

Derived Type Encapsulation

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Problem:

It is possible to define an opaque derived type OT that has a user-defined assignment procedure. However, the user-defined assignment procedure is not invoked when assigning objects of another type T containing components of type OT. This applies both to pointer and non-pointer components. Since the very reason type OT has user-defined assignment is probably that the intrinsic assignment was inappropriate, this means that an inappropriate assignment will be performed unless the writer of type T takes special care (i.e. also has user-defined assignment).

Example:

```
MODULE iso_varying_string
  TYPE varying_string
    PRIVATE
    CHARACTER, POINTER :: value(:)
  END TYPE
  INTERFACE ASSIGNMENT(=)
    MODULE PROCEDURE assign_vs_to_vs
  END INTERFACE
CONTAINS
  SUBROUTINE assign_vs_to_vs(var,expr)
    TYPE(varying_string),INTENT(OUT) :: var
    TYPE(varying_string),INTENT(IN) :: expr
    ALLOCATE(var%value(SIZE(expr%value,1)))
    var%value = expr%value
  END SUBROUTINE
END MODULE
PROGRAM programme
  USE iso_varying_string
  TYPE mytype
    TYPE(varying_string) name
  END TYPE
  TYPE(varying_string) x, y
  TYPE(mytype) a, b
  x = y ! invokes "assign_vs_to_vs(x,y)"
  a%name = b%name ! invokes "assign_vs_to_vs(a%name,b%name)"
  a = b ! does intrinsic assignment on A%name and B%name
END
```

Other Problems:

(1) It is very easy to drop the user-defined assignment even for normal variables - a simple "USE iso_varying_string,ONLY:varying_string" quietly loses the appropriate assignment.

(2) Deliberate subversion of the "opaque" data type is just as easy.

Solution:

1. Add "default assignment" that is used by the assignment statement for derived types.

Default assignment will

- (i) do pointer-assignment on pointer components
- (ii) do intrinsic assignment on non-pointer components of intrinsic type
- (iii) do defined assignment on non-pointer components of derived type if there is a defined assignment procedure for the component type; and
- (iv) do default assignment on other non-pointer components of derived type.

And, add a note to section 1.x noting that this is a change from F95 to F2002.