



# Engineering Development Group

## UMBORAGE: StolenGoods Version 2.1

### **User Manual**

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## 1. (U) Scope

(S//NF) This document is the User Manual for Stolen Goods v2.1, a persistence method for the Grasshopper installer or the Shellterm shellcode injector. It provides a description of how Stolen Goods works, the payloads Stolen Goods can persist, and how to use Stolen Goods with Grasshopper and Shellterm.

(S//NF) Stolen Goods 2.0 is fundamentally different from Stolen Goods 1.0. This user guide will not include information about Stolen Goods 1.0. Please see the original Stolen Goods 1.0 user guide for all 1.0 information. All information contained here is in reference to Stolen Goods 2.0 only.

(S//NF) Stolen Goods 2.1 adds a few core features, and other quality of life improvements. SG 2.1 adds support for Windows 8.1 (x86 and x64), a limited stealth mechanism, and a network capture capability for use with IcePick 1.2

## 2. (U) Fair Warning

(S//NF) This document will stress some details, often repeatedly and in bold letters, that are crucial to remember. This was done purely in the interest of making sure the user has a good first experience with the tool, and to help the user avoid the same mistakes the developer made while testing the tool. There are plenty of ways to easily misconfigure Stolen Goods 2.1 for a target OS. Most mistakes will cause the system to constantly fail to boot or constantly blue screen during start up. The target would then need to reinstall their OS to fix the issue most likely (or use some kind of recovery CD). Considering the consequences for installing a misconfigured SG2 install are high, it is important that you either:

- Read this guide in its entirety (or at least the sections pertaining to the installation method of choice)
- Ask the developer for a quick demo on how to use it for your particular CONOPS

(S//NF) The current developer of SG2 is very much willing to do demos for parties who want to use SG2 and want to make sure they're using it correctly. The builders are easy to use after going through the process once or twice.

### 3. (U) Overview

#### 3.1 (U) Stolen Goods Tool Description

(S//NF) Stolen Goods 2.1 (SG2) is a persistence module for Grasshopper and Shellterm based on components from 3<sup>rd</sup> party malware. The components were taken from malware known as Carberp, a suspected Russian rootkit used by organized crime. The source of Carberp was published online, and has allowed AED\RDB to easily 'borrow' components as needed from the malware. Most of Carberp was not used in Stolen Goods 2, specifically all the Bot net/Communications components. The persistence method, and parts of the installer, were taken and modified to fit our needs. All components taken from Carberp were carefully analyzed for hidden functionality, backdoors, vulnerabilities, etc. **A vast majority of the original Carberp code that was used has been heavily modified. Very few pieces of the original code exist unmodified.**

(S//NF) SG2 maintains persistence by installing custom Initial Program Loader (IPL) code found in the Volume Boot Record (VBR; also known as the Partition Boot Record or PBR). Using a series of function hooks, SG2 is able to maintain execution along the Windows boot sequence, when at one point it loads a stub driver into the system to maintain code execution after the boot process is finished. The stub driver borrows some ideas and components from the original Carberp source, but most of the stub driver has been rewritten by RDB.

(S//NF) SG2 is able to persist two different payloads at once: a DLL payload (GH1 or Persistence Spec compliant) and a driver payload (JediMindTricks/AncientProtector specifically). The driver payload does **not/not** need to be signed at all, even on 64-bit Windows systems.

#### 3.2 (U) Dependencies

(S//NF) SG2 requires Grasshopper for configuration and installation. This document assumes the user has a working Grasshopper build (along with all of Grasshopper's dependencies).

(S//NF) SG2 also has the ability to be launched through a kernel shellcode install module included in the latest version of ShellTerm (2.8.1+). This method installation is easier to configure compared to Grasshopper, but does not contain many of the safety checks Grasshopper gives you. Therefore, the shellcode installer should only be used by someone who is comfortable and confident with its use.

#### 3.3 (U) MD5 Hashes

(U) Hashes of the Stolen Goods v2.1 binaries

Control32.dll	b3dc808fc7cb4492669ec019911ef22a
Control64.dll	bec30379078d5c5c7845d3be33707b89
GH_PM32.dll	2f2c5b3f3b1f97908074f526ac90a28d
GH_PM64.dll	fe6c0097412b2c7b7f4b8a489004dd14
MemStub32-GH1.dll	0a579ad25fdd4db8110aac4dbb7d2da3

