Design of the Excel VBA Password Changing Module

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ABSTRACT: *In this paper, we design a module that can change password when Excel VBA password is set. Especially, I designed it to be applicable to VBA environment using macros in Excel. It often happens that you cannot access important file data due to password loss, after setting the VBA password. For these users, it is possible to access valuable data by more convenient VBA password using the proposed program. We actually implemented the proposed design in this paper. Experiments were performed on the actual contents of the excel file. Experimental results show that the contents of Excel VBA password can change.*

Keywords: Excel VBA, Password Change, Password Recovery, VBA(Visual Basic for Application), Excel File Security

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1. Introduction

This paper relates to an Excel spreadsheet that we use daily in our daily life. VBA is often used in Excel spreadsheets for complex data processing. We design a module that enables changes to the password used in this VBA. Recent Excel spreadsheets have an OLE structure. Object Linking and Embedding (OLE) files (or COM Structured Storage) format has been used as document formats for Microsoft Office, Word, Excel, and PowerPoint. The OLE file format has the same file system structure as the internal hard disk. Therefore, there is the concept of folders and files inside the OLE file.

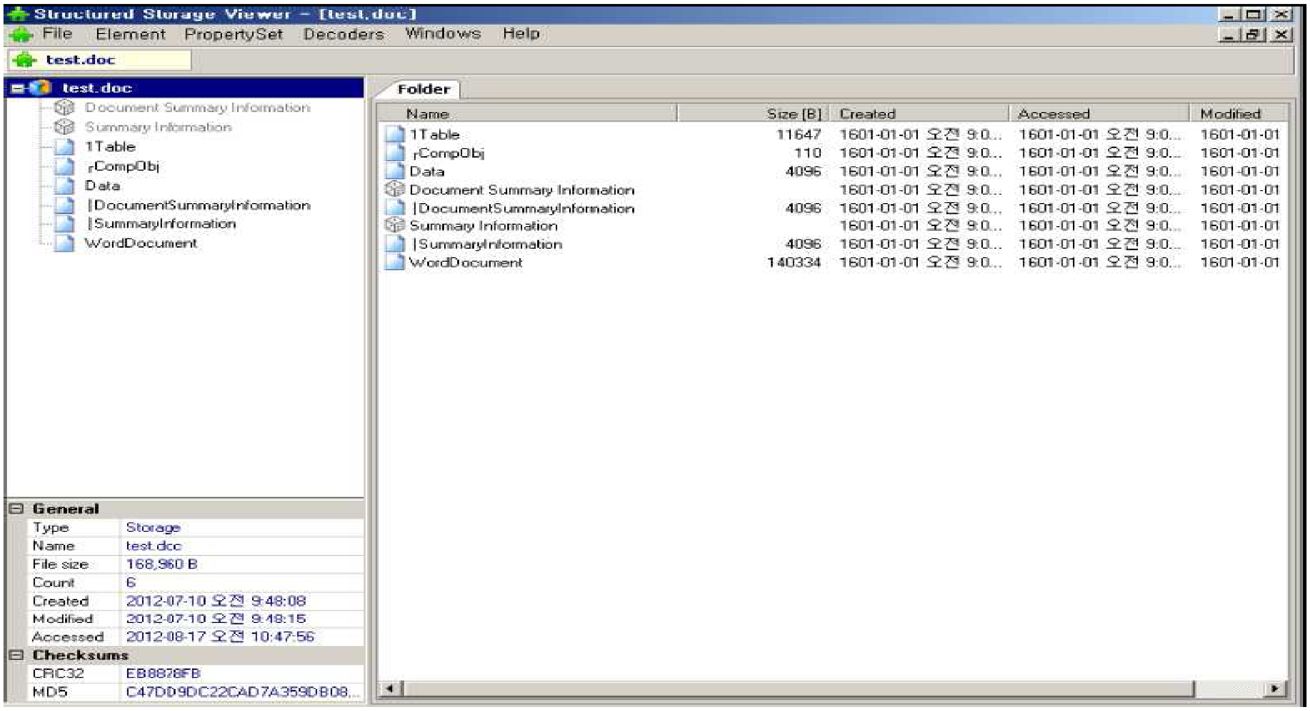
Since OLE files are one small file system, MS Office has backward compatibility and upward compatibility.For example, even if you create and save a document in MS Word 2007, you can read it in MS Word 2003. If you create a storage / stream that is used by the version of MS Word 2007 and a storage / stream that is used by the version of MS Word 2003 inside the OLE file, then the version of MS Word 2003 only refers to that version of storage and stream. Even if the MS Word 2007 related storage and stream exist, the version will not access the area, and it will have the effect as if the lower version software reads the document in the upper version without any problem [1, 2].

In this paper, I design a module that can change password when Excel VBA password is set. Especially in Excel, we designed it to be applicable to VBA environment using macros. After setting the VBA password, it often happens that you cannot access important file data due to password loss. By using programs for these users, it is possible to access valuable data through more convenient VBA password access. I actually implemented the proposed design in this paper. Experiments were performed on the actual contents of the excel file.

In this paper, Chapter 2 refers to related research, Chapter 3 refers to VBA password module design, Chapter 4 experiment, and Chapter 5 conclusion.

2. Related Research

The following Figure 1 shows the internal structure of a doc file written in MS Excel simply by SSViewer (Structured Storage Viewer) program.



