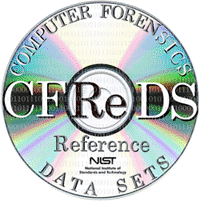
**NIST CFReDS Project**

**(Computer Forensic Reference Data Sets)**



**NIST CFReDS:**

**Data Leakage Case**

Software and Systems Division

Information Technology Laboratory

National Institute of Standards and Technology

Gaithersburg, MD 20899

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NIST logo

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# Scenario Overview

‘Iaman Informant’ was working as a manager of the technology development division at a famous international company OOO that developed state-of-the-art technologies and gadgets.

One day, at a place which ‘Mr. Informant’ visited on business, he received an offer from ‘Spy Conspirator’ to leak of sensitive information related to the newest technology. Actually, ‘Mr. Conspirator’ was an employee of a rival company, and ‘Mr. Informant’ decided to accept the offer for large amounts of money, and began establishing a detailed leakage plan.

‘Mr. Informant’ made a deliberate effort to hide the leakage plan. He discussed it with ‘Mr. Conspirator’ using an e-mail service like a business relationship. He also sent samples of confidential information though personal cloud storage.

After receiving the sample data, ‘Mr. Conspirator’ asked for the direct delivery of storage devices that stored the remaining (large amounts of) data. Eventually, ‘Mr. Informant’ tried to take his storage devices away, but he and his devices were detected at the security checkpoint of the company. And he was suspected of leaking the company data.

At the security checkpoint, although his devices (a USB memory stick and a CD) were briefly checked (protected with portable write blockers), there was no evidence of any leakage. And then, they were immediately transferred to the digital forensics laboratory for further analysis.

The information security policies in the company include the following:

1. Confidential electronic files[[1]](#footnote-2) should be stored and kept in the authorized external storage devices and the secured network drives.
2. Confidential paper documents and electronic files can be accessed only within the allowed time range from 10:00 AM to 16:00 PM with the appropriate permissions.
3. Non-authorized electronic devices such as laptops, portable storages, and smart devices cannot be carried onto the company.
4. All employees are required to pass through the ‘Security Checkpoint’ system.
5. All storage devices such as HDD, SSD, USB memory stick, and CD/DVD are forbidden under the ‘Security Checkpoint’ rules.

In addition, although the company managed separate internal and external networks and used DRM (Digital Rights Management) / DLP (Data Loss Prevention) solutions for their information security, ‘Mr. Informant’ had sufficient authority to bypass them. He was also very interested in IT (Information Technology), and had a slight knowledge of digital forensics.

In this scenario, find any evidence of the data leakage, and any data that might have been generated from the suspect’s electronic devices.

# Target Systems and Devices

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Target** | **Detailed Information** | | | **Note** |
| Personal Computer  (PC) | HW | Type | Virtual System | VMWare v11 |
| CPU | 1 Processer (2 Core) |  |
| RAM | 2,048 MB |  |
| HDD Size | 20 GB |  |
| File System | NTFS |  |
| IP Address | 10.11.11.129 | NAT |
| SW (OS) | Operating System | Microsoft Windows 7 Ultimate (SP1) | English (64 bits) MSDN image[[2]](#footnote-3) (not activated) |
| SW (Apps) | Web | - MS Internet Explorer  - Google Chrome | Latest versions  if possible |
| Document | Microsoft Office | Word, Excel, PowerPoint  MSDN image[[3]](#footnote-4) (not activated) |
| Cloud | - Google Drive  - Apple iCloud | Auto Syncing is ON  if possible |
| E-mail | Microsoft Outlook | NIST.gov mail server[[4]](#footnote-5) |
| Anti-forensics | - CCleaner  - Eraser | Latest versions  if possible |
| Removable Media #1 (RM#1) [[5]](#footnote-6) | HW | Type | USB removable storage device |  |
| Mfg. | SanDisk | Vendor ID = 0x0781 |
| Model | Cruzer Fit |  |
| Serial No. | 4C530012450531101593 | Unique serial number |
| Size | 4 GB |  |
| File System | exFAT |  |
| Volume label | Authorized USB |  |
| Removable Media #2 (RM#2) | HW | Type | USB removable storage device |  |
| Mfg. | SanDisk | Vendor ID = 0x0781 |
| Model | Cruzer Fit |  |
| Serial No. | 4C530012550531106501 | Unique serial number |
| Size | 4 GB | Partitioned 1 GB only |
| File System | FAT32 |  |
| Volume label | IAMAN $\_@ |  |
| Removable Media #3 (RM#3) | HW | Type | CD-R |  |
| Size | 700 MB |  |
| File System | UDF | Created by Windows 7 |
| Volume label | IAMAN CD |  |
| Smart Device | - | - | - | Future work[[6]](#footnote-7) |

# Detailed Behavior of the Suspect

Regarding developing user and system artifacts, we tried to keep simple as much as possible. For efficiency of both developing and analyzing images, it was designed to avoid complicated operations and create various meaningful artifacts from the viewpoint of digital forensics.

Detailed behavior of the suspect is described as a text (below table) and visual diagram.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Step** | **Date/Time** | **Action** | **Additional Description** | | | **Note** |
| Normal | ~ 2015-03-22 | Install OS | Windows 7 Ultimate | | |  |
| Configure settings | Set the timezone to (UTC-05) Eastern Time | | |  |
| Install Apps | (1) Microsoft Office  (2) Microsoft Internet Explorer  (3) Google Chrome | | | Latest versions if possible |
| Create/Download business data | Electronic documents  (Word, Excel, PowerPoint…) | | | Company’s common files |
| Email | Microsoft Outlook with NIST e-mail account | | | iaman.informant@nist.gov |
| Create user accounts | “admin11” 🡪 login count: 2  “ITechTeam” 🡪 login count: 0  “temporary” 🡪 login count: 1 | | |  |
|  |  | | | | | |
| D-2 | 2015-03-23 13:29 | Receive an e-mail | spy.conspirator@nist.gov  🡪 iaman.informant@nist.gov | | | [ Subject: Hello, Iaman ]  “How are you doing?” |
| 2015-03-23 14:01  ~  2015-03-23 14:21 | Prepare a crime  (data leakage) | Searching the leakage methods through web-browsers:  - Microsoft Internet Explorer  - Google Chrome | | | Google, Bing search engine  ------------------------------------------- Chrome   1. data leakage methods 2. leaking confidential information 3. information leakage cases 4. intellectual property theft 5. how to leak a secret   ------------------------------------------- IE 11   1. file sharing and tethering 2. DLP DRM 3. e-mail investigation 4. what is windows system artifacts 5. investigation on windows machine 6. windows event logs 7. cd burning method in Windows 8. external device and forensics   ------------------------------------------- Chrome   1. cloud storage 2. digital forensics 3. how to delete data 4. anti-forensics 5. system cleaner 6. how to recover data 7. data recovery tools |
| 2015-03-23 14:31 | Connect USB | ‘RM#1’ USB memory stick | | |  |
| 2015-03-23 14:36 | Search keywords | Searching confidential data using Windows Search function | | | Keyword: “secret” |
| 2015-03-23 14:37 | Open files | [secret\_project]\_proposal.docx  [secret\_project]\_design\_concept.ppt | | | Open and read files |
| 2015-03-23 14:39 | Copy & open files | Copying confidential files from ‘RM#1’ to ‘PC’ | | | “\Desktop\S data” |
| [ RM#1 ]  RM#1\Secret Project Data\proposal\[secret\_project]\_proposal.docx  RM#1\Secret Project Data\design\[secret\_project]\_design\_concept.ppt | | | [ PC ]  %UserProfile%\Desktop\S data\[secret\_project]\_proposal.docx  %UserProfile%\Desktop\S data\[secret\_project]\_design\_concept.ppt | |
| 2015-03-23 14:39 | Disconnect USB | Ejecting ‘RM#1’ | | |  |
| 2015-03-23 14:39 | Configure settings | Show ‘file name extensions’ in Windows Explorer | | |  |
| 2015-03-23 14:41 | Rename files | All names and extensions are changed  (e.g., xlsx 🡪 jpg, docx 🡪 mp3…) | | | [secret\_project]\_detailed\_proposal.docx  🡪 landscape.png  [secret\_project]\_design\_concept.ppt  🡪 space\_and\_earth.mp4 |
| 2015-03-23 14:44 | Send an e-mail | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov | | | “Successfully secured.” |
| 2015-03-23 15:14 | Receive an e-mail | spy.conspirator@nist.gov  🡪 iaman.informant@nist.gov | | | [ Subject: Good job, buddy ]  “Good, job. I need a more detailed data about this business.” |
| 2015-03-23 15:19 | Send an e-mail | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov | | | “This is a sample.”  (space\_and\_earth.mp4) |
| 2015-03-23 15:20 | Receive an e-mail | spy.conspirator@nist.gov  🡪 iaman.informant@nist.gov | | | “Okay, I got it. I’ll be in touch.” |
| 2015-03-23 15:26 | Receive an e-mail | spy.conspirator@nist.gov  🡪 iaman.informant@nist.gov | | | [ Subject: Important request ]  “I confirmed it. But, I need a more data. Do your best.” |
| 2015-03-23 15:27 | Send an e-mail | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov | | | “Umm... I need time to think.” |
| 2015-03-23 16:00 | Search and download Apps | Searching cloud storage services using Chrome | | |  |
| 2015-03-23 16:00 | Install Apps | (1) Google Drive  (2) Apple iCloud | | |  |
| 2015-03-23 16:05 | Login cloud service | Login Google Drive service with an account (iaman.informant.personal@gmail.com) | | |  |
| 2015-03-23 16:23 | Connect  network drive | Connecting secured shared network drive | | | \\10.11.11.128\secured\_drive |
| 2015-03-23 16:24 | Search files | Traversing directories and files using Windows Explorer | | |  |
| 2015-03-23 16:26 | Connect  network drive | Mapping network drive (v:) | | | \\10.11.11.128\secured\_drive |
| 2015-03-23 16:26 | Open files | (secret\_project)\_pricing\_decision.xlsx [secret\_project]\_final\_meeting.pptx | | | Open and read files |
| 2015-03-23 16:28 | Copy & open files | Copying confidential files from a network drive to ‘PC’ | | | “\Desktop\S data” |
| [ Network Drive ]  Secret Project Data\pricing decision\(secret\_project)\_pricing\_decision.xlsx  Secret Project Data\final\[secret\_project]\_final\_meeting.pptx | | | [ PC ]  %UserProfile%\Desktop\S data\(secret\_project)\_pricing\_decision.xlsx  %UserProfile%\Desktop\S data\[secret\_project]\_final\_meeting.pptx | |
| 2015-03-23 16:29 | Disconnect  network drive | Unmapping network drive (v:) | | | \\10.11.11.128\secured\_drive |
| 2015-03-23 16:30 | Rename files | All names and extensions are changed  (e.g., xlsx 🡪 jpg, docx 🡪 mp3…) | | | (secret\_project)\_pricing\_decision.xlsx  🡪 happy\_holiday.jpg  [secret\_project]\_final\_meeting.pptx  🡪 do\_u\_wanna\_build\_a\_snow\_man.mp3 |
| 2015-03-23 16:32 | Upload files | Uploading some files to Google Drive and sharing them | | | happy\_holiday.jpg  do\_u\_wanna\_build\_a\_snow\_man.mp3 |
| 2015-03-23 16:38 | Send an e-mail | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov | | | [ Subject: It’s me ]  “Use links below.” |
| 2015-03-23 16:41 | Receive an e-mail | spy.conspirator@nist.gov  🡪 iaman.informant@nist.gov | | | “I got it.” |
| 2015-03-23 16:42 | Delete files | Deleting files from Google Drive | | |  |
| 2015-03-23 16:43 | Misc. | Personal web-browsing using IE | | | During approx. 15 minutes |
|  |  | | | | | |
| D-1 | 2015-03-24 09:26 | Receive an e-mail | spy.conspirator@nist.gov  🡪 iaman.informant@nist.gov | | | [ Subject: Last request ]  “This is the last request. I want to get the remaining data.” |
| 2015-03-24 09:30 | Send an e-mail | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov | | | “Stop it! It is very hard to transfer all data over the internet!” |
| 2015-03-24 09:33 | Receive an e-mail | spy.conspirator@nist.gov  🡪 iaman.informant@nist.gov | | | “No problem. U can directly deliver storage devices that stored it.” |
| 2015-03-24 09:35 | Send an e-mail | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov | | | “This is the last time..” |
| 2015-03-24 09:38 | Connect USB | ‘RM#1’ USB memory stick | | |  |
| 2015-03-24 09:40 | Copy files | Copying confidential files ‘RM#1’ to ‘PC’ | | |  |
| [ RM#1 ]  RM#1\Secret Project Data\design\[secret\_project]\_design\_concept.ppt  RM#1\Secret Project Data\design\[secret\_project]\_detailed\_design.pptx  RM#1\Secret Project Data\design\[secret\_project]\_revised\_points.ppt  RM#1\Secret Project Data\proposal\[secret\_project]\_detailed\_proposal.docx  RM#1\Secret Project Data\proposal\[secret\_project]\_proposal.docx | | [ PC ]  %UserProfile%\Desktop\S data\Secret Project Data\design\[secret\_project]\_design\_concept.ppt  %UserProfile%\Desktop\S data\Secret Project Data\design\[secret\_project]\_detailed\_design.pptx  %UserProfile%\Desktop\S data\Secret Project Data\design\[secret\_project]\_revised\_points.ppt  %UserProfile%\Desktop\S data\Secret Project Data\proposal\[secret\_project]\_detailed\_proposal.docx  %UserProfile%\Desktop\S data\Secret Project Data\proposal\[secret\_project]\_proposal.docx | | |
| 2015-03-24 09:40 | Disconnect USB | Ejecting ‘RM#1’ | | |  |
| 2015-03-24 09:47 | Connect  network drive | Secured shared network drive | | | \\10.11.11.128\secured\_drive |
| 2015-03-24 09:47 | Copy files | Copying confidential files from a network drive to ‘PC’ | | |  |
| [ Network Drive ]  Secret Project Data\design\[secret\_project]\_detailed\_design.pptx  Secret Project Data\final\[secret\_project]\_final\_meeting.pptx  Secret Project Data\pricing decision\(secret\_project)\_market\_analysis.xlsx  Secret Project Data\pricing decision\(secret\_project)\_market\_shares.xls  Secret Project Data\pricing decision\(secret\_project)\_price\_analysis\_#1.xlsx  Secret Project Data\pricing decision\(secret\_project)\_price\_analysis\_#2.xls  Secret Project Data\pricing decision\(secret\_project)\_pricing\_decision.xlsx  Secret Project Data\progress\[secret\_project]\_progress\_#1.docx  Secret Project Data\progress\[secret\_project]\_progress\_#2.docx  Secret Project Data\progress\[secret\_project]\_progress\_#3.doc  Secret Project Data\proposal\[secret\_project]\_detailed\_proposal.docx  Secret Project Data\technical review\[secret\_project]\_technical\_review\_#1.docx  Secret Project Data\technical review\[secret\_project]\_technical\_review\_#1.pptx  Secret Project Data\technical review\[secret\_project]\_technical\_review\_#2.docx  Secret Project Data\technical review\[secret\_project]\_technical\_review\_#2.ppt  Secret Project Data\technical review\[secret\_project]\_technical\_review\_#3.doc  Secret Project Data\technical review\[secret\_project]\_technical\_review\_#3.ppt | | [ PC ]  %UserProfile%\Desktop\S data\Secret Project Data\design\[secret\_project]\_detailed\_design.pptx  %UserProfile%\Desktop\S data\Secret Project Data\final\[secret\_project]\_final\_meeting.pptx  %UserProfile%\Desktop\S data\Secret Project Data\pricing decision\(secret\_project)\_market\_analysis.xlsx  %UserProfile%\Desktop\S data\Secret Project Data\pricing decision\(secret\_project)\_market\_shares.xls  %UserProfile%\Desktop\S data\Secret Project Data\pricing decision\(secret\_project)\_price\_analysis\_#1.xlsx  %UserProfile%\Desktop\S data\Secret Project Data\pricing decision\(secret\_project)\_price\_analysis\_#2.xls  %UserProfile%\Desktop\S data\Secret Project Data\pricing decision\(secret\_project)\_pricing\_decision.xlsx  %UserProfile%\Desktop\S data\Secret Project Data\progress\[secret\_project]\_progress\_#1.docx  %UserProfile%\Desktop\S data\Secret Project Data\progress\[secret\_project]\_progress\_#2.docx  %UserProfile%\Desktop\S data\Secret Project Data\progress\[secret\_project]\_progress\_#3.doc  %UserProfile%\Desktop\S data\Secret Project Data\proposal\[secret\_project]\_detailed\_proposal.docx  %UserProfile%\Desktop\S data\Secret Project Data\technical review\[secret\_project]\_technical\_review\_#1.docx  %UserProfile%\Desktop\S data\Secret Project Data\technical review\[secret\_project]\_technical\_review\_#1.pptx  %UserProfile%\Desktop\S data\Secret Project Data\technical review\[secret\_project]\_technical\_review\_#2.docx  %UserProfile%\Desktop\S data\Secret Project Data\technical review\[secret\_project]\_technical\_review\_#2.ppt  %UserProfile%\Desktop\S data\Secret Project Data\technical review\[secret\_project]\_technical\_review\_#3.doc  %UserProfile%\Desktop\S data\Secret Project Data\technical review\[secret\_project]\_technical\_review\_#3.ppt | | |
| 2015-03-24 09:50  ~  2015-03-24 09:56 | Rename files | All names and extensions are changed  (20 files in “%UserProfile%\Desktop\S data\ Secret Project Data\”) | | | (secret\_project)\_market\_analysis.xlsx  🡪 new\_years\_day.jpg  [secret\_project]\_progress\_#3.doc  🡪 my\_friends.svg |
| 2015-03-24 09:58 | Connect USB | ‘RM#2’ USB memory stick | | |  |
| 2015-03-24 09:59 | Copy files | Copying confidential files to ‘RM#2’ | | | Copy a directory “%UserProfile%\ Desktop\S data\Secret Project Data\” including sub-dirs and files to RM#2 |
| 2015-03-24 10:00 | Verify files | Traversing directories and files in ‘RM#2’ using Windows Explorer | | | Open a file (winter\_whether\_advisory.zip) |
| 2015-03-24 10:02 | Disconnect USB | Ejecting ‘RM#2’ | | |  |
| 2015-03-24 10:07 | Delete files | Deleting directories and files from ‘PC’ | | | “\Desktop\S data” Normal deletion: [Shift] + [Delete] |
| 2015-03-24 10:07 | Misc. | Personal web-browsing and searching anti-forensic methods (Chrome, IE) | | | During approx. 4 hours |
| 2015-03-24 14:28 | Misc. | Launching a game (‘Solitaire’) | | |  |
| 2015-03-24 14:31 | Misc. | Launching the sticky note and writing text | | |  |
| 2015-03-24 14:32 | Misc. | Creating a letter of resignation (.docx) | | | During approx. 30 minutes  Windows Desktop |
| 2015-03-24 15:32 | Receive an e-mail | spy.conspirator@nist.gov  🡪 iaman.informant@nist.gov | | | [ Subject: Watch out! ]  “USB device may be easily detected. So, try another method.” |
| 2015-03-24 15:34 | Send an e-mail | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov | | | “I am trying.” |
| 2015-03-24 15:38 | Connect USB | ‘RM#2’ USB memory stick | | |  |
| 2015-03-24 15:40 | Practice CD burning | Testing CD-R burning process and preparing meaningless files for anti-forensics | | | During approx. 55 minutes  “\Desktop\temp” (1 exe, 8 images) |
| 2015-03-24 16:40 | Insert CD | CD-R | | | Windows CD Burning Type 2: With a CD/DVD/ player (Mastered) |
| 2015-03-24 16:40 | Copy files | Copying confidential files from ‘RM#2’ to CD-R | | | With renaming directories:  - design 🡪 de  - pricing decision 🡪 pd  - progress 🡪 prog  - proposal 🡪 prop  - technical review 🡪tr |
| 2015-03-24 16:41 | Burn files | Burning confidential files to CD-R | | |  |
| 2015-03-24 16:44 | Verify files | Traversing directories and files in CD-R using Windows Explorer | | |  |
| 2015-03-24 16:44 | Format disk | Formatting the CD-R as an empty disk | | |  |
| 2015-03-24 16:45 | Copy files | Copying and burning meaningless files to CD-R in order for creating a new session | | | Anti-forensics |
| 2015-03-24 16:53 | Insert CD | CD-R (new one) | | | Windows CD Burning Type 1: Like a USB flash drive |
| 2015-03-24 16:54 | Copy files | Copying and burning confidential files from ‘RM#2’ to CD-R | | |  |
| 2015-03-24 16:55 | Rename directories | Renaming directories in CD-R | | |  |
| 2015-03-24 16:57 | Copy files | Copying 3 meaningless files to CD-R | | | Koala.jpg  Penguins.jpg  Tulips.jpg |
| 2015-03-24 16:58 | Delete files | Deleting confidential files from CD-R | | |  |
| 2015-03-24 17:01 | Verify files | Traversing directories and files in CD-R using Windows Explorer | | |  |
| 2015-03-24 17:02 | Delete files | Deleting copied files from ‘RM#2’ (Quick format) | | | Anti-forensics |
| 2015-03-24 17:03 | Disconnect USB | Ejecting ‘RM#2’ | | |  |
| 2015-03-24 17:05 | Send an e-mail | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov | | | [ Subject: Done ]  “It’s done. See you tomorrow.” |
| 2015-03-24 17:06 | Search keywords | Searching keywords using Chrome | | | “security checkpoint CD-R” |
|  |  | | | | | |
| D-Day | 2015-03-25 10:46 | Search and download Apps | Searching apps for anti-forensics using IE | | | Anti-forensic tools, eraser, ccleaner… |
| 2015-03-25 10:50 | Install Apps | (1) Eraser (with .NET Framework)  (2) CCleaner | | | During approx. 8 minutes |
| 2015-03-25 11:00 | Delete e-mails | Deleting some e-mails in Outlook | | | Anti-forensics  (9 emails are deleted, and 4 items of them remain in Deleted Items folder.)  During approx. 10 minutes |
| 2015-03-25 11:13 | Delete traces | Running anti-forensic tools and deleting some files | | | Wiping “\Desktop\temp” directory using Eraser |
| 2015-03-25 11:14 | Delete traces | Emptying the Recycle Bin | | |  |
| 2015-03-25 11:15 | Delete traces | Deleting downloaded installer files (Eraser, CCleaner) | | | Normal deletion: [Shift] + [Delete] |
| 2015-03-25 11:15 | Delete traces | Launching CCleaner | | | And then, the app was closed after doing nothing |
| 2015-03-25 11:18 | Delete Apps | Uninstalling some Apps | | | CCleaner, iCloud  During approx. 2 minutes |
| 2015-03-25 11:22 | Delete traces | Launching Google Drive app and disconnecting an account | | | Logout from Google Drive |
| 2015-03-25 11:23 | Delete traces | Cleaning and arranging Windows desktop | | | Directories and icons in Windows Desktop |
| 2015-03-25 11:24 | Open files | Opening the resignation letter (.docx) | | | Windows Desktop |
| 2015-03-25 11:28 | Print files | Printing the document to the MS XPS file and reviewing it with MS XPS viewer | | |  |
| 2015-03-25 11:30 | Finish works | Turning off the system and trying to go outside with ‘RM#2’ and ‘RM#3’ | | | RM#3 is one of two CD-Rs |

