TATA ELXSI

Python Scripting

Learning & Development Team

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Module – 6 : Modules

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Agenda

- Why use modules?
- Using the os, sys modules
- How import works
- Different ways of importing
- Byte-compiled .pyc files
- Making your own Modules
- Creating your own Modules
- Module Namespaces
- Changing the module search path

What is module?

- A module is a Python object with arbitrarily named attributes that you can bind and reference.
- Simply, a module is a file consisting of Python code.
- A module allows you to logically organize your Python code.
- Grouping related code into a module makes the code easier to understand and use.
- A module can define functions, classes and variables.
- A module can also include run able code.

Module

hello.py

```
def print_func( par ):
    print ("Hello : ", par)
    return
```

hello_main.py

```
import  hello

hello.print_func('world')
```

The import Statement:

- You can use any Python source file as a module by executing an import statement in some other Python source file.

- The import has the following syntax:
  - *import importable*
  - *import importable1, importable2, ..., importableN*
  - *import importable as preferred_name*

Import statement

- When the interpreter encounters an import statement, it imports the module if the module is present in the search path.

- A search path is a list of directories that the interpreter searches before importing a module.

- Here are some other import syntaxes:
  - *from importable import object as preferred_name*
  - *from importable import object1, object2, ..., objectN*
  - *from importable import (object1, object2, object3, object4, object5,object6, ..., objectN)*

Module name : fibo.py

```
# Fibonacci numbers module
def fib(n):    # write Fibonacci series up to n
    a, b = 0, 1
    while a < n:
        print(a, end=' ')
        a, b = b, a+b
    print()
```

```
def fib2(n):   # return Fibonacci series up to n
    result = []
    a, b = 0, 1
    while a < n:
        result.append(a)
        a, b = b, a+b
    return result
```

- import fibo
- >>>
- >>> fibo.fib(1000)
- 0 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987
- >>> fibo.fib2(100)
- [0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89]
- >>> fibo.__name__
- 'fibo‘

- If you intend to use a function often you can assign it to a local name:
- >>>
- >>> fib = fibo.fib
- >>> fib(500)
- 0 1 1 2 3 5 8 13 21 34 55 89 144 233 377
-

Import Example

- directly to module's symbol table.
- For example:

```
>>> from fibo import fib, fib2
```

OR

```
>>> from fibo import *
>>> fib(500)
```

1 1 2 3 5 8 13 21 34 55 89 144 233 377

- This imports all names except those beginning with an underscore (_).
- In most cases Python programmers do not use this facility since it introduces an unknown set of names into the interpreter, possibly hiding some things you have already defined.

create a .pyc

- Python automatically compiles your script to compiled code, so called byte code, before running it.
- When a module is imported for the first time, or when the source is more recent than the current compiled file, a .pyc file containing the compiled code will usually be created in the same directory as the .py file.
- When you run the program next time, Python uses this file to skip the compilation step.

create a .pyc

- Running a script is not considered an import and no .pyc will be created.

- if you have a script file abc.py that imports another module xyz.py, when you run abc, xyz.pyc will be created

- If you need to create a .pyc file for a module that is not imported, you can use the py_compile and compileall modules.

- The py_compile module can manually compile any module.
- One way is to use the py_compile.compile function in that module interactively:

```
>>> import py_compile
>>> py_compile.compile('abc.py')
```

optimization

- You can also automatically compile all files in a directory or directories using the compileall module.

- $ python -m compileall .

Standard Modules

- Python comes with a library of standard modules which are ,built into the interpreter.
- One particular module deserves some attention: sys , which is built into every Python interpreter.
- The variables sys.ps1 and sys.ps2 define the strings used as primary and secondary prompts:

- >>> import sys
- >>> sys.ps1
- '>>> '
- >>> sys.ps2
- '... '

Standard Modules

- The built-in function dir() is used to find out which names a module defines.
- It returns a sorted list of strings:

- >>> import sys
- >>> dir(sys)

['__displayhook__', '__doc__', '__excepthook__', '__loader__', '__name__', '__package__', '__stderr__', '__stdin__', '__stdout__', '_clear_type_cache', '_current_frames', '_debugmallocstats', '_getframe', '_home', '_mercurial', '
_xoptions', 'api_vers...ion', 'argv',…….

