

Essential Commands

gdb program [*core*] debug *program* [using *coredump core*]
b [*file*:]*function* set breakpoint at *function* [*in file*]
run [*arglist*] start your program [with *arglist*]
bt backtrace: display program stack
p *expr* display the value of an expression
c continue running your program
n next line, stepping over function calls
s next line, stepping into function calls

Starting GDB

gdb start GDB, with no debugging files
gdb program begin debugging *program*
gdb program core debug *coredump core* produced by *program*
gdb --help describe command line options

Stopping GDB

quit exit GDB; also **q** or **EOF** (eg C-d)
INTERRUPT (eg C-c) terminate current command, or send to running process

Getting Help

help list classes of commands
help class one-line descriptions for commands in *class*
help command describe *command*

Executing your Program

run [*arglist*] start your program with *arglist*
run start your program with current argument list
run ... <inf>outf start your program with input, output redirected
kill kill running program

tty dev use *dev* as stdin and stdout for next **run**
set args [*arglist*] specify *arglist* for next **run**
set args specify empty argument list
show args display argument list
show environment show all environment variables
show env var show value of environment variable *var*
set env var string set environment variable *var*
unset env var remove *var* from environment

Shell Commands

cd *dir* change working directory to *dir*
pwd Print working directory
make ... call "make"
shell *cmd* execute arbitrary shell command string

[] surround optional arguments ... show one or more arguments

Breakpoints and Watchpoints

break [*file*:]*line* set breakpoint at *line* number [*in file*]
b [*file*:]*line* eg: **break main.c:37**
break [*file*:]*function* set breakpoint at *function* [*in file*]
break +offset set break at *offset* lines from current stop
break -offset set breakpoint at address *addr*
break *addr set breakpoint at next instruction
break set breakpoint conditionally on nonzero *expr*
break ... if expr new conditional expression on breakpoint
cond n [*expr*] *n*: make unconditional if no *expr*
tbreak ... temporary break; disable when reached
rbreak regexpr break on all functions matching *regexpr*
watch expr set a watchpoint for expression *expr*
catch x break at C++ handler for exception *x*

info break show defined breakpoints
info watch show defined watchpoints
clear delete breakpoints at next instruction
clear [*file*:]*fun* delete breakpoints at entry to *fun*()
clear [*file*:]*line* delete breakpoints on source line
delete [*n*] delete breakpoints [or breakpoint *n*]
disable [*n*] disable breakpoints [or breakpoint *n*]
enable [*n*] enable breakpoints [or breakpoint *n*]
enable once [*n*] enable breakpoints [or breakpoint *n*]; disable again when reached
enable del [*n*] enable breakpoints [or breakpoint *n*]; delete when reached
ignore n count ignore breakpoint *n*, *count* times

commands n execute GDB *command-list* every time
[silent] breakpoint *n* is reached. **[silent]** suppresses default display
command-list end of *command-list*
end end of *command-list*
Program Stack
backtrace [*n*] print trace of all frames in stack; or of *n* frames—innermost if *n*>0, outermost if *n*<0
bt [*n*] select frame number *n* or frame at address *n*; if no *n*, display current frame
frame [*n*] select frame *n* frames up/down
up n select frame *n* frames down
down n describe selected frame, or frame at *addr*
info frame [*addr*] arguments of selected frame
info args local variables of selected frame
info locals register values [for regs *m*] in selected frame; **all-reg** includes floating point
info reg [*m*]... exception handlers active in selected
info all-reg [*m*] frame
info catch

Execution Control

continue [*count*] continue running; if *count* specified, ignore this breakpoint next *count* times
c [*count*] execute until another line reached; repeat *count* times if specified
step [*count*] step by machine instructions rather than source lines
stepi [*count*] execute next line, including any function calls
si [*count*] next machine instruction rather than source line
next [*count*] run until next instruction (or *location*)
n [*count*] run until selected stack frame returns
nexti [*count*] pop selected stack frame without executing [setting return value]
ni [*count*] resume execution with signal *s* (none if 0) or *address*
set var=expr resume execution at specified *line* number or *address*

Display

print [*f*] [*expr*] show value of *expr* [or last value \$]
p [*f*] [*expr*] according to format *f*:
x hexadecimal
d signed decimal
u unsigned decimal
o octal
t binary
a address, absolute and relative
c character
f floating point
call [*f*] [*expr*] like **print** but does not display **void**
x [*N/vf*] [*expr*] examine memory at address *expr*; optional format spec follows slash
N count of how many units to display
n unit size; one of
b individual bytes
h halfwords (two bytes)
w words (four bytes)
g giant words (eight bytes)
f printing format. Any **print** format, or **s** null-terminated string
i machine instructions
disassem [*addr*] display memory as machine instructions

