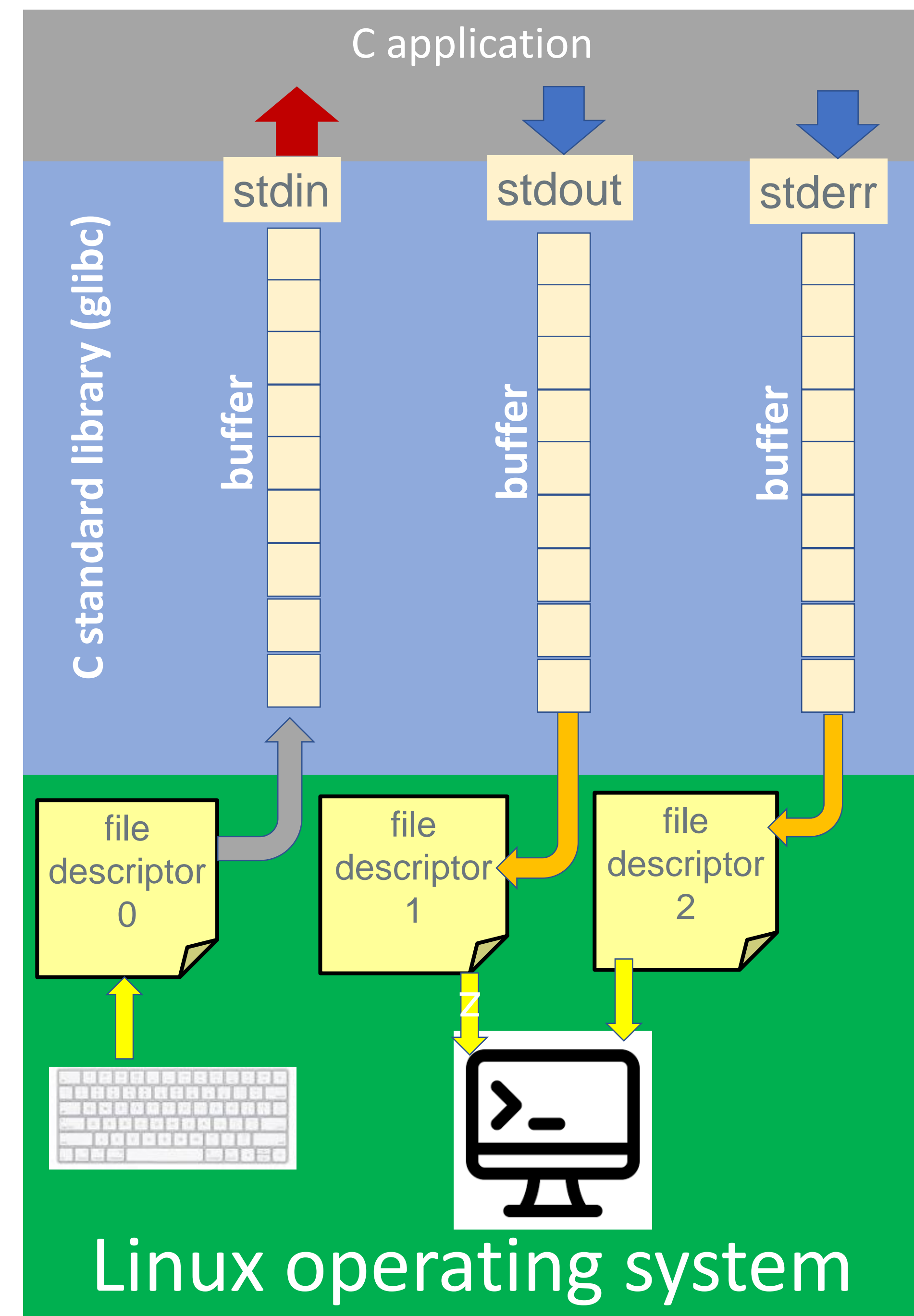


C Runtime: **stdio** streams (simplified)

- C's **stdio** library : notion of a **stream**
 - Sequence of bytes flow **to** and **from** a device
 - *text* or *binary*, Linux does not distinguish
- Most streams : *fully buffered*, reading/writing copy data from and to area of memory : *buffer*
 - Copying to and from a memory *buffer* is very fast
- *buffer* for output stream is *flushed* (physically written) when it becomes full or *fflush()* is called
Why: do this?
- Input buffers refilled when empty by reading next large **chunk** of input from device or file into buffer



Streams

In addition to `stdin`, `stdout` and `stderr`
`fopen` associates a stream with a file

```
FILE *fopen(char *str, int mode); // declaration
```

- `str` is string representing the file name
- `mode` is "r", "w", "rw" and others (man 3 fopen for more information)

Example:

```
FILE *fp = NULL;  
if ((fp = fopen("inpfile", "r")) == NULL) {  
    // print an error to stderr  
    // exit program  
};
```

Specifying Streams

- `fgetc(stdin)`
- `fputc(stdout)`
- `printf()` same as `fprintf(stdout,)`

```
#include <stdio.h>
#include <stdlib.h>
int
main(void)
{
    printf("An output message - this message is going to stdout\n");
    fprintf(stderr, "An error message - this message is going to stderr\n");
    exit EXIT_SUCCESS;
}
bwc@bwcsurface:~/tmp$
```

```
bwc@bwcsurface:~/tmp$ ./a.out > out 2> err
bwc@bwcsurface:~/tmp$ cat out
An output message - this message is going to stdout
bwc@bwcsurface:~/tmp$ cat err
An error message - this message is going to stderr
bwc@bwcsurface:~/tmp$
```

File Input and stdout Example

```
FILE *fopen(char *str, int mode); // declaration
```

```
#include <stdio.h>
#include <stdlib.h>

int main(int argc, char **argv) {
    FILE *fp = NULL;
    if ((fp = fopen(argv[1], "r")) == NULL) {
        fprintf(stderr, "Couldn't open file %s\n", argv[1]);
        return EXIT_FAILURE;
    }
    int c;
    while ((c = fgetc(fp)) != EOF) {
        fputc(c, stdout);
    }
    fputc('\n', stdout);
    return EXIT_SUCCESS;
}
```

<https://edstem.org/us/courses/37726/workspaces/> - basicFileIO