Current Developments in Fortran Standards

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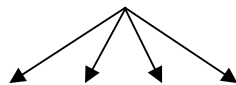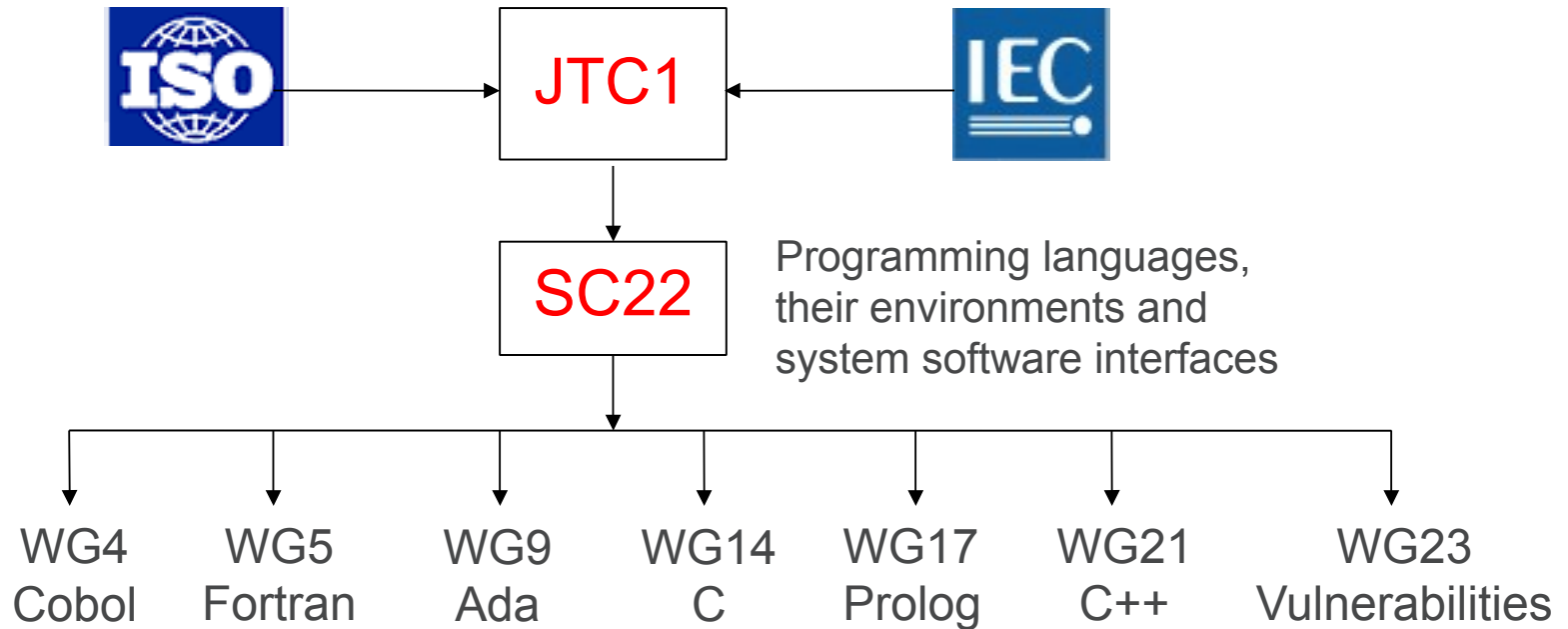
Purpose of standardization

BSI was founded in 1901, amongst other things to:

co-ordinate the efforts of producers and users for the improvement, standardization and simplification of engineering and industrial materials so as to simplify production and distribution, and to eliminate the national waste of time and material involved in the production of an unnecessary variety of patterns and sizes of articles for one and the same purpose.

The International Organization for Standardization dates from 1926,
the International Electrotechnical Commission from 1906

Standardization committee structure

ISO → JTC1 ← IEC

JTC1 → SC22

SC22 — Programming languages, their environments and system software interfaces

WG4 Cobol | WG5 Fortran | WG9 Ada | WG14 C | WG17 Prolog | WG21 C++ | WG23 Vulnerabilities

National Fortran committees in BSI, ANSI, JISC, SCC, DIN, NEN, etc

Ongoing projects, June 2012

- Technical Specification (TS) on Further Interoperability with C

- TS on Enhanced Parallel Computing Facilities

- Fortran annex for the TR on "Guidance to Avoiding Vulnerabilities in Programming Languages through Language Selection and Use"

- Decide what to do about Part 2 of the standard (Varying Length Character Strings)

