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Case Project 02

CY5210 Information System Forensics

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November 6th, 2022

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EXECUTIVE SUMMARY

In this report, I will include findings that pertain to a recent data exposure of the company Capital Computing. Ethan Thomas was an employee with privileged administrator access to sensitive documents of the company. He reported that his primary windows were running slow and suspected malware on the system. The Cyber Investigations Team inspected the corrupted system and asked the forensics team to perform an analysis of the system for suspicious behavior. The investigation was released to the Directory of Cybersecurity James Smith for a summary of the case report.

Ethan Thomas was reported to Human Resources by multiple employees from his dissatisfaction of the company, and interest of applying to one of the company's main competitors Next Generation Computing. From the shell items section in the analysis, it was reported that Ethan Thomas connected three USB devices into his system. On one of the devices labeled "IronKey", included multiple sensitive, proprietary, and intellectual property documents company documents and his resignation letter. There were multiple malware applications found on E. Thomas's system that can lead to the corruption of the system. From this, it can be shown that Ethan wanted to leave the company and take sensitive information with him. This is a violation of the company's policy of proprietary data exposure.

E. Thomas then tried covering his tracks by uninstalling the company-controlled cloud service and having the security team wipe his old system. Little did he know that instead of wiping the system, security analyzed the system and found multiple points of malicious activity by the user. This report will conclude with the analysis findings, recommendations, and possible conclusions of the actions of Ethan Thomas.

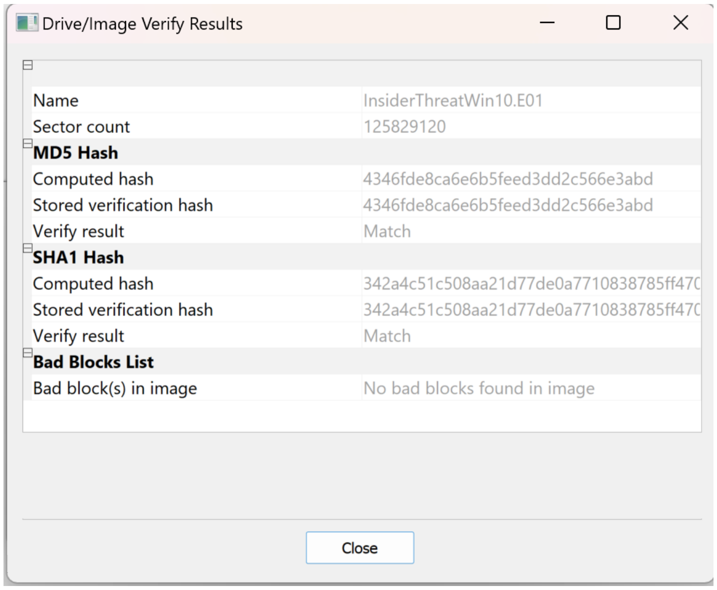
INTRODUCTION

The organization Capital Computing which distributes computer related products for corporate, small businesses and educational clients was subject to a potential data exposure. It is suspected that the exposure came from one of their employees Ethan Thomas. He reported that his primary Windows system was running slow and suspected of various adware or malware installed. The system's anti-virus alerts identified of these possible malware applications installed on the system that can produce harm to the systema and network connected.

The system was analyzed by the Cyber Investigations Team on March 27th, 2018, and a new system was provided to E. Thomas. A remote acquisition of E. Thomas's old infected system was performed on April 3rd, 2018. After, the Director of Cybersecurity asked for a forensics report of any potential data loss, exposure, or company proprietary data leakage by Ethan Thomas.

Ethan Thomas was reported to Human Resources that he was suspected of drafting his notice and planned to leave the company to work for their competitor Next Generation Computing. He was also known to have privileged access to sensitive information at the company. It is suspected that Ethan Thomas exported sensitive and confidential data from the system using escalated privileges to potentially sell or provide to the competitor organization.

The scope of the investigation includes the infected and any external media that might have been connected. In the below figure is the verification of the system's hash. The hashes match meaning that the acquisition integrity was maintained. The chain of custody document is provided in APPENDIX IX of this report released at the time of the acquisition of the system. This highlights the connected external media and who managed the systems to be investigated. It will be interesting to see if these dots connect to expose Ethan Thomas as violating the company policy of data loss, exposure, and leakage to the company's competition.



Drive/Image Verify Results

Name	InsiderThreatWin10.E01
Sector count	125829120
MD5 Hash	
Computed hash	4346fde8ca6e6b5feed3dd2c566e3abd
Stored verification hash	4346fde8ca6e6b5feed3dd2c566e3abd
Verify result	Match
SHA1 Hash	
Computed hash	342a4c51c508aa21d77de0a7710838785ff470
Stored verification hash	342a4c51c508aa21d77de0a7710838785ff470
Verify result	Match
Bad Blocks List	
Bad block(s) in image	No bad blocks found in image

Figure 1 Hash Verification

ANALYSIS

The analysis will cover Windows Registry, System Information, User activity, USB Device activity, Application and Malware use, Prefetch, Shellbags, Linkfiles, and JumpLists. By the forensics team obtaining this information from the incident response team, we will be able to justify if the user E. Thomas violated company policy.

REGISTRY ANALYSIS

The Windows Registry identifies current system configurations and settings used during the investigation. They can show the current state of the system and actions performed by all users on the system. The following Hives were analyzed for the analysis using the tool Access Data FTK Imager, which can be found in APPENDIX III:

- **NONAME [NTFS]/[root]/Windows/System32/config/SAM**
- **NONAME [NTFS]/[root]/Windows/System32/config/SYSTEM**
- **NONAME [NTFS]/[root]/Windows/System32/config/SOFTWARE**
- **NONAME [NTFS]/[root]/Users/<USER>/NTUSER.DAT**

The SAM Registry Hive focused on profiling users and groups. The SYSTEM Registry Hive identified system information and configuration settings. The SOFTWARE Registry Hive revealed applications downloaded, installed, executed, and uninstalled onto the system. The NTUSER.DAT Registry Hive focused on specific user activity.

USER INFORMATION

Within the SAM report, the forensic investigator can see user and group information. Users for this system have the Domain UID of **S-1-5-21-82160412-4011698849-1881082856**. With "S" indicating the type is a SID, "1" as the revision level, "5" as the authority value, "21" meaning that it is a domain ID, and 82160412-4011698849-1881082856 as the "unique identifier." Next are each username "RID" of the system specified in the below table. Together make the "Security IDentified" or SID. Using the template:

"<id_type>-<revision_level>-<authority_value>-<specification_id>-<unique_identifier>-<RID>"

The ethomas SID is **S-1-5-21-82160412-4011698849-1881082856-1001**

The ethan_local SID is **S-1-5-21-82160412-4011698849-1881082856-1002**

The user information of the system of interest is in the below table with the username, RID, Status with number of logins, last login, group associated with and password information.

User accounts ethomas and ethan_local are a focus of this analysis since that account is given administrative privileges, multiple logins, password reset times of 2018-03-27 00:09:38Z and 2018-03-31 12:53:03Z respectively which are after, password not required and does not expire, and the last login is around the time of the security alert.

Username	RID	Status	Last Login	Password Reset	Group	Password
ethomas	1001	Enabled, 9 logins	2018-04-03 16:30:23Z	2018-03-27 00:09:38Z	Administrators	Not Required/Not Expired
ethan_local	1002	Enabled, 10 logins	2018-04-03 16:14:23Z	2018-03-31 12:53:03Z	Users, Administrators	Not Required/Not Expired
Administrator	500	Enabled, 0 logins	Never	Never	Administrators	Not Expire
Guest	501	Disabled	Never	Never	Guests	Not Required/Not Expired
DefaultAccount	503	Disabled	Never	Never	System Managed Accounts Group	Not Required/Not Expired

Table 1 User Information

GROUP INFORMATION

As shown in the table in the previous section, no user was under the group Remote Desktop Users, so no user was able to ssh into the system. However, the Administrator, ethomas and ethan_local users are under the privileged group Administrators. Any user in this group can cause potential harm to the system and organization the system is associated with. All but the Administrator account has their password not required and not expired. This can be a vulnerability in the system where privileged accounts can be easily accessed. This analysis states that the ethomas and ethan_local accounts were not adequately secured and given full privileges. It was also the only account on the system that was enabled with the multiple logins. The last login time of ethomas was at last login time 2018-04-03 16:30:23Z and ethan_local at 2018-04-03 16:14:23Z which was after the Cyber Investigations Team was notified of the infected system and provided a clean system to E. Thomas on March 27th, 2018, and the same day as the system was analyzed by the forensics team on April 3rd, 2018. This means that the response to this user's malicious activity was slow and allowed five days of those users to access the system before being scanned.

SYSTEM INFORMATION

${ControlSet} = HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001

${CurrentVersion} = HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion

Key	Location	Value
Microsoft OS Version	${CurrentVersion}\ProductName	Windows 10 Pro (10.0.16299.15)
Build Version	${CurrentVersion}\CurrentBuild	16299
Current Control Set	${ControlSet}	001
Computer Name	${ControlSet}\Control\ComputerName\ComputerName	ETHOMAS_DESKTOP
Time Zone	${ControlSet}\Control\TimeZoneInformation	Eastern Standard Time
OS Install Date	${CurrentVersion}\InstallDate	2018-03-26 20:01:29 EST (1522108889)
Network Interfaces	${ControlSet}\Services\NetBT\Parameters\Interfaces\Tcpip_{49e11da8-a9a9-4046-a9e2-67d832c476b5}	192.168.171.2
AutoStart Programs	${CurrentVersion}\Run	LastWrite Time 2018-04-03 13:46:35Z SlitherIO - "C:\Users\ethan_local\AppData\Roaming\slitherio\slitherio.exe" OneDrive - "C:\Users\ethan_local\AppData\Local\Microsoft\OneDrive\OneDrive.exe" /background CCleaner Monitoring - "C:\Program Files\CCleaner\CCleaner64.exe" /MONITOR
Last Shutdown Time	${ControlSet}\Control\Windows\ShutdownTime	2018-04-03 00:56:01 EST

Table 2 System Information

Our goal was to collect the system's configurations, settings, user data, and activity to scope a full picture of the activity that went on around the time of the alert. The hostname "ETHOMAS_DESKTOP" was analyzed by the Forensics team to inspect the malicious activity that was reported. On the Windows 10 Pro system, we found that the operating installation time was 2019-01-19 at 03:06:56Z and set in Eastern Standard time. We used Registry Ripper to analyze the hives of SAM, SYSTEM, SOFTWARE, and User (NTUSER.DAT and USRCLASS.DAT). The system's network configurations are set to IP Address 192.168.171.2. The system's last shutdown time was five days after the incident was identified which allowed E. Thomas to continue his access while the Cyber Investigations Team was aware of his old infected system.

The three Autostart programs were slitherio.exe, OneDrive and CCleaner. Slitherio seems like the virus that Ethan Thomas reported, and CCleaner was started to clean the computer for better performance. It looks like neither application is a standard Windows software nor should not be installed on a company-controlled system.

USER ACTIVITY

The forensics team went through the user activity of the user E. Thomas on both of his accounts. They reviewed the user's Windows Search History, Typed Paths, RecentDocs, Last Executed Commands, and UserAssist findings. These registry locations can be found in APPENDIX II.

- **Windows Search History**

Search list history includes the ccsetup, cc and sensitive. The sensitive search found in the wordwheelquery is concerning since it can contain the Sensitive Potential Client List or other confidential information.

- **Typed Paths**

NTUSER.DAT hive reports no typed paths for either user due to the lack of evidence identified under the registry key.

- **RecentDocs**

There was a lot of recent documents accessed by the ethan_local and ethomas users. These included Notes, Company Sensitive Document, Intellectual Property Document, Proprietary Corporate Data, Sensitive Potential Client List, Dropbox and IronKey Secure Files (F Drive). This indicates that the users had access to sensitive information and used external media to potentially export these items.

- **LastExecutedCommands**

The list of last executed commands was not populated due to the user not running commands from START -> RUN box. These were instead after launching the "cmd.exe" executable.

- **UserAssist**

A list of the UserAssist executables of interest can be found in the below table. It includes the external media with the name IronKey that was used by E. Thomas, the command line to perform privileged commands, CCSetup for the CCleaner application. It also shows that even though the system reported to have no RDP users, E. Thomas used RemoteDesktop and PuTTY to remote out of the system that forensic investigators can possibly not have oversight of. Lastly the Cat and Dog Screensaver executable is showed in the Downloads directory that can potentially contain malware that the user E. Thomas knowingly or not knowingly installed and corrupted the newly wiped system.

