/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

To be the apostrophe which changed "Impossible" into "I'm possible"!

POC code of chapter 6.2 in book "Vulnerability Exploit and Analysis Technique"

file name : heap\_debug.c

author : failwest

date : 2007.04.04

description : demo show of how heap works

Noticed : 1 only run on windows 2000

2 complied with VC 6.0

3 build into release version

4 only used for run time debugging

version : 1.0

E-mail : failwest@gmail.com

Only for educational purposes enjoy the fun from exploiting :)

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

#include <windows.h>

main()

{

HLOCAL h1,h2,h3,h4,h5,h6;

HANDLE hp;

hp = HeapCreate(0,0x1000,0x10000);

\_\_asm int 3

h1 = HeapAlloc(hp,HEAP\_ZERO\_MEMORY,3);

h2 = HeapAlloc(hp,HEAP\_ZERO\_MEMORY,5);

h3 = HeapAlloc(hp,HEAP\_ZERO\_MEMORY,6);

h4 = HeapAlloc(hp,HEAP\_ZERO\_MEMORY,8);

h5 = HeapAlloc(hp,HEAP\_ZERO\_MEMORY,19);

h6 = HeapAlloc(hp,HEAP\_ZERO\_MEMORY,24);

//free block and prevent coaleses

HeapFree(hp,0,h1); //free to freelist[2]

HeapFree(hp,0,h3); //free to freelist[2]

HeapFree(hp,0,h5); //free to freelist[4]

HeapFree(hp,0,h4); //coalese h3,h4,h5,link the large block to freelist[8]

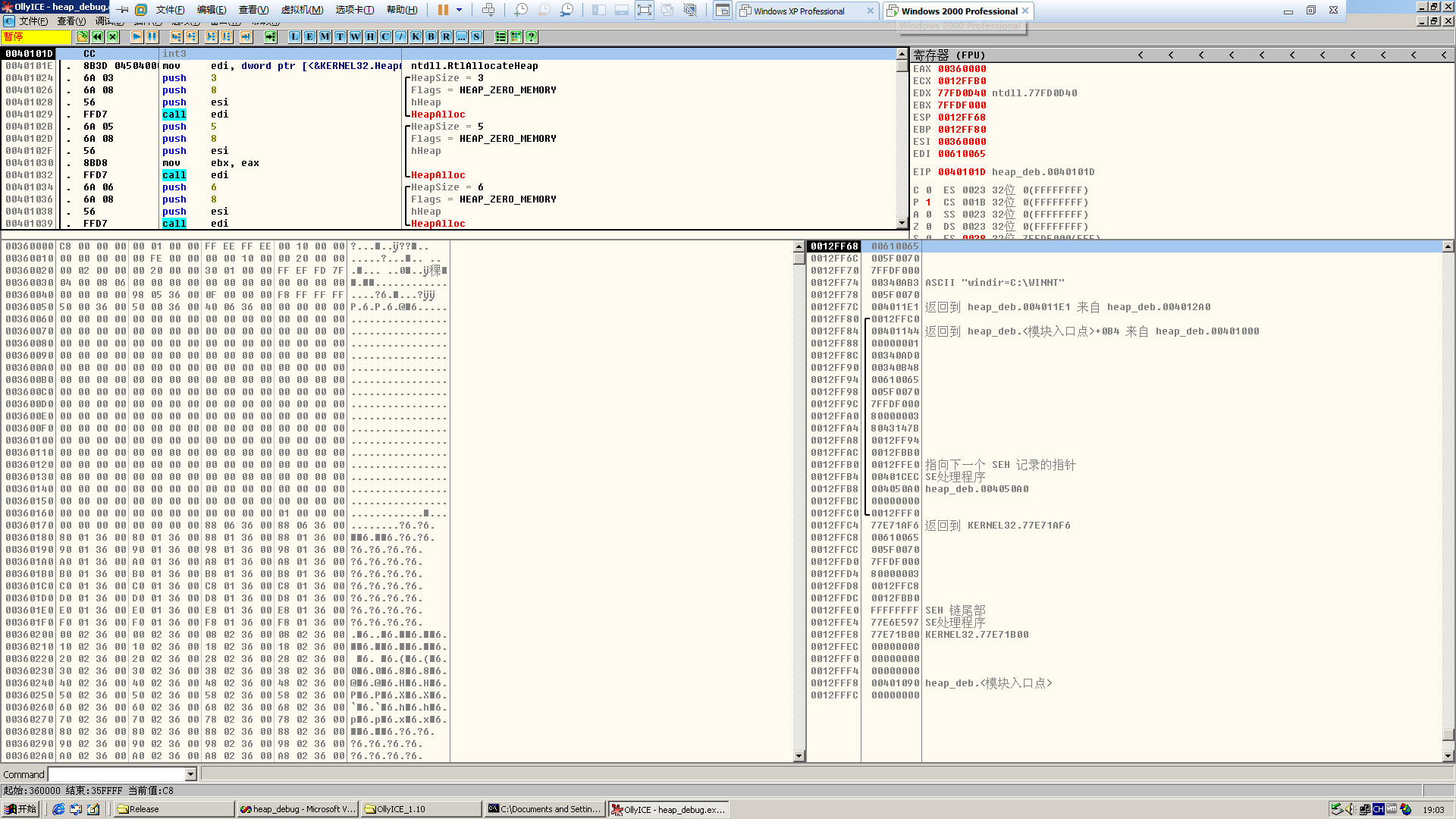
return 0;

}

这里的环境是win 2000 sp4 然后打了一个安装VMtools的补丁，再安装VMtools

关于OD，设置成默认调试器就行了，然后编译生成release版本，打开后中断，点取消进入OD

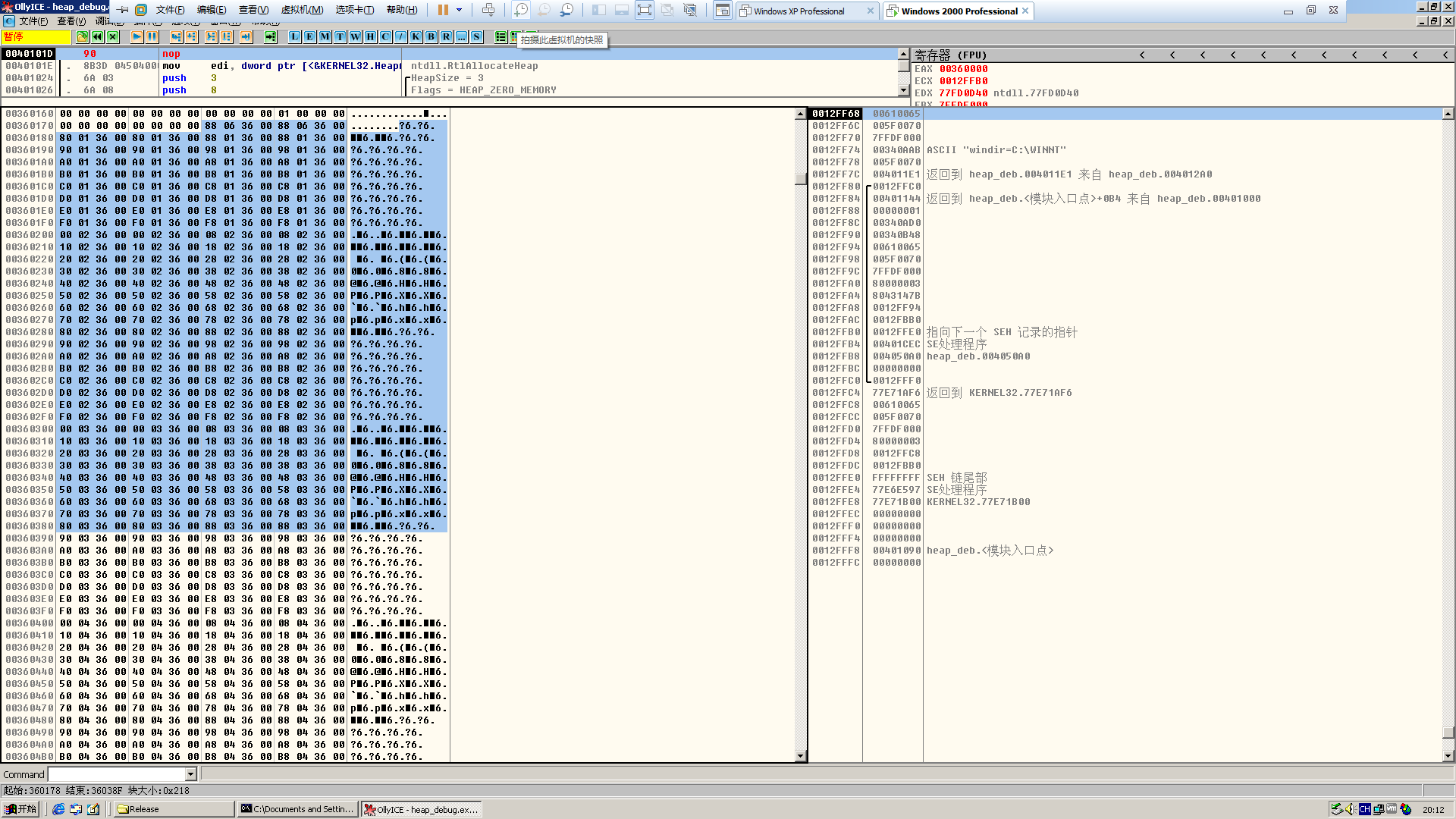
这里可以看到已经断在了我们设置的中断位置，注意寄存器EAX的值，这是整个堆区的起始位置，所以跳到0x00360000看看



从0x00360000开始一段就是堆区的各种信息了，然后中间一堆0x00就是虚分配索引，因为刚刚初始化没有任何记录所以全是0

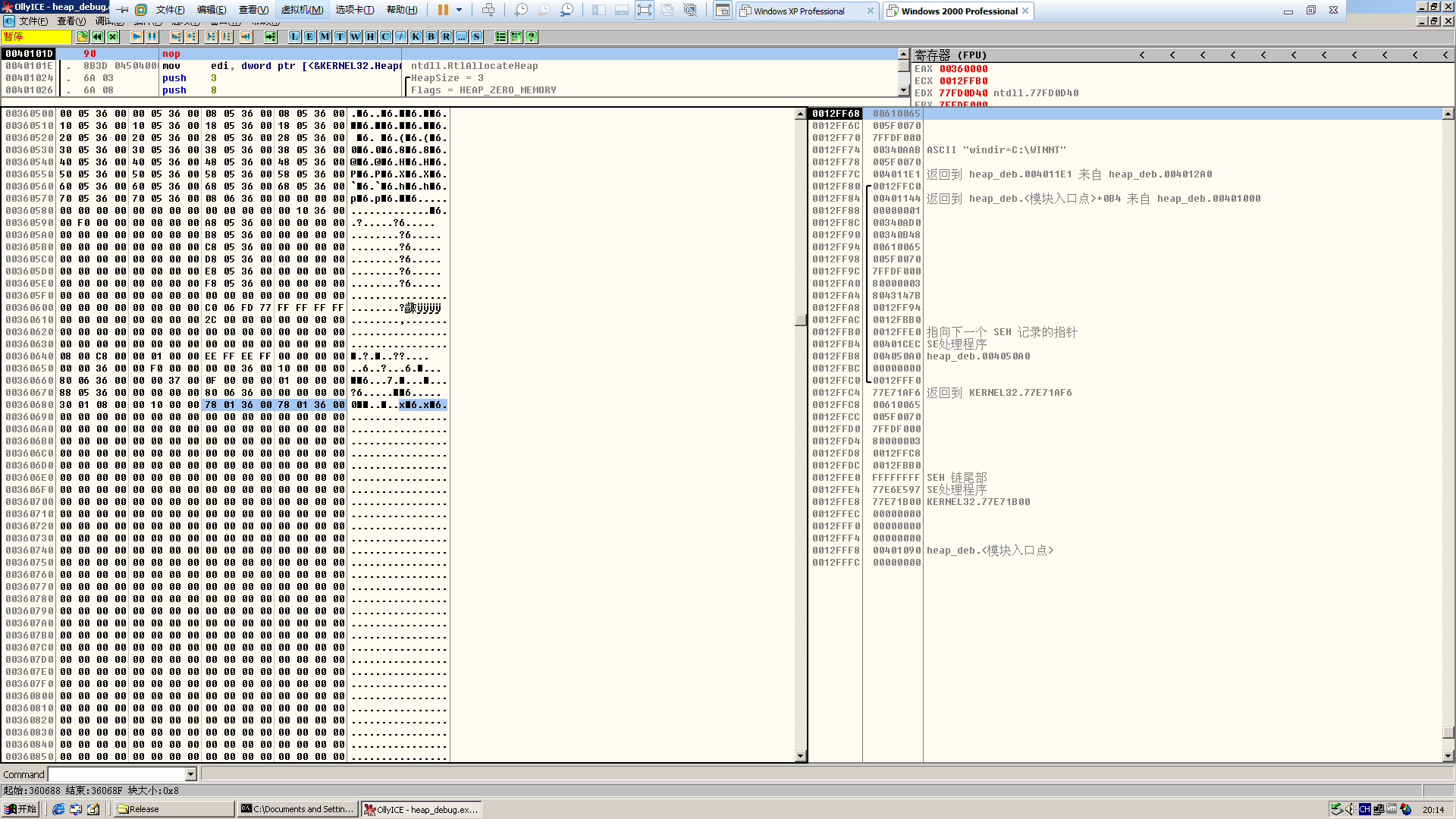
要说明的是这里的快表并没有使用，因为我们创建的是不可扩展的堆，所以在0x00360584处的快表指针始终为NULL，那么接下来就只是空表的操作了

接下来就是关键了，看0x00360178，标记的部分是部分空表索引区，可以看到0x00360178处的值指向的是0x00360688，而接下来其它的索引都是指向自己本身

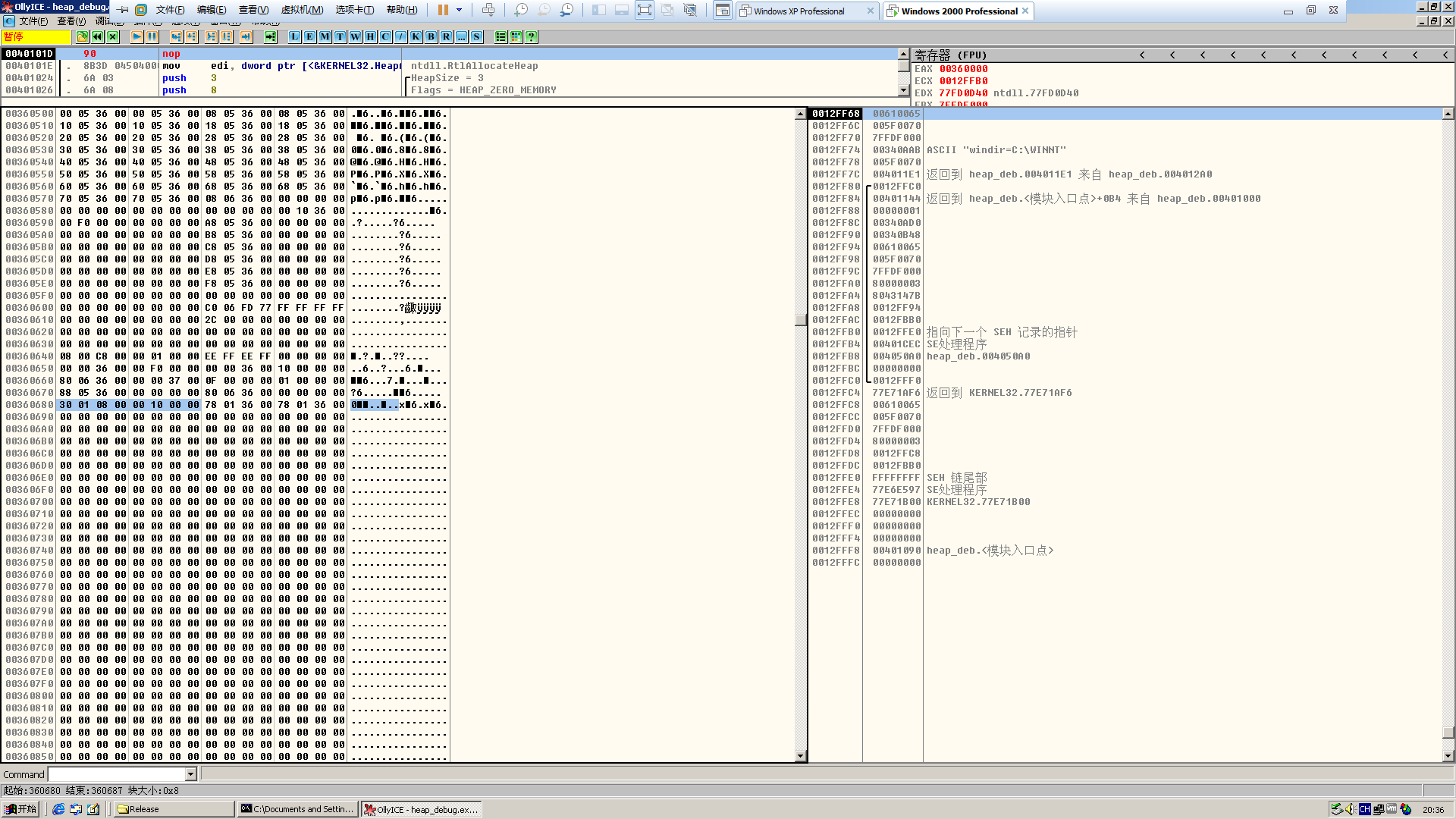


那么就跳到0x00360688看看，可以看到这个位置的指针是指向0x00360178

补充一点：其实这个堆块的内存起始位置是0x00360680，因为跳过了8字节块首直接指向了数据区，所以直接是0x00360688，这个空闲的堆块也被称为尾块



再来注意下内存0x00360680的值为0x00080130，0x0130表示这个堆块大小为0x0130，计算单位是8字节，0x0008表示Previous chunk size，堆块大小包括块首



现在来看一下整个堆区的布局

这是初始化的堆区

00360000 C8 00 00 00 00 01 00 00 FF EE FF EE 00 10 00 00 ?.....??..

00360010 00 00 00 00 00 FE 00 00 00 00 10 00 00 20 00 00 .....?..... ..

00360020 00 02 00 00 00 20 00 00 30 01 00 00 FF EF FD 7F .... ..0..稞

00360030 04 00 08 06 00 00 00 00 00 00 00 00 00 00 00 00 .............

