

The Solaris™ Operating Environment — Opening Global Markets

A Technical White Paper



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Chapter 1

Introduction

In the beginning there was commerce. And commerce was simple, because businesses were small and served only local communities. Today, business is much more complex and wide ranging. Relationships with customers, partners, and suppliers span provincial, national, and international boundaries. With the unprecedented growth of the Internet, the rules of business commerce are dramatically changing. Any company that relies upon the Internet to conduct business must consider the global market from the moment it opens its doors. Each geographical market or locale has unique language, culture, and business practices that must be considered within internal and external business operations.

The global economy is changing as well. Some countries are making technology a driver for new national economies, leaping from agricultural or industrial bases into knowledge-based markets. While technology markets are maturing in North America, Europe, and Japan, nations such as China and India are experiencing explosive growth. Governments within these new emerging markets are rapidly adjusting their laws to accommodate the evolving demands of a technology-based economy. In a virtual world where speed is king and laws are still evolving, businesses must be attuned to the changing dynamics of a global, interconnected marketplace. Their employees, partners, suppliers, and customers can be located anywhere in the world and want to exchange multilingual information from any number of devices, including traditional desktops, information kiosks, and wireless devices.

To meet the needs of such a diverse, global environment, a company's network system infrastructure must be built from the start to accommodate the complexity of a heterogeneous, multi-lingual network. Data integrity must be maintained as files are served and retrieved in multiple languages and cultural environments from many different kinds of network devices on a range of platforms. If the underlying operating system infrastructure is flexible and expandable, the cultural challenges are easier to manage.

The Solaris™ Operating Environment (OE), offers a single, global solution, with support for 39 languages and 162 geographic locales in a unified package. Sun built the Solaris OE around open standards, giving it flexibility to react to an ever-changing world. With Solaris software, customers can easily exchange data between varying language representation formats and diverse platforms (including Microsoft Windows, Macintosh, and Linux). In the global marketplace, the language of business is the language of the customer. Solaris software eliminates language barriers.

Chapter 2

Forethought of Design in Globalization

A decade before the Internet became significant, Sun recognized that network computing would demand universal design principles that could evolve with changing global standards. So Sun engineers built a system architecture that considered language handling features from the beginning, instead of as afterthoughts in product development. In collaboration with other industry leaders, Sun helped develop standards for how language data would be represented, displayed, printed, transported, and exchanged across a network. To achieve maximum flexibility in adapting to these evolving standards, language and cultural-specific elements were considered early in the design of the Solaris Operating Environment.

These design principles include:

- True internationalization of the core system infrastructure
- Pluggable architecture for maximum interoperability
- Open standards for global computing

True Internationalization

The Web requires software to be global ready — meaning that it can be developed independently of the countries or languages of its users, and then “localized” for multiple countries or regions. Developers need a common foundation for language handling so they can avoid rewriting software for each individual market region. If the system infrastructure can provide a language-neutral approach to application development, developers can more easily create global-ready software.

Sun engineers built the Solaris globalization architecture to transparently separate and hide language-specific details from application programming interfaces (APIs), allowing software applications to inherit language support from the underlying platform. With a system infrastructure for cultural and linguistic handling, developers can write a single application binary and deploy it in any supported language environment simply by following a consistent set of APIs.

Since Solaris software provides backward- and forward-compatibility features, developers need not rewrite applications each time there is an upgrade to the operating environment. Legacy applications that the customer has used on previous versions of the Solaris OE will still work on new releases, without additional cost upon upgrade. In contrast, most other operating platforms require both an application code change and a recompile each time the OS is upgraded.

Pluggable Architecture Provides Extensibility

The Solaris OE internationalization architecture provides a flexible, pluggable method of handling input methods, character set encodings, codeset conversion, and other basic aspects of language services. With the Solaris OE, application developers have the power of choice. They may choose to rely upon the powerful tools already provided, or opt to customize the development environment to their needs. By simply following standard interfaces, developers can deploy applications in multiple language environments without knowing how, for example, the underlying input method engines work. However, if they wish to customize particular language attributes, such as changing convertor tables or adding a new input method editor, the architecture allows them to plug in custom solutions. The Solaris architecture was designed for extensibility.

Open Standards Provide Flexibility

Networks were created to exchange information. As multiple networking systems evolved, computer system manufacturers and developers began to collaborate on common protocols which would make it easier for data to be transported across multiple platforms. With common standards, application developers would no longer have to choose only one platform to deploy their software, because they could easily write software for different platforms and markets. This design principle led to a number of innovations in open standards for global computing. Open standards provide more cross-platform agility and therefore, greater market opportunity for the development community.

