

getopt(3) — Linux manual page

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 GETOPT(3)

Linux Programmer's Manual

GETOPT(3)**NAME** [top](#)

getopt, getopt_long, getopt_long_only, optarg, optind, opterr, optopt - Parse command-line options

SYNOPSIS [top](#)

```
#include <unistd.h>

int getopt(int argc, char *const argv[],
           const char *optstring);

extern char *optarg;
extern int optind, opterr, optopt;

#include <getopt.h>

int getopt_long(int argc, char *const argv[],
                const char *optstring,
                const struct option *longopts, int *longindex);
int getopt_long_only(int argc, char *const argv[],
                    const char *optstring,
                    const struct option *longopts, int *longindex);
```

Feature Test Macro Requirements for glibc (see [feature_test_macros\(7\)](#)):

```
getopt():
    _POSIX_C_SOURCE >= 2 || _XOPEN_SOURCE

getopt_long(), getopt_long_only():
    _GNU_SOURCE
```

DESCRIPTION [top](#)

The **getopt()** function parses the command-line arguments. Its arguments *argc* and *argv* are the argument count and array as passed to the *main()* function on program invocation. An element of *argv* that starts with '-' (and is not exactly "-" or "--") is an option element. The characters of this element (aside from the initial '-') are option characters. If **getopt()** is called repeatedly, it returns successively each of the option characters from each of the option elements.

The variable *optind* is the index of the next element to be processed in *argv*. The system initializes this value to 1. The caller can reset it to 1 to restart scanning of the same *argv*, or when scanning a new argument vector.

If **getopt()** finds another option character, it returns that character, updating the external variable *optind* and a static variable *nextchar* so that the next call to **getopt()** can resume the scan with the following option character or *argv*-element.

If there are no more option characters, **getopt()** returns -1. Then *optind* is the index in *argv* of the first *argv*-element that is not an option.

optstring is a string containing the legitimate option characters. A legitimate option character is any visible one byte *ascii(7)* character (for which *isgraph(3)* would return nonzero) that is not '-', ':', or ';'. If such a character is followed by a colon, the option requires an argument, so **getopt()** places a pointer to the following text in the same *argv*-element, or the text of the following *argv*-element, in *optarg*. Two colons mean an option takes an optional arg; if there is text in the current *argv*-element (i.e., in the same word as the option name itself, for example, "-oarg"), then it is returned in *optarg*, otherwise *optarg* is set to zero. This is a GNU extension. If *optstring* contains **W** followed by a semicolon, then **-W foo** is treated as the long option **--foo**. (The **-W** option is reserved by POSIX.2 for implementation extensions.) This behavior is a GNU extension, not available with libraries before glibc 2.

By default, **getopt()** permutes the contents of *argv* as it scans, so that eventually all the nonoptions are at the end. Two other scanning modes are also implemented. If the first character of *optstring* is '+' or the environment variable **POSIXLY_CORRECT** is set, then option processing stops as soon as a nonoption argument is encountered. If '+' is not the first character of *optstring*, it is treated as a normal option. If **POSIXLY_CORRECT** behaviour is required in this case *optstring* will contain two '+' symbols. If the first character of *optstring* is '-', then each nonoption *argv*-element is handled as if it were the argument of an option with character code 1. (This is used by programs that were written to expect options and other *argv*-elements in any order and that care about the ordering of the two.) The special

argument "--" forces an end of option-scanning regardless of the scanning mode.

While processing the option list, **getopt()** can detect two kinds of errors: (1) an option character that was not specified in *optstring* and (2) a missing option argument (i.e., an option at the end of the command line without an expected argument). Such errors are handled and reported as follows:

- * By default, **getopt()** prints an error message on standard error, places the erroneous option character in *optopt*, and returns '?' as the function result.
- * If the caller has set the global variable *opterr* to zero, then **getopt()** does not print an error message. The caller can determine that there was an error by testing whether the function return value is '?'. (By default, *opterr* has a nonzero value.)
- * If the first character (following any optional '+' or '-' described above) of *optstring* is a colon (':'), then **getopt()** likewise does not print an error message. In addition, it returns ':' instead of '?' to indicate a missing option argument. This allows the caller to distinguish the two different types of errors.

getopt_long() and getopt_long_only()

The **getopt_long()** function works like **getopt()** except that it also accepts long options, started with two dashes. (If the program accepts only long options, then *optstring* should be specified as an empty string (""), not NULL.) Long option names may be abbreviated if the abbreviation is unique or is an exact match for some defined option. A long option may take a parameter, of the form **--arg=param** or **--arg param**.

