Case Western Reserve University

Department of Computer and Data Sciences

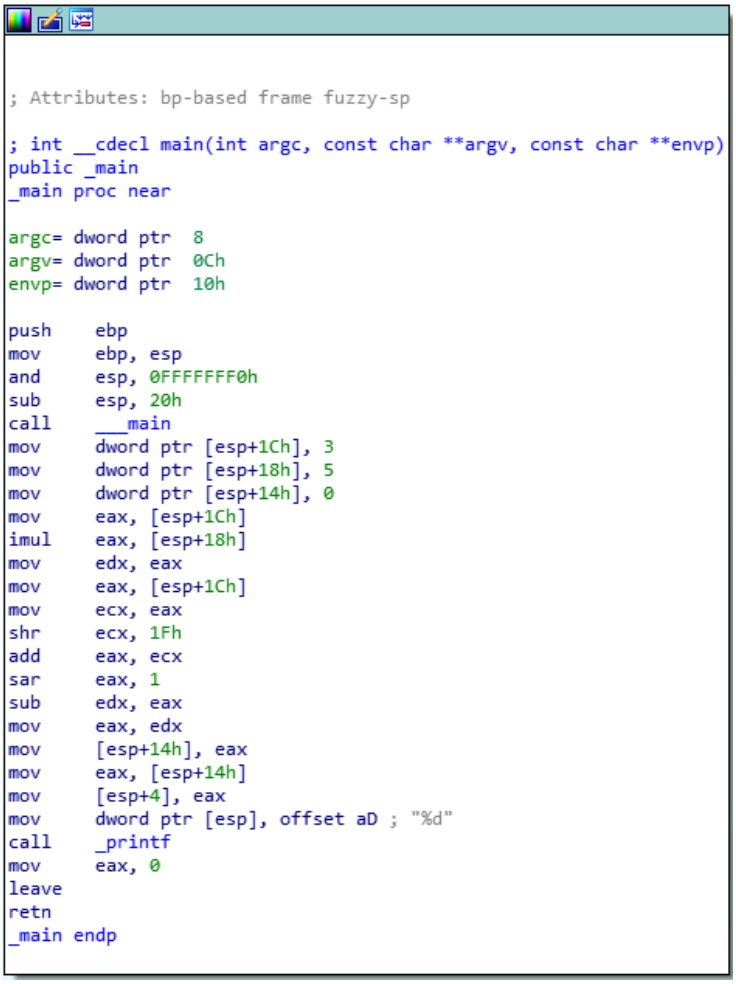
EECS 349&444: Computer Security

Assignment Date:	10/17/2019
Sumission Date:	10/23/2019@11:59pm
First Name:	
Last Name:	
Google Drive Link:	
Abstract of the feedback:	

* This is the third part of HW2 which contains 60 points. You are encouraged to finish independently. Any submitted work that it copied from any source or too similar to be an independent write-up will not be given credit. **Please post your solutions along with your detailed analysis and source codes in GitHub and provided your GitHub link for this submission on Canvas by 23:59pm on 10/23/2019.**

Q1: Assembly code is shown below. Please access its functionality and rewrite in C to printf() its output. (10pts)

```
push    ebp
mov     ebp, esp
and     esp, 0FFFFFFF0h
sub     esp, 20h
call    ___main
mov     dword ptr [esp+1Ch], 3
mov     dword ptr [esp+18h], 5
mov     dword ptr [esp+14h], 0
mov     eax, [esp+1Ch]
imul    eax, [esp+18h]
mov     edx, eax
mov     eax, [esp+1Ch]
mov     ecx, eax
shr     ecx, 1Fh
add     eax, ecx
sar     eax, 1
sub     edx, eax
mov     eax, edx
mov     [esp+14h], eax
mov     eax, [esp+14h]
mov     [esp+4], eax
mov     dword ptr [esp], offset aD ; "%d"
call    _printf
mov     eax, 0
leave
retn
_main endp
```

