

# Software Engineering

Moscow Institute of Physics and Technology

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- Graduate of the Moscow Institute of Physics and Technology
- Candidate of Technical Sciences in specialty 1.2.1
- Associate Professor and Course Lecturer at the MIPT
- Software Developer and AI Researcher since 2010
- Author of 20 publications in peer-reviewed scientific journals
- Author of 11 reports at IEEE / ICPS conferences

Currently, I am engaged in the design and development of various computing systems using concurrent and network programming, in particular, I am working on the optimization of infrastructure components for financial systems of automated high-frequency trading.

# Course Program

- 01. Introduction and Brief Overview
- 02. Basics of Programming
- 03. Object - Oriented Programming
- 04. Generic Programming
- 05. Software Architecture Patterns
- 06. Projects and Libraries
- 07. Handling Errors and Debugging
- 08. Instruments of Calculus
- 09. Detailed Memory Management
- 10. Collections and Containers
- 11. Iterators and Algorithm Libraries
- 12. Text Data Processing
- 13. Streams and Data Serialization
- 14. Concurrent Programming
- 15. Network Technologies and Tools

# C++ Definition

C++ is a compiled general - purpose programming language based on weak static type system. This language supports multiple programming paradigms and provides both low - level and high - level features.

- The processor understands only low - level machine code
- The developer writes high - level source code
- The compiler translates the source code into machine code
- The types of all objects are known at compile time
- Various automatic implicit type conversions are allowed

# C++ Evolution

- Originally developed as a set of the C language extensions
- Currently is an independent and full-fledged language
- Inherited components of Ada, Fortran, Simula and others
- Influenced Java, Go, Python and many other languages
- Has taken place in the market and has several competitors

The first commercial release of the C++ language was on 14/10/1985.

# C++ Standards

- C++98 – fundamental standard
- C++03 – patch
- Technical Report 1 2007 and Boost
- C++11 – language core +30%, standard library +100%
- C++14 – patch
- C++17 – patch
- C++20 – significant extensions
- C++23 – patch
- C++26 – the next standard under development

Additional features are provided by libraries such as Boost and Qt.

# C++ Use Cases

- Operating systems and control systems
- Highly loaded data processing systems
- Game software and simulation systems
- Financial systems of automated trading
- Systems for highly responsible industry

The C++ language provides both low - level and high - level features.

# Programming Paradigms

- Declarative programming – SQL and HTML
- Imperative programming – statements
- Procedural programming – subroutines
- Functional programming – Lisp, Erlang and Haskell
- Structured programming – sequences, selections and loops
- Object - oriented programming – classes
- Generic programming – templates
- Event - driven programming – events and callbacks
- Concurrent programming – threads, processes and networks



# Instruments

<b>Instrument</b>	<b>Considered</b>	<b>Alternative</b>
Linux operating system	Ubuntu	Debian, CentOS
Environment	Visual Studio Code	CLion
Toolset : Compiler	Compiler GNU	Clang
Toolset : Builder	CMake	Bazel, Ninja
Toolset : Debugger	GDB, Valgrind	LLDB
Toolset : Profiler	Google.Benchmark	gperftools
Version control system	Git	no
Git graphical client	SmartGit, IDE	GitHub Desktop
Project hosting system	GitHub	Bitbucket

# References

- [learncpp.com](http://learncpp.com) – basic educational materials
- [cppreference.com](http://cppreference.com) – language reference
- [boost.org](http://boost.org) – Boost libraries documentation
- [github.com](http://github.com) – open projects and libraries
- [stackoverflow.com](http://stackoverflow.com) – developers QA forum

The list of recommended books is available at my own Google - table.