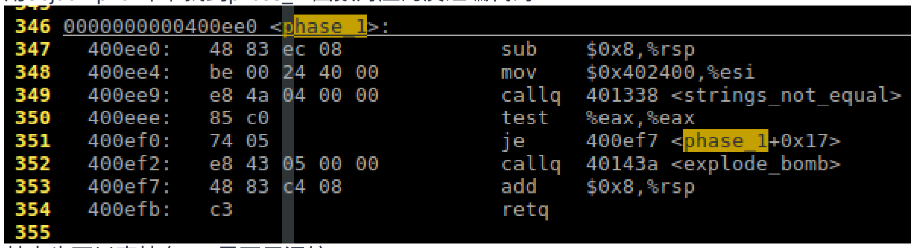
15213-ICS-Bomb

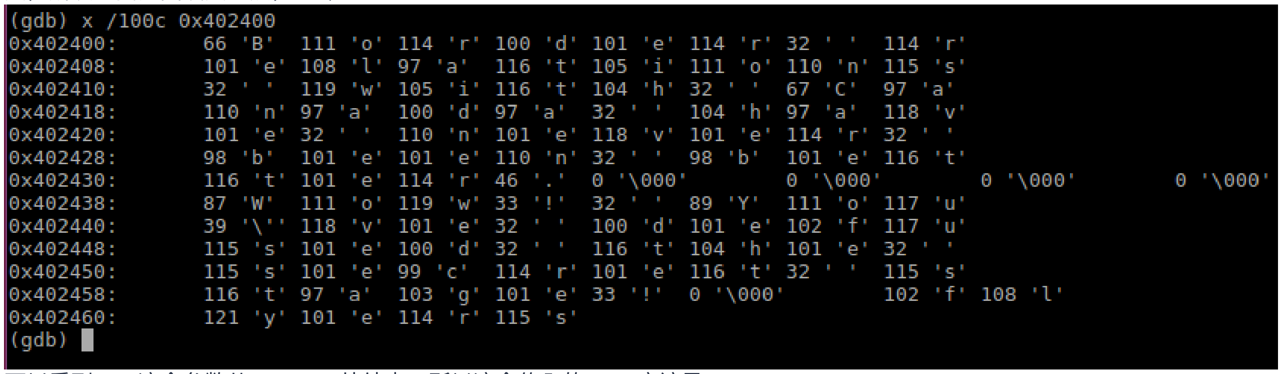
2017年8月24日 20:04

先介绍给工具：objdump
Objdump命令是用查看目标文件或者可执行的目标文件的构成的gcc工具
用objdump -d 命令找到phase_1 函数对应的反汇编代码：



```
0000000000400ee0 <phase_1>:
  400ee0:   48 83 ec 08             sub    $0x8,%rsp
  400ee4:   be 00 24 40 00          mov    $0x402400,%esi
  400ee9:   e8 4a 04 00 00          callq  401338 <strings_not_equal>
  400eee:   85 c0                   test   %eax,%eax
  400ef0:   74 05                   je     400ef7 <phase_1+0x17>
  400ef2:   e8 43 05 00 00          callq  40143a <explode_bomb>
  400ef7:   48 83 c4 08             add    $0x8,%rsp
  400efb:   c3                      retq
```

