

OpenI18N 1.3  
Globalization Specification

Free Standards Group

## **OpenI18N Globalization Specification 1.3**

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## 1. Foreword

### 1.1 Scope

This document specifies interfaces and functionalities beyond LSB 1.3 that must be supported by operating systems to run internationalized application software. This document also includes recommendations for operating systems to ease development of internationalized application software.

This specification only lists internationalization aspects of each functionality provided by the conforming operating systems.

### 1.2 Normative References

#### [LSB]

Linux Standard Base 1.3

#### [POSIX.1]

ISO/IEC 9945-1:1996 Information technology — Portable Operating System Interface (POSIX) — Part 1: System Application Program Interface (API) [C Language]

#### [POSIX.2]

ISO/IEC 9945-2:1993 Information technology — Portable Operating System Interface (POSIX) — Part 2: Shell and Utilities

#### [ISO C]

ISO/IEC 9899:1990 Programming Languages — C

ISO/IEC 9899:1990/Amd.1:1995 Programming Languages — C Amendment 1: C Integrity

#### [ISO C 99]

ISO/IEC 9899:1999 Programming Languages — C

#### [XCU5]

The Single UNIX Specification, Version 2  
Commands and Utilities, Issue 5  
(The Open Group CAE Specification C604)

#### [XBD5]

The Single UNIX Specification, Version 2  
System Interface Definitions, Issue 5  
(The Open Group CAE Specification C605)

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[XSH5]

The Single UNIX Specification, Version 2  
System Interfaces and Headers, Issue 5 (2 volumes)  
(The Open Group CAE Specification C606)

[XCURSES4.2]

The Single UNIX Specification, Version 2  
X/Open Curses (XCurses), Issue 4 Version 2  
(The Open Group CAE Specification C610)

[ICU]

International Components for Unicode 2.0 or followup compatible versions  
<http://oss.software.ibm.com/icu/>

[ICU4J]

International Components for Unicode for Java 2.0 or followup compatible versions  
<http://oss.software.ibm.com/icu4j/>

[Perl]

Perl 5.8.0 or followup compatible versions  
<http://www.perl.com/>  
[http://www.perl.com/CPAN-local/modules/00modlist.long.html#ID13\\_Internationalization](http://www.perl.com/CPAN-local/modules/00modlist.long.html#ID13_Internationalization)

[Java]

Java 2 Platform, Standard Edition, v1.3 API Specification or followup compatible versions  
<http://java.sun.com/j2se/>

[X11R6]

The X Window System, Version 11, Release 6  
<ftp://ftp.x.org/pub/R6.4/xc/doc/hardcopy/>

[Unicode 3.0]

The Unicode Standard, Version 3.0  
The Unicode Consortium, Addison-Wesley Developers Press, ISBN 0-201-61633-5

[Unicode 3.2]

The Unicode Standard, Version 3.2  
The Unicode Consortium. The Unicode Standard, Version 3.2.0 is defined by *The Unicode*

*Standard, Version 3.0* (Addison-Wesley Developers Press, ISBN 0-201-61633-5), as amended by the *Unicode Standard Annex #27: Unicode 3.1* (<http://www.unicode.org/reports/tr27/>) and by the *Unicode Standard Annex #28: Unicode 3.2* (<http://www.unicode.org/reports/tr28/>).

[ISO 10646-1]

ISO/IEC 10646-1:2000 Information technology — Universal Multiple-Octet Coded Character Set (UCS) — Part 1: Architecture and Basic Multilingual Plane

[ISO 639]

ISO 639:1988 Code for the representation of names of languages

[ISO 3166-1]

ISO 3166-1:1997 Codes for the representation of names of countries and their subdivisions — Part 1: Country codes

[IANA-Charset-Registry]

IANA Registry of Character Sets

<http://www.isi.edu/in-notes/iana/assignments/character-sets>

[ISO 8859-1]

ISO/IEC 8859-1:1998 Information technology — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1

[ISO 8859-2]

ISO/IEC 8859-2:1999 Information technology — 8-bit single-byte coded graphic character sets — Part 2: Latin alphabet No. 2

[ISO 8859-5]

ISO/IEC 8859-5:1999 Information technology — 8-bit single-byte coded graphic character sets — Part 5: Latin/Cyrillic alphabet

[ISO 8859-7]

ISO 8859-7:1987 Information processing — 8-bit single-byte coded graphic character sets — Part 7: Latin/Greek alphabet

[ISO 8859-9]

ISO/IEC 8859-9:1999 Information technology — 8-bit single-byte coded graphic character sets — Part 9: Latin alphabet No. 5

[ISO 8859-13]

ISO/IEC 8859-13:1998 Information technology — 8-bit single-byte coded graphic character sets — Part 13: Latin alphabet No. 7

[ISO 8859-15]

ISO/IEC 8859-15:1999 Information technology — 8-bit single-byte coded graphic character sets — Part 15: Latin alphabet No. 9

### 1.3 Conformance

Conformance to LSB 1.3 is the prerequisite condition for the conformance to this standard.

#### 1.3.1 Conforming Environments

For conformance purposes the following environments are defined:

(1) End User Environment

End User Environment is an operating system environment with user interface. It is assumed that End User Environment has a set of utilities for user interaction.

(a) Desktop Environment

Desktop Environment is an operating system environment suitable for end user interaction. Graphical user interface is required in this environment.

The following sections are applied to Desktop Environment:

3. *Base Libraries*
4. *Shells and Utilities*
5. *Programming Languages (with Software Development Options)*
6. *Graphical User Interface*
7. *Input Methods*
8. *Output Methods*
9. *Internet Tools*

If an interface or utility is defined as “supported in End User Environment”, that interface or utility shall be available in Desktop Environment.

The following options can be supported in Desktop Environment:

(2) Software Development Options

If any of these options is supported, utilities, libraries and associated modules to develop internationalized software (such as compilers or interpreters) shall be provided.