Solaris engineers have been actively participating in driving industry standards for global computing since the early 1990s. Currently, Sun employees serve on the board and as technical committee members of the Unicode Consortium, the Free Standards Group, the Linux Internationalization Initiative, X.Org, the Worldwide Web Consortium (W3C), and the Open Group, to name a few. Sun understands the value of designing systems for maximum flexibility by leveraging open standards in global computing. This has led the company to focus its attention on relevant standards developments in all parts of the globe. By continually anticipating significant events in the standards arena, the Solaris OE continues to build upon world-class development in global computing.

Code Release Demonstrates Commitment

Both Linux and the Solaris OE embed the X11 Window System, and many open source applications are deployed on both environments. Since the internationalization architecture for Linux is still evolving, many Linux applications require additional customized code for each spoken language and locale.

Sun recognized that true internationalization and common open standards would encourage cross-platform data sharing, and so in the fall of 2000, Sun decided to release the source code of its internationalization infrastructure within X11 to the open community through X.Org.

This code, made available under the X license, provides open source software developers with an easy way to design applications that operate in virtually all national language environments within Linux and UNIX®. Developers may use this code to enhance compatibility and interoperability of global applications by following a common reference implementation for true internationalization. Having all of the code available allows programmers to easily customize locales, design proprietary input methods, and quickly debug and alter the application environment.

The decision to release the Solaris Operating Environment X internationalization enhancements under a commonly recognized open source license emphasizes Sun's ongoing commitment to improve standards for global application development in the open source community.

Chapter 3

Solaris Globalization Infrastructure

Unified Global Product Structure: 39 Languages, 162 Locales

The Solaris 9 Operating Environment includes support for 39 languages and 162 geographic locales in a single, global product structure. This unified global packaging approach greatly simplifies the deployment, development, and testing of applications for international markets. On many competitive platforms, users and developers must purchase multiple media kits localized for each global market region. For a multinational corporation, purchasing multiple media kits for worldwide deployment can be costly and complicated. Without a single global binary, developers must spend additional time and money creating and testing applications for multiple locale environments.

Based upon a single binary architecture, the Solaris 9 Operating Environment supports both internationalization and localization. Customers need purchase only one product for deployment around the world, as it includes all language support. This single-product approach allows developers to write one binary which can be tested for all supported languages within the same product. In this way, Solaris software simplifies global development and deployment.

Codeset Independence (Unicode/Native)

Part of Sun's universal design principle is the adoption and implementation of Codeset Independence (CSI) in the platform architecture. This means that the platform does not make any assumptions about the codeset it needs to process. Usually, locale-specific features (such as keyboard input methods, text display, and printing) are tied to specific codesets, and every time a character encoding standard changes, platform source code must be adapted. CSI makes it easier

for the platform to easily adapt to evolving standards. Any geographic locale or language codeset can be added to the system without a major reconfiguration of the source code.

With CSI, the Solaris OE can easily adapt to changes in language encoding, both in open standards efforts (Unicode), as well as national, mandated standards for language handling (GB18030). An application that has been properly internationalized will automatically inherit locale support (whether Unicode or native) from the underlying system, without a costly recompile for each upgrade of the Solaris OE.

Unicode, also called Universal Codeset, is a universal character encoding scheme developed by the Unicode Consortium, a nonprofit industry coalition. The Unicode standard was created to represent characters from all languages of the world. It encompasses most alphabetic, ideographic, and symbolic characters used on computers today. Unicode is now supported by nearly all major international industry standards, Internet protocols, and software development environments. Because of this, Unicode locales provide users with many advantages in cross-platform computing. Using a single codeset enables applications to support text from multiple language scripts in the same documents without requiring special fonts or changing locales.

For example, users can read their e-mail correctly in French, while the desktop itself displays a Japanese Unicode language environment. Within any Unicode environment, e-mails can be exchanged with a combination of several languages in the same mail, including bidirectional text such as Arabic or Hebrew. Unicode also permits files from different languages to be easily exchanged across the network. Using Unicode as a basis for data interchange, network environments with distributed applications can give individual users simultaneous access to multiple language environments.

