Functions & Pointers (1A)

Young Won Lim
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Please send corrections (or suggestions) to youngwlim@hotmail.com.

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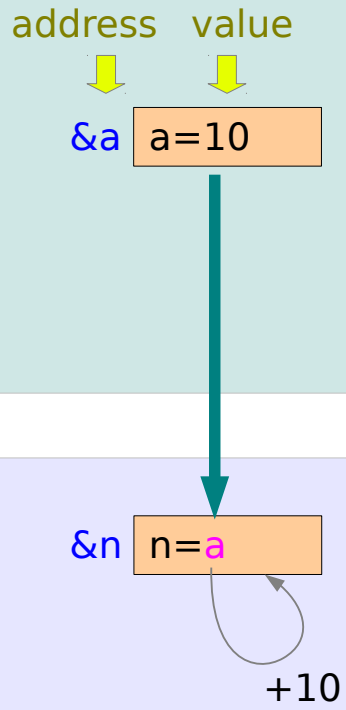
Call by Value

```
void func(int n);

int main (void)
{
        int a = 10;

        printf("a = %d \n", a);
        func ( a );
        printf("a = %d \n", a);

        return 0;
}

void func (int n)
{
        printf("n = %d \n", n);
        n += 10;
        printf("n = %d \n", n);
}
```

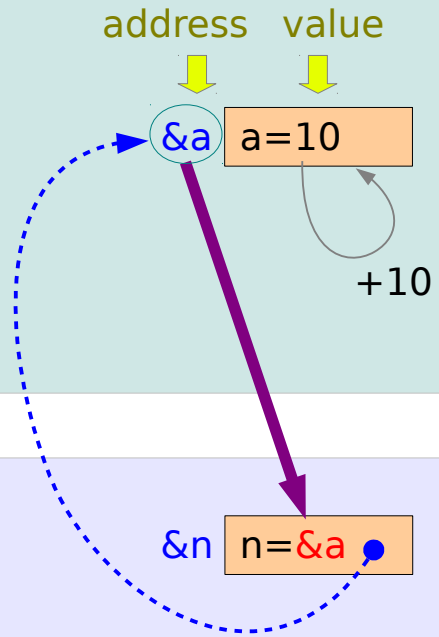


the **value** of **a** is passed through the parameter variable **n**

n is **local** to the function func and exists **while** the function is being **called**

Call by Reference

```
void func(int * n);

int main (void)
{
        int a = 10;

        printf("a = %d \n", a);
        func ( &a );
        printf("a = %d \n", a);

        return 0;
}

void func(int * n)
{
        printf("*n = %d \n", *n);
        *n += 10;
        printf("*n = %d \n", *n);
}
```



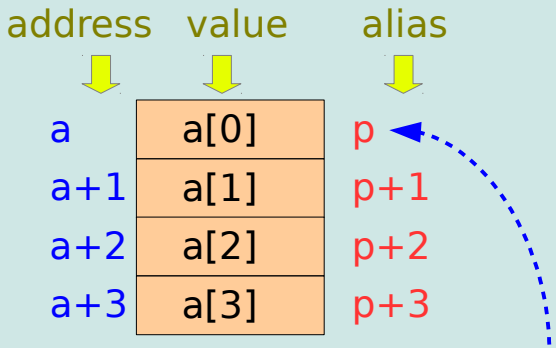
the **address** of **a** is passed through the parameter variable **n**

```
*n += 10;
```

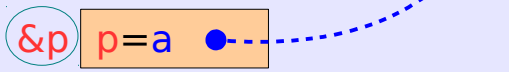
n is **local** to the function func and exists **while** the function is being **called**

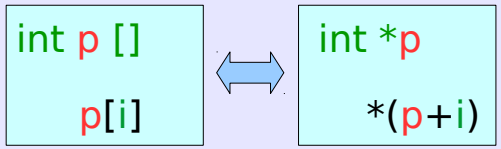
Call by Reference – Passing Arrays

```
void sum(int p [], int n);

int main (void)
{
        int a[4], T;

        T = sum( a ,  4 );

        printf("Sum = %d \n", T);

        return 0;
}
```




```
int sum(int  p []   , int n)
{
        int i, S;
        for (i=0; i<n; ++i)
           S += p[i];
        return S;
}
```

