③ 可选文件头中：
- AddressOfEntryPoint　PE装载器准备运行的PE文件的第一条指令的RVA
- ImageBase　PE文件在内存中的优先装载地址
- SectionAlignment　内存中节对齐粒度
- FileAlignment　文件中节对齐粒度

机器类型x86 | 节数目 | 生产该文件的时间 | COFF符号表的偏移

test.exe程序-PE文件格式分析

姓名：曹海琪　　学号：2018302180132

PE文件固定开头 MZ的ASCII码

IMAGE_DOS_HEADER

MS-DOS Stub Program

signature PE标志“PE\0\0” 识别是否为有效PE文件

IMAGE_NT_HEADERS
① signature
② FileHeader 映像文件头（0x14）
③ OptionalHeader 可选文件头

Directory 前四个字节：RVA 后四个字节：size

IMAGE_SECTION_HEADER

Section .text

代码节——程序可执行代码

Section .rdata

① IMPORT Address Table(IAT)
一系列DWORD格式的数组。在文件中，每个双字中存放对应引入函数的函数名字符串的RVA;在内存中，每个双字中存放对应引入函数的地址。

② IMPORT Directory Table(IDT)
引入表，引入目录是IMAGE IMPORT DESCRIPTIONS数组，每个DLL都使用一个元素，终止于一个全为0元素。

③ IMport Nmae Table
一系列DWORD格式的数组。在文件中与IAT相同，在内存中IAT会变化，但引入名字表不变。
当DWORD数组数据的高位为0时，表示通过函数名引入，指向IMPORT Hints/Names &DLL names；为1时表示通过序号引入。

④ IMPORT Hints/Names & DLL Nmaes
引入名字表和IAT每个双字都是IMAGE IMPORT BY NAME结构，由Hints和Name构成

Section .data

已初始化的数据节——存放在编译时刻已经确认的数据

未初始化的数据节 .bbs——存放未初始化的全局变量和静态变量

在文件中①③部分是相同的

```
                0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
-------------------------------------------------------------------------------
00000000h: 4D 5A 90 00 03 00 00 00 04 00 00 00 FF FF 00 00 ; MZ?.....  ..
00000010h: B8 00 00 00 00 00 00 00 40 00 00 00 00 00 00 00 ; ?.......@.......
00000020h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000030h: 00 00 00 00 00 00 00 00 00 00 00 00 B0 00 00 00 ; 指向PE文件头开始位置
00000040h: 0E 1F BA 0E 00 B4 09 CD 21 B8 01 4C CD 21 54 68 ; ..?.???L?Th
00000050h: 69 73 20 70 72 6F 67 72 61 6D 20 63 61 6E 6E 6F ; is program canno
00000060h: 74 20 62 65 20 72 75 6E 20 69 6E 20 44 4F 53 20 ; t be run in DOS
00000070h: 6D 6F 64 65 2E 0D 0D 0A 24 00 00 00 00 00 00 00 ; mode....$.......
00000080h: 5D 65 FD C8 19 04 93 9B 19 04 93 9B 19 04 93 9B ; ]e ..搏..搏..搏
00000090h: 97 1B 80 9B 11 04 93 9B E5 24 81 9B 18 04 93 9B ; ?€?.搏?仜..搏
000000a0h: 52 69 63 68 19 04 93 9B 00 00 00 00 00 00 00 00 ; Rich..搏........
000000b0h: 50 45 00 00 4C 01 03 00 9B 4D 8F 42 00 00 00 00 ; PE..L...汳廈....
000000c0h: 00 00 00 00 E0 00 0F 01 0B 01 05 0C 00 02 00 00 ; 符号数?..可选文件头大小 文件信息标记
