© 2016 IJSRST | Volume 2 | Issue 2 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X
Themed Section: Technical - Review

Throughput-Delay Analysis for Multicast with Inter Session Network Coding

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ABSTRACT

Here, we characterize the throughput of a broad cast network with receivers using rate less codes with block size. We characterize the system throughput asymptotically. Specifically, we explicitly show how the throughput behaves for different values of the coding block size as a function. We are able to provide a lower bound on the maximum achievable throughput. Using simulations, we show the tightness of the bound with respect to system parameters and find that its performance is significantly better than the previously known lower bounds. The packets are not decidable if any deviation is occurred.

Keywords: Broadcast, network coding, rateless codes, throughput analysis.

I. INTRODUCTION

Broadcast erasure channel (BEC) channels between the transmitter and the receivers are modeled as packet erasure channels where transmitted packets may either be erased or successfully received. This model describes a situation where packets may get lost or are not decodable at the receiver due to a variety of factors such as channel fading, interference, or checksum errors. Instead of transmitting the broadcast data packet one after another through feedback and retransmissions, we investigate a class of coding schemes called rateless codes,[2] Fountain codes are erasure coding schemes which are rateless, in the sense that they adapt to erasure channels with unknown parameters [3].

II. METHODS AND MATERIAL

Experimental Study

Here we have a centralized server and multiple users, user need to get registered, each of them will be provided a unique key. The key that is generated will be unique and complex so that it will not be accessible by any of the users. So files cannot be easily exposable. Any one user will be considered as a main user among them, others will have to get recourses from the main user, with the help of that unique key. Everything will get completed in a synchronous manner, if any deviations occurred, it will be overseen by the user, which will be transparent to the admin. If there is a mismatch in keys the data or content will get automatically erased. It will have response time and throughput. All the requests from the users will queued in coding blocks, called rateless code. The broadcast with discrete queuing model will show the process flow of how the queuing takes place in the coding blocks.

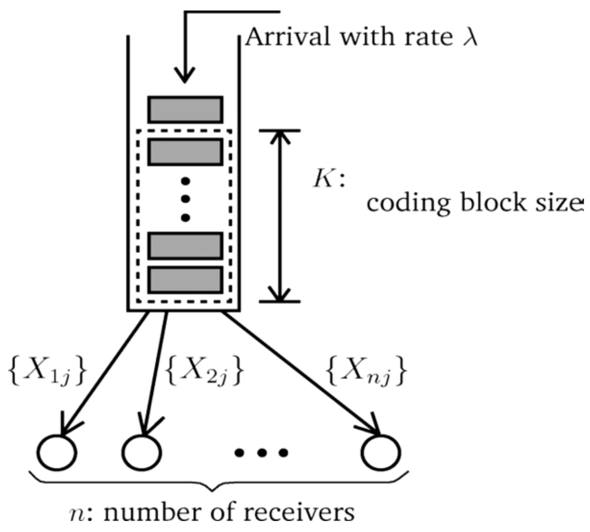

Figure 1. Broadcast with Discrete-Time Queuing Model.

We let denote the packet arrival rate and assume that the encoder waits until there are at least packets in the queue and then encodes the first of them as a single coding block. The largest arrival rate that can be stabilized is equal to the average number of packets that can be transmitted per slot, which we call the throughput.[8] Therefore, we only need to characterize the throughput that can be achieved using rateless codes under parameters. As described in Fig. 1, the channel dynamics for the the receiver are denoted by a stochastic process, $\{X_{ij}\}_{j\in\mathbb{N}}$ where is the index of the time-slot in which one packet can be transmitted and is the channel state of the receiver during the transmission of the packet.[1] We capture a fairly general correlation structure by letting the current channel state to be impacted by the channel states in previous time-slots. As the number of receivers approaches infinity, we show that the throughput is nonzero only if the coding block size increases at least as fast as, the asymptotic throughput is positive whenever c>0 .

