Application of a Collaboration Platform to the Computer Graphics Compositing Process in Digital Cinema Production

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Abstract

With the use of computer graphics (CG) compositing in movie production increasing day by day, we analyze the current issues concerning CG compositing by examining Toei Film's latest production "Yamato" as an example and explain the improved production efficiency that could be achieved in future through the use of the collaboration platform developed by NTT East.

1. Fully digital movie production

The July 2005 agreement on the DCI (Digital Cinema Initiatives, LLC) standard [1] has created expectations for a further acceleration of digital movie distribution. Digital technology has already made inroads in movie production, and attempts to utilize the advantages of fully digital production have recently begun. One example is efficient high-quality computer graphics (CG) compositing performed in an extremely short time, which is impossible with the conventional film production process. The film "Yamato", which commemorates the 60th anniversary of the end of World War II, released by Toei in December 2005, uses various CG composite scenes that are indistinguishable from actual photography, including ones of the battleship Yamato (**Fig. 1**). This article describes the CG compositing workflow for the production, identify problems in the efficiency of CG compositing, and describe a collaboration platform that can solve those problems.

2. Current CG compositing and efficiency problems

The initial intention was to start the film production project with several days of shooting using a VariCam[*1] in Kure, Onomichi, and other locations and store the digital data in 10-bit uncompressed format on hard disk drives (40 minutes of filming per unit). When several (e.g., 2–4) disk drives became full, they would be transported to Toei Labtech in Chofu. There, the data would be converted to HDCAM[*2] for-

Shooting with blue background

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Image after CG synthesis

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Fig. 1. CG synthesis in "Yamato".

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*1 VariCam: A camera recorder developed by Panasonic. It can record at frame rates between 4 and 60 fps in the same way as motion picture film cameras do.

*2 HDCAM: A VTR (video tape recorder) specification developed by Sony for high-definition (HD) video recording and playback.

