

TOSHIBA REVIEW

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Special Reports

Digital Content Protection

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Special Reports

Digital Content Protection

*Content Protection for the Multimedia Era

YAMADA Hisashi

*Current Status of Digital Content Protection and Related Issues

YAMADA Hisashi KAWAHARA Junichi

The worldwide expansion of the Internet has created many issues to be solved from the content protection perspective. Content protection is necessary not only to properly protect the rights of content owners but also to do business via the Internet. Technologies for content protection are well developed and can realize a sufficiently strong protection system. Causing inconvenience to users by content protection, however, would be like putting the cart before the horse. On the other hand, there is an expanding view that information via the Internet is or should be free of charge.

In this connection, it is important for a general perception to be established that content should always be enjoyed and consumed correctly by paying a reasonable fee to content owners, otherwise business via the Internet will never become a reality. Significant changes in a social system are always accompanied by chaos and confusion among the public. Moreover, legislation is not prepared in time for rapid change. We are now in such a period of chaos, and need to introduce reasonable technical solutions for the future.

*Content Protection Architecture

KATOH Taku

Since content recorders and PCs became popular, content protection has been an important technology for the handling of entertainment content by users. In situations such as users watching and recording digital TV broadcast content, it is important to preserve the soundness of the chain of content protection technologies.

In content protection architecture, it is necessary to consider both the technologies and their licenses. It is also important to take the related legislation into consideration.

*Home Network Content Protection

SAITO Takeshi ISOZAKI Hiroshi

Content protection needs to be taken into consideration when creating a digital audiovisual (AV) system, including broadcasting, recording, and data transmission. Home networks are one of the targets of a content protection system.

This paper introduces digital transmission content protection (DTCP), a technology standardized by five companies including Toshiba, as a de-facto standard for home network content protection. In the near future it will be necessary to support several new applications, such as the inflow of various types of AV content to the home and new home network media.

*Watermarking Technology for Content Protection

YAMAKAGE Tomoo KOGURE Nakaba ASANO Wataru

Watermarking technologies are attracting considerable interest as a means of protecting the analog signal output of audiovisual equipment from unauthorized copying. It is essential for watermarking technology to adopt appropriate methods based on the requirements derived from the system concerned.

Toshiba has developed a video watermarking technology that is suitable for DVD content protection. Among the features of this technology are good transparency and a high capability to detect embedded information after many types of attacks, as well as low complexity suitable for consumer products.

*Software Protection in Open Software Environment

HASHIMOTO Mikio YAMAGUCHI Kensaku ISOZAKI Hiroshi

With multimedia applications having become popular for personal computers and personal digital assistants, some content protection mechanisms are necessary for their open software. Since an open software is inevitably vulnerable to the possibility of attack, a software protection mechanism also serves to protect its embedded secret information for content protection. Moreover, the chain of secure transmission and recording of copyrighted content depends on the software of an appliance.

A software protection technology called tamper resistant software (TRS) is playing an important role in appliance software protection.

*Digital Rights Management for Content Delivery over Networks

TOCHIKUBO Koya NAKASHIMA Koji CHIJIYA Masateru

Toshiba has proposed a content delivery system using public key infrastructure (PKI) cards as an example of a digital rights management system for content delivery over networks. The PKI card is a smart card that can execute the public key cryptosystem. PKI is a security infrastructure using the public key cryptosystem. It is considered an effective way to avoid risks such as unauthorized interception, modification, and fabrication in electronic commerce via the Internet. In the proposed system, security transactions such as authentication and key exchange are carried out within the PKI card. The proposed system therefore provides a highly secure content delivery system.

*Content Protection on DVD

ISHIHARA Atsushi

Content protection has been considered to be indispensable for DVD since its birth, since it can record high-quality motion picture and audio contents in digital form. The content protection schemes specified for DVD-Video, DVD-Audio, and recordable DVD not only protect the contents of these media by encryption, but also affect various aspects of DVD products.

*Content Protection for SD Memory Card

KAMBAYASHI Toru SHIMODA Kenji SAKAMOTO Hiroyuki

The secure digital (SD) memory card, which has already become one of the most popular media, has a considered and well-defined mechanism for content protection. The most important concepts of the content protection mechanism are (1) binding of content to the medium, (2) revocation, and (3) moving of content. These three concepts, which were realized in integrated form for the first time in the SD memory card, have become fundamental concepts of content protection for a new generation of media. The SD memory card is very useful for a wide range of applications because of its advanced mechanism for content protection, its dimensions that make it easy to use, and its wide bandwidth for data transfer. The SD memory card will continue to be a leading medium in the expanding market for memory media.