The Solaris Operating Environment treats Unicode locales in the same way as all other locales. Users can choose to load the Unicode locale for their language, or rely upon popular native encodings instead. Viewing and editing documents or running applications with different codesets is simply a matter of selecting or specifying a locale which supports that particular codeset, with no need to reboot or reconfigure the system. For application interoperability, an extensive set of codeset converters is available to convert between native and Unicode codesets. Language support is built in from the start. This is one way Solaris OE scales with the growth of business needs worldwide.

Cross-Platform Interoperability

The Solaris OE provides a rich set of data converters to ensure interoperability between various formats for representing characters (Unicode, EUC, and so on) and various platforms (Microsoft Windows, Linux, and Macintosh). Users are no longer penalized because of changing network topologies and standards. With transparent code conversion, language files from various environments can be freely exchanged without data corruption.

Data interoperability has been enhanced in the Solaris 9 Operating Environment with the addition of many new data converters. These useful utilities save users time by allowing them to operate within a preferred environment, and still view data encoded in an entirely different character set encoding. The Solaris 9 OE includes these enhancements to code conversion:

- Data conversion utilities for exchange between Unicode locales and government-mandated locales for the Chinese language, including GB18030 and the Hong Kong Supplementary Character Set (HKSCS)
- Support for code conversion between the Solaris OE and code pages from IBM and Microsoft

- Greater conversion support between Japanese Solaris locales and mainframe codesets from Fujitsu, Hitachi, and NEC
- Additional data conversion utilities between Solaris Unicode locales and the new Hindi encoding

Support for Complex Text Layout (CTL) Scripts

In many languages of the world, especially those based on Latin, Cyrillic, and Greek scripts, there is no difference between how text is stored for data processing and how it is presented on a display device or a printer. The text is read horizontally from left to right and the characters are stored in a manner identical to how they are processed. However, not all languages of the world share these characteristics. Some Middle Eastern and Southeast Asian languages including Arabic, Hebrew, Thai, Lao, and Hindi have complex characteristics, such as bidirectionality and context-sensitive shaping, that require special processing of characters or text-based data before actual rendering on display devices.

The Solaris Operating Environment contains patented support for CTL scripts in all Unicode locales for Arabic, Hebrew, Thai, and Hindi. CTL scripts are properly rendered as screen output or in printed form. To enable these CTL scripts, most applications need only be recompiled and linked to the new CTL library, without changing the source code. A CTL-supported application enables users to input, view, and display CTL text without any additional development work. Support for complex text layout environments is another example of how the Solaris Operating Environment opens new growth opportunities in emerging markets.

User Customizability

Solaris software enables users to build upon and customize their own environment. User-defined characters (UDC), for example, allow people to customize language characters. This capability becomes extremely useful for personal data, such as names and addresses, that are not available as part of a standard character set. In Chinese, for example, even though there are more than 30,000 glyphs in the language to choose from, a personal name or address may not be among them. With UDC, the Chinese user can create a Chinese character to represent their name or address, and easily add it to their local environment.

In addition, Solaris offers tools for creating user-definable code conversion between any two kinds of codesets. For example, a Japanese company may create a new character to represent the company logo, and wants its codeset to easily communicate with other codesets on the system. After adding the logo to its standard Japanese codeset, user-defined code conversion ensures compatibility.

The codeset conversion tool provided with the Solaris OE enables the creation of a table of all custom characters for any given encoding, enabling easier creation of codeset conversions. Through powerful globalization tools and robust code conversion support, Solaris software provides an ideal solution to customize network environments.

Chapter 4

Solaris 9 Broadens Market Opportunities

Many globalization enhancements have been added to the Solaris 9 OE to address changing global standards in emerging markets, particularly in Asia. As these developing markets become more active players on the global Internet, Solaris software provides a foundation to make the transition easy.

Today, it is easier than ever to run applications or view and edit documents within different language environments. The multilingual Solaris system permits users to operate a desktop in their native language, and simultaneously view and edit text documents in another language. Through a simple set of keystrokes or mouse clicks, users can easily switch input mechanisms to match the language of choice. Moreover, the information presented to the user can be correctly collated for the specified language and culture. A single, global binary enables the cost-effective development and deployment of multilingual applications from a single environment, without the complexity usually associated with multiple language kits.

