Broadcasting Service Platform Solution of the Next Generation

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Abstract

Japanese digital terrestrial TV stations have ceased analog TV broadcasting and shifted to digital TV except for in a few areas. Today, new broadcasting/communication services such as multimedia broadcasting and white space utilization are beginning using the bandwidths vacated by analog broadcasting. Existing broadcasting stations are also advancing efforts for responding to diversification of viewing environments. For example, by introducing Internet broadcasting and other measures such as the secondary use of new contents, which are aimed at meeting the networking needs of the times. This strategy is expected to promote a shift from the previous tape medium to file-based media and the construction of new intra-station systems by applying IP protocol to the TV station networks. This paper introduces the orientation of a next-generation service platform capable of supporting the new services that the TV stations are expected to start up in the near future in order to meet the needs of diversifying video content.

Keywords

broadcasting, nonlinearity, network, data filing system, cloud computing

1. Introduction

As many readers of the present paper may already know, Japanese terrestrial broadcasting stations have ceased analog TV broadcasting and have shifted to digital TV as of July 24, 2011. The 2011 Great East Japan Earthquake occurred earlier in the year, but new digital broadcasting services such as the 1 segment and data broadcast services made a significant contribution to the provision of disaster information for the disaster victims, including for inter-city commuters who were unable to return to their homes. This was an opportunity to re-recognize the importance of broadcasting in cases of disaster and serious incidents.

Nevertheless, the situations and issues surrounding the digital terrestrial TV stations and broadcast-related businesses are still changing and developing rapidly. An example of such change is the fact that the Internet has stepped up its presence as a medium and begun to exert certain influences in fields that have been previously covered by broadcasting. Existing broadcasting stations have entered a phase of major change, in which they are required to digitalize broadcasting, enhance its public aspects and deal with new media.

Under the popularization of the IPTV (Internet Protocol TeleVision) using the Internet and viewing styles that make use of VOD (Video on Demand), the boundaries between communications and broadcasting are becoming more ambiguous than ever before. The digitalization of broadcasting has advanced the use both of the computer and of networking in support of broadcasting equipment. Below, we describe the networking of the TV station infrastructures in the general trend of computer and network use by the systems currently used in TV stations.

2. Present Status of Networking in the TV Stations

The use of networking and cloud computing has advanced in the market of Internet-based services. However, such trends in the TV stations have not yet reached to the same extent. For example, a situation in which everything is processed without using a medium has not yet been realized. A series of action from capturing images with a camera to processing them on a PC for storing them in a storage service in the cloud computing and sharing them with friends; that is already common with internet web services. At present, the conversion of materials into files and nonlinear-based operations are being advanced under the direction of the news gathering/reporting sections.

For the archiving, systems storing materials in media such as the LTO (Linear Tape-Open) are gradually expanding. However, the majority of broadcasting stations including some key stations are continuing to use analog-type operations by

using the traditional tape medium and transferring materials physically. Such a situation is due to various reasons including those related to economies, and we will focus on the following four reasons.

(1) High quality requirements for images

Since the image quality required by broadcasting stations is very high, the volume of handled data is very large. This is due to the data related to the image quality including hue, depth and color tone. Although these are subjective factors, it is usual that they are included with the required items. Image quality requirements before coding are increasing, however, those of compressed images are also increasing, as is seen with the need to process coding any images without failure even if they contain complicated processes. The amount of data required to meet such highly demanding requirements becomes huge. Since large files necessitate large-capacity network circuitries and servers with high-speed processing capabilities, the equipment and systems that would be able to meet such requirements have hitherto been very expensive, even for undertaking simple transfers.

(2) Need for operational immediacy

Sections such as the news section are frequently required to offer immediacy. However, previously available ICT equipment has been subject to many performance-related restrictions such as its incapability of dealing with speeds required for editing and processing large amounts of data. As a result, tape-based linear editing has been used invariably because it is faster in spite of the necessity of more labor.

(3) Past tape assets

TV stations own a large volume of image content that they have broadcast over time. Most of this content is often stored in archives in the form of tape assets.

Although these tapes could be converted to start a file-based system, the necessity for a large amount of labor for converting the large volume of owned assets makes this a serious proposition.

(4) Presence of dedicated broadcasting equipment

It is traditional in the image industry to use non-compressed image signals in real-time image transfer. Since relatively low-priced equipment is available as is seen with the video-dedicated routing switcher, there has been no problem in using such equipment so far as the signals are transferred in-house. Communication carriers also offer dedicated image transmission services in consideration of the circumstances of broadcasting stations. It has therefore already been possible to transfer non-compressed image signals from a relay location to the broadcasting station.