*Content Protection for Audiovisual Network

KOKUBO Takashi OKUYAMA Takehiko

New types of audiovisual products enabling users to view, listen to, or record high-definition digital contents have recently appeared on the market. A feature of digitized data is that it can be copied without degradation of quality. It is therefore necessary to have a content protection mechanism when digital contents are transmitted between such products.

Digital transmission content protection (DTCP), a standard by which contents on a network are protected, is being adopted for digital-broadcast receivers, recording devices, and so on. Toshiba is developing and commercializing digital products based on DTCP, such as digital television.

*Implementation of Copy Protection Technologies for Audiovisual Equipment

MAWATARI Masahiko SAWA Shigetaka AZUMA Kazuki

A licensee has to comply with the robustness rules and confidentiality of content protection technology when manufacturing licensed products. This includes maintaining the secrecy of the algorithm of the content protection cryptography technology and/or device keys for each product, as well as maintaining secrecy when delivering or writing the device keys.

Toshiba has developed not only content protection LSIs but also tools for writing device keys in order to meet these security requirements.

*Editing Functions and Copy Protection Technologies for DVD/HDD Recorders

MIZUSAWA Tsutomu KATAYAMA Yoshitaka

Toshiba has proposed a succession of new functions for DVD/HDD combo recorders including an intelligible user interface, a substantial original DVD creation function, and a cooperation function with PCs via LAN, and is playing the role of a leading company in this field.

Although the major advantage of a DVD/HDD combo recorder is its editing functions centering on dubbing between HDD and DVD, a structure for protecting copyright is also indispensable to it. Copy protection technologies such as the content scramble system (CSS), content protection for recordable media (CPRM), copy generation management system (CGMS), and analog protection system (APS) are now incorporated in DVD/HDD combo recorders.

*Portable Secure Audio Players

IZAWA Hidehiko MOROHOSHI Toshihiro TAKAHASHI Masaki

Music is a familiar form of entertainment that can be enjoyed both in and outside the home at any time due to the advent of portable players. However, with the rapid development of digital equipment enabling music to be easily copied without degradation of the tone quality, cases of copyright infringement have been increasing in recent years.

In response to this situation, portable audio players offering the benefits of portability as well as a function to protect music copyrights have appeared. A portable audio player and a PC application that writes music data in the player protects the rights of music copyright holders. This system functions by detecting music data copy control information and controlling copy generations.

Feature Articles

*GroupScribe™: Communityware with Automatic Message Consolidation Mechanism

YOKOTA Takehiko UMEKI Hideo

Communication tools such as e-mail and bulletin board systems have become indispensable in performing business activities. However, the more messages that have to be dealt with, the more likely it becomes that important information will be overlooked.

Toshiba has developed GroupScribe™, a communityware characterized by an automatic message consolidation mechanism to extract necessary information from messages in each community. The system can spare users the trouble of checking all messages to find important information, and facilitate the sharing and reuse of the consolidation results as knowledge among community members.

*GENIO e550C: Pocket PC with Digital Camera Function

SUDO Hidehiko OGAWA Kiyohisa NAKAYAMA Takao

The introduction of low-priced and compact digital camera modules has led to a rapid and remarkable expansion of the digital camera market, especially cellular phones with a digital camera function. However, the display of a cellular phone is small and the functions of a cellular phone are limited. Toshiba has developed the GENIO e550C Pocket PC, which features a CCD camera module, a digital camera application, and a viewer application. The GENIO e550C is expected to further expand the use of Pocket PCs.

*TCAD Simulation for Virtual Design of Semiconductor Processes

ONOUE Seiji NISHITANI Kazuhito TAKAGI Shigeyuki

The development time for new semiconductor devices is becoming longer, accompanied by shrinkage of design rules, strict process specifications, and increase in the number of process steps. In order to reduce the development time, a decrease in the number of experiments is strongly desired. Technology CAD (TCAD) is one possible candidate to improve the efficiency of development by simulating processes virtually. However, topography simulation, one part of TCAD, has not been widely used due to its inability to deal with complex chemical reactions.

Toshiba has therefore been developing new topography simulation models based on plasma diagnosis and surface analysis. We have been successfully applying these models to semiconductor processes to reduce the development time.

Frontiers of Research & Development

*Spintransistor

*Personal, Mobile, Multimedia, and Network Technologies