(in consultation with industry) and to undertake further technical work. The Issues Paper also indicates that the Government will consider the outcomes of the current and future digital radio trials.

Submissions in response to the Issues Paper close on 20 April 2005 and can be accessed from the website of the Department of Communications, Information, Technology and the Arts[5].

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(Endnotes)

[1] http://www.minister.dcita.gov.au/media/media_releases/introducing_digital_radio_to_australia

[2] In Sydney, a consortium of commercial and public radio broadcasters is conducting trials to test listener and advertiser responses to the new technology and a range of digital receivers. The trial is being coordinated by Commercial Radio Australia on behalf of commercial radio as well as the ABC and SBS, and is being broadcast on channel 9A in Band III spectrum. More details are available at http://www.commercialradio.com.au/

[3] Broadcast Australia is also conducting a digital radio trial in Melbourne on channel 9A in Band III spectrum, in conjunction with third party content providers (including the ABC and the SBS). More details are available at http://www.broadcastaustralia.com.au/

[4] The Digital Radio Study Group was comprised of Departmental and agency representatives (DoCITA, ABA, ACA). Its report is at http://www.dcita.gov.au/broad/radio/digital_radio/introduction_of_digital_radio_-_issues_paper/digital_radio_study_group

[5] http://www.dcita.gov.au/broad/radio/digital_radio/introduction_of_digital_radio_-_issues_paper

[6] http://www.aba.gov.au/abanews/news_releases/2003/60nr03.htm

Digital Rights Management in Television

Rob Nicholls focuses in on digital rights management from an Australian broadcaster's perspective

This article addresses some of the issues associated with digital rights management that face commercial and subscription television broadcasters, having regard to their particular business needs and constraints. In so doing, it looks at differences between the digital rights management issues faced by broadcasters and those concerned with the treatment of content on personal computers, including issues raised by open boxes, broadcast flags and the problem of the analog hole.

It concludes by looking at some of the practical issues raised by keeping personal video recorders and set-top boxes connected to the television rather than the internet and addressing the balance between the needs of viewers (who are important to both commercial and subscription television broadcasters) and those of the rights holders.

Digital Rights Management in Broadcasting

Digital rights management is simply a set of technologies that enables content owners to specify and control the access they want to give consumers and the conditions under which it is given. The use of the content is determined by the rights holder and in a television environment could include entitlement to:

- watch once as the content goes to air;
- time delay and watch once;
- time delay and watch many times;
- copy once to an external medium;
- copy many times to specified external media; and/or
- watch, but only on the condition that the viewer has watched some other content (such as an advertisement).

This is an indicative rather than exhaustive list.

Digital rights management includes four core elements:

- Persistent Protection - technology for protecting files via encryption and allowing access to them only after the entity desiring access has had its identity authenticated and its rights to that specific type of access verified;
- Business rights – the capability of associating business rights with content by contract;
- Access tracking – the capability of tracking access to and operations on content; and
- Rights licensing – the capability of defining specific rights to content and making them available by contract.

The term technology is used here to mean protecting files via encryption. In the television sense this should probably be technology for protecting programs via encryption. However, commercial broadcasting cannot be encrypted unless there are widely available decryption devices (which rather defeats the point of encryption). However, encryption applying to copying could be sent with a free-to-air program and this is dealt with this below in the discussion on broadcast flags.

Clearly, if there is going to be use of content then there needs to be technology to provide for business rights covering all of contracting for content, access tracking and rights licensing.

Commercial Television Broadcasting

The business of commercial television is the sale of advertising. There is an exchange of value whereby consumers watch advertisements in return for enjoyable programming. That is, programming that is designed to entertain, inform or educate in addition to advertising (which is other than this).

Although commercial broadcasters in Australia make television programming, they also buy programming. In particular, commercial broadcasters acquire drama, particularly movies, from the major studios. Popular dramas such as "Lost", "ER" and even "The Simpsons" are acquired from a small number of organisations (mainly the studios) which have their headquarters in the United States. The importance of the United States in this regard is that the expecta-

tions of protections of rights are initially set by those protections provided under United States law. Whereas it might be argued that Australian law applies to rights in Australia, the reality is that contracts for the supply of programming will reflect US assumptions.

