Python programming - introduction

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Outline

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Basic programming concepts

- **Algorithm**: Finite sequence of steps for solving a specific problem.
  - The concept can be applied for everyday tasks too (e.g. making a Sacher cake, cleaning the bookshelf).
- **Data structure**: A scheme for the storage and efficient use of data elements (example: list).
- **Programming language**: A language defined by rigorous rules, that can be used to communicate instructions to the computer.
- **Programming**: Designing algorithms and data structures, and implementing them in a programming language (coding).

Programming languages

Sep 2023	Sep 2022	Change	Programming Language		Ratings
1	1			Python	14.16%
2	2			C	11.27%
3	4	^		C++	10.65%
4	3	v		Java	9.49%
5	5			C#	7.31%
6	7	^		JavaScript	3.30%
7	6	v		Visual Basic	2.22%
8	10	^		PHP	1.55%
9	8	v		Assembly language	1.53%
10	9	v		SQL	1.44%
11	15	^^		Fortran	1.28%

Source: https://www.tiobe.com/tiobe-index/

Integrated Development Environments

Input	→	IDE	→	Output

- **Input data**
  - Source codes
  - Compiled elements
    - Components, libraries (DLL), …
  - …

- **IDE**
  - MS Visual Studio
    - Visual Basic, C#, C++, J#, Python, …
  - RAD Studio
    - Delphi, C/C++
  - NetBeans, Eclipse
    - Java, C/C++, PHP, Python, …
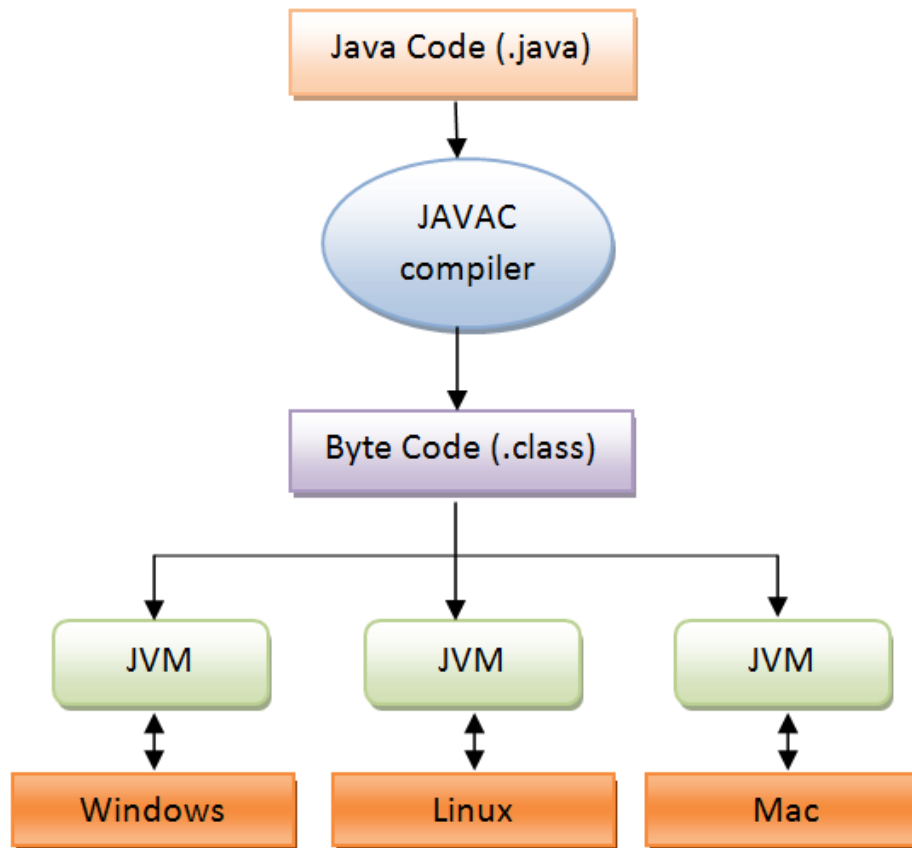 - …

- **Output data**
  - Compiled elements
    - *.obj, byte code, …
  - Runnable software
    - *.exe, …
  - …

- **Integrated Development Environment**
  - Source code editor
  - Compiler, interpreter → executing
  - Debugger, code completion
  - …

Platform independency - Java

- Java Virtual Machine
  - Executes the Java byte codes on the given operation system.

Characteristics of Python

- Positive
    - concise and elegant syntax
    - easy to learn ("brain-friendly")
    - tens of thousands of external packages (https://pypi.org/)
    - strong community, annual PyCon conferences
    - free and open source
    - platform independent
    - dynamically typed, interpreted language
    - multi-paradigm language

- Negative
    - can be slow for certain tasks
    - its multi-threaded capabilities are limited

History

1994　Python 1.0 was released.

2000　Python 2.0 was released.

2001　The Python Software Foundation was launched.

2001　The first PyCon conference was held.

2008　Python 3.0 was released. It was not compatible with version 2. The transition was slow, but finally happened.

2018　Guido van Rossum steps down as BDFL. The main authority behind the language will be a five-person steering committee (see: PEP 8016).

Guido van Rossum

Evolution of the language, PEPs

Prominent applications

- Youtube
  - *„Python has been an important part of Google since the beginning, and remains so as the system grows and evolve."* (Peter Norvig, Google)
- Dropbox
  - *„Python became my favorite programming language because it had a balance of simplicity, flexibility, and elegance."* (Drew Houston, CEO, Dropbox)

Implementations

- CPython (`http://python.org/`)
- PyPy (`http://pypy.org/`)
- IronPython (`http://ironpython.net/`)
- Jython (`http://www.jython.org/`)
- MicroPython (`https://micropython.org/`)
- …

Python development environments

- Heavyweight
    - PyCharm (`http://www.jetbrains.com/pycharm/`)
    - Visual Studio Code (`https://code.visualstudio.com/`)
    - PyScripter (`https://sourceforge.net/projects/pyscripter/`)
    - Spyder (`https://code.google.com/p/spyderlib/`)
    - …

- Lightweight
    - Emacs / Vim / ...
    - Sublime Text (`http://www.sublimetext.com/`), $70
    - IDLE (shipped with the interpreter)
    - Jupyter Notebook
    - …

Installation

- Windows: the easiest way is to use a Python distribution
  - Anaconda (`https://www.continuum.io/downloads`)
  - Miniconda (`http://conda.pydata.org/miniconda.html`)
  - WinPython (`http://winpython.sourceforge.net/`)

- Linux: There are more viable options
  - Using the package manager of the operating system.
  - Installing the interpreter with the package manager, installing the external packages with pip.
  - Using a Python distribution.

Let's do programming, but how?

VS.

„keyboard monkey"   „real programmer"