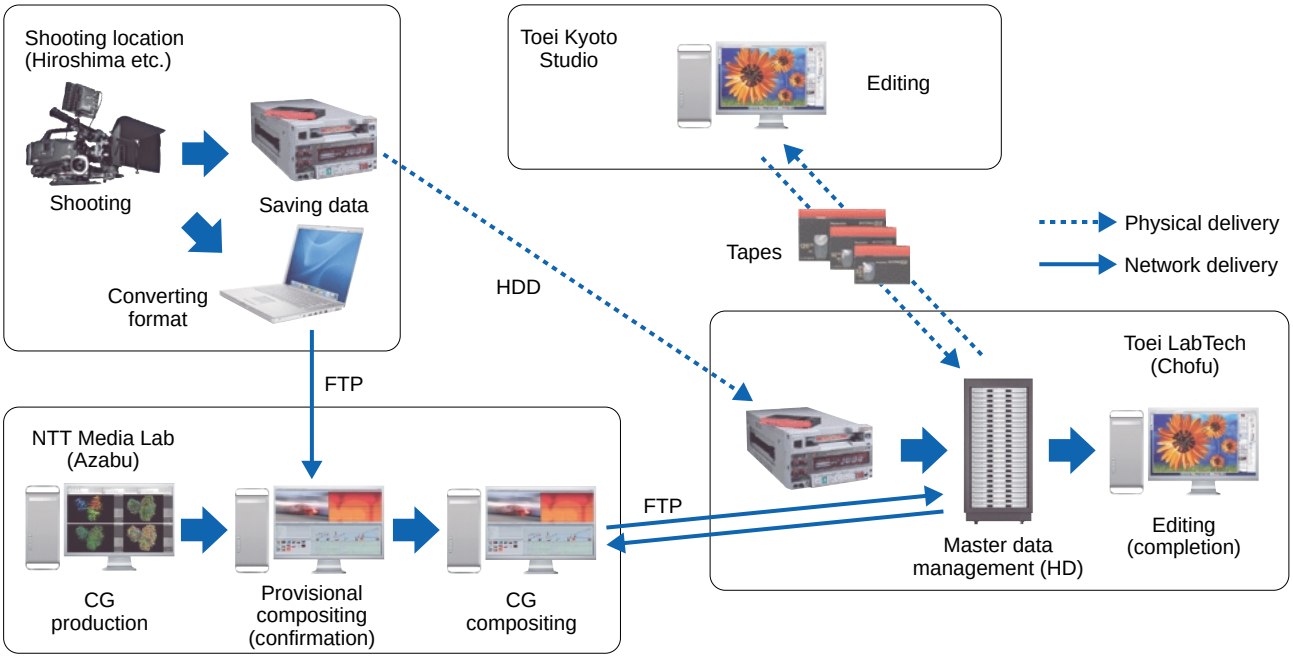

Fig. 2. Workflow used in “Yamato”.

mat and then further converted to standard definition (SD) materials for offline editing. Thus, with the initial plan, it would take a certain amount of time, a few days, to check composite scenes after the actual photography sessions. In the final plan, when the VariCam data was stored in the 10-bit uncompressed HDD recorder, it was also recorded at the same time by DVCPRO HD[*3] for on-site checking. Then, the data was recorded on DVD (digital versatile disk) or in a notebook computer and brought to NTT Media Lab. in Azabu, Tokyo, where the composite scenes were checked and used for editing in Final Cut Pro[*4] (**Fig. 2**). The introduction of this workflow shortened the work time, but had other benefits as well. Conventionally, when the actual photography and composite scenes do not match, entire scenes are cut and amendments are conducted by CG compositing, which causes a huge amount of work for the CG compositing team. In this case, however, it was possible to re-shoot the actual photography and thus greatly increase production efficiency.

On the other hand, a number of issues that could lead to even higher efficiency became apparent. The first is the need for a secure and inexpensive broadband network. As an experiment, an FTP (file transfer protocol) server was set up to exchange DVCPRO HD files over the Internet, but the line speed and security were not entirely satisfactory. The second issue is the need for a collaborative environment. If a system for file management and collaboration via a network server could be implemented, it would be possible to eliminate uncorrectable physical errors. Time could also be saved by storing the data on DVD or a notebook computer or by exporting it to those media on another system. The saved time could be shifted to production time to improve the quality of films. Furthermore, there would be no need to set up an FTP server for each company, so system management tasks could be greatly reduced.

*3 DVCPRO HD: A digital VTR specification developed by Panasonic for broadcasting and professional use.

*4 Final Cut Pro: Video editing software produced by Apple Computer.

3. Collaboration platform

One way to resolve the security issue and the need for a collaborative environment is the collaboration platform developed by NTT East. This section describes this system, which allows secure and easy content-based collaboration from different locations.

3.1 Platform functions and features

The platform provides the following functions and features required for collaboration (**Fig. 3**).

3.1.1 Collaboration functions

(1) Group function (sharing)

