stat()

❓ It works everywhere (unlike “d_type”), provides detailed metadata, and handles symbolic links.

The `stat()` function retrieves metadata about a file or directory by filling a “struct stat”. It’s defined in “sys/stat.h”.

It’s the most reliable way to get file attributes, especially when “d_type” from “readdir()” is unavailable or insufficient.

```
#include <sys/stat.h>
// for symbolic link handling (optional)
#include <unistd.h>

// "pathname" is a relative/absolute path to the
//          file or directory
// "statbuf" is a pointer to where metadata is stored
int stat(const char *pathname, struct stat *statbuf);
```

If success, returns 0. In case of failure, returns -1 and sets “errno”.

Common “errno” values:

- “ENOENT” → File does not exist
- “EACCES” → Permission denied
- “ENOTDIR” → Path component is not a directory

struct stat

The `struct stat` is a metadata container used by the “stat()”, “fstat()”, and “lstat()” functions to store information about a file or directory. It’s defined in “sys/stat.h”.

```
#include <sys/stat.h>

struct stat
{
	dev_t st_dev; // id of device containing file
	dev_t st_rdev; // device id (if special file)
	blksize_t st_blksize; // block size for filesystem i/o
	blkcnt_t st_blocks; // number of 512B blocks allocated
	ino_t st_ino; // inode number
	mode_t st_mode; // bitmask containing file type + permissions
	nlink_t st_nlink; // number of hard links
	off_t st_size; // size in bytes (for regular files)
	uid_t st_uid; // owner user id
	gid_t st_gid; // owner group id
	time_t st_atime; // last access time
	time_t st_mtime; // last modification time
	time_t st_ctime; // last status change time (e.g. permissions)
}
```

Macros to check file types with “st_mode”:

- “S_ISREG(st_mode)” → Regular file
- “S_ISDIR(st_mode)” → Directory
- “S_ISLNK(st_mode)” → Symbolic link
- “S_ISCHR(st_mode)” → Character device

- “S_ISBLK(st_mode)” → Block device
- “S_ISFIFO(st_mode)” → FIFO (named pipe)
- “S_ISSOCK(st_mode)” → Socket

Example Usage

```
#include <sys/stat.h>
#include <stdio.h>

int main(void)
{
    struct stat statbuf;

    if (stat("example.txt", &statbuf) == -1)
    {
        perror("stat");
        return (1);
    }
    if (S_ISREG(statbuf.st_mode))
        printf("Regular file. Size: %ld bytes\n", statbuf.st_size);
    else if (S_ISDIR(statbuf.st_mode))
        printf("Directory.\n");
    return (0);
}
```