리버스 엔지니어링 바이블

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2015. 10. 13.

Reverse Engineering

- 소스코드를 역추적하는 것
- 빌드된 파일의 원래의 소스코드를 파악하는 것

Register

- esp, ebp, edx, eax….

```c
#include <stdio.h>

int main()
{
        int a=0, b=1, c=2, d=3, e;
        a = b + c;
        e = c + d;
        a = a + e;

        return 0;
}
```

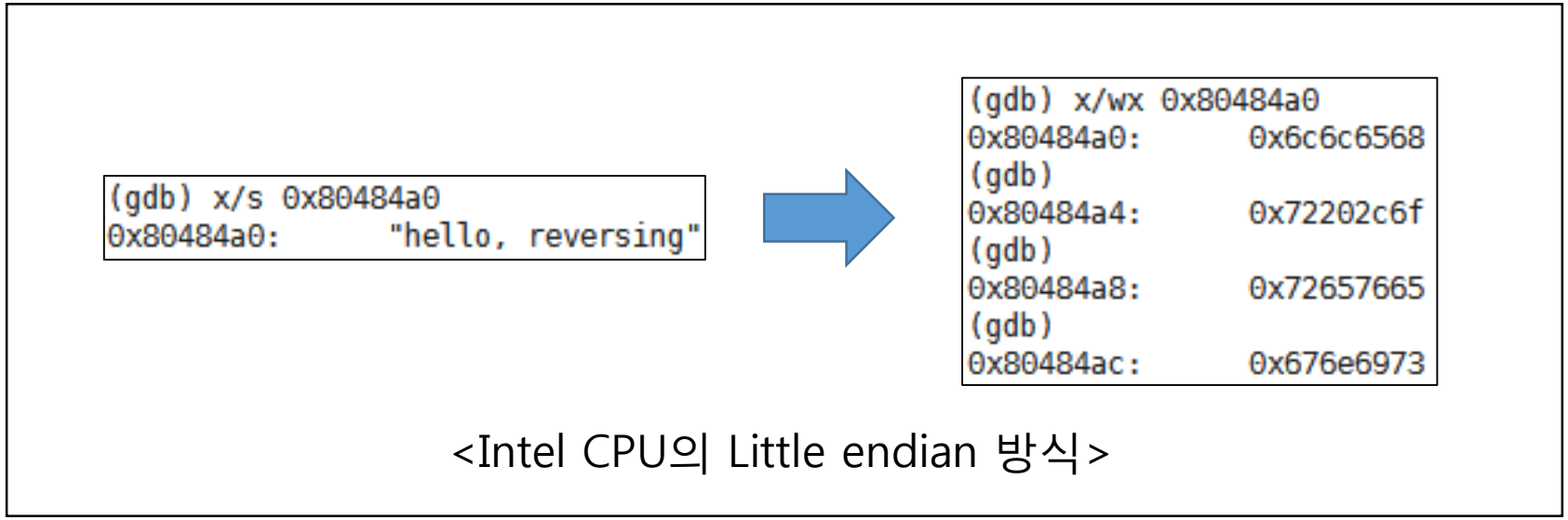
```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     sub    $0x20,%esp
   0x080483f3 <+6>:     movl   $0x0,-0x14(%ebp)
   0x080483fa <+13>:    movl   $0x1,-0x10(%ebp)
   0x08048401 <+20>:    movl   $0x2,-0xc(%ebp)
   0x08048408 <+27>:    movl   $0x3,-0x8(%ebp)
   0x0804840f <+34>:    mov    -0xc(%ebp),%eax
   0x08048412 <+37>:    mov    -0x10(%ebp),%edx
   0x08048415 <+40>:    add    %edx,%eax
   0x08048417 <+42>:    mov    %eax,-0x14(%ebp)
   0x0804841a <+45>:    mov    -0x8(%ebp),%eax
   0x0804841d <+48>:    mov    -0xc(%ebp),%edx
   0x08048420 <+51>:    add    %edx,%eax
   0x08048422 <+53>:    mov    %eax,-0x4(%ebp)
   0x08048425 <+56>:    mov    -0x4(%ebp),%eax
   0x08048428 <+59>:    add    %eax,-0x14(%ebp)
   0x0804842b <+62>:    mov    $0x0,%eax
   0x08048430 <+67>:    leave
   0x08048431 <+68>:    ret
End of assembler dump.
```

Register

레지스터 이름	역할	비고
EAX	산술 연산에 사용, 함수의 리턴값 저장	Accumulator
EDX	산술 연산에 사용	Data
ECX	반복문의 반복 횟수 저장	Counter
EBX	여분의 레지스터	-
ESI	문자열 연산에서 사용되는 Source Index	Source Index
EDI	문자열 연산에서 사용되는 Destination Index	Destination Index
EBP	현재 스택의 바닥을 가리키는 포인터	Base Pointer
ESP	현새 스택의 꼭대기를 가리키는 포인터	Stack Pointer

Endian

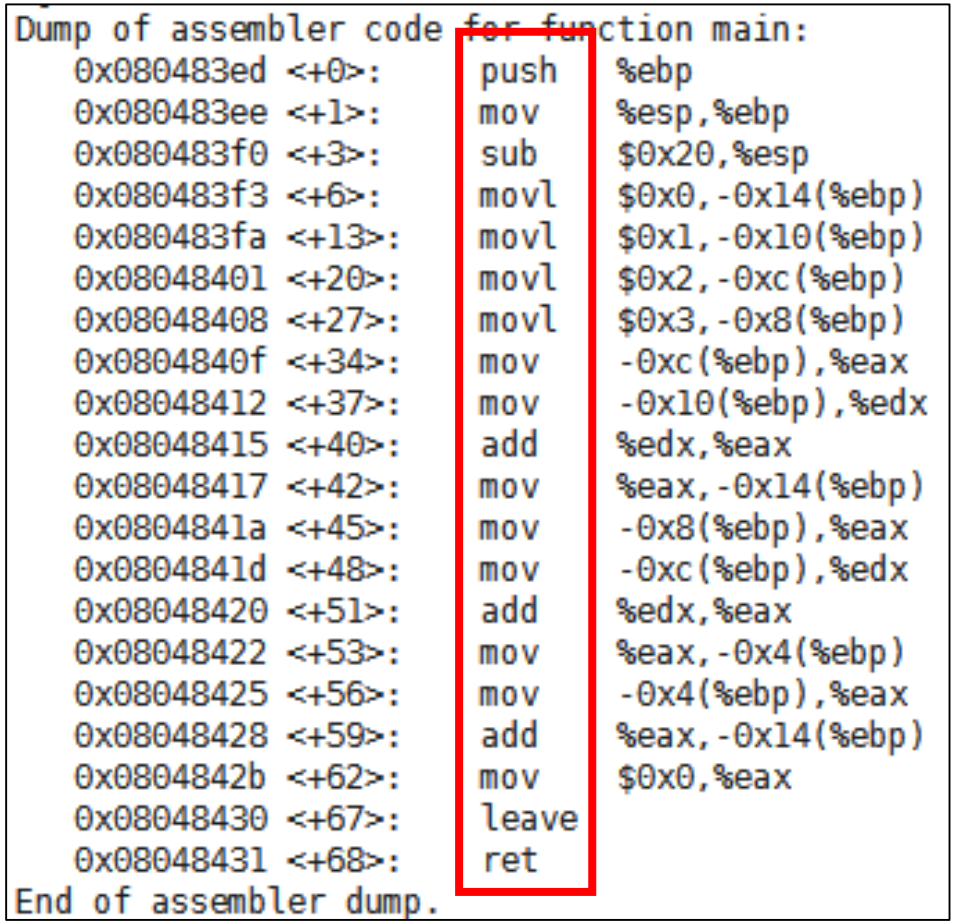
- Endian - 바이트 저장 순서, big endian & little endian
  Big endian - 흔히 사용하는 순서(왼쪽부터 시작)
  Little endian – Big endian의 반대 방향



<Intel CPU의 Little endian 방식>

Assembly Language

- push – 스택에 값을 넣는 명령
- mov – 값을 넣는 명령
- sub – 뺄셈 연산
- add – 덧셈 연산
- leave – ebp 복원
- ret – 리턴주소로 점프
- Etc.



