CSU, College of Engineering and Computer Science
Department of Computer Science
CSC 153 – Computer Forensics Principles and Practice

Activity 3: Linux Data Acquisition

Introduction

Data Acquisition is the process of copying data. For digital forensics, it's the task of collecting digital evidence from electronic media. There are two types of data acquisition: static acquisition and live acquisition. In this practice, you'll perform a static data acquisition using the Linux dd and dcfldd commands. Operations in this guide are performed in CAINE Linux. You may also use Kali Linux for the same practice.

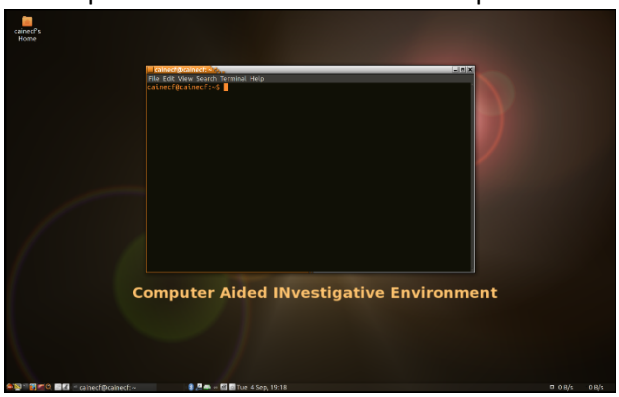
Objectives

- Get familiar with the data acquisition process.
- Prepare a target drive for data acquisition.
- Use Linux data acquisition tool to acquire data from a USB drive.
- Validate the acquired data.

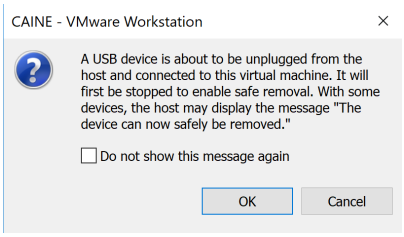
Tasks

Part1. Prepare the target drive

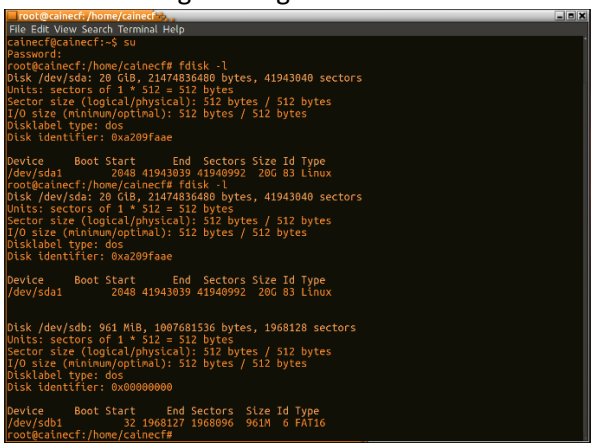
1. In CAINE, Find terminal in Main->system tools->MATE Terminal. In Kali Linux, Find the terminal on the panel to the left of the screen. Open the terminal.



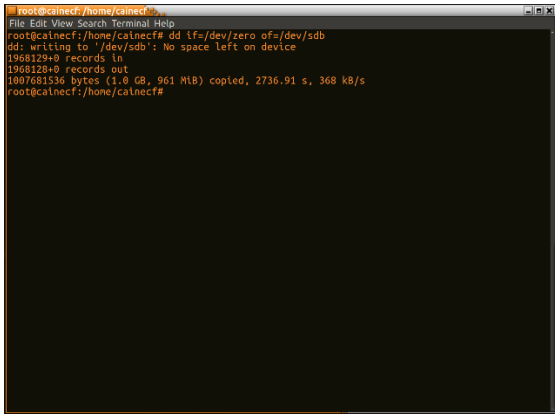
2. To change to root account, type command
   su
   And provide the password.
3. Type ***fdisk –l*** to show the current disks.
4. Plug the USB (target disk where the image will be stored) to the host.
5. Then you need to connect the USB to the Linux virtual machine. In vmware workstation, click on VM->Removable Devices->Flash Disk->Connect



6. Type ***fdisk –l*** again. The extra drive showed now (/dev/sdb in this case) is the target disk drive where the image of original disk will be stored on.



7. Zero out the target drive:
   dd if=/dev/zero of=/dev/sdb
   This will take some time depending on the virtual machine configuration and the usb data transfer speed. Please be patient as it is writing bit by bit. The time can vary from seconds to half an hour. *Make sure you are zeroing out the target drive, not the original drive or other drives!*



8. Type ***fdisk /dev/sdb*** to begin creating a partition on the target drive.

   a. Then type ***m*** to show the menu
   b. Type ***p*** to print the partition table and see if there are any partitions on /dev/sdb
      If there are no partitions on target drive, the output will sometimes be similar to:

Disk /dev/sdb doesn't contain a valid partition table

Or the output simply doesn't show any partition information.

