Introduction to Computing

Lecture 3

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Introduction to C++ Programming

Computer Languages

Machine Language	Assembly Language	High-Level Language

Computer Languages

Machine Language:

- Only language computer directly understands
- Defined by hardware design
  - Machine-dependent
- Generally consist of 0s and 1s (**Binary Language**)
- Instruct computers to perform elementary operations
  - One at a time
- Cumbersome for humans
- Example:

```
10100111010
01011101001
```

Assembly Language:

- English-like abbreviations representing elementary computer operations
- Clearer to humans
- Incomprehensible to computers
  - Translator programs (assemblers)
    - Convert to machine language
- Example:

```
LOAD    BASEPAY
ADD     OVERPAY
STORE   GROSSPAY
```

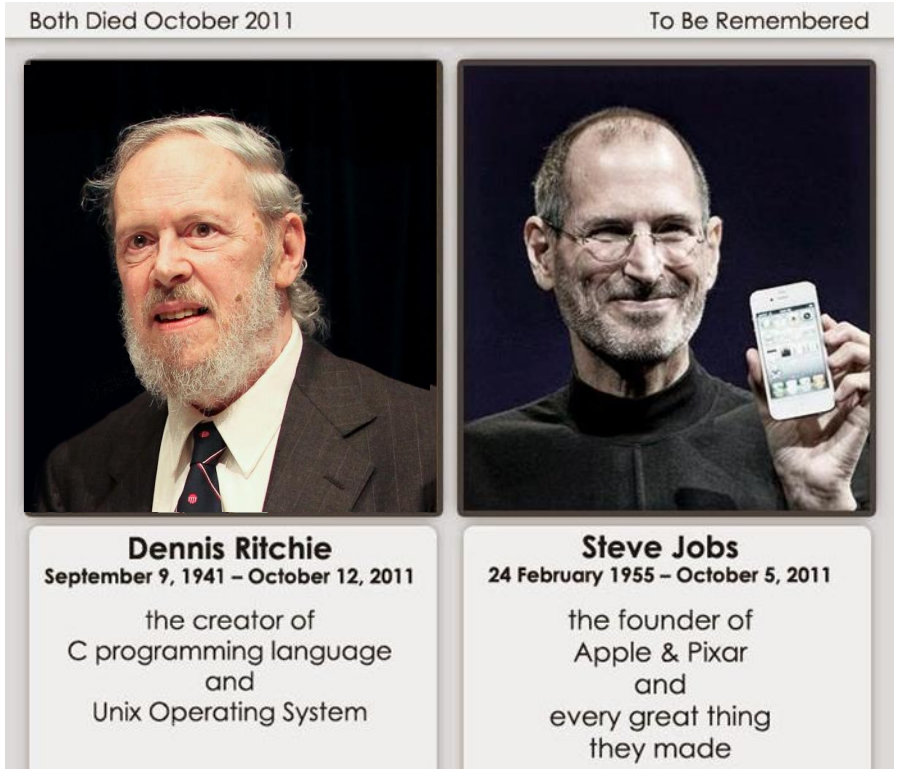
High-Level Language:

- Similar to everyday English, use common mathematical notations
- Single statements accomplish substantial tasks
  - Assembly language requires many instructions to accomplish simple tasks
- Translator programs (compilers)
  - Convert to machine language
- Example:

```
grossPay = basePay + overTimePay
```

History of C and C++

- History of C
  - Evolved from other programming language ‘B’
  - Dennis Ritchie (Bell Laboratories)
    - Added data typing, other features
  - Hardware independent
- History of C++
  - Extension of C
  - Early 1980s: Bjarne Stroustrup (Bell Laboratories)
  - Provides capabilities for object-oriented programming
    - Objects: reusable software components
      - Model items in real world
    - Object-oriented programs
      - Easy to understand, correct and modify



C++ Standard Library

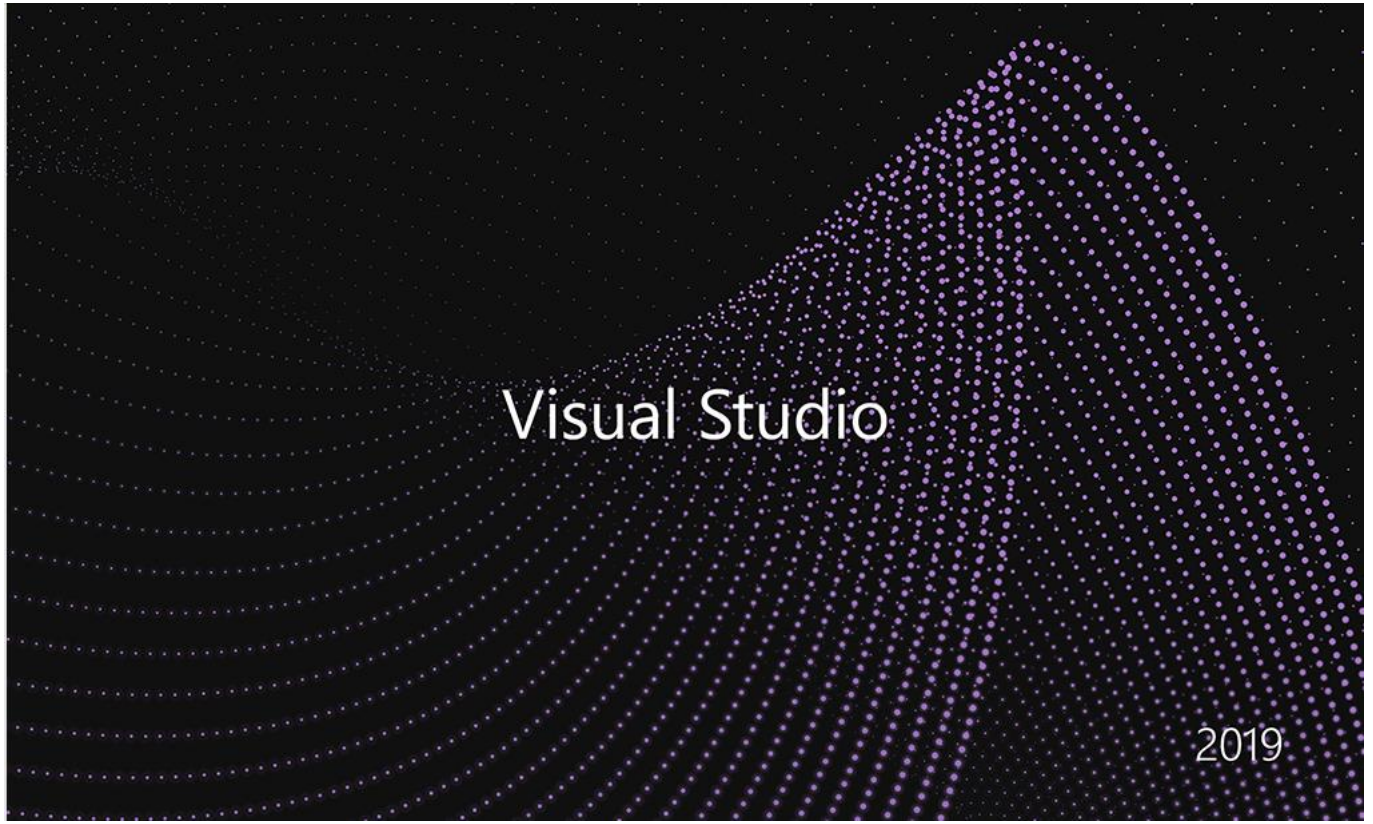
- C++ programs
  - Built from pieces called classes and functions
- C++ standard library
  - Rich collections of existing classes and functions

