Digital radio accessibility
Developments with digital radio technology for people with disabilities

AUGUST 2010

communicating | facilitating | regulating

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Introduction

According to the United Nations, around 10 per cent of the world's population, or 650 million people, live with some form of disability such as vision, hearing, physical, mental or intellectual impairments.[1] With the advent of next generation digital radio technology, there have been some significant developments in improving the accessibility of digital radio design, features and content for people with impaired sensory abilities.

This report provides an overview of the current developments in digital radio technology and associated applications available to people with sensory impairments.

Four aspects of digital radio technology and applications are covered:

> captioned radio
> accessible design developments
> digital radio for the blind or visually impaired
> emergency warning notifications for people with sensory impairments delivered using digital radio.

This report contributes to the Australian Communication and Media Authority's (ACMA) work in understanding technology developments and is relevant to its regulatory roles in captioning, spectrum planning for digital radio services and accessibility to telecommunications services.

The research in this report was conducted using desktop analysis from January to July 2010.

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[1]United Nations fact sheet on persons with disabilities, viewed 11 August 2010, http://www.un.org/disabilities/default.asp?id=18

Captioned radio

Digital radio broadcasting systems offer new features that have the potential to change the way audiences listen and interact with radio, and in particular, the way people with hearing impairments interact with digital radio content. Captioned radio is one such feature that allows people with a hearing impairment greater interaction with broadcasts through reading captioned text or song lyrics on a digital display and participating in talk-back radio discussions.

This report provides a snapshot of the developments in captioned radio, but does not examine any of the issues that would arise in adding captions to digital radio services in Australia.

Proof of concept

At the International Consumer Electronics Show 2008, National Public Radio (NPR), Harris Technology and Towson University conducted a live demonstration of captioned radio.

NPR employed a stenographer to present the speech as captions. The stenographer's machine was connected to a computer and each keystroke became part of a text stream sent with the audio content in a HD Radio broadcast.[2] HD Radio is a proprietary digital radio standard used in the US.

A prototype HD Radio receiver was connected to another computer to decode the audio and captioned text. The prototype receiver displayed the text, along with the audio, on a large plasma screen. NPR stated that the total end-to-end time was 5.6 seconds, which is the combination of the stenographer's response time and the software processing time.

There are further plans by NPR, Harris Technology and Towson University to develop and deliver captioned radio in the US within the next three to five years. In developing a radio captioning service, NPR has identified design specifications in order to meet the expectation of users, namely:

> appropriate display size—the text should also be accessible to people with a vision impairment

> user defined appearances—font size, contrast and appropriate backlighting should be user adjustable

> data buffer—an audio and text data buffer should allow a digital radio user to pause and rewind captions, with a function to control the speed of captions

> emergency—a designated data channel to provide unobstructed emergency messages to a digital radio user.

Current efforts are directed towards speech-to-text conversion for HD Radio captioning. Three options have been tested by NPR.[3] They are:

> Speech recognition software packages, but to date these have not provided reliable results in interpreting the variations in the radio presenter's voice and speech speeds.

> Speaker-dependent automatic speech recognition software was specifically optimised to the characteristics of the voice writer's voice.[4] In the results, the voice

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[2] Ibiquity HD radio, viewed 11 August 2010, www.ibiquity.com/about_us

[3] NPR Labs, Accuracy Analysis of Captioned Radio Report, 7 July 2008, viewed 11 August 2010, www.nprlabs.org/research/accessibleradio/AccuracyAnalysis_CaptionedRadio.pdf

writer's transcript was comprehensible, but was forced to replace and drop several words.

> Use of a stenographer to produce a transcript, which provided the most reliable and comprehensive transcript. However, there are expected to be higher costs associated with training and hiring a stenographer for digital radio captioning.

In the short term, none of the above options may prove viable, but as computing technology increases in speed and reliability, it is anticipated that software-based solutions will be developed to interpret the variable nature of the human voice.

It should be noted that applying any of the above options to digital radio in Australia would not be straightforward. HD Radio has been developed for US conditions and the HD Radio standard differs significantly from the DAB+ standard used in Australia.

