



S60 5th Edition Overview

S60 on Symbian OS

December 2008



Table of contents

Introduction to S60 on Symbian OS	3
Introduction to S60 5th Edition	4
S60 Architecture	6
Applications	7
Telephony/ real-time communication	7
Messaging	7
Personal Information Management (PIM)	8
Multimedia applications	9
Browser	10
Content Download	10
Digital Rights Management	10
User Interface	11
Touch UI	11
UI customization and personalization	12
Sensor based user experience	13
UI Accelerator Toolkit	13
Runtime environments and middleware components	13
Application runtime environments	13
Native C/ C++ application environment	13
Java™ application environment	14
Adobe Flash Lite	15
Web Runtime	15
Location-based services (LBS)	16
Manageability and Connectivity	16
Device management	16
Networking and Connectivity	16
Local connectivity	17
Connectivity using Web services and Session Initiation Protocol (SIP)	17
The Symbian Operating System	18
Conclusions	19

The contents of this document are copyright © 2008 Nokia. All rights reserved. A license is hereby granted to download and print a copy of this document for personal use only. No other license to any other intellectual property rights is granted herein. Unless expressly permitted herein, reproduction, transfer, distribution or storage of part or all of the contents in any form without the prior written permission of Nokia is prohibited.

The content of this document is provided "as is", without warranties of any kind with regards its accuracy or reliability, and specifically excluding all implied warranties, for example of merchantability, fitness for purpose, title and non-infringement. In no event shall Nokia be liable for any special, indirect or consequential damages, or any damages whatsoever resulting from loss of use, data or profits, arising out of or in connection with the use of the document. Nokia reserves the right to revise the document or withdraw it at any time without prior notice.

Nokia and Nokia Connecting People are registered trademarks of Nokia Corporation. Nokia product names are either trademarks or registered trademarks of Nokia. Other product and company names mentioned herein may be trademarks or trade names of their respective owners.



Introduction to S60 on Symbian OS

S60 on Symbian OS is the world's leading smartphone software. It is licensed by some of the world's leading mobile phone manufacturers including LG Electronics, Lenovo, Nokia and Samsung – collectively they sell millions of devices based on the S60 software.

S60 offers a software base for mobile devices that is rich in features. With support for an excellent user experience, a complete suite of applications and a rich set of innovation platform enablers, S60 is the ideal platform for the latest mobile services – including both Internet and other services. S60 is a source code product that S60 licensees can port and integrate into their own hardware designs to produce handsets with advanced data capabilities and offers numerous benefits for users, operators, developers, service providers and enterprises, including:

Users

- Extensibility and personalization with many popular third party applications and a wide range of user interface themes
- Best-of-breed full Web browsing experience on mobile devices
- Ease of use via the S60 user interface, which also supports advanced use cases such as multitasking and copy-paste of information

Operators

- Increased Average Revenue Per User (ARPU) through ease-of-use and extensive support for revenue generating applications and enablers
- Operational efficiency through platform compatibility and efficient device and service management
- Extensive branding and differentiation support through effective, scalable customization enablers

Developers and Service providers

- Increased number of profitable business opportunities due to high volume sales of terminals and numerous deployment channels
- A future-proof platform that offers a stable and secure application development environment with reduced development time and cost savings through harmonized platform APIs
- Availability of leading development tools and SDKs

Enterprises

- A comprehensive range of mobile e-mail and PIM applications with versatile connectivity options to corporate back-end servers
- Strong support for productivity tools and vertical business applications
- Advanced device management and security capabilities supporting enterprise-grade security, manageability and configurability of mobile devices

A solid ecosystem already exists around S60. A prime example of this is the several thousand third party S60 applications available to end users. The number of these applications is constantly increasing, along with the number of available handsets based on S60. In addition, the S60 Product Creation Community was established to further assist S60 licensees in reducing the initial time-to-market of their S60-based handsets, as well as controlling the associated costs of development and production.



Introduction to S60 5th Edition

This document focuses on the features and functions of S60 5th Edition. S60 5th Edition includes the features and functions of the earlier S60 releases as well as a number of others, particularly in the areas of multimedia/Internet experience and Internet innovation enabler.

S60 software includes a built-in full Web browser with Adobe Flash Lite 3 support. With the built-in touch UI support in S60 5th Edition, it's convenient to browse the Internet by scrolling the Web page with a finger and directly interact with Web content by touch. A new touch UI optimized toolbar also gives quick access to browser options. In addition to the Web browser, Web widgets offer easy to create, focused and optimized front ends to Web based information and services. The seamless integration of the Web content with personal context on S60 5th Edition makes it very convenient for users while offering new opportunities for business.

