

Project 1: Warmup to C and Unix programming

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Link to source code Github repository: https://github.com/lkomovONE/C-Unix_SimpleLReverser

For this mini-project, we made a simple C program which reverses lines of strings. The program works as a Unix utility and takes in lines of text as input (either manual input or through a file), then produces the lines in reversed order (either on screen or to output file).

The reverse.c is the only codebase of the program. The program can be compiled with gcc using this command: “gcc -o reverse reverse.c”

The repository already includes a compiled program. There are 3 ways to run the program:

-0 arguments:

```
prompt> ./reverse
```

This command will run the program in manual input mode, after that it will be possible to write as many lines as wished until the input is stopped (ctrl+D). The program will then print the result on the screen.

-1 argument:

```
prompt> ./reverse <input>
```

This prompt will run the program in file input mode, it will open the input file, read the lines and display the resulting reversing order on the screen. Paste input file name instead of <input>.

-2 arguments:

```
prompt> ./reverse <input> <output>
```

This prompt will run the program in file input/output mode, it will open the input file, read the lines and write the resulting reversed order into the provided file (a new file will be created in case an existing one is not found). Paste input file name instead of <input>, and output file name instead of <output>

Error handling

- Input and output files have to be different, otherwise error will occur “Input and output file must differ”.
- If the file is corrupt or unavailable, error will pop up “error: cannot open file ‘<file>”.
- In case of internal memory allocation issue, an error message will appear “malloc failed”.

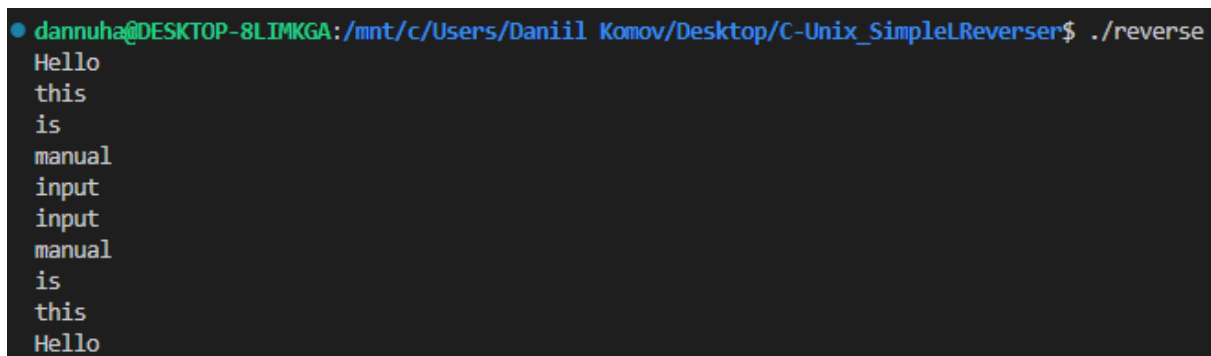
The program has no line length or file size limitations, however, very large files may affect system performance.

Use cases examples

-0 arguments:

prompt> ./reverse

The program runs in manual input mode, few line input gives result:



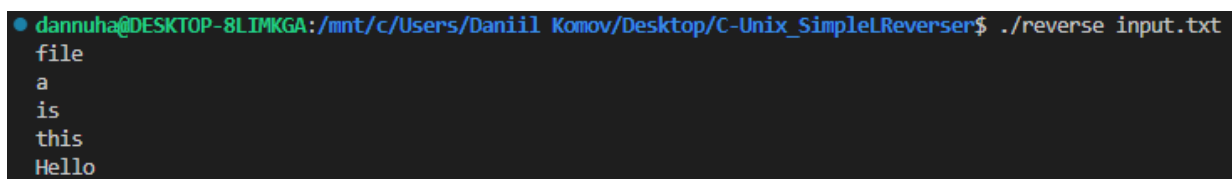
```
dannuha@DESKTOP-8LIMKGA:/mnt/c/Users/Daniil Komov/Desktop/C-Unix_SimpleReverser$ ./reverse
Hello
this
is
manual
input
input
manual
is
this
Hello
```

First 5 lines are the manually entered input lines, below is the output of the program.

-1 argument:

prompt> ./reverse input.txt

The program runs in file input mode, input file and resulting output:



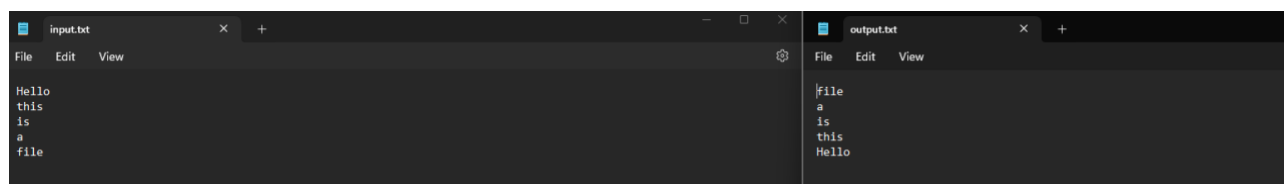
```
dannuha@DESKTOP-8LIMKGA:/mnt/c/Users/Daniil Komov/Desktop/C-Unix_SimpleReverser$ ./reverse input.txt
file
a
is
this
Hello
```

