Executive Summary

News about 5G, the fifth generation of mobile telecommunications technology, is on the rise. In the US, Verizon began launching 5G services in some cities starting October 2018. The service, called Verizon 5G Home, offers fixed-wireless access (FWA) to the home, rather than mobile connectivity.. News coming out of South Korea, meanwhile, said that three mobile carriers are launching 5G services there in December 2018. The initial aim, apparently, will be to provide solutions to industry.

In Japan, 5G services are set to roll out in full from 2020, but the country's three big mobile carriers plan to launch pre-commercial 5G services during 2019. Information about those pre-commercial services revealed by the carriers at a Ministry of Internal Affairs and Communications (MIC) hearing in October 2018 indicates that they will cover diverse ground, including services related to regional revitalization as well as sports stadium VR experiences.

Frequency bands for 5G services are slated to be allocated by the end of March 2019, ahead of the pre-commercial services, and the MIC announced the guidelines for the process this past November. A total of 10 frequency ranges spanning 1,800 MHz are to be allocated for nationwide use from the 3.7GHz, 4.5GHz, and 28GHz bands, and additionally, a range of 200MHz in the 4.5GHz band and 900MHz in the 28GHz band are being left open, with the idea being that the MIC will consider allocating frequency ranges for privately operated applications and the like. How these frequency ranges will be allocated depends on the course of debate ahead, but perhaps we can look forward to seeing some distinctive services being offered by operators other than the incumbent nationwide carriers.

The IIR introduces the wide range of technology that IIJ researches and develops, comprising periodic observation reports that provide an outline of various data IIJ obtains through the daily operation of services, as well as focused research examining specific areas of technology.

In our periodic observation report in Chapter 1, we look at Internet trends as viewed from IIJ infrastructure. Of the various types of data we observe via IIJ network infrastructure, in this issue we analyze BGP route numbers, DNS queries, IPv6 traffic, mobile traffic, and backbone traffic. The analysis of BGP route numbers yielded some interesting results. For example, with IPv4 addresses being exhausted, we are seeing a rise in /22, /23, and /24 routes, possibly because address blocks are being split up for the purpose of transfer, and we also find that 32-bit only ASNs, the number of which continues to rise, appear to be operated only in the IPv4 space. We also note that the data on BGP route numbers, DNS queries, and the various types of traffic we look at indicate that use of IPv6 continues to progress.

Chapter 2 is our first focused research report, summarizing our attempt to apply deep learning to the task of identifying rogue URLs. The WWW is without doubt responsible for driving the explosive spread of the Internet and having a major impact on the way our society operates. Malicious uses of that WWW, which now pervades our society, include fraudulent sites masquerading as legitimate online services and banking facilities. Protecting users from accessing such rogue sites is a crucial task for people whose job it is to provide network services. Many approaches to identifying rogue sites have been proposed. Here, we evaluate an approach that uses a simple neural network and report high accuracy in the classification of URLs.

Chapter 3 presents our second focused research report, which looks at submarine cables. With 99% of all international data being carried by submarine cables, these cables are utterly crucial to the global Internet. Here, we describe the growth and state of the submarine cable network based on publicly available information and put forward an approach for examining the impact of submarine cable disruptions on the Internet based on various observational data on actual disruptions.

Through activities such as these, IIJ strives to improve and develop its services on a daily basis while maintaining the stability of the Internet. We will continue to provide a variety of services and solutions that our customers can take full advantage of as infrastructure for their corporate activities.

Junichi Shimagami

Mr. Shimagami is a Senior Executive Officer and the CTO of IIJ. His interest in the Internet led to him joining IIJ in September 1996. After engaging in the design and construction of the A-Bone Asia region network spearheaded by IIJ, as well as IIJ's backbone network, he was put in charge of IIJ network services. Since 2015, he has been responsible for network, cloud, and security technology across the board as CTO. In April 2017, he became chairman of the Telecom Services Association of Japan MVNO Council.