

Open C for S60: Increasing Developer Productivity

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S60 Development

NOKIA

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Change history

January 2007	Version 1.0	Initial publication with SDK beta
February 7, 2007	Version 1.1	Added open source project references
March 23, 2007	Version 1.2	Increased coverage of libglib (Chapter 2); added references to examples in SDK (Chapter 4); added reference to the public release of the SDK (Chapters 1 and 5)

1 Delivering the benefits of open source to S60 on Symbian OS

Open C is a set of industry-standard POSIX and middleware C libraries for S60 on Symbian OS, the most successful smartphone platform in the world, with more than 50 percent market share and more than 84 million devices shipped through the end of 2006. Open C increases the speed of application development by enabling the reuse of existing software assets. Because it is based on popular open-source projects, it offers a fast, flexible, and familiar development environment that is easier to learn than native Symbian C++.

Open C speeds projects in three ways. First, it gives projects a head start by allowing developers to bring existing Linux and other solutions to S60 with minimal effort. It speeds team building because well-known APIs make it possible to take advantage of a larger pool of competent developers. And finally, once a project is deployed, Open C speeds maintenance and quality assurance by enabling a common code base for all platforms.

Open C increases flexibility because it brings the benefits of Linux to S60 on Symbian OS. Developers can extend their S60 environment by combining Open C with Symbian C++ code. They can port existing open-source projects to mobile devices or create new mobile applications that combine existing components with mobile-specific features. The Open C SDK even includes an example of porting a Linux project to S60 on Symbian OS.

Open C APIs offer a familiar, mature programming environment on a powerful mobile platform with a large installed base. Open C APIs are built on open source projects that are already being used by thousands of developers working in desktop, server, and embedded environments. Open C avoids Symbian programming idioms, which are optimized for the mobile experience but are often difficult for developers to master.

2 Don't reinvent the wheel!

Open C makes smartphone application development easier with standard interfaces and programming models. The architects of Open C wanted a design that would provide maximum code reuse across platforms, but they knew that they needed to deliver a real-world solution that would work well with the limited processing power of mobile devices, gracefully tolerating the memory constraints that exist today. Like most great designs, this one began with a series of brainstorming questions, including, What would it take for real open-source projects to run on S60? The design progressed through a study of the subset of the POSIX standard that is actually used by the open source Apache, Firefox, and GMPlayer projects, as well as study of other open-source projects that made sense for mobile projects.

The result is an initial release of the Open C library that covers more than 75 percent of the functions contained in the desktop and server standards on which the mobile libraries are based. The implementation includes 100 percent coverage of libraries containing such mobile-critical features as password hashing (*libcrypt*), compression (*libz*), and loading DLLs (*libdl*), while scaling back coverage in libraries containing esoteric functions that hold little relevance to mobile developers.

Most Open C projects will include some Symbian OS programming. The Open C development will result in platform-agnostic DLLs that implement core application logic or other functionality not dependent on the specific platform on which it executes. The DLLs expose APIs accessed by platform-aware components that implement UI and other functionality.

Library	Description	Open source project	Coverage (%)*
libc	The Standard C libraries include standard input/output routines, database routines, bit operators, string operators, character tests and character operators, Data Encryption Standard (DES) encryption routines, storage allocation, time functions, and signal handling.	OpenBSD (POSIX APIs)	47
libcrypt	The cryptography libraries contain functions for encrypting blocks of data, messages, and password hashing.	OpenSSL	100
libcrypto	The services provided by this library are used by the OpenSSL implementations of Secure Sockets Layer (SSL), Transport Layer Security (TLS), and S/MIME, and they have also been used to implement SSH, OpenPGP, and other cryptographic standards.	OpenSSL	77
libdl	This is for loading DLLs.	POSIX	100
libglib	This general-purpose utility library provides, for example, many useful data types, macros, type conversions, string utilities, file utilities, and a main loop abstraction. It works on many UNIX-like platforms, Windows, OS/2, and BeOS.	GNOME	100
libm	The arithmetical and mathematical functions operate according to the Standard C library.	OpenBSD (POSIX APIs)	42
libpthread	This implements IEEE Std1003.1c (POSIX) standard interface for implementing multiple threads of execution within a traditional user process. It includes thread creation and destruction, an interface to the thread scheduler to establish thread scheduling parameters, and mutex and condition variables to provide mechanisms for the programmer to synchronize access to shared process resources.	OpenBSD (POSIX APIs)	60
libssl	The OpenSSL library implements SSL v2/v3 and TLS v1 protocols.	OpenSSL	86
libz	The “zlib” compression library provides in-memory compression and decompression functions, including integrity checks of the uncompressed data.	LIBZ	100
Total			78

*Percentage of functions of the full open-source project that is included in Open C.

