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Malware RCE: Debuggers and Decryptor Development

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Topics

- How to script a debugger for malware RCE
- Almost all malicious code uses some form of obfuscation to protect
  - » Strings
  - » Configurations
  - » Command-and-Control (C&C) protocols/hosts
  - » Stolen Data
- Save time, leverage the code’s own functions
  - » All you have to do is find it
- We'll show you some examples
  - » Kraken, Laqma, Silent Banker, DHTMLSpy, Torpig/MBR

The Hiding Game

Why do malicious code authors obfuscate things?

- To make RCE significantly more difficult
- To prevent others from reading the stolen data
- To prevent others from deciphering the C&C protocol
- To make building IDS/IPS and anti-virus signatures more difficult

The Hiding Game

Why do we de-obfuscate things?

- To make RCE easier
- To recover stolen data and credentials
- To decipher the C&C protocol
- To build IDS/IPS and anti-virus signatures

Decryptor Development Methods

1. Manual RCE: Decryptor developement based on ASM
   - » Requires the most intimacy with ASM
   - » More code + more complexity = more time consuming
2. Assisted RCE: Pressing F5 (Hex-rays)
   - » Requires type fix-up often
3. Scripting the debugger: Let the malware do the work
   - » More code + more complexity = more time consuming

The best method depends on the project

- » For example, Wireshark plugins require manual or assisted

Scripting the Debugger

- Generally speaking, there are three classes of scriptable analysis
  - **Active**
    - You control which functions execute and in which order
    - Redirect EIP (“New origin here”) and “crawl” through code
    - Example: Silent Banker encoded strings (max code coverage)
  - **Passive**
    - Monitor Trojan with function hooks, API or internal
    - Let it run through (may need !hidedebug)
    - Example: Kraken network traffic
  - **Recon and utility scripting**
    - Kind of a catch-all, hybrid class
    - Examples include
      - Scanning an arbitrary file for shell code
      - Checking shared DLLs for hooks
      - Unpacking malware or other “protected” binaries

Requirements

- Required
  - » **Copy of the Trojan**
  - » **Debugger**
    - » Immunity Debugger + Python
    - » Olly + OllyScript
    - » IDA + IDC/IDAPython
  - » **Basic RCE knowledge**
    - » Unpacking, breakpoints, stepping, running, registers
- Optional
  - » **Disassembler**
  - » **Virtual environment**

Demo Summary

Demo Line-up

- Silent Banker
  - Decode binary strings
  - Resolve hash-based API imports
- Kraken
  - Print decrypted network traffic
  - Generate C&C hostnames
- Laqma
  - Snoop on shared memory and window messages (IPC)
- Torpig/MBR
  - Extract decrypted data from the kernel driver

[Active] Example: SilentBanker Strings Decoder

- Decoding strings requires some basic RCE work
  - **Locate obfuscated strings**
  - **Locate function xrefs to the obfuscated string**
  - **Does the function look like a decoder?**
    - Yes - analyze parameters/output (registers and stack)
    - No - keep looking
    - The following looks like a decoder

```
mov     eax, offset aTnrevxmr ; "tnrevxmr"
push    eax
push    eax
call    sub_100122E8
mov     eax, offset aUkbr ; "ukbr"
push    eax
push    eax
call    sub_100122E8
mov     eax, offset aAdudpmjgy ; "adudpmjgy"
```

```
mov     esi, offset aYekorgwfimadhj ; "YEKORGWFIMADHJBCUTZQPXSLVN"
lea     edi, [ebp+var_1C]
rep movsd
movsw
movsb
push    6
pop     ecx
mov     esi, offset aSdhvkpltrjizgn ; "sdhvkpltrjizgnaqfybmueoxwc"
lea     edi, [ebp+var_38]
```


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[Active] Example: SilentBanker Strings Decoder

```
decoder_start = 0x100122E8
ref = imm.getXrefFrom(decoder_start)
# for each function that calls the decoder function
for info in ref:
    xref = info[0]
    mov_eax = 0
    addr = 0
    # disassemble backwards until finding MOV EAX, offset aStringName
    for i in range (1,4):
        op = imm.disasmBackward(xref, i)
        instr = op.getDisasm()
        if "MOV EAX" in instr:
            # get address of encoded string in memory (.text section)
            addr = op.operand[1][3]
            break
    if addr != 0:
        before = imm.readString(addr)
        # prepare the stack for the function call
        imm.setReg('EIP', xref)
        # the input and output buffers can be the same
        imm.writeLong(imm.getRegs()['ESP'], addr)
        imm.writeLong(imm.getRegs()['ESP']+4, addr)
        imm.stepOver()
        # now read the result
        after = imm.readString(addr)
        table.add('', ['0x%x' % addr, '%s' % before, '%s' % after])
```


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[Active] Example: SilentBanker Strings Decoder

DEMO

Silent Banker Strings

Address	Encoded	Decoded
0x1000145c	QUTRN*UP	WORTH_OF
0x10001cc0	Srlj	Memo
0x10001424	Kteersgk*Mklpjm	Currency_Symbol
0x100015d0	PXLR*TLRB	FIAT_RATE
0x100019b8	FLJBB*HLSB	PAYEE_NAME
0x10001d18	FLJSBHR*LSUOHR	PAYMENT_AMOUNT
0x10001714	FLJSBHR*OHXRM	PAYMENT_UNITS
0x10001c08	FLJSBHR*SBRLA*XV	PAYMENT_METAL_ID
0x10001854	FLJBT*LKKUOHR	PAYER_ACCOUNT
0x10001b68	OMV*FBT*UOHKB	USD_PER_OUNCE
0x100017c0	dtujR2	autoT1
0x10001920	dtujR1	autoT2
0x10001c1c	.ELguxjs)Kjsvxel	&BAction=Confirm
0x100018bc	mjcxs:	login:
0x10001a74	bnz:	psw:
0x10001ad0	OMBT	USER
0x1000164c	FLMM	PASS
0x10001dfc	bdenre	parser
0x10001cb4	<455UC55>	<!--OK-->
0x10001c64	MrVrptcFexfxmrcr	SeDebugPrivilege

