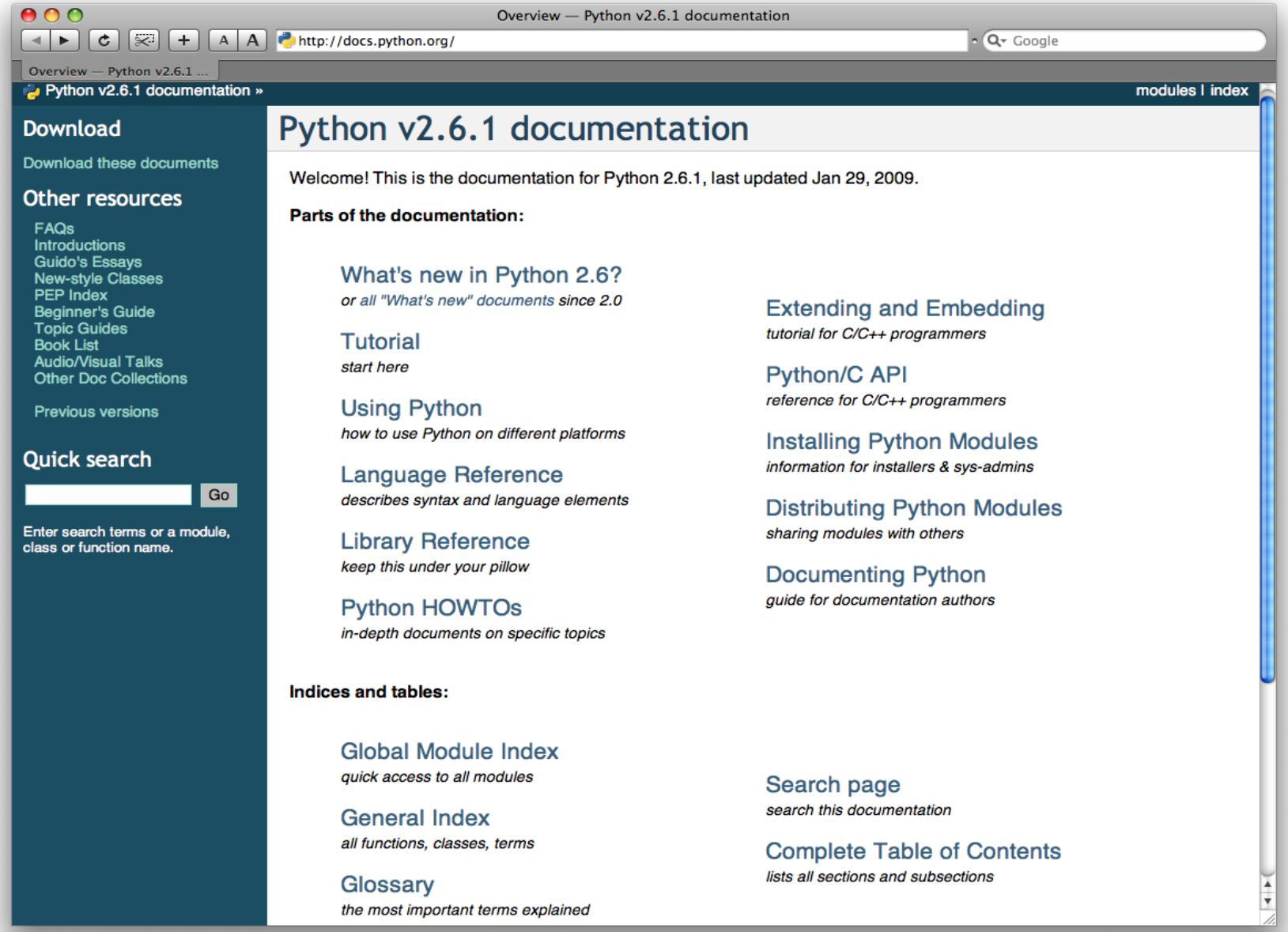