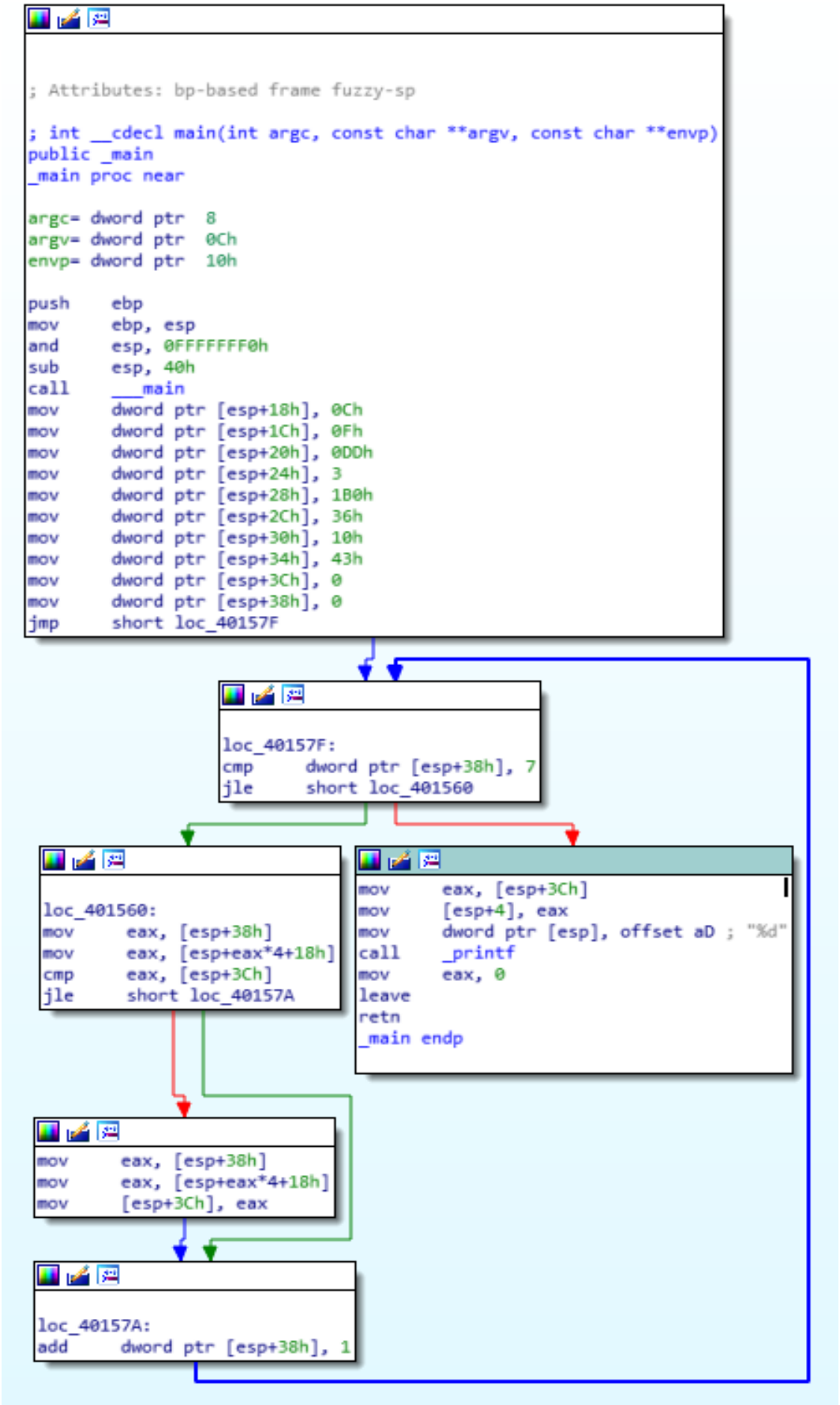


```
; Attributes: bp-based frame fuzzy-sp

; 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

push    ebp
mov     ebp, esp
and     esp, 0FFFFFFF0h
sub     esp, 20h
call    ___main
mov     dword ptr [esp+1Ch], 3
mov     dword ptr [esp+18h], 5
mov     dword ptr [esp+14h], 0
mov     eax, [esp+1Ch]
imul    eax, [esp+18h]
mov     edx, eax
mov     eax, [esp+1Ch]
mov     ecx, eax
shr     ecx, 1Fh
add     eax, ecx
sar     eax, 1
sub     edx, eax
mov     eax, edx
mov     [esp+14h], eax
mov     eax, [esp+14h]
mov     [esp+4], eax
mov     dword ptr [esp], offset aD ; "%d"
call    _printf
mov     eax, 0
leave
retn
_main endp
```

