Python - Packages

We organize a large number of files in different folders and subfolders based on some criteria, so that we can find and manage them easily. In the same way, a package in Python takes the concept of the modular approach to next logical level. As you know, a module can contain multiple objects, such as classes, functions, etc. A package can contain one or more relevant modules. Physically, a package is actually a folder containing one or more module files.

Let's create a package named mypackage, using the following steps:

- Create a new folder named D:\MyApp.
- Inside MyApp, create a subfolder with the name 'mypackage'.
- Create an empty __init__.py file in the mypackage folder.
- Using a Python-aware editor like IDLE, create modules greet.py and functions.py with following code:

greet.py

```
def SayHello(name):
    print("Hello " + name)
    return
```

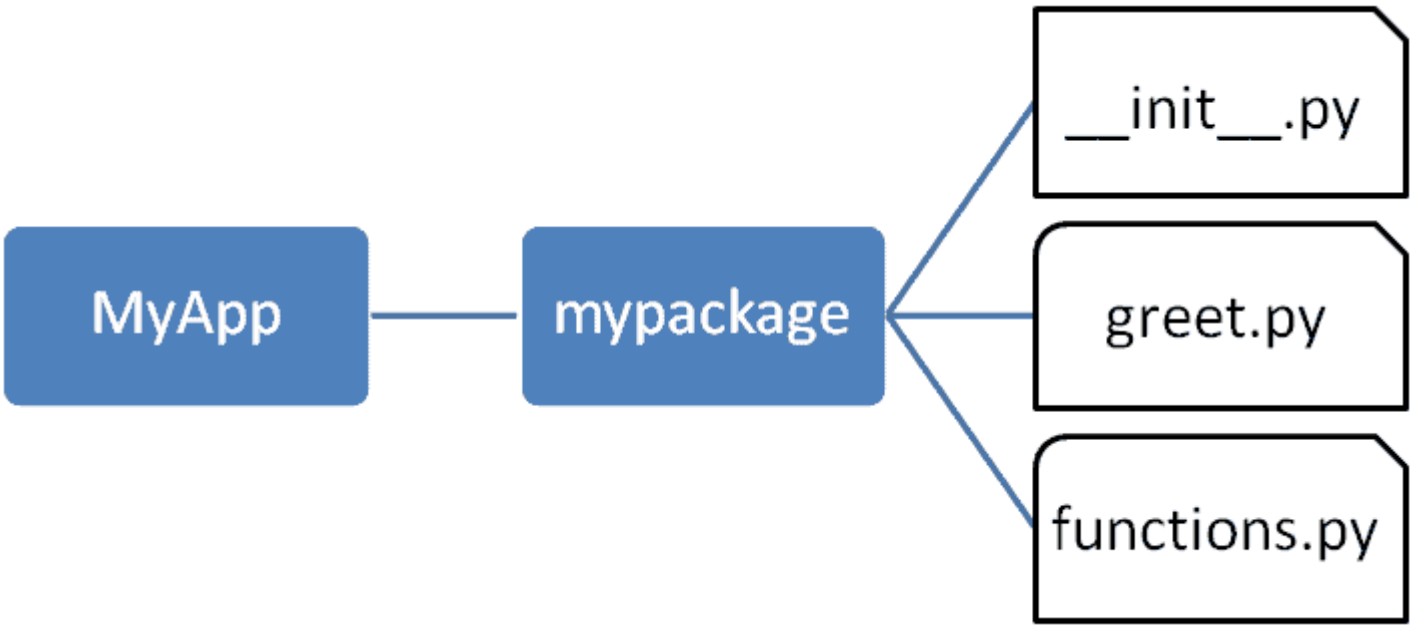
functions.py

```
def sum(x,y):
    return x+y

def average(x,y):
    return (x+y)/2

def power(x,y):
    return x**y
```

That's it. We have created our package called mypackage. The following is a folder structure:



Package Folder Structure

Importing a Module from a Package

Now, to test our package, invoke the Python prompt from the MyApp folder.

```
D:\MyApp>python
```

Import the functions module from the mypackage package and call its power() function.

```
>>> from mypackage import functions
>>> functions.power(3,2)
9
```

It is also possible to import specific functions from a module in the package

```
>>> from mypackage.functions import sum
>>> sum(10,20)
30
>>> average(10,12)
Traceback (most recent call last):
File "<pyshell#13>", line 1, in <module>
NameError: name 'average' is not defined
```

__init__.py

The package folder contains a special file called __init__.py, which stores the package's content. It serves two purposes:

1. The Python interpreter recognizes a folder as the package if it contains `__init__.py` file.
2. __init__.py exposes specified resources from its modules to be imported.

An empty __init__.py file makes all functions from above modules available when this package is imported. Note that __init__.py is essential for the folder to be recognized by Python as a package. You can optionally define functions from individual modules to be made available.

Note:
We shall also create another Python script in the MyApp folder and import the mypackage package in it. It should be at the same level of the package to be imported.

The __init__.py file is normally kept empty. However, it can also be used to choose specific functions from modules in the package folder and make them available for import. Modify __init__.py as below:

__init__.py
```
from .functions import average, power
from .greet import SayHello
```

The specified functions can now be imported in the interpreter session or another executable script.

Create test.py in the MyApp folder to test mypackage.

test.py
```
from mypackage import power, average, SayHello
SayHello()
x=power(3,2)
print("power(3,2) : ", x)
```

Note that functions `power()` and `SayHello()` are imported from the package and not from their respective modules, as done earlier. The output of above script is:

```
D:\MyApp>python test.py
Hello world
power(3,2) : 9
```

Install a Package Globally

Once a package is created, it can be installed for system wide use by running the setup script. The script calls `setup()` function from setuptools module.

Let's install mypackage for system-wide use by running a setup script.

Save the following code as setup.py in the parent folder 'MyApp'. The script calls the `setup()` function from the setuptools module. The `setup()` function takes various arguments such as

name, version, author, list of dependencies etc. The zip_safe argument defines whether the package is installed in compressed mode or regular mode.

Example: setup.py

```
from setuptools import setup
setup(name='mypackage',
version='0.1',
description='Testing installation of Package',
url='#',
author='malhar',
author_email='mlathkar@gmail.com',
license='MIT',
packages=['mypackage'],
zip_safe=False)
```

Now execute the following command to install mypack using the pip utility. Ensure that the command prompt is in the parent folder, in this case D:\MyApp.

```
D:\MyApp>pip install .
Processing d:\MyApp
Installing collected packages: mypack
Running setup.py install for mypack ... done
Successfully installed mypackage-0.1
```

Now mypackage is available for system-wide use and can be imported in any script or interpreter.

```
D:\>python
>>> import mypackage
>>>mypackage.average(10,20)
15.0
>>>mypackage.power(10,2)
100
```