Electronic Publishing & Digital Rights Management

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WORLD TECHNOLOGIES

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Introduction to Electronic publishing

Electronic publishing or **ePublishing** includes the digital publication of e-books and electronic articles, and the development of digital libraries and catalogues. Electronic publishing has become common in scientific publishing where it has been argued that peer-reviewed scientific journals are in the process of being replaced by electronic publishing. Although distribution via the Internet (also known as **online publishing** or **web publishing** when in the form of a website) is nowadays strongly associated with electronic publishing, there are many non network electronic publications such as Encyclopedias on CD and DVD, as well as technical and reference publications relied on by mobile users and others without reliable and high speed access to a network.

After an article is submitted to a journal for consideration, there can be a delay ranging from several months to more than two years before it is published in a journal, rendering journals a less than ideal format for disseminating current research. In some fields such as astronomy and some parts of physics, the role of the journal in disseminating the latest research has largely been replaced by preprint repositories such as arXiv.org. However, scholarly journals still play an important role in quality control and establishing scientific credit. In many instances, the electronic materials uploaded to preprint repositories are still intended for eventual publication in a peer-reviewed journal.

There is statistical evidence that electronic publishing provides wider dissemination. A number of journals have, while retaining their peer review process, established electronic versions or even moved entirely to electronic publication.

Electronic publishing is increasingly popular in works of fiction as well as with scientific articles. Electronic publishers are able to provide quick gratification for late-night readers, books that customers might not be able to find in standard book retailers (erotica is especially popular in eBook format), and books by new authors that would be unlikely to be profitable for traditional publishers.

While the term "electronic publishing" is primarily used today to refer to the current offerings of online and web-based publishers, the term has a history of being used to describe the development of new forms of production, distribution, and user interaction in regard to computer-based production of text and other interactive media.

Examples

Electronic versions of traditional media:

- CD-ROM
- E-book
- Electronic journal
- Online newspaper
- Online magazine

New media:

- File sharing
- Podcast
- Collaborative software
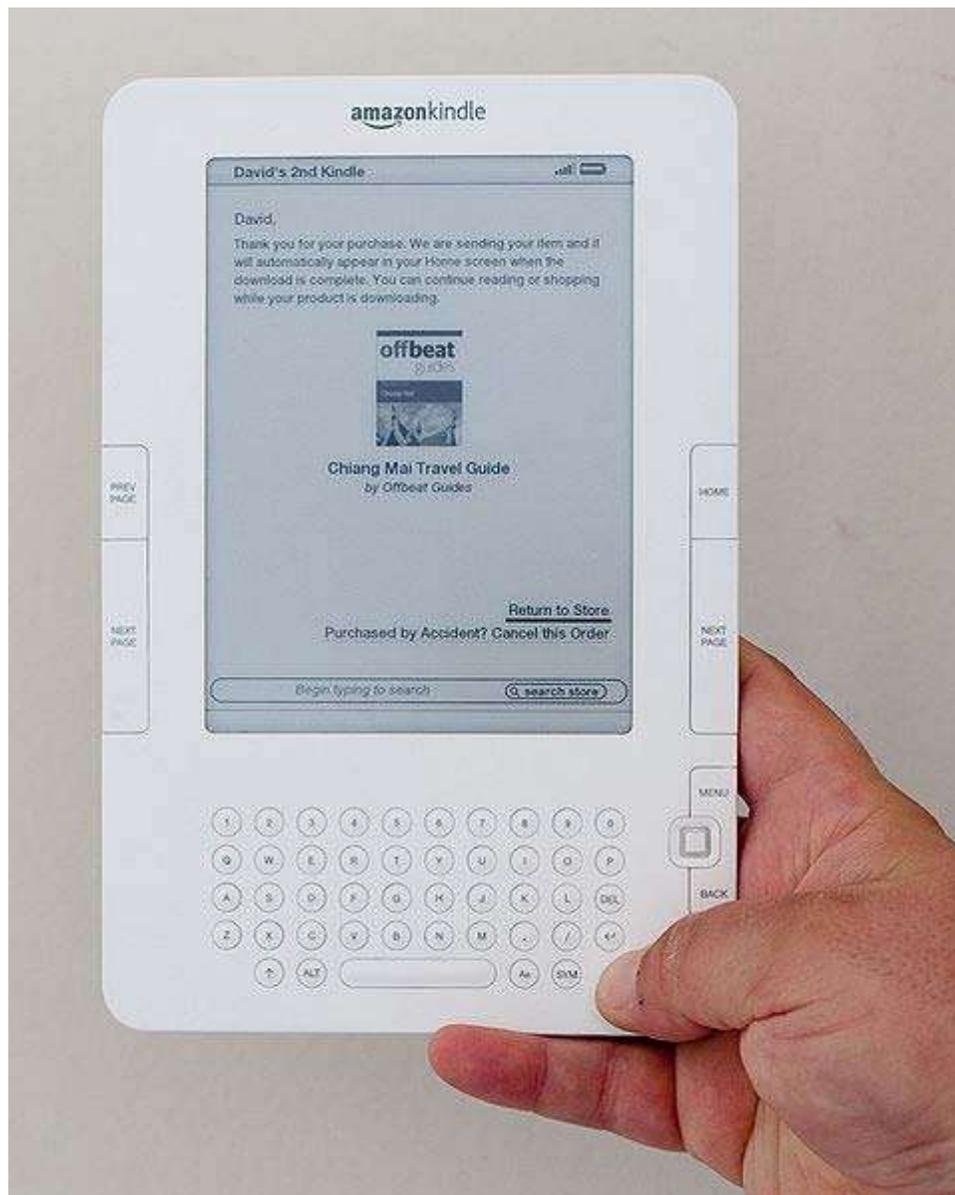- Blog

Business models

- Online advertising
- Open access (publishing)
- Pay-Per-View
- Print on demand
- Subscriptions
- Self-publishing
- Non-Subsidy Publishing

Technology vendors

- Eastgate Systems
- eMeta Corporation
- InformIT
- Ingenta
- Mygazines
- Safari Books Online
- Zmags

Chapter 1

E-Book

Amazon Kindle 2

A user viewing an electronic page on a prototype OLPC

An **electronic book** (also **e-book**, **ebook**, **digital book**) is a text and image-based publication in digital form produced on, published by, and readable on computers or other digital devices. Sometimes the equivalent of a conventional printed book, e-books can also be born digital. The *Oxford Dictionary of English* defines the e-book as "an electronic version of a printed book," but e-books can and do exist without any printed equivalent. E-books are usually read on dedicated hardware devices known as *e-Readers* or *e-book devices*. Personal computers and some cell phones can also be used to read e-books.

History

Among the earliest general e-books were those in *Project Gutenberg,* in 1971. One early e-book implementation was the desktop prototype for a proposed notebook computer, the *Dynabook,* in the 1970s at PARC: a general-purpose portable personal computer capable of displaying books for reading.

Early e-books were generally written for specialty areas and a limited audience, meant to be read only by small and devoted interest groups. The scope of the subject matter of

these e-books included technical manuals for hardware, manufacturing techniques and other subjects. In the 1990s, the general availability of the Internet made transferring electronic files much easier, including e-books.

Numerous e-book formats, view comparison of e-book formats, emerged and proliferated, some supported by major software companies such as Adobe with its PDF format, and others supported by independent and open-source programmers. Multiple readers followed multiple formats, most of them specializing in only one format, and thereby fragmenting the e-book market even more. Due to exclusiveness and limited readerships of e-books, the fractured market of independents and specialty authors lacked consensus regarding a standard for packaging and selling e-books. In 2010 e-books continued to gain in their own underground markets. Many e-book publishers began distributing books that were in the public domain. At the same time, authors with books that were not accepted by publishers offered their works online so they could be seen by others. Unofficial (and occasionally unauthorized) catalogs of books became available over the web, and sites devoted to e-books began disseminating information about e-books to the public.

U.S. Libraries began providing free e-books to the public in 1998 through their web sites and associated services, although the e-books were primarily scholarly, technical or professional in nature, and could not be downloaded. In 2003, libraries began offering free downloadable popular fiction and non-fiction e-books to the public, launching an e-book lending model that worked much more successfully for public libraries. The number of library e-book distributors and lending models continued to increase over the next few years. In 2010, a Public Library Funding and Technology Access Study found that 66% of public libraries in the U.S. were offering e-books, and a large movement in the library industry began seriously examining the issues related to lending e-books, acknowledging a tipping point of broad e-book usage.

As of 2009, new marketing models for e-books were being developed and dedicated reading hardware was produced. E-books (as opposed to ebook readers) have yet to achieve global distribution. In the United States, as of September 2009, the Amazon Kindle model and Sony's PRS-500 were the dominant e-reading devices. By March 2010, some reported that the Barnes & Noble Nook may be selling more units than the Kindle. On January 27, 2010 Apple Inc. launched a multi-function device called the iPad and announced agreements with five of the six largest publishers that would allow Apple to distribute e-books. However, many publishers and authors have not endorsed the concept of electronic publishing, citing issues with demand, piracy and proprietary devices.

In July 2010, online bookseller Amazon.com reported sales of ebooks for its proprietary Kindle outnumbered sales of hardcover books for the first time ever during the second quarter of 2010, saying it sold 140 e-books for every 100 hardcover books, including hardcovers for which there was no digital edition. By January 2011, ebook sales at Amazon had surpassed its paperback sales. In the overall U.S. market, paperback book sales are still much larger than either hardcover or e-book; the American Publishing Association estimated e-books represented 8.5% of sales as of mid-2010. In Canada, the

option of ebook publishing took a higher profile when the novel, *The Sentamentalists*, won the prestigious national Giller Prize. Owing to the small scale of the novel's independent publisher, the book was initially not widely available in printed form, but the ebook edition had no such problems with it becoming the top-selling title for Kobo devices.

Timeline

1971

- Michael S. Hart launches *Project Gutenberg*.

1985–1992

- Robert Stein starts Voyager Company Expanded Books and books on CD-ROM.

1992

- Charles Stack's Book Stacks Unlimited begins selling new physical books online.

1993

- Zahur Klemath Zapata develops the first software to read digital books. Digital book version 1 and the first digital book is published *On Murder Considered as one of the Fine Arts* (Thomas de Quincey).
- Digital Book, Inc. offers the first 50 digital books in floppy disk with Digital Book Format (DBF).
- Hugo Award for Best Novel nominee texts published on CD-ROM by Brad Templeton.
- Bibliobytes, a project of free digital books online in Internet.

1995

- Amazon starts to sell physical books on the Internet.
- Online poet Alexis Kirke discusses the need for wireless internet electronic paper readers in his article "The Emuse".

1996

- Project Gutenberg reaches 1,000 titles. The target is 1,000,000.

1998

- Kim Blagg obtained the first ISBN issued to an ebook and began marketing multimedia-enhanced ebooks on CDs through retailers including amazon.com, bn.com and borders.com. Shortly thereafter through her company "Books

OnScreen" she introduced the ebooks at the Book Expo America in Chicago, IL to an impressed, but unconvinced bookseller audience.
- First ebook Readers: Rocket ebook and SoftBook.
- Cybook / Cybook Gen1 Sold and manufactured at first by Cytale (1998–2003) then by Bookeen.

1999

- Baen Books opens up the Baen Free Library.
- Webscriptions starts selling unencrypted eBooks.

2000

- Microsoft Reader with ClearType technology.
- Stephen King offers his book "Riding the Bullet" in digital file; it can only be read on a computer.

2001

- Todoebook.com, the first website selling ebooks in Spanish.

2002

- Random House and HarperCollins start to sell digital versions of their titles in English.

2004

- Sony Librie with e-ink.

2005

- Amazon buys Mobipocket.
- Bookboon.com is launched, allowing people to download free textbooks and travel guide eBooks.

2006

- Sony Reader with e-ink.
- LibreDigital launched BookBrowse as an online reader for publisher content.
- BooksOnBoard, one of the largest independent ebookstores, opens and sells ebooks and audiobooks in six different formats.

2007.

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- Amazon launches Kindle in US.
- Bookeen launched Cybook Gen3 in Europe.

2008

- Adobe and Sony agreed to share their technologies (Reader and DRM).
- Sony sells the Sony Reader PRS-505 in UK and France.
- BooksOnBoard is first to sell ebooks for iPhones.

2009

- Bookeen releases the Cybook Opus in the US and in Europe.
- Sony releases the Reader Pocket Edition and Reader Touch Edition.
- Amazon releases the Kindle 2.
- Amazon releases the Kindle DX in the US.
- Barnes & Noble releases the Nook in the US.
- Bookboon.com achieves over 10 Million downloads in one year — placing the company as the world's largest publisher of free eBooks.

2010

- Amazon releases the Kindle DX International Edition worldwide.
- Bookeen reveals the Cybook Orizon at CES.
- TurboSquid Magazine announces first magazine publication using Apple's iTunes LP format.
- Apple releases the iPad with an e-book app called iBooks. Between its release in April 2010, to October, Apple has sold 7 million iPads.
- Kobo Inc. releases its Kobo eReader to be sold at Indigo/Chapters in Canada and Borders in the United States.
- Amazon.com reported that its e-book sales outnumbered sales of hardcover books for the first time ever during the second quarter of 2010.
- Amazon releases the third generation kindle, available in 3G+Wi-Fi and Wi-Fi versions.
- Kobo Inc. releases an updated Kobo eReader which now includes Wi-Fi.
- Barnes & Noble releases the new NOOKcolor.
- Sony releases its second generation Daily Edition PRS-950.
- PocketBook expands its successful line of e-readers in the ever-growing market.
- Google launches Google eBooks

Formats

There are a variety of e-book formats used to create and publish e-books. A writer or publisher has many options when it comes to choosing a format for production. Every format has its proponents and champions, and debates over which format is best can become intense.

Comparison to printed books

Advantages

There are over 2 million free books available for download as of August 2009. Mobile availability of e-books may be provided for users with a mobile data connection, so that these e-books need not be stored on the device. An e-book can be offered indefinitely, without ever going "out of print". In the space that a comparably sized print book takes up, an e-reader can potentially contain thousands of e-books, limited only by its memory capacity. If space is at a premium, such as in a backpack or at home, it can be an advantage that an e-book collection takes up little room and weight.

E-book websites can include the ability to translate books into many different languages, making the works available to speakers of languages not covered by printed translations. Depending on the device, an e-book may be readable in low light or even total darkness. Many newer readers have the ability to display motion, enlarge or change fonts, use Text-to-speech software to read the text aloud for visually impaired, partially sighted, elderly or dyslectic people, search for key terms, find definitions, or allow highlighting bookmarking and annotation. Devices that utilize E Ink can imitate the look and ease of readability of a printed work while consuming very little power, allowing continuous reading for weeks at time.

While an e-book reader costs much more than one book, the electronic texts are at times cheaper. Moreover, a great share of e-books are available online for free, minus the minimal costs of the electronics required. For example, all fiction from before the year 1900 is in the public domain. Also, libraries lend more current e-book titles for limited times, free samples are available of many publications, and there are other lending models being piloted as well. E-books can be printed for less than the price of traditional new books using new on-demand book printers.

An e-book can be purchased/borrowed, downloaded, and used immediately, whereas when one buys or borrows a book, one must go to a bookshop, a home library, or public library during limited hours, or wait for a delivery. The production of e-books does not consume paper and ink. The necessary computer or e-reader uses less materials. Printed books use 3 times more raw materials and 78 times more water to produce albeit they do not require a machine for use (out of context) Depending on possible digital rights management, e-books can be backed up to recover them in the case of loss or damage and it may be possible to recover a new copy without cost from the distributor. Compared to printed publishing, it is cheaper and easier for authors to self-publish e-books. Also, the dispersal of a free e-book copy can stimulate the sales of the printed version.

Drawbacks

Ebook formats and file types continue to develop and change through time through advances and developments in technology or the introduction of new proprietary formats. While printed books remain readable for many years, e-books may need to be copied or

converted to a new carrier or file type over time. PDF and epub are growing standards, but are not universal.

Not all books are available as e-books. Paper books can be bought and wrapped for a present and a library of books can provide visual appeal, while the digital nature of e-books makes them non-visible or tangible. E-books cannot provide the physical feel of the cover, paper, and binding of the original printed work. An author who publishes a book often puts more into the work than simply the words on the pages. E-books may cause people "to do the grazing and quick reading that screens enable, rather than be by themselves with the author's ideas". They may use the e-books simply for reference purposes rather than reading for pleasure and leisure. Books with large pictures (such as children's books) or diagrams are more inconvenient for viewing and reading.

A book will never turn off and would be unusable only if damaged or after many decades. The shelf life of a printed book exceeds that of an e-book reader, as over time the reader's battery will drain and require recharging. Additionally, "As in the case of microfilm, there is no guarantee that [electronic] copies will last. Bits become degraded over time. Documents may get lost in cyberspace...Hardware and software become extinct at a distressing rate." E-book readers are more susceptible to damage from being dropped or hit than a print book. Due to faults in hardware or software, e-book readers may malfunction and data loss can occur. As with any piece of technology, the reader must be protected from the elements (such as extreme cold, heat, water, etc.), while print books are not susceptible to damage from electromagnetic pulses, surges, impacts, or extreme temperatures.

The cost of an e-book reader far exceeds that of a single book, and e-books often cost the same as their print versions. Due to the high cost of the initial investment in some form of e-reader, e-books are cost prohibitive to much of the world's population. Furthermore, there is no used e-book market, so consumers will neither be able to recoup some of their costs by selling an unwanted title they have finished, nor will they be able to buy used copies at significant discounts, as they can now easily do with printed books. Because of the high-tech appeal of the e-reader, they are a greater target for theft than an individual print book. Along with the theft of the physical device, any e-books it contains also become stolen. E-books purchased from vendors like Amazon or Barnes & Noble.com are stored "in the cloud" on servers and "digital lockers" and have the benefit of being easily retrieved if an e-reading device is lost. Not all e-booksellers are cloud based; if an e-book is stolen, accidentally lost, or deleted, in the absence of a backup it may have to be repurchased.

The display resolutions of reading devices are currently lower than printed materials. Because of proprietary formats or lack of file support, formatted e-books may be unusable on certain readers. Additionally, the reader's interaction with the reader may cause discomfort, for example glare on the screen or difficulty holding the device. Due to digital rights management, customers typically cannot resell or loan their e-books to other readers. However, some Barnes & Noble e-books are lendable for two weeks via their 'LendMe' technology. Additionally, the potential for piracy of e-books may make

publishers and authors reluctant to distribute digitally. E-book readers require various toxic substances to produce, are non-biodegradable, and the disposal of their batteries in particular raises environmental concerns. As technologies rapidly change and old devices become obsolete, there will be larger amounts of toxic wastes that are not easily biodegradable like paper. Paper products are easily sustainable and reusable, unlike many rare earth minerals that are used up in electronic devices.

A rare or fine book can be an art object with a high monetary value. One can invest in first editions and out of print books. Some books will have a very high resale value. Real paper books can be used to decorate a home or office. Some finely bound, limited edition books can be considered very beautiful. Very old books often have great historical importance, and are one of a kind. Archives can easily store old paper books and documents, unlike e-books.

E-books and software can easily track data, times, usage, pages, and details about what one is reading and how often. Similar to this is the growing amount of data available through Google search engines, Facebook, and through data mining. For the first time in history it is now far easier to track and record what specific people might be reading. The notions of privacy, private writing, solitude, and personal reading are changing.

Digital rights management

Anti-circumvention techniques may be used to restrict what the user may do with an e-book. For instance, it may not be possible to transfer ownership of an e-book to another person, though such a transaction is common with physical books. Some devices can phone home to track readers and reading habits, restrict printing, or arbitrarily modify reading material. This includes restricting the copying and distribution of works in the public domain through the use of "click-wrap" licensing, effectively limiting the rights of the public to distribute, sell or use texts in the public domain freely.

Most e-book publishers do not warn their customers about the possible implications of the digital rights management tied to their products. Generally they claim that digital rights management is meant to prevent copying of the e-book. However in many cases it is also possible that digital rights management will result in the complete denial of access by the purchaser to the e-book. With some formats of DRM, the e-book is tied to a specific computer or device. In these cases the DRM will usually let the purchaser move the book a limited number of times after which he cannot use it on any additional devices. If the purchaser upgrades or replaces their devices eventually they may lose access to their purchase. Some forms of digital rights management depend on the existence of online services to authenticate the purchasers. When the company that provides the service goes out of business or decides to stop providing the service, the purchaser will no longer be able to access the e-book.

As with digital rights management in other media, e-books are more like rental or leasing than purchase. The restricted book comes with a number of restrictions, and eventually access to the purchase can be removed by a number of different parties involved. These

include the publisher of the book, the provider of the DRM scheme, and the publisher of the reader software. These are all things that are significantly different from the realm of experiences anyone has had with a physical copy of the book.

Production

Some e-books are produced simultaneously with the production of a printed format, as described in electronic publishing, though in many instances they may not be put on sale until later. Often, e-books are produced from pre-existing hard-copy books, generally by document scanning, sometimes with the use of robotic book scanners, having the technology to quickly scan books without damaging the original print edition. Scanning a book produces a set of image files, which may additionally be converted into text format by an OCR program. Occasionally, as in some e-text projects, a book may be produced by re-entering the text from a keyboard.

As a newer development, sometimes only the electronic version of a book is produced by the publisher. It is even possible to release an e-book chapter by chapter as each chapter is written. This is useful in fields such as information technology where topics can change quickly in the months that it takes to write a typical book (See: Realtime Publishers). It is also possible to convert an electronic book to a printed book by print on demand. However these are exceptions as tradition dictates that a book be launched in the print format and later if the author wishes an electronic version is produced.

