

Forty years of FSG and Fortran Standards

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Early years of Fortran: 1954-1961

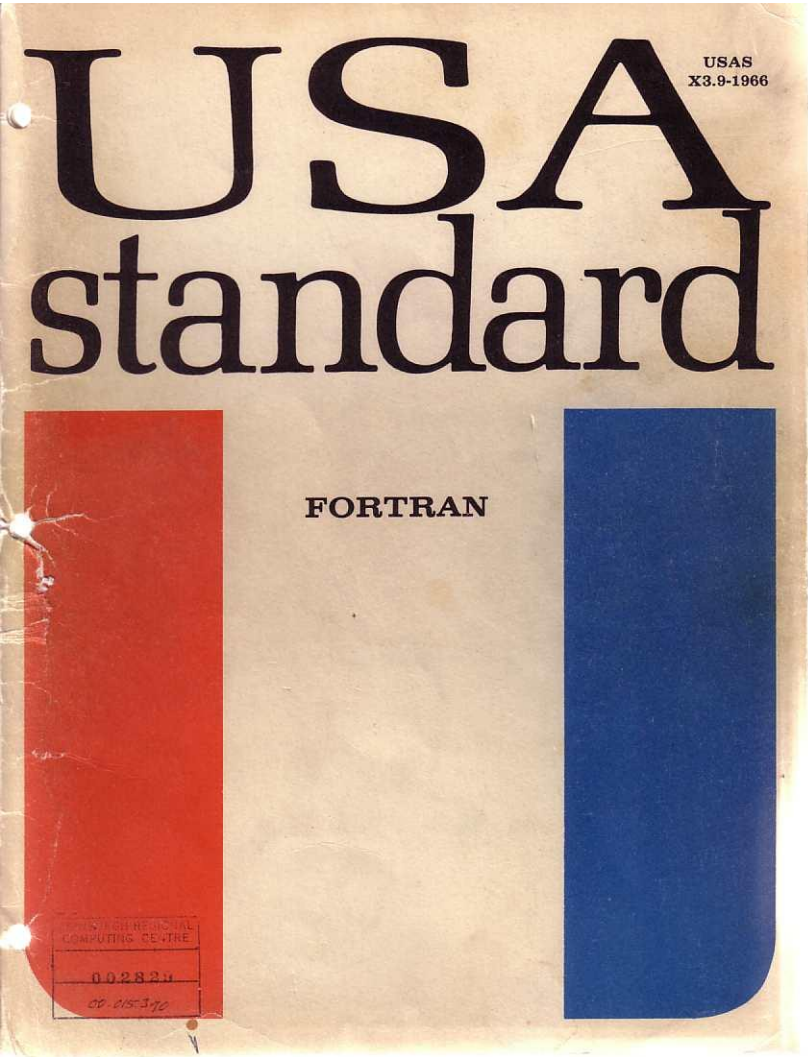


- 1954** Development work starts in IBM
- 1957** IBM release a Fortran compiler for the IBM 704
- 1958** IBM release Fortran II, with subroutines and blank common
- 1960** Philco release ALTAC, a Fortran II look-alike
- 1961** IBM have eight different compilers (for the 709, 650, 1620 and 7090) and publish a guide to language variations between them
- 1961** Univac release Fortran I for the SS80, the first compiler called 'Fortran' for a non-IBM machine

The first Fortran Standard 1962-1966

- 1962** Work on an ASA standard begins in order to promote consistency and enable portability
- 1962** IBM release Fortran IV for the 7030, 7090 and 7094; this removes some of the machine dependencies
- 1963** Most major US vendors have Fortran systems, either Fortran II or, increasingly, Fortran IV
- 1964** Technical work on the standard is complete. It is essentially a common subset of vendors' offerings
- 1965** ICT have Fortran IV on the 1900 and English Electric have Egtran on the KDF9
- 1966** The ASA/USASI standard is published
Clarifications are published in 1969 and 1971
(The US standard is reproduced as an ISO standard in 1972)

The first US Standard X3.9-1966



The Fortran Specialist Group is established: 1970



FSG Minutes of 6 January 1970:

The objectives of the group were formally agreed to be:

- (a) to form a focus in the United Kingdom for work concerned with establishing and maintaining FORTRAN standards.
- (b) to work in association with national and international standardisation bodies.

FSG Minutes of 5 April 1976:

4. Revision of objectives

Following further discussion, the wording of the proposed revised objectives now becomes "To undertake activities associated with any aspects of Fortran".

It is intended to present this for approval at the next Specialist Groups meeting.

