Preface
Special Issue on Networks —Preparing for Evolving Networks—

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Fujitsu's corporate vision states that, "Through our constant pursuit of innovation, the Fujitsu Group aims to contribute to the creation of a networked society that is rewarding and secure, bringing about a prosperous future that fulfills the dreams of people throughout the world." This clearly reflects Fujitsu's view that the network has a major role to play in improving future information and communications technology (ICT) systems and then society. For example, Cloud computing, which is a major trend in the ICT world, is based on the existence of broadband networks. As a leading total ICT system company, Fujitsu has started offering Cloud services. More than ten years ago when broadband access deployment started, I drew a picture showing the possible ICT paradigm that broadband access would bring, namely services/resources on demand, and I presented it on many occasions. Now, this picture is becoming a reality as represented by Cloud computing. This is largely the result of advances in the access network in terms of both increased bandwidth and reduced tariffs. A variety of Web services have been created, and people are enjoying them via the network. As this trend accelerates, telecommunication networks are becoming increasingly important as social infrastructures. Current network-related R&D by Fujitsu can be characterized as having five directions: capacity growth with cost reductions, greater flexibility, network virtualization and visualization, more use of wireless, and provision of new experiences via the network.

Capacity growth with a lower cost per bit is a continuous requirement in telecommunications, and new technologies have been developed. These days, new technology trends can be seen in both optical and wireless communications. In optical communication, multilevel phase modulation technologies are being introduced for over-40-Gb/s

transmission, leading to coherent detection technology. In wireless communication, orthogonal frequency division multiplexing, multiple-input and multiple-output schemes, and multihop relay technologies are in use, and they are enabling the transmission capacity to approach that of fixed-line access, like 100 Mb/s.

Network flexibility is also a continuous demand. At present, the packet-switched network provides flexibility, which especially suits the current Internet. However, the majority of network traffic is gradually moving towards video streams, TV broadcasts, and fine-grained sensor data. To enable the network to efficiently accommodate these types of traffic, we need a different level of flexibility involving converged control of multiple layers.

Virtualization is one of the key ways for ICT systems to provide cost efficiency by resource sharing and easy service development. Networks are also moving in this direction, as can be seen in overlay network R&D. As the basis of virtualization, network visualization is an essential technology. It is strongly desired even for current networks because it is difficult to grasp the total configuration and operating status of the Internet.

Because of the freedom of mobility that it provides, wireless communication is expanding its field of application. It started with mobile phones and wireless local area networks, is now used for radio-frequency tag applications, sensor networks, and the intelligent transport system, and will in future extend to body area networks.

From the business point of view, new network service offerings that give the customer new experiences are the key. At present, the potential capabilities of networks, such as connecting to anything, reaching everywhere, and gathering a huge amount of data, are not utilized well enough to provide services for users. A network service platform for efficient network service provisioning and easy service creation is strongly needed.

In carrying out the abovementioned R&D activities, we always take into account environmental impacts. Smart usage of networks can contribute to efforts to solve the problem of global warming by eliminating a lot of transportation, reducing the amount of hardware produced by efficient sharing of resources (as in Cloud computing), avoiding unnecessary use of electricity through monitoring and control, and so on. Making networks themselves green is another aspect of R&D.

This special issue reports on some of Fujitsu's R&D activities related to the approaches described above. I hope that these papers will help to give readers a deeper understanding of Fujitsu's R&D of telecommunication networks.