

Maemo Diablo Reference Manual for maemo 4.1

Introduction

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Preface

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Chapter 1

Introduction

This document strives to give an overall picture of the maemo platform to developers willing to bring their applications to the Nokia Internet Tablets. These mobile devices run a Linux-based operating system on ARM architecture. The maemo software development kit (SDK) is currently provided natively for desktop GNU/Linux distributions, such as Debian and Ubuntu. The SDK can also be used in other operating systems through a virtual environment.

The main focus is to explain the basics necessary to create and port maemo-compatible software. It is simple to get started, even if concepts such as cross-compilation or touchscreen user interface design are not familiar. Those who are familiar with GNU/Linux, GTK+ toolkit and C programming language will feel right at home.

This document is also a good starting point for software development for any platform or device related to the GNOME Mobile family. As well as giving an introduction to the new frameworks, libraries and tools provided by maemo, it explains the overall design concepts for this new generation of Internet-capable devices.

History and Philosophy

Maemo uses known open desktop frameworks to enable easy software portability and familiarity. This strategy is quite different compared to many Linux-based media players and phones that are closed, or require special development tools. About 90% of the maemo platform is open, and the majority of that comes from upstream open source projects. The rest that is closed consists of e.g. parts of the user interface and device drivers, owned either by Nokia or third-party providers.

One important philosophy is to enable easy development and hacking. Developers can make modifications to the platform, e.g. to introduce their own kernel modules. Nokia also hosts an active open source maemo community around the platform (maemo.org).

Internet Tablet Overview

The devices are smaller than a laptop, larger than a PDA, and quite lightweight. Some of them (e.g. Nokia N810) have a small keyboard, and all of them have a stylus and a touch-sensitive screen. The stylus-driven GUI will cause some design challenges later on, since software will need to be designed with this in mind. There is also a possibility of using an on-screen keyboard with the stylus, including handwriting recognition and a predictive input system to aid the user. In all devices, there is a limited set of hardware buttons available for applications.



Figure 1.1: The Virtual Keyboard (VKB)

As programmers appreciate knowing a bit about the fundamentals of the devices for which they program, table 1.1 presents a short list of the most important components.

N800	N810	N810 WiMax Edition
an 800x480 pixel, 225 pixels-per-inch (PPI) wide-screen touch screen display with 16-bits per pixel color depth		
Hardware buttons with a layout optimized for Web surfing		
Virtual Keyboard	Small slide-out keyboard (& VKB)	
Wi-Fi (802.11b/g)		
		WiMAX 802.16e / 2.5GHz
External GPS via Bluetooth	Integrated GPS (external also supported)	
1500 mAh battery		
3.5 mm stereo audio out socket (works also as mic input on N800/N810)		
Built-in VGA resolution webcam		
USB 2.0 port (in target mode by default)		
128 MiB of RAM		
256 MiB flash memory with JFFS2 file system		
Two memory card slots, SD, MicroSD, MiniSD, MMC, and RS-MMC (some types with extender).	One memory card slot, compatible with MiniSD and MicroSD (with extender).	
Bluetooth 2.0		
TI OMAP 2420 multi-core processor with maximum clock frequency of 400 MHz, with: <ul style="list-style-type: none"> • TMS320C55x DSP logic (Backward compatibility with the 54x-series) • ARM1136 core ("ARMv6") with an MMU (Backward compatibility with ARM926) 		

Table 1.1: Internet Tablet components

The USB port normally acts as a USB target, although the direction can be reversed, and the device can be the USB host (i.e. initiator). The port is not capable of providing USB power, so an external power feed is necessary. This allows various usage scenarios, when the R&D mode is enabled on a device. The default version of Internet Tablet software runs in target mode only.

Some noteworthy points about the hardware and software:

- There is not a lot of RAM (compared to a "modern PC"), and the memory is shared between all the applications that are running at any given time.
- The system runs a modified Linux kernel 2.6 (omap-port).
- The system library is GNU libc 2, meaning that most software can be ported without too much effort (even networking software).
- To conserve battery power, one needs to be careful with application core logic (loops, delays, timeouts, threads, etc.)