Standard Modules

- >>> import builtins
- >>> dir(builtins)

- ['ArithmeticError', 'AssertionError', 'AttributeError', 'BaseException', 'BlockingIOError', 'BrokenPipeError', 'BufferError', 'BytesWarning', 'ChildProcessError', 'ConnectionAbortedError', 'ConnectionError', 'ConnectionRefusedError', 'ConnectionResetError', 'DeprecationWarning', 'EOFError', 'Ellipsis', 'EnvironmentError', 'Exception', 'False',……
- ……
- ……
- …….

variables

- >>> names=['vikas','suhas','ullas']
- >>> print (names)
- ['vikas', 'suhas', 'ullas']

- >>> dir()
- ['__builtins__', '__doc__', '__loader__', '__name__', '__package__', 'builtins', 'names', 'sys']

- >>>

Packages

- Packages are a way of structuring Python's module namespace by using "dotted module names".
- For example, the module name A.B designates a submodule named B in a package named A.
- The use of dotted module names saves from name collision.

Packages

https://docs.python.org/3/tutorial/modules.html#packages

```
sound/                          Top-level package
      __init__.py               Initialize the sound package
      formats/                  Subpackage for file format conversions
              __init__.py
              wavread.py
              wavwrite.py
              aiffread.py
              aiffwrite.py
              auread.py
              auwrite.py
              ...
      effects/                  Subpackage for sound effects
              __init__.py
              echo.py
              surround.py
              reverse.py
              ...
      filters/                  Subpackage for filters
              __init__.py
              equalizer.py
              vocoder.py
              karaoke.py
              ...
```

__init__.py file

- When importing the package, Python searches through the directories on sys.path looking for the package subdirectory.

- The __init__.py files are required to make Python treat directories containing the file as packages.

- This prevents directories with a common name, such as string, unintentionally hiding valid modules that occur later on the module search path.

- In the simplest case, __init__.py can just be an empty file, but it can also execute initialization code for the package or set the __all__ variable.

usage

- Users of the package can import individual modules from the package, for example:

- import sound.effects.echo
- This loads the submodule sound.effects.echo. It must be referenced with its full name.

- An alternative way of importing the submodule is:

- from sound.effects import echo
- This also loads the submodule echo, and makes it available without its package prefix

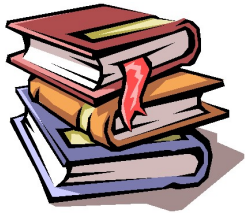
- Yet another variation is to import the desired function or variable directly:

- from sound.effects.echo import echofilter
- Again, this loads the submodule echo, but this makes its function echofilter() directly available:

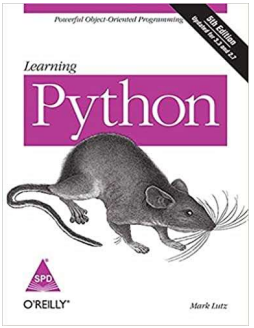
- Note that when using from package import item, the item can be either a submodule (or subpackage) of the package, or some other name defined in the package, like a function, class or variable.

- The import statement first tests whether the item is defined in the package; if not, it assumes it is a module and attempts to load it. If it fails to find it, an ImportError exception is raised.

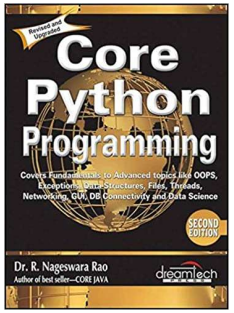
References



- **Python 3.x.x documentation**: https://docs.python.org/3/



- **Learning Python: Powerful Object-Oriented Programming: 5th Edition**



- **Core Python Programming [**by R. Nageswara Rao (Author)]

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