[Active] Example: Silent Banker API Resolution

- The effect of run-time dynamic linking
  - » LoadLibrary/GetProcAddress instead of IAT
  - » API calls look like “call dword ptr [eax+20h]”
  - » Makes static analysis a PITA

- SilentBanker uses hash-based RTDL
  - » Frequently used in shell code
  - » Binary contains 32-bit hash instead of function name
  - » It walks a loaded library's exports
    - » if hash(getNextExportName()) == 0x19272710
  - » Makes static analysis an even bigger PITA

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[Active] Example: Silent Banker API Resolution

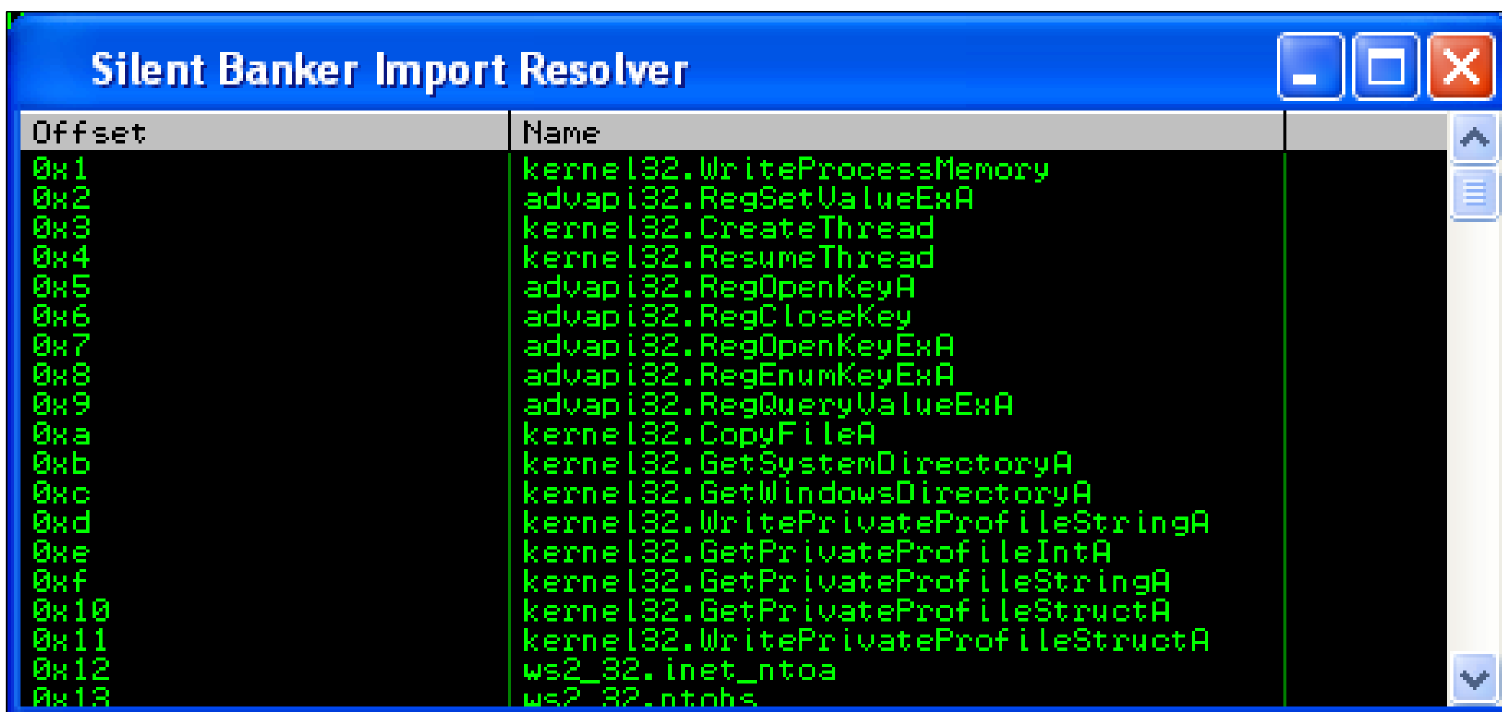
Quick solution to the problem

- Find the base address of call table
- Run the Trojan until it fills in the call table
- Loop through the call table with reverse lookups
- Add a structure to the IDB and rename if desired
  - call dword ptr [eax+20h]
  - call dword ptr [eax+ExitProcess]

```
for i in range (1,100):
    addr = imm.readLong( fxtbl + (i*4) )
    if addr:
        func = imm.getFunction(addr)
        name = func.getName()
        table.add('', ["0x%x" % i, "%s" % name])
```

