Multimedia im Netz

Wintersemester 2012/2013

Part II

Content-Oriented Base Technologies for Networked Multimedia

Aktuelles Ereignis:
Diskussion um Leistungsschutzrecht

Verlage vs. Google: Bundestag
e-Recht24.de (Blog) - by Sören Siebert
Der Bundestag diskutierte gestern Nac...
Presseverlagen. Google griff das Then...

Gesetzentwurf: Bundestag streitet über Leistungss...
Spiegel Online - Nov 29, 2012

Anti-Leistungsschutzrecht: Google startet Kampag...
netzwelt.de - Nov 27, 2012

+ Syndication
+ Intellectual Property Rights
+ Lobbying

ARD   YouTube   Stuttgarter Z...   Handelsblatt   Frankfurter R...   Spiegel Online   Salzburger N...
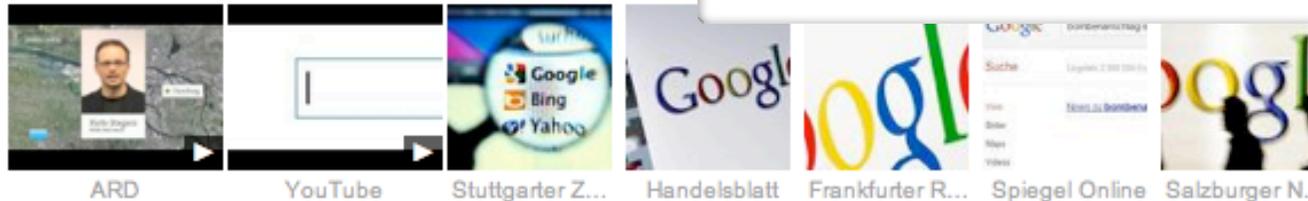
all 661 news sources »

Leistungsschutzrecht: Google schaltet Kampagne in Deutschland
Gulli - 4 hours ago

Die Debatte um das in Deutschland geplante **Leistungsschutzrecht** für Presseverlage kommt nicht zur Ruhe. Nachdem die Online-Petition ...

Snippet (ohne Rechtsschutz)

Leistungsschutzrecht Eine unheilige Scheindebatte
FAZ - Frankfurter Allgemeine Zeitung - Dec 3, 2012

Die Debatte um das **Leistungsschutzrecht** geht an der Sache vorbei. Worum geht es eigentlich? Der Kern der Argumentation der Verfechter ...

Snippet (mit Rechtsschutz)

Outline

5 Digital Rights Management

Literature:

Bill Rosenblatt, Bill Trippe, Stephen Mooney: Digital Rights Management – Business and Technology, M&T Books 2002

Ronan Deazley, Martin Kretschmer, Lionel Bently (eds): Privilege and property: essays on the history of copyright, Open Book Publishers 2010

Copyright / Intellectual Property Right (IPR)

- History:
  - "Intellectual property" unknown in ancient and medieval cultures
  - "Author privileges" (since 1486, Venice) (book printing since 1440)
  - Theory of intellectual property since approx. 1700
- Functions of copyright:
  - Securing rights for the author of a work to use it, publish it, benefit financially from it and to control its use
  - Copyright is established directly, independent of registration
    - » Differently as with other forms of IPR (patents, trade marks)
- Principle of territoriality
  - Regional laws
  - Few international treaties
    - » WIPO = World Intellectual Property Organisation (www.wipo.int)
    - » 150 participating countries

www.copyrighthistory.org

Types of Copyrighted Works

- Literary works, e.g. newspapers, manuals, fiction, non-fiction, poetry, advertisements, ...

- Musical works, such as songs and instrumentals

- Dramatic works, such as plays

- Pantomime and choreographic works, such as dance and mime

- Pictorial, graphic and sculptural works, such as photographs, paintings, maps, drawings, ...

- Motion pictures and other audiovisual works

- Sound recordings

- Architectural works

- Audio-visual displays

- Software programs

IPR in the U.S. (1)

- Article 1, section 8 of U.S. Constitution:
  - "The Congress shall have Power […] to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."
- Copyright Act of U.S. Congress 1976
  - Protects "…original works of authorship fixed in a tangible medium of expression, now known or later developed, from which they can be perceived, reproduced and otherwise communicated, either directly or with the aid of a machine or device"
  - ***Fair-Use*** Doctrine

    Use of the copyrighted work to a small extent which does not affect the market value of the work is admitted
  - ***First-Sale*** Doctrine

    Buyers get extensive rights to do everything they want with the physical copy bought, but they do not get the copyright for the content
  - ***Public-Domain*** Doctrine

    Works older than 70 years are free of copyright

IPR in the U.S. (2)

- Digital Millennium Copyright Act (DMCA) 1998
    - US response to world-wide copyright treaties
      (*WIPO Copyright Treaty* and *WIPO Performances and Phonograms Treaty*)
    - Section 1201: **Anti-circumvention provision:**

      It is prohibited to make or sell devices that
        - » Are primarily designed or produced to circumvent technological measures to protect copyrights
        - » Have only limited commercial significant purpose or use other than this kind of circumvention
        - » Are marketed for such circumvention
    - Tacit admission that copy-protection technologies will never be perfect!
    - Problematic:
        - » Where does fair use end? (e.g. circumvention for backup copies)
        - » Can DMCA restrict the right of free speech?
          (e.g. for magazines publicizing protection-cracking software code)

IPR in the EU

- Original Idea: Harmonization of the individual regulations of the EU member states

  - "Green Book" 1997

- Basis: Article 94 of EU Treaty

  - "Harmonization of national provisions affecting Common Market"

- EU entered WIPO in 2001

- EU Copyright Directive (Info-Richtlinie) 2001

  - Gives a similar basis for Digital Rights Management as the DMCA in the U.S.A.

  - Strong emphasis on the rights of the creator *(droit moral),* less market-oriented

Urheberrecht in Deutschland

- Urheberrechtsgesetz (UrhG) 1965

- Novelliert 2003 in Anpassung an die EU-Info-Richtlinie und die WIPO-Abkommen ("Erster Korb")
  - Künstlerische und ästhetische Interessen des Urhebers an seinem Werk (nur natürliche Personen, nicht wie in den USA auch juristische)
  - Anreiz für Urheber, weiter Werke herzustellen
  - Sicherung einer angemessenen Vergütung
  - Eigentümerstellung des Urhebers fast so stark wie bei einer materiellen Sache

- Zweierlei Rechte:
  - Urheber-Persönlichkeitsschutz
    » Nicht veräußerlich (kann nicht verkauft, verschenkt, vererbt werden)
  - Verwertungsrechte
    » Urheber bestimmt, ob Werk vervielfältigt werden darf
    » Privatkopie (Vervielfältigung zum eigenen Gebrauch) im Prinzip immer erlaubt (§53) – aber eingeschränkt durch §95a!

Aktuelle Entwicklung im deutschen Urheberrecht

Weitere Reform des UrhG („Zweiter Korb"), Gesetz seit 2008

* Privatkopie und Tausch:
    – Privatkopie kopiergeschützter Materialien verboten (§95a)
    – Tausch von urheberrechtlich geschützten Inhalten über Netzwerke verboten
    – Pauschalvergütung für Privatkopien (Abgaben auf Geräte, mit denen Kopien angefertigt werden können)
    – Vergütungshöhe unter den Beteiligten auszuhandeln, bei technischem Kopierschutz entfällt der Anspruch auf Vergütung
    – Keine Bagatellklausel (Kabinettsbeschluss 22.3.2006): Auch Privatpersonen prinzipiell mit bis zu drei Jahren Haft bedroht
* Urheberrecht in Wissenschaft und Forschung:
    – Relativ großzügige Regelung in §52a gilt nur befristet bis Ende 2012 (§137k)
        » Verlängerung bis Ende 2014 "in letzter Minute" wahrscheinlich
    – §52b: Digitalisierte Bibliotheksbestände nur an Leseplätzen der Bibliothek nutzbar (Ausnahme: Explizit weitergehende Rechte erworben)

http://www.gesetze-im-internet.de/urhg

Rights Management Terminology

- *Rightsholder:* A party owning rights in intellectual property
- *User:* A party that intends to make us of intellectual property rights. May be a *licensee* or a *buyer* (or *grantee*).
- *Content owner:* Like rightsholder, but less strict. May own the rights only partially, e.g. only for specific countries.
- *Rights transaction:* Transaction establishing a new rights situation
  - Example: Buying a newspaper, buying the right to re-publish content from the newspaper, buying the publishing house
- *Agent:* A legal entity authorized by a rightsholder to enter into a rights transaction on behalf of the rightsholder
- *Royalties:* Monetary compensation to a rightsholder or his agent for the use of intellectual property rights
- *Rights management:* Business processes that for legal and commercial purposes track rights, rightsholders, licenses, sales, royalties, and associated terms and conditions
- *Digital rights management (DRM):* Rights management using digital technology

Traditional Rights Management Solutions (1)

