

# HackTM CTF 2020 Writeup

Since the CTF is still active I won't be dropping the flags. You can follow along and complete the challenges for yourself here: <https://ctfx.hacktm.ro/>

## 0x01 Strange PCAP

### Strange PCAP 144 Points

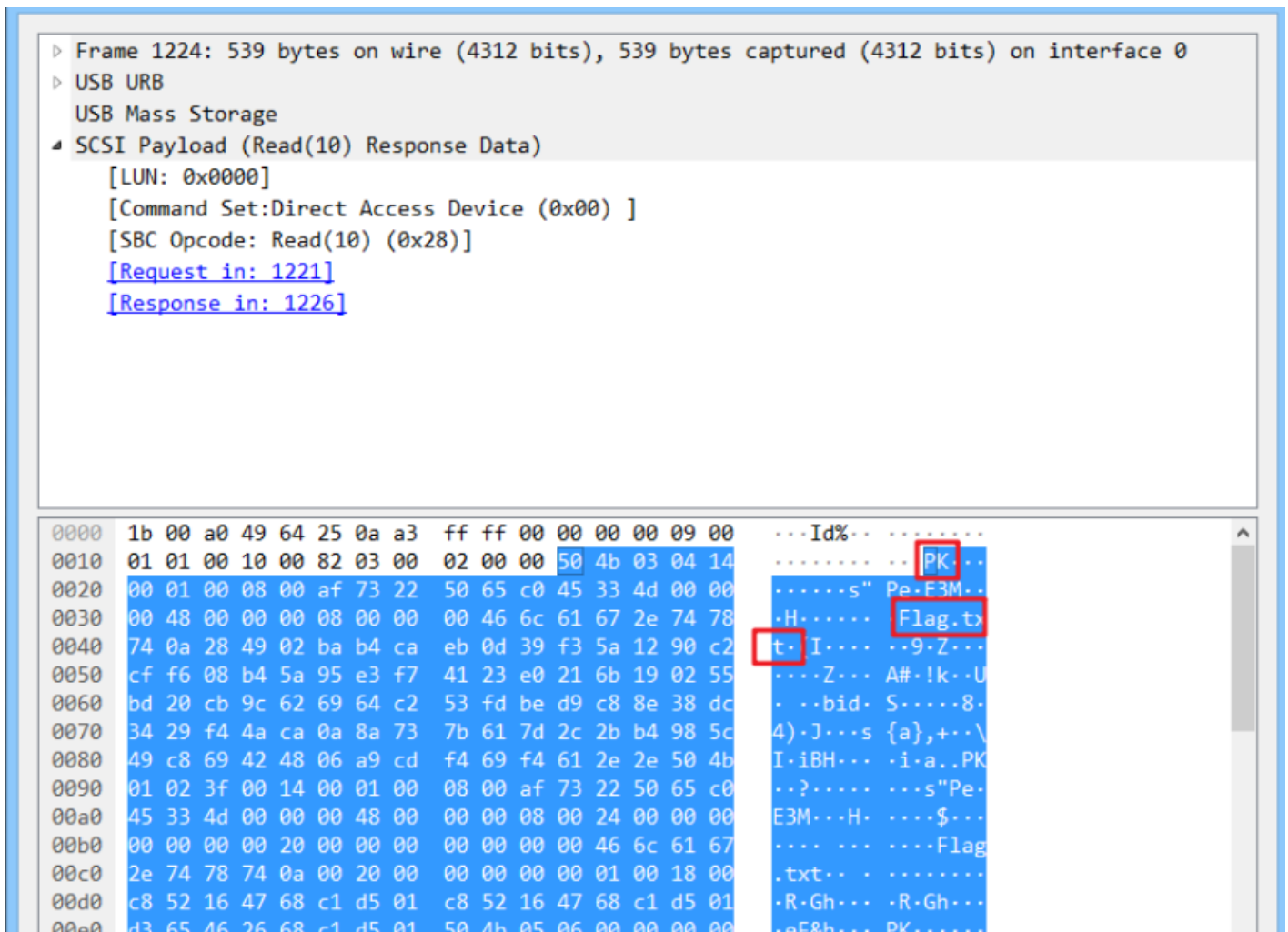
We managed to get all the data to incriminate our CEO for selling company secrets. Can you please help us and give us the secret data that he has leaked?