FSG Working Parties: 1970-1976



January 1970

Analyse existing standard
Comparison of existing compilers
Extension to Fortran

April 1970

Extensions to ASI Fortran IV
Adaptation to conversational use
Fortran on small machines

April 1971

Free format
Mini computers
Diagnostics
Extensions

1975

FORTREV (draft Fortran 77) review

April 1976

Preprocessors
Group Promotion & Information

December 1976

Review Codasyl FDBMLC JOD

FSG Activities 1970-1980



- **FSG hold typically four to six meetings per year, mostly discussing working party progress, applications, software tools, programming techniques and, from late 1971, Fortran standards developments**
- **First contact with X3J3 members 1971**
- **FSG get on X3J3 mailing list and two-way flow of information and opinion starts**
- **FSG members attend occasional X3J3 meetings in the US**
- **Presentations are made at conferences and workshops, e.g. Datafair 73, 75 and 77 and a Fortran Forum in London in 1978 with six US members of X3J3 as speakers**

FSG Review of draft Fortran 77



- **In 1976 the FSG buy 50 copies of the draft Fortran 77 standard published by the ACM for distribution to members and to the general public**
- **Comments are relayed back to the US Fortran committee**
- **On completion of the technical work, FSG nominate Frank Engel, chairman of the US Fortran committee for honorary fellowship of the BCS**

Fortran 77: Principal changes



type CHARACTER

IMPLICIT, PARAMETER, SAVE

block IF

ENTRY

INQUIRE

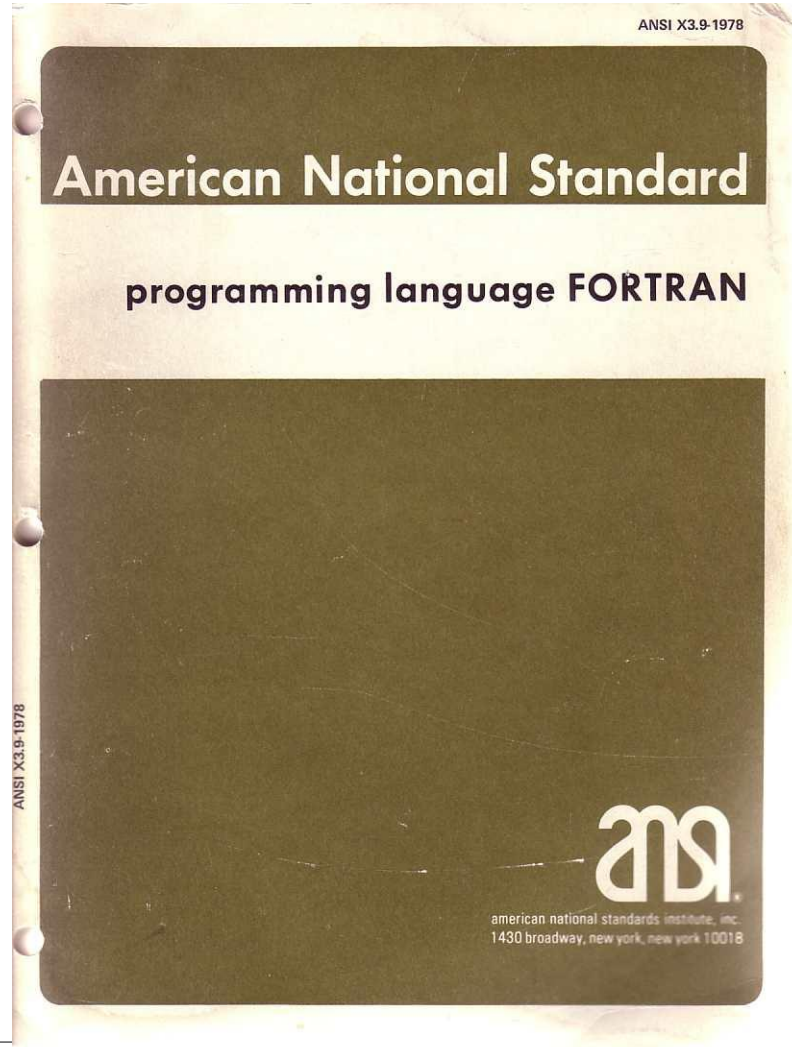
new intrinsic functions

many detailed extensions to existing statements

real and double precision DO index

removal of Hollerith constants and data

The second US Standard X3.9-1978 (Fortran 77)



1978: DoD Supplement to Fortran 77



IMPLICIT NONE

INCLUDE

END DO

DO WHILE

Additional functions for bit manipulation

Programming Language Standardization up to late 1970s

US: Cobol, Fortran, PL/I

UK: Coral, Pascal, RTL/2

Germany: Pearl

IFIP: Algol 60

US, UK, Japan, ECMA were all independently standardizing Basic!

