Introduction to Classes

SMJE4383 by Dr Zool

```python
class Student(object):
    """Simple Student class."""
    def __init__(self,first='', last='', id=0): # initializer
        self.first_name_str = first
        self.last_name_str = last
        self.id_int = id

    def __str__(self):  # string representation, e.g. for printing
        return "{} {}, ID:{}".format\
               (self.first_name_str, self.last_name_str, self.id_int)
```

What is a class?

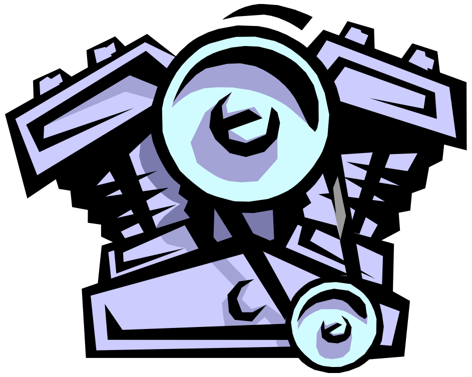
- If you have done anything in computer science before, you likely will have heard the term **object oriented programming (OOP)**
- What is OOP, and why should I care?

Short answer

- The short answer is that object oriented programming is a way to think about "objects" in a program (such as **variables, functions**, etc.)
- A program becomes less a list of instruction and more a set of objects and how they interact.

Responding to “messages”

- As a set of interacting objects, each object responds to “messages” sent to it
- The interaction of objects via messages makes a high level description of what the program is doing.



Everything in Python is an object

- In case you hadn't noticed, everything in Python is an object
- Thus, Python embraces OOP at a fundamental level

type vs class

There is a strong similarity between a type and a Python class

- seen many types already: `list, dict, str`, ...
- suitable for representing different data
- respond to different messages regarding the manipulation of that data

OOP helps for software engineering

- ***software engineering*** (SE) is the discipline of managing code to ensure its long-term use
- remememember, SE via refactoring
- refactoring:
  - takes existing code and modifies it
  - makes the overall code simpler, easier to understand
  - doesn't change the functionality, only the form!

More refactoring

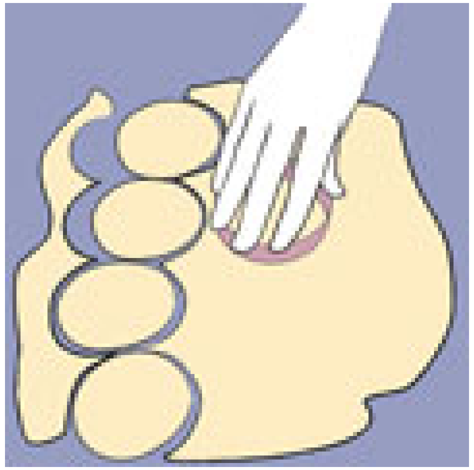
- Hiding the details of what the message entails means that changes can be made to the object and the flow of messages (and their results) can stay the same
- Thus the implementation of the message can change but its intended effect stay the same.
- This is ***encapsulation***

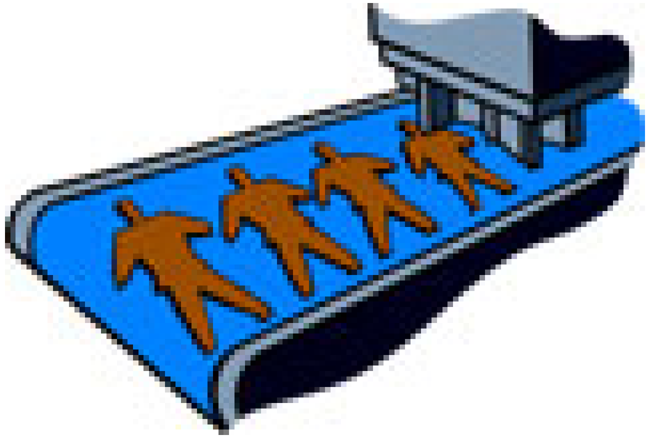
OOP principles

- ***encapsulation***: hiding design details to make the program clearer and more easily modified later
- ***modularity***: the ability to make objects stand alone so they can be reused (our modules). Like the math module
- ***inheritance***: create a new object by inheriting (like father to son) many object characteristics while creating or over-riding for this object
- ***polymorphism***: (hard) Allow one message to be sent to any object and have it respond appropriately based on the type of object it is.

Class vs Instance

- One of the harder things to get is what a class is and what an instance of a class is.
- The analogy of the cookie cutter and a cookie.





Template vs Exemplar

- The cutter is a template for stamping out cookies, the cookie is what is made each time the cutter is used
- One template can be used to make an infinite number of cookies, each one just like the other.
- No one confuses a cookie for a cookie cutter, do they?

Same in OOP

- You define a class as a way to generate new instances of that class.
- Both the instances and the classes are themselves objects
- the structure of an instance starts out the same, as dictated by the class.
- The instances respond to the messages defined as part of the class.

Why a class

- We make classes because we need more complicated, user-defined data types to construct instances we can use.
- Each class has potentially two aspects:
  - the data (types, number, names) that each instance might contain
  - the messages that each instance can respond to.

A First Class

Standard Class Names

The standard way to name a class in Python is called ***CapWords***:

- Each word of a class begins with a Capital letter
- no underlines
- sometimes called ***CamelCase***
- makes recognizing a class easier