The music and video players incorporated in the S60 software offer support for a wide variety of content, including MP3, AAC, eAAC+, H.264 and Windows Media encoded content. Thanks to the larger, high resolution 640x360 (16:9) display support in S60 5th Edition, users can enjoy widescreen multimedia on their mobile device. S60 5th Edition also includes support for content rights management technologies such as OMA DRM and Windows Media Digital Rights Management 10. These technologies are typically used by digital music and video stores to protect content.

The updated camera application with new features such as scene mode, self timer and white balance make digital photography easy for photographers of all levels and experience. New image and video editors in the S60 5th Edition make it quick and easy to edit pictures and videos directly on the device before sharing them with others. Users can, for example, decrease red eye, down sample, crop, adjust contrast/brightness/sharpness or add text to pictures. The video editor enables users to quickly cut and merge videos as well as add text directly on the device.

As the amount of information stored on a mobile device increases, it can become challenging to find and manage information. S60 5th Edition includes improvements to manage, find and store the content. The revamped Gallery application can show preview thumbnails even for videos and a built-in search application can be used to find content ranging from images to e-mails. The mass storage handling in S60 5th Edition has also been updated to handle several memory cards and internal storage media areas, up to 32 GB each. This enables users to carry more digital content such as music, videos, documents and e-mails, even with large attachments, on their S60 device.



S60 5th Edition extends the flexibility of manufacturers to target new innovative device concepts by introducing support for touch UI with tactile feedback and gestures and by providing an extensible sensor framework that allows motion, orientation and further sensor concepts to be well integrated into the overall user experience. S60 based devices can therefore range anywhere from mass market to high-end multimedia or enterprise focused devices.

Demand paging enables more efficient use of RAM memory. Improvements in S60 5th Edition's demand paging further decrease the use of on device RAM, helping lower the manufacturer's bill of materials. Other benefits of demand paging include improvements in device stability as "out of memory" situations become less frequent. It also offers faster application start up and device boot times.

