

NEC Group's Approach to Tackling the Mobile Terminal Technologies

The NEC Group has brought innovation to diverse areas of mobile terminal-related technology, improving mobility and anticipating needs for high performance. Among the many technologies that support mobile terminals, this special issue will focus on our latest advances in hardware and software platform technology and introduce how we endeavor to make terminals more compact and enhance their functionality.

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1 Mobile Terminal Development Trends

Users expect and demand a mobile phone to be a compact, thin and lightweight device that can be used for extended periods without recharging. When the mobile phone first appeared in the marketplace, the top priority was on making them smaller and lighter, and by the mid 90s, Japan had introduced models in the sub 100cc/100g range.

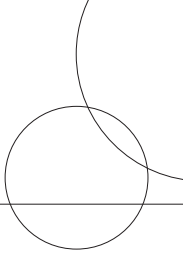
From the end of the 90s, mobile terminals saw functionality expand with the primary function of voice communications joined by mobile internet and e-mail. These have since been followed by camera and music player functions, and recently the capability to display terrestrial digital television. To the ideal of “anytime,” “anywhere” and “with anyone” has been added the quality of “anything.” In other words, the “mobile phone” that simply functions telephony, has evolved into a “mobile phone” that delivers a diverse range of functionality and services. With this expansion of applications has come a heightened demand for bigger display screens, cameras that can capture more beautiful images, faster communications, more intuitive and comfortable operation, and a capability for new services.

On the other hand, responding to these increased multifunc-

tionality and heightened performance requirements inevitably meant that the fundamental essence of mobile terminals - their “portability” suffered as a consequence due to factors such as larger cases to hold the features and increased power consumption. In addition both the scale and scope of development continued to broaden, and manufacturers were reaching the limits of what could be achieved by independent development. In this situation, the mobile terminal continues to evolve day by day, driven by efforts of each of the mobile terminal manufacturers as they integrate a variety of technological innovations into terminals, vigorously compete and occasionally cooperate, and always seeking to achieve both mobility and high performance while striving for efficiency in development.

2 NEC Group Approach

The NEC Group has introduced a variety of technological innovations to the field of mobile terminals, enhancing their mobility while leading the way in responding to the need for higher performance. In this special issue, we have selected from among the broad array of technologies that go into the making of mobile terminals and focused on several key areas: NEC's



latest approaches in the development of hardware and software platforms; how we are tackling the conflicting challenges of more compact terminals and enhancing performance; the basic technologies behind making terminals more compact and thinner; camera image quality technology and wireless LAN technology in mobile terminals.

2.1 NEC's Development of Hardware/Software Platforms

Mobile terminal hardware platform (HW platform) consists of the chipset that performs core functions such as applications processing, digital baseband processing and power supply management. The HW platform is the key to realizing not only gains in functionality and performance but also smaller, thinner terminals that use power more efficiently; it is the source of the competitive strength of our products. For the FOMA^(R) N905i launched in November 2007 (see **Photo**, left), the Medity2 platform and an originally developed power management LSI were adopted as the HW platform. Despite realizing enhanced functionality and performance ranging from HSDPA and GSM communications capability to a built-in 500MHz CPU, NEC was able to reduce the package size through LSI integration, contributing to a smaller and thinner form, and still realizing low power consumption on a par with conventional models through detailed power management and process shrinking.

In the domain of software (SW) development, NEC adopted the Linux OS, and pursued the development of a Linux-based middleware for mobile devices in collaboration with NTT DoCoMo, Inc. and Panasonic Mobile Communication Co., Ltd., achieving both higher SW productivity and quality while boosting functionality. However, as a result of factors such as the accelerating demand for greater multifunctionality and global competition, NEC sensed that it was approaching the limit from perspectives of the scale and efficiency of development. In order to respond to this situation, NEC joined forces with a total of 6 companies (mobile terminal manufacturers and mobile phone carriers) to establish the LiMo Foundation and started its activities in 2007 with the aim of promoting the building of a



Photo Exterior of the N905i and N705i.

Linux OS-based SW platform for mobile devices. The LiMo Foundation is not only devising the architecture and formulating API specifications, but also developing a global SW platform through contributions of source code from its members. In addition, it is also involved in the development of various applications and constructing a global ecosystem, making available APIs to non-members and providing SDKs.

2.2 NEC Blazes a Trail to More Compact Terminals with Higher Performance

In order to provide users with larger screens and key size sufficiently large to facilitate operation while still maintaining the mobility of the terminal, the need to make terminals thinner is increasingly important. Also to preserve freedom in designing the terminal exterior, smaller and slimmer technology is vital. With this aim in mind, NEC tackled making all models under development more compact and slimmer: developing cutting-edge prototypes that incorporated the technology essential for realizing slim and compact terminals, verifying the practicality of the new technologies and introducing proven technological assets in a variety of models. N705iμ (see Photo, right) is an example of the result of this approach. In the early prototype which was the base for the N705iμ, NEC sought to realize an array of fundamental technologies for smaller and slimmer terminals including a block package approach for the printed circuit board, battery, etc., that takes into consideration measures to prevent mutual interference by these large components; a hybrid casing that promises thinness while delivering both strength and rigidity; a bathtub-type structure that achieves a slimmer form without sacrificing the tactile feel of a key click; and thin-membrane piezoelectric speakers to further slim components.

Cameras built into mobile terminals must satisfy the demand for not only an extremely compact and slim form but also increasingly higher image quality. NEC was the first to develop “camera shake” correction for still photo shooting with a mobile phone camera, and was first to commercialize it in Japan, incorporating it in the N902i. In addition, NEC continues to introduce significant improvements in camera function and performance, for example, the incorporation of PictMagic IV with the double function of correction of 6-axis camera shake and subject motion blur, and auto optimizing correction using scene recognition.

Also in response to the need for mobile phones to access low-cost services such as IP telephony using IP networks, NEC tackled the incorporation of the IP network-friendly and fast wireless LAN capability in mobile terminals, leaping ahead with the development of various services that use IP and SIP telephony functions. Exploiting the fruits of these efforts, NEC has

developed a dual-protocol handset that combined 3G mobile phone capability with IP telephony functions using wireless LAN, and launched the IEEE802.11b-standard N900iL in November 2004 followed by the IEEE802.11b/g-standard N902iL in February 2007. In order to equip mobile terminals with wireless LAN capability, NEC developed chip packaging technologies that contribute to shrinking the size of the wireless LAN module as well as energy conservation technologies that minimize power consumption when operating in the dual mode. In addition, QoS and security technologies have also been implemented in chips. Today research and development goes on with the aim of bringing users a more seamless and comfortable operating experience.

3 Conclusions

In this special issue, this article is followed by a closer look at how NEC is approaching each of the above mentioned challenges.

Here we have only introduced a few of the diverse technologies that support the indispensable mobile terminal. Now and in the future, NEC will be at the leading edge of innovation in a broad variety of technological domains, strengthening collaboration among related technologies in the NEC Group and driving the evolution of the mobile terminal to meet the demands of the coming Ubiquitous Society.

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