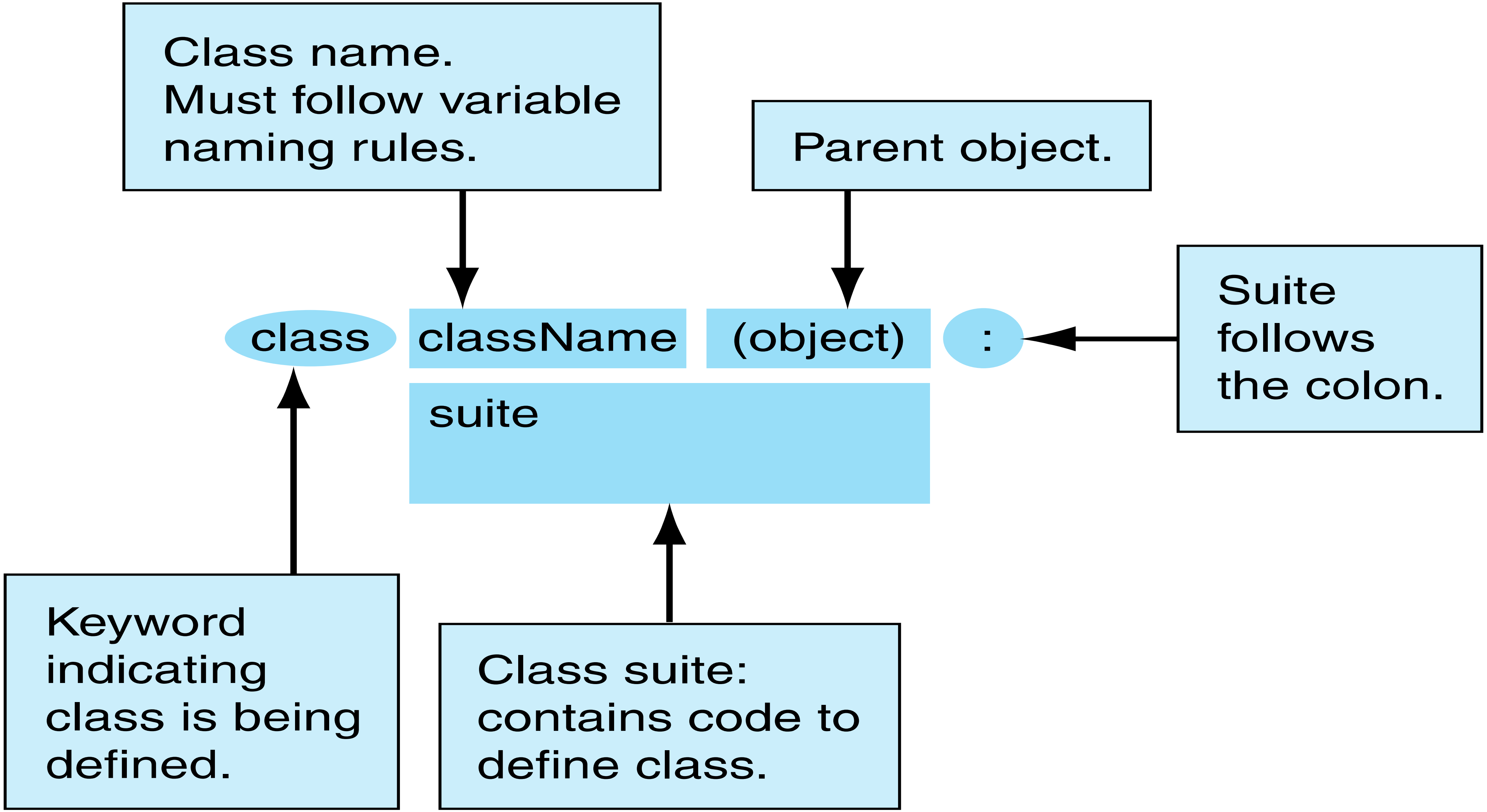


FIGURE 11.2 The basic format of a class definition.

dir() function

The `dir()` function lists all the attributes of a class

- you can think of these as keys in a dictionary stored in the class.

pass keyword

Remember, the `pass` keyword is used to signify that you have *intentionally* left some part of a definition (of a function, of a class) undefined

- by making the suite of a class undefined, we get only those things that Python defines for us automatically

```
>>> class MyClass (object):
        pass

>>> dir(MyClass)
'__class__', '__delattr__', '__dict__', '__doc__', '__eq__',
'__format__', '__ge__', '__getattribute__', '__gt__', '__hash__',
'__init__', '__le__', '__lt__', '__module__', '__ne__', '__new__',
'__reduce__', '__reduce_ex__', '__repr__', '__setattr__',
'__sizeof__', '__str__', '__subclasshook__', '__weakref__']

>>> my_instance = MyClass()
>>> dir(my_instance)
['__class__', '__delattr__', '__dict__', '__doc__', '__eq__',
'__format__', '__ge__', '__getattribute__', '__gt__', '__hash__',
'__init__', '__le__', '__lt__', '__module__', '__ne__', '__new__',
'__reduce__', '__reduce_ex__', '__repr__', '__setattr__',
'__sizeof__', '__str__', '__subclasshook__', '__weakref__']

>>> type(my_instance)
<class '__main__.MyClass'>
```

Constructor

- When a class is defined, a function is made *with the same name as the class*
- This function is called the *constructor*. By calling it, you can create an instance of the class
- We can affect this creation (more later), but by default Python can make an instance.

dot reference

- we can refer to the attributes of an object by doing a dot reference, of the form:

  `object.attribute`

- the attribute can be a variable or a function
- it is part of the object, either directly or by that object being part of a class

examples

`print(my_instance.my_val)`

print a variable associated with the object `my_instance`

`my_instance.my_method()`

call a method associated with the object `my_instance`

variable versus method, you can tell by the parenthesis at the end of the reference

How to make an object-local value

- once an object is made, the data is made the same way as in any other Python situation, by assignment
- Any object can thus be augmented by adding a variable

```
my_instance.attribute = 'hello'
```

New attribute shown in dir

```
dir(my_instance)
```

- ['__class__', '__delattr__', '__dict__', '__doc__', '__format__', '__getattribute__', '__hash__', '__init__', '__module__', '__new__', '__reduce__', '__reduce_ex__', '__repr__', '__setattr__', '__sizeof__', '__str__', '__subclasshook__', '__weakref__', attribute]

Class instance relationship

Instance knows its class

- Because each instance has as its type the class that it was made from, an instance remembers its class
- This is often called the ***instance-of*** relationship
- stored in the __class__ attribute of the instance

```
>>> class MyClass (object):
        pass

>>> my_instance = MyClass()
>>> MyClass.class_attribute = 'hello'
>>> my_instance.instance_attribute = 'world'
>>> dir(my_instance)
['__class__', ... , 'class_attribute', 'instance_attribute']
>>> print(my_instance.__class__)
<class '__main__.MyClass'>
>>> type(my_instance)
<class '__main__.MyClass'>
>>> print(my_instance.instance_attribute)
world
>>> print(my_instance.class_attribute)
hello
>>> print(MyClass.instance_attribute)

Traceback (most recent call last):
  File "<pyshell#11>", line 1, in <module>
    print MyClass.instance_attribute
AttributeError: type object 'MyClass' has
no attribute 'instance_attribute'
```

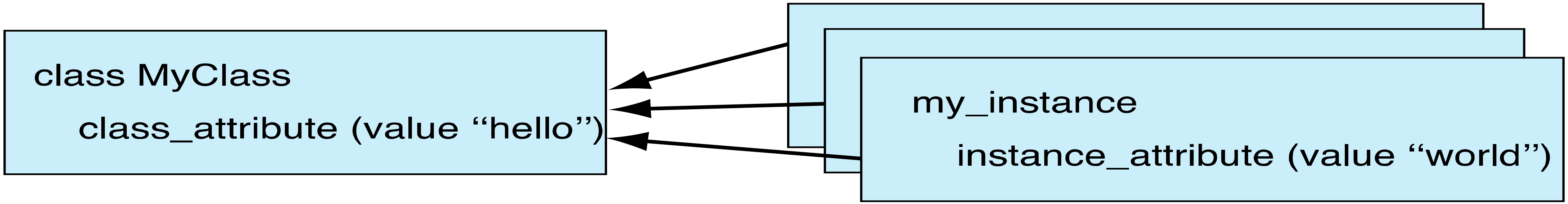


FIGURE 11.3 The instance-of relationship.

