Euro Currency Support in the Solaris Operating Environment

Adobe PostScript™

Please Recycle

Contents

Preface

The *Euro Currency Support in the Solaris*™ *Operating Environment* white paper presents information and software features for internationalizing software with euro currency support.

Who Should Use This Book

This white paper is intended for software developers who are interested in developing internationalized software with euro currency support. This white paper is part of a 4–part series on internationalization for Solaris software developers. The four internationalization white papers are:

- *Asian-Language Support in the Solaris*™ *Operating Environment*
- *Complex Text Layout Language Support in the Solaris*™ *Operating Environment*
- *Unicode Support in the Solaris*™ *Operating Environment*
- *Euro Currency Support in the Solaris*™ *Operating Environment*

How This Book Is Organized

Chapter 1 lists the Euro transition timetable.

Chapter 2 describes euro currency implementation.

Appendix A shows the euro currency locales, the latest euro currency standards, and useful euro internet links.

Related Books

The following books are related to software internationalization:

- *Creating Worldwide Software: Solaris International Developer's Guide* Bill Tuthill and David Smallberg.
- *Internationalization Guide, Version 2: Open Group Guide* The Open Group
- *International Language Environments Guide* Solaris Developer Collection.
- *Programming for the World: A Guide to Internationalization* Sandra Martin O'Donnell.
- *The Unicode Standard, Version 3.0* The Unicode Consortium.
- *X Windows on the World, Developing Internationalized Software with X, Motif, and CDE* Thomas C. McFarland.

Ordering Sun Documents

Fatbrain.com, an Internet professional bookstore, stocks select product documentation from Sun Microsystems, Inc.

For a list of documents and how to order them, visit the Sun Documentation Center on Fatbrain.com at `http://www1.fatbrain.com/documentation/sun`.

Accessing Sun Documentation Online

The docs.sun.com℠ Web site enables you to access Sun technical documentation online. You can browse the docs.sun.com archive or search for a specific book title or subject. The URL is `http://docs.sun.com`.

Introduction to the Euro

The transition to a single euro currency is a phased implementation. The deadline for complete changeover is set for July 2002 at the latest. For more information on the euro transition, refer to the links in Appendix A.

Figure 1–1   The Euro

1.1 A Phased Implementation to the Euro

The transition from numerous national currencies in Europe to a single European currency, the euro, is profoundly effecting business. All business are involved in the changeover, including changing information systems to use the euro.

The impact of the euro is far-ranging, and not limited solely to European companies. Anyone conducting a financial transaction with a European customer or supplier must change their information systems to support the euro. In today's global economy, many of these companies are not located in Europe.

The following list some systems that are affected by the introduction of the euro:

- Accounting software (general ledger)
- Electronic payment and trading systems

- Invoicing and billing systems
- Payroll systems
- Accounts receivable and accounts payable sub-ledgers
- Inventory systems recording the value of the inventory
- Fixed asset systems monitoring value and depreciation charges of assets
- Work-in-progress (WIP) systems
- Financial planning and budgeting software

    - Costing systems
    - Enterprise resource planning (ERP) systems
    - Treasury management systems
    - Legal databases containing financial contracts

The euro was introduced on January 1, 1999. The full transition to a single euro currency will take place in a phased implementation. The transition timetable is listed below in Table 1–1.

TABLE 1–1   Euro Transition Timetable

Date	Milestone
By June 30, 1997	■ Legislation establishes the euro as a new currency
Spring 1998	■ Economic Monetary Union (EMU) members named ■ Bilateral exchange rates announced
January 1999	■ Conversion rates irrevocably fixed ■ Euro becomes legal currency ■ European Central Bank (ECB) now responsible for interest rates ■ Financial markets will operate in euro ■ Private sector free to use euro

TABLE 1–1   Euro Transition Timetable   *(continued)*

Date	Milestone
Until December 31, 2001	■ National currencies co-exist with euro ■ Businesses free to use euro or national currency ■ Only national currency bank notes/coins used ■ No euro bank notes/coins available ■ Users will include: wholesale financial markets, large multinationals, retail banking, small businesses (cross-border operations, etc.)
January 1 - June 30, 2002	■ Euro bank notes/coins to be introduced in member countries, will circulate alongside national bank notes/coins
July 2002 (at the latest)	■ National bank notes/coins will be withdrawn ■ Euro will replace national bank notes/coins

The Solaris operating environment provides input, output, and printing support for the euro, as well as system support for ISVs wanting supported APIs to format monetary strings using the euro symbol.

