

# DECLARATION OF RODELIO G. FIÑONES IN SUPPORT OF PLAINTIFFS' APPLICATION FOR AN EMERGENCY EX PARTE TEMPORARY RESTRAINING ORDER AND ORDER TO SHOW CAUSE RE PRELIMINARY INJUNCTION

- I, Rodelio G. Fiñones, declare as follows:
- 1. I am a Senior Security Software Engineer & Malware Researcher Digital Crimes Unit ("DCU"). I make this declaration in support of Microsoft's Application for An Emergency Temporary Restraining Order and Order To Show Cause Re Preliminary Injunction. I make this declaration of my own personal knowledge or on information and belief where noted. If called as a witness, I could and would testify competently to the truth of the matters set forth herein.

## I. <u>INTRODUCTION</u>

2. I have been employed by Microsoft since June 2009. In my role at Microsoft, I assess technological security threats to Microsoft and the impact of such threats on Microsoft's business and customers. I work with a team of investigators that focuses in part on researching different categories of malware, including botnets. My team and I research emerging malware threats through analysis of submitted samples, reverse engineering, forensic examination, data

stream analysis, and development of tools to track botnet development. I am the team lead in developing malware prevention and eradication tools. Prior to joining Microsoft, I worked from 2004-2009 for Fortinet Technologies (Canada), Inc. as a Principal Software

Developer/Researcher (2007-2009) and Senior Antivirus Analyst (2004-2007). My job included research and analysis of complex malware and the development of tools to detect and eradicate malware. From 1999-2004, I worked for Trend Micro, Inc. as a Senior Anti-Virus Researcher and Anti-Virus Engine Developer. During my professional career, I have received advanced, specialized training and extensive practical experience in investigating malware and botnets and in devising technical countermeasures to detect and disable them. A current version of my curricula vitae is attached to this declaration as **Exhibit 1**.

## A. Overview Of My Investigation Into Trickbot And My Top Conclusions

- 3. My declaration concerns a botnet referred to collectively as "Trickbot." A "botnet" is a network of computing devices comprised of Internet-connected computing devices that have been infected with some form of malicious software ("malware"). The malware provides control over the infected computers to the individual criminals who operate the botnet. Botnets vary in size and complexity and may be comprised of only a few hundred up to many millions of infected computers. The Defendants in this case have directed such malware over the Internet to many victim computing devices and have created and control the Trickbot botnet.
- 4. Trickbot is a very scaled botnet that has infected millions of computing devices around the world, leveraging victim machines to steal online banking credentials with a variety of tools, including Man in the Browser ("MITB") capabilities. My investigation leads me to believe that a central group of botnet developers wrote the code for Trickbot and then chose to commercialize it by offering other criminals use of Trickbot on a "rental-as-a-service" basis. Trickbot is disseminated via exploits, malicious spam email and spearphising campaigns, among other methods. The spam email and spearphishing campaigns send unsolicited messages that deceive targeted victims into downloading the Trickbot malware from malicious websites or

through malicious attachments, such as those designed to look like legitimate Microsoft Word documents. TrickBot is also dropped as a secondary payload by other malware.

- 5. Once Trickbot infects a new victim computing device, it contacts a command and control computer over the Internet from which it begins to receive instructions and additional malware modules. This effectively places the infected computer under the command of the operators of the botnet.
- 6. TrickBot's design is "modular," which means that it is designed to allow other types of malware to plug into it and perform different tasks. This allows the Trickbot malware running on an infected computing device to serve as a general platform for other types of malware. Consequently, Trickbot-infected computing devices are subject to a wide range of secondary malware infections, which victimize the infected user in a wide variety of criminal schemes. I have witnessed or have read reports of Trickbot's modules performing tasks for stealing banking information, conducting web injections to perform man-in-the-browser attacks, scrape email addresses from SQL servers, system/network reconnaissance, credential harvesting, and network propagation.

## B. <u>Description of Investigation into Trickbot</u>

- 7. Investigators at Microsoft's Digital Crimes Unit and Microsoft Defender Advanced Threat Protection have been researching Trickbot recently. One of the other investigators with whom I have worked on this investigation, Jason B. Lyons, is a co-declarant in this matter, and I refer the Court to his declaration for further information on other aspects of Trickbot, including Trickbot's command and control structure, function, and operation, Trickbot's harm to Microsoft customers, and the plan for disrupting its operations. I have reviewed his declarations and concur in his conclusions.
- 8. In the course of Microsoft's investigation into Trickbot, we analyzed approximately 61,000 samples of Trickbot malware. In some cases, we purposely infected several investigator-controlled computing devices with the Trickbot malware. This placed the

computing devices under the control of the cybercriminals operating the botnet, but also allowed us to monitor all of the illicit communications going to and coming from the infected computing devices, and to analyze the activities of the infected computing devices.