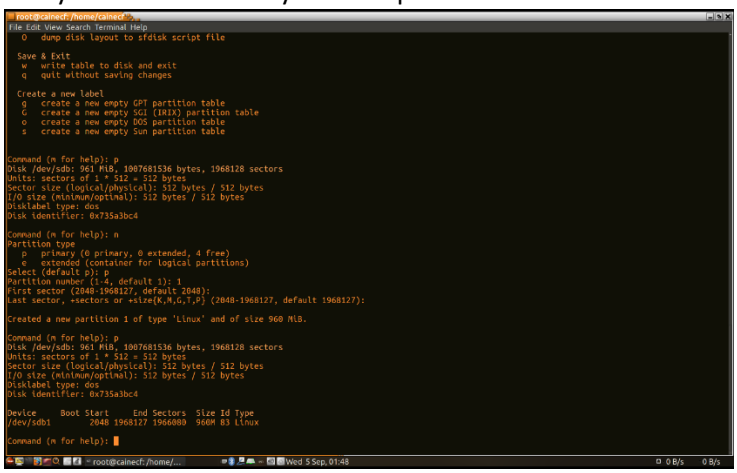
Then you'll need to create a new partition following the steps below.

c. Type ***n*** and hit enter, to create a new partition. It lists two partition types: primary and extended.

d. Type ***p*** and hit enter, to choose a primary partition table.

e. Type ***1*** and hit enter, to select the first partition

f. After the new partition is created, type ***p*** again to show current partitions on /dev/sdb and you'll see the newly created partition.

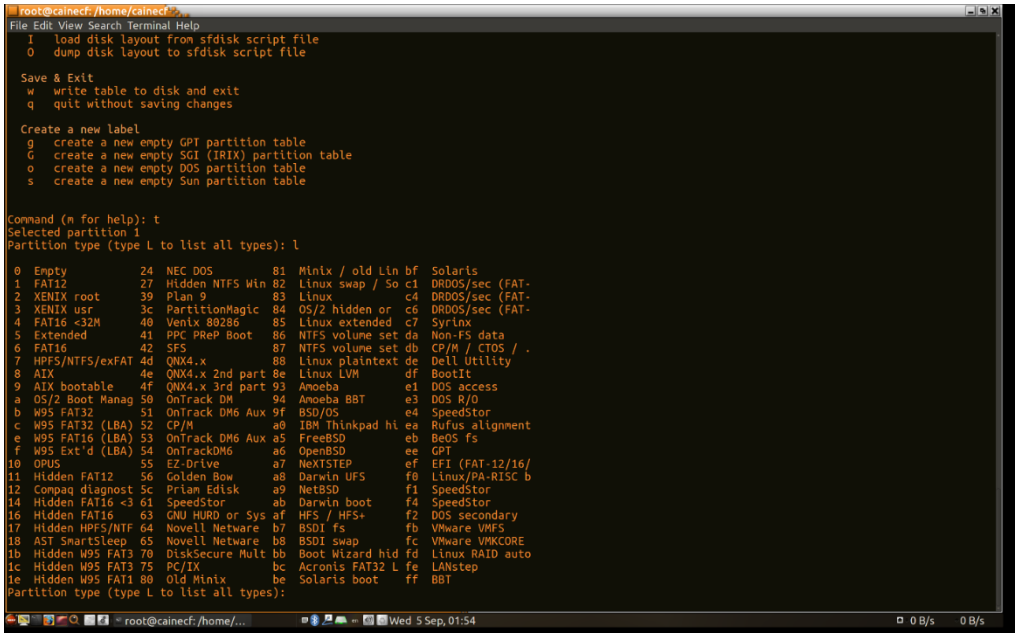


9. Last step creates a new linux partition /dev/sdb1. This step changes the newly created partition to windows 95 FAT32 file system.

a. Type ***m*** to show the menu

b. Type ***t*** to change the partition type

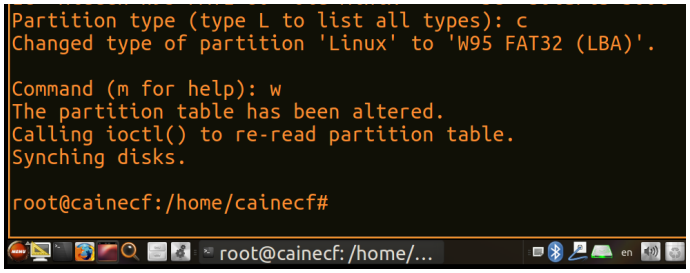
c. Type ***l*** (lowercase L) to show available file systems and their code values