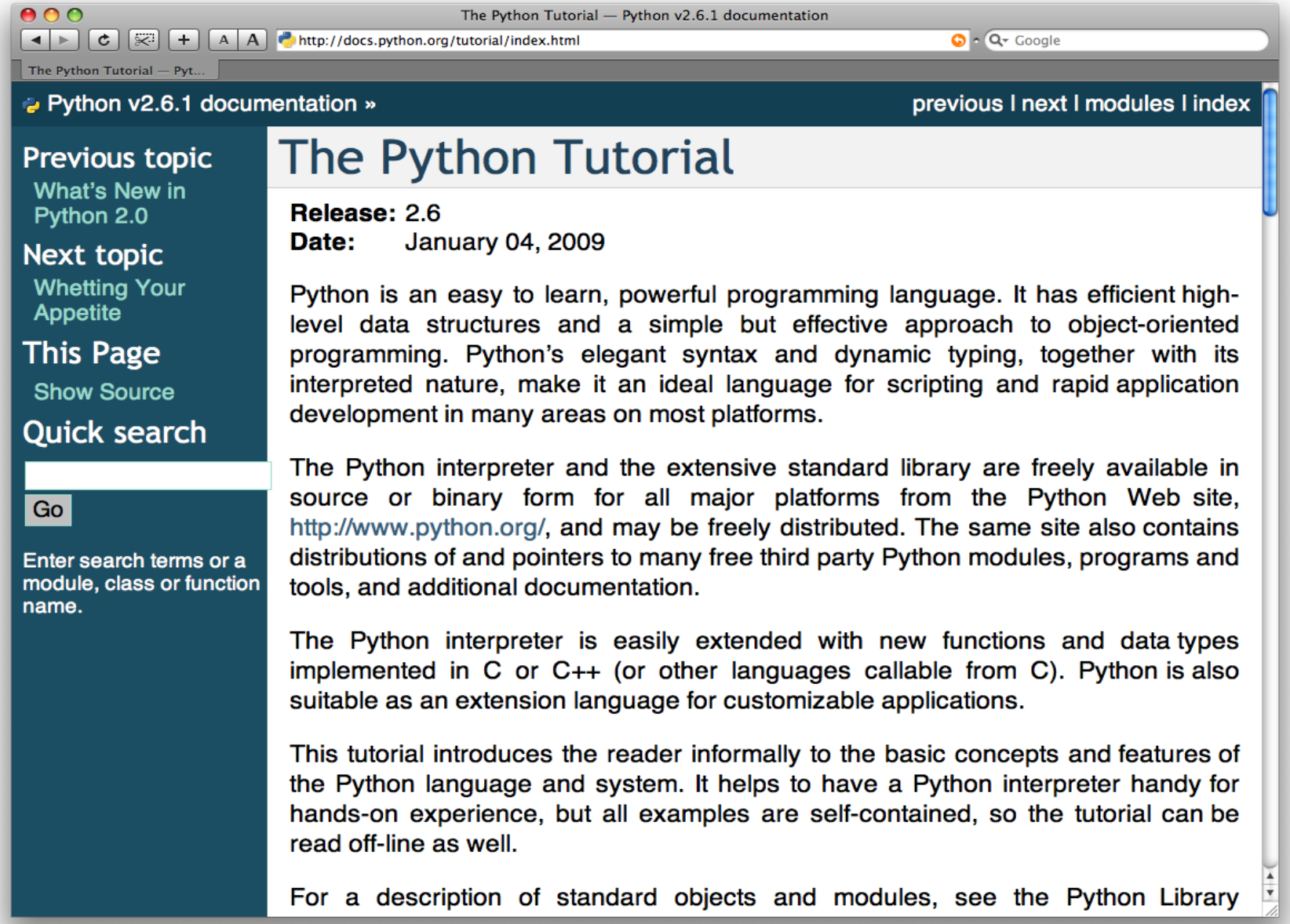
PYTHON PROGRAMMING

