

Microsoft Visual Studio Debug

Compiler && Compiled Languages

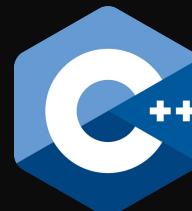
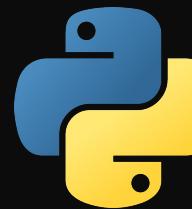
Week 0

```
C:\Users\brend\source\repos\VGATestProject\x64\Release\VGATestProject.exe (process 70484) exited with code 0.  
Press any key to close this window . . .
```

Compiler

No Hablo Inglés

Human Legible



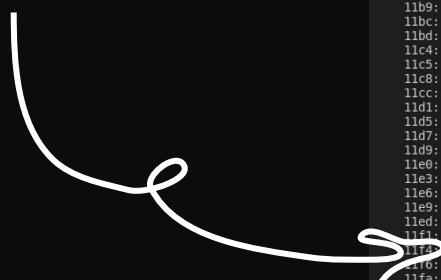
Computer Legible

```
C:\Users\brend\source\repos\VGATestProject\x64\Release\VGATestProject.exe (process 70484) exited with code 0.  
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```

Compiler

```
#include <iostream>
```

```
int main() {
    std::cout << "Hello World!";
    return 0;
}
```



```
0000000000001169 <main>:           endbr64
1169:   f3 0f 1e fa                 push %rbp
116d:   55                         mov %rsp,%rbp
116e:   48 89 e5                 mov %0xc,%rdx
1171:   ba 0c 00 00 00             mov 0xe8(%rip),%rsi      # 2004 <_IO_stdin_used+0x4>
1176:   48 8d 35 87 0e 00 00         lea 0xe0(%rip),%rdi
117d:   bf 01 00 00 00             mov $0x1,%rdi
1182:   e8 d9 fe ff ff            callq 1060 <_write@plt>
1187:   bf 00 00 00 00             mov $0x0,%rsi
118c:   e8 df fe ff ff            callq 1070 <_exit@plt>
1191:   66 2e 0f 1f 84 00 00         nopw %cs:0x0(%rax,%rax,1)
1198:   00 00 00                  nopl 0x0(%rax,%rax,1)

00000000000011a0 <_libc_csu_init>:    endbr64
11a0:   f3 0f 1e fa                 push %r15
11a4:   41 57                     lea 0x2c03(%rip),%r15      # 3db0 <_frame_dummy_init_array_entry>
11a6:   41 8d 3d 03 2c 00 00         push %r14
11a8:   41 56                     mov %rdx,%r14
11af:   49 89 d6                 mov %r13,%r13
11b2:   41 55                     push %r13
11b4:   49 89 f5                 mov %rsi,%r13
11b7:   41 54                     push %r12
11b9:   41 89 fc                 mov %edi,%r12d
11bc:   55                         push %rbp
11bd:   48 8d 2d f4 2b 00 00         lea 0x2bf4(%rip),%rbp      # 3db8 <_do_global_dtors_aux_fini_array_entry>
11c4:   53                         push %rbx
11c5:   4c 29 fd                 sub %r15,%rbp
11c8:   48 83 ec 08             sub $0x8,%rsp
11c9:   e8 2f fe ff ff            callq 1000 <_init>
11d1:   48 c1 fd 03             sar $0x3,%rbp
11d5:   74 1f                     je 11f6 <_libc_csu_init+0x56>
11d7:   31 db                     xor %ebx,%ebx
11d9:   0f 1f 80 00 00 00 00         nopl 0x0(%rax)
11e0:   4c 89 f2                 mov %r14,%rdx
11e3:   4c 89 ee                 mov %r13,%rsi
11e6:   44 89 e7                 mov %r12d,%rsi
11e9:   41 ff 14 df             callq *(%r15,%rbx,8)
11ed:   48 83 c3 01             add $0x1,%rbx
11f1:   48 39 dd                 cmp %rbx,%rbp
11f4:   75 ea                     jne 11e0 <_libc_csu_init+0x40>
11f6:   48 83 c4 08             add $0x8,%rsp
11fa:   5b                         pop %rbx
11fb:   5d                         pop %rbp
11fc:   41 5c                     pop %r12
11fe:   41 5d                     pop %r13
1200:   41 5e                     pop %r14
1202:   41 5f                     pop %r15
1204:   c3                         retq
1205:   66 66 2e 0f 1f 84 00         data16 now %cs:0x0(%rax,%rax,1)
```

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Compiled Languages

What is a Compiled Language

Compiled Languages

- Code converted to assembly at build time
- Runs directly on the machine

Interpreted Languages

- Has a VM that reads the code and runs it
- Essentially a real time translation layer between code and machine at runtime
- Some languages have an intermediary step like ByteCode in Java

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Pros and Cons

Compiled Languages

- Low-Level Access
- Minimal Overhead
- Control Implementation Details

- Only compiles for one type of Assembly (Hardware Dependent)
- Fussy on Implementation Details
- Less Safe (Memory Overflow, Pointer overriding, etc)

Interpreted Languages

- Code Compatible with any OS
- Forgiving with errors
- Programs isolated, thus safe
- Smooths Implementation Details

- Restrictive System Access
- High Overhead for VM

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C++

C Language

```
int main()
{
    char aa[] = "Studytonight ";
    char bb[] = "- Best place to learn";

    char *a = aa;
    char *b = bb;

    while (*a)
    {
        a++;
    }
    while (*b)
    {
        *a = *b;
        b++;
        a++;
    }
    *a = '\0';

    printf("The string after concatenation is: %s ", aa);

    return (0);
}
```

Evolution of Windows Logos



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C++

```
#include <iostream>
#include <string>
using namespace std;

int main() {
    string name = "Jimmy";
    string title = "Dr.";
    string fullName = title + " " + name;
    cout << fullName;

    return 0;
}
```

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Installing C++

Some Helpful Resources

- <https://visualstudio.microsoft.com/downloads/>
- https://clang.llvm.org/get_started.html **
- <https://code.visualstudio.com/docs/languages/cpp> *

* Always remember to restart the computer after adjusting environment variables

** Linux and Mac should already have working versions of the C++ compiler: g++