

Efforts for Global Software Platforms

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Abstract

NEC has adopted Linux as the OS for its mobile terminal software and has been developing Linux-based middleware for mobile devices based on MOAP^(R) (L) jointly with the NTT DoCoMo, Inc. and Panasonic Mobile Communications Co., Ltd. Meanwhile, six companies including both mobile phone carriers and manufacturers started the LiMo Foundation in 2007, defined the API specifications and published the Beta version of the specifications in February 2008. The LiMo Foundation plans to continue its efforts in promoting construction of Linux OS-based platform for mobile terminals and in building so-called “ecosystem.”

Keywords

mobile terminal, software platform, Linux, LiMo Foundation, ecosystem

1. Introduction

NEC released N900iL in November 2004, thus adopting “Linux” as a mobile terminal OS for the first time in Japan. Since then we have been shortening the development period and improving the software quality by using this multifunction OS that features high productivity and reliability.

Moreover, we have also developed a mobile terminal middleware for Linux, “MOAP (L) (Mobile-phone Oriented Application Platform Linux),” which was undertaken together with NTT DoCoMo, Inc. and Panasonic Mobile Communications Co., Ltd. We are jointly developing components that can be shared with other manufacturers and are also focusing on the in-house development for those parts that are intended for our own exclusive products. This policy has made it possible for us to reduce development costs.

Nevertheless, the speed with which technological progress advances continues to increase and manufacturers who try to develop the software for new functions either independently or in joint development with a few chosen manufacturers are almost reaching the practical limit in terms both of development scale and efficiency. Moreover, it has also become necessary to introduce applications and utilities that are available in overseas markets but not in Japan in order to advance the Linux-based platforms and promote their use in export mobile phone models.

To deal with these circumstances, six companies including both mobile phone carriers and manufacturers (NEC, etc.) have organized the “LiMo Foundation,” an organization that aims to promote the construction of Linux OS-based mobile de-

vice software platforms.

The following sections of this paper introduce the efforts being made by the LiMo Foundation and discuss NEC’s related activities.

2. The LiMo Foundation

It was in January 2007 that the LiMo Foundation was started jointly by NEC, Motorola Inc., NTT DoCoMo, Inc., Panasonic Mobile Communications Co., Ltd., Samsung Electronics Co., Ltd. and Vodafone Group Plc. The foundation aims at the construction of Linux OS-based software platforms for mobile terminals. It develops software platforms by determining the API (Application Programming Interface) specifications and architectures and by soliciting contributions of software components from the foundation members.

By inviting contributions of shared software components for the Linux OS-based software platforms for mobile devices it is intended to support the construction of an “ecosystem” that is committed to the application middleware that has been developed outside the LiMo Foundation.

2.1 Members of the LiMo Foundation

The LiMo Foundation was originally established by six firms including NEC. Since then the foundation has attracted mobile phone carriers, manufacturers of terminals, software vendors and integrators from various fields including OS, tools, security and Java as well as chip manufacturers. By April 10,

2008 the number of member firms had increased to 35.

The LiMo Foundation invites members to make endeavors in their own fields that are aimed at contributing to the overall development of the Linux-based mobile device platforms.

2.2 Features of the LiMo Foundation

The LiMo Foundation defines specifications as other standardization organizations do. However, it also conducts studies of architectures, specifications and APIs and when it deems it if necessary, it invites members to contribute by modifying the proven source codes, aiming at the creation of LiMo Foundation platforms. The codes obtained by such contributions (Foundation codes) are accessible or modifiable only by the members of the LiMo Foundation. Avoiding open sourcing and limiting the access rights of members prevents misuse by malignant hackers and security is ensured.

The LiMo Foundation publishes the APIs defined for the platforms in order to promote applications developments by developers from outside of the foundation.

2.3 Licensing System of the LiMo Foundation

The LiMo Foundation prepares the licenses shown in the following **Table** in order to promote contributions of proven source codes from its members.

