

ISO/IEC JTC 1 Subcommittee 22 Chairman's Report

For the Period September 30, 2000 to October 1, 2001

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October 5, 2001

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1 Chairman's Report

1.1 Introduction

JTC 1 Subcommittee 22 is responsible for the international standardization of programming languages and of a number of interfaces that are particularly useful for producing portable applications. The most notable portable interfaces are the set of standards being developed for the Portable Operating System Interface for Computer Environments, POSIX and the completed program of work on the Portable Common Tool Environment (PCTE).

Portability is the key objective of Subcommittee 22's standardization efforts. Programming language standards have been contributing to the portability of applications for over three decades. The POSIX environment has added significantly to the ability of users to run applications across vendor and architectural boundaries.

SC22 is standardizing common language independent specifications to facilitate standardized bindings between programming languages and system services, as well as greater interaction between programs written in different languages. SC22 is also addressing the complex area of internationalization, which involves the use of techniques designed to make programs truly portable for users with widely varying international language and cultural backgrounds.

This Chairman's Report is arranged by subgroup and will give a view of the activities and accomplishments of SC22 during the reporting period.

1.2 WG 3 - APL

The working group WG 3 meets only as needed, usually once a year. It works mainly by electronic correspondence. WG 3 suffers from a decline in official support for standardization.

There is need for a new standard for moving data between APL applications. Three APL vendors are cooperating in the implementation of SCAR "Self Contained Array Representation". The APL Character Repertoire has aided in this effort.

Near-term work priorities for APL are:

- (1) APL Character Repertoire
- (2) Perhaps SCAR

In future, it is likely that the APL working group will move into a maintenance mode

1.3 WG 4 - COBOL

COBOL continues to be widely used for development and for enhancement and re-engineering of existing applications. Many factors drive the market for COBOL standardization:

- Technology advances and the resulting spread of computers to end-users makes it mandatory that computer systems adapt to the languages of users. This gives rise to a need in COBOL for support of large character sets and

cultural adaptability. The current draft revision of the COBOL standard includes substantial support for large character sets and cultural adaptability.

- The trend in the industry is to web-enable COBOL applications, with COBOL running on a server interacting with a non-COBOL user interface. This gives rise to the need for enhanced interoperability with other programming languages and system services. The current draft revision of the COBOL standard provides a variety of new data types, user-defined functions, and call enhancements.
- Market pressure for new technology led COBOL vendors to cooperate on object-oriented design through the standardization process. Early implementations of the object-oriented features in the draft are now available and users are designing them into new applications.
- Deployment of applications across workstations and distributed environments and the growth of COBOL in UNIX™ environments generated requirements for new features in the language. COBOL met these needs by implementer extensions to the language, in different ways by different implementers, leading to a need for post-implementation standardization. The draft revision of the COBOL standard includes many of these extensions.
- Growth of COBOL in the UNIX™ market led The Open Group to develop a Common Application Environment (CAE) providing a portable definition of features essential in a UNIX™ environment, but lacking in standard COBOL. The need for portability with non-UNIX™ platforms has caused the inclusion of some of these features in the draft.

The current draft COBOL standard addresses many of the market requirements for COBOL, but not all of them. Continued evolution of the international standard for COBOL is essential to provide the benefits of new technologies and new environments to COBOL users worldwide.

WG 4 meets as needed, usually once a year, and works by electronic correspondence between meetings. Five countries are participating in meetings: Germany, Japan, The Netherlands, the UK, and the USA. Detailed technical development is delegated to NCITS J4. J4 has 13 members participating in detailed technical development - 6 COBOL vendor organizations and 7 user organizations.

WG 4 will focus on quality and preparing the draft for Final CD ballot. WG 4 anticipates delivering a document for FCD ballot in the first quarter of 2001. The next priorities are development of a technical report for a finalizer feature, development of a technical report for an object-oriented class library, and processing of defect reports - in that order.

1.4 WG 5 - Fortran

Fortran is still the language of choice for the majority of scientific and technological programming. The long delay between the release of Fortran 77 and the availability of Fortran 90 compilers, at a time when other languages, such as C and C++, were evolving rapidly, had a significant impact on the use of Fortran. There are now clear signs that the facilities available in Fortran 90 and Fortran 95 are causing a growing number of scientific and technological users to move towards these latest versions of

Fortran. Most vendors have upgraded their Fortran 90 compilers to Fortran 95 and some have incorporated the extensions of TR 15580 and TR 15581.

Most major Fortran compiler vendors are represented either on WG5 or its Primary Development Body, NCITS/J3, as are many of the major research establishments that rely on Fortran for their numerical computing. There are also two active email lists for users of Fortran, which provide valuable feedback from users. All these diverse sources are being used to guide the development of the language, both through revisions to the base language Standard, and through other related standards and technical reports.

As elsewhere in the Standardization world, it is becoming increasingly difficult to persuade employers to provide the necessary funding for Standards activity. WG 5 delegates most of the technical work involved in developing Standards and Technical Reports to 'development bodies'. These are typically a national Fortran committee, as in the case of NCITS J3. J3 is the primary development body responsible for development of the revision to the base language standard and its subsequent maintenance

WG 5 itself carries out much of its discussions via email, with an annual meeting during the summer, and occasional other meetings at critical stages in the development of the base language standard. Thirteen members attended the meeting in July/August 2001.

