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International Business Machines Corporation

April 4, 1968

Chairman and Members of
USASI X3.4.2C

Gentlemen:

I enclose a document entitled "PL/I Language Specifications", issued March 11, 1968 which I wish to formally submit for your consideration as a basis for a draft PL/I Standard.

This document has also been submitted to the ECMA TC10 PL/I Committee and was very favourably received by their Chairman, Mr. C.A.R. Hoare, who cited it as "... making a significant step in the crystallisation of the language specification;..." and "... has made a major step towards cooperation in the field of PL/I Standardisation." The document is to be wholly under the control of the standardisation bodies and will not be subject to unilateral amendment by the IBM Corporation.

I also request that an item be placed on the agenda for our next X3.4.2C meeting to discuss what action should be taken on the document.



M.P. Seward

MPS/pm
CC without enclosure to X3.4.2C Mailing List



Data Systems Division
1271 Avenue of the Americas
New York 20, New York

International Business Machines Corporation

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April 20, 1962

Dr. J. Chuan Chu, Chairman
X3.4 Committee (ASA)
Remington Rand Univac Division
Sperry Rand Corporation
315 Park Avenue South
New York 10, New York

SUBJECT: Manual entitled "Description of the FORTRAN Language"

Dear Dr. Chu:

Attached is a manual entitled "Description of the FORTRAN Language," which is submitted to X3.4, Common Programming Languages Subcommittee of American Standards Association Sectional Committee X3 on Data Processing. This is in accordance with the offer made to you by Mr. W. E. Andrus, Jr., IBM Group Director of Standards, in his letter of February 9, 1962.

As you know, there are a large number of nearly identical FORTRAN-type programming languages in existence today. Many of them use FORTRAN in their name.

In the preparation of the attached manual, consideration was given by the authors to only those FORTRAN programming systems developed or under development by IBM for its machines. Consideration was not given to the other similar systems because of a lack of detailed knowledge of these systems on the part of IBM.

Language aspects were included in this manual which have been proven through usage, and which extend through a wide range of FORTRAN systems for machines of widely varying size and power. Language aspects were excluded without consideration of their value, which are contained only in systems for the largest machines.

April 20, 1962

The specifications used were drawn to substantially conform to the widest reasonable range of the IBM FORTRAN systems. Where a language conflict existed in a vital area such as input-output, a definite choice was made. In cases of conflict in areas of lesser importance, those language aspects were excluded.

While IBM has, of course, no objection to the use of the name FORTRAN in material published by the X3.4 Committee, we do request that credit be given to IBM with proper notice for material copied from our Copyrighted manuals.

It is recognized, of course, that questions will arise that cannot be answered with the information found in this manual. I am, therefore, including the FORTRAN manuals listed below for the use of the Committee.

Please be assured of our cooperation in providing additional information as required. Do not hesitate to call on me personally if I can be of assistance.



W. P. Heising
Manager,
Programming Systems Planning

WPH:lc

cc: Mr. W. E. Andrus, Jr. - with Attachment 1
All Members of the X3.4 Committee - with Attachment 1

Attachment 1: "Description of the FORTRAN Language"

Attachment 2: List of Manuals:

709/7090 FORTRAN C28-6054-2
7090/7094 FORTRAN Part IV (FORTRAN Compiler) J28-6197-0
1620 FORTRAN II Preliminary Bulletin J26-5602
7070 Full FORTRAN II Reference Manual C28-6170
FORTRAN General Information Manual F28-8074-1
1410 FORTRAN Preliminary Specifications J24-1468-0
1401 FORTRAN Specifications J24-1455-1

DRAFT MINUTES

MINUTES OF TWELFTH MEETING

SUBCOMMITTEE X3.4, COMMON PROGRAMMING LANGUAGES

NOVEMBER 30, 1961

1.0 RECORD OF ATTENDENCE

1.1 The meeting was called to order by Chairman Chu at 10:00 AM with the following members and alternates* attending.

J. C. Chu (Chairman)
R. E. Utman (Alt. Chairman)
E. W. Bemer
R. F. Clippinger
S. Gorn
J. L. Jones
J. Wegstein
*W. W. Youden
*G. Cadwallader
H. Bromberg
*S. E. Wright
K. H. Speierman
* R. M. Petersen
R. Rossheim

1.2 Guests: John Gosden

2.0 AGENDA

The agenda was approved.