ITU developments in captioned radio

Captioned radio is also a subject of interest for international standards bodies such as the International Telecommunication Union (ITU). In November 2009, the ITU Radiocommunication Sector (ITU-R) Working Party 6A, investigated developments in terrestrial digital radio broadcasting, and developed a recommendation regarding captioned radio for people with a hearing impairment.[5]

A preliminary draft, *Developmental Digital Radio Broadcast Service: Captioned Radio*, recommends that any one of the following digital radio broadcasting systems can be utilised to support captioned radio:

> Digital Audio Broadcasting (DAB)

> Digital Audio Broadcasting Plus (DAB+)

> HD Radio

> Digital Radio Mondiale Plus (DRM+)

> Digital Multimedia Broadcasting (DMB)

> Integrated Services Digital Broadcasting (ISDB). [6]

DRM30, the Digital Radio Mondiale (DRM) standard for short wave, medium wave and long wave digital radio transmission, is not included in Working Party 6A's draft recommendation.

Working Party 6A recommends that a minimum of 500 bits per second (bps) of additional capacity be allocated to deliver captioned radio. A better than FM quality DAB+ digital radio station in Australia currently utilises 64,000 bps capacity, therefore an allocation of 500 bps for captions is not expected to substantially degrade the audio quality of a digital radio broadcast. The following table shows comparative audio qualities and the corresponding bit rates required to achieve them using the DAB+ standard.

[4] A voice writer re-transcribes spoken words, from a radio presenter, into the speech recognition software. The software has been tailored to the characteristics of the voice writer's voice making speech-to-text conversion more reliable.

[5] ITU-R Working Party 6A, viewed 11 August 2010, http://www.itu.int/ITU-R/index.asp?category=study-groups&rlink=rwp6a07&lang=en

[6] ITU-R Working Party 6A—Report on the meeting of Working Party 6A (Geneva, 4–12 November 2009), Annex 04, viewed 11 August 2010, http://www.itu.int/md/R07-WP6A-C-0285/en

Table 1 Comparative audio qualities and corresponding bit rates

Source: Commercial Radio Australia[7]

Prior to the meeting, Working Party 6A received two related contributions concerning captioned radio:

> contribution 248 was submitted by CBS Inc.[8]

> contribution 235 was submitted by the North American Broadcasters Association (NABA).[9]

The contribution by NABA outlined most of the requirements identified by Working Party 6A, while CBS Inc. indicated interest in delivering captioned radio via their existing radio broadcast infrastructure to listeners with a hearing impairment within the US. The deployment of captioned radio in the US may offer lessons for services delivered in Australia, notwithstanding their use of the HD Radio standard.

Journaline and captioned radio

Journaline is a captioning process specified by the World Digital Multimedia Broadcasting Forum (WorldDMB Forum), an international non-government organisation that coordinates the implementation of DAB, DAB+ and DMB digital radio technologies.[10] WorldDMB Forum members include the Australian Broadcasting Corporation (ABC), Broadcast Australia and Commercial Radio Australia. Journaline can also be used with the DRM technology (both DRM30 and DRM+), DAB and DAB+.

The main advantage of Journaline is its ability to deliver diverse categories of textual content, such as news and sports services and other program-related information, to a digital radio receiver. The textual content makes Journaline adaptable for people with hearing impairments.[11]

Journaline creates the possibility of text-based services with DRM and DAB+ technology. Even though it is still in its infancy, the British Broadcasting Corporation (BBC) and Deutsche Welle have included Journaline with their DRM30 broadcasts.[12]

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[7] DAB+ Technical Summary, Broadcast Papers, viewed 11 August 2010, www.broadcastpapers.com/whitepapers/DAB-Technical-Summary.cfm?objid=32&pid=857&fromCategory=47

[8] ITU, support for preliminary draft new recommendation, development digital radio broadcast service, captioned radio from CBS, Inc, viewed 11 August 2010, http://www.itu.int/md/R07-WP6A-C-0248/en

[9] ITU, support for preliminary draft new recommendation, development digital radio broadcast service, captioned radio from North American Broadcasters Association, viewed 11 August 2010, http://www.itu.int/md/R07-WP6A-C-0235/en

