

Compiling in Unix

Common Errors, and Debugging
CS-121

Basic Errors

- Syntax errors
- Run-Time errors
- Logic errors

Syntax Errors

- An error in which a C++ grammar rule has been violated.
 - Missing ;
 - Uneven quotes
 - Misspellings
 - Undefined variables

Syntax Errors

- Are flagged at compile time
- Program cannot be converted to machine code until these are fixed
- Easiest errors to find once you get used to them

Syntax Errors

- emacs flags syntax errors in compilation mode
 - ESC-X compile : to enter compilation mode you MUST have a Makefile
 - Place your cursor on the error and hit enter you will jump to the appropriate place in the source file

Syntax Error Example

Run-Time Errors

- Errors detected by the computer during program execution (program crashes)
- Common run-time errors
 - division by zero
 - accessing a memory cell you don't have permission to access (well get to this later)

Run-Time Errors

- In Unix run-time errors create core-dumps
 - a file named "core"
 - contains run-time information
 - The line-number where the error occurred
 - The values of variables at the time the program crashed

Run-Time Errors

- In order to generate useful core-dumps your program must be compiled with debugging information

• `g++ helloworld.cpp -o helloworld -g`



The `-g` option enables debugging information

Run-Time Errors


- In a Makefile you can enable debugging information by setting the `CPPFLAGS` variable at the beginning of the Makefile
- `CPPFLAGS=-g`


Run-Time Errors

- Use `gdb` (GNU debugger) to see the core dump info

• `ESC-X gdb` (in `emacs`)

• `gdb ./helloworld core` (on the shell)

The machine code
(executable) file

The core dump file

Run-Time Errors

- `gdb` commands
 - `bt` : (backtrace) list the functions that are executing when the error occurred
 - There may be more than one each stored in a "frame"
 - Tells you where in the program the error occurred
 - `frame [num]` : Select the frame [num]

Run-Time Errors

- gdb commands
 - display [var_name] : display the contents of the variable when the error occurred
 - quit : quits gdb

Run-Time Error Example

Logic Errors

- An error that occurs when we have a faulty algorithm
- These are the hardest errors to find
 - Not flagged at compile time
 - Not flagged at run-time
- Usually need to trace through the program (execute it line-by-line)

Logic Errors

- You also use gdb to trace through programs
 - gdb ./helloworld
- The program must be compiled with debugging information

Logic Errors

- gdb commands (for tracing)
 - break [filename]:[line number] : tells gdb to stop the program written in file [filename] at line number [line number] and begin tracing from that point
 - run : runs the program

Logic Errors

- gdb commands
 - list : list the source code of the program (use only in shell mode)
 - next : execute the next line
 - cont : continue running the program (stop tracing)

`gdb trace example`