Author: Legacy

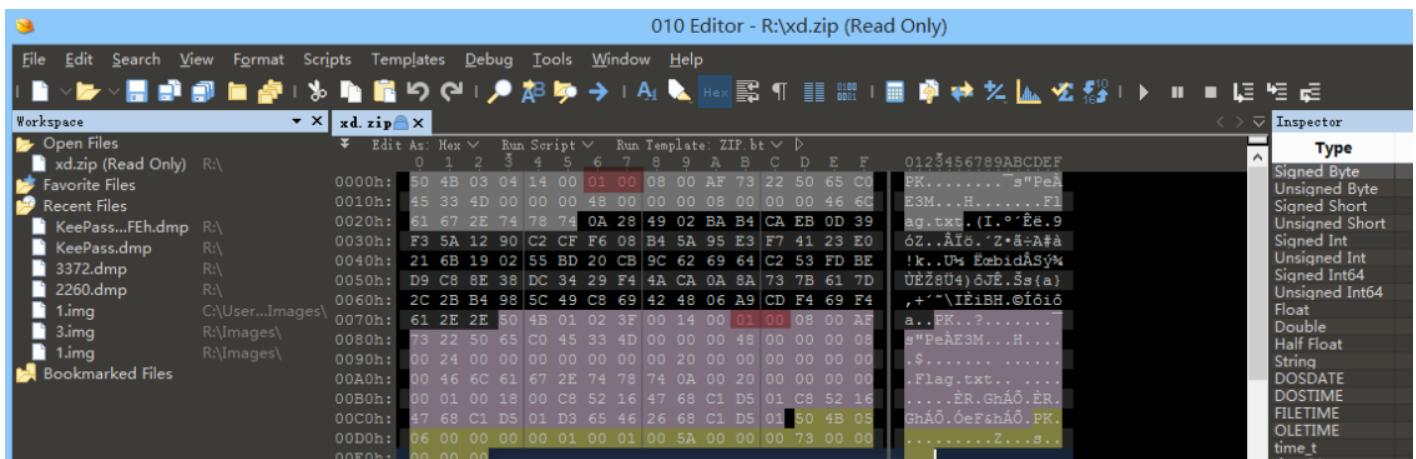
Strange.pcapng ccd21d48fd04137551833d2e4493243e

A basic PCAP forensics question. When you get the file, you will find that there are many USB Massive Storage packages. The initial guess is to find the flag in it.

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help						
Apply a display filter ... <Ctrl-/>						
No.	Time	Source	Destination	Protocol	Length	Info
301	7.352045	1.16.2	host	USBMS	35	SCSI: Data In LUN: 0x00 (Read Capacity(10) Response Data)
302	7.352046	host	1.16.2	USB	27	URB_BULK in
303	7.352101	1.16.2	host	USBMS	40	SCSI: Response LUN: 0x00 (Read Capacity(10)) (Good)
304	7.352125	host	1.16.1	USBMS	58	SCSI: Read(10) LUN: 0x00 (LBA: 0x00000000, Len: 1)
305	7.352156	1.16.1	host	USB	27	URB_BULK out
306	7.352158	host	1.16.2	USB	27	URB_BULK in
307	7.352714	1.16.2	host	USBMS	539	SCSI: Data In LUN: 0x00 (Read(10) Response Data)
308	7.352728	host	1.16.2	USB	27	URB_BULK in
309	7.352849	1.16.2	host	USBMS	40	SCSI: Response LUN: 0x00 (Read(10)) (Good)
310	7.352939	host	1.16.1	USBMS	58	SCSI: Read(10) LUN: 0x00 (LBA: 0x00000800, Len: 16)
311	7.353003	1.16.1	host	USB	27	URB_BULK out
312	7.353005	host	1.16.2	USB	27	URB_BULK in
313	7.353832	1.16.2	host	USBMS	8219	SCSI: Data In LUN: 0x00 (Read(10) Response Data)
314	7.353943	host	1.16.2	USB	27	URB_BULK in
315	7.354004	1.16.2	host	USBMS	40	SCSI: Response LUN: 0x00 (Read(10)) (Good)
316	7.355069	host	1.16.1	USBMS	58	SCSI: Read(10) LUN: 0x00 (LBA: 0x00000800, Len: 16)
317	7.355137	1.16.1	host	USB	27	URB_BULK out
318	7.355138	host	1.16.2	USB	27	URB_BULK in
319	7.356055	1.16.2	host	USBMS	8219	SCSI: Data In LUN: 0x00 (Read(10) Response Data)
> Frame 1: 36 bytes on wire (288 bits) 36 bytes captured (288 bits) on interface wireshark-ethcan1920 id 0						
0000	1c 00 00 00 00 00 00 00	00 00 00 00 00 00 0b 00	.....			
0010	00 01 00 01 00 80 02 08	00 00 00 00 80 06 00 01	.....			
0020	00 00 12 00		....			