****

# Acquired Data Information

## Personal Computer (PC) – ‘DD’ Image

|  |  |
| --- | --- |
| **Item** | **Detailed Information** |
| Filename | cfreds\_2015\_data\_leakage\_pc |
| MD5 | A49D1254C873808C58E6F1BCD60B5BDE |
| SHA-1 | AFE5C9AB487BD47A8A9856B1371C2384D44FD785 |
| Imaging S/W | FTK Imager 3.4.0.1 |
| Image Format | DD converted from VMDK ( Some sectors were scrubbed[[7]](#footnote-8) ) |
| Compression | Best (Smallest) |
| Bytes per Sector | 512 |
| Total Sectors | 41,943,040 |
| Total Size | 20.00 GB (21,474,836,480 bytes) |
| Compressed Size | 5.05 GB (5,427,795,228 bytes) 🡨 compressed by 7zip |

## Personal Computer (PC) – ‘EnCase’ Image

|  |  |
| --- | --- |
| **Item** | **Detailed Information** |
| Filename | cfreds\_2015\_data\_leakage\_pc |
| MD5 | A49D1254C873808C58E6F1BCD60B5BDE |
| SHA-1 | AFE5C9AB487BD47A8A9856B1371C2384D44FD785 |
| Imaging S/W | EnCase Imager 7.10.00.103 |
| Image Format | E01 (Expert Witness Compression Format) converted from above DD image |
| Compression | Best (Smallest) |
| Bytes per Sector | 512 |
| Total Sectors | 41,943,040 |
| Total Size | 20.00 GB (21,474,836,480 bytes) |
| Compressed Size | 7.28 GB (7,825,209,454 bytes) |

## Removable Media #1 (RM#1) – ‘EnCase’ Image

|  |  |
| --- | --- |
| **Item** | **Detailed Information** |
| Filename | cfreds\_2015\_data\_leakage\_rm#1 |
| MD5 | 8BFA4230BF4E35DB966B8C1A9321A0B1 |
| SHA-1 | F6BB840E98DD7C325AF45539313FC3978FFF812C |
| Imaging S/W | FTK Imager 3.3.0.5 (write-blocked by Tableau USB Bridge T8-R2) |
| Image Format | E01 (Expert Witness Compression Format) |
| Compression | Best (Smallest) |
| Bytes per Sector | 512 |
| Total Sectors | 7,821,312 |
| Total Size | 3.7 GB (4,004,511,744 bytes) |
| Compressed Size | 74.5 MB (78,186,742 bytes) |

## Removable Media #2 (RM#2) – ‘DD’ Image

|  |  |
| --- | --- |
| **Item** | **Detailed Information** |
| Filename | cfreds\_2015\_data\_leakage\_rm#2 |
| MD5 | B4644902ACAB4583A1D0F9F1A08FAA77 |
| SHA-1 | 048961A85CA3ECED8CC73F1517442D31D4DCA0A3 |
| Imaging S/W | FTK Imager 3.3.0.5 (write-blocked by Tableau USB Bridge T8-R2) |
| Image Format | E01 (Expert Witness Compression Format) |
| Compression | Best (Smallest) |
| Bytes per Sector | 512 |
| Total Sectors | 7,821,312 |
| Total Size | 3.7 GB (4,004,511,744 bytes) |
| Compressed Size | 219 MB (229,899,285 bytes) 🡨 compressed by 7zip |

## Removable Media #2 (RM#2) – ‘EnCase’ Image

|  |  |
| --- | --- |
| **Item** | **Detailed Information** |
| Filename | cfreds\_2015\_data\_leakage\_rm#2 |
| MD5 | B4644902ACAB4583A1D0F9F1A08FAA77 |
| SHA-1 | 048961A85CA3ECED8CC73F1517442D31D4DCA0A3 |
| Imaging S/W | EnCase Imager 7.09.00.111 (write-blocked by Tableau USB Bridge T8-R2) |
| Image Format | E01 (Expert Witness Compression Format) |
| Compression | Best (Smallest) |
| Bytes per Sector | 512 |
| Total Sectors | 7,821,312 |
| Total Size | 3.7 GB (4,004,511,744 bytes) |
| Compressed Size | 243 MB (255,051,328 bytes) |

## Removable Media #3 (RM#3) – ‘RAW / CUE’ Image

|  |  |
| --- | --- |
| **Item** | **Detailed Information** |
| Filename | cfreds\_2015\_data\_leakage\_rm#3\_type1 |
| MD5 | 858C7250183A44DD83EB706F3F178990 |
| SHA-1 | 471D3EEDCA9ADD872FC0708297284E1960FF44F8 |
| Imaging S/W | FTK Imager 3.3.0.5 |
| Image Format | RAW ISO / CUE (sometime BIN / CUE)[[8]](#footnote-9) |
| Bytes per Sector | 2,048 |
| Total Sectors | 52,514 |
| Total Size | 102.57 MB (107,548,672 bytes) |
| Compressed Size | 92.8 MB (97,311,442 bytes) 🡨 compressed by 7zip |

## Removable Media #3 (RM#3) – ‘DD’ Image

|  |  |
| --- | --- |
| **Item** | **Detailed Information** |
| Filename | cfreds\_2015\_data\_leakage\_rm#3\_type2 |
| MD5 | 858C7250183A44DD83EB706F3F178990 |
| SHA-1 | 471D3EEDCA9ADD872FC0708297284E1960FF44F8 |
| Imaging S/W | FTK Imager 3.3.0.5 + bchunk[[9]](#footnote-10) |
| Image Format | DD converted from ‘RAW + CUE’ using bchunk |
| Bytes per Sector | 2,048 |
| Total Sectors | 52,514 |
| Total Size | 102.57 MB (107,548,672 bytes) |
| Compressed Size | 78.6 MB (82,511,830 bytes) 🡨 compressed by 7zip |

## Removable Media #3 (RM#3) – ‘EnCase’ Image

|  |  |
| --- | --- |
| **Item** | **Detailed Information** |
| Filename | cfreds\_2015\_data\_leakage\_rm#3\_type3 |
| MD5 | DF914108FB3D86744EB688EBA482FBDF |
| SHA-1 | 7F3C2EB1F1E2DB97BE6E963625402A0E362A532C |
| Imaging S/W | EnCase Imager 7.09.00.111 |
| Image Format | E01 (Expert Witness Compression Format) |
| Compression | Best (smallest) |
| Bytes per Sector | 2,048 |
| Total Sectors | 52,513 |
| Total Size | 102.56 MB (107,546,624 bytes) |
| Compressed Size | 90.21 MB (94,594,894 bytes) |
| Read Errors (Sector No.) | (321), (51,213), (51,233), (51,244), (51,265), (51,276), (51,297), (51,308), (51,329), (51,340), (51,361), (51,372), (51,393), (52,472), (52,481), (52,500) |

# Digital Forensics Practice Points

The followings are the summary of detailed practice points related to above images.

|  |  |  |
| --- | --- | --- |
| **Practice Point** | **Description** | **Note** |
| Understanding  Types of Data Leakage | - Storage devices   * HDD (Hard Disk Drive) * SSD (Solid State Drive) * USB flash drive * Flash memory cards * CD/DVD (with Optical Disk Drive)   - Network Transmission   * File sharing * Remote Desktop Connection * E-mail * SNS (Social Network Service) * Cloud services * Messenger   \* Underlined parts are covered on this image | - Interfaces   * ATA * SATA, eSATA * USB * IEEE 1394   - Network interfaces   * Ethernet cable * Wi-Fi * Bluetooth   - Note   * Tethering |
| Windows Forensics | - Windows event logs  - Opened files and directories  - Application (executable) usage history  - CD/DVD burning records  - External devices attached to PC  - Network drive connection traces  - System caches  - Windows Search databases  - Volume Shadow Copy | - Windows 7 artifacts  - 64 bits Windows |
| File System Forensics | - FAT, NTFS, UDF  - Metadata (NTFS MFT, FAT Directory entry)  - Timestamps  - Transaction logs (NTFS) |  |
| Web Browser Forensics | - History, Cache, Cookie  - Internet usage history (URLs, Search Keywords…) | - MS Internet Explorer  - Google Chrome |
| E-mail Forensics | - MS Outlook file examination  - E-mails and attachments |  |
| Database Forensics | - MS Extensible Storage Engine (ESE) Database  - SQLite Database | - Windows Search  - MS Internet Explorer  - Google Chrome  - Google Drive |
| Deleted Data Recovery | - Metadata based recovery  - Signature & Content based recovery (aka Carving)  - Recycle Bin of Windows  - Unused area examination |  |
| User Behavior Analysis | - Constructing a forensic timeline of events  - Visualizing the timeline |  |

# Questions and Answers about the Scenario

#### What are the hash values (MD5 & SHA-1) of all images?

Does the acquisition and verification hash value match?

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer | Class | Hash Algo. | Hash value |
| PC | MD5 | A49D1254C873808C58E6F1BCD60B5BDE |
| SHA-1 | AFE5C9AB487BD47A8A9856B1371C2384D44FD785 |
| RM#2 | MD5 | B4644902ACAB4583A1D0F9F1A08FAA77 |
| SHA-1 | 048961A85CA3ECED8CC73F1517442D31D4DCA0A3 |
| RM#3 (Type1) | MD5 | 858C7250183A44DD83EB706F3F178990 |
| SHA-1 | 471D3EEDCA9ADD872FC0708297284E1960FF44F8 |
| RM#3 (Type2) | MD5 | 858C7250183A44DD83EB706F3F178990 |
| SHA-1 | 471D3EEDCA9ADD872FC0708297284E1960FF44F8 |
| RM#3 (Type3) | MD5 | DF914108FB3D86744EB688EBA482FBDF |
| SHA-1 | 7F3C2EB1F1E2DB97BE6E963625402A0E362A532C |
| Considerations | N/A | | |

#### Identify the partition information of PC image.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Possible Answer | No. | Bootable | File system | Start Sector | Total Sectors | Size |
| 1 |  | NTFS | 2,048 | 204,800 | 100 MB |
| 2 | \* | NTFS | 206,848 | 41,734,144 | 19.9 GB |
| Considerations | N/A | | | | | |

#### Explain installed OS information in detail.

(OS name, install date, registered owner…)

|  |  |  |
| --- | --- | --- |
| Possible Answer | OS Name | Windows 7 Ultimate |
| Version | 6.1 |
| Build Number | 7601 |
| Registered Owner | informant |
| System Root | C:\\Windows |
| Install Date | 2015-03-22 14:34:26 (GMT) |
| Considerations | HKLM\SOFTWARE\Microsoft\Windows NT\CurrentVersion | |

#### What is the timezone setting?

|  |  |  |
| --- | --- | --- |
| Possible Answer | Timezone | Eastern Time (US & Canada) (UTC-05:00) |
| Daylight Time Bias | +1 |
| Considerations | HKLM\SYSTEM\ControlSet###\Control\TimeZoneInformation | |

#### What is the computer name?

|  |  |
| --- | --- |
| Possible Answer | INFORMANT-PC |
| Considerations | HKLM\SYSTEM\ControlSet###\Control\ComputerName\ComputerName (value: ComputerName)  HKLM\SYSTEM\ControlSet###\Services\Tcpip\Parameters (value: Hostname)  …… |

#### List all accounts in OS except the system accounts: *Administrator, Guest, systemprofile*, *LocalService*, *NetworkService*. (Account name, login count, last logon date…)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Account | SID | NT Hash | Status | Login Count | Account Created Time | Last Login Time | Login Failure Time |
| informant | 1000 | (a) | Enabled | 10 | 2015-03-22  09:33:54 | 2015-03-25  09:45:59 | 2015-03-25  09:45:43 |
| admin11 | 1001 | (b) | Enabled | 2 | 2015-03-22  10:51:54 | 2015-03-22  10:57:02 | 2015-03-22  10:53:02 |
| ITechTeam | 1002 | (c) | Enabled | 0 | 2015-03-22  10:52:30 | - | - |
| Temporary | 1003 | (d) | Enabled | 1 | 2015-03-22  10:53:01 | 2015-03-22  10:55:57 | 2015-03-22  10:56:37 |
| Considerations | - HKLM\SAM\~  - SYSTEM hive is required for calculating hash values of passwords.  - NT Hashes and user passwords (it will be useful for practicing Windows password cracking)  (a) 9E3D31B073E60BFD7B07978D6F914D0A 🡪 Password: *informant#suspect1*  (b) 21759544B2D7EFCCC978449463CF7E63 🡪 Password: *djemals11*  (c) 75ED0CB7676889AB43764A3B7D3E6943 🡪 Password: *dkdlxpzmxla*  (d) 1B3801B608A6BE89D21FD3C5729D30BF 🡪 Password: *xpavhfkfl* | | | | | | | |

#### Who was the last user to logon into PC?

|  |  |
| --- | --- |
| Possible Answer | informant |
| Considerations | HKLM\SAM\~ |

#### When was the last recorded shutdown date/time?

|  |  |
| --- | --- |
| Possible Answer | 2015-03-25 11:31:05 (Eastern Time + DST) |
| Considerations | HKLM\SYSTEM\ControlSet###\Control\Windows (value: ShutdownTime) |

#### Explain the information of network interface(s) with an IP address assigned by DHCP.

|  |  |  |
| --- | --- | --- |
| Possible Answer | Device Name | Intel(R) PRO/1000 MT Network Connection |
| IP Address | 10.11.11.129 |
| Subnet Mask | 255.255.255.0 |
| Name Server | 10.11.11.2 |
| Domain | localdomain |
| Default Gateway | 10.11.11.2 |
| DHCP Usage | Yes |
| DHCP Server | 10.11.11.254 |
| Considerations | HKLM\SYSTEM\ControlSet###\Services\Tcpip\Parameters\Interfaces\{GUID} | |