Automatic Display

display [*f*] [*expr*] show value of *expr* each time program stops [according to format *f*]
display all enabled expressions on list
undisplay n remove number(s) *n* from list of automatically displayed expressions
disable disp n disable display for expression(s) number *n*
enable disp n enable display for expression(s) number *n*
info display numbered list of display expressions

Expressions

expr an expression in C, C++, or Modula-2 (including function calls), or:
addr@len an array of *len* elements beginning at *addr*
file::nm a variable or function *nm* defined in *file*
{*type*}*addr* read memory at *addr* as specified *type*
\$ most recent displayed value
\$*n* *n*th displayed value
\$\$*n* *n*th displayed value previous to \$
\$-*n* last address examined with *x*
\$_ value at address \$-
\$*var* convenience variable; assign any value

show values [*n*] show last 10 values [or surrounding \$*n*]
show convenience display all convenience variables

Symbol Table

info address *s* show where symbol *s* is stored
info func [*regex*] show names, types of defined functions (all, or matching *regex*)
info var [*regex*] show names, types of global variables (all, or matching *regex*)
whatis [*expr*] show data type of *expr* [or \$] without evaluating; **ptype** gives more detail
ptype [*expr*] describe type, struct, union, or enum
ptype type

GDB Scripts

source script read, execute GDB commands from file *script*
define new cmd create new GDB command *cmd*, execute *command-list*
end end of *command-list*
document cmd create online documentation for new GDB command *cmd*
end end of *help-text*

Signals

handle signal act specify GDB actions for *signal*:
print announce signal
noprint be silent for signal
stop halt execution on signal
nostop do not halt execution
pass allow your program to handle signal
nopass do not allow your program to see signal
info signals show table of signals, GDB action for each

Debugging Targets

target type param connect to target machine, process, or file
help target display available targets
attach param connect to another process
detach release target from GDB control

Controlling GDB

set param value set one of GDB's internal parameters
show param display current setting of parameter
show Parameters understood by **set** and **show**:
complaints limit number of messages on unusual symbols
confirm on/off enable or disable cautionary queries
editing on/off control **readline** command-line editing
height tpp number of lines before pause in display
language lang Language for GDB expressions (**auto**, **c** or **modula-2**)
listsize n number of lines shown by **list**
prompt str use *str* as GDB prompt
radix base octal, decimal, or hex number
verbose on/off control messages when loading symbols
width cpl number of characters before line folded
write on/off Allow or forbid patching binary; core files (when reopened with **exec** or **core**)
history ... groups with the following options:
h ... disable/enable **readline** history expansion
h exp off/on file for recording GDB command history
h file filename number of commands kept in history list
h size size control use of external file for command history
h save off/on control use of external file for command history
print ... groups with the following options:
p ... print memory addresses in stacks, values
p address on/off compact or attractive format for arrays
p array off/on source (demangled) or internal form for C++ symbols
p demangl on/off demangle C++ symbols in machine-instruction output
p asm-dem on/off number of array elements to display
p elements limit print C++ derived types for objects
p object on/off struct display: compact or indented
p pretty off/on display of union members
p union on/off display of C++ virtual function tables
p vtbl off/on

show commands show last 10 commands
show commands n show 10 commands around number *n*
show commands + show next 10 commands

Working Files

file [file] use *file* for both symbols and executable; with no arg, discard both
core [file] read *file* as coredump; or discard
exec [file] use *file* as executable only; or discard
symbol [file] use symbol table from *file*; or discard
load file dynamically link *file* and add its symbols
add-sym file addr read additional symbols from *file*, dynamically loaded at *addr*
info files display working files and targets in use
path dirs add *dirs* to front of path searched for executable and symbol files
show path display executable and symbol file path
info share list names of shared libraries currently loaded

Source Files

dir names add directory *names* to front of source path
dir clear source path
show dir show current source path
list show next ten lines of source
list - show previous ten lines
list lines display source centered around *lines*, specified as one of:
[*file:*]*num* line number [in named file]
[*file:*]*function* beginning of function [in named file]
+off *off* lines after last printed
-off *off* lines previous to last printed
***address** line containing *address*
list f, l from line *f* to line *l*
Info line num show starting, ending addresses of compiled code for source line *num*
info source show name of current source file
info sources list all source files in use
for regex search following source lines for *regex*
rev regex search preceding source lines for *regex*

GDB under GNU Emacs

M-x gdb run GDB under Emacs
C-h m describe GDB mode
M-s step one line (**step**)
M-n next line (**next**)
M-i step one instruction (**stepl**)
C-c C-f finish current stack frame (**finish**)
M-c continue (**cont**)
M-u up *arg* frames (**up**)
M-d down *arg* frames (**down**)
C-x & copy number from point, insert at end
C-x SPC (in source file) set break at point

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