Promoting the Advancement of Broadcasting Services: the Road Map to 4K and 8K

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1. Changes in the environment surrounding broadcasting

About sixty years have passed since the start of terrestrial TV broadcasting in 1953. Since then, other services such as satellite broadcasting and cable TV have also been introduced, and these have evolved into digital multi-channel services. At the end of March 2012, the digital switch-over of terrestrial broadcasting was completed. Broadcasting has become fully digital, and an infrastructure that allows the viewing of high-quality HD broadcasts has been set up. Meanwhile, broadband communication networks have also been set up. These provide an environment that supports services such as Smart TV with full collaboration between broadcasting and communication.

However, in the broadcasting-related market and the market for television receivers, the digital terrestrial switch-over caused demand to surge in the domestic markets due to people replacing their old televisions, and as a result the number of TV sets shipped annually since the start of digital broadcasting has plummeted to about 60% of its level before the switch-over. In the global market, the share of Japanese manufacturers has declined from a hitherto dominant position, and Korean and Chinese manufacturers and now in ascendency.

In television viewing trends, the spread of new technologies such as tablets, smart phones and Internet video distribution services has made it possible to use video distribution services with a diverse range of agents and transmission paths. It could be said that the younger generation in particular are moving away from the old era of families sitting around the TV into a new era where people are watching more but spend less time in front of the television.

For broadcasting and related services to continue meeting the needs of viewers amid these upheavals in infrastructure, markets and so on, it is becoming necessary to exploit new technologies to offer interesting broadcast programs and services with higher picture resolution and enhanced functionality.

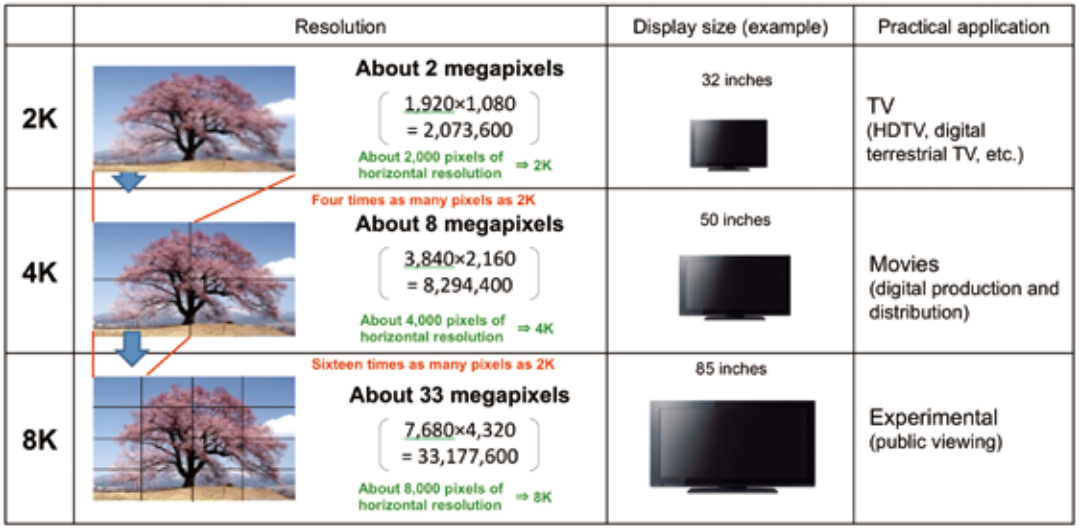
2. Enhanced picture quality: The appeal of 4K and 8K

Although current digital broadcasting is referred to as high-definition television, video systems with higher resolution have already appeared, and two video formats were standardized by the ITU-R in 2006. Since these formats respectively have about 4,000 and 8,000 pixels in the horizontal direction, they are referred to as "4K" and "8K" (current Full HD video is designated as "2K").

These formats provide highly detailed and ultra-sharp video pictures, since 4K has four times as many pixels as 2K, and 8K has sixteen times as many. 4K is already making inroads into movies, and compatible products such as cameras and projectors are now commercially available. Some 4K videos have even appeared on Internet content delivery services such as YouTube. Television receivers equipped with 4K compatible displays are already available from manufacturers in Japan and overseas. Even in Japan, large-screen televisions (37 inches or more) now account for over 30% of the televisions shipped annually and there is a growing demand for high-definition displays, resulting in gradual sales growth and hopes of a recovery in demand. The display resolution of tablets and smart phones has also been increasing, and there is reckoned to be a large latent demand from users who want high-quality video services.

