BUGKU-逆向(reverse)-writeup

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原文链接：http://www.cnblogs.com/zhengjim/p/10002657.html
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目录

前言：在bugku上把能写的逆向都写了，由于大佬们的writeup太深奥或者说太简洁了让我(小白)看得云里雾里。所以我写了这个详细点的writeup（理解错的地方望指出），尽量让大家都看得懂。最近比较忙先写到了这里，未完待续

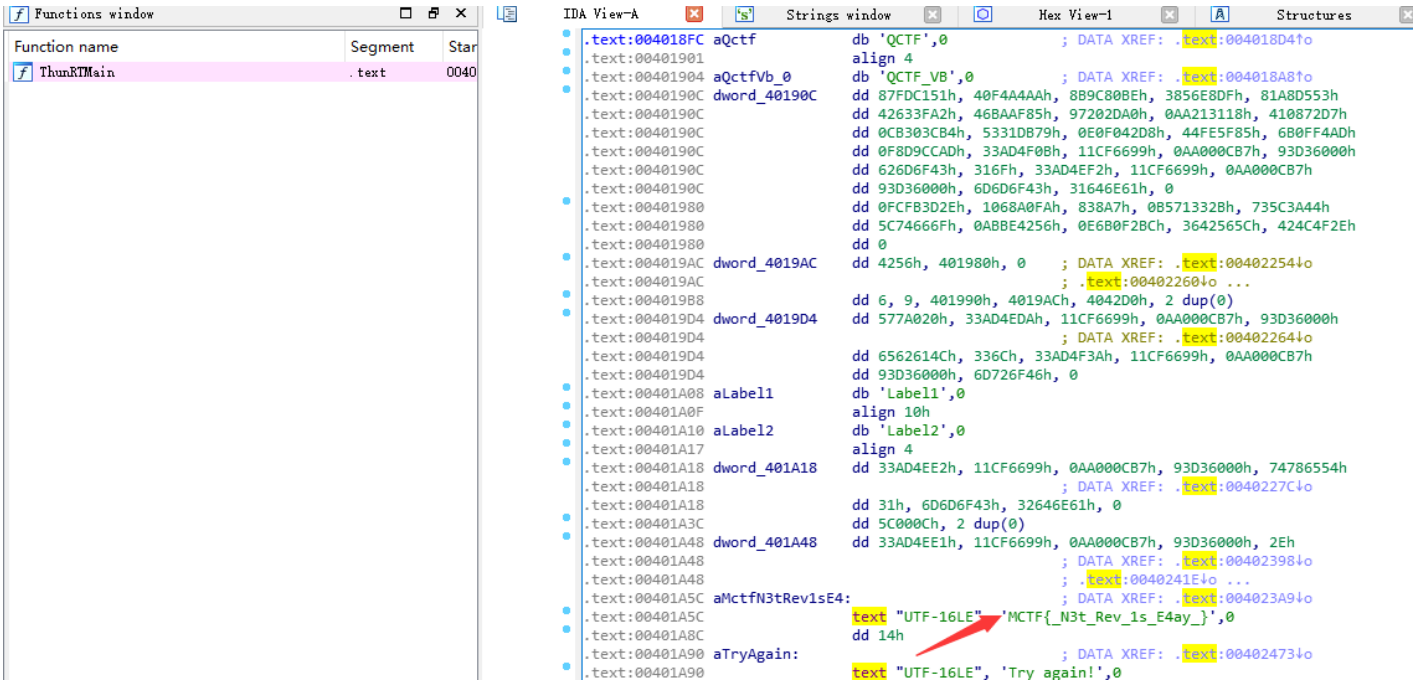
入门逆向

下载后ida打开,双击`_mail`函数里就有flag

```
; Attributes: bp-based frame

; int __cdecl main(int argc, const char **argv, const char **envp)
public _main
_main proc near

argc= dword ptr  8
argv= dword ptr  0Ch
envp= dword ptr  10h

; __unwind {
push    ebp
mov     ebp, esp
and     esp, 0FFFFFFF0h
sub     esp, 30h
call    ___main
mov     dword ptr [esp], offset aHiThisIsABabyr ; "Hi~ this is a babyre
call    _printf
mov     byte ptr [esp+2Fh], 'f'
mov     byte ptr [esp+2Eh], 'l'
mov     byte ptr [esp+2Dh], 'a'
mov     byte ptr [esp+2Ch], 'g'
mov     byte ptr [esp+2Bh], '{'
mov     byte ptr [esp+2Ah], 'R'
mov     byte ptr [esp+29h], 'e'
mov     byte ptr [esp+28h], '_'
mov     byte ptr [esp+27h], '1'
mov     byte ptr [esp+26h], 's'
mov     byte ptr [esp+25h], '_'
mov     byte ptr [esp+24h], 'S'
mov     byte ptr [esp+23h], '0'
mov     byte ptr [esp+22h], '_'
mov     byte ptr [esp+21h], 'C'
mov     byte ptr [esp+20h], '0'
mov     byte ptr [esp+1Fh], 'O'
mov     byte ptr [esp+1Eh], 'L'
mov     byte ptr [esp+1Dh], '}'
mov     eax, 0
leave
retn
; } // starts at 401460
_main endp
```

Easy_vb

下载后ida打开,往下翻里就有flag



提交flag出错，将MCTF改成flag即可。

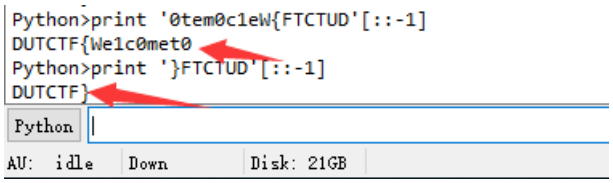
Easy_Re

下载后ida打开，双击_mail函数，F5翻译为伪C代码

```
int __cdecl main(int argc, const char **argv, const char **envp)
{
  int v3; // eax
  __int128 v5; // [esp+0h] [ebp-44h]
  __int64 v6; // [esp+10h] [ebp-34h]
  int v7; // [esp+18h] [ebp-2Ch]
  __int16 v8; // [esp+1Ch] [ebp-28h]
  char v9; // [esp+20h] [ebp-24h]

  _mm_storeu_si128((__m128i *)&v5, _mm_loadu_si128((const __m128i *)&xmmword_413E34));
  v7 = 0;
  v6 = qword_413E44;
  v8 = 0;
  printf("欢迎来到DUTCTF呦\n");
  printf("这是一道很可爱很简单的逆向题呦\n");
  printf("输入flag吧:");
  scanf("%s", &v9);
  v3 = strcmp((const char *)&v5, &v9);
  if ( v3 )
    v3 = -(v3 < 0) | 1;
  if ( v3 )
    printf(aFlag_0);
  else
    printf((const char *)&unk_413E90);
  system("pause");
  return 0;
}
```

strcmp()对面输入的值是否等于xmmword_413E34位置的值，双击跟过去，发现了flag

小端存储的问题，看起来反了而已。

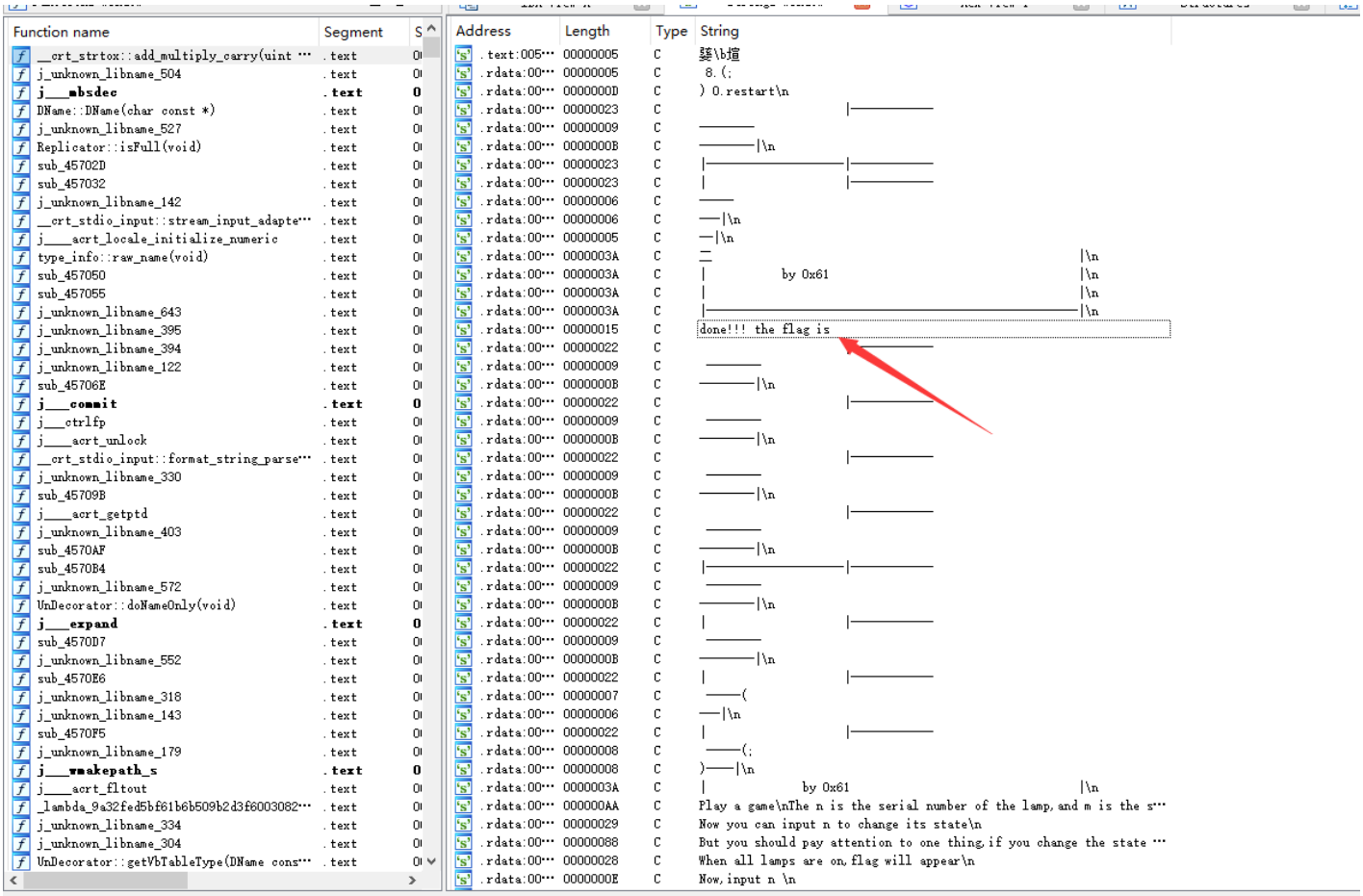


游戏过关

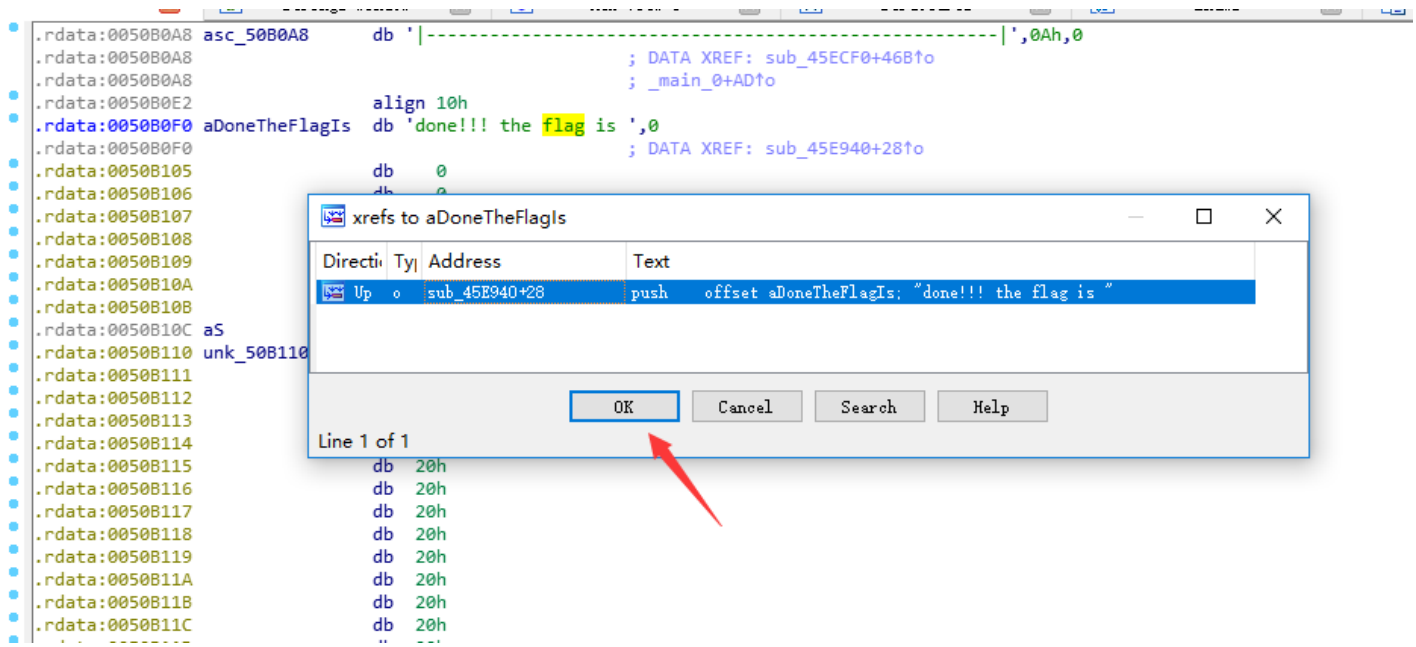
下载后ida打开，看到函数比较多，分享一种快速找关键函数的方法。

首先就是看运行遍程序，了解下程序流程以及关键字符串。然后打开ida

1.Shift+F12查看下字符串。



2.然后双击过去。



3.再按Cirt+X交叉引用显示调用位置

```
push    ebp
mov     ebp, esp
sub     esp, 158h
push    ebx
push    esi
push    edi
lea     edi, [ebp+var_158]
mov     ecx, 56h
mov     eax, 0CCCCCCCCh
rep stosd
mov     eax, ___security_cookie
xor     eax, ebp
mov     [ebp+var_4], eax
push    offset aDoneTheFlagIs ; "done!!! the flag is "
call    sub_45A7BE
add     esp, 4
mov     [ebp+var_44], 12h
mov     [ebp+var_43], 40h
mov     [ebp+var_42], 62h
mov     [ebp+var_41], 5
mov     [ebp+var_40], 2
mov     [ebp+var_3F], 4
mov     [ebp+var_3E], 6
mov     [ebp+var_3D], 3
mov     [ebp+var_3C], 6
mov     [ebp+var_3B], 30h
mov     [ebp+var_3A], 31h
mov     [ebp+var_39], 41h
```

