

# Chapter 1: Introduction to S60

It can be surprising to realize how complex a device a mobile phone really is, and how difficult it is to create one. Because of that, it is not at all surprising to see how difficult it is for any manufacturer to succeed in the mobile phone market. The purpose of this chapter is to describe the tip of the iceberg of why that is so, by describing the elements of a typical smartphone from a logical architecture point of view. Later chapters will go into further detail about creating an S60-based device. The general architecture of an S60-based smartphone consists of a cellular modem controlled by the modem software, the Domestic Operating System (DOS) and the application processor engine controlled by the Symbian Operating System (OS) and S60 software.

What is it that makes a device a smartphone? The simplest mobile phone (Figure 1-1) enables voice calls and short messaging (SMS). In addition, a contact list can be considered as a fundamental feature of any mobile device. The next step from 'any' device is a feature phone, which contains some significant additional functionality:

- calendar for keeping track of appointments
- a web or WAP (Wireless Application Protocol) browser

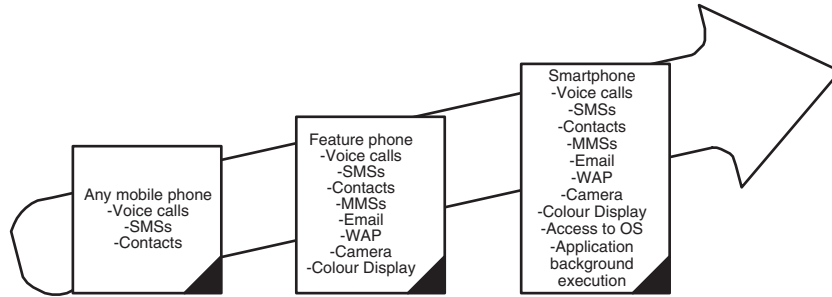


Figure 1-1. Mobile phone evolution.

- multimedia messaging support (MMS)
- email
- games and other pieces of application software
- a colour display
- a digital camera
- support for additional memory through the use of a memory card
- etc.

A feature phone has a relatively simple, but effective, proprietary software environment based on a real-time operating system (RTOS). Smartphones, on the other hand, use a more advanced, open high-level operating system with support for multitasking, expandability, multimedia or convergence features, application interaction and so on.

Feature phone functionality may have support for additional extensibility through installable software applications, usually based on the Java 2 Micro Edition (J2ME) technology and the Java programming language from Sun Microsystems. Smartphones, while supporting J2ME, also support software development through direct, native access to the underlying operating system and its functions (through, for example, software written using the C++ programming language). Perhaps the most notable difference, however, between a smartphone and a feature phone is the way the applications use the phone resources. In feature phones only one application can be run at any given time, whereas in a smartphone the execution of multiple

applications happens in the foreground (visible to the phone user on the display) or in the background, and all the applications can access phone or operating system resources simultaneously, including other applications and network services.

## 1.1 The Competitive Advantage of the S60 Platform

The S60 Platform is the world's leading smartphone software platform, offering a feature-rich software base for phones with advanced data capabilities. It includes the Symbian OS and the Nokia S60 UI (user interface). This UI is the most extensively researched and thoroughly developed graphical user interface (GUI) ever created by Nokia. Its inclusion in the S60 Platform ensures UI consistency across all phones based on the S60 Platform from all device manufacturers. The S60 UI is designed for one-hand operation of advanced and consumer-friendly data services. It supports a variety of different functions, including two softkeys, five-way navigation and an application launching and swapping key, as well as *Call creation* and *Call termination* keys. To improve and facilitate text input, it includes a *Clear* key and an *Edit* key. In addition, it uses the standard 12-key number keypad with alpha printing.

S60 now includes scalable UI support for the following screen resolutions (in pixels):

- 176 × 208 (classic)
- 240 × 320 (QVGA)
- 352 × 416 (double)

Scalable UI also supports each screen resolution in either portrait or landscape view and introduces a scalable graphics (SVG) format for icons and themes.

In addition to the quality assurance of an S60-based phone, this book guides the reader through the concept, idea and competitive advantage of S60 in the global smartphone markets. Nokia's Mobile Software (MSW) is the organization behind the S60 platform. The Product Creation Community (PCC) members represent the leading third-party companies in different regions when it comes to manufacturing a mobile phone. They get the full S60 release at the same

time as the device programs, and are entitled to use it for internal competence development purposes. There is a Developer Community of developers around the world who are innovating on top of the Nokia platform. A commonly used description for all these is the S60 ecosystem. The entire S60 ecosystem is shown in Figure 1-2. This licensing model enables the platform to be used in different manufacturers' device programs.

In addition to the platform itself, MSW works on a reference hardware that contains the platform as well as modem software. Developers of customer programs can buy and utilize this pre-integrated product as a base for their final product. The usage of the reference hardware is highly recommended as it provides a half-ready product and allows the developer to dedicate resources to differentiation only.

The term 'Licensee' in this book can mean either a Nokia device program or another manufacturer's device program. Another name that is used in this book for the Licensee is customer program. All customer programs are treated equally. In practice, this means that all of them have equal access to all platform releases and documentation.

