ScyllaHide v1.4 - Documentation

2018-11-11

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1 Description

ScyllaHide is an advanced open-source x64/x86 usermode Anti-Anti-Debug library. It hooks various functions in usermode to hide debugging. This tool is intended to stay in usermode (ring3). If you need kernelmode (ring0) Anti-Anti-Debug please see TitanHide. ScyllaHide hooks as stealth as possible in usermode and the goal is to not interfere any other functionality.

ScyllaHide supports various debuggers with plugins:

- OllyDbg v1 and v2 `http://www.ollydbg.de`
- x64dbg `http://x64dbg.com` or `https://github.com/x64dbg/x64dbg`
- Hex-Rays IDA v6 `https://www.hex-rays.com/products/ida`
- TitanEngine v2 `https://bitbucket.org/mrexodia/titanengine-update` and `http://www.reversinglabs.com/open-source/titanengine.html`

PE x64 debugging is fully supported with plugins for x64dbg and IDA.

Please note: ScyllaHide is not limited to these debuggers. You can use the standalone commandline version of ScyllaHide. You can inject ScyllaHide in any process debugged by any debugger.

2 Usage Information

2.0.1 NtApiTool

The NtApiCollection.ini can be generated for your operating system by using the appropriate NtApiTool.exe in the release folder. Copy the generated NtApiCollection.ini to your plugin directory.

2.0.2 Standalone (debugger-independent)

InjectorCLI.exe ”process name” ”HookLibrary.dll path” [nowait]

InjectorCLI.exe pid:*process ID* ”HookLibrary.dll path” [nowait]

For example: InjectorCLI.exe crackme.exe `C:\HookLibrary.dll`

The injector waits for a keystroke after injection by default. You can modify this behaviour by passing ”nowait” (without quotes) as the last parameter.

2.0.3 OllyDbg v1

Copy scylla_hide.ini, NtApiCollection.ini, HookLibraryx86.dll and ScyllaHideOlly1.dll to your specific plugins directory.

2.0.4 OllyDbg v2

Copy scylla_hide.ini, NtApiCollection.ini, HookLibraryx86.dll and ScyllaHideOlly2.dll to your specific plugins directory.

2.0.5 IDA v6

32-bit: Copy scylla_hide.ini, NtApiCollection.ini, HookLibraryx86.dll and ScyllaHideIDA.plw to your IDA plugins directory.

64-bit: Copy scylla_hide.ini, NtApiCollection.ini, HookLibraryx64.dll, ScyllaHideIDASrvx64.exe and ScyllaHideIDA.p64 to your IDA plugins directory.

Note:
Start ScyllaHideIDASrvx64.exe to debug 64bit applications (remotely).
Start ScyllaHideIDASrvx86.exe to debug 32bit applications remotely.

Commandline: ScyllaHideIDASrvxXX.exe "port"
For example: ScyllaHideIDASrvxXX.exe 1345

ScyllaHideIDASrv needs HookLibraryxXX.dll and NtApiCollection.ini

2.0.6 x64dbg

32-bit: Copy scylla_hide.ini, NtApiCollection.ini, HookLibraryx86.dll and ScyllaHideX64DBGPlugin.dp32 to your `\x32\plugins\` directory.

64-bit: Copy scylla_hide.ini, NtApiCollection.ini, HookLibraryx64.dll and ScyllaHideX64DBGPlugin.dp64 to your `\x64\plugins\` directory.

2.0.7 TitanEngine

32-bit: Copy scylla_hide.ini, NtApiCollection.ini, HookLibraryx86.dll and ScyllaHideTEx86.dll to your `\plugins\x86\` directory.

64-bit: Copy scylla_hide.ini, NtApiCollection.ini, HookLibraryx64.dll and ScyllaHideTEx64.dll to your `\plugins\x64\` directory.

3 Features

3.1 Anti-Anti-Debug

3.1.1 Process Environment Block (PEB)

The most important anti-anti-debug option. Almost every protector checks for PEB values. There are three important options and one minor option.

- BeingDebugged: Very important option, should be always enabled. *IsDebuggerPresent* is using this value to check for debuggers.
- NtGlobalFlag: Very important option, a lot of protectors check this value.
- HeapFlags: Very important option. E.g. Themida checks for heap artifacts and heap flags.
- StartupInfo: This is not really important, only a few protectors check for this. Maybe Enigma checks it.

