

The C Standard Library Part 3

`strtol` and Stream-based File I/O

strtol

The Problem with `atoi`

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int main(int argc, char **argv) {
    if(argc != 2) {
        printf("usage: %s <number>\n", argv[0]);
        return -1;
    }

    int n = atoi(argv[1]);
    printf("n is: %d\n");
    return 0;
}
```

[13-standard-library-3/atoi-limitation.c](#) 

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[13-standard-library-3/atoi-limitation.c](https://github.com/rust-lang/rust/blob/master/src/libstd/sys/posix/errno.rs#L13) 

`atoi` does not offer any way to know the string is invalid or overflows/underflows an `int`!

Solution: Use `strtol`

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- `base` can be 10, 8, 16, etc.
- after the call `*endptr` points to the first invalid character of the string, and to `'\0'` if the string is fully valid
- Under/overflows cause `errno` to be set to `ERANGE`, and the function returns `LONG_MIN` (underflow) or `LONG_MAX` (overflow)

strtol Usage Example

```
/* ... */
#include <errno.h>
#include <limits.h>

int main(int argc, char **argv) {
    if(argc != 2) { /* ... */ }

    char *endptr;
    long n = strtol(argv[1], &endptr, 10);

    if(*endptr != '\0') {
        printf("invalid string!\n");
        return -1;
    }

    if(errno == ERANGE) {
        if(n == LONG_MIN) printf("underflow!\n");
        if(n == LONG_MAX) printf("overflow!\n");
        return -1;
    }

    printf("n is: %ld\n", n);
    return 0;
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[13-standard-library-3/strtol.c](https://en.cppreference.com/w/cpp/string/basic/basic_strtol) 

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[13-standard-library-3/strtol.c](#)

- Check string validity by looking at the value of `*endptr`

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[13-standard-library-3/strtol.c](#)

- Check string validity by looking at the value of `*endptr`
- Check for under/overflows with `errno` and the return value

Stream-based File I/O

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- `mode` can be:
 - `"r"`: read-only
 - `"r+"`: read-write
 - `"w"`: write-only, truncate file if it exists, create it if it does not
 - `"w+"`: read-write, truncate file if it exists, create it if it does not
 - and more, see man page

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 - and more, see man page
- Close stream with `fclose`:

```
int fclose(FILE *stream);
```

[man](#)

Stream-based File I/O

```
size_t fread(void *ptr, size_t size, size_t nmemb, FILE *stream);  
size_t fwrite(const void *ptr, size_t size, size_t nmemb, FILE *stream);
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[man](#)

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 - I.e. total number of bytes transferred only when `size` is 1

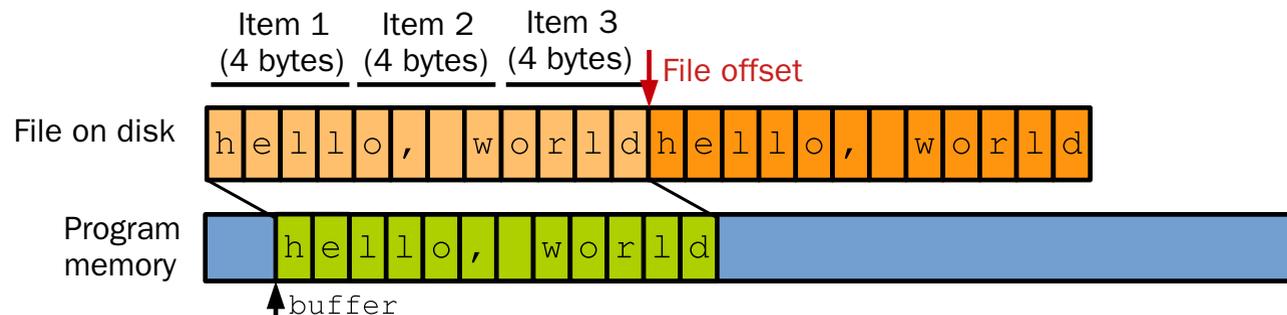
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- Return the total number of **items** read/written
 - I.e. total number of bytes transferred only when `size` is 1
- Example: reading 3 items of size 4 bytes:

```
items_read = fread(buffer, 4, 3, file_ptr);
```



Stream-based File I/O: Example

```
#include <stdio.h>

char *alphabet = "abcdefghijklmnopqrstuvwxy";

int main(int argc, char **argv) {
    FILE *f1, *f2;
    char buffer[27];

    f1 = fopen("test-file.txt", "w");
    if(f1 == NULL) {
        perror("fopen");
        return -1;
    }

    if(fwrite(alphabet, 2, 13, f1) != 13) {
        perror("fwrite");
        fclose(f1);
        return -1;
    }

    fclose(f1);
```

```
f2 = fopen("test-file.txt", "r");
if(f2 == NULL) {
    perror("fopen");
    return -1;
}

if(fread(buffer, 1, 26, f2) != 26) {
    perror("fread");
    fclose(f2);
    return -1;
}

buffer[26] = '\0';
printf("read: %s\n", buffer);

fclose(f2);
return 0;
}
```

```
//
```

[13-standard-library-3/file-stream.c](https://en.cppreference.com/w/cpp/string/basic/basic_stringstream) 

Summary

- `strtol` to convert strings to integers in a robust way
 - `FILE * I/O`, higher level operations than `read/write/etc.`
-

Feedback form: <https://bit.ly/3R8dSGr>