MemStub32.dll	8987652f26732607b769247adb4e9cce
MemStub64-GH1.dll	2350403a09e6928f0a7ba5d74da58cb9
MemStub64.dll	6b5b46d3212fc3fc5b455d9efd8d3ffa
msvcrt_Win7AMD64.sys	c8fc794cc5a22b5a1e0803b0b8acce77
msvcrt_Win7x86.sys	7713e5c5a48b020c9575b1b50f2e5e9e
msvcrt_WIN8AMD64.sys	33c59fcdf027470e0ab1d366f54a6ebf
msvcrt_WIN8x86.sys	95490c2b284a9bb63f0ee49254ab727e
msvcrt_WinXPx86.sys	b68f72d77754f8b76168ced0924a4174
Network_Win7AMD64.sys	eb92031a38f17d0e63285b5142b31966
Network_Win7x86.sys	548889baed7768b828d9c2f373abd225
Network_WinXPx86.sys	877341a16d5d223435c43a9db7f721bc
RabbitStew32.exe	a9d2e8ae5ddb8f2842d96f7de2faef8
RabbitStew64.exe	fa415b6280104e813770df520b303897
Vbr.exe	961d2fd68fde2ae0b7c52e0c90767d0d

## 4. (U) Operation

### 4.1 (S//NF) Important note for 2.1+

(S//NF) SG 2.1 added in a stealth component. SG2 will now 'hide' the disk sectors where the payload data is written to inspection with tools such as WinHex. The sectors will appear as 0's. Also, the infected IPL code in the VBR will be 'hidden' by SG2. When a tool such as WinHex inspects the VBR's IPL code, it will see the original IPL code, not SG2's IPL code. This, unfortunately, means that the SG2 installer cannot detect a previous install of SG2 on a system if the system has been rebooted since the first install. **SG2 will still be able to prevent double installs before the first system reboot.**

(S//NF) To compensate, SG2's Uninstall DLL will now have an additional feature, and it's name changed to Control32 and Control64. Running the Control DLL on a target after first reboot, with the '-c' argument, will instruct the Control DLL to verify whether SG2 is installed on a machine. This will only work after the system has been rebooted following installation. Therefore, there is complete coverage for installation detection. **It is very important to ensure that a machine does not have SG2 installed before attempting installation of SG2. Double installs are very bad.**

### 4.2 (S//NF) Payload Types

(S//NF) SG2 can persist up to 2 payloads: A driver payload (.sys) and a DLL payload (.dll). The latter can come in 2 forms:

- Standard Persistence Specification compliant DLLs
- Grasshopper-1 interface compliant DLLs

(S//NF) The driver payload **MUST//MUST** match the bitness of the target, and should be compatible with the target OS. No driver signing is required.

### 4.3 (S//NF) Grasshopper installation

(S//NF) The following steps describe how to install the SG2 persistence module to an existing Grasshopper build:

1. Navigate to the main folder of an existing Grasshopper build. This is the folder containing the Grasshopper builder scripts and other Grasshopper components.
2. There should be a "Modules" folder here. Copy the "StolenGoods2" directory to the "Modules" folder.
3. In the Grasshopper build folder (where "Modules" was located) there should also be a folder named "Payloads". Copy the following provided folders into "Payloads": Generic\_DLL, Generic\_GH1

### 4.4 (U) Configuration

(S//NF) SG2 is unique compared to normal Grasshopper modules in it's ability to persist two separate types of payloads. Because of this, SG2 has an odd build path when using Grasshopper. Please pay careful attention as misconfiguration can cause at best a bad install, and at worst a BSOD on the target box.