In this version of the specification, the following options are available:

- C Language Development Option
- Java Language Development Option

### 1.3.2 Conformance Levels

Several levels are defined for conformance for each environment. These levels are defined as follows:

(1) Level 1

The level 1 is the bottom-line level of conformance. All conforming implementations shall provide this level of interfaces and utilities to conform to this specification. If level is not specified in the specification, that specification shall be considered as Level 1.

(2) Level 2

The level 2 is more advanced or extended level of conformance. Conforming implementations are encouraged to provide this level of interfaces and utilities to conform to this specification, but it is not mandatory.

## 2. Terminology

### 2.1 Definition of Terms

The following terms are used in this specification:

#### **Implementation-defined**

A value or behavior is implementation-defined when it is left to the implementation to define [and document] the corresponding requirements for correct application behavior.

#### **May**

With respect to implementations, the word “may” is to be interpreted as an optional feature that is not required in this specification but can be provided. With respect to application, the word “may” means that the feature is optional. The term “optional” has the same definition as “may”.

#### **Shall**

In this specification, the word “shall” is to be interpreted as a mandatory requirement on the implementation or on application, depending upon the context. The term “must” has the same definition as “shall”.

#### **Should**

With respect to implementations, the word “should” is to be interpreted as an implementation recommendation, but not a requirement. With respect to application, the word “should” is to be interpreted as recommended programming practice.

#### **Supported**

Certain facilities in this specification are optional. If a facility is supported, it behaves as specified by this specification.

If a facility is “supported” by an implementation, the implementation must document how to obtain and install the facility, or the facility is installed by installer of the implementation by explicitly selected by the user or implicitly installed with other system components. If an implementation “supports” a facility, the distributor of the implementation shall commit that the facility can run on the implementation.

#### **Unspecified**

When a value or behavior is unspecified, the specification defines no portability requirements for a facility on an implementation even when faced with an application that uses the facility. An application that requires specific behavior in such an instance, rather than tolerating any behavior when using that facility, is not a portable application.

### **Provided**

Certain facilities in this specification are mandatory and implemented in all conforming implementations.

### **Obsolescence**

The indication of that subject statement or clause will be removed from future revision of this standard.

## 2.2 General Terms

### **character**

A sequence of one or more bytes representing a single graphic symbol or control code. This term corresponds to the ISO C standard term multibyte character (multi-byte character), where a single-byte character is a special case of a multi-byte character. Unlike the usage in the ISO C standard, character here has no necessary relationship with storage space, and byte is used when storage space is discussed.

[The Single UNIX Specification Version 2, System Interface Definitions, Issue 5]

### **byte**

An individually addressable unit of data storage that is equal to or larger than an octet, used to store a character or a portion of a character; see *character*.

A byte is composed of a contiguous sequence of bits, the number of which is implementation-dependent. The least significant bit is called the low-order bit; the most significant is called the high-order bit.

Note that this definition of byte deviates intentionally from the usage of byte in some international standards, where it is used as a synonym for octet (always eight bits). On a system based on the ISO/IEC 9945-2:1993 standard, a byte may be larger than eight bits so that it can be an integral portion of larger data objects that are not evenly divisible by eight bits (such as a 36-bit word that contains four 9-bit bytes).

[The Single UNIX Specification Version 2, System Interface Definitions, Issue 5]

### **character set**

A finite set of different characters used for the representation, organization or control of data.

[The Single UNIX Specification Version 2, System Interface Definitions, Issue 5]

### **coded character set**

A set of unambiguous rules that establishes a character set and the one-to-one relationship between each character of the set and its bit representation.

[The Single UNIX Specification Version 2, System Interface Definitions, Issue 5]

**codeset**

The result of applying rules that map a numeric code value to each element of a character set. An element of a character set may be related to more than one numeric code value but the reverse is not true. However, for state-dependent encodings the relationship between numeric code values to elements of a character set may be further controlled by state information.

The character set may contain fewer elements than the total number of possible numeric code values; that is, some code values may be unassigned.

[The Single UNIX Specification Version 2, System Interface Definitions, Issue 5]

**internationalization**

The provision within a computer program of the capability of making itself adaptable to the requirements of different native languages, local customs and coded character sets.

[The Single UNIX Specification Version 2, System Interface Definitions, Issue 5]

**globalization**

A product development approach which ensures that software products are usable in the worldwide markets through a combination of internationalization and localization.

**locale**

The definition of the subset of a user's environment that depends on language and cultural conventions.

[The Single UNIX Specification Version 2, System Interface Definitions, Issue 5]

**localization**

The process of establishing information within a computer system specific to the operation of particular native languages, local customs and coded character sets.

[The Single UNIX Specification Version 2, System Interface Definitions, Issue 5]

**local customs**

The conventions of a geographical area or territory for such things as date, time and currency formats.

[The Single UNIX Specification Version 2, System Interface Definitions, Issue 5]

**portable filename character set**

The set of characters from which portable filenames are constructed. For a filename to be portable across implementations conforming to this specification set and the ISO POSIX-1 standard, it must consist only of the following characters:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z  
a b c d e f g h i j k l m n o p q r s t u v w x y z  
0 1 2 3 4 5 6 7 8 9 . \_ -

The last three characters are the period, underscore and hyphen characters, respectively. The hyphen must not be used as the first character of a portable filename. Upper- and lower-case letters retain their unique identities between conforming implementations. In the case of a portable pathname, the slash character may also be used.

[The Single UNIX Specification Version 2, System Interface Definitions, Issue 5]

**file-system-safe character**

Multibyte character which does not contain either 0x00 or 0x2F in any byte of its representation.

**Input Method Engine**

A part or a module of building block of input method which implements a language- or a script-specific logic of composing a string from one or more sequence of event or a string, which can be independent from windowing system, graphical user interface, or visual appearance.