III. RESULT AND DISCUSSION

Experimental Results

We model the broadcast channel as a slotted broadcast packet erasure channel where one packet can be transmitted per slot. The channel dynamics can be represented by a stochastic process $\{X_{ij}\}_{1\le i\le n, j\in\mathbb{N}}$, where X_{ij} is the state of channel between transmitter and the receiver during the transmission of the packet. If we assume that the erasure network operates on long packets, i.e., packets are either erased or received exactly on each link, then this assumption can be justified by using headers in the packets to convey erasure locations or by sending a number of extra packets containing this information.[4] We consider the simpler problem of achieving optimal capacity for the case where coding is done only across packets of the same session, and give policies that asymptotically achieve optimality in this case. For simplicity, we analyze the case where no restrictions are placed on coding among packets from the same multicast session.[2] When transmitting information using a traditional code, both the sender and the receiver are in possession of a description of the coding method used. For Fountain codes this is not necessarily the case, since the code is being generated concurrently with the transmission. Therefore, in order to be able to recover the original information from the output symbols, it is necessary to transmit a description of the code together with the output symbols.

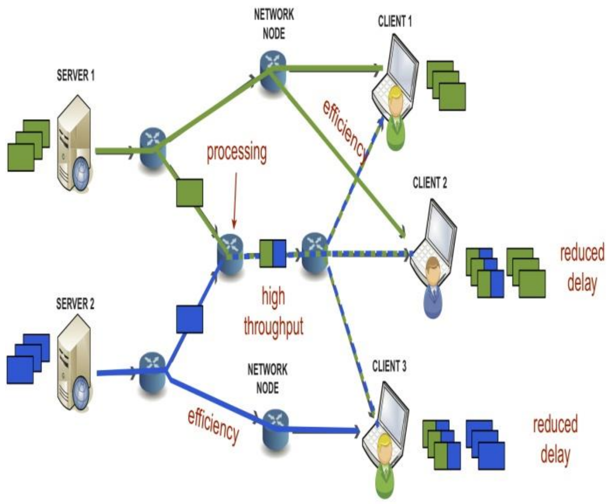

Figure 2. System architecture for throughput rateless code.

For rateless coding schemes, the best encoding and decoding complexity increases linearly in (e.g., Raptor codes [2]), the size of the coding block. Each receiver sends an ACK feedback signal after it has successfully decoded the packets. We assume that the ACK signal is transmitted instantaneously and received without error. In the following context, the terms *packet* and *symbol* are used interchangeably. We further show that similar to the wireline case, for multicast problems over wireless erasure networks, linear encoding at nodes achieves all the points in the capacity region.[12] The sources compress the infor-mation stream and transmit packets into the network at rates limited by the gradients and thus each source in the set of correlated sources transmits at the appropriate rate.

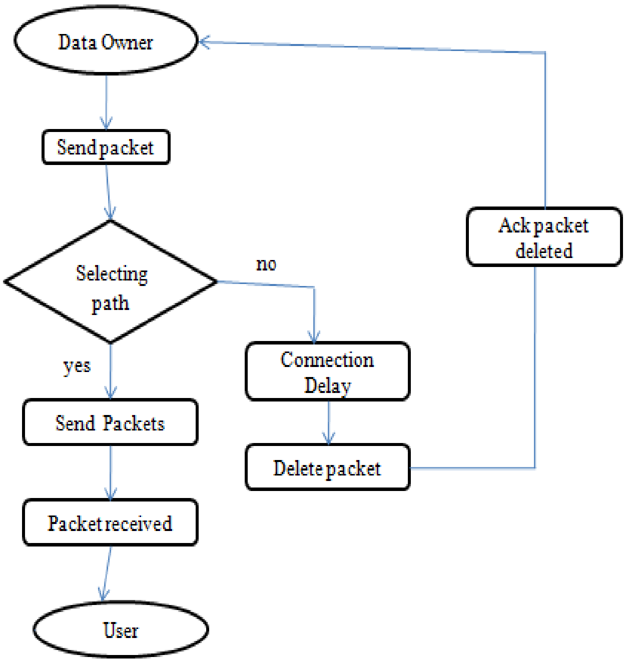

Figure 3. Flow Chart of Throughput Rateless Code.