There has been a major change recently in the technical model associated with commercial broadcasting, that is reflected in the quality of video received at the home. In the analog world, commercial broadcasters did their very best to deliver to the transmitter the highest quality video and audio services that they could. As the analog mode programming was transmitted from the towers to the antennas at viewers' homes, it degraded and the pictures that were received were not of the same quality that was delivered to the transmitter. This has changed. In the digital world, the quality of pictures and of audio that arrives at the home is identical in every respect to that which leaves the commercial broadcaster's facility. Further, that quality is comparable to DVD quality in the case of standard definition signals and substantially better quality then DVD in the case of high definition signals.

Commercial broadcasters understand this paradigm shift. However, it is only recently that rights holders are starting to be concerned that these perfect quality television programs could be redistributed by consumers unless steps are taken to prevent it.

At the same time that the rights holders have realised the potential for consumers to copy, it is has become much more apparent to the commercial broadcasters that they have little or no involvement in consumer equipment. Indeed, the move by the commercial broadcasters to "seed" the market for digital set-top boxes at the start of digital broadcasting in Australia was unusual and anomalous. It was not the operation of the commercial broadcasters in their normal course of business.

Subscription Broadcasters

Contrast the commercial broadcasters with the subscription broadcasters. The business model is different. Rather than viewers watching the service and putting up with advertisements, consumers pay to watch. There is revenue from the sale of advertising space but subscription revenue is the predominant source of revenue.

The technical model for subscription broadcasters has also changed. In analog cable systems, the best possible quality transmission is delivered to the cable head ends. Therefore, while the business model is different, the technical issues are the same. The major issue which differentiates the operation of commercial television from subscription television, at least from the digital rights management perspective, is that subscription television providers determine the specifications of consumer equipment. Further, the set-top box used to watch FOXTEL is specified, owned and controlled by FOXTEL.

From a consumer perspective, the basic set-top box cost forms part of the subscription price. From the perspective of digital rights management however, the subscription television broadcasters have the benefit of having control of all of the elements of delivery of their service, including the set-top box.

"Digital rights management is simply a set of technologies that enables content owners to specify and control the access they want to give consumers and the conditions under which it is given"

Digital Rights Management and Television

Digital rights management systems for television need to be effective and robust. That is, the system must work and must continue working even when circumstances change - and this includes the concept of renewability. If there are cryptography aspects in a digital rights management system these need to be able to be changed if the system is "hacked". An example of renewability in conditional access systems in subscription television broadcasting is the replacement of a single element of the system, such as a smartcard, when there is a degree of piracy introduced. Importantly, digital rights management systems need to have that level of renewability without creating a population of legacy devices which are no longer useable by consumers.

A digital rights management system associated with broadcasting in Australia has to deal with several types of broadcasting. It has to be able to handle each of:

- datacasting and other forms of enhancement for commercial broadcasters;
- multi-channelling for the national broadcasters; and
- multi-channel and additional conditional access systems for subscription broadcasters.

It may be that there is not a single solution. However, the degree to which there is interoperability and commonality between subscription television and commercial and national broadcasting, particularly in a market as small as Australia, can influence the cost of implementation.

Any widely used digital rights management system requires simple compliance mechanisms. It must be simple for consumers to comply with the rules. It must in addition be as invisible to viewers as is technically and operationally feasible . As a practical matter consumers are not primarily interested in illegally exploiting rights holder's content. In general, the rights management system will be used by an audience which is seeking to be entertained or informed.

The challenge faced in designing a digital rights management system is to balance the threat posed by the very small minority who would abuse the delivery of programming against the reasonable expectations of the majority of viewers.

Open and Closed Devices

It is useful to understand the difference between open and closed devices by comparing a personal computer and a DVD player. Where most new desktop personal computers sold today include at least a DVD player and often a DVD recorder, this comparison is easier than comparing a computer with a set-top unit or personal video recorder.

The contrast is set out in Table 1. Broadly speaking, a general purpose computer is not terribly secure. The user can have access to everything and there is a low level of tamper resistance. There are minimal licensing obligations and those licensing obligations tend not to have cross requirements for other people's content. Contrast this with a DVD player

where the device is not user programmable except that the viewer can choose which tracks to watch in which order. To the user, a DVD player is a closed device. The personal computer is also likely to be connected to millions of other personal computers via the internet. Networking a DVD player is currently a non-trivial exercise.