Solaris 9 OE provides these new features to address a growing global marketplace:

- New language offerings of localized software
- Expanded Asian language support:
 - Chinese government-mandated GB18030 and HKSCS
 - Unicode locales for Thailand, India, Hong Kong
 - New Chinese layout features
 - More Asian input methods
 - Auxiliary window for managing Asian input methods

- More features for Europe, the Middle East, South America
 - Unicode locales for Belgium (Walloon), Brazil, Egypt, Finland, Poland, Spain, and Turkey
 - Euro default currency support
 - New European and Middle Eastern keyboard layouts
- Indic language support today and in the future
- Enhanced printing utilities for all locales
- Common font format for all locales
- New geo-specific software offerings
- Coming soon: GNOME software in 12 languages

Expanded Language Offerings for the Browser and Desktop

- New localized GUI for Netscape 6.2.2 on the Solaris OE in Brazilian Portuguese, Polish, and Russian via convenient download

When Solaris 9 ships, users will be able to download the Netscape 6.2.2 browser with localized user interface content not only in the core nine Solaris languages (French, German, Italian, Japanese, Korean, Spanish, Swedish, Simplified Chinese, and Traditional Chinese), but also in Brazilian Portuguese, Polish, and Russian.
- Additional translations of core CDE into Catalan, Polish, and Russian
- Users in Spain, Poland, and Russia can access localized content of the core CDE applications in Catalan, Polish, and Russian through the Extra Value directory located within the Solaris OE

Enhanced Asian Language Support

Solaris 9 greatly enhances the computing experience for users across Asia. Chinese users will be able to interact within the new, government-mandated multibyte character set, GB18030. Users in Hong Kong will find a popular local government standard for encoding (HKSCS), as well as conversion utilities to exchange data with Unicode environments. All Asian language users will benefit from better processing of native characters with new collation and input method utilities.

Specific features encompass these areas:

- New encoding support for Chinese GB18030 standard

In September 2001, the GB18030 standard became law in the People's Republic of China (PRC). GB18030 is a new, national character-set standard that all software products sold in the country must support. The Solaris OE received the highest rating the government provides (A+) for its level of compliance with GB18030.

The Solaris globalization architecture can now handle not only the more than 30,000 characters in Mandarin Chinese, but also minority languages such as Mongolian, Tibetan, Wei, and Yi. Applications running on the Solaris platform can easily process files encoded in GB18030, because the Solaris OE provides the platform support. These files can also be exchanged with legacy data from other language standards through a process of transparent code conversion. Due to codeset independence in the Solaris globalization framework, adapting to changing standards becomes another part of the universal design principle.
- New Unicode (UTF-8) locales for Hong Kong, India, Thailand

Users in India, Hong Kong, and Thailand will be able to join the universal world of Unicode and exchange messages, mail, and files with people using other platforms and language environ-

ments. All of the benefits provided by Unicode are now available for users in these important emerging markets.

- New Thai input method specified by the Thai government (WTT)

The Thai language requires compose-key sequences so that a standard keyboard can be used for character entry. The WTT keyboard input method standard is now mandated by law for all Thai-capable computer systems.

- Enhanced Chinese input methods (Chuyin, Cantonese)

With more than 30,000 characters in the Chinese language, the keyboard is often a barrier to high-speed data input. Solaris 9 now offers a much wider choice of popular, powerful input methods for Traditional Chinese locales (used in Hong Kong and Taiwan) and Simplified Chinese locales (used in the rest of the PRC). Chuyin provides methods for character input based on character sound and appearance. Chuyin is based on Bopomofo, a phonetic system, and is popular in Taiwan. Cantonese input methods are popular primarily in Hong Kong and the rest of southern China.

- New zh_HK.BIG5HK Locale Supports HKSCS for Hong Kong, China

The zh_HK.BIG5HK locale has been added to the Solaris 9 OE to support the Hong Kong Supplementary Character Set (HKSCS), which facilitates electronic communication in Chinese between Hong Kong local government departments and the public.

- New Chinese and Korean collation locales

Asian languages require different schemes for sorting data than Latin-based languages. Collation locales provide collation options to users, such as stroke count, as well as radical, phonetic, and dictionary options.

- New Auxiliary window for Chinese input methods

The Auxiliary window provides an input method user interface (UI) that is friendly and extensible for all Chinese locales. New functions supported by the auxiliary window include:

- Input method switching
- Input method properties configuration
- Look-up tables for GB2312, GBK, GB18030, HKSCS, CNS, Big-5, and Unicode character sets
- Code table management tool
- Visual keyboard

New Features for Europe, the Middle East, South America

- New Unicode (UTF-8) locales for Belgium (Walloon), Brazil, Egypt, Finland, Poland, Spain, and Turkey

Using Solaris 9, Sun is expanding its market reach to more emerging markets. Unicode support is being added for users in the Middle East, Northern and Eastern Europe, and South America. As in other Unicode locales, users in Belgium, Brazil, Egypt, Finland, Poland, Spain, and Turkey can more easily create and exchange multilingual data, e-mails, and Web pages with multiple platforms and multiple language environments.