Major disadvantage 1: national standards could be adopted as ISO standards without many of their eventual users having had opportunity to specify their interests or requirements

Major disadvantage 2: nothing to prevent conflicting standards

Internationalization in ISO



- 1977** ‘The Hague Agreement’: Countries agree to closer international collaboration on development of programming language standards.
- 1978** First meeting of ISO Fortran Experts Group, in London. 36 individuals from seven countries attend
- 1980** The US Fortran 77 standard is re-issued as ISO 1539
- 1983** After annual formal meetings or short ad hoc meetings at SC5 plenaries, the Fortran group is established as a formal ISO Working Group
- 1985** X3J3 start holding occasional meetings outside the US – Oxford, Halifax NS, Liverpool, Vienna, ...
- 1985** The ISO Fortran group is renamed SC22/WG5 and is formally required to ‘coordinate’ revision of the Fortran standard

FSG Activities 1981-1993



- **FSG thrives, continuing in the same mode**
- **Fortran Forums are held in London (4) and Edinburgh (2), sometimes with visiting US speakers**
- **Some meetings are held outside London: Blacknest, Coventry, Jodrell Bank, Oxford, Reading, Rutherford Lab, Salford**
- **An experimental subgroup meeting is held in Glasgow as part of a drive for every Specialist Group to have meetings in Scotland**
- **Some FSG members become members of X3J3 and/or WG5 and attend regularly; others attend occasionally; the UK plays a significant part in development of Fortran 90**

Development of Fortran 90



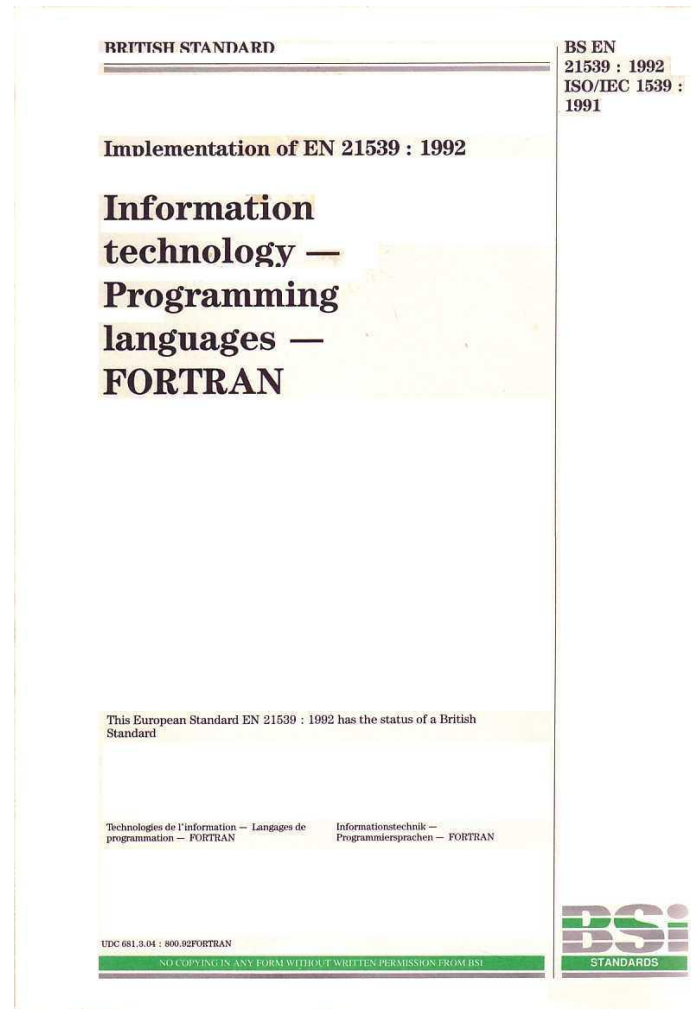
- Originally scheduled for completion in 1982
- Renamed Fortran 8X, then Fortran 88 and finally completed in 1990 after rancorous discussions and attempts by some US vendors to derail the entire project
- Some US organizations attempt to retain Fortran 77 alongside Fortran 90
- See “The Fortran (not the foresight) saga: the light and the dark” by Brian Meek and “The Standards Hiatus” by Miles Ellis and Lawrie Schonfelder both linked from <http://www.fortran.bcs.org/2007/jubileeprog.php>