Q2: Assembly code is shown below. Please access its functionality and rewrite in C to printf() its output. (15pts)

```
.text:00401500                  push    ebp
.text:00401501                  mov     ebp, esp
.text:00401503                  and     esp, 0FFFFFFF0h
.text:00401506                  sub     esp, 40h
.text:00401509                  call    ___main
.text:0040150E                  mov     dword ptr [esp+18h], 0Ch
.text:00401516                  mov     dword ptr [esp+1Ch], 0Fh
.text:0040151E                  mov     dword ptr [esp+20h], 0DDh
.text:00401526                  mov     dword ptr [esp+24h], 3
.text:0040152E                  mov     dword ptr [esp+28h], 1B0h
.text:00401536                  mov     dword ptr [esp+2Ch], 36h
.text:0040153E                  mov     dword ptr [esp+30h], 10h
.text:00401546                  mov     dword ptr [esp+34h], 43h
.text:0040154E                  mov     dword ptr [esp+3Ch], 0
.text:00401556                  mov     dword ptr [esp+38h], 0
.text:0040155E                  jmp     short loc_40157F
.text:00401560 ; ---------------------------------------------------
.text:00401560
.text:00401560 loc_401560:                              ; CODE XREF: _main+84↓j
.text:00401560                  mov     eax, [esp+38h]
.text:00401564                  mov     eax, [esp+eax*4+18h]
.text:00401568                  cmp     eax, [esp+3Ch]
.text:0040156C                  jle     short loc_40157A
.text:0040156E                  mov     eax, [esp+38h]
.text:00401572                  mov     eax, [esp+eax*4+18h]
.text:00401576                  mov     [esp+3Ch], eax
.text:0040157A
.text:0040157A loc_40157A:                              ; CODE XREF: _main+6C↑j
.text:0040157A                  add     dword ptr [esp+38h], 1
.text:0040157F
.text:0040157F loc_40157F:                              ; CODE XREF: _main+5E↑j
.text:0040157F                  cmp     dword ptr [esp+38h], 7
.text:00401584                  jle     short loc_401560
.text:00401586                  mov     eax, [esp+3Ch]
.text:0040158A                  mov     [esp+4], eax
.text:0040158E                  mov     dword ptr [esp], offset aD ; "%d"
.text:00401595                  call    _printf
.text:0040159A                  mov     eax, 0
```

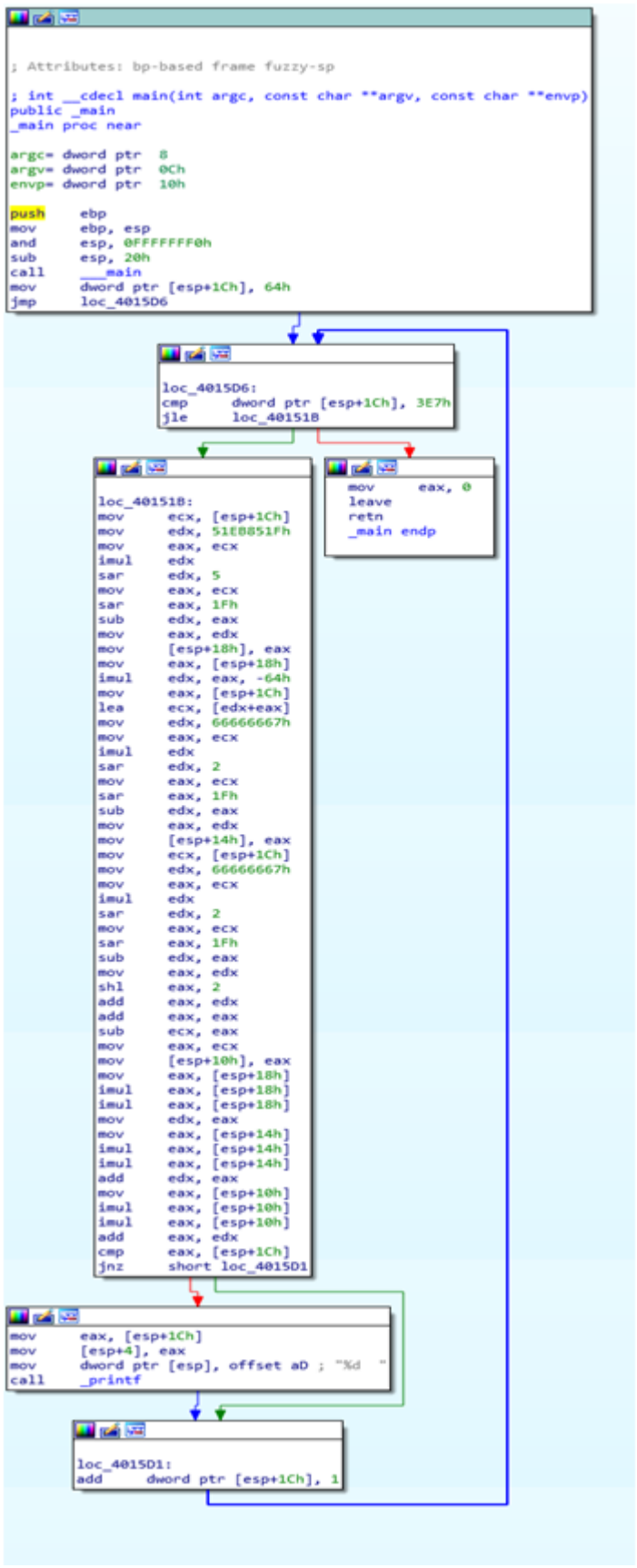
.text:0040159F leave
.text:004015A0 retn
.text:004015A0 _main endp



