Computer System Design Lab
Design Experiment 8: Full System Demonstration

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1 Objective and Problem Statement:

With the set of exercises that have been executed those would be used together to build a computer system. The computer system would be capable of executing a program written in high-level programming language. The objective of this exercise is to stitch together all the hardware and software components that have been designed in isolation.

Problem Statement:
Design a computer system by integrating the components of it in such a way that the final system would be capable of executing a program written in high-level jack programming language.

2 Integration Methodology

Following four components are to be used to build the computer system.

- Hardware computer system (Exercise 5b)

- Assembler Design (Exercise 6)

- VM translator (Exercise 7)

- Compiler (the inbuilt compiler to be used)

- Operating system (the inbuilt OS to be used)

- High-level programing interface (the Jack language to be used)

In the process of integration the input-output of each of the component above will be aligned in a way that there will be less manual intervention. Here, you will be building a common interface that would compile the code written in jack using the inbuilt compiler. Then the output of compiler which is a or set of .vm files will be fed into your VM translator. Further the interface script would call on your assembler. Finally the output of the assembler will be loaded into the hardware computer system that has been designed. The interface could be designed using bash or python script that would execute step by step the different tools with the help of .tst script to load the files as inputs and produce the necessary output. While writing the scripts the file names and the path of the files be appropriate.

3 Experiment

As part of the experiment you will be testing the complete system using three self written program and one N2T supplied program. Following three programs are expected to be written by you and the one program to be taken from the N2T.

1. Write a jack program to perform (3 + 5) - (3 - 5) and print the result in output screen.

2. Write a jack program to perform multiplication of two number (a * b) where a and b are variable to be read from the keyboard. The final output be printed in screen.

3. Write a program to perform maxfind in an array of size 4. Each element of the array be read first from the keyboard. Finally the maximum element be printed back in the screen.

4. Take a program called Pong Game and execute it in the setup that you have made. The program is provided in a separate tar file.

4   Tools:

- Language: The Nand2Tetris HDL and TSL (test scripting language)
  Refer: Appendix A and B of text book.

- Tools: Hardware Simulator of Nand2Tetris.
  https://www.nand2tetris.org/software

- Machine and OS: x86_64 machines with any distribution of Linux (Ubuntu or CentOS).

5   Reporting and Evaluation

An one page write-up on the working of your entire system to be prepared. The write up should indicate the input and output files to the different components (tools).

The evaluation will be based on the successful execution of the jack programs.