3.1.2 NtSetInformationThread

The THREADINFOCLASS value ThreadHideFromDebugger (17) is a well-known anti-debug measurement. The debugger cannot handle hidden threads. This leads to a loss of control over the target.

3.1.3 NtSetInformationProcess

The PROCESSINFOCLASS value ProcessHandleTracing (32) can be used to detect a debugger. The PROCESSINFOCLASS value ProcessBreakOnTermination (29) can be used to generate a Blue Screen of Death on process termination. ScyllaHide protects from both. The function *RtlSetProcessIsCritical* from ntdll.dll uses ProcessBreakOnTermination internally.

3.1.4 NtQuerySystemInformation

The SYSTEM_INFORMATION_CLASS value SystemKernelDebuggerInformation (35) can be used to detect kernel debuggers. The SYSTEM_INFORMATION_CLASS value SystemProcessInformation (5) is used to get a process list. A debugger should be hidden in a process list and the debugee should have a good parent process ID like the ID from explorer.exe.

3.1.5 NtQueryInformationProcess

A very important option. Various PROCESSINFOCLASS values can be used to detect a debugger:

- ProcessDebugFlags (31): Should return 1 in the supplied buffer.
- ProcessDebugPort (7): Should return 0 in the supplied buffer.
- ProcessDebugObjectHandle (30): Should return 0 in the supplied buffer and the error STATUS_PORT_NOT_SET (0xC0000353).
- ProcessBasicInformation (0): Reveals the parent process ID.
- ProcessBreakOnTermination (29): Please see *NtSetInformationProcess* in Section 3.1.3.
- ProcessHandleTracing (32): Please see *NtSetInformationProcess* in Section 3.1.3.

A lot of protectors use this to detect debuggers. The windows API *CheckRemoteDebuggerPresent* uses *NtQueryInformationProcess* with ProcessDebugPort internally.

3.1.6 NtQueryObject

The OBJECT_INFORMATION_CLASS ObjectTypesInformation (3) and ObjectTypeInformation (2) can be used to detect debuggers. ScyllaHide filters DebugObject references.

3.1.7 NtYieldExecution

A very unrealiable anti-debug method. This is only used in some UnpackMe's or in some Proof of Concept code. Only activate this if you really need it. Probably you will never need this option. This function is used in the kernel32.dll *SwitchToThread* function.

Listing 1: SwitchToThread Implementation

```
1 BOOL __stdcall SwitchToThread()
2 {
3   //STATUS_NO_YIELD_PERFORMED 0x40000024
4   return NtYieldExecution() != 0x40000024;
5 }
```

3.1.8 NtCreateThreadEx

Threads hidden from debuggers can be created with a special creation flag THREAD_CREATE_FLAGS_HIDE_FROM_DEBUGGER (4). ScyllaHide doesn't allow hidden threads. The anti-debug effect is similar to *NtSetInformationThread* in Section 3.1.2.

3.1.9 OutputDebugStringA (deprecated since v1.3)

OutputDebugStringW uses *OutputDebugStringA* internally, so hooking the ANSI version is enough. This is a very unreliable anti-debug method, so you will not need this option very often. The Listing shows the implementation of the function. The recent versions of ScyllaHide don't need this hook anymore, because they handle the DBG_PRINTEXCEPTION_C exception. See Section 3.1.19.

Listing 2: OutputDebugStringA Implementation

```
1 void __stdcall OutputDebugStringA(LPCSTR lpOutputString)
2 {
3      ULONG_PTR args[2];
4      args[0] = (ULONG_PTR)strlen(lpOutputString);
5      args[1] = (ULONG_PTR)lpOutputString;
6      RaiseException(0x40010006, 0, 2, args);//DBG_PRINTEXCEPTION_C
7 }
```

3.1.10 BlockInput

Very effective anti-debug method. This is used e.g. in Yoda's Protector. "Blocks keyboard and mouse input events from reaching applications."

3.1.11 NtUserFindWindowEx

This is a system call function in user32.dll. The windows APIs *FindWindowA/W* and *FindWindowExA/W* call this internally. The debugger window will be hidden.

Note: Requires a valid relative virtual address in NtApiCollection.ini.

3.1.12 NtUserBuildHwndList

This is a system call function in user32.dll. The windows APIs *EnumWindows* and *EnumThreadWindows* call this internally. The debugger window will be hidden.