- The solution found for photocopying: *Copyright Clearance Center*
    - Obtains the rights from publishers to make photocopies (relating to over 1.75 million works)
        - » US: Copyright Clearance Center (CCC), www.copyright.com
        - » International Federation of Reproduction Rights Organizations (IFRRO)
    - Bundles publisher rights into an offer to users like copy centers
    - Publicly available photocopy machines can obtain a license from CCC
    - Corporate organizations charged according to survey data
    - Individual "Pay-per-use" via Internet
- Rather successful, low overhead
- Situation in Germany:
  VG WORT (Verwertungsgemeinschaft Wort, www.vgwort.de)
    - Income is changing over time due to disputes with other organisations
        2009: 434 Mio EUR, 2010: 131 Mio EUR, 2011: 120 Mio EUR
        distributed to over 148.000 receivers
    - System works well for photocopies, extension to audiovisual media is problematic
    - Represents German position in the "Google Books settlement" law case

Traditional Rights Management Solutions (2)

- Voluntary collective music licensing

- Organizations for collecting fees from commercial music use
  - U.S.:
    American Society of Composers, Authors and Publishers
    		(ASCAP, www.ascap.com),
    Broadcast Music International (BMI, www.bmi.com),
    SoundExchange (www.soundexchange.com)
    		since 2000, for digital performance
  - Germany:
    "Gesellschaft für musikalische Aufführungs- und mechanische
    Vervielfältigungsrechte" (GEMA, www.gema.de)

- Music is played commercially at a high number of occasions:
  - Radio broadcasting, concerts, restaurants, shops, airlines, soundtracks for
    movie broadcasts, sound on websites, hold music for telephones, ...
  - This use is not covered by the license obtained with e.g. a CD –
    Additional fees are collected

Traditional Rights Management Solutions (3)

- In the schemes discussed above, the rightsholder is free to admit a certain use or not, depending on a rights transaction.

- *Compulsory licensing:*
  - Government-regulated pricing
  - As soon as user pays an established fee (possibly to a governmental organization), he has certain rights of use
  - Frequently used for patents the broad use of which is needed for the society welfare
    » Compulsary licensing of "clean air" technologies
    » Compulsary licensing of unique pharmaceutical products
    » Sometimes also applied to media (e.g. for National Public Radio in US)
  - Pricing scheme is likely to be "flat", e.g. monthly fee independent of actual degree of usage and used works

Public Domain

- Complete refrainment from copyright-based usage restrictions
  - Enables free collaboration and "remixing" of content and knowledge
- Some content is in the public domain automatically:
  - National anthems, traditional songs, ...
  - Content the last creator of which has died 50/70/75 years ago
- Various initiatives:
  - Projekt Gutenberg (gutenberg.org): Free electronic books
  - Wikibooks
  - See publicdomainworks.net
- Various legal formulations:
  - Open Content License
  - Free Art License
  - Free Music Public License
  - Open Publication License
  - GNU Free Documentation License

Some Rights Reserved: Creative Commons

- Web culture requires new forms of copyright rules
  - Keep the copyright but allow certain uses by others
- Creative Commons (CC):
  - Non-profit organization offering "legal tools"
  - Spectrum of possibilities between public domain and full copyright
- License Conditions identified by CC:

Attribution	**Share Alike**	**Noncommercial**	**No Derivative Works**
You let others copy, distribute, display, and perform your copyrighted work — and derivative works based upon it — but only if they give credit the way you request.	You allow others to distribute derivative works only under a license identical to the license that governs your work.	You let others copy, distribute, display, and perform your work — and derivative works based upon it — but for noncommercial purposes only.	You let others copy, distribute, display, and perform only verbatim copies of your work, not derivative works based upon it.

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Attribution

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Attribution No Derivatives

Attribution Non-Commercial

Attribution Non-Commercial Share Alike

Attribution Non-Commercial No Derivatives ("Free advertising")

Position of the Music Industry

2002:

WASHINGTON-The Recording Industry Association of America (RIAA) announced today that the number of units shipped domestically from record companies to retail outlets and special markets (music clubs and mail order) fell 10.3 percent in 2001.

Specifically, total U.S. shipments dropped from 1.08 billion units shipped in 2000 to 968.58 million in 2001-a 10.3 percent decrease. The dollar value of all music product shipments decreased from $14.3 billion in 2000 to $13.7 billion in 2001-a 4.1 percent decrease, according to figures released today by the RIAA.

"This past year was a difficult year in the recording industry, and there is no simple explanation for the decrease in sales. The economy was slow and 9/11 interrupted the fourth quarter plans, but, a large factor contributing to the decrease in overall shipments last year is online piracy and CD-burning," said Hilary Rosen, President and CEO of the RIAA. "When 23 percent of surveyed music consumers say they are not buying more music because they are downloading or copying their music for free, we cannot ignore the impact on the marketplace."

http://www.azoz.com/music/features/0008.html

Each downloaded or copied file is equal to lost sales income –

is it?

IFPI Germany press release 21.3.2002:
"Mass music copying and music piracy in the Internet threatens music markets"

Music Sales Statistics (1)
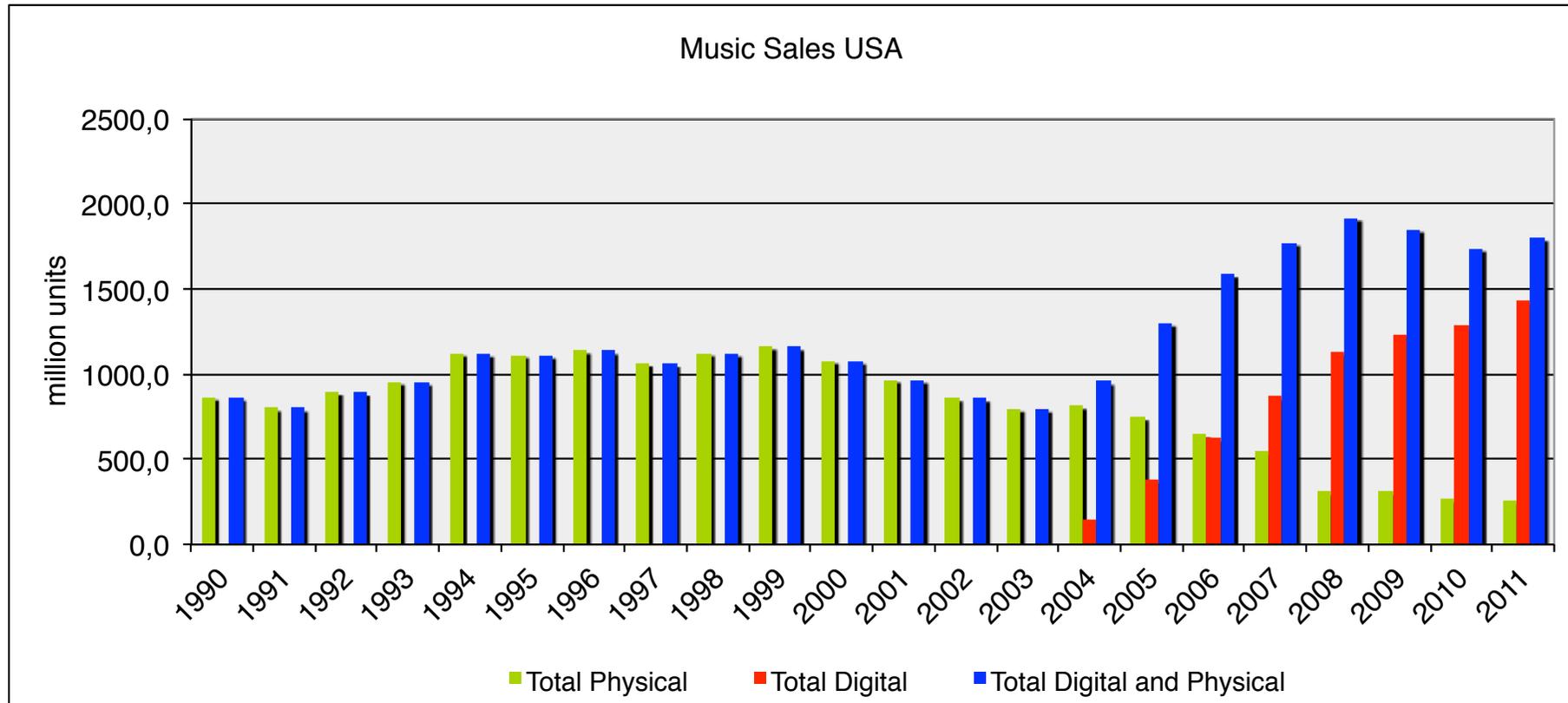
Music Sales USA

Units shipped
Data: RIAA (riaa.com)