Name	Size [B]	Created	Accessed	Modified
1Table	11647	1601-01-01 오전 9:0...	1601-01-01 오전 9:0...	1601-01-01
ᵣCompObj	110	1601-01-01 오전 9:0...	1601-01-01 오전 9:0...	1601-01-01
Data	4096	1601-01-01 오전 9:0...	1601-01-01 오전 9:0...	1601-01-01
Document Summary Information		1601-01-01 오전 9:0...	1601-01-01 오전 9:0...	1601-01-01
|DocumentSummaryInformation	4096	1601-01-01 오전 9:0...	1601-01-01 오전 9:0...	1601-01-01
Summary Information		1601-01-01 오전 9:0...	1601-01-01 오전 9:0...	1601-01-01
|SummaryInformation	4096	1601-01-01 오전 9:0...	1601-01-01 오전 9:0...	1601-01-01
WordDocument	140334	1601-01-01 오전 9:0...	1601-01-01 오전 9:0...	1601-01-01

General	
Type	Storage
Name	test.dcc
File size	168,960 B
Count	6
Created	2012-07-10 오전 9:48:08
Modified	2012-07-10 오전 9:48:15
Accessed	2012-08-17 오전 10:47:56
Checksums	
CRC32	EB8878FB
MD5	C47DD9DC22CAD7A359DB08...

Figure 1. Internal Structure of OLE Document using SSViewer

OLE file is divided into two big blocks. They are a header block and a data block. The header block has a size of 512 bytes, and the data block has 512 bytes or more. The header block contains the main information of the entire OLE file, and the data block has the following information.

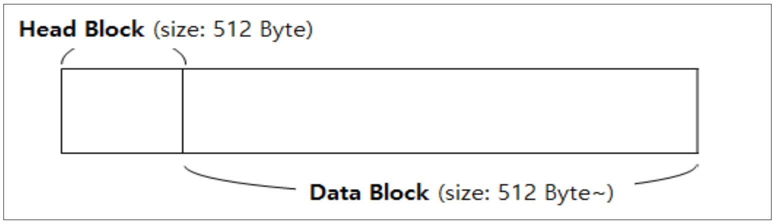


Figure 2. Structure of OLE data block

- Properties
- Stream data
- Big Block Allocation Table (BBAT)
- Small Block Allocation Table (SBAT)

Most of the data blocks are occupied by the stream data.

2.1. Structure of OLE Block

An OLE header block is a block that contains the main information of an OLE file. The OLE file is divided into 512 bytes and the block number is assigned.

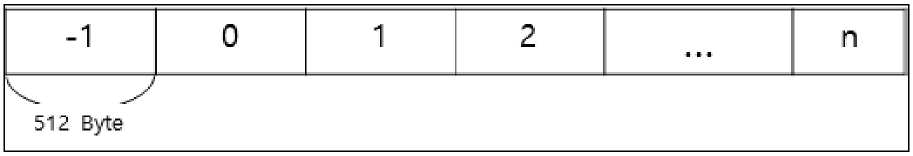


Figure 3. Structure of OLE Block

In this case, -1 block is a header block, and 0..n block is a data block. When opening an OLE file and reading it by 512 Bytes, it is like reading the header block. An OLE file is a file format used in various word documents. It consists of storage and streams similar to the FAT file system. Due to the limitations of the traditional file system, CFB(Compound File Binary) is structured according to the needs to put file and folder structure in one file [3, 4].

2.2. Storage and Stream

You can think of an OLE file as a normal file system. It consists of storage of folder role and stream of file role. It takes a very similar approach to the FAT file system to store storage and streams within OLE files. If you have a basic knowledge of the FAT file system, you can access it more easily. All information is stored in 512-byte sector units.

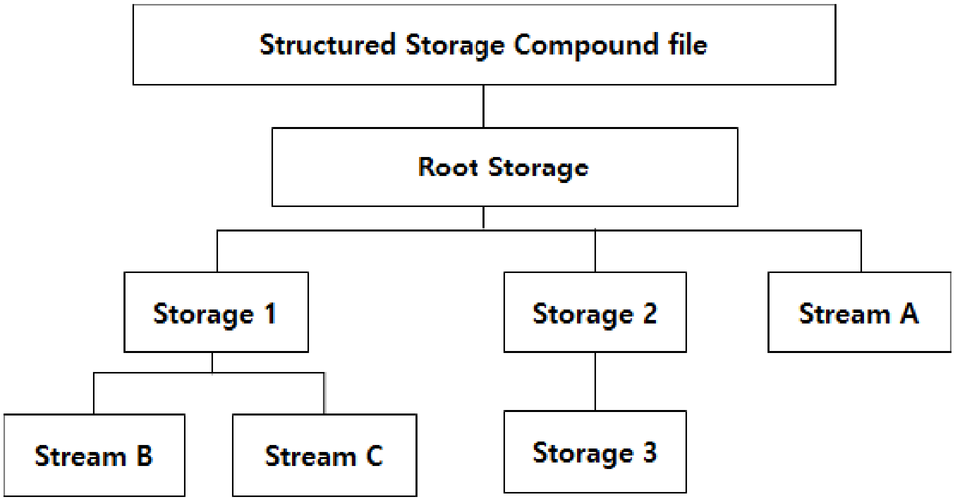


Figure 4. Structure of OLE storage and stream

2.3. CFB(Compound File Binary) Components

To understand the compound file, you need to know the various components that make up the file. The Figure 5 shows the structure of the compound file.

