In-Class Problem 2

Given the following C struct compiled using gcc on an x86 architecture on the Ubuntu 20.2 Operating System with a base address in Data Memory of `0x004efca0`

- Calculate the optimal amount of memory the struct could consume in memory
- Calculate the actual amount of memory the struct consumes, and draw the layout. Show the segmentation in memory
- Re-design the struct to improve the memory consumed
- Calculate the actual amount of memory the new struct consumes, and draw the layout. Show any remaining segmentation in memory

```
typedef struct first_struct{
    float fl_1;
    char ch_1;
    double do_1;
    int int_1;
    double do_2;
    float fl_2;
    char ch_2;
    char ch_3;
    char* char_array;
    int int_2;
    double do_3;
}first_struct;
```

```
Optimal Size:      2xfloat + 3xdouble + 2xint + 3xchar + 1xpointer
                   2*4 + 3*8 + 2*4 + 3*1 + 1*8 = 51
```

```
Actual
|ca0-3|4 |5-7|8-F|cb0-3|4-7|8-F|cc0-3|4 |5 |6-7|8-F|cd0-3|4-7|8-F|
|f1   |c1|Seg|d1 |i1   |Seg|d2 |f2   |c2|c3|Seg|c_a|i2   |Seg|d3 |

64 bits
```

```
typedef struct first_struct{
    char* char_array;
    double do_1;
    double do_2;
    double do_3;
    float fl_1;
    float fl_2;
    int int_1;
    int int_2;
    char ch_1;
    char ch_2;
    char ch_3;
}first_struct;
```

```
|ca0-7|8-F|cb0-7|8-F|cc0-3|4-7|8-B|C-F|cd0|1 |2 |3-7|
|c_a  |d1 |d2   |d3 |f1   |f2 |i1 |i2 |c1 |c2|c3|Seg|

Final Size: 56
```