

Errors and Good Practice

CS449 Spring 2016

Errors

- Most functions in C return an indication of an error
- For instance, `printf`
 - Upon successful return, these functions return the number of characters printed ...
 - If an output error is encountered, a negative value is returned.
- Many also set `errno`:
`#include <errno.h>`

man recv

The `recv()` function shall fail if:

`EAGAIN` or `EWOULDBLOCK` The socket's file descriptor is marked `O_NONBLOCK` and no data is waiting to be received; or `MSG_OOB` is set and no out-of-band data is available and either the socket's file descriptor is marked `O_NONBLOCK` or the socket does not support blocking to await out-of-band data.

`EBADF` The socket argument is not a valid file descriptor.

`ECONNRESET` A connection was forcibly closed by a peer.

`EINTR` The `recv()` function was interrupted by a signal that was caught, before any data was available.

`EINVAL` The `MSG_OOB` flag is set and no out-of-band data is available.

`ENOTCONN` A receive is attempted on a connection-mode socket that is not connected.

`ENOTSOCK` The socket argument does not refer to a socket.

`EOPNOTSUPP` The specified flags are not supported for this socket type or protocol.

`ETIMEDOUT` The connection timed out during connection establishment, or due to a transmission timeout on active connection.

Dealing with Errors

- Check return values!
- Read man pages!
 - `man -s 2 system_call`
 - `man -s 3 library_function`
- If unrecoverable, display a message and exit gracefully

Displaying an Error Message

```
#include <stdio.h>
void perror(const char *s);
```

```
#include <string.h>
char *strerror(int errnum);
```

```
#include <stdio.h>
int ferror(FILE *stream);
```

```
#include <netdb.h>
extern int h_errno;
void herror(const char *s);
```

Exiting Gracefully

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

```
void exit(int status);
```

- The C standard specifies two defines EXIT_SUCCESS and EXIT_FAILURE that may be passed to exit() to indicate successful or unsuccessful termination, respectively.

```
void abort(void);
```

- Will send SIGABRT and usually cause a core dump

Preachy!

- **The Ten Commandments for C Programmers (Annotated Edition)**

- by Henry Spencer



- <http://www.lysator.liu.se/c/ten-commandments.html>

I

- Thou shalt run lint frequently and study its pronouncements with care, for verily its perception and judgment oft exceed thine.
- *lint* is a Unix utility that flags some suspicious and non-portable constructs (likely to be bugs) in C language source code;
- Available as `splint` on thot

II

- Thou shalt not follow the NULL pointer, for chaos and madness await thee at its end.

III

- **Thou shalt cast all function arguments to the expected type if they are not of that type already, even when thou art convinced that this is unnecessary, lest they take cruel vengeance upon thee when thou least expect it.**

IV

- **If thy header files fail to declare the return types of thy library functions, thou shalt declare them thyself with the most meticulous care, lest grievous harm befall thy program.**

V

- **Thou shalt check the array bounds of all strings (indeed, all arrays), for surely where thou typest ``foo'' someone someday shall type ``supercalifragilisticexpialidocious'"/>.**

VI

- **If a function be advertised to return an error code in the event of difficulties, thou shalt check for that code, yea, even though the checks triple the size of thy code and produce aches in thy typing fingers, for if thou thinkest `it cannot happen to me'', the gods shall surely punish thee for thy arrogance.**

VII

- **Thou shalt study thy libraries and strive not to reinvent them without cause, that thy code may be short and readable and thy days pleasant and productive.**

VIII

- **Thou shalt make thy program's purpose and structure clear to thy fellow man by using the One True Brace Style, even if thou likest it not, for thy creativity is better used in solving problems than in creating beautiful new impediments to understanding.**

IX

- **Thy external identifiers shall be unique in the first six characters, though this harsh discipline be irksome and the years of its necessity stretch before thee seemingly without end, lest thou tear thy hair out and go mad on that fateful day when thou desirest to make thy program run on an old system.**

X

- **Thou shalt foreswear, renounce, and abjure the vile heresy which claimeth that ``All the world's a VAX'', and have no commerce with the benighted heathens who cling to this barbarous belief, that the days of thy program may be long even though the days of thy current machine be short.**