2.4. FAT(File Allocation Table) Array

A FAT Array is an array of 32-bit integers. The index of the array refers to the sector number, and the element corresponding to the index refers to the next index number. OLE file does not store the stream as a single line, just as a large file is not written to the disk from the beginning to the end. The storage is divided into sectors of 512 bytes size.

2.5. Directory Entry Array

A directory entry is where the meta information related to the storage stream is stored. A Directory Entry Array is an array of this

Directory Entry. Directory Entry Arrays have meta information, so if you have Directory Entry information, you can easily access the information [7, 8, 9].

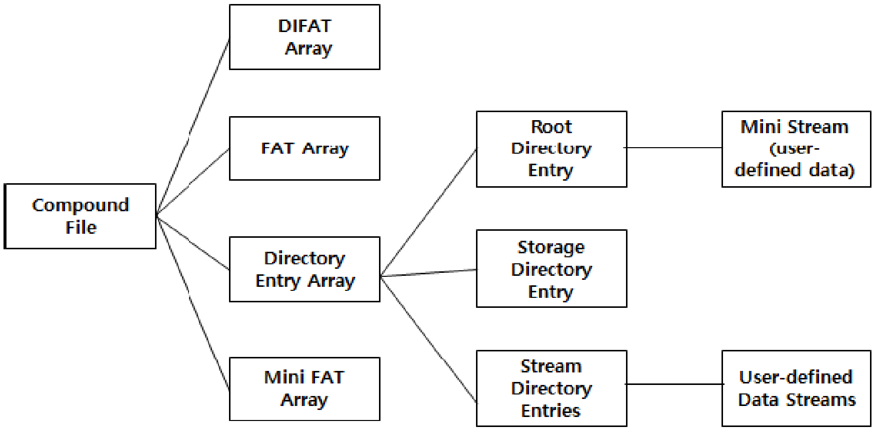
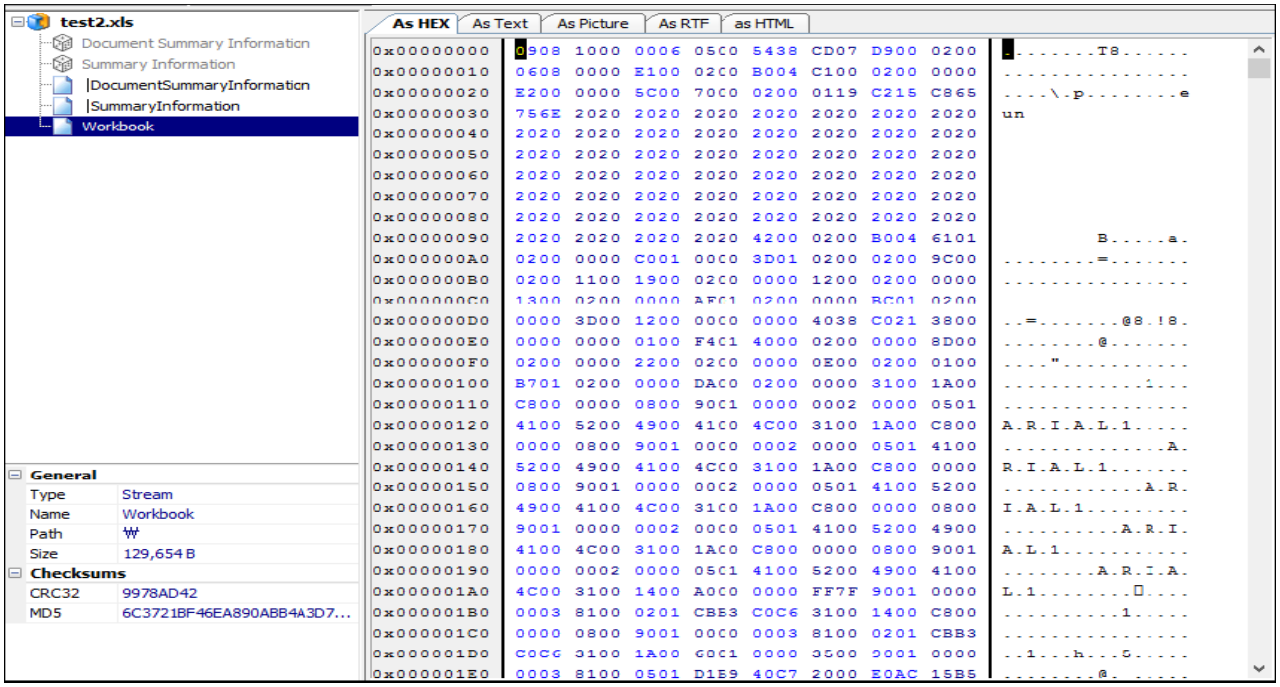


Figure 5. Structure of OLE Compound File

3. Design of VBA Password Changing Module

As we have seen in the related study, it is necessary to analyze the file structure of Excel in order to design Excel VBA password release module. The internal structure of Excel can be checked using SSViewer (Structure Storage Viewer).



