Euro Currency Support in the Solaris™ Operating Environment

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Preface

The introduction of the euro as the single European currency will have a profound impact on the way enterprises operate; it will most likely be the most important change in the economic landscape in Europe over the next few years. The transition to the euro also has a number of practical consequences for the day-to-day operations of enterprises, such as the need for information systems to be prepared for the use of the euro. To fulfill this need, careful planning is essential. However, recent surveys have shown that few enterprises, except perhaps for large banks and insurance companies, are actually preparing themselves for the introduction of the euro.

The impact of the euro is far-ranging, and not limited solely to European companies. Anyone with the need to conduct a financial transaction with a European customer or supplier will find it necessary to modify their information systems to support the euro. Many of these companies will not be located in Europe, for in today's global economy, the distinction of geographical location becomes increasingly blurred over time.

Examples of systems that are affected by the introduction of the euro include:

- Accounting software (general ledger)
- Electronic payment and trading systems
- Invoicing and billing systems
- Payroll systems
- Accounts receivable and accounts payable sub-ledgers
- Inventory systems that record the value of the inventory
- Fixed asset systems that monitor 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

Planning the transition for information systems to handle the use of the euro is not just a matter of dealing with the practical issues and consequences. For many enterprises, there will be strategy-level issues that need attention. These issues will fundamentally affect the way an enterprise conducts business.

Any changes in the business environment, such as the introduction of the euro, change the expected functionality of information systems. These strategic considerations do not specifically fall within the scope of this white paper, but should certainly be taken into account before modifying those systems for the use of the euro.

The transition to the single euro currency will take place in a phased implementation, for which a timetable has been set:

TABLE 1 Timetable for Transition to the Euro

Timeframe	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
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 preparations for the introduction of the euro on January 1, 1999 are well underway. This document outlines the technical implementation of support for the euro within the Solaris™ operating environment and provides guidance to developers who are tasked with the transition of application or information systems to support the euro currency standard.

The Solaris operating environment and the Java™ language provide input, output, and printing support for the euro, as well as system support for ISVs who wish to use supported APIs to format monetary strings. The following sections detail how euro currency support is implemented.

CHAPTER 1

The Euro in Information Technology Standards

Since the euro currency will be used on a global scale, the euro is being registered in several international standards. The following reflects the status (at the time of writing) of the euro with regard to Information Technology Standards.

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

  A new ISO 8859 codeset, incorporating the euro and other “required” characters (Latin 0 – ISO/IEC JTC 1/SC 2/WG 3 N2910), is due to become an International Standard in July 1998.

- 8-bit code table registration

  Proposals exist for the registration of a number of code pages, each of which mirrors the G1 sets of ISO/IEC 8859, where the INTERNATIONAL CURRENCY SIGN is replaced by the euro. At the time of writing, these proposals were being actively debated.

- ISO/IEC 9995-3 Keyboards

  A new draft of this standard is being balloted, which includes the euro in the common secondary layout. This placement provides for the inclusion of the euro in those keyboards where the primary layout does not already include the euro. This enables national standards to define primary layouts for local use without a conflict on the position. Both the European Commission and Microsoft are agreed on the use of AltGraph+E to represent the euro on most primary layouts.

- ISO 4217:1995 Codes for the representation of currencies and funds

  Banking and electronic commerce generally use a 3-letter code to represent particular currencies; these codes are registered at the international level by adoption into ISO 4217. The European Commission (Secretariat General), working with banks and industry, have approached the maintenance authority (BSI) for ISO 4217 and have had "EUR" registered as the 3-letter currency code for the euro.

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

  There is currently no 2-letter country code available for the “European Union”. The ISO 3166 Maintenancy Agency in Berlin believes the European Union to be outside the scope of ISO 3166. However, the 2-letter code “EU” has been reserved.

- ISO/IEC 10036:1996 Information technology – Font information interchange – Procedures for registration of font-related identifiers

  The euro symbol glyph (rounded E with a double central bar) has been registered by the AFII (Association for Font Information Interchange) as a part of ISO/IEC 10036:1996. The ISO Glyph ID is 8959. The glyph is shown below:

- W3C-HTML 4.0

  The code `&EURO` is proposed for HTML 4.0.

