Chapter-2: Introduction to Python

Topics:

What is python?

History of Python

Python Features

Python Versions

Python Software

What is Python?

Python is a programming language and has some of the features of scripting language.

Python is a general purpose programming language. A programming language used for developing any type of software or application is called a general purpose programming language.

Python is a high level programming language. All high level programming languages are portable. Python portability allows developing and running python applications irrespective hardware.

Python is an object oriented programming language but also supports other programming paradigms.

Python is also called a multi paradigm programming language.

Python is an interpreted programming language.

“Python is a general purpose, high level, portable, object oriented, multi paradigm and interpreted programming language”

History of Python

1. Python language development is started in the year 1989
2. This first version of python is released to public 1991
3. Python language is developed in C language. Initially python was called CPYTHON.
4. Python language is developed to overcome the limitations of ABC Language.
5. Python language is developed at CWI (Centrum Wiskunde & Informatica (CWI) is the national research institute for mathematics and computer science in the Netherlands).
6. Python language is developed by a Dutch programmer Guido Van Rossum
7. Python language is developed using some of the features of other programming languages which includes,
    a. C (Procedural Oriented Programming)
    b. C++ (Object Oriented Programming)
    c. Modula7 (Modular Programming)
    d. Perl (Scripting Language)
8. “Python” name is taken from one popular comic serial broadcasting in BBC “Monty Python Flying Circus”
9. Python language is a product of or maintained by a non profitable organization called PSF (Python Software Foundation).

Python Features

Python features are nothing but facilities provided by python to the developers or programmers.

1. Simple or Easy
2. Free and Open Source
3. Large Standard Libraries
4. Platform Independent
5. Dynamic
6. High Level and Portable
7. Extensible
8. Embeddable
9. Object Oriented
10. Interpreted
11. Robust

Simple or Easy

1. **Less Coding:** Python provides libraries which contain predefined code/functionality. This functionality is used by python developer to perform specific task
2. **Easy Syntax:** The syntax of python is easy compare to other languages (C,C++)
    - **a.** In python statements are not terminated with ;
    - **b.** In python blocks are not defined with { }
    - **c.** In python there is no variable declarations

3. **Automatic Memory Management**

   Python provides a facility called garbage collector, which removes unused memory (garbage)

Free and Open Source

Python software is free to download

This software can be downloaded from

www.python.org (official website of python)

What is open source?

Python software source code is given to public or open source

If source code is open to public,

The public can develop new technologies and new python languages or software.

Large Standard Libraries

Python has a very big community. This community people develop and provide libraries. Python comes with a large number of libraries.

www.pypi.org

pypi stands for python package index, it is a repository where all python libraries are available.

Platform Independent

Programming languages are 2 types

1. Platform dependent languages
2. Platform independent languages

What is a platform?

Platform is software which provides development environment and execution environment for applications or softwares.

The Operating System is called a platform.

Platform Dependent Languages

C,C++ are called platform dependent languages

Why are C,C++ are called platform dependent?

What is the problem with platform dependent languages?

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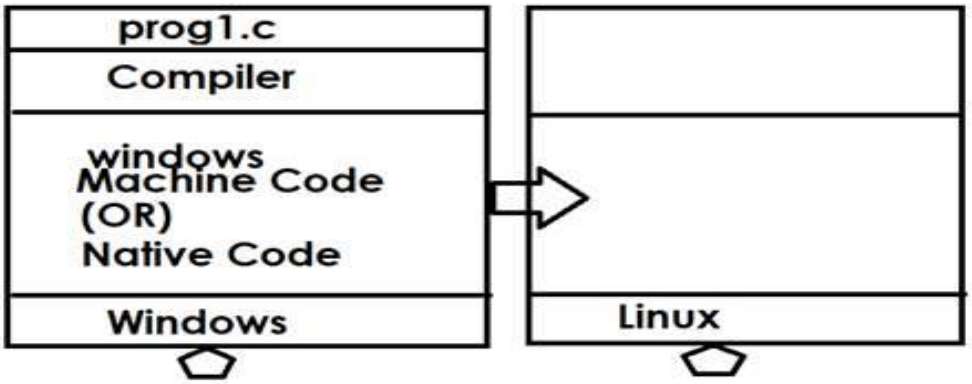
Platform Dependent Languages

C,C++ are called platform dependent languages.

Why are C,C++ are called platform dependent?

1. When C,C++ programs are compiled, C,C++ compilers generate machine code/native code. The code generated respective to OS

This is platform dependent code.



2. Data representation in C,C++ changes from one os to another os

C,C++	16bit	32bit
int long	2bytes 4bytes	4bytes 8bytes

What is the problem with platform dependent languages?