- Euro Default Currency Support

Most of the Western European countries have changed from their national currency unit (NCU) to Euro currency. All European locales in Solaris 9 now provide support for the Euro as the default currency selection.

- New European and Middle Eastern Keyboard Support

Users in Belgium, Turkey, and Arabic-speaking markets will be able to more easily interact with the Solaris Operating Environment from keyboards customized for their markets, instead of modifying a U.S./English keyboard.

- Support for Sun Ray™ system USB keyboards for Arabic, Belgian, and Turkish languages
- Support for traditional, non-USB keyboard layouts in Arabic and Turkish

Indic Language Support Today and In the Future

Beginning with Hindi, Solaris Unicode locales now provide Indian regional language support. The Solaris OE platform infrastructure now allows the input, display, and printing of Hindi data within these locales. The Devanagari script (upon which Hindi is based) is used by various languages in the Indian subcontinent and covers a large geographical region in South Asia. Infrastructure support for this script within the Solaris OE lays the foundation for additional Indian regional language support in the future.

Common Font Format

As codeset support becomes more stable and robust, users prefer a common appearance for text displayed in different language environments. Solaris 9 OE now offers a common font set for this purpose. With support for the same typefaces in different codesets, users will benefit from a more common look and feel in their applications and documents.

Enhanced Printing for all Locales

Printing solutions for all locales are greatly improved in Solaris 9 OE with enhancements to the printing filter, “mp.” This printing filter now supports various new options that enable users to utilize low-cost printers. For instance, Japanese text files can be printed to any non-Japanese PostScript™ technology or PCL printer, regardless of the current locale displayed on the desktop. With this filter, documents written with TrueType and Type 1 scalable fonts, as well as X11 bitmap fonts (available on the Solaris system) can be output as standard PostScript files to any PostScript printer.

New Geo-Specific Software

- The Companion CD, provided with Solaris 9 software media kits, now includes market-specific offerings such as stardic for China and Ruby for Japan, as well as improved compatibility with global Linux distributions.
- Asian language multibyte support has been updated for system software offerings such as perl, tcsh, bash, and less.

Coming Soon: GNOME in 12 languages

Sun has adopted GNOME 2.0 as the next desktop for the Solaris Operating Environment. The GNOME 2.0 desktop exploits the power of the Solaris OE with an easy-to-use, innovative user environment. GNOME provides an intuitive, appealing interface, plus a wealth of productivity applications and built-in accessibility solutions. Based on open source and free software, GNOME is gaining widespread adoption by key industry leaders such as Sun, IBM, HP, Red Hat, Ximian, and others because it provides a unified desktop that runs across most UNIX software-based systems. Planned for an update of the Solaris 9 OE, GNOME 2.0 will be available in many European languages (French, German, Italian, Polish, Russian, Spanish, and Swedish), Asian languages (Japanese, Korean, Simplified Chinese and Traditional Chinese) and Latin American languages (Spanish and Brazilian Portuguese). GNOME and the Solaris OE provide the right platform for delivering global-ready solutions: they been carefully designed to support today's pervasive global network; and they support major industry standards required for interoperability and seamless exchange of data across heterogeneous systems.

Chapter 5

Solaris OE Helps Global Developers

For software developers, time to market is a critical element of their business strategy. Customizing products for various market regions takes time and money that could be better spent improving the software. If programmers are able to write one binary that works on different platforms and in many language environments, they can maximize potential earnings while minimizing future maintenance costs. Global customers benefit from higher quality software that interoperates easily with other applications in their computer environment, especially if they are exchanging data from other languages and other platforms.

Solaris software is designed with the global market in mind. Universal language support in the Solaris OE, combined with powerful internationalization tools and tutorials, gives developers what they need to write software that can be deployed in virtually any market around the world.

Sun Global Application Developer Corner Program

Sun provides Web-ready tools and tutorials that enable developers to distribute their products quickly and easily. Anyone in the global development community who is building multilingual applications on the Solaris Operating Environment and the Java™ platform can take advantage of the Sun Global Application Developer Corner program (GADC) at no extra cost. With wide corporate migration to the Solaris operating platform, this free Web resource adds value to developers, independent software vendors, and users who need quick and easy access to Sun's globalization information and resources anytime, anywhere. In one convenient location, developers will find

relevant information and resources on how to create global software applications, saving time and frustration.

