Errors and Good Practice

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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.**

- 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.