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TryHackMe: MBR and GPT Analysis

Learn how MBR and GPT forensics are carried out to identify attacks during the boot process.

David Varghese · Follow
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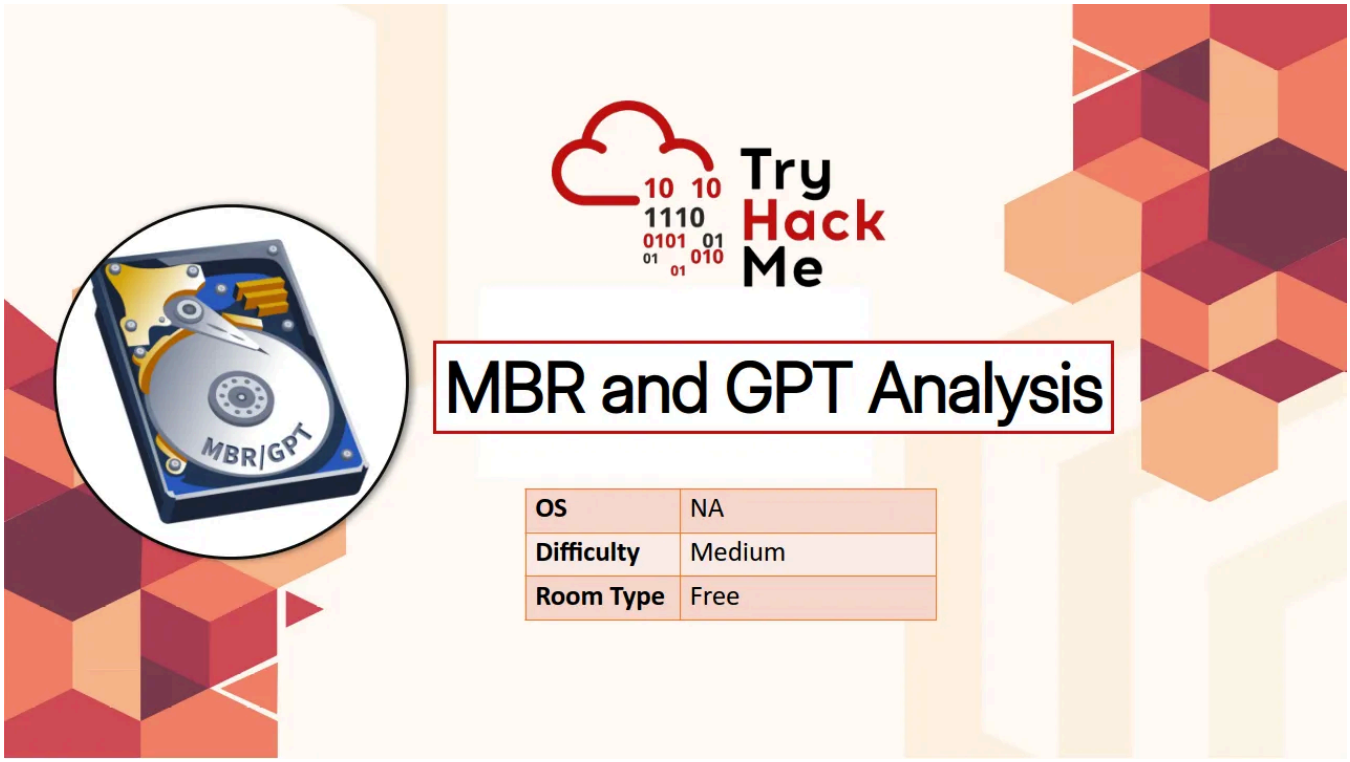

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MBR and GPT Analysis

Learn how MBR and GPT forensics are carried out to identify attacks during the boot process.

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> ⚠️ *Important*
>
> *Read the material that accompanies each task before taking a look at this guide. This guide will only cover content that is necessary to answer the questions.*

Task 1: Introduction

1. What are the separate sections on a disk known as?

Imagine your disk as a large building storing all the data. This data is stored in binary format, as 1s and 0s, for the computers to understand. The challenge here is that without properly organizing this data, it would be a mess in the whole disk. To solve this problem, the disk is divided into multiple partitions, just like rooms in the building, and each partition contains specific data. For example, operating system files can be stored in one partition, personal files can be stored in another, etc. In the Windows OS, these partitions are represented by drive letters such as **C**, **D**, **E**, etc. Other operating systems may use different ways to refer to these partitions.

> *Partition*

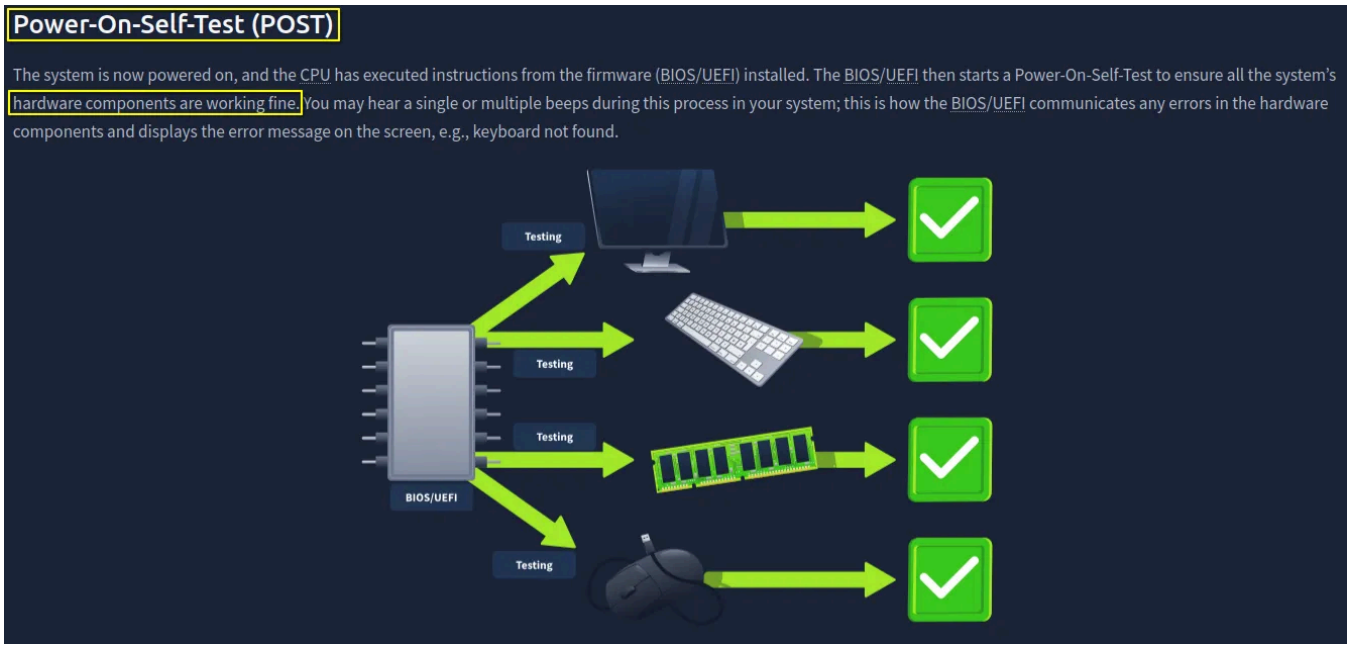
2. Which type of malware infects the boot process?

This solves the problem of organizing the data on the disk. However, the computer still needs a map that helps guide it through these partitions, where they start and end, and what they contain. **MBR** (Master Boot Record) and **GPT** (GUID Partition Table) are different partitioning schemes that act as a map for all of the partitions used in the disk. They are like a blueprint of the building (disk) containing all the rooms (partitions). Both partitioning schemes differ in structure and properties, and choosing between them depends on multiple factors, including the disk size, hardware compatibility, and much more. The MBR/GPT is located in the very first sector of the disk and contains information about the structure and partitions of the disk. It also plays a key role during the boot process of a system. Due to this, the MBR/GPT has become an attractive target for attackers to manipulate the boot process by embedding their malware, often known as Bootkits, or tampering with them to make the system un-bootable.

> *Bootkit*

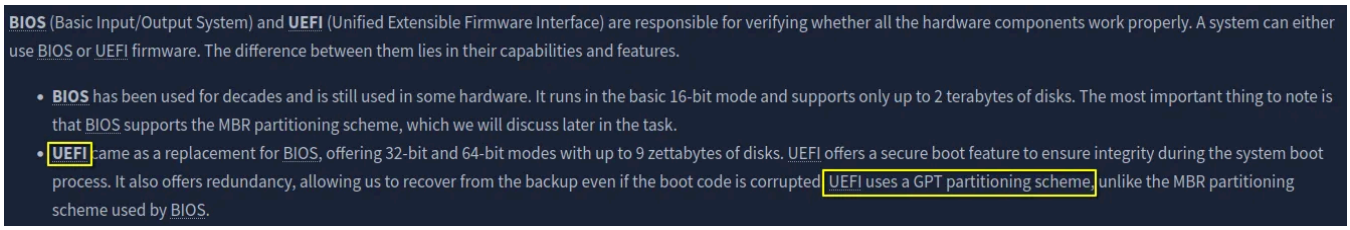
Task 2: Boot Process

1. What is the name of the hardware diagnostic check performed during the boot process?



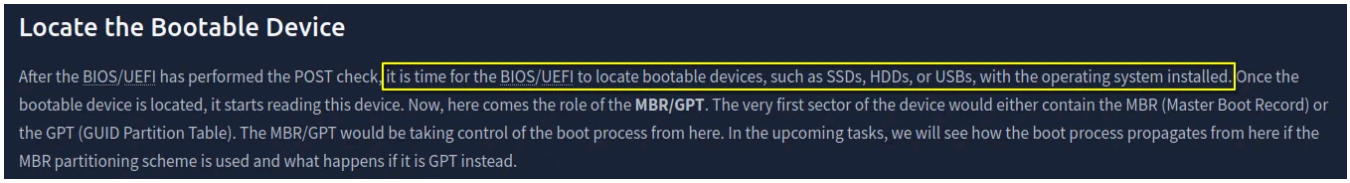
Power-On-Self-Test

2. Which firmware supports a GPT partitioning scheme?



UEFI

3. Which device has the operating system to boot the system?



Bootable Device

Task 3: What if MBR?

1. Which component of the MBR contains the details of all the partitions present on the disk?

Partitions Table (Bytes 446-509)

The second component of the MBR is the partition table, which comprises 64 bytes (Bytes 446-509). This table contains the details of all the partitions present on the disk. One of the partitions in the disk contains all the operating system files necessary for booting, known as a bootable partition. The initial bootloader that was started from the bootloader code of the MBR finds the bootable partition from this partition table, and it loads the second bootloader from it. The second bootloader then loads the **Operating System's Kernel**. A partition table is used during this boot process. However, this partition table can also give us valuable information during forensics. Let's dive into the details of this partition table.

An MBR disk has a total of 4 partitions, and each partition is represented by 16 bytes in the partition table. In the screenshot below, four partitions (each with 16 bytes) are highlighted with different colors.

> *Partition Table*

2. What is the standard sector size of a disk in bytes?

The bootable device, which was located in the 3rd step of the boot process, would be in the form of a disk. A disk is divided into multiple sectors, each with a standard size of 512 bytes. The first sector of this disk would contain the MBR. A disk's MBR can be viewed by taking the system's disk image and opening it in a hexadecimal editor.

We will be using the HxD tool, a hexadecimal editor available in the taskbar of the attached machine. Open the HxD tool, click the File button in the options tab, and select Open from the options. Now, you have to input the file's location to be opened. We have extracted the MBR portion from a disk image and saved it at `C:\Analysis\MBR`. You can select this file to examine the MBR for this task.

> *512*

3. Which component of the MBR is responsible for finding the bootable partition?

This Bootloader code contains the **Initial Bootloader**. The initial bootloader is the first thing that executes in the MBR. This initial bootloader code has a primary purpose of finding the bootable partition from the **partition table** present on the MBR.

Note: To better understand the initial bootloader code, it can be disassembled into assembly language, which is beyond the scope of this task.

> *Bootloader Code*

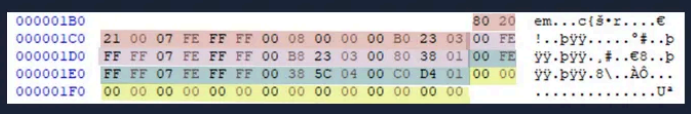
4. What is the magic number inside the MBR?

These two bytes `55 AA` are also known as a **Magic Number** and they indicate that the MBR has been ended now. If these two bytes are changed to some value other than `55 AA`, the system cannot boot. These bytes often get corrupted due to bad sectors on the disk and sometimes can be intentionally changed by malware to interrupt the normal boot process.