Euro Currency Implementation

In the Solaris operating environment, euro support is achieved without any API changes. Instead, a new set of locales and locale extensions for single-byte and multibyte environments are provided. The codeset used by the single-byte locales is that defined by ISO/IEC 8859-15:1999.

The ISO 8859–15 codeset was created to support additional French and Finnish characters and the euro. The euro is assigned position \xA4 in the ISO 8859-15 codeset. (For this whitepaper, ISO 8859-15 is discussed only in regard to the euro.)

The euro is supported in a multibyte environment through the existing Unicode locales. Special locale extensions, however, are necessary for both single-byte and multibyte locales to support locale-specific euro currency formatting (dual-currency handling).

2.1 Euro Currency Support in Single-Byte Locales

The Solaris operating environment provides a set of single-byte locales to support the euro. In each locale, a user can input, output, and print the euro.

TABLE 2–1   Single-Byte Euro Locales

Locale	Country
da_DK.ISO8859-15	Denmark
de_DE.ISO8859-15	Germany
de_AT.ISO8859-15	Austria
en_GB.ISO8859-15	United Kingdom
en_IE.ISO8859-15	Ireland
es_ES.ISO8859-15	Spain
fi_FI.ISO8859-15	Finland
fr_FR.ISO8859-15	France
fr_BE.ISO8859-15	Belgium
it_IT.ISO8859-15	Italy
nl_NL.ISO8859-15	Netherlands
nl_BE.ISO8859-15	Belgium
pt_PT.ISO8859-15	Portugal
sv_SE.ISO8859-15	Sweden

If an application formats currency strings using the Solaris internationalization APIs, however, national currency formatting rules apply instead of euro currency formatting rules in the locales listed in Table 2–1.

Because most users want to continue using their national currencies during the earlier part of the transition period, Sun has opted to provide national currency support for these locales rather than euro currency support. Users may still input, output, and print the euro during the transition period. For users and developers who want both

input, output, and print support and locale-specific euro currency formatting, the Solaris operating environment provides an extension to each ISO 8859-15 locale.

2.1.1 Locale-Specific Euro Currency Formatting ("@euro" Extension)

As for other currencies, the euro is a cultural element—each country will format euro currency strings using its own national convention. The ISO 8859-15 locales use national currency conventions to format currency strings. To provide locale-specific euro currency formatting, the Solaris operating environment provides a "@euro" extension to these locales. The "@" modifier is part of the XPG-4 standard and allows finer granularity in locale definitions.

For example:

`fr_FR.ISO8859-15` uses national (French) currency formatting rules.
`fr_FR.ISO8859-15@euro` uses euro currency formatting rules.

Each ISO 8859-15 locale supports the "@euro" extension.

Note - Locales with the "@euro" extension are not available to users in the language selection during login. They are provided to support currency string formatting for the euro.

2.1.2 Dual-Currency Support in the Euro Locales

In the Solaris operating environment, accessing locale data in ISO 8859-15 is no different than any other locale. For more information on locale-specific data, refer to the latest Solaris *International Language Environments Guide*. However, using these locales in a dual-currency environment requires additional explanation.

One business requirement during the transition period (January 1, 1999 to December 31, 2002) is to display prices in both the national currency and the euro. The Solaris operating environment supports both using the "@euro" extension as shown in the program example below.

