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AN OVERVIEW OF FORTRAN STANDARDIZATION ACTIVITIES

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DISCLAIMER

ABSTRACT

The committee of the American National Standards Institute (ANSI) responsible for Fortran standardization is the X3J3 technical committee. On April 3, 1978 a new Fortran standard was officially adopted. The X3J3 is already working on the next standard. They are considering a "core plus modules" approach to Fortran, where stand alone modules may be interfaced with the core Fortran to privide certain facilities. The features under consideration for future Fortran include free form source statements, data and control structures, and array processing.

AN OVERVIEW OF FORTRAN STANDARDIZATION ACTIVITIES

I. ANSI X3J3 Committee

The committee of the American National Standards Institute (ANSI) responsible for Fortran Standardization is the X3J3 technical committee. This group is a successor to the ASA X3.4.3 subcommittee which was formed in May of 1962 and which was responsible for the first Fortran standard approved in March of 1966. It was through the effort of X3J3 that the 1966 Fortran standard was revised and was replaced April 3, 1978 by a new Fortran standard known as Fortran 77.

II. Fortran 77 Development

Fortran 77 culminated seven years of work for X3J3. During this time they met six times a year, considered hundreds of technical proposals, and spent thousands of hours between meetings to draft the document now accepted as a new standard. The effort of X3J3 was tracked by many groups and individuals during this time. Several international groups such as the European Computer Manfacturers Association (ECMA) were active in critiquing X3J3 efforts and providing input to their effort. The high degree of interest in the X3J3 effort was manifest during the public review period, when they received an overwhelming response to their proposed document. X3J3 had to respond to approximately 2500 comments on their proposed document before Fortran 77 was completed. In excess of a dozen different countries were represented in the responses, showing the high visibility that the X3J3 effort had abroad and the high degree of interest in it. It is estimated that the effort to produce Fortran 77 was in excess of two million dollars.

One of the characteristics of Fortran has been that it can be compiled efficiently producing code which is reasonable well optimized and which executes efficiently. One of the goals of X3J3 in writing Fortran 77 was to perpetuate this characteristic. How well they have succeeded will probably not be understood fully until the compiler writers and Fortran users have had considerable experience with it. One thing is sure, X3J3 did add appreciably to the Fortran language, but in fairness, one is forced to recognize that the features that were added were some which already existed in the myriad of Fortran extensions implemented by the various compiler writers.

X3J3 faced an interesting problem in developing Fortran 77. On one hand, there were many desirable features which people felt should be included and for which they were actively lobbying; on the other hand, a new standard was long overdue and there was great pressure to complete their document and to issue a new standard. Realizing that there were many other features which people desired in Fortran which were not in their proposed standard, and realizing that proper consideration of these features often takes an incredibly long time, X3J3 was finally forced to refuse consideration of any new features and to complete the work on those already under consideration. With this decision, X3J3 was able to complete the work on the Fortran 77.

The decision to complete the work under consideration and to not process any proposals involving new features was the only realistic one at the time; however it did leave many desirable features which had not been seriously considered, but which many felt should be a part of the Fortran standard. In some cases these features were championed by X3J3 members themselves. These individuals had to resign themselves to the realization that such features would not be in Fortran 77 and their best hope for standardization was in the next standard after Fortran 77. Because of these factors, X3J3 did not disband as their predecessor, the ASA X3.4.3 subcommittee had done when their proposed standard was accepted, in fact, the X3J3 committee did not even break its stride. Months before Fortran 77 was accepted, an X3J3 group was assigned to study features to be included in a future standard. By the time Fortran 77 became a standard, X3J3 groups had already been assigned to study and create technical recommendations concerning the next Fortran.

III Future Fortran Features

Since in a very real sense, Fortran 77 is an interim standard, a natural question is to ask "Just what will be in future Fortrans?" At this point, no one can say for sure just what will be the next standard, but we can list some of the features currently under consideration by assigned X3J3 working groups. This list will not be all inclusive but will include some of the major items being studied.

1. Free form Fortran statements. This will change the appearance of Fortran programs. It includes features mentioned in many of the comments received during the Fortran 77 public review period. The items under consideration here include trailing comments, multi-statement lines, and longer variable names. This form of Fortran source will be more oriented towards computer terminal input than the current source form. This form will remove position dependencies and by so doing will change features of Fortran which have been characteristic of it since its inception, e.g., a "C" in position one to indicate comments or a nonblank, nonzero in position six to flag a continuation line. Whatever form that X3J3 arrives at will certainly give Fortran a "new look".