[10] Journaline News Service, 11 August 2010, http://www.worlddab.org/introduction_to_digital_broadcasting/applications_list/journaline

[11] Presentation by Alexander Zink at EBU/DRM conference 2009 Advanced Functionality and Commercial Aspects of DRM, slide 13, viewed 11 August 2010, http://tech.ebu.ch/docs/events/drm09/presentations/ebu_drm09_zink.pdf

[12] DRM Monthly Newsletter, 10 December 2008, viewed 11 August 2010, http://www.drm.org/index.php/uploads/files/index.php?p=news_item&uid=129

In the Australian context, there is no suggestion that Australian broadcasters will test or embed Journaline in the existing DAB+ services in the near future.

Accessible design

Accessible design is the process of extending a standard design of a product to enable use or enjoyment by people with any form of sensory or motor impairment. The process aims to maximise the number of people who can readily use a product, building or service.[13]

Product developers tend to design a product or service for the non-impaired consumer in the first instance, and then add on accessibility features later in the product's lifecycle. This approach usually requires modifications or an alteration to a product to accommodate accessibility features.

In the context of digital radio receivers, there are international developments in identifying accessible receivers and developing accessibility guidelines for manufacturers.

Royal National Institute of Blind People

The Royal National Institute of Blind People (RNIB) in the United Kingdom commissioned a study examining the ease of use of DAB radio receivers by people with vision impairments.[14] Some of the main findings of the study include:

> 90 per cent of people with a vision impairment require assistance when using a digital radio receiver without a voice output feature

> 48 per cent of people with a vision impairment require assistance when using a digital radio receiver with a voice output feature

> design features such as tactile feedback and button design need extra consideration.

The study produced a checklist of the most important features requested by vision impaired people. Ricability, the Research Centre for Consumer Affairs, used the checklist to produce a consumer guide titled *Choosing a DAB Radio 2009*.[15] This guide was developed to assist vision impaired people in the United Kingdom in choosing which DAB digital radio receivers would best suit their needs.[16]

National Public Radio

NPR have compiled *Guide to Accessible Consumer Electronics Manufacturing Practices for Blind and Low-Vision Consumers*, which provides guidance to digital radio manufacturers when establishing which features are most important to listeners who have vision impairments.[17] In establishing their recommendations, NPR surveyed 250 people with varying severity of vision loss.[18] The most popular features were:

> a spoken prompt when a button is pushed

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[13] ISO, *ISO helps make design work for more people*, media release, ISO, 13 November 2008, viewed 11 August 2010, http://www.iso.org/iso/pressrelease.htm?refid=Ref1179

[14] Royal National Institute of Blind (RNIB) People, viewed 11 August 2010, http://www.rnib.org.uk/livingwithsightloss/Documents/Executive_summary_i2_media_DAB_report.pdf

[15] Research Centre for Consumer Affairs, viewed 11 August 2010, http://www.ricability.org.uk

[16] Ricability report*, Choosing a DAB Radio 2009*, viewed 11 August 2010, http://www.ricability.org.uk/consumer_reports/at_home/digital_radio/

[17] NPR report on best manufacturing recommendation, viewed 11 August 2010, http://www.nprlabs.org/research/accessibleradio/BestManufacturingRecommendationsForLowVisionUsers.pdf

[18] NPR Labs radio text displays final report, June 2009, viewed 11 August 2010, http://www.nprlabs.org/research/accessibleradio/RadioTextDisplayFinalReport.pdf

> tactile feedback and numbered keypads

> control features (such as telephone key layout)

> an additional remote control with a keypad layout

> voice navigating for menu-driven systems.

WorldDMB Forum receiver profile

The WorldDMB Forum has indicated that the DAB/DAB+/DMB receiver profile provisions a minimum set of functions to ensure digital radio receivers operate throughout Europe.[19] However, the WorldDMB Forum does not reference any specific features or guidelines on accessible design requirements for people with special needs.

Accessible design with the European Commission

The European Commission encourages accessible design for information and communications technologies (ICT). In November 2007, the European Commission adopted the *European i2010 initiative on eInclusion—to be part of the information society*.[20] This initiative aims to ensure that every person, regardless of social or individual difficulties, is part of the information society.