Example: Dual-Currency Handling in Solaris

```
#include <stdio.h>
#include <math.h>
#include <ctype.h>
#include <locale.h>
#include <monetary.h>
char buf[20];
main(argc,argv)
int argc;
char *argv[];
```

```
{
 double num = atoi(argv[1]);
 setlocale(LC_MONETARY, "fr_FR.ISO8859-15");
 strfmon(buf, sizeof(buf), "%n", num);
 printf("National currency format is  %s\n",buf);
 strfmon(buf, sizeof(buf), "%i", num);
 printf("International currency format is %s\n",buf);
 setlocale(LC_MONETARY, "fr_FR.ISO8859-15@euro");
 num=num*2; strfmon*buf, sizeof(buf), "%n", num);
 printf("National currency format is %s\n",buf);
 strfmon(buf, sizeof(buf), "%i", num);
 printf("International currency format is %s\n",buf);
}
```

Note - For illustration purposes, the following example uses a fictional exchange rate conversion (1 French Franc = 2 euro). Exchange rate support is not provided in the Solaris operating environment and should be handled by the application.

The output is: show below in Figure 2–1.

```
National currency format is 123,00 F
International currency format is 123,00 FRF
National currency format is 246,00 €
International currency format is 246,00 EUR
```

Figure 2–1   Euro sample output

Note - To change locales in a multithreaded application, setlocale() should be called prior to using any locale-sensitive routine. Using setlocale() to query the current locale is safe, and can be used anywhere in a multithreaded application.

2.1.3   Locale Settings for ISO 8859-15 Locales

Locale settings (LC_* but excluding LC_MESSAGES) are defined in the Solaris locale definition files. These files are defined and supplied by Sun's Localization Centers and are based on XPG-4 specifications. For further information on the format of locale definition files, refer to *Internationalization Guide, Version 2: Open Group Guide*. The detailed changes made to the LC_* settings of ISO 8859-15 locales to support the euro are listed below.

2.1.3.1   LC_MESSAGES

LC_MESSAGES for each ISO 8859-15 locale is symbolically linked to its ISO 8859-1 equivalent. It is possible that this linkage will cause codeset compatibility issues, since messages will be encoded in ISO 8859-1 and not ISO 8859-15. This should have

minimal impact, however, because the characters being replaced in ISO 8859-1 are rarely used.

2.1.3.2 LC_TIME, LC_NUMERIC

`LC_TIME` and `LC_NUMERIC` in the ISO 8859-15 locales will be in the same format as their ISO 8859-1 locale equivalents.

2.1.3.3 LC_CTYPE, LC_COLLATE

`LC_CTYPE` and `LC_COLLATE` will be <locale>_iso8859-15 specific. Most of the delta characters in ISO 8859-15 (those different from ISO 8859-1) can be classified as uppercase or lowercase, thus requiring a locale-specific ISO 8859-15 classification. The delta characters will also be sorted differently than the characters that they replaced in ISO 8859-1 and must use a separate locale-specific ISO 8859-15 sort sequence.

2.1.4 Locale Settings for ISO 8859-15 "@euro" Extensions

The only difference between ISO 8859-15 locales and their "@euro" extensions is in `LC_MONETARY`. In locales using the "@euro" extension, `LC_MONETARY` will contain locale-specific formatting information for the euro.

2.2 Euro Currency Support in Unicode Locales

To work in a multilingual and multiscript environment, the Solaris operating environment provides multibyte Unicode (UTF-8) locales. All UTF–8 locales contain the euro currency symbol at position \x20AC and, thus, no additional codeset is required to support the euro in the Solaris multibyte environment.

In all UTF-8 locales, users can input, output, and print the euro currency symbol. If an application formats currency strings using the Solaris internationalization APIs, however, national currency formatting rules apply instead of euro currency formatting rules. Locale-specific euro currency formatting is supported for multibyte locales through the "@euro" extensions.

For example:

`fr.UTF-8` uses national (French) currency formatting rules. `fr.UTF-8@euro` uses euro currency formatting rules.

Dual-currency support in the UTF-8 locales and their extensions is the same as that in single-byte locales.