Stack

- 함수 호출 시 파라미터가 들어가는 방향
- 리턴 주소
- 지역 변수 사용

Stack

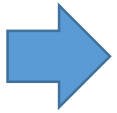
```c
#include <stdio.h>

int add(int a, int b);

int main()
{
        int a = 1, b = 2;
        add(a, b);

        return 0;
}

int add(int a, int b)
{
        return a+b;
}
```



```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     and    $0xfffffff0,%esp
   0x080483f3 <+6>:     sub    $0x20,%esp
   0x080483f6 <+9>:     movl   $0x1,0x18(%esp)
   0x080483fe <+17>:    movl   $0x2,0x1c(%esp)
   0x08048406 <+25>:    mov    0x1c(%esp),%eax
   0x0804840a <+29>:    mov    %eax,0x4(%esp)
   0x0804840e <+33>:    mov    0x18(%esp),%eax
   0x08048412 <+37>:    mov    %eax,(%esp)
   0x08048415 <+40>:    call   0x8048421 <add>
   0x0804841a <+45>:    mov    $0x0,%eax
   0x0804841f <+50>:    leave
   0x08048420 <+51>:    ret
End of assembler dump.
```

<main함수>

```
Dump of assembler code for function add:
   0x08048421 <+0>:     push   %ebp
   0x08048422 <+1>:     mov    %esp,%ebp
   0x08048424 <+3>:     mov    0xc(%ebp),%eax
   0x08048427 <+6>:     mov    0x8(%ebp),%edx
   0x0804842a <+9>:     add    %edx,%eax
   0x0804842c <+11>:    pop    %ebp
   0x0804842d <+12>:    ret
End of assembler dump.
```

<add함수>

Stack

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     and    $0xfffffff0,%esp
   0x080483f3 <+6>:     sub    $0x20,%esp
   0x080483f6 <+9>:     movl   $0x1,0x18(%esp)
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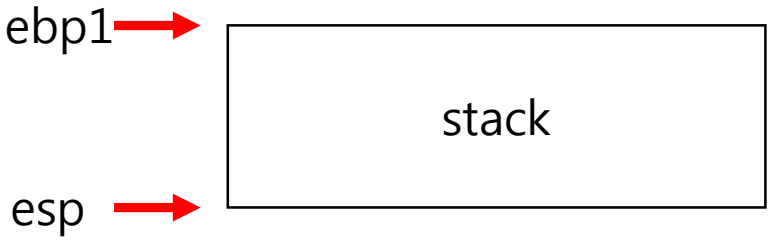
   0x08048412 <+37>:    mov    %eax,(%esp)
   0x08048415 <+40>:    call   0x8048421 <add>
   0x0804841a <+45>:    mov    $0x0,%eax
   0x0804841f <+50>:    leave
   0x08048420 <+51>:    ret
End of assembler dump.
```



Stack

- call main

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     and    $0xfffffff0,%esp
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   0x08048406 <+25>:    mov    0x1c(%esp),%eax
   0x0804840a <+29>:    mov    %eax,0x4(%esp)
   0x0804840e <+33>:    mov    0x18(%esp),%eax
   0x08048412 <+37>:    mov    %eax,(%esp)
   0x08048415 <+40>:    call   0x8048421 <add>
   0x0804841a <+45>:    mov    $0x0,%eax
   0x0804841f <+50>:    leave
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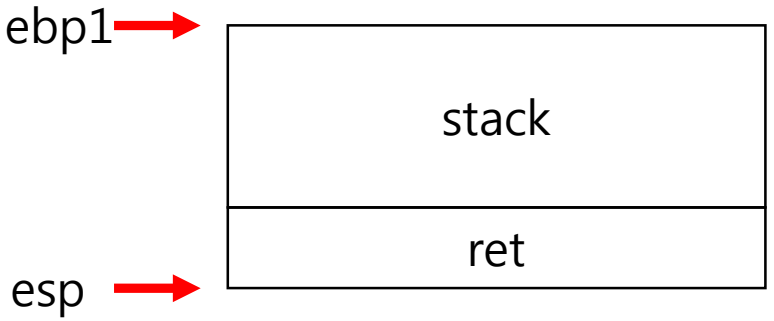
End of assembler dump.
```



Stack

- push %ebp

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
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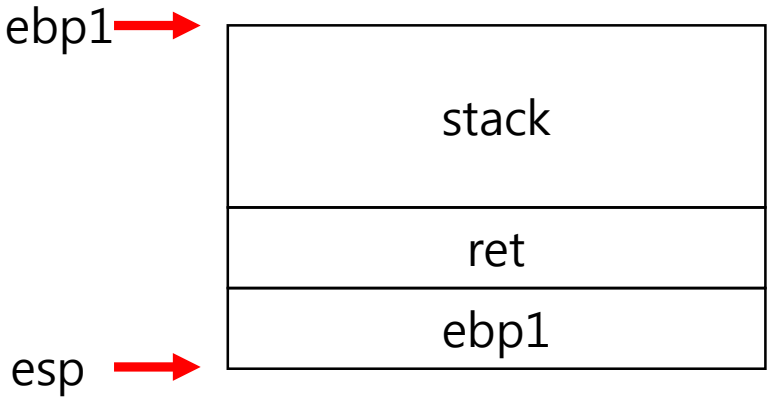
End of assembler dump.
```



Stack

- mov %esp, %ebp

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
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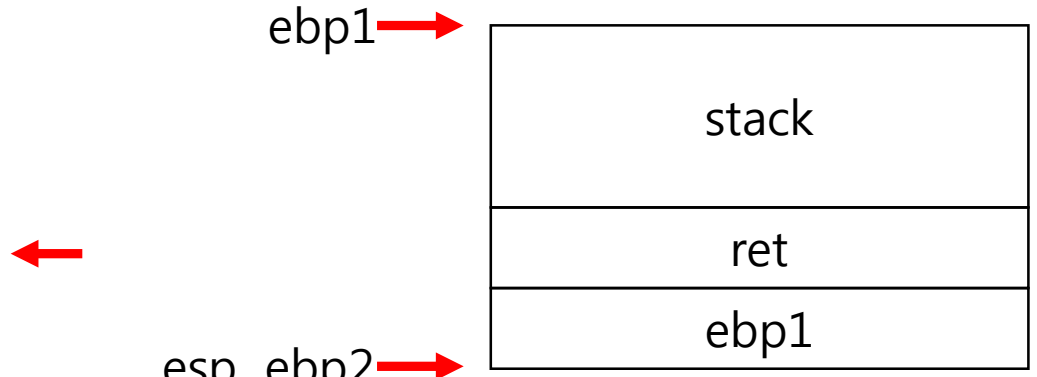
End of assembler dump.
```



Stack

- and $0xfffffff0, %esp

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     and    $0xfffffff0,%esp
   0x080483f3 <+6>:     sub    $0x20,%esp
   0x080483f6 <+9>:     movl   $0x1,0x18(%esp)
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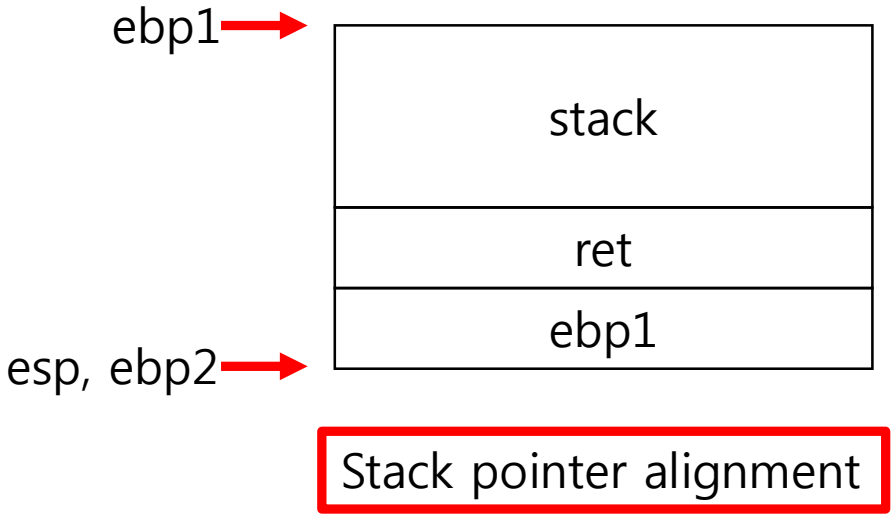
   0x0804841f <+50>:    leave
   0x08048420 <+51>:    ret
End of assembler dump.
```



Stack

- sub $0x20, %esp

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     and    $0xfffffff0,%esp
   0x080483f3 <+6>:     sub    $0x20,%esp
   0x080483f6 <+9>:     movl   $0x1,0x18(%esp)
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   0x08048406 <+25>:    mov    0x1c(%esp),%eax
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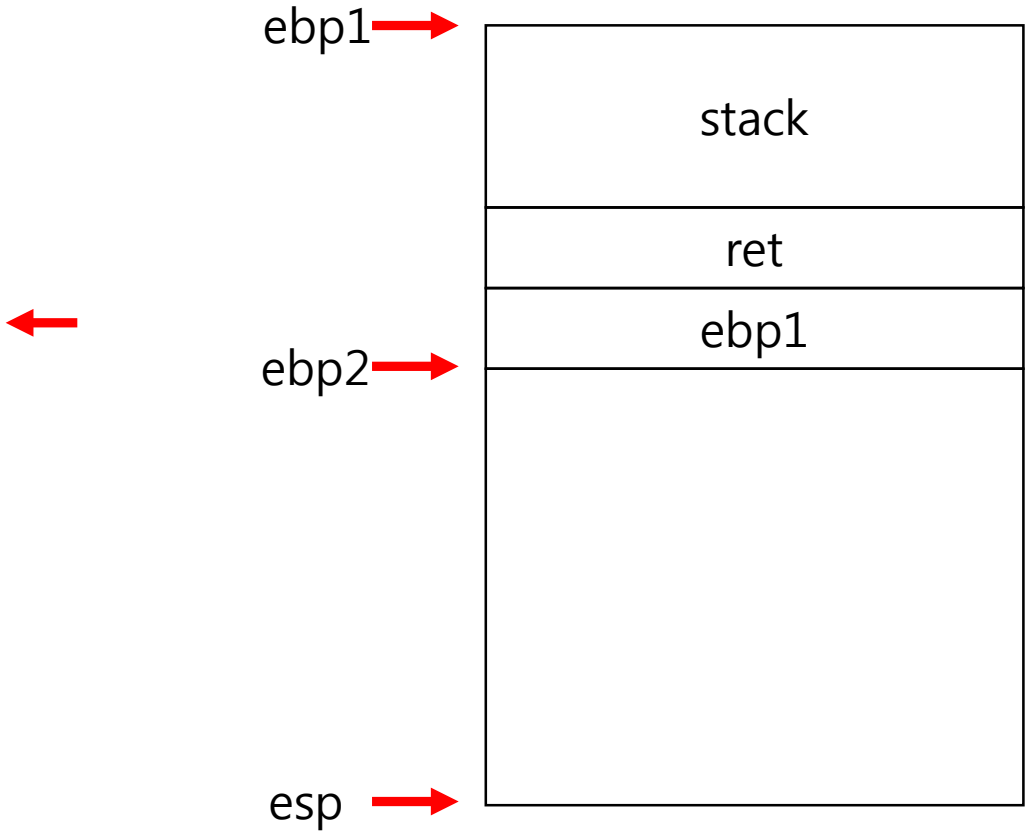
   0x0804840e <+33>:    mov    0x18(%esp),%eax
   0x08048412 <+37>:    mov    %eax,(%esp)
   0x08048415 <+40>:    call   0x8048421 <add>
   0x0804841a <+45>:    mov    $0x0,%eax
   0x0804841f <+50>:    leave
   0x08048420 <+51>:    ret
End of assembler dump.
```