Conceptual S60 devices

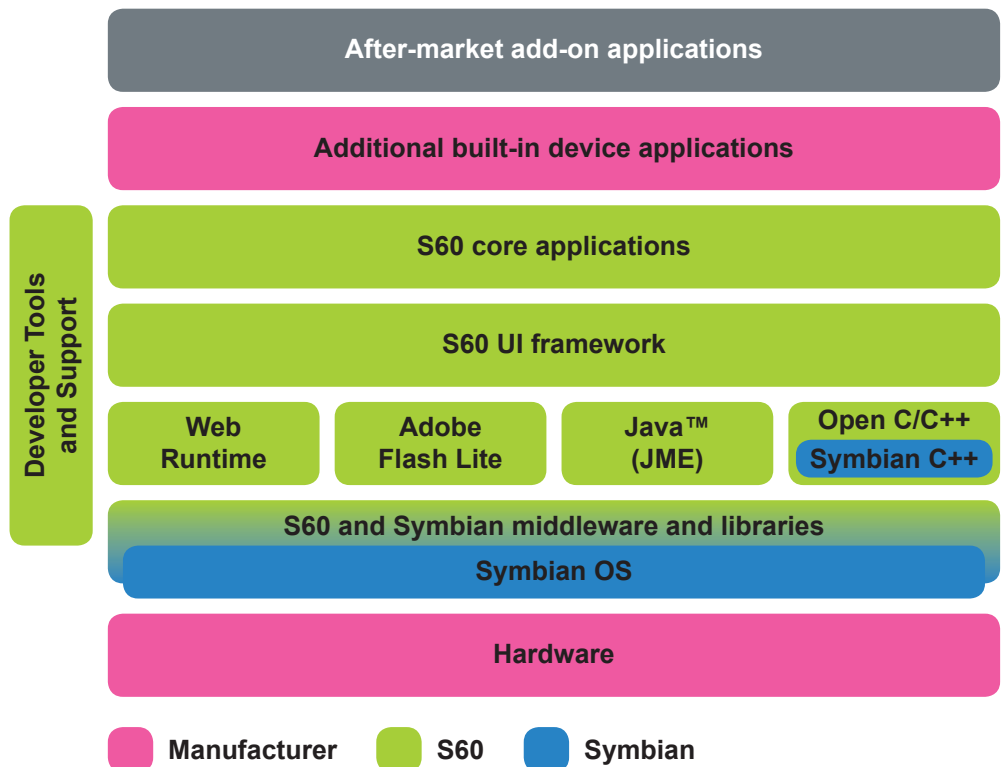


S60 offers versatile developer support that enables developers to write applications in a language with which they are already familiar and choose the technology that best suits their needs in implementing a new service or application. Supported developer technologies include powerful native environment (Symbian C++ and Open C/C++), portable and standard mobile Java™ environment (Java ME) and efficient environments based on Web technology (Web Runtime, Adobe Flash Lite 3). In particular, S60 5th Edition improves the capabilities of Web Runtime and Adobe Flash Lite based applications by providing access to platform services. This allows the creation of personal, context-aware applications that can access local device information and functionality, such as GPS co-ordinates, phonebook entries and messaging functionality.

S60 Architecture

The following picture illustrates the high-level software architecture of S60-based devices. The functionality provided by S60 can be divided into three main layers:

- Core smartphone applications
- User interface framework
- Runtimes/ middleware enablers



S60 includes an extensive suite of standard smartphone applications. These include voice and video telephony, SMS/MMS/e-mail messaging, full Internet browser, calendar and media player – all of which provide state-of-the-art functionality for users. S60 applications are also seamlessly integrated with each other, providing a smooth user experience.

To drive the usage of services, S60 includes an award winning user interface framework that allows a consistent and seamless user experience across all S60-based handsets. The S60 user interface framework supports numerous display resolutions, several input methods (phone keypad, QWERTY keyboard, touch) and various combinations of these. Rich personalization and customization features are built into the user interface framework.

S60 supports a number of runtime technologies (native C/C++, Java, and Web), allowing developers to choose the development environment most suitable for their needs and skills. S60 also provides an extensive set of embedded middleware libraries and components, such as location middleware and advanced device management capabilities, promoting interoperability among terminals.



Applications

S60 includes a variety of built-in applications, enabling S60 licensees to provide a common set of features across different S60-based devices. For users, this means they can easily find their favorite S60 functionality in different device designs, from different vendors. The following are a few examples of S60 applications.

Telephony/ real-time communication

S60 includes a full-featured set of telephony applications that support both voice and video telephony. The latter is included in the GSM-WCDMA configuration and is supported when WCDMA network coverage is available.

Video share application is also included with S60 on Symbian OS. In video share, participants in a voice call can share their real-time camera view or a video clip from their mobile device's multimedia gallery. Both users see the same video on their mobile phone's display and can discuss it while they continue the call. The sender can also save the shared video.

The advanced features include conference calling and the ability to send an SMS message to the caller rather than answering the call.

The OMA PoC 1.0 standard based Push to Talk functionality allows network operators to provide "walkie talkie" group communication for their users using standards-based network infrastructure for enhanced interoperability.



Messaging

S60 includes comprehensive support for different messaging services such as SMS, MMS, instant messaging and e-mail. Messaging activities are mostly concentrated into a single messaging centre application. It offers common functionality to all supported message types, including the composition and viewing of messages. SMS and MMS messages are created with one combined message editor that selects the SMS or MMS type automatically according to the content of the message. In S60 5th Edition, OMA MMS 1.3 is used to provide interoperable rendering of messages that include formatted text, megapixel images and vector graphics.

Message sending functionality is also integrated into many standard S60 applications, such as phonebook, calendar and media gallery and is also offered to third party applications for easy integration.

S60 includes an e-mail client that supports the most widely used standard e-mail protocols (POP3/IMAP4/SMTP/MIME). In addition to user-initiated e-mail access, S60 also supports push e-mail using IMAP IDLE and OMA E-mail notification combined with POP or IMAP. With push e-mail, the user can automatically be notified when a new e-mail arrives in their inbox. Multiple e-mail accounts, for example, personal and corporate, can be defined within the S60 messaging client. OMA Data Synchronization 1.2 protocol enables mail synchronization using PC Suite.

S60 instant messaging complies with OMA IMPS 1.2 specifications. The instant messaging application supports conversations in chat groups, private chatting with friends, family and colleagues as well as friends' lists that can show presence information.

