Providing Video Platform Service as New Social Infrastructure to Facilitate Digital Transformation (DX) of Video Distribution

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Abstract

The management and distribution of video footage is shifting from analog tapes to digital files, and the mechanisms to do so are also changing dramatically. As a result, there is a need for service infrastructure that not only stores and transmits video footage, but also provides safe and secure video distribution DX with functions such as quality check, preview, and online transmission. This paper presents an overview of the Video Platform Service, a new social infrastructure for video distribution provided by NEC, and examines the main functions, technologies, and future prospects of the service.

Keywords

video distribution DX, video platform, video footage, services, metadata, quality check function, subtitles, preview function

1. Introduction

In recent years, the management and distribution of video footage, especially in the broadcasting industry, has shifted from analog tapes to digital files, and the handling of these files is not limited to inB (intracompany) but has expanded to BtoB (business-tobusiness) and BtoC (for general consumers) domains. For example, in October 2017, the online delivery of TV commercials in digital files began, and a platform for cross-industry video distribution has been developed; so, even wider distribution is expected in the future.

In this way, while the service platform that enables a new video distribution system is drawing attention, this paper outlines the functions and technologies that make up the Video Platform Service, a new social infrastructure platform for video distribution provided by NEC, and also examines its future prospects.

2. Overview of the Video Platform Service

Fig. 1 provides an overview of the functions of NEC's Video Platform Service.

This service provides a platform infrastructure with functions for the management and distribution of material content, mainly video. Each function adopts a microservices architecture, which enables a flexible combination of functions to suit the type of service used. In addition, the service is provided on a hybrid cloud platform using the JDCC Tier 4 rated NEC Cloud Infrastructure as a Service (NEC Cloud IaaS), which provides a high level of security and reliability, and the AWS environment, which offers superior flexibility and versatility. This enables us to provide services in an optimal environment that meets the needs of both mission-critical systems that require high processing accuracy (System of Record) and flexibly changing operations that require speed and diversity (System of Engagement).

A description of each function is given below.

(1) Security

Web Application Firewall (WAF) and Intrusion Detection System (IDS) functions are implemented to block unauthorized access and cyber-attacks to the network layer and application layer. Providing Video Platform Service as New Social Infrastructure to Facilitate Digital Transformation (DX) of Video Distribution



Fig. 1 List of Video Platform Service functions.

(2) Approval Workflow

The system manages the status of each project and provides an inter-company and inter-departmental approval workflow function.

(3) Metadata management

This function provides a metadata management function for each video material. Details are given in section 3.1.

(4) Material management/preview function

This function provides management and preview functions for each video material. Details are given in section 3.2.

(5) QC (Quality Check) function

This function provides a quality check function for video footage. Details are described in section 3.4.

(6) Editing functions

Simple automatic editing functions such as transcoding and scene cutting of video footage are provided.

(7) Transfer PF (Platform)

Equipped with a multi-server (thread) operation engine, this function enables large amounts of video footage to be sent and received efficiently. In addition, the external disclosure function allows temporary users to share video footage and request uploads.

3. The Main Functions that Make Video Distribution DX Possible

Section 3 describes the key functions that are particularly important in making Video Distribution DX a reality.

3.1 Metadata management function

To make video distribution between companies and departments possible, it is necessary to unify the

metadata used during delivery and extraction.

For example, in the case of TV commercial delivery to broadcasting stations, metadata for delivery defined by the Japan Commercial Broadcasters Association (JBA) has been prepared. The Video Platform Service has a function to check that the delivered metadata is in accordance with the standards defined by the JBA. This enables safe and secure delivery and extraction between companies and departments.

In addition, functions for incorporating and managing the delivered metadata, as well as functions for outputting the metadata and linking it to an external system can help improve the delivery and extraction process. In the Video Platform Service, the XML file input/output function for metadata enables flexible metadata linkage. In the case of TV commercials delivered to broadcasters, NEC has achieved automation of the submission process at broadcasting stations by using metadata linked to the CM submission server provided to broadcasters (Patent No. 5999756).

Furthermore, in addition to the above-mentioned metadata, it is also possible to manage information related to the file structure (format, compression rate, etc.) of the video itself, and custom metadata that the user can freely set for each video.