Longopts is a pointer to the first element of an array of *struct option* declared in *<getopt.h>* as

```
struct option {
    const char *name;
    int      has_arg;
    int      *flag;
    int      val;
};
```

The meanings of the different fields are:

name is the name of the long option.

has_arg

is: **no_argument** (or 0) if the option does not take an argument; **required_argument** (or 1) if the option requires

an argument; or **optional_argument** (or 2) if the option takes an optional argument.

flag specifies how results are returned for a long option. If *flag* is NULL, then **getopt_long()** returns *val*. (For example, the calling program may set *val* to the equivalent short option character.) Otherwise, **getopt_long()** returns 0, and *flag* points to a variable which is set to *val* if the option is found, but left unchanged if the option is not found.

val is the value to return, or to load into the variable pointed to by *flag*.

The last element of the array has to be filled with zeros.

If *longindex* is not NULL, it points to a variable which is set to the index of the long option relative to *longopts*.

getopt_long_only() is like **getopt_long()**, but '-' as well as "--" can indicate a long option. If an option that starts with '-' (not "--") doesn't match a long option, but does match a short option, it is parsed as a short option instead.

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If an option was successfully found, then **getopt()** returns the option character. If all command-line options have been parsed, then **getopt()** returns -1. If **getopt()** encounters an option character that was not in *optstring*, then '?' is returned. If **getopt()** encounters an option with a missing argument, then the return value depends on the first character in *optstring*: if it is ':', then ':' is returned; otherwise '?' is returned.

getopt_long() and **getopt_long_only()** also return the option character when a short option is recognized. For a long option, they return *val* if *flag* is NULL, and 0 otherwise. Error and -1 returns are the same as for **getopt()**, plus '?' for an ambiguous match or an extraneous parameter.

ENVIRONMENT [top](#)

POSIXLY_CORRECT

If this is set, then option processing stops as soon as a nonoption argument is encountered.

_<PID>_GNU_nonoption_argv_flags_

This variable was used by **bash(1)** 2.0 to communicate to glibc which arguments are the results of wildcard expansion and so should not be considered as options.

This behavior was removed in [bash\(1\)](#) version 2.01, but the support remains in glibc.

ATTRIBUTES [top](#)

For an explanation of the terms used in this section, see [attributes\(7\)](#).

Interface	Attribute	Value
<code>getopt()</code> , <code>getopt_long()</code> , <code>getopt_long_only()</code>	Thread safety	MT-Unsafe race:getopt env

CONFORMING TO [top](#)

`getopt()`:
POSIX.1-2001, POSIX.1-2008, and POSIX.2, provided the environment variable **POSIXLY_CORRECT** is set. Otherwise, the elements of *argv* aren't really *const*, because these functions permute them. Nevertheless, *const* is used in the prototype to be compatible with other systems.

The use of '+' and '-' in *optstring* is a GNU extension.

On some older implementations, `getopt()` was declared in *<stdio.h>*. SUSv1 permitted the declaration to appear in either *<unistd.h>* or *<stdio.h>*. POSIX.1-1996 marked the use of *<stdio.h>* for this purpose as LEGACY. POSIX.1-2001 does not require the declaration to appear in *<stdio.h>*.

`getopt_long()` and `getopt_long_only()`:
These functions are GNU extensions.

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A program that scans multiple argument vectors, or rescans the same vector more than once, and wants to make use of GNU extensions such as '+' and '-' at the start of *optstring*, or changes the value of **POSIXLY_CORRECT** between scans, must reinitialize `getopt()` by resetting *optind* to 0, rather than the traditional value of 1. (Resetting to 0 forces the invocation of an internal initialization routine that rechecks **POSIXLY_CORRECT** and checks for GNU extensions in *optstring*.)