3.0 MINUTES OF PREVIOUS MEETING

The minutes of the October 26, 1961 meeting were approved with corrections.

4.0 REPORTS FROM ASSOCIATED ACTIVITIES

4.1 ASA, BEMA Activity

The IEC held an organizational meeting in London and established TG-53, Computers and Information Processing Equipment. They will limit themselves to electrical characteristics.

5.0 TASK GROUP REPORTS

5.1 X3.4.1

Task groups B and C are now being organized.
TG-A Basic Terminology
TG-B Language Specifications
TG-C Processor and System Specifications

5.2 X3.4.2

R. Bemer is preparing a package of programming manuals e.g. COBOL 61, Burroughs 220 ALGOL etc. to send with each letter of invitation to participate.

They expect to prepare a report like the A.P.I.C. Studies in Data Processing No. 1, "Some Commercial Autocodes - A Comparative Study"

Ambiguities and inconsistencies will be pointed out and referred back to the ALGOL and COBOL committees.

R. Clippinger made the motion that X3.4 add FORTRAN to the list of languages being considered for draft standards.

J. Wegstein seconded this motion.

Chairman Chu suggested tabling the motion until arrangements can be made on IBM cooperation and identification of a FORTRAN maintenance authority.

S. Gorn moved that the motion be tabled until the next meeting.

R. Bemer seconded this motion.

| | | |
|-------|---------------------|---|
| Vote: | in favor of tabling | 6 |
| | against | 1 |
| | abstain | 3 |

PROPOSED PROGRAM OF WORK
PER ISO/TC 97

1. Introduction
2. Objectives
3. History
4. Preamble to Program
5. Analysis of Activity by Goals
6. Staff Responsibilities
7. Phase Diagram Chart

2.2 Greater Convenience

Better and more consistent documentation.

Easier and more general education possible for programming.

Easier education for users who are not programmers.

The more specific objectives are:

2.3 Best Solution to Outstanding Problems

Define levels of language appropriate to different classes of computer power.

Define test problems for processors of different levels.

Anticipate and arrange for an orderly method of improvements.

2.4 Development Basis

Reduce the number of insignificant dialects of languages.

Provide an established basis for further development.

3. HISTORY

The following is a brief history of three languages which have attained a wide degree of acceptance, FORTRAN, ALGOL and COBOL. This may assist in showing some of the pitfalls to be avoided, the obstacles to be expected, confirmation of the value of standardization, and an indication of the type and rate of progress to be expected.

3.1 FORTRAN And Implications for Standardization

FORTRAN, whose development started in 1954, began to be used by customers in late 1956. Usage on the 704-709-7090 machines gradually increased as bugs in the program were removed and more people became familiar with it. A large SHARE library of FORTRAN routines became available, and soon every machine of this family was running some FORTRAN programs. Many installations were programming in no other language. During this period there were several lessons learned which should be borne in mind by any standardizing body.

- (1) Users want stability and will only accept change at a certain metered rate. As an example of this FORTRAN III offered many improvements over FORTRAN II yet the SHARE organization did not adopt it for some years.
- (2) SHARE itself became a standardization body for FORTRAN for the 704-9-90 family.

The use of FORTRAN was not restricted to the original family. Indeed it has been implemented on 17 other machine types, 9 in the IBM family and 8 others, and is currently being implemented on still more non-IBM types. These implementations were governed by no standardizing body. In fact, the membership requirements for SHARE rules out users of non-IBM equipment. Other FORTRANs were provided because of the success of FORTRAN in the 704-9-90 family and because the users of other equipments wanted access to the SHARE library and the ability to use the programming convenience of FORTRAN. On the other hand, in order to get simpler versions of FORTRAN suitable to simpler machines, three kinds of limitations were imposed. First, there were restrictions of function, e.g., number of subscripts, library functions and own sub-routine calls. Second, there were parametric limitations, such as the size of an array, the number of FORTRAN statements that could be compiled, etc. Third, there were limitations that did not affect the language but only the object program, such as reduction in the scope of optimization. The lack of the existence of a standardizing body led to the result that there is more fiction than fact in the notion that an arbitrary FORTRAN program will run on any of these machines. Nevertheless, even in the absence of a standardizing body, there has been tremendous advantage gained from the use of FORTRAN as a de facto, albeit a poorly defined, standard.