[Active] Example: Silent Banker API Resolution

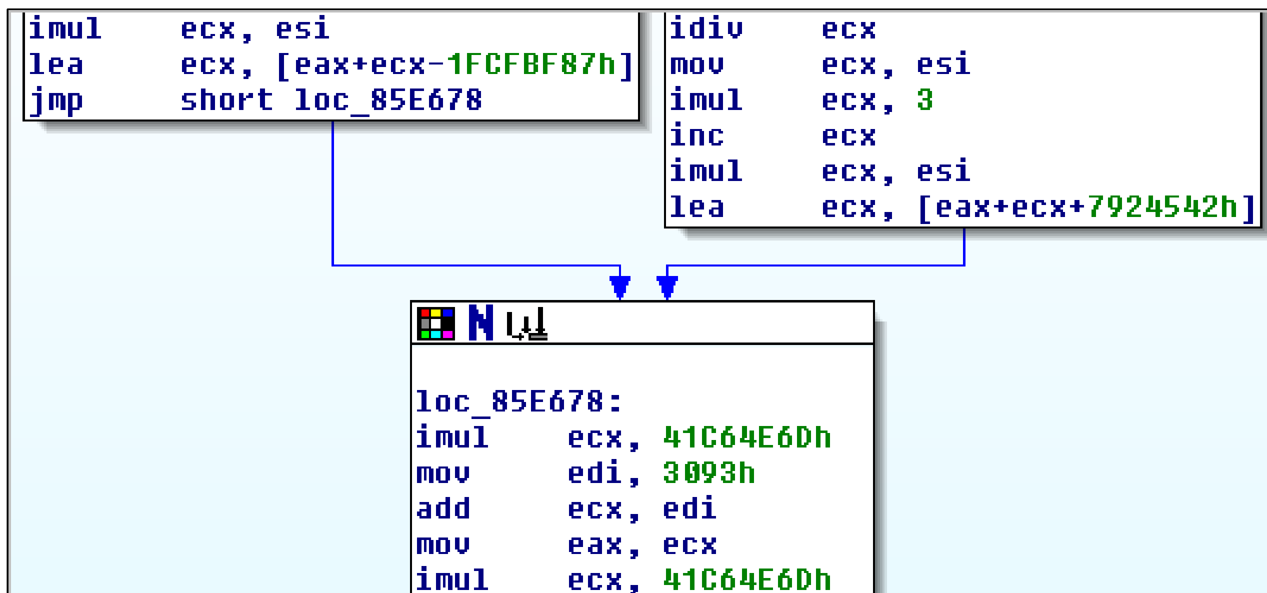
DEMO



[Active] Example: Kraken C&C Hostname Generation

Spam bot uses UDP 447 and HTTP POST for C&C

- Locates C&C servers based on hostname algorithm
- It is easy to find the algorithm-containing function
- Analyze the function parameters
  - for(i=0; i<1000; i++) { getDomain(&ptr, i); ...... }



[Active] Example: Kraken C&C Hostname Generation

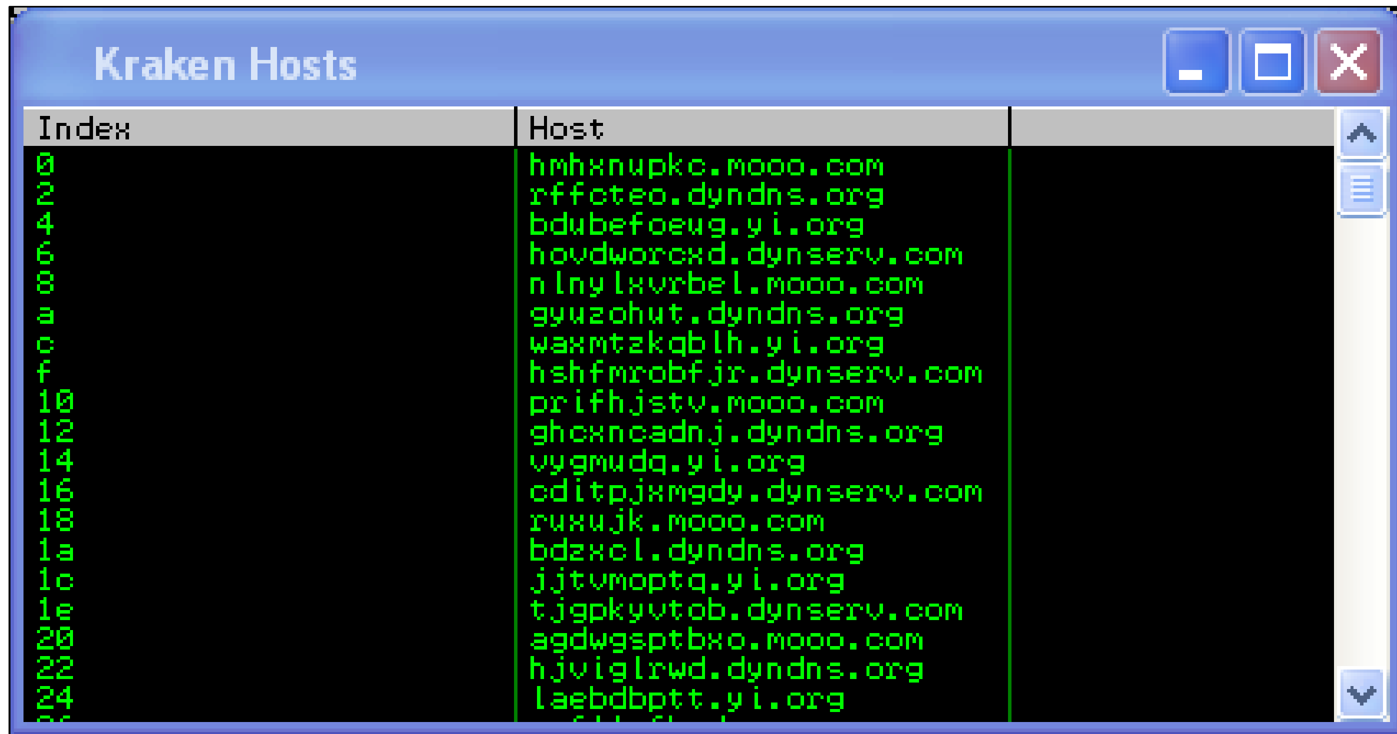
Make our own loop around the algorithm function