Music Sales Statistics (2)
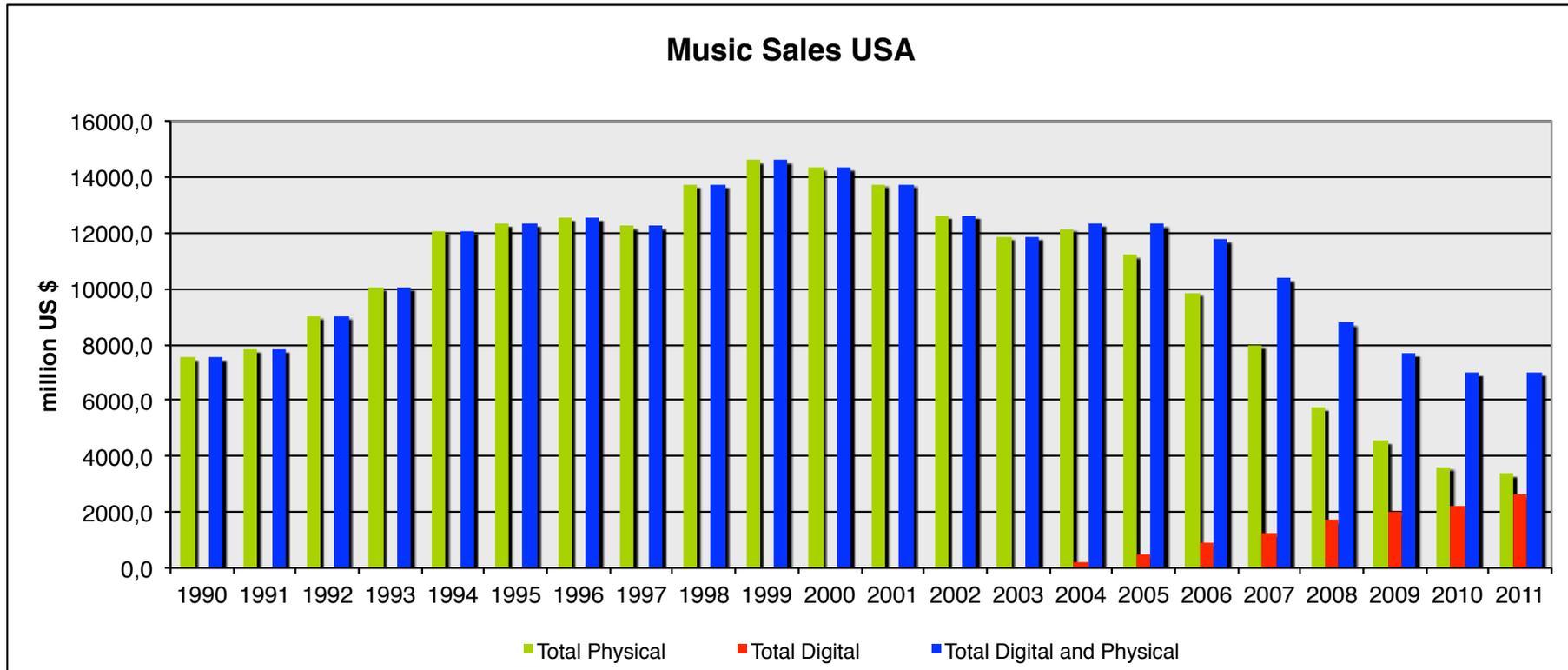
Music Sales USA

Retail value
Data: RIAA (riaa.com)

Analog physical (vinyl) in 2011:
124 mio US $ = 3.7% of total revenue

RIAA Music Sales: Physical 2009-2011

Physical		2009	2010		2010	2011	
(Units Shipped)	CD	292.9	225.8	-22.9%	253.0	240.8	-4.8%
(Dollar Value)		4,274.1	3,361.3	-21.4%	3,389.4	3,100.7	-8.5%
CD Single		0.9	1.2	31.2%	1.0	1.3	28.3%
		3.1	3.3	7.2%	2.9	3.5	18.4%
LP/EP		3.2	4.0	25.9%	4.2	5.5	31.5%
		60.2	87.0	44.4%	88.9	119.4	34.2%
Vinyl Single		0.3	0.3	-3.9%	0.3	0.4	19.7%
		2.5	2.2	-9.4%	2.3	4.6	99.6%
Music Video		11.8	9.1	-22.6%	9.1	7.7	-15.0%
		212.0	178.8	-15.7%	177.6	151.0	-15.0%
DVD Video[5]		11.2	8.7	-22.4%	8.5	7.2	-15.1%
		206.9	175.3	-15.3%	169.7	144.5	-14.8%
Total Units[6]		309.2	240.5	-22.2%	267.7	255.7	-4.5%
Total Value[6]		4,555.9	3,635.1	-20.2%	3,663.9	3,381.1	-7.7%

- Physical records with increase: LP/EP (Vinyl albums), CD Single
- DVD Video is decreasing also!
- DVD Audio and SACD are almost neglectable

Background for Digital Rights Management?

RIAA
Year-End Statistics

% of Shipments	2008	2009	2010	2011
Physical	66 %	59 %	54 %	50 %
Digital	34 %	41 %	46 %	50 %

- Trends:
  - Transition from physical distribution to virtual distribution
  - "Digital performance royalties" (SoundExchange) are increasing rapidly (almost 200% increase from 2008 to 2011, now $ 292 mio)
  - Overall music market is not expanding, maybe even shrinking

- Independent positions:
  - Process of finding new music is coupled with sharing and copying
    -> Sharing often leads to later purchases
    » Not only physical copies (CD), but concert tickets, merchandise etc.
  - See e.g. Singh et al.: Downloading vs. Purchase, DRMTICS 2005 Conference

http://papers.ssrn.com/sol3/
papers.cfm?abstract_id=2176246

25. November 2012 18:34   Unerwarteter Effekt durch Filesharing

Filmumsätze seit Megaupload-Aus gesunken

sueddeutsche.de

5   Digital Rights Management

Literature:

      Bill Rosenblatt, Bill Trippe, Stephen Mooney: Digital Rights Management – Business and Technology, M&T Books 2002

      Wenjun Zeng, Heather Yu, Ching-Yung Lin: Multimedia Security Technologies for Digital Rights Management, Academic Press

      Mark Stefik: Internet Dreams - Archetypes, Myths, and Metaphors, MIT Press 1996

Examples for Content Rights Transactions

- Buying a book, the buyer gets:
  - The right to read one copy of the physical book arbitrarily often
  - The right to sell or give the book to someone else
  - He does *not* get the rights to, e.g.:
    - » To perceive the book in a different technology (eBook, audio book)
    - » To quote from the book in own publications beyond fair use
- Buying a cinema ticket, the buyer gets:
  - The right to see the movie once (or sometimes until the theatre closes)
  - He does *not* get the rights to, e.g.:
    - » Let a friend see the movie
    - » Make a video recording of the movie
- Listening to a song on the radio, the listener gets (without paying)
  - The right to listen to the song
  - The right to record it for personal use

Fundamental Types of Rights

- According to Mark Stefik, Xerox PARC ("Letting Loose the Light")
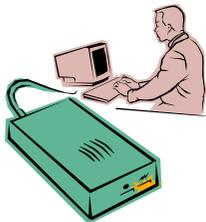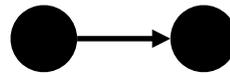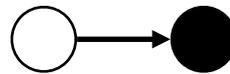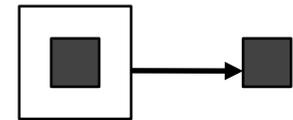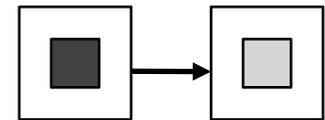
Render Rights		Transport Rights		Derivative Work Rights	
Print		Copy		Extract	
Play/ View		Transfer		Edit	
Export		Loan		Embed	
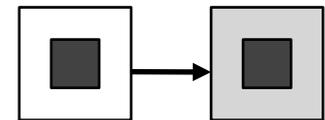
Utility Rights

- Additional types of rights which exist for technological reasons rather than to support publishers' business models

- Backup rights:

  - Right to make a copy as a safety means against technical failure

- Caching rights:

  - Right to make temporary local copies to improve performance

- Data integrity rights:

  - Right to create redundant code information etc. to ensure that the data does not get corrupted

Rights Attributes

- Rights attributes are additional specifications added to each of the fundamental rights

- Rights model = fundamental rights + rights attributes

Consideration
(what to give in return)

- Money
- Personal data

Types of users

(subscribers vs. visitors, regular vs. student, ...)

