

MyPrintf

Deadline: September 22nd, 2014

1 Instructions

You must implement the following function:

```
int st_printf(st_t *, const char *fmt, ...);
```

Constraints:

- each function must be implemented in a `.c` file of its own, named after the function it contains. The function prototypes must be declared in a `.h` file, in accordance with the C coding standard. The submitted archive may (but needs not) include a test program.
- you must include a `Makefile` which properly places the function(s) in `libminic.a`.
- you must not include any standard/system header in your code, except for `<stdarg.h>`, `<stddef.h>` and `<stdlib.h>`.
- you must not use any function from the standard C library, except for `malloc/realloc/free`; however, you may use functions from a previous assignment, by including their source in your submission.

2 Function semantics

`st_printf` is based on the previous assignment (`MyStream`). It must format its arguments and output them to the stream identified by its first argument, buffering the output as needed.

The format string is composed of zero or more directives: ordinary characters (not `"%"`), which are copied unchanged to the output stream; and conversion specifications, each of which results in fetching zero or more subsequent argument. `st_printf` must recognize the following conversions:

Conversion	Meaning
<code>%c</code>	An <code>int</code> argument is converted to <code>unsigned char</code> , and the resulting character is written.
<code>%s</code>	A <code>const char*</code> argument is written as a nul-terminated string.

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Conversion	Meaning
%p	The value of a pointer is written in hexadecimal with a 0x prefix, or the string "null" if the pointer is equal to 0.
%d / %ld	A int/long argument is written in decimal.
%u / %lu	A unsigned/unsigned long argument is written in decimal.
%x / %lx	An unsigned/unsigned long argument is written in hexadecimal.
%%	A single "%" is written; no argument is converted.

The function must return the number of characters written/buffered, or 0 if no character could be written.

You may implement the following for a higher grade:

- an optional "minimum width" in decimal between the "%" character and the format. For example, `st_printf(st, "%10s", "hello")` prints 5 spaces followed by "hello".
- the modifier "-" to align the field on the left instead of the right. For example, `st_printf(st, "%-10s", "hello")` prints "hello" followed by 5 spaces.
- the modifier "0" to pad a number with zeroes. For example, `st_printf(st, "%06d", 123)` would print "000123".
- a variable "minimum width" with *, where the width is determined by an int positional argument. For example, `st_printf(st, "%*s", 6, "hello")` prints 1 spaces then "hello".
- the function:

```
size_t my_snprintf(char* buf, size_t n, const char* fmt, ...);
```

which formats its arguments like `st_printf` but outputs the characters to the buffer `buf`, with a maximum of `n-1` characters, terminated with a nul character. `my_snprintf` must return the number of characters written (excluding the terminating nul) if `n` is large enough, or the number of characters that would have been written otherwise.

3 Grading

- 0.75 point per conversion correctly implemented in the mandatory list (7.50 points in total);
- +0.5 if constant minimum width and alignment modifiers are properly implemented.
- +0.5 if zero-padding is properly implemented.
- +0.5 if variable minimum width is properly implemented.
- +0.5 if `st_printf` does not use `malloc/realloc/free`.
- +0.5 if `my_snprintf` is properly implemented.

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