

Assignment 9

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ASSIGNMENT IS TO BE COMPLETED INDIVIDUALLY BY ALL STUDENTS!

1 Description

This assignment is to strengthen your understanding of operations on the files, file formats, and to practice your binary parsing skills. **The assignment is Due by 11:59 p.m. on Friday, 6th of December 2024 (one minute before Saturday).**

2 Task

In this assignment you are to write a program that "recovers corrupted files" in a PNG file format. In the simulated scenario, you are working on a hard-drive that was "encrypted" by "hackers" to ask for ransom. The "hackers" signature move is to XOR random parts of the files with the key 42, as it is the answer to "Answer to the Ultimate Question of Life, the Universe, and Everything", and also a * in ASCII. You are currently working on recovering PNG files, which (luckily) have CRC code in them, so you are hoping to recover the files.

The format specification is free to use, provided you supply the license text in all the documents that use modify and reproduce the format (see license for details). To determine which file is in front of you, you need to verify the header matches the one described in the standard. Files in the PNG file format are composed of one header and of numerous chunks, which means the file can be traversed carefully following the description of the chunks, reading the length field, and skipping so many bytes, skipping the CRC section. When the final chunk is encountered, you may consider the traversal finished. You can use hex editors/viewers to inspect the files. PNG files are in Big-Endian format, whereas the lab machines use Little-Endian which means to read the length of the chunks you might need to use endianness converters. The `ntoh1()` function can be accessed by including:

```
#include <arpa/inet.h>
```

2.1 What to do

Your program should accept a file name as a command line parameter, i.e.

```
./a.out test1.png
```

and print if the file is a PNG file or not (based on the header). You are to run CRC checks on every chunk of a .PNG file and see if the chunk was corrupted. Later, your program needs to output every chunk type and its size. For some IDAT chunk(s), the data part was corrupted by XOR'ing every byte with a 42 key. Luckily, the XOR operation is reversible - i.e. by XOR'ing the contents of the chunks by the same value you'd be able to recover the original image. You are to XOR every byte of the DATA part of the IDAT chunk with 42 and modify the bytes of the file in their corresponding positions. After successfully running the algorithm, you will observe a "recovered picture" as a result. Note: Please use the makefile to avoid having to download the tests multiple times.

2.2 What to use

You are not allowed to [use/copy from /copy and cite] the implementation of the libraries used for parsing PNG files. You can borrow, use (and cite) the CRC code from w3.org. For file operations, you are to use any or all of the following low-level functions:

```
fseek();  
fgetc();  
fwrite();  
ftell();  
fread();  
fopen();  
fclose();
```

For the tests 3 through 6 to pass, the program should finish working on them within 20 seconds. To succeed in finishing tests 3 and test 4 in a reasonable time, consider reading and writing to buffers rather than one byte at a time. The tests are considered passing if your program recovers the image.

3 Submission instructions

Please submit just your .C and .H files (if any) to D2L Assignment box. Make sure your code compiles and runs. Make sure your code follows the specified input/output format. You must use the C programming language to solve this assignment.

NOTE: THE INPUT AND OUTPUT OF YOUR PROGRAM IS SPECIFIED SUCH THAT THE MARKER CAN AUTO TEST YOUR SUBMISSIONS.

As we are using part of the free PNG specification, the sections of this document discussing the PNG file format were borrowed from png specification. All the parts of the document that use/modify the PNG format are under the license described in:

4 PNG Format Copyright notice

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This specification is a modification of the PNG 1.0 specification. It is being provided by the copyright holder under the provisions of the 1996 MIT copyright and license:

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