Extents (Time period, repetitions, number copies, ...)
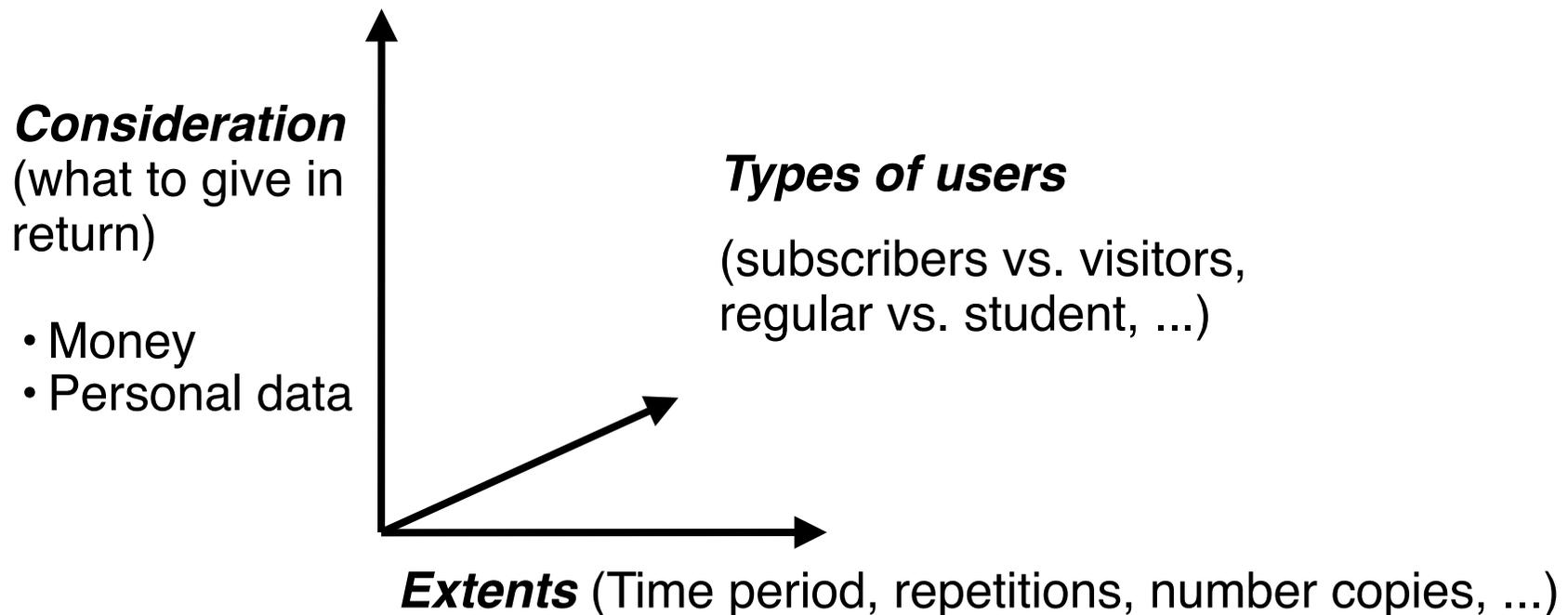
Examples (Basic Rights Language) (1)

- Buying a book:
  - **Render rights:** Print
    - » Consideration: Price of the book
    - » Extent: Forever, one copy only
    - » Type of user: No distinctions
  - **Transport rights:** Sell, give away, loan
    - » No restrictions
  - **Derivative rights:** None
- Buying a cinema ticket:
  - **Render rights:** Play
    - » Consideration: Price of movie ticket
    - » Extent: Once or rest of the day
    - » Type of user: Adult or child
  - **Transport rights:** None
  - **Derivative rights:** None

Examples (Basic Rights Language) (2)

- Listening to a song on the radio
    - **Render rights:** Play
        - » Consideration: None
        - » Extent: Once for each receiver
        - » Type of user: No distinction
    - **Transport rights:** Copy for personal use
        - » Consideration: Percentage of the cost of the recording media
        - » Extent: Personal use only
        - » Type of user: No distinction
    - **Derivative rights:** None

Chains of Rights Transactions

- Rights transactions always take place in chains
- Each transaction creates a new set of rights
- Example:

Royalties

License Fees

Musician

Record Company

Radio Station

Listener

Render: CD,...
Extents: ...,
  distributor, ...
Derivative:
  publishing
  (cover vsns.)

Render: Play
Extents: arb.
Derivative:
  30 s samples

Render: Play
Transport:
  Copy for
  personal use
...
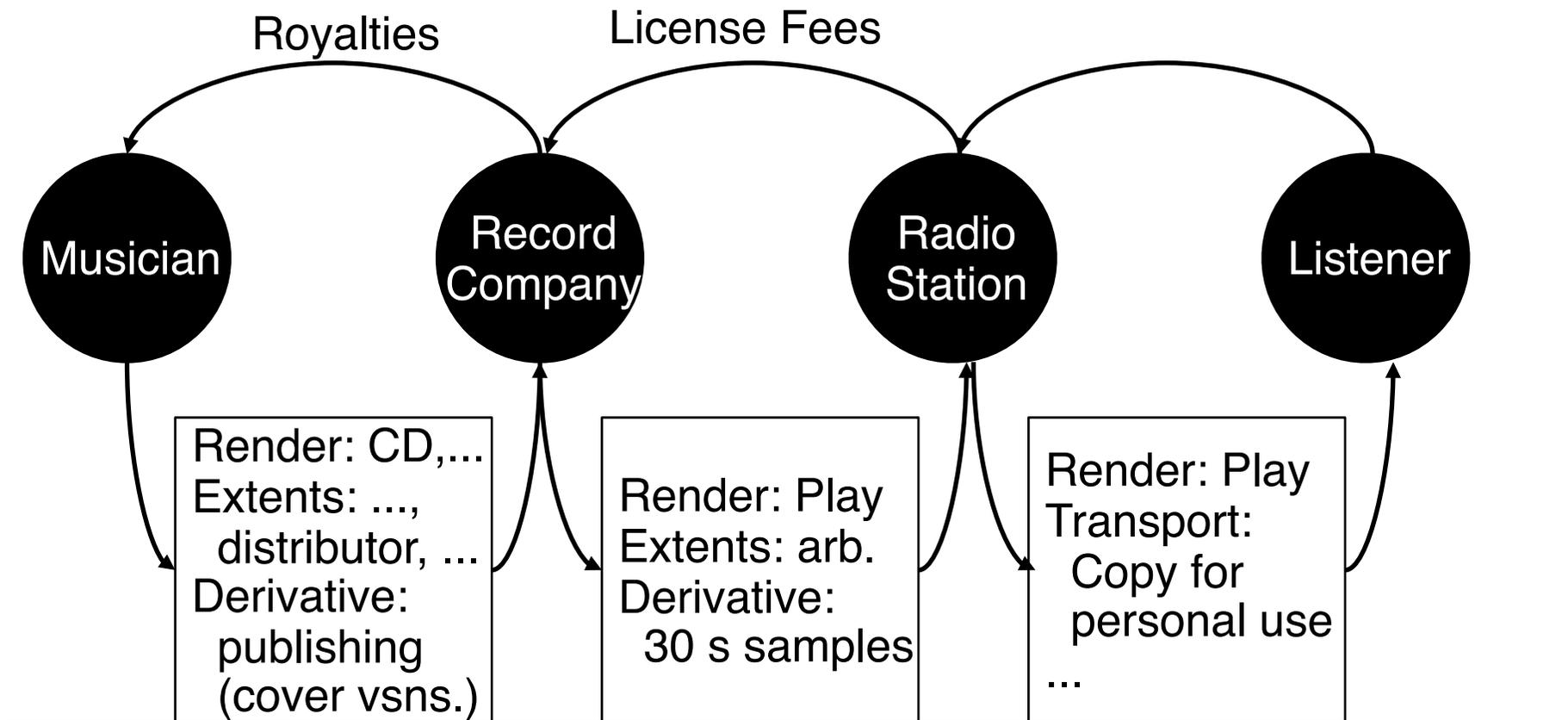
Rights Transactions May Change Rights

- Recording a tape from radio is a step in a chain of rights transactions
- After recording, the rights on the record change:
  - Extent of the render right is now "forever"
  - New derivative rights are added, e.g.:
  - **Derivative right:** Extract and embed rights for commercial use
    - » Consideration: None
    - » Extent: Only 30 seconds samples
   - » Type of user: Commercial

Rights Models and Digital Media

- Example: Music or video download service
  - **Render rights:** View
    - » Consideration: Price of the download
    - » Extent: Forever
    - » Type of user: No distinction
  - **Transport rights:** None
  - **Derivative rights:** None

- Practical questions:
  - How to ensure that the transport rights are obeyed (i.e. the file is not copied to other people)?
    - » Legal measures: How to prove from where the file came?
    - » Technical measures: How to make content viewable only for uniquely identified users?
  - These are technical challenges of DRM technology

Superdistribution

- Basic idea (Ryoichi Mori): *A software object cannot easily determine whether it has been copied or not, but it can easily be built to do some extra things when run.*
    - "Extra things" may be: metering, billing, requiring a license, …

- Superdistribution needs to be enabled at :
    - Content: "Wrapped" with superdistribution component
    - Computer: Executes superdistribution routines when accessing content

- Brad Cox: Superdistribution, *Wired Magazine*, Issue 2.09, Sep 1994 (www.wired.com)

Playback system / Computer

Content

Content

Extra things

Rendering
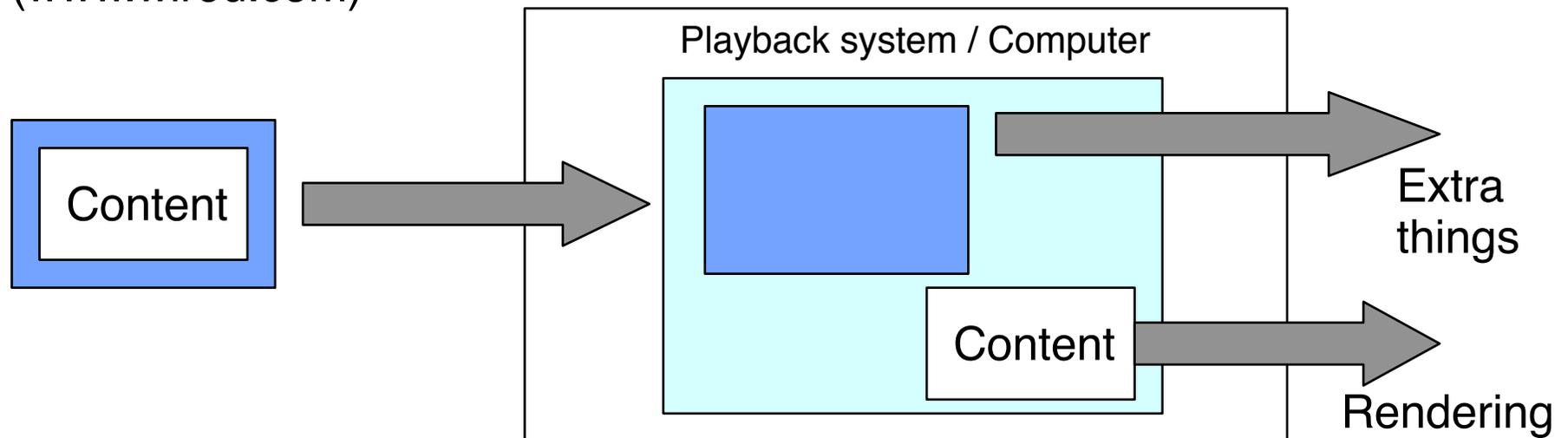
Superdistribution for Web 2.0: Research Ideas