2.2.1 Locale Settings for Unicode "@euro" Extensions

The only difference between the Unicode UTF-8 locales and their "@euro" extensions is in `LC_MONETARY`. In locales using the "@euro" extension, `LC_MONETARY` will contain locale-specific formatting information for the euro.

2.3 Input and Output Support

Input and output support information is detailed below for keyboards, fonts, and codeset conversion.

2.3.1 Keyboard Support

In April 1998, the European Commission (EC) recommendations on the euro currency symbol keyboard location referred to the three main functional levels in keyboard standards:

- Level 1: press `m` to produce "m".

- Level 2: press `Shift+m` to produce "M".

- Level 3: press `AltGraph+a` on a UK keyboard to produce "à".

The European Commission (EC) proposed a short-term and long-term solution. The short-term solution was to place the euro currency symbol on the "E" key at Level 3. Here, the euro is generated by pressing two keys: `AltGraph+e`. The EC also recommended that the symbol be engraved on the keytop, which is common practice for many Level 3 characters on European keyboards (for example, German).

The short-term solution was chosen because it can be implemented easily on most national keyboards and is ergonomically sound. The key combination is also easy to remember, since "e" can be associated with "euro". Some countries (United Kingdom and Ireland), however, already use `AltGraph+e` to produce the "è" character. The EC has offered some alternative solutions for these countries. One alternative is to place the euro currency symbol at Level 3 on Keys "3" or "4", both of which already contain currency signs at Level 2 on most keyboards.

The long-term proposal is to introduce a new euro currency-symbol key on future keyboards. This new key would be in a common position at Level 1 for all countries.

2.3.1.1   Sun Keyboard Strategy

Sun has adopted the short-term proposal for the euro currency symbol keyboard location. The euro will be placed at Level 3 and will be generated by pressing `AltGraph+e`. For national keyboards with contentions (United Kingdom, Ireland, U.S. International), the euro will also be placed at level 3 but will be generated by pressing `AltGraph+4`. On U.S. International keyboards, the euro can also be generated by pressing `AltGraph+5` or `AltGraph+e`. On keyboards in the United Kingdom, the euro can also be generated by pressing `AltGraph+e`. The following table summarizes the euro currency symbol location on Sun Type 6 keyboards.

TABLE 2–2   Euro currency symbol location on Sun Type 6 Keyboards

Type 6 Keyboard	EU Member	Location
U.S.	No	`AltGraph+4`
UNIX	No	`AltGraph+e`
UNIX/Logoless	No	`AltGraph+e`
French	Yes	`AltGraph+e`
Danish	Yes	`AltGraph+e`
Italian	Yes	`AltGraph+e`
Netherlands/ Dutch	Yes	`AltGraph+e`
Norwegian	No	`AltGraph+e`
Portuguese	Yes	`AltGraph+e`
Spanish	Yes	`AltGraph+e`
Swedish	Yes	`AltGraph+e`
Finnish	Yes	`AltGraph+e`
Swiss/French	No	`AltGraph+e`
Swiss/German	No	`AltGraph+e`

TABLE 2–2 Euro currency symbol location on Sun Type 6 Keyboards *(continued)*

Type 6 Keyboard	EU Member	Location
UK	Yes	`AltGraph+4`
Ireland	Yes	`AltGraph+4`

2.3.1.2   Keyboard Input in UTF-8 Locales

Sun also provides two additional methods to input the euro:

- Unicode Hex and Unicode Octal input method

- Table lookup method

In the Unicode Hexadecimal input method, the user generates the euro currency symbol by typing the Unicode value for the symbol (`U+20AC`).

In the table lookup method, the user presses `Compose+Control+L`, which lists the possible scripts. Choose "Latin" and then the euro from the character table.