Stack

- movl $0x1, 0x18(%esp)

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
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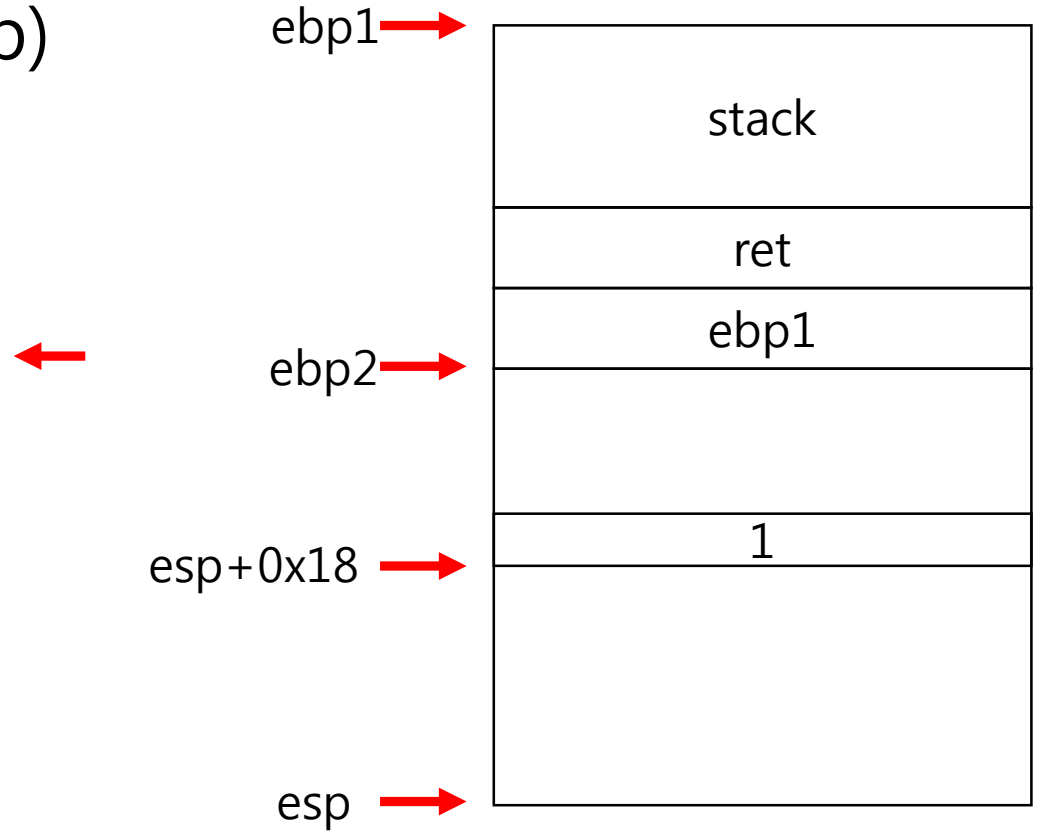
   0x0804841a <+45>:    mov    $0x0,%eax
   0x0804841f <+50>:    leave
   0x08048420 <+51>:    ret
End of assembler dump.
```



Stack

- movl $0x1, 0x18(%esp)

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
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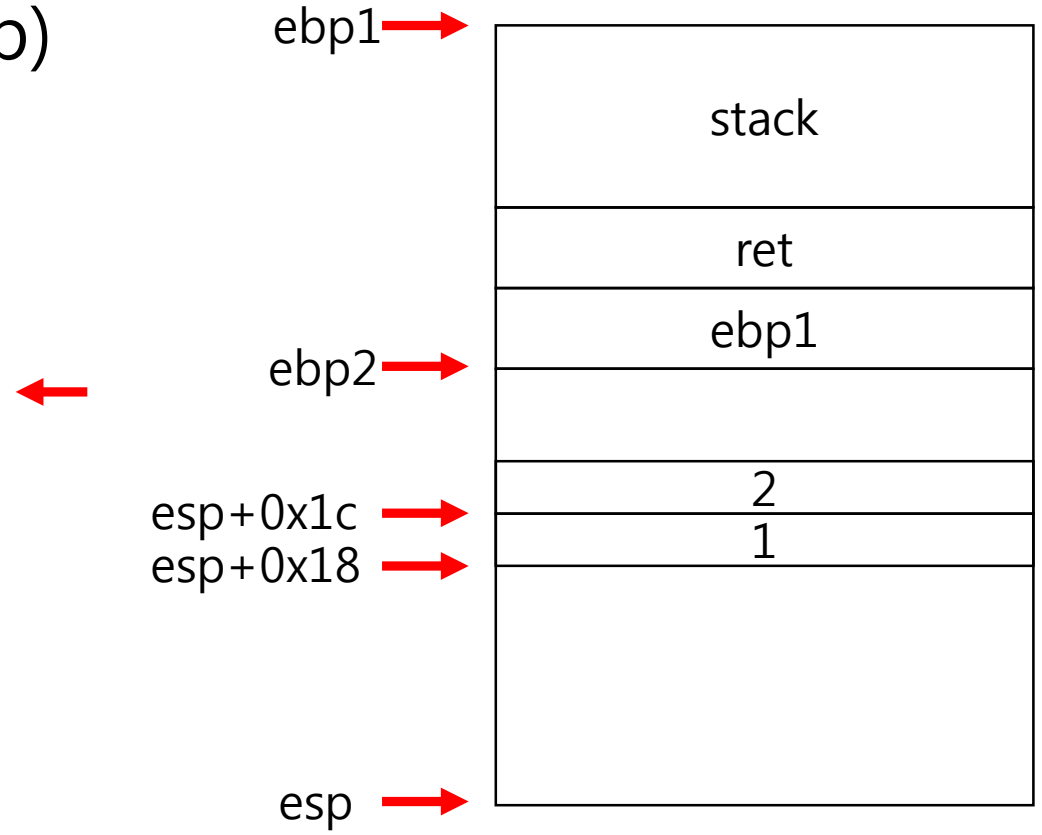
End of assembler dump.
```



