TECHNICAL REPORT

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Information technology — Programming languages — Fortran — Enhanced data type facilities

Technologies de l'information — Langages de programmation — Fortran — Facilités de type de données améliorées

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
— type 2, when the subject is still under technical development or where for any other reason there is still the future but not immediate possibility of an agreement on an International Standard;
— type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

Technical Reports are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Attention is drawn to the possibility that some of the elements of this Technical Report may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC TR 15581, which is a Technical Report of type 2, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 22, *Programming languages, their environments and system software interfaces*.

This second edition cancels and replaces the first edition (ISO/IEC TR 15581:1998), which has been technically revised.

Annex A of this Technical Report is for information only.

This Technical Report specifies an extension to the data type facilities of the programming language Fortran. Fortran is specified by the international standard ISO/IEC 1539-1. This document has been prepared by ISO/IEC JTC1/SC22/WG5, the technical working group for the Fortran language.

It is the intention of ISO/IEC JTC1/SC22/WG5 that the semantics and syntax specified by this Technical Report be included in the next revision of the Fortran standard (ISO/IEC 1539-1) without change unless experience in the implementation and use of this feature identifies any errors that need to be corrected, or changes are required to achieve proper integration, in which case every reasonable effort will be made to minimize the impact of such changes on existing commercial implementations.

Introduction

There are many situations when programming in Fortran where it is necessary to allocate and deallocate arrays of variable size but the full power of pointer arrays is unnecessary and undesirable. In such situations the abilities of a pointer array to alias other arrays and to have non-unit (and variable at execution time) strides are unnecessary, and they are undesirable because this limits optimization, increases the complexity of the program, and increases the likelihood of memory leakage. The ALLOCATABLE attribute solves this problem but can currently only be used for locally stored arrays, a very significant limitation. The most pressing need is for this to be extended to array components; without allocatable array components it is overwhelmingly difficult to create opaque data types with a size that varies at runtime without serious performance penalties and memory leaks.

A major reason for extending the ALLOCATABLE attribute to include dummy arguments and function results is to avoid introducing further irregularities into the language. Furthermore, allocatable dummy arguments improve the ability to hide inessential details during problem decomposition by allowing the allocation and deallocation to occur in called subprograms, which is often the most natural position. Allocatable function results ease the task of creating array functions whose shape is not determined initially on function entry, without negatively impacting performance.

This extension is being defined by means of a Technical Report in the first instance to allow early publication of the proposed definition. This is to encourage early implementation of important extended functionalities in a consistent manner and will allow extensive testing of the design of the extended functionality prior to its incorporation into the language by way of the revision of ISO/IEC 1539-1.

Information technology - Programming languages - Fortran - Enhanced data type facilities

1 General

1.1 Scope

This Technical Report specifies an extension to the data-type facilities of the programming language Fortran. The current Fortran language is specified by ISO/IEC 1539-1 : 1997. The proposed extension allows dummy arguments, function results, and components of derived types to be allocatable arrays.

Clause 2 of this Technical Report contains a general informal but precise description of the proposed extended functionalities. Clause 3 contains detailed editorial changes which if applied to the current International Standard would implement the revised language specification.

1.2 Normative Reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this Technical Report. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this Technical Report are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 1539-1 : 1997 *Information technology - Programming languages - Fortran - Part 1: Base language.*

