hgame 2022 逆向 reverse 部分题目 Writeup

原创

拾光、 已于 2022-02-24 16:33:08 修改 347 收藏 1
分类专栏： ctf 文章标签： ctf hgame hgame2022 逆向 writeup
于 2022-02-18 17:21:49 首次发布

文章目录

由于csdn字数限制，有些代码贴不出来。。。

Level - Week1

easyasm

ida分析:

分析汇编得到逻辑如下:

```
for  si  in range(28):
  a=si < 4
  b = si >4
  c = a+b
  c ^ 0x17
```

exp:

```
r=[0x91,0x61,0x01,0xC1,0x41,0xA0,0x60,0x41,0xD1,0x21,0x14,0xC1,0x41,0xE2,0x50,0xE1,0xE2,0x54,0x20,0xC1,0xE2,0x60
,0x14,0x30,0xD1,0x51,0xC0,0x17]
for i in range(28):
 a=r[i] ^ 0x17
 r[i] = (((a&0xf)<<4)|(a>>4))
print(r)
print( bytes(r))
#b'hgame{welc0me_to_4sm_w0rld}\x00'
```

creakme

魔改的tea算法，对照着tea算法修改一下即可。

exp：

```
from ctypes import *

def encrypt(v, k):
    v0 = c_uint32(v[0])
    v1 = c_uint32(v[1])
    summ = c_uint32(0)
    delta = 0x12345678
    k0, k1, k2, k3 = c_uint32(k[2]), c_uint32(k[3]), c_uint32(k[0]), c_uint32(k[1])
    w = [0,0]
    for i in range(32):
        summ.value += delta
        v0.value += summ.value^ ((v1.value << 4) + k0.value) ^ (v1.value + summ.value) ^ ((v1.value >> 5) + k1.v
alue)
        v1.value += summ.value^ ((v0.value << 4) + k2.value) ^ (v0.value + summ.value) ^ ((v0.value >> 5) + k3.v
alue)
    w[0], w[1] = v0, v1
    print("summ.value",summ.value)
    return w
def decrypt(v, k):
    v0 = c_uint32(v[0])
    v1 = c_uint32(v[1])
    summ = c_uint32(1183502080)
    delta = 0x12345678
    k0, k1, k2, k3 = c_uint32(k[2]), c_uint32(k[3]), c_uint32(k[0]), c_uint32(k[1])
    w = [0,0]
    for i in range(32):
        v1.value -= summ.value^ ((v0.value << 4) + k2.value) ^ (v0.value + summ.value) ^ ((v0.value >> 5) + k3.v
alue)
        v0.value -= summ.value^ ((v1.value << 4) + k0.value) ^ (v1.value + summ.value) ^ ((v1.value >> 5) + k1.v
alue)
        summ.value -= delta
```

```
    w[0] = v0.value
    w[1] = v1.value
    return w

def u32(bytes_n):
    #b'11223344' -> 0x11223344
    n = 0
    n += bytes_n[0]
    n += bytes_n[1]<<8
    n += bytes_n[2]<<16
    n += bytes_n[3]<<24
    return n

def p32(int_n):
    #0x11223344 -> b'11223344'
    n = int_n.to_bytes(4,'little')
    return n

def pack_teadata(data):# 将bytes数据转换为 整型数组
    pack=[]
    for i in range(len(data)//4):
        pack.append(u32(data[i*4:i*4+4]))
    return pack

def upack_teadata(data):#将整型数组转换为bytes
    bytes_data = b''
    for i in range(len(data)):
        bytes_data+=(p32(data[i]&0xffffffff))
    return bytes_data

key = [ 1145258561, 1212630597, 1280002633, 1347374669 ]
cipher_int=[1222194312, 51123276, 1391163586, 3986482669, 2921328102, 3126465133, 3482485930, 1709241059]
############ 解密
plain_int=[]
for i in range(len(cipher_int)//2):
    tmp = decrypt(cipher_int[i*2:i*2 +2],key)
    plain_int.append(tmp[0])
    plain_int.append(tmp[1])

plain_dec = upack_teadata(plain_int)
print(plain_dec)
#b'hgame{H4ppy_v4c4ti0n!}\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00'
```