然后F5看下伪代码

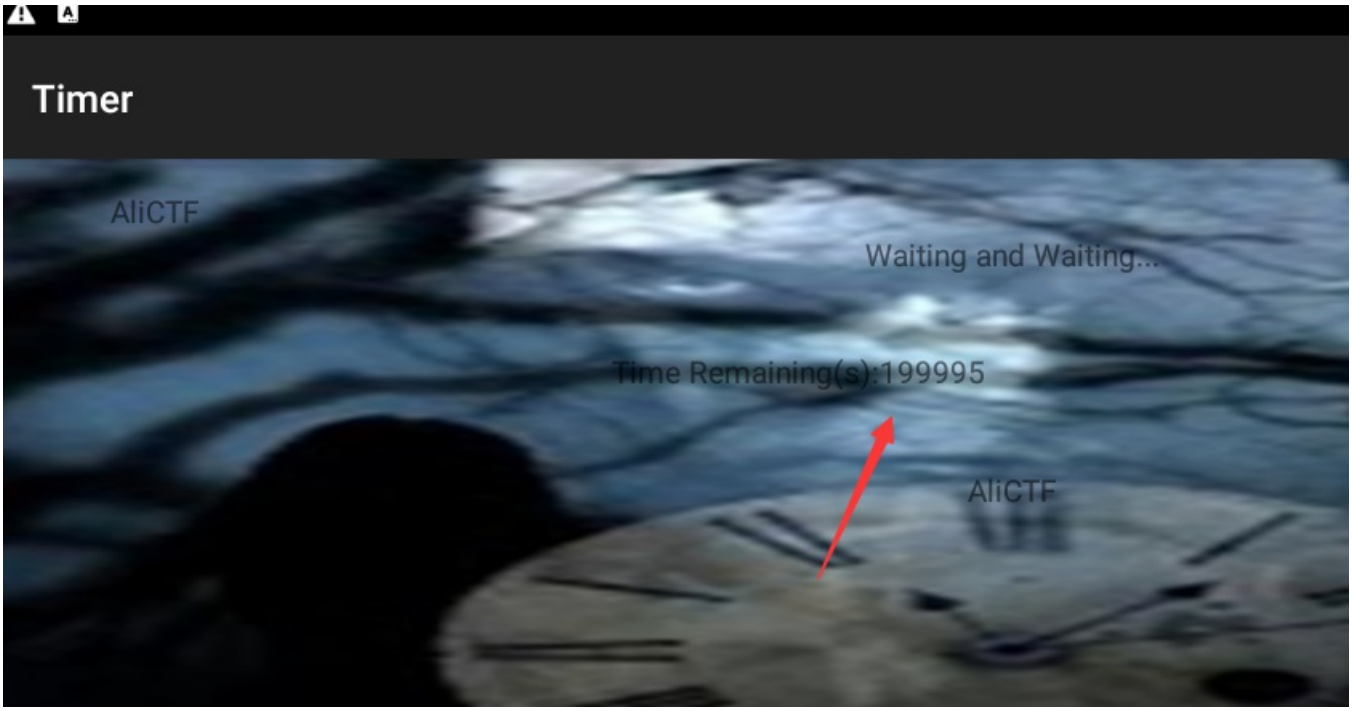
```
v57 = 126;
v58 = 0;
for ( i = 0; i < 56; ++i )
{
  *(&v2 + i) ^= *(&v59 + i);
  *(&v2 + i) ^= 0x13u;
}
return sub_45A7BE("%s\n");
}
```

打印出`done!!! the flag is `然后有两个数组按位异或再和0x13异或生成flag

```
#!usr/bin/env python
#!coding=utf-8

__author__ = 'zhengjim'

array1 = [18,64,98,5,2,4,6,3,6,48,49,65,32,12,48,65,31,78,62,32,49,32,1,57,96,3,21,9,4,62,3,5,4,1,2,3,44,65
array2 = [123,32,18,98,119,108,65,41,124,80,125,38,124,111,74,49,83,108,94,108,84,6,96,83,44,121,104,110,32

flag = ''
for i in range(len(array1)):
    flag+= chr(array1[i] ^ array2[i] ^ 0x13 )
print flag
```

Timer(阿里CTF)

下载文件发现是apk，先安装运行下发现有一个倒计时，只是时间为200000秒。猜测是让时间走完获取flag。



用jadx-gui反编译，双击看MainActivity查看

```
package net.bluelotus.tomorrow.easyandroid;

import android.os.Bundle;
import android.os.Handler;
import android.support.v7.app.AppCompatActivity;
import android.view.Menu;
import android.view.MenuItem;
import android.widget.TextView;

public class MainActivity extends AppCompatActivity {
    int beg = (((int) (System.currentTimeMillis() / 1000)) + 200000);
    int k = 0;
    int now;
    long t = 0;

    public native String stringFromJNI2(int i);

    public static boolean is2(int n) {
        if (n <= 3) {
            if (n > 1) {
                return true;
            }
            return false;
        } else if (n % 2 == 0 || n % 3 == 0) {
            return false;
        } else {
            int i = 5;
            while (i * i <= n) {
                if (n % i == 0 || n % (i + 2) == 0) {
                    return false;
                }
                i += 6;
            }
            return true;
        }
    }
```

```
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView((int) R.layout.activity_main);
        final TextView tv1 = (TextView) findViewById(R.id.textView2);
        final TextView tv2 = (TextView) findViewById(R.id.textView3);
        final Handler handler = new Handler();
        handler.postDelayed(new Runnable() {
            public void run() {
                MainActivity.this.t = System.currentTimeMillis();
                MainActivity.this.now = (int) (MainActivity.this.t / 1000);
                MainActivity.this.t = 1500 - (MainActivity.this.t % 1000);
                tv2.setText("AliCTF");
                if (MainActivity.this.beg - MainActivity.this.now <= 0) {
                    tv1.setText("The flag is:");
                    tv2.setText("alictf{" + MainActivity.this.stringFromJNI2(MainActivity.this.k) + "}");
                }
                MainActivity mainActivity;
                if (MainActivity.is2(MainActivity.this.beg - MainActivity.this.now)) {
                    mainActivity = MainActivity.this;
                    mainActivity.k += 100;
                } else {
                    mainActivity = MainActivity.this;
                    mainActivity.k--;
                }
                tv1.setText("Time Remaining(s):" + (MainActivity.this.beg - MainActivity.this.now));
                handler.postDelayed(this, MainActivity.this.t);
            }
        }, 0);
    }

    public boolean onCreateOptionsMenu(Menu menu) {
        getMenuInflater().inflate(R.menu.menu_main, menu);
        return true;
    }

    public boolean onOptionsItemSelected(MenuItem item) {
        if (item.getItemId() == R.id.action_settings) {
            return true;
        }
        return super.onOptionsItemSelected(item);
    }

    static {
        System.loadLibrary("lhm");
    }
}
```

首先初始化了beg为当前时间加上200000。`(System.currentTimeMillis() / 1000)`是获得系统的时间，单位为毫秒,转换为秒。

看`onCreate`方法，找到关键处

```
if (MainActivity.this.beg - MainActivity.this.now <= 0) {
                    tv1.setText("The flag is:");
                    tv2.setText("alictf{" + MainActivity.this.stringFromJNI2(MainActivity.this.k) + "}");
                }
```

所以`MainActivity.this.beg - MainActivity.this.now <= 0`就是过了得时间。如果过了200000秒则出现flag。flag是使用native层来打印。
思路：能不能直接跳过200000秒直接出现flag呢？
有一个关键变量`k`，往下看，看看k有没有什么运算。

```
 if (MainActivity.is2(MainActivity.this.beg - MainActivity.this.now)) {
                    mainActivity = MainActivity.this;
                    mainActivity.k += 100;
                } else {
                    mainActivity = MainActivity.this;
                    mainActivity.k--;
                }
```

将差值用is2函数判断，如果true，就k+100 ,如果false,就k-1。那就要看下is2函数

```
public static boolean is2(int n) {
        if (n <= 3) {
            if (n > 1) {
                return true;
            }
            return false;
        } else if (n % 2 == 0 || n % 3 == 0) {
            return false;
        } else {
            int i = 5;
            while (i * i <= n) {
                if (n % i == 0 || n % (i + 2) == 0) {
                    return false;
                }
                i += 6;
            }
            return true;
        }
    }
```

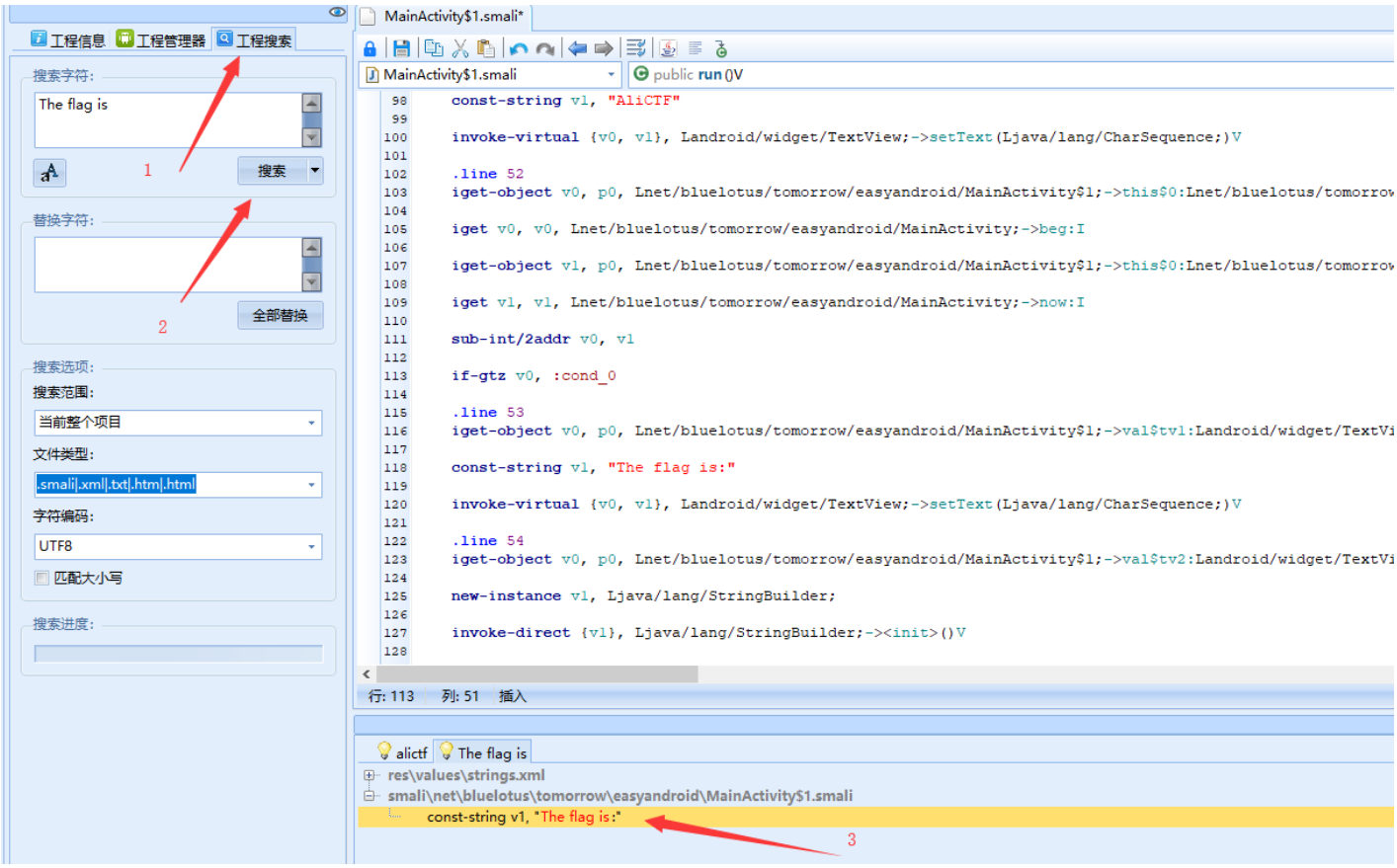
直接照着写一个即可，然后可以算出关键变量`k`
解密脚本

```
#!usr/bin/env python
#!coding=utf-8

__author__ = 'zhengjim'

def is2(n):
    if(n <= 3):
        if(n > 1):
            return True
        return False
    elif(n % 2 == 0 or n % 3 == 0):
        return False
    else:
        i = 5
        while(i * i <= n):
            if (n % i == 0 or n % (i + 2) == 0):
                return False
            i += 6
    return True

k=0

for i in xrange(200000,0,-1):
    k = k + 100 if is2(i) else k - 1
print k
```