2. Array Processing. Many people felt strongly that this feature should have been in Fortran 77, however, this topic impacts on many other areas and will require extensive work to develop properly.

3. Control structures. This feature includes consideration of some new looping constructs, some kind of a CASE construct and internal procedures.

4. Expansion of procedure interfaces. Several of the features under study by X3J3 will involve a more sophisticated procedure calling mechanism than has been traditional in Fortran. In

addition it is desirable to adequately define an interface so that special application modules, such as a scientific data base module, may be developed and can interface with Fortran in a standard manner. Because of this a technical group of X3J3 is studying ways enhancing procedure interfaces.

5. Data Structures. Data structures is one of the items being considered by an X3J3 working group looking at Fortran specifications statement. This same group is studying the feasibility of adding a BIT data type.

6. Data base manipulations. This work will not only provide a standard for accessing a scientific data base from Fortran, but will set a precident for the standardization of other special applications modules which may interface with Fortran.

7. Other features. The above list was not meant to be all-inclusive, however, it does seem appropriate to indicate that an INCLUDE facility, an event handling and error recovery facility and some kind of precision specification facility are also under study.

IV. Fortran Dilemma

Can future Fortran encompass so many features and maintain the characteristic of a language which compiles quickly into code which runs efficiently? This is one of the goals of the X3J3 committee, yet it is not obvious that even Fortran 77 fully achieves this goal. On one hand the language will be so comprehensive as to include all the features being considered, and on the other it should be so fundamental so as to permit efficient compiling and produce efficient running code.

V. Core Plus Modules

The answer to the Fortran dilemma seems to lie in a core plus modules approach being considered by X3J3. With this approach the Fortran language will consist of a core Fortran plus a small number of optional modules. The core Fortran will be a small, elegant, contemporary version of Fortran which may be compiled quickly to produce efficient code. It may be run by itself or in conjunction with the various modules. The modules can be special applications modules, or they may represent collateral standards which interface with core Fortran.

One of the special application modules, called here the Fortran 77 module, will contain all of the features of Fortran 77 which are not contained in the core. An example of a collateral standard would be a module for accessing a scientific data base. Using a familiar colloquialism, this approach seems to allow X3J3 to "have its cake and eat it too", at least it appears that it will allow core Fortran to be a reasonably small, contemporary language while retaining the ability to compile all of the Fortran 1966 and Fortran 77 features by merely adding the Fortran 77 module.

VI. A New Language?

When one considers the implications here a natural question is, "But X3J3 is a standardization committee, should it be inventing a new language?" In response we hasten to point out that it is not the intent of X3J3 to invent a new language. The intent of X3J3 is to maintain Fortran as the usable, compilable, portable language it has always been. Fortran has become the most widely used scientific language in the world. It cannot remain a leader without being responsive to the needs of its users and the philosophies of computer science.

The feature which will undoubtedly make Fortran look like a new language will be the "new look" which comes from free form statements, trailing comments, and multiple assignment statements. The Fortran source will appear different, but this is only the form of the language, and does not make it a new language. Trailing comments and multiple statements will require a statement delimitor, and appropriate rules must be made for free-form continuation statements, but the basic Fortran syntax rules should not change appreciably. The Fortran "new look" is in response to a very large number of requests received during the public review period of Fortran 77. Its time to divorce Fortran from a source form which is card oriented.

It is true that the future core Fortran may contain statements which seem foreign to Fortran and that some of the old familiar statements may be missing. Does this constitute a new language? It does not to X3J3. We hasten to point out that Core Fortran plus the Fortran 77 module will compile and execute any standard Fortran available today, so that all the traditional features of Fortran will be retained. The core plus the Fortran 77 module will constitute a super set of Fortran 77.

VII. Fortran Experts

The organizations which send members to support X3J3 are user groups, hardware and software vendors, universities, government bureaus and departments, and research laboratories. Thus X3J3 members have diverse backgrounds, some are compiler writers, some are users, some are teachers. But X3J3 members do have one thing in common--they are all Fortran experts. They work hard and they take their Fortran standardization work seriously. They are working to keep Fortran current while maintaining it as the practical language it has always been.