-2 arguments:

prompt> ./reverse input.txt output.txt

The program runs in file input/output mode, input file and resulting output file:

```
dannuha@DESKTOP-8LIMKGA:/mnt/c/Users/Daniil_Komov/Desktop/C-Unix_SimpleReverser$ ./reverse input.txt output.txt
```



Screenshots of the reverse.c code:

```
C reverse.c X
C reverse.c > main(int, char *)
1 #include <stdio.h>
2 #include <stdlib.h>
3 #include <string.h>
4 #include <stddef.h> //importing libraries
5
6
7 void message_printer(const char *msg) { //Function for printing errors and messages
8     fprintf(stderr, "%s\n", msg);
9 }
10
11
12
13 int main(int arg_counter, char *arg_select[]) { //defining main method, with future arguments
14
15     FILE *inF = stdin; //input variable, can be used for making manual input or for opening an input file, set to manual input
16     FILE *outF = stdout; //output variable, set to print the content by default, can be changed to a file
17     char **lines_array = NULL; //variable for storing the input lines
18     size_t lines_counter = 0, lines_c = 10; //line counter, line capacity is also set for optimization (to be fixed)
19     char *line = NULL; //variable for single line initialization
20     size_t length = 0; //variable for determining the length of the line, acts as a buffer size
21     long read; //read variable, for reading the lines
22     char message[50]; //variable for editing error messages
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24
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28
29 //creating if-conditions for each program run use case
30
31 if (arg_counter > 3) { //Adding "usage" printout if too many args provided ("Assumptions and errors")
32     message_printer("usage: reverse <input> <output>"); //using error printer to print
33
34     exit(1); //exiting with error code
35
36
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39 }
40
41
42 if (arg_counter >= 2) { //open input file in case if at least 1 argument provided
43
44
45     inF = fopen(arg_select[1], "r");
46
47     if (!inF) { //Checks if the existing file was able to be opened, prints error if not ("Assumptions and errors")
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63 //there's no condition for 0 arguments: do nothing in case of no arguments provided, keep the variables set to stdin & stdout
64
65
66 if (arg_counter == 3) { //open output file in case if 2 arguments provided
67
68     //Checking if input and output files are different (part of the "Assumptions and Errors")
69
70     if (strcmp(arg_select[1], arg_select[2]) == 0) { //Using strcmp to compare
71
72
73
74         message_printer("Input and output file must differ"); //using universal function to print the error
75         fclose(inF); //closing the input file
76         exit(1); //exiting with error code
77     }
78
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82     outF = fopen(arg_select[2], "w");
83
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85     if (!outF) { //Checks if the existing file was able to be opened, prints error if not ("Assumptions and errors")
86
87         sprintf(message, "error: cannot open file %s", arg_select[2]);
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```
C reverse.c x
C reverse.c > main(int, char* [])
85 if (!outF) { //Checks if the existing file was able to be opened, prints error if not ("Assumptions and errors")
86
87     sprintf(message, "error: cannot open file '%s'", arg_select[2]);
88
89     message_printer(message); //calling error message function
90
91     exit(1); //exiting with error code
92
93 }
94
95 }
96
97
98
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109
110
111 lines_array = malloc(lines_c * sizeof(char *)); //Allocating memory for the array
112
113 if (!lines_array) { //print malloc failed error if allocation is failed ("Assumptions and errors")
114     message_printer("malloc failed"); //calling message printer
115
116     exit(1); //exiting with error code
117 }
118
119
120
121
122 //Creating a while loop for reading the lines, adding each line to array
123
124 while ((read = getline(&line, &length, inF)) != -1) {
125
126     //Adding handling for large input files("Assumptions and errors")
127
128     if (lines_counter >= lines_c) { //Checking of line count exceeds the line capacity
129         lines_c *= 4; // multiply the capacity x4 in case if it's exceeded
130
131         lines_array = realloc(lines_array, lines_c * sizeof(char *)); //Reallocate the memory for the array
132
133         if (!lines_array) { //print malloc failed error if allocation is failed ("Assumptions and errors")
```

```
C reverse.c x
C reverse.c > main(int, char* [])
130
131     lines_array = realloc(lines_array, lines_c * sizeof(char *)); //Reallocate the memory for the array
132
133     if (!lines_array) { //print malloc failed error if allocation is failed ("Assumptions and errors")
134         message_printer("malloc failed"); //calling message printer
135
136         exit(1); //exiting with error code
137     }
138
139 }
140
141
142 lines_array[lines_counter++] = strdup(line); //add the line to the array
143
144 }
145
146
147
148
149
150
151
152 // Printing the lines using for-loop
153 for (long i = lines_counter - 1; i >= 0; i--) {
154
155     fprintf(outF, "%s", lines_array[i]); //printing
156
157     free(lines_array[i]); //Freeing the array
158 }
159
160
161
162
163 free(lines_array); //Freeing the array
164 free(line); //Freeing the line variable
165
166 if (inF != stdin) fclose(inF); //closing input file
167
168 if (outF != stdout) fclose(outF); //closing output file
169
170
171 return 0; //returning the function
172
173
174
175
176
177
```