算出`k = 1616384`

然后就可以绕过200000秒将k带入传入进去获取flag。

实现的话，用`Androidkiller`打开项目，因为跳转后输出了`The flag is`,所以搜索该字符串,双击跟过去。

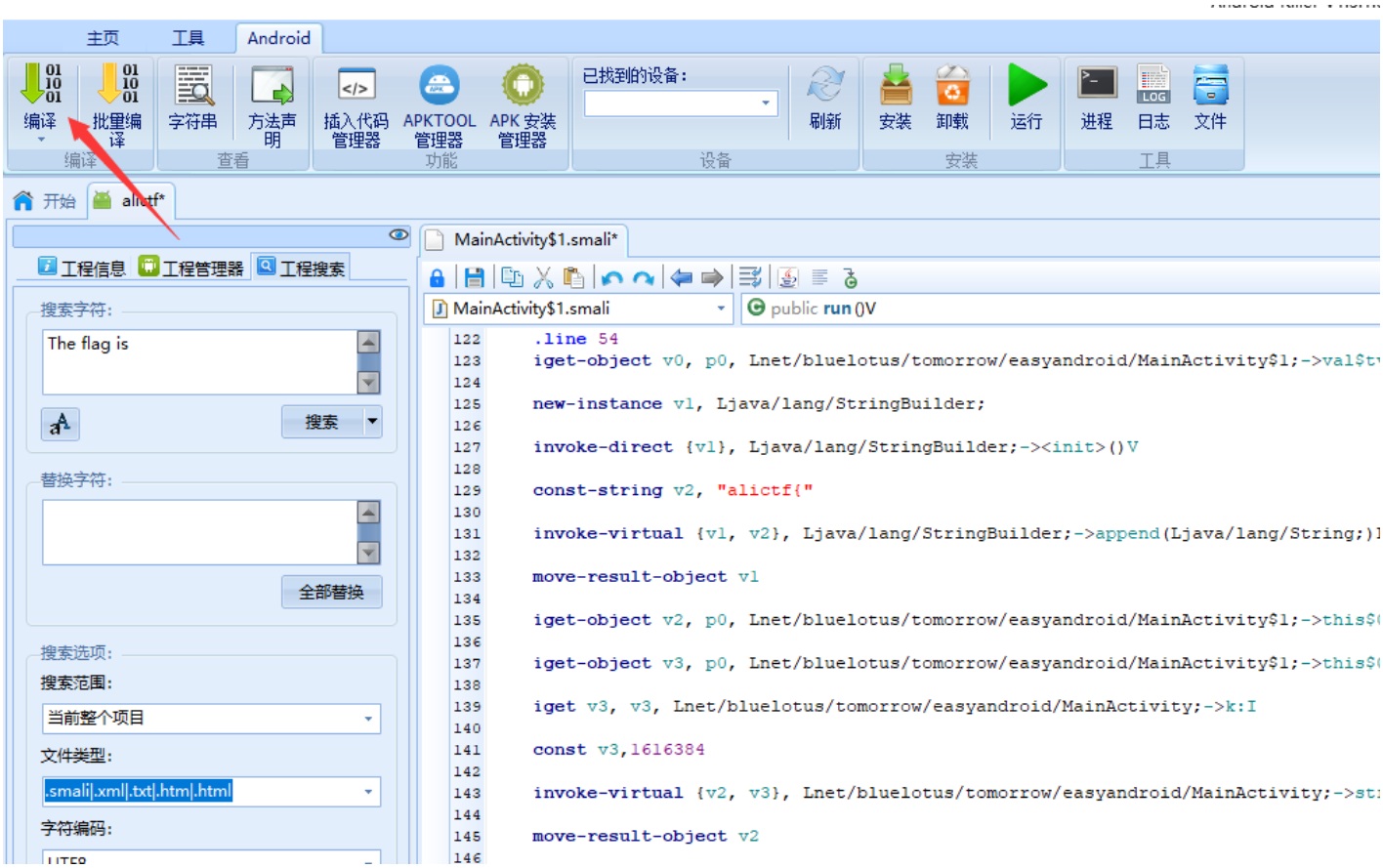


往上看第113行的`if-gtz v0, :cond_0`。`if-ltz`是如果大于0跳转，那改成如果小于0跳转就跳过了200000秒等待了。对应的语句为`if-ltz v0, :cond_0`。

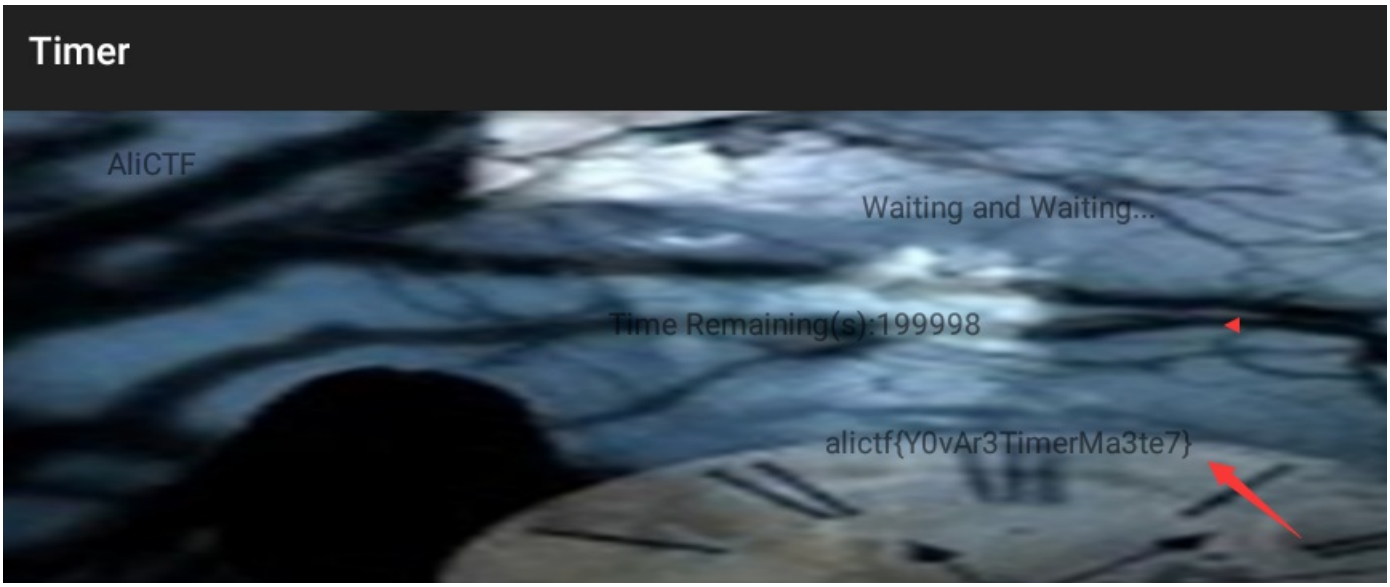
然后要找到赋值k的位置，看第129行-149行，因为k的值是在alictf{和}之间传入的。
看到了139行的的`iget v3, v3, Lnet/bluelotus/tomorrow/easyandroid/MainActivity;->k:I`，知道v3是k的值。
于是在下面赋值`const v3,1616384`

```
    move-result-object v1

    iget-object v2, p0, Lnet/bluelotus/tomorrow/easyandroid/MainActivity$1;->this$0:Lnet/b

    iget-object v3, p0, Lnet/bluelotus/tomorrow/easyandroid/MainActivity$1;->this$0:Lnet/b

    iget v3, v3, Lnet/bluelotus/tomorrow/easyandroid/MainActivity;->k:I

    const v3,1616384

    invoke-virtual {v2, v3}, Lnet/bluelotus/tomorrow/easyandroid/MainActivity;->stringFrom

    move-result-object v2

    invoke-virtual {v1, v2}, Ljava/lang/StringBuilder;->append(Ljava/lang/String;)Ljava/la

    move-result-object v1

    const-string v2, "}"
```

然后保存，编译，安装运行就出现flag。



flag



逆向入门

下载后发现不是pe文件，右键txt打开，看到`...`开头的，为图像文件。
开头添加`<img scr="`，结尾添加`">`，html打开。有二维码扫描既可。

---

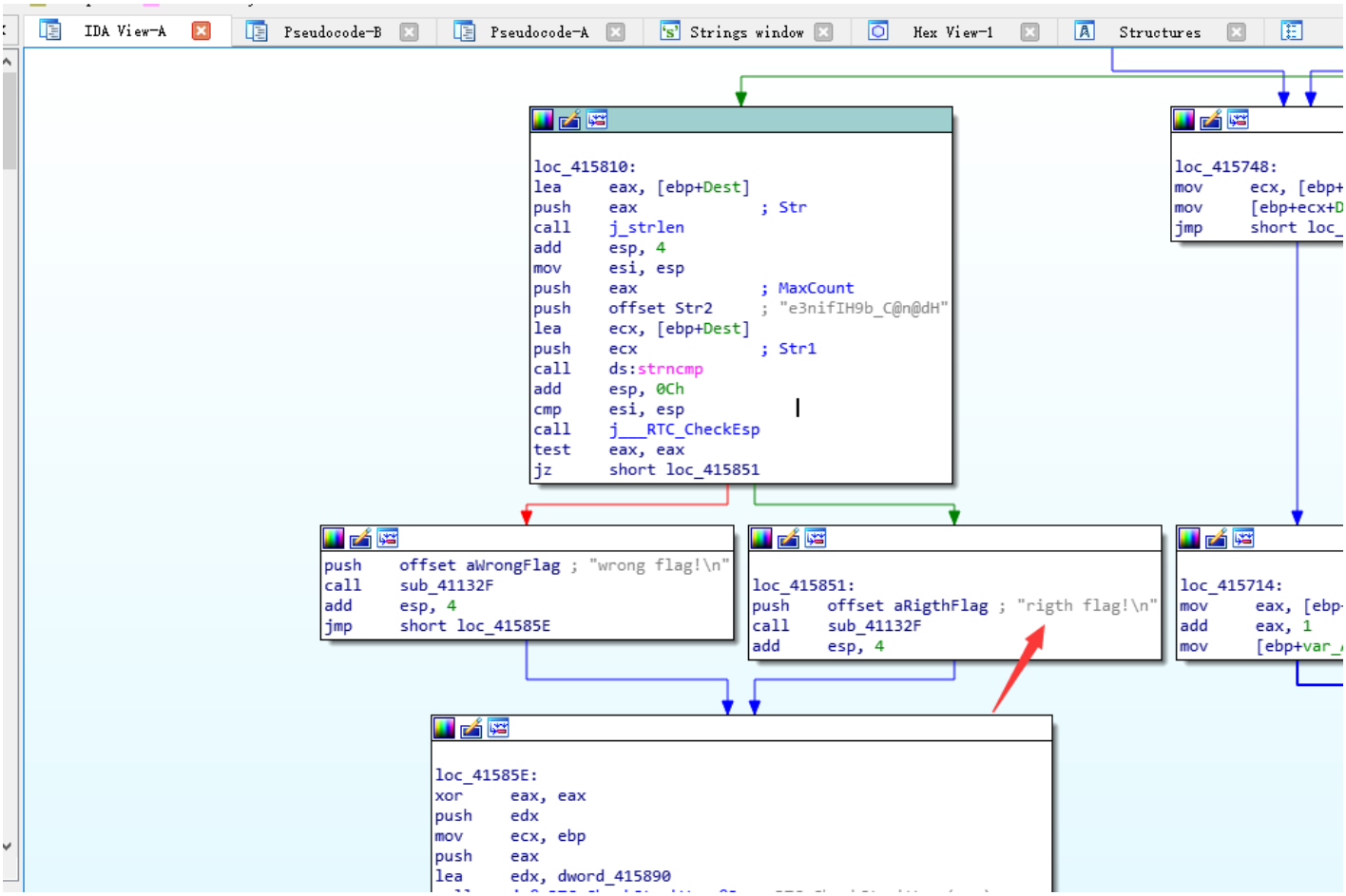
love

下载来用peid看是C++的，先运行下。

```
Microsoft Windows [版本 10.0.17134.407]
(c) 2018 Microsoft Corporation。保留所有权利。

C:                              3>reverse_3.exe
please enter the flag:1
wrong flag!
```

