

Networked Systems and Services, Fall 2019

Assignment

In this assignment, you will implement forward error correction (FEC) for transmission over an unreliable network between two nodes. You need to implement two variants of FEC and compare their performance as a function of the loss in the network.

Requirements

Your implementation must conform to the following specifications:

- Sender and receiver are separate processes
- Messages must be sent using UDP via standard UDP sockets (but sender and receiver can reside on the same computer)
- Your implementation must be able to inject loss into the transmission (for example by simply not sending a packet). The amount of loss must be controllable by a user-supplied parameter (e.g., on command line)
- Data to be sent must be packetized into UDP packets of 100 bytes of your data in each. You can use any data source you wish, as long as you can tell that it was successfully received and decoded at the receiver.

You need to implement two variants of FEC:

1. A simple triple redundancy where each packet is sent three times consecutively.
2. A scheme which takes two packets A and B and calculates a redundant packet C as $A \oplus B$. The packets are then sent in order A, B, C.

In both cases, the receiver must receive the packets and decode the originals. Have some mechanism for determining if the decoding was successful and which original packets were decoded. Obviously, for very high loss rates decoding might be impossible.

Explore the efficiency and resource use of the two schemes by varying the loss rate. You need to answer the following questions in your document:

- How does increasing loss rate affect the success rate of decoding? Provide your answer as a graph where you plot the success rate as a function of the loss rate.
- What was the overhead, i.e., how many additional bytes you needed to send to get a certain number of bytes successfully decoded?

Documentation

In the documentation, you should explain how your code answers the requirements above and how you have implemented the loss injection. You also need to provide the answers to the above questions.

Grading

Grading is based on the correctness of the program and the answers, quality of the program code, and associated documentation.

Guidelines

The assignment is individual work. You can of course discuss any problems you encounter with other students, but sharing code is not allowed and if found, will be considered as plagiarism.

In your implementation, first implement the basic communication between the sender and receiver, including the loss injection. After that part is working, then move on to implementing the FEC schemes. You can implement them as two separate solutions (one pair of sender/receiver for each scheme) or implement everything in one sender/receiver pair with some selector for deciding which of the two schemes is to be used.

Deliverables

Program source code with documentation. The document should explain how you have solved the problems and provide answers to the questions from Requirements section.

Timeline

The assignment is due on September 19th at 23:00. No extensions will be given.

Return

Store all the files in a directory that has same name as your username. Zip this directory, name the zip-file "username_NSS19_EX.zip", and return the zip-file via Moodle. Please indicate clearly your name and student ID in every returned file.