NAME

clisp – **ANSI**[38] **Common Lisp**[1] compiler, interpreter and debugger.

SYNOPSIS

clisp [[**−h**] | [**−−help**]] [**−−version**] [**−−license**] [**−help−image**] [**−B** *lisp−lib−dir*] [**−b**] [**−K** *linking−set*] [**−M** *mem−file*] [**−m** *memory−size*] [**−L** *language*] [**−N** *locale−dir*] [**−E***domain encoding*] [[**−q**] | [**−−quiet**] | [**−−silent**] | [**−v**] | [**−−verbose**]] [**−on−error** *action*] [**−repl**] [**−w**] [**−I**] [**−disable−readline**] [[**−ansi**] | [**−traditional**]] [**−modern**] [**−p** *package*] [**−C**] [**−norc**] [**−lp** *directory*...] [**−i** *init−file*...] [**−c** [**−l**] *lisp−file* [**−o** *output−file*]...] [**−x** *expressions*...] [*lisp−file* [*argument*...]]

DESCRIPTION

Invokes the **Common Lisp**[1] interpreter and compiler.

Interactive Mode

When called without batch arguments, executes the **read−eval−print loop**[2], in which expressions are in turn

- **READ**[3] from the standard input,
- **EVAL**[4]uated by the lisp interpreter,
- and their results are **PRINT**[5]ed to the standard output.

Non−Interactive (Batch) Mode

Invoked with **−c**, compiles the specified lisp files to a platform−independent bytecode which can be executed more efficiently.

Invoked with **−x**, executes the specified lisp expressions.

Invoked with *lisp−file*, runs the specified lisp file.

Batch mode activates the **−q** option.

OPTIONS

−h

−−help

Displays a help message on how to invoke **CLISP**[6].

−−version

Displays the **CLISP**[6] version number, as given by the function **LISP−IMPLEMENTATION−VERSION**[7], the value of the variable **FEATURES**, as well some other information.

−−license

Displays a summary of the licensing information, the **GNU**[8] **GPL**[9].

−help−image

Displays information about the memory image being invoked: whether is it suitable for scripting as well as the **:DOCUMENTATION** supplied to **EXT:SAVEINITMEM**.

−B *lisp−lib−dir*

Specifies the installation directory. This is the directory containing the linking sets and other data files. This option is normally not necessary, because the installation directory is already built−in into the **clisp** executable. Directory *lisp−lib−dir* can be changed dynamically using the **SYMBOL−MACRO**[10] *CUSTOM:*LIB−DIRECTORY**.

−b

Print the installation directory and exit immediately. The namestring of *CUSTOM:*LIB−DIRECTORY** is printed without any quotes. This is mostly useful in module Makefiles, see, e.g., modules/syscalls/Makefile.in (file in the CLISP sources).

−K *linking−set*

Specifies the linking set to be run. This is a directory (relative to the *lisp−lib−dir*) containing at least a main executable (runtime) and an initial memory image. Possible values are

base

the core **CLISP**[6]

full
core plus all the modules with which this installation was built, see Section 32.2, "External Modules".

The default is **base**.

–M *mem–file*
Specifies the initial memory image. This must be a memory dump produced by the **EXT:SAVEINITMEM** function by this **clisp** runtime. It may have been compressed using **GNU**[8] **gzip**[11].

–m *memory–size*
Sets the amount of memory **CLISP**[6] tries to grab on startup. The amount may be given as

n
*n***B**
measured in bytes

n
*n***W**
measured in machine words (4×*n* on 32–bit platforms, 8×*n* on 64–bit platforms)

*n***K**
*n***KB**
measured in kilobytes

*n***KW**
measured in kilowords

*n***M**
*n***MB**
measured in megabytes

*n***MW**
measured in megawords

The default is 3 megabytes. The argument is constrained above 100 KB.

This version of **CLISP**[6] is not likely to actually use the entire *memory–size* since garbage–collection will periodically reduce the amount of used memory. It is therefore common to specify 10 MB even if only 2 MB are going to be used.