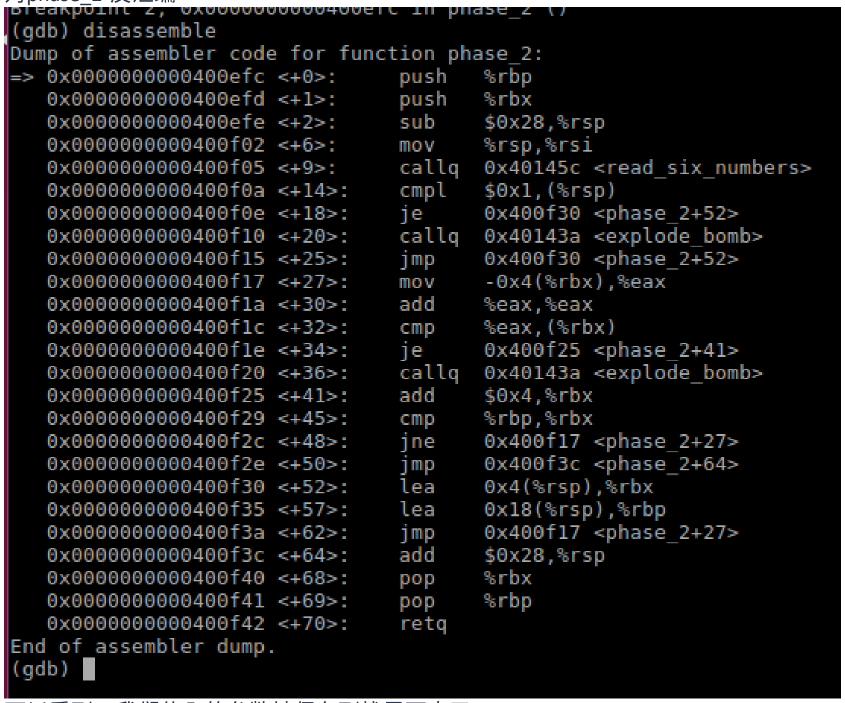
其实也可以直接在gdb里面反汇编
可以看到有把输入参数寄存器%esi里面的内容放在了0x402400里面。我们进去这个里面看看这个参数是什么（因为不知道这个string究竟有多大，所以查找范围设大一点，100）：



```
(gdb) x /100c 0x402400
0x402400:       66 'B'  111 'o' 114 'r' 100 'd' 101 'e' 114 'r' 32 ' '  114 'r'
0x402408:       101 'e' 108 'l' 97 'a'  116 't' 105 'i' 111 'o' 110 'n' 115 's'
0x402410:       32 ' '  119 'w' 105 'i' 116 't' 104 'h' 32 ' '  67 'C'  97 'a'
0x402418:       110 'n' 97 'a'  100 'd' 97 'a'  32 ' '  104 'h' 97 'a'  118 'v'
0x402420:       101 'e' 32 ' '  110 'n' 101 'e' 118 'v' 101 'e' 114 'r' 32 ' '
0x402428:       98 'b'  101 'e' 101 'e' 110 'n' 32 ' '  98 'b'  101 'e' 116 't'
0x402430:       116 't' 101 'e' 114 'r' 46 '.'  0 '\000'        0 '\000'        0 '\000'        0 '\000'
0x402438:       87 'W'  111 'o' 119 'w' 33 '!'  32 ' '  89 'Y'  111 'o' 117 'u'
0x402440:       39 '\'' 118 'v' 101 'e' 32 ' '  100 'd' 101 'e' 102 'f' 117 'u'
0x402448:       115 's' 101 'e' 100 'd' 32 ' '  116 't' 104 'h' 101 'e' 32 ' '
0x402450:       115 's' 101 'e' 99 'c'  114 'r' 101 'e' 116 't' 32 ' '  115 's'
0x402458:       116 't' 97 'a'  103 'g' 101 'e' 33 '!'  0 '\000'        102 'f' 108 'l'
0x402460:       121 'y' 101 'e' 114 'r' 115 's'
(gdb)
```

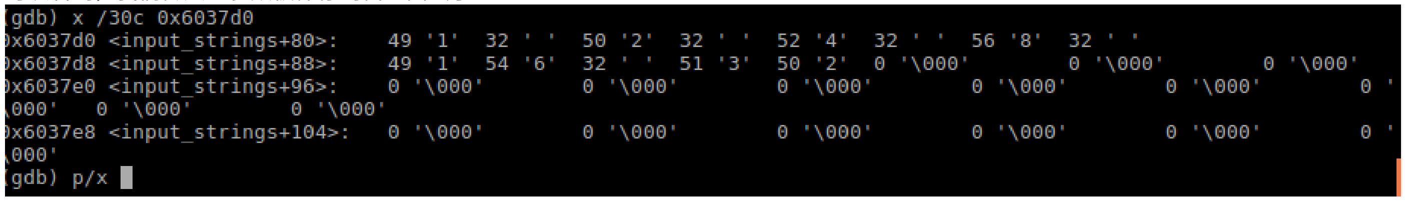
可以看到， 这个参数从0x402435处结束，所以这个传入的string应该是"Border relations with Canada ha ve never been better."
这样的话，只有当phase_1输入的参数和预设的参数相等的时候才会跳过explode_bomb函数，才能安全通过这个测试.

对phase_2 反汇编



```
Breakpoint 2, 0x0000000000400efc in phase_2 ()
(gdb) disassemble
Dump of assembler code for function phase_2:
=> 0x0000000000400efc <+0>:     push   %rbp
   0x0000000000400efd <+1>:     push   %rbx
   0x0000000000400efe <+2>:     sub    $0x28,%rsp
   0x0000000000400f02 <+6>:     mov    %rsp,%rsi
   0x0000000000400f05 <+9>:     callq  0x40145c <read_six_numbers>
   0x0000000000400f0a <+14>:    cmpl   $0x1,(%rsp)
   0x0000000000400f0e <+18>:    je     0x400f30 <phase_2+52>
   0x0000000000400f10 <+20>:    callq  0x40143a <explode_bomb>
   0x0000000000400f15 <+25>:    jmp    0x400f30 <phase_2+52>
   0x0000000000400f17 <+27>:    mov    -0x4(%rbx),%eax
   0x0000000000400f1a <+30>:    add    %eax,%eax
   0x0000000000400f1c <+32>:    cmp    %eax,(%rbx)
   0x0000000000400f1e <+34>:    je     0x400f25 <phase_2+41>
   0x0000000000400f20 <+36>:    callq  0x40143a <explode_bomb>
   0x0000000000400f25 <+41>:    add    $0x4,%rbx
   0x0000000000400f29 <+45>:    cmp    %rbp,%rbx
   0x0000000000400f2c <+48>:    jne    0x400f17 <phase_2+27>
   0x0000000000400f2e <+50>:    jmp    0x400f3c <phase_2+64>
   0x0000000000400f30 <+52>:    lea    0x4(%rsp),%rbx
   0x0000000000400f35 <+57>:    lea    0x18(%rsp),%rbp
   0x0000000000400f3a <+62>:    jmp    0x400f17 <phase_2+27>
   0x0000000000400f3c <+64>:    add    $0x28,%rsp
   0x0000000000400f40 <+68>:    pop    %rbx
   0x0000000000400f41 <+69>:    pop    %rbp
   0x0000000000400f42 <+70>:    retq
End of assembler dump.
(gdb)
```

