Parameter Passing

The parameters are pushed on the stack and then function calls are made. So the parameters are just below the return address. If a function wants to read the parameters, then it can read from the stack just below the return address.
Let's see this in an example

C code:

```
void fun(int x, int y)
{
   x++;
   x += y;
}
int main()
{
   fun(2, 3);
}
```

Here is the generated assembly code:

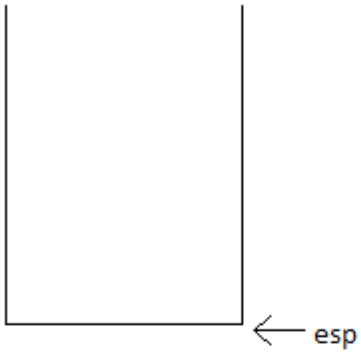
```
.text
.globl fun
fun:
   pushl    %ebp
   movl     %esp, %ebp
   addl     $1, 8(%ebp)
   movl     12(%ebp), %eax
   addl     %eax, 8(%ebp)
   popl     %ebp
   ret
.globl main
main:
   pushl   %ebp
   movl    %esp, %ebp
   subl    $8, %esp
   movl    $3, 4(%esp)
   movl    $2, (%esp)
   call    fun
   leave
   ret
```

Location of local variables of the stack (local variables are explained here (memorymanagement.html))

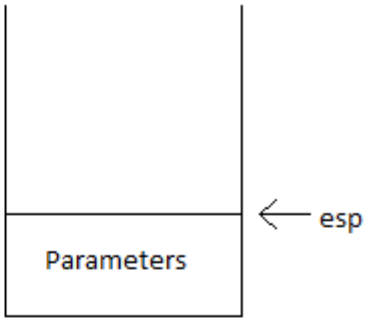
```
x ==> 8(%ebp)
y ==> 12(%ebp), %eax
```

This is very much related to what is described in the local variable chapters. The parameters are allocated as the local variables only. The only one difference is that the local variables are allocated on the top where the return address is pushed on the stack and the parameters lie beneath the return address.

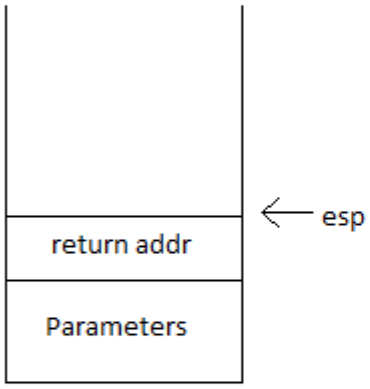
The parameter passing can be explained with this diagram:



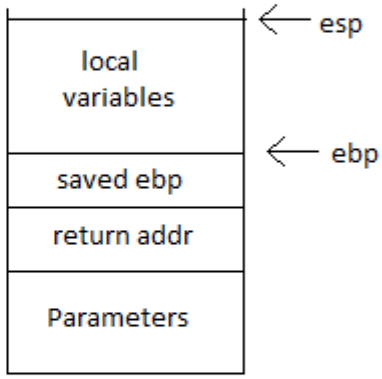
before parameter passing



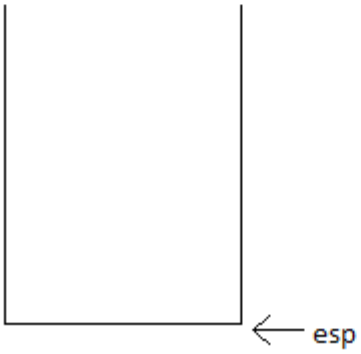
After parameter passing



just after call instruction



While the called function is executing



After returing

Comments on the generated code:

```
# .text segment starts
   .text

# export the the function fun
.globl fun

# function fun starts here
fun:

# save ebp on stack
   pushl   %ebp
   movl    %esp, %ebp

# x++;
   addl    $1, 8(%ebp)

# tmp = y
   movl    12(%ebp), %eax

# x = x + tmp
   addl    %eax, 8(%ebp)

#restore ebp and return
   popl    %ebp
      ret

# export the main function
.globl main

# main function starts here
main:
# save the ebp register
   pushl   %ebp
   movl    %esp, %ebp

# stack_pointer -= 8
   subl      $8, %esp
```

```
# push the second parameter
   movl    $3, 4(%esp)

# push the first parameter
   movl    $2, (%esp)

# call the function fun
   call      fun

# return the main function
   leave
   ret
```

Points to understand:

- The parameters are passed left to right. The last parameter in C code is pushed first and the first parameter is pushed in the last. So if you scan the stack from top, then the first parameter will be found first.
- The generated code does not use the push instruction. Instead it decrements the stack pointer first then add parameters to the space created by decrementing the stack pointer. This has been possibly done for perf reasons (subl + movl could be faster than push + pop).
- If the parameter is of type structure then the whole of the structure will be pushed on the stack.

‹ Function Call (/cin/functioncall.html)
up (/cin/cin.html)
Returning Value From Function › (/cin/return.html)