000000d0h: 00 04 00 00 00 00 00 00 00 10 00 00 00 10 00 00 ; Address Of Entry Point
000000e0h: 00 20 00 00 00 00 40 00 00 10 00 00 00 02 00 00 ; Image Ba @.  Section Alignment  File Alignment
000000f0h: 04 00 00 00 00 00 00 00 04 00 00 00 00 00 00 00 ; ................
00000100h: 00 40 00 00 00 04 00 00 00 00 00 00 02 00 00 00 ; .@..............
00000110h: 00 00 10 00 00 10 00 00 00 00 10 00 00 10 00 00 ; ................
00000120h: 00 00 00 00 10 00 00 00 00 00 00 00 00 00 00 00 ; Number of Directories  EXPORT Table
00000130h: 14 20 00 00 3C 00 00 00 00 00 00 00 00 00 00 00 ; IMPORT Table  Source Table
00000140h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000150h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000160h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000170h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000180h: 00 00 00 00 00 00 00 00 00 20 00 00 14 00 00 00 ; IMPORT Address Table
00000190h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000001a0h: 00 00 00 00 00 00 00 00 2E 74 65 78 74 00 00 00 ; .........text...  代码节
000001b0h: 46 00 00 00 00 10 00 00 00 02 00 00 00 04 00 00 ; F...............
000001c0h: 00 00 00 00 00 00 00 00 00 00 00 00 20 00 00 60 ; ............ ..`
000001d0h: 2E 72 64 61 74 61 00 00 A6 00 00 00 00 20 00 00 ; .rdata..?... ..  引出函数节
000001e0h: 00 02 00 00 00 06 00 00 00 00 00 00 00 00 00 00 ; ................
000001f0h: 00 00 00 00 40 00 00 40 2E 64 61 74 61 00 00 00 ; ....@..@.data...  已初始化的数据节
00000200h: 8E 00 00 00 00 30 00 00 00 02 00 00 00 08 00 00 ; ?...0...........
00000210h: 00 00 00 00 00 00 00 00 00 00 00 00 40 00 00 C0 ; ............@..?
00000220h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000230h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000240h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000250h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000260h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000270h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000280h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000290h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
```