1. Need to compile program on every OS
2. Before compiling required changes according to OS

Platform Independent Language

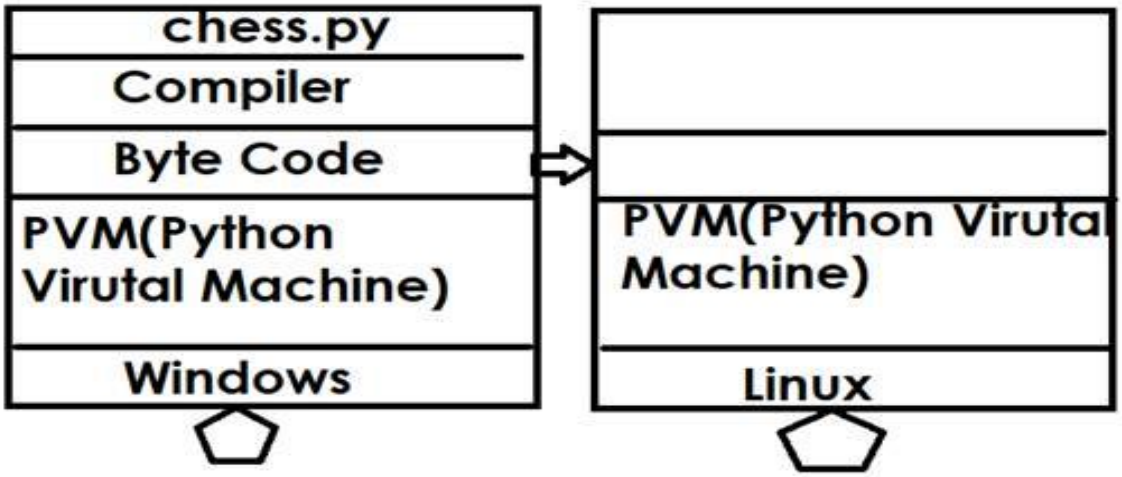
WORA : Write Once Run Any Where

CORA : Compile Once Run Any Where

Python is a platform independent programming language

In platform independent programming languages the development environment and execution environment may not be the same.

How is Python platform independent?



What is Bytecode?

1. Compiled code of python source program or program is called byte code
2. Byte code is not 0's and 1's (not machine code)
3. Byte code is platform independent code
4. Byte code is a collection mnemonics (verbs)
5. Byte code is python virtual machine code

What is PVM?

1. PVM stands for Python virtual machine
2. PVM is software provided by python.
3. PVM provides interpreter, which translates byte code into native code or executable machine code

Data representation in python is the same for all operating systems.

Dynamic

Programming languages are 2 types

1. Statically typed programming languages
2. Dynamically typed programming languages

Statically typed

C,C++, Java, C#.net are called statically typed programming languages. Static means fixed.

A statically typed programming language is one where the type of a variable is known and checked at **compile time**, before the program is run. In most cases, the programmer must explicitly declare the data type of each variable, and once assigned, that type cannot be changed.

Dynamic typed

In dynamic typed programming languages the type of variable is not known at compile time, it is known at runtime.

Data type of variable changes based on value type.

High Level and Portable

All high level languages are in simple english

Python portability allows developers to develop and run python applications on any system or hardware architecture.

Extensible and Embeddable

Inserting python code inside other programming languages is called embeddable.

Using other languages code within python is called extensible.

Object Oriented

Object oriented is not language; it is a programming paradigm that defines a set of rules and regulations to write code. Or organize data and code

Interpreted

Python is compiled and interpreted.

Python compiler generates byte code and byte code is interpreted and executed by interpreter provided by PVM.

Robust

Robust means strong

In Python, "robust" describes code that is strong, resilient, and can handle unexpected errors, invalid inputs, or changing conditions without

crashing. It emphasizes writing reliable and maintainable software for both current and future use

Robust code includes

1. Exception Handling (OR) Error Handling
2. Type Hints
3. Programming approaches (POP,MOP,OOP)

Python versions

Python1 → 1.1,1.2,1.3,1.4,1.5

Python2 → 2.0,2.1,2.2,2.3,2.4,..2.7

Python3 → 3.0,3.1,3.2,3.3,3.4,… 3.14.2

Python 1 ,python 2 ,python 3 → these are called major versions because there is 70 to 80 % percent changes in language

3.0,3.1,3.2 → these are called minor versions

3.14.2→micro version

3.14.2

│ │ └── Micro (bug fixes)

│ └──── Minor (new features)

└────── Major (big language changes)

There is no compatibility between major versions

There is compatibility between minor versions

Python software installation

Python software is free to download

Python software provides

1. IDLE (Integrated Development Learning Environment) is code editor/ide(integrated development environment)
2. Standard Libraries
3. Python Shell (REPL tool R-Read,E-Evaluate,P-Print,L-Loop)
4. Python Compiler
5. PVM
6. Python tools (Python installer package (PIP), Python Debugger,..)

Third party ide's or editors

PyCharm

VSCODE

Spyder

Jupyter Notebook

Google Colab (Cloud)

Python implementations

1. Jython
2. Ironpython
3. Rpython

4. Pypy
5. Micropython

Python Distributions

Python distribution is a python software bundle, it consist of

1. Python software
2. Application specific libraries
3. IDE’s

Some of Python Distribution :

Anaconda

ActiveState ActivePython

pyodide

WinPython

Conceptive Python SDK

Python Working Modes

Python developer work with python in 2 modes

1. Interactive mode
2. Scripting mode or programming mode

1.Interactive mode

In interactive mode python developer work with python shell

What is a python shell?

Python Shell is an interactive environment where we can write and execute Python commands one line at a time and get the output immediately.

Mainly used for:

- Learning Python
- Testing small code snippets
- Quick calculations

Example :

>>> 10 + 20

30

2.Scripting Mode (Programming Mode)

Scripting Mode is the mode where a Python developer writes Python code in a file, saves it, and then executes it as a program.

Python Script

A Python program saved with `.py` extension

Example: `hello.py`

Steps in Scripting Mode:

1. Write code in an editor (VS Code, Notepad, PyCharm, etc.)
2. Save the file with .py extension
3. Run the program (**python hello.py**)
4. Output