1. After installing SG2 (section 3.2), browse to the StolenGoods2 folder in Modules. Inside there will be the binary 'Vbr.exe'. Run it (double clicking it will be fine). It should create a file called 'ipl.asm'. This is the VBR persistence code. Each time you run Vbr.exe, it will remix the VBR persistence code. All but the first 12 bytes of ipl.asm will change each time Vbr.exe is run. This is important if you wish to create signature diversity between installers.
  - **Windows 8.1 support:** In 2.1, SG2 can operate against Windows 8.1. This requires different IPL code compared to Windows XP-7. To produce the right IPL code, run VBR.exe from the command line with one of the following arguments:
    1. --832: To generate IPL code for Windows 8.1 x86
    2. --864: To generate IPL code for Windows 8.1 x64
2. Start up the Grasshopper or Cricket installer
3. When choosing a payload type, choose the type that corresponds to the DLL payload you wish to persist.
  - You can persist a Persistence Spec DLL, or a GH1 compliant DLL
  - If you're not going to persist a DLL (driver only) then pick any option that is compatible with SG2
4. When prompted for the Binary path, **do not enter the path to the payload DLL you wish to use.** You will be prompted for that path later. Instead, you must enter the path to one of the following four DLLs: MemStub32, MemStub32-GH1, MemStub64, MemStub64-GH1. All four DLLs are in the SG2 folder you installed (<grasshopper install folder>\Modules\StolenGoods2). Pick the correct one based on the DLL you're going to persist and the target system.
  - If you're not using a GH1 DLL payload, pick MemStub32 or MemStub64 (based on target OS bitness). If you are, pick one of the GH1 DLLs
  - If you're not persisting a DLL (driver only) you can pick any DLL that matches the bitness of the target system
5. The builder will now prompt you to select a persistence method. For 64-bit target OS, there will be one SG2 entry (Win 7). For 32-bit target, there will be two SG2 entries (Win 7, Win XP, or Win 8.1). Pick the one you want based on your target.
  - **Windows 8.1 support:** It is important to pick the correct entry for Windows 8.1. If you pick the Win 7 entry and throw on 8.1, the system will throw a BSOD on boot.
6. The SG2 persistence module will now take over and prompt you for a path to your target payload DLL. This is where you enter the path to the DLL you want to persist
  - If you're not persisting a DLL, just leave this blank and hit enter
7. Next, you'll be prompted for an optional command line to send to the payload DLL (Persistence Spec compliant DLLs). Enter a command line here if needed
  - If not needed, leave blank and hit enter
8. Next, you'll be prompted for the Environment Variable name to create to send the command line entered previously to a Persistence Spec compliant DLL. Enter that name here if needed
  - If not needed, leave blank and hit enter

9. Next, you'll be prompted for a path **on target** to write the stub DLL to. The stub DLL handles loading the payload DLL in-memory. The path will be created by Grasshopper if it doesn't already exist, if Grasshopper is able to (sufficient permissions at time of install)
  - If a DLL is not being persisted (driver only) leave this blank and hit enter
10. You'll be prompted for the path to the payload driver you wish to persist.
  - If you're not persisting a driver (DLL only) leave this blank and hit enter
  - **Make sure you are using a driver that is compatible with the target system. Grasshopper cannot perform any checks to determine if the payload driver you gave will be OK to run on the target system. Choosing an incompatible driver for the target system will most likely cause a Blue Screen of Death (BSOD) on the target machine.**
11. Finally, you'll be asked if you wish to use the network driver component. This component captures network packets and allows a payload to call into SG2 to retrieve the network packets. The only tool which supports talking with SG2 (at the time of this writing) is IcePick v1.2
12. You may be prompted to change Grasshopper rules (two T/F questions). Unless you know what you want, you should just hit enter (default answer of F) for both questions.
13. (Grasshopper only) Type generate and hit enter
14. (Grasshopper only) Type build and hit enter
15. You'll be asked if the target is Windows 8.1 or not. Make sure to answer these questions correctly. Failure to do so will mean Grasshopper will pick the wrong IPL code for persistence, and will brick the OS install on target.
16. If you chose to use the network component, then you'll have to type in the target OS twice during the build phase when prompted. Make sure to select the proper OS target!

(S//NF) You're now done configuring a Grasshopper/Cricket build. The installers will be written to the given output folder. No matter what your target OS/Bitness is, a 64 and 32 bit version of the Grasshopper/Cricket DLL and EXE installers will be built. Choose what you need accordingly.

#### **4.5 (S//NF) Shellterm Kernel Shellcode Installer**

(S//NF) SG2 comes with the ability to be installed using Shellterm's kernel shellcode launcher. **FULL DISCLOSURE: This installation method does not have any real safety checks, and requires the user to be very careful about using it. All payloads must be chosen by the user, and making an incompatible choice will, most likely, cause the system to crash with a BSOD either during installation or after reboot.**

(S//NF) Included in this delivery is a 'shellcode builder' folder. Inside will be several binaries. First, you must run (double clicking is fine) the Vbr.exe binary. This will mix the VBR assembly code and produce ipl.asm. Re-running Vbr.exe will remix the VBR persistence code, resulting in all but the first 12 bytes being different.

(S//NF) **Windows 8.1 support:** In 2.1, SG2 can operate against Windows 8.1. This requires different IPL code compared to Windows XP-7. To produce the right IPL code, run VBR.exe from the command line with one of the following arguments:

- --832: To generate IPL code for Windows 8.1 x86. Will generate ipl\_832.asm
- --864: To generate IPL code for Windows 8.1 x64. Will generate ipl\_864.asm

(S//NF) Next, using a command prompt, you'll need to run RabbitStew32.exe or RabbitStew64.exe. Remember, you must choose the correct binaries that are compatible with the target system, or you will BSOD the target