The foundation does not exercise patent rights, which are a matter of problems for the sharing of source codes. It provides FPL (Common Capable) licenses and promotes its application to mobile terminal software by making the copyright free among the members. The fear of infringement of the patents of others by the contributors and anxieties concerning the payment of patent fees by the users is thus eliminated.

The foundation also prepares a licensing system that combines onerous and gratuitous licenses in order to promote the contribution of source codes by using a business model that

Table Licensing System of LiMo Foundation.

License type	Copyright	Patent (Excludes Standard and Pool Patent)
Open source (e.g. GPL, LGPL, BSD, Apache)	Royalty-Free	As defined in applicable open source license
FPL (Common Capable)	Royalty-Free	Patent non-assert
FPL (Non-Common Capable)	Royalty-Free	Non-discriminatory & discretionary \$fee
Proprietary (Terms are subject to bilateral agreement between Licensee and Contributor)	Non-discriminatory & discretionary \$fee	Non-discriminatory & discretionary \$fee

FPL: Foundation Public License

offers its core components free of charge but sells those parts that have been specially developed as plug-ins. The introduction of onerous licenses is intended to arouse the motivation of the members for obtaining considerations for better functions as well as to reduce the overall costs based on the principles of competition.

2.4 Architectures of the LiMo Foundation

The platform architectures defined by the LiMo Foundation include the frameworks and plug-ins. The frameworks include the foundation APIs and framework APIs and the definitions of these APIs protect the framework against fragmentation and maintain its compatibility. The foundation APIs are targeted mainly at applications developers and can be used by non-members of the LiMo Foundation. The framework APIs are used between frameworks or with plug-ins for the platforms of the LiMo Foundation. The plug-ins enable the extension of the framework functions without modifying the foundation APIs and contribute to the differentiation of new technologies and functions that are dependent on hardware, region and operator-specific services.

The defined source codes are classified into common codes and non-common codes. The common codes are independent of hardware and region, their compatibility and quality are guaranteed and they are not subject to the patent rights of other members. Contribution without a fee serves to promote the use of common codes by more manufacturers and to prevent platform fragmentation. The non-common codes may be dependent on the device, function and/or region and the fee is determined according to the source code licensing conditions.

A block diagram of the platform architectures is drawn up as a common architecture diagram by combining frameworks. **Fig. 1**¹⁾ shows the architecture diagram of the LiMo Platform.

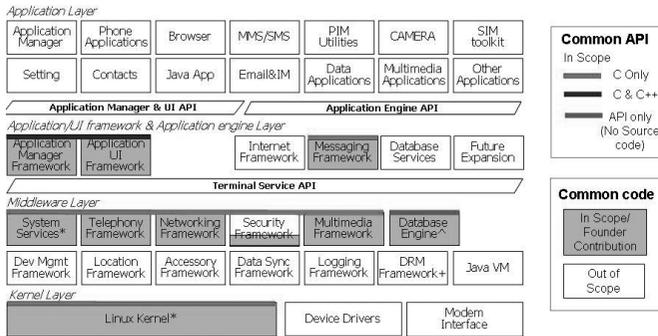
2.5 LiMo Foundation WG (Working Groups)

At the LiMo Foundation, the manufacturers of terminals among the founder members discussed the framework of R1 (Release 1) in order to decide the work allotment according to the fields in which their expertise is recognized. The hatched blocks in Fig. 1 indicate the frameworks covered by R1.

WGs were started to support the frameworks covered by R1.

After other members interested in the frameworks joined the WGs, the architectures and APIs were proposed by the members contributing to the source codes, reviewed by the WG

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* Only minimum versions are specified for kernel (2.6.x) and libraries (2.4.x); no source code contribution will be made
 ^ ASCMW recommends to continue research for this component for R2
 ^ An optional API based on ODBC will be defined; no source code contribution will be made

Fig. 1 LiMo Platform architectures.

members and finally decided upon by their collective agreement.

2.6 Releases by the LiMo Foundation

The LiMo Foundation conducted developments aimed at releasing R1 in March 2008. Prior to the release it publicized the Beta version of the API specifications on its website in February.