00360040 00 00 00 00 98 05 36 00 0F 00 00 00 F8 FF FF FF ....?6....?

00360050 50 00 36 00 50 00 36 00 40 06 36 00 00 00 00 00 P.6.P.6.@6.....

00360060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360110 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360130 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360140 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360150 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360160 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 ...............

00360170 00 00 00 00 00 00 00 00 88 06 36 00 88 06 36 00 ........?6.?6.

00360180 80 01 36 00 80 01 36 00 88 01 36 00 88 01 36 00 €6.€6.?6.?6.

00360190 90 01 36 00 90 01 36 00 98 01 36 00 98 01 36 00 ?6.?6.?6.?6.

003601A0 A0 01 36 00 A0 01 36 00 A8 01 36 00 A8 01 36 00 ?6.?6.?6.?6.

003601B0 B0 01 36 00 B0 01 36 00 B8 01 36 00 B8 01 36 00 ?6.?6.?6.?6.

003601C0 C0 01 36 00 C0 01 36 00 C8 01 36 00 C8 01 36 00 ?6.?6.?6.?6.

003601D0 D0 01 36 00 D0 01 36 00 D8 01 36 00 D8 01 36 00 ?6.?6.?6.?6.

003601E0 E0 01 36 00 E0 01 36 00 E8 01 36 00 E8 01 36 00 ?6.?6.?6.?6.

003601F0 F0 01 36 00 F0 01 36 00 F8 01 36 00 F8 01 36 00 ?6.?6.?6.?6.

00360200 00 02 36 00 00 02 36 00 08 02 36 00 08 02 36 00 .6..6.6.6.

00360210 10 02 36 00 10 02 36 00 18 02 36 00 18 02 36 00 6.6.6.6.

00360220 20 02 36 00 20 02 36 00 28 02 36 00 28 02 36 00 6. 6.(6.(6.

00360230 30 02 36 00 30 02 36 00 38 02 36 00 38 02 36 00 06.06.86.86.

00360240 40 02 36 00 40 02 36 00 48 02 36 00 48 02 36 00 @6.@6.H6.H6.

00360250 50 02 36 00 50 02 36 00 58 02 36 00 58 02 36 00 P6.P6.X6.X6.

00360260 60 02 36 00 60 02 36 00 68 02 36 00 68 02 36 00 `6.`6.h6.h6.

00360270 70 02 36 00 70 02 36 00 78 02 36 00 78 02 36 00 p6.p6.x6.x6.

00360280 80 02 36 00 80 02 36 00 88 02 36 00 88 02 36 00 €6.€6.?6.?6.

00360290 90 02 36 00 90 02 36 00 98 02 36 00 98 02 36 00 ?6.?6.?6.?6.

003602A0 A0 02 36 00 A0 02 36 00 A8 02 36 00 A8 02 36 00 ?6.?6.?6.?6.

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003602C0 C0 02 36 00 C0 02 36 00 C8 02 36 00 C8 02 36 00 ?6.?6.?6.?6.

003602D0 D0 02 36 00 D0 02 36 00 D8 02 36 00 D8 02 36 00 ?6.?6.?6.?6.

003602E0 E0 02 36 00 E0 02 36 00 E8 02 36 00 E8 02 36 00 ?6.?6.?6.?6.

003602F0 F0 02 36 00 F0 02 36 00 F8 02 36 00 F8 02 36 00 ?6.?6.?6.?6.

00360300 00 03 36 00 00 03 36 00 08 03 36 00 08 03 36 00 .6..6.6.6.

00360310 10 03 36 00 10 03 36 00 18 03 36 00 18 03 36 00 6.6.6.6.

00360320 20 03 36 00 20 03 36 00 28 03 36 00 28 03 36 00 6. 6.(6.(6.

00360330 30 03 36 00 30 03 36 00 38 03 36 00 38 03 36 00 06.06.86.86.

00360340 40 03 36 00 40 03 36 00 48 03 36 00 48 03 36 00 @6.@6.H6.H6.

00360350 50 03 36 00 50 03 36 00 58 03 36 00 58 03 36 00 P6.P6.X6.X6.

00360360 60 03 36 00 60 03 36 00 68 03 36 00 68 03 36 00 `6.`6.h6.h6.

00360370 70 03 36 00 70 03 36 00 78 03 36 00 78 03 36 00 p6.p6.x6.x6.

00360380 80 03 36 00 80 03 36 00 88 03 36 00 88 03 36 00 €6.€6.?6.?6.

00360390 90 03 36 00 90 03 36 00 98 03 36 00 98 03 36 00 ?6.?6.?6.?6.

003603A0 A0 03 36 00 A0 03 36 00 A8 03 36 00 A8 03 36 00 ?6.?6.?6.?6.

003603B0 B0 03 36 00 B0 03 36 00 B8 03 36 00 B8 03 36 00 ?6.?6.?6.?6.

003603C0 C0 03 36 00 C0 03 36 00 C8 03 36 00 C8 03 36 00 ?6.?6.?6.?6.

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003603F0 F0 03 36 00 F0 03 36 00 F8 03 36 00 F8 03 36 00 ?6.?6.?6.?6.

00360400 00 04 36 00 00 04 36 00 08 04 36 00 08 04 36 00 .6..6.6.6.

00360410 10 04 36 00 10 04 36 00 18 04 36 00 18 04 36 00 6.6.6.6.

00360420 20 04 36 00 20 04 36 00 28 04 36 00 28 04 36 00 6. 6.(6.(6.

00360430 30 04 36 00 30 04 36 00 38 04 36 00 38 04 36 00 06.06.86.86.

00360440 40 04 36 00 40 04 36 00 48 04 36 00 48 04 36 00 @6.@6.H6.H6.

00360450 50 04 36 00 50 04 36 00 58 04 36 00 58 04 36 00 P6.P6.X6.X6.

00360460 60 04 36 00 60 04 36 00 68 04 36 00 68 04 36 00 `6.`6.h6.h6.

00360470 70 04 36 00 70 04 36 00 78 04 36 00 78 04 36 00 p6.p6.x6.x6.

00360480 80 04 36 00 80 04 36 00 88 04 36 00 88 04 36 00 €6.€6.?6.?6.

00360490 90 04 36 00 90 04 36 00 98 04 36 00 98 04 36 00 ?6.?6.?6.?6.

003604A0 A0 04 36 00 A0 04 36 00 A8 04 36 00 A8 04 36 00 ?6.?6.?6.?6.

003604B0 B0 04 36 00 B0 04 36 00 B8 04 36 00 B8 04 36 00 ?6.?6.?6.?6.

003604C0 C0 04 36 00 C0 04 36 00 C8 04 36 00 C8 04 36 00 ?6.?6.?6.?6.

003604D0 D0 04 36 00 D0 04 36 00 D8 04 36 00 D8 04 36 00 ?6.?6.?6.?6.

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003604F0 F0 04 36 00 F0 04 36 00 F8 04 36 00 F8 04 36 00 ?6.?6.?6.?6.

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00360520 20 05 36 00 20 05 36 00 28 05 36 00 28 05 36 00 6. 6.(6.(6.

00360530 30 05 36 00 30 05 36 00 38 05 36 00 38 05 36 00 06.06.86.86.

00360540 40 05 36 00 40 05 36 00 48 05 36 00 48 05 36 00 @6.@6.H6.H6.

00360550 50 05 36 00 50 05 36 00 58 05 36 00 58 05 36 00 P6.P6.X6.X6.

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00360580 00 00 00 00 00 00 00 00 00 00 00 00 00 10 36 00 .............6.

00360590 00 F0 00 00 00 00 00 00 A8 05 36 00 00 00 00 00 .?.....?6.....

003605A0 00 00 00 00 00 00 00 00 B8 05 36 00 00 00 00 00 ........?6.....

003605B0 00 00 00 00 00 00 00 00 C8 05 36 00 00 00 00 00 ........?6.....

003605C0 00 00 00 00 00 00 00 00 D8 05 36 00 00 00 00 00 ........?6.....

003605D0 00 00 00 00 00 00 00 00 E8 05 36 00 00 00 00 00 ........?6.....

003605E0 00 00 00 00 00 00 00 00 F8 05 36 00 00 00 00 00 ........?6.....

003605F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360600 00 00 00 00 00 00 00 00 C0 06 FD 77 FF FF FF FF ........?齱

00360610 00 00 00 00 00 00 00 00 2C 00 00 00 00 00 00 00 ........,.......

00360620 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360630 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360640 08 00 C8 00 00 01 00 00 EE FF EE FF 00 00 00 00 .?...??....

00360650 00 00 36 00 00 F0 00 00 00 00 36 00 10 00 00 00 ..6..?...6....

00360660 80 06 36 00 00 00 37 00 0F 00 00 00 01 00 00 00 €6...7.......

00360670 88 05 36 00 00 00 00 00 80 06 36 00 00 00 00 00 ?6.....€6.....

00360680 30 01 08 00 00 10 00 00 78 01 36 00 78 01 36 00 0....x6.x6.

00360690 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360700 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

第一次

C语言

h1 = HeapAlloc(hp,HEAP\_ZERO\_MEMORY,3);

汇编

00401024 |. 6A 03 push 3 ; /HeapSize = 3

00401026 |. 6A 08 push 8 ; |Flags = HEAP\_ZERO\_MEMORY

00401028 |. 56 push esi ; |hHeap

00401029 |. FFD7 call edi ; \HeapAlloc

运行完后的堆区

00360000 C8 00 00 00 00 01 00 00 FF EE FF EE 00 10 00 00 ?.....??..

00360010 00 00 00 00 00 FE 00 00 00 00 10 00 00 20 00 00 .....?..... ..

00360020 00 02 00 00 00 20 00 00 2E 01 00 00 FF EF FD 7F .... .....稞

00360030 04 00 08 06 00 00 00 00 00 00 00 00 00 00 00 00 .............

00360040 00 00 00 00 98 05 36 00 0F 00 00 00 F8 FF FF FF ....?6....?

00360050 50 00 36 00 50 00 36 00 40 06 36 00 00 00 00 00 P.6.P.6.@6.....

00360060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

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003600F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

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00360150 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

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00360180 80 01 36 00 80 01 36 00 88 01 36 00 88 01 36 00 €6.€6.?6.?6.

00360190 90 01 36 00 90 01 36 00 98 01 36 00 98 01 36 00 ?6.?6.?6.?6.

003601A0 A0 01 36 00 A0 01 36 00 A8 01 36 00 A8 01 36 00 ?6.?6.?6.?6.

003601B0 B0 01 36 00 B0 01 36 00 B8 01 36 00 B8 01 36 00 ?6.?6.?6.?6.

003601C0 C0 01 36 00 C0 01 36 00 C8 01 36 00 C8 01 36 00 ?6.?6.?6.?6.

003601D0 D0 01 36 00 D0 01 36 00 D8 01 36 00 D8 01 36 00 ?6.?6.?6.?6.

003601E0 E0 01 36 00 E0 01 36 00 E8 01 36 00 E8 01 36 00 ?6.?6.?6.?6.

003601F0 F0 01 36 00 F0 01 36 00 F8 01 36 00 F8 01 36 00 ?6.?6.?6.?6.

00360200 00 02 36 00 00 02 36 00 08 02 36 00 08 02 36 00 .6..6.6.6.

00360210 10 02 36 00 10 02 36 00 18 02 36 00 18 02 36 00 6.6.6.6.

00360220 20 02 36 00 20 02 36 00 28 02 36 00 28 02 36 00 6. 6.(6.(6.

00360230 30 02 36 00 30 02 36 00 38 02 36 00 38 02 36 00 06.06.86.86.

00360240 40 02 36 00 40 02 36 00 48 02 36 00 48 02 36 00 @6.@6.H6.H6.

00360250 50 02 36 00 50 02 36 00 58 02 36 00 58 02 36 00 P6.P6.X6.X6.

00360260 60 02 36 00 60 02 36 00 68 02 36 00 68 02 36 00 `6.`6.h6.h6.

00360270 70 02 36 00 70 02 36 00 78 02 36 00 78 02 36 00 p6.p6.x6.x6.

00360280 80 02 36 00 80 02 36 00 88 02 36 00 88 02 36 00 €6.€6.?6.?6.

00360290 90 02 36 00 90 02 36 00 98 02 36 00 98 02 36 00 ?6.?6.?6.?6.

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003602B0 B0 02 36 00 B0 02 36 00 B8 02 36 00 B8 02 36 00 ?6.?6.?6.?6.

003602C0 C0 02 36 00 C0 02 36 00 C8 02 36 00 C8 02 36 00 ?6.?6.?6.?6.

003602D0 D0 02 36 00 D0 02 36 00 D8 02 36 00 D8 02 36 00 ?6.?6.?6.?6.

003602E0 E0 02 36 00 E0 02 36 00 E8 02 36 00 E8 02 36 00 ?6.?6.?6.?6.

003602F0 F0 02 36 00 F0 02 36 00 F8 02 36 00 F8 02 36 00 ?6.?6.?6.?6.

00360300 00 03 36 00 00 03 36 00 08 03 36 00 08 03 36 00 .6..6.6.6.

00360310 10 03 36 00 10 03 36 00 18 03 36 00 18 03 36 00 6.6.6.6.

00360320 20 03 36 00 20 03 36 00 28 03 36 00 28 03 36 00 6. 6.(6.(6.

00360330 30 03 36 00 30 03 36 00 38 03 36 00 38 03 36 00 06.06.86.86.

00360340 40 03 36 00 40 03 36 00 48 03 36 00 48 03 36 00 @6.@6.H6.H6.

00360350 50 03 36 00 50 03 36 00 58 03 36 00 58 03 36 00 P6.P6.X6.X6.

00360360 60 03 36 00 60 03 36 00 68 03 36 00 68 03 36 00 `6.`6.h6.h6.

00360370 70 03 36 00 70 03 36 00 78 03 36 00 78 03 36 00 p6.p6.x6.x6.

00360380 80 03 36 00 80 03 36 00 88 03 36 00 88 03 36 00 €6.€6.?6.?6.

00360390 90 03 36 00 90 03 36 00 98 03 36 00 98 03 36 00 ?6.?6.?6.?6.

003603A0 A0 03 36 00 A0 03 36 00 A8 03 36 00 A8 03 36 00 ?6.?6.?6.?6.

003603B0 B0 03 36 00 B0 03 36 00 B8 03 36 00 B8 03 36 00 ?6.?6.?6.?6.

003603C0 C0 03 36 00 C0 03 36 00 C8 03 36 00 C8 03 36 00 ?6.?6.?6.?6.

003603D0 D0 03 36 00 D0 03 36 00 D8 03 36 00 D8 03 36 00 ?6.?6.?6.?6.

003603E0 E0 03 36 00 E0 03 36 00 E8 03 36 00 E8 03 36 00 ?6.?6.?6.?6.

003603F0 F0 03 36 00 F0 03 36 00 F8 03 36 00 F8 03 36 00 ?6.?6.?6.?6.

00360400 00 04 36 00 00 04 36 00 08 04 36 00 08 04 36 00 .6..6.6.6.

00360410 10 04 36 00 10 04 36 00 18 04 36 00 18 04 36 00 6.6.6.6.

00360420 20 04 36 00 20 04 36 00 28 04 36 00 28 04 36 00 6. 6.(6.(6.

00360430 30 04 36 00 30 04 36 00 38 04 36 00 38 04 36 00 06.06.86.86.

00360440 40 04 36 00 40 04 36 00 48 04 36 00 48 04 36 00 @6.@6.H6.H6.

00360450 50 04 36 00 50 04 36 00 58 04 36 00 58 04 36 00 P6.P6.X6.X6.

00360460 60 04 36 00 60 04 36 00 68 04 36 00 68 04 36 00 `6.`6.h6.h6.

00360470 70 04 36 00 70 04 36 00 78 04 36 00 78 04 36 00 p6.p6.x6.x6.

00360480 80 04 36 00 80 04 36 00 88 04 36 00 88 04 36 00 €6.€6.?6.?6.

00360490 90 04 36 00 90 04 36 00 98 04 36 00 98 04 36 00 ?6.?6.?6.?6.

003604A0 A0 04 36 00 A0 04 36 00 A8 04 36 00 A8 04 36 00 ?6.?6.?6.?6.

003604B0 B0 04 36 00 B0 04 36 00 B8 04 36 00 B8 04 36 00 ?6.?6.?6.?6.

003604C0 C0 04 36 00 C0 04 36 00 C8 04 36 00 C8 04 36 00 ?6.?6.?6.?6.

003604D0 D0 04 36 00 D0 04 36 00 D8 04 36 00 D8 04 36 00 ?6.?6.?6.?6.

003604E0 E0 04 36 00 E0 04 36 00 E8 04 36 00 E8 04 36 00 ?6.?6.?6.?6.

003604F0 F0 04 36 00 F0 04 36 00 F8 04 36 00 F8 04 36 00 ?6.?6.?6.?6.

00360500 00 05 36 00 00 05 36 00 08 05 36 00 08 05 36 00 .6..6.6.6.

00360510 10 05 36 00 10 05 36 00 18 05 36 00 18 05 36 00 6.6.6.6.

00360520 20 05 36 00 20 05 36 00 28 05 36 00 28 05 36 00 6. 6.(6.(6.

00360530 30 05 36 00 30 05 36 00 38 05 36 00 38 05 36 00 06.06.86.86.

00360540 40 05 36 00 40 05 36 00 48 05 36 00 48 05 36 00 @6.@6.H6.H6.

00360550 50 05 36 00 50 05 36 00 58 05 36 00 58 05 36 00 P6.P6.X6.X6.

00360560 60 05 36 00 60 05 36 00 68 05 36 00 68 05 36 00 `6.`6.h6.h6.

00360570 70 05 36 00 70 05 36 00 08 06 36 00 00 00 00 00 p6.p6.6.....

00360580 00 00 00 00 00 00 00 00 00 00 00 00 00 10 36 00 .............6.

00360590 00 F0 00 00 00 00 00 00 A8 05 36 00 00 00 00 00 .?.....?6.....

003605A0 00 00 00 00 00 00 00 00 B8 05 36 00 00 00 00 00 ........?6.....

003605B0 00 00 00 00 00 00 00 00 C8 05 36 00 00 00 00 00 ........?6.....

003605C0 00 00 00 00 00 00 00 00 D8 05 36 00 00 00 00 00 ........?6.....

003605D0 00 00 00 00 00 00 00 00 E8 05 36 00 00 00 00 00 ........?6.....