Personal Information Management (PIM)

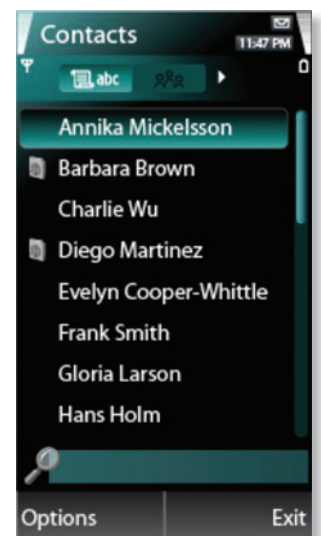
S60 includes a variety of personal information management functions. These PIM applications can be used as stand-alone features and can also be easily synchronized with Microsoft Outlook and other major PC-based software. Specific applications include, for example, phonebook, calendar with to-do, notepad, clock, calculator, unit converter, voice recorder and file manager.

The S60 calendar application keeps track of appointments, meetings, to-do lists, birthdays, anniversaries and other events. The user can add, modify and remove calendar entries, set alarms to remind them of upcoming events and also synchronize the calendar with their PC calendar. Calendar events can also be received from other users via infrared, Bluetooth, SMS or e-mail. While browsing the calendar, the user can select to view a day, a week or a month.

The phonebook application can be used to create, edit and manage all contact information such as phone numbers and addresses. In addition to basic operations, a thumbnail image, special ring tone or speed dial can be attached to the contact card.

The phonebook is closely integrated with other applications and can be used as a starting point for all communication, both calls and messaging.

The phonebook data can be stored on either the device's memory or on the SIM card. Data from both sources can be displayed on the same phonebook view.



S60 supports OMA Data Synchronization technology for comprehensive synchronization. SyncML version 1.2 is supported, enabling end users to synchronize information such as contacts, tasks, e-mail, calendar and address book with a synchronization server. Synchronization can either be done locally through the PC Suite, or remotely over the air (OTA).



Multimedia applications

For users of multimedia such as music and video, S60 offers a wealth of possibilities. The integrated media player enables the viewing of video streams, for example, from the Internet. In addition, the media player can be used to view multimedia files stored on the device. Accessing the local multimedia content is easy using the Gallery application.

The media player application allows users to view all supported video files and is also used for media streaming. The media player application can be launched as a standalone application from the application shell. Alternatively, it can be used as an embedded application from other applications that need audio or video streaming or video playback capabilities.

S60 also includes a music player application that can be used to download and play music files such as MP3s. The music player supports protected content formats which enable, for example, a preview of the content before purchase.

S60 software includes support for Media Transfer Protocol (MTP), which can be used to synchronize media files such as MP3, AAC and WMA between a S60 device and Windows Media Player. MTP synchronization can be made automatic, allowing seamless content synchronization between S60 device and PC.

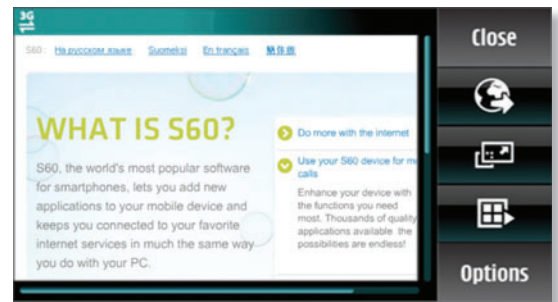
The S60 camera application is used for taking still images or video clips. In S60 5th Edition, the camera application supports widescreen (16:9) recording. Images and video clips are stored within the gallery application and can even be edited on the device. Media files can also be sent via MMS, e-mail, Bluetooth or infrared connections.





Browser

The Web Browser for S60 is based on the industry-leading open source Webkit engine which delivers full Web content (HTML, JavaScript) compliance and performance, providing users with an enjoyable Internet browsing experience. The S60 browser also supports mobile Internet standards, such as XHTML MP and CSS. With the comprehensive support for both Web and mobile Internet technologies, users can access both content categories with the same browser.



On the user interface, the S60 browser implements several innovative concepts, allowing a desktop like user experience on small screen devices. A Page Overview function with fast zoom support makes it easy to navigate and move around in the familiar Web page. Visual History shows a thumbnail of previously visited Web sites, making it easy to identify the page that the user wants to go back to. Support for multiple simultaneously open windows, pop-up blocking, URL auto-complete, password manager and a toolbar for accessing the most frequently used functions – these are all examples of the great functionality provided by the S60 browser that users are familiar with from desktop browser environments.