It is anticipated that the second corrigendum for Part 1 of the Standard will be ready for SC22 processing before the end of the year.

WG 5 operates under a strategic plan described in WG 5 Standing Document 4, the latest version of which is WG 5 N1349. In particular, the revision of the base Standard, IS 1539-1, is delegated to ANSI NCITS J3 operating as WG 5's Primary Development Body, while the other projects for which WG 5 is responsible are handled by other Development Bodies in liaison with the Primary Development Body as required.

As far as possible, WG 5 tries to anticipate technical comments during international ballots by holding informal ballots of its members before any documents are submitted for ballot. Nevertheless, unexpected technical comments can always delay the planned schedule.

WG5 has made extensive use of email for over a decade to speed up technical development. Since 1995 most documents have been distributed via an official file server in the UK; all documents have been distributed in this way since 1997. An open web site is also used to provide non-technical, and other publicly available, information to interested parties. In addition to speeding up the distribution of documents, the use of electronic distribution and communication systems also provides many other benefits, such as the ability to rapidly carry out informal ballots of the members for various reasons.

Finalization of Corrigendum 2 to Fortran 95 is a WG 5 priority activity this year. WG5 members will also monitor, and/or participate in, the work of WG 5's Primary Development Body, NCITS J3, as it moves into the final stages of the development of the Working Draft of the revision of the base Fortran language Standard, ISO/IEC 1539-1:1997. It is intended that this work will reach the CD stage by September 2002.

1.5 WG 9 - Ada

Although support for Ada has declined in the US defense sector, Ada remains the language of choice for major parts of the real-time, embedded systems community. Ada usage in other sectors of the marketplace seems to be stable. There is demand for

minor improvements while retaining the stability of the existing language. This motivates WG 9 to update the language standard by means of an Amendment rather than a Revision.

WG9 achieved the following during the past year:

- A Technical Corrigendum to ISO/IEC 8652:1995 was published 2001-06-01.

WG9 screens all new work item suggestions with the requirement for active support from five national bodies. This has worked well, resulting in explicit commitments from national bodies supporting a possible project. The Technical Corrigendum document described above is the most important item in WG9's current work program. WG9 anticipates developing an Amendment to IS 8652:1995 during the year 2002.

1.6 WG11 - Binding Techniques

There are no clearly defined market requirements for the WG11 projects; however several ISO/IEC standards make reference to the documents. There is thus apparently an indirect market requirement. Despite the sometimes-small participation in WG11, a number of high quality ISO standards have been produced.

During the period covered, TR 14369:1999 - Guidelines for the Preparation of Language Independent Service Specifications was published.

WG11 resources have been a problem for the past years, and continue to be so. Attendance is very low, and project editors are difficult to find.

WG11 will focus on preparation of a first WD for LIA-3, and completion of LIA-2 (Language-Independent Arithmetic). Participation is a clear risk for the progression of the WG11 work. The SC22 Member Bodies are invited to provide resources so that WG11 at least can finalize its current work items.

1.7 WG13 - Modula-2

WG13 reacted to strong demands by the Modula-2 user community in preparing extensions to IS 10514-1. In particular, there was popular demand for object-oriented extensions, and it is hoped that the publication of IS 10514-3 will lead to a uniform way of handling these extensions in the available compilers. With regard to generics, there was popular demand mainly from academia that has also been met in IS 10514-2. Finally, the requirement for interfacing to libraries defined in the C language is being handled by project JTC1.22.15436. WG13 is currently not aware of any other demands or concerns regarding Modula-2.

1.8 WG14 - C

WG14 feels that it is responding to user community pressure and to implementers concerns by revising the ISO/IEC 9899 standard on schedule. WG14 believes this new ISO/IEC 9899:1999 answers these concerns and keeps the International Standard for the C programming language current with today's programming trends and market. The evolution of object oriented programming, numerical extensions that were proposed by NCITS J11.1, internationalization, advancements in character set standardization, cross-language standards and cross-language bindings all were considered in the newly revised standard. These issues were also taken into consideration when request for the

newly approved project JTC 1 NP 18037 was submitted. Most of these issues were not considered during the technical discussions for the original ISO C Standard ISO/IEC 9899:1999. Please, see document ISO/IEC JTC 1/SC22 N2265 "Charter for the Revision of the C Standard" for more details.

WG14 produced the ISO/IEC 9899:1999, a revision of ISO/IEC 9899:1990. WG14 also worked on Defect Reports, keeping the Defect Report Log current. A new work item has also been approved, see ISO/IEC SC22 N3120, a Technical Report type II, "Extensions for the programming language C to support embedded processors".

WG14 meets two times per year in collocated technical sessions with the US committee J11. Over the past year, WG14 has timed its technical sessions to coincide with WG21, allowing those technical experts that would like to attend both technical sessions the opportunity to do so. Twelve countries participate by attending these meetings or by being involved in the technical discussions that take place over the reflector. The countries are: Australia, Canada, Denmark, France, Germany, Ireland, Japan, Netherlands, Norway, Sweden, UK, and the USA. WG14 has been monitoring the cross-language standards activities, and are using the ISO/IEC JTC 1/WG20 guidelines on extended characters. WG14 has also keep apprised of the requirements of the LIA-1, 2) language independent arithmetic) standards.