节表的名称 | 虚拟大小 | 虚拟偏移量 | Raw大小 | Raw偏移

```
                0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
-------------------------------------------------------------------------------
000002a0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000002b0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000002c0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000002d0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000002e0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000002f0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000300h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000310h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000320h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000330h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000340h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000350h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000360h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000370h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000380h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000390h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000003a0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000003b0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000003c0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000003d0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000003e0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000003f0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000400h: 68 40 10 00 00 68 00 30 40 00 68 09 30 40 00 6A ; h@...h.0@.h.0@.j
00000410h: 00 E8 2A 00 00 00 68 40 10 00 00 68 00 30 40 00 ; .?...h@...h.0@.
00000420h: 68 31 30 40 00 6A 00 E8 14 00 00 00 6A 00 E8 01 ; h10@.j.?...j.?
00000430h: 00 00 00 CC FF 25 00 20 40 00 FF 25 0C 20 40 00 ; ...?%. @. %. @.
00000440h: FF 25 08 20 40 00 00 00 00 00 00 00 00 00 00 00 ;  %. @...........
00000450h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000460h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000470h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000480h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000490h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000004a0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000004b0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000004c0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000004d0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000004e0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000004f0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000500h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000510h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000520h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000530h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000540h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000550h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000560h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000570h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000580h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
```

```
                0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
-------------------------------------------------------------------------------
00000590h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000005a0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000005b0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000005c0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000005d0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000005e0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000005f0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000600h: 64 20 00 00 00 00 00 00 8C 20 00 00 80 20 00 00 ; d ......?..€ ..
00000610h: 00 00 00 00 50 20 00 00 00 00 00 00 00 00 00 00 ; ....P ..... ..  对应kernel32.dll
00000620h: 72 20 00 00 00 20 00 00 58 20 00 00 00 00 00 00 ; r ... ..X ..... 对应user32.dll
00000630h: 00 00 00 00 9A 20 00 00 08 20 00 00 00 00 00 00 ; ....?... ..      全0元素标识结束
00000640h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000650h: 64 20 00 00 00 00 00 00 8C 20 00 00 80 20 00 00 ; d ......?..€ ..
00000660h: 00 00 00 00 80 00 45 78 69 74 50 72 6F 63 65 73 ; ....€.ExitProces
00000670h: 73 00 6B 65 72 6E 65 6C 33 32 2E 64 6C 6C 00 00 ; s.kernel32.dll..
00000680h: 62 02 77 73 70 72 69 6E 74 66 41 00 9D 01 4D 65 ; b.wsprintfA.?Me
00000690h: 73 73 61 67 65 42 6F 78 41 00 75 73 65 72 33 32 ; ssageBoxA.user32
000006a0h: 2E 64 6C 6C 00 00 00 00 00 00 00 00 00 00 00 00 ; .dll.. .........
000006b0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000006c0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000006d0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000006e0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000006f0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000700h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000710h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000720h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000730h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000740h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000750h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000760h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000770h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000780h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000790h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000007a0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000007b0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000007c0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000007d0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000007e0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000007f0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000800h: BD CC D1 A7 B2 E2 CA D4 00 50 45 C8 EB BF DA B5 ; 教学测试.PE入口?
00000810h: E3 B2 E2 CA D4 31 A3 BA BD F8 C8 EB B5 DA D2 BB ; 悴饯?：进入第一
00000820h: C8 EB BF DA CE BB D6 C3 34 30 31 30 30 30 48 21 ; 入口位置401000H!
00000830h: 00 50 45 C8 EB BF DA B5 E3 B2 E2 CA D4 32 A3 BA ; .PE入口点测试2：
00000840h: BD F8 C8 EB B5 DA B6 FE C8 EB BF DA CE BB D6 C3 ; 进入第二入口位置
00000850h: 34 30 31 30 31 36 48 21 00 00 00 00 00 00 00 00 ; 401016H!........
00000860h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000870h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
```

```
                0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
-------------------------------------------------------------------------------
00000880h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000890h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000008a0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000008b0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000008c0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000008d0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000008e0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000008f0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000900h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000910h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000920h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000930h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000940h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000950h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000960h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000970h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000980h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
00000990h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000009a0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000009b0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000009c0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000009d0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000009e0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
000009f0h: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ; ................
```