Note: Requires a valid relative virtual address in NtApiCollection.ini.

3.1.13 NtUserQueryWindow

This is a system call function in user32.dll. The windows API *GetWindowThreadProcessId* calls this internally, see Listing for implementation. This is used to hide the debugger process.

Note: Requires a valid relative virtual address in NtApiCollection.ini.

Listing 3: GetWindowThreadProcessId Implementation

```
DWORD __stdcall GetWindowThreadProcessId(HWND hWnd, LPDWORD
    lpdwProcessId)
{
        if (lpdwProcessId != 0)
                *lpdwProcessId = (DWORD)NtUserQueryWindow(hwnd,
                    WindowProcess);//0
        return (DWORD)NtUserQueryWindow(hwnd, WindowThread);//2
}
```

3.1.14 NtSetDebugFilterState

ScyllaHide returns always STATUS_ACCESS_DENIED. This anti-debug measurement isn't used very often. Probably you will never need this option in a real world target.

3.1.15 NtClose

This is called with an invalid handle to detect a debugger. ScyllaHide calls *NtQueryObject* to check the validity of the handle. A few protectors are using this method.

3.1.16 Remove Debug Privileges

If a debugger creates the process of the target, the target will have debug privileges. This can be used to detect a debugger.

3.1.17 Hardware Breakpoint Protection (DRx)

Hardware breakpoints can be detected/cleared with exceptions or the windows APIs *NtGetContextThread/NtSetContextThread*. Enable this option only if you need it!

3.1.18 Timing

There are a few windows APIs to measure the time. Timing can be used to detect debuggers, because they slow down the execution. Enable with care and only if you need it!

3.1.19 Raise Exception

It is possible to raise specific exceptions with various windows API functions (e.g. *RaiseException* from kernel32.dll). The problem is that various debuggers consume various different exceptions and the exception is not returned to the application. The application can detect a debugger if there is no exception triggered. Please see the Listing for an example code.

Listing 4: Raise Exception Example

```
__try
{
    RaiseException(0x40010006, 0, 0, 0);//DBG_PRINTEXCEPTION_C
    MessageBox("Debugger detected");
}
__except(EXCEPTION_EXECUTE_HANDLER) //catch exception
{
    MessageBox("Debugger NOT detected");
}
```

Examples for swallowed exceptions are:

- 0x4000001F STATUS_WX86_BREAKPOINT
- 0x40010006 DBG_PRINTEXCEPTION_C
- 0x40010007 DBG_RIPEXCEPTION
- 0x80000001 STATUS_GUARD_PAGE_VIOLATION
- 0x80000003 STATUS_BREAKPOINT
- 0xC0000025 STATUS_NONCONTINUABLE_EXCEPTION
- 0xC0000420 STATUS_ASSERTION_FAILURE

Table 1: OllyDbg v1, v2 and WinDbg v6 comparision on Windows 7 64-bit.

	Olly v1	**Olly v2**	**WinDbg v6**
DBG_RIPEXCEPTION	X	X	X
DBG_PRINTEXCEPTION_C	X	X	X
NONCONTINUABLE_EXCEPTION	X	X	
WX86_BREAKPOINT	X		
GUARD_PAGE_VIOLATION	X		
BREAKPOINT	X		
ASSERTION_FAILURE			X

3.2 Special

3.2.1 DLL Injection

Normal DLL injection or stealth dll injection. You better try the normal injection first...

3.2.2 Prevent Thread Creation

This option prevents the creation of new threads. This can be useful if a protector uses a lot of protection threads. This option can be useful for EXECryptor. Enable with care and only if you need it! You must know what you are doing here!

3.2.3 RunPE Unpacker

This option hooks *NtResumeThread*. If the malware creates a new process, ScyllaHide terminates and dumps any newly created process. If you are unpacking malware, enable and try it. Should be only used inside a Virtual Machine (VM).

A typical RunPE workflow:

1. Create a new process of any target in suspended state (Process flag CREATE_SUSPENDED: 0x00000004)
2. Replace the original process PE image with a new (malicious) PE image. This can involve several steps and various windows API functions.
3. Start the process with the windows API function *ResumeThread* (or *NtResumeThread*)

3.2.4 Improved Attach Dialog

Use the integrated window finder to quickly select your attach target. Drag'n'Drop the bullseye/crosshair to your target window or enter the Process ID manually in decimal or hexadecimal notation.