1. [--xp | --732 | --764 | --832 | --864]: The OS of the target system. This choice is crucial, as an incorrect choice here will lead to an incorrect choice by the builder for many key components, which *will* result in system instability, BSOD, or straight OS boot failure. Only 1 choice should be given.
2. --ps <path to driver payload>: Optional. Path to the driver payload for SG2 to persist. The user needs to ensure this payload will work on the target OS. SG2 does no verification of the driver payload beyond checking that it exists.
3. --pd <path to DLL payload>: Optional. Path to the DLL payload for SG2 to persist. As for --ps, the user must ensure the DLL will work on the target system.
4. --sp <path on target for a stub>: Required if --pd is used. Path on target for SG2 to save a stub DLL for injection of the payload DLL. The stub is a simple downloader/memory loader which is used to inject the payload into the target process. This path must exist on the target or installation will fail (Error 104).
5. --network: Optional. Turns on the network component.
  - i. Note for Windows 8.1: The network component should work just fine on Windows 8.1. However, it is using a Windows 7 driver and deprecated functionality (deprecated since XP). It uses the same functionality as WinPCap, which supports Windows 8.1. Having said all that, there is still risk involved. Therefore, when using the network component for Windows 8.1 targets, you must specify --network AND --ikwid. Otherwise, the builder will fail and tell you that --network can't be used on Windows 8.1
6. --gh: Optional. If a payload DLL is given, **and the payload DLL is GH1 compatible**, then this switch can be used to utilize the GH1 stub, allowing use of GH1 functionality with the GH1 DLL payload. **Do not use this switch unless you are 100% sure the payload DLL is GH1 compliant. Otherwise, process instability can occur.**
7. --output: Optional. The name of the output .bin file, containing the configured SG2 install for Shellterm's shellcode installer.

(S//NF) At least one payload is required (DLL or Driver). You can persist one driver and one DLL at the same time if you wish. There are two RabbitStew executables (32 and 64 bit). Choose the EXE that reflects the target machine's bitness. For example, if building an installer for Win 7 32-bit, use RabbitStew32.exe.

(S//NF) RabbitStew will print out a bunch of diagnostic information, including all files it opened and read for use. Make sure the files selected are the ones you want. RabbitStew will write out to the given output file (--output) or a default name if none is given. A receipt file is generated with a time stamp in the name. This receipt file contains all the options used when configuring SG2, the XOR keys used for obfuscating the payloads for install, and a SHA256 hash of the output bin file.

(S//NF) Example (using provided kshellcode.py script): kshellcode  
'/home/user/shellcode\_x86.bin'

(S//NF) The shellcode installer should return a number based on the result of the installation. If the installer returns 0, then installation was successful. If the installer returns a non-zero number, the installation failed. There are a lot of unique codes that can be returned. Some common ones are as follows:

- 900 – Previous installation of SG2 was detected. If you're 100% sure this is not the case, it may be possible that someone else installed a custom VBR implant on the machine. See the developer to get more details
- 102 – The machine is using a non-standard sector size (standard is 512 bytes). This can really mess up installation, so SG2 exits safely. If this occurs, you'll need to talk to the developer about a custom compilation to run on this machine.
- 103 – The total size of the payloads is too big for the free space found on the target machine. Typically using a DLL and Driver payload combination that totals more than 1 MB will be too big. The goal is to remain under 850 KB in total payload sizes (overhead of required components is typically < 150 KB), which would result in ~1MB total size. Space requirements are dependent on the target machine. Some machines can have 6-7 MB of unpartitioned space, others may only have 1 MB (contiguous).
- 104 – The installer failed to write the stub DLL to disk. The likely cause of this is that the target path exists already. Example: Tried to lay down stub DLL to c:\windows\system32\msxml6.dll but msxml6.dll already exists in that directory.
- 6 – The active partition is not an NTFS partition. Not safe to install in this case.
- 105 – This generally means there was not sufficient space on the disk that SG2 could write to when installing payload data. SG2 installs to free space on the disk (not the file system). If this error occurs after repeated throws (2-3 times in a row) then SG2 cannot install on the system at this time. Report these instances to the developer. If there are enough important systems that have this issue, there are (non-trivial) ways of getting around this problem that can be worked on in future versions.

(S//NF) Other return errors for the shellcode installer, and for the Grasshopper installer, describe many other issues that could arise. If you get a code not listed above, the developer can look it up for you.

#### 4.6 (U) Installation Confirmation

(S//NF) To confirm an installation of SG2 which persisted a DLL payload, simply check that the stub DLL was laid down on disk at the target location.

(S//NF) To confirm that a driver-only payload installation of SG2 worked, you'll have to rely on the return codes of the installers. Driver-only installs write nothing to the file system on disk, and verification of installation would require inspection of the disk using something like WinHex. You could try to re-install again and see if you get a previous install return code (900 for the shellcode installer).