Flag Checker

jadx分析：

```
public void onClick(View view) {
                byte[] bArr = new byte[0];
                try {
                    bArr = MainActivity.encrypt(((EditText) MainActivity.this.findViewById(R.id.editTextTextPers
onName)).getText().toString(), "carol");
                } catch (Exception e) {
                    e.printStackTrace();
                }
                if (Base64.encodeToString(bArr, 0).replace("\n", "").equals("mg6CITV6GEaFDTYnObFmENOAVjKcQmGncF9
0WhqvCFyhhsyqq1s=")) {
                    Toast.makeText(MainActivity.this, "Congratulations!!!", 1).show();
                } else {
                    Toast.makeText(MainActivity.this, "Fail,try again.", 1).show();
                }
            }
```

```
 public static byte[] encrypt(String str, String str2) throws Exception {
        SecretKeySpec secretKeySpec = new SecretKeySpec(str2.getBytes(), 0, str2.length(), "RC4");
        Cipher instance = Cipher.getInstance("RC4");
        instance.init(1, secretKeySpec);
        return instance.doFinal(str.getBytes());
 }
```

得知为rc4算法。

密钥为：

密文：mg6CITV6GEaFDTYnObFmENOAVjKcQmGncF90WhqvCFyhhsyqq1s=

使用工具解密：hgame{weLC0ME_To-tHE_WORLD_oF-AnDr0|D}

猫头鹰是不是猫

ida分析得知算法过程为

```
cat=[16, 16, 16, 16, 15, 15, 。。。。。]
owl=[15, 14, 14, 13, 13, 14, 。。。。。]
a=[104, 。。。。。。]
r=[]
for k in range(64):
 v3=0
 for m in range(64):
  v3 += a[m]*cat[64*m + k]
 r.append(v3)

rr=[]
for k in range(64):
 v3=0
 for m in range(64):
  v3 += r[m]*owl[64*m + k]
 rr.append(v3)
print(rr)
```

分两步 每一步都需要解64元方程：

```
enc[0] = r[0]*owl[0] + r[1]*owl[64] + r[2]*owl[128] + r[3]*owl[192] +...+ + r[63]*owl[4033]
enc[1] = r[0]*owl[1] + r[1]*owl[65] + r[2]*owl[129] + r[3]*owl[193] +...+ + r[63]*owl[4034]
。。。。。。
```

可以使用z3来解，分两步：

```
cat=[16, 16, 16, 16, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15, 16, 18, 19, 17, 17, 17, 17, 16, 15, 18, 20,
 20, 18, 16, 19, 19, 18, 20, 20, 19, 16, 16, 16, 16, 16, 16, 16, 16, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17,
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6, 8, 7, 8, 11, 12, 16, 16, 13, 11, 8, 9, 12, 10, 7, 12, 4, 9, 16, 10, 8, 18, 15, 14, 18, 18, 15, 15, 15, 15, 1
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0, 10, 10, 10, 12, 13, 13, 7, 1, 1, 1, 1, 1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 0, 0, 0, 0
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, 17, 13, 8, 2, 1, 1, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0, 1, 0, 1, 1, 1,
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, 17, 14, 7, 2, 1, 1, 1, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
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1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
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 25, 25, 25, 24, 19, 20, 13, 12, 12, 11, 9, 5, 2, 1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
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 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 13, 25, 25, 24, 25, 25, 25, 25, 25, 25, 25, 25, 25, 25, 25]
enc=[39654868, 38564788, 37998449, 36705100, 34811134, 29241290, 21154342, 14031189, 9709480, 10192500, 9488434,
 8917703, 8436312, 7963105, 7514984, 7654219, 7487295, 8176216, 9031004, 8970914, 9341190, 9144480, 9366669, 938
5331, 9139311, 9514114, 9272562, 8593561, 8340901, 6839039, 5285074, 5402594, 5804603, 5414593, 5336346, 5993555
, 7350502, 9029370, 10868398, 13859348, 12111786, 11582283, 11430308, 10556747, 10341351, 10607648, 11143139, 11
689137, 11730328, 11611945, 14952608, 18555268, 23156514, 27591411, 29403805, 30676639, 32476022, 36955579, 4126
4880, 44681781, 44601420, 44143855, 43151161, 42898115]

#z3分步求解
from z3 import *
s=Solver()
r = [ Int(f'a[{i}]') for i in range(64)]
rr=[]
for k in range(64):
 v3=0
 for m in range(64):
  v3 += r[m]*owl[64*m + k]
 s.add(v3==enc[k])

print(s.check())
m=s.model()
print(m)

#得到一组解:
enc[33] = 38575
enc[36] = 46137
enc[9] = 42574
enc[35] = 40920
enc[19] = 32015
enc[12] = 38813
enc[27] = 32739
enc[29] = 34208
enc[13] = 33034
enc[34] = 37661
enc[16] = 29057
```

```
enc[24] = 33438
enc[28] = 34235
enc[17] = 26765
enc[20] = 34769
enc[11] = 40936
enc[2] = 50090
enc[10] = 43020
enc[1] = 49684
enc[7] = 46797
enc[41] = 53609
enc[30] = 32414
enc[0] = 50409
enc[6] = 47074
enc[15] = 32345
enc[23] = 32113
enc[21] = 34933
enc[31] = 32762
enc[22] = 32060
enc[8] = 45297
enc[43] = 52995
enc[4] = 47646
enc[3] = 49395
enc[37] = 48875
enc[14] = 32512
enc[58] = 58319
enc[5] = 44689
enc[25] = 34385
enc[18] = 27745
enc[32] = 34717
enc[26] = 34094
enc[40] = 51468
enc[63] = 60254
enc[51] = 55296
enc[50] = 54881
enc[44] = 52056
enc[52] = 54632
enc[45] = 51479
enc[38] = 45934
enc[39] = 47834
enc[61] = 58052
enc[62] = 58623
enc[56] = 55535
enc[59] = 58074
enc[47] = 52533
enc[55] = 56164
enc[42] = 50819
enc[60] = 57949
enc[57] = 59558
enc[54] = 54943
enc[53] = 53955
enc[48] = 55281
enc[49] = 55774
enc[46] = 52784

#继续z3求解
s=Solver()
r = [ Int(f'a[{i}]') for i in range(64)]
rr=[]
for k in range(64):
 v3=0
```