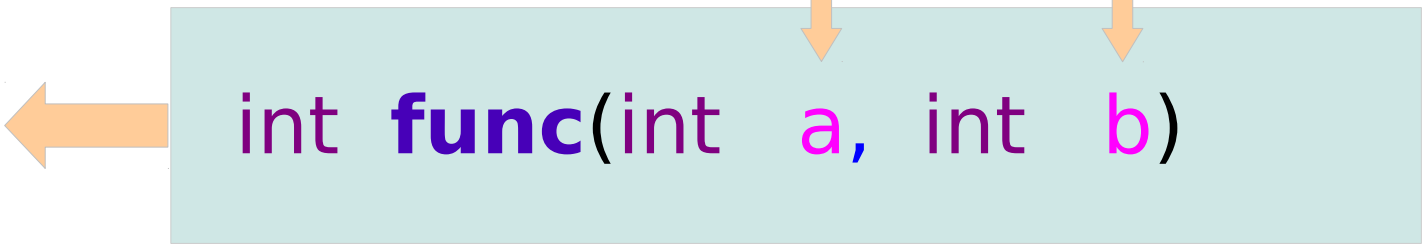




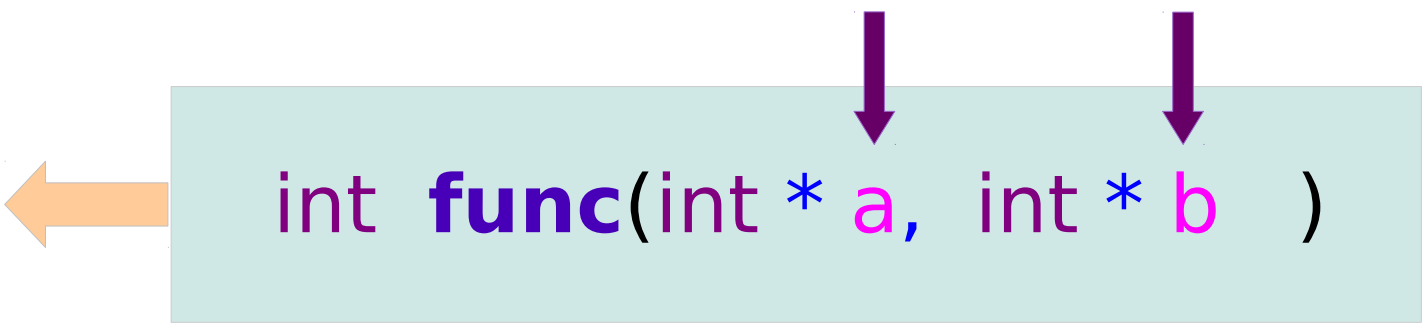
Function Calls in C (1)

```
int x, y;
```

Data is passed — call by value — x — y — input



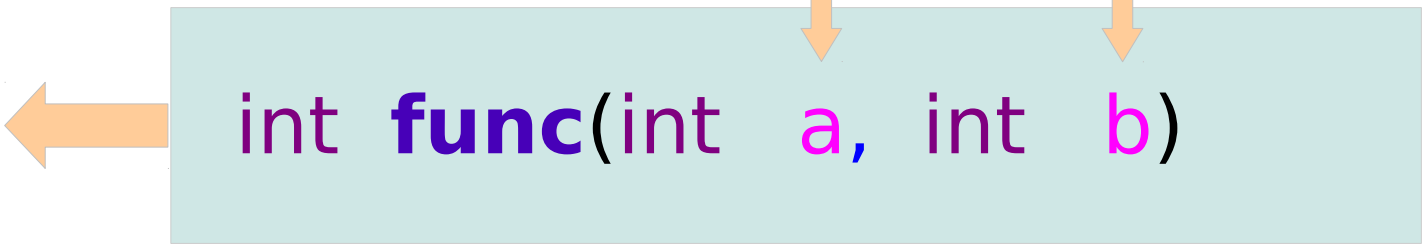
Address is passed — call by reference — &x — &y — in/out



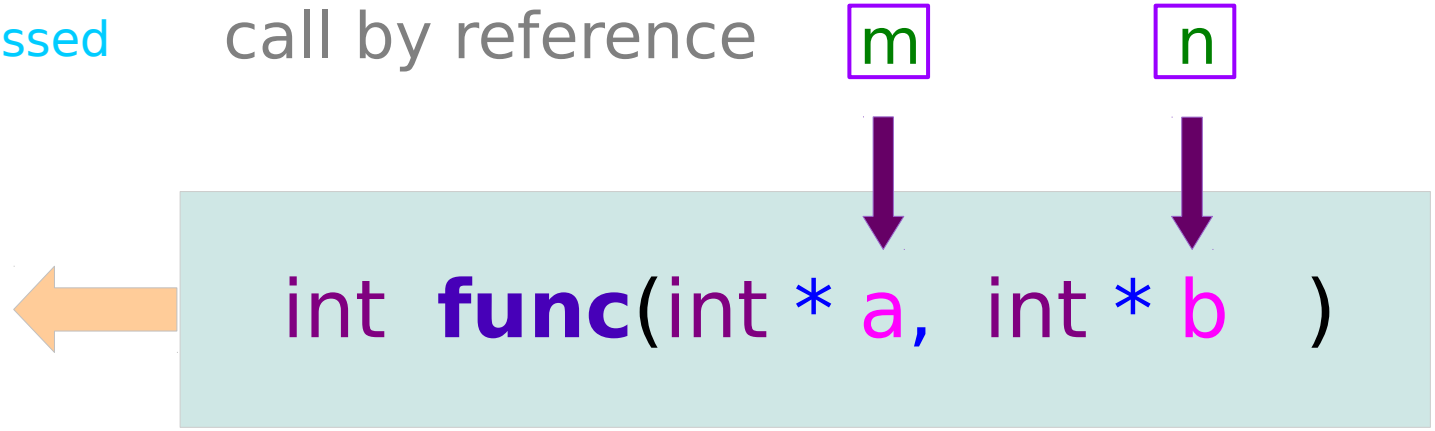
Function Calls in C (2)

```
int *m, *n;
```