- 9. Among other things, we carefully analyzed Trickbot's core malware, additional modules that are part of the malware and associated configuration files. These Trickbot components contain software code that interacts with and makes changes to Microsoft's operating system and application software during the infection process. We reverse-engineered the Trickbot malware to determine how it operates.
- 10. In order to reverse engineer Trickbot's code, we allowed the malware samples to execute in an isolated and controlled environment in order to take a code snapshot (called a "dump") containing decrypted and unpacked malware code from computer memory. These dumps are then loaded to a decompiler called IDA Pro, for comprehensive analysis and understanding of the behavior of the Trickbot sample.
- 11. Through this investigation and as discussed more thoroughly below, Trickbot's malware core executables and modules are written with verbatim copies of declaring code in header files ("Declaring Code") taken from Microsoft's copyrighted Software Development Kit for Windows 8.1 ("SDK 8.1"). SDK 8.1 was the released version of the SDK at the time that the Trickbot authors first created the Trickbot malware. SDK 8.1, which includes the Declaring Code, is licensed by Microsoft to end-users. Attached hereto as **Exhibit 2** is a true and correct copy of Microsoft Windows Software Development Kit for Windows 8.1. ("SDK License"). The SDK License specifically prohibits using the Declaring Code in malicious, deceptive, or unlawful programs.
- 12. Trickbot inflicts substantial damage on Microsoft whose products, copyrights, and trademarks Defendants systematically abuse as part of the botnet's fraudulent operations.
  - C. Microsoft Windows SDK 8.1 Prohibits Use Of Microsoft Code In Malware
  - 13. Microsoft develops, manufactures, licenses, and supports a wide range of

programs and services, including Windows, Microsoft Office, Microsoft Outlook, and Edge, its new Internet browser. It is my understanding that Microsoft invests billions of dollars in research, development, and promotion of new technologies, products, and services to compete in the dynamic technology markets.

- 14. Microsoft also spends considerable time and energy building its Windows platform and making it available to third-party developers to create programs that are compatible with Windows. With every Windows release, Microsoft also makes available a software development kit ("SDK"). The SDK is a package of tools that includes a range of things, including APIs, header files, libraries, documentation, code samples, processes, and guides that developers can use and integrate into their own apps. Microsoft's SDKs are required when developing any application, program, or tool for Microsoft Windows.
- 15. One critical component of the SDK is code set forth in header files in the SDK. This code can be used and copied into applications written for Windows. This code serves the purpose of enabling applications to call and invoke pre-packaged functionality in libraries contained within the Windows operating system. This code is referred to here as "Declaring Code." The Declaring Code identifies prewritten functions and is referred to as the "declaration" or "header." The Declaring Code specifies precisely the inputs, name, and other functionality required to carry out a declared function.
- 16. Microsoft makes its SDK and the code contained within the SDK available to the public through a license ("SDK License"). This enables Microsoft to maintain an open platform for third-party developers while preventing malicious actors from using the code in the SDK in a harmful way. While the SDK License grants the right to a range of permissible uses, the license specifically prohibits developers from using Distributable Code "in malicious, deceptive, or unlawful programs." See Exhibit 2. As discussed below, the Declaring Code is a subset of "Distributable Code" and is subject to the SDK License's prohibition.
  - 17. Any developer who downloads Microsoft's SDK tools and uses Microsoft's

Declaring Code must accept the terms of the SDK License, as shown in **Figure 1**. The Trickbot malware authors accepted the terms of the SDK License because they needed to download the SDK tools in order to use the Declaring Code.

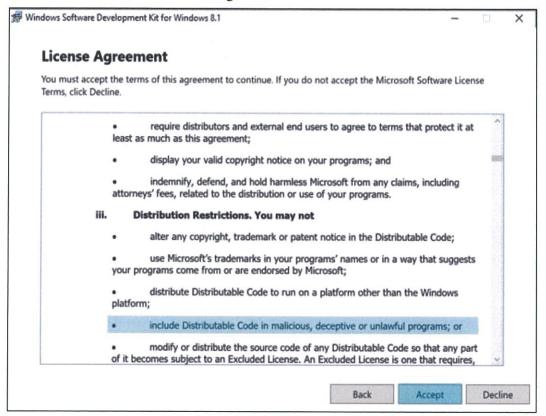


Figure 1

## D. Windows SDK 8.1's Declaring Code Is Subject To The License Term Prohibiting Use In Malware

18. According to the SDK 8.1 license, any material contained within the following ".lib" directories in the SDK licensing documentation, set forth at **Figure 2**, may not be used in a malicious program:

2. Microsoft Windows Software Development Kit ("SDK") for Windows 8 Redist.txt

This is the "REDIST list" that is referenced in the "Distributable Code" section of the Microsoft Software License Terms for Windows SDK for Windows 8 software (the "software"). If you have a validly licensed copy of such software, you may copy and distribute the unmodified object code form of the files listed below, subject to the software's License Terms and to the additional terms or conditions that are indicated below.