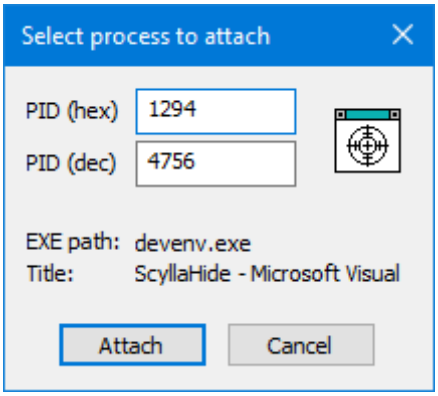

Figure 1: Improved Attach Dialog

3.3 OllyDbg v1 Specific

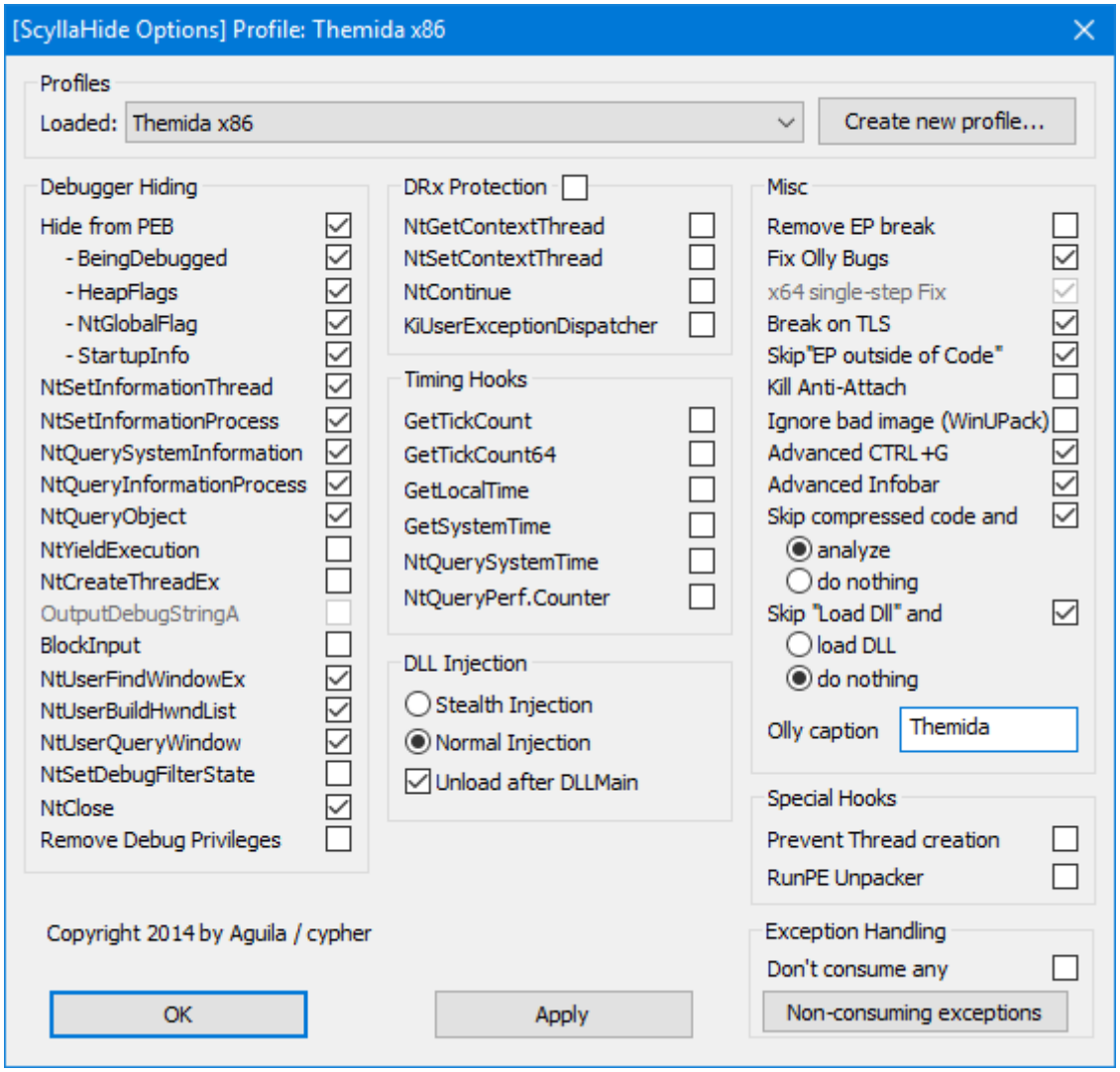

Figure 2: OllyDbg v1 Plugin

3.3.1 Remove entry point breakpoint

Some protectors use Thread-Local-Storage (TLS) as entrypoint and check for breakpoints at the normal PE entrypoint address. You must remove the PE entrypoint to hide your debugger. This option is necessary for VMProtect.

3.3.2 Fix Olly Bugs

This option fixes various OllyDbg bugs:

- PE fix for NumOfRvaAndSizes

- ForegroundWindow fix
- FPU bug
- Format string (sprintf) bug, CVE-2004-0733 `http://www.cvedetails.com/cve/CVE-2004-0733/`
- NT Symbols path bug, patch by blabberer `http://www.woodmann.com/forum/showthread.php?8460-Debug-symbols-information-symbol-server-setup&p=56246&viewfull=1#post56246`
- Faulty handle bug. Sometimes Olly does not terminate and this error appears "Operating system reports error ERROR_ACCESS_DENIED"
- System DLL detection on Windows x64. Olly thinks that the system dlls are located at C:\windows\system32 but on Windows x64 they are at C:\windows\SysWOW64. The result is that various Olly features will not work properly for example "Execute till user code".

3.3.3 x64 single-step fix

OllyDbg doesn't work very well on x64 operating systems. This option fixes the most annoying bug. More information here: `http://waleedassar.blogspot.de/2012/03/ollydbg-v110-and-wow64.html`

3.3.4 Skip Entrypoint outside code

Annoying warning can be skipped.

3.3.5 Ignore bad PE image