The eInclusion initiative focuses on improving eAccessibility by identifying specific problems where it believes industry should play a stronger role.[21] These include:

> safeguarding access to emergency services for people who have sensory, physical, motor or cognitive impairments

> stimulating and enabling the ICT industry to assist people with sensory impairments to access electronic products.

The European Commission continues to sponsor several research projects on eAccessibility.[22] In addition, the European Commission anticipates that policy developers and industry members will embrace the 'design for all' concept, which sets a goal that products, services and applications can be accessed by all members of the community including the elderly and people with sensory impairments negating the need to modify a product at a later stage.[23] As a minimum, the product should have the ability to use assistive technologies that are outlined within the European Commission documents.[24]

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[19] World DMB digital radio receiver profile, viewed 11 August 2010,
http://www.worlddab.org/news/document/896/World_DMB_Receiver_Profiles_Final_charset__2_.pdf

[20] European Information Society, viewed 11 August 2010,
http://ec.europa.eu/information_society/activities/einclusion/policy/i2010_initiative/index_en.htm

[21] eAccessibility definition, viewed 11 August 2010, http://www.who.int/features/qa/50/en/index.html

[22] European Information Society on eAccessibility, viewed 11 August 2010,
http://ec.europa.eu/information_society/activities/einclusion/research/accessibility/index_en.htm

[23] European Information Society on Design for All, viewed 11 August 2010,
http://ec.europa.eu/information_society/activities/einclusion/policy/accessibility/dfa/index_en.htm

[24]European Commission on Assistive Technologies, viewed 11 August 2010,
http://ec.europa.eu/information_society/activities/einclusion/policy/accessibility/assist_tech/index_en.htm

Radio reading services for the visually impaired in Australia

Australian radio reading services for the visually impaired were established in 1975 when a community radio station began broadcasting printed content over radio in Melbourne. In 1978, the Minister for Post and Telecommunications announced 'the establishment of a special radio communications service for the blind and other people with reading difficulties'.[25] This was followed by radio for the printed handicapped (RPH) services. Today there are 12 licensed RPH community broadcasting services in Australia operating under a community broadcasting licence. RPH Australia is the national peak body for radio reading services.[26]

With DAB+ digital radio now being broadcast in the five metropolitan areas of Adelaide, Brisbane, Melbourne, Perth and Sydney, the community radio sector has received funding from the Australian Government for digital community radio broadcasting. The Community Broadcasting Association of Australia (CBAA) has indicated that it will provide 37 designated community radio stations with digital transmission and content delivery infrastructure.[27]

All five metropolitan areas have RPH services as designated community radio services, and have been assigned sufficient bandwidth to broadcast RPH digital radio services in these areas. Despite having access to DAB+ in some areas, RPH services will continue to broadcast printed content on AM and FM radio across Australia.

RPH Australia has also indicated that if the audience for digital radio were to grow sufficiently then consideration might be given to provide more diverse printed content for the digital radio audience, rather than offering a simulcast of AM and FM services.

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[25] Radio for the Printed Handicapped (RPH) Service Development, viewed 11 August 2010, http://www.rph.org.au/html/development.html

[26] RPH Australia, viewed 11 August 2010, http://www.rph.org.au/html/about_us.html

[27] Community Broadcasting Association of Australia (CBAA), digital radio project, viewed 11 August 2010, http://www.cbaa.org.au/What_We_Do/Digital-Radio-Project-DRP

Emergency communications with digital radio technology

Broadcasters play an important role in issuing emergency warning notifications. A non-sensory impaired person has the choice of turning on a television, radio or even receiving an emergency notification via their fixed-line or mobile telephone. For a person with a sensory impairment, there is not such a wide range of choices. Digital radio provides additional capabilities which can alert a person with a sensory impairment to an emergency.