Static LIB files

Subject to the license terms for the software, the .lib files under the following directories may be distributed unmodified when built as part of your program:

Program Files\Windows Kits\8.0\Lib\win8\um\x86

Program Files\Windows Kits\8.0\Lib\win8\um\x86

Program Files\Windows Kits\8.0\Lib\win8\um\x86

Program Files\Windows Kits\8.0\Lib\win8\um\x86

Figure 2

19. These .lib directories contain the following representative list of .lib files, as reflected in Figure 3 and Figure 4:

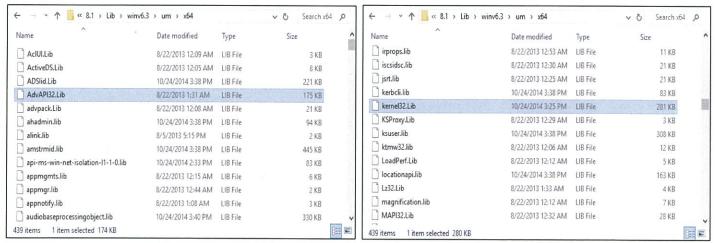


Figure 3 Figure 4

20. Contained within each of these .lib files are hundreds of .dll files that contain the specific Declaring Code that is at issue and is used by Defendants to create the Trickbot malware, as discussed further below. For example, extracting the contents of advapi32.lib file, reveals numerous relevant code declarations, as reflected in **Figure 5**.

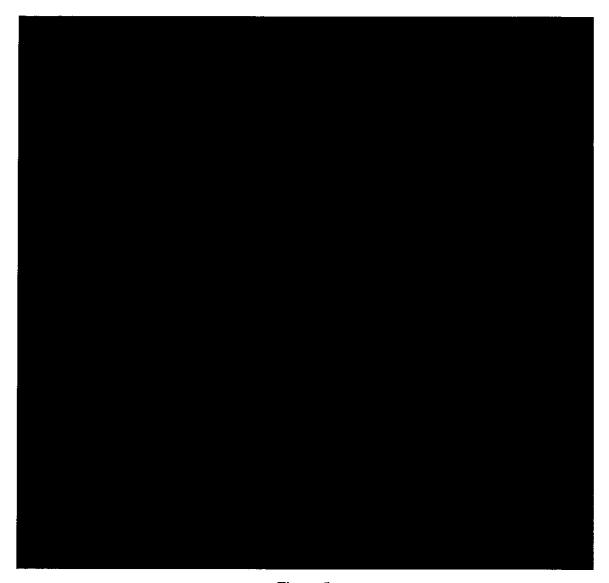


Figure 5

21. Similarly, upon extracting the contents of kernel32.lib files, numerous relevant code declarations can be seen, as reflected in **Figure 6**.

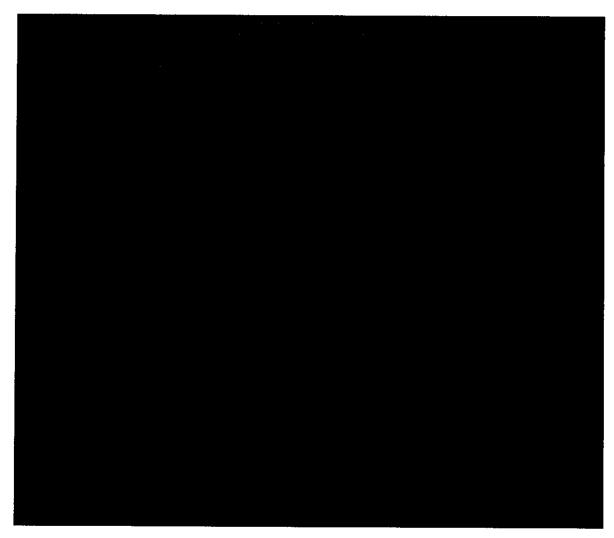


Figure 6

These files contain the Declaring Code reproduced by the Defendants to create the Trickbot malware, as discussed in more detail below. This same Declaring Code is contained in corresponding header files distributed with the Windows SDK, such as "advapi32.h," "kernel32.h," and many other header files used by the Defendants to create the Trickbot malware, as discussed below. Thus, the Declaring Code at issue is explicitly subject to the Windows SDK license terms prohibiting use of such code in malware.

## II. TRICKBOT'S UNAUTHORIZED USE OF MICROSOFT'S COPYRIGHTED SOFTWARE

## A. <u>Initial Infection</u>

- 23. Defendants target the owners of computing devices. The primary purpose of the Trickbot botnet is to access and steal users' online financial account credentials and other personal information and to engage in other criminal activities.
- 24. The creators of Trickbot designed it specifically to attempt to infect computing devices running operating systems sold by Microsoft, Windows 7, Windows 8, Windows 8.1, Windows 10 and Windows Server. Trickbot is also designed to detect automated malware analysis sandboxes and antivirus products.
- 25. Once a cybercriminal has obtained a Trickbot kit, they will then attempt to infect as many computing devices as they can. I have studied the mechanism that Defendants use to infect computing devices and have concluded that the operators of the Trickbot botnet have deployed several of the most common means to spread Trickbot infections including malicious spam email message or other phishing campaigns. These campaigns deliver Trickbot using themes that are familiar to the public, including important current events such as Black Lives Matter and COVID-19. Examples of such deceptive phishing emails are set forth in the Declaration of Jason Lyons, submitted with this declaration. The emails typically include an attachment, such as a Microsoft Word or Excel document, that has been weaponized to contain code that downloads the Trickbot malware. The malicious document downloads and executes an initial Trickbot payload on the device.
- 26. During the initial infection process, a newly infected device runs the malware's executable file, creating a folder inside the %APPDATA% local user folder. The initial payload is the only file physically present on the infected device and is designed to allocate memory and decrypt the loader. The payload changes a number of settings in the user's Windows scheduled tasks and system folders to ensure that it is launched at certain periods of time. In particular, the Trickbot malware writes entries to Windows registry and folder paths, modifies the system

processes that contain the "Microsoft" and "Windows" trademarks. The following are examples of such Trickbot registry paths.