> *55 AA*

5. What is the maximum number of partitions MBR can support?

An MBR disk has a total of 4 partitions, and each partition is represented by 16 bytes in the partition table. In the screenshot below, four partitions (each with 16 bytes) are highlighted with different colors.



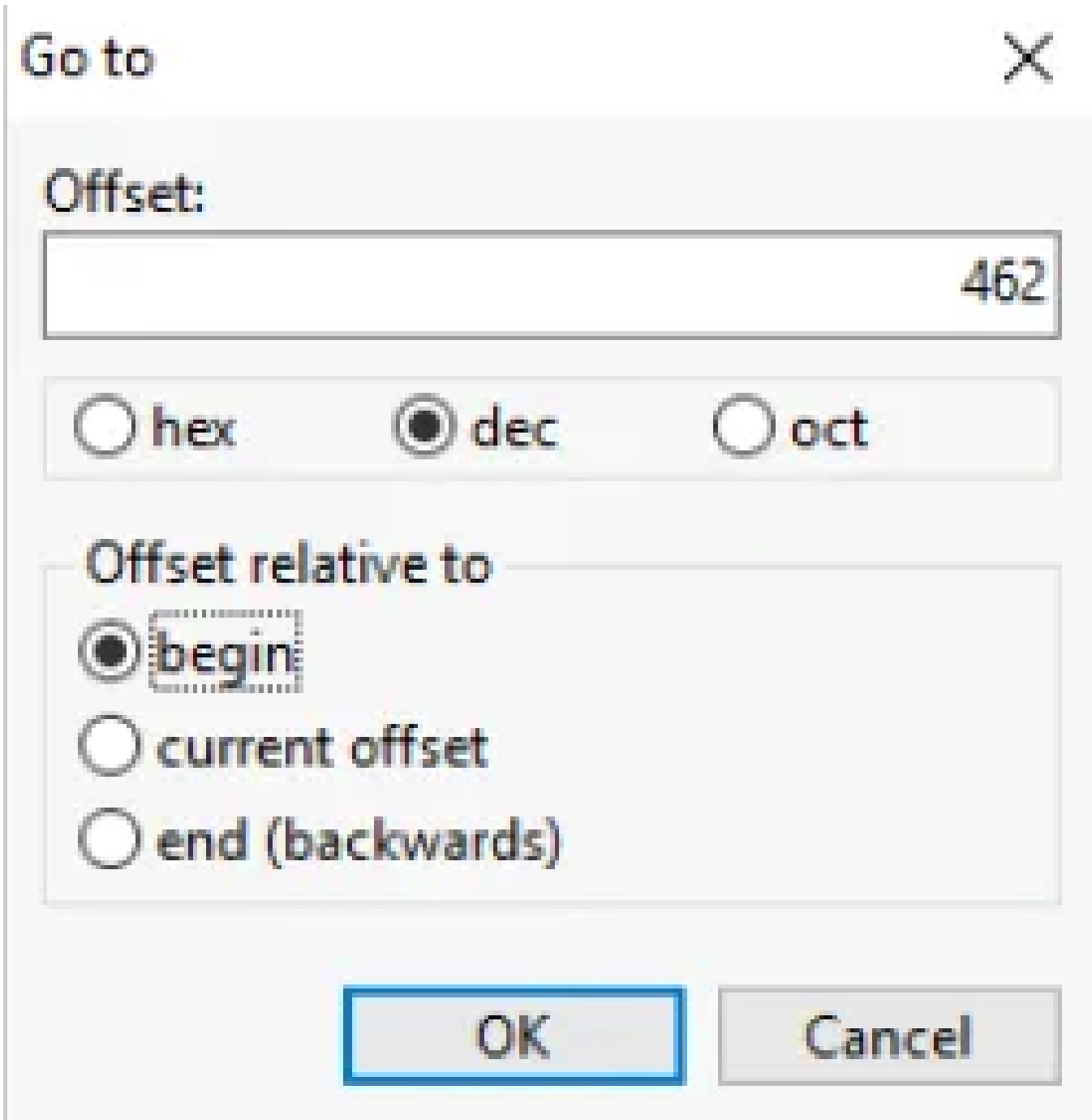
> *4*

6. What is the size of the second partition in the MBR attached to the machine? (rounded to the nearest GB)

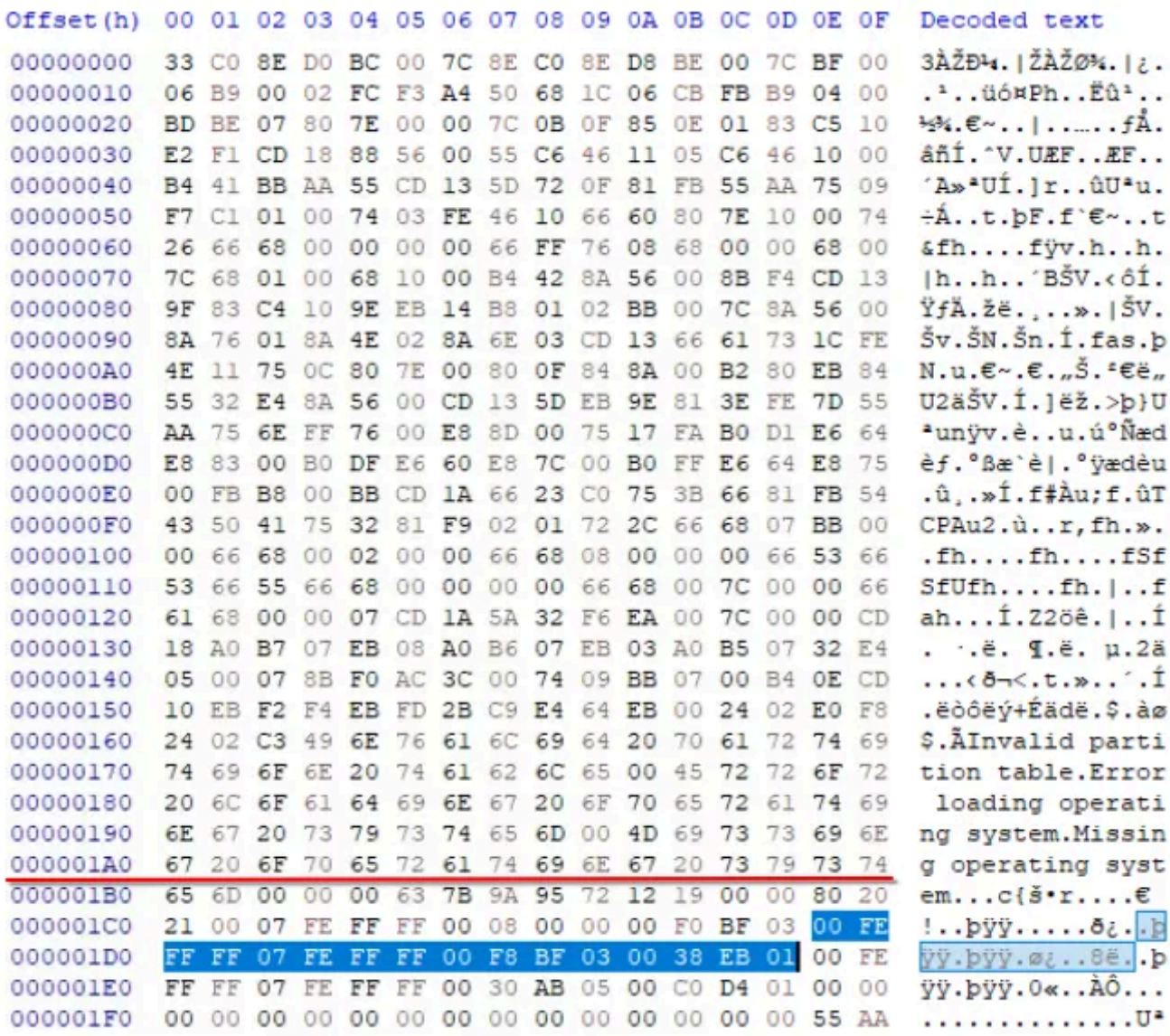
Launch the VM and load the MBR file in HxD Editor. To calculate the size of the partition we first need to locate the partition table.

From the write-up we know that the partition table starts at byte 446. We also know that each entry in the partition table is 16 bytes. Using this information we can deduce that the entry for the 2nd partition will start from byte `462` (446 + 16).

We can directly jump to this location using “Search → Go to”.

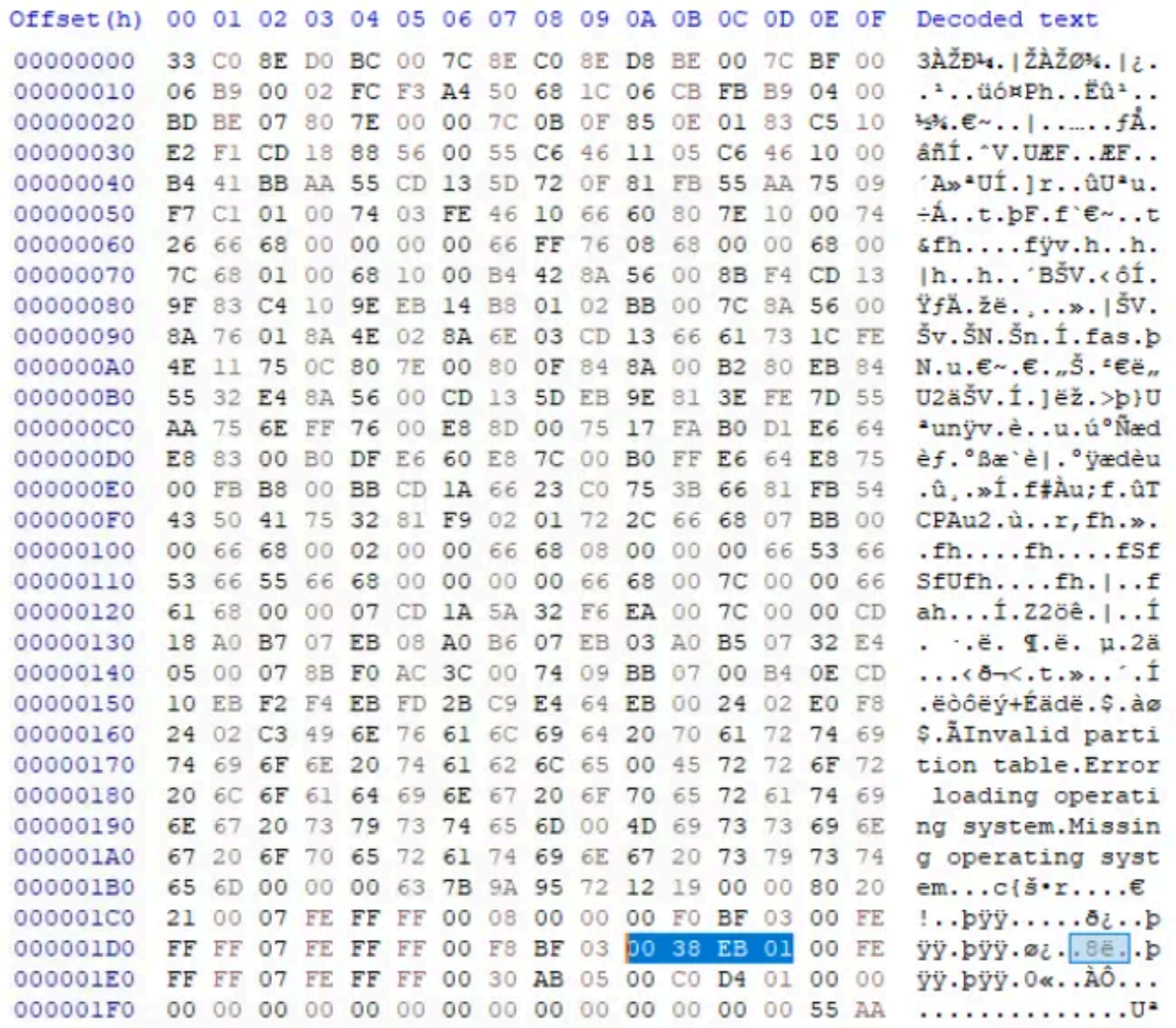


The below image shows the partition table entry for the 2nd partition.