WG14 will focus on the new work item JTC 1 NP 18037, a type II technical report, see ISO/IEC SC22 N3120. The Committee discussed several other possible new work items, but has not reached consensus on any of the remaining items yet. The items identified to discuss are:

1. Conformance
2. Sequence Points
3. Time

WG14 will concentrate on the new work item NP 18037, however WG14 will still respond to Defect Report logged for the current ISO/IEC 9899:1999 Standard.

1.9 WG15 - POSIX

The joining of efforts among IEEE PASC, TOG and WG15 addresses several issues that confront standardization effort within the computer operating systems area. The stabilizing of 'base' standards so that vendors can provide a mature product meeting their customers' requirements. Conformance testing suites and activities provide the user community with well-tested product from which to choose.

The POSIX work is dependent on IEEE and The Open Group, as a source of technical expertise, support and development work. WG15 has traditionally had five active (i.e. attending meetings) national bodies, and technical contributions from additional national bodies. Three national bodies attended the last WG15 meeting in July 1999 while five national bodies attend the WG15 meeting in July 2000.

The close association that continues to develop between The Open Group, POSIX and WG15 and discussed elsewhere in this report provides sufficient resources to continue development of standards.

The current strategy has two elements. The first is to complete the amendment process to the POSIX base standards with several standards expecting to complete this year. And second is to support the work of 'the Austin Group'.

The main opportunity expected of the strategy is to stabilize the joint POSIX and The Open Group base standards so that vendors can enhance and mature their products.

Many POSIX projects have mature documents at various stages within the ISO balloting process. It will be a priority to move these documents along and push them to completion.

1.10 WG16 - Lisp

WG 16 observed no market requirement change over this period.

WG16 is developing a list of informal defect reports concerning 13816:1997. Resources to address defect reports are secured (FR and US, and GB and JP as backup).

For the upcoming work period, WG16 will be ready to receive reports on ISO/IEC 13816, and also discuss the opportunity of a five-year revision (to address defect reports, or to introduce extensions e.g. C connection). No deliverables are planned over the next period. Wait for defect reports and organize the work of WG16 depending on the content of these reports.

1.11 WG17 – Prolog

Prolog is a niche language. It is extensively used by a small number of users mainly for applications in configuration, constraint handling and natural language. It is taught in a significant number of universities.

A short list of topics for inclusion in any third part has been prepared. The list is in the process of an email review for decision on the items to be standardised.

Options for future work were discussed at an open meeting held during the Practical Application of Prolog and Constraints programming in London April 1999. A additional email, survey of interested parties produced a list of five topics for potential standardization. Although some countries indicated a willingness to re-enter the Prolog standardization arena support is still weak.

1.12 WG19 - Formal Specification Languages

Formal development methods have often been developed in academia. Standardization will give credibility to their work, and encourage their tuition and future developments to be built on sound and common foundations.

The increasing interest in safety-critical systems and in secure systems suggests a continuing interest in the use of formal notations like Z and VDM. Industrial users of the notations continue to exert pressure for standards, and contribute people's time to the work.

Although resources in general are declining, the future of the current WG19 projects seems to be secured. The WG19 mailing list includes experts from Australia, Canada, Denmark, France, Germany, Ireland, Japan, Netherlands, New Zealand, United Kingdom, & USA.

For the upcoming work period, WG19's main task will be to publish

ISO/IEC FDIS 13568 and ISO/IEC 13568:2002. WG19 will also start the revision of ISO/IEC 14977.

1.13 WG20 - Internationalization

WG20 believes that through the proliferation of PCs in homes world-wide, and the ubiquitous World Wide Web, internationalization has become a very important factor in the creation of applications and thus all programming languages. Despite this importance, and due to reduced resource availability, WG20 has to prioritize its work to make best use of the scarce resources available.

WG20's focus for 2001 and 2002 will be to amend the international string ordering standard ISO/IEC 14651 to align the character repertoire with the rapidly growing repertoire of ISO 10646, parts 1 and 2. WG20 will also work on amending ISO/IEC 15897 – Registration of cultural elements, to align the registration process with the process for character set registrations in ISO/IEC 2375.

Technical correctness of the WG20 work ensures that resulting standards can and will be implemented immediately after publication, sometimes even before. WG20 develops standards and Technical Reports with contributions and requirements from many liaisons. This ensures comprehensive standards that provide excellent service to a wide variety of users.

Culturally correct processing is important for all facets of data processing. Culturally correct ordering of data is one of the most complex tasks due to contradicting requirements from various parts of the user community. WG20 was using most of its resources to complete IS 14651, a standard that allows international string ordering with the option to tailor the output to satisfy specific user communities (e.g. geographic areas, cultural groups, businesses). Amending the template table that defines the sort order with new characters from the rapidly growing repertoire of ISO/IEC 10646 is time critical. In light of the extensive use of international search engines this task deserves highest priority in the work of WG20. Specification methods for cultural conventions and a registry of cultural elements allow developers of programming languages and of user applications alike to write code against well defined, approved sets of such conventions in consistent formats. TR 14652 and IS 15897 are examples of WG20 work that support these groups of users. For the remainder of 2000 and in 2001 these documents have priority in WG20.