要输入flag。用ida打开

按之前说的方法，快速定位到关键函数



打F5查看伪代码

```
__int64 main_0()
{
  int v0; // eax
  const char *v1; // eax
  size_t v2; // eax
  int v3; // edx
  __int64 v4; // ST08_8
  signed int j; // [esp+DCh] [ebp-ACh]
  signed int i; // [esp+E8h] [ebp-A0h]
  signed int v8; // [esp+E8h] [ebp-A0h]
  char Dest[108]; // [esp+F4h] [ebp-94h]
  char Str; // [esp+160h] [ebp-28h]
  char v11; // [esp+17Ch] [ebp-Ch]

  for ( i = 0; i < 100; ++i )
  {
    if ( i >= 0x64 )
      j____report_rangecheckfailure();
    Dest[i] = 0;
  }
  sub_41132F("please enter the flag:");
  sub_411375("%20s", &Str);
  v0 = j_strlen(&Str);
  v1 = sub_4110BE(&Str, v0, &v11);
  strncpy(Dest, v1, 0x28u);
  v8 = j_strlen(Dest);
  for ( j = 0; j < v8; ++j )
    Dest[j] += j;
  v2 = j_strlen(Dest);
  if ( !strncmp(Dest, Str2, v2) )
    sub_41132F("rigth flag!\n");
  else
    sub_41132F("wrong flag!\n");
  HIDWORD(v4) = v3;
  LODWORD(v4) = 0;
  return v4;
}
```

可以看到有两步加密，第一步是先`sub_4110BE(&Str, v0, &v11);`用这个函数加密。然后再去循环加密

```
for ( j = 0; j < v8; ++j )
    Dest[j] += j;
```

然后把加密后的字符串与`str2`相比较。str2的值为`e3nifIH9b_C@n@dH`，先把循环逆向了。

```
#!usr/bin/env python
#!coding=utf-8

__author__ = 'zhengjim'

str2 ='e3nifIH9b_C@n@dH'
flag =''

for i in range(len(str2)):
    flag += chr(ord(str2[i])- i)
print flag
```

得到`e2lfbDB2ZV95b3V9`
然后看sub_4110BE()函数。一串长算法，发现首先将输入的`flag`每`3`位变成`4`位。然后有`64`位密码表。其实就是个base64加密（记下来,base64加密算法的特征）。

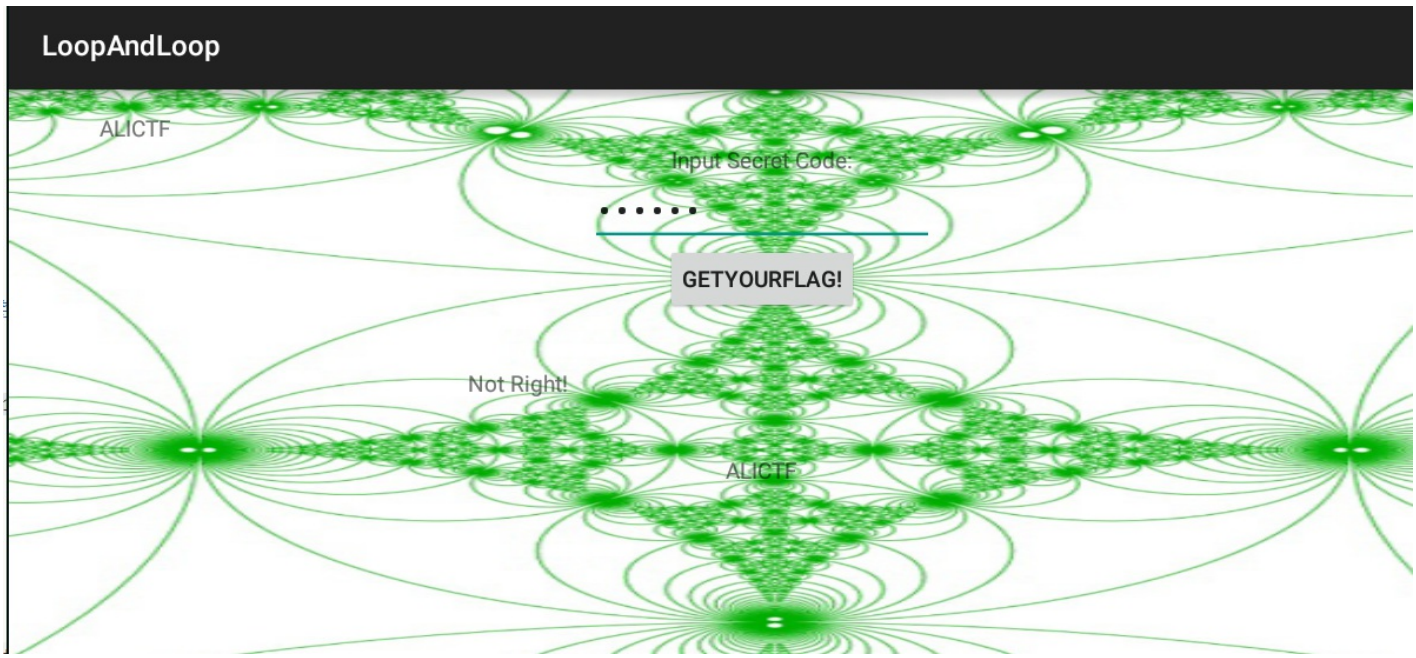
"ABC"的转化为base64字符的逻辑如下：

	A	B	C
ASCII十进制	65	66	67
8bit/byte	01000001	01000010	01000011
6bit/byte	010000	010100	001001	000011
base64十进制	16	20	9	3
base64字符	Q	U	J	D

也就是将刚刚得到的值base64解密就是flag。

LoopAndLoop(阿里CTF)

下载文件发现是apk，先安装运行下发现有一个输入框，随便输入点`getyourflag`跳出Not Right



用`jadx-gui`反编译，双击看`MainActivity`查看

```
package net.bluelotus.tomorrow.easyandroid;

import android.os.Bundle;
import android.support.v7.app.AppCompatActivity;
import android.view.Menu;
import android.view.MenuItem;
import android.view.View;
import android.view.View.OnClickListener;
import android.widget.Button;
import android.widget.EditText;
import android.widget.TextView;

public class MainActivity extends AppCompatActivity {
    public native int chec(int i, int i2);
```

```
public native String stringFromJNI2(int i);

protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView((int) R.layout.activity_main);
    final TextView tv1 = (TextView) findViewById(R.id.textView2);
    final TextView tv2 = (TextView) findViewById(R.id.textView3);
    final EditText ed = (EditText) findViewById(R.id.editText);
    ((Button) findViewById(R.id.button)).setOnClickListener(new OnClickListener() {
        public void onClick(View v) {
            try {
                int in_int = Integer.parseInt(ed.getText().toString());
                if (MainActivity.this.check(in_int, 99) == 1835996258) {
                    tv1.setText("The flag is:");
                    tv2.setText("alictf{" + MainActivity.this.stringFromJNI2(in_int) + "}");
                    return;
                }
                tv1.setText("Not Right!");
            } catch (NumberFormatException e) {
                tv1.setText("Not a Valid Integer number");
            }
        }
    });
}

public boolean onCreateOptionsMenu(Menu menu) {
    getMenuInflater().inflate(R.menu.menu_main, menu);
    return true;
}

public boolean onOptionsItemSelected(MenuItem item) {
    if (item.getItemId() == R.id.action_settings) {
        return true;
    }
    return super.onOptionsItemSelected(item);
}

public String messageMe(String text) {
    return "LoopOk" + text;
}

public int check(int input, int s) {
    return chec(input, s);
}

public int check1(int input, int s) {
    int t = input;
    for (int i = 1; i < 100; i++) {
        t += i;
    }
    return chec(t, s);
}

public int check2(int input, int s) {
    int t = input;
    int i;
    if (s % 2 == 0) {
        for (i = 1; i < 1000; i++) {
            t += i;
```

```
            }
            return chec(t, s);
        }
        for (i = 1; i < 1000; i++) {
            t -= i;
        }
        return chec(t, s);
    }

    public int check3(int input, int s) {
        int t = input;
        for (int i = 1; i < 10000; i++) {
            t += i;
        }
        return chec(t, s);
    }

    static {
        System.loadLibrary("lhm");
    }
}
```

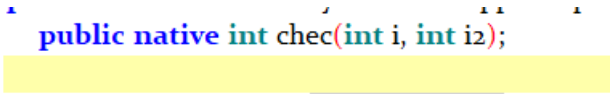
看到关键代码：

```
public void onClick(View v) {
                try {
                    int in_int = Integer.parseInt(ed.getText().toString());
                    if (MainActivity.this.check(in_int, 99) == 1835996258) {
                        tv1.setText("The flag is:");
                        tv2.setText("alictf{" + MainActivity.this.stringFromJNI2(in_int) + "}");
                        return;
                    }
                    tv1.setText("Not Right!");
                } catch (NumberFormatException e) {
                    tv1.setText("Not a Valid Integer number");
                }
            }
```

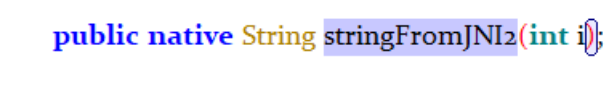
流程为：将用户输入作为参数1(one)，99作为参数2(two)传入check函数里，如果返回的值为1835996258，则将用户输入作为参数传入stringFromJNI2函数计算，返回值与alictf{和}拼接组成flag 。

于是我们只要逆向出check函数，将1835996258带入得到的值，拿到apk里边运行即可得到flag。

追过去发现check函数调用了chec函数 为Native层的函数



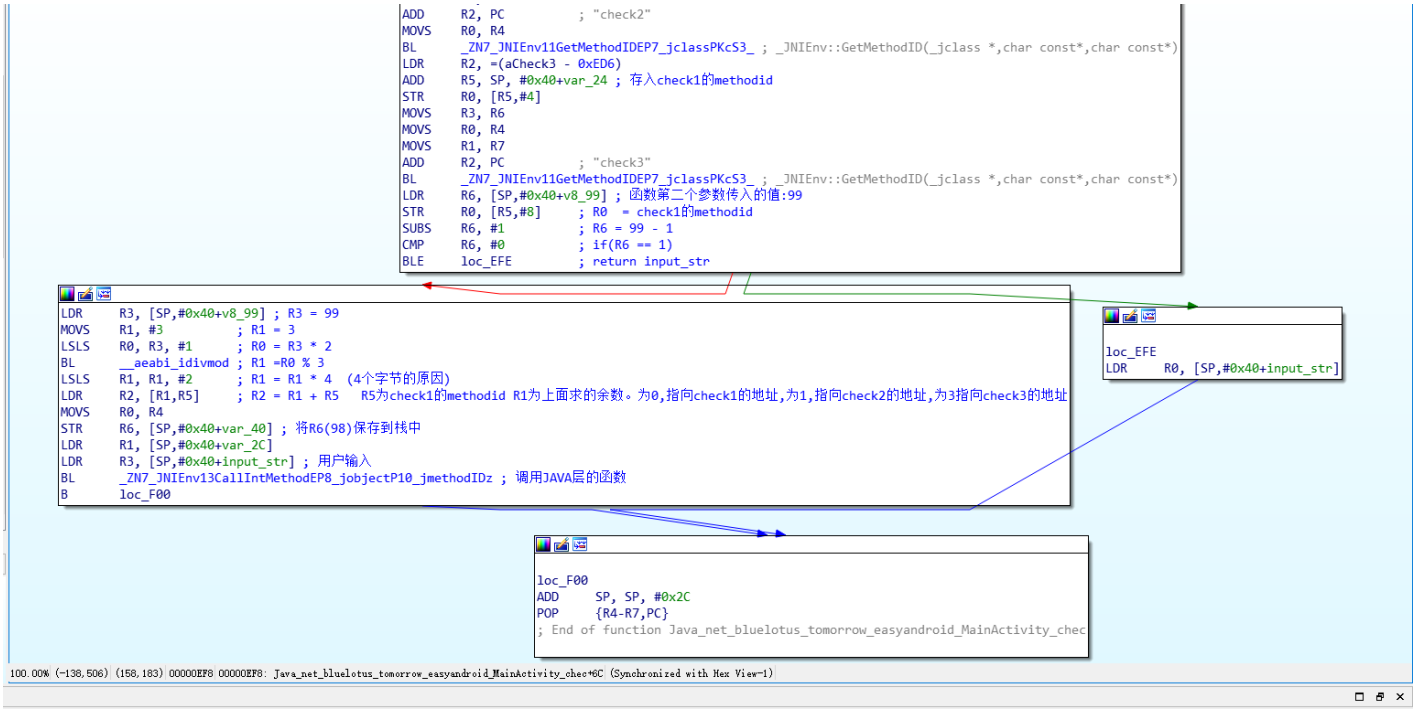
stringFromJNI2函数也为Native层的函数



加载了System.loadLibrary("lhm");，所以逆向liblhm.so文件。

用IDA打开，还是上面的办法，找到了chec函数
这部分看得比较混乱，查了比较多的资料，所以有不对之处请指出来。

汇编



伪代码

上面是自己加了注释，然后通过看汇编与伪代码分析得出流程，即将传入的99进行2 * i % 3运算，判断得到的余数。

1. 如果等于0，将one与two-1传到JAVA层的check1进行计算
2. 如果等于1，将one与two-1传到JAVA层的check2进行计算
3. 如果等于2，将one与two-1传到JAVA层的check3进行计算