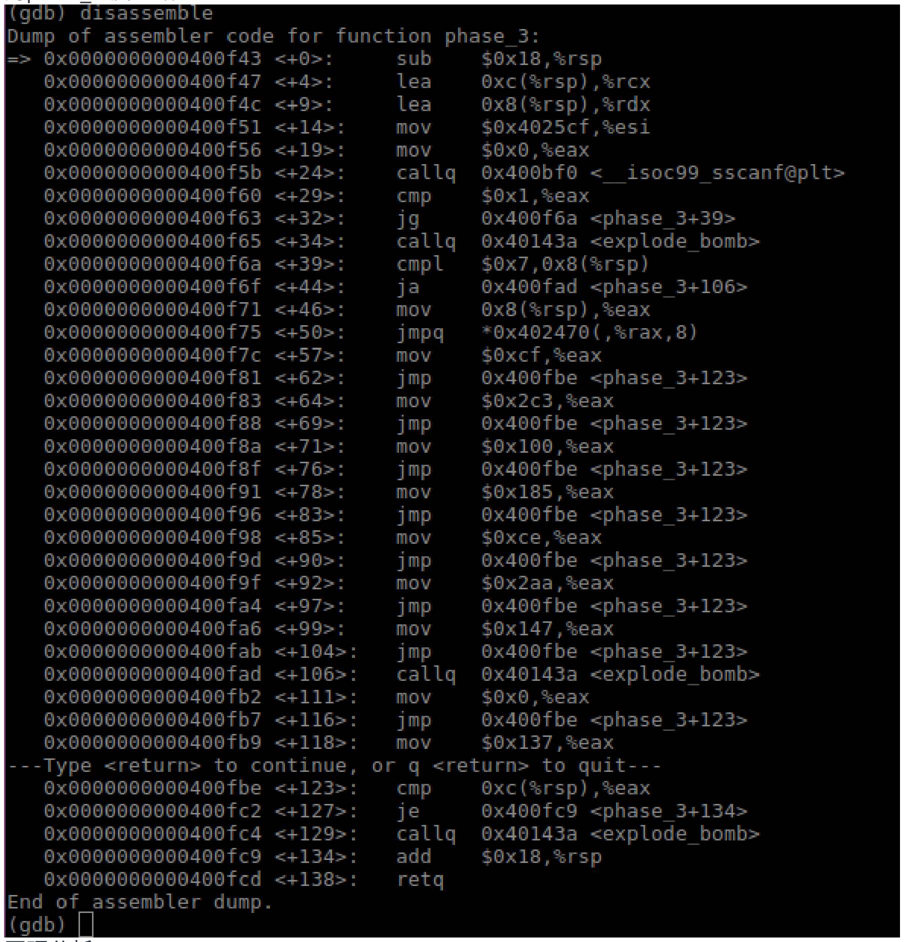
可以看到，我们传入的参数被保存到栈里面去了。



```
(gdb) x /30c 0x6037d0
)x6037d0 <input_strings+80>:    49 '1'  32 ' '  50 '2'  32 ' '  52 '4'  32 ' '  56 '8'  32 ' '
)x6037d8 <input_strings+88>:    49 '1'  54 '6'  32 ' '  51 '3'  50 '2'  0 '\000'        0 '\000'        0 '\000'
)x6037e0 <input_strings+96>:    0 '\000'        0 '\000'        0 '\000'        0 '\000'        0 '\000'        0 '
\000'   0 '\000'        0 '\000'
)x6037e8 <input_strings+104>:   0 '\000'        0 '\000'        0 '\000'        0 '\000'        0 '\000'        0 '
\000'
(gdb) p/x
```

可以看到我们传入的参数分别与1, 2, 4, 8, 16, 32 比较，相等就跳过explode_bomb 函数.