- %WINDIR%\System32\Tasks\, for example Ex: C:\Windows\System32\Tasks\
- %WINDIR%\Tasks\, for example C:\Windows\Tasks\
- HKLM\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Schedule\TaskCache\Tasks\
- HKLM\SOFTWARE\Policies\Microsoft\Windows Defender\
  - DisableAntiSpyware
- HKLM\SOFTWARE\Policies\Microsoft\Windows Defender\Real-Time Protection
  - DisableBehaviorMonitoring
  - DisableOnAccessProtection
  - DisableScanOnRealtimeEnable
  - DisableIOAVProtection
- 27. Set forth below at **Figure 7** is an example of a scheduled task created by the Trickbot malware.

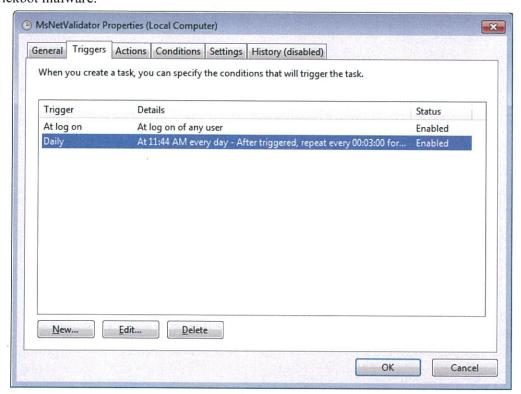


Figure 7

28. Set forth below at **Figure 8** is an example of a Windows process that has been tampered with and modified by the Trickbot malware.

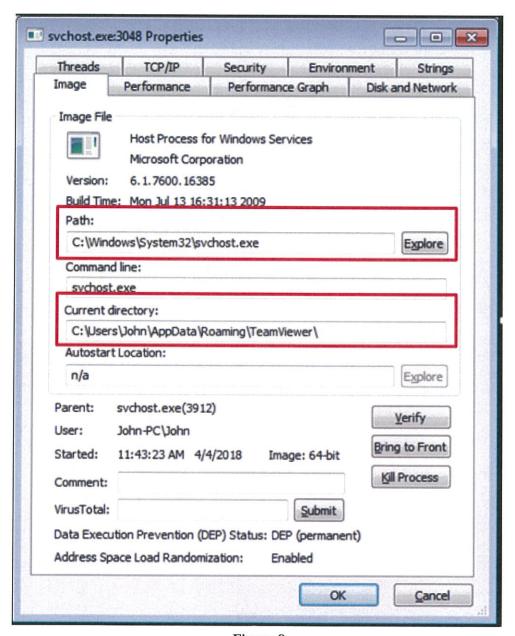


Figure 8

29. Trickbot arrives with an encrypted set of files, including initial configuration that consists of a version number, a list of command and control ("C2") servers, and autorun

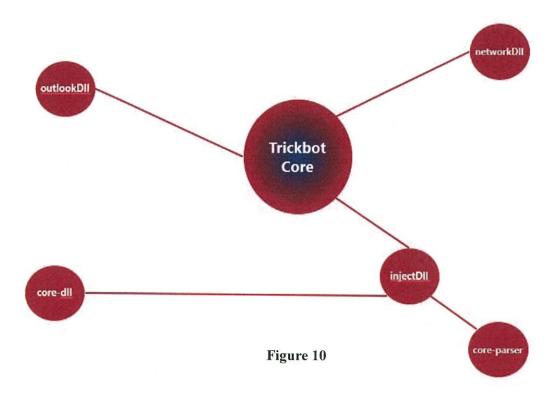
instructions for the first module. It is set to run at startup, a minute after the task is created, and then every nine minutes from that point on. As the scheduled task is triggered, the malware extracts and executes a shellcode in its own memory space.

- 30. Communication with the C2 server takes place over encrypted HTTP requests. Each request contains some basic information about the victim's device and a command code. Responses from the C2 servers are also encrypted and decrypted by the malware in the same manner as the IP address list is decrypted by the bot.
- 31. Depending on the intention of Trickbot's operators for a particular intrusion, Trickbot can download and deploy from the C2 servers various modules that provide varying forms of functionality and criminal activity, as shown in Figure 9. Of particular note, several of the Trickbot modules are designed to carry out reconnaissance on victim systems, enabling the Trickbot operators to determine whether the system is a viable target for installing ransomware. These modules can collect both technical details, information about files and data that may be encrypted and held hostage as part of the ransomware attack, and details about the victim themselves in order to determine whether the victim is a viable target. This is a multi-step process, and may involve further reconnaissance using the CobaltStrike and Mimikatz tools. Once the Trickbot operators identify viable target systems and victims, they install the Ryuk ransomware, which locks the victim's files and data, and demand that the victim pay a ransom in order to unlock those resources. The modules are capable of many other forms of attack as well and are sent with a configuration file that allows the Trickbot operators to update and adapt this code as needs change. Our investigation has seen Trickbot modules—also referred to as secondary malware infections—with the following names and purposes:

