

## Proposal for BITS in Fortran 2008

This note is a summary of an e-mail discussion in the BSI Fortran panel on type BITS in 07-007r1, intended for further discussion at the FSG meeting on 14 June 2007.

During most of the development of F90 there were discussions about introducing a type BITS. It proved impossible to reconcile the different interests of those who wished to manipulate short sets of bits within a single storage unit and those who wished to handle arbitrary length strings of bits, possibly running to many thousands. Thus a type BITS did not appear in F90, F95 or F03, although a few bit manipulation procedures were added to help the first set of users above.

BITS as currently proposed does cater for the first set of users by increasing ease of expression for manipulating short bit-strings and, in relating bit types to storage units, by allowing compatibility with other types.

In the proposal only fixed-length bit-strings are allowed. The maximum guaranteed string length is the higher of the length of four numeric storage units and the size of the maximum intrinsic type. The length of a numeric storage unit is of course processor-dependent and whether or not the maximum string length in any implementation exceeds the specified minimum is also processor-dependent.

This means (a) that the feature provides no facilities for the user of long strings or variable-length strings and (b) that it is of limited utility to the writer of portable standard-conforming programs. The note (4.18) "it is expected that the actual size limit will be much larger [than the minimum requirement]" is of little use for portability since a standard's lower limit is a programmer's maximum.

After the higher levels of abstraction gradually introduced in F90, F95 and F03 it appears to be a retrograde step to introduce a highly system-dependent feature which will in any case provide only a subset of the features reasonably to be expected from a type BITS. The heavily system-based design will preclude future extension to a more general facility, that is one which would allow for arbitrary length strings and for variable length strings.

The panel is concerned that the proposed new intrinsic type, the first since CHARACTER in F77, adds considerably to the size and complexity of the language, thereby increasing the load on implementers (and incidentally on those learning Fortran and on teachers and textbook writers), but makes little improvement to the utility of the language, does not add significantly to the set of problems solvable by Fortran and disaffirms the increase in elegance of expression which has taken place from F90 onwards.

We note too that the proposal is incompatible with existing vendor extensions and may be incompatible with the true decimal architectures now being mooted.

During the discussion the proposal was described as important and useful and that it offered "gains in convenience and efficiency". The majority view however was that it was bad design, harmful and nonportable and would lead to losses in performance, safety and portability. In view of this, and in view of the fact that depending on the detail, similar effects could be achieved by using CLASS, TRANSFER or TYPE(c\_ptr), the majority view was that BITS should be removed entirely from the draft standard.

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