**CSC3320 System Level Programming**

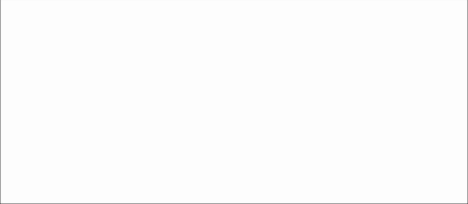
**Lab Assignment 8 - Post-Lab**

Due at 11:59 pm on Friday, March 12, 2021

Purpose: Learn how to use debugger in **gdb** to debug a program in Unix.

**Part 1:**

You are given a C program “q1.c” as below. But since there are no enough comments in the program, it is hard to find out the feature of the function ***foo***. So let us trace the execution of the program and find out what ***foo*** does. Please follow the steps below and answer the questions accordingly.

#include <stdio.h> 

int foo(int num)

{

int rev\_num = 0;

while (num > 0)

{

rev\_num = rev\_num\*10 + num%10;

num = num/10;

}

return rev\_num;

}

/\* Driver program to test foo \*/

int main()

{

int num = 1125;

printf("Result is %d", foo(num));

return 0;

}

1) Compile “q1.c” with **–g** option so that we can debug the executable using **gdb**. $gcc -o q1 -g q1.c

2) Lauch **gdb** for “q1”.

$gdb q1

3) List the source code of “q1.c” from line 1.

(gdb)list 1

4) Set a breakpoint at the line of statement “while (num > 0)”. *Question: Write your command.*

(gdb) break 6

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4) Run the program until the first breakpoint.

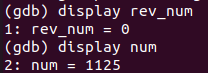
*Question: Write your command.*

(gdb) run

5) Use **display** to show the value of rev\_num and num at each time when program stops.

(gdb)display rev\_num

(gdb)display num



6) Run the while loop step by step using command **n** multiple times. (gdb)n

*Question: check the value of rev\_num and num after each iteration and fill in the table below.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 1st iteration | 2nd iteration | 3rd iteration | 4th iteration |
| num | 112 | 11 | 1 | 0 |
| rev\_num | 5 | 52 | 521 | 5211 |

7) When the program terminates, quit **gdb** using command **q**.

(gdb)q

8) *Question: Now can you tell what the function foo does?*

The function foo reverses the digits of the initial number input parameter (num)*.*

Rev\_num holds the reverse number value.

We take the rightmost digit by taking the modulus 10 of the initial number.

By multiplying by 10, we’re moving the rev\_num to the 10th place and adding the reminder value so that the rev\_number is inserted to the right.

This continues till the inputted initial number is 0, and when the foo function finishes then the reversed number is printed in the main function.

**Part 2:**

You are given a C program “q2.c” as below. This program is used to calculate the average word length for a sentence (a string in a single line):

Enter a sentence: It was deja vu all over again.

Average word length: 3.4

For simplicity, the program considers a punctuation mark to be part of the word to which it is attached. And it displays the average word length to one decimal place.

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|  |  |
| --- | --- |
| 1  2  3  4  5      11  12  13  14  15  16  17  18  19  20  21  22  23  24  25 | 1#include <stdio.h>  2  3 int main() {  4  5 int letters;  6 int words;  7 char character;  8  9 printf("Enter a Sentence: ");  10  while((character=getchar()) != \n){  if(character != ' '){  if(!space){  words++;  space=1;  }  letters++;  }else  space = 0;  }  printf("Average word length : %.1f", letters/words);  return 0;  } |

However, there are multiple errors in the given C program. Please correct complier errors and use **gdb** to debug the program and find out the errors.

*Question: Please write down the line numbers containing the errors and show how to correct them.*

(Note: you do not need to write down the commands you issued in **gdb**.)

Line 12 : Missing apostrophe around \n.

Correction: while((character=getchar()) != \’n’){

Line 8: Initialize space variable.

Correction: int space = 0;

Line 22: Cast the type in the printf statement.

Correction: printf("Average word length : %.1f \n", (float)letters/words);

Results:



***Submssion***:

• Please follow the instructions below step by step, and then write a report by answering the questions and upload the report (named as

Lab8\_FirstNameLastName.pdf or Lab8\_FirstNameLastName.doc) to Google Classroom, under the rubric Lab 8 Out-of-lab Assignment. • Please add the lab assignment NUMBER and your NAME at the top of your file sheet.

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