Looking through the data packets one by one, I found the ZIP file header and Flag.txt in Frame 1224, extract them and have a look.



After extracting the data, it is found to be an encrypted compressed package. Check it with 010 Editor and find that it is really encrypted. Next, we have to find the password. Let's make a preliminary guess about the HID package sent by the keyboard because we have seen the USB HID data package before Types of.

No.	Time	Source	Destination	Protocol	Length	Leftover Capture Data	Info
1327	37.973014	1.15.0	host	USBHID	28		SET_REPORT Response
1328	37.973471	1.15.0	host	USBHID	30		GET_REPORT Response
1329	37.973535	1.15.3	host	USB	30	210012	URB_INTERRUPT in
1332	37.973585	1.15.1	host	USB	35	0000240000000000	URB_INTERRUPT in
1334	37.974323	1.15.0	host	USBHID	28		SET_REPORT Response
1336	37.974789	1.15.0	host	USBHID	30		GET_REPORT Response
1338	37.975545	1.15.0	host	USBHID	28		SET_REPORT Response
1339	37.997791	1.15.1	host	USB	35	0000000000000000	URB_INTERRUPT in
1342	38.399042	1.16.1	host	USB	27		URB_BULK out
1344	38.399115	1.16.2	host	USBMS	40		SCSI: Response LUN: 0x00 (Test Unit Ready) (Good)
1345	38.645921	1.15.1	host	USB	35	0000190000000000	URB_INTERRUPT in
1347	38.737929	1.15.1	host	USB	35	0000000000000000	URB_INTERRUPT in
1350	39.401615	1.16.1	host	USB	27		URB_BULK out
1352	39.401683	1.16.2	host	USBMS	40		SCSI: Response LUN: 0x00 (Test Unit Ready) (Good)
1353	39.429649	1.15.1	host	USB	35	00000a0000000000	URB_INTERRUPT in
1355	39.509595	1.15.1	host	USB	35	0000000000000000	URB_INTERRUPT in
1357	40.393950	1.15.1	host	USB	35	00000d0000000000	URB_INTERRUPT in
1360	40.405221	1.16.1	host	USB	27		URB_BULK out
1362	40.405290	1.16.2	host	USBMS	40		SCSI: Response LUN: 0x00 (Test Unit Ready) (Good)
1363	40.477555	1.15.1	host	USB	35	0000000000000000	URB_INTERRUPT in
1366	41.408476	1.16.1	host	USB	27		URB_BULK out
1368	41.408531	1.16.2	host	USBMS	40		SCSI: Response LUN: 0x00 (Test Unit Ready) (Good)
1369	42.161608	1.15.1	host	USB	35	0000210000000000	URB_INTERRUPT in
1371	42.241928	1.15.1	host	USB	35	0000000000000000	URB_INTERRUPT in
1374	42.410764	1.16.1	host	USB	27		URB_BULK out
1376	42.410838	1.16.2	host	USBMS	40		SCSI: Response LUN: 0x00 (Test Unit Ready) (Good)
1377	42.769943	1.15.1	host	USB	35	0200000000000000	URB_INTERRUPT in
1379	43.041885	1.15.1	host	USB	35	0200160000000000	URB_INTERRUPT in

Frame 1332: 35 bytes on wire (280 bits), 35 bytes captured (280 bits) on interface 0

USB URB

Leftover Capture Data: 0000240000000000

Scrolling down, I saw a lot of URB\_INTERRUPT types. We exported these data packets with tshark. For the detailed process, please refer to the second [level](#) of [the 2020 New Year Red Packet Writeup of Milk Ice](#) . I will not repeat it here.

Refer to the [USB Keyboard data packet format](#) , you can know that the first Byte of each packet corresponds to the state of the control key, and the third Byte corresponds to the input key.