–L *language*
Specifies the language **CLISP**[6] uses to communicate with the user. This may be one of **english**, **german**, **french**, **spanish**, **dutch**, **russian**, **danish**. Other languages may be specified through the **environment variable**[12] **LANG**, provided the corresponding message catalog is installed. The language may be changed dynamically using the **SYMBOL–MACRO**[10] *CUSTOM:*CURRENT–LANGUAGE**.

–N *locale–dir*
Specifies the base directory of locale files. **CLISP**[6] will search its message catalogs in *locale–dir*/*language*/LC_MESSAGES/clisp.mo. This directory may be changed dynamically using the **SYMBOL–MACRO**[10] *CUSTOM:*CURRENT–LANGUAGE**.

–E*domain encoding*
Specifies the encoding used for the given domain, overriding the default which depends on the **environment variable**[12]s **LC_ALL**, **LC_CTYPE**, **LANG**. *domain* can be

file
affecting *CUSTOM:*DEFAULT–FILE–ENCODING**

pathname
affecting *CUSTOM:*PATHNAME−ENCODING**

terminal
affecting *CUSTOM:*TERMINAL−ENCODING**

foreign
affecting *CUSTOM:*FOREIGN−ENCODING**

misc
affecting *CUSTOM:*MISC−ENCODING**

blank
affecting all of the above.

Warning

Note that the values of these **SYMBOL−MACRO**[10]s that have been saved in a memory image are ignored: these **SYMBOL−MACRO**[10]s are reset based on the OS environment **after** the memory image is loaded. You have to use the RC file, *CUSTOM:*INIT−HOOKS** or init function to set them on startup, but it is best to set the aforementioned **environment variable**[12]s appropriately for consistency with other programs. See Section 31.1, "Customizing CLISP Process Initialization and Termination".

−q
−−quiet
−−silent
−v
−−verbose
Change verbosity level: by default, **CLISP**[6] displays a banner at startup and a good−bye message when quitting, and initializes **LOAD−VERBOSE**[13] and **COMPILE−VERBOSE**[14] to **T**[15], and **LOAD−PRINT**[13] and **COMPILE−PRINT**[14] to **NIL**[16], as per [ANSI CL standard]. The first **−q** removes the banner and the good−bye message, the second sets variables **LOAD−VERBOSE**[13], **COMPILE−VERBOSE**[14] and *CUSTOM:*SAVEINITMEM−VERBOSE** to **NIL**[16]. The first **−v** sets variables *CUSTOM:*REPORT−ERROR−PRINT−BACKTRACE**, **LOAD−PRINT**[13] and **COMPILE−PRINT**[14] to **T**[15], the second sets *CUSTOM:*LOAD−ECHO** to **T**[15]. These settings affect the output produced by **−i** and **−c** options. Note that these settings persist into the **read−eval−print loop**[2]. Repeated **−q** and **−v** cancel each other, e.g., **−q −q −v −v −v** is equivalent to **−v**.

−on−error *action*
Establish global error handlers, depending on *action*:

appease
continuable[17] **ERROR**[18]s are turned into **WARNING**[19]s (with **EXT:APPEASE−CERRORS**) other **ERROR**[18]s are handled in the default way

debug
ERROR[18]s **INVOKE−DEBUGGER**[20] (the normal **read−eval−print loop**[2] behavior), disables batch mode imposed by **−c**, **−x**, and *lisp−file*,

abort
continuable[17] **ERROR**[18]s are appeased, other **ERROR**[18]s are **ABORT**[21]ed with **EXT:ABORT−ON−ERROR**

exit
continuable[17] **ERROR**[18]s are appeased, other **ERROR**[18]s terminate **CLISP**[6] with **EXT:EXIT−ON−ERROR** (the normal batch mode behavior).

See also **EXT:SET−GLOBAL−HANDLER**.

−repl
Start an interactive **read−eval−print loop**[2] after processing the **−c**, **−x**, and *lisp−file* options and on any **ERROR**[18] **SIGNAL**[22]ed during that processing.

Disables batch mode.

−w
Wait for a keypress after program termination.