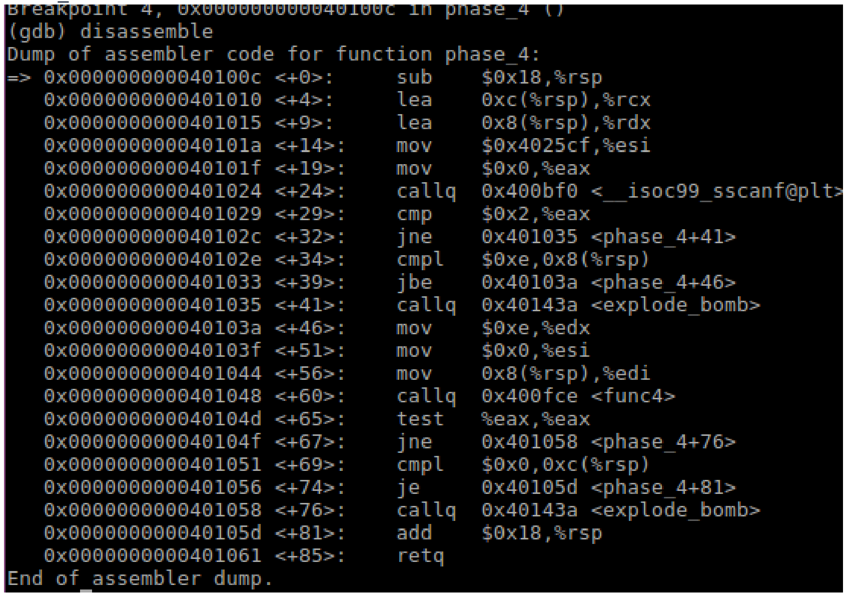
对phase_3 反汇编



```
(gdb) disassemble
Dump of assembler code for function phase_3:
=> 0x0000000000400f43 <+0>:     sub    $0x18,%rsp
   0x0000000000400f47 <+4>:     lea    0xc(%rsp),%rcx
   0x0000000000400f4c <+9>:     lea    0x8(%rsp),%rdx
   0x0000000000400f51 <+14>:    mov    $0x4025cf,%esi
   0x0000000000400f56 <+19>:    mov    $0x0,%eax
   0x0000000000400f5b <+24>:    callq  0x400bf0 <__isoc99_sscanf@plt>
   0x0000000000400f60 <+29>:    cmp    $0x1,%eax
   0x0000000000400f63 <+32>:    jg     0x400f6a <phase_3+39>
   0x0000000000400f65 <+34>:    callq  0x40143a <explode_bomb>
   0x0000000000400f6a <+39>:    cmpl   $0x7,0x8(%rsp)
   0x0000000000400f6f <+44>:    ja     0x400fad <phase_3+106>
   0x0000000000400f71 <+46>:    mov    0x8(%rsp),%eax
   0x0000000000400f75 <+50>:    jmpq   *0x402470(,%rax,8)
   0x0000000000400f7c <+57>:    mov    $0xcf,%eax
   0x0000000000400f81 <+62>:    jmp    0x400fbe <phase_3+123>
   0x0000000000400f83 <+64>:    mov    $0x2c3,%eax
   0x0000000000400f88 <+69>:    jmp    0x400fbe <phase_3+123>
   0x0000000000400f8a <+71>:    mov    $0x100,%eax
   0x0000000000400f8f <+76>:    jmp    0x400fbe <phase_3+123>
   0x0000000000400f91 <+78>:    mov    $0x185,%eax
   0x0000000000400f96 <+83>:    jmp    0x400fbe <phase_3+123>
   0x0000000000400f98 <+85>:    mov    $0xce,%eax
   0x0000000000400f9d <+90>:    jmp    0x400fbe <phase_3+123>
   0x0000000000400f9f <+92>:    mov    $0x2aa,%eax
   0x0000000000400fa4 <+97>:    jmp    0x400fbe <phase_3+123>
   0x0000000000400fa6 <+99>:    mov    $0x147,%eax
   0x0000000000400fab <+104>:   jmp    0x400fbe <phase_3+123>
   0x0000000000400fad <+106>:   callq  0x40143a <explode_bomb>
   0x0000000000400fb2 <+111>:   mov    $0x0,%eax
   0x0000000000400fb7 <+116>:   jmp    0x400fbe <phase_3+123>
   0x0000000000400fb9 <+118>:   mov    $0x137,%eax
---Type <return> to continue, or q <return> to quit---
   0x0000000000400fbe <+123>:   cmp    0xc(%rsp),%eax
   0x0000000000400fc2 <+127>:   je     0x400fc9 <phase_3+134>
   0x0000000000400fc4 <+129>:   callq  0x40143a <explode_bomb>
   0x0000000000400fc9 <+134>:   add    $0x18,%rsp
   0x0000000000400fcd <+138>:   retq
End of assembler dump.
(gdb) 
```

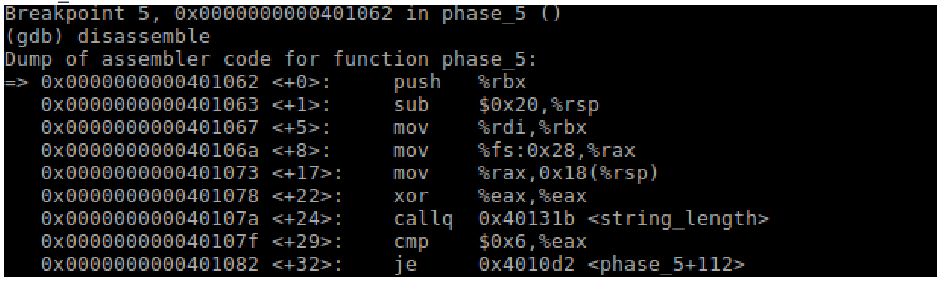
同理分析

Phase_4:

