My presentation about C++

the presentation is made to test my Latex skills

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Abstract

C++ is a general-purpose programming language created by Danish computer scientist **Bjarne Stroustrup** as an extension of the C programming language, or "C with Classes". The language has expanded significantly over time, and modern *C++* now has object-oriented, generic, and functional features in addition to facilities for low-level memory manipulation. It is almost always implemented as a compiled language, and many vendors provide *C++* compilers, it is available on many platforms.

C++ was designed with an orientation toward systems programming and embedded, resource-constrained software and large systems, with performance, efficiency, and flexibility of use as its design highlights. *C++* has also been found useful in many other contexts, with key strengths being software infrastructure and resource-constrained applications, including desktop applications, video games, servers (e.g. e-commerce, web search, or databases), and performance-critical applications (e.g. telephone switches or space probes).

C++ is standardized by the **International Organization for Standardization (ISO)** [2], with the latest standard version ratified and published by ISO in December 2020 as ISO/IEC 14882:2020 (informally known as *C++*20). The *C++* programming language was initially standardized in 1998 as ISO/IEC 14882:1998, which was then amended by the *C++*03, *C++*11, *C++*14, and *C++*17 standards. The current *C++* standard supersedes these with new features and an enlarged standard library. Before the initial standardization in 1998, *C++* was developed by Stroustrup[1] at Bell Labs since 1979 as an extension of the C language; he wanted an efficient and flexible language similar to C that also provided high-level features for program organization. Since 2012, *C++* has been on a three-year release schedule with *C++*23 as the next planned standard. [1]

[1] as we have seen he has developped the extension for C

Contents

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1.1 Brief history of C++

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3. Meta
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5. Nasa
6. Роскосмос

1.3 Table: various data types in C++

1. int
2. char
3. float
4. double
5. bool
6. other ...

1.4 Some easy exercises

1.5 Areas of application

1. machine learning
2. databases
3. game development
4. operating systems
5. Internet of things devices

2 history of C++

2.1 creation

In 1979, Bjarne Stroustrup, a Danish computer scientist, began work on "C with Classes", the predecessor to C++. The motivation for creating a new language originated from Stroustrup's experience in programming for his PhD thesis. Stroustrup found that Simula had features that were very helpful for large software development, but the language was too slow for practical use, while BCPL was fast but too low-level to be suitable for large software development.

When Stroustrup started working in ATT Bell Labs, he had the problem of analyzing the UNIX kernel with respect to distributed computing. Remembering his PhD experience, Stroustrup set out to enhance the C language with Simula-like features. C was chosen because it was general-purpose, fast, portable and widely used. As well as C and Simula's influences, other languages also influenced this new language, including ALGOL 68, Ada, CLU and ML.

2.2 photos

Figure 1: Bjarne Stroustrup

Figure 2: C++ logo

3 What are the companies that use C++?

Well-known large tech companies and organizations use C++ including Apple, Google, Meta, Microsoft, Nasa and even Роскосмос to achieve their goals and to deliver great products to the market.

Here are their logos:

Figure 3: Apple

Figure 4: Google

Figure 5: Meta

Figure 6: Microsoft

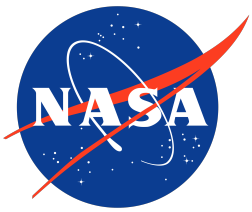

Figure 7: Nasa

Figure 8: Roscosmos

4 data types in C++

4.1 primitive data types

Since the C++ is a statically typed programming language, it has many built in data types that should be explicitly indicated by the programmer. Here is the table indicating information about these data types:

name	size in bytes	description	range
char	character of 8 bit integer	1	-128...127 or 0...255
int	4	4 bytes / 32 bits	-32768...32767 or 0...65535
float	4	floating point number	3.4e ± 308 (15 digits)
double	8	double precision floating point	1.7e± 308 (15 digits)
long double	10	long double precision float	1.2e ± 4932 (19 digits)
bool	1	boolean value false = 0 / true = 1	0, 1

Table 1: Elementary data types

4.2 other data types

But also there exit other data types. They are more complicated and require more precise explanation [3]:

1. Derived
   - function
   - array
   - pointer
   - reference
   - vector
2. User defined
   - structure
   - class
   - Union
   - Enum
   - Typedef

5 C++ practice

Now since you have already covered the basics, you are surely able to use basic functionality of C++. Some exercises are left for the reader as a possibility to practice your C++ skills, try to implement the following 5 trivial formulas in C++:

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}(\frac{x-\mu}{\sigma})^2} \tag{1}$$

$$\frac{\partial^2 \psi}{\partial x^2} + \frac{8\pi^2 m}{h^2}(E - V)\psi = 0 \tag{2}$$

$$\frac{\partial \int\limits_V |\psi|^2 \, dV}{\partial t} + \oiint\limits_S j \, dS = 0 \tag{3}$$

$$\rho(\frac{\partial V}{\partial t}) + V(\nabla V) = \nabla P + \rho g + \mu \nabla^2 V \tag{4}$$

$$\hat{H} = -\frac{\hbar^2}{2} \sum_{n=1}^{N} \frac{1}{m_n} \frac{\partial^2}{\partial x_n^2} \psi + V\psi \tag{5}$$

6 Areas of application of C++

name of the company	areas of application	number of employees
Adobe	Databases, IoT devices, machine learning	22 516
Apple	OS, databases, IoT devices, machine learning	147 000
Blizzard	Game dev, databases, IoT devices, machine learning	9 800
Evernote	Databases, IoT devices, machine learning	201 - 500
Meta	OS, databases, IoT devices, machine learning	58 604
Microsoft	OS, databases, IoT devices, machine learning	181 000
Nasa	Databases, IoT devices, machine learning	17 000
Netflix	Databases, IoT devices, machine learning	9 400
Google	Machine learning, databases, IoT devices	135 301
LinkedIn	Databases, IoT devices, machine learning	16 000

Table 2: areas of application of C++

C++ is used in making large software infrastructures. Since C++ can directly operate the hardware it's running on, coders and programmers can edit and modify their code to run proficiently in any environment. That's why C++ is an excellent choice for building software[2], controlling system resources, and completing critical tasks[3].

[2] like games
[3] tasks that require optimised computations

References

[1] Anfernee Goon, Yuhao Wu, Makoto Matsushita, and Katsuro Inoue. Evolution of code clone ratios throughout development history of open-source c and c++ programs. In *2017 IEEE 11th International Workshop on Software Clones (IWSC)*, pages 1–7. IEEE, 2017.

[2] Eun-Hee Nah, Seon Cho, Suyoung Kim, Han-Ik Cho, Catalina-Suzana Stingu, Klaus Eschrich, Juliane Thiel, Toralf Borgmann, Reiner Schaumann, Arne C Rodloff, et al. International organization for standardization (iso) 15189. *Annals of laboratory medicine*, 37(5):365–370, 2017.

[3] Bjarne Stroustrup. An overview of c++. In *Proceedings of the 1986 SIGPLAN workshop on Object-oriented programming*, pages 7–18, 1986.