Variables (1)

Definitions – a selection

Donald Knuth: A quantity that may possess different values as a program is being executed.
Mehran Sahami: A box in which we stuff things – i.e. a box with variable content.
Wikipedia: User defined keyword that is linked to a value stored in computer's **memory** (runtime).

The concept of a **variable** consists of:

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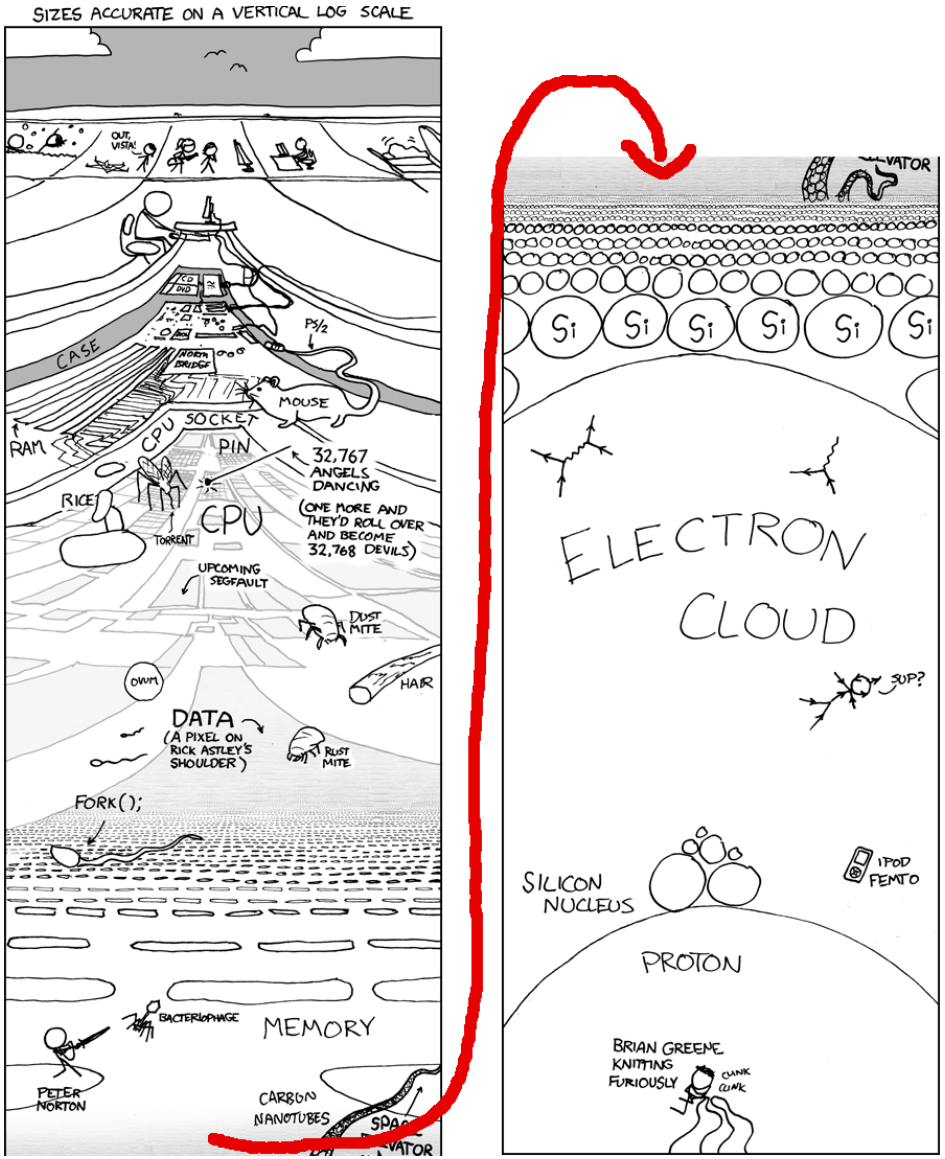
The concept of a **variable** consists of:

- name
- type
- value

Memory interlude



"Depth",
http://xkcd.com/485 (September 16, 2009)