去查看下check123函数

```
public int check1(int input, int s) {
       int t = input;
       for (int i = 1; i < 100; i++) {
           t += i;
       }
       return chec(t, s);
   }

   public int check2(int input, int s) {
       int t = input;
       int i;
       if (s % 2 == 0) {
           for (i = 1; i < 1000; i++) {
               t += i;
           }
           return chec(t, s);
       }
       for (i = 1; i < 1000; i++) {
           t -= i;
       }
       return chec(t, s);
   }

   public int check3(int input, int s) {
       int t = input;
       for (int i = 1; i < 10000; i++) {
           t += i;
       }
       return chec(t, s);
   }
```

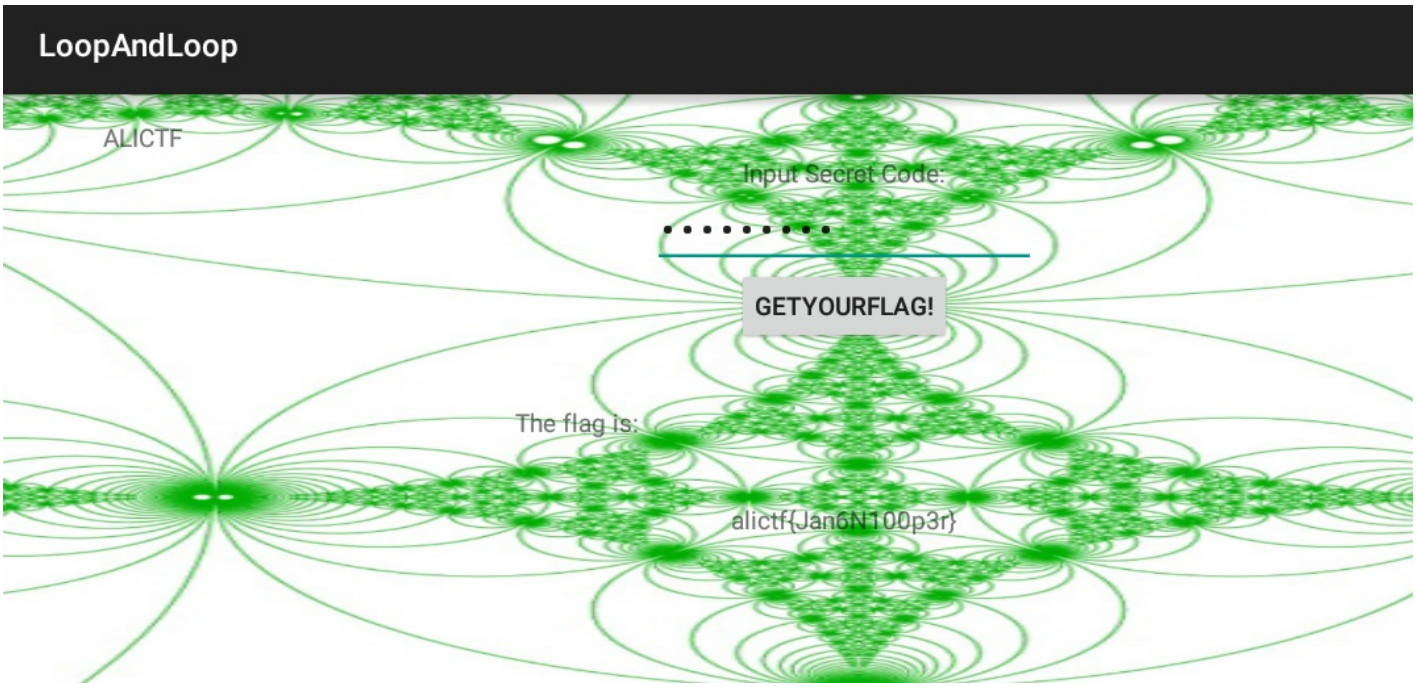
发现只是简单的遍历然后加减运算，计算完又返回`chec`函数

只到two小于等于1，输出结果。

于是写逆函数就不难了,check123 加变减，减变加就可以了。本来从99到2(因为two小于等于1)，变成从2到99。

```
#!usr/bin/env python
#!coding=utf-8

__author__ = 'zhengjim'

def check1(input,s):
    t = input
    for i in range(1,100):
        t -= i
    return t

def check2(input,s):
    t = input
    if(s % 2 == 0):
        for i in range(1,1000):
            t -= i
        return t
    for i in range(1,1000):
        t += i
    return t

def check3(input,s):
    t = input
    for i in range(1,10000):
        t -= i
    return t

output = 1835996258
for i in range(2,100):
    flag =  2 * i % 3
    if flag == 0 :
        output = check1(output, i-1)
    elif flag == 1 :
        output = check2(output, i-1)
    elif flag == 2 :
        output = check3(output, i-1)
print output
```

得到236492408，带入apk运行出现flag。



---

easy-100(LCTF)

下载文件发现是apk，先安装运行下（我的逍遥安卓运行失败，不懂为啥）。
用jeb2反编译(用jadx-gui反编译出了问题，a方法重载反编译出了问题)，双击看MainActivity查看

```
package com.example.ring.myapplication;

import android.content.pm.ApplicationInfo;
import android.os.Bundle;
import android.support.v7.a.q;
import java.io.InputStream;

public class MainActivity extends q {
    private String v;

    public MainActivity() {
        super();
    }

    static String a(MainActivity arg1) {
        return arg1.v;
    }

    static boolean a(MainActivity arg1, String arg2, String arg3) {
        return arg1.a(arg2, arg3);
    }

    private boolean a(String arg4, String arg5) {
        return new c().a(arg4, arg5).equals(new String(new byte[]{21, -93, -68, -94, 86, 117, -19, -68, -92
    }

    protected void onCreate(Bundle arg3) {
        super.onCreate(arg3);
        this.setContentView(2130968602);
        ApplicationInfo v0 = this.getApplicationInfo();
        v0.flags &= 2;
        this.p();
        this.findViewById(2131427413).setOnClickListener(new d(this));
    }

    private void p() {
        try {
            InputStream v0_1 = this.getResources().getAssets().open("url.png");
            int v1 = v0_1.available();
            byte[] v2 = new byte[v1];
            v0_1.read(v2, 0, v1);
            byte[] v0_2 = new byte[16];
            System.arraycopy(v2, 144, v0_2, 0, 16);
            this.v = new String(v0_2, "utf-8");
        }
        catch(Exception v0) {
            v0.printStackTrace();
        }
    }
}
```

首先看onCreate()方法

```
protected void onCreate(Bundle arg3) {
        super.onCreate(arg3);
        this.setContentView(2130968602);
        ApplicationInfo v0 = this.getApplicationInfo();
        v0.flags &= 2;
        this.p();
        this.findViewById(2131427413).setOnClickListener(new d(this));
    }
```

执行了`p()`方法，然后创建了一个按钮监听事件在`classs d`。

跟过去看下`class d`

```
package com.example.ring.myapplication;

import android.view.View$OnClickListener;
import android.view.View;
import android.widget.TextView;
import android.widget.Toast;

class d implements View$OnClickListener {
    d(MainActivity arg1) {
        this.a = arg1;
        super();
    }

    public void onClick(View arg5) {
        if(MainActivity.a(this.a, MainActivity.a(this.a), this.a.findViewById(2131427414).getText().toStrin
            View v0 = this.a.findViewById(2131427412);
            Toast.makeText(this.a.getApplicationContext(), "Congratulations!", 1).show();
            ((TextView)v0).setText(2131099682);
        }
        else {
            Toast.makeText(this.a.getApplicationContext(), "Oh no.", 1).show();
        }
    }
}
```

如果`a()`方法返回真，则输出flag。第一个参数为句柄，第二个参数调用了另外一个a方法返回一个字符串，第三个参数是我们输入的字符串。
跟过去看下`a()`方法,发现为重载（JAVA重载概念）

```
    static String a(MainActivity arg1) {
        return arg1.v;
    }

    static boolean a(MainActivity arg1, String arg2, String arg3) {
        return arg1.a(arg2, arg3);
    }

    private boolean a(String arg4, String arg5) {
        return new c().a(arg4, arg5).equals(new String(new byte[]{21, -93, -68, -94, 86, 117, -19, -68, -92
    }
```

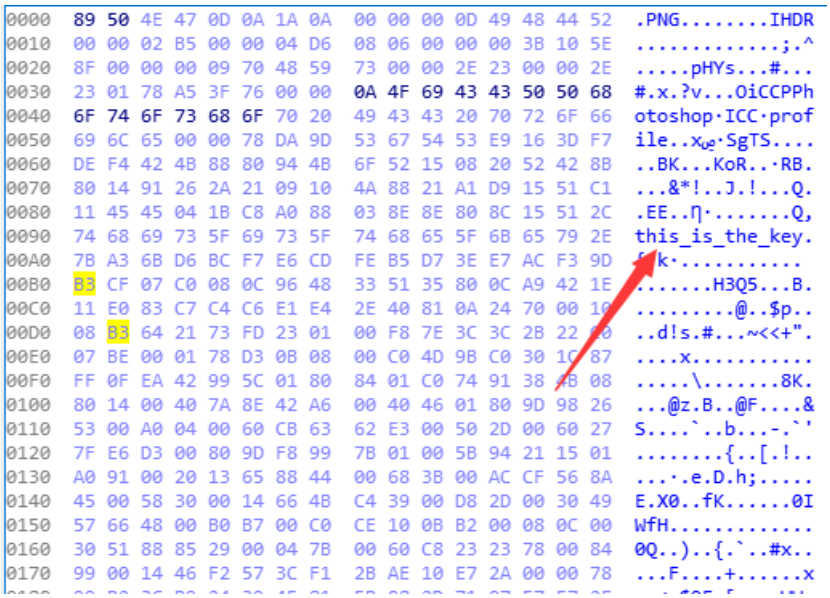
1. `static String a(MainActivity arg1)`方法直接返回了字符串，返回的是arg1.v
2. `private boolean a(String arg4, String arg5)`方法中调用了equals方法进行比较返回布尔值。

由于`arg4`是类d中传入的`MainActivity.a(this.a)`,所以得先看返回了什么字符串`v`,
而`v`是`MainActivity`的String类型的数据成员以及有相应的方法进行赋值`p`方法。

```
private void p() {
        try {
            InputStream v0_1 = this.getResources().getAssets().open("url.png");
            int v1 = v0_1.available();
            byte[] v2 = new byte[v1];
            v0_1.read(v2, 0, v1);
            byte[] v0_2 = new byte[16];
            System.arraycopy(v2, 144, v0_2, 0, 16);
            this.v = new String(v0_2, "utf-8");
        }
        catch(Exception v0) {
            v0.printStackTrace();
        }
    }
```

首先读取`url.png`文件以二进制数据取出来。从文件的144位置开始，读取16字符保存为`v`。

用`winhex`打开这张文件，找到144位置，往后的16位为`this_is_the_key.`



得到了key后，要看回三参数的a方法

```
static boolean a(MainActivity arg1, String arg2, String arg3) {
        return arg1.a(arg2, arg3);
    }

private boolean a(String arg4, String arg5) {
        return new c().a(arg4, arg5).equals(new String(new byte[]{21, -93, -68, -94, 86, 117, -19, -68, -92
    }
```

发现三参数a方法调用了两参数a方法，将`this_is_the_key.` 与用户输入作为参数传了进去。.而两参数a方法是调用类c的两参数a方法.计算完后和后面的字节比较。相等返回真。跟过去看下类c的两参数a方法

```
public String a(String arg5, String arg6) {
        String v0 = this.a(arg5);
        String v1 = "";
        a v2 = new a();
        v2.a(v0.getBytes());
        try {
            v0 = new String(v2.b(arg6.getBytes()), "utf-8");
        }
        catch(Exception v0_1) {
            v0_1.printStackTrace();
            v0 = v1;
        }

        return v0;
    }
```

首先将`this_is_the_key.`传入一个参数a方法，然后将返回值赋值给v0。看下一个参数a方法。

```
 private String a(String arg4) {
        String v0_2;
        try {
            arg4.getBytes("utf-8");
            StringBuilder v1 = new StringBuilder();
            int v0_1;
            for(v0_1 = 0; v0_1 < arg4.length(); v0_1 += 2) {
                v1.append(arg4.charAt(v0_1 + 1));
                v1.append(arg4.charAt(v0_1));
            }

            v0_2 = v1.toString();
        }
        catch(UnsupportedEncodingException v0) {
            v0.printStackTrace();
            v0_2 = null;
        }

        return v0_2;
    }
```

将传入的字符串每两个字符为一组然后交换这两个字符的位置最后返回改变后的字符串。就是变成`htsii__sht_eek.y`,可以手动也可以写脚本。

```
#!usr/bin/env python
#!coding=utf-8

__author__ = 'zhengjim'

key = 'this_is_the_key.'
ckey =""
for i in range(0,len(key),2):
    ckey += key[i+1]
    ckey += key[i]
print(ckey)
```