003605E0 00 00 00 00 00 00 00 00 F8 05 36 00 00 00 00 00 ........?6.....

003605F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

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00360620 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360630 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360640 08 00 C8 00 00 01 00 00 EE FF EE FF 00 00 00 00 .?...??....

00360650 00 00 36 00 00 F0 00 00 00 00 36 00 10 00 00 00 ..6..?...6....

00360660 80 06 36 00 00 00 37 00 0F 00 00 00 01 00 00 00 €6...7.......

00360670 88 05 36 00 00 00 00 00 90 06 36 00 00 00 00 00 ?6.....?6.....

00360680 02 00 08 00 00 01 0D 00 00 00 00 00 78 01 36 00 .........x6.

00360690 2E 01 02 00 00 10 00 00 78 01 36 00 78 01 36 00 .....x6.x6.

003606A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360700 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360710 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

来对比一下都哪里发生了变化

内存0x00360028处的0x00000130变成了0x0000012E，减小了2个堆单位，一个堆单位是8字节，也就是说减小了16个字节，而这个数字的意思就是尾块还有多少可以分配的空间，因为分配的时候会带上块首，所以第一次申请了3个字节加上块首8个字节，最终一共申请的是11个字节，所以实际就分配了16个字节也就是两个堆单位

同时注意到内存0x00360178的变化

0x00360178 88 06 36 00 88 06 36 00

变成了

0x00360178 98 06 36 00 98 06 36 00

上面是数据在内存的表示，实际是0x00360688变成了0x00360698，因为是16进制，所以是相差了16字节

前面说了0x00360688处的堆块其实应该从0x00360680开始，所以0x00360680开始的16字节数据为

0x00360680 30 01 08 00 00 10 00 00 78 01 36 00 78 01 36 00

最前面两个字节代表0x130个堆单位

然后看看分配第一次后0x00360680的值，也就是刚分配的空间

0x00360680 02 00 08 00 00 01 0D 00 00 00 00 00 78 01 36 00

前面8字节是块首，0x0002表示两个堆单位

那么0x00360698处变成了什么呢？

00360690 2E 01 02 00 00 10 00 00 78 01 36 00 78 01 36 00

前面提到过，0x00360178处是freelist[0]，指向的是尾块，所以现在0x00360178处的指针变成了0x00360698，也就是说现在尾块的起始位置是0x00360690

块首的前两个字节是代表堆块的大小，所以0x012E的确是现在未分配堆块的大小，和前面的数据是匹配的

以上就是第一次分配内存里的部分变化，也是比较直观可见的变化，接下来看看其余五次的申请，过程和第一次是一样的，只是数据会有所不同

第二次

C语言代码

h2 = HeapAlloc(hp,HEAP\_ZERO\_MEMORY,5);

汇编

0040102B |. 6A 05 push 5 ; /HeapSize = 5

0040102D |. 6A 08 push 8 ; |Flags = HEAP\_ZERO\_MEMORY

0040102F |. 56 push esi ; |hHeap

00401030 |. 8BD8 mov ebx, eax ; |

00401032 |. FFD7 call edi ; \HeapAlloc

运行完后的堆区

00360000 C8 00 00 00 00 01 00 00 FF EE FF EE 00 10 00 00 ?.....??..

00360010 00 00 00 00 00 FE 00 00 00 00 10 00 00 20 00 00 .....?..... ..

00360020 00 02 00 00 00 20 00 00 2C 01 00 00 FF EF FD 7F .... ..,..稞

00360030 04 00 08 06 00 00 00 00 00 00 00 00 00 00 00 00 .............

00360040 00 00 00 00 98 05 36 00 0F 00 00 00 F8 FF FF FF ....?6....?

00360050 50 00 36 00 50 00 36 00 40 06 36 00 00 00 00 00 P.6.P.6.@6.....

00360060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360110 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360130 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360140 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360150 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360160 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 ...............

00360170 00 00 00 00 00 00 00 00 A8 06 36 00 A8 06 36 00 ........?6.?6.

00360180 80 01 36 00 80 01 36 00 88 01 36 00 88 01 36 00 €6.€6.?6.?6.

00360190 90 01 36 00 90 01 36 00 98 01 36 00 98 01 36 00 ?6.?6.?6.?6.

003601A0 A0 01 36 00 A0 01 36 00 A8 01 36 00 A8 01 36 00 ?6.?6.?6.?6.

003601B0 B0 01 36 00 B0 01 36 00 B8 01 36 00 B8 01 36 00 ?6.?6.?6.?6.

003601C0 C0 01 36 00 C0 01 36 00 C8 01 36 00 C8 01 36 00 ?6.?6.?6.?6.

003601D0 D0 01 36 00 D0 01 36 00 D8 01 36 00 D8 01 36 00 ?6.?6.?6.?6.

003601E0 E0 01 36 00 E0 01 36 00 E8 01 36 00 E8 01 36 00 ?6.?6.?6.?6.

003601F0 F0 01 36 00 F0 01 36 00 F8 01 36 00 F8 01 36 00 ?6.?6.?6.?6.

00360200 00 02 36 00 00 02 36 00 08 02 36 00 08 02 36 00 .6..6.6.6.

00360210 10 02 36 00 10 02 36 00 18 02 36 00 18 02 36 00 6.6.6.6.

00360220 20 02 36 00 20 02 36 00 28 02 36 00 28 02 36 00 6. 6.(6.(6.

00360230 30 02 36 00 30 02 36 00 38 02 36 00 38 02 36 00 06.06.86.86.

00360240 40 02 36 00 40 02 36 00 48 02 36 00 48 02 36 00 @6.@6.H6.H6.

00360250 50 02 36 00 50 02 36 00 58 02 36 00 58 02 36 00 P6.P6.X6.X6.

00360260 60 02 36 00 60 02 36 00 68 02 36 00 68 02 36 00 `6.`6.h6.h6.

00360270 70 02 36 00 70 02 36 00 78 02 36 00 78 02 36 00 p6.p6.x6.x6.

00360280 80 02 36 00 80 02 36 00 88 02 36 00 88 02 36 00 €6.€6.?6.?6.

00360290 90 02 36 00 90 02 36 00 98 02 36 00 98 02 36 00 ?6.?6.?6.?6.

003602A0 A0 02 36 00 A0 02 36 00 A8 02 36 00 A8 02 36 00 ?6.?6.?6.?6.

003602B0 B0 02 36 00 B0 02 36 00 B8 02 36 00 B8 02 36 00 ?6.?6.?6.?6.

003602C0 C0 02 36 00 C0 02 36 00 C8 02 36 00 C8 02 36 00 ?6.?6.?6.?6.

003602D0 D0 02 36 00 D0 02 36 00 D8 02 36 00 D8 02 36 00 ?6.?6.?6.?6.

003602E0 E0 02 36 00 E0 02 36 00 E8 02 36 00 E8 02 36 00 ?6.?6.?6.?6.

003602F0 F0 02 36 00 F0 02 36 00 F8 02 36 00 F8 02 36 00 ?6.?6.?6.?6.

00360300 00 03 36 00 00 03 36 00 08 03 36 00 08 03 36 00 .6..6.6.6.

00360310 10 03 36 00 10 03 36 00 18 03 36 00 18 03 36 00 6.6.6.6.

00360320 20 03 36 00 20 03 36 00 28 03 36 00 28 03 36 00 6. 6.(6.(6.

00360330 30 03 36 00 30 03 36 00 38 03 36 00 38 03 36 00 06.06.86.86.

00360340 40 03 36 00 40 03 36 00 48 03 36 00 48 03 36 00 @6.@6.H6.H6.

00360350 50 03 36 00 50 03 36 00 58 03 36 00 58 03 36 00 P6.P6.X6.X6.

00360360 60 03 36 00 60 03 36 00 68 03 36 00 68 03 36 00 `6.`6.h6.h6.

00360370 70 03 36 00 70 03 36 00 78 03 36 00 78 03 36 00 p6.p6.x6.x6.

00360380 80 03 36 00 80 03 36 00 88 03 36 00 88 03 36 00 €6.€6.?6.?6.

00360390 90 03 36 00 90 03 36 00 98 03 36 00 98 03 36 00 ?6.?6.?6.?6.

003603A0 A0 03 36 00 A0 03 36 00 A8 03 36 00 A8 03 36 00 ?6.?6.?6.?6.

003603B0 B0 03 36 00 B0 03 36 00 B8 03 36 00 B8 03 36 00 ?6.?6.?6.?6.

003603C0 C0 03 36 00 C0 03 36 00 C8 03 36 00 C8 03 36 00 ?6.?6.?6.?6.

003603D0 D0 03 36 00 D0 03 36 00 D8 03 36 00 D8 03 36 00 ?6.?6.?6.?6.

003603E0 E0 03 36 00 E0 03 36 00 E8 03 36 00 E8 03 36 00 ?6.?6.?6.?6.

003603F0 F0 03 36 00 F0 03 36 00 F8 03 36 00 F8 03 36 00 ?6.?6.?6.?6.

00360400 00 04 36 00 00 04 36 00 08 04 36 00 08 04 36 00 .6..6.6.6.

00360410 10 04 36 00 10 04 36 00 18 04 36 00 18 04 36 00 6.6.6.6.

00360420 20 04 36 00 20 04 36 00 28 04 36 00 28 04 36 00 6. 6.(6.(6.

00360430 30 04 36 00 30 04 36 00 38 04 36 00 38 04 36 00 06.06.86.86.

00360440 40 04 36 00 40 04 36 00 48 04 36 00 48 04 36 00 @6.@6.H6.H6.

00360450 50 04 36 00 50 04 36 00 58 04 36 00 58 04 36 00 P6.P6.X6.X6.

00360460 60 04 36 00 60 04 36 00 68 04 36 00 68 04 36 00 `6.`6.h6.h6.

00360470 70 04 36 00 70 04 36 00 78 04 36 00 78 04 36 00 p6.p6.x6.x6.

00360480 80 04 36 00 80 04 36 00 88 04 36 00 88 04 36 00 €6.€6.?6.?6.

00360490 90 04 36 00 90 04 36 00 98 04 36 00 98 04 36 00 ?6.?6.?6.?6.

003604A0 A0 04 36 00 A0 04 36 00 A8 04 36 00 A8 04 36 00 ?6.?6.?6.?6.

003604B0 B0 04 36 00 B0 04 36 00 B8 04 36 00 B8 04 36 00 ?6.?6.?6.?6.

003604C0 C0 04 36 00 C0 04 36 00 C8 04 36 00 C8 04 36 00 ?6.?6.?6.?6.

003604D0 D0 04 36 00 D0 04 36 00 D8 04 36 00 D8 04 36 00 ?6.?6.?6.?6.

003604E0 E0 04 36 00 E0 04 36 00 E8 04 36 00 E8 04 36 00 ?6.?6.?6.?6.

003604F0 F0 04 36 00 F0 04 36 00 F8 04 36 00 F8 04 36 00 ?6.?6.?6.?6.

00360500 00 05 36 00 00 05 36 00 08 05 36 00 08 05 36 00 .6..6.6.6.

00360510 10 05 36 00 10 05 36 00 18 05 36 00 18 05 36 00 6.6.6.6.

00360520 20 05 36 00 20 05 36 00 28 05 36 00 28 05 36 00 6. 6.(6.(6.

00360530 30 05 36 00 30 05 36 00 38 05 36 00 38 05 36 00 06.06.86.86.

00360540 40 05 36 00 40 05 36 00 48 05 36 00 48 05 36 00 @6.@6.H6.H6.

00360550 50 05 36 00 50 05 36 00 58 05 36 00 58 05 36 00 P6.P6.X6.X6.

00360560 60 05 36 00 60 05 36 00 68 05 36 00 68 05 36 00 `6.`6.h6.h6.

00360570 70 05 36 00 70 05 36 00 08 06 36 00 00 00 00 00 p6.p6.6.....

00360580 00 00 00 00 00 00 00 00 00 00 00 00 00 10 36 00 .............6.

00360590 00 F0 00 00 00 00 00 00 A8 05 36 00 00 00 00 00 .?.....?6.....

003605A0 00 00 00 00 00 00 00 00 B8 05 36 00 00 00 00 00 ........?6.....

003605B0 00 00 00 00 00 00 00 00 C8 05 36 00 00 00 00 00 ........?6.....

003605C0 00 00 00 00 00 00 00 00 D8 05 36 00 00 00 00 00 ........?6.....

003605D0 00 00 00 00 00 00 00 00 E8 05 36 00 00 00 00 00 ........?6.....

003605E0 00 00 00 00 00 00 00 00 F8 05 36 00 00 00 00 00 ........?6.....

003605F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360600 00 00 00 00 00 00 00 00 C0 06 FD 77 FF FF FF FF ........?齱

00360610 00 00 00 00 00 00 00 00 2C 00 00 00 00 00 00 00 ........,.......

00360620 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360630 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360640 08 00 C8 00 00 01 00 00 EE FF EE FF 00 00 00 00 .?...??....

00360650 00 00 36 00 00 F0 00 00 00 00 36 00 10 00 00 00 ..6..?...6....

00360660 80 06 36 00 00 00 37 00 0F 00 00 00 01 00 00 00 €6...7.......

00360670 88 05 36 00 00 00 00 00 A0 06 36 00 00 00 00 00 ?6.....?6.....

00360680 02 00 08 00 00 01 0D 00 00 00 00 00 78 01 36 00 .........x6.

00360690 02 00 02 00 00 01 0B 00 00 00 00 00 00 01 36 00 ...  
......6.

003606A0 2C 01 02 00 00 10 00 00 78 01 36 00 78 01 36 00 ,....x6.x6.

003606B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360700 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360710 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

尾块可分配的大小变为0x0000012C个堆单位

00360020 00 02 00 00 00 20 00 00 2C 01 00 00 FF EF FD 7F

尾块数据区的起始位置变为0x003606A8

00360170 00 00 00 00 00 00 00 00 A8 06 36 00 A8 06 36 00

这是刚申请的堆块

00360690 02 00 02 00 00 01 0B 00 00 00 00 00 00 01 36 00

第三次

C语言代码

h3 = HeapAlloc(hp,HEAP\_ZERO\_MEMORY,6);

汇编

00401034 |. 6A 06 push 6 ; /HeapSize = 6

00401036 |. 6A 08 push 8 ; |Flags = HEAP\_ZERO\_MEMORY

00401038 |. 56 push esi ; |hHeap

00401039 |. FFD7 call edi ; \HeapAlloc

运行完的堆区

00360000 C8 00 00 00 00 01 00 00 FF EE FF EE 00 10 00 00 ?.....??..

00360010 00 00 00 00 00 FE 00 00 00 00 10 00 00 20 00 00 .....?..... ..

00360020 00 02 00 00 00 20 00 00 2A 01 00 00 FF EF FD 7F .... ..\*..稞

00360030 04 00 08 06 00 00 00 00 00 00 00 00 00 00 00 00 .............

00360040 00 00 00 00 98 05 36 00 0F 00 00 00 F8 FF FF FF ....?6....?

00360050 50 00 36 00 50 00 36 00 40 06 36 00 00 00 00 00 P.6.P.6.@6.....

00360060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360110 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360130 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360140 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360150 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360160 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 ...............

00360170 00 00 00 00 00 00 00 00 B8 06 36 00 B8 06 36 00 ........?6.?6.

00360180 80 01 36 00 80 01 36 00 88 01 36 00 88 01 36 00 €6.€6.?6.?6.

00360190 90 01 36 00 90 01 36 00 98 01 36 00 98 01 36 00 ?6.?6.?6.?6.

003601A0 A0 01 36 00 A0 01 36 00 A8 01 36 00 A8 01 36 00 ?6.?6.?6.?6.

003601B0 B0 01 36 00 B0 01 36 00 B8 01 36 00 B8 01 36 00 ?6.?6.?6.?6.

003601C0 C0 01 36 00 C0 01 36 00 C8 01 36 00 C8 01 36 00 ?6.?6.?6.?6.

003601D0 D0 01 36 00 D0 01 36 00 D8 01 36 00 D8 01 36 00 ?6.?6.?6.?6.

003601E0 E0 01 36 00 E0 01 36 00 E8 01 36 00 E8 01 36 00 ?6.?6.?6.?6.

003601F0 F0 01 36 00 F0 01 36 00 F8 01 36 00 F8 01 36 00 ?6.?6.?6.?6.

00360200 00 02 36 00 00 02 36 00 08 02 36 00 08 02 36 00 .6..6.6.6.

00360210 10 02 36 00 10 02 36 00 18 02 36 00 18 02 36 00 6.6.6.6.

00360220 20 02 36 00 20 02 36 00 28 02 36 00 28 02 36 00 6. 6.(6.(6.

00360230 30 02 36 00 30 02 36 00 38 02 36 00 38 02 36 00 06.06.86.86.

00360240 40 02 36 00 40 02 36 00 48 02 36 00 48 02 36 00 @6.@6.H6.H6.

00360250 50 02 36 00 50 02 36 00 58 02 36 00 58 02 36 00 P6.P6.X6.X6.

00360260 60 02 36 00 60 02 36 00 68 02 36 00 68 02 36 00 `6.`6.h6.h6.

00360270 70 02 36 00 70 02 36 00 78 02 36 00 78 02 36 00 p6.p6.x6.x6.

00360280 80 02 36 00 80 02 36 00 88 02 36 00 88 02 36 00 €6.€6.?6.?6.

00360290 90 02 36 00 90 02 36 00 98 02 36 00 98 02 36 00 ?6.?6.?6.?6.

003602A0 A0 02 36 00 A0 02 36 00 A8 02 36 00 A8 02 36 00 ?6.?6.?6.?6.

003602B0 B0 02 36 00 B0 02 36 00 B8 02 36 00 B8 02 36 00 ?6.?6.?6.?6.

003602C0 C0 02 36 00 C0 02 36 00 C8 02 36 00 C8 02 36 00 ?6.?6.?6.?6.

003602D0 D0 02 36 00 D0 02 36 00 D8 02 36 00 D8 02 36 00 ?6.?6.?6.?6.

003602E0 E0 02 36 00 E0 02 36 00 E8 02 36 00 E8 02 36 00 ?6.?6.?6.?6.

003602F0 F0 02 36 00 F0 02 36 00 F8 02 36 00 F8 02 36 00 ?6.?6.?6.?6.

00360300 00 03 36 00 00 03 36 00 08 03 36 00 08 03 36 00 .6..6.6.6.

00360310 10 03 36 00 10 03 36 00 18 03 36 00 18 03 36 00 6.6.6.6.