(S//NF) Starting in SG 2.1, the Uninstall DLL (Named Control32 or Control64) will have the ability to verify installation without uninstalling. Using the -c argument, the DLL will verify installation **after a reboot**.

### 5. (U) Uninstall

(S//NF) If a GH1 payload is being persisted, the GH1 payload can trigger an uninstall. Otherwise, two DLLs have been provided to trigger an uninstall event. The DLLs Control32 and Control64 are simple Fire and Forget DLLs which tell SG2 to uninstall. To instruct the Control DLL to uninstall, provide the -u argument. A non-zero return value indicates failure. Otherwise, zero is returned.

(S//NF) If a payload DLL was used, the stub DLL on disk will be queued for deletion after the next reboot. All other artifacts (stub driver, payload driver, payload DLL) are wiped from disk during the uninstall process (3x overwrite with zeros).

(S//NF) **Note:** GH1 uninstalls can take some time. During testing, it was possible to trigger the GH1 uninstall through something like IcePick, and restart the system before IcePick had a chance to notify the SG2 stub to uninstall. Typically, the GH1 uninstall will take 30-60 seconds to complete.

## 6. (U) Additional Information

### 6.1 (U) Startup Delay

(S//NF) Stolen Goods 2.1 uses a start up delay timer when injecting the DLL payload to ensure process stability. The current timer is set to 5 minutes, which starts when a certain event is detected on the system during system startup. Following this timer, the stub will inject the DLL at the first opportunity it gets. This timer is not configurable at build time, but the developer can recompile a driver with an adjusted wait timer if the need arises.

### 6.2 (U) System Presence

(S//NF) Stolen Goods 2 will drop at most 1 file to disk (stub DLL). The stub DLL contains open-source memory load code, and code to initialize a GH1 payload (if used). It also contains code to contact the stub driver for downloading the decrypted DLL payload, and for triggering an uninstall.

(S//NF) SG2 saves the stub driver, payload driver (if any) and payload DLL (if any) in free space on the disk. Usually this space is between the MBR and partition entries, or in unpartitioned space at the end of the disk. The stub driver is XOR obfuscated. The payload driver and payload DLL are encrypted with a host-key that is based off information in the Bios Partition Block in the partition block. If this host-key information is changed, decryption will fail and SG2 will uninstall immediately.

(S//NF) If SG2 is installed through the shellcode installer, the payload are XOR obfuscated upon initial installation. After the first reboot, SG2 will figure out that the payloads are only XOR obfuscated, and will rewrite them to disk encrypted. Therefore, after the first reboot, all the payloads will be encrypted, regardless of install method.

(S//NF) SG2 will create registry keys for the NULL driver for use with JediMindTricks. If the payload driver is not JediMindTricks, the registry creation will still occur, and will cause no side effects on the system. The registry keys are not out of the ordinary; they are standard registry keys/values needed for a filter driver. The values do not contain file names or other information that relates to JediMindTricks, SG2, or any paths used by those tools. The keys are created for the NULL service/driver entry. SG2, if configured to use the network component, will create an additional registry value under the NULL service key entry.

(S//NF) During the uninstall process, SG2 will write a registry key to schedule the disk stub for deletion after the next reboot. This key will be removed by Windows after reboot.

### **6.3 (U) Troubleshooting**

**(S//NF) Q: The Grasshopper/Cricket installer blew up on me when I tried to generate/build a binary (after answering all the SG2 questions)**

**(S//NF) A:** Make sure all paths to binaries you want to use on your box are valid and the files exist. Typically the configuration tool will blow up if a file you gave it doesn't exist when the config tool goes to find and read the file.

**(S//NF) Q: Does this work on Windows 8?**

**(S//NF) A:** Yes! Starting in 2.1 it will. However, you must take additional steps to build a Win 8.1 install. It is not the normal build process for a XP-7 build.

**(S//NF) Q: This works on Win 7/Win XP, does it work on Windows Server 20XX?**

**(S//NF) A:** I do not know. SG2 will likely work just fine on Server 2003. It is untested on any OS outside of Win XP/Win 7/Win 8.1. Chances are if it's a Server version that is similar to Win XP/Win 7/Win 8.1. You should test any new OS with SG2 before deployment, because the consequences of failure typically are BSODs or constant system boot failures.

### **6.4 (S) PSP characterization**

#### **6.4.1 (S//NF) Kaspersky**

**(S//NF)** Nothing to note for this release. Kaspersky has signed this tool in the past, and the current version of SG2 was resignatured to defeat past signatures. Be sure to test this tool against the Kaspersky version on target (or the latest release) to ensure new updates have not resignatured SG2 again.