回到类c的两参数a方法，实例化的了类a，然后将用户输入作为参数带入。跟过去看看。

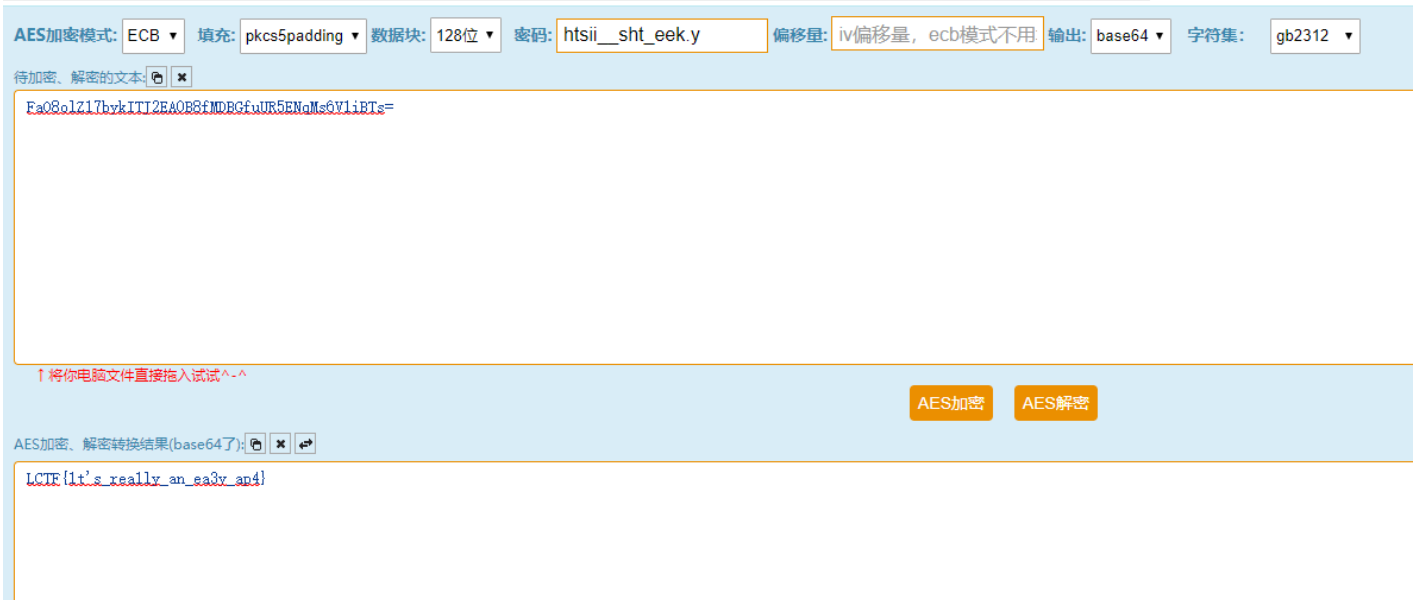
```
package com.example.ring.myapplication;

import java.io.UnsupportedEncodingException;
import java.security.MessageDigest;
import java.security.NoSuchAlgorithmException;
import javax.crypto.Cipher;
import javax.crypto.NoSuchPaddingException;
import javax.crypto.spec.SecretKeySpec;

public class a {
    private SecretKeySpec a;
    private Cipher b;

    public a() {
        super();
    }

    protected void a(byte[] arg4) {
        if(arg4 != null) {
            goto label_15;
        }

        try {
            this.a = new SecretKeySpec(MessageDigest.getInstance("MD5").digest("".getBytes("utf-8")), "AES"
            this.b = Cipher.getInstance("AES/ECB/PKCS5Padding");
            return;
        label_15:
            this.a = new SecretKeySpec(arg4, "AES");
            this.b = Cipher.getInstance("AES/ECB/PKCS5Padding");
        }
        catch(UnsupportedEncodingException v0) {
            v0.printStackTrace();
        }
        catch(NoSuchAlgorithmException v0_1) {
            v0_1.printStackTrace();
        }
        catch(NoSuchPaddingException v0_2) {
            v0_2.printStackTrace();
        }
    }

    protected byte[] b(byte[] arg4) {
        this.b.init(1, this.a);
        return this.b.doFinal(arg4);
    }
}
```

发现是用AES加密，ECB模式，PKCS5Padding填充。然后要找下密钥。`this.a = new SecretKeySpec(arg4, "AES");`是将arg4作为密钥。而arg4则是在类c中传入的`v0.getBytes()`，也就是密钥为`htsii__sht_eek.y`。

回到类c的两参数a方法，将返回的字符串赋值给`v0`然后再返回。到了`MainActivity`的两参数a方法，与那串字符串比较。正确则返回真，就出现`Congratulations!`。
所以百度了一个AES解密网站。由于网站输出的是base64。所以讲密文转为base64格式。

```
#!usr/bin/env python
#!coding=utf-8

__author__ = 'zhengjim'

import base64

str1 = [21, -93, -68, -94, 86, 117, -19, -68, -92, 33,50, 118, 16, 13, 1, -15, -13, 3, 4, 103, -18, 81, 30,
ctext = ''
for i in str1:
    ctext += chr((i+256)%256)
a = base64.b64encode(ctext)
print(a)
```

得到了密文为FaO8olZ17bykITJ2EA0B8fMDBGfuUR5ENqMs6V1iBTs=,密钥为htsii__sht_eek.y,AES解密后出现flag。



SafeBox(NJCTF)

首先下载发现是apk，安装运行下。就一个输入框，其他的按不了。
用jadx-gui反编译下,双击MainActivity查看。

```
package com.geekerchina.hi;

import android.os.Bundle;
import android.support.v7.app.AppCompatActivity;
import android.view.Menu;
import android.view.MenuItem;
import android.view.View;
import android.view.View.OnClickListener;
import android.widget.Button;
import android.widget.EditText;

public class MainActivity extends AppCompatActivity {
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView((int) R.layout.activity_main);
        final EditText Et1 = (EditText) findViewById(R.id.editText);
        ((Button) findViewById(R.id.button)).setOnClickListener(new OnClickListener() {
            public void onClick(View v) {
                String strTmp = "NJCTF{";
                int i = Integer.parseInt(Et1.getText().toString());
                if (i > 10000000 && i < 99999999) {
                    int t = 1;
                    int t1 = 10000000;
                    int flag = 1;
                    if (Math.abs(((i / 1000) % 100) - 36) == 3 && (i % 1000) % 584 == 0) {
                        for (int j = 0; j < 4; j++) {
                            if ((i / t) % 10 != (i / t1) % 10) {
                                flag = 0;
                                break;
                            }
                            t *= 10;
                            t1 /= 10;
                        }
                        if (flag == 1) {
                            char c2 = (char) ((i / 10000) % 100);
                            char c3 = (char) ((i / 100) % 100);
                            Et1.setText(strTmp + ((char) (i / 1000000)) + c2 + c3 + "f4n}");
                        }
                    }
                }
            }
        });
    }

    public boolean onCreateOptionsMenu(Menu menu) {
        getMenuInflater().inflate(R.menu.menu_main, menu);
        return true;
    }

    public boolean onOptionsItemSelected(MenuItem item) {
        if (item.getItemId() == R.id.action_settings) {
            return true;
        }
        return super.onOptionsItemSelected(item);
    }
}
```

看到onCreate方法关键位置18行-37行，输入一个8位数满足条件后，将其变换后与NJCTF{和f4n}拼接。

用python脚本来爆破

```
#!usr/bin/env python
#!coding=utf-8

__author__ = 'zhengjim'

import math

for i in range(10000000, 99999999):
    t = 1
    t1 =10000000
    flag = 1
    if (abs(((i / 1000) % 100) - 36) == 3 and (i % 1000) % 584 == 0):
        for j in range(4):
            if ((i / t) % 10 != (i / t1) % 10):
                flag = 0
                break
            t *= 10
            t1 /= 10
        if(flag ==1):
            print i
            c2 = chr((i / 10000) % 100)
            c3 = chr((i / 100) % 100)
            print('NJCTF{'+chr(i / 1000000)+c2+c3+'f4n}')
```

得到i应该为48533584 ，flag为NJCTF{05#f4n}，但提交却发现错误了。看了好几遍发现没错。再看目录发现了类androidTest。

```
package com.geekerchina.hi;

import android.os.Bundle;
import android.support.v7.app.AppCompatActivity;
import android.view.Menu;
import android.view.MenuItem;
import android.view.View;
import android.view.View.OnClickListener;
import android.widget.Button;
import android.widget.EditText;

public class androidTest extends AppCompatActivity {
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView((int) R.layout.build);
        final EditText Et1 = (EditText) findViewById(R.id.editText);
        ((Button) findViewById(R.id.button)).setOnClickListener(new OnClickListener() {
            public void onClick(View v) {
                String strTmp = "NJCTF{have";
                int i = Integer.parseInt(Et1.getText().toString());
                if (i > 10000000 && i < 99999999) {
                    int t = 1;
                    int t1 = 10000000;
                    int flag = 1;
                    if (Math.abs(((i / 1000) % 100) - 36) == 3 && (i % 1000) % 584 == 0) {
                        for (int j = 0; j < 3; j++) {
                            if ((i / t) % 10 != (i / t1) % 10) {
                                flag = 0;
                                break;
                            }
                            t *= 10;
                            t1 /= 10;
                        }
                        if (flag == 1) {
                            char c2 = (char) ((i / 10000) % 100);
                            char c3 = (char) (((i / 100) % 100) + 10);
                            Et1.setText(strTmp + ((char) (i / 1000000)) + c2 + c3 + "f4n}");
                        }
                    }
                }
            }
        });
    }

    public boolean onCreateOptionsMenu(Menu menu) {
        getMenuInflater().inflate(R.menu.menu_main, menu);
        return true;
    }

    public boolean onOptionsItemSelected(MenuItem item) {
        if (item.getItemId() == R.id.action_settings) {
            return true;
        }
        return super.onOptionsItemSelected(item);
    }
}
```

和MainActivity很像，但有细微不同：

1. 第27行的String strTmp = "NJCTF{have";
2. 第27行的for (int j = 0; j < 3; j++) {
3. 第39行的char c3 = (char) (((i / 100) % 100) + 10);

python脚本爆破

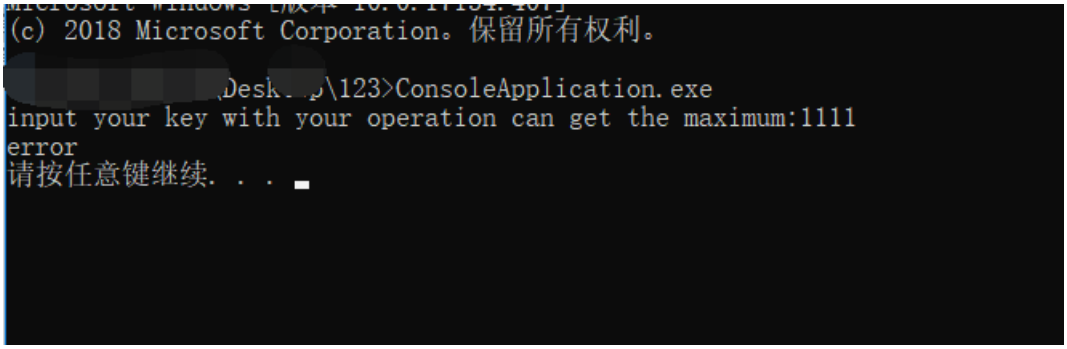
```
#!usr/bin/env python
#!coding=utf-8

__author__ = 'zhengjim'

import math

for i in range(10000000, 99999999):
    t = 1
    t1 = 10000000
    flag = 1
    if (abs(((i / 1000) % 100) - 36) == 3 and (i % 1000) % 584 == 0):
        for j in range(3):
            if ((i / t) % 10 != (i / t1) % 10):
                flag = 0
                break
            t *= 10
            t1 /= 10
        if (flag == 1):
            print i
            c2 = chr((i / 10000) % 100)
            c3 = chr((i / 100) % 100 + 10)
            print('NJCTF{have' + chr(i / 1000000) + c2 + c3 + 'f4n}')
```

得到两组答案。

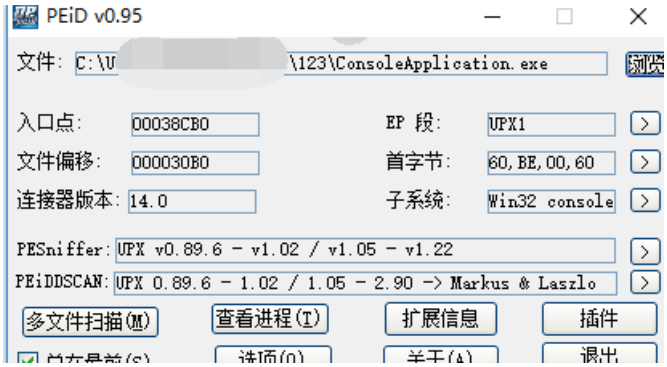
1. i为48533584，flag为NJCTF{have05-f4n}
2. i为48539584，flag为NJCTF{have05if4n}
   均提交试试发现第二组为正确。