Fortran 90: Principal changes



- Free form source
- Many minor modernizations and removal of arbitrary restrictions
- Array operations
- Facilities for modular data and procedure definitions
- Improved control over numerical computation
- Parameterized intrinsic types
- User-defined data types
- Pointers
- Some features deemed obsolescent – to allow for future deletion
- **Still retaining compatibility for Fortran 77 programs!!**

ISO/IEC 1539:1991 (Fortran 90)



First Fortran 90 Compiler



- **NAG announce the world's first Fortran 90 compiler in June 1991**
- **The FSG nominate NAG for a BCS Excellence award; NAG are awarded a BCS medal**

Varying Length String Module



- 1988** Project agreed in principle
- 1989** Formal request to ISO to initiate project
- 1990** First draft
- 1994** Published as ISO/IEC 1539-2:1994
- 2000** Revision, to take advantage of new features in Fortran 95, published as ISO/IEC 1539-2:2000
- 201x** Expected to be withdrawn when Fortran 2008 is published

Fortran 95: Principal changes



Part 1:

- **FORALL**
- **PURE and ELEMENTAL procedures**
- **Initialization for pointers and for structures**
- **Designation of some older, duplicated features as 'obsolescent'**
- ***Deletion of real and DP DO variables, PAUSE, ASSIGN and assigned GO TO, H edit descriptor***

Part 2:

- **Varying length strings**

Fortran Conditional Compilation Standard

- 1995** Project agreed in principle
- 1996** Formal request to ISO to initiate project
- 1999** Published as ISO/IEC 1539-3:1999 (with one line inadvertently omitted)
- 2000** A number of desirable clarifications are identified and are designated to appear in the first corrigendum. This is never published due to lack of interest
- 2010** The standard is currently being voted on for retention or deletion (the latter being more likely)

FSG Activities 1993-2001



- **Attendances wilt with the advent of the internet**
- **The FSG debates winding itself up but decides against**
- **In 1994, taking advantage of X3J3 and WG5 meetings in the UK, well-attended forums are held in Edinburgh, London and Oxford – but:**
- **a nadir is reached when the 1995 AGM is postponed because of a rail strike and the 1996 AGM is postponed due to rooms being double-booked; not everyone gets to know in time**
- **It is decided to hold only annual meetings plus special events**
- **NAG hold very successful ‘Fortran Futures 96’ and ‘Fortran Futures 98’ conferences “in association with the FSG”**

Fortran 2003: Principal changes



- **Parameterized derived types**
- **Object oriented programming support**
- **I/O enhancements, including stream access and asynchronous transfers**
- **Support for IEEE arithmetic and exception handling**
- **Interoperability with C**
- **Support for ‘international usage’**
- **ASSOCIATE construct**
- **Data manipulation enhancements: allocatable components, etc**
- **Procedure pointers**
- **Scoping enhancements**
- **Access to command line arguments, etc**

Fortran 2003: Implementation Problems

- **Fortran 2003 turns out to be far more difficult to implement than had been foreseen**
- **Cray release the first full compiler, for some of their hardware, in December 2009 - six years after completion of the technical definition**
- **In 2010 IBM are the second vendor to release a full compiler**
- **Some suppliers let it be known that they plan to implement all of Fortran 2003 only if explicitly required by their customers**

Technical Reports



Current:

ISO/IEC TR 19767:2005 Enhanced Module Facilities

In development:

PDTR 29113 Further Interoperability of Fortran with C

Withdrawn:

ISO/IEC TR 15580:2001 Floating-point exception handling

ISO/IEC TR 15581:2001 Fortran -- Enhanced data type facilities

Development re-incorporated into base standard:

PDTR 15815 Interoperability with C - started April 1995, reassigned to X3J3 July 1997

