

## The “4K Pure Cinema” Joint Digital Cinema Trial

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### Abstract

We describe a trial of the distribution of the latest Hollywood movies in digital data format to theaters in Japan via a network for projection as digital cinema (4K Pure Cinema). It is a joint effort by NTT and NTT West, in cooperation with Warner Bros. Entertainment, Warner Entertainment Japan, and Toho. It began in October 2005 and is still in progress.

### 1. Introduction

As was explained in the first article [1] in this Special Feature, DCI (Digital Cinema Initiatives, LLC) [2] was established in 2002 with the objective of creating technical specifications for digital cinema. Although the DCI specifications were completed in July 2005 [3], the standard must be tested in experiments that involve all the players in digital cinema from distribution to exhibition, including movie producers, distributors, network operators, and theater operators, before it can be used in practice. Therefore, a digital cinema joint trial, called “4K Pure Cinema”, was begun [4]. The digital cinema process and the roles of the participants in the trial are outlined in **Fig. 1**.

### 2. Joint 4K Pure Cinema trial

The trial began on October 22, 2005 and is scheduled to run for almost a year, so it is still in progress.

#### 2.1 Participants

The participants are Warner Bros. Entertainment Inc. (WBEI), Warner Entertainment Japan Inc. (WEJI), NTT, NTT West, and Toho. WBEI played the central role in establishing the DCI specifications,

WEJI distributes Warner Bros. movies in Japan, NTT developed the 4K digital cinema technology on which the DCI standards are based and distribution technology for transferring large volumes of high-quality content with a high degree of security, and Toho owns and operates cinemas in Japan. In the summer of 2001, Toho and NTT West together conducted a ground-breaking digital cinema distribution experiment with the movie ‘Sen to Chihiro no Kamikakushi’ (‘Spirited Away’, produced by Studio Ghibli and distributed by Toho) to verify distribution and exhibition using a high-speed optical fiber network and establish a new service model. The 4K Pure Cinema trial began with Tim Burton’s ‘Corpse Bride’ in the world’s first attempt at network distribution of DCI-compliant digital cinema to multiple commercial movie theaters in continuous and regular exhibition of the latest feature movies distributed from Hollywood via a network. This trial leads the world in the premiere exhibition of movies in revolutionary high-quality video across an entire country simultaneously. The main objective of this joint trial is overall evaluation of the DCI specifications applied to the digital cinema process from distribution to exhibition. To that end, the movies in this trial were exhibited with both the 4K specification (4096 × 2160 pixels), which is the highest level in DCI, and the 2K specification (2048 × 1080 pixels), which uses one-fourth the number of pixels, to evaluate the technology and operation from the viewpoint of broad practicality, including video quality, operation system, security, network

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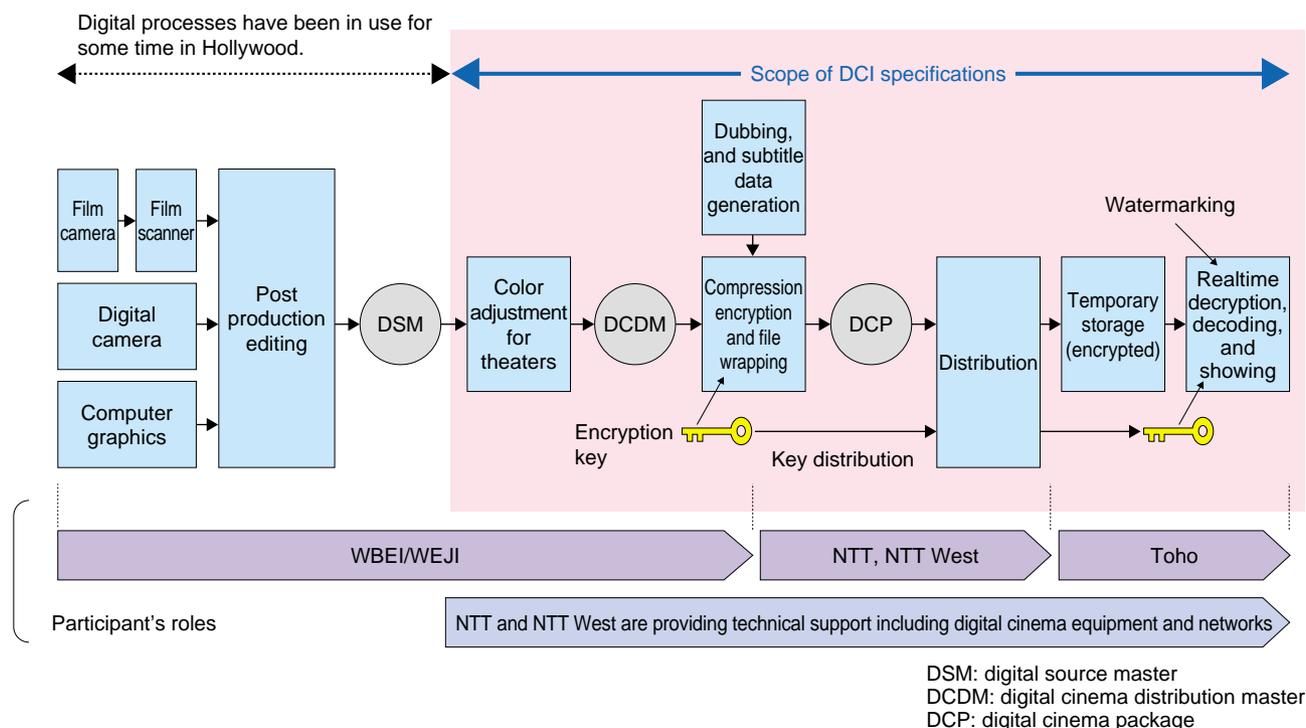