Deutsche Telekom Laboratories

Dr. Heinrich Arnold (links), Head of Innovation Development, und Dr. Behrend Freese, Innovation and Venture Manager, der Deutschen Telekom Laboratories. Gemeinsam mit der T-Systems und dem Zentrum für Internetforschung und Medienintegration der Ludwig-Maximilians-Universität München forschen die beiden Wissenschaftler seit 2006 an Superdistribution.

MediaNet LMU

Superdistribution 2.0

Selbst erstellte digitale Inhalte sicher in Communities verteilen

Superdistribution 2.0 demonstriert ein innovatives Geschäftsmodell, das die Superdistribution ungeschützter und rechtegeschützter digitaler Inhalte ermöglicht. Basierend auf Web 2.0-Technologien können Nutzer selbst erstellte Inhalte über Festnetz, Mobilfunk und zwischen verschiedenen Endgeräten einfach, schnell und legal an andere Nutzer weitergeben und erhalten durch die Community-Plattform Feedback zu ihren Inhalten.

Implementing Rights Models

- Mark Stefik, Xerox Labs
  - "Letting Loose the Light: Igniting Commerce in Electronic Publication", in: Internet Dreams, MIT Press 1996
  - *Digital Property Rights Definition Language (DPRL)* (Lisp-like syntax)
- ContentGuard (Xerox spin-off company, partially owned by Microsoft)
  - DPRL idea in XML syntax: *XrML (Extensible Rights Management Language)*
    » Current version: 2.0 (www.xrml.org)
    » Submitted to OASIS, ContentGuard holds key patents
- Impact of XrML:
  - Microsoft implements XrML in its Unified DRM solution
  - ISO standard MPEG-21 "Rights expression language" (REL) based on XrML
  - Open eBook Forum adopted MPEG-21 REL
- Two key questions, to be separated:
  - How to *specify the rights* which are adequate in a certain situation
    » Addressed by Rights Modeling Languages
  - How to *enforce* that the *usage* obeys the rights

XrML Terminology: Grant
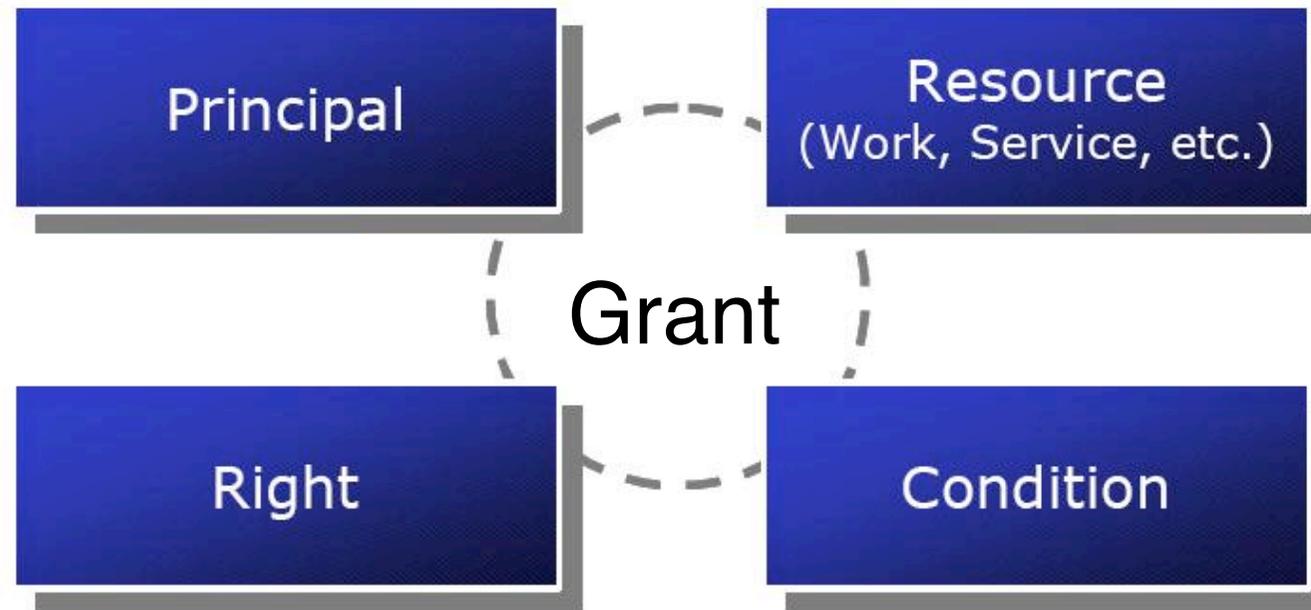
- Principal: Identification of a party to which rights are granted
- Right: A "verb" that the principal is granted to execute on a resource
- Resource: Object to which the grant refers (e.g. audio file or service)
- Condition: Specifies the terms under which the grant is valid

From XRML 2.0 Technical Overview

XrML Terminology: License
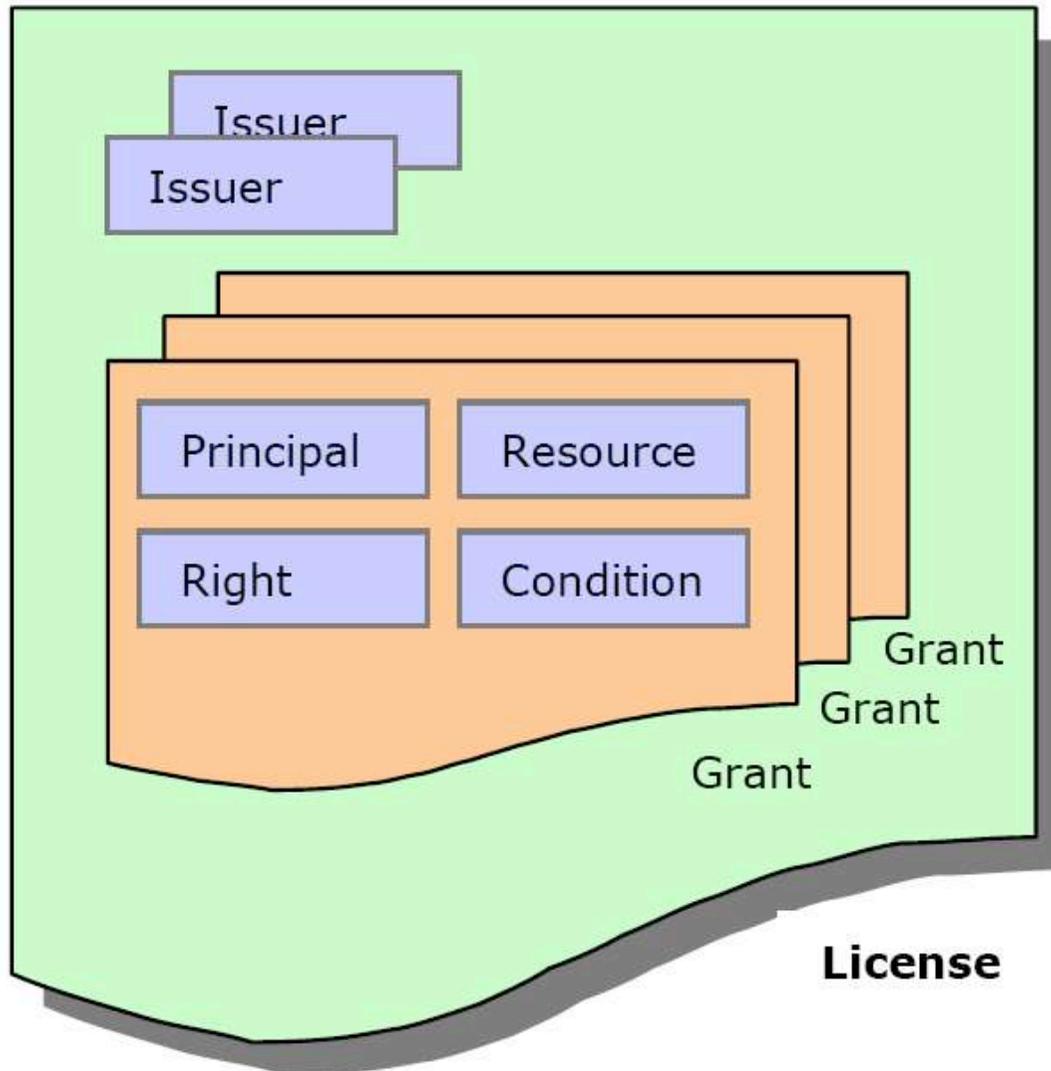
- *License* defines a set of grants
  - plus identification of issuer(s)
  - plus additional information like description, validity date, ...