Technical Corrigenda

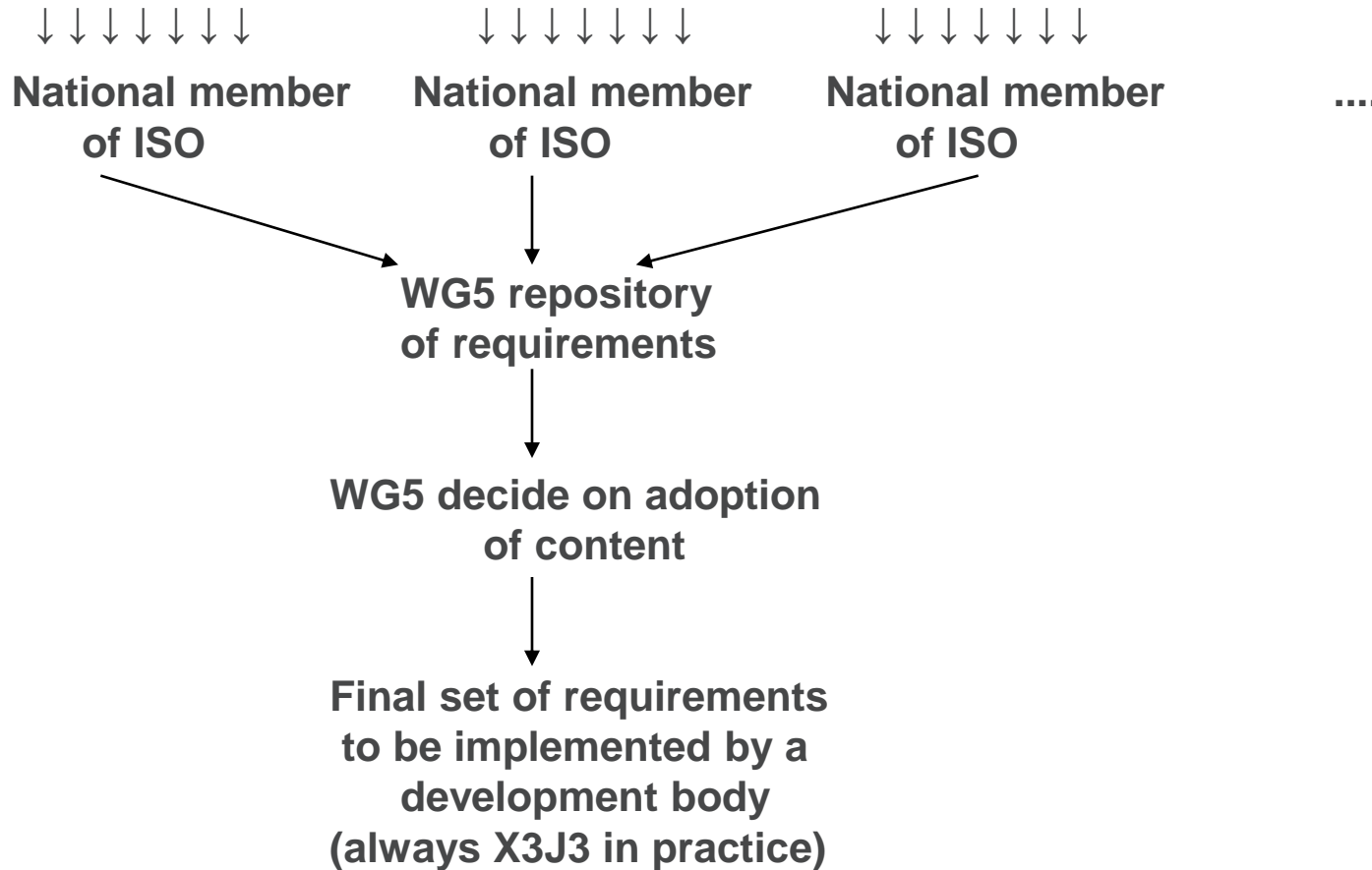


Technical corrigenda correct errors and specify edits for clarifications in an existing standard.

ISO have published corrigenda for Fortran 2003 annually, price CHF 0,00, from 2006 to 2009. A 2010 edition was prepared but could not be published because of the impending formal redundancy of the standard. It is on the WG5 website.

A combined set of the five corrigenda is also on the WG5 website as N1823.

Requirements collection procedure



Schedule for revision



2004 May	Repository of requirements started
2005 May - 2006 Feb	Choice of significant features
2007 Dec	First working draft of revised standard
2008 May	Document submitted for Committee Draft ballot
2008 Oct	Comments available
2009 Jul - 2009 Dec	Final Committee Draft submission and ballot
2010 Apr	Edited document submitted for Final Draft International Standard ballot
2010 Jul	FDIS ballot results available
2010 Aug	Standard published

FSG Activities 2002-2010



The FSG is revived:

- In 2002 a Forum is held to discuss UK requirements for revision of Fortran 2003
- Also in 2002 a successful application is made to the BCS to support three FSG members (reduced to one member latterly) to attend WG5 meetings to help put the UK case on standards
- In 2007 a very successful full-day meeting is held to mark the 50th anniversary of the release of the first Fortran compiler
- FSG members organize the 2007 WG5 meeting in BCS London offices and hold a reception for WG5 members

Further Information



FSG website

<http://www.fortran.bcs.org/index.php>

WG5 document archive

<http://www.nag.co.uk/sc22wg5/>

J3 document archive

<http://www.j3-fortran.org/>

Fortran and Fortran II history, including 1982 IBM film

<http://www.softwarepreservation.org/projects/FORTRAN/>