Basics of a Typical C++ Environment

- C++ systems
  - IDE (Integrated Development Environment)
  - Language
  - C++ Standard Library
- C++ program extension
  - .cpp
  - .h (header file)

Web-based IDE's can work as well, but functionality is limited

Basics of a Typical C++ Environment



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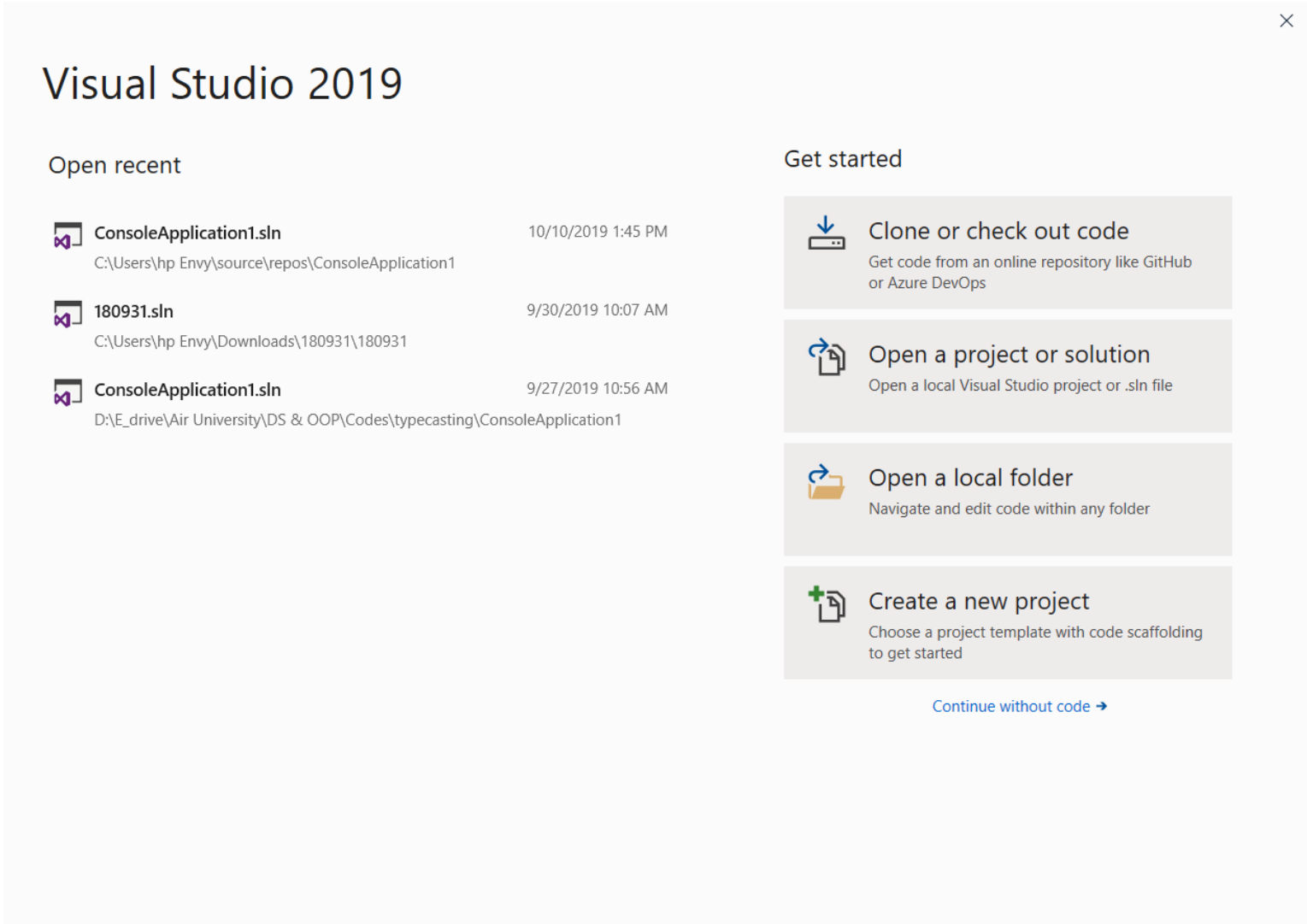

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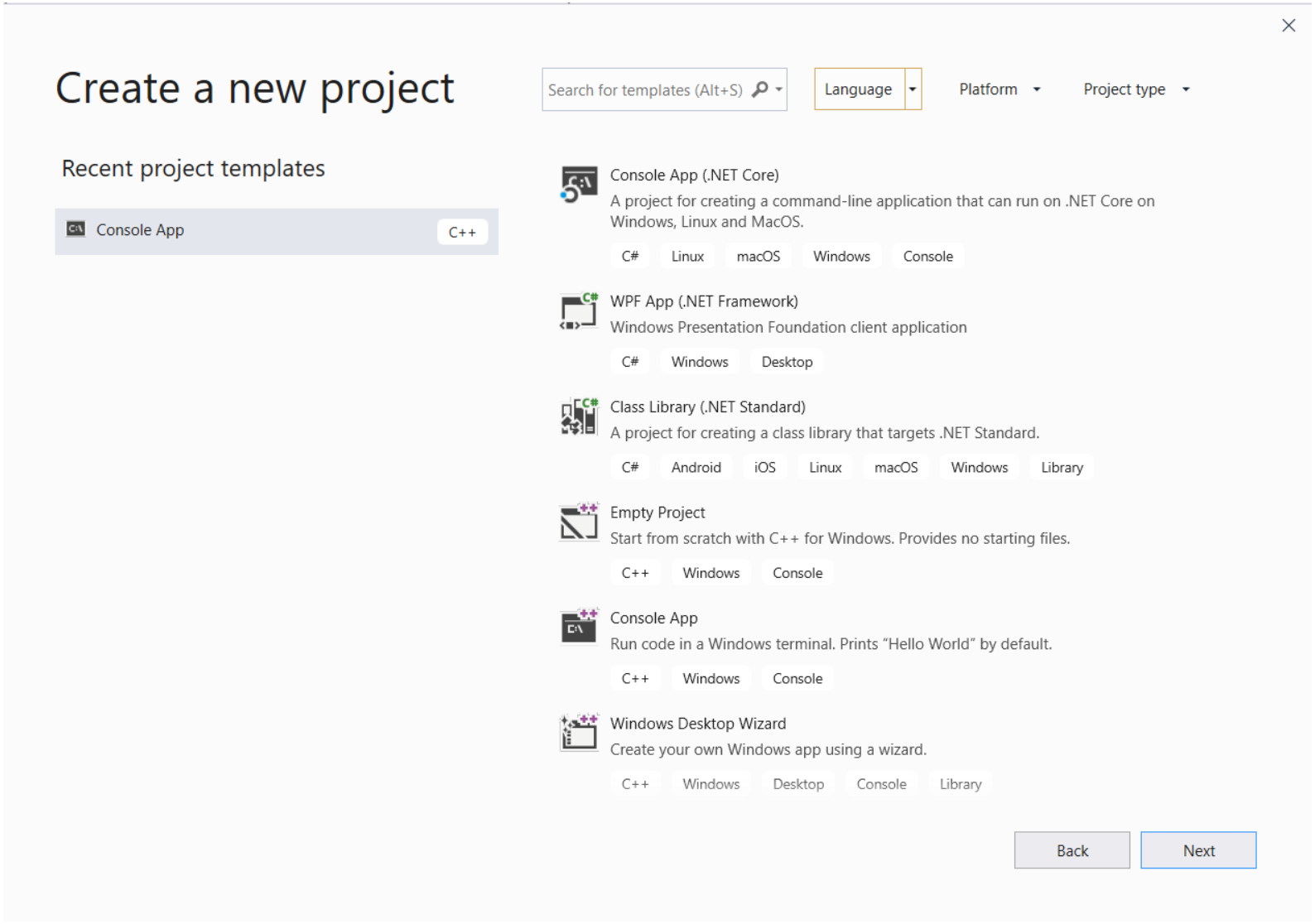