#### What applications were installed by the suspect after installing OS?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Installation Time | Name | Version | Manufacturer | Installation Path |
| 2015-03-22 10:04:14 | Microsoft Office Professional Plus 2013 | 15.0.4420.1017 | Microsoft Corporation | C:\Program Files\Microsoft Office |
| 2015-03-22 10:11:51 | Google Chrome | 41.0.2272.101 | Google Inc. | C:\Program Files (x86)\Google\Chrome\Application |
| 2015-03-22 10:16:03 | Google Update Helper | 1.3.26.9 | Google Inc. |  |
| 2015-03-23 15:00:45 | Apple Application Support | 3.0.6 | Apple Inc. | C:\Program Files (x86)\Common Files\Apple\Apple Application Support\ |
| 2015-03-23 15:00:58 | Bonjour | 3.0.0.10 | Apple Inc. | C:\Program Files (x86)\Bonjour\ |
| 2015-03-23 15:01:01 | Apple Software Update | 2.1.3.127 | Apple Inc. | C:\Program Files (x86)\Apple Software Update\ |
| 2015-03-23 15:02:46 | Google Drive | 1.20.8672.3137 | Google Inc. |  |
| 2015-03-25 09:51:39 | Microsoft .NET Framework 4 | 4.0.30319 | Microsoft Corporation | C:\Windows\Microsoft.NET\Framework64\v4.0.30319 |
| 2015-03-25 09:57:31 | Eraser | 6.2.2962 | The Eraser Project |  |
| Considerations | HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\Uninstall\~  HKLM\SOFTWARE\Wow6432Node\Microsoft\Windows\CurrentVersion\Uninstall\~  … | | | | |

#### List application execution logs.

(Executable path, execution time, execution count...)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Possible Answer  (Some Windows executables and duplicated items are excluded)  (Timezone is applied) | Timestamp | Execution Path | Count | Source |
| 2015-03-22 11:11:04 | C:\Users\informant\Desktop\temp\IE11-Windows6.1-x64-en-us.exe | N/A | Shimcache |
| 2015-03-22 11:11:04 | C:\Users\informant\Desktop\Download\IE11-Windows6.1-x64-en-us.exe | N/A | Shimcache |
| 2015-03-22 11:12:32 | C:\Users\informant\Desktop\Download\IE11-Windows6.1-x64-en-us.exe | 1 | UserAssist |
| 2015-03-23 15:56:33 | C:\Users\informant\Downloads\googledrivesync.exe | N/A | Shimcache |
| 2015-03-23 15:56:33 | C:\Users\INFORM~1\AppData\Local\Temp\GUMA150.tmp\GoogleUpdateSetup.exe | N/A | Shimcache |
| 2015-03-23 15:56:33 | C:\Users\informant\Downloads\icloudsetup.exe | N/A | Shimcache |
| 2015-03-23 16:00:59 | C:\Windows\Installer\{789A5B64-9DD9-4BA5-915A-F0FC0A1B7BFE}\AppleSoftwareUpdateIco.exe | N/A | Shimcache |
| 2015-03-23 16:02:07 | C:\Users\INFORM~1\AppData\Local\Temp\GUMA150.tmp\GoogleUpdate.exe | N/A | Shimcache |
| 2015-03-23 16:02:09 | C:\Program Files (x86)\GUMA94B.tmp\GoogleUpdate.exe | N/A | Shimcache |
| 2015-03-23 16:26:50 | C:\PROGRAM FILES\Microsoft Office\Office15\EXCEL.EXE | 1 | UserAssist |
| 2015-03-23 16:27:33 | C:\PROGRAM FILES\Microsoft Office\Office15\POWERPNT.EXE | 2 | UserAssist |
| 2015-03-24 14:29:07 | C:\PROGRAM FILES\MICROSOFT GAMES\SOLITAIRE\SOLITAIRE.EXE | 1 | Prefetch |
| 2015-03-24 14:31:55 | C:\Windows\System32\StikyNot.exe | 2 | Prefetch |
| 2015-03-24 14:31:55 | Microsoft.Windows.StickyNotes | 13 | UserAssist |
| 2015-03-24 17:05:38 | C:\PROGRAM FILES (X86)\GOOGLE\CHROME\APPLICATION\CHROME.EXE | 71 | Prefetch |
| 2015-03-25 10:41:03 | C:\PROGRAM FILES\MICROSOFT OFFICE\OFFICE15\OUTLOOK.EXE | 1 | Prefetch |
| 2015-03-25 10:41:03 | C:\PROGRAM FILES\MICROSOFT OFFICE\OFFICE15\OUTLOOK.EXE | 5 | UserAssist |
| 2015-03-25 10:42:47 | C:\PROGRAM FILES (X86)\WINDOWS MEDIA PLAYER\wmplayer.exe | 1 | Prefetch |
| 2015-03-25 10:42:47 | Microsoft.Windows.MediaPlayer32 | 1 | UserAssist |
| 2015-03-25 10:47:40 | C:\Users\informant\Desktop\Download\Eraser 6.2.0.2962.exe | N/A | Shimcache |
| 2015-03-25 10:48:28 | C:\Users\informant\Desktop\Download\ccsetup504.exe | N/A | Shimcache |
| 2015-03-25 10:50:14 | C:\USERS\INFORMANT\DESKTOP\DOWNLOAD\ERASER 6.2.0.2962.EXE | 1 | Prefetch |
| 2015-03-25 10:50:14 | C:\USERS\INFORMANT\DESKTOP\DOWNLOAD\ERASER 6.2.0.2962.EXE | 1 | UserAssist |
| 2015-03-25 10:50:15 | C:\Users\INFORM~1\AppData\Local\Temp\eraserInstallBootstrapper\dotNetFx40\_Full\_setup.exe | N/A | Shimcache |
| 2015-03-25 10:50:15 | C:\USERS\INFORMANT\APPDATA\LOCAL\TEMP\ERASERINSTALLBOOTSTRAPPER\DOTNETFX40\_FULL\_SETUP.EXE | 1 | Prefetch |
| 2015-03-25 10:57:56 | C:\USERS\INFORMANT\DESKTOP\DOWNLOAD\CCSETUP504.EXE | 1 | Prefetch |
| 2015-03-25 10:57:56 | C:\USERS\INFORMANT\DESKTOP\DOWNLOAD\CCSETUP504.EXE | 1 | UserAssist |
| 2015-03-25 11:12:28 | C:\PROGRAM FILES\Eraser\Eraser.exe | 1 | UserAssist |
| 2015-03-25 11:13:30 | C:\PROGRAM FILES\Eraser\Eraser.exe | 2 | Prefetch |
| 2015-03-25 11:15:50 | C:\PROGRAM FILES\CCLEANER\CCLEANER64.EXE | 1 | UserAssist |
| 2015-03-25 11:15:50 | C:\PROGRAM FILES\CCLEANER\CCLEANER64.EXE | 2 | Prefetch |
| 2015-03-25 11:16:00 | C:\PROGRAM FILES (X86)\GOOGLE\UPDATE\GOOGLEUPDATE.EXE | 38 | Prefetch |
| 2015-03-25 11:18:29 | C:\PROGRAM FILES\CCLEANER\UNINST.EXE | 1 | Prefetch |
| 2015-03-25 11:21:30 | C:\PROGRAM FILES (X86)\GOOGLE\DRIVE\GOOGLEDRIVESYNC.EXE | 1 | UserAssist |
| 2015-03-25 11:21:31 | C:\PROGRAM FILES (X86)\GOOGLE\DRIVE\GOOGLEDRIVESYNC.EXE | 2 | Prefetch |
| 2015-03-25 11:22:06 | C:\PROGRAM FILES\INTERNET EXPLORER\iexplore.exe | 2 | Prefetch |
| 2015-03-25 11:22:07 | C:\PROGRAM FILES (X86)\INTERNET EXPLORER\iexplore.exe | 14 | Prefetch |
| 2015-03-25 11:24:48 | C:\PROGRAM FILES\MICROSOFT OFFICE\OFFICE15\WINWORD.EXE | 3 | Prefetch |
| 2015-03-25 11:24:48 | C:\PROGRAM FILES\MICROSOFT OFFICE\OFFICE15\WINWORD.EXE | 4 | UserAssist |
| 2015-03-25 11:28:47 | C:\Windows\System32\xpsrchvw.exe | 1 | Prefetch |
| 2015-03-25 11:28:47 | C:\Windows\System32\xpsrchvw.exe | 1 | UserAssist |
| N/A | C:\Users\informant\Downloads\icloudsetup.exe | N/A | UserAssist |
| N/A | C:\PROGRAM FILES (X86)\Common Files\Apple\Internet Services\iCloud.exe | N/A | UserAssist |
| N/A | C:\Users\informant\AppData\Local\Temp\eraserInstallBootstrapper\dotNetFx40\_Full\_setup.exe | N/A | UserAssist |
| MuiCache | C:\Program Files\Internet Explorer\iexplorer.exe | | |
| MuiCache | C:\Users\informant\Desktop\Download\IE11-Windows6.1-x64-en-us.exe | | |
| MuiCache | C:\Windows\System32\xpsrchvw.exe (XPS Viewer) | | |
| Considerations | \* ‘Execution Count’ may not be accurate.  \* Timestamps of UserAssist and Prefetch: ‘Execution Time’  \* Timestamps of Shimcache: ‘Last Modified Time’ from filesystem metadata  [File] Windows Prefetch folder  > \Windows\Prefetch\\*.pf  > Executable file paths and their execution timestamps (+ execution counts)  [File] IconCache  > \Users\informant\AppData\Local\IconCache.db  > Executable file paths and their icon images  [Reg] UserAssist  > HKU\informant\Software\Microsoft\Windows\CurrentVersion\Explorer\UserAssist\\*\Count\  > Executable file paths and their execution timestamps (+ execution counts)  [Reg] Application Compatibility (Shimcache)  > HKLM\SYSTEM\ControlSet###\Control\Session Manager\AppCompatCache\  > Executable file paths and their modified timestamps  [Reg] Application Compatibility Cache  > HKU\informant\Software\Microsoft\Windows NT\CurrentVersion\AppCompatFlags\Compatibility Assistant\  > Executable file paths and their modified timestamps  [Reg] MuiCache  > HKU\informant\Software\Classes\Local Settings\Software\Microsoft\Windows\Shell\MuiCache\  > Executable file paths | | | |

#### List all traces about the system on/off and the user logon/logoff.

(It should be considered only during a time range between 09:00 and 18:00 in the timezone from Question 4.)

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Some duplicated and meaningless items are excluded)  (Timezone is applied) | Time Generated | Event ID | Description |
| 2015-03-22 10:51:14 | 4608 | Starting up |
| 2015-03-22 11:00:08 | 4624 | Logon |
| 2015-03-22 11:22:54 | 4624 | Logon |
| 2015-03-22 12:00:08 | 4647 | Logoff |
| 2015-03-22 12:00:09 | 1100 | Shutdown |
| 2015-03-23 13:24:23 | 4624 | Logon |
| 2015-03-23 13:24:23 | 4608 | Starting up |
| 2015-03-23 14:36:07 | 4624 | Logon |
| 2015-03-23 16:00:22 | 4624 | Logon |
| 2015-03-23 16:01:02 | 4624 | Logon |
| 2015-03-23 17:02:53 | 4647 | Logoff |
| 2015-03-23 17:02:59 | 1100 | Shutdown |
| 2015-03-24 09:21:29 | 4624 | Logon |
| 2015-03-24 09:21:29 | 4608 | Starting up |
| 2015-03-24 09:23:40 | 4624 | Logon |
| 2015-03-24 11:14:30 | 4624 | Logon |
| 2015-03-24 11:22:39 | 4624 | Logon |
| 2015-03-24 11:46:14 | 4624 | Logon |
| 2015-03-24 14:28:38 | 4624 | Logon |
| 2015-03-24 16:58:52 | 4624 | Logon |
| 2015-03-24 17:07:25 | 4647 | Logoff |
| 2015-03-24 17:07:26 | 1100 | Shutdown |
| 2015-03-25 09:05:41 | 4624 | Logon |
| 2015-03-25 09:05:41 | 4608 | Starting up |
| 2015-03-25 09:07:49 | 4624 | Logon |
| 2015-03-25 09:23:59 | 4624 | Logon |
| 2015-03-25 10:31:53 | 4624 | Logon |
| 2015-03-25 10:45:59 | 4637 | Logoff |
| 2015-03-25 10:50:28 | 4624 | Logon |
| 2015-03-25 10:50:30 | 4624 | Logon |
| 2015-03-25 10:50:50 | 4624 | Logon |
| 2015-03-25 10:56:55 | 4624 | Logon |
| 2015-03-25 10:57:18 | 4624 | Logon |
| 2015-03-25 11:18:54 | 4624 | Logon |
| 2015-03-25 11:30:57 | 4647 | Logoff |
| 2015-03-25 11:31:00 | 1100 | Shutdown |
| Considerations | - Security event logs  - Event IDs for Windows Vista or higher  : 4608 (Windows is starting up), 1100 (service shutdown)  : 4624 (successful logon), 4634 (logoff), 4625 (logon failure), 4647 (a user initiated the logoff process)...  \* Some events may not be accurate. | | |

#### What web browsers were used?

|  |  |
| --- | --- |
| Possible Answer | - Microsoft Internet Explorer v11.0.9600.17691  (Microsoft Internet Explorer 9 or lower 🡪 updated to IE 11 version)  - Google Chrome v41.0.2272.101 |
| Considerations | HKLM\SOFTWARE\Microsoft\Internet Explorer (value: svcVersion)  HKU\informant\Software\Google\Chrome\BLBeacon (value: version) |

#### Identify directory/file paths related to the web browser history.

|  |  |  |
| --- | --- | --- |
| Possible Answer | MS IE  (9 or lower) | C:\Users\informant\AppData\Local\Microsoft\Windows\History\  C:\Users\informant\AppData\Local\Microsoft\Windows\Temporary Internet Files\  C:\Users\informant\AppData\Roaming\Microsoft\Windows\Cookies\ |
| MS IE 11 | C:\Users\informant\AppData\Local\Microsoft\Windows\WebCache\WebCacheV01.dat |
| Chrome | C:\Users\informant\AppData\Local\Google\Chrome\User Data\Default\History  C:\Users\informant\AppData\Local\Google\Chrome\User Data\Default\Application Cache\  C:\Users\informant\AppData\Local\Google\Chrome\User Data\Default\Media Cache\  C:\Users\informant\AppData\Local\Google\Chrome\User Data\Default\GPUCache\  C:\Users\informant\AppData\Local\Google\Chrome\User Data\Default\Cookies\  C:\Users\informant\AppData\Local\Google\Chrome\User Data\Default\Extension Cookies  C:\Users\informant\AppData\Local\Google\Chrome\User Data\Default\Extensions\  …… |
| Considerations | - History, Cache, Cookie…  - Windows Search database (related to Question 42 ~ 46)  > C:\ProgramData\Microsoft\Search\Data\Applications\Windows\Windows.edb | |