Combined with the [USB HID Keyboard scan codes](#), the following script can be constructed to analyze the data packet.

```
usb_codes = {
    0x04: "aA", 0x05: "bB", 0x06: "cC", 0x07: "dD", 0x08: "eE", 0x09: "fF",
    0x0A: "gG", 0x0B: "hH", 0x0C: "iI", 0x0D: "jJ", 0x0E: "kK", 0x0F: "lL",
    0x10: "mM", 0x11: "nN", 0x12: "oO", 0x13: "pP", 0x14: "qQ", 0x15: "rR",
    0x16: "sS", 0x17: "tT", 0x18: "uU", 0x19: "vV", 0x1A: "wW", 0x1B: "xX",
    0x1C: "yY", 0x1D: "zZ", 0x1E: "1!", 0x1F: "2@", 0x20: "3#", 0x21: "4$",
    0x22: "5%", 0x23: "6^", 0x24: "7&", 0x25: "8*", 0x26: "9(", 0x27: "0)",
    0x2C: " ", 0x2D: "-_", 0x2E: "=", 0x2F: "[{", 0x30: "]", 0x32: "#~",
    0x33: ";:", 0x34: "`\"'", 0x36: "<,", 0x37: ">"
}

data = ''
for x in open("xd","r").readlines():
```

```

code = int(x[ 4: 6],16)
print(x[ 4: 6])
if code == 0:
    continue
if code == 0x28:
    print(' ENTER! ')
    print(data)
    data = ''
    continue
upper = 0
if int(x[ 0: 2],16) == 0x02 or int(x[ 0: 2],16) == 0x20:
    upper = 1
data += usb_codes[code][upper]
print(data)

```

After parsing, the compressed package password is obtained and completed.




## 0x02 RR

### RR 298 Points

One of my drives failed and I need help recovering all my files. As far as I know the persons who have set up my PC used something like Reusing All of Internal Disks.

Author: Legacy

[https://mega.nz/#!1MEQRCpD!YfSQZQSmKn520Jh8DCBb2Xh0ndqF\\_kPjgZsQIYtvH8A](https://mega.nz/#!1MEQRCpD!YfSQZQSmKn520Jh8DCBb2Xh0ndqF_kPjgZsQIYtvH8A)  
<https://drive.google.com/open?id=1hPBksCtm3a4wGs9cd8DYkM4mcV0aNCEJ>

Name	Type	Compressed size
 1	Disc Image File	150,529 KB
 2	Disc Image File	0 KB
 3	Disc Image File	150,489 KB

I got the title and found that there are three imgs, two of which are the same size, and the other is 0.

According to the meaning of the title "One of my drives failed", it is guessed that the file with a size of 0 is the damaged disk. According to the two disks can "recovering all my files", it may be a