① 指向ExitProcess函数的序号和函数名
DWORD数组结束标志
③ 指向MessageBoxA函数的序号和函数名
指向wsprintfA函数的序号和函数名
DWORD数组结束标志

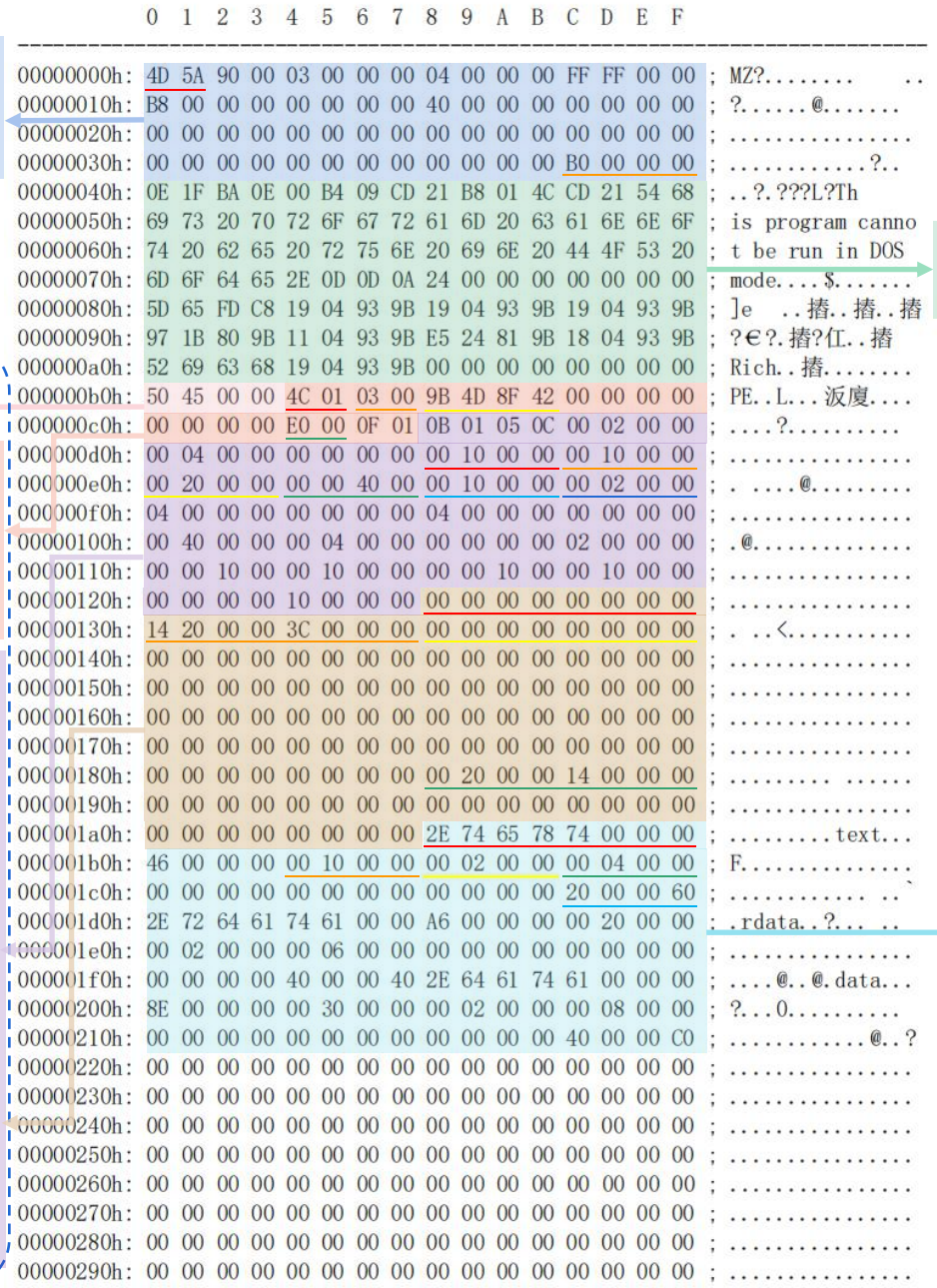
Kernal32引入的第一个函数在INT中的RVA
② 50 20 00 00 00 00 00 00 00 00 00 00 00 00 00 00
72 20 00 00 00 20 00 00
Kernal32文件名字符串的RVA | Kernal32引入的第一个函数在IAT中的RVA
（对应user32.dll同理）

