Homework–2

Compilers, Monsoon-2020, IIIT-H
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1. Read the handout on cross compilation posted on Moodle.
2. Read Chapters 3, 5, 6, 9 and 10 of the book *An Introduction to GCC* by Brian Gough.
3. How do you compile a compiler? Do you see any *chicken and egg* problem here? Can you mention any other such chicken and egg problems you encountered in computer science and engineering? Check the build process of LLVM and GCC, and report how they are compiled?
4. Run the following program, for $a = 10^k, 5 \leq k \leq 10$, on a Java Hotspot Virtual Machine with and without enabling Hotspot compilation. Report the JDK used and the options to enable/disable hotspot. Report the observed timings in the form of a table.

   Report the corresponding timings.

```
public class sqrsum {
    public static void main(String args[]) throws NumberFormatException {
        int a = Integer.parseInt(args[0]);
        long result=0;
        for(int i=1; i<= a; ++i)
               result+= sqrsum(i);
       System.out.println("sqrsum of the numbers is: " + result);
    }

    static int sqrsum(int b) {
        return b * b;
    }
}
```

5. Download the Polybench benchmark suite at the following url: `https://sourceforge.net/projects/polybench/files/latest/download`. Run the attached Python program with your roll number as command line argument (for example, `$python3.8 polyb.py 20183456`). You will get three polybench programs as

output. Compile and execute those programs using gcc, llvm, icc at the optimization levels -O0, -O1, -O2, -O3, -Os. Report runtimes and executable file size in a tabular form.

6. **Challenge Problem:** Can you use a combination of compiler optimization flags and beat the execution time provided by -O3 for any of the benchmark programs in Polybench? If you are able to find such a scenario, report the same.