Annoying warning can be skipped.

3.3.6 Skip compressed code warning

Annoying warning "Compressed code?" can be skipped with a default behaviour.

3.3.7 Skip "load dll" warning

Annoying warning "Request to load DLL" can be skipped with a default behaviour.

3.3.8 Break on TLS

This option sets a breakpoint to any available Thread-Local-Storage (TLS) address. This is necessary for various protectors e.g. VMProtect.

3.3.9 Advanced CTRL+G

Replaces the default OllyDbg "Go to Address" dialog. Now you can enter RVA and offset values. Be sure to select the correct module.

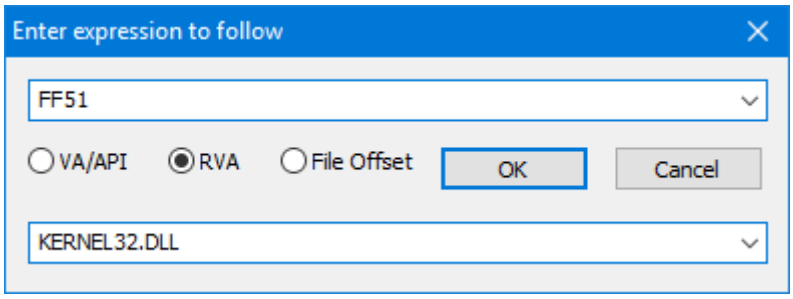

Figure 3: Advanced CTRL+G

3.3.10 Change window caption

Change the OllyDbg window caption. This can be useful against e.g. FindWindow anti-debug tricks. You don't need to enable this, if you have the NtUser* hooks enabled! Hint: You can use it to make the currently used profile visible.

3.3.11 Special Keyboard Shortcuts

- "INSERT" will fill the selected data with 0x00 bytes
- "DELETE" will fill the selected data with 0x90 (NOP) bytes

3.3.12 Custom Toolbar

This setting displays a custom toolbar while using the dump and cpu window.

3.3.13 Exception Problem

OllyDbg has a problem with several exceptions. The exceptions can be triggered in different ways. They cannot be ignored with the exception options.

- 0x40010006 STATUS_ILLEGAL_INSTRUCTION
- 0xC000001E STATUS_INVALID_LOCK_SEQUENCE

For example, EXECryptor uses STATUS_INVALID_LOCK_SEQUENCE to defeat OllyDbg. Obsidium uses STATUS_ILLEGAL_INSTRUCTION.