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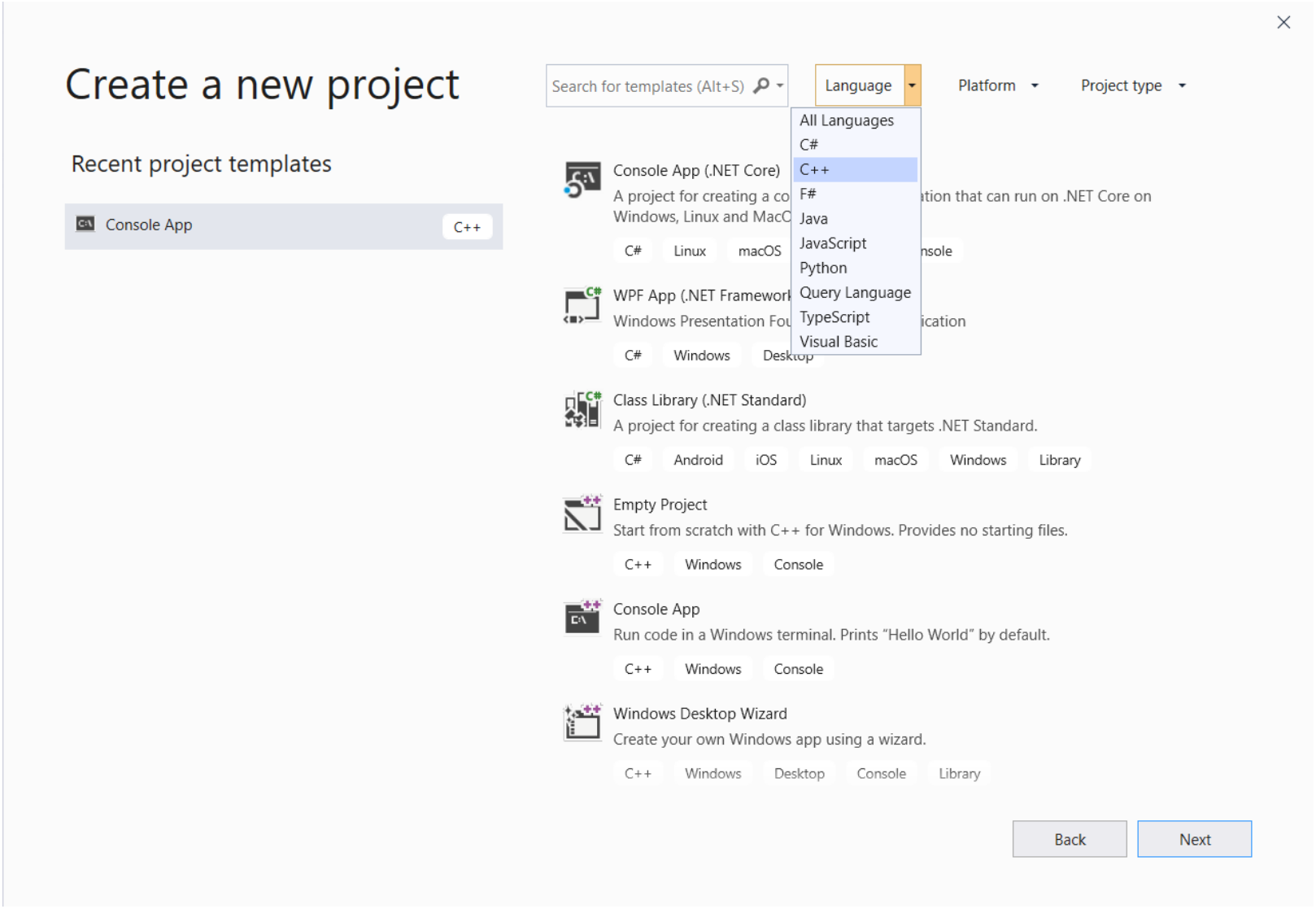

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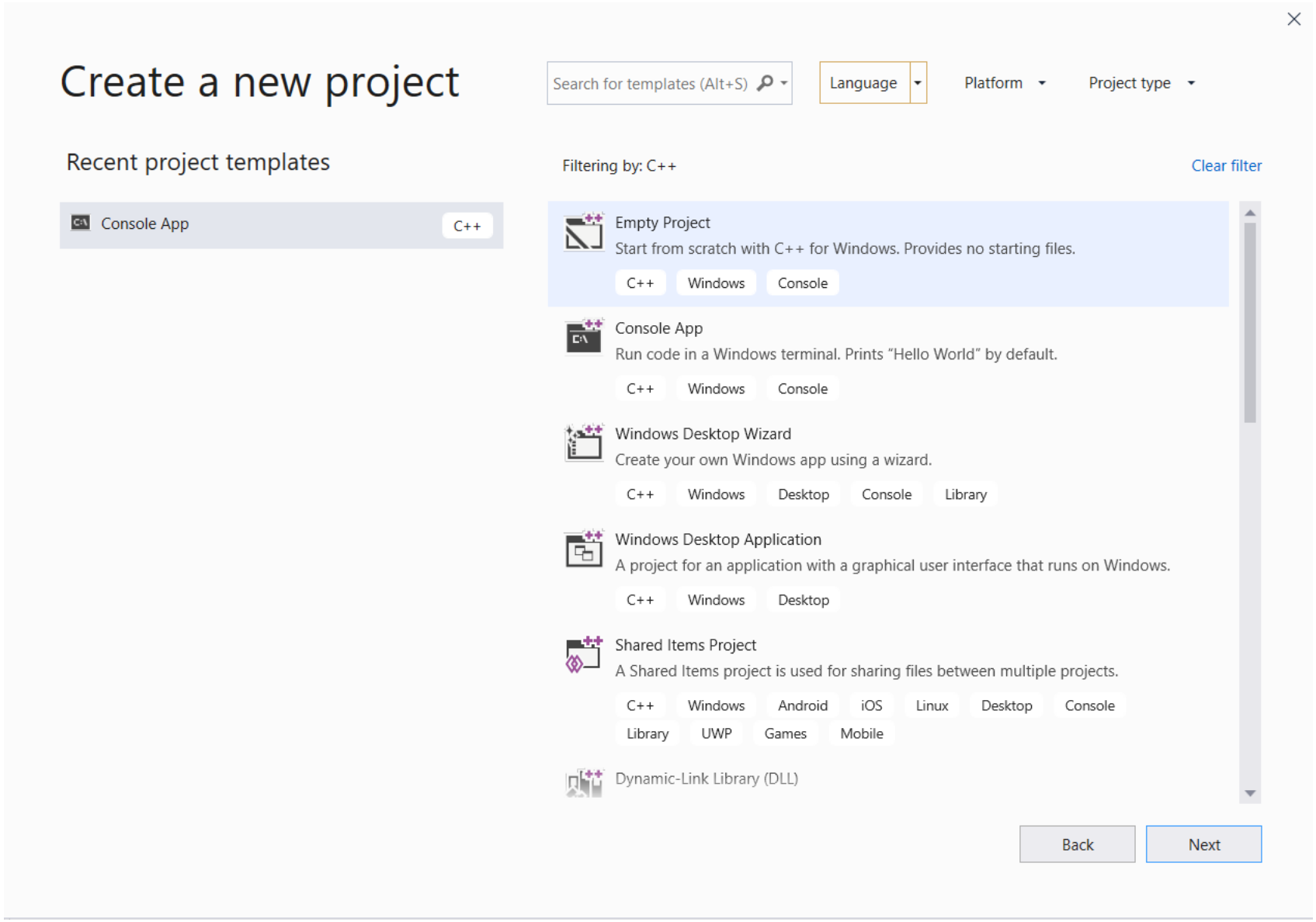

