

Procedures for the Future Development of Urgent New Features in Fortran

Summary

Urgent user requirements for separable facilities in the Fortran Standard will be met by the timely production of ISO Technical Reports of Type 2. These will act as the standards equivalent of beta-testing for software. The main development of the revised Standard will proceed as at present.

The content of the Technical Reports will be incorporated unchanged into the succeeding revision of the Standard unless any major disadvantages are identified.

1. Background

The procedures used for the revision of IS 1539:1991 (Fortran 90) were determined by WG5 in 1992 and documented in the "Strategic Plan for Fortran Standardization" (WG5 Standing Document 4). These procedures involved WG5 determining the features to be added to, or removed from, the current Standard, and the delegation to a "Primary Development Body" of the technical work involved in determining exactly how to achieve these changes. The US Fortran Technical Committee, X3J3, was appointed as the Primary Development Body, although it, in turn, delegated the initial development of some features to other bodies and individuals.

It was WG5's expressed intent that the 1995/96 revision of IS 1539, which is a relatively minor revision, should be followed by a more major revision in 2000/2001. Although the procedures defined in the Strategic Plan have worked reasonably well, and have enabled X3J3 to deliver a draft CD to WG5 at the time requested, during the final stages of preparation of the draft CD it has become increasingly clear that there are several major additional features that are required by the Fortran user community, or by significant segments of it, that cannot wait until 2002/2003 - allowing the usual 2-3 year delay between the publication of the Standard and the availability of a range of compilers conforming to that Standard - without having a serious effect on the future acceptability of the Fortran language.

Some members of WG5 have argued that WG5 should delay Fortran 95 and add these features before it is sent out for a CD ballot. However, the majority view favours sticking to the widely announced revision schedule - not least because once the agreed schedule is allowed to slip for one new feature it may prove impossible to prevent further delays to allow for the addition of other new features as well.

This paper describes the use of ISO/IEC Technical Reports to enable a limited number of major new features to be developed and, hopefully, implemented in compilers several years before they would otherwise be defined in the next revision of the Fortran International Standard.

2. The use of Type 2 Technical Reports to specify the syntax and semantics of specific new features

There are two conflicting problems associated with adding new features to Fortran when there is perceived to be an urgent market requirement for these features:

- Vendors wish to extend their compilers in order to satisfy the demands being expressed by their customers (and potential customers);
- Vendors are unwilling to add new features to their compilers in advance of the final standardisation of such features for fear that the standardised version may differ from that already implemented.

It is proposed to make use of Type 2 Technical Reports to resolve this conflict and, in addition, to enable major new features to undergo a form of "beta test" in advance of formal standardisation. It would be WG5's declared intention that the syntax and semantics described in such a report would be incorporated unaltered in the next revision of the International Standard for Fortran, unless experience in the implementation and use of the features covered by the TR indicated that a change was required.

This approach will enable major new features to be developed more quickly than at present, and will allow for experience with such features (similar to the "beta testing" of software) before they are finally incorporated in the Standard, while providing a reasonable guarantee that implementations of the features described in the TR(s) will not be wasted effort.

A Type 2 Technical Report is defined in the JTC1 Directives as being for use when "the subject in question is still under technical development or where for any other reason there is the possibility of an agreement [on publication as an International Standard] at some time in the future." (15.2.2) Furthermore, there is a requirement that, prior to the third year after publication, a recommendation be made to JTC1 "stating whether the TR should be

- converted to an IS without change;
- revised and published as an IS;
- confirmed for continuation as a TR;
- revised for publication as a revision to the TR;
- withdrawn." (15.4.1.2)

Such a TR is, therefore, appropriate for items which are not yet ready to be standardised but which, it is expected, will be so ready within three years.