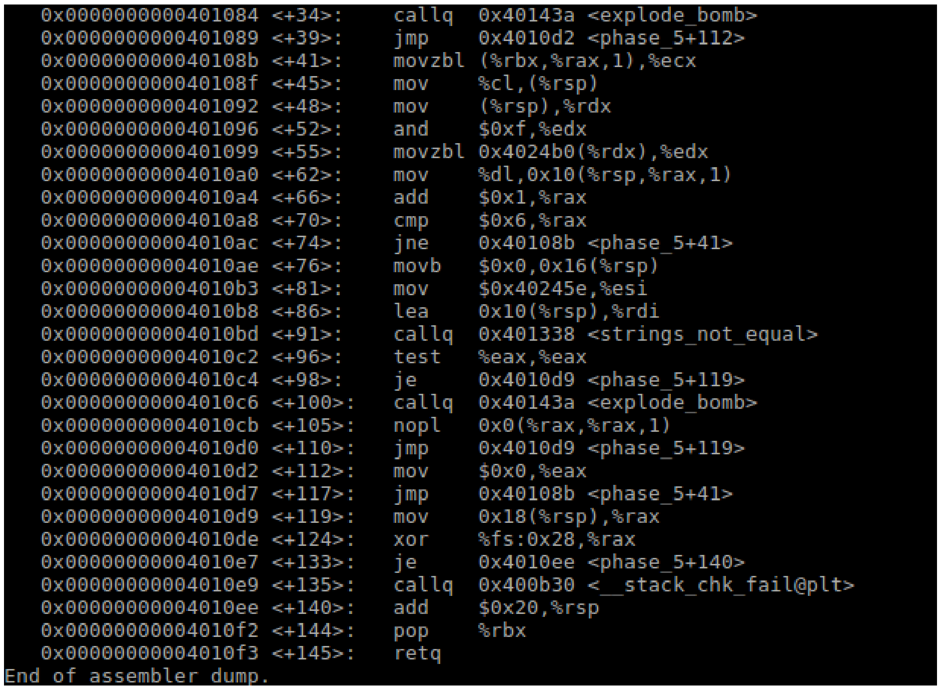


```
Breakpoint 4, 0x000000000040100c in phase_4 ()
(gdb) disassemble
Dump of assembler code for function phase_4:
=> 0x000000000040100c <+0>:     sub    $0x18,%rsp
   0x0000000000401010 <+4>:     lea    0xc(%rsp),%rcx
   0x0000000000401015 <+9>:     lea    0x8(%rsp),%rdx
   0x000000000040101a <+14>:    mov    $0x4025cf,%esi
   0x000000000040101f <+19>:    mov    $0x0,%eax
   0x0000000000401024 <+24>:    callq  0x400bf0 <__isoc99_sscanf@plt>
   0x0000000000401029 <+29>:    cmp    $0x2,%eax
   0x000000000040102c <+32>:    jne    0x401035 <phase_4+41>
   0x000000000040102e <+34>:    cmpl   $0xe,0x8(%rsp)
   0x0000000000401033 <+39>:    jbe    0x40103a <phase_4+46>
   0x0000000000401035 <+41>:    callq  0x40143a <explode_bomb>
   0x000000000040103a <+46>:    mov    $0xe,%edx
   0x000000000040103f <+51>:    mov    $0x0,%esi
   0x0000000000401044 <+56>:    mov    0x8(%rsp),%edi
   0x0000000000401048 <+60>:    callq  0x400fce <func4>
   0x000000000040104d <+65>:    test   %eax,%eax
   0x000000000040104f <+67>:    jne    0x401058 <phase_4+76>
   0x0000000000401051 <+69>:    cmpl   $0x0,0xc(%rsp)
   0x0000000000401056 <+74>:    je     0x40105d <phase_4+81>
   0x0000000000401058 <+76>:    callq  0x40143a <explode_bomb>
   0x000000000040105d <+81>:    add    $0x18,%rsp
   0x0000000000401061 <+85>:    retq
End of assembler dump.
```