### 3. Base Libraries

#### (1) Scope

This chapter defines runtime library interfaces required to conform to this specification. Conforming implementations shall provide the following C language APIs. In addition to the C language interface, conforming level 2 implementations shall provide interfaces for other programming languages.

#### (2) Requirements

Conforming implementations shall provide the environment variables specified in *Annex A*.

Conforming implementations shall support the application execution environments specified in *Annex B*

Conforming level 2 implementations shall define **`_XOPEN_CURSES`** version test macro and provide the internationalized curses library functions which are specified in [XCURSES4.2].

Conforming level 2 implementations shall support Java Runtime environment ([Java]), Internationalization Components for Unicode [ICU], ICU for Java [ICU4J], and Perl execution environment [Perl] including Perl interpreter and modules.

#### 4. Shells and Utilities

##### (1) Scope

This chapter defines runtime environment required to support traditional UNIX command interpreter called "shell" and other basic utilities defined in [POSIX.2].

##### (2) Requirements

###### ▪ Shell implementation

Conforming level 1 implementations shall be able to use Portable Filename Character Set defined in [POSIX.2].

Conforming level 2 implementations shall be able to use file-system-safe characters as arguments and filenames.

Conforming level 2 implementations shall implement the globbing functionality of the shell as defined in [POSIX.2].

###### ▪ The utilities implementation

##### (a) Locale

Conforming implementations shall provide the following utilities to generate and refer to locale definitions as specified in [XCU5]: The `localedef` utility shall have the capability to accept charmap for UTF-8, at least.

**locale**

**localedef**

##### (b) Text Editor

Conforming implementations shall provide the following utilities to edit text files encoded in the supported codesets as specified in [XCU5].

**Note:** To *edit* text is to determine character boundaries correctly and perform operations such as insert, copy and delete characters based on the determined character boundaries. Input and output requirements are specified in 7. *Input Methods* and 8. *Output Methods* respectively.

**ed**

**ex**

**vi**

(c) Text Processing

Conforming implementations shall provide the following utilities to process text as specified in [XCU5].

**mailx**                      **nm** (symbol sorting order )

The **mailx** utility can be implemented as **Mail**.

(d) Regular Expressions

On conforming level 2 implementations, the following utilities that process regular expressions shall have capability to handle Basic Regular Expression (BRE) and Extended Regular Expression (ERE) as specified in [POSIX.2].

The following utilities are relevant:

**egrep**              **grep**              **sed**              **awk**

(e) Filename Handling

Conforming implementations shall provide the following utilities to correctly handle filenames that use file-system-safe characters. On conforming level 2 implementations, the following utilities shall have capability of filename globbing functionality as specified in [POSIX.2].

**cpio**                      **find**                      **ls**                      **tar**

(f) General Text Editor

Conforming implementations shall support at least one text editor that can edit text encoded in UTF-8.

**Note:** To *edit* text is to determine character boundaries correctly and perform operations such as insert, copy and delete characters based on the determined character boundaries. Input and output requirements are specified in 7. *Input Methods* and 8. *Output Methods* respectively.

(g) Terminal Emulator

Conforming implementations shall support terminal emulators that can handle codesets for supported locales.

Conforming implementations should support terminal emulation for all supported locales, but an implementation may provide different terminal emulators for each locale.

(h) Message catalogs

Conforming implementations with C Language Development Option shall provide the following utilities to create and update message catalog source files as specified in *Annex C*.

**msgmerge**

**xgettext**

## 5. Programming Languages

### (1) Scope

This chapter defines the requirements for various programming languages. Only programming languages with internationalization requirements are listed here. Note that the specifications defined by this chapter shall be provided by conforming implementations if the relevant Software Development Option is supported.

### (2) Requirements

Conforming level 2 implementations with Software Development Options shall support the compiler or interpreter for the following languages:

- C (if the implementation supports the C Language Development Option)
- Java (if the implementation supports the Java Language Development Option)
- Perl

Each programming language shall be internationalized as specified in the following specifications:

- C language as specified in [ISO C]
- Java language as specified in [Java]
- Perl language as specified in [Perl]

**Note:** See 3. *Base Libraries* about runtime environment of Perl and Java languages.

## 6. Graphical User Interface

### 6.1 Graphic Libraries

#### (1) Scope

This chapter defines runtime library interfaces for graphical user interface (GUI). Conforming implementations shall provide the X Window System Version 11 Release 6 graphical user interface specified in [LSB].

#### (2) Requirements

Conforming level 2 implementations shall support languages listed in *Annex B*. Conforming level 1 implementations need not to support languages that require complex text layout (the applicable languages are marked in the table in *Annex B*).

### 6.2 Graphic Toolkits and X Window Servers

#### (1) Scope

This chapter defines the requirements for graphic toolkits supported on top of the X Window System and the X Window System servers.

#### (2) Requirements

- Graphic Toolkits

There are no requirements beyond [LSB] on the Graphic Toolkits in terms of internationalization.

- X Window Servers

There are no requirements beyond [LSB] on the X Window Servers in terms of internationalization.

## 7. Input Methods

### (1) Scope

This chapter defines the requirements for text input used by the X Window System and other environments. Such mechanism is needed to support non-Western languages (for example, Chinese, Japanese and Korean).

### (2) Requirements

Conforming implementations shall provide means, i.e., Input Method(s) for user to input characters specified in the *Annex B: Supported locales and codesets*.

Conforming implementations shall provide X Input Method Server(s) which can connect with Input Method Engines of the supported locales. An Input Method Engine can be implemented as a separate process communicating with an X Input Method Server or can be integrated into the X Input Method Server.

Conforming implementations shall support Input Method Engines for the supported locales, that can be connected with the above Input Method Server(s). The conforming implementations shall document which Input Method Engines are supported by the above X Input Method Server(s) and how user can get and install the Engines into the conforming implementations.