1.14 WG21 - C++

ISO C++ remains a widely-used foundation technology, well-received in the marketplace. WG21 is developing responses to Defect Reports, and has begun work on a Technical Report on C++ Performance.

WG21 meets two times per year in co-located technical sessions with the US committee J16. Over the past year, WG21 has timed its technical Sessions to catenate with WG14, allowing those technical experts that would like to attend both technical sessions the opportunity to do so. (The convener of WG21 wishes to thank the convener of WG14 for valiant efforts at harmonious liaison.)

Thirteen countries participate by attending these meetings or by being involved in the technical discussions that take place over the reflector. The countries are: Australia, Canada, Denmark, France, Germany, Ireland, Japan, Netherlands, Norway, Sweden, Switzerland, UK, and the USA. WG21 has been monitoring the cross-language

standards activities, and made use of the ISO/IEC JTC 1/WG20 guidelines on extended characters.

Due in June 2002 is the PDTR for JTC 1.22.18015 Information Technology Programming Languages Technical Report on C++ Performance (Technical Report Type 3)

WG21 has developed internal procedures for receiving, logging, and Addressing Defect Reports, consistent with JTC1 and SC22 directives. Some new features: the moderators of the newsgroup comp.std.c++ play a role in the initial DR processing, and the WG21 web page provides reasonably current DR status information.

1.15 Project Editors

1.15.1 Basic

No change from 2000.

1.15.2 Pascal

No change from 2000.

1.15.3 PL/I

No change from 2000.

1.15.4 PCTE

Currently vacant. Call for candidates has been issued.

1.15.5 CHILL

No change from 2000.

1.15.6 M

No change from 2000.

1.16 SC22 Plenary Meeting

SC22 held its fourteenth plenary meeting in Hawaii, USA during the period 18-20 September 2001. Seven National Bodies were represented at the meeting (2 by proxy); all are P-members. One of the fourteen working group conveners was present. This severely limited attendance resulted from the events of September 11, 2001. Most working group conveners submitted business plans to the plenary.

JTC 1 had requested contributions on several subjects. The committee had planned on addressing these during its plenary meeting. The reduced duration of the meeting resulted in our inability to prepare formal documents. The committee briefly discussed the matters and offers the following.

N3257 Stabilized/Obsolescent Standards – SC 22 encourages JTC 1 to approve procedures providing for subcommittees to declare standards to be stabilized. We have several candidates at this time.

N3254 Marketing Initiatives – SC 22 has, on two opportunities, prepared articles for publication in the ISO Bulletin. We have received positive commentary on them. We intend to begin preparing post-plenary press releases following our meeting in 2002.

2 Description of ISO/IEC Subcommittee 22

2.1 Title

Programming Languages, their Environments and Systems Software Interfaces

2.2 Area of Work

Standardization of programming languages, their environments and systems software interfaces such as:

- Specification techniques
- Common facilities and interfaces

Excluded: specialized languages or environments assigned to the program of work of another Subcommittee or Technical Committee

2.3 Chairman

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2.5 Membership

2.5.1 "P" Members

Austria
Canada
Denmark
France
Japan
Romania
Ukraine

Belgium
China
Egypt
Germany
Netherlands
Russian Federation
United Kingdom

Brazil
Czech Republic
Finland
Ireland
Norway
Slovenia
USA

2.5.2 "O" Members

Argentina	Australia	Bulgaria
Cuba	Estonia	Greece
Hungary	Iceland	India
Indonesia	Israel	Italy
Poland	New Zealand	Republic of Korea
Sweden	Portugal	Singapore
Turkey	Switzerland	Thailand
Yugoslavia		

2.5.3 JTC 1 Liaisons

SC2, SC7, SC32.

2.5.4 External Category A Liaisons

CCE, ECMA, ITU.

3 Working Groups

3.1 WG3 APL

Title	APL
Convener	L. Dickey (Canada) (Acting)
Terms of Reference	Development of ISO standards for Programming Language APL and Extended APL.

3.2 WG4 COBOL

Title	COBOL
Convener	A. Bennett (USA) (Acting)
Terms of Reference	Coordinate the development of ISO standards for Programming Language COBOL. Coordinate the development of draft amendments for language extensions to ISO 1989.
Category C Liaison	X/Open

3.3 WG5 Fortran

Title	Fortran
Convener	J. Reid (UK)
Terms of Reference	Coordinate the revision of ISO 1539, Programming Language Fortran.

3.4 WG9 Ada

Title	Ada
Convener	J. Moore (USA) (Acting)
Terms of Reference	Development of ISO standards for Programming Language Ada

3.5 WG11 Binding Techniques & Language Independent

Title	Binding Techniques
Convener	W. Wakker (Netherlands)
Terms of Reference	Study binding issues between programming languages and the abstract facilities with which they interface or interact, and to propose, develop and maintain ISO/IEC standards in this area.