Offset(h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	Decoded text
00000000	33	C0	8E	D0	BC	00	7C	8E	C0	8E	D8	BE	00	7C	BF	00	3ÀŽÐ¼.|ŽÀŽØ¾.|¿.
00000010	06	B9	00	02	FC	F3	A4	50	68	1C	06	CB	FB	B9	04	00	.¹..üó¤Ph..ËÛ¹..
00000020	BD	BE	07	80	7E	00	00	7C	0B	0F	85	0E	01	83	C5	10	½¾.€~..|.…..ƒÅ.
00000030	E2	F1	CD	18	88	56	00	55	C6	46	11	05	C6	46	10	00	âñÍ.ˆV.UÆF..ÆF..
00000040	B4	41	BB	AA	55	CD	13	5D	72	0F	81	FB	55	AA	75	09	´A»ªUÍ.]r..ûUªu.
00000050	F7	C1	01	00	74	03	FE	46	10	66	60	80	7E	10	00	74	÷Á..t.þF.f`€~..t
00000060	26	66	68	00	00	00	00	66	FF	76	08	68	00	00	68	00	&fh....fÿv.h..h.
00000070	7C	68	01	00	68	10	00	B4	42	8A	56	00	8B	F4	CD	13	|h..h..´BŠV.‹ôÍ.
00000080	9F	83	C4	10	9E	EB	14	B8	01	02	BB	00	7C	8A	56	00	ŸƒÄ.žë.¸..».|ŠV.
00000090	8A	76	01	8A	4E	02	8A	6E	03	CD	13	66	61	73	1C	FE	Šv.ŠN.Šn.Í.fas.þ
000000A0	4E	11	75	0C	80	7E	00	80	0F	84	8A	00	B2	80	EB	84	N.u.€~.€.„Š.²€ë„
000000B0	55	32	E4	8A	56	00	CD	13	5D	EB	9E	81	3E	FE	7D	55	U2äŠV.Í.]ëž.>þ}U
000000C0	AA	75	6E	FF	76	00	E8	8D	00	75	17	FA	B0	D1	E6	64	ªunÿv.è..u.ú°Ñæd
000000D0	E8	83	00	B0	DF	E6	60	E8	7C	00	B0	FF	E6	64	E8	75	èƒ.°ßæ`è|.°ÿædèu
000000E0	00	FB	B8	00	BB	CD	1A	66	23	C0	75	3B	66	81	FB	54	.û¸.»Í.f#Àu;f.ûT
000000F0	43	50	41	75	32	81	F9	02	01	72	2C	66	68	07	BB	00	CPAu2.ù..r,fh.».
00000100	00	66	68	00	02	00	00	66	68	08	00	00	00	66	53	66	.fh....fh....fSf
00000110	53	66	55	66	68	00	00	00	00	66	68	00	7C	00	00	66	SfUfh....fh.|..f
00000120	61	68	00	00	07	CD	1A	5A	32	F6	EA	00	7C	00	00	CD	ah...Í.Z2öê.|..Í
00000130	18	A0	B7	07	EB	08	A0	B6	07	EB	03	A0	B5	07	32	E4	. ·.ë. ¶.ë. µ.2ä
00000140	05	00	07	8B	F0	AC	3C	00	74	09	BB	07	00	B4	0E	CD	...‹ð¬<.t.»..´.Í
00000150	10	EB	F2	F4	EB	FD	2B	C9	E4	64	EB	00	24	02	E0	F8	.ëòôëý+Éädë.$.àø
00000160	24	02	C3	49	6E	76	61	6C	69	64	20	70	61	72	74	69	$.ÃInvalid parti
00000170	74	69	6F	6E	20	74	61	62	6C	65	00	45	72	72	6F	72	tion table.Error
00000180	20	6C	6F	61	64	69	6E	67	20	6F	70	65	72	61	74	69	loading operati
00000190	6E	67	20	73	79	73	74	65	6D	00	4D	69	73	73	69	6E	ng system.Missin
000001A0	67	20	6F	70	65	72	61	74	69	6E	67	20	73	79	73	74	g operating syst
000001B0	65	6D	00	00	00	63	7B	9A	95	72	12	19	00	00	80	20	em...c{š•r....€
000001C0	21	00	07	FE	FF	FF	00	08	00	00	00	F0	BF	03	00	FE	!..þÿÿ.....ð¿..þ
000001D0	FF	FF	07	FE	FF	FF	00	F8	BF	03	00	38	EB	01	00	FE	ÿÿ.þÿÿ.ø¿..8ë..þ
000001E0	FF	FF	07	FE	FF	FF	00	30	AB	05	00	C0	D4	01	00	00	ÿÿ.þÿÿ.0«..ÀÔ...
000001F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	55	AA	..............Uª

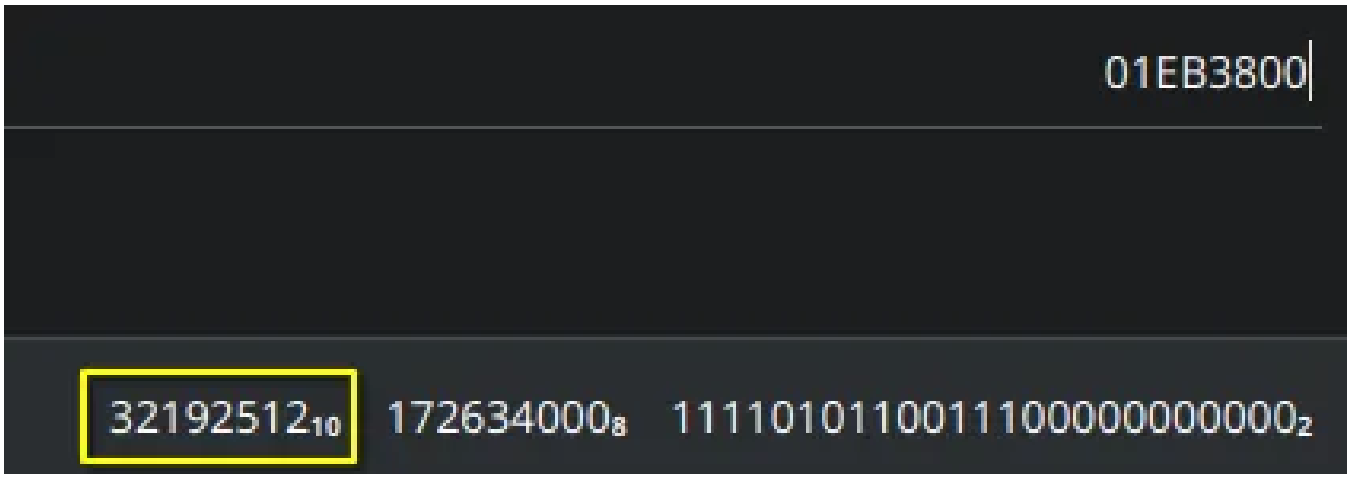
From the table provided in the write-up we know that the last 4 bytes of the partition table entry contains the count of sectors in a partition.



Offset(h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	Decoded text
00000000	33	C0	8E	D0	BC	00	7C	8E	C0	8E	D8	BE	00	7C	BF	00	3ÀŽÐ¼.|ŽÀŽØ¾.|¿.
00000010	06	B9	00	02	FC	F3	A4	50	68	1C	06	CB	FB	B9	04	00	.¹..üó¤Ph..ËÛ¹..
00000020	BD	BE	07	80	7E	00	00	7C	0B	0F	85	0E	01	83	C5	10	½¾.€~..|.....ƒÅ.
00000030	E2	F1	CD	18	88	56	00	55	C6	46	11	05	C6	46	10	00	âñÍ.ˆV.UÆF..ÆF..
00000040	B4	41	BB	AA	55	CD	13	5D	72	0F	81	FB	55	AA	75	09	´A»ªUÍ.]r..ûUªu.
00000050	F7	C1	01	00	74	03	FE	46	10	66	60	80	7E	10	00	74	÷Á..t.þF.f`€~..t
00000060	26	66	68	00	00	00	00	66	FF	76	08	68	00	00	68	00	&fh....fÿv.h..h.
00000070	7C	68	01	00	68	10	00	B4	42	8A	56	00	8B	F4	CD	13	|h..h..´BŠV.‹ôÍ.
00000080	9F	83	C4	10	9E	EB	14	B8	01	02	BB	00	7C	8A	56	00	ŸƒÄ.žë.¸...».|ŠV.
00000090	8A	76	01	8A	4E	02	8A	6E	03	CD	13	66	61	73	1C	FE	Šv.ŠN.Šn.Í.fas.þ
000000A0	4E	11	75	0C	80	7E	00	80	0F	84	8A	00	B2	80	EB	84	N.u.€~.€.„Š.²€ë„
000000B0	55	32	E4	8A	56	00	CD	13	5D	EB	9E	81	3E	FE	7D	55	U2äŠV.Í.]ëž.>þ}U
000000C0	AA	75	6E	FF	76	00	E8	8D	00	75	17	FA	B0	D1	E6	64	ªunÿv.è..u.ú°Ñæd
000000D0	E8	83	00	B0	DF	E6	60	E8	7C	00	B0	FF	E6	64	E8	75	èƒ.°ßæ`è|.°ÿædèu
000000E0	00	FB	B8	00	BB	CD	1A	66	23	C0	75	3B	66	81	FB	54	.û¸.»Í.f#Àu;f.ûT
000000F0	43	50	41	75	32	81	F9	02	01	72	2C	66	68	07	BB	00	CPAu2.ù..r,fh.».
00000100	00	66	68	00	02	00	00	66	68	08	00	00	00	66	53	66	.fh....fh....fSf
00000110	53	66	55	66	68	00	00	00	00	66	68	00	7C	00	00	66	SfUfh....fh.|..f
00000120	61	68	00	00	07	CD	1A	5A	32	F6	EA	00	7C	00	00	CD	ah...Í.Z2öê.|..Í
00000130	18	A0	B7	07	EB	08	A0	B6	07	EB	03	A0	B5	07	32	E4	. ·.ë. ¶.ë. µ.2ä
00000140	05	00	07	8B	F0	AC	3C	00	74	09	BB	07	00	B4	0E	CD	...‹ð¬<.t.»..´.Í
00000150	10	EB	F2	F4	EB	FD	2B	C9	E4	64	EB	00	24	02	E0	F8	.ëòôëý+Éädë.$.àø
00000160	24	02	C3	49	6E	76	61	6C	69	64	20	70	61	72	74	69	$.ÃInvalid parti
00000170	74	69	6F	6E	20	74	61	62	6C	65	00	45	72	72	6F	72	tion table.Error
00000180	20	6C	6F	61	64	69	6E	67	20	6F	70	65	72	61	74	69	loading operati
00000190	6E	67	20	73	79	73	74	65	6D	00	4D	69	73	73	69	6E	ng system.Missin
000001A0	67	20	6F	70	65	72	61	74	69	6E	67	20	73	79	73	74	g operating syst
000001B0	65	6D	00	00	00	63	7B	9A	95	72	12	19	00	00	80	20	em...c{š•r....€
000001C0	21	00	07	FE	FF	FF	00	08	00	00	00	F0	BF	03	00	FE	!..þÿÿ.....ð¿..þ
000001D0	FF	FF	07	FE	FF	FF	00	F8	BF	03	00	38	EB	01	00	FE	ÿÿ.þÿÿ.ø¿..8ë..þ
000001E0	FF	FF	07	FE	FF	FF	00	30	AB	05	00	C0	D4	01	00	00	ÿÿ.þÿÿ.0«..ÀÔ...
000001F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	55	AA	..............Uª

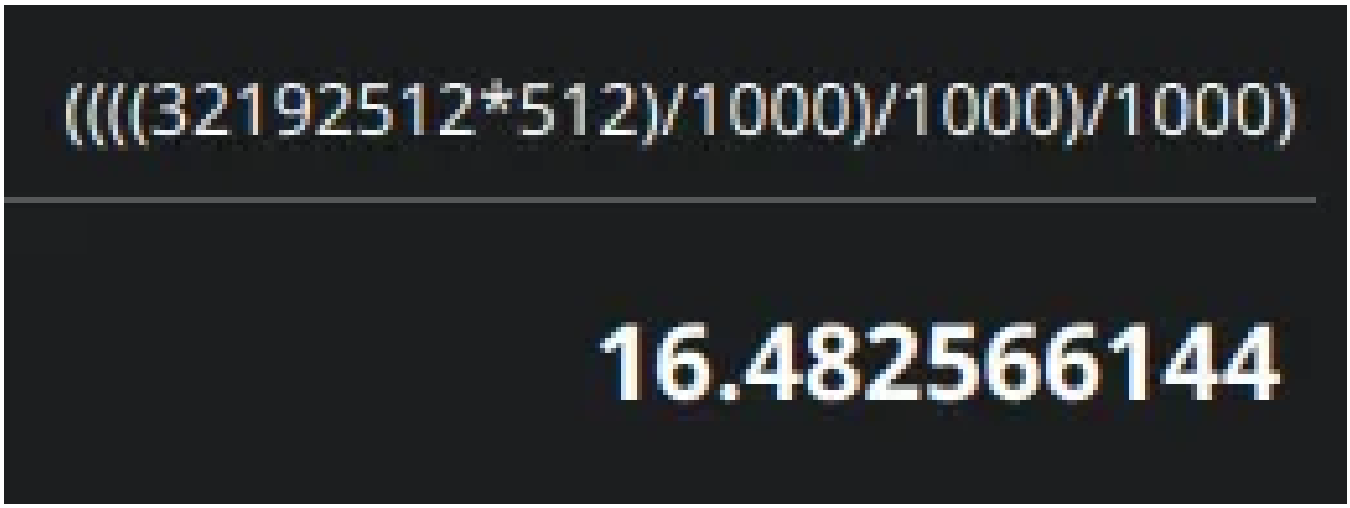
The value store in the partition table uses little-endian representation, we need to reverse the bytes to get the big-endian representation so that we can convert it to decimal.