Stack

- mov 0x1c(%esp), %eax

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
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   0x08048415 <+40>:    call   0x8048421 <add>
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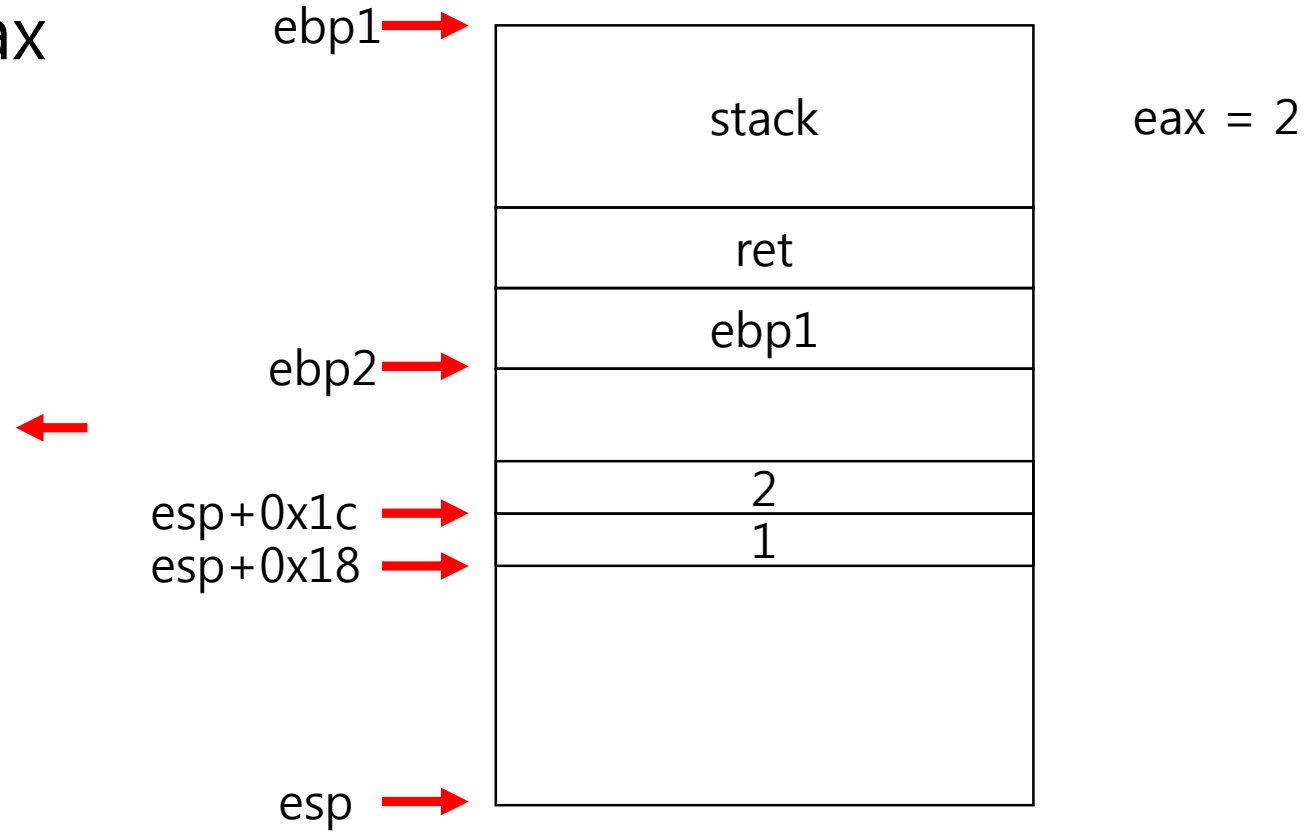
End of assembler dump.
```



Stack

- mov %eax, 0x4(%esp)

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     and    $0xfffffff0,%esp
   0x080483f3 <+6>:     sub    $0x20,%esp
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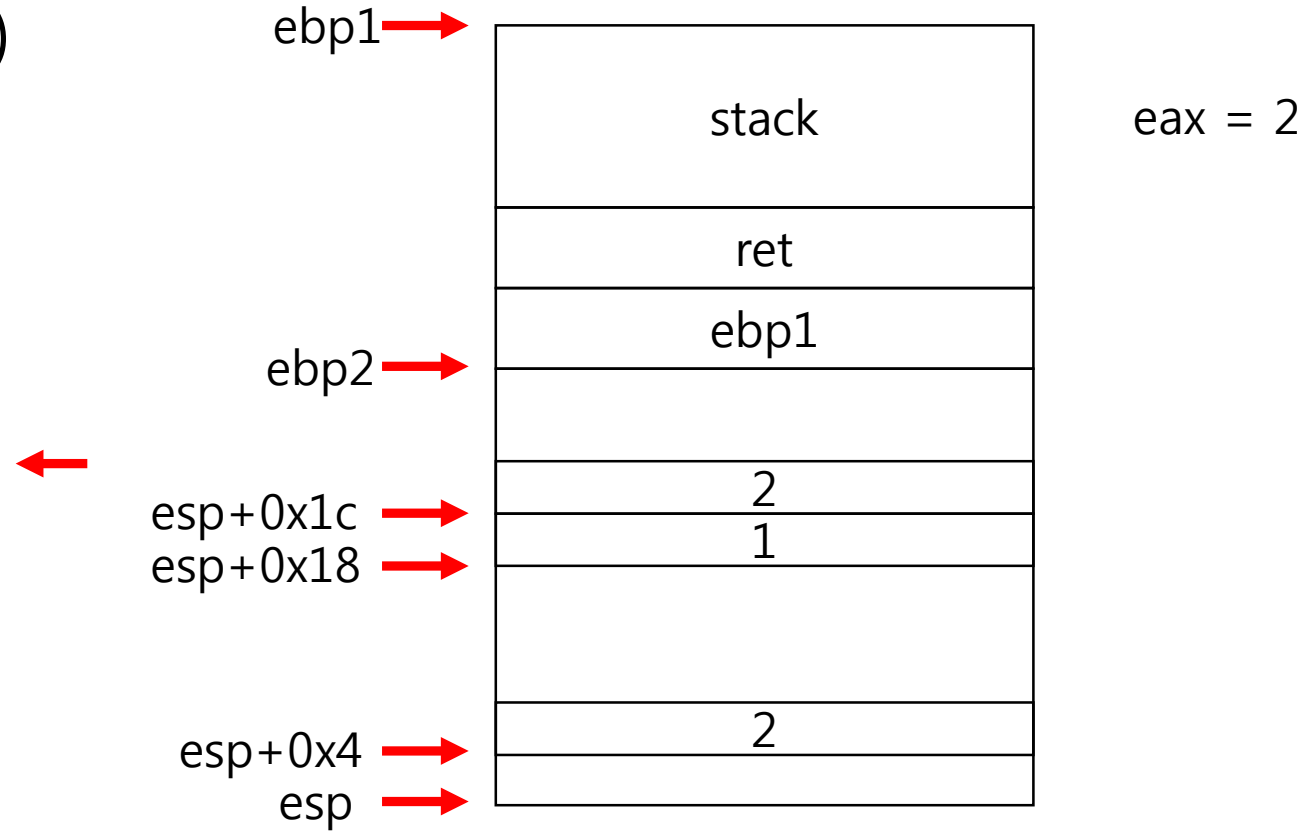
   0x0804841a <+45>:    mov    $0x0,%eax
   0x0804841f <+50>:    leave
   0x08048420 <+51>:    ret
End of assembler dump.
```