- Direct EIP to start of function
- Set breakpoint at end of function
- Modify stack parameters on each iteration (relative to EBP)
- Run until the end breakpoint is hit
- Read the generated hostname string

```
for idx in range(0,2000):
    imm.setReg("EIP", start)
    imm.Run()  # past function prologue
    regs = imm.getRegs()
    imm.writeLong(regs['EBP']+8, memvar)
    imm.writeLong(regs['EBP']+12, idx)
    imm.Run()  # to end of function
    host = imm.readString(imm.readLong(memvar))
    table.add('', ['%x' % idx, '%s' % host])
```

[Active] Example: Kraken C&C Hostname Generation

DEMO



[Wireshark] Example: Kraken Network Traffic Decryption

Kraken cryptography model has a weakness

» Keys derived from IP address, CPU details, HDD serial
» Dummies! The keys are in the packet header
» A Wireshark plugin can decrypt data in live or still pcaps

```
typedef struct MSG_HDR {
   unsigned char type[2];
   unsigned short ver;
   int length;
} MSG_HDR;

typedef struct PACKET {
    unsigned int key0;
    unsigned int key4;
    unsigned int key8;
    MSG_HDR msg;
    unsigned int chksum;
    unsigned char data[1];
} PACKET;
```

Key Criteria	Generation Methodology
IP addresses	API: GetAdaptersInfo
CPU Vendor ID	cpuid (eax = 0)
CPU Info and Feature Bits	cpuid (eax = 1)
CPU Serial Number	cpuid (eax = 3)
C:\ Volume Serial Number	API: GetVolumeInformation

[Wireshark] Example: Kraken Network Traffic Decryption

85 74.482548 66.29.87.159 192.168.2.5 UDP Source port: ddm-dfm Destination port: remote-as

```
Frame 85 (298 bytes on wire, 298 bytes captured)
Ethernet II, Src: AsustekC_61:5b:f1 (00:e0:18:61:5b:f1), Dst: 00:54:00:12:34
Internet Protocol, Src: 66.29.87.159 (66.29.87.159), Dst: 192.168.2.5 (192.1
User Datagram Protocol, Src Port: ddm-dfm (447), Dst Port: remote-as (1053)
Kraken Protocol
    key0: 0x8e8d6e1c
    key4: 0x34ede158
    key8: 0x723e3212
    Type 0: 0x14 ("Module Catalog")
    Type 1: 0x00
    Version: 315
    Payload Length: 232
  Brought to you by MHL and Greg from iDefense. Enjoy.
```

```
0000   8e 8d 6e 1c 34 ed e1 58  72 3e 32 12 14 00 3b 01   ..n.4..X r>2...;.
0010   e8 00 00 00 ec 20 b1 b9  3c 6d 6f 64 75 6c 65 73   ..... .. <modules
0020   3e 3c 6d 6f 64 75 6c 65  3e 3c 76 65 72 73 69 6f   ><module ><versio
0030   6e 3e 31 31 33 3c 2f 76  65 72 73 69 6f 6e 3e 3c   n>113</v ersion><
0040   6e 61 6d 65 3e 69 6d 6d  6f 64 75 6c 65 3c 2f 6e   name>imm odule</n
0050   61 6d 65 3e 3c 6d 6f 64  75 6c 65 69 64 3e 31 31   ame><mod uleid>11
0060   32 3c 2f 6d 6f 64 75 6c  65 69 64 3e 3c 63 72 63   2</modul eid><crc
0070   3e 33 32 35 30 38 36 34  39 35 33 3c 2f 63 72 63   >3250864 953</crc
0080   3e 3c 2f 6d 6f 64 75 6c  65 3e 3c 6d 6f 64 75 6c   ></modul e><modul
0090   65 3e 3c 76 65 72 73 69  6f 6e 3e 31 30 33 3c 2f   e><versi on>103</
00a0   76 65 72 73 69 6f 6e 3e  3c 6e 61 6d 65 3e 73 6e   version> <name>sn
00b0   69 66 66 6d 6f 64 75 6c  65 3c 2f 6e 61 6d 65 3e   iffmodul e</name>
00c0   3c 6d 6f 64 75 6c 65 69  64 3e 31 31 35 3c 2f 6d   <modulei d>115</m
```

Frame (298 bytes) | Decoded Payload (Client Mode) (232 bytes) | Decoded Payload (Server Mode) (232 bytes)

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[Passive] Example: Laqma IPC Snooping

Two usermode components: client (DLL) and server (EXE)

- **Client DLL hooks API functions**
  - PFXImportCertStore (certificates)
  - HttpSendRequest (login credentials)
  - Writes data to “Global\temp_xchg”
  - Sends “data waiting” message to __axelsrv
- **Server EXE monitors messages to __axelsrv**
  - Maps “Global\temp_xchg” to acquire data
  - Dispatches attack based on data type

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[Passive] Example: Laqma IPC Snooping

```
BOOL HOOK_HttpSendRequest(HINTERNET  hRequest,
                   LPCTSTR lpszHeaders, DWORD dwHeadersLength,
                   LPVOID lpOptional, DWORD dwOptionalLength)
{
      PTEMP_XCHG  lpvData;
      HWND        hwnd;
      BOOL        bStatus;

      //Call the legitimate API function
      bStatus = HttpSendRequest(hRequest,
            lpszHeaders,
            dwHeadersLength,
            lpOptional,
            dwOptionalLength);

      //Write the stolen data to shared memory segment
      lpvData = (PTEMP_XCHG) MapSharedMemory("Global\\temp_xchg");
      if (lpvData != NULL && lpOptional != NULL) {
            lpvData->uMsg = HTTPSENDREQUESTAW;
            memcpy(&lpvData->Buff.Handle, &hRequest, sizeof(HANDLE));
            memcpy(&lpvData->Buff.Data, lpOptional, strlen(lpOptional));
            //Send the message to server that the API was triggered
            hwnd = FindWindow(TEXT("__intsrv32"), NULL);
            SendMessage(hwnd, HTTPSENDREQUESTAW, 0, 0);
      }

      return bStatus;
}
```