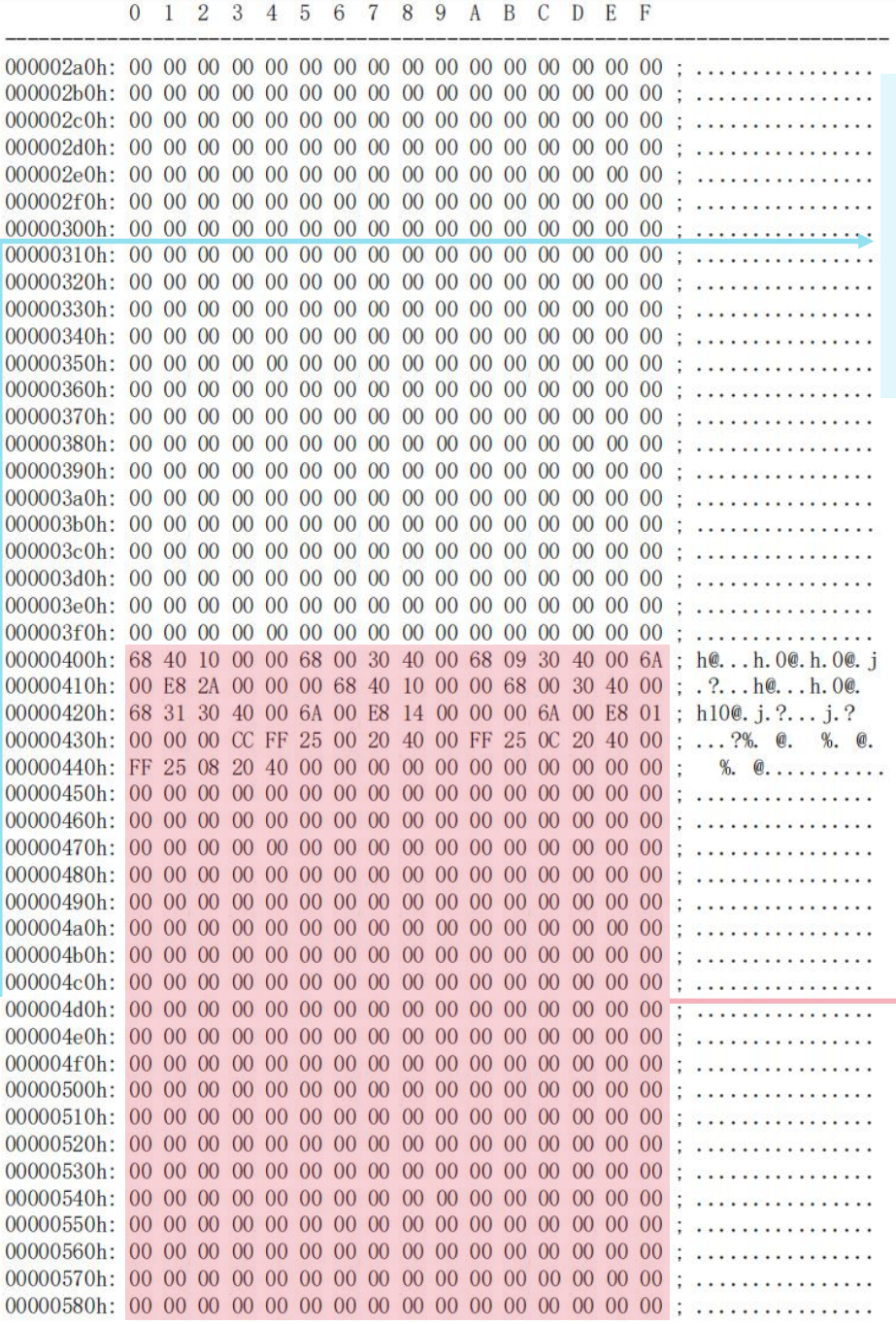
要求：
1丐　分割PE文件的各个部分：MZ头部+DOS Stub+PE文件头+可选文件头+节表+节
2丐　标明各个关键字段结构和字段，及其含义
3丐　详细分析函数引入表中的各个字段及其关系

④
Hints　引入函数名 ExitProcess
80 00 45 78 69 74 50 72 6F 63 65 73 ;
kernel32.dll 的函数名
73 00 6B 65 72 6E 65 6C 33 32 2E 64 6C 6C 00 00 ;
Hints　引入函数名 MessageBoxA　Hints
62 02 77 73 70 72 69 6E 74 66 41 00 9D 01 4D 65 ;
引入函数名 wsprintfA　user32.dll 的函数名
73 73 61 67 65 42 6F 78 41 00 75 73 65 72 33 32 ;
2E 64 6C 6C 00 00

test.exe 程序-PE 文件格式分析

姓名：_____ 学号：_____





MZ 文件头

- MZ 标识符
- PE 文件头入口地址

PE 文件头

PE 标识符

映像文件头

- 运行平台(I386)
- 文件中节的数目
- 文件的生成时间
- 可选文件头的大小

可选文件头

- PE 文件第一条运行指令的RVA
- 代码节RVA
- 引入函数节RVA
- PE 文件优先装载地址 (Image Base)
- 内存中节的粒度
- 文件中节的粒度

数据目录表

(16表项，每项8字节。表项结构为4字节的表RVA与4字节的表大小)