The FORTRAN experience has demonstrated:

- (1) There is a tremendous user appetite for a language designed for scientific use.
- (2) There is a user desire for standardization.
- (3) Users need stability and will not accept rapid nor trivial changes.
- (4) The ability to change at a reasonable rate as a result of feed-back is nevertheless required.

There is such a large volume of work currently being written in FORTRAN that the rate of increase of FORTRAN work today probably exceeds the rate of increase of ALGOL work. FORTRAN will therefore continue to be important for at least another five years. Because of the life left in FORTRAN and the fact that SHARE does not fill all the needs for standardization for FORTRAN users outside the 704-9-90 family, there is a strong need for FORTRAN standardization. This need is recognized by SHARE and JUG. (JUG is the Joint Users' Group of the ACM; SHARE is represented in it.)

3.2 ALGOL

FORTRAN illustrated the desirability of a common scientific programming language and taught us many lessons of standardization, but FORTRAN is not perfect and so to permit more powerful features, for example, better subscripting and deeper recursiveness, ALGOL sprang up out of the joint efforts of the European body GAMM and the American body ACM. Born in 1958, it has already acquired certain eminence as a publication language and those who have used it have been well satisfied with many aspects of it. Indeed the report on ALGOL 60 introduced a new

X3.4 PROGRAMMING LANGUAGES

SUMMARY OF PROGRESS
UP TO SEPTEMBER, 1962

by

R. F. CLIPPINGER

1962

Administrative

During 1962, the following added changes have occurred. R. Utman as alternate to J. C. Chu served frequently as Chairman. In May the task groups of X3.4 changed to working groups. Chairmanship of X3.4.2 changed from Bemer to Utman and its scope was modified as discussed below. A new working group X3.4.3 was created called FORTRAN. The program of work of X3.4.4 was modified to give COBOL top priority. X3.4.6, programming glossaries, under the chairmanship of Robert Gordon was activated, and finally J. C. Chu who had brought programming languages standardization to this point during the difficult initial period resigned and was replaced by R. Clippinger.

FORTRAN

In December, 1961, X3.4 added FORTRAN to the list of languages it proposed to process for American Standards. The chairmanship of X3.4.3, FORTRAN, was offered to W. P. Heising of IBM. In April, Heising delivered to X3.4 an IBM paper entitled a description of the FORTRAN language by Heising and Ridgway serving as a kickoff point for FORTRAN standards work. In May, X3.4 approved the formation of X3.4.3 with the scope to develop standards of FORTRAN language with an organization which included a policy committee and technical committee. The policy committee will be responsible to X3.4 for the working group missions to be accomplished, development of general policy, such as language content and the direction of the technical committees. X3.4 provided that membership in the FORTRAN policy committee would be subject to the following guide line which would be amended:

- a. For each FORTRAN implementation in active development or use, one sponsor voting representative and one user voting representative are authorized.
- b. A representative who is inactive may be dropped.
- c. Associate members, not entitled to vote but entitled to participate in discussions, are authorized.

Mr. Heising then proceeded to contact prospective members for X3.4.3 which held its first meeting on August 13 and 14. The theme of the August 16 meeting is FORTRAN. At that meeting two technical committees were formed. The first, chaired by M. Greenfield is to explore a level of standardization around the FORTRAN IV level and the second, chaired by J. Palmer is to explore a level of standardization at about the FORTRAN II level. The principle was approved that the levels of language should be upward compatible if possible.

