# SEC 522-001: Cybersecurity Lab Spring 2021, KSU 2021 - Buffer Overflow

Sumaya Altamimi – 442203026

This document is organized as follow:

- Introduction
- How to exploit
- Code Vulnerability explanation
- How to fix

## Introduction

I develop an ATM C program with one intentional buffer overflow. The Program allows legitimate user to check balance, withdraw or deposit cash. The program resources are protected by password (PIN), However the buffer overflow vulnerability can be exploitable to give access to all of these resources (balance and withdraw/deposit cash) even for illegitimate users who can perform the exploit.

## How to exploit?

In terminal/command line, open the 'src' directory, which contains the source code files. For example:

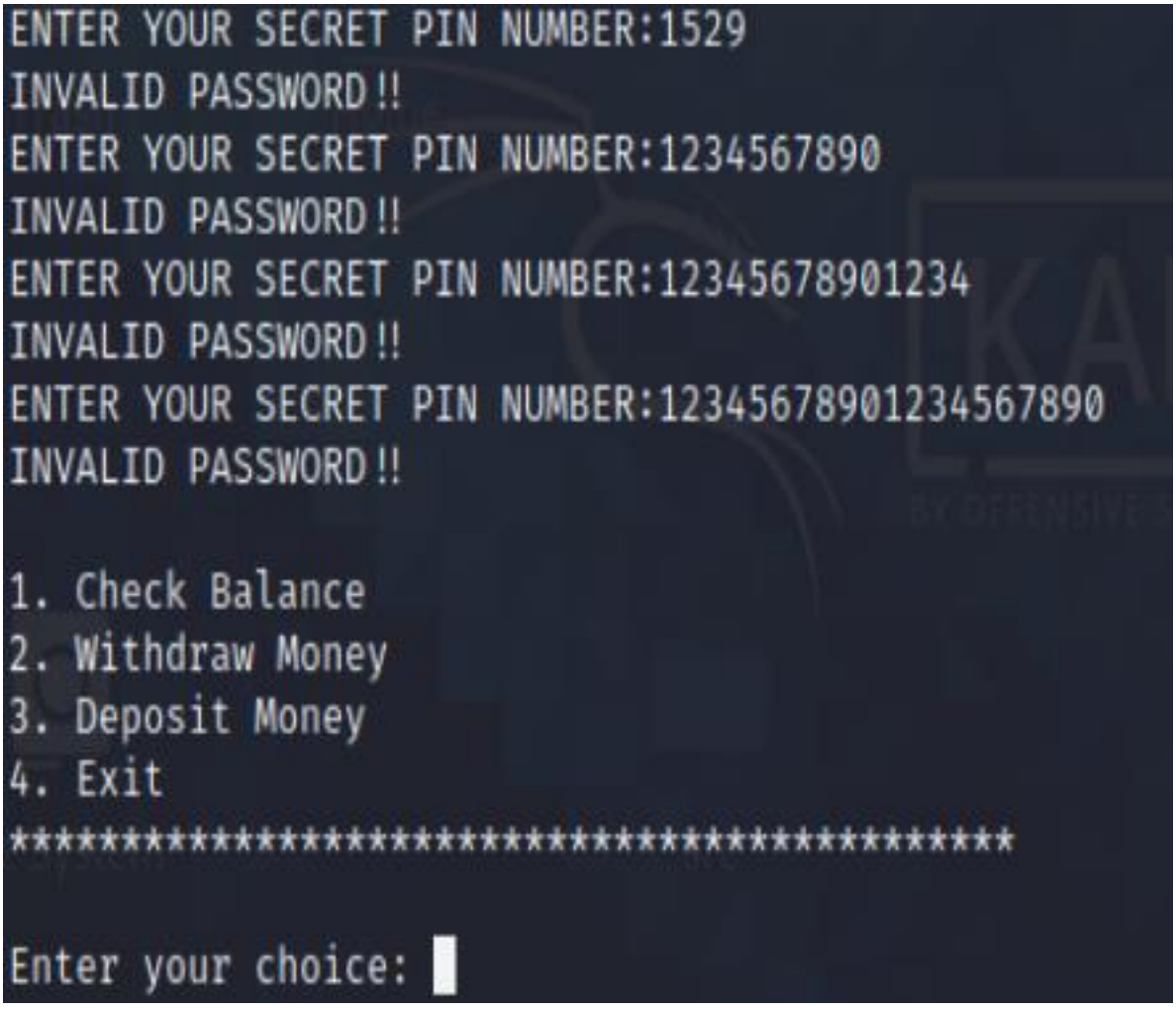
```
cd Desktop/src
```

Execute the program by typing:

./main

Now, you are asked for your password, the correct password is 1520, if you enter anything else it will not be accepted.

However, because of the intended  vulnerability, you can write any **longer password** and it will be accepted. Simply try this one: 12345678901234567890 .




Now, you can do whatever you want as if you are the actual user.

## Vulnerability in code

If we go back to the code, these two lines are the source of the problem:

```
char pin[16];
int checkPIN =0;
```

**PIN** is the user password, and **checkPIN** is the password status (either true or false) and zero means it is false by default. It can be true if it is assigned to any other value, say one.

### Normal scenario

If the user enters the valid PIN, I change the value of checkPIN to 1. Otherwise, it is unchanged.

```
if(strcmp(pin, "1520")){

    printf("INVALID PASSWORD!!\n");

}
else{
    printf("\n********Welcome to our ATM **************\n");
    checkPIN=1;
}
```

### Alternative scenario

As shown in the first screenshot, PIN has a size of 16 only, so if user pass anything more than 16 to it, the remaining value will be assigned to the next variable, In this case, checkPIN.

The user will not be asked for any password again if the checkPIN is true/not zero.

```
while (!checkPIN)
{
    printf("ENTER YOUR SECRET PIN NUMBER:");
    gets(pin);

    if(strcmp(pin, "1520")){

        printf("INVALID PASSWORD!!\n");

    }
    else{
        printf("\n********Welcome to our ATM **************\n");
        checkPIN=1;
    }

}
```

The next piece of code will be executed, and he/she will gain access to all resources.

## Fixing Vulnerabilities

After detailed discussion about issues of the code, the summary of what needs to be refined is as follow:

- Since ‘gets()’ method is insecure and has no way to stop buffer overflow, you have to change it. You may use ‘scanf()’ method when dealing with user inputs.
    > Replace ‘gets()’ with ‘scanf()’.

- Second thing you may need to change is replacing the while loop condition with the string comparison value directly, without creating a new variable to check if the status is true/false.
    > Remove checkPIN variable
    > Make a new variable ‘Result’ and assign it to ‘strcmp’ statement.
    > Replace the while condition with ‘result’.