The Product Creation Community (PCC) is composed of technology integrators and other companies competent to participate in the customer product program of making a phone. PCC companies can provide help to Licensees in platform integration, testing and development activities, just to mention a few. S60 Product Creation Community members are divided into four categories:

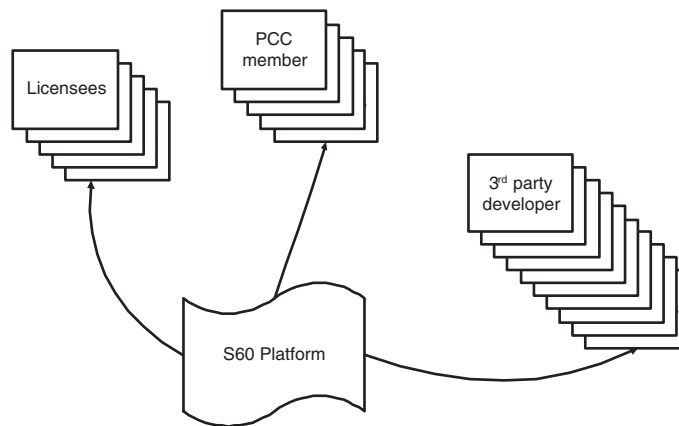


Figure 1-2. The S60 Ecosystem.

- **Boutiques** – experts in designing complete S60 phones and managing entire S60 phone projects
- **Competence Centers** – top-tier software companies with deep S60 end-to-end understanding and extensive S60 project support
- **Wireless Technology Providers** – experts on the hardware platforms or hardware components upon which S60 phones are built
- **Contractors** – skilled software companies offering focused expertise in specific technology areas

Each member is carefully selected and required to meet stringent qualification criteria.

The third-party developer community represents the biggest entity in terms of the number of participants. Forum Nokia is the entity in Nokia that supports these 2.5 million developers worldwide. It arranges training throughout the world, manages the discussion board on technical topics and provides case-based technical support for independent issues as well as tailored technical consultancy for customer projects. Developers can implement applications on top of the S60 platform by utilizing both JAVA and C++ interfaces. Developers make their profit by selling these applications. Together these applications represent one of the widest mobile application portfolios in the world.

The ecosystem is like a chain with equally important pieces. Together they create a unique and strong base for a special competitive advantage amongst platform providers. If one piece breaks, the entire chain is paralysed.

## 1.2 S60 Architecture

S60 consists of numerous architectural units, for example the Symbian OS, the Domestic OS adaptation and UICON. This section explains in turn the platform's main building blocks and their purpose. Other important concepts are also briefly introduced below. The overall architecture of a smartphone is introduced in Figure 1-3.

Once a customer program receives a platform release, it needs to integrate it into the hardware and the Domestic OS. Base Port is the exercise of adapting the Symbian kernel to a particular hardware. Kernel port consists of providing the Symbian kernel access to the necessary hardware functionality. Symbian runs in the following two modes:

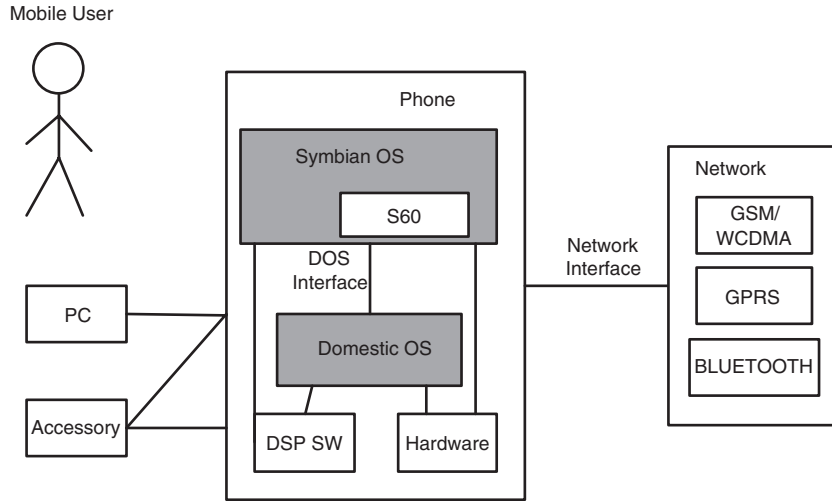


Figure 1-3. Smartphone architecture.

- **User mode** – kernel services can only be accessed through the EUSER.DLL. The lack of a proper kernel port does not stop the development of user-side components because the platform provides a complete Kernel Port for the PC environment under the Windows Operating System. This is called the emulator.
- **Kernel mode** – EUSER.DLL is an interface between common code and hardware-specific code. In the other words, kernel mode means that the software is run on the target hardware.

## 1.2.1 The Symbian Operating System (Symbian OS)

S60 is based on the Symbian operating system, which provides several services to the platform and to platform-based devices. Such services are, for example, the User Interface (UI), applications and middleware.

## 1.2.2 Domestic Operating System (DOS)

The Domestic Operating System (DOS) is the proprietary operating system and no interfaces in it are open to third-party developers. DOS plug-ins are device specific and need to be implemented by the customer program.

### 1.2.3 User Interface (UICon)

S60 includes the user interface components needed by an application. UICon is a graphical user interface (UI) library for reference-design (DFRD) independent functions based on EIKON, which is the original graphical user interface library for the Symbian OS. Use of such components guarantees the implementation of the application of the user interface by developers.

## 1.3 Summary

This chapter has briefly introduced the smartphone, what it is, its architecture and how it differs from other device types. The basic components of the S60 Symbian operating system, the domestic operating system adaptation and the user interface library are all explained in this chapter. The overall architecture of the S60 consists of the Symbian Operating System, the User Interface components and adaptation to a device-specific Domestic Operating System plus telephony software. The S60 ecosystem consists of Nokia's Mobile Software, platform Licensees (device manufacturers), the product creation community and third-party developers, which together provide a strong basis for the success of the platform.