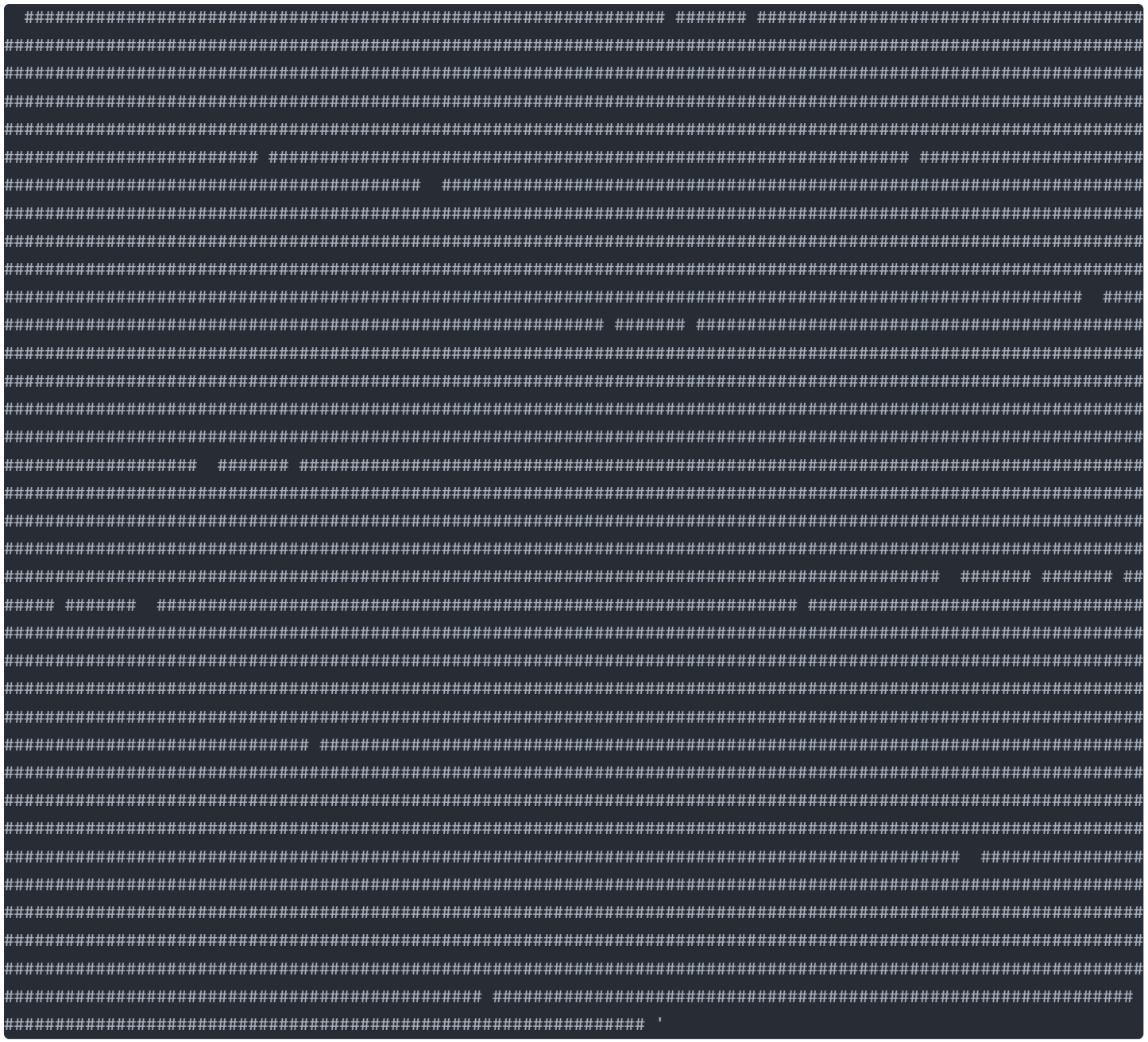
```
 for m in range(64):
  v3 += r[m]*cat[64*m + k]
 s.add(v3==enc[k])

print(s.check())
m=s.model()
print(m)

#得到flag的数组：

a=[ 0 for i in range(64)]
a[33] = 49
a[36] = 48
a[44] = 48
a[62] = 49
a[51] = 48
a[27] = 48
a[40] = 49
a[29] = 48
a[54] = 48
a[50] = 48
a[34] = 49
a[16] = 48
a[39] = 48
a[28] = 48
a[20] = 48
a[49] = 48
a[61] = 49
a[26] = 48
a[11] = 49
a[2] = 97
a[57] = 48
a[41] = 48
a[60] = 49
a[0] = 104
a[6] = 49
a[23] = 48
a[31] = 48
a[59] = 49
a[48] = 49
a[22] = 48
a[55] = 49
a[3] = 109
a[37] = 48
a[56] = 49
a[5] = 123
a[63] = 125
a[58] = 48
a[53] = 48
a[32] = 48
a[9] = 48
a[35] = 48
a[38] = 49
a[45] = 48
a[19] = 49
a[12] = 49
a[13] = 48
a[24] = 49
a[42] = 49
```

```
a[10] = 49
a[1] = 103
a[7] = 48
a[46] = 48
a[30] = 48
a[15] = 48
a[21] = 48
a[43] = 49
a[8] = 48
a[4] = 101
a[14] = 48
a[25] = 48
a[18] = 49
a[17] = 48
a[47] = 48
a[52] = 49
print(bytes(a))
#hgame{10001110000011000010000000011000101011000010001001100111}
```