Scope

- Introduced the idea of scope in Chapter 7
- It works differently in the class system, taking advantage of the ***instance-of*** relationship

Part of the Object Scope Rule

The first two rules in object scope are:

1. First, look in the object itself
2. If the attribute is not found, look up to the class of the object and search for the attribute there.

```
>>> class MyClass (object):
        pass

>>> inst1 = MyClass()
>>> inst2 = MyClass()
>>> inst3 = MyClass()
>>> MyClass.class_attribute = 27
>>> inst1.class_attribute = 72
>>> print(inst1.class_attribute)
72
>>> print(inst2.class_attribute)
27
>>> print(inst3.class_attribute)
27
>>> MyClass.class_attribute = 999
>>> print(inst1.class_attribute)
72
>>> print(inst2.class_attribute)
999
>>> print(inst3.class_attribute)
999
```

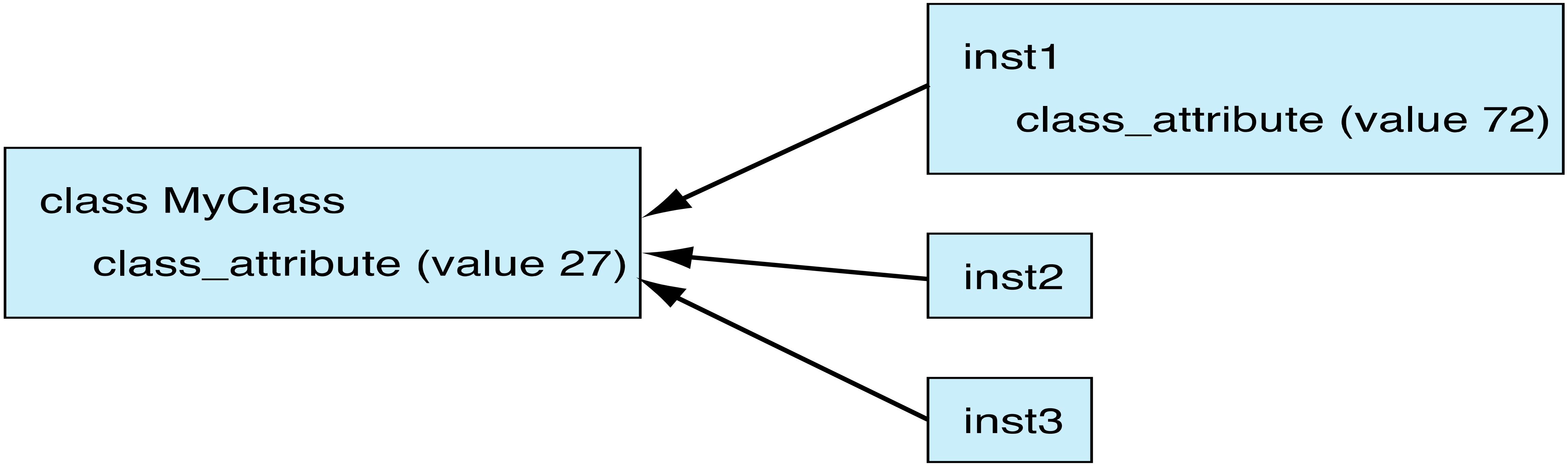


FIGURE 11.4 A mixture of local and instance-of attribute relationships.

Methods

Code Listing 11.2

```python
class MyClass (object):
    class_attribute = 'world'

    def my_method (self, param1):
        print('\nhello {}'.format(param1))
        print('The object that called this method is: {}'.\
              format(str(self)))
        self.instance_attribute = param1


my_instance = MyClass()
print("output of dir(my_instance):")
print(dir(my_instance))
my_instance.my_method('world')                # adds the instance_attribute
print("Instance has new attribute with value: {}".\
      format(my_instance.instance_attribute))
print("output of dir(my_instance):")
print(dir(my_instance))
```

method versus function

- discussed before, a method and a function are closely related. They are both “small programs” that have parameters, perform some operation and (potentially) return a value

- main difference is that methods are functions tied to a particular object

difference in calling

functions are called, methods are called in the context of an object:

- function:

```
do_something(param1)
```

- method:

```
an_object.do_something(param1)
```

This means that the object that the method is called on is *always implicitly a parameter*!

difference in definition

- methods are defined ***inside*** the suite of a class
- methods always bind the first parameter in the definition to the object that called it
- This parameter can be named anything, but traditionally it is named ***self***

```
class MyClass(object):
    def my_method(self,param1):
        suite
```

more on self

- `self` is an important variable. In any method it is bound to the object that called the method
- through `self` we can access the instance that called the method (and all of its attributes as a result)

Back to the example

```
class MyClass (object):
    class_attribute = 'world'

    def my_method (self, param1):
        print('\nhello {}'.format(param1))
        print('The object that called this method is: {}'.\
              format(str(self)))
        self.instance_attribute = param1
```

Binding self

```
my_instance = MyClass()
my_instance.my_method( “world” )
```

```
class MyClass (object):
    def my_method (self, param1):
        #method suite
```

FIGURE 11.5 How the calling object maps to **`self`**.

self is bound for us

- when a dot method call is made, the object that called the method is **automatically** assigned to `self`
- we can use `self` to remember, and therefore refer, to the calling object
- to reference any part of the calling object, we must always precede it with `self.`
- The method can be written generically, dealing with calling objects through `self`

Writing a class

Code Lisitng 11.3

```python
class Student(object):
    def __init__(self, first='', last='', id=0):
        # print 'In the __init__ method'
        self.first_name_str = first
        self.last_name_str = last
        self.id_int = id

    def update(self, first='', last='', id=0):
        if first:
            self.first_name_str = first
        if last:
            self.last_name_str = last
        if id:
            self.id_int = id

    def __str__(self):
        # print "In __str__ method"
        return "{} {}, ID:{}".\
            format(self.first_name_str, self.last_name_str, self.id_int)
```

Python Standard Methods

Python provides a number of standard methods which, if the class designer provides, can be used in a normal "Pythony" way

- many of these have the double underlines in front and in back of their name
- by using these methods, we "fit in" to the normal Python flow

Standard Method: Constructor

- Constructor is called when an instance is made, and provides the class designer the opportunity to set up the instance with variables, by assignment

calling a constructor

As mentioned, a constructor is called by using the name of the class as a function call (by adding () after the class name)

```
student_inst = Student()
```

- creates a new instance using the constructor from class `Student`

defining the constructor

- one of the special method names in a class is the constructor name, __init__
- by assigning values in the constructor, every instance will start out with the same variables
- you can also pass arguments to a constructor through its init method

Student constructor

```
def __init__(self,first='', last='', id=0):
        self.first_name_str = first
        self.last_name_str = last
        self.id_int = id
```

- self is bound to the default instance as it is being made
- If we want to add an attribute to that instance, we modify the attribute associated with self.

