15213 Lecture 8: Data in Memory

1 Getting Started

To obtain a copy of today's activity, log into a shark machine and do the following:

- 1. \$ wget http://www.cs.cmu.edu/~213/activities/lec8.tar
- $2.\$ \$ tar xf lec8.tar
- 3. \$ cd lec8

Now run \$./act8 and follow the instructions on your screen. It will occasionally ask you discussion questions, whose answers you can record in the following section. Feel free to refer to the activity sheet from last week if you need a reference of GDB commands.

2 Discussion Questions

Use GDB's c command to progress through the stages. These questions accompany the program; as it poses each one, discuss with your partner and write your answer here.

2.1 Integers

1. Imagine we needed to take the address of the variable local. What problem might we run into, and what do you expect the compiler to do about it?

2.2 Arrays

- 2. What is the stride of this array (the number of bytes occupied by each entry)?
- 3. Assuming you already have a pointer to the beginning of a C string, how do you determine where it ends?

2.3 Structs

- 4. Did you notice anything interesting about the layout?
- 5. Write 'a', 'b', 'c', or 'd' in each box based on your prediction of what that byte will contain. If you expect any bytes to be unused, leave them empty.

0x00				
0x08				
0x10				
0x18				

6. If you were incorrect, lightly cross out the previous table and use this one to record the correct layout as shown in the dump.

0x00				
80x0				
0x10				
0x18				

7. Will this type take up more or less space than the first?

2.4 Arrays of Structs

- 8. What stride do you expect this array to have?
- 9. How does this struct's size compare to that of pair?

2.5 2-D Arrays

- 10. What stride do the "inner" arrays have? How about the "outer" ones? _____
- 11. Do you think this function would be useful for an array declared as: int8_t flipped[3][2]?
- 12. What stride does the outer array have this time?
- 13. Do you think this function would still be useful if first and second each had 4 elements? How about if they each had a different length?
- 14. What effect would we observe if we modified an element of first?

2.6 Endianness (Optional)

- 15. What disadvantage of little-endian did you just observe?
- 16. How would the assembly of this function differ if x86-64 were a big-endian architecture?