National Public Radio

Digital radio is similar to other data services—audio is encoded into a data stream and broadcast over the airwaves, after which a digital radio receiver can decode the data and play the audio. The technical capability exists to now embed text, multimedia content and emergency messages into a digital radio broadcast. With the increased flexibility of digital radio technology, NPR has been examining methods of embedding emergency messages into a HD Radio broadcast for use in the US.[28]

Concepts in NPR's research include:

> Wake-up-on-alert—the ability to power up a digital radio receiver and warn a sensory impaired person, by means of sirens or tones, of an emergency. Building on the proven concept of captioned radio, a wake-up-on-alert feature could possibly attract attention and display emergency captions to a person with a hearing-impairment.

> Bed shaking function—the bed shaking concept is another method of waking a sensory impaired person from sleep; an output port could be included on the digital radio receiver and connected to a bed, equipped with an appropriate mechanical device to provide the bed shaking function.

> Strobe light alerting—coupled with the bed shaking function, a strobe lighting effect on a digital radio receiver could alert a hearing impaired person of an emergency; this concept must take into consideration the effect of strobe lighting on people who suffer from seizures.[29]

NPR has surveyed a number of individuals in the US who have varying levels of vision and hearing impairments. From this survey, NPR has concluded that a radio emergency notification system is their first priority. Other features that people with a sensory impairment sought to have implemented on a HD Radio broadcast include emergency notifications for major traffic jams and road and school closures. Other features include flashing displays and colour-coded notifications on receivers to indicate the level of emergency.

DAB+ emergency warnings

In the wake of the Black Saturday bushfires in February 2009, the Victorian Government signed a memorandum of understanding (MoU) with the ABC and a number of commercial radio stations to broadcast emergency warnings.[30] In addition,

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[28] iBiquity Digital Corporation, viewed 11 August 2010, http://www.ibiquity.com/

[29] Presentation by Mike Starling at PREC 2008, slide 15, viewed 11 August 2010, http://www.nprlabs.org/apre/PREC2008_VirtualNotebook/2-09_AccessibleRadioAdvancesinContentDelivery/Accessibility_PREC08_APR08.pdf

[30] Office of the Emergency Management Services Commissioner Victoria, viewed 11 August 2010, http://www.oesc.vic.gov.au/wps/wcm/connect/OESC/Home/Strategic+Partnerships/Formal+Agreements/

the Australian Government established an emergency alert system that delivers an emergency message to an individual's fixed-line or mobile telephone.[31]

Under the MoU, the radio broadcasters will issue emergency warnings on AM and FM radio and, if available, provide a simulcast on DAB+ digital radio. The coverage of DAB+ in Australia is limited to the metropolitan areas of Adelaide, Brisbane, Melbourne, Perth and Sydney.

The European Telecommunications Standards Institute (ETSI) includes a provision to provide an emergency warning system in the European standard, EN 300 401— version 1.4.1—*Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers.*

The DAB+ standard allows for the broadcasting of digital data services such as paging, traffic management and emergency warnings. ETSI did not develop a new emergency warning system for DAB+ but instead embedded a known stable technical notation.[32]

DRM emergency warnings

The DRM Consortium, the international non-governmental organisation which coordinates the implementation of DRM30 and DRM+, makes mandatory the implementation of emergency warning and alert features in all DRM radio receivers.[33] In an emergency, DRM radio receivers can automatically re-tune to a specific DRM radio station, or to an alternate radio system such as traditional AM and FM radio, for notification of the emergency warning.

In addition, DRM transmissions can include emergency textual information that provides additional background information and instructions. The text service can either be provided by the Journaline news service or through an independent emergency service. Textual information is essential in warning the hearing impaired population of an emergency.[34]

DRM and DAB+ digital radio receivers may also provide text-to-speech capabilities, which can also be integrated with the Journaline news service. This can provide visually impaired people with verbal clarification on the state of an emergency.[35] With features such as pause, play back and rewind, visually impaired people can be reassured by their being informed of specific details in an emergency notification.

The DRM Consortium also mandates a function known as 'service following' which enables DRM service continuity through a process of automatic frequency switching based on the strongest available DRM radio signal. This provides a better opportunity for the emergency notification to be successfully received by the DRM radio receiver. This is useful in mobile environments where an individual may move between coverage areas.