Adobe Flash Lite 3.0 plug-in for the browser makes it possible to view sites that contain Flash based videos and animations. Adobe Flash Lite 3.0 supports most Flash 8 based content.

Content Download

S60 supports the reliable download and delivery of a variety of content items such as full music tracks, add-on applications, ringtones, images and video clips. As such, S60 supports the handling of several MIME content types. All supported MIME types are accessible directly through the browser – WAP Push messages, MMS messages, e-mail, infrared, Bluetooth and PC-based provisioning. In addition, both the OMA download specifications as well as content object descriptor (COD) are supported by S60.

When downloading through the browser, S60 supports instant content playback during the downloading session, allowing the content to be viewed or listened to before the complete file is downloaded to the device.

Digital Rights Management

S60 includes support for Digital Rights Management (DRM) as specified in the OMA 1.0 and OMA 2.0 specifications. DRM allows users to play, display, execute and copy media according to rights specified for content usage. As an example, rights can limit content usage to particular time periods. Content protection is achieved by encrypting essential theme and application data.

Windows Media Digital Rights Management (WMDRM 10) is also supported as a complementary offering on the S60 5th Edition. WMDRM 10 must be separately licensed and, as a complementary offering, might not be included with all S60 licensee devices.



User Interface

S60 UI supports a number of screen resolutions, including 320x240 (QVGA) and 640x360 pixel resolutions in portrait and landscape modes. The screen can be switched between portrait and landscape modes. For user input, S60-based devices support finger and stylus operated touch screen, standard 12-key numeric keypad with a full QWERTY keyboard, or with any combination of these methods.

Application shell, or the main menu, displays all the applications available to the user, either pre-installed or downloaded over-the-air. The user is able to organize the applications into their preferred order in the menu and also to categorize these into folders. Active idle, a dynamic idle state on the phone, allows shortcuts to be defined for the most commonly used applications. In addition, active idle also provides direct access to personal data, from the calendar and to-do list, as well as to operator services.

S60 UI and applications are available in some 50+ different languages and include country and region specific functionality such as Chinese lunar calendar. This means S60 provides truly global market access to S60 based devices.

Touch UI

In S60 5th Edition, the flexibility of the user interface framework is greatly enhanced by the introduction of touch UI support. This allows S60 licensees to innovate even further in their device concepts.



The S60 Touch UI with tactile feedback provides users with a fast and intuitive way to engage with their devices. Even though the design is new, users will find it easy to adopt because of its familiar and consistent feel.

All applications and elements of the S60 UI are touch-enabled consistently. Familiar applications are even easier to use because the direct manipulation method gives faster access to the most important functions. The S60 UI takes things even further with some specific new touch applications such as virtual dialer and several methods for inputting text. These are virtual ITU-T for inputting with finger or thumb, as well as virtual handwriting recognition and keyboard for accurate stylus use.

The S60 Touch UI also supports selected gesture based use cases, such as flipping from one image to another in the image viewer by simply swiping with a finger. Panning and scrolling is intuitive – for example, in Browser, scrolling starts when the user touches the screen and moves their finger on the screen.



UI customization and personalization

A core S60 UI design goal is the ability to support licensee differentiation, operator customization and user personalization, without affecting the compatibility of services and applications among S60-based devices.

While certain elements of the UI are mandated to ensure service and application compatibility, there are still numerous possibilities for customization, allowing licensees to continue using the different elements that have contributed to their own branding and success. In addition to standard UI themes, examples of such licensee specific possibilities include the flexibility to support various device design concepts (with different screen resolutions and orientations), the ability to add new functionality through plug-ins on the Active Idle screen and the possibility of defining various UI transition effects.

S60 includes several options designed specifically for easy operator customization, enabling operators to differentiate the devices they offer. Differentiation can be based on, for example, a unique service offering, brand identity of services and visual look and feel. Examples of S60 operator customization options are operator specific UI themes, operator menu, embedded download links in applications, active idle news ticker and a branded graphical soft key. Some of these customization features require co-operation and agreement between phone manufacturer and operator – others can also be applied over-the-air.



UI themes enable users, operators and licensees to change the visual appearance of the UI quickly. Several themes may be preinstalled on the device and users can easily download further pre-made UI themes or use the Carbide.ui to create new themes.