Executables	LastWriteTime
C:\Users\ethan_local\Downloads\Cat_And_Dog_Screensaver.exe (1)	2018-03-31 16:05:07Z
SimonTatham.PuTTY (2)	2018-03-31 17:14:12Z
Microsoft.Windows.RemoteDesktop (2)	2018-03-31 17:15:54Z
E:\ccsetup541pro.exe (1)	2018-04-03 13:37:01Z
{1AC14E77-02E7-4E5D-B744-2EB1AE5198B7}\cmd.exe (2)	2018-04-03 13:37:16Z
E:\IronKey.exe (2)	2018-04-03 16:15:09Z

Table 3 UserAssist

USB DEVICE ACTIVITY

Device Name	Serial Number	User Account	First Time	Last Time
IronKey Secure Drive USB Device (F:\)	00787613	ethomas/ ethanlocal	2018-03-31 14:03:01Z	2018-04-03 16:17:25Z
Kingston DataTraveler G3 USB Device (Personal USB)	0019E000B499EBB166A2018F	ethomas/ ethanlocal	2018-03-31 15:36:49Z	2018-04-03 13:49:35Z
Kingston DT Rubber 3.0 USB Device (SSD_FAC)	0018F30C9FEABD80610D1AAC	ethomas	2018-04-03 16:20:19Z	2018-04-03 16:21:12Z
WD My Passport 2599 (New Volume)	575854314541354441545352	n/a	2018-04-03 16:22:43Z	2018-04-03 16:23:33Z
PNY USB 3.0 FD	070877F6181C2830	n/a	2018-04-03 16:41:30Z	n/a

Table 4 USB Device Connected to “ETHOMAS_DESKTOP”

The forensics team identified five external media devices that were connected to the system. Three of them were under the E. Thomas users with their last time access at the time of the system scan. IronKey Secure Drive has been mentioned multiple times in the analysis section and can contain sensitive and company confidential information that the user exported for their own personal use.

APPLICATIONS AND MALWARE

Path	Filename	LastUsed	Download	Installed	Executed	Uninstalled
N/A	Microsoft OneDrive v.18.240.1202.0004	2018-04-03 00:11:42Z				X
C:\Users\ethan_local\ Downloads	Cat_And_Dog_Screensaver .exe	2018-03-31 16:05:07Z	X	X	X	
{1AC14E77-02E7-4E5D-B744-2EB1AE5198B7}	cmd.exe	2018-04-03 16:56:25			X	
C:\Users\ethan_local\ AppData\Roaming\slitherio	slitherio.exe	2018-04-03 00:58:59		X	X	

Table 5 Applications by LastUsed

The applications listed above is also in the Prefetch list. However, this list includes their activity of download, installed, executed, and uninstalled applications. The forensics data shows OneDrive is being uninstalled by the E. Thomas user. This can hide activity that the user can potentially export sensitive data from the system to an external location on the cloud. The Screensaver executable was downloaded, installed, and executed onto the system which can potentially include viruses. The Slitherio executable is a known virus and could have potentially been installed by the E. Thomas users or installed onto the system by a phishing email or malicious application. Finally, the cmd.exe is used over 116 times by the user should be an area of concern since this user has escalated administrator privileges.

PREFETCH

Executable Name	Source Created	Source Modified	Size	Run Count	Last Run	First Run	Volume Serial
CAT_AND_DOG_SCREENSAVER.EXE	2018-03-31 16:05:20	2018-03-31 16:05:20	97026	1	2018-03-31 16:05:07		60D53EE6
CCLEANER.EXE	2018-04-03 14:01:44	2018-04-03 14:01:44	27064	1	2018-04-03 14:01:43		60D53EE6
CMD.EXE	2018-03-30 15:13:07	2018-04-03 16:56:25	9576	116	2018-04-03 16:56:25	2018-04-03 16:31:18	60D53EE6
DROPBOX.EXE	2018-03-31 13:09:17	2018-04-03 00:59:11	171872	12	2018-04-03 00:59:01	2018-03-31 14:44:24	BAA935F8
IRONKEY.EXE	2018-03-31 14:03:22	2018-04-03 16:15:20	61610	4	2018-04-03 16:15:09	2018-03-31 14:03:11	BAA935F8
ONEDRIVE.EXE	2018-03-31 14:49:46	2018-04-03 00:59:07	149932	5	2018-04-03 00:58:57	2018-03-31 14:49:36	60D53EE6
PUTTY.EXE	2018-03-31 16:08:44	2018-03-31 17:14:22	33362	2	2018-03-31 17:14:12	2018-03-31 16:08:34	60D53EE6
SLITHERIO.EXE	2018-03-31 16:05:12	2018-04-03 00:59:03	107090	3	2018-04-03 00:58:59	2018-03-31 16:05:09	60D53EE6

Table 6 Prefix Analysis for "ETHOMAS_DESKTOP"

The Prefetch data can be found in APPENDIX IV. A snippet of the information gathered by the forensics team with an area of concern can be found in the table above. The cmd.exe was ran 116 times in the period of 25 minutes. That is a lot to run by the user who is suspected of malicious activity by the files he accessed and the user’s plan to work for a competitor company. Included in the prefetch data were several RDP and external media applications. This enabled the user to remote to other systems to potentially secure copy files to other systems, external media, or cloud storages.

SHELL ITEMS

The below table identifies the areas of interest in the shell bag analysis located in APPENDIX V. The user E. Thomas accesses the System and Security section in control panel. This area is a privileged area and can be used to open firewall protections or permissions for malicious activity. Activity can include allowing the use of cloud-based software like Dropbox or external media. The user also accessed the F drive which can be linked to the IronKey removable media USB. The analysis shows that the user accessed their Documents which can contain sensitive and confidential files to be shared outside of the secured system.

AbsolutePath	ShellType	Value	FirstInteracted	LastInteracted
Desktop\Control Panel\System and Security	Control Panel Category	System and Security		2018-03-31 12:46:31
Desktop\Control Panel\System and Security\System	GUID: Control panel	System	2018-03-31 12:46:31	2018-03-31 12:46:31
Desktop\E:\	Users property view: Drive letter	E:\	2018-03-31 15:36:58	2018-04-03 13:59:22
Desktop\E:\\Documents	Directory	Documents	2018-03-31 14:43:06	2018-03-31 14:43:06
Desktop\F:\	Users property view: Drive letter	F:\		2018-04-03 16:43:43
Desktop\My Computer\C:\Users\ethomas	Directory	ethomas	2018-03-31 14:46:27	2018-03-31 14:46:27
Desktop\My Computer\C:\Users\ethomas\Documents	Directory	Documents	2018-03-31 15:38:00	2018-03-31 15:38:00
Desktop\My Computer\Desktop	Root folder: GUID	Desktop	2018-04-03 00:16:48	2018-04-03 00:16:48
Desktop\My Computer\Documents	Root folder: GUID	Documents	2018-03-31 15:37:41	
Desktop\My Computer\Downloads	Root folder: GUID	Downloads	2018-03-31 16:04:50	
Desktop\My Computer\E:	Drive letter	E:	2018-04-03 13:36:33	2018-04-03 13:36:33
Desktop\Shared Documents Folder (Users Files)\Dropbox	Users Files Folder	Dropbox	2018-03-31 13:21:49	2018-03-31 13:21:49

Table 7 Shellbag Items

The below table highlights LNK files of interest. The full list can be found in APPENDIX VI. Of those files, the Intellectual Property Document, Proprietary Corporate Data, Sensitive Potential Client List, Company Sensitive Document are sensitive documents accessed by the E. Thomas users. With the additional access to Dropbox and F drive of the IronKey USB, these documents can be easily exported and shared. The EthanThomas_Notes can be interesting to investigate since the user can document notes of shared passwords, access steps or anything else that is sensitive towards the organization.

LocalPath	Src/Dst Created	Src/Dst Modified	Source Accessed	File Size	DriveType	VolumeSerial/Label	MachineID
C:\Users\ethomas\Dropbox\Intellectual Property Document.docx	2018-03-31 14:43:38	2018-03-31 14:45:17	2018-03-31 14:45:17	16063	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Documents\Proprietary Corporate Data.pptx	2018-03-31 14:22:00	2018-03-31 14:42:39	2018-03-31 14:42:39	49764	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
F:\Sensitive Potential Client List.xlsx	2018-03-31 14:22:13	2018-03-31 14:22:13	2018-03-31 14:22:13	9206	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
C:\Users\ethomas\Documents\EthanThomas_Notes.docx	2018-03-31 14:44:00	2018-03-31 14:45:48	2018-03-31 14:45:48	9015	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Documents\Company Sensitive Document.docx	2018-03-31 14:21:36	2018-03-31 14:45:42	2018-03-31 14:45:42	9007	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Dropbox	2018-03-31 14:45:17	2018-03-31 14:45:23	2018-03-31 14:45:23	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
F:\	2018-03-31 14:21:36	2018-03-31 14:42:59	2018-03-31 14:42:59	0	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
C:\Users\ethomas\Downloads	2018-03-31 14:07:45	2018-03-31 14:07:45	2018-03-31 14:07:45	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Documents\Intellectual Property Document.docx	2018-03-31 15:38:39	2018-03-31 16:04:34	2022-11-03 23:08:14	16063	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop

C:\Users\ethan_local\Documents\Sensitive Potential Client List.xlsx	2018-03-31 15:38:22	2018-03-31 15:38:22	2018-03-31 15:38:22	7412	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Documents\EthanThomas_Notes.docx	2018-03-31 15:38:34	2018-03-31 16:04:39	2018-03-31 16:04:39	9015	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Downloads	2018-03-31 15:42:45	2018-03-31 15:42:45	2018-03-31 15:42:45	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop

Table 8 LNK Files

Jump Lists that were collected by the forensics investigation team. Most overlap with the LNK files and can be found in APPENDIX VII. Of those applications or files of interest are shown in the table below. The interesting application "mstsc.exe" relates to Remote Desktop Connections. By running this application on the system can provide access for outside systems to remote in without the need for RDP user created. The remaining files are sensitive documents that were copied over to an internal media.

LocalPath	Target Created	Target Modified	Target Accessed	File Size	Drive Type	VolumeSerial/Label	MachineID
C:\Windows\System32\mstsc.exe	2017-09-29 13:42:03	2017-09-29 13:42:03	2017-09-29 13:42:03	3630080	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
E:\Intellectual Property Document.docx	2018-03-31 15:39:16	2018-03-31 15:39:16	2018-03-31 15:39:16	9015	Removable storage media (Floppy, USB)	7295345F/ Personal USB	ethomas_desktop
F:\Company Sensitive Document.docx	2018-03-30 18:18:45	2018-03-30 18:00:42	2018-03-31 04:00:00	15967	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
F:\Proprietary Corporate Data.pptx	2018-03-30 18:18:45	2018-03-30 18:15:24	2018-03-30 04:00:00	49764	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
F:\Sensitive Potential Client List.xlsx	2018-03-30 18:18:45	2018-03-30 18:17:48	2018-03-30 04:00:00	9206	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	

Table 9 Jump Lists

With this analysis, we can prove that the user E. Thomas had privileged access to the system, had access to remote file systems on the system, and exported sensitive documents from the system to external media whether it was a USB or cloud storage.

CONCLUSION

After observing evidence on the hard drive labeled "ETHOMAS_DESKTOP" on April 3rd, 2018, the forensics team can conclude that Ethan Thomas intended to leave the company and bring sensitive and proprietary information on his USB external media. It can be connected that E. Thomas downloaded malware to the system after exporting sensitive documents to his personal USB device. The malware set off anti-malware alerts that conducted Thomas to notify security to wipe his system. He thought that by wiping the system, he would be able to cover his tracks. Instead, the forensics team analyzed the system and found evidence of his malicious activities.