As of 2010, there is no industry-wide e-book bestseller list, but various e-book vendors compile bestseller lists, such as those by Amazon Kindle Bestsellers and Fictionwise. There are two yearly awards for excellence in e-books—the EPIC eBook Award (formerly EPPIE) given by EPIC, and the Dream Realm Award for science fiction, fantasy and horror e-books. Both awards have been given since 2000.

e-Readers

e-Readers may be specifically designed for that purpose, or intended for other purposes as well. The term is restricted to hardware devices and used to describe a category type.

Specialized devices have the advantage of doing one thing well. Specifically, they tend to have the right screen size, battery lifespan, lighting and weight. A disadvantage of such devices is that they are often expensive when compared to multi-purpose devices such as laptops and PDAs.

In 2010, competition sent the price for the most popular electronic reading devices below USD 200.

Research released in March 2011 indicated that e-books and e-book readers are actually more popular with the older generation than the younger generation in the UK. The survey carried out by Silver Poll found that around 6% of over 55s owned an e-book reader compared with just 5% of 18-24 year olds.

The survey also revealed that the Amazon Kindle is the most popular e-book reader in the UK (47%) followed by the Apple iPad (31%) and the Sony Reader (14%).

It has been reported that there is a differing level of dissatisfaction amongst owners of different ebook readers due to poor availability of sought after ebook titles. A survey of the number of contemporary and popular titles available from ebook store, revealed that Amazon.com has the largest collection, over twice as large as Barnes and Noble, Sony Reader Store, Apple iBookstore and OverDrive, the public libraries lending system.

Chapter 2

Metadata Publishing & Online Magazine

Metadata Publishing

Metadata publishing is the process of making metadata data elements available to external users, both people and machines using a formal review process and a commitment to change control processes.

Metadata publishing is the foundation upon which advanced distributed computing functions are being built. But like building foundations, care must be taken in metadata publishing systems to ensure the structural integrity of the systems built on top of them.

Definition of metadata publishing

Published metadata has the following characteristics:

1. Metadata structures available to the general public on a public web site or by a download
2. There is a documented review and approval process for adding or updating data elements to the system
3. New releases are made available without disturbing prior versions
4. A publishing organization that makes a commitment to change control process

Benefits of metadata publishing

When classifying benefits of metadata publishing two groups are usually considered. External parties are usually consumers of information that are not part of the publishing organization. Internal parties are usually the various business units or departments within an organization.

Benefits to external parties

1. Allows external systems (both people and agents) to have a clear understanding of the semantics of data elements in a system
2. Allows third parties to build semantic maps between data models and import and export data between systems

3. Promotes service oriented architectures and allow horizontal sharing of information between traditional information silos
4. Allows systems to participate in accurately indexed and federated search processes

Benefits to internal parties

1. allows parties from diverse business units to agree on shared data definitions and separate department or function specific definitions
2. makes Extract, transform, load (ETL) operations more precise for data warehousing
3. allows user interface designers to access a common pool of screen and report header labels
4. promotion of model-driven architecture

Objections to metadata publishing

- Organizations that publish their metadata could make it easier for unauthorized people to find sensitive data if they breach an organization's firewall
- Vendors that publish their metadata risk customers creating tools that could allow their customers to export their data from computer systems therefor making it easier to migrate off of a vendor's system

Core process in metadata publishing

The following are some of the core processes in metadata publishing

1. Gathering of metadata requirements
2. Selection of metadata registry and metadata publishing tools
3. Training of metadata concepts to project participants
4. Stakeholder group formation
5. Metadata harvesting
6. Glossary consolidation
7. Initial upper ontology construction (abstract data elements)
8. Draft data element loading
9. Data element review process
10. Publishing approved metadata elements in a variety of output formats
11. Creation and maintenance of versions and depreciation of unused or redundant data elements

File format metadata publishing

Organizations that create applications that store data in file systems can also publish metadata definitions. One common way to perform this is to store application data in a compressed XML file format. The XML files can be uncompressed and validated against an external XML Schema. An example of this is done by the Open Source FreeMind tool.

Metadata publishing formats

1. HTML - used for browsing a web site and indexing by text-based search engines
2. Web Ontology Language (OWL) - used by metadata search engines such as Swoogle
3. XML Metadata Interchange (XMI) - OMG standard for exchanging metadata
4. Common Warehouse Metamodel (CMW) - OMG standard for data warehouse metadata
5. Topic maps - an ISO standard for the representation and interchange of knowledge, with an emphasis on the findability of information.
6. KM3 or Kernel Meta Meta Model as used in the Metamodel Zoos. The AtlanticZoo is an open source library of more than 100 metamodels under EPL License. KM3 is a simple Domain Specific Language for specifying metamodels. A number of transformations are available to translate from KM3 to other notations like XMI.

Online Magazine

An **online magazine** shares some features with a blog and also with online newspapers, but can usually be distinguished by its approach to editorial control. Magazines typically have editors or editorial boards who review submissions and perform a quality control function to ensure that all material meets the expectations of the publishers (those investing time or money in its production) and the readership.

Online magazines that are part of the World Wide Web, that is, all or part of a website, are sometimes called *webzines*. An **ezine** (also spelled **e-zine** and usually is a more specialized term appropriately applied to small magazines and newsletters distributed by any electronic method, for example, by electronic mail (e-mail/email). Some social groups may use the terms **cyberzine** and **hyperzine** when referring to electronically distributed resources. Similarly, some online magazines may refer to themselves as "electronic magazines" to reflect their readership demographics or to capture alternative terms and spellings in online searches.

Many large print-publishers now provide digital reproduction of their print magazine titles through various online services for a fee. These service providers also refer to their collections of these digital format products as online magazines, and sometimes as digital magazines.

Online magazines representing matters of interest to specialists in or societies for academic subjects, science, trade or industry are typically referred to as online journals.

Business model

Many general interest online magazines provide free access to all aspects of their online content although some publishers have opted to require a subscription fee to access premium online article and/or multi-media content. Online magazines may generate revenue based on targeted search ads to web-site visitors, banner ads (online display advertising), affiliations to retail web sites, classified advertisements, product-purchase capabilities, advertiser directory links, or alternative informational/commercial purpose.

The original online magazines, ezines and disk magazines, due to their low cost and initial non-mainstream targets, may be seen as a disruptive technology to traditional publishing houses. The high cost of print publication and large web readership has encouraged these publishers to embrace the World Wide Web as a marketing and content delivery system and another medium for delivering their advertisers' messages.

Growth

In the late 1990s ezine publishers began adapting to the interactive qualities of the Internet instead of duplicating magazines on the web. Publishers of traditional print titles and entrepreneurs with an eye to a potential readership in the millions started publishing online titles. Salon.com founded in July 1995 by David Talbot was launched with considerable media exposure and today reports 5.8 million monthly unique visitors.

In the 2000s, some webzines began appearing in a printed format to complement their online versions. These included *Movie Insider*, *Slate*, *Synthesis* and *Lucire* magazines.

Conferences

Between 1998 and 2005, in San Francisco and New York, a series of webzine-focused conferences brought together independent personal online publishers to share their experiences. Started by Srini Kumar, the "Webzine" conferences were continued primarily by filmmaker Ryan Junell and Eddie Codel. Junell has worked to track the history of the early webzine movement through these festivals; his research is linked below. After a hiatus, Codel and Junell organized the return of the Webzine conference to the Bay Area in 2005. Webzine 2005 took place over two days at the Swedish-American Hall in San Francisco. It consisted of three main areas: speakers and panel discussions, workshops and a self-organizing area called the Master's Lounge modeled after BAR Camp. Webzine 2005 was emceed by veteran Webzine emcee Justin Hall, Annalee Newitz and Charlie Anders.

Today there are many conferences that address online magazine publishing from a variety of perspectives.

Chapter 3

Comparison of e-Book Formats

The following is a **comparison of e-book formats** used to create and publish e-books.

A writer or publisher has many options when it comes to choosing a format for publication. While the average end-user might arguably simply want to read books, every format has its proponents. The myriad e-book formats are sometimes collectively referred to as the "Tower of eBabel".

The storage size for texts without images depends on the file format, but is always relatively small compared with a richly illustrated text.

Format descriptions

Formats available include, but are by no means limited to:

Plain text files

Format: text
Published as: .txt

E-books in plain text exist. The size in bytes is simply the number of characters, including spaces, and with a new line counting for 1 or 2. For example, the Bible, an 800,000-word book, is about 4 MB. The ASCII standard allows ASCII-only text files (unlike most other file types) to be interchanged and readable on Unix, Macintosh, Microsoft Windows, DOS, and other systems. These differ in their preferred line ending convention and their interpretation of values outside the ASCII range (their character encoding).

Hypertext Markup Language

Format: Hypertext
Published as: .htm; .html

HTML is the markup language used for most web pages. E-books using HTML can be read using a Web browser. The specifications for the format are available without charge from the W3C.

HTML adds specially marked meta-elements to otherwise plain text encoded using character sets like ASCII or UTF-8. As such, suitably formatted files can be, and sometimes are, generated *by hand* using a *plain text editor* or *programmer's editor*. Many *HTML generator* applications exist to ease this process and often require less intricate knowledge of the format details involved.

HTML on its own is not a particularly efficient format to store information, requiring more storage space for a given work than many other formats. However, several e-Book formats including the Amazon Kindle, Open eBook, Compressed HM, Mobipocket and EPUB use one HTML file for each book chapter and then Zip compress the files, along with images, metadata and style sheets into one file.

HTML files encompass a wide range of standards and displaying HTML files correctly can be complicated. Additionally many of the features supported, such as forms, are not relevant to e-books.

Amazon Kindle

Format:	Kindle
Published as:	.azw

With the launch of the Kindle eBook reader, Amazon.com created the proprietary format, AZW. It is based on the Mobipocket standard, with a slightly different serial number scheme (it uses an asterisk instead of a dollar sign) and its own DRM formatting. Because the eBooks bought on the Kindle are delivered over its wireless system called Whispernet, the user does not see the AZW files during the download process. The Kindle format is now available on a variety of platforms.

Open Electronic Package

Format:	Open eBook
Published as:	.opf

OPF is an XML-based e-book format created by E-Book Systems.

TomeRaider

Format:	TomeRaider
Published as:	.tr2; .tr3

The TomeRaider e-book format is a proprietary format. There are versions of TomeRaider for Windows, Windows Mobile (aka Pocket PC), Palm, Symbian, iPhone and more. Capabilities of the TomeRaider3 e-book reader vary considerably per platform: the Windows and Windows Mobile editions support full HTML and CSS. The Palm edition supports limited HTML (e.g., no tables, no fonts), and CSS support is missing. For Symbian there is only the older TomeRaider2 format, which does not render images or offer category search facilities. Despite these differences any TomeRaider e-book can

be browsed on all supported platforms. The Tomeraider website claims to have over 4000 e-books available, including free versions of the Internet Movie Database.

Arghos Diffusion

Format: Arghos Reader

Published as: .aeh

The AEH format is an XML-based proprietary format developed by the French firm Arghos Diffusion. AEH files use a proprietary DRM and encryption method and are readable only in the *Arghos Player*. It supports various input formats for text, audio or video, such as PDF, WMA, MP3, WMV, and allows multiple interactive functions such as bookmarking, advanced plain-text searching, dynamic text highlighting, etc.

Flip Books

Format: Interaxive media

Published as:

A "Flip Book" is a type of E-Book distinguished by virtual pages that actually "flip", much like turning pages of paper in a real book or magazine. The first dynamic Flip Book Reader was developed in 2003/2004 by Interaxive Media for Nishe Media (Canada) and was therefore called "Nishe Pages". The first version was produced in part by Cybaris (Canada) and was first publicly showcased in August 2004. Soon thereafter, many copycat "flip books" started appearing thanks to technological advances in Macromedia Flash, mostly hard coded using Flash components.

The original software remains unique in that it is powered by a complete server-based CMS system that allows the books to be created, published, and viewed remotely from a web server without requiring any custom software to be installed. Nishe Media went defunct in 2004, leaving the unfinished software to Interaxive Media who continued its development in Hong Kong. Though not widely used outside of Asia, it is now at version 3.0 and can be a server-based E-Book platform. It remains privately held by the original developer, Ryan Sutherland, owner and founder of Interaxive Media.

ANSI/NISO Z39.86 (DAISY)

Format: DAISY

Published as:

The Digital Accessible Information SYstem (DAISY) is an XML-based open standard maintained by the DAISY Consortium for people with print disabilities. DAISY has wide international support with features for multimedia, navigation and synchronization. A subset of the DAISY format has been adopted by law in the United States as the National Instructional Material Accessibility Standard (NIMAS), and K-12 textbooks and instructional materials are now required to be provided to students with disabilities.

DAISY is already aligned with the EPUB open standard, and is expected to fully converge with its forthcoming EPUB3 revision.

FictionBook (Fb2)

Format: FictionBook
Published as: .fb2

FictionBook is a popular XML-based e-book format, supported by free readers such as FBReader, Haali Reader and STDU Viewer.

Text Encoding Initiative

Format: TEI Lite
Published as: .xml

TEI Lite is the most popular of the TEI-based (and thus XML-based or SGML-based) electronic text formats.

Plucker

Format: Plucker
Published as:

Plucker is a free e-book reader application with its own associated file format and software to automatically generate plucker files from HTML files, web sites or RSS feeds. The format is a compressed HTML archive, somewhat like Microsoft's CHM.

Compressed HM

Format: Microsoft Compressed HTML Help
Published as: .chm

CHM format is a proprietary format based on HTML. Multiple pages and embedded graphics are distributed along with proprietary metadata as a single compressed file. In contrast, in HTML, a site consists of multiple HTML files and associated image files in standardized formats.

Portable Document Format

Format: Adobe Portable Document Format
Published as: .pdf

A file format created by Adobe Systems, initially to provide a standard form for storing and editing printed publishable documents. The format derives from PostScript, but without language features like loops, and with added support for features like compression and passwords. Because PDF documents can easily be viewed and printed

by users on a variety of computer platforms, they are very common on the World Wide Web. The specification of the format is available without charge from Adobe.

PDF files typically contain brochures, product manuals, magazine articles — up to entire books, as they can embed fonts, images, and other documents. A PDF file contains one or more zoomable page images.

Since the format is designed to reproduce page images, the text traditionally could not be re-flowed to fit the screen width or size. As a result PDF files designed for printing on standard paper sizes are less easily viewed on screens with limited size or resolution, such as those found on mobile phones and PDAs. Adobe has addressed this drawback by adding a re-flow facility to its Acrobat Reader software, but for it to work the document must be marked for re-flowing at creation — meaning that existing PDF documents won't benefit unless they are tagged and resaved. The Windows Mobile (aka Pocket PC) version of Adobe Acrobat will automatically attempt to tag a PDF for reflow during the synchronization process using an installed plugin to Active Sync. However, this tagging process will not work on most locked or password protected PDF documents. It also doesn't work at present (2009–10) on the Windows Mobile Device Center (the successor to Active Sync) as found in Windows Vista and Windows 7. Thus, automatic tagging support during synchronization is limited to Windows XP/2000.

Multiple products support creating and tagging PDF files, such as Adobe Acrobat, PDFCreator, OpenOffice.org, iText, and FOP, and several programming libraries. Adobe Reader (formerly called *Acrobat Reader*) is Adobe's product used to view PDF files; third party viewers such as xpdf are also available. Mac OS X has built-in PDF support, both for creation as part of the printing system and for display using the built-in Preview application.

Later versions of the specification add support for forms, comments, hypertext links, and even interactive elements such as buttons for forms entry and for triggering sound and video. Such features may not be supported by older or third-party viewers and some are not transferable to print.

PDF files are supported on the following e-book readers: Mobipocket, iRex iLiad, iRex DR1000, Sony Reader, Bookeen Cybook, Foxit eSlick, Amazon Kindle (1, 2, International & DX), Barnes & Noble Nook, the iPad, PocketBook Reader, Bebook Neo and the Kobo eReader. Also, pdf files can be read on the iPod Touch using the free Stanza app.

PostScript

Format: PostScript
Published as: ps

PostScript is a page description language used in the electronic and desktop publishing areas for defining the contents and layout of a printed page, which can be used by a rendering program to assemble and create the actual output bitmap. Many office printers

directly support interpreting PostScript and printing the result. As a result, the format also sees wide use in the Unix world.

DjVu

Format: DjVu
Published as: .djvu

DjVu is a format specialized for storing scanned documents. It includes advanced compressors optimized for low-color images, such as text documents. Individual files may contain one or more pages. DjVu files cannot be re-flowed.

The contained page images are divided in separate layers (such as multi-color, low-resolution, background layer using lossy compression, and few-colors, high-resolution, tightly-compressed foreground layer), each compressed in the best available method. The format is designed to decompress very quickly, even faster than vector-based formats.

The advantage of DjVu is that it is possible to take a high-resolution scan (300-400 DPI), good enough for both on-screen reading and printing, and store it very efficiently. Several dozens of 300 DPI black-and-white scans can be stored in less than a megabyte.

Microsoft LIT

Format: Microsoft Reader
Published as: .lit

DRM-protected LIT files are only readable in the proprietary Microsoft Reader program, as the .LIT format, otherwise similar to Microsoft's CHM format, includes Digital Rights Management features. Other third party readers, such as Lexcycle Stanza, can read unprotected LIT files. There are also tools such as Convert Lit, which can convert .lit files to HTML files or OEBPS files.

The Microsoft Reader uses patented ClearType display technology. In Reader navigation works with a keyboard, mouse, stylus, or through electronic bookmarks. The Catalog Library records reader books in a personalized "home page", and books are displayed with ClearType to improve readability. A user can add annotations and notes to any page, create large-print e-books with a single command, or create free-form drawings on the reader pages. A built-in dictionary allows the user to look up words.

eReader

Formerly Palm Digital Media/Peanut Press
Format: Palm Media
Published as: .pdb

eReader is a freeware program for viewing Palm Digital Media electronic books. Versions are available for iPhone, PalmOS, WebOS, Android, Symbian, BlackBerry,

Windows Mobile Pocket PC/Smartphone, desktop Windows, and Macintosh. The reader shows text one page at a time, as paper books do. eReader supports embedded hyperlinks and images. Additionally, the Stanza application for the iPhone and iPod Touch can read both encrypted and unencrypted eReader files.

The company's web site - ereader.com maintains a wide selection of eReader-formatted e-books, available for purchase and download, with a handful of public domain titles available for free. Those books that aren't free are encrypted, with the key being the purchaser's full name and credit card number. This information is not preserved in the e-book. A one-way hash is used, so there is no risk of the user's information being extracted.

The program supports features like bookmarks and footnotes, enabling the user to mark any page with a bookmark, and any part of the text with a footnote-like commentary. Footnotes can later be exported as a Memo document.

The company also offers two Windows/MacOS programs for producing e-books: the Dropbook, which is free, and the eBook Studio, which is not. Dropbook is a file-oriented PML-to-PDB converter; eBook Studio incorporates a WYSIWYG editor. Both programs are compatible with simple text files.

There is also support for an integrated reference dictionary (with many options up to and including a 476,000-word Merriam-Webster Dictionary, including pronunciation keys) so that any word in the text can be highlighted and looked up on the dictionary instantly. Commercial fonts can also be individually purchased and downloaded at the company's web site, ereader.com.

On July 20, 2009, Barnes & Noble announced that the eReader format will be the method they will use to deliver e-books. Updated versions of the Palm Digital programs for Apple iPhone/Touch, Blackberry, Mac OS X, and Windows platforms were made available on the Barnes & Noble eBooks website.

On October 20, 2009, Barnes & Noble announced that their Nook Reader will support the eReader format. eReader format is also supported by the discontinued eSlick, an e-reading device from Foxit Software. It is not currently supported on Barnes & Noble's NookColor.

Desktop Author

Format: DNL Reader
Published as: .dnl; .exe

Desktop Author is an electronic publishing suite that allows creation of digital web books with virtual turning pages. Digital web books of any publication type can be written in this format, including brochures, e-books, digital photo albums, e-cards, digital diaries, online resumes, quizzes, exams, tests, forms and surveys. DesktopAuthor packages the e-

book into a ".dnl" or ".exe" book. Each can be a single, plain stand-alone executable file which does not require any other programs to view it. DNL files can be viewed inside a web browser or stand-alone via the *DNL Reader*.

DNL format is an e-Book format, one which replicates the real life alternative, namely page turning Books. The DNL e-Book is developed by DNAML Pty Limited an Australian company established in 1999. A DNL e-Book can be produced using DeskTop Author or DeskTop Communicator.

Newton eBook

Format: Newton eBook

Published as: .pkg

Commonly known as an Apple Newton book; a single Newton package file can contain multiple books (for example, the three books of a trilogy might be packaged together). All systems running the Newton operating system (the most common include the Newton MessagePads, eMates, Siemens Secretary Stations, Motorola Marcos, Digital Ocean Seahorses and Tarpons) have built-in support for viewing Newton books. The Newton package format was released to the public by Newton, Inc. prior to that company's absorption into Apple Computer. The format is thus arguably open and various people have written readers for it (writing a Newton book converter has even been assigned as a university-level class project).

Newton books have no support for DRM or encryption. They do support internal links, potentially multiple tables of contents and indexes, embedded gray scale images, and even some scripting capability (for example, it's possible to make a book in which the reader can influence the outcome). Newton books utilize Unicode and are thus available in numerous languages. An individual Newton book may actually contain multiple views representing the same content in different ways (such as for different screen resolutions).

Founder Electronics

Format: Apabi Reader

Published as: .xeb; .ceb

APABI is a format deviced by Founder Electronics. It is a popular format for Chinese e-books. It can be read using the Apabi Reader software, and produced using Apabi Publisher. Both .xeb and .ceb files are encoded binary files. The Iliad e-book device includes an Apabi 'viewer'.