−I
Interact better with **Emacs**[23] (useful when running **CLISP**[6] under **Emacs**[23] using **SLIME**[24], **ILISP**[25] et al). With this option, **CLISP**[6] interacts in a way that **Emacs**[23] can deal with:

- unnecessary prompts are not suppressed.
- The **GNU**[8] **readline**[26] library treats TAB (see TAB key) as a normal self−inserting character (see Q: A.4.6).

−disable−readline
Do not use **GNU**[8] **readline**[26] even when it has been linked against. This can be used if one wants to paste non−*ASCII*[27] characters, or when **GNU**[8] **readline**[26] misbehaves due to installation (different versions on the build and install machines) or setup (bad **TERM environment variable**[12] value) issues.

−ansi
Comply with the [ANSI CL standard] specification even where **CLISP**[6] has been traditionally different by setting the **SYMBOL−MACRO**[10] *CUSTOM:*ANSI** to **T**[15].

−traditional
Traditional: reverses the residual effects of **−ansi** in the saved memory image.

−modern
Provides a modern view of symbols: at startup the **PACKAGE**[28] variable will be set to the "CS−COMMON−LISP−USER" package, and the **PRINT−CASE**[29] will be set to **:DOWNCASE**. This has the effect that symbol lookup is case−sensitive (except for keywords and old−style packages) and that keywords and uninterned symbols are printed with lower−case preferrence. See Section 11.5, "Package Case-Sensitivity".

−p *package*
At startup the value of the variable **PACKAGE**[28] will be set to the package named *package*. The default is the value of **PACKAGE**[28] when the image was saved, normally **"COMMON−LISP−USER"**[30].

−C
Compile when loading: at startup the value of the variable *CUSTOM:*LOAD−COMPILING** will be set to **T**[15]. Code being **LOAD**[31]ed will then be **COMPILE**[32]d on the fly. This results in slower loading, but faster execution.

−norc
Normally **CLISP**[6] loads the user **"run control" (RC)**[33] file on startup (this happens **after** the **−C** option is processed). The file loaded is .clisprc.lisp or .clisprc.fas in the home directory **USER−HOMEDIR−PATHNAME**[34], whichever is newer. This option, **−norc**, prevents loading of the RC file.

−lp *directory*
Specifies directories to be added to *CUSTOM:*LOAD−PATHS** at startup. This is done **after** loading the RC file (so that it does not override the command−line option) but **before** loading the init−files specified by the **−i** options (so that the init−files will be searched for in the specified directories). Several **−lp** options can be given; all the specified directories will be added.

−i *init−file*
Specifies initialization files to be **LOAD**[31]ed at startup. These should be lisp files (source or compiled). Several **−i** options can be given; all the specified files will be loaded in order.

−c *lisp−file*
Compiles the specified *lisp−file*s to bytecode (*.fas). The compiled files can then be **LOAD**[31]ed instead of the sources to gain efficiency.

Imposes batch mode.

−o *outputfile*
Specifies the output file or directory for the compilation of the last specified *lisp−file*.

−l
Produce a bytecode **DISASSEMBLE**[35] listing (*.lis) of the files being compiled. Useful only for debugging. See Section 24.1, “Function COMPILE-FILE” for details.

−x *expressions*
Executes a series of arbitrary expressions instead of a **read−eval−print loop**[2]. The values of the expressions will be output to **STANDARD−OUTPUT**[36]. Due to the argument processing done by the shell, the *expressions* must be enclosed in double quotes, and double quotes and backslashes must be escaped with backslashes.

Imposes batch mode.

lisp−file [*argument ...*]
Loads and executes a *lisp−file*, as described in Section 32.6.2, “Scripting with CLISP”. There will be no **read−eval−print loop**[2]. Before *lisp−file* is loaded, the variable *EXT:*ARGS** will be bound to a list of strings, representing the *argument*s. The first line of *lisp−file* may start with **#!**, thus permitting **CLISP**[6] to be used as a script interpreter. If *lisp−file* is **−**, the **STANDARD−INPUT**[36] is used instead of a file.