3.3.14 Detach Process

Olly v1 does not support detaching from a process. ScyllaHide implements a "detach process" feature. All user software breakpoints will be cleared prior to detaching the process. Olly is terminated, but the process will be alive.

3.4 OllyDbg v2 Specific

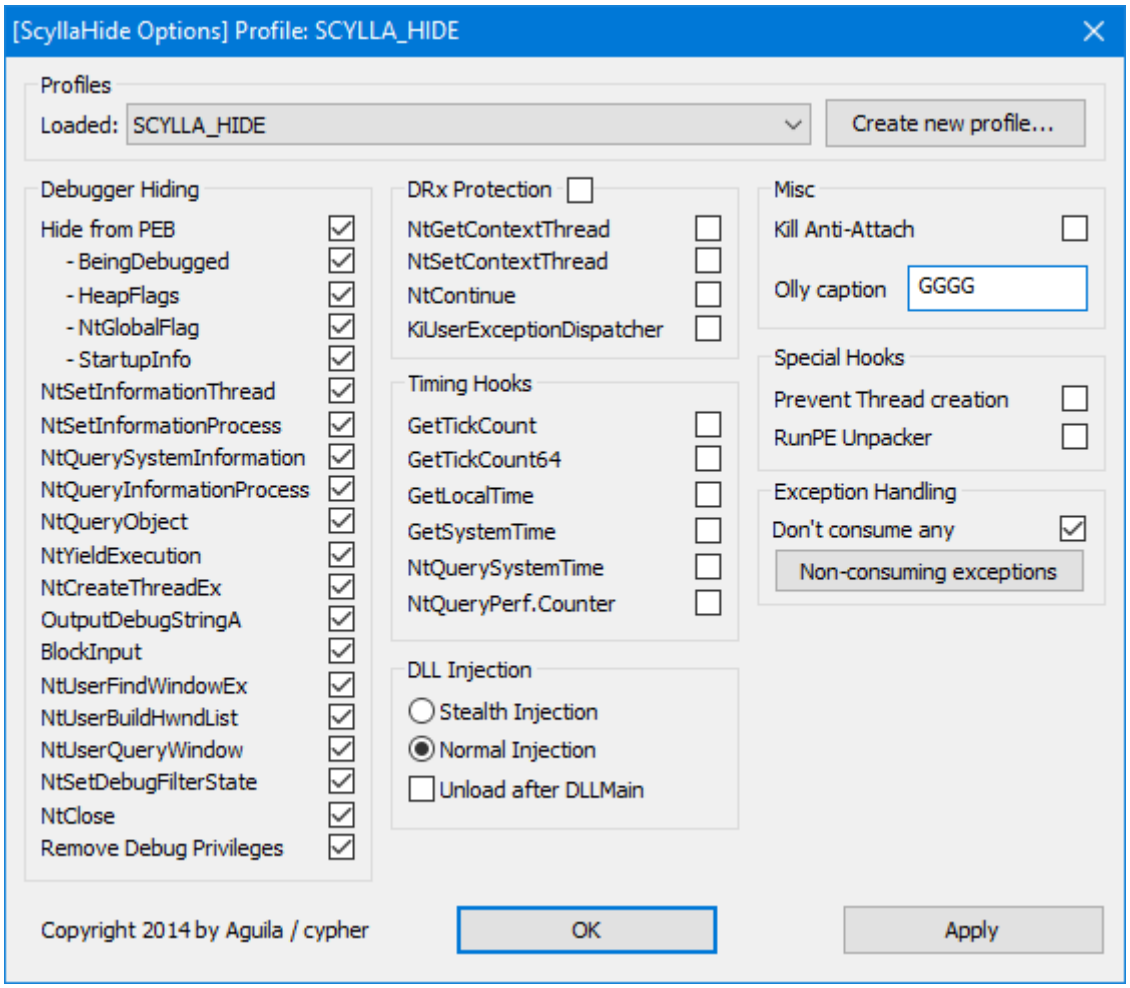

Figure 4: OllyDbg v2 Plugin

3.4.1 Change window caption

Change the OllyDbg window caption. This can be useful against e.g. FindWindow anti-debug tricks. You don't need to enable this, if you have the NtUser* hooks enabled! Hint: You can use it to make the currently used profile visible.