Phase_5

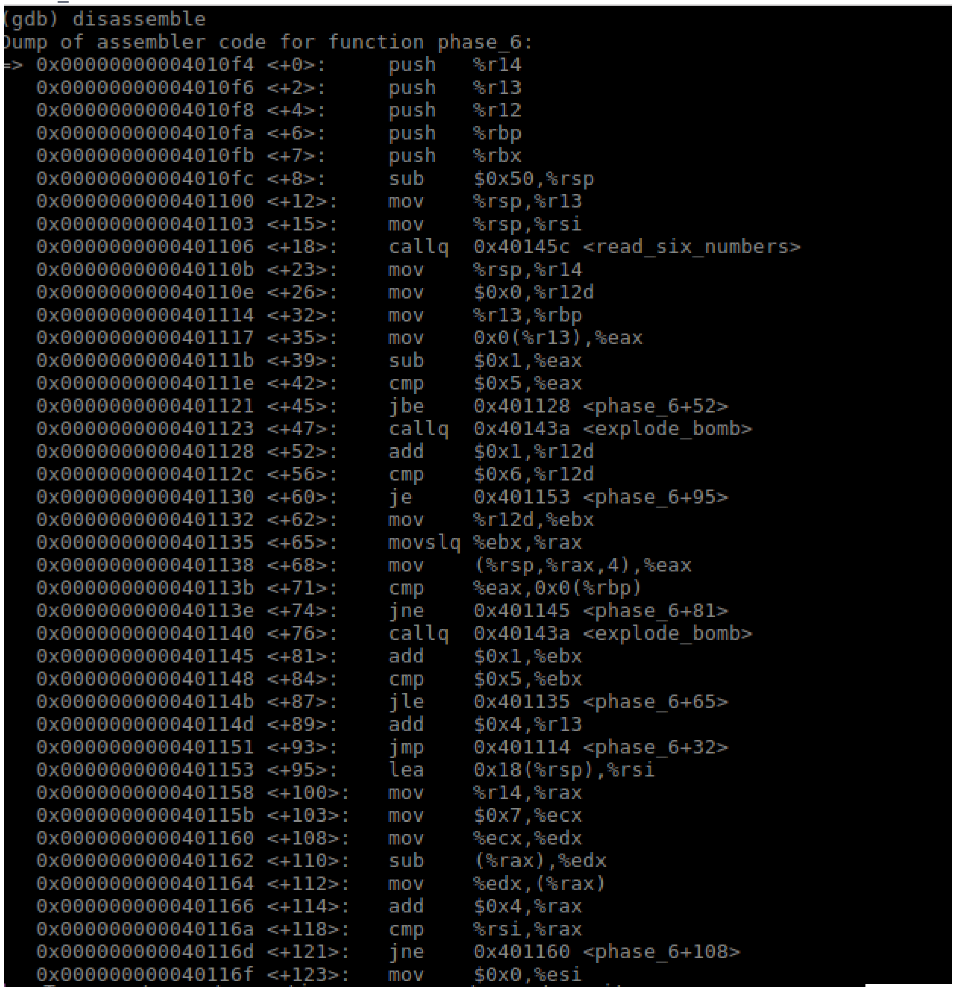


```
Breakpoint 5, 0x0000000000401062 in phase_5 ()
(gdb) disassemble
Dump of assembler code for function phase_5:
=> 0x0000000000401062 <+0>:     push   %rbx
   0x0000000000401063 <+1>:     sub    $0x20,%rsp
   0x0000000000401067 <+5>:     mov    %rdi,%rbx
   0x000000000040106a <+8>:     mov    %fs:0x28,%rax
   0x0000000000401073 <+17>:    mov    %rax,0x18(%rsp)
   0x0000000000401078 <+22>:    xor    %eax,%eax
   0x000000000040107a <+24>:    callq  0x40131b <string_length>
   0x000000000040107f <+29>:    cmp    $0x6,%eax
   0x0000000000401082 <+32>:    je     0x4010d2 <phase_5+112>
```

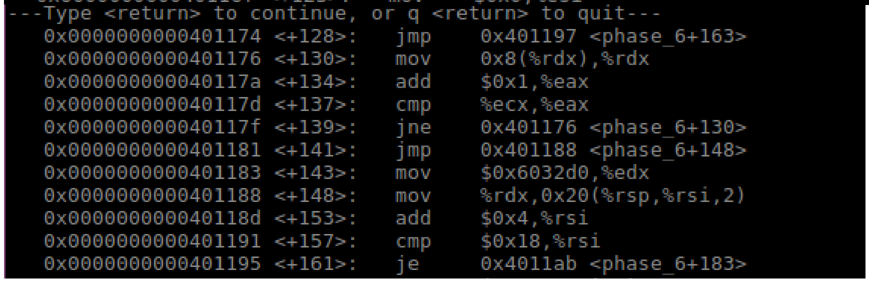


```
   0x0000000000401084 <+34>:    callq  0x40143a <explode_bomb>
   0x0000000000401089 <+39>:    jmp    0x4010d2 <phase_5+112>
   0x000000000040108b <+41>:    movzbl (%rbx,%rax,1),%ecx
   0x000000000040108f <+45>:    mov    %cl,(%rsp)
   0x0000000000401092 <+48>:    mov    (%rsp),%rdx
   0x0000000000401096 <+52>:    and    $0xf,%edx
   0x0000000000401099 <+55>:    movzbl 0x4024b0(%rdx),%edx
   0x00000000004010a0 <+62>:    mov    %dl,0x10(%rsp,%rax,1)
   0x00000000004010a4 <+66>:    add    $0x1,%rax
   0x00000000004010a8 <+70>:    cmp    $0x6,%rax
   0x00000000004010ac <+74>:    jne    0x40108b <phase_5+41>
   0x00000000004010ae <+76>:    movb   $0x0,0x16(%rsp)
   0x00000000004010b3 <+81>:    mov    $0x40245e,%esi
   0x00000000004010b8 <+86>:    lea    0x10(%rsp),%rdi
   0x00000000004010bd <+91>:    callq  0x401338 <strings_not_equal>
   0x00000000004010c2 <+96>:    test   %eax,%eax
   0x00000000004010c4 <+98>:    je     0x4010d9 <phase_5+119>
   0x00000000004010c6 <+100>:   callq  0x40143a <explode_bomb>
   0x00000000004010cb <+105>:   nopl   0x0(%rax,%rax,1)
   0x00000000004010d0 <+110>:   jmp    0x4010d9 <phase_5+119>
   0x00000000004010d2 <+112>:   mov    $0x0,%eax
   0x00000000004010d7 <+117>:   jmp    0x40108b <phase_5+41>
   0x00000000004010d9 <+119>:   mov    0x18(%rsp),%rax
   0x00000000004010de <+124>:   xor    %fs:0x28,%rax
   0x00000000004010e7 <+133>:   je     0x4010ee <phase_5+140>
   0x00000000004010e9 <+135>:   callq  0x400b30 <__stack_chk_fail@plt>
   0x00000000004010ee <+140>:   add    $0x20,%rsp
   0x00000000004010f2 <+144>:   pop    %rbx
   0x00000000004010f3 <+145>:   retq
End of assembler dump.
```