Level - Week2

xD MAZE

一维迷宫,根据空格的步长，还原即可。



exp:

```
m=[32, ] #csdn字数限制，这里就不写全了
m=bytes(m)
print(bytes(m))
last=0
flag=""
m=m[1:]
for i in range(0,28):
 a=m.find(b' ')
 print(a)
 if a==0:
  flag +='3'
 if a==7:
  flag +='2'
 if a==63:
  flag +='1'
 if a==511:
  flag +='0'
 m=m[a+1:]

print(flag)

#hgame{31201130312032032222231003011}
```

upx magic 0

没有upx壳。。。算法爆破：

```
r=[36200, 40265, 10770, 43802, 52188, 47403, 11826, 40793, 56781, 40265, 43274, 3696, 62927, 2640, 23285, 65439,
 40793, 48395, 22757, 14371, 48923, 30887, 43802, 18628, 43274, 11298, 40793, 23749, 24277, 30887, 9842, 22165]

def calcc(data):
 data = ord(data)
 data = data<<8
 for j in range(8):
   if  (data & 0x8000) != 0 :
     data = (2 * data) ^ 0x1021;
   else:
     data *= 2;
 data = data &0xffff
 return data
import string
flag=""
for i in r:
 for t in  string.printable:
  if calcc(t) == i:
   flag+=t
   break
print(flag)
#noW_YOu~koNw-UPx~mAG|C_@Nd~crC16
```

fake shell

ida分析，需要执行 sudo cat flag.txt

但是在sudo中有校验密码

校验逻辑为：

1、rc4加密，密钥为w0wy0ugot1t（有反调试，需要运行后attach上去）。

2、rc4密钥与内存数据对比。

解密过程为：

1、计算rc4密文：

```
v7=[1,1,1,1]
v7[0] = 0xE0B25F3D8FFA94B6
v7[1] = 0xE79D6C9866D20FEA
v7[2] = 0x6D6FBEC57140081B
v7[3] = 0xF6F3BDA88D097B7C

r=b''
for i in v7:
    a=hex(i)[2:]
    a=bytes.fromhex(a)[::-1]
    r+=a
print(r.hex())
#b694fa8f3d5fb2e0ea0fd266986c9de71b084071c5be6f6d7c7b098da8bdf3f6
```

