

NAME

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

SYNOPSIS

```
#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

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. 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 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 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.

RETURN VALUE

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**POSIXLY_CORRECT**

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

_PID_GNU_noption_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

For an explanation of the terms used in this section, see **attributes**(7).

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

CONFORMING TO**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 we permute them. We pretend they're *const* 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.

NOTES

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*.)

EXAMPLE**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

getopt(1), getsubopt(3)

COLOPHON

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