With this use of TRs, the process of revising the Fortran Standard may be summarised as follows:

- the method used for the revision of IS 1539:1991, whereby WG5

determines the requirements and delegates the production of a draft CD to a Primary Development Body, will be used for the next revision and, in principle, for further revisions thereafter;

- where a single feature is deemed to satisfy certain criteria, as described in section 2.1 of this paper, WG5 will request SC22 to establish a New Work Item for the production of a Type 2 Technical Report specifying the syntax and semantics of this new feature according to the principles described below (2.2), and will establish a (small) development body to produce a draft PDTR within a defined period (see 2.3) - it is expected that this body will work primarily by electronic means, consulting others within the Fortran community to whatever degree it feels to be necessary and appropriate;
- the features described in any such Technical Reports will be incorporated in the next revision of the Standard exactly as described in the TR unless experience in the implementation and use of the feature has identified errors which need to be corrected.

2.1 The criteria for selecting a feature for definition in a Type 2 Technical Report

The major criteria which must be satisfied before WG5 will consider developing a Technical Report for a new language feature are as follows:

- there must be a demonstrable demand for the feature from the Fortran user community;
- there must be no alternative method of achieving the desired result by use of existing features of the language which is acceptable to the major part of the identified user community demanding the feature;
- the feature must be important enough to the identified user community for a significant proportion to seriously consider converting their programs to another language if the feature is not available within a significantly shorter timescale than would be the case if it was only added at the next revision of the Fortran Standard.

In addition, WG5 must be confident that

- a draft PDTR can be produced within eighteen months of approval of the relevant New Work Item;
- the Technical Report can be published at least two years before the anticipated publication date of the next full revision of the Standard.

2.2 The content of a new feature Technical Report

Every Type 2 Technical Report developed under this process will commence with a statement along the following lines:

It is the intention of ISO/IEC JTC1/SC22/WG5 that the semantics and syntax described in this Technical Report shall be incorporated in the next revision of IS 1539-1 (Fortran) *exactly as they are specified here* unless experience in the implementation and use of this feature has identified any errors which need to be corrected, in which case only those changes necessary to correct the errors will be made.

The Technical Report will contain the following three main sections:

- an explanation of why it was felt necessary to define the feature which is the subject of the Report in advance of the next revision of the Standard;
- a full description of the syntax and semantics of the new feature;
- a complete set of edits to the current Fortran Standard which would be necessary to incorporate the feature in the Standard; if no errors are found during implementation and/or use of the feature then these edits will be the means by which the feature will be incorporated into the next revision of the Standard (other than changes to line numbers, etc, to accommodate other changes to the language taking place at the same time).

2.3 The membership of the Development Bodies and their relationship to the Primary Development Body

Since one of the primary criteria for the adoption of the Technical Report route is that there must be a demonstrable demand for the feature from the Fortran user community, it is anticipated that the particular user community will already have one or more representatives amongst the membership of WG5, and that one of these individuals, who will, by definition, have a strong personal interest in the success of the project, will be nominated as Editor of the Technical Report.

The Editor will be assisted by a (small) number of individuals having a particular interest and/or expertise in the relevant area of the language, who will, together, form the Development Body.

In general, it is expected that such a Development Body will always have at least one member from the Primary Development Body in order that the Development Body can have an effective, albeit informal, means of interaction with the body which will, in due course, be responsible for incorporating the syntax defined in the TR into

the full Standard. Although the Development Body will report directly to WG5, it is clearly highly desirable that it should take full advantage of the expertise within the Primary Development Body.

3. Implementation

WG5 will take the following steps to implement the process described in this paper:

- inform SC22 of WG5's intent to use Type 2 Technical Reports, as described in Section 2 of this paper, as a means of accelerating the definition of the syntax and semantics of a small number of new features deemed to be too urgent to wait for the next revision of the Fortran Standard, which will, nevertheless, continue in parallel with the development of these Technical Reports;
- request SC22 to approve New Work Items for WG5 for the production of Type 2 Technical Reports in the following areas:
 - a floating-point exception handling mechanism;
 - the extension of derived-types to provide the same functionality as for intrinsic types, with respect to parameterisation and allocatable components;
 - to provide the means for interoperability of Fortran with C.