

C++ Lesson 1

C++

vs.

C, Java, Python

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Some of the slides were written by:
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Software written in C++:

Facebook

<https://github.com/facebook/folly>



Bitcoin:

<https://github.com/bitcoin/bitcoin>



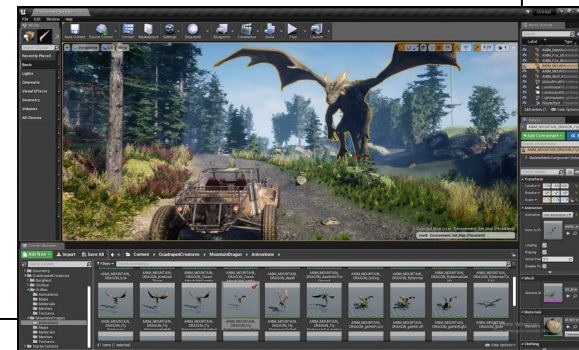
LibreOffice:

<https://github.com/LibreOffice/core>



Unreal:

<https://github.com/EpicGames/UnrealEngine>



Why C++?

C++ = <i>C + Java + More...</i>	C	C++	Java, Python
Low-level machine programming (benchmarks)	Yes	Yes	No
High-level Object-Oriented programming	No	Yes	Yes
Complexity	Low	High	Med.

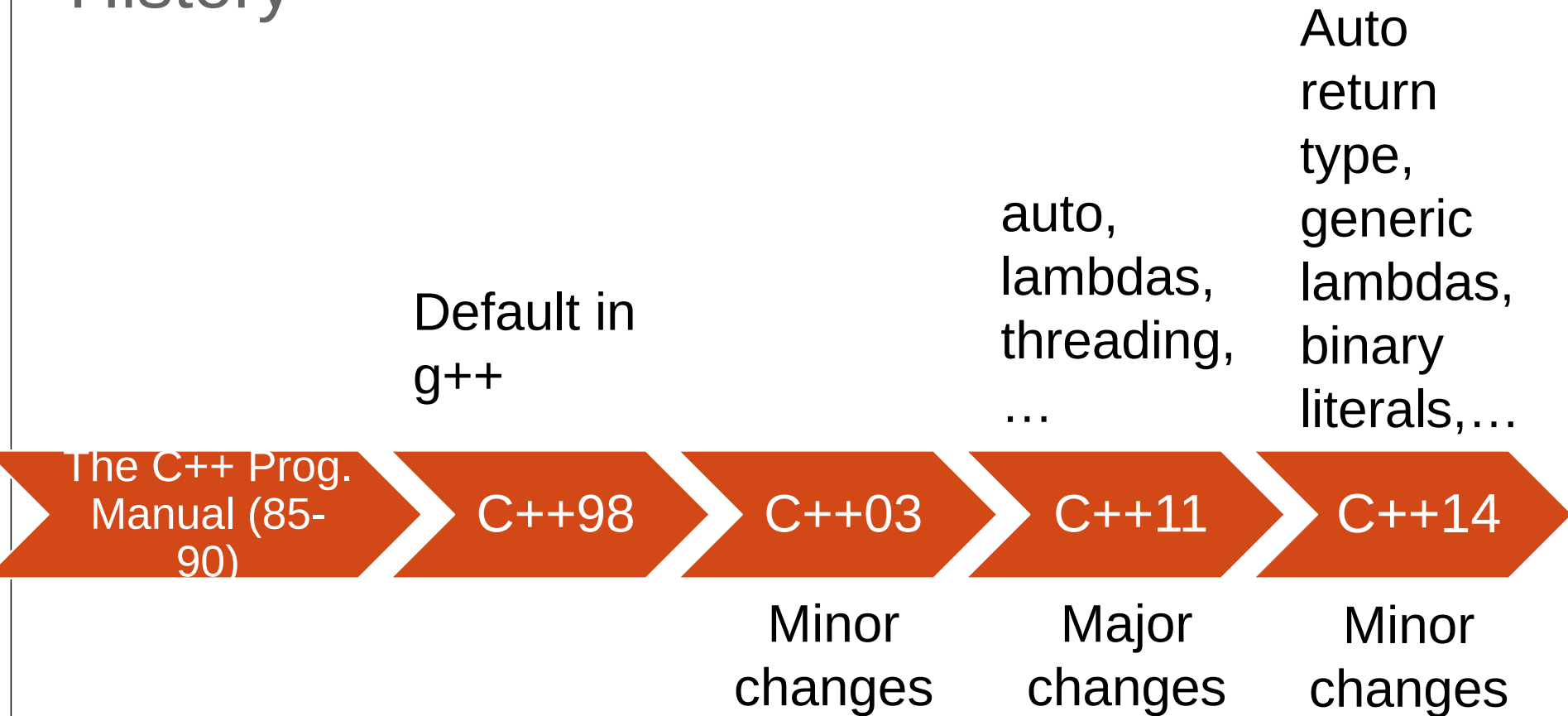
C++ vs. Java – memory

- In C++, the memory consumption of a data structure is tight – you get only what you ask for.
- In Java, your data structures might consume much more memory.
- See example in folder 1.
 - *Why is this?*

C++ vs. Python – time

- In both languages, you can solve complex algorithmic problems, such as the Traveling Salesman Problem.
- In C++, the code runs 10-100 times faster; see example in folder 1.
- Besides speed, C++ is also better suited to work in *real time*.

History



**We'll learn parts of C++-11, 14, 17,
Mostly parts that makes C++ more “pythonic” while keeping it
efficient**

Future



C++17

C++20

...

The missing types

strings in C++

```
#include <iostream>
#include <string>
```

```
int main()
```

```
{
```

```
    std::string str;
```

```
    int a;
```

```
    double b;
```

```
    std::cin >> str >> a >> b;
```

```
    if(std::cin.fail())
```

```
    {
```

```
        std::cerr << "input problem\n";
```

```
        return 1;
```

```
    }
```

```
    std::cout << "I got: " << str << ' '
```

```
    << a << ' ' << b << std::endl;
```

```
}
```

:More about string functions

<http://www.cppreference.com/cppstring>

Boolean variables

```
#include <iostream>
```

```
int main()
```

```
{
```

```
    int a = 5;
```

```
    bool isZero = (a == 0);
```

```
    // same conditions
```

```
    if(!isZero && isZero==false &&
```

```
isZero!=true && !!! isZero && a )
```

```
{
```

```
    std::cout << "a is not zero\n";
```

```
}
```

```
}
```

Good
style

C++ namespace (folder 3)

- Groups different variables and functions together;
- Reduces danger of name-collision when including different libraries;
- Can span multiple files.
- Standard library namespace: `std`;
- Another example: `folly`
https://github.com/facebook/folly/blob/master/folly/stop_watch.h

Error Handling in C++ *(folders 5-6)*

	Exception	Assert
Used during:	Normal run	Development
Used for:	Handling exceptional conditions.	Spotting internal errors and bugs.
Disabling:	No	With compiler flag

Unit-testing in C++

- You learned to do it in Java (JUnit).
- It is at least as important in C++.
- There are many frameworks for automated unit-testing in C++.
- We will use **doctest** – an open-source framework:
<https://github.com/onqtam/doctest>
- See folder 8 for an example.