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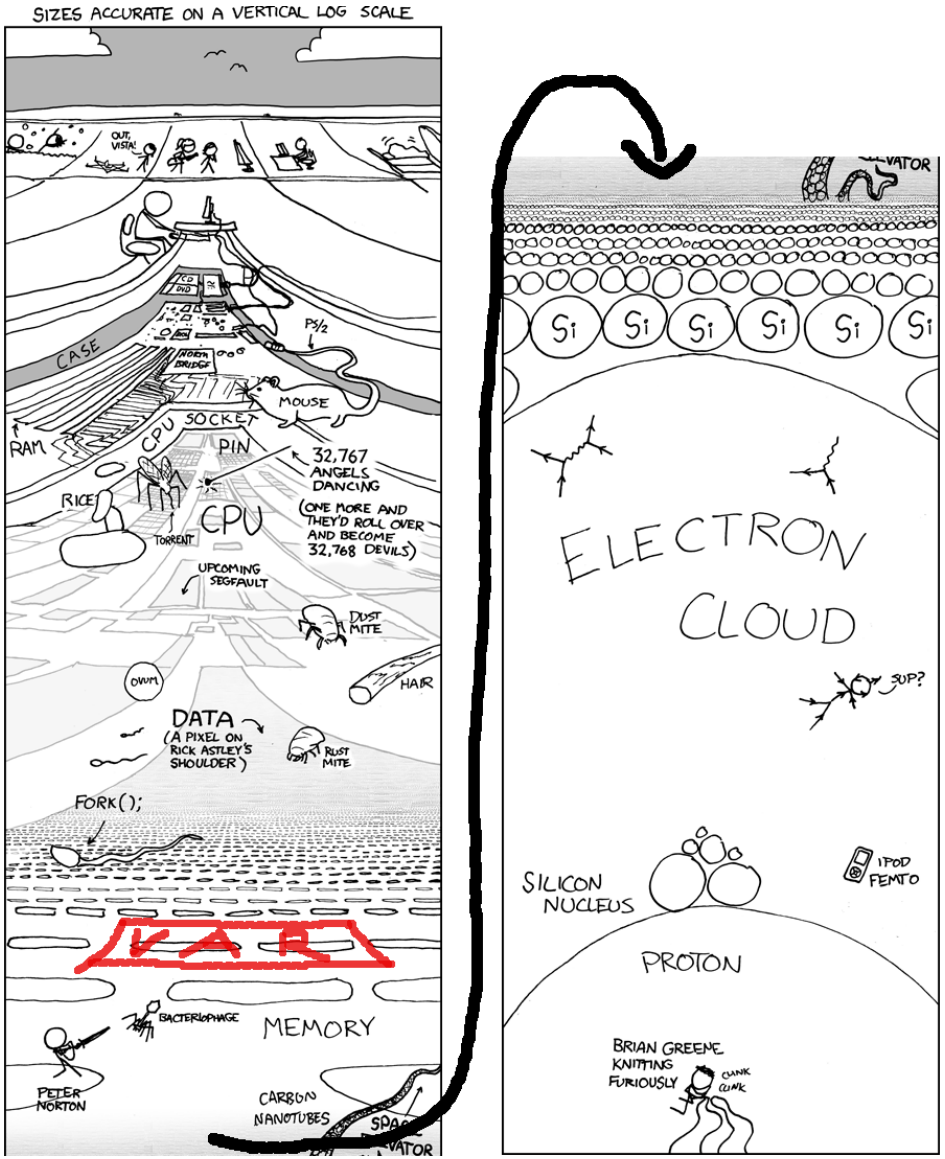

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Variables (2) – name

USE VALID NAME: follow programming language rules – Python variable names must **begin with a letter**, followed by any **combination of letters, digits, and underscores**. Uppercase different from lowercase. Don't use reserved keywords!

USE MEANINGFUL NAMES, i.e. names that speak:

‘`lengthGlacier`’ or ‘`glacier_length`’ ... **Don't use** ‘`a`’ – avoid ambiguity (Unless following a paper, textbook)

USE CONSITENT FORMATTING, i.e.: ‘`my_cool_var`’ vs. ‘`myCoolVar`’ –supports reading

Many style guides exist – punchline: use meaningful names, be consistent (that’s hard enough)!

Variables (3) – type

What is a type? – Think of sets of numbers in math: $\mathbb{N}, \mathbb{R}, \mathbb{Z}, \ldots$ The type refers to how **values** are being represented in a computer's memory, i.e. the meaning of each bit, and how many bits are necessary

Two kinds of Types

- primitive, built-in types – for Python e.g.: `'boolean'`, `'int'`, `'float'`, `'complex'` (important for `print` function)
- non-primitive (built-in or self made) – sequences, iterators, classes, ... `https://docs.python.org/2.7/library/stdtypes.html`

Types in Programming Languages

- some languages, e.g. Python, Shells, Matlab are weakly typed: implicit type conversions (OR one type can be treated as another)
- this is nice at first, occasionally this leads to nasty/hard to fix problems (e.g. string interpreted as number, etc.)

Variables (4) – value

Value

- a value of the type of the variable: `23, 3.1415926..., false`
- i.e., the thing we stuff in the box
- can/should change during the runtime of the program, otherwise use a constant (if possible)

Declaring a variable and Assigning a value:

In General: `(type) name = value;` or `(type) name = expression;`

Python: `myNewVar=10;` **TC-Shell** (differs) `set myNewVar = 10;`
Access to the values (de-referencing):
Python: use `myNewVar;` **TC-Shell** (differs) use '`$`': `$myNewVar`

What's that?

```
myNewVar = myNewVar + 1;
```