#### **6.4.2 (S//NF) 360safe**

**(S//NF)** On Windows 8.1 x86, system instability was noted when running 360safe and StolenGoods 2.1. The issue is being investigated. This issue was not seen on Windows 8.1 x64, nor any other supported OS tested. The issue is likely related to PSP interactions with the OS and SG components.

#### **6.4.3 (S//NF) Symantec**

**(S//NF)** On Windows 8.1 x86, system instability was noted when running Symantec and StolenGoods 2.1. The issue is being investigated. This issue was not seen on Windows 8.1 x64, nor any other supported OS tested. The issue is likely related to PSP interactions with the OS and SG components.

#### **6.4.4 (S//NF) ESET NOD 32**

**(S//NF)** Nothing to note for this release. ESET NOD 32 has signed this tool in the past, and the current version of SG2 was resignatured to defeat past signatures. Be sure to test this tool against the ESET NOD 32 version on target (or the latest release) to ensure new updates have not resignatured SG2 again.

#### **6.4.5 (S//NF) Other PSPs**

(S//NF) Testing should be done with PSPs not listed on the requirement. There is no reason why SG2 would not work on systems running other PSPs, but each PSP signatures things differently. Frankly speaking, all PSPs should be tested before deployment, as signatures can change and cause alerts. SG2 has been resignatured several times to beat PSPs, and can be resignatured again should an issue arise with a particular PSP.

### **7. (U) Acronyms and Abbreviations**

(U) The following acronyms and abbreviations are used in this document:

(S//NF) GH1 – Grasshopper-1 Interface

(S//NF) FNF, F&F – Fire and Forget (specification)

(S//NF) SG2 – Stolen Goods 2.1 (this tool).

## 8. (S//NF) Example 1: Using Grasshopper to install SG2.1

(S//NF) This example will configure a Grasshopper installer for Stolen Goods 2.1. The target will be Windows XP, SG2 will use the network component, the payloads will be ICEPICK and JediMindTricks, and it will use the GH1 stub. This example assumes you've run Vbr.exe in the Grasshopper StolenGoods2 folder. Make sure you've generated ipl.asm (or ipl\_832.asm/ipl\_864.asm if building for Windows 8.1) and that the file is in the StolenGoods2 module folder in the Grasshopper build directory.

(S//NF) Figure 1 – We want to use a 32-bit payload, so we select the generic, Persistence-spec compliant 32-bit entry, #8

```

-----
|      | Payload Name                | Persist Method | Interface |
-----+-----+-----+-----
| 4    | Generic PnF DLL (32bit)      |                | fnf       |
| 5    | Generic DLL (32bit)          |                |           |
| 6    | Generic DLL (64bit)          |                |           |
| 7    | Persistence Spec DLL (64bit) |                |           |
| 8    | Persistence Spec DLL (32bit) |                |           |
| 9    | Generic GH1 (32bit)          |                | gh1       |
| 10   | ICEPICK DLL-32               |                | gh1       |
| 11   | ICEPICK EXE-32               |                |           |
| 12   | ICEPICK DLL-64               |                | gh1       |
| 13   | ICEPICK EXE-64               |                |           |
-----+-----+-----+-----
Type '? <index>' for more information about the payload
Payload Index to Add: 8_

```

(S//NF) Figure 2 – The 'payload' here is really the correct on-disk stub. Since we're going to use a GH1 payload on a 32-bit machine, we write the path to MemStub32-GH1.dll here.

```

Entry:
Type: hitness.32, run_level.system, format.exe

Entry:
Type: hitness.64, run_level.system, format.exe

Compat Result: False

Binary [None]: C:\Users\Dev\Documents\grasshopper\grasshopper_1.1\build_out\2014-01-28T16.20.07_grasshopper_1\
Modules\StolenGoods2\MemStub32-Gh1.dll

```

(S//NF) Figure 3 – We want to use Stolen Goods 2 on XP, so we choose #6

```

Available Persistence Modules:
-----
|      | Module Name                    | Persist Method |
-----+-----+-----
| 0    | Bermuda 32-bit                 | Windows Scheduled Task |
| 1    | Bamboo 32-bit                  | Service DLL Hijack     |
| 2    | Buffalo 32-bit                 | Service DLL             |
| 3    | Crab 32-bit                    | Standalone Service     |
| 4    | Netman 32-bit                  | Netman Registry Mod    |
| 5    | Stolen Goods 2 (WIN 7 - 32 bit) | Windows UBR            |
| 6    | Stolen Goods 2 (WIN XP - 32 bit) | Windows UBR            |
-----+-----+-----
Type '? <index>' for more information about the persist module
Persist Module Index to Add: 6