- 引出函数节表项
- 引入函数节表项
- 资源节表项
- IAT表项

DOS 桩

节表

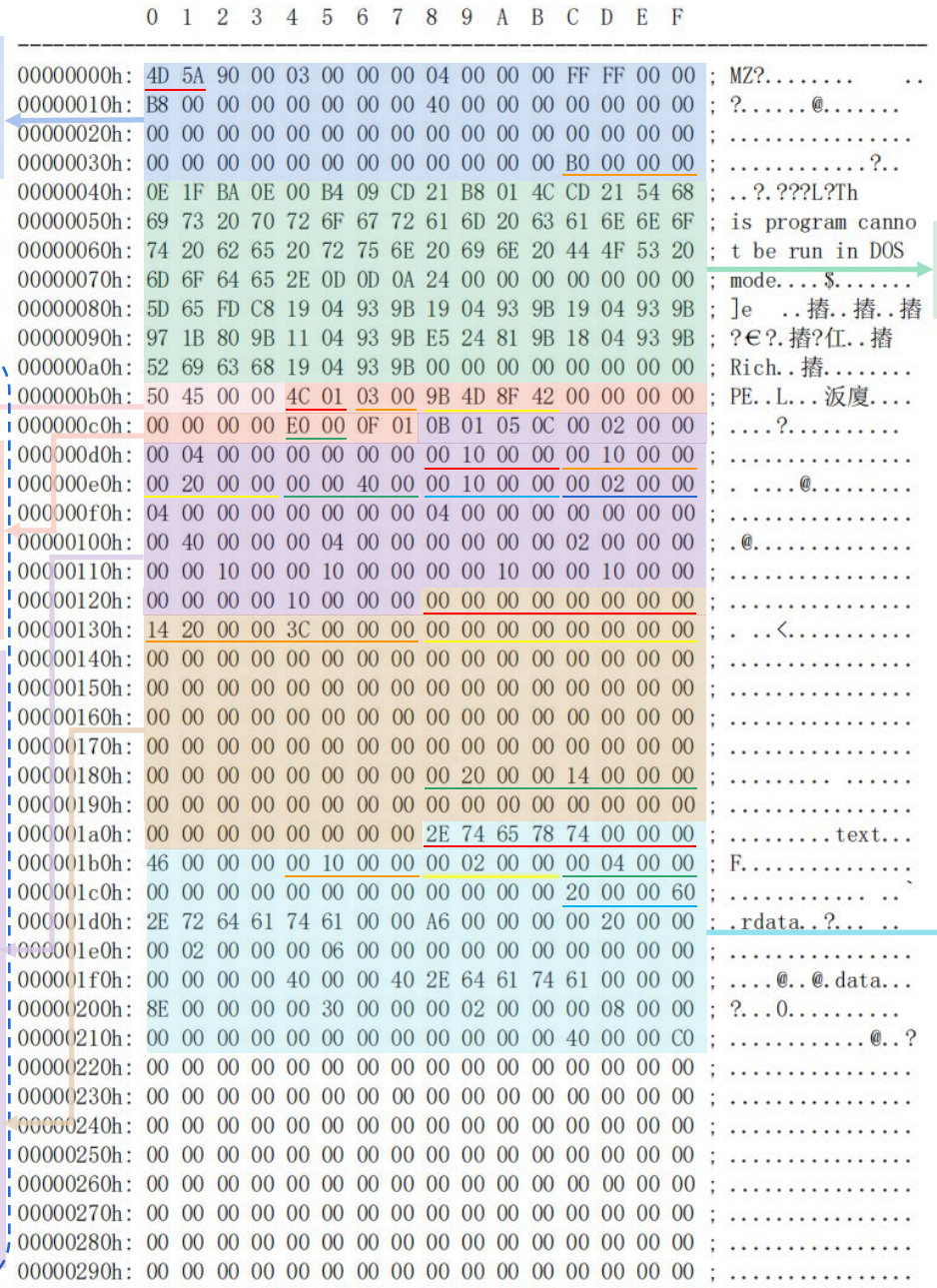
(本例包含代码节、引入函数节、数据节3个表项，每表项20字节)