Mobipocket

Format: Mobipocket

Published as: .prc; .mobi

The Mobipocket e-book format based on the Open eBook standard using XHTML and can include JavaScript and frames. It also supports native SQL queries to be used with embedded databases. There is a corresponding e-book reader.

The Mobipocket Reader has a home page library. Readers can add blank pages in any part of a book and add free-hand drawings. Annotations — highlights, bookmarks, corrections, notes, and drawings — can be applied, organized, and recalled from a single location. Images are converted to GIF format and have a maximum size of 64K, sufficient for mobile phones with small screens, but rather restrictive for newer gadgets. Mobipocket Reader has electronic bookmarks, and a built-in dictionary.

The reader has a full screen mode for reading and support for many PDAs, Communicators, and Smartphones. Mobipocket products support most Windows, Symbian, BlackBerry and Palm operating systems. Using WINE, the reader works under Linux or Mac OS X. Third-party applications like Okular and FBReader can also be used under Linux or Mac OS X, but they work only with unencrypted files.

The Amazon Kindle's AZW format is basically just the Mobipocket format with a slightly different serial number scheme (it uses an asterisk instead of a Dollar sign), and .prc publications can be read directly on the Kindle.

Mobipocket has developed an .epub to .mobi converter called KindleGen (supports IDPF 1.0 and IDPF 2.0 epub format, according to the company).

Notably, Eastern European letters with diacritical marks are not supported.

EPUB

Format: IDPF/EPUB
Published as: .epub

The EPUB logo

The .epub or OEBPS format is an open standard for e-books created by the International Digital Publishing Forum (IDPF). It combines three IDPF open standards:

- Open Publication Structure (OPS) 2.0, which describes the content markup (either XHTML or Daisy DTBook)
- Open Packaging Format (OPF) 2.0, which describes the structure of an .epub in XML
- OEBPS Container Format (OCF) 1.0, which bundles files together (as a renamed ZIP file)

Currently, the format can be read by the Kobo eReader, Apple's iBooks app running on iOS devices such as the iPhone and iPad, Barnes and Noble Nook, Sony Reader, BeBook, Bookeen Cybook Gen3 (with firmware v. 2 and up),COOL-ER, Adobe Digital Editions, Lexcycle Stanza, BookGlutton, AZARDI, Aldiko and WordPlayer on Android, Freda on Windows Mobile and Windows Phone 7, and the Mozilla Firefox add-on EPUBReader. Several other reader software programs are currently implementing support for the format, such as dotReader, FBReader, Mobipocket, uBook and Okular. Another software .epub reader, Lucidor, is in beta.

Adobe Digital Editions uses .epub format for its e-books, with DRM protection provided through their proprietary ADEPT mechanism. The recently developed INEPT framework and scripts have been reverse-engineered to circumvent this DRM system.

DSLibris, a Sourceforge.net project, is able to decode e-books in .epub and .xht format for reading on Nintendo DS systems.

Broadband eBooks (BBeB)

Format: Sony media
Published as: .lrf; .lrx

The digital book format used by Sony Corporation. It is a proprietary format, but some reader software for general-purpose computers, particularly under Linux (for example, calibre's internal viewer), has the capability to read it. The LRX file extension represents a DRM encrypted eBook.

SSReader

Format: SSReader
Published as: .pdg

The digital book format used by a popular digital library company 超星数字图书馆 in China. It is a proprietary raster image compression and binding format, with reading time OCR plug-in modules. The company scanned a huge number of Chinese books in the China National Library and this becomes the major stock of their service. The detailed format is not published. There are also some other commercial e-book formats used in Chinese digital libraries.

TealDoc

Format: TealDoc
Published as: .pdb

TealPoint Software's proprietary reader for Palm OS. In addition to its own format, it opens plain text and PalmDoc files. Newer versions of the software include an editor for Palm OS. Embedded images must be converted to TealPoint's proprietary TealPaint format. The format uses HTML like tags for formatting and has been reverse-engineered for 3rd party programs to edit and convert to/from TealDoc format.

IEC 62448

Format: IEC 62448
Published as:

IEC 62448 is an international standard created by International Electrotechnical Commission (IEC)), Technical Committee 100, Technical Area 10 (Multimedia e-publishing and e-book).

The current version of IEC 62448 is an umbrella standard that contains as appendices two concrete formats, XMDF of Sharp and BBeB of Sony. However, BBeB has been discontinued by Sony and the version of XMDF that is in the specification is out of date. The IEC TA10 group is discussing next steps, and has invited the IDPF organization which has standardized EPUB to be a liaison. It is possible that the current version of EPUB and/or the forthcoming EPUB3 revision may be added to IEC 62448. Meanwhile a number of Japanese companies have proposed that IEC standardize a proposed new Japanese-centric file format that is expected to unify DotBook of Voyager Japan and XMDF of Sharp. This new format has not been publicly disclosed as of November, 2010 but it is supposed to cover basic representations for the Japanese language. Technically speaking, this revision is supposed to provide a Japanese minimum set, a Japanese extension set, and a stylesheet language. These issues were discussed in the TC100 meeting held in October 2010 but no decisions were taken besides offering the liaison status to IDPF.

Comic Book Archive file

Format: compressed images
Published as: .cbr (RAR); .cbz (ZIP); .cb7 (7z); .cbt (TAR); .cba (ACE)

A Comic Book Archive file or ComicBook Reader File consists of a series of image files, typically PNG (lossless compression) or JPEG (lossy compression) files, stored as a single archive file, for the purpose of sequential viewing of images, especially comic books. The idea was made popular by the CDisplay image viewer; since then, many viewers for different platforms have been created. Comic Book Archive files are not a distinct file format; only the file name extension differs from a standard file of the given archive type. Some applications support additional tag information (like artists or story

information) in the form of embedded XML files in the archive, or use of the Zip comment function.

Multimedia eBooks

Format: Eveda
Published as: .exe or .html

A multimedia ebook is media and book content that utilizes a combination of different book content formats. The term can be used as a noun (a medium with multiple content formats) or as an adjective describing a medium as having multiple content formats.

The 'multimedia ebook' term is used in contrast to media which only utilize traditional forms of printed or text books. Multimedia ebooks include a combination of text, audio, images, video, and/or interactive content formats. Much like how a traditional book can contain images to help the text tell a story, a multimedia ebook can contain other elements not formerly possible to help tell the story.

With the advent of more widespread tablet-like computers, such as the smartphone, some publishing houses are planning to make multimedia ebooks, such as Penguin.

Comparison tables

Features

Format	Filename extension	DRM support	Image support	Table support	Sound support	Interactivity support	Word wrap support	Open standard	Embedded annotation support	Book-marking
Plain text	.txt	No	No	No	No	No	Yes	Yes	No	No
HTML	.html	No	Yes	Yes	No	No	Yes	Yes	No	No
PostScript	.ps	No	Yes	?	No	No	No	Yes	?	?
Portable Document Format	.pdf	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
DjVu	.djvu	?	Yes	Yes	No	No	No	Yes	Yes	Yes
EPUB (IDPF)	.epub	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FictionBook	.fb2	Yes	Yes	?	No	No	Yes	Yes	Yes	?
Mobipocket	.prc, .mobi	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Kindle	.azw	Yes	Yes	Yes[f 1]	Yes[f 2]	No	Yes	No	Yes	Yes
eReader	.pdb	Yes	Yes	?	No	No	Yes	No	Yes	Yes
TealDoc	.pdb	Yes	Yes	?	No	No	Yes	Yes	?	Yes
Broadband eBook	.lrf, .lrx	Yes	Yes	?	No	No	Yes	No	?	?

WOLF	.wol	Yes	Yes	?	No	No	No	No	?	?
Tome Raider	.tr2, .tr3	Yes	Yes	?	No	No	Yes	No	?	?
ArghosReader	.aeh	Yes	Yes	?	No	No	Yes	No	?	Yes
Microsoft Reader	.lit	Yes	Yes	?	No	No	Yes	No	?	Yes
Multimedia EBook	.exe	Yes	Yes	?	Yes	Yes	No	Yes	Yes	Yes
Repligo	.rgo	?	Yes	Yes	No	No	Yes	No	No	No

1. **^** Supported in all except 1st Generation Kindle. (Support level is as it is in mobipocket)
2. **^** Supported only in kindle for iPhone, iPod, iPad.

Supporting Hardware

Hardware Reader	Plain text	PDF	ePub	HTML	Mobi-Pocket	Fiction-Book (Fb2)	DjVu	Broadband eBook (BBeB) [h 1]	eReader [h 1]	Kindle [h 1]	WOLF [h 1]	Tome Raider [h 1]	Open eBook [h 2]
Amazon Kindle 1	Yes	No	No	No	Yes	No	No	No	No	Yes	No	No	No
Amazon Kindle 2, DX	Yes	Yes	No	Yes	Yes	No	No	No	No	Yes	No	No	No
Amazon Kindle 3	Yes	Yes	No	No	Yes	No	No	No	No	Yes	No	No	No
Android Devices	Yes	Yes	Yes	Yes	Yes[h 3]	Yes	Yes[h 3]	No	Yes[h 3]	Yes	No	Yes[h 3]	Yes[h 3]
Apple iOS Devices	Yes	Yes	Yes	Yes	Yes[h 3]	Yes[h 3]	Yes[h 3]	No	Yes[h 3]	Yes[h 3]	No	Yes[h 3]	Yes[h 3]
Azbooka WISEreader	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No
Barnes & Noble Nook	Yes	Yes	Yes	No	No	No	No	No	Yes	No	No	No	No
Bookeen Cybook Gen3, Opus	Yes	Yes	Yes[h 4]	Yes	Yes[h 4]	Yes[h 5]	No	No	No	No	No	No	Yes
COOL-ER Classic	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No
Foxit eSlick	Yes	Yes	Yes	No	No	No	No	No	Yes	No	No	No	No

Hanlin e-Reader V 3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No
Hanvon WISEreader	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No
iRex iLiad	Yes	Yes	Yes	No	Yes	No	Yes	No	No	No	No	No	No
Iriver Story	Yes	Yes	Yes	No	No	Yes[h 3]	Yes[h 3]	No	No	No	No	No	No
Kobo eReader	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No
Nokia N900	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes
NUUTbook 2	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No
OLPC XO, Sugar	Yes	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No	No
Onyx Boox 60	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Windows PC	Yes	Yes	Yes	Yes	Yes	?	Yes	?	Yes	Yes[h 6]	?	?	Yes
Pocketbook 301 Plus, 302, 360°	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Sony Reader	Yes	Yes	Yes	No	No	No	No	Yes	No	No	No	No	No
Viewsonic VEB612	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No
Windows Phone 7	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	No	No	No

Chapter 4

Digital Edition

A **digital edition** is an online magazine or online newspaper delivered in electronic form which is formatted identically to the print version. Digital editions are often called digital facsimiles to underline the likeness to the print version. Digital editions have the benefit of reduced cost to the publisher and reader by avoiding the time and expense to print and deliver like a paper edition. This format is considered more environmentally friendly due to the reduction of paper and energy use. These editions also often feature interactive elements such as hyperlinks both within the publication itself and to other internet resources, searching and bookmarking, and can also incorporate multimedia such as video or animation to enhance articles themselves or for advertisements. Some delivery methods also include animation and sound effects replicating page turning to further simulate the experience of their print counterparts. However, the popularity of these facsimile digital editions is limited because they provide neither the best reading experience to the customer, nor a viable revenue stream to the publisher. Additionally some publishers are using other electronic publication methods such as RSS to reach out to readers and inform them when new digital editions are available.

Current technologies are generally either reader-based, requiring download of an application and subsequent download of each edition, or browser-based, requiring no application download (such as Adobe Acrobat) and is often Flash-based. Mygazines and Nxtbook Media are among the main technology providers of web-based digital editions. Some application-based readers allow readers to access editions while not connected to the internet. Dedicated hardware such as the Amazon Kindle and the iPad is also available for reading digital editions of select books, popular national magazines such as Relevant, TIME, Atlantic Monthly, and Forbes and popular national newspapers such as the New York Times, Wall Street Journal, and Washington Post. Other E-book manufacturers that deliver digital editions include Plastic Logic and Sony.

Archives of print newspapers, in some cases going back hundreds of years, are being digitized and made available online. Google is indexing existing digital archives produced by the newspapers themselves or by 3rd parties.

Newspaper and magazine archival is not new with microform film formats solving the problem of efficiently storing and preserving though the format lacked accessibility. Many libraries, especially state libraries in the United States are archiving their collections digitally and converting existing microfilm to digital format. The Library of

Congress provides project planning assistance and the National Endowment for the Humanities provides funding through grants from its National Digital Newspaper Program.

Digital magazines, ezines, e-editions and emags are sometimes referred to as digital editions but some of these formats are published only in digital format unlike digital editions which replicate a printed edition as well.

Digital magazines

Digital-replica magazines number in the thousands—consumer and business publications, and house magazines for associations, institutions and corporations – and adoption was still increasing as of 2009.

Adoption by publishers accelerated when the circulation-audit bureaus such as BPA to give publishers the same credit for subscribers receiving digital-replica editions as for subscribers receiving print; this concept is being extended to other media reached by a publication's brand.

A 2008 report funded by digital-replica technology providers and auditing agencies counted 1,786 digital-replica editions having more than 7 million circulation among business-to-business publications, of which 230 editions were audited The same report counted 1,470 digital-replica editions of consumer magazines having 5.5 million digital circulation, of which 240 editions were audited. These authors estimated that by yearend 2009 there would be 8,000 digital magazines, having a combined distribution of more than 30 million people

Surveys have shown that, while not all subscribers prefer a digital edition, some do because of the environmental benefit, also because digital magazines are searchable and may easily be passed along or linked to. One such survey funded by a digital publisher reported on inputs from more than 30,000 subscribers to business, consumer and other digital magazines.

Digital magazine business models

Reduced printing and distribution costs

The ability for publishers to save by moving some or all subscribers from print to digital is widely accepted. Oracle magazine, which has 176,000 of its 516,000 subscribers receiving digital according to its June 2009 BPA circulation statement, is said to be the most widely circulated digital edition of a business-to-business publication. Publishers who do this need to choose whether to make some issues all-digital, move some subscribers to digital edition, add some digital-only subscribers, or send all subscribers the digital edition

Paid subscription revenue

In 2009, a major consumer magazine, PC magazine, went all-digital, charging an annual subscription fee for its digital-replica edition

Many consumer magazines and newspapers are already available in eReader formats sold through booksellers. The Barnes and Noble ecommerce site had 1,289 digital magazines available for purchase as of late October 2009.

Sponsorship and advertising revenue

Digital editions often carry special "front cover" advertising, or advertising on the email message alerting the subscriber to the digital edition. Publishers also produce special digital-only inserts and rich-media ads or advertorials.

Designed-for-digital issues

Another approach is to replace entire printed issues with digital ones, or to use digital editions for extra issues that would otherwise have to be printed.

Where to find digital magazines

There are a number of portal sites available that offer a range of digital editions. Most portal sites offer replica editions (digital versions of a print magazine) rather than stand alone digital titles, including Zinio, Emagazines, and Digital Magazine Deals.

Chapter 5

Online Newspaper

An **online newspaper**, also known as a **web newspaper**, is a newspaper that exists on the World Wide Web or Internet, either separately or as an online version of a printed periodical.

Going online created more opportunities for newspapers, such as competing with broadcast journalism in presenting breaking news in a more timely manner. The credibility and strong brand recognition of well-established newspapers, and the close relationships they have with advertisers, are also seen by many in the newspaper industry as strengthening their chances of survival. The movement away from the printing process can also help decrease costs.

Professional journalists have some advantages over blogs, as editors are normally aware of the potential for legal problems.

Online newspapers are much like hard-copy newspapers and have the same legal boundaries, such as laws regarding libel, privacy and copyright, also apply to online publications in most countries, like in the UK. Also in the UK the Data Protection Act applies to online newspapers and news pages. As well as the PCC rules in the UK. But the distinction was not very clear to the public in the UK as to what was a blog or forum site and what was an online newspaper. In 2007, a ruling was passed to formally regulate UK based online newspapers, news audio, and news video websites covering the responsibilities expected of them and to clear up what is, and what isn't, an online publication.

News reporters are being taught to shoot video and to write in the succinct manner necessary for the Internet news pages. Many are learning how to implement blogs and the ruling by the UK's PCC should help this development of the internet.

Journalism students in schools around the world are being taught about the "convergence" of all media and the need to have knowledge and skills involving print, broadcast and web.

Some newspapers have attempted to integrate the internet into every aspect of their operations, i.e., reporters writing stories for both print and online, and classified advertisements appearing in both media; others operate websites that are more distinct

from the printed newspaper. The Newspaper National Network LP is an online advertising sales partnership of the Newspaper Association of America and 25 major newspaper companies.

Introduction

In the developing world online publishers are drawing large amounts of traffic and reaping the rewards of online publishing. The Guardian also leads the way with online news with a revolutionary website that trumps many other UK based newspaper websites. The oldest example of an online newspaper or in this case a weekly summary over the weekend's news is The Weekend City Press Review, set up in 1991 this was a pioneer in the online market. Popular in the city, this subscription based service continues to run today. But they are based on hard copy reports and papers. See 'Hybrid newspapers' section of this page. Truly 'Online Only' newspapers and magazines started much later, with the exception of "News Report", an online newspaper created by Bruce Parrello in 1974 on the PLATO system at the University of Illinois.

Examples of newspaper online

It would be difficult to find a daily newspaper in the UK or United States, in fact in the world, in the 21st century, that does not have or share a website.

Very few newspapers in 2006 will claim to have made money from their websites, which are mostly free to all viewers. Declining profit margins and declining circulation in daily newspapers have forced executives to contemplate new methods of obtaining revenue from websites, without charging for subscription. This has been difficult. Newspapers with specialized audiences such as *The Wall Street Journal* or *The Chronicle of Higher Education*, successfully charge subscription fees. Most newspapers now have an online edition, including, *The Los Angeles Times*, *The Washington Post*, *USA Today*, and *The New York Times*.

The Guardian experimented with new media in 2005, offering a free twelve part weekly podcast series by Ricky Gervais. Another UK daily to go online is *The Daily Telegraph*.

In India, major newspapers went online to provide latest and most updated news from them *Times of India*, *Hindustan Times*, *The Hindu*, *Indian Express* and *The New Indian Express*. Some newspapers even provide E-Paper which is regarded as the digital replica of the newspaper.

In Australia, some newspapers corporations offer an online version to let their readers read the news online, such as The Australian, Sydney Morning Herald.

The Santiago Times operates out of Santiago, Chile and is 100% on line, editions are published in English covering Chilean current events daily Monday through Friday..

Online-only newspapers

The true **online only paper** is a paper that does not have any hard copy connections. An example of this is an independent web only newspaper, introduced in the UK in 2000, called the *Southport Reporter*. It is a weekly regional newspaper that is not produced or run in any format other than 'soft-copy' on the internet by its publishers PCBT Photography. Unlike blog sites and other news websites it is run as a newspaper and is recognized by media groups in the UK, like the NUJ and/or the IFJ. Also they fall under the UK's PCC rules. But even print media is turning to online only publication. As of 2009, the collapse of the traditional business model of print newspapers has led to various attempts to establish local, regional or national online-only newspapers - publications that do original reporting, rather than just commentary or summaries of reporting from other publications. An early major example in the U.S. is the Seattle Post-Intelligencer, which stopped publishing after 149 years in March 2009 and went online only. In Scotland in 2010, Caledonian Mercury was set, as Scotland's first online-only newspaper with the same aims as Southport Reporter, in the UK.

In the US, technology news websites such as CNET, TechCrunch, and ZDNet started as web publications and enjoy comparable readership to the conventional newspapers. Also, with the ever-rising popularity of online media, veteran publications like the US News & World Report are abandoning print and going online-only.

Hybrid newspapers

There are some newspapers which are predominantly an online newspaper, but also provide limited hard copy publishing An example is annarbor.com, which replaced the Ann Arbor News in the summer of 2009. It is primarily an online newspaper, but publishes a hardcopy twice a week.

Soft-copy news sheets

A news sheet is a paper that is on one or two pages only. Soft-copy sheets are like online newspapers, in that they have to be predominantly news, not advert or gossip based. These sheets can be updated periodically or regularly, unlike a newspaper. They must also like a newspaper be regarded as a news outlet by media groups and governments.

Future

The development of electronic newspapers, will very soon be supplementing hard-copy printed papers via electronic paper. In February 2006, the Flemish daily *De Tijd* of Antwerp announced plans to distribute an electronic-ink version of the paper to selected subscribers. This would have been the first such application of electronic ink to newspaper publishing.

Fair use

In a question and answer session, suggestions that Google and the Internet was eroding the intellectual property rights of newspapers was downplayed.

Chapter 6

Open Access (Publishing)

Open Access logo, originally designed by Public Library of Science

Open access (**OA**) refers to unrestricted online access to articles published in scholarly journals, and increasingly also book chapters or monographs.

Open Access comes in two forms, Gratis versus Libre: Gratis OA is no-cost online access, while Libre OA offers some additional usage rights. Open content is similar to OA, but usually includes the right to *modify* the work, whereas in scholarly publishing it

is usual to keep an article's content intact and to associate it with a fixed author. Creative Commons licenses can be used to specify usage rights. The Open Access idea can be extended to the learning objects and resources provided in e-learning.

OA can be provided in two ways:

- "Green OA" is provided by authors publishing in any journal and then self-archiving their postprints in their institutional repository or on some other OA website. Green OA journal publishers endorse immediate OA self-archiving by their authors.
- "Gold OA" is provided by authors publishing in an open access journal that provides immediate OA to all of its articles on the publisher's website. (Hybrid open access journals provide Gold OA only for those individual articles for which their authors (or their author's institution or funder) pay an OA publishing fee.)