example

```
s1 = Student()
print(s1.last_name_str)

s2 = Student(last='Python', first='Monty')
print(s2.last_name_str)

Python
```

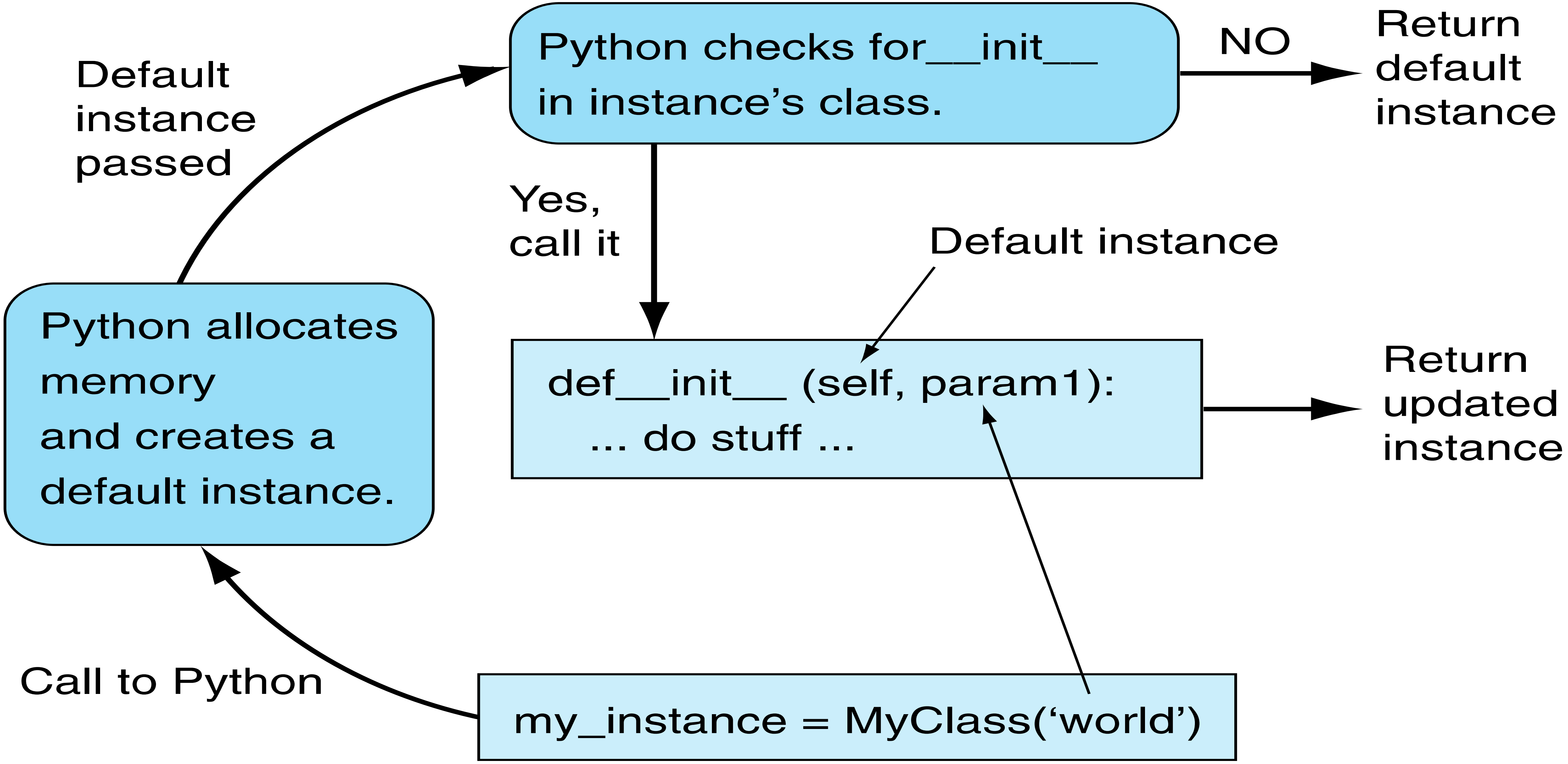


FIGURE 11.6 How an instance is made in Python.

default constructor

- if you don't provide a constructor, then only the default constructor is provided
- the default constructor does system stuff to create the instance, nothing more
- you cannot pass arguments to the default constructor.

Every class should have __init__

- By providing the constructor, we ensure that every instance, at least at the point of construction, is created with the same contents
- This gives us some control over each instance.

__str__, printing

```
def __str__(self):
    # print "In __str__ method"
    return "{} {}, ID:{}".\
        format(self.first_name_str, self.last_name_str, self.id_int)
```

- When `print(my_inst)` called, it is assumed, by Python, to be a call to "convert the instance to a string", which is the __str__ method
- In the method, `my_inst` is bound to `self`, and printing then occurs using that instance.
- __str__ ***must return a string***!

Now there are three

There are now three groups in our coding scheme:

- – user
- – programmer, class user
- – programmer, class designer

Class designer

- The class designer is creating code to be used by other programmers
- In so doing, the class designer is making a kind of library that other programmers can take advantage of

Point Class, Code listings 11.4-11.7

Code Listing 11.7

```python
import math  # need sqrt (square root)

# a Point is a Cartesion point (x,y)
# all values are float unless otherwise stated
class Point(object):
    def __init__(self, x_param = 0.0, y_param = 0.0):
        '''Create x and y attributes. Defaults are 0.0'''
        self.x = x_param
        self.y = y_param

    def distance (self,param_pt):
        """Distance between self and a Point"""
        x_diff = self.x - param_pt.x  # (x1 - x2)
        y_diff = self.y - param_pt.y  # (y1 - y2)
        # square differences, sum, and take sqrt
        return math.sqrt(x_diff**2 + y_diff**2)

    def sum (self,param_pt):
        """Vector Sum of self and a Point
           return a Point instance"""
        # new_pt = Point()
        # new_pt.x = self.x + param_pt.x
        # new_pt.y = self.x + param_pt.x
        return Point(self.x + param_pt.x, self.x + param_pt.x)

    def __str__(self):
        """Print as a coordinate pair."""
        # print("called the __str__ method")
        return "({:.2f}, {:.2f})".format(self.x,self.y)
```

Rule 9

Make sure your new class does the right thing

- we mean that a class should behave in a way familiar to a Python programmer
  - for example, we should be able to call the `print` function on it

OOP helps software engineering

- software engineering is the discipline of managing code to ensure its long-term use
- remememember, SE via refactoring
- refactoring:
  - takes existing code and modifies it
  - makes the overall code simpler, easier to understand
  - doesn't change the functionality, only the form!

