Scribe Notes CS61 Thursday, October 23, 2014

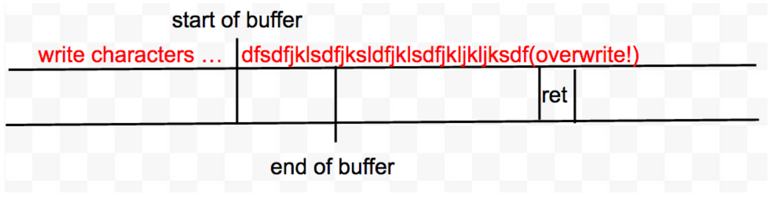
General Approaches to CS61 exams and life:
When faced with a long/difficult question use form hypothesizes/guesses and test through scientific examination.

Example: label the following data structures with their corresponding assembly code.

array
array of array pointers
linked list
binary tree

Solution: examine their complexity and number of assembly code lines. Examine the number of calls. It is NOT necessary/efficient to try and completely understand the assembly code for a question like this.

stacksmash:
This is a type of attack when someone tries to overwrite the return address of a function. This can happen if someone is able to write more data than can fit into a buffer. This can be achieved for example if the function **gets** is used.



Attempting to stacksmash!
1) If we try a buffer overflow attack on a buffer that uses **gets**. **Gets** is dangerous because it will read an unlimited amount of data without returning an error. However, when we use **gets** to try and overwrite the return address and get an error meaning our attempt was foiled. How???

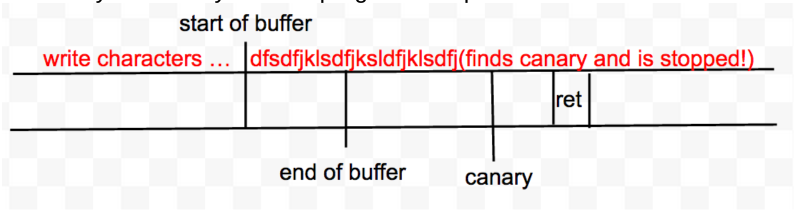
Answer: **gets** actually uses **get_chk** that ensures that the size is big enough to fit the amount of data we are trying to write.

2) We can then get around this by using a function like **read_line** that calls **get_s**. This way, **gets** is masked and not identified by the compiler. See below

```
read_line(char* buffer) {
    if (gets(buffer))
        return 1;
    else
        return 0;
}
```

We still get an error and are thus foiled. How???

Answer: Gcc keeps us safe using thread local storage area.
%gs stores the canary in between buffer and return address at some random place: this way, buffer overflow will modify the canary and the program will quit.


start of buffer
write characters ...
dfsdfjklsdfjksldfjklsdfj(finds canary and is stopped!)
ret
end of buffer
canary