The forensics team found applications of interest on the system which includes mstsc.exe, and PuTTY to enable remote desktop connections. They also found that the user tried uninstalling the company's OneDrive to disable auto syncing his actions. On the external media was found Intellectual Property Document, Company Sensitive Document, Proprietary Corporate Data, Sensitive Potential Client List. By downloading executable CAT_AND_DOG_SCREENSAVER.EXE Thomas was able to install malware onto the system to set off the alert. E. Thomas also used his privileged access to access the System and Security control panel to enable him to export sensitive documents past the companies defenses. The user ran multiple commands on the terminal as an administrator which can cause harm towards the system

It is recommended by the forensics team that this evidence can be used against Ethan Thomas in court that he tried to leave the company and bring sensitive information to one of the competitor organizations. Legal actions should be taken by the organization that owns the sensitive documents against the individual. The organization's IT department will need to restrict USB access to their system for this does not occur again, even by administrators. They additionally will need to lock down elevated privileges, require administrative rights to download applications not already authorized by the ISSO, and secure these sensitive and confidential documents in a secure location and not on the user's Documents and Desktop directories. Overall, it is a good idea to notify the organization of this breach, to provide reminders on the consequences, and require additional security/human error training. This event may have occurred in a public setting with other employees on the premises. They should be reminded to report any unusual behavior to security.

APPENDIX

APPENDIX I: Forensic Tools

Tool	Version	Command
Access Data Forensic Toolkit (FTK)	v6.4	GUI
Access Data FTK Imager	v3.4.2.6	GUI
Registry Ripper	v3.0	GUI
Autopsy	v4.6.0	GUI
USBDeviceForensics	v1.5.2	GUI
AccessData Registry Viewer	v2.0	GUI
ShellBags Explorer*	V1.0	GUI
DCode Date	V4.02	GUI
Prefetch*	v1.5	PECmd –d “Directory for Prefetch Files” --csv “Directory Output\pf.csv”
Link File*	v1.5	LECmd –d “Directory for Link Files” --csv “Directory Output\lnk.csv”
Jump List*	v1.5	JLECmd –d “Directory for Jump Files” --csv “Directory Output\jmp.csv”
Shellbags Cmd	v2.0	SBECmd –d “Directory for ShellBag Items” --csv “Directory Output\sb.csv”

*Eric Zimmerman’s Tools (Source: https://ericzimmerman.github.io/#!index.md)

APPENDIX II: Registry Paths

Hive	Directory	Name	Description
NTUSER.DAT	Software\Microsoft\Windows\CurrentVersion\Explorer	TypedPaths	Paths Typed by User
NTUSER.DAT	Software\Microsoft\Windows\CurrentVersion\Explorer	WordWheelQuery	Windows Search History
NTUSER.DAT	Software\Microsoft\Windows\CurrentVersion\Explorer	RecentDocs	Recent Documents
NTUSER.DAT	Software\Microsoft\Windows\CurrentVersion\Explorer	UserAssist	User Program execution
NTUSER.DAT	\Software\Microsoft\Windows\CurrentVersion\Explorer\	<Policies>\RunMRU	User Command execution
NTUSER.DAT	Software\Microsoft\Windows\CurrentVersion	Run	Applications Ran
NTUSER.DAT	Software\Microsoft\Windows\CurrentVersion	RunOnce	Applications Ran Once
NTUSER.DAT	Software\Microsoft\Windows\Shell	Bags (Desktop)	ShellBags
NTUSER.DAT	Software\Microsoft\Windows\Shell	BagMRU (Desktop)	ShellBags List
NTUSER.DAT	System\CurrentControlSet\Services\Tcpip\Parameters	Interfaces	Network Interfaces
USRCLASS.DAT	Local Settings\Software\Microsoft\Windows\Shell	Bags (Explorer)	ShellBags
USRCLASS.DAT	Local Settings\Software\Microsoft\Windows\Shell	BagMRU (Explorer)	ShellBags List

APPENDIX III: Artifacts List

NOTE: <USER> is both ethomas and ethan_local

I. NTFS Files
   - NONAME [NTFS]/[root]/$MFT
   - NONAME [NTFS]/[root]/$LogFile

II. Registry Hives
   - NONAME [NTFS]/[root]/Windows/System32/config/SYSTEM
   - NONAME [NTFS]/[root]/Windows/System32/config/SECURITY
   - NONAME [NTFS]/[root]/Windows/System32/config/SAM
   - NONAME [NTFS]/[root]/Windows/System32/config/SOFTWARE
   - NONAME [NTFS]/[root]//Users/<USER>/NTUSER.DAT
   - NONAME [NTFS]/[root]//Users/<USER>/AppData/Local/Microsoft/Windows/UsrClass.dat

III. Logs
   - NONAME [NTFS]/[root]/Windows/System32/winevt/Logs

IV. Additional Shellbag Folders
   - NONAME [NTFS]/[root]/Windows/Prefetch
   - NONAME [NTFS]/[root]/Users/<USER>/AppData
   - NONAME [NTFS]/[root]/Users/<USER>/AppData/Roaming/Microsoft/Windows/Recent

V. User’s Profile Folders
   - NONAME [NTFS]/[root]/Users/<USER>/Desktop
   - NONAME [NTFS]/[root]/Users/<USER>/Documents
   - NONAME [NTFS]/[root]/Users/<USER>/Downloads
   - NONAME [NTFS]/[root]/Users/<USER>/Dropbox

VI. Additional Artifacts
   - NONAME [NTFS]/[root]/$Recycle.Bin (folder)
   - NONAME [NTFS]/[root]/Windows/INF/setupapi.dev.log

APPENDIX IV: Prefetch Analysis

ExecutableName	SourceCreated	SourceModified	Size	RunCount	LastRun	FirstRun	VolumeSerial
7Z1801-X64.EXE	2018-03-31 13:22:54	2018-03-31 13:22:54	70046	1	2018-03-31 13:22:45		60D53EE6
ACCESSDATA%20FTK%20IMAGER%203	2018-04-03 16:46:17	2018-04-03 16:46:17	31520	1	2018-04-03 16:46:07		60D53EE6
AM_DELTA_PATCH_1.263.1974.0.E	2018-04-03 16:32:43	2018-04-03 16:32:43	13212	1	2018-04-03 16:32:33		60D53EE6
AM_DELTA.EXE	2018-04-01 15:24:03	2018-04-01 15:24:03	12300	1	2018-04-01 15:23:53		60D53EE6
APPLICATIONFRAMEHOST.EXE	2018-03-30 15:10:09	2018-04-03 16:35:36	65048	8	2018-04-03 16:35:26	2018-03-30 15:09:59	60D53EE6
AUDIODG.EXE	2018-03-27 00:01:51	2018-04-03 16:41:28	27130	25	2018-04-03 16:41:18	2018-04-03 00:54:03	60D53EE6
BACKGROUNDTASKHOST.EXE	2018-03-31 14:52:00	2018-03-31 15:10:42	40714	2	2018-03-31 15:10:32	2018-03-31 14:51:50	60D53EE6
BACKGROUNDTASKHOST.EXE	2018-03-31 14:51:58	2018-03-31 15:10:42	36272	2	2018-03-31 15:10:32	2018-03-31 14:51:48	60D53EE6
BACKGROUNDTASKHOST.EXE	2018-03-31 18:16:07	2018-03-31 18:16:07	3034	1	2018-03-31 18:15:55		60D53EE6
BACKGROUNDTASKHOST.EXE	2018-03-27 00:12:35	2018-04-03 13:34:08	43044	15	2018-04-03 13:33:58	2018-03-31 19:29:05	60D53EE6
BACKGROUNDTASKHOST.EXE	2018-01-30 16:22:17	2018-04-03 16:32:03	46974	12	2018-04-03 16:31:53	2018-04-01 04:40:17	60D53EE6
BACKGROUNDTASKHOST.EXE	2018-04-03 16:14:29	2018-04-03 16:14:29	34552	1	2018-04-03 16:14:19		60D53EE6
BACKGROUNDTASKHOST.EXE	2018-03-30 15:14:58	2018-04-03 13:37:32	160310	22	2018-04-03 13:37:17	2018-04-01 04:43:40	60D53EE6
BACKGROUNDTASKHOST.EXE	2018-03-27 00:13:08	2018-04-03 12:39:42	61810	7	2018-04-03 12:39:42	2018-03-27 00:13:06	60D53EE6
BACKGROUNDTRANSFERHOST.EXE	2018-03-27 00:13:23	2018-03-31 15:05:12	73834	3	2018-03-31 15:05:09	2018-03-27 00:13:13	60D53EE6
BCASTDVR.EXE	2018-03-31 15:06:01	2018-04-01 04:43:05	54586	17	2018-04-01 04:42:55	2018-03-31 19:30:27	60D53EE6
BROWSER_BROKER.EXE	2018-03-30 15:10:09	2018-04-03 13:37:44	36516	7	2018-04-03 13:37:33	2018-03-30 15:09:59	60D53EE6
BYTECODEGENERATOR.EXE	2018-04-03 01:03:32	2018-04-03 01:03:32	19444	1	2018-04-03 01:03:31		60D53EE6
BYTECODEGENERATOR.EXE	2018-04-03 01:03:34	2018-04-03 01:03:34	17296	1	2018-04-03 01:03:34		60D53EE6
CAT AND DOG.SCR	2018-03-31 16:06:30	2018-04-03 00:10:49	76976	4	2018-04-03 00:10:39	2018-03-31 16:06:20	60D53EE6
CAT_AND_DOG_SCREENSAVER.EXE	2018-03-31 16:05:20	2018-03-31 16:05:20	97026	1	2018-03-31 16:05:07		60D53EE6
CCLEANER.EXE	2018-04-03 14:01:44	2018-04-03 14:01:44	27064	1	2018-04-03 14:01:43		60D53EE6
CCLEANER64.EXE	2018-04-03 13:37:32	2018-04-03 14:01:53	84174	5	2018-04-03 14:01:43	2018-04-03 13:37:25	60D53EE6
CCUPDATE.EXE	2018-04-03 13:37:37	2018-04-03 13:37:37	22678	1	2018-04-03 13:37:26		60D53EE6

CHRMSTP.EXE	2018-04-01 04:17:32	2018-04-01 04:17:32	26600	1	2018-04-01 04:17:32		60D53EE6
CHRMSTP.EXE	2018-04-01 04:17:32	2018-04-01 04:17:32	42318	1	2018-04-01 04:17:32		60D53EE6
CHROME.EXE	2018-04-01 04:17:15	2018-04-01 04:17:15	25606	1	2018-04-01 04:16:53		60D53EE6
CHROME.EXE	2018-01-30 16:23:49	2018-04-01 05:24:33	45048	20	2018-04-01 05:24:22	2018-03-31 13:02:23	60D53EE6
CHROME.EXE	2018-01-30 16:23:49	2018-04-01 05:14:56	84932	17	2018-04-01 05:14:50	2018-03-31 12:12:33	60D53EE6
CHROME.EXE	2018-01-30 16:23:49	2018-04-01 04:17:15	188238	4	2018-04-01 04:16:52	2018-01-30 16:23:41	60D53EE6
CHROME.EXE	2018-04-01 04:46:29	2018-04-01 04:53:28	48782	2	2018-04-01 04:53:18	2018-04-01 04:46:19	60D53EE6
CHROME.EXE	2018-04-01 04:17:15	2018-04-01 04:17:15	27002	1	2018-04-01 04:16:53		60D53EE6
CHROME.EXE	2018-04-01 04:17:15	2018-04-01 04:17:15	43286	1	2018-04-01 04:16:53		60D53EE6
CHXSMARTSCREEN.EXE	2018-03-31 16:05:06	2018-04-03 12:40:57	118264	2	2018-04-03 12:40:46	2018-03-31 16:04:54	60D53EE6
CMD.EXE	2018-03-30 15:13:07	2018-04-03 16:56:25	9576	116	2018-04-03 16:56:25	2018-04-03 16:31:18	60D53EE6
CMD.EXE	2018-04-03 00:11:41	2018-04-03 00:11:42	10078	2	2018-04-03 00:11:41	2018-04-03 00:11:40	60D53EE6
COMPATTELRUNNER.EXE	2018-03-30 15:30:41	2018-04-03 00:50:18	13728	7	2018-04-03 00:50:08	2018-03-30 15:30:36	60D53EE6
CONHOST.EXE	2018-03-30 15:12:15	2018-04-03 16:56:25	21646	111	2018-04-03 16:56:25	2018-04-03 16:24:05	60D53EE6
CONSENT.EXE	2018-03-30 15:11:35	2018-04-03 16:43:55	287240	16	2018-04-03 16:43:52	2018-03-31 13:06:49	4EE65D55
CREDENTIALUIBROKER.EXE	2018-03-31 17:14:58	2018-03-31 17:16:27	109834	2	2018-03-31 17:16:17	2018-03-31 17:14:48	60D53EE6
CSRSS.EXE	2018-03-27 00:11:12	2018-04-03 16:17:52	30166	7	2018-04-03 16:17:42	2018-03-27 00:11:01	60D53EE6
CTFMON.EXE	2018-03-30 15:13:34	2018-04-03 16:17:40	32838	10	2018-04-03 16:17:40	2018-03-31 14:46:48	60D53EE6
DEFRAG.EXE	2018-03-30 15:30:37	2018-04-03 01:10:05	16604	3	2018-04-03 01:09:55	2018-03-30 15:30:35	60D53EE6
DLLHOST.EXE	2018-04-03 00:45:16	2018-04-03 00:45:16	21570	1	2018-04-03 00:45:06		60D53EE6
DLLHOST.EXE	2018-03-27 00:13:17	2018-04-03 12:39:52	47756	7	2018-04-03 12:39:41	2018-03-27 00:13:07	60D53EE6
DLLHOST.EXE	2018-03-27 00:11:17	2018-03-31 14:47:54	25258	2	2018-03-31 14:47:49	2018-03-27 00:11:12	60D53EE6
DLLHOST.EXE	2018-04-03 14:01:46	2018-04-03 14:01:46	39032	1	2018-04-03 14:01:41		BAA935F8
DLLHOST.EXE	2018-03-27 00:13:13	2018-04-03 12:39:47	16988	11	2018-04-03 12:39:41	2018-03-31 12:49:33	60D53EE6
DLLHOST.EXE	2018-03-31 15:38:03	2018-03-31 15:38:03	78032	1	2018-03-31 15:37:53		60D53EE6
DLLHOST.EXE	2018-03-27 00:09:44	2018-04-03 16:43:59	16960	47	2018-04-03 16:43:54	2018-04-03 01:02:12	60D53EE6
DLLHOST.EXE	2018-03-27 00:02:07	2018-04-03 16:47:48	27610	45	2018-04-03 16:47:39	2018-04-03 12:29:37	60D53EE6
DLLHOST.EXE	2018-04-03 13:48:18	2018-04-03 13:48:18	23402	1	2018-04-03 13:48:13		60D53EE6
DLLHOST.EXE	2018-03-31 13:12:04	2018-04-03 16:37:45	31712	10	2018-04-03 16:37:35	2018-04-03 12:30:04	60D53EE6
DLLHOST.EXE	2018-03-30 15:11:50	2018-04-03 16:32:31	26184	10	2018-04-03 16:32:26	2018-03-31 12:53:17	60D53EE6
DLLHOST.EXE	2018-03-31 12:53:09	2018-03-31 23:52:49	38456	4	2018-03-31 23:52:44	2018-03-31 12:53:04	60D53EE6
DROPBOX.EXE	2018-03-31 13:09:17	2018-04-03 00:59:11	171872	12	2018-04-03 00:59:01	2018-03-31 14:44:24	BAA935F8
DROPBOXCRASHHANDLER.EXE	2018-03-31 13:11:00	2018-03-31 14:47:36	31914	2	2018-03-31 14:47:35	2018-03-31 13:11:00	60D53EE6

