Executive Summary

To say that modern society runs on information and communications technology (ICT) is no exaggeration. Computers and communication networks are no longer absent from any of our social activities, and we reap the benefits of ICT in terms of increased sophistication and efficiency. What constitutes the infrastructure that supports the workings of society? Energy, transport, government services, finance—the list goes on. Yet none of these would function without ICT. Against this backdrop, Japan is no different from the rest of the world in experiencing the impact on financial and communications services when faults cause system outages at major financial institutions and communications carriers. In our highly information-oriented society, there is an increasing need for reliability with respect to information and communications, and the demands of governance with respect to the businesses that ensure that reliability are also growing. There is no room for doubt about the Internet's role as crucial social infrastructure, and we are well aware that, as part of this, IIJ's networks also play a role underpinning society. We hope to continue meeting society's expectations, and to that end we strive to develop technologies to ensure that we can continue to provide highly reliable services.

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.

Our periodic observation report in Chapter 1 presents the 2021 edition of our look at Internet trends as seen from IIJ's infrastructure. The report covers IPv4 and IPv6 routes on the Internet, an analysis of DNS queries obtained from the full resolver provided by IIJ, IPv6 and mobile traffic, and an analysis of traffic during the Tokyo Olympics. As the Internet expands, all sorts of resources and traffic continue to grow, and we are also observing a steady shift in protocols—a rise in AAAA record and HTTPS record DNS queries, for instance, and a rise in absolute IPv6 traffic levels.

The focused research report in Chapter 2 discusses the challenges encountered with the network newly developed for IIJ GIO Infrastructure P2 Gen.2, IIJ's new cloud service released in October 2021, as well as the outlook ahead. While using VMware NSX-T, the engineers also worked in-house to create mechanisms to efficiently operate the infrastructure, which are used for monitoring and capacity planning. The technology is currently used to build networks within data centers and between data centers, but development is ongoing with the aim of extending its applications to connections with distributed edge-computing resources.

Our second focused research report in Chapter 3, titled "In Pursuit of Carbon Neutrality in the Data Center," describes our initiatives at IIJ's Matsue Data Center Park and Shiroi Data Center Campus, offering insights about technologies IIJ has actually deployed at the facilities. Matsue is host to Japan's first commercially operating outside-air cooled modular data center, which runs on a three-phase four-wire power supply, while Shiroi features direct outside-air cooling, system modules, AI control, lithium-ion storage batteries, and more. With carbon neutrality now a major topic, I think you will find the report highly interesting.

Chapter 4 presents our third focused research report on the IIJ's Group's BCRs (Binding Corporate Rules). The IIJ Group created its BCRs in an effort to comply with the EU's GDPR (General Data Protection Regulation), and on August 5, 2021, these BCRs were approved by the competent data protection authority in Germany. In addition to BCRs and the GDPR, the report looks at global efforts around personal data protection, and walks the reader through the IIJ's BCR approval process. The story is a valuable record of events. After IIJ submitted the BCRs for approval in the UK in 2016, the UK withdrew from the EU, and the approval eventually ended up coming from Germany.

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.