Data is passed call by value *m *n input



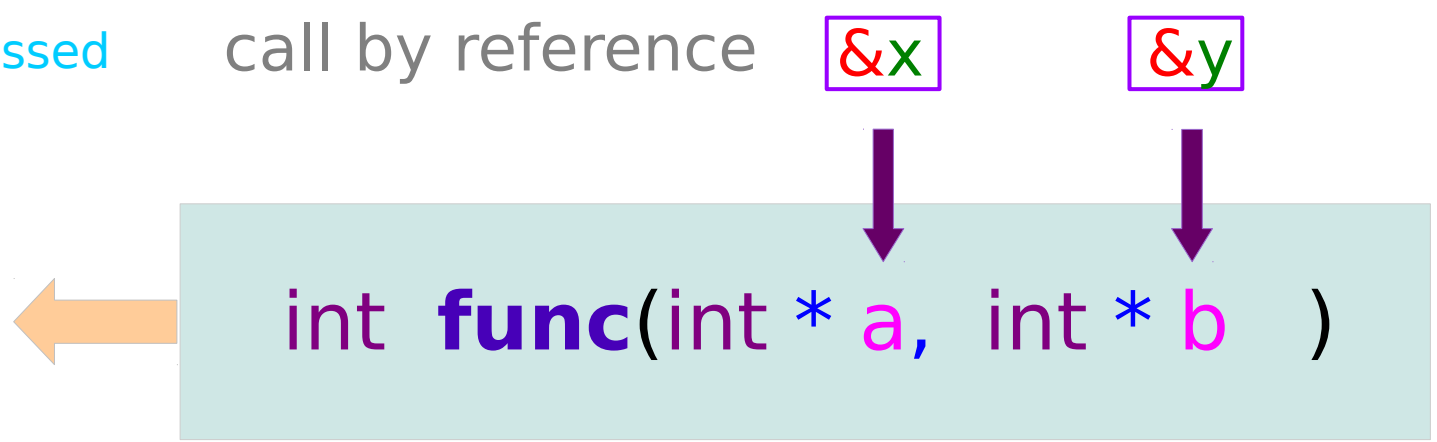
Address is passed call by reference m n in/out



Function Calls in C (3)

```
int x, y;
```

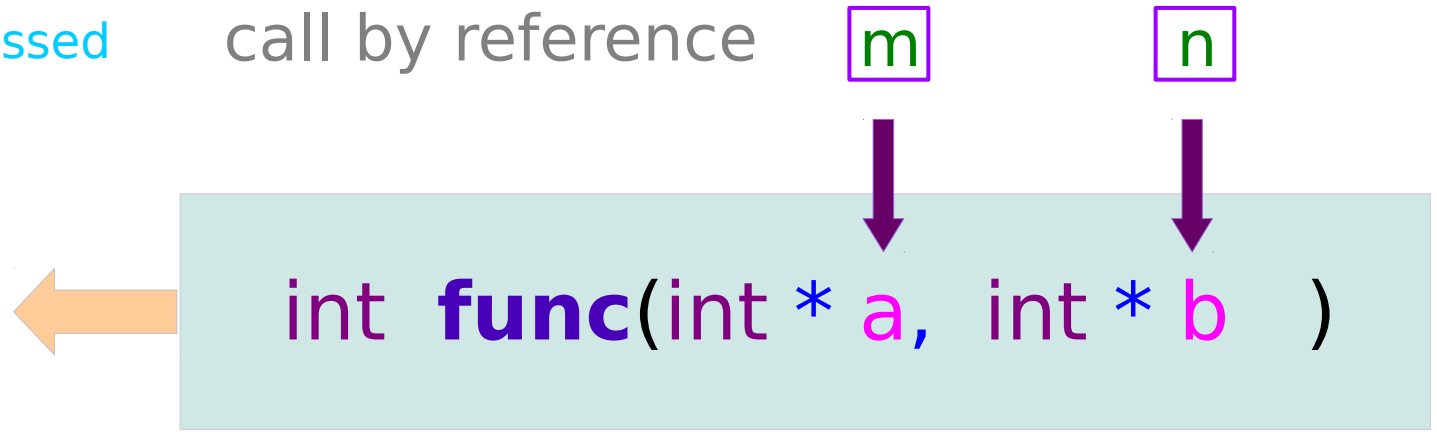
Address is passed call by reference &x &y in/out