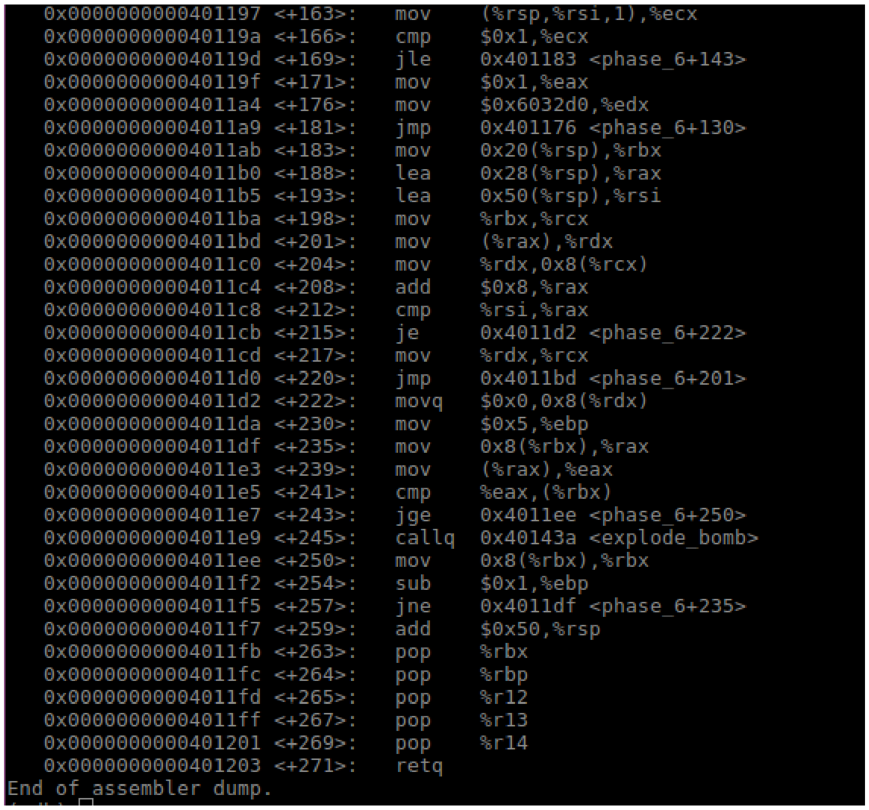
Phase_6



```
(gdb) disassemble
Dump of assembler code for function phase_6:
=> 0x00000000004010f4 <+0>:     push   %r14
   0x00000000004010f6 <+2>:     push   %r13
   0x00000000004010f8 <+4>:     push   %r12
   0x00000000004010fa <+6>:     push   %rbp
   0x00000000004010fb <+7>:     push   %rbx
   0x00000000004010fc <+8>:     sub    $0x50,%rsp
   0x0000000000401100 <+12>:    mov    %rsp,%r13
   0x0000000000401103 <+15>:    mov    %rsp,%rsi
   0x0000000000401106 <+18>:    callq  0x40145c <read_six_numbers>
   0x000000000040110b <+23>:    mov    %rsp,%r14
   0x000000000040110e <+26>:    mov    $0x0,%r12d
   0x0000000000401114 <+32>:    mov    %r13,%rbp
   0x0000000000401117 <+35>:    mov    0x0(%r13),%eax
   0x000000000040111b <+39>:    sub    $0x1,%eax
   0x000000000040111e <+42>:    cmp    $0x5,%eax
   0x0000000000401121 <+45>:    jbe    0x401128 <phase_6+52>
   0x0000000000401123 <+47>:    callq  0x40143a <explode_bomb>
   0x0000000000401128 <+52>:    add    $0x1,%r12d
   0x000000000040112c <+56>:    cmp    $0x6,%r12d
   0x0000000000401130 <+60>:    je     0x401153 <phase_6+95>
   0x0000000000401132 <+62>:    mov    %r12d,%ebx
   0x0000000000401135 <+65>:    movslq %ebx,%rax
   0x0000000000401138 <+68>:    mov    (%rsp,%rax,4),%eax
   0x000000000040113b <+71>:    cmp    %eax,0x0(%rbp)
   0x000000000040113e <+74>:    jne    0x401145 <phase_6+81>
   0x0000000000401140 <+76>:    callq  0x40143a <explode_bomb>
   0x0000000000401145 <+81>:    add    $0x1,%ebx
   0x0000000000401148 <+84>:    cmp    $0x5,%ebx
   0x000000000040114b <+87>:    jle    0x401135 <phase_6+65>
   0x000000000040114d <+89>:    add    $0x4,%r13
   0x0000000000401151 <+93>:    jmp    0x401114 <phase_6+32>
   0x0000000000401153 <+95>:    lea    0x18(%rsp),%rsi
   0x0000000000401158 <+100>:   mov    %r14,%rax
   0x000000000040115b <+103>:   mov    $0x7,%ecx
   0x0000000000401160 <+108>:   mov    %ecx,%edx
   0x0000000000401162 <+110>:   sub    (%rax),%edx
   0x0000000000401164 <+112>:   mov    %edx,(%rax)
   0x0000000000401166 <+114>:   add    $0x4,%rax
   0x000000000040116a <+118>:   cmp    %rsi,%rax
   0x000000000040116d <+121>:   jne    0x401160 <phase_6+108>
   0x000000000040116f <+123>:   mov    $0x0,%esi
```



```
---Type <return> to continue, or q <return> to quit---
   0x0000000000401174 <+128>:   jmp    0x401197 <phase_6+163>
   0x0000000000401176 <+130>:   mov    0x8(%rdx),%rdx