General

Type	Stream
Name	Workbook
Path	₩
Size	129,654 B

Checksums

CRC32	9978AD42
MD5	6C3721BF46EA890ABB4A3D7...

```
0x00000000  0908 1000 0006 05C0 5438 CD07 D900 0200  ........T8......
0x00000010  0608 0000 E100 02C0 B004 C100 0200 0000  ................
0x00000020  E200 0000 5C00 70C0 0200 0119 C215 C865  ....\.p........e
0x00000030  756E 2020 2020 2020 2020 2020 2020 2020  un
0x00000040  2020 2020 2020 2020 2020 2020 2020 2020
0x00000050  2020 2020 2020 2020 2020 2020 2020 2020
0x00000060  2020 2020 2020 2020 2020 2020 2020 2020
0x00000070  2020 2020 2020 2020 2020 2020 2020 2020
0x00000080  2020 2020 2020 2020 2020 2020 2020 2020
0x00000090  2020 2020 2020 2020 4200 0200 B004 6101          B.....a.
0x000000A0  0200 0000 C001 00C0 3D01 0200 0200 9C00  ........=.......
0x000000B0  0200 1100 1900 02C0 0000 1200 0200 0000  ................
0x000000C0  1300 0200 0000 AFC1 0200 0000 BC01 0200
0x000000D0  0000 3D00 1200 00C0 0000 4038 C021 3800  ..=.......@8.!8.
0x000000E0  0000 0000 0100 F4C1 4000 0200 0000 8D00  ........@.......
0x000000F0  0200 0000 2200 02C0 0000 0E00 0200 0100  ...."...........
0x00000100  B701 0200 0000 DAC0 0200 0000 3100 1A00  ............1...
0x00000110  C800 0000 0800 90C1 0000 0002 0000 0501  ................
0x00000120  4100 5200 4900 41C0 4C00 3100 1A00 C800  A.R.I.A.L.1.....
0x00000130  0000 0800 9001 00C0 0002 0000 0501 4100  ..............A.
0x00000140  5200 4900 4100 4CC0 3100 1A00 C800 0000  R.I.A.L.1.......
0x00000150  0800 9001 0000 00C2 0000 0501 4100 5200  ............A.R.
0x00000160  4900 4100 4C00 31C0 1A00 C800 0000 0800  I.A.L.1.........
0x00000170  9001 0000 0002 00C0 0501 4100 5200 4900  ..........A.R.I.
0x00000180  4100 4C00 3100 1AC0 C800 0000 0800 9001  A.L.1...........
0x00000190  0000 0002 0000 05C1 4100 5200 4900 4100  ........A.R.I.A.
0x000001A0  4C00 3100 1400 A0C0 0000 FF7F 9001 0000  L.1.......□.....
0x000001B0  0003 8100 0201 CBE3 C0C6 3100 1400 C800  ..........1.....
0x000001C0  0000 0800 9001 00C0 0003 8100 0201 CBB3  ................
0x000001D0  C0C6 3100 1A00 60C1 0000 3500 9001 0000  ..1...h...5.....
0x000001E0  0003 8100 0501 D1E9 40C7 2000 E0AC 15B5  ........@.......
```

Figure 6. Structure of Test2.xlsm File

The Excel file has an OLE structure as shown Figure 6 above. The OLE structure consists of a header and a block. For Excel files that use macros, the extension is in .xlsm format. If you open Excel's xlsm file format with Notepad, it is shown like Figure 7 below. As shown in Figure 7, the Excel file format has an unknown structure. This is because the Excel file is compressed. In the case of an Excel file that uses a macro, the format of the file is a compressed file.

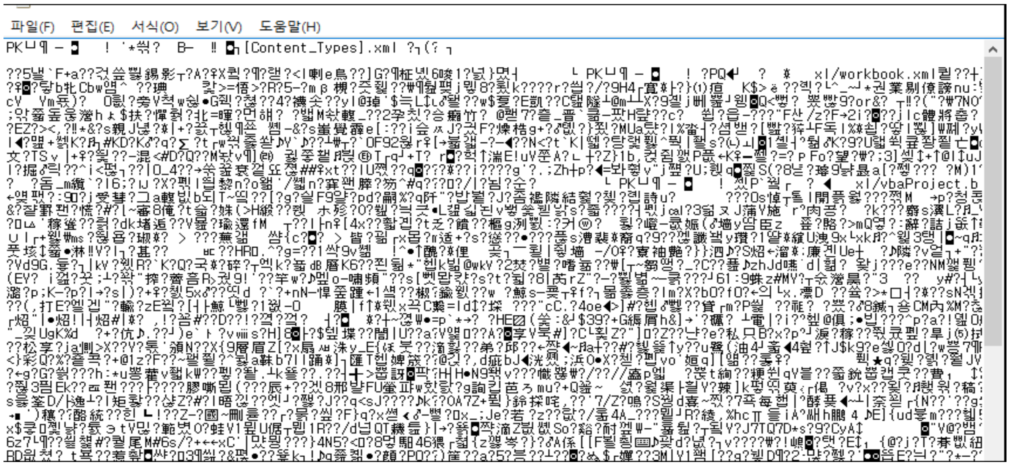


Figure 7. Binary Structure of Excel File

In this way, macro-format files in Excel are basically compressed. Therefore, the macro file of Excel can be opened by changing the extension to compressed file format. The following Figure 8 is the result of opening a macro format Excel file using a compression program.

By using these results, it is possible to recover the password error environment in VBA more conveniently by allowing the users to change the extension name etc. by using the program without manually performing this process.

When opening the above compressed file, there is a .bin file. The VBA program is stored in this file. In this paper, we change the .xlsm extension to .zip and open the modified compressed file using a compression program. This process is designed to be done through the program. If the compression program opens successfully, it looks for the .bin file. When you find the .bin file, it is extracted from the compressed file.