From XRML 2.0 Technical Overview

XrML Content Extension

- Specific XrML language elements for digital multimedia content
- Specific rights:
    - File Management Rights (accessFolderInfo, backup, delete, ...)
    - Render Rights (export, play, print)
    - Transport Rights (copy, loan, transfer)
    - Derivative Work Rights (edit, embed, extract)
    - Configuration Rights (install, uninstall)
- Specific resources:
    - DigitalWork
    - DigitalWorkMetadata
- Specific conditions:
    - Helper (software to exercise a right)
    - Renderer (device to render a work)
    - Watermark (information to be embedded)

From XRML 2.0 Technical Overview

XrML Example (1)

XYZ@$32

Stock Quotes Online

$2

Alice
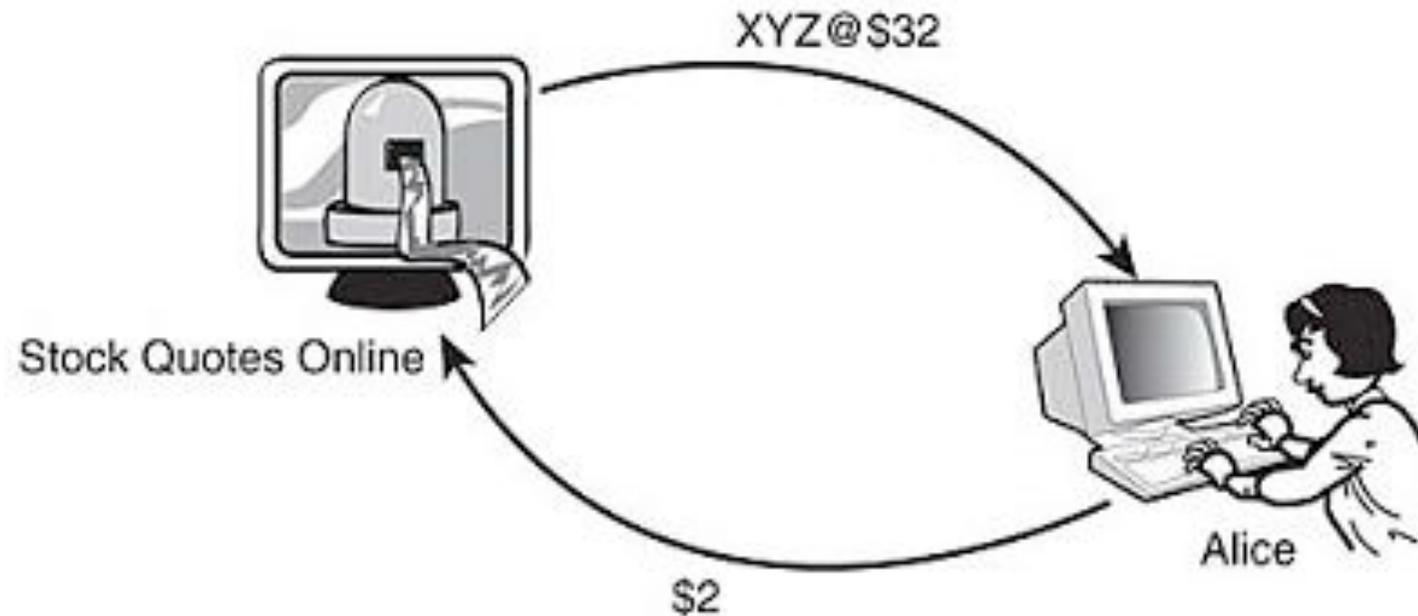
- From: http://www.devshed.com
  (Trust, Access Control, and Rights for Web Services, Part 2)

XrML Example (2)

License

Grant

Principal

Alice

Right

Use

Resource

StockQuotes Online

Condition

$2.00
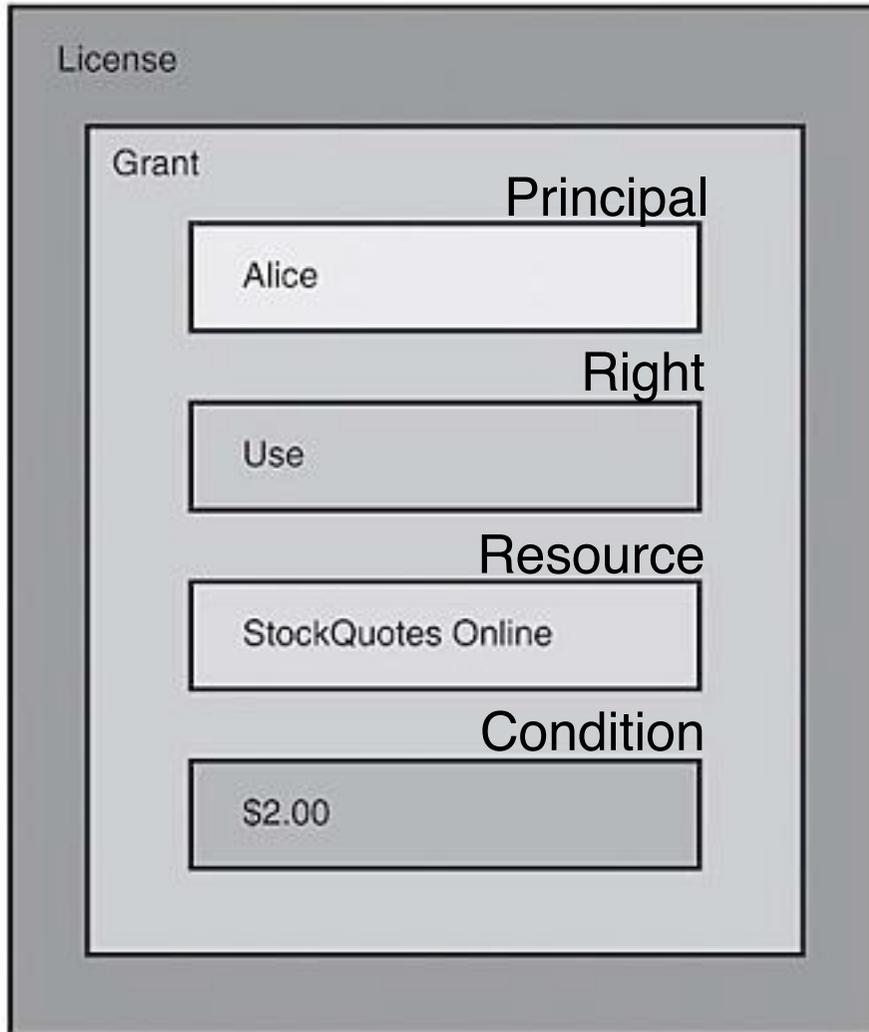
```
<license>
 <grant>
  <keyHolder licensePartId="Alice">
   <info> digital signature </info>
  </keyHolder>

  <service:use/>

  <serviceReference>
    WSDL definition of
    StockQuotes Online
  </serviceReference>

  <sx:fee>
   <sx:paymentPerUse>
    <sx:rate>
      <sx:amount>2.00</sx:amount>
      <sx:currency>US</sx:currency>
    </sx:rate>
   </sx:paymentPerUse>
   <sx:to> payment info </sx:to>
  </sx:fee>
 </grant>
</license>
```