DROPBOXUPDATE.EXE	2018-03-31 13:06:53	2018-04-03 16:37:42	65674	44	2018-04-03 16:37:35	2018-04-03 13:11:19	60D53EE6
DROPBOXUPDATE.EXE	2018-03-31 13:06:38	2018-03-31 13:06:38	57000	1	2018-03-31 13:06:29		60D53EE6
DROPBOXUPDATE.EXE	2018-03-31 13:06:59	2018-03-31 13:07:01	97308	2	2018-03-31 13:06:51	2018-03-31 13:06:49	60D53EE6
DRVINST.EXE	2018-03-27 00:01:55	2018-04-03 16:41:31	57658	15	2018-04-03 16:41:30	2018-03-30 15:12:50	60D53EE6
DWM.EXE	2018-03-27 00:11:12	2018-04-03 16:17:53	67182	7	2018-04-03 16:17:42	2018-03-27 00:11:01	60D53EE6
EXPLORER.EXE	2018-03-31 13:09:32	2018-04-03 00:13:56	186378	2	2018-04-03 00:13:41	2018-03-31 13:09:22	60D53EE6
FILESYNCCONFIG.EXE	2018-04-03 00:11:41	2018-04-03 00:11:41	43924	1	2018-04-03 00:11:40		60D53EE6
FINDSTR.EXE	2018-01-30 16:26:26	2018-04-03 16:56:25	8612	82	2018-04-03 16:56:25	2018-04-03 01:24:00	60D53EE6
FIREFOX INSTALLER.EXE	2018-01-30 16:26:43	2018-01-30 16:26:43	29990	1	2018-01-30 16:26:33		60D53EE6
FIREFOX.EXE	2018-01-30 16:27:17	2018-04-03 16:41:52	148492	40	2018-04-03 16:41:49	2018-04-03 00:45:33	60D53EE6
FIRSTLOGONANIM.EXE	2018-03-27 00:11:13	2018-03-27 00:11:13	52958	1	2018-03-27 00:11:01		60D53EE6
FONTDRVHOST.EXE	2018-03-27 00:11:12	2018-04-03 16:17:53	436920	7	2018-04-03 16:17:42	2018-03-27 00:11:01	60D53EE6
FSQUIRT.EXE	2018-03-27 00:12:27	2018-03-31 14:48:08	40944	2	2018-03-31 14:48:07	2018-03-27 00:12:25	60D53EE6
FTK IMAGER.EXE	2018-04-03 16:44:01	2018-04-03 16:45:41	19942	3	2018-04-03 16:45:31	2018-04-03 16:43:55	4EE65D55
FTK IMAGER.EXE	2018-04-03 16:47:59	2018-04-03 16:47:59	108762	1	2018-04-03 16:47:49		4EE65D55
GAMEBARPRESENCEWRITER.EXE	2018-03-31 18:16:28	2018-04-01 04:44:14	16860	5	2018-04-01 04:44:03	2018-03-31 18:16:16	60D53EE6
GAMEPANEL.EXE	2018-04-01 04:44:49	2018-04-01 04:44:56	27448	1	2018-04-01 04:44:39		60D53EE6
GAMEPANEL.EXE	2018-03-31 18:16:23	2018-04-01 04:44:19	67086	5	2018-04-01 04:44:04	2018-03-31 18:16:17	60D53EE6
GOOGLEUPDATE.EXE	2018-01-30 16:22:59	2018-01-30 16:22:59	126214	1	2018-01-30 16:22:49		60D53EE6
GOOGLEUPDATE.EXE	2018-01-30 16:22:54	2018-04-03 16:31:16	58752	19	2018-04-03 16:31:16	2018-04-03 00:10:01	60D53EE6
GOOGLEUPDATE.EXE	2018-01-30 16:22:55	2018-01-30 16:22:55	54528	1	2018-01-30 16:22:45		60D53EE6
HELPER.EXE	2018-03-31 23:52:44	2018-03-31 23:52:44	36542	1	2018-03-31 23:52:41		60D53EE6
HXTSR.EXE	2018-03-31 16:41:29	2018-04-03 16:14:20	70292	6	2018-04-03 16:14:19	2018-03-31 16:41:19	60D53EE6
ICACLS.EXE	2018-04-03 00:11:41	2018-04-03 00:11:42	13076	2	2018-04-03 00:11:42	2018-04-03 00:11:40	60D53EE6
IEXPLORE.EXE	2018-03-31 13:04:04	2018-03-31 13:04:12	161778	2	2018-03-31 13:04:02	2018-03-31 13:03:54	60D53EE6
IEXPLORE.EXE	2018-03-31 13:04:03	2018-03-31 13:04:03	92784	1	2018-03-31 13:03:53		60D53EE6
IPCONFIG.EXE	2018-03-31 23:42:30	2018-04-03 16:25:15	10146	8	2018-04-03 16:25:08	2018-03-31 23:42:26	60D53EE6
IRONKEY.EXE	2018-03-31 14:41:41	2018-03-31 14:41:41	54718	1	2018-03-31 14:41:31		BAA935F8
IRONKEY.EXE	2018-03-31 14:03:22	2018-04-03 16:15:20	61610	4	2018-04-03 16:15:09	2018-03-31 14:03:11	BAA935F8
IRONKEY.EXE	2018-03-31 14:03:12	2018-04-03 16:15:09	55902	4	2018-04-03 16:15:09	2018-03-31 14:03:11	BAA935F8
LOCKAPP.EXE	2018-03-30 15:29:18	2018-04-03 01:35:50	101274	3	2018-04-03 01:35:40	2018-03-30 15:29:08	60D53EE6
LOGONUI.EXE	2018-03-27 00:11:12	2018-04-03 16:17:42	132142	18	2018-04-03 16:17:39	2018-04-03 00:12:30	60D53EE6
MANAGEMENTAGENTHOST.EXE	2018-04-03 16:31:27	2018-04-03 16:31:27	53456	1	2018-04-03 16:31:17		60D53EE6

MICROSOFT.PHOTOS.EXE	2018-03-31 15:37:21	2018-04-03 00:58:59	221186	3	2018-04-03 00:58:47	2018-03-31 15:37:13	60D53EE6
MICROSOFTEDGE.EXE	2018-04-03 13:37:42	2018-04-03 13:37:42	140114	1	2018-04-03 13:37:32		60D53EE6
MICROSOFTEDGE.EXE	2018-03-30 15:10:09	2018-03-31 16:08:22	228222	3	2018-03-31 16:08:12	2018-03-30 15:09:59	60D53EE6
MICROSOFTEDGECP.EXE	2018-03-30 15:10:20	2018-03-31 16:08:24	200596	18	2018-03-31 16:08:14	2018-03-31 14:48:05	60D53EE6
MICROSOFTEDGECP.EXE	2018-04-03 13:37:46	2018-04-03 13:42:35	87102	6	2018-04-03 13:42:24	2018-04-03 13:37:36	60D53EE6
MMC.EXE	2018-03-31 12:50:10	2018-03-31 12:50:10	248104	1	2018-03-31 12:50:00		60D53EE6
MMC.EXE	2018-01-30 16:17:25	2018-01-30 16:17:25	129324	1	2018-01-30 16:17:15		60D53EE6
MOBSYNC.EXE	2018-03-27 00:12:39	2018-04-03 00:59:00	36238	8	2018-04-03 00:58:49	2018-03-27 00:12:29	60D53EE6
MPAM-9B898230.EXE	2018-04-01 15:24:45	2018-04-01 15:24:45	123542	1	2018-04-01 15:24:35		60D53EE6
MPAM-C74E2EB3.EXE	2018-04-03 00:20:36	2018-04-03 00:20:36	92820	1	2018-04-03 00:20:24		60D53EE6
MPCMDRUN.EXE	2018-03-31 12:57:31	2018-04-03 16:39:26	38446	19	2018-04-03 16:39:16	2018-04-03 00:19:30	60D53EE6
MPCMDRUN.EXE	2018-03-30 15:14:58	2018-03-31 12:22:50	33694	5	2018-03-31 12:22:40	2018-03-30 15:14:38	60D53EE6
MPSIGSTUB.EXE	2018-04-03 00:20:47	2018-04-03 00:20:47	142560	1	2018-04-03 00:20:44		60D53EE6
MPSIGSTUB.EXE	2018-04-01 15:24:38	2018-04-01 15:24:38	144464	1	2018-04-01 15:24:37		60D53EE6
MPSIGSTUB.EXE	2018-04-01 15:23:54	2018-04-03 16:32:34	268436	2	2018-04-03 16:32:33	2018-04-01 15:23:53	60D53EE6
MRT-KB890830.EXE	2018-04-03 00:21:33	2018-04-03 00:21:33	125292	1	2018-04-03 00:21:31		60D53EE6
MSASCUIL.EXE	2018-03-27 00:12:45	2018-04-03 16:30:52	28942	9	2018-04-03 16:30:42	2018-03-30 15:14:38	60D53EE6
MSCORSVW.EXE	2018-03-31 17:37:18	2018-04-03 01:12:53	130358	14	2018-04-03 01:12:53	2018-04-03 00:58:24	60D53EE6
MSCORSVW.EXE	2018-03-31 17:37:11	2018-04-03 01:12:20	88702	13	2018-04-03 01:12:20	2018-03-31 17:37:18	60D53EE6
MSI2FF8.TMP	2018-03-31 14:20:51	2018-03-31 14:20:51	91094	1	2018-03-31 14:20:41		BAA935F8
MSIEXEC.EXE	2018-03-30 15:12:23	2018-04-03 16:46:23	51514	4	2018-04-03 16:46:13	2018-03-30 15:12:13	BAA935F8
MSIEXEC.EXE	2018-03-30 15:11:54	2018-04-03 16:46:23	102060	12	2018-04-03 16:46:13	2018-03-31 13:06:53	60D53EE6
MSINFO32.EXE	2018-03-27 00:13:21	2018-03-27 00:13:21	38076	2	2018-03-27 00:13:11	2018-03-27 00:13:11	60D53EE6
MSPAINT.EXE	2018-03-31 15:37:10	2018-03-31 15:37:10	76642	1	2018-03-31 15:37:07		60D53EE6
MSTSC.EXE	2018-03-31 17:14:52	2018-03-31 17:16:04	52864	2	2018-03-31 17:15:54	2018-03-31 17:14:42	60D53EE6
MUSIC.UI.EXE	2018-03-31 15:05:13	2018-03-31 15:05:13	182586	1	2018-03-31 15:05:08		60D53EE6
MUSNOTIFICATIONUX.EXE	2018-04-03 00:54:18	2018-04-03 00:54:22	60534	2	2018-04-03 00:54:20	2018-04-03 00:54:17	60D53EE6
NGEN.EXE	2018-03-31 17:37:10	2018-04-03 01:12:02	28084	13	2018-04-03 01:11:52	2018-03-31 17:37:18	60D53EE6
NGEN.EXE	2018-03-31 17:37:10	2018-04-03 01:12:06	18230	13	2018-04-03 01:11:57	2018-03-31 17:37:19	60D53EE6
NGENTASK.EXE	2018-03-31 17:37:20	2018-04-03 01:14:09	87616	6	2018-04-03 01:14:09	2018-03-31 17:37:10	60D53EE6
NGENTASK.EXE	2018-03-31 17:37:20	2018-04-03 01:14:06	88774	6	2018-04-03 01:14:06	2018-03-31 17:37:10	60D53EE6
NOTEPAD.EXE	2018-03-31 16:08:04	2018-03-31 16:08:04	42820	1	2018-03-31 16:08:02		60D53EE6
ONEDRIVE.EXE	2018-03-31 14:49:46	2018-04-03 00:59:07	149932	5	2018-04-03 00:58:57	2018-03-31 14:49:36	60D53EE6