#### What websites were the suspect accessing? (Timestamp, URL...)

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Some duplicated and meaningless items are excluded)  (Timezone is applied) | Timestamp | URL | Browser |
| 2015-03-22 11:09:01 | http://windows.microsoft.com/en-us/internet-explorer/ie-8-welcome | IE 8 |
| 2015-03-22 11:09:47 | https://www.google.com/ | IE 8 |
| 2015-03-22 11:10:50 | http://windows.microsoft.com/en-us/internet-explorer/download-ie | IE 8 |
| 2015-03-22 11:11:04 | http://download.microsoft.com/download/7/1/7/7179A150-F2D2-4502-9D70-4B59EA148EAA/IE11-Windows6.1-x64-en-us.exe | IE 8 |
| 2015-03-22 11:11:06 | https://dl.google.com/update2/1.3.26.9/GoogleInstaller\_en.application?appguid%3D%7B8A69D345-D564-463C-AFF1- | IE 8 |
| 2015-03-22 11:11:58 | https://www.google.com/intl/en/chrome/browser/welcome.html | Chrome |
| 2015-03-22 11:27:59 | https://www.google.com/#q=outlook+2013+settings | Chrome |
| 2015-03-23 13:26:58 | http://www.bing.com/ | Chrome |
| 2015-03-23 13:26:58 | https://www.google.com/webhp?hl=en | Chrome |
| 2015-03-23 13:27:36 | http://go.microsoft.com/fwlink/?LinkId=69157 | IE 11 |
| 2015-03-23 13:27:49 | http://www.microsoft.com/en-us/ie-firstrun/win-7/ie-11/vie | IE 11 |
| 2015-03-23 14:02:09 | https://www.google.com/webhp?hl=en#hl=en&q=data+leakage+methods | Chrome |
| 2015-03-23 14:02:18 | http://www.sans.org/reading-room/whitepapers/awareness/data-leakage-threats-mitigation\_1931 | Chrome |
| 2015-03-23 14:02:44 | https://www.google.com/webhp?hl=en#hl=en&q=leaking+confidential+information | Chrome |
| 2015-03-23 14:03:40 | https://www.google.com/webhp?hl=en#hl=en&q=information+leakage+cases | Chrome |
| 2015-03-23 14:04:54 | http://www.emirates247.com/business/technology/top-5-sources-leaking-personal-data-2015-03- | Chrome |
| 2015-03-23 14:05:48 | https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=intellectual+property+theft | Chrome |
| 2015-03-23 14:05:55 | http://www.fbi.gov/about-us/investigate/white\_collar/ipr/ipr | Chrome |
| 2015-03-23 14:06:01 | http://en.wikipedia.org/wiki/Intellectual\_property | Chrome |
| 2015-03-23 14:06:27 | https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=how+to+leak+a+secret | Chrome |
| 2015-03-23 14:06:53 | http://research.microsoft.com/en-us/um/people/yael/publications/2001-leak\_secret.pdf | Chrome |
| 2015-03-23 14:07:58 | http://www.bing.com/news/search?q=file+sharing+and+tethering&FORM=HDRSC6 | IE 11 |
| 2015-03-23 14:08:18 | http://sysinfotools.com/blog/tethering-internet-files-sharing/ | IE 11 |
| 2015-03-23 14:08:31 | http://www.bing.com/search?q=DLP%20DRM&qs=n&form=QBRE&pq=dlp%20drm&sc=8-7&sp=-1&sk=&cvid=6e206ee8751e4ad89f882ed52daf3aea&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=0 | IE 11 |
| 2015-03-23 14:08:54 | http://www.bing.com/search?q=e-mail%20investigation&qs=n&form=QBRE&pq=e-mail%20investigation&sc=8-7&sp=-1&sk=&cvid=fe1c3738d8c7471284731724166959af&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=1 | IE 11 |
| 2015-03-23 14:10:03 | http://www.bing.com/search?q=Forensic+Email+Investigation&FORM=QSRE1&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=3 | IE 11 |
| 2015-03-23 14:10:27 | http://www.bing.com/search?q=what%20is%20windows%20system%20artifacts&qs=n&form=QBRE&pq=what%20is%20windows%20system%20artifacts&sc=0-27&sp=-1&sk=&cvid=1ef4ace146854d97acf263b53bf97b8c&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=4 | IE 11 |
| 2015-03-23 14:11:12 | http://resources.infosecinstitute.com/windows-systems-and-artifacts-in-digital-forensics-part-i-registry/ | IE 11 |
| 2015-03-23 14:11:50 | http://www.bing.com/search?q=investigation%20on%20windows%20machine&qs=n&form=QBRE&pq=investigation%20on%20windows%20machine&sc=8-4&sp=-1&sk=&cvid=eb73de7f523c48769d56201379f55e67&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=5 | IE 11 |
| 2015-03-23 14:12:07 | https://technet.microsoft.com/en-us/library/cc162846.aspx | IE 11 |
| 2015-03-23 14:12:35 | http://www.bing.com/search?q=windows%20event%20logs&qs=n&form=QBRE&pq=windows%20event%20logs&sc=0-32&sp=-1&sk=&cvid=36b33ac5151246398f7dc1ca79de069c&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=6 | IE 11 |
| 2015-03-23 14:12:45 | https://support.microsoft.com/en-us/kb/308427 | IE 11 |
| 2015-03-23 14:12:52 | http://en.wikipedia.org/wiki/Event\_Viewer | IE 11 |
| 2015-03-23 14:13:20 | http://www.bing.com/search?q=cd%20burning%20method&qs=n&form=QBRE&pq=cd%20burning%20method&sc=8-2&sp=-1&sk=&cvid=b7dbe6fb67424c578172ba57330a0894&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=7 | IE 11 |
| 2015-03-23 14:13:37 | http://www.bing.com/search?q=cd%20burning%20method%20in%20windows&qs=n&form=QBRE&pq=cd%20burning%20method%20in%20windows&sc=0-0&sp=-1&sk=&cvid=acec9b1dcb8146c58258ad65c770d76e&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=8 | IE 11 |
| 2015-03-23 14:13:57 | https://msdn.microsoft.com/en-us/library/windows/desktop/dd562212(v=vs.85).aspx | IE 11 |
| 2015-03-23 14:14:11 | http://www.bing.com/search?q=external%20device%20and%20forensics&qs=n&form=QBRE&pq=external%20device%20and%20forensics&sc=8-9&sp=-1&sk=&cvid=c30c4b1f36114b1c9bc683838c69823a&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=9 | IE 11 |
| 2015-03-23 14:14:24 | http://www.forensicswiki.org/wiki/USB\_History\_Viewing | IE 11 |
| 2015-03-23 14:14:50 | https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=cloud+storage | Chrome |
| 2015-03-23 14:15:09 | http://en.wikipedia.org/wiki/Cloud\_storage | Chrome |
| 2015-03-23 14:15:32 | http://www.pcadvisor.co.uk/test-centre/internet/3506734/best-cloud-storage-dropbox-google-drive-onedrive-icloud/ | Chrome |
| 2015-03-23 14:15:44 | https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=digital+forensics | Chrome |
| 2015-03-23 14:15:49 | http://en.wikipedia.org/wiki/Digital\_forensics | Chrome |
| 2015-03-23 14:16:06 | http://nij.gov/topics/forensics/evidence/digital/pages/welcome.aspx | Chrome |
| 2015-03-23 14:16:55 | https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=how+to+delete+data | Chrome |
| 2015-03-23 14:17:14 | https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=anti-forensics | Chrome |
| 2015-03-23 14:17:19 | http://forensicswiki.org/wiki/Anti-forensic\_techniques | Chrome |
| 2015-03-23 14:18:00 | https://defcon.org/images/defcon-20/dc-20-presentations/Perklin/DEFCON-20-Perklin-AntiForensics.pdf | Chrome |
| 2015-03-23 14:18:10 | https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=system+cleaner | Chrome |
| 2015-03-23 14:18:30 | https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=how+to+recover+data | Chrome |
| 2015-03-23 14:19:03 | https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=data+recovery+tools | Chrome |
| 2015-03-23 14:19:17 | http://en.wikipedia.org/wiki/List\_of\_data\_recovery\_software | Chrome |
| 2015-03-23 14:19:21 | http://www.forensicswiki.org/wiki/Tools:Data\_Recovery | Chrome |
| 2015-03-23 15:55:09 | https://www.google.com/webhp?hl=en#hl=en&q=apple+icloud | Chrome |
| 2015-03-23 15:55:28 | https://www.apple.com/icloud/setup/pc.html | Chrome |
| 2015-03-23 15:56:04 | https://www.google.com/webhp?hl=en#hl=en&q=google+drive | Chrome |
| 2015-03-23 15:56:15 | https://www.google.com/drive/download/ | Chrome |
| 2015-03-23 16:43:52 | http://www.bing.com/news?FORM=Z9LH3 | IE 11 |
| 2015-03-23 16:45:30 | http://www.bing.com/news?q=Soccer+News&FORM=NSBABR | IE 11 |
| 2015-03-23 16:53:46 | http://www.bing.com/news?q=top+stories&FORM=NWRFSH | IE 11 |
| 2015-03-23 16:55:10 | http://www.bing.com/news?q=world+news&FORM=NSBABR | IE 11 |
| 2015-03-23 16:55:18 | http://www.bing.com/news?q=entertainment+news&FORM=NSBABR | IE 11 |
| 2015-03-23 16:55:54 | http://www.bing.com/news?q=business+news&FORM=NSBABR | IE 11 |
| 2015-03-24 11:22:46 | https://news.google.com/news/section?pz=1&cf=all&ned=us&topic=w&siidp=0b2226a6a5dab3b27ee85fc5e8d21f28f01e | Chrome |
| 2015-03-24 11:23:16 | https://news.google.com/news/section?pz=1&cf=all&ned=us&topic=tc&siidp=e6116f8175cb189b8dd7fd58ef6bc922ec04&ar=1427212899 | Chrome |
| 2015-03-24 14:59:52 | https://news.google.com/news?pz=1&cf=all&ned=us&siidp=0c33ef04190b3734a22c5bae18801ff1041e | Chrome |
| 2015-03-24 15:00:27 | https://news.google.com/news/section?pz=1&cf=all&ned=us&topic=w&siidp=538c61c825aba06be7485be747a619778015 | Chrome |
| 2015-03-24 17:06:50 | https://www.google.com/#q=security+checkpoint+cd-r | Chrome |
| 2015-03-25 10:46:44 | http://www.bing.com/search?q=anti-forensic+tools&qs=n&form=QBLH&pq=anti-forensic+tools&sc=8-13&sp=-1&sk=&cvid=e799e715fa2244a5a7967675bdcca9d3 | IE 11 |
| 2015-03-25 10:46:54 | http://www.bing.com/search?q=eraser&qs=n&form=QBRE&pq=eraser&sc=8-6&sp=-1&sk=&cvid=e3b983fe889944179093ff5199b2eac4&sid=C7E8F3776E804120B57C623F21EF33C4&format=jsonv2&jsoncbid=0 | IE 11 |
| 2015-03-25 10:46:59 | http://eraser.heidi.ie/ | IE 11 |
| 2015-03-25 10:47:34 | http://iweb.dl.sourceforge.net/project/eraser/Eraser%206/6.2/Eraser%206.2.0.2962.exe | IE 11 |
| 2015-03-25 10:47:51 | http://www.bing.com/search?q=ccleaner&qs=n&form=QBRE&pq=ccleaner&sc=8-8&sp=-1&sk=&cvid=d434736d4e514ad497f68734a6779104&sid=C7E8F3776E804120B57C623F21EF33C4&format=jsonv2&jsoncbid=1 | IE 11 |
| 2015-03-25 10:48:12 | http://www.piriform.com/ccleaner/download | IE 11 |
| Considerations | - History, Cache, Cookie… | | |

#### List all search keywords using web browsers. (Timestamp, URL, keyword...)

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Some duplicated and meaningless items are excluded)  (Timezone is applied) | Timestamp | Keyword (URL) | Browser |
| 2015-03-23 14:02:09 | **data leakage method**  (https://www.google.com/webhp?hl=en#hl=en&q=**data+leakage+methods)** | Chrome |
| 2015-03-23 14:02:44 | **leaking confidential information**  (https://www.google.com/webhp?hl=en#hl=en&q=**leaking+confidential+information)** | Chrome |
| 2015-03-23 14:03:40 | **information leakage cases**  (https://www.google.com/webhp?hl=en#hl=en&q=**information+leakage+cases)** | Chrome |
| 2015-03-23 14:05:48 | **intellectual property theft**  (https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=**intellectual+property+theft)** | Chrome |
| 2015-03-23 14:06:27 | **how to leak a secret**  (https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=**how+to+leak+a+secret)** | Chrome |
| 2015-03-23 14:07:58 | **file sharing and tethering**  (http://www.bing.com/news/search?q=**file+sharing+and+tethering**&FORM=HDRSC6) | IE 11 |
| 2015-03-23 14:08:31 | **DLP DRM**  (http://www.bing.com/search?q=**DLP%20DRM**&qs=n&form=QBRE&pq=**dlp%20drm**&sc=8-7&sp=-1&sk=&cvid=6e206ee8751e4ad89f882ed52daf3aea&sid=BE5E388F87574  06CAA32E58334719A20&format=jsonv2&jsoncbid=0) | IE 11 |
| 2015-03-23 14:08:54 | **e-mail investigation**  (http://www.bing.com/search?q=**e-mail%20investigation**&qs=n&form=QBRE&pq=**e-mail%20investigation**&sc=8-7&sp=-1&sk=&cvid=fe1c3738d8c7471284731724166959af&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=1) | IE 11 |
| 2015-03-23 14:10:03 | **Forensic Email Investigation**  (http://www.bing.com/search?q=**Forensic+Email+Investigation**&FORM=QSRE1&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=3) | IE 11 |
| 2015-03-23 14:10:27 | **what is windows system artifacts**  (http://www.bing.com/search?q=**what%20is%20windows%20system%20artifacts**&qs=n&form=QBRE&pq=**what%20is%20windows%20system%20artifacts**&sc=0-27&sp=-1&sk=&cvid=1ef4ace146854d97acf263b53bf97b8c&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=4) | IE 11 |
| 2015-03-23 14:11:50 | **investigation on windows machine**  (http://www.bing.com/search?q=**investigation%20on%20windows%20machine**&qs=n&form=QBRE&pq=**investigation%20on%20windows%20machine**&sc=8-4&sp=-1&sk=&cvid=eb73de7f523c48769d56201379f55e67&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=5) | IE 11 |
| 2015-03-23 14:12:35 | **windows event logs**  (http://www.bing.com/search?q=**windows%20event%20logs**&qs=n&form=QBRE&pq=**windows%20event%20logs**&sc=0-32&sp=-1&sk=&cvid=36b33ac5151246398f7dc1ca79de069c&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=6) | IE 11 |
| 2015-03-23 14:13:20 | **cd burning method**  (http://www.bing.com/search?q=**cd%20burning%20method**&qs=n&form=QBRE&pq=**cd%20burning%20method**&sc=8-2&sp=-1&sk=&cvid=b7dbe6fb67424c578172ba57330a0894&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=7) | IE 11 |
| 2015-03-23 14:13:37 | **cd burning method in windows**  (http://www.bing.com/search?q=**cd%20burning%20method%20in%20windows**&qs=n&form=QBRE&pq=**cd%20burning%20method%20in%20windows**&sc=0-0&sp=-1&sk=&cvid=acec9b1dcb8146c58258ad65c770d76e&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=8) | IE 11 |
| 2015-03-23 14:14:11 | **external device and forensics**  (http://www.bing.com/search?q=**external%20device%20and%20forensics**&qs=n&form=QBRE&pq=**external%20device%20and%20forensics**&sc=8-9&sp=-1&sk=&cvid=c30c4b1f36114b1c9bc683838c69823a&sid=BE5E388F8757406CAA32E58334719A20&format=jsonv2&jsoncbid=9) | IE 11 |
| 2015-03-23 14:14:50 | **cloud storage**  (https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=**cloud+storage)** | Chrome |
| 2015-03-23 14:15:44 | **digital forensics**  (https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=**digital+forensics)** | Chrome |
| 2015-03-23 14:16:55 | **how to delete data**  (https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=**how+to+delete+data)** | Chrome |
| 2015-03-23 14:17:14 | **anti-forensics**  (https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=**anti-forensics)** | Chrome |
| 2015-03-23 14:18:10 | **system cleaner**  (https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=**system+cleaner)** | Chrome |
| 2015-03-23 14:18:30 | **how to recover data**  (https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=**how+to+recover+data)** | Chrome |
| 2015-03-23 14:19:03 | **data recovery tools**  (https://www.google.com/search?q=information+leakage+cases&hl=en&biw=950&bih=499&site=webhp&tbm=vid&source=lnms&sa=X&ei=3VUQVYH3FMO1sQTf1YGwBw&ved=0CAoQ\_AUoBA&dpr=1#hl=en&q=**data+recovery+tools)** | Chrome |
| 2015-03-23 15:55:09 | **apple icloud**  (https://www.google.com/webhp?hl=en#hl=en&q=**apple+icloud)** | Chrome |
| 2015-03-23 15:56:04 | **google drive**  (https://www.google.com/webhp?hl=en#hl=en&q=**google+drive)** | Chrome |
| 2015-03-24 17:06:50 | **security checkpoint cd-r**  (https://www.google.com/#q=**security+checkpoint+cd-r)** | Chrome |
| 2015-03-25 10:46:44 | **anti-forensic tools**  (http://www.bing.com/search?q=**anti-forensic+tools**&qs=n&form=QBLH&pq=**anti-forensic+tools**&sc=8-13&sp=-1&sk=&cvid=e799e715fa2244a5a7967675bdcca9d3) | IE 11 |
| 2015-03-25 10:46:54 | **eraser**  (http://www.bing.com/search?q=**eraser**&qs=n&form=QBRE&pq=**eraser**&sc=8-6&sp=-1&sk=&cvid=e3b983fe889944179093ff5199b2eac4&sid=C7E8F3776E804120B57C623F21EF33C4&format=jsonv2&jsoncbid=0) | IE 11 |
| 2015-03-25 10:47:51 | **ccleaner**  (http://www.bing.com/search?q=**ccleaner**&qs=n&form=QBRE&pq=**ccleaner**&sc=8-8&sp=-1&sk=&cvid=d434736d4e514ad497f68734a6779104&sid=C7E8F3776E804120B57C623F21EF33C4&format=jsonv2&jsoncbid=1) | IE 11 |
| Considerations | - Web browser logs | | |

#### List all user keywords at the search bar in Windows Explorer. (Timestamp, Keyword)

|  |  |  |
| --- | --- | --- |
| Possible Answer | Timestamp (Timezone is applied) | Search Keyword |
| 2015-03-23 14:40:17 | secret |
| Considerations | HKU\informant\Software\Microsoft\Windows\CurrentVersion\Explorer\WordWheelQuery\  - ‘Timestamp’ can be inferred from a timestamp of the parent key (‘WordWheelQuery’).  - ‘Timestamp’ may not be accurate because it depends on the update mechanism of Windows Explorer. | |

#### What application was used for e-mail communication?

|  |  |
| --- | --- |
| Possible Answer | Microsoft Outlook 2013 |
| Considerations | HKLM\SOFTWARE\Classes\mailto\shell\open\command (🡪Microsoft Outlook)  HKLM\SOFTWARE\Clients\Mail (🡪Microsoft Outlook)  HKU\informant\Software\Microsoft\Office\15.0\Outlook  … |

#### Where is the e-mail file located?

|  |  |
| --- | --- |
| Possible Answer | C:\Users\informant\AppData\Local\Microsoft\Office\iaman.informant@nist.gov.ost |
| Considerations | - Microsoft Outlook 2013  - Microsoft OST file format  HKEY\_USERS\informant\Software\Microsoft\Office\15.0\Outlook\Search  (value: C:\Users\informant\AppData\Local\Microsoft\Outlook\iaman.informant@nist.gov.ost)  HKEY\_USERS\informant\Software\Microsoft\Office\15.0\Outlook\PST  (value: LastCorruptStore) |

#### What was the e-mail account used by the suspect?

|  |  |
| --- | --- |
| Possible Answer | iaman.informant@nist.gov |
| Considerations | - See Question 19. |

#### List all e-mails of the suspect. If possible, identify deleted e-mails.

(You can identify the following items: *Timestamp*, *From*, *To*, *Subject*, *Body*, and *Attachment*)

[Hint: just examine the OST file only.]

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Timestamp | E-Mail Communication | |
| 2015-03-23 13:29:27 | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | Hello, Iaman |
| Body | How are you doing? |
|  |  |  |
| 2015-03-23 14:44:31 | Source | [Sent Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | RE: Hello, Iaman |
| Body | Successfully secured.  ---------------------------  **From**: spy  **Sent**: Monday, March 23, 2015 1:29 PM  **To**: iaman  **Subject**: Hello, Iaman  How are you doing? |
|  |  |  |
| 2015-03-23 15:14:58 | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | Good job, buddy. |
| Body | Good, job.  I need a more detailed data about this business. |
|  |  |  |
| 2015-03-23 15:20:41 | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | RE: Good job, buddy. |
| Body | Okay, I got it.  I’ll be in touch.  ---------------------------  **From**: iaman  **Sent**: Monday, March 23, 2015 3:19 PM  **To**: spy  **Subject**: RE: Good job, buddy.    This is a sample.  ---------------------------  **From**: spy  **Sent**: Monday, March 23, 2015 3:15 PM  **To**: iaman  **Subject**: Good job, buddy.    Good, job.  I need a more detailed data about this business. |
|  |  |  |
| 2015-03-23 15:26:22 | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | Important request |
| Body | I confirmed it.  But, I need a more data.  Do your best. |
|  |  |  |
| 2015-03-23 15:27:05 | Source | [Sent Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | RE: Important request |
| Body | Umm….. I need time to think.    ---------------------------  **From**: spy  **Sent**: Monday, March 23, 2015 3:26 PM  **To**: iaman  **Subject**: Important request    I confirmed it.  But, I need a more data.  Do your best. |
|  |  |  |
| 2015-03-23 16:38:47 | Source | *Recovered Item* from unused area of OST file |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | It's me |
| Body | Use links below,    https://drive.google.com/file/d/0Bz0ye6gXtiZaVl8yVU5mWHlGbWc/view?usp=sharing    https://drive.google.com/file/d/0Bz0ye6gXtiZaakx6d3R3c0JmM1U/view?usp=sharing |
|  |  |  |
| 2015-03-23 16:41:19 | Source | [Deleted Items] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | RE: It's me |
| Body | I got it.  ---------------------------  **From**: iaman  **Sent**: Monday, March 23, 2015 4:39 PM  **To**: spy  **Subject**: It's me    Use links below,    https://drive.google.com/file/d/0Bz0ye6gXtiZaVl8yVU5mWHlGbWc/view?usp=sharing    https://drive.google.com/file/d/0Bz0ye6gXtiZaakx6d3R3c0JmM1U/view?usp=sharing |
|  |  |  |
| 2015-03-24 09:25:57 | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | Last request |
| Body | This is the last request.  I want to get the remaining data. |
|  |  |  |
| 2015-03-24 09:35:10 | Source | [Deleted Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | RE: Last request |
| Body | This is the last time..    ---------------------------  **From**: spy  **Sent**: Tuesday, March 24, 2015 9:34 AM  **To**: iaman  **Subject**: RE: Last request    No problem.  U can directly deliver storage devices that stored it.  ---------------------------  **From**: iaman  **Sent**: Tuesday, March 24, 2015 9:30 AM  **To**: spy  **Subject**: RE: Last request    Stop it!  It is very hard to transfer all data over the internet!  ---------------------------  **From**: spy  **Sent**: Tuesday, March 24, 2015 9:26 AM  **To**: iaman  **Subject**: Last request    This is the last request.  I want to get the remaining data. |
|  |  |  |
| 2015-03-24 15:34:02 | Source | [Deleted Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | RE: Watch out! |
| Body | I am trying.  ---------------------------  **From**: spy  **Sent**: Tuesday, March 24, 2015 3:33 PM  **To**: iaman  **Subject**: Watch out!  USB device may be easily detected.  So, try another method. |
|  |  |  |
| 2015-03-24 17:05:09 | Source | [Deleted Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | Done |
| Body | It’s done. See you tomorrow. |
| Considerations | - Fortunately, a suspected OST file was not protected and encrypted with a password.  - OST file parsing 🡪 Inbox, Deleted Items, Contact, and Calendar…  - Deleted e-mail recovery from unused area of OST file. | | |

#### List external storage devices attached to PC.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Possible Answer | Device Name | Volume Name | Serial No. | First Connected Time | Connected Time After Reboot |
| SanDisk Cruzer Fit USB Device |  | 4C530012450531101593 | 2015-03-23 14:31:10 Mon | 2015-03-24 09:38:00 Tue |
| SanDisk Cruzer Fit USB Device | IAMAN $\_@ | 4C530012550531106501 | 2015-03-24 09:58:32 Tue | 2015-03-24 09:58:33 Tue |
| Considerations | - ‘First Connected Time’ can be identified from SetupAPI Log. (🡪 C:\Windows\inf\setupapi.dev.log)  HKLM\SYSTEM\MountedDevices\  HKLM\SYSTEM\ControlSet###\Enum\USBSTOR\  HKLM\SYSTEM\ControlSet###\Control\DeviceClasses\{a5dcbf10-6530-11d2-901f-00c04fb951ed}\  HKLM\SYSTEM\ControlSet###\Control\DeviceClasses\{53f56307-b6bf-11d0-94f2-00a0c91efb8b}\  ……  HKU\informant\Software\Microsoft\Windows\CurrentVersion\Explorer\MountPoints2\  HKLM\SOFTWARE\Microsoft\Windows Search\VolumeInfoCache\E:  > timestamp: 2015-03-24 09:58:34 Tue  > value: VolumeLabel  > data: ‘IAMAN $\_@’  \Windows\System32\winevt\Logs\System.evtx (Event ID: 20001, 20003…)  …… | | | | |

#### Identify all traces related to ‘renaming’ of files in Windows Desktop.

(It should be considered only during a date range between 2015-03-23 and 2015-03-24.)