http://docs.python.org/



The Python tutorial is good!

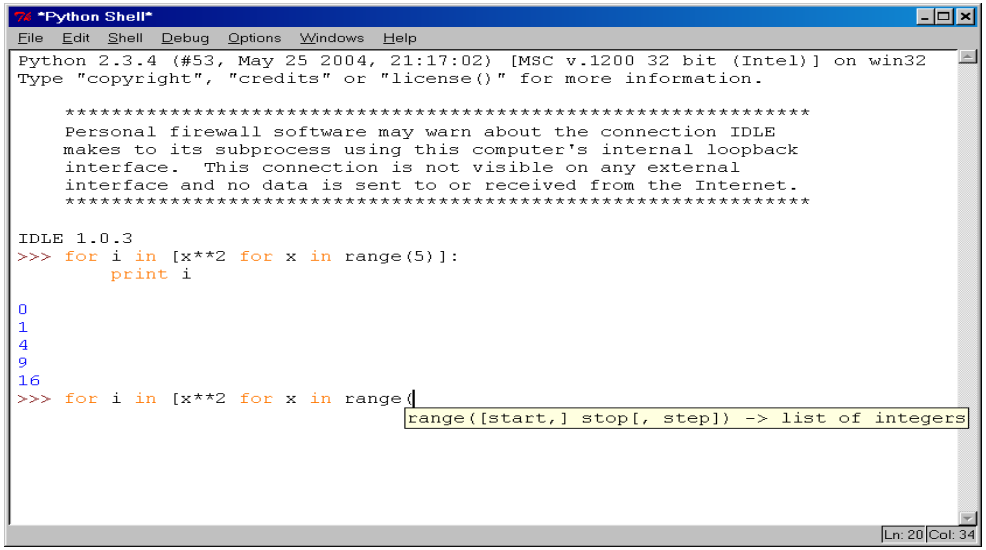


Installing

- Download from http://python.org/download/
- There are several options for an IDE
  - IDLE – works well with Windows
  - Emacs with python-mode or your favorite text editor
  - Eclipse with Pydev (http://pydev.sourceforge.net/)

IDLE Development Environment

- IDLE is an Integrated DeveLopment Environment for Python, typically used on Windows
- Multi-window text editor with syntax highlighting, auto-completion, smart indent and other.
- Python shell with syntax highlighting.
- Integrated debugger with stepping, persis-tent breakpoints, and call stack visi-bility



What is Python?

- Python is an
  - Open Source,
  - High Label,
  - Dynamically typed,
  - Compiled and
  - Interpreted,
  - Procedure Oriented and,
  - Object Oriented,
  - Generalized,
  - General Purpose,
  - Platform Independent,
  - Portable,
  - Extensible,
  - Robust

Programming language.

Description

- **Open source:**
  - If the source code is available with machine code at the end user is known as open source. The benefit of open source is, we can modify the output by changing the source code at any moment.
- **High label:**
  - The label of a programming language is decided by the accessing style to memory by the programming language. Basically there are three labels are available,
    1. low label
    2. middle label
    3. high label
  - In every programming language, memory is compulsory used in back end. To handle the memory in backend, memory management mechanism is used. But in high label programming language that back end which is interacting with memory is hidden from the end user. In high label programming language all the memory management is the responsibility of programming language itself, not the responsibility of the programmer. End user is not responsible to write the memory management mechanism explicitly in high level programming language.

Contd.

```
no = 100
fact = 1
while no > 0 :
      fact = fact * no
      no -= 1
print fact
[litindia@localhost demo]$ python test.py
933262154439441526816992388562667004907159682643816214685929638952175999932299156
089414639761565182862536979208272237582511852109168640000000000000000000000000
```

The above program logic is a valid logic in C, C++, Java, and in Python, But this logic in C, C++ , Java will provide the output 0 for the factorial of 100. What the logic is written will work for C, and C++ up to a specific value, but for bigger number like 100 the same logic will not work. The problem is not present in logic, the problem is present in memory.