- There is no hardware acceleration for graphics operations (2D or 3D).
- The built-in flash contains approximately 64 MiB of shipped software. 192 MiB available to be shared between applications covers also data those applications use. Using tablet as memory stick is not so common use case.
- The built-in flash uses a file system specifically designed for flash memory, and contains transparent compression and decompression. This means that sometimes optimizing for space requirements is not sensible. Compressing an image as a **.gif** is not very good idea, as it would have been compressed anyhow. However, the RS-MMC card uses FAT/VFAT file system. The compression rates may vary, and if space conservation is important for an application, it is advisable to test the specific use scenario properly.
- There is some support for Java acceleration in the ARM core, but this is not utilized, since there is no supported JVM to execute Java code.

N.B. The above feature list holds for the "end user" version of the software that is shipped with Internet Tablets.

Chapter 2

Glossary

ABI Application Binary Interface, providing object code level compatibility.

API Application Programming Interface, providing source code level compatibility.

applet A small application that integrates to *Hildon Desktop*.

ARMEL A name that e.g. Debian uses for the little endian ARM EABI (*ABI* for the ARM architecture).

devkit Part of the *maemo SDK* that contains software development tools. The SDK contains multiple devkits, e.g. doctools devkit.

Hildon Application framework used in the *maemo platform*. Developed by Nokia and based on GNOME/GTK+ technologies, currently in the process of becoming an upstream project in gnome.org.

Hildon Desktop The main user interface component of the maemo release Chinook, rewrite of *maemo desktop*.

Internet Tablet Product category for Internet-optimized mobile devices with touchscreen. The term was coined by Nokia, but is nowadays used more widely to include other devices.

initfs Initial file system used as the root file system during Linux kernel boot e.g. for hardware initialization (contains kernel modules and utilities for initializing them). Mounted after boot to `/mnt/initfs`.

maemo Software platform for mobile devices developed by Nokia, based on GNU/Linux and GNOME/GTK+ technologies. It includes proprietary components to make it work on the Nokia Internet Tablets.

maemo.org Developer community web site maintained by Nokia, main point of reference for open source and third-party developers in general.

maemo SDK Software Development Kit to create and port applications to the maemo platform using a PC.

Nokia Internet Tablet OS *maemo platform* + proprietary applications packaged to an official device image provided by Nokia.

OSSO Open Source Software Operations, Nokia organization developing and integrating software for Internet Tablets.

rootfs Root file system on the device.

rootstrap Part of the SDK that contains selected software components from rootfs. Rootstrap is the root file system of a target inside Scratchbox.

Sardine An experimental distribution based on Hildon for maemo, primarily of interest for developers wishing to test "bleeding edge" features that are being developed for future releases of maemo.

toolchain Part of the SDK that contains ARM cross compilation tools, such as compiler and linker.

Maemo SDK Releases

Mistral maemo 2.0 release. Corresponds to the Nokia Internet Tablet SE 2006 version 2.01.2006.26-8.

Scirocco maemo 2.1 release, including mainly bugfixes and some other enhancements. Corresponds to Nokia Internet Tablet SE 2006 version 2.2006.39- 14.

Gregale maemo 2.2 release (bugfixes and enhancements)

Bora maemo 3.x releases. corresponds to Internet Tablet OS releases "1.2006.47-20", "2.2006.51-6" (maemo 3.0), "3.2007.10-7" (maemo 3.1) and "4.2007.26-8"+"4.2007.38-2" (maemo 3.2)

Chinook maemo 4.0.x releases, corresponds to Internet Tablet OS releases "1.2007.44-4" (maemo 4.0) and "2.2007.51-3" (maemo 4.0.1)

Diablo maemo 4.1.x releases, corresponds to Internet Tablet OS releases 4.2008.23-14 (maemo 4.1) and 4.2008.36-5 (maemo 4.1.1)

Fremantle maemo 5.x releases, corresponds to Internet Tablet OS release "x.2009.xx-x" (maemo 5.x)