3.6 WG13 Modula-2

Title	Modula-2
Convener	M. Schönhacker (Austria)
Terms of Reference	Coordinate the content of an ISO standard for Programming Language Modula-2.

3.7 WG14 C

Title	C
Convener	J. Benito (USA)
Terms of Reference	Coordinate the content of an ISO standard for Programming Language C.

3.8 WG15 POSIX

Title	POSIX
Convener	J. Oblinger (USA)
Terms of Reference	Coordinate the content of ISO standards on the Portable Operating System Interface.
Category C Liaison	X/Open

3.9 WG16 Lisp

Title	Lisp
Convener	P. Parquier (France)
Terms of Reference	Coordinate the content of an ISO standard for Programming Language Lisp.

3.10 WG17 Prolog

Title	Prolog
Convener	J. Hodgson (USA)
Terms of Reference	Coordinate the content of an ISO standard for Programming Language Prolog

3.11 WG19 Formal Specification Languages

Title	Formal Specification Languages
Convener	R. Scowen (UK)
Terms of Reference	Develop and coordinate the content of ISO standards for formal specification languages within the scope of SC22

3.12 WG20 Internationalization

Title	Internationalization
Convener	A. Winkler (USA)
Terms of Reference	Identify elements relevant to the work of SC22 that may be affected by differences in language, culture, customs and habits; for these elements, develop standards that enable applications to be portable across differing cultural practices; develop a Technical Report that describes a framework for nations to provide those elements.
Category C Liaisons	X/Open, SHARE Europe

3.13 WG21 C++

Title	C++
Convener	T. Plum (USA)
Terms of Reference	Coordinate the development of an ISO standard for Programming Language C++.

4 Program of Work

Following are the current projects assigned by JTC 1 to Subcommittee 22, arranged by project number. The SC 22 secretariat continuously maintains this data to reflect changes that take place.

Project	Title	Ref. No.	WG	Editor	WD	CD	DIS	IS	Note
22.01.01	Programming language COBOL Defect Reports 1-55 Defect Reports 56-61 Defect Reports 62-81	ISO 1989 N1604 N1634 N2310	04	Convenor					Published (1985)
22.01.03	Amendment 1 to ISO 1989 - Intrinsic Functions	ISO 1989/ Amd. 1	04	A. Bennett USA					Published (1989)
22.01.04	Amendment 2 to ISO 1989 - Correction and clarification	ISO 1989/ Amd. 2	04	A. Bennett USA					Published (1994)
22.01.07	Revision of ISO 1989:1985	FCD 1989	04	D. Nelson USA	(03/95)	(09/96) (09/99 2nd)	(11/97) (04/00)	(08/98) (08/00)	N1811 is prelim WD N2260 is CD Reg & ballot N2383 is SoV N2616 is DoC N3204 is FCD ballot N3239 is SoV
22.01.07.01	Object finalization for programming language COBOL (Type 2 TR)	PDTR 19755	04	W. Takagi					Approval for addition to PoW contained in N3208 New ISO/IEC designation assigned by JTC 1 Secretariat
22.02.01.01	Programming language Fortran, Part 1 Revision of ISO 1539-1:1997	IS 1539-1 WD 1539-1	05	R. Maine USA	(08/00)	(02/02)			Published (1997) Revision approved by N2574 (Res. 97-3) COR 1 published (2001-06-01)
22.02.01.02	Floating Point Exception Handling TR (Type 2) - Second Edition	TR 15580	05	J. Reid UK					Published (2001)

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Project	Title	Ref. No.	WG	Editor	WD	CD	DIS	IS	Note
22.02.01.04	Enhanced Data Type Facilities TR (Type 2) - Second Edition	TR 15581	05	M. Cohen UK					Published (2001)
22.02.02	Fortran - Part 2: Varying length character strings	IS 1539-2	05	J. Reid UK					Published (2000)
22.02.03	Fortran - Part 3: Conditional compilation	IS 1539-3	05	D. Epstein USA					Published (1999) Corrected and reprinted 2000-12-15
22.05	Programming Language PL/I	IS 6160		J. Klensin USA					Published (1979) Confirmed in 2000 (N3218)
22.06	General Purpose PL/I	IS 6522		J. Klensin USA					Published (1992) Confirmed in 2001 (N3305)
22.08	Programming Language Pascal	IS 7185		T. Hetherington UK					Published (1990) Confirmed in 2000 (N3218)
22.09.01	Programming Language APL	IS 8485	03	L. Dickey Canada					Published (1989)
22.09.02	Character Repertoire for APL	PDAM 1 to IS 8485: 1989	03	L. Dickey Canada					N3067 is PDAM reg ballot N3094 is SoV
22.10.01	Ada	IS 8652	09	E. Ploedereder Germany & R. Brukardt USA					Published (1995) Confirmed in 2000 (N3218) COR 1 published (2001-06-01) Project sub. Request (N3241) closes 2001-09-01
22.10.02	Ada Numeric Packages	IS 11430	09	K. Dritz USA					Published (1994) Withdrawn 2000-09-28
22.10.03	Ada Primitive Functions	IS 11729	09	K. Dritz USA					Published (1994) Withdrawn 2000-09-28