Networking of broadcasting sites has not advanced smoothly because of the reasons described above. Nevertheless, following recent performance improvements and price reductions of ICT and network equipment, the availability of equipment capable of handling large-capacity image content has been increasing, thereby promoting penetration of data filing systems and archiving systems into the production of news broadcasts. At present, there are many cases in which systems exist in a TV station as a closed network. In these cases, the exchange of materials with sources outside the system still employs traditional methods, for example in the handling of media such as tapes or the real-time transmission of image signals. Such systems are unable to offer overall convenience or efficiency for the system.

3. TV Station Networking

As described above, many TV stations are still utilizing traditional broadcasting infrastructures. However, the progress of file-based systems and non-linear operations has been promoting research into TV station networking by connecting individual systems across shared boundaries. One of the main issues of TV station networking is to connect individual systems via a large-capacity IP network for the online transfer of image files. Image signals can also be transferred via such IP networks without using dedicated image transfer equipment. This strategy enables the transfer of recorded image files that had not been possible with the previously used and exclusively real-time image transfer systems that used a video switcher called the circuit center. The introduction of a TV station network is expected to bring about advantages as described below.

(1) Promotion of nonlinearity throughout the entire station

The possibility of sharing content that has previously been transferred in the form of tape media on the network enables nonlinear-based operations of the workflow of the entire station. This can solve one of the traditional issues, which is the time loss due to intervention of linear media in transfers between different systems.

(2) Possibility of relocation of server equipment over the entire station

Previously, a group of servers has been present in each of the closed systems. The intra-station networking makes it possible to install servers at the entire station level without being concerned about individual system issues, thereby improving efficiency by means of an aggregation of server equip-

ment. A specific example of this practice is to install the primary material receiving servers together with the shared servers for the nonlinear editors that have formerly been installed on a per system basis, thereby enabling their use by the entire station. The concentrated server set-up can be organized as improved redundancy, thereby resulting in the improved reliability of the whole system as another advantage. The concentration and relocation of servers can also enable cloud systematization and virtualization of the servers. Though cloud systematization of shared servers for nonlinear editors is difficult from the viewpoint of performance that of primary material-receiving servers is easier to research. This means that the benefits of the latest ICT technologies and services will be available to support circumstances specific to each broadcasting station.

(3) Convenient increase/decrease of resources

The intra-station network also makes it possible to receive increased numbers of resources from the coverage/relay locations and from overseas. Previously, transfers from relay locations used image-dedicated communication carrier networks and a dedicated means of wireless transmission such as the FPU (Field Pickup Unit) or SNG (Satellite News Gathering). In such cases, however, restrictions in the numbers of connections were produced depending on the number of contracted networks and the equipment environments of each broadcasting station. Equipment replacement was often necessary even when simply increasing the number of networks. If an external IP network can be connected, it is possible to deal flexibly with increase/decrease or with an emergency addition of networks.

(4) Utilization of metadata

The previous image transfer method was basically not capable of sending metadata together with images, but simultaneous metadata transfer is now possible with file-based image data. The use of metadata can bring various advantages for program production and archiving, such as identification of the recording location based on the altitude/latitude information provided by GPS and the transfer of coverage details including staff names and the contents dealt with in the coverage record.

(5) Archive affinities

One of the important merits of the implementation of file-based content is the possibility of archiving. An archive in which materials are stored in the form of files can be searched using metadata as the key and subsequently reused. Previously, tapes were managed by means of barcode management from the tape archive. However, such management involved human input for handling and transporting tapes. Once the station is networked, files can be handled online for both storage and reuse. The elimination of labor such as that required for bringing tapes from shelves should improve the convenience of operation.

When considering specific configurations, affinity with existing infrastructures is required for TV station networking. **Fig.** shows the concept of TV station networking. A broadcasting station handles signals of several formats. The main formats are the video signals and the TS (Transport Stream) signal (DVB-ASI signal). The video signals are classified based on resolution into the HD (High Definition) and SD (Standard Definition) signals, and the mainstream used by digital terrestrial TV stations is the HD signal since the digitalization of broadcasting. The TS signal is also used in digital broadcasting, and it is obtained by compressing the video signal in a certain format such as by MPEG-2.

These signals are transmitted to the network as IP packets using an interface device. The bandwidth of the HD signal in its non-compressed state is about 1.5 Gbps, but in the IP stream, it becomes about 1.7 Gbps due to overheads. The IP stream output from the interface device is supplied to distribution destinations via the router.

At each distribution destination, the signal is converted into the required video signal format by the interface device before being output. At the network center, the video signals received via various networks from outside the station are often distributed to several locations. The router therefore must be capable of adding/deleting the distribution destinations (routing changes) without affecting other signals. The image data converted into files is transferred in a dedicated wrapping format called the MXF (Material eXchange Format). The MXF includes video, audio and metadata and the resulting transfer is like sending an entire medium online.