Stack

- mov 0x18(%esp), %eax

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     and    $0xfffffff0,%esp
   0x080483f3 <+6>:     sub    $0x20,%esp
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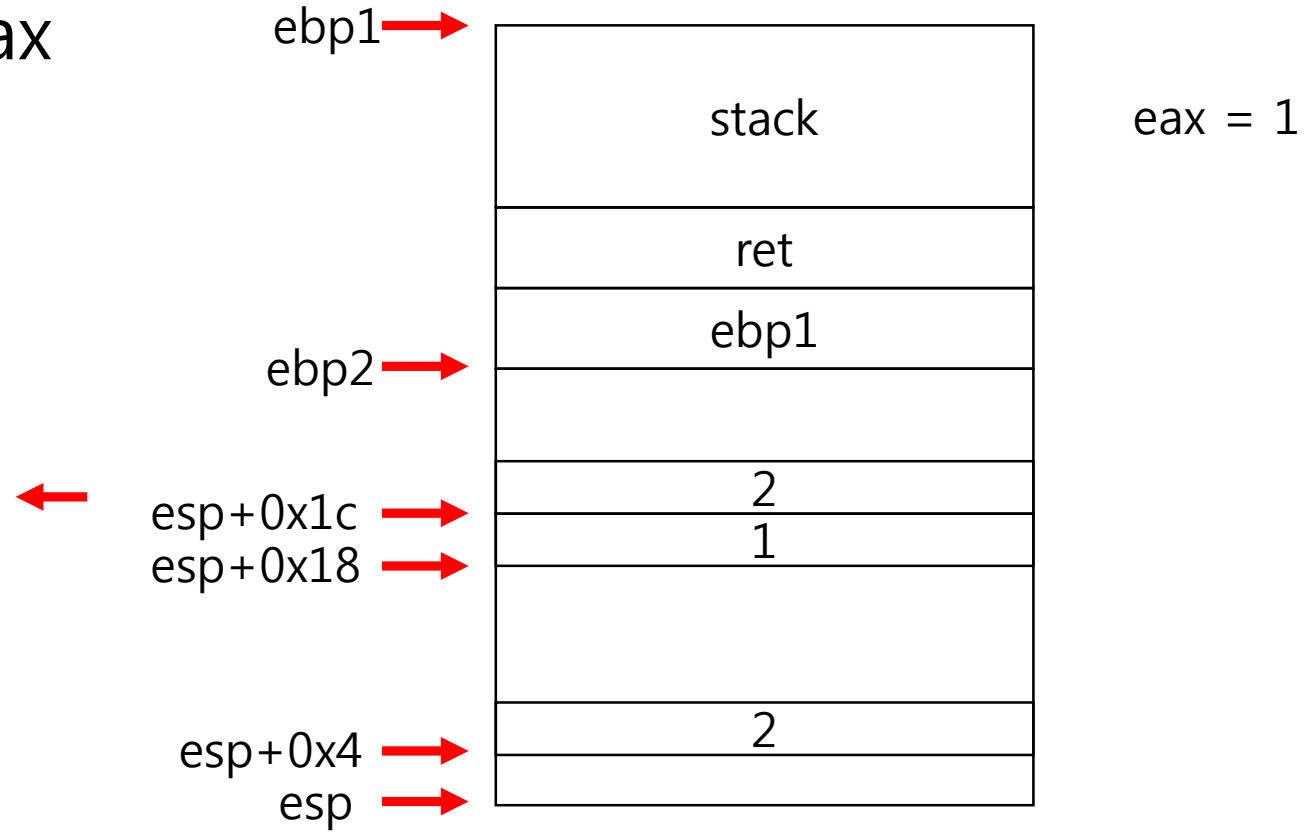
End of assembler dump.
```



Stack

- mov %eax, (%esp)

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     and    $0xfffffff0,%esp
   0x080483f3 <+6>:     sub    $0x20,%esp
   0x080483f6 <+9>:     movl   $0x1,0x18(%esp)
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   0x08048406 <+25>:    mov    0x1c(%esp),%eax
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End of assembler dump.
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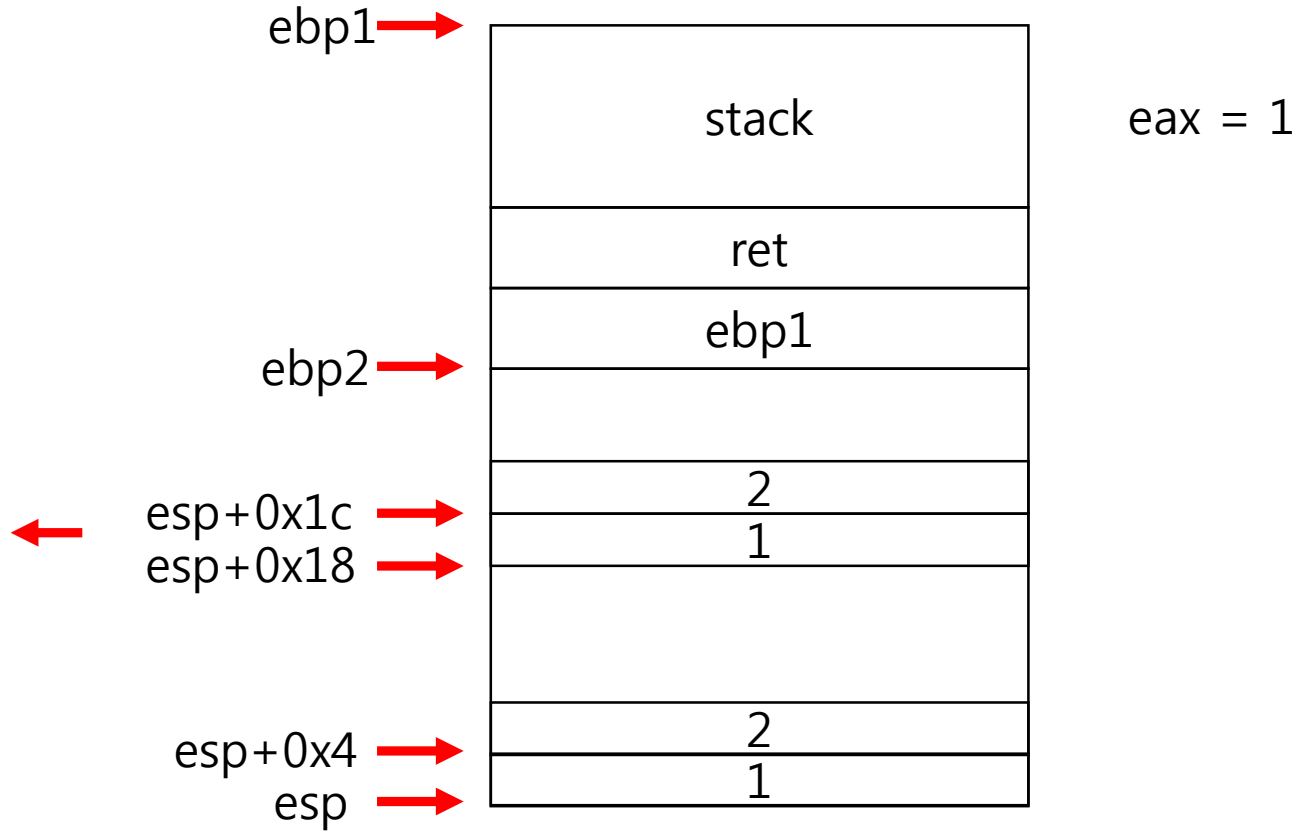
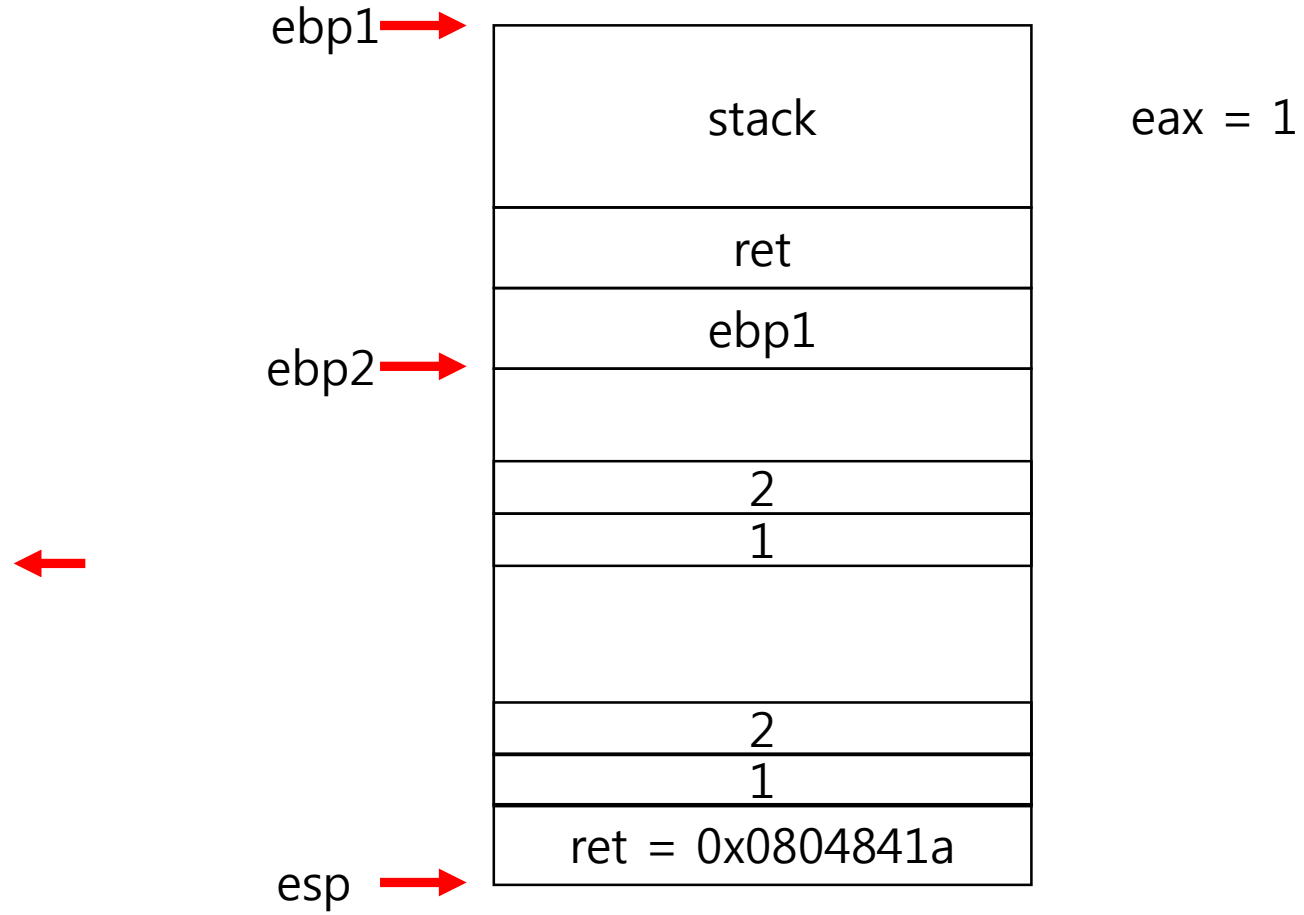


Stack

- call add

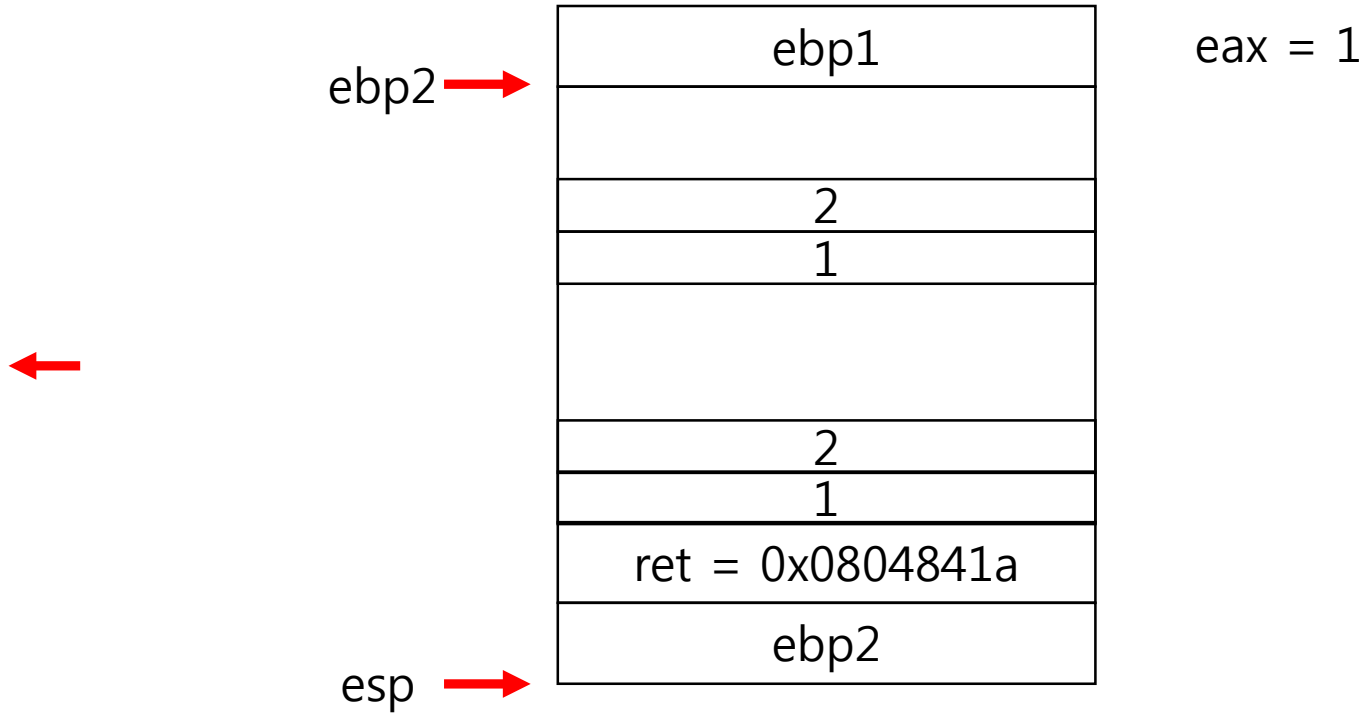
```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     and    $0xfffffff0,%esp
   0x080483f3 <+6>:     sub    $0x20,%esp
   0x080483f6 <+9>:     movl   $0x1,0x18(%esp)
   0x080483fe <+17>:    movl   $0x2,0x1c(%esp)
   0x08048406 <+25>:    mov    0x1c(%esp),%eax
   0x0804840a <+29>:    mov    %eax,0x4(%esp)
   0x0804840e <+33>:    mov    0x18(%esp),%eax
   0x08048412 <+37>:    mov    %eax,(%esp)
   0x08048415 <+40>:    call   0x8048421 <add>
   0x0804841a <+45>:    mov    $0x0,%eax
   0x0804841f <+50>:    leave
   0x08048420 <+51>:    ret
End of assembler dump.
```



Stack

- push %ebp

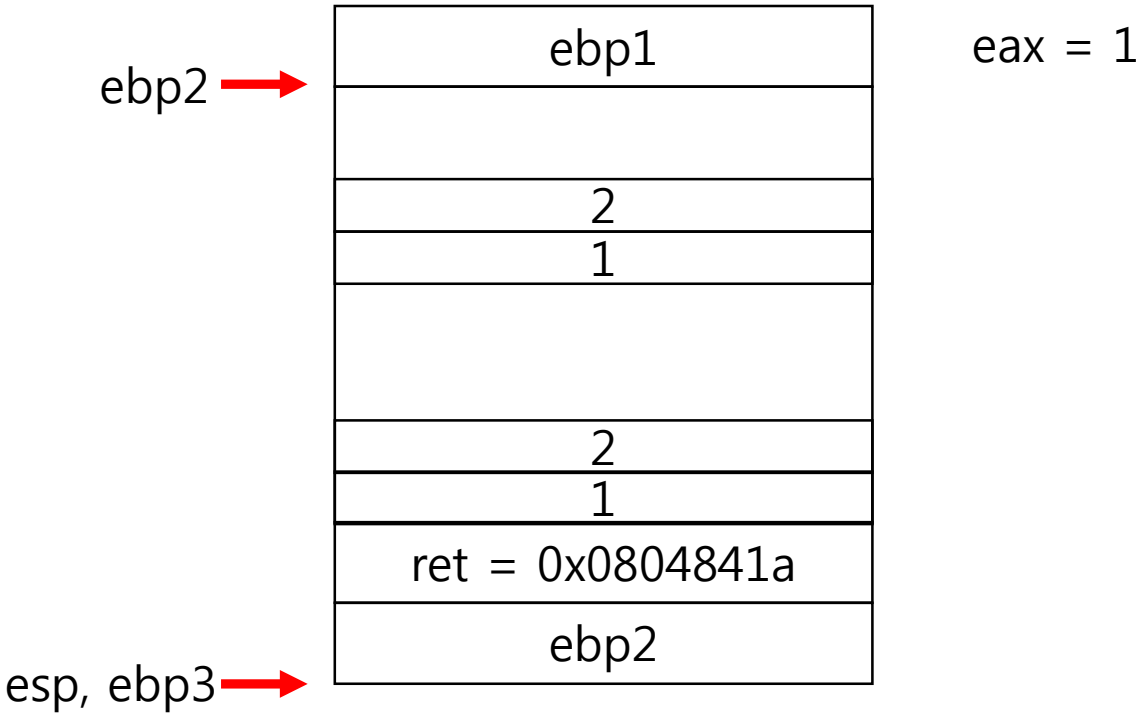
```
Dump of assembler code for function add:
   0x08048421 <+0>:     push   %ebp