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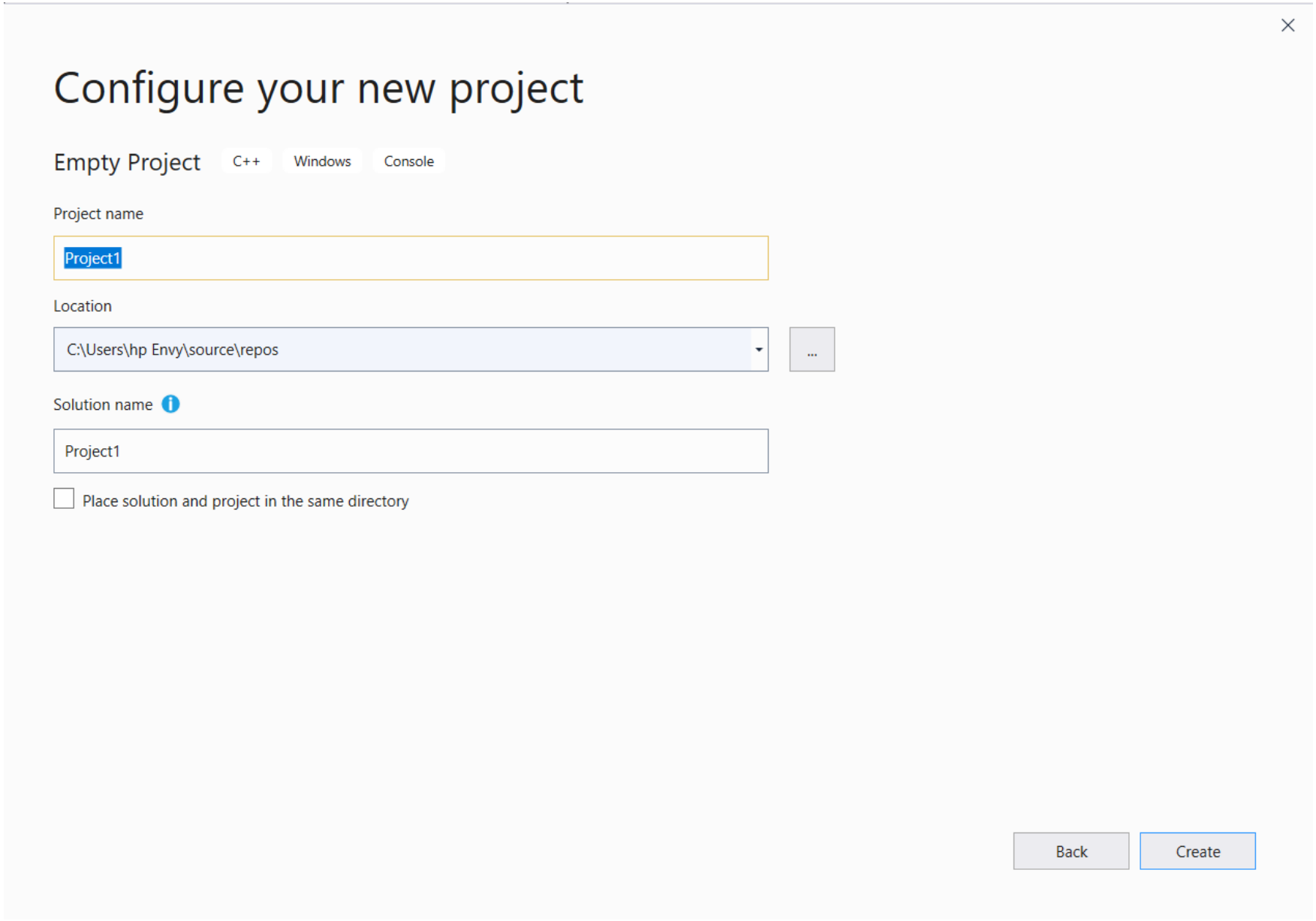

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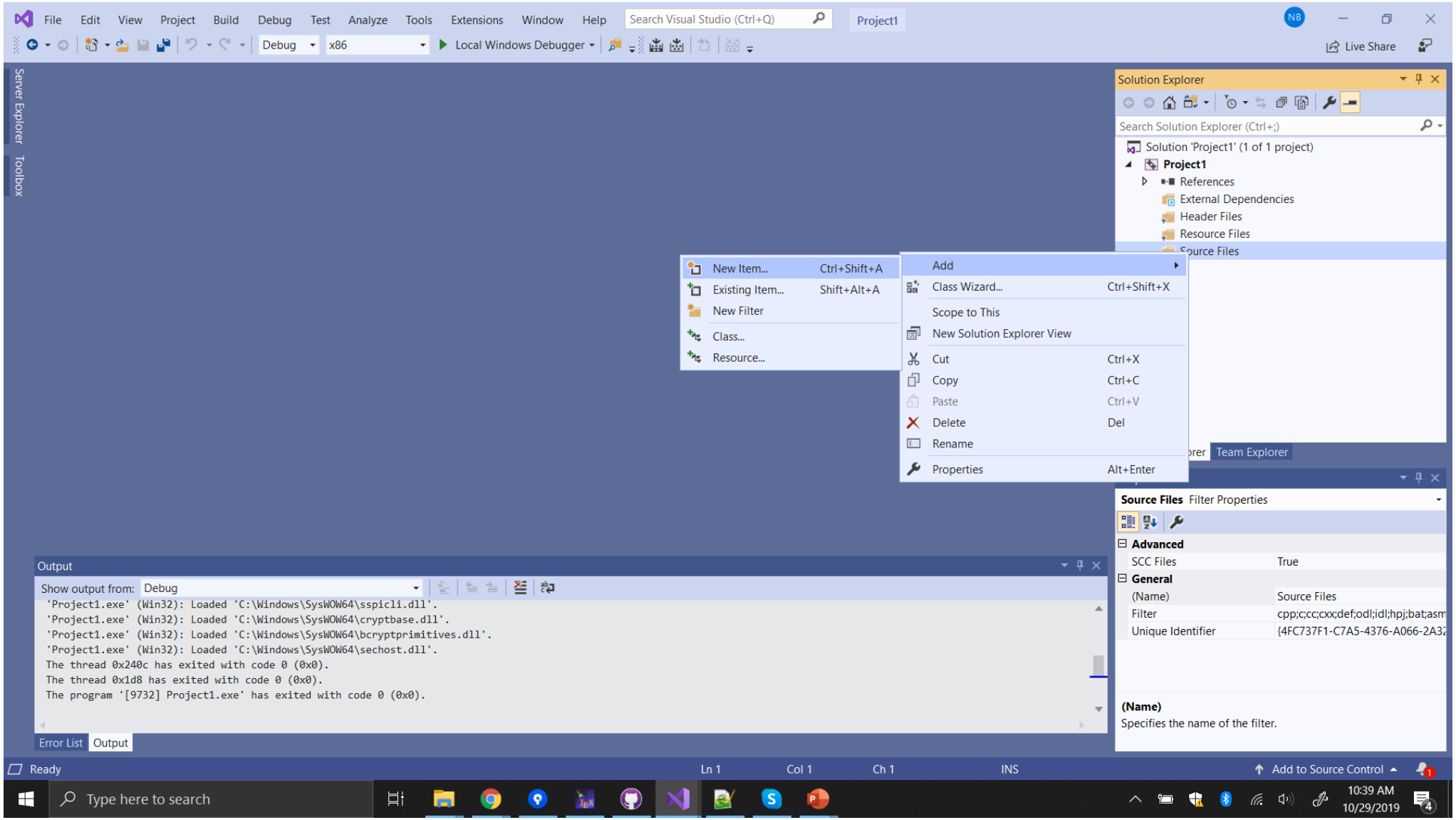