Content can be shared among members who have

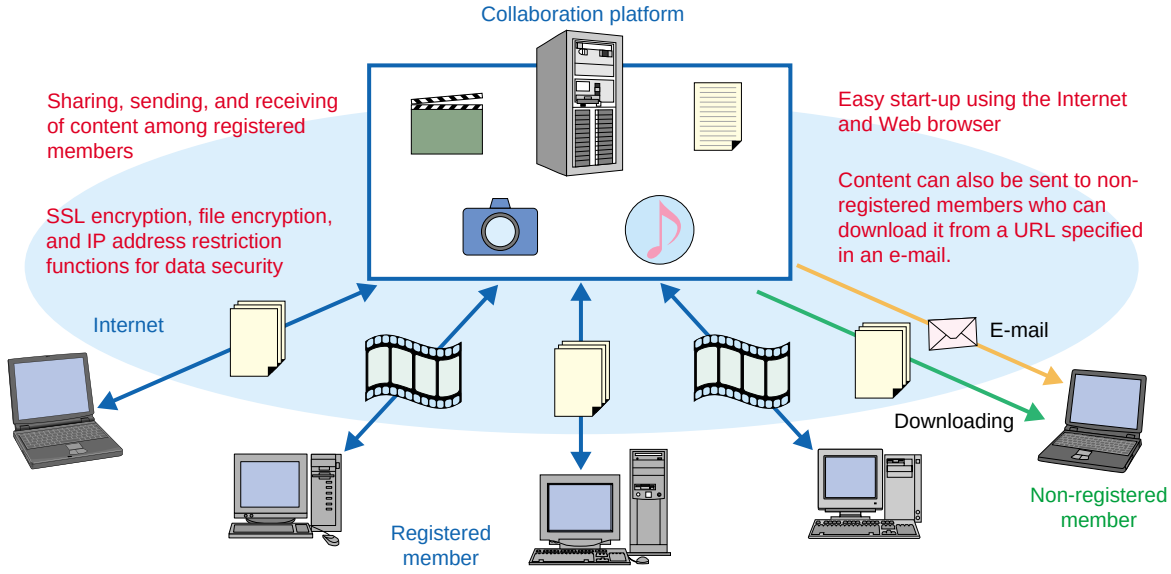

Fig. 3. Overview of the collaboration platform.

been given access permission in advance. There are functions for access restriction, encryption, version control, and automatic e-mail notification of each new content item to registered members. This makes it possible for members to obtain any content produced by any other members at any time.

(2) Mail function (sending)

The platform allows content to be made available to non-registered members by sending someone an e-mail message containing a URL (uniform resource locator) from which the content can be downloaded. Access to the URL can be restricted by setting a password or specifying a period of availability, and confirmation of receipt is also possible, allowing for safe transfer of content.

3.1.2 Security functions

SSL[*5] encryption is used to maintain a secure communication path. In addition, the IP (Internet protocol) addresses from which access by each user account is permitted can be set so that access from any other address will be denied. An expiration time can also be set for each account.

3.1.3 Administration functions

The administrator can add or delete user accounts and change the account settings. User behavior (logging in, logging out, and various other operations) can also be monitored by means of logs.

*5 SSL (secure socket layer): A protocol developed by Netscape Communications for sending encrypted data over the Internet to prevent eavesdropping, tampering, or forgery of data during transmission.

3.1.4 User environment

There is no need to prepare a special environment for users; only a Web browser and Internet connection are required. Menus can be switched between Japanese and English, and interaction with locations in other countries is also possible.

3.2 Application fields

In cases where content is currently exchanged by physical delivery using a courier or by multiple e-mails each containing part of the original source, our platform can increase efficiency and reduce transport costs. Its various security functions enable customer data and other confidential information to be exchanged safely. This platform uses the GigaCC Service that NTT BizLink provides in its role as an application service provider.

4. Application of the collaboration platform to the CG process

Applying our collaboration platform to the CG compositing production process can relieve various problems. When the processes of sending and receiving content by FTP or by storage and physical transport are replaced by the transfer and sharing functions of this platform in each process of the production, the workflow will improve, as shown in **Fig. 4**. The following improvements are expected.

1) Collaboration will be accomplished entirely within this platform, so the content will be maintained in one place and can be managed and