- SO/IEC 10646-1:1993 Information technology – Universal Multiple-Octet Coded Character Set (UCS) – Part 1: Architecture and Basic Multilingual Plane

  Unicode 2.1 will include the euro currency symbol at position `hex20AC`. CEN TC304 will include the euro currency symbol in three Multilingual European Subsets currently in development for registration in ISO/IEC 10646-1.

Note – Users should not use `hex20A0` – EURO CURRENCY SIGN for the euro currency symbol. This position was a placeholder for the ECU.

CHAPTER 2

Euro Currency Implementation

Support for the euro in the Solaris operating environment is achieved without any API changes. Instead, support is achieved by providing a new set of locales and locale extensions for single-byte and multibyte environments. The single-byte locales are based on a new, proposed ISO 8859 codeset: ISO 8859-15 (Latin 9). This new codeset is being introduced to support additional characters for French and Finnish, and to support the euro.

The euro has been placed at position `10/04` in the new ISO 8859-15 codeset. In this document, we will only discuss ISO 8859-15 with regard to the euro.

A new codeset is not required in the multibyte environments because the Solaris operating environment multibyte locales are based on Unicode.

Additionally, special locale extensions are necessary for both single-byte and multibyte locales to support locale-specific euro currency formatting with regard to dual-currency handling.

Euro Currency Support in Single-Byte Locales

The Solaris operating environment provides a new set of single-byte locales to support the euro. To use the euro, users must be running in one of the locales defined in the following table. In all of these locales, users can input, output, and print the euro.

TABLE 1 Single-Byte Euro Locales in the Solaris Operating Environment

Locale	Country
da.ISO8859-15	Denmark
de.ISO8859-15	Germany
de_AT.ISO8859-15	Austria
en_GB.ISO8859-15	United Kingdom
en_IE.ISO8859-15	Ireland
es.ISO8859-15	Spain
fi.ISO8859-15	Finland
fr.ISO8859-15	France
fr_BE.ISO8859-15	Belgium
it.ISO8859-15	Italy
nl.ISO8859-15	Netherlands
nl_BE.ISO8859-15	Belgium
pt.ISO8859-15	Portugal
sv.ISO8859-15	Sweden

However, national currency formatting rules will apply rather than euro currency formatting rules if an application formats currency strings using the Solaris internationalization APIs.

Sun has opted to provide national currency support for these locales rather than euro currency support. This is because most users wish to continue to use their national currencies during the earlier part of the transition period. During this time, however, users may still input, output, and print the euro. To facilitate those users and developers who wish to have input, output, and print support as well as locale-specific euro currency formatting, the Solaris operating environment provides an extension to each ISO 8859-15 locale.

Locale-Specific Euro Currency Formatting (“@euro” Extension)

The euro, like any other currency, has a cultural element. In other words, individual countries will use their own national conventions for formatting euro currency strings. The ISO 8859-15 locales in the Solaris operating environment will use national currency conventions when formatting 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.ISO8859-15`	Uses national (French) currency formatting rules
`fr.ISO8859-15@euro`	Uses euro currency formatting rules.

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

Dual-Currency Support in the Euro Locales

Accessing locale data based on ISO 8859-15 is no different from accessing locale data for any other locale in the Solaris operating environment. Users should refer to the *Solaris Internationalization Guide For Developers* for further information. However, using these locales in a dual-currency environment requires additional explanation.

One of the requirements for business during the transition period (January 1, 1999 to December 31, 2002) is to display prices in both the national currency and in the euro. The Solaris operating environment provides support for this through the “@euro” extension to its locales. An example program shows how this can be achieved.

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

Example: Dual-Currency Handling in Solaris

```
#include &lt;stdio.h>
#include &lt;math.h>
#include &lt;ctype.h>
#include &lt;locale.h>
#include &lt;monetary.h>
char buf[20];
main(argc,argv)
int argc;
char *argv[];
{
double num = atoi(argv[1]);

setlocale(LC_MONETARY, "fr");
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.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);
}
```

The output from this program is:

```
National currency format is 200,00 F
International currency format is 200,00 FRF
National currency format is 400,000 €
International currency format is 400,00 EUR
```

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.

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 content of locale definition files, please refer to the *X/Open Internationalization Guide Version 2.* Following are the detailed changes made to the `LC_*` settings of ISO 8859-15 locales in order to support the euro.

LC_MESSAGES

`LC_MESSAGES` for each ISO 8859-15 locale will be 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, however, have minimal impact since the characters being replaced in ISO 8859-1 are rarely used.

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.