   0x08048422 <+1>:     mov    %esp,%ebp
   0x08048424 <+3>:     mov    0xc(%ebp),%eax
   0x08048427 <+6>:     mov    0x8(%ebp),%edx
   0x0804842a <+9>:     add    %edx,%eax
   0x0804842c <+11>:    pop    %ebp
   0x0804842d <+12>:    ret
End of assembler dump.
```



Stack

- mov %esp, %ebp

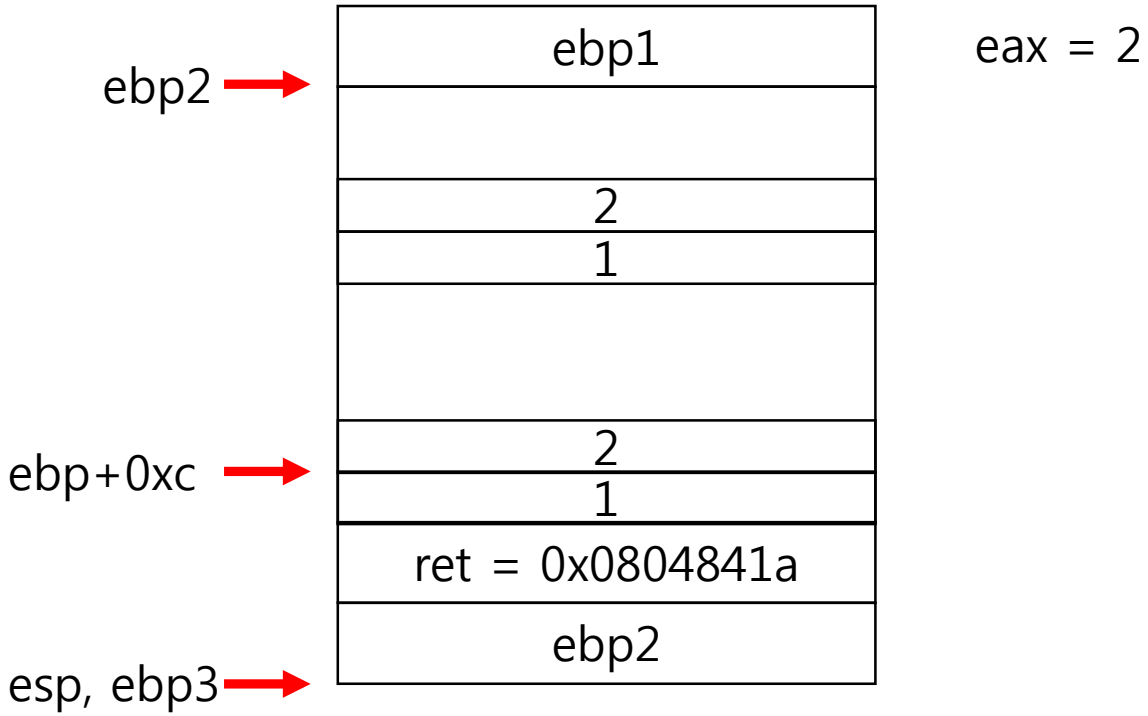
```
Dump of assembler code for function add:
   0x08048421 <+0>:     push   %ebp
   0x08048422 <+1>:     mov    %esp,%ebp
   0x08048424 <+3>:     mov    0xc(%ebp),%eax
   0x08048427 <+6>:     mov    0x8(%ebp),%edx
   0x0804842a <+9>:     add    %edx,%eax
   0x0804842c <+11>:    pop    %ebp
   0x0804842d <+12>:    ret
End of assembler dump.
```



Stack

- mov 0xc(%ebp), %eax

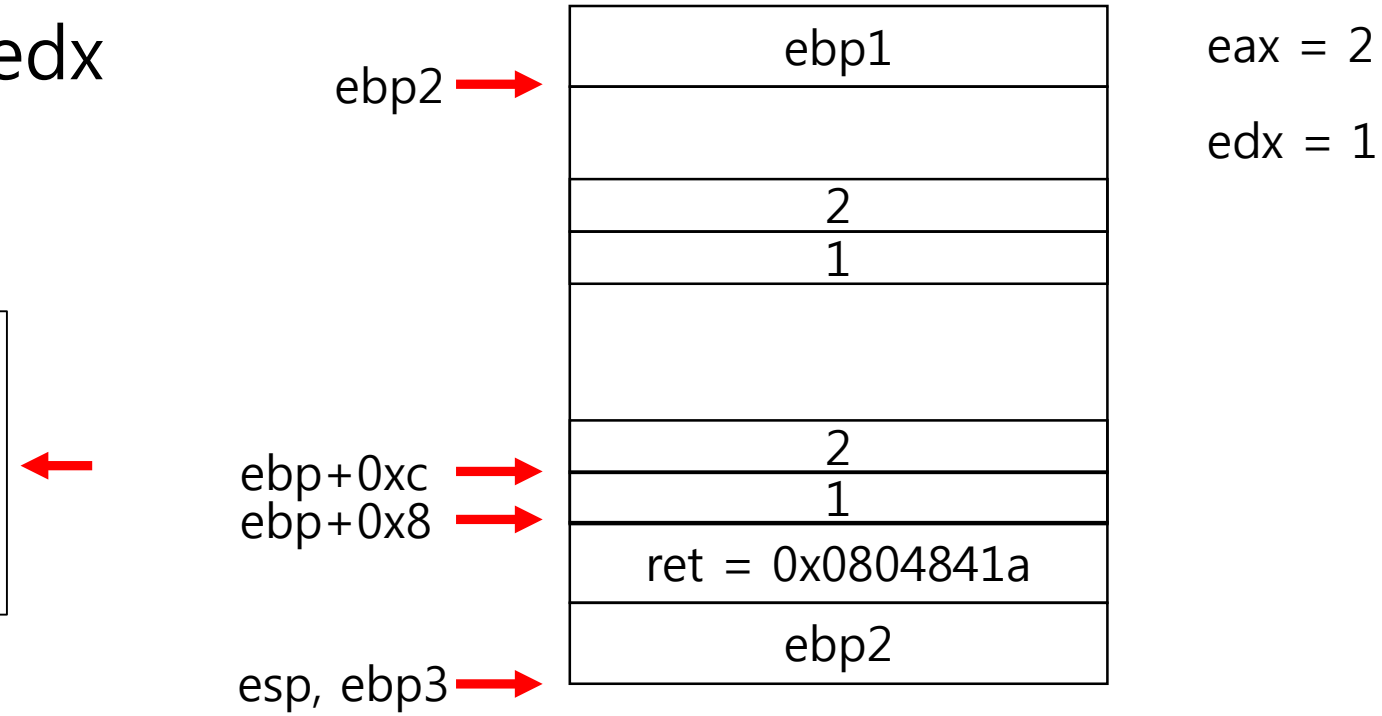
```
Dump of assembler code for function add:
   0x08048421 <+0>:     push   %ebp
   0x08048422 <+1>:     mov    %esp,%ebp
   0x08048424 <+3>:     mov    0xc(%ebp),%eax
   0x08048427 <+6>:     mov    0x8(%ebp),%edx
   0x0804842a <+9>:     add    %edx,%eax
   0x0804842c <+11>:    pop    %ebp
   0x0804842d <+12>:    ret
End of assembler dump.
```



Stack

- mov 0x8(%ebp), %edx

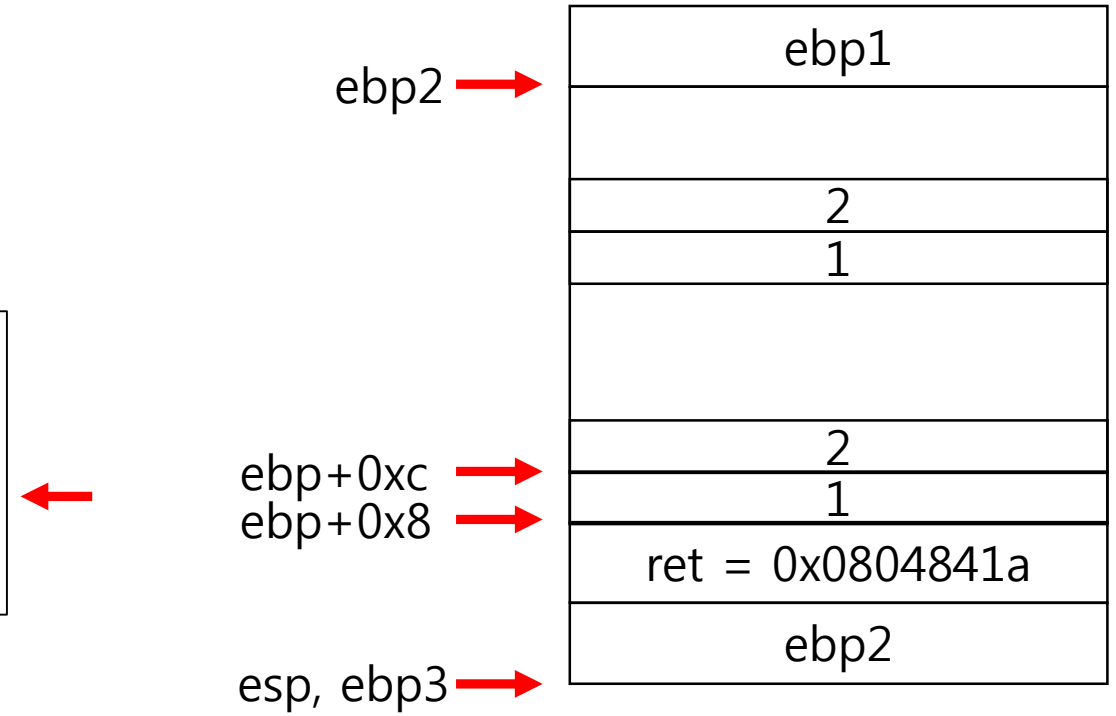
```
Dump of assembler code for function add:
   0x08048421 <+0>:     push   %ebp
   0x08048422 <+1>:     mov    %esp,%ebp
   0x08048424 <+3>:     mov    0xc(%ebp),%eax
   0x08048427 <+6>:     mov    0x8(%ebp),%edx
   0x0804842a <+9>:     add    %edx,%eax
   0x0804842c <+11>:    pop    %ebp
   0x0804842d <+12>:    ret
End of assembler dump.
```



Stack

- add %edx, %eax