Command-line arguments are parsed in strict order meaning that an option requiring an argument will consume the next argument,

regardless of whether that argument is the correctly specified option argument or simply the next option (in the scenario the user mis-specifies the command line). For example, if *optstring* is specified as "1n:" and the user specifies the command line arguments incorrectly as *prog -n -1*, the *-n* option will be given the *optarg* value "-1", and the *-1* option will be considered to have not been specified.

EXAMPLES

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getopt()

The following trivial example program uses *getopt()* to handle two program options: *-n*, with no associated value; and *-t val*, which expects an associated value.

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

int
main(int argc, char *argv[])
{
    int flags, opt;
    int nsecs, tfnd;

    nsecs = 0;
    tfnd = 0;
    flags = 0;
    while ((opt = getopt(argc, argv, "nt:")) != -1) {
        switch (opt) {
            case 'n':
                flags = 1;
                break;
            case 't':
                nsecs = atoi(optarg);
                tfnd = 1;
                break;
            default: /* '?' */
                fprintf(stderr, "Usage: %s [-t nsecs] [-n] name\n",
                        argv[0]);
                exit(EXIT_FAILURE);
        }
    }

    printf("flags=%d; tfnd=%d; nsecs=%d; optind=%d\n",
           flags, tfnd, nsecs, optind);

    if (optind >= argc) {
        fprintf(stderr, "Expected argument after options\n");
        exit(EXIT_FAILURE);
    }
}
```

```

    printf("name argument = %s\n", argv[optind]);

    /* Other code omitted */

    exit(EXIT_SUCCESS);
}

```

getopt_long()

The following example program illustrates the use of **getopt_long()** with most of its features.

```

#include <stdio.h>      /* for printf */
#include <stdlib.h>     /* for exit */
#include <getopt.h>

int
main(int argc, char *argv[])
{
    int c;
    int digit_optind = 0;

    while (1) {
        int this_option_optind = optind ? optind : 1;
        int option_index = 0;
        static struct option long_options[] = {
            {"add",      required_argument, 0, 0 },
            {"append",   no_argument,       0, 0 },
            {"delete",   required_argument, 0, 0 },
            {"verbose",   no_argument,       0, 0 },
            {"create",    required_argument, 0, 'c'},
            {"file",      required_argument, 0, 0 },
            {0,           0,                  0, 0 }
        };

        c = getopt_long(argc, argv, "abc:d:012",
                        long_options, &option_index);
        if (c == -1)
            break;

        switch (c) {
        case 0:
            printf("option %s", long_options[option_index].name);
            if (optarg)
                printf(" with arg %s", optarg);
            printf("\n");
            break;

        case '0':
        case '1':
        case '2':
            if (digit_optind != 0 && digit_optind != this_option_optind)

```

```

        printf("digits occur in two different argv-elements.\n");
        digit_optind = this_option_optind;
        printf("option %c\n", c);
        break;

    case 'a':
        printf("option a\n");
        break;

    case 'b':
        printf("option b\n");
        break;

    case 'c':
        printf("option c with value '%s'\n", optarg);
        break;

    case 'd':
        printf("option d with value '%s'\n", optarg);
        break;

    case '?':
        break;

    default:
        printf("?? getopt returned character code 0%o ??\n", c);
    }
}

if (optind < argc) {
    printf("non-option ARGV-elements: ");
    while (optind < argc)
        printf("%s ", argv[optind++]);
    printf("\n");
}

exit(EXIT_SUCCESS);
}

```

SEE ALSO [top](#)

[getopt\(1\)](#), [getsubopt\(3\)](#)

COLOPHON [top](#)

This page is part of release 5.13 of the Linux *man-pages* project. A description of the project, information about reporting bugs, and the latest version of this page, can be found at <https://www.kernel.org/doc/man-pages/>.

GNU

2021-08-27

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