Contd.

- **Statically typed Vs dynamically typed:**

C Program	C++ Program	Java Program	Python

#include "stdio.h"
main ()
{
int x ;
x = 10 ;
}
	#include "iostream"
	using namespace std ;
	main ()
	{
	int x ;
	x = 10 ;
	}
		class demo
		{
		public static void main (String args [])
		{
		int x ;
		x = 10 ;
		}
		}
			x = 10
			print (x)

In C, C++, Java before using a variable, the declaration of data type is compulsory required (int x). If we will not provide the data type then it will generate an error i.e. variable is not declared. But in Python, the declaration of data type is not required.

Before using a variable if it is compulsory to declare the data type of that variable is known as statically typed programming language. If it is not required to specify the data type of a variable before using that is called dynamically typed programming language. So Python is a dynamically typed programming language.

Contd.

- **Procedure Oriented Vs Object Oriented:**

C Program	Java Program

#include "stdio.h"
main ()
{
function () ;
}
void function ()
{
// implement logic here
}
	class demo
	{
	public static void main (String args [])
	{
	method ();
	}
	void method ()
	{
	// implement logic here
	}
	}

- According to Procedure oriented, to implement the logic, function is required. That function may be main function or may be any other function. Function is also known as procedure.

- But according to object oriented to implement the logic, method is used. A method is nothing but a function present inside the class. To access, a method caller object is required of same class. In object oriented if we will write a function without a class that is an error.

Contd.

Python Program

```
def function () :
    # implement logic here
    pass

class demo :
    def method ( self ) :
        # implement logic here
        pass
```

But in python we can implement the logic using function also by using method. So we can say python is both Procedure oriented and object oriented programming language.

Contd.

- **General purposed Programming Language:**
  - If a programming language can be used different types of application, then that programming language is known as general purpose programming language. The different types of applications are:
    - Desktop Application
    - Gamming Application
    - Web based Application
    - Embedded System Application
    - Robotics Application
    - Real Time System
    - Database Application

Contd.

- **Generalized programming language**
  - If a single function can work with different types of parameter that function is known as generalized function and that language is known as generalized programming language.

C Program	Python Program

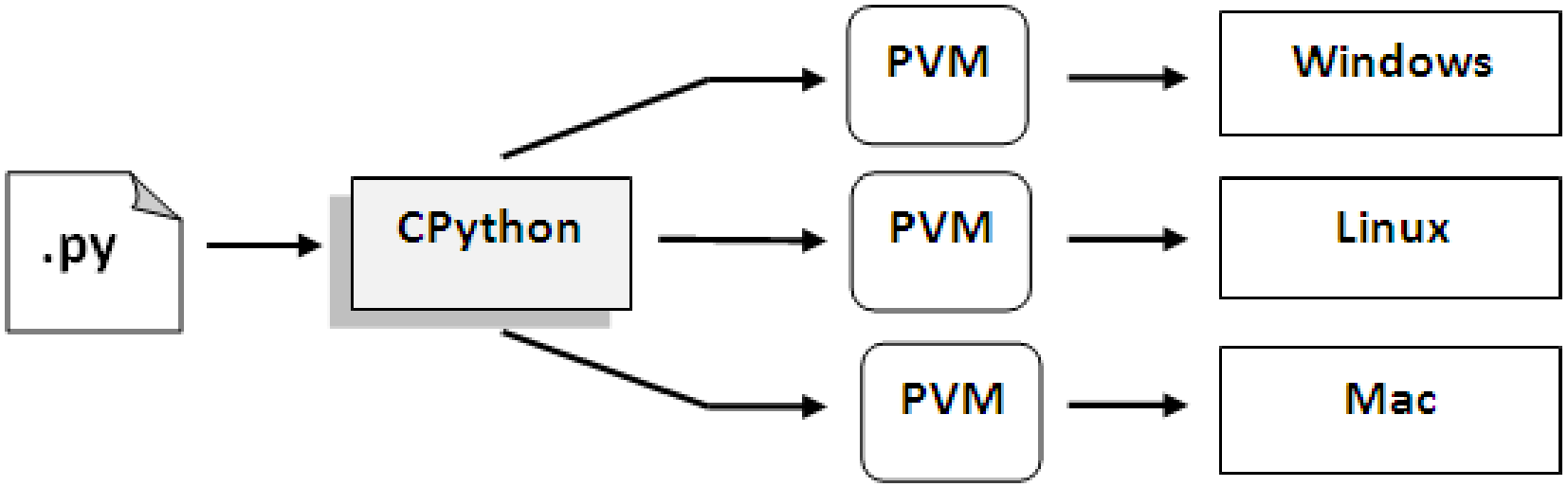
#include "stdio.h"
using namespace std ;
void myprint(int x)
{
printf ("%d \n", x);
}
main ()
{
myprint (10);
myprint (11.22);
myprint ('a');
myprint ("India");
}
	def myprint (x) :
	