2、rc4解密：

密钥：w0wy0ugot1t

密文：b694fa8f3d5fb2e0ea0fd266986c9de71b084071c5be6f6d7c7b098da8bdf3f6

得到：hgame{s0meth1ng_run_bef0r_m4in?}

creakme2

更加复杂的魔改TEA。

```
#encoding=utf-8
import sys
from ctypes import *

def u32(bytes_n):
    n = 0
    n += bytes_n[0]
    n += bytes_n[1]<<8
    n += bytes_n[2]<<16
    n += bytes_n[3]<<24
    return n

def p32(int_n):
    #0x11223344 -> b'11223344'
    n = int_n.to_bytes(4,'little')
    return n

def pack_teadata(data):# 将bytes数据转换为 整型数组
    pack=[]
    for i in range(len(data)//4):
        pack.append(u32(data[i*4:i*4+4]))
    return pack

def upack_teadata(data):#将整型数组转换为bytes
    bytes_data = b''
    for i in range(len(data)):
        bytes_data+=(p32(data[i]&0xffffffff))
    return bytes_data
```

```
def tea_enc(v, k):
    y = c_uint32(v[0])
    z = c_uint32(v[1])
    sum = c_uint32(0)
    delta = 0x9E3779B1
    n = 32
    w = [0,0]

    while(n>0):
        y.value += (k[sum.value & 3] + sum.value) ^ (z.value + ((z.value >> 5) ^ (z.value << 4)))
        sum.value += delta
        if sum.value & 0x80000000 == 0:
            sum.value ^= 0x1234567
        z.value += (k[(sum.value >> 11) & 3] + sum.value) ^ (y.value + ((y.value >> 5) ^ (16 * y.value)))
        n -= 1
    w[0] = y.value
    w[1] = z.value
    print(hex(sum.value))
    return w

def tea_dec(v, k):
    y = c_uint32(v[0])
    z = c_uint32(v[1])
    sum = c_uint32(0xc78e4d05)
    delta = 0x9E3779B1
    n =32
    w = [0,0]

    while(n>0):
        z.value -= (k[(sum.value >> 11) & 3] + sum.value) ^ (y.value + ((y.value >> 5) ^ (16 * y.value)))
        if sum.value & 0x80000000 == 0:
            sum.value ^= 0x1234567
        sum.value -= delta
        y.value -= (k[sum.value & 3] + sum.value) ^ (z.value + ((z.value >> 5) ^ (z.value << 4)))
        n -= 1
    w[0] = y.value
    w[1] = z.value
    return w
Buf2=[1,1,1,1,1,1,1,1]
Buf2[0] = 0x457E62CF
Buf2[1] = 0x9537896C
Buf2[2] = 0x1F7E7F72
Buf2[3] = 0xF7A073D8
Buf2[4] = 0x8E996868
Buf2[5] = 0x40AFAF99
Buf2[6] = 0xF990E34
Buf2[7] = 0x196F4086

key  = [1,2,3,4,5,6,7,8,9,0]
flag=b''
for i in range(0,8,2):
    p = tea_dec(Buf2[i:],key)
    a=upack_teadata(p)
    flag+=a
print(flag)
#b'hgame{SEH_s0und5_50_1ntere5ting}'
```

upx magic 1

upx手动脱壳，脱壳后算法同upx magic 0

```
v14 = [0 for i in range(37)]
v14[0] = 36200;
v14[1] = 40265;
v14[2] = 10770;
v14[3] = 43802;
v14[4] = 52188;
v14[5] = 47403;
v14[6] = 11826;
v14[7] = 40793;
v14[8] = 56781;
v14[9] = 40265;
v14[10] = 43274;
v14[11] = 3696;
v14[12] = 62927;
v14[13] = 24277;
v14[14] = 15363;
v14[15] = 31879;
v14[16] = 9842;
v14[17] = 43802;
v14[18] = 2640;
v14[19] = 23285;
v14[20] = 65439;
v14[21] = 40793;
v14[22] = 48395;
v14[23] = 22757;
v14[24] = 14371;
v14[25] = 48923;
v14[26] = 30887;
v14[27] = 43802;
v14[28] = 18628;
v14[29] = 43274;
v14[30] = 11298;
v14[31] = 40793;
v14[32] = 23749;
v14[33] = 24277;
v14[34] = 30887;
v14[35] = 9842;
v14[36] = 22165;

def checkval(data):
  v12 = ord(data) << 8
  for j in range(8):
    if (v12 & 0x8000) != 0:
      v12 = (2 * v12)^ 0x1021
    else:
      v12 = 2 * v12
  print(data,hex(v12&0xffff))
  return v12&0xffff

import string

def checkval1(dest):
  for i in string.printable:
    if checkval(i) == dest:
      return i
  return 0
```

```
flag=''
for i in range(37):
  flag+=checkval1(v14[i])
print(flag)

#noW_YOu~koNw-rea1_UPx~mAG|C_@Nd~crC16
```