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[Passive] Example: Laqma IPC Snooping

Script fundamentals

- Laqma calls MapViewOfFile to locate "Global\temp_xchg" and then writes data to the region
- If we hook MapViewOfFile, it will occur before the write
- Also don't want to hook internal write function
  - Laqma uses internal memcpy-like write function
  - The write function address may change
- We can hook FlushViewOfFile instead
  - First parameter is a pointer to memory region
  - Parse the values for validity before interpreting

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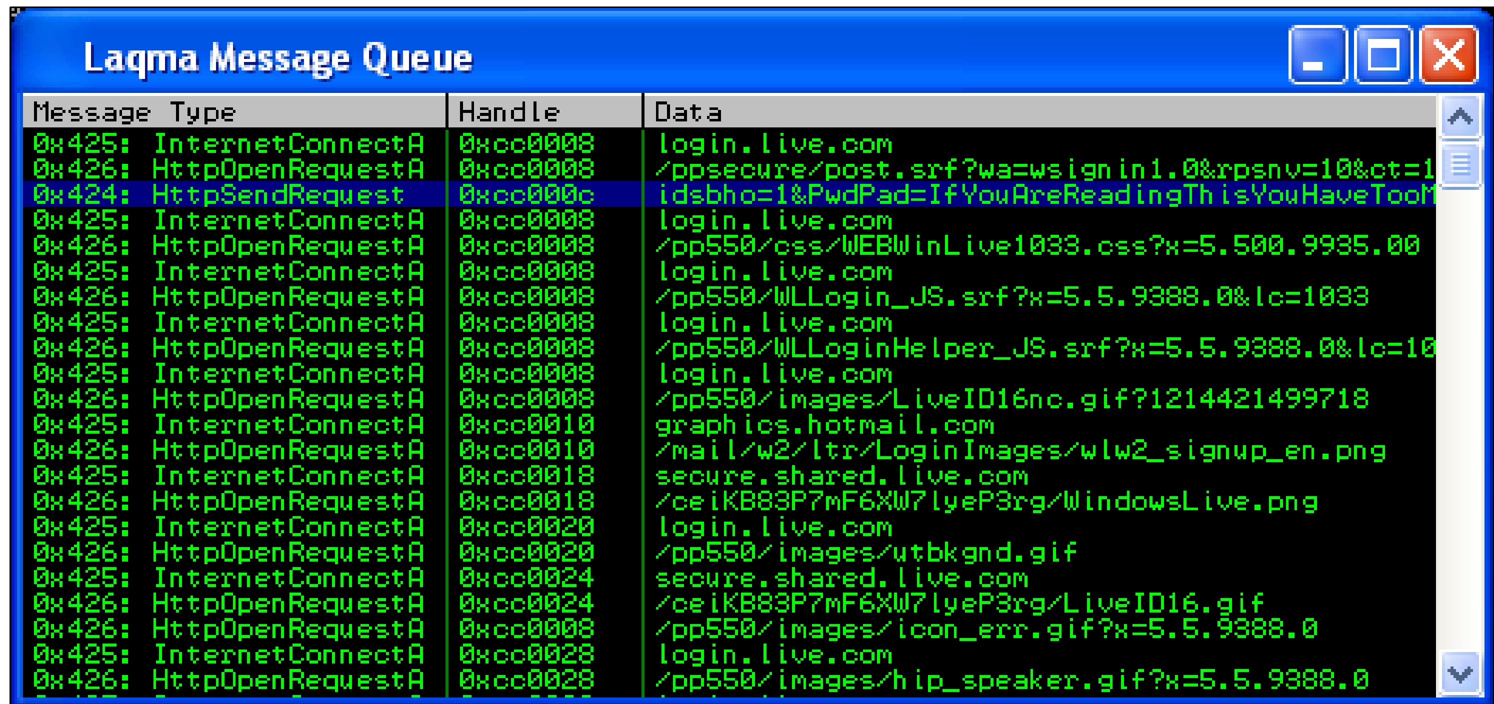
[Passive] Example: Laqma IPC Snooping

DEMO



[Passive] Example: Torpig/MBR Configuration Decryption

- Torpig incorporates MBR rootkit
  - » Based on eEye BootRoot
- Kernel driver downloads encrypted files over HTTP
  - » DLL that hooks API functions
  - » Configuration file containing targeted URLs, drop sites, etc.
- Decryption occurs in kernel space
  - » The configuration is available to the DLL via \\.\pipe\!win$
  - » But any usermode process can query the named pipe

[Passive] Example: Torpig/MBR Configuration Decryption

Script fundamentals

- **Pipe interactions occur when DLL loads**
  - Attach to running process will not work (too late)
- **We can hook CreateFile and wait for \\.\pipe\!win$**
  - Then activate ReadFile and WriteFile hooks
  - Verify that the handle belongs to the right object
  - Perform analysis on data sent/received

```
if function_name == "CreateFileW":
    addr = imm.readLong(regs['ESP'] + 0x4)
    filename = imm.readWString(addr)
    filename = filename.replace("\x00", "")
    if filename == "\\\\.\\pipe\\!win$":
        self.add("readfile",  imm.getAddress("kernel32.ReadFile"))
        self.add("writefile", imm.getAddress("kernel32.WriteFile"))
```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[Passive] Example: Torpig/MBR Configuration Decryption