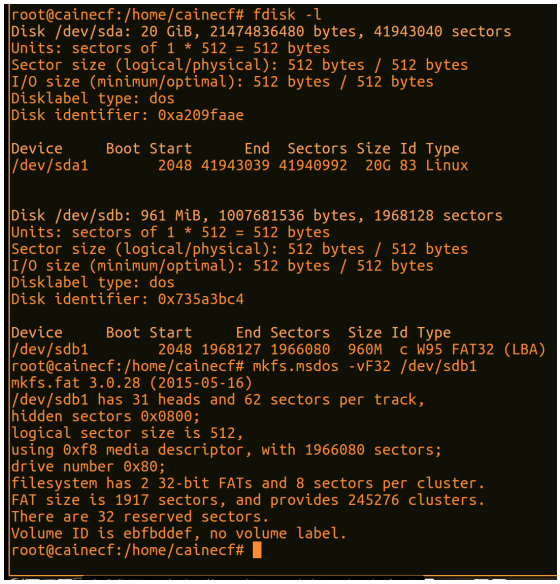
d. Type ***c*** to change the partition to Windows 95 FAT32(LBA)

e. Type ***p*** to display the newly changed drive

f. Type ***w*** to save/write the newly created partition to the /dev/sdb drive.



10. Type ***fdisk –l*** to see the drives again.
11. To format a FAT file system from Linux, type ***mkfs.msdos –vF32 /dev/sdb1***
    a. –v means verbose execution
    b. F32 means the type of file allocation table used is 32 bit (it can be 12, 16 or 32 bit).



Part 2. Perform Data Acquisition

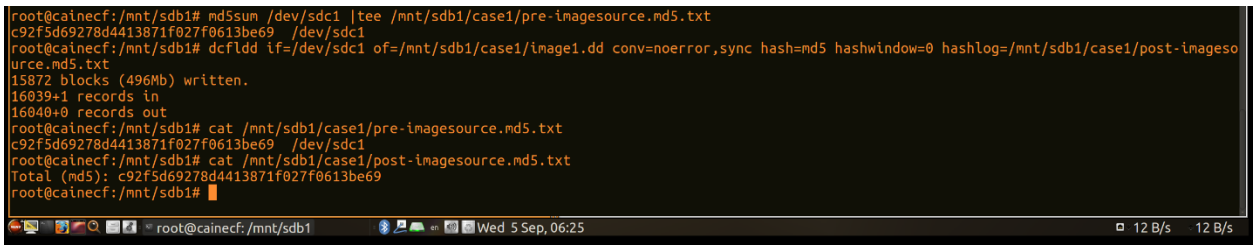
12. Insert the second USB drive as the *source drive*, type ***fdisk –l*** to show all disks and identify which one is the source drive and which one is target drive. The next step is to perform data acquisition towards the source drive. In this case, /dev/sdc1 is the source drive.

```
root@cainecf:/home/cainecf# fdisk -l
Disk /dev/sda: 20 GiB, 21474836480 bytes, 41943040 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xa209faae

Device     Boot Start      End  Sectors Size Id Type
/dev/sda1        2048 41943039 41940992  20G 83 Linux


Disk /dev/sdb: 961 MiB, 1007681536 bytes, 1968128 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x735a3bc4

Device     Boot Start     End Sectors  Size Id Type
/dev/sdb1        2048 1968127 1966080  960M  c W95 FAT32 (LBA)


Disk /dev/sdc: 501.5 MiB, 525860864 bytes, 1027072 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x000d27cc

Device     Boot Start     End Sectors   Size Id Type
/dev/sdc1  *       32 1026559 1026528 501.2M  6 FAT16
root@cainecf:/home/cainecf#
```

