Digital Rights Management and Watermarking of Multimedia Content for M-Commerce Applications

Frank Hartung and Friedhelm Ramme,
Ericsson Research,
IEEE Communications Magazine, Nov. 2003
Outline

♦ Introduction

♦ Digital Rights Management for Multimedia
  – MPEG-4 DRM Standardization
  – SDMI Portable Device Specification

♦ Watermarking Technology
  – Watermarking for E-commerce application

♦ Mobile DRM
E-commerce and M-commerce

- **E-commerce** has become a huge business and a driving factor in the development of the Internet.
- With the advent of evolved 2G and 3G mobile network, mobile e-commerce (**m-commerce**) will be more and more significant.
- Online *delivery of digital media*, such as MP3 audio or video, is becoming an increasing important part in e-commerce and m-commerce.
- Unlimited consecutive copying in the digital *domain* is the major obstacle for digital media distribution and associated business.
Digital Rights Management

- Digital rights management systems are required to protect both rights and business.
- Like any cryptographic system, a DRM system is as strong as its weakest component.

Diagram:

- Encryption
- Conditional Access
- Copy Control
- Identification and Tracing

The DRM pillar model
A DRM system enables the secure exchange of intellectual property, such as copyright-protected music, video, or text, in digital form over the Internet or other electronic media, such as CDs, removable disks, or mobile networks.

DRM allows content owners to distribute securely to authorized recipients and gives them control over the whole distribution chain.
Functions of DRM Systems

- DRM systems shall provide
  - **Encryption** of the content or parts in order to disallow uncontrolled access
    - Partial or full encryption
    - Real-time or off-line encryption
  - Decryption key management
  - **Access control** (conditional access) according to flexible usage rules
    - Usage rules can be adapted to the business model
    - Examples:
      - Restricting access to certain users, a limited time, or a limited number of accesses
      - Trading access right for customer information or advertisement exchange
      - Initial access to digital data may be free, while subsequent access must be paid for
Functions of DRM Systems

- Interface to billing systems or mechanisms
  - DRM system must be able to trigger monetary transactions

- Copy control or copy prevention
  - The DRM system can enforce copy restrictions, such as no/one/several/unlimited copies of the multimedia data are allowed, and with/without rights to produce copies of these copies
  - Watermarking is suitable for some usage rules.

- Identification and tracing of multimedia data
  - Copies produced from the analog output cannot be prohibited
  - Individual watermarking (fingerprinting) of the distributed data shall be part of the DRM system
A Digital Watermarking System

Cover Work → Watermarked Work → Watermark Detector → Detected Watermark Message

Watermark Embedder

Watermark Message

Recording, transmissions, or processing

(c) 1979 Playboy Magazine
Watermarking Technology

◮ Requirements of digital watermarking
  – Imperceptibility
  – Robustness
    • Against malicious or unintentional attacks
  – Capacity
Watermarking for E-commerce Applications

- Watermarking is not a standalone technology
  - It is only useful as system component
- Important applications of digital watermarking
  - DRM
    - MPEG-4
    - SDMI
    - DVD
  - Copyright protection
Is Watermarking Secure?

- Watermarking methods have reached a certain level of maturity, but they are not as secure as modern cryptography.
- Thus, they will be regarded as weak pillar of DRM system.
**Mobile DRM**

- DRM systems in mobile environment v.s. DRM systems in fixed Internet
  - Advantages
    - Mobile terminals provide much more reliable information about the identity of the user
    - Rights management and protection is potentially more secure in more closed environments
      - Telephone communication devices like phones are potentially less vulnerable to attacks against DTRM systems than open systems, like PC as used in the Internet
  - Disadvantages
    - Additional traffic between the network and the terminal
    - Additional complexity in the terminal
Watermarking in Mobile Network

- Multimedia Server
- Watermarking
- Mobile IP Network
- Client/Receiver

Reliable Receiver ID