Figure 9	
Module	Purpose
injectDll	Main banker module using "static" and "dynamic" web browser injection and data theft

networkDll	A reconnaissance module that gathers network and system
	information for the purpose, among many, to determine if the victim machine meets criteria for revictimization with ransomware
Systeminfo	Gathers system information
tabDll	Propagate Trickbot via EternalRomance Exploit
wormDll	Propagate Trickbot via SMB - EternalBlue Exploit
shareDll	Propagate Trickbot via Windows Network Shares
vncDll / BCTestDll	Remote control/Virtual Network Computing module to provide backdoor for further module downloads
rdpscanDll	Launch brute-force attacks against selected Windows systems running a Remote Desktop Protocol (RDP) connection exposed to the Internet
mailsearcher	Searches all files on disk and compares their extensions to a predefined list to harvest email addresses
outlookDll	Gather Outlook credentials
importDll	Gather browser data
psfin	Gather point of sale software credentials
squlDll	Gather email addresses stored in SQL servers
aDll	Execute various commands on a Windows domain controller to steal Windows Active Directory Credentials
pwgrab	Gather credentials, autofill data, history and so on from browsers

32. For illustrative purposes, the relationship between the main Trickbot malware and several modules and sub-modules are represented below in **Figure 10**.



33. Each of these secondary malware infections makes further changes to user's computing device, including by adding files, changing registry settings, opening additional backdoors that allow remote control by other cybercriminals, altering the integrity of certain software contained in Windows, such as Internet Explorer, Edge, or Outlook, and allowing further sets of malwares to be downloaded onto the computing device. All of these malware variants are designed to attack computing devices running Microsoft Windows operating systems.

## B. <u>Trickbot Authors Use Microsoft's Declaring Code in Writing The Malicious Modules</u>

34. The secondary malware infections are delivered as Dynamic Link Libraries ("DLLs"). A DLL is a library containing code and data that is used by many programs at once. DLLs promote modular architecture and ease of deployment and installation. For example,

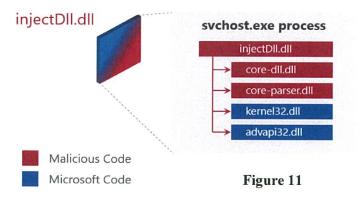
when a function within a DLL needs updating or a fix, the deployment and installation of the DLL does not require the program to be relinked with the DLL. Additionally, if multiple programs use the same DLL, the multiple programs will all benefit from the update or the fix. By using DLLs, the Defendants are able to efficiently add, remove, or update the modules.

- 35. During my investigation, I purposely infected several investigator-controlled computing devices with the Trickbot malware to allow us to monitor the communications and data packets it was receiving from the C2. I observed that after the initial infection but before any of the secondary malware instructions were executed on the infected device, Trickbot would dynamically import a list of DLL library executables that would enable the individual modules to be executed on the victim device.
- 36. Once the DLL libraries were imported from the C2s onto the victim device, I parsed through the files to determine how the individual malware modules execute and interact with code libraries in Windows to achieve their malicious purpose. While Trickbot encrypts the configuration files with a cryptographic hash value in order to obfuscate the DLL and API names, I implemented code that was able to decrypt the DLL modules and decode their corresponding configuration files in XML format. I then used the XML format to reverse engineer the modules.
- 37. I initially investigated the injectDll module because it is the main malware module used to perpetuate the fraud and steal financial information for the Trickbot operators. The injectDll is designed to monitor for banking website activity and uses web injects (e.g., pop ups and extra fields) to steal financial information. The configuration files define the targeted websites and the targeted C2 servers that will receive the stolen data. InjectDll enumerates all the running processes and checks if the running processes on the device include a browser, such as Microsoft Edge, Internet Explorer, Google Chrome, Mozilla Firefox, or others. Trickbot monitors the computing device's Internet browser communications and once it detects any of these browsers, Trickbot deploys malicious code that interacts with the browser application to

intercept or modify information sent from a user's browser to a server.

38. Once a victim's device is infected, the injectDll module will connect over the Internet to the C2 servers in order to load the required DLL and header code contained on the C2s to enable the malware to monitor browser usage. In particular, I uncovered that the injectDll has copied into a substantial amount of Microsoft's Declaring Code, which is then used to call functions with particular libraries available in particular DLL files that are part of the Windows operating system. For example, within the malicious Trickbot "injectDll" file, the Defendants copied literal code and the structure sequence and organization of Windows code such as the AdjustTokenPrivileges, TerminateThread, LookupPrivilegeValueW, RevertToSelf, DuplicateTokenEx, OpenProcessToken, LoadLibrary, GetProcAddress, GetCurrentProcess, CloseHandle code and many other Windows code elements. The following is a representative example of such literally infringed source code:

39. The Defendants copied that Declaring Code and its structure, sequence and organization from the Windows SDK at the time that they were using the SDK to create the Trickbot malware and its constituent files, including the "injectDll" file. **Figure 11** below illustrates how the malware authors reproduced literal copies of Microsoft's Declaring Code (in blue) in the injectDll file alongside their own malicious code (in red).



40. The infringing Trickbot code hosted at the IP addresses associated with C2 servers literally reproduces hundreds of lines of such Microsoft source code, as well as the structure, sequence and organization of such code, across multiple infringing Trickbot files.