`00 38 EB 01` becomes `01 EB 38 00` in big-endian representation. When this hex value is converted to decimal we get `3219512` . We know that each sector is `512` bytes. To get the size of the partition we need to multiply the sector count with the sector size. This gives us `16482566144` (32192512 * 512). This is the size of the partition in bytes.



> *Note*
> *Disk size can be represented as a multiple of 2 (1 KB = 1024 bytes) or multiple of 10 (1 KB = 1000 bytes). The notation that is used depends on the OS. Windows and Linux use the binary notation (1024 bytes) while MacOS uses the decimal notation (1000 bytes). Most disk manufactures also use the decimal notation as it makes their disk appear larger.*

This room expects the sizes in multiples of 10. So to convert bytes to gigabytes we have to divide the `16482566144` trice by 1000 (B → KB → MB → GB).



> *16*

Task 4: Threats Targeting MBR

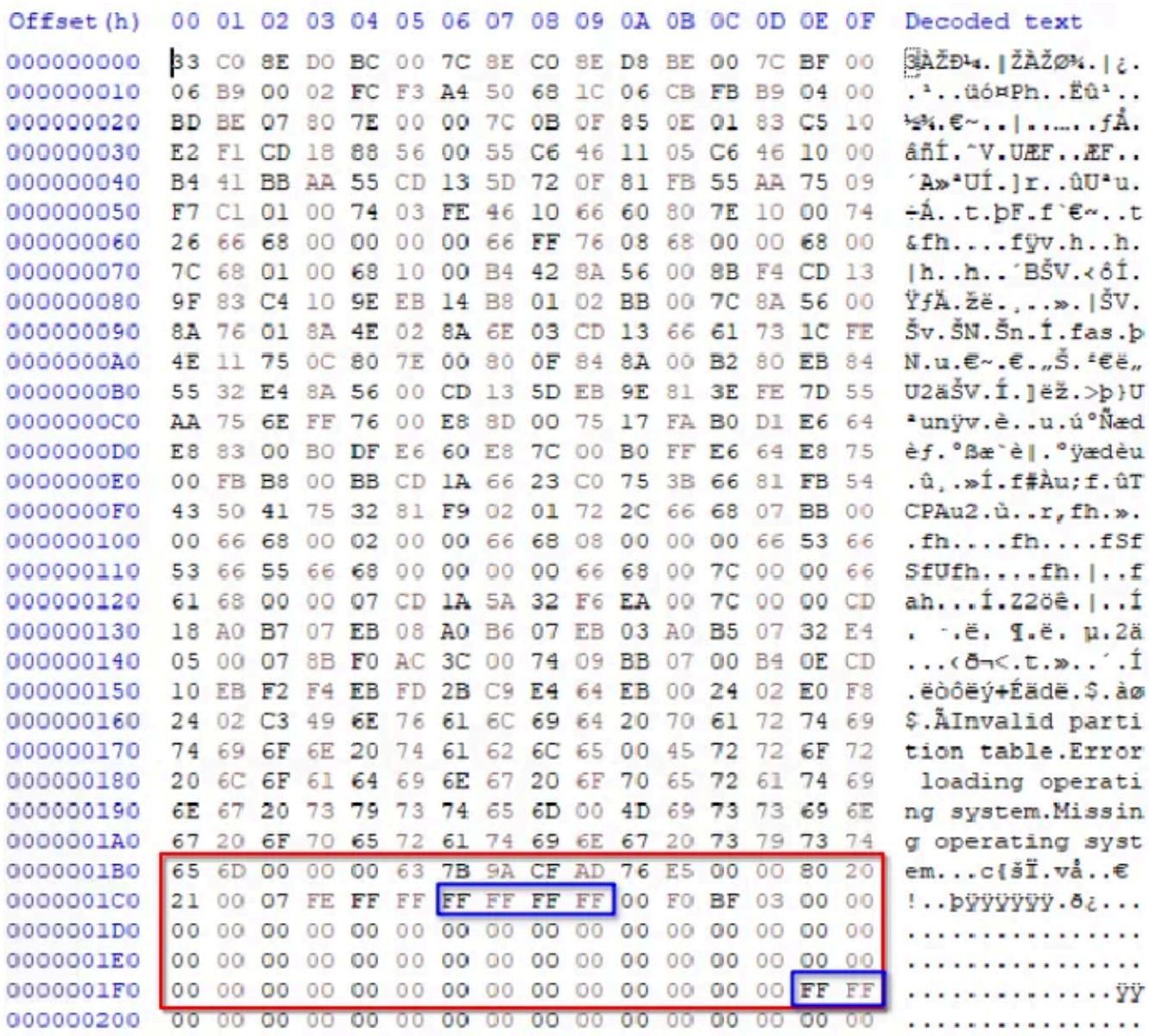
1. Complete this task.

> *No answer required*

Task 5: MBR Tampering Case

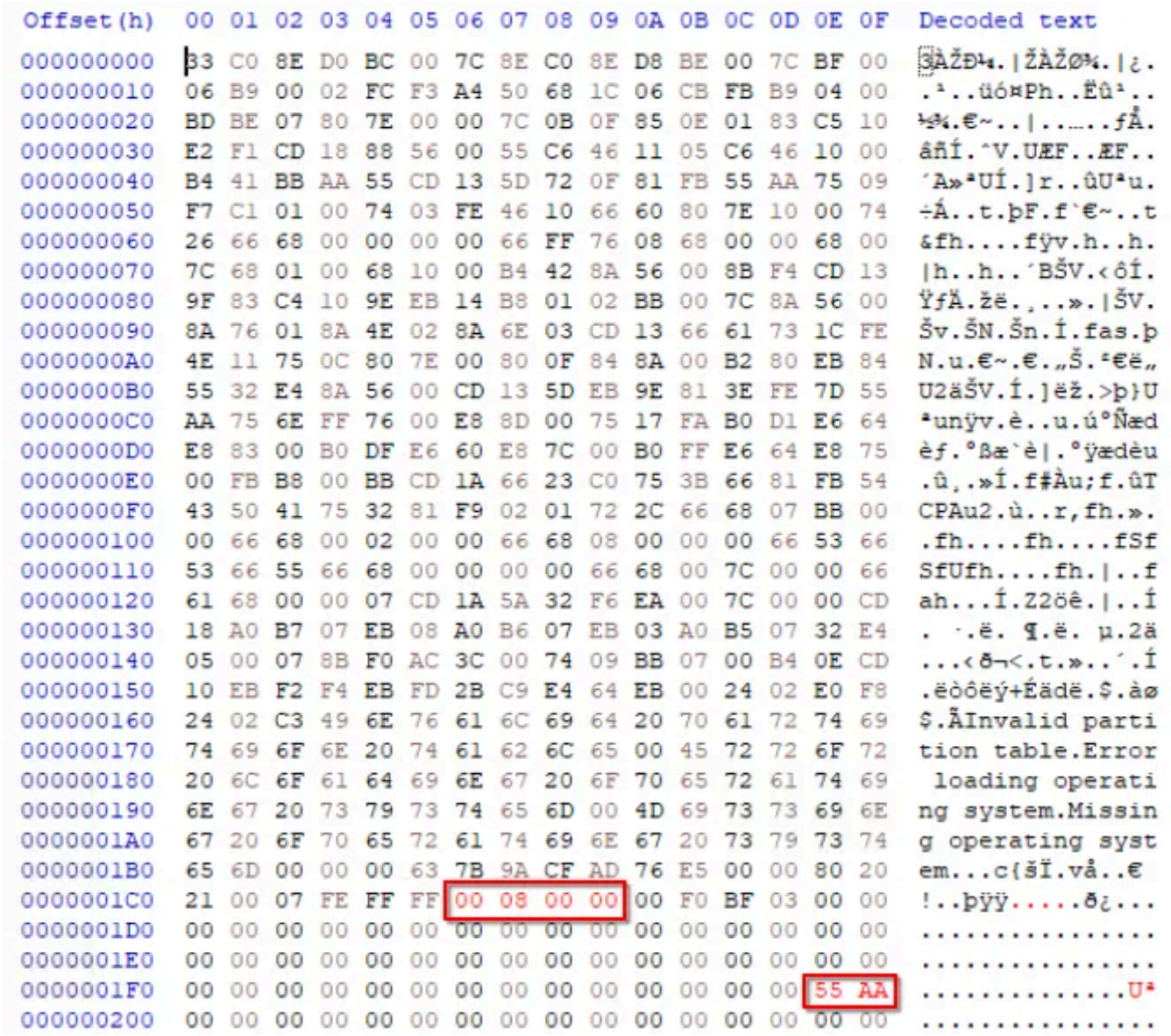
In this task we have been instructed to fix `MBR_Corrupted_Disk`. On loading the image in HxD we can see that the Magic Number of the MBR partition is corrupted (correct

value is `55 AA`). We are also told in the write-up that the LBA field of the bootable partition has been corrupted.



Offset (h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	Decoded text
000000000	33	C0	8E	D0	BC	00	7C	8E	C0	8E	D8	BE	00	7C	BF	00	3ÀŽÐ¼.|ŽÀŽØ¾.|¿.
000000010	06	B9	00	02	FC	F3	A4	50	68	1C	06	CB	FB	B9	04	00	.¹..üó¤Ph..Ëû¹..
000000020	BD	BE	07	80	7E	00	00	7C	0B	0F	85	0E	01	83	C5	10	½¾.€~..|.…..ƒÅ.
000000030	E2	F1	CD	18	88	56	00	55	C6	46	11	05	C6	46	10	00	âñÍ.ˆV.UÆF..ÆF..
000000040	B4	41	BB	AA	55	CD	13	5D	72	0F	81	FB	55	AA	75	09	´A»ªUÍ.]r..ûUªu.
000000050	F7	C1	01	00	74	03	FE	46	10	66	60	80	7E	10	00	74	÷Á..t.þF.f`€~..t
000000060	26	66	68	00	00	00	00	66	FF	76	08	68	00	00	68	00	&fh....fÿv.h..h.
000000070	7C	68	01	00	68	10	00	B4	42	8A	56	00	8B	F4	CD	13	|h..h..´BŠV.‹ôÍ.
000000080	9F	83	C4	10	9E	EB	14	B8	01	02	BB	00	7C	8A	56	00	Ÿƒ Ä.žë.¸..».|ŠV.
000000090	8A	76	01	8A	4E	02	8A	6E	03	CD	13	66	61	73	1C	FE	Šv.ŠN.Šn.Í.fas.þ
0000000A0	4E	11	75	0C	80	7E	00	80	0F	84	8A	00	B2	80	EB	84	N.u.€~.€.„Š.²€ë„
0000000B0	55	32	E4	8A	56	00	CD	13	5D	EB	9E	81	3E	FE	7D	55	U2äŠV.Í.]ëž.>þ}U
0000000C0	AA	75	6E	FF	76	00	E8	8D	00	75	17	FA	B0	D1	E6	64	ªunÿv.è..u.ú°Ñæd
0000000D0	E8	83	00	B0	DF	E6	60	E8	7C	00	B0	FF	E6	64	E8	75	èƒ.°ßæ`è|.°ÿædèu
0000000E0	00	FB	B8	00	BB	CD	1A	66	23	C0	75	3B	66	81	FB	54	.û¸.»Í.f#Àu;f.ûT
0000000F0	43	50	41	75	32	81	F9	02	01	72	2C	66	68	07	BB	00	CPAu2.ù..r,fh.».
000000100	00	66	68	00	02	00	00	66	68	08	00	00	00	66	53	66	.fh....fh....fSf
000000110	53	66	55	66	68	00	00	00	00	66	68	00	7C	00	00	66	SfUfh....fh.|..f
000000120	61	68	00	00	07	CD	1A	5A	32	F6	EA	00	7C	00	00	CD	ah...Í.Z2öê.|..Í
000000130	18	A0	B7	07	EB	08	A0	B6	07	EB	03	A0	B5	07	32	E4	. ·.ë. ¶.ë. µ.2ä
000000140	05	00	07	8B	F0	AC	3C	00	74	09	BB	07	00	B4	0E	CD	...‹ð¬<.t.».´.Í
000000150	10	EB	F2	F4	EB	FD	2B	C9	E4	64	EB	00	24	02	E0	F8	.ëòôëý+Éädë.$.àø
000000160	24	02	C3	49	6E	76	61	6C	69	64	20	70	61	72	74	69	$.ÃInvalid parti
000000170	74	69	6F	6E	20	74	61	62	6C	65	00	45	72	72	6F	72	tion table.Error
000000180	20	6C	6F	61	64	69	6E	67	20	6F	70	65	72	61	74	69	loading operati
000000190	6E	67	20	73	79	73	74	65	6D	00	4D	69	73	73	69	6E	ng system.Missin
0000001A0	67	20	6F	70	65	72	61	74	69	6E	67	20	73	79	73	74	g operating syst
0000001B0	65	6D	00	00	00	63	7B	9A	CF	AD	76	E5	00	00	80	20	em...c{šÏ.vå..€
0000001C0	21	00	07	FE	FF	FF	FF	FF	FF	FF	00	F0	BF	03	00	00	!..þÿÿÿÿÿÿ.ð¿...
0000001D0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0000001E0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0000001F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	FF	FF	.....ÿÿ
000000200	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....