Public access to the World Wide Web became widespread in the late 1990s and early 2000s. The low-cost distribution technology has fueled the OA movement, and prompted both the Green OA self-archiving of non-OA journal articles and the creation of Gold OA journals. Conventional non-OA journals cover publishing costs through access tolls such as subscriptions, site-licenses or pay-per-view. Some non-OA journals provide OA after an embargo period of 6–12 months or longer. Active debate over the economics and reliability of various ways of providing OA continues among researchers, academics, librarians, university administrators, funding agencies, government officials, commercial publishers, and society publishers.

Adoption statistics

A study published in 2010 showed that of the total output of peer-reviewed articles roughly 20 % could be found Openly Accessible. 8.5 % of the journal literature could be found free at the publishers' sites ("Gold OA"), of which 62 % in full OA journals, 14 % in subscription journals making their electronic versions free after a delay, and 24 % as individually open articles (against payment) in otherwise subscription journals. For an additional 11.9 % of the articles free full text copies were found elsewhere ("Green OA") in either subject-based repositories (43 %), institutional repositories (24%) or on the home pages of the authors or their departments (33%). These copies were further classified into exact copies of the published article (38 %), manuscripts as accepted for publishing (46 %) or manuscripts as submitted (15 %).
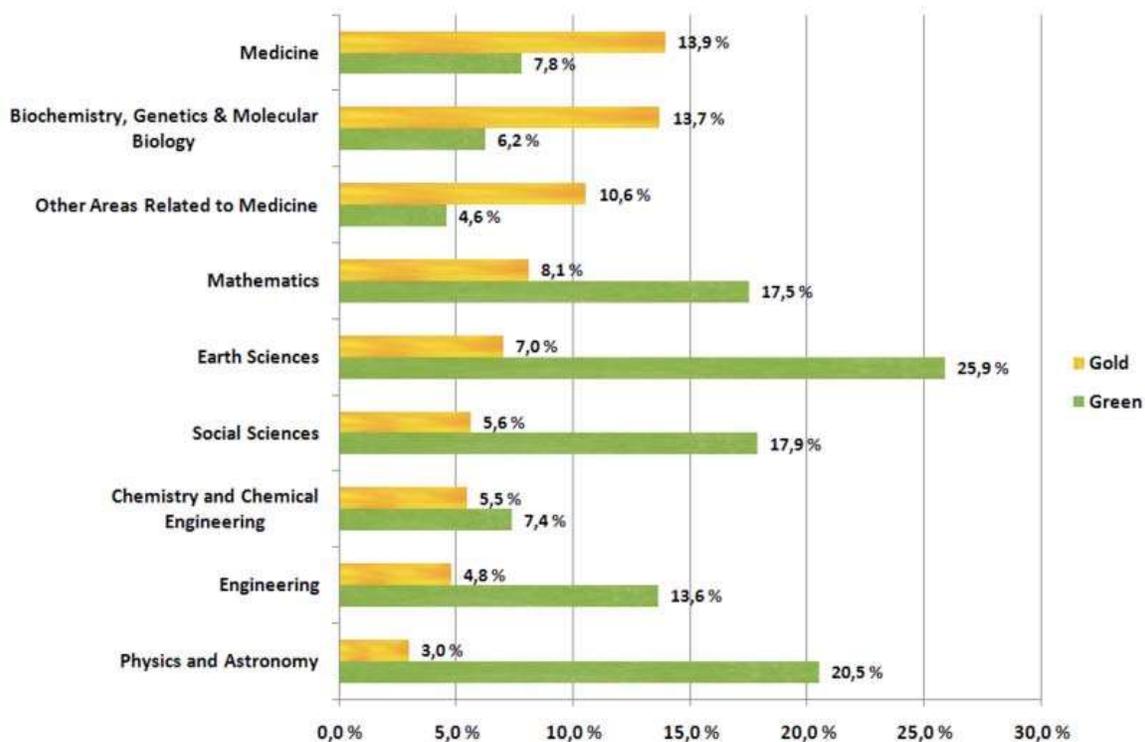
Chemistry (13 %) had the lowest overall share of OA of all scientific fields, Earth Sciences (33%) the highest. In medicine, biochemistry and chemistry gold publishing in OA journals was more common than the author posting of manuscripts in repositories. In all other fields author-posted green copies dominated the picture.

Manner of distribution

Like the self-archived Green OA articles, most Gold OA journal articles are distributed via the World Wide Web, due to low distribution costs, increasing reach, speed, and increasing importance for scholarly communication. Open source software is sometimes used for institutional repositories, OA journal websites, and other aspects of OA provision and OA publishing. Gratis OA articles are free online and Libre OA articles have limited copyright and licensing restrictions.

Access to online content requires Internet access, and this distributional consideration presents physical and sometimes financial "barriers" to access. Proponents of OA argue that Internet access barriers are relatively low in many circumstances, that efforts should be made to subsidize universal Internet access, whereas pay-for-access presents a relatively high additional barrier over and above Internet access itself.

OA can be provided by traditional publishers, or under other arrangements. Some OA publishers, such as Public Library of Science (PLoS), publish only OA journals; others publish OA as well as subscription-based journals.

Methods of financing gold OA publishing

Advertising is a major source of funding for mass media that do not charge for content, as well as modern web sites and search engines.

In scholarly publishing, there are many business models for OA journals. Some charge publication fees (paid by authors or by their funding agencies or employers) and some do not. Some of the no-fee journals have institutional subsidies and some do not.

Roughly half the Gold OA journals have author fees to cover the cost of publishing (e.g. PLoS fees vary from $1,300 to $2,850) instead of reader subscription fees. Advertising revenue and/or funding from foundations and institutions are also used to provide funding.

Authors and researchers

The main reason authors make their articles openly accessible is to maximize their research impact. A study in 2001 first reported an OA citation impact advantage, and a growing number of studies have confirmed, with varying degrees of methodological rigor, that an OA article is more likely to be used and cited than one behind subscription barriers. For example, a 2006 study in *PLoS Biology* found that articles published as immediate open access in *PNAS* were three times more likely to be cited than non-open access papers, and were also cited more than *PNAS* articles that were only self-archived. This result has been challenged as possibly due to authors self-selectively making higher quality articles OA, but a recent study comparing self-selected OA with mandated OA found that the citation advantage remained just as big when the OA was mandated.

Scholars are paid by research funders and/or their universities to do research; the published article is the report of the work they have done, rather than an item for commercial gain. The more the article is used, cited, applied and built upon, the better for research as well as for the researcher's career. Similarly, the more *quickly* it is accessible, the better; open access can reduce publication delays, an obstacle which led many research fields to traditions of widespread preprint access.

Some professional organizations have encouraged use of OA: In 2001, the International Mathematical Union communicated to its members that "Open access to the mathematical literature is an important goal" and encouraged them to "[make] available electronically as much of our own work as feasible" to "[enlarge] the reservoir of freely available primary mathematical material, particularly helping scientists working without adequate library access."

Authors who wish to make their work openly accessible have two options. One option is to publish in an OA journal ("Gold OA"). An open access journal may or may not charge a processing fee; open access publishing does not necessarily mean that the author has to pay. Traditionally, many academic journals levied page charges, long before open access became a possibility. When OA journals do charge processing fees, it is the author's

employer or research funder who typically pays the fee, not the individual author, and many journals will waive the fee in cases of financial hardship, or for authors in less-developed countries.

The other option is author self-archiving ("Green OA"). To find out if a publisher or journal has given a green light to author self-archiving, the author can check the Publisher Copyright Policies and Self-Archiving list on the SHERPA RoMEO web site. To find out by journal, the author can check the EPrints Romeo site, which is derived from the SHERPA/RoMEO dataset. The EPrints site itself also provides a FAQ on self-archiving. Extensive details and links can also be found in the Open Access Archivangelism blog and the Eprints Open Access site.

While open access is currently focused on scholarly research articles, any content creators can now decide how to make their content available and, if they wish, they can share their work openly. Creative Commons provides a number of licenses with which authors may easily indicate which uses are allowed.

Users

For the most part, the direct users of research articles are other researchers. Open access helps researchers as readers by opening up access to articles that their libraries do not subscribe to. One of the great beneficiaries of open access may be users in developing countries,where currently some universities find it difficult to pay for subscriptions required to access the most recent journals. Some schemes exist for providing subscription scientific publications to those affiliated to institutions in developing countries at little or no cost. All researchers benefit from OA as no library can afford to subscribe to every scientific journal and most can only afford a small fraction of them – this is known as the serials crisis".

Open access extends the reach of research beyond its immediate academic circle. An OA article can be read by anyone – a professional in the field, a researcher in another field, a journalist, a politician or civil servant, or an interested hobbyist. Indeed, a 2008 study revealed that mental health professionals are roughly twice as likely to read a relevant article if it is freely available.

The Directory of Open Access Journals lists a number of peer-reviewed open access journals for browsing and searching. Open J-Gate is another index of articles published in English language OA journals, peer reviewed and otherwise, which launched in 2006. Open access articles can also often be found with a web search, using any general search engine or those specialized for the scholarly/scientific literature, such as OAIster and Google Scholar. Results may include preprints that have not yet been peer reviewed, or gray literature that will remain unreviewed.

Research funders and universities

Research funding agencies and universities want to ensure that the research they fund and support in various ways has the greatest possible research impact.

Research funders are beginning to expect open access to the research they support. Forty-two of them (including all seven UK Research Councils) have already adopted Green OA self-archiving mandates, and four more (including two in the US) have proposed to adopt mandates.

Canada's Social Sciences and Humanities Research Council, which made a commitment to open access in October 2004, has not yet adopted or proposed a mandate but the Canadian Institutes of Health Research (CIHR) proposed a mandate in 2006 and adopted it in September 2007, the first North American public research funder to do so.

In May 2006, the US Federal Research Public Access Act (FRPAA) was proposed toward improving the NIH Public Access Policy. Besides points about making open access mandatory, to which the NIH complied in 2008, it argues to extend self-archiving to the full spectrum of major US-funded research. In addition, the FRPAA would no longer stipulate that the self-archiving must be central; the deposit can now be in the author's own institutional repository (IR). The new U.S. National Institutes of Health's Public Access Policy took effect in April 2008 and states that "all articles arising from NIH funds must be submitted to PubMed Central upon acceptance for publication". It stipulates self-archiving in PubMed Central rather than in the author's own institutional repository, which some consider a strength and others a weakness.

The Canadian Institutes of Health Research (CIHR) Policy on Access to Research Outputs provides a number of options to researchers, including publication in open access journals, or making their manuscripts available in an online repository such as PubMed Central Canada.

In April 2006, the European Commission recommended: «EC Recommendation A1 : "Research funding agencies... should [e]stablish a European policy mandating published articles arising from EC-funded research to be available after a given time period in open access archives...»". This recommendation has since been updated and strengthened by the European Research Advisory Board (EURAB).
The OpenAIRE (Open Access Infrastructure for Research in Europe) project has hence been started. The EC Open Access pilot covers about 20 % of the budget of the Seventh Research Framework Programme.

To somewhat improve on the EC's (and FRPAA's) allowable embargo (of up to six months), EURAB has revised the mandate: all articles must be deposited immediately upon acceptance: the allowable delay applies only to the time when access to the deposit must be made open access rather than to the time when it must be deposited. This is intended to permit individual users to use an eprint request "email eprint" button found on some archives to send a semi-automatic email message to the author requesting an

individual eprint during the embargo period: This is not open access, but in the view of at least some advocates it provides for some needs during any embargo, and might help hasten the demise of embargoes altogether, while facilitating the adoption of self-archiving mandates by funders and universities.

A growing number of universities are providing institutional repositories in which their researchers can deposit their published articles. Eighty-six individual universities and eighteen faculties and departments have already adapted self-archiving mandates (including Harvard, MIT, Stanford, U. College London, U. Edinburgh) and ten further individual multi-university mandates (in Europe and Brazil) have been proposed. Eprints maintains a Registry of OA Repository Material Archiving Policies (ROARMAP). and EnablingOpenScholarship (EPS) provides universities with OA policy-building.

In May 2005, 16 major Dutch universities cooperatively launched DAREnet, the Digital Academic Repositories, making over 47,000 research papers available to anyone with internet access. From 1 January 2007, at the completion of the DARE programme, KNAW Research Information has taken over responsibility for the DAREnet portal. On 2 June 2008, DAREnet has been incorporated into the scholarly portal NARCIS. At the end of 2009 NARCIS provides access to 185.000 open access publications from all Dutch universities, KNAW, NWO and a number of scientific institutes.

Public and advocacy

Open access to scholarly research is argued to be important to the public for a number of reasons. One of the arguments for public access to the scholarly literature is that most of the research is paid for by taxpayers through government grants, who therefore have a right to access the results of what they have funded. This is one of the primary reasons for the creation of advocacy groups such as The Alliance for Taxpayer Access in the US. Examples of people who might wish to read scholarly literature include individuals with medical conditions (or family members of such individuals) and serious hobbyists or 'amateur' scholars who may be interested in specialized scientific literature (e.g. amateur astronomers). Additionally, professionals in many fields may be interested in continuing education in the research literature of their field, and many businesses and academic institutions cannot afford to purchase articles from or subscriptions to much of the research literature that is published under a toll access model.

Even those who do not read scholarly articles benefit indirectly from open access. For example, patients benefit when their doctor and other health care professionals have access to the latest research. As argued by open access advocates, open access speeds research progress, productivity, and knowledge translation. Every researcher in the world can read an article, not just those whose library can afford to subscribe to the particular journal in which it appears. Faster discoveries benefit everyone. High school and junior college students can gain the information literacy skills critical for the knowledge age. Critics of the various open access initiatives point out that there is little evidence that a significant amount of scientific literature is currently unavailable to those who would benefit from it. While no library has subscriptions to every journal that might be of

benefit, virtually all published research can be acquired via interlibrary loan. Note that interlibrary loan may take a day or weeks depending on the loaning library and whether they will scan and email, or mail the article. Open Access online, by contrast is faster, often immediate, making it more suitable than interlibrary loan for high paced research.

Due to the benefits of open access, many governments are considering whether or not to mandate open access to publicly funded research. However, some organizations representing publishers, such as the DC Principles group in the United States, feel that such mandates are an unwarranted governmental intrusion in the publishing marketplace. Lobbying on both sides is fierce, both for pro-OA and contra-OA.

In developing nations, open access archiving and publishing acquires a unique importance. Scientists, health care professionals, and institutions in developing nations often do not have the capital necessary to access scholarly literature, although schemes exist to give them access for little or no cost. Among the most important is HINARI, the Health InterNetwork Access to Research Initiative, sponsored by the World Health Organization. HINARI, however, also has restrictions. For example, individual researchers may not register as users unless their institution has access, and several countries that one might expect to have access do not have access at all (not even "low-cost" access) (e.g. South Africa).

Many open access projects involve international collaboration. For example the SciELO (Scientific Electronic Library Online), is a comprehensive approach to full open access journal publishing, involving a number of Latin American countries. Bioline International, a non-profit organization dedicated to helping publishers in developing countries is a collaboration of people in the UK, Canada, and Brazil; the Bioline International Software is used around the world. Research Papers in Economics (RePEc), is a collaborative effort of over 100 volunteers in 45 countries. The Public Knowledge Project in Canada developed the open source publishing software Open Journal Systems (OJS), which is now in use around the world, for example by the African Journals Online group, and one of the most active development groups is Portuguese.

A 2004 study of open access publishing by Kristin Antelman found that in philosophy, political science, electrical and electronic engineering and mathematics, open access papers had a greater research impact.

Libraries and librarians

Many librarians have been vocal and active advocates of open access. These librarians believe that open access promises to remove both the *price barriers* and the *permission barriers* that undermine library efforts to provide access to the journal literature. Many library associations have either signed major open access declarations, or created their own. For example, the Canadian Library Association endorsed a Resolution on Open Access in June 2005. Librarians also educate faculty, administrators, and others about the benefits of open access. For example, the Association of College and Research Libraries of the American Library Association has developed a Scholarly Communications Toolkit.

The Association of Research Libraries has documented the need for increased access to scholarly information, and was a leading founder of the Scholarly Publishing and Academic Resources Coalition (SPARC).

There is question, however, as to the extent to which Open Access will solve the serials crisis. In a Nature Web Focus forum, The Pros and Cons of Open Access, Kate Worlock discusses whether Open Access is truly the answer to the crisis, or if it is simply an ends to a means in a world with shrinking library budgets. The argument from the publisher is that while the cost of publications have "undisputedly [sic] risen more sharply than the library budgets," the library budget is too small of a portion of the university's (in this example)overall budget at roughly 2%.

At most universities, the library houses the institutional repository, which provides free access to scholarly work of the university's faculty. Some open access advocates believe that institutional repositories will play a very important role in responding to open access mandates from funders. The Canadian Association of Research Libraries has a program to develop institutional repositories at all Canadian university libraries.

An increasing number of libraries provide hosting services for open access journals. A recent survey by the Association of Research Libraries found that 65% of surveyed libraries either are involved in journal publishing, or are planning to become involved in the very near future.

History

The roots of the concept of open access can be found in the distant past, from the very beginnings of publishing, re-emerging with every innovation in publishing technology. The printing press allowed the written word to be printed and distributed, thereby extending literacy to the population at large. Moving from vellum to paper made it possible to print more cheaply. The invention of the postal system provided a means of widespread distribution.

The beginnings of the scholarly journal were a way of expanding low-cost access to scholarly findings. Many individuals anticipated the open access concept long before modern low-cost distribution methods. One early proponent was the physicist Leo Szilard. To help stem the flood of low-quality publications, he jokingly suggested in the 1940s that at the beginning of his career each scientist should be issued with 100 vouchers to pay for his papers. The Common Knowledge project was an attempt to share information for the good of all, the brainchild of Brower Murphy, formerly of The Library Corporation. Brower and Common Knowledge are recognised in the Library Microcomputer Hall of Fame.

The modern Open Access movement (as a social movement) traces its history at least back to the 1960s, but became much more prominent in the 1990s with the advent of the Digital Age. With the spread of the Internet and the ability to copy and distribute electronic data at no cost, the arguments for open access gained new importance.

Probably the earliest book publisher to provide open access was the National Academies Press, publisher for the National Academy of Sciences, Institute of Medicine, and other arms of the National Academies. They have provided free online full-text editions of their books alongside priced, printed editions since 1994, and assert that the online editions promote sales of the print editions. As of June 2006 they had more than 3,600 books up online for browsing, searching, and reading.

An explosion of interest and activity in open access journals has occurred since the 1990s, largely due to the widespread availability of Internet access. It is now possible to publish a scholarly article and *also* make it instantly accessible anywhere in the world where there are computers and Internet connections. The fixed cost of producing the article is separable from the minimal marginal cost of the online distribution.

These new possibilities emerged at a time when the traditional, print-based scholarly journals system was in a crisis. The number of journals and articles produced has been increasing at a steady rate; however the average cost per journal has been rising at a rate far above inflation for decades, and budgets at academic libraries have remained fairly static. The result was decreased access - ironically, just when technology has made almost unlimited access a very real possibility, for the first time. Libraries and librarians have played an important part in the open access movement, initially by alerting faculty and administrators to the serials crisis. The Association of Research Libraries developed the Scholarly Publishing and Academic Resources Coalition (SPARC), in 1997, an alliance of academic and research libraries and other organizations, to address the crisis and develop and promote alternatives, such as open access.

The first online-only, free-access journals (eventually to be called "open access journals") began appearing in the late 1980s. Among them was *Bryn Mawr Classical Review*, *Postmodern Culture* and *Psycoloquy*.

The first free scientific online archive was arXiv.org, started in 1991, initially a preprint service for physicists, initiated by Paul Ginsparg. Self-archiving has become the norm in physics, with some sub-areas of physics, such as high-energy physics, having a 100% self-archiving rate. The prior existence of a "preprint culture" in high-energy physics is one major reason why arXiv has been successful. arXiv now includes papers from related disciplines, such as computer science and mathematics, but computer scientists mostly self-archive on their own websites and have been doing so for even longer than physicists. (Citeseer is a computer science archive that harvests, Google-style, from distributed computer science websites and institutional repositories and contains almost twice as many papers as arxiv.) arXiv now includes postprints as well as preprints. The two major physics publishers (American Physical Society and Institute of Physics Publishing) have reported that arXiv has had no effect on journal subscriptions in physics; even though the articles are freely available, usually before publication, physicists value their journals and continue to support them.

The inventors of the Internet and the Web -- computer scientists—had been self-archiving on their own FTP sites and then their websites since even earlier than the physicists, as

was revealed when Citeseer began harvesting their papers in the late 1990s. The 1994 "Subversive Proposal" was to extend self-archiving to all other disciplines; from it arose CogPrints (1997) and eventually the OAI-compliant generic GNU Eprints.org software in 2000.

In 1997, the U.S. National Library of Medicine (NLM) made Medline, the most comprehensive index to medical literature on the planet, freely available in the form of PubMed. Usage of this database increased a hundredfold when it became free, strongly suggesting that prior limits on usage were impacted by lack of access. While indexes are not the main focus of the open access movement, free Medline is important in that it opened up a whole new form of use of scientific literature - by the public, not just professionals.

In 1998, the American Scientist Open Access Forum was launched (and first called the "September98 Forum"). The *Journal of Medical Internet Research* (*JMIR*), one of the first Open Access journals in medicine, was created in 1998, publishing its first issue in 1999.

In 1999, Harold Varmus of the NIH proposed a journal called E-biomed, intended as an open access electronic publishing platform combining a preprint server with peer-reviewed articles. E-biomed later saw light in a revised form as PubMed Central, a postprint archive.