Figure 12 represents the way that an exemplary infringing Trickbot file (in red) reproduces the structure, sequence and organization of several examples of Microsoft source code (in blue).

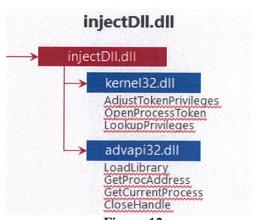


Figure 12

41. When the malicious "injectDll" module is running on a victim's computing device, it will use the infringing Declaring Code in order to invoke functionality within, among others, the "advapi32.dll" and "kernel32.dll" library files within Windows. **Figure 13** below sets forth several examples of Microsoft's Windows SDK Declaring Code and the structure, sequence and organization of that code, as copied by the Defendants from the Windows SDK

into the infringing Trickbot malware, which has been annotated with explanatory comments (in green).

```
// declaration of function pointers for advapi32.dll APIs
 typedef BOOL (*AdjustTokenPrivileges)(
                                                                               TokenHandle,
DisableAllPrivileges,
                       HANDLE
                       BOOL
                       PTOKEN PRIVILEGES NewState,
                                                                               BufferLength,
                       PTOKEN PRIVILEGES PreviousState
                                                                               ReturnLength
typedef BOOL (*OpenProcessToken)(HANDLE ProcessHandle, DWORD DesiredAccess, PHANDLE TokenHandle);
typedef BOOL (*LookupPrivilegeValueA)(LPCSTR lpSystemName, LPCSTR lpName, PLUID lpLuid);
 // declaration of function pointers for kernel32.dll APIs
typedef HMODULE (*LoadLibraryA)(LPCSTR lpLibFileName);
typedef FARPROC (*GetProcAddress)(HMODULE hModule, LPCSTR lpProcName);
typedef HANDLE (*GetCurrentProcess)();
typedef BOOL (*CloseHandle)(HANDLE hObject);
 int InjectCoreDll(HANDLE hBrowserProcess)
                      // parse the kernel32.dll in memory to get the addresses of these APIs
LoadLibraryA LoadLibraryA addr = GetApiAddressBrute("LoadLibraryA");
GetProcAddress GetProcAddress addr = GetApiAddressBrute("GetProcAddress");
                       // Run-Time DLL loading to access advapi32.dll APIs
// RUN-lime DLL loading to access auvapiac.uli Aria
HMCDULE hAdvapi32 = LoadLibraryA addr("advapi32.dll");
AdjustickenPrivileges AdjustickenPrivileges addr =
(AdjustickenPrivileges)GetProcAddress addr(hAdvapi32, "AdjustIckenPrivileges");
OpenProcessToken OpenProcessToken add = (OpenProcessToken)GetProcAddress
 OpenProcessToken");

[OpenProcessToken");

[OpenProcessToken"];

[
                       // Run-Time DLL loading to access kernel32.dll APIs
                     HMODULE hKernel32 = LoadLibraryA addr("kernel32.dll");
GetCurrentProcess GetCurrentProcess addr = (GetCurrentProcess)GetProcAddress addr(hKernel32,
 GetCurrentProcess GetCurrentProcess addr = (GetCurrentProcess)GetProcAddress addr(hKernel3
GetCurrentProcess');
CloseHandle addr = (CloseHandle)GetProcAddress addr(hKernel32, "CloseHandle");
                    HANDLE TokenHandle;
struct TOKEN PRIVILEGES NewState;
NewState PrivilegeCount = 0;
                      NewState.Privileges[0].Attributes = 0;
                      NewState.Privileges[0].Luid = 0;
                     // get the handle to the host process -> svchost.exe
HANDLE hCurrentProcess = GetCurrentProcess addr();
                     // adjust token privilege to allow this host process to manipulate browser process
if (OpenProcessToken addr(hCurrentProcess, 0x28u, &TokenHandle))
                                            NewState.PrivilegeCount = 1;
                                          NewState.Privileges[0].Attibutes = 2;
if (LookupPrivilegeValueA addr(0, "SeDebugPrivilege", (PLUID)NewState.Privileges))
AdjustTokenPrivileges addr(TokenHandle, FALSE, ENewState, 0, NULL, NULL);
                                            CloseHandle addr(TokenHandle);
                     }
                                                                                                                                  Figure 13
```

42. I used the same process to investigate the other modules and uncovered evidence that the Trickbot authors copied verbatim Microsoft's Declaring Code causing the modules to invoke other functionality relating to other software applications running on Windows or libraries within Windows. In other words, each time the modules are executed on the infected

device, the modules will call pre-written and pre-packaged code in Microsoft's SDK and use the Declaring Code to perpetuate the malicious conduct.

43. In total, I observed the Trickbot authors copied hundreds of lines of Microsoft's Declaring Code and the structure, sequence, and organization of that code are copied within and across the numerous Trickbot modules, as shown in **Figure 14** and **Figure 15** below.