DEMO

Torpig Spy

Hook	Size	Data	Description
Read	0x1	N/A	< Request Ack
Read	0x4	N/A	< Response size
Read	0x9	N/A	< Response
Write	0x1	01	> Client Hello 1
Write	0x1	02	> Client Hello 2
Write	0x4	06 00 00 00	> Request size (6 bytes)
Write	0x6	00 00 00 00 11 00	> Request structure (Type 17)
Read	0x1	N/A	< Request Ack
Read	0x4	N/A	< Response size
Read	0x9	N/A	< Response
Write	0x1	01	> Client Hello 1
Write	0x1	02	> Client Hello 2
Write	0x4	06 00 00 00	> Request size (6 bytes)
Write	0x6	00 00 00 00 12 00	> Request structure (Type 18)
Read	0x1	N/A	< Request Ack
Read	0x4	N/A	< Response size
Read	0x2112	N/A	< Response

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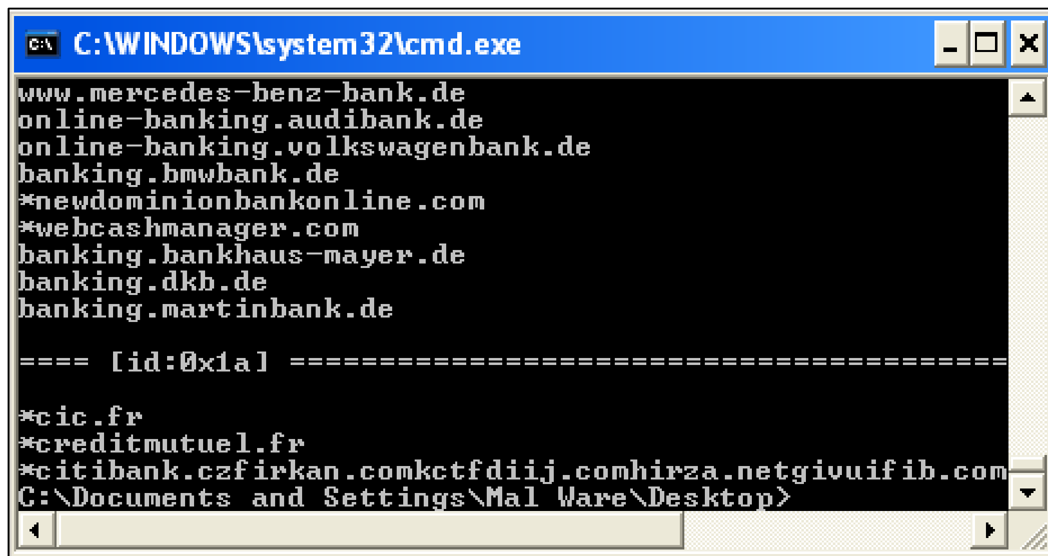
[Passive] Example: Torpig/MBR Configuration Decryption

- A stand-alone program can read the data
  - » Use the protocol displayed in script output
  - » Increment the reqType for each iteration

```
#define DOMAIN_TARGETS_A 0x17
#define DOMAIN_TARGETS_B 0x18
#define DOMAIN_TARGETS_C 0x19
#define DOMAIN_TARGETS_D 0x1a

typedef struct pipeCONTROL {
    BYTE     helloStatus;
    BYTE     Reserved0[3];
    BYTE     reqType;
    BYTE     Reserved1;
} PIPE_CONTROL;
```



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Reconnaissance and Utility Scripting

- Facilitate RCE with useful scripts
  - » Importing and exporting data (IDA <-> Immdbg)
  - » Scanning arbitrary files for shellcode
  - » Scanning memory for API function hooks

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[Utility] Importing and Exporting Data

- Transfer data into IDA for static analysis
  - » Save the debugger script's output to text file
  - » Use IDAPython to import the data to the .idb
  - » Patch decoded strings, rename call tables with API
- Transfer data into Immdbg for dynamic analysis
  - » Reverse the process above
  - » Save named functions, comments, structure members

[Utility] Importing and Exporting Data

DEMO

```
100242D8  . E8 33F6FFFF    CALL p.10023910
100242DD  . 8B85 70FFFFFF  MOV EAX,DWORD PTR SS:[EBP-90]
100242E3  . E8 4C05FEFF    CALL p.10004834
100242E8  . 50             PUSH EAX                                  ┌ProcNameOrOrdinal
100242E9  . A1 B8AA0210    MOV EAX,DWORD PTR DS:[1002AAB8]           │
100242EE  . 50             PUSH EAX                                  │hModule => NULL
100242EF  . E8 7025FEFF    CALL <JMP.&kernel32.GetProcAddress>       └GetProcAddress
100242F4  . A3 34AA0210    MOV DWORD PTR DS:[1002AA34],EAX
100242F9  . 8D8D 6CFFFFFF  LEA ECX,DWORD PTR SS:[EBP-94]
100242FF  . 66:BA BC7C     MOV DX,7CBC
10024303  . B8 CC460210    MOV EAX,p.100246CC                         ASCII "Kgq54jNDN7igMlC"
10024308  . E8 03F6FFFF    CALL p.10023910
1002430D  . 8B85 6CFFFFFF  MOV EAX,DWORD PTR SS:[EBP-94]
10024313  . E8 1C05FEFF    CALL p.10004834
10024318  . 50             PUSH EAX                                  ┌FileName
10024319  . E8 B625FEFF    CALL <JMP.&kernel32.LoadLibraryA>         └LoadLibraryA
1002431E  . A3 C0AA0210    MOV DWORD PTR DS:[1002AAC0],EAX
10024323  . 8D8D 68FFFFFF  LEA ECX,DWORD PTR SS:[EBP-98]
10024329  . 66:BA BC7C     MOV DX,7CBC
```

```
100242D8  . E8 33F6FFFF    CALL p.10023910
100242DD  . 8B85 70FFFFFF  MOV EAX,DWORD PTR SS:[EBP-90]
100242E3  . E8 4C05FEFF    CALL <p.@System@@LStrToPChar$qqrx17Syst
100242E8  . 50             PUSH EAX                                  ┌ProcNameOrOrdinal
100242E9  . A1 B8AA0210    MOV EAX,DWORD PTR DS:[1002AAB8]           │
100242EE  . 50             PUSH EAX                                  │hModule => NULL
100242EF  . E8 7025FEFF    CALL <p.GetProcAddress_0>                 └GetProcAddress
100242F4  . A3 34AA0210    MOV DWORD PTR DS:[1002AA34],EAX
100242F9  . 8D8D 6CFFFFFF  LEA ECX,DWORD PTR SS:[EBP-94]
100242FF  . 66:BA BC7C     MOV DX,7CBC
10024303  . B8 CC460210    MOV EAX,p.100246CC                         ASCII "Kgq54jNDN7igMlC"
10024308  . E8 03F6FFFF    CALL p.10023910
1002430D  . 8B85 6CFFFFFF  MOV EAX,DWORD PTR SS:[EBP-94]
10024313  . E8 1C05FEFF    CALL <p.@System@@LStrToPChar$qqrx17Syst
10024318  . 50             PUSH EAX                                  ┌FileName
10024319  . E8 B625FEFF    CALL <p.LoadLibraryA>                     └LoadLibraryA
1002431E  . A3 C0AA0210    MOV DWORD PTR DS:[1002AAC0],EAX
10024323  . 8D8D 68FFFFFF  LEA ECX,DWORD PTR SS:[EBP-98]
10024329  . 66:BA BC7C     MOV DX,7CBC
```

