessarily implement all of these three blocks. For instance, when one implements a link state routing protocol, one simply implement a routing agent that exchanges information in the link state manner, and a route logic that does on the resulting topology database. It can then use the same classifiers as other unicast routing protocols.

In this paper we are considered the two-hop routing. Using this two-hop routing the packet can transfer in uni directional. In this routing mechanism we can differentiate the packet routing in two ways, I.e. A source can reserve own packets in its communication nodes and A source cannot reserve own packets in its communication nodes. The reason for the second scenario would be to stop the source spoofing, if any authentication is used between the source and destination.

5.3.3 Simulation Module

In the simulation module we can implement many functionalities, the list of functionalities are mentioned below,

a) By using various movement models we will create the node moment between source and destination.
b) By using various routing algorithms will routing the messages between source to destination with sender and receiver manner.
c) Anticipation of both message delivery and movability in a real time with graphical representations.

5.3.4 Evolution module

Evolution module is mainly focus on the presentation of the system. In this module we evaluate our system with the help of graphs. The elements generated from one's connectivity report modules are applicable to manage the link status between the delay tolerant network instances. This process may require external network controllers which may analyze the fragments generated by the one's simulator. The controller reads these events sequentially and instructs the corresponding dtnd instances to open or close the specified link. Real-time operation is achieved by scheduling issuing the control commands according to the trace file's timestamps.

5.3.5 Case with example:

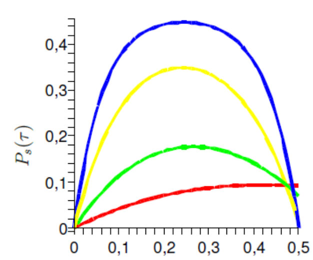
Let's consider two packets namely t1 and t2 are arriving at source, also consider the policy μ(s) whereas 0=t1 is less than s and the result is less than or equals to t2 which may transmits the first packets at the interval (t1,s) and do not transmit any packet at the interval (t2,s) and then it may transmit the second packet after t2. Let us define the codes,

$$X_1(t) = \begin{cases} X(t) & 0 \le t \le s \\ X(s) & s \le t \le \tau \end{cases} \quad ; \quad X_2(t) = \begin{cases} 0 & 0 \le t \le t_2 \\ X(t-(t_2-s)) - X(s) = & \\ e^{-\beta s} - e^{-\beta(t-(t_2-s))} & t_2 \le t \le \tau \end{cases}$$

This gives

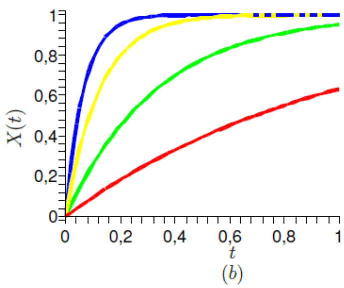
$$\int_0^\tau X_1(t)dt = \frac{-1+\beta s+e^{-\beta s}}{\beta} + (\tau - s)(1-e^{-\beta s}) \quad ; \quad \int_0^\tau X_2(t)dt = \frac{e^{-\beta s}}{\beta}(\beta(\tau - t_2) - 1 + e^{-\beta(\tau - t_2)})$$

From the above equations, we can say that the non-work conserving policies may bring the improvement. We are considered the values of t1 and t2 are 0 and 0.8 respectively. We will differentiate s between 0 and t2 and compute the probability of successful delivery for the values 1,3,8 and 15. The below figure will illustrate the functionality of s which will may varies between 0 and t2.



(a)

The above figure will state the success probability under non work conserving policy with the function s. the highest curve is the largest value of β similarly the second largest value represents the second highest value of β.



The above figure will represents the evolution of X(t) as function of t with better work conserving policies. The curves order will represents the value of β, the top and lowest curve will represents the highest and lowest values respectively.

6. Conclusion

We have found a solution to the problem discussed in the project which is, about maximum transference and programming channels in DTN with two-hop routing under memory and energy suppression, when the file packets made available at the source gradually which are to be conducted. Issue was resolved for WC/non WC policies when the source can/cannot overwrite its packets. We stretched this theory to fixed rate systematic erasure codes and rateless random linear codes. The model consists both the cases when coding is implemented after all the packets are available at the source, and as well as the vital case of random linear codes, that allows for effective runtime coding of packets as soon as they become available at the source.

7. Future Work

In our Distance-vector algorithms have advantages over link-state algorithms, e.g., lower resource requirements and often greater stability by keeping the impact of changes local. However, the dependencies across nodes they induce can magnify the impact and duration of inconsistent decisions across nodes.

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PG student, Department of CSE, Madanapalle Institute of Technology & Science, JNTUA University, A.P, India.

Assistant professor, Department of CSE, Madanapalle Institute Of Technology & Science, JNTUA University, A.P, India.