	print x
	
	myprint (10)
	myprint (11.22)
	myprint ('a')
	myprint ("India")

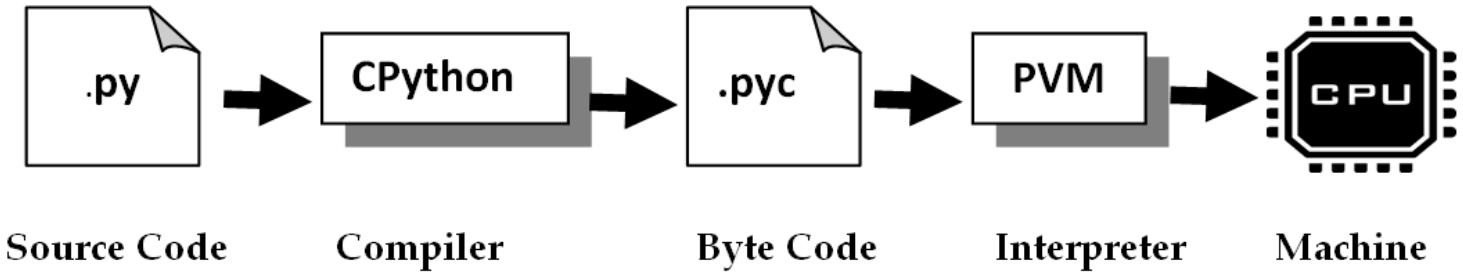
Contd.

- In that program of C, there is an user defined function myprint to print an integer value. If we will pass float or char or string instead of an integer there will be no any error in compilation but the output will not come properly for float, double, char and string. For float/ double instead of 11.22, the output will come 11, for char instead of `a` the output will come ASCI value of `a` i.e 97, and for string instead of “india” the memory address of base element will come.
- But in Python program, for every types of value belongs to any data types, that single function can provide the output according to the type is given to that function.
- So we can say python is also a generalized programming language.

Contd.

- **Platform Independent**





Contd.

- **Portable**
  - Portability means moving the instruction of one language from one operating environment to another operating environment. It allows developing programs irrespective of hardware.
  - It is not required to be confused between a platform-independent programming language and portable programming language. Portability is used in the domain of hardware (Micro Processor 32bit/ 64 bit) whereas platform independent used in the domain of operation system.

Contd.

- **Extensible**
  - A program is written in C or C++ can be integrated into Python or CPython and can be executed using PVM. To integrate Java code with Python code and run on JVM, Jython is used. And to integrate .NET code and library with Python code, Iron Python is useful that will run on CLR (Common Language Runtime).
- **Robust**
  - Nothing is more important than to recognize error for a programmer in his program.
  - When some errors come in python, the interpreter provides a “stack trace” with use full information such as, at which position the program is crashed and why, with the file name, line number and reason.

