C programming language

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origins

Dennis Ritchie in 2011 / CC BY 2.0

Brian Kernighan in 2012 / CC BY 2.0

Dennis Ritchie and Brian Kernighan creators of C circa 1972

comparison

Java	C
object-oriented	procedural
interpreted	compiled
`String`	`char` array
condition (`boolean`)	condition (`int`)
garbage-collected	no memory management
references	pointers
exceptions	error codes

in Java, everything is a method that is called on an object

in C, everything is a function

in Java, source code is compiled to byte code, which is then interpreted by Java VM

in C, source code is compiled into binary machine code

in Java, String is a class

in C, a string is just an array of `char` values which ends with the `char '\0'`

in Java, the Java VM takes care of deallocating memory used

in C, any memory you allocate, you must also deallocate

hello, world

```c
/* file: helloworld.c */

#include <stdio.h>

int main() {
  printf("hello, world\n");
  return 0;
}
```

```
$ gcc -o helloworld helloworld.c
$ ./helloworld
hello, world
```

The tradition of using the phrase ”Hello, world!” as a test message was influenced by an example program in the seminal book *The C Programming Language*

variables

```c
// file: figure2-4.c
// Stan Warford
// A nonsense program to illustrate global variables

#include <stdio.h>

char ch;
int j;

int main() {
  scanf("%c %d", &ch, &j);
  j += 5;
  ch++;
  printf("%c\n%d\n", ch, j);
  return 0;
}
```

```
$ gcc -o figure2-4 figure2-4.c
$ ./figure2-4
M 419
N
424
```

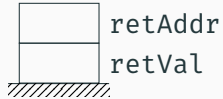
This program would behave exactly the same had this program declared `ch` and `j` as local variables instead of global variables.

memory model — part i

global variables
: declared outside of any function and remain in place throughout the execution of the entire program. they are stored at a fixed location in memory.

local variables
: declared within a function and come into existence when the function is called and cease to exist when the function terminates. they are stored on the run-time stack.

(a) Fixed location.



(b) Run-time stack.

conditions

under what conditions will each of the following be execute?

```
if (x) {
  /* ??? */
}
if (x-y) {
  /* ??? */
}
if (x=y) {
  /* ??? */
}
```

x != 0

x != y

y != 0