ODRL

- Open Digital Rights Language ODRL (www.odrl.net)
    - International initiative of various supporters (e.g. Nokia)
    - Officially accepted by the Open Mobile Alliance (OMA)
      (formerly known as WAP Forum)
    - XML language, standardized through W3C (version 2.0 under development)
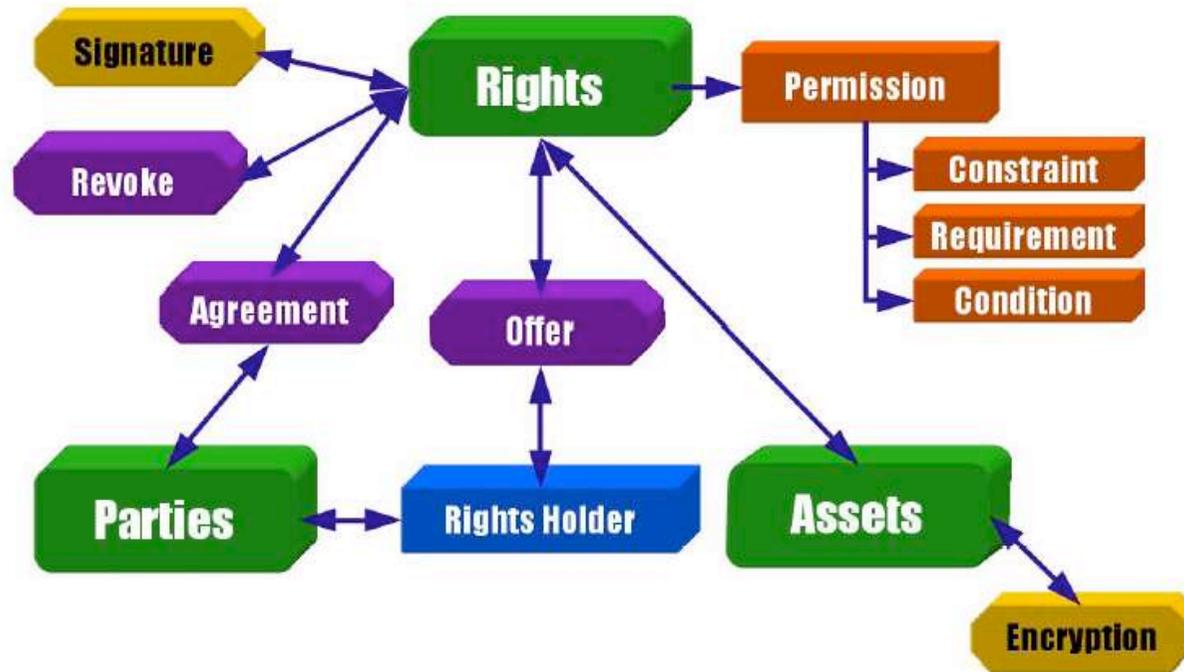
ODRL Example

```
<permission>
   <play>
        <constraint>
                <container type="in-or">
                        <cpu/>
                        <storage/>
                </container>
        </constraint>
   </play>
   <requirement>
                <container type="ex-or">
                        <prepay>
                                <payment>
                                        <amount currency="AUD">200.00</amount>
                                </payment>
                        </prepay>
                        <peruse>
                                <payment>
                                        <amount currency="AUD">1.50</amount>
                                </payment>
                        </peruse>
                </container>
   </requirement>
</permission>
```

5 Digital Rights Management

5.1 Media Rights

5.2 Rights Models

5.3 Principles of Encryption-Based DRM Systems

5.4 Watermarking

5.5 DRM Standards and Selected Commercial Solutions

Literature:

Bill Rosenblatt, Bill Trippe, Stephen Mooney: Digital Rights
Management – Business and Technology, M&T Books 2002

Seth Schoen: Trusted Computing - Promise and Risk,
http://www.eff.org/Infrastructure/trusted_computing

Eberhard Becker et al.: Digital Rights Management – Technological, legal
and political aspects, Springer 2003 (LNCS 2770)

Encryption-Based DRM

- Content is transmitted to users only in *encrypted* form
  - Not readable/playable without decoding using appropriate *keys*
- A *license* contains keys, coupled with *rights*
  - Rights specified according to a rights model
  - Keys have to be inseparable from rights
  - Licenses can and should be separate entities from content files
    - » Different licenses for same content
    - » One license for many pieces of content
- *User identities*
  - Ensure that rights are granted to a specific person or organization
  - Corresponds to the "principals" of XrML
- *Device identities*
  - Ensure that restrictions on device usage are checkable
  - E.g. using some content only on a limited number of devices

A DRM Reference Architecture

Content Server

Content Repository

Product Info

DRM Packager

Encryption
- Content
- Metadata

Content package

Client

Content package

DRM Controller

Rendering Application

License Server

Rights

Decryption Keys

DRM License Generator

Identities

Encryption
- Keys
- Rights

License

License

Identity
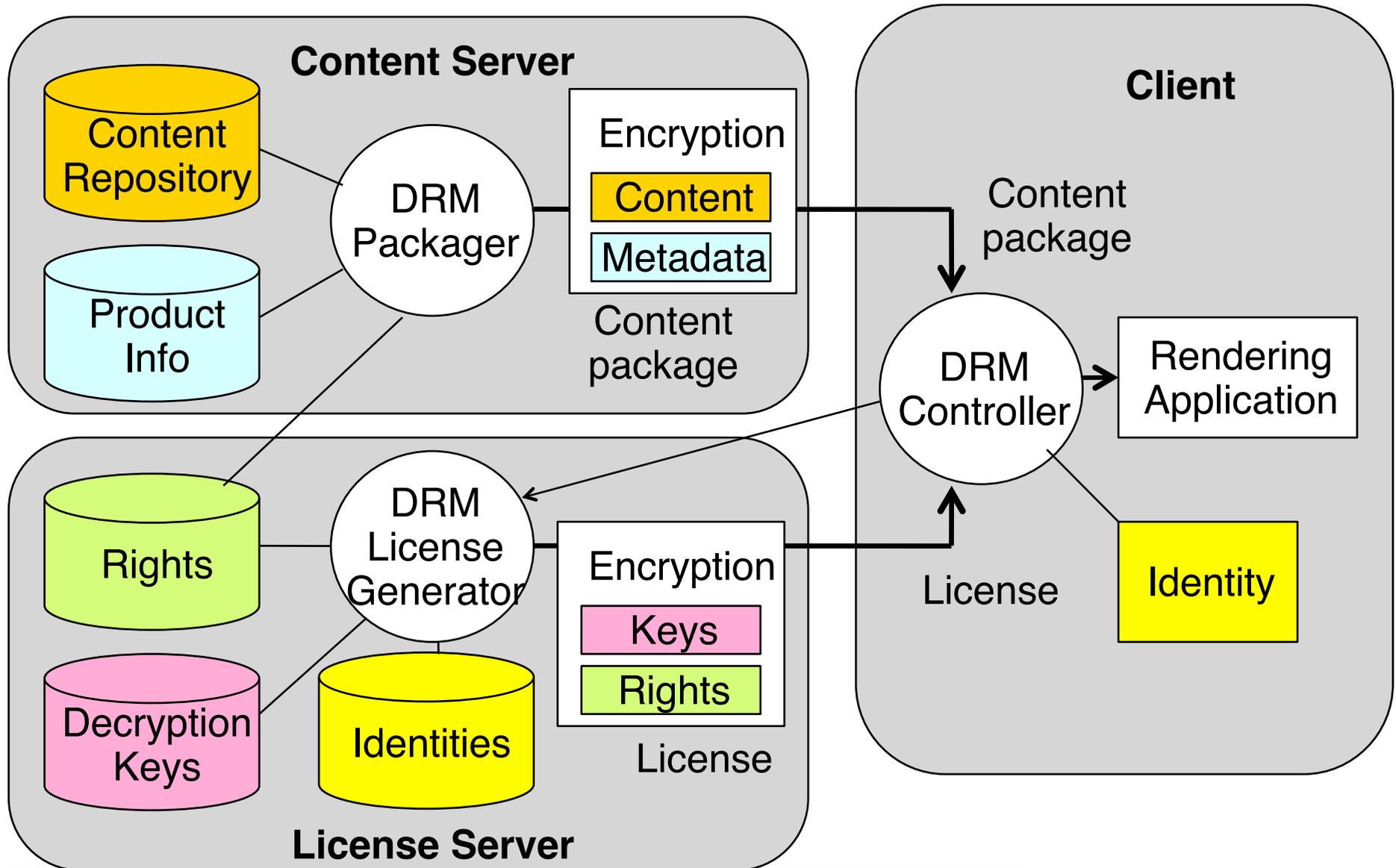
10 Steps To Play Protected Content (1)
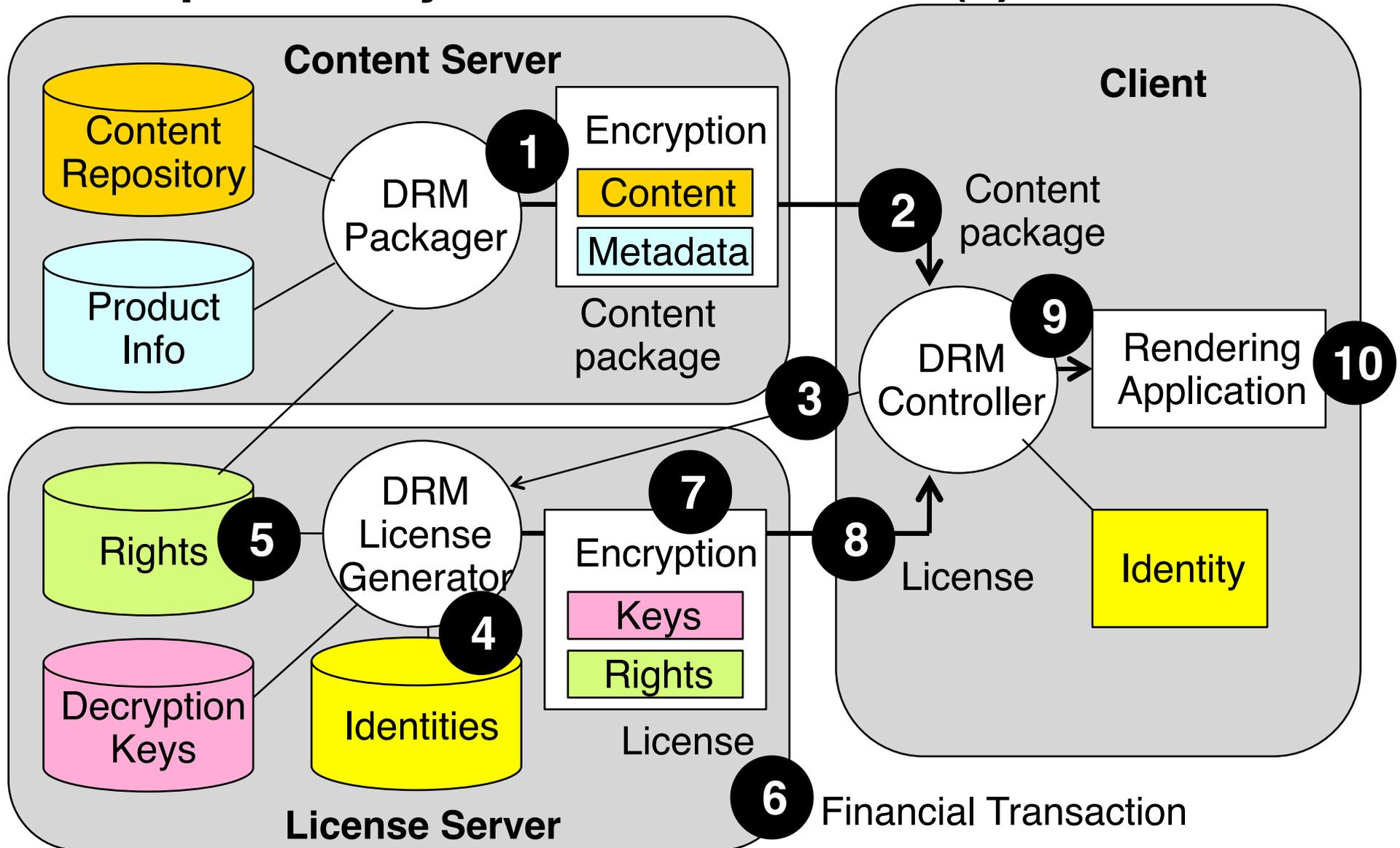
10 Steps To Play Protected Content (2)