Level - Week3

Answer's Windows

换表base64：

```
import base64
a = 'ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/'    #标准表
b = [33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59,
 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87,
 88, 89, 90, 91, 92, 93, 94, 95, 96]
b = bytes(b).decode()

c = ";'>B<76\\=82@-8.@=T\"@-7ZU:8*F=X2J<G>@=W^@-8.@9D2T:49U@1aa"
trantab = c.maketrans(b, a)
print(base64.b64decode(c.translate(trantab)))

#b'hgame{qt_1s_s0_1nteresting_so_1s_b4se64}\x06\x9a'
```

creakme3

IDA只能看到汇编，Ghidra可以看到伪代码。

exp

```
a=[48, 48, 48, 48, 48, 49, 50, 50, 50, 50, 50, 51, 51, 51, 51, 51, 51, 51, 51, 51, 53, 56, 56, 57, 57, 57, 57, 6
6, 95, 95, 95, 95, 97, 100, 100, 100, 100, 100, 101, 101, 102, 102, 102, 102, 102, 102, 102, 103, 103, 104, 104,
 104, 104, 104, 105, 105, 105, 106, 106, 107, 107, 108, 109, 110, 110, 110, 111, 111, 111, 112, 114, 114, 114, 1
15, 115, 115, 115, 115, 115, 115, 116, 116, 116, 117, 117, 119, 119, 123, 125]
b=[20093, 26557, 31304, 33442, 37694, 39960, 23295, 27863, 42698, 48505, 52925, 12874, 12946, 14597, 17041, 2326
2, 28319, 42282, 48693, 52067, 32571, 14612, 45741, 14554, 20048, 27138, 45327, 30949, 32502, 35235, 36541, 3837
1, 29658, 21388, 25403, 40604, 46987, 51302, 12974, 30329, 10983, 19818, 22280, 26128, 41560, 47116, 51333, 2893
8, 31988, 16246, 28715, 41966, 44368, 47815, 16420, 35362, 49237, 11090, 50823, 24320, 50199, 24962, 30171, 1545
7, 18838, 24001, 11638, 32023, 43291, 39661, 17872, 33895, 43869, 20611, 25122, 36243, 37434, 38686, 46266, 5107
7, 13656, 34493, 38712, 14096, 38777, 12095, 17629, 30945, 40770]
c=[20093, 26557, 31304, 33442, 37694, 39960, 23295, 27863, 42698, 48505, 52925, 12874, 12946, 14597, 17041, 2326
2, 28319, 42282, 48693, 52067, 32571, 14612, 45741, 14554, 20048, 27138, 45327, 30949, 32502, 35235, 36541, 3837
1, 29658, 21388, 25403, 40604, 46987, 51302, 12974, 30329, 10983, 19818, 22280, 26128, 41560, 47116, 51333, 2893
8, 31988, 16246, 28715, 41966, 44368, 47815, 16420, 35362, 49237, 11090, 50823, 24320, 50199, 24962, 30171, 1545
7, 18838, 24001, 11638, 32023, 43291, 39661, 17872, 33895, 43869, 20611, 25122, 36243, 37434, 38686, 46266, 5107
7, 13656, 34493, 38712, 14096, 38777, 12095, 17629, 30945, 40770]

c.sort()
print(c)
f=[]
for i in c:
 idx=b.index(i)
 f.append(a[idx])
print(bytes(f))
#b'fjow33etu938nhi3wrnf90sdf32nklsdf0923hgame{B0go_50rt_is_s0_stup1d}fh32orh98sdfh23ikjsdf32'
#hgame{B0go_50rt_is_s0_stup1d}
```

hardened

加了壳的apk，先用FRIDA-DEXDump脱壳。

java源码：

```
    public void sendPwd(View view) {
        Intent intent = new Intent(this, rightpage.class);
        if (bbbbb(aesEncryption(((EditText) findViewById(2131165238)).getText().toString().getBytes())).equals("
mXYxnHYp61u/5qksdDel6TgiKqcvUbBkX3xErlR4lO0aEAdU0acJY8PRSVXJxxsRR8Dq9MTJhkWLSbBvCG5gtm=="
            startActivity(intent);
        } else {
            Toast.makeText(this, "fail >__<", 1).show();
        }
    }
```