```

(S//NF) Figure 4 – Here is where we enter the full path to the DLL payload we want to persist. If none is used, we can just hit enter here (no other input)

```
Getting data for StolenGoods2 Module:
<Optional>Target DLL payload file [None]: c:\payloads\sg_ip_32_gh1.dll_
```

(S//NF) Figure 5 – We can enter optional command line arguments for a Persistence Spec compliant DLL here. The first entry is the command line to send, the second entry is the name of the environment variable to store the command line in for the payload to access. Both are optional, and can be skipped by just hitting enter (no input)

```
<Optional>DLL payload command line [None]:
<Optional>DLL payload command line environment variable name [None]:
```

(S//NF) Figure 6 – Next, we enter the on-target path to save the on-disk stub for launching the DLL payload. For Grasshopper, the directory does not have to exist on target, but Grasshopper must have the permissions to create the directory path, and to write a file to that location.

```
<Optional>DLL payload command line environment variable name [None]:
Overt full stub Path <including file name> [None]: c:\noscan\dontscanmebro\stub.dll
```

(S//NF) Figure 7 – Next, we enter the full path to the payload driver we want to persist. If none is used, we can just hit enter here (no other input). Remember, at least 1 payload (DLL or driver) is required (otherwise, what's the point?)

```
Overt full stub Path <including file name> [None]: c:\noscan\dontscanme
<Optional>Target Driver payload file [None]: c:\payloads\ap_winxp.sys_
```

(S//NF) Figure 8 – We want to use the network component, so we enter T here.

```
<Optional>Target Driver payl
Network Addon, T/F [F]: T_
```

(S//NF) Figure 9 – Grasshopper will let you edit rules here. This example uses the default rules, which only verifies that the target OS is Windows XP SP3, and admin access is granted to the Grasshopper process when installing. Just hit enter to move on from both prompts to leave it as-is.

```

Network Addon, T/F [F]: T
Using Payload Rule:
and {
  grasshopper.true
}
Would you like to edit T/F [F]:
Using Persist Rule:
and {
  grasshopper.access_at_least(admin)
  os.release(winxp-sp3)
}
Would you like to edit T/F [F]: _

```

(S//NF) Figure 10 – If using the Grasshopper builder (not the Cricket builder) you'll have the chance to add more persistence modules for the payload. In this example, we only want the 1 entry, so we'll type 'generate' to signal we're done configuring persistence for this payload.

```

Current Payload:
-----
| Payload Name                | Persist Method | Interface |
| Persistence Spec DLL (32bit) |                |           |
-----

Applied Persist Modules:
-----
| | Name                                | Persist Method |
| 0 | Stolen Goods 2 (WIN XP - 32 bit) | Windows UBR    |
-----

Add Payload Commands
=====
add_persist      cancel          delete_persist
edit_persist     generate        insert_persist
move_persist     print_persist

<type help <command> for specific information>
add_payload# generate

```

(S//NF) Figure 11 - If using the Grasshopper builder (not the Cricket builder), you'll have a chance to add more payloads. In this example, we're only using the 1 payload, so we'll type 'build' to signal we're done configuring this Grasshopper build.

```

Payload supported type:
Type: bitness.32, run_level.system, format.dll

Entry Stolen Goods 2 (WIN XP - 32 bit) Type List:

Entry:
Type: bitness.32, run_level.system, format.dll

found a matching payload type in the persist module: Stolen Goods 2 (WIN XP - 32 bit)
Compat Result: True
Build Outputs: all

Selected Payloads:
-----
| | Payload Name |
-----
| 0 | Persistence Spec DLL (32bit) |
-----

Grasshopper Tool Builder Commands
=====
add_catalog      add_payload      build
delete_payload  edit_payload     exit
insert_payload  move_payload     print_payload
set_build_note  set_build_outputs set_global_rule
set_log_path

<type help <command> for specific information>
grasshopper# build

```

(S//NF) Figure 12 – Both the Grasshopper and Cricket builders will reach this point where the binary is being built. SG2 needs to know if the target OS is Windows 8.1 or not (VERY IMPORTANT TO ANSWER CORRECTLY). In this example, the target OS is Windows XP, so we answer 'n' here

```

Created binary output file: c:\Users\Dev\Documents\grasshopper_1\stout\2014-07-16t13.46.15-grasshopper.build\
***IMPORTANT*** Is the target OS Windows 8.1? [y/n]: n_

```

(S//NF) Figure 13 – Since the previous question is extremely important, Grasshopper gives you one last chance to confirm that the OS target is or is not Windows 8.1. Again, this example targets Windows XP, so we'll answer 'y' here to confirm that the target OS is NOT//NOT Windows 8.1

```

***IMPORTANT*** Is the target OS Windows 8.1? [y/n]: n
***REALLY, REALLY, SUPER SUPER IMPORTANT*** Confirm target OS is NOT//NOT Windows 8.1 [y/n]: y_