ONEDRIVE.EXE	2018-04-03 00:14:22	2018-04-03 16:30:57	119214	2	2018-04-03 16:30:47	2018-04-03 00:14:12	60D53EE6
ONEDRIVESETUP.EXE	2018-03-31 14:49:47	2018-04-03 00:09:56	211658	4	2018-04-03 00:09:53	2018-03-31 14:49:46	60D53EE6
ONEDRIVESETUP.EXE	2018-03-27 00:12:37	2018-03-31 14:48:31	176620	4	2018-03-31 14:48:21	2018-03-27 00:12:36	60D53EE6
OOBENETWORKCONNECTIONFLOW.EXE	2018-03-27 00:07:26	2018-03-27 00:07:26	172228	1	2018-03-27 00:07:19		60D53EE6
OPENWITH.EXE	2018-03-31 15:37:08	2018-03-31 15:37:08	110202	1	2018-03-31 15:37:03		60D53EE6
PHOTOSCREENSAVER.SCR	2018-03-31 16:07:34	2018-03-31 16:07:34	52874	1	2018-03-31 16:07:31		60D53EE6
PING.EXE	2018-04-03 13:37:05	2018-04-03 13:37:23	12512	2	2018-04-03 13:37:23	2018-04-03 13:37:05	60D53EE6
PINGSENDER.EXE	2018-03-31 15:42:52	2018-04-03 16:41:54	48048	4	2018-04-03 16:41:51	2018-03-31 15:42:51	60D53EE6
POQEXEC.EXE	2018-04-03 00:54:59	2018-04-03 00:54:59	42168	1	2018-04-03 00:54:49		60D53EE6
PUTTY.EXE	2018-03-31 16:08:44	2018-03-31 17:14:22	33362	2	2018-03-31 17:14:12	2018-03-31 16:08:34	60D53EE6
QTWEBENGINEPROCESS.EXE	2018-03-31 13:09:43	2018-04-03 16:41:47	83268	3	2018-04-03 16:41:40	2018-03-31 13:09:33	60D53EE6
REGSVR32.EXE	2018-03-27 00:01:48	2018-03-31 13:08:49	29434	4	2018-03-31 13:08:49	2018-03-27 00:01:46	60D53EE6
REGSVR32.EXE	2018-03-27 00:01:51	2018-03-31 13:08:49	31036	6	2018-03-31 13:08:49	2018-03-27 00:01:48	60D53EE6
RUNDLL32.EXE	2018-03-27 00:01:48	2018-04-03 01:03:17	24082	18	2018-04-03 01:03:07	2018-03-31 12:49:15	60D53EE6
RUNDLL32.EXE	2018-03-30 15:28:06	2018-03-30 15:28:06	36130	1	2018-01-30 16:27:57		60D53EE6
RUNDLL32.EXE	2018-04-03 00:50:09	2018-04-03 00:50:09	16610	1	2018-04-03 00:50:08		60D53EE6
RUNDLL32.EXE	2018-03-31 16:06:20	2018-03-31 16:06:20	15352	1	2018-03-31 16:06:08		60D53EE6
RUNDLL32.EXE	2018-03-30 15:11:17	2018-04-03 12:29:42	20068	4	2018-04-03 12:29:37	2018-03-30 15:11:16	60D53EE6
RUNDLL32.EXE	2018-03-31 12:43:42	2018-04-03 16:43:42	19918	6	2018-04-03 16:43:41	2018-03-31 12:43:42	60D53EE6
RUNONCE.EXE	2018-04-03 00:09:54	2018-04-03 16:30:55	49190	4	2018-04-03 16:30:49	2018-04-03 00:09:48	60D53EE6
RUNTIMEBROKER.EXE	2018-03-31 12:49:25	2018-04-03 16:30:41	126230	6	2018-04-03 16:30:31	2018-03-31 12:49:15	60D53EE6
RUNTIMEBROKER.EXE	2018-03-27 00:13:17	2018-04-03 12:39:52	42022	6	2018-04-03 12:39:42	2018-03-27 00:13:07	60D53EE6
RUNTIMEBROKER.EXE	2018-04-03 13:37:47	2018-04-03 13:37:47	20706	1	2018-04-03 13:37:36		60D53EE6
RUNTIMEBROKER.EXE	2018-03-27 00:11:21	2018-04-03 16:30:39	56578	8	2018-04-03 16:30:29	2018-03-27 00:11:11	60D53EE6
RUNTIMEBROKER.EXE	2018-03-31 15:23:50	2018-03-31 15:23:50	11266	1	2018-03-31 15:23:40		60D53EE6
RUNTIMEBROKER.EXE	2018-03-27 00:01:51	2018-04-03 16:47:52	111920	21	2018-04-03 16:47:42	2018-04-03 00:22:37	4EE65D55
RUNTIMEBROKER.EXE	2018-03-31 16:41:31	2018-04-03 16:30:56	33154	10	2018-04-03 16:30:46	2018-04-01 04:40:18	60D53EE6
RUNTIMEBROKER.EXE	2018-03-31 15:37:24	2018-03-31 15:37:24	80092	1	2018-03-31 15:37:14		60D53EE6
RUNTIMEBROKER.EXE	2018-04-03 00:19:02	2018-04-03 00:19:02	17938	1	2018-04-03 00:18:51		60D53EE6
RUNTIMEBROKER.EXE	2018-03-31 16:08:23	2018-03-31 16:08:23	31462	1	2018-03-31 16:08:13		60D53EE6
RUNTIMEBROKER.EXE	2018-03-31 16:08:24	2018-03-31 16:08:24	20386	1	2018-03-31 16:08:14		60D53EE6
RUNTIMEBROKER.EXE	2018-03-31 23:42:38	2018-04-03 01:35:51	108012	2	2018-04-03 01:35:40	2018-03-31 23:42:28	60D53EE6
RUNTIMEBROKER.EXE	2018-03-31 19:36:32	2018-03-31 23:52:41	61250	2	2018-03-31 23:52:31	2018-03-31 19:36:17	60D53EE6

RUNTIMEBROKER.EXE	2018-04-03 16:35:36	2018-04-03 16:35:36	19710	1	2018-04-03 16:35:26		60D53EE6
RUNTIMEBROKER.EXE	2018-03-27 00:11:20	2018-03-31 14:48:01	50000	3	2018-03-31 14:47:48	2018-03-27 00:11:10	60D53EE6
RUNTIMEBROKER.EXE	2018-03-31 16:05:06	2018-04-03 12:40:58	18342	2	2018-04-03 12:40:48	2018-03-31 16:04:54	60D53EE6
RUNTIMEBROKER.EXE	2018-04-03 13:37:45	2018-04-03 13:37:45	31382	1	2018-04-03 13:37:35		60D53EE6
RUNTIMEBROKER.EXE	2018-04-03 00:19:06	2018-04-03 00:19:06	21790	1	2018-04-03 00:18:56		60D53EE6
SCALC.EXE	2018-03-31 15:38:32	2018-03-31 15:38:32	10132	1	2018-03-31 15:38:21		60D53EE6
SCRNSAVE.SCR	2018-03-31 16:07:31	2018-03-31 16:07:31	16814	1	2018-03-31 16:07:29		60D53EE6
SDIAGNHOST.EXE	2018-04-03 00:50:14	2018-04-03 00:50:14	168934	1	2018-04-03 00:50:09		60D53EE6
SEARCHFILTERHOST.EXE	2018-03-27 00:13:35	2018-04-03 16:59:12	17528	74	2018-04-03 16:59:02	2018-04-03 13:39:34	60D53EE6
SEARCHINDEXER.EXE	2018-04-03 00:57:54	2018-04-03 00:57:54	56676	1	2018-04-03 00:57:44		60D53EE6
SEARCHPROTOCOLHOST.EXE	2018-03-27 00:13:35	2018-04-03 16:59:12	19870	65	2018-04-03 16:59:02	2018-04-03 13:37:25	60D53EE6
SEARCHUI.EXE	2018-03-27 00:14:36	2018-04-03 16:30:39	327358	10	2018-04-03 16:30:28	2018-03-31 12:49:13	60D53EE6
SETTINGSYNCHOST.EXE	2018-03-27 00:12:34	2018-03-31 14:48:16	26628	2	2018-03-31 14:48:06	2018-03-27 00:12:24	60D53EE6
SETUP-STUB.EXE	2018-01-30 16:26:43	2018-01-30 16:26:45	102566	2	2018-01-30 16:26:35	2018-01-30 16:26:33	60D53EE6
SETUP64.EXE	2018-03-30 15:11:36	2018-03-30 15:11:36	46818	1	2018-03-30 15:11:35		60D53EE6
SHELLEXPERIENCEHOST.EXE	2018-03-31 12:49:23	2018-04-03 16:30:39	230200	9	2018-04-03 16:30:28	2018-03-31 13:09:25	60D53EE6
SIHOST.EXE	2018-03-27 00:11:13	2018-04-03 00:58:48	66926	6	2018-04-03 00:58:38	2018-03-27 00:11:01	60D53EE6
SIMPRESS.EXE	2018-03-31 14:22:10	2018-03-31 14:42:46	10090	4	2018-03-31 14:42:39	2018-03-31 14:22:00	60D53EE6
SLITHERIO.EXE	2018-03-31 16:05:12	2018-04-03 00:59:03	107090	3	2018-04-03 00:58:59	2018-03-31 16:05:09	60D53EE6
SLUI.EXE	2018-03-27 00:02:06	2018-04-03 16:30:39	35804	41	2018-04-03 16:30:28	2018-04-03 12:29:45	60D53EE6
SMARTSCREEN.EXE	2018-03-27 00:01:48	2018-04-03 16:39:27	83040	29	2018-04-03 16:39:17	2018-04-03 00:45:32	60D53EE6
SMSS.EXE	2018-03-27 00:11:01	2018-04-03 16:17:42	10010	7	2018-04-03 16:17:42	2018-03-27 00:11:01	60D53EE6
SOFFICE.BIN	2018-03-31 14:21:39	2018-03-31 23:11:06	364312	16	2018-03-31 23:10:56	2018-03-31 14:42:50	CBB6FC8
SOFFICE.EXE	2018-03-31 14:21:46	2018-03-31 23:11:06	15248	15	2018-03-31 23:10:55	2018-03-31 14:42:59	60D53EE6
SPEECHRUNTIME.EXE	2018-03-27 00:02:29	2018-04-03 00:54:22	77954	9	2018-04-03 00:54:19	2018-03-27 00:05:48	60D53EE6
SPPEXTCOMOBJ.EXE	2018-03-27 00:02:06	2018-04-03 16:30:39	22324	26	2018-04-03 16:30:27	2018-04-03 00:57:59	60D53EE6
SPPSVC.EXE	2018-03-27 00:13:49	2018-04-03 16:31:26	45962	28	2018-04-03 16:31:16	2018-04-03 12:29:44	60D53EE6
STRITZ.EXE	2018-03-31 23:52:41	2018-03-31 23:52:41	338584	1	2018-03-31 23:52:30		60D53EE6
SVCHOST.EXE	2018-04-03 16:31:29	2018-04-03 16:31:29	20950	1	2018-04-03 16:31:19		60D53EE6
SVCHOST.EXE	2018-04-03 16:44:05	2018-04-03 16:44:05	60226	1	2018-04-03 16:43:54		4EE65D55
SVCHOST.EXE	2018-04-03 16:30:57	2018-04-03 16:30:57	30530	1	2018-04-03 16:30:47		60D53EE6
SVCHOST.EXE	2018-03-31 18:16:29	2018-04-01 04:43:50	18500	4	2018-04-01 04:43:38	2018-03-31 18:16:19	60D53EE6
SVCHOST.EXE	2018-04-03 16:32:39	2018-04-03 16:32:39	24416	1	2018-04-03 16:32:28		60D53EE6