bbbbb和aesEncryption函数实现在libenc.so中，bbbbb为换表base64，aesEncryption为AES CBC加密。

分析 aesEncryption 得到key和iv计算发现不正确，调试时发现key iv 还有 base64表数据不同。

当时怀疑时不同的区域异或了一个数据，但是没有深入分析，爆破了一下key 和iv的数据。

```
from Crypto.Cipher import AES
import base64

key=[122, 101, 99, 100, 111, 113, 111, 126, 127, 98, 125, 113, 124, 111, 123, 117, 105, 111, 118, 127, 98, 111,
105, 127, 101, 111, 100, 127, 111, 116, 117, 115]
iv=[6, 16, 10, 32, 25, 22, 17, 27, 32, 18, 26, 94, 94, 94, 94, 94]
msg_enc=[114,92,-80,1,-41,-2,-4,2,115,85,18,-114,43,-19,39,-29,19,-54,-71,-66,101,46,-87,-90,-5,1,-102,-20,92,14
,-9,36]
for i in range(32):
 msg_enc[i] = msg_enc[i] & 0xff
msg_enc = bytes(msg_enc)

msg_p=b'1234567812345678'
for i in range(0xff):
 tkey=[]
 for x in key:
  tkey.append(x ^ i)
 tkey=bytes(tkey)
 for j in range(0xff):
  tiv=[]
  for y in iv:
   tiv.append(y ^ j)
  tiv=bytes(tiv)

  aes = AES.new(tkey,AES.MODE_CBC,tiv)
  msg = aes.encrypt(msg_p)
  if msg[:16] == msg_enc[:16]:
   print(i,j)
   print(tkey,tiv)

key=b'JUST_A_NORMAL_KEY_FOR_YOU_TO_DEC'
iv=b'you_find_me!!!!!'

a = 'ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/'     #标准表
b = '0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz+/'    #新表
c = 'mXYxnHYp61u/5qksdDel6TgiKqcvUbBkX3xErlR4lO0aEAdU0acJY8PRSVXJxxsRR8Dq9MTJhkWLSbBvCG5gtm=='
trantab = c.maketrans(b, a)

msg_enc=base64.b64decode(c.translate(trantab))
aes = AES.new(key,AES.MODE_CBC,iv)
msg = aes.decrypt(msg_enc)
print(msg.decode())

#48 127
#b'JUST_A_NORMAL_KEY_FOR_YOU_TO_DEC' b'you_find_me!!!!!'
#hgame{cONGraTUl4T|0N5!N0w_yoU_C4n_eN?Oy~thE~MUsIc}
```

Level - Week4

(WOW)

程序本身存在解密函数，在数据对比后，又对输入数据的密文进行了解密。只要把flag密文复制 输入密文那即可。

1、在结果比较前下断点，在return时下断点，随便输入。
2、读取32个字节的密文标准数据，patch Buf2的内容。继续执行。
3、在return时，v10中存放flag

server

这个题拿到了一血。

跟踪调试得到加密过程为

```
import gmpy2
from Crypto.Util.number import bytes_to_long,long_to_bytes

p=92582184765240663364795767694262273105045150785272129481762171937885924776597
q=10731052865803998570889663655911240033426200536764917674642953127430085949899 3

n=p*q
e=950501
m=b'hgame{12123333333333333333333333333333333333333}'
m=bytes_to_long(m)
c=pow(m,e,n)
print(hex(c), c)
cc=str(c).encode().ljust(153,b'\0')
cc =b'480856246755930918853646960284513996465042625507755175073557975588365361488153082402793738425677614000307090113926819061232387511326704622862441103917794'
tmp=0x66
dd=[]
for i in range(0,153):
 dd.append(cc[i] ^ tmp)
 tmp=cc[i]
 #print(i,hex(tmp))
#print(hex(tmp), dd)
ee=[]
for i in range(0,153):
 ee.append(dd[i] ^ tmp)
 tmp=dd[i]
```

得到算法的核心为：

```
假设明文：0123456
第一步：0^0x66  1^0 2^1 3^2 4^3 5^4 6^5
第二步：0^0x66^6 1^0^0^0x66  2^1^1^0 3^2^2^1  4^3^3^2  5^4^4^3  6^5^5^4
一二步可以简化为：  0^0x66^6 1^0x66  2^0 3^1  4^2  5^3  6^4
```

1、3、5。。。奇数位置可以直接解：

```
enc[1]=c[1]^0x66
enc[3]=c[3]^c[1]
enc[5]=c[5]^c[3]
...
得到：
c[1]=enc[1]^0x66
c[3]=enc[3]^c[1]
c[5]=enc[5]^c[3]
...
```