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Project	Title	Ref. No.	WG	Editor	WD	CD	DIS	IS	Note
22.10.04	Ada Complex Functions	IS 13813	09	D. Sando & K. Dritz USA					Published (1998)
22.10.05	Generic Package of Complex Elementary Functions in Ada	IS 13814	09	J. Squire & K. Dritz USA					Published (1998)
22.11	Programming Language Full Basic Technical Info Bulletin 1	IS 10279		T. Kurtz USA					Published (1991) Confirmed in 2001 (N3305)
22.12	Industrial Realtime Fortran	IS 7846							Published (1985) Recommended for withdrawal
22.13	Guidelines for the Preparation of Programming Language Standards (Third edition)	TR 10176	20	A. Winkler USA					Published (2001)
22.14	Binding Techniques for Prog Languages	TR 10182	11	D. Nelson USA					Published (1993)
22.15.01	Guidelines for Preparation of Conformity Clauses	TR 10034							Published (1990)
22.15.02	Test Methods for Programming Language Processors	TR 9547							Published (1988)
22.16	Language-Independent Procedure Calling	IS 13886	11	Convenor					Published (1996) JTC 1 approved per N6491. Request sent to ITTF to make publicly available. Confirmed in 2001 (N3305)
22.17	Language-Independent Datatypes	IS 11404 WD 11404	11	F. Farance USA					Published (1996) To be revised per 2001 Systematic Review (n3305)
22.18.01	Programming Language Modula-2 Base language	IS 10514-1	13	C. Pronk Netherlands					Published (1996) Confirmed in 2001 (N3305)

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22.18.02	Object-Oriented Extensions to Modula-2	IS 10514-3	13	A. Wiedemann Germany					Published (1998)
22.18.04	Generics in Modula-2	IS 10514-2	13	R. Sutcliffe Canada					Published (1998)
22.19	Programming Language Extended Pascal	IS 10206		T. Hetherington UK					Published (1991) Confirmed in 2001 (N3305)
22.20.01	Programming Language C	IS 9899	14	Convenor					Published (1999) Corrigendum 1 published 2001.
22.21.01.03.03	Amendment 4 to Portable Operating System Interface (POSIX) - Part 1: System API	IS 9945-1/PDAM 4	15	S. Walli USA	10/95	08/96	08/97		
22.21.02.01	POSIX Shell and Utilities Defect Reports 01-147	IS 9945-2 N2689	15	S. Walli USA					Published (1993) N2689 is Published record of responses
22.21.02.03	Amendment 1 on Batch Services Portability Extensions	IS 9945-2/PDAM 1	15	N. Aaronson USA	12/92	8/94	12/95	08/96	N1645 is PDAM N1758 is SoV N2017 is DoC N2232 is ITTF ToR N2480 is DoC Time delay in forwarding for pub. required new JTC 1 LB N2961 is ITTF ToR
22.21.03.01	POSIX System Administration (Umbrella Work Item)		15	M. Kirk USA					
22.21.03.04	POSIX System Administration Software Administration	IS 15068-2	15	J. Ashford USA					Published (1999)

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22.21.03.05	POSIX System Administration User Administration	DIS 15068-3	15	M. Kirk UK	07/94	11/95	08/97		WD is N1635 N1986 is CD reg and ballot N2086 is SoV N2475 is DoC N2673 is ITTF Table of Replies
22.21.04.01	POSIX C Binding	IS 9945-1	15	S. Walli USA					Published (1996)
22.21.04.01.01	Revision of IS 9945-1:1996	FCD 9945-1	15	M. Gonzalez Spain	11/96	03/97			Subdivision approved in N2301 (res 96-13) N2329 is PDAM reg ballot N2443 is SoV N2678 is PDAM approval ballot N2781 is SoV N3037 is DoC N3042 is FPDAM ballot N3086 is SoV N3161 is Concurrent CD Reg. and FCD Approval Ballot for the revision of ISO/IEC 9945-1 N3202 is SoV N3232 is 2nd FCD ballot N3319 is SoV approving 2nd FCD
22.21.04.02	POSIX Ada Binding, Part 1 Defect Reports 1-10	IS 14519 N2591	15	T. Baker USA					Published (1999)
22.21.04.02	Revision of IS 14519:1999	DIS 14519	15	T. Baker USA					N3212 is ToR Sent 01-02-23 to ITTF for pub. and is currently undergoing pub.
22.22.01	Prolog General Core	IS 13211-1	17	Convenor					Published (1995) Confirmed in 2000 (N3218)
22.22.02	Prolog Modules	IS 13211-2	17	J. Hodgson USA					Published (2000)