The X Input Method Server(s) should have a capability to switch Input Method Engines dynamically, but a conforming implementation may provide multiple Input Method Servers per locale.

Conforming level 1 implementations should provide an X Input Method Server which supports UTF-8 encoding and allows user to input whole repertoire of [Unicode 3.0].

Conforming level 2 implementations shall provide an X Input Method Server which supports UTF-8 encoding and allows user to input whole repertoire of [Unicode 3.2].

**Note:** User-friendly input operation is preferable, but it is acceptable to use non-user-friendly input operation, such as entering hexadecimal code points, to input not-so-frequently-used characters. Also note that the *input* requirement does not imply that the input characters are displayed correctly.

Conforming implementations may provide X Input Method Server(s) which supports locale specific character repertoire and locale specific character encodings.

Every application that has X Window System based GUI and has a capability to accept character input from users should have the interface with the above X Input Method Server(s).

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Conforming implementations should provide means for user to input characters specified in the supported locale through Console and TTY device interfaces.

## 8. Output Methods

### (1) Scope

This chapter defines the requirements for text output used by the X Window System. Such mechanism is needed to support languages that require complex text rendering.

### (2) Requirements

Conforming implementations shall provide means, i.e., Output Method(s), for user to output characters specified in the *Annex B: Supported locales and codesets*.

Conforming implementations shall provide X Output Method interface defined in X11R6 Xlib specification chapter 13 as a displaying primitive for X Window System.

Conforming level 1 implementations should provide multibyte and wide character interface which cover the following collections of UCS implementation level 1 defined in [ISO 10646-1].

Conforming level 2 implementations shall provide multibyte and wide character interface which cover the following collections of UCS implementation level 1 defined in [ISO 10646-1].

**Note:** [ISO 10646-1] defines character blocks for subsetting purpose and are called *character collections*. Such character collections are used here to indicate minimum displayable subset.

|    |                             |                                       |
|----|-----------------------------|---------------------------------------|
| 1  | BASIC LATIN                 | 0020-007E                             |
| 2  | LATIN-1 SUPPLEMENT          | 00A0-00FF                             |
| 3  | LATIN EXTENDED-A            | 0100-017F                             |
| 4  | LATIN EXTENDED-B            | 0180-024F                             |
| 5  | IPA EXTENSIONS              | 0250-02AF                             |
| 8  | BASIC GREEK                 | 0370-03CF                             |
| 9  | GREEK SYMBOLS AND COPTIC    | 03D0-03FF                             |
| 10 | CYRILLIC                    | 0400-04FF                             |
| 11 | ARMENIAN                    | 0530-058F                             |
| 27 | BASIC GEORGIAN              | 10D0-10FF                             |
| 30 | LATIN EXTENDED ADDITIONAL   | 1E00-1EFF                             |
| 31 | GREEK EXTENDED              | 1F00-1FFF                             |
| 32 | GENERAL PUNCTUATION         | 2000-206F (only graphical characters) |
| 33 | SUPERSCRIPTS AND SUBSCRIPTS | 2070-209F                             |
| 34 | CURRENCY SYMBOLS            | 20A0-20CF                             |
| 36 | LETTERLIKE SYMBOLS          | 2100-214F                             |

|    |                                    |           |
|----|------------------------------------|-----------|
| 37 | NUMBER FORMS                       | 2150-218F |
| 38 | ARROWS                             | 2190-21FF |
| 39 | MATHEMATICAL OPERATORS             | 2200-22FF |
| 40 | MISCELLANEOUS TECHNICAL            | 2300-23FF |
| 41 | CONTROL PICTURES                   | 2400-243F |
| 42 | OPTICAL CHARACTER RECOGNITION      | 2440-245F |
| 44 | BOX DRAWING                        | 2500-257F |
| 45 | BLOCK ELEMENTS                     | 2580-259F |
| 46 | GEOMETRIC SHAPES                   | 25A0-25FF |
| 47 | MISCELLANEOUS SYMBOLS              | 2600-26FF |
| 49 | CJK SYMBOLS AND PUNCTUATION        | 3000-303F |
| 50 | HIRAGANA                           | 3040-309F |
| 51 | KATAKANA                           | 30A0-30FF |
| 52 | BOPOMOFO                           | 3100-312F |
| 54 | CJK MISCELLANEOUS                  | 3190-319F |
| 55 | ENCLOSED CJK LETTERS AND MONTHS    | 3200-32FF |
| 56 | CJK COMPATIBILITY                  | 3300-33FF |
| 60 | CJK UNIFIED IDEOGRAPHS             | 4E00-9FFF |
| 62 | CJK COMPATIBILITY IDEOGRAPHS       | F900-FAFF |
| 66 | CJK COMPATIBILITY FORMS            | FE30-FE4F |
| 69 | HALFWIDTH AND FULLWIDTH FORMS      | FF00-FFEF |
| 71 | HANGUL EXTENDED                    | AC00-D7A3 |
| 76 | YI SYLLABLES                       | A000-A48F |
| 77 | YI RADICALS                        | A490-A4CF |
| 81 | CJK UNIFIED IDEOGRAPHS EXTENSION A | 3400-4DBF |

Conforming implementations should provide an X Output Method which supports the encoding schemes listed in *Annex B*.

Conforming implementations shall provide a terminal emulator on the X Window System that output characters in the supported locale.

Conforming implementations should provide console or tty device interface that output characters in the supported locale.

## 9. Internet Tools

### (1) Scope

This chapter defines the requirements for Internet client tools, such as WWW browsers and Mail User Agents (MUAs).

### (2) Requirements

Conforming implementations shall make at least one codeset available per locale specified in *Annex B*.

The supported codeset should be in [IANA-Charset-Registry].

Conforming level 2 implementations of Web browsers and mail user agents shall be able to input and output whole repertoire of [Unicode 3.0].