3.5 IDA Specific

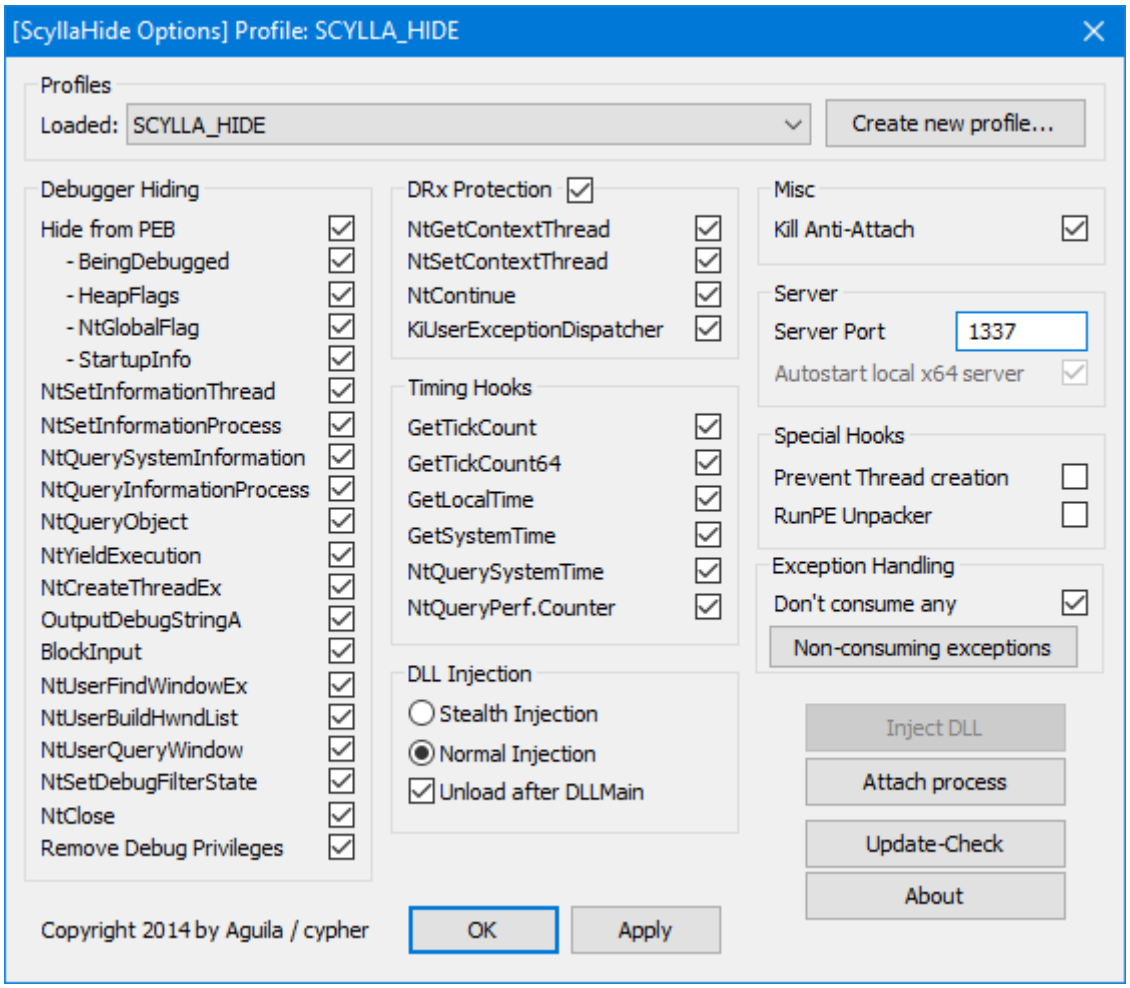

Figure 5: IDA Plugin

3.5.1 Server Option

Remote debugging is fully supported. Define the TCP port for the special IDA Server application. X64 debugging requires remote debugging, because IDA (64-bit) is a 32-bit application.

