Programming BootCamp

Debugging C Applications

SimCenter
Center for Computational Modeling and Simulation
Outline

❖ Introduction to Debugging
❖ Debugging Main Concepts
  ▪ Breakpoint, Step, Watch...etc.
❖ Debugging Tools
  ▪ GDB, CDB, LLDB...etc.
❖ Debugging Demos
  ▪ Using an IDE (Qt creator, VS Code...etc.)
  ▪ Using Console
❖ Common Bugs
  ▪ Overflow, Invalid Pointers, Access Violation, ...etc.
Introduction

❖ What is Debugging?
   The process of finding and fixing bugs in computer programs

❖ What is a Software Bug?
   A software bug is a flaw in the computer code that causes the program to fail or produce wrong or unexpected results

❖ Types of Bugs
   Typos, Mistakes, Logic flaws...etc.
Debugging Process

❖ Observe the bug
First we notice that the program is not functioning properly

❖ Reproduce the bug
We determine a sequence of steps and/or data to reproduce the problem

❖ Fix the bug
We use debugging tools to track down and fix the problem
Debugging Main Concepts

❖ **Breakpoint**
  Pause/interrupt the program execution to allow the programmer to inspect current state of the program

❖ **Step**
  Allow the programmer to control the execution of code

❖ **Watch**
  Allows the programmer to inspect variables, evaluate expressions, and examine value changes
**Popular C/C++ Debuggers**

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Popular IDE Debugging Tools

- VS or VS Code
- Xcode
- Qt Creator
Qt Creator Debugging Tools
Debugging Demos

git clone https://github.com/el7addad/Programming-Bootcamp.git
Debugging Demo: List Integers Application

❖ Compile the code
   
   `gcc -o ListIntegers ListIntegers.c`

❖ Running the application
   
   `./ListIntegers`

❖ Compile the code with debug info
   
   `gcc -g -o ListIntegers ListIntegers.c`

`git clone https://github.com/el7addad/Programming-Bootcamp.git`
Debugging Demo: Print Identity Application

❖ Compile the code
  gcc -o PrintIdentity PrintIdentity.c

❖ Running the application
  ./PrintIdentity

❖ Compile the code with debug info
  gcc -g -o PrintIdentity PrintIdentity.c