More refactoring

- Hiding the details of what the message entails means that changes can be made to the object and the flow of messages (and their results) can stay the same
- Thus the implementation of the message can change but its intended effect stay the same.
- This is encapsulation

OOP principles (again)

- ***encapsulation***: hiding design details to make the program clearer and more easily modified later
- ***modularity***: the ability to make objects “stand alone” so they can be reused (our modules). Like the math module
- ***inheritance***: create a new object by inheriting (like father to son) many object characteristics while creating or over-riding for this object
- ***polymorphism***: (hard) Allow one message to be sent to any object and have it respond appropriately based on the type of object it is.

We are still at encapsulation

- We said that encapsulation:
- hid details of the implementation so that the program was easier to read and write
- modularity, make an object so that it can be reused in other contexts
- providing an interface (the methods) that are the approved way to deal with the class

Private values

class namespaces are dicts

- the namespaces in every object and module is indeed a dictionary
- that dictionary is bound to the special variable __dict__
- it lists all the local attributes (variables, functions) in the object

private variables in an instance

- many OOP approaches allow you to make a variable or function in an instance ***private***
- private means not accessible by the class user, only the class developer.
- there are advantages to controlling who can access the instance values

privacy in Python

- Python takes the approach “We are all adults here”. No hard restrictions.
- Provides naming to avoid accidents. Use __ (double underlines) in front of any variable
- this ***mangles*** the name to include the class, namely __var becomes _class__var
- still fully accessible, and the __dict__ makes it obvious

privacy example

```
class NewClass (object):
    def __init__(self, attribute='default', name='Instance'):
        self.name = name                   # public attribute
        self.__attribute = attribute       # a "private" attribute
    def __str__(self):
        return '{} has attribute {}'.format(self.name, self.__attribute)
```

```
>>> inst1 = NewClass(name='Monty', attribute='Python')
>>> print(inst1)
Monty has attribute Python
>>> print(inst1.name)
Monty
>>> print(inst1.__attribute)
Traceback (most recent call last):
  File "<pyshell#3>", line 1, in <module>
    print(inst1.__attribute)
AttributeError: 'newClass' object has no attribute '__attribute'
>>> dir(inst1)
'_NewClass__attribute', '__class__', ... , 'name']

>>> print(inst1._NewClass__attribute)
Python
```

Reminder, rules so far

1. Think before you program!
2. A program is a human-readable essay on problem solving that also happens to execute on a computer.
3. The best way to imporve your programming and problem solving skills is to practice!
4. A foolish consistency is the hobgoblin of little minds
5. Test your code, often and thoroughly
6. If it was hard to write, it is probably hard to read. Add a comment.
7. All input is evil, unless proven otherwise.
8. A function should do one thing.
9. Make sure your class does the right thing.

Adding GUI & Widget

Chapter 7

Revision

- Using Lists

```
>>> bob = ['Bob Smith', 42, 30000, 'software']
>>> sue = ['Sue Jones', 45, 40000, 'hardware']


>>> bob[0].split()[-1]          # what's bob's last name?
'Smith'
>>> sue[2] *= 1.25              # give sue a 25% raise
>>> sue
['Sue Jones', 45, 50000.0, 'hardware']
```

- Using Dictionaries

```
>>> bob = {'name': 'Bob Smith', 'age': 42, 'pay': 30000, 'job': 'dev'}
>>> sue = {'name': 'Sue Jones', 'age': 45, 'pay': 40000, 'job': 'hdw'}

>>> bob['name'], sue['pay']            # not bob[0], sue[2]
('Bob Smith', 40000)

>>> bob['name'].split()[-1]
'Smith'

>>> sue['pay'] *= 1.10
>>> sue['pay']
44000.0
```

Revision

- **Using Classes - 1**

```
class Person:
    def __init__(self, name, age, pay=0, job=None):
        self.name = name
        self.age  = age
        self.pay  = pay
        self.job  = job
    def lastName(self):
        return self.name.split()[-1]
    def giveRaise(self, percent):
        self.pay *= (1.0 + percent)

if __name__ == '__main__':
    bob = Person('Bob Smith', 42, 30000, 'software')
    sue = Person('Sue Jones', 45, 40000, 'hardware')
    print(bob.name, sue.pay)

    print(bob.lastName())
    sue.giveRaise(.10)
    print(sue.pay)
```

-

```
Bob Smith 40000
Smith
44000.0
```

Revision

- **Using Classes -2 :** Encapsulated in the form of classes customizable implementations of our records and their processing logic

```
from person import Person

class Manager(Person):
    def giveRaise(self, percent, bonus=0.1):
        self.pay *= (1.0 + percent + bonus)

if __name__ == '__main__':
    tom = Manager(name='Tom Doe', age=50, pay=50000)
    print(tom.lastName())
    tom.giveRaise(.20)
    print(tom.pay)
```

When run, this script's self-test prints the following:

```
Doe
65000.0
```

Revision

- ## Using make_db_classes

```
import shelve
from person import Person
from manager import Manager

bob = Person('Bob Smith', 42, 30000, 'software')
sue = Person('Sue Jones', 45, 40000, 'hardware')
tom = Manager('Tom Doe',  50, 50000)

db = shelve.open('class-shelve')
db['bob'] = bob
db['sue'] = sue
db['tom'] = tom
db.close()
```

- ## Using dump_db_classes

```
import shelve
db = shelve.open('class-shelve')
for key in db:
    print(key, '=>\n  ', db[key].name, db[key].pay)

bob = db['bob']
print(bob.lastName())
print(db['tom'].lastName())
```

```
bob =>
   Bob Smith 30000
sue =>
   Sue Jones 40000
tom =>
   Tom Doe 50000
Smith
Doe
```

- ## Using update_db_classes

```
import shelve
db = shelve.open('class-shelve')

sue = db['sue']
sue.giveRaise(.25)
db['sue'] = sue

tom = db['tom']
tom.giveRaise(.20)
db['tom'] = tom
db.close()
```

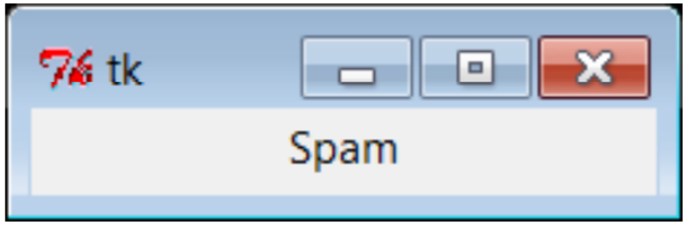
```
bob =>
   Bob Smith 30000
sue =>
   Sue Jones 50000.0
tom =>
   Tom Doe 65000.0
Smith
Doe
```

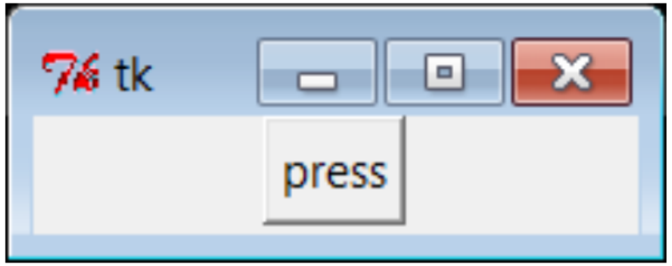
GUI Basics

- GUI toolkits and builders are available for Python programmers:
    - tkinter
    - wxPython
    - PyQt
    - PythonCard
    - Dabo
- **tkinter** is a lightweight toolkit and so meshes well with a scripting language such as Python
- Also portable across Windows, Linux/Unix, and Macintosh
- simply copy the source code to the machine on which you wish to use your GUI.