13. Type ***ls /*** to show files under /.
14. Type ***ls /mnt*** to show files under /mnt.
15. Type ***mkdir /mnt/sdb1*** to create a folder under /mnt.
16. Type ***ls /mnt/sdb1*** again to show files under /mnt/sdb1.
17. Type ***mount –t vfat /dev/sdb1 /mnt/sdb1*** to mount the target drive partition.
    a. –t means the file system type is vfat.
18. Type cd ***/mnt/sdb1*** to change to default directory to target drive
19. Type ***ls –al*** to show the contents of the target drive's root level.
20. Type ***mkdir case1*** to create a target directory.
21. Type ***ls*** to confirm that the new directory has been created.
22. Type ***md5sum /dev/sdc1 |tee /mnt/sdb1/case1/pre-imagesource.md5.txt***
    a. Md5sum calculate the hash of the source drive using MD5 algorithm
    b. |tee means the output is added to the txt file and also displayed in terminal

```
root@cainecf:/home/cainecf# ls /
bin  boot  cdrom  dev  etc  home  initrd.img  lib  lib64  lost+found  media  mnt  opt  proc  root  run  sbin  snap  srv  sys  tmp  usr  var  vmlinuz
root@cainecf:/home/cainecf# ls /mnt
root@cainecf:/home/cainecf# mkdir /mnt/sdb1
root@cainecf:/home/cainecf# ls /mnt
sdb1
root@cainecf:/home/cainecf# mount -t vfat /dev/sdb1 /mnt/sdb1
root@cainecf:/home/cainecf# cd /mnt/sdb1
root@cainecf:/mnt/sdb1# ls -al
total 8
drwxr-xr-x 2 root root 4096 Jan  1  1970 .
drwxr-xr-x 3 root root 4096 Sep  5 05:36 ..
root@cainecf:/mnt/sdb1# ls
root@cainecf:/mnt/sdb1# mkdir case1
root@cainecf:/mnt/sdb1# ls
case1
root@cainecf:/mnt/sdb1# md5sum /dev/sdc1 |tee /mnt/sdb1/case1/pre-imagesource.md5.txt
c92f5d69278d4413871f027f0613be69  /dev/sdc1
root@cainecf:/mnt/sdb1#
root@cainecf: /mnt/sdb1   Wed 5 Sep, 05:59   0 B/s   0 B/s
```

23. To acquire data from the source drive /dev/sdc1, type
    dcfldd if=/dev/sdc1 of=/mnt/sdb1/case1/image1.dd conv=noerror,sync hash=md5 hashwindow=0 hashlog=/mnt/sdb1/case1/post-imagesource.md5.txt



a. To create segmented volumes of 2MB each, you may use
dcfldd if=/dev/sdc1 split=2M of=/mnt/sdb1/case1/image1.dd conv=noerror,sync hash=md5 hashwindow=0 hashlog=/media/sdb1/case1/post-imagesource.md5.txt

b. If use dd command for data acquisition, the command should be
dd if=/dev/sdc1 |split -b 2m – image_sdc
if you want to create multiple segments.
Otherwise you can simply use
dd if=/dev/sdc1 of=/mnt/sdb1/case1/image1-dd.dd
In my demo, my target drive does not have enough disk storage to store the target image. You can read the number of blocks and bytes copied.

```
root@cainecf:/mnt/sdb1/case1# dd if=/dev/sdc1 of=/mnt/sdb1/case1/image1-dd.dd
dd: writing to '/mnt/sdb1/case1/image1-dd.dd': No space left on device
935617+0 records in
935616+0 records out
479035392 bytes (479 MB, 457 MiB) copied, 890.542 s, 538 kB/s
root@cainecf:/mnt/sdb1/case1#
```

Part 3. Validate the acquired data

24. To validate the acquired data, there are two ways if using *dcfldd* for data acquisition:
    a. Type
    md5sum /dev/sdc1 |tee /mnt/sdb1/case1/pre-imagesource.md5.txt
    to generate the hash of the original source drive;
    Type
    cat /mnt/sdb1/case1/pre-imagesource.md5.txt
    to show the hash value of original source drive;
    The hash of the acquired image is already computed and put into post-imagesource.md5.txt.Type
    cat /mnt/sdb1/case1/post-imagesource.md5.txt
    to show the hash value and then compare the value in pre-imagesource.md5.txt
    b. Type ***dcfldd if=/dev/sdc1 vf=/mnt/sdb1/case1/image1.dd*** (Note: this only applies to the nonsegmented image file).

25. To validate the acquired data if using *dd* for data acquisition:
    a. Type ***md5sum /dev/sdc1 |tee /mnt/sdb1/case1/pre-imagesource.md5.txt***
    b. Type ***cat image_sdc.*|md5sum > post-imagesource.md5.txt***
    And then compare the values in both files to see if they are the same. This applies to the segmented image file too.

Post-Activity questions.

Please complete this exercise and submit the PDF to Canvas.

1. What are the two broad categories of acquisition?
2. What is a live storage acquisition and when is it used?
3. Which command should be used to check the disks available on the current system? You only need to state the command name, not the entire command string.
4. The mkfs -t command does what?
5. Which drive should be 'zeroed out', the source evidence drive or the target drive?
6. What is the purpose of 'zeroing out' before a storage acquisition is performed?
7. When you issue the command the command
   dd if=/dev/zero of=/dev/sdb
   What does the string "/dev/sdb" represent?
8. The md5sum /dev/sda command does what? Why is it used?
9. How many times should the ***md5sum*** command be used at least in one acquisition?
10. Instead of using “dd”, what other commands can you use to perform data acquisition in Linux?