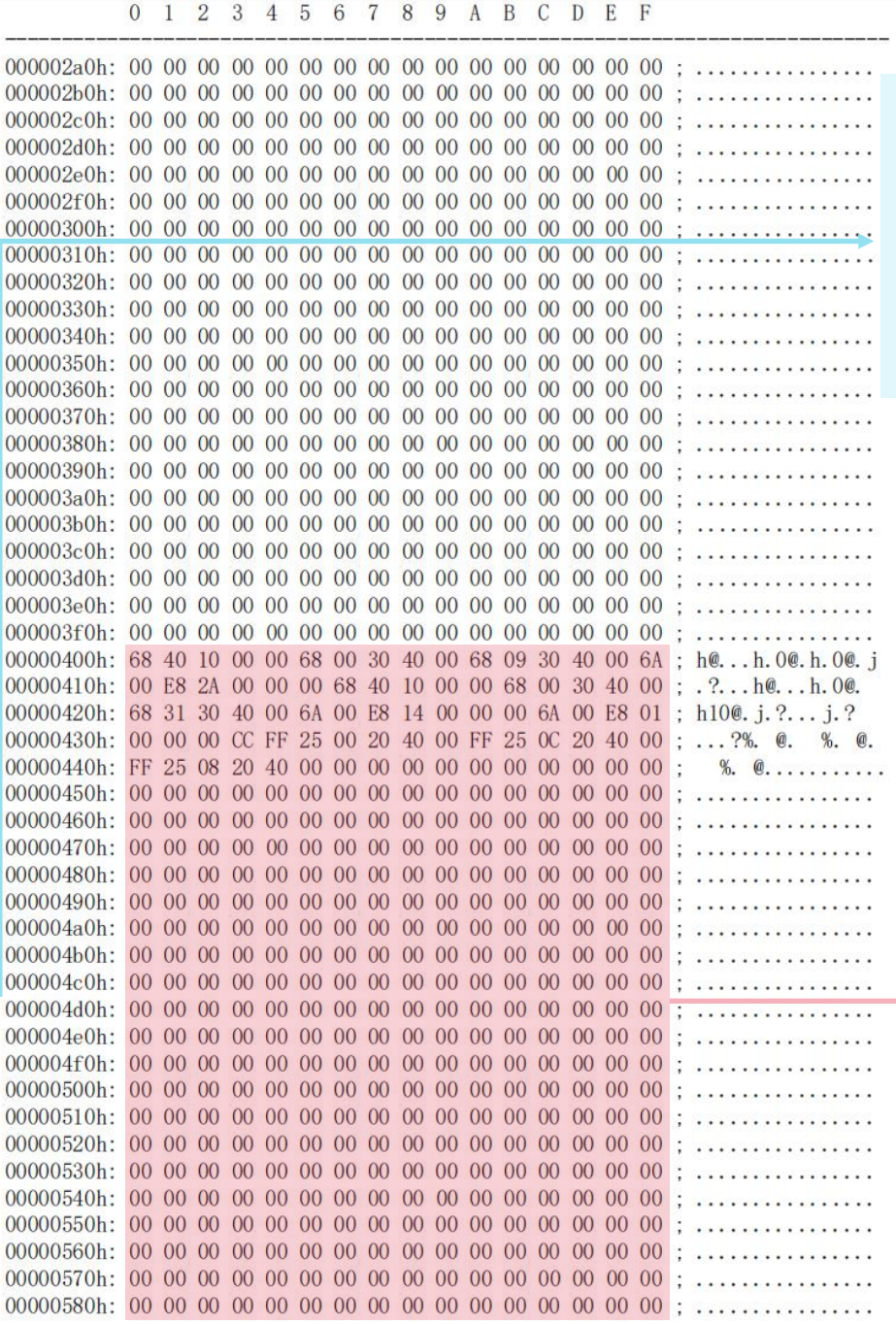
- 节名称(.text)
- 节的RVA
- 节的长度
- 节在文件中的位置
- 节属性

代码节

test.exe 程序-PE 文件格式分析

姓名：_____ 学号：_____





MZ 文件头

- MZ 标识符
- PE 文件头入口地址

PE 文件头

PE 标识符

映像文件头

- 运行平台(I386)
- 文件中节的数目
- 文件的生成时间
- 可选文件头的大小

可选文件头

- PE 文件第一条运行指令的RVA
- 代码节RVA
- 引入函数节RVA
- PE 文件优先装载地址 (Image Base)
- 内存中节的粒度
- 文件中节的粒度

数据目录表

(16表项，每项8字节。表项结构为4字节的表RVA与4字节的表大小)

- 引出函数节表项
- 引入函数节表项
- 资源节表项
- IAT表项

DOS 桩

节表

(本例包含代码节、引入函数节、数据节3个表项，每表项20字节)

- 节名称(.text)
- 节的RVA
- 节的长度
- 节在文件中的位置
- 节属性

代码节