00360320 20 03 36 00 20 03 36 00 28 03 36 00 28 03 36 00 6. 6.(6.(6.

00360330 30 03 36 00 30 03 36 00 38 03 36 00 38 03 36 00 06.06.86.86.

00360340 40 03 36 00 40 03 36 00 48 03 36 00 48 03 36 00 @6.@6.H6.H6.

00360350 50 03 36 00 50 03 36 00 58 03 36 00 58 03 36 00 P6.P6.X6.X6.

00360360 60 03 36 00 60 03 36 00 68 03 36 00 68 03 36 00 `6.`6.h6.h6.

00360370 70 03 36 00 70 03 36 00 78 03 36 00 78 03 36 00 p6.p6.x6.x6.

00360380 80 03 36 00 80 03 36 00 88 03 36 00 88 03 36 00 €6.€6.?6.?6.

00360390 90 03 36 00 90 03 36 00 98 03 36 00 98 03 36 00 ?6.?6.?6.?6.

003603A0 A0 03 36 00 A0 03 36 00 A8 03 36 00 A8 03 36 00 ?6.?6.?6.?6.

003603B0 B0 03 36 00 B0 03 36 00 B8 03 36 00 B8 03 36 00 ?6.?6.?6.?6.

003603C0 C0 03 36 00 C0 03 36 00 C8 03 36 00 C8 03 36 00 ?6.?6.?6.?6.

003603D0 D0 03 36 00 D0 03 36 00 D8 03 36 00 D8 03 36 00 ?6.?6.?6.?6.

003603E0 E0 03 36 00 E0 03 36 00 E8 03 36 00 E8 03 36 00 ?6.?6.?6.?6.

003603F0 F0 03 36 00 F0 03 36 00 F8 03 36 00 F8 03 36 00 ?6.?6.?6.?6.

00360400 00 04 36 00 00 04 36 00 08 04 36 00 08 04 36 00 .6..6.6.6.

00360410 10 04 36 00 10 04 36 00 18 04 36 00 18 04 36 00 6.6.6.6.

00360420 20 04 36 00 20 04 36 00 28 04 36 00 28 04 36 00 6. 6.(6.(6.

00360430 30 04 36 00 30 04 36 00 38 04 36 00 38 04 36 00 06.06.86.86.

00360440 40 04 36 00 40 04 36 00 48 04 36 00 48 04 36 00 @6.@6.H6.H6.

00360450 50 04 36 00 50 04 36 00 58 04 36 00 58 04 36 00 P6.P6.X6.X6.

00360460 60 04 36 00 60 04 36 00 68 04 36 00 68 04 36 00 `6.`6.h6.h6.

00360470 70 04 36 00 70 04 36 00 78 04 36 00 78 04 36 00 p6.p6.x6.x6.

00360480 80 04 36 00 80 04 36 00 88 04 36 00 88 04 36 00 €6.€6.?6.?6.

00360490 90 04 36 00 90 04 36 00 98 04 36 00 98 04 36 00 ?6.?6.?6.?6.

003604A0 A0 04 36 00 A0 04 36 00 A8 04 36 00 A8 04 36 00 ?6.?6.?6.?6.

003604B0 B0 04 36 00 B0 04 36 00 B8 04 36 00 B8 04 36 00 ?6.?6.?6.?6.

003604C0 C0 04 36 00 C0 04 36 00 C8 04 36 00 C8 04 36 00 ?6.?6.?6.?6.

003604D0 D0 04 36 00 D0 04 36 00 D8 04 36 00 D8 04 36 00 ?6.?6.?6.?6.

003604E0 E0 04 36 00 E0 04 36 00 E8 04 36 00 E8 04 36 00 ?6.?6.?6.?6.

003604F0 F0 04 36 00 F0 04 36 00 F8 04 36 00 F8 04 36 00 ?6.?6.?6.?6.

00360500 00 05 36 00 00 05 36 00 08 05 36 00 08 05 36 00 .6..6.6.6.

00360510 10 05 36 00 10 05 36 00 18 05 36 00 18 05 36 00 6.6.6.6.

00360520 20 05 36 00 20 05 36 00 28 05 36 00 28 05 36 00 6. 6.(6.(6.

00360530 30 05 36 00 30 05 36 00 38 05 36 00 38 05 36 00 06.06.86.86.

00360540 40 05 36 00 40 05 36 00 48 05 36 00 48 05 36 00 @6.@6.H6.H6.

00360550 50 05 36 00 50 05 36 00 58 05 36 00 58 05 36 00 P6.P6.X6.X6.

00360560 60 05 36 00 60 05 36 00 68 05 36 00 68 05 36 00 `6.`6.h6.h6.

00360570 70 05 36 00 70 05 36 00 08 06 36 00 00 00 00 00 p6.p6.6.....

00360580 00 00 00 00 00 00 00 00 00 00 00 00 00 10 36 00 .............6.

00360590 00 F0 00 00 00 00 00 00 A8 05 36 00 00 00 00 00 .?.....?6.....

003605A0 00 00 00 00 00 00 00 00 B8 05 36 00 00 00 00 00 ........?6.....

003605B0 00 00 00 00 00 00 00 00 C8 05 36 00 00 00 00 00 ........?6.....

003605C0 00 00 00 00 00 00 00 00 D8 05 36 00 00 00 00 00 ........?6.....

003605D0 00 00 00 00 00 00 00 00 E8 05 36 00 00 00 00 00 ........?6.....

003605E0 00 00 00 00 00 00 00 00 F8 05 36 00 00 00 00 00 ........?6.....

003605F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360600 00 00 00 00 00 00 00 00 C0 06 FD 77 FF FF FF FF ........?齱

00360610 00 00 00 00 00 00 00 00 2C 00 00 00 00 00 00 00 ........,.......

00360620 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360630 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360640 08 00 C8 00 00 01 00 00 EE FF EE FF 00 00 00 00 .?...??....

00360650 00 00 36 00 00 F0 00 00 00 00 36 00 10 00 00 00 ..6..?...6....

00360660 80 06 36 00 00 00 37 00 0F 00 00 00 01 00 00 00 €6...7.......

00360670 88 05 36 00 00 00 00 00 B0 06 36 00 00 00 00 00 ?6.....?6.....

00360680 02 00 08 00 00 01 0D 00 00 00 00 00 78 01 36 00 .........x6.

00360690 02 00 02 00 00 01 0B 00 00 00 00 00 00 01 36 00 ...  
......6.

003606A0 02 00 02 00 00 01 0A 00 00 00 00 00 00 00 36 00 ...........6.

003606B0 2A 01 02 00 00 10 00 00 78 01 36 00 78 01 36 00 \*....x6.x6.

003606C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360700 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360710 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

尾块可分配的空间变为0x0000012A个堆单位

00360020 00 02 00 00 00 20 00 00 2A 01 00 00 FF EF FD 7F

尾块数据区的起始位置变为0x003606B8

00360170 00 00 00 00 00 00 00 00 B8 06 36 00 B8 06 36 00

刚分配的堆块

003606A0 02 00 02 00 00 01 0A 00 00 00 00 00 00 00 36 00

第四次

C语言代码

h4 = HeapAlloc(hp,HEAP\_ZERO\_MEMORY,8);

汇编

0040103B |. 6A 08 push 8 ; /HeapSize = 8

0040103D |. 6A 08 push 8 ; |Flags = HEAP\_ZERO\_MEMORY

0040103F |. 56 push esi ; |hHeap

00401040 |. 8945 FC mov dword ptr [ebp-4], eax ; |

00401043 |. FFD7 call edi ; \HeapAlloc

运行完的堆区

00360000 C8 00 00 00 00 01 00 00 FF EE FF EE 00 10 00 00 ?.....??..

00360010 00 00 00 00 00 FE 00 00 00 00 10 00 00 20 00 00 .....?..... ..

00360020 00 02 00 00 00 20 00 00 28 01 00 00 FF EF FD 7F .... ..(..稞

00360030 04 00 08 06 00 00 00 00 00 00 00 00 00 00 00 00 .............

00360040 00 00 00 00 98 05 36 00 0F 00 00 00 F8 FF FF FF ....?6....?

00360050 50 00 36 00 50 00 36 00 40 06 36 00 00 00 00 00 P.6.P.6.@6.....

00360060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360110 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360130 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360140 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360150 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360160 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 ...............

00360170 00 00 00 00 00 00 00 00 C8 06 36 00 C8 06 36 00 ........?6.?6.

00360180 80 01 36 00 80 01 36 00 88 01 36 00 88 01 36 00 €6.€6.?6.?6.

00360190 90 01 36 00 90 01 36 00 98 01 36 00 98 01 36 00 ?6.?6.?6.?6.

003601A0 A0 01 36 00 A0 01 36 00 A8 01 36 00 A8 01 36 00 ?6.?6.?6.?6.

003601B0 B0 01 36 00 B0 01 36 00 B8 01 36 00 B8 01 36 00 ?6.?6.?6.?6.

003601C0 C0 01 36 00 C0 01 36 00 C8 01 36 00 C8 01 36 00 ?6.?6.?6.?6.

003601D0 D0 01 36 00 D0 01 36 00 D8 01 36 00 D8 01 36 00 ?6.?6.?6.?6.

003601E0 E0 01 36 00 E0 01 36 00 E8 01 36 00 E8 01 36 00 ?6.?6.?6.?6.

003601F0 F0 01 36 00 F0 01 36 00 F8 01 36 00 F8 01 36 00 ?6.?6.?6.?6.

00360200 00 02 36 00 00 02 36 00 08 02 36 00 08 02 36 00 .6..6.6.6.

00360210 10 02 36 00 10 02 36 00 18 02 36 00 18 02 36 00 6.6.6.6.

00360220 20 02 36 00 20 02 36 00 28 02 36 00 28 02 36 00 6. 6.(6.(6.

00360230 30 02 36 00 30 02 36 00 38 02 36 00 38 02 36 00 06.06.86.86.

00360240 40 02 36 00 40 02 36 00 48 02 36 00 48 02 36 00 @6.@6.H6.H6.

00360250 50 02 36 00 50 02 36 00 58 02 36 00 58 02 36 00 P6.P6.X6.X6.

00360260 60 02 36 00 60 02 36 00 68 02 36 00 68 02 36 00 `6.`6.h6.h6.

00360270 70 02 36 00 70 02 36 00 78 02 36 00 78 02 36 00 p6.p6.x6.x6.

00360280 80 02 36 00 80 02 36 00 88 02 36 00 88 02 36 00 €6.€6.?6.?6.

00360290 90 02 36 00 90 02 36 00 98 02 36 00 98 02 36 00 ?6.?6.?6.?6.

003602A0 A0 02 36 00 A0 02 36 00 A8 02 36 00 A8 02 36 00 ?6.?6.?6.?6.

003602B0 B0 02 36 00 B0 02 36 00 B8 02 36 00 B8 02 36 00 ?6.?6.?6.?6.

003602C0 C0 02 36 00 C0 02 36 00 C8 02 36 00 C8 02 36 00 ?6.?6.?6.?6.

003602D0 D0 02 36 00 D0 02 36 00 D8 02 36 00 D8 02 36 00 ?6.?6.?6.?6.

003602E0 E0 02 36 00 E0 02 36 00 E8 02 36 00 E8 02 36 00 ?6.?6.?6.?6.

003602F0 F0 02 36 00 F0 02 36 00 F8 02 36 00 F8 02 36 00 ?6.?6.?6.?6.

00360300 00 03 36 00 00 03 36 00 08 03 36 00 08 03 36 00 .6..6.6.6.

00360310 10 03 36 00 10 03 36 00 18 03 36 00 18 03 36 00 6.6.6.6.

00360320 20 03 36 00 20 03 36 00 28 03 36 00 28 03 36 00 6. 6.(6.(6.

00360330 30 03 36 00 30 03 36 00 38 03 36 00 38 03 36 00 06.06.86.86.

00360340 40 03 36 00 40 03 36 00 48 03 36 00 48 03 36 00 @6.@6.H6.H6.

00360350 50 03 36 00 50 03 36 00 58 03 36 00 58 03 36 00 P6.P6.X6.X6.

00360360 60 03 36 00 60 03 36 00 68 03 36 00 68 03 36 00 `6.`6.h6.h6.

00360370 70 03 36 00 70 03 36 00 78 03 36 00 78 03 36 00 p6.p6.x6.x6.

00360380 80 03 36 00 80 03 36 00 88 03 36 00 88 03 36 00 €6.€6.?6.?6.

00360390 90 03 36 00 90 03 36 00 98 03 36 00 98 03 36 00 ?6.?6.?6.?6.

003603A0 A0 03 36 00 A0 03 36 00 A8 03 36 00 A8 03 36 00 ?6.?6.?6.?6.

003603B0 B0 03 36 00 B0 03 36 00 B8 03 36 00 B8 03 36 00 ?6.?6.?6.?6.

003603C0 C0 03 36 00 C0 03 36 00 C8 03 36 00 C8 03 36 00 ?6.?6.?6.?6.

003603D0 D0 03 36 00 D0 03 36 00 D8 03 36 00 D8 03 36 00 ?6.?6.?6.?6.

003603E0 E0 03 36 00 E0 03 36 00 E8 03 36 00 E8 03 36 00 ?6.?6.?6.?6.

003603F0 F0 03 36 00 F0 03 36 00 F8 03 36 00 F8 03 36 00 ?6.?6.?6.?6.

00360400 00 04 36 00 00 04 36 00 08 04 36 00 08 04 36 00 .6..6.6.6.

00360410 10 04 36 00 10 04 36 00 18 04 36 00 18 04 36 00 6.6.6.6.

00360420 20 04 36 00 20 04 36 00 28 04 36 00 28 04 36 00 6. 6.(6.(6.

00360430 30 04 36 00 30 04 36 00 38 04 36 00 38 04 36 00 06.06.86.86.

00360440 40 04 36 00 40 04 36 00 48 04 36 00 48 04 36 00 @6.@6.H6.H6.

00360450 50 04 36 00 50 04 36 00 58 04 36 00 58 04 36 00 P6.P6.X6.X6.

00360460 60 04 36 00 60 04 36 00 68 04 36 00 68 04 36 00 `6.`6.h6.h6.

00360470 70 04 36 00 70 04 36 00 78 04 36 00 78 04 36 00 p6.p6.x6.x6.

00360480 80 04 36 00 80 04 36 00 88 04 36 00 88 04 36 00 €6.€6.?6.?6.

00360490 90 04 36 00 90 04 36 00 98 04 36 00 98 04 36 00 ?6.?6.?6.?6.

003604A0 A0 04 36 00 A0 04 36 00 A8 04 36 00 A8 04 36 00 ?6.?6.?6.?6.

003604B0 B0 04 36 00 B0 04 36 00 B8 04 36 00 B8 04 36 00 ?6.?6.?6.?6.

003604C0 C0 04 36 00 C0 04 36 00 C8 04 36 00 C8 04 36 00 ?6.?6.?6.?6.

003604D0 D0 04 36 00 D0 04 36 00 D8 04 36 00 D8 04 36 00 ?6.?6.?6.?6.

003604E0 E0 04 36 00 E0 04 36 00 E8 04 36 00 E8 04 36 00 ?6.?6.?6.?6.

003604F0 F0 04 36 00 F0 04 36 00 F8 04 36 00 F8 04 36 00 ?6.?6.?6.?6.

00360500 00 05 36 00 00 05 36 00 08 05 36 00 08 05 36 00 .6..6.6.6.

00360510 10 05 36 00 10 05 36 00 18 05 36 00 18 05 36 00 6.6.6.6.

00360520 20 05 36 00 20 05 36 00 28 05 36 00 28 05 36 00 6. 6.(6.(6.

00360530 30 05 36 00 30 05 36 00 38 05 36 00 38 05 36 00 06.06.86.86.

00360540 40 05 36 00 40 05 36 00 48 05 36 00 48 05 36 00 @6.@6.H6.H6.

00360550 50 05 36 00 50 05 36 00 58 05 36 00 58 05 36 00 P6.P6.X6.X6.

00360560 60 05 36 00 60 05 36 00 68 05 36 00 68 05 36 00 `6.`6.h6.h6.

00360570 70 05 36 00 70 05 36 00 08 06 36 00 00 00 00 00 p6.p6.6.....

00360580 00 00 00 00 00 00 00 00 00 00 00 00 00 10 36 00 .............6.

00360590 00 F0 00 00 00 00 00 00 A8 05 36 00 00 00 00 00 .?.....?6.....

003605A0 00 00 00 00 00 00 00 00 B8 05 36 00 00 00 00 00 ........?6.....

003605B0 00 00 00 00 00 00 00 00 C8 05 36 00 00 00 00 00 ........?6.....

003605C0 00 00 00 00 00 00 00 00 D8 05 36 00 00 00 00 00 ........?6.....

003605D0 00 00 00 00 00 00 00 00 E8 05 36 00 00 00 00 00 ........?6.....

003605E0 00 00 00 00 00 00 00 00 F8 05 36 00 00 00 00 00 ........?6.....

003605F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360600 00 00 00 00 00 00 00 00 C0 06 FD 77 FF FF FF FF ........?齱

00360610 00 00 00 00 00 00 00 00 2C 00 00 00 00 00 00 00 ........,.......

00360620 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360630 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360640 08 00 C8 00 00 01 00 00 EE FF EE FF 00 00 00 00 .?...??....

00360650 00 00 36 00 00 F0 00 00 00 00 36 00 10 00 00 00 ..6..?...6....

00360660 80 06 36 00 00 00 37 00 0F 00 00 00 01 00 00 00 €6...7.......

00360670 88 05 36 00 00 00 00 00 C0 06 36 00 00 00 00 00 ?6.....?6.....

00360680 02 00 08 00 00 01 0D 00 00 00 00 00 78 01 36 00 .........x6.

00360690 02 00 02 00 00 01 0B 00 00 00 00 00 00 01 36 00 ...  
......6.

003606A0 02 00 02 00 00 01 0A 00 00 00 00 00 00 00 36 00 ...........6.

003606B0 02 00 02 00 00 01 08 00 00 00 00 00 00 00 00 00 ............

003606C0 28 01 02 00 00 10 00 00 78 01 36 00 78 01 36 00 (....x6.x6.

003606D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360700 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360710 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

尾块可分配的空间变为0x00000128个堆单位

00360020 00 02 00 00 00 20 00 00 28 01 00 00 FF EF FD 7F

尾块数据区起始位置变为0x003606C8

0x00360170 00 00 00 00 00 00 00 00 C8 06 36 00 C8 06 36 00

刚分配的堆块

0x003606B0 02 00 02 00 00 01 08 00 00 00 00 00 00 00 00 00

第五次

C语言

h5 = HeapAlloc(hp,HEAP\_ZERO\_MEMORY,19);

汇编

00401045 |. 6A 13 push 13 ; /HeapSize = 13 (19.)