[Hint: the parent directories of renamed files were deleted and their MFT entries were also overwritten. Therefore, you may not be able to find their full paths.]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Timestamp | USN | Path (Of course, just file names are OK) | Event |
| 2015-03-23 14:41:40 | 56306184 | \Users\informant\Desktop\S data\[secret\_project]\_detailed\_proposal.docx | Renamed Old |
| 56306328 | \Users\informant\Desktop\S data\**landscape.png** | Renamed New |
| 2015-03-23 14:41:55 | 56307712 | \Users\informant\Desktop\S data\[secret\_project]\_design\_concept.ppt | Renamed Old |
| 56307848 | \Users\informant\Desktop\S data\**space\_and\_earth.mp4** | Renamed New |
| 2015-03-23 16:30:44 | 58506640 | \Users\informant\Desktop\S data\(secret\_project)\_pricing\_decision.xlsx | Renamed Old |
| 58506776 | \Users\informant\Desktop\S data\**happy\_holiday.jpg** | Renamed New |
| 2015-03-23 16:31:02 | 58510288 | \Users\informant\Desktop\S data\[secret\_project]\_final\_meeting.pptx | Renamed Old |
| 58510424 | \Users\informant\Desktop\S data\**do\_u\_wanna\_build\_a\_snow\_man.mp3** | Renamed New |
| 2015-03-24 09:49:51 | 59801680 | \Users\informant\Desktop\S data\Secret Project Data\design\  [secret\_project]\_detailed\_design.pptx | Renamed Old |
| 59801816 | \Users\informant\Desktop\S data\Secret Project Data\design\  **winter\_whether\_advisory.zip** | Renamed New |
| 2015-03-24 09:50:08 | 59802408 | \Users\informant\Desktop\S data\Secret Project Data\design\  [secret\_project]\_revised\_points.ppt | Renamed Old |
| 59802544 | \Users\informant\Desktop\S data\Secret Project Data\design\  **winter\_storm.amr** | Renamed New |
| 2015-03-24 09:50:49 | 59803456 | \Users\informant\Desktop\S data\Secret Project Data\design\  [secret\_project]\_design\_concept.ppt | Renamed Old |
| 59803592 | \Users\informant\Desktop\S data\Secret Project Data\design\  **space\_and\_earth.mp4** | Renamed New |
| 2015-03-24 09:52:35 | 59814352 | \Users\informant\Desktop\S data\Secret Project Data\final\  [secret\_project]\_final\_meeting.pptx | Renamed Old |
| 59814488 | \Users\informant\Desktop\S data\Secret Project Data\final\  **do\_u\_wanna\_build\_a\_snow\_man.mp3** | Renamed New |
| 2015-03-24 09:52:56 | 59814904 | \Users\informant\Desktop\S data\Secret Project Data\pricing decision\  (secret\_project)\_market\_analysis.xlsx | Renamed Old |
| 59815040 | \Users\informant\Desktop\S data\Secret Project Data\pricing decision\  **new\_years\_day.jpg** | Renamed New |
| 2015-03-24 09:53:08 | 59815232 | \Users\informant\Desktop\S data\Secret Project Data\pricing decision\  (secret\_project)\_market\_shares.xls | Renamed Old |
| 59815360 | \Users\informant\Desktop\S data\Secret Project Data\pricing decision\  **super\_bowl.avi** | Renamed New |
| 2015-03-24 09:53:38 | 59815536 | \Users\informant\Desktop\S data\Secret Project Data\pricing decision\  (secret\_project)\_price\_analysis\_#1.xlsx | Renamed Old |
| 59815680 | \Users\informant\Desktop\S data\Secret Project Data\pricing decision\  **my\_favorite\_movies.7z** | Renamed New |
| 2015-03-24 09:53:52 | 59815968 | \Users\informant\Desktop\S data\Secret Project Data\pricing decision\  (secret\_project)\_price\_analysis\_#2.xls | Renamed Old |
| 59816104 | \Users\informant\Desktop\S data\Secret Project Data\pricing decision\  **my\_favorite\_cars.db** | Renamed New |
| 2015-03-24 09:54:05 | 59816312 | \Users\informant\Desktop\S data\Secret Project Data\pricing decision\  (secret\_project)\_pricing\_decision.xlsx | Renamed Old |
| 59816448 | \Users\informant\Desktop\S data\Secret Project Data\pricing decision\  **happy\_holiday.jpg** | Renamed New |
| 2015-03-24 09:54:23 | 59816880 | \Users\informant\Desktop\S data\Secret Project Data\progress\  [secret\_project]\_progress\_#1.docx | Renamed Old |
| 59817008 | \Users\informant\Desktop\S data\Secret Project Data\progress\  **my\_smartphone.png** | Renamed New |
| 2015-03-24 09:54:43 | 59817984 | \Users\informant\Desktop\S data\Secret Project Data\progress\  [secret\_project]\_progress\_#2.docx | Renamed Old |
| 59818112 | \Users\informant\Desktop\S data\Secret Project Data\progress\  **new\_year\_calendar.one** | Renamed New |
| 2015-03-24 09:54:52 | 59818320 | \Users\informant\Desktop\S data\Secret Project Data\progress\  [secret\_project]\_progress\_#3.doc | Renamed Old |
| 59818448 | \Users\informant\Desktop\S data\Secret Project Data\progress\  **my\_friends.svg** | Renamed New |
| 2015-03-24 09:55:08 | 59818624 | \Users\informant\Desktop\S data\Secret Project Data\proposal\  [secret\_project]\_detailed\_proposal.docx | Renamed Old |
| 59818768 | \Users\informant\Desktop\S data\Secret Project Data\proposal\  **a\_gift\_from\_you.gif** | Renamed New |
| 2015-03-24 09:55:17 | 59818976 | \Users\informant\Desktop\S data\Secret Project Data\proposal\  [secret\_project]\_proposal.docx | Renamed Old |
| 59819096 | \Users\informant\Desktop\S data\Secret Project Data\proposal\  **landscape.png** | Renamed New |
| 2015-03-24 09:55:32 | 59819272 | \Users\informant\Desktop\S data\Secret Project Data\technical review\  [secret\_project]\_technical\_review\_#1.docx | Renamed Old |
| 59819416 | \Users\informant\Desktop\S data\Secret Project Data\technical review\  **diary\_#1d.txt** | Renamed New |
| 2015-03-24 09:55:42 | 59819592 | \Users\informant\Desktop\S data\Secret Project Data\technical review\  [secret\_project]\_technical\_review\_#1.pptx | Renamed Old |
| 59819736 | \Users\informant\Desktop\S data\Secret Project Data\technical review\  **diary\_#1p.txt** | Renamed New |
| 2015-03-24 09:55:53 | 59819912 | \Users\informant\Desktop\S data\Secret Project Data\technical review\  [secret\_project]\_technical\_review\_#2.docx | Renamed Old |
| 59820056 | \Users\informant\Desktop\S data\Secret Project Data\technical review\  **diary\_#2d.txt** | Renamed New |
| 2015-03-24 09:56:09 | 59823280 | \Users\informant\Desktop\S data\Secret Project Data\technical review\  [secret\_project]\_technical\_review\_#2.ppt | Renamed Old |
| 59823424 | \Users\informant\Desktop\S data\Secret Project Data\technical review\  **diary\_#2p.txt** | Renamed New |
| 2015-03-24 09:56:14 | 59823600 | \Users\informant\Desktop\S data\Secret Project Data\technical review\  [secret\_project]\_technical\_review\_#3.doc | Renamed Old |
| 59823744 | \Users\informant\Desktop\S data\Secret Project Data\technical review\  **diary\_#3d.txt** | Renamed New |
| 2015-03-24 09:56:20 | 59823920 | \Users\informant\Desktop\S data\Secret Project Data\technical review\  [secret\_project]\_technical\_review\_#3.ppt | Renamed Old |
| 59824064 | \Users\informant\Desktop\S data\Secret Project Data\technical review\  **diary\_#3p.txt** | Renamed New |
| Considerations | - NTFS journal file analysis (🡪 $UsnJrnl)  - \$Extend\$UsnJrnl·$J (+ $MFT for identifying full paths of files)  - With NTFS journal file only, it may be hard to find full paths.  - You can consider the Registry ShellBags for further information.  - You can also consider the Windows Search database. (See Questions 46) | | | |

#### What is the IP address of company’s shared network drive?

|  |  |
| --- | --- |
| Possible Answer | 10.11.11.128 |
| Considerations | HKU\informant\Software\Microsoft\Windows\CurrentVersion\Explorer\RunMRU\  > timestamp: 2015-03-23 16:23:28 Mon  > value: b  > data: ‘\\10.11.11.128\secured\_drive’  HKU\informant\Software\Microsoft\Windows\CurrentVersion\Explorer\Map Network Drive MRU\  > timestamp: 2015-03-23 16:26:04 Mon  > value: a  > data: ‘\\10.11.11.128\secured\_drive’  HKU\informant\Software\Classes\Local Settings\Software\Microsoft\Windows\Shell\BagMRU\8\0\  …… |

#### List all directories that were traversed in ‘RM#2’.

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Timestamp | Directory Path | Source |
| 2015-03-24  10:00:19 | E:\Secret Project Data\ | ShellBag  (created) |
| 2015-03-24  10:01:11 | E:\Secret Project Data\technical review\ | ShellBag  (created) |
| 2015-03-24  10:01:14 | E:\Secret Project Data\proposal\ | ShellBag  (created) |
| 2015-03-24  10:01:15 | E:\Secret Project Data\progress\ | ShellBag  (created) |
| 2015-03-24  10:01:17 | E:\Secret Project Data\pricing decision\ | ShellBag  (created) |
| 2015-03-24  10:01:29 | E:\Secret Project Data\design\ | ShellBag  (last accessed) |
| 2015-03-24  16:54:07 | E:\Secret Project Data\ | ShellBag  (last accessed) |
| 2015-03-24  16:54:07 | E:\Secret Project Data\progress\ | ShellBag  (last accessed) |
| Considerations | - ‘Timestamp’ may not be accurate.  - E:\ can be inferred from external storage devices attached to PC in Question 22.  - You can consider a created timestamp and a last accessed timestamp of each ShellBag entry.  HKU\informant\Software\Classes\Local Settings\Software\Microsoft\Windows\Shell\BagMRU\1\0\1~  …… | | |

#### List all files that were opened in ‘RM#2’.

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Timestamp | Directory Path | Source |
| 2015-03-24 10:01:23 | E:\Secret Project Data\design\winter\_whether\_advisory.zip\ | JumpList |
| 2015-03-24 10:01:29 | E:\Secret Project Data\design\winter\_whether\_advisory.zip\ppt\ | JumpList |
| 2015-03-24 10:01:29 | E:\Secret Project Data\design\winter\_whether\_advisory.zip\ | ShellBag  (created) |
| Considerations | - Actually, above list shows directories opened in ‘RM#2’.  - We can infer that a file ‘winter\_whether\_advisory.zip’ was opened and traversed in Windows Explorer.  - ‘Timestamp’ may not be accurate.  - E:\ can be inferred from external storage devices attached to PC in Question 22.  HKU\informant\Software\Classes\Local Settings\Software\Microsoft\Windows\Shell\BagMRU\1\0\1~  \User\informant\AppData\Roaming\Microsoft\Windows\Recent\AutomaticDestinations  \User\informant\AppData\Roaming\Microsoft\Windows\Recent\CustomDestinations  …… | | |

#### List all directories that were traversed in the company’s network drive.

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Timestamp | Directory Path | Source |
| 2015-03-23 16:24:01 | \\10.11.11.128\secured\_drive\Common Data\ | ShellBag  (created) |
| 2015-03-23 16:24:08 | \\10.11.11.128\secured\_drive\Past Projects\ | ShellBag  (created) |
| 2015-03-23 16:24:12 | \\10.11.11.128\secured\_drive\Secret Project Data\design\ | ShellBag  (created) |
| 2015-03-23 16:24:15 | \\10.11.11.128\secured\_drive\Secret Project Data\pricing decision\ | ShellBag  (created) |
| 2015-03-23 16:24:16 | \\10.11.11.128\secured\_drive\Secret Project Data\final\ | ShellBag  (created) |
| 2015-03-23 16:24:18 | \\10.11.11.128\secured\_drive\Secret Project Data\technical review\ | ShellBag  (created) |
| 2015-03-23 16:24:20 | \\10.11.11.128\secured\_drive\Secret Project Data\proposal\ | ShellBag  (created) |
| 2015-03-23 16:24:27 | \\10.11.11.128\secured\_drive\Secret Project Data\progress\ | ShellBag  (created) |
| 2015-03-23 16:26:53 | \\10.11.11.128\secured\_drive\Secret Project Data\pricing decision\ | JumpList |
| 2015-03-23 16:26:54 | \\10.11.11.128\secured\_drive\Secret Project Data\pricing decision\ | .LNK (Windows) |
| 2015-03-23 16:27:24 | V:\Secret Project Data\ | ShellBag  (created) |
| 2015-03-23 16:27:29 | V:\Secret Project Data\final\ | ShellBag  (created) |
| 2015-03-23 16:27:33 | V:\Secret Project Data\final\ | JumpList |
| 2015-03-23 16:27:33 | V:\Secret Project Data\final\ | .LNK (Windows) |
| 2015-03-23 16:28:17 | \\10.11.11.128\secured\_drive\Secret Project Data\ | ShellBag  (last accessed) |
| 2015-03-23 16:28:17 | \\10.11.11.128\secured\_drive\Secret Project Data\pricing decision\ | ShellBag  (last accessed) |
| 2015-03-24 09:47:54 | \\10.11.11.128\secured\_drive\ | ShellBag  (last accessed) |
| 2015-03-24 09:47:54 | \\10.11.11.128\secured\_drive\Past Projects\ | ShellBag  (last accessed) |
| Considerations | - ‘Timestamp’ may not be accurate.  - V:\ is mapped on \\10.11.11.128  HKU\informant\Software\Classes\Local Settings\Software\Microsoft\Windows\Shell\BagMRU\8\0\~  \User\informant\AppData\Roaming\Microsoft\Windows\Recent\AutomaticDestinations  \User\informant\AppData\Roaming\Microsoft\Windows\Recent\CustomDestinations  \User\informant\AppData\Roaming\Microsoft\Windows\Recent\\*.lnk  \User\informant\AppData\Roaming\Microsoft\Office\Recent\\*.lnk  …… | | |

#### List all files that were opened in the company’s network drive.

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Timestamp | Directory Path | Source |
| 2015-03-23 16:26:53 | \\10.11.11.128\SECURED\_DRIVE\Secret Project Data\ pricing decision\(secret\_project)\_pricing\_decision.xlsx | JumpList |
| 2015-03-23 16:26:53 | \\10.11.11.128\SECURED\_DRIVE\Secret Project Data\ pricing decision\(secret\_project)\_pricing\_decision.xlsx | .LNK (Windows) |
| 2015-03-23 16:26:53 | \\10.11.11.128\SECURED\_DRIVE\Secret Project Data\ pricing decision\(secret\_project)\_pricing\_decision.xlsx | .LNK (Office) |
| 2015-03-23 16:26:56 | \\10.11.11.128\secured\_drive\Secret Project Data\ pricing decision\(secret\_project)\_pricing\_decision.xlsx | Registry (Office) |
| 2015-03-23 16:27:33 | V:\Secret Project Data\final\[secret\_project]\_final\_meeting.pptx | JumpList |
| 2015-03-23 16:27:33 | V:\Secret Project Data\final\[secret\_project]\_final\_meeting.pptx | .LNK (Windows) |
| 2015-03-23 16:27:37 | V:\Secret Project Data\final\[secret\_project]\_final\_meeting.pptx | .LNK (Office) |
| 2015-03-23 16:27:37 | V:\Secret Project Data\final\[secret\_project]\_final\_meeting.pptx | Registry (Office) |
| Considerations | - V: is mapped on \\10.11.11.128  \User\informant\AppData\Roaming\Microsoft\Windows\Recent\\*.lnk  \User\informant\AppData\Roaming\Microsoft\Office\Recent\\*.lnk  \User\informant\AppData\Roaming\Microsoft\Windows\Recent\AutomaticDestinations  \User\informant\AppData\Roaming\Microsoft\Windows\Recent\CustomDestinations  HKU\informant\Software\Microsoft\Office\15.0\Excel\File MRU  HKU\informant\Software\Microsoft\Office\15.0\PowerPoint\File MRU  …… | | |

#### Find traces related to cloud services on PC.

(Service name, log files...)