Q3: Assembly code is shown below. Please access its functionality and rewrite in C to printf() its output. (15pts)

```
.text:00401500                  push    ebp
.text:00401501                  mov     ebp, esp
.text:00401503                  and     esp, 0FFFFFFF0h
.text:00401506                  sub     esp, 20h
.text:00401509                  call    ___main
.text:0040150E                  mov     dword ptr [esp+1Ch], 64h
.text:00401516                  jmp     loc_4015D6
.text:0040151B ; ---------------------------------------------------------------------------
.text:0040151B
.text:0040151B loc_40151B:                                      ; CODE XREF: _main+DE↓j
.text:0040151B                  mov     ecx, [esp+1Ch]
.text:0040151F                  mov     edx, 51EB851Fh
.text:00401524                  mov     eax, ecx
.text:00401526                  imul    edx
.text:00401528                  sar     edx, 5
.text:0040152B                  mov     eax, ecx
.text:0040152D                  sar     eax, 1Fh
.text:00401530                  sub     edx, eax
.text:00401532                  mov     eax, edx
.text:00401534                  mov     [esp+18h], eax
.text:00401538                  mov     eax, [esp+18h]
.text:0040153C                  imul    edx, eax, -64h
.text:0040153F                  mov     eax, [esp+1Ch]
.text:00401543                  lea     ecx, [edx+eax]
.text:00401546                  mov     edx, 66666667h
.text:0040154B                  mov     eax, ecx
.text:0040154D                  imul    edx
.text:0040154F                  sar     edx, 2
.text:00401552                  mov     eax, ecx
.text:00401554                  sar     eax, 1Fh
.text:00401557                  sub     edx, eax
.text:00401559                  mov     eax, edx
.text:0040155B                  mov     [esp+14h], eax
.text:0040155F                  mov     ecx, [esp+1Ch]
.text:00401563                  mov     edx, 66666667h
.text:00401568                  mov     eax, ecx
.text:0040156A                  imul    edx
.text:0040156C                  sar     edx, 2
```

```
.text:0040156F                  mov     eax, ecx
.text:00401571                  sar     eax, 1Fh
.text:00401574                  sub     edx, eax
.text:00401576                  mov     eax, edx
.text:00401578                  shl     eax, 2
.text:0040157B                  add     eax, edx
.text:0040157D                  add     eax, eax
.text:0040157F                  sub     ecx, eax
.text:00401581                  mov     eax, ecx
.text:00401583                  mov     [esp+10h], eax
.text:00401587                  mov     eax, [esp+18h]
.text:0040158B                  imul    eax, [esp+18h]
.text:00401590                  imul    eax, [esp+18h]
.text:00401595                  mov     edx, eax
.text:00401597                  mov     eax, [esp+14h]
.text:0040159B                  imul    eax, [esp+14h]
.text:004015A0                  imul    eax, [esp+14h]
.text:004015A5                  add     edx, eax
.text:004015A7                  mov     eax, [esp+10h]
.text:004015AB                  imul    eax, [esp+10h]
.text:004015B0                  imul    eax, [esp+10h]
.text:004015B5                  add     eax, edx
.text:004015B7                  cmp     eax, [esp+1Ch]
.text:004015BB                  jnz     short loc_4015D1
.text:004015BD                  mov     eax, [esp+1Ch]
.text:004015C1                  mov     [esp+4], eax
.text:004015C5                  mov     dword ptr [esp], offset aD ; "%d    "
.text:004015CC                  call    _printf
.text:004015D1
.text:004015D1 loc_4015D1:                              ; CODE XREF: _main+BB↑j
.text:004015D1                  add     dword ptr [esp+1Ch], 1
.text:004015D6
.text:004015D6 loc_4015D6:                              ; CODE XREF: _main+16↑j
.text:004015D6                  cmp     dword ptr [esp+1Ch], 3E7h
.text:004015DE                  jle     loc_40151B
.text:004015E4                  mov     eax, 0
.text:004015E9                  leave
.text:004015EA                  retn
.text:004015EA _main            endp
```



Q4: Given a binary (i.e., HW2-P3-Q4), please use IDA to access its functionality and rewrite in C to printf() its output. (20pts)