SVCHOST.EXE	2018-03-27 00:11:16	2018-04-03 16:30:51	56724	19	2018-04-03 16:30:40	2018-03-30 15:43:04	60D53EE6
SVCHOST.EXE	2018-04-03 16:41:39	2018-04-03 16:41:39	12240	1	2018-04-03 16:41:29		60D53EE6
SVCHOST.EXE	2018-04-03 16:39:27	2018-04-03 16:39:27	18496	1	2018-04-03 16:39:17		60D53EE6
SVCHOST.EXE	2018-04-03 16:41:39	2018-04-03 16:41:39	37500	1	2018-04-03 16:41:29		60D53EE6
SVCHOST.EXE	2018-03-30 15:30:45	2018-04-03 01:10:05	20140	4	2018-04-03 01:09:55	2018-03-30 15:30:35	CCD44B81
SVCHOST.EXE	2018-04-03 16:48:04	2018-04-03 16:48:04	29328	1	2018-04-03 16:47:54		60D53EE6
SVCHOST.EXE	2018-04-03 16:32:25	2018-04-03 16:32:25	37632	1	2018-04-03 16:32:15		60D53EE6
SVCHOST.EXE	2018-04-03 16:31:28	2018-04-03 16:31:28	23112	1	2018-04-03 16:31:18		60D53EE6
SVCHOST.EXE	2018-04-03 00:13:56	2018-04-03 01:03:16	40664	2	2018-04-03 01:03:06	2018-04-03 00:13:41	60D53EE6
SVCHOST.EXE	2018-03-30 15:43:28	2018-04-03 14:01:49	33944	16	2018-04-03 14:01:39	2018-03-31 23:58:22	60D53EE6
SVCHOST.EXE	2018-04-03 00:59:03	2018-04-03 16:31:26	14974	2	2018-04-03 16:31:16	2018-04-03 00:58:51	60D53EE6
SVCHOST.EXE	2018-04-03 16:41:34	2018-04-03 16:41:34	19966	1	2018-04-03 16:41:24		60D53EE6
SVCHOST.EXE	2018-04-03 16:39:27	2018-04-03 16:39:27	43860	1	2018-04-03 16:39:19		60D53EE6
SVCHOST.EXE	2018-04-03 16:32:27	2018-04-03 16:45:40	21568	4	2018-04-03 16:45:30	2018-04-03 16:32:17	60D53EE6
SVCHOST.EXE	2018-03-31 15:37:18	2018-03-31 15:37:18	26034	1	2018-03-31 15:37:08		60D53EE6
SVCHOST.EXE	2018-04-03 12:32:59	2018-04-03 12:32:59	38276	1	2018-04-03 12:32:49		60D53EE6
SVCHOST.EXE	2018-04-03 16:44:02	2018-04-03 16:44:02	17714	1	2018-04-03 16:43:52		4EE65D55
SVCHOST.EXE	2018-03-30 15:13:00	2018-04-03 16:31:05	22700	12	2018-04-03 16:30:55	2018-03-31 14:38:48	60D53EE6
SVCHOST.EXE	2018-04-03 16:46:24	2018-04-03 16:46:24	15406	1	2018-04-03 16:46:14		60D53EE6
SVCHOST.EXE	2018-03-30 15:30:46	2018-04-03 16:25:19	21952	16	2018-04-03 16:25:09	2018-04-01 02:29:19	60D53EE6
SVCHOST.EXE	2018-04-03 00:58:37	2018-04-03 00:58:37	21038	1	2018-04-03 00:58:27		60D53EE6
SVCHOST.EXE	2018-04-03 16:31:27	2018-04-03 16:31:27	21288	1	2018-04-03 16:31:17		60D53EE6
SVCHOST.EXE	2018-03-30 15:30:46	2018-04-03 13:48:23	21036	8	2018-04-03 13:48:13	2018-03-30 15:30:36	60D53EE6
SVCHOST.EXE	2018-04-03 16:31:29	2018-04-03 16:31:29	44920	1	2018-04-03 16:31:19		60D53EE6
SVCHOST.EXE	2018-03-31 14:47:49	2018-04-03 00:13:50	97500	3	2018-04-03 00:13:39	2018-03-31 14:47:35	60D53EE6
SVCHOST.EXE	2018-03-27 00:02:29	2018-04-03 12:33:19	50552	10	2018-04-03 12:33:09	2018-03-27 00:09:39	60D53EE6
SWRITER.EXE	2018-03-31 14:21:46	2018-03-31 23:11:06	11118	13	2018-03-31 23:10:55	2018-03-31 14:45:42	60D53EE6
SYSTEMPROPERTIESCOMPUTERNAME.	2018-03-31 12:44:27	2018-03-31 12:44:27	42708	1	2018-03-31 12:44:17		60D53EE6
SYSTEMSETTINGS.EXE	2018-03-30 15:16:03	2018-04-03 00:54:27	229842	6	2018-04-03 00:54:17	2018-03-30 15:15:52	60D53EE6
SYSTEMSETTINGSADMINFLOWS.EXE	2018-03-30 15:16:00	2018-03-31 12:53:41	99674	3	2018-03-31 12:53:35	2018-03-30 15:16:00	60D53EE6
TASKHOSTW.EXE	2018-03-27 00:05:53	2018-04-03 16:45:24	69648	74	2018-04-03 16:45:24	2018-04-03 13:44:09	60D53EE6
TASKLIST.EXE	2018-01-30 16:21:25	2018-04-03 16:56:25	24820	83	2018-04-03 16:56:25	2018-04-03 01:24:00	60D53EE6
TIWORKER.EXE	2018-04-03 00:19:20	2018-04-03 16:32:29	61488	6	2018-04-03 16:32:19	2018-04-03 00:19:10	60D53EE6

TIWORKER.EXE	2018-03-30 14:07:56	2018-04-03 00:12:29	819452	7	2018-04-03 00:12:19	2018-03-30 14:07:46	60D53EE6
TRUSTEDINSTALLER.EXE	2018-03-30 14:07:56	2018-04-03 16:45:34	20056	18	2018-04-03 16:45:24	2018-04-03 00:28:41	60D53EE6
UNSECAPP.EXE	2018-04-03 13:46:46	2018-04-03 13:46:46	17688	1	2018-04-03 13:46:36		60D53EE6
USERINIT.EXE	2018-04-03 00:13:56	2018-04-03 00:13:56	13760	1	2018-04-03 00:13:41		60D53EE6
VC_REDIST.X64.EXE	2018-03-31 14:21:10	2018-03-31 14:21:10	69348	1	2018-03-31 14:21:08		60D53EE6
VCREDIST_X64.EXE	2018-03-30 15:11:57	2018-03-30 15:11:57	61958	1	2018-03-30 15:11:49		60D53EE6
VCREDIST_X86.EXE	2018-03-30 15:11:46	2018-03-30 15:11:46	60472	1	2018-03-30 15:11:36		60D53EE6
VMTOOLSD.EXE	2018-03-30 15:13:31	2018-04-03 16:30:54	229526	9	2018-04-03 16:30:43	2018-03-30 15:13:21	60D53EE6
VMWARERESOLUTIONSET.EXE	2018-04-01 04:48:00	2018-04-03 16:15:52	32166	5	2018-04-03 16:15:51	2018-04-01 04:47:59	60D53EE6
VSSVC.EXE	2018-03-30 15:30:46	2018-04-03 13:48:23	23482	8	2018-04-03 13:48:13	2018-03-30 15:30:36	60D53EE6
WERFAULT.EXE	2018-03-31 14:38:49	2018-04-03 00:11:20	119026	3	2018-04-03 00:11:10	2018-03-31 14:38:48	BAA935F8
WERFAULT.EXE	2018-04-03 00:18:42	2018-04-03 00:18:52	31764	2	2018-04-03 00:18:42	2018-04-03 00:18:42	60D53EE6
WERMGR.EXE	2018-04-03 00:19:52	2018-04-03 01:05:49	25108	2	2018-04-03 01:05:48	2018-04-03 00:19:46	60D53EE6
WHOAMI.EXE	2018-04-03 13:37:18	2018-04-03 13:37:18	15160	1	2018-04-03 13:37:18		60D53EE6
WINDOWS-KB890830-X64-V5.58.EX	2018-04-03 00:21:15	2018-04-03 00:21:15	8130	1	2018-04-03 00:21:10		60D53EE6
WINLOGON.EXE	2018-03-27 00:11:12	2018-04-03 16:17:52	33798	7	2018-04-03 16:17:42	2018-03-27 00:11:01	60D53EE6
WINSAT.EXE	2018-04-03 01:14:20	2018-04-03 01:14:20	39676	1	2018-04-03 01:14:10		60D53EE6
WINSTORE.APP.EXE	2018-04-03 16:35:36	2018-04-03 16:35:36	124894	1	2018-04-03 16:35:26		60D53EE6
WMIADAP.EXE	2018-03-27 00:03:53	2018-04-03 16:33:09	20628	15	2018-04-03 16:33:09	2018-04-01 15:14:55	60D53EE6
WMIAPSRV.EXE	2018-04-03 00:22:37	2018-04-03 16:33:46	21750	7	2018-04-03 16:33:36	2018-04-03 00:22:26	60D53EE6
WMIPRVSE.EXE	2018-03-27 00:09:56	2018-04-03 16:26:23	50656	20	2018-04-03 16:26:13	2018-04-01 15:13:46	60D53EE6
WMIPRVSE.EXE	2018-03-31 13:09:35	2018-04-03 16:31:06	24584	5	2018-04-03 16:30:55	2018-03-31 13:09:25	60D53EE6
WUAUCLT.EXE	2018-04-01 15:24:02	2018-04-03 16:32:43	103366	6	2018-04-03 16:32:33	2018-04-01 15:23:52	60D53EE6
WUDFHOST.EXE	2018-03-31 14:03:15	2018-04-03 16:41:35	27256	11	2018-04-03 16:41:25		60D53EE6
WWAHOST.EXE	2018-03-27 00:01:48	2018-03-31 12:51:42	258802	2	2018-03-31 12:51:32	2018-03-27 00:01:37	60D53EE6

APPENDIX V: Shellbag Analysis

AbsolutePath	ShellType	Value	FirstInteracted	LastInteracted
Desktop\Control Panel	Root folder: GUID	Control Panel		
Desktop\Control Panel\System and Security	Control Panel Category	System and Security		2018-03-31 12:46:31
Desktop\Control Panel\System and Security\System	GUID: Control panel	System	2018-03-31 12:46:31	2018-03-31 12:46:31
Desktop\E:\	Users property view: Drive letter	E:\		
Desktop\E:\	Users property view: Drive letter	E:\	2018-03-31 15:36:58	2018-04-03 13:59:22