Two basic examples

```
from tkinter import *
Label(text='Spam').pack()
mainloop()
```






```
from tkinter import *
from tkinter.messagebox import showinfo

def reply():
    showinfo(title='popup', message='Button pressed!')

window = Tk()
button = Button(window, text='press', command=reply)
button.pack()
window.mainloop()
```

Process Flow

- Creating a widget
- Using a widget
- Getting input from user
- GUI Shelve Interface

Using OOP for GUIs – Creating a Widget

- In larger programs, it is often more useful to code a GUI as a subclass of the tkinter Frame widget—a container for other widgets.
- Single-button GUI recorded in this way as a class

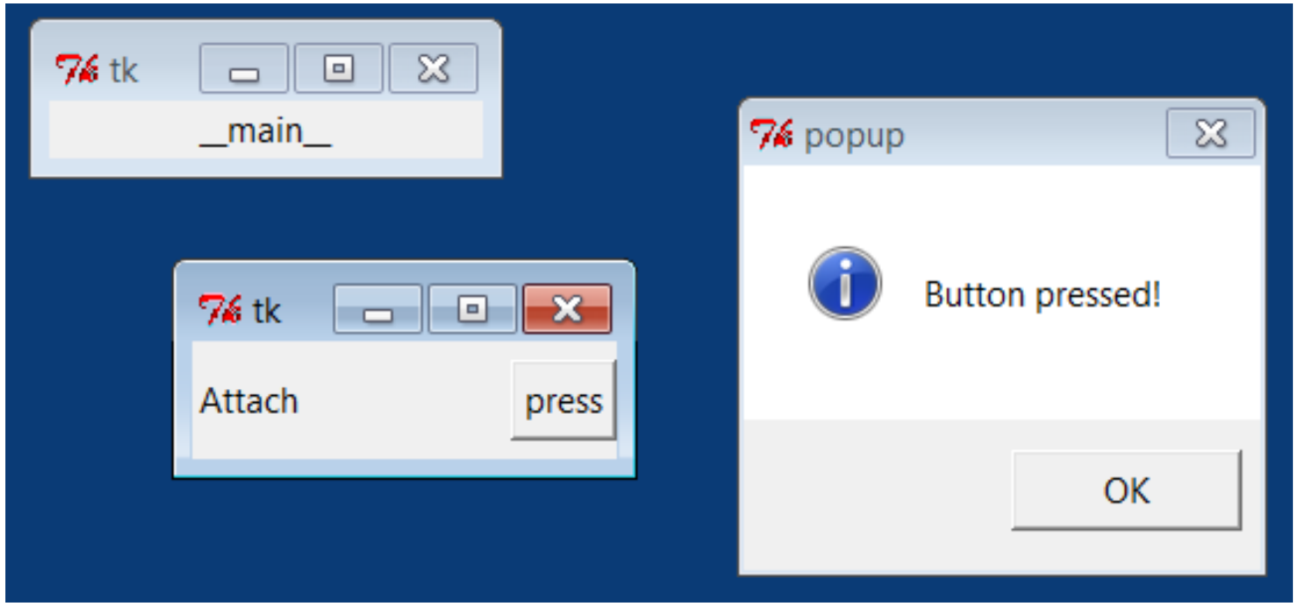
```
from tkinter import *
from tkinter.messagebox import showinfo

class MyGui(Frame):
    def __init__(self, parent=None):
        Frame.__init__(self, parent)
        button = Button(self, text='press', command=self.reply)
        button.pack()
    def reply(self):
        showinfo(title='popup', message='Button pressed!')

if __name__ == '__main__':
    window = MyGui()
    window.pack()
    window.mainloop()
```

Example – Using a widget

- This example attaches our one-button GUI to a larger window, here a Top-level popup window created by the importing application and passed into the construction call as the explicit parent.
- Our one-button widget package is attached to the right side of its container this time.

```
from tkinter import *
from tkinter102 import MyGui

# main app window
mainwin = Tk()
Label(mainwin, text=__name__).pack()

# popup window
popup = Toplevel()
Label(popup, text='Attach').pack(side=LEFT)
MyGui(popup).pack(side=RIGHT)                    # attach my frame
mainwin.mainloop()
```

Example – Using a widget



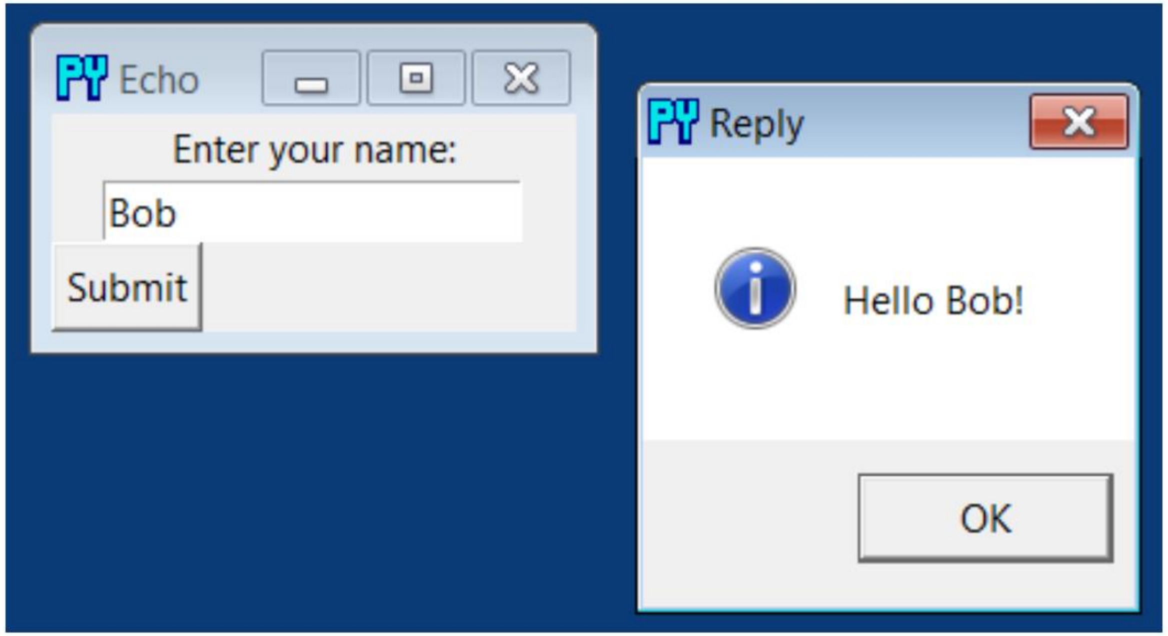
Process Flow

- Creating a widget
- Using a widget
- Getting input from user
- GUI Shelve Interface