Mountain climbing

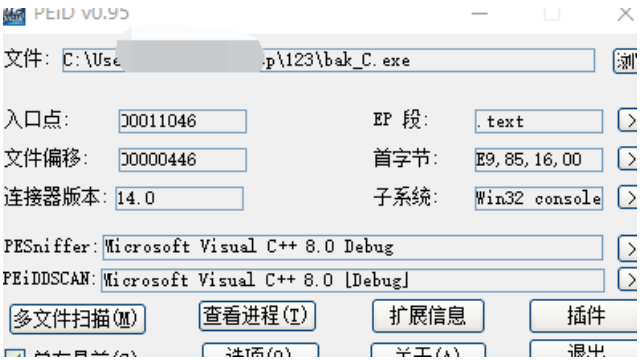
下载后运行,发现要输入最大数字，乱输后跳出error。



用PEID 查看下 发现有 UPX的壳。



直接用52pojie的脱UPX工具进行脱壳。成功



载入IDA

```
__int64 main_0()
{
  int v0; // edx
  __int64 v1; // ST04_8
  char v3; // [esp+0h] [ebp-160h]
  int v4; // [esp+D0h] [ebp-90h]
  int j; // [esp+DCh] [ebp-84h]
  int i; // [esp+E8h] [ebp-78h]
  char Str[104]; // [esp+F4h] [ebp-6Ch]

  srand(0xCu);
  j_memset(&unk_423D80, 0, 0x9C40u);
  for ( i = 1; i <= 20; ++i )
  {
    for ( j = 1; j <= i; ++j )
      dword_41A138[100 * i + j] = rand() % 100000;
  }
  ((void (__cdecl *)(const char *, char))sub_41134D)("input your key with your operation can get the maximu
  sub_411249("%s", (unsigned int)Str);
  if ( j_strlen(Str) == 19 )
  {
    sub_41114F(Str);
    v4 = 0;
    j = 1;
    i = 1;
    dword_423D78 += dword_41A138[101];
    while ( v4 < 19 )
    {
      if ( Str[v4] == 76 )
      {
        dword_423D78 += dword_41A138[100 * ++i + j];
      }
      else
      {
        if ( Str[v4] != 82 )
        {
          ((void (__cdecl *)(const char *, char))sub_41134D)("error\n", v3);
          system("pause");
          goto LABEL_18;
        }
        dword_423D78 += dword_41A138[100 * ++i + ++j];
      }
      ++v4;
    }
    sub_41134D("your operation can get %d points\n", dword_423D78);
    system("pause");
  }
  else
  {
    ((void (__cdecl *)(const char *, char))sub_41134D)("error\n", v3);
    system("pause");
  }
LABEL_18:
  HIDWORD(v1) = v0;
  LODWORD(v1) = 0;
  return v1;
}
```

首先生成一个数组存在。这个数组由伪随机数生成。`srand(0xCu)`随机数种子一定，那么rand出来的数也是一定的。

然后往下看，下面是自己加入了注释。

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

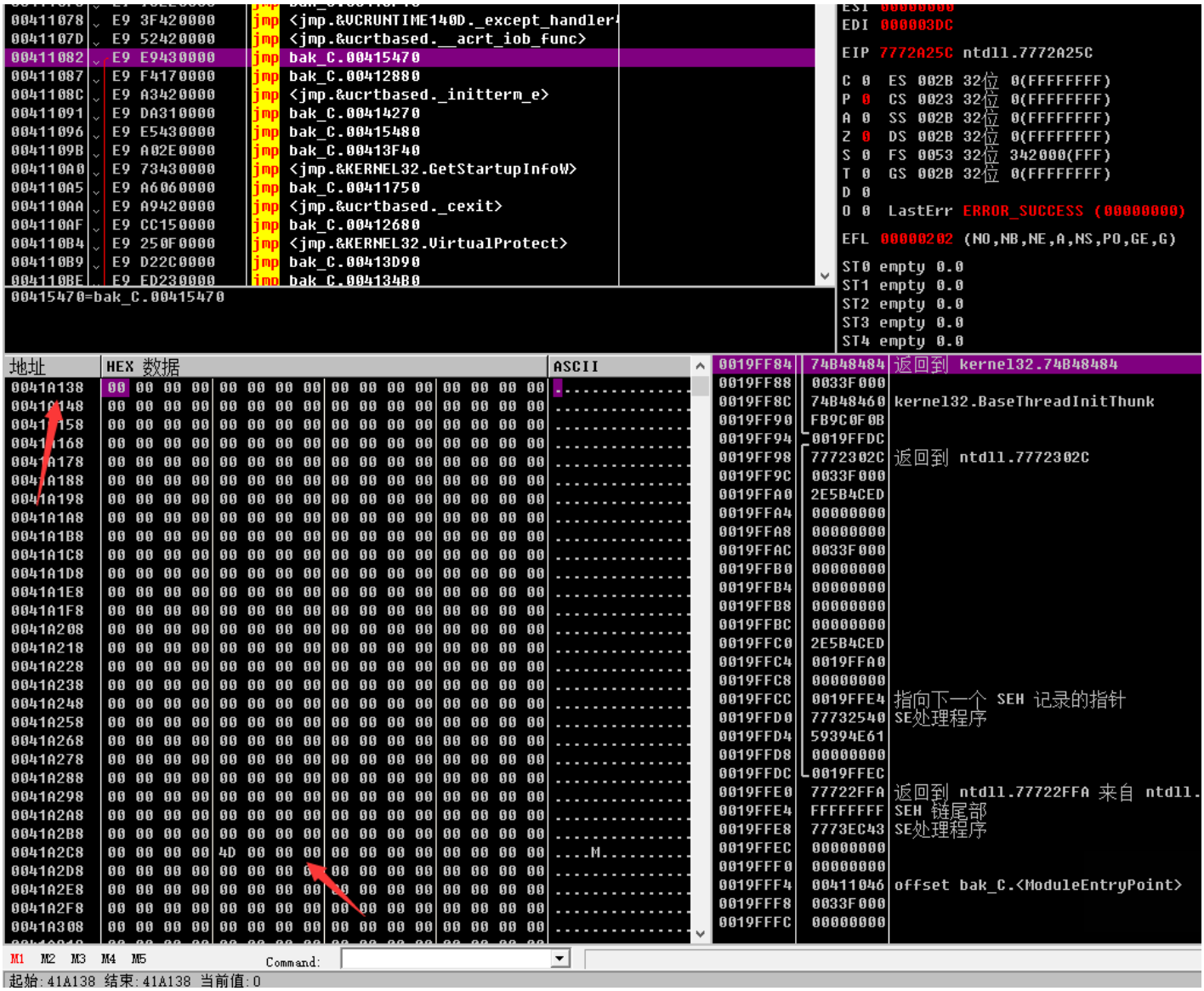
```
10  srand(0xCu);                                // 设置随机种子
11  j_memset(&unk_423D80, 0, 0x9C40u);
12  for ( i = 1; i <= 20; ++i )                 // 生成一个随机数组
13  {
14    for ( j = 1; j <= i; ++j )
15      arr[100 * i + j] = rand() % 100000;
16  }
17  printf1("input your key with your operation can get the maximum:");// 输入操作获取最大值
18  raw_input("%s", Str);
19  if ( j_strlen(Str) == 19 )                  // 长度为19
20  {
21    sub_41114F();
22    sign = 0;
23    j = 1;
24    i = 1;
25    score += arr[101];                        // 将数组第一个数加到score里 score = arr[101]
26    while ( sign < 19 )                       // 遍历用户输入
27    {
28      if ( Str[sign] == 'L' )                 // 如果输入'L' , score  = score + arr[201]
29      {
30        score += arr[100 * ++i + j];
31      }
32      else
33      {
34        if ( Str[sign] != 'R' )               // 如果输入'R' , score  = score + arr[202]
35        {
36          printf1("error\n");                 // 不为R或L 输出error 退出
37          system("pause");
38          goto LABEL_18;
39        }
40        score += arr[100 * ++i + ++j];
41      }
42      ++sign;
43    }
44    printf1("your operation can get %d points\n", score);// 输出分数
45    system("pause");
46  }
47  else
48  {
49    printf1("error\n");
50    system("pause");
51  }
```

总得来看就是先将从`arr[101]` 相加，往下的循环为：

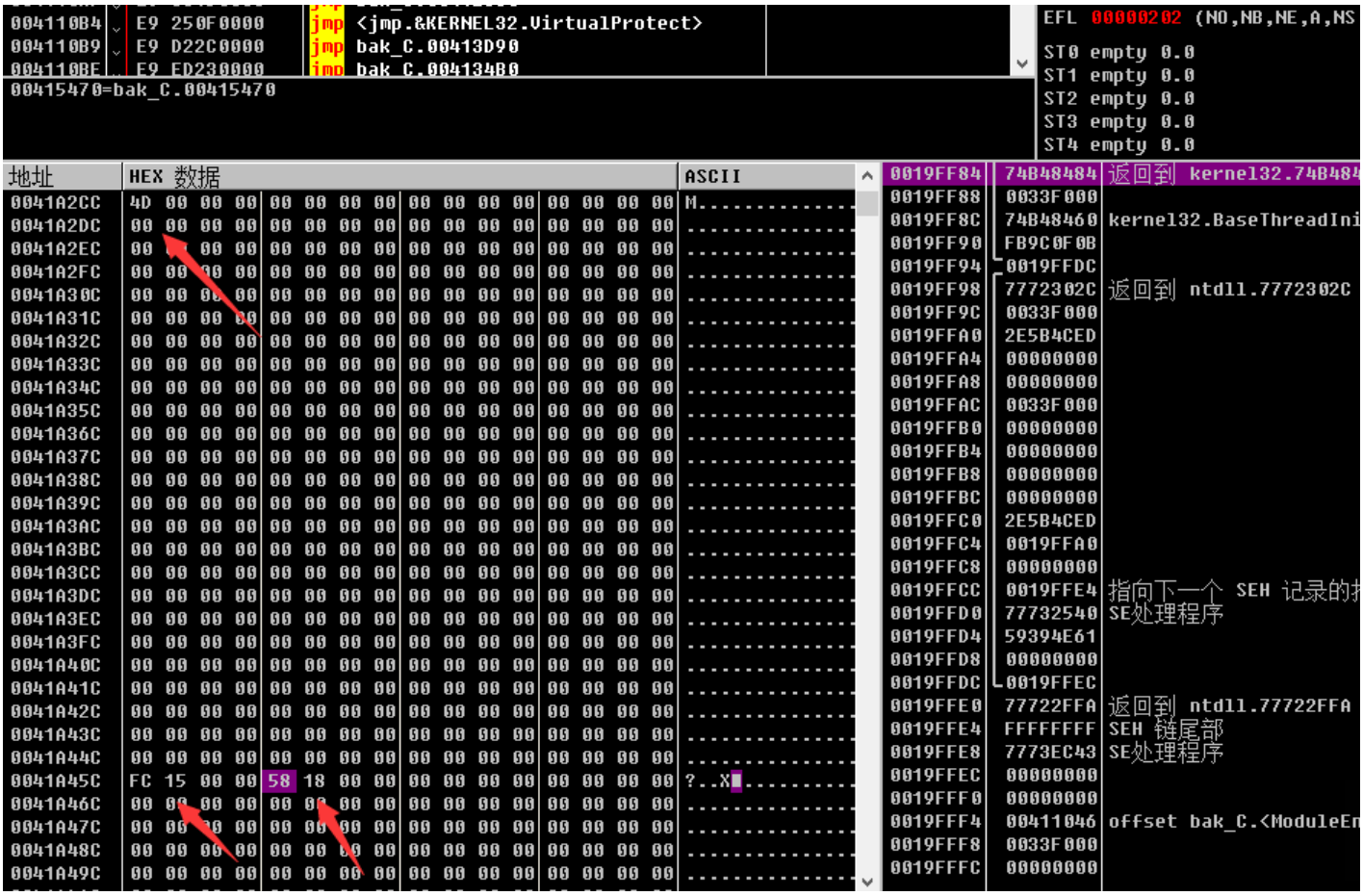
1. 第一次循环：经过用户按"L"或"R"来控制加`arr[201]`还是`arr[202]`
2. 第二次循环：**(情况1)**第一次选择了`arr[201]`:经过用户按"L"或"R"来控制加`arr[301]`还是`arr[302]` **(情况2)**第二次选择了`arr[202]`:经过用户按"L"或"R"来控制加`arr[302]`还是`arr[303]`

跟两次循环帮组理解，这样子就很清楚了。整个题可以理解成站在山顶往下走，每一行走到的数字累加，每次只能走一格（左或右），走到最后一行。然后最后的数要最大。与题目Mountain climbing呼应

那首先要先找到这座山，看ida反编译后是`dword_41A138`存在`0041A138`,我们用`OD`载入后运后，跟过去看看。



dword是4字节的，而且第一个数是存在在[101]位置的。所以首位置存在`41A2CC`位置。往下的都是往后400节。



还是要注意小端存储问题。所以可以得到arr[101] = 4D(16进制) =77 , arr[201] = 15FC(16进制) = 5628(10进制) , arr[202] = 1858(16进制) = 6232(10进制)