00401047 |. 6A 08 push 8 ; |Flags = HEAP\_ZERO\_MEMORY

00401049 |. 56 push esi ; |hHeap

0040104A |. 8945 F4 mov dword ptr [ebp-C], eax ; |

0040104D |. FFD7 call edi ; \HeapAlloc

运行完的堆区

00360000 C8 00 00 00 00 01 00 00 FF EE FF EE 00 10 00 00 ?.....??..

00360010 00 00 00 00 00 FE 00 00 00 00 10 00 00 20 00 00 .....?..... ..

00360020 00 02 00 00 00 20 00 00 24 01 00 00 FF EF FD 7F .... ..$..稞

00360030 04 00 08 06 00 00 00 00 00 00 00 00 00 00 00 00 .............

00360040 00 00 00 00 98 05 36 00 0F 00 00 00 F8 FF FF FF ....?6....?

00360050 50 00 36 00 50 00 36 00 40 06 36 00 00 00 00 00 P.6.P.6.@6.....

00360060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360110 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360130 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360140 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360150 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360160 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 ...............

00360170 00 00 00 00 00 00 00 00 E8 06 36 00 E8 06 36 00 ........?6.?6.

00360180 80 01 36 00 80 01 36 00 88 01 36 00 88 01 36 00 €6.€6.?6.?6.

00360190 90 01 36 00 90 01 36 00 98 01 36 00 98 01 36 00 ?6.?6.?6.?6.

003601A0 A0 01 36 00 A0 01 36 00 A8 01 36 00 A8 01 36 00 ?6.?6.?6.?6.

003601B0 B0 01 36 00 B0 01 36 00 B8 01 36 00 B8 01 36 00 ?6.?6.?6.?6.

003601C0 C0 01 36 00 C0 01 36 00 C8 01 36 00 C8 01 36 00 ?6.?6.?6.?6.

003601D0 D0 01 36 00 D0 01 36 00 D8 01 36 00 D8 01 36 00 ?6.?6.?6.?6.

003601E0 E0 01 36 00 E0 01 36 00 E8 01 36 00 E8 01 36 00 ?6.?6.?6.?6.

003601F0 F0 01 36 00 F0 01 36 00 F8 01 36 00 F8 01 36 00 ?6.?6.?6.?6.

00360200 00 02 36 00 00 02 36 00 08 02 36 00 08 02 36 00 .6..6.6.6.

00360210 10 02 36 00 10 02 36 00 18 02 36 00 18 02 36 00 6.6.6.6.

00360220 20 02 36 00 20 02 36 00 28 02 36 00 28 02 36 00 6. 6.(6.(6.

00360230 30 02 36 00 30 02 36 00 38 02 36 00 38 02 36 00 06.06.86.86.

00360240 40 02 36 00 40 02 36 00 48 02 36 00 48 02 36 00 @6.@6.H6.H6.

00360250 50 02 36 00 50 02 36 00 58 02 36 00 58 02 36 00 P6.P6.X6.X6.

00360260 60 02 36 00 60 02 36 00 68 02 36 00 68 02 36 00 `6.`6.h6.h6.

00360270 70 02 36 00 70 02 36 00 78 02 36 00 78 02 36 00 p6.p6.x6.x6.

00360280 80 02 36 00 80 02 36 00 88 02 36 00 88 02 36 00 €6.€6.?6.?6.

00360290 90 02 36 00 90 02 36 00 98 02 36 00 98 02 36 00 ?6.?6.?6.?6.

003602A0 A0 02 36 00 A0 02 36 00 A8 02 36 00 A8 02 36 00 ?6.?6.?6.?6.

003602B0 B0 02 36 00 B0 02 36 00 B8 02 36 00 B8 02 36 00 ?6.?6.?6.?6.

003602C0 C0 02 36 00 C0 02 36 00 C8 02 36 00 C8 02 36 00 ?6.?6.?6.?6.

003602D0 D0 02 36 00 D0 02 36 00 D8 02 36 00 D8 02 36 00 ?6.?6.?6.?6.

003602E0 E0 02 36 00 E0 02 36 00 E8 02 36 00 E8 02 36 00 ?6.?6.?6.?6.

003602F0 F0 02 36 00 F0 02 36 00 F8 02 36 00 F8 02 36 00 ?6.?6.?6.?6.

00360300 00 03 36 00 00 03 36 00 08 03 36 00 08 03 36 00 .6..6.6.6.

00360310 10 03 36 00 10 03 36 00 18 03 36 00 18 03 36 00 6.6.6.6.

00360320 20 03 36 00 20 03 36 00 28 03 36 00 28 03 36 00 6. 6.(6.(6.

00360330 30 03 36 00 30 03 36 00 38 03 36 00 38 03 36 00 06.06.86.86.

00360340 40 03 36 00 40 03 36 00 48 03 36 00 48 03 36 00 @6.@6.H6.H6.

00360350 50 03 36 00 50 03 36 00 58 03 36 00 58 03 36 00 P6.P6.X6.X6.

00360360 60 03 36 00 60 03 36 00 68 03 36 00 68 03 36 00 `6.`6.h6.h6.

00360370 70 03 36 00 70 03 36 00 78 03 36 00 78 03 36 00 p6.p6.x6.x6.

00360380 80 03 36 00 80 03 36 00 88 03 36 00 88 03 36 00 €6.€6.?6.?6.

00360390 90 03 36 00 90 03 36 00 98 03 36 00 98 03 36 00 ?6.?6.?6.?6.

003603A0 A0 03 36 00 A0 03 36 00 A8 03 36 00 A8 03 36 00 ?6.?6.?6.?6.

003603B0 B0 03 36 00 B0 03 36 00 B8 03 36 00 B8 03 36 00 ?6.?6.?6.?6.

003603C0 C0 03 36 00 C0 03 36 00 C8 03 36 00 C8 03 36 00 ?6.?6.?6.?6.

003603D0 D0 03 36 00 D0 03 36 00 D8 03 36 00 D8 03 36 00 ?6.?6.?6.?6.

003603E0 E0 03 36 00 E0 03 36 00 E8 03 36 00 E8 03 36 00 ?6.?6.?6.?6.

003603F0 F0 03 36 00 F0 03 36 00 F8 03 36 00 F8 03 36 00 ?6.?6.?6.?6.

00360400 00 04 36 00 00 04 36 00 08 04 36 00 08 04 36 00 .6..6.6.6.

00360410 10 04 36 00 10 04 36 00 18 04 36 00 18 04 36 00 6.6.6.6.

00360420 20 04 36 00 20 04 36 00 28 04 36 00 28 04 36 00 6. 6.(6.(6.

00360430 30 04 36 00 30 04 36 00 38 04 36 00 38 04 36 00 06.06.86.86.

00360440 40 04 36 00 40 04 36 00 48 04 36 00 48 04 36 00 @6.@6.H6.H6.

00360450 50 04 36 00 50 04 36 00 58 04 36 00 58 04 36 00 P6.P6.X6.X6.

00360460 60 04 36 00 60 04 36 00 68 04 36 00 68 04 36 00 `6.`6.h6.h6.

00360470 70 04 36 00 70 04 36 00 78 04 36 00 78 04 36 00 p6.p6.x6.x6.

00360480 80 04 36 00 80 04 36 00 88 04 36 00 88 04 36 00 €6.€6.?6.?6.

00360490 90 04 36 00 90 04 36 00 98 04 36 00 98 04 36 00 ?6.?6.?6.?6.

003604A0 A0 04 36 00 A0 04 36 00 A8 04 36 00 A8 04 36 00 ?6.?6.?6.?6.

003604B0 B0 04 36 00 B0 04 36 00 B8 04 36 00 B8 04 36 00 ?6.?6.?6.?6.

003604C0 C0 04 36 00 C0 04 36 00 C8 04 36 00 C8 04 36 00 ?6.?6.?6.?6.

003604D0 D0 04 36 00 D0 04 36 00 D8 04 36 00 D8 04 36 00 ?6.?6.?6.?6.

003604E0 E0 04 36 00 E0 04 36 00 E8 04 36 00 E8 04 36 00 ?6.?6.?6.?6.

003604F0 F0 04 36 00 F0 04 36 00 F8 04 36 00 F8 04 36 00 ?6.?6.?6.?6.

00360500 00 05 36 00 00 05 36 00 08 05 36 00 08 05 36 00 .6..6.6.6.

00360510 10 05 36 00 10 05 36 00 18 05 36 00 18 05 36 00 6.6.6.6.

00360520 20 05 36 00 20 05 36 00 28 05 36 00 28 05 36 00 6. 6.(6.(6.

00360530 30 05 36 00 30 05 36 00 38 05 36 00 38 05 36 00 06.06.86.86.

00360540 40 05 36 00 40 05 36 00 48 05 36 00 48 05 36 00 @6.@6.H6.H6.

00360550 50 05 36 00 50 05 36 00 58 05 36 00 58 05 36 00 P6.P6.X6.X6.

00360560 60 05 36 00 60 05 36 00 68 05 36 00 68 05 36 00 `6.`6.h6.h6.

00360570 70 05 36 00 70 05 36 00 08 06 36 00 00 00 00 00 p6.p6.6.....

00360580 00 00 00 00 00 00 00 00 00 00 00 00 00 10 36 00 .............6.

00360590 00 F0 00 00 00 00 00 00 A8 05 36 00 00 00 00 00 .?.....?6.....

003605A0 00 00 00 00 00 00 00 00 B8 05 36 00 00 00 00 00 ........?6.....

003605B0 00 00 00 00 00 00 00 00 C8 05 36 00 00 00 00 00 ........?6.....

003605C0 00 00 00 00 00 00 00 00 D8 05 36 00 00 00 00 00 ........?6.....

003605D0 00 00 00 00 00 00 00 00 E8 05 36 00 00 00 00 00 ........?6.....

003605E0 00 00 00 00 00 00 00 00 F8 05 36 00 00 00 00 00 ........?6.....

003605F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360600 00 00 00 00 00 00 00 00 C0 06 FD 77 FF FF FF FF ........?齱

00360610 00 00 00 00 00 00 00 00 2C 00 00 00 00 00 00 00 ........,.......

00360620 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360630 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360640 08 00 C8 00 00 01 00 00 EE FF EE FF 00 00 00 00 .?...??....

00360650 00 00 36 00 00 F0 00 00 00 00 36 00 10 00 00 00 ..6..?...6....

00360660 80 06 36 00 00 00 37 00 0F 00 00 00 01 00 00 00 €6...7.......

00360670 88 05 36 00 00 00 00 00 E0 06 36 00 00 00 00 00 ?6.....?6.....

00360680 02 00 08 00 00 01 0D 00 00 00 00 00 78 01 36 00 .........x6.

00360690 02 00 02 00 00 01 0B 00 00 00 00 00 00 01 36 00 ...  
......6.

003606A0 02 00 02 00 00 01 0A 00 00 00 00 00 00 00 36 00 ...........6.

003606B0 02 00 02 00 00 01 08 00 00 00 00 00 00 00 00 00 ............

003606C0 04 00 02 00 00 01 0D 00 00 00 00 00 00 00 00 00 .............

003606D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606E0 24 01 04 00 00 10 00 00 78 01 36 00 78 01 36 00 $....x6.x6.

003606F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360700 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360710 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

可分配尾块空间为0x00000124个堆单位

0x00360020 00 02 00 00 00 20 00 00 24 01 00 00 FF EF FD 7F

尾块数据区的起始位置为0x003606E8

0x00360170 00 00 00 00 00 00 00 00 E8 06 36 00 E8 06 36 00

刚分配的堆块

0x003606C0 04 00 02 00 00 01 0D 00 00 00 00 00 00 00 00 00

0x003606D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

第六次

C语言代码

h6 = HeapAlloc(hp,HEAP\_ZERO\_MEMORY,24);

汇编

0040104F |. 6A 18 push 18 ; /HeapSize = 18 (24.)

00401051 |. 6A 08 push 8 ; |Flags = HEAP\_ZERO\_MEMORY

00401053 |. 56 push esi ; |hHeap

00401054 |. 8945 F8 mov dword ptr [ebp-8], eax ; |

00401057 |. FFD7 call edi ; \HeapAlloc

运行完的堆区

00360000 C8 00 00 00 00 01 00 00 FF EE FF EE 00 10 00 00 ?.....??..

00360010 00 00 00 00 00 FE 00 00 00 00 10 00 00 20 00 00 .....?..... ..

00360020 00 02 00 00 00 20 00 00 20 01 00 00 FF EF FD 7F .... .. ..稞

00360030 04 00 08 06 00 00 00 00 00 00 00 00 00 00 00 00 .............

00360040 00 00 00 00 98 05 36 00 0F 00 00 00 F8 FF FF FF ....?6....?

00360050 50 00 36 00 50 00 36 00 40 06 36 00 00 00 00 00 P.6.P.6.@6.....

00360060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360110 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360130 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360140 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360150 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360160 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 ...............

00360170 00 00 00 00 00 00 00 00 08 07 36 00 08 07 36 00 ........6.6.

00360180 80 01 36 00 80 01 36 00 88 01 36 00 88 01 36 00 €6.€6.?6.?6.

00360190 90 01 36 00 90 01 36 00 98 01 36 00 98 01 36 00 ?6.?6.?6.?6.

003601A0 A0 01 36 00 A0 01 36 00 A8 01 36 00 A8 01 36 00 ?6.?6.?6.?6.

003601B0 B0 01 36 00 B0 01 36 00 B8 01 36 00 B8 01 36 00 ?6.?6.?6.?6.

003601C0 C0 01 36 00 C0 01 36 00 C8 01 36 00 C8 01 36 00 ?6.?6.?6.?6.

003601D0 D0 01 36 00 D0 01 36 00 D8 01 36 00 D8 01 36 00 ?6.?6.?6.?6.

003601E0 E0 01 36 00 E0 01 36 00 E8 01 36 00 E8 01 36 00 ?6.?6.?6.?6.

003601F0 F0 01 36 00 F0 01 36 00 F8 01 36 00 F8 01 36 00 ?6.?6.?6.?6.

00360200 00 02 36 00 00 02 36 00 08 02 36 00 08 02 36 00 .6..6.6.6.

00360210 10 02 36 00 10 02 36 00 18 02 36 00 18 02 36 00 6.6.6.6.

00360220 20 02 36 00 20 02 36 00 28 02 36 00 28 02 36 00 6. 6.(6.(6.

00360230 30 02 36 00 30 02 36 00 38 02 36 00 38 02 36 00 06.06.86.86.

00360240 40 02 36 00 40 02 36 00 48 02 36 00 48 02 36 00 @6.@6.H6.H6.

00360250 50 02 36 00 50 02 36 00 58 02 36 00 58 02 36 00 P6.P6.X6.X6.

00360260 60 02 36 00 60 02 36 00 68 02 36 00 68 02 36 00 `6.`6.h6.h6.

00360270 70 02 36 00 70 02 36 00 78 02 36 00 78 02 36 00 p6.p6.x6.x6.

00360280 80 02 36 00 80 02 36 00 88 02 36 00 88 02 36 00 €6.€6.?6.?6.

00360290 90 02 36 00 90 02 36 00 98 02 36 00 98 02 36 00 ?6.?6.?6.?6.

003602A0 A0 02 36 00 A0 02 36 00 A8 02 36 00 A8 02 36 00 ?6.?6.?6.?6.

003602B0 B0 02 36 00 B0 02 36 00 B8 02 36 00 B8 02 36 00 ?6.?6.?6.?6.

003602C0 C0 02 36 00 C0 02 36 00 C8 02 36 00 C8 02 36 00 ?6.?6.?6.?6.

003602D0 D0 02 36 00 D0 02 36 00 D8 02 36 00 D8 02 36 00 ?6.?6.?6.?6.

003602E0 E0 02 36 00 E0 02 36 00 E8 02 36 00 E8 02 36 00 ?6.?6.?6.?6.

003602F0 F0 02 36 00 F0 02 36 00 F8 02 36 00 F8 02 36 00 ?6.?6.?6.?6.

00360300 00 03 36 00 00 03 36 00 08 03 36 00 08 03 36 00 .6..6.6.6.

00360310 10 03 36 00 10 03 36 00 18 03 36 00 18 03 36 00 6.6.6.6.

00360320 20 03 36 00 20 03 36 00 28 03 36 00 28 03 36 00 6. 6.(6.(6.

00360330 30 03 36 00 30 03 36 00 38 03 36 00 38 03 36 00 06.06.86.86.

00360340 40 03 36 00 40 03 36 00 48 03 36 00 48 03 36 00 @6.@6.H6.H6.

00360350 50 03 36 00 50 03 36 00 58 03 36 00 58 03 36 00 P6.P6.X6.X6.

00360360 60 03 36 00 60 03 36 00 68 03 36 00 68 03 36 00 `6.`6.h6.h6.

00360370 70 03 36 00 70 03 36 00 78 03 36 00 78 03 36 00 p6.p6.x6.x6.

00360380 80 03 36 00 80 03 36 00 88 03 36 00 88 03 36 00 €6.€6.?6.?6.

00360390 90 03 36 00 90 03 36 00 98 03 36 00 98 03 36 00 ?6.?6.?6.?6.

003603A0 A0 03 36 00 A0 03 36 00 A8 03 36 00 A8 03 36 00 ?6.?6.?6.?6.

003603B0 B0 03 36 00 B0 03 36 00 B8 03 36 00 B8 03 36 00 ?6.?6.?6.?6.

003603C0 C0 03 36 00 C0 03 36 00 C8 03 36 00 C8 03 36 00 ?6.?6.?6.?6.

003603D0 D0 03 36 00 D0 03 36 00 D8 03 36 00 D8 03 36 00 ?6.?6.?6.?6.

003603E0 E0 03 36 00 E0 03 36 00 E8 03 36 00 E8 03 36 00 ?6.?6.?6.?6.

003603F0 F0 03 36 00 F0 03 36 00 F8 03 36 00 F8 03 36 00 ?6.?6.?6.?6.

00360400 00 04 36 00 00 04 36 00 08 04 36 00 08 04 36 00 .6..6.6.6.

00360410 10 04 36 00 10 04 36 00 18 04 36 00 18 04 36 00 6.6.6.6.