The values can be modified by double clicking in the hex editor and then typing the new value. Once done save the file to persist the changes.



Offset(h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	Decoded text
000000000	33	C0	8E	D0	BC	00	7C	8E	C0	8E	D8	BE	00	7C	BF	00	3ÀŽÐ¼.|ŽÀŽØ¾.|¿.
000000010	06	B9	00	02	FC	F3	A4	50	68	1C	06	CB	FB	B9	04	00	.¹..üó¤Ph..ËÛ¹..
000000020	BD	BE	07	80	7E	00	00	7C	0B	0F	85	0E	01	83	C5	10	½¾.€~..|.....ƒÅ.
000000030	E2	F1	CD	18	88	56	00	55	C6	46	11	05	C6	46	10	00	âñÍ.ˆV.UÆF..ÆF..
000000040	B4	41	BB	AA	55	CD	13	5D	72	0F	81	FB	55	AA	75	09	´A»ªUÍ.]r..ûUªu.
000000050	F7	C1	01	00	74	03	FE	46	10	66	60	80	7E	10	00	74	÷Á..t.þF.f`€~..t
000000060	26	66	68	00	00	00	00	66	FF	76	08	68	00	00	68	00	&fh....fÿv.h..h.
000000070	7C	68	01	00	68	10	00	B4	42	8A	56	00	8B	F4	CD	13	|h..h..´BŠV.‹ôÍ.
000000080	9F	83	C4	10	9E	EB	14	B8	01	02	BB	00	7C	8A	56	00	ŸƒÄ.žë.¸..».|ŠV.
000000090	8A	76	01	8A	4E	02	8A	6E	03	CD	13	66	61	73	1C	FE	Šv.ŠN.Šn.Í.fas.þ
0000000A0	4E	11	75	0C	80	7E	00	80	0F	84	8A	00	B2	80	EB	84	N.u.€~.€.„Š.²€ë„
0000000B0	55	32	E4	8A	56	00	CD	13	5D	EB	9E	81	3E	FE	7D	55	U2äŠV.Í.]ëž.>þ}U
0000000C0	AA	75	6E	FF	76	00	E8	8D	00	75	17	FA	B0	D1	E6	64	ªunÿv.è..u.ú°Ñæd
0000000D0	E8	83	00	B0	DF	E6	60	E8	7C	00	B0	FF	E6	64	E8	75	èƒ.°ßæ`è|.°ÿædèu
0000000E0	00	FB	B8	00	BB	CD	1A	66	23	C0	75	3B	66	81	FB	54	.û¸.»Í.f#Àu;f.ûT
0000000F0	43	50	41	75	32	81	F9	02	01	72	2C	66	68	07	BB	00	CPAu2.ù..r,fh.».
000000100	00	66	68	00	02	00	00	66	68	08	00	00	00	66	53	66	.fh....fh....fSf
000000110	53	66	55	66	68	00	00	00	00	66	68	00	7C	00	00	66	SfUfh....fh.|..f
000000120	61	68	00	00	07	CD	1A	5A	32	F6	EA	00	7C	00	00	CD	ah...Í.Z2öê.|..Í
000000130	18	A0	B7	07	EB	08	A0	B6	07	EB	03	A0	B5	07	32	E4	. ·.ë. ¶.ë. µ.2ä
000000140	05	00	07	8B	F0	AC	3C	00	74	09	BB	07	00	B4	0E	CD	...‹ð¬<.t.».´.Í
000000150	10	EB	F2	F4	EB	FD	2B	C9	E4	64	EB	00	24	02	E0	F8	.ëòôëý+Éädë.$.àø
000000160	24	02	C3	49	6E	76	61	6C	69	64	20	70	61	72	74	69	$.ÃInvalid parti
000000170	74	69	6F	6E	20	74	61	62	6C	65	00	45	72	72	6F	72	tion table.Error
000000180	20	6C	6F	61	64	69	6E	67	20	6F	70	65	72	61	74	69	loading operati
000000190	6E	67	20	73	79	73	74	65	6D	00	4D	69	73	73	69	6E	ng system.Missin
0000001A0	67	20	6F	70	65	72	61	74	69	6E	67	20	73	79	73	74	g operating syst
0000001B0	65	6D	00	00	00	63	7B	9A	CF	AD	76	E5	00	00	80	20	em...c{šÏ.vå..€
0000001C0	21	00	07	FE	FF	FF	00	08	00	00	00	F0	BF	03	00	00	!..þÿÿ.....ð¿...
0000001D0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0000001E0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....
0000001F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	55	AA	.....UA
000000200	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	.....

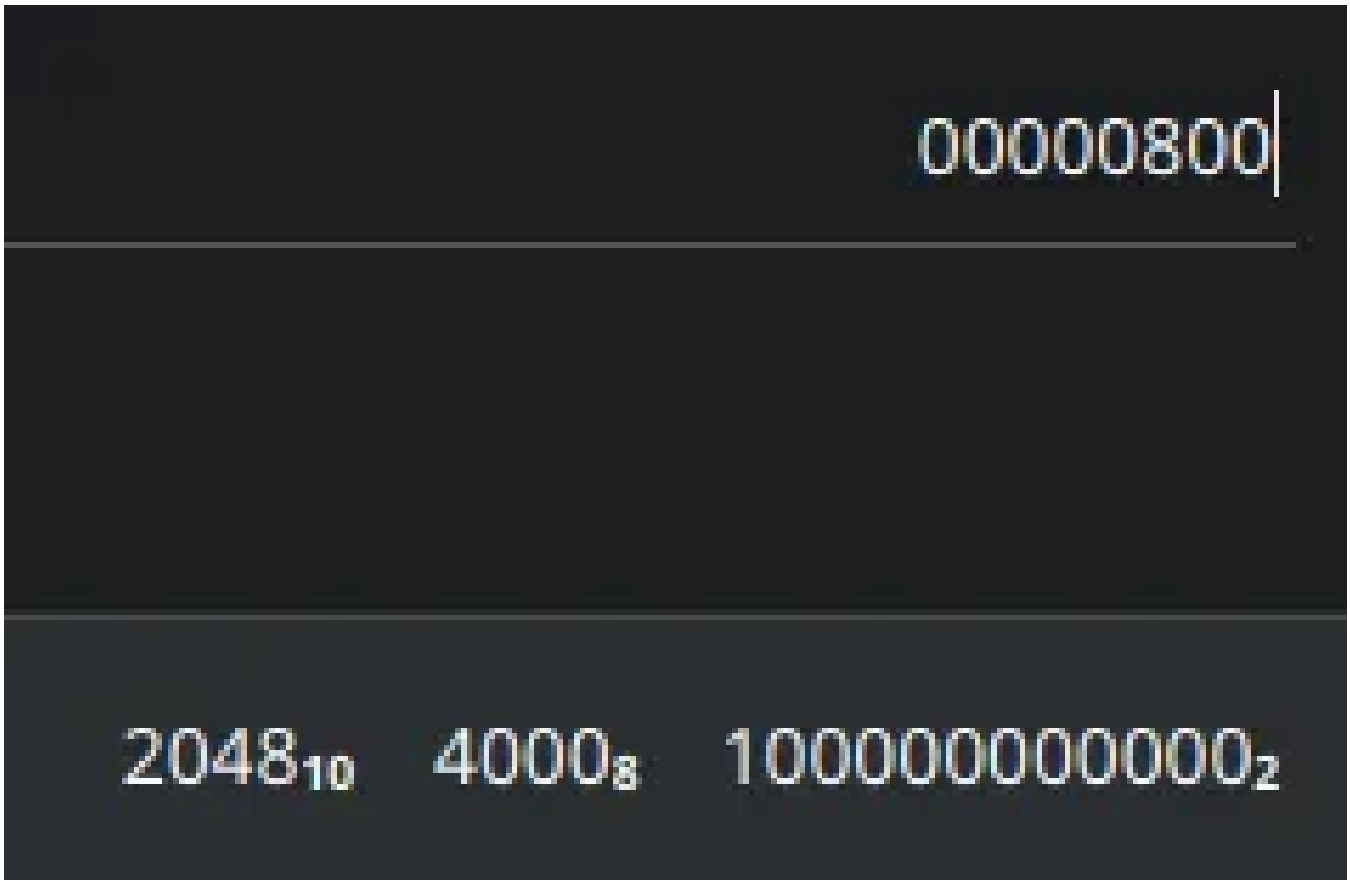
1. How many partitions are on the disk?

If we look at the above images we can see that only the first 16 bytes in the partition table has any value. Every byte after that is set to 0. From this we can conclude that this disk only has a single partition.