Fig. 1. Digital cinema process and the roles of the companies involved in the trial.

distribution and theater operation costs, and evaluation by movie goers. There have been several experiments of displaying 4K content, but this trial is the world's first networked distribution of 4K content to commercial theaters.

The configuration of the experimental system is illustrated in **Fig. 2**. First, movies are produced and color-corrected by WBEI in Burbank, California, and then sent in the form of digital data to the WBEI GDMX (global digital media exchange) distribution center. There, the data is compressed, the related files are unified, and the data is encrypted to create a digital cinema package (DCP). The DCP is then sent over an experimental high-speed optical fiber line between the USA and Japan to Distribution Center 2 at the NTT Yokosuka R&D Center, where it is dubbed and subtitles are added. Next, the processed DCP is sent to Distribution Center 1 in Osaka, which is run by NTT West. From these two distribution centers, a domestic optical network is used to distribute the DCP to three theaters. At the same time, Distribution Center 1 generates the encryption key for the DCP and distributes it to the three theaters. In this way, the network technology for future movie distribution is being verified.

## 2.2 Details

### 2.2.1 Trial period

October 22, 2005 to August 31, 2006

### 2.2.2 Trial venues

Distribution center in the USA

- WBEI GDMX (Los Angeles, California)

Distribution centers in Japan

- Distribution Center 1: NTT West Osaka Data Center (Dojima Building)
- Distribution Center 2: NTT Yokosuka Data Center in Yokosuka R&D Center

Theaters (public screening)

Tokyo:

- Virgin Toho Cinemas Roppongi Hills (Roppongi, Minato-ku, Tokyo) (**Fig. 3**)
- Cinema Mediage (Toho cinema in Daiba, Minato-ku, Tokyo)

Osaka:

- Toho Cinemas Takatsuki (Takatsuki)

### 2.2.3 Movies that have been shown so far (future sequels are also planned)

(1) National release on October 22, 2005

Tim Burton's *Corpse Bride*, 4K digital cinema version

- Director: Mike Jackson and Tim Burton
- Theaters: Cinema Mediage and Toho Cinemas Takatsuki



- Theaters: Virgin Toho Cinemas Roppongi Hills and Toho Cinemas Takatsuki

### 2.3 Description of the trial and main roles of the participants

This trial involved the construction and testing of facilities for digital cinema distribution and exhibition according to the DCI specifications. The facilities include the optical fiber networks for the distribution center in the USA and the distribution centers and theaters in Japan, and the facilities for encryption and key management, prevention of camcorder piracy, and security management. This is the world's first regular exhibition in commercial movie theaters for DCI-compliant digital cinema. The experiment is in the process of evaluating video image quality, viewer impressions, the operation system, data security, network distribution, theater operating costs, and other such factors from technical and business viewpoints. The main responsibilities of the participants, illustrated in Fig. 2, are outlined below. The DCI specifications, NTT's contributions to them, and the technology and equipment provided by NTT for the trial are described in detail in the next article in this Special Feature [5].

#### WBEI and WEJI

- Construction, operation, and management of the distribution center in the USA
- Preparation of high-quality DCI-compliant digital cinema content

#### NTT

- High-speed optical fiber networks between the USA and Japan and between the distribution centers and theaters in Japan
- Distribution center 2 (Yokosuka R&D Center)
- Development of the DCI-compliant digital cinema

ma distribution system that incorporates realtime on-the-fly processing technology for secure decompression and decryption of content

#### NTT West

- High-speed optical fiber network in the western part of Japan
- Distribution center 1 (Osaka Data Center)
- Development of a theater control box [6] for digital cinemas

#### Toho

- Theaters for exhibiting the movies
- Theater operations
- Operation and management of the digital cinema exhibition system

### 3. Future work

Since the beginning of the trial, over 1000 movie exhibitions have been held. We are studying how to increase the number of movies and the number of trial participants in future. We expect this trial to encourage the wider use of the DCI specifications.

### References

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