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer | Cloud Service | Type | Traces |
| Google Drive | File/Dir | \Program Files (x86)\Google\Drive\ |
| Google Drive | File/Dir | \User\informant\AppData\Google\Drive\user\_default\  > sync\_config.db (deleted)  > snapshot.db (deleted)  > sync\_log.log  … |
| Google Drive | File/Dir | \User\informant\Downloads\googledrivesync.exe |
| Google Drive | Registry | HKU\informant\Software\Google\Drive |
| Google Drive | Registry | HKU\informant\Software\Classes\GoogleDrive.\* |
| Apple iCloud | File/Dir | \User\informant\Downloads\icloudsetup.exe |
| Considerations | - Installation directory  - Registry (Configuration, Uninstall Information, Autoruns, UserAssist, Classes…) | | |

#### What files were deleted from Google Drive?

Find the filename and modified timestamp of the file.

[Hint: Find a transaction log file of Google Drive.]

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Timestamp | File name | Modified Time (UTC-05) |
| 2015-03-23 16:42:17 | happy\_holiday.jpg | 2015-01-30 11:49:20 |
| 2015-03-23 16:42:17 | do\_u\_wanna\_build\_a\_snow\_man.mp3 | 2015-01-29 15:35:14 |
| Considerations | \User\informant\AppData\Google\Drive\user\_default\sync\_log.log  > 2015-03-23 16:32:35,072 -0400 INFO pid=2576 4004:LocalWatcher common.aggregator:114 --------> Received event RawEvent(**CREATE**, path=u'\\\\?\\C:\\Users\\informant\\Google Drive\\**happy\_holiday.jpg**', time=1427142755.056, is\_dir=False, ino=4503599627374809L, size=440517L, mtime=**1422563714.5256062**, parent\_ino=844424930207017L, is\_cancelled=<RawEventIsCancelledFlag.FALSE: 0>, backup=<Backup.NO\_BACKUP\_CONTENT: (False, False)>) None  > 2015-03-23 16:32:35,086 -0400 INFO pid=2576 4004:LocalWatcher common.aggregator:114 --------> Received event RawEvent(**CREATE**, path=u'\\\\?\\C:\\Users\\informant\\Google Drive\\**do\_u\_wanna\_build\_a\_snow\_man.mp3**', time=1427142755.072, is\_dir=False, ino=1125899906846942L, size=6844294L, mtime=**1422636560.5520115**, parent\_ino=844424930207017L, is\_cancelled=<RawEventIsCancelledFlag.FALSE: 0>, backup=<Backup.NO\_BACKUP\_CONTENT: (False, False)>) None  > 2015-03-23 16:42:17,026 -0400 INFO pid=2576 4004:LocalWatcher common.aggregator:114 --------> Received event RawEvent(**DELETE**, path=u'\\\\?\\C:\\Users\\informant\\Google Drive\\**happy\_holiday.jpg**', time=1427143336.964, ino=4503599627374809L, parent\_ino=844424930207017L, affects\_gdoc=False, is\_cancelled=<RawEventIsCancelledFlag.FALSE: 0>, backup=<Backup.NO\_BACKUP\_CONTENT: (False, False)>) None  > 2015-03-23 16:42:17,026 -0400 INFO pid=2576 4004:LocalWatcher common.aggregator:114 --------> Received event RawEvent(**DELETE**, path=u'\\\\?\\C:\\Users\\informant\\Google Drive\\**do\_u\_wanna\_build\_a\_snow\_man.mp3**', time=1427143336.964, ino=1125899906846942L, parent\_ino=844424930207017L, affects\_gdoc=False, is\_cancelled=<RawEventIsCancelledFlag.FALSE: 0>, backup=<Backup.NO\_BACKUP\_CONTENT: (False, False)>) None  \User\informant\AppData\Google\Drive\user\_default\snapshot.db  \User\informant\AppData\Google\Drive\user\_default\snapshot.db-wal  > These files are deleted because of the logoff activity.  > Need to recover records from unused area of SQLite file.  > If ‘sync\_log.log’ file is missing, deleted SQLite record recovery should be considered.  … | | |

#### Identify account information for synchronizing Google Drive.

|  |  |  |
| --- | --- | --- |
| Possible Answer  (Timezone is applied) | Logon Time (from sync\_log.log) | Account |
| 2015-03-23 16:05:32 | iaman.informant.personal@gmail.com |
| Considerations | \User\informant\AppData\Google\Drive\user\_default\sync\_log.log  > 2015-03-23 16:05:32,279 -0400 INFO pid=2576 2828:LaunchThreads common.service.user:64 Initializing User instance with new credentials. **iaman.informant.personal@gmail.com**  \User\informant\AppData\Google\Drive\user\_default\sync\_config.db  \User\informant\AppData\Google\Drive\user\_default\sync\_config.db-wal  > These files are deleted because of the logoff activity.  > Need to recover records from unused area of SQLite file.  > If ‘sync\_log.log’ file is missing, deleted SQLite record recovery should be considered.  … | |

#### What a method (or software) was used for burning CD-R?

|  |  |
| --- | --- |
| Possible Answer | Windows default CD/DVD burning feature  (🡪 No 3rd party application was used for burning CD-R) |
| Considerations | - http://windows.microsoft.com/en-us/windows-vista/burn-a-cd-or-dvd  > Burning Type 1: Like a USB flash drive  > Burning Type 2: With a CD/DVD/ player (Mastered)  - System event logs (for burning type 2 only)  > Event IDs for Windows Vista or higher : 113 (cdrom)  - Default burning directory (for burning type 2 only)  > \User\informant\AppData\Local\Microsoft\Windows\Burn\Burn  - NTFS journal file analysis (for burning type 2 only)  > \$LogFile  > \$Extend\$UsnJrnl·$J (+ $MFT for identifying full paths of files)  > DAT#####.tmp, DAT#####.tmp, FIL#####.tmp, POST#####.tmp  …… |

#### When did the suspect burn CD-R?

[Hint: It may be one or more times.]

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Timestamp | Source | Description |
| 2015-03-24 15:47:47 | $UsnJrnl | Burning Type 2: With a CD/DVD/ player (Mastered)  --------------------  > DAT67383.tmp, DAT34216.tmp  > FIL39751.tmp, POST39751.tmp |
| 2015-03-24 15:47:47 | Event Log (System) | Burning Type 2: With a CD/DVD/ player (Mastered) |
| 2015-03-24 15:56:01 | $UsnJrnl | Burning Type 2: With a CD/DVD/ player (Mastered)  --------------------  > DAT32224.tmp, DAT08538.tmp  > FIL66692.tmp, POST66692.tmp |
| 2015-03-24 15:56:11 | Event Log (System) | Burning Type 2: With a CD/DVD/ player (Mastered) |
| 2015-03-24 16:24:19 | $UsnJrnl | Burning Type 2: With a CD/DVD/ player (Mastered)  --------------------  > DAT67829.tmp, DAT74017.tmp  > FIL51898.tmp, POST51898.tmp |
| 2015-03-24 16:24:46 | Event Log (System) | Burning Type 2: With a CD/DVD/ player (Mastered) |
| 2015-03-24 16:41:21 | Event Log (System) | Burning Type 2: With a CD/DVD/ player (Mastered)  --------------------  > DAT85234.tmp, DAT11399.tmp  > FIL61821.tmp, POST61821.tmp |
| 2015-03-24 16:41:21 | Event Log (System) | Burning Type 2: With a CD/DVD/ player (Mastered) |
| 2015-03-24 16:53:16 | Registry (Burning Option) | Selecting the method ‘Type 1: Like a USB flash drive’  --------------------  > A registry key was updated because the suspect selected a new method for burning CD-R  > It can be inferred from timestamps of RM#3 image |
| 2015-03-24 16:53:17 | RM#3 image | Formatting Type 1: Like a USB flash drive |
| 2015-03-24 16:54 ~ 16:58 | RM#3 image | Burning Type 1: Like a USB flash drive  --------------------  > Creating 17 confidential files  > Renaming files  > Creating 3 meaningless files  > Deleting 17 confidential files |
| Considerations | - http://windows.microsoft.com/en-us/windows-vista/burn-a-cd-or-dvd  > Burning Type 1: Like a USB flash drive  > Burning Type 2: With a CD/DVD/ player (Mastered) 🡪 System event logs, burning directory, journal logs…  - System event logs (for burning type 2 only)  > Event IDs for Windows Vista or higher : 113 (cdrom)  - Default burning directory (for burning type 2 only)  > \User\informant\AppData\Local\Microsoft\Windows\Burn\Burn  > NTFS Journal Logs  > Deleted MFT entry  > Registry ShellBag  > NFTS INDX slack  - NTFS journal file analysis (for burning type 2 only)  > \$LogFile  > \$Extend\$UsnJrnl·$J (+ $MFT for identifying full paths of files)  > DAT#####.tmp, DAT#####.tmp, FIL#####.tmp, POST#####.tmp  - CD Burning Options  > HKU\informant\Software\Microsoft\Windows\CurrentVersion\Explorer\CD Burning\  > If the last selection is burning type 1, ‘DefaultToMastered’ value will be 0.  > If the last selection is burning type 2, ‘DefaultToMastered’ value will be 1.  - Traces of mounting a CD volume for both burning types  > Windows .LNK  > Jumplist  > …  - How to find more traces of burning type 1 on PC?  > Is there a solution? It’s up to you!  - UDF (Universal Disk Format, http://www.osta.org/specs/pdf/udf260.pdf)  > Timestamps stored in descriptors of UDF (ECMA 167 1/7.3)  > ex) file offset 0x1017A of RM#3  DF 07 (2015) 03 (03) 18 (24) 10 (16) 35 (53) 11 (17)  > DF 07 (2015), 03 (03), 18 (24), 10 (16), 35 (53), 11 (17)…  > 2015-03-24 16:53:17 – Format time of UDF  …… | | |

#### What files were copied from PC to CD-R?

[Hint: Just use PC image only. You can examine transaction logs of the file system for this task.]

|  |  |
| --- | --- |
| Possible Answer | \Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\de\  > winter\_storm.amr  > winter\_whether\_advisory.zip  \Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\pd\  > my\_favorite\_cars.db  > my\_favorite\_movies.7z  > new\_years\_day.jpg  > super\_bowl.avi  \Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\prog\  > my\_friends.svg  > my\_smartphone.png  > new\_year\_calendar.one  \Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\prop\  > a\_gift\_from\_you.gif  > landscape.png  \Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\tr\  > diary\_#1d.txt  > diary\_#1p.txt  > diary\_#2d.txt  > diary\_#2p.txt  > diary\_#3d.txt  > diary\_#3p.txt  \Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\  > Penguins.jpg  > Koala.jpg  > Tulips.jpg |
| Considerations | - It can be inferred from traces of burning type 2 and Question 35.  - Traces related to a burning directory (for burning type 2 only)  > \User\informant\AppData\Local\Microsoft\Windows\Burn\Burn  - NTFS journal file analysis (for burning type 2 only)  > \$Extend\$UsnJrnl·$J (+ $MFT for identifying full paths of files) |

#### What files were opened from CD-R?

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Timestamp | File (or Directory) Path | Source |
| 2015-03-24 16:44:13 | D:\de\winter\_whether\_advisory.zip\ | JumpList |
| 2015-03-24 16:44:14 | D:\de\winter\_whether\_advisory.zip\ppt\ | JumpList |
| 2015-03-24 16:44:16 | D:\de\winter\_whether\_advisory.zip\ppt\slides\ | JumpList |
| 2015-03-24 16:44:18 | D:\de\winter\_whether\_advisory.zip\ppt\slideMasters\ | JumpList |
| 2015-03-24 16:44:18 | D:\de\winter\_whether\_advisory.zip | .LNK (Windows) |
| 2015-03-24 17:01:10 | D:\Penguins.jpg | .LNK (Windows) |
| 2015-03-24 17:01:12 | D:\Koala.jpg | .LNK (Windows) |
| 2015-03-24 17:01:14 | D:\Tulips.jpg | .LNK (Windows) |
| Considerations | \User\informant\AppData\Roaming\Microsoft\Windows\Recent\AutomaticDestinations  \User\informant\AppData\Roaming\Microsoft\Windows\Recent\\*.lnk  …… | | |

#### Identify all timestamps related to a resignation file in Windows Desktop.

[Hint: the resignation file is a DOCX file in NTFS file system.]

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Timestamp | Type | Source |
| 2015-03-24 14:48:40 | File Created | NTFS MFT Entry $STANDARD\_INFORMATION  attribute |
| 2015-03-24 14:59:30 | File Modified |
| 2015-03-24 14:59:30 | Last Accessed |
| 2015-03-24 14:59:30 | Entry Modified |
| 2015-03-24 14:48:40 | File Created | NTFS MFT Entry $FILE\_NAME  attribute |
| 2015-03-24 14:59:30 | File Modified |
| 2015-03-24 14:59:30 | Last Accessed |
| 2015-03-24 14:59:30 | Entry Modified |
| 2015-03-24 14:32:00 | File Created | OOXML  \docProps\core.xml |
| 2015-03-24 14:59:00 | File Modified |
| Considerations | - External timestamps (🡪 NTFS File system)  - Internal timestamps (🡪 OOXML) | | |

#### How and when did the suspect print a resignation file?

|  |  |  |
| --- | --- | --- |
| Possible Answer  (Timezone is applied) | Type | Description |
| How | Printed to XPS format |
| When | 2015-03-25 11:28:34 |
| Where | \Users\informant\Desktop\Resignation\_Letter\_(Iaman\_Informant).xps |
| Considerations | - There are no real printer devices.  - A XPS file can be found in Windows Desktop.  HKLM\SOFTWARE\Microsoft\Windows NT\CurrentVersion\Print\Printers\  > Fax  > Microsoft XPS Document Writer  … | |

#### Where are ‘Thumbcache’ files located?

|  |  |
| --- | --- |
| Possible Answer | cf\thumbcache\_32.db  \Users\informant\AppData\Local\Microsoft\Windows\Explorer\thumbcache\_64.db  \Users\informant\AppData\Local\Microsoft\Windows\Explorer\thumbcache\_256.db  \Users\informant\AppData\Local\Microsoft\Windows\Explorer\thumbcache\_idx.db |
| Considerations | thumbcache\_32.db : BMP files for less than or equal to 32x32  thumbcache\_64.db : BMP files for less than or equal to 64x64  thumbcache\_256.db : JPG or PNG files for less than or equal to 256x256 |

#### Identify traces related to confidential files stored in Thumbcache. (Include ‘256’ only)

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer | A thumnail image related to 'final_meeting.pptx' | A thumnail image related to 'revised_points.ppt' | A thumnail image related to 'detailed_design.pptx' |
| A thumnail image related to 'technical_review_#1.pptx' | A thumnail image related to 'technical_review_#2.ppt' | A thumnail image related to 'technical_review_#3.ppt' |
| Considerations | - thumbcache\_256.db  - Thumbnail images of the first pages in MS PowerPoint files. | | |

#### Where are Sticky Note files located?

|  |  |
| --- | --- |
| Possible Answer | \Users\informant\AppData\Roaming\Microsoft\Sticky Notes\StickyNotes.snt |
| Considerations | - Microsoft Compound File Binary File Format  > https://msdn.microsoft.com/en-us/library/dd942138.aspx |

#### Identify notes stored in the Sticky Note file.

|  |  |  |
| --- | --- | --- |
| Possible Answer | Timestamp (File Modified) | Content |
| 2015-03-24 14:31:59 | Tomorrow…  Everything will be OK… |
| Considerations | \* Timestamp may not be accurate. | |

#### Was the ‘Windows Search and Indexing’ function enabled? How can you identify it?

If it was enabled, what is a file path of the ‘Windows Search’ index database?

|  |  |  |
| --- | --- | --- |
| Possible Answer | Search & Indexing | Enabled |
| DB File path | C:\ProgramData\Microsoft\Search\Data\Applications\Windows\Windows.edb |
| Considerations | HKLM\SOFTWARE\Microsoft\Windows Search\  HKLM\SOFTWARE\Microsoft\Windows Search\Databases\Windows (value: FileName)  HKU\informant\Software\Microsoft\Windows Search\  HKLM\SYSTEM\ControlSet001\services\WSearch\ (SearchIndexer service 🡪 Start up automatically)  …... | |

#### What kinds of data were stored in Windows Search database?

|  |  |
| --- | --- |
| Possible Answer | - Internet Explorer History  - Microsoft Outlook  - Files in %UserProfile% (Excluding ‘AppData’ directory)  - Start Menu (/ProgramData/Microsoft/Windows/Start Menu/)  - Sticky Note |
| Considerations | - Microsoft ESE (Extensible Storage Engine) database format  - Windows.edb  > ‘*System\_ItemFolderPathDisplay*’ column  > ‘*System\_ItemPathDisplay*’ column  > ‘*System\_Search\_Store*’ column (🡪 file, iehistory, mapi15, StickyNotes…)  > ‘*System\_ItemNameDisplay*’ column  > ‘*System\_ItemName*’ column  > … |

#### Find traces of Internet Explorer usage stored in Windows Search database.

(It should be considered only during a date range between 2015-03-22 and 2015-03-23.)