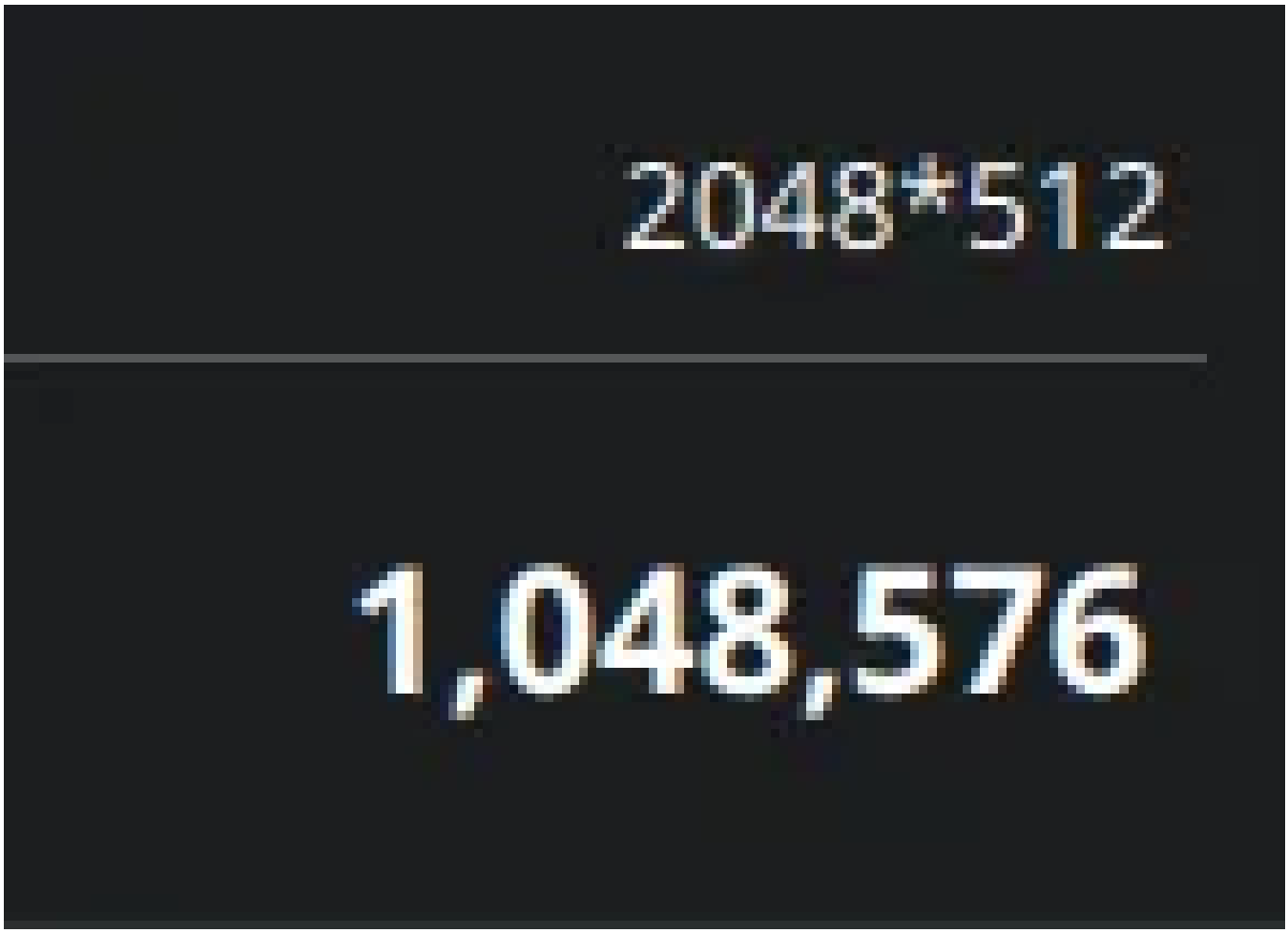
> *1*

2. What is the first byte at the starting LBA of the partition? (represented by two hexadecimal digits)

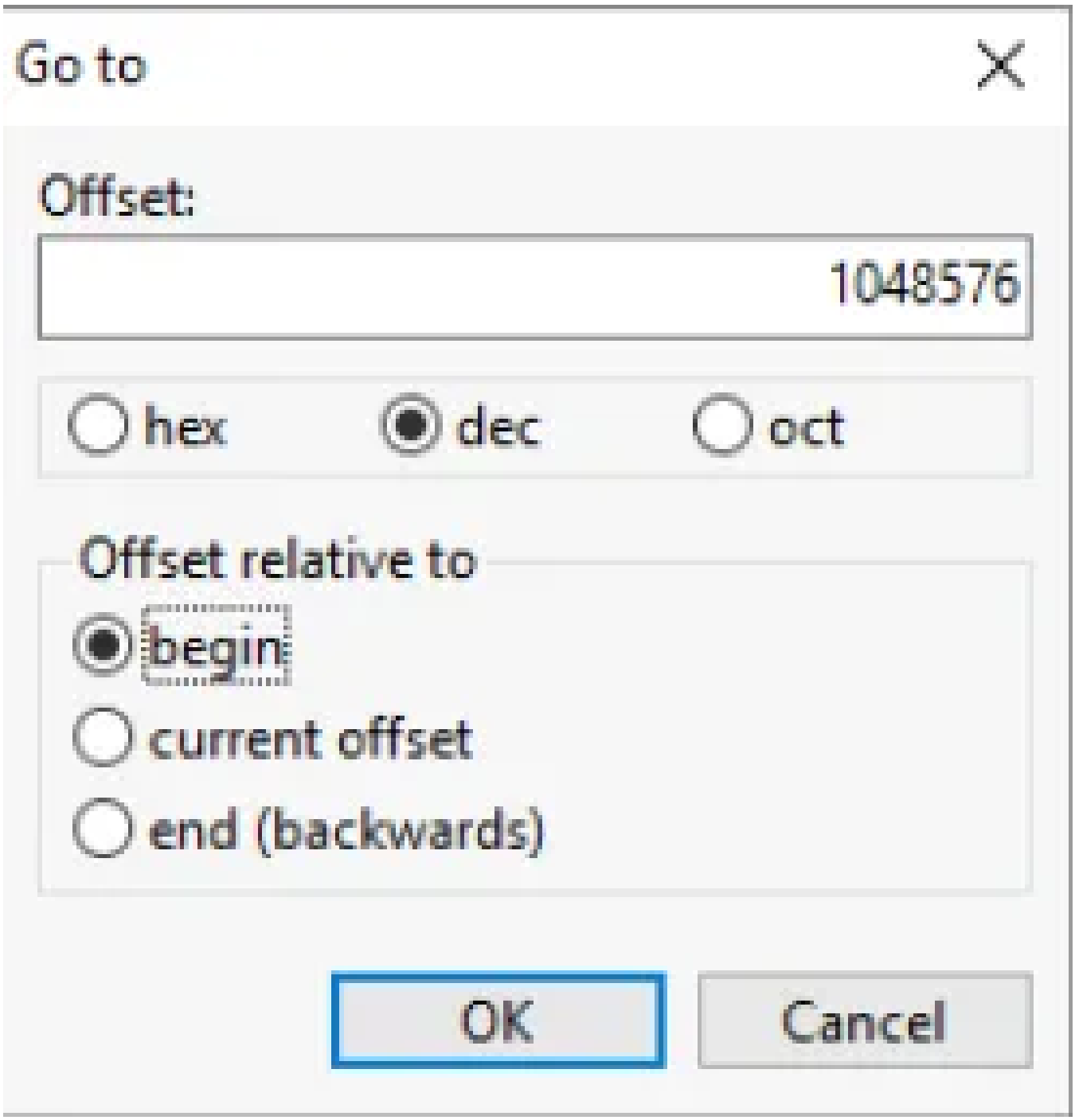
From the write-up we know that the LBA address field contains the sector from which the data for this partition starts. Since this value is in little-endian we need to reverse it to get the big-endian notation. Once its reversed we can calculate the decimal value. The data for the partition starts at sector `2048`.



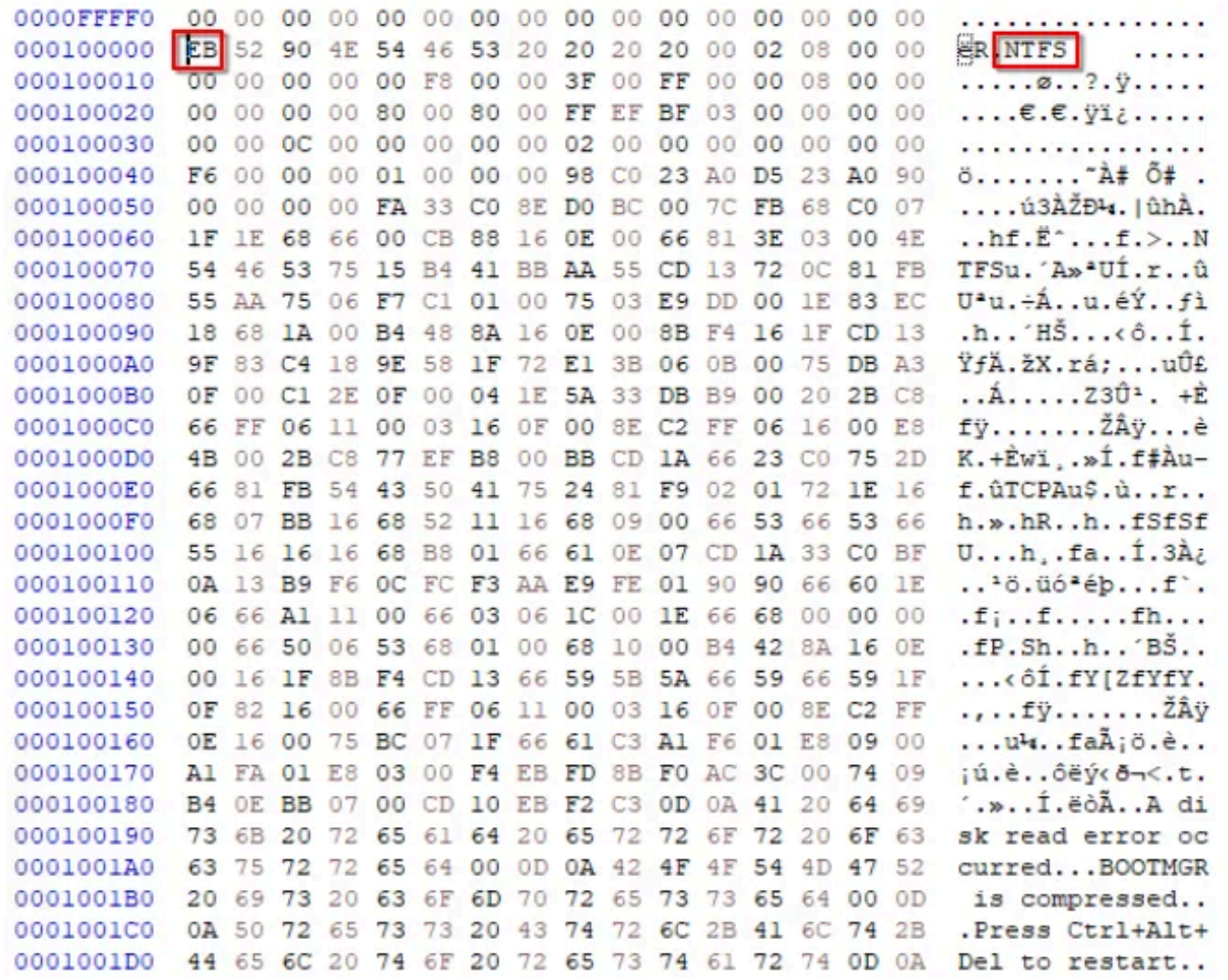
We need the address, for that we need to multiply the value by `512` (sector size) which gives us `1048576`.



We can use “Search → Go to” to jump to the address.



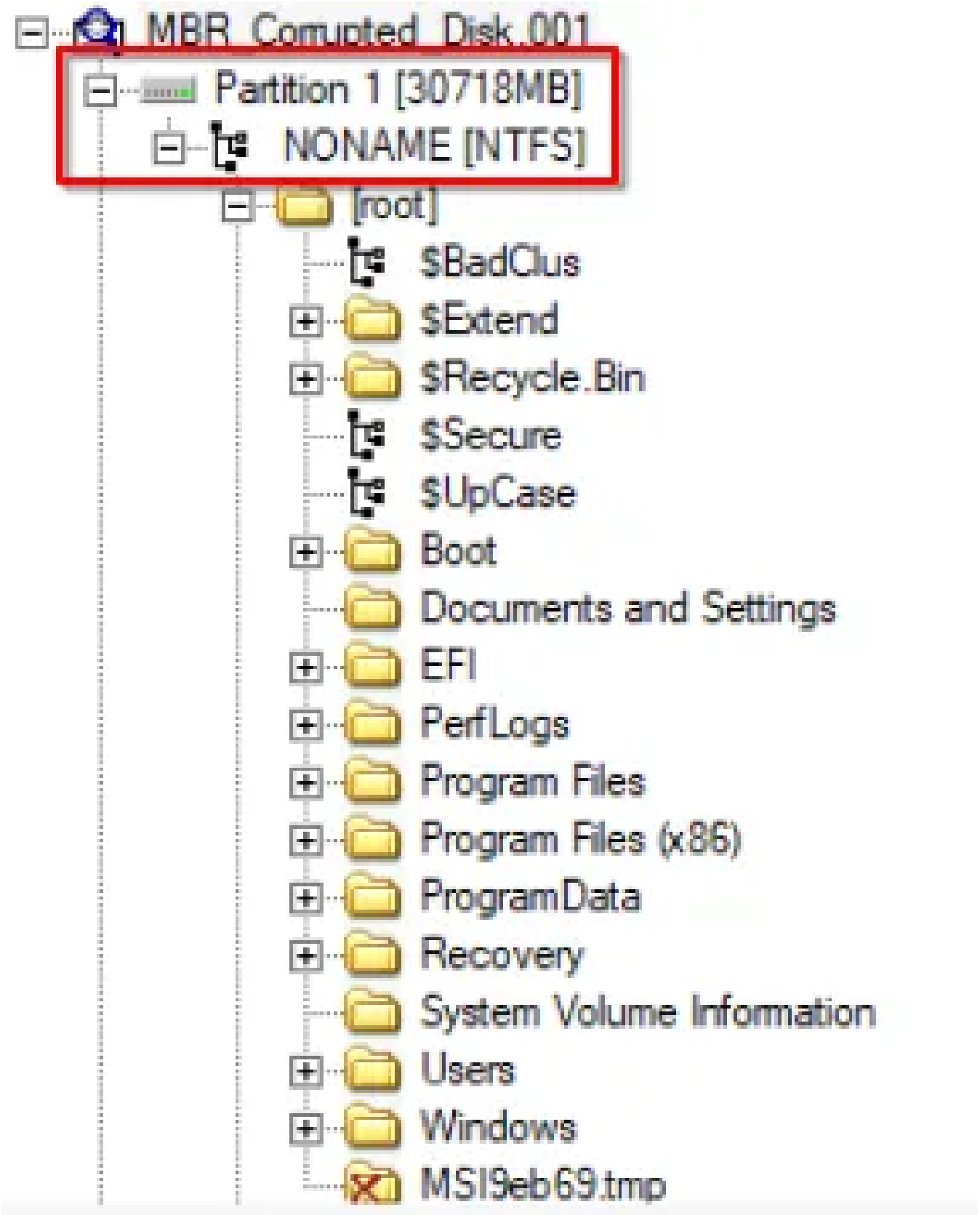
We can see that the 1st byte at this address has the value `EB` .



> *EB*

3. What is the type of the partition?

In the above image if we look at the ASCII column we can see that the partition uses NTFS. Alternatively, we can load the modified image in FTK Imager to get the partition type.

