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**Information technology — Framework for  
internationalization**

*Technologies de l'information — Cadre pour l'internationalisation*



Reference number  
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## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Committee) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard (“state of the art”, for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/IEC TR 11017, which is a Technical Report of type 3, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 22, *Programming languages, their environments and system software interfaces*.

## Introduction

### **Background**

ISO/IEC JTC 1 created SC 22/WG 20 with a specific task to address internationalization in programming languages and applications. The development of a Technical Report for a framework for internationalization of programming languages and applications was selected as the first project of the working group. The update of ISO/IEC TR 10176:1991 "Information technology — Guidelines for the preparation of programming language standards", was added to the projects of the WG 20 to ensure that the other working groups in the SC 22 profit from WG 20's work by including the services described in the framework document, into the development and update of programming language standards.

After surveying the various requirements, ISO/IEC JTC 1 SC 22 defined a set of services that might be provided in a truly internationalized application, and thus also in programming languages. These services are described in this Technical Report, together with short explanations of the requirements and a list of standards on which they are based. This Technical Report forms the base document for the consideration of internationalization features in applications.

The revision of ISO/IEC TR 10176, introduces the services defined in this Technical Report into the development of programming language standards. The recommendations in the guide will enable programming languages to deal with the issues of internationalization and to create programs that can run in culturally different environments without changes to the program code.

While preparing this Technical Report, it became obvious that the culturally correct ordering (sorting) of data is an essential part of most commercial processing. This is particularly difficult when the underlying character set is capable of representing all of today's written languages. SC 22 therefore proposed, and was assigned, an additional work item to develop a standard for "Information technology — International String Ordering — Method for Comparing Character Strings and Description of Default Tailorable Ordering", ISO/IEC 14651.

"The specification of cultural conventions in language independent form" is another work item assigned to SC 22. Programming language specific specifications for such repositories exist in ISO/IEC 9945-2 and in publicly available specifications from various consortia. It is a requirement that output from this work (ISO/IEC 14652) must be compatible with the work already done by ISO/IEC JTC 1 SC 22/WG 15 (POSIX working group) in this field. A working draft exists for this Technical Report.

### **This Technical Report**

The role of information technology in daily life is rapidly growing, and its prevalence now approaches that of social infrastructures such as water or power supplies, public communications links and road or public transportation systems. To ensure the future success of this technology, all communication between systems and users of the systems must be in the natural language of the user in the user's script, and must fit the natural behaviour of the user.

Traditionally, the process of the adaptation to a user culture has been called the internationalization (or localization, or customization in an intermixed way) of information technology.

Historically, the internationalization of information technology has been provided on a demand/requirement basis, and thus solutions have been based on the "best available technology" approach. As a result, the solutions to internationalization for different systems do not necessarily share any common directions or goals. In many cases, different technology solutions have different goals altogether.

This Technical Report is intended to present an organised overview of, and relationship between, the various requirements, approaches and solutions to the internationalization of information technology systems. In addition, this Technical Report recommends services for internationalization of software.

This Technical Report refers to the ISO/IEC JTC 1 TSG-1 final report as a base document (see Annex A).

The purpose of the ISO/IEC JTC 1 internationalization activity is to establish the goals and directions for its production of applications adapted for use in the international environment which can be customised to local cultural conventions, and then to produce the necessary standards. The common internationalization standards will benefit a number of parties in the information technology field:

- users will have a much greater chance of having applications which are compliant with their local cultural conventions, and will also be able to experience a much greater commonality between the handling of cultural conventions in different applications.
- application developers will be relieved from specifying a number of internationalization parameters, which can simply be taken from ISO/IEC member bodies specifications.
- procurers can specify cultural convention sets and obtain well-defined uniform behaviour across hardware and software platforms.
- ISO/IEC member bodies can produce specifications for their national cultural conventions, which then can be applied uniformly across application platforms.
- ISO/IEC JTC 1 working groups can produce bindings to ISO/IEC JTC 1 standards that use the specifications of cultural conventions from ISO/IEC JTC 1 member bodies, and thus reuse internationalization data and specifications without further work.

As the internationalization activity involves many parties, it is planned to have a staged approach to producing the relevant standards. First a framework document will be produced (this document); then the "Guidelines for the preparation of programming language standards" will be revised with respect to internationalization (a revised ISO/IEC TR 10176); and finally the various internationalization standards will be produced.

This Technical Report is structured as follows:

Clause 1 describes the scope of this Technical Report, clause 2 lists the documents referenced, and clause 3 defines the key terminology (Only those items necessary for the understanding of this Technical Report are referenced in clause 2 and clause 3).

Clause 4 presents many different categories of internationalization, all of which are useful in internationalized information systems.

Clause 5 recommends the INTERNATIONALIZATION/LOCALIZATION model as a comprehensive solution to accommodate the different types of internationalization described in clause 4.

Clause 6 itemises the major conventions which differ between cultures, also emphasizing that number of these conventions are open ended.

Clause 7 presents the basic model for internationalized systems and recommends a set of services which are necessary to support the major cultural differences (described in clause 6) based on the model.

Annexes provide supporting information to the main text.



# Information technology — Framework for internationalization

## 1 Scope

This Technical Report presents the framework and recommended model for internationalization and identifies the services required for the internationalization of information technology.

This Technical Report:

- discusses the requirements of internationalized systems and their users,
- suggests a concerted, unified approach to internationalization,
- recommends services to fulfil the requirements, and lists the standards related to the services.

This Technical Report is intended to be a reference for future standards on the internationalization of information technology, to act as a communication vehicle between those who provide standards and those who request them, and also to function as a basis for all future ISO/IEC JTC 1/SC 22/WG 20 activities.

NOTE 1 This Technical Report does not propose any specific solutions for internationalization. Future standards are expected to provide the solutions, reflecting the directions in this Technical Report.

NOTE 2 Internationalization services consist of internationally generic services and nationally specific information (data). This Technical Report covers only the internationally generic portion of software, so it does not discuss:

- preparation of internationalized information technology systems for localization by a local user.
- hardware-related issues or requirements.
- requirements related to system ergonomics.

NOTE 3 The internationalization solutions and services available in the mid-late 1980s are the technical basis for this Technical Report.

## 2 References

See annex A.