The GADC contains comprehensive internationalization resources and documentation to address various design and development issues encountered while creating global software. It includes downloadable tools, sample code and references, white papers, and tutorials. Multiple FAQs answer common development questions. A link enables customers to receive timely responses to specific global development questions. Please visit the GADC at www.sun.com/globalization.

Chapter 6

Solaris OE - A Solid Foundation for Global Business

When company executives begin to think of doing business in other regions, the global-ready Solaris Operating Environment offers the convenience of a single product in a unified package. Codeset Independence gives Solaris software the flexibility it needs to keep up with changing standards for Unicode and popular native encodings. Transparent code conversion provides maximum interoperability, allowing users to exchange multilingual files and e-mail across platforms, regardless of the language installed on the client system. The pluggable architecture and open source code of the Solaris globalization framework makes it easy for application developers to customize and build upon the system to meet their unique needs.

In addition, Solaris software helps multinational corporations dynamically manage language services across a global network. Language services in the Solaris OE may be added or deleted as needed. System administrators can dynamically add or remove locales and language support while the system is still running, without rebooting. The Solaris OE also allows system administrators to enable language services remotely across a worldwide network, regardless of the client system. To add a new language or locale environment to the network, most competitive platforms require local host install. However, the client-independent approach of the Solaris OE allows for easy upgrade of the system without changing client applications.

With a long history of support for global networking and open standards, Sun has proven itself to be a trusted development partner for assisting customers in expanding their businesses in key growth markets worldwide. With the Solaris 9 Operating Environment, corporations and developers have a solid foundation for global business.

Chapter 7

Additional Resources

- Developing global applications with the Solaris OE
www.sun.com/globalization
- Global standards for Linux
www.li18nux.org/
- Java technology development
www.java.sun.com
- GNOME 2.0 desktop
www.sun.com/gnome

Chapter 8

GLOSSARY

CHARACTER SET

A set of numbers, letters, and special characters with some commonality.

CODESET

A set of unambiguous rules establishing a one-to-one relationship between each character of a character set and its bit representation. In essence, a mapping between characters and computer code. ASCII is the most common codeset; others are ISO 8859-1, JIS X0208, and Unicode.

CODESET INDEPENDENCE (CSI)

Ability to handle any codesets in a single software environment.

COMPLEX TEXT LAYOUT (CTL)

Languages whose scripts have one or more of these characteristics: context-sensitive text, composite characters, and bidirectional text.

GADC

Sun Global Application Developer Corner; an online Sun globalization resource for global developers and independent software vendors, accessible at www.sun.com/globalization.

GNOME

GNOME (pronounced guh-nome) stands for GNU Network Object Model Environment. GNOME 2.0 for the Solaris Operating Environment enables all users to run full-featured office productivity software; surf the Web; easily and freely exchange files; and personalize the work environment.

INTERNATIONALIZATION (I18N)

The process of designing and implementing software to transparently handle different cultural and linguistic conventions without additional modification.

GLOBALIZATION (G11N)

A product development and marketing approach that ensures software products are usable in the world's major markets, achieved through a combination of internationalization and localization work.

INPUT METHOD

The way that users enter characters into a data stream. The method differs significantly depending on the writing system. As an example, rules around keyboard entry for a particular character codeset would be an input method.

LANGUAGE SUPPORT

Within the Solaris OE, language support involves the ability to input, display, and print a particular language, and ensure conformance to cultural conventions within the country in which it is spoken.

LOCALE

A specific region definition that can contain linguistic, cultural, and governmental rules and conventions.

LOCALIZATION (L10N)

The process of developing culture-specific software components and translations that can be accessed by internationalized software at runtime. Software must be internationalized before it is localized.

OPEN STANDARDS

Open standards are characterized by the fact that the specifications upon which they are based are owned by a vendor-neutral organization, rather than by the original developers. Anyone is free to build software according to the specifications without infringement of intellectual property rights, although there are often several freely available implementations (commercial or open source).

OUTPUT METHOD

Rules that govern the way language characters are displayed and printed. Character renditions can differ vastly from one writing system to another. A single-stroke entry can produce equivalent single-stroke output or multiple-strokes output, depending upon the writing system involved.

UNICODE

The international character system developed by the Unicode Consortium and adopted in 1992 by ISO. Originally a 16-bit system, Unicode is no longer a fixed-length character set.

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