CS2100: Computer Organisation
Lab #2: Debugging using GDB II
(Week 4: 5 – 9 Feb 2024)
[This document is available on Canvas and course website https://www.comp.nus.edu.sg/~cs2100]

Name: _____   Student No.: _____

Lab Group: _____

C Arrays

Arrays are data structures that store <u>fixed-size</u> sequential collections of elements of the <u>same type</u>. While an array simply stores a collection of data, it is often more useful to think of the collection as a collection of variables of the same type.
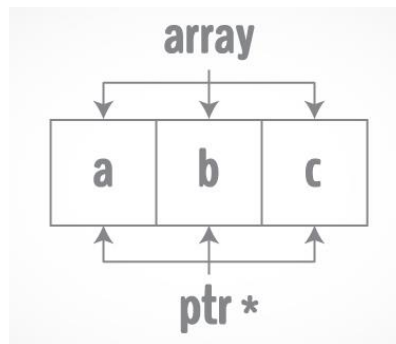

Instead of declaring individual variables, eg. number0, number1... number99, we can declare a single array variable numbers and use numbers[0], numbers[1],…numbers[99] to represent individual variables. A specific element in an array is accessed by an index which starts from 0.

All arrays consist of <u>contiguous memory locations</u>. The lowest address corresponds to the first element and the highest address to the last element.

C Functions and Arrays

In C programming, both a single array element or an entire array can be passed to a function. A single value will be passed by value, whereas a whole array is always passed as a reference (think pointer) to the first element of the array. In other words, the array itself is represented by a pointer to the first element of the array.
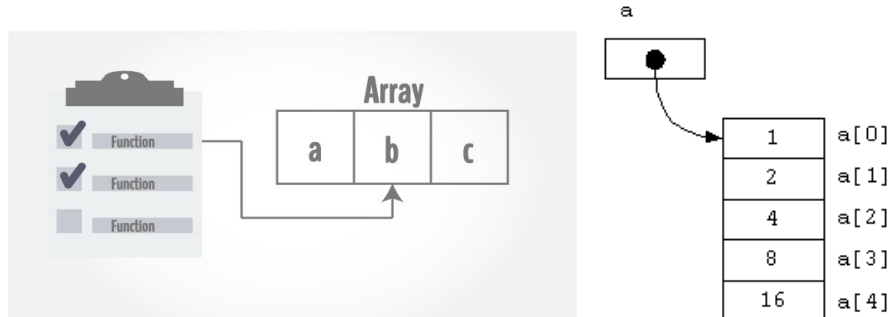
Objective: You will learn how to use arrays and functions in C.

Preparation (before the lab): Please refer to lab#1.

Procedure:

1. Download the files **lab2a.c and lab2b.c** from Canvas or CS2100 website "Labs page": https://www.comp.nus.edu.sg/~cs2100/3_ca/labs.html

2. Compile **lab2a.c** with **gcc** using the following command: **gcc –o lab2a lab2a.c**

3. What is the output of the program?

4. Which line in the code should you change to get output **"2"** instead? Show the changed line.
   Note: The output should be related to the **ageArray**. Do not hardcode "2" in your code!

5. What is the purpose of the unary operator **sizeof**?
   What datatype will **sizeof** give the value **"1"** for all architectures?

6. Can you get the number of elements in **ageArray**? Write a modified main function below to produce the following output. Show your lab TA the output of the code.

   2
   Size of the array is 4

   Note: The output **"2"** and size of array (i.e., **4**) are related to **ageArray**. Do not hardcode the value "2" and "4" in your code!

7. Compile **lab2b.c** with **gcc** using the following command: **gcc –o lab2b lab2b.c**

8. Give 2 ways of displaying the stored value of the first element of an array.
   Give 2 ways of displaying the address value of the first element of an array.

9. Can you define the function **hexToDecimal(char hex[], size_t size)** in lab2b.c,
   using pointers to traverse the array?
   Write your function below and show your labTA the output.

   Note: You are not allowed to use **strtoul**, **strtol**, or other functions from **stdlib.h**.
   Hint: Reading from the back of array is easier. Furthermore, you are already given the
   *function **hexVal(char hex)** to simplify your work.*

10. Why do we pass the size of the array to the **hexToDecimal** function in lab2b.c? Can we
    calculate the size of the array inside the function?

11. What is the format specifier to print a variable of datatype **size_t**?

Marking Scheme: Report – 11 marks; correct output – 4 marks; Total: 15 marks.