Chapter 1: What is Python?

1.0 Introduction to Python

- Python is an interpreted, interactive, object-oriented programming language, first developed in 1990 by Guido van Rossum.
- By the end of 1998, it had grown to an estimated user base of 300,000, and it's beginning to attract wide attention in the industry.
- It combines many of the best design principles and ideas from many different programming languages.
- It's simple and powerful.

1.1 Language Features

Interpreted to bytecodes

- Python code lives in text files ending in *.py*
- The program compiles the text files to a machine-independent set of *bytecodes* in a way similar to Java, which are usually saved in files ending in *.pyc*; these can then later be imported and run quickly.
- The source is recompiled only when necessary.
- Python's speed is of a similar order of magnitude to Java or Perl.

Very high level

- All languages support basic types such as strings, integers, and floating-point numbers.
- Python has higher-level built-in types such as lists and dictionaries, and high-level operations to work on them.
- For example, you can load a file into a string with one line and split it into chunks based on a delimiter with another line. This means writing less code. It also means that the speed is better than you might suppose: the built-in functions have been written in C and extensively optimized by a lot of smart people, and are faster than C or C++ code you might write yourself.

Interactive mode

- You can use Python interactively, entering expressions one line at a time.
- This mode allows you to try ideas quickly and cheaply, testing each function or method as you write it.
- This style of programming encourages experimentation and ideas.

The interpreter is always available

- Every Python program has the ability to compile and execute text files while running; there is no distinction between the runtime and development environments.

Clean syntax

- The syntax is straightforward and obvious, and there are no cryptic special characters to learn.

Advanced language features

- Python offers all the features expected in a modern programming language: object-oriented programming with multiple inheritance, exception handling, overloading of common operators, default arguments, namespaces, and packages.

Introspection

- You can ask an object what attributes it has at runtime and give it new ones.

Platform independence

- Python is written in ANSI C and is available for a wide range of platforms including Windows, Unix, and Macintosh.
- The core language and standard libraries are identical on all platforms, although each platform offers its own dedicated extensions.

Extensible

- Python is written in C in a modular architecture.
- It can be extended easily to add new features or APIs.
- If you want a new feature, you can add it and find plenty of help to do so.

Extensive libraries

- The Python library, included in the standard installation, includes over 200 modules, covering everything from operating-system functions and data structures to full-blown web servers.
- The main Python web site provides a comprehensive index to the many Python projects and third-party libraries. http://www.python.org/
- Whatever your problem domain, you will probably find someone else working on it and a good base of code to start with.

Support

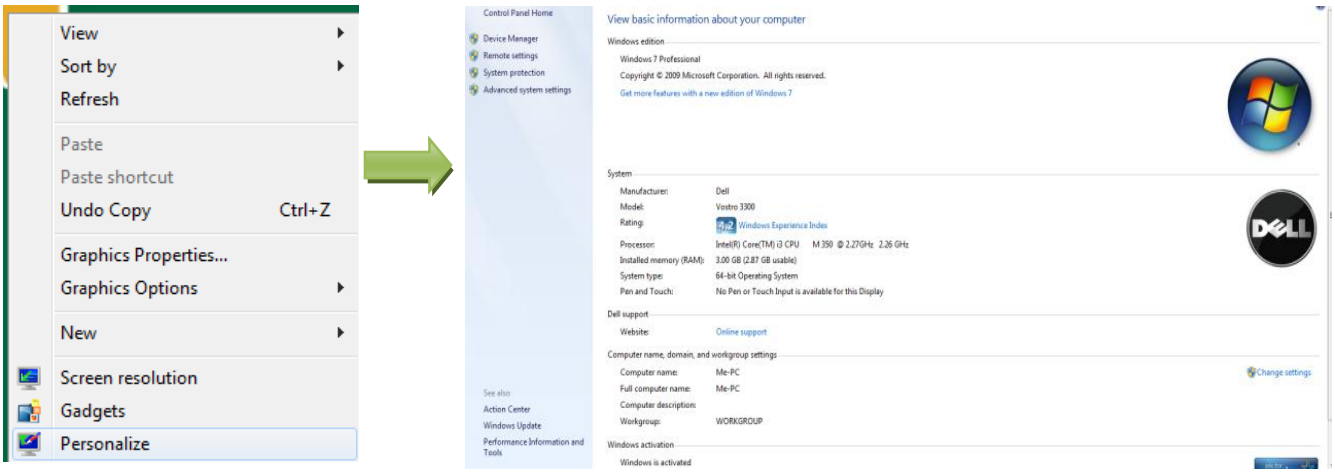
- Python has a large and enthusiastic user community
- It's currently doubling in size every two years.

1.2 Python as an Integration Tool

- Python can integrate a variety of disparate systems; you may hear it referred to as a *glue language,* because it's a powerful way to glue systems together.
- The basic integration technologies available on Windows can be broken into five groups: files, DLLs, COM, networking, and distributed objects.

1.3 Installation

- A standalone version of Python can be downloaded at http://www.python.org/download/
- Every installation of ArcGIS has Python installed by default.
- Download the Python setup executable that is supported by your hardware and software architecture.
- For Windows users', the current hardware and software architecture can be found by right clicking on "My Computer" and then clicking on the "Properties" or "Personalize" (on Windows 7) option.



- To verify the installation, click on the Python icon in the "Startup Menu". A Windows application should start up and display an input prompt. Enter 2 + 2 and press Enter; you should be rewarded by a 4. Python is now successfully installed.
- At this point, it's well worth clicking on Python Manuals and browsing around. The manuals are stored in HTML format and are now installed on your hard disk. They include a tutorial and a complete library reference.

PythonWin, what is it?

- An IDE (Interactive Development Environment) for Python
  - Works well with windows
  - There are other platform independent IDEs
- Can run Geoprocessing scripts in Python
  - Can also run regular Python scripts
- Its free
- Offers better debugging utilities compared to the standard Python IDE
- Environment can be tailored to support user customizations.
- Color codes help support better understanding and better debugging logic.

Installation

- ArcGIS no longer installs PythonWin, because the recommended methodology for creating the geoprocessor has changed to using a new Python module that Esri has developed to support the latest version of Python and multiple platforms, such as Windows, UNIX, and Linux.
- Download: http://sourceforge.net/projects/pywin32/files/pywin32
- Note that there is one download package for each supported version of Python - please check what version of Python you have installed and download the corresponding package.
- Some packages have a 32bit and a 64bit version available - you must download the one which corresponds to the Python you have installed.
- Even if you have a 64bit computer, if you installed a 32bit version of Python you must install the 32bit version of pywin32.
- If the installation process informs you that Python is not found in the registry, it almost certainly means you have downloaded the wrong version - either for the wrong version of Python.