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Cloud and 5G

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Among the many important R&D initiatives we are pursuing, I would like to particularly mention about "cloud" and "5G," two seemingly unrelated topics. I believe these two areas represent the major challenges we need to face as we aim to develop the mobile communication systems for 2020.

What is generally referred to when talking about cloud could be slightly different for mobile services, but what we need to aim for is to offer everything, including processing and storage in the mobile device, through the cloud via the network. We have already offered services under this concept. For example, in services such as "Shabette Concier (voice-agent application)" and "Hanashite Honyaku (automatic voice translation service)," users may feel that the device is directly responding to their queries, but these services are actually made possible through massive behind-the-scenes processing carried out in the cloud.

Although "5G" is still not widely known, efforts to develop the 5th generation mobile systems have already been initiated through organized movements in Europe and major Asian countries. Themes related to 5G have already started to come up even in academic conferences. In fact, during the Vehicular Technology Conference*1 (VTC2013-Fall), I was part of a panel session called "The Dawn of 5G" [1]. Up to 4G, there have been well-defined technologies and next-generation concepts almost ten years prior to the launch. Thus, my assertion during the panel session was that we are already at the stage of initiating 5G discussions aimed at its launching in 2020. I also pointed out the relationship of data traffic and cloud, which I would like to expound further below.

One driving factor for the global spread of LTE is the need to respond to the increasing data traffic around the world. As data traffic continues to expand, many in the industry claim that it will swell to 1,000 times its current volume in ten years. We at NTT DOCOMO in fact have been one of the first to give this forecast. In reality, for the past few years, data traffic has approximately doubled every year. Thus, at this rate, it could easily expand to 1,000 times its current volume in ten years. Even for 3G and LTE, in the early stages of standardization, many people had doubts as to whether they were really needed. However, asserting that the increase in traffic points to such a demand, we started the study of next-generation technologies. This time, however, I myself feel some doubt whether there would really be a 1,000 times traffic growth. The reason for my apprehension is that the recent increase in traffic is due to the fact that services are offered on an unlimited flat-rate plan. However, in consideration of factors such as fairness among users and business sustainability, rate plans that put a certain limit to volume of data or data speed are now also becoming widely adopted worldwide. Thus, this would mean that users need to be more careful in the way they use the data, putting some kind of restraint to the expansion of communications traffic.

The cloud era, however, has already come, and is bound to further evolve. Service application may transmit data that are actually not used, and such cases will increase in cloud services. Although this is a result of service providers wanting to offer the best user experience, in this case, users do not necessarily have control of the volume of data used. I think the ultimate form of cloud service is one in which all processing would be performed in the cloud wherein users would not be aware of the processing location, and one that offers the kind of experience users want. Moreover, an important feature of this ultimate cloud service is that it should be offered at reasonable rates in accordance with the kind of user experience being offered.

During the VTC panel session, I concluded, even though with some apprehension, that, in this cloud era, a 1,000 times traffic increase would be a possible scenario. In fact, I believe that we do need to aim for 1,000 times more traffic in order to realize the ultimate form of cloud service. In other words, we need to aim for offering services that are realized at 1,000 times traffic volume, and for building networks that can withstand and support such volume of traffic.

This is a major challenge we have to face. No matter how much transmission capacity may improve, the nature of mobile communications is such that it is difficult to guarantee 100% transmission. Offering services at reasonable rates would also be a challenge. This is where the unique and subtle relationship of 5G communications technology and cloud service systems comes to play. There is a need for new concepts and new technologies for cloud systems in order to address issues that cannot be resolved with 5G technologies alone. We may need to come up with new ideas, including new business models, to resolve this problem.

5G, cloud, and a wide range of other technologies that underpin them are essential in realizing the ultimate mobile services for 2020. Let's take on this big challenge together, because we cannot overcome this task ahead of us unless people from different fields join forces and work side by side.

Reference

[1] Seizo Onoe, Jan Färjh and Ed Tiedemann: "The dawn of 5G," VTC2013-Fall Panel Sessions, Sep. 2013.
http://www.ieeevtc.org/vtc2013fall/panels.php

*1 **VTC**: The semi-annual flagship conference of the IEEE Vehicular Technology Society. The conference covers topics in the field of vehicular technology including wireless and mobile.