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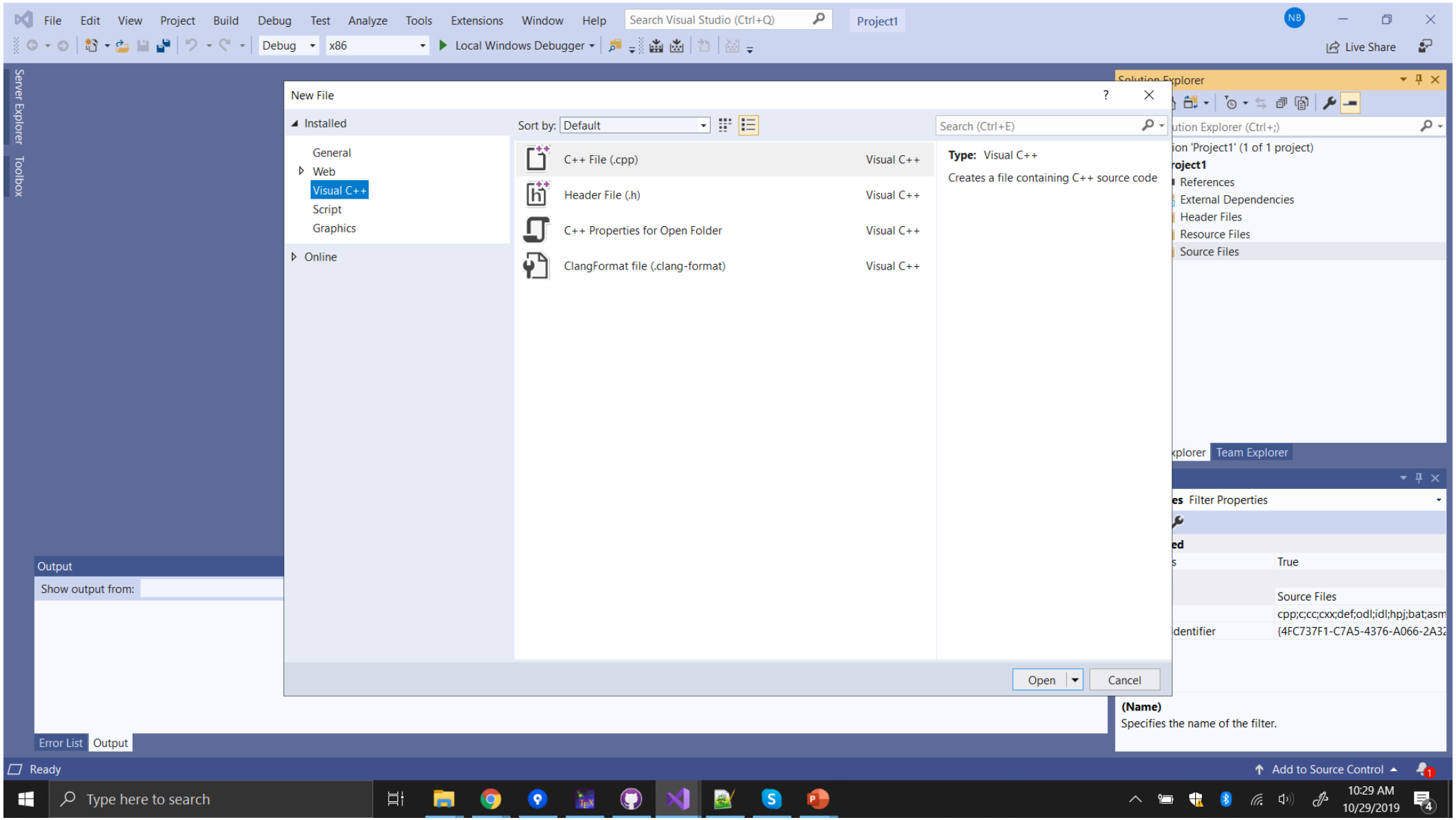