3.2 Proxy generation and preview function

3.2.1 Proxy generation and preview function

Video footage is often managed in a proprietary format with high resolution and low compression rates to prioritize video quality. On the other hand, when assuming video distribution, it is necessary for inter-company and inter-departmental viewing to be confirmed without any discrepancies. To preview the video in a general-purpose PC environment, it is Providing Video Platform Service as New Social Infrastructure to Facilitate Digital Transformation (DX) of Video Distribution

necessary to generate a proxy file that can be viewed on a PC at the time of upload and manage it with metadata. In this case, it is important to maintain a picture quality level that enables identification of the content of the video material without stress, assuming that the connection is made from the Internet environment of each PC. Therefore, the Video Platform Service adopts MP2 (MEPG1 Audio Layer-2) as its file format, which can be viewed on Windows and MAC. In addition, to maintain a visually identifiable image quality, the bit rate is set at 2 Mbps and the frame rate at 29.97 fps, which enables preview viewing without any discrepancies between companies and departments.

3.2.2 Subtitle preview function

In order to improve the accessibility of information for the hearing impaired and the elderly who have difficulty in hearing, and to ensure that video content can be understood fairly and widely, the use of subtitles in video is becoming more widespread.

On the other hand, closed captioning on TV is an original broadcasting standard, so a dedicated player is required to preview it on a PC. By implementing the proxy file generation function for subtitles, the Video Platform Service enables the simultaneous previewing of subtitles for HD, SD, and mobiles without the need for a special viewing environment (**Fig. 2**) (Patent No. 6380695).

By providing this function, we will contribute to the further distribution of subtitled content and ensure that the service is provided equitably across a diverse range of users.

3.3 Video material identity guarantee function

In order to realize safe and secure video distribution, it is important to ensure the identity of the footage being delivered and extracted.



Fig. 2 Subtitle preview function.

The Video Platform Service generates a hash value at the time of material upload and manages it as metadata. By checking this hash value when uploading or transferring footage, it is possible to ensure the identity of the footage when they are delivered or extracted.

The hash value is also used for version control of the footage. When footage with the same hash value is uploaded or submitted, you can choose to overwrite it as the same footage, register it as a new version, or copy it as different footage. These functions allow for efficient management of footage.

3.4 Function to confirm the safety of video footage

In order to realize safe and secure video distribution, safety is also important in addition to ensuring the identity of video footage.

Section 3.4 describes two technologies of the Video Platform Service used to check the safety of video footage.

3.4.1 Technology to detect sections with flashing lights

In the past, there have been cases where users suffered from optically stimulated epileptic seizures and other problems triggered by viewing bright flashing lights in animations. In light of the harmful effects of excessive flashing lights in videos¹⁾, a function that detects sections with intense flashing lights in advance can ensure the safety of users. Such a function is offered by the Video Platform Service through its unique quality check functions (**Fig. 3**).

The mechanism for detection of flashing lights is shown below.

- For each frame of video data, an 8x8 reduced image is generated.
- (2) The ratio of luminance change of the 8x8 reduced image within the analysis window in the time direction of 1 second is calculated for all 64 pixels, and the ratio of pixels whose luminance change reaches 10% is calculated. If the number of pixels



Fig. 3 Overview of detecting sections with flashing lights.

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Fig. 4 Overview of detecting sections with subliminal stimuli.

with a luminance change of 10% or more exceeds 1/4 (16 pixels), the temporal difference of luminance between adjacent frames is calculated for the corresponding pixels.

(3) The number of times the sign of the temporal difference reverses in one second is counted, and if the number exceeds 10 times, it is detected as a section with flashing lights that may cause an adverse effect.

3.4.2 Technology to detect sections with subliminal stimuli

Japan Broadcasting Corporation (NHK) and JBA prohibit the use of subliminal stimuli in their respective program broadcast standards. A function that can detect the presence of sections with subliminal stimuli can be used to ensure the safety of video footage.

The Video Platform service features a unique quality check function that can detect sections with subliminal stimuli in advance (**Fig. 4**).

The mechanism for detection of subliminal stimuli is shown below²⁾.

- (1) Visual feature quantity is extracted for each frame of the video.
- (2) The temporal trajectory of the feature quantity is analyzed, divided into shots when the feature prediction is off, and shots with a length of less than one second are detected (extremely short shots).
- (3) The pattern of occurrence of ultra-short shots before and after the detected shots are examined and identified as subliminal stimuli if they occur in isolation. These detection techniques make it possible to detect shots of less than one second inserted in a video.

4. Conclusion

The Video Platform Service is evolving from inB (intra-company) video management to BtoB (busi-

ness-to-business) video distribution. This has resulted in transforming the service previously aimed only at improving business efficiency, such as through the management of past assets, into one aimed at creating new value from video.

Currently, information handled in the video distribution process (usage results, effects, etc.) can also be managed in detail as metadata. Such information accumulated daily will create new value as marketing data, and will further develop into a service that realizes a continuous PDCA cycle in the video production business through video content analysis.

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