00360420 20 04 36 00 20 04 36 00 28 04 36 00 28 04 36 00 6. 6.(6.(6.

00360430 30 04 36 00 30 04 36 00 38 04 36 00 38 04 36 00 06.06.86.86.

00360440 40 04 36 00 40 04 36 00 48 04 36 00 48 04 36 00 @6.@6.H6.H6.

00360450 50 04 36 00 50 04 36 00 58 04 36 00 58 04 36 00 P6.P6.X6.X6.

00360460 60 04 36 00 60 04 36 00 68 04 36 00 68 04 36 00 `6.`6.h6.h6.

00360470 70 04 36 00 70 04 36 00 78 04 36 00 78 04 36 00 p6.p6.x6.x6.

00360480 80 04 36 00 80 04 36 00 88 04 36 00 88 04 36 00 €6.€6.?6.?6.

00360490 90 04 36 00 90 04 36 00 98 04 36 00 98 04 36 00 ?6.?6.?6.?6.

003604A0 A0 04 36 00 A0 04 36 00 A8 04 36 00 A8 04 36 00 ?6.?6.?6.?6.

003604B0 B0 04 36 00 B0 04 36 00 B8 04 36 00 B8 04 36 00 ?6.?6.?6.?6.

003604C0 C0 04 36 00 C0 04 36 00 C8 04 36 00 C8 04 36 00 ?6.?6.?6.?6.

003604D0 D0 04 36 00 D0 04 36 00 D8 04 36 00 D8 04 36 00 ?6.?6.?6.?6.

003604E0 E0 04 36 00 E0 04 36 00 E8 04 36 00 E8 04 36 00 ?6.?6.?6.?6.

003604F0 F0 04 36 00 F0 04 36 00 F8 04 36 00 F8 04 36 00 ?6.?6.?6.?6.

00360500 00 05 36 00 00 05 36 00 08 05 36 00 08 05 36 00 .6..6.6.6.

00360510 10 05 36 00 10 05 36 00 18 05 36 00 18 05 36 00 6.6.6.6.

00360520 20 05 36 00 20 05 36 00 28 05 36 00 28 05 36 00 6. 6.(6.(6.

00360530 30 05 36 00 30 05 36 00 38 05 36 00 38 05 36 00 06.06.86.86.

00360540 40 05 36 00 40 05 36 00 48 05 36 00 48 05 36 00 @6.@6.H6.H6.

00360550 50 05 36 00 50 05 36 00 58 05 36 00 58 05 36 00 P6.P6.X6.X6.

00360560 60 05 36 00 60 05 36 00 68 05 36 00 68 05 36 00 `6.`6.h6.h6.

00360570 70 05 36 00 70 05 36 00 08 06 36 00 00 00 00 00 p6.p6.6.....

00360580 00 00 00 00 00 00 00 00 00 00 00 00 00 10 36 00 .............6.

00360590 00 F0 00 00 00 00 00 00 A8 05 36 00 00 00 00 00 .?.....?6.....

003605A0 00 00 00 00 00 00 00 00 B8 05 36 00 00 00 00 00 ........?6.....

003605B0 00 00 00 00 00 00 00 00 C8 05 36 00 00 00 00 00 ........?6.....

003605C0 00 00 00 00 00 00 00 00 D8 05 36 00 00 00 00 00 ........?6.....

003605D0 00 00 00 00 00 00 00 00 E8 05 36 00 00 00 00 00 ........?6.....

003605E0 00 00 00 00 00 00 00 00 F8 05 36 00 00 00 00 00 ........?6.....

003605F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360600 00 00 00 00 00 00 00 00 C0 06 FD 77 FF FF FF FF ........?齱

00360610 00 00 00 00 00 00 00 00 2C 00 00 00 00 00 00 00 ........,.......

00360620 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360630 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360640 08 00 C8 00 00 01 00 00 EE FF EE FF 00 00 00 00 .?...??....

00360650 00 00 36 00 00 F0 00 00 00 00 36 00 10 00 00 00 ..6..?...6....

00360660 80 06 36 00 00 00 37 00 0F 00 00 00 01 00 00 00 €6...7.......

00360670 88 05 36 00 00 00 00 00 00 07 36 00 00 00 00 00 ?6......6.....

00360680 02 00 08 00 00 01 0D 00 00 00 00 00 78 01 36 00 .........x6.

00360690 02 00 02 00 00 01 0B 00 00 00 00 00 00 01 36 00 ...  
......6.

003606A0 02 00 02 00 00 01 0A 00 00 00 00 00 00 00 36 00 ...........6.

003606B0 02 00 02 00 00 01 08 00 00 00 00 00 00 00 00 00 ............

003606C0 04 00 02 00 00 01 0D 00 00 00 00 00 00 00 00 00 .............

003606D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606E0 04 00 04 00 00 01 08 00 00 00 00 00 00 00 00 00 ............

003606F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360700 20 01 04 00 00 10 00 00 78 01 36 00 78 01 36 00 ....x6.x6.

00360710 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

尾块可分配空间变为0x00000120个堆单位

0x00360020 00 02 00 00 00 20 00 00 20 01 00 00 FF EF FD 7F

尾块数据区起始位置变为0x00360708

0x00360170 00 00 00 00 00 00 00 00 08 07 36 00 08 07 36 00

刚分配的堆区

0x003606E0 04 00 04 00 00 01 08 00 00 00 00 00 00 00 00 00

0x003606F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

然后就是释放了

第一次

C语言代码

HeapFree(hp,0,h1); //free to freelist[2]

汇编

00401059 |. 8B3D 4C504000 mov edi, dword ptr [<&KERNEL32.HeapFree>] ; ntdll.RtlFreeHeap

0040105F |. 53 push ebx ; /pMemory

00401060 |. 6A 00 push 0 ; |Flags = 0

00401062 |. 56 push esi ; |hHeap

00401063 |. FFD7 call edi ; \HeapFree

释放完的堆区

00360000 C8 00 00 00 00 01 00 00 FF EE FF EE 00 10 00 00 ?.....??..

00360010 00 00 00 00 00 FE 00 00 00 00 10 00 00 20 00 00 .....?..... ..

00360020 00 02 00 00 00 20 00 00 22 01 00 00 FF EF FD 7F .... .."..稞

00360030 04 00 08 06 00 00 00 00 00 00 00 00 00 00 00 00 .............

00360040 00 00 00 00 98 05 36 00 0F 00 00 00 F8 FF FF FF ....?6....?

00360050 50 00 36 00 50 00 36 00 40 06 36 00 00 00 00 00 P.6.P.6.@6.....

00360060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360110 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360130 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360140 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360150 00 00 00 00 00 00 00 00 04 00 00 00 00 00 00 00 ...............

00360160 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 ...............

00360170 00 00 00 00 00 00 00 00 08 07 36 00 08 07 36 00 ........6.6.

00360180 80 01 36 00 80 01 36 00 88 06 36 00 88 06 36 00 €6.€6.?6.?6.

00360190 90 01 36 00 90 01 36 00 98 01 36 00 98 01 36 00 ?6.?6.?6.?6.

003601A0 A0 01 36 00 A0 01 36 00 A8 01 36 00 A8 01 36 00 ?6.?6.?6.?6.

003601B0 B0 01 36 00 B0 01 36 00 B8 01 36 00 B8 01 36 00 ?6.?6.?6.?6.

003601C0 C0 01 36 00 C0 01 36 00 C8 01 36 00 C8 01 36 00 ?6.?6.?6.?6.

003601D0 D0 01 36 00 D0 01 36 00 D8 01 36 00 D8 01 36 00 ?6.?6.?6.?6.

003601E0 E0 01 36 00 E0 01 36 00 E8 01 36 00 E8 01 36 00 ?6.?6.?6.?6.

003601F0 F0 01 36 00 F0 01 36 00 F8 01 36 00 F8 01 36 00 ?6.?6.?6.?6.

00360200 00 02 36 00 00 02 36 00 08 02 36 00 08 02 36 00 .6..6.6.6.

00360210 10 02 36 00 10 02 36 00 18 02 36 00 18 02 36 00 6.6.6.6.

00360220 20 02 36 00 20 02 36 00 28 02 36 00 28 02 36 00 6. 6.(6.(6.

00360230 30 02 36 00 30 02 36 00 38 02 36 00 38 02 36 00 06.06.86.86.

00360240 40 02 36 00 40 02 36 00 48 02 36 00 48 02 36 00 @6.@6.H6.H6.

00360250 50 02 36 00 50 02 36 00 58 02 36 00 58 02 36 00 P6.P6.X6.X6.

00360260 60 02 36 00 60 02 36 00 68 02 36 00 68 02 36 00 `6.`6.h6.h6.

00360270 70 02 36 00 70 02 36 00 78 02 36 00 78 02 36 00 p6.p6.x6.x6.

00360280 80 02 36 00 80 02 36 00 88 02 36 00 88 02 36 00 €6.€6.?6.?6.

00360290 90 02 36 00 90 02 36 00 98 02 36 00 98 02 36 00 ?6.?6.?6.?6.

003602A0 A0 02 36 00 A0 02 36 00 A8 02 36 00 A8 02 36 00 ?6.?6.?6.?6.

003602B0 B0 02 36 00 B0 02 36 00 B8 02 36 00 B8 02 36 00 ?6.?6.?6.?6.

003602C0 C0 02 36 00 C0 02 36 00 C8 02 36 00 C8 02 36 00 ?6.?6.?6.?6.

003602D0 D0 02 36 00 D0 02 36 00 D8 02 36 00 D8 02 36 00 ?6.?6.?6.?6.

003602E0 E0 02 36 00 E0 02 36 00 E8 02 36 00 E8 02 36 00 ?6.?6.?6.?6.

003602F0 F0 02 36 00 F0 02 36 00 F8 02 36 00 F8 02 36 00 ?6.?6.?6.?6.

00360300 00 03 36 00 00 03 36 00 08 03 36 00 08 03 36 00 .6..6.6.6.

00360310 10 03 36 00 10 03 36 00 18 03 36 00 18 03 36 00 6.6.6.6.

00360320 20 03 36 00 20 03 36 00 28 03 36 00 28 03 36 00 6. 6.(6.(6.

00360330 30 03 36 00 30 03 36 00 38 03 36 00 38 03 36 00 06.06.86.86.

00360340 40 03 36 00 40 03 36 00 48 03 36 00 48 03 36 00 @6.@6.H6.H6.

00360350 50 03 36 00 50 03 36 00 58 03 36 00 58 03 36 00 P6.P6.X6.X6.

00360360 60 03 36 00 60 03 36 00 68 03 36 00 68 03 36 00 `6.`6.h6.h6.

00360370 70 03 36 00 70 03 36 00 78 03 36 00 78 03 36 00 p6.p6.x6.x6.

00360380 80 03 36 00 80 03 36 00 88 03 36 00 88 03 36 00 €6.€6.?6.?6.

00360390 90 03 36 00 90 03 36 00 98 03 36 00 98 03 36 00 ?6.?6.?6.?6.

003603A0 A0 03 36 00 A0 03 36 00 A8 03 36 00 A8 03 36 00 ?6.?6.?6.?6.

003603B0 B0 03 36 00 B0 03 36 00 B8 03 36 00 B8 03 36 00 ?6.?6.?6.?6.

003603C0 C0 03 36 00 C0 03 36 00 C8 03 36 00 C8 03 36 00 ?6.?6.?6.?6.

003603D0 D0 03 36 00 D0 03 36 00 D8 03 36 00 D8 03 36 00 ?6.?6.?6.?6.

003603E0 E0 03 36 00 E0 03 36 00 E8 03 36 00 E8 03 36 00 ?6.?6.?6.?6.

003603F0 F0 03 36 00 F0 03 36 00 F8 03 36 00 F8 03 36 00 ?6.?6.?6.?6.

00360400 00 04 36 00 00 04 36 00 08 04 36 00 08 04 36 00 .6..6.6.6.

00360410 10 04 36 00 10 04 36 00 18 04 36 00 18 04 36 00 6.6.6.6.

00360420 20 04 36 00 20 04 36 00 28 04 36 00 28 04 36 00 6. 6.(6.(6.

00360430 30 04 36 00 30 04 36 00 38 04 36 00 38 04 36 00 06.06.86.86.

00360440 40 04 36 00 40 04 36 00 48 04 36 00 48 04 36 00 @6.@6.H6.H6.

00360450 50 04 36 00 50 04 36 00 58 04 36 00 58 04 36 00 P6.P6.X6.X6.

00360460 60 04 36 00 60 04 36 00 68 04 36 00 68 04 36 00 `6.`6.h6.h6.

00360470 70 04 36 00 70 04 36 00 78 04 36 00 78 04 36 00 p6.p6.x6.x6.

00360480 80 04 36 00 80 04 36 00 88 04 36 00 88 04 36 00 €6.€6.?6.?6.

00360490 90 04 36 00 90 04 36 00 98 04 36 00 98 04 36 00 ?6.?6.?6.?6.

003604A0 A0 04 36 00 A0 04 36 00 A8 04 36 00 A8 04 36 00 ?6.?6.?6.?6.

003604B0 B0 04 36 00 B0 04 36 00 B8 04 36 00 B8 04 36 00 ?6.?6.?6.?6.

003604C0 C0 04 36 00 C0 04 36 00 C8 04 36 00 C8 04 36 00 ?6.?6.?6.?6.

003604D0 D0 04 36 00 D0 04 36 00 D8 04 36 00 D8 04 36 00 ?6.?6.?6.?6.

003604E0 E0 04 36 00 E0 04 36 00 E8 04 36 00 E8 04 36 00 ?6.?6.?6.?6.

003604F0 F0 04 36 00 F0 04 36 00 F8 04 36 00 F8 04 36 00 ?6.?6.?6.?6.

00360500 00 05 36 00 00 05 36 00 08 05 36 00 08 05 36 00 .6..6.6.6.

00360510 10 05 36 00 10 05 36 00 18 05 36 00 18 05 36 00 6.6.6.6.

00360520 20 05 36 00 20 05 36 00 28 05 36 00 28 05 36 00 6. 6.(6.(6.

00360530 30 05 36 00 30 05 36 00 38 05 36 00 38 05 36 00 06.06.86.86.

00360540 40 05 36 00 40 05 36 00 48 05 36 00 48 05 36 00 @6.@6.H6.H6.

00360550 50 05 36 00 50 05 36 00 58 05 36 00 58 05 36 00 P6.P6.X6.X6.

00360560 60 05 36 00 60 05 36 00 68 05 36 00 68 05 36 00 `6.`6.h6.h6.

00360570 70 05 36 00 70 05 36 00 08 06 36 00 00 00 00 00 p6.p6.6.....

00360580 00 00 00 00 00 00 00 00 00 00 00 00 00 10 36 00 .............6.

00360590 00 F0 00 00 00 00 00 00 A8 05 36 00 00 00 00 00 .?.....?6.....

003605A0 00 00 00 00 00 00 00 00 B8 05 36 00 00 00 00 00 ........?6.....

003605B0 00 00 00 00 00 00 00 00 C8 05 36 00 00 00 00 00 ........?6.....

003605C0 00 00 00 00 00 00 00 00 D8 05 36 00 00 00 00 00 ........?6.....

003605D0 00 00 00 00 00 00 00 00 E8 05 36 00 00 00 00 00 ........?6.....

003605E0 00 00 00 00 00 00 00 00 F8 05 36 00 00 00 00 00 ........?6.....

003605F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360600 00 00 00 00 00 00 00 00 C0 06 FD 77 FF FF FF FF ........?齱

00360610 00 00 00 00 00 00 00 00 2C 00 00 00 00 00 00 00 ........,.......

00360620 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360630 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360640 08 00 C8 00 00 01 00 00 EE FF EE FF 00 00 00 00 .?...??....

00360650 00 00 36 00 00 F0 00 00 00 00 36 00 10 00 00 00 ..6..?...6....

00360660 80 06 36 00 00 00 37 00 0F 00 00 00 01 00 00 00 €6...7.......

00360670 88 05 36 00 00 00 00 00 00 07 36 00 00 00 00 00 ?6......6.....

00360680 02 00 08 00 00 00 0D 00 88 01 36 00 88 01 36 00 ......?6.?6.

00360690 02 00 02 00 00 01 0B 00 00 00 00 00 00 01 36 00 ...  
......6.

003606A0 02 00 02 00 00 01 0A 00 00 00 00 00 00 00 36 00 ...........6.

003606B0 02 00 02 00 00 01 08 00 00 00 00 00 00 00 00 00 ............

003606C0 04 00 02 00 00 01 0D 00 00 00 00 00 00 00 00 00 .............

003606D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606E0 04 00 04 00 00 01 08 00 00 00 00 00 00 00 00 00 ............

003606F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360700 20 01 04 00 00 10 00 00 78 01 36 00 78 01 36 00 ....x6.x6.

00360710 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

尾块可分配的空间变为0x00000122个堆单位

0x00360020 00 02 00 00 00 20 00 00 22 01 00 00 FF EF FD 7F

Freelist[0]指向的地方没有变，依旧是0x00360708

0x00360170 00 00 00 00 00 00 00 00 08 07 36 00 08 07 36 00

Freelist[2]变了，变为了0x00360688，是h1申请的空间

0x00360180 80 01 36 00 80 01 36 00 88 06 36 00 88 06 36 00

因为直接指向了数据区，所以其实是这一整个堆块，注意后面的指针

0x00360680 02 00 08 00 00 00 0D 00 88 01 36 00 88 01 36 00

第二次

C语言代码

HeapFree(hp,0,h3); //free to freelist[2]

汇编

00401065 |. 8B45 FC mov eax, dword ptr [ebp-4]

00401068 |. 50 push eax ; /pMemory

00401069 |. 6A 00 push 0 ; |Flags = 0

0040106B |. 56 push esi ; |hHeap

0040106C |. FFD7 call edi ; \HeapFree

释放后的堆区

00360000 C8 00 00 00 00 01 00 00 FF EE FF EE 00 10 00 00 ?.....??..

00360010 00 00 00 00 00 FE 00 00 00 00 10 00 00 20 00 00 .....?..... ..

00360020 00 02 00 00 00 20 00 00 24 01 00 00 FF EF FD 7F .... ..$..稞

00360030 04 00 08 06 00 00 00 00 00 00 00 00 00 00 00 00 .............

00360040 00 00 00 00 98 05 36 00 0F 00 00 00 F8 FF FF FF ....?6....?

00360050 50 00 36 00 50 00 36 00 40 06 36 00 00 00 00 00 P.6.P.6.@6.....