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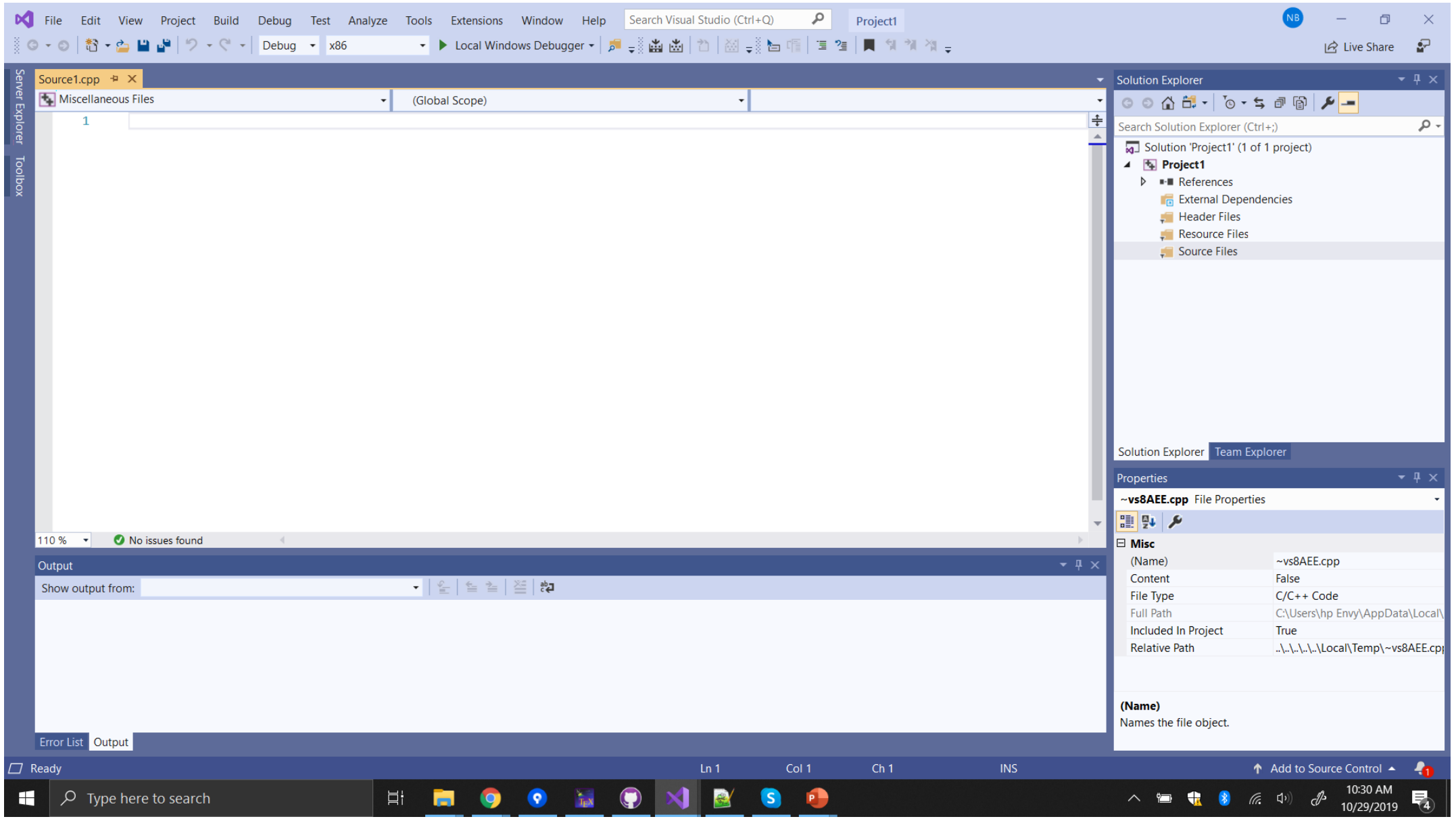
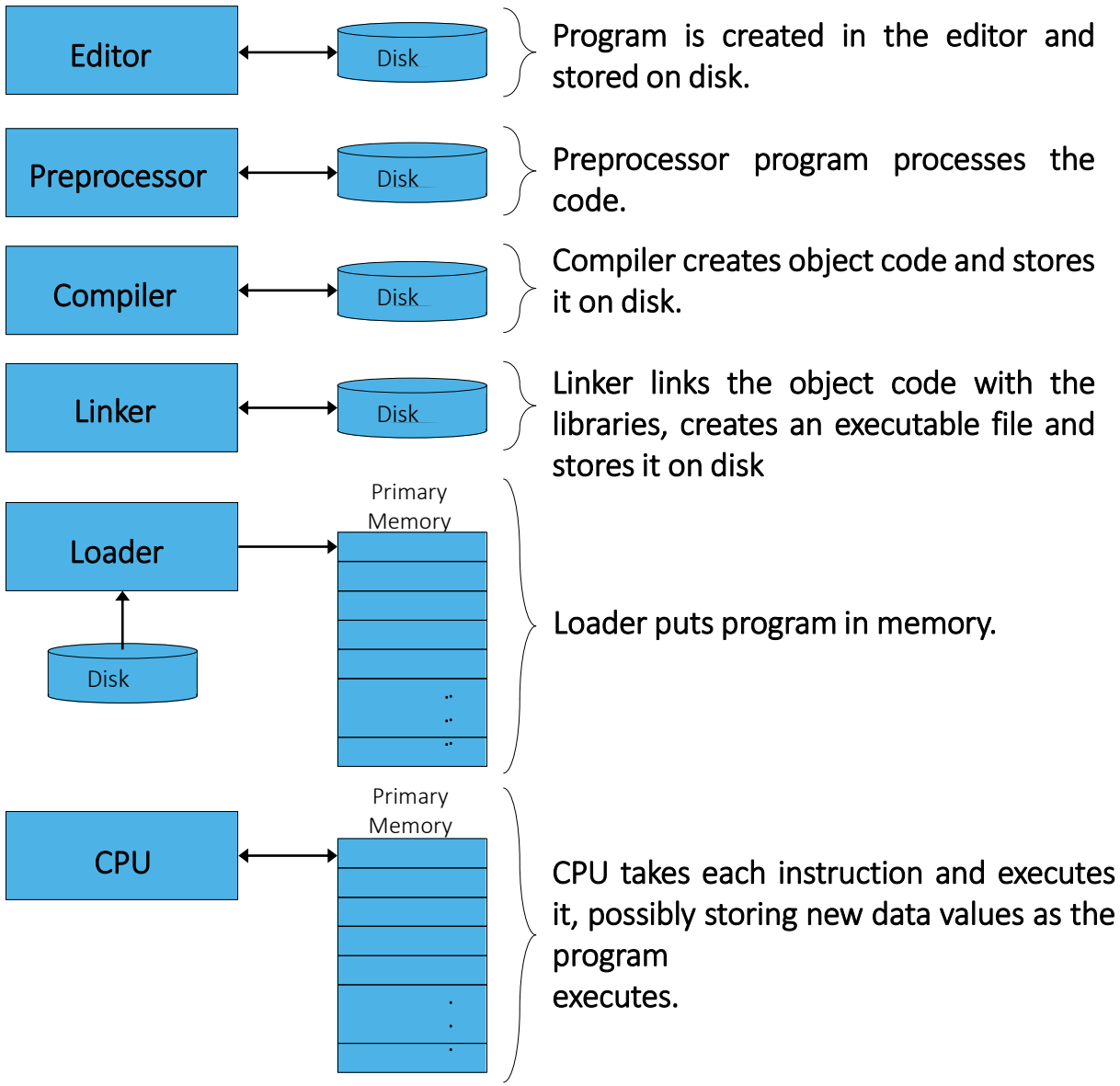


Basics of a Typical C++ Environment

Phases of C++ Programs:

1. Edit
2. Preprocess
3. Compile
4. Link
5. Load
6. Execute



Basics of a Typical C++ Environment

- Common Input/output functions
  - `cin`
    - Standard input stream
    - Normally keyboard
  - `cout`
    - Standard output stream
    - Normally computer screen

A Simple Program: Printing a Line of Text

- Before writing the programs
  - Comments
    - Document programs
    - Improve program readability
    - Ignored by compiler
    - Single-line comment
      - Use C's comment **/* .. */** OR Begin with **// or**
  - Preprocessor directives
    - Processed by preprocessor before compiling
    - Begin with **#**

A Simple Program: Printing a Line of Text

Single-line comments.

```
1.  // A first program in C++.
2.  #include <iostream>
3.  using namespace std;
4.  // function main begins program execution
5.  int main()
6.   {
7.      cout << "Welcome to C++!\n";
8.
9.      return 0;   // indicate that program ended successfully
10.
11. } // end function main
```

```
Welcome to C++!
```

A Simple Program: Printing a Line of Text

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Preprocessor directive to include input/output stream header file **<iostream>**.

```
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`using namespace std` means that we can use names for objects and variables from the ***standard library***

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Function **`main`** returns an integer value

```
Welcome to C++!
```

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Function **`main`** appears exactly once in every C++ program

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Left brace { begins function body

```
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```

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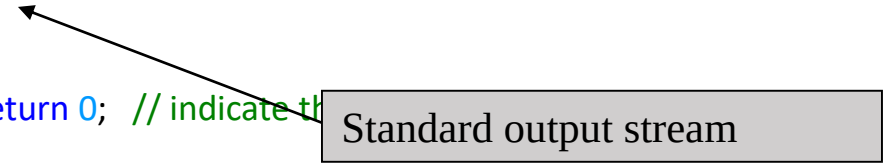


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A Simple Program: Printing a Line of Text

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Stream insertion operator

```
Welcome to C++!
```

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Another way to insert a new line, is with the **`endl`** manipulator

Special character **"\"** is used. **"n"** means new line

```
Welcome to C++!
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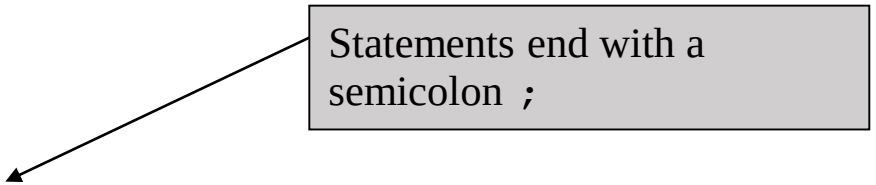


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Keyword **`return`** is one of several means to exit function; value **`0`** indicates program terminated successfully