3 Tap more code

Open C makes smartphone application development teams more productive by enabling a common code base across multiple platforms and easing the task of porting existing Linux and other code to S60 devices. This is particularly productive when bringing services to mobile users in situations where substantial portions of the service implementation already exist in a desktop implementation or open source project. The Open C libraries make it easy for development teams to port the application logic and connectivity middleware from the existing implementation, while rewriting the user interface to serve the needs of the mobile user.

For example, the Open C Plug-in for S60 3rd Edition SDK includes an example project that converts files in Microsoft Word format to other formats, including PDF, TXT, and XML. The project begins with Antiword, an open source format converter for Linux, and illustrates all the steps required to port the project to S60 devices.

4 Tap more coders

Open C makes it easier for developers with no Symbian OS experience to contribute to mobile projects. The large pool of developers who are experienced in Linux and other C language work can now contribute immediate value to projects serving S60 users. Here are a few examples of project modules that can now be written on top of Open C by developers with little experience in mobile systems. Sample code for each of these project types is included in the Open C Plug-in for S60 3rd Edition SDK available at www.forum.nokia.com/openc.

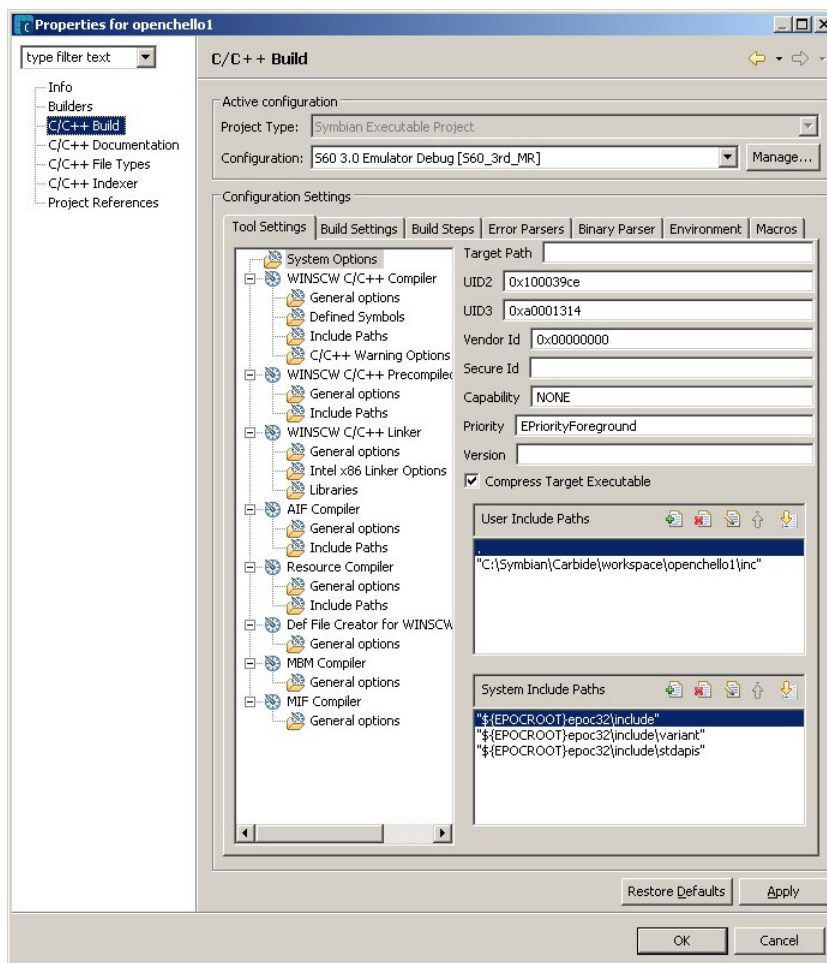
- ◆ **3D graphics** that use OpenGL ES.
- ◆ **Event-driven systems** that implement finite-state machines.
- ◆ **Message queue management** that exposes an API through which other modules can create and close message queues, send and receive messages through the queues, and query the status of created message queues.

5 Open the spigot

Developers can begin to increase their productivity today by downloading the Open C Plug-in for S60 3rd Edition SDK available at www.forum.nokia.com/openc. The SDK is compatible with S60 3rd Edition and S60 3rd Edition, Feature Pack 1. The Open C SDK plugs into all editions of Carbide.c++ (Express, Developer, and Professional) with minimal effort. The Open C SDK is also compatible with GCC and RVCT compilers.

For example, expanding an existing Carbide.c++ environment to support Open C requires the following simple procedure:

1. Download the Open C Plug-in for S60 3rd Edition SDK.
2. Install the SDK.
3. Launch Carbide.c++.
4. Define the system include files required by Open C. This is done in the System Options view in the project properties window.
5. Specify needed Open C libraries:
 - o The lib.c.lib must always be specified.
 - o Libraries must be specified for all build configurations.



Adding Open C capability to Carbide.c++ is easy.