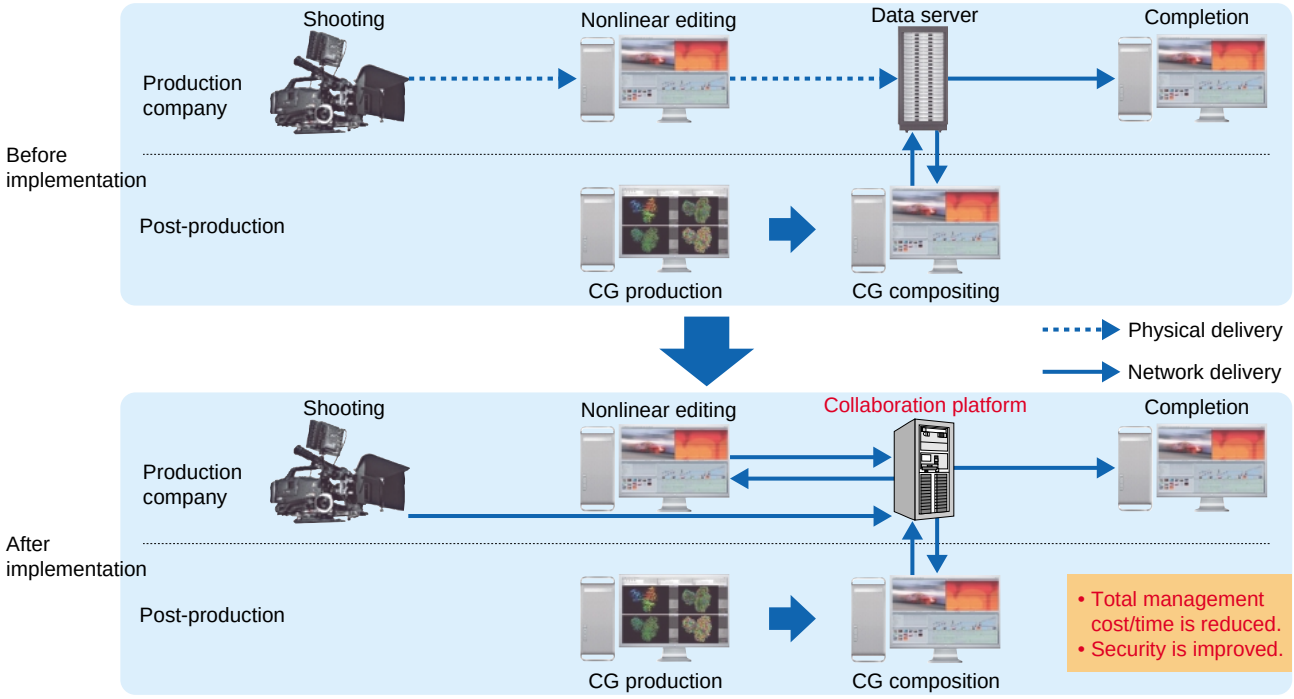

Fig. 4. Improvements in CG production process achieved by using the collaboration platform.

accessed from one location and shared and distributed rather than being dispersed and duplicated in various places.

2) Rather than being transferred as plaintext by FTP, the data will be exchanged over an encryption-protected communication path, so confidential pre-release content can be exchanged securely and easily. Furthermore, using closed B-FLET'S and FLET'S IP-VPN (Internet protocol virtual private network) services rather than sending data via multiple Internet service providers will allow an even higher level of security.
3) The automatic notification function will make it possible for any user to know instantly when other members edit or save materials, which will reduce time wasted on communication and waiting.
4) Using the network for all exchanges of materials will eliminate problems such as damage or loss of files during transport. The sending of materials can be coordinated with the workflow, so work efficiency will be increased. If there are any problems with delivered content, it can be immediately resent. Moreover, because previous versions will be automatically saved, it will always be possible to return to the original version without resending.

The benefits described above show how this platform can be applied to the various processes involved in CG compositing to improve the production process and shorten production time. Use of this platform will also lead to improved product quality, because it allows the saved time to be devoted to the production process itself.

5. Future development

In future, we will work to expand the introduction of this platform in the movie production and CG compositing processes to achieve an even more efficient workflow as the production process moves toward a fully digital format. We also intend to continue making improvements to allow smooth cooperation in the downstream distribution processes through compatibility with the DCI specifications and other such standards. In this way, we hope to contribute to the achievement of integrated and fully digital film production, distribution, and presentation to expand the use of digital cinema.

References

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[4] http://www. gigacc.com

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