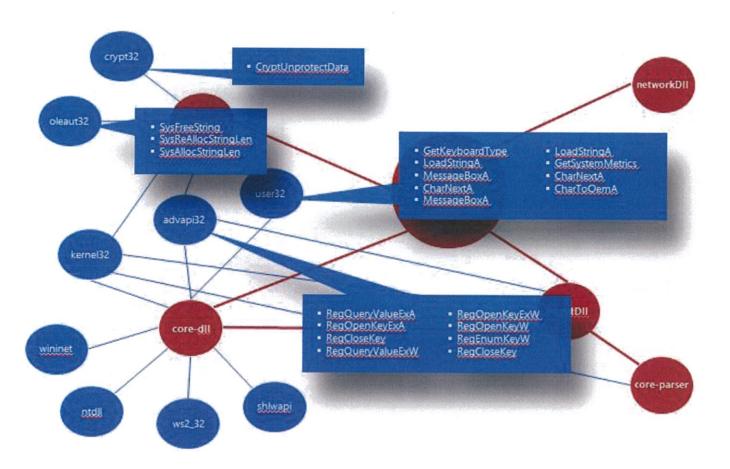


Figure 14



Figure 15

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct to the best of my knowledge. Executed this \_\_\_ day of October, 2020, in Alexandria, Virginia.

# **EXHIBIT 1**

## Rodelio Fiñones

## Objective:

Security Software Engineer/Threat Researcher with 20 years experienced seeking to acquire a rewarding career in the field of computer, internet, and cloud security where my expertise, experience, and knowledge in cyber threats and software engineering will be utilized to make big impact to the success of the company.

## PROFESSIONAL EXPERIENCE:

## Senior Security Software Engineer/Threat Researcher, Digital Crimes Unit (Nov 2017 – Present)

#### Microsoft

- · Comprehensive reverse engineering of different malwares types.
- Analysis, decryption, and dissecting network captures.
- Design and develop tools and automation systems for analyzing and tracking botnets.
- Utilize big data to hunt known and unknown threats, create IOCs and improve detection/remediation capabilities.
- Collaborate with DCU investigators, lawyers, and internal/external partners to eradicate/disrupt botnets through civil, criminal referrals, or pure blocking strategy.
- Research and develop malware emulators, crawlers and sinkhole systems for tracking their infrastructures.
- Utilize Azure cloud technologies to accelerate development of robust tools and pipelines to combat cyber threats.
- Prepare and submitted botnet legal declarations for civil and criminal referrals.
  - Dorkbot: https://botnetlegalnotice.com/dorkbot/
  - o Gamarue: https://www.noticeofpleadings.net/gamarue/

## Senior Antivirus Researcher / Strategist (June 2009 – Nov 2017) Microsoft

- Handle malware samples from different sources to provide analysis, tracking, detections, advice, and remediation.
- Tracking top acute threats impacting customer and doing end to end research and providing up to date protection and mitigation (Ex: Zeus/Zbot, Locky, Cerber, etc.)
- Lead the team on focus research of different categories of malwares such Botnets, Clickfraud, MSIL, and Spambots to provide different kind customer

protection such as sourcing, protections (File, memory, and cloud-based, behavior-based, and etc.). Also includes identifying the malware infection chain and monetization.

- Design and develop tools and automation projects for unpacking and tracking botnets.
- Utilize big data (cosmos) to analyze malware treat landscape and to better protect the customer.
- Lead team and hands on research on prevalent malwares for CME (MS Collective Malware Eradication) to disrupt/eradicate malwares.
- End to end research and development of antimalware engine and product features to improve customer protections.
- Drive improvements to windows platform and its components (OS, script engines
   – JS, PS, etc.)
- Static and dynamic analysis of different types of malwares and vulnerabilities.
- Creating rules and programs to improve automatic detections of malwares.
- Respond to malware outbreaks.
- · Write tweets, blogs, research papers, and present to top security conferences.
- · Provide mentoring to other researchers.

## **Principal Software Developer / Researcher (**Dec 2007 – June 2009) Fortinet Technologies (Canada), Inc.

- Improved signature-based detection algorithm to support more complex malwares. Detection methods such as x-raying and behavioral and characteristics detections.
- Research and develop AV engine features to support packer through scriptbased. Generic unpacker coupled with script-based unpacker will be a powerful and effective solution for most malwares.
- Handle complex malwares analysis and detection through script-based or hardcoded.
- Improvements and optimizations for Fortinet's AV detection algorithms.
- Provide technical knowledge to new AV analyst.

## Senior Antivirus Analyst / Engine developer (May 2004 – Dec 2007) Fortinet Technologies (Canada), Inc.

## Analysis, Research and Development Projects

- Research, design, and develop the clean engine for Fortinet's desktop Antivirus product. It supports cleaning Win32 PE, Office, DOS, and script formats.
- Improve the scanning technology through research and development of new scanning algorithm that suits for complex viruses.
- Fix bugs and AV scan and clean engine limitations

- Participate in the research, development, and improvements of Win32 emulator engine.
- Create detection module for hard to detect viruses such metamorphic, polymorphic, and EPO viruses.
- Improved the scanning technology for scripts malwares.
- Research, design, and develop an automated system to replicate, analyze, and heuristically detect known and unknown malwares through sandboxing technology.
- Handle complex malwares.
  - o Analysis
  - o Creating detection signatures
  - AV Engine support (if necessary)

#### Other Tasks:

- Provide malware related technical expertise to analyst and product development team
- Create documentation for developed systems.
- · Conduct trainings regarding virus analysis, detection and disinfection algorithm.
- · Provide quick and quality solution to customer problems.
- · Configure replication system for any kinds of malware

Senior Anti-Virus Researcher / AV Engine Developer (Nov 1999 – April 2004) Trend Micro, Inc. (Anti- Virus and Internet Security)

#### AV Trainee

→ 3-month extensive virus / malware training. Include analysis and creation of detection and clean signatures.