UI themes are customized graphical designs that change a handset's default visual theme, allowing the user to tailor the look and feel of S60-based devices. Themes allow the customization of more than 1,000 graphical UI elements, including menu icons and background, wallpapers, screensaver, signal indicators, color palettes and sounds. Carbide.ui is freely available at the Forum Nokia Web site. (www.forum.nokia.com).



Sensor based user experience

The S60 sensor framework allows advanced sensor technologies to add further innovation to the user experience, bringing even more opportunities for innovative applications and devices. Sensors enable easy interaction with the device based on motion or other sensorial information. The device display orientation can be changed simply by turning the device. Users can also silence a calendar alarm or an incoming call simply by turning the device upside down or by tapping it twice.

UI Accelerator Toolkit

UI Accelerator Toolkit for S60 offers a rapid way for S60 licensees to design stunning, scalable and innovative applications on top of S60. 3D graphics with smooth animations and freely formable layouts allows designers to impress users with their creativity. UI Accelerator Toolkit scalability features allow the UI to fit different screens and portions, while designing application variations is quick because the UI is layered to different parts – the underlying functionality doesn't affect the UI layer. This helps achieve faster development with a shorter design time.

Runtime environments and middleware components

S60 supports the widest range of technologies that enable efficient application and service development, advanced device management and network and local connectivity. This section covers some of these enablers.

Although S60 5th Edition maintains compatibility with previous S60 3rd Edition, it offers a set of new and exciting features that can enhance the user experience and performance of any S60 application. Developers are encouraged to integrate touch UI, sensor integration, and the larger display size into their applications, and take advantage of the support that Nokia provides for all S60 developers. The S60 5th Edition SDK, tools, and other documentation are available at www.forum.nokia.com.

Application runtime environments

On S60, applications run either in native C/ C++ space or within a managed runtime environment like Java ME, Adobe Flash Lite or Web Runtime. From the S60 3rd Edition onwards, built-in application security frameworks have been included to better protect S60 devices against malicious content, such as viruses and worms.

Native C/ C++ application environment

S60 is built on top of the open Symbian operating system, allowing third party applications to be developed using the C++ application environment. Such applications benefit from the best possible performance and have access to comprehensive device functionality.

The security architecture of S60 / Symbian OS C++ is founded on the principle of controlled access to the protected system resources. These resources can be other processes, application program interfaces (APIs) or user/system files stored in the file system. Controlled access to these resources means that only trusted applications or processes are allowed to access them. For example, applications can store information in their private directories that are protected from other applications.



To create different levels of trust, all C++ applications are categorized into different domains. How much an application is trusted depends on the application and the domain. Trusted applications include a digital signature within the application file. Applications can be granted a signature, for example, after passing the Symbian Signed testing criteria.

S60 includes also Open C libraries – a set of POSIX standard C libraries that extend the Symbian C++ development environment. These libraries are already supported by most major operating systems and provide a familiar way for developers to port existing components to S60 or create new ones using mature, well-known interfaces. Open C also makes it possible to port existing open source projects to S60.

Open C consists of middleware libraries, each implemented as static DLLs that can be linked to new and existing S60 software projects. The Open C libraries adhere to S60 security rules and guidelines to ensure components that use Open C cannot bypass the platform security features of S60.

With the introduction of Open C++ in S60 5th Edition, the benefits of Open C are extended to C++ programmers. Through the support of standard C++ and Standard Template Library (STL), C++ developers can now also use familiar programming techniques and code created originally for other platforms.

Java™ application environment

S60 supports the installation and running of Java applications. The Java technology supported is Java ME, consisting of MIDP 2.1 (Mobile Information Device Profile, JSR 118) and CLDC 1.1 (Connected, Limited Device Configuration).

S60 supports the Java MSA (Mobile Service Architecture, JSR 248) specification, which builds on the earlier JTWI (Java Technology for the Wireless Industry 1.0, JSR 185) specification. Like JTWI, MSA provides an overall architectural description for mobile Java implementations. MSA is designed to minimize API fragmentation in the mobile device market, as well as deliver a predictable and clear specification for device manufacturers, operators and application developers. MSA does not define any new APIs but instead mandates the use of a specific set of component specifications.

Through support for eSWT – introduced in S60 3rd Edition Feature Pack 2 – Java applications can also benefit from richer and more compelling user interfaces than those possible using MIDP2.1 capabilities.

In a similar way to the security domains for the C++ applications, the Java MIDP 2.1 includes different kinds of security domains for different Java applications. In Java there are four security domains: unidentified third party, identified third party, operator and manufacturer, as specified in the MSA. Access to the protected Java APIs is controlled on a domain basis.



