

Indirect DRM Evaluation Architecture

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Virtual Goods, October 11, 2007



Outline

- The DRM problem.
- Design goals of DRM.
- Systems to be used.
- IDEA architecture.
- Conclusions.

Effect of Virtual Goods

- Physical goods have had a well maintained equilibrium of interests among producers, distributors and users.
- The moment goods become “virtual”, the situation changes.
- Ease of perfect replication, and distribution of the goods have shifted the balance drastically in favor of consumers.



- The industry hit back with strong copy protection mechanisms
 - Sony rootkit

The DRM War of Words

[DRM is] set up by conspiracies of companies that are formed with the specific purpose of restricting the public's use of technology. Now, this ought to be a crime. If we had governments of the people, by the people, for the people then, the executives of those companies would be in prison. But, they're not in prison and the reason is we have governments of the people, by the sellouts for the corporations.

–Richard Stallman



There are some new modern-day sort of communists who want to get rid of the incentive for musicians and moviemakers and software makers under various guises.

– Bill Gates



The actual DRM War

<http://defectivebydesign.org/>



October 3rd, World Anti-DRM Day

<http://www.bbc.co.uk/>

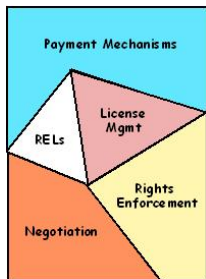
A screenshot of the BBC News website. The main headline reads "Jury penalises music file-sharer". The sub-headline says "A court in the US has ordered a woman to pay \$222,000 (£109,000) in damages for illegally file-sharing music." The article text states: "The jury ordered Jammie Thomas, 32, from Minnesota, to pay for offering to share 24 specific songs online - a cost of \$9,250 per song." A photo of Jammie Thomas is shown. The website navigation includes Home, News, Sport, Radio, TV, Weather, and Languages. The page is dated Friday, 5 October 2007, 11:01 GMT 12:01 UK.

Recording Industry Association of America (RIAA) has sued over 20,000 music fans for file sharing in just under three years.

Design Goals of DRM Systems

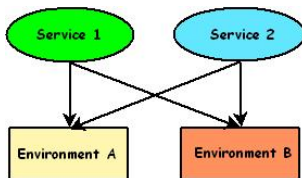
Openness

- Different pieces must work together.
- Vendors differentiate based on features, cost, etc.



Interoperability

- Content should play in different environments.
- DRM services should be separated from rendering environments.



Flexibility

- Satisfy **lightweight** & **heavyweight** DRM requirements.
- Support complex DRM scenarios such as **loan** and **superdistribution**.

These Systems Make DRM Easier

The IDEA uses these systems and exploits their properties to address many of the problems faced by current DRM systems.

- **Handle System:** It provides a generic environment for **persistent identification** to support **indirection**.
- **Transient Network Architecture:** It constitutes a **shell** which abstracts low-level hardware specific operations and provides an interface consisting of a common **environment-neutral** language of operation instructions.
- **Advanced Distributed Learning Registry:** This registry allows storage of digital objects and information about their metadata, along with queries generated over that metadata.

<http://www.tna.cnri.net/Welcome.html>

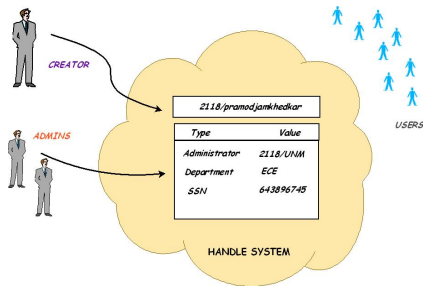
<http://www.handle.net/>

<http://www.dlib.org/dlib/february06/jerez/02jerez.html>

IDEA uses the above mechanisms to address some of the important problems in DRM.

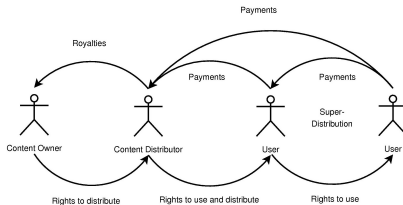
- Use of TNA architecture to address interoperability by REL abstraction.
- Use of the Handle system to manage indirection and lazy evaluation.
- Use of ADL-R and TNA to associate license with users rather than machines.
- Use of the Handle System and TNA architecture to implement Authorized Domains.
- Efficient implementation of superdistribution to maintain control over the content throughout its distribution chain.

The Handle System



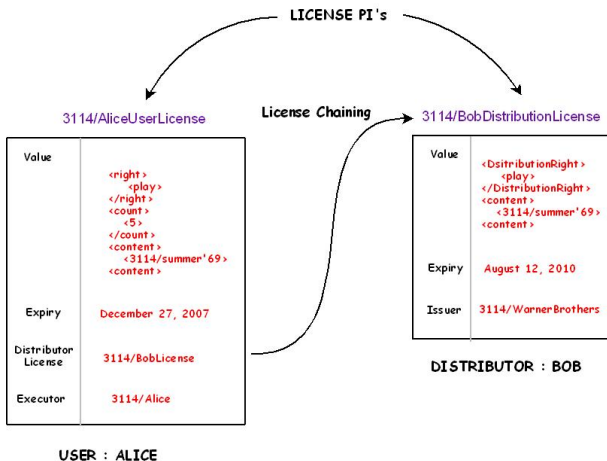
- Handle System is a distributed name service that allows unique and persistent identification of entities.
- These services are used by IDEA to identify entities in the DRM environment, and maintain their attributes.
- Creators, Users, Distributors, Content, Licenses, Devices, etc.