```
Welcome to C++!
```

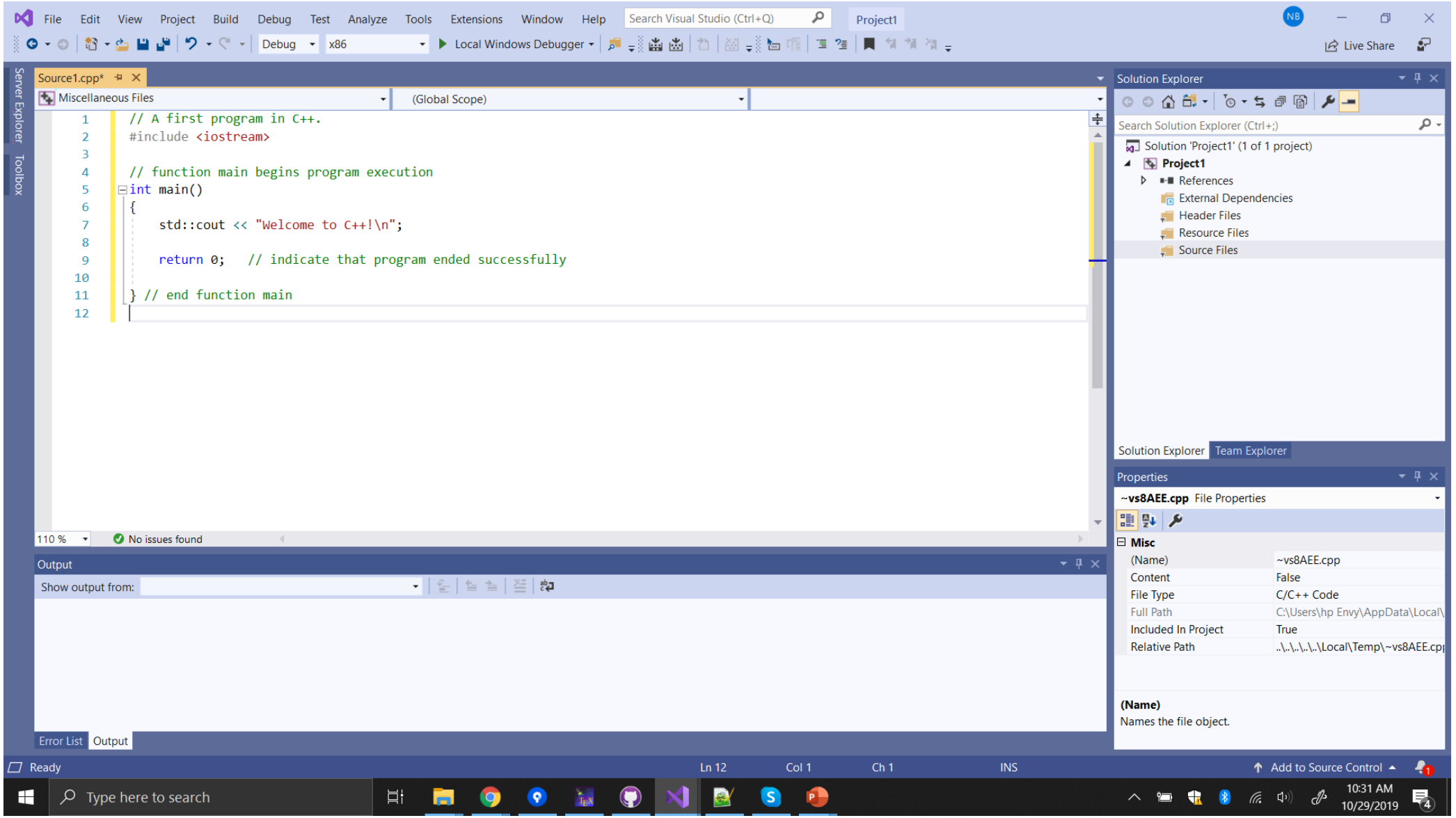
A Simple Program: Printing a Line of Text

- Standard output stream object
  - “Connected” to screen
  - <<
    - Stream insertion operator
    - Value to right (right operand) inserted into output stream
- Escape characters
  - \
  - Indicates “special” character output

A Simple Program: Printing a Line of Text

Escape Sequence	Description
`\n`	Newline. Position the screen cursor to the beginning of the next line.
`\t`	Horizontal tab. Move the screen cursor to the next tab stop.