- Process interpretation requests for Fortran 2008 and develop the next corrigendum document

- [In 2012-14] Review Fortran 2008, decide on revision strategy and schedule, and invite submissions from ISO member countries

TS 29113 on Further Interoperability with C

The facilities enhance those incorporated in Fortran 2008 for certain categories of Fortran dummy arguments

The draft is currently out for a ballot of JTC1 members

If approved it is expected to be published later this year

The draft is available on the WG5 website at
ftp://ftp.nag.co.uk/sc22wg5/N1901-N1950/N1917.pdf

Parallel Facilities in Fortran 2008

There is an overview of the parallel facilities introduced in Fortran 2008 in "Coarrays in the next Fortran Standard" at

ftp://ftp.nag.co.uk/sc22wg5/N1801-N1850/N1824.pdf

The facilities are based on the Single-Program-Multiple-Data (SPMD) programming model

A late draft of the full standard is at

ftp://ftp.nag.co.uk/sc22wg5/N1801-N1850/N1830.pdf

TS on Enhanced Parallel Computing Facilities

Facilities are to be defined to enhance those incorporated in Fortran 2008, particularly to do with teams of images

There has been a general trawl for user requirements in the past few months and a requirements document is to be drawn up at the WG5 meeting in June 2012

The project has not yet been formally registered with SC22

The original schedule proposed for the project has slipped slightly so that the TS is now unlikely to be published before the end of 2014

Fortran annex for the TR on Programming Languages Vulnerabilities

TR 24772:2010 "Guidance to Avoiding Vulnerabilities in Programming Languages through Language Selection and Use" is a cross-language document with sections, so far, specifically for Ada, C, Python, Ruby and SPARK

Developed by SC22/WG23 and intended to be updated annually as new languages and new vulnerabilities are added

WG5 is developing the Fortran annex; it is proposed to submit a version to WG23 after the June 2012 WG5 meeting

Examples of Fortran Vulnerabilities

Bit Representations

Numeric Conversion Errors

Unchecked Array Indexing

Unchecked Array Copying

Dangling Reference to Heap

Using Shift Operations for Multiplication and Division

Choice of Clear Names

Unused Variable

Identifier Name Reuse

Initialization of Variables

Loop Control Variables

Recursion

Vulnerabilities References

The latest draft of the whole document is at

http://grouper.ieee.org/groups/plv/DocLog/300-399/380-thru-399/22-WG23-N-0389/n0389.pdf

The latest draft of the proposed Fortran annex is at

ftp://ftp.nag.co.uk/sc22wg5/N1901-N1950/N1915.pdf

Part 2 of the standard
(Varying Length Character Strings)

Some, but not all, of the facilities in ISO/IEC 1539-2:2000 are redundant following the publication of Fortran 2008

WG5 is considering whether making publicly available a module to provide the missing facilities would allow part 2 to be withdrawn

Meanwhile, the standard has been formally confirmed, until 2016

The varying length character strings standard is available at ftp://ftp.nag.co.uk/sc22wg5/N1351-N1400/N1375.pdf

Character procedures to be added

Functions for substring manipulation

       EXTRACT

       INSERT

       REMOVE

       REPLACE

       SPLIT

Function for type conversion

       VAR_STR

Subroutines for input/output

       GET

       PUT

       PUT_LINE

Part 3 of the standard (Conditional Compilation)

The standard for Conditional Compilation for Fortran, ISO/IEC 1539-3:1999, was withdrawn in May 2011

Process interpretation requests for Fortran 2008 and develop a corrigendum document

Interpretation requests are processed first by ANSI J3, then passed to WG5 for confirmation

If approved, they are collected into an annual corrigendum; if not, they are typically returned to J3 for reconsideration

The first corrigendum for Fortran 2008 has been published; a copy of the text is at