## AV Technical Support Engineer

- + Provides complete solution to the customer.
  - Provides scan and clean solution. Includes signature to remove system infections such as registry, system files, process, services, and files.
  - Create detailed / comprehensive virus description and manual removal instructions.
  - · Provides other assistance needed by the clients.

## AV Research Engineer

- + Focus on the detailed / comprehensive analysis of Windows viruses.
- + Process escalation cases from Virus support engineers.
- + Conduct technology upgrade trainings to Virus support team (New virus technology; new Scan / Clean feature).
- + Respond to Virus Alerts

- + Develop removal tools for specific malware.
- + Design and develop TSC (Trojan System Cleaner). Engine module to detect and restore system infection through registry, process, system files, and services.
- + Process Scan / Clean Engine related cases.
- + Analyze exploits and system vulnerabilities (Windows & Linux).
- + Research and develop a system for automating the replication of malware that covers controlled and simulated Internet environment + Research and develop Scan/Clean Engine modules:
  - Metamorphic virus support
  - · Win32 virus clean modules
  - · New file formats support
  - Trojan System Cleaner
  - Compression / Packer engine support (UPX, Petite, and PEPack)

## **TECHNICAL SKILLS:**

- + Advance knowledge and experience in reverse engineering any kinds of malware using debugger (Soft-ice, IDA Pro, OllyDbg, and Immunity debugger) → In-depth knowledge and experience in exploits and vulnerabilities.
- → Strong knowledge and experience in creating comprehensive malware description.
- + Strong experience in developing detection and cleaning engine for different kinds of malware such as virus, worms, Trojans, and spywares.
- In-depth knowledge in windows operating system internals.
- + In-depth knowledge and experience in virus, Trojans, worms, and spywares behaviors.
- Experience in TCP/IP networks, Unix/Linux networks (AIX, Redhat, Slackware, Ubuntu), Windows network (Windows 9X/NT/2K), Novell Netware. Background knowledge in Windows CE, Palm, and EPOC operating system.
- + Advance experience in C and DOS/Win32 Assembly, VB Script, JavaScript.
- + Experience in C/C++, Linux shell scripts, PowerBuilder, and SQL programming.
- Intermediate experience in analyzing and testing various Anti-virus products.
- + Experience in using soft-ice debugger, IDA Pro, OllyDbg, Snort, and Ethereal.
- + Intermediate experience and knowledge in network protocols like TCP/IP, IPX/SPX, SMTP, FTP, HTTP, DNS, NTTP, and MAPI32.
- + Intermediate knowledge in Windows and Unix/Linux system and network security.
- + Knowledge in ASP, MS Access, FoxPro, and HTML.
- + Knowledge in IP chains/tables, Ethereal packet sniffer, Snort IDS, Tripwire integrity checker.
- + Knowledge in Lotus Notes and Domino server
- + Advance experience in python and Diango web framework.
- + Have a strong problem-solving ability, can-do attitude, reliability, team player and hard working.

- → Significant experience in software development utilizing Azure cloud technologies.
- + Advance experience in Network forensics.
- + Advance experienced in software development using C#.
- → GIAC Certified Incident Handler
- → GIAC Advisory Board

## PREVIOUS EMPLOYMENT:

## System analyst / Programmer (July 1999, October 1999)

Gestalt Consulting Inc. (PowerBuilder and MS SQL)

- + Create, maintain, and improve Inventory system and Accounting system.
- + Provide support to problem of clients.
- + Review and document the current application system.

#### **EDUCATION:**

## **Bachelor of Science in Computer Engineering** (1995 -1999)

FEU - East Asia College of Information Technology, May 1999, 3.2/4.0 GPA

# **EXHIBIT 2**

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#### Cette limitation concerne:

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- les réclamations au titre de violation de contrat ou de garantie, ou au titre de responsabilité stricte, de négligence ou d'une autre faute dans la limite autorisée par la loi en vigueur.

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- supplements,
- Internet-based services, and
- support services

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  - i. Right to Use and Distribute. The code and text files listed below are "Distributable

#### Code."

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- distribute Distributable Code included in a setup program only as part of that setup program without modification;
- require distributors and external end users to agree to terms that protect it at least as much as this agreement;
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- display your valid copyright notice on your programs; and
- indemnify, defend, and hold harmless Microsoft from any claims, including attorneys' fees, related to the distribution or use of your programs.

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- alter any copyright, trademark or patent notice in the Distributable Code;
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- 3. WINDOWS APPLICATION CERTIFICATION KIT. You may use the Windows Application Certification Kit solely to test your programs before you submit them for a potential Microsoft Windows Certification and for inclusion on the Microsoft Windows Store. The results you receive are for informational purposes only. Microsoft has no obligation to either (i) provide you with a Windows Certification for your programs and/or (ii) include your program on the Microsoft Windows Store.
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