[Utility] Detect Shellcode in Arbitrary Files

- Is that .pdf, .doc or .jpeg malicious?
  - » Applies to any file type
  - » Could still be malicious without shellcode
    - » JavaScript bytecode
    - » PDF FlateDecode
- Based on common characteristics of shellcode
  - » Load the file into memory and scan each byte
  - » Is it a jump or a call instruction?
  - » Is the destination address valid?
  - » Are the instructions at the destination address valid?

[Utility] Detect Shellcode in Arbitrary Files

Shell Code Detect

Rel/Abs Addr	Op	Dest Addr	Next Op
0x2c1d8 (0x17c1d8)	JMP SHORT 0017C21F	0x17c21f	ADC ECX,DWORD PTR DS:[ESI] : MOV EBP,DWO
0x2c728 (0x17c728)	JMP SHORT 0017C77F	0x17c77f	LODS DWORD PTR DS:[ESI] : LODS DWORD PTR
0x2d587 (0x17d587)	JMP SHORT 0017D5E9	0x17d5e9	NOT DWORD PTR DS:[ESI] : ADD DH,CH
0x2eb69 (0x17eb69)	JMP SHORT 0017EBC3	0x17ebc3	POP EBX : OUT DX,AL
0x2f390 (0x17f390)	JMP SHORT 0017F406	0x17f406	INTO : XCHG EAX,ECX
0x2f3e6 (0x17f3e6)	JMP SHORT 0017F42A	0x17f42a	CALL E3193A9F : CMPS DWORD PTR DS:[ESI],
0x30e53 (0x180e53)	CALL 00180E58	0x180e58	POP EBX : ADD EBX,FFBFEF54
0x30e5f (0x180e5f)	JMP SHORT 00180E91	0x180e91	MOV EAX,DWORD PTR FS:[30] : MOV EAX,DWOR
0x30eb2 (0x180eb2)	CALL 00180FA7	0x180fa7	PUSHAD : MOV E I,DWORD PTR DS:[EBX+4010D
0x30ed7 (0x180ed7)	JMP SHORT 00180EF3	0x180ef3	CMP ESI,2000 JB SHORT 00180ED9
0x30ef0 (0x180ef0)	JMP SHORT 00180F00	0x180f00	MOV DWORD PT DS:[EBX+4010D9],ESI : PUSH
0x30efb (0x180efb)	JMP 00180F92	0x180f92	PUSH DWORD TR DS:[EBX+4010D9] : CALL DW
0x30f1d (0x180f1d)	JMP SHORT 00180F92	0x180f92	PUSH DWORD PTR DS:[EBX+4010D9] : CALL DW
0x30f1f (0x180f1f)	JMP SHORT 00180F34	0x180f34	PUSH 0 : USH 0
0x30f7c (0x180f7c)	JMP SHORT 00180F92	0x180f92	PUSH DW D PTR DS:[EBX+4010D9] : CALL DW
0x30ff1 (0x180ff1)	JMP SHORT 0018100C	0x18100c	SUB ED DWORD PTR DS:[ESI+20] : SUB EDX,
0x31039 (0x181039)	JMP SHORT 0018103C	0x18103c	POPAD RETN
0x32012 (0x182012)	JMP SHORT 00182019	0x182019	NOP PREFIX REPNE:

CPU - main thread

```
00180E91   64:A1 30000000   MOV EAX,DWORD PTR FS:[30]
00180E97   8B40 0C          MOV EAX,DWORD PTR DS:[EAX+C]
00180E9A   8B70 1C          MOV ESI,DWORD PTR DS:[EAX+1C]
00180E9D   AD               LODS DWORD PTR DS:[ESI]
00180E9E   8B40 08          MOV EAX,DWORD PTR DS:[EAX+8]
00180EA1   8983 D1104000    MOV DWORD PTR DS:[EBX+4010D1],EAX
00180EA7   FC               CLD
00180EA8   8DBB B5104000    LEA EDI,DWORD PTR DS:[EBX+4010B5]
00180EAE   33C9             XOR ECX,ECX
00180EB0   B1 07            MOV CL,7
00180EB2   E8 F0000000      CALL 00180FA7
```


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[Utility] Detect Shellcode in Arbitrary Files