## RAID array

```
root@Boschko 14:19:44 ~/CTF/blog
# file 1.img 66 file 3.img
1.img: DOS/MBR boot sector MS-MBR Windows 7 english at offset 0x163 "Invalid partition table" at offset 0x17b "Error loading operating system" at offset 0x19a "Missing operating system", disk signature 0xd7f49e5c; p
S (0x0,32,33), end-CHS (0x41,69,4), startsector 2048, 1046528 sectors
3.img: DOS/MBR boot sector MS-MBR Windows 7 english at offset 0x163 "Invalid partition table" at offset 0x17b "Error loading operating system" at offset 0x19a "Missing operating system", disk signature 0xd7f49e5a; p
S (0x0,32,33), end-CHS (0x41,69,4), startsector 2048, 1046528 sectors

root@Boschko 14:20:01 ~/CTF/blog
# binwalk 1.img 66 binwalk 3.img

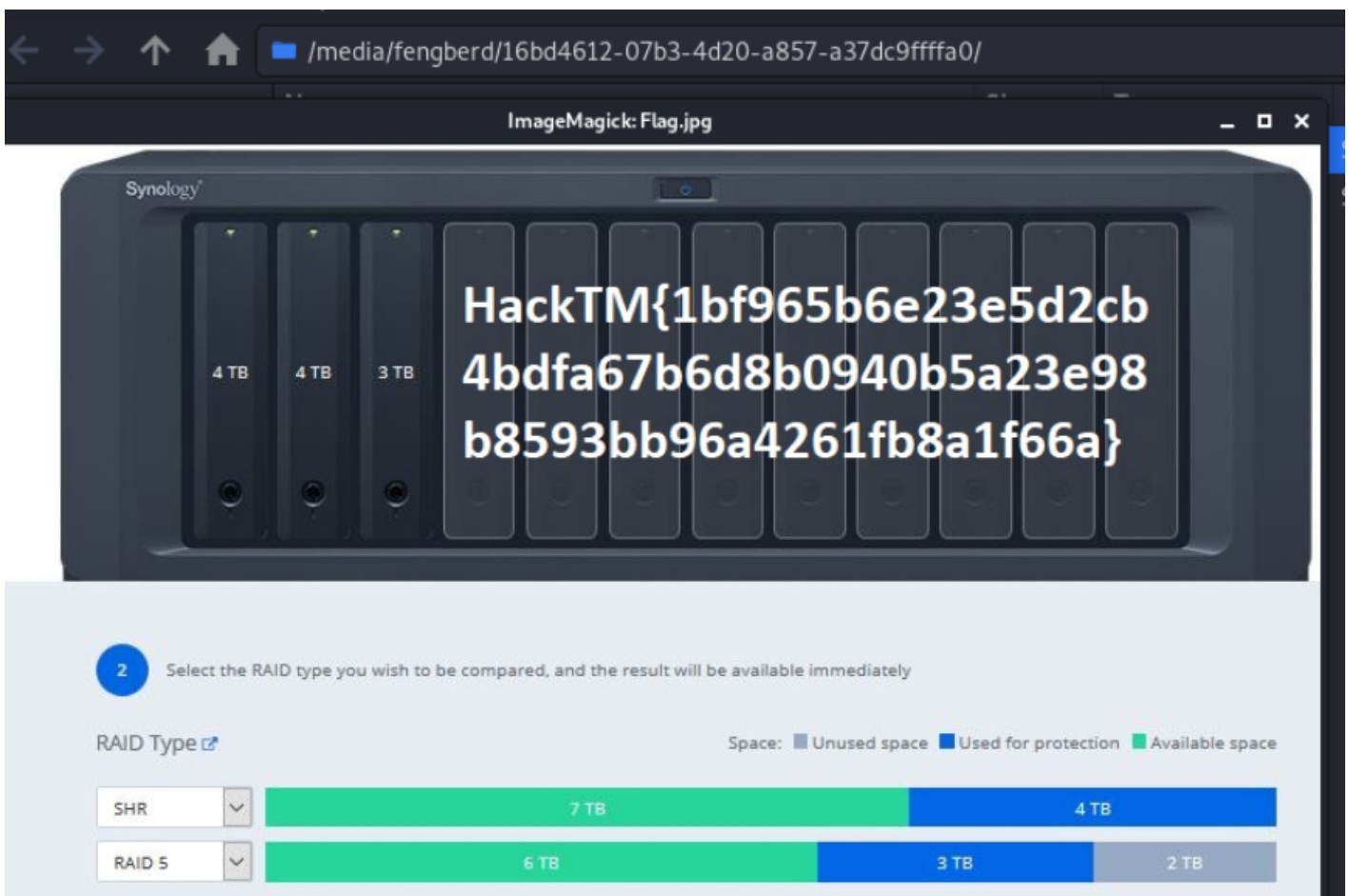
DECIMAL      HEXADECEMAL  DESCRIPTION
1048576      0x100000     Linux EXT filesystem, blocks count: 523264, image size: 535822336, rev 1.0, ext4 filesystem data, UUID=4b485c27-8a32-4116-b5c8-e541cbf3cbf3

DECIMAL      HEXADECEMAL  DESCRIPTION
1048576      0x100000     Linux EXT filesystem, blocks count: 523264, image size: 535822336, rev 1.0, ext4 filesystem data, UUID=7c004893-5625-4a6a-b3f2-562e72b272b2

root@Boschko 14:20:18 ~/CTF/blog
# mdadm --misc --examine 1.img
1.img:
  MBR Magic : aa55
  Partition[0] : 1046528 sectors at 2048 (type 83)
```

But there is a hole in this question. The beginning of the img file is filled with an invalid partition table. Using the file command or directly checking with mdadm will not be recognized as a RAID disk. Check with binwalk to find the correct offset.

Here, use dd to simply crop this file, and then use mdadm to view the detailed RAID information, it is indeed a RAID5. Next, create a loop and then do with losetup `mdadm --assemble --run /dev/md0 --readonly /dev/loop0 /dev/loop1` directly mount the hard drive on it. Here you go losetup -o rather use the dd process the file because encountered some mysterious Bug.





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