It then programs the .bin file extracted from the compressed file to use binary edits. It runs binary edits so that you can edit the .bin file extracted from the compressed file. It is written in a program so that these processes can be operated.

When you run binary editing of the .bin file, it modifies the DPB string in the .bin file. It changes DPB string to DPx string. It will then save the .bin file. This process is shown in Figure 8.

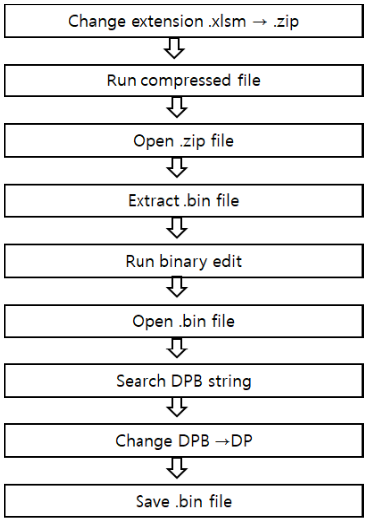
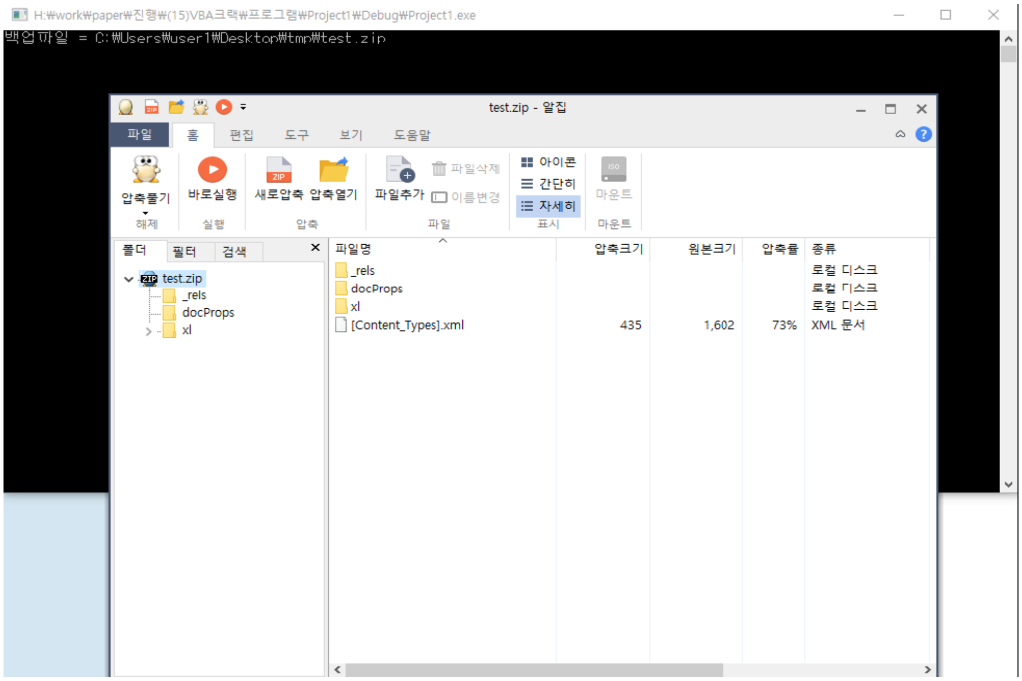


Figure 8. Decryption Process

4. Experiment

We design the contents in this paper using C program. The operation of the implemented program is shown in Figure 9.


H:₩work₩paper₩진행₩(15)VBA크랙₩프로그램₩Project1₩Debug₩Project1.exe

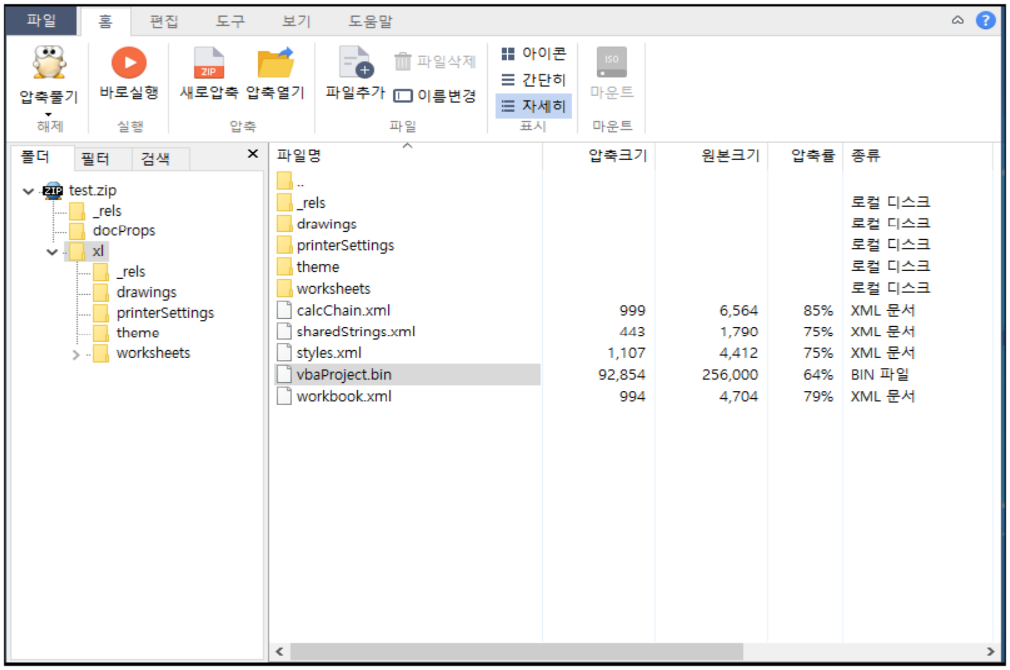
```
백업파일 = C:₩Users₩user1₩Desktop₩tmp₩test.zip
```