License Chaining and Handle System



- Each entity in the distribution chain, except the end user, creates a license.
- Each license is chained to the previous license using indirection. This means a “link” is provided for the previous license in the distribution chain.
- Before a license is evaluated, distribution rights of the distributor are checked.

License Chaining

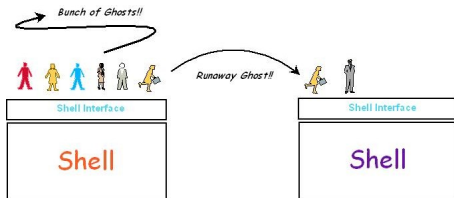


Design Goals & Handle System

Handle System provides a generic environment where entities can be **uniquely and persistently named and resolved**.

Handle System allows to **define properties** of those entities and manage them effectively.

- Handle System thus allows separation rights management functions from rights expression languages.
- Provides a generic infrastructure for management of these functions.
- It makes easier to partition and reduce the scope of RELs.
- Allows “lazy” evaluation of licenses.



- The Shell exposes a neutralizing interface which in essence virtualizes the actual device's hardware resources to the residing ghosts.
- **Mobility of ghosts** and **hardware abstraction** is exploited by IDEA.
- The environment neutral shell interface is used to **map rights to actions**.
- This allows licenses to be linked to **mobile ghosts** rather than devices.

Authorized Domains

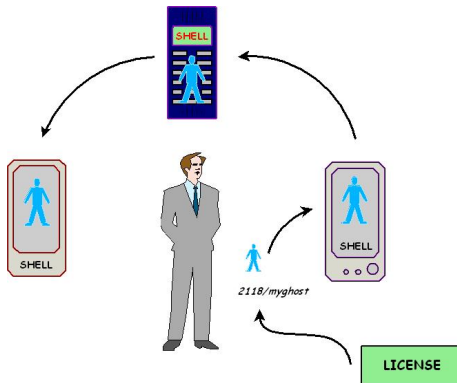


Figure: The licenses are associated with ghosts and the ghost moves within an authorized domain or is spawned by the user on devices within an AD.

ADL-R is the Advanced Distributed Learning Registry. It is the first instance of a registry-based approach to repository federation resulting from the Content Object Repository Discovery and Registration/Resolution Architecture (CORDRA) project.

- Discovery of and access to distributed, heterogeneous collections of information.
- Data items are associated with “tags” or metadata.
- Entities can be queried for specific metadata using XML.

IDEA uses ADL-R to **associate licenses with users**.

Interoperability

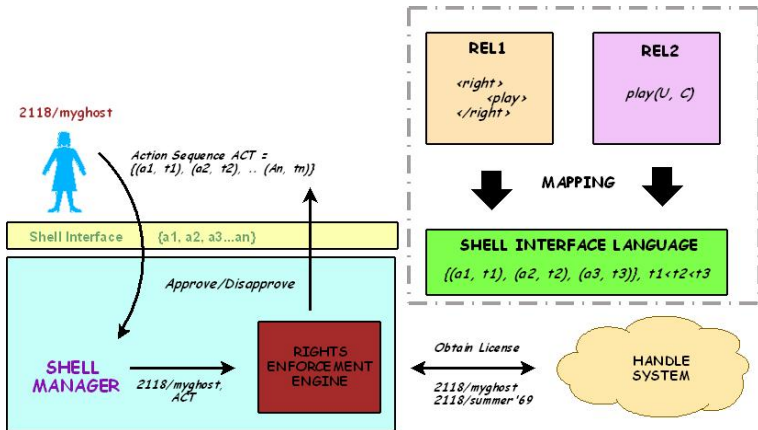
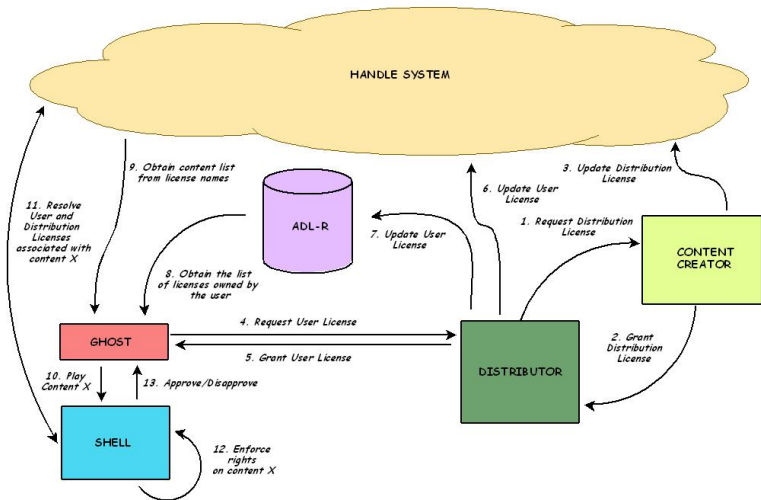


Figure: Enforcement of rights in the shell and REL abstraction.

Complete Architecture



Conclusions and Future Work

- Use of TNA, Handle System and ADL-R can address some of the important problems of DRM.
- Refactoring of RELs made much more easy.
- Allows clean implementation of interesting use cases.
- Provides much more flexibility via persistent identification, indirection and hardware abstraction.