Debugging Techniques

Course: Introduction to Programming and Data Structures

Dr. Laltu Sardar

Institute for Advancing Intelligence (IAI),
TCG Centres for Research and Education in Science and Technology (TCG Crest)

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Debugging a program in C

Debugger

Debugger

A program that runs other programs, allowing the user

- to exercise control over these programs,
- to examine variables when problems arise

GNU Debugger (GDB)

- The most popular debugger for UNIX systems to debug C and C++ programs.
- Helps you in getting information about the following:
  - If a core dump happened, then what statement or expression did the program crash on?
  - If an error occurs while executing a function, what line of the program contains the call to that function, and what are the parameters?
  - What are the values of program variables at a particular point during execution of the program?
  - What is the result of a particular expression in a program?

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Begin with GDB

Requirement

- output executable file must be compiled with -g
  $ gcc -g -Wall demo-gdb.c -o prog.out

Starting GDB

- $ gdb ./prog.out
- $ gdb ./prog.out inp1 inp2 . . . //If it needs command line inputs

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Most used commands in GDB

After selecting the program, we can use following commands.

- $ `start, s`
- $ `breakpoint, b`
- $ `next, n`
- $ `continue, c`
- $ `print, p`

Other Commands I

- `b` - Puts a breakpoint at the current line
- `b main` - Puts a breakpoint at the beginning of the program
- `b N` - Puts a breakpoint at line N
- `b +N` - Puts a breakpoint N lines down from the current line
- `b fn` - Puts a breakpoint at the beginning of function "fn"
- d N - Deletes breakpoint number N
- `info break` - list breakpoints
- `r` - Runs the program until a breakpoint or error
- `c` - Continues running the program until the next breakpoint or error
- `f` - Runs until the current function is finished
- `s` - Runs the next line of the program

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Other Commands II

- `s N` - Runs the next N lines of the program
- `n` - Like s, but it does not step into functions
- `u N` - Runs until you get N lines in front of the current line
- `p var` - Prints the current value of the variable "var"
- `bt` - Prints a stack trace
- `u` - Goes up a level in the stack
- `d` - Goes down a level in the stack
- `q` - Quits gdb

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Limitation of GDB

- Even though GDB can help you in finding out memory leakage related bugs, but it is not a tool to detect memory leakages.
- GDB cannot be used for programs that compile with errors and it does not help in fixing those errors.

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Dr. Laltu Sardar

laltu.sardar@tcgcrest.org

https://laltu-sardar.github.io.