|  |  |  |
| --- | --- | --- |
| Possible Answer  (Timezone is applied) | Date Modified | Microsoft IE TargetUrl |
| 2015-03-22 11:09:22 | http://windows.microsoft.com/en-us/internet-explorer/ie-8-welcome |
| 2015-03-22 11:09:23 | http://www.msn.com/?ocid=iehp |
| 2015-03-22 11:09:40 | https://www.google.com/?gws\_rd=ssl |
| 2015-03-22 11:09:50 | https://www.google.com/search?hl=en&source=hp&q=internet+explorer+11&gbv=2&oq=internet+explorer+11&gs\_l=heirloom-hp.3..0l10.5163.7893.0.9562.20.13.0.7.7.0.156.1110.11j2.13.0.msedr...0...1ac.1.34.heirloom-hp..0.20.1250.5j7Xm44tv5w |
| 2015-03-22 11:09:52 | http://www.google.com/url?url=http://windows.microsoft.com/en-us/internet-explorer/download-ie&rct=j&frm=1&q=&esrc=s&sa=U&ei=6ykQVZWLGbeJsQT7goDACg&ved=0CB8QFjAA&usg=AFQjCNEwsIz17kY-jTXbaWPcQDfBbVEi7A |
| 2015-03-22 11:09:54 | http://windows.microsoft.com/en-us/internet-explorer/download-ie |
| 2015-03-22 11:09:56 | http://www.google.com/url?url=http://windows.microsoft.com/en-us/internet-explorer/ie-11-worldwide-languages&rct=j&frm=1&q=&esrc=s&sa=U&ei=6ykQVZWLGbeJsQT7goDACg&ved=0CCoQFjAB&usg=AFQjCNE7UKIWEBiWO2N96IFeo6ZywhRLfw |
| 2015-03-22 11:10:24 | http://windows.microsoft.com/en-us/internet-explorer/ie-11-worldwide-languages |
| 2015-03-22 11:10:54 | https://www.google.com/webhp?hl=en |
| 2015-03-22 11:10:58 | https://www.google.com/chrome/index.html?hl=en&brand=CHNG&utm\_source=en-hpp&utm\_medium=hpp&utm\_campaign=en |
| 2015-03-22 11:11:06 | http://download.microsoft.com/download/7/1/7/7179A150-F2D2-4502-9D70-4B59EA148EAA/IE11-Windows6.1-x64-en-us.exe |
| 2015-03-22 11:11:16 | https://www.google.com/chrome/browser/thankyou.html?brand=CHNG&platform=win&clickonceinstalled=1 |
| 2015-03-23 13:26:33 | https://odc.officeapps.live.com/odc/emailhrd?lcid=1033&syslcid=1033&uilcid=1033&app=5&ver=15&build=15.0.4420&p=0&a=1&hm=1&sp=0 |
| 2015-03-23 13:27:49 | http://www.microsoft.com/en-us/ie-firstrun/win-7/ie-11/vie |
| 2015-03-23 13:27:49 | http://www.bing.com/search |
| 2015-03-23 13:27:49 | http://go.microsoft.com/fwlink/?LinkId=69157 |
| 2015-03-23 13:28:19 | http://www.bing.com/ |
| 2015-03-23 14:07:52 | http://www.bing.com/news/search?q=Top Stories&FORM=NSBABR |
| 2015-03-23 14:07:55 | http://www.bing.com/search?q=Top+Stories&FORM=HDRSC1 |
| 2015-03-23 14:07:58 | http://www.bing.com/news/search?q=file+sharing+and+tethering&FORM=HDRSC6 |
| 2015-03-23 14:08:00 | http://www.bing.com/search?q=file+sharing+and+tethering&qs=n&form=QBLH&pq=file+sharing+and+tethering&sc=0-18&sp=-1&sk=&cvid=171b77e4ffd54b2a92c4e97abf995fe1 |
| 2015-03-23 14:08:18 | http://sysinfotools.com/blog/tethering-internet-files-sharing/ |
| 2015-03-23 14:11:13 | http://resources.infosecinstitute.com/windows-systems-and-artifacts-in-digital-forensics-part-i-registry/ |
| 2015-03-23 14:12:08 | https://technet.microsoft.com/en-us/library/cc162846.aspx |
| 2015-03-23 14:12:45 | https://support.microsoft.com/en-us/kb/308427 |
| 2015-03-23 14:12:52 | http://en.wikipedia.org/wiki/Event\_Viewer |
| 2015-03-23 14:13:58 | https://msdn.microsoft.com/en-us/library/windows/desktop/dd562212(v=vs.85).aspx |
| 2015-03-23 14:14:25 | http://www.forensicswiki.org/wiki/USB\_History\_Viewing |
| 2015-03-23 16:43:48 | http://www.bing.com/search?q=external%20device%20and%20forensics&qs=n&form=QBRE&pq=external%20device%20and%20forensics&sc=8-9&sp=-1&sk=&cvid=c30c4b1f36114b1c9bc683838c69823a |
| 2015-03-23 16:43:50 | http://www.bing.com/?FORM=Z9FD1 |
| 2015-03-23 16:43:52 | http://www.bing.com/news?FORM=Z9LH3 |
| 2015-03-23 16:44:58 | http://www.bing.com/news?q=science+technology+news&FORM=NWBTCB |
| 2015-03-23 16:45:22 | http://www.wired.com/?p=1756538 |
| 2015-03-23 16:45:30 | http://www.bing.com/news?q=Soccer+News&FORM=NSBABR |
| 2015-03-23 16:53:47 | http://www.bing.com/news?q=top+stories&FORM=NWRFSH |
| 2015-03-23 16:55:09 | http://www.bing.com/news?q=us+news&FORM=NSBABR |
| 2015-03-23 16:55:10 | http://www.bing.com/news?q=world+news&FORM=NSBABR |
| 2015-03-23 16:55:17 | http://www.bing.com/news?q=local&FORM=NSBABR |
| 2015-03-23 16:55:18 | http://www.bing.com/news?q=entertainment+news&FORM=NSBABR |
| 2015-03-23 16:55:29 | http://www.bing.com/news?q=science+technology+news&FORM=NSBABR |
| 2015-03-23 16:55:55 | http://www.bing.com/news?q=business+news&FORM=NSBABR |
| 2015-03-23 16:55:56 | http://www.bing.com/news?q=political+news&FORM=NSBABR |
| 2015-03-23 16:55:57 | http://www.bing.com/news?q=sports+news&FORM=NSBABR |
| 2015-03-23 16:55:59 | http://www.bing.com/news?q=health+news&FORM=NSBABR |
| 2015-03-23 16:56:09 | http://www.bing.com/news?q=top+stories&FORM=NSBABR |
| 2015-03-23 16:56:33 | http://www.wired.com/2015/03/stealing-data-computers-using-heat/ |
| Considerations | - Microsoft ESE (Extensible Storage Engine) database format  - Windows.edb  > ‘*System\_DateModified*’ column  > ‘*Microsoft\_IE\_TargetUrl*’ column | |

#### List the e-mail communication stored in Windows Search database.

(It should be considered only during a date range between 2015-03-23 and 2015-03-24.)

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Timestamp | E-Mail Communication | |
| 2015-03-23 13:29:29 | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | Hello, Iaman |
| Body | How are you doing? |
|  |  |  |
| 2015-03-23 14:44:32 | Source | [Sent Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | RE: Hello, Iaman |
| Body | Successfully secured.  ---------------------------  **From**: spy  **Sent**: Monday, March 23, 2015 1:29 PM  **To**: iaman  **Subject**: Hello, Iaman  How are you doing? |
|  |  |  |
| 2015-03-23 15:14:58 | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | Good job, buddy. |
| Body | Good, job.  I need a more detailed data about this business. |
|  |  |  |
| 2015-03-23 15:19:22  **(Windows.edb only)** | Source | [Sent Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | Good job, buddy. |
| Attachment | space\_and\_earth.mp4 |
| Body | This is a sample.  ---------------------------  **From**: spy  **Sent**: Monday, March 23, 2015 3:15 PM  **To**: iaman  **Subject**: Good job, buddy.  Good, job.  I need a more detailed data about this business. |
|  |  |  |
| 2015-03-23 15:20:41 | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | RE: Good job, buddy. |
| Body | Okay, I got it.  I’ll be in touch.  ---------------------------  **From**: iaman  **Sent**: Monday, March 23, 2015 3:19 PM  **To**: spy  **Subject**: RE: Good job, buddy.    This is a sample.  ---------------------------  **From**: spy  **Sent**: Monday, March 23, 2015 3:15 PM  **To**: iaman  **Subject**: Good job, buddy.    Good, job.  I need a more detailed data about this business. |
|  |  |  |
| 2015-03-23 15:26:22 | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | Important request |
| Body | I confirmed it.  But, I need a more data.  Do your best. |
|  |  |  |
| 2015-03-23 15:27:05 | Source | [Sent Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | RE: Important request |
| Body | Umm….. I need time to think.    ---------------------------  **From**: spy  **Sent**: Monday, March 23, 2015 3:26 PM  **To**: iaman  **Subject**: Important request    I confirmed it.  But, I need a more data.  Do your best. |
|  |  |  |
| 2015-03-23 16:38:48 | Source | [Sent Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | It's me |
| Body | Use links below,    https://drive.google.com/file/d/0Bz0ye6gXtiZaVl8yVU5mWHlGbWc/view?usp=sharing    https://drive.google.com/file/d/0Bz0ye6gXtiZaakx6d3R3c0JmM1U/view?usp=sharing |
|  |  |  |
| 2015-03-23 16:41:19 | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | RE: It's me |
| Body | I got it.  ---------------------------  **From**: iaman  **Sent**: Monday, March 23, 2015 4:39 PM  **To**: spy  **Subject**: It's me    Use links below,    https://drive.google.com/file/d/0Bz0ye6gXtiZaVl8yVU5mWHlGbWc/view?usp=sharing    https://drive.google.com/file/d/0Bz0ye6gXtiZaakx6d3R3c0JmM1U/view?usp=sharing |
|  |  |  |
| 2015-03-24 09:25:57 | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | Last request |
| Body | This is the last request.  I want to get the remaining data. |
|  |  |  |
| 2015-03-24 09:30:11  **(Windows.edb only)** | Source | [Sent Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | RE: Last request |
| Body | Stop it!  It is very hard to transfer all data over the internet!  ---------------------------  **From**: spy  **Sent**: Tuesday, March 24, 2015 9:26 AM  **To**: iaman  **Subject**: Last request    This is the last request.  I want to get the remaining data. |
|  |  |  |
| 2015-03-24 09:33:45  **(Windows.edb only)** | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | RE: Last request |
| Body | No problem.  U can directly deliver storage devices that stored it.  ---------------------------  **From**: iaman  **Sent**: Tuesday, March 24, 2015 9:30 AM  **To**: spy  **Subject**: RE: Last request    Stop it!  It is very hard to transfer all data over the internet!  ---------------------------  **From**: spy  **Sent**: Tuesday, March 24, 2015 9:26 AM  **To**: iaman  **Subject**: Last request    This is the last request.  I want to get the remaining data. |
|  |  |  |
| 2015-03-24 09:35:10 | Source | [Sent Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | RE: Last request |
| Body | This is the last time..    ---------------------------  **From**: spy  **Sent**: Tuesday, March 24, 2015 9:34 AM  **To**: iaman  **Subject**: RE: Last request    No problem.  U can directly deliver storage devices that stored it.  ---------------------------  **From**: iaman  **Sent**: Tuesday, March 24, 2015 9:30 AM  **To**: spy  **Subject**: RE: Last request    Stop it!  It is very hard to transfer all data over the internet!  ---------------------------  **From**: spy  **Sent**: Tuesday, March 24, 2015 9:26 AM  **To**: iaman  **Subject**: Last request    This is the last request.  I want to get the remaining data. |
|  |  |  |
| 2015-03-24 15:32:42  **(Windows.edb only)** | Source | [Inbox] |
| From 🡪 To | spy.conspirator@nist.gov 🡪 iaman.informant@nist.gov |
| Subject | Watch out! |
| Body | USB device may be easily detected.  So, try another method. |
|  |  |  |
| 2015-03-24 15:34:02 | Source | [Sent Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | RE: Watch out! |
| Body | I am trying.  ---------------------------  **From**: spy  **Sent**: Tuesday, March 24, 2015 3:33 PM  **To**: iaman  **Subject**: Watch out!  USB device may be easily detected.  So, try another method. |
|  |  |  |
| 2015-03-24 17:05:10 | Source | [Sent Items] |
| From 🡪 To | iaman.informant@nist.gov 🡪 spy.conspirator@nist.gov |
| Subject | Done |
| Body | It’s done. See you tomorrow. |
| Considerations | - Microsoft ESE (Extensible Storage Engine) database format  - Windows.edb  > ‘*System\_ItemPathDisplay*’ column  > ‘*System\_Message\_FromName*’ column  > ‘*System\_Message\_ToAddress*’ column  > ‘*System\_Message\_ToName*’ column  > ‘*System\_Message\_DateSent*’ column  > ‘*System\_Message\_DateReceived*’ column  > ‘*System\_Message\_AttachmentNames*’ column  > ‘*System\_Search\_AutoSummary*’ column  > ‘*System\_Search\_AutoSummary*’ column  …  - Some e-mail items can be found only in Windows Search database. | | |

#### List files and directories related to Windows Desktop stored in Windows Search database.

(Windows Desktop directory: \Users\informant\Desktop\)

|  |  |  |
| --- | --- | --- |
| Possible Answer  (Timezone is applied) | Date Created | Full Path |
| 2015-03-23 16:05:33 | C:\\Users\\informant\\Desktop\\Google Drive.lnk |
| 2015-03-24 09:40:09 | C:\\Users\\informant\\Desktop\\S data\\Secret Project Data\\Secret Project Data\\design\\space\_and\_earth.mp4 |
| 2015-03-24 09:40:09 | C:\\Users\\informant\\Desktop\\S data\\Secret Project Data\\Secret Project Data\\design\\winter\_whether\_advisory.zip |
| 2015-03-24 09:40:10 | C:\\Users\\informant\\Desktop\\S data\\Secret Project Data\\Secret Project Data\\design\\winter\_storm.amr |
| 2015-03-24 09:40:11 | C:\\Users\\informant\\Desktop\\S data\\Secret Project Data\\Secret Project Data\\proposal\\[secret\_project]\_detailed\_proposal.docx |
| 2015-03-24 09:40:13 | C:\\Users\\informant\\Desktop\\S data\\Secret Project Data\\Secret Project Data\\proposal\\[secret\_project]\_proposal.docx |
| 2015-03-24 09:47:58 | C:\\Users\\informant\\Desktop\\S data\\Secret Project Data\\Secret Project Data\\design\\[secret\_project]\_detailed\_design.pptx |
| 2015-03-24 09:47:58 | C:\\Users\\informant\\Desktop\\S data\\Secret Project Data\\Secret Project Data\\final\\[secret\_project]\_final\_meeting.pptx |
| 2015-03-24 09:47:58 | C:\\Users\\informant\\Desktop\\S data\\Secret Project Data\\Secret Project Data\\pricing decision\\(secret\_project)\_market\_analysis.xlsx |
| 2015-03-24 09:47:58 | C:\\Users\\informant\\Desktop\\S data\\Secret Project Data\\Secret Project Data\\pricing decision\\(secret\_project)\_market\_shares.xls |
| 2015-03-24 09:47:58 | C:\\Users\\informant\\Desktop\\S data\\Secret Project Data\\Secret Project Data\\pricing decision\\(secret\_project)\_price\_analysis\_#1.xlsx |
| 2015-03-24 09:47:59 | C:\\Users\\informant\\Desktop\\S data\\Secret Project Data\\Secret Project Data\\proposal |
| 2015-03-24 14:48:41 | C:\\Users\\informant\\Desktop\\Resignation\_Letter\_(Iaman\_Informant).docx |
| 2015-03-24 15:52:06 | C:\\Users\\informant\\Desktop\\temp |
| 2015-03-24 15:52:36 | C:\\Users\\informant\\Desktop\\temp\\IE11-Windows6.1-x64-en-us.exe |
| 2015-03-24 15:52:47 | C:\\Users\\informant\\Desktop\\temp\\Chrysanthemum.jpg |
| 2015-03-24 15:52:47 | C:\\Users\\informant\\Desktop\\temp\\Hydrangeas.jpg |
| 2015-03-24 15:52:47 | C:\\Users\\informant\\Desktop\\temp\\Desert.jpg |
| 2015-03-24 15:52:47 | C:\\Users\\informant\\Desktop\\temp\\Lighthouse.jpg |
| 2015-03-24 15:52:47 | C:\\Users\\informant\\Desktop\\temp\\Koala.jpg |
| 2015-03-24 15:52:47 | C:\\Users\\informant\\Desktop\\temp\\Jellyfish.jpg |
| 2015-03-24 15:52:47 | C:\\Users\\informant\\Desktop\\temp\\Tulips.jpg |
| 2015-03-24 15:52:47 | C:\\Users\\informant\\Desktop\\temp\\Penguins.jpg |
| Considerations | - Microsoft ESE (Extensible Storage Engine) database format  - Windows.edb  > ‘*System\_DateCreated*’ column  > ‘*System\_ItemDate*’ column  > ‘*System\_ItemPathDisplay*’ column  > ‘*System\_Search\_AutoSummary*’ column  … | |

#### Where are Volume Shadow Copies stored? When were they created?

|  |  |
| --- | --- |
| Possible Answer | There is a Volume Shadow Copy in ‘\System Volume Information\’ directory  \System Volume Information\{9b365826-d2ef-11e4-b734-000c29ff2429}{*Global GUID*}  > Created Time: 2015-03-25 10:57:27 AM (Timezone is applied)  > File size: 320 MB (335,544,320 bytes) |
| Considerations | - \System Volume Information\{*Random GUID for a VSC*}{*VSS identifier - Common GUID for VSCs*}  - VSS identifier stored at file offset 0 for 16 bytes  > {3808876b-c176-4e48-b7ae-04046e6cc752}  > Global GUID for VSS  - Shadow Copy ID stored at file offset 144 for 16 bytes  > {8f1a2a2d-ce6b-42a5-b92b-f13e65d9c2cb}  - Shadow Copy set ID stored at file offset 160 for 16 bytes  > {56e43eb5-ac18-4f06-a521-1e17712b7ced}  … |

#### Find traces related to Google Drive service in Volume Shadow Copy. What are the differences between the current system image (of Question 29 ~ 31) and its VSC?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Date Created | Date Modified | Path | Size | Format |
| 2015-03-23  16:02:51 | 2015-03-23  16:47:55 | \User\informant\AppData\Google\Drive\user\_default\**snapshot.db** | 20 KB | SQLite |
| 2015-03-23  16:02:51 | 2015-03-23  16:47:55 | \User\informant\AppData\Google\Drive\user\_default\**sync\_config.db** | 11 KB | SQLite |
| 2015-03-23  16:02:51 | 2015-03-23  16:47:56 | \User\informant\AppData\Google\Drive\user\_default\**sync\_log.log** | 341 KB | TEXT |
|  | | | | |
| [ Current system image *vs.* VSC ]  - The last log inside *sync\_log.log* from VSC was added at 2015-03-23 16:47:56.  - Two SQLite files (*snapshot.db* and *sync\_config.db*) exist in VSC.  - These files were deleted because of the logoff activity in 2015-03-25.  - In other words, VSC was created before the logoff activity. | | | | |
| Considerations | - Creation time of a Volume Shadow Copy  > 2015-03-25 10:57:27 AM | | | | |

#### What files were deleted from Google Drive?

Find deleted records of *cloud\_entry* table inside *snapshot.db* from VSC.

(Just examine the SQLite database only. Let us suppose that a text based log file was wiped.)

[Hint: DDL of *cloud\_entry* table is as follows.]