`\\`	Backslash. Used to print a backslash character.
`\"`	Double quote. Used to print a double quote character.

Basics of a Typical C++ Environment



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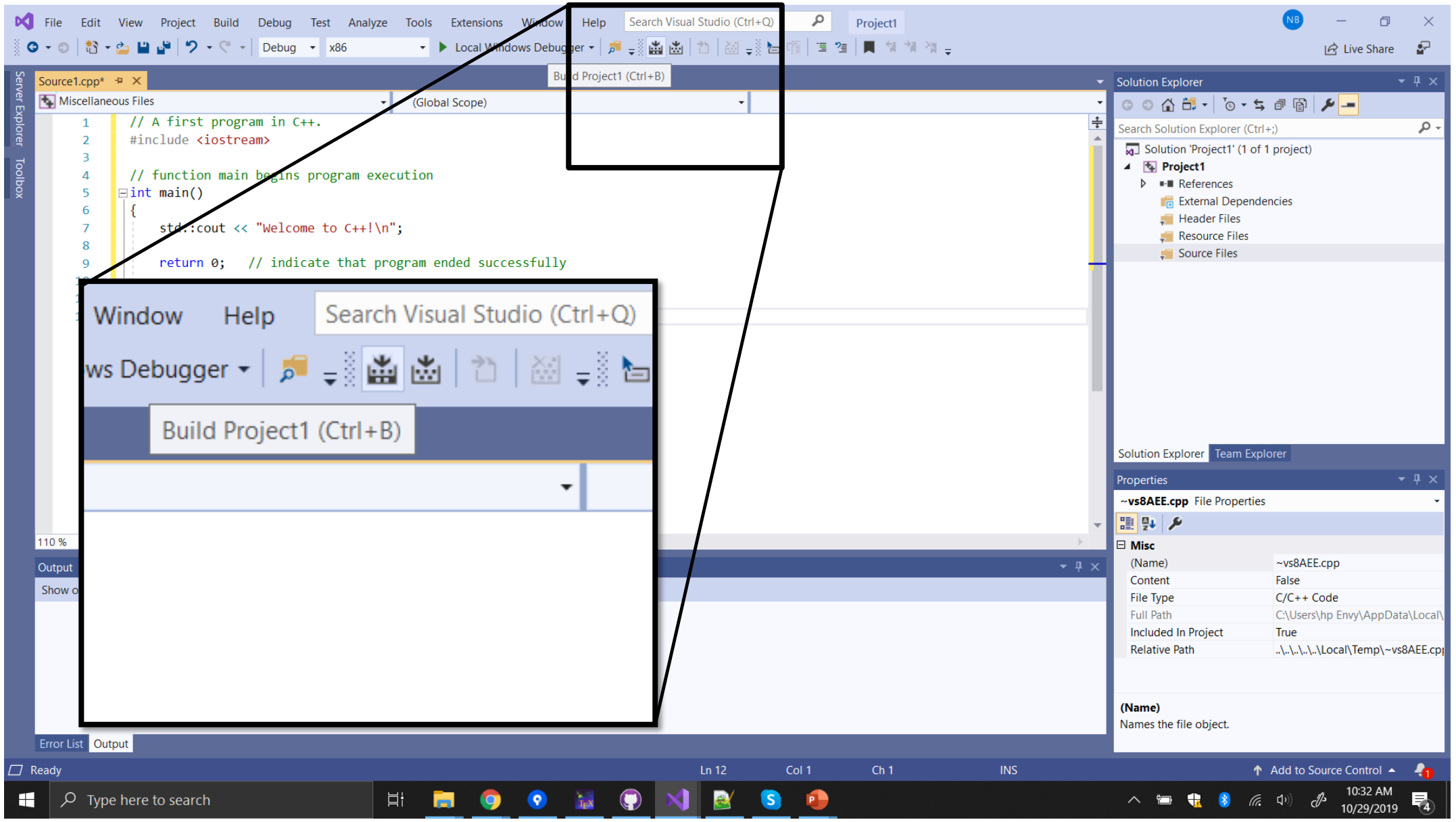

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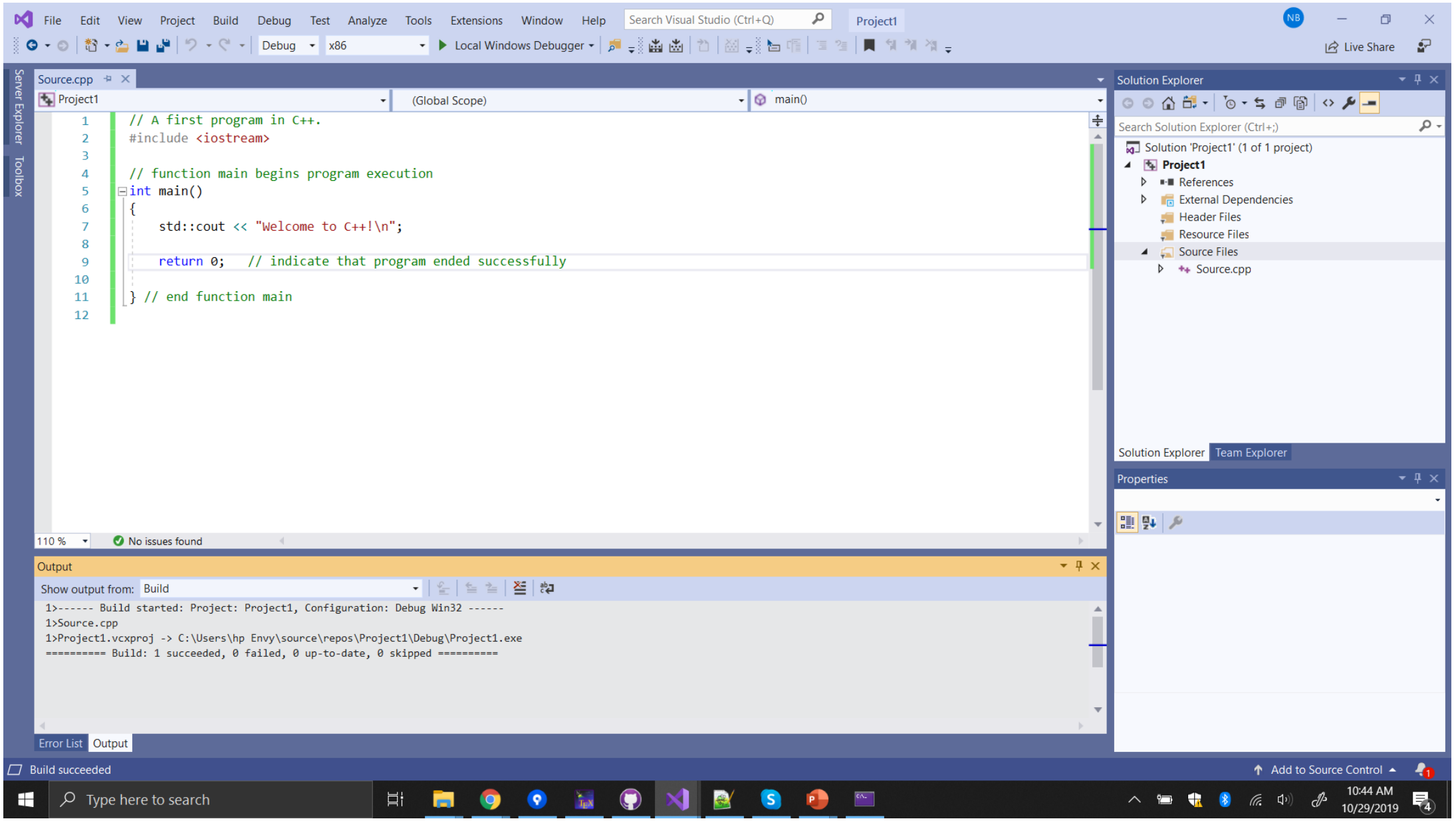

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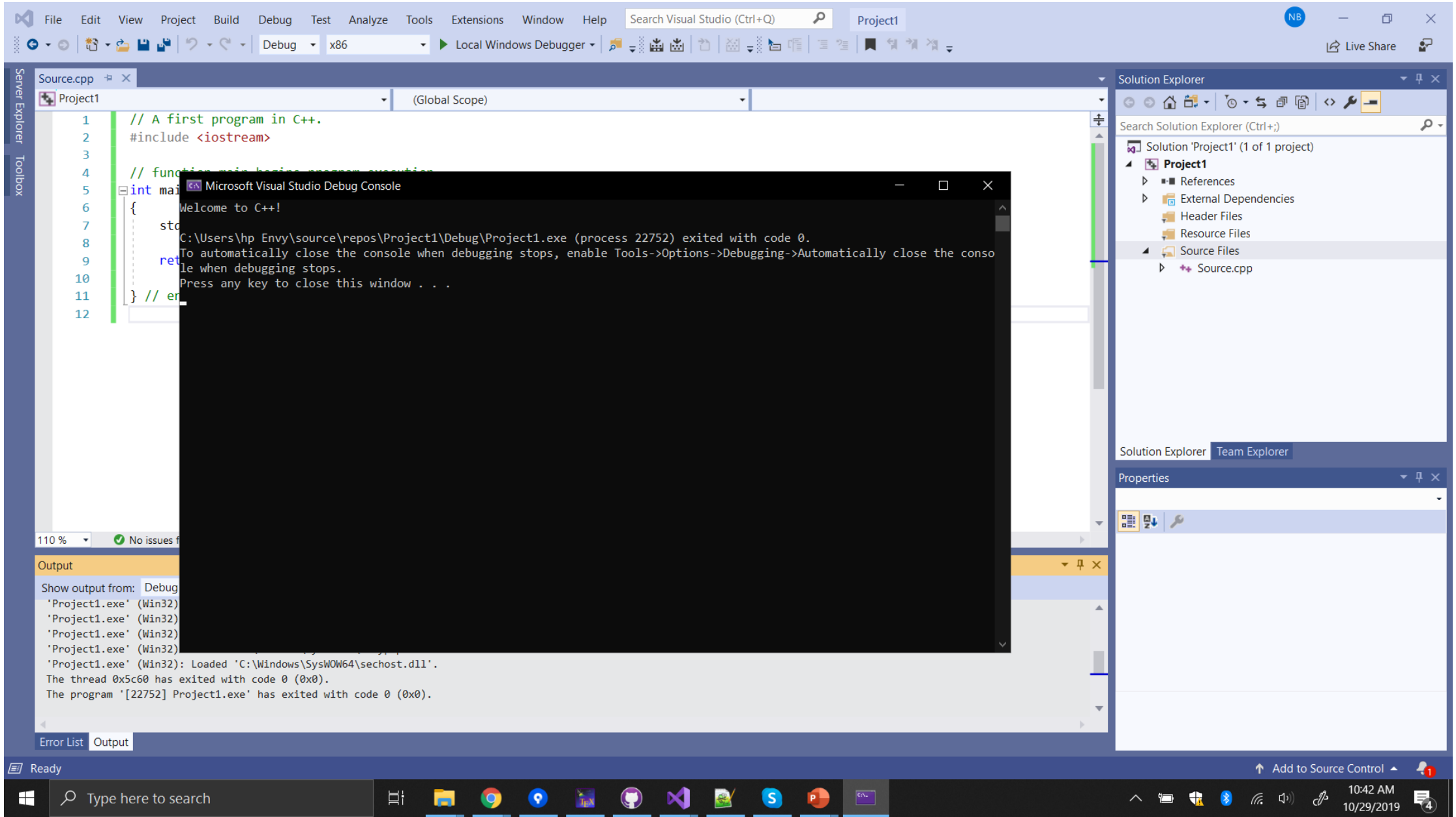

Thanks a lot

If you are taking a Nap, **wake up**.....Lecture Over