DOCOMO Today

Mobile Terminals: Advances to Date and Advances Going Forward

Norihito Tokuhiro

Managing Director of Communication Device Development Department

I joined NTT in 1987. A year later, in July, I became involved in the development of mobile phones. Since then I have continued to be engaged in its development.

The first project I joined was the development of the TZ-803BI mobile phone. At the time of its launch, it was considered revolutionary with specifications such as 400 cc volume, 640 g weight, 40 minutes of talk time, and 9 hours of standby time, although they seemed to be inferior to those of today's features. Mobile phones have been evolving since then, especially in the area of size reduction. In April 1991, a mobile phone branded "mova" was released. It had 150 cc volume, 230 g weight, 45 minutes of talk time, and 12 hours of standby time. Further developments have been made in size and weight reduction and in battery longevity.

The first mobile communication system was an analog-based system. In April 1995, however, a digital-based mobile phones system called "PDC" was launched. The mobile communication system next evolved to the W-CDMA system in October 2001, and then to LTE. Also, as radio communication technology progressed, data communication bandwidth drastically improved, from just 9.6 kbps at first to a maximum download speed of 225 Mbps at present. Meanwhile, in terms of services, prior to February 1999 mobile phones could handle only voice calls, and mobile data communication was possible only on PCs. After the launch of the i-mode service, however, users could enjoy email and Web browsing on mobile phones themselves. In terms of mobile phone development, the focus changed from making phones more compact and lighter to making phones thinner. With regard to displays on mobile phones, after color LCD was implemented in December 1999, the development trend shifted to a greater emphasis on enlarging screen size and improving qualities of display in order to display more rich and attractive content. Furthermore, after the introduction of smartphones, large touch-panel displays became dominant on mobile phones. In addition, application CPUs used in mobile phones have also advanced significantly, from 200 MHz single-core processors in 2005 to 2 GHz octa-core processors in 2015.

In summary, the evolution of mobile phones to date has focused on improving high-speed data communication, increasing system capacity, shortening latency, and boosting application CPU performance to enable more advanced services, as well as on evolution of displays for larger screens and higher resolution.

I believe that there are two major directions in the future mobile phones. The first is the further evolution of current smartphones. The other is development of data communication modules for the purpose of connecting not people but "things" to the network, known as the Internet of Things (IoT). Smart meters are a good example.

The evolution of smartphones entails, firstly, the provision of stress-free, convenient, and easy-to-use services at even faster data communication speeds, greater system capacity, and less latency, which will be realized by the further development of LTE (LTE-Advanced) and the commercialization of the new generation mobile communication system called 5G. Another important element in the evolution of smartphones is improvements in user experience (UX). The expected UX enables mobile phones to be used by wide range of users with more intuitive and naturally operable user interfaces. Because users have a variety of IT literacy, it is necessary to personalize the user interface and functions to meet each user's needs and preferences. Furthermore, more highly convenient UX can be provided by activity support functions. These functions enable the mobile phones to learn users' activities and operation and usage histories and also take into account the current time, place, and occasion, and then provide appropriate activity support to users by estimating their future behaviors based on learnt users' context. On the other hand, there is also a need to balance advancements in security functionality and ease of use on the mobile phones. Even though fingerprint and iris authentication have been implemented, more diverse and user-friendly biometric authentication, such as face authentication and voice print authentication, are expected to be implemented.

The above mentioned advanced UX and security features cannot be realized just on the smartphone itself; they must be realized by highly sophisticated interworking with the cloud. Regarding smartphone displays, we have dealt with advanced technologies (i.e. 3D displays). Going forward, we will continue to further develop higher resolution, larger displays and so on. In addition, we can provide added value by linking mobile phones with peripheral devices, such as display mirroring to TVs and displays on wearable devices like smart glasses.

As for the evolution of data communication modules, smaller and lower-cost devices, which are realized by applying a specialized standard focused on narrowband data communication, will enable solutions to suit various application areas. Furthermore, for example, battery-less data communication modules powered by solar battery and specialized compact wireless data communication with low power consumption will enable application in environments where provision of power supply is difficult.

Smartphones and data communication modules will surely play active roles in our daily lives to an even greater extent going forward. We will continue to develop mobile phones (devices) that will not only become even closer partners with customers, but also elicit exciting and attractive feelings about the future when customers hold them in their hands.