At the Mobile World Congress that was held in Barcelona, Spain, in February 2008, the largest mobile communications event in the world, the LiMo Foundation announced the first mobile phone to be based on the LiMo platform.

2.7 NEC's Contribution to the LiMo Foundation

NEC is uncompromisingly leading the efforts of the LiMo Foundation.

We have made a joint contribution together with Panasonic Mobile Communications Co., Ltd. based on the MOAP (L), to Windows Manager, which handles the application UI and is a key component of the "ecosystem."

A topic that we are planning to advance is networking. In this field, we are leading the Networking WG by assuming the post of chairman of the framework WG. We make contributions to the MOAP (L) based HTTP and WTCP, and propose architectures and API specifications for their frameworks. We also compile them together with other components in the framework by also coordinating requests from other members.

We developed the frameworks aiming at the release of source codes of R1 scheduled for the end of March 2008 by also incorporating the requests of other foundation members.

At the Mobile World Congress in February 2008, we exhibited FOMA (R) N905i, N905iμ, N705i and N705iμ as the first NEC mobile phones based on the LiMo Foundation platform.

3. Future Perspectives

3.1 Proposed Future Activities of the LiMo Foundation

In the future, the LiMo Foundation will expand its platforms by developing new frameworks for Internet, device management and Java that are aimed at supplementing the frameworks constructed for R1. These will be released as R2 (Release 2) as shown in Fig. 2²⁾. The development of R2 will be participated by new members as well as by the LiMo Foundation founder members and all members will make contributions from their specialized fields.

The LiMo Foundation is also planning to announce the SDK (Software Development Kit) for supporting the development of software for the LiMo Foundation-compliant mobile devices in the second half of 2008. The SDK will allow software developers other than LiMo Foundation members to develop applications for the LiMo platforms easily and thereby contribute to the construction of an even better "ecosystem."

3.2 NEC's Efforts

As a founder member of the LiMo Foundation, NEC is

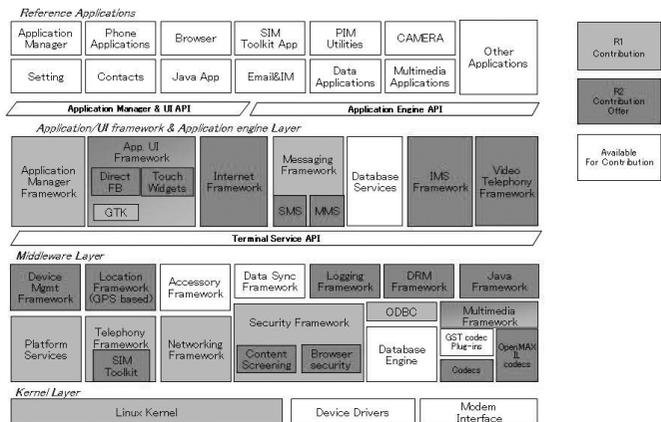


Fig. 2 Frameworks planned to be developed for the LiMo Foundation R2.

determined to continue to adopt the leadership in the activities of the foundation.

Our aim is to launch products that can quickly and in a timely manner trace the launch of new services by making full use of the frameworks and plug-ins that will result from our activities. We will also make good use of the applications procured via the “ecosystem” that is to be formed around the LiMo Foundation.

4. Conclusion

In the above, we have introduced activities that are aimed at the construction software platforms in a global context by focusing on those of the LiMo Foundation.

At NEC, we intend to construct more competitive global software platforms based on the results achieved by the LiMo Foundation and to develop products that can suitably be deployed overseas as well as domestically.

*“LiMo” and “LiMo Foundation” are trademarks or registered trademarks of the LiMo Foundation in the USA and other countries.

*“MOAP” and “FOMA” are registered trademarks of the NTT DoCoMo Inc.

*“Linux” is a registered trademark of Linus Torvalds in the USA and other countries.

*“Java” is a trademark or registered trademark of Sun Microsystems, Inc. in the USA and other countries.

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