S60 includes implementation of Java Micro Edition (Java ME) consisting of an MSA subset. The implementations of the following JSRs are compliant with the MSA specifications:

- CLDC 1.1 (JSR 139)
- MIDP 2.1 (Mobile Information Device Profile, JSR 118)
- PDA Optional Packages for the J2ME™ Platform (JSR 75)
- Java APIs for Bluetooth (JSR 82)
- Mobile Media API 1.1 (JSR 135)
- Mobile 3D Graphics API for J2ME 1.1 (JSR 184)
- Wireless Messaging API 2.0 (JSR 205)
- Scalable 2D Vector Graphics API for J2ME (JSR 226)

In addition, the following features are supported:

- J2ME Web Services Specification (JSR 172)
- Security and Trust Services API for J2ME (JSR 177)
- Location API for J2ME (JSR 179)
- SIP API for J2ME (JSR 180)
- Advanced Multimedia Supplements (JSR 234)
- eSWT

Adobe Flash Lite

S60 5th Edition supports Adobe Flash Lite 3.0 content via the mobile browser or the standalone Adobe Flash Lite viewer. Flash allows applications and content to be delivered to a mobile phone, enabling a richer consumer experience. As a result, mobile phones will have more powerful and easy-to-use interfaces, a broader range of content and more compelling services.

In S60 5th Edition, Flash developers can use new ActionScript extensions that enable Flash applications to access S60 Platform Services such as calendar, contacts and location information. This enables developers to create more Flash applications with more functionality and decreases the need to learn native programming.

Web Runtime

By leveraging the same feature-rich, robust, open-source components used by S60's highly acclaimed Web browser, the S60 Web Runtime enables millions of Web developers to go mobile with Web applications and Web widgets. S60 presents a new and exciting opportunity for Web developers to reach out to the rapidly growing number of mobile subscribers. With Web applications and widgets, end-users are able to gain instant access to content and services that matter most to them with stunning animations and visual effects.

S60 5th Edition with S60 Platform Services makes it possible to create more personal and context-aware widgets by using standard HTML and JavaScript. By gaining access to information stored locally on the device, such as calendar or phonebook, a widget can now combine information from the Internet and these local sources to provide a new, personal service experience. By accessing, for example, GPS functionality on the device, widgets are now able to provide more relevant, context-aware information to users. These new features are easily accessible to Web developers via new JavaScript extensions. To ensure security and user privacy, the user can control an application's access to the S60 Platform Services.



Location-based services (LBS)

If you know where you are, mobility becomes much more powerful and useful in everyday life. For S60, making the handset, mobile application and user experience location-aware has been a long-term commitment. Native, position-technology-agnostic APIs were introduced as far back as S60 2nd Edition. More recently, S60 3rd Edition introduced Landmarks!, which is an open format point-of-interest creation, management and sharing system. S60 3rd Edition also included support for JSR-179, which enables Java applications to access location capabilities, and landmarks.

S60 5th Edition improves the use of location capabilities even further by introducing S60 Platform Services, which enables Web widgets and Flash Lite applications to access location information. Only two lines of Flash Lite ActionScript or JavaScript are required to access location information, demonstrating unprecedented simplicity in development of mobile Location Based Services.

Manageability and Connectivity

Device management

Mobile device management is a generic term for a system that can be used by or on behalf of users to configure, manage and update applications and their settings, as well as network access settings on their mobile devices. With device management, the operator, service provider, the enterprise or even the users themselves, can help users to use new services and applications, as well as modify the configuration of existing ones with the minimum of effort.

S60 3rd Edition, Feature Pack 1 onwards, provides advanced device management for device customization, application management and device administration over the air, removing the need to physically visit the management provider. Device management can also be performed silently.

Networking and Connectivity

S60 supports several networking technologies: Global System for Mobile communications (GSM), General Packet Radio Service (GPRS), Enhanced Data Rates for Global Evolution (EDGE), Wideband CDMA (WCDMA), High Speed Downlink Packet Access (HSDPA) data service in WCDMA and Wireless Local Area Network (WLAN). Wide support for networking technologies means that S60-based devices can be tailored to meet the needs of specific geographical regions.

GPRS packet data is fully supported on the platform. It also supports multiple PDP contexts, enabling simultaneous access to multiple GPRS access points. This allows for more flexibility in network configurations and billing models.