CREATE TABLE *cloud\_entry*

(doc\_id **TEXT**, filename **TEXT**, modified **INTEGER**, created **INTEGER**, acl\_role **INTEGER**, doc\_type **INTEGER**, removed **INTEGER**, size **INTEGER**, checksum **TEXT**, shared **INTEGER**, resource\_type **TEXT**, PRIMARY KEY (doc\_id));

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Possible Answer | Record Info | Column | Size (bytes) | Data |
| [File offset 0x702]  RecordSize: 0x76  RowID: 0x03  HeaderSize: 0x0C | doc\_id | (69-13)/2 = 28 | 0Bz0ye6gXtiZaVl8yVU5mWHlGbWc |
| Filename | (75-13)/2 = 31 | do\_u\_wanna\_build\_a\_snow\_man.mp3 |
| modified | 4 | 0x54CBB610 (1422636560)  🡪 2015-01-30 11:49:20 (UTC-05) |
| created | 4 | 0x5510786D (1427142765)  🡪 2015-03-23 16:32:45 (UTC-04) |
| acl\_role | 0 | 0 |
| doc\_type | 0 | 1 |
| removed | 0 | 0 |
| size | 3 | 0x686F86 (6844294)  🡪 6,844,294 bytes |
| checksum | (77-13)/2 = 32 | 2c4553f99533d85adb104b3a5c38521a |
| shared | 0 | 1 |
| resource\_type | (21-13)/2 = 4 | file |
|  |  |  |  |
| [File offset 0x77A]  First 4 bytes are overwritten  RecordSize: N/A  RowID: N/A  HeaderSize: N/A | doc\_id | fixed size (28) | 0Bz0ye6gXtiZaakx6d3R3c0JmM1U |
| Filename | (47-13)/2 = 17 | happy\_holiday.jpg |
| modified | 4 | 0x54CA9982 (1422563714)  🡪 2015-01-29 15:35:14 (UTC-05) |
| created | 4 | 0x5510786A (1427142762)  🡪 2015-03-23 16:32:42 (UTC-04) |
| acl\_role | 0 | 0 |
| doc\_type | 0 | 1 |
| removed | 0 | 0 |
| size | 3 | 0x6B8C5 (440517)  🡪 440,517 bytes |
| checksum | (77-13)/2 = 32 | 0c77d6a2704155dbfdf29817769b7478 |
| shared | 0 | 1 |
| resource\_type | (21-13)/2 = 4 | file |
| Considerations | - Deleted SQLite record recovery  > http://www.sqlite.org/fileformat2.html  > …  - (Deleted record #1) File offset 0x702 of *snapshot.db* from VSC  Raw bytes on the file offset 0x702 of snapshot.db from a VSC  - (Deleted record #2) File offset 0x77A of *snapshot.db* from VSC  Raw bytes on the file offset 0x77A of snapshot.db from a VSC | | | |

#### Why can’t we find Outlook’s e-mail data in Volume Shadow Copy?

|  |  |
| --- | --- |
| Possible Answer | Outlook OST files were excluded by the following snapshot configuration.  HKLM\System\CurrentControlSet\Control\BackupRestore\FilesNotToSnapshot\  > OutlookOST: $UserProfile$\AppData\Local\Microsoft\Outlook\\*.ost |
| Considerations | - Excluding Files from Shadow Copies  > https://msdn.microsoft.com/en-us/library/windows/desktop/aa819132(v=vs.85).aspx |

#### Examine ‘Recycle Bin’ data in PC.

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | $I Name | Timestamp  Deleted | Original File (or Directory) Path |
| $I40295N | 2015-03-24 15:51:47 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\prop |
| $IXWGVWC | 2015-03-24 15:51:47 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\prog |
| $I55Z163 | 2015-03-24 15:51:47 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\pd |
| $I9M7UMY | 2015-03-24 15:51:47 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\tr |
| $I508CBB.jpg | 2015-03-24 16:11:42 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\Hydrangeas.jpg |
| $I8YP3XK.jpg | 2015-03-24 16:11:42 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\Jellyfish.jpg |
| $IDOI3HE.jpg | 2015-03-24 16:11:42 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\Tulips.jpg |
| $IFVCH5V.jpg | 2015-03-24 16:11:42 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\Penguins.jpg |
| $II3FM2A.jpg | 2015-03-24 16:11:42 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\Desert.jpg |
| $IIQGWTT.ini | 2015-03-24 16:11:42 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\desktop.ini |
| $IJEMT64.exe | 2015-03-24 16:11:42 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\IE11-Windows6.1-x64-en-us.exe |
| $IKXD1U3.jpg | 2015-03-24 16:11:42 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\Chrysanthemum.jpg |
| $IU3FKWI.jpg | 2015-03-24 16:11:42 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\Koala.jpg |
| $IX538VH.jpg | 2015-03-24 16:11:42 | C:\Users\informant\AppData\Local\Microsoft\Windows\Burn\Burn\Lighthouse.jpg |
| Considerations | - The SID of ‘informant’ account is **1000**.  > \$Recycle.Bin\S-1-5-21-2425377081-3129163575-2985601102-**1000**\\*  - Windows 7 Recycle Bin  > pairs of **$I***[random].extension*& **$R***[random].extension*  - Although Recycle Bin was emptied in this scenario, the deleted files can be recovered by metadata based data recovery. | | |

#### What actions were performed for anti-forensics on PC at the last day ‘2015-03-25’?

|  |  |  |  |
| --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Timestamp | Behavior | Description |
| 2015-03-25 10:46:44 | Search  anti-forensic methods | anti-forensic tools |
| 2015-03-25 10:46:54 | Search  anti-forensic methods | eraser |
| 2015-03-25 10:47:34 | Download  anti-forensic tools | http://iweb.dl.sourceforge.net/project/eraser/Eraser%206/6.2/Eraser%206.2.0.2962.exe |
| 2015-03-25  10:47:51 | Search  anti-forensic methods | ccleaner |
| 2015-03-25 10:48:12 | Download  anti-forensic tools | http://www.piriform.com/ccleaner/download |
| 2015-03-25 10:50:14 | Install anti-forensic tools | \USERS\INFORMANT\DESKTOP\DOWNLOAD\ERASER 6.2.0.2962.EXE |
| 2015-03-25 10:57:56 | Install anti-forensic tools | \USERS\INFORMANT\DESKTOP\DOWNLOAD\CCSETUP504.EXE |
| 2015-03-25 11:13:30 | Run  anti-forensic tools | \PROGRAM FILES\Eraser\Eraser.exe |
| 2015-03-25 11:13:39  ~ 11:14:44 | Wiping  files & directories using Eraser | \User\Informant\Desktop\Temp\Chrysanthemum.jpg  \User\Informant\Desktop\Temp\Desert.jpg  \User\Informant\Desktop\Temp\Hydrangeas.jpg  \User\Informant\Desktop\Temp\IE11-Windows6.1-x64-en-us.exe  \User\Informant\Desktop\Temp\Jellyfish.jpg  \User\Informant\Desktop\Temp\Koala.jpg  \User\Informant\Desktop\Temp\Lighthouse.jpg  \User\Informant\Desktop\Temp\Penguins.jpg  \User\Informant\Desktop\Temp\Tulips.jpg  \User\Informant\Desktop\Temp\Tulips.jpg  \User\Informant\Desktop\Temp\  (See below) |
| 2015-03-25 11:15:45 | Delete files  [Shift] + [Delete] | \Users\informant\Desktop\Download\ccsetup504.exe  \Users\informant\Desktop\Download\Eraser 6.2.0.2962.exe |
| 2015-03-25 11:15:50 | Run  anti-forensic tools | \PROGRAM FILES\CCLEANER\CCLEANER64.EXE |
| 2015-03-25 11:18:29 | Uninstall  anti-forensic tools | \PROGRAM FILES\CCLEANER\UNINST.EXE |
| 2015-03-25 11:22:47 | Disconnecting  Google drive account | sync\_log.log  > 2015-03-25 11:22:47,053 -0400 INFO pid=3164 1528:MainThread common.sync\_app:1630 **Signing Out**  > 2015-03-25 11:22:48,878 -0400 INFO pid=3164 1528:MainThread common.sync\_app:1741 **Deleting file**: C:\Users\INFORM~1\AppData\Local\Google\Drive\user\_default\sync\_config.db  > 2015-03-25 11:22:48,878 -0400 INFO pid=3164 1528:MainThread common.sync\_app:1741 **Deleting file**: C:\Users\INFORM~1\AppData\Local\Google\Drive\user\_default\snapshot.db |
| N/A | Delete some e-mails  in Outlook | See Question 21 and Question 45.  (1) It's me  (2) RE: It's me  (3) Good job, buddy.  (4) RE: Last request  (5) Watch out!  (6) RE: Watch out!  (7) Done |
| Considerations | [Wiping traces of Eraser in $UsnJrnl]  - Eraser renames the target file as random bytes, and fills random data.  > Current Eraser settings: erasure method (US DoD 5220.22-M 🡪 7 Passes)  > (0) Chrysanthemum.jpg (🡨 target file)  > (1) S9(wQm9ff\_gd/hZ~c (Renamed file for Step 1)  > (2) KclInDLFM3YdDX}t1 (Renamed file for Step 2)  > (3) C0jAF)No] VBZJoxE (Renamed file for Step 3)  > (4) +a]Zd+UuQ88qn/K9J (Renamed file for Step 4)  > (5) 2O8josN{78q7Ju7dx (Renamed file for Step 5)  > (6) v1hNH f]1bDJc2'(I (Renamed file for Step 6)  > (7) 8BkLKk2 cBfQ7`SvH (Renamed file for Step 7)  > (8) Delete the last file  - See Question 10 and 11 for identifying application usage logs.  - See Question 15, 16 and 44 for identifying web history.  - See Question 30 and 49 for identifying cloud storage drive history.  …… | | |

#### Recover deleted files from USB drive ‘RM#2’.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Possible Answer | Recovery Type | Filename (Path) | Format | Filesize | Viewable |
| Metadata  (FAT Directory Entry) | \DESIGN\winter\_storm.amr | PPT | 13.8 MB | O |
| \DESIGN\winter\_whether\_advisory.zip | PPTX | 15.6 MB | O |
| \pricing decision\my\_favorite\_cars.db | XLS | 1.20 MB | O |
| \pricing decision\my\_favorite\_movies.7z | XLSX | 97.7 KB | O |
| \pricing decision\new\_years\_day.jpg | XLSX | 9.76 MB | O |
| \pricing decision\super\_bowl.avi | XLS | 9.81 MB | O |
| \PROGRESS\my\_friends.svg | DOC | 57.0 KB | O |
| \PROGRESS\my\_smartphone.png | DOCX | 4.23 MB | O |
| \PROGRESS\new\_year\_calendar.one | DOCX | 26.7 KB | O |
| \PROPOSAL\a\_gift\_from\_you.gif | DOCX | 33.5 MB | O |
| \PROPOSAL\landscape.png | DOCX | 6.18 MB | O |
| \technical review\diary\_#1d.txt | DOCX | 118 KB | O |
| \technical review\diary\_#1p.txt | PPTX | 447 KB | O |
| \technical review\diary\_#2d.txt | DOCX | 643 KB | O |
| \technical review\diary\_#2p.txt | PPT | 1.10 MB | O |
| \technical review\diary\_#3d.txt | DOC | 2.25 MB | O |
| \technical review\diary\_#3p.txt | PPT | 317 KB | O |
| Carving | - All other files do not have a relationship with this scenario.  - Results from TestData (PhotoRec)  > OGG, 3GP, GIF, JPG, XLS, DOC, MOV, MP4, MPG, PNG, TIF, WMA, WMV, XML… | | | |
| Considerations | - Metadata based data recovery  > Directory Entries of FAT file system.  > This task may be enough for ‘RM#2’ image.  - Contents (signatures) based data carving  > This task is optional. | | | | |

#### What actions were performed for anti-forensics on USB drive ‘RM#2’?

[Hint: this can be inferred from the results of Question 53.]

|  |  |
| --- | --- |
| Possible Answer | Quick format for deleting data |
| Considerations | - Inference from data recovery results.  - Some directory entries prior to the quick format do exist in unallocated areas. |

winter

#### What files were copied from PC to USB drive ‘RM#2’?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Possible Answer  (Timezone is applied) | Filename | Format | Filesize | JumpList and ShellBag entry in PC |
| winter\_storm.amr | PPT | 13.8 MB | None |
| winter\_whether\_advisory.zip | PPTX | 15.6 MB | E:\Secret Project Data\design\winter\_whether\_advisory.zip |
| my\_favorite\_cars.db | XLS | 1.20 MB | None |
| my\_favorite\_movies.7z | XLSX | 97.7 KB | None |
| new\_years\_day.jpg | XLSX | 9.76 MB | None |
| super\_bowl.avi | XLS | 9.81 MB | None |
| my\_friends.svg | DOC | 57.0 KB | None |
| my\_smartphone.png | DOCX | 4.23 MB | None |
| new\_year\_calendar.one | DOCX | 26.7 KB | None |
| a\_gift\_from\_you.gif | DOCX | 33.5 MB | None |
| landscape.png | DOCX | 6.18 MB | None |
| diary\_#1d.txt | DOCX | 118 KB | None |
| diary\_#1p.txt | PPTX | 447 KB | None |
| diary\_#2d.txt | DOCX | 643 KB | None |
| diary\_#2p.txt | PPT | 1.10 MB | None |
| diary\_#3d.txt | DOC | 2.25 MB | None |
| diary\_#3p.txt | PPT | 317 KB | None |
| Considerations | - Inference from the results of deleted data recovery in Question 53.  - Inference from the results of traversed files/directories in Question 25 and 26. | | | |

#### Recover hidden files from the CD-R ‘RM#3’.

How to determine proper filenames of the original files prior to renaming tasks?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Possible Answer | Recovery Type | Filename inferred from  the First Page & its storage format | Format | Filesize | Viewable |
| Data  Carving | [secret\_project]\_revised\_points.ppt | PPT | 13.8 MB | O |
| [secret\_project]\_detailed\_design.pptx | PPTX | 15.6 MB | O |
| [secret\_project]\_price\_analysis\_#1.xlsx | XLSX | 97.7 KB | O |
| [secret\_project]\_price\_analysis\_#2.xls | XLS | 1.20 MB | O |
| [secret\_project]\_market\_analysis.xlsx | XLSX | 9.76 MB | O |
| [secret\_project]\_market\_shares.xls | XLS | 9.81 MB | O |
| [secret\_project]\_progress\_#1.docx | DOCX | 4.23 MB | O |
| [secret\_project]\_progress\_#2.docx | DOCX | 26.7 KB | O |
| [secret\_project]\_progress\_#3.doc | DOC | 56.0 KB | O |
| [secret\_project]\_detailed\_proposal.docx | DOCX | - | Partial |
| [secret\_project]\_proposal.docx | DOCX | 6.18 MB | O |
| [secret\_project]\_technical\_review\_#1.docx | DOCX | 118 KB | O |
| [secret\_project]\_technical\_review\_#1.pptx | PPTX | 447 KB | O |
| [secret\_project]\_technical\_review\_#2.docx | DOCX | 643 KB | O |
| [secret\_project]\_technical\_review\_#2.ppt | PPT | 1.10 MB | O |
| [secret\_project]\_technical\_review\_#3.doc | DOC | 2.25 MB | O |
| [secret\_project]\_technical\_review\_#3.ppt | PPT | 317 KB | O |
| Considerations | - Contents (signatures) based data carving  > This task is useful for ‘RM#3’ image.  > Filename can be inferred from the first page and its storage format.  - Metadata based data recovery  > If this task is possible, it may be good for analyst.  > With this method, we may be able to identify renamed filenames.  > So, additional process is needed for determining original filenames.  - All other files (some JPEG files) do not have a relationship with this scenario. | | | | |

#### What actions were performed for anti-forensics on CD-R ‘RM#3’?

|  |  |
| --- | --- |
| Possible Answer | (1) Formatting CD-R (Burning Type 1: Like a USB flash drive)  (2) Copying confidential files and some meaningless files to CD-R  (3) Deleting confidential files from CD-R for hiding them |
| Considerations | - This can be inferred from CD-R image examination. |

#### Create a detailed timeline of data leakage processes.

|  |  |
| --- | --- |
| Possible Answer | See Section 3 |
| Considerations | - Behavior of the suspect  > 2015-03-22: Normal business works (installation and configuration of apps)  > 2015-03-23: Transferring sample confidential data through the internet  > 2015-03-24: Copying confidential data to storage devices  > 2015-03-25: Trying to do anti-forensics and take storage devices out  - Some traces may be hard to be exactly identified from the images. |

#### List and explain methodologies of data leakage performed by the suspect.

|  |  |
| --- | --- |
| Possible Answer | (1) Network Transmission  - E-mail  > 2015-03-23 15:19 – space\_and\_earth.mp4  > 2015-03-23 16:38 – links of shared files in cloud storage service  - Cloud storage services  > 2015-03-23 16:32 – happy\_holiday.jpg, do\_u\_wanna\_build\_a\_snow\_man.mp3  (2) Storage Device  - USB flash drive  > 2015-03-24 09:58 ~ 10:00 – winter\_whether\_advisory.zip and so on  > The suspect formatted the partition, but copied files exist in unused area  - CD-R  > 2015-03-24 16:54 ~ 16:58 – 17 files (e.g., winter\_whether\_advisory.zip and so on)  > The suspect deleted the confidential files, but the files exist in unused area |
| Considerations | - See Section 5.  - See Question 45 related to the e-mail communication.  - See Question 30 and 49 related to the cloud storage service.  - See Question 22, 25, 26, 54 and 55 related to USB flash drive.  - See Question 34 and 56 related to CD-R. |

#### Create a visual diagram for a summary of results.

|  |  |
| --- | --- |
| Possible Answer | Graphical Timeline of the Data Leakage Scenario  - See Section 3 (Graphical Timeline of the Data Leakage Scenario) |
| Considerations | - A visual diagram of Section 3 is a simple example to better understanding.  - You can create your own visual diagram for explaining the results of digital forensic analysis. |

# History

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Issue Date** | **Section** | **History** |
| 1.00 | 2015-06-05 | All | - First release version |
| 1.10 | 2015-09-08 | 6 | - Added additional information about user accounts to Question 6 |
| 1.20 | 2016-11-10 | 3 | - Added additional information about copying files |
| 1.30 | 2017-12-06 | All | - Corrected typing errors  - Added additional information about seed files |
| 1.31 | 2018-03-05 | 4 | - Added a subsection for describing the RM#1 image file |
| 1.32 | 2018-07-23 | 6 | - For Question 11, updated additional entries from UserAssist, Prefetch and Shimcache, and corrected wrong information (NULL timestamps of several UserAssist entries) |

1. All the seed files (confidential files used in the scenario) were created based on MS Office files randomly selected from Govdocs1 (https://digitalcorpora.org/corpora/files). The seed files are available online at NIST/CFReDS web-site. [↑](#footnote-ref-2)
2. SHA-1 hash value: 1693B6CB50B90D96FC3C04E4329604FEBA88CD51 [↑](#footnote-ref-3)
3. SHA-1 hash value: 377F1F97DBE99104CF053DF3632377F07C9310C7 [↑](#footnote-ref-4)
4. NIST e-mail accounts: iaman.informant@nist.gov, spy.conspirator@nist.gov [↑](#footnote-ref-5)
5. Authorized USB memory stick (🡨 confidential electronic files of the company) [↑](#footnote-ref-6)
6. Smart devices and Apple OS X system can be considered in the future work. [↑](#footnote-ref-7)
7. Unnecessary data (a group of sectors) were scrubbed manually. It was nothing to do with this scenario. [↑](#footnote-ref-8)
8. The RAW ISO file is a raw sector-by-sector binary copy of tracks in the original disk, and the CUE file is a plain-text file which stores the information of disk and tracks. [↑](#footnote-ref-9)
9. bchunk v1.2.0 - BinChunker for Unix / Linux (<http://he.fi/bchunk/>) [↑](#footnote-ref-10)