**Note:** Character output is restricted as specified in 8. *Output Methods*.

Annex A (Normative): Environment Variables

Conforming implementations shall provide the following environment variables that are relevant to the operation of internationalized interfaces or internationalized commands and utilities.

**LANG**

**LC\_ALL**

**LC\_COLLATE**

**LC\_CTYPE**

**LC\_MESSAGES**

**LC\_MONETARY**

**LC\_NUMERIC**

**LC\_TIME**

**NLSPATH**

The usage and the semantics of these environment variables shall be the same as the description in “6.2 Internationalisation Variables” in [XBD5].

Annex B (Normative): Supported locales and codesets

Conforming implementations shall provide handling capability of the following locales.

**C**

**POSIX**

Conforming implementations shall support the following locales.

**Note 1:** The language names come from ISO 639.

**Note 2:** To avoid political discussion, the region/country names used here does not strictly follow ISO 3166-1.

|              |              |                        |   |
|--------------|--------------|------------------------|---|
| <b>af_ZA</b> | Afrikaans    | SOUTH AFRICA           | [Support of this locale is level 2]                                       |
| <b>ar_AE</b> | Arabic       | UNITED ARAB EMIRATES   | [Output method support is level 2]  |
| <b>ar_BH</b> |              | BAHRAIN                | [Output method support is level 2]  |
| <b>ar_DZ</b> |              | ALGERIA                | [Output method support is level 2]  |
| <b>ar_EG</b> |              | EGYPT                  | [Output method support is level 2]  |
| <b>ar_IN</b> |              | INDIA                  | [Support of this locale is level 2]<br>[Output method support is level 2] |
| <b>ar_IQ</b> |              | IRAQ                   | [Output method support is level 2]  |
| <b>ar_JO</b> |              | JORDAN                 | [Output method support is level 2]  |
| <b>ar_KW</b> |              | KUWAIT                 | [Output method support is level 2]  |
| <b>ar_LB</b> |              | LEBANON                | [Output method support is level 2]  |
| <b>ar_LY</b> |              | LIBYAN ARAB JAMAHIRIYA | [Output method support is level 2]  |
| <b>ar_MA</b> |              | MOROCCO                | [Output method support is level 2]  |
| <b>ar_OM</b> |              | OMAN                   | [Output method support is level 2]  |
| <b>ar_QA</b> |              | QATAR                  | [Output method support is level 2]  |
| <b>ar_SA</b> |              | SAUDI ARABIA           | [Output method support is level 2]  |
| <b>ar_SD</b> |              | SUDAN                  | [Output method support is level 2]  |
| <b>ar_SY</b> |              | SYRIAN ARAB REPUBLIC   | [Output method support is level 2]  |
| <b>ar_TN</b> |              | TUNISIA                | [Output method support is level 2]  |
| <b>ar_YE</b> |              | YEMEN                  | [Output method support is level 2]  |
| <b>as_IN</b> | Assamese     | INDIA                  | [Support of this locale is level 2]<br>[Output method support is level 2] |
| <b>be_BY</b> | Byelorussian | BELARUS                |   |
| <b>bg_BG</b> | Bulgarian    | BULGARIA               |   |
| <b>bn_IN</b> | Bengali      | INDIA                  | [Support of this locale is level 2]<br>[Output method support is level 2] |

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|              |         |                    |                                     |
|--------------|---------|--------------------|-------------------------------------|
| <b>ca_ES</b> | Catalan | SPAIN              |                                     |
| <b>cs_CZ</b> | Czech   | CZECH REPUBLIC     |                                     |
| <b>da_DK</b> | Danish  | DENMARK            |                                     |
| <b>de_AT</b> | German  | AUSTRIA            |                                     |
| <b>de_BE</b> |         | BELGIUM            | [Support of this locale is level 2] |
| <b>de_CH</b> |         | SWITZERLAND        |                                     |
| <b>de_DE</b> |         | GERMANY            |                                     |
| <b>de_LU</b> |         | LUXEMBOURG         |                                     |
| <b>el_GR</b> | Greek   | GREECE             |                                     |
| <b>en_AU</b> | English | AUSTRALIA          |                                     |
| <b>en_BE</b> |         | BELGIUM            |                                     |
| <b>en_BW</b> |         | BOTSWANA           | [Support of this locale is level 2] |
| <b>en_CA</b> |         | CANADA             |                                     |
| <b>en_GB</b> |         | UNITED KINGDOM     |                                     |
| <b>en_HK</b> |         | HONG KONG          | [Support of this locale is level 2] |
| <b>en_IE</b> |         | IRELAND            |                                     |
| <b>en_IN</b> |         | INDIA              | [Support of this locale is level 2] |
| <b>en_NZ</b> |         | NEW ZEALAND        |                                     |
| <b>en_PH</b> |         | PHILIPPINES        | [Support of this locale is level 2] |
| <b>en_SG</b> |         | SINGAPORE          | [Support of this locale is level 2] |
| <b>en_US</b> |         | UNITED STATES      |                                     |
| <b>en_ZA</b> |         | SOUTH AFRICA       |                                     |
| <b>en_ZW</b> |         | ZIMBABWE           | [Support of this locale is level 2] |
| <b>es_AR</b> | Spanish | ARGENTINA          |                                     |
| <b>es_BO</b> |         | BOLIVIA            |                                     |
| <b>es_CL</b> |         | CHILE              |                                     |
| <b>es_CO</b> |         | COLOMBIA           |                                     |
| <b>es_CR</b> |         | COSTA RICA         |                                     |
| <b>es_DO</b> |         | DOMINICAN REPUBLIC |                                     |
| <b>es_EC</b> |         | ECUADOR            |                                     |
| <b>es_ES</b> |         | SPAIN              |                                     |
| <b>es_GT</b> |         | GUATEMALA          |                                     |
| <b>es_HN</b> |         | HONDURAS           |                                     |
| <b>es_MX</b> |         | MEXICO             |                                     |
| <b>es_NI</b> |         | NICARAGUA          |                                     |
| <b>es_PA</b> |         | PANAMA             |                                     |