LC_CTYPE, LC_COLLATE

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

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.

Euro Currency Support in Unicode Locales

The Solaris operating environment provides multibyte Unicode (UTF-8) locales to enable users to work in a multilingual and multiscript environment. These UTF-8 locales are based on Unicode 2.1, which contains the euro currency symbol at position `hex20AC`. Therefore, 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. However, national currency formatting rules will apply rather than euro currency formatting rules if an application formats currency strings using the Solaris internationalization APIs. 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.

Note – In future releases of the Solaris operating environment, Sun will include support for UTF-8 versions of other European locales.

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.

Input and Output Support

Keyboard Support

In April 1998, the European Commission (EC) issued recommendations on the placement of the euro currency symbol on computer keyboards. The EC recommendation refers to the three main functional levels in keyboard standards:

- Level 1: press “M” key to produce “m”
- Level 2: press SHIFT and “m&” to produce “M”
- Level 3: press AltGraph key and “A” on a UK keyboard to produce “à“

The European Commission proposed both a short-term and long-term solution. The short-term proposal is to place the euro currency symbol on the “E” key at Level 3. This means that the euro may be generated by pressing two keys: AltGraph and “E”. The EC also recommends that the symbol be engraved on the keytop, which is common practice for many Level 3 characters on European keyboards (e.g. German). This short-term solution was chosen because it can be implemented easily, it can be used on most national keyboards and is ergonomically sound. The key combination is also easy to remember, since “E” can be associated with “euro”.

However, some countries (e.g. United Kingdom, Ireland) already use AltGraph+E key combination to produce the “è” character. The European Commission 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.

Sun Keyboard Strategy

Sun has adopted the short-term proposal for placement of the euro currency symbol on keyboards. The euro will be placed at Level 3 and will be generated by AltGraph+E. For national keyboards where there is contention (e.g. United Kingdom, Ireland, US International) the euro will also be placed at level 3 but will be generated by the AltGraph+4 key combination. On US International keyboards, the euro may also be generated using the AltGraph+5 or AltGraph+E key combinations. On keyboards in the United Kingdom, the euro may also be generated using the AltGraph+E key combinations. The following table summarizes the placement of the euro currency symbol on Sun Type 6 keyboards.

TABLE 2 Placement of the euro currency symbol on Sun Type 6 Keyboards

Type 6 Keyboard	EU Member	Placement
US	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
UK (Ireland)	Yes	AltGraph+4

Keyboard Input in UTF-8 Locales

Sun also provides two additional ways of inputting the euro:

- Unicode Hexadecimal code input method
- Table lookup method

In the Unicode Hexadecimal input method, the user can generate the euro currency symbol by switching into this input method and typing the Unicode value for the symbol (U+20AC).

Users can also use a table lookup method to generate the euro. This input method is activated by pressing Compose and then Control+L, which will provide a list of possible scripts. Choose “Latin”, then choose the euro from the table of characters.

Font Support

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

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

No additional tasks are necessary for users or developers to access the new euro fonts. Users should refer to their X Window System documentation for information on accessing fonts in X.

Printer Support

In the Solaris operating environment, it is not assumed that printers will have the correct fonts installed. System fonts are downloaded to the printer with the document to be printed. Likewise, euro fonts will be downloaded to the printer automatically when printing documents in the ISO 8859-15 or UTF-8 locales.

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. Likewise, support has been added in `dtmail` to ensure appropriate codeset conversion of incoming ISO 8859-15, MIME-compliant e-mail. Codeset conversion will only happen if the local `dtmail` is running in a UTF-8 locale.

CHAPTER 3

Euro Support Availability

The Solaris Operating Environment

Support for the euro currency symbol is available in the following locales:

TABLE 1 Euro locales

Locale (plus “@euro” extension)
de.ISO8859-15
es.ISO8859-15
fr.ISO8859-15
it.ISO8859-15
sv.ISO8859-15
da.ISO8859-15
de_AT.ISO8859-15
es.ISO8859-15
en_GB.ISO8859-15
en_IE.ISO8859-15
fi.ISO8859-15
fr_BE.ISO8859-15
nl.ISO8859-15
pt.ISO8859-15

Patch Availability:

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.

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/`.

CHAPTER 4

Useful Links on the World Wide Web

The following links provide useful information regarding the transition to the euro currency.

Note – These URLs were accurate at the time of writing.

- 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`

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