On the other hand, NHK has spent many years researching and developing 8K technology. 8K is said to be the ultimate two-dimensional resolution that can be distinguished by the human eye, resulting in highly immersive and realistic images when

Figure 1: 4K and 8K video formats



shown on a large screen. 8K television receivers are still at the prototype and testing stages, but were enthusiastically received at public viewings held during the 2012 London Olympics and Paralympics and this year's Sochi Olympics and Paralympics.

The 4K and 8K video standards do not simply call for more pixels and higher resolution, but also specify a wider color gamut with more gradation levels, allowing them to display images of objects that look just like the real thing, and offering viewers new experiences and emotions. Concerned parties have already started researching how to exploit the compelling nature of this technology across a range of genres where objects and events can be presented with a sense of presence, such as dynamic sports action, fine architecture, or the detailed structure of precious works of art.

When employing Smart TV functions to make use of large amounts of information at a time by combining television broadcast programs with data from the Internet, it is possible to provide a clear picture on large-screen displays, which can be said to have the merit of high definition.

In August 2012, the ITU-R established recommendations for video formats in ultra-high definition broadcasting. Also, since video compression technology is a key requirement for sending high-definition, high-capacity video data by broadcasting or communications, international standards for next-generation compression and coding methods were issued in April 2013. Due to this sort of progress in the international standardization of important related technologies, various countries and businesses have started on the development of related products and the like, and it can be said that efforts to develop new products for the implementation of 4K and 8K video services have started to gain pace.

3. Preparation of a road map by the investigative committee for the advancement of broadcasting services

Work is already being done by related businesses in various countries — especially South Korea and Europe — regarding the enhancement of broadcast services for next-generation broadcasting technologies such as 4K and 8K. There are also increasing efforts being made in connection with services other than broadcasting. Things are changing in this field at a remarkable pace, and intense competition is predicted. Japan needs to make the best use of its technological strength in the field of audio-visual services without falling behind the movements of other countries, and should accelerate and promote efforts aimed at the introduction of advanced broadcasting services.

In recognition of this, the Ministry of Internal Affairs and Communications (MIC) set up an Investigative committee for the advancement of broadcasting services in November 2012, and on June 11, 2013 it formulated and published a road map obtained in the early implementation of 4K and 8K broadcasting.

Specifically, it investigated the transmission paths to be used (satellite broadcasting, cable TV, etc.), the schedule for the introduction of next-generation broadcasting services, the agents involved in their implementation, and the like, and set forth targets to be worked on in partnership with concerned parties.

First, as the transmission path used for 4K and 8K broadcasts, it was decided that experimental broadcasting would start in satellite broadcasting where the constraints such as frequency availability are relatively relaxed, and that efforts would also be made simultaneously on broadcasting by cable networks and IPTV. The idea is to respond to the needs of users, such as those wishing to receive advanced services without affecting the viewers of broadcast services such as terrestrial and satellite TV.

Regarding the schedule for the introduction of next-generation broadcasting services, the decision was made to promote the spread of television receivers by targeting years when international sports events of interest to viewers would be held. Specifically, targets were set for 2014 (Brazil World Cup), 2016 (Rio de Janeiro Olympics and Paralympics), and 2020, and to accelerate the necessary technical verification and other requirements for the start of broadcasting while keeping an eye on technological trends. The aim is to have experimental 4K broadcasts starting in 2014 and 8K broadcasts starting in 2016, paving the way for full-scale broadcasting of both 4K and 8K by 2020.

In September 2013, after establishing this road map, the resolve of related organizations to steadily realize these goals was strengthened by the decision to hold the 2020 Olympics and Paralympics in Tokyo.

4. All-Japan promotion — Next Generation Television & Broadcasting Promotion Forum

This road map is a considerable challenge, since it pushes forward the start of broadcasting targeted by industries by at least two years. In the investigative committee, to achieve an early launch, it was pointed out that it is essential for the concerned parties to cooperate in preparing a promotional system to achieve the pooling of Japan's resources relating to this field. As a part of this, “Next Generation Television & Broadcasting Promotion Forum” was established in May 2013 with the participation of 21 businesses including broadcasters, manufacturers and communications providers. Subsequently, an even wider range of concerned parties took part in this initiative, and there are now 42 businesses playing an active role (details will appear in the next paper). In addition to work commissioned by the MIC and technical verifications performed by constructing a test bed (experimental platform), the forum also carries out activities such as content production trials to produce content for test broadcasts, and accumulating and sharing know-how, and is the driving force for the steady implementation of the road map. In the future, it is expected that individual broadcasters will advance to the stage of working on 4K and 8K services as the business of each company.