|              |             |                           |   |
|--------------|-------------|---------------------------|---|
| <b>es_PE</b> |             | PERU                      |   |
| <b>es_PR</b> |             | PUERTO RICO               |   |
| <b>es_PY</b> |             | PARAGUAY                  |   |
| <b>es_SV</b> |             | REPUBLIC OF EL SALVADOR   |   |
| <b>es_UY</b> |             | URUGUAY                   |   |
| <b>es_VE</b> |             | VENEZUELA                 |   |
| <b>et_EE</b> | Estonian    | ESTONIA                   |   |
| <b>eu_ES</b> | Basque      | SPAIN                     | [Support of this locale is level 2]   |
| <b>fa_IN</b> | Persian     | INDIA                     | [Support of this locale is level 2]   |
| <b>fa_IR</b> |             | IRAN, ISLAMIC REPUBLIC OF | [Output method support is level 2]<br>[Support of this locale is level 2]<br>[Output method support is level 2] |
| <b>fi_FI</b> | Finnish     | FINLAND                   |   |
| <b>fo_FO</b> | Faroese     | FAROE ISLANDS             |   |
| <b>fr_BE</b> | French      | BELGIUM                   |   |
| <b>fr_CA</b> |             | CANADA                    |   |
| <b>fr_CH</b> |             | SWITZERLAND               |   |
| <b>fr_FR</b> |             | FRANCE                    |   |
| <b>fr_LU</b> |             | LUXEMBOURG                |   |
| <b>ga_IE</b> | Irish       | IRELAND                   |   |
| <b>gl_ES</b> | Galician    | SPAIN                     | [Support of this locale is level 2]   |
| <b>gu_IN</b> | Gujarati    | INDIA                     | [Support of this locale is level 2]<br>[Output method support is level 2]                                       |
| <b>gv_GB</b> | Manx Gaelic | UNITED KINGDOM            | [Support of this locale is level 2]   |
| <b>he_IL</b> | Hebrew      | ISRAEL                    | [Output method support is level 2]  |
| <b>hi_IN</b> | Hindi       | INDIA                     | [Support of this locale is level 2]<br>[Output method support is level 2]                                       |
| <b>hr_HR</b> | Croatian    | CROATIA                   |   |
| <b>hu_HU</b> | Hungarian   | HUNGARY                   |   |
| <b>id_ID</b> | Indonesian  | INDONESIA                 | [Support of this locale is level 2]   |
| <b>is_IS</b> | Icelandic   | ICELAND                   |   |
| <b>it_CH</b> | Italian     | SWITZERLAND               |   |
| <b>it_IT</b> |             | ITALY                     |   |
| <b>ja_JP</b> | Japanese    | JAPAN                     |   |
| <b>kl_GL</b> | Greenlandic | GREENLAND                 |   |
| <b>kn_IN</b> | Kannada     | INDIA                     | [Support of this locale is level 2]   |

|              |                  |   |   |
|--------------|------------------|---|---|
| <b>ko_KR</b> | Korean           | KOREA, REPUBLIC OF                            | [Output method support is level 2]  |
| <b>ks_IN</b> | Kashmiri         | INDIA   | [Support of this locale is level 2]<br>[Output method support is level 2] |
| <b>kw_GB</b> | Cornish          | UNITED KINGDOM                                | [Support of this locale is level 2]                                       |
| <b>lt_LT</b> | Lithuanian       | LITHUANIA                                     |   |
| <b>lv_LV</b> | Latvian, Lettish | LATVIA  |   |
| <b>mk_MK</b> | Macedonian       | MACEDONIA, THE FORMER<br>YUGOSLAV REPUBLIC OF |   |
| <b>ml_IN</b> | Malayalam        | INDIA   | [Support of this locale is level 2]<br>[Output method support is level 2] |
| <b>ms_MY</b> | Malay            | MALAYSIA                                      | [Support of this locale is level 2]                                       |
| <b>nl_BE</b> | Dutch            | BELGIUM                                       |   |
| <b>nl_NL</b> |                  | NETHERLANDS                                   |   |
| <b>no_NO</b> | Norwegian        | NORWAY  |   |
| <b>or_IN</b> | Oriya            | INDIA   | [Support of this locale is level 2]<br>[Output method support is level 2] |
| <b>pa_IN</b> | Punjabi          | INDIA   | [Support of this locale is level 2]<br>[Output method support is level 2] |
| <b>pl_PL</b> | Polish           | POLAND  |   |
| <b>ps_IN</b> | Pashto, Pushto   | INDIA   | [Support of this locale is level 2]<br>[Output method support is level 2] |
| <b>pt_BR</b> | Portuguese       | BRAZIL  |   |
| <b>pt_PT</b> |                  | PORTUGAL                                      |   |
| <b>ro_RO</b> | Romanian         | ROMANIA                                       |   |
| <b>ru_RU</b> | Russian          | RUSSIAN FEDERATION                            |   |
| <b>ru_UA</b> |                  | UKRAINE                                       | [Support of this locale is level 2]                                       |
| <b>sd_IN</b> | Sindhi           | INDIA   | [Support of this locale is level 2]<br>[Output method support is level 2] |
| <b>sh_YU</b> | Serbo-Croatian   | YUGOSLAVIA                                    |   |
| <b>sk_SK</b> | Slovak           | SLOVAKIA                                      |   |
| <b>sl_SI</b> | Slovenian        | SLOVENIA                                      |   |
| <b>sq_AL</b> | Albanian         | ALBANIA                                       |   |
| <b>sr_YU</b> | Serbian          | YUGOSLAVIA                                    |   |
| <b>sv_FI</b> | Swedish          | FINLAND                                       |   |
| <b>sv_SE</b> |                  | SWEDEN  |   |

