Message from the CTO

2020– The Start of the 5G Society

Yukihiro Takahashi
Vice President, CTO

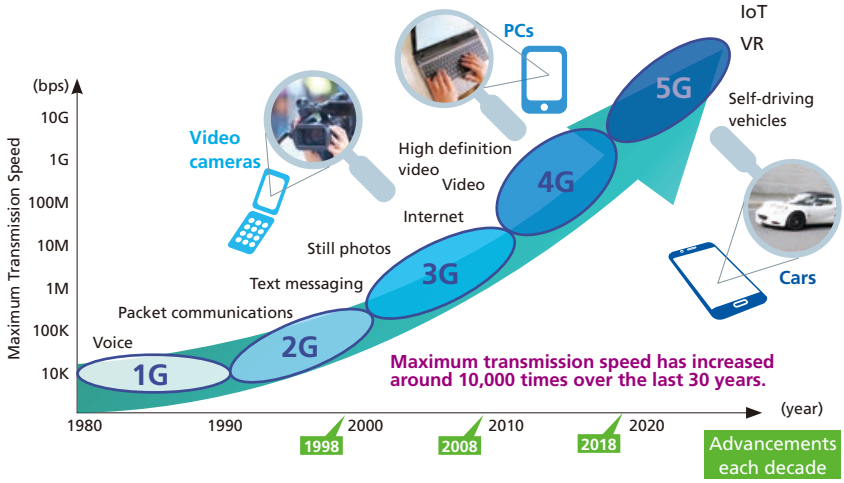
Japan's Ministry of Internal Affairs and Communications (MIC) has announced a road map for the world's first introduction of high-speed, large-capacity 5G mobile communications technology by the 2020 Tokyo Olympics and Paralympics, and is accelerating efforts to achieve this goal through collaboration among industry, academia, and government. Anritsu will provide the leading-edge network solutions to be a corporate group supporting the Internet of Things (IoT) society, in which all manner of everyday appliances are networked utilizing this 5G system.

Transformations in the mobile communications market, Anritsu's main business field, have occurred around every 10 years, starting with 2G in the 1990s, 3G in the 2000s, and 4G in the 2010s. The "G" in this case stands for "generation." There were 2G technologies in cameras, 3G in video cameras, and 4G in computers. Cars are likely to include 5G technologies. It may sound unbelievable, but the advent of safe and reliable self-driving vehicles through advancements in communications technologies is not a fantasy.

National governments and mobile operators around the world are competing fiercely to be the first to create a 5G system. The Japanese government has launched a nationwide effort to develop and implement 5G by the time of the Tokyo Olympics and Paralympics in 2020.

The new 5G technology will not only significantly increase communication speeds and widen bandwidth, but offers numerous other features, including ultra-low latency and simultaneous connecting of large volume terminals. Let's examine the representative technologies of 5G.

Advancements in Mobile Communications Systems



New 5G Technology Supporting the IoT Society

Features of 5G

Ultra-high Speed: 20Gbps

Download a two-hour movie in three seconds

Ultra-low latency: Less than 1ms

Precision control of a robot in a remote location in real time

Multiple simultaneous connections: Connect 1 million devices per km²

Nearby devices and sensors connected to the Internet

The first is utilization of micro and millimeter waves. The full utilization of an extremely broad frequency will make ultra-fast communication possible. In order to enhance data processing capacity per unit time in 5G, frequencies of 28 GHz, 39 GHz, and even 6 GHz or less have been proposed as candidates.

While the 4G (LTE) system uses the 20 MHz band, 5G (depending on the frequency) will be able to use the entire 1 GHz band. Simply calculated, the system will be able to reach communication speeds of 20 Gbps, around 50 times faster than 4G. This is sufficient to download a high vision movie in just a few seconds. Smartphone video streaming services have significantly changed the way people consume entertainment, and 5G is likely to generate innovative services utilizing 5G's large capacity.

A second key technology is smaller and array (multi-element) antennas. Controlling the phases of multiple antenna elements enables a technology (beamforming) that enhances the directivity of the signal in a prescribed direction, allowing the signal to be sent to the recipient with minimal loss. This technology limits the transmission loss that is an issue with micro and millimeter waves, and allows for a broader transmission area.

In addition, there are plans to introduce mass connectivity technologies to support IoT, as well as ultra-low latency networks to enable remote medical treatment over high definition video.

New fields in which this technology will be applied include the self-driving vehicles mentioned above. Ensuring the safety of elderly drivers has become a social issue recently, and monitoring within the range visible to radar and cameras is insufficient. Even if the driver is able to stop his car, there is a danger of a collision from vehicles following behind. Solving this problem will require widespread use of dedicated short range communications (DSREC), wireless communication between vehicles, and 5G is the leading candidate for this. The target for 5G communication is to shorten the round-trip latency time below one millisecond. Safety can be enhanced by accurately accessing information from not just the car in front of you, but several vehicles ahead, and conveying the actions of your car to those behind you. Ultimately, these systems will utilize artificial intelligence (AI) and other technologies, and by anticipating the future through data learning, and coordination with the surrounding environment, lead to fully self-driving vehicles. This will liberate people from considerable time and labor.

Anritsu will provide strong support for advancements in wireless technology, as well as the development of the computing clouds, data centers, and backbone networks that the 5G society will utilize.

The 5G society will connect numerous things, and vastly improve prediction accuracy. This will reduce loss in time, energy, food, and many other areas. For example, we are approaching an era when refrigerators will have cameras to monitor what foods have been purchased and how much remains, and suggest recipes based on the items available. The term "5G" will come to represent a transformation in not just communications, but society. At the same time, while the 5G society will enhance convenience through the utilization of Big Data, management of that data is likely to become much stricter. Anritsu is pursuing measures to strengthen data management, and contribute to a safe, secure, and prosperous society.

Beamforming