ftp://ftp.nag.co.uk/sc22wg5/N1901-N1950/N1903.pdf

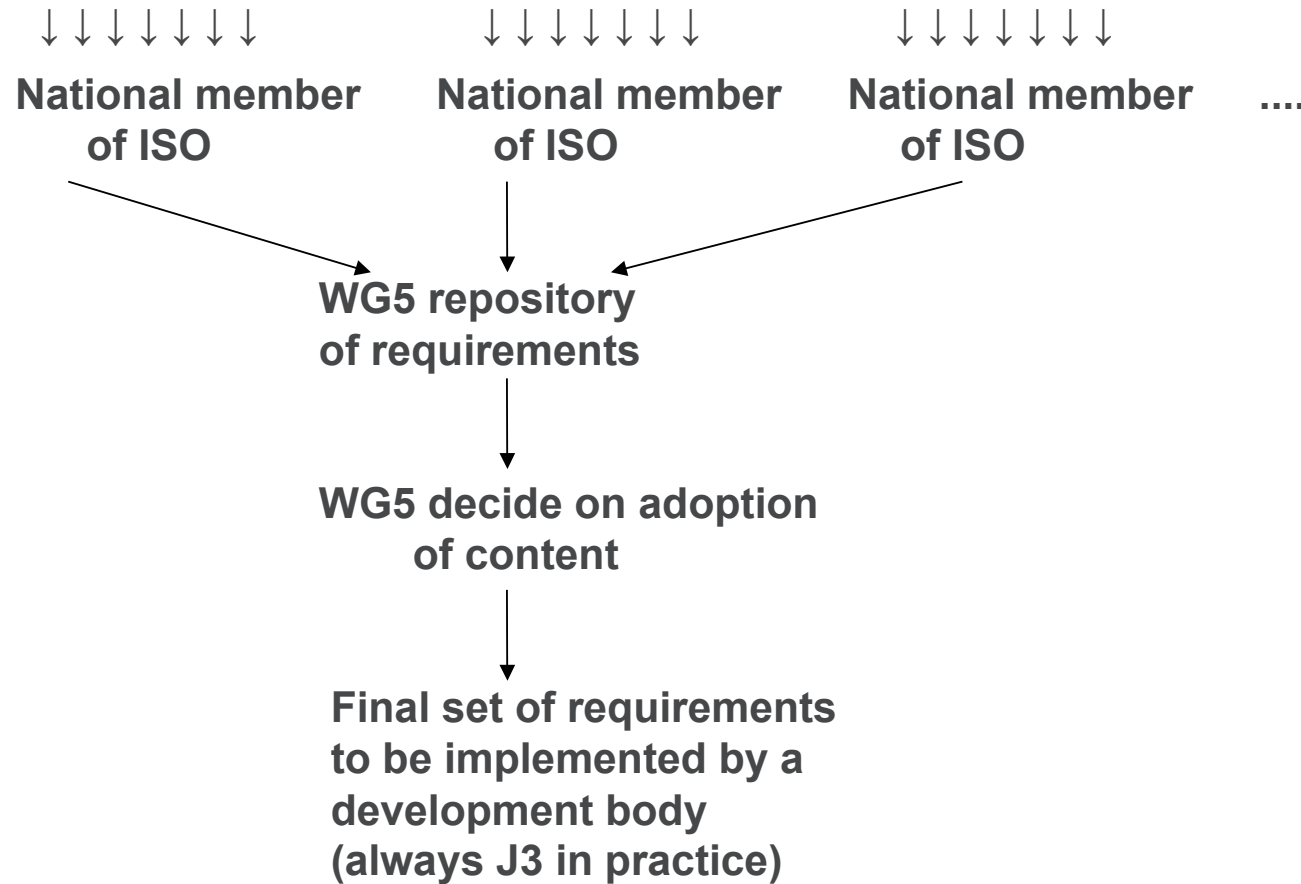WG5 reviews Fortran 2008 to identify weaknesses

WG5 specifies an outline schedule for the revision

Each country puts forward ideas for development of the standard

These are collected into a Repository of Requirements

WG5 reviews the repository, categorizes the requirements into definites, possibles and rejects and specifies a detailed schedule for the revision

Requirements collection procedure

↓ ↓ ↓ ↓ ↓ ↓ ↓   ↓ ↓ ↓ ↓ ↓ ↓ ↓   ↓ ↓ ↓ ↓ ↓ ↓ ↓

National member   National member   National member   ....
of ISO   of ISO   of ISO

WG5 repository
of requirements

WG5 decide on adoption
of content

Final set of requirements
to be implemented by a
development body
(always J3 in practice)

Further Information

WG5 document archive
http://www.nag.co.uk/sc22wg5/

J3 document archive
http://www.j3-fortran.org/

FSG website
http://www.fortran.bcs.org/index.php

Summary of features introduced in Fortran 2003 (Data enhancements, object orientation, input/output, interoperability with C, miscellaneous others) at

ftp://ftp.nag.co.uk/sc22wg5/N1601-N1650/N1648.pdf

Similarly for Fortran 2008 (Coarrays, performance improvements, data declarations and usage, input/output, intrinsic procedures, etc) at

ftp://ftp.nag.co.uk/sc22wg5/N1801-N1850/N1828.pdf