但是偶数位置因为 enc[0]=c[0]^{0x66}c[6] 里面 c[0]和c[6]均未知，但是计算出enc[0]后续enc[2、4、6]都可以计算。尝试使用爆破c[6]的方式爆破出c即可。c为纯数字。

```
import gmpy2
from Crypto.Util.number import bytes_to_long,long_to_bytes

p=92582184765240663364795767694262273105045150785272129481762171937885924776597
q=10731052865803998570889663655911240033426200536764917674642953127430085949899 3
n=p*q
e=950501
ccc=[99, 85, 4, 3, 5, 5, 5, 3, 7, 7, 2, 8, 8, 11, 1, 2, 10, 4, 2, 13, 8, 9, 12, 9, 4, 13, 8, 0, 14, 0, 15, 13, 1
4, 10, 2, 2, 1, 7, 3, 5, 6, 4, 6, 7, 6, 2, 2, 5, 3, 3, 9, 6, 0, 11, 13, 11, 0, 2, 3, 8, 3, 11, 7, 1, 11, 5, 14,
5, 0, 10, 14, 15, 13, 7, 13, 7, 14, 1, 15, 1, 11, 5, 6, 2, 12, 6, 10, 4, 1, 7, 4, 2, 6, 3, 6, 12, 5, 12, 3, 12,
6, 0, 4, 15, 2, 14, 7, 0, 14, 14, 12, 4, 3, 4, 2, 0, 0, 2, 6, 2, 3, 6, 4, 4, 4, 7, 1, 2, 3, 9, 2, 12, 8, 1, 12,
3, 12, 2, 0, 3, 14, 3, 14, 12, 9, 1, 7, 15, 5, 7, 2, 2, 4, 102, 94]

tmp=0x66
for i in range(1,153,2):
 ccc[i] ^= tmp
 tmp = ccc[i]
 #print(i, chr(tmp))

print(hex(tmp))
for j in range(0x30,0x3a):
 tmp=j
 tmp ^= 0x66
 cct=[i for i in ccc]
 for i in range(0,153,2):
  cct[i] ^= tmp
  tmp = cct[i]
 a=bytes(cct)
 print(a)

c=13500556210982903419905914947489634156630760022714828952506853229772789740977687325096322567046834086827097997
536747452711551200391594579596759908772002 4
#c=34015463119928024098049048464997351467317701237049299424078433287626887508766972240862235771478241878371969874377575537014502102905844785866589186730125
d=gmpy2.invert(e,(p-1)*(q-1))
m=pow(c,d,n)
print(long_to_bytes(m))

#b'hgame{g0_and_g0_http_5erv3r_nb}'
```

ezvm

vm虚拟机

分析每个指令的功能，一步步跟踪下逻辑：

1、初始化几个寄存器。

2、输入flag以回车结束

3、对flag长度判断是否是0x20。

4、循环处理flag每个字符：

```
flag[i]  *=2
flag[i] ^= salt[i]
```

5、同结果比较。

复现算法：

```
flag=b'hgame{12345678901234567890abcde}'
flag=list(flag)
salt=[94, 70, 97, 67, 14, 83, 73, 31, 81, 94, 54, 55, 41, 65, 99, 59, 100, 59, 21, 24, 91, 62, 34, 80, 70, 94, 5
3, 78, 67, 35, 96, 59]
for i in range(0x20):
 flag[i]  *=2
 flag[i] ^= salt[i]
print(flag)

#enc=[142, 136, 163, 153, 196, 165, 195, 221, 25, 236, 108, 155, 243, 27, 139, 91, 62, 155, 241, 134, 243, 244,
164, 248, 248, 152, 171, 134, 137, 97, 34, 193]
```

exp：

```
salt=[94, 70, 97, 67, 14, 83, 73, 31, 81, 94, 54, 55, 41, 65, 99, 59, 100, 59, 21, 24, 91, 62, 34, 80, 70, 94, 5
3, 78, 67, 35, 96, 59]
enc=[142, 136, 163, 153, 196, 165, 195, 221, 25, 236, 108, 155, 243, 27, 139, 91, 62, 155, 241, 134, 243, 244, 1
64, 248, 248, 152, 171, 134, 137, 97, 34, 193]
for i in range(32):
 enc[i] ^= salt[i]
 enc[i] = enc[i]//2
print(bytes(enc))

#b'hgame{Ea$Y-Vm-t0-PrOTeCT_cOde!!}'
```