It was also in 1999 that the Open Archives Initiative and its OAI-PMH protocol for metadata harvesting was launched in order to make online archives interoperable.

In 2000, BioMed Central, a for-profit open access publisher, was launched by the then Current Science Group (the founder of the *Current Opinion* series, and now known as the Science Navigation Group). In some ways, BioMed Central resembles Harold Varmus' original E-biomed proposal more closely than does PubMed Central. BioMed Central now publishes over 170 journals.

In 2001, 34,000 scholars around the world signed "An Open Letter to Scientific Publishers", calling for "the establishment of an online public library that would provide the full contents of the published record of research and scholarly discourse in medicine and the life sciences in a freely accessible, fully searchable, interlinked form". Scientists signing the letter also pledged not to publish in or peer-review for non-open access journals. This led to the establishment of the Public Library of Science, an advocacy organization. However, most scientists continued to publish and review for non-open access journals. PLoS decided to become an open access publisher aiming to compete at the high quality end of the scientific spectrum with commercial publishers and other open access journals, which were beginning to flourish. Critics have argued that, equipped with a $10 million grant, PLoS competes with smaller OA journals for the best submissions and runs danger to destroy what it originally wanted to foster.

The *first major international* statement on open access was the Budapest Open Access Initiative in February 2002, launched by the Open Society Institute . This provided a definition of open access, and has a growing list of signatories. Two further statements followed: the Bethesda Statement on Open Access Publishing in June 2003 and the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities in October 2003.

In 2003, the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities was drafted and the World Summit on the Information Society included open access in its Declaration of Principles and Plan of Action.

In 2006, a Federal Research Public Access Act was introduced in US Congress by senators John Cornyn and Joe Lieberman. The act continues to be brought up every year since then, but has never made it past committee.

The idea of mandating self-archiving was mooted at least as early as 1998. Since 2003 efforts have been focused on open access mandating by the funders of research: governments, research funding agencies, and universities. These efforts have been fought by the publishing industry. However, many countries, funders, universities and other organizations have now either made commitments to open access, or are in the process of reviewing their policies and procedures, with a view to opening up access to results of the research they are responsible for.

One of the many librarians involved in advocating the self-archiving approach to open access is Hélène Bosc; her work can be found in her "15-year retrospective".

Criticism

Opponents of the open access model assert that the pay-for-access model is necessary to ensure that the publisher is adequately compensated for their work. Scholarly journal publishers that support pay-for-access claim that the "gatekeeper" role they play, maintaining a scholarly reputation, arranging for peer review, and editing and indexing articles, require economic resources that are not supplied under an open access model, though acknowledging that open access journals do provide peer review. The cost of paper publication may also make open access to paper copies infeasible. Opponents claim that open access is not necessary to ensure fair access to developing nations; differential pricing, or financial aid from developed countries or institutions can make access to proprietary journals affordable. Conventional journal publishers may also lose customers to open access publishers who compete with them. The Partnership for Research Integrity in Science and Medicine (PRISM), a lobbying organization formed by the Association of American Publishers (AAP), is opposed to the open access movement. PRISM and AAP have lobbied against the increasing trend amongst funding organizations to require open publication, describing it as "government interference" and a threat to peer review.

Textbook publishers generally make an even greater investment in the editing process, and electronic textbooks have yet to become widely accepted. For researchers, publishing

an article describing novel results in a reputable scientific journal usually does more to enhance one's reputation among scientific peers, and advance one's academic career. Journal article authors are generally not directly financially compensated for their work beyond their institutional salaries and the indirect benefits that an enhanced reputation provides in terms of institutional funding, job offers, and peer collaboration. It could be argued, then, that the financial reward from writing a successful textbook is an important motivating factor, without which the quality and quantity of available textbooks would decrease.

There are those, for example PRISM, who think that open access is unnecessary or even harmful. It has been argued that there is no need for those outside major academic institutions to have access to primary publications, at least in some fields.

In the entertainment industry, it is argued that, unlike science, there is no pressing social need for widespread and barrier-free access to the content.

One argument against Open Access is highlighted in a Nature (a for-profit publication) Web Focus forum, The Pros and Cons of Open Access. One argument brought up in the forum is that the supposed tax-payer right to access is blown out of proportion by the advocates of Open Access. Kate Worlock, the author of the forum article argues, "...where research is publicly-funded, taxes are generally not paid so that taxpayers can access research results, but rather so that society can benefit from the results of that research; in the form of new medical treatments, for example. Publishers claim that 90% of potential readers can access 90% of all available content through national or research libraries, and while this may not be as easy as accessing an article online directly it is certainly possible." The argument for tax-payer funded research is only applicable in certain countries as well. For instance in Australia, 80% of research funding comes through taxes, whereas in Japan and Switzerland, only approximately 10% is from the public coffers.

Funding issues

The "article processing charges" for open access shifts the burden of payment from readers to authors, which could conceivably create a new set of concerns. For example, budget processes may need adjustments to provide funding for the "article processing charges" required to publish in almost all open access journals (e.g. those published by BioMed Central). Unless discounts are available to authors from countries with low incomes or external funding is provided to cover the cost, article processing charges could exclude authors from developing countries or less well-funded research fields from publishing in open access journals. However, under the traditional model, the prohibitive cost of non-open access journal subscriptions would preclude conducting any research in the first place. Moreover, many open access publishers offer discounts or publishing fee waivers to authors from developing countries or those suffering financial hardship. Self-archiving of non-OA publications also provides a low cost alternative model.

Outside of science and academia, it is unusual for producers of creative output to be financially compensated on anything other than a pay-for-access model. (Notable exceptions include open source software and public broadcasting.) Successful writers, for example, support themselves by the revenues generated by people purchasing copies of their works; publishing houses are able to finance the publication of new authors based on anticipated revenues from sales of those that are successful. Opponents of open access would argue that without direct financial compensation via pay-for-access, many authors would be unable to afford to write, though some would accept the economic hardship of holding down a day job while continuing to write as a "labor of love". However, this argument has no relevance to academic publishing, because scientific journals do not pay royalties to article authors.

Citation study

A study published in the British Medical Journal disputes the claim that open access articles equal more citations. In the study, researchers from Cornell University randomly made some journal articles freely available while keeping others available by subscription only in order to determine whether increased access to journal articles results in more article downloads and citations. They found, in an interim analysis, that in the first year after the articles were published, open-access articles were downloaded more but were no more likely to be cited than subscription-based articles. However, many responses to the paper argue that the interim analysis was premature.

Comparison with other media

Many traditional media such as certain newspapers, television, and radio broadcasts could be considered "open access". These include commercial broadcasting and free newspapers supported by advertising, public broadcasting, and privately funded political advocacy materials. Minor barriers are also present in other media: broadcast media require receiving equipment, online content requires Internet access, and locally distributed printed media requires transportation to a distribution point.

Many other types of material can also be published in this manner: magazines and newsletters, e-text or other e-books, music, fine arts, or any product of intellectual activity.

Chapter 7

Introduction to Digital Rights Management

Digital rights management (**DRM**) is a term for access control technologies that can be used by hardware manufacturers, publishers, copyright holders and individuals to limit the usage of digital content and devices. The term is used to describe any technology that inhibits uses of digital content not desired or intended by the content provider. The term does not generally refer to other forms of copy protection which can be circumvented without modifying the file or device, such as serial numbers or keyfiles. It can also refer to restrictions associated with specific instances of digital works or devices. Digital rights management is used by companies such as Sony, Amazon, Apple Inc., Microsoft, AOL and the BBC.

The use of digital rights management is controversial. Proponents argue it is needed by copyright holders to prevent unauthorized duplication of their work, either to maintain artistic integrity or to ensure continued revenue streams. Some opponents, such as the Free Software Foundation (through its Defective By Design campaign), maintain that the use of the word "rights" is misleading and suggest that people instead use the term **digital restrictions management**. Their position is essentially that copyright holders are restricting the use of material in ways that are beyond the scope of existing copyright laws, and should not be covered by future laws. The Electronic Frontier Foundation, and other opponents, also consider DRM systems to be anti-competitive practices. This position holds that the rights of the user need legal protection.

Introduction

DRM technologies attempt to control use of digital media by preventing access, copying or conversion to other formats by end users. Long before the arrival of digital or even electronic media, copyright holders, content producers, or other financially or artistically interested parties had business and legal objections to copying technologies. Examples include: player piano rolls early in the 20th century, audio tape recording, and video tape recording (e.g., the "Betamax case" in the U.S.). Copying technology thus exemplifies a disruptive technology.

The advent of digital media and analog/digital conversion technologies, especially those that are usable on mass-market general-purpose personal computers, has vastly increased

the concerns of copyright-dependent individuals and organizations, especially within the music and movie industries, because these individuals and organizations are partly or wholly dependent on the revenue generated from such works. While analog media inevitably loses quality with each copy generation, and in some cases even during normal use, digital media files may be duplicated an unlimited number of times with no degradation in the quality of subsequent copies. The advent of personal computers as household appliances has made it convenient for consumers to convert media (which may or may not be copyrighted) originally in a physical/analog form or a broadcast form into a universal, digital form (this process is called ripping) for location- or timeshifting. This, combined with the Internet and popular file sharing tools, has made unauthorized distribution of copies of copyrighted digital media (digital piracy) much easier.

DRM technologies have enabled publishers to enforce access policies that not only disallow copyright infringements, but also prevent lawful fair use of copyrighted works, or even implement use constraints on non-copyrighted works that they distribute; examples include the placement of DRM on certain public-domain or open-licensed e-books, or DRM included in consumer electronic devices that time-shift (and apply DRM to) both copyrighted and non-copyrighted works.

DRM is most commonly used by the entertainment industry (e.g., film and recording). Many online music stores, such as Apple Inc.'s iTunes Store, as well as many e-book publishers have implemented DRM. In recent years, a number of television producers have implemented DRM on consumer electronic devices to control access to the freely-broadcast content of their shows, in response to the rising popularity of time-shifting digital video recorder systems such as TiVo.

Technologies

DRM and film

An early example of a DRM system was the Content Scrambling System (CSS) employed by the DVD Forum on film DVDs since ca. 1996. CSS used a simple encryption algorithm, and required device manufacturers to sign license agreements that restricted the inclusion of features, such as digital outputs that could be used to extract high-quality digital copies of the film, in their players. Thus, the only consumer hardware capable of decoding DVD films was controlled, albeit indirectly, by the DVD Forum, restricting the use of DVD media on other systems until the release of DeCSS by Jon Lech Johansen in 1999, which allowed a CSS-encrypted DVD to play properly on a computer using Linux, for which the Alliance had not arranged a licensed version of the CSS playing software.

Microsoft's Windows Vista contains a DRM system called the Protected Media Path, which contains the Protected Video Path (PVP). PVP tries to stop DRM-restricted content from playing while unsigned software is running in order to prevent the unsigned software from accessing the content. Additionally, PVP can encrypt information during

transmission to the monitor or the graphics card, which makes it more difficult to make unauthorized recordings.

Advanced Access Content System (AACS) is a DRM system for HD DVD and Blu-ray Discs developed by the AACS Licensing Administrator, LLC (AACS LA), a consortium that includes Disney, Intel, Microsoft, Matsushita (Panasonic), Warner Brothers, IBM, Toshiba and Sony. In December 2006 a process key was published on the internet by hackers, enabling unrestricted access to AACS-restricted HD DVD content. After the cracked keys were revoked, further cracked keys were released.

DRM and television

The CableCard standard is used by cable television providers in the United States to restrict content to services to which the customer has subscribed.

The broadcast flag concept was developed by Fox Broadcasting in 2001 and was supported by the MPAA and the U.S. Federal Communications Commission (FCC). A ruling in May 2005 by a US Court of Appeals held that the FCC lacked authority to impose it on the TV industry in the US. It required that all HDTVs obey a stream specification determining whether or not a stream can be recorded. This could block instances of fair use, such as time-shifting. It achieved more success elsewhere when it was adopted by the Digital Video Broadcasting Project (DVB), a consortium of about 250 broadcasters, manufactures, network operators, software developers, and regulatory bodies from about 35 countries involved in attempting to develop new digital TV standards.

An updated variant of the broadcast flag has been developed in the Content Protection and Copy Management (DVB-CPCM). It was developed in private, and the technical specification was submitted to European governments in March 2007. As with much DRM, the CPCM system is intended to control use of copyrighted material by the end-user, at the direction of the copyright holder. According to Ren Bucholz of the EFF, which paid to be a member of the consortium, "You won't even know ahead of time whether and how you will be able to record and make use of particular programs or devices". The DVB supports the system as it will harmonize copyright holders' control across different technologies and so make things easier for end users. The normative sections have now all been approved for publication by the DVB Steering Board, and will be published by ETSI as a formal European Standard as ETSI TS 102 825-X where X refers to the Part number of specification. Nobody has yet stepped forward to provide a Compliance and Robustness regime for the standard (though several are rumoured to be in development), so it is not presently possible to fully implement a system, as there is nowhere to obtain the necessary device certificates.

DRM and music

Audio CDs

Discs with digital rights management schemes are not legitimately standards-compliant Compact Discs (CDs) but are rather CD-ROM media. Therefore they all lack the CD logotype found on discs which follow the standard (known as Red Book). Therefore these CDs could not be played on all CD players. Many consumers could also no longer play purchased CDs on their computers. Personal computers running Microsoft Windows would sometimes even crash when attempting to play the CDs.

In 2005, Sony BMG introduced new DRM technology which installed DRM software on users' computers without clearly notifying the user or requiring confirmation. Among other things, the installed software included a rootkit, which created a severe security vulnerability others could exploit. When the nature of the DRM involved was made public much later, Sony initially minimized the significance of the vulnerabilities its software had created, but was eventually compelled to recall millions of CDs, and released several attempts to patch the surreptitiously included software to at least remove the rootkit. Several class action lawsuits were filed, which were ultimately settled by agreements to provide affected consumers with a cash payout or album downloads free of DRM.

Sony's DRM software actually had only a limited ability to prevent copying, as it affected only playback on Windows computers, not on other equipment. Even on the Windows platform, users regularly bypassed the restrictions. And, while the Sony DRM technology created fundamental vulnerabilities in customers' computers, parts of it could be trivially bypassed by holding down the "shift" key while inserting the CD, or by disabling the autorun feature. In addition, audio tracks could simply be played and re-recorded, thus completely bypassing all of the DRM (this is known as the analog hole). Sony's first two attempts at releasing a patch which would remove the DRM software from users' computers failed.

In January 2007, EMI stopped publishing audio CDs with DRM, stating that "the costs of DRM do not measure up to the results." Following EMI, Sony BMG was the last publisher to abolish DRM completely, and audio CDs containing DRM are no longer released by the four record labels.

Internet music

Many online music stores employ DRM to restrict usage of music purchased and downloaded online. There are many options for consumers wishing to purchase digital music over the internet:

- The iTunes Store (run by Apple), allows users to purchase a track online. The tracks purchased use Apple's FairPlay DRM system. Apple later launched *iTunes Plus*, which offered higher quality DRM-free tracks for a higher price. On

October 17, 2007, iTunes Plus became available at the usual US$0.99 price, replacing the non-Plus tracks. On January 6, 2009 Apple announced at its Macworld Expo keynote that iTunes music would be available completely DRM free by the end of the month. Videos sold and rented through iTunes, as well as mobile software sold through the iTunes App Store for the iPhone and iPod touch, continue to use Apple's FairPlay DRM to inhibit casual copying. Apple increased the price of many hit singles and selected classic tracks to $1.29 on April 7, 2009.

- Napster music store offers a subscription-based approach to DRM alongside permanent purchases. Users of the subscription service can download and stream an unlimited amount of music transcoded to Windows Media Audio (WMA) while subscribed to the service. But when the subscription period lapses, all of the downloaded music is unplayable until the user renews his or her subscription. Napster also charges users who wish to use the music on their portable device an additional $5 per month. In addition, Napster gives users the option of paying an additional $0.99 per track to burn it to CD or for the song to never expire. Music bought through Napster can be played on players carrying the Microsoft PlaysForSure logo (which, notably, do not include iPods or even Microsoft's own Zune). As of June 2009 Napster is giving DRM free MP3 music, which can be played on iPhones and iPods.

- Wal-Mart Music Downloads, another online music download store, charges $0.94 per track for all non-sale downloads. All Wal-Mart, Music Downloads are able to be played on any Windows PlaysForSure marked product. The music does play on the SanDisk's Sansa mp3 player, for example, but must be copied to the player's internal memory. It cannot be played through the player's microSD card slot, which is a problem that many users of the mp3 player experience.

- Sony operated an online music download service called "Connect" which used Sony's proprietary OpenMG DRM technology. Music downloaded from this store (usually via Sony's SonicStage software) was only playable on computers running Microsoft Windows and Sony hardware (including the PSP and some Sony Ericsson phones).

- Kazaa is one of a few services offering a subscription-based pricing model. However, music downloads from the Kazaa website are DRM-protected, and can only be played on computers or portable devices running Windows Media Player, and only as long as the customer remains subscribed to Kazaa.

The various services are currently not interoperable, though those that use the same DRM system (for instance the several Windows Media DRM format stores, including Napster, Kazaa and Yahoo Music) all provide songs that can be played side-by-side through the same player program. Almost all stores require client software of some sort to be downloaded, and some also need plug-ins. Several colleges and universities, such as Rensselaer Polytechnic Institute, have made arrangements with assorted Internet music suppliers to provide access (typically DRM-restricted) to music files for their students, to

less than universal popularity, sometimes making payments from student activity fee funds. One of the problems is that the music becomes unplayable after leaving school unless the student continues to pay individually. Another is that few of these vendors are compatible with the most common portable music player, the Apple iPod. The Gowers Review of Intellectual Property (to HMG in the UK; 141 pages, 40+ specific recommendations) has taken note of the incompatibilities, and suggests (Recommendations 8—12) that there be explicit fair dealing exceptions to copyright allowing libraries to copy and format-shift between DRM schemes, and further allowing end users to do the same privately. If adopted, some of the acrimony may decrease.

Although DRM is prevalent for Internet music, some online music stores such as eMusic, Dogmazic, Amazon, and Beatport, do not use DRM despite encouraging users to avoid sharing music. Another online retailer, Xiie.net, which sells only unsigned artists, encourages people to share the music they buy from the site, to increase exposure for the artists themselves. Major labels have begun releasing more online music without DRM. Eric Bangeman suggests in Ars Technica that this is because the record labels are "slowly beginning to realize that they can't have DRMed music and complete control over the online music market at the same time... One way to break the cycle is to sell music that is playable on any digital audio player. eMusic does exactly that, and their surprisingly extensive catalog of non-DRMed music has vaulted it into the number two online music store position behind the iTunes Store." Apple's Steve Jobs has called on the music industry to eliminate DRM in an open letter titled Thoughts on Music. Apple's iTunes store will start to sell DRM-free 256 kbit/s (up from 128 kbit/s) AAC encoded music from EMI for a premium price (this has since reverted to the standard price). In March 2007, Musicload.de, one of Europe's largest online music retailers, announced their position strongly against DRM. In an open letter, Musicload stated that three out of every four calls to their customer support phone service are as a result of consumer frustration with DRM.

Computer games

Computer games sometimes use DRM technologies to limit the number of systems the game can be installed on by requiring authentication with an online server. Most games with this restriction allow three or five installs, although some allow an installation to be 'recovered' when the game is uninstalled. This not only limits users who have more than three or five computers in their homes (seeing as the rights of the software developers allow them to limit the number of installations), but can also prove to be a problem if the user has to unexpectedly perform certain tasks like upgrading operating systems or reformatting the computer's hard drive, tasks which, depending on how the DRM is implemented, count a game's subsequent reinstall as a new installation, making the game potentially unusable after a certain period even if it is only used on a single computer.

In mid-2008, the publication of *Mass Effect* marked the start of a wave of titles primarily making use of SecuROM and Steam for DRM and requiring authentication via an online server. The use of DRM scheme in 2008's *Spore* backfired and there were protests, resulting in a considerable number of users seeking a pirated version instead. This

backlash against 3 activation limit was a significant factor in *Spore* becoming the most pirated game in 2008.

Many mainstream publishers continued to rely on online-based DRM throughout the later half of 2008 and early 2009, including Electronic Arts, Ubisoft and Atari. Ubisoft broke with the tendency to use online DRM in late 2008 with the release of *Prince of Persia* as an experiment to "see how truthful people really are" regarding the claim that DRM was inciting people to use pirated copies. Although Ubisoft has not commented on the results of the 'experiment', the majority of their subsequent titles in 2009 contained no online-based DRM since the release of *Prince of Persia* - notable examples being *Anno 1404* and *James Cameron's Avatar: The Game* making use of the online version of the TAGES copy protection system. An official patch has since been released stripping *Anno 1404* of the DRM. Electronic Arts followed suit in June 2009 with *The Sims 3*, with subsequent EA and EA Sports titles also being devoid of online DRM.

Ubisoft formally announced a return to on-line authentication on 9 February 2010 through its Uplay on-line gaming platform, starting with Silent Hunter 5, The Settlers 7 and Assassin's Creed 2. Silent Hunter V was first reported to have been compromised within 24 hours of release, but users of the cracked version soon found out that only early parts of the game were playable. The Uplay system works by having the installed game on the local PCs incomplete and then continuously downloading parts of the game-code from Ubisoft's servers as the game progresses, making cracking games using the system a daunting task. It was only more than a month after the PC release in the first week of April that software was released that could bypass Ubisoft's DRM in Assassin's Creed 2, demonstrating its strength. The software did this by emulating a Ubisoft server for the game. Later that month, a real crack was released that was able to remove the connection requirement altogether. No fully working crack for Silent Hunter V has been confirmed.