(1) User obtains a content package, e.g. by download

(2) User makes request to exercise rights, e.g. to play or store the content

      Rendering software activates the DRM controller

(3) DRM controller determines identity of user and content and contacts license server

      May require user interaction, e.g. filling a registration form

(4) License server authenticates user against identities database

(5) License server looks up rights specification for the requested content

(6) If necessary, a financial transaction is started

      Financial transaction may happen also at another point in the process

(7) License generator combines rights information, client identity and decryption keys and seals them (packaged by encryption again)

(8) License is sent to the client

(9) DRM controller decrypts the content and hands it over to the rendering application

(10) Content is rendered for the user

Identification

- User identification
  - Supplied by user: User name, password
    - » Can be passed on from user to user
  - Inherent: Biometric data
  - Supplied by trusted third party: Digital certificate

- Device identification
  - Serial number readable by software
    - » Processor or other hardware components
  - IP address
    - » Unsuitable, due to techniques like NAT (network address translation)
  - Combination of various identifying information
    - » E.g. various serial numbers, MAC addresses, ...

Various Attacks on DRM
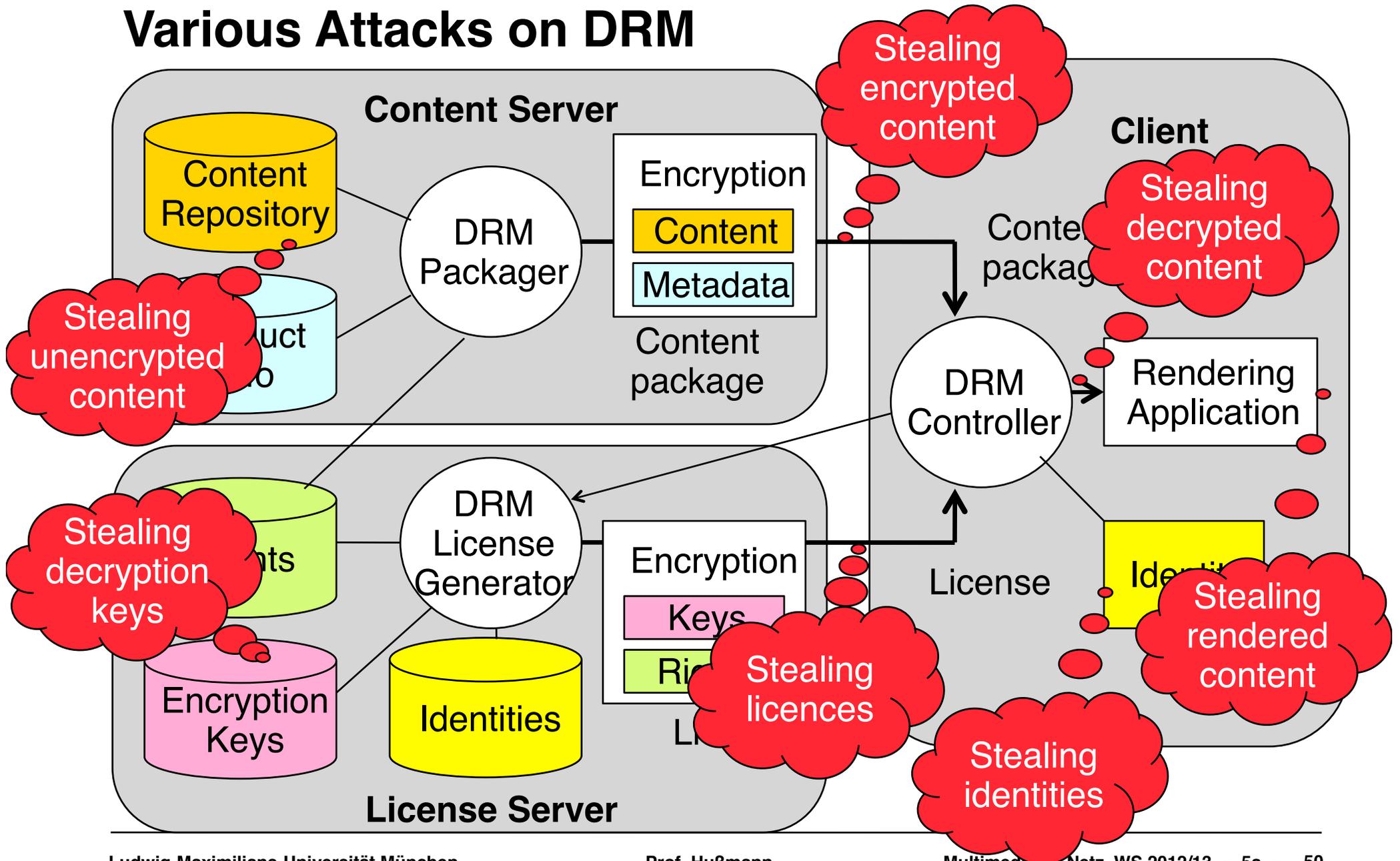
Integration DRM Controller – Rendering

- Coupling between DRM Controller and rendering application: has to be very tight
  - Intermediate storage of decoded data in file or socket would be harmful
- DRM Controllers in rendering software of high market domination
  - E.g. Adobe Acrobat, various eBook readers
  - E.g. Microsoft Windows Media Player, Apple iTunes & QuickTime
- DRM Controllers built into specialized devices
  - E.g. Apple iPod
- General problem:
  - Decoded digital signal has to be stored and transmitted somewhere (in the computer software)
  - Possibility to capture decoded signal on hardware or operating system level
    - » Except with "trusted systems"…

Trusted Computing and DRM

- Microsoft initiative: "Palladium" architecture (re-named "Next Generation Secure Computing Base (NGSCB)")

- "Trusted Computing Group (TCG)" (https://www.trustedcomputinggroup.org/)

- Authentication and validation of software and documents built into operating system and based on "tamper-proof" hardware

  - Promises:

    » (Almost) unbreakable realization of DRM

    » Complete control over software licensing

    » Secure storage for sensitive information like electronic money or valuable keys

- Hardware (TPM) (last version of spec 2011)

  - present in business grade computers ("secure boot")

  - not legally allowed in some countries

  - Microsoft uses TPM in "BitLocker" encryption (Windows Vista, 7+8)

TPM = Trusted Platform Module

Key Concepts of Trusted Computing

- Endorsement key:
  - Unique key encoded in TPM hardware
- Memory Curtaining
  - Hardware-enforced memory isolation to prevent programs from reading or writing other program's memory
  - Excluding even the operating system from accessing curtained memory!
- Secure Input/Output
  - Secure hardware path to and from input/output devices
- Sealed Storage
  - Sensitive information like cryptographic keys is not simply stored but generated if authorized software runs on an authorized machine
  - Encrypted in a way including the identities of the encrypting program and the current hardware
- Remote Attestation
  - Unauthorized changes of software detectable from a remote system (before actually sending data to the suspicious system)

Trusted Computing: Current Situation

- In PC consumer markets, under heavy criticism and not enforced
- In PC business applications, promoted as a way for better security
- *No* viable solution for Rights Management on PCs, currently
- *Mobile Devices:*
  - Similar hardware/operating system concepts exist on mobile devices (e.g. Apple iOS)
  - Ongoing discussion: Is there a right of the customer to be able to gain full control over his/her device?
    - » "jailbreaking" iOS devices is *not* illegal, it just may damage warranty