Software Vulnerabilities: Exploitation and Mitigation

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Lab 9

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The report for the lab should consist of a single pdf file. Please use the following filename:

`lab9_FIRSTNAME_LASTNAME.pdf`

Send the report to alexandre.bartel@uni.lu with the following subject:

`MICS2019SVEM Lab9 FIRSTNAME_LASTNAME`

The deadline is the 19^{th} of May 2019 at 23:59.

1 Lab 9 (42 P.)

1.1 `system` function

```
// example from OWASP
// https://www.owasp.org/index.php/Command_injection

#include <stdio.h>
#include <unistd.h>

int main(int argc, char **argv) {
 char cat[] = "cat ";
 char *command;
 size_t commandLength;

 commandLength = strlen(cat) + strlen(argv[1]) + 1;
 command = (char *) malloc(commandLength);
 strncpy(command, cat, commandLength);
 strncat(command, argv[1], (commandLength - strlen(cat)) );

 system(command);
 return (0);
}
```

Question 1.1 Show how to change the C code to prevent any shell command injection. 5 P.

1.2 SQL Injection

In this part of the lab you will exploit an SQL injection vulnerability to dump the database containing user names and passwords. Use the virtual image available here (user:user and root:root). The image size represents ≈ 5 Gb. Launch the image with:

```
$ qemu-system-x86_64 -hda debian-svem.qcow -m 512 -enable-kvm
```

CHANGE THE RESOLUTION to make the image run faster!
The vulnerable website is running at the following URL:

`http://localhost/lab09/`.

Parameters are passed using the GET method:

Ex: `http://localhost/lab09/login.php?u=toto&p=tata`

1.2.1 Vulnerable Code

The target server use the following code to check the validity of users:

```
<? php
[...]
 $username = $_REQUEST["u"];
 $password = $_REQUEST["p"];

 $result = $conn->query("SELECT * FROM users WHERE username = \"$username\" AND password =
 ↪  \"$password\"");
 if ($result->num_rows > 0) {
   # ok
   [...]
 } else {
   # not ok
   [...]
 }
 [...]
?>
```

Question 1.2 Where is the injection vulnerability in the code? 2 P.

Question 1.3 What input should the attacker give for `username` and `password` to bypass the authorisation check of the password? 3 P.

1.2.2 User Name Brute Force

Question 1.4 You quickly want to know a valid user name. Using the above input structure to bypass the authorization check, try user names from the list of most used user names for ssh brute for attacks below. What is one valid user name? 3 P.

```
root
test
oracle
admin
info
user
postgres
mysql
backup
guest
web
tomcat
michael
r00t
upload
alex
sales
linux
bin
ftp
support
temp
nagios
user1
www
test1
nobody
```

1.2.3 Blind

Question 1.5 What is the difference on the html page for a successful authentication and for a failed authentication? 3 P.

Question 1.6 Using this difference, you can know when your SQL query succeeds or not. Build a script/program with the language of your choice to perform a blind SQL attack to dump the 100 rows of the `users` database (100 pairs username/password). Usernames and passwords consist of ascii characters. If you use the GET method to pass parameters, do not forget to convert special characters (ex: space is %20). 15 P.

1.2.4 Patch

Question 1.7 Show how you can patch the code to prevent SQL injection. 5 P.

Question 1.8 Is/Are there any other security problem(s) with this website (PHP code / SQL request / information stored in the database / etc.)? If yes, how would you fix it/them? 5 P.

1.3 Bonus

Question 1.9 There is a reference to a movie when the authentication does not succeed. Which movie? 1 P.

Note on plagiarism

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