test.zip - 알집

파일명	압축크기	원본크기	압축률	종류
_rels				로컬 디스크
docProps				로컬 디스크
xl				로컬 디스크
[Content_Types].xml	435	1,602	73%	XML 문서

Figure 9. Screen of Program Operation

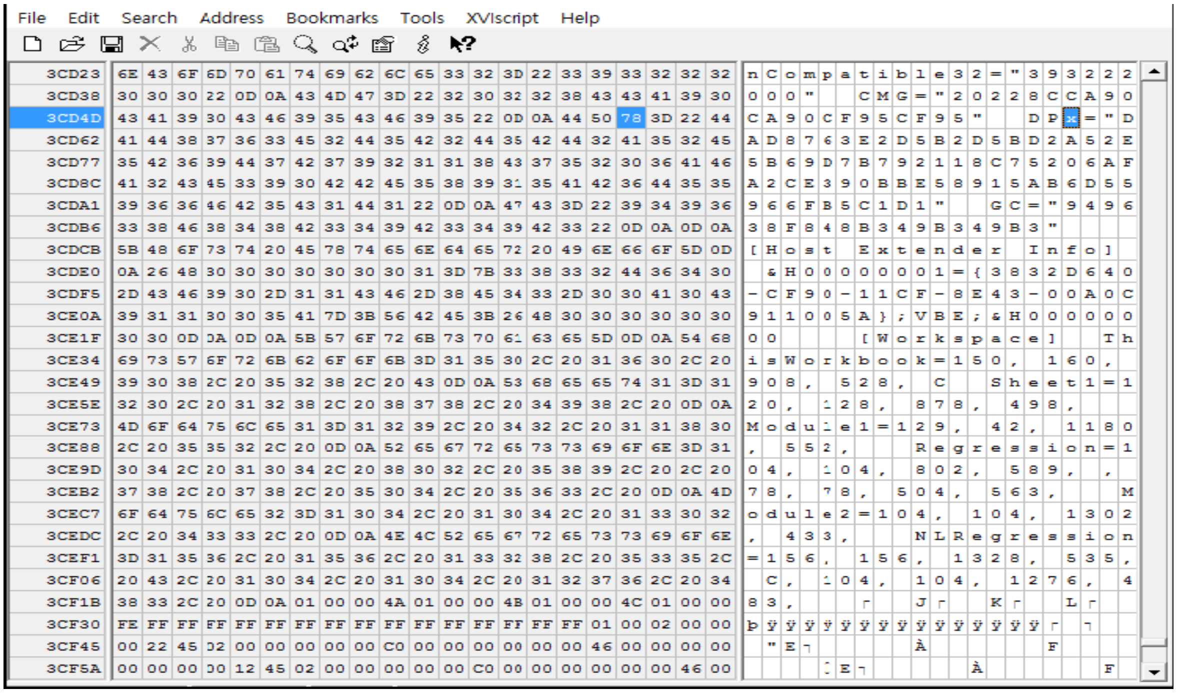
Figure 9 above shows the program screen that executes the proposed design in this paper. The program performs the function of changing the .xlsm file to a .zip file.



파일명	압축크기	원본크기	압축률	종류
..				
_rels				로컬 디스크
drawings				로컬 디스크
printerSettings				로컬 디스크
theme				로컬 디스크
worksheets				로컬 디스크
calcChain.xml	999	6,564	85%	XML 문서
sharedStrings.xml	443	1,790	75%	XML 문서
styles.xml	1,107	4,412	75%	XML 문서
vbaProject.bin	92,854	256,000	64%	BIN 파일
workbook.xml	994	4,704	79%	XML 문서

