PH502: Scientific Programming Concepts

Irish Centre for High End Computing (ICHEC)

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Overview

- In this lecture we will continue with variables.
- The programmer is responsible for declaring all variables.
- Also in addition each variable needs to be initialized.

Declaring Variables

- In compiled languages, like C and FORTRAN, you must as the programmer manage the memory usage.
- The most basic manifestation of this is to declare all the variables in the program.
- There are four properties of a variable:
  1. type; integer, real etc,
  2. name,
  3. $r-value$; the value stored,
  4. $l-value$; memory address.
- Declaration means that an amount of memory (dependent on the type) and its location is reserved for the program.

Variable Names

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- The name of a variable can be composed of letters, digits, and the underscore character.
- It must begin with either a letter or an underscore in C and a letter in Fortran.
- Upper and lowercase letters are distinct in C because C is case-sensitive.
- Fortran does not distinguish between upper and lower case, in fact, it assumes all input is upper case.
- Not allowed: 2foo, my foo, Reserved words

Declaration Examples

```c
// C Code
int i,j,k;
float x,y,z;
double xx;
char abc, ABC;
char s[5];
```

```fortran
! Fortran Code
integer (kind=4) :: i,j,k
real (kind=4) :: x,y,z
real (kind=8) :: xx
character (len=1) :: abc
character (len=5) :: s
logical (kind=4) :: truefalse
```

Initialization

- To complete the construction of our variables, there is one final operation.
- That is to initialize the variable or set the $r-value$.
- The type and name are given in the code.
- The address or $l-value$ is assigned at runtime by the system. Thus if the program was run twice in succession all the $l-values$ will be different.
- To set and $r-value$ we need to know about the assignment operator.