This option is *disabled* if the memory image was created by **EXT:SAVEINITMEM** with **NIL**[16] **:SCRIPT** argument. In that case the **LIST**[37] *EXT:*ARGS** starts with *lisp−file*.

This option must be the last one.

No RC file will be executed.

Imposes batch mode.

As usual, **−−** stops option processing and places all remaining command line arguments into *EXT:*ARGS**.

LANGUAGE REFERENCE

The language implemented is **ANSI**[39][38] **Common Lisp**[1]. The implementation mostly conforms to the ANSI Common Lisp standard, see Section 31.10, “Maximum ANSI CL compliance”. [ANSI CL] ANSI CL standard1994. ANSI[40] INCITS 226-1994 (R1999)
Information Technology - Programming Language - Common Lisp
[formerly ANSI X3.226-1994 (R1999)].

COMMAND LINE USER ENVIRONMENT

help
get context−sensitive on−line help, see Chapter 25, Environment chap-25.

(**APROPOS** *name*)
list the **SYMBOL**[41]s matching *name*.

(**DESCRIBE** *symbol*)
describe the *symbol*.

(exit)
(quit)
(bye)

quit **CLISP**[6].

EOF (Control+D on **UNIX**[42])
: leave the current level of the **read–eval–print loop**[2] (see also Section 1.1, "Special Symbols sec_1-4-1-3").

arrow keys
: for editing and viewing the input history, using the **GNU**[8] **readline**[26] library.

TAB key
: Context sensitive:

- If you are in the "function position" (in the first symbol after an opening paren or in the first symbol after a **#'**[44]), the completion is limited to the symbols that name functions.
- If you are in the "filename position" (inside a string after **#P**[45]), the completion is done across file names, **GNU**[8] **bash**[46]–style.
- If you have not typed anything yet, you will get a help message, as if by the **help** command.
- If you have not started typing the next symbol (i.e., you are at a whitespace), the current function or macro is **DESCRIBE**d.
- Otherwise, the symbol you are currently typing is completed.

USING AND EXTENDING CLISP

Common Lisp[1] is a *programmable* programming language. —**John Foderaro**[47]

When **CLISP**[6] is invoked, the runtime loads the initial memory image and outputs the prompt; at which one can start typing **DEFVAR**[48]s, **DEFUN**[49]s and **DEFMACRO**[50]s.

To avoid having to re–enter the same definitions by hand in every session, one can create a lisp file with all the variables, functions, macros, etc.; (optionally) compile it with **COMPILE–FILE**[51]; and **LOAD**[31] it either by hand or from the RC file; or save a memory image to avoid the **LOAD**[31] overhead.

However, sometimes one needs to use some functionality implemented in another language, e.g., call a **C**[52] library function. For that one uses the Foreign Function Interface and/or the External Modules facility. Finally, the truly adventurous ones might delve into Extending the Core.

FILES

clisp
clisp.exe
: startup driver (an executable or, rarely, a shell script) which remembers the location of the runtime and starts it with the appropriate arguments

lisp.run
lisp.exe
: main executable (runtime) – the part of **CLISP**[6] implemented in **C**[52].

lispinit.mem
: initial memory image (the part of **CLISP**[6] implemented in lisp)

config.lisp
: site–dependent configuration (should have been customized before **CLISP**[6] was built); see Section 31.12, "Customizing CLISP behavior"

*.lisp
: lisp source

*.fas
: lisp code, compiled by **CLISP**[6]

*.lib

lisp source library information, generated by **COMPILE−FILE**, see Section 24.3, “Function REQUIRE”.

*.c
C code, compiled from lisp source by **CLISP**[6] (see Section 32.3, “The Foreign Function Call Facility”)

For the **CLISP**[6] source files, see Chapter 34, The source files of CLISP.

ENVIRONMENT

All **environment variable**[12]s that **CLISP**[6] uses are read at most once.

CLISP_LANGUAGE
specifies the language **CLISP**[6] uses to communicate with the user. The legal values are identical to those of the **−L** option which can be used to override this **environment variable**[12].