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[31] Emergency Alert, viewed 11 August 2010, http://www.emergencyalert.gov.au/ In Western Australia, the State Alert system provides warning for details see https://statealert.wa.gov.au/Vox/publicuser/
[32] Specified in EN 62106: Specification of the radio data system (RDS) for VHF/FM sound broadcasting in the frequency range from 87,5 to 108,0 MHz
[33]Digital Radio Mondiale Consortium, *Digital Radio Receiver Profiles*, media release, 11 September 2009, viewed 11 August 2010, http://www.drm.org/uploads/files/drm_receiver_profiles.pdf
[34]Presentation by Alexander Zink at EBU/DRM conference 2009, Advanced Functionality and Commercial Aspects of DRM, slide 4, viewed 11 August 2010, http://tech.ebu.ch/docs/events/drm09/presentations/ebu_drm09_zink.pdf
[35]Presentation by Alexander Zink at Radio Festival 2009, Session 8: Enhancing the Digital Experience, viewed 11 August 2010, http://www.radioacademy.org/events/radio-festival/radio-festival-2009/radio-festival-09-running-order/

A primary distinction between DRM30 and DAB+/DRM+ is that DRM30 operates in the existing AM radio broadcast band, allowing for much further signal propagation, while delivering near-FM sound quality. As such, DRM30 can reach a wider audience and is especially suited for people living in regional and remote areas.

DRM30 and DRM+ digital radio is still in its initial rollout phase, which is evident from the small number of DRM radio receivers available.

ETSI and emergency warnings

Emergency Telecommunications (EMTEL) has been established by ETSI to produce, maintain and coordinate development of technical specifications and standards for emergency communications.[36]

EMTEL has released the technical specification, TS 102 182—version 1.2.1— *Emergency Communications (EMTEL); Requirements for communications from authorities/organisation to individuals, groups and general public during emergencies.* This technical specification identifies various methods that can be used to broadcast emergency messages to all members of the community using digital radio technology.

Voice break-in (VBI) services are generally used in road tunnels for re-broadcasting an emergency notification on AM and FM radio stations. VBI services are complex to implement in DAB systems in comparison to traditional AM and FM services. If VBI can be implemented within the DAB+ environment, it may also provide VBI captioning for the hearing impaired.

The EMTEL technical specification identifies DAB as a method for communicating emergency warnings from the emergency management agency to the public, but recommends current FM radio technologies because digital radio receivers were not common within European households when the specification was published in 2006. EMTEL is currently working on a new draft and it is anticipated DAB, DAB+, DRM30 and DRM+ will all be included as methods of delivering emergency notification to all members of the community.

In a presentation by the EMTEL chairman in June 2007, EMTEL acknowledged that no single technology will satisfy all services and performance expectations for notifying the general public of an emergency. Therefore, EMTEL recommended that a variety of communications technologies should be utilised to notify the public in an emergency situation, one of which is the established public broadcasting services such as television and AM/FM radio.

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[36] ETSI Emergency Telecommunications, viewed 11 August 2010, http://www.emtel.etsi.org/

Conclusion

DAB+ digital radio in Australia offers potential new features and applications for radio listeners who have sensory impaired abilities. NPR has demonstrated that captioned radio using HD Radio is able to provide access to a wider range of broadcasting content for people with a hearing impairment. With the ITU developing international standards for captioned radio using various digital radio broadcasting systems, including DAB+, the developments in captioned radio could allow for integration of accessibility features into future communications equipment standards.

Accessible design features have been demonstrated with HD Radio in the US and the European Community is taking a broader focus on ICT services. These technology developments and standardisation activities are important as they offer potential for people with sensory impairments to access a broader range of applications for their media and communications needs, extending beyond the current scope of regulated service specifications for captioning of television programs and standard telephone services.

The delivery of emergency warnings to the sensory impaired population is gaining momentum with NPR investigating alerting concepts using digital radio in the US. The DAB+ standard features the use of an emergency warning system, whereas the DRM radio receiver profile allows for added flexibility—the broadcast of emergency warning and alert features, textual content and service-following functions—which can offer critical information for sensory impaired and non-sensory impaired individuals.

