

Miscellaneous items

Arjen Markus

Deltares

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Selecting precision of numerical types

Use the kind mechanism to select single or double precision:

```
integer, parameter :: wp = kind(1.0d0)
real(kind=wp)      :: x, y, z
```

!

! Explicitly select on decimal precision, range of exponent

!

```
integer, parameter :: wp = selected_real_kind(10,30)
real(kind=wp)      :: x, y, z
```

Note: The kind number is arbitrary but positive – it had only a coincidental relation to the number of bytes

```
integer, parameter :: wp = 4      ! This is NOT portable
real(kind=wp)      :: x, y, z
```

The intrinsic module ISO_FORTRAN_ENV defines a number of useful constants:

- Logical unit numbers for standard files (keyboard, output, error)
- Kinds for commonly used real and integer variable types, like REAL64
- Constants involved with file I/O

The intrinsic module IEEE_ARITHMETIC defines a number of useful routines to deal with arithmetic exceptions and special numbers:

- Control if the program stops after some exception:
 `ieee_set_halting_mode` or check if it does:
 `ieee_get_halting_mode`.
- Check numbers for *infinity*, *NaN*, ...: `ieee_is_finite`,
 `ieee_is_nan` ...
- Check if the processor (compiler and operating system) supports certain IEEE features.

Enhancements for complex data

Accessing the imaginary and real parts:

```
complex :: z
```

```
z = (1.0,2.0)
```

```
write(*,*) z%im, ' -- ', z%re
```

Also:

```
real, parameter :: one = 1.0, two = 2.0
```

```
complex :: z = (one, two)
```

Using argument names

You can use named arguments and thereby pass actual arguments in arbitrary order:

```
subroutine print( x, y, z )  
    ...  
end subroutine print  
...  
  
call print( z = z1, x = 2.0, y = yy )
```

Interaction with the environment

Routines to interact with the operating system:

- The function `command_argument_count` returns the number of arguments on the command line.
- Use subroutine `get_command_argument` to get an argument from the command line. (Argument 0 is the name of the program.)
- Use subroutine `get_command` to get the full command line.
- The subroutine `get_environment_variable` allows you to get the value of an environment variable.
- The subroutine `execute_command_line` runs an external program.

New mathematical functions:

- Bessel functions of integer order: `bessel_j0`, `bessel_jn`, ...
- Error function and related functions: `erf`, `erfc`, `erfc_scaled`
- ...

Bit manipulation functions, such as:

- `BTEST` to see if a particular bit has been set.
- `IAND` performs bitwise logical AND operation.
- ...