有耐心的话可以一行行扣出来，没有的话，直接还原c代码生成"一座山"。
代码如下：

```
srand(0xCu);
for (int i = 1; i <= 20; ++i)
{
    for (int j = 1; j <= i; ++j)
        arr[100 * i + j] = rand() % 100000;
}


for (int i = 1; i <= 20; ++i)
{
    for (int j = 1; j <= i; ++j)
        printf("%5d ", arr[100 * i + j]);
    cout << endl;
}
```

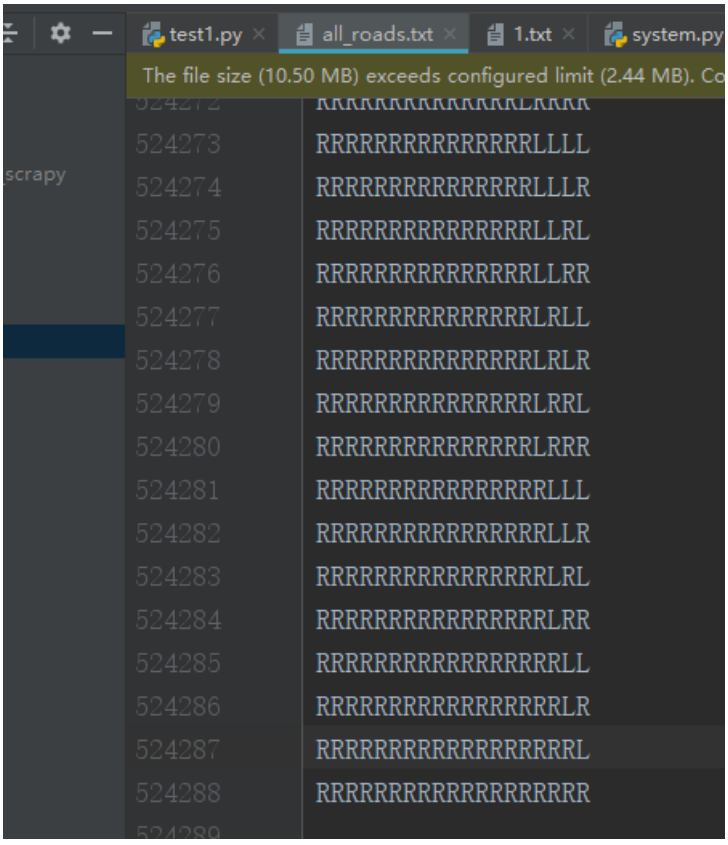
得到完整的，与OD获取的值是一致。

```
   77
 5628  6232
29052  1558 26150
12947 29926 11981 22371
 4078 28629  4665  2229 24699
27370  3081 18012 24965  2064 26890
21054  5225 11777 29853  2956 22439  3341
31337 14755  5689 24855  4173 32304   292  5344
15512 12952  1868 10888 19581 13463 32652  3409 28353
26151 14598 12455 26295 25763 26040  8285 27502 15148  4945
26170  1833  5196  9794 26804  2831 11993  2839  9979 27428  6684
 4616 30265  5752 32051 10443  9240  8095 28084 26285  8838 18784  6547
 7905  8373 19377 18502 27928 13669 25828 30502 28754 32357  2843  5401 10227
22871 20993  8558 10009  6581 22716 12808  4653 24593 21533  9407  6840 30369  2330
    3 28024 22266 19327 18114 18100 15644 21728 17292  8396 27567  2002  3830 12564  1420
29531 21820  9954  8319 10918  7978 24806 30027 17659  8764  3258 20719  6639 23556 25786 11048
 3544 31948    22  1591   644 25981 26918 31716 16427 15551 28157  7107 27297 24418 24384 32438
12285 12601 13235 21606  2516 13095 27080 16331 23295 20696 31580 28758 10697  4730 16055 22208
```

接下来就是找到最大解的路线。直接遍历所有路线，然后比较最大数。

首先生成所有路径

```
#!usr/bin/env python
#!coding=utf-8

__author__ = 'zhengjim'

import itertools

words = "LR"
r = itertools.product(words,repeat=19)
f = open("all_roads.txt",'a')
for i in r:
    f.write("".join(i)+"\n")
f.close()
```



然后将每个走法得到的值进行判断大小，最大的值就是我们要的答案。

```
#!usr/bin/env python
#!coding=utf-8

__author__ = 'zhengjim'


s = [
    [77],
    [5628, 6232],
    [29052, 1558, 26150],
    [12947, 29926, 11981, 22371],
    [4078, 28629, 4665, 2229, 24699],
    [27370, 3081, 18012, 24965, 2064, 26890],
    [21054, 5225, 11777, 29853, 2956, 22439, 3341],
    [31337, 14755, 5689, 24855, 4173, 32304, 292, 5344],
    [15512, 12952, 1868, 10888, 19581, 13463, 32652, 3409, 28353],
    [26151, 14598, 12455, 26295, 25763, 26040, 8285, 27502, 15148, 4945],
    [26170, 1833, 5196, 9794, 26804, 2831, 11993, 2839, 9979, 27428, 6684],
    [4616, 30265, 5752, 32051, 10443, 9240, 8095, 28084, 26285, 8838, 18784, 6547],
    [7905, 8373, 19377, 18502, 27928, 13669, 25828, 30502, 28754, 32357, 2843, 5401, 10227],
    [22871, 20993, 8558, 10009, 6581, 22716, 12808, 4653, 24593, 21533, 9407, 6840, 30369, 2330],
    [3, 28024, 22266, 19327, 18114, 18100, 15644, 21728, 17292, 8396, 27567, 2002, 3830, 12564, 1420],
    [29531, 21820, 9954, 8319, 10918, 7978, 24806, 30027, 17659, 8764, 3258, 20719, 6639, 23556, 25786, 110
    [3544, 31948, 22, 1591, 644, 25981, 26918, 31716, 16427, 15551, 28157, 7107, 27297, 24418, 24384, 32438
    [12285, 12601, 13235, 21606, 2516, 13095, 27080, 16331, 23295, 20696, 31580, 28758, 10697, 4730, 16055,
    [16325, 24537, 16778, 17119, 18198, 28537, 11813, 1490, 21034, 1978, 6451, 2174, 24812, 28772, 5283, 64
    [7299, 6961, 32019, 24731, 29103, 17887, 17338, 26840, 13216, 8789, 12474, 24299, 19818, 18218, 14564,

all_score = {}
with open('all_roads.txt', 'r')as f:
    for line in f.readlines():
        row = 0
        go = 0
        score = s[row][go]
        for i in line:
            if i == 'L':
                row += 1
                score += s[row][go]
            elif i == 'R':
                row += 1
                go += 1
                score += s[row][go]
        all_score[line] = score

max_road = max(all_score, key=all_score.get)
print(max_road, all_score[max_road])
```

得到了最大路径:RRRRRLLRRRLRLRRRLRL和最大值444740。

在程序输入却还是error

```
input your key with your operation can get the maximum:RRRRRLLRRRLRLRRRLRL
error
请按任意键继续. . .
```

不知道是哪错了，又看了一遍程序，发现第22行的sub_41114F(Str)对我们输入的数据进行了处理。
跟进去,发现又调用了sub_411900(Str)在跟进去，发现调用了sub_4110A5(nullsub_1, sub_411994 - nullsub_1, 4)。再跟进去。

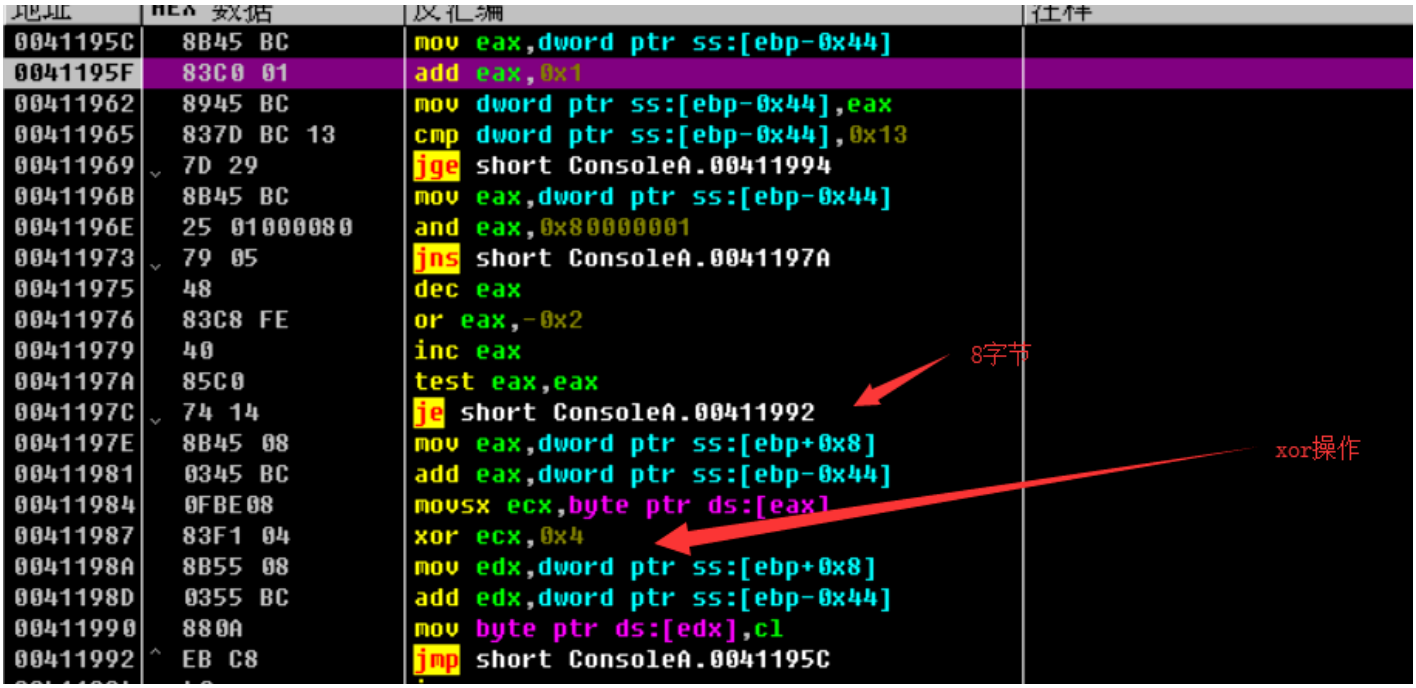
```
1 int __cdecl sub_4110A5(LPCVOID lpAddress, int a2, int a3)
2 {
3   return sub_411750(lpAddress, a2, a3);
4 }
```

再往里跟。sub_411750(lpAddress, a2, a3 = 4);

```
1  BOOL __cdecl sub_411750(LPCVOID lpAddress, int a2, int a3)
2  {
3    int v3; // ST1C_4
4    DWORD flOldProtect; // [esp+D4h] [ebp-2Ch]
5    struct _MEMORY_BASIC_INFORMATION Buffer; // [esp+E0h] [ebp-20h]
6
7    VirtualQuery(lpAddress, &Buffer, 0x1Cu);
8    VirtualProtect(Buffer.BaseAddress, Buffer.RegionSize, 0x40u, &Buffer.Protect);
9    while ( 1 )
10   {
11     v3 = a2--;
12     if ( !v3 )
13       break;
14     *lpAddress ^= a3;
15     lpAddress = lpAddress + 1;
16   }
17   return VirtualProtect(Buffer.BaseAddress, Buffer.RegionSize, Buffer.Protect, &flOldProtect);
18 }
```

结合OD来查看。

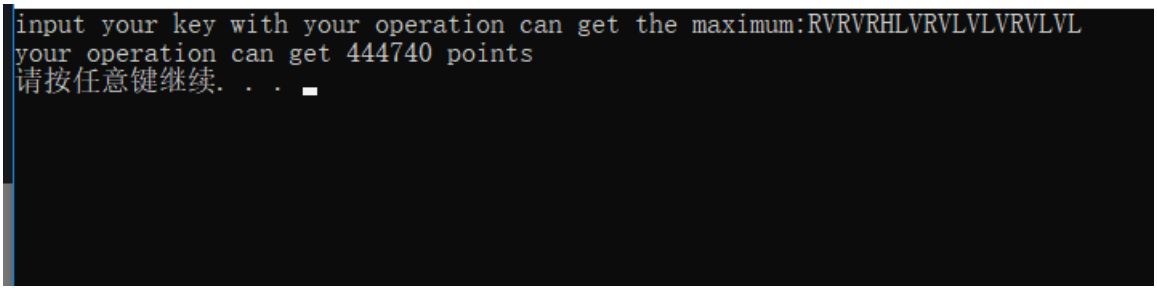
前面几行是往内存获取值理解成获取用户输入。因为调用到了内存，所以结合OD来查看。



因为一个dword占了4字节，所以8字节为第二字符。所以就是偶数位的字符与传入的4进行xor运算。

```
#!usr/bin/env python
#!coding=utf-8

__author__ = 'zhengjim'

max_road = 'RRRRRLLRRRLRLRRRLRL'
flag = ''
for i, s in enumerate(max_road):
    if (i - 1) % 2 == 0:
        flag += chr(ord(s) ^ 4)
    else:
        flag += s
print(flag)
```

得到flag：`RVRVRHLVRVLVLVRVLVL`



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