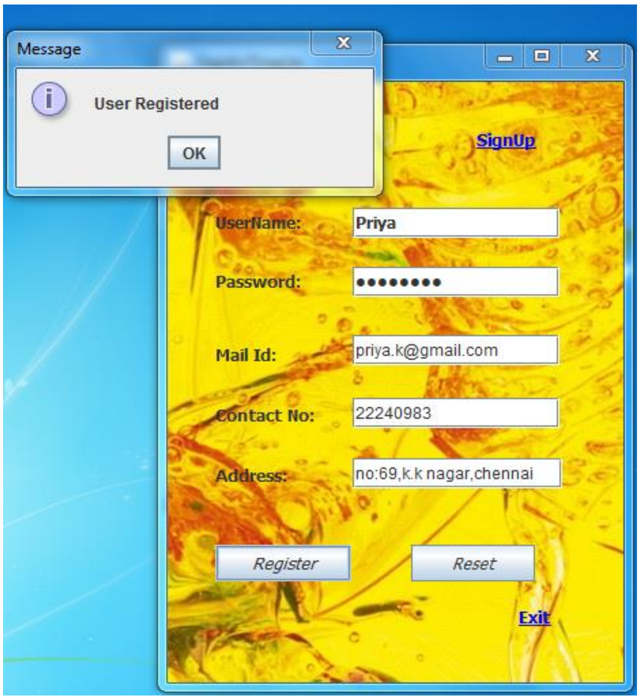

Figure 4. A User Registration

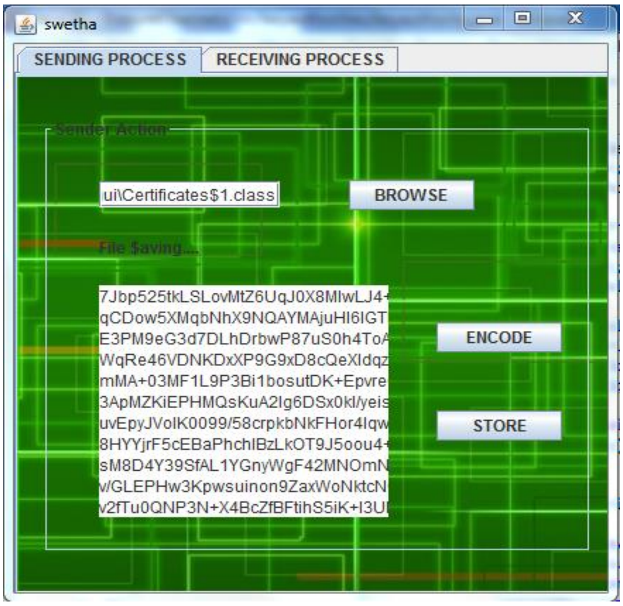

Figure 4.a Source to Send the Data

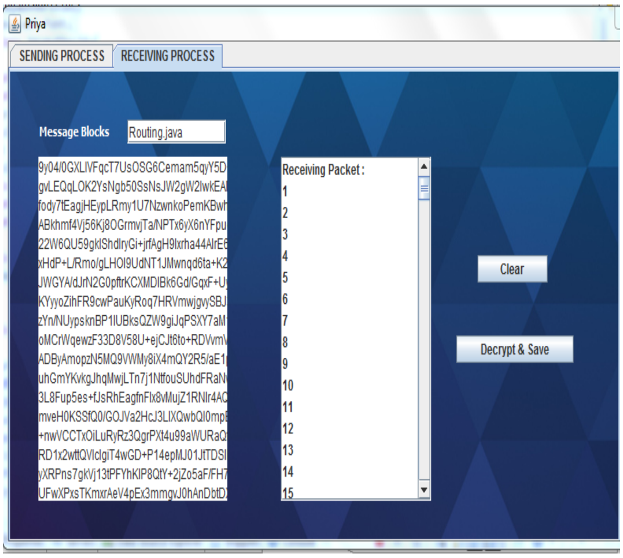

Figure 4.b Destination to Receive The Data

IV. CONCLUSION

We characterize the throughput of a broadcast network using rateless codes. The broadcast channels for each receiver the current channel state distribution depends on the channel states in previous packet transmissions. Furthermore, through numerical evaluations, we show that our bound is significantly better than existing results. We have obtained the capacity for a class of wireless erasure networks with broadcast and no interference at the reception. A throughput optimal rateless coding scheme to relay codes across multiple nodes was described. Its complexity of *packet operations* is close to that of the single channel case.

V. FUTURE ENHANCEMENTS

The broadcast channels for each receiver the current channel state distribution need not to depend on the channel states in previous packet transmissions. A better routing and resource assignment strategy can be provided for each packet flow in order to avoid future contention and decrease the packet loss rate. The essence of the strategy is switching the packet to a route with the most available resources, so that it would have a less chance of encountering future potential contentions.

VI. REFERENCES

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