- Result set is proportional to file size
- Other methods/resources for detecting shellcode
  - » Open suspect file in IDA and press “c”
  - » Use a stream disassembler
    - » diStorm64 (http://www.ragestorm.net/distorm)
  - » Polymorphic Shellcode (Detection) by Christoph Gratl
  - » Hybrid Engine for Polymorphic Shellcode Detection by Payer, Teufl and Lamberger
  - » Libemu (http://libemu.mwcollect.org)

[Utility] Detect Hooked API Functions

- Multiple methods for user mode API hooking
  - » **Trampoline hooks**
  - » **IAT hooks (watch out for LoadLibrary/GetProcAddress hooks)**
  - » **Modify DLL on disk**
- It is easy to check for trampoline hooks
  - » **For each loaded DLL**
  - » **For each exported function**
  - » **Is the prologue overwritten?**
    - » CALL
    - » JMP
    - » PUSH/RET
  - » **Yes – is the destination inside the loaded DLL?**

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[Utility] Detect Hooked API Functions

- Determine the purpose of an API hook
  - » **Set breakpoints on the hooked functions**
  - » **Use the target process as desired (i.e., browse to Web page)**
  - » **Debug**

```
addr = imm.getAddress(string)
if addr != -1:
    op = imm.disasm(addr)
    instr = op.getDisasm()
    # Check for hooks of type "jmp 0xdeadbeef" or "call 0xdeadbeef"
    if op.isJmp() or op.isCall():
        dest = op.getJmpAddr()
        if isExternalToModule(imm, addr, dest) == True:
            table.add('', ['%s' % string, '0x%x' % addr, '%s' % instr])
    # Check for hooks of type "push 0xdeadbeef; retn"
    elif op.isPush():
        nextop = imm.disasm(addr + op.getSize())
        if nextop.isRet():
            call_dest = imm.readLong(addr+op.getSize()+1)
            if isExternalToModule(imm, addr, call_dest):
                table.add('', ['%s' % string, '0x%x' % addr, '%s' % instr])
```


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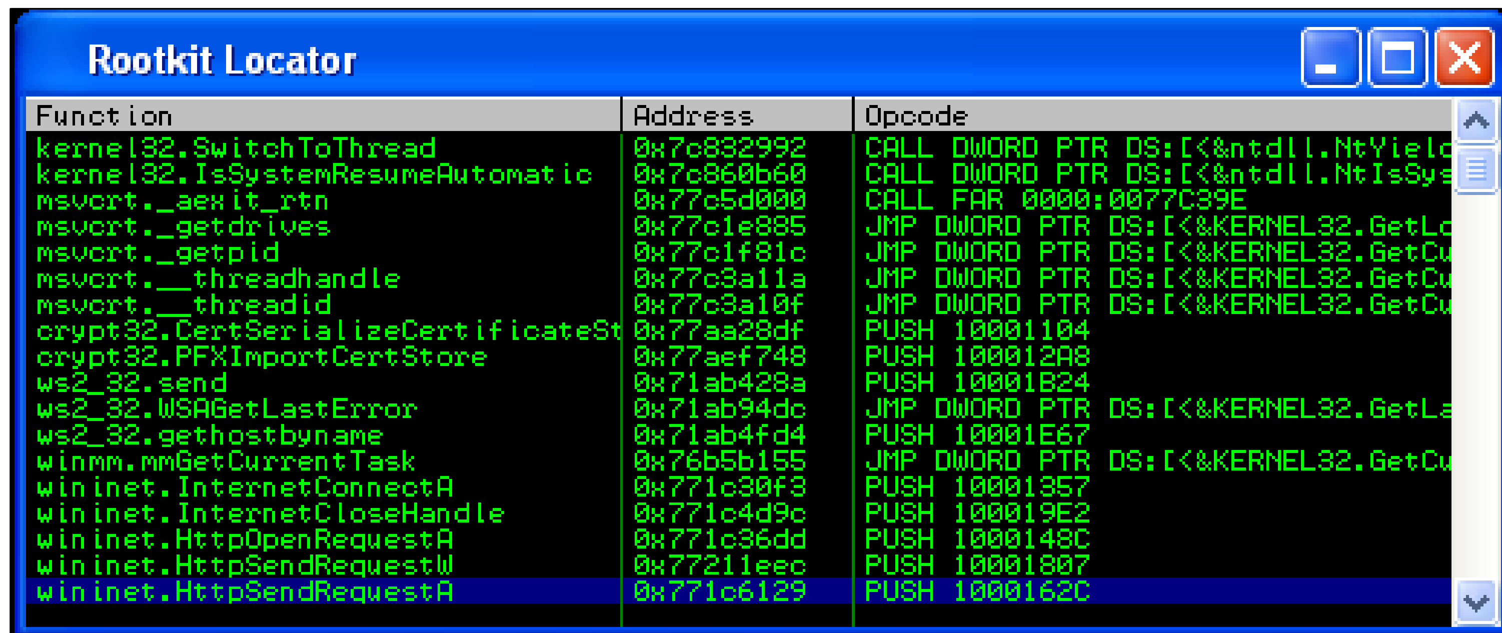
DEMO



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Potential Caveats

- The project may require “manual” or “assisted” RCE
  - » Wireshark, Glamour/Gpcoder tool
- Scripting ring-zero malicious code is possible, but challenging
  - » Patch API calls (ntoskrnl.exe:RtlTimeToTimeFields -> ntdll.dll:RtlTimeToFileFields)
- Interpreted scripts can take a while to execute
- Subject to anti-debugger detection
  - » But try http://www.PEiD.info/BobSoft

Additional Resources

- Immunity Debugger and Forums
  - » http://www.immunitysec.com/products-immdbg.shtml
  - » http://forum.immunityinc.com
- OpenRCE has a few scripts, too
  - » http://www.openrce.org
- We're hosting ours with Google Code
  - » http://code.google.com/p/mhl-malware-scripts

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Q and A

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