

Open C: 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

1 Full power, less effort

Open C increases the efficiency of developers working on products based on Symbian OS, allowing them to draw on existing code and components as part of their development projects. Open C libraries provide a vendor-neutral C-programming interface to core functionality on mobile devices. Because Open C was jointly developed with Symbian Ltd., code written on top of Open C delivers the performance expected of a native environment. This cooperation delivers an integrated environment for S60 developers, while allowing maximum code reuse for developers supporting additional platforms.

Open C makes it easier for developers who are new to mobile projects, because it is based on POSIX and other open-source standards widely used in desktop and server environments. It delivers a subset of the POSIX libraries, optimized for performance and memory constraints on mobile devices. Other libraries in Open C draw on the OpenSSL, LIBZ, and GNOME open-source projects. The libraries and functions included in Open C are based on studies of large-scale open-source projects such as Apache, Firefox, and GMPPlayer. The initial implementation of Open C delivers more than 70 percent of the functions available in the POSIX and other open-source standards.

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 and open source code to S60 devices. Developers are now able to implement core logic and middleware in Open C and leverage that code outside the Symbian OS environment. Developers also gain a productivity boost if they have existing POSIX code available or can tap high-quality open-source code to fulfill part of their project requirements.

Complete mobile applications and services can combine components written in Symbian C++ with DLLs coded on top of Open C. This frees experienced S60 developers to deliver their maximum value — application integration with the S60 UI and other smartphone-specific features not envisioned by POSIX and other open-source project architects.

2 Do not 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, it began with a series of brainstorming questions, including, What would it take for real open-source projects to run on the S60 platform? The design progressed through a study of the subset of the POSIX standard that is actually used by the open source Apache, Firefox, and GMPPlayer 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 70 percent of the functions contained in the desktop and server projects 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	Standard C libraries, including standard input/output routines, database routines, bit operators, string operators, character tests and character operators, DES encryption routines, storage allocation, time functions, and signal handling.	POSIX	47
libpthread	Implements IEEE Std1003.1c (POSIX) standard interface for implementing multiple threads of execution within a traditional user process. Includes thread creation and destruction, an interface to the thread scheduler to establish thread scheduling parameters, mutex and condition variables to provide mechanisms for the programmer to synchronize access to shared process resources.	POSIX	60
libm	Arithmetical and mathematical functions operating according to the Standard C library.	POSIX	42
libdl	Loading of DLLs	POSIX	100
libz	The 'zlib' compression library provides in-memory compression and decompression functions, including integrity checks of the uncompressed data.	LIBZ	100
libcrypt	Cryptography libraries containing 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 SSL, TLS, and S/MIME, and they have also been used to implement SSH, OpenPGP, and other cryptographic standards.	OpenSSL	77
libglib	A general-purpose utility library that 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	77
libssl	The OpenSSL Secure Sockets Layer (SSL) library implements SSL v2/v3 and Transport Layer Security (TLS v1) protocols.	OpenSSL	86
Total			72

*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 and open source 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 or 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, 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 experienced in 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:

- ◆ Client/server management including the use of sockets for interprocess communication and the use of threads for managing multiple connections to the server.
- ◆ 3D graphics using OpenGL ES.
- ◆ Event-driven systems implementing finite-state automata.
- ◆ 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.

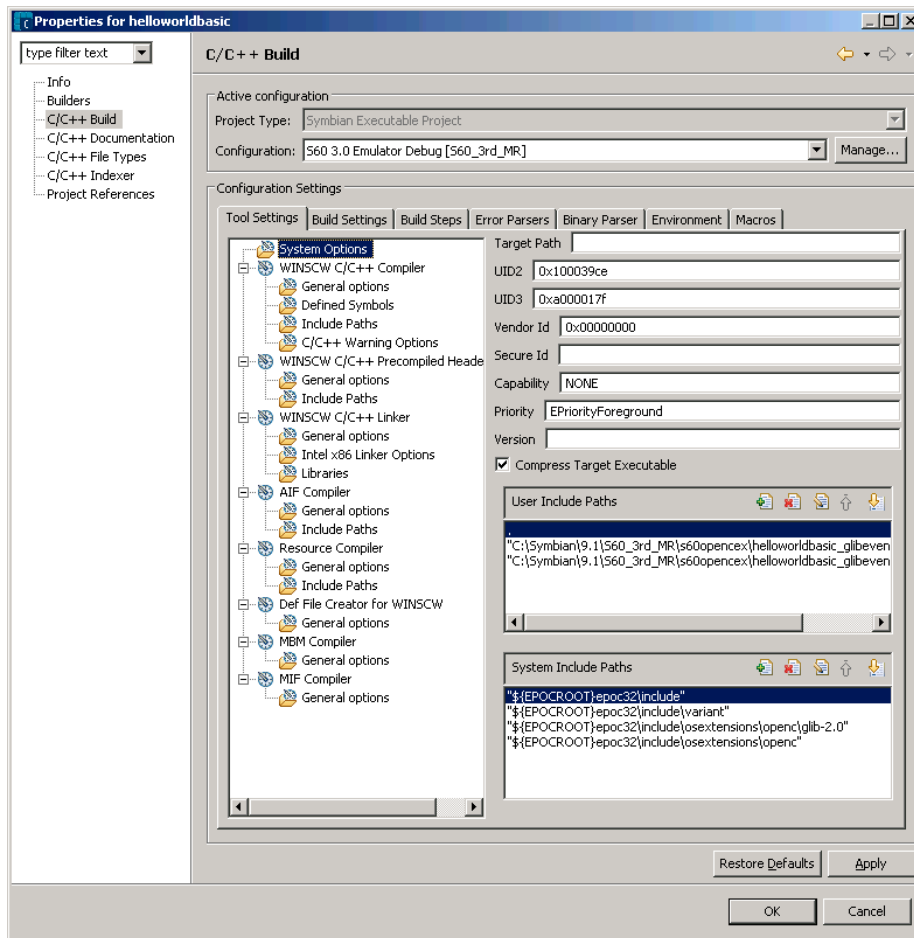
5 Open the spigot

Developers can begin to increase their productivity today by adding Open C to their application architecture. The Open C Plug-in for S60 3rd Edition SDK, which is in the final stages of beta testing, will be released to the public in the coming weeks. For the latest in technology, tools, and example code, go to 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 GCCE 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. This SDK will be released to the public in the coming weeks.
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:
 - The `libc.lib` must always be specified.
 - Libraries must be specified for all build configurations.



The Open C SDK Plug-in makes it easy to extend a Carbide.c++ development environment.