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Project	Title	Ref. No.	WG	Editor	WD	CD	DIS	IS	Note
22.23	Programming Language Lisp	IS 13816	16	K. Pitman USA					Published (1997)
22.24.01	Programming Language Extended APL	IS 13751	03	Convenor					Published (2001)
22.24.02	Character Repertoire for Extended APL	IS 13751/ PDAM 1	03	Convenor	(04/97)				N3082 is PDAM reg. Ballot N3095 is SoV
22.28	Language Independent Arithmetic	IS 10967-1	11	K. Karlsson Sweden					Published (1995)
22.29.01	Vienna Development Method/ Specification Language, Part 1: Base Language	IS 13817-1	19	D. Andrews UK					Published (1996) Confirmed in 2001 (N3305)
22.30.01	Framework for Internationalization	TR 11017	20						Published (1998)
22.30.02.01	Functionality for Internationalization (Umbrella Project)		20						
22.30.02.02	International String Ordering and Comparison - Method for Comparing Character Strings and Description of a Common Tailorable Ordering Template	IS 14651	20	A. LaBonte Canada					Published (2001)
22.30.02.02. 01	Amendment 1 to IS 14651	IS 14651/ PDAM 1	20	A. LaBonte Canada					Approval for addition to PoW contained in N3208 N3242 is concurrent PDAM reg N3318 is SoV

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Project	Title	Ref. No.	WG	Editor	WD	CD	DIS	IS	Note
22.30.02.03	Functionality for Internationalization Specification Method for Cultural Conventions	DTR 14652	20	K. Simonsen Denmark	12/97	12/98 (2nd)			N2504 is concurrent CD reg CD ballot N2612 is vote summary N2637 is comts disposition N2638 is FCD Ballot Title change approved N2806 (res 98-18) N2732 is vote summary N2829 is comts disposition N2869 is second FCD ballot N2917 SoV N2937 DoC N2955 PDTR ballot N3024 SoV N3028 UK vote N3133 is DoC N3227 is text sent to JTC 1 for final approval N3261 is JTC 1 SoV (not approved)
22.32	Programming Language C++	IS 14882	21	A. Koenig USA					Published (1998)
22.33	Elementary Numerical Functions	IS 10967-2	11	K. Karlsson Sweden					Published (2001)
22.34	Complex Floating Point Arithmetic and Complex Elementary Numeric Functions	NP 10967-3	11	K. Karlsson Sweden	(09/99)	(09/00)			New title approved 9/95 Resolution 95-8 N1970 N3208 grants year extension for move from NP to CD stage N3270 is CD Reg. Ballot
22.35	Ada Extensions and User Run Time Executive Interface	TR 11735	09	N. Kettani France					Published (1996)
22.36	Amendment 1 to ISO 10279:1991	IS 10279/ Amd. 1							Published (1994)
22.37	Test Methods for Measuring Conformance to POSIX	IS 13210	15	B. Hedquist USA					Published (1999)

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Project	Title	Ref. No.	WG	Editor	WD	CD	DIS	IS	Note
22.38	Guide to POSIX Open Systems Environments	TR 14252	15	D. Folland UK					Published (1996)
22.39	Amendment 5 to Portable Operating System Interface (POSIX) - Part 1: System API	IS 9945-1/PDAM 5	15	Convener	06/95	08/96			N1125 is NWI summary N1843 is WD N2210 is PDAM reg ballot N2347 is SoV N2601 is DoC N2648 is PDAM ballot
22.40	Amendment 8 to Portable Operating System Interface (POSIX) - Part 1: System API	IS 9945-1/PDAM 8	15	S. Walli USA	06/96	08/98			N1126 is NWI summary N2159 is WD N2404 is PDAM reg. Ballot N2489 is SoV N2599 is DoC N2817 is PDAM ballot N2875 is SoV N3038 is FPDAM ballot N3085 is SoV
22.41	Amendment 2 to IS 9945-2, POSIX - Part 2: Shell and Utility Security Administration	IS 9945-2/FPDAM 2	15	S. Walli USA	11/94	7/95			N1737 is WD N1896 is draft CD N2054 is CD reg. Ballot N2156 is SoV N2971 is DoC N2972 is PDAM ballot N3047 is SoV N 3208 approves extension of time permitted between CD and DIS stages

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Project	Title	Ref. No.	WG	Editor	WD	CD	DIS	IS	Note
22.45	Z Notation	FCD 13568	19	I. Toyn UK			02/96 09/98 (FCD) 11/00 (2nd FCD)		N1339 is NWI summary New title approved 9/95 Resolution 95-19 N1970 N1982 is CD reg and ballot N2081 is summary of voting N2174 is comts disposition N2982 FCD ballot N4048 SoV N3049 UK coments N3186 is FCD DoC N3187 is 2nd FCD ballot N3224 is SoV
22.46	Guidelines for Preparation of Language Independent Service Specification	TR 14369	11	Convenor					Published (1999)
22.47.1	PCTE, Part 1 PCTE, Part 2 PCTE, Part 3	IS 13719-1 IS 13719-2 IS 13719-3		Vacant					Published (1998) Published (1998) Published (1998)
22.47.5	IDL Binding to PCTE	IS 13719-4		Vacant					Published (1998)
22.9496	Programming Language CHILL	IS 9496							Published (1998)
22.11756	Programming Language MUMPS	IS 11756		K. Schell USA					Published (1999)
22.14515-1.01	Initial System API	IS 14515-1	15	B. Hedquist USA					Published (2000)
22.14515-1.02	Amendment 1 to IS 14515-1:1996 - Realtime Extensions	IS 14515-1/ FPDAM 1	15	B. Hedquist USA	06/96	01/97			N2162 is WD N2233 is PDAM Reg Ballot N2358 is SoV N2647 is PDAM Ballot N2744 is SoV N2871 is DoC N3112 is FPDAM Ballot N3189 is SoV
22.14515-2	Shell and Utilities Test Methods (TM for 22.21.02.01 and 21.02.02)	DIS 14515-2	15	S. McCarron USA	08/95	03/96	08/97		N1924 is WD N2093 is CD reg and CD Ballot N2226 is Summary of Voting N2677 is ITTF Table of Replies