EDGE increases the potential data transfer rate by up to three fold. S60 EDGE functionality can be used with GPRS connections.



Wideband Code Division Multiple Access (WCDMA) is used as a radio interface technology for third generation mobile systems. WCDMA enables simultaneous circuit switched voice and packet switched data connections.

Wireless Local Area Network (WLAN) is used as a local area network using wireless connections as a transmission path.

The S60 Connection Manager application facilitates the management of all active connections within an S60-based device. Through the Connection Manager, end users can, for example, monitor active connections (Access Point Name, amount of transferred data, etc), as well as terminate active connections.

Off-line mode support within the platform effectively shuts down all RF functionality in a terminal while allowing for the continued use of S60 applications. Off-line mode can also be used when the SIM card is not in the phone.

Local connectivity

Support for Bluetooth 2.0 + EDR connectivity with eSCO support enables fast local data exchange with improved voice and audio quality. S60 software Bluetooth implementation supports multiple, simultaneous Bluetooth connections, with the number of simultaneous connections limited by Bluetooth hardware and the actual protocol design. S60 also supports infrared (IrDA) connections.

S60 software includes a high-speed USB v2.0 connectivity support, while the device battery can also be charged using the USB connection. USB connection can be used in different modes on S60. PC Suite mode is used in communication with PC Suite software. In Data Transfer (Mass storage) mode, the S60 device is used like an external USB memory card without the need to install additional drivers on the PC. Image print mode enables transfer and direct printing of images via USB. Media Player (MTP, Media Transfer Protocol) mode is used to synchronize media files with a PC using MTP protocol.

Connectivity using Web services and Session Initiation Protocol (SIP)

SOA for S60 is implemented as the native functionality starting with the S60 3rd Edition. This makes the device an integral part of service-oriented architectures. Since Web services protocols (XML, SOAP, etc.) are being widely deployed for both enterprise and consumer services, it is now possible to develop client applications that use Web services protocols end-to-end. Along with these implementations, tools will be available through Forum Nokia.



The Symbian Operating System

S60 5th Edition runs on Symbian OS version 9.4, which is a common core of Symbian APIs and operating system technology. In addition to the common UI components, it contains all the interfaces to the dynamic link libraries, executables and device drivers for controlling the keyboard, display, RTC, Bluetooth, IR and Flash file devices.

While it is optimized for the requirements of mobile devices, including economic use of power, CPU and memory resources, the Symbian OS is extremely robust. The Symbian OS is based on a client-server architecture, where many applications are clients that use the resources of servers.

The client-server framework is widely acknowledged in the software community as a powerful mechanism. For example, the multimedia framework architecture provides the basic client-server functionality that enables multiple client access to all audio, video and speech recognition functionality on S60-based devices, while minimizing demand for large amounts of processing.

S60 licensees must obtain a separate license for the Symbian operating system from Symbian.



Conclusions

S60 on Symbian OS is the world's leading smartphone software platform, offering a software base for mobile devices that is rich in features, including advanced data capabilities. Several mobile device manufacturers have already licensed S60 and several S60-based mobile devices have already been introduced.

S60 UI enables licensees and operators to differentiate their offering in a non-fragmented way that ensures service and application compatibility among S60-based devices. Users can also easily personalize the S60 UI and ready-made themes enable the user to quickly personalize their terminals. Touch UI and sensor support enhance user experiences with the familiar S60 UI and the UI accelerator toolkit enables new stunning graphics.

Support for larger nHD (16:9) display support improves the Internet browsing experience on S60 5th Edition and enables multimedia content to be enjoyed in widescreen mode. New touch UI support with tactile feedback gives users an intuitive way to experience Internet and multimedia on their device. Even though the touch UI design is new, users will find it easy to adopt because of its familiar and consistent feel.

S60 Platform Services in S60 5th Edition enable developers to unleash their innovation in Web Runtime and Flash environments. S60 Platform Services enable widget and Flash developers to access local mobile specific features. With S60 Platform Services, developers can write context aware Web widget and Flash applications that provide a convenient Web user experience in a mobile environment.

A solid ecosystem already exists around S60 on Symbian OS. Thousands of third party applications are available to users and the number of applications is constantly increasing along with the number of available S60 handsets.



Contact details

Nokia Corporation
P.O. Box 100
FI-00045 Nokia Group
Finland
Tel. +358 (0) 7180 08000
www.S60.com

S60  Open to new features