4 Advanced Information

4.1 Nt* APIs from user32.dll

Listing 5: Special Nt* APIs declaration

```
HWND
NTAPI
NtUserFindWindowEx(
    IN HWND hwndParent,
    IN HWND hwndChild,
    IN PUNICODE_STRING pstrClassName OPTIONAL,
    IN PUNICODE_STRING pstrWindowName OPTIONAL,
    IN DWORD dwType);

NTSTATUS
NTAPI
NtUserBuildHwndList(
    IN HDESK hdesk,
    IN HWND hwndNext,
    IN BOOL fEnumChildren,
    IN DWORD idThread,
    IN UINT cHwndMax,
    OUT HWND *phwndFirst,
    OUT PUINT pcHwndNeeded);

HANDLE
NTAPI
NtUserQueryWindow(
    IN HWND hwnd,
    IN WINDOWINFOCLASS WindowInfo);
```

4.2 Special PEB Fix Information

There is a special piece of code inside the debug loop of the plugins and it seems like there is a bug:

Listing 6: Special PEB Fix Code

```
    if (pHideOptions.PEBHeapFlags)
    {
        if (specialPebFix)
        {
            StartFixBeingDebugged(ProcessId, false);
            specialPebFix = false;
        }

        if (debugevent->u.LoadDll.lpBaseOfDll == hNtdllModule)
        {
            StartFixBeingDebugged(ProcessId, true);
            specialPebFix = true;
        }
    }
```

But this code is correct and very important. This nice trick removes heap artifacts (You can read more about it here: `http://pferrie.tripod.com/papers/unpackers.pdf` "The heap"). Themida and other protectors are checking for

heap artifacts. Instead of manually wiping the artifacts, the code prevents the heap artifact creation.

5 Frequently Asked Questions

The error "NT APIs missing" appears, how to solve it?

- You need to put NtApiCollection.ini in the same directory as ScyllaHide.dll or the following hooks will not work: NtUserQueryWindow, NtUserBuildHwndList, NtUserFindWindowEx
- Some Nt* WINAPI functions are not exported by a DLL, so it is necessary to get the function addresses from another source. The other source is the PDB file. The adresses can be resolved with the NtApiTool packaged in the release. It will download the PDB file from the Microsoft server to resolve the missing function addresses.

6 Developer Contact Information

Carbon *alias* **Aguila** *alias* **NtQuery**

- `https://github.com/NtQuery/`
- `https://bitbucket.org/NtQuery/`
- `https://forum.tuts4you.com/user/22354-aguila/`
- `https://forum.exetools.com/member.php?u=36473`

cypher *alias* **cypherpunk**

- `https://bitbucket.org/cypherpunk/`
- `https://forum.tuts4you.com/user/77269-cypher/`
- `https://forum.exetools.com/member.php?u=36610`

mrexodia

- `https://github.com/mrexodia/`
- `https://bitbucket.org/mrexodia/`
- `https://forum.tuts4you.com/profile/54652-mrexodia/`

Mattiwatti

- `https://github.com/Mattiwatti/`
- `https://bitbucket.org/Mattiwatti/`
- `https://forum.tuts4you.com/profile/93562-mattiwatti/`

7 Version History

Version 1.4

- Fixed bug with PEB heap flags, bug found by kao `http://lifeinhex.com/net-scyllahide-and-heap_create_enable_execute/`
- All Plugins: Cool ghost icon
- Olly v1 Plugin: Fix bug - system dll detection
- Olly v1 Plugin: Detach from process feature

Version 1.3

- All Plugins: Improved tooltips
- All Plugins: Bugfixes
- All Plugins: Don't swallow exceptions like DBG_RIPEXCEPTION or DBG_PRINTEXCEPTION_C
- Olly v1 Plugin: Custom Toolbar for Dump and CPU window
- Olly v1 Plugin: Special shortcuts

Version 1.2

- All Plugins: New attach dialog with crosshair/bullseye window finder.
- All Plugins: Tooltips with information (unfinished).
- Olly v1 Plugin: Fix for NT Symbols path
- Olly v1 Plugin: Fix for faulty handle bug

Version 1.1

- Added "thanks" to About
- Added kill anti-attach (for x86 only)
- Olly v1 Plugin: Advanced CTRL+G
- Olly v1 Plugin: Skip "compressed code" message
- Olly v1 Plugin: Ignore bad PE image (WinUPack)
- Olly v1 Plugin: Skip "Load DLL" message

8 License Information

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Version 3, 29 June 2007

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The "source code" for a work means the preferred form of the work for making modifications to it. "Object code" means any non-source form of

a work.

A "Standard Interface" means an interface that either is an official standard defined by a recognized standards body, or, in the case of interfaces specified for a particular programming language, one that is widely used among developers working in that language.

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```
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