Figure 10. Screen of Compression Program Execution

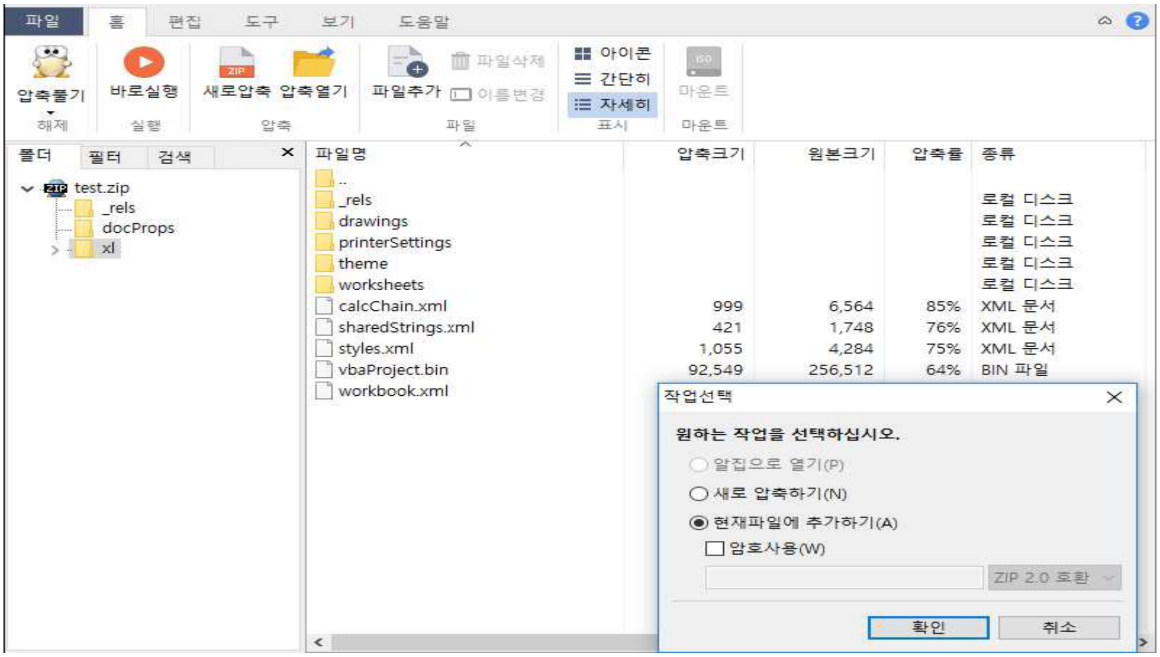
Figure 10 shows the screen of compression program execution. It extracts the vbaProject.bin file from the compressed program. The program is that binary edits can be performed on the extracted vbaProject.bin file.



```
3CD23  6E 43 6F 6D 70 61 74 69 62 6C 65 33 32 3D 22 33 39 33 32 32 32  nCompatible32="393222
3CD38  30 30 30 22 0D 0A 43 4D 47 3D 22 32 30 32 32 38 43 43 41 39 30  000"  CMG="20228CCA90
3CD4D  43 41 39 30 43 46 39 35 43 46 39 35 22 0D 0A 44 50 78 3D 22 44  CA90CF95CF95"  DPx="D
3CD62  41 44 38 37 36 33 45 32 44 35 42 32 44 35 42 44 32 41 35 32 45  AD8763E2D5B2D5BD2A52E
3CD77  35 42 36 39 44 37 42 37 39 32 31 31 38 43 37 35 32 30 36 41 46  5B69D7B792118C75206AF
3CD8C  41 32 43 45 33 39 30 42 42 45 35 38 39 31 35 41 42 36 44 35 35  A2CE390BBE58915AB6D55
3CDA1  39 36 36 46 42 35 43 31 44 31 22 0D 0A 47 43 3D 22 39 34 39 36  966FB5C1D1"  GC="9496
3CDB6  33 38 46 38 34 38 42 33 34 39 42 33 22 0D 0A 0D 0A  38F848B349B3"
3CDCB  5B 48 6F 73 74 20 45 78 74 65 6E 64 65 72 20 49 6E 66 6F 5D 0D  [Host Extender Info]
3CDE0  0A 26 48 30 30 30 30 30 30 30 31 3D 7B 33 38 33 32 44 36 34 30   &H00000001={3832D640
3CDF5  2D 43 46 39 30 2D 31 31 43 46 2D 38 45 34 33 2D 30 30 41 30 43  -CF90-11CF-8E43-00A0C
3CE0A  39 31 31 30 30 35 41 7D 3B 56 42 45 3B 26 48 30 30 30 30 30 30  911005A};VBE;&H000000
3CE1F  30 30 0D 0A 0D 0A 5B 57 6F 72 6B 73 70 61 63 65 5D 0D 0A 54 68  00    [Workspace]  Th
3CE34  69 73 57 6F 72 6B 62 6F 6F 6B 3D 31 35 30 2C 20 31 36 30 2C 20  isWorkbook=150, 160,
3CE49  39 30 38 2C 20 35 32 38 2C 20 43 0D 0A 53 68 65 65 74 31 3D 31  908, 528, C  Sheet1=1
3CE5E  32 30 2C 20 31 32 38 2C 20 38 37 38 2C 20 34 39 38 2C 20 0D 0A  20, 128, 878, 498,
3CE73  4D 6F 64 75 6C 65 31 3D 31 32 39 2C 20 34 32 2C 20 31 31 38 30  Module1=129, 42, 1180
3CE88  2C 20 35 35 32 2C 20 0D 0A 52 65 67 72 65 73 73 69 6F 6E 3D 31  , 552,   Regression=1
3CE9D  30 34 2C 20 31 30 34 2C 20 38 30 32 2C 20 35 38 39 2C 20 2C 20  04, 104, 802, 589, ,
3CEB2  37 38 2C 20 37 38 2C 20 35 30 34 2C 20 35 36 33 2C 20 0D 0A 4D  78, 78, 504, 563,   M
3CEC7  6F 64 75 6C 65 32 3D 31 30 34 2C 20 31 30 34 2C 20 31 33 30 32  odule2=104, 104, 1302
3CEDC  2C 20 34 33 33 2C 20 0D 0A 4E 4C 52 65 67 72 65 73 73 69 6F 6E  , 433,   NLRegression
3CEF1  3D 31 35 36 2C 20 31 35 36 2C 20 31 33 32 38 2C 20 35 33 35 2C  =156, 156, 1328, 535,
3CF06  20 43 2C 20 31 30 34 2C 20 31 30 34 2C 20 31 32 37 36 2C 20 34   C, 104, 104, 1276, 4
3CF1B  38 33 2C 20 0D 0A 01 00 00 4A 01 00 00 4B 01 00 00 4C 01 00 00  83,   ┌  J┌  K┌  L┌
3CF30  FE FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF 01 00 02 00 00  þÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ┌ ¬
3CF45  00 22 45 02 00 00 00 00 00 C0 00 00 00 00 00 00 46 00 00 00 00   "E¬     À      F
3CF5A  00 00 00 00 12 45 02 00 00 00 00 00 C0 00 00 00 00 00 00 46 00      ¦E¬     À      F
```