|              |            |           |   |
|--------------|------------|-----------|---|
| <b>ta_IN</b> | Tamil      | INDIA     | [Support of this locale is level 2]<br>[Output method support is level 2] |
| <b>te_IN</b> | Telugu     | INDIA     | [Support of this locale is level 2]<br>[Output method support is level 2] |
| <b>th_TH</b> | Thai       | THAILAND  |   |
| <b>tr_TR</b> | Turkish    | TURKEY    |   |
| <b>uk_UA</b> | Ukrainian  | UKRAINE   |   |
| <b>ur_IN</b> | Urdu       | INDIA     | [Support of this locale is level 2]<br>[Output method support is level 2] |
| <b>vi_VN</b> | Vietnamese | VIETNAM   |   |
| <b>zh_CN</b> | Chinese    | CHINA     |   |
| <b>zh_HK</b> |            | HONG KONG |   |
| <b>zh_SG</b> |            | SINGAPORE | [Support of this locale is level 2]                                       |
| <b>zh_TW</b> |            | TAIWAN    |   |

Conforming implementations shall make at least UTF-8 coded character set usable under the above locale environments. Conforming implementations also may make other coded character sets, including the following codesets, usable under some of the above locale environments.

ISO/IEC 8859-1

ISO/IEC 8859-2

ISO/IEC 8859-5

ISO/IEC 8859-7

ISO/IEC 8859-9

ISO/IEC 8859-13

ISO/IEC 8859-15

Korean EUC

Japanese EUC

Simplified Chinese EUC

Traditional Chinese EUC

If an implementation supports non UTF-8 codesets, the implementation shall support codeset conversions between the supported codesets and UTF-8 (for both directions) by **iconv** utility and **iconv** family functions (**iconv()**, **iconv\_open()** and **iconv\_close()**).

## Annex C (Normative): Publicly Available Specification

### C.1 xgettext utility

#### NAME

`xgettext` — extract `gettext` call strings from C programs

#### SYNOPSIS

`xgettext` [ *options* ] *filename* ...

#### DESCRIPTION

The `xgettext` utility is used to automate the creation of portable message files (`.po`). A `.po` file contains copies of the C language strings that are found in ISO C source code in *filename* or the standard input if `-` is specified on the command line. The `.po` file can be used as input to the `msgfmt` utility, which produces a binary form of the message file that can be used by application during run-time.

`xgettext` writes `msgid` strings from `gettext()` calls in *filename* to the default output file `messages.po`. The default output file name can be changed by `-d` option. `msgid` strings in `dgettext()` calls are written to the output file `domainname.po` where *domainname* is the first parameter to the `dgettext()` call.

By default, `xgettext` creates a `.po` file in the current working directory, and each entry is in the same order the strings are extracted from *filenames*. When the `-p` option is specified, the `.po` file is created in the *pathname* directory. An existing `.po` file is overwritten.

Duplicate `msgids` are written to the `.po` file as comment lines. When the `-s` option is specified, the `.po` is sorted by the `msgid` string, and all duplicated `msgids` are removed. All `msgstr` directives in the `.po` file are empty unless the `-m` option is used.

#### OPTIONS

`-a`

`--extract-all`

Extract all strings, not just those found in `gettext()` and `dgettext()` calls. Only one `.po` file is created.

`-c[comment-tag]`

`--add-comments[=comment-tag]`

The comment block beginning with *comment-tag* as the first token of the comment block is added to the output `.po` file as `#` delimited comments. For multiple domains, `xgettext` directs comments and messages to the prevailing text domain.

`-C`

`--c++`

Recognize C++ style comments.

`-d default-domain`

`--default-domain=default-domain`

Rename default output file from `messages.po` to `default-domain.po`.

The special domain name `-` means to write the output to the standard output.

`-D directory`

`--directory=directory`

Change to `directory` before beginning to search and scan source files. The resulting `.po` file will be written relative to the original directory, though.

`--debug`

Use the flags `c-format` and `possible-c-format` to show who was responsible for marking a message as a format string. The later form is used if the `xgettext` utility decided, the `format` form is used if the programmer prescribed it.

By default only the `c-format` form is used. The translator should not have to care about these details.

`-e`

`--no-escape`

Do not use C escapes in output (default).

`-E`

`--escape`

Use C escapes in output if non-ASCII characters are used.

`-f file`

`--files-from=file`

Read the names of the input files from `file` instead of getting them from the command line. If `-` is specified as `file`, the standard input is read.

`-F`

`--sort-by-file`

Sort output by file location.

`--force-po`

Always write output file even if no message is defined.

`-i`

`--indent`

Write the `.po` file using indented style.

`-j`

`--join-existing`

Join messages with existing message files. If a `.po` file does not exist, it is created. If a `.po` file does exist, new messages are appended. Any duplicate `msgid`s are

commented out in the resulting `.po` file. Domain directives in the existing `.po` file are ignored. Results not guaranteed if the existing message file has been edited.

`-k[keywordspec]`

`--keyword[=keywordspec]`

Specify additional keyword to be looked for (without `keywordspec` means not to use default keywords).

If `keywordspec` is a C identifier `id`, `xgettext` looks for strings in the first argument of each call to the function or macro `id`. If `keywordspec` is of the form `id:argnum`, `xgettext` looks for string in the `argnum`th argument of the call. If `keywordspec` is of the form `id:argnum1,argnum2`, `xgettext` looks for strings in the `argnum1`st argument and in the `argnum2`nd argument of the call, and treats them as singular/plural variants for a message with plural handling.

The default keywords, which are always looked for if not explicitly disabled, are `gettext`, `dgettext:2`, `dcgettext:2`, `ngettext:1,2`, `dngettext:2,3`, `dcngettext:2,3` and `gettext_noop`.

`-L name`

`--language=name`

Recognize the specified language. Valid values are C, C++, and PO. Otherwise the language is guessed from file extension.