The ACMA monitors developing services and applications as part of its statutory responsibilities advising on technology developments.

Abbreviations

ABC	Australian Broadcasting Corporation
ACMA	Australian Communications and Media Authority
AM	Amplitude Modulation
BBC	British Broadcasting Corporation
bps	Bits per second
CBAA	Community Broadcast Association of Australia
DAB	Digital Audio Broadcasting
DAB+	Digital Audio Broadcasting Plus
DMB	Digital Multimedia Broadcasting
DRM	Digital Radio Mondiale
DRM30	Digital Radio Mondiale 30
DRM+	Digital Radio Mondiale Plus
EMTEL	Emergency Telecommunications (within ETSI)
EN	European Standard (from the French *norme*)
ETSI	European Telecommunications Standards Institute
FM	Frequency modulation
IBOC	In-band on-channel
ICT	Information and communication technologies
ISDB	Integrated Services Digital Broadcasting
ISO	International Organization for Standardization
ITU	International Telecommunication Union
ITU-R	ITU Radiocommunication Sector
ITU-T	ITU Telecommunication Standardization Sector
MoU	Memorandum of understanding
NABA	North American Broadcasters Association
NPR	National Public Radio (United States of America)
RNIB	Royal National Institute of Blind (United Kingdom)
RPH	Radio for the Printed Handicapped
TS	Technical Specification (ETSI)
VBI	Voice break-in

Glossary

Assistive technologies
Assistive technologies are processes that can be associated with a device for use by older members of the community or by people with some form of disability. For example, people with motor impairments may use a keyboard with large keys, or people with vision impairments may use computer software that provides a spoken description of an item on a computer screen.

Captions
Captions provide a real-time on-screen transcript of the spoken dialogue as well as any sound effects.

Digital Audio Broadcasting (DAB)
DAB is a digital radio broadcasting technology that has been adopted by several European countries, most notably the United Kingdom. DAB has the capacity to deliver audio, data, multimedia and Internet content to a digital radio receiver. DAB is designed to operate in VHF Band III (174–230 MHz) and L-Band (1452–1492 MHz) spectrum.

Digital Audio Broadcasting Plus (DAB+)
DAB+ is the upgraded version of the DAB standard that has been adopted in Australia. It uses an enhanced audio codec High Efficiency Advanced Audio Coding version 2 (HE-AAC v2), also known as AAC+. DAB+ receivers are backwards compatible with the DAB standard.

Digital Radio Mondiale (DRM)
DRM is a digital radio broadcasting technology that describes a number of different operating modes, broadly split into DRM30 and DRM+.

Digital Radio Mondiale 30 (DRM30)
DRM30 describes the modes of DRM that operates in the AM radio broadcasting bands below 30 MHz. DRM uses the AAC+ audio codec.

Digital Radio Mondiale Plus (DRM+)
DRM+ describes the modes of DRM that operates in the spectrum from 30 MHz to 174 MHz, centred on the FM broadcast band (VHF Band II). DRM+ uses the AAC+ audio codec.

HD Radio
HD Radio is a trademark for iBiquity's In-Band On-Channel (IBOC) proprietary digital radio technology. In 2002, the Federal Communications Commission selected IBOC as a method to transmit digital radio in conjunction with existing analogue radio.[37]

Journaline
Journaline is a teletext-based news information service specifically designed for low bit rate digital radio systems such as DAB, DAB+, DRM30 and DRM+. Journaline can deliver content such as news, sports, weather and captions to a digital radio receiver.

National Public Radio (NPR)
NPR is an organisation that operates community radio stations throughout the US. In January 2008, NPR Labs, an adjunct of NPR, began investigating the possibility of

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[37] See Federal Communications Commission FCC 02-286, viewed 11 August 2010,
http://www.fcc.gov/mb/audio/digital.html

implementing captioned radio for people with hearing impairments. NPR established the International Centre for Accessible Radio Technology (I-CART), which is a collaborative effort between NPR, Towson University and Harris Technology, to bring digital radio captioning to people with hearing impairments.[38]

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[38] International Centre for Accessible Radio Technology, viewed 11 August 2010, http://www.i-cart.net/

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