In early March, 2010, Uplay servers suffered a period of inaccessibility due to a large scale DDoS attack, causing around 5% of game owners to become locked out of playing their game. The company later credited owners of the affected games with a free download, and there has been no further downtime.

Some most prominent cases making use of online DRM technology SecuROM include *Spore*, *BioShock*, *Mass Effect* and *Gears Of War*.

E-books

Electronic books read on a personal computer or an e-book reader typically use DRM restrictions to limit copying, printing, and sharing of e-books. E-books are usually limited to a certain number of reading devices and some e-publishers prevent any copying or printing. Some commentators believe that DRM is something that makes E-book publishing complex.

There are four main ebook formats at present. Mobipocket, Topaz, ePub and PDF. The Amazon Kindle uses both Mobipocket and Topaz format ebooks. Other ebook readers mostly use ePub format ebooks, but with differing DRM schemes.

There are four main ebook DRM schemes at present, one each from Adobe, Apple, Barnes & Noble and Amazon. Adobe's Adept DRM is applied to ePubs and PDFs, and can be read by several third-party ebook readers, as well as Adobe's Adobe Digital Editions software. Apple's Fairplay DRM is applied to ePubs,and can currently only be read by Apple's iBooks app on iOS devices. Barnes & Noble's DRM scheme is implemented by Adobe, and is applied to ePubs and the older Palm format ebooks. Amazon's DRM is an adaption of the original Mobipocket encryption, and is applied to Amazon's Mobipocket and Topaz format ebooks

Two software programs to view e-books are Adobe Reader and Microsoft Reader. Each program uses a slightly different approach to DRM. The first version of Adobe Acrobat e-book Reader to have encryption technologies was version 5.05. In the later version 6.0, the technologies of the PDF reader and the e-book reader were combined, allowing it to read both DRM-restricted and unrestricted files. After opening the file, the user is able to view the rights statement, which outlines actions available for the specific document. For example, for a freely transferred PDF, printing, copying to the clipboard, and other basic functions are available to the user. However, when viewing a more highly restricted e-book, the user is unable to print the book, copy or paste selections. The level of restriction is specified by the publisher or distribution agency.

Microsoft Reader, which exclusively reads e-books in a .lit format, contains its own DRM software. In Microsoft Reader there are three different levels of access control depending on the e-book: sealed e-books, inscribed e-books and owner exclusive e-books. Sealed e-books have the least amount of restriction and only prevents the document from being modified. Therefore, the reader cannot alter the content of the book to change the ending, for instance. Inscribed e-books are the next level of restriction. After purchasing and downloading the e-book, Microsoft Reader puts a digital ID tag to identify the owner of the e-book. Therefore, this discourages distribution of the e-book because it is inscribed with the owner's name making it possible to trace it back to the original copy that was distributed. Other e-book software uses similar DRM schemes. For example, Palm Digital Media, now known as Ereader, links the credit card information of the purchaser to the e-book copy in order to discourage distribution of the books.

The most stringent form of security that Microsoft Reader offers is called owner exclusive e-books, which uses traditional DRM technologies. To buy the e-book the consumer must first open Microsoft Reader, which ensures that when the book is downloaded it becomes linked to the computer's Microsoft Passport account. Thus the e-book can only be opened with the computer with which it was downloaded, preventing copying and distribution of the text.

Amazon.com has remotely deleted purchased copies of George Orwell's *1984* and *Animal Farm* from customer's Amazon Kindles. Commenters have widely described these

actions as Orwellian, and have alluded to Big Brother from Orwell's *1984*. After an apology from Amazon CEO Jeff Bezos, the Free Software Foundation has written that this is just one more example of the excessive power Amazon has to remotely censor what people read through its software, and called upon Amazon to free its e-book reader and drop DRM.

DRM and documents

Enterprise digital rights management (**E-DRM** or **ERM**) is the application of DRM technology to the control of access to corporate documents such as Microsoft Word, PDF, and AutoCAD files, emails, and intranet web pages rather than to the control of consumer media. E-DRM, now more commonly referenced as IRM (Information Rights Management), is generally intended to prevent the unauthorized use (such as industrial or corporate espionage or inadvertent release) of proprietary documents. IRM typically integrates with content management system software.

DRM has been used by organizations such as the British Library in its secure electronic delivery service to permit worldwide access to substantial numbers of rare (and in many cases unique) documents which, for legal reasons, were previously only available to authorized individuals actually visiting the Library's document centre at Boston Spa in England.

Watermarks

Digital watermarks are features of media that are added during production or distribution. Digital watermarks involve data that is arguably steganographically embedded within the audio or video data.

Watermarks can be used for different purposes that may include:

- recording the copyright owner
- recording the distributor
- recording the distribution chain
- identifying the purchaser of the music

Watermarks are not complete DRM mechanisms in their own right, but are used as part of a system for Digital Rights Management, such as helping provide prosecution evidence for purely legal avenues of rights management, rather than direct technological restriction. Some programs used to edit video and/or audio may distort, delete, or otherwise interfere with watermarks. Signal/modulator-carrier chromatography may also separate watermarks from original audio or detect them as glitches. Use of third party media players and other advanced programs render watermarking useless. Additionally, comparison of two separately obtained copies of audio using simple, home-grown algorithms can often reveal watermarks. New methods of detection are currently under investigation by both industry and non-industry researchers.

Metadata

Sometimes, metadata is included in purchased music which records information such as the purchaser's name, account information, or email address. This information is not embedded in the played audio or video data, like a watermark, but is kept separate, but within the file or stream.

As an example, metadata is used in media purchased from Apple's iTunes Store for DRM-free as well as DRM-restricted versions of their music or videos. This information is included as MPEG standard metadata.

Laws regarding DRM

Digital rights management systems have received some international legal backing by implementation of the 1996 WIPO Copyright Treaty (WCT). Article 11 of the Treaty requires nations party to the treaties to enact laws against DRM circumvention.

The WCT has been implemented in most member states of the World Intellectual Property Organization. The American implementation is the Digital Millennium Copyright Act (DMCA), while in Europe the treaty has been implemented by the 2001 European directive on copyright, which requires member states of the European Union to implement legal protections for technological prevention measures. In 2006, the lower house of the French parliament adopted such legislation as part of the controversial DADVSI law, but added that protected DRM techniques should be made interoperable, a move which caused widespread controversy in the United States.

Digital Millennium Copyright Act

The Digital Millennium Copyright Act (DMCA) is an amendment to United States copyright law passed unanimously on May 14, 1998, which criminalizes the production and dissemination of technology that allows users to circumvent technical copy-restriction methods. Under the Act, circumvention of a technological measure that effectively controls access to a work is illegal if done with the primary intent of violating the rights of copyright holders.

Reverse engineering of existing systems is expressly permitted under the Act under specific conditions. Under the reverse engineering safe harbor, circumvention necessary to achieve interoperability with other software is specifically authorized. Open-source software to decrypt content scrambled with the Content Scrambling System and other encryption techniques presents an intractable problem with the application of the Act. Much depends on the intent of the actor. If the decryption is done for the purpose of achieving interoperability of open source operating systems with proprietary operating systems, the circumvention would be protected by Section 1201(f) the Act. Cf., Universal City Studios, Inc. v. Corley, 273 F.3d 429 (2d Cir. 2001) at notes 5 and 16. However, dissemination of such software for the purpose of violating or encouraging others to violate copyrights has been held illegal.

On 22 May 2001, the European Union passed the EU Copyright Directive, an implementation of the 1996 WIPO Copyright Treaty that addressed many of the same issues as the DMCA.

The DMCA has been largely ineffective in protecting DRM systems,<http://boingboing.net/2007/03/24/dmcas_author_says_th.html> as software allowing users to circumvent DRM remains widely available. However, those who wish to preserve the DRM systems have attempted to use the Act to restrict the distribution and development of such software, as in the case of DeCSS.

Although the Act contains an exception for research, the exception is subject to vague qualifiers that do little to reassure researchers. Cf., 17 U.S.C. Sec. 1201(g). The DMCA has had an impact on cryptography, because many fear that cryptanalytic research may violate the DMCA. The arrest of Russian programmer Dmitry Sklyarov in 2001, for alleged infringement of the DMCA, was a highly publicized example of the law's use to prevent or penalize development of anti-DRM measures. Sklyarov was arrested in the United States after a presentation at DEF CON, and subsequently spent several months in jail. The DMCA has also been cited as chilling to non-criminal inclined users, such as students of cryptanalysis (including, in a well-known instance, Professor Felten and students at Princeton), and security consultants such as the Netherlands based Niels Ferguson, who has declined to publish information about vulnerabilities he discovered in an Intel secure-computing scheme because of his concern about being arrested under the DMCA when he travels to the US.

On 25 April 2007 the European Parliament supported the first directive of EU, which aims to harmonize criminal law in the member states. It adopted a first reading report on harmonizing the national measures for fighting copyright abuse. If the European Parliament and the Council approve the legislation, the submitted directive will oblige the member states to consider a crime a violation of international copyright committed with commercial purposes. The text suggests numerous measures: from fines to imprisonment, depending on the gravity of the offense.

The EP members supported the Commission motion, changing some of the texts. They excluded patent rights from the range of the directive and decided that the sanctions should apply only to offenses with commercial purposes. Copying for personal, non-commercial purposes was also excluded from the range of the directive.

International issues

In Europe, there are several ongoing dialog activities that are characterized by their consensus-building intention:

- Workshop on Digital Rights Management of the World Wide Web Consortium (W3C), January 2001.

- Participative preparation of the European Committee for Standardization/Information Society Standardisation System (CEN/ISSS) DRM Report, 2003 (finished).
- DRM Workshops of Directorate-General for Information Society and Media (European Commission) (finished), and the work of the DRM working groups (finished), as well as the work of the High Level Group on DRM (ongoing).
- Consultation process of the European Commission, DG Internal Market, on the Communication COM(2004)261 by the European Commission on "Management of Copyright and Related Rights" (closed).
- The INDICARE project is an ongoing dialogue on consumer acceptability of DRM solutions in Europe. It is an open and neutral platform for exchange of facts and opinions, mainly based on articles by authors from science and practice.
- The AXMEDIS project is a European Commission Integrated Project of the FP6. The main goal of AXMEDIS is automating the content production, copy protection and distribution, reducing the related costs and supporting DRM at both B2B and B2C areas harmonising them.
- The Gowers Review of Intellectual Property is the result of a commission by the British Government from Andrew Gowers, undertaken in December 2005 and published in 2006, with recommendations regarding copyright term, exceptions, orphaned works, and copyright enforcement.

Controversy

DRM opposition
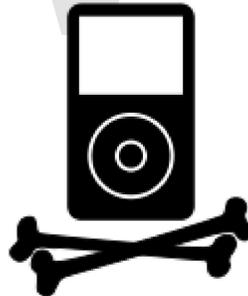
A parody on the Home Taping Is Killing Music logo

Many organizations, prominent individuals, and computer scientists are opposed to DRM. Two notable DRM critics are John Walker, as expressed for instance, in his article *The Digital Imprimatur: How big brother and big media can put the Internet genie back in the bottle*, and Richard Stallman in his article *The Right to Read* and in other public statements: "DRM is an example of a malicious feature - a feature designed to hurt the user of the software, and therefore, it's something for which there can never be toleration". Professor Ross Anderson of Cambridge University heads a British organization which opposes DRM and similar efforts in the UK and elsewhere. Cory

Doctorow, a prominent writer and technology blogger, spoke on the Microsoft campus criticizing the technology, the morality, and the marketing of DRM.

There have been numerous others who see DRM at a more fundamental level. TechMediums.com argues that DRM-free music allows for viral marketing, arguing that independent artists benefit from "free marketing" and can then focus on revenues from higher margin products like merchandise and concert ticket sales. This is similar to some of the ideas in Michael H. Goldhaber's presentation about "The Attention Economy and the Net" at a 1997 conference on the "Economics of Digital Information." (sample quote from the "Advice for the Transition" section of that presentation: "If you can't figure out how to afford it without charging, you may be doing something wrong.")

The Electronic Frontier Foundation and similar organizations such as FreeCulture.org also hold positions which are characterized as opposed to DRM.

The Foundation for a Free Information Infrastructure has criticized DRM's impact as a trade barrier from a free market perspective.

The final version of the GNU General Public License version 3, as released by the Free Software Foundation, has a provision that 'strips' DRM of its legal value, so people can break the DRM on GPL software without breaking laws like the DMCA. Also, in May 2006, the FSF launched a "Defective by Design" campaign against DRM.

Creative Commons provides licensing options encouraging the expansion of and building upon creative work without the use of DRM. In addition, the use of a Creative Commons-licensed work on a device which incorporates DRM is a breach of the Baseline Rights asserted by each license.

Bill Gates spoke about DRM at CES in 2006. According to him, DRM is not where it should be, and causes problems for legitimate consumers while trying to distinguish between legitimate and illegitimate users.

According to Steve Jobs, Apple opposes DRM music after a public letter calling its music labels to stop requiring DRM on its iTunes Store. As of January 6, 2009, the iTunes Store is DRM-free for songs. However, Apple considers DRM on video content as a separate issue and has not removed DRM from all of its video catalog.

Defective by Design member protesting DRM on May 25, 2007

As already noted, many DRM opponents consider "digital rights management" to be a misnomer. They argue that DRM manages rights (or access) the same way prison manages freedom and often refer to it as "digital restrictions management". Alternatively, ZDNet Executive Editor David Berlind suggests the term "Content Restriction, Annulment and Protection" or "CRAP" for short.

The Norwegian Consumer rights organization "Forbrukerrådet" complained to Apple Inc. in 2007 about the company's use of DRM in, and in conjunction with, its iPod and iTunes products. Apple was accused of restricting users' access to their music and videos in an unlawful way, and of using EULAs which conflict with Norwegian consumer legislation. The complaint was supported by consumers' ombudsmen in Sweden and Denmark, and is currently being reviewed in the EU. Similarly, the United States Federal Trade Commission held hearings in March 2009 to review disclosure of DRM limitations to customers' use of media products.

The use of DRM may also be a barrier to future historians, since technologies designed to permit data to be read only on particular machines, or with particular keys, or for certain periods, may well make future data recovery impossible.

DRM opponents argue that the presence of DRM violates existing private property rights and restricts a range of heretofore normal and legal user activities. A DRM component would control a device a user owns (such as a Digital audio player) by restricting how it may act with regards to certain content, overriding some of the user's wishes (for example, preventing the user from burning a copyrighted song to CD as part of a compilation or a review). An example of this effect may be seen in Microsoft's Windows Vista operating system in which content using a Protected Media Path is disabled or degraded depending on the DRM scheme's evaluation of whether the hardware and its use are 'secure'. All forms of DRM depend on the DRM enabled device (e.g., computer, DVD player, TV) imposing restrictions that (at least by intent) cannot be disabled or modified by the user. Key issues around digital rights management such as the right to make personal copies, provisions for persons to lend copies to friends, provisions for service discontinuance, hardware agnosticism, software and operating system agnosticism, contracts for public libraries, and customers´ protection against one-side amendments of the contract by the publisher have not been fully addressed. It has also been pointed out that it is entirely unclear whether owners of content with DRM are legally permitted to pass on their property as inheritance to another person.

Tools like FairUse4WM have been created to strip Windows Media of DRM restrictions.

Valve Corporation President Gabe Newell also stated "most DRM strategies are just dumb" because they only decrease the value of a game in the consumer's eyes. Newell's suggests combating piracy by "[creating] greater value for customers through service value".

"DRM-Free"

Due to the strong opposition that exists to DRM, many companies and artists have begun advertising their products as "DRM-Free".

Apple began selling "DRM-Free" music through their iTunes store in April 2007. It was later revealed that the DRM-Free iTunes files were still embedded with each user's account information, a technique called Digital watermarking generally not regarded as DRM. In January 2009, iTunes began marketing all of their songs as "DRM-Free", however iTunes continues to use DRM on movies, TV shows, ringtones, and audiobooks.

Impossible task

Bruce Schneier has written about the futility of digital copy prevention and says it's an impossible task. He says "What the entertainment industry is trying to do is to use technology to contradict that natural law. They want a practical way to make copying hard enough to save their existing business. But they are doomed to fail." He has also described trying to make digital files uncopyable as being like "trying to make water not wet". The creators of StarForce also take this stance, stating that "The purpose of copy protection is not making the game uncrackable - it is impossible."

Both the Association for Computing Machinery and the Institute of Electrical and Electronics Engineers have historically opposed DRM, even going so far as to name AACS as a technology "most likely to fail" in an issue of IEEE Spectrum.

Shortcomings

Methods to bypass DRM

There are many methods to bypass DRM control on audio and video content.

One simple method to bypass DRM on audio files is to burn the content to an audio CD and then rip it into DRM-free files. This is only possible when the software that plays these DRM-restricted audio files allows CD-burning. Some software products simplify and automate this burn-rip process by allowing the user to burn music to a CD-RW disc or to a Virtual CD-R drive, then automatically ripping and encoding the music, and automatically repeating this process until all selected music has been converted, rather than forcing the user to do this one CD (72–80 minutes worth of music) at a time.

Many software programs have been developed that intercept the data stream as it is decrypted out of the DRM-restricted file, and then use this data to construct a DRM-free file. These programs require a decryption key. Programs that do this for DVDs, HD DVDs, and Blu-ray Discs include universal decryption keys in the software itself. Programs that do this for TiVo ToGo recordings, iTunes audio, and PlaysForSure songs, however, rely on the user's own key — that is, they can only process content that the user has legally acquired under his or her own account.

Another method is to use software to record the signals being sent through the audio or video cards, or to plug analog recording devices into the analog outputs of the media player. These techniques utilize the so-called "analog hole" (see below).

Analog hole

All forms of DRM for audio and visual material (excluding interactive materials, e.g. videogames) are subject to the *analog hole*, namely that in order for a viewer to play the material, the digital signal must be turned into an analog signal containing light and/or sound for the viewer, and so available to be copied as no DRM is capable of controlling content in this form. In other words, a user could play a purchased audio file while using a separate program to record the sound back into the computer into a DRM-free file format.

All DRM to date can therefore be bypassed by recording this signal and digitally storing and distributing it in a non DRM limited form, by anyone who has the technical means of recording the analog stream. However the conversion from digital to analog and back is likely to force a loss of quality, particularly when using lossy digital formats. HDCP is an attempt to restrict the analog hole, although it is largely ineffective.

Asus released a soundcard which features a function called "Analog Loopback Transformation" to bypass the restrictions of DRM. This feature allows the user to record DRM-restricted audio via the soundcard's built-in analog I/O connection.

DRM on general computing platforms

Many of the DRM systems in use are designed to work on general purpose computing hardware, such as desktop PCs apparently because this equipment is felt to be a major contributor to revenue loss from disallowed copying. Large commercial copyright infringers ("pirates") avoid consumer equipment, so losses from such infringers will not be covered by such provisions.

Such schemes, especially software based ones, can never be wholly secure since the software must include all the information necessary to decrypt the content, such as the decryption keys. An attacker will be able to extract this information, directly decrypt and copy the content, which bypasses the restrictions imposed by a DRM system.

DRM on purpose-built hardware

Many DRM schemes use encrypted media which requires purpose-built hardware to hear or see the content. This appears to ensure that only licensed users (those with the hardware) can access the content. It additionally tries to protect a secret decryption key from the users of the system.

While this in principle can work, it is extremely difficult to build the hardware to protect the secret key against a sufficiently determined adversary. Many such systems have failed in the field. Once the secret key is known, building a version of the hardware that performs no checks is often relatively straightforward. In addition user verification provisions are frequently subject to attack, pirate decryption being among the most frequented ones.

A common real-world example can be found in commercial direct broadcast satellite television systems such as DirecTV and Malaysia's Astro. The company uses tamper-resistant smart cards to store decryption keys so that they are hidden from the user and the satellite receiver. However, the system has been compromised in the past, and DirecTV has been forced to roll out periodic updates and replacements for its smart cards.

Watermarks

Watermarks can very typically be removed, although degradation of video or audio can occur.

Mass piracy failure

Mass piracy of hard copies does not necessarily need DRM to be decrypted or removed, as it can be achieved by bit-perfect copying of a legally obtained medium without accessing the decrypted content. Additionally, still-encrypted disk images can be distributed over the Internet and played on legitimately licensed players.

Obsolescence

When standards and formats change, it may be difficult to transfer DRM-restricted content to new media. Additionally, any system that requires contact with an authentication server is vulnerable to that server becoming unavailable, as happened in 2007 when videos purchased from Major League Baseball (mlb.com) prior to 2006 became unplayable due to a change to the servers that validate the licences.

Microsoft Zune - When Microsoft introduced their Zune media player in 2006, it did not support content that uses Microsoft's own PlaysForSure DRM scheme they had previously been selling. The EFF calls this "a raw deal".

MSN Music - In April 2008, Microsoft sent an email to former customers of the now-defunct MSN Music store: "As of August 31, 2008, we will no longer be able to support the retrieval of license keys for the songs you purchased from MSN Music or the authorization of additional computers. You will need to obtain a license key for each of your songs downloaded from MSN Music on any new computer, and you must do so before August 31, 2008. If you attempt to transfer your songs to additional computers after August 31, 2008, those songs will not successfully play."

However, to avoid a public relations disaster, Microsoft re-issued MSN Music shutdown statement on June 19th and allowed the users to use their licenses until the end of 2011: "After careful consideration, Microsoft has decided to continue to support the authorization of new computers and devices and delivery of new license keys for MSN Music customers through at least the end of 2011, after which we will evaluate how much this functionality is still being used and what steps should be taken next to support our customers. This means you will continue to be able to listen to your purchased music and transfer your music to new PCs and devices beyond the previously announced August 31, 2008 date."