Getting input from user

```
from tkinter import *
from tkinter.messagebox import showinfo

def reply(name):
    showinfo(title='Reply', message='Hello %s!' % name)

top = Tk()
top.title('Echo')
top.iconbitmap('py-blue-trans-out.ico')

Label(top, text="Enter your name:").pack(side=TOP)
ent = Entry(top)
ent.pack(side=TOP)
btn = Button(top, text="Submit", command=(lambda: reply(ent.get())))
btn.pack(side=LEFT)

top.mainloop()
```

Getting input from user



Process Flow

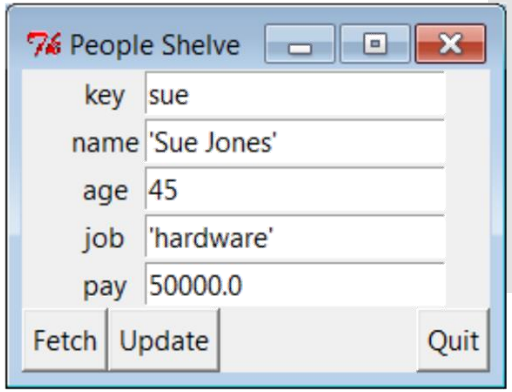
- Creating a widget
- Using a widget
- Getting input from user
- GUI Shelve Interface

GUI Shelve Interface

- Console-based interface approach of the preceding section works, and it may be sufficient for some users assuming that they are comfortable with typing commands in a console window.
- A view on the shelve file and allows us to browse and update the file without typing any code.

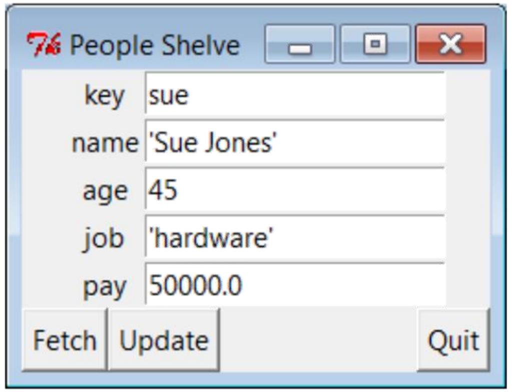
GUI Shelve Interface

```
"""
Implement a GUI for viewing and updating class instances stored in a shelve;
the shelve lives on the machine this script runs on, as 1 or more local files;
"""

from tkinter import *
from tkinter.messagebox import showerror
import shelve
shelvename = 'class-shelve'
fieldnames = ('name', 'age', 'job', 'pay')

def makeWidgets():
    global entries
    window = Tk()
    window.title('People Shelve')
    form = Frame(window)
    form.pack()
    entries = {}
    for (ix, label) in enumerate(('key',) + fieldnames):
        lab = Label(form, text=label)
        ent = Entry(form)
        lab.grid(row=ix, column=0)
        ent.grid(row=ix, column=1)
        entries[label] = ent
    Button(window, text="Fetch",  command=fetchRecord).pack(side=LEFT)
    Button(window, text="Update", command=updateRecord).pack(side=LEFT)
    Button(window, text="Quit",   command=window.quit).pack(side=RIGHT)
    return window
```



GUI Shelve Interface

```
def fetchRecord():
    key = entries['key'].get()
    try:
        record = db[key]                        # fetch by key, show in GUI
    except:
        showerror(title='Error', message='No such key!')
    else:
        for field in fieldnames:
            entries[field].delete(0, END)
            entries[field].insert(0, repr(getattr(record, field)))

def updateRecord():
    key = entries['key'].get()
    if key in db:
        record = db[key]                        # update existing record
    else:
        from person import Person               # make/store new one for key
        record = Person(name='?', age='?')      # eval: strings must be quoted
    for field in fieldnames:
        setattr(record, field, eval(entries[field].get()))
    db[key] = record

db = shelve.open(shelvename)
window = makeWidgets()
window.mainloop()
db.close() # back here after quit or window close
```