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Project	Title	Ref. No.	WG	Editor	WD	CD	DIS	IS	Note
22.14766	Guide for POSIX National Profiles	PDTR 14766	15	K. Simonsen Denmark					NP ballot is N1741 N1822 is summary of voting N2044 is JTC 1 vote summary N3162 is PDTR Reg. Ballot N3192 is SoV N3234 is PDTR LB N3299 is SoV
22.14977	Syntactic Metalanguage - Extended BNF	IS 14977 WD 14977	19	R. Scowen UK					Published (1996) To be revised per 2001 Systematic Review (n3305)
22.15145	FORTH Programming Language	IS 15145		J. Rible USA					Published (1997)
22.15287	International Standardized Profiles (Umbrella Project)		15						
22.15287.01	POSIX Supercomputing Application Environment Profiles	FPDISP 15287-1	15	J. Oblinger USA					N2723 Revised is FPDISP Bit N2724 is Explanatory Report N2859 is SoV
22.15287.02	Standardized Application Environment Profile -- Part 2: POSIX Realtime Application Support (AEP)	ISP 15287-2	15	J. Oblinger USA					Published (2000)
22.15287.02.01	Amendment 1 to ISP 15287-2:2000 - Embedded Systems Profile	PDAM 1 to 15287-2	15						Approval for addition to PoW contained in N3208
22.15287.02.02	Amendment 2 to ISP 15287-2:2000 - Extended Profiles	PDAM 2 to 15287-2	15						Approval for addition to PoW contained in N3208
22.15291	Ada Semantic Interface Specification	IS 15291	09	S. Blake & C. Roby USA					Published (1999)
22.15435	APIs for Internationalization	NP 15435	20	K. Simonsen Denmark					SC22 approval in N2301 (res 96-18) N2424 is JTC 1 NP approval summary of voting N3208 grants year extension from NP to CD stage

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Project	Title	Ref. No.	WG	Editor	WD	CD	DIS	IS	Note
22.15436	Interfacing Modula-2 to C	NP 15436	13	Convenor					NP approval in N2301 (res 96-9) N2420 is JTC 1 NP approval summary of voting N3208 grants year extension from NP to CD stage
22.15851	Communications Protocol - Open Interconnect	IS 15851		K. Schell USA					Published (1999)
22.15852	M Windowing API	IS 15852		K. Schell USA					Published (1998)
22.15879	Distributed Software Administration DCE-RPC Interoperability (XDSA/DCE)	DIS 15879	15	M. Kirk Open Group			02/98		Fast-track - Open Group (PAS) N2659 is ITTF Table of Replies
22.15897	Procedure for the Registration of Cultural Elements Revision of IS 15897:1999	IS 15897 CD 15897	20	K. Simonsen Denmark					Published (1999) N2845 is Reg Auth Approval Conc. Reg. & CD ballots approved by N3013 Res. (99-15) N3266 is conc. Reg and CD ballot
22.15942	Guidance for Use of Ada In High Integrity Systems (Type 3 TR)	TR 15942	09	B. Wichmann UK					Published (2000)
22.16262	ECMAScript: A General Purpose Cross Platform Programming Language	IS 16262 DIS 16262		M. Cowlshaw ECMA					Published (1998) Currently being revised by Fast Track. N 3188 contains ToR from ITTF.
22.16509	Year 2000 Terminology	IS 16509		K. Lewis USA					Published (1999)
22.18009	Ada: Conformity Assessment	IS 18009	9	E. Ploedereder Germany					Published (1999)

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Project	Title	Ref. No.	WG	Editor	WD	CD	DIS	IS	Note
22.18011	POSIX Realtime Distributed Systems API (Language Independent) (C Language & Ada Language)	DIS 10811	15	P. Place USA					NWI did not originate in SC22 N2861 is JTC 1 SoV on NWI Conc. Reg and CD ballots approved by N3013 (Res. 99-15)
22.18015	C++ Performance (Type 3 TR)	PDTR 18015	21	M. O'Riordan Ireland					N2831 is NP for SC 22 ballot N2891 is SoV N2952 is JTC 1 SoV on NP
22.18037	C Extensions to Support Embedded Processors	NP 18037	14						N3039 is NP for SC 22 N3083 is SoV JTC 1 N6089 is NP Ballot N3120 is JTC 1 SoV N3269 is PDTR Reg. Ballot, closing 2001-10-26
22.20970	J-Consortium: JEFF file format specification	DIS 20970	TB D	J Consortium					PAS Fast Track Ballot close date: 2001-11-10