History and Summary of FORTRAN Standardization Development for the ASA

By W. P. Heising

The American Standards Association (ASA) Sectional Committee X3 for Computers and Information Processing was established in 1960 under the sponsorship of the Business Equipment Manufacturers Association. ASA X3 in turn established an X3.4 Sectional Subcommittee to work in the area of common programming language standards. On May 17, 1962, X3.4 established by resolution a working group, X3.4.3-FORTRAN to develop American Standard FORTRAN proposals.

RESOLVED:

That X3.4 form a FORTRAN Working Group, to be known as X3.4.3-FORTRAN, with the

Scope. To develop proposed standards of FORTRAN language.

Organization. Shall contain a Policy Committee and a Technical Committee. The Policy Committee will be responsible to X3.4 for the Working Group's mission being accomplished. It will determine general policy, such as language content, and direct the Technical Committee.

Policy Committee Membership. Will be determined by the X3.4 Steering Committee subject to written guidelines which may be amended later and including the following:

a. For each FORTRAN implementation in active development or use, one sponsor voting representative and one user voting representative are authorized.

b. A representative who is inactive may be dropped.

c. Associate members, not entitled to vote but entitled to participate in discussion, are authorized.

Technical Committee. Will develop proposed standards of FORTRAN language under the Policy Committee direction. The Technical Committee will conduct investigations and make reports to the Policy Committee.

On June 25, 1962 invitations to an organizational meeting of X3.4.3 were sent to manufacturers and user groups who might be interested in participating in the development of FORTRAN standards. The first meeting was held August 13-14, 1962 in New York City. X3.4.3 decided to proceed because (1) FORTRAN standardization was needed, and (2) a sufficiently wide representation of interested persons was participating.

A resolution on objectives was adopted unanimously on August 14, 1962.

The objective of the X3.4.3 Working Group of ASA is to produce a document or documents which will define the ASA Standard or

Standards for the FORTRAN language. The resulting standard language will be clearly and recognizably related to that language, with its variations, which has been called FORTRAN in the past. The criteria used to consider and evaluate various language elements will include (not in order of importance):

a. Ease of use by humans.

b. Compatibility with past FORTRAN use,

c. Scope of application,

d. Potential for extension,

e. Facility of implementation, i.e. compilation and execution efficiency.

THE FORTRAN standard will facilitate machine-to-machine transfer of programs written in ASA Standard FORTRAN. The Standard will serve as a reference document both for users who wish to achieve this objective and for manufacturers whose programming products will make it possible. The content and method of presentation of the standard will recognize this purpose."

It was the consensus of the group that (1) there was definite interest in developing a standard corresponding to what is popularly known as FORTRAN IV, and (2) there was interest in developing for small and intermediate computers a FORTRAN standard near the power of FORTRAN II, however suitably modified to be compatible with the associated FORTRAN IV. Accordingly, two Technical Committees, designated X3.4.3-IV and X3.4.3-II respectively, were established to create drafts. Most of the detailed work in developing drafts has been done by technical committees.

The X3.4.3-II Technical Committee completed and approved a draft in May, 1963. A Technical Fact Finding Committee was appointed and reported in August, 1964 on a comparison of the X3.4.3-II approved draft and an approved working draft of the X3.4.3-IV Technical Committee. This brought to light stylistic, terminological, and content differences and conflicts. In April, 1964 the X3.4.3-IV Technical Committee completed a draft of FORTRAN. In June, 1964 X3.4.3 received and compared the two drafts and (1) resolved conflicts in content, and (2) resolved the conflicting style and terminology. This was accomplished by re-casting the X3.4.3-II document to reflect the style of the X3.4.3-IV document while retaining the original content. To reduce confusion, X3.4.3 decided to call the languages Basic FORTRAN and FORTRAN.

Editor's Note

The following working documents have been produced by a Subcommittee of the American Standards Association Sectional Committee X3, Computers and Information Processing, in its efforts to develop a proposed American Standard. In order that the final version of the proposed American Standard reflect the largest public consensus, X3 has authorized publication of these documents to elicit comment,

criticism and general public reaction with the understanding that such working documents are intermediate results in the standardization process and are subject to change, modification or withdrawal in part or in whole. Correspondence about the documents should be addressed to the X3 Secretary, BEMA, 235 East 42nd Street, New York, N. Y. 10017.—R.V.S.