   0x000000000040117a <+134>:   add    $0x1,%eax
   0x000000000040117d <+137>:   cmp    %ecx,%eax
   0x000000000040117f <+139>:   jne    0x401176 <phase_6+130>
   0x0000000000401181 <+141>:   jmp    0x401188 <phase_6+148>
   0x0000000000401183 <+143>:   mov    $0x6032d0,%edx
   0x0000000000401188 <+148>:   mov    %rdx,0x20(%rsp,%rsi,2)
   0x000000000040118d <+153>:   add    $0x4,%rsi
   0x0000000000401191 <+157>:   cmp    $0x18,%rsi
   0x0000000000401195 <+161>:   je     0x4011ab <phase_6+183>
```



```
   0x0000000000401197 <+163>:   mov    (%rsp,%rsi,1),%ecx
   0x000000000040119a <+166>:   cmp    $0x1,%ecx
   0x000000000040119d <+169>:   jle    0x401183 <phase_6+143>
   0x000000000040119f <+171>:   mov    $0x1,%eax
   0x00000000004011a4 <+176>:   mov    $0x6032d0,%edx
   0x00000000004011a9 <+181>:   jmp    0x401176 <phase_6+130>
   0x00000000004011ab <+183>:   mov    0x20(%rsp),%rbx
   0x00000000004011b0 <+188>:   lea    0x28(%rsp),%rax
   0x00000000004011b5 <+193>:   lea    0x50(%rsp),%rsi
   0x00000000004011ba <+198>:   mov    %rbx,%rcx
   0x00000000004011bd <+201>:   mov    (%rax),%rdx
   0x00000000004011c0 <+204>:   mov    %rdx,0x8(%rcx)
   0x00000000004011c4 <+208>:   add    $0x8,%rax
   0x00000000004011c8 <+212>:   cmp    %rsi,%rax
   0x00000000004011cb <+215>:   je     0x4011d2 <phase_6+222>
   0x00000000004011cd <+217>:   mov    %rdx,%rcx
   0x00000000004011d0 <+220>:   jmp    0x4011bd <phase_6+201>
   0x00000000004011d2 <+222>:   movq   $0x0,0x8(%rdx)
   0x00000000004011da <+230>:   mov    $0x5,%ebp
   0x00000000004011df <+235>:   mov    0x8(%rbx),%rax
   0x00000000004011e3 <+239>:   mov    (%rax),%eax
   0x00000000004011e5 <+241>:   cmp    %eax,(%rbx)
   0x00000000004011e7 <+243>:   jge    0x4011ee <phase_6+250>
   0x00000000004011e9 <+245>:   callq  0x40143a <explode_bomb>
   0x00000000004011ee <+250>:   mov    0x8(%rbx),%rbx
   0x00000000004011f2 <+254>:   sub    $0x1,%ebp
   0x00000000004011f5 <+257>:   jne    0x4011df <phase_6+235>
   0x00000000004011f7 <+259>:   add    $0x50,%rsp
   0x00000000004011fb <+263>:   pop    %rbx
   0x00000000004011fc <+264>:   pop    %rbp
   0x00000000004011fd <+265>:   pop    %r12
   0x00000000004011ff <+267>:   pop    %r13
   0x0000000000401201 <+269>:   pop    %r14
   0x0000000000401203 <+271>:   retq
End of assembler dump.
```

Solution:

Border relations with Canada ha ve never been better.

1 2 4 8 16 32

5 206

7 0

ionefg

4 3 2 1 6 5