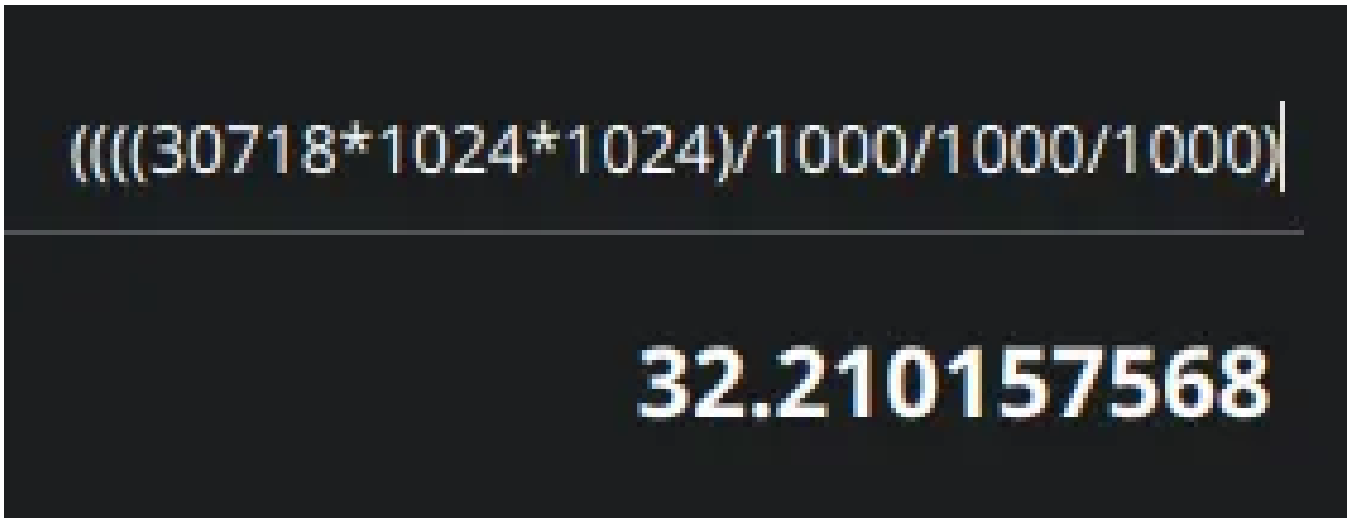


> *NTFS*

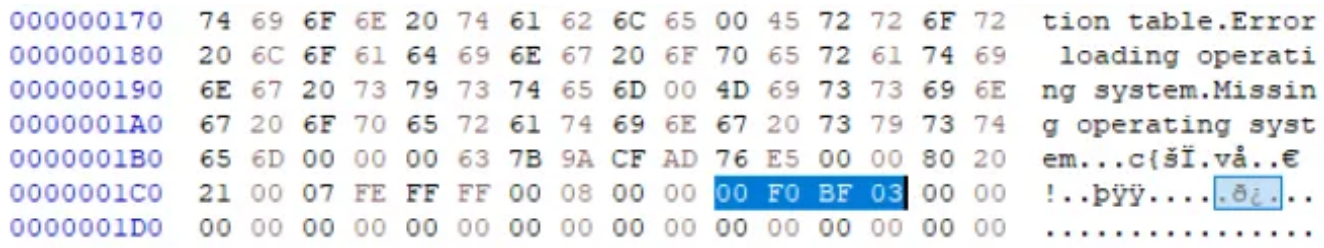
4. What is the size of the partition? (rounded to the nearest GB)

FTK shows us the size of the partition in MB besides the partition name. FTK shows the size in binary notation but in this room we are required to provide the sizes in

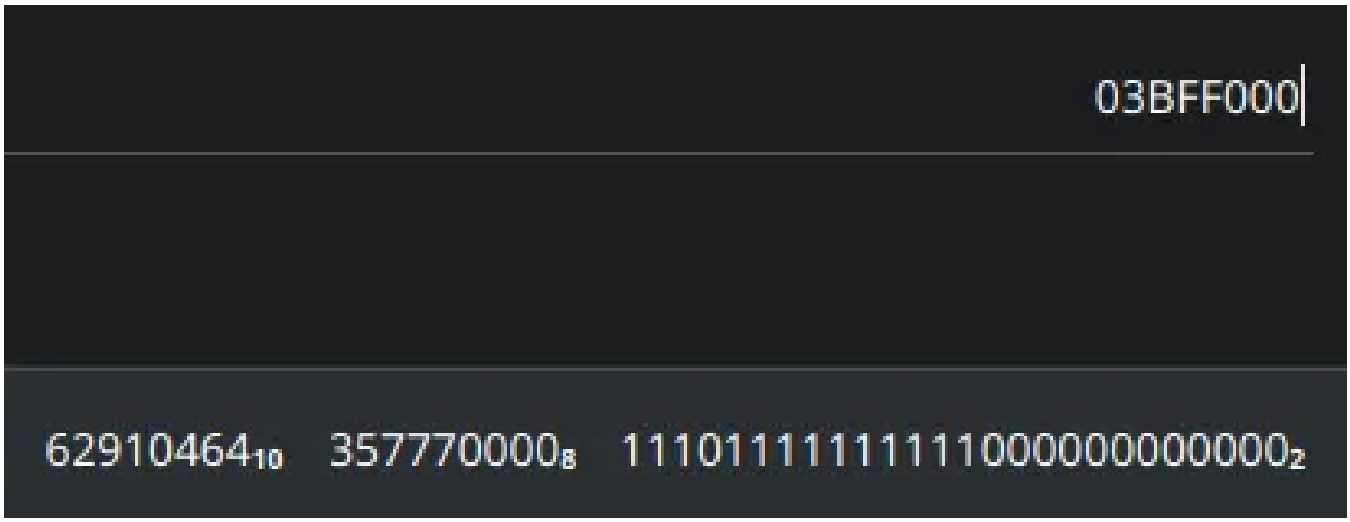
decimal notation. So, we first need to multiply the size twice by 1024 to get the size in bytes then we can divide it thrice by 1000 to get the size in GB.

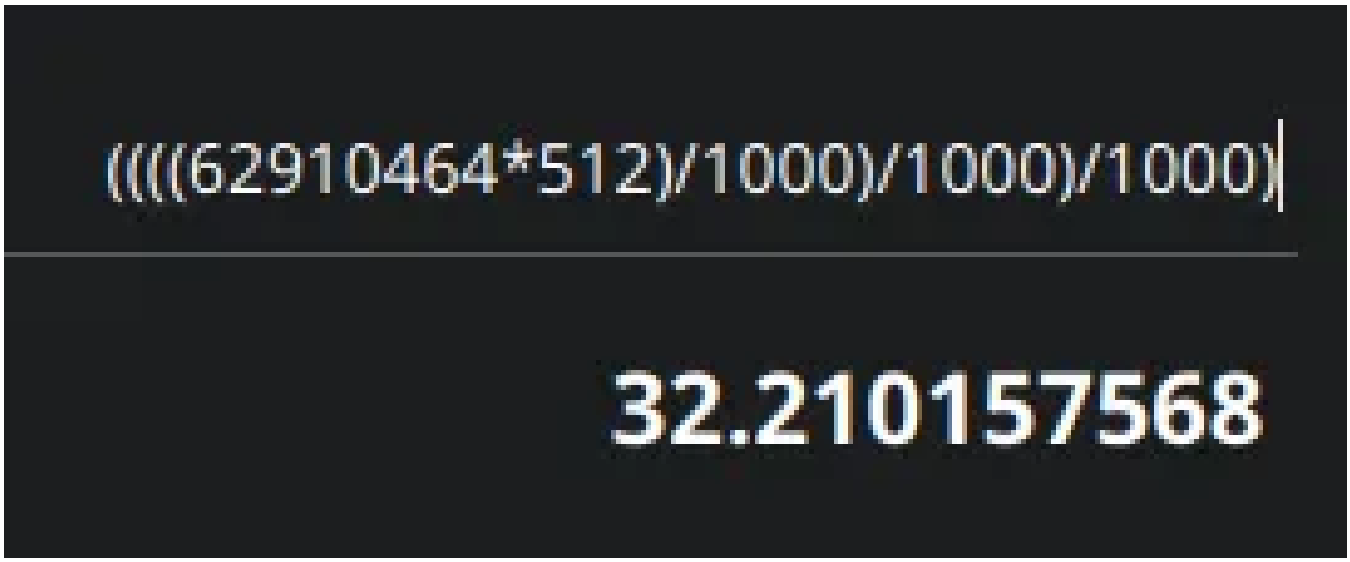


An alternative approach would be to use the value provided in the no. of sectors field (last field) in the partition entry.



Flip the bits to get the big-endian representation, then convert the value to decimal. This will give us `62910464`. This is the no. of sectors that make up the partition to get the size we need to multiple this value by `512` which will give us the size in bytes. We divide this value thrice by 1000 to get the size in GB.

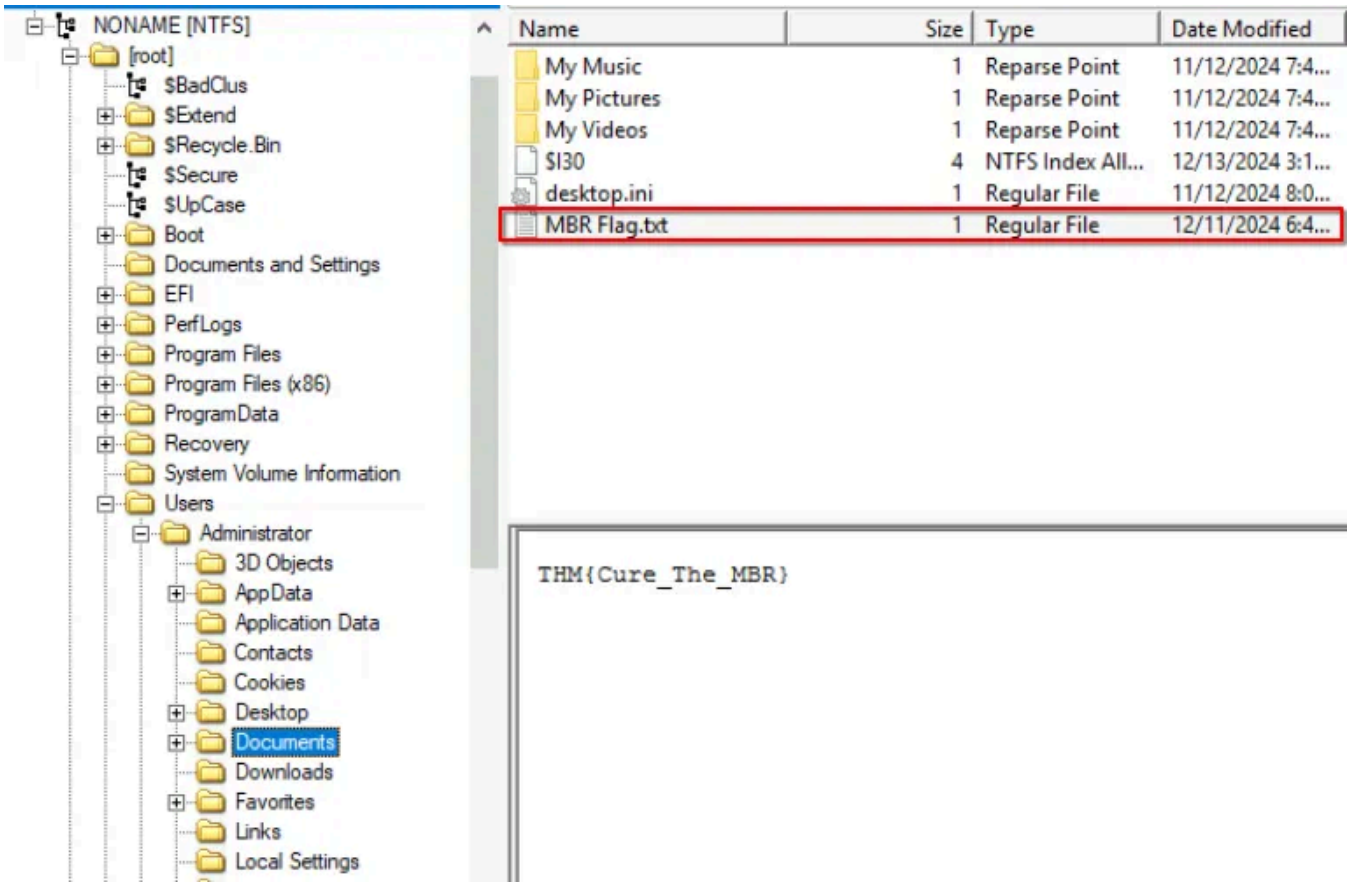




> *32*

5. What is the flag hidden in the Administrator's Documents folder?

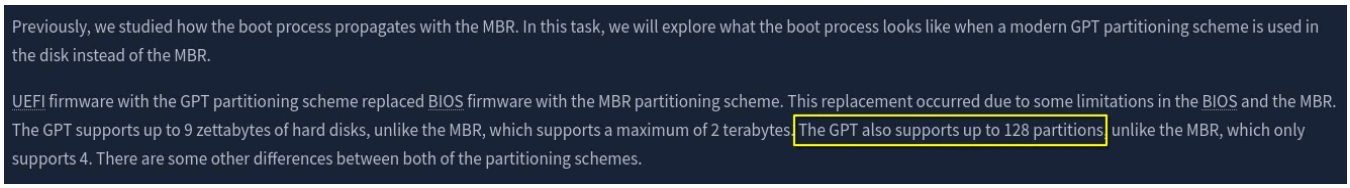
The Documents folder is located under the users home directory. The home directory for all users are stored in `Users`. In this directory there is a file called `MBR Flag.txt` which contains the flag.