5. Potential applications of 4K and 8K

It is expected that 4K and 8K ultra-high-definition video technology will be used not only in broadcasting but also in diverse video delivery services but also in various business fields where video is used to assist with medical treatment, education, design, crime prevention and the like. For example, in the medical field it is possible to provide solutions by using 4K and 8K technology in situations where high-resolution video is required, such as endoscopy or the monitoring of surgical procedures. We hope to promote 4K and 8K technology for use in BtoB applications in the business field, and this possibility is also being investigated by

Next Generation Television & Broadcasting Promotion Forum. By using the early introduction of this technology into the business field as a way of generating momentum, and by promoting its use in a wide range of business fields, we expect to hasten reductions in the cost of related equipment, thereby accelerating the spread of this technology in other fields like broadcasting.

6. Initiatives of the MIC

The MIC is putting its weight behind private-sector initiatives such as these, thereby promoting the relaxation of budgets and the implementation of necessary systems.

3.1 billion yen was allocated in the FY2012 supplementary budget for the operation of a next-generation satellite broadcasting test bed, and this work was entrusted to and promoted by the next-generation broadcasting promotion forum. A further 1.55 billion yen was allocated in the supplementary budget for FY2013, showing support for the steady future implementation of the road map. We therefore think it would be worth measuring indicators such as the level of activation in the broadcast-related market.

Regarding the technical criteria that are necessary for the implementation of 4K and 8K broadcasting in Japan, the telecommunications council is proceeding with investigations based on the purpose of the road map and on the schedule for the introduction of next-generation broadcasting services, and is planning initiatives such as a revision of the required technical standards.

The promotion of 4K and 8K broadcasting is connected with the next-generation infrastructure for broadcasting itself, and leads one to consider the future form of broadcasting and related services. Consequently, as with the digital switch-over of terrestrial broadcasting, it is important to proceed carefully while obtaining the consent not only of broadcasting stations but also of manufacturers, distributors, and ordinary citizens including viewers and users. Unlike the digital switch-over, people are not being asked to switch over during a fixed period. However, it is necessary to buy a new TV set in order to receive the new services, and to make things as smooth as possible for viewers, it is important to provide them with the information they need, whenever they need it. It is also important for broadcasters to publicize their future service plans so as to smoothly implement investment and planning measures such as updating their facilities. Finally, although this is a matter for the business judgment of each service provider, it is thought that a major trend is the need to set common goals by providing places where fixed consent still applies. From this sort of viewpoint, it is thought that government also has a major role to play.

7. Conclusion: Putting 4K and 8K technology within everyone's reach

The purpose of the 4K and 8K road map drawn up last year was to provide the concerned parties with a common broad outlook on the future. First, preparations are currently gathering pace smoothly with the aim of starting test broadcasts in the current year FY2014.

However, for 4K and 8K broadcasts to become accepted as actual services, it is necessary to overcome transmission path issues and content production technology issues, including various specific issues such as how to proceed and how these services will relate to current broadcasting.

Since February this year, the MIC has held conferences aimed at fleshing out the road map and accelerating its implementation. Keeping an eye on technology and market trends, we hope to follow up the promotion plan while assessing the needs of viewers/users and the business of service providers. Rather than simply taking a technological lead, we also hope to make advances based on the needs of consumers, the business viewpoints of service providers, and international trends.

Broadcasting has a strong influence and a wide reach over the whole of Japan, and it is not appropriate to take a technology-led approach to the introduction of new services in this medium. So as not to cause confusion among viewers or in the market, we want to keep pace with the road map while striving for consensus among a wide range of concerned parties regarding the promotion schedule and processes.

We are also aiming for the recovery and improvement of the international competitiveness of manufacturers. We will not achieve this by forcing viewers to replace their television sets, but will instead proceed with a viewer-centric viewpoint.

In June last year, the cabinet published "Declaration to be the World's Most Advanced IT Nation." Their plan is to create an IT user society at the world's highest levels and disseminate the results globally over a five-year period (by 2020), through a process described as "Creating new business and reinforcing international competitiveness in the imaging industry through the creation of next-generation broadcasting services." The MIC will also promote activities relating to the strengthening of broadcasting services as part of its long-term ICT strategy.

Figure 2: The road map to 4K and 8K broadcasting (Investigative committee for the advancement of broadcasting services)