00360060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360110 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360130 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360140 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360150 00 00 00 00 00 00 00 00 04 00 00 00 00 00 00 00 ...............

00360160 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 ...............

00360170 00 00 00 00 00 00 00 00 08 07 36 00 08 07 36 00 ........6.6.

00360180 80 01 36 00 80 01 36 00 88 06 36 00 A8 06 36 00 €6.€6.?6.?6.

00360190 90 01 36 00 90 01 36 00 98 01 36 00 98 01 36 00 ?6.?6.?6.?6.

003601A0 A0 01 36 00 A0 01 36 00 A8 01 36 00 A8 01 36 00 ?6.?6.?6.?6.

003601B0 B0 01 36 00 B0 01 36 00 B8 01 36 00 B8 01 36 00 ?6.?6.?6.?6.

003601C0 C0 01 36 00 C0 01 36 00 C8 01 36 00 C8 01 36 00 ?6.?6.?6.?6.

003601D0 D0 01 36 00 D0 01 36 00 D8 01 36 00 D8 01 36 00 ?6.?6.?6.?6.

003601E0 E0 01 36 00 E0 01 36 00 E8 01 36 00 E8 01 36 00 ?6.?6.?6.?6.

003601F0 F0 01 36 00 F0 01 36 00 F8 01 36 00 F8 01 36 00 ?6.?6.?6.?6.

00360200 00 02 36 00 00 02 36 00 08 02 36 00 08 02 36 00 .6..6.6.6.

00360210 10 02 36 00 10 02 36 00 18 02 36 00 18 02 36 00 6.6.6.6.

00360220 20 02 36 00 20 02 36 00 28 02 36 00 28 02 36 00 6. 6.(6.(6.

00360230 30 02 36 00 30 02 36 00 38 02 36 00 38 02 36 00 06.06.86.86.

00360240 40 02 36 00 40 02 36 00 48 02 36 00 48 02 36 00 @6.@6.H6.H6.

00360250 50 02 36 00 50 02 36 00 58 02 36 00 58 02 36 00 P6.P6.X6.X6.

00360260 60 02 36 00 60 02 36 00 68 02 36 00 68 02 36 00 `6.`6.h6.h6.

00360270 70 02 36 00 70 02 36 00 78 02 36 00 78 02 36 00 p6.p6.x6.x6.

00360280 80 02 36 00 80 02 36 00 88 02 36 00 88 02 36 00 €6.€6.?6.?6.

00360290 90 02 36 00 90 02 36 00 98 02 36 00 98 02 36 00 ?6.?6.?6.?6.

003602A0 A0 02 36 00 A0 02 36 00 A8 02 36 00 A8 02 36 00 ?6.?6.?6.?6.

003602B0 B0 02 36 00 B0 02 36 00 B8 02 36 00 B8 02 36 00 ?6.?6.?6.?6.

003602C0 C0 02 36 00 C0 02 36 00 C8 02 36 00 C8 02 36 00 ?6.?6.?6.?6.

003602D0 D0 02 36 00 D0 02 36 00 D8 02 36 00 D8 02 36 00 ?6.?6.?6.?6.

003602E0 E0 02 36 00 E0 02 36 00 E8 02 36 00 E8 02 36 00 ?6.?6.?6.?6.

003602F0 F0 02 36 00 F0 02 36 00 F8 02 36 00 F8 02 36 00 ?6.?6.?6.?6.

00360300 00 03 36 00 00 03 36 00 08 03 36 00 08 03 36 00 .6..6.6.6.

00360310 10 03 36 00 10 03 36 00 18 03 36 00 18 03 36 00 6.6.6.6.

00360320 20 03 36 00 20 03 36 00 28 03 36 00 28 03 36 00 6. 6.(6.(6.

00360330 30 03 36 00 30 03 36 00 38 03 36 00 38 03 36 00 06.06.86.86.

00360340 40 03 36 00 40 03 36 00 48 03 36 00 48 03 36 00 @6.@6.H6.H6.

00360350 50 03 36 00 50 03 36 00 58 03 36 00 58 03 36 00 P6.P6.X6.X6.

00360360 60 03 36 00 60 03 36 00 68 03 36 00 68 03 36 00 `6.`6.h6.h6.

00360370 70 03 36 00 70 03 36 00 78 03 36 00 78 03 36 00 p6.p6.x6.x6.

00360380 80 03 36 00 80 03 36 00 88 03 36 00 88 03 36 00 €6.€6.?6.?6.

00360390 90 03 36 00 90 03 36 00 98 03 36 00 98 03 36 00 ?6.?6.?6.?6.

003603A0 A0 03 36 00 A0 03 36 00 A8 03 36 00 A8 03 36 00 ?6.?6.?6.?6.

003603B0 B0 03 36 00 B0 03 36 00 B8 03 36 00 B8 03 36 00 ?6.?6.?6.?6.

003603C0 C0 03 36 00 C0 03 36 00 C8 03 36 00 C8 03 36 00 ?6.?6.?6.?6.

003603D0 D0 03 36 00 D0 03 36 00 D8 03 36 00 D8 03 36 00 ?6.?6.?6.?6.

003603E0 E0 03 36 00 E0 03 36 00 E8 03 36 00 E8 03 36 00 ?6.?6.?6.?6.

003603F0 F0 03 36 00 F0 03 36 00 F8 03 36 00 F8 03 36 00 ?6.?6.?6.?6.

00360400 00 04 36 00 00 04 36 00 08 04 36 00 08 04 36 00 .6..6.6.6.

00360410 10 04 36 00 10 04 36 00 18 04 36 00 18 04 36 00 6.6.6.6.

00360420 20 04 36 00 20 04 36 00 28 04 36 00 28 04 36 00 6. 6.(6.(6.

00360430 30 04 36 00 30 04 36 00 38 04 36 00 38 04 36 00 06.06.86.86.

00360440 40 04 36 00 40 04 36 00 48 04 36 00 48 04 36 00 @6.@6.H6.H6.

00360450 50 04 36 00 50 04 36 00 58 04 36 00 58 04 36 00 P6.P6.X6.X6.

00360460 60 04 36 00 60 04 36 00 68 04 36 00 68 04 36 00 `6.`6.h6.h6.

00360470 70 04 36 00 70 04 36 00 78 04 36 00 78 04 36 00 p6.p6.x6.x6.

00360480 80 04 36 00 80 04 36 00 88 04 36 00 88 04 36 00 €6.€6.?6.?6.

00360490 90 04 36 00 90 04 36 00 98 04 36 00 98 04 36 00 ?6.?6.?6.?6.

003604A0 A0 04 36 00 A0 04 36 00 A8 04 36 00 A8 04 36 00 ?6.?6.?6.?6.

003604B0 B0 04 36 00 B0 04 36 00 B8 04 36 00 B8 04 36 00 ?6.?6.?6.?6.

003604C0 C0 04 36 00 C0 04 36 00 C8 04 36 00 C8 04 36 00 ?6.?6.?6.?6.

003604D0 D0 04 36 00 D0 04 36 00 D8 04 36 00 D8 04 36 00 ?6.?6.?6.?6.

003604E0 E0 04 36 00 E0 04 36 00 E8 04 36 00 E8 04 36 00 ?6.?6.?6.?6.

003604F0 F0 04 36 00 F0 04 36 00 F8 04 36 00 F8 04 36 00 ?6.?6.?6.?6.

00360500 00 05 36 00 00 05 36 00 08 05 36 00 08 05 36 00 .6..6.6.6.

00360510 10 05 36 00 10 05 36 00 18 05 36 00 18 05 36 00 6.6.6.6.

00360520 20 05 36 00 20 05 36 00 28 05 36 00 28 05 36 00 6. 6.(6.(6.

00360530 30 05 36 00 30 05 36 00 38 05 36 00 38 05 36 00 06.06.86.86.

00360540 40 05 36 00 40 05 36 00 48 05 36 00 48 05 36 00 @6.@6.H6.H6.

00360550 50 05 36 00 50 05 36 00 58 05 36 00 58 05 36 00 P6.P6.X6.X6.

00360560 60 05 36 00 60 05 36 00 68 05 36 00 68 05 36 00 `6.`6.h6.h6.

00360570 70 05 36 00 70 05 36 00 08 06 36 00 00 00 00 00 p6.p6.6.....

00360580 00 00 00 00 00 00 00 00 00 00 00 00 00 10 36 00 .............6.

00360590 00 F0 00 00 00 00 00 00 A8 05 36 00 00 00 00 00 .?.....?6.....

003605A0 00 00 00 00 00 00 00 00 B8 05 36 00 00 00 00 00 ........?6.....

003605B0 00 00 00 00 00 00 00 00 C8 05 36 00 00 00 00 00 ........?6.....

003605C0 00 00 00 00 00 00 00 00 D8 05 36 00 00 00 00 00 ........?6.....

003605D0 00 00 00 00 00 00 00 00 E8 05 36 00 00 00 00 00 ........?6.....

003605E0 00 00 00 00 00 00 00 00 F8 05 36 00 00 00 00 00 ........?6.....

003605F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360600 00 00 00 00 00 00 00 00 C0 06 FD 77 FF FF FF FF ........?齱

00360610 00 00 00 00 00 00 00 00 2C 00 00 00 00 00 00 00 ........,.......

00360620 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360630 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360640 08 00 C8 00 00 01 00 00 EE FF EE FF 00 00 00 00 .?...??....

00360650 00 00 36 00 00 F0 00 00 00 00 36 00 10 00 00 00 ..6..?...6....

00360660 80 06 36 00 00 00 37 00 0F 00 00 00 01 00 00 00 €6...7.......

00360670 88 05 36 00 00 00 00 00 00 07 36 00 00 00 00 00 ?6......6.....

00360680 02 00 08 00 00 00 0D 00 A8 06 36 00 88 01 36 00 ......?6.?6.

00360690 02 00 02 00 00 01 0B 00 00 00 00 00 00 01 36 00 ...  
......6.

003606A0 02 00 02 00 00 00 0A 00 88 01 36 00 88 06 36 00 ......?6.?6.

003606B0 02 00 02 00 00 01 08 00 00 00 00 00 00 00 00 00 ............

003606C0 04 00 02 00 00 01 0D 00 00 00 00 00 00 00 00 00 .............

003606D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606E0 04 00 04 00 00 01 08 00 00 00 00 00 00 00 00 00 ............

003606F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360700 20 01 04 00 00 10 00 00 78 01 36 00 78 01 36 00 ....x6.x6.

00360710 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

可分配空间变为0x00000124个堆单位

0x00360020 00 02 00 00 00 20 00 00 24 01 00 00 FF EF FD 7F

Freelist[0]指向的地方没有变，依旧是0x00360708

0x00360170 00 00 00 00 00 00 00 00 08 07 36 00 08 07 36 00

Freelist[2]发生了变化

0x00360180 80 01 36 00 80 01 36 00 88 06 36 00 A8 06 36 00

分别看0x00360688和0x003606A8

0x00360680 02 00 08 00 00 00 0D 00 A8 06 36 00 88 01 36 00

0x003606A0 02 00 02 00 00 00 0A 00 88 01 36 00 88 06 36 00

目前一共释放了h1和h3

0x00360188 0x00360688 0x003606A8

0x00360688 0x003606A8 0x00360188

0x003606A8 0x00360188 0x00360688

观察上面三组数据，0x00360688当作内存值，可以找到0x003606A8，把0x003606A8当作内存值，可以找到0x00360188，最右边那列也是一样，不过需要倒过来，也就是说构成了一个双向链表

第三次

C语言代码

HeapFree(hp,0,h5); //free to freelist[4]

汇编

0040106E |. 8B4D F8 mov ecx, dword ptr [ebp-8]

00401071 |. 51 push ecx ; /pMemory

00401072 |. 6A 00 push 0 ; |Flags = 0

00401074 |. 56 push esi ; |hHeap

00401075 |. FFD7 call edi ; \HeapFree

释放后的堆区

00360000 C8 00 00 00 00 01 00 00 FF EE FF EE 00 10 00 00 ?.....??..

00360010 00 00 00 00 00 FE 00 00 00 00 10 00 00 20 00 00 .....?..... ..

00360020 00 02 00 00 00 20 00 00 28 01 00 00 FF EF FD 7F .... ..(..稞

00360030 04 00 08 06 00 00 00 00 00 00 00 00 00 00 00 00 .............

00360040 00 00 00 00 98 05 36 00 0F 00 00 00 F8 FF FF FF ....?6....?

00360050 50 00 36 00 50 00 36 00 40 06 36 00 00 00 00 00 P.6.P.6.@6.....

00360060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360110 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360130 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360140 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360150 00 00 00 00 00 00 00 00 14 00 00 00 00 00 00 00 ...............

00360160 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 ...............

00360170 00 00 00 00 00 00 00 00 08 07 36 00 08 07 36 00 ........6.6.

00360180 80 01 36 00 80 01 36 00 88 06 36 00 A8 06 36 00 €6.€6.?6.?6.

00360190 90 01 36 00 90 01 36 00 C8 06 36 00 C8 06 36 00 ?6.?6.?6.?6.

003601A0 A0 01 36 00 A0 01 36 00 A8 01 36 00 A8 01 36 00 ?6.?6.?6.?6.

003601B0 B0 01 36 00 B0 01 36 00 B8 01 36 00 B8 01 36 00 ?6.?6.?6.?6.

003601C0 C0 01 36 00 C0 01 36 00 C8 01 36 00 C8 01 36 00 ?6.?6.?6.?6.

003601D0 D0 01 36 00 D0 01 36 00 D8 01 36 00 D8 01 36 00 ?6.?6.?6.?6.

003601E0 E0 01 36 00 E0 01 36 00 E8 01 36 00 E8 01 36 00 ?6.?6.?6.?6.

003601F0 F0 01 36 00 F0 01 36 00 F8 01 36 00 F8 01 36 00 ?6.?6.?6.?6.

00360200 00 02 36 00 00 02 36 00 08 02 36 00 08 02 36 00 .6..6.6.6.

00360210 10 02 36 00 10 02 36 00 18 02 36 00 18 02 36 00 6.6.6.6.

00360220 20 02 36 00 20 02 36 00 28 02 36 00 28 02 36 00 6. 6.(6.(6.

00360230 30 02 36 00 30 02 36 00 38 02 36 00 38 02 36 00 06.06.86.86.

00360240 40 02 36 00 40 02 36 00 48 02 36 00 48 02 36 00 @6.@6.H6.H6.

00360250 50 02 36 00 50 02 36 00 58 02 36 00 58 02 36 00 P6.P6.X6.X6.

00360260 60 02 36 00 60 02 36 00 68 02 36 00 68 02 36 00 `6.`6.h6.h6.

00360270 70 02 36 00 70 02 36 00 78 02 36 00 78 02 36 00 p6.p6.x6.x6.

00360280 80 02 36 00 80 02 36 00 88 02 36 00 88 02 36 00 €6.€6.?6.?6.

00360290 90 02 36 00 90 02 36 00 98 02 36 00 98 02 36 00 ?6.?6.?6.?6.

003602A0 A0 02 36 00 A0 02 36 00 A8 02 36 00 A8 02 36 00 ?6.?6.?6.?6.

003602B0 B0 02 36 00 B0 02 36 00 B8 02 36 00 B8 02 36 00 ?6.?6.?6.?6.

003602C0 C0 02 36 00 C0 02 36 00 C8 02 36 00 C8 02 36 00 ?6.?6.?6.?6.

003602D0 D0 02 36 00 D0 02 36 00 D8 02 36 00 D8 02 36 00 ?6.?6.?6.?6.

003602E0 E0 02 36 00 E0 02 36 00 E8 02 36 00 E8 02 36 00 ?6.?6.?6.?6.

003602F0 F0 02 36 00 F0 02 36 00 F8 02 36 00 F8 02 36 00 ?6.?6.?6.?6.

00360300 00 03 36 00 00 03 36 00 08 03 36 00 08 03 36 00 .6..6.6.6.

00360310 10 03 36 00 10 03 36 00 18 03 36 00 18 03 36 00 6.6.6.6.

00360320 20 03 36 00 20 03 36 00 28 03 36 00 28 03 36 00 6. 6.(6.(6.

00360330 30 03 36 00 30 03 36 00 38 03 36 00 38 03 36 00 06.06.86.86.

00360340 40 03 36 00 40 03 36 00 48 03 36 00 48 03 36 00 @6.@6.H6.H6.

00360350 50 03 36 00 50 03 36 00 58 03 36 00 58 03 36 00 P6.P6.X6.X6.

00360360 60 03 36 00 60 03 36 00 68 03 36 00 68 03 36 00 `6.`6.h6.h6.

00360370 70 03 36 00 70 03 36 00 78 03 36 00 78 03 36 00 p6.p6.x6.x6.

00360380 80 03 36 00 80 03 36 00 88 03 36 00 88 03 36 00 €6.€6.?6.?6.

00360390 90 03 36 00 90 03 36 00 98 03 36 00 98 03 36 00 ?6.?6.?6.?6.

003603A0 A0 03 36 00 A0 03 36 00 A8 03 36 00 A8 03 36 00 ?6.?6.?6.?6.

003603B0 B0 03 36 00 B0 03 36 00 B8 03 36 00 B8 03 36 00 ?6.?6.?6.?6.

003603C0 C0 03 36 00 C0 03 36 00 C8 03 36 00 C8 03 36 00 ?6.?6.?6.?6.

003603D0 D0 03 36 00 D0 03 36 00 D8 03 36 00 D8 03 36 00 ?6.?6.?6.?6.

003603E0 E0 03 36 00 E0 03 36 00 E8 03 36 00 E8 03 36 00 ?6.?6.?6.?6.

003603F0 F0 03 36 00 F0 03 36 00 F8 03 36 00 F8 03 36 00 ?6.?6.?6.?6.

00360400 00 04 36 00 00 04 36 00 08 04 36 00 08 04 36 00 .6..6.6.6.

00360410 10 04 36 00 10 04 36 00 18 04 36 00 18 04 36 00 6.6.6.6.

00360420 20 04 36 00 20 04 36 00 28 04 36 00 28 04 36 00 6. 6.(6.(6.

00360430 30 04 36 00 30 04 36 00 38 04 36 00 38 04 36 00 06.06.86.86.

00360440 40 04 36 00 40 04 36 00 48 04 36 00 48 04 36 00 @6.@6.H6.H6.

00360450 50 04 36 00 50 04 36 00 58 04 36 00 58 04 36 00 P6.P6.X6.X6.

00360460 60 04 36 00 60 04 36 00 68 04 36 00 68 04 36 00 `6.`6.h6.h6.