4. Future of Broadcasting Systems

TV station networking is the first step in the advancement of broadcasting systems toward a robust information-based system. When TV station systems are networked, image content is distributed via the network in the form of files and streams and old media such as tapes and discs are no longer used. The station is now free of location-based restrictions. It may also be possible to enable the station to be devoted to production while the archiving and transmission functions are entrusted to the cloud system. The effectiveness in the case of

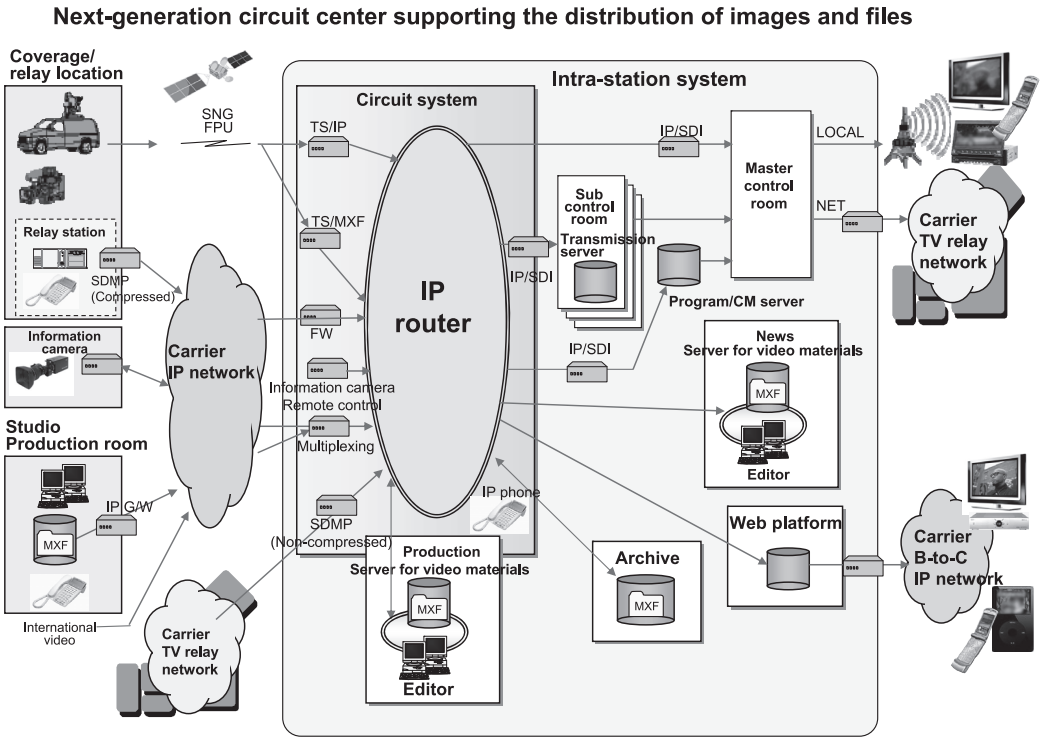

Fig. Diagram of a TV station network.

an emergency in the cloud services based on a data center has been recognized as a result of the experience of The 2011 Great East Japan Earthquake. In addition, the data center also has more general advantages such as safety, reduced maintenance costs and energy saving. The adoption of data centers is expected to advance among broadcasting stations in order to protect valuable broadcast content assets and to ensure prompt provision of news and of disaster and accident information.

Introduction of the cloud system and networking in support of TV stations makes it possible to lay out systems without being concerned about locations either inside or outside the station. Just as cloud computing and virtualization have significantly changed the job formats of information systems, the job formats of broadcasting systems may also be changed significantly in the future. The required solution in consideration of the circumstances specific to broadcasting systems and the broadcasting industry is the introduction of networking and the cloud system. At NEC, we are ready to offer a wide range of next-generation platform solutions that conform to the latest trends in broadcasting systems in support of broadcasting performance upgrades.

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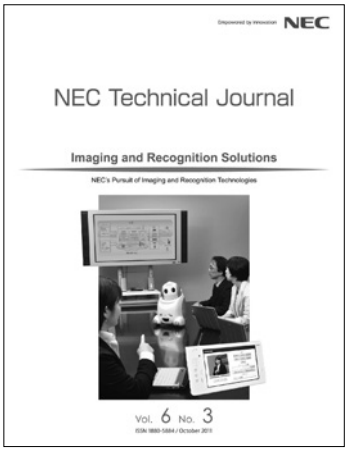

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Special Issue TOP