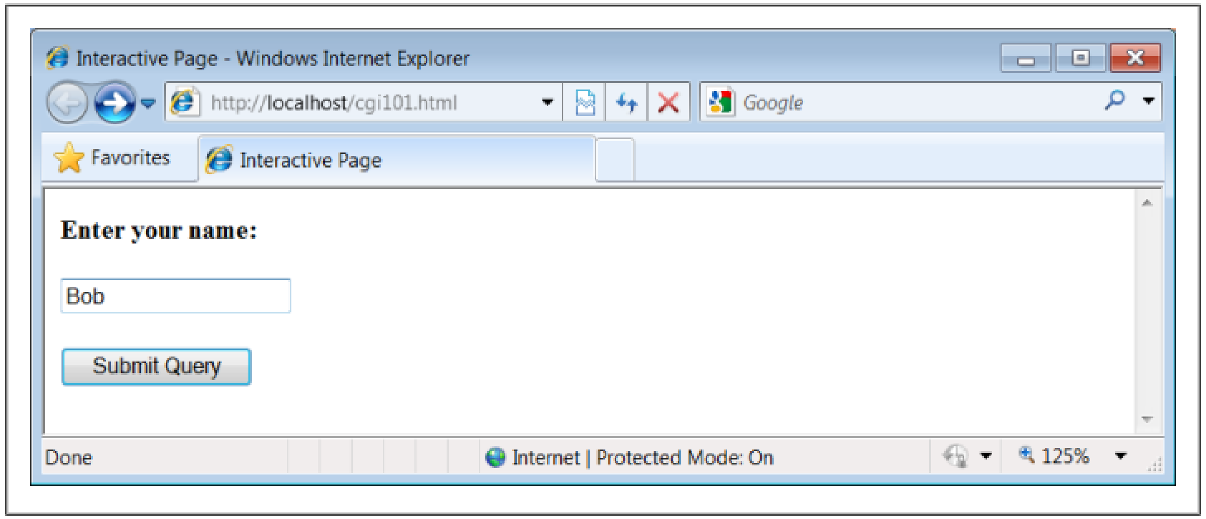


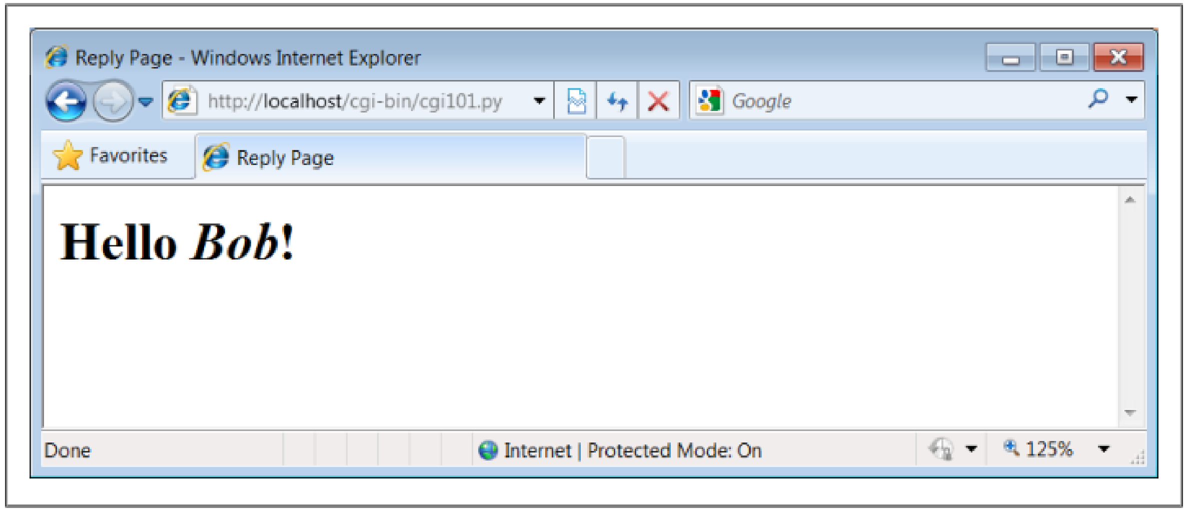
Exercise #1

Design a GUI Shelve Interface for the following DB:

Restaurant	Signature Dish	Drink	Dessert	Rating
KFC				
Burger King				
McD				

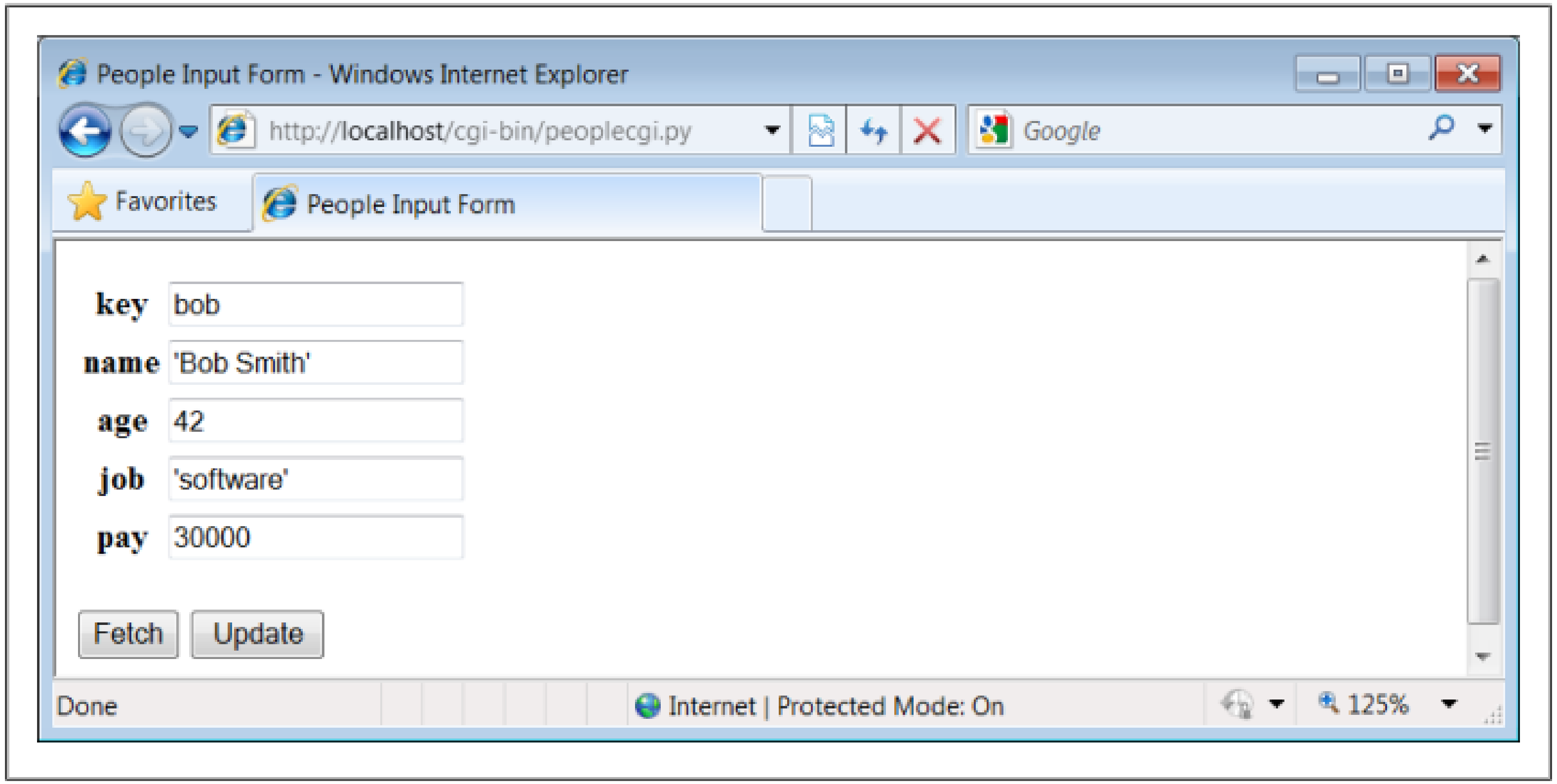
Adding a Web Interface





- If you have trouble getting this interaction to run on Unix-like systems, you may need to modify the path to your Python in the #! line at the top of the script file and make it executable with a chmod command.

A Web-Based Shelve Interface



A Web-Based Shelve Interface

```
"""
Implement a web-based interface for viewing and updating class instances
stored in a shelve; the shelve lives on server (same machine if localhost)
"""

import cgi, shelve, sys, os                    # cgi.test() dumps inputs
shelvename = 'class-shelve'                    # shelve files are in cwd
fieldnames = ('name', 'age', 'job', 'pay')

form = cgi.FieldStorage()                      # parse form data
print('Content-type: text/html')               # hdr, blank line is in replyhtml
sys.path.insert(0, os.getcwd())                # so this and pickler find person

# main html template
replyhtml = """
<html>
<title>People Input Form</title>
<body>
<form method=POST action="peoplecgi.py">
    <table>
    <tr><th>key<td><input type=text name=key value="%(key)s">
    $ROWS$
    </table>
    <p>
    <input type=submit value="Fetch",  name=action>
    <input type=submit value="Update", name=action>
</form>
</body></html>
"""

# insert html for data rows at $ROWS$
rowhtml  = '<tr><th>%s<td><input type=text name=%s value="%%(%s)s">\n'
rowshtml = ''
for fieldname in fieldnames:
    rowshtml += (rowhtml % ((fieldname,) * 3))
```