Figure 11. Screen of Starting Binary Edit on vbaProject.bin

After performing the binary edit of the vbaProject.bin file, it looks for the DPB string. After finding, it modifies the DPB string with DPx. The process of modifying with DPx.After modifying the DPB string, it saves this file. When the vbaProject.bin file has been modified, the vbaProject.bin file is added to the compressed file.



파일명	압축크기	원본크기	압축률	종류
..				
_rels				로컬 디스크
drawings				로컬 디스크
printerSettings				로컬 디스크
theme				로컬 디스크
worksheets				로컬 디스크
calcChain.xml	999	6,564	85%	XML 문서
sharedStrings.xml	421	1,748	76%	XML 문서
styles.xml	1,055	4,284	75%	XML 문서
vbaProject.bin	92,549	256,512	64%	BIN 파일
workbook.xml				

작업선택

원하는 작업을 선택하십시오.

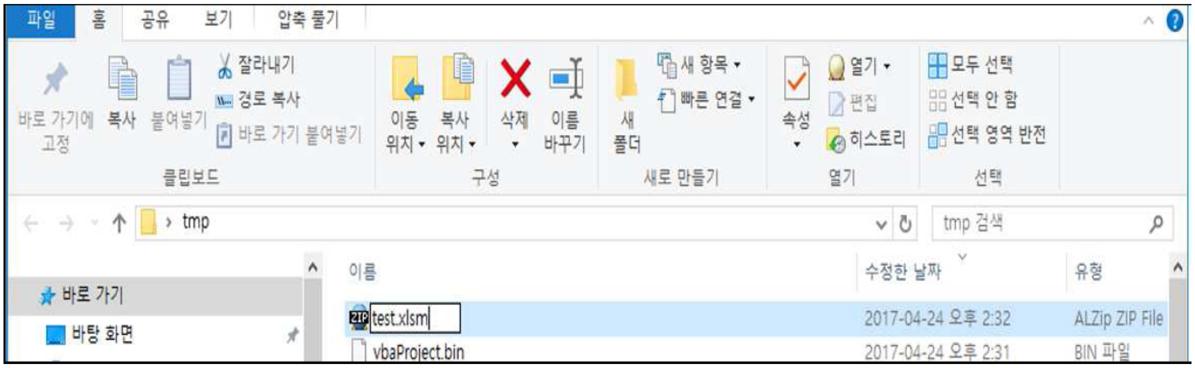
○ 알집으로 열기(P)
○ 새로 압축하기(N)
● 현재파일에 추가하기(A)
□ 암호사용(W)

ZIP 2.0 호환

확인 취소

Figure 12. Add the Modified vbaProject.bin File to the Compressed File

After adding the modified vbaProject.bin file to the compressed file as shown in Fig. 12, it returns the .zip extension name back to .xlsm. This process is shown in Figure 13 below.



이름	수정한 날짜	유형
test.xlsm	2017-04-24 오후 2:32	ALZip ZIP File
vbaProject.bin	2017-04-24 오후 2:31	BIN 파일

Figure 13. Return Extension Name to .xlsm

After returning the extension name to .xlsm as shown in Figure 13, you open the Excel file. If you open this Excel file, the file will open. Then you can set a new project property password in the security function area.Iset “123” as the new password. Then, we store the Excel file. When we exit Excel and open it again, it works. When you run the VBA module, you must enter the password. At this time, if you input the newly changed password “123”, you can check that the VBA module opened normally.

5. Conclusion

In this paper, we designed a system that could change the password when using Excel VBA. Especially, I designed it to be applicable to VBA environment using macros in Excel. It often happens that you cannot access important file data after setting the VBA password, due to password loss. The proposed program can make it possible for these users to access valuable data using more convenient VBA password change module.

We designed a program that makes it easier to release the password for the file that is set VBA password. The structure of this program is roughly divided into two parts. One is the process of extracting the .bin file from the Excel xlsm file. The other is the configuration process to modify the VBA password through changing the DPB keyword in the extracted .bin file.

I designed the program so that the above two processes can be used easily and conveniently. It changes the extension of the xlsm file to zip. After changing to zip, it starts a program that can decompress. When the decompression program is started, it extracts the vbaProject.bin file from the compressed file.

Next, it performs to edit binary of the vbaProject.bin file extracted from the compressed file. Then it runs the binary edit program to edit the vbaProject.bin file. When the binary edit program starts, it loads the vbaProject.bin file. If the vbaProject.bin file is opened normally, DPB string modification work will be done in this file. When the string modification is completed normally, the changed vbaProject.bin file is saved.

Once the modification of vbaProject.bin file has been completed, it will be saved in the original compressed file. When the vbaProject.bin file is newly saved, the extension zip of the compressed file is modified to the original extension xlsm.

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