Yahoo! Music Store - On July 23, 2008, the Yahoo! Music Store emailed its customers to tell them it will be shutting down effective September 30, 2008 and the DRM license key servers will be taken offline.

Walmart - In August 2007, Walmart's online music division started offering (DRM-free) MP3s as an option. Starting in February 2008, they made all sales DRM-free. On September 26, 2008, the Walmart Music Team notified its customers via email they will be shutting down their DRM servers October 9, 2008 and any DRM-encumbered music

acquired from them will no longer be accessible unless ripped to a non-DRM format before that date.

After bad press and negative reaction from customers, on October 9, 2008, Walmart decided not to take its DRM servers offline.

Fictionwise / Overdrive - In January 2009, OverDrive informed Fictionwise that they would no longer be providing downloads for purchasers of e-books through Fictionwise as of 31 January 2009. No reason was provided to Fictionwise as to why they were being shut down. This prevents previous purchasers from being able to renew their books on new devices. Fictionwise is working to provide replacement ebooks for its customers in alternative, non-DRM formats, but does not have the rights to provide all of the books in different formats.

Ads for Adobe PDF - Also in January 2009, Adobe Systems announced that as of March 2009 they would no longer operate the servers that served ads to their PDF reader. Depending on the restriction settings used when PDF documents were created, they may no longer be readable.

Historical note

A very early implementation of DRM was the Software Service System (SSS) devised by the Japanese engineer Ryoichi Mori in 1983 and subsequently refined under the name superdistribution. The SSS was based on encryption, with specialized hardware that controlled decryption and also enabled payments to be sent to the copyright holder. The underlying principle of the SSS and subsequently of superdistribution was that the distribution of encrypted digital products should be completely unrestricted and that users of those products would not just be permitted to redistribute them but would actually be encouraged to do so.

Chapter 8

Digital Millennium Copyright Act

The **Digital Millennium Copyright Act** (**DMCA**) is a United States copyright law that implements two 1996 treaties of the World Intellectual Property Organization (WIPO). It criminalizes production and dissemination of technology, devices, or services intended to circumvent measures (commonly known as digital rights management or DRM) that control access to copyrighted works. It also criminalizes the act of circumventing an access control, whether or not there is actual infringement of copyright itself. In addition, the DMCA heightens the penalties for copyright infringement on the Internet. Passed on October 12, 1998 by a unanimous vote in the United States Senate and signed into law by President Bill Clinton on October 28, 1998, the DMCA amended Title 17 of the United States Code to extend the reach of copyright, while limiting the liability of the providers of on-line services for copyright infringement by their users.

On May 22, 2001, the European Union passed the Copyright Directive or EUCD, which addresses some of the same issues as the DMCA. The DMCA's principal innovation in the field of copyright, the exemption from direct and indirect liability of internet service providers and other intermediaries (Title II of the DMCA), was separately addressed, and largely followed, in Europe by means of the separate Electronic Commerce Directive. (Unlike U.S. federal laws and regulations, the execution of European Union directives usually requires separate legislation by or within each of the Union's member states.)

Provisions

Title I: WIPO Copyright and Performances and Phonograms Treaties Implementation Act

DMCA Title I, the WIPO Copyright and Performances and Phonograms Treaties Implementation Act, amends U.S. copyright law to comply with the WIPO Copyright Treaty and the WIPO Performances and Phonograms Treaty, adopted at the WIPO Diplomatic Conference in December, 1996. The treaties have two major portions. One portion includes works covered by several treaties in U.S. copy prevention laws and gave the title its name.

The second portion is often known as the DMCA anti-circumvention provisions. These provisions changed the remedies for the circumvention of copy-prevention systems (also called "technical protection measures") and required that all analog video recorders have

support for a specific form of copy prevention created by Macrovision (now Rovi Corporation) built in, giving Macrovision an effective monopoly on the analog video-recording copy-prevention market. However, section 1201(c) of the title clarified that the title does not change the underlying substantive copyright infringement rights, remedies, or defenses. The title contains other limitations and exemptions, including for research and reverse engineering in specified situations.

Title II: Online Copyright Infringement Liability Limitation Act

DMCA Title II, the Online Copyright Infringement Liability Limitation Act ("OCILLA"), creates a safe harbor for online service providers (OSPs, including ISPs) against copyright liability if they adhere to and qualify for certain prescribed safe harbor guidelines and promptly block access to allegedly infringing material (or remove such material from their systems) if they receive a notification claiming infringement from a copyright holder or the copyright holder's agent. OCILLA also includes a counternotification provision that offers OSPs a safe harbor from liability to their users upon notice from such users claiming that the material in question is not, in fact, infringing. OCILLA also provides for subpoenas to OSPs to provide their users' identity.

Title III: Computer Maintenance Competition Assurance Act

DMCA Title III modified section 117 of the copyright title so that those repairing computers could make certain temporary, limited copies while working on a computer.

Title IV: Miscellaneous Provisions

DMCA Title IV contains an assortment of provisions:

- Clarified and added to the duties of the Copyright Office.
- Added ephemeral copy for broadcasters provisions, including certain statutory licenses.
- Added provisions to facilitate distance education.
- Added provisions to assist libraries with keeping copies of sound recordings.
- Added provisions relating to collective bargaining and the transfer of movie rights.

Title V: Vessel Hull Design Protection Act

DMCA Title V added sections 1301 through 1332 to add a *sui generis* protection for boat hull designs. Boat hull designs were not considered covered under copyright law because they are useful articles whose form cannot be cleanly separated from their function.

Anti-circumvention exemptions

In addition to the safe harbors and exemptions the statute explicitly provides, 17 U.S.C. 1201(a)(1) requires that the Librarian of Congress issue exemptions from the prohibition

against circumvention of access-control technology. Exemptions are granted when it is shown that access-control technology has had a substantial adverse effect on the ability of people to make non-infringing uses of copyrighted works.

The exemption rules are revised every three years. Exemption proposals are submitted by the public to the Registrar of Copyrights, and after a process of hearings and public comments, the final rule is recommended by the Registrar and issued by the Librarian. Exemptions expire after three years and must be resubmitted for the next rulemaking cycle. Consequently, the exemptions issued in the prior rulemakings, in 2000, 2003 and 2006 are no longer valid.

The current administratively-created exemptions, issued in July 2010, are:

- Motion pictures on DVDs that are lawfully made and acquired and that are protected by the Content Scrambling System when circumvention is accomplished solely in order to accomplish the incorporation of short portions of motion pictures into new works for the purpose of criticism or comment, and where the person engaging in circumvention believes and has reasonable grounds for believing that circumvention is necessary to fulfill the purpose of the use in the following instances:
  - o Educational uses by college and university professors and by college and university film and media studies students;
  - o Documentary filmmaking;
  - o Noncommercial videos. (A new exemption in 2010, similar to a previous educational exemption.)
- Computer programs that enable wireless telephone handsets to execute software applications, where circumvention is accomplished for the sole purpose of enabling interoperability of such applications, when they have been lawfully obtained, with computer programs on the telephone handset. (A new exemption in 2010.)
- Computer programs, in the form of firmware or software, that enable used wireless telephone handsets to connect to a wireless telecommunications network, when circumvention is initiated by the owner of the copy of the computer program solely in order to connect to a wireless telecommunications network and access to the network is authorized by the operator of the network. (Revised from a similar exemption approved in 2006.)
- Video games accessible on personal computers and protected by technological protection measures that control access to lawfully obtained works, when circumvention is accomplished solely for the purpose of good faith testing for, investigating, or correcting security flaws or vulnerabilities, if:
  - o The information derived from the security testing is used primarily to promote the security of the owner or operator of a computer, computer system, or computer network; and
  - o The information derived from the security testing is used or maintained in a manner that does not facilitate copyright infringement or a violation of applicable law. (A new exemption in 2010.)

- Computer programs protected by dongles that prevent access due to malfunction or damage and which are obsolete. A dongle shall be considered obsolete if it is no longer manufactured or if a replacement or repair is no longer reasonably available in the commercial marketplace. (A renewed exemption from 2006, based on a similar exemption approved in 2003.)
- Literary works distributed in e-book format when all existing e-book editions of the work (including digital text editions made available by authorized entities) contain access controls that prevent the enabling either of the book's read-aloud function or of screen readers that render the text into a specialized format. (A renewed exemption from 2006, based on a similar exemption approved in 2003.)

The Copyright Office approved two exemptions in 2000; four in 2003; six in 2006 and 2010. In 2000, the Office exempted (a) "Compilations consisting of lists of websites blocked by filtering software applications" (renewed in 2003 but not renewed in 2006); and (b) "Literary works, including computer programs and databases, protected by access control mechanisms that fail to permit access because of malfunction, damage, or obsoleteness." (revised and limited in 2003 and again in 2006). In 2003, the 2000 "literary works including computer programs" exemption was limited to "Computer programs protected by dongles that prevent access due to malfunction or damage and which are obsolete" and this exemption was renewed in both 2006 and 2010. The 2003 exemption for text readers of ebooks was renewed in both 2006 and 2010. The 2003 exemption for obsolete software and video game formats was renewed in 2006 but was not renewed in 2010. The 2000 filtering exemption was revised and renewed in 2003, but was not renewed in 2006. The 2006 exemption for sound recordings allowed after security flaws were found in a copy protection system on some Sony CDs was not renewed in 2010. An exemption covering the audiovisual works included in the educational library of a college or university's film or media studies department was not renewed in 2010. This exemption was replaced with an exemption on DVDs protected by the Content Scrambling System when circumvention is for the purpose of criticism or comment using short sections, for educational, documentary or non-profit use. The 2006 exemption for wireless handsets connecting to wireless networks was revised in 2010 to specify used handsets and require authorization from the wireless network operator. Another exemption for wireless handsets was introduced in 2010 specific to interoperability software on the phone itself.

Linking to infringing content

The law is currently unsettled with regard to websites that contain links to infringing material; however, there have been a few lower-court decisions which have ruled against linking in some narrowly prescribed circumstances. One is when the owner of a website has already been issued an injunction against posting infringing material on their website and then links to the same material in an attempt to circumvent the injunction. Another area involves linking to software or devices which are designed to circumvent DRM (digital rights management) devices, or links from websites whose sole purpose is to circumvent copyright protection by linking to copyrighted material.

There have been no cases in the US where a website owner has been found liable for linking to copyrighted material outside of the above narrow circumstances.

Notable court cases

Edelman v. N2H2

In July 2002, American Civil Liberties Union filed a lawsuit on the behalf of Benjamin Edelman, a computer researcher at Berkman Center for Internet and Society, sought a Declaratory judgment to affirm his first amendment rights when reverse engineering the censorware product of defendant N2H2 in case he intended to publish the finding. N2H2 filed a motion to dismiss, which the court granted.

RealNetworks, Inc. v. DVD Copy Control Association, Inc.

In August 2009, the DVD Copy Control Association won a lawsuit against RealNetworks for violating copyright law in selling its RealDVD software, allowing users to copy DVDs and store them on a harddrive. The DVD Copy Control Association claimed that Real violated the DMCA by circumventing anti-piracy measures ARccOS Protection and RipGuard, as well as breaking Real's licensing agreement with the MPAA's Content Scrambling System.

Viacom Inc. v. YouTube, Google Inc.

On March 13, 2007, Viacom filed a lawsuit against YouTube and its corporate parent Google for copyright infringement seeking more than $1 billion in damages. The complaint was filed in the U.S. District Court for the Southern District of New York. Viacom claims the popular video-sharing site was engaging in "massive intentional copyright infringement" for making available a contended 160,000 unauthorized clips of Viacom's entertainment programming. Google lawyers say they are relying on the 1998 Digital Millennium Copyright Act to shield them from liability. On June 23, 2010, U.S. District Judge Louis Stanton granted summary judgment in favor of YouTube. The court held that YouTube is protected by the safe harbor of the DMCA. Viacom has said that it will appeal before the U.S. Court of Appeals for the Second Circuit as soon as possible.

IO Group, Inc. v. Veoh Networks, Inc.

On June 23, 2006 IO Group, Inc. filed a complaint against Veoh Networks, Inc. in the U.S. District Court for California's Northern District. IO Group alleged that Veoh was responsible for copyright infringement by allowing videos owned by Io Group to be accessed through Veoh's online service without permission over 40,000 times between the dates June 1 and June 22. Veoh is a Flash video site relying on user contributed content. IO Group argued that since Veoh transcoded user uploaded videos to Flash format it became a direct infringer and the materials were under their direct control, thereby disqualifying them for DMCA safe harbor protection. The ruling judge disagreed

with the argument stating that "Veoh has simply established a system whereby software automatically processes user-submitted content and recasts it in a format that is readily accessible to its users. Veoh preselects the software parameters for the process from a range of default values set by the thirdparty software... But Veoh does not itself actively participate or supervise the uploading of files. Nor does it preview or select the files before the upload is completed. Instead, video files are uploaded through an automated process which is initiated entirely at the volition of Veoh's users." The Court has granted the Veoh's motion for summary judgment, on the basis of the DMCA, holding that the defendant's video-sharing web site complied and was entitled to the protection of the statute's "safe harbor" provision. Even though Veoh won the court case, it blamed the litigation as one of the causes of its preparing to file Chapter 7 bankruptcy and its subsequent sale to Qlipso.

Vernor v. Autodesk

After numerous stifling DMCA takedown notices on his eBay listings Timothy S. Vernor sued Autodesk in August 2007 for abusing the DMCA and disrupting his right to sell used software he bought at a garage sale. In May 2008, a federal district judge in Washington State dismissed Autodesk's argument that the software's license agreement preempted the seller from his rights under the first-sale doctrine. In September 2010, the US Court of Appeals for the Ninth Circuit reversed, holding that "a software user is a licensee rather than an owner of a copy where the copyright owner (1) specifies that the user is granted a license; (2) significantly restricts the user's ability to transfer the software; and (3) imposes notable use restrictions."

Lenz v. Universal Music Corp.

In 2007, Stephanie Lenz, a writer and editor from Gallitzin, Pennsylvania made a home video of her 13-month-old son dancing to "Let's Go Crazy" and posted a 29-second video on the video-sharing site YouTube. Four months after the video was originally uploaded, Universal Music Group, which owned the copyrights to the song, ordered YouTube to remove the video enforcing the Digital Millennium Copyright Act.

Lenz notified YouTube immediately that her video was within the scope of fair use, and demanded that it be restored. YouTube complied after six weeks—not two weeks, as required by the Digital Millennium Copyright Act—to see whether Universal planned to sue Lenz for infringement. Lenz then sued Universal Music in California for her legal costs, claiming the music company had acted in bad faith by ordering removal of a video that represented fair use of the song.

In August 2008, U.S. District Judge Jeremy Fogel of San Jose, California ruled that copyright holders cannot order a deletion of an online file without determining whether that posting reflected "fair use" of the copyrighted material.

Criticisms

Takedown Notice

The DMCA has been criticized for making it too easy for copyright owners to encourage website owners to take down allegedly infringing content and links which may in fact not be infringing. When website owners receive a takedown notice it is in their interest not to challenge it, even if it is not clear if infringement is taking place, because if the potentially infringing content is taken down the website will not be held liable. The Electronic Frontier Foundation senior IP attorney Fred von Lohmann has said this is one of the problems with the DMCA.

Google asserted misuse of the DMCA in a filing concerning New Zealand's copyright act, quoting results from a 2005 study by Californian academics Laura Quilter and Jennifer Urban based on data from the Chilling Effects clearinghouse. Takedown notices targeting a competing business made up over half (57%) of the notices Google has received, the company said, and more than one-third (37%), "were not valid copyright claims."

Effect on Analog Video Equipment

Analog Copy Protection (ACP), the encryption technology created by Rovi Corporation (Formerly Macrovision), is designed thwart users' attempts to reproduce content via analog cables. When a DVD disc is played through an analog video cable and recorded using a VCR, Rovi's ACP technology will distort or prevent the copy altogether.

The technology works by adding additional lines to the video signal. In the NTSC video standard, blank lines (vertical blanking intervals) that the user cannot see are used for functions like closed captioning. Rovi Corporation uses these blank lines to implement its ACP technology.

The implementation of ACP has been ill-regarded by some video enthusiasts. Many claim that the technology has led to signal issues with VCRs and analog video equipment. Some VCRs misread the encryption used to prevent copying, distorting the video image regardless of whether the recording is original or a copy.

The DMCA has been criticized for forcing all producers of analog video equipment to support the proprietary copy protection technology of Rovi Corporation (formerly Macrovision), a commercial firm. The producers of video equipment are forced by law to support and implement the corporation's proprietary technology. This benefits Rovi Corporation financially, whereas those forced to implement it receive neither profit nor compensation.

Additionally, some criticize the implementation of ACP as a violation of their fair usage right. A recently developed TV-streaming product called the Slingbox uses analog signals to convey video from television to a mobile device. However, the encryption used by

ACP blocks analog transmission, rendering the Sling box unusable. Additionally ACP blocks the use of recording for educational purposes. On one or more accounts, students have not been able to cite and record cable sources properly due to ACP restrictions.

Effect on research

The DMCA has had an impact on the worldwide cryptography research community, since an argument can be made that any cryptanalytic research violates, or might violate, the DMCA. The arrest of Russian programmer Dmitry Sklyarov in 2001, for alleged infringement of the DMCA, was a highly publicized example of the law's use to prevent or penalize development of anti-DRM measures. While working for ElcomSoft in Russia, he developed *The Advanced eBook Processor*, a software application allowing users to strip usage restriction information from restricted e-books, an activity legal in both Russia and the United States. Paradoxically, under the DMCA, it is not legal in the United States to provide such a tool. Sklyarov was arrested in the United States after presenting a speech at DEF CON and subsequently spent nearly a month in jail. The DMCA has also been cited as chilling to legitimate users, such as students of cryptanalysis (including, in a well-known instance, Professor Edward Felten and students at Princeton), and security consultants such as Niels Ferguson, who has declined to publish information about vulnerabilities he discovered in an Intel secure-computing scheme because of his concern about being arrested under the DMCA when he travels to the US.

Effect on Innovation and Competition

In at least one court case, the DMCA has been used by Open Source software projects to defend against conversion of software (i.e. license violations) that involved removal of copyright notices. This defense can be used even without timely copyright registration, and can generate attorney fee awards, which together make it a useful strategy for Open Source organizations.

Reform and opposition

There are efforts in Congress to modify the Act. Rick Boucher, a Democratic congressman from Virginia, is leading one of these efforts by introducing the Digital Media Consumers' Rights Act (DMCRA).

A prominent bill related to the DMCA is the Consumer Broadband and Digital Television Promotion Act (CBDTPA), known in early drafts as the Security Systems and Standards Certification Act (SSSCA). This bill, if it had passed, would have dealt with the devices used to access digital content and would have been even more restrictive than the DMCA.

On the tenth anniversary of the DMCA, the Electronic Frontier Foundation documented harmful consequences of the anti-circumvention provisions. They document that the DMCA:

1. stifles free expression, such as in its use against Russian programmer Dmitry Sklyarov, Princeton Professor Edward Felten, and journalists;
2. jeopardizes fair use;
3. impedes competition, such as blocking aftermarket competition in toner cartridges, garage door openers, and enforcing walled gardens around the iPod; and
4. interferes with computer intrusion laws.

Chapter 9

WIPO Copyright and Performances and Phonograms Treaties Implementation Act

The **WIPO Copyright and Performances and Phonograms Treaties Implementation Act**, is a part of the Digital Millennium Copyright Act (DMCA), a 1998 U.S. law. It has two major portions, Section 102, which implements the requirements of the WIPO Copyright Treaty, and Section 103, which arguably provides additional protection against the circumvention of copy prevention systems (with some exceptions) and prohibits the removal of copyright management information.

Section 102

Section 102 gives the act its name, which is based on the requirements of the WIPO Copyright Treaty concluded at Geneva, Switzerland, on 20 December 1996. It modifies US copyright law to include works produced in the countries which sign the following treaties:

- the Universal Copyright Convention
- the Geneva Phonograms Convention (Convention for the Protection of Producers of Phonograms Against Unauthorized Duplication of Their Phonograms, Geneva, Switzerland, 29 October 1971)
- the Berne Convention for the Protection of Literary and Artistic Works
- the WTO Agreement (as defined in the Uruguay Round Agreements Act)
- the WIPO Copyright Treaty signed at Geneva, Switzerland on 20 December 1996
- the WIPO Performances and Phonograms Treaty concluded at Geneva, Switzerland on 20 December 1996
- any other copyright treaty to which the United States is a party

Section 103

Section 103 provoked most of the controversy which resulted from the act. It is often called **DMCA anti-circumvention** provisions. It restricts the ability to make, sell, or distribute devices which circumvent Digital Rights Management systems, adding Chapter 12 (sections 1201 through 1205) to US copyright law.

Section 1201 makes it illegal to:

- (1) "circumvent a technological measure that effectively controls access to a work" except as allowed after rulemaking procedures administered by the Register of Copyrights every three years. (The exemptions made through the three-yearly review do not apply to the supply of circumvention devices, only to the act of circumvention itself.)
- (2) "manufacture, import, offer to the public, provide, or otherwise traffic in" a device, service or component which is primarily intended to circumvent "a technological measure that effectively controls access to a work," and which either has limited commercially significant other uses or is marketed for the anti-circumvention purpose.
- (3) "manufacture, import, offer to the public, provide, or otherwise traffic in" a device, service or component which is primarily intended to circumvent "protection afforded by a technological measure that effectively protects a right of a copyright owner," and which either has limited commercially significant other uses or is marketed for the anti-circumvention purpose.
- sell any VHS VCR, 8 mm analogue video tape recorder, Beta video recorder or other analogue video cassette recorder which isn't affected by automatic gain control copy protection (the basis of Macrovision), with some exceptions.