2.3.2   Font Support

The following fonts have been added to the Solaris operating environment to allow the euro to display and print:

```
monotype-arial-bold-i-normal--0-0-0-0-p-0-iso8859-15
monotype-arial-bold-r-normal--0-0-0-0-p-0-iso8859-15
monotype-arial-regular-i-normal--0-0-0-0-p-0-iso8859-15
monotype-arial-regular-r-normal--0-0-0-0-p-0-iso8859-15
monotype-courier-bold-i-normal--0-0-0-0-p-0-iso8859-15
monotype-courier-bold-r-normal--0-0-0-0-p-0-iso8859-15
monotype-courier-regular-i-normal--0-0-0-0-p-0-iso8859-15
monotype-courier-regular-r-normal--0-0-0-0-p-0-iso8859-15
monotype-times-bold-i-normal--0-0-0-0-p-0-iso8859-15
monotype-times-bold-r-normal--0-0-0-0-p-0-iso8859-15
monotype-times-regular-i-normal--0-0-0-0-p-0-iso8859-15
monotype-times-regular-r-normal--0-0-0-0-p-0-iso8859-15
```

Note - For Asian locales, euro support is Asian UTF-8 locales only.

There are no additional tasks to access the new euro fonts. For information on accessing fonts in X, refer to the *X Window System User's Guide*.

2.3.3 Printer Support

The Solaris operating environment does not assume that printers have the correct installed fonts. System fonts are downloaded to the printer with the document. Euro fonts will also be downloaded to the printer when printing documents in the ISO 8859-15 or UTF-8 locales.

2.3.4 Codeset Conversion

Codeset conversion support for roundtrip conversion between ISO 8859-15 and UTF-8 using new `iconv(1)` modules has been added to the Solaris operating environment. Users can access these modules via the `iconv(1)` command. Developers can access these modules via the `iconv(3)` function. The Common Deskset Environment (CDE) `dtmail` utility has also been modified to ensure that outgoing e-mail based on ISO 8859-15 is tagged accordingly. Support has also been added in `dtmail` to ensure appropriate codeset conversion of incoming ISO 8859-15, MIME-compliant e-mail. Codeset conversion applies only if `dtmail` is running in a UTF-8 locale.

Euro Support Availability

A.1 Solaris Operating Environment

Support for the euro currency symbol is available in the following locales (locale plus "@euro" extension:

- `de_DE.ISO8859-15`
- `es_ES.ISO8859-15`
- `fr_FR.ISO8859-15`
- `it_IT.ISO8859-15`
- `sv_SE.ISO8859-15`
- `da_DK.ISO8859-15`
- `de_AT.ISO8859-15`
- `en_GB.ISO8859-15`
- `en_IE.ISO8859-15`
- `fi_FI.ISO8859-15`
- `fr_BE.ISO8859-15`
- `nl_NL.ISO8859-15`
- `pt_PT.ISO8859-15`

A.2   Information Technology Standards

The following international standards have been registered. For more information on international euro standards, refer to http://www.stri.is/TC304/Euro/default.html.

- Codesets: The Euro is included in the multi-octet Universal Character Set (ISO/IEC 10646-1 AM 18, and UNICODE) as the EURO SIGN at position '20AC'. The Euro is included in the 8-bit ISO/IEC 8859-15 "Latin-9" codeset as the EURO SIGN at position 'A4'.

- Keyboard: The Open Workshop on the Euro in IT Standardization and CEN TC304 support `AltGr+e` in the primary layout. 1.

- Currency codes: The currency code is registered as 'EUR' and '978' with the international registration authority BSI (British Standards Institute), according to standard ISO 4217.

- Markup Languages: In HTML, the Euro sign is referred to as '€'.

A.3   Useful Euro Links

Information on the transition to the euro currency can be found at the following links. These URLs are accurate as of May 2000.

- The IT impact of the euro: `http://www.ispo.cec.be/y2keuro/euroit.htm`

- The official euro Web site of the European Commission: `http://europa.eu.int/euro/`

- "Preparing Financial Systems for the euro" `http://www.ispo.cec.be/y2keuro/src/wdiseuro.htm`

Patches can be obtained from the following Sun Web site:

- http://www.sun.com/solaris/euro/

Support for the euro will also be included in future releases of the Solaris operating environment.

A.4　Java Software

Support for the euro currency is available in JDK 1.1.7 software and later. JDK versions are available from http://www.javasoft.com/.