```
Dump of assembler code for function add:
   0x08048421 <+0>:     push   %ebp
   0x08048422 <+1>:     mov    %esp,%ebp
   0x08048424 <+3>:     mov    0xc(%ebp),%eax
   0x08048427 <+6>:     mov    0x8(%ebp),%edx
   0x0804842a <+9>:     add    %edx,%eax
   0x0804842c <+11>:    pop    %ebp
   0x0804842d <+12>:    ret
End of assembler dump.
```



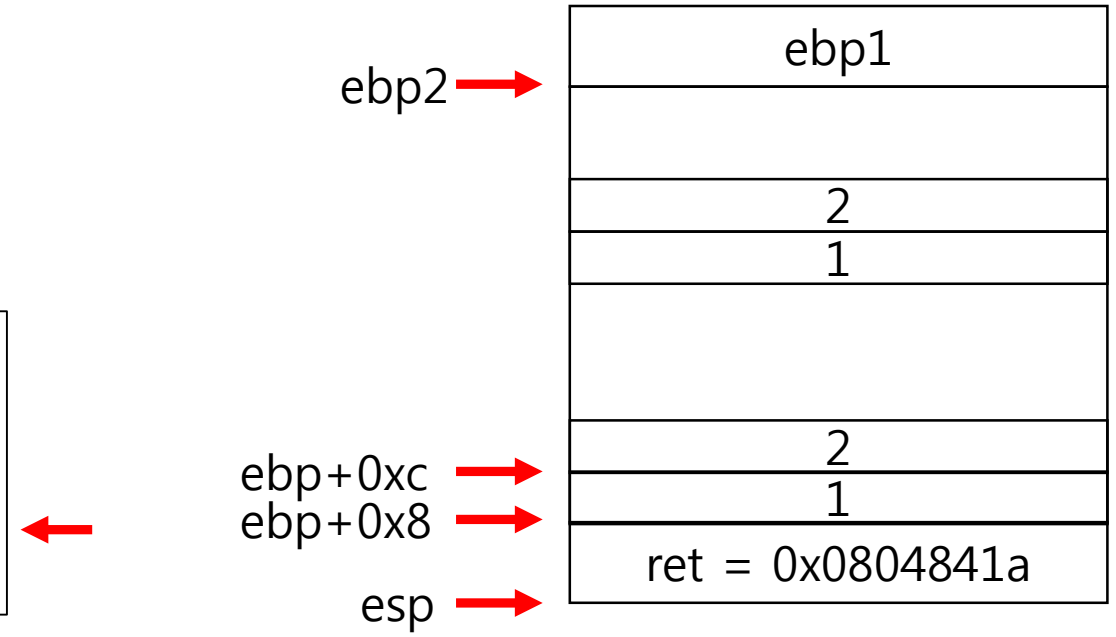
eax = 2 + 1 = 3

edx = 1

Stack

- pop %ebp