Once in a personal computer, content can be copied, reformatted and redistributed via the internet. In general there is little security within a personal computer to enforce the digital rights management associated with content. This is particularly true in the case of broadcast content where a digital television tuner card in a personal computer can be used with the software that comes with it to record ad-free programming and to subsequently burn it on to a DVD or redistribute it using peer to peer technology such as Bit Torrent.

Broadly then, if content is delivered to a personal computer it is delivered to an open box and the content is no longer secure, no longer protected, and is available for redistribution. Once again, this contrasts to delivery to a closed box, such as a DVD player, and leads to the logical conclusion that, from a broadcaster's perspective, both set-top boxes and personal video recorders should be "closed" if the contractual obligations to rights holders such as the studios are going to be able to be implemented.

The Analog Hole

The issues raised above also indicate that there is an "analog" hole. That is, that digital content is like a genie out of the bottle as soon as it is in the analog world. After all, digital rights management is digital and not analog. Although such devices as visible bugs and invisible watermarks can be used to deter analog copying, these have limited application to video capture.

In practice, relatively simple deterrents have worked with the vast majority of consumers. Attempts to make a VHS to VHS recording of a tape hired from a video store are thwarted by the simple operation of "Macro Vision" which is a deterrent used to prevent such copying. On the other hand, electronic hobbyist shops sell a "video clean-up box" which strips the Macro Vision information and allows such recording. Despite the fact that the prohibition of anti-circumvention devices in the analog domain has not been addressed by Australian copyright law, there are not large numbers of infringers.

Personal Computer	DVD Player
User programmable	Non-user programmable
Software-based operating system	Hardware-based operating system
Software-based protection	Hardware-based protection
Less tamper resistant	More tamper resistant
Few licensing obligations	Many licensing obligations

Table 1 – Comparison of personal computer and DVD player

Broadcast Flags

The "broadcast flag", which has caused so much controversy in the United States and is still the subject of appeal there, is simply a piece of service information which is broadcast with a digital television signal that says to devices which choose to look for it, that this signal was originally broadcast.

It is only of value if it is associated with a regime which binds the suppliers of devices which would allow for copying of digital video content. This copying does not include use of a personal video recorder. Rather, it is the recopying of video which has been captured by a consumer device.

The issue in the United States which has lead to the appeal of the decision by FCC to mandate the broadcast flag, is that the subsequent copying of programming becomes illegal by regulatory intervention in respect of consumer devices. That is, the broadcast flag operates to keep devices closed by requiring that devices with portable media (such as an all digital DVD recorders) must be configured not to record that program because it contains the broadcast flag.

In the absence of a broadcast flag, and perhaps even in its presence, broadcasters have a motivation to keep personal video recorders and set-top boxes connected to the television and not connected to networks. The overriding driver is that the studios provide major content and will be looking for protection of the content over which they hold rights. All broadcasters have an objective of maintaining "television eyes". That is, their business models rely on programming being watched either live over the air or by time shifting. The assumption is that television is not available from another source although it is understood that some competition for eyes will exist from businesses such as DVD and video stores.

Closed devices are of benefit to both commercial and subscription broadcasters. However, at this stage at least, it is the subscription broadcasters who have a better mechanism for practical control.

Viewers' Needs

The vast majority of viewers use video cassette recorders to play pre-recorded tapes and to do time shifting. The redistribution of content received from FOXTEL or from commercial television is not common in this country and this situation is not expected to change. This presents a challenge to all broadcasters to enable time shifting to occur without endangering the supply of programming. The aspects of this challenge include the fact that we need to come to terms with mechanisms that allow time shifting but prevent the leakage of valuable content in a country which has far less interventionist regulation of consumer devices than the US or Europe.

Subscription broadcasters have set a lead in this regard. For example, FOXTEL supplies personal video recorders to its viewers (FOXTEL iQ) but the personal video recorders themselves encrypt the recorded programming on the hard disk of the personal video recorder. This does not limit subscribers' ability to time shift and to watch recorded programs as many times as they wish. What is does however is limit the export of recorded programs from that hard disk to the internet. From the commercial broadcasters' perspective it make sense for personal video recorders and set-top boxes to be closed to allow them to continue using the business models that they currently operate.

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