`-m[prefix]`

`--msgstr-prefix[=prefix]`

Fill in the `msgstr` with `prefix`. This is useful for debugging purposes. To make `msgstr` identical to `msgid`, use an empty string (`" "`) for `prefix`.

`-M[suffix]`

`--msgstr-suffix[=suffix]`

Fill in the `msgstr` with `suffix`. This is useful for debugging purposes.

`-n`

`--add-location`

Add comment lines to the output file indicating file name and line number in the source file where each extracted string is encountered (default). These lines appear before each `msgid` in the following format:

```
#: filename:line
```

`--no-location`

Do not write `#: filename:line` lines.

`-o file`

`--output=file`

Write output to the specified file.

`-p pathname`

`--output-dir=pathname`

Specify the directory where the output files will be placed. This option overrides the current working directory.

`-s`

`--sort-output`

Generate output sorted by `msgid`s with all duplicate `msgid`s removed.

`--strict`

Write out strict UniForum conforming PO file.

`-T`

`--trigraphs`

Understand ISO C trigraphs for input.

`-w number`

`--width=number`

Limit the output lines to *number* columns.

`-x exclude-file`

`--exclude-file=exclude-file`

Specify a `.po` file that contains a list of `msgid`s that are not to be extracted from the input files. The format of `exclude-file` is identical to the `.po` file. However, only the `msgid` directive line in `exclude-file` is used. All other lines are simply ignored.

The `-x` option can only be used with the `-a` option.

#### OPERANDS

The operands are pathnames to the C or C++ language source files.

#### STDIN

The standard input is not used unless a *filename* operand is specified as `-`.

#### INPUT FILES

The input files are text files.

#### ENVIRONMENT VARIABLES

##### **LANGUAGE**

Specifies one or more locale names. See *C.1 gettext message handling functions* for more information.

##### **LANG**

Specifies default locale name.

##### **LC\_ALL**

Specifies locale name for all categories. If defined, overrides **LANG**, **LC\_CTYPE** and **LC\_MESSAGES**.

#### **LC\_CTYPE**

Specifies locale name for character handling.

#### **LC\_MESSAGES**

Specifies messaging locale, and if present overrides **LANG** for messages.

#### STDOUT

The standard output is not used unless the option-argument to the `-o` option is specified as `-`.

#### STDERR

The standard error is used only for diagnostic messages.

#### OUTPUT FILES

The output files are text files.

#### EXTENDED DESCRIPTION

None.

#### EXIT STATUS

The following exit values are returned:

- 0 Successful completion.
- >0 An error occurred.

#### APPLICATION USAGE

`xgettext` is not able to extract cast strings, for example ISO C casts of literal strings to `(const char *)`. This is unnecessary anyway, since the prototypes in `<libintl.h>` already specify this type.

#### EXAMPLES

None.

#### FUTURE DIRECTIONS

None.

## C.2 msgmerge utility

### NAME

`msgmerge` — merge two portable object files

### SYNOPSIS

`msgmerge [ options ] def.po ref.po`

### DESCRIPTION

The `msgmerge` utility merges two UniForum style `.po` files together. The `def.po` file is an existing PO file with the old translations which will be taken over to the newly created file as long as they still match; comments will be preserved, but extract comments and file positions will be discarded.

The `ref.po` file is the last created PO file (generally by `xgettext`), any translations or comments in the file will be discarded, however dot comments (`#.` comments) and file positions (`#:` comments) will be preserved. Where an exact match cannot be found, fuzzy matching is used to produce better results. The results are written to the standard output unless an output file is specified.

### OPTIONS

`-D directory`

`--directory=directory`

Change to `directory` before beginning to search and scan source files. The resulting `.po` file will be written relative to the original directory, though.

`-e`

`--no-escape`

Do not use C escapes in output (default).

`-E`

`--escape`

Use C escapes in output if non-ASCII characters are used.

`--force-po`

Always write output file even if no message is defined.

`-i`

`--indent`

Write the `.po` file using indented style.

`-o file`

`--output-file=file`

Write output to the specified file.

`--add-location`

Add comment lines to the output file indicating file name and line number in the source file where each extracted string is encountered (default). These lines appear before each `msgid` in the following format:

```
#: filename:line ...
```

```
--no-location
```

Do not write `#: filename:line` lines.

```
--strict
```

Write out strict UniForum conforming PO file.

```
-w number
```

```
--width=number
```

Limit the output lines to *number* columns.

## OPERANDS

The following operands are supported:

*def.po*

The *def.po* operand is a pathname of the message portable object file that may have translated text.

*ref.po*

The *ref.po* operand is a pathname of the message portable object file newly generated by the `xgettext` utility with modified program source files. This file may contain newly introduced message strings or modified message strings, and the `msgmerge` utility will detect such changes and merge the changes to *def.po*.

## STDIN

The standard input is not used unless *def.po* or *ref.po* operand is specified as `-`.

## INPUT FILES

The input files are text files.

## ENVIRONMENT VARIABLES

### **LANGUAGE**

Specifies one or more locale names. See *C.1 gettext message handling functions* for more information.

### **LANG**

Specifies default locale name.

### **LC\_ALL**

Specifies locale name for all categories. If defined, overrides **LANG**, **LC\_CTYPE** and **LC\_MESSAGES**.

### **LC\_CTYPE**

Specifies locale name for character handling.

## **LC\_MESSAGES**

Specifies messaging locale, and if present overrides **LANG** for messages.

### STDOUT

The standard output is used to write merged result unless `-o` option is specified.

### STDERR

The standard error is used only for diagnostic messages.

### OUTPUT FILES

The output files are text files.

### EXTENDED DESCRIPTION

None.

### EXIT STATUS

The following exit values are returned:

0           Successful completion.

>0          An error occurred.

### APPLICATION USAGE

None.

### EXAMPLES

None.

### FUTURE DIRECTIONS

None.

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Version 1.1, March 2000

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