00360470 70 04 36 00 70 04 36 00 78 04 36 00 78 04 36 00 p6.p6.x6.x6.

00360480 80 04 36 00 80 04 36 00 88 04 36 00 88 04 36 00 €6.€6.?6.?6.

00360490 90 04 36 00 90 04 36 00 98 04 36 00 98 04 36 00 ?6.?6.?6.?6.

003604A0 A0 04 36 00 A0 04 36 00 A8 04 36 00 A8 04 36 00 ?6.?6.?6.?6.

003604B0 B0 04 36 00 B0 04 36 00 B8 04 36 00 B8 04 36 00 ?6.?6.?6.?6.

003604C0 C0 04 36 00 C0 04 36 00 C8 04 36 00 C8 04 36 00 ?6.?6.?6.?6.

003604D0 D0 04 36 00 D0 04 36 00 D8 04 36 00 D8 04 36 00 ?6.?6.?6.?6.

003604E0 E0 04 36 00 E0 04 36 00 E8 04 36 00 E8 04 36 00 ?6.?6.?6.?6.

003604F0 F0 04 36 00 F0 04 36 00 F8 04 36 00 F8 04 36 00 ?6.?6.?6.?6.

00360500 00 05 36 00 00 05 36 00 08 05 36 00 08 05 36 00 .6..6.6.6.

00360510 10 05 36 00 10 05 36 00 18 05 36 00 18 05 36 00 6.6.6.6.

00360520 20 05 36 00 20 05 36 00 28 05 36 00 28 05 36 00 6. 6.(6.(6.

00360530 30 05 36 00 30 05 36 00 38 05 36 00 38 05 36 00 06.06.86.86.

00360540 40 05 36 00 40 05 36 00 48 05 36 00 48 05 36 00 @6.@6.H6.H6.

00360550 50 05 36 00 50 05 36 00 58 05 36 00 58 05 36 00 P6.P6.X6.X6.

00360560 60 05 36 00 60 05 36 00 68 05 36 00 68 05 36 00 `6.`6.h6.h6.

00360570 70 05 36 00 70 05 36 00 08 06 36 00 00 00 00 00 p6.p6.6.....

00360580 00 00 00 00 00 00 00 00 00 00 00 00 00 10 36 00 .............6.

00360590 00 F0 00 00 00 00 00 00 A8 05 36 00 00 00 00 00 .?.....?6.....

003605A0 00 00 00 00 00 00 00 00 B8 05 36 00 00 00 00 00 ........?6.....

003605B0 00 00 00 00 00 00 00 00 C8 05 36 00 00 00 00 00 ........?6.....

003605C0 00 00 00 00 00 00 00 00 D8 05 36 00 00 00 00 00 ........?6.....

003605D0 00 00 00 00 00 00 00 00 E8 05 36 00 00 00 00 00 ........?6.....

003605E0 00 00 00 00 00 00 00 00 F8 05 36 00 00 00 00 00 ........?6.....

003605F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360600 00 00 00 00 00 00 00 00 C0 06 FD 77 FF FF FF FF ........?齱

00360610 00 00 00 00 00 00 00 00 2C 00 00 00 00 00 00 00 ........,.......

00360620 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360630 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360640 08 00 C8 00 00 01 00 00 EE FF EE FF 00 00 00 00 .?...??....

00360650 00 00 36 00 00 F0 00 00 00 00 36 00 10 00 00 00 ..6..?...6....

00360660 80 06 36 00 00 00 37 00 0F 00 00 00 01 00 00 00 €6...7.......

00360670 88 05 36 00 00 00 00 00 00 07 36 00 00 00 00 00 ?6......6.....

00360680 02 00 08 00 00 00 0D 00 A8 06 36 00 88 01 36 00 ......?6.?6.

00360690 02 00 02 00 00 01 0B 00 00 00 00 00 00 01 36 00 ...  
......6.

003606A0 02 00 02 00 00 00 0A 00 88 01 36 00 88 06 36 00 ......?6.?6.

003606B0 02 00 02 00 00 01 08 00 00 00 00 00 00 00 00 00 ............

003606C0 04 00 02 00 00 00 0D 00 98 01 36 00 98 01 36 00 ......?6.?6.

003606D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606E0 04 00 04 00 00 01 08 00 00 00 00 00 00 00 00 00 ............

003606F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360700 20 01 04 00 00 10 00 00 78 01 36 00 78 01 36 00 ....x6.x6.

00360710 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

可分配的空间变成了0x00000128个堆单位

0x00360020 00 02 00 00 00 20 00 00 28 01 00 00 FF EF FD 7F

Freelist[0]指向的地方没有变，依旧是0x00360708

0x00360170 00 00 00 00 00 00 00 00 08 07 36 00 08 07 36 00

Freelist[4]处的值发生了变化

0x00360190 90 01 36 00 90 01 36 00 C8 06 36 00 C8 06 36 00

现在一共释放了h1，h3，h5，然后Freelist[2]串着h1和h3，Freelist[4]串着h5

还有h2，h4，h6没有释放

第四次

C语言代码

HeapFree(hp,0,h4); //coalese h3,h4,h5,link the large block to freelist[8]

汇编

00401077 |. 8B55 F4 mov edx, dword ptr [ebp-C]

0040107A |. 52 push edx ; /pMemory

0040107B |. 6A 00 push 0 ; |Flags = 0

0040107D |. 56 push esi ; |hHeap

0040107E |. FFD7 call edi ; \HeapFree

释放完的堆区

00360000 C8 00 00 00 00 01 00 00 FF EE FF EE 00 10 00 00 ?.....??..

00360010 00 00 00 00 00 FE 00 00 00 00 10 00 00 20 00 00 .....?..... ..

00360020 00 02 00 00 00 20 00 00 2A 01 00 00 FF EF FD 7F .... ..\*..稞

00360030 04 00 08 06 00 00 00 00 00 00 00 00 00 00 00 00 .............

00360040 00 00 00 00 98 05 36 00 0F 00 00 00 F8 FF FF FF ....?6....?

00360050 50 00 36 00 50 00 36 00 40 06 36 00 00 00 00 00 P.6.P.6.@6.....

00360060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600B0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003600F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360110 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360130 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360140 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360150 00 00 00 00 00 00 00 00 04 01 00 00 00 00 00 00 ..............

00360160 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 ...............

00360170 00 00 00 00 00 00 00 00 08 07 36 00 08 07 36 00 ........6.6.

00360180 80 01 36 00 80 01 36 00 88 06 36 00 88 06 36 00 €6.€6.?6.?6.

00360190 90 01 36 00 90 01 36 00 98 01 36 00 98 01 36 00 ?6.?6.?6.?6.

003601A0 A0 01 36 00 A0 01 36 00 A8 01 36 00 A8 01 36 00 ?6.?6.?6.?6.

003601B0 B0 01 36 00 B0 01 36 00 A8 06 36 00 A8 06 36 00 ?6.?6.?6.?6.

003601C0 C0 01 36 00 C0 01 36 00 C8 01 36 00 C8 01 36 00 ?6.?6.?6.?6.

003601D0 D0 01 36 00 D0 01 36 00 D8 01 36 00 D8 01 36 00 ?6.?6.?6.?6.

003601E0 E0 01 36 00 E0 01 36 00 E8 01 36 00 E8 01 36 00 ?6.?6.?6.?6.

003601F0 F0 01 36 00 F0 01 36 00 F8 01 36 00 F8 01 36 00 ?6.?6.?6.?6.

00360200 00 02 36 00 00 02 36 00 08 02 36 00 08 02 36 00 .6..6.6.6.

00360210 10 02 36 00 10 02 36 00 18 02 36 00 18 02 36 00 6.6.6.6.

00360220 20 02 36 00 20 02 36 00 28 02 36 00 28 02 36 00 6. 6.(6.(6.

00360230 30 02 36 00 30 02 36 00 38 02 36 00 38 02 36 00 06.06.86.86.

00360240 40 02 36 00 40 02 36 00 48 02 36 00 48 02 36 00 @6.@6.H6.H6.

00360250 50 02 36 00 50 02 36 00 58 02 36 00 58 02 36 00 P6.P6.X6.X6.

00360260 60 02 36 00 60 02 36 00 68 02 36 00 68 02 36 00 `6.`6.h6.h6.

00360270 70 02 36 00 70 02 36 00 78 02 36 00 78 02 36 00 p6.p6.x6.x6.

00360280 80 02 36 00 80 02 36 00 88 02 36 00 88 02 36 00 €6.€6.?6.?6.

00360290 90 02 36 00 90 02 36 00 98 02 36 00 98 02 36 00 ?6.?6.?6.?6.

003602A0 A0 02 36 00 A0 02 36 00 A8 02 36 00 A8 02 36 00 ?6.?6.?6.?6.

003602B0 B0 02 36 00 B0 02 36 00 B8 02 36 00 B8 02 36 00 ?6.?6.?6.?6.

003602C0 C0 02 36 00 C0 02 36 00 C8 02 36 00 C8 02 36 00 ?6.?6.?6.?6.

003602D0 D0 02 36 00 D0 02 36 00 D8 02 36 00 D8 02 36 00 ?6.?6.?6.?6.

003602E0 E0 02 36 00 E0 02 36 00 E8 02 36 00 E8 02 36 00 ?6.?6.?6.?6.

003602F0 F0 02 36 00 F0 02 36 00 F8 02 36 00 F8 02 36 00 ?6.?6.?6.?6.

00360300 00 03 36 00 00 03 36 00 08 03 36 00 08 03 36 00 .6..6.6.6.

00360310 10 03 36 00 10 03 36 00 18 03 36 00 18 03 36 00 6.6.6.6.

00360320 20 03 36 00 20 03 36 00 28 03 36 00 28 03 36 00 6. 6.(6.(6.

00360330 30 03 36 00 30 03 36 00 38 03 36 00 38 03 36 00 06.06.86.86.

00360340 40 03 36 00 40 03 36 00 48 03 36 00 48 03 36 00 @6.@6.H6.H6.

00360350 50 03 36 00 50 03 36 00 58 03 36 00 58 03 36 00 P6.P6.X6.X6.

00360360 60 03 36 00 60 03 36 00 68 03 36 00 68 03 36 00 `6.`6.h6.h6.

00360370 70 03 36 00 70 03 36 00 78 03 36 00 78 03 36 00 p6.p6.x6.x6.

00360380 80 03 36 00 80 03 36 00 88 03 36 00 88 03 36 00 €6.€6.?6.?6.

00360390 90 03 36 00 90 03 36 00 98 03 36 00 98 03 36 00 ?6.?6.?6.?6.

003603A0 A0 03 36 00 A0 03 36 00 A8 03 36 00 A8 03 36 00 ?6.?6.?6.?6.

003603B0 B0 03 36 00 B0 03 36 00 B8 03 36 00 B8 03 36 00 ?6.?6.?6.?6.

003603C0 C0 03 36 00 C0 03 36 00 C8 03 36 00 C8 03 36 00 ?6.?6.?6.?6.

003603D0 D0 03 36 00 D0 03 36 00 D8 03 36 00 D8 03 36 00 ?6.?6.?6.?6.

003603E0 E0 03 36 00 E0 03 36 00 E8 03 36 00 E8 03 36 00 ?6.?6.?6.?6.

003603F0 F0 03 36 00 F0 03 36 00 F8 03 36 00 F8 03 36 00 ?6.?6.?6.?6.

00360400 00 04 36 00 00 04 36 00 08 04 36 00 08 04 36 00 .6..6.6.6.

00360410 10 04 36 00 10 04 36 00 18 04 36 00 18 04 36 00 6.6.6.6.

00360420 20 04 36 00 20 04 36 00 28 04 36 00 28 04 36 00 6. 6.(6.(6.

00360430 30 04 36 00 30 04 36 00 38 04 36 00 38 04 36 00 06.06.86.86.

00360440 40 04 36 00 40 04 36 00 48 04 36 00 48 04 36 00 @6.@6.H6.H6.

00360450 50 04 36 00 50 04 36 00 58 04 36 00 58 04 36 00 P6.P6.X6.X6.

00360460 60 04 36 00 60 04 36 00 68 04 36 00 68 04 36 00 `6.`6.h6.h6.

00360470 70 04 36 00 70 04 36 00 78 04 36 00 78 04 36 00 p6.p6.x6.x6.

00360480 80 04 36 00 80 04 36 00 88 04 36 00 88 04 36 00 €6.€6.?6.?6.

00360490 90 04 36 00 90 04 36 00 98 04 36 00 98 04 36 00 ?6.?6.?6.?6.

003604A0 A0 04 36 00 A0 04 36 00 A8 04 36 00 A8 04 36 00 ?6.?6.?6.?6.

003604B0 B0 04 36 00 B0 04 36 00 B8 04 36 00 B8 04 36 00 ?6.?6.?6.?6.

003604C0 C0 04 36 00 C0 04 36 00 C8 04 36 00 C8 04 36 00 ?6.?6.?6.?6.

003604D0 D0 04 36 00 D0 04 36 00 D8 04 36 00 D8 04 36 00 ?6.?6.?6.?6.

003604E0 E0 04 36 00 E0 04 36 00 E8 04 36 00 E8 04 36 00 ?6.?6.?6.?6.

003604F0 F0 04 36 00 F0 04 36 00 F8 04 36 00 F8 04 36 00 ?6.?6.?6.?6.

00360500 00 05 36 00 00 05 36 00 08 05 36 00 08 05 36 00 .6..6.6.6.

00360510 10 05 36 00 10 05 36 00 18 05 36 00 18 05 36 00 6.6.6.6.

00360520 20 05 36 00 20 05 36 00 28 05 36 00 28 05 36 00 6. 6.(6.(6.

00360530 30 05 36 00 30 05 36 00 38 05 36 00 38 05 36 00 06.06.86.86.

00360540 40 05 36 00 40 05 36 00 48 05 36 00 48 05 36 00 @6.@6.H6.H6.

00360550 50 05 36 00 50 05 36 00 58 05 36 00 58 05 36 00 P6.P6.X6.X6.

00360560 60 05 36 00 60 05 36 00 68 05 36 00 68 05 36 00 `6.`6.h6.h6.

00360570 70 05 36 00 70 05 36 00 08 06 36 00 00 00 00 00 p6.p6.6.....

00360580 00 00 00 00 00 00 00 00 00 00 00 00 00 10 36 00 .............6.

00360590 00 F0 00 00 00 00 00 00 A8 05 36 00 00 00 00 00 .?.....?6.....

003605A0 00 00 00 00 00 00 00 00 B8 05 36 00 00 00 00 00 ........?6.....

003605B0 00 00 00 00 00 00 00 00 C8 05 36 00 00 00 00 00 ........?6.....

003605C0 00 00 00 00 00 00 00 00 D8 05 36 00 00 00 00 00 ........?6.....

003605D0 00 00 00 00 00 00 00 00 E8 05 36 00 00 00 00 00 ........?6.....

003605E0 00 00 00 00 00 00 00 00 F8 05 36 00 00 00 00 00 ........?6.....

003605F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360600 00 00 00 00 00 00 00 00 C0 06 FD 77 FF FF FF FF ........?齱

00360610 00 00 00 00 00 00 00 00 2C 00 00 00 00 00 00 00 ........,.......

00360620 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360630 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360640 08 00 C8 00 00 01 00 00 EE FF EE FF 00 00 00 00 .?...??....

00360650 00 00 36 00 00 F0 00 00 00 00 36 00 10 00 00 00 ..6..?...6....

00360660 80 06 36 00 00 00 37 00 0F 00 00 00 01 00 00 00 €6...7.......

00360670 88 05 36 00 00 00 00 00 00 07 36 00 00 00 00 00 ?6......6.....

00360680 02 00 08 00 00 00 0D 00 88 01 36 00 88 01 36 00 ......?6.?6.

00360690 02 00 02 00 00 01 0B 00 00 00 00 00 00 01 36 00 ...  
......6.

003606A0 08 00 02 00 00 00 0A 00 B8 01 36 00 B8 01 36 00 ......?6.?6.

003606B0 02 00 02 00 00 01 08 00 00 00 00 00 00 00 00 00 ............

003606C0 04 00 04 00 00 00 0D 00 98 01 36 00 98 01 36 00 ......?6.?6.

003606D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

003606E0 04 00 08 00 00 01 08 00 00 00 00 00 00 00 00 00 ............

003606F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

00360700 20 01 04 00 00 10 00 00 78 01 36 00 78 01 36 00 ....x6.x6.

00360710 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................

释放后可分配空间为0x0000012A个堆单位

0x00360020 00 02 00 00 00 20 00 00 2A 01 00 00 FF EF FD 7F

Freelist[0]指向的地方没有变，依旧是0x00360708

0x00360170 00 00 00 00 00 00 00 00 08 07 36 00 08 07 36 00

注意Freelist[2]和Freelist[4]和Freelist[8]前后的变化

前

0x00360180 80 01 36 00 80 01 36 00(1) 88 06 36 00 A8 06 36 00(2)

0x00360190 90 01 36 00 90 01 36 00(3) C8 06 36 00 C8 06 36 00(4)

0x003601B0 B0 01 36 00 B0 01 36 00(7) B8 01 36 00 B8 01 36 00(8)

后

0x00360180 80 01 36 00 80 01 36 00(1) 88 06 36 00 88 06 36 00(2)

0x00360190 90 01 36 00 90 01 36 00(3) 98 01 36 00 98 01 36 00(4)

0x003601B0 B0 01 36 00 B0 01 36 00(7) A8 06 36 00 A8 06 36 00(8)

可以看到Freelist[4]原来串着的h5没了，0x00360198处的指针已经指向了自身

而Freelist[8]发生了变化，值为0x003606A8，那就过去看看

0x003606A0 08 00 02 00 00 00 0A 00 B8 01 36 00 B8 01 36 00

可以看到这里出现了一个大小为8个堆单位的堆块

而原先这里是h3的空间

h3 0x003606A0 02 00 02 00 00 00 0A 00 88 01 36 00 88 06 36 00

h4 0x003606B0 02 00 02 00 00 01 08 00 00 00 00 00 00 00 00 00

h5 0x003606C0 04 00 02 00 00 00 0D 00 98 01 36 00 98 01 36 00

因为当h4被释放的时候，h3，h4，h5发生了合并，大小为8个堆单位，所以串在了Freelist[8]上

既然合并了，那么h3，h4和h5自然的要从Freelist[2]和Freelist[4]上面卸掉下来

现在的堆区情况：h2和h6未被释放，Freelist[2]和Freelist[8]各串着一个堆块