```

(S//NF) Figure 14 – The builder needs to know the exact target OS for the network component. This is necessary because the Grasshopper builder does not provide a way for the handlers to know the target OS selected earlier. Select one of the possible choices, and make sure you select the correct one. In this example, we type 'xp'.

```

Network Component: Target OS (xp | win732 | win764 | win832 | win864): xp_

```

(S//NF) Figure 15 – Currently, there is no way to save your previous 3 answers when Grasshopper goes to build the x64 versions of the installer. Sadly, you'll have to re-answer the last 3 questions again. Make sure you give the same answers...

```
Generating Grasshopper binary: Grasshopper-32.exe
Completed generation of file: Grasshopper-32.exe

***IMPORTANT*** Is the target OS Windows 8.1? [y/n]: n
***REALLY, REALLY, SUPER SUPER IMPORTANT*** Confirm target OS is NOT//NOT Windows 8.1 [y/n]: y

Network Component: Target OS (xp | win732 | win764 | win832 | win864): xp_
```

(S//NF) Figure 16 – Thankfully, you're done! Since this example targeted Windows XP (32-bit) we're only going to use the Grasshopper-32.exe/Grasshopper-32.dll binaries for install (ignoring the 64-bit install binaries).

```
Generating Grasshopper binary: Grasshopper-64.exe
Completed generation of file: Grasshopper-64.exe

Completed building package
```

## 9. (S//NF) Example 2: Configuring SG 2.1 for Shellterm's Shellcode injector module

(S//NF) The following example shows how to configure SG2.1 with an ICEPICK DLL payload, JediMindTricks driver payload, and to use the network component. The resulting binary file will be written to 'winxp32\_dsn.bin'. This assumes Vbr.exe has been run to generate the proper .asm file, and the .asm file is in the same folder as RabbitStew32.

(S//NF) Figure 17 – The first line is what the user enters. We use '--xp' to denote that the target OS is Windows XP. The output from the command includes some debugging information that you can use for verification (these details can be found in the receipt file). Note: some sizes are in sectors (1 sector = 512 bytes for SG2)

```
C:\...\shellcode_builder>RabbitStew32.exe --xp --pd sg_ip_32_gh1.dll --sp c:\stub.dll
--output winxp32_dsn.bin --network --ps c:\payloads\ap_winxp.sys
```

```
Binary: 'winxp32_dsn.bin'..
pArgs [009800F6] offset [d6]
Copying in VBR image
File [Binaries\msvcrt_WinXPx86.sys] size is [49664]
File [c:\payloads\ap_winxp.sys] size is [18560]
File [sg_ip_32_gh1.dll] size is [109568]
File [Binaries\MemStub32.dll] size is [70144]
File [Binaries\network_WinXPx86.sys] size is [23296]
Copying in parameters
Stub Driver size is [97]
Payload Driver size is [37]
Payload DLL size is [215]
Addons size is [46]
Total payload size is [395]
DLL PATH XOR key is: bd ac fa 6d f0 ff 7b ba d6 27 b8 29 56 7d 72 07
--- Write completed..
```

(S//NF) Yes, it is that simple! Note, in the above example, we use a GH1 ICEPICK without using the --gh1 switch (non-GH1 stub). This is OK for ICEPICK, as ICEPICK properly handles the condition where the stub launching ICEPICK is not GH1 compliant. This is by design in ICEPICK, to reduce the number of binaries that can be created. Not all implants are created equally, so do not assume another implant/payload will handle things accordingly.

(S//NF) There are two main downsides to using the shellcode installer. The first, and obvious, one is that you must use Shellterm to launch it. The second downside is that the shellcode installer does not do a lot of safety checks. If the files provided to --ps and --pd exist, they will be read in and used accordingly. If you accidentally provide a text file to --ps, instead of a valid driver file, the system will explode on use. The Grasshopper installer performs a few more verification checks for the user.

(S//NF) The main advantage to using the shellcode installer is the ease of use. The shellcode installer only asks for the target OS once, and selects the SG2-specific binaries for you based on the target OS given. The other advantage on-target is that installing through the Kernel changes the risk of installing. For example, I had seen Kaspersky flag an older cut of SG2 when installing through Grasshopper, but the same configuration was not flagged when installed through kernel shellcode. While this issue has been resolved in previous releases, the fact remains that as PSPs update, installation vectors from the kernel are likely to be safer than user-mode installation vectors (if the former is possible on target).