The act creates a distinction between access-control measures and copy-control measures. An access-control measure limits access to the contents of the protected work, for example by encryption. A copy-control measure only limits the ability of a user to copy the work. Though the act makes it illegal to distribute technology to circumvent either type of copy protection, only the action of circumventing access-control measures is illegal. The action of circumventing a copy-control measure is not prohibited, though any copies made are still subject to other copyright law.

The section goes on to limit its apparent reach. The statute says that:

- it will not affect rights, remedies, limitations, or defenses to copyright infringement, including fair use;
- it is not necessary to design components specifically to use copy protection systems;
- "nothing in this section shall enlarge or diminish any rights of free speech or the press for activities using consumer electronics, telecommunications, or computing products";
- circumvention for law enforcement, intelligence collection, and other government activities is allowed;
- reverse engineering to achieve interoperability of computer programs is allowed;
- encryption research is allowed;
- systems to prevent minors from accessing some internet content are allowed to circumvent;
- circumvention to protect personal information by disabling part of a system is allowed; and

- security testing is allowed.

In addition, the statute has a "primary intent" requirement, which creates evidentiary problems for those seeking to prove a violation. In order for a violation to be proved, it must be shown that the alleged violator must have primarily intended to circumvent copyright protection. However, if the primary intent is to achieve interoperability of software or devices, the circumvention is permitted and no violation has occurred.

Section 1202 prohibits the removal of copyright management information.

On balance, it is difficult to say whether the Act expands copyright enforcement powers or limits them. Because it does not affect the underlying substantive copyright protections, the Act can be viewed as merely changing the penalties and procedures available for enforcement. Because it grants safe harbors in various situations for research, reverse engineering, circumvention, security, and protection of minors, the Act in many ways limits the scope of copyright enforcement.

Section 103 cases

Judicial enforcement of the statute and the treaty has not been nearly as far-reaching as was originally hoped by its advocates. Here are a handful of notable instances where advocates of proprietary encryption techniques sought to use the law to their advantage:

DVDs are often encrypted with the Content Scrambling System (CSS). To play a CSS DVD, it must be decrypted. Jon Johansen and two anonymous colleagues wrote DeCSS, a program that did this decryption, so they could watch DVDs in Linux. US servers distributing this software were asked to stop on the theory they were violating this law. Mr. Johansen was tried in his native Norway under that country's analogous statute. The Norwegian courts ultimately acquitted Mr. Johansen because he was acting consistent with interoperability and he could not be held responsible for others' motives. The software is now widely available.

2600 Magazine was sued under this law for distributing a list of links to websites where DeCSS could be downloaded. The court found that the "primary purpose" of the defendants' actions was to promote redistribution of DVDs, in part because the defendants admitted as much. The finding was upheld by the Second Circuit Court of Appeals on the specific facts of the case, but the appellate court left open the possibility that different facts could change the result.

A similar program, also by Johansen, decrypted iTunes Music Store files so they could be played on Linux. Apple had the software taken down from several servers for violating this law. However, Apple Computer has since reversed its stand and begun advocating encryption-free distribution of content.

Dmitry Sklyarov, a Russian programmer was jailed under this law when he visited the U.S., because he had written a program in Russia which allowed users to access

documents for which they had forgotten the password. (He was eventually acquitted by a jury of all counts, reportedly because the jury thought the law was unfair—a phenomenon known as jury nullification.)

aibohack.com, a website which distributed tools to make Sony's AIBO robotic pet do new tricks, like dance jazz. Sony alleged that the tools violated this law, and asked for them to be taken down. (After negative press they changed their mind.)

A company selling mod chips for Sony PlayStations, which allowed the systems to play video games from other countries, was raided by the US government and their products were seized under this law.

Smart cards, while they have many other purposes, are also used by DirecTV to decrypt their television satellite signals for paying users. Distributors of smart card readers, which could create smart cards (including ones that could decrypt DirecTV signals) were raided by DirecTV and their products and customer lists were seized. DirecTV then sent a letter to over 100,000 purchasers of the readers and filed lawsuits against over 5,000. They offered to not file or drop the suit for $3500, less than litigating the case would cost. (The suits are ongoing.)

Lexmark sued Static Control Components which made replacement recycled toner cartridges for their printers under this law. Lexmark initially won a preliminary injunction, but that injunction was vacated by the Court of Appeals for the Sixth Circuit.

The Chamberlain Group sued Skylink Technologies for creating garage door openers that opened their own garage doors under this law. (The lawsuit is ongoing, though the Court of Appeals for the Federal Circuit has issued a ruling casting serious doubt on Chamberlain's likelihood of success.)

Prof. Edward Felten and several colleagues, were threatened with a lawsuit under this law if they presented a paper at a technical conference describing how they participated in the Secure Digital Music Initiative (SDMI) decryption challenge. (After Felten sued for declaratory judgment, the threat was dropped.)

Secure Network Operations (SNOsoft), a group of secrurity researchers, published a security flaw in HP's Tru64 operating system after HP refused to fix it. HP threatened to sue them under this law. (After negative press they dropped the threat.)

Blackboard Inc. filed a civil complaint against university students Billy Hoffman and Virgil Griffith who were researching security holes in the Blackboard Transaction System. A judge issued an injunction on the two students to prevent them from publishing their research. Blackboard Inc. had previously sent a complaint to the students saying they were violating this law. Since that time, however, Blackboard has pledged to cooperate with open-source developers. On February 1, 2007, Blackboard announced via press release "The Blackboard Patent Pledge". In this pledge to the open source and do-it-yourself course management community, the company vows to forever refrain from

asserting its patent rights against open-source developers, except when it is itself sued for patent infringement.

Princeton student J. Alex Halderman was threatened by SunnComm under this law for explaining how Mediamax CD-3 CD copy protection worked. Halderman explained that the copy protection could be defeated by holding down the shift key when inserting the CD into Windows (this prevented autorun, which installed the Mediamax protection software). After press attention SunnComm withdrew their threat.

Blizzard Entertainment threatened the developers of bnetd, a freely available clone of battle.net, a proprietary server system used by all Blizzard games on the Internet. Blizzard claims that these servers allow circumvention of its CD key copy protection scheme. (The Electronic Frontier Foundation is currently negotiating a settlement.)

The Advanced Access Content System Licensing Administrator, LLC sent violation notices to a number of sites who had published the encryption key to HD-DVD discs. The key and the software with which to decrypt the disks had been published by an anonymous programmer. When Digg took down references to the key, its users revolted and began distributing it in many creative ways. Eventually, Digg was unable to stop its users and gave up. AACS executives have vowed to fight on.

Open-source software to decrypt content scrambled with the Content Scrambling System presents an intractable problem with the application of this law. Because the decryption is necessary to achieve interoperability of open source operating systems with proprietary operating systems, the circumvention is protected by the Act. However, the nature of open source software makes the decryption techniques available to those who wish to violate copyright laws. Consequently, the exception for interoperability effectively swallows the rule against circumvention.

Criticisms

Large industry associations like the MPAA and RIAA say the law is necessary to prevent copyright infringement in the digital era, while a growing coalition of open source software developers and Internet activists argue that the law stifles innovation while doing little to stop copyright infringement. Because the content must ultimately be decrypted in order for users to understand it, near-perfect copying of the decrypted content always remains possible for pirates. Meanwhile, developers of open source and other next-generation software must write complex and sophisticated software routines to ensure interoperability of their software with legacy Windows technology. Thus, the opponents are angry at having to bear the costs of technology that results in no benefit.

Some proponents of the law claim it was necessary to implement several WIPO treaties. Opponents respond that the law was not necessary, even if it was it went far beyond what the treaties require, and the treaties were written and passed by the same industry lobbyists people who wanted to pass this law. They also note that the severe ambiguities

in the law, its difficulty in enforcement, and its numerous exceptions make it ineffective in achieving its stated goal of protecting copyright holders.

Others claim that the law is necessary to prevent online copyright infringement, using perfect digital copies. Opponents note that copyright infringement was already illegal and the DMCA doesn't outlaw infringement but only legal uses like display and performance.

Opponents of the law charge that it violates the First Amendment on its face, because it restricts the distribution of computer software, like DeCSS. The Second Circuit rejected this argument in *MPAA v. 2600*, suggesting that software wasn't really speech. Under the specific facts of the case, however, the Constitutional decision was not controlling. The defendants' ultimate purpose was to make possible the copying of copyrighted content, not publishing their own speech. Most other circuits that have considered the issue concluded software is speech, but have not considered this law.

Opponents also say it creates serious chilling effects stifling legitimate First Amendment speech. For example, John Wiley & Sons changed their mind and decided not to publish a book by Andrew Huang about security flaws in the Xbox because of this law. After Huang tried to self-publish, his online store provider dropped support because of similar concerns. (The book is now being published by No Starch Press.)

Opponents also argue that the law might be read to give full control to copyright holders over what uses are and are not permitted, essentially eliminating fair use. For example, ebook readers protected by this law can prevent the user from copying short excerpts from the book, printing a couple pages, and having the computer read the book aloud—all of which are legal under copyright law, but this law could be expanded to prohibit building a tool to do what is otherwise legal. However, other legal scholars note that the law's emphasis on violations of preexisting rights of copyright holders ensures that the DMCA does not expand those rights. If the purpose of the activity is not to violate a preexisting right, the activity is not illegal. Fair use, the scholars say, would still be protected.

Copyright Office rulemaking procedures

As required by the DMCA, in 1999 the U.S. Copyright Office launched a public appeal for comments on the DMCA in order "to determine whether there are particular classes of works as to which users are, or are likely to be, adversely affected in their ability to make noninfringing uses due to the prohibition on circumvention of access controls". The entire set of written submissions, testimonial transcripts, and final recommendations and rulings for all three rulemakings (2000, 2003, and 2006) are available here.

Chapter 10

Advanced Access Content System
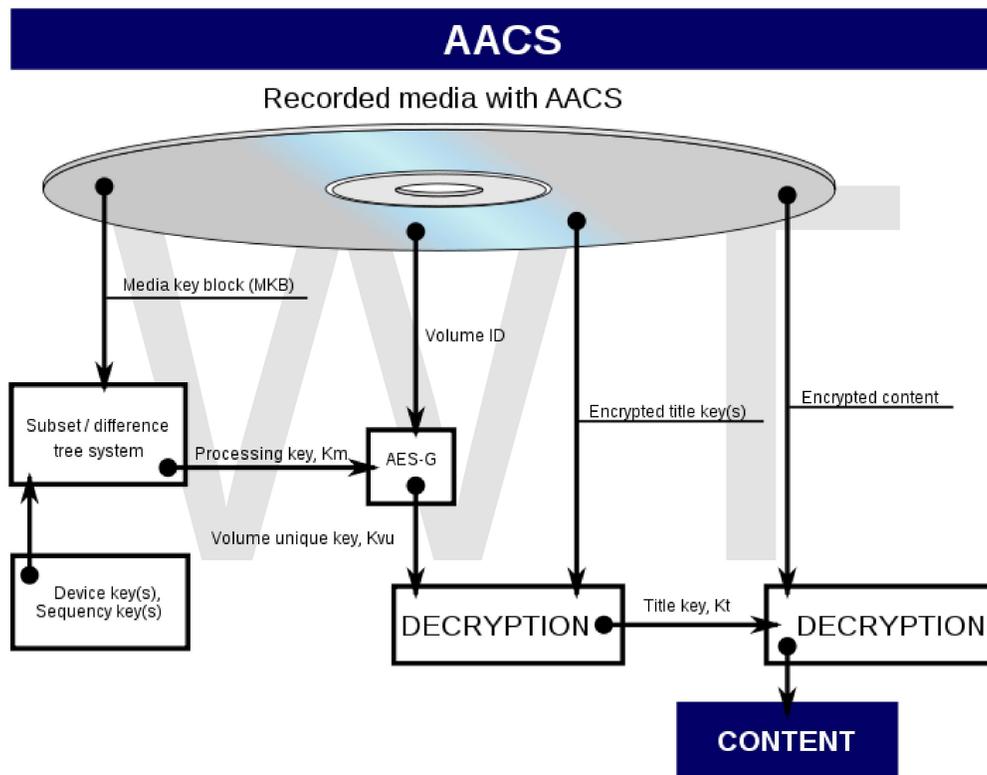
AACS decryption process

The **Advanced Access Content System** (**AACS**) is a standard for content distribution and digital rights management, intended to restrict access to and copying of the next generation of optical discs and DVDs. The specification was publicly released in April 2005 and the standard has been adopted as the access restriction scheme for HD DVD and Blu-ray Disc (BD). It is developed by **AACS Licensing Administrator, LLC** (**AACS LA**), a consortium that includes Disney, Intel, Microsoft, Panasonic, Warner Bros., IBM, Toshiba and Sony. AACS has been operating under an "interim agreement" since the final specification (including provisions for Managed Copy) has not yet been finalised.

Since appearing in devices in 2006, several AACS decryption keys have been extracted from weakly protected software players and published on the Internet, allowing decryption by other unlicensed software.

System overview

Encryption

AACS uses cryptography to control the use of digital media. It encrypts content under one or more *title keys* using the Advanced Encryption Standard (AES). Title keys are derived from a combination of a *media key* (encoded in a Media Key Block) and the *Volume ID* of the media (e.g., a physical serial number embedded on a pre-recorded disc).

The principal difference between AACS and CSS, the DRM system used on DVDs, lies in how the device decryption keys are organized.

Under CSS, all players of a given model are provisioned with the same, shared decryption key. Content is encrypted under the title-specific key, which is itself encrypted under each model's key. Thus each disc contains a collection of several hundred encrypted keys, one for each licensed player model.

In principle, this approach allows licensors to "revoke" a given player model (prevent it from playing back future content) by omitting to encrypt future title keys with the player model's key. In practice, however, revoking all players of a particular model is costly, as it causes many users to lose playback capability. Furthermore, the inclusion of a shared key across many players makes key compromise significantly more likely, as was demonstrated by a number of compromises in the mid-1990s.

The approach of AACS provisions each individual player with a unique set of decryption keys which are used in a broadcast encryption scheme. This approach allows licensors to "revoke" individual players, or more specifically, the decryption keys associated with the player. Thus, if a given player's keys are compromised and published, the AACS LA can simply revoke those keys in future content, making the keys/player useless for decrypting new titles.

AACS also has traitor tracing. The standard allows different versions of short sections of a movie to be encrypted with different keys. A certain player will only be able to decrypt one version of each section. By embedding a digital watermark in the different versions and analyzing what sections of the movie the attacker publishes, the compromised keys can eventually be identified and revoked (this feature is called *Sequence keys* in the AACS specifications).

Volume IDs

Volume IDs are unique identifiers or serial numbers that are stored on pre-recorded discs with special hardware. They cannot be duplicated on consumers' recordable media. The

point of this is to prevent simple bit-by-bit copies, since the Volume ID is required (though not sufficient) for decoding content. On Blu-ray discs, the Volume ID is stored in the BD-ROM Mark.

To read the Volume ID, a cryptographic certificate (the *Private Host Key*) signed by the AACS LA is required. However, hackers claim to have circumvented that particular protection by modifying the firmware of an HD DVD reader.

Decryption process

To view the movie, the player must first decrypt the content on the disc. The decryption process is somewhat convoluted. The disc contains 4 items—the Media Key Block (MKB), the Volume ID, the Encrypted Title Keys, and the Encrypted Content. The MKB is encrypted in a subset difference tree approach. Essentially, a set of keys are arranged in a tree such that any given key can be used to find every other key except its parent keys. This way, to revoke a given device key, the MKB needs only be encrypted with that device key's parent key.

Once the MKB is decrypted, it provides the Media Key, or the km. The km is combined with the Volume ID (which the program can only get by presenting a cryptographic certificate to the drive, as described above) in a one-way encryption scheme (AES-G) to produce the Volume Unique Key (Kvu). The Kvu is used to decrypt the encrypted title keys, and that is used to decrypt the encrypted content.

Analog Outputs

AACS-compliant players must follow guidelines pertaining to outputs over analog connections. This is set by a flag called the Image Constraint Token (ICT), which restricts the resolution for analog outputs to 960×540. Full 1920×1080 resolution is restricted to HDMI or DVI outputs that support HDCP. The decision to set the flag to restrict output ("down-convert") is left to the content provider. Warner Pictures is a proponent of ICT, and it is expected that Paramount and Universal will implement down-conversion as well. AACS guidelines require that any title that implements the ICT must clearly state so on the packaging. The German magazine "Der Spiegel" has reported about an unofficial agreement between film studios and electronics manufacturers to not use ICT until 2010 - 2012. However, some titles have already been released that apply ICT.

Audio watermarking

On June 5, 2009, the licensing agreements for AACS were finalized, which were updated to make Cinavia detection on commericial Blu-ray disc players a requirement.

Managed Copy

Managed Copy refers to a system by which consumers can make legal copies of films and other digital content protected by AACS. This requires the device to obtain authorization by contacting a remote server on the Internet. The copies will still be protected by DRM, so infinite copying is not possible (unless it is explicitly allowed by the content owner). It is mandatory for content providers to give the consumer this flexibility in both the HD DVD and the Blu-ray standards (commonly called *Mandatory Managed Copy*). The Blu-ray standards adopted Mandatory Managed Copy later than HD DVD, after HP requested it.

Possible scenarios for Managed Copy include (but are not limited to):

- Create an exact duplicate onto a recordable disc for backup
- Create a full-resolution copy for storage on a media server
- Create a scaled-down version for watching on a portable device

This feature was not included in the interim standard, so the first devices on the market did not have this capability. It was expected to be a part of the final AACS specification.

In June, 2009, the final AACS agreements were ratified and posted online, and include information on the Managed Copy aspects of AACS.

History

On February 24, 2001, Dalit Naor, Moni Naor and Jeff Lotspiech published a paper entitled "Revocation and Tracing Schemes for Stateless Receivers", where they described a broadcast encryption scheme using a construct called Naor-Naor-Lotspiech subset-difference trees. That paper laid the theoretical foundations of AACS.

The AACS LA consortium was founded in 2004. With DeCSS in hindsight, the *IEEE Spectrum* magazine's readers voted AACS to be one of the technologies most likely to fail in the January 2005 issue. The final AACS standard was delayed, and then delayed again when an important member of the Blu-ray group voiced concerns. At the request of Toshiba, an interim standard was published which did not include some features, like managed copy. As of October 15, 2007, the final AACS standard had not yet been released.

Open-source implementations

On December 26, 2006 a person using the alias "muslix64" published a working, open-sourced AACS decrypting utility named BackupHDDVD, looking at the publicly available AACS specifications. Given the correct keys, it can be used to decrypt AACS-encrypted content. A corresponding BackupBluRay program was soon developed, as well as a "ClownBD" program mimicking CloneDVD but for Blu-Ray. SlySoft have stated they are working on CloneBD that supports Blu-Ray.

Security

Both title keys and one of the keys used to decrypt them (known as *Processing Keys* in the AACS specifications) have been found by using debuggers to inspect the memory space of running HD DVD and Blu-ray player programs.   Hackers also claim to have found Device Keys (used to calculate the Processing Key) and a Host Private Key (a key signed by the AACS LA used for hand-shaking between host and HD drive; required for reading the Volume ID). The first unprotected HD movies were available soon afterwards. The processing key was widely published on the Internet after it was found and the AACS LA sent multiple DMCA takedown notices in the aim of censoring it. Some sites that rely on user-submitted content, like Digg, tried to remove any mentions of the key. The Digg administrators eventually gave up trying to censor submissions that contained the key.

The AACS key extractions highlight the inherent weakness in any DRM system that permit software players for PCs to be used for playback of content. No matter how many layers of encryption are employed, it doesn't offer any true protection, since the keys needed to obtain the unencrypted content stream must be available somewhere in memory for playback to be possible. The PC platform offers no way to prevent memory snooping attacks on such keys, since a PC configuration can always be emulated by a virtual machine, in theory without any running program or external system being able to detect the virtualization. The only way to wholly prevent attacks like this would require changes to the PC platform which could provide protection against such attacks. This would require that content distributors do not permit their content to be played on PCs without trusted computing technology, by not providing the companies making software players for non-trusted PCs with the needed encryption keys.

On April 16, 2007, the AACS consortium announced that it had expired certain encryption keys used by PC-based applications. Patches were available for WinDVD and PowerDVD which used new and uncompromised encryption keys. The old, compromised keys can still be used to decrypt old titles, but not newer releases as they will be encrypted with these new keys. All users of the affected players (even those considered "legitimate" by the AACS LA) are forced to upgrade or replace their player software in order to view new titles.

Despite all revocations, current titles can be decrypted using new MKB v7, v9 or v10 keys widely available in the internet.

Besides spreading *processing keys* on the Internet, there have also been efforts to spread *title keys* on various sites. The AACS LA has sent DMCA takedown notices to such sites on at least one occasion. There is also commercial software (AnyDVD HD) that can circumvent the AACS protection. Apparently this program works even with movies released after the AACS LA expired the first batch of keys.

Patent challenges

On May 30, 2007, Canadian encryption vendor Certicom sued Sony alleging that AACS violated two of its patents, "Strengthened public key protocol" and "Digital signatures on a Smartcard." The patents were filed in 1999 and 2001 respectively, and in 2003 the National Security Agency paid $25 million for the right to use 26 of Certicom's patents, including the two that Sony is alleged to have infringed on.

Trivia

- While great care has been taken with AACS to ensure that contents are encrypted right up to the display device, on the first versions of some Blu-ray and HD DVD software players a perfect copy of any still frame from a film could be made simply by utilizing the Print Screen function of the Windows operating system. This was broken in later versions.