Contd.

```
[root@localhost demo]# vi test.py

x = 10
print 'The value of x is :', x

print 'The value of y is :', y

print 'Bye'
```

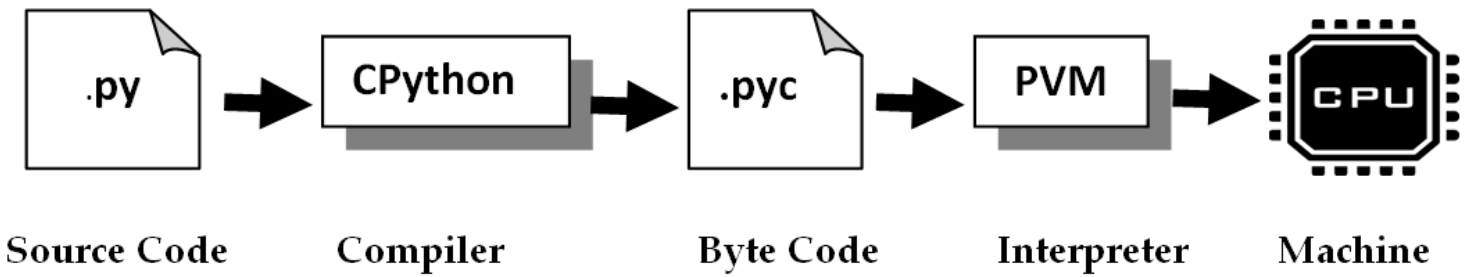
```
[root@localhost demo]# python test.py
The value of x is : 10
The value of y is :
Traceback (most recent call last):
  File "test.py", line 5, in <module>
    print 'The value of y is :', y
NameError: name 'y' is not defined
```

Contd.

- In the above program, the variable x is defined but y is not defined, so x is a variable in my program but y is not a variable in my program. That's why when the value of y is printed; the process is terminated without printing Bye message in the output screen and error information is provided, like the file name is test.py, the line number is 5, in the same module, and the reason that name `y` is not defined i.e. NameError in python.

How Python Works?

- Python is basically called as Interpreted language but in Python only interpreter is not working alone. In Python internally two steps are working, the first step is the Compiler and the second step is the Interpreter.
  - Compiler (CPython)
  - Interpreter (PVM)



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- What the code we are writing in .py file is the python source code.
- The source code will be converted to Byte Code with the help of CPython compiler.
- The Byte code extension in python is .pyc. pyc stands for python compiled file.
- What the byte code is created that will be executed by the virtual machine of python i.e. PVM (Python Virtual Machine).

Script mode and Interactive mode

- To write a program in python there are two different modes are available.
  - Script mode
  - Interactive mode
- In script mode, we will create a file and then write the program in that file having the extension .py. But in the interactive mode, we have to start the python IDLE. Interactive mode is basically used to test small code. What the code is written in interactive mode, that code will be not saved. We can start the python interactive mode by `python` command in command prompt or in the terminal if python is installed. By `python` command python2 version will be started and to start python 3 version interactive mode ‘python3` command is used.

Summary

- The source code extension in python is .py.
- Python is basically called interpreted programming language. But in python internally two steps are working.
  - compiler
  - interpreter
- The standard compiler in python is CPython.
- The interpreter of python is technically called as Python Virtual Machine(PVM).
- Like java in python byte code is created after compilation.
- The byte code extension in python is .pyc.
- pyc stands for python compiled file.
- CPython compiler is implemented using C language.
- JPython compiler is implemented using Java language.
- In JPython compiler, byte code extension is .class which can be executed by JVM.
- To write a program in python, there are two different modes are available.
  - script mode
  - interactive mode