```
Dump of assembler code for function add:
   0x08048421 <+0>:     push   %ebp
   0x08048422 <+1>:     mov    %esp,%ebp
   0x08048424 <+3>:     mov    0xc(%ebp),%eax
   0x08048427 <+6>:     mov    0x8(%ebp),%edx
   0x0804842a <+9>:     add    %edx,%eax
   0x0804842c <+11>:    pop    %ebp
   0x0804842d <+12>:    ret
End of assembler dump.
```



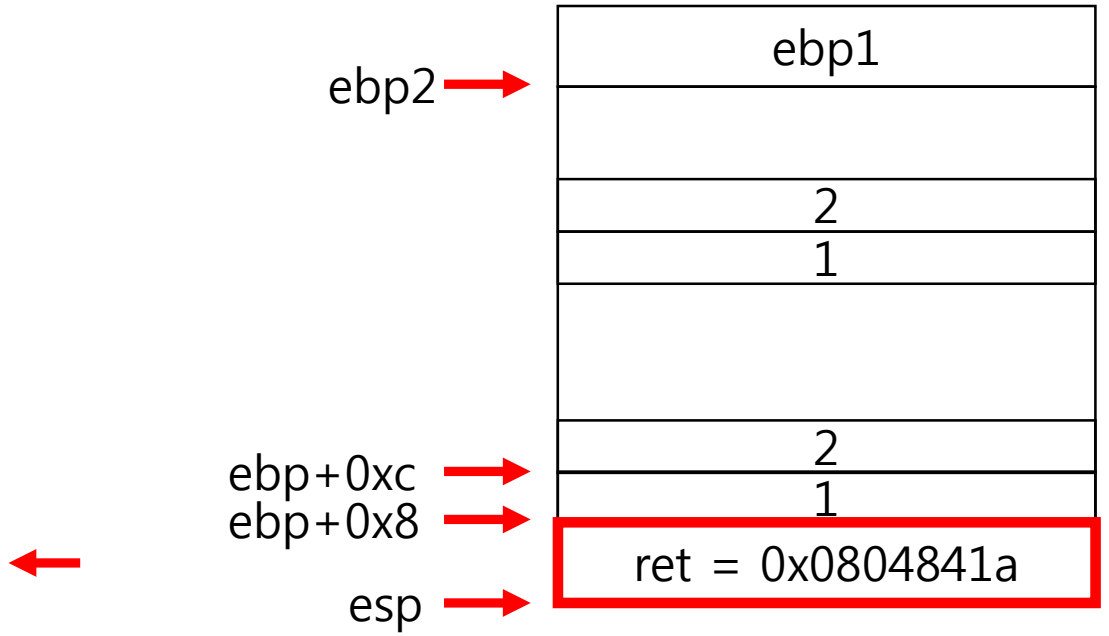
eax = 2 + 1 = 3

edx = 1

Stack

- ret

```
Dump of assembler code for function add:
   0x08048421 <+0>:     push   %ebp
   0x08048422 <+1>:     mov    %esp,%ebp
   0x08048424 <+3>:     mov    0xc(%ebp),%eax
   0x08048427 <+6>:     mov    0x8(%ebp),%edx
   0x0804842a <+9>:     add    %edx,%eax
   0x0804842c <+11>:    pop    %ebp
   0x0804842d <+12>:    ret
End of assembler dump.
```



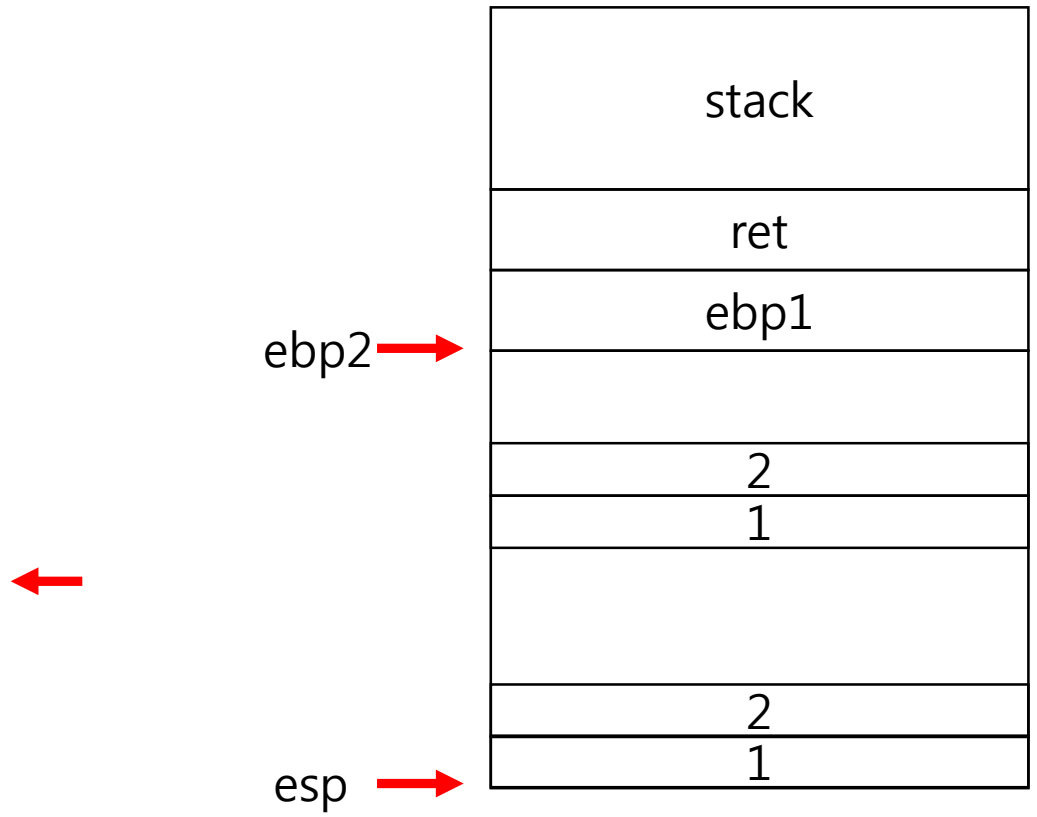
eax = 2 + 1 = 3

edx = 1

Stack

- mov $0x0, %eax

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     and    $0xfffffff0,%esp
   0x080483f3 <+6>:     sub    $0x20,%esp
   0x080483f6 <+9>:     movl   $0x1,0x18(%esp)
   0x080483fe <+17>:    movl   $0x2,0x1c(%esp)
   0x08048406 <+25>:    mov    0x1c(%esp),%eax
   0x0804840a <+29>:    mov    %eax,0x4(%esp)
   0x0804840e <+33>:    mov    0x18(%esp),%eax
   0x08048412 <+37>:    mov    %eax,(%esp)
   0x08048415 <+40>:    call   0x8048421 <add>
   0x0804841a <+45>:    mov    $0x0,%eax
   0x0804841f <+50>:    leave
   0x08048420 <+51>:    ret
End of assembler dump.
```



eax = 0

Stack

- leave

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     and    $0xfffffff0,%esp
   0x080483f3 <+6>:     sub    $0x20,%esp
   0x080483f6 <+9>:     movl   $0x1,0x18(%esp)
   0x080483fe <+17>:    movl   $0x2,0x1c(%esp)
   0x08048406 <+25>:    mov    0x1c(%esp),%eax
   0x0804840a <+29>:    mov    %eax,0x4(%esp)
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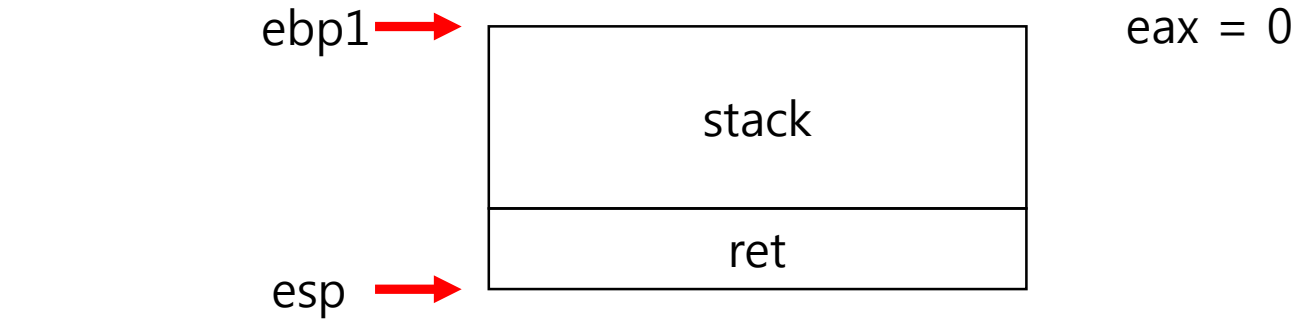
   0x08048412 <+37>:    mov    %eax,(%esp)
   0x08048415 <+40>:    call   0x8048421 <add>
   0x0804841a <+45>:    mov    $0x0,%eax
   0x0804841f <+50>:    leave
   0x08048420 <+51>:    ret
End of assembler dump.
```



Stack

- ret

```
Dump of assembler code for function main:
   0x080483ed <+0>:     push   %ebp
   0x080483ee <+1>:     mov    %esp,%ebp
   0x080483f0 <+3>:     and    $0xfffffff0,%esp
   0x080483f3 <+6>:     sub    $0x20,%esp
   0x080483f6 <+9>:     movl   $0x1,0x18(%esp)
   0x080483fe <+17>:    movl   $0x2,0x1c(%esp)
   0x08048406 <+25>:    mov    0x1c(%esp),%eax
   0x0804840a <+29>:    mov    %eax,0x4(%esp)
   0x0804840e <+33>:    mov    0x18(%esp),%eax
   0x08048412 <+37>:    mov    %eax,(%esp)
   0x08048415 <+40>:    call   0x8048421 <add>
   0x0804841a <+45>:    mov    $0x0,%eax
   0x0804841f <+50>:    leave
   0x08048420 <+51>:    ret
End of assembler dump.
```