> *THM{Cure_The_MBR}*

Task 6: What if GPT?

1. How many partitions are supported by the GPT?

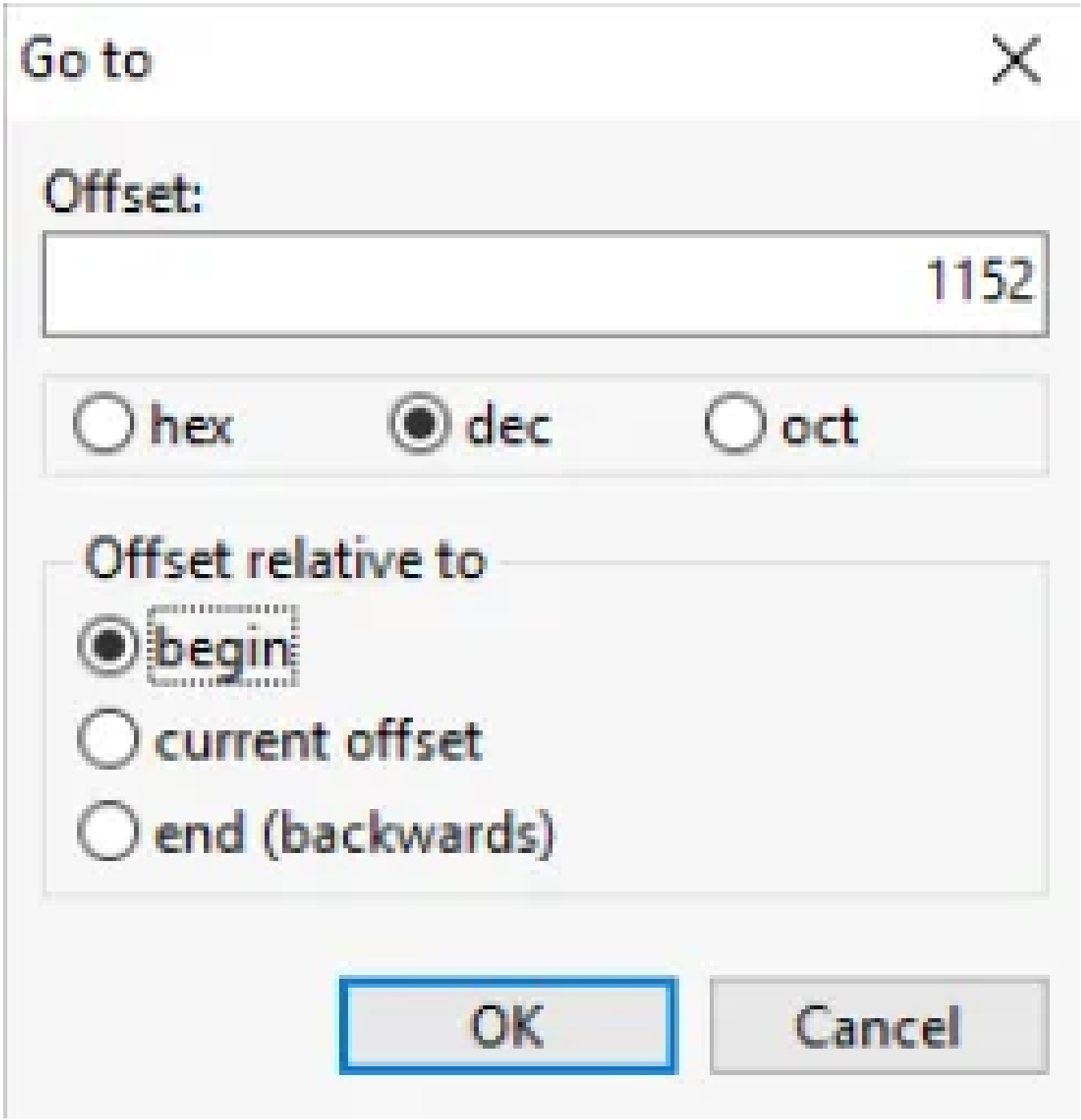


> *128*

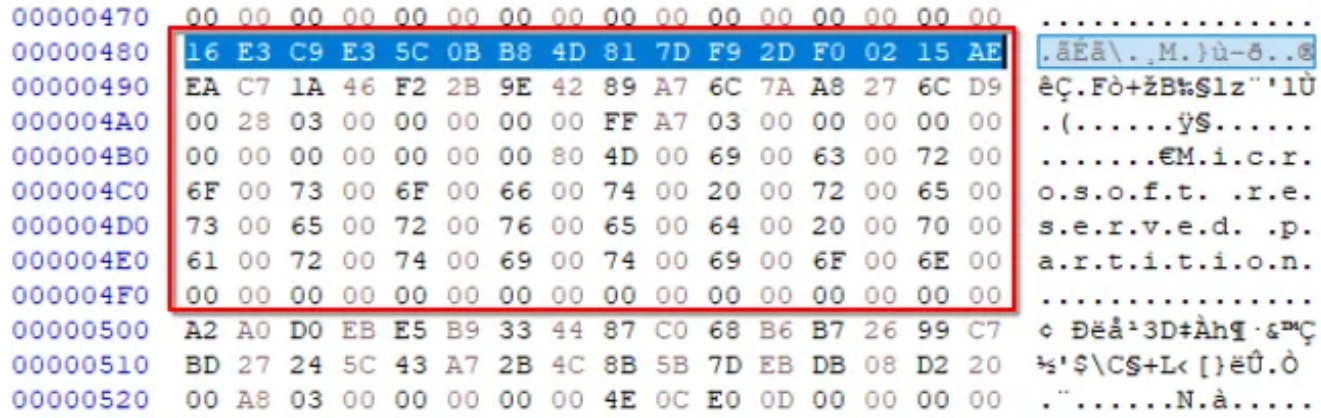
2. What is the partition type GUID of the 2nd partition given in the attached GPT file?

From the write-up we learn that the partition related metadata is stored in the GPT Partition Array. The partition array is located in the 3rd sector on the disk. Each entry in the partition array is 128 bytes. Each sector on the disk is 512 bytes.

We can get the starting address for the 3rd sector by calculating `512 * 2`. We multiply by 2 as the sector count starts from 0 so the 3rd sector becomes the 2nd sector. To this value we need to add 128 (size of entry in partition array) to get the start of the 2nd entry in the partition array. This comes out to `1152` ((512 * 2) + 128).



From the table provided in the write-up we know that the first 16 bytes represent the partition type GUID. By following the instructions provided we can get the GUID in the correct format.



E3C9E316–0B5C-4DB8–817D-F92DF00215AE

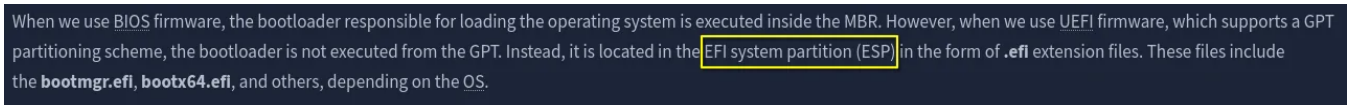
Task 7: Threats Targeting GPT

1. Complete this task

No answer required

Task 8: UEFI Bootkit Case

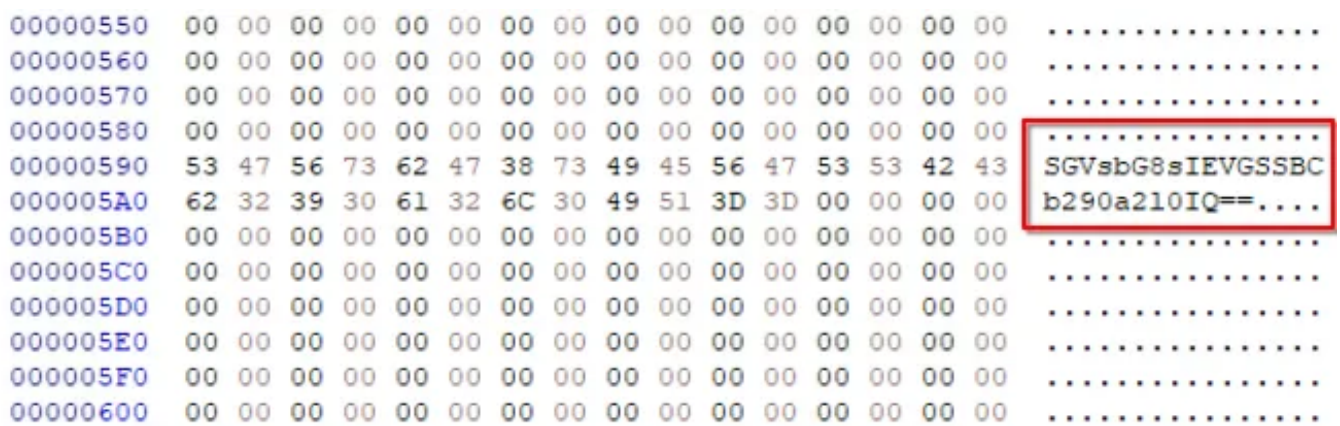
1. Which partition has the bootloader in it?



EFI System Partition

2. What is the malicious string embedded in the bootloader?

For this task we need to use `bootmgr.efi` . On scrolling a few lines I noticed a string that ended in “==”. Strings that end with equal signs are almost always base64 encoded.



```
SGVsbG8sIEVGSSBCb290a2l0IQ==
```

On decoding the string we get the malicious message.

CyberChef — Decode Recipie

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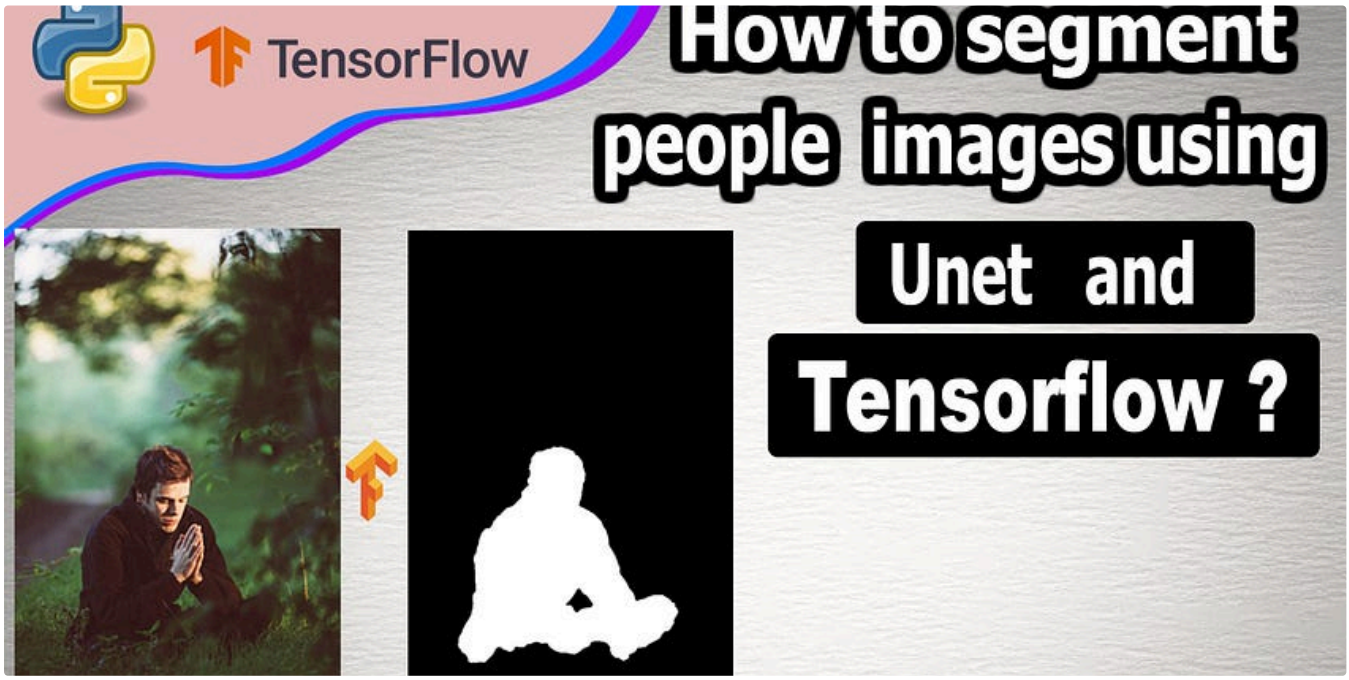

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