Function Calls in C (4)

```
int *m, *n;
```

Address is passed call by reference m n in/out



input	RD	*a	*m
output	WR	*a	*m
input	RD	*b	*n
output	WR	*b	*n

A point to a function (1)

```
int   m ;          an integer variable
int  * m ;         a pointer variable
```

```
int   f  (int  a,  int  b) ;      a prototype    a function's type
int  (* f) (int  a,  int  b) ;    a function pointer
```

without **( )** → `int *  f (int  a,  int  b) ;`

a function's return type

A point to a function (2)

```
int   fn   (int  a,  int  b) ;
```

a function name fn

```
int  (* fp) (int  a,  int  b) ;
```

a function pointer fp

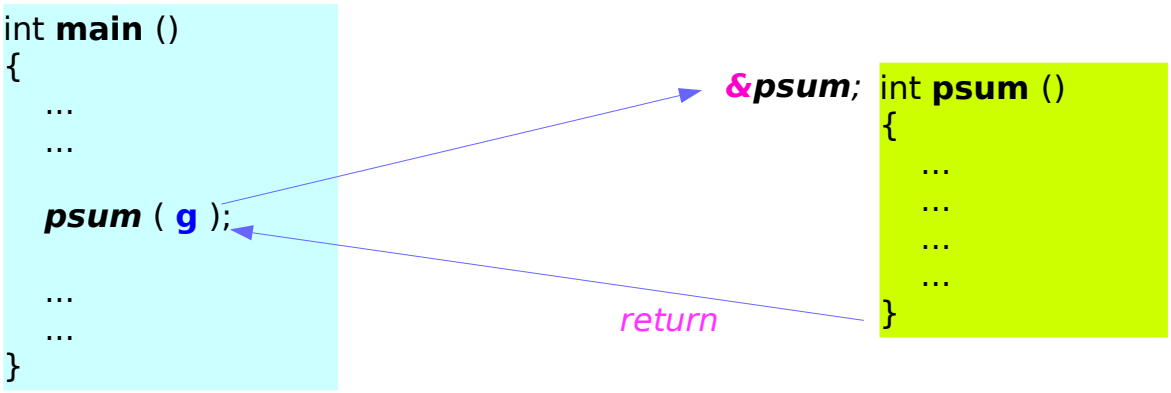
explicit method

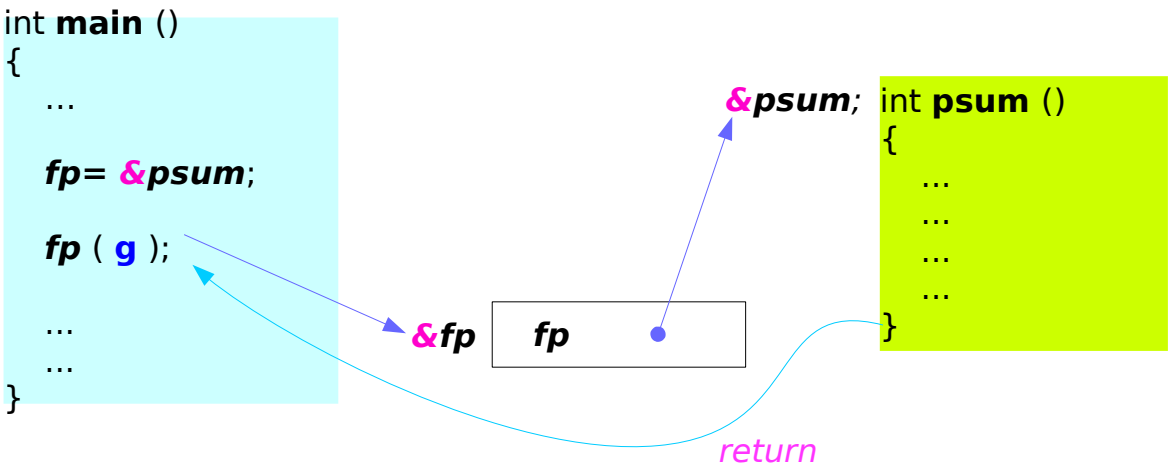
```
fp = &fn;

z = (*fp) (x, y);
```

implicit method

```
fp = fn;

z = fp (x, y);
```

Indirect Function Call





References

[1] Essential C, Nick Parlante
[2] Efficient C Programming, Mark A. Weiss
[3] C A Reference Manual, Samuel P. Harbison & Guy L. Steele Jr.
[4] C Language Express, I. K. Chun