Desktop\E:\\Documents	Directory	Documents	2018-03-31 14:43:06	2018-03-31 14:43:06
Desktop\F:\	Users property view: Drive letter	F:\		2018-04-03 16:43:43
Desktop\F:\\Forensic Software	Directory	Forensic Software		2018-04-03 16:43:41
Desktop\F:\\Forensic Software\FTK Imager	Directory	FTK Imager		2018-04-03 16:43:42
Desktop\F:\\Forensic Software\FTK Imager\FTK Imager	Directory	FTK Imager	2018-04-03 16:43:43	2018-04-03 16:43:43
Desktop\Home Folder	Root folder: GUID	Home Folder	2018-03-31 12:43:42	
Desktop\Home Folder	Root folder: GUID	Home Folder	2018-03-31 15:36:58	
Desktop\My Computer	Root folder: GUID	My Computer		
Desktop\My Computer	Root folder: GUID	My Computer		
Desktop\My Computer\C:	Drive letter	C:		
Desktop\My Computer\C:	Drive letter	C:		
Desktop\My Computer\C:\Users	Directory	Users		2018-03-31 14:46:26
Desktop\My Computer\C:\Users	Directory	Users		2018-03-31 15:37:50
Desktop\My Computer\C:\Users\ethomas	Directory	ethomas	2018-03-31 14:46:27	2018-03-31 14:46:27
Desktop\My Computer\C:\Users\ethomas	Directory	ethomas		2018-03-31 15:37:51
Desktop\My Computer\C:\Users\ethomas\Documents	Directory	Documents	2018-03-31 15:38:00	2018-03-31 15:38:00
Desktop\My Computer\Desktop	Root folder: GUID	Desktop	2018-04-03 00:16:48	2018-04-03 00:16:48
Desktop\My Computer\Desktop	Root folder: GUID	Desktop	2018-03-31 15:54:12	
Desktop\My Computer\Documents	Root folder: GUID	Documents	2018-03-31 13:06:23	
Desktop\My Computer\Documents	Root folder: GUID	Documents	2018-03-31 15:37:41	
Desktop\My Computer\Downloads	Root folder: GUID	Downloads	2018-03-31 12:43:42	
Desktop\My Computer\Downloads	Root folder: GUID	Downloads	2018-03-31 16:04:50	
Desktop\My Computer\E:	Drive letter	E:	2018-04-03 13:36:33	2018-04-03 13:36:33
Desktop\Search Folder	Users property view	Search Folder	2018-04-03 00:15:17	
Desktop\Search Folder	Users property view	Search Folder	2018-04-03 00:15:21	
Desktop\Search Folder	Users property view	Search Folder	2018-04-03 00:16:53	
Desktop\Search Folder	Users property view	Search Folder	2018-04-03 00:16:54	
Desktop\Search Folder	Users property view	Search Folder	2018-04-03 00:10:04	
Desktop\Shared Documents Folder (Users Files)	Root folder: GUID	Shared Documents Folder (Users Files)		
Desktop\Shared Documents Folder (Users Files)\Dropbox	Users Files Folder	Dropbox	2018-03-31 13:21:49	2018-03-31 13:21:49

APPENDIX VI: Link Analysis

LocalPath	Src/Dst Created	Src/Dst Modified	Source Accessed	File Size	DriveType	VolumeSerial/Label	MachineID
C:\Users\ethomas\Dropbox\Intellectual Property Document.docx	2018-03-31 14:43:38	2018-03-31 14:45:17	2018-03-31 14:45:17	16063	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Documents\Proprietary Corporate Data.pptx	2018-03-31 14:22:00	2018-03-31 14:42:39	2018-03-31 14:42:39	49764	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
F:\9781111310646_PPT_ch07.pptx	2018-03-31 14:41:52	2018-03-31 14:41:52	2018-03-31 14:41:52	493205	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
F:\SFIR Lab Lesson 5.pptx	2018-03-31 14:42:01	2018-03-31 14:42:01	2018-03-31 14:42:01	2193088	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
F:\Sensitive Potential Client List.xlsx	2018-03-31 14:22:13	2018-03-31 14:22:13	2018-03-31 14:22:13	9206	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
C:\Users\ethomas\Documents\EthanThomas_Notes.docx	2018-03-31 14:44:00	2018-03-31 14:45:48	2018-03-31 14:45:48	9015	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Documents\Company Sensitive Document.docx	2018-03-31 14:21:36	2018-03-31 14:45:42	2018-03-31 14:45:42	9007	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Dropbox	2018-03-31 14:45:17	2018-03-31 14:45:23	2018-03-31 14:45:23	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
F:\	2018-03-31 14:21:36	2018-03-31 14:42:59	2018-03-31 14:42:59	0	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
C:\Users\ethomas\Downloads	2018-03-31 14:07:45	2018-03-31 14:07:45	2018-03-31 14:07:45	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
E:\Adorable Cats.jpg	2018-03-31 15:37:03	2018-03-31 15:37:03	2018-03-31 15:37:03	14901	Removable storage media (Floppy, USB)	7295345F/Personal USB	ethomas_desktop
C:\Users\ethan_local\Desktop\Ethan Thomas Resignation Letter.docx	2018-03-31 15:54:33	2018-03-31 23:10:56	2022-11-03 23:08:14	4620	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Documents\Intellectual Property Document.docx	2018-03-31 15:38:39	2018-03-31 16:04:34	2022-11-03 23:08:14	16063	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Documents\Sensitive Potential Client List.xlsx	2018-03-31 15:38:22	2018-03-31 15:38:22	2018-03-31 15:38:22	7412	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Documents\EthanThomas_Notes.docx	2018-03-31 15:38:34	2018-03-31 16:04:39	2018-03-31 16:04:39	9015	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
E:\Cat in cute pose.jpg	2018-03-31 15:37:14	2018-03-31 15:37:14	2018-03-31 15:37:14	25880	Removable storage media (Floppy, USB)	7295345F/Personal USB	ethomas_desktop
E:\	2018-03-31 15:37:03	2018-03-31 15:39:16	2018-03-31 15:39:16	8192	Removable storage media (Floppy, USB)	7295345F/Personal USB	ethomas_desktop
E:\Cat with Tongue Out.jpg	2018-03-31 15:37:21	2018-03-31 15:37:21	2018-03-31 15:37:21	5919	Removable storage media (Floppy, USB)	7295345F/Personal USB	ethomas_desktop
C:\Users\ethan_local\Downloads	2018-03-31 15:42:45	2018-03-31 15:42:45	2018-03-31 15:42:45	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop

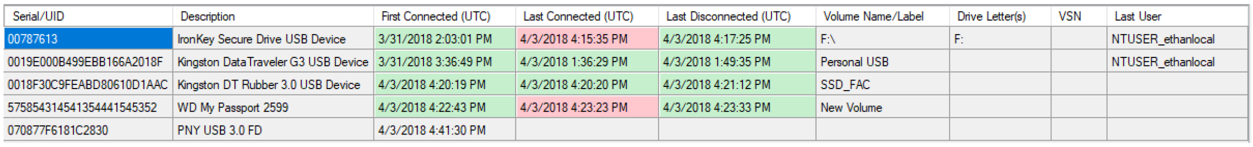
APPENDIX VII: Jump List Analysis

LocalPath	Target Created	Target Modified	Target Accessed	File Size	Drive Type	VolumeSerial/Label	MachineID
F:\Sensitive Potential Client List.xlsx	2018-03-30 18:18:45	2018-03-31 14:22:40	2018-03-31 04:00:00	7412	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
C:\Users\ethomas\Documents\EthanThomas_Notes.docx	2018-03-31 14:43:58	2018-03-31 14:44:00	2018-03-31 14:44:00	9015	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Documents\Company Sensitive Document.docx	2018-03-31 14:42:31	2018-03-30 18:00:42	2018-03-31 14:42:31	15967	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Dropbox\EthanThomas_Notes.docx	2018-03-31 14:45:12	2018-03-31 14:44:00	2018-03-31 14:45:12	9015	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Dropbox\Intellectual Property Document.docx	2018-03-31 14:45:12	2018-03-30 18:01:50	2018-03-31 14:45:12	16063	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Documents\Intellectual Property Document.docx	2018-03-31 14:42:31	2018-03-30 18:01:50	2018-03-31 14:42:31	16063	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
F:\Company Sensitive Document.docx	2018-03-30 18:18:45	2018-03-30 18:00:42	2018-03-31 04:00:00	15967	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
C:\Users\ethomas\Documents\Proprietary Corporate Data.pptx	2018-03-31 14:42:31	2018-03-30 18:15:24	2018-03-31 14:42:31	49764	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
F:\SFIR Lab Lesson 5.pptx	2018-03-31 14:40:26	2017-09-04 20:31:52	2018-03-31 04:00:00	2193088	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
F:\9781111310646_PPT_ch07.pptx	2018-03-31 14:41:00	2013-08-15 13:46:04	2018-03-31 04:00:00	493205	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
F:\Proprietary Corporate Data.pptx	2018-03-30 18:18:45	2018-03-30 18:15:24	2018-03-31 04:00:00	49764	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
C:\Users\ethomas\Dropbox	2018-03-31 13:21:49	2018-03-31 14:45:54	2018-03-31 14:45:54	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop

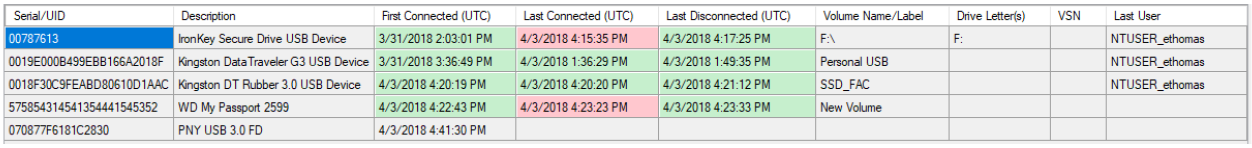
C:\Users\ethomas\Documents	2018-03-27 00:09:38	2018-03-31 14:45:51	2018-03-31 14:45:51	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Downloads	2018-03-27 00:09:38	2018-03-31 14:07:45	2018-03-31 14:07:45	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Desktop	2018-03-27 00:09:38	2018-03-27 00:11:05	2018-03-27 00:11:05	0	Fixed storage media (Hard drive)	60D53EE6	desktop-impb9r9
C:\Users\ethomas\Videos	2018-03-27 00:09:38	2018-03-27 00:11:05	2018-03-27 00:11:04	0	Fixed storage media (Hard drive)	60D53EE6	desktop-impb9r9
C:\Users\ethomas\Music	2018-03-27 00:09:38	2018-03-27 00:11:05	2018-03-27 00:11:05	0	Fixed storage media (Hard drive)	60D53EE6	desktop-impb9r9
C:\Users\ethomas\Pictures	2018-03-27 00:09:38	2018-03-27 00:11:05	2018-03-27 00:11:05	0	Fixed storage media (Hard drive)	60D53EE6	desktop-impb9r9
C:\Users\ethomas\Documents\EthanThomas_Notes.docx	2018-03-31 14:43:58	2018-03-31 14:44:00	2018-03-31 14:44:00	9015	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Dropbox\Company Sensitive Document.docx	2018-03-31 14:42:31	2018-03-31 14:43:21	2018-03-31 14:42:31	9007	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Dropbox\EthanThomas_Notes.docx	2018-03-31 14:45:12	2018-03-31 14:44:00	2018-03-31 14:45:12	9015	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Documents\Intellectual Property Document.docx	2018-03-31 14:42:31	2018-03-30 18:01:50	2018-03-31 14:42:31	16063	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
F:\Company Sensitive Document.docx	2018-03-30 18:18:45	2018-03-30 18:00:42	2018-03-31 04:00:00	15967	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
C:\Users\ethomas\Documents\Proprietary Corporate Data.pptx	2018-03-31 14:42:31	2018-03-30 18:15:24	2018-03-31 14:42:31	49764	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
F:\SFIR Lab Lesson 5.pptx	2018-03-31 14:40:26	2017-09-04 20:31:52	2018-03-31 04:00:00	2193088	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
F:\9781111310646_PPT_ch07.pptx	2018-03-31 14:41:00	2013-08-15 13:46:04	2018-03-31 04:00:00	493205	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
F:\Sensitive Potential Client List.xlsx	2018-03-30 18:18:45	2018-03-30 18:17:48	2018-03-30 04:00:00	9206	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
F:\Proprietary Corporate Data.pptx	2018-03-30 18:18:45	2018-03-30 18:15:24	2018-03-30 04:00:00	49764	Removable storage media (Floppy, USB)	0CBB6FC8/IronKey USB	
E:\Cat with Tongue Out.jpg	2018-03-30 19:18:13	2018-03-30 19:18:13	2018-03-30 19:18:13	5919	Removable storage media (Floppy, USB)	7295345F/ Personal USB	ethomas_desktop
E:\Cat in cute pose.jpg	2018-03-30 19:17:31	2018-03-30 19:17:31	2018-03-30 19:17:31	25880	Removable storage media (Floppy, USB)	7295345F/ Personal USB	ethomas_desktop
E:\Adorable Cats.jpg	2018-03-30 19:17:09	2018-03-30 19:17:09	2018-03-30 19:17:09	14901	Removable storage media (Floppy, USB)	7295345F/ Personal USB	ethomas_desktop
C:\Users\ethan_local\Documents\Sensitive Potential Client List.xlsx	2018-03-31 15:38:15	2018-03-31 14:22:40	2018-03-31 15:38:15	7412	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
				0	(None)		
C:\Windows\System32\mstsc.exe	2017-09-29 13:42:03	2017-09-29 13:42:03	2017-09-29 13:42:03	3630080	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Desktop\Ethan Thomas Resignation Letter.docx	2018-03-31 15:54:33	2018-03-31 15:54:33	2018-03-31 15:54:33	4619	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Documents\EthanThomas_Notes.docx	2018-03-31 15:38:15	2018-03-31 14:44:00	2018-03-31 15:38:15	9015	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Documents\Intellectual Property Document.docx	2018-03-31 15:38:15	2018-03-30 18:01:50	2018-03-31 15:38:15	16063	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
E:\Intellectual Property Document.docx	2018-03-31 15:39:16	2018-03-31 15:39:16	2018-03-31 15:39:16	9015	Removable storage media (Floppy, USB)	7295345F/ Personal USB	ethomas_desktop
C:\Users\ethan_local\Desktop	2018-03-31 14:47:33	2018-03-31 23:11:20	2018-03-31 23:11:20	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Documents	2018-03-31 14:47:33	2018-03-31 16:04:42	2018-03-31 16:04:42	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Downloads	2018-03-31 14:47:33	2018-03-31 15:42:45	2018-03-31 15:42:45	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethomas\Documents	2018-03-27 00:09:38	2018-03-31 14:45:54	2018-03-31 14:45:54	4096	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop

C:\Users\ethan_local\Videos	2018-03-31 14:47:33	2018-03-31 14:47:39	2018-03-31 14:47:39	0	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Music	2018-03-31 14:47:33	2018-03-31 14:47:39	2018-03-31 14:47:39	0	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Pictures	2018-03-31 14:47:33	2018-03-31 14:47:39	2018-03-31 14:47:39	0	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
E:\Adorable Cats.jpg	2018-03-30 19:17:09	2018-03-30 19:17:09	2018-03-30 19:17:09	14901	Removable storage media (Floppy, USB)	7295345F/ Personal USB	ethomas_desktop
C:\Users\ethan_local\Desktop\Ethan Thomas Resignation Letter.docx	2018-03-31 15:54:33	2018-03-31 15:54:44	2018-03-31 15:54:33	4620	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Documents\EthanThomas_Notes.docx	2018-03-31 15:38:15	2018-03-31 14:44:00	2018-03-31 15:38:15	9015	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
C:\Users\ethan_local\Documents\Intellectual Property Document.docx	2018-03-31 15:38:15	2018-03-30 18:01:50	2018-03-31 15:38:15	16063	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
E:\Intellectual Property Document.docx	2018-03-31 15:39:16	2018-03-31 15:39:16	2018-03-31 15:39:16	9015	Removable storage media (Floppy, USB)	7295345F/ Personal USB	ethomas_desktop
C:\Users\ethan_local\Documents\Sensitive Potential Client List.xlsx	2018-03-31 15:38:15	2018-03-31 14:22:40	2018-03-31 15:38:15	7412	Fixed storage media (Hard drive)	60D53EE6	ethomas_desktop
E:\Cat with Tongue Out.jpg	2018-03-30 19:18:13	2018-03-30 19:18:13	2018-03-30 19:18:13	5919	Removable storage media (Floppy, USB)	7295345F/ Personal USB	ethomas_desktop
E:\Cat in cute pose.jpg	2018-03-30 19:17:31	2018-03-30 19:17:31	2018-03-30 19:17:31	25880	Removable storage media (Floppy, USB)	7295345F/ Personal USB	ethomas_desktop
E:\Adorable Cats.jpg	2018-03-30 19:17:09	2018-03-30 19:17:09	2018-03-30 19:17:09	14901	Removable storage media (Floppy, USB)	7295345F/ Personal USB	ethomas_desktop

APPENDIX VIII: USB Analysis

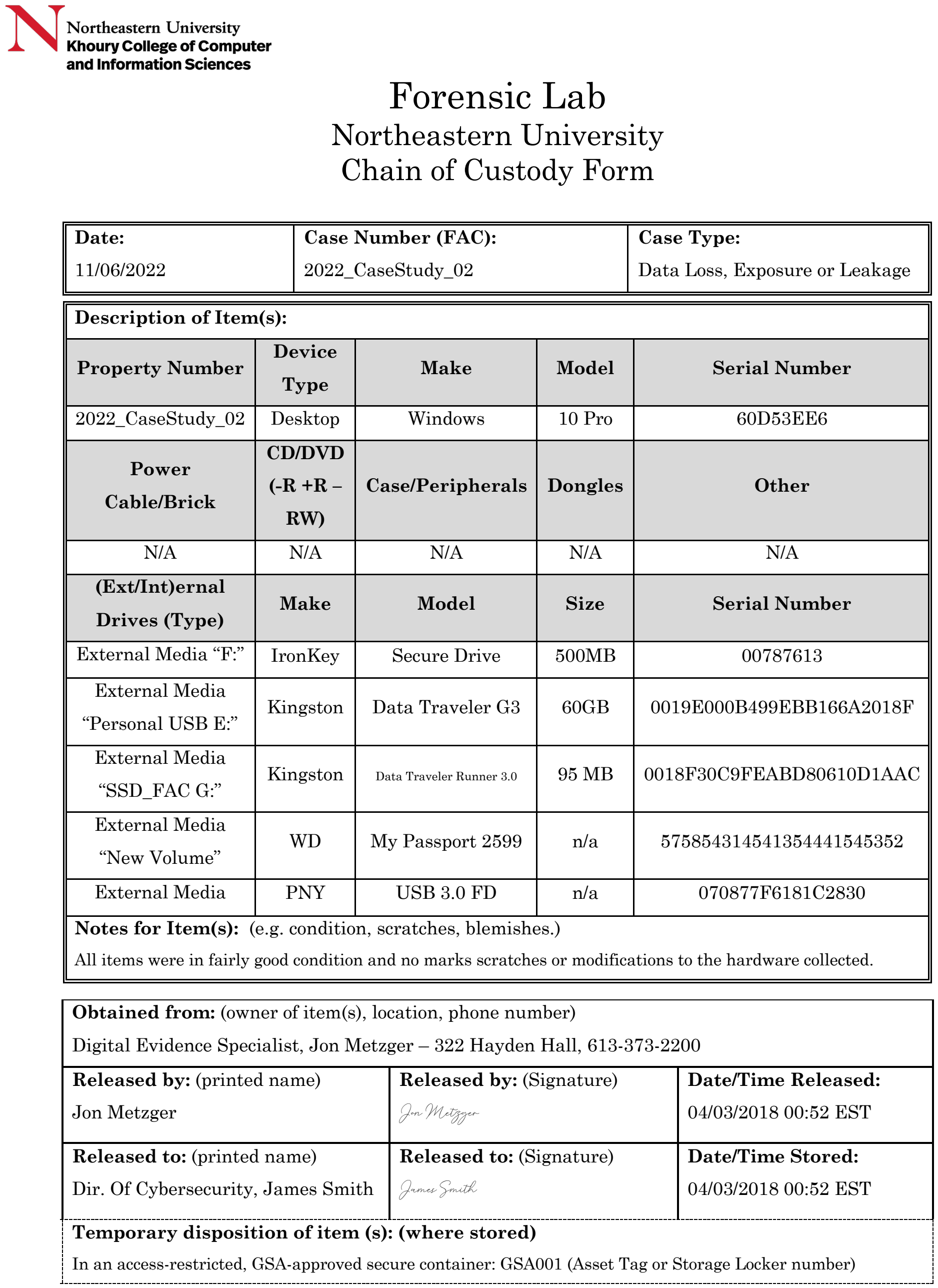


Serial/UID	Description	First Connected (UTC)	Last Connected (UTC)	Last Disconnected (UTC)	Volume Name/Label	Drive Letter(s)	VSN	Last User
00787613	IronKey Secure Drive USB Device	3/31/2018 2:03:01 PM	4/3/2018 4:15:35 PM	4/3/2018 4:17:25 PM	F:\	F:		NTUSER_ethanlocal
0019E000B499EBB166A2018F	Kingston DataTraveler G3 USB Device	3/31/2018 3:36:49 PM	4/3/2018 1:36:29 PM	4/3/2018 1:49:35 PM	Personal USB			NTUSER_ethanlocal
0018F30C9FEABD80610D1AAC	Kingston DT Rubber 3.0 USB Device	4/3/2018 4:20:19 PM	4/3/2018 4:20:20 PM	4/3/2018 4:21:12 PM	SSD_FAC			
575854314541354441545352	WD My Passport 2599	4/3/2018 4:22:43 PM	4/3/2018 4:23:23 PM	4/3/2018 4:23:33 PM	New Volume			
070877F6181C2830	PNY USB 3.0 FD	4/3/2018 4:41:30 PM						



Serial/UID	Description	First Connected (UTC)	Last Connected (UTC)	Last Disconnected (UTC)	Volume Name/Label	Drive Letter(s)	VSN	Last User
00787613	IronKey Secure Drive USB Device	3/31/2018 2:03:01 PM	4/3/2018 4:15:35 PM	4/3/2018 4:17:25 PM	F:\	F:		NTUSER_ethomas
0019E000B499EBB166A2018F	Kingston DataTraveler G3 USB Device	3/31/2018 3:36:49 PM	4/3/2018 1:36:29 PM	4/3/2018 1:49:35 PM	Personal USB			NTUSER_ethomas
0018F30C9FEABD80610D1AAC	Kingston DT Rubber 3.0 USB Device	4/3/2018 4:20:19 PM	4/3/2018 4:20:20 PM	4/3/2018 4:21:12 PM	SSD_FAC			NTUSER_ethomas
575854314541354441545352	WD My Passport 2599	4/3/2018 4:22:43 PM	4/3/2018 4:23:23 PM	4/3/2018 4:23:33 PM	New Volume			
070877F6181C2830	PNY USB 3.0 FD	4/3/2018 4:41:30 PM						

APPENDIX IX: Chain of Custody Report



Northeastern University
Khoury College of Computer and Information Sciences

Forensic Lab

Northeastern University
Chain of Custody Form

Date: 11/06/2022	**Case Number (FAC):** 2022_CaseStudy_02	**Case Type:** Data Loss, Exposure or Leakage

Description of Item(s):

Property Number	**Device Type**	**Make**	**Model**	**Serial Number**
2022_CaseStudy_02	Desktop	Windows	10 Pro	60D53EE6
Power Cable/Brick	**CD/DVD (-R +R – RW)**	**Case/Peripherals**	**Dongles**	**Other**
N/A	N/A	N/A	N/A	N/A
(Ext/Int)ernal Drives (Type)	**Make**	**Model**	**Size**	**Serial Number**
External Media "F:"	IronKey	Secure Drive	500MB	00787613
External Media "Personal USB E:"	Kingston	Data Traveler G3	60GB	0019E000B499EBB166A2018F
External Media "SSD_FAC G:"	Kingston	Data Traveler Runner 3.0	95 MB	0018F30C9FEABD80610D1AAC
External Media "New Volume"	WD	My Passport 2599	n/a	575854314541354441545352
External Media	PNY	USB 3.0 FD	n/a	070877F6181C2830

Notes for Item(s): (e.g. condition, scratches, blemishes.)
All items were in fairly good condition and no marks scratches or modifications to the hardware collected.

Obtained from: (owner of item(s), location, phone number)
Digital Evidence Specialist, Jon Metzger – 322 Hayden Hall, 613-373-2200

Released by: (printed name) Jon Metzger	**Released by:** (Signature) Jon Metzger	**Date/Time Released:** 04/03/2018 00:52 EST
Released to: (printed name) Dir. Of Cybersecurity, James Smith	**Released to:** (Signature) James Smith	**Date/Time Stored:** 04/03/2018 00:52 EST

Temporary disposition of item (s): (where stored)
In an access-restricted, GSA-approved secure container: GSA001 (Asset Tag or Storage Locker number)