LC_CTYPE
specifies the locale which determines the character set in use. The value can be of the form *language* or *language_country* or *language_country.charset*, where *language* is a two−letter ISO 639 language code (lower case), *country* is a two−letter ISO 3166 country code (upper case). *charset* is an optional character set specification, and needs normally not be given because the character set can be inferred from the language and country. This **environment variable**[12] can be overridden with the **-Edomain encoding** option.

LANG
specifies the language **CLISP**[6] uses to communicate with the user, unless it is already specified through the **environment variable**[12] **CLISP_LANGUAGE** or the **−L** option. It also specifies the locale determining the character set in use, unless already specified through the **environment variable**[12] **LC_CTYPE**. The value may begin with a two−letter ISO 639 language code, for example **en**, **de**, **fr**.

HOME
USER
used for determining the value of the function **USER−HOMEDIR−PATHNAME**[34].

SHELL
COMSPEC
is used to find the interactive command interpreter called by **EXT:SHELL**.

TERM
determines the screen size recognized by the pretty printer.

ORGANIZATION
for **SHORT−SITE−NAME**[53] and **LONG−SITE−NAME**[53] in config.lisp.

CLHSROOT
for **CUSTOM:CLHS−ROOT** in config.lisp.

IMPNOTES
for **CUSTOM:IMPNOTES−ROOT** in config.lisp.

EDITOR
for **editor−name** in config.lisp.

LOGICAL_HOST_*host*_**FROM**
LOGICAL_HOST_*host*_**TO**
LOGICAL_HOST_*host*
for *CUSTOM:*LOAD−LOGICAL−PATHNAME−TRANSLATIONS−DATABASE**

INPUT AND OUTUT

See Section 21.1.1, “Initialization of Standard Streams”.

SEE ALSO

CLISP impnotes
clisp-link(1)

CMU CL[54] – **cmucl**(1)
SBCL[55] – **sbcl**(1)
Emacs[23] – **emacs**(1)

BUGS

When you encounter a bug in **CLISP**[6] or in its documentation (this manual page or CLISP impnotes), please report it to the **CLISP**[6] **SourceForge bug tracker**[56]. Login, either to your **SourceForge**[57] account, or to your **OpenID**[58] account. Then click the "Create Ticket" link on the left−hand side.

Before submitting a bug report, please take the following basic steps to make the report more useful:

1. Unless your bug is locale−specific, please set your locale to en. You *cannot* assume that **CLISP**[6] maintainers understand a language other than **English**[59], even though, historically, few **CLISP**[6] maintainers spoke English natively.
2. Do a clean build (remove your build directory and build **CLISP**[6] with **./configure −−cbcx build** or at least do a **make distclean** before **make**).
3. If you are reporting a "hard crash" (segmentation fault, bus error, core dump etc), please do **./configure −−with−debug −−cbcx build−g ; cd build−g; gdb lisp.run**, then load the appropriate linking set by either **base** or **full gdb**[60] command, and report the backtrace (see also Q: A.1.1.10).
4. If you are using pre−built binaries and experience a hard crash, the problem is likely to be in the incompatibilities between the platform on which the binary was built and yours; please try compiling the sources and report the problem if it persists.

When submitting a bug report, please specify the following information:

1. What is your platform (**uname −a** on a **UNIX**[42] system)?
2. Please supply the full output (copy and paste) of all the error messages.
3. Please provide detailed instructions on how to reproduce the problem.
4. Where did you get the **CLISP**[6] sources or binaries? When? (Absolute dates, e.g., "2006−01−17", are preferred over the relative ones, e.g., "2 days ago". If you are using **Git**[61], please supply the output of **git rev−list −−max−count=1 HEAD**).
5. If you are reporting a build failure:
   1. What is your compiler version?
   2. What is your **GNU**[8] **libc**[62] version (on **GNU**[8]/*Linux*[63])?
   3. What is the version of each of the DEPENDENCIES (file in the CLISP sources)?
   4. How did you run configure (file in the CLISP sources)? We need the options you used as well as the values of the **environment variable**[12]s
      CC
      CFLAGS
      CPPFLAGS
      LDFLAFS
      LD_LIBRARY_PATH
      .
   5. Please attach all build logs.
6. If you have a working **CLISP**[6], please supply the output of **clisp −−version**

PROJECTS

- Enhance the compiler so that it can inline local functions.
- Embed **CLISP**[6] in **VIM**[64].

AUTHORS

Bruno Haible <http://www.haible.de/bruno/>
The original author and long−time maintainer.

Michael Stoll <http://www.mathe2.uni-bayreuth.de/stoll/>
The original author.

Sam Steingold <http://sds.podval.org/>
Co−maintainer since 1998.

Others
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NOTES

1. **Common Lisp**
   https://common-lisp.net
2. read-eval-print loop
   [set $man.base.url.for.relative.links]/sec_25-1-1
3. **READ**
   http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_readcm_re_g-whitespace.html
4. **EVAL**
   http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_eval.html
5. **PRINT**
   http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_writecm_p_rintcm_princ.html
6. **CLISP**
   http://clisp.org
7. **LISP-IMPLEMENTATION-VERSION**
   http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_lisp-impl_tion-version.html
8. GNU
   https://www.gnu.org
9. GPL
   https://www.gnu.org/copyleft/gpl.html
10. SYMBOL-MACRO
    [set $man.base.url.for.relative.links]/mac_define-symbol-macro
11. **gzip**
    http://www.gzip.org/
12. environment variable
    [set $man.base.url.for.relative.links]/basedefs/V1_chap08.html
13. **LOAD-VERBOSE**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/var_stload-pr_ad-verbosest.html
14. **COMPILE-VERBOSE**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/var_stcompile_le-verbosest.html
15. **T**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/convar_t.html

16. **NIL**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/convar_nil.html
17. continuable
    [set $man.base.url.for.relative.links]/clhs/glo
18. ERROR
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/contyp_error.html
19. WARNING
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/contyp_warning.html
20. **INVOKE-DEBUGGER**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_invoke-debugger.html
21. **ABORT**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_abortcm_c_cm_use-value.html
22. **SIGNAL**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_signal.html
23. Emacs
    https://www.gnu.org/software/emacs/
24. SLIME
    https://common-lisp.net/project/slime/
25. ILISP
    https://sourceforge.net/projects/ilisp/
26. readline
    http://tiswww.case.edu/php/chet/readline/readline.html
27. *ASCII*
    https://en.wikipedia.org/wiki/ASCII
28. **PACKAGE**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/var_stpackagest.html
29. **PRINT-CASE**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/var_stprint-casest.html
30. “COMMON-LISP-USER”
    [set $man.base.url.for.relative.links]/sec_11-1-2-2
31. **LOAD**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_load.html
32. **COMPILE**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_compile.html
33. “run
    control” (RC)
    http://www.faqs.org/docs/artu/ch10s03.html
34. **USER-HOMEDIR-PATHNAME**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_user-homedir-pathname.html
35. **DISASSEMBLE**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_disassemble.html
36. **STANDARD-OUTPUT**
    http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/var_stdebug-i_ace-outputst.html

37. LIST
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/syscla_list.html
38. ANSI
https://www.ansi.org/
39. The American National Standards Institute
40. ANSI
https://webstore.ansi.org
41. SYMBOL
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/syscla_symbol.html
42. **UNIX**
http://www.unix.org/online.html
43. *Win32*
https://winehq.org/
44. #'
[set $man.base.url.for.relative.links]/sec_2-4-8-2
45. #P
[set $man.base.url.for.relative.links]/sec_2-4-8-14
46. bash
https://www.gnu.org/software/bash/
47. John Foderaro
http://www.franz.com/~jkf/
48. **DEFVAR**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/mac_defparametercm_defvar.html
49. **DEFUN**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/mac_defun.html
50. **DEFMACRO**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/mac_defmacro.html
51. **COMPILE-FILE**
http://www.ai.mit.edu/